

INDIAN RIVER COUNTY



BOARD OF COUNTY COMMISSIONERS

Solid Waste Disposal District

**Phase 2 – Cell 3 Construction Class 1 Landfill –
Segment 3 Expansion**

Indian River County Bid No: 2024027

Prepared for



**INDIAN RIVER COUNTY
SOLID WASTE DISPOSAL DISTRICT**
1325 74th Avenue SW
Vero Beach, Florida 32968

PROJECT SPECIFICATIONS

PHASE 2 – CELL 3 CONSTRUCTION CLASS I LANDFILL – SEGMENT 3 EXPANSION

**Indian River County Landfill Facility
Vero Beach, Florida**

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

1200 Riverplace Boulevard
Suite 710
Jacksonville, Florida 32207

Project No.: FL9363A

November 2023

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1. INTRODUCTION

These specifications were prepared to define the material, products, systems and services that will be used during construction of Phase 2 – Cell 3 Construction of the Class I Landfill Segment 3 Expansion at the Indian River County Landfill (IRCL) facility located in Vero Beach, Indian River County, Florida. Each specification is prepared consistent with the Construction Specification Institute (CSI) *MasterFormat* 1995 Edition, which includes the following three parts:

- *Part 1: General.* This part provides general information regarding the description of the work/product, submittal requirements, and construction quality control provisions.
- *Part 2: Product.* This part provides specific information regarding the product/service including composition of the material, mechanical properties of the product, handling and shipping requirements, and protection of the product prior to installation.
- *Part 3: Execution.* This part provides specific information regarding the execution of the service, installation of the product, testing of the installed product and acceptance criteria for the installation.

2. REFERENCES

The Technical Specifications include references to test procedures of the American Society for Testing and Materials (ASTM), American Association of State Highways and Transportation Officials (AASHTO), and the Geosynthetic Institute (GSI).

**DIVISION 0:
BIDDING AND CONTRACT
REQUIREMENTS**

SECTION 00020
ADVERTISEMENT FOR BIDS
INDIAN RIVER COUNTY

The Indian River County (IRC) Board of County Commissioners is accepting sealed bids until **2 P.M on December, 20, 2023.** Each bid shall be submitted in a sealed envelope and shall bear the name and address of the bidder and “**Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion**”, **Bid Number 2024027** on the outside. Bids should be addressed to Purchasing Division, Room B1-301, 1800 27th Street, Vero Beach, Florida 32960. All bids will be opened publicly and read aloud at 2:00 P.M. All bids received after 2:00 P.M., on the day specified above, will not be accepted or considered.

Project Description:

Construction of the Segment 3 Cell 3 Landfill Expansion Project at the Indian River County Solid Waste Disposal District Landfill at 1325 74th Ave. SW, Vero Beach, FL 32968. The overall scope of the Project includes construction of Cell 3 liner system and appurtenant structures as indicated on the Construction Drawings. Details include: Mobilization/Demobilization, Construction of Cell 3 double liner system, including anchor trench and temporary intercell berm/rain flap, and placement of liner protective layer soils to the grades shown on the Construction Drawings; Construction of the leachate collection system (LCS) and leak detection system (LDS), leachate transfer system and appurtenant structures; Establishment of erosion and sediment control structures; and Construction of other features of the Cell 3 – Segment 3 Expansion of the Class I Landfill in accordance with the Construction Drawings, Technical Specifications, Construction Quality Assurance (CQA) Plan, or as directed by the Owner or the Engineer.

All material and equipment furnished and all work performed shall be in strict accordance with the plans, specifications, and contract documents; which may be obtained at: www.demandstar.com or at https://indianriver.gov/services/management_budget/purchasing/index.php under “Current Solicitations”. All communications as to this bid shall be directed to **IRC Purchasing Division at purchasing@indianriver.gov.**

All bidders shall submit one (1) original and one (1) copy of the Bid Proposal forms provided within the specifications. Bid Security must accompany each Bid, and must be in the form of an AIA Document A310 Bid Bond, properly executed by the Bidder and by a qualified surety, or a certified check or a cashier’s check, drawn on any bank authorized to do business in the State of Florida. Bid security must be in the sum of not less than Five Percent (5%) of the total amount of the bid, made payable to Indian River County Board of County Commissioners. In the event the Contract is awarded to the Bidder, Bidder will enter into a Contract with the County and furnish the required 100% Public Construction Bond and certificates of insurance within the timeframe set by the County. If Bidder fails to do so, the Bid Security shall be retained by the County as liquidated damages and not as penalty.

County reserves the right to delay awarding of the Contract for ninety (90) days after the bid opening, to waive informalities in any bid, or reject any or all bids in whole or in part with or without cause/or to accept the bid that, in its judgment, will serve the best interest of Indian River County, Florida. The County will not reimburse any Bidder for bid preparation costs.

A MANDATORY Pre-Bid Conference will be held on November 29, 2023 at 11:00 AM EST at the Indian River County Solid Waste Disposal District office, 1325 74th Ave SW, Vero Beach, FL 32968. ATTENDANCE AT THIS CONFERENCE BY ALL BIDDERS IS **REQUIRED**. No bidder arriving after the meeting has begun will be allowed to sign in.

INDIAN RIVER COUNTY
PURCHASING MANAGER

For Publication in the Indian River Press Journal:
November 19, 2023

Please furnish tear sheet and Affidavit of Publication to:

INDIAN RIVER COUNTY PURCHASING DIVISION
1800 27th Street
Vero Beach, Florida 32960

SECTION 00100

INSTRUCTIONS TO BIDDERS

(Based Upon EJCDC No. C-700(Rev. 1), 2013 Ed.)

1.01 DEFINED TERMS

Terms used in these Instructions to Bidders which are defined in the Standard General Conditions of the Construction Contract (No. C-700(Rev. 1), 2013 ed.) have the meanings assigned to them in the General Conditions. The term "Bidder" means one who submits a bid directly to Owner, as distinct from a sub-bidder, who submits a bid to a Bidder. The term "Successful Bidder" means the lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as hereinafter provided) makes an award. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, The Bid Form, Disclosure of Relationships Statement, General Information Regarding Bidder, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.02 COPIES OF BIDDING DOCUMENTS

- A. Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office.
- B. Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- C. Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids on the work and do not confer a license or grant for any other use of the Bidding Documents.

1.03 QUALIFICATIONS OF BIDDERS

To demonstrate qualifications to perform the work, each Bidder must be prepared to submit, within 5 days of Owner's request, written evidence, such as financial data, previous experience, present commitments, and other such data as may be necessary to prove to the satisfaction of the Owner that the Bidder is qualified by experience to do the work and is prepared to complete the work within the stated time period.

Bidder must be registered with and use, at their sole expense, the Department of Homeland Security's E-Verify system (www.e-verify.gov) to confirm the employment eligibility of all newly hired employees, as required by Section 448.095, F.S.. Owner, contractor, and subcontractors may not enter into a contract unless each party to the contract registers with and uses the E-Verify system. Contractor is responsible for obtaining an affidavit from all subcontractors, as required in Section 448.095(5)(b), F.S., stating the subcontractor does not employ, contract with, or subcontract with an unauthorized alien.. This requirement applies to any provider of services or goods.

1.04 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

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

B. Reference is made to the Supplementary Conditions for identification of:

1. Those reports of explorations and tests of subsurface conditions at the site which have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such reports, but not upon non-technical data, interpretations, or opinions contained therein or for the completeness thereof the purposes of bidding or construction.

To obtain access to the site, the following shall be contacted: Purchasing Division, purchasing@indianriver.gov or (772) 226-1416. The site is located in Vero Beach, Indian River County as shown on the plans.

2. Those drawings of physical conditions in relation to existing surface and subsurface conditions (except underground facilities) which are at or contiguous to the site have been utilized by Engineer in preparation of the Contract Documents. Bidder may rely upon the accuracy of the technical data contained in such drawings, but not upon the completeness thereof for the purposes of bidding or construction. Copies of such reports and drawings will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which Bidder is entitled to rely as provided in Paragraphs 1.04.B1 and 1.04.B2 are incorporated therein by reference. Such technical data has been identified and established in the Supplementary Conditions.

C. Information and data reflected in the Contract Documents with respect to underground facilities at or contiguous to the site is based upon information and data furnished to Owner and Engineer by owners of such underground facilities or others, and Owner does not assume responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.

D. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders on subsurface conditions, underground facilities and other physical conditions, and possible changes in the Contract Documents due to differing conditions appear in Paragraphs 4.02, 4.03, and 4.04 of the General Conditions.

- E. Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies, and obtain any additional information and data which pertain to the physical conditions (surface, subsurface and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the work and which Bidder deems necessary to determine its Bid for performing and furnishing the work in accordance with the time, price and other terms and conditions of the Contract Documents.
- F. On request in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. Bidder shall fill all holes, clean up, and restore the site to its former condition upon completion of such explorations.
- G. The lands upon which the work is to be performed, right-of-way and easements for access thereto and other lands designed for use by the Contractor in performing the work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by and paid for by the Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by the Owner unless otherwise provided in the Contract Documents.
- H. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this the Instruction to Bidder, that without exception the Bid is premised upon performing and furnishing the work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the work.

1.05 INTERPRETATIONS AND ADDENDA

- A. CONE OF SILENCE. Potential bidders and their agents shall not communicate in any way with the Board of County Commissioners, County Administrator or any County or Solid Waste Disposal District staff other than Purchasing personnel in reference or relation to this solicitation. This restriction shall be effective from the time of bid advertisement until the Board of County Commissioners meets to authorize award. Such communication may result in disqualification.
- B. All questions about the meaning or intent of the Bidding Documents are to be submitted to PURCHASING (purchasing@indianriver.gov) in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties through the Issuing Office as having received the Bidding Documents. Questions received less than ten 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.

- C. Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

1.06 BID SECURITY

- A. Each Bid must be accompanied by Bid Security made payable to OWNER in the amount of five percent of the Bidder's maximum base bid price and in the form of a certified check; cashier's check; or an AIA Document A310 Bid Bond issued by a surety meeting the requirements of Paragraph 5.01 of the General Conditions. The Bid Bond shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. The Surety must be authorized to issue surety bonds in Florida. The Bidder shall require the attorney-in-fact who executes any Bond, to affix to each a current certified copy of their Power of Attorney, reflecting such person's authority as Power of Attorney in the State of Florida. Further, at the time of execution of the Contract, the Successful Bidder shall for all Bonds, provide a copy of the Surety's current valid Certificate of Authority issued by the United States Department of the Treasury under 31 United States Code sections 9304-9308. The Surety shall also meet the requirements of paragraphs 5.01 and 5.02 of the General Conditions.
- B. The Bid security of the 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. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be retained by the owner. The Bid Security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of seven days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid Security furnished by such Bidders will be returned.

Bid Security of other Bidders whom OWNER believes do not have a reasonable chance of receiving the award will be returned within seven days after the Bid opening.

1.07 CONTRACT TIME

The number of days within which, or dates by which, the work is to be substantially completed and also complete and ready for final payment (the Contract Time) are set forth in the Agreement (Section 00530).

1.08 LIQUIDATED DAMAGES

Provisions for liquidated damages are set forth in the Agreement (Section 00530).

1.09 SUBSTITUTE OR "OR EQUAL" ITEMS

The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or equal" item of material or equipment may be furnished or used by Contractor if acceptable to Engineer, application for such acceptance will not be considered by Engineer until after the Effective Date of the Agreement. The procedure for submission of any such application by Contractor and consideration by Engineer is set forth in Paragraph 6.05 of the General Conditions (Section 00700), may be supplemented in the General Requirements (Section 00800), and Substitutions and Product Options (Section 01630).

1.10 PREPARATION OF BIDS

- A. The Bid form is included with the Bidding Documents. Only the bid form provided by OWNER is acceptable (Bidders are not to recreate the bid form). ***Bids not submitted on the bid form(s) shall be rejected, as will bids submitted on rewritten, recreated or modified bid forms.***
- B. All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item, and unit price item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.
- C. A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer 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 below the signature.
- D. 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 below the signature.
- E. 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 must be shown below the signature.
- F. A Bid by an individual shall show the Bidder's name and official address.
- G. A Bid by a joint venture shall be executed by each joint venturor in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.
- H. All names shall be typed or printed in ink below the signatures.

- I. The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.
- J. The address and telephone number for communications regarding the Bid shall be shown.
- K. The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number or county registration number for the state or county of the Project, if any, shall also be shown on the Bid form.
- L. All supporting information requested in the Bid Form must be furnished. Do not leave any questions or requests unanswered.
- M. CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to perform additional work not covered on the Contract Drawings. The **FORCE ACCOUNT** is intended as a contingency for unforeseen work. Lump sum amount for **FORCE ACCOUNT** work will be calculated by the ENGINEER after receipt of bids. The value of force account work will be determined in accordance with Article 12 of the General Conditions.
- N. Unit Price Bid: Bidders shall submit a Bid on a unit price basis for each item of Work listed in the bid schedule. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

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. Discrepancies between words and figures will be resolved in favor of the words.

The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 11.02 of the General Conditions. The Bidder's attention is called to the fact that any estimate of quantities of work to be done and materials to be furnished under the Specifications as shown on the Bid Schedule, or elsewhere, is approximate only and not guaranteed. The OWNER does not assume any responsibility that the final quantities shall remain in strict accordance with the estimated quantities, nor shall the Bidder plead misunderstanding or deception because of such estimate of quantities or of the character, location of the work, or other conditions pertaining thereto.

1.11 SUBMISSION OF BIDS

A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project Title and Bid Number (and, if applicable, the designated portion of the Project for which the Bid is submitted), Bid Number, the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If mail or other delivery system sends a Bid, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to Indian River County, Purchasing Division, 1800 27th Street, B1-301, Vero Beach, Florida, 32960. The Bid form is to be completed and submitted with the Bid Security and the following forms:

- A. Sworn Statement under Section 105.08, Indian River County Code, on Disclosure of Relationships.
- B. Sworn Statement under the Florida Trench Safety Act.
- C. Qualifications Questionnaire.
- D. List of Subcontractors.
- E. Certification Regarding Prohibition Against Contracting with Scrutinized Companies

1.12 MODIFICATION AND WITHDRAWAL OF BIDS

- A. Bids may be modified or withdrawn by an appropriate document duly executed (in the manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.
- B. If, within 48 hours after Bids are opened, any Bidder files a duly signed, written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the Work.

1.13 OPENING OF BIDS

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.

1.14 BIDS TO REMAIN SUBJECT OF ACCEPTANCE

All bids will remain subject to acceptance for ninety days after the day of the Bid opening, but the Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of that period.

1.15 AWARD OF CONTRACT

OWNER reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER may also reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder. OWNER also reserves the right to waive all technicalities and informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder. The County will not reimburse any Bidder for bid preparation costs. Owner reserves the right to cancel the award of any Contract at any time before the execution of such Contract by all parties without any liability to the Owner. For and in consideration of the Owner considering Bids submitted, the Bidder, by submitting its Bid, expressly waives any claim to damages, of any kind whatsoever, in the event the Owner exercises its right to cancel the award in accordance herewith.

- A. 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. In evaluating Bids, Owner will consider the qualifications of the Bidder, 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.
- B. Owner may consider the qualifications and experience of subcontractors, suppliers, and other persons and organizations proposed for those portions of the work as to which the identity of subcontractors, suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Owner may consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the work when such data is required to be submitted prior to the Notice to Award.
- C. Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and establish the responsibility, qualifications, and financial ability of Bidders, proposed subcontractors, suppliers, and other persons and organizations to perform and furnish the work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.
- D. If the Contract is to be awarded, it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of the Owner.
- E. More than one Bid for the same Work from an individual, firm, partnership, corporation, or association under the same or different names will not be considered. Reasonable grounds for believing that one Bidder has any interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all proposals in which such Bidders are believed to be interested. Any or all proposals will be rejected if there is reason to believe that collusion exists among the Bidders, and no participants in such collusion will be considered in future proposals for the same work.

- F. OWNER has no local ordinance or preferences, as set forth in FS 255.0991 (2) in place, therefore no preference prohibited by that section will be considered in the acceptance, review or award of this bid.
- G. Any actual or prospective bidder or proposer who is aggrieved in connection with the bidding and/or selection process may protest to the OWNER's Purchasing Manager. The protest shall be submitted in writing to the Purchasing Manager within five (5) calendar days after the bidder or proposer knows or should have known of the facts giving rise to the protest.
- H. CONTRACTOR certifies that it and its related entities as defined by Florida law are not on the Scrutinized Companies that Boycott Israel List, created pursuant to s. 215.4725 of the Florida Statutes, and are not engaged in a boycott of Israel. In addition, if this agreement is for goods or services of one million dollars or more, CONTRACTOR certifies that it and its related entities as defined above by Florida law are not on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to Section 215.473 of the Florida Statutes and are not engaged in business operations in Cuba or Syria. OWNER may terminate this Contract if CONTRACTOR is found to have submitted a false certification as provided under section 287.135(5), Florida Statutes, been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or been engaged in business operations in Cuba or Syria, as defined by section 287.135, Florida Statutes.

OWNER may terminate this Contract if CONTRACTOR, including all wholly owned subsidiaries, majority-owned subsidiaries, and parent companies, that exist for the purpose of making profit, is found to have been placed on the Scrutinized Companies that Boycott Israel List or is engaged in a boycott of Israel as set forth in section 215.4725, Florida Statutes.

Accordingly, firms responding to this solicitation shall return with their response an executed copy of the attached "Certification Regarding Prohibition Against Contracting with Scrutinized Companies." Failure to return this executed form with submitted bid/proposal/statement of qualifications will result in the response being deemed non-responsive and eliminated from consideration.

- I. Per section 287.05701, Florida Statutes, as amended, OWNER may not request documentation of, or consider a Bidder's social, political, or ideological interests when determining if the Bidder is responsible, and may not give preference to a Bidder based on the Bidder's social, political, or ideological interests.
- J. When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within fifteen (15) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached

documents to OWNER. OWNER shall return one fully signed counterpart to Successful Bidder.

Should Bidder to whom the Contract has been awarded refuse or fail to complete the requirements of Paragraph J above, the additional time in calendar days, required to correctly complete the documents will be deducted, in equal amount, from the Contract time. Or, the OWNER may elect to revoke the Award and the OWNER shall hold the Bid Bond for consequential damages incurred, and the Contract may be awarded as the OWNER desires.

1.16 PUBLIC CONSTRUCTION BOND

Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to Public Construction Bond and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by the required insurance certificate(s) and Bond, unless the Bond has been waived due to the total contract being less than \$100,000.

1.17 PUBLIC DISCLOSURE STATEMENT

Any entity submitting a bid or proposal or entering into a contract with the County shall disclose any relationship that may exist between the contracting entity and a County Commissioner or a County Employee. The relationship with a County Commissioner or a County Employee that must be disclosed is as follows: father, mother, son, daughter, brother, sister, uncle, aunt, first cousin, nephew, niece, husband, wife, father-in-law, mother-in-law, daughter-in-law, son-in-law, brother-in-law, sister-in-law, stepfather, stepmother, stepson, stepdaughter, stepbrother, stepsister, half-brother, half-sister, grandparent, or grandchild. The term "affiliate" includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of the entity. The disclosure of relationships shall be a sworn statement made on a County approved form. Failure to submit the form may be cause for rejection of the bid or proposal.

1.18 FLORIDA PRODUCED LUMBER

The selected Bidder as Contractor agrees to comply with the provisions of Section 255.20, Florida Statutes, as such statute may be amended from time to time, wherein Indian River County as Owner must specify lumber, timber and other forest products produced and manufactured in Florida whenever such products are available and their price, fitness and quality are equal.

1.19 TRENCH SAFETY

Florida Statutes Section 553.60 through 553.64, known as the "Trench Safety Act" requires all contractors engaged by Indian River County, Florida to comply with Occupational Safety and Health Administration's excavation safety standard, found in 29 C.F.R. s. 1926.650 Subpart P. All prospective subcontractors are required to sign a

Trench Safety Act Compliance Statement and provide compliance cost information where indicated. The costs for complying with the Trench Safety Act must be incorporated into the Bid.

1.20 PUBLIC ENTITY CRIME STATEMENT

Pursuant to Florida Statutes Section 287.133(2)(a), all Bidders are hereby notified that a person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity (defined as the State of Florida, any of its departments or agencies, or any political subdivision); may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity in excess of the threshold amount provided in Florida Statutes Section 287.017 for CATEGORY TWO [currently \$35,000] for a period of 36 months from the date of being placed on the convicted vendor list. A "public entity crime" means a violation of any state or federal law by a person with respect to and directly related to the transaction of business with any public entity or with an agency or political subdivision of any other state or with the United States, including, but not limited to, any bid, proposal, reply, or contract for goods or services, any lease for real property, or any contract for the construction or repair of a public building or public work, involving antitrust, fraud, theft, bribery, collusion, racketeering, conspiracy, or material misrepresentation.

1.21 PERMITS, IMPACT, AND INSPECTION FEES.

In accordance with Florida Statutes Section 218.80, the "Public Bid Disclosure Act", Indian River County as OWNER is obligated to disclose all license, permit, impact, or inspection fees that are payable to Indian River County in connection with the construction of the Work by the accepted bidder. ALL PERMIT, IMPACT, OR INSPECTION FEES PAYABLE TO INDIAN RIVER COUNTY IN CONNECTION WITH THE WORK ON THIS COUNTY PROJECT WILL BE PAID BY INDIAN RIVER COUNTY, WITH THE EXCEPTION OF RE-INSPECTION FEES AS SET FORTH IN THE CONTRACT. The bidder shall not include ANY PERMIT, IMPACT, OR INSPECTION FEES payable to Indian River County in the bid.

*** END OF SECTION ***

SECTION 00300
BID PACKAGE CONTENTS

THIS PACKAGE CONTAINS:

<u>SECTION TITLE</u>	<u>SECTION NUMBER</u>
Bid Form	00310
Bid Bond	00430
Sworn Statement on Disclosure of Relationships	00452
Sworn Statement Under the Florida Trench Safety Act	00454
Qualifications Questionnaire	00456
List of Subcontractors	00458
Certification Regarding Prohibition Against Contracting with Scrutinized Companies	00460

SUBMIT ONE (1) ORIGINAL AND ONE (1) COPY OF THIS COMPLETE PACKAGE WITH YOUR BID

**** END OF SECTION ****

SECTION 00310

BID FORM

PROJECT IDENTIFICATION:

Project Name: **INDIAN RIVER COUNTY BID NO.**
2024027
PHASE 2 – CELL 3 CONSTRUCTION
CLASS 1 LANDFILL – SEGMENT 3
EXPANSION

Project Address: **1325 74th Ave SW, Vero Beach, FL 32968**

Project Description: CONTRACTOR shall complete all work as specified or indicated in the Contract Documents. The work is generally described as follows which shall include, but is not necessarily limited to the following:

1. Clearing, grubbing, and/or stripping the construction area if necessary and as directed by the Engineer or Owner;
2. Use of appropriate dust control measures during earthwork operations;
3. Construction of access ramp road into for Cell 3;
4. Furnish materials for general/structural fill that meets the Technical Specifications, placement and compaction to the subbase grades shown on the Construction Drawings;
5. Cleaning of the Segment 3 Cell 2 liner system geomembrane for tie-in (extrusion welding or double-track fusion welding as appropriate) to the Cell 3 – Segment 3 Expansion geomembrane liners;
6. Proofrolling of compacted fill or prepared liner subbase surface;
7. Construction of Cell 3 – Segment 3 Expansion double liner system, including anchor trench and temporary intercell berm/rain flap;
8. Construction of leachate detection, leachate collection, and leachate transfer systems for Cell 3 – Segment 3 Expansion;
9. Construction of LCS manhole and LDS pump station and associated electrical and mechanical features;
10. Construction of Liner penetration boxes;
11. Construction of erosion and sediment control structures (including silt check dams, straw bale barriers in perimeter ditches, and silt fence) as necessary to facilitate construction and minimize erosion during storm events;

12. Clearing, grubbing, excavation, backfilling, compaction, grading, and proofrolling necessary to facilitate construction of previously mentioned components of Phase 2 of Cell 3 – Segment 3 Expansion.

THIS BID IS SUBMITTED TO:

INDIAN RIVER COUNTY
1800 27th Street
VERO BEACH, FLORIDA 32960

1.01 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.

2.01 Bidder accepts all of the terms and conditions of the Advertisement or Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, 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 all which is hereby acknowledged.

<u>Addendum Date</u>	<u>Addendum Number</u>
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder 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. 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 at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazardous Environmental Condition, if any, which have been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done 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.

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

4.01 Bidder further represents that 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; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

[The remainder of page intentionally left blank]

Item No.	Work Description/Item	Units	Estimated Quantity (Note VI)	Unit Cost (\$)		Total Cost (\$)
				Material	Labor	
General Site Preparation						
1	Mobilization and Demobilization (not-to-exceed 5% of total bid) (Note I)	LS	1	\$	\$	\$
2	Surveying & As-Built Drawings (Note II)	LS	1	\$	\$	\$
Subtotal Site Preparation =						\$
Earthwork (Includes Grading and In-place Compaction Note III)						
3	General and Structural Fill					
	A. Intercell Separation Berm	cyd	1,200	\$	\$	\$
	B. Temporary Intercell Berm with Rain Flap	cyd	1,700	\$	\$	\$
	C. Site Grading of Top of Liner Subbase (2 inch) Prior to Geosynthetics Installation	cyd	3,000	\$	\$	\$
Subtotal Earthwork =						\$
Cell 3 Liner System (Note IV)						
4	24-in. Liner Protective Layer with Grading and Compaction	cyd	36,000	\$	\$	\$
5	Primary Geocomposite Drainage Layer	sq ft	499,500	\$	\$	\$
6	Primary 60 mil Textured HDPE Geomembrane	sq ft	499,500	\$	\$	\$
7	Secondary Geocomposite Drainage Layer	sq ft	499,500	\$	\$	\$
8	Secondary 60 mil Textured HDPE Geomembrane	sq ft	499,500	\$	\$	\$
9	Geosynthetic Clay Liner	sq ft	499,500	\$	\$	\$
10	Electrical Leak Location Survey	LS	1	\$	\$	\$
11	Liner System Tie-in (Extrusion Weld/Double-track Fusion Weld)	LF	1,300	\$	\$	\$
12	Geomembrane Rainflap					
	A. Geomembrane Rainflap	sq ft	37,100	\$	\$	\$
	B. Extrusion Weld - Geomembrane Sacrificial Rainflap to Primary HDPE Geomembrane	LF	800	\$	\$	\$
13	Anchor Trench	LF	800	\$	\$	\$
Subtotal Cell 3 Liner System =						\$
Leachate Collection & Detection System						
14	LCS Corridor					
	A. Granular Drainage Material (AASHTO No. 57)	cyd	1,000	\$	\$	\$
	B. Geotextile Filter/Cushion with 2-in. overlap and sewn at seam	sq yd	900	\$	\$	\$
15	LDS Additional Geonet Drainage Layer in Corridor	sq yd	1,920	\$	\$	\$
16	LDS Granular Drainage Material (AASHTO No. 4)	cyd	80	\$	\$	\$
17	10-in. Dia. SDR 17 Solid HDPE Carrier Pipe (Leachate Collection + Leachate Detection + Leachate Gravity Line + Horizontal Direction Drill)	LF	510	\$	\$	\$
18	12-in. Dia. SDR 21 Solid HDPE Containment Pipe (Leachate Collection + Leachate Detection + Leachate Gravity Line + Horizontal Direction Drill)	LF	510	\$	\$	\$
19	10-in. Dia. SDR 17 LDS Perforated Pipe & Fittings	LF	350	\$	\$	\$
20	10-in. Dia. SDR 17 LCS Perforated Pipe & Fittings	LF	1,300	\$	\$	\$
21	Toe Drain (Note VII.)			\$	\$	\$
	A. 6-in Dia. SDR 17 Perforated HDPE Pipe	LF	1,260	\$	\$	\$
	B. Granular Drainage Material (AASHTO No. 57)	cyd	200	\$	\$	\$
	C. Geotextile Filter/Cushion with 2-in. overlap and sewn at seam	sq yd	1,560	\$	\$	\$
22	Jet Cleaning and Video Inspection of LCS and LDS	LS	1	\$	\$	\$
23	Trenches with Unpaved Easements	LF	300	\$	\$	\$
24	Excavation, Grading, and Compaction for Sump	LS	1	\$	\$	\$
25	10-in. Dia. Perforated Leachate Detection Manifold	each	1	\$	\$	\$

INDIAN RIVER COUNTY LANDFILL PHASE 2 - CELL 3 - SEGMENT 3 EXPANSION (11.5 AC.) BID FORM

Item No.	Work Description/Item	Units	Estimated Quantity (Note VI)	Unit Cost (\$)		Total Cost (\$)
				Material	Labor	
26	LCS Cleanout					
	A. 10-in. Dia. Solid SDR-17 LCS Cleanout Pipe with Gasket, Secure Boot and all other Fittings	LF	20	\$	\$	\$
	B. Fabric Formed Riprap	sq yd	10	\$	\$	\$
27	10-in. Dia. Solid SDR-17 LDS Cleanout Pipe with Gasket, Secure Boot and all other	LF	130	\$	\$	\$
28	LCS & LDS Cleanout Cap and fittings	each	3	\$	\$	\$
29	WYE Fittings for Cleanout	each	1	\$	\$	\$
30	Wall Sleeve with Mechanical Seal	each	12	\$	\$	\$
31	Liner Penetration Box	each	2	\$	\$	\$
32	Valve and Box with Box Pad	each	1	\$	\$	\$
33	Concrete Slab for Control Panel	each	1	\$	\$	\$
34	Electrical, Control Panel, Grounding & Lightning Protection (Note V)	LS	1	\$	\$	\$
35	LDS Pump Station Sump Pump	each	1	\$	\$	\$
36	LCS Manhole	each	1	\$	\$	\$
37	Reinforcements around openings	LS	1	\$	\$	\$
38	Liner Markers (Post- 4"x4"x8')	each	2	\$	\$	\$
39	Bollard Post with Encasement	each	5	\$	\$	\$
40	Limit of Waste Markers	each	6	\$	\$	\$
41	Marker Tape	LF	800	\$	\$	\$
42	Post Mounted Pipe Support	each	2	\$	\$	\$
43	8-Ft. Aluminium Sign Post with 2-Ft. Dia. Concrete Footing	each	1	\$	\$	\$
44	24-in. x 20-in. Warning Sign	each	1	\$	\$	\$
45	Sandbags	each	200	\$	\$	\$
46	Rain Tarp (Dura Skirm 12 BV or approved equivalent) with Ropes & Ties	sq ft	334,000	\$	\$	\$
Subtotal Leachate Collection Sump =						\$
Drainage Ditch, Access Road and Entrance Road						
47	Regrading	LF	100	\$	\$	\$
48	Access Roads and Ramps					
	A. RCA - Provided by the Client (Labor Only)	cyd	150	\$	\$	\$
	B. Stabilizer Material	cyd	100	\$	\$	\$
49	24-in. by 36-in. RCP Elliptical Culvert	LF	130	\$	\$	\$
Subtotal Drainage Ditch & Access Road =						\$
Miscellaneous						
50	Erosion and Sediment Controls	LS	1	\$	\$	\$
51	Site Restoration including Vegetation	LS	1	\$	\$	\$
Total Miscellaneous =						\$
TOTAL =						\$

- I. Mobilization/Demobilization (Item 1) shall include any partial demobilization required for all components of construction specified herein and in the Construction Drawings and Technical Specifications.
- II. The survey activities (Item 2) shall include surveying of existing conditions prior to construction, as-built surveys, liner protective, leachate collection system, a final survey and any surveying needed throughout the duration of the project.
- III. Earthwork quantities are in-place compacted quantities. Earthwork pay items include all cost to haul, place, compact, and grade general/structural fill. Existing conditions represent top of liner subbase resulting from Phase I Site Preparation construction project. For bidding purposes assume 2 inches of fill material will be placed. Payment will be based on actual quantity placed based on initial and final as-built survey of top of liner subbase.
- IV. All geosynthetic quantities provided are installation quantities for bid estimate purposes. Material supply quantities shall be based on installed panels and layout, surveyed by the Owner's surveyor and approved by the Engineer. Supply quantities shall include waste, slope, anchor trench, overlap, and any other adjustment factors necessary to supply all material to complete the work. Install pay quantities will be based on actual square footage verified by 3rd party survey.
- V. Includes all material, equipment and labor required to install pumps, piping, meters, valves, and other components/instrumentation at the leachate collection and detection systems and sumps.
- VI. Quantities presented herein are estimated quantities and should be verified by Contractor. If quantities are found to be significantly different, Contractor shall notify Construction Manager. Quantities not provided shall be estimated and verified by Contractor. Payment shall be made on surveyed and calculated quantities in accordance with the Technical Specifications.
- VII. Toe drain is currently pending permit modification approval by FDEP.

5.01 Bidder shall complete the Work in accordance with the Contract Documents for the price(s) contained in the Bid Schedule:

- A. The 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. Discrepancies between words and figures will be resolved in favor of the words.
- B. The Owner reserves the right to omit or add to the construction of any portion or portions of the work heretofore enumerated or shown on the plans. Furthermore, the Owner reserves the right to omit in its entirety any one or more items of the Contract without forfeiture of Contract or claims for loss of anticipated profits or any claims by the Contractor on account of such omissions.
- C. 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 provided. The quantities actually required to complete the contract and work may be less or more than so estimated, and, if so, no action for damages or for loss of profits shall accrue to the Contractor by reason thereof.
- D. Unit Prices have been computed in accordance with paragraph 11.03.B of the General Conditions.

6.01 Bidder agrees that the Work will be substantially completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified, which shall be stated in the Agreement.

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

- A. Itemized Bid Schedule;
- B. Required Bid security in the form of _____;
- C. Sworn Statement under Section 105.08, Indian River Code, on Disclosure of Relationships;
- D. Sworn Statement Under the Florida Trench Safety Act;
- E. Qualifications Questionnaire;
- F. List of Subcontractors;
- G. Certification Regarding Prohibition Against Contracting with Scrutinized Companies

8.01 The terms used in this Bid with initial capital letters have the meanings indicated in the

Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SUBMITTED on _____, 20__.

State Contractor License No. _____

If Bidder is:

An Individual

Name (typed or printed): _____

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

Doing business as: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email: _____

A Partnership

Partnership Name: _____ (SEAL)

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

Name (typed or printed): _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email: _____

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 _____
(Signature of Corporate Secretary)

Business address: _____

Phone No.: _____ FAX No.: _____

Email: _____

Date of Qualification to do business is _____.

A Joint Venture

Joint Venture Name: _____ (SEAL)

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

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email: _____

Joint Venture Name: _____ (SEAL)

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

Name (typed or printed): _____

Title: _____

Business address: _____

Phone No.: _____ FAX No.: _____

Email: _____

Phone and FAX Number, and Address for receipt of official communications:

(Each joint venturor 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.)

**** END OF SECTION ****

SECTION 00430 – Bid Bond

AIA DOCUMENT A310 BID BOND

The Contractor shall use the document form entitled “AIA Document A310 Bid Bond.”

END OF SECTION

SECTION 00452 – Sworn Statement on Disclosure of Relationships

**SWORN STATEMENT UNDER SECTION 105.08, INDIAN RIVER COUNTY CODE,
ON DISCLOSURE OF RELATIONSHIPS**

THIS FORM MUST BE SIGNED IN THE PRESENCE OF A NOTARY PUBLIC OR OTHER OFFICER AUTHORIZED TO ADMINISTER OATHS.

1. This sworn statement MUST be submitted with Bid, Proposal or Contract No. 2024027

for INDIAN RIVER COUNTY PHASE 2 – CELL 3 CONSTRUCTION CLASS 1 LANDFILL – SEGMENT 3

EXPANSION

2. This sworn statement is submitted by: _____

(Name of entity submitting Statement)

whose business address is:

3. My name is _____

(Please print name of individual signing)

and my relationship to the entity named above is _____

4. I understand that an “affiliate” as defined in Section 105.08, Indian River County Code, means:

The term “affiliate” includes those officers, directors, executives, partners, shareholders, employees, members, and agents who are active in the management of the entity.

5. I understand that the relationship with a County Commissioner or County employee that must be disclosed as follows:

Father, mother, son, daughter, brother, sister, uncle, aunt, first cousin, nephew, niece, husband, wife, father-in-law, mother-in-law, daughter-in-law, son-in-law, brother-in-law, sister-in-law, stepfather, stepmother, stepson, stepdaughter, stepbrother, stepsister, half brother, half sister, grandparent, or grandchild.

6. Based on information and belief, the statement, which I have marked below, is true in relation to the entity submitting this sworn statement. [Please indicate which statement applies.]

Neither the entity submitting this sworn statement, nor any officers, directors, executives, partners, shareholders, employees, members, or agents who are active in management of the entity, have any

relationships as defined in section 105.08, Indian River County Code, with any County Commissioner or County employee.

The entity submitting this sworn statement, or one or more of the officers, directors, executives, partners, shareholders, employees, members, or agents, who are active in management of the entity have the following relationships with a County Commissioner or County employee:

Name of Affiliate or entity	Name of County Commissioner or employee	Relationship

(Signature)

(Date)

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____ 20____, by _____
_____ (name of person making statement).

(Signature of Notary Public - State of Florida)
(Print, Type, or Stamp Commissioned Name of Notary Public)

who is personally known to me or who has produced _____ as identification.

SECTION 00454 – Sworn Statement Under the Florida Trench Safety Act

THIS FORM MUST BE SIGNED BY THE BIDDER WHO WILL BE RESPONSIBLE FOR THE EXCAVATION WORK ("BIDDER"), OR ITS AUTHORIZED REPRESENTATIVE, IN THE PRESENCE OF A NOTARY PUBLIC AUTHORIZED TO ADMINISTER OATHS.

1. This Sworn Statement is submitted with Bid 2024027 for **INDIAN RIVER COUNTY PHASE 2 – CELL 3 CONSTRUCTION CLASS 1 LANDFILL – SEGMENT 3 EXPANSION**
2. This Sworn Statement is submitted by _____
(Legal Name of Entity Submitting Sworn Statement)
_____, hereinafter
“BIDDER”. The BIDDER’s address is _____

BIDDER’s Federal Employer Identification Number (FEIN) is _____.
3. My name is _____ and my relationship to the BIDDER
(Print Name of Individual Signing)
is _____.
(Position or Title)

I certify, through my signature at the end of this Sworn Statement, that I am an authorized representative of the BIDDER.

4. The Trench Safety Standards that will be in effect during the construction of this Project are contained within the Trench Safety Act, Section 553.60 et.seq. Florida Statutes and refer to the applicable Florida Statute(s) and/or OSHA Regulation(s) and include the “effective date” in the citation(s). Reference to and compliance with the applicable Florida Statute(s) and OSHA Regulation(s) is the complete and sole responsibility of the BIDDER. Such reference will not be checked by OWNER or ENGINEER and they shall have no responsibility to review or check the BIDDER’s compliance with the Trench Safety Standards.
5. The BIDDER assures the OWNER that it will comply with the applicable Trench Safety Standards.
6. The BIDDER has allocated and included in its bid the total amount of \$_____, based on the linear feet of trench to be excavated over five (5) feet deep, for compliance with the applicable Trench Safety Standards, and intends to comply with said standards by instituting the following specific method(s) of compliance on this Project: _____

_____.

The determination of the appropriate method(s) of compliance is the complete and sole responsibility of the BIDDER. Such methods will not be checked by the OWNER or ENGINEER for accuracy, completeness, or any other purpose. The OWNER and ENGINEER shall have no responsibility to review or check the BIDDER’s compliance with the Trench Safety Standards.

7. The BIDDER has allocated and included in its bid the total amount of \$_____ based on the square feet of shoring to be used for compliance with shoring safety requirements and intends to comply with said shoring requirements by instituting the following specific method(s) of compliance on this Project: _____

The determination of the appropriate method(s) of compliance is the complete and sole responsibility of the BIDDER. Such methods will not be checked by the OWNER or ENGINEER for accuracy, completeness or any other purpose. The OWNER and ENGINEER shall have no responsibility to review or check the BIDDER's compliance with the Trench Safety Standards.

- 8. The BIDDER, in submitting this bid, represents that it has obtained and considered all available geotechnical information, has utilized said geotechnical information and that, based on such information and the BIDDER's own information, the BIDDER has sufficient knowledge of the Project's surface and subsurface site conditions and characteristics to assure BIDDER's compliance with the applicable Trench Safety Standards in designing the trench safety system(s) for the Project.

BIDDER: _____

By: _____

Position or Title: _____

Date: _____

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this ____ day of _____ 20____, by _____
(name of person making statement).

(Signature of Notary Public - State of Florida)

(Print, Type, or Stamp Commissioned Name of Notary Public)

who is personally known to me or who has produced
_____ as identification.

**** END OF SECTION ****

SECTION 00456 – QUALIFICATIONS QUESTIONNAIRE

NOTICE: THE OWNER RETAINS THE DISCRETION TO REJECT THE BIDS OF NON-RESPONSIBLE BIDDERS.

Documentation Submitted with Bid No: 2024027

Project Name: INDIAN RIVER COUNTY PHASE 2 – CELL 3 CONSTRUCTION CLASS 1 LANDFILL – SEGMENT 3 EXPANSION

1. Bidder's Name / Address: _____

2. Bidder's Telephone & FAX Numbers: _____

3. Licensing and Corporate Status:
 - a. Is Contractor License current? _____
 - b. Bidder's Contractor License No: _____
[Attach a copy of Contractor's License to the bid]
 - c. Attach documentation from the State of Florida Division of Corporations that indicates the business entity's status is active and that lists the names and titles of all officers.
4. Number of years the firm has performed business as a Contractor in construction work of the type involved in this contract: _____
5. What is the last project OF THIS NATURE that the firm has completed?

6. Has the firm ever failed to complete work awarded to you? _____

[If your answer is "yes", then attach a separate page to this questionnaire that explains the circumstances and list the project name, Owner, and the Owner's telephone number for each project in which the firm failed to complete the work.]
7. Has the firm ever been assessed liquidated damages? _____

[If your answer is "yes", then attach a separate page to this questionnaire that explains the circumstances and list the project name, Owner, and the Owner's telephone number for each project in which liquidated damages have been assessed.]
8. Has the firm ever been charged by OSHA for violating any OSHA regulations? _____

[If your answer is "yes", then attach a separate page to this questionnaire that explains the circumstances and list the project name, Owner, and the Owner's telephone number for each project in which OSHA violations were alleged.]
9. Has the firm implemented a drug-free workplace program in compliance with Florida Statute 287.087? _____

(In the case of a tie, preference will be given to businesses with drug-free workplace programs)

10. Has the firm ever been charged with noncompliance of any public policy or rules?

[If your answer is “yes”, then attach a separate page to this questionnaire that explains the circumstances and list the project name, Owner, and the Owner’s telephone number for each project.]

11. Attach to this questionnaire, a notarized financial statement and other information that documents the firm’s financial strength and history.

12. Has the firm ever defaulted on any of its projects? _____

[If your answer is “yes”, then attach a separate page to this questionnaire that explains the circumstances and list the project name, Owner, and the Owner’s telephone number for each project in which a default occurred.]

13. Attach a separate page to this questionnaire that summarizes the firm’s current workload and that demonstrates its ability to meet the project schedule.

14. Name of person who inspected the site of the proposed work for the firm:

Name: _____ Date of Inspections: _____

15. Name of on-site Project Foreman: _____

Number of years of experience with similar projects as a Project Foreman: _____

16. Name of Project Manager: _____

Number of years of experience with similar projects as a Project Manager: _____

17. State your total bonding capacity: _____

18. State your bonding capacity per job: _____

19. Please provide name, address, telephone number, and contact person of your bonding company:

[The remainder of this page was left blank intentionally]

19. Complete the following table for SIMILAR projects:

Name of Project	Date Completed	Owner	Contact Person: Name/ Email Address/Phone	Original Contract Amount	Final Contract Amount

SECTION 00458 – List of Subcontractors

The Bidder **MUST** list below the name and address of each Subcontractor who will perform work under this Contract in excess of one-half percent of the total bid price and shall also list the portion of the work which will be done by such Subcontractor. After the opening of Bids, additions, changes or substitutions will not be allowed unless approved by Indian River County after a request for such a change has been submitted in writing by the Contractor, which shall include reasons for such request. Subcontractors must be properly licensed and hold a valid Certificate of Competency.

Documentation Submitted with Bid No. 2024027 for INDIAN RIVER COUNTY PHASE 2 – CELL 3 CONSTRUCTION CLASS 1 LANDFILL – SEGMENT 3 EXPANSION

	Work to be Performed	Subcontractor's Name/Address	Portion of Work (%)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			

Note: Attach additional sheets if required.

**** END OF SECTION ****

SECTION 00460 – CERTIFICATION REGARDING PROHIBITION AGAINST CONTRACTING WITH SCRUTINIZED COMPANIES

I hereby certify that neither the undersigned entity, nor any of its wholly owned subsidiaries, majority-owned subsidiaries, parent companies, or affiliates of such entities or business associations, that exists for the purpose of making profit have been placed on the Scrutinized Companies that Boycott Israel List created pursuant to s. 215.4725 of the Florida Statutes, or are engaged in a boycott of Israel.

In addition, if this solicitation is for a contract for goods or services of one million dollars or more, I hereby certify that neither the undersigned entity, nor any of its wholly owned subsidiaries, majority-owned subsidiaries, parent companies, or affiliates of such entities or business associations, that exists for the purpose of making profit are on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, created pursuant to s. 215.473 of the Florida Statutes, or are engaged in business operations in Cuba or Syria as defined in said statute.

I understand and agree that the County may immediately terminate any contract resulting from this solicitation upon written notice if the undersigned entity (or any of those related entities of respondent as defined above by Florida law) are found to have submitted a false certification or any of the following occur with respect to the company or a related entity: (i) it has been placed on the Scrutinized Companies that Boycott Israel List, or is engaged in a boycott of Israel, or (ii) for any contract for goods or services of one million dollars or more, it has been placed on the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or it is found to have been engaged in business operations in Cuba or Syria.

Name of Respondent: _____

By: _____
(Authorized Signature)

Title: _____

Date: _____

**SECTION 00530 – EJCDC STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR ON THE BASIS OF A STIPULATED PRICE**

THIS AGREEMENT (“Agreement” or “Contract”) dated the _____ day of _____
_____ in the year 20__ by and between Indian River County Solid Waste Disposal District, a
dependent special district of Indian River County, which is a political subdivision in the State of
Florida (hereinafter called OWNER) and _____. (Hereinafter called
CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth,
agree as follows:

ARTICLE 1 WORK

CONTRACTOR as an independent contractor and not as an employee shall furnish
and complete all of the necessary labor, material, and equipment to perform the
work as specified or indicated in the Contract Documents. The work is generally
described as follows:

1. Clearing, grubbing, and/or stripping the construction area as directed by the
Engineer or Owner;
2. Use of appropriate dust control measures during earthwork operations;
3. Construction of access ramp for Cell 3 construction;
4. Furnish materials for general/structural fill that meets the Technical
Specifications, placement and compaction to the subgrade grades shown on the
Construction Drawings;
5. Cleaning of the Segment 3 final cover geomembrane or liner system
geomembrane for tie-in (extrusion welding or double-track fusion welding as
appropriate) to the Cell 3 – Segment 3 Expansion geomembrane liners;
6. Proofrolling of compacted fill or prepared subgrade surface prior to placement of
the liner subbase;
7. Construction of Cell 3 – Segment 3 Expansion double liner system, including
anchor trench and temporary intercell berm/rain flap;
8. Construction of leachate detection, leachate collection, and leachate transfer
systems for Cell 3 – Segment 3 Expansion;
9. Construction of LCS manhole and LDS pump station;

10. Construction of Liner penetration boxes;
11. Construction of erosion and sediment control structures (including silt check dams, straw bale barriers in perimeter ditches, and silt fence) as necessary to facilitate construction and minimize erosion during storm events;
12. Clearing, grubbing, excavation, backfilling, compaction, grading, and proofrolling necessary to facilitate construction of previously mentioned components of Phase 2 of Cell 3 – Segment 3 Expansion.

ARTICLE 2 ENGINEER

The project has been designed by Geosyntec Consultants, Inc., hereinafter called ENGINEER, and who 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 completion of the work in accordance with the Contract Documents.

ARTICLE 3 CONTRACT TIME

3.1 The CONTRACTOR shall be substantially completed with the following timeframe

- (a) Within 30 calendar days from effective date of Notice to Proceed, Contractor shall complete the following tasks:
 1. Obtain all necessary permits.
 2. Receive approved shop drawings for all materials and equipment to be utilized in the job.
 3. Perform all photographic recording and documentation of conditions prior to construction.
 4. Locate all existing utilities in the area of work.
 5. Submit and secure approval of shop drawings.
 6. Mobilize all labor, equipment, and materials.
 7. Deliver and store all equipment and materials to the job site.
 8. Notify all utilities and other affected parties prior to initiating construction.
- (b) From 30 calendar days to 90 calendar days from the effective date of Notice to Proceed, the CONTRACTOR shall complete the following tasks:
 1. Substantially complete the Work described in these Contract Documents.
 2. Correct all deficiencies noted by Engineer.

Completion of all tasks outlined above (i.e., Subparagraphs a) and b) constitutes Substantial Completion.

- (b) From 90 calendar days to 120 calendar days from the effective date of Notice to

Proceed, the CONTRACTOR shall complete the following tasks:

1. Clean up project area.
2. Remove all equipment and material from project site.
3. Perform contract closeout procedures.

3.2 Completion of all tasks outlined above (i.e., Subparagraphs a, b, and c) constitute Final Completion.

3.3 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the work is not completed within the times specified in Paragraphs 3.1 and 3.2 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal proceeding the actual loss suffered by OWNER if the work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER four-hundred and fifty dollars (\$450.00) for each day that expires after the time specified in Paragraph 3.1 for 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 four-hundred and fifty dollars (\$450.00) for each day that expires after the time specified in Paragraph 3.2 for completion and readiness for final payment.

3.3.1 The CONTRACTOR and OWNER agree that OWNER is authorized to deduct all or any portion of the above-stated liquidated damages due to the Owner from payments due to the Contractor; or, in the alternative, all or any portion of the above-stated liquidated damages may be collected from the Contractor or its Surety or Sureties. These provisions for liquidated damages shall not prevent the OWNER, in case of the CONTRACTOR's default, from terminating the Contractor's right to proceed as provided in this AGREEMENT.

3.3.2 In addition to the above-stated liquidated damages, the CONTRACTOR shall be responsible for reimbursing OWNER to third party consultants in administering the Project beyond the Substantial Completion date specified in this Agreement, or beyond an approved extension of time granted to CONTRACTOR, whichever date is later.

ARTICLE 4 CONTRACT PRICE

4.1 OWNER shall pay CONTRACTOR for completion of the work in accordance with the Contract Documents in current funds in the amount of \$ _____

ARTICLE 5 PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions and the Contract Documents.

5.1 Progress Payments.

A. The OWNER shall make progress payments to the CONTRACTOR on the basis of the approved partial payment request as recommended by ENGINEER in accordance with the provisions of the Local Government Prompt Payment Act, Florida Statutes section 218.70 et. seq. The OWNER shall retain five percent (5%) of the payment amounts due to the CONTRACTOR until substantial completion of all work to be performed by CONTRACTOR under the Contract Documents.

B. For construction projects less than \$10 million, at the time the OWNER is in receipt of the Certificate of Substantial Completion, the OWNER shall have 30 calendar days to provide a list to the CONTRACTOR of items to be completed and the estimated cost to complete each item on the list. OWNER and CONTRACTOR agree that the CONTRACTOR'S itemized bid shall serve as the basis for determining the cost of each item on the list. For projects in excess of \$10 million, OWNER shall have up to 45 calendar days following receipt of Certificate of Substantial Completion of the project to provide CONTRACTOR with said list.

C. Payment of Retainage - Within 20 business days following the creation of the list, OWNER shall pay CONTRACTOR the remaining contract balance including all retainage previously withheld by OWNER except for an amount equal to 150% of the estimated cost to complete all of the items on the list. Upon completion of all items on the list, the CONTRACTOR may submit a payment request for the amount of the 150% retainage held by the OWNER. If a good faith dispute exists as to whether one or more of the items have been finished, the OWNER may continue to withhold the 150% of the total cost to complete such items. The OWNER shall provide CONTRACTOR written reasons for disputing completion of the list.

5.2 Pay Requests. Each request for a progress payment shall be submitted on the application for payment form supplied by OWNER and the application for payment shall contain the CONTRACTOR's certification. All progress payments will be on the basis of progress of the work measured by the schedule of values established, or in the case of unit price work based on the number of units completed.

5.3 Paragraphs 5.1 and 5.2 do not apply to construction services work purchased by the County as OWNER which are paid for, in whole or in part, with federal funds and are subject to federal grantor laws and regulations or requirements that are contrary to any provision of the Local Government Prompt Payment Act. In such event, payment and retainage provisions shall be governed by the applicable grant requirements and guidelines.

5.4 ACCEPTANCE AND FINAL PAYMENT: Upon receipt of written notice that the work is ready for final inspection and acceptance, the ENGINEER will promptly make such inspection and when the ENGINEER finds the work acceptable under the terms of the Contract and the Contract fully performed, the ENGINEER will promptly issue a final

completion certificate stating that the work provided for in this Contract has been completed, and acceptance by the OWNER under the terms and the conditions thereof is recommended and the entire balance found to be due the CONTRACTOR, will be paid to the CONTRACTOR by the OWNER following County Commission approval of the final Contract payment.

- 5.5 Acceptance of Final Payment as Release. The acceptance by the CONTRACTOR of final payment shall be and shall operate as a release to the OWNER from all claims and all liability to the CONTRACTOR other than claims in stated amounts as may be specifically excepted by the CONTRACTOR for all things done or furnished in connection with the work under this Contract and for every act and neglect of the OWNER and others relating to or arising out of the work. Any payment, however, final or otherwise, shall not release the CONTRACTOR or its sureties from any obligations under the Contract Documents or the Payment and Performance Bonds.

ARTICLE 6 INTEREST

Not Applicable.

ARTICLE 7 CONTRACTOR'S REPRESENTATIONS

In order to induce OWNER to enter into this Agreement, CONTRACTOR makes the following representations:

- 7.1 CONTRACTOR has familiarized itself with the nature and extent of the Contract Documents, work, site, locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance or furnishing of the work.
- 7.2 CONTRACTOR has studied carefully all reports of explorations and tests of subsurface conditions and drawings of physical conditions which are identified in the Supplementary Conditions as provided in Paragraph 4.02 of the General Conditions, and accepts the determination set forth in Paragraph SC-4.02 of the Supplementary Conditions of the extent of the technical data contained in such reports and drawings upon which CONTRACTOR is entitled to rely.
- 7.3 CONTRACTOR has obtained and carefully studied (or assumes responsibility for obtaining and carefully studying) all such examinations, investigations, explorations, tests, reports and studies (in addition to or to supplement those referred to in Paragraph 7.2 above) which pertain to the subsurface or physical conditions at or contiguous to the site or otherwise may affect the cost, progress, performance or furnishing of the work as CONTRACTOR considers necessary for the performance of furnishing of the work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.02 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports, studies or similar information or data are or will be required by CONTRACTOR for such purposes.

- 7.4 CONTRACTOR has reviewed and checked all information and data shown or indicated on the Contract Documents with respect to existing underground facilities at or contiguous to the site and assumes responsibility for the accurate location of said underground facilities. No additional examinations, investigations, explorations, tests, reports, studies or similar information or data in respect of said underground facilities are or will be required by CONTRACTOR in order to perform and furnish the work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of Paragraph 4.04 of the General Conditions.
- 7.5 CONTRACTOR has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.
- 7.6 CONTRACTOR has given ENGINEER written notice of all conflicts, errors or discrepancies that he has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.
- 7.7 The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.
- 7.8 CONTRACTOR is registered with and will use the Department of un Security's E-Verify system (www.e-verify.gov) to confirm the employment eligibility of all newly hired employees for the duration of this agreement, as required by Section 448.095, F.S. CONTRACTOR is also responsible for obtaining an affidavit from all subcontractors, as required in Section 448.095(5)(b), F.S., stating the subcontractor does not employ, contract with, or subcontract with an unauthorized alien.

ARTICLE 8 CONTRACT DOCUMENTS.

The Contract Documents which comprise the entire agreement between OWNER and CONTRACTOR concerning the work consist of the following:

- 8.1 This Agreement (Section 00530).
- 8.2 Public Construction Bond (Section 00610).
- 8.3 Notice of Award and Notice to Proceed (examples in Section 00800).
- 8.4 General Conditions (Section 00700).
- 8.5 Supplementary Conditions (Section 00800).
- 8.6 Specifications bearing the title **"Phase 2 - Cell 3 Construction Class 1 Landfill - Segment 3 Expansion"** as listed in the table of contents hereof.
- 8.7 Drawings, inclusive with each sheet bearing the following general title **"Phase 2 - Cell 3 Construction Class 1 Landfill - Segment 3 Expansion."**
- 8.8 Addenda numbers _____ to _____, inclusive.
- 8.9 CONTRACTOR'S Bid (Section 00300).

- 8.10 The following, which may be delivered or issued after the effective date of the Agreement and are not attached hereto: All written amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to Paragraphs 3.04 of the General Conditions.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified or supplemented as provided in Paragraphs 3.04 of the General Conditions.

ARTICLE 9 MISCELLANEOUS

- 9.1 Terms used in this Agreement which are defined in Article 1 of the General Conditions will have the meanings indicated in the General Conditions.

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.

- 9.2 OWNER and CONTRACTOR each bind itself, its partners, successors, assigns and legal representatives to the other party hereto, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

- 9.3 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.

- 9.4 The CONTRACTOR shall be properly licensed to practice its trade or trades which are involved in the completion of this Agreement and the work thereunder.

- 9.5 This Agreement shall be governed by the laws of the State of Florida. Venue for any lawsuit brought by either party against the other party or otherwise arising out of this agreement shall be in Indian River County, Florida, or, in the event of federal jurisdiction, in the United States District Court for the Southern District of Florida.

- 9.6 CONTRACTOR shall indemnify OWNER, ENGINEER, and others in accordance with paragraph 6.20 (Indemnification) of the General Conditions to the Construction Contract.

- 9.7 Pledge of Credit. The CONTRACTOR shall not pledge the OWNER'S credit or make it a guarantor of payment or surety for any Agreement, debt, obligation, judgment, lien or

any form of indebtedness. The CONTRACTOR further warrants and represents that it has no obligation of indebtedness that would impair its ability to fulfill the terms of this Agreement.

9.8. Counterparts. This Agreement may be executed in one or more counterparts, but all such counterparts, when duly executed, shall constitute one and the same Agreement.

9.9. Indian River County is a public agency subject to Chapter 119, Florida Statutes. The CONTRACTOR shall comply with Florida's Public Records Law. Specifically, the CONTRACTOR shall:

- (1) Keep and maintain public records required by the County to perform the service.
- (2) Upon request from the County's Custodian of Public Records, provide the County with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119 or as otherwise provided by law.
- (3) Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the contractor does not transfer the records to the County.
- (4) Upon completion of the contract, transfer, at no cost, to the County all public records in possession of the CONTRACTOR or keep and maintain public records required by the County to perform the service. If the CONTRACTOR transfers all public records to the County upon completion of the contract, the CONTRACTOR shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the CONTRACTOR keeps and maintains public records upon completion of the contract, the CONTRACTOR shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the County, upon request from the Custodian of Public Records, in a format that is compatible with the information technology systems of the County.

(5) IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

**(772) 226-1424
publicrecords@indianriver.gov
Indian River County Office of the County Attorney
1801 27th Street
Vero Beach, FL 32960**

6. Failure of the Contractor to comply with these requirements shall be a material breach of this Agreement.

IN WITNESS WHEREOF, OWNER AND CONTRACTOR have signed this Agreement the day and year first written above.

OWNER

CONTRACTOR

Indian River County
Board of County Commissioners

By: _____
TBD, Chairman

By: _____
(CORPORATE SEAL)

Attest: _____

Attest: Ryan L. Butler, Clerk of the Circuit Court

Address for giving notices

By: _____
Deputy Clerk

Approved By:

License No. _____

John A. Titkanich, Jr., County Administrator

Approved as to Form and Legal Sufficiency:

William K. DeBaal, County Attorney

Address for giving notices

1801 27th Street _____

Vero Beach, Florida 32960 _____

END OF SECTION

SECTION 00610

INSTRUCTION FOR PUBLIC CONSTRUCTION BOND

The front or cover page to the required public construction payment and performance bond shall contain the information required by Fla. Stat. 255.05(1)(a) and be substantially in the format shown on the first page following this instruction.

The Public Construction Bond shall be in the form suggested by Fla. Stat. 255.05(3) as shown on the second page following this instruction.

A Power of Attorney from a surety insurer authorized to do business in Florida, authorizing the signature of the Attorney in Fact who executes the Public Construction Bond shall accompany that Bond.

**Public Work
F.S. Chapter 255.05 (1)(a)
Cover Page**

THIS BOND IS GIVEN TO COMPLY WITH SECTION 255.05 OR SECTION 713.23 FLORIDA STATUTES, AND ANY ACTION INSTITUTED BY A CLAIMANT UNDER THIS BOND FOR PAYMENT MUST BE IN ACCORDANCE WITH THE NOTICE AND TIME LIMITATION PROVISIONS IN SECTION 255.05(2) OR SECTION 713.23 FLORIDA STATUTES.

BOND NO: _____

CONTRACTOR NAME: _____

CONTRACTOR ADDRESS: _____

CONTRACTOR PHONE NO: _____

SURETY COMPANY NAME: _____

**SURETY PRINCIPAL
BUSINESS ADDRESS:** _____

SURETY PHONE NO: _____

OWNER NAME: _____

OWNER ADDRESS: _____

OWNER PHONE NO: _____

OBLIGEE NAME: _____
(If contracting entity is different from the owner, the contracting public entity)

OBLIGEE ADDRESS: _____

OBLIGEE PHONE NO: _____

BOND AMOUNT: _____

CONTRACT NO: _____
(If applicable)

DESCRIPTION OF WORK: _____

PROJECT LOCATION: _____

LEGAL DESCRIPTION: _____
(If applicable)

FRONT PAGE

All other bond page(s) are deemed subsequent to this page regardless of any page number(s) that may be printed thereon.

PUBLIC CONSTRUCTION BOND

Bond No. _____
(enter bond number)

BY THIS BOND, We _____ as Principal and _____, a corporation, as Surety, are bound to Indian River County, herein called Owner, in the sum of \$ _____, for payment of which we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally.

THE CONDITION OF THIS BOND is that if Principal:

1. Performs the contract dated _____, _____, between Principal and Owner for construction of **Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion** the contract being made a part of this bond by reference, at the times and in the manner prescribed in the contract: and
2. Promptly makes payments to all claimants, as defined in Section [255.05](#)(1), Florida Statutes, supplying Principal with labor, materials, or supplies, used directly or indirectly by Principal in the prosecution of the work provided for in the contract; and
3. Pays Owner all losses, damages, expenses, costs, and attorney's fees, including appellate proceedings, that Owner sustains because of a default by Principal under the contract; and
4. Performs the guarantee of all work and materials furnished under the contract for the time specified in the contract, then this bond is void; otherwise, it remains in full force.
5. Any action instituted by a claimant under this bond for payment must be in accordance with the notice and time limitation provisions in Section [255.05](#)(2), Florida Statutes.
6. Any changes in or under the contract documents and compliance or noncompliance with any formalities connected with the contract or the changes does not affect Surety's obligation under this bond.

DATED ON _____, _____

(Name of Principal)

By _____
(As Attorney in Fact)

(Name of Surety)

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.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by



Issued and Published Jointly by



Endorsed by



These General Conditions have been prepared for use with the Agreement Between Owner and Contractor for Construction Contract (EJCDC® C-520, Stipulated Sum, or C-525, Cost-Plus, 2013 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC's Guide to the Preparation of Supplementary Conditions (EJCDC® C-800, 2013 Edition). The full EJCDC Construction series of documents is discussed in the Commentary on the 2013 EJCDC Construction Documents (EJCDC® C-001, 2013 Edition).

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American Council of Engineering Companies
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www.acec.org

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

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

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. (“CERCLA”); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. (“RCRA”); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.
13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .
15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
17. *Cost of the Work*—See Paragraph 13.01 for definition.
18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
20. *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 does not change the Contract Price or the Contract Times.
22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.
23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.
26. *Notice of Award*—The written notice by Owner to a Bidder of Owner’s acceptance of the Bid.
27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
29. *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.
30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.
31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.
32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or “RPR” includes any assistants or field staff of Resident Project Representative.
33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals and the performance of related construction activities.
35. *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.
36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.
38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
39. *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.
40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.
42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
44. *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 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.
45. *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 but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
46. *Unit Price Work*—Work to be paid for on the basis of unit prices.
47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in the following paragraphs 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 authority to undertake responsibility contrary to the provisions of Article 10 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
 - 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 15.03 or 15.04).
- 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. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. *Bonds*: 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.
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.
- C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

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

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 2. a preliminary Schedule of Submittals; and

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

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

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

2.05 *Initial Acceptance of Schedules*

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

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.
- B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

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

3.03 *Reporting and Resolving Discrepancies*

- A. *Reporting Discrepancies:*
 - 1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

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

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

- A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.
- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

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

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

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

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. 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.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.
- C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. 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. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:
1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;
 2. abnormal weather conditions;
 3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and
 4. acts of war or terrorism.
- D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.
- E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.
- F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

- G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *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.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*
 - 1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 - 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris 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 and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading of Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and
 - 3. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; 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.

5.04 *Differing Subsurface or Physical Conditions*

- A. *Notice by Contractor:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site 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 5.03 is materially inaccurate; or
 2. is of such a nature as to require a change in the Drawings or Specifications; 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;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

- B. *Engineer's Review:* After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- C. *Owner's Statement to Contractor Regarding Site Condition:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.
- D. *Possible Price and Times Adjustments:*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

- c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or
 - b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice as required by Paragraph 5.04.A.
3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent 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 Supplementary Conditions:
 1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; 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 information and data regarding existing Underground Facilities at the Site;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;
 - c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 - d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

- C. *Engineer's Review:* Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Possible Price and Times Adjustments:*
 - 1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - c. 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; and
 - d. Contractor gave the notice required in Paragraph 5.05.B.
 - 2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.
 - 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

- A. *Reports and Drawings*: The Supplementary Conditions identify:
1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
 2. Technical Data contained in such reports and drawings.
- B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; 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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.
- H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.
- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. 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 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.
- B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.
- C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.
- D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then 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 bond and surety requirements above.
- E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.
- F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

- D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.
- E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.
- H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.
- I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.
- J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

- A. *Workers' Compensation:* Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.
 - 2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).
 - 3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).
- B. *Commercial General Liability—Claims Covered:* Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:
1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.
 2. claims for damages insured by reasonably available personal injury liability coverage.
 3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.
- C. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:
1. Products and completed operations coverage:
 - a. Such insurance shall be maintained for three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
 2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
 3. Broad form property damage coverage.
 4. Severability of interest.
 5. Underground, explosion, and collapse coverage.
 6. Personal injury coverage.
 7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.
 8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.
- D. *Automobile liability:* Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.
- E. *Umbrella or excess liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.
- F. *Contractor's pollution liability insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

- G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.
- H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.
- I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:
 - 1. include at least the specific coverages provided in this Article.
 - 2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.
 - 3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.
 - 4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.
 - 5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, 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.
- J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, 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.
- B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
 - 1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."
 - 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, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; 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 Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.
 - 3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.
 - 4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).
 6. extend to cover damage or loss to insured property while in transit.
 7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
 8. allow for the waiver of the insurer's subrogation rights, as set forth below.
 9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.
 10. not include a co-insurance clause.
 11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.
 12. include performance/hot testing and start-up.
 13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.
- B. *Notice of Cancellation or Change:* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.
- C. *Deductibles:* The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.
- D. *Partial Occupancy or Use by Owner:* If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.
- E. *Additional Insurance:* If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.
- F. *Insurance of Other Property:* If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

- A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, 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 insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. 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 or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:
 - 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; 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 occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.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, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.
- D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

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

- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 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. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 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, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 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, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work 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.

- 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.

7.04 "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 Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, 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;
 - 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) it has a proven record of performance and availability of responsive service; and
 - 4) it is not objectionable to Owner.
 - b. Contractor certifies 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.
- B. *Contractor's Expense:* Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

- D. *Effect of Engineer's Determination:* Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.
- E. *Treatment as a Substitution Request:* If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

- A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.
 - 1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.
 - 2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.
 - 3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - a. shall certify that the proposed substitute item will:
 - 1) perform adequately the functions and achieve the results called for by the general design,
 - 2) be similar in substance to that specified, and
 - 3) be suited to the same use as that specified.
 - b. will state:
 - 1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,
 - 2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and
 - 3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.
 - c. will identify:
 - 1) all variations of the proposed substitute item from that specified, and

- 2) available engineering, sales, maintenance, repair, and replacement services.
 - d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.
- B. *Engineer's Evaluation and Determination:* Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.
 - C. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
 - D. *Reimbursement of Engineer's Cost:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
 - E. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute at Contractor's expense.
 - F. *Effect of Engineer's Determination:* If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.
- B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

- E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.
- F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.
- H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be 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.
- J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.
- K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.
- L. 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.
- M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.
- N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. 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 money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *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. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *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 necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

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

7.10 *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 or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

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

7.12 *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, other work in progress, 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 Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
 - C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
 - 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 7.12.A.2 or 7.12.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 at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
 - F. Contractor's duties and responsibilities for safety and protection 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 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).
 - G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *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.

7.14 *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.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent 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.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements:*

1. Before submitting a Shop Drawing or Sample, Contractor shall have:
 - a. reviewed and coordinated the 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 and equipment 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 of that submittal, and that Contractor approves the 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 set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Contractor shall submit the number of copies required in the Specifications.
- 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 show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples:*
 - a. Contractor shall submit the number of Samples required in the Specifications.
 - b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.
 3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.
- C. *Other Submittals:* Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.
- D. *Engineer's Review:*
1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, 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 or to safety precautions or programs incident thereto.
 3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
 4. Engineer's review and approval of a Shop Drawing or Sample 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 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.
 5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.
 6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.
 7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

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.
2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.
3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 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 that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 1. observations by Engineer;
 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 4. use or occupancy of the Work or any part thereof by Owner;
 5. any review and approval of a Shop Drawing or Sample submittal;
 6. the issuance of a notice of acceptability by Engineer;
 7. any inspection, test, or approval by others; or
 8. any correction of defective Work by Owner.

- D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A 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, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *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. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.
- 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, Owner and Engineer will specify all performance and design criteria 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, and other submittals prepared by such professional. 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 that such services must satisfy.
- D. Pursuant to this paragraph, 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 7.16.D.1.
- E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.
- D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, 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.

8.02 *Coordination*

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

8.03 *Legal Relationships*

- A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.
- C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

- D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

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

9.03 *Furnish Data*

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

9.04 *Pay When Due*

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

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

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

9.06 *Insurance*

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

9.07 *Change Orders*

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

9.08 *Inspections, Tests, and Approvals*

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

9.09 *Limitations on Owner's Responsibilities*

- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

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

9.11 *Evidence of Financial Arrangements*

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

9.12 *Safety Programs*

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

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. 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 Supplementary Conditions.

10.04 *Rejecting Defective Work*

- A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

- A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.
- B. 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, are set forth in Paragraph 7.19.
- C. Engineer's authority as to Change Orders is set forth in Article 11.
- D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

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

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

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

10.08 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, 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.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

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

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
 - 1. *Change Orders:*
 - a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.
 - b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.
 - 2. *Work Change Directives:* A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

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

11.02 *Owner-Authorized Changes in the Work*

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

11.03 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:
 1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or
 2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or
 3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

- C. *Contractor's Fee*: When applicable, 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 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.
- B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

- A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures:* Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.
 2. *Engineer's Action:* Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.
 3. *Binding Decision:* Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.
- B. *Resolution of Certain Change Proposals:* If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 Execution of Change Orders

- A. Owner and Contractor shall execute appropriate Change Orders covering:
1. 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;
 2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and
 4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

- A. *Claims Process:* The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:
 - 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 - 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and
 - 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.
- B. *Submittal of Claim:* The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.
- C. *Review and Resolution:* The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.
- D. *Mediation:*
 - 1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.
 - 2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.
- E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.
- F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.
- G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

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

13.01 Cost of the Work

- A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:
 1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or
 2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.
- B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work 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 13.01.C, 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, and 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 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 13.01.
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.
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 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses 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 communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded:* The term Cost of the Work 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, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
- 2. 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 Paragraph 13.01.B.

D. *Contractor's Fee:* When the Work as a whole 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, Change Proposal, Claim, set-off, or other 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 11.04.C.

E. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, 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.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

- B. *Cash Allowances*: Contractor agrees that:
 - 1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: 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.

13.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.
- E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

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

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction 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.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:
 - 1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
 - 2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
 - 3. by manufacturers of equipment furnished under the Contract Documents;
 - 4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
 - 5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

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

- E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.
- F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

- A. *Contractor's Obligation:* It is Contractor's obligation to assure that the Work is not defective.
- B. *Engineer's Authority:* Engineer has the authority to determine whether Work is defective, and to reject defective Work.
- C. *Notice of Defects:* Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.
- D. *Correction, or Removal and Replacement:* Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.
- E. *Preservation of Warranties:* When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.
- F. *Costs and Damages:* In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

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

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

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

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work 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.

14.07 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, 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, then 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 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

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

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments:*
1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.
 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 will be as stipulated in the Agreement.
- C. *Review of Applications:*
1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
 2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

- a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
 4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, 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 money 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 15.01.C.2.
 6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

- e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due:*

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

E. *Reductions in Payment by Owner:*

- 1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:
 - a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;
 - b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. the Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. the Contract Price has been reduced by Change Orders;
 - i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;
 - j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - l. there are other items entitling Owner to a set off against the amount recommended.
- 2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

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

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.
 - 2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
 - 4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

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

15.06 *Final Payment*

- A. *Application for Payment:*
 - 1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents;
 - b. consent of the surety, if any, to final payment;
 - c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
 - d. a list of all disputes that Contractor believes are unsettled; and
 - e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of 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 have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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 15.07. 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. *Completion of Work:* The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due:* Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

- A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.
- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the 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 Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such other adjacent areas;
 - 2. correct such defective Work;
 - 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 to 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. 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 repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).
- 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, 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 are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

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

16.02 *Owner May Terminate for Cause*

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

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

- F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.
- G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.
- B. Contractor shall not be paid on account of loss of anticipated overhead, profits, or revenue, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 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 are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

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

ARTICLE 18 – MISCELLANEOUS

18.01 *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, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or
 - 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

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

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

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

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

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

SECTION 00800

SUPPLEMENTARY CONDITIONS

*INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES
BOARD OF COMMISSIONERS
1801 27th Street, Vero Beach, Florida 32960*



SUPPLEMENTARY CONDITIONS
TO THE
GENERAL CONDITIONS

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SUPPLEMENTARY CONDITIONS

AMENDMENTS TO GENERAL CONDITIONS

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (EJCDC Document No. C-700, 2002 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

SC-1.01A.43.

Delete paragraph 1.01A.43. of the General Conditions in its entirety and replace with the following:

43. Specifications - Sections included under Division 1 through Division 2 of the Project Manual.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.01B.

Delete paragraph 2.01B of the General Conditions in its entirety and replace with the following:

B. Before any Work at the site is started, Contractor shall deliver to Owner, with copies to Engineer, certificates of insurance, which Contractor is required to purchase and maintain in accordance with the requirements of the Contract Documents.

SC 2.03A

Delete paragraph 2.03A of the General Conditions in its entirety, and replace with the following:

The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 60 days after the Effective Date of the Agreement.

SC 2.05A1 Add the following immediately at the end of subparagraph 2.05A1: using the Critical Path_Method (CPM).

SC 2.05A.4 Add new subparagraph 4 after the existing text of 2.05 of the General Conditions:

4. If this Project is an addition to an existing working plant, then the Contractor shall coordinate with the Owner on tie-ins. The Owner shall have final say on plant shut down times and duration to make tie-ins.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

SC-3.01C

Add a new paragraph immediately after Paragraph 3.01C of the General Conditions which is to read as follows:

D. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein.

SC3.03A.3 Delete existing 3.03A.3 of the General Conditions in its entirety and replace it with the following:

Contractor shall not be liable to Owner or Engineer for failure to report any such conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor knew or, in the exercise of ordinary care, reasonably should have recognized such conflict, error, ambiguity, or discrepancy and failed to report it in writing to the Owner and the Engineer.

SC 3.03B Delete existing 3.03B of the General Conditions in its entirety and replace it with the following

B. *Resolving Discrepancies.* Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall be read together as a whole not in isolation so as to give meaning to each provision; however, to the extent there is a conflict or inconsistency between or among provisions, the strictest or most stringent standard shall apply.

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

SC 4.01A Delete existing paragraph 4.01A of the General Conditions in its entirety and replace it with the following:

A. Owner shall furnish the site.

SC 4.01B Delete existing paragraph 4.01B of the General Conditions in its entirety.

SC 4.02A Delete 4.02 A.1 of the General Conditions in its entirety and replace it with the following:

A. *Reports and Drawings:* The Contract Documents may identify those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Contract Documents. Engineer has relied upon the data obtained from subsurface investigations made at the site in the form of test borings. Such data is in the form of boring logs, which are available upon request. The locations of the test borings are indicated on the Drawings. Such logs and samples are not part of the Contract Documents.

SC-4.02A.2.

Add the following new sentences immediately at the end of existing paragraph 4.02A.2. of the General Conditions which is to read as follows:

In the preparation of Drawings and Specifications, the Engineer has relied upon the reports and tests of subsurface physical conditions at the site. The foregoing information and data shown or indicated in the Contract Documents is based on information and data furnished to Owner or the Engineer by others. The Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data, and the Contractor shall have full responsibility for requesting, reviewing, and checking all such information and data.

Sc 4.03A Delete 4.03 A of the General Conditions in its entirety and replace it with the following:

A. *Notice.* The Contractor shall promptly, and before such conditions are disturbed, and in no event later than 10 days after first observance of the conditions, notify the Owner and Engineer in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this Contract, or (2) unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in this Contract. The Owner will promptly investigate the conditions, and if it finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the Work under this Contract, a Change Order shall be issued accordingly based on the Schedule of Values and executed by the Owner and the Contractor. Contractor's failure to provide notice upon discovery of the differing site condition shall waive any entitlement to such an adjustment in the

Contract Price or Contract Time. Further, no Claim of the Contractor under this paragraph 4.03A shall be allowed unless the Contractor has given the notice as required in this paragraph 4.03A.

SC 4.03C1 Delete subparagraph 4.03C1 of the General Conditions in its entirety.

SC 4.03-C.3: Delete the words: “arbitration or” in line 10 of paragraph 4.03-C.3 of the General Conditions.

SC-4.05A. Add the following new paragraph immediately after paragraph 4.05A. of the General Conditions to read as follows:

B. Engineer may check the lines, elevations, reference marks, batter boards, etc., set by Contractor, and Contractor shall correct any errors disclosed by such check. Such a check shall not be considered as approval of Contractor's work and shall not relieve Contractor of the responsibility for accurate construction of the entire Work. Contractor shall furnish personnel to assist Engineer in checking lines and grades.

SC 4.06D Delete the last sentence of paragraph 4.06D of the General Conditions in its entirety

SC 4.06G Delete paragraph 4.06G of the General Conditions in its entirety.

SC 4.07 Add the following new paragraph immediately after Paragraph 4.06I of the General Conditions.

SC 4.07 Archaeological or Resources at Site

SC4.07A If Archaeological or Historical Resources are revealed, uncovered or discovered at site, Contractor shall cease work immediately and solicit the services of an Archaeologist Registered with the Registry of Professional Archaeologists. Based on Archaeologist’s determination, Contractor shall then submit a Change Order in order to avoid resources or mitigate as required to proceed with project.

ARTICLE 5 - BONDS AND INSURANCE

SC 5.01A Replace the words “performance and payment bonds” with the words “Public Construction Bond.”; then add the following sentence immediately after the existing text in paragraph 5.01A of the General Conditions:

Pursuant to Florida Statutes section 255.05(1)(c) (2023), any claimant (as such term is defined in Florida Statutes section 713.01) may apply to Indian River County as Owner for copies of the Agreement and the recorded payment and performance bonds and shall thereupon be furnished with certified copies of such documents.

SC 5.03B Delete existing paragraph 5.03B of the General Conditions in its entirety.

SC 5.04B Delete existing paragraph 5.04B of the General Conditions in its entirety and replace with the following:

B. The Contractor shall not commence Work under the Agreement until it has obtained all insurance required under the Agreement and the Indian River County Risk Manager has approved such insurance. The Contractor shall procure and maintain, for the duration of the Agreement, the minimum insurance coverage as set forth herein. The cost of such insurance shall be included in the Contract Price

C. The insurance required by paragraph 5.04A of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers’ Compensation: To meet statutory limits in compliance with the Workers Compensation Law of Florida. This policy must include employers’ liability with a limit \$500,000 for each accident, \$500,000

disease policy limit and \$100,000 disease each employee. Such policy shall include a waiver of subrogation as against Owner on account of injury sustained by an employee(s) of the Contractor.

2. Commercial General Liability: A per occurrence form policy, including Premise Operations, Independent Contractors, Products and Completed Operations including X, C, U (Explosion, Collapse, Underground) Broad Form Property Damage, Broad Form Property Damage Endorsement, with a combined single limit of not less than \$3,000,000 general aggregate to include products/completed operations, fire damage /legal liability, and medical payments. Limits can be layered with an Excess Liability Policy (Umbrella).
3. Business Auto Liability: Coverage shall include Owned vehicles and Hired/Non-Owned vehicles, for a combined single limit (bodily injury and property damage) of not less than \$500,000/combined single limit (Bodily Injury/Property Damage); personal injury protection - statutory limits; \$500,000/hired/non-owned auto liability. Limits can be layered with Excess Liability Policy (Umbrella).
4. Contractor's Builders' Risk "All Risk" Insurance: – All risk coverage with limits equal to one hundred percent (100%) of the completed value of the Work. There shall be a waiver of occupancy endorsement to enable the Owner to occupy the facility under construction during such activity. The policy must be endorsed to provide machinery/equipment endorsement during transit and installation, and Owner direct purchase materials, if any. The maximum deductible under this coverage is \$10,000 per claim, except Wind Storm coverage which will have a maximum deductible equal to 2 percent of the completed value of the work.
5. Flood Insurance - Contractor shall maintain coverage when the buildings or structures are located within an identified special flood hazard area. Such flood insurance shall protect the interests of the Contractor and the County and shall be afforded for the lesser of the total insurable value of such buildings or structures, or, the maximum amount of flood insurance coverage available under the National Flood Insurance Program.

D. Insurance Requirements – Ten (10) days prior to the commencement of any Work under the Contract, a certificate of insurance shall be provided to the Indian River County Risk Manager for review and approval. The certificate shall provide that: (a) Indian River County (as Owner) and Masteller & Moler, Inc. (as Engineer) be named as an additional insured on the commercial general liability, auto liability, and Contractor's Builders' Risk "All Risk" insurance policies; (b) the Contractor's insurance coverage shall be primary; and (c) Indian River County (as Owner) and Masteller & Moler, Inc. will be given thirty (30) days' notice prior to cancellation or modification of any required insurance and such notice shall be in writing by registered mail, return receipt requested and addressed to the Indian River County Risk Manager. It shall be the responsibility of the Contractor to ensure that all subcontractors comply with all insurance requirements of this Contract.

E. All coverage shall be maintained without interruption from date of commencement of Work until date of final payment.

F. All insurers must be authorized to do business in Florida and have a Best Key Rating of A- VII.

G. The insurance companies selected shall send written verification to the Indian River County Risk Manager that they will provide 30 days prior written notice to the Indian River County Risk Manager of its intent to cancel or modify any required policies of insurance.

SC 5.05 Delete existing paragraph 5.05 of the General Conditions in its entirety.

SC-5.06 Delete existing paragraph 5.06 of the General Conditions in its entirety.

SC-5.07 Delete existing paragraph 5.07 of the General Conditions in its entirety and replace with the following.

A. All insurance policies provided by the Contractor shall contain provisions to the effect that the insurer waives all rights of subrogation against any of the insured, additional insured, (and the officers, directors, partners, employees, agents, consultants and subcontractors of each and any of them) Owner and the Engineer.

SC-5.08 Delete existing paragraph 5.08 of the General Conditions in its entirety.

SC-5.09 Delete existing paragraph 5.09 of the General Conditions in its entirety.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

SC 6.01B Delete paragraph 6.01B of the General Conditions in its entirety, and replace with the following:

6.01B The Contractor shall employ a competent superintendent and necessary assistants who shall be assigned to, and in attendance at, the Project site during performance of the Work. The superintendent shall be reasonably satisfactory to the Owner. So long as the superintendent remains employed by the Contractor or any related entity, the superintendent shall not be replaced without the Owner's prior written consent, except under extraordinary circumstances. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

SC-6.02B Add the following new paragraphs immediately after paragraph 6.02B. of the General Conditions which are to read as follows:

C. Regular working hours are defined as 8 hours per day, Monday through Friday, excluding holidays, between the hours of 7:00 AM and 7:00 PM. Requests to work other than regular working hours shall be submitted to Engineer not less than 48 hours prior to any proposed weekend work or scheduled extended work weeks. Occasional unscheduled overtime on weekdays may be permitted provided two hours notice is given to Engineer.

D. Contractor shall reimburse the Owner for additional engineering and/or inspection costs incurred as a result of overtime work in excess of the regular working hours stipulated in Article SC-6.02C. At Owner's option, overtime costs may either be deducted from the Contractor's monthly payment request or deducted from the retainage prior to release of final payment. Overtime costs for the Owner's personnel shall be based on the individual's current overtime wage rate. Overtime costs for personnel employed by the Engineer or Owner's independent testing laboratory shall be calculated in accordance with the terms of their respective contracts with the Owner.

SC 6.04A.1 Add the following sentence immediately after the existing text in paragraph 6.04 A.1 of the General Conditions:

Additionally, any and all changes to the Project's critical path must be reflected in each Project schedule.

SC-6.04.A.3 Add the following paragraph immediately after paragraph GC-6.04.A.2 of the General Conditions:

Contractor shall give Owner full information in advance as to its plans for performing each part of the Work. If at any time during the progress of Work, Contractor's actual progress is inadequate to meet the requirements of the Contract, Owner may, but is not obligated to, so notify Contractor. In such event, Contractor acknowledges and agrees that Contractor shall implement some or all of the following remedial actions at the sole cost and expense of Contractor: (a) Increase manpower in such quantities and crafts as necessary to eliminate the backlog of Work; (b) Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of Work; or (c) Reschedule the Work in conformance with the specification requirements. Neither such notice by Owner nor Owner's failure to issue such notice shall relieve Contractor of its obligation to achieve the quality of Work and rate of progress required by the Contract. Failure of Contractor to implement some or all of the remedial actions may be grounds for determination by Owner that Contractor is not prosecuting its Work with such diligence as will assure completion within times specified. Upon such determination, Owner may terminate Contractor's right to proceed with the performance of the Contract, or any separable part thereof, in accordance with the applicable provisions of this Contract.

SC-6.06A

Delete Paragraph 6.06A of the General Conditions in its entirety and replace with the following:

A. Contractor shall not employ any Subcontractor, Supplier or other person or organization, (including those who are to furnish the principal items of materials or equipment), whether initially or as a substitute, against whom Owner may have reasonable objection. Acceptance of any Subcontractor, Supplier or other person or organization by Owner shall not constitute a waiver of any right of Owner to reject defective Work. Contractor shall not be required to employ any Subcontractor, Supplier or other person or organization against whom Contractor has reasonable objection.

SC-6.06B Delete Paragraph 6.06B of the General Conditions in its entirety.

SC-6.08 Delete Paragraph 6.08 of the General Conditions in its entirety and replace with the following:

ALL PERMIT, IMPACT, OR INSPECTION FEES APPLICABLE AT THE TIME OF OPENING OF BIDS THAT ARE PAYABLE TO INDIAN RIVER COUNTY IN CONNECTION WITH THE WORK ON THIS COUNTY PROJECT WILL BE PAID BY INDIAN RIVER COUNTY. Contractor acknowledges that the foregoing items are governed by the provisions of Florida Statutes section 218.80, Public Bid Disclosure Act. Further, Contractor shall pay the applicable business tax and obtain a business tax receipt from the Indian River County Tax Collector. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all applicable construction permits. Owner shall reimburse Contractor for the cost of such permits on the basis of actual cost. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. As set forth in the Contract Documents, re-inspection fees are payable solely by Contractor. Owner shall pay all charges of utility owners for connections for providing permanent services to the Work. Owner has made application for and received the Indian River County (IRC) Right-of-way and Florida Department of Transportation (FDOT) Rights-of-way Permits. Said permits will be included in Section 00901. Any permits issued after issuance of bid documents and prior to bid opening will be provided as an Addendum.

The selected Contractor will need to obtain FDEP NPDES Permit for this project if the manner in which the project is constructed exceeds applicable thresholds. In the event an FDEP NPDES permit is not required for this project, the Contractor will still be responsible for installation of silt fences, turbidity barriers and other erosion control devices as necessary to minimize erosion due to construction activities. It will be the Contractor's responsibility to develop and maintain an erosion control plan at all times. The selected Contractor shall obtain an Indian River County dewatering permit, if such permit is required.

Contractor acknowledges that the foregoing items are governed by the provisions of Florida Statutes section 218.80 (2006), Public Bid Disclosure Act.

SC 6.11 A.3: Delete the words: "arbitration or" in line 9 of paragraph 6.11 A.3 of the General Conditions.

SC 6.19A: Delete Paragraph 6.19A. of the General Conditions in its entirety and replace with the following:

A. Contractor warrants and guarantees to Owner for one (1) year from the date of Final Completion that all Work will be in accordance with the Contract Documents and will not be defective; provided, however, that manufacturer equipment warranties may be of a longer duration.

SC-6.20A

Delete paragraph 6.20A of the General Conditions in its entirety.

SC-6.21E

Delete paragraph 6.21E of the General Conditions in its entirety and replace with the following:

E. Contractor shall not be responsible for the adequacy of the performance criteria or design criteria required by or contained in the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

No Changes

ARTICLE 8 OWNER'S RESPONSIBILITIES

SC-8.02 Delete paragraph 8.02 of the General Conditions in its entirety and replace with the following:

If Owner terminates the employment of Engineer, Owner may appoint another engineer whose status under the Contract Documents shall be that of the former Engineer.

SC-8.04 Delete paragraph 8.04 of the General Conditions in its entirety and replace with the following:

Payments under this contract are governed by the Local Government Prompt Payment Act, Florida Statutes section 218.70 et. seq.,

SC-8.06

Delete paragraph 8.06 of the General Conditions in its entirety.

SC-8.11

Delete paragraph 8.11 of the General Conditions in its entirety.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

SC 9.02 Delete the first sentence of paragraph 9.03A of the General Conditions in its entirety and replace with the following:

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 Engineer the progress that has been made and the quality of the various aspects of Contractor's executed Work.

SC-9.03A

Add the following new paragraph immediately after paragraph 9.03A of the General Conditions which is to read as follows:

B. Engineer will furnish a part-time Project Representative. Contractor is responsible to give 24-hour notice on all required inspections so that the Project Representative may be present.

SC 9.04 A Delete the third sentence of paragraph 9.04A of the General Conditions in its entirety and replace with the following:

However, if Contractor claims entitlement to additional time or money as a result of the Field Order, such entitlement is conditioned upon obtaining a Change Order authorized and executed by Owner after timely making a Claim as provided in the Contract Documents.

SC 9.08-A:

Delete the second sentence of 9.08A of the General Conditions in its entirety and replace with the following:

Except for: (a) Claims for differing subsurface or physical conditions governed by paragraph 4.03; and (b) claims for

time extensions governed by paragraph 12.03, 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 15 days after occurrence of the event giving rise to such Claim or within 15 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later; provided, however, the Owner shall make all final determination of such matters.

SC 9.08-C Delete paragraph 9.08-C of the General Conditions in its entirety

SC 9.08-D Delete paragraph 9.08-D of the General Conditions in its entirety

SC 10.03 A.3 Delete subparagraph 10.03.A.3 of the General Conditions in its entirety

SC 10.05.A Delete paragraph 10.05.A of the General Conditions in its entirety and replace with the following:

A. All Claims shall initially be referred to the Engineer for decision.

SC 10.05.B Delete paragraph 10.05.B of the General Conditions in its entirety and replace with the following:

Except for: (a) Claims for differing subsurface or physical conditions governed by paragraph 4.03; and (b) claims for time extensions governed by paragraph 12.03, Claims by either party shall be initiated within 15 days after occurrence of the event giving rise to such Claim or within 15 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later, by written notice of the amount or extent of the Claim, dispute, or other matter with supporting data to the Engineer and the other party by written notice stating the general nature of each Claim, dispute, or other matter delivered by the claimant to Engineer and the other party to the Contract. 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 Time shall be prepared in accordance with the provisions of paragraph 12.02.B. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

SC 10.05 C Delete paragraph 10.05C of the General Conditions in its entirety.

SC 10.05 D and E Delete paragraphs 10.05.D and E of the General Conditions in their entirety

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

SC-11.02A Delete paragraph 11.02.A of the General Conditions in its entirety and replace with the following:

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 as may be acceptable to OWNER.

Delete paragraphs 11.02B through D of the General Conditions in their entirety.

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

SC12.01C Delete "15 percent" in line 2 of paragraph 12.01C.2.a of the General Conditions and replace with "10 percent".

SC12.01C Delete "15 percent" in line 6 of paragraph 12.01C.2.c of the General Conditions and replace with "10 percent".

12.03A and B Delete paragraphs 12.03.A and 12.03B of the General Conditions in their entirety and replace with the following:

A. Where Contractor is delayed or prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if (1) a Claim is made therefore as provided in paragraph 12.02.A and (2) Contractor provides evidence that the delay impacted the critical path of the Project. Delays beyond the control of Contractor shall include, but not be 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, abnormal weather conditions, or acts of God. The Contractor must request the extension of time in writing and must provide the following information within the time periods stated hereafter. Failure to submit such information and in compliance with the time requirements hereinafter stated, shall constitute a waiver by the Contractor and a denial of the claim for extension of time:

1. Nature of the delay or change in the Work;
2. Dates of commencement and cessation of the delay or change in the Work;
3. Activities on the current progress schedule affected by the delay or change in the Work;
4. Identification and demonstration that the delay or change in Work affects the critical path;
5. Identification of the source of delay or change in the Work;
6. Anticipated extent of the delay or change in the Work; and
7. Recommended action to minimize the delay.

B. Contractor hereby affirms that the extension of time granted herein is the Contractor's sole and exclusive remedy. Apart from extension of time, no payment or claim for damages shall be made to the Contractor as compensation for damages for any delays or hindrances from any cause whatsoever in the progress of the Work whether such delay is avoidable or unavoidable.

SC 12.03C Delete paragraph 12.03.C of the General Conditions in its entirety.

SC 12.03D Delete paragraph 12.03D of the General Conditions in its entirety and replace with the following:

In no event shall Owner, Engineer, or the Related Entities of either of them be liable to Contractor, any Subcontractor, any Supplier, any other person or organization, or any surety for or employee or agent of any of them, for any claim, cost, loss, or damages of any nature whatsoever arising out of or resulting from delays.

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

SC 13.04C Delete the words: "arbitration or" in line 10 of paragraph 13.04.C of the General Conditions.

SC 13.06A Delete the words: "arbitration or" in line 9 of paragraph 13.06.A of the General Conditions.

SC 13.07C Add the following sentence at the beginning of paragraph 13.07.C of the General Conditions:

The Owner and Contractor agree that a warranty inspection shall be scheduled no later than eleven (11) months after final payment under this Contract so that the Owner and the Contractor may inspect and otherwise examine the Work prior to the expiration of the Performance Bond

SC 13.07E Delete paragraph 13.07E of the General Conditions in its entirety and replace with the following:

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 any way to limit the Contractor's continued liability for defective Work, including latent defects.

SC 13.08A TWO changes:

1. Delete the words: “arbitration or” in line 8 of paragraph 13.08.A of the General Conditions.
2. Delete the phrase “(such costs to be approved by Engineer as to reasonableness)” in lines 10 and 11 of paragraph 13.08.A of the General Conditions.

13.09C Delete the words: “arbitration or” in line 4 of paragraph 13.09.C of the General Conditions.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02A.1

Delete the first sentence of paragraph 14.02.A.1 of the General Conditions in its entirety and replace with the following:

On or before the tenth (10th) day of each month, the Contractor shall submit completed partial progress payment requests to the Engineer, as set forth herein. Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application for Payment and accompanied by such supporting documentation as is required by the Contract Documents. Such supporting documents shall include but not be limited to, the required Contractor’s certification; retainage as set forth in the Agreement; and a monthly dated CPM schedule for the Project. The Contractor shall make the following certification (Affidavit) on each Application for Payment: “I hereby certify that the labor and materials listed on this Application for Payment have been used in the construction of this Work and payment received from the last request for payment has been used to make payments to all subcontractors, laborers, material, men and suppliers except as listed below: ”All payments by Indian River County as Owner shall be made in accordance with the Local Government Prompt Payment Act. Florida Statutes section 218.70 et. seq.

SC-14.02A.3

Add a new paragraph immediately after paragraph 14.02A.3 of the General Conditions, which is to read as follows:

4. Contractor shall furnish satisfactory proof to Owner and Engineer that payment received from Owner for materials and equipment not incorporated into the Work and suitably stored, has in fact been paid to the respective supplier(s) within ten (10) days of Contractor’s receipt of payment from Owner. Failure to provide such evidence of payment shall result in the withdrawal of previous approval(s) and removal of the cost of related materials and equipment from the next submitted Application for Payment, and shall be deemed a default under the Contract.

SC-14.02C.1 Delete paragraph 14.02.C of the General Conditions in its entirety and replace with the following: All payments by Indian River County as Owner shall be made in accordance with the Local Government Prompt Payment Act. Florida Statutes section 218.70 et. seq.

SC- 14.02D.1.d Delete paragraph 14.02D.1.d of the General Conditions in its entirety and replace with the following:
d. OWNER has actual knowledge of the occurrence or probable 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.

SC- 14.02D.2 Delete paragraph 14.02D.2 of the General Conditions in its entirety and replace with the following:

If Owner refuses to make payment of the full amount recommended by Engineer, Owner shall provide notice to Contractor in accordance with the provisions of the Local Government Prompt Payment Act. Florida Statutes section 218.70 et. seq. and pay Contractor any amount remaining after deduction of the amount so withheld in accordance with the provisions of the Local Government Prompt Payment Act. Florida Statutes section 218.70 et. seq. Owner shall pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, in accordance with the provisions of the Local Government Prompt Payment Act. Florida Statutes section 218.70 et. seq.

SC-14.03A.

Add the following sentences to the end of the existing paragraph 14.03A of the General Conditions as follows:

No materials or supplies for the Work shall be purchased by Contractor or Subcontractor subject to any chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller. Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

SC-14.04C. Delete paragraph 14.04C of the General Conditions in its entirety and replace with the following:

If Engineer considers the Work substantially complete, Engineer will prepare and deliver to Owner a tentative certificate of Substantial Completion that shall fix the date of Substantial Completion. In accordance with the provisions of Florida Statutes section 255.077(2023), upon receipt of the tentative certificate of Substantial Completion from Engineer, the Owner, the Engineer, and the Contractor shall conduct a walk-through inspection of the Project to document a list of any items required to render the Work on the Project complete, satisfactory, and acceptable under this Agreement (herein the "Statutory List"). The Statutory List shall be reduced to writing and circulated among the Owner, the Engineer, and the Contractor by the Owner or the Engineer within 30 calendar days after substantial completion. The Owner and Contractor acknowledge and agree that: 1) the failure to include any corrective work, or pending items that are not yet completed, on the Statutory List does not alter the responsibility of the Contractor to complete all of the Work under this Agreement; 2) upon completion of all items on the Statutory List, the Contractor may submit a pay request for all remaining retainage except as otherwise set forth in this Agreement; and 3) any and all items that require correction under this Agreement and that are identified after the preparation of the Statutory List remain the obligation of the Contractor to complete to the Owner's satisfaction under this Agreement. After receipt of the Statutory List by the Contractor, the Contractor acknowledges and agrees that it will diligently proceed to complete all items on the Statutory List and schedule a final walk-through in anticipation of final completion on the Project.

SC 14.04D Delete paragraph 14.04D of the General Conditions in its entirety and replace with the following:

At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, HVAC, utilities, insurance, and warranties and guarantees.

SC14.07A.3 Delete paragraph 14.07A.3 of the General Conditions in its entirety.

SC-14.07B.1 Delete paragraph 14.07B.1 of the General Conditions in its entirety and replace with the following:

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, all 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 indicate, within twenty days after receipt of the final Application for Payment, in writing Engineer's recommendation of payment and present the Application to Owner for payment. Thereupon Engineer will give written notice to Owner and Contractor that the Work is acceptable. 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.

SC-14.07.C.1 Delete paragraph GC-14.07.C.1 in its entirety and replace with the following: Payment shall be made by Owner to Contractor according to the Local Government Prompt Payment Act, Florida Statutes section 218. et.seq.

SC 14.08 Delete paragraph 14.08 of the General Conditions in its entirety.

SC 14.09 Delete paragraph 14.09 of the General Conditions in its entirety.

SC 14.09 Delete paragraph 14.09 of the General Conditions in its entirety.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

SC-15.02.A.1 Delete subparagraph 15.02.A.1 of the General Conditions in its entirety, and replace with the following:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents;

SC-15.02.A.4 Delete subparagraph 15.02.A.4 of the General Conditions in its entirety, and replace with the following:

4. Contractor's violation of any material provisions of the Contract Documents.

SC 15.02.A.5 and 6: Add the following new subparagraphs at the end of paragraph GC-15.02.A

5. Failure of Contractor to make proper payments to Subcontractors for labor, services, materials or equipment in connection with the Work;
6. If Contractor abandons the Work, or assigns Contract or any part thereof, without the previous written consent of Owner, otherwise than in accordance with the Contract Documents.

SC-15.02.C Delete the words: "arbitration or" in line 7 of paragraph 15.02.C of the General Conditions.

SC-15.03.A.3 Delete subparagraph 15.03.A.3 of the General Conditions in its entirety.

SC 15.02.G Add the following new paragraph immediately following paragraph 15.02.F of the General Conditions:

G. If, after termination of the Contract by the Owner for cause as set forth in paragraph 15.02, it is determined that the Contractor had not failed to fulfill its contractual obligations, the termination under paragraph 15.02 shall be deemed to have been for the convenience of the Owner. In such event, adjustment of the contract price shall be made as provided in paragraph 15.03.

ARTICLE 16 - DISPUTE RESOLUTION

SC-16.01A

Delete the paragraph 16.01A of the General Conditions in its entirety and replace with the following:

A. Prior to the filing of any suit or other legal proceedings, the parties shall endeavor to resolve claim disputes or other matters in question by mediation. Mediation shall be initiated by any party by serving a written request for same on the other party. The parties shall, by mutual agreement, select a circuit court mediator as certified by the Supreme Court of Florida within 15 days of the date of the request for mediation. If the parties cannot agree on the selection of a circuit court mediator as certified by the Supreme Court of Florida, then the Owner shall select the mediator, who shall be a circuit court mediator as certified by the Supreme Court of Florida. The mediator's fee shall be paid in equal shares by Owner and Contractor.

SC 16.01.C. Delete paragraph 16.01 C of the General Conditions in its entirety and replace with the following

C. Contractor shall carry on the Work and maintain the progress schedule during the dispute resolution proceedings, unless otherwise agreed by Contractor and Owner in writing.

ARTICLE 17 - MISCELLANEOUS

SC 17.01A

Delete paragraph 17.01A of the General Conditions in its entirety and replace with the following

Notices: Any notice, request, demand, consent, approval, or other communication required or permitted by this Agreement shall be given or made in writing and shall be served, as elected by the party giving such notice, by any of the following methods: (a) Hand delivery to the other party; (b) Delivery by commercial overnight courier service; or (c) Mailed by registered or certified mail (postage prepaid), return receipt requested at the addresses of the parties shown in the Agreement. Notices shall be effective when received at the address as specified above. Facsimile transmission is acceptable notice effective when received, provided, however, that facsimile transmissions received (i.e., printed) after 5:00 p.m. or on weekends or holidays, will be deemed received on the next day that is not a weekend day or a holiday. The original of the notice must additionally be mailed. Either party may change its address, for the purposes of this paragraph, by written notice to the other party given in accordance with the provisions of this paragraph.

SC 17.07 through and including 17.14 Add the following new paragraphs after paragraph 17.06 of the General Conditions:

17.07 Utilities: The Contractor shall, at its expense, arrange for, develop and maintain all utilities in Work areas to meet the requirements of the Contract. Such utilities shall be furnished by Contractor at no additional cost to the Owner, and shall include but not be limited to the following: public telephone service for the Contractor's use; construction power as required at each point of construction; and water as required throughout the construction. Prior to final acceptance of the Work the Contractor shall, at its expense, satisfactorily remove and dispose of all temporary utilities developed to meet the requirements of the Contract.

17.08 Drainage: The contractor shall so conduct its operations and maintain the Work in such condition that adequate drainage will be in effect at all times. Existing functioning storm sewers, gutters, ditches and other run-off shall not be obstructed.

17.09 Fire Hydrants: Fire hydrants on or adjacent to the highway shall be kept accessible to fire apparatus at all times and no material or obstruction shall be placed within fifteen feet (15') of any such hydrant.

17.10 Protection of Structures: Heavy equipment shall not be operated close enough to pipe headwalls or other structure to cause their displacement.

17.11 Fencing: On all Work which includes fencing and where the Engineer determines it to be necessary for maintaining the security of livestock or adjacent property, or for protection of pedestrians who are likely to gain access to the Work from adjacent property, the Contractor shall erect an appropriate temporary security fence as a first order of business. Temporary fencing shall be installed at temporary construction easement areas on all commercial and residential properties appropriate to secure the Work area and protect persons and domestic animals. At all times the Contractor shall conduct the Work under secure temporary fencing. Permanent fencing shall be addressed as required by the Plans and Specifications.

17.12 Record Drawings: The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the site in good order and annotated to show all changes made during the construction process. These items shall be available to the Engineer and shall be delivered to the Engineer for the Owner. Record Drawings shall be submitted with each pay request. Final acceptance of the Work will be withheld until the approval of such documents is made by the Owner.

17.13 Progress Videotapes / Photographs: Contractor shall deliver to the Owner prior to commencing the Project a preconstruction videotaping (DVD-type color video) of the Project with descriptive radio narrative clarifying orientation and objects viewed. Contractor shall provide monthly photographs taken on cutoff date for each scheduled Application for Payment and each major process component indicated construction status and progress from invitation of work at each component through substantial completion of each component. The cost of the video and photographs shall be included in the bid submitted by the Contractor.

17.14 Commercial Activities: Contractor shall not establish any commercial activity or issue concessions or permits of any kind to third parties for establishing commercial activities on land owned or controlled by Owner. Contractor shall not allow its employees to engage in any commercial activities on the Project site.

END OF SECTION

Change Order Form

No. _____

DATE OF ISSUANCE:
DATE:

EFFECTIVE

OWNER: Indian River County

CONTRACTOR _____

Project: _____

OWNER's Project No. _____

You are directed to make the following changes in the Contract Documents:

Description:

Reason for Change Order:

Attachments: (List documents supporting change)

CHANGE IN CONTRACT PRICE:	
Description	Amount
Original Contract Price	\$
Net Increase (Decrease) from previous Change Orders No. ___to : :	\$
Contract Price prior to this Change Order:	\$
Net increase (decrease) of this Change Order:	\$
Contract Price with all approved Change Orders:	\$

CHANGE IN CONTRACT TIMES	
Description	Time
Original Contract Time: Substantial Completion: Final Completion:	(days or dates)
Net change from previous Change Orders No. ___to Substantial Completion: Final Completion:	(days)
Contract Time prior to this Change Order: Substantial Completion: Final Completion:	(days or dates)
Net increase (decrease) this Change Order: Substantial Completion: Final Completion:	(days or dates)
Contract Time with all approved Change Orders: Substantial Completion: Final Completion:	(days or dates)

ACCEPTED:
By:
CONTRACTOR (Signature)
Date:

RECOMMENDED:
By:
ENGINEER (Signature)
Date:

APPROVED:
By:
OWNER (Signature)
Date:

BOARD OF COUNTY COMMISSIONERS



Date

via Email

Contractor

NOTICE OF AWARD

Reference: *Indian River County Bid No. 2024027
Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion*

Dear :

It is my pleasure to inform you that on [Date] the Board of County Commissioners awarded the above-referenced project to your company. The following documents are required before the applicable County department can issue a "Notice to Proceed" letter.

1. Public Construction Bond (unrecorded) in the amount of **100%** of the award amount (~~\$xxxxxxx~~).
2. Two Signed Copies of Enclosed Agreement.
3. Certificate of Insurance indicating coverage required in the General Terms and Conditions and Agreement. Certificate(s) **must name Indian River County as additional insured** and must provide for a 30 day Notice of Cancellation.
4. W-9.

The Public Construction Bond must be executed in accordance with section 255.05(1)(a), Florida Statutes. Please submit the Bond, W-9, the Certificate(s) of Insurance and two fully-executed copies of the enclosed agreement to this office at the address provided below no later than [Date]. Failure to comply with the established deadline for submittal of required documents may be grounds for cancellation of award.

Thank you for your prompt attention and if you have any questions, please do not hesitate to contact our office.

Sincerely,

Jennifer Hyde, NIGP-CPP, CPPO
Purchasing Manager

Cc: Project Manager

Office of Management and Budget • Purchasing Division
1800 27th Street, Vero Beach, Florida 32960 • (772) 226-1416
E-mail: purchasing@indianriver.gov

DIVISION 1:
GENERAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SCOPE

- A. The project consists of the soils construction (excavation, diversion berm/rain flap, general fill, structural fill, prepared subbase, liner protective layer, aggregate/stabilizer material), Cell 3 liner construction including geosynthetics installation (geotextile separators, geosynthetic clay liner, primary and secondary geocomposite and geomembrane), liner penetration boxes, pipes for leachate detection, leachate collection and leachate transfer system; and LCS manhole and LDS pump station construction at the Indian River County Landfill.
- B. CONTRACTOR shall cooperate with OWNER and other contractors so that the OWNER's work or work by other contractors can be carried out smoothly without interfering or delaying the Work.
- C. This project will include several work tasks, as outlined below:

Item 1 - Mobilization and Demobilization:

This item shall include charges related to transit of equipment, project startup and project closeout. CONTRACTOR shall also include in this item a job site trailer, generator for trailer power, and fuel for the generator for the OWNER'S REPRESENTATIVE'S use for the duration of the project.

Item 2 - Surveying

This item is to be utilized to perform surveying work by the CONTRACTOR to delineate areas for stripping, perform earthwork for general/structural fill and prepared subbase. CONTRACTOR shall perform an initial topographic survey of existing conditions prior to construction, and as-built surveys of the liner subbase, liner protective layer, geomembrane panel seams and destructive test sample locations, surveying for the leachate management system including the leachate collection, leachate detection, and leachate transmission system for Cell 3, and to perform other survey work, as needed, to complete various construction activities.

Item 3 – Site Preparation (Clearing, Grubbing and Stripping)

This item is to be utilized to perform clearing, grubbing and stripping of the designated Cell 3, if necessary, prior to construction of the Cell 3 liner system as shown in the construction drawings.

Item 4 – Erosion and Sediment Control

This item is to be utilized to implement the erosion and sediment control measures for preparation of the site for Cell 3. This item includes furnishing of all labor, materials, tools, transportation, and equipment necessary for construction and maintenance of the erosion and sediment control measures. This item shall be in accordance with Technical Specifications Section 02290 and as shown on Construction Drawings.

Item 5 – General Fill (Cut and Fill)

This item is to be utilized when soils suitable for earthwork are imported to and excavated from Cell 3. The soil excavated shall be used as fill and the remaining portion of the fill shall be furnished by the CONTRACTOR. As a part of this item, CONTRACTOR shall be responsible for all the earthwork related to Cell 3, perimeter drainage ditch and perimeter access road including material placement, moisture conditioning, compaction, and grading. Fill lift thickness shall not exceed 10 in. (loose). The earthwork shall be in accordance with Technical Specifications Section 02200 and the Construction Drawings.

Item 6 – Construction of Double-liner System

Construction of Class I double-lined landfill Segment 3, Cell 3 including geosynthetic clay liner, secondary liner, primary liner, geocomposites, geonets, geotextiles, in-cell piping, pipe penetrations, and protective sand.

Item 7 – Cell 3 Access ramp and Road

Construction of access ramp to Cell 3. This item shall be in accordance with Technical Specifications Section 02230 and as shown on Construction Drawings.

Item 8 – Vegetation/Permanent Stabilization

This item is to be utilized for sodding the perimeter drainage and any other areas disturbed from Cell 3 construction as directed by the Engineer. This item includes all labor, tools, equipment, supervision, and materials necessary to pre-qualify, procure, deliver, stockpile, and install sodding meeting the requirements of Section 02930 of the Technical Specifications.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01025
MEASUREMENT AND PAYMENT

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. This Section describes the methods for Measurement and Payment for the Work of this Contract.
- B. Measurement and Payment of Work will be made, and payment for Work will be taken to be included in, and covered by, the Contract unit prices and lump sum payment methods for the various bid items listed in Contractor's Bid Form.
- C. Contractor shall provide necessary equipment, workers, construction quality control testing, and survey (for its own use) personnel as required. Owner will provide surveying for as-built record drawings and for measurement and payment purposes.

1.02 ENGINEER'S ESTIMATE OF QUANTITIES

- A. Bid items and estimated quantities are identified in Contractor's Bid Form of the Contract Documents. The estimated quantities for unit price pay items are approximate only and are included solely for the purpose of comparison of Bids. Owner does not expressly or by implication agree that the nature of the materials encountered below the surface of the ground, or the actual quantities of material encountered or required will correspond with the estimated quantities.

1.03 BID ITEMS

- A. Bid Item Number 1: Mobilization/Demobilization
 - 1. Measurement for payment will not be made for this item.
 - 2. Payment of the lump sum listed in the Bid Form for this Bid Item will be prorated as follows for work covered by each payment request submitted by the Contractor: 20% for the first invoice and 5% per month thereafter with 20% held and payable with Contractor's final payment in accordance with the Contract Documents.
 - 3. The lump sum price shall include and cover the furnishing of all materials, labor, tools, and equipment necessary for Contractor to mobilize the necessary operations to the project site, including: the initial movement of personnel and

equipment to the project site; application, fee payment, and acquisition for all necessary permits; the establishment of Contractor's shops, plants, storage areas, field office, temporary water, electrical, telephone, sanitary and other temporary facilities; and other expenses required for the Work included in this Contract.

4. The lump sum price shall include, but not be limited to:
 - a. preparation of Site-Specific Health and Safety Plan if required by the Contract Documents;
 - b. preparing and maintaining all project safety and other records required by this Contract;
 - c. obtaining any permits required by County in order to perform the Work included in this Contract;
 - d. the cost of Contractor's insurance requirements for the duration of the Work; and
 - e. the cost of furnishing and maintaining performance and payment bonds as required in the Contract Documents for the duration of the Work.
5. The lump sum price shall include and cover demobilizing all materials, labor, tools, and personnel and equipment from the project site; dismantling of Contractor's shops, plants, storage areas, field office, temporary water, electrical, telephone, sanitary, and all other activities required for the project closeout.
6. Mobilization/Demobilization may not be more than 10% of the total bid price.

B. Bid Item Number 2: Surveying

1. Measurement for payment will not be made for this item.
2. Payment of the lump sum price listed in the Bid Form for this Bid Item will be prorated based on the actual work accomplished by the Surveyor for work covered by each payment request submitted by Contractor. Contractor shall submit proof of survey work performed through survey work products.
3. The lump sum price shall include and cover the furnishing of all labor, materials, tools, supervision, transportation, and equipment necessary to perform surveying work as specified in Section 02100 necessary for Contractor to perform Work included in this Contract. Surveying for as-built record drawings and for measurement and payment purposes will be provided by the Owner.

C. Bid Item Number 3: Site Preparation (clearing, grubbing, stripping)

1. Measurement for payment will be made on a per acre basis.
 2. Payment of the unit price listed in the Bid Form for this Bid Item will be based on the as-built area of actual work accomplished as listed in the Bid Form.
 3. The per acre bid price shall include all labor, tools, equipment, supervision, materials, and testing necessary to perform clearing, grubbing, and stripping, as specified in Section 02110 of these Specifications and at the locations shown on the Construction Drawings.
 4. No payment will be made until after the designated locations have been cleared, grubbed, or stripped and accepted pursuant to the Specifications and Construction Drawings. No payment will be made for stored materials.
- D. Bid Item Number 4: Erosion and Sediment Control
1. Measurement for payment will not be made for this item.
 2. Payment of the lump sum price listed in the Bid Form for this Bid Item will be prorated based on the contract schedule as agreed to between Owner and Contractor.
 3. The lump sum price shall include and cover the furnishing of all labor, materials, tools, supervision, transportation, and equipment necessary to construct and maintain the erosion and sediment control features as described in the Section 02290 and as shown on the Construction Drawings. Work includes, but is not limited to:
 - a. temporary stormwater diversion dikes;
 - b. rock check dams;
 - c. lined sediment traps;
 - d. temporary stormwater piping;
 - e. stabilized construction entrance;
 - f. removal and disposal of accumulated sediment;
 - g. temporary seeding and mulching of stockpiles and disturbed areas;
 - h. soil amendments, fertilizer, disc harrowing, and other seedbed preparation;
 - i. permanent seeding, and mulching, and maintenance until acceptable permanent vegetation is established;
 - j. erosion control matting; and
 - k. sodding in lieu of seeding.
 4. The lump sum price also includes materials supply and delivery to the site, proper protection, and storage until placement.

5. No payment will be made for stored materials.

E. Bid Item Number 5: General Fill (Supply and Install)

1. Measurement for payment will be made on an in-place, compacted cubic yard basis.
2. Payment of the unit price listed in the Bid Form for this Bid Item will be based on the as-built, placed and compacted volume of actual work accomplished as listed in the Bid Form and shall be measured based on pre- and post-construction surveys. Interim payments may be made on the basis of truck counts or other method as proposed by the Contractor and agreed by the Owner; no more than 90% of the bid price will be paid based on truck counts.
3. The per cubic yard bid price shall include all labor, tools, equipment, supervision, and materials necessary to transport (from off-site borrow sources), place, moisture condition, and compact General Fill from approved off-site borrow sources or as provided by the Contractor. The installed General Fill shall meet the requirements of Section 02200 of the Specifications and to the lines and grades shown on the Construction Drawings. The unit price includes all CQC testing required by Sections 01410 and 02200 of the Specifications.
4. No payment will be made until after the General Fill is installed pursuant to the Specifications at the locations required in the Construction Drawings. No payment will be made for stored materials.

F. Bid Item Number 6: Construction of Double-liner System

1. Measurement for payment will be made on a square yard basis.
2. Payment of the unit price listed in the Bid Form for this Bid Item will be based on the as-built area of actual work accomplished as listed in the Bid Schedule. The unit price bid will be full compensation for all labor, materials, tools, equipment, testing, testing equipment, implementing the required QA/QC procedures, supervision, and incidentals required to furnish and install the double-liner system as shown on the Construction Drawings and described in the Specifications. No payment will be made for liner areas for which the topographic surveys have not been submitted and approved by the OWNER.

F. Bid Item Number 7: Access Road

3. Measurement for payment will be made on a cubic yard/square yard basis.

4. Payment of the unit price listed in the Bid Form for this Bid Item will be based on the as-built area of actual work accomplished as listed in the Bid Schedule.
 5. The per cubic yard/square yard bid price shall include and cover the furnishing of all labor, materials, tools, supervision, transportation, and equipment necessary to construct the Access Road as described in Section 02230 of the Specifications and as shown on the Drawings. Work includes, but is not limited to:
 - i. placement of the multifilament woven geotextile;
 - ii. placement and compaction of the structural fill; and
 - iii. placement and compaction of a minimum 8 inches of stabilizer material.
 6. Stabilizer material may be crushed limerock, shell material, or crushed coquina. Contractor shall submit samples of stabilizer material intended for use on the Entrance Road to the Engineer for review no less than 30 calendar days prior to use. Final selection of the stabilizer material will be made by the Owner.
 7. The unit price also includes materials supply and delivery to the site, proper protection, and storage until placement.
 8. Payment will be made after the Perimeter Access Road is completed and accepted pursuant to the Specifications and Construction Drawings. No payment will be made for stored materials.
- G. Bid Item Number 8: Vegetation/ Permanent Stabilization
1. Measurement for payment will be made on a per acre basis for this item.
 2. Payment of the unit price listed in the Bid Form for this Bid Item will be based on the as-built area of actual work accomplished as listed in the Bid Form.
 3. The per acre bid price shall include all labor, tools, equipment, supervision, and materials necessary to pre-qualify, procure, deliver, stockpile, and install sodding meeting the requirements of Section 02930 of the Technical Specifications.
 4. The per acre bid price shall also include all labor, tools, equipment, supervision, and materials necessary to supply and apply/place the Hydro-seeding/Vegetative Stabilization, including additional over-seeding and other work necessary to establish permanent vegetation, at the locations shown on the Construction Drawings and as described in the Specifications.

5. No payment will be made until after the Vegetation/Permanent Stabilization is installed pursuant to the Specifications at the locations required in the Construction Drawings. No payment will be made for stored materials.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 CONTRACT PRICE FORM

- A. See Contract Attachment A for Bid Form.

3.02 APPLICATION FOR PAYMENT

- A. Contractor shall use the Application for Payment Form provided in this Specification Section.

3.03 SUPPORT DOCUMENTATION FOR APPLICATIONS FOR PAYMENT

- A. Contractor is responsible to obtain and submit all documentation, including all measurement and quantity computations, required for verification of pay applications. Engineer shall verify measurements and quantities for payment.
- B. Should Engineer determine that insufficient data has been submitted to accurately verify a pay application, Engineer shall notify Contractor of deficiencies. Contractor shall address identified deficiencies prior to further review of the pay application.
- C. In the event that survey data provided by Contractor is not sufficient to determine actual pay quantity, and the status of Work prevents additional data from being obtained, Engineer shall attempt to reasonably estimate the pay quantity based upon available information. Engineer's estimate shall be final.

[END OF SECTION]

SECTION 01052
APPLICATIONS FOR PAYMENT

SECTION 01052

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Submit Applications for Payment to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement between Owner and Contractor.

1.02 RELATED REQUIREMENTS

- A. In other parts of the Construction Documents:
 - 1. Agreement between Owner and Contractor.
 - 2. General Conditions of the Contract.
 - 3. Article 14 Payments to Contractor and Completion.
- B. Specified in Other Sections:
 - 1. Section 01010: Summary of Work.
 - 2. Section 01700: Contract Closeout.

1.03 FORMAT AND DATA REQUIRED

- A. Submit itemized applications typed in a format approved by Engineer. All applications for payment must be numbered, dated, and signed by the Contractor.
- B. Provide itemized data on payment application (format, schedules, line items and values accepted by Engineer).

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to the date of submittal of application.
 - 2. Fill in summary of dollar values.
 - 3. Execute certification with the signature of a responsible officer of the contract firm.
 - 4. Have resident project representative review and sign application prior to submission to Engineer.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
 - 1. Project.
 - 2. Application number and date.
 - 3. Detailed list of enclosures.
 - 4. For stored products:
 - a. Item number and identification.
 - b. Description of specific material.
- B. Submit one copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Application for payment is required for progress payments.
- B. Only one application will be acceptable in any one month.

1.07 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to Engineer at the time stipulated in the Agreement.
- B. Number: Four copies of each progress Application.
- C. When Engineer finds the Application properly completed and correct, he will transmit the applications for payment to the Owner.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

[END OF SECTION]

SECTION 01060

REGULATORY REQUIREMENTS AND NOTIFICATION

SECTION 01060

REGULATORY REQUIREMENTS AND NOTIFICATION

PART 1 - GENERAL

1.01 PERMITS REQUIRED

- A. Florida Department of Environmental Protection: The required solid waste construction permit from the Florida Department of Environmental Protection (FDEP) for the project will be obtained by Indian River County Solid Waste Disposal District prior to commencement of construction.
- B. Indian River Farms Water Control District: If needed, a permit from the Drainage District to cross any canals will be obtained by the SWDD Department.
- C. Other Permits Required: The Contractor is responsible for obtaining any discharge permits that may be required by local drainage districts, and for Consumptive Use Permit from the SJRWMD for construction dewatering activities and for a “Generic Permit for the Discharge of Produced Groundwater from Any Non-Contaminated Site Activity” from the FDEP and a “General Permit for Stormwater Discharge from Construction Activities” (NOI) from the FDEP.
- D. Contractor is required to provide Stormwater Pollution Prevention Plan (SWPPP), inspections in accordance with the FDEP NOI permit conditions. This will include weekly reports, reports after certain rainfall events, and turbidity testing of all receiving waters. An inspector with appropriate qualifications shall provide the reports, testing, certification from the FDEP Inspection reports shall be kept on the job site, and copies shall be submitted monthly to the Engineer.

1.02 NOTIFICATION

- A. Indian River County: The Contractor is required to notify the Indian River County SWDD Department 48 hours prior to initiating construction (Ronnie T. Jones, Assistant Managing Director, Solid Waste Disposal District, 1325 74th Avenue SW, Vero Beach, FL 32968; Office: 772-226-3214; Fax: 772-770-5296).
- B. Utility Companies: Contractor shall notify the following known utility companies in the area 48 hours prior to initiating construction:
 - SUNSHINE LOCATES (800) 432-4770
 - Southern Bell Telephone, Bill Moore, (772) 468-5538
 - Comcast, Craig Bowers, (772) 567-3444 Ext. 51
 - FP&L, Paul Hess, (772) 337-7002
 - City Gas Company, Glen “Bock” Kreinhagen, (561) 871-2552 ext.23
 - Florida Gas & Transmission, Cecil Walker, (321) 288-8839

- C. The Contractor shall give the Engineer not less than seven (7) calendar days notice of the time and place (or places) where he will start the work.

- D. When the Contractor's excavating operations encounter prehistoric remains or artifacts of historical or archeological significance, the operations shall be temporarily discontinued in that area and the Engineer shall be notified. The Engineer will consult archaeological authorities and determine the disposition of the remains or artifacts. The Contractor agrees that he will make no claim for additional payment or for extension of time because of any delays in or alteration of his procedure due to removal of any such remains or artifacts.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

Not applicable

[END OF SECTION]

SECTION 01090
REFERENCE STANDARDS

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OR ORGANIZATIONS

- A. Obtain copies of reference standards direct from publication source, when needed for proper performance of work, or when required for submittal by Contract Documents.
- B. The following, as appropriate to project, is a list of referenced standards and their mailing addresses for requesting copies of standards:

AA	Aluminum Association 818 Connecticut Avenue, NW Washington, D.C. 20006
AABC	Associated Air Balance Council 1000 Vermont Avenue, NW Washington, D.C. 20005
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, NW Washington, D.C. 20001
ACI	American Concrete Institute Box 19150 Redford Station Detroit, MI 48219

ADC	Air Diffusion council 435 North Michigan Avenue Chicago, IL 60611
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16 th Street, NW Washington, D.C., 20036
AMCA	Air Movement and Control Association 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
ARI	Air Conditioning and Refrigeration Institute 1815 North Fort Myer Drive Arlington, VA 22209
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers 345 East 47 th Street New York, NY 10017
ASME	American Society of Mechanical Engineers 345 East 47 th Street New York, NY 10017
ASPA	American Sod Producers' Association Association Building Ninth and Minnesota Hastings, NE 68901
ASSE	American Society of Sanitary Engineers 960 Illuminating Building Cleveland, OH 44113

ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 2310 South Walter Reed Drive Arlington, VA 22206
AWPA	American Wood-Preservers Association 7735 Old Georgetown Road Bethesda, MD 20014
AWS	American Welding Society 2501 NW 7 th Street Miami, FL 33125
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235
CDA	Copper Development Association 57 th Floor, Chrysler Building 405 Lexington Avenue New York, NY 10017
CLFMI	Chain Link Fence Manufacturers Institute 1101 Connecticut Avenue Washington, D.C. 20036
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
FDOT	Florida Department of Transportation Haydon Burns Building 605 Suwannee Street Tallahassee, FL 32301
FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
FS	Federal Specifications General Services Administration Specifications and Information Distribution Section (WFSIS)

	Washington Navy Yard, Bldg. 197 Washington, D.C. 20407
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
MFMA	Maple Flooring Manufacturers Association 2400 East Devon, Suite 205 Des Plaines, IL 60018
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MLSFA	Metal Lath / Steel Framing Association 221 North LaSalle Street Chicago, IL 60601
NAAMM	National Association of Architectural Metal Manufacturers 221 North LaSalle Street Chicago, IL 60601
NEBB	National Environmental Balancing Bureau 8224 Old Courthouse Road Vienna, VA 22180
NEMA	National Electrical Manufacturers Association 2101 L Street, NW Washington, D.C. 20037
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
NFPA	National Forest Products Association 1619 Massachusetts Avenue, NW Washington, D.C. 20036
NOFMA	National Oak Flooring Manufacturers Association 804 Sterick Building Memphis, TN 38103
NSF	National Sanitation Foundation

	NSF Building 3475 Plymouth Road Ann Arbor, MI 48106
NSWMA	National Solid Waste Management Association 1120 Connecticut Avenue, NW Washington, D.C. 20036
NTMA	National Terrazzo and Mosaic Association 3166 Des Plaines Avenue Des Plaines, IL 60018
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
PS	Product Standard U.S. Department of Commerce Washington, D.C. 20203
RCSHSB	Red Cedar Shingle and Handsplit Shake Bureau 515 116 th Avenue Bellevue, WA 98004
SDI	Steel Deck Institute Box 3812 St. Louis, MO 63122
SDI	Steel Door Institute 712 Lakewood Center North Cleveland, OH 44107
SIGMA	Sealed Insulating Glass Manufacturers Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joint Institute 1703 Parham Road, Suite 204 Richmond, VA 23229
SMACNA	Sheet Metal and Air Conditioning Contractors National Association

8224 Old Courthouse Road
Vienna, VA 22180

TCA Technical Aid Series Construction Specifications Institute
1150 Seventeenth Street, NW
Washington, D.C. 20036

TCA Tile Council of America, Inc.
Box 326
Princeton, NJ 08540

UL Underwriters Laboratories, Inc.
333 Pfingston Road
Northbrook, IL 60062

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

[END OF SECTION]

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.
- D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Florida Department of Environmental Protection. Contractor shall prepare sedimentation and erosion control drawings NOI, meeting the requirements for approval by that agency. Upon approval, furnish two copies of the approved Drawing and NOI to the Engineer.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State, and local laws and regulations

concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or Local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer and incorporate permanent control features into the project at the earliest practicable time.

PART 2 – PRODCUTS (not used)

PART 3 – EXECUTION

3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Offsite surface water shall be diverted around the site, to a downstream channel ahead of siltation barriers. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the

completion of the work, ditches shall be backfilled, and the ground surface restored to original condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

- A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.
- B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.
- C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action plan approved by the Florida Department of Environmental Protection. Submit two copies of approved contingency plans to the Engineer.
- D. Water being flushed from structures or pipelines after disinfection, with a Cl₂ residue of 2 mg/l or greater shall be treated with a dichlorination solution, in a method approved by the Engineer, prior to discharge.

3.03 PROTECTION OF LAND RESOURCES

- A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project.
- B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without

prior approval. No ropes, cables, or guys shall be fastened to or attached to an existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

- C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.
- D. Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.
 - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
 - 2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, both within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.
- E. The Contractor's storage and other construction buildings required temporarily for the performance of the work, shall be located at previously cleared portions of the job site or areas which are proposed to be cleared and shall not be within wetlands, stormwater detention areas or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted by the Contractor for approval of the Engineer.
- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
 - 1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.
 3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
 4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.
- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and sodded as described in Section 02485, or as approved by the Engineer.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

- A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited. The use of chlorides may be permitted with approval from the Engineer.

- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 NOISE CONTROL

- A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

[END OF SECTION]

SECTION 01153
CHANGE ORDER PROCEDURES

SECTION 01153

CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDE

- A. Promptly implement Change Order Procedures
- B.
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on a time-and-material/force account basis.
 - 3. Provide full documentation to Engineer on request.
- C. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work
 - 2. Who is responsible for informing others in the contractor's employ of the authorization of changes in the Work.
- D. Owner will designate in writing the person who is authorized to execute Change Orders.

1.02 RELATED REQUIREMENTS

- A. The amount of established unit prices.
- B. Conditions of the Contract:
 - 1. Methods of determining cost or credit to Owner resulting from changes in Work made on a time-and-materials basis.
 - 2. Contractor's claims for additional costs.
- C. Section 01052: Applications for payment.
- D. Section 01311: Construction schedules.
- E. Section 00300: Bid Form.
- F. Section 01720: Project Record Documents.

1.03 DEFINITIONS: "Change Order" See General Conditions

1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a proposal Request to Contractor. Request will include the following:
 - 1. Detailed description of the Change, Products, and location of the change in the Project. Supplementary or revised Drawings and Specifications.
 - 2. The projected time span for making the change, and a specific statement as to whether overtime work is, or is not, authorized.
 - 3. A specific period of time during which the requested price will be considered valid.
 - 4. Such request is for information only, and is not an instruction to execute the changes, nor to stop work in progress.

- B. Contractor may initiate changes by submitting a written notice to Engineer, containing:
 - 1. Description of the proposed changes.
 - 2. Statement of the reason for making the changes.
 - 3. Statement of the effect on the Contract Sum and the Contract Time.
 - 4. Statement of the effect on the work of separate contractors.
 - 5. Documentation supporting any changes in Contract Sum or Contract Time, as appropriate.

1.05 CONSTRUCTION CHANGE AUTHORIZATION

- A. In lieu of Proposal Request, Engineer may issue a “Work Directive Change” for Contractor to proceed with a change for subsequent inclusion in a Change Order.
- B. Authorization will describe changes in the work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- C. Owner and Engineer will sign and date the Work Directive Change as authorization for the Contractor to proceed with the Changes.

1.06 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Engineer to evaluate the quotation.

- B. On request, provide additional data to support time and cost computation including the following:
 - 1. Labor required.
 - 2. Equipment required.
 - 3. Products required:
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 - 4. Taxes, insurance bonds.
 - 5. Credit for work deleted from Contract, similarly documented.
 - 6. Overhead and profit.
 - 7. Justification for any change in Contract Time.

- C. Support each claim for additional costs, and for work done on a time-and-material / force account basis, with documentation as required for a lump sum proposal, plus the following additional information:
 - 1. Name of the Owner's authorization agent who ordered the work, and date of the order.
 - 2. Dates and time work performed, and by whom.
 - 3. Time record, summary of hours worked, and hourly rates paid.
 - 4. Receipts and invoices for:
 - a. Equipment used, listing dates and times of use.
 - b. Products used, listing quantities.
 - c. Subcontracts.

- D. Document requests for substitutions for Products as specified in Section 01600.

1.07 PREPARATION OF CHANGE ORDERS

- A. Engineer will prepare each Change Order.
- B. Form Change Order format provided in the Contract Documents.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.08 LUMP SUM / FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on either:

- B.
 - 1. Engineer's Proposal Request and Contractor's responsible Proposal as mutually agreed upon between Owner and Contractor.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
- C. Owner and Engineer will sign and date the Change Order as authorization for the Contractor to proceed with the changes.
- D. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.

1.09 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
 - 3. Survey of completed work.
- B. The amount of the unit prices shall be:
 - 1. Those stated in the Agreement.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:
 - 1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
 - 2. Contractor shall sign and date the Change Order to indicate agreement with the terms therein.
- D. When quantities of the items cannot be determined prior to start of the work:
 - 1. Engineer or Owner will issue a Change Order directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit prices.
 - 2. At completion of the change, Engineer will determine the cost of such work based on the unit prices and quantities used.
 - 3. Contractor shall submit documentation to establish the number of units of each item and any claims for a change in Contract Time.
 - 4. Engineer will sign and date a second Change Order to establish the change in Contract Sum and in Contract Time.
 - 5. Owner and Contractor will sign and date the second Change Order to indicate their agreement with the terms therein.

**1.10 TIME AND MATERIAL / FORCE ACCOUNT CHANGE ORDER /
CONSTRUCTION AUTHORIZATION**

- A. Engineer and Owner will issue a Work Directive Change directing Contractor to Proceed with the changes on a time-and-material / force account basis.
- B. At completion of the change, Contractor shall submit itemized accounting and supporting data as provided in the Article “Documentation of Proposals and Claims” of this Section.
- C. Engineer will determine the allowable cost of such work, as provided in General Conditions and Supplementary Condition.
- D. Engineer will sign and date the Change Order to establish the change in Contract Sum and Contract Time.
- E. Owner and Contractor will sign and date the Change Order to indicate their agreement therein.

1.11 CORRELATION WITH CONTRACTOR’S SUBMITTALS

- A. Contractor shall periodically revise Schedule of Values and Request for Payment forms to record each change as a separate item of Work, and to record the adjusted Contract Sum.
- B. Contractor shall periodically revise the Construction Schedule to reflect each change in Contract Time.
 - 1. Revise sub-schedules to show changes for other items of work affected by the changes.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

[END OF SECTION]

SECTION 01200
PROJECT MEETINGS

SECTION 01200

PROJECT MEETINGS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

- A. The Contractor shall cooperate and coordinate with the Resident Project Representative to schedule and administer pre-construction meeting, periodic progress meetings and specially called meetings throughout progress of the work. Resident/Project Representative or Engineer shall:
 - 1. Prepare agenda for meetings.
 - 2. Make physical arrangements for meetings.
 - 3. Preside at meetings.
 - 4. Record the minutes; include significant proceedings and decisions.
 - 5. Reproduce and distribute copies of minutes within 15 working days after each meeting.
 - a. To participants in the meeting.
 - b. To Owner, Engineer, and other parties affected by decisions made at the meeting.
- B. Representatives of Contractors, Owner, Subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
- C. Attend meetings to ascertain that work is expedited consistent with Contract Documents and construction schedules.

1.02 RELATED REQUIREMENTS

- A. Instructions to Bidders are included in Division 0.
- B. Construction Schedules are included in Section 01311.
- C. Contract Closeout is included in Section 01700.

1.03 PRE-CONSTRUCTION MEETING

- A. Schedule a preconstruction meeting no later than 15 days after date of Notice to Proceed.
- B. Location: A central site, convenient for all parties, designated by the Owner.
- C. Attendance
 - 1. Owner's Representative.
 - 2. Engineer and his/her professional consultants.
 - 3. Resident Project Representative.

4. Contractor's Superintendent.
5. Major Subcontractors.
6. Major suppliers.
7. Others as appropriate.

D. Suggested Agenda

1. Distribution and discussion of:
 - a. List of major Subcontractors and suppliers.
 - b. Projected Construction Schedules.
2. Critical work sequencing.
3. Major equipment deliveries and priorities.
4. Project Coordination.
 - a. Designation of responsible personnel.
 - b. Contractor, Owner, Engineer, and Resident Project Representative responsibilities.
5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. Change Orders.
 - e. Applications for Payment.
6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Use of premises:
 - a. Office, work and storage areas.
 - b. Owner's requirements.
9. Construction facilities, controls, and construction aids.
10. Temporary utilities.
11. Housekeeping procedures.

1.04 PROGRESS MEETINGS

- A. Schedule regular periodic meetings. The progress meetings will be held every 7 days with the first meeting 30 days after the pre-construction meeting or 30 days after the date of Notice to Proceed or one week following mobilization to the site by Contractor.
- B. Hold called meetings as required by progress of the work.
- C. Location of the meetings: Project field office of Contractor or Resident Project Representative.
- D. Attendance
 1. Contractor
 2. Owner's representatives
 3. Engineer and his/her professional consultants as needed.

4. Subcontractors as appropriate to the agenda.
 5. Suppliers as appropriate to the agenda.
 6. Others as appropriate.
- E. Suggested Agenda
1. Review, approval of minutes of previous meeting.
 2. Review of work progress since previous meeting.
 3. Field observations, problems and conflicts.
 4. Problems which impede Construction Schedule.
 5. Review of off-site fabrication, delivery schedules.
 6. Corrective measures and procedures to regain projected schedule.
 7. Revisions to Construction Schedule.
 8. Progress, schedule, during succeeding work period.
 9. Coordination of schedules.
 10. Review submittal schedules; expedite as required.
 11. Maintenance of quality standards.
 12. Pending changes and substitutions.
 13. Review proposed changes for change orders.
 14. Effect on Construction Schedule and on completion date.
 15. Effect on other contracts of the project.
 16. Other business.
 17. Construction schedule.
 18. Critical/long lead items.
- F. Attend progress meetings to study previous meeting minutes and current agenda items, in order to be prepared to discuss pertinent topics such as deliveries of materials and equipment, progress of the work, etc.

PART 2 – PRODUCTS

Not applicable.

PART 3 – EXECUTION

Not applicable.

[END OF SECTION]

SECTION 01201
PRE-CONSTRUCTION CONFERENCE

SECTION 01201 PRE-CONSTRUCTION CONFERENCE

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Engineer shall schedule and administer the preconstruction conference and shall perform the following duties:
 - 1. Prepare agenda for meeting.
 - 2. Give notice of meeting three days in advance of meeting date.
 - 3. Make physical arrangements for meeting.
 - 4. Preside at meeting.
 - 5. Record the minutes, which shall include all significant proceedings and decisions.
 - 6. Reproduce and distribute copies of minutes within fifteen (15) working days after meeting. Minutes shall be distributed to all participants in the meeting and to all parties affected by decisions made at the meeting.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work.
- B. Section 01311: Construction Schedule.
- C. Section 01720: Project Record Documents.

1.03 PRECONSTRUCTION CONFERENCE

- A. Engineer will schedule meeting with Contractor, Owner and other affected parties.
- B. Location of the preconstruction meeting: The project site or a nearby office to be selected by Owner/Engineer.
- C. Attendance:
 - 1. Owner/Owner's representative.
 - 2. Engineer/Engineer's representative and his professional consultant.
 - 3. Contractor/Contractor's superintendent.
 - 4. Local utilities representatives.
 - 5. Local government agencies representative.
- D. Agenda:
 - 1. Record of Attendance.

2. Project Summary Description.
3. Local Utilities to be affected.
 - a. Water lines
 - b. Sewer lines
 - c. Gas lines
 - d. Telephone lines
 - e. Cable TV lines
 - f. Electric lines
 - g. Highways
 - h. Railroads
4. Contractor Responsibilities:
 - a. Start date
 - b. Completion date
 - c. Liquidated damages
 - d. Contract amount
 - e. Work schedule
 - f. Space utilization
 - g. Rights-of-Way occupancy
 - h. Progress Payment Application
 - i. As-Builts (Records/Drawings)
 - j. Photographs
 - k. Shop drawings
 - l. Subcontractors
 - m. Project coordination
 - n. Guarantee, Warranties, Maintenance Manuals
5. Owner Responsibilities:
 - a. Property and right-of-way purchase
 - b. Monthly meetings
 - c. Special meetings
 - d. Partial and final payment
 - e. Change Orders
 - f. Periodic site visits
 - g. Public announcements and public relations
 - h. Project acceptance
6. Engineer Responsibilities:
 - a. Technical representative of Owner
 - b. Interpreter of contract documents
 - c. Periodic inspections of job progress
 - d. Reviews partial and final payment applications
 - e. Prepares Change Orders
 - f. Checks and approves shop drawings
 - g. Reviews record drawings

- h. Performs final inspection and issues certificate of completion
7. Resident Inspector Responsibilities:
- a. Engineer's and Owner's representative on site
 - b. Review materials and work and reports any deficiencies to Engineer
 - c. Reviews applications for payment
 - d. Works with Contractor on public notification of work items
 - e. Attends progress meetings
 - f. Observes testing work
 - g. Maintains daily diary of work tasks
 - h. Furnishes reports to Engineer as deemed advisable

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01300

SUBMITTALS

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS

- A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Product Data, Samples, Audio-Visual Documentation, and Construction or Submittal Schedules. Additional general submission requirements are contained in Article 6.17 of the General Conditions. Detailed submittal requirements are specified in the technical Specifications Sections.
- B. All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.
- C. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:
 - 1. Submittal-Description and File number assigned.
 - 2. Date to Engineer.
 - 3. Date returned to Contractor from Engineer.
 - 4. Status of submittal (approved/resubmit/rejected).
 - 5. Date of re-submittal and return (as applicable).
 - 6. Date material released for fabrication.
 - 7. Projected date of fabrication.
 - 8. Projected date of delivery to site.
 - 9. Status of O&M submittal.

1.02 SHOP DRAWINGS, PRODUCT DATA, SAMPLES

- A. Shop Drawings
 - 1. Shop drawings as specified in individual Sections include custom-prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection and test reports including performance curves and certifications, as applicable to the work.
 - 2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. Check all subcontractors' shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission thereof.
 4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.
- B. Product Data
1. Product data as specified in individual Sections include, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the work.
- C. Samples
1. Samples specified in individual Sections include, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.
 2. The Contractor shall prepare a transmittal letter in triplicate for each shipment of samples. Contractor shall enclose a copy of this letter with the shipment and send a copy of this letter to the Engineer. Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify any Contract Requirements.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
1. Field measurement.
 2. Field construction criteria.

3. Catalog numbers and similar data.
 4. Conformance with related Sections.
 5. Catalog numbers and similar data
 6. Conformance with related Sections.
- B. Each shop drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-inch by 17-inch and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.
- C. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
- D. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility thereof.
- E. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated or installed prior to the approval or qualified approval of such item. Fabrication performed, materials purchased, or on-site construction accomplished which does not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- F. Project work, materials, fabrication, and installation shall conform with approved shop drawings, applicable samples, and product data.

1.04 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- B. Each submittal, appropriately coded, will be returned within 30 calendar days following receipt of submittal by the Engineer.

- C. Number of submittals required:
 - 1. Shop Drawings: Five copies.
 - 2. Product Data: Three copies.
 - 3. Samples: Submit the number stated in the respective Sections.

- D. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The Project title and number.
 - 3. Contractor identification.
 - 4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 5. Identification of the product, with the section number, page and paragraph(s).
 - 6. Field dimensions, clearly identified as such.
 - 7. Relation to adjacent or critical features of the work or materials.
 - 8. Applicable standards, such as ASTM or Federal Standards numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on re-submittals.
 - 11. A blank space suitably sized for Contractor and Engineer stamps.
 - 12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

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

- A. The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
 - 1. as permitting any departure from the Contract requirements;
 - 2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;
 - 3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.

- B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

- C. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or

Contract Time, the Engineer may return the reviewed drawings without noting an exception.

- D. Submittals will be returned to the Contractor under one of the following codes.
- Code 1 -"APPROVED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
 - Code 2 -"APPROVED AS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
 - Code 3 -"APPROVED AS NOTED/CONFIRM". This combination of codes is assigned when a confirmation of the notations and comments IS required by the Contractor. The Contractor may, at his own risk, release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the confirmation.
 - Code 4 -"APPROVED AS NOTED/RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within 15 calendar days of the date of the Engineer's transmittal requiring the resubmittal.
 - Code 5 -"NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.
 - Code 6 -"COMMENTS ATTACHED" is assigned where there are comments attached to the returned submittal which provide additional data to aid the Contractor.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showing there has been an attachment of additional data.

- E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall identify all revisions made to the submittals, either in writing on the letter of transmittal or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the

Engineer on the previous submission. Additionally, the Contractor shall direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

- F. Partial submittals may not be reviewed. The Engineer will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the Contractor and will be considered "Not Approved" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
- G. Repetitive Review
 - 1. Shop Drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved,
 - 2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittal will not entitle Contractor to extension of the contract time.
- H. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.
- I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

1.06 DISTRIBUTION

- A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

1.07 GENERAL PROCEDURES FOR SUBMITTALS

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

P.E. CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of Florida and that he/she has been employed by

_____ to design
(Name of Contractor)

(Insert P.E. Responsibilities)

in accordance with Section _____ for the

(Name of Project)

The undersigned further certifies that he/she has performed the design of the _____, that said design is in conformance

(Name of Project)
with all applicable local, state and federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

_____ Indian River County Department of Utility Services
(Insert Name of Owner)

or the Owner's authorized representative within seven days following written request therefor by the Owner.

P.E. Name

Contractor's Name

Signature

Signature

Address

Title

Address

[END OF SECTION]

SECTION 01311
CONSTRUCTION SCHEDULES

SECTION 01311

CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Promptly after award of the Contract, Contractor shall prepare and submit to the Engineer estimated construction progress for the Work, with sub-schedules of related activities which are essential to its progress.
- B. Coordinate the work and scheduling with and around other contractors and individual trades performing work on the Project.
- C. Submit revised progress schedules with each application for payment.
- D. Progress Schedule shall become part of Contract Documents after approval by Engineer.

1.02 RELATED REQUIREMENTS

- A. In other parts of the Contract Documents:
 - 1. General Conditions:
 - a. Articles 2 and 6 – Schedules, Reports, and Records
 - b. Sections 6.1 and 6.2 – Supervision by Contractor
 - c. Article 15 – Supervision of Work, Termination, and Delay
- B. Specified in other sections.
 - 1. Section 01010: Summary of Work
 - 2. Section 01201: Preconstruction Conference

1.03 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart as follows:
 - 1. Provide separate horizontal bar for each trade or operation
 - 2. Horizontal time scale: Identify the first workday of each week.
 - 3. Scale and spacing: To allow space for notations and future revisions.
 - 4. Minimum sheet size: 11" x 17"
- B. Format of listings: The chronological order of the start of each item of work
- C. Identification of listings: By major specification section numbers.

1.04 CONTENT OF SCHEDULES

- A. Construction Progress Schedule shall:
 - 1. Show the complete sequence of construction by activity.
 - 2. Show the dates for the beginning and completion of each major element of construction, specifically list:
 - a. Subcontractor work
 - b. Utility construction
 - c. Restoration
 - 3. Show projected percentage of completion for each item, as of the first day of each month.

1.05 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission
- B. Show changes occurring since previous submission of Schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.
 - 3. Revised projections of progress and completion.
 - 4. Other identifiable changes.
- C. Provide a narrative report as needed to define:
 - 1. Problem areas, anticipated delays, and the impact on the schedule.
 - 2. Corrective action recommended, and its effect.
 - 3. The effect of changes on schedules of other prime contractors.

1.06 SUBMISSIONS

- A. Submit initial schedules within ten (10) days after award of Contract; Engineer will review schedules for information only.
- B. Submit revised progress schedules with each application for payment.
- C. Submit the number of opaque reproductions which the Contractor requires, plus two (2) additional copies; one for Owner and one for Engineer.

1.06 DISTRIBUTION

- A. Distribute copies of approved schedules to:
 - 1. Job site file
 - 2. Subcontractors
 - 3. Other concerned parties

- B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedule.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01370
SCHEDULE OF VALUES

SECTION 01370 SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Standard General Conditions of the Construction Contract.
- B. Application for Payment is included in Section 01052.

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Type schedule on an 8½-inch by 11-inch or 8½-inch by 14-inch white paper furnished by the Owner; Contractor's standard forms and automated printout will be considered for approval by the Engineer upon Contractor's request. Identify schedule with:
 - 1. Title of Project and location.
 - 2. Engineer and Project number.
 - 3. Name and Address of Contractor.
 - 4. Contract designation.
 - 5. Date of submission.
- B. Schedule shall list the installed value of the component parts of the work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Identify each line item with the number and title of the respective Section.

- D. For each major line-item list sub values of major products or operations under the item.
- E. For the various portions of the work:
 - 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 - 2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials delivered and unloaded, with taxes paid. Paid invoices are required for materials upon request by the Engineer.
 - b. The total installed value.
- F. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.04 SUB-SCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a sub-schedule of unit costs and quantities for:
 - 1. Products on which progress payments will be requested for stored products.
- B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in the Schedule of Values.
- C. The unit quantity for bulk materials shall include an allowance for normal waste.
- D. The unit values for the materials shall be broken down into:
 - 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
 - 2. Copies of invoices for component material shall be included with the payment request in which the material first appears.

Paid invoices shall be provided with the second payment request in which the material appears, or no payment shall be allowed and/or may be deleted from the request.
- E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01381
AUDIO-VISUAL DOCUMENTATION

SECTION 01381

AUDIO-VISUAL DOCUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Prior to commencing the Work, the Contractor shall have a continuous color audio-video CD recording taken along the entire length of the Project to serve as a record of preconstruction, construction and post construction conditions.

1.02 APPROVAL

- A. No construction shall begin prior to review and acceptance of the tapes covering the construction area by the Engineer. The Engineer shall have the authority to reject all or any portion of a videotape not conforming to specifications and order that it be redone at no additional charge. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the audio-video coverage. Tape recordings shall not be made more than thirty (30) days prior to beginning of construction in any area. All tapes and written records shall become property of Owner. The tapes shall be delivered to the Owner as soon as possible after recording.

1.03 QUALITY ASSURANCE

- A. The Contractor shall engage the services of a professional electrographer. The color audio-video tapes shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business of preconstruction color audio-video tape documentation.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All equipment, accessories, materials, and labor to perform this service shall be furnished by the Contractor.

2.02 QUALITY

- A. The total audio-video system shall reproduce bright, sharp, clear pictures with accurate colors and shall have minimal distortion, tearing, rolls, or other imperfections. The audio portion of the recording shall reproduce the commentary of the camera operator with proper volume and clarity and be free from distortion and interruptions.

2.03 CAMERA

- A. The color video camera used in the recording system shall have a horizontal resolution of 300 lines at center, a luminance signal-to-noise ratio of 45dB, and a minimum illumination requirement of 25 foot candles.

2.04 TAPES

- A. Audio-video tapes shall be new. Reprocessed tapes will not be acceptable. The tapes shall be one-half inch, high energy, extended still frame capable videocassette, shall be interchangeable with the color videocassette player, and shall be compatible for playback with the player-receiver.

PART 3 - EXECUTION

3.01 VIDEOTAPING PROCEDURES

- A. Each tape shall begin with the current date, project name, and municipality, and be followed by the general location; i.e., name of street, house address, viewing side, and direction of progress. The audio track shall consist of an original live recording. The recording shall contain the narrative commentary.
- B. All video recordings must, by electronic means, display continuously and simultaneously generate, with the actual taping, transparent digital information to include the date and time of recording, and station numbers, if shown on the Drawings. The date information shall contain the month, day, and year. The time information shall contain the hour, minute, and second. Additional information shall be displayed periodically. Such information shall include, but not be limited to, project name, contract number, name of street, house address, direction of travel, and the viewing side. The transparent information shall appear on the screen.
- C. All taping shall be done during times of good visibility. No taping shall be done during precipitation, mist, or fog. The recording shall be done only when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.
- D. The rate of speed in the general direction of travel of the vehicle used during taping shall not exceed 44 feet per minute. Panning, zoom-in, and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.
- E. Tape coverage shall include all surface features located within the zone of influence of construction supported by appropriate audio coverage. Such coverage shall include, but not be limited to, existing driveways, sidewalks, curbs, pavements, ditches, mailboxes, landscaping, culverts, fences, signs, and headwalls within the area covered.

- F. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be more than twelve (12) feet. In some instances, audio-video tape coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance approved by the Engineer.

[END OF SECTION]

SECTION 01410
TESTING LABORATORY SERVICES

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 –GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Owner may employ and pay for the services of an independent testing laboratory to perform certain specified testing in addition to what is called for in the Contract Documents. Owner shall pay for all additional testing.
 - 1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.
 - 2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the work of the Contract.
- B. Contractor will employ and pay for the services of an independent testing laboratory to perform certain specified testing. All testing described in the contract Documents shall be paid for by the Contractor.

1.02 RELATED REQUIREMENTS

- A. General Conditions of the contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.
- B. Respective sections of specifications: Certification of Products.

1.03 QUALIFICATION OF LABORATORY

- A. Meet "Recommended Requirements for Independent Laboratory Qualification," published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction."
- C. Authorized to operate in the State in which the Project is located.
- D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of Inspection, with memorandum of remedies of any deficiencies reported by the inspection.
- E. Testing Equipment:
 - 1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards
 - b. Accepted values of national physical constants.

1.04 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling, and testing of materials and methods of construction:
 - 1. Comply with specified standards
 - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.
- D. Promptly submit written report of each test and inspection; one copy each to Engineer, Owner, and Contractor, and one copy to Record Documents File. Each report shall include:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name, address, and telephone number
 - 4. Name and signature of laboratory inspector
 - 5. Date and time of sampling or inspection
 - 6. Record of temperature and weather conditions
 - 7. Date of test
 - 8. Identification of product and specification section
 - 9. Location of sample or test in the Project
 - 10. Type of inspection or test
 - 11. Results of tests and compliance with Contract Documents
 - 12. Interpretation of test results, when requested by Engineer
- E. Perform additional tests as required by Engineer or the Owner

1.05 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

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

1.06 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with laboratory personnel and provide access to work and to manufacturer's facilities.
- B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes which require control by the testing laboratory.
- D. Furnish copies of product test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide access to work to be tested
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested
 - 3. To facilitate inspections and tests
 - 4. For storage and curing of test samples
- F. Notify laboratory, in advance of operations to allow for laboratory assignments of personnel and scheduling of tests.

PART 2 - PRODUCTS

Not applicable

PART 3 -EXECUTION

Not applicable

[END OF SECTION]

SECTION 01600

DELIVERY, STORAGE AND HANDLING

SECTION 01600

DELIVERY, STORAGE AND HANDLING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY

- A. Transport and handle items in accordance with manufacturer's instructions.
- B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of Subcontractors and other Contractors and will not interfere with the flow of necessary traffic.
- F. Provide necessary equipment and personnel to unload all items delivered to the site.
- G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct and items are undamaged. For items furnished by others (i.e. Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the

Contractor and reviewed with the Engineer by him/her. Instruction shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.

B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

**** END OF SECTION ****

SECTION 01630

SUBSTITUTIONS AND PRODUCT OPTIONS

SECTION 01630

SUBSTITUTIONS AND PRODUCT OPTIONS

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish and install products specified, under options and conditions for substitutions stated in this Section.
- B. Whenever a product, material or item of equipment is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, followed by the phase "or equal," the specific item mentioned shall be the basis upon which bids are to be prepared, and shall be understood as establishing the type, function, dimension, appearance and quality desired. Other manufacturer's or vendor's products not named will be considered as substitutions, Provided the required information is submitted in the manner set forth in this Section and provided the substitution will not require substantial revision to the Contract Documents.

1.02 RELATED WORK

- A. Bid Form is included in Division 0.
- B. Change Order Procedures are included in Section 01153.

1.03 SUBMITTAL OF LIST OF PROPOSED SUBSTITUTIONS

- A. Bidders shall submit their list of proposed substitutions and the proposed monetary changes associated therewith to the Owner on the standard form provided together with their bids.

1.04 CONTRACTOR'S OPTIONS

- A. For Products specified only by reference standard, select product meeting that standard, by any manufacturer.
- B. For Products specified by naming several products or manufacturers, select any one of products and manufacturers named which complies with Specifications.
- C. For products specified by naming one or more products or manufacturers and stating "or equal," submit a request as for substitutions, for any product or manufacturer which is not specifically named.
- D. For products specified by naming only one product and manufacturer, there is no option, and no substitution will be allowed.

1.05 SUBSTITUTIONS

- A. In order for substitutions to be considered, the Contractor shall submit, within 30 days of issuance of Notice of Award, complete data as set forth herein to permit complete analysis of all proposed substitutions noted on his substitutions list. No substitution shall be considered unless the Contractor provides the required data in accordance with the requirements of this Section within the 30 day period.
- B. Submit separate request for each substitution. Support each request with:
1. Complete data substantiating compliance of proposed substitution with requirements stated in Contract Documents:
 - a. Product identification, including manufacturer's name and address.
 - b. Manufacturer's literature; identify:
 - 1) Product description.
 - 2) Reference standards.
 - 3) Performance and test data.
 - 4) Operation and maintenance data.
 - c. Samples, as applicable.
 - d. Name and address of similar projects on which product has been used, and date of each installation.
 2. Itemized comparison of the proposed substitution with product specified; List significant variations. Substitution shall not change design intent and shall perform equal to that specified.
 3. Data relating to impact on construction schedule occasioned by the proposed substitution.
 4. Any effect of substitution on separate contracts.
 5. List of changes required in other work or products.
 6. Accurate cost data comparing proposed substitution with product specified.
 - a. Amount of any net change to Contract Sum.
 7. Designation of required license fees or royalties.
 8. Designation of availability of maintenance services, sources of replacement materials.
- C. Substitutions will not be considered for acceptance when:
1. They are indicated or implied on shop drawings or product data submittals without a formal request from Contractor.
 2. They are requested directly by a Subcontractor or supplier.
 3. Acceptance will require substantial revision of Contract Documents.
- D. Requests for substitutions submitted after Notice of Award will not be considered unless evidence is submitted to the Engineer that all of the following circumstances exist:
1. The specified product is unavailable for reasons beyond the control of the Contractor. Such reasons shall consist of strikes, bankruptcy, discontinuance of manufacturer, or acts of God.

2. The Contractor placed, or attempted to place, orders for the specified products within 10 days after Notice of Award.
 3. Request for substitution is made in writing to the Engineer within 10 days of the date on which the Contractor ascertains that he cannot obtain the item specified.
 4. Complete data as set forth herein to permit complete analysis of the proposed substitution is submitted with the request.
- E. The Engineer's decision regarding evaluation of substitutions shall be considered final and binding. Requests for time extensions and additional costs based on submission of, acceptance of, or rejection of substitutions will not be allowed. All approved substitutions will be incorporated into the Agreement by Change Order.

1.06 CONTRACTOR'S REPRESENTATION

- A. In making formal request for substitution, Contractor represents that:
1. He has investigated proposed product and has determined that it is equal to or superior in all respects to that specified.
 2. He will provide same warranties or bonds for substitution as for product specified.
 3. He will coordinate installation of accepted substitution into the Work, and will make such changes as may be required for the Work to be complete in all respects.
 4. He waives claims for additional costs caused by substitution which may subsequently become apparent.
 5. Cost data is complete and includes related costs under his Contract, but not:
 - a. Costs under separate contracts.
 - b. Engineer's costs for redesign or revision of Contract Documents.

1.07 ENGINEER DUTIES

- A. Review Contractor's requests for substitutions with reasonable promptness.
- B. Notify Contractor, in writing, of decision to accept or reject requested substitution.

PART 2 – PRODUCTS

Not Applicable

PART 3 – EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01700
CONTRACT CLOSEOUT

SECTION 01700

CONTRACT CLOSEOUT

PART 1 --GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Comply with requirements stated in General and Special Conditions of the Contract and in Specifications for administrative procedures in closing out the work.
- B. Related requirements in other parts of the Contract Documents:
 - 1. Fiscal provisions, legal submittals, and additional administrative requirements; General Conditions of the Documents:
 - a. Paragraph 6.19 – Record Documents
 - b. Paragraph 14.11 – Final Inspection
 - c. Paragraph 14.8 – Substantial Completion
 - d. Paragraph 14.12 – Application for Final Payment
 - e. Paragraph 14.13 – Final Payment and Acceptance
 - f. Paragraph 13.1 – Guarantee of Work
- C. Related requirements specified in other sections:
 - 1. Section 01710: Cleaning
 - 2. Section 01720: Project Record Documents
 - 3. Section 01740: Warranties and Bonds

1.02 SUBSTANTIAL COMPLETION

- A. When Contractor considers his work is substantially complete, he shall submit to Engineer:
 - 1. A written notice that the work or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion.
- C. Should Engineer determine that the work is not substantially complete:
 - 1. Engineer will promptly notify the Contractor, in writing, giving the reasons.

2. Contractor shall remedy the deficiencies in the work, and shall send a second written notice of substantial completion to Engineer.
 3. Engineer will re-inspect the work.
- D. When Engineer concurs that the work is substantially complete, he will:
1. Prepare a Certificate of Substantial Completion, accompanied by a list of items to be completed or corrected.
 2. Submit the Certificate to Owner and Contractor for their written acceptance of the responsibilities assigned to them in the certificate.

1.03 FINAL INSPECTION

- A. When Contractor considers the work is complete, he shall submit written certification that:
1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents.
 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 5. Work is completed and ready for final inspection.
- B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer consider that the work is incomplete or defective:
1. Engineer will promptly notify the Contractor, in writing, listing the incomplete or defective work.
 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to Engineer that the work is complete.
 3. Engineer will re-inspect the work.
- D. When Engineer finds that the work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals.

1.04 RE-INSPECTION FEES

- A. Should the Engineer perform re-inspection due to failure of the work to comply with the claims of status of completion made by the Contractor, Contractor will compensate Engineer/Owner for such additional services.

1.05 ADDITIONAL SERVICES

- A. Should Engineer be required to provide representation at the site for the administration of the Contract for Construction, more than thirty days after the specified Date of Substantial Completion of the work, Contractor will compensate Engineer for such additional services.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- A. Evidence of compliance with requirements of governing authorities: Certificate of Occupancy.
- B. Project Record Documents: To requirements of Section 01720.
- C. Warranties and Bonds: To requirements of Section 01740; also, see Item H below.
- D. Evidence of Payment and Release of Liens: To requirements of General and Supplementary Conditions.
- E. Certificate of Insurance for Products and Completed Operations.
- F. One (1) Year Maintenance Bond.
- G. Certificate of Operation from equipment manufacturers.

1.07 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
 - 1. The original Contract Sum
 - 2. Additions and deductions resulting from:
 - a. Previous change orders
 - b. Allowances
 - c. Unit prices
 - d. Deductions for uncorrected work
 - e. Deductions for liquidated damages
 - f. Deductions for re-inspection payments
 - g. Other adjustments
 - 3. Total Contract sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due

- C. Engineer will prepare a final change order, reflecting approved adjustments to the Contract sum which were not previously made by change order.

1.08 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

Not applicable

[END OF SECTION]

SECTION 01710

CLEANING

SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning, during progress of the work, and at completion of the work, as required by General conditions.

1.02 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage finishes and surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the work, the site, and adjacent properties free from accumulation of waste materials, rubbish, and windblown debris resulting from construction operations.
- B. Dispose of waste materials, cartons, crating, debris, and rubbish at designated waste receptacles.
- C. Contractor shall maintain a broom-cleaned site during the entire construction phase.
- D. For exterior utility work (such as underground pipelines, roadways, service areas, etc.), these shall be cleaned daily. Not less frequently than once weekly. Roadways shall be mechanically broomed.

3.02 DUST CONTROL

- A. Contractor shall broom-clean interior spaces prior to the start of completing painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from the cleaning process will not fall on wet or newly coated surfaces.

3.03 FINAL CLEANING

- A. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials.
- B. Contractor shall broom-clean paved surface; rake-clean other surfaces of the grounds.
- C. Prior to final completion, Contractor shall conduct an inspection of all work areas to verify that the entire work area is clean.

[END OF SECTION]

SECTION 01720
PROJECT RECORD DOCUMENTS

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall maintain at the site for the Owner one record copy of the following:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change orders and other modifications to the Contract
 - 5. Engineer field orders or written instructions
 - 6. Approved shop drawings, product data, and samples
 - 7. Field test records

- B. Related requirements in the other parts of the Contract Documents:
 - 1. General Conditions of the Contract.
 - 2. Section 2 – Schedules, Reports and Records

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Contractor shall store documents and samples in the field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.

- B. File documents and samples in accordance with Specifications – Table of Contents.

- C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

- D. Make documents and samples available at all times for inspection by Engineer.

1.03 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color red.

1.04 RECORDING (SEE ALSO SPECIAL CONDITIONS)

- A. Label each document “PROJECT RECORD” in neat large, printed letters.

- B. Record information concurrently with construction progress. DO NOT conceal or backfill any work until required information is recorded.
- C. Drawings: Legibly mark to record actual construction:
 - 1. Depths of various elements of construction in relation to N.G.V.D. 1929.
 - 2. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by field order or by change order.
 - 6. Details not on original contract drawings.
- D. Specifications and Addenda: Legibly mark each section to record:
 - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
 - 2. Changes made by field order or by change order.

1.05 SUBMITTAL

- A. At Contract close-out, deliver Record Documents to Engineer for the Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each Record Document
 - 5. Signature of Contractor or his authorized representative

1.06 AS-BUILT SURVEYS

- A. GENERAL INFORMATION TO BE SHOWN ON AS-BUILT AND SURVEY DRAWINGS
 - 1. Existing right-of-way limits and/or easements within the limits of construction.
 - 2. Survey baseline stationing every 100', control points set every 500', and at angle change of direction.
 - 3. Show cross section elevations at grade every 100' for gravity sewer line construction and 500' for water line and force main construction. Elevations that reflect any significant change in grade between the previously stated footage shall be shown on plans.

4. Existing parcels, tracts, and lot corner locations shown with front footage dimensions per plat when platted. If construction project is along back of lots, then show back lot dimensions.
 5. Existing roadway edge of pavement or edge of dirt road.
 6. Existing utilities as located in field (water, sewer, telephone, electric, cable TV, etc.) (NOTE: Sunshine One to be contacted by surveying firm prior to survey locate; with the intent of county excavation.)
 7. Existing utilities as associated with number 5 above (example: valves, meters, manholes, etc.)
 8. Existing curbs, driveway widths and types.
 9. Existing drainage pipe crossings and driveway culverts (type, sizes and invert elevations.)
 10. Existing swales and/or ditches and elevations every 100' at top and bottom if within area of construction.
 11. Existing fences.
 12. Existing trees and/or shrubbery.
 13. All other non-movable items such as mailboxes, flag poles, etc.
 14. All street names.
- B. CONTROL INFORMATION FOR AS-BUILT UTILITY SURVEY WORK
1. All as-built drawings (24"x36") shall state in 1" lettering "AS-BUILT" located in the bottom right hand side of the drawing original and/or copies, along with the as-built date.
 2. All as-built surveys shall meet the minimum requirements of the Chapter 61G17, Florida Administrative Code Pursuant to Section 472 of the Florida Statutes. All surveys shall be based on a minimum horizontal control Third Order, "Class 2."
 3. All state plane coordinates shall be based on the Florida State Plane Horizontal data (East Zone); or Florida High Precision Geodetic Network (superstation) and NAD 83/1990 – final adjustment.
 4. All engineering or surveying as-built drawings shall be tied to a minimum of one (1) permanent reference monument (P.R.M.) that shall be tied to a minimum of one (1) section corner or one-quarter (1/4) section corner

whichever is closest to the project. State plane coordinates shall be physically shown on the drawing next to the P.R.M. used.

5. All elevations shown shall be based on 1929 NGVD.
6. All incoming as-built drawings (24"x36") shall be received on a CD or USB thumb drive, as an electronic copy, AutoCAD 2000 format, with a tie to a minimum of two (2) state plane coordinates. (NOTE: Prior to submitting the electronic copy, one (1) copy of each as-built shall be submitted for review and approval. After all approvals, five (5) signed and sealed copies of each as-built shall be submitted.
7. All utility as-built construction plans that are located within a distance of one (1) mile from any Indian River County Global Positioning System (G.P.S.) control project monuments shall be tied into the project from one (1) on-site Permanent Reference Monument (P.R.M.) subdivision Corner, or site plan project corner.
8. All as-built surveys shall include a minimum of two (2) existing or established benchmarks for vertical control every 1,400 feet and shown on all surveys.
9. All Utility As-built construction located within one mile of the Indian River County Global Positioning System (G.P.S.) control project shall be tied from that nearest G.P.S. point and into the closest construction site Permanent Reference Monument (P.R.M.), if available. This does not eliminate Item No. 7 above.
10. All as-builts shall clearly depict as-built utility lines that were constructed along with their respective easement (if required). As-builts will not be accepted unless the verbiage "Proposed" and/or "To Be constructed" have been revised to read "AS-Built". As-built Construction drawings with, to be constructed terminology, will not be accepted.
11. All as-builts shall be certified by the contractor's surveyor.
12. All utility as-built construction located within the rights-of-way, easements and alike shall be tied to the respective rights-of way, easements, etc., every 1,000 feet and change of direction.
13. All fire hydrants, valves, Tee's, crosses, A.R.V.'s and pipeline changes in direction (fittings), shall be located with state plane coordinates and shall be identified on the as-builts.
14. All as-builts shall be complete and approved before commencement of field test.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

Not Applicable

[END OF SECTION]

SECTION 01730
OPERATION AND MAINTENANCE DATA

SECTION 01730 OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section includes procedural requirements for compiling and submitting operation and maintenance data required to complete the project.

1.02 RELATED WORK

- A. Submittals are included in Section 01300.
- B. Contract closeout is included in Section 01700.
- C. Warranties and Bonds are included in Section 01740.

1.03 OPERATING MANUALS

- A. Provide specific operation and maintenance instructions for all electrical, mechanical, and instrumentation & controls equipment furnished under various technical specifications Sections.
- B. Separate manuals shall be provided for each type of equipment, or each Section number. Each manual shall contain the following:
 - 1. Format and Materials:
 - a. Binders:
 - 1) Commercial quality three ring binders with durable and cleanable plastic covers.
 - 2) Maximum ring width capacity: 3 inches.
 - 3) When multiple binders are used, correlate the data into related consistent groupings/volumes.
 - b. Identification: Identify each volume on the cover and spine with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". Include the following:
 - 1) Title of Project.
 - 2) Identify the general subject matter covered in the manual.
 - 3) Identify structure(s) and/or location(s), of the equipment provided.
 - 4) Specification Section number.
 - c. 20 lb loose leaf paper, with hole reinforcement.
 - d. Page size: 8-1/2-inch by 11-inch.
 - e. Provide heavy-duty fly leaves (section separators), matching the table of

contents, for each separate product, each piece of operating equipment, and organizational sections of the manual.

- f. Provide reinforced punched binder tab; bind in with text.
 - g. Reduce larger drawings and fold to the size of text pages - but not larger than 11-inch by 17-inch - or provide a suitable clear plastic pocket (with drawing identification) for such folded drawings/diagrams.
2. Contents:
- a. A table of contents/Index, divided into section reflective of the major components provided.
 - b. Specific description of each system and components.
 - c. Name, address, telephone number(s) and e-mail address(es) of vendor(s) and local service representative(s).
 - d. Specific on-site operating instructions (including starting and stopping procedures).
 - e. Safety considerations.
 - f. Project specific operational procedures and recommended log sheet(s).
 - g. Project specific maintenance procedures.
 - h. Manufacturer's operating and maintenance instructions – specific to the project.
 - i. Copy of each wiring diagram.
 - j. Copy of approved shop drawing(s) and Contractor's coordination/layout drawing(s).
 - k. List of spare parts and recommended quantities.
 - l. Product Data: Mark each sheet to clearly identify specific products and component parts and data applicable to installation. Delete inapplicable information.
 - m. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - n. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified.
 - o. Warranties and Bonds, as specified in the General Conditions.
3. Transmittals:
- a. Prepare separate transmittal sheets for each manual. Each transmittal sheet shall include at least the following: The Contractor's name and address, Owner's name, project name, project number, submittal number, description of submittal and number of copies submitted.
 - b. Submittals shall be transmitted or delivered directly to the office of the Engineer, as indicated in the Contact Documents, or as otherwise directed by the Engineer.
 - c. Provide copies of transmittals (only, i.e., without copies of the respective submittal) directly to the Resident Project Representative.

C. Manuals for Equipment and Systems - In addition to the requirements listed

above, for each System, provide the following:

1. Overview of system and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include legible performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.
2. Panelboard circuit directories including electrical service characteristics, controls and communications and color-coded wiring diagrams as installed.
3. Operating procedures: include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.
4. Maintenance Requirements:
 - a. Procedures and guides for trouble-shooting; disassembly, repair, and reassembly instructions.
 - b. Alignment, adjusting, balancing and checking instructions.
 - c. Servicing and lubrication schedule and list of recommended lubricants.
 - d. Manufacturer's printed operation and maintenance instructions.
 - e. Sequence of operation by instrumentation and controls manufacturer.
 - f. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.
5. Control diagrams by controls manufacturer as installed (as-built).
6. Contractor's coordination drawings, with color coded piping diagrams, as installed (as- built).
7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams. Include equipment and instrument tag numbers on diagrams.
8. List of original manufacturer's spare parts and recommended quantities to be maintained in storage.
9. Test and balancing reports, as required.
10. Additional Requirements as specified in individual product specification.
11. Design data for systems engineered by the Contractor or its Suppliers.

D. Electronic Transmission of O&M Manuals:

1. Unless otherwise approved by the Engineer, O&M manuals may not be transmitted by electronic means other than by CD-ROM or USB flash drive. Electronic O&M manuals shall meet the following conditions:
 - a. The above-specified transmittal form is included.
 - b. All other requirements specified above have been met, including, but not limited to, coordination by the Contractor, review and approval by the Contractor.
 - c. The submittal contains no pages or sheets larger than 11-inch by 17-inch.
 - d. With the exception of the transmittal sheet, the entire submittal is included in a single file.
 - e. Files are Portable Document Format (PDF) – with the printing function enabled.
 - f. All scanned manufacturer's O&M manuals must be quality checked after scanning to ensure the page are not crooked and all information is legible.
2. When electronic copies are provided, transmit 2 hard copy (paper) originals to the Engineer with an electronic copy on CD-ROM.
3. The electronic copy of the O&M manual shall be identical in organization, format and content to the hard copies of the manual.
4. The electronic O&M Manual shall be bookmarked identically to the paper manual table of contents to allow quick access to information. Electronic submittals that require extensive scrolling will not be accepted. The document shall be indexed and searchable.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 SUBMITTAL SCHEDULE

- A. Operation and maintenance manuals shall be delivered directly to the office of the Engineer, as follows:
 1. Provide preliminary copies of each manual to the office of the Engineer, no later than 30 days following approval of the respective shop drawings.
 2. Provide final copies of each completed manual prior to testing.
 3. Provide a letter that grants the Engineer and Owner to the limited right to use and reproduce each manual (in its entirety or any portion thereof) from the respective equipment manufacturer(s). Such limited right shall allow the

- Engineer and Owner to use each manual or and portion thereof for:
- a. The potential assembly of a comprehensive facility operation and maintenance manual for the sole benefit of the Owner; and,
 - b. supplemental training of the Owner's personnel and operators, over and above the required vendor's training, regarding operation of the facility as a system.
- B. The Engineer will review Operation and Maintenance manuals submittals for operating equipment for conformance with the requirements of the applicable specification Section. The review will generally be based on the O&M Manual Review Checklist appended to this Section.
- C. If during test and start-up of equipment, any changes were made to the equipment, provide 2 hard copies of as-built drawings or any other amendments for insertion, by the contractor, in the previously transmitted final manuals. In addition, provide one revised electronic version including the as-built drawings and any other amendments. The manuals shall be completed, including updates, if any, within 30 days of start-up and testing of the facility.

3.02 VENDOR TRAINING/INSTRUCTIONS (TO OWNER'S PERSONNEL)

- A. Before final initiation of operation, Contractor's vendors shall train/instruct Owner's designated personnel in the operation, adjustment, and maintenance of products, equipment and systems at times convenient to the Owner.
- B. Unless specified otherwise under the respective equipment specification section, vendor training/instruction shall consist of eight hours of training for each type of equipment. Such training/instruction shall be scheduled and held at times to accommodate the work schedules of Owner's personnel, including splitting the required training/instruction time into separate sessions and/or presented at reasonable times other than the Contractor's "normal working hours" or the Owner's normal day shift.
- C. Use operation and maintenance manuals as basis for instruction. Train/instruct the Owner's personnel, in detail, based on the contents of manual explaining all aspects of operation and maintenance of the equipment. If the respective equipment is inter-related to the operation of other equipment, all interlock, constraints, and permissive shall be explained.
- D. At least 2 weeks prior to the schedule for vendor training, a detailed lesson plan, representative of the material to be covered during instruction, shall be submitted to the Engineer for approval. Lesson plans shall consist of in-depth outlines of the training material, including a table of contents, resume of the instructor, materials to be covered, start-up procedures, maintenance requirements, safety considerations, and shut-down procedures.

- E. Prepare and insert additional data in each Operation and Maintenance Manual when the need for such data becomes apparent during training/instruction.
- F. Vendor's training/instruction will be considered acceptable based on the completed Owner's Acknowledgement of Manufacturer's Instruction as indicated on the Equipment Manufacturer's Certification of Installation, Testing, and Instruction appended to this Section.

3.03 VIDEOGRAPHY OF VENDOR TRAINING/INSTRUCTION

- A. Audio/video (A/V) record (in DVD format) training/instructions as they are being provided to the Owner's personnel. Such recording shall include the entire training/instruction session(s) as well as all questions and answers. A/V recording shall be performed by a professional organization experienced in the production of such recordings. Self-recording by the Contractor may be considered, provided that Contractor can demonstrate, in advance, proficient examples of such recordings.
- B. To avoid audio problems, training/instruction shall be held in a location sufficiently removed from construction activity, insulated from the noise of construction activity, or during a time when construction activity is not occurring in the vicinity.
- C. The audio portion of the A/V recording should be done with a microphone (wired or wireless) attached to the trainer/instructor to maximize the quality of speech.
- D. Each A/V recording should have "chapters" to segregate the distinct portions of the training/instruction or have visual cues at the start of a change in subject.
- E. Two copies of the A/V recordings shall be submitted to the Engineer on DVD disk(s). The DVDs will become the property of the Owner.

[END OF SECTION]

SECTION 01740

WARRANTIES AND BONDS

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Compile specified service and maintenance contracts.
- C. Co-execute submittal when so specified.
- D. Review submittals to verify compliance with Contract Documents
- E. Submit to Engineer for review and transmittal to Owner

1.02 RELATED REQUIREMENTS

- A. In other parts of the Contract Documents:
 - 1. Instructional to Bidders: Bid or Proposal Bonds
 - 2. General Conditions of Contract:
 - a. Performance Bond and Labor and Material Payment Bond
 - b. General Warranty of Construction.
- B. Specified in other sections:
 - 1. Section 01700: Contract Closeout
 - 2. Each respective section of Specifications shall have Warranties and Bonds required for specific products.
 - 3. Provisions of Warranties and Bonds, Duration: The respective section of specification which specifies the product.

1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.
- B. Number of original signed copies requires: Two each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or work item
 - 2. Firm, with name of principal, address, and telephone number.
 - 3. Scope.

4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service maintenance contract.
6. Provide information for Owner’s personnel:
 - a. Proper procedure in case of failure
 - b. Instances which might affect the validity of warranty bonds.
7. Contractor, name of responsible principal, address and telephone number.

1.04 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 1. Size 8-1/2” X 11” punched sheets for 3-ring binder
 - a. Fold larger sheets to fit into binders
 2. Cover: Identify each packet with typed or printed title “WARRANTIES AND BONDS.” List:
 - a. Title of project
 - b. Name of Contractor
- C. Binders: Commercial quality, three-ring, with durable and cleanable plastic cover.

1.05 TIME OF SUBMITTALS

- A. Make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- B. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

1.06 SUBMITTALS REQUIRED

- A. Submit warranties, bonds, and service and maintenance contracts as specified in the respective sections of Specifications, as appropriate.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTIVE

Not applicable

[END OF SECTION]

**DIVISION 2:
SITework**

**SECTION 02100
SURVEYING**

SECTION 02100

SURVEYING

PART 1 GENERAL

1.01 SCOPE

This section describes the requirements for surveying during construction, production of “as-built” documents, and computation of quantities for payment purposes. Survey work will be required to be performed by the Contractor to delineate areas to perform earthwork for general fill and prepared liner subbase. Contractor shall perform an initial topographic survey of existing conditions prior to construction, and as-built surveys of the liner subbase, liner protective layer, geomembrane panel seams and destructive test sample locations, surveying for the leachate management system including the leachate collection system, leachate detection, and leachate transmission system for Cell 3, and to perform other survey work, as needed, to complete various construction activities.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02110 - Clearing, Grubbing and/or Stripping
- B. Section 02200 - Earthwork
- C. Section 02221 - Trenching and Backfilling
- D. Section 02230 - Road Construction
- E. Section 02240 - Liner Protective Soil
- F. Section 02715 - HDPE Pipes and Fittings
- G. Section 02770 - Geomembrane
- H. Construction Drawings
- I. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. National Geodetic Survey Standards.

1.04 SUBMITTALS

- A. Upon request, interim surveys for measurement and payment shall be submitted to the Engineer with each payment request to substantiate the quantities claimed.
- B. Contractor will be required to submit survey notes during construction upon request by the Engineer.

1.05 PROJECT RECORD DOCUMENTS

- A. Contractor shall maintain on site a complete, accurate survey log documenting survey work as it progresses.
- B. Contractor shall maintain on site a plan clearly showing all site reference points, survey control points, and benchmarks.
- C. Contractor shall maintain on site an accurate and current set of marked-up drawings showing "as-built" conditions.
- D. As-built surveys, stamped and signed, by a State of Florida Licensed/Registered Land Surveyor or Professional Engineer, shall be submitted immediately following the completion of any applicable construction element. Complete as-built surveys shall be submitted upon substantial completion of each phase of construction and are a prerequisite for contract closeout.
- E. Upon completion of each work item, Contractor shall prepare and/or update "as-built" drawings.

PART 2 PRODUCTS

2.01 MATERIALS AND SURVEY EQUIPMENT

- A. Provide materials and survey equipment as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts, and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required.
- B. The survey instruments used for this work shall be precise and accurate to meet the needs of the projects. All survey instruments should be capable of reading to a precision of 0.001 ft and with a setting accuracy of ± 0.8 seconds.

PART 3 EXECUTION

3.01 GENERAL

- A. Maintain accurate and complete notes of surveys:
 - 1. Handwritten survey notes and information shall be written with lead pencil(s) and entered in "write in rain" notebooks. A copy of the numbered, dated, and signed field book pages shall be provided to the Engineer as requested for use in checking the work.
 - 2. Electronic field survey information shall be collected, and backup equipment shall be available in the event of equipment malfunction.
 - a. Electronic format for printed output of data collector field survey notes shall be compatible with the approved fieldbook notation format.
 - b. Electronic format for printed output of data collector field work shall be compatible with the Contractor's and Engineer's computer equipment and software for verifying and checking the work. A copy of the data disk shall be submitted to the Engineer as requested.
- B. During construction, survey notes shall be retained by the Contractor and shall be submitted to the Engineer for review upon request. Prior to the placement of successive soil or geosynthetic layers the Contractor shall submit a written statement certifying compliance of the preceding layer thickness and grades to the Engineer. Surveys will be required from the Contractor prior to approval by the Engineer for the placement of overlying materials.
- C. Conformance check surveys for elevation and for horizontal coordinates shall be to the nearest 0.01 ft and for angles shall be to the nearest 20 seconds.
- D. Measurement and payment surveys for elevation and for horizontal distances shall be to the nearest 0.1 ft \pm 0.05 ft.
- E. Perform construction layout surveys in advance of scheduled construction activities. At completion of a survey, provide a copy of the field notes, drawings, or sketches to the Engineer for review. The Contractor shall allow the CQA Consultant and/or Engineer three calendar days for review. The Contractor is responsible for rework and/or construction delays caused by survey or staking errors.
- F. Set slope stakes in accordance with accepted surveying practices.

- G. Set grade stakes required for construction activities as the work progresses. Set fine grade stakes on all items for which the plans show a definite grade line.
- H. Upon completion of the work, the Contractor shall provide the Engineer with all original surveying field notes, layouts, computations, and electronic files in standard bound survey notebooks. Electronic file information shall be compatible with the Engineer's computer equipment and software as requested.
- I. Protect survey control points. Replace disturbed survey control points at no additional cost to the Owner.

3.02 SPECIFIC FIELD REQUIREMENTS

- A. Establish temporary control points, as necessary, to support construction work activities.
- B. Survey Documentation:
 - 1. Record the following information in survey notebooks for each control point established and for all other surveying:
 - a. designation of control point;
 - b. state Planar North American Datum (NAD);
 - c. elevation;
 - d. date of establishment;
 - e. description and sketch of the control point location; and
 - f. a minimum of three reference features that can be seen from the control point.
 - 2. Document survey work in the field notebooks using the format and procedures described below:
 - a. title and consecutive number on the front cover;
 - b. consecutively numbered pages;
 - c. table of contents, indicated by survey task, on the first numbered page;
 - d. legend indicating symbols used in survey notes;
 - e. names of survey team for each task;

- f. notes on weather and equipment;
- g. date and time on each page to indicate when work was recorded;
- h. notes in a uniform character such that they can be interpreted and used by anyone with survey knowledge; and
- i. description and/or sketches of the survey control used.

C. Preliminary Surveys:

- 1. Earthwork Staking: Staking for cut and fill limits shall establish the exterior limits of excavations and embankments. The maximum staking interval shall be 50 feet. Stakes shall be prominently noted with description of point, vertical distance to design elevation, and offset distance as applicable.
- 2. Structures: Stake structure centerlines so that the orientation, position, limits, and foundation elevation(s) are positively identified. Mark stakes to reflect the design elevation and offset distance as applicable.
- 3. Ditches and Channels: Stake ditches and channels such that the layout remains undisturbed during construction.
- 4. Pipes and Culverts: Stake pipes and culverts on 50-ft maximum stationing. Place offset stakes beyond excavation limits and material stockpiles. Continuously check invert elevation during placement.

D. Final Surveys:

- 1. Final topography shall be staked at nominal 50-ft intervals. Additionally, the following points shall be staked and noted as applicable:
 - a. Grade breaks;
 - b. Mid-point of slopes less than 50 ft;
 - c. Points of horizontal curvature and tangency; and
 - d. Points of stationing equation.
- 2. Pipes and culverts: Survey alignment and elevations at 50-ft maximum stations.

3.03 SURVEYS FOR MEASUREMENT AND PAYMENT

- A. Perform surveys to determine quantities of work and percent of completed work.

- B. Calculate and certify quantities and submit survey results, calculations, and certification to the Engineer for review and evaluation.

3.04 SURVEYS FOR CONFORMANCE CHECKS AND "AS-BUILT" DOCUMENTS

- A. Survey the following surfaces to verify the lines and grades achieved during construction:
 - 1. for berms, ditches, drainage swales, roads, and other earthwork:
 - a. original grade surface;
 - b. compacted surface of cut slopes;
 - c. top of general fill; and
 - d. finished grade surface.
 - 2. for the liner system:
 - a. prepared subgrade;
 - b. top of liner subbase;
 - c. geomembrane liner panel drawings showing all panel seaming and identification, repairs, destructive tests, and extrusion weld locations; and
 - d. top of liner protective layer.
 - 3. for all leachate piping:
 - a. top of pipe at 50-ft stations;
 - b. center of all wyes or other pipe branches; and
 - c. manhole connections.
- B. Perform earthwork conformance checks and "as-built" surveying immediately upon completion of a given installation to facilitate progress and avoid delaying commencement of the next installation. Provide the following minimum spacing and locations for survey points:
 - 1. surfaces with gradients less than 10 percent, survey on a square grid spaced not wider than 50 ft.;

2. on slopes greater than 10 percent, a square grid spaced not wider than 50 ft. shall be used, but in any case, a line at the crest, midpoint, and toe of the slope shall be taken;
3. a line of survey points spaced not more than 50 ft. apart shall be taken along any slope break (this will include the inside edge and outside edge of any bench on a slope); and
4. a line of survey points spaced not more than 50 ft. apart shall be taken at the top of any pipes or other appurtenances.

[END OF SECTION]

**SECTION 02110
CLEARING, GRUBBING, AND/OR STRIPPING**

SECTION 02110

CLEARING, GRUBBING, AND/OR STRIPPING

PART 1 GENERAL

1.01 SCOPE

- A. This section describes the requirements for clearing, grubbing, and/or stripping activities.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02221 – Trenching and Backfilling
- D. Section 02290 – Erosion and Sediment Control
- E. Section 02930 – Vegetation

1.03 DEFINITIONS

- A. Clearing consists of the removal of trees, bushes, vegetation, and other surface debris that are 18 inches above the ground surface.
- B. Grubbing consists of the removal of stumps, roots, and vegetation to a depth of 3 feet below the existing ground surface or subgrade elevation, whichever is lower.
- C. Stripping consists of the removal of minimum 6 inches topsoil layer including roots and organic matter, grass, and other material unsuitable for use as subgrade or compacted fill.

1.04 SUBMITTALS

- A. Provide list of equipment, description of construction methods, and other required information to perform clearing, grubbing, and stripping with the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 COMPLIANCE WITH REGULATIONS

- A. It is the sole responsibility of the Contractor to be completely familiar with and to follow all local, state, and federal regulations pertaining to the work required in this Section.

1.06 EXISTING CONDITIONS

- A. The Contractor shall comply with applicable regulations in locating and providing clearance for all underground and above ground utilities, if applicable, prior to beginning construction activities. The Contractor shall immediately notify the Owner's Representative and the Engineer if utility lines, or structures not shown on the Construction Drawings are encountered. Repair of damage and all restitution for liabilities resulting from damage to existing facilities due to activities by the Contractor shall be at the Contractor's expense.

PART 2 PRODUCTS

2.01 EQUIPMENT

- A. Furnish equipment to perform the clearing, grubbing, and stripping specified in this Section.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any of the work described in this section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work described in this section.
- B. Contractor shall note that the elevation of groundwater is at or near the existing ground surface for areas covered under this Contract. Some areas may also be inundated with water at the start of construction. Contractor is responsible for any dewatering required to execute the required work.
- C. Inspection:
 - 1. Prior to implementing any of the work in this section, the Contractor shall carefully inspect and verify that related work required by other sections is complete to the point where the work described in this section may properly commence without adverse impact.
 - 2. If the Contractor has any concerns regarding the related work required by other Sections, he shall notify the Owner's Representative in writing prior to the commencement of operations. Failure to notify the Owner's Representative will be construed as Contractor acceptance of the related work of all other sections.

3.02 EROSION AND SEDIMENT CONTROL

- A. Prior to implementing any work described in this section, the Contractor shall install all erosion and sediment controls in the relevant area(s) of construction.
- B. Contractor is solely responsible for selecting, implementing, and maintaining proper and fully adequate erosion and sediment controls at all times during construction.

3.03 CLEARING AND GRUBBING

- A. Perform clearing and grubbing in excavation, compacted fill, trenching, road construction, fencing, stockpiling areas; and other areas as shown on the Construction Drawings unless otherwise directed by the Owner's Representative or the Engineer.
- B. Perform clearing and grubbing as separate activities.
- C. In those areas where only clearing is required, perform clearing in a manner that minimizes disturbance to the existing ground surface.
- D. Chip cleared materials of a woody nature to a size that is suitable for use as mulch. Keep cleared material to be chipped as free of soil and other inorganic matter as possible. Cleared material smaller than 3 inches in maximum dimension need not be chipped.
- E. Stockpile cleared and grubbed materials separately in the stockpile areas shown on the Construction Drawings or as directed by the Owner's Representative. Stockpiling of cleared and grubbed materials shall be in accordance with Section 02200.
- F. After completion of grubbing, fill and compact depressions outside the grading limits. Material type and degree of compaction shall meet the requirements specified for compacted fill in Section 02200. Match fill elevation to the surrounding grade and grade to drain.

3.04 STRIPPING

- A. Perform stripping in excavation, compacted fill, trenching, road construction, stockpiling areas, and other areas as shown on the Construction Drawings. Transport stripped material to the stockpile areas shown on the Construction Drawings or as directed by the Owner's Representative. Stockpiling of stripped material shall be in accordance with Section 02200.
- B. If soil or weather conditions are unsuitable for stripping, due to precipitation or high wind as determined by the Owner's Representative, cease stripping activities until permission to resume stripping activities is obtained from the Owner's Representative.

3.05 SURVEYING AND CONSTRUCTION TOLERANCES

- A. The Contractor shall retain a Surveyor who shall be responsible for providing survey control for the work. The areas to be cleared, grubbed, and/or stripped shall be surveyed prior to performing the work for the purpose of measurement and payment.
- B. Survey the limits of clearing in accordance with Section 02100.

3.06 PROTECTION OF WORK

- A. The Contractor shall protect all prior work, including all materials and related work of other Sections.
- B. In the event of damage, the Contractor shall immediately make all necessary repairs and replacements necessary, as directed and approved by the Owner's Representative, at no additional cost to the Owner.

[END OF SECTION]

**SECTION 02200
EARTHWORK**

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary to perform all work associated with earthwork activities. The work shall be performed as specified herein and in accordance with the Construction Drawings.
- B. The work shall include, but not necessarily be limited to, site preparation, excavating, stockpiling, surface water control, dewatering, placing moisture conditioning, compacting, and grading soil material.
- C. This section also includes the requirements to maintain the prepared subbase surface until the geosynthetics installer has completed construction of the liner system.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02110 – Clearing, Grubbing, and/or Stripping
- C. Section 02221 – Trenching and Backfilling
- D. Section 02240 – Liner Protective Soil
- E. Section 02290 – Erosion and Sediment Control
- F. Section 13005 – Linear Penetration Boxes
- G. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Construction Quality Assurance (CQA) Plan.
- B. Latest version of American Society for Testing and Materials (ASTM) standards:

1. ASTM D 698. Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
2. ASTM D 1557. Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
3. ASTM D 2216. Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
4. ASTM D 2487. Standard Test Method for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D 2937. Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
6. ASTM D 4220. Standard Practices for Preserving and Transporting Soil Samples.
7. ASTM D 4318. Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
8. ASTM D 6913. Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
9. ASTM D 6938. Standard Test Methods for Density and Water Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
10. ASTM D 7928. Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.

1.04 SUBMITTALS

- A. For each source of general fill material, submit the following to the Engineer for review within 30 calendar days from Notice to Proceed:
 1. the source of the material;
 2. certification and test results from the supplier that the general fill material meets the requirements of this Section; certification shall also include that tests were performed in accordance with ASTM D 698, ASTM D 2487, ASTM D 6913, and ASTM D 7928; and

3. 50-pound representative sample of the general fill material from each source for visual examination, and testing, if necessary.
- B. Within 15 calendar days from Notice to Proceed, submit to the Engineer for review an Earthwork Work Plan. The Earthwork Work Plan shall include, at a minimum:
1. list of equipment proposed for the construction activities including earthwork and other scope of work specified and described in the contract documents;
 2. construction methods for each construction activity;
 3. dewatering methods and techniques;
 4. coordination of survey requirements for the earthwork;
 5. proposed locations of temporary soil stockpile areas;
 6. coordination of earthwork activities with surface water management and erosion and sediment control measures;
 7. schedule for earthwork activities; and
 8. dust control measures.
- C. In addition, the Contractor shall submit a work plan for pipe installation. Limit the maximum length of open trench to 200 feet in advance and 200 feet behind pipe unless otherwise approved by the Engineer. Contractor shall provide appropriate non-skid surface walkways, such as wooden boards, for access across open trenches.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The earthwork will be monitored and tested by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform soil conformance testing on general fill to establish compliance with this Section. Provide equipment and labor to assist the CQA Consultant in obtaining conformance samples from excavations and stockpiles.

- C. The CQA Consultant will perform soil performance testing on the subgrade surface and general fill lifts to evaluate compliance with this Section. The CQA Consultant will indicate any portion of the earthwork that does not meet the requirements of this Section and will delineate the extent of the nonconforming area.
- D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.
- E. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule

1.06 EXISTING CONDITIONS

- A. Existing conditions, based on available site data, are indicated on the Construction Drawings.
- B. Contractor shall verify existing conditions as indicated in Section 02100.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain materials for general fill from excavations, stockpiles, and off-site borrow sources approved by the Engineer.
- B. General fill material shall be free of debris, foreign objects, large rock fragments, organics, and other deleterious materials. General fill material shall classify as SW, SP, SW-SM, SW-SC, SP-SM, SP-SC, SM, or according to the Unified Soil Classification System (per ASTM D 2487). Soils having other classifications may be acceptable as general fill, if approved by the Engineer.
- C. General fill material used as liner subbase under the liner system of the landfill shall be free of sharp materials or any materials larger than 0.5 inches.

2.02 EQUIPMENT

- A. Furnish equipment to perform work specified in this Section and achieve required compaction specified in this Section.
- B. Furnish hand compaction equipment, such as walk-behind padfoot compactors, hand tampers, or vibratory plate compactors, for compaction in areas inaccessible to large compaction equipment.
- C. Furnish water tank trucks, pressure distributors, or other equipment designed to apply water uniformly and in controlled quantities at variable surface widths to provide the required in-place moisture content and to prevent drying of soil surfaces.
- D. Furnish equipment such as scarifiers, disks, spring tooth or spike tooth harrows, earth hauling equipment, and other equipment as required for earthwork construction.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any work described in this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Section.
- B. Inspection:
 - 1. Prior to implementing any of the work in this Section, Contractor shall carefully inspect the installed work of all other sections and verify that all work is complete to the point where the installation of this Section may properly commence without adverse impact.
 - 2. If the Contractor has any concerns regarding the installed work of other Sections, the Owner's Representative shall be notified in writing within 48 hours of the site visit. Failure to notify the Owner's Representative or continuance with earthworks will be construed as Contractor's acceptance of the related work of all other Sections.

3.02 SITE PREPARATION

- A. Prior to initiating earthwork activities, the Contractor shall install erosion and sediment controls in accordance with Section 02290. Contractor shall inspect and maintain the erosion and sediment control features in accordance with Section 02290 and Construction Drawings.
- B. Contractor shall construct temporary stormwater diversion berms/ditches required to divert run-on around the construction area.
- C. Prior to earthwork activities, perform clearing, grubbing, and stripping in accordance with Section 02110.

3.03 EXCAVATION

- A. Excavate designated areas to the subgrade elevations or excavation limits shown on the Construction Drawings. Stockpile excavated material in the designated stockpile area approved by the Owner's Representative.
- B. Install construction safety fence and barricades around open trenches, and excavated areas.
- C. Contractor shall excavate material as necessary to achieve subgrade elevation within the construction limits. Contractor shall be responsible for excavating rock or bedrock formations during construction.
- D. Blasting shall not be permitted without written approval from Owner.

3.04 EXCAVATION DEWATERING

- A. Contractor should anticipate the possibility of seepage of groundwater into and accumulation of surface-water runoff in excavations. Contractor shall manage groundwater and surface-water runoff in excavations in accordance with this Section and Section 02290.
- B. Collect water that accumulates in the excavation in a toe drain, or other suitable sump, and pump to the perimeter drainage ditches, or other locations as directed by the Owner's Representative. Maintain dewatered areas until overlying construction is complete.

3.05 STOCKPILING

- A. Separate stockpiles by material type.
- B. Stockpile excavated soils at the areas shown on the Construction Drawings or as directed by the Owner's Representative.
- C. Construct stockpiles no steeper than 3H:1V (horizontal:vertical), grade to drain, seal by tracking perpendicular to the slope contours with a dozer, and dress daily during periods when material is taken from or added to the stockpile.
- D. Install erosion and sediment control measures at the stockpile areas in accordance with Section 02290.

3.06 SUBGRADE PREPARATION

- A. Subgrade material shall consist of soil relatively free of debris, foreign objects, organics, and other deleterious materials.
- B. Compact all subgrade within the limits of landfill cells to a minimum 95 percent of the standard Proctor (ASTM D 698) maximum dry density at a moisture content approved by the Engineer.
- C. In the presence of the CQA Consultant, perform subgrade proof rolling by driving a loaded dump truck (minimum weight of 10 tons per axle and minimum loaded weight of 20 tons) or other pneumatic-tired vehicle, back and forth across the area to confirm the firmness of subgrade surface. Overlap the passes such that one set of tires on each pass runs between the two sets of tire tracks from the previous pass. Soils shall not exhibit pumping or develop ruts more than two inches in depth. Minor rutting, defined as less than two inches in depth, shall be regarded or covered with general fill to match finish grade.
- D. Subgrade for general fill shall be scarified to a depth of 2 inches using equipment identified in this Section.
- E. Unsuitable soils shall be removed and replaced with general fill to a minimum depth of 2 feet below the proposed subgrade elevation. Suitable soil exhibiting pumping or developing ruts more than two inches in depth will be removed to a minimum depth of 1 foot or dried in place, if feasible. Compact the general fill and liner subbase materials to a minimum 95 percent of standard Proctor (ASTM D 698) maximum dry density at a moisture content approved by the Engineer.

- F. In areas where unsuitable soils are encountered, remove and replace the soil to a minimum depth of 1 foot below the proposed subgrade elevation. Remove unsuitable subgrade to an additional depth if necessary to obtain a suitable soil surface for subsequent fill placement. Removal of unsuitable soils to additional depth shall be as approved by the Engineer. Suitable soils exhibiting pumping or developing ruts more than 2 inches in depth shall be removed to a minimum depth of 1 foot or dried in place by a method approved by the Engineer. Fill areas from which subgrade has been removed with compacted fill in accordance with this Section.
- G. In excavations or other areas where water accumulates, implement measures to remove the water in accordance with this section. Maintain the subgrade surface free of standing water and in firm condition to meet proof rolling requirements of this section. Maintain dewatered areas until overlying construction is complete.
- H. Manage surface water as described in Section 02290.

3.08 COMPACTED FILL

- A. Use fill material that meets the material requirements of this Section. Place the fill material to the limits and grades shown on the Construction Drawings.
- B. Contractor shall stage the placement of general fill in the cell such that the cell floor drains towards the toe of the perimeter berm temporarily. A drainage corridor shall be maintained until geosynthetic installer is prepared to place and weld the final panels of the secondary geomembrane to completely “black-out” the cell floor.
- C. Place fill material on surfaces that are free of debris, branches, vegetation, mud, ice, or other deleterious materials.
- D. Place fill material in loose lifts with a thickness of 12 inches. In areas where compaction is to be performed using hand-operated equipment, place the fill material in loose lifts with a thickness of 6 inches.
- E. Remove visible rock particles with a maximum dimension larger than 6 inches for 12-inch thick loose lifts. For 6-inch thick loose lifts, the maximum rock particle size shall be 3 inches.
- F. Prior to placing a succeeding lift of fill material over a previously compacted lift, thoroughly scarify the previous lift to a depth of 2 inches by discing, raking, or

tracking with a dozer. Moisture condition the preceding lift in accordance with this Section if the moisture content of the surface of the preceding lift is not within the range of acceptable moisture contents specified in this Section.

- G. The traversing of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.
- H. Compact fill material and the liner subbase material in each lift to at least 95 percent of its standard Proctor maximum dry unit weight as determined by ASTM D 698. Compact fill at a moisture content as required to attain the specified density, or as approved by Engineer.
- I. Moisture condition the fill material to achieve the compaction requirements of this Section. Use a water spraying system for wetting. During wetting or drying, regularly disc, rake, or otherwise mix the material to thoroughly blend the moisture throughout the lift. Use discing, raking, or other appropriate methods to dry the material as required.
- J. Do not place fill during periods of precipitation. Placement may occur during periods of misting or drizzle, but only if authorized by the Engineer.
- K. Rework compacted fill that does not meet the required compaction.
- L. Dust shall be controlled by the application of water to the general fill surfaces
- M. Contractor shall coordinate the final surface of the liner subbase in the cell with the geosynthetics installer. Contractor is responsible for maintenance of the subbase until its acceptance by the geosynthetics installer.

3.09 SURVEY CONTROL

- A. Survey the locations, limits, and grades of excavations, prepared subgrade, liner subbase, and top of general fill in accordance with Section 02100.

3.10 TOLERANCES

- A. Perform earthwork construction related to berms, composite liner system, and roads to within ± 0.1 ft. of the elevations and within 10 percent of the slopes indicated on the Construction Drawings.
- B. Positively draining slopes shall be maintained during all construction.

3.12 PROTECTION OF WORK

- A. The Contractor shall use all means necessary to protect all materials and all partially-completed and fully-completed work of this Section.
- B. In the event of damage, the CQA Consultant will identify areas requiring repair, and the Contractor shall make all repairs and replacements necessary to the approval of the CQA Consultant and at no additional cost to the Owner.
- C. At the end of each day, the Contractor shall verify that the entire work area was left in a state that promotes surface drainage off and away from the area and from finished work. If threatening weather conditions are forecast, compacted surfaces shall be seal-rolled to protect finished work.

[END OF SECTION]

**SECTION 02221
TRENCHING AND BACKFILLING**

SECTION 02221

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SCOPE

- A. This Section describes the requirement for trenching, backfilling, placing, and compacting materials and to perform other work as directed by the engineer.
- B. Furnish all labor, material, tools, equipment and incidentals required to perform trench excavation and backfill operations necessary to achieve the specified grades and elevations shown on the Construction Drawings. Review with the Engineer the location, limits, and methods to be used prior to commencing work under this section. Provide support for as-built survey work by installing and removing survey markers.

1.02 RELATED SECTIONS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02290 – Erosion and Sediment Control
- D. Section 13005 – Liner Penetration Boxes
- E. Section 15051 – High Density Polyethylene (HDPE) Pipe and Fittings
- F. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM C 136. Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 2. ASTM D 698. Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 3. ASTM D 2487. Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

4. ASTM D 2488. Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
- B. Latest version of Florida Department of Transportation Construction and Material Specifications (FDOT Specifications).
- C. Latest version of Occupational Safety and Health Administration (OSHA) Construction Standards.

1.04 SUBMITTALS

- A. For each source of pipe embedment fill material obtained from a different source than the source of general/structural fill, submit the following to the Engineer for review within 30 calendar days from Notice to Proceed:
 1. the source of the pipe embedment fill material;
 2. written certification and test results conducted in accordance with ASTM C 136; and
 3. 50-pound representative sample of the pipe embedment fill for visual examination, and testing, if necessary.
- B. Provide a list of equipment, description of construction methods for trenching and backfilling, and other required information for trenching and backfilling in the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 EXISTING CONDITIONS

- A. In advance of trenching in an area, verify the accuracy of existing conditions indicated on the Construction Drawings. Immediately notify the Engineer in writing of deviations from the existing conditions indicated on the Construction Drawings.
- B. The approximate locations of all known underground utilities, above ground utilities, and other structures, if any, are indicated on the Construction Drawings.

PART 2 - MATERIALS

2.01 PIPE BEDDING

- A. Furnish natural sand pipe embedment fill material for reinforced concrete pipe (RCP), corrugated metal pipe (CMP), or high-density polyethylene (HDPE) pipe meeting the gradation requirements of Section 703.06 of the FDOT Specifications unless otherwise indicated on the Construction Drawings or specified in this Section. Gradation testing shall be in accordance with ASTM C 136.

- B. Clean sandy soils or equivalent material approved by the Owner's Representative.
- C. Trench backfill material for pipe trenches shall meet the material requirements for general fill specified in this Section.

2.02 GENERAL FILL

- A. General fill shall be mineral soil, substantially free from organic materials, loam, wood, trash, and other objectionable materials that may be compressible or that cannot be properly compacted. General fill shall not contain stones larger than 4 in. in the largest diameter, broken concrete, masonry rubble, or other similar materials. Natural soils visually classified in accordance with USCS (per ASTM D 2487 or D 2488) as SP-SM, SW-SM, SM, ML, SP-SC, SW-SC, SC, and CL or mixtures of these soil types are acceptable. Soils classifying as SW and SP can be used, with written approval of the Engineer, if they are mixed with adequate quantities of amendment such as bentonite to facilitate tight compaction as approved by the Engineer.
- B. The soil shall be visually inspected and approved by the Engineer before use. The Contractor shall notify the Engineer of any changes in the soil borrow source and submit new soil samples for inspection and approval.

2.03 STOCKPILES

- A. All pipe bedding and other material purchased by the Contractor can be stockpiled on site as directed by the Owner's Representative.
- B. Separate stockpiles by material type.
- C. Stockpile excavated soils at the areas shown on the Construction Drawings or as directed by the Owner's Representative.
- D. Construct stockpiles no steeper than 3H:1V (horizontal:vertical), grade to drain, seal by tracking perpendicular to the slope contours with a dozer, and dress daily during periods when material is taken from or added to the stockpile.
- E. Install erosion and sediment control measures at the stockpile areas in accordance with Section 02290.

2.04 EQUIPMENT

- A. Furnish equipment to perform the work specified in this Section.

- B. Furnish hand compaction equipment such as walk-behind pad-foot compactor, hand tamper, or vibratory plate compactors for compaction in areas inaccessible to large compaction equipment.

PART 3 - EXECUTION

3.01 GENERAL

- A. Verify existing conditions in accordance with Section 02100.
- B. Review existing site utility drawings and identify and stake existing above and below ground utilities in vicinity of trenching. Staking shall be as approved by the Engineer.
- C. In areas of trenching and backfilling, maintain and protect existing above and below ground utilities.
- D. Do not damage or disturb survey benchmarks, finished construction, and existing utilities and structures.
- E. Perform clearing, grubbing, and stripping in accordance with Section 02110.

3.02 TRENCHING

- A. Trench for placement of pipes and for liner system anchor trenches shall be to the depths and dimensions shown on the Construction Drawings. Stockpile excess excavated material from trenching in the stockpile areas shown on the Construction Drawings or as approved by Engineer in accordance with Section 02200.
- B. Use trench support methods approved by the Engineer. Trench support shall satisfy applicable local, state, and federal requirements, including requirements of the OSHA Construction Standards. Provide trench support materials on site prior to the start of trenching. Maintain the safety and stability of slopes and trenches and protect adjacent utilities and structures.
- C. Protect and maintain the trench bottom. Remove rock fragments or raveled materials that collect on the trench bottom. Backfill any over excavation with compacted fill in accordance with Section 02200. Excavate any soft subgrade encountered at the trench bottom and backfill to trench bottom elevation with compacted fill in accordance with Section 02200.
- D. Where trenches will be excavated in compacted fill areas, perform trenching only after compacted fill has reached at least 12 inches above proposed elevation of top of the pipe.

- E. For pipe installation limit the maximum length of open trench to 200 feet in advance and 200 feet behind pipe unless otherwise approved by the Engineer. Contractor shall provide appropriate non-skid surface walkways, such as wooden boards, for access across open trenches.
- F. Continuously dewater trenches. Perform dewatering in accordance with Section 02200.

3.03 BACKFILLING

A. General:

- 1. Do not backfill with frozen or saturated material.
- 2. Do not backfill over frozen, wet, or soft trench bottom or side slopes. Remove materials that are frozen, wet, or soft as specified in this Section.
- 3. Do not disturb or damage piping in trench during backfilling.
- 4. Do not use compaction equipment which exerts greater than 10 pounds per square inch ground pressure over piping that is covered by less than 12 inches of backfill material.

B. Placement of pipe embedment fill for pipes and culverts:

- 1. Place pipe embedment fill in 7-inch \pm 1-inch thick loose lifts to the elevation of the bottom of the pipe or culvert.
- 2. Compact pipe embedment fill with a minimum of 4 passes of a vibratory plate compactor prior to placing pipe.
- 3. Place pipe or culvert on top of the compacted pipe embedment fill.
- 4. For pipes 12 inches in diameter or less, place additional pipe embedment fill on the sides and gently hand tamp the fill around the sides as needed, such that intimate contact between the pipe and the pipe embedment fill is maintained below the spring line of the pipe.
- 5. Continue placing pipe embedment fill until it is even with the top of the pipe. Compact the pipe embedment fill with a minimum of 4 passes of a walk-behind pad-foot compactor, hand tamper, or vibratory plate compactor, as appropriate. Place pipe embedment fill above the top of pipe to a minimum depth of 12 inches in two 7-inch \pm 1-inch thick loose lifts. Compact each lift of pipe embedment fill with a minimum of 4 passes of a walk-behind pad-foot compactor, hand tamper, or vibratory plate compactor, as appropriate.

6. For pipes or culverts greater than 12 inches in diameter, place pipe embedment fill in 7-inch \pm 1-inch thick loose lifts to the limits shown on the
 7. Construction Drawings. Compact each lift with a minimum of 4 passes of a vibratory plate compactor.
- C. Placement of trench backfill material for pipes and culverts:
1. After placement and compaction of pipe embedment fill to the limits shown on the Construction Drawings, place the first lift of trench backfill material in a 12-inch thick loose lift. Place subsequent lifts of trench backfill material in 8-inch \pm 1-inch thick loose lifts.
 2. Compact trench backfill material in each lift to at least 95 percent of its standard Proctor maximum dry unit weight and at a moisture content within \pm 3 percent of the optimum moisture content as determined by ASTM D 698.

3.04 PERFORATIONS

- A. Perforations in the trench backfill resulting from survey stakes or other activities shall be backfilled with trench backfill material. Perforations resulting from nuclear density tests and sand-cone or drive cylinder density tests will be filled with trench backfill material by the CQA Consultant.

3.05 ROAD CROSSING

- A. Schedule all road crossings with Engineer to minimize disruption to waste disposal operations and traffic.
- B. Corrugated metal pipe or an equivalent approved by the Engineer shall be used as a casing to protect pipes along the road crossings. The annulus between the pipe and the casing shall be filled with cement grout. Engineer may approve construction of road crossing without a sleeve depending on the nature of traffic expected on the road, size, and strength of pipe, pipe cover, etc.

3.06 BLASTING

- A. Blasting will not be permitted for purposes of trenching without approval of the Engineer.

3.07 PROTECTION OF UNDERGROUND PIPING AND UTILITIES

- A. The Contractor shall take all necessary precautions to protect underground piping during the course of the construction. The Engineer/Owner shall make available

information pertaining to the location and existence of underground piping and utilities. Contractor shall be responsible for field verification of the locations. Contractor shall perform excavation using hand tools close to the anticipated pipe locations.

3.08 SURVEY CONTROL

- A. Survey the locations, limits, and grades of the bottom of the liner system anchor trench and compacted trench backfill in accordance with Section 02100.
- B. Survey the locations, limits, and grades of pipes and culverts, including invert elevations, in accordance with Section 02100.

3.09 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQA Consultant will perform conformance testing on pipe embedment fill and trench backfill materials to establish compliance with this Section, and Section 02200, as applicable. The conformance testing to be performed and the minimum testing frequencies shall be in accordance with the Construction Quality Assurance (CQA) Plan.
- B. CQA Consultant will monitor trenching and backfilling as specified in this Section and the CQA Plan.
- C. CQA Consultant will perform performance testing on the backfill materials to establish compliance with this Section. The performance testing to be performed and minimum testing frequencies shall be in accordance with the CQA Plan.
- D. CQA Consultant shall review and approve pipe installation as-built elevations prior to backfilling.

3.10 TOLERANCES

- A. Trench bottom shall be within 0.0 to +0.2 feet of the depth indicated on the Construction Drawings.
- B. Embedment fill for pipes and culverts shall be placed within 0.0 to +0.2 feet of the depth indicated on the Construction Drawings.

[END OF SECTION]

**SECTION 02230
ROAD CONSTRUCTION**

SECTION 02230

ROAD CONSTRUCTION

PART 1 GENERAL

1.01 SCOPE

- A. This Section describes the requirements for constructing the road crossing over the culvert and other roads as indicated on the Construction Drawings.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02721 – Culverts
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Standard Specifications for Road and Bridge Construction, Florida Department of Transportation, 2000 Edition (FDOT Specifications).

1.04 SUBMITTALS

- A. At least 14 days prior to the start of road construction, the Contractor shall provide for Engineer's review the equipment and construction method for placing and compacting the road materials.
- B. For each source of the base material, submit the following to the Engineer for review at least 21 calendar days prior to road construction:
 - 1. source of the material;

2. test results conducted on three samples of the material which demonstrates the material meets the requirements of the FDOT Specifications; and
3. a 50-pound representative sample of the proposed material.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The construction of the roads will be monitored by the Engineer as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing and installation quality control testing during road construction as required by the CQA Plan.
- C. The Contractor shall be aware of the activities required by the CQA Consultant in the CQA Plan and account for these activities in the construction schedule.
- D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish base material for the road crossing over the culvert and other roads meeting the requirements of Base Course in Section 911 of the FDOT Specifications. Contractor shall submit reports of testing and supplier certifications showing that base material meets this Section at least 21 days before material is delivered to the site.
- B. Alternate base material may consist of a crushed concrete aggregate as approved by the Engineer. Base material shall meet requirements of Section 204-2 of the FDOT Specifications for Group 1 aggregates. Contractor shall submit reports of testing and supplier certificates showing that alternate base material meets this section at least 21 days before material is delivered to the site.
- C. Furnish embankment material and prepared subbase materials for the road crossing over the box culvert and other roads meeting the requirements of general fill material in Section 02200 from designated borrow area or other areas as directed by the Engineer.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to construct roads in accordance with the requirements of this Section.
- B. Use Caterpillar CS 563 or equivalent self-propelled vibratory compactor, as approved by the Engineer, for compacting the subgrade, embankment, and base materials.

PART 3 EXECUTION

3.01 ROAD CROSSING OVER THE BOX CULVERT

- A. The road crossing over the culvert and other roads shall be constructed to the thickness, grades, lines, and limits indicated on the Construction Drawings.
- B. The base materials shall be placed in two equal lifts and compacted to the grades, lines, and limits indicated on the Construction Drawings and compacted in accordance with this Section.

3.02 COMPACTION REQUIREMENTS AND TEST FREQUENCIES

- A. Embankment materials for the road crossing over the culvert and other roads shall be compacted to 95 percent of maximum dry density determined by ASTM D 698. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the Engineer.
- B. Prepared subbase for the road crossing over the culvert and other roads shall be compacted to 100 percent of maximum dry density determined by ASTM D 698. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the Engineer.
- C. Base course materials for the road crossing over the culvert and other roads shall be compacted to 95 percent of maximum dry density determined by ASTM D 698 or as directed by the Engineer. Construction quality control tests will be performed by the CQA Consultant at a minimum frequency of one test for every 200 linear feet per lift or as directed by the Engineer.

3.04 SURVEY CONTROL

- A. Survey the grades, lines, and limits of the road crossing over the culvert construction in accordance with Section 02100 to verify compliance with the Construction Drawings.

3.05 TOLERANCES

- A. Place and compact embankment materials and base materials to ± 0.1 ft of the elevations indicated on the Construction Drawings.
- B. Construct the road crossing over the culvert to within ± 0.1 ft of the final grades and slopes indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02235
GRANULAR DRAINAGE MATERIAL

SECTION 02235

GRANULAR DRAINAGE MATERIAL

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes the requirements for granular drainage material in the primary leachate collection system (LCS) corridor and the enlarged leachate detection system (LDS) and LCS area.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02720 – Geotextiles
- C. Section 02770 – Geomembrane
- D. Section 13005 – Liner Penetration Boxes
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.

1.04 SUBMITTALS

- A. For each source of granular drainage material, submit the following to the Engineer for review not less than 21 calendar days prior to use:
 - 1. source of the material;
 - 2. test results conducted on each material such that the material is fully represented in accordance with ASTM C 136, ASTM D 2434, and ASTM D 3042; and
 - 3. a 50-pound representative sample of the material.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the granular drainage material will be monitored by the CQA Consultant as required in the CQA Plan.

- B. The CQA Consultant will perform material conformance testing and installation quality control testing on the granular drainage materials as required in the CQA Plan.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Furnish granular drainage materials consisting of homogeneous crushed or natural stones that are free of materials that, due to their nature or size, are deleterious to the intended use as determined by the Engineer.
- B. Granular drainage material in the LCS Corridor shall be rounded or subrounded (as defined by ASTM D 2488), shall have a gradation (per ASTM C 136) that meets the requirements for a No. 57 stone in ASTM D 448, and shall have a minimum hydraulic conductivity of 1 cm/sec based on laboratory permeability testing conducted in accordance with the ASTM D 2434.
- C. Granular drainage material in the LDS shall be rounded or subrounded (as defined by ASTM D 2488), shall have a gradation (per ASTM C 136) that meets the requirements for a No. 4 stone in ASTM D 448, and shall have a minimum hydraulic conductivity of 10 cm/sec based on laboratory permeability testing conducted in accordance with the ASTM D 2434.
- D. Furnish granular drainage material having less than 5 percent loss by weight when tested in accordance with ASTM D 3042 modified at a pH of 4.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to transport, place, and spread the granular drainage materials without damage to adjacent geosynthetics.

PART 3 EXECUTION

3.01 MATERIAL PLACEMENT

- A. Do not commence placement of the granular drainage material until the CQA Consultant has completed conformance evaluation of the material and evaluation

of previous work, including evaluation of the Contractor's survey results for previous work.

- B. Place the granular drainage material to the minimum thicknesses and limits indicated on the Construction Drawings.
- C. Surround granular drainage material with geosynthetic material as indicated on the Construction Drawings. Care shall be taken to avoid damage to geosynthetics during granular drainage material placement.

3.02 SURVEY CONTROL

- A. Survey the limits and elevations of the top of the granular drainage material in accordance with Section 02100.

3.03 TOLERANCES

- A. Construct the granular drainage material to the minimum thicknesses indicated on the Construction Drawings.

[END OF SECTION]

SECTION 02240
LINER PROTECTIVE LAYER

SECTION 02240

LINER PROTECTIVE LAYER

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes the requirements for the liner protective soil layer placed on top of the bottom liner system.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02740 – Geocomposites
- D. Section 02770 – Geomembranes
- E. Section 13005 – Liner Penetration Boxes
- F. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) Standards:
 - 1. ASTM D 698. Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 2. ASTM D 2434. Standard Test Method for Permeability of Granular Soils.
 - 3. ASTM D 2487. Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 4. ASTM D 4373. Standard Test Method for Rapid Determination of Carbonate Content of Soils.
 - 5. ASTM D 6913. Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.

1.04 SUBMITTALS

- A. Provide list of equipment, description of construction methods, and other required information to be used for the placement of protective soil layers with the Contractor's Earthwork Work Plan specified in Section 02200.
- B. For each source of protective soil layer material, submit the following to the Engineer for review at least 15 calendar days prior to use:
 - 1. source of the material;
 - 2. certification and test results conducted on each liner protective soil layer material in accordance with ASTM D 2487, ASTM D 2434, ASTM D 4373, and ASTM D 6913 and;
 - 3. a 50-pound representative sample of the protective soil layer material.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The protective soil layer construction will be monitored and tested by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform soil conformance testing on the protective soil layer materials to establish compliance with this Section. Conformance testing on protective soil layer will be performed on materials obtained from the source and the completed protective soil layer. The Contractor shall provide equipment and labor to assist the CQA Consultant in obtaining conformance samples from excavation and stockpile areas.
- C. The CQA Consultant will perform soil testing on the protective soil layer to evaluate compliance with this Section. The CQA Consultant will indicate any portion of the protective soil layer that does not meet the requirements of this Section and will delineate the extent of the nonconforming area.
- D. The Contractor shall correct all deficiencies and non-conformances identified by the CQA Consultant at no additional cost to the Owner.
- E. The Contractor shall be aware of the activities of the CQA Consultant required by the CQA Plan and shall account for these activities in the construction schedule.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Obtain material for protective soil layer from off-site borrow sources approved by the Engineer.
- B. Protective soil layers material shall consist of relatively homogeneous natural soils that are free of materials that due to their nature or size are deleterious to the intended use as determined by the Engineer. No particles larger than 0.50 inches shall be allowed in protective soil layer.
- C. For liner protective soil layer, the material shall be classified according to the Unified Soil Classification System (per ASTM D 2487) as SP, SW, SW-SM, SW-SC, or SP-SM. Other soil classification may be accepted by the Engineer provided the soil meets the hydraulic conductivity requirement noted below.
- D. Liner protective layer soils shall have:
 - 1. hydraulic conductivity of no less than 1×10^{-3} cm/sec when tested according to ASTM D2434;
 - 2. less than 10 percent (typically) passing through a standard U.S. No. 200 sieve per ASTM D 6913; and
 - 3. less than 10 percent loss of weight when tested according to ASTM D 4373.

2.02 EQUIPMENT

- A. Furnish, operate, and maintain equipment necessary to transport, place, and compact the protective soil layer material.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Construct the protective soil layers to the thickness, elevations, and limits indicated on the Construction Drawings and as specified in this Section.
- B. All lifts of the protective soil layer shall be placed upslope where the slopes exceed 10 percent. The Contractor may deliver material downslope on specially constructed ramps as approved by the Engineer.
- C. Prior to placing the protective soil layer, the Contractor shall verify by visual inspection that the underlying geosynthetic layer is free of holes, tears, wrinkles, or

foreign objects. Material shall be spread over the underlying geosynthetics to cause the material to cascade over the geosynthetics rather than be shoved across the geosynthetics. The Contractor shall “work out” wrinkles in the geosynthetic layers to the satisfaction of the CQA Consultant prior to placement of the protective soil layer. In all cases, wrinkles shall not be of a size that they could fold back on themselves.

- D. The equipment used to spread and compact the protective soil layer shall comply with the following:

Maximum Allowable Equipment Ground Pressure (psi)	Thickness of Protective Soil Layer over Geosynthetics (in.)
<5	12
<10	18
<20	24
>20	36

- E. The protective soil layer shall be placed directly on top of the geosynthetics indicated on the Construction Drawings. The liner protective soil layer shall be placed in 12-inch thick lifts resulting to a minimum total thickness of 24 inches after placement and compaction (tracking). A low ground-pressure dozer shall be used for spreading in accordance with the requirements of this Section. The tracked equipment shall operate only over previously placed protective soil material. The Contractor shall not operate equipment directly on the geomembrane or geocomposite.
- F. The 12-inch thick lifts of liner protective soil layer shall be compacted by tracking with the low ground-pressure dozer or other relatively light-weight compaction equipment meeting the ground pressure requirements specified in this Section. Manually operated compaction equipment may be required in constricted locations and directly adjacent to structures. Soil lifts above the initial 12-inch lift shall be compacted with equipment suitable to the soil type and which meets the ground pressure requirements specified in this Section.
- G. In any area where compaction is to be performed using hand-operated equipment, place the fill material with a loose thickness of 4 inches \pm 1 inch.
- H. The trafficking of scarified surfaces by trucks or other equipment, except compaction equipment, is not permitted.

3.02 COMPACTION

- A. Do not compact the liner protective soil layer. Place and track the liner protective soil layer.

3.03 SURVEY CONTROL

- A. Survey the limits and elevation of the top of the protective soil layer in accordance with Section 02100.
- B. The Owner may supply surveying for quality assurance purposes, measurement and payment and Record Drawings.

3.03 TOLERANCES

- A. Construct the liner protective soil layer to within +0.2 feet of the thickness shown on the Construction Drawings.
- B. Construct the liner protective soil layer to within +0.5 feet of the elevations and within 10 percent of the slopes indicated on the Construction Drawings.

[END OF SECTION]

**SECTION 02245
RIPRAP**

SECTION 02245

RIPRAP

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes riprap products and placement.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02720 - Geotextiles
- B. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (FDOT Specifications).

1.04 SUBMITTALS

- A. Submit the following to the Construction Manager for review with the Contractor's Earthwork Work Plan specified in Section 02200, within 15 calendar days from Notice to Proceed:
 - 1. the source of the riprap; and
 - 2. certification from the supplier that the riprap meets the material requirements of this Section.
- B. Provide list of equipment, description of construction methods, and other required information related to riprap placement in the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The placement of riprap will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing as required by the CQA Plan.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and account for these activities in the construction schedule.

- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Riprap shall consist of hard, durable, angular field or quarry stone.
- B. Riprap for drainage swales shall conform to Section 530-2.2.2 of the FDOT Specifications.
- C. Furnish geotextile separator as specified in Section 02720 and as shown on the Construction Drawings.

2.02 EQUIPMENT

- A. Furnish equipment to perform work specified in this Section.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place riprap to the thickness, elevations, and locations indicated on the Construction Drawings.
- B. Place riprap on geotextile separator or prepared subgrade as shown on the Construction Drawings. Geotextiles shall be shingled downgradient and shall be overlapped a minimum of 1 foot as specified in Section 02720.
- C. Carefully place riprap to avoid segregation or disturbance or damage of the underlying material. Place the material in such a manner as to produce a well graded mass of riprap with the minimum practicable percentage of voids. Distribute the larger pieces throughout the entire mass such that the finished riprap is free from objectionable pockets of small or large pieces.
- D. Do not place riprap by dumping into chutes or by similar methods likely to cause segregation of various sizes.
- E. Do not place riprap in a manner that causes damage to an underlying geotextile separator or geocomposite. Repair damaged geotextile as directed by the CQA Consultant and in accordance with Section 02720.

3.02 SURVEY CONTROL

- A. Survey the limits of riprap placement in accordance with Section 02100.

3.03 TOLERANCES

- A. Place the riprap to the minimum thicknesses as indicated on the Construction Drawings.

[END OF SECTION]

**SECTION 02290
EROSION AND SEDIMENT CONTROL**

SECTION 02290

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SCOPE

- A. The Contractor shall furnish all labor, materials, tools, and incidentals required to install and maintain the temporary erosion and sediment control measures and structures including, but not limited to, silt fence, straw bales, check dams, and sediment traps, throughout the duration of the construction work. The Contractor shall also be responsible for removing the temporary erosion and sediment control measures and structures after the construction work is completed.
- B. The Contractor shall contain all stormwater discharges within the property boundary. Contractor shall protect and maintain all existing stormwater features including, but not limited to, berms, swales, culverts, and drainage ditches. Any disturbed stormwater feature shall be repaired by the Contractor.
- C. It is Contractor's sole responsibility to select, implement and maintain proper and fully adequate erosion and sediment control at all times throughout the duration of the project.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02110 – Clearing, Grubbing, and/or Stripping
- C. Section 02200 – Earthwork
- D. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. The Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual, First Edition, January 1999.

1.04 COMPLIANCE WITH REGULATIONS

- A. It is the sole responsibility of the Contractor to be completely familiar and in compliance with all local, state, and federal regulations pertaining to the work required in this section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. Erosion and sediment control activities shall be monitored as outlined in the CQA Plan.
- B. The Contractor shall be aware of the activities set forth in the CQA Plan and shall account for these activities in the construction schedule.
- C. The Contractor shall assist the CQA Consultant in every manner necessary for the proper performance of activities set forth in the CQA Plan.
- D. CQA testing or inspections do not relieve the Contractor of the responsibility to construct all work in conformance with the Construction Drawings and Specifications.
- E. If quality control or quality assurance tests indicate that work does not meet specified requirements, the Contractor shall remove, replace, and retest the work at no additional cost to the Owner.

1.06 SUBMITTALS

- A. Submit the following to the Construction Manager for review within 15 calendar days from Notice to Proceed:
 - 1. manufacturer's product data and recommended methods of installation for products used for erosion and sediment control measures; and
 - 2. certification from the supplier or Manufacturer that products meet the requirements of this Section.

PART 2 PRODUCTS

2.01 SILT FENCE

- A. Furnish silt fence with either woven or nonwoven fabric. Silt fence shall:
 - 1. be woven fabric consisting of slit films of polypropylene treated with ultraviolet light stabilizers or nonwoven fabric consisting of long chain polymeric filaments or polyester yarns;
 - 2. be inert to hydrocarbons and chemicals commonly found in soils;
 - 3. be resistant to mildew, rot, insects, and rodent attack;
 - 4. have fence post of minimum 2" x 2" lumber and with minimum length of 36 inches spaced at a maximum distance of 6 ft along the fabric; and

5. have a minimum fabric width of 36 inches.

2.02 EROSION MAT

- A. Furnish erosion mat, where applicable, which shall be a woven blanket-like fabric made of biodegradable yarn with the following material properties:
 1. Yarn Content: 100 percent jute except as indicated on Construction Drawings;
 2. Weight: Minimum 11.5 ounces per square yard;
 3. Open Area: 55 ± 10 percent; and
 4. Minimum Mesh Opening: 0.5 inches.
- B. Furnish erosion mat that will resist degradation for a minimum 6-month period after installation.
- C. Furnish erosion mat having a permissible velocity of 7 feet per second (fps).

2.03 STRAW BALES

- A. Furnish rectangular shaped bales of hay weighing at least 40 pounds per bale. Straw bales shall be free of primary noxious weed seeds and shall be staked in place.

2.04 STABILIZATION

- A. Materials for stabilization, including vegetation and crusting agent, shall be in accordance with Section 02930.

2.05 OTHER MATERIALS

- A. Materials for berms shall be as specified for compacted fill in Section 02200.
- B. Construction entrances and check dams shall be in accordance with Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual

PART 3 EXECUTION

3.01 INSTALLATION

- A. Silt fence shall be installed in accordance with the manufacturer's recommendations as needed or as directed by the Construction Manager, prior to any construction activities. Minimum fabric burial depth shall be 6 inches or as recommended by the manufacturer, whichever is greater.

- B. The exterior slopes of landfill berms and road shoulders shall be grassed immediately after final grading and shaping.
- C. The Contractor shall use straw bales to contain sediment and water from dewatering operations and promote infiltration. Accumulated sediment shall be removed and stockpiled for reuse in an area designated by the Construction Manager.

3.02 PROTECTION OF WORK

- A. The Contractor shall protect all prior work, including materials and related work of other sections.
- B. In the event of damage, the Contractor shall immediately make all repairs and replacements necessary, as directed and approved by the Construction Manager, at no additional cost to the Owner.

[END OF SECTION]

SECTION 02605

PRECAST CONCRETE MANHOLES AND STRUCTURES

SECTION 02605

PRECAST CONCRETE MANHOLES AND STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and install precast concrete manholes, structures, frames and covers, access hatches, manhole rungs, and appurtenances all as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Section 02200 – Earthwork
- B. Section 02235 – Granular Drainage Material
- C. Section 03300 – Cast-in-place Concrete

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings showing details of construction, reinforcing, buoyancy calculations, joints, pipe connection to manhole, manhole rungs, manhole platforms (if applicable), manhole frames and covers, access hatches, and ladders. Submittals shall include the method of repair for minor damage to precast concrete sections including coatings to detection manholes and wetwells which may be required due to installation of components under this contract.
- B. Submit for review, structural calculations and drawings for all precast structures and manholes.
- C. Concrete design mix data and concrete test cylinder reports from an approved concrete testing laboratory certifying that the concrete used in the precast structures conforms with the strength requirements specified herein.

1.04 REFERENCE STANDARDS

- A. ASTM International:
 - 1. ASTM A48. Standard Specification for Gray Iron Castings.
 - 2. ASTM A615. Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

3. ASTM C32. Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
 4. ASTM C33. Specification for Concrete Aggregates.
 5. ASTM C62. Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
 6. ASTM C150. Standard Specification for Portland Cement.
 7. ASTM C207. Standard Specification for Hydrated Lime for Masonry Purposes.
 8. ASTM C443. Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 9. ASTM C478. Standard Specification for Precast Reinforced Concrete Manhole Sections.
 10. ASTM D4101. Standard Specification for Propylene Plastic Injection and Extrusion Materials.
- B. American Concrete Institute (ACI):
1. ACI 318. Building Code Requirement for Structural Concrete
 2. ACI 350R. Concrete Sanitary Engineering Structures.
- C. American Association of State Highway and Transportation Officials (AASHTO).
- D. Occupational Safety and Health Administration (OSHA).
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such inspection may be made at the place of manufacture, or on the work after delivery, or at both places and the materials shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein; even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All materials which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the

Contractor's expense.

- B. At the time of inspection, the materials will be carefully examined for compliance with the ASTM standard specified below and this Section and with the approved manufacturer's drawings. All manhole sections shall be inspected for general appearance at the surface, dimension, "scratch- strength", blisters, cracks, roughness, soundness, etc.
- C. At the time of inspection, the materials will be carefully examined for compliance with the ASTM standard specified below and this Section and with the approved manufacturer's drawings. All manhole sections shall be inspected for general appearance, dimension, "scratch- strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close- textured.
- D. Imperfections in manhole sections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3-inch by 6-inch cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

PART 2 PRODUCTS

2.01 PRECAST CONCRETE MANHOLE SECTIONS

- A. Precast concrete barrel sections and transition top sections, shall conform to ASTM C478 and meet the following requirements:
 - 1. The wall thickness shall not be less than 8 inches for reinforced barrel sections.
 - 2. Top sections shall be eccentric except that barrel sections shall be used where shallow pipe cover requires a top section less than 4-ft as shown on the Drawings.
 - 3. Barrel sections shall have tongue and groove joints.
 - 4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 5,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.
 - 5. Precast concrete barrel sections with precast top slabs and precast concrete transition sections shall be designed for a minimum of H-20 loading plus the weight of the soil above at 120 pcf.
 - 6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.
 - 7. Precast concrete bases shall be constructed and installed as shown on the Drawings.

The thickness of the bottom slab of the precast bases shall not be less than the manhole barrel sections or top slab whichever is greater.

8. Knock out panels shall be provided in precast manhole sections at the locations shown on the Drawings. They shall be integrally cast with the section, 2-1/2-inch-thick and shall be sized as shown on the Drawings. There shall be no steel reinforcing in knock out panels.
9. Structural design calculations and Drawings shall be prepared and stamped by a professional engineer registered in the State of Florida.
10. The manholes shall be designed to prevent flotation without the benefit of skin friction when the ground water level is at finished ground surface. Flotation forces shall be resisted by the dead load of the structure and soil directly above the structure. Weight of equipment and piping within the structure and soil frictional forces shall not be considered as being effective in resisting flotation forces.
11. All exterior walls shall be designed for an equivalent fluid pressure of 90 lbs/sq ft. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in accordance with AASHTO.

2.02 PRECAST CONCRETE STRUCTURES

- A. The precast reinforced concrete structures shall be manufactured by Rotundo & Sons, Inc.; American Precast or equal. The inside dimensions, headroom requirements and minimum thickness of concrete shall be as indicated on the Drawings. The manufacturer shall notify the Engineer at least 5 working days prior to placing concrete during the manufacturing process. The Engineer may inspect the reinforcing steel placement and/or require the manufacturer to provide photographs of each section showing the location of all reinforcing steel prior to the placing of concrete. Should it be found that the placement of steel is not as detailed in the shop drawing submittals, the section in question shall be rejected and a replacement section shall be manufactured at the Contractor's expense. Failure to properly notify the Engineer prior to placing concrete shall require the precast sections to be rejected and replacement sections to be manufactured at the Contractor's expense.
- B. Structural design calculations and Drawings shall be prepared and stamped by a professional engineer registered in the State of Florida.
- C. All precast concrete shall have a minimum compressive strength of 5,000 psi at 28 days. Water shall be kept to a minimum to obtain concrete which is as dense and watertight as possible. The maximum water-to-cement ratio shall be 0.40 by weight and the minimum cement content shall be 600 lbs of cement per cubic yard of concrete. The above ratios shall be revised for sacks of cement weighing different from 94 pounds per sack.

D. Design Criteria:

1. All precast concrete members shall conform to ACI 318.
 2. When the design yield strength "fy" for tension reinforcement exceeds 40,000 psi, the "z" values referred to in ACI 318 shall not exceed 95 kips/in. The flexural stress in reinforcement under service loads "fs" shall be calculated and shall not be greater than 50 percent of the specified yield strength fy.
 3. The precast concrete structure's elements shall be designed to support their own weight, the weight of soil above at 120 pcf and shall be capable of withstanding a live load equal to an AASHTO H-20 highway loading applied to the top slab.
 4. The base slab and walls shall be cast together to form a monolithic base section.
 5. All exterior walls shall be designed for an equivalent fluid pressure of 90 lbs/sq ft. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in accordance with AASHTO.
 6. The structural design shall take into account discontinuities in the structure produced by openings and joints in the structure.
 7. The structures shall be designed to prevent flotation without the benefit of skin friction when the ground water level is at finished ground surface. Flotation forces shall be resisted by the dead load of the structure and soil directly above the structure. Weight of equipment and piping within the structure and soil frictional forces shall not be considered as being effective in resisting flotation forces.
 8. If the design of the box structure requires a concrete pad to prevent flotation, the cost of designing, furnishing and installing a reinforced concrete pad shall be included in the price for the structure. Details of the design of the concrete pad (if required) shall be submitted to the Engineer for review.
 9. All walls and slabs shall be analyzed by accepted engineering principles. Openings shall be completely framed as required to carry the full design loads to support walls. All slabs and walls shall be fully reinforced on both faces and the minimum reinforcing shall be No. 5 at 12 inches E.F.E.W. Additional reinforcing shall be provided around all openings.
 10. The horizontal wall joints shall not be located within 18 inches of the horizontal centerline of wall penetrations.
- E. The structure shall be built by the manufacturer in no more than four major sections including the top slab if required.

- F. Where top slabs are used or required, lifting hooks shall be provided.
- G. As required, access openings and pipe penetrations shall be formed openings and located as shown on the Drawings.
- H. Wall sleeves as shown on the Drawings, shall be provided to the precast concrete manufacturer for inclusion in the manufacture of the structure.

2.03 BRICK MASONRY

- A. The bricks shall be good, sound, hard and uniformly burned, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Underburned or salmon brick will not be acceptable and only whole brick shall be used unless otherwise permitted. In case bricks are rejected by the Engineer, they shall be immediately removed from the site of the work and satisfactory bricks substituted therefor:
 - 1. Bricks for the channels and shelves shall comply with ASTM C32 for Sewer Brick, Grade SS (from clay or shale) except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.
 - 2. Bricks for building up and leveling manhole frames shall conform to ASTM C62.
- B. Mortar used in the brickwork shall be composed of 1 part Type II Portland cement conforming to ASTM C150 to 2 parts sand to which a small amount of hydrated lime not to exceed 10 lbs to each bag of cement shall be added.
- C. The sand used shall be washed, cleaned, screened, sharp and well graded as to different sizes and with no grain larger than will pass a No. 4 sieve. It shall be free from vegetable matter, loam, organic or other materials of such nature or of such quantity as to render it unsatisfactory.
- D. The hydrated lime shall also conform to ASTM C207.

2.04 ACCESS HATCHES

- A. Access hatches shall have single or double leaf doors as indicated by the Drawings. The doors shall be 1/4-inch aluminum diamond pattern plate with welded stiffeners, as necessary, to withstand an AASHTO H20 wheel load. Hatches shall have a 1/4-inch aluminum channel frame with a perimeter anchor flange or strap anchors for concrete embedment around the perimeter. Unless otherwise noted on the Drawings, use pivot torsion bars for counterbalance or spring operators for easy operation along with automatic door hold open. Hardware shall be durable and corrosion resistant with Type 316 stainless steel hardware used throughout. Provide removable lock handle. Finish shall be the factory mill finish for aluminum doors and frames with bituminous coating on the exterior of the frames in contact with concrete. Hatches shall be watertight and

have a 1-1/2-inch drainage coupling to the channel frame. Access hatches shall have a safety grate and be in accordance with the Indian River County Department of Utilities Services (IRCDUS) Standard Details and Specifications and Approved Materials List, Latest Edition.

2.05 JOINTING PRECAST MANHOLE SECTIONS

- A. Tongue and groove joints of precast manhole sections shall be sealed with either a round rubber O-ring gasket or a preformed flexible joint sealant. The O-ring shall conform to ASTM C443. The preformed flexible joint sealant shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company or equal.
- B. Joints shall be designed and manufactured so that the completed joint will withstand an internal water pressure of 15 psi without leakage or displacement of the gasket or sealant.

2.06 PIPE CONNECTIONS TO MANHOLE

- A. Manhole pipe connections shall be accomplished in accordance with the products listed in IRCDUS Approved Products List.

2.07 DAMPPROOFING

- A. Brushed dampproofing shall be an asphalt emulsion reinforced with fibers conforming to ASTM D1227, Type II, Class 1. The dampproofing shall be Hydrocide 700B by Sonneborn Building Products, Division of ChemRex Inc., Minneapolis, MN; Karnak 220 Asphalt Emulsion by Karnak Corporation, Clark, NJ or equal.

2.08 COATING

- A. Precast manholes and structures shall have a high-density polyethylene (HDPE) liner in accordance with IRCDUS Standards and Approved Products List.
- B. HDPE liner installation and welding shall be spark tested.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Manhole and Structure Installation:
 - 1. Manhole and structure shall be constructed to the dimensions shown on the Drawings and as specified herein. All work shall be protected against flooding and flotation.
 - 2. The bases of manholes shall be placed on a bed of 12-inch screened gravel as shown on the Drawings. The bases shall be set at a grade to assure that a maximum of 8-inch thickness of brickwork will bring the manhole frame and cover to final grade. Cast-in-

place bases shall be constructed in accordance with the requirements of Division 3 and the details shown on the Drawings.

3. Precast concrete barrel sections and structures shall be set plumb and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed. The joints of precast barrel sections shall be sealed with either a rubber O-ring set in a recess, or the preformed flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces the joint cavity. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces. Allow joints to set for 24 hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If any leaks appear in the manholes the inside joints shall be caulked with lead wool to the satisfaction of the Engineer. Install the precast sections in a manner that will result in a watertight joint.
4. Holes in the concrete barrel sections required for handling or other purposes shall be plugged with a non-shrinking grout or non-shrinking grout in combination with concrete plugs and finished flush on the inside.
5. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done prior to setting manhole sections in place to prevent any subsequent jarring which may loosen the mortar joints.

B. Manhole Pipe Connections:

1. Manhole pipe connections shall be accomplished in the ways specified herein. Pipe stubs for future extensions shall also be connected and the stub end closed by a suitable watertight plug.

C. Brickwork:

1. Mortar shall be mixed only in such quantity as may be required for immediate use and shall be used before the initial set has taken place. Mortar shall not be retained for more than 1 1/2 hours and shall be constantly worked over with hoe or shovel until used. Anti-freeze mixtures will not be allowed in the mortar. No masonry shall be laid when the outside temperature is below 40 degrees F unless provisions are made to protect the mortar, bricks, and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. The Engineer's decision as to the adequacy of protection against freezing shall be final.
2. Channels and shelves shall be constructed of brick and concrete as shown on the Drawings. The brick lined channels shall correspond in shape with the lower half of the pipe. The top of the shelf shall be set at the elevation of the crown of the highest pipe and shall be sloped 1-inch per foot to drain toward the flow through channel. Brick surfaces exposed to sewage flow shall be constructed with the nominal 2-inch by 8-inch face exposed (i.e., bricks on edge).

3. Manhole covers and frames shall be set in a full mortar bed and bricks, a maximum of 8 inches thick, shall be utilized to assure frame and cover are set to the existing grade. If full width paving is the permanent paving, the manhole frame and cover shall be reset to final grade prior to placement of permanent paving.

D. Damp proofing:

1. Outer surfaces of precast and cast-in-place manholes shall dampproofed at the rate of 30 to 35 sq ft per gallon as directed by the Engineer and in accordance with manufacturer's instructions.

3.02 LEAKAGE TESTS

- A. Leakage tests shall be made and observed by the Engineer on each manhole. The test shall be the exfiltration test made as described below:
- B. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6-ft of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints below the 6-ft depth line. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.
- C. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24 hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24 hour period. If the manhole fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.
- D. No adjustment in the leakage allowance will be made for unknown causes such as leaking

plugs, absorptions, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

- E. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water-tightness of the manhole. However, if the Engineer is not satisfied, lower the water table, and carry out the test as described here in before.

Leakage Tests for Structures:

1. The Engineer will visually inspect structure(s) for possible leaks before backfilling of structures is allowed. All joints shall be sealed to the satisfaction of the Engineer.
2. The Engineer will require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

3.03 CLEANING

- A. All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

[END OF SECTION]

**SECTION 02715
HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND
FITTINGS**

SECTION 02715

HIGH DENSITY POLYETHYLENE (HDPE) PIPES AND FITTINGS

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes requirements for high-density polyethylene (HDPE) pipes and fittings installation and products for the Cell 3 leachate collection and detection systems.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02215 – Trenching and Backfilling
- C. Section 02235 – Granular Drainage Material
- D. Section 13005 – Liner Penetration Boxes
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards and other standards noted in this specification.
- B. Latest version of the American National Standards Institute (ANSI) standards:
 - 1. ANSI B16.1. Standard Specifications for Cast-Iron Pipe Flanges and Flange Fittings.
- C. Latest version of the American Society of Mechanical Engineers (ASME) standard:
 - 1. ASME B31.9 Building Services Piping §937.1 through 937.3.

1.04 SUBMITTALS

- A. Submit the following to the Engineer for review not less than 30 calendar days prior to first installation of material under this section:

1. detailed shop drawings of all HDPE pipes, fittings, supports, and other appurtenances;
 2. a list of materials to be furnished;
 3. the names of the suppliers and the proposed dates of delivery of the materials to the site;
 4. detailed procedures to be used for hydrostatic testing of the pipes and fittings;
 5. documentation demonstrating that the manufacturer has adequate quality control procedures to ensure that fabrication of the HDPE pipes and fittings complies with the requirements of this section;
 6. origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used; and
 7. certification of minimum values and the corresponding test procedures for HDPE material properties listed in Tables 02715-1.
- B. Submit at least 30 calendar days prior to installation of any material covered by this Section, manufacturer's written certification of compliance with these Specifications for that material.
- C. Submit at least 14 calendar days prior to installation, documentation of training and certification of personnel qualified for performing HDPE pipe joining operations.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of HDPE pipe and fittings shall be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant may perform material conformance testing and installation quality assurance evaluations of the HDPE pipe and fittings.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the installation schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GENERAL

- A. Design and proportion all parts to have adequate strength and stiffness and to be adapted for the purposes shown on the Construction Drawings.
- B. Furnish each HDPE completely assembled with all pipes, valves, fittings, supports, gussets, and appurtenances such that field work involves only installation and connection of external products.
- C. Furnish each HDPE with watertight construction of welds and pipe penetrations.

2.02 HDPE COMPOUND

- A. Furnish HDPE and flat stock manufactured from new, high performance, high molecular weight, HDPE resin conforming to the minimum cell classification as shown in Table 02715-1, and stamped and designated PE 3408 or PE 4710. The resin shall be pre-compounded. In-plant blending of non-compounded resins is not permitted. Furnish material having the minimum specified property values listed in Table 02715-1.
- B. Furnish HDPE pipe and fittings manufactured from new, high performance, high molecular weight, HDPE resin conforming to the minimum cell classification as shown in Table 02715 1, and stamped and designated PE 3408 or PE 4710. Furnish material having the minimum specified property values listed in Table 02715-1.

2.03 HDPE PIPES AND FITTINGS

- A. Unless otherwise shown on the Construction Drawings, furnish HDPE pipe and fittings that have a SDR of 17 and conform to ASTM F714.
- B. Furnish HDPE pipes in standard laying lengths not exceeding 50 feet.
- C. Furnish HDPE pipes and fittings that are homogeneous throughout and free of visible cracks, holes (other than intentional manufactured perforations), foreign inclusions, or other deleterious effects, and are uniform in color, density, melt index, and other physical properties.
- D. Furnish HDPE end caps at the end of pipes as shown on the Construction Drawings.
- E. Furnish electrofusion couplings meeting the requirements of ASTM F1055 and as recommended by the electrofusion coupling manufacturer.
- F. Perforate pipe by factory drilling at locations shown on the Construction Drawings.

2.05 IDENTIFICATION

- A. Continuously indent print on the HDPE pipe, or space at intervals not exceeding 5 feet the following:
 - 1. name and/or trademark of the HDPE pipe manufacturer;
 - 2. nominal HDPE pipe size;
 - 3. standard dimension ratio (e.g., SDR-11);
 - 4. the letters PE followed by the polyethylene grade per ASTM D 1248, followed by the Hydrostatic Design Stress in 100's of psi (e.g., PE 3408);
 - 5. Manufacturing Standard Reference (e.g., ASTM F 714); and
 - 6. a production code from which the date and place of manufacture can be determined.

2.06 EMBEDMENT FILL AND BACKFILL MATERIALS

- A. Furnish embedment fill materials in accordance with Section 02221.
- B. Furnish trench backfill materials in accordance with Section 02221.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform HDPE installation and pipe joining operations with trained and certified personnel.

3.02 HDPE PIPE, FITTINGS, AND APPURTENANCES

- A. Deliver HDPE pipe, fittings, and appurtenances to the site at least 10 calendar days prior to the planned installation date.
- B. Provide proper handling and storage of the HDPE pipe, fittings, and appurtenances at the site. Protect materials from excessive heat or cold, dirt, moisture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.
- C. Exercise care when transporting, handling, and placing HDPE pipe and fittings. Use rope, fabric, or nylon slings and straps when handling HDPE pipe. Do not position slings,

- straps, at butt-fusion joints or at fittings. Ends of pipe shall be temporarily capped when transporting onsite to prevent soil from entering pipes.
- D. The maximum allowable depth of cuts, gouges or scratches on the exterior surface of HDPE pipe, fittings, or appurtenances is 10 percent of the wall thickness. The interior of the pipe and fittings shall be free of foreign materials (e.g., soil, shavings, etc.), cuts, gouges and scratches. Replace any HDPE pipe and fittings that become gouged, twisted, or crimped. Remove from the work area damaged pipes and fittings.
 - E. Whenever pipe laying is not actively in progress, close the open ends of all installed pipes using watertight plugs.
 - F. Perform trenching and backfilling of all installed pipe, fittings, and appurtenances in accordance with Section 02221.
 - G. Perform testing of all installed pipe, fittings, and appurtenances in accordance with this section.

3.03 HDPE PIPE AND FITTINGS INSTALLATION

- A. Carefully examine HDPE pipe and fittings for cracks, damage or defects before installation. Do not use cracked, damaged, or defective material.
- B. Inspect the interior of all pipe and fittings and remove any foreign material (e.g., soil, shavings, etc.) from the pipe interior before the pipe is moved into final position. Foreign materials shall be removed by flushing the pipe with water.
- C. Perform field-cutting of pipes, where required, with a machine specifically designed for cutting pipe. Make cuts carefully without damage to pipe, so as to leave a smooth end at right angles to the axis of pipe. Taper cut ends and smooth sharp edges. Flame cutting is not allowed.
- D. Do not lay pipe until the CQA Consultant has verified the bedding conditions.
- E. Install HDPE pipe and fittings in accordance with the Manufacturer's recommendations and the requirements of this section.
- F. Install pipe and fittings to the lines and grades shown on the Construction Drawings.
- G. Place and compact embedment fill and trench backfill material as shown on the Construction Drawings and in accordance with Section 02221.
- H. Provide all necessary adapters and/or fittings required when connecting different types and sizes of pipe or when connecting pipe made by different manufacturers.

3.04 HDPE PIPE, FITTINGS, AND APPURTENANCES CONNECTIONS

- A. Personnel performing joining operations shall submit certification that demonstrates proficiency to the satisfaction of the CQA Consultant.
- B. Weather Conditions for Joining:
 - 1. Do not join HDPE pipes and fittings at ambient temperatures below 40 °F or above 104 °F, unless authorized in writing by the Engineer. For cold (< 40 °F) or hot (> 104 °F) weather joining, use the additional procedures authorized in writing by the Engineer.
 - 2. Measure ambient temperatures at fusion machine.
 - 3. Do not join HDPE pipe and fittings during any precipitation, in the presence of heavy fog or dew, or in areas of ponded water.
- C. Prior to joining, clean the joint area to be free of moisture, dust, dirt, debris of any kind, and foreign material.
- D. Joining equipment shall be approved for the applicable field joining processes. Fusion-welding apparatus shall be an automated device equipped with gauges giving the applicable temperatures and pressures.
- E. Join HDPE pipe with thermal butt-fusion joints or electrofusion adapters. Fabricate joints in compliance with ASTM D 2657, ASTM F 1055, the manufacturer's recommendations, and the requirements of this section.
- F. Install flanged connections of HDPE pipe and fittings as shown on the Construction Drawings and as follows:
 - 1. Thermally butt-fuse HDPE flange connection (flange adapter) to HDPE pipe.
 - 2. Use Type 316 stainless steel lap joint flange. Outside diameter and drillings shall comply with American National Standards Institute (ANSI) B16.1.
 - 3. Use Type 316 stainless steel flange bolts, nuts and washers that meet the requirements of ANSI B16.1. Lubricate bolt threads prior to attaching nuts. Tighten bolts to a torque of 100 ±5 foot-pounds.
- G. Bolt HDPE flange adapter and stainless steel lap joint flanges at the ambient temperature of the surrounding soil to prevent relaxation of the flange bolts and loosening of the joint due to thermal contraction of the polyethylene. Draw bolts up evenly and in line. Retighten bolts 1 and 4 hours after initial tightening.

3.05 FIELD TESTING AND INSPECTION

- A. Notify the CQA Consultant a minimum of 24 hours in advance of pipe testing or pipe inspection.
- B. HDPE Pipe and Fittings Hydrostatic Testing:
 - 1. Provide testing apparatus, including pumps, hoses, gauges, taps, plugs, drains, temporary connections, and fittings to perform testing in accordance with this Section.
 - 2. HDPE Pipe and Fittings Hydrostatic Testing:
 - a. Pressure test all installed HDPE solid wall pipe prior to placing fill over the pipes.
 - b. Perform tests in the presence of the CQA Consultant and in accordance with the detailed test procedure submitted by the Contractor in accordance with this section.
 - c. Test HDPE solid wall pipes at 130 psi internal pressure. Test pipes in accordance with ASME B31.9 §937.1 through §937.3.
 - d. Test pipes at the required internal pressure for a minimum of one hour after the pressure in the pipe has stabilized. The test duration does not include the initial expansion phase after the pipe is first pressurized. The duration of the expansion phase shall be as recommended by the manufacturer.
 - e. Identify any leaks, remove the water, and make repairs to the pipe.
 - f. Retest the pipe until acceptance criteria are achieved in accordance with the approved procedures for testing prior to placing backfill over the pipe.
 - g. Test gauges shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry standards where possible.
 - h. Acceptance criteria for hydrostatic testing is zero leakage for the stabilized pressure for the minimum duration of the test.
- C. HDPE Pipe Inspection:
 - 1. Inspect fusion joints for evidence of excess or insufficient bead size, contamination, offset, or any other evidence of inadequate joining. The surface of the HDPE pipe shall be clean at the time of inspection. Wipe or wash the HDPE pipe surface if surface contamination inhibits inspection.

2. Repair any pipe sections where greater than 4 percent pipe diameter deflection from vertical is observed.
- D. Defects and Repairs:
1. Repair Procedures:
 - a. Repair any portion of the HDPE pipe exhibiting a flaw, or poor quality fusion joint by removing bad joint or pipe section and replacing with a new pipe section.
 - b. When making repairs, satisfy the following:
 - (1) clean and dry all pipe surfaces immediately prior to repair; and
 - (2) only use approved fusion equipment or electrofusion fitting.
 2. Repair Verification:
 - a. Inspect each repair using the methods described in this Section. Repair areas that fail the inspection.

3.06 PIPE AND STRUCTURE CLEANING

- A. All pipe, fittings, and associated structures shall be jet cleaned twice as follows:
 1. After pipe has been fused, but prior to placement; and
 2. After pipe has been placed, installed, and/or joined to fittings and structures and backfilled with soil or granular drainage material.
- B. All pipes shall be video-taped after the second jet cleaning (flushing and extracting) described in the Section. Video shall be submitted on DVD media. If the video shows the presence of foreign matter for any given pipe, such pipes shall be jet cleaned again and video inspection shall be re-performed.

3.07 SURVEY CONTROL

- A. Survey the top of HDPE pipe at each change in direction or grade, at all fittings (e.g., couplers, repairs, etc.), and at no greater than 50-foot centers and at all inlets and outlets in accordance with Section 02100.

3.08 TOLERANCES

- A. Install all HDPE pipes to within ± 0.1 feet of bottom of pipe elevations as indicated on the Construction Drawings.
- B. Provide positive slope of gravity lines at all locations to within ± 10 percent of the values indicated on the Construction Drawings.

TABLE 02715-1

**REQUIRED HDPE PIPE AND FITTINGS PROPERTIES
 ASTM D3350 CELL CLASSIFICATION PROPERTIES AND RANGES**

Property	Minimum Cell Classification	Qualifier	Units⁽¹⁾	Specified Value	Test Method
Density	3	Minimum	g/cm ³	0.941	ASTM D1505
Melt Flow Index	4	Maximum	g/10 min	0.15	ASTM D1238 (Condition E)
	5	Range	g/10 min	0.15 to 4.0	(Condition F)
Flexural Modulus	5	Minimum	lb/in ²	110,000	ASTM D790
Tensile Strength	4	Minimum	lb/in ²	3,000 to <3,500	ASTM D638
Environmental Stress Crack	3	Minimum	hrs	F20 > 192	ASTM D1693
PENT Slow Crack Growth	6	Minimum	hrs	> 100	ASTM F1473
Hydrostatic Design Basis at 73°F	4	Minimum	lb/in ²	1,600	ASTM D2837
UV Stabilizer	C	Minimum	Percent Carbon Black	2	ASTM D1603

Notes:

- g/cm³ = gram per cubic centimeter min = minute
 lb/in² = pound per square inch hrs = hours

[END OF SECTION]

**SECTION 02720
GEOTEXTILES**

SECTION 02720 GEOTEXTILES

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes geotextile products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02221 – Trenching and Backfilling
- B. Section 02230 – Road Construction
- C. Section 02235 – Granular Drainage Material
- D. Section 02245 – Riprap
- E. Section 02715 – HDPE Pipe & Fittings
- F. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) standards:
 - 1. ASTM D 4355. Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus .
 - 2. ASTM D 4491. Standard Test Method for Water Permeability of Geotextiles by Permittivity.
 - 3. ASTM D 4533. Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - 4. ASTM D 4632. Standard Test Method for Grab Breaking Load and Elongation of Geotextiles (Grab Method).
 - 5. ASTM D 4751. Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 - 6. ASTM D 4873. Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.

7. ASTM D 5261. Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
 8. ASTM D 5493. Standard Test Method for Permittivity of Geotextiles Under Load.
 9. ASTM D 6241. Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
- B. Federal Standard No. 751a - Stitches, Seams, and Stitching.
- C. Latest version of the Geosynthetic Research Institute (GRI) test method:
- 1.GRI GT13(a). Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soil and Aggregate (ASTM).

1.04 SUBMITTALS

- A. Submit the following to the Engineer for review not less than 21 calendar days prior to use:
1. geotextile Manufacturer and product name;
 2. certification of minimum average roll values and the corresponding test procedures for all geotextile properties listed in Tables 02720-1 and 02720-2; and
 3. projected geotextile delivery dates.
- B. Submit to the Engineer for review at least 14 calendar days prior to geotextile placement, manufacturing quality control certificates for each roll of geotextile as specified in this Section.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of geotextiles will be monitored by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of the geotextiles as required in the CQA Plan.

- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GEOTEXTILE

- A. Furnish geotextile products with minimum average roll values (95 percent lower confidence limit) meeting or exceeding the required property values in Tables 02720-1 (for geotextile filters) and 02720-2 (for geotextile separators).
- B. Furnish geotextiles that are stock products.
- C. Furnish geotextiles that are manufactured from first quality polymers, with not more than 20 percent reclaimed polymer used in production.
- D. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size of 2,000 denier.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the geotextile to demonstrate that the material conforms to the requirements of this Section.
- B. Perform manufacturing quality control tests to demonstrate that the geotextiles properties conform to the values specified in Tables 02720-1 and 02720-2. Perform as a minimum, the following manufacturing quality control tests at a minimum GRI frequency of once per 100,000 ft²:

<u>Test</u>	<u>Procedure</u>
Mass per unit area	ASTM D5261
Grab strength	ASTM D4632
Tear strength	ASTM D4533
Puncture strength	ASTM D6241

- C. Perform additional manufacturing quality control tests on the geotextile filter at a minimum frequency of once per 100,000 ft², with a minimum of 1 test per resin lot

to demonstrate that its apparent opening size (ASTM D 4751) and permittivity (ASTM D 4491) of the geotextile conform to the values specified in Table 02720-1.

- D. Submit quality control certificates signed by the geotextile manufacturer quality control manager. The certificates shall state that the geotextiles are continuously inspected and are needle-free. The quality control certificates shall also include: lot, batch, and roll number and identification; and results of manufacturing quality control tests including description of test methods used.
- E. Do not supply any geotextile roll that does not comply with the manufacturing quality control requirements.
- F. If a geotextile sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.03 PACKING AND LABELING

- A. Supply geotextiles in rolls wrapped in relatively impermeable and opaque protective wrapping. Wrapping which becomes torn or damaged shall be repaired with similar materials.
- B. Mark or tag geotextile rolls in accordance with ASTM D 4873 with the following information:
 - 1. manufacturer's name;
 - 2. product identification;
 - 3. lot or batch number;
 - 4. roll number; and
 - 5. roll dimensions.
- C. Geotextile rolls not labeled in accordance with this Section or on which labels are illegible upon delivery to the site shall be rejected and replaced at no expense to the Owner.

2.04 TRANSPORTATION

- A. Deliver geotextiles to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform conformance testing on the geotextile samples as described in the CQA Plan.

2.05 HANDLING AND STORAGE

- A. Protect geotextiles from sunlight, moisture, excessive heat or cold, puncture, mud, dirt, and dust or other damaging or deleterious conditions. Follow all geotextile manufacturer recommendations for handling and storage.
- B. Store geotextile rolls on pallets or other elevated structures. Do not store geotextile rolls directly on the ground.
- C. Outdoor storage of geotextile rolls shall not exceed the manufacturer's recommendation or longer than 6 months, whichever is less.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Do not commence geotextile installation until the CQA Consultant completes conformance evaluation of the geotextiles and performance evaluation of previous work, including evaluation of Contractor's survey results for previous work.
- B. Handle geotextiles so as to ensure they are not damaged in any way.
- C. Take necessary precautions to prevent damage to underlying layers including rutting during placement of the geotextiles.
- D. After unwrapping the geotextiles from its opaque cover, do not leave them exposed for a period in excess of 15 calendar days or for the Manufacturer's written recommended exposure period, whichever is less.
- E. If white colored geotextiles are used, take precautions against "snowblindness" of personnel.
- F. Examine the geotextile surface after installation to ensure that no potentially harmful foreign objects are present. Remove any such objects and replace any damaged geotextiles.

3.02 SEAMS AND OVERLAPS

- A. Continuously overlap a minimum of 6 in. and sew filter geotextiles (i.e., spot sewing is not allowed) using a "single prayer" seam. Sew seams using Stitch Type 401 as per Federal Standard No. 751a. In lieu of sewing, geotextile filters may be overlapped a minimum of two feet.
- B. Do not install horizontal seams on slopes that are steeper than 10 horizontal to 1 vertical. Seams shall be along, not across, the slopes.

- C. Overlap separator geotextiles a minimum of 12 in. and ensure that the overlap is maintained.

3.03 REPAIR

- A. Repair any holes or tears in the geotextiles using a patch made from the same geotextile material. Extend geotextile patches a minimum of 1 ft beyond the damaged area. Sew geotextile patches into place no closer than 1 in. from any panel edge. Should any tear exceed 50 percent of the width of the roll, remove and replace that roll.
- B. Remove any soil or other material that may have penetrated the torn geotextiles.

3.04 PLACEMENT OF SOIL MATERIALS

- A. Place soil materials on top of geotextiles in such a manner as to ensure that:
 - 1. the geotextiles and the underlying materials are not damaged; and
 - 2. slippage does not occur between the geotextile and the underlying layers during placement.
- B. Spread soil on top of the geotextile to cause the soil to cascade over the geotextile rather than be shoved across the geotextile.
- C. Place aggregate over geotextile separators as indicated on the Construction Drawings prior to trafficking.
- D. Place soil over geotextile filters as indicated on the Construction Drawings prior to trafficking.

TABLE 02720-1
REQUIRED PROPERTY VALUES FOR GEOTEXTILE FILTER

PROPERTIES⁽⁷⁾	QUALIFIER	UNITS	SPECIFIED⁽¹⁾ VALUES	TEST METHOD
<u>Type</u>				
Nonwoven needle punched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd ²	8	ASTM D 5261
<u>Filter Requirements</u>				
Apparent opening size (O ₉₅)	maximum	mm	O ₉₅ ≤ 0.21	ASTM D 4751
Permittivity	minimum	sec ⁻¹	1.0	ASTM D 4491
<u>Mechanical Requirements</u>				
Grab strength	minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	minimum	lb	75	ASTM D 4533 ⁽³⁾
Static Puncture strength	minimum	lb	500	ASTM D 6241 ⁽⁴⁾
<u>Durability Requirements</u>				
Ultraviolet Resistance ⁽⁶⁾	minimum	%	70	ASTM D 4355

Notes:

- (1) All values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- (4) Tension testing machine with a 1.75-in. diameter ring clamp, the steel ball being replaced with 0.31-in. diameter solid steel cylinder with flat tip centered within the ring clamp.
- (5) mm = millimeter % = percent
 oz/yd² = ounce per square yard sec = second
 lb = pound psi = pound per square inch
- (6) After 500 hours of exposure.
- (7) See Paragraph 2.02 for required MQC test frequencies.

TABLE 02720-2
REQUIRED PROPERTY VALUES FOR GEOTEXTILE SEPARATOR/CUSHION

PROPERTIES	QUALIFIER	UNITS	SPECIFIED ⁽¹⁾ VALUES	TEST METHOD
<u>Type</u>				
Nonwoven needle punched				(-)
Polymer composition	minimum	%	95 polypropylene or polyester by weight	(-)
Mass per unit area	minimum	oz/yd ²	10	ASTM D 5261
<u>Mechanical Requirements</u>				
Grab strength	minimum	lb	248	ASTM D 4632 ⁽²⁾
Trapezoidal Tear strength	minimum	lb	90	ASTM D 4533 ⁽³⁾
Static Puncture strength	minimum	lb	500	ASTM D 6241 ⁽⁴⁾
<u>Durability</u>				
Ultraviolet Resistance	minimum	%	70	ASTM D 4355

Notes:

- (1) All values represent minimum average roll values.
- (2) Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
- (3) Minimum value measured in machine and cross machine direction.
- (4) Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
- (5) % = percent oz/yd² = ounce per square yard
 lb = pound psi = pound per square inch

[END OF SECTION]

**SECTION 02740
GEOCOMPOSITES**

SECTION 02740 GEOCOMPOSITES

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes requirements for liner system geocomposite drainage layer products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 01025 – Measurement and Payment
- B. Section 02240 – Liner Protective Soil
- C. Section 02770 – Geomembrane
- D. Section 02780 – Geosynthetic Clay Liner
- E. Section 02790 – Interface Friction Conformance Testing
- F. Section 13005 – Liner Penetration Boxes
- G. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) standards:
 - 1. ASTM D 1505. Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - 2. ASTM D 1603. Standard Test Method for Carbon Black Content in Olefin Plastics.
 - 3. ASTM D 1777. Standard Method for Measuring Thickness of Textile Materials.
 - 4. ASTM D 3786. Standard Test Method for Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabric -Diaphragm Bursting Strength Tester Method.
 - 5. ASTM D 4491. Standard Test Method for Water Permeability of Geotextiles by the Permittivity Method.

6. ASTM D 4533. Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 7. ASTM D 4632. Standard Test Method for Breaking Load and Elongation of Geotextiles (Grab Method).
 8. ASTM D 4716. Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 9. ASTM D 4751. Standard Test Method for Determining Apparent Opening Size of a Geotextile.
 10. ASTM D 4833. Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
 11. ASTM D 5199. Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.
 12. ASTM D 5261. Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
 13. ASTM F 904. Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials.
- B. Federal Standard No. 751a - Stitches, Seams, and Stitching.
- C. Latest version of the Geosynthetic Research Institute (GRI) test method:
1. GRI GN2 and GRI GC13. Joining and Attaching Geonets and Drainage Composites.
 2. GRI GN4. Test Methods, Required Properties and Testing Frequency for Biplanar Geonets and Biplanar Geonet Composites.

1.04 SUBMITTALS

- A. Submit the following to the Engineer for review at least 21 calendar days prior to use:
1. geocomposite Manufacturer and product names;

2. certification of minimum average roll values and the corresponding test procedures for all geocomposite properties listed in Table 02740-1; and
 3. projected geocomposite delivery dates.
- B. Submit to the Engineer for review at least 14 calendar days prior to geocomposite placement, manufacturing quality control certificates for each roll of geocomposite as specified in this section.
- C. For each proposed geocomposite material, the Contractor shall submit to the Engineer for review at least 14 calendar days prior to transporting the geocomposite to site the results of manufacturing quality control testing and certification that the geocomposite is manufactured to meet the minimum interface shear strength criteria when tested in compliance with requirements of Section 02790.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the geocomposite drainage layers will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of the geocomposites as required by the CQA Plan.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the installation schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCT

2.01 GEOCOMPOSITES

- A. Furnish geocomposite drainage layer materials consisting of a polyethylene geonet core with a needle-punched nonwoven geotextile heat laminated to both sides of the geonet core.
- B. Furnish geocomposite for the primary and secondary leachate collection drainage layers having properties meeting the required property values shown in Table 02740-1. Required geocomposites properties shall be considered minimum average roll values (95 percent lower confidence limit).
- C. Furnish geocomposites that are stock products.

- D. In addition to the property values listed in Table 02740-1, the geocomposites shall:
 - 1. retain their structure during handling, placement, and long-term service (provide manufacturer’s data for long-term compression creep testing); and
 - 2. be capable of withstanding outdoor exposure for a minimum of 30 days with no measurable deterioration.
- E. Furnish geocomposite that meets the interface shear strength requirements of Section 02790 as tested by an approved testing laboratory.
- F. Furnish polymeric threads for stitching that are ultra-violet (UV) light stabilized to at least the same requirements as the geotextile to be sewn. Furnish polyester or polypropylene threads that have a minimum size of 2,000 denier.
- G. Furnish geocomposite meeting the transmissivity requirements in Table 02740-1 as tested by an approved testing laboratory. The transmissivity of the geocomposites for liner system construction shall be tested in accordance with ASTM D 4716 to demonstrate that the design transmissivity will be maintained for the design period of the facility. The primary and secondary geocomposites used in the bottom liner system shall be tested using the actual boundary materials intended for each geocomposite at the normal loads of 1,000 and 13,000 pounds per square foot (psf). At the proposed normal loads, testing shall be conducted for a minimum period of 100 hours unless project-specific data equivalent to the 100-hour period is provided in which case the test shall be conducted for a minimum period of 24 hours.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the geotextile and geonet components of the geocomposite to demonstrate that these materials conform to the requirements of this section.
- B. Perform manufacturing quality control tests to demonstrate that the geotextile properties conform to the values specified in Table 02740-1. Perform as a minimum, the following manufacturing quality control tests at a minimum GRI frequency of once per 100,000 square feet with minimum of 1 test per lot:

<u>Test</u>	<u>Procedure</u>
Mass per unit area	ASTM D 5261
Grab strength	ASTM D 4632
Tear strength	ASTM D 4533
Static Puncture strength	ASTM D 6241

- C. Perform additional manufacturing quality control tests on the geotextile, at a minimum frequency of once per 250,000 square feet with minimum of 1 test per lot, to demonstrate that the apparent opening size (per ASTM D 4751) and permittivity (per ASTM D 4491) of the geotextile conform to the values specified in Table 02740-1.
- D. Perform manufacturing quality control tests to demonstrate that the geonet drainage core properties conform to the values specified in Table 02740-1. Perform as a minimum, the following manufacturing quality control tests at a minimum frequency of once per 100,000 square feet with minimum of 1 test per lot:

<u>Test</u>	<u>Procedure</u>
Polymer density	ASTM D 792 or 1505
Carbon black	ASTM D 1603 or 4218
Thickness	ASTM D 5199

- E. Perform additional manufacturing quality control tests, at a minimum frequency of once per 100,000 square feet with minimum of 1 test per geonet lot, to demonstrate that the geocomposite drainage layers conform to the hydraulic transmissivity (per ASTM D 4716) and ply adhesion (per ASTM F 904) requirements of Table 02740-1.
- F. Submit quality control test certificates signed by the geotextile, geonet, and geocomposite manufacturer quality control manager. The quality control certificates shall include:
 - 1. lot, batch, and roll number and identification; and
 - 2. results of manufacturing quality control tests including description of test methods used.
- G. Do not supply any geocomposite roll that does not comply with the manufacturing quality control requirements.
- H. If a geotextile, geonet, or geocomposite sample fails to meet the quality control requirements of this section, sample and test rolls manufactured at the same time or in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply failing rolls.

2.03 PACKING AND LABELING

- A. The geocomposite shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.
- B. Geocomposite rolls shall be labeled with the following information:
 - 1. fabricator’s name;
 - 2. product identification;
 - 3. lot or batch number;
 - 4. roll number; and
 - 5. roll dimensions.
- C. Geocomposite rolls not labeled in accordance with this section or on which labels are illegible upon delivery to the site shall be rejected and replaced with properly labeled rolls at no additional cost to the Owner.
- D. If any special handling is required, it shall be so marked on the geotextile component e.g., “This Side Up” or “This Side Against Soil To Be Retained”.

2.04 TRANSPORTATION

- A. Geocomposites shall be delivered to the site at least 21 days prior to the planned deployment date to allow the CQA CONSULTANT adequate time to perform conformance testing on the geocomposite samples as required by the CQA Plan.

2.05 HANDLING AND STORAGE

- A. The CONTRACTOR shall be responsible for storage of the geocomposite at the site.
- B. Handling and care of the geocomposite prior to and following installation at the site, is the responsibility of the CONTRACTOR. The CONTRACTOR shall be liable for all damage to the materials incurred prior to final acceptance by the OWNER.
- C. The geocomposite shall be stored off the ground and out of direct sunlight, and shall be protected from excessive heat or cold, mud, dirt, and dust. Any additional storage procedures required by the manufacturer shall be the CONTRACTOR’S responsibility.

PART 3 EXECUTION

3.01 PLACEMENT

- A. The CONTRACTOR shall not commence geocomposite installation until the CQA CONSULTANT completes conformance evaluation of the geocomposite and quality assurance evaluation of previous work, including evaluation of CONTRACTOR'S survey results for previous work.
- B. For geocomposite with directional hydraulic transmissivity, the CONTRACTOR shall install the geocomposite with the high transmissivity direction (usually the roll direction) in the downgradient direction and perpendicular to elevation contours.
- C. The CONTRACTOR shall handle the geocomposite in such a manner as to ensure the geocomposite is not damaged in any way.
- D. The CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- E. The geocomposite shall only be cut using manufacturer's recommended procedures.
- F. In the presence of wind, all geocomposite panels shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with cover material.
- G. Care shall be taken during placement of geocomposite not to entrap dirt or excessive dust in the geocomposite that could cause clogging of the drainage system, and/or stones that could damage the adjacent geomembrane. Care shall be exercised when handling sandbags, to prevent rupture or damage of the sandbags.
- H. If necessary, the geocomposite shall be positioned by hand after being unrolled over a smooth rub sheet.
- I. Tools shall not be left on, in, or under the geocomposite.
- J. After unwrapping the geocomposite from its opaque cover, the geocomposite shall not be left exposed for a period in excess of 30 days.

- K. If white colored geotextile is used in the geocomposite, precautions shall be taken against “snowblindness” of personnel.

3.02 SEAMS AND OVERLAPS

- A. The components of the geocomposite (i.e., geotextile, geonet, and geotextile) are not bonded together at the ends and edges of the rolls. Each component will be secured or seamed to the like component of adjoining panels.
- B. Geotextile Components:
 - 1. The bottom layers of geotextile shall be overlapped. The top layers of geotextiles shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped a minimum of 6 inches prior to seaming.
 - 2. No horizontal seams shall be allowed higher than one-third the slope height on slopes steeper than 10 horizontal to 1 vertical.
 - 3. Polymeric thread, with chemical resistance properties equal to or exceeding those of the geotextile component, shall be used for all sewing. The seams shall be sewn using Stitch Type 401 per Federal Standard No. 751a. The seam type shall be Federal Standard Type SSN-1.

3.03 REPAIR

- A. Any holes or tears in the geocomposite shall be repaired by placing a patch extending 2 ft beyond the edges of the hole or tear. The patch shall be secured by tying fasteners through the bottom geotextile and the geonet of the patch, and through the top geotextile and geonet on the slope. The patch shall be secured every 6 inches with approved tying devices. The top geotextile component of the patch shall be heat sealed to the top geotextile of the geocomposite needing repair. If the hole or tear width across the panel 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 this section.
- B. All repairs shall be performed at no additional cost to the OWNER.

3.04 PLACEMENT OF SOIL MATERIALS

- A. The CONTRACTOR shall place all soil materials in such a manner as to ensure that:
 - 1. the geocomposite and underlying geosynthetic materials are not damaged;

2. minimal slippage occurs between the geocomposite and underlying layers;
and
 3. excess tensile stresses are not produced in the geocomposite.
- B. Spread soil on top of the geocomposite from the bottom of slopes upward to cause the soil to cascade over the geocomposite rather than be shoved across the geocomposite.
- C. For geocomposites overlying the geomembrane, do not place overlying soil material at ambient temperatures below 40 °F or above 104 °F, unless authorized in writing by the Engineer.
- D. Do not drive equipment directly on the geocomposite. Only use equipment above a geocomposite overlying a geomembrane that meets the following ground pressure requirements above the geomembrane:

Maximum Allowable Equipment Ground Pressure (pounds per square inch)	Minimum Thickness of Overlying Soil (inches)
<5	12
<10	18
<20	24
>20	36

TABLE 02740-1
GEOCOMPOSITE PROPERTY VALUES

PROPERTIES ⁽⁶⁾	QUALIFIER	UNITS	SPECIFIED VALUES ⁽¹⁾	TEST METHOD
<u>Geonet Component:</u>				
Polymer composition	Minimum	%	95 polyethylene by wt	--
Polymer density	Minimum	g/cm ³	0.93	ASTM D 792 (Md B) or 1505
Carbon black content	Range	%	1.5 - 3	ASTM D 1603 or 4218
Nominal thickness	Minimum	mil	200	ASTM D 5199
<u>Geotextile Component</u>				
Type	None	none	Needle punched nonwoven	--
Polymer composition	Minimum	%	95 polyester or polypropylene	
Mass per unit area	Minimum	oz/yd ²	8	ASTM D 5261
Apparent opening size	Maximum	mm	O ₉₅ ≤ 0.21 mm	ASTM D 4751
Permittivity	Minimum	sec ⁻¹	0.5	ASTM D 4491
Grab strength	Minimum	lb	200	ASTM D 4632 ⁽²⁾
Tear strength	Minimum	lb	80	ASTM D 4533 ⁽²⁾
Static puncture strength	Minimum	psi	430	ASTM D 6241
<u>Geocomposite:</u>				
Transmissivity ^(4,5)	Minimum	m ² /s	See Note 4	ASTM D 4716
Ply Adhesion	Minimum	lb/in	1.0	ASTM D 7005

Notes:

1. All values represent minimum average roll values.
2. Minimum value measured in machine and cross-machine direction.
3. Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with flat tip centered within the ring clamp.
4. The design transmissivity of the primary and secondary geocomposite drainage layers is measured using water at a gradient of 0.02 under compressive stresses of 1,000 psf and 13,000 psf for a period of 100 hours. The minimum required transmissivities are 1.0×10^{-2} m²/s and 7.5×10^{-3} m²/s under the compressive stresses of 1,000 psf and 13,000 psf, respectively. For testing of the primary geocomposite drainage layer, the geocomposite shall be sandwiched between 60-mil textured HDPE geomembrane and soil actually used for the liner protective layer. For testing of the secondary geocomposite drainage layer, the geocomposite shall be sandwiched between two 60-mil textured HDPE geomembranes.
5. See Paragraph 2.02 for required MQC test frequencies.

[END OF SECTION]

**SECTION 02770
GEOMEMBRANE**

SECTION 02770 GEOMEMBRANE

PART 1 GENERAL

1.01 SCOPE

- A. The Section includes requirements for geomembrane products and installation.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02221 – Trenching and Backfilling
- D. Section 02740 – Geocomposite
- E. Section 02780 – Geosynthetic Clay Liner (GCL)
- F. Section 02790 – Interface Friction Conformance Testing
- G. Section 13005 – Liner Penetration Boxes
- H. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society for Testing and Materials (ASTM) standards:
 - 1. ASTM D 638. Standard Test Method for Tensile Properties of Plastics.
 - 2. ASTM D 746. Standard Test Method for Brittleness, Temperature of Plastics and Elastomers by Impact.
 - 3. ASTM D 792. Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement.
 - 4. ASTM D 1004. Standard Test Method of Initial Tear Resistance of Plastic Film and Sheeting.
 - 5. ASTM D 1204. Standard Plastics Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.

6. ASTM D 1238. Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
7. ASTM D 1505. Standard Test Methods for Density of Plastics by Density-Gradient Technique.
8. ASTM D 1603. Standard Test Method for Carbon Black in Olefin Plastics.
9. ASTM D 1693. Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
10. ASTM D 4437. Standard Test Methods for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Geomembranes.
11. ASTM D 5199. Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
12. ASTM D 5321. Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.
13. ASTM D 5397. Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
14. ASTM D 5596. Recommended Practice for Microscopical Examination of Pigment Dispersion in Plastic Compounds.
15. ASTM D 5994. Standard Test Method for Measuring the Core Thickness of Textured Geomembranes.
16. ASTM D 6365. Standard Practice for the Nondestructive Testing of Geomembrane Seams using the Spark Test.
17. ASTM D 6392. Standard Test Methods for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
18. ASTM D 6693. Standard Test Method for Determining Tensile Properties of Non-Reinforced Polyethylene and Non-Reinforced Flexible Polypropylene Geomembranes.

19. ASTM E96-00. Standard Test Methods for Water Vapor Transmission of Materials (Procedure BW).
- B. Latest version of the Geosynthetic Research Institute (GRI) test methods:
1. GRI GM 5. Test Method for Ductile/Brittle Transition Time for Notched Polyethylene Specimens Under Constant Stress.
 2. GRI GM 13 Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
 3. GRI-GM19a Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.
- C. Latest version of Federal Test Method Standard (FTMS).
1. FTMS 101/2065 Federal Test Method Standard for Puncture Resistance and Elongation Test (1/8 Inch Radius Probe Method).

1.04 WARRANTY

- A. Furnish a 20-year written warranty against defects in materials. Warranty conditions concerning limits of liability will be evaluated by, and be acceptable to, the Engineer.

1.05 SUBMITTALS

- A. Submit the following information to the Engineer for review not less than 45 calendar days prior to geomembrane use:
1. Geomembrane manufacturer capabilities, including:
 - a. daily production capacity available for this Contract; and
 - b. manufacturing quality control procedures.
 2. A list of 10 completed facilities for which the manufacturer has supplied a minimum total of 10,000,000 square feet of polyethylene geomembrane. Provide the following information for each facility:
 - a. name, location, purpose of facility, and date of installation;
 - b. names of owner, project manager, design engineer, and installer; and

- c. thickness and surface area of geomembrane provided.
 3. Origin (resin supplier's name, resin production plant) and identification (brand name, number) of the polyethylene resin used.
 4. Certification of minimum average roll values (95 percent lower confidence limit) for physical, mechanical, and environmental properties and the corresponding test procedures for the geomembrane properties listed in Table 02770-1. Submit values that are specific to the resin used in manufacture.
 5. Certification that welding rod or granules are compatible with the specifications and the resin of the geomembrane furnished for this project.
 6. Manufacturer warranty as specified in this section.
- B. Submit to the Engineer for review not less than 30 calendar days prior to geomembrane use the following documentation on the resin used to manufacture the geomembranes:
1. Copies of quality control certificates issued by the resin supplier including the production dates and origin of the resin used to manufacture the geomembrane for this Contract.
 2. Results of tests conducted by the manufacturer to verify the quality of the resin used to manufacture the geomembrane rolls assigned to the project.
 3. Certification that no more than 10 percent reclaimed polymer is added to the resin during the manufacturing of the geomembrane to be used for this project and that all reclaimed polymer (if added) is same as the parent material.
- C. Submit to the Engineer for review the following documentation on geomembrane roll production at least 14 calendar days prior to transporting any geomembrane to the site:
1. Manufacturing certificates for each shift's production of geomembrane, signed by the manufacturer quality control manager.
 2. Certificate shall include:
 - a. roll numbers and identification;
 - b. sampling procedures; and

- c. results of manufacturer quality control tests, including descriptions of the test methods used (the manufacturer quality control tests to be performed are given in Part 2 of this Section).
- D. Submit to the Engineer for review the following information from the installer at least 14 calendar days prior to mobilization of the installer to the site:
 1. Layout drawings showing the installation layout identifying geomembrane panel configurations, dimensions, details, locations of seams, as well as any variance or additional details which deviate from the Construction Drawings. The layout drawings shall be adequate for use as a construction plan and shall include dimensions, details, etc. The layout drawings, as modified and/or approved by the Engineer, shall become part of the contract.
 2. Installation schedule.
 3. Copy of installer's letter of approval or license by the manufacturer.
 4. Installation capabilities, including:
 - a. information on equipment proposed for this project;
 - b. average daily production anticipated for this project; and
 - c. quality control procedures to include quality control organization.
 5. A list of 10 completed facilities for which the installer has installed a minimum of 5,000,000 square feet of polyethylene geomembrane. The following information shall be provided for each facility:
 - a. the name and purpose of the facility, its location, and dates of installation;
 - b. the names of the owner, project manager, and geomembrane manufacturer;
 - c. name and qualifications of the supervisor of the installation crew;
 - d. thickness and surface area of installed geomembrane;
 - e. type of seaming and type of seaming apparatus used; and
 - f. duration of installation.
 6. Resumes of the installer superintendent and quality control chief to be assigned to this project, including dates and duration of employment.

7. Resumes of all personnel who will perform seaming operations on this project, including dates and duration of employment.
8. Evidence that the installation crew has the following experience:
 - a. The superintendent shall have supervised the installation of a minimum of 2,000,000 square feet of polyethylene geomembrane.
 - b. At least one seamer shall have experience seaming a minimum of 500,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Seamers with such experience will be designated "master seamers" and shall provide direct supervision over less experienced seamers.
 - c. All other seaming personnel shall have seamed at least 100,000 square feet of polyethylene geomembrane using the same type of seaming apparatus to be used at this site. Personnel who have seamed less than 100,000 square feet of seams shall be allowed to seam only under the direct supervision of the master seamer or Superintendent.
- E. Submit to the Engineer for review at least 14 days prior to geomembrane placement, a certificate of calibration less than 12 months old for the field tensiometer. Tensiometer shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards where possible.
- F. Submit subgrade acceptance certificates, signed by the installer, for each area to be covered by the geomembrane prior to that area being covered by geomembrane.
- G. Within 14 calendar days of completion of the geomembrane installation, submit to the Engineer the executed installation warranty as specified in this section.
- H. Submit to the Construction Manager for review, an Electrical Leak Detection Testing Work Plan for testing an exposed geomembrane liner within 30 calendar days from Notice to Proceed. The Electrical Leak Detection Testing Work Plan shall include, but not be limited to, the following:
 1. Qualification and experience of the specialty subcontractor proposed to implement the Electrical Leak Detection Testing Work Plan including the following:
 - a. the name of the specialty subcontractor company with minimum of 3 years of experience in the field of electrical leak detection testing and with a minimum of 100,000 square feet of electrical leak detection testing on an exposed geomembrane;

- b. list of facilities for which the electrical leak detection testing specialty subcontractor has successfully performed electrical leak detection testing on exposed geomembrane; the following shall be provided for each facility:
 - i. the names and purposes of the facility, its location, and dates of electrical leak detection testing;
 - ii. names of the leak detection supervisor and technicians;
 - iii. thickness and surface area of geomembrane tested; and
 - iv. duration of testing;
 - c. resumes of electrical leak detection testing supervisor proposed for this Contract; supervisor shall have a minimum of 200,000 square feet of electrical leak detection testing experience with a minimum of 50,000 square feet of electrical leak detection testing experience on exposed geomembrane using the procedures in proposed Electrical Leak Detection Testing Work Plan; and
 - d. resumes of electrical leak detection testing technicians;
2. Leak detection testing:
- a. description of the test methods and procedures to implement the Work Plan;
 - b. proposed voltage and grounding requirements;
 - c. methods for water management to implement the tests;
 - d. description of safe work practices as required in Part 8 of the Contract Documents;
 - e. description of the quality assurance procedures; and
 - f. schedule showing various activities related to the electrical leak detection testing from mobilization to submission of the Electric Leak Detection Testing Report.
- I. Submit to Construction Manager a Leak Detection Testing Report within 7 calendar days after completion of electrical leak detection testing.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the geomembrane component of the liner system will be monitored by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of geomembrane materials and installation quality assurance testing of the geomembrane seams.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 RESIN

- A. Provide geomembrane manufactured from new, first-quality polyethylene resin. Do not add reclaimed polymer to the resin. The use of polymer recycled during the manufacturing process is permitted if performed with appropriate cleanliness and if the recycled polymer during the manufacturing process does not exceed 2 percent by weight of the total polymer weight.
- B. Use high density polyethylene (HDPE) resin having the following properties:
 - 1. Specific Gravity (min.): 0.932 (ASTM D 792 Method B or ASTM D 1505)
 - 2. Melt Index (max.): 1.0 g/10 min (ASTM D 1238)

2.02 GEOMEMBRANE PROPERTIES

- A. Furnish 60-mil HDPE textured geomembranes having properties that comply with the required values shown in Table 02770-1.
- B. Furnish geomembrane that meets the shear strength requirements of Section 02790 as tested by an approved testing laboratory.
- C. In addition, furnish geomembrane that:
 - 1. contains a maximum of 1 percent by weight of additives, fillers, or extenders not including carbon black;
 - 2. does not have striations, pinholes, bubbles, blisters, nodules, undispersed raw materials, or any sign of contamination by foreign matter on the surface or in the interior;

3. is free of holes, blisters, modules, undispersed raw materials, or any sign of contamination by foreign matter; and
4. is manufactured in a single layer (thinner layers shall not be welded together to produce the final required thickness).

2.03 MANUFACTURING QUALITY CONTROL

A. Resin:

1. Sample and test resin at a minimum frequency of one test per rail car to demonstrate that the resin complies with the requirements of this section. Perform tests on resin after the addition of additives to the virgin resin. Certify in writing that the resin meets the requirements of this section.
2. Do not use any noncomplying resin.

B. Rolls:

1. Continuously monitor geomembrane for inclusions, bubbles, or other defects during manufacture. Geomembrane shall be subjected to continuous spark testing by the Manufacturer at the factory.
2. Do not supply geomembrane that exhibits any defects.
3. Regular monitor for geomembrane thickness during manufacture. Geomembrane that fails to meet the specified minimum thickness will not be accepted.
4. Sample and test the geomembrane in accordance with the test frequency in Table 2 (a) of GRI GM 13 Test Method for HDPE geomembrane to demonstrate that its properties conform to the values specified in Tables 02770-1 and 02770-2. Perform the following tests at the maximum interval specified in Table 2 (a) of GRI GM 13 for the geomembrane manufactured. All tested rolls of material used to certify compliance shall be delivered to the site. Test data for rolls not delivered to the site will not be accepted.

<u>Test</u>	<u>Procedure</u>
density	ASTM D 1505
thickness	ASTM D 5994
asperity height	GRI GM 12
yield strength	ASTM D 638 Type IV or ASTM D 6693
yield elongation	ASTM D 638 Type IV or ASTM D 6693
tensile strength	ASTM D 638 Type IV or ASTM D 6693

tensile elongation	ASTM D 638 Type IV or ASTM D 6693
tear resistance	ASTM D 1004
index puncture resistance	ASTM D 4833
carbon black content	ASTM D 1603 or ASTM D 4218
carbon black dispersion	ASTM D 5596
oxidative induction time	ASTM D 3895
stress crack resistance	ASTM D 5397

5. If a geomembrane sample fails to meet the quality control requirements of this Section, sample and test rolls manufactured, in the same resin batch, or at the same time, as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply any failing rolls.
6. Provide a written certification that the geomembrane meets the GRI GM13 material requirements for the following tests using the indicated test procedures. Provide written certification that these tests have been performed on geomembrane samples representative of rolls delivered to the site.

<u>Test</u>	<u>Procedure</u>
Oven aging	ASTM D 5721
UV resistance	ASTM D 5885

C. Welding Rod:

1. Sample and test HDPE welding rod for resin density and melt flow index per Geomembrane manufacturer’s requirements. Results shall meet Geomembrane manufacturer minimum/maximum requirements and as specified in this Section.
2. Certify that HDPE welding rod is compatible with this Section and consists of the same or compatible resin used to manufacture the geomembrane.

D. Permit the CQA Consultant and/or Engineer to visit the manufacturing plant for project specific visits. If possible, such visits will be prior to, or during, the manufacturing of the geomembrane rolls for this project.

2.04 LABELING

A. Label the geomembrane rolls with the following information.

1. thickness of the material;
2. length and width of the roll;

3. name of Manufacturer;
 4. product identification;
 5. lot number; and
 6. roll number.
- B. Geomembrane rolls not labeled in accordance with this Section or on which labels are illegible upon arrival at the site will be rejected and replaced at no additional expense to the Owner.

2.05 TRANSPORTATION, HANDLING, AND STORAGE

- A. Deliver geomembranes to the site at least 14 calendar days prior to the planned deployment date to allow the CQA Consultant adequate time to perform conformance testing on the geomembrane samples as described in the CQA Plan.
- B. Provide proper handling and storage of the geomembrane at the site. Protect the geomembrane from excessive heat or cold, dirt, puncture, cutting, or other damaging or deleterious conditions. Provide any additional storage procedures required by the Manufacturer.
- C. Store geomembrane rolls on pallets or other elevated structures. Do not store geomembrane rolls directly on the ground surface. Do not store more than 3 rolls high.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any of the work described in this section, the Contractor shall become thoroughly familiar with all portions of the work falling within this section.
- B. Inspection:
1. Prior to implementing any of the work in this section, the Contractor shall carefully inspect the installed work of all other sections and verify that all work is complete to the point where the installation of this section may properly commence without adverse impact.
 2. If the Contractor has any concerns regarding the installed work of other sections, the Contractor shall immediately notify the Engineer in writing. Failure to inform the Engineer in writing or continuance of installation of the

geomembrane will be construed as the Contractor's acceptance of the related work of all other sections.

3.02 SUBGRADE SURFACE PREPARATION

- A. Contractor shall provide certification in writing that the surface on which the geomembrane will be installed is acceptable. Where a GCL is installed on the subgrade prior to the geomembrane, the Contractor shall inspect the subgrade prior to GCL installation. This certification of acceptance shall be given to the CQA Consultant prior to commencement of geomembrane installation in the area under consideration.
- B. Special care shall be taken to maintain the prepared surface.
- C. No geomembrane shall be placed onto areas of standing water or hydrated GCL.
- D. Any damage to the GCL or prepared subgrade caused by installation activities shall be repaired at the Contractor's expense.

3.03 GEOMEMBRANE DEPLOYMENT

- A. General:
 - 1. Textured geomembrane is to be used for all liner construction indicated on the Construction drawings.
 - 2. The Contractor shall produce layout drawings prior to geomembrane deployment. These drawings shall indicate the geomembrane configuration, dimensions, details, locations of seams, etc. The layout drawings must be approved by the Engineer prior to the installation of any geomembranes. The layout drawings, as modified and/or approved by the Engineer, shall become part of these specifications.
 - 3. Do not deploy geomembrane until the layout drawings are approved by the Engineer.
 - 4. Do not deploy a geomembrane panel in an area until the CQA Consultant has been provided with a certificate of subgrade acceptance for that area.
 - 5. Do not deploy geomembranes until CQA Consultant completes conformance evaluation of the geomembrane and performance evaluation of previous work, including evaluation of Contractor's survey results for previous work.
 - 6. Deploy each geomembrane panel in accordance with the approved layout drawings.

B. Field Panel Identification:

1. A geomembrane field panel is a roll or a portion of roll cut in the field.
2. Give each field panel an identification code (number or letter-number). This identification code shall be agreed upon by the CQA Consultant and the Installer.

C. Field Panel Placement:

1. Place each geomembrane panel one at a time and seam each panel immediately after its placement.
2. Use temporary rub sheets as required to prevent displacement or damage to underlying geosynthetics. High spots in geomembrane-backed geosynthetic clay liners shall be covered by a temporary rub sheets during placement of geomembrane.
3. Do not place geomembrane panels when the ambient temperature is below 40° Fahrenheit (F), unless authorized in writing by the Engineer. For cold weather (< 40°F) deployment, use the additional procedures authorized in writing by the Engineer.
4. Do not place geomembranes during any precipitation, in the presence of heavy fog or dew, in an area of ponded water, or in the presence of high wind.
5. Ensure that:
 - a. No vehicular traffic drives directly on the geomembrane;
 - b. Equipment used does not damage the geomembrane by handling, trafficking, or leakage of hydrocarbons (i.e., fuels);
 - c. Personnel working on the geomembrane do not smoke, bring glass onto the geomembrane, or engage in other activities that could damage the geomembrane;
 - d. The method used to unroll the panels does not scratch or crimp the geomembrane and does not damage lower geosynthetics or the supporting soil;
 - e. The method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels). The method used to place the panels results in intimate contact with the geosynthetic clay liner. Adjust or repair any area of geomembrane wrinkles where the wrinkle

height, measured perpendicular to the slope during the hottest portion of the day, is more than 4 inches;

- f. The method used to place the panels does not cause the panels to lift up or trampoline during the coolest portion of the day; and
 - g. The geomembrane is anchored or weighted with sandbags, or the equivalent, to prevent damage or uplift from wind. Install sufficient anchoring or weighting to prevent uplift and maintain such system until overlying material is placed.
6. Replace any field panel or portion thereof that becomes damaged (torn, twisted, or crimped). Remove from the work area damaged panels or portions of damaged panels.
- D. Do not install geomembrane between one hour before sunset and one hour after sunrise unless approved by the Engineer.

3.04 FIELD SEAMING

- A. Personnel shall be experienced as specified in this section. Do not perform seaming unless a "master seamer" and the CQA Consultant are on-site.
- B. Orient seams parallel to the line of maximum slope (i.e., oriented down, not across, the slope). Minimize the number of seams in corners and at odd-shaped geometric locations. No horizontal seam shall be less than 10 feet from the toe of the slope, except where approved by the Engineer. Do not locate seams at an area of potential stress concentration.
- C. Weather Conditions for Seaming:
 - 1. Do not seam geomembrane at ambient temperatures below 40 °F or above 104 °F, unless authorized in writing by the Engineer. For cold (< 40 °F) or hot (> 104 °F) weather seaming, use the additional procedures authorized in writing by the Engineer.
 - 2. Measure ambient temperatures between 0 to 6 inches above the geomembrane surface.
 - 3. In all cases the geomembrane seam areas shall be dry and protected from wind.
- D. Overlapping and Temporary Bonding:

1. Sufficiently overlap geomembrane panels for welding and to allow peel tests to be performed on the seam. Any seams that cannot be destructively tested because of insufficient overlap are failing seams.
2. Control the temperature of the air at the nozzle of heat bonding apparatus such that the geomembrane is not damaged.

E. Seam Preparation:

1. Prior to seaming, clean the seam area and ensure that area to be bonded is free of moisture, dust, dirt, debris of any kind, and foreign material.
2. If seam overlap grinding is required, complete the process according to the Manufacturer's instructions or within 60 minutes of the seaming operation. Do not grind to a depth that exceeds ten percent of the geomembrane thickness. Grinding marks shall not appear beyond 0.25 inch of the extrudate after it is placed.
3. Align seams with the fewest possible number of wrinkles and "fishmouths".

F. General Seaming Requirements:

1. Extend seams to the outside edge of panels to be placed in the anchor trench.
2. If required, place a firm substrate such as a flat board or similar hard surface directly under the seam overlap to achieve proper support.
3. Cut fishmouths or wrinkles at the seam overlaps along the ridge of the wrinkle to achieve a flat overlap. Seam the cut fishmouths or wrinkles and patch any portion where the overlap is less than 6 inches with an oval or round patch of geomembrane that extends a minimum of 6 inches beyond the cut in all directions.
4. Place the electric generator used for power supply to the welding machines outside the area to be lined or mount it on soft tires such that no damage occurs to the geomembrane. Properly ground the electric generator. Place a smooth insulating plate or fabric beneath the hot welding apparatus after use.

G. Seaming Process:

1. Approved processes for field seaming are extrusion welding and fusion welding. The primary method of welding shall be fusion. Seaming equipment shall not damage the geomembrane. Use only geomembrane Manufacturer-approved equipment.

2. Extrusion Equipment and Procedures:

- a. Maintain at least one spare operable seaming apparatus on site.
- b. Equip extrusion welding apparatus with gauges giving the temperature in the apparatus and at the nozzle.
- c. Prior to beginning a seam, purge the extruder until all heat-degraded extrudate has been removed from the barrel. Whenever the extruder is stopped, purge the barrel of all heat-degraded extrudate.

3. Fusion Equipment and Procedures:

- a. Maintain at least one spare operable seaming apparatus on site.
- b. Fusion-welding apparatus shall be automated self-propelled devices equipped with gauges giving the applicable temperatures and pressures.
- c. Fusion-welding apparatus shall produce a double-track seam.
- d. Abrade the edges of cross seams to a smooth incline (top and bottom) prior to extrusion welding.

H. Trial Seams:

1. Make trial seams on excess pieces of geomembrane to verify that seaming conditions are adequate. Conduct trial seams on the same material to be installed and under similar field conditions as production seams. Conduct trial seaming at the beginning of each seaming period, and at least once each five hours, for each seaming apparatus used that day prior to seaming. Also, each seamer shall make at least one trial seam each day, for each day that seaming is performed by that seamer. Conduct trial seaming under the same conditions as the actual seaming. Prepare trial seams that are at least 15 feet long by 1 foot wide (after seaming) with the seam centered lengthwise for fusion equipment and at least 3 feet long by 1 foot wide for extrusion equipment. Prepare seam overlap as indicated in the "Overlapping and Temporary Bonding" Article of this Part.
2. Cut four specimens, each 1.0 inch wide, from the trial seam sample. Test two specimens in shear and two in peel, using a field tensiometer. The test specimens shall not fail in the seam. If a specimen fails, repeat the entire operation. If the additional specimen fails, do not accept the seaming apparatus or seamer until the deficiencies are corrected and two consecutive successful trial seams are achieved. A seamer may start production seaming prior to

testing of the trial seams. In the event the trial seam fails, all production seams by the seamer are failed seams.

I. Nondestructive Seam Continuity Testing:

1. Nondestructively test field seams for continuity over their full length. Perform continuity testing as the seaming work progresses, not at the completion of field seaming. Complete any required repairs in accordance with the "Defects and Repairs" Article of this Part. Apply the following procedures:

- a. use vacuum testing for extrusion welds; and
- b. use air pressure testing for double-track fusion seams.

2. Vacuum Testing:

- a. Use the following equipment:
 - i. A vacuum box assembly consisting of a stiff housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a vacuum gauge.
 - ii. A system for applying 5 pound per square inch (psi) gauge suction to the box.
 - iii. A bucket of soapy solution and applicator.
- b. Follow these procedures:
 - i. Energize the vacuum pump and reduce the tank pressure to 5 \pm 1 psi gauge.
 - ii. Wet an area of the geomembrane seam larger than the vacuum box with the soapy solution.
 - iii. Place the box over the wetted area.
 - iv. Close the bleed valve and open the vacuum valve.
 - v. Ensure that a leak tight seal is created.
 - vi. Examine the geomembrane through the viewing window for the presence of soap bubbles for not less than 20 seconds.

- vii. If no bubbles appear after 20 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inch overlap, and repeat the process.
 - viii. Mark all areas where soap bubbles appear with a marker that will not damage the geomembrane and repair in accordance with the "Defects and Repairs" Article of this Part.
3. Air Pressure Testing:
- a. Use the following equipment:
 - i. an air pump (manual or motor driven) or air reservoir, equipped with a pressure gauge, capable of generating and sustaining a pressure between 25 and 30 pounds per square inch;
 - ii. a rubber hose with fittings and connections; and
 - iii. a hollow needle, or other approved pressure feed device..
 - b. Follow these procedures:
 - i. Seal both ends of the seam to be tested.
 - ii. Insert needle, or other approved pressure feed device, into the tunnel created by the fusion weld.
 - iii. Insert a protective cushion between the air pump and the geomembrane.
 - iv. Energize the air pump to a pressure between 25 and 30 pounds per square inches, close valve, and sustain the pressure for not less than 5 minutes.
 - v. If loss of pressure exceeds 3 pounds per square inches, or does not stabilize, locate faulty area and repair in accordance with the "Defects and Repairs" Article of this Part.
 - vi. Cut opposite end of air channel from pressure gauge and observe release of pressure to ensure air channel is not blocked.
 - vii. Remove needle, or other approved pressure feed device, and seal both ends in accordance with the "Defects and Repairs" Article of this Part.

4. Electrical Leak Detection Testing:

- a. Implement electrical leak detection testing program on the primary exposed geomembrane liner and the geomembrane cap in accordance with the Electrical Leak Detection Testing Work Plan specified in this Section. Electrical leak detection testing shall include:
 - i. Provision of materials as required by the Electrical Leak Detection Testing Work Plan to implement the electrical leak detection testing program;
 - ii. Identification of areas requiring repair by field marking, in person, and in writing and on a field sketch, to the CQC Consultant, Construction Manager, and the geomembrane Installer's supervisor; and
 - iii. Submission of electrical leak detection testing report for the geomembrane liner or cap that is tested; at a minimum the report shall contain information on the methods and procedures used and location of all detected leaks.
- b. Perform electric leak detection testing after performance testing of geomembrane is completed by the CQC Consultant.

J. Destructive Testing:

1. Destructive testing of field seam shall be performed on samples collected from selected locations to evaluate seam strength and integrity to comply with the requirements of Table 02770-2. Destructive test shall be carried out as the geomembrane installation progresses, not at the completion of all field seaming.
2. Sampling and Testing:
 - a. Field seam samples shall be collected for destructive testing at a minimum average frequency of one test location per 500 feet of seam length per seamer and/or seaming equipment. Test locations shall be determined during seaming, and may be prompted by suspicion of excess crystallinity, contamination, offset seams, or any other potential cause of imperfect seaming. The CQA consultant will be responsible for choosing the locations. The geosynthetic installer shall not be informed in advance of the locations where the seam samples will be taken. The owner reserves the right to increase the sampling frequency.

- b. Samples of the field seams shall be cut with rounded corners by the geosynthetic installer at the locations designated by the CQA consultant as the seaming progresses. Passing laboratory test results must be obtained before the field seams are covered by another material. Each sample shall be numbered and the sample number and location identified on the panel layout drawing. All holes in the geomembrane resulting from the field seam sampling shall be immediately repaired in accordance with the repair procedures described in this Section. The continuity of the new seams in the repaired areas shall be tested as specified in this Section.
 - c. Two strips, 1 inch wide and 12 inch long with the seam centered parallel to the width, shall be taken. The strips shall be spaced a clear distance of 42 inches apart. These samples shall be tested in the field using the field tensiometer in accordance with this Section. If these samples pass the field test, then a laboratory sample shall be taken. The laboratory sample shall be at least 1 foot wide by 3.5 feet long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:
 - i. one 1-ft long portion to the geosynthetic installer;
 - ii. one 1-ft long portion to the owner for its archives; and
 - iii. one 1.5-ft long portion to the CQA consultant for laboratory testing.
3. If any field test sample fails to meet the required seam strength properties presented in Table 02770-2 then the procedures outlined in this Section and the CQA Plan shall be followed.
 4. Samples shall be tested in the laboratory in accordance with the requirements of this Section and the CQA Plan.
 5. Destructive Test Failure:
 - a. The following procedures shall apply whenever a sample fails a destructive test, whether the test is conducted by the CQA laboratory, the geosynthetic installer's laboratory, or by a field tensiometer. The geosynthetic installer shall have two options as described below.
 - b. The geosynthetic installer can reconstruct the seam (e.g., remove the old seam and reseam) between any two passed test locations. The

welding path of the seaming apparatus shall be tracked (in each direction).

- c. The geosynthetic installer can trace the welding path to an intermediate location, a minimum of 10 feet from the location of the failed test (in each direction) and take a small sample for an additional field test at each location. If these additional samples pass the tests, then full laboratory samples shall be taken. If these laboratory samples pass the tests, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases where the length of reconstructed seam exceeds 150 feet, a destructive sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, the CQA consultant may require additional tests for seams that were performed by the same seamer and/or seaming apparatus or seamed during the same time shift.

K. Defects and Repairs:

1. All seams and non-seam areas of the geomembrane will be examined by the CQA consultant and the geosynthetic installer for evidence of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed by the geosynthetic installer if surface contamination inhibits examination. The geosynthetic installer shall ensure that this examination of the geomembrane precedes any seaming of that section. Review results of electrical leak detection testing and repair in accordance with this Section.
2. Each suspect location, both in seam and non-seam areas, shall be nondestructively tested using the methods described this Section, as appropriate. Each location that fails nondestructive testing shall be marked by the CQA consultant and repaired by geosynthetic installer. Work shall not proceed with any materials that will cover the defective area until the suspect location is repaired and passing nondestructive test are obtained. In addition, passing destructive test results shall be achieved prior to placing any material over geomembrane.
3. When seaming of a geomembrane is completed (or when seaming of a large area of a geomembrane is completed) and prior to placing overlying materials, the CQA consultant shall identify all excessive geomembrane wrinkles. The

geosynthetic installer shall cut and reseam all wrinkles so identified. The seams thus produced shall be tested like any other seams.

4. Repair Procedures:

- a. Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, shall be repaired by the geosynthetic installer. Several repair procedures are specified below. The final decision as to the appropriate repair procedure shall be agreed upon between the CQA consultant and the geosynthetic installer. The procedures available include:
 - i. patching, used to repair holes, small tears, undispersed raw materials, and contamination by foreign matter;
 - ii. abrading and reseaming, used to repair small sections of extruded seams;
 - iii. spot seaming, used to repair minor localized flaws and surface damage;
 - iv. capping, used to repair lengths of failed seams; and
 - v. removing failed seam lengths and replacing with a strip of new material seamed into place (used with long lengths of fusion seams and/or extrusion seams).
- b. In addition, the following shall be satisfied:
 - i. surfaces of the geomembrane which are to be repaired shall be abraded no more than 20 minutes prior to the repair;
 - ii. all surfaces must be clean and dry at the time of repair;
 - iii. all seaming equipment used in repair procedures must be approved by the engineer and/or the CQA consultant;
 - iv. the repair procedures, materials, and techniques shall be approved in advance, for the specific repair, by the CQA consultant and geosynthetic installer;
 - v. patches or caps shall extend at least 6 inches beyond the edge of the defect, and all corners of holes and patches shall be rounded with a radius of at least 3 inches; and

- vi. the geomembrane below large caps shall be appropriately cut to avoid water or gas collection between the two sheets.

5. Repair Verification:

- a. Each repair shall be numbered and logged and shall be nondestructively tested using the methods described in this Section, as appropriate. Repairs that pass the nondestructive test shall be taken as an indication of an adequate repair. Failed tests will require the repair to be redone and retested until a passing test results. At the discretion of the CQA consultant, destructive testing may be required on large caps.
- b. Final verification of geomembrane primary liner and cap repair shall be performed using electrical leak detection testing on the exposed geomembrane.

3.05 ANCHORAGE SYSTEM

- A. The anchor trench shall be excavated prior to geomembrane placement to the lines, grades, and configuration indicated on the Construction Drawings.
- B. Slightly rounded corners shall be provided in the trench where the geomembrane adjoins the trench to avoid sharp bends in the geomembrane.
- C. Temporarily anchor each geomembrane panel in the anchor trench at the crest of the slope as soon as the panel is deployed or positioned.
- D. Do not entrap loose soil, sand bags, or other materials between or beneath the geosynthetic layers.
- E. Do not backfill the anchor trench until all geosynthetic layers are installed in the anchor trench. Backfill in accordance with the Construction Drawings and Section 02215.
- F. Do not damage any geosynthetic layer when backfilling the anchor trench.

3.06 MATERIALS IN CONTACT WITH THE GEOMEMBRANE

- A. Take all necessary precautions to prevent damage to the geomembrane during the installation of other components of the liner and final cover system.
- B. Do not drive equipment directly on the geomembrane. Only use equipment above the geomembrane that meets the following ground pressure requirements.

<u>Maximum Allowable Equipment Ground Pressure (pounds per square inches)</u>	<u>Minimum Thickness of Overlying Material (inches)</u>
<5	12
<10	18
<20	24
>20	36

3.07 SURVEY CONTROL

- A. Survey the installed geomembrane in accordance with Section 02100.

3.08 GEOMEMBRANE ACCEPTANCE

- A. The Contractor shall retain all ownership and responsibility for the geomembrane until accepted by the Owner.
- B. The geomembrane shall be accepted by the Owner when:
1. the installation is finished;
 2. all documentation of installation is completed including the CQA Consultant's final report; and
 3. verification of the adequacy of all field seams and repairs, including associated testing, is complete.

3.09 PROTECTION OF WORK

- A. The Contractor shall use all means necessary to protect all prior work and all materials and completed work of other sections.
- B. In the event of damage, the Contractor shall make all repairs and replacements necessary at no additional cost to Owner.

TABLE 02770-1

REQUIRED HDPE GEOMEMBRANE PROPERTIES

Properties	Qualifiers	Units ⁽¹⁾	Specified Values Textured	Test Method
<u>Physical Properties</u>				
Thickness	Nominal Minimum	mils	60 54	ASTM D 5199 (S) ASTM D 5994 (T)
Asperity Height	Min. Avg.	mils	16	GRI-GM13
Specific Gravity	Minimum	N/A	0.94	ASTM D 792 (Method B) or ASTM D 1505
Carbon Black Content	Range	%	2-3	ASTM D 1603 or 4218
Carbon Black Dispersion	N/A	none	9 of 10 in Category 1 or 2 and all in Category 1, 2, or 3	ASTM D 5596
<u>Mechanical Properties</u>				
Tensile Properties				
1. Tensile Strength at Yield	Minimum	lb/in	126	ASTM D 6693
2. Tensile Strength at Break	Minimum	lb/in	90	ASTM D 6693
3. Elongation at Yield	Minimum	%	12	ASTM D 6693
4. Elongation at Break	Minimum	%	100	ASTM D 6693
Tear Resistance	Minimum	lb	42	ASTM D 1004 Die C Puncture
Puncture Resistance	Minimum	lb	90	ASTM D 4833
<u>Environmental Properties</u>				
Stress Crack Resistance	Minimum	hrs	500 ⁽²⁾	ASTM D 5397 (Appendix)
Oxidative Induction Time (OIT)	Minimum	min	100 / 400	ASTM D 3895 / 5885
<u>Notes:</u>				
1. % = percent hrs = hours min = minutes lb/in = pounds per inch lb = pound N/A = Not Applicable				
2. For textured geomembrane, test is conducted on smooth geomembrane from the same resin lot (batch) as the textured geomembrane furnished.				

TABLE 02770-2
REQUIRED HDPE GEOMEMBRANE SEAM PROPERTIES

Properties	Qualifiers	Units ⁽³⁾	Specified Values	Test Method
<u>Shear Strength⁽¹⁾</u>				
Fusion	minimum	lb/in	120	ASTM D 6392
Extrusion	minimum	lb/in	120	ASTM D 6392
<u>Peel Adhesion</u>				
FTB ⁽²⁾				
Fusion	minimum	lb/in	91	ASTM D 6392
Extrusion	minimum	lb/in	78	ASTM D 6392

Notes:

1. Also called "Bonded Seam Strength." Value is at material yield point
2. FTB = Film Tear Bond. (Maximum 10 percent seam separation).
3. lb/in = pounds per inch.
4. All dual track seams shall be tested in accordance with ASTM D 5820. All extrusion seams shall be tested in accordance with ASTM D 5741.

[END OF SECTION]

SECTION 02775

RAIN TARP

SECTION 02775

RAIN TARP

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Contractor shall furnish all labor, materials, tools, supervision, transportation, and installation equipment necessary for the installation of a temporary rain tarp on top of liner protective soils as specified herein and as shown on the Construction Drawings.
- B. Contractor shall install all rain tarp and shall be responsible for field handling, storing, deploying, seaming or connecting, temporary restraining, anchoring utilizing sandbags and on-site tires and other aspects of rain tarp installation.
- C. Contractor shall be prepared to install rain tarp in conjunction with the other components of the project.

1.02 SUBMITTALS

- A. At least 14 days prior to shipping any rain tarp, Contractor shall provide Engineer with the following documentation on the proposed rain tarp:
 - 1. installation plan, including but not limited to a description of rain tarp placement, seaming and anchoring;
 - 2. manufacturer and product name;
 - 3. minimum property values of the proposed rain tarp and corresponding test procedures; and
 - 4. proposed rain tarp delivery dates.

1.04 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the geomembrane component of the liner system will be monitored by the CQA Consultant as required in the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of geomembrane materials and installation quality assurance testing of the geomembrane seams.
- C. The Contractor shall be aware of the activities required of the CQA Consultant by the CQA Plan and shall account for these activities in the construction schedule.

- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 RAIN TARP AND ANCHORAGE

- A. Temporary tarp material shall be DURA-SKRIM[®] 12BV by Raven Industries or owner-approved equivalent.
- B. Equivalent materials may be considered provided they demonstrate the material strength and ultraviolet (UV) resistance properties provided in the specified material. Approval by Engineer of equivalent materials is required.
- C. On-site tires shall be utilized by the Contractor to anchor the rain tarp along the periphery of the rain tarp area (end-to end of the corners). On-site tires will be provided by the Owner.
- D. Sandbags shall be made of the same material as the temporary tarp and of a volume to weight approximately 20 lbs when filled.

2.02 TRANSPORTATION

- A. Contractor shall be liable for all damages to the materials incurred prior to and during transportation.

2.05 HANDLING AND STORAGE

- A. Contractor shall be responsible for handling, unloading, storage, and care of the tarp prior to, during, and following installation. Contractor shall be liable for all damages to the tarp incurred prior to final acceptance by Owner and Engineer.
- B. Contractor shall be responsible for storage of the tarp at the Site after the material is delivered and shall protect the tarp from moisture, long-term direct exposure to sunlight, puncture, or other damaging or deleterious conditions (e.g., mud, dirt, and dust). Contractor shall be responsible for any additional storage procedures required by the Rain Tarp Manufacturer.

PART 3 EXECUTION

3.01 FAMILIARIZATION

- A. Prior to implementing any Work described in this Section, Contractor shall become thoroughly familiar with all portions of the Work falling within this Section.

- B. Contractor shall familiarize himself with the project Drawings and get clarification(s), if required, from the Engineer prior to implementing any Work.
- C. Prior to implementing any of the Work within this Section, Contractor shall carefully inspect the installed Work of all other Sections and verify that all such Work is complete to the point where the Work of this Section may properly commence without adverse impact.

3.02 HANDLING AND PLACEMENT

- A. The tarp shall be handled in such a manner as to ensure that it is not damaged.
- B. Precautions shall be taken to prevent damage to underlying materials during placement of the tarp.
- C. Contractor shall examine the surfaces to be covered with tarp before deployment to ensure there are no potentially harmful foreign objects. Foreign objects shall be removed to the satisfaction of the CQA Consultant prior to deploying the tarp at no additional cost to the Owner.
- D. All tarp shall be anchored with ballast to prevent wind uplift and associated damage. Such ballasts shall be installed immediately following tarp deployment.
- E. The tarp will be held down by on-site tires and sandbags weighing approximately 20 lbs each. On-site tires shall be placed along the periphery of the tarp area (i.e. end-to-end of the corners). The sandbags shall be placed in a 10-ft by 10-ft square pattern. Two sandbags shall be tied with a UV resistant rope at each node of the square pattern. Sandbags are to be connected by ropes in the downslope direction, as shown in Figure 1.
- F. At the top of slope (i.e. at the crest of the berm), the uppermost sand bag and rope shall be buried within the anchor trench.
- G. The tarp shall be anchored within the sand berms on east, west, north, and south of the tarped area.
- H. The CQA Consultant shall examine the deployed tarp surface after installation to ensure that no potentially harmful foreign objects are present either above or below the tarp.
- I. Tarp shall not be placed on saturated or frozen subgrade standing water.

3.03 SEAMS AND OVERLAPS

- A. Tarp shall be overlapped and seamed using heat bonding techniques which conform to Manufacturer recommendations.

3.04 REPAIR

- A. Any holes or tears in the tarp shall be repaired using a patch made from the same tarp. Tarp patches will be heat bonded or as recommended by Tarp Manufacturer. Holes shall be patched with a minimum 6-in overlap. Should any tear exceed 30% percent of the width of the panel, that panel shall be removed and replaced.

3.05 PRODUCT PROTECTION

- A. Contractor shall use all means necessary to protect all prior Work and materials and completed Work of other Sections.
- B. In the event of damage, Contractor shall immediately make all repairs and replacements necessary to the approval of CQA Consultant and at no cost to Owner.

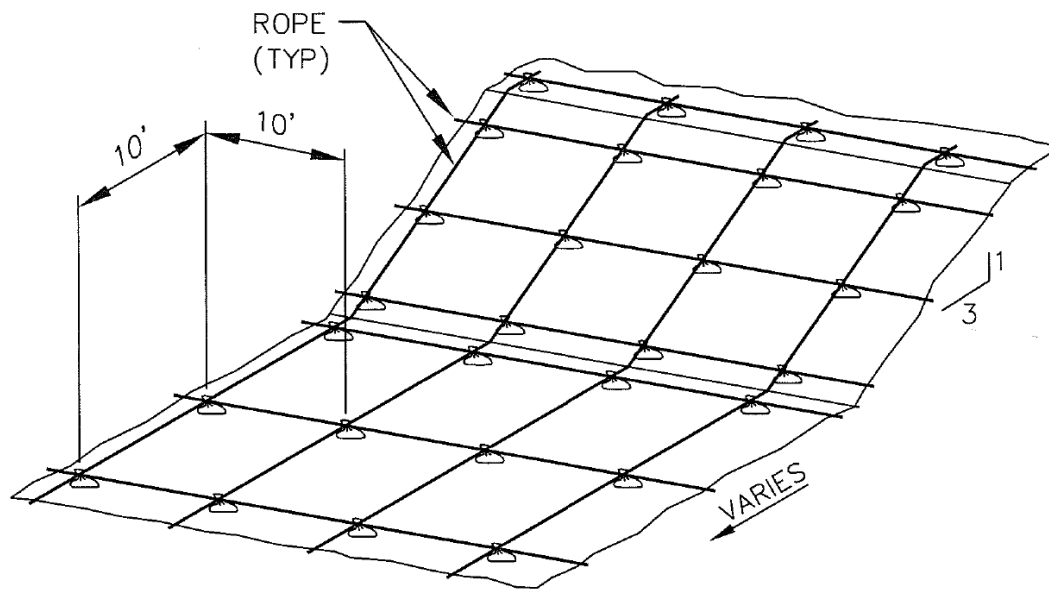


FIGURE 1. Sandbag Configuration

[END OF SECTION]

**SECTION 02780
GEOSYNTHETIC CLAY LINER (GCL)**

SECTION 02780

GEOSYNTHETIC CLAY LINER

PART 1 GENERAL

1.01 SCOPE

- A. This section includes the requirements for geosynthetic clay liner (GCL) products and placement.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02200 - Earthwork
- B. Section 02740 - Geocomposites
- C. Section 02770 - Geomembranes
- D. Section 02790 - Interface Friction Conformance Testing
- E. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of American Society of Testing and Materials (ASTM) standards:
 - 1. ASTM D 4643. Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Method.
 - 2. ASTM D 5084. Standard Test Method for Measurement of Saturated Porous Materials Using a Flexible Wall Permeameter.
 - 3. ASTM D 5887. Standard Test Method for Measurement of Index Flux through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
 - 4. ASTM D 5889. Standard Practice for Quality Control of Geosynthetic Clay Liners.
 - 5. ASTM D 5890. Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
 - 6. ASTM D 5891. Standard Test Method for Fluid Loss of Clay Component of Geosynthetic Clay Liners.

7. ASTM D 5993. Standard Test Method for Measuring Mass per Unit Area of Geosynthetic Clay Liners.
 8. ASTM D 6243. Standard Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
 9. ASTM D 6496. Standard Test Method for Determining Average Bonding Peel Strength Between Top and Bottom Layers of Needle Puncture Geosynthetic Clay Liners.
 10. ASTM D 6768. Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.
- B. Latest version of the Geosynthetic Research Institute (GRI) test method:
1. GRI GCL 3. Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs).

1.04 SUBMITTALS

- A. Submit to the ENGINEER for review not less than 21 calendar days prior to use the following information regarding the GCL proposed for the project:
1. manufacturer and product name;
 2. evidence that the manufacturer has more than two years of experience in the manufacturing of GCL;
 3. manufacturer's quality control procedures;
 4. manufacturer's requirements for the geotextile component of the GCL that include (as a minimum) mass per unit area and grab strength;
 5. certification that manufacturer's requirements for geotextile component of GCL are met;
 6. certification of minimum average roll values (95 percent lower confidence limit) and the corresponding test procedures for all GCL properties listed in Table 02780-1; and
 7. manufacturer's recommended procedures for overlapping adjacent GCL panels.

- B. Submit to the Engineer for review at least 14 days prior to GCL placement the manufacturing quality control certificates for each roll of GCL as specified in this section. Submit certificates signed by the manufacturer quality control manager. The quality control certificates shall include:
 - 1. lot, batch, or roll numbers and identification;
 - 2. sampling procedures; and
 - 3. results of Manufacturer quality control tests.

- C. For each proposed GCL material, the Contractor shall submit for review by the Engineer at least 14 calendar days prior to transporting the GCL to the site the results of manufacturing quality control testing and certification that the GCL is manufactured to meet the minimum internal shear strength requirements of this section and the minimum interface shear strength requirements of Section 02790.

1.05 CONSTRUCTION QUALITY ASSURANCE

- A. The installation of the GCL will be monitored by the CQA Consultant as required by the CQA Plan.
- B. The CQA Consultant will perform material conformance testing of the GCLs.
- C. The Contractor shall be aware of the activities required of the CQA Consultant per the CQA Plan and shall account for these activities in the installation schedule.
- D. The Contractor shall correct all deficiencies and nonconformances identified by the CQA Consultant and shall do so at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GEOSYNTHETIC CLAY LINER (GCL)

- A. Furnish GCL with internally-reinforced bentonite core and woven and/or nonwoven geotextile backings. The GCL must be free of broken needles or fragments of needles.
- B. Furnish GCL having properties that comply with the required values shown in Table 02780-1.

- C. GCL consisting of an internally-reinforced bentonite core with woven and/or nonwoven geotextile backings shall meet the following requirements:
1. Hydraulic conductivity is equal to or less than 5×10^{-9} cm/s, when measured in a flexible wall permeameter in accordance with ASTM D 5887 under an effective confining stress of 5 psi;
 2. Minimum roll width is 15 feet;
 3. Minimum roll length is 100 feet;
 4. Bentonite component is at least 90 percent sodium montmorillonite;
 5. Bentonite component is applied at a minimum rate of 0.75 pounds per square foot, when measured at a water content of zero (0) percent;
 6. Geotextile backings are woven and/or nonwoven materials, respectively, manufactured with polypropylene or polyester material, and conforming to the minimum property values shown in Table 02780-1;
 7. Needle punching is used to bind geotextile backings and bentonite core; and
 8. Bentonite is contained by the geotextiles in a manner that prevents more than nominal dislodgment of bentonite during GCL transportation, handling, and installation.
- D. Furnish GCL that meets the internal shear strength requirements of this Section and interface shear strength requirements of Section 02790 as tested by an approved testing laboratory. Tests will be performed in accordance with ASTM D 6243 and as specified below on representative samples of GCL destined for use on this project. The source of the representative samples will be provided with the test results. The GCL will be tested for:
1. internal shear strength in accordance with this Section; and
 2. interface shear strength in accordance with Section 02790.
- E. The testing laboratory will follow the specific procedures and conditions listed below for internal shear strength testing of the GCL:
1. Place the materials to be tested with their machine directions aligned in the direction of shear in the shear box. Use a test specimen configuration of (from bottom to top): rigid substrate with textured gripping surface, GCL, and rigid substrate with textured gripping surface.

2. Perform the direct shear tests at normal stresses of 1, 50 and 100 pounds per square inch (psi), and report the peak and large-displacement (3-inch displacement) shearing resistance for each test.
3. Use fresh specimens for each normal stress.
4. Repeat any tests for which the shear displacements do not occur within the desired material (internal strength).
5. The testing laboratory shall report peak and large-displacement internal shear strength of GCL. The peak internal shear strength envelope for the GCL shall equal or exceed an envelope characterized by an effective friction angle of 15.0° assuming no cohesion.

2.02 MANUFACTURING QUALITY CONTROL

- A. Sample and test the GCL to demonstrate that the material complies with the requirements of this Section.
- B. Perform manufacturing quality control tests to demonstrate that GCL properties conform to the requirements in Table 02780-1. Perform the following tests at the minimum frequency per ASTM D5889 or as indicated below with a minimum of one test per lot.

<u>Test</u>	<u>Frequency</u>
Bentonite content	45,000 sq. ft
Bentonite moisture content	45,000 sq. ft
Bentonite free swell	50 ton
Hydraulic conductivity	100,000 sq. ft.
Tensile/Grab strength	45,000 sq. ft.
Peel	45,000 sq. ft

- C. Comply with the certification and submittal requirements of this Section.
- D. If a GCL sample fails to meet the quality control requirements of this Section, sample and test rolls fabricated at the same time and in the same lot as the failing roll. Continue to sample and test the rolls until the extent of the failing rolls are bracketed by passing rolls. Do not supply the failing rolls.

2.03 PACKING AND SHIPPING

- A. Supply GCL in rolls wrapped in impermeable and opaque protective covers.

- B. Mark or tag GCL rolls with the following information:
 - 1. manufacturer's name;
 - 2. product identification;
 - 3. lot number;
 - 4. roll number;
 - 5. roll weight; and
 - 6. roll dimensions.
- C. GCL rolls not labeled in accordance with this Section or on which labels are illegible upon delivery to the project site will be rejected and replaced at no additional expense to the Owner.
- D. Deliver the GCL to the site at least 14 calendar days prior to the scheduled installation date to allow the CQA Consultant to obtain conformance samples and complete conformance testing as described in the CQA Plan.

2.04 HANDLING AND STORAGE

- A. Handle, store, and care for the GCL in a manner that does not cause hydration or damage.
- B. Protect the GCL from moisture, excessive heat or cold, puncture, or other damaging or deleterious conditions. Store the GCL rolls on pallets or other elevated structures. Do not store GCL rolls directly on the ground surface. Cover the GCL entirely with a tarp. GCL rolls shall be stored out of direct sunlight. Follow any additional storage procedures required by the Manufacturer.

PART 3 EXECUTION

3.01 SURFACE PREPARATION

- A. Provide certification in writing that the surface on which the GCL will be installed is acceptable as described below. Give this certification of acceptance to the CQA Consultant prior to commencement of GCL installation in the area under consideration.
- B. Maintain the prepared soil surface until the GCL is placed. The subgrade should be rolled with a smooth-drum compactor to remove any wheel ruts, footprints, or other abrupt grade changes before placement of the GCL.

- C. Do not place the GCL onto an area that has been softened by precipitation or that has cracked due to desiccation. Repair such areas in accordance with Section 02200.

3.02 PLACEMENT

- A. Do not commence GCL placement until the CQA Consultant completes conformance evaluation of this material and performance evaluation of previous work, including Contractor's survey results for previous work.
- B. Weight GCL with sandbags or other means to prevent uplift or movement inwind. Immediately remove and replace any damaged or leaking sandbags.
- C. Cut the GCL using a utility blade. Do not damage underlying material during cutting and fully repair any such damage.
- D. Do not entrap stones or other foreign objects under the GCL. Do not drag equipment across the exposed GCL.
- E. Replace any GCL that is damaged by any means including foreign objects, or installation activities.
- F. Install GCLs in accordance with Manufacturer's recommendation (i.e., typically geotextile on the outside of the roll facing down).
- G. Do not install the GCL on a wet subgrade or in standing water. Prevent hydration of the bentonite core prior to completion of construction of the liner system.
- H. Do not install the GCL during precipitation or other conditions that may cause hydration of the GCL.
- I. Install the overlying geomembrane as soon as possible following GCL installation. Cover all GCL that is placed during a workday with overlying geomembrane. Cover and protect the edges of GCL from hydration due to storm water run-on.
- J. Remove and replace GCL that becomes hydrated. Hydration is defined by a moisture content of 100 percent or greater when measured in accordance with ASTM D 4643.
- K. Place earthen and other geosynthetics material components of the liner system over the GCL as soon after installation of the GCL as possible, but in no case longer than 7 days after the first GCL is placed.

3.03 OVERLAPS

- A. On slopes steeper than 5 horizontal to 1 vertical, install GCLs continuously down the slope; that is, allow no horizontal seams on the slope.
- B. Allow no horizontal seams on the base of the landfill within 5 feet of the toe of a slope.
- C. Overlap GCL in strict accordance with the Manufacturer's recommended procedures. As a minimum, overlap adjacent panels at least 6 inches along the sides and 12 inches along the ends.

3.04 MATERIALS IN CONTACT WITH THE GCL

- A. Perform installation of other components in a manner that prevents damage to the GCL.
- B. Do not drive equipment directly on the GCL.
- C. Install the GCL in appurtenant areas, and connect the GCL to appurtenances as indicated on the Construction Drawings. Do not damage the GCL while working around the appurtenances.

3.05 REPAIR

- A. Repair any holes or tears in the GCL by placing a GCL patch over or under the hole. On slopes greater than 5 percent, the patch shall overlap the edges of the hole or tear by a minimum of 2 feet in all directions. On slopes 5 percent or flatter, the patch shall overlap the edges of the hole or tear by a minimum of 1 foot in all directions. Secure the patch with a water-based adhesive approved by the Manufacturer.
- B. Remove any soil or other material that may have penetrated the torn GCL.
- C. Do not nail or staple the patch.

TABLE 02780-1
REQUIRED GCL PROPERTY VALUES

PROPERTIES	QUALIFIERS	UNITS ⁽⁴⁾	SPECIFIED VALUES ⁽¹⁾	TEST METHOD
<u>GCL Properties ⁽⁷⁾</u>				
Bentonite Content ⁽²⁾	Minimum	lb/ft ²	0.75	ASTM D 5993
Bentonite Moisture Content	Maximum	%	35	ASTM D 5993 or 2216
Bentonite Free Swell	Minimum	ml/2g	24	ASTM D 5890
Hydraulic Conductivity ^(5,6)	Minimum	cm/s	5 x 10 ⁻⁹	ASTM D 5887
Tensile / Grab Strength ⁽³⁾	Minimum	ppi / lb	23 / 90	ASTM D 6768 / 4632
Peel Strength ⁽³⁾	Minimum	ppi / lb	2.1 / 15	ASTM D 6496 / 4632
<u>Geotextile Properties</u>				
Polymer Composition	Minimum	%	95 polyester or polypropylene	

- Notes:
- All values represent minimum average roll values.
 - Measured at a moisture content not exceeding 0 percent.
 - For geotextile backed GCLs.
 - lb/ft² = pounds per square foot
 cm/s = centimeter per second
 % = percent
 lb = pound
 ppi = pounds per inch
 ml/2g = milliliters per two grams
 - The GCL test specimen shall be hydrated with the fluid which is expected to cause hydration in the field, or similar fluid, for a minimum of 48 hours using sufficient backpressure to achieve a minimum B coefficient of 0.9 and using a confined effective consolidation stress not exceeding five pounds per square inch. Then, the hydraulic conductivity test on the GCL specimen shall be conducted, using the appropriate permeant fluid, at a confined effective consolidation stress not exceeding five pounds per square inch. The hydraulic conductivity test shall continue until steady state conditions are reached or a minimum of two pore volumes of permeant fluid have passed through the test specimen. The permeant fluid shall be either leachate from the landfill (or similar landfill) if the GCL is used in a liner system.
 - Hydraulic conductivity may be performed using water once the relationship between hydraulic conductivities measured using the appropriate permeant fluid and water is established for the GCL product being supplied for the project.
 - See Part 2.02 of this Section for required MQC test frequencies.

[END OF SECTION]

SECTION 02790
INTERFACE FRICTION CONFORMANCE TESTING

SECTION 02790 INTERFACE FRICTION CONFORMANCE TESTING

PART 1 GENERAL

1.01 SCOPE

A. The work in this Section includes all labor, materials, tools and equipment necessary to perform conformance interface shear strength testing using a composite configuration (i.e., “sandwich” test) for the bottom liner system. The composite configuration for the bottom liner system shall consist of the following components, from top to bottom:

1. Liner protective soil;
2. Primary geocomposite drainage layer;
3. Primary HDPE textured geomembrane;
4. Secondary geocomposite drainage layer;
5. Secondary HDPE textured geomembrane;
6. Geosynthetic Clay Liner; and
7. Compacted subbase layer.

B. The Contractor shall be responsible to provide a bucket of representative soil to the CQA Consultant 21 days prior to using the material and will provide assistance in obtaining geosynthetics samples from on-site stockpiles. The CQA Consultant shall perform the test.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02200 – Earthwork
- B. Section 02240 – Liner Protective Soil
- C. Section 02740 – Geocomposites
- D. Section 02770 – Geomembrane
- E. Section 02780 – Geosynthetic Clay Liner

1.03 QUALITY CONTROL

- A. The Materials Testing Laboratory performing the interface friction angle conformance testing shall be accredited by the Geosynthetics Accreditation Institute.
- B. The Materials Testing Laboratory shall perform the required interface friction angle testing in accordance with the American Society for Testing and Materials (ASTM) method D 5321 and/or ASTM D 6243.
- C. The Materials Testing Laboratory shall provide test results to the CQA Consultant within five (5) days of receipt of the test samples. Test results shall be in the form of figures that present shear force versus displacement and shear stress versus normal stress. Both peak strength and large displacement (i.e., residual) strength shall be plotted. The laboratory shall report any influences or conditions that may have affected the test results. The laboratory shall indicate the correlation coefficient of the best-fit lines drawn through the strength data and the resulting peak strength and residual strength values for adhesion and friction angle.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials to be tested shall be obtained from materials that will be used during construction.
- B. Sample size shall be determined by the Materials Testing Laboratory requirements.
- C. Soil components used in the laboratory testing program shall be obtained from the borrow source or from soil stockpiles to be utilized in the construction of the soil components of the landfill.
- D. Additional tests may be required at the discretion of the CQA Consultant.

2.02 TESTING CONDITIONS

- A. The following testing conditions shall be utilized for the “sandwich” interface friction testing.
 - 1. Use twelve (12) inch by twelve (12) inch square direct shear apparatus as defined by ASTM D5321;
 - 2. Use site-specific soils and materials;

3. Test all geosynthetics in the direction parallel to the length of the roll (i.e., machine direction);
4. Orient surface texturing of the HDPE textured geomembrane so that machine direction is oriented parallel to the direction of movement of the testing apparatus;
5. Soil components shall be remolded and compacted into the testing apparatus at the minimum dry density and maximum moisture content permitted by the relevant Specification Sections;
6. The composite configuration, normal pressures, and strain rate for the “sandwich” test shall be as indicated below:

Case	System Analyzed	Composite Configuration (Sandwich Test)	Normal Stresses (psi)	Displacement Rate (inch/min)
1	Bottom Liner System	Liner Protective Layer Primary Geocomposite Primary Geomembrane Secondary Geocomposite	1 50 100	0.04
2	Bottom Liner System	Primary Geomembrane Secondary Geocomposite Secondary Geomembrane Geosynthetics Clay Liner Compacted Subbase	1 50 100	0.04

7. Test results will be used to develop a failure envelope;
8. The interface between the geocomposite drainage layer and the geomembrane will be wetted before initiating the shear deformation; and
9. All tests shall be run out to a minimum of three (3) inches of horizontal displacement. The large displacement (residual) strengths shall be defined as the strength occurring at the point that shear stress levels off to a constant value or the shear stress at three (3) inches of horizontal displacement, whichever occurs first.

PART 3 EXECUTION

3.01 INTERFACE STRENGTH REQUIREMENTS

- A. Cases 1 and 2: The peak interface shear strength envelope for the “sandwich” shall equal or exceed an envelope characterized by an effective friction angle of 15.0° assuming no adhesion when measured in accordance with the ASTM D 5321 or ASTM D 6243.

3.02 REVIEW OF TEST RESULTS

- A. The CQA Consultant shall review all test reports to determine if the test results meet the minimum requirements stated above.

3.03 RETESTING

- A. The Contractor, Geosynthetics Subcontractor or the Manufacturer may elect to retest failed tests. Testing may be done at the same laboratory or another independent laboratory. The CQA Consultant shall approve the testing laboratory and the testing conditions shall be in accordance with ASTM D 5321 and this Section. Retesting shall be done at the Contractor’s or Manufacturer’s expense. Retest results shall also be reviewed by the CQA Consultant.

[END OF SECTION]

**SECTION 02930
VEGETATION**

SECTION 02930 VEGETATION

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes the requirements for sodding, seeding, liming, fertilizing, and maintaining vegetation until established and accepted. Areas to be vegetated include areas noted on the Construction Drawings and any other areas as directed by the CQA Consultant.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Standard Specifications for Road and Bridge Construction (SSRBC), Florida Department of Transportation, 2001 Edition (FDOT Specifications)

1.04 SUBMITTALS

- A. Submit the following to the Construction Manager not less than 30 calendar days prior to use for review:
 - 1. proposed type and source of sod and seed; and
 - 2. manufacturer's product data for commercial fertilizer and lime and the recommended methods of application.
- B. Submit a plan for handling and storage of materials to prevent damage by moisture, heat, or exposure. Include all recommendations of manufacturers and suppliers.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Sod shall be live, thriving, and meet the requirements of Florida Department of Agriculture and Consumer Services.
- B. Seeds shall be live seed and meet the requirements of Florida Department of Agriculture and Consumer Services.
- C. The seeds should have been harvested from the previous year's crop.
- D. All seed bags shall have a label attached stating the date of harvest, LOT number, percent purity, percent germination, noxious weed certification, and date of test.
- E. Use fertilizer that is dry or liquid commercial grade fertilizer uniform in composition that meets the requirements of all State and Federal regulations and standards of the Association of Agricultural Chemists. Deliver fertilizer to the site in original, properly labeled, unopened, clean, containers each showing the manufacturer's guaranteed analysis conforming to applicable fertilizer regulations and standards. Use fertilizer that is 16-4-8 or as modified by the Construction Manager based on testing of the topsoil by the Contractor. Apply fertilizer to all sodded areas.
- F. Use lime that is agricultural ground limestone with a minimum total neutralizing power of 90 percent. The lime shall have a gradation of at least 40 percent passing the U.S. Standard Number 100 sieve, and at 95 percent passing the U.S. Standard Number 8 sieve.

PART 3 EXECUTION

3.01 PLANTING AND APPLICATION OF FERTILIZER

- A. Do not commence vegetation until the Construction Manager reviews the results of soil analyses.
- B. Notify the Construction Manager 24 hours prior to laying sod, seeding, or fertilizing.
- C. The seed and fertilizer shall be placed by hydro seeding, or other method approved by the Construction Manager.
- D. The underlying soil layer should be graded to the lines and limits as indicated on the Construction Drawings. The soil layer surface shall be scarified and damp immediately prior to the seed or sod placement.

- E. Repair all gullies, washes, or disturbed areas that develop subsequent to final dressing of the prepared surface.
- F. Seeded areas shall be watered after germination as necessary until the vegetation is well established.
- G. Apply fertilizer and lime to all vegetated areas unless otherwise indicated by the Construction Manager.
- H. Apply fertilizer and lime at the specified rates. If not applied hydraulically, thoroughly rake the fertilizer and lime into the prepared surface to a minimum depth of 2 inches.
- I. Application rates:
 - 1. Application rates for seeding shall be according to manufacture/supplier recommendations or as directed by the Construction Manager.
 - 2. Application rates for fertilizer and lime in this section may be adjusted after the results of the site soil test results performed by the Contractor are available.
 - 3. Base contract price on application rates for fertilizer and lime specified in this section. Contract price will be adjusted for any variations either decreasing or increasing the application rates
- J. For areas to be covered with seed or sod:
 - 1. Apply fertilizer at a uniform rate of 1,200 pounds per acre or as otherwise directed by the Construction Manager.
 - 2. Apply agricultural lime at a rate of two tons per acre or as otherwise directed by the Construction Manager.

3.02 MAINTENANCE

- A. Maintain seeded and sodded areas immediately after placement until vegetation is well established and exhibits a vigorous growing condition.
- B. The Contractor shall supply and apply supplemental irrigation for the maintenance period following the placement of the seed or sod. All seeded and sodded areas should receive a minimum of 1½ in. of water per week either by precipitation or supplemental irrigation.
- C. Maintain the seeded and sodded areas in satisfactory condition. Maintenance of the seeded and sodded areas includes repairing eroded areas, revegetating, watering, and mowing (if applicable). A satisfactory condition of a seeded or sodded area is defined as a 10,000 square feet section of turf that has no bare spots larger than three square feet.

- D. The inspection will be performed by the Construction Manager, who will determine whether repair of sodded areas or revegetation is required. The Contractor shall make the repair or revegetation at the Contractor expense.

3.03 ACCEPTANCE

- A. The vegetated areas shall be accepted at the end of the warranty period if a satisfactory condition as defined in this Section exists or if accepted by the Construction Manager.

3.04 WARRANTY PERIOD

- A. Vegetated areas shall be subject to a warranty period of not less than 60 days from the issuance of the Construction Manager's final completion notice to the Contractor for the Contract over 100 percent of the areas seeded and sodded.
- B. At the end of the warranty period, the Construction Manager will perform an inspection upon written request by the Contractor. Vegetated areas not demonstrating satisfactory condition of vegetation as outlined above, shall be repaired, resodded, and maintained to meet all requirements as specified herein at the Contractor's expense. All unaccepted areas requiring repair, replacement of sod and/or reseeding shall be subject to a 60-day warranty period commencing at the completion of the reworking.
- C. After all necessary corrective work has been completed, the Construction Manager will certify in writing the final acceptance of the vegetated areas.

[END OF SECTION]

**DIVISION 3:
CONCRETE**

SECTION 03300
CAST-IN-PLACE CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE

- A. The CONTRACTOR shall furnish all material, equipment, labor, services, etc., to complete and install all concrete work as specified in this Section.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 - Surveying
- B. Section 02110 - Clearing, Grubbing, and Stripping
- C. Section 02200 - Earthwork
- D. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. The CONTRACTOR shall conform to the following standards:
 - 1. ACI 301. Specifications for Structural Concrete for Buildings
 - 2. ACI 318. Building Code Requirements for Reinforced Concrete
 - 3. ACI 350R. Environmental Engineering Concrete Structures
 - 4. CRSI. Manual of Standard Practice
 - 5. ACI SP-15. Field Reference Manual: Building Code Requirements for Reinforced Concrete
 - 6. Florida Building Code

1.04 SUBMITTALS

- A. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water cementitious ratio, type and manufacturer of cement.
- B. Placing drawings and bar bending details in conformity with the recommendations of ACI 315.
- C. Technical data on all materials and components.

- D. Material Safety Data Sheets (MSDS) for all concrete admixtures and curing agents.
- E. Test results to confirm the average concrete cylinder strength at 28 days is at least 3,000 psi.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Portland cement shall conform to the Standard Specifications for Portland Cement of ANSI/ASTM C150, Type I or Type II. All cement shall be obtained from one source. Different brands of cement shall not be permitted, except as previously specified.
- B. All cement shall be stored in a suitable way to protect the cement from dampness in a way to be easily inspected and to permit easy identification of each shipment. Facilities shall be provided for inspection and sampling of stored cement being used. The cement shall be rejected if it fails to meet any of the requirements of these specifications.
- C. Fly ash (Alternate): Fly ash shall meet the requirements of ASTM C618, Class C, F or N with the exception of loss of ignition, where the maximum shall be less than 6 percent for Class F or N.
- D. All admixtures shall be approved by the Engineer/Owner and shall be added to the concrete in strict accordance with the recommendation of the manufacturer.
- E. Water used in mixing and curing concrete shall be fresh, clean and free from injurious amounts of sewage, oil, acid, alkali, organic matter or other deleterious substances. Water shall be approved for human consumption.
- F. Concrete aggregate shall conform to the "Specifications for Concrete Aggregate", ANSI/ASTM C33, except as revised. Aggregate shall be certified by an independent commercial testing laboratory to show compliance with the above-mentioned specifications.

2.02 AGGREGATES

- A. Fine Aggregates
 - 1. Only clean, natural sand shall be used. Artificial or manufactured sand will not be acceptable. The grading of the fine aggregate shall be as shown in the table below:

Sieve Designations	Percent Passing
3/8 in.	100
No. 4	95-100
No. 8	80-90
No. 16	50-75
No. 30	30-50
No. 50	10-20
No. 100	2-5

B. Coarse Aggregate

1. Coarse aggregate shall consist of crushed stone or crushed gravel conforming to the following limits:
 - a. Sodium sulfate test - 10% max loss
 - b. L. A. abrasion test - 35% max loss
 - c. Crushed particles (gravel) - 45% min loss
2. The sizes of coarse aggregate for the type of concrete being used in this work, as described hereafter, are as follows:

Concrete	ANSI/ASTM Size Number
Class AA	467
Class A	467
Class B	467
Class C	467

3. The gradations required for the coarse aggregate are 8 to 18 percent for the top size aggregates and 8 to 22 percent for smaller top size aggregates retained on each sieve.

2.03 STORAGE OF MATERIALS

- A. Cement and aggregates shall be stored in such a manner as to prevent deterioration of or contamination with foreign matter. Fine and coarse aggregate shall be stored separately and in such a manner as to avoid segregation. Cement, which has become caked, partially set, or otherwise deteriorated, or any material, which has become damaged or contaminated, shall be rejected for use.

2.04 ADMIXTURES

- A. The admixture shall conform to ASTM C494, Type A, and not contain more chloride ions than are present in municipal drinking water.
- B. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
- C. Written conformance to the above-mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Engineer/Owner.

2.05 CONCRETE MIXES

- A. All mixes shall be approved by the Engineer or Owner prior to use on the job. No deviations from the approved mixes shall be permitted without prior approval from the Engineer or Owner.
- B. Fly ash may be used in the mix design. When fly ash is used as a partial replacement for cement, the minimum cement content shall be met by considering Portland cement plus fly ash as the total cementitious material. The replacement rate shall be determined from laboratory trial mixes, but shall not exceed 20 percent by weight of the total cementitious material.
- C. Where the concrete production facility can establish the uniformity of its production for concrete of similar strength and materials based on recent test data, the average strength used as a basis for determining mix design proportions shall exceed the specified design strength by the requirements of ACI 318, Section 4.3 or ACI 301, Section 3.9.
- D. When a concrete production facility does not have field test records for calculation of standard deviation, the required average strength shall be at least 1200 psi greater than the specified design strength.

- E. The contractor shall submit the mix design accompanied by complete standard deviation analysis or trial mixture test data.
- F. All concrete containing the high-range water-reducing admixture (Superplasticizer shall have a maximum slump of 9 in. unless otherwise approved by the Engineer or Owner. The concrete shall arrive at the job site at a slump of 2 in. to 3 in., (3 in. to 4 in. for lightweight concrete or concrete receiving a "shake-on" hardener), be verified, then the high-range water-reducing admixture added to increase the slump to the approved level. All other concrete shall have a maximum slump of 3 in. for slabs, and 4 in. for other members.
- G. All concrete shall contain the specified water-reducing or water-reducing retarding admixture and/or high-range water-reducing admixture (Superplasticizer). All concrete slabs, placed at air temperatures below 50°F, shall contain the specified non-corrosive, non-chloride accelerator

PART 3 - EXECUTION

3.01 MIXING CONCRETE

- A. The concrete shall be mixed in a batch mixer until there is a uniform distribution of the materials, and shall be discharged completely before the mixer is recharged. For job-mixed concrete, the mixer shall be rotated at the speed recommended by the manufacturer and mixing shall be continued as follows for various sizes of mixers:
 - 1. 1/2 cu. yd. mixer or smaller at 1-1/4 minutes
 - 2. 3/4 to 1-1/4 cu. yd. mixer at 1-1/2 minutes
 - 3. Larger than 1-1/4 cu. yd. mixer at 2 minutes
 - 4. For each additional cu. yd. over 2 cu. yd. add 1/4 minutes
- B. The ready-mixed concrete shall be mixed and delivered in accordance with the requirements of "Standard Specifications For Ready-Mixed Concrete" ANSI/ASTM C-94 or as modified by these specifications. During a continuous pour, the interval between loads shall not be greater than 20 minutes, or in any case be so great as to allow the concrete in place to become partially hardened. Water used to flush the mixer or agitator between loads shall not be allowed to become a part of any concrete in the work.
- C. When the temperature is below 40°F, adequate equipment shall be provided for heating the component materials of the concrete so that the concrete being deposited can be

maintained at a temperature of 50°F minimum to 90°F maximum. When the air temperature is above 90°F, the temperature of the concrete being deposited shall not exceed 90°F, and adequate means of cooling the concrete mix shall be provided.

- D. Truck mixers shall be revolving-drum type and shall be equipped with a mixing water tank. Only the prescribed amount of mixing water shall be placed in the tank for any one batch, unless the tank is equipped with an approved device by which the amount of water added to each batch can be readily verified by the Engineer or Owner's representative.
- E. Delivery tickets shall be prepared for each load of ready-mixed concrete delivered. In the event a laboratory representative is designated to inspect the batching operation, he shall prepare the ticket. In the event no laboratory representative is required for the project, the batch plant operator shall prepare the ticket. The drivers of the trucks shall deliver the tickets to the Owner's representative at the site at the time of delivery. The tickets shall contain the following information:
 - 1. Number of yards delivered on this truck;
 - 2. Quantities of materials in the batch;
 - 3. The time at which the truck left the batching plant;
 - 4. The time at which the cement was added;
 - 5. The outdoor temperature in the shade;
 - 5. The numerical sequence of the delivery; and
 - 6. The Date.

3.02 PLACING CONCRETE

- A. Placing of the concrete shall be done in accordance with ANSI/ACI 304, "Recommended Practice for Measuring, Mixing, and Placing Concrete", except as modified or revised by these specifications.
- B. Before depositing concrete all debris shall be removed from the space to be occupied by the concrete. Forms, if constructed of lumber, shall be thoroughly wetted, except in freezing weather. Reinforcement, pipe sleeves and other materials to be embedded in the concrete shall be thoroughly secured in position. Water shall be removed from the space to be occupied by the concrete before concrete is deposited.
- C. Concrete shall be handled from the transporting vehicle in such a way as to prevent the separation or loss of the ingredients. Under no circumstances shall concrete that has

partially hardened be deposited in the work. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling. It shall be so deposited as to maintain, until the completion of the unit, a plastic surface approximately horizontal.

- D. Where concrete is conveyed to chutes, the equipment shall be of such size and design as to insure a continuous flow in the chute. The chutes shall be of metal, or metal-lined, and if two or more lengths are used, they shall have approximately the same slope. The slope shall not be less than 1 vertical to 2 horizontal and shall be such as to prevent the segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate to prevent segregation. If the distance of the discharge end of the chute above the surface of the concrete is more than 3 times the thickness of the layer being deposited, or more than 4 ft above the surface of the concrete, a spout or "elephant trunk" shall be used and the lower end maintained as near to the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. The chute shall be thoroughly cleaned before and after each run and the debris from any water used shall be discharged outside the forms.
- E. Before depositing new concrete on or against concrete which has hardened and to which it is to bond, the forms shall be re-tightened. The surface of the hardened concrete shall be roughened in a manner that will not leave loosened particles of aggregate or damaged concrete at the surface. It shall be thoroughly cleaned of foreign matter and laitance, and saturated with water.
- F. Concrete during and immediately after depositing shall be thoroughly compacted by means of vibration. The number of vibrators used shall at all times be subject to the approval of the Engineer or Owner's representative. The concrete shall be thoroughly worked around the reinforcement, and around embedded fixtures, and into the corners of the forms. Attention is directed to the fact that manhole bottoms, pipe cradle and encasement, and similar concrete work are required to be thoroughly vibrated.
- G. The accumulation of water on the surface of the concrete due to water gain, segregation, or other causes, during placement and compacting, shall be prevented as far as possible by adjustments in the mixture. Provision shall be made for the removal of such accumulated water so that under no circumstances will concrete be placed in such accumulation.
- H. To minimize the formation of laitance, great care shall be exercised to disturb the concrete as little as possible while it is being deposited. Upon completion of a section of concrete, all laitance shall be entirely removed before work is resumed. The CONTRACTOR shall submit to the OWNER, prior to start of work, the details of procedures he proposes to minimize and control the development of shrinkage cracks.

3.03 PLACING CONCRETE IN HOT WEATHER

- A. Concrete shall be placed in hot weather in accordance with "Hot Weather Concreting" (ACI 305) latest revision, except as modified or revised by these specifications.
- B. If after stripping of forms any concrete is found to be not formed as shown on the drawings, out of alignment or not level, or shows a defective surface, it shall be considered as not conforming with the intent of these specifications and shall be removed and replaced by the contractor at his expense unless the Owner grants permission to patch the defective area, in which case patching shall be done as hereinafter described.
- C. Defects that require replacement or repair are those that consist of honeycomb, damage due to stripping forms, loose pieces of concrete, surface holes caused by bolts and ties, excessive ridges at form joints and bulges due to movement of the forms. Ridges and bulges shall be removed by chipping, tooling or grinding on finished surfaces. Honeycomb and other defective concrete shall be chipped out, and the chipped openings having sharp edges shaped so that the mortar filling will be keyed in place. All holes shall be kept thoroughly moistened for several hours before mortar filling is placed. The area to be patched shall be filled with the specified repair material.
- D. Imperfections, bolt and tie-rod holes, and chipped-out honeycomb areas to be repaired shall be filled with dry-patching mortar composed of 1 part of Portland cement to 2 parts of regular concrete sand (volume measurement) and just enough water so that after the ingredients are mixed thoroughly the mortar will stick together on being molded into a ball by slight pressure of the hands, and will not exude free water. Mortar repairs shall be placed in thin layers and thoroughly compacted by suitable tools.
- E. The contractor shall take care in filling rod and bolt-holes so that the entire depth of the hole is completely filled with compacted mortar. "EMBECO", Five Star, or equal, shall be added to all patching mortar in an amount as recommended by the manufacturer for the mix to be used except for unpainted, exposed surfaces, or surfaces which are specified to be waterproofed or damp-proofed with a chemical-type protective coating. For surfaces on which the chemical-type protective coatings are specified, only materials recommended by the coating manufacturer shall be used for repairs.
- F. Materials for exposed surfaces not requiring painting or waterproofing shall not cause discoloration of the proposed patch or the surrounding concrete surfaces. All honeycomb areas, bolt-holes and other imperfections shall be repaired with Master Builders, Cleveland, OH, "Set 45" or U.S. Grout Corporation, Old Greenwich, CT, Five Star structural concrete, or an approved equal which shall be installed according to the manufacturer's recommendations.

[END OF SECTION]

DIVISION 11:
EQUIPMENT

SECTION 11207
SUBMERSIBLE SUMP PUMPS

SECTION 11207 SUBMERSIBLE SUMP PUMPS

PART 1 GENERAL

1.01 SCOPE

- A. This Section identifies the minimum requirements for the purchase and installation of the simplex submersible pump station for the leak detection system and a duplex submersible pump station for the leachate collection system as shown on the Construction Drawings and as specified herein.

1.02 RELATED SECTIONS AND PLANS

- A. Division 15 - Mechanical
- B. Division 16 - Electrical
- C. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of the following published standards as applicable:
 - 1. American Gear Manufacturers Association (AGMA).
 - 2. American Institute of Steel Construction (AISC).
 - 3. American Iron and Steel Institute (AISI).
 - 4. American Society of Mechanical Engineers (ASME).
 - 5. American National Standards Institute (ANSI).
 - 6. American Society for Testing Materials (ASTM).
 - 7. American Welding Society (AWS).
 - 8. American Bearing Manufacturers Association (ABMA).
 - 9. Hydraulic Institute Standards (current edition).
 - 10. Institute of Electrical and Electronics Engineers (IEEE).
 - 11. National Electric Code (NEC).
 - 12. National Electrical Manufacturers Association (NEMA).

13. Occupational Safety and Health Administration (OSHA).
14. Steel Structures Painting Council (SSPC).
15. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

- A. Submittals shall include at least the following:
 1. Certified shop drawings showing all important details of construction, dimensions and anchor bolt locations.
 2. Descriptive literature, bulletins, and/or catalogs of the equipment.
 3. Data on the characteristics and performance of each size pump. Data shall include guaranteed performance curves, based on actual shop tests of duplicate units, which show that they meet the specified requirements for head, capacity, efficiency, allowable NPSH, allowable suction lift, and horsepower. Curves shall be submitted on 8-1/2-inch by 11-inch sheets. Catalog sheets showing a family of curves will not be accepted.
 4. The total weight of the equipment including the weight of the single largest item.
 5. A complete total bill of materials for all equipment.
 6. A list of the manufacturer's recommended spare parts with the manufacturer's current price for each item. Include gaskets, packing, etc. on the list. List the bearings by the bearing manufacturer's numbers only.
 7. A statement indicating bearing life.
 8. Complete description of surface preparation and shop prime painting.
 9. Factory performance test reports.
 10. Field test results as specified in Part 3.0.

1.05 QUALIFICATIONS

- A. The pumps shall be submersible, non-clog centrifugal pumps designed to pump leachate. The submersible sump pumps shall be as manufactured by Flygt, Sulzer, or approved equal.
- B. All pumps for each lift station shall be the product of a single pump manufacturer.
- C. To assure unity of responsibility, the pumps, motors, local control panels and

other auxiliary equipment, and materials specified in this Section shall be furnished and coordinated by the pump manufacturer (Manufacturer) who shall assume responsibility for the satisfactory operation of the entire pumping system including pumps, motors, local control panel, and accessories.

- D. The pumps and other equipment covered by these Specifications shall be standard production units of the manufacturers, currently available and listed in the respective manufacturer's catalog. The pumps furnished shall be in accordance with the Hydraulic Institute Standards and shall be designed, constructed and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed.
- E. The pump manufacturer shall have an authorized warranty center within a 150-mile radius of the job site, fully staffed with factory trained mechanics, and equipped with a stock of all necessary spare parts for each model of pump furnished under this contract. The service facility shall be an established entity prior to delivery of equipment for this project.
- F. The control system shall have an established record of successful performance for similar service.
- G. All equipment furnished under this Specification shall be new and unused, shall be the standard product of manufacturers having a successful record of manufacturing and servicing similar equipment and systems to that specified herein for a minimum of five (5) years.
- H. The pumping equipment shall be furnished complete with controls, and accessories required and shall meet the detailed requirements of the Specifications.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. The equipment covered by these Specifications is intended to be standard pumping equipment of proven ability as manufactured by reputable concerns having long experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practice and methods, and shall operate satisfactorily when installed as shown on the Drawings.
- B. All parts shall be so designed and proportioned as to have liberal strength, and stiffness and to be especially adapted for the work to be done. Ample room and facilities shall be provided for inspection, repairs, and adjustment.
- C. Brass or stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperes

and all other pertinent data shall be attached to each pump.

- D. The nameplate ratings for the motors shall not be exceeded, nor shall the design service factor be reduced when its pump is operating at any point on its characteristic curve at maximum speed.

2.02 HANDLING AND STORAGE

- A. All equipment and parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of fabrication until final delivery to the job site.
- B. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the Engineer.
- C. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto or by other approved means.
- D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
- E. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
- F. Each box or package shall be properly marked to show its net weight in addition to its contents.

2.03 LEAK DETECTION SYSTEM (LDS) SUBMERSIBLE SUMP PUMP

A. General:

- 1. The sump pump shall be of the heavy duty, non-clog impeller submersible type. The pump shall be installed in accordance with the Manufacturer's recommendations to automatically remove leachate from the leak detection manhole.
- 2. Performance Requirements:
 - a. The pumps shall be designed and manufactured as specified for the conditions of service tabulated below.
 - 1) Submersible sump pumps:

Number of Units	1
Discharge size	2 inch
Capacity	38 gpm

- | | |
|--------------------|---|
| Total dynamic head | 11 feet |
| Drive horsepower | 1/3 hp, 115V, 1-
phase Model Used for Design Sulzer EF 03W-2 |
| 60 HZ Power Supply | see Drawings |
- 2) The casing shall be shall be ASTM A48 Cast Iron.
 - 3) Impeller shall be bronze, non-clog type and be able to pass a 3/4 inch solid.
 - 4) Motor shall be oil filled for continuous duty and be controlled by a float switch.
 - 5) Shaft shall be heavy-duty stainless steel.
 - 6) Lifting cables shall be 316 stainless steel.

2.04 LEACHATE DETECTION SYSTEM TURBINE METER

A. Flow Element - Turbine Meter and Indicator:

1. Type:
 - a. Magnetic Drive Type.
 - b. Polyethylene Rotor/316 Stainless Steel Body.
 - c. Tube with 1-1/2-inch NPT Fittings.
2. Operation:
 - a. Purpose: To sense flow in a pipeline, by means of a propeller, rotated by the flowing fluid, and provide a local display of the integrated flow value.
 - b. Operating Principle: Magnetically linked to indicator.
3. Functional:
 - a. Max Fluid Temperature: 100 degrees. F.
 - b. Max Working Pressure: 150 psi.
 - c. Local Mechanical Totalization.
4. Physical:
 - a. Carbon Steel Tube Body with Straightening Valves.
 - b. Rotor: Molded Polyethylene.
 - c. Bearings: Stainless Steel.
 - d. Wetted Working Parts: Stainless Steel, unless otherwise noted.
 - e. Gear Box: Cast Iron.
 - f. Exterior Surfaces: Prepared and primed.
5. Performance:
 - a. Accuracy: Plus or minus 2 percent of rate between 10 percent and 100 percent of flow.
6. Manufacturer:
 - a. Unit shall be as manufactured by the Rockwell of the Hersey Corporation or

approved equal.

2.05 LEACHATE COLLECTION SYSTEM (LCS) SUMP PUMPS

A. The LCS sump pumps shall be of the heavy duty, non-clog impeller submersible type. The pump shall be installed in accordance with the Manufacturer's recommendations to automatically remove leachate from the leachate collection pump station.

B. Performance Requirements:

1. The pumps shall be designed and manufactured as specified for the conditions of service tabulated below.

a. Submersible sump pumps:

Number of Units:	2
Configuration	Duplex
Capacity	170 gpm
Total dynamic head	55 feet
Drive horsepower	4 HP
Power Supply	460V, 3 phase
Pump Discharge Size	3 inch
Model Used for Design	Flygt NP 3085 SH 3

PART 3 EXECUTION

3.01 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's instructions and recommendations in the locations shown on the Drawings.

B. Supply all anchor bolts, temporary lift equipment, power, water, labor, and all other incidentals required for the proper installation of the pumps.

3.02 SURFACE PREPARATION AND SHOP PAINTING

A. All surfaces shall be prepared, shop primed and finish coated as part of the work under this Section.

3.03 INSPECTION AND TESTING

A. Factory Test:

1. The pump manufacturer shall factory test all pumps prior to shipment in accordance with the standards of the Hydraulic Institute. Flow, Total Head and Input KW shall be tested and recorded for at least 5 points on the pump performance curve. The five points shall include the points specified on the pump data table. Test shall be performed to demonstrate that the pumps meet ANSI/HI 11.6 acceptance grade 1U for all specified points. Certified copies of the test report shall be furnished to the Engineer for approval prior
 - a. Controls shall be factory tested and documentation of the test shall be submitted.
 - b. No equipment shall be shipped until the above test results are received.
- B. Furnish the services of a factory representative for one day who has complete knowledge of proper operation and maintenance to inspect the final installation and supervise a test run of the equipment.
- C. After all pumps have been completely installed and are working under the direction of the manufacturer, conduct in the presence of the Engineer such tests as are necessary to indicate that pump efficiency and discharge conform to the specifications. Field tests shall include all pumps included under this Section. Supply all electric power, water or wastewater, labor, equipment, and incidentals required to complete the field test.
- D. If the pump performance does not meet the Specifications, corrective measures shall be taken by the Contractor, or pumps shall be removed and replaced with pumps that satisfy the conditions specified. A four-hour operating period of the pumps will be required before acceptance. During this four-hour operating period, the Contractor shall supply all power necessary.
- E. The components of each lubricating system shall be completely tested by the Contractor in the presence of the Engineer. All component parts which are damaged as a result of testing or which fail to meet the requirements of the specification shall be replaced, reinstalled and retested at the manufacturer's expense.

[END OF SECTION]

DIVISION 13:
SPECIAL CONSTRUCTION

SECTION 13005
LINER PENETRATION BOXES

SECTION 13005

LINER PENETRATION BOXES

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes material, fabrication, and installation of liner penetration boxes.

1.02 RELATED SECTIONS AND PLANS

- A. Section 02100 – Surveying
- B. Section 02200 – Earthwork
- C. Section 02221 – Trenching and Backfilling
- D. Section 02235 – Granular Drainage Material
- E. Section 02715 – High-Density Polyethylene (HDPE) Pipes and Fittings
- F. Section 02770 – Geomembrane
- G. Section 02780 – GCL
- H. Construction Quality Assurance (CQA) Plan

1.03 REFERENCES

- A. Latest version of the American Society for Testing and Materials (ASTM) standards:
 - 1. ASTM D638 Standard Test Method for Tensile Properties of Plastics
 - 2. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - 3. ASTM D 1248. Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
 - 4. ASTM D 3212. Standard Specification for Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals.
 - 5. ASTM D 3350. Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 - 6. ASTM F 1055. Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.04 SUBMITTALS

- A. Submit to the Engineer for review the following liner penetration box fabrication details, together with Fabricator qualification and documentation of resins to be used, within 30 calendar days from Notice to Proceed:
1. Fabricator Qualifications:
 - a. name and qualifications of Fabricator of liner penetration boxes, including Fabricator quality control procedures;
 - b. a list of completed facilities for which the Fabricator has fabricated appurtenances from HDPE flat stock such as the liner penetration boxes; the list shall include the following information for each facility:
 - i. name, location, purpose of facility, and date of installation;
 - ii. names of owner, project manager, and design engineer; and
 - iii. description of special fabrication;
 - c. proposed fabrication dates for liner penetration boxes;
 - d. qualification procedure for Fabricator's welder(s);
 - e. extrusion welding procedure for HDPE pipe, flat stock, and geomembrane liner; and
 - f. simultaneous butt fusion procedures.
 2. Documentation on the HDPE flat stock of the liner penetration boxes:
 - a. name of Manufacturer of HDPE flat stock used to fabricate liner penetration boxes; and
 - b. certification from the HDPE flat stock supplier that the HDPE flat stock meets the material requirements of this Section; certification shall include a statement that no reclaimed polymer is added to the resin during the manufacturing of the products to be used for this project.
 3. Two 6-inch by 6-inch by 1-inch thick samples of HDPE flat stock used in fabrication of the liner penetration boxes.
 4. Documentation on the HDPE pipe and solid homogeneous end termination used in the fabrication of the liner penetration boxes.
 5. Liner penetration box fabrication:
 - a. detailed shop drawings of liner penetration boxes as shown on the Construction Drawings, showing:
 - i. box component dimensions;
 - ii. location of welds;
 - iii. weld types; and
 - iv. material tolerances;
 - b. detailed design by liner penetration box Manufacturer for fabrication and installation of lifting hooks; design should be based on center gravity of liner penetration box; and
 - c. detailed handling and storing instructions.

6. Fabricator's quality assurance procedures including spark testing of geomembrane liner and pneumatic testing of the liner penetration boxes.
 7. Material Safety Data Sheet (MSDS) for HDPE products.
- B. Submit the following to the Engineer for review not less than 14 calendar days before liner penetration box shipment to the site:
1. results of Fabricator quality control tests required by this Section;
 2. written detailed installation procedures for the liner penetration boxes, including rigging for offloading and installation;
 3. written certification from the Fabricator that the materials and fabricated liner penetration boxes meet the requirements of this Section; and
 4. written certification from the Fabricator that welders are qualified to perform extrusion welding specified in this Section.
- C. Provide list of equipment, description of construction methods, and other required information related to installation of liner penetration boxes in the Contractor's Earthwork Work Plan specified in Section 02200.

1.05 CQA

- A. Contractor's quality assurance requirements shall be in accordance with Part 9 of the Contract Documents.

PART 2 PRODUCTS

2.01 HDPE FLAT STOCK

- A. Furnish 1-inch thick HDPE flat stock manufactured from new, high performance, high molecular weight, HDPE resin conforming to ASTM D 1248 (Type III, Class C Category 5, Grade P 34), ASTM D 3350 (Cell Classification PE 345434C), and having a Plastic Pipe Institute (PPI) Rating of PE 3408. The resin shall be pre-compounded. In-plant blending of non-compounded resins is not permitted. Furnish material having minimum specified property values listed in Table 13005-1.
- B. Furnish only smooth HDPE flat stock with no sharp projections, homogeneous throughout with respect to resin compound, and with surfaces free of foreign inclusions and surface defects. Furnish HDPE flat stock that is as uniform as commercially practical in color, opacity, density, and other physical properties.

2.02 HDPE GEOMEMBRANE SKIRT

- A. Furnish HDPE geomembrane meeting the requirements of Section 02770 required for the HDPE skirt shown on the Construction Drawings.

2.02 HDPE PIPES AND FITTINGS

- A. Furnish HDPE pipe and solid homogeneous end termination in accordance with Section 02605.
- B. Fabricate pipe outlets as shown on the Construction Drawings.

2.03 LINER PENETRATION BOXES

- A. Fabricate liner penetration boxes to the dimensions shown on the Construction Drawings and tolerances specified in this Section.
- B. Fabricate liner penetration box outlets from HDPE pipe. Do not use flat stock. HDPE pipe outlets shall meet the requirements shown on the Construction Drawings.
- C. Weld liner penetration box components in accordance with the recommended HDPE welding procedures by the Fabricator and approved by the Construction Manager. Weld HDPE geomembrane skirt to liner penetration boxes using extrusion welding method and perform spark testing specified in this Section.
- D. Furnish one 3/8-inch National Pipe Thread (NPT) air pressure test port for each box.
- E. Liner penetration boxes shall be furnished with lifting hooks as required by the Fabricator.

2.04 EQUIPMENT

- A. Provide equipment to install and test liner penetration boxes in accordance with the requirements of this Section.

2.05 FABRICATOR QUALITY CONTROL

- A. Conduct welder prequalification test each day before production welding in accordance with the submittal procedure specified in this Section. Archive test specimens for 90 calendar days from date of shipment.
- B. Pressure test each completed liner penetration box prior to shipping. Perform pressure test in accordance with ASTM D 3212, except that the air pressure shall be maintained for a testing period of 30 minutes and at an air pressure of 10.8 pounds per square inch (psi) applied through the air pressure ports. Monitor the air pressure and apply soapy solution to all welds to facilitate detection of leaks. Measured air pressure shall remain constant over the testing period except for changes which can be explained due to material relaxation and expansion. Grind out any leaking seams and reweld. Repeat test. Reject any box with a pressure loss in which the leak cannot be found and repaired. Test gauges shall be calibrated within one year of date of test. Calibration shall be traceable to national or industry recognized standards.

- C. Extrusion welds at the geomembrane liner seam to the liner penetration box shall be spark tested.
- D. Geomembrane skirt on liner penetration box shall be vacuum tested.
- E. Permit the CQA Consultant and/or Owner to visit the fabrication plant for project specific visits. If possible, such visits will be prior to, or during, the fabrication and/or Fabricator quality control testing of the liner penetration boxes.

PART 3 EXECUTION

3.01 EXCAVATION

- A. Do not commence installation of liner penetration boxes until the CQA Consultant completes performance testing and confirmation of compliance of underlying layers, including acceptance of Contractor's survey results for underlying layers.
- B. Notify the Construction Manager a minimum of 2 working days prior to the start of liner penetration box installation.
- C. Excavate compacted fill perimeter berm and granular drainage material to the lines and grades shown on the Construction Drawings for placement of liner penetration boxes. Minimize overexcavation and disturbance of the compacted fill perimeter berm and granular drainage material.
- D. Perform excavation in accordance with Section 02200.
- E. Dewater excavation in accordance with the requirements of Section 02200.

3.02 BOX INSTALLATION

- A. Grade subgrade and granular drainage material surface under the footprint of the box on which liner penetration box is to be installed. Make surface smooth to obtain close contact between the subgrade and liner penetration box. Recompact material in accordance with Section 02200 and regrade if contact occurs between the bottom of the box and the prepared subgrade.
- B. Install the liner penetration boxes at the locations and elevation shown on the Construction Drawings.
- C. Join the sections of pipe between liner penetration boxes, LCS manhole and LDS pump station using butt-fusion welding as specified in Section 02605.
- D. Backfill around LCS and LDS pipes in accordance with Sections 02221 using soil-bentonite mix.

- E. Backfill around liner penetration boxes using soil-bentonite mixture and compact. Fill any interface between the prepared subgrade and liner penetration box with bentonite granules.
- F. Air pressure test liner penetration boxes in accordance with the requirements of this Section. Air pressure testing shall be conducted after the backfill around the penetration boxes is completed. Testing equipment shall be equipped with a regulator capable of limiting supply pressure to 15 psi.
- H. Weld geomembrane to each liner penetration box skirt as soon as air pressure testing, surveying, and bentonite filling are complete. Welding shall be by the extrusion method and shall be non-destructively tested as specified in Section 02770.

3.03 AIR PRESSURE TEST

- A. Air pressure test each liner penetration box after associated earthwork and compacted clay liner placement is complete and prior to geosynthetics installation over the boxes. Use the air pressure testing procedure specified in this Section. Conduct the pressure test in the presence of the CQA Consultant. Test gauges shall be calibrated within one year of use. Calibration shall be traceable to national or industry recognized standards where possible.
- B. In the event an unexplainable pressure loss occurs, excavate the liner penetration box, and investigate for leaks and perform necessary repairs. Replace any liner penetration box that has a pressure leak if the leak cannot be found and repaired.
- C. The Fabricator shall make repairs to the liner penetration box.
- D. HDPE geomembrane skirt extrusion weld shall be vacuum tested in accordance with Section 02770 after associated earthwork and compacted fill perimeter berm placement is complete.
- E. Seal test openings with HDPE extrudate placed with extrusion welding equipment as specified in Section 02770.

3.04 CONSTRUCTION QUALITY REQUIREMENTS

- A. CQA Consultant will monitor installation of liner penetration boxes in accordance with this Section and the CQA Plan.
- B. CQA Consultant will monitor air pressure testing of liner penetration boxes to confirm and document compliance with this Section.

3.05 SURVEY CONTROL

- A. Survey the locations and elevations of the liner penetration boxes in accordance with Section 02100 and as indicated on the Construction Drawings.

3.06 TOLERANCES

- A. Tolerances shall be 0.1 feet vertical and 0.5 feet horizontal for any dimension shown on the construction Drawings for the liner penetration boxes.

TABLE 13005-1

**REQUIRED HDPE FLAT STOCK PROPERTIES
 ASTM D 3350 CELL CLASSIFICATION PROPERTIES AND RANGES**

Properties	Cell Classification	Qualifiers	Units⁽¹⁾	Specified Property Values	Test Method
Density	3	Minimum	g/cm ³	0.94	ASTM D 1505
Melt Flow Index	3 to 5	Maximum	g/10 min	<0.4	ASTM D 1238 (Condition E)
Flexural Modulus	5	Minimum	lb/in ²	110,000	ASTM D 790
Tensile Strength	4 or 5	Minimum	lb/in ²	3,000	ASTM D 638
Environmental Stress Crack	3	Minimum	hrs	F ₂₀ > 192	ASTM D 1693
Hydrostatic Design Basis at 73°F	4	Minimum	lb/in ²	1,600	ASSTM D 2837
UV Stabilizer	C	Minimum	% carbon black	2	ASTM D 1603

Notes:

1.
 - g/cm³ = grams per cubic centimeter
 - g/10 min = grams per 10-minutes
 - lb/in² = pounds per square inch
 - hrs = hours
 - % = percent

[END OF SECTION]

**SECTION 13300
INSTRUMENTATION AND CONTROLS – GENERAL
PROVISIONS**

SECTION 13300 INSTRUMENTATION AND CONTROLS – GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The Contractor shall procure the services of a Process Control System Supplier (PCSS) to furnish and install all materials, equipment, labor and services, required to achieve a fully integrated and operational system as specified herein, in the Specification Sections listed below, and in related drawings, except for those services and materials specifically noted.

1.	Section No.	Title
	13340	Instruments

- B. The PCSS shall furnish and install a pre-engineered Telemetry Control Units (TCU), manufactured by Data Flow Systems for the Leachate Detection System Control Panel. The TCU's shall monitor and control all equipment as described on the P&IDs and communicate with the County SCADA system. Units to be supplied shall be the TAC Pack TCU Pump Controller.
- C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators, software, and drivers to interface with existing equipment or equipment provided by others under other sections of these specifications, shall be included whether they are shown on the Drawings or not.
- D. All equipment and installations shall satisfy applicable Federal, State and local codes.
- E. Use the equipment, instrument, and loop numbering scheme shown on the Drawings and specifications in the development of the submittals. Do not deviate from or modify the numbering scheme without the Engineer's approval.

1.02 RELATED WORK

- A. Instrumentation and Controls conduit systems are specified in Section 16110.
- B. Instrumentation signal cable and alarm and status wiring are specified in Section 16120.

1.03 SUBMITTALS

- A. General Requirements:
1. Refer to Section 01300 for general submittal requirements.

2. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.
3. Submittals shall be complete, giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.
4. Substitutions on functions or type of equipment specified shall not be acceptable unless specifically noted.
5. Separate submittals shall be made for each submittal listed below:
 - a. Input/Output List.
 - b. Field Instruments.
 - c. Hardware and Software Packages.
 - d. Preliminary Training Plan Submittal.
 - e. Final Training Plan Submittal.
 - f. Operation and Maintenance Manuals.

B. Input/Output (I/O) List Submittal:

1. Submit, within 60 days after Notice to Proceed, a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.
2. I/O list shall be based on the P&IDs, the Drawings, the design I/O list (if included), and requirements in the Specifications.
3. The I/O list shall be submitted in both a Microsoft Excel readable electronic file format and an 8-1/2-inch by 11-inch hard copy.
4. The I/O list shall reflect all active and spare I/O points. Add points to accommodate spare I/O as required in the specifications.
5. The I/O list shall be arranged such that each control panel has a dedicated worksheet. At a minimum, I/O worksheet shall include the following information:
 - a. TAG NUMBER(S): As indicated on the Drawings, the identifier assigned to a device that performs a function in the control system. As part of this information, the loop number of the tag shall be broken out to allow for sorting by loop.
 - b. DESCRIPTION: A description of the function of the device (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.
 - c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.
 - d. Physical POINT ADDRESS: Rack, Slot, and Point (or Channel) assignment for each I/O point.
 - e. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output,

AI - Analog Input, PI - Pulse Input, or PO - Pulse Output.

- f. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or, the state at which the value of the discrete points are "1."
 - g. ENGINEERING UNITS: The engineering units associated with the Analog I/O. ALARM LIMITS: Include alarm limits based on the control descriptions and the Drawings.
 - h. P&ID - the P&ID or drawing where the I/O point appears on. Mark as "NA" (Not Applicable) if the I/O point is derived from a specification requirement and is not on the P&IDs.
6. The I/O list shall be sorted in order by:
 - a. Physical location.
 - b. I/O Type.
 - c. Loop Number.
 - d. Device Tag.
 7. Once the I/O list is approved, the I/O list shall not be modified without approval by the Engineer.

C. Field Instruments Submittal:

1. Refer to the Instruments section for submittal requirements.

D. Hardware and Software Packages Submittal:

1. For each hardware and software packages component, submit a cover page that lists, at a minimum, date, specification number, product name, manufacturer, model number, location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01- 2007, general data sheet; however, other formats will be acceptable provided they contain all required information.

E. Preliminary Training Plan Submittal:

1. Prior to the preparation of the Final Training Plans, submit outlines of each training course including course objectives and target audience, resumes of instructors, prerequisite requirements for each class, and samples of handouts for review.

F. Final Training Plan Submittal:

1. Upon receipt of the Engineer's comments on the preliminary training plan, submit the specific proposed training plan. The training plan shall include:
 - a. Definitions, objectives, and target audience of each course.
 - b. Schedule of training courses including proposed dates, duration and locations of each class.
 - c. Complete copy of all proposed handouts and training materials. Training information shall be bound and logically arranged with all materials reduced to

a maximum size of 11-inch by 17-inch, then folded to 8.5-inch by 11-inch for inclusion into the binder.

G. Operations and Maintenance (O&M) Manuals:

1. Submit in accordance with Section 01730.
2. The operations and maintenance manuals shall, at a minimum, contain the following information:
 - 1) Table of Contents: A Table of Contents shall be provided for the entire manual with the specific contents of each volume clearly listed. The complete Table of Contents shall appear in each volume.
 - b. Instrument and Equipment Lists:
 - 1) The following lists shall be developed in Microsoft Excel format and provided not only as a hardcopy in O&M but also electronically on a CD.
 - 2) An instrument list for all devices supplied including tag number, description, specification section and paragraph number, manufacturer, model number, serial number, range, span, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.
 - 3) An equipment list for all non-instrument devices supplied listing description, specification section and paragraph number, manufacturer, model number, serial number, location, manufacturer phone number, local supplier name, local supplier phone number, completion year replacement cost, and any other pertinent data.
 - c. Equipment Operations and Maintenance Information:
 - 1) ISA-TR20.00.01-2007 data sheets shall be provided for all field instruments. For non-field instrumentation devices, provide a cover page for each device, piece of equipment, and OEM software that lists date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2007, general data sheet; however, other formats will be acceptable provided they contain all required information.
 - 2) Vendor O&M documentation for each device, piece of equipment, or OEM software shall be either new documentation written specifically for this project or modified standard vendor documentation. All standard vendor documentation furnished shall have all portions that apply clearly indicated with arrows or circles. All portions that do not apply shall be neatly lined out or crossed out. Groups of pages that do not apply at all to the specific model supplied shall be removed.
 - d. As-Built Drawings:
 - 1) Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system is connected to, including terminal points of equipment not supplied by the PCSS.
 - 2) As built documentation shall include information from submittals, as

described in this Specification, updated to reflect the as-built system. Errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests shall be incorporated in this documentation.

- e. Electronic O&M Information:
 - 1) In addition to the hard copy of O&M data, provide an electronic version of all equipment manuals and data sheets, along with any software back-up of configuration files, on CD-ROM or DVD. Electronic documents shall be supplied in Adobe Acrobat format.
 - 2) Provide electronic files for all custom-developed manuals including training manuals. Text shall be supplied in both Microsoft Office format and Adobe Acrobat format.
 - 3) Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and in Adobe Acrobat format. Drawings shall be provided using the AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files. Each computer system hardware device shall be backed up onto CD-ROM or DVD after Substantial Completion and shall be turned over to the Owner.
- 3. The cover and edge of each volume shall contain the information as specified in Section 01730.

1.04 REFERENCE STANDARDS

- A. Publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.
- B. International Society of Automation (ISA):
 - 1. ISA S5.2, Binary Logic Diagrams for Process Operations.
 - 2. ISA S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.
 - 3. ISA S5.4, Instrument Loop Diagrams.
 - 4. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.
 - 5. ISA-99, Industrial Automation and Control Systems Security.
- C. National Electrical Manufacturers Association (NEMA).
- D. National Fire Protection Agency (NFPA):
 - 1. NFPA 70, National Electrical Code (NEC).

2. NFPA 79, Industrial Control Equipment.

E. Underwriters Laboratories, Inc. (UL):

1. UL 508 - Industrial Control Equipment - for custom fabricated equipment.
2. A nationally recognized testing laboratory, as approved by the Authority having jurisdiction, may substitute for UL listing on commercial off the shelf products.

1.05 QUALITY ASSURANCE

A. The Process Control System Supplier (PCSS) shall be a "systems integrator" regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all of the following criteria:

1. Employs personnel on this project who have successfully completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. Key personnel shall hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable startup experience. Key personnel shall include, as a minimum, the lead field technician.
2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references shall be for projects where the PCSS's contract was of similar size to this project.
3. Has been actively engaged in the type of work specified in this section for a minimum of five years.

B. The PCSS shall maintain a permanent, fully staffed and equipped service facility within 200 miles of the project site with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the PCSS shall be capable of responding to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled startup to two months after startup completion.

C. PCSS shall hold a valid UL-508 certification for their panel fabrication facility.

D. Actual installation of the instrumentation system need not be performed by the PCSS's employees; however, the PCSS as a minimum shall be responsible for the technical supervision of the installation by providing on site supervision to the installers of the various components.

- E. Being listed in this specification does not relieve any potential PCSS from meeting the qualifications specified in this Section.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Delivery, storage, and handling shall be in accordance with Section 01600.
- B. Shipping Precautions:
 - 1. After completion of shop assembly, factory test and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.
 - 2. Manufacturer's special instructions for field handling, storage and installation required for protection, shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other means of protection.
 - 3. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the Owner.

1.07 WARRANTY

- A. Provide warranty per Section 01740, Warranties and Bonds, and as specified herein.

1.08 PROJECT/SITE REQUIREMENTS

- A. Environmental Requirements. Refer to Section 16000 and Electrical Drawings for specific environmental and hazardous area classifications.
- B. Elevation: Equipment shall be designed to operate at the project ground elevation.
- C. Temperature:
 - 1. Outdoor areas' equipment shall operate between -30 to 50 degrees C ambient.
 - 2. Equipment located in indoor locations shall operate between 10 to 35 degrees C ambient minimum.
 - 3. Storage temperatures shall range from 0 to 50 degrees C ambient minimum.

4. Additional cooling or heating shall be furnished if required by the equipment as specified herein.
- D. Relative Humidity: Air-conditioned area equipment shall operate between 20 to 95 percent relative, non-condensing humidity. All other equipment shall operate between 5 to 100 percent relative, condensing humidity.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All equipment shall be as designated in the IRCDUS “Section 18 Approved Manufacturer's Product List.”
- B. All instrumentation and electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or equal coating to prevent contamination by dust, moisture and fungus. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.
- C. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks unless otherwise noted. Fasteners for securing control panels and enclosures to walls and floors shall be either hot-dipped galvanized after fabrication or stainless steel. Provide stainless steel fasteners only in corrosive areas rated NEMA 4X on the Drawings or as defined under Section 16000. Provide minimum size anchor of 3/8-inch.
- D. All indicators shall be linear in process units, unless otherwise noted. All transmitters shall be provided with indicators in process units, accurate to two percent or better.
- E. All equipment, cabinets and devices furnished shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.
- F. All electronic/digital equipment shall be provided with radio frequency interference protection.
- G. Electrical:
 1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
 2. With the exception for field device network connected devices, all electronic

instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC.

3. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.
4. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 VA, unless noted otherwise.
5. Switches and/or signals indicating an alarm, failure or upset condition shall be wired in a fail-safe manner. A fail-safe condition is an open circuit when in an alarm state.
6. Materials and equipment shall be UL approved whenever such approved equipment and materials are available.
7. All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no loss of memory and shall resume normal operation without manual resetting when power is restored, unless otherwise noted.

2.02 ELECTRICAL SURGE PROTECTION

- A. General - Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning or utility electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an $8 \times 20 \mu\text{s}$ impulse waveform) of at least 8 kA. Ground wires for all instrumentation device surge protectors shall be connected to a low resistance ground in accordance with Section 337900.
- B. Provide protection of all analog signal (4-20 mA) circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Protection devices located near the transmitter shall be mounted in a separate NEMA 4X stainless steel enclosure (plastic is not acceptable) or conduit mounted, and shall be Phoenix Contact PT Series, MTL Surge Technologies (Telematic) TP48, Citel TSP-10 series, or equal. Substitution of a single device to protect both 120 VAC and 4-20 mA wires to an instrument is acceptable. Protection devices in control panels shall be MTL Surge Technologies (Telematic) SD Series, Phoenix Contact PT Series, Citel DLA series, or equal.
- C. Provide protection of all 120 VAC power feeds into control panels and instruments.

Surge arresters shall be Transtector ACP-100BW Series, Phoenix Contact "Mains-PlugTrab", MCG Surge Protection 400 Series, Citel DS40 series, or equal.

- D. RF Coaxial Cable - Provide protection on communication cables between radios and antennas, mounted either inside the panel, or in the wall of the enclosure in accordance with NEMA and UL standards. Surge protection devices shall be Citel P8AX series, Polyphaser, or equal.
- E. Inductive Loads - Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120 VA or less that drive solenoid, coil, or motor loads.

2.03 SPARE PARTS

- A. All spare parts shall be wrapped in bubble wrap, sealed in a polyethylene bag complete with dehumidifier, then packed in cartons and labeled with indelible markings. Complete ordering information including manufacturer's contact information (address and phone number), part name, part number, part ordering information, and equipment name and number(s) for which the part is to be used shall be supplied with the required spare parts. The spare parts shall be delivered and stored in a location directed by the Owner or Engineer.
- B. Furnish one of each type of installed surge protection devices.
- C. Instrument related Spare Parts - see the Instrument section 13340.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Instrumentation and accessory equipment shall be installed in accordance with manufacturer instructions. The indicated locations of equipment, transmitters, alarms and similar devices indicated are approximate only. Exact locations of all devices shall be as approved by the Engineer during construction. Obtain in the field, all information relevant to the placing of process control equipment and in case of interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner at no additional cost to the Owner.
- B. Provide stainless steel brackets and hangers required for mounting of equipment.
- C. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded at only one ground point for each shield, unless otherwise indicated in the installation details from the instrument manufacturer.
- D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through

restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's approval. Certify that field wiring associated with the equipment is installed in accordance with best industry practice. Coordinate work under this Section with that of the electrical work specified under applicable sections of Division 16.

- E. Provide sunshades for equipment mounted outdoors in direct sunlight. Sunshades shall include standoffs to allow air circulation around the cabinet. Orient equipment outdoors to face to the North or as required to minimize the impact of glare and ultraviolet exposure on digital readouts.

3.02 TESTING

- A. All testing requirements under this section shall be provided for the new lift station. All finalized testing documentation shall be submitted within 30 days of each completed test.
- B. All instrumentation equipment shall be tested at the factory prior to shipment. Unless otherwise specified in the individual specification sections, all instrumentation equipment provided as a system shall be tested at the factory as a single fully integrated system.
- C. As a minimum, the testing shall include the following:
 - 1. Functional Demonstration Test (FDT).
- D. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and upon the system's or subsystem's producing the correct result (effect), the specific test requirement will have been satisfied.
- E. All tests shall be conducted in accordance with prior Engineer approved procedures, forms and checklist. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion.
- F. Copies of these signoff test procedures, forms and checklists will constitute the required test documentation.
- G. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment and data, provide suitable means of simulation. Define these simulations techniques in the test procedures.
- H. The Contractor shall coordinate all of their testing with all affected subcontractors and the Owner.
- I. The Engineer reserves the right to test or retest all specified functions whether or not explicitly stated in the prior approved Test Procedures.

- J. The Engineer's decision shall be final regarding the acceptability and completeness of all testing.
- K. No equipment shall be shipped until the Engineer has received all test results and approved the system is ready for shipment.
- L. The PCSS shall furnish all special calibration and test equipment and labor to perform the field tests.

3.03 FUNCTIONAL DEMONSTRATION TEST (FDT)

- A. After the lift station is started-up and running the process in automatic control to the extent possible, a Functional Demonstration Test shall be performed. The purpose of the FDT is to allow the Engineer and/or Owner representatives to witness the actual functionality, performance, and stability of the system while connected to the process equipment.
- B. Required Documents for Test:
 - 1. Set of panel drawings and wiring diagrams.
 - 2. Set of contract documents - all drawings and specifications.
 - 3. All design change related documentation.
 - 4. Testing procedures.
 - 5. Copy of completed calibration forms.
 - 6. One copy of all O & M Manuals for supplied equipment.
- C. After coordinating with Operations, a "Black Start" of the lift station shall be performed to confirm that operation recovers as specified in the contract documents. Black start means shutting off power to the lift station and turning it back on. Separate tests shall be performed by recovering the lift station while on generator (if a generator is specified) and while on utility power.
- D. Punchlist items and resolutions noted during the test shall be documented on the Punchlist/Resolution form. In the event of rejection of any part or function test procedure, the PCSS shall perform repairs, replacement, and/or retest within 10 days. Upon successful completion of the FDT, the PCSS shall submit a record copy of the test results.

3.04 TRAINING

- A. The cost of the training programs shall be included in the Contract price. The training and instruction shall be directly related to the system being supplied. The training

program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

- B. All training schedules shall be coordinated with and at the convenience of the Owner. Shift training may be required to correspond to the Owner's working schedule.
- C. All onsite instructors must be intimately familiar with the operation and control of the Owner's facilities.
- D. Provide detailed training manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project. The manuals shall be provided in hardcopy for each student. Provide electronic copy of each training manual in PDF format for Owner's future use.
- E. The trainer shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, all training materials shall be delivered to Owner.
- F. The Owner reserves the right to videotape all custom training sessions. All training tapes shall become the sole property of the Owner.
- G. Cost of Travel for off-site training:
 - 1. Cost of Travel for off-site training shall be paid directly by the entity employing the staff doing the traveling.

3.05 ONSITE TRAINING

- A. Training personnel shall be intimately familiar with the control system equipment, its manipulation, and configuration. Training personnel shall command knowledge of system debugging, program modification, troubleshooting, maintenance procedure, system operation, and programming, and shall be capable of transferring this knowledge in an orderly fashion to technically oriented personnel.
- B. Installed Control System Training:
 - 1. Provide training for the Owner's personnel in the functionality, maintenance, and troubleshooting, of the installed Control System. The training shall be held before the Functional Demonstrator Test (FDT), but not more than two months before.
 - 2. Training and instruction shall be specific to the system that is being supplied.
 - 3. Training shall include hands-on instruction utilizing the Owner's system.
 - 4. Detailed training shall be provided on the actual configuration and implementation for this Contract. Training shall cover all aspects of the system that will allow the Owner's personnel to maintain, modify, troubleshoot, and develop future additions/deletions to the system. The training shall cover the following subjects, as a minimum:

- a. System overview.
- b. System hardware components and specific equipment arrangements.
- c. Periodic maintenance.
- d. Troubleshooting and diagnosis.
- e. Radio configuration, communications, and operation.
- f. Network configuration, communications, and operation.
- g. TCP/IP addressing procedures for all Ethernet devices.

C. Instrument Training:

1. Provide instruction on the maintenance of the field and panel instrumentation for the Owner's instrumentation technicians. This training shall be conducted before the FDT, but no more than 1 month before and at a time suitable to the Owner. This training shall take place at the Owner's facility. As a minimum the following shall be included:
 - a. Training in standard hardware maintenance for the instruments provided.
 - b. Specific training for the actual instrumentation configuration to provide a detailed understanding of how the equipment and components are arranged, connected, and set up for this Contract.
 - c. Test, adjustment, and calibration procedures.
 - d. Troubleshooting and diagnosis.
 - e. Periodic maintenance.

D. Instruments - Operator familiarity:

1. Provide operator level instruction on the use of the field and panel instrumentation for the Owner's operations staff. This training shall take place at the Owner's facility. Include hands on demonstration of the information each transmitter indicates, and the method used to retrieve any operator information from the transmitter, including use of pushbuttons and interpretation of international graphic symbols used on the instruments.

[END OF SECTION]

**SECTION 13340
INSTRUMENTATION AND CONTROLS – INSTRUMENTS**

SECTION 13340

INSTRUMENTATION AND CONTROLS – INSTRUMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section covers the furnishing, installation, and services for instruments.

1.02 RELATED WORK

- A. Refer to Section 13300 “Instrumentation and Controls - General Provisions.”

1.03 SUBMITTALS

- A. Submit complete documentation of all field instruments using ISA-TR20.00.01-2007 data sheet formats. Submit a complete Bill of Materials (BOM) or Index that lists all instrumentation equipment.
- B. Submit separate data sheets for each instrument including:
 - 1. Equipment Number and ISA tag number per the Drawings.
 - 2. Product (item) name used herein and on the Drawings.
 - 3. Manufacturer's complete model number.
 - 4. Location of the device.
 - 5. Input - output characteristics.
 - 6. Physical size with dimensions, enclosure NEMA classification and mounting details in sufficient detail to determine compliance with requirements.
 - 7. Materials of construction for enclosure and wetted parts.
- C. Submit catalog cuts for all instruments. Submit descriptive literature for each hardware component, which fully describes the units being provided.
- D. Submit index and data sheets in electronic format as well as hard copies on 8-1/2-inch by 11- inch formats. Electronic format shall be in Microsoft Excel, Word or pdf.

1.04 INSTRUMENT TAGS

- A. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as indicated in the Drawings, shall be provided on each piece of equipment supplied under this Section and

related sections. Equipment shall be tagged before shipping to the site.

1.05 APPROVALS/CERTIFICATIONS

- A. Instruments for hazardous locations shall have Factory Mutual (FM), Canadian Standards Association (CSA), and CENELEC approvals and certifications as specified herein and as indicated on the Drawings or in the Instrument Device Schedule. The instrument specifications in Part 2 state the Class, Division, and gas groups for FM/CSA approval, followed in parenthesis by the CENELEC certification; however, instruments provided are only required to have the approval/certification stated above. The instrument shall have a stainless-steel tag identifying the relevant approval or certification.

PART 2 – PRODUCTS

2.01 FLOAT SWITCHES

- A. Type:
 - 1. Mercury free ball float switch.
- B. Function/Performance:
 - 1. Differential: Less than 8 inches.
 - 2. Switch Rating: 1 amps at 120 VAC or 100 VA @ 120 VAC.
 - 3. Provide NO or NC type contact for fail-safe operation per Section 13300, Paragraph 2.01.F or as shown on the Drawings.
- C. Physical:
 - 1. Float: Type 316 stainless steel, Teflon or non-stick coating, minimum 5-inch diameter.
 - 2. Totally encapsulated switch.
 - 3. Cable shall be heavy-duty, PVC or equivalent jacketed integral to float.
- D. Options/Accessories Required:
 - 1. Provide stainless steel hardware.
 - 2. Lead wire shall be a waterproof cable of sufficient length so that no splice or junction box is required in the vault

3. Provide cast-aluminum weatherproof junction box outside the vault with terminals for all floats and tapped as required for conduit connections.
 4. Include intrinsically safe barrier for float switches used in class 1 division 1 locations.
- E. Manufacturers:
1. Siemens Water Technologies Model 9G-EF.
 2. Contegra FS 90.
 3. Or Equal.
- F. Instrument Device Schedule:
1. LSS-1000: Stop Leachate Pump
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 2. LSL-1000: Start Leachate Pump
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 3. LSSL-1010: Low Level Alarm
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 4. LSS-1010: Stop All Pumps
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 5. LSL-1010: Start Lead Pump
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 6. LSH-1010: Start Lag Pump
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2
 7. LSHH-1010: High Level Alarm
 - a. Location Classification: Class 1 Division 1
 - b. Drawing Reference: I-2

2.02 MAGNETIC FLOWMETER

- A. Flow Element:

1. Type:
 - a. Pulsed DC type.
2. Function/Performance:
 - a. Operating Temperature: Process liquid temperatures of 0 to 140 degrees F or greater dependent upon liner and an ambient of minus 30 to 150 degrees F.
 - b. Radio Frequency Interference (RFI) protection: RFI protection shall be provided as recommended by the manufacturer.
 - c. Pressure rating: Equal to piping system where meter is installed.
 - d. Additional: Meter shall be capable of running empty indefinitely without damage to any component.
3. Physical:
 - a. Metering Tube: Type 304 stainless steel or equivalent.
 - b. Flanges: ANSI 150 lb. or DIN PN 16 carbon steel, as required by the piping system, unless otherwise indicated. ANSI 150 lb. or DIN PN 16 stainless steel flanges shall be used on all SS process pipes.
 - c. Liner: Polyurethane or composite elastomer unless otherwise indicated on the Drawings or in the Instrument Device Schedule.
 - d. Electrodes: Type 316 stainless steel standard minimum requirements. All electrodes to be compatible with process fluid as indicated on the Drawings or electrodes to be supplied as listed in the Instrument Device Schedule.
 - e. For sludge, polymer, or any slurry application where the electrodes will be coated, a self-cleaning or a removable electrode option must be provided with that meter.
 - f. Housing: For meters with remote mounted transmitters, meters below grade shall be suitable for submergence for up to 48 hours to a depth of 30-ft (9m). Meters above grade shall be NEMA 4X (IP65). Where hazardous areas are indicated on the Drawings, the equipment shall be rated for that area.
 - g. Finish: All external surfaces shall have a chemical and corrosion resistant finish.
4. Power Requirements:
 - a. Meter shall be 24 VDC powered instrument, receiving its power from transmitter.
5. Accessories/Documentation Required:
 - a. Factory calibration: All meters shall be factory calibrated. A copy of the calibration report shall be included in the O&M manual.
 - b. Grounding: Meter shall be grounded in accordance with the manufacturer's recommendation. Provide ground ring, ground wires, gaskets, etc., as required. All materials shall be suitable for the liquid being measured and must be compatible with process fluid and with the process pipe.
 - c. For meters with remote mounted transmitters, signal cable for installation between the flow tube and the transmitter. Length shall be as required by installation as indicated on the Drawings.

B. Flow Converter/Transmitter:

1. Type:
 - a. Micro-processor based; intelligent transmitter compatible with flow tube provided.
 - b. Integral mount or mounted remote from the flow tube as shown on the drawings or as required by the physical location.
2. Functional/Performance:
 - a. Accuracy (including flow tube): Plus/minus 0.5 percent of flow rate or better.
 - b. Operating Temperature: –20 to 140 degrees F.
 - c. Output: Isolated 4-20 mA with HART protocol. Current output adjustable over the full range of the instrument. Provide a dry contact to indicate reverse flow.
 - d. Diagnostics: Self diagnostics with on screen display of faults.
 - e. Display: Digital indicator displaying flow in engineering units indicated in the Instrument Device Schedule.
 - f. Totalizer: A fully configurable totalizer integral to the transmitter. Totalized flow shall be displayed.
 - g. Empty Tube Zero: The transmitter shall include a feature that will lock the output at zero when no flow is detected. The empty tube zero feature shall be enabled automatically when the transmitter detects no flow or manually through a contact input.
 - h. Provide electrode cleaning unit to match flow element requirements.
3. Physical:
 - a. Transmitter shall be suitable for surface or pipe stand mounting.
 - b. Enclosure shall be NEMA 4X (IP65).
4. Power Requirements:
 - a. The transmitter shall be 120 VAC powered instrument.
5. Accessories/ Required:
 - a. Keypad where required for transmitter configuration.

C. Manufacturer:

1. ABB Instruments WaterMaster.
2. Krohne Optiflux 2000 or 4000 Series.
3. Siemens Sitrans FM MAG.
4. Rosemount Series 8705 Meter and 8712 Transmitter for remote mounted transmitter, or 8732E meter/transmitter for integral mounted.

5. Or equal.

2.03 COMBUSTIBLE GAS/LEL DETECTOR

A. Sensor:

1. Type:
 - a. Intrinsically safe.
 - b. Continuous infrared sensor.
2. Function/Performance:
 - a. Response Time: T90 in less than 30 seconds.
 - b. Temperature Range: -50 to 90 degrees C.
 - c. Sensor Life: 3 years typical.
3. Physical:
 - a. Infrared sensor technology.
 - b. Suitable for remote wall or ceiling mounting, or directly fitted to transmitter as indicated on the Drawings.
4. Accessories Required:
 - a. Sufficient cable up to 50-ft (15 m) of the type recommended by the manufacturer shall be provided for installation between sensor and transmitter as required by the installation indicated on the Drawings.
 - b. Remote sensor enclosures shall be explosion proof, approved for Class 1, Division 1, Groups C and D (EEx d IIC T4) areas.
 - c. Detectors that are mounted below 6-ft (2 m) above floor level shall be fitted with splash guards supplied by the manufacturer, to protect the sensor from accidental wetting.

B. Remote Indicating Transmitter/Controller:

1. Type:
 - a. Electronic, microprocessor based single channel transmitter compatible with sensor provided.
2. Function/Performance:
 - a. Accuracy: ± 3 percent up to 50 percent LEL, ± 5 percent for greater than 50 percent LEL.
 - b. Range: 0 to 100 percent LEL.
 - c. Environmental Conditions: -20 to 60 degrees C; 10 to 95 percent relative humidity.
 - d. Output: One 4-20 mA output proportional to calibrated range. Two programmable relay contacts for warning, alarm, and/or fault.
 - e. Display: Digital display indicating the gas level, alarm or fault messages, and diagnostic information.

3. Physical:
 - a. Explosion proof enclosure approved for Class 1, Division 1, Groups B, C, and D (EEx d IIC T4).
 - b. Suitable for surface mounting.
4. Accessories Required:
 - a. Handheld programming unit if required for setup and calibration.
- C. Manufacturers:
 - a. MSA Ultima XIR Series.
 - b. Industrial Scientific iTrans.
 - c. Dräger Polytron 8310.
 - d. Or equal.
- D. Manufacturer Start-up and Training services:
 1. Provide manufacturer's start-up and training services as specified in the start-up and training services paragraph.

2.04 PROPELLER/TURBINE FLOW METER

- A. Flow Element:
 1. Type:
 - a. Magnetically coupled propeller/turbine flowmeter.
 2. Function/Performance:
 - a. Accuracy: Plus or minus 2 percent of rate.
 - b. Operating Temperature: -20 to 180 degrees F.
 - c. Repeatable to +/- 0.25 percent of range.
 3. Physical:
 - a. Propeller or rotor shall be compatible with process fluid in which it is measuring. The rotor shall be Type 316 SS, Hast C or molded of polyethylene.
 - b. Propeller shall be secured on shaft with a key.
 - c. For meters in pipes up to 14 inches (350 mm), propeller shafts shall drive the vertical shaft through a magnetic coupling.
 - d. For meters in pipes 16 to 30 inches (400 to 750 mm), the propeller shall be magnetically coupled to the horizontal drive shaft. Gearing on the horizontal and vertical shafts shall be hardened Type 316 stainless steel.
 - e. Vertical shaft shall have a carbide tip resting on opposing carbide disc.
 - f. Wetted parts shall be coated with a protective coating.
 - g. Meters shall be flange mounted with ANSI 150 lb. flanged ends that shall be compatible and similar to process pipe.
 - h. Meters shall be NEMA 4X (IP65). Where hazardous areas are indicated on the Drawings, the equipment shall be rated for that area.

- i. Finish: All external surfaces shall have a chemical and corrosion resistant finish.
 4. Power Requirements:
 - a. Meter shall receive its power from its transmitter.
 5. Accessories/Documentation Required:
 - a. For meters with remote mounted transmitters, signal cable for installation between the meter and the transmitter. Length shall be as required by installation indicated on the Drawings.
- B. Flow Totalizer/Transmitter:
1. Type:
 - a. Micro-processor based, intelligent transmitter compatible with meter provided.
 - b. Mounted remote from the meter.
 2. Functional/Performance:
 - a. Accuracy (including flow tube): Plus/minus 0.5 percent of flow rate.
 - b. Operating Temperature: 14 to 122 degrees F.
 - c. Output: The indicator/totalizer shall provide a 4-20 mA output proportional to flow and a scaled pulsed output for remote totalization. Current output adjustable over the full range of the instrument.
 - d. Diagnostics: Self diagnostics with on screen display of faults.
 - e. Display: Digital indicator displaying flow in engineering units indicated in the Instrument Device Schedule.
 - f. Totalizer: A fully configurable totalizer integral to the transmitter. Totalized flow shall be displayed.
 3. Physical:
 - a. Integral mount suitable for surface or pipe stand mounting. Or mounted remote from the meter as shown on the Drawings or as required by the physical location.
 - b. Enclosure shall be NEMA 4X (IP65). Where hazardous areas are indicated on the Drawings, the equipment shall be rated for that area.
 4. Power Requirements:
 - a. The transmitter shall be a loop powered 24 VDC instrument.
 5. Accessories/ Required:
 - a. Keypad or remote device where required for transmitter configuration depending upon area classification.
- C. Manufacturers:

[END OF SECTION]

DIVISION 15:
MECHANICAL

**SECTION 15100
VALVES**

SECTION 15100 VALVES

PART 1 GENERAL

1.01 SCOPE

- A. This Section identifies the minimum requirements for ball, gate, butterfly, check, and globe valves (valves) to be provided and installed.

1.02 REFERENCES

- A. The publications listed below, latest revision, form a part of this specification to the extent referenced. The publications are referenced within the text by the designation only.
 - 1. ANSI/ASME B31.3 Code for Chemical Plant Refinery Piping
 - 2. ASME/ANSI B16.5 Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys

PART 2 PRODUCTS

2.01 VALVES

- A. Check and ball valves shall be constructed of plastic or HDPE and shall contain Viton or Teflon seats and seals.
- B. Butterfly valves shall have coated or painted cast iron, stainless steel, or plastic bodies with Viton seats and seals. The seats and seals shall wrap around the interior of the valve body to prevent leachate contact with the valve body.
- C. Disks on butterfly valves shall be constructed of PVDF.
- D. Air release valves shall be APCO Model 200A. Air release valves shall be rated for 0-50 psi operating pressure and shall have a 1” NPT inlet size.
- E. Flanges shall be HDPE or PVC. Stainless steel or ductile iron backing flanges shall be provided where necessary to prevent flange distortion or leakage at the flange joints.
- F. Flange spacers shall be provided between flanges and butterfly valves to prevent the valve disc from contacting the flange face.

2.02 PRODUCT STORAGE

- A. All flange faces shall be covered by plastic or other suitable covers.
- B. All threaded connections shall be covered with plastic caps or plugs to protect against damage during shipment.
- C. Each shipping crate or box shall be marked to clearly identify the contents. Like valves shall be crated or boxed together.
- D. Bare metal surfaces prone to rusting prior to installation shall be coated with a suitable rust preventative.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Installation of valves shall comply with the requirements of this specification and ANSI/ASME B31.3.

3.02 EXAMINATION

- A. Prior to installation the Contractor shall verify that the valves have been handled properly, including verification that the valves are not damaged, and the interior is free of dirt and debris.

3.03 INSTALLATION

- A. Valves shall be installed in accordance with the requirements of the applicable design drawings.
- B. If not otherwise specified on the applicable design drawings, valves shall be oriented to allow operator access to hand wheels or levers.
- C. Valves shall be installed preceding all gauges.
- D. All valves shall be accessible and located to provide easy replacement, repair, or service.
- E. No valve shall be installed with the stem pointing down below the horizontal.

[END OF SECTION]

**DIVISION 16:
ELECTRICAL**

**SECTION 16000
ELECTRICAL - GENERAL PROVISIONS**

SECTION 16000
ELECTRICAL - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment required to install, complete and make operational the electrical and process instrumentation systems for the Segment 3 Cell 3 Expansion Project, Indian River County, Florida as shown on the Construction Drawings and as specified herein.
- B. The work shall include furnishing, installing, and testing the equipment and materials specified in other Sections of the Division 16 Specifications and as shown on the Construction Drawings, including:

1. Section No	Title
16000	- Electrical - General Provisions
16110	- Raceways, Boxes, Fittings and Supports
16120	- Wires and Cables
16150	- Motors
16191	- Miscellaneous Equipment
16470	- Panelboards
16600	- Underground System
16660	- Grounding System

- C. The work shall include furnishing and installing the following:
1. All equipment and materials per the project drawings.
 2. Conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions of these specifications.
 3. Conduit, wiring and terminations for all field-mounted instruments furnished under other Divisions of these specifications, including process instrumentation primary elements, transmitters, local indicators, and control panels. Lightning and surge protection equipment wiring at process instrumentation transmitters. Install vendor furnished cables specified under other Divisions of these specifications.
 4. Precast manholes, precast handholes and light pole bases.
 5. Manhole and handhole frames and covers.
 6. It is the intent of these Specifications that the electrical system shall be suitable in

every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Section shall be furnished at no extra cost.

7. Modifications to existing control systems including installation of auxiliary motor starter contacts, relays, switches, etc, as required to provide the control functions or inputs as shown on the Drawings. Obtain the existing equipment shop drawings from the Owner before attempting to make any modifications to the existing equipment wiring. Verify all existing wiring and connections for correctness. If record drawings are not available, trace all circuits in the field and develop the wiring diagrams necessary for completion of the work. Document all changes made to the wiring diagrams and return a marked-up set of Record Drawings to the Owner after the work is complete.
 8. Coordinate the sequence of demolition with the sequence of construction to maintain plant operation in each area. Remove and demolish equipment and materials in such a sequence that the existing and proposed plant will function properly with no disruption of treatment.
 9. Modifications to existing motor control centers, switchboards, panelboards and motor controllers including installation of circuit breakers, etc, or disconnection of circuits as required to provide the power supplies to new and existing equipment to maintain the plant in operation.
- D. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing site, buildings, and structures in which work under this Division is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that their representative has visited the site, buildings and structures and noted the locations and conditions under which the work will be performed and that he/she takes full responsibility for a complete knowledge of all factors governing his/her work.
- E. Provide all electrical relocation work associated with the relocation of equipment for the existing and new facilities, including disconnecting all existing wiring and conduits and providing new wiring and conduit to the relocated equipment, as needed.
- F. All power interruptions to electrical equipment shall be at the Owner's convenience with 72 hours (minimum) notice. Each interruption shall have prior approval.
- G. The Contractor shall maintain the existing plant in operation at all times. Temporary power connections as required shall be provided by the Contractor at no additional expense to the Owner. All temporary wiring shall be in accordance with the NEC. Any temporary equipment feeders (480V, 120V, etc.) shall be installed in conduit. The Contractor shall provide to the Engineer details, methods, materials etc. prior to making temporary connections. Furnish and install all equipment and materials including control equipment, motor starters, branch and feeder circuit breakers, panelboards,

transformers, etc., for temporary power.

- H. Field verify all existing underground electrical conduit, concrete duct banks, manhole, pull boxes, etc. and mechanical piping. The Contractor shall include in his bid all costs associated with relocation or removal of underground equipment as required for construction of the new facilities.
- I. The Contractor shall prepare and furnish electrical and instrumentation conduit layout shop drawings for yard electrical, within and under all roads, buildings and structures to the Engineer for approval prior to commencing work. Layouts shall include but not be limited to equipment, pull boxes, manholes, conduit routing, dimensioning, methods and locations of supports, reinforcing, encasement, materials, conduit sizing, equipment access, potential conflicts, building and yard lighting, and all other pertinent technical specifications for all electrical and instrumentation conduits and equipment to be furnished. All layouts shall be drawn to scale on 24 by 36 sheets. Refer to the Submittals paragraph within this specification for additional requirements.
- J. The work shall include complete testing of all equipment and wiring at the completion of work and making any minor correction changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; substandard work will be rejected.
- K. Contractor shall provide their own temporary power for miscellaneous power (drills, pumps, etc.). No facility circuits shall be used unless approved in writing by the Engineer. Any temporary added shall be removed at job completion.
- L. Complete coordination with other contractors. Contractor shall coordinate with all other contractors' equipment submittals and obtain all relevant submittals.
- M. Mount transmitters, process instruments, operator stations, etc. furnished under other Divisions of these specifications.
- N. Concrete electrical duct encasement, including but not limited to excavation, concrete, conduit, reinforcement, backfilling, grading and seeding is included in Division 16. All work shall be done in accordance with Divisions 2 and 3 of these specifications.
- O. Excavation, bedding material, forms, concrete and backfill for underground raceways; forms and concrete for electrical equipment furnished herein is included in Division 16. All work shall be done in accordance with Divisions 2 and 3 of these specifications.
- P. Perform testing of the electrical equipment in accordance with the requirements of the individual specification sections.
- Q. Set the electrical protective devices in accordance with NETA standards and in accordance with the protective coordination study.

- R. Review the electrical underground system and the civil yard piping. Install the electrical underground system in a manner that avoids conflicts with manholes, catch basins, etc. provided under other Divisions of the specifications.
1. Sequencing and Scheduling: Coordinate electrical equipment installation with other trades.
 2. Arrange for chases, slots, and openings in the building structures during the progress of construction to allow for the electrical installation.
 3. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
 4. Sequence, coordinate and integrate the installation of electrical materials and equipment for efficient flow of the work. Coordinate the installation of large equipment requiring position prior to closing in the building.
 5. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- S. The Contractor shall include in the bid the following miscellaneous material and labor allowances. Assume all exposed conduit to at elevations up to 20 feet and include all necessary fittings, pullboxes, supports, etc. Assume all buried conduit to include all miscellaneous hardware, fitting, warning tape, trenching, backfill, and compaction for a complete installation. Unused allowance value in dollars shall be returned to the Owner as a credit change order at the end of the project:
1. 50 feet of 4#12 AWG in 3/4 inch rigid aluminum conduit.
 2. 50 feet of 2#14 AWG in 3/4 inch rigid aluminum conduit.
 3. 50 feet of 2/C #16 AWG shielded cable in 3/4 inch rigid aluminum conduit.
 4. 10 hours of journeyman electrician labor.

1.02 RELATED WORK

- A. Excavation and backfilling, including gravel or sand bedding for underground electrical work is included in Division 2.
- B. Cast in place concrete work, including concrete encasements for electrical duct banks, equipment pads, light pole bases and reinforcing steel, is included in Division 3.
- C. Instrumentation and control equipment is included under Division 13.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings for equipment, materials and other items furnished under Division 16.
- B. As a minimum all equipment specified in each Section of Division 16 shall be submitted at one time. As an example, all lighting fixtures shall be submitted together, all motor control centers shall be submitted together, etc. Submittals that do not comply will be returned disapproved.
- C. Shop drawings shall be submitted for the following equipment and materials:
 - 1. Raceways, Boxes, Fittings and Hangers, Wires and Cables.
 - 2. Miscellaneous Equipment (as specified in Section 16191).
 - 3. Lighting Fixtures and Lamps.
 - 4. Switches, Receptacles and Covers.
 - 5. Precast Manholes and Handholes, Frames and Covers.
 - 6. Grounding Hardware and Connections.
 - 7. Control panels.
- D. Submittals shall be required for the following items:
 - 1. Qualifications of Electrical Contractor Superintendent.
 - 2. Testing Reports.
- E. Installation working drawings shall be submitted for all conduit routing layouts. Contractor shall utilize the Contract AutoCAD drawings for base files and show conduit routing using the layers described herein. Colors, line type and line widths shall be appropriate for plotting using AIA standards. Dashed lines shall indicate the conduit is concealed or buried. Solid lines shall indicate the conduit is exposed. The conduits and any major pulling points shall be drawn in model space. The associated text shall be drawn in paper space at a size not less than 0.1 inch. Provide associated type written conduit schedules for easy cross check. Schedules may be included on the drawings or in a separate spreadsheet/table. Layers shall be:
 - 1. E-POWR-CDT: 480 volt power.
 - 2. E-LITE-CDT: 120/208/240 volt power or lighting.

3. E-CNTRL-CDT: 120 volt control, instrumentation, signal, communication or fiber.
 4. E-ANNO-TEXT: Annotation text.
 5. Layouts shall be shown at an appropriate scale for clarity. If the Contract drawings need to be re-scaled to adequately represent the conduit routing, the Contractor shall do so. Contractor may submit separate drawings for power, lighting and control for one area to avoid re-scaling of drawings.
 6. Layouts shall include locations of process equipment, motor control centers, transformers, panelboards, control panels and equipment, motors, switches, motor starters, large junction or pull boxes, instruments and any other electrical devices connected to concealed or buried conduits.
 7. Contractor layouts of conduit routing shall comply with installation specifications 16110 and 16600 for raceway and underground systems. It is expected for major conduit corridors that there would be two separate duct banks, with a minimum spacing of 12 inches between the two different ductbank systems. One ductbank would contain 480-volt and 120-volt power and control while the other ductbank would contain fiber optic, Ethernet, shielded instrumentation wiring or other signal / communication wiring.
 8. Submittal shall include a file with the AutoCAD drawings along with full size (36 inch by 24 inch) hardcopy prints on high quality paper.
 9. Concrete floors and/or walls containing concealed conduits shall not be poured until conduit layouts are approved.
- F. The manufacturers name and product designation or catalog numbers shall be submitted for the following material utilized:
1. Testing Equipment.
 2. Ground System Resistance Test Equipment.
- G. Operation and Maintenance Data:
1. Submit operations and maintenance data for equipment furnished under this Division, in accordance with Section 01730. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc, to instruct operating and maintenance personnel unfamiliar with such equipment.
 2. Manuals shall include the following as a minimum:
 - a. A comprehensive index.

- b. A complete "As Built" set of approved shop drawings.
 - c. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.
 - d. A table listing of the "as left" settings for all timing relays and alarm and trip setpoints.
 - e. System schematic drawings "As Built", illustrating all components, piping and electric connections of the systems supplied under this Section.
 - f. Detailed service, maintenance and operation instructions for each item supplied.
 - g. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.
 - h. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.
 - i. Complete parts list with stock numbers, including spare parts.
- H. Mark submittals to clearly identify proposed equipment including accessories, options, and features and to exclude parts not applicable to the project. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submittal piece of literature and each submittal drawing shall reference the Project Specification and/or Contract Drawing that the submittal is to cover. General catalogs will not be accepted as cut sheets to fulfill submittal requirements.
- I. Check shop drawings for accuracy prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to this Section and the Drawings. This statement shall also list all exceptions to this Section and the Drawings. Mark submittals to identify proposed equipment including accessories, options and features being proposed for approval and exclude parts not to be used. Shop drawings not so checked and noted shall be returned marked NOT APPROVED.
- J. The Engineer's check shall be for conformance with the design concept of the project and compliance with this Section and the Drawings. Errors and omissions on approved shop drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by this Section and the Drawings.
- K. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.
- L. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered, or shop work started if shop drawings are marked "APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED."
- M. Exceptions for Submittals:

1. Exceptions to the Specifications or Drawings shall be clearly defined by the Electrical Subcontractor in a separate section of each submittal package. The submittal shall contain the reason for the exception, the exact nature of the exception and the proposed substitution so that a proper evaluation may be made by the Engineer. The acceptability of any device or methodology submitted as an "or equal" or "exception" to the Specifications shall be at the sole discretion of the Engineer.

1.04 REFERENCE STANDARDS

- A. Electric equipment, materials and installation shall comply with the National Electrical Code (NEC) and with the latest edition of the following codes and standards:
 1. National Electrical Safety Code (NESC).
 2. Occupational Safety and Health Administration (OSHA).
 3. National Fire Protection Association (NFPA).
 4. National Electrical Manufacturers Association (NEMA).
 5. American National Standards Institute (ANSI).
 6. Insulated Cable Engineers Association (ICEA).
 7. International Society of Automation (ISA).
 8. Underwriters Laboratories (UL).
 9. Factory Mutual (FM).
 10. International Electrical Testing Association (NETA).
 11. Institute of Electrical and Electronics Engineers (IEEE).

1.05 PRIORITY OF THE CONTRACT DOCUMENTS

- A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the Sections or between or among one or more Sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or installation method which represents the most stringent option, the highest quality or the largest quantity.
- B. In all cases, figured dimensions shall govern over scaled dimensions, but work not

dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

- C. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.
- D. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.
- E. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

1.07 SERVICE AND METERING (NOT USED)

1.08 HAZARDOUS AREAS

- A. Equipment, materials, and installation in areas designated as hazardous on the Drawings shall comply with NEC Articles 500, 501, 502 and 503.
- B. Equipment and materials installed in hazardous areas shall be UL listed for the appropriate hazardous area classification.

1.09 CODES, INSPECTION AND FEES

- A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.
- B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.10 ELECTRICAL SYSTEM TESTING AND SETTINGS

- A. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements.
- B. Make adjustments to the systems and instruct the Owner's personnel in the proper

operation of the systems. In addition to the specific testing requirements listed in the individual Sections, the following minimum tests and settings shall be performed. Submit test reports upon completion of testing in accordance with Section 01300.

1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, motor starters, overload relays, control circuits and equipment for proper operation.
2. Check the full load current draw of each motor. Where power factor correction capacitors are provided the capacitor shall be in the circuit at the time of the measurement. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer of the same, including control panel location and driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace same with the correct size overload.
3. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.
4. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.
5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.
6. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation is incorrect for the driven equipment correct motor connections at the motor terminal box.
7. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.
8. Inspect each piece of equipment in areas designated as HAZARDOUS to ensure that equipment of proper rating is installed.
9. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A", "B" and "C" phases.
10. Check all wire and cable terminations. Verify to the Engineer connections meet the equipment's torque requirements.
11. Field set all transformer taps as required to obtain the proper secondary voltage.
12. Infra-red hot spot inspection shall be made of all electrical equipment including but

not limited to switchgear, motor control centers, transformers, switches, power and control panels, etc. This shall be done under representative load conditions before the equipment is used by the Owner and again 3 months before expiration of the 1-year warranty period.

- C. Testing shall be scheduled and coordinated in writing with the Engineer at least 2 weeks in advance. Provide qualified test personnel, instruments and test equipment. Provide certified calibration sheets including dates for all equipment to be used for testing with notice of scheduled testing. Calibration sheets shall also indicate that the units have been calibrated within six months of the testing date. The Contractor shall have qualified personnel present during the testing.
- D. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements. Employ the services of an independent recognized power systems testing company, other than the Manufacturer of the switchgear or motor control centers, to perform the tests specified herein.
- E. Field testing and commissioning shall be performed in accordance with the latest revisions of NETA Standard ATS "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" unless otherwise modified by these Sections.
- F. A typed test report for each component tested shall be submitted to the Engineer for the project record files. The firm doing the testing shall include, in the report, their opinion whether or not the equipment being tested complies with the specification. Any discrepancies shall be noted in the concluding summary of the report. Test report forms shall be in compliance with NETA standards. A minimum of three complete copies shall be provided. Reports shall be signed by the person in responsible charge of the field testing, an officer of the firm performing the tests and an officer of the Electrical Contractor.
- G. Make adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.
- H. Make the following minimum tests and checks prior to energizing electrical equipment. Submit test reports upon completion in accordance with Section 01300.
 - 1. Test circuit breakers.
 - 2. Mechanical inspection of air interrupter switches and circuit breakers to assure proper operation.

1.11 SHORT CIRCUIT, COORDINATION AND ARC FLASH STUDY

A. General:

1. The major electrical equipment manufacturer (i.e., main circuit breaker, automatic transfer switch, panelboards, transformer panel assemblies, etc.) shall provide an updated computerized Power System Study for the electrical power distribution and motor control equipment. The study shall verify adequacy of all of the equipment installed at the Indian River County Leachate Collection System Pump Station being implemented under these Specifications.
2. The study shall also include the main circuit breaker, all feeders from the power panelboard, and all associated control panels. Graphic indication of coordination shall be furnished in the form of a clearly labeled and identified composite drawing showing time-current curves of system protective devices. Time-current curves of each device shall also be furnished. The Contractor/Manufacturer shall be responsible for obtaining and verifying with the Power Company in writing all information needed to conduct this study. Provide this correspondence and information including contacts and phone numbers with the study submittals.
3. The Contractor/Manufacturer shall provide data necessary to perform the study. This includes feeder cable sizes, approximate feeder length, motor data and any other information relevant to the studies.
4. Summaries of the short circuit analysis shall be provided to the Contractor at the time shop drawings for all of the new equipment is submitted for approval.

B. Scope:

1. The short circuit study shall be in accordance with ANSI Standard C37.010 and C37.13, shall be performed to check the adequacy, and to verify the correct application of circuit protective devices and other system components specified. The study shall address the case when the systems are being powered from the normal source as well as from the on-site generating facilities. Minimum as well as maximum possible fault conditions shall be adequately covered in the study.
2. Fault contribution of all motors shall be considered. The Contractor shall be responsible for obtaining all required data of equipment. All back-up calculations shall become part of the final reports. The Calculations shall be in sufficient detail to allow easy review.

C. Contents:

1. The study shall include representation of the power company's systems, the base quantities selected, impedance source-data, calculation methods and tabulations, one-line and impedance diagrams, conclusions, and recommendations. Short circuit

momentary duties shall be calculated on the basis of an assumed bolted three-phase short circuit at each medium voltage bus, low voltage switchboard bus, switchboards, motor control centers, distribution panelboards, pertinent branch circuit panelboards, and other significant locations through the systems. The short-circuit tabulations shall include significant X to R ratios, asymmetry factors, KVA, and symmetrical fault current.

2. A protective device time current coordination studies shall be included with coordination plots of key devices.

D. General Information for Time-Current Curves Presentations:

1. The coordination plots shall include complete titles, representative one-line diagrams, legends, associated power company's relay or system characteristics, significant motor starting characteristics, complete parameters for transformers, and complete operating bands for low-voltage circuit breaker trip devices. Low-voltage circuit breakers shall be separated from each other and the associated primary protective device, where feasible, by a 16 percent current margin for coordination and protection in the event of secondary line-to-line faults.

E. Arc Flash Study:

1. The study shall utilize the fault current values calculated in the short circuit studies and the clearing time of the upstream protective device in the coordination study to calculate the incident energy at each fault location.
2. Study shall be in accordance with IEEE Standard 1584 and NFPA 70E.
3. Study shall calculate the incident energy and flash protection boundary at all significant locations in the electrical distribution system (main circuit breaker, panelboards, automatic transfer switch, control panels, transformer panel assemblies, etc.) where work could be performed on energized parts. Include any/all 120 volt, 240 volt and 480 volt equipment.
4. Incident energy calculations shall include maximum and minimum fault contribution scenarios, since protective device clearing times can vary greatly depending upon the fault current.
5. Tabulations shall be provided showing each fault location, the arcing fault magnitude, protective device clearing time, duration of the arc, arc flash boundary, working distance, incident energy and hazard risk category.

- F. The power system study shall be bound in standard 8-1/2-inch x 11-inch size reports and submitted in accordance with Section 01300. The completed short circuit and coordination study shall be submitted to and approved by the Engineer before any of the equipment is shipped.

- G. The study shall be stamped and signed by a professional engineer registered in the state in which the equipment is to be installed.
- H. Arc Flash Warning Labels:
 - 1. Provide a machine printed 3.5-inch by 5-inch thermal transfer type label of high adhesion polyester for each location identified in the arc flash study.
 - 2. Labels shall include the following machine printed information (hand lettering is not acceptable): equipment name, flash hazard boundary, incident energy, boundaries for shock hazard, limited approach, restricted approach and prohibited approach, PPE (personal protective equipment) category and date.
 - 3. One label shall be required at each applicable main circuit breaker, panelboard, automatic transfer switch, transformer panel assembly and control panel.

1.12 INTERPRETATION OF DRAWINGS

- A. In general, the Drawings do not show conduit routing. The Contractor shall be responsible for the planning and routing of all conduits in compliance with the specifications and Drawing details.
- B. Drawings noting equipment identification and associated circuitry is found on the following drawings:
 - 1. One-line power diagrams show power, grounding and control circuitry requirements associated with substations, switchgear, switchboards, motor control centers, distribution panels, transformers, and feeders to lighting panels.
 - 2. Panelboard schedules show branch circuit conduit and wire requirements.
 - 3. Riser diagrams show circuitry for instrumentation and control devices along with miscellaneous signal or communication wiring.
- C. Unless specifically stated to the contrary, the Drawings do not show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.
- D. Install each three-phase circuit in a separate conduit unless otherwise shown on the Drawings.
- E. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.
- F. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be

- provided for a complete raceway installation.
- G. Verify the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.
 - H. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.
 - I. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials to install and place in satisfactory operation all power, lighting and other electrical systems shown.
 - J. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed plans shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.
 - K. Surface mounted panel boxes, junction boxes, conduit, etc. shall be supported by 1/2-inch spacers to provide a clearance between wall and equipment.
 - L. All floor mounted electrical equipment shall be placed on a 4-inch-thick (3/4-inch, 45-degree chamfer at all exposed edges) concrete pads, provide reinforcement, anchors, etc.
 - M. The Contractor shall harmonize the work of the different trades so that interferences between conduits, piping, equipment, architectural and structural work will be avoided. All necessary offsets shall be furnished so as to take up a minimum space a minimum space and all such offsets, fittings, etc., required to accomplish this shall be furnished and installed by the Contractor without additional expense to the Owner. In case interference develops, the Engineer is to decide which equipment, piping, etc., must be relocated, regardless of which was installed first.
 - N. Raceways and conductors for the fire alarm and lightning protection systems are not shown on the Drawings. Provide raceways and conductors as required by the system manufacturer for a complete and operating system. Raceways shall be installed concealed in all finished spaces and may be installed exposed or conducted in process spaces.
 - O. Raceways and conductors for lighting, switches, receptacles and other miscellaneous low voltage power and signal systems as specified are not shown on the Drawings.

Raceways and conductors shall be provided as required for a complete and operating system. Homeruns, as shown on the Drawings, are to assist the Contractor in identifying raceways to be run exposed and raceways to be run concealed. Raceways shall be installed concealed in all finished spaces and may be installed exposed or concealed in all process spaces. Raceways installed exposed shall be near the ceiling or along walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes hoists, monorails, equipment hatches, doors, windows, etc. Raceways installed concealed shall be run in the center of concrete floor slabs, above suspended ceilings, or in partitions as required.

- P. It is the intent of these Specifications that the Electrical Systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to the Owner.

1.13 RECORD DRAWINGS

- A. As the work progresses, legibly record all field changes on a set of Project Contract Drawings, hereinafter called the "Record Drawings."
- B. Record Drawings shall accurately show the installed condition of the following items:
1. One-line Diagrams.
 2. Equipment elevations (front views).
 3. Raceways and pull boxes.
 4. Conductor sizes and conduit fills.
 5. Panel Schedules.
 6. Control Wiring Diagrams.
 7. Lighting Fixture Schedules.
 8. Lighting fixture, receptacle, and switch outlet locations.
 9. Underground raceway and duct bank routing.
 10. Grounding system.
- C. Submit a schedule of control wiring raceways and wire numbers, including the following information:
1. Circuit origin, destination and wire numbers.

2. Field wiring terminal strip names and numbers.

- D. In addition to the schedule, provide point to point connection diagrams showing the same information submitted in the schedule of control wiring raceways including all designations and wiring numbers.
- E. Submit the record drawings, schedule of control wiring raceways and wire numbers and the point-to-point connection diagrams to the Engineer. The schedule of control wiring raceways and wire numbers and the point-to-point connection diagrams shall be computer generated (i.e., no hand-written or drawn schedules, drawings or diagrams will be accepted).

1.14 EQUIPMENT INTERCONNECTIONS

- A. Review shop drawings of equipment furnished under Divisions 11 and 13 and prepare coordinated wiring interconnection diagrams. Submit copies of wiring diagrams or tables with Record Drawings.
- B. Furnish and install all equipment interconnections.

1.15 MATERIALS AND EQUIPMENT

- A. Materials and equipment furnished under this contract shall be new, unless specifically called for on the Drawings.
- B. All electrical equipment and materials shall be listed by Underwriter's Laboratories, Inc., and shall bear the appropriate UL listing mark or classification marking. Equipment, materials, etc. utilized not bearing a UL certification shall be field or factory UL certified prior to equipment acceptance and use.
- C. Warrant all equipment furnished under Division 16 in accordance with Section 01740. Refer to individual equipment sections for additional warranty items.

1.16 EQUIPMENT AND DEVICE IDENTIFICATION

- A. Identify all electrical equipment furnished under Division 16 and all equipment control panels furnished under other Divisions with nameplates as described herein. Equipment includes switchgear, switchboards, motor control centers, panelboards, transformers, variable frequency drives, disconnect switches, separately mounted motor starters, transfer switches, control panels, control stations, named terminal cabinets, etc. The designation of the equipment shall correspond to the designation shown on the Drawings:
 - 1. A minimum of two nameplates shall be required at electrical equipment. The first nameplate shall identify the equipment or the name of the equipment it serves. For

example, a panelboard identification nameplate would have the identification of “LP-1” while a local disconnect switch for a pump motor would have the identification of

“EFFLUENT PUMP No. 4”. The second nameplate shall identify the power source, i.e. “FED FROM MCC-2”.

- B. Nameplates shall be engraved, laminated plastic, not less than 1/16-inch-thick by 3/4-inch by 2- 1/2-inch with 3/16-inch-high black letters on a white background.
- C. Nameplates shall be screw mounted to NEMA 1 enclosures. Nameplates shall be bonded to all other enclosure types using an epoxy or similar permanent waterproof adhesive. Two-sided foam adhesive tape is not acceptable. Where the equipment size does not have space for mounting a nameplate the nameplate shall be permanently fastened to the adjacent mounting surface. Cemented nameplates shall not be drilled.
- D. All voltages (e.g. 480 volts, 120 volts, etc.) within pull boxes, junction boxes etc. shall be identified on the front exterior cover. Signs shall be red background with white engraved lettering, lettering shall be a minimum of 1-inch high.
- E. All receptacles, wall switches, lighting fixtures, photo cells, emergency lights, exit lights, instruments, etc. shall be identified with the panel and circuit to which it is connected. For example, a receptacle fed from circuit 4 from panel LP-2 would have the label “LP-2/4”. Identification shall be with machine generated labels with 1/4-inch-high letters.

1.17 PROFESSIONAL ENGINEERING SERVICES

- A. When engineering services are specified to be provided by the Contractor, the Contractor shall retain a licensed professional engineer to perform the services. The engineer shall be licensed at the time the work is done and licensed in the State in which the project is located. If the State issues discipline specific licenses, the engineer shall be licensed in the applicable discipline. In addition, the engineer shall be experienced in the type of work being provided.
- B. All engineering work shall be done according to the applicable regulations for professional engineers to include signing, sealing and dating documents. When submittals are required by a professional engineer, in addition to state required signing and sealing, a copy of the current wallet card or wall certificate indicating the date of expiration shall be included with the submittal.

1.18 QUALIFICATION

- A. The Electrical Contractor shall have regularly engaged in the installation of 480 voltage systems for a minimum period of 10 years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

- B. Provide a field superintendent who has had a minimum of 10 years previous successful experience on medium voltage projects of comparable size and complexity. Superintendent shall be present at all times that work under this Division is being installed or affected. A resume of the Superintendent's experience shall be submitted to the Engineer before starting work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SLEEVES AND FORMS FOR OPENINGS

- A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all slots for electrical work and form before concrete is poured.
- B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.
- C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation must be submitted in writing. No additional compensation for such change will be allowed.
- D. Seal all openings, sleeves, penetration, and slots as specified in Section 16110.

3.02 SCUTTING AND PATCHING

- A. Cutting and patching shall be done in a thoroughly workmanlike manner. Saw cut concrete and masonry prior to breaking out sections.
- B. Core drill holes in concrete floors and walls as required.
- C. Install work at such time as to require the minimum amount of cutting and patching.
- D. Do not cut joists, beams, girders, columns or any other structural members.
- E. Cut opening only large enough to allow easy installation of the conduit.
- F. Patching to be of the same kind and quality of material as was removed.
- G. The completed patching work shall restore the surface to its original appearance or better.

- H. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed.
- I. Remove rubble and excess patching materials from the premises.
- J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.03 INSTALLATION

- A. Work not installed according to the Drawings and Specification shall be subject to change as directed by the Engineer at Contractor's expense. Electrical equipment shall be protected against mechanical and water damage. Store all electrical equipment in dry permanent shelters. Do not install electrical equipment in place until structures are weather-tight.
- B. Damaged equipment shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion and at the Contractor's expense.
- C. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer.

3.04 CLEANING

- A. Remove all rubbish and debris from inside and around electrical equipment and enclosures.
- B. Remove dirt, dust or concrete spatter from the interior and exterior of equipment using brushes, vacuum clear or clean lint-free rags. Do not use compressed air.

[END OF SECTION]

SECTION 16110
RACEWAYS, BOXES, FITTINGS AND SUPPORTS

SECTION 16110 RACEWAYS, BOXES, FITTINGS AND SUPPORTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install complete raceway systems as shown on the Drawings and as specified herein.
- B. The word raceway as used in this section shall mean an enclosed channel designed expressly for holding wires, cables, or busbars. This does not include cable tray. This does include conduit, wireways, and surface raceways.
- C. Raceway routings in general are not shown on the Drawings but shall be generated by the Contractor as a shop drawing submittal for review by the Engineer.

1.02 RELATED WORK

- A. Refer to Section 16600 for Underground Systems and requirements.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, the manufacturers' names and product designation or catalog numbers with cut-sheets of all materials specified. Indicate in the submittal, the areas where specific materials are used.
- B. Raceway routing in accordance with Section 16000.

PART 2 - PRODUCTS

2.01 RACEWAYS AND FITTINGS

- A. Rigid Aluminum Conduit and Fittings (NEC Type RMC):
 - 1. Rigid aluminum conduit shall be 6063 alloy and shall be as manufactured by New Jersey Aluminum Corp.; Reynolds Aluminum International Services Inc.; Alumax Extrusions, Inc; VAW of America, Inc. or equal.
 - 2. Rigid aluminum conduit shall be for use under the provisions of NEC Article 344.
- B. Rigid Nonmetallic Conduit:
 - 1. PVC conduit shall be rigid polyvinyl chloride schedule 40 or 80 based upon the application listed in this section and as manufactured by Carlon; An Indian Head Co.; Cantex; Queen City Plastics or equal.

2. PVC conduit shall be sunlight resistant, rated for use with 90-degree C conductors in exposed and direct or concrete encased applications.
 3. PVC conduit shall be for use under the provisions of NEC Article 352.
- C. Liquidtight Flexible Metal Conduit, Couplings and Fittings (NEC Type LFMC):
1. Liquidtight flexible metal conduit shall be Sealtite, Type UA, constructed of continuously interlocked hot dipped zinc galvanized steel core for crush and corrosion resistance with a sunlight, heat, oil, and chemical resistance jacket as manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co. or equal.
 2. Fittings used with liquidtight flexible metal conduit shall be of the 3-piece screw in type malleable iron as manufactured by the O.Z. Gedney Co. or equal.
 3. Liquidtight flexible metal conduit shall be for use under the provisions of NEC Article 350.
- D. Wireways:
1. NEMA 1 wireway shall be gasketed painted steel with hinged cover. Hardware shall be stainless-steel.
 2. NEMA 4X wireway shall be 316 stainless-steel with gasketed hinged and clamped cover with drip lip. Hardware shall be stainless-steel.
 3. NEMA 1 wireway shall be Square Duct as manufactured by the Square D Co.; NEMA 4X shall be Bulletin F 22 as manufactured by the Hoffman Engineering Co. or equal.

2.02 BOXES AND FITTINGS

- A. Pressed steel switch and outlet boxes shall be hot dipped galvanized with hot-dipped galvanized tile rings as manufactured by the Raco Manufacturing Co.; Adalet Co.; O.Z. Manufacturing Co. or equal.
- B. NEMA 1 and NEMA 12, junction boxes, pull boxes etc., shall be sheet steel unless otherwise shown on the Drawings. Boxes shall be galvanized and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies and covers shall not be less than 14 gauge metal. Covers shall be gasketed, hinged, and fastened with quick connect door clamp. Terminal boxes shall be furnished with hinged doors with 3-point latch, terminal mounting straps and brackets (refer to Section 16191 for additional requirements). Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; ASCO Electrical Products Co., Inc., or equal. All boxes shall be shop primed and painted by the box manufacturer.

- C. NEMA 4X stainless-steel, junction boxes and pull boxes shall be 316 stainless-steel with 316 stainless-steel hardware and gasketed covers. Boxes shall have continuously welded seams and welds shall be ground smooth. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies and covers shall not be less than 14 gauge metal. Covers shall be gasketed, hinged, and fastened with quick connect door clamp. Terminal boxes shall be furnished with hinged doors with 3-point latch, terminal mounting straps and brackets (refer to Section 16191 for additional requirements.) Boxes shall be as manufactured by Hoffman Engineering Co.; Lee Products Co.; ASCO Electrical Products Co., Inc., or equal. Any box located outdoors shall be powder coated white and shop primed and painted by the box manufacturer.
- D. In areas designated as “CORROSIVE”, NEMA 4X boxes shall be ultraviolet resistant fiberglass reinforced plastic (FRP) with stainless steel hardware and gasketed covers. Boxes shall be as manufactured by Hoffman, or equal.
- E. Explosion proof boxes shall be designed for Class 1, Group D, Division 1 hazardous locations. They shall be cast aluminum, with stainless steel hinged covers and stainless-steel hardware and bolts; Type EJB N4 as manufactured by the Crouse Hinds Co.; Appleton Electric Co.; Adalet PLM or equal.
- F. Cast aluminum boxes and fittings shall be copper free aluminum with cast aluminum covers and stainless-steel screws as manufactured by the Killark Electric Co.; Crouse-Hinds Co.; Appleton Electric Co.; or equal.
- G. Cast aluminum device boxes shall be Type FD. All cast aluminum boxes and fittings shall be copper free aluminum with cast aluminum covers and stainless-steel screws as manufactured by the Killark Electric Co.; Crouse Hinds Co.; L. E. Mason Co. or equal.
- H. Cast aluminum fittings (C's, T's, LB's, etc.) shall be of the mogul design (with rollers) as manufactured by Appleton Electric Co.
- I. Conduit hubs shall be of the grounding type as manufactured by Myers Electric Products, Inc. or equal.
- J. Conduit wall seals for new concrete walls below grade shall be O.Z./Gedney Co., Type WSK; Spring City Electrical Manufacturing Co., Type WDP or equal.
- K. Conduit wall seals for cored holes shall be Type CSML as manufactured by the O.Z./Gedney Co. or equal.
- L. Conduit wall and floor seals for sleeved openings shall be Type CSMI as manufactured by the O.Z./Gedney Co. or equal.
- M. Combination expansion deflection fittings embedded in concrete shall be Type XD as

manufactured by the Crouse Hinds Co.; O.Z./Gedney Co.; Spring City Electrical Mfg. Co. or equal.

- N. Combination expansion-deflection fittings installed exposed shall be Type XJ as manufactured by Crouse-Hinds Co.; O.Z. Gedney Co.; Spring City Electrical Mfg. Co. or equal.
- O. Explosion proof fittings shall be as manufactured by the Crouse Hinds Co.; Appleton Electric Co.; O.Z./Gedney Co. or equal.
- P. Conduit sealing bushings shall be O.Z./Gedney, Type CSB or equal.
- Q. Flexible couplings shall be type ECGJH as manufactured by the Crouse Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co. or equal.

2.03 CONDUIT MOUNTING EQUIPMENT

- A. 316 stainless steel channel with 316 stainless steel hardware (hangers, rods, backplates, beam clamps, fasteners, anchors, nuts, washers, etc.) shall be used in process areas, as shown on the drawings, in areas designated "WET", "DAMP" and "CORROSIVE" on the Drawings and in outdoor locations. All channel and hardware shall be resistant to the chemicals present in the area in which it is used.
- B. In areas designated "CORROSIVE", channel shall be ultraviolet resistant FRP. Associated hardware shall be compatible non-metallic or Type 316 stainless steel.
- C. Expansion anchors (minimum 3/8-inch diameter) shall be equal to Kwik Bolt as manufactured by the McCulloch Industries, Minneapolis, MI; Wej it by Wej it Expansion Products, Inc., Bloomfield, CO; or Kwik-Bolt II as manufactured by the Hilti Fastening Systems, Inc, Tulsa, OK. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of 1 in behind the steel reinforcement. Apply anti-seize compound to all nuts and bolts. Supports installed without the approved compound shall be dismantled and correctly installed, at no cost to the Owner.
- D. Wall and Floor Slab Opening Seals:
 - 1. Wall and floor slab openings shall be sealed with "FLAME SAFE" as manufactured by the Thomas & Betts Corp.; Pro Set Systems; Neer Mfg. Co.; Specified Technologies, Inc. or equal.
- E. Cold Galvanizing Compound:
 - 1. Cold galvanizing compound shall be 95 percent zinc rich paint as manufactured by ZRC Products Company, a Division of Norfolk Corp. or equal.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATIONS

- A. Refer to Table 16110-1 for specific raceway application requirements.
- B. All conduit of a given type shall be the product of one manufacturer.
- C. Refer to Section 16600 for underground applications.

3.02 BOX APPLICATIONS

- A. Unless otherwise specified herein or shown on the Drawings, all boxes shall be metal.
- B. Exposed switch, receptacle and lighting outlet boxes and conduit fittings shall be cast malleable iron.
- C. Concealed switch, receptacle and lighting outlet boxes shall be pressed steel. Welded seamed boxes will not be permitted.
- D. Terminal boxes, junction boxes and pull boxes shall have NEMA ratings suitable for the location in which they are installed, as specified in Section 16000.
- E. Boxes flush in block, brick or tile walls shall be located at a course line and provided with square tile covers. Flush boxes shall not project beyond the finished surfaces nor shall surfaces project more than 1/8-inch beyond the box enclosure. Wiring devices located in close proximity to each other shall be installed in one solid gang box with single cover.
- F. All conduit bodies and pulling outlets shall comply with NEC wire bending space requirements. Mogul type fittings shall be used for sizes 2-1/2-inch and larger.

3.03 FITTINGS APPLICATIONS

- A. Combination expansion deflection fittings shall be used where conduits cross structure expansion joints. Refer to Structural Drawings for expansion joint locations. Provide bonding jumpers around fittings.
- B. Conduit wall seals shall be used where underground conduits penetrate walls or at other locations shown on the Drawings.
- C. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather and at other locations shown on the Drawings.

3.04 INSTALLATION

- A. No conduit smaller than 3/4-inch electrical trade size shall be used, nor shall any have more than the equivalent of three 90-degree bends in any one run. Pull boxes shall be provided as required or directed.
- B. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.
- C. All conduit which may under any circumstance contain liquids such as water, condensation, liquid chemicals, etc., shall be arranged to drain away from the equipment served. If conduit drainage is not possible, conduit seals shall be used to plug the conduits.
- D. The ends of all conduits shall be tightly plugged to exclude dust and moisture during construction.
- E. Conduit supports, other than for underground raceways, shall be spaced at intervals of 8 feet or less, as required to obtain rigid construction.
- F. Single conduits shall be supported by means of aluminum one-hole pipe clamps in combination with aluminum one screw back plates, to raise conduits from the surface. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8-inch diameter. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a minimum of 1/2-inch clearance between wall and equipment.
- G. Conduit hangers shall be attached to structural steel by means of beam or channel clamps. Where attached to concrete surfaces, concrete expansion anchors shall be provided.
- H. All conduits on exposed work, within partitions and above suspended ceilings, shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.
- I. Conduit terminating in pressed steel boxes shall have double locknuts (aluminum) and insulated grounding bushings.
- J. Conduit terminating in gasketed enclosures shall be terminated with Meyers grounding type conduit hubs.
- K. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings with lay-in type lugs.
- L. Conduits shall be installed using threaded fittings unless otherwise specified herein.
- M. Liquidtight flexible metal conduit (Type LFMC) shall be used for all motor terminations, the primary and secondary of transformers, generator terminations and other equipment where vibration is present and the area is not designated as "CORROSIVE" Liquidtight flexible non-metallic conduit (Type LFNC) shall be used

in “CORROSIVE” areas. The length of LFMC or LFNC shall not exceed 72 inches.

- N. LFMC installation shall include adequate slack to allow for thermal expansion as well as mechanical vibration in order to avoid cracking of the outer thermoplastic PVC jacket.
- O. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.
- P. Aluminum fittings and boxes shall be used with aluminum conduit. Aluminum conduit shall not be imbedded in concrete containing chlorides, unwashed beach sand, sea water, or coral bearing aggregates. Aluminum conduit shall be isolated from other metals with heat shrink tubing (Raychem or equal) or plastic-coated hangers. Strap wrenches shall be used for tightening aluminum conduit. Pipe wrenches, channel locks, chain wrenches, pliers, etc. shall not be used.
- Q. All threads on aluminum conduit and fittings shall be cleaned and coated with “No-Oxide” compound before installing.
- R. Aluminum conduit installed in concrete or below grade shall be completely covered with two coats of bitumastic paint or with heat shrink tubing (Raychem or equal).
- S. Where conduits pass through openings in walls or floor slabs, the remaining openings shall be sealed against the passage of flame and smoke.
- T. PVC conduit to non-metallic and metallic box connections shall be made with sealing rings, with a stainless-steel retainer as manufactured by Thomas & Betts Co.
- U. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.
- V. Expansion fittings shall be used on exposed runs of PVC conduit where required for thermal expansion. Installation and number of fittings shall be as provided per the NEC and approved by the PVC conduit manufacturer.
- W. All conduit entering or leaving a motor control center, switchboard or other multiple compartment enclosure shall be stubbed up into the bottom horizontal wireway or other manufacturer designated area, directly below the vertical section in which the conductors are to be terminated.
- X. Conduit sealing and drain fittings shall be installed in areas designated as NEMA 7.
- Y. Spare conduits and conduit stub outs for future construction shall be provided with threaded PVC end caps at each end.
- Z. No unbroken run shall exceed 300 feet in length. This length shall be reduced by 75 feet for each 90-degree elbow.

- AA. Aluminum conduit entering manholes and below grade pull boxes shall be terminated with grounding type bushings and connected to a 3/4-inch by 10-ft rod with a #6 bare copper wire.
- BB. Underground circuits shall be installed directly to the respective motor control centers, lighting panels, etc., except stainless steel pull boxes shall be wall mounted on structures to eliminate excessive bends. With prior written approval, below grade pull boxes may be used. Splices shall not be made in above or below grade pull boxes unless otherwise indicated on the plans and approved in writing by the Engineer.
- CC. All conduits shall have a 4-inch concrete housekeeping pad at all slab and grade penetrations. The housekeeping pad shall have 45-degree, 3/4-inch chamfer at all exposed edges.
- DD. All risers from underground, concrete pads, floors, etc. shall be provided with heat shrink tubing (Raychem Co. or equal) from a point 1-foot 0-inch below bottom of slab or grade to a point not less than 6 inches above grade or surface of slab.
- EE. Existing conduits are to be reused only where specifically noted on the drawings. Mandrels shall be pulled through all existing conduits which will be reused and through all new conduits 2 inches in diameter and larger prior to installing conductors.
- FF. 3/16-inch polypropylene pull lines shall be installed in all new conduits noted as spares or designated for future equipment.
- GG. Where no size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of NEC Article 314.
- HH. Conduits shall not cross pipe shafts, access hatches or vent duct openings. They shall be routed to avoid such present or future openings in floor or ceiling construction.
- II. The use of running threads is prohibited. Where such threads are necessary, a 3-piece malleable iron union shall be used.
- JJ. Conduits passing from heated to unheated spaces, exterior spaces, refrigerated spaces, cold air plenums, etc., shall be sealed with "Duxseal" as manufactured by Manville or seal fitting to prevent the accumulation of condensation.
- KK. All field cut ends of hot dipped galvanized mounting channel shall be cleaned and painted with cold galvanizing compound before installation.
- LL. All underground control and instrumentation conduits shall be separated from power conduits by a minimum of 12 inches unless specifically noted otherwise. Crossing of

control and instrumentation conduits with power conduits shall be kept to a minimum and where they must cross they shall cross at 90-degree angles.

- MM. A phenolic conduit identification plate shall be installed on all power, instrumentation, alarm and control conduits at each end of the run and at intermediate junction boxes, manholes, etc. Conduit plates shall be installed before conductors are pulled into the conduits. Exact identification plate location shall be coordinated with the Engineer at the time of installation to provide uniformity of placement and ease of reading. The conduit identification tags shall provide detailed “to” and “from” information.

**TABLE 16110-1
 Raceway Application Guidelines**

Raceway Type	Location / Application
Rigid Aluminum Conduit (RAC)	Used for all indoor and outdoor applications, except where other types are listed. All exposed applications. All concealed applications. Under slabs in slab on grade construction. Flexible connections shall be LFMC.
PVC Schedule 40	Concrete encased duct banks. Embedded in concrete slabs or structures. Elbows underground shall be RAC.
PVC Schedule 80	Direct buried. Protection of grounding electrode conductors. Protection of lightning conductors. Flexible connections shall be LFNC. Elbows underground shall be RAC.

[END OF SECTION]

**SECTION 16120
WIRES AND CABLES**

SECTION 16120 WIRES AND CABLES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish, install, and test all wire, cable and appurtenances as shown on the Drawings and as specified herein.
- B. Install data highway, fiber optic, coaxial and I/O cables furnished under Division 13.

1.02 RELATED WORK

- A. Refer to Division 13 for fiber optic cables.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, samples of proposed wire. Each sample shall have the size, type of insulation and voltage stenciled on the jacket.
- B. Approved samples will be sent to the project location for comparison by the Resident Engineer with the wire actually installed.
- C. Installed unapproved wire shall be removed and replaced at no additional cost to the Owner.
- D. Submit results of insulation resistance testing as specified herein.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Carefully handle all conductors to avoid kinks and damage to insulation.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Wires and cables shall be of annealed, 98 percent conductivity, soft drawn copper.
- B. All conductors shall be stranded, except that lighting and receptacle wiring may be solid.
- C. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.

- D. Wire shall have 600V insulation except where indicated otherwise.
- E. All wire of a given type shall be the product of a single manufacturer.
- F. Acceptable manufacturers (when product type is available):
 - 1. American Insulated Wire Corp. Belden.
 - 2. General Cable.
 - 3. Okonite.
 - 4. Pirelli.
 - 5. Rockbestos.
 - 6. Southwire.
 - 7. Or equal.

2.02 POWER WIRE

- A. Wire for lighting, receptacles, and other circuits not exceeding 150 volts to ground shall be NEC type XHHW-2. Below grade and underground the wire shall be type XHHW-2.
- B. Wire for circuits over 150 volts to ground shall be NEC type XHHW-2 for sizes No. 4/0 AWG and smaller, and shall be NEC type RHW-2 for sizes 250 kcmil and larger.
- C. Equipment grounding conductors shall be the same NEC type as the phase conductors described previously, green and sized per NEC Table 250.122.
- D. Bare copper ground wire shall be stranded, tinned soft drawn annealed copper wire.
- E. Ground grid conductors shall be uninsulated unless shown otherwise on the Drawings.

2.03 CONTROL, STATUS AND ALARM WIRE

- A. Wire shall be shall be No. 14 AWG minimum NEC type XHHW-2 stranded.
- B. Multi-conductor control cable shall be NEC type TC (tray cable), stranded, No. 14 AWG, XHHW-2 600V insulated color-coded conductors, bare stranded ground wire, with overall PVC cable jacket. Cable shall be rated for cable tray or direct burial use and sunlight resistant. Number of conductors as listed on the Drawings.

2.04 INSTRUMENTATION WIRE

- A. Process instrumentation wire shall be twisted pair, 600V, cross linked polyethylene insulated, aluminum tape shielded, polyvinyl chloride jacketed type "XLP".
- B. Cable for 4-20 mA instrumentation, potentiometer, RTD and similar analog circuits shall be multi-conductor twisted and shielded:
 - 1. Single pair cable:
 - a. Conductors: 2 No. 16 AWG stranded and twisted.
 - b. Insulation: XLP.
 - c. Shield: 100 percent tape with drain wire.
 - 2. Jacket: PVC with UL and manufacturers identification.
 - 3. Three conductor (triad) cable:
 - a. Conductors: 3 No. 16 AWG stranded and twisted.
 - b. Insulation: XLP.
 - c. Shield: 100 percent tape with drain wire.
 - d. Jacket: PVC with UL and manufacturers identification.
 - 4. Multiple pair cables (where shown on the Drawings):
 - a. Conductor: Multiple 2 No. 16 AWG stranded and twisted.
 - b. Insulation: XLP.
 - c. Shield: Individual pairs and overall shielded with 100-percent tape and drain wire.
 - d. Jacket: PVC with UL manufacturers identification.

2.05 TERMINATIONS AND SPLICES (POWER CONDUCTORS)

- A. Unless otherwise indicated on the Drawings, splices shall not be made in the cables without prior written approval of the Engineer. Where splicing is approved by the Engineer, splicing materials for all 600V splices shall be made with long barrel, tin plated copper compression (hydraulically pressed) connectors and insulated with heavy wall heat shrinkable tubing. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance of all completed connections of insulated conductors shall be not less than that of the uncut conductor.
- B. Wire lugs shall be tin plated copper, long barrel compression type (hydraulically pressed) for wire sizes No. 8 AWG and larger. Use one-hole lug for sizes No. 8 AWG to No. 4/0 AWG. Use two-hole lug for sizes 250 kcmil and larger. Lugs for No. 10 AWG and smaller wire shall be locking spade type with insulated sleeve. Lugs shall be as manufactured by the Thomas and Betts Co.; Burndy; Amp; or equal.
- C. Compression type connectors shall be insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem (Tyco); Ideal Industries; 3M Co. or equal.

- D. Connectors (wire nuts) for pigtail splicing all wires and cables No. 10 AWG and smaller shall be solderless pressure type.
- E. Connectors used at all exterior, wet or corrosive locations shall be pre-filled with silicone based sealant. Connectors shall be as manufactured by Ideal Industries, or equal.
- F. All splices below grade shall be made waterproof using “Scotch-Cast”, or equal.
- G. Splices in branch circuit conductors No. 8 AWG and larger shall be made with split bolt connectors.

2.06 MOTOR CONNECTIONS

- A. Motor connections shall be ring type mechanical compression terminations installed on the branch circuit wires and the motor leads and secured with bolt, nut and spring washer. Connections shall be insulated with a Raychem Type RVC, roll-on stub insulator; Thomas & Betts, Shrink-Kon MSCV20; or equal. For wire sizes No. 8 AWG and larger, long barrel, tin plated copper compression (hydraulically pressed) type connections Burndy Co., or equal) shall be installed on the branch circuit wires and the motor leads. Connections shall be insulated with heavy duty heat shrinkable material (Raychem Corp., or equal).

2.07 TERMINATIONS AND SPLICES (CONTROL, STATUS AND ALARM CONDUCTORS)

- A. Unless otherwise indicated on the Drawings, splices shall not be made in the cables without prior written approval of the Engineer. Where splicing is approved by the Engineer, splicing materials shall be approved by the Engineer and cable manufacturer. Splicing materials and installation shall be as required by the Engineer. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance of all completed connections of insulated conductors shall be not less than that of the uncut conductor.
- B. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.
- C. Insulated compression type connectors shall be of the expanded vinyl insulated parallel or pigtail type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.
- D. Solderless pressure connectors shall be self-contained, waterproof and corrosion-proof units incorporating prefilled silicone grease to block out moisture and air. Connectors shall be sized according to manufacturer's recommendations. The connectors shall be UL listed and CSA approved, as manufactured by King Innovation; Ideal Industries, Inc or equal.

2.08 TERMINATIONS AND SPLICES (INSTRUMENTATION CABLES)

- A. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

2.09 WIRE AND CABLE MARKERS

- A. Wire and cable markers shall be type written, heat shrinkable type as manufactured by the - W.H. Brady Co., Thomas & Betts Co., 3M Co., or equal.
- B. Wire and cables with diameters exceeding the capacity of the heat shrinkable markers shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by the W.H. Brady Co., Panduit Corp., or equal.

2.10 WALL AND FLOOR SLAB OPENING SEALS

- A. Wall and floor slab openings shall be sealed with UL approved expanding material which equals or exceeds the fire rating of the wall or floor construction such as "FLAME-SAFE" as manufactured by the Thomas & Betts Corp. or equal.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

- A. Uniquely identify all wires, cables and each conductor of multi-conductor cables (except lighting and receptacle wiring) at each end and in all manholes, hand holes and pull boxes with wire and cable markers.
- B. Identify circuit number associated with lights, receptacles, and other miscellaneous loads at panelboards. Identify phase and neutral conductors.
- C. Use lubrications to facilitate wire pulling. Pulling compound shall be nontoxic, nonflammable, noncombustible and noncorrosive. The material shall be UL listed and compatible with the cable insulation and jacket.
- D. All wire and cable shall be continuous and without splices between points of connection to equipment terminals, except a splice will be permitted by the Engineer if the length required between the points of connection exceeds the greatest standard shipping length available from the manufacturer specified or approved by the Engineer as the manufacturer of the particular item or wire and cable.
- E. The crimping tools used in securing the conductor in the compression type connectors or terminal lugs shall be those made for that purpose and for the conductor sizes involved. The crimping tool shall be the ratchet type which prevents the tool from opening until

the crimp action is completed. Such tools shall be a product of the connector manufacturer.

- F. Equipment grounding conductors shall be installed in all power and control raceways.
- G. Seal openings in slabs and walls through which wires and cables pass.
- H. Steel fish tapes and/or steel pulling cables shall not be used in PVC conduit runs or in raceways that terminate into energized enclosures.
- I. Pull cable from direction that requires the least tension. Feed cable into raceway with zero tension and without cable crossover at raceway entrance. Use a feed-in tube and sheave designed for cable installation. Use sheaves with radii that exceed the cable manufacturer's recommended minimum bending radius. Use a dynamometer and constant velocity power pulling. Velocity should not be less than 15-ft./min or more than 50-ft/min. Do not exceed the cable manufacturer's maximum recommended tension.
- J. If cable cannot be terminated immediately after installation, install heat shrinkable end caps.
- K. Fireproof exposed cables in manholes, vaults, pullboxes, switchgear and other areas not protected by conduit where medium voltage cables are present. Use fire-proofing tape and glass tape in accordance with the manufacturer's instructions. Fire-proofing tape shall be with one half-lapped layer of Scotch Brand 77 Electric Arc and Fireproofing Tape by 3M Corp. or equal. Tape shall be secured with a two-layer band of Scotch Brand 69 Glass Electrical Tape by 3M Corp. or equal over the last wrap.
- L. Hydraulically or manually operated cable benders shall not be used unless approved in writing by the Engineer.
- M. To protect wires prior to installation of devices, coil slack wires at outlets, inside the outlet boxes and seal the outlet opening with cardboard or fiber plug to prevent entrance of concrete, plaster or paint.
- N. When solid conductors are to be connected directly to wiring devices without the use of lugs, the wires shall be formed into a loop to fit around the terminal screw. Under no circumstance shall the wire be wrapped completely around the screw with one conductor over-lapping the other.

3.02 INSTRUMENTATION AND COMMUNICATION CABLE INSTALLATION

- A. Instrumentation cables shall be installed in raceways as specified. All circuits shall be installed as twisted pairs or triads. In no case shall a circuit be made up using conductors from different pairs or triads. Triads shall be used wherever three wire circuits are required.

- B. Install shielded instrumentation wire from terminal to terminal with no splicing at any intermediate point. Shielded instrumentation wire, coaxial, data highway, I/O, fiber optic and communications cables shall be run without splices between instruments, terminal boxes, or panels.
- C. Terminal blocks shall be provided at all instrument cable junctions, and all circuits shall be identified at such junctions.
- D. Ground shielding on instrumentation wire at one end only as recommended by the instrument manufacturer and isolated at all other locations. Terminal blocks shall be provided for inter-connecting shield drain wires at all junction boxes. Where individual circuit shielding is required, each shield circuit shall be provided with its own terminal block.
- E. Install shielded instrumentation wire in conduit and pull boxes that contain only shielded instrumentation wire. Instrumentation cables shall be separated from all other (i.e. power, control, etc.) cables in manholes.
- F. All shielded cable terminations at each end shall be provided with heat shrinkable tubing placed over the exposed shield and conductors. The tubing shall extend 1-inch minimum over the jacket end and extend 1/2-inch minimum from the jacket end over the exposed conductors.

3.03 FIBER OPTIC CABLES

- A. Unless otherwise indicated on the plans, no splices may be made in the cables without prior written approval of the Engineer. Where splicing is approved, then splicing material shall be approved by the Engineer and cable manufacturer.
- B. Provide all material, equipment and labor to install the fiber optic cables as specified in Division 13.
- C. Installation shall be in accordance with the NEC.
- D. Install cables in the raceway systems as indicated. Inspect raceways prior to pulling in the cables. Notify the Engineer of any conditions which would prevent installation of the specified cables before proceeding with the installation.
- E. Lubricate cables with lubricants specially formulated for fiber cabling jackets during installation. Do not exceed cable manufacturers' specifications for pulling tension and bending radius. Pulleys used to aid in the installation of the fiber optic cable must be sized according to the minimum bending radius.
- F. Installation tools and materials shall be approved by the cable manufacturer.
- G. Label each termination point.

- H. Tag each cable in junction boxes, manholes and handholes. Provide permanent nylon/plastic tie-wrap type tags with waterproof markings.

3.04 WIRE COLOR CODE

- A. All wire shall be color coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes, manholes and other accessible intermediate locations as well as at each termination.
- B. The following coding shall be used:

<u>System</u>	<u>Wire</u>	<u>Color</u>
240/120 Volts Single-Phase, 3 Wire	Neutral	White
	Line 1	Black
	Line 2	Red
208Y/120 Volts 3 Phase, 4 Wire	Neutral	White
	Phase A	Black
	Phase B	Red
	Phase C	Blue
240Δ/120 Volts 3 Phase, 4 Wire tap	Neutral	White
	Phase A	Black High-leg delta, center
	Phase B (High-leg)	Orange Ground on A-C coil
	Phase C	Blue
480Y/277 Volts 3 Phase, 4 Wire	Neutral	Gray
	Phase A	Brown
	Phase B	
	Phase C	Yellow
Control (Individual Conductors)	AC	Red
	DC	Blue.

3.05 TERMINATIONS AND SPLICES

- A. Power conductors: Unless otherwise indicated on the Drawings, no splices may be made in the cables without prior written approval of the Engineer. Where splicing is approved, terminations shall be die type or set screw type pressure connectors as specified. Splices

(where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling for copper conductors # 4 AWG and larger. Splices shall be solderless pressure connectors with insulating covers for copper conductors # 6 AWG and smaller. Aluminum conductors (where specified) shall employ terminations and splices specifically designed for aluminum conductors.

- B. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of 2 conductors. Termination on screw type terminals shall be made with a maximum of 2 spade connectors. Splices (where allowed) shall be made with insulated compression type connectors.
- C. Instrumentation Signal Conductors (including graphic panel, alarm, low and high-level signals): terminations same as for control conductors. Splices allowed at instrumentation terminal boxes only.
- D. Except where permitted by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.
- E. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc), conduit bodies, etc.

3.06 FIELD TESTING

- A. Test all 600V wire insulation with a megohm meter after installation and prior to termination. Make tests at not less than 1000 volts DC. Test duration shall be one minute. Submit a written test report of the results to the Engineer. Notify Engineer in writing 48 hours prior to testing.
- B. Field testing and commissioning shall be done in accordance with the latest revision of the "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" published by the InterNational Electrical Testing Association (NETA Standard ATS) unless otherwise modified by this Section. Minimum wire insulation resistance shall not be less than 250 Megohms.
- C. All service conductors shall be tested as in paragraph A above with the Engineer present.

[END OF SECTION]

**SECTION 16150
MOTORS**

SECTION 16150 MOTORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. All motors shall be as called for in other Sections of these Specifications shall be in conformance with the requirements of this Section.
- B. Motors connected to Variable Frequency Drive (VFD) Controllers shall be designed for inverter duty.

1.02 RELATED WORK

- A. Section 16110: Raceways, Boxes, Fittings, and Supports.
- B. Section 16120: Wires and Cables.

1.03 SUBMITTALS

- A. Submit complete motor nameplate data and test characteristics per NEMA Standard MG1-12.54 "Report of Test Form for Routine tests on Induction Motors" in accordance with Section 01300, including:
 - 1. Efficiency at 1/2, 3/4 and full load.
 - 2. Power factor at 1/2, 3/4 and full load.
 - 3. Motor outline, dimensions and weight.
 - 4. Conduit entry points and sizes.
 - 5. Descriptive bulletins, including full description of insulation system.
 - 6. Bearing design data.
 - 7. Special features and accessories (i.e., space heaters, temperature detectors, etc.).
 - 8. Power factor correction capacitor rating and type (when required).
- B. Provide operation and maintenance manual in accordance with Section 01730.
- C. Provide equipment warranty in accordance with Section 01740.

1.04 REFERENCE STANDARDS

- A. American Bearing Manufacturers Association (ABMA).
- B. American National Standards Institute (ANSI).
- C. American Society for Testing Materials (ASTM).
- D. Institute of Electrical and Electronics Engineers (IEEE).
- E. International Organization for Standardization (ISO).
- F. National Electrical Manufacturers Association (NEMA).
- G. National Fire Protection Association (NFPA).
- H. Underwriters Laboratories (UL).
- I. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. Motors shall be listed under UL recognized component file as applicable.
- B. Motor manufacturer shall maintain authorized service centers capable of providing training, parts, and emergency maintenance and repairs.
- C. Electric motors driving identical machines shall be identical.
- D. Routine tests shall be performed on representative motors, and shall include the information described on NEMA MG1-12.54 “Report of Test Form for Routine Tests on Induction Motors”. Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

1.06 SYSTEM DESCRIPTION

- A. To assure unity of responsibility, the motors shall be furnished and coordinated by the manufacturer of the driven equipment. The Contractor shall assume responsibility for the satisfactory installation and operation of the entire system as specified.
- B. When electrically driven equipment differs from that indicated, adjust the motor size, wiring and conduit systems, disconnect devices, and circuit protection to accommodate the equipment actually installed, without additional cost.

1.07 DELIVERY, STORAGE AND HANDLING

- A. When furnished, energize motor space heaters to prevent moisture condensation throughout the storage and construction period. Perform periodic motor insulation resistance tests per manufacturer's storage recommendation.
- B. Maintain the bearings during storage and construction, and periodically rotate the motor shaft according to manufacturer's instructions.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Unless otherwise noted, all motors 1/2 through 100 horsepower shall be rated 230/460 volt, three-phase, 60 Hertz A.C.; motors 125 horsepower and above shall be rated 460 volt, three-phase, 60 Hertz, and motors below 1/2 horsepower shall be rated 115/230 volt, single-phase, 60 Hertz A.C.
- B. All motors used with variable frequency drives shall be rated for inverter duty and shall be in accordance with NEMA MG1, Section IV, Part 31.
- C. All motors operating with variable frequency drives shall be equipped with winding temperature switches unless specified with another temperature sensing device.
- D. All motors rated 50 horsepower and larger shall have a 120-volt space heater for moisture control.
- E. Vertical motors shall be hollow or solid shaft as required by the equipment furnished under other Sections of these Specifications.
- F. Submersible pump motor construction and accessories shall be as specified under the associated pump specification.
- G. All motors shall be built in accordance with current NEMA, IEEE, ANSI and ABMA standards. Motors shall be of the type and quality described by this Section and other Divisions of the Specifications, and/or as shown on the Drawings, fully capable of performing in accordance with Manufacturer's nameplate rating, and free from defective material and workmanship.
- H. Torque output: Minimum performance characteristics for locked rotor and breakdown torque with rated voltage and frequency applied as defined by NEMA MG1, to accelerate and operate the load throughout its operating speed range, including conditions imposed by reduced voltage starting methods.
- I. Motors shall deliver the specified performance at rated load under the combinations of

voltage and frequency variations and voltage unbalance specified in NEMA MG1.

- J. Horsepower rating: Sized for operation within the full load nameplate rating without applying the service factor, throughout the full range of mechanical or hydraulic operating condition.
- K. Service Factor: 1.15 service factor on sine wave power and 1.0 service factor on VFD power in a 40 degrees C ambient, unless otherwise noted.
- L. Specific motor application data such as horsepower, speed, enclosure type, etc., is specified under the detailed driven mechanical equipment specification.
- M. Enclosures: Conform to one of the NEMA standard enclosure designs as specified under the detailed driven mechanical equipment specification. If no enclosure type is specified, provide TEFC (Totally Enclosed Fan Cooled) enclosures.
- N. Nameplates: Engraved or embossed on stainless steel fastened to the motor frame with stainless steel screws or drive pins with information per NEMA MG1.
- O. Acceptable Manufacturers: Nidec (US Motors), Baldor, TECO-Westinghouse, Toshiba, WEG, or equal.

2.02 SINGLE-PHASE MOTORS

- A. Application: Motors smaller than 1/2 Hp shall be 115/230 or 208 Volts single phase, continuous heavy duty, reversible, capacitor start. Small fan motors may be split-phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.
- B. Overload protection: Provide internal automatic thermal overloads unless otherwise noted.
- C. Insulation: Class F or better, with Class B temperature rise, 1.15 service factor. Locked rotor current shall not be greater than specified in NEMA Standard MG1, Design "N".
- D. Enclosure: Provide fully gasketed, totally-enclosed air over or fan cooled in conformance with NEMA Standard MG1. Small fan motors may be open type if suitably protected from moisture, dripping water and lint accumulation.
- E. Washdown duty: Where motor is installed in wet or corrosive areas routinely exposed to washdowns, high humidity or caustic chemicals, provide stainless steel, paint free washdown motors with Inpro bearing isolators, stainless steel T-type condensation drains, nitrile conduit box gasket, and corrosion resistant fans.
- F. Bearings: Sealed ball bearings permanently lubricated for 10 years normal use,

furnished with shaft slinger.

- G. Class 1, Division 1 and 2 locations: Single phase motors installed in Class 1, Division 1 and 2 locations shall be explosion proof, marked with a T3B temperature code label, and UL listed for use in Class 1, Division 1, Groups C & D, and Class II, Groups E, F, & G hazardous location. The temperature code marking shall appear on the nameplate.

2.03 THREE-PHASE INDUCTION MOTORS (SQUIRREL-CAGE)

A. Applications

1. Energy efficiency: Meet or exceed requirements of NEMA MG1 Part 12 for NEMA Premium Efficient motors, for 1 Hp and larger.
2. Severe duty: Motors installed in process areas and wet or corrosive locations shall be of a type designated by the manufacturer as "Corro Duty", "Mill and Chemical", "Severe Duty", or similar quality designation.
3. Class 1, Division 2 locations: Motors in Class 1, Division 2 locations shall be marked with a temperature code label suitable for use in the hazardous area classification where installed. Motors shall also comply with IEEE 841 severe duty requirements, with the following additional requirements:
 - a. The Class, Group and Temperature Code shall be one of the following:
 - b. Class I Group D - T2B (260-degree C)
 - c. Class I Group D, Class II Groups F and G - T3B (165-degree C)
 - d. Class I Groups C and D, Class II Groups F and G - T3C (160-degree C)
 - e. Thermostats: Where winding thermostats are used to obtain surface temperature limitation, the thermostats shall be connected in series with the starter holding coil (stop button). Winding temperature detectors and switches shall be UL listed for use in Class 1, Division 1 locations.
 - f. The exposed surface of motor condensation heaters shall not exceed 80 percent of the nameplate temperature code value.
 - g. Ventilation fan shall be constructed of corrosion-resistant, non-sparking material such as bronze.
4. Class 1, Division 1 locations: Motors installed in Class 1, Division 1 locations shall be explosion proof, temperature code T3C (160-degree C), listed for use in Class 1, Division 1, Group C & D locations in accordance with UL 674. The operating temperature or temperature range marking shall appear on the nameplate, indicating the maximum temperature for all conditions including overload, locked rotor and single-phasing.
5. Inverter Duty: Motors connected to Variable Frequency Drive Controllers shall be designed for inverter duty and shall comply with the following:
 - a. Definite purpose: Motors operated on variable frequency drives shall be

- designed specifically for inverter duty, per NEMA MG1, Part 31, and comply with IEEE 841. Motors shall be designed for constant or variable torque over the speed range required by the driven equipment application. Motors shall be capable of across the line starting at the motor minimum terminal voltage with an acceptable maximum locked rotor current.
- b. Torsional critical speed: First or second torsional shall not be encountered within the operating speed range. Rotors shall be stiff shaft design, statically and dynamically balanced with the first lateral critical speed at least 15 percent above the maximum running speed.
 - c. Thermal protection: Provide temperature winding switches, or other type of thermal protective device specified in the mechanical equipment section. Refer to the “Accessories” paragraph of this specification.
 - d. Cooling provisions: Maintain temperature rises at design levels while operating throughout the speed range. Ventilation system shall be designed for maximum heat transfer including larger fans or auxiliary cooling fans to maintain proper low speed cooling.
 - e. Inverter grade insulation system: Minimum Class F or better insulation materials with additional phase insulating material, extra end-turn bracing and Class H spike resistant wire. The resultant system shall withstand up to 2000-volt transients without premature motor failure and have no cable limitations in motor application.
 - f. Motor shaft currents: Insulate the ODE bearing and provide a shaft grounding strap. Insulate bearing probes to prevent shorting out bearing insulation.
6. Motors rated 100 HP and larger, not controlled by VFD: Shall be furnished with power factor power correction. The motor manufacturer shall provide suitable capacitors to the motor control center manufacturer unless otherwise noted. Power factor correction capacitors shall be provided only for the high-speed winding on a 2-speed motor.

B. Construction:

1. Stator core: Built up, fully processed, high grade, low loss silicon steel laminations keyed or dovetailed to the stator frame and securely held in place at each end.
2. Stator winding: Assembled using random wound copper coils. A split component epoxy insulation system shall be used in order to provide high resistance to moisture and other contaminants.
3. Insulation: Manufacturer's premium grade non-hygroscopic, chemical and humidity resistant insulation system consisting of Class F or H materials, operated at Class B temperature rise, with at least one impregnation cycle using solventless resin, and multiple additional dip and bake cycles using polyester varnish.
4. Motor leads: Non-wicking type, minimum Class F temperature rating and

permanently numbered for identification.

5. Rotor shaft: Forged or rolled steel, accurately machined, smoothly finished, with sufficient strength to withstand all stresses resulting from normal operation at any speed up to and including a 25 percent overspeed condition. Coordinate shaft end details with driven equipment coupling.
6. Rotor core: Solid, built-up stack of fully processed and coated, high-grade, low-loss silicon steel laminations, with die cast aluminum or fabricated copper bars or their respective alloys. Rotors on frames 213T and above shall be keyed to shaft and rotating assembly dynamically balanced.
7. Cooling fan: Corrosion-resistant, bi-directional, keyed, clamped and shouldered on the shaft.
8. Rotor assembly: Coated with a corrosion resistant epoxy insulating varnish or other protective coating, thermally stable, statically and dynamically balanced. Balance weights shall be securely attached to the rotor resistance ring by welding or similar permanent method.

C. Bearings:

1. Motors shall be equipped with vacuum-degassed anti-friction bearings made to ABMA Standards and be of ample capacity for the motor rating. The bearing housing shall be large enough to hold sufficient lubricant to minimize the need for frequent lubrication, but facilities shall be provided for adding new lubricant and draining out old lubricant without motor disassembly. The bearing housing shall have long, tight, running fits or rotating seals to protect against the entrance of foreign matter into the bearings, or leakage of lubricant out of the bearing cavity.
2. Bearings of high thrust motors will be locked for momentary up-thrust of 30 percent down- thrust. All bearings shall have a minimum L10 life rating of 100,000 hours in accordance with ABMA life and thrust values including rotor weight. For applications with higher thrust loads which cannot meet the L10 life, spring loaded spherical roller thrust bearings may be used.
3. Anti-backspin device: When specified or requested by the pump manufacturer, provide a shaft mounted, mechanical non-reverse ratchet rated at 100 percent of motor full load torque for immediate protection against reversing due to phase reversals or from backspin at shutdown. Ratchet shall be suitable for duty with variable frequency drives.

D. Enclosures:

1. Motor frames: cast iron or welded heavy plate steel construction, stiff enough to withstand the rotating forces and torques generated and shall be designed to limit

- or avoid any undesirable harmonic resonances. Provide a threaded, forged steel, shouldered eyebolt blind tapped into the motor frame for lifting on all frames 254T and larger.
2. Condensate drain openings: locate drain holes at the low points in the end brackets to allow removal of accumulated moisture from enclosures. Provide corrosion resistant, breather drain plugs for severe duty motors.
 3. Enclosure type: as specified in the mechanical equipment section, designed in accordance with NEMA MG1. All drip-proof and weather protected Type I and Type II motors (WPI and WPII) shall have epoxy encapsulated windings. Totally enclosed designs shall be provided with an upgraded insulation by additional dips and bakes to increase moisture resistance and shall not be encapsulated. Motors for outdoor service shall have vacuum pressure impregnated (VPI) epoxy insulation for moisture resistance.
 4. Hardware: hex head, SAE Grade 5 or better, plated for corrosion protection.
 5. Main terminal box: fabricated steel or cast iron, sized per the NEC for number and size of conduit connections and conductor bending and terminations as indicated on the drawings, arranged to accommodate conduit entry from any quadrant, with a grounding terminal and gaskets between the box and motor frame and between the box and its cover.
 6. Bearing housings: provide machined surfaces for attaching a magnet mounted accelerometer in order to monitor the motor vibration in the vertical, horizontal, and axial directions at each bearing housing.
 7. Frame grounding: provide motor frame grounding pad or threaded stud where supplemental grounding to frame is indicated on the drawings.
- E. Accessories: provide where specified herein or under the detailed mechanical specifications for individual equipment:
1. Space heaters: shall be of the cartridge or flexible wrap around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120 Volt, single phase with wattage as required. The heater wattage and voltage shall be embossed on the motor nameplate.
 2. Winding temperature switches: factory installed, embedded, bi-metallic, temperature actuated switches with leads terminating in the main conduit box. This device shall protect the motor against damage from overheating caused by single phasing, overload, high ambient temperature, abnormal voltage, locked rotor, frequent starts or ventilation failure. The switch shall have normally open contacts. Not less than three switches shall be furnished with each motor.

3. Winding temperature relay: complete winding thermal protection system consisting of three PTC thermistors and a separately mounted, separately excited, 115 VAC, 1 phase, solid state control module with dual Form C contacts, mounted in a NEMA 4X enclosure.
4. Bearing temperature detectors: replaceable, three wire RTDs, one per bearing with spring loaded tip, mounted as closely as possible to the outer surface of each bearing with conduit connection head and terminal block.
5. Bearing temperature relays: indicating type bearing temperature relays, furnished with iron or copper constantan thermocouples, one per bearing.
6. Vibration monitoring switch: acceleration sensitive, NEMA 4 switch, with DPDT contacts rated 5A at 240 VAC/30 VDC, with starting and monitoring time delay circuits equal to Robertshaw Model 376A Vibraswitch. For TEXP motors use Metrix Model 5550, or equal, mounted per manufacturer's instructions.
7. Bearing vibration sensors: provision for mounting sensors per vibration monitoring system manufacturer's instructions. Coordinate with the supplier of the machine monitoring equipment.

2.04 POWER FACTOR CORRECTION CAPACITORS

- E. The operating power factor of the motors shall range from 93 to 95 percent at full load and 95 to 98 percent when partially loaded. The capacitor current shall not exceed the motor no-load magnetizing current.
- F. Capacitors shall be oil insulated or dry type (600 volt capacitors shall be of the dry type) with three high interrupting capacity current limiting integral fuse protection, blown fuse indicators, and discharge resistor and shall be hermetically sealed in steel enclosures. The insulating medium shall be nonflammable and meet the U.S. Environmental Protection Agency Standards. Covers shall be gasketed, bolt on type. Capacitors shall be UL listed and NEMA rated and tested. Oil insulated type shall be non-PCB dielectric, biodegradable and low toxicity.

2.05 SURFACE PREPARATION AND SHOP COATINGS

- A. Cast and Fabricated Components:
 1. Motor cast iron and fabricated metal components shall be cleaned; free of grease, oil, dirt, or other contaminants; then oxide primed and painted with manufacturer's standard finish coating.
 2. Severe duty motors: surpass the 250 hour salt spray test per ASTM B117.

B. Internal Surfaces:

1. Internal surfaces: shaft, rotor, end bells and parts shall be covered with a corrosion-resistant coating of epoxy paint or equal material of 2 mils minimum dry film thickness for increased life against adverse environmental conditions. The stator bore and end turns shall be coated with clear epoxy varnish in addition to the insulating varnish treatment.
2. Shaft extension: protected with a rust preventive strippable coating capable of being peeled off or unwrapped.
3. Machined joints and threaded parts: coated with rust-inhibiting compound.

2.06 FACTORY TESTING

- A. Each motor shall be given an unwitnessed routine short commercial test per NEMA MG1 and IEEE 112.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install the motors per manufacturer's installation instructions.
1. Prepare rigid foundation or mounting surface to minimize vibration and maintain alignment between motor and load shaft.
 2. Align the motor shaft with driven equipment according to manufacturer's written instructions. Adjust axial position of motor frame with respect to load shaft.
 3. Accurately adjust flexible couplings for direct drive according to machine manufacturer's guidelines. Check alignment to minimize vibrations. Coupling spacing shall be according to coupling manufacturer guidelines.
 4. Anchor motor base to load bearing surface with grade 5 steel bolts or better.
- B. Electrical Connections:
1. All motors shall be connected to the conduit system by means of a short section of liquid-tight flexible conduit to isolate the conduit system from motor vibration. Refer to Section 16110.
 2. Install motor branch circuit conduits and conductors in accordance with NEC and local code requirements.

3. Terminate the motor leads using products rated for vibration applications and per the manufacturer's connection diagrams. Refer to Section 16120.
4. Install equipment grounding conductors per NEC and local code requirements.
5. Tighten electrical connections and terminals according to manufacturer's published torque values.
6. Install conduit and wiring between motor auxiliary devices and associated indicators, controllers and protective devices in accordance with shop drawings.
7. Connect electro-magnetic field sensitive devices such as RTDs, thermistors, thermal protector switches, and vibration sensors with twisted and shielded instrumentation wiring.
8. When furnished, mount power factor correction capacitor adjacent to the motor and connect to the motor junction box with liquid tight flexible conduit and code sized wiring. For explosion-proof motors, mount the capacitor in a non-hazardous area above or near the MCC.

C. Pre-Commissioning Inspection:

1. Inspect for physical damage. Verify all shipping materials and braces are removed.
2. Compare equipment nameplate information with site conditions and report any discrepancies.
3. Inspect for proper mounting, grounding, and wiring connections. Check all hardware for looseness and re-tighten as necessary.
4. Verify that the motor and the coupled load are properly aligned. Inspect bearings for proper lubrication and rotate motor shaft by hand to check for binding. Oil lubricated bearing housings that have been filled with preservative oil shall be drained and re-filled with the proper grade of bearing oil before putting the machine into service.
5. Clean motor externally, on completion of installation. Vacuum dirt and debris; do not use blown compressed air to assist in cleaning.

D. Field Commissioning:

1. All testing and commissioning shall be done in accordance with the latest revision of the "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" published by the InterNational Electrical Testing Association (NETA Standard ATS).

2. Perform insulation resistance (megger) tests in accordance with manufacturer's instructions. If the test fails consult the manufacturer and dry out the machine.
3. Perform a phase rotation test to ensure proper shaft direction with load uncoupled. The correction for wrong rotational direction shall be made at the motor terminal box.
4. Check all connections with wiring diagrams prior to energizing.
5. Inspect for unusual mechanical or electrical noise or signs of overheating during initial test run.
6. Measure running current and evaluate relative to load conditions and nameplate full load amperes.
7. The Contractor shall submit to the Engineer a typed list of all motors 1 hp and larger listing the no load motor current and voltage along with the current and voltage with the motor under load. Any phase current imbalance greater than 10% or greater than be flagged for corrective action.

[END OF SECTION]

**SECTION 16191
MISCELLANEOUS EQUIPMENT**

SECTION 16191 MISCELLANEOUS EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install all miscellaneous equipment as shown on the Drawings and as specified herein.
- B. This Section provides the requirements for miscellaneous equipment typically employed in a facility, however, not all components specified in this Section are necessarily utilized on this project.

1.02 RELATED WORK

- A. Identification requirements are included in Section 16000.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, detailed catalog information or drawings with sufficient detail to determine compliance with the specifications including describing electrical and physical characteristics of all equipment specified.

1.04 REFERENCE STANDARDS

- A. Equipment enclosures shall have NEMA ratings suitable for the location in which they are installed, as specified in Section 16000.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Disconnect Switches:
 - 1. Disconnect switches shall be heavy duty, quick make, quick break, visible blades, 600 Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle unless otherwise noted. Enclosure type shall be as noted on the drawings. All current carrying parts shall be copper.
 - 2. NEMA 4X enclosures shall be stainless steel.
 - 3. NEMA 7 enclosures shall be cast aluminum.
 - 4. Lugs shall be copper.

5. All exterior hardware shall be stainless steel.
 6. Switches shall be as manufactured by Eaton, Schneider Electric/Square D or General Electric.
- B. Manual Motor Starters:
1. Manual starters shall be furnished and installed for all typed of single-phase motors. Manual starters shall be non-reversing, reversing or two speed type as required. NEMA sizes shall be as required for the actual horsepower of the motor furnished. Manual starters shall have motor overload protection in each phase. Built-in control stations shall be furnished as required or as shown on the Drawings. Starter shall be furnished with lock off provisions.
 2. NEMA 4X enclosures shall be stainless steel.
 3. NEMA 7 enclosures shall be cast aluminum.
 4. Manual motor starters shall be as manufactured by Eaton, Schneider Electric/Square D or General Electric.
- C. Magnetic Motor Starters:
1. Motor starters shall be 2 or 3 Pole, single or 3 Phase as required, 60 Hz, 600 Volt, magnetically operated, full voltage non-reversing unless otherwise shown on the Drawings. NEMA sizes shall be as required for the horsepowers shown on the Drawings. Minimum size shall be NEMA size 1.
 2. Two speed starters shall be for single or two winding motors as required by the actual motor furnished or as shown on the Drawings.
 3. Each motor starter shall have a 120 Volt operating coil, and control power transformer. Starters shall have motor overload protection in each phase. Auxiliary contacts shall be provided as required or as shown on the Drawings. A minimum of one N.O. and one N.C. auxiliary contacts shall be provided in addition to the contacts shown on the Drawings.
 4. Overload relays shall be non-adjustable, ambient compensated and manually reset.
 5. Control power transformers shall be sized for additional load where required. Transformer secondaries shall be equipped with time delay fuses.
 6. Built in control stations and indicating lights shall be furnished as specified herein where shown on the Drawings.
 7. NEMA 4X enclosures shall be stainless steel.

8. NEMA Type 7 enclosures shall be cast aluminum.
9. Magnetic motor starters shall be as manufactured by Eaton, Schneider Electric/Square D or General Electric.

D. Combination Magnetic Motor Starters:

1. Motor starters shall be a combination motor circuit protector and contactor, 2 or 3 Pole, single or 3 Phase as required, 60 Hz, 600 Volt, magnetically operated, full voltage non-reversing unless otherwise shown on the Drawings. NEMA sizes shall be as required for the horsepower shown on the Drawings. Motor circuit protectors shall be molded case with adjustable magnetic trip only. They shall be specifically designed for use with magnetic motor starters. Motor circuit protectors shall be current limiting type, with additional current limiters if required. Combination motor starters shall be fully rated for 22,000 Amps RMS symmetrical.
2. Two speed starters shall be for single or two winding motors as required by the actual motor furnished or as shown on the Drawings.
3. Each motor starter shall have a 120 Volt operating coil, and control power transformer. Starters shall have motor overload protection in each phase. Auxiliary contacts shall be provided as required or as shown on the Drawings. A minimum of one N.O. and one N.C. auxiliary contacts shall be provided in addition to the contacts shown on the Drawings.
4. Overload relays shall be non-adjustable, ambient compensated and manually reset.
5. Control power transformers shall be sized for additional load where required. Transformer secondaries shall be equipped with time delay fuses.
6. Built in control stations and indicating lights shall be furnished as specified herein where shown on the Drawings.
7. NEMA 4X enclosures shall be stainless steel.
8. NEMA Type 7 enclosures shall be cast aluminum.
9. Combination magnetic motor starters shall be as manufactured by Eaton, Schneider Electric/Square D or General Electric.

E. Control Stations and Indicators:

1. Control stations shall be heavy duty type, with full size (30.5mm) NEMA 4X or 7 operators, indicators, etc.

2. Indicators shall be LED, full voltage and push-to-test type.
3. NEMA 4X enclosures shall be stainless steel.
4. NEMA 7 enclosures shall be cast aluminum.
5. Control stations shall be Square D Class 9001, similar by Eaton or General Electric.

F. General Purpose Dry Type Transformers:

1. Transformers shall be dry type, two winding with kVA and voltage ratings as shown on the Drawings.
2. Four full capacity taps shall be furnished, two 2 1/2 percent above and four 2 1/2 percent below rated primary voltage.
3. Maximum temperature rise shall be 80 degrees C. Windings shall be copper.
4. Transformers shall be built in accordance with ANSI C89.2 and NEMA ST 20.
5. Transformers shall be provided in NEMA 1 enclosures unless otherwise noted on the Drawings or as required by Section 16000. Where a NEMA 4X and/or stainless steel enclosure is required, the transformer shall be of the TENV type.
6. Transformers shall be furnished with hot dipped galvanized mounting hardware. Where a NEMA 4X and/or stainless steel enclosure is required, the hardware shall be 316 stainless steel.
7. Transformers shall be manufactured by Eaton, Schneider Electric/Square D or General Electric.

G. Transformer Panel Assemblies

1. Each Transformer-Panel Assembly (TPA) shall include a main primary breaker, a dry type transformer and a secondary panelboard with main breaker.
2. Enclosures shall be type NEMA 1 enclosures unless otherwise noted on the Drawings or as required by Section 16000. Main primary, secondary, and feeder breakers shall be enclosed with a padlockable hinged door. Where NEMA 3R stainless steel enclosure is required, the hardware shall be 316 stainless steel.
3. Transformers shall be dry type, two winding with kVA and voltage ratings as shown on the Drawings.

4. Transformer windings shall be copper, 115-degree C rise, epoxy-resin encapsulated with two full capacity taps rated 5 percent below rated primary voltage.
5. Interconnecting wiring between the primary breaker and transformer, transformer and secondary main breaker, and secondary main breaker and distribution section shall be factory installed.
6. Panelboard bus shall be copper.
7. TPA main primary breaker shall have a minimum interrupting rating of 18 kA at 480 volts and shall be sized per manufacturer's standard for the kVA size.
8. TPA secondary main breaker shall have a minimum interrupting rating of 10 kA at 240 volts and shall be sized per manufacturer's standard for the kVA size.
9. TPA feeder breakers shall be bolt-on type with a minimum interrupting rating of 10 kA.
10. Panelboard section shall include copper equipment ground bar.
11. TPA shall be Mini Power-Zone as manufactured by Schneider Electric/Square D, Mini- Power Center as manufactured by Eaton, Servicecenter as manufactured by General Electric or Sentron Power Center as manufactured by Siemens.
12. Lightning and Surge Protection: Lightning and surge protection shall be UL 3rd edition certified as manufactured by Advanced Protection Technologies or equal. Models based on voltage and phase shall be:
 - a. TE01XDS104X 120/240 volt, single phase.
 - b. TE04XDS104X 480 volt, three phase.

H. Wireway:

1. NEMA 1 wireway shall be gasketed painted steel with stainless steel screw covers.
2. NEMA 4X wireway shall be 316 stainless steel with gasketed clamped covers.
3. NEMA 1 wireway shall be Square Duct as manufactured by the Schneider Electric/Square D or equal.
4. NEMA 4X wireway shall be Bulletin F 22 as manufactured by the Hoffman Engineering Co. or equal.

I. Manual Transfer Switch:

1. Manual transfer switches shall be heavy duty, load-break, quick make, quick break, visible blades, 3 or 4 Pole, 600 Volt, double throw, with direct manual operation, full cover interlock, interlock defeat and shall be listed under UL 1008. Switch ratings shall be as shown on the Drawings. Enclosure type shall be NEMA 1, unless otherwise noted on the Drawings or as required by Section 16000. All current carrying parts shall be copper.
2. NEMA 4X enclosures shall be stainless steel.
3. NEMA 7 enclosures shall be cast aluminum.
4. Lugs shall be copper.
5. Manual transfer switches shall be as manufactured by Eaton, Schneider Electric/Square D or General Electric.

J. Control Relays:

1. Control relays shall be heavy duty machine tool type, with 10 Amp, 300 Volt convertible contacts. Number of contacts and coil voltage shall be as shown on the Drawings. General use relays shall be Square D Company, Class 8501 Type X; General Electric CR120B; or similar by Eaton or Allen-Bradley. Latching relays shall be Square D, Class 8501 Type X; General Electric CR120BL; or similar by Eaton or Allen-Bradley.
2. Time delay relays shall be pneumatic, 600 Volt, 20 Amp contacts, with calibrated knob operated adjustment and numerical time dial. On delay and off delay types and timing ranges shall be as shown on the Drawings or as required for proper operation of the actual equipment furnished. Relays shall be Agastat Model 7012 or 7022 or equal.

K. Terminal Blocks:

1. Terminal blocks shall be 600 Volt, channel mounted, with tubular screw and pressure plate.
2. Terminal blocks shall be Bulletin 1492-CA1 as manufactured by Allen-Bradley Co. or equal.

L. JIC Boxes for GF Receptacles:

1. JIC boxes shall be 6-inch by 6-inch by 4-inch aluminum continuous hinge clamp cover boxes, Hoffman Catalog Number A-606 CHAL with Type L23 stainless steel fast operating JIC clamp, or equal.

2. Install 1-1/2-inch bushings in bottom of box for cord and plug to pass through.

M. Corrosion Inhibitors:

1. All equipment enclosures, terminal boxes, etc, located in a NEMA 4X rated area (where shown on the Drawings) that contains electrical or electronic equipment or terminal strips shall be furnished with an internally mounted, chemically treated corrosion inhibitor pad.
2. The corrosion inhibitor pads shall be as manufactured by Hoffman Engineering Co.; 3M or equal.

N. Equipment Mounting Stands:

1. Equipment mounting stands shall be custom fabricated from 1/4-inch 316 stainless steel plate and 3-inch 316 stainless steel channel, unless otherwise shown on the Drawings.
2. All hardware shall be 316 stainless steel.

O. Intrinsically Safe Relays:

1. Intrinsically safe relays shall be solid state type with 5 Amp output contacts, suitable for use on a 120 Volt, 60 Hz power supply and shall be FM approved for pilot devices in Class I, Division 1, Group D hazardous atmospheres.
2. Intrinsically safe relays shall be Gems Solid State Safe Pak as manufactured by Gems Sensors, Division of Transamerica Delaval, Inc. or equal.

P. Alarm Horn and Light:

1. Alarm horn shall be vibrating type for 120 volts, 60 Hertz and shall be Federal Signal Corp. Cat. No. 350 + WB for surface mounting, Federal Signal Corp. Cat. No. 350+FG+FB for flush mounting, equal by Benjamin Co. or Edwards Co. or equal.
2. Alarm light shall be a NEMA 4X flashing strobe unit with red glass globe, for use on a 120 volts, 60 Hertz power supply, and shall be Federal Signal Co. Model 191X, or equal.]

Q. Photocells:

1. The photocells shall be suitable for power duty with individual fixtures or for pilot duty with contactors as detailed on the Drawings. Enclosure shall be NEMA 3R or 4. Contacts shall be rated for 2,000 watts continuous at 120 Volts. The unit shall turn on at 1.5 footcandles and off at 5.5 footcandles.

2. Photocells shall be Tork, Model 2101 or equal.

R. Main Circuit Breaker Enclosures:

1. Service: 200 Amp, 480 volt, 3-phase, 3-wire, 60 Hertz.
2. The overall short circuit withstand rating of the equipment and devices shall be 42,000 Amperes R.M.S. symmetrical at 480 volts. Main circuit protective devices shall be fully rated for the specified short circuit duty. Systems employing series connected ratings for main and feeder devices shall not be used. Bus shall be tin plated copper.
3. Main circuit breakers 200 A and lower shall be molded case.
4. Main breakers shall be housed in a rack mounted, NEMA 4X 316 stainless steel enclosures. Each main breaker shall be labeled as main service disconnecting means, signage shall also be provided which reads as follows "DANGER 480 VOLTS - KEEP OUT".
5. Main circuit breakers, enclosures, etc., shall be as manufactured by Eaton, Schneider Electric/Square D, or General Electric.

S. Automatic Transfer Switch:

1. The rating of the automatic load transfer switch shall be as shown on Drawings.
2. The automatic transfer switch shall be mechanically held on both the emergency and the normal side, and rated for continuous duty in an unventilated enclosure. The switch shall be double throw with the main contacts rigidly and mechanically interlocked to insure only two possible positions; Normal or Emergency. The transfer switch shall be rack mounted, front connected, NEMA Type 4X, stainless steel construction. A manual operator shall be provided to enable manual operation. Two sets of normally closed and open auxiliary switches shall be provided on each breaker in addition to those required for controls.
3. The transfer switch shall be listed under UL 1008. Switches utilizing reversing contactor mechanisms as a means to transfer load will not be considered.
4. Automatic load transfer switch shall include the following accessories:
 - a. Engine starting contacts to provide for generator starting (2 sets).
 - b. Test switch, to simulate a power outage, mounted external.
 - c. Adjustable time delay in the neutral position, to allow inductive loads to decay.
 - d. Adjustable time delay on engine starting to over-ride momentary outages and nuisance voltage dips.
 - e. Adjustable time delay on transfer of load to emergency source.

- f. Adjustable time delay on retransfer of load to normal with 5 minute cool-down timer wherein the generator set runs unloaded after retransfer to line.
 - g. Plant exerciser to start and run the generator set without load each 168 hours for a 30 minute interval.
 - h. One auxiliary contact closed on emergency and four auxiliary contacts open on emergency.
 - i. Pilot lights to indicate the normal and emergency position of the transfer switch.
 - j. The transfer switch shall be rated for 42,000 AIC.
 - k. Engine mounted pre- start warning alarm horn controls.
5. The Contractor shall be responsible for providing all necessary wiring between the generator set and the ATS, at no additional cost to the Owner. All materials shall be in accordance with Division 16.

2.02 CONTROL PANELS

- A. The Manufacturer shall provide a complete and fully functional control system to manually or automatically operate the control system as specified herein and in other applicable sections of these specifications. All Manufacturers recommended safety devices shall be furnished to protect operators. All control devices, unless specified otherwise, shall be mounted in the Control Panel.
- B. Control Panel Construction:
 1. The control panel shall consist of a main circuit breaker, a motor circuit protector (MCP) and magnetic starter for each motor, and a 120 volt control power transformer (fused on primary and secondary). All control components shall be mounted in one common enclosure. Control switches shall provide means to operate each motor manually or automatically.
 2. Unless specifically noted otherwise, the electrical control equipment shall be mounted within a NEMA 4X enclosure, constructed of not less than 14 gauge 316 stainless steel, factory powder coated white. Latches shall be quarter turn quick release type and all hardware shall be 316 stainless steel. The door shall be provided with a pad-lockable vault type 3-point latch. The enclosure shall be equipped with a door and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Door(s) shall be interlocked with main circuit breaker and provided with pad-locking provision.
 3. Outdoor enclosures shall be provided with sun shields. Additional temperature control shall be provided if required to meet UL temperature rating of internal components.

4. All control panels containing PLC's shall contain UPS or battery ride-through for the PLC in accordance with Division 13 specifications.
5. All motor branch circuit breakers, motor starters and control relays shall be of highest industrial quality, securely fastened to the removable back panels with screws and lock washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.
6. A thermal-magnetic air circuit breaker, as manufactured by the Schneider Electric/Square D, or equal, shall be furnished for the main breaker. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering. Each circuit breaker shall be adequately sized to meet the equipment operating conditions. Motor Circuit Protectors (MCP) shall be molded case with adjustable magnetic trip only, "Mag-Gard" as manufactured by Square D or equal.
7. An open frame, across-the-line, NEMA-rated magnetic motor/starter, Class 8536 as manufactured by Square D, or equal, shall be furnished for each motor. All motor starters shall be provided with motor circuit protectors and equipped to provide under-voltage release and overload protection on all three phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position. Overloads shall be solid state type. Submersible motors shall use Class 10 quick trip overload setting.
Overload reset push-buttons shall be located on the exterior of the door. Normally open and normally closed auxiliary motor overload contacts wired to terminal blocks shall be provided for each motor starter within the control panel.
8. Auxiliary contacts shall be provided for remote run indication and indication of each status and alarm condition. Additional controls shall be provided as specified herein and as required by Divisions 13, 16 and as shown on the drawings.
9. All operating control and instruments shall be securely mounted on the exterior door. All controls and instruments shall be clearly labeled to indicate function. All exterior mounted equipment shall be NEMA 4X.
10. Mode selector switches shall be Hand-Off-Auto type to permit override of automatic control and manual actuation of shutdown. Switches shall be NEMA 4X (800H) as manufactured by Allen-Bradley, or equal, providing three (3) switch positions, each of which shall be clearly labeled according to function.
11. Indicator lamps shall be LED full voltage type and mounted in NEMA 4X (800H) modules, as manufactured by Allen-Bradley. Lamp modules shall be equipped to operate at 120 volt input. Lamps shall be easily replaceable from the front of the control compartment door without removing lamp module from its mounted position. Indicators shall be provided for individual motor run and an indicator for

each failure condition.

12. A six (6) digit, nonreset elapsed time meter shall be connected to each motor starter to indicate the total running time of each motor in "hours" and "tenth of hours". The elapsed time meters shall be Series T50 as manufactured by the ENM Company or equal.
13. A failure alarm with horn and beacon light shall be provided. Silence and reset push buttons shall also be furnished. A common failure reset pushbutton shall be provided to reset the alarm conditions (reset shall occur only if fault condition has been cleared). The alarm horn shall be weatherproof rated with gasket (Federal Signal Corporation, Cat. #350 or equal). The alarm beacon shall be NEMA 4X rated, red lense and solid-state flasher (Ingam Products Inc. LRX-40).
14. The control panel shall operate on a power supply of 480 volts, 3-phase, 60 hertz unless otherwise noted.
15. The control diagrams and overload tables shall be laminated to the inside of the door except where door space is limited the laminated documents shall be in the print storage pocket.
16. Print storage pockets shall be provided on the inside of each panel. Pocket shall be of sufficient size as required to hold all prints necessary to service the equipment. A set of reduced drawings shall be provided for each panel, fixed to fit in the storage pocket.
17. A duplex GFCI utility receptacle (circuit breaker protected) providing 120 volts, 60 Hertz, single phase current shall be mounted on the side of the enclosure.
18. The control panel shall include an adjustable time delay relay to prevent any two motors from starting simultaneously. All timing relays shall be solid state, with pin (octal) and bases, relays shall be T-series as manufactured by Diversified Electronics Inc. or equal.
19. Alternators shall be provided to sequence lead/lag motors, alternators shall be 008-120- 13SP or 009-120-23AP as manufactured by Sta-con, or equal.
20. A phase monitor shall be provided for the control panel, monitors shall be model SUA-440- ASA as manufactured by Diversified Electronics Inc., or equal.
21. All exterior mounted equipment shall be rated NEMA 4X. Hinged NEMA 4X 316 stainless steel viewing windows will be permitted where such equipment is not available with a NEMA 4X rating.

22. The control panel shall be provided with a surge protective device (SPD) rated for 100kA per mode for the incoming power. SPD shall be mounted within the control panel enclosure. Lead lengths shall not be longer than 12 inches from the main circuit breaker.
23. All control panel wiring shall be numbered at both ends with type written heat shrinkable wire markers.
24. Wiring shall be stranded copper, minimum size #14 AWG (except for shielded instrumentation cable), with 600 volt, 90-degree C, flame retardant, Type MTW thermoplastic insulation.
25. The control panel shall be provided with nameplates identifying each component, selector switches, pilot lights, etc. Nameplates shall be permanently affixed using an epoxy process (inner door nameplates shall be fastened with stainless steel screws). Nameplates shall be laminated plastic, engraved white letters with a black background.
26. All control panels shall be provided with two nameplates located on the exterior door. The first nameplate shall identify the control panel name. The second nameplate shall identify the power source.
27. Where applicable provide a nameplate, which reads as follows "CAUTION - THIS PANEL CONTAINS A VOLTAGE FROM AN EXTERNAL SOURCE." Letters shall be black on a high visibility yellow background.
28. Corrosion Inhibitor Emitter: Inclusion of an industrial corrosion inhibitor emitter that shall protect internal components of control panel from corrosion for up to one year. One spare emitter shall be provided for each control panel.
29. All control relays shall be 10 amp rated contacts (minimum), 11 pin with mounting base, 3PDT (minimum), with LED indicators to show relay status, relays shall be manufactured by Potter Brumfield or equal.
30. Terminal blocks shall be 600 volt heavy duty rated, tubular clamp type. Terminal strips shall be Allen Bradley catalog #1492-CA-1 or equal. Each terminal shall be individually labeled.
31. The completed control panel assembly shall be UL 508 certified.
32. Intrinsically safe relays shall be solid state type with 5 amp output contacts, suitable for use on 120 volt, 60 hertz power supply and shall be Factory Mutual approved for

devices in Class 1, Division 1 hazardous atmospheres. Intrinsically safe relays shall be Gems Solid State Safe-Pak as manufactured by Gems Sensors, Division of Transamerica Delaval, Inc. or equal.

33. All electronic control equipment (i.e. controllers, isolators, signal boosters, transmitters, PLC's, etc) shall be as specified in Division 13.
34. A copper ground bar with sufficient terminals for all field and panel ground connections shall be provided.
35. All signal wiring entering and exiting the control panel shall be provided with surge protection. Surge protection shall be as specified in Division 13.
36. An 8-inch (minimum) clear space within the enclosure shall be provided horizontally along the entire top and bottom of the control panel. A 4-inch (minimum) clear space within the enclosure shall be provided vertically along the entire sides of the control panel. No devices, terminals, etc., shall be installed within this space, the space shall be provided for field conduit and wiring access only.
37. Incoming phase conductor terminals shall be clearly identified. All wiring within the control panel shall be color coded or coded using electrical tape in sizes where colored insulation is not available. The following coding shall be used:

System	Wire	Color
Incoming line voltage	Phase conductors	Black
	Ground	Green
	Neutral (as required)	Gray
Internal control voltage	AC	Red
Internal control voltage	DC	Blue
External source	All	Yellow

C. Spare Parts:

1. The following number of spare parts shall be furnished for each control panel:
 - a. 1 Indicator light assembly.
 - b. 2 control relays for each type furnished.
 - c. 5 fuses for each type/size furnished.
 - d. 1 set thermal overloads for each size furnished.
 - e. 1 selector switch for each type furnished.
 - f. 1 starter coil for each size furnished.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Mounting Stands:

1. Field mounted disconnects, pushbutton control stations, etc, shall be mounted on 316 stainless steel stands as specified herein or as shown on the Drawings. Where clearance requirements for stands may not be maintained, the Engineer may direct equipment to be wall mounted adjacent to the motor or device, but in no case shall the distance from the motor or device to the control station exceed 3-ft.
2. All floor mounting stands, bracing, anchor bolts and appurtenances furnished to support equipment loads, dynamic loads, wind loads and seismic forces shall conform to the latest applicable requirements of the State Building Code in effect at the time of Bid.
3. All wall mounted brackets, bracing, bolts and appurtenances to support equipment loads dynamic loads, wind loads and seismic forces shall conform to the latest applicable requirements of the State Building Code in effect at the time of Bid.
4. The feet of all mounting stands shall be leveled with leveling nuts and then grouted with non-shrink grout.
5. Channel supports shall be ground smooth and fitted with plastic end caps.

B. Miscellaneous Equipment:

1. Provide and install identification as required per Section 16000.
2. All wiring shall be done in a neat and workmanlike manner.
3. Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner or clean lint-free rags. Do not use compressed air.

[END OF SECTION]

**SECTION 16470
PANELBOARDS**

SECTION 16470 PANELBOARDS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install all panelboards as shown on the Drawings and as specified herein.
- B. All panelboard wiring shall include wiring numbers and terminal point numbers cross referenced to shop drawing and subsequent record drawing submittals.

1.02 RELATED WORK

- A. Refer to Section 16000 for nameplate identification requirements.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data, for the following as a minimum:
 - 1. Equipment outline drawings showing elevation and plan views, dimensions and weight. Indicate all options, special features, ratings and deviations from this Section.
 - 2. Bus arrangement drawings.
 - 3. Product data sheets and catalog numbers for circuit breakers, etc. List all options, trip adjustments and accessories furnished specifically for this project.
 - 4. Instruction and renewal parts books.
 - 5. Test and inspection reports.
 - 6. Complete bill of materials list.
 - 7. The equipment drawings, summary tables, and bill of materials list shall be computer generated (i.e., no hand-drawn drawings, sketches, lists will be accepted).

1.04 REFERENCE STANDARDS

- A. Panelboards shall be in accordance with the Underwriter Laboratories (UL) "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code (NEC).
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 MANUFACTURERS

- A. 120/240 Volt, single phase, 3 Wire and 120/208 Volt, 3 Phase, 4 Wire panelboards shall be Type NQ as manufactured by Schneider Electric; Type Pow R Line by Eaton; Type AQ by General Electric; or P Series by Siemens.
- B. 277/480 Volt, 3 Phase, 4 Wire panelboards shall be; Type NF as manufactured by Schneider Electric; Type Pow R Line by Eaton; Type AE by General Electric; or P Series by Siemens.
- C. 480 Volt, 3 Phase, 3 Wire panelboards shall be; I Line series as manufactured by Schneider Electric; Type Pow R Line by Eaton; Type Spectra by General Electric; or P Series by Siemens.
- D. Refer to additional requirements for manufacturers in Section 16000. Alternate suppliers must be submitted for approval to the Engineer in writing four weeks prior to the original bid date with supporting documentation to confirm all aspects of the specifications.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Rating:
 - 1. Panelboard ratings shall be as shown on the Drawings. All panelboards shall be rated for the intended voltage.
 - 2. Circuit breaker panelboards shall be fully rated for the specified circuit breaker fault current interrupting capacity. Series connected short circuit ratings will not be acceptable.

2.02 MATERIALS (NEMA 1)

- A. Interiors:
 - 1. All interiors shall be completely factory assembled with circuit breakers, wire connectors, etc. All wire connectors, except screw terminals, shall be of the anti-turn solderless type and all shall be suitable for copper wire of the sizes indicated.
 - 2. Interiors shall be so designed that circuit breakers can be replaced without disturbing adjacent units and without removing the main bus connectors and shall be so designed that circuits may be changed without machining, drilling, or tapping.
 - 3. Branch circuits shall be arranged using double row construction except when narrow column panels are indicated. Branch circuits shall be numbered by the manufacturer.

4. A nameplate shall be provided listing manufacturer's name, panel type and rating.

B. Buses:

1. Bus bars for the mains shall be of tin-plated copper. Full-size tin-plated copper neutral bars shall be included where neutral bus is required. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction. Cross connectors shall be tin plated copper. Each panel shall be provided with a ground bus bar, with removable link/jumper between neutral and ground bus. The ground bus shall be sized to the maximum number of circuit breakers that can be installed in the panelboard.
2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.
3. Spaces for future circuit breakers shall have busses sized for the maximum device that can be fitted into them and any hardware attached to the bus, so the addition of a future breaker only required the addition of the breaker itself and no other hardware.
4. Tin plated copper equipment ground bars shall be furnished.

C. Boxes:

1. Recessed or flush mounted boxes shall be made from galvanized code gauge steel having multiple knockouts, unless otherwise noted. Boxes shall be of sufficient size to provide a minimum gutter space of 4-inch on all sides.
2. Surface mounted boxes and trims shall have an internal and external finish as specified in Paragraph 2.04D4 below.
3. At least four studs for mounting the panelboard interior shall be furnished.
4. All conduit entrances shall be field punched.

D. Trim:

1. Doors shall have semi flush type cylinder lock and catch, except that doors over 48-inch in height shall have a vault handle and 3-point catch, complete with lock arranged to fasten door at top, bottom and center. Door hinges shall be concealed. Furnish two keys for each lock. All locks shall be keyed alike; directory frame and card having a transparent cover shall be furnished on each door.
2. Hinged doors covering all circuit breaker handles shall be included in all panel trims
3. The trims shall be fabricated from code gauge sheet steel.

4. All exterior and interior steel surfaces of the panelboard shall be properly cleaned and finished with ANSI Z55.1, No. 49 or No. 61 light gray paint over a rust-inhibiting phosphatized coating. The finish paint shall be of a type to which field applied paint will adhere.
5. Trims for flush panels shall overlap the box by at least 3/4-inch all around. Surface trims shall have the same width and height as the box. Trims shall be fastened with quarter turn clamps.
6. Door-in-door type construction shall be provided so that trim may be opened to access wire ways without removing the trim from the panel.

2.03 NEMA 3R OR NEMA 12 PANELBOARDS

- A. Interiors and buses shall be as hereinbefore specified for NEMA 1 construction.
- B. Boxes and trim shall be NEMA 3R or NEMA 12 construction using painted steel boxes, unless 316 stainless steel (SS) is called out on the panel schedule.
- C. Conduit openings shall be tapped.

2.04 NEMA 4X PANELBOARDS

- A. 225A and less:
 1. A complete NEMA 1 panel in accordance with paragraph 2.02 above shall be placed inside a larger NEMA 4X 316 stainless steel hinged (piano type) box as manufactured by Hoffman or equal.
- B. 250A and larger:
 1. Interiors and busses shall be as hereinbefore specified for NEMA 1 construction.
 2. Boxes and Covers:
 - a. Boxes and covers shall be made from 316 stainless steel with natural finish.
 - b. Boxes and covers shall have continuous welded seams and shall be hinged (piano type) together and gasketed.
 3. The completed assembly shall be manufactured by the panelboard manufacturer.
- C. Conduit openings shall be tapped.

2.05 CIRCUIT BREAKERS

- A. Panelboards shall be equipped with circuit breakers with frame size and trip settings as shown on the Drawings.
- B. Circuit breakers shall be molded case, bolt-in type.

- C. Each circuit breaker used in 120/208 Volt, 3 phase, 4 wire panelboards shall have an interrupting capacity of not less than 10,000 Amps, RMS symmetrical.
- D. Each circuit breaker used in 120/240 Volt, single phase, 3 wire panelboards shall have an interrupting capacity of not less than 10,000 Amps, RMS symmetrical.
- E. Each circuit breaker used in 277/480 Volt 3 phase, 4 wire panelboards shall have an interrupting capacity of not less than 35,000 Amps, RMS symmetrical.
- F. Each circuit breaker used in 480 Volt, 3 phase, 3 wire Power panelboards shall have an interrupting capacity of not less than 35,000 Amps, RMS symmetrical.
- G. Each circuit breaker used in 480 Volt, 3 phase, 3 wire Distribution panelboards shall have an interrupting capacity of not less than 35,000 Amps, RMS symmetrical.
- H. GFCI (ground fault circuit interrupter) shall be provided for circuits where shown on the Drawings. GFCI units shall be 1 Pole, 120 Volt, molded case, bolt-on breakers, incorporating a solid-state ground fault interrupter circuit insulated and isolated from the breaker mechanism. The unit shall be UL listed Class A Group I device (5 milliamp sensitivity, 25 millisecond trip time) and an interrupting capacity of 10,000 Amps, RMS.
- I. Each circuit breaker used as switches in Fluorescent Lighting circuits or High Intensity Discharge lighting circuits shall be listed and shall be marked as HID.
- J. Circuit breakers shall be as manufactured by the panelboard manufacturer.

2.06 FACTORY TESTS

- A. Standard factory testing shall be performed for the equipment furnished under this section and these tests shall be in accordance with the latest version of NEMA and UL standards. Certified copies of these tests shall be provided to the Engineer upon request.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify location at site before installing enclosure or conduits.
- B. Provide minimum access and working space, as described in NEC Article 110.26, for all electric equipment.

3.02 INSTALLATION

- A. Provide complete and perfect installation for all items of equipment included in this Section. Provide all miscellaneous bolts, washers, nuts, clips, lock washers, small hardware, etc., of equal rust resistant material, to make installation complete.
- B. Mount cabinet level and plumb, flush or surface as scheduled.
- C. Mount boxes for surface mounted panelboards so there is at least 1/2-inch air space between the box and the wall.
- D. Unless otherwise noted on the Drawings, top of cabinets shall be mounted 6-ft 0-inch above the floor, properly aligned and adequately supported independently of the connecting raceways.
- E. Properly align panel in cabinet.
- F. Connect panelboard branch circuit loads so that the load is distributed as equally as possible between the phase busses.
- G. All wiring in panelboards shall be neatly formed, grouped, and identified to provide a neat and orderly appearance.
- H. Paint all scratches, mars, etc., resulting from installation. Use matching paint.
- I. All unused or abandoned openings in panelboards shall be sealed using a knockout closure or similar device.
- J. All circuit wires removed from panels shall be disconnected completely with no cut off wire stubs left on the circuit breaker, ground, and neutral bar terminals.
- K. Splices in panelboards are not permitted, except for shunt trip connections.
- L. All panelboards shall be protected from physical damage, water damage, moisture, corrosion, dirt and dust during construction. Any panelboard judged to be unacceptable by the Engineer shall be replaced by the Contractor at no additional cost to the Owner.

3.03 IDENTIFICATION

- A. Branch circuit wires shall be labeled with associated pole number using vinyl cloth wrap around labels.
- B. Provide typed as built circuit directories giving location and nature of load served. Install circuit directories in each panelboard.
- C. Each panelboard shall be provided with two nameplates. The first shall be provided by

the panelboard manufacturer and shall identify the panel. The second shall be field installed by the Contractor to identify the panel's upstream power source. Refer to Section 16000 for additional information.

3.04 TESTING

- A. Field testing and commissioning shall be done in accordance with the latest revision of the "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" published by the InterNational Electrical Testing Association (NETA Standard ATS) unless otherwise modified by this Section.
- B. Record normal base load phase voltages and currents for each phase and the total neutral current and submit to the Engineer for review.

3.05 CLEANING

- A. Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner or clean lint-free rags. Do not use compressed air.

[END OF SECTION]

**SECTION 16600
UNDERGROUND SYSTEMS**

SECTION 16600 UNDERGROUND SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish and install a complete underground system of raceways and handholes as shown on the Drawings and as specified herein. Multiple underground raceways are referred to in this Section as duct banks, whether they are direct buried or concrete encased.
- B. The Contractor shall be responsible for setting handholes at the proper elevation such that the pitch of raceways will be towards handholes and away from structures, vaults and buildings.
- C. Duct bank and handhole depths vary. Coordinate with other utilities, yard piping, yard structures and field conditions to determine required depths and install raceways and handholes at that required depth at no additional cost to the Owner.
- D. Duct bank routing and handhole locations shown on the Drawings are diagrammatically depicted. Coordinate with other utilities, yard piping, yard structures and field conditions to determine required paths and depths at no additional cost to the Owner.

1.02 RELATED WORK

- A. All concrete and reinforcing steel shall be as specified in Division 3, but the responsibility of furnishing and installing the material shall be that of this Section.
- B. All trenching, excavation, and backfilling, including gravel and sand bedding and surface restoration shall be as specified in Division 2, but the responsibility of furnishing and installing the material shall be that of this Section.
- C. Raceways, fittings, and installation shall be as specified in Section 16110.
- D. Ground rods and other grounding materials and methods shall be as specified in Section 16660.
- E. Precast electrical concrete handholes shall be furnished under Division 16.

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, shop drawings and product data, for the following:
 - 1. Handholes.

2. Plastic duct spacers.
3. Handhole frames and covers.
4. Buoyancy calculations.
5. Warning tape.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Refer to Section 16110 and detail drawings for the material requirements for raceways.
- B. Cable racks, supports, pulling-in irons and hardware shall be hot dipped galvanized steel as manufactured by Line Materials Co.; Underground Devices, Inc.; Chance or equal.
- C. Precast handholes shall be heavy duty type, designed for a H-20-wheel load. Manufacturer shall provide buoyancy calculations to the Engineer for approval:
 1. Refer to the drawings for inside dimensions, headroom requirements and minimum thickness of concrete for precast reinforced concrete structures.
 2. Buoyancy calculations shall be prepared and stamped by a professional engineer registered in the State of Florida.
 3. Design Criteria:
 - a. Precast Concrete:
 - 1) Minimum compressive strength shall be 5,000 psi at 28 days.
 - 2) Maximum water to concrete ratio shall be 0.40 by weight.
 - 3) Minimum cement content shall be 600 lbs of cement per cubic yard of concrete.
 - b. Manufactured Products:
 - 1) Conform to ACI 318.
 - 2) Products shall support their own weight, weight of soil above at 130 pcf and a live load equal to AASHTO H20 applied to top slab. Depth of soil will be calculated from finished grade.
 - 3) Cast base slab and walls together to form a monolithic base section.
 - 4) Structure walls shall be designed for an equivalent lateral fluid pressure of 90 pcf. Originate pressure diagram at finished ground surface. Include lateral pressure from vehicles in accordance with AASHTO.
 - 5) Consider discontinuities in structure produced by openings and joints. Provide additional reinforcing around openings. Frame openings to carry full design loads to support walls.

- 6) Prevent flotation, with ground water level at finished ground surface, by dead weight of structure and soil load above structure. Do not consider skin friction, soil friction, or weight of equipment or contents in structure. Factor of safety against buoyancy shall be 1.15. If a concrete slab is required to prevent flotation, design the slab and provide anchorage of the structure to the slab.
 - 7) Design structure with a minimum number of joints.
 - 8) Provide lifting hooks for the top slab.
 - 9) Locate access openings, knockouts, and penetrations as indicated.
4. The date of manufacture, name and trademark of manufacturer shall be marked on the inside of each precast section.
 5. Provide integrally cast knock-out panels in precast concrete handhole sections at locations indicated and with sizes indicated. Knock-out panels shall have no steel reinforcing.
 6. Seal tongue and groove joints of precast handhole sections with rubber O-ring gasket. O- ring gasket shall conform to ASTM C443. In lieu of the O-ring gasket, a flexible joint sealant may be used. Sealant shall be Kent Seal No. 2; ConSeal No. 2; Ram-Nek or equal. Completed joints shall withstand 15 psi internal water pressure without leakage or displacement of gasket or sealant.
 7. Damp proofing shall be Hydrocide 648 by Sonneborn Building Products; Dehydratine 4 by A.C. Horn, Inc.; RIW Marine Liquid by Toch Brothers; or equal.
- D. Precast handholes shall be as manufactured by Brooks Products Co., or equal and constructed to dimensions as shown on the Drawings.
 - E. Handhole frames and covers shall be hot dipped galvanized steel and designed for Class H-20- wheel loading. Handhole covers and hatches shall have Type 316 stainless-steel security bolts. Covers shall be marked “ELECTRIC” unless otherwise shown on the Drawings.
 - F. Ground rods and other grounding materials and methods shall be as specified in Section 16660.
 - G. Bell ends and plastic duct spacers shall be as manufactured by Carlon; Underground Devices Inc. or equal.
 - H. Pull line for spare conduits shall be 1/8-inch nylon rope.
 - I. Cement, lime, aggregate and all other concrete components for concrete encasement of duct banks shall be as specified in Section 03300 except that aggregate size shall not exceed 3/8- inch. Concrete shall have a minimum compressive strength at 28 days of 2500 psi.

J. Detectable Warning Tape:

1. Detectable warning tape shall be capable of being detected or located by either conductive or inductive location techniques.
2. Detectable warning tape shall consist of 5 mil (.005 inch) overall thickness; five-ply composition; ultra-high molecular weight; virgin polyethylene; acid; alkaline and corrosion resistant; with 150 pounds of tensile break strength minimum per 6-inch width.
3. The top side of the tracer tape shall be color banded red for electrical and high voltage lines, and orange for signal, communication, telephone and fire alarm lines. Tracer tape shall be 4-inch-wide with four color bands. The tape shall be inscribed with the warning message for the utility such as "CAUTION – ELECTRICAL LINED BURIED BELOW". Tape shall be as manufactured by Mutual Industries, Inc., Terra Tape, Div. of Reef Industries Inc. or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install raceways to drain away from buildings. Raceways between handholes shall drain toward the handholes. Raceway slopes shall not be less than 3-inch per 100-ft.
- B. Reinforce duct banks as shown on the Drawings.
- C. Lay raceway lines in trenches on a clean backfill bedding not less than 6 inches thick and well graded and compacted.
- D. Use plastic spacers located not more than 4-ft apart to hold raceways in place. Spacers shall provide not less than 2-inch clearance between raceways and edge of concrete envelope.
- E. The minimum cover for raceway banks if not concrete encased shall be 24 inches, unless otherwise permitted by the Engineer.
- F. Make raceway entrances to buildings, structures, and vaults (except handholes) with rigid aluminum conduit not less than 10-ft long.
- G. Conduits run below floor slabs in slab-on-grade construction shall be rigid aluminum conduit.

- H. Raceway terminations at handholes shall be with end bells for PVC conduit and insulated throat grounding bushings with lay-in type lugs for metal conduit.
- I. For bends in 2-inch and larger raceways, use long radius elbows, sweeps and offsets.
- J. Elbows and sweeps are to be rigid aluminum (painted with bitumastic) where shown on the drawings.
- K. All 2-inch and larger raceways shall have a mandrel drawn through followed by a swab to clean out any obstruction which may cause cable abrasions. The mandrel shall be 12 inches in length and the diameter 1/2-inch less than the inside diameter of the raceway. All 1 1/2-inch and smaller raceways shall be swabbed clean before installing cables.
- L. Plug and seal spare raceways watertight at all handholes, buildings and structures.
- M. Seal the ends of raceways and make watertight at all handholes, buildings and structures.
- N. Install pulling-in irons opposite all raceway entrances to handholes.
- O. Train cables in handholes and support and restrain them on racks and hooks at intervals not greater than 3 feet. Supports shall be installed on each side of all splices. Furnish inserts on all handhole walls for mounting future racks as well as racks required for present installation.
- P. A 3/16-inch polypropylene pull line shall be installed and left in all spare and empty raceways.
- Q. Install detectable warning tape in all underground raceways, duct banks, etc. Tape shall be placed along the entire length of the raceway and installed 18 inches above the top of the raceway or duct rely on compacted backfill material. Where trench exceeds 24-inch width, provide additional detectable tape runs to mark each side of the duct bank in addition to the one in the center.
- R. Handhole Installation:
 - 1. Place bases on 12-inch bed screened gravel or crushed stone as shown on the drawings. Set base grade so that a minimum grade adjustment of 4 inch of grade ring is required to bring the handhole frame and cover to final grade:
 - 2. Use HDPE grade rings to adjust frame and cover to final grade.
 - 3. Set precast sections plumb with a 1/4-inch maximum out-of-plumb tolerance. Seal joints of precast sections with either a rubber O-ring set in a recess or a flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. Fill

the outside and inside joint with non-shrink grout and finished flush with the adjoining surfaces. Caulk the inside of leaking barrel section joints with non-shrink grout. If leaks appear in the handholes the inside joints shall be cleaned out and remade in a manner that will result in a watertight joint.

4. Allow joints to set for 24 hours before backfilling. Backfilling shall be performed by bringing the fill up evenly on all sides.
5. Plug holes in concrete with non-shrink grout or non-shrink grout in combination with concrete plugs. Finish flush on the inside.
6. Cut holes in precast sections to accommodate conduits prior to setting handhole sections in place.
7. Handhole covers in streets shall finish flush with the finished paving and in other areas shall finish 3 inches above crown of adjacent roadway. Floor elevations of handholes shall be so set that the center line of the lowest conduit entering will be not less than 1-foot above the floor, and center line of the highest conduit entering will not be less than 1-foot below the roof slab.

S. Concrete monuments:

1. Concrete monuments shall be provided at each stubbed conduit location. Monuments shall be as shown on the Drawings and shall be installed in the same manner outline for handhole covers.
2. Concrete monuments shall be provided along the path of major conduit duct banks (duct banks which contain at least 10 conduits). Monuments shall be located at each change in direction if a handhole is not provided, and at 100-foot intervals of straight runs between handholes.

T. Grounding and Bonding:

1. A 3/4 inch by 10-foot copper-clad ground rod shall be driven in the bottom of each handhole. All bond wires, metal conduits and metal cable racks shall be bonded to the ground rod.

U. Brickwork:

1. Mix mortar only in such quantity as may be required for immediate use and use before initial set takes place. Anti-freeze mixtures shall not be included in the mortar. Install masonry when the outside temperature is above 40 degrees F unless provisions are made to protect the mortar, brick and finished work from frost by

heating and enclosing the work with tarpaulins other equivalent material.

2. Set handhole covers and frames in a full mortar bed. Utilize HDPE grade rings, a maximum of 8-inch-thick, to assure frame and cover are set to the finished grade.
- V. Damp proofing:
1. Coat outer surfaces of precast handholes with two coats of damp proofing in accordance with manufacturer's instructions.

3.02 CONCRETE ELECTRICAL DUCT ENCASEMENT

- A. Concrete shall be measured, mixed, and placed, and compacted as required in Section 03300 for 2500 psi concrete and as specified below.
- B. Provide not less than 3 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts. Refer to drawings for spacing requirements.
- C. All duct line concrete pours shall be continuous between handholes and between handholes and structures.
- D. Where duct lines pass through concrete walls, concrete envelopes shall be extended through the finished flush with inside surfaces. Watertight construction joints of an approved type shall be provided.
- E. Duct banks shall be reinforced when laid on backfill covering new pipelines, roads, parking lots or any are subject to vehicular traffic. Beneath these areas, install reinforcing bars as shown on the Drawings, extending 10-ft beyond area needing protection.
- F. Duct lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded.
- G. The minimum cover for concrete encased duct banks shall be 24 inches, unless otherwise permitted by the Engineer.
- H. All electrical duct banks shall be colored red for safety purposes. Color may be added during the concrete pour and raked in.

3.03 CLEANING

- A. All new handholes shall be thoroughly cleaned of all silt, debris and foreign matter prior to final inspection.

3.04 AS BUILTS

- A. Provide as-built drawings showing underground routing along with locations of handholes. Include top of duct bank elevations.
- B. For duct banks, provide handhole elevation sketches identifying all circuits and their relative conduit for all sides of the handhole. Identify spare conduits also. (I.E. north side, south side, east side, west side).

[END OF SECTION]

**SECTION 16660
GROUNDING SYSTEM**

SECTION 16660 GROUNDING SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install a complete grounding system in strict accordance with Article 250 of the National Electrical Code (NEC), as shown on the Drawings and as specified herein.
- B. All raceways, conduits, ducts, and multi-conductor cables for power and control wiring shall contain equipment grounding conductors sized in accordance with the NEC. Minimum sizes shall be No. 12 AWG.
- C. Supplemental grounding conductors shall be provided as shown on the Drawings.

1.02 RELATED WORK

- A. Refer to Section 16110 for conduit.
- B. Refer to Section 16120 for wire.

1.03 SUBMITTALS

- A. Submit to the Engineer, in accordance with Section 01300, the following:
 - 1. Manufacturer's name and catalog data for ground rods, exothermic welding methods, grounding clamps, ground test wells.
 - 2. Results of grounding and bonding resistance testing as specified herein.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Conduit shall be as specified under Section 16110.
- B. Wire shall be as specified under Section 16120.
- C. Ground rods shall be 3/4-inch diameter by 10-foot copper clad steel and constructed in accordance with UL 467. The minimum copper thickness shall be 0.25 mm (10 mil). Ground rods shall be Copperweld or equal.

- D. Grounding conduit hubs shall be malleable iron type, manufactured by Thomas & Betts Co.; Catalog No. 3940 (3/4-inch conduit size), similar to Burndy; O.Z./Gedney Co. or equal, and of the correct size for the conduit.
- E. Waterpipe ground clamps shall be cast bronze saddle type, manufactured by Thomas & Betts Co. Cat. No. 2 (1/2-inch, 3/4-inch, or 1-inch size), similar by Burndy; O.Z./Gedney Co. or equal, and of the correct size for the pipe.
- F. Exothermic welding shall be by CADWELD process, or equal. Molds and powder shall be furnished by the same manufacturer and sized and selected per manufacturer's instructions for specific combination of conductors and connected items.
- G. Welds used indoors in occupied buildings or confined spaces shall be the low emission type, CADWELD EXOLON or equal.
- H. Ground rod test wells shall be as detailed on the Drawings.
- I. Ground Enhancement Material (GEM) shall be a low-resistance, non-corrosive, carbon dust based material that improves grounding effectiveness. GEM shall contain cement, which hardens when set to provide a permanent, maintenance-free, low-resistant grounding system that never leaches or washes away. GEM shall be suitable for installation in trenches or backfilling around ground rods. GEM shall have a resistivity of no more than 20 ohm-cm in cured state. GEM shall be ERICO Part No. GEM25A or equivalent.

PART 3 - EXECUTION

3.01 GENERAL INSTALLATION

- A. Where grounding conductors pass through floor slabs, walls, etc., they shall be installed in conduit or sleeved.
- B. All grounding electrode conductors subject to mechanical damage shall be protected by non-ferrous conduit to avoid a choke effect for fault currents. Run grounding electrode conductors in Schedule 80 PVC conduits and seal conduits watertight.
- C. All underground connections, connections which will be inaccessible after completion of project, connections to structural steel, or connections to ground rods shall be made by using an exothermic welding process.
- D. All equipment ground bus, ground pads, frames, enclosures, etc. shall have surfaces at point of connection thoroughly cleaned and brightened just prior to actually making the connection.

- E. The service entrance equipment ground bus shall be grounded to a 3/4-inch cold water pipe and to the ground as indicated on the Drawings. Do not allow water pipe connections to be painted. If the connections are painted, disassemble them and re make them with new fittings.
- F. Install equipment grounding conductors with all feeders and branch circuits.
- G. Metal conduits stubbed into a motor control center shall be terminated with insulated grounding bushings and connected to the motor control center ground bus. Bond boxes mounted below motor control centers to the motor control center ground bus. Size the grounding wire in accordance with NEC Table 250.122, except that a minimum No. 12 AWG shall be used.
- H. Ground bus in all motor control centers and unit substations shall be connected to the service entrance equipment ground bus with a No. 1/0 conductor or as noted on the Drawings.
- I. Separately derived systems such as transformers or generators (if identified as such) shall bond neutral and ground together with a bonding jumper at the equipment in accordance with NEC 250.102. Connection to the grounding electrode system via the electrode grounding conductor shall be in accordance with NEC Table 250.66 or as shown on the Drawings.
- J. Grounding electrodes shall be installed vertically and not allowed to be deformed or driven at an angle. Where driving is difficult or where rock is encountered, Contractor shall use purpose- designed drilling equipment, install the rod into the drilled hole and backfill around rod using ground enhancement material (GEM) mixed with water to form a slurry in accordance with the Manufacturer's instructions.
- K. Install ground grids as shown on the Drawings.
- L. All equipment enclosures, motor and transformer frames, conduits systems, cable armor, exposed structural steel and all other equipment and materials required by the NEC to be grounded, shall be grounded and bonded in accordance with the NEC.
- M. Seal exposed connections between different metals with No-Oxide Paint Grade A or equal.
- N. Lay all underground grounding conductors slack and, where exposed to mechanical injury, protect by pipes or other substantial guards. If guards are iron pipe, or other magnetic material, electrically connect conductors to both ends of the guard. Make connections as specified herein.
- O. Care shall be taken to ensure good ground continuity, in particular between the

conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

- P. All grounding type receptacles shall be grounded to the outlet boxes with a No. 12 AWG green conductor connected to the ground terminal of the receptacle and fastened to the outlet box by means of a grounding screw.
- Q. Molds used for welding shall be in good condition. The number of welds made per mold shall not exceed manufacturer's recommendations.
- R. Ground metal poles supporting outdoor lighting fixtures mounted on grade to a supplemental grounding electrode (rod) in addition to the separate equipment grounding conductor run with the supply branch circuit.
- S. Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with ground clamp connectors.
- T. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters and HVAC equipment. Use braided-type bonding straps.
- U. Ufer Ground (Concrete-Encased Electrode): Fabricate in accordance with NEC Article 250.52 and connect to grounding electrode system.
- V. Install driven ground rods at manholes and handholes as shown on detail Drawing.

3.02 ATTACHMENT TO STRUCTURAL STEEL

- A. Location of attachment bonds of ground conductors shall be at points not subject to mechanical damage, but if possible where accessible for inspection.
- B. Attach by exothermic weld for wire sizes #1/0 AWG and larger.
- C. Where the wire size is smaller than #1/0 AWG, weld a pigtail of #1/0 AWG to the structural steel and then mechanically connect the two wires.

3.03 INSPECTION AND TESTING

- A. Inspect the grounding and bonding system conductors and connections for tightness and proper installation.
- B. Measure ground resistance of each grounding electrode system by the fall-of-potential method using a digital ground resistance meter in accordance with the test instrument manufacturer's instructions and IEEE Standard No. 81.

- C. Notify the Engineer in writing at least two weeks prior to scheduling any testing.
- D. Testing shall be performed under dry conditions, with no rainfall three days prior to test.
- E. Test report shall include the following minimum information: weather and soil conditions, location of test, manufacturer and model of test instrument, technician's name and company, ground rod materials, date of test and the test data. Provide graphical data along with the numerical resistance to ground.
- F. Testing shall be performed before energizing the distribution system.
- G. A separate test shall be conducted for each building or system.
- H. Notify the Engineer immediately if the resistance to ground for any building or system is greater than five ohms.

[END OF SECTION]

SECTION 01052 – Contractor’s Application for Payment
Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion

Application for Payment No. _____
For Work Accomplished through the period of _____ through _____

To: Indian River County (OWNER)
From: _____ (CONTRACTOR)

Bid No.: Error! Reference source not found.

1) Attach detailed schedule and copies of all paid invoices.

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

CONTRACTOR'S CERTIFICATION:

UNDER PENALTY OF PERJURY, the undersigned CONTRACTOR certifies that (1) the labor and materials listed on this request for payment have been used in the construction of this Work; (2) payment received from the last pay request has been used to make payments to all subcontractors, laborers, materialmen and suppliers except as listed on Attachment A, below; (3) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); (4) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective; and (5) If this Periodic Estimate is for a Final Payment to project or improvement, I further certify that all persons doing work upon or furnishing materials or supplies for this project or improvement under this foregoing contract have been paid in full, and that all taxes imposed by Chapter 212 Florida Statutes, (Sales and Use Tax Act, as Amended) have been paid and discharged, and that I have no claims against the OWNER.

Attached to or submitted with this form are:

- Signed release of lien forms (partial or final as applicable) from all subcontractors, laborers, materialmen and suppliers except as listed on Attachment A, together with an explanation as to why any release of lien form is not included;

2. Updated Construction Schedule per [Specification Section 01310](#).

Dated _____

By: _____
(CONTRACTOR – must be signed by
an Officer of the Corporation)

Print Name and Title

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization,
this _____ day of _____ 20_, by _____
(name of person making statement).

(Signature of Notary Public - State of Florida)
(Print, Type, or Stamp Commissioned Name of Notary Public)

who is personally known to me or who has produced
_____ as identification.

Please remit payment to:

Contractor's Name: _____

Address: _____

[The remainder of this page was left blank intentionally]

SURETY'S CONSENT OF PAYMENT TO CONTRACTOR:

The Surety, _____

_____, a corporation, in accordance with Public Construction Bond Number _____, hereby consents to payment by the OWNER to the CONTRACTOR, for the amounts specified in this CONTRACTOR'S APPLICATION FOR PAYMENT.

TO BE EXECUTED BY CORPORATE SURETY:

Attest:

Secretary

Corporate Surety

Business Address

BY: _____

Print Name: _____

Title: _____

(Affix Corporate SEAL)

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this ____ day of _____ 20____, by _____ (name of person making statement).

(Signature of Notary Public - State of Florida)

(Print, Type, or Stamp Commissioned Name of Notary Public)

who is personally known to me or who has produced _____ as identification.

[The remainder of this page was left blank intentionally]

CERTIFICATION OF INDIAN RIVER COUNTY PROJECT MANAGER:

I certify that I have reviewed the above and foregoing Periodic Estimate for Partial Payment; that to the best of my knowledge and belief it appears to be a reasonably accurate statement of the work performed and/or material supplied by the Contractor. I am not certifying as to whether or not the Contractor has paid all subcontractors, laborers, materialmen and suppliers because I am not in a position to accurately determine that issue.

Dated _____

SIGNATURE

CERTIFICATION OF INDIAN RIVER COUNTY INSPECTOR:

I have checked the estimate against the Contractor's Schedule of Amounts for Contract Payments and the notes and reports of my inspections of the project. To the best of my knowledge, this statement of work performed and/or materials supplied appears to be reasonably accurate, that the Contractor appears to be observing the requirements of the Contract with respect to construction, and that the Contractor should be paid the amount requested above, unless otherwise noted by me. I am not certifying as to whether or not the Contractor has paid all subcontractors, laborers, materialmen and suppliers because I am not in a position to accurately determine that issue.

Dated _____

SIGNATURE

[The Remainder of This Page Was Left Blank Intentionally]

ATTACHMENT A

- 1. List of all subcontractors, laborers, materialmen and suppliers who have not been paid from the payment received from the last Pay Request and the reason why they were not paid (attach additional pages as necessary):**

- 2. List of all subcontractors, laborers, materialmen and suppliers for which a signed release of lien form (partial or final as applicable) is not included with this Pay Request, together with an explanation as to why the release of lien form is not included (attach additional pages as necessary):**

Certificate of Substantial Completion

Date of Issuance: _____, 20____

OWNER: Indian River County
CONTRACTOR: _____
CONTRACT FOR: Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion
Project Description: Error! Reference source not found.
OWNER's Bid No. 2024027

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

To: _____
OWNER

And To: _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within 30 calendar days of the above date of Substantial Completion.

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

OWNER:

CONTRACTOR:

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

[For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.]

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 on: _____ (Date).

ENGINEER: _____

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____ (date).

CONTRACTOR: _____

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____ (date).

OWNER: INDIAN RIVER COUNTY _____

By: _____
(Authorized Signature)

**** END OF SECTION ****

CONTRACTOR'S FINAL CERTIFICATION OF THE WORK
(TO ACCOMPANY CONTRACTOR'S FINAL APPLICATION FOR PAYMENT)

PROJECT NAME: Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion
BID NO.: 2024027

STATE OF _____
COUNTY OF _____

Personally before me the undersigned officer, authorized by the laws of said state to administer oaths, comes _____, who on oath says: That he is the CONTRACTOR with whom Indian River County, Florida, a political subdivision of said state, did on the _____ day of _____, 20____, enter into a contract for the performance of certain work, more particularly described as follows:

Error! Reference source not found. construction of the Segment 3 Cell 3 Landfill Expansion Project at the Indian River County Solid Waste Disposal District Landfill at 1325 74th Ave. SW, Vero Beach, FL 32968. The overall scope of the Project includes construction of Cell 3 liner system and appurtenant structures as indicated on the Construction Drawings. Details include: Mobilization/Demobilization, Construction of Cell 3 double liner system, including anchor trench and temporary intercell berm/rain flap, and placement of liner protective layer soils to the grades shown on the Construction Drawings; Construction of the leachate collection system (LCS) and leak detection system (LDS), leachate transfer system and appurtenant structures; Establishment of erosion and sediment control structures; and Construction of other features of the Cell 3 – Segment 3 Expansion of the Class I Landfill in accordance with the Construction Drawings, Technical Specifications, Construction Quality Assurance (CQA) Plan, or as directed by the Owner or the Engineer.

UNDER PENALTY OF PERJURY, affiant further says that said construction has been completed and the Contract therefore fully performed and final payment is now due and that all liens of all firms and individuals contracting directly with or directly employed by such CONTRACTOR have been paid in full EXCEPT:

Name	Description/Amount
_____	_____
_____	_____

who have not been paid and who are due the amount set forth.

Affiant further says that:

1. CONTRACTOR has reviewed the Contract Documents.
2. CONTRACTOR has reviewed the Work for compliance with the Contract Documents.
3. CONTRACTOR has completed the Work in accordance with the Contract Documents.

4. All equipment and systems have been tested in the presence of the ENGINEER or his representative and are fully operational with no defects or deficiencies except as listed below.

5. The Work is complete and ready for final acceptance by the OWNER.
6. CONTRACTOR hereby certifies that it has no claims against the OWNER.

(Corporate Seal)

(Contractor)

By: _____

STATE OF _____

COUNTY OF _____

Sworn to (or affirmed) and subscribed before me by means of physical presence or online notarization, this _____ day of _____ 20__, by _____

(name of person making statement).

(Signature of Notary Public - State of Florida)
(Print, Type, or Stamp Commissioned Name of Notary Public)

who is personally known to me or who has produced _____ as identification.

+ + END OF SECTION + +

PROFESSIONAL SURVEYOR AND MAPPER'S CERTIFICATION AS TO ELEVATIONS AND LOCATIONS OF THE WORK

(TO BE COMPLETED BY A FLORIDA PROFESSIONAL SURVEYOR AND MAPPER RETAINED BY THE CONTRACTOR AND TO ACCOMPANY CONTRACTOR'S FINAL APPLICATION FOR PAYMENT)

I CERTIFY that I am a Florida Professional Surveyor and Mapper retained by:

(Insert name of CONTRACTOR)

Who is the CONTRACTOR for the following Project:

PROJECT NAME: Phase 2 – Cell 3 Construction Class 1 Landfill – Segment 3 Expansion
Bid # 2024027

I FURTHER CERTIFY that I have personally performed the survey work for the preparation of Record Drawings for the CONTRACTOR for this project or that such work was performed under my direct control and supervision.

I FURTHER CERTIFY that all constructed elevations and locations of the Work are in conformance with the Contract Documents, except for discrepancies listed below.

[Attach additional sheets as necessary]

(SURVEYOR'S SEAL)

CERTIFIED BY: _____

Printed Name: _____

Florida Professional Surveyor and Mapper Registration Number: _____

Date Signed and Sealed by Professional Surveyor and Mapper: _____

Company Name: _____

Company Address: _____

Telephone Number: _____

Prepared for



**INDIAN RIVER COUNTY
SOLID WASTE DISPOSAL DISTRICT**

1325 74th Avenue, S.W.
Vero Beach, FL 32968

**CONSTRUCTION QUALITY ASSURANCE
(CQA) PLAN**

**PHASE II – CELL 3 CONSTRUCTION
CLASS I LANDFILL – SEGMENT 3 EXPANSION**

Indian River County, Florida

Prepared by

Geosyntec 
consultants

engineers | scientists | innovators

1200 Riverplace Boulevard
Suite 710
Jacksonville, FL 32207

Project Number FL9363A

November 2023

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Appendix A CQA Forms and Log

1 INTRODUCTION

1.1 Overview

This Construction Quality Assurance (CQA) Plan describes the quality assurance and construction quality control (CQC) activities that will be undertaken during construction of Cell 3 of the Segment 3 Expansion at the Indian River County Landfill (IRCL, Class I) facility located in Indian River County, Florida. The purpose of this document is to define the scope, formal organization, and procedures necessary to achieve a high level of quality and assure that Cell 3 of the Segment 3 Expansion is constructed in compliance with the approved design as shown or indicated in the Construction Drawings and Technical Specifications. This plan addresses the CQA and CQC activities to be performed during construction.

1.2 Project Description

The design of Cell 3 of the Segment 3 Expansion at the IRCL, Class I facility is presented in the Construction Drawings and Technical Specifications. The project includes the following:

- double composite liner construction including geosynthetics installation;
- construction of the leachate collection, detection, removal, and transmission system;
- construction of the surface water management system;
- installation of various appurtenances such as mechanical and electrical systems, and piping; and/or
- general site work including landfill grading and general earthwork.

1.3 CQA Plan Scope

The CQA Plan establishes the quality assurance (QA) and quality control (QC) monitoring and testing activities to be implemented during construction at the IRCL, Class I facility. The CQA Plan was developed in consideration of the current Florida Department of Environmental Protection (FDEP) guidelines and regulations. The scope of the CQA Plan includes:

- defining the responsibilities of parties involved with the construction of Cell 3 of the Segment 3 Expansion at the IRCL, Class I facility;
- providing guidance in the proper construction of Cell 3 components;
- establishing testing protocols for the evaluation of Cell 3 components;

- establishing procedures for construction documentation; and
- providing the means for assuring that the overall construction conforms to the Construction Drawings and Technical Specifications.

The CQA Plan is intended to establish procedures for the CQA Consultant and to inform the Contractor of CQA activities during the construction at the IRCL, Class I facility. The CQA Plan is considered a supplement to the Technical Specifications and a part of the construction contract. In the case of any conflict between the CQA procedures described in this plan and the requirements of the Technical Specifications, the Technical Specifications will govern.

1.4 CQA Plan Organization

The remainder of this CQA Plan is organized as follows:

- definitions of key terms are presented in Section 2;
- project organization and descriptions, responsibilities, and qualifications of key parties involved with the construction at the IRCL, Class I facility are presented in Section 3;
- requirements for CQA documentation are described in Section 4;
- CQA activities for the soil components of the IRCL, Class I facility, to include fill placement, liner system, and general earthwork, are presented in Section 5;
- CQA activities for geomembranes, geosynthetic clay liner, geotextiles, and geocomposites are presented in Sections 6 through 9, respectively;
- CQA activities for pipes and fittings are covered in Section 10;
- CQA activities for mechanical and electrical components are described in Section 11;
- CQA activities for concrete associated work are outlined in Section 12; and
- CQA activities for road construction and general civil site work are presented in Sections 13 & 14 respectively.

2 CQA PLAN DEFINITIONS

2.1 Construction Quality Assurance and Construction Quality Control

In the context of this document, construction quality assurance and construction quality control are defined as follows:

- Construction Quality Assurance (CQA) - The planned and systematic means and actions designed to assure adequate confidence that materials and/or services meet contractual and regulatory requirements and will perform satisfactorily in service.
- Construction Quality Control (CQC) - Those actions which provide a means to measure and regulate the characteristics of an item or service in relation to contractual and regulatory requirements.

In the context of this document:

- CQA refers to means and actions employed by the CQA Consultant, Design Engineer, or the Owner to assure conformity of the various components of the IRCL, Class I facility construction project with the requirements of the Construction Drawings and Technical Specifications.
- CQC refers to those actions taken by the CQA Consultant, Contractor, Manufacturers, or Installers to ensure that the materials and the workmanship of the various components of the IRCL, Class I facility construction project meet the requirements of the Construction Drawings and Technical Specifications. In the case of the geosynthetic components of these systems, CQC is provided by the CQA Consultant and/or Manufacturers and Installers of the various geosynthetics.

2.2 Plans and Specifications

In this CQA Plan, reference to Construction Drawings and Technical Specifications is understood to mean those plans and specifications issued as a part of this specific contract for construction of Cell 3 of the Segment 3 Expansion at the IRCL, Class I facility. In all cases, it is expected that this CQA Plan will conform to the Construction Drawings and Technical Specifications. In case of conflict, the approved Construction Drawings and Technical Specifications will govern.

2.3 Geosynthetics

Geosynthetics is the generic term for all synthetic materials used in geotechnical engineering applications; the term includes geotextiles, geogrids, geonets, geomembranes, geosynthetic clay

liners (GCL), and geocomposites. There are four types of geosynthetic products referenced in this CQA Plan that are included in the IRCL, Class I facility construction. These geosynthetics include: (i) high density polyethylene (HDPE) geomembrane used in the liner system; (ii) GCL used in the liner system; (iii) geotextiles used as filters, cushions, or separators; and (iv) geocomposite drainage layers used in the liner system.

2.4 Construction Activities

In the context of this CQA Plan, the IRCL, Class I facility construction is understood to include:

- geosynthetic and soil components of the double liner system;
- leachate collection, detection, removal, transmission, and storage systems;
- surface-water management system components;
- other site work including grading and general earthwork;
- access ramp and road work; and
- other construction activities as assigned by the Owner.

2.5 CQA Lines of Communications

Successful execution of this CQA Plan is dependent on open and continuous communication between all parties having a role in the project. The lines of communication between the Owner, Engineer of Record, Design Engineer, Construction Manager, Contractor, and CQA Consultant are defined in the organization charts included in Section 3 of this CQA Plan.

3 PROJECT ORGANIZATION AND PERSONNEL

3.1 Overview

The IRCL, Class I facility construction organization chart is shown in Figure 3-1. It is understood that the Project Manager will act on behalf of the Owner in all matters relating to the construction of the IRCL, Class I facility. Day-to-day construction activities at the IRCL, Class I facility will be managed through the direct interaction of several parties below Project Manager level including but not limited to the Construction Manager, Design Engineer, Contractor, and CQA Consultant. The organization chart for the IRCL, Class I facility CQA Consultant is presented in Figure 3-2. The description, qualifications, and responsibilities of the parties responsible for construction and CQA at the IRCL, Class I facility project are described below.

3.2 Construction Manager

The Construction Manager may be an individual or firm employed by the Project Manager or Owner and who is responsible for overall management of the construction project at the site. In this CQA plan the term "Construction Manager" shall refer specifically to an authorized representative of the Project Manager or Owner at the IRCL, Class I facility. The Construction Manager will hold a baccalaureate degree in construction management, engineering, or related field or have 10 years of construction management experience. The Construction Manager will also have three years of landfill construction experience. The Construction Manager shall be responsible for coordination and oversight of all construction activities including: (i) contract administration; (ii) construction management; (iii) review of any modifications or changes to the construction contract documents; and (iv) final approval authority for contract or shop drawings and submittals.

3.3 Design Engineer

The Design Engineer is the individual representing the firm having responsibility for the design of the Cell 3 construction project. The Design Engineer will hold a minimum of a baccalaureate degree in engineering, be a Professional Engineer registered in the state of Florida, and have 10 years experience in construction management, engineering, or related fields. The Design Engineer shall have expertise which demonstrates significant familiarity with geosynthetics and soils, as appropriate, including design and construction experience related to landfill liner systems and final cover systems. The Design Engineer is responsible for approving all design and specification changes and making design clarifications that may be required during construction at the IRCL facility. The Design Engineer shall assist the Construction Manager in reviewing and approving the Contractor's shop drawings and submittals as necessary. The Design Engineer will not be present on-site but will visit the project during construction and

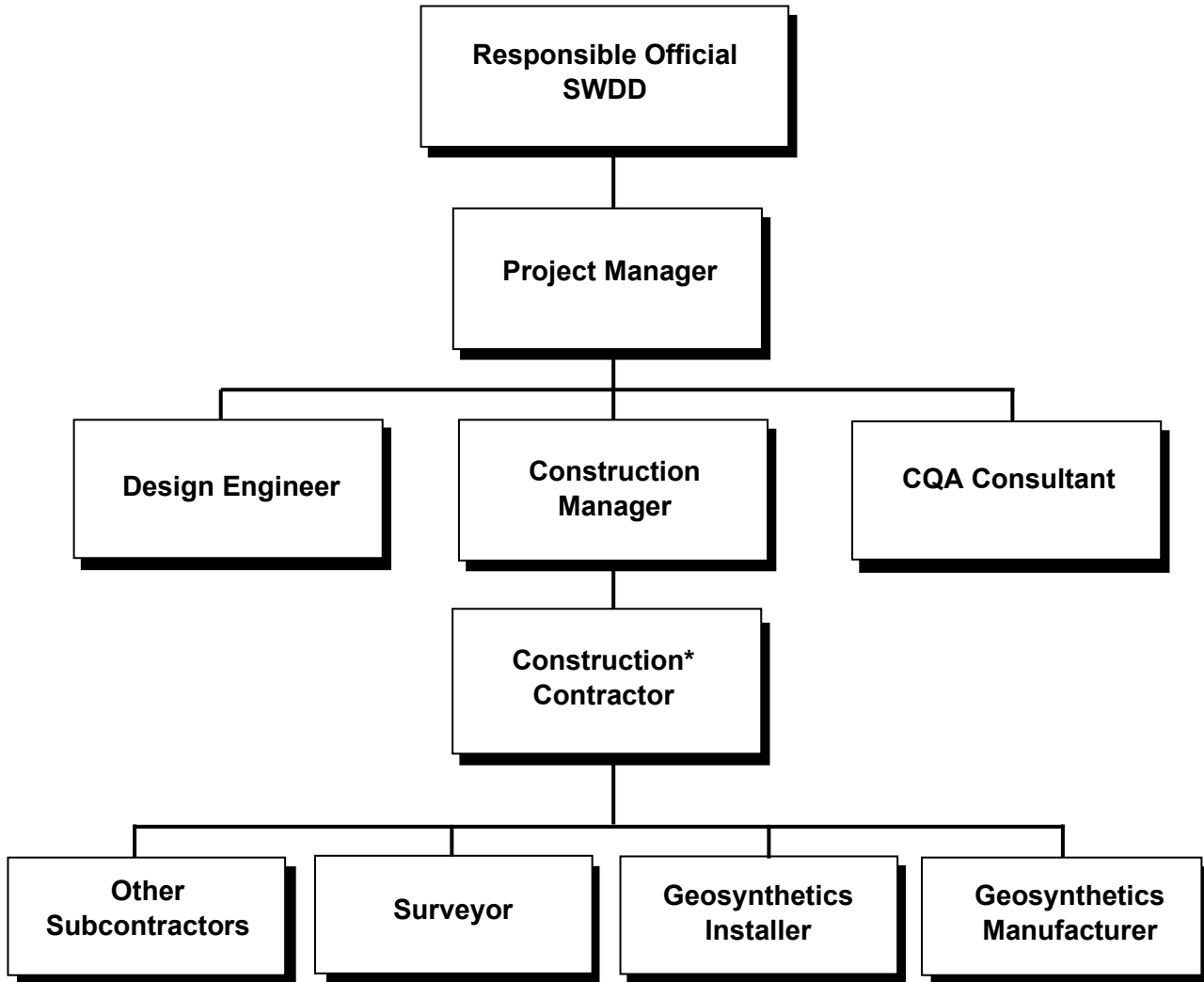
attend the project coordination meetings as required to assure conformance with plans and specifications. The Design Engineer will be capable of discussing and interpreting all elements of the IRCL, Class I facility design. The Design Engineer shall have the authority to recommend changes or modifications to the Construction Drawings and Technical Specifications for approval by the Indian River County (IRC) Solid Waste Disposal District (SWDD) and FDEP, as required.

3.4 Contractor

The Contractor is the firm or corporation having a legally binding agreement to construct components of the IRCL, Class I facility construction or shall be qualified construction personnel hired directly by the Owner and working under the direct supervision of a construction foreman and superintendent. The Contractor is represented on site by a qualified individual who is authorized to act on behalf of the Contractor in all matters pertaining to the construction at the IRCL, Class I facility. The Contractor shall be qualified as required by the contract to perform all aspects of work required to successfully construct the project. The Contractor shall be registered in accordance with applicable local, state, and federal requirements and shall demonstrate significant prior related experience. The Contractor's field representative shall be a qualified individual who is able to perform all tasks associated with IRCL, Class I facility construction activities. The Contractor's field representative shall demonstrate experience in similar projects. The Contractor's field representative shall have the authority to direct and instruct the Contractor's crews and its subcontractors.

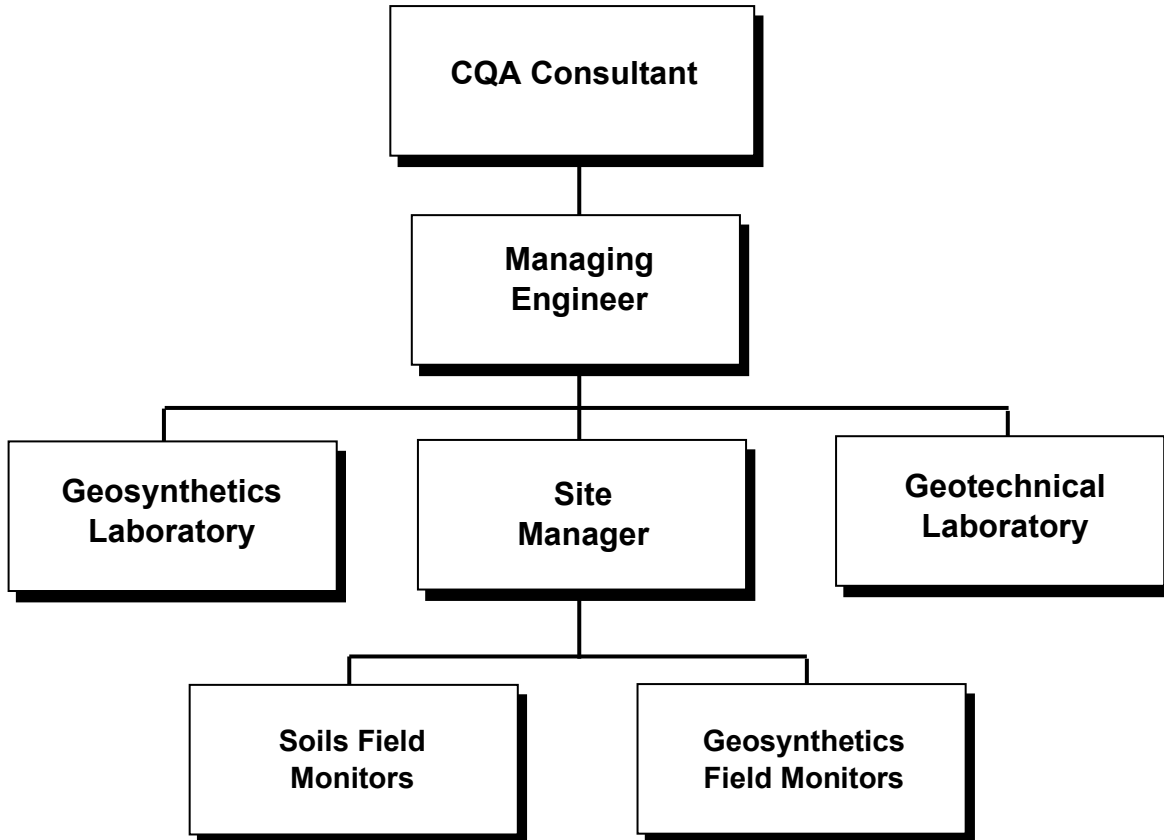
The Contractor is responsible for all construction materials and activities. The Contractor is also responsible for scheduling and coordination of the required work with its subcontractors to complete the project within the construction schedule approved by the Construction Manager. The Contractor shall provide an experienced supervisory representative at all times during any construction activity on site. The Contractor is responsible for furnishing as-built record drawings and a copy of all documentation required during the construction at the IRCL, Class I facility. The Contractor is also responsible for updating all construction drawings for any deviations from the original plans and specifications on a regular basis.

Figure 3-1
IRCL, Class I Facility Construction Organization Chart



* The Construction Contractor is assumed to have earthwork capabilities as an integral part of the firm. Otherwise, the earthwork subcontractor is a major entity in this chart under the prime contractor.

Figure 3-2
IRCL, Class I Facility CQA Organization Chart



The Contractor's field representative is responsible for coordinating and supervising the work of all subcontractors on site. At a minimum, the Contractor's field representative will be responsible for the following:

- informing the Construction Manager of any discrepancies between the plans and specifications and the field conditions;
- submitting all documentation required by the Construction Drawings and Technical Specifications in a timely manner;
- attending all project coordination meetings held on site;
- scheduling all phases of the construction;
- maintaining a daily log of all construction activities on site;
- implementing and verifying all QC procedures required of the Contractor and/or subcontractors; and
- submitting proposed alternative materials or construction methods to the Construction Manager for approval prior to acquisition and use.

3.5 CQA Consultant

3.5.1 Definition

The CQA Consultant is the party, independent from the Owner and the Contractor, responsible for observing, testing, and documenting activities related to the CQA and CQC of the soil and geosynthetic components and other activities related to the construction at the IRCL, Class I facility as described in this CQA Plan.

3.5.2 Qualifications

The CQA Consultant shall be a well-established firm specializing in geotechnical engineering, liner and final cover system design, construction management, and CQA. The CQA Consultant shall possess the equipment, personnel, and licenses necessary to conduct the monitoring and testing activities required by this CQA Plan and the IRCL, Class I facility Construction Drawings and Technical Specifications. The CQA Consultant shall also be experienced in the installation and CQA of soil and geosynthetic materials similar to those materials to be used for the IRCL, Class I facility construction. The CQA Consultant will be experienced in the preparation of CQA documentation including CQA plans, field documentation, field testing procedures, laboratory testing procedures, construction specifications, construction plans, and CQA certification reports. The CQA Consultant shall provide qualified staff for the project.

In addition, the CQA Consultant shall provide the following, in writing, to the Owner as required:

- corporate background and information;
- a detailed summary of the firm's CQA capabilities;
- a detailed summary of the firm's CQA experience; and
- a representative list of at least 10 completed facilities for which the CQA Consultant has provided CQA monitoring services for the installation of the corresponding geosynthetic material; for each facility, the following information will be provided:
 - name and purpose of facility, its location, and date of installation;
 - name of owner;
 - surface area of each geosynthetic material installed; and
 - telephone number of person familiar with the project.

The CQA Consultant shall provide resumes of personnel to be involved in the project, including:

- the CQA Managing Engineer, who operates from the office of the CQA Consultant and who conducts periodic visits to the site as required;
- the CQA Site Manager, who is located at the site; and
- the CQA Field Monitors, who will be located at the site.

The CQA Consultant organization will be led by the CQA Managing Engineer, who will hold a baccalaureate degree in engineering and be a Professional Engineer registered to practice in the state of Florida. The CQA Site Manager will be the representative of the CQA Consultant on site and will have experience in similar construction and be specifically familiar with the construction of soil and geosynthetic components of the landfill.

3.5.3 Responsibilities

The CQA Consultant shall be responsible for monitoring and documenting the activities of the Contractor relative to the installation of the double liner system components as well as various appurtenances related to the construction at the IRCL, Class I facility. The CQA Consultant will be responsible for monitoring the compliance of construction materials delivered to the site with the submittals and/or shop drawings previously reviewed and approved by the Construction Manager. The CQA Consultant shall assure that the Contractor's construction methods and workmanship are performed in accordance with the Construction Drawings and Technical Specifications. The CQA Consultant shall be responsible for obtaining and testing samples of

the various construction materials in accordance with the testing frequencies identified in this plan. The CQA Consultant shall also be responsible for obtaining, labeling, and shipping samples for off-site laboratory testing in accordance with the requirements of this plan and appropriate specifications.

The CQA Consultant shall be responsible for soils quality control testing to be performed by both the on-site and off-site testing laboratories. The CQA Consultant shall be responsible for staffing and operating the on-site soils laboratory, if required. Test results from the on-site and off-site laboratories shall be submitted to the Construction Manager within a time frame that will not impede or delay construction activities.

The on-site soils laboratory, if required, shall be equipped to perform routine index testing including, but not limited to:

- standard Proctor (ASTM D 698);
- particle-size analysis (ASTM D 422 or ASTM D 6913 and ASTM C 136);
- Atterberg limits (ASTM D 4318);
- moisture content (ASTM D 2216 and ASTM D 4643);
- soils Classification (ASTM D 2487); and
- percent passing No. 200 sieve (ASTM D 1140).

The CQA Consultant shall also be responsible for conducting routine field tests during construction of the IRCL, Class I facility, which shall include:

- moisture content by nuclear methods (ASTM D 6938);
- in-place density by nuclear methods (ASTM D 2922);
- lift thickness by direct measurement;
- sand cone (ASTM D 1556); and
- drive cylinder (ASTM D 2937).

The CQA Consultant will be responsible for the quality control of its on-site laboratory testing program and for documenting the calibration of the soils laboratory testing equipment. Equipment calibration certificates shall be maintained in the CQA Consultant's on-site project file. All tests will be conducted in accordance with ASTM or other applicable state or federal standards. Test results shall be submitted to the Construction Manager within a time frame that will not impede or delay construction of activities.

The duties of the CQA Personnel are discussed in the following subsections.

3.5.3.1 CQA Managing Engineer

The CQA Managing Engineer:

- reviews the landfill Construction Drawings and Technical Specifications;
- reviews soils and geosynthetics-related documents (such reviews are for familiarization and for evaluation of constructability only);
- attends project meetings related to construction quality activities;
- administers the CQA program (i.e., assigns and manages all on-site CQA personnel, reviews all field reports, and provides engineering review of all CQA-related activities);
- provides quality control of CQA documentation;
- reviews changes to the construction design, and assures any major changes are submitted to FDEP for approval prior to incorporation into the Construction Drawings and Technical Specifications; and
- prepares the final certification report with the CQA Site Manager.

3.5.3.2 CQA Site Manager

The CQA Site Manager:

- acts as the on-site representative of the CQA Consultant;
- familiarizes all CQA Field Monitors with the site, project documents, and the CQA requirements;
- manages the daily activities of the CQA Field Monitors;
- attends regularly scheduled CQA-related meetings on-site;
- reviews the ongoing preparation of the construction record drawings;
- reviews test results provided by the Contractor;
- verifies the calibration and condition of on-site testing equipment;
- reviews the CQA Field Monitors' daily reports and logs;
- provides reports to the Construction Manager, and documents in a daily report any reported relevant observations by the CQA Field Monitors;

- prepares a daily report for the project;
- oversees the collection and shipping of all laboratory test samples;
- reviews results of laboratory testing and makes appropriate recommendations;
- reports any unresolved deviations from the CQA Plan and Construction Drawings and Technical Specifications to the Construction Manager;
- assists with the preparation of the final certification report;
- reviews appropriate certifications and documentation from the Contractor and the Geosynthetics Manufacturer and Installer, and makes appropriate recommendations;
- reviews the Geosynthetics Manufacturer's QC documentation;
- reviews the geosynthetics Installer's personnel qualifications for conformance with those required by the Technical Specifications; and
- performs duties of CQA Field Monitor as needed.

3.5.3.3 CQA Field Monitors

The duties of the CQA Field Monitors are monitoring and documenting construction of all soils and geosynthetics components of the landfill and other IRCL, Class I facility activities, as assigned by the CQA Site Manager.

The duties of the CQA Field Monitors will include:

- monitoring material stockpiles for any deterioration of materials;
- monitoring surface-water drainage in the areas of soil and geosynthetic material stockpiles;
- preparing daily field reports;
- recording CQA and CQC activities on field logs;
- reporting problems to the CQA Site Manager;
- assisting with collection of samples from the constructed soil components in accordance with the CQA Plan;
- monitoring soil placement and compaction operations;
- monitoring the unloading and on-site handling and storage of the geosynthetics;
- monitoring geosynthetic repair operations;

- monitoring geosynthetic material deployment and installation operations; and
- collecting conformance samples for testing by CQA laboratories.

In addition to these specific duties, all CQA Field Monitors will document any on-site activities that could result in damage to the soils or geosynthetic components of the landfill. This is particularly true during the placement and compaction of the initial lift of soil on top of the underlying geosynthetic material. Any observations so noted by the CQA Field Monitors shall be reported immediately to the CQA Site Manager.

3.6 Soils CQA Laboratory

3.6.1 Definition

The Soils CQA Laboratory is the party, independent from the Owner and Contractor, responsible for conducting geotechnical laboratory tests in accordance with standards referenced in the Construction Drawings and Technical Specifications and this CQA Plan. The testing results generated by the Soils CQA Laboratory shall be used by the CQA Consultant to verify compliance of the soils construction materials with the plans and specifications and submittals previously approved by the Construction Manager.

3.6.2 Qualifications

The Soils CQA Laboratory will be experienced in testing of soils similar to those proposed for use in the construction at the IRCL, Class I facility in accordance with ASTM and other applicable soil test standards. The Soils CQA Laboratory will be capable of providing test results within a maximum of seven (7) working days of receipt of samples and will maintain that capability throughout the duration of the earthwork construction.

Prior to construction, the Soils CQA Laboratory, if different from the CQA Consultant, shall submit their qualifications and QA/QC procedures to the CQA Consultant for review and approval, if required. The qualifications presented by the Soils CQA Laboratory shall, as a minimum, include:

- corporate background and statement of qualifications;
- list of testing capabilities including reference to ASTM test methods;
- a laboratory QA/QC plan;
- information on staff size and experience; and
- information regarding turnaround time for test results.

3.6.3 Responsibilities

The Soils CQA Laboratory will be responsible for testing various soils components at the IRCL, Class I facility. These tests shall include, but not be limited to, material qualification (conformance) tests and material construction quality control (performance) tests as described in Construction Drawings and Technical Specifications. The CQA Consultant will be responsible for coordinating the Soils CQA Laboratory testing.

3.7 Geosynthetics CQA Laboratory

3.7.1 Definition

The Geosynthetics CQA Laboratory is the party, independent from the Owner, Contractor, and geosynthetics Manufacturer and Installer, responsible for conducting tests on samples of geosynthetic materials used in construction of the landfill in accordance with standards referenced in the Construction Drawings and Technical Specifications and this CQA Plan. The testing results generated by the Geosynthetics CQA Laboratory shall be used by the CQA Consultant to verify compliance of the geosynthetic materials with plans and specifications and submittals previously approved by the Construction Manager.

3.7.2 Qualifications

The Geosynthetics CQA Laboratory shall hold current accreditation by Geosynthetic Research Institute (GRI) or be approved by the Design Engineer and have experience in testing geosynthetics similar to those proposed for use during construction at the IRCL, Class I facility. The Geosynthetics CQA Laboratory shall be familiar with ASTM and other applicable geosynthetic test standards. The Geosynthetics CQA Laboratory will be capable of providing destructive test results for geomembrane field seams within 24 hours of receipt of samples and will maintain that capability throughout the duration of geosynthetic material installation.

Prior to construction, the Geosynthetics CQA Laboratory, if different from the CQA Consultant, shall submit their qualifications to the CQA Consultant for review and approval, if required. The qualifications presented by the Geosynthetics CQA Laboratory shall, as a minimum, include:

- corporate background and statement of qualifications;
- listing of testing capabilities including reference to ASTM or other applicable test methods;
- a laboratory QA/QC plan;
- information on staff size and experience; and

- information regarding turnaround time for test results.

3.7.3 Responsibilities

The Geosynthetics CQA Laboratory will be responsible for testing various geosynthetic components of the landfill. These tests shall include, but not be limited to, geosynthetic conformance and performance tests and destructive testing of the geomembrane field seams as described in the Construction Drawings and Technical Specifications. The CQA Consultant will be responsible for coordinating the Geosynthetics CQA Laboratory testing.

3.8 Geosynthetics Manufacturers

The geosynthetics Manufacturers are the firms or corporations responsible for production of the geosynthetic materials to be used in construction at the IRCL, Class I Facility. The geosynthetics Manufacturers shall be able to provide sufficient production capacity and qualified personnel to meet the demands of the project schedule. Prior to shipment of any material to the site, each geosynthetics Manufacturer shall be pre-qualified and approved by the Construction Manager. The geotextile, geomembrane, geocomposite and GCL Manufacturers shall meet the qualifications outlined in the Technical Specifications, respectively.

Each geosynthetics Manufacturer is responsible for the production and quality control of its respective geosynthetic product. In addition, each geosynthetics Manufacturer is responsible for the condition of the geosynthetic until the material is accepted by the Contractor. Each geosynthetics Manufacturer shall produce a consistent high-quality product that shall meet all the requirements of the Technical Specifications. Each geosynthetics Manufacturer shall submit quality control documentation to the Construction Manager for its respective products as required by the Technical Specifications.

3.9 Geosynthetics Installer

The geosynthetics Installer will be experienced and qualified to install the geosynthetic materials of the type specified for this project. The geosynthetics Installer will be approved and/or licensed by the geosynthetics Manufacturers. A copy of the approval letter or license will be submitted by the Contractor to the Construction Manager as required by the Technical Specifications. The geosynthetics Installer shall meet the qualifications outlined in the Technical Specifications. The geosynthetics Installer will designate one representative as its supervisor, who will be responsible for acting as the geosynthetics Installer's spokesman on site. The geosynthetics Installer will provide the Construction Manager with a list of proposed seaming personnel and their qualifications. This document will be reviewed by the CQA Consultant. Final approval of the geosynthetic Installer's geomembrane seaming personnel will be the responsibility of the Construction Manager. Any proposed seaming personnel deemed insufficiently experienced will

not be accepted. The most experienced seamer, the "master seamer", shall provide direct supervision, as required, over less experienced seamers. No field seaming shall take place without the master seamer being present.

The geosynthetics Installer's supervisor will be responsible for installation of the geosynthetics used in construction at the IRCL, Class I facility and for providing supervision and guidance to the installation crew. The geosynthetics Installer's supervisor is also responsible for the following: (i) obtaining samples, as required by the CQA Plan and the specifications; (ii) field testing; (iii) documenting quality control testing activities; and (iv) coordinating the geosynthetics installation activities with the Construction Manager. The geosynthetics Installer's supervisor will be responsible for documenting the geosynthetics installation activities, including, but not limited to, on-site personnel, material inventories, production figures, test results, installation deficiencies, and resolution of construction problems.

3.10 Surveyor

The Surveyor is responsible for lines and grades required for control of the work on an ongoing basis during all phases of the IRCL, Class I facility construction. Close interaction between the Surveyor, Contractor, and the CQA Consultant is essential to ensure that construction at the IRCL, Class I facility is completed in accordance with the Construction Drawings and Technical Specifications. The project Surveyor shall be a state of Florida licensed Professional Land Surveyor or registered Professional Engineer who shall sign and seal all construction survey record drawings. All surveying personnel shall be experienced in the provision of surveying services, including detailed accurate documentation as required in the Technical Specifications. The Surveyor is responsible for all surveying activities and products in accordance with the Technical Specifications.

4 DOCUMENTATION

4.1 Overview

An effective CQA Plan depends largely on recognition of all construction activities that should be monitored and the assignment of responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance and quality control activities. The CQA Consultant shall be responsible for assuring that the Contractor's quality control requirements have been addressed and satisfied.

The CQA Site Manager shall provide the Construction Manager descriptive daily field reports, data sheets, and logs, as requested, which document that monitoring activities have been accomplished. Examples of some of the forms that will be used to document CQA activities are included in **Appendix A**. The CQA Site Manager shall also maintain at the job site a complete file of Construction Drawings and Technical Specifications, this CQA Plan, the Contractor's Quality Control Plan(s), checklists, test procedures, daily logs, and other pertinent construction and CQA documents.

4.2 Daily Record Keeping

The CQA Consultant's daily reporting procedures shall include: (i) daily summary report; (ii) monitoring logs; (iii) testing data sheets; and (iv) problem identification and corrective measures reports, when appropriate.

4.2.1 Daily Summary Reports

The CQA Consultant's daily summary reports shall include the following information as applicable:

- an identifying sheet number for cross referencing and document control;
- date, project name, location, and other pertinent project identification;
- data on weather conditions;
- summary on meetings held and their results;
- process description(s) and location(s) of construction activities underway during the time frame of report;
- descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;

- description of locations where tests and samples were taken;
- a narrative summary of field test results;
- off-site materials received, including quality control documentation;
- decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard testing results;
- identifying sheet numbers of data sheets and/or problem reporting and corrective measures reports used to substantiate the decisions described above; and
- signature of the respective CQA Site Manager and/or the CQA Field Monitor.

4.2.2 CQA Monitoring Logs and Test Data Sheets

Monitoring observations, sampling information, and test results shall be recorded on the appropriate monitoring logs and test data sheets. The CQA Consultant shall use the monitoring logs and test data sheets to ensure completeness of the required CQA activities. Any corrections to the monitoring logs and test data sheets shall be single line crossed out, initialed by the CQA personnel responsible for the correction and dated. Examples of relevant monitoring logs are presented in **Appendix A**.

The CQA Consultant's monitoring logs and test data sheets shall include the following information as applicable:

- project specific information such as project name and location;
- the date the CQA activity was performed;
- a unique identifying sheet number for cross-referencing and document control;
- description or title of the CQA activity or test procedure;
- location of the CQA activity or location from which the sample was obtained;
- type of CQA activity or procedure used (reference to standard method when appropriate);
- recorded observation or test data, with all necessary calculations;
- results of the CQA activity and comparison with specification requirements (pass/fail); and
- the initials or signature of personnel involved in CQA inspection activity.

4.2.3 Nonconformance Identification and Reporting

A nonconformance is defined herein as material or workmanship that does not meet the specified requirement(s). Nonconformance identification and corrective measures reports should be cross-referenced to specific summary reports, logs, or test data sheets where the nonconformance was identified. The reports should include the following information as applicable:

- a unique identifying sheet number for cross-referencing and document control;
- detailed description of the problem;
- location of the problem;
- probable cause;
- how and when the problem was located;
- estimation of how long problem has existed;
- suggested corrective measures;
- documentation of corrections (reference to inspection data sheets);
- suggested methods to prevent similar problems; and
- signature of the appropriate CQA Field Monitor and concurrence by the CQA Site Manager.

In some cases, not all of the above information will be available or obtainable. However, when available, such efforts to document nonconformances could help to avoid similar nonconformances in the future. The CQA Site Manager shall distribute copies of the report to the Construction Manager for further actions.

4.3 Photographic Documentation

The CQA Site Manager will be responsible for obtaining photographic documentation of the Contractor's activities, materials installation methods, and testing procedures. Photographs will serve as a pictorial record of work progress, problems, and corrective measures. Photographic reporting data sheets should be utilized to organize and document photographs taken during construction at the IRCL, Class I facility. Such data sheets could be cross-referenced or appended to summary reports, CQA monitoring logs, or test data sheets and/or problem identification and corrective measures reports. At a minimum, photographic reporting data sheets should include the following information:

- a unique identifying number on data sheets and photographs for cross-referencing and document control;
- person responsible for photograph;
- the date and location where the photograph was taken; and
- location and description of the work;

These photographs will serve as a pictorial record of work progress, problems, and corrective measures. Color prints shall be organized chronologically and kept in a permanent protective file. Negatives and/or digital files shall be stored in a separate protective file.

4.4 Design and/or Specifications Changes

Design and/or specifications changes may be required during construction. In cases of Contractor initiated changes, the Contractor must submit written requests for such changes to the Construction Manager. The Design Engineer shall review and respond to these requests in a timely manner. All design and/or specifications changes will be made only with the approval of the Engineer-of-Record and Design Engineer and approval by FDEP, if required. Such changes will take the form of a change order to the contract, if required.

4.5 Nonconformances

The Construction Manager will be informed in writing of any significant recurring nonconformance with the Construction Drawings, Technical Specifications, or CQA Plan by the CQA Consultant. The cause of the nonconformance will be determined by the CQA Consultant. The Contractor will be directed by the Construction Manager to make appropriate changes in materials or procedures in order to correct the nonconformance. When this type of evaluation is made, the results will be documented, and any revision to procedures or specifications must be approved by the Design Engineer.

4.6 CQA Certification Report

At the completion of construction phases, the CQA Consultant will provide the Owner with a construction phase final certification report for submittal to FDEP. This report will acknowledge: (i) that the work has been performed in compliance with the approved Construction Drawings, Technical Specifications, and approved modifications; (ii) physical sampling and testing has been conducted at the appropriate frequencies; and (iii) that the summary documentation provides the necessary supporting information.

At a minimum, this report will include:

- summary of CQA activities;
- CQA monitoring logs and testing data sheets including sample location plans;
- laboratory test results;
- problem identification and reports of corrective measures;
- a descriptive summary of any changes to the Construction Drawings or Technical Specifications; and
- a summary statement indicating compliance with the Construction Drawings or Technical Specifications and any approved changes that are signed and sealed by the CQA Managing Engineer.

The record drawings, which include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.), and a geomembrane panel drawing prepared by the CQA Consultant will also be included as part of the final certification report.

4.7 Storage of Records

The CQA Site Manager will be responsible for all CQA document storage during the construction at the IRCL, Class I facility. This includes the CQA Consultant's copy of the Construction Drawings and Technical Specifications, the CQA Plan, and the originals of all the data sheets and reports. When the IRCL, Class I facility construction is complete and upon issuance of the final certification report, the CQA document originals will be organized and retained by the CQA Consultant until requested by the Owner. Required records shall include, but not be limited to, field logbooks, other data collections forms, equipment calibration records, costs data, drawings, maintenance records, and all associated reports.

5 SOILS CONSTRUCTION

5.1 Introduction

CQA monitoring and testing shall be performed during installation of the liner system, and other earthwork components. Criteria to be used for determination of acceptability of the various soil components are identified in the Construction Drawings and Technical Specifications and this CQA Plan.

5.2 Soil Components

There are several principal soil components included in the IRCL, Class I facility construction. The soil components or layers of the liner system for the Cell 3 construction include the following:

- a 2-ft thick liner protective layer above the geocomposite;
- gravel drainage layer in the leachate collection corridors and sumps; and
- a minimum 0.5-ft thick compacted general fill layer (i.e., subbase) below the liner system.

General fill material is used in other areas of earthwork outside the liner system. All general fill placement, grading, and compaction will be monitored and tested in accordance with the Construction Drawings, Technical Specifications, and this CQA Plan.

5.3 Record Drawings and As-Built Surveys

During construction of the soil components at the IRCL, Class I facility, the CQA Consultant shall routinely review record drawings submitted by the Contractor. The drawings are used to verify location of work, percent of work completed, layer thickness, or final grades. Prior to the placement of successive soil or geosynthetic layers, the CQA Consultant shall review as-built surveys that indicate compliance of the preceding layer thickness, lines, and grades. Once an as-built survey has been received, it will be the responsibility of the CQA Consultant to review the information in a timely manner and notify the Contractor of any noncompliance.

5.4 Related Construction Drawings and Technical Specifications

Several sections of the Technical Specifications should be referenced by the CQA Consultant for pertinent soil materials physical properties and construction requirements. Related specifications include the following:

- Section 02100 - Surveying;
- Section 02110 - Site Preparation (Clearing, Grubbing, and/or Stripping);
- Section 02200 - Earthwork;
- Section 02221 - Trenching and Backfilling;
- Section 02230 - Road Construction;
- Section 02235 - Granular Drainage Material
- Section 02240 - Liner Protective Soil;
- Section 02245 - Riprap;
- Section 02290 - Erosion & Sediment Control; and
- Section 02930 - Vegetation.

Prior to the start of soils construction, the CQA Consultant shall review the information required by the Technical Specifications listed above. Compliance of the submittals with the Technical Specifications shall be determined by the Construction Manager.

5.5 Conformance Testing

5.5.1 Overview

It will be necessary for the CQA Consultant to observe and test the soil components to ensure they are uniform and conform to the requirements of the Technical Specifications. For soil materials obtained from on-site sources, visual inspections and conformance tests shall be performed by the CQA Consultant prior to the materials being used. If soil materials are obtained from off-site borrow sources, visual inspection and conformance tests shall be performed at the source location or as the materials arrive at the project site. Borrow area inspections may also be utilized by the CQA Consultant to ensure that only suitable soil materials are transported to the project site. For off-site borrow areas containing non-uniform materials, it shall be necessary for the Contractor and the CQA personnel to coordinate excavation and monitoring of the segregation of substandard materials.

All materials failing to comply with conformance standards shall be rejected for use at the project site.

Initial evaluation of various soil types by CQA personnel during construction shall be largely visual; therefore, the CQA personnel must be experienced with visual-manual soil classification

procedures. CQA personnel shall be aware that changes in color or texture can be indicative of a change in soil type. CQA personnel shall observe soils for deleterious materials (e.g., roots, stumps, and large objects). When necessary, the visual-manual procedure for the description and identification of soils shall be conducted by the CQA Consultant in accordance with test method ASTM D 2488.

5.6.2 Test Methods

Conformance tests used to evaluate the suitability of soil materials during construction shall be performed in accordance with the current ASTM or other applicable test procedures indicated in Table 5-1. Documentation and reporting of the test results shall be the responsibility of the CQA Consultant.

The standard Proctor test (ASTM D 698) shall be used for the evaluation of moisture/density relationships unless otherwise indicated. Any conflict regarding acceptance of test results shall be resolved by the Design Engineer.

5.6.3 Test Frequency

The frequency of conformance tests shall conform to the minimum frequencies presented in Table 5-1. The frequency of testing may be increased at the discretion of the CQA Consultant or if variability of the materials is observed. The testing frequencies described herein for general fill shall also apply to materials used by the Contractor in areas outside the limits of the liner systems at the IRCL, Class I facility.

5.6 Construction Monitoring

During installation of the various soil components, the CQA Consultant shall visually observe and document the Contractor's earthwork activities for the following:

- changes in the soil consistency;
- the thickness of lifts as loosely placed and as compacted;
- soil conditioning prior to placement including general observations regarding moisture distribution, clod size, etc.;
- placement method which may damage or cause displacement or wrinkling of geosynthetics;
- the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.);
- the number of passes used to compact each lift;

- desiccation cracks or the presence of ponded water; and
- final lift or layer thickness.

5.7 Hydraulic Conductivity Testing Evaluations

As shown in Table 5-1, hydraulic conductivity (permeability) tests shall be conducted on soil materials proposed in the liner system including the liner protective layer and granular drainage materials. Permeability testing of these materials shall be performed in accordance with ASTM D 2434 or ASTM D5084, as applicable. The CQA Consultant shall be responsible for documenting pertinent sampling information including the date the sample was obtained, sample identification number, and location.

5.8 Performance Testing

5.8.1 Overview

During construction, the CQA Consultant shall observe and test all soil components to ensure they are installed in accordance with the requirements of the Construction Drawings and Technical Specifications. The CQA Consultant shall also evaluate the procedures, methods, and equipment used by the Contractor to install the various soil components.

5.8.2 Test Methods

All performance testing shall be conducted in accordance with the Technical Specifications or as directed by the Design Engineer. The field testing methods, used to evaluate the suitability of soils during their installation, shall be performed by the CQA Consultant in accordance with current ASTM test procedures indicated in Table 5-2. Documentation and reporting of the test results shall be the responsibility of the CQA Consultant.

The standard Proctor test (ASTM D 698) shall be used for the evaluation of moisture/density relationships unless otherwise indicated. In-place surface moisture/density by nuclear test methods (ASTM D 6938 and D 2922) shall be used for in-situ field testing. The sand cone test method (ASTM D 1556) or drive cylinder test method (ASTM D 2937) shall be used to establish correlations of moisture and density in cases of uncertainty, and as a check of the nuclear surface moisture/density gauge calibration. Any conflict regarding acceptance of test results shall be resolved by the Design Engineer.

5.8.3 Test Frequency

Performance testing shall be conducted during the course of the work. The minimum construction performance testing frequencies are presented in Table 5-2. The frequency may be

increased at the discretion of the CQA Consultant or if variability of the materials is observed by the CQA Consultant. Sampling locations shall be selected by the CQA Consultant. If necessary, the location of routine in-place density tests shall be selected using a non-biased sampling approach.

A special testing frequency shall be used at the discretion of the CQA Consultant when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas shall be considered when:

- rollers slip during rolling operations;
- lift thickness is greater than specified;
- material is at improper and/or variable moisture content;
- it is suspected that less than the specified number of roller passes are made;
- dirt-clogged rollers are used to compact the material;
- rollers may not have used optimum ballast;
- there is change to subgrade condition since subgrade approval;
- fill materials differ substantially from those specified;
- the degree of compaction is doubtful; and
- as directed by the Design Engineer or the Construction Manager.

During construction, the frequency of testing may also be increased in the following situations:

- adverse weather conditions;
- breakdown of equipment;
- at the start and finish of grading;
- material fails to meet specifications; and
- the work area is reduced.

5.9 Deficiencies

If a defect is discovered in the soils construction, the CQA Consultant shall immediately determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA Consultant shall determine the extent of the deficient area by additional tests,

observations, a review of records, or other means that the CQA Consultant deems appropriate. If the defect is related to adverse site conditions, such as overly wet soils or surface desiccation, the CQA Consultant shall define the limits and nature of the defect and the appropriate remedy.

As soon as possible, after determining the extent and nature of substandard materials, noncompliant construction practice, or other such deficiency in materials or workmanship which cannot be immediately resolved on-the-spot, the CQA Consultant shall notify the Construction Manager and Contractor and schedule appropriate retests when the work deficiency is to be corrected.

The CQA Consultant shall verify that the Contractor has corrected all noted deficiencies. If a specified criterion cannot be met, or unusual weather conditions hinder work, the Contractor shall submit suggested solutions or alternatives to the Construction Manager for review.

At locations where the field testing indicates in-situ conditions which do not comply with the requirements of the Technical Specifications, the failing area shall be reworked to the satisfaction of the CQA Consultant. Alternatively, at the CQA Consultant's option, undisturbed samples of in-place material shall be obtained for appropriate testing. All retests performed by the CQA Consultant must verify that the deficiency has been corrected before any additional work is performed by the Contractor in the area of the deficiency.

5.10 Documentation

The documentation of soils CQA testing activities is an important factor in assuring the successful construction, performance, and approval of the soil components of the IRCL, Class I construction project. The CQA monitoring observations, sample location descriptions, field test results, and on-site laboratory test results shall be documented by the CQA Consultant on forms specifically designed for their purpose. Reports and forms shall be submitted to the Construction Manager as requested.

TABLE 5-1
MINIMUM CONFORMANCE TESTING FREQUENCIES
FOR SOIL COMPONENTS

TEST NAME/ TEST METHOD	GENERAL FILL	LINER PROTECTIVE SOIL	GRANULAR DRAINAGE MATERIAL	VEGETATIVE LAYER
SPECIFICATION SECTION	02200	02240	02235	02920
Particle Size Analysis (ASTM D 422 or ASTM D 6913)	1 test per 10,000 yd ³	1 test per 5,000 yd ³	N/A	1 test per 5,000 yd ³
Particle Size Analysis/ ASTM C 136	N/A	N/A	1 test per 2,000 yd ³	N/A
Atterberg Limits/ASTM D 4318	N/A	N/A	N/A	N/A
Soil Classification/ASTM D 2487	1 test per 10,000 yd ³	1 test per 5,000 yd ³	1 test per 2,000 yd ³	1 test per 5,000 yd ³
Standard Proctor/ASTM D 698	1 test per 25,000 yd ³	N/A	N/A	N/A
Hydraulic Conductivity/ASTM D 2434 or ASTM D 5084, as applicable)	N/A	1 test per 5,000 yd ³	1 test per 2,000 yd ³	N/A
Carbonate Content/(ASTM D 3042 and ASTM D 4373)	N/A	1 test per 5,000 yd ³	1 test per 5,000 yd ³	N/A
Organic Content/ASTM D2974	N/A	N/A	N/A	1 test per 5,000 yd ³

Notes:

1. ASTM D 3042 for granular drainage material (gravel) and ASTM D 4373 for liner protective soils.

2. N/A = Not Applicable

TABLE 5-2
MINIMUM PERFORMANCE TESTING FREQUENCIES
FOR SOIL COMPONENTS

TEST NAME/ TEST METHOD	GENERAL FILL/ MISC. SOILS	LINER PROTECTIVE SOIL
SPECIFICATION SECTION	02200	02240
In-Situ Moisture/ASTM D 3017	5 tests per acre per lift(1) or 1 test per 250 lf per lift	N/A
In-situ Density/ASTM D 2922	1 test per 25 nuclear tests or 1 test per 250 lf per lift	N/A
Sand Cone/ASTM D 1556 or Drive Cylinder/ASTM D 2937	1 test per 25 nuclear test	N/A

NOTE:

1. A minimum of two nuclear moisture and density tests each day of active soils construction.
2. N/A = Not Applicable

6 GEOMEMBRANE

6.1 Introduction

The CQA Consultant shall perform conformance and destructive seam testing and shall monitor the installation of geomembranes as required by Section 02770 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the geomembrane sheet and seams with the requirements of the Technical Specifications shall be carried out by the CQA Consultant in accordance with the current versions of the ASTM or other applicable test procedure indicated in Tables 6-1 and 6-2.

6.2 Manufacturing Plant Visit

At the request of the Owner, the CQA Consultant, or authorized representative, shall visit the plant of the geomembrane Manufacturer for the purpose of collecting conformance samples and verifying that manufacturing quality control procedures are in conformance with Section 02770 of the Technical Specifications. If possible, such a visit shall be performed prior to or during the manufacturing of the geomembrane rolls for the IRCL, Class I facility construction project. The CQA Consultant shall review the manufacturing process, quality control procedures, laboratory facilities, and testing procedures.

During the project specific plant visit, the CQA Consultant shall:

- verify that properties guaranteed by the geomembrane Manufacturer meet all specifications;
- verify that the measurements of properties by the geomembrane Manufacturer are properly documented and test methods used are acceptable;
- spot inspect the rolls and verify that they are free of holes, blisters, or any sign of contamination by foreign matter;
- review packaging and transportation procedures to verify that these procedures are not damaging the geomembrane;
- verify that all rolls are properly labeled; and
- verify that extrusion rods and/or beads manufactured for the field seaming of the geomembrane are derived from the same base resin type as the geomembrane.

Upon completion of the manufacturing plant visit, a report describing the findings and observations shall be completed by the CQA Consultant and shall be included as an attachment to the final certification report.

6.3 Transportation, Handling and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geomembrane on-site. The Construction Manager shall designate a geomembrane storage location. It will be the responsibility of the Contractor to protect the geomembrane stored on site from theft, vandalism, and damage.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe or non-repairable flaws which may compromise geomembrane quality; and
- rolls that include minor and repairable flaws that do not compromise geomembrane quality.

The CQA Consultant shall also monitor that equipment used to handle the geomembrane on-site is adequate and does not pose any risk of damage to the geomembrane when used properly.

6.4 Conformance Testing

6.4.1 Sampling Procedures

Upon delivery of the geomembrane rolls to the IRCL, Class I facility, the CQA Consultant shall ensure that representative geomembrane conformance samples are obtained at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing. Geomembrane conformance samples shall be taken across the entire width of the roll and shall not include the first 3 ft of material. Unless otherwise directed by the Design Engineer, samples shall be 3 ft long by the roll width. The required minimum geomembrane conformance sampling frequencies are provided in Table 6-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;

- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

6.4.2 Testing Procedures

Conformance testing of the geomembrane materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the geomembrane conformance test procedures listed in Table 6-1 shall be performed by the Geosynthetics CQA Laboratory.

6.4.3 Test Results

All conformance test results shall be reviewed, accepted, and reported by the CQA Consultant before deployment of the geomembrane. Any non-conformance of the material's properties with the requirements of the Technical Specifications shall be reported to the Construction Manager. In all cases, the test results shall meet, or exceed, the property values specified in Section 02770 of the Technical Specifications.

6.4.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA Laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geomembrane conformance failures.

6.5 Anchor Trench

The CQA Consultant shall verify and document that the anchor trench has been constructed as indicated in the Construction Drawings. The amount of anchor trench open at any time shall be limited to one day of geomembrane installation capacity. The anchor trench shall be constructed with proper drainage to prevent ponding.

Geosynthetic materials in the anchor trench shall be temporarily anchored with sand bags or other suitable methods approved by the CQA Consultant. The anchor trench shall be backfilled with suitable material as indicated in the Construction Drawings and Technical Specifications as soon as possible after all geosynthetics are installed. In-place moisture/density by nuclear methods testing of the compacted anchor trench backfill shall be performed at a frequency of one per 100 lineal feet of anchor trench.

The anchor trench shall be constructed with a slightly rounded corner where the geosynthetics enter the trench. No loose soil shall be allowed to underlie the geosynthetics in the anchor trench. The CQA Consultant shall verify that all temporary ballast (i.e., sandbags) and deleterious materials are removed from the anchor trench prior to backfilling. Backfilling of the anchor trench shall be performed when the geomembrane is in its most contracted state to prevent stress inducement and using extreme care to prevent any damage to the geosynthetic materials.

6.6 Geomembrane Placement

6.6.1 Field Panel Identification

A field panel is a piece of geomembrane larger than approximately 10 ft², which is to be seamed in the field, i.e., a field panel is a roll or a portion of roll cut in the field. The CQA Consultant shall assure that each field panel is given an "identification code" (number or letter-number) consistent with the as-built layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. This field panel identification code shall be as simple and logical as possible. The geosynthetic Manufacturer's roll numbers shall be traceable to the field panel identification code.

The CQA Consultant shall document the correspondence between roll numbers, factory panels, and field panel identification codes. The field panel identification code shall be used for all quality assurance/quality control records.

6.6.2 Field Panel Placement

The CQA Consultant shall monitor that field panels are installed substantially at the location indicated in the Installer's layout plan, as approved or modified. The CQA Consultant shall record the field panel identification code, Manufacturer's roll number, location, date of installation, time of installation, and dimensions of each field panel.

Geomembrane placement shall not proceed at an ambient temperature below 40°F or above 104°F unless authorized by the Design Engineer. Geomembrane placement shall not proceed during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in an area of ponded water, or in the presence of excessive winds. The CQA Consultant shall monitor that the

above conditions are fulfilled and that the supporting soil has not been damaged by adverse weather conditions.

The CQA Consultant shall monitor geomembrane deployment for the following:

- any equipment used does not damage the geomembrane by handling, trafficking, excessive heat, leakage of hydrocarbons or other means;
- the prepared surface underlying the geomembrane has not deteriorated since previous acceptance, and is still acceptable immediately prior to geomembrane placement;
- any geosynthetic elements immediately underlying the geomembrane are clean and free of foreign objects or debris;
- all personnel working on the geomembrane do not smoke, wear damaging shoes, or engage in other activities which could damage the geomembrane;
- the method used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil;
- the method used to place the panels minimizes wrinkles (especially differential wrinkles between adjacent panels);
- adequate temporary loading and/or anchoring (e.g., sand bags, tires), not likely to damage the geomembrane, has been placed to prevent uplift by wind (in case of high winds, continuous loading, e.g., by adjacent sand bags, is recommended along edges of panels to minimize risk of wind flow under the panels); and
- direct contact with the geomembrane is minimized; i.e., the geomembrane is protected by geotextiles, extra geomembrane, or other suitable materials, in areas where excessive traffic may be expected.

The CQA Consultant shall observe the geomembrane panels, after placement and prior to seaming, for damage. The CQA Site Manager shall advise the Construction Manager which panels, or portions of panels, should be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected shall be marked and their removal from the work area recorded by the CQA Consultant. Repairs shall be made according to procedures described in this Section.

6.7 Field Panel Seaming

6.7.1 Panel Layout

The CQA Consultant shall review the panel layout drawing previously submitted to the Construction Manager by the Installer and verify that it is consistent with accepted state of practice. In general, seams should be oriented parallel to the line of maximum slope, i.e., 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 5 ft beyond the toe or shoulder of the slope, or areas of potential stress concentrations, unless otherwise authorized by the Design Engineer. A seam numbering system compatible with the field panel identification numbering system shall be agreed upon prior to any seaming.

6.7.2 Seaming Equipment and Products

Approved processes for field seaming are extrusion welding and fusion welding. Proposed alternate processes shall be documented and submitted to the Construction Manager for approval. Only equipment which has been specifically recommended by the geosynthetics Manufacturer by make and model shall be used. All seaming equipment shall be permanently marked with an identification number.

6.7.2.1 Fusion Process

The fusion-welding apparatus must be automated, self-propelled devices. The fusion-welding apparatus shall be equipped with gauges giving the applicable temperatures and welding speed. The CQA Consultant shall monitor ambient temperatures, geomembrane surface temperatures, apparatus speed, and apparatus temperatures at appropriate intervals.

The CQA Consultant shall also monitor that:

- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on site;
- equipment used for seaming will not damage the geomembrane;
- the seaming zone is dry and clean;
- there is sufficient overlap between panels;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane;
- for cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding;

- an insulating material is placed beneath the hot welding apparatus after usage; and
- a movable protective layer is used, as necessary, directly below each overlap of geomembrane that is to be seamed to prevent build-up of moisture between the sheets.

6.7.2.2 Extrusion Process

The extrusion-welding apparatus shall be equipped with gauges giving the temperature in the apparatus and at the nozzle. The CQA Consultant shall verify that the extrudate is comprised of the same resin as the geomembrane sheeting. The CQA Consultant shall monitor extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals.

The CQA Consultant shall also monitor that:

- the number of spare operable seaming apparatus agreed by the Construction Manager are maintained on site;
- equipment used for seaming is not likely to damage the geomembrane;
- the seaming zone is dry and clean;
- the extruder is purged prior to beginning a seam until all heat-degraded extrudate has been removed from the barrel;
- the electric generator is placed on a smooth base such that no damage occurs to the geomembrane; and
- an insulating material is placed beneath the hot welding apparatus after usage.

6.7.3 Seam Preparation

The CQA Consultant shall monitor that:

- prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material;
- seams are overlapped a minimum of 4 inches;
- if seam overlap grinding is required, the process is completed according to the geosynthetics Manufacturer's instructions or Section 02770 of the Technical Specifications, whichever is the more stringent, prior to the seaming operation, and in a way that does not damage the geomembrane;
- the grind depth shall not exceed 10 percent of the geomembrane thickness;

- grinding marks shall not appear beyond the extrudate after it is placed; and
- seams are aligned with the fewest possible number of wrinkles and "fishmouths".

6.7.4 Weather Conditions for Seaming

The normally required weather conditions for seaming are as follows:

- Unless authorized by the Design Engineer, no seaming shall be attempted at an ambient temperature below 40°F or above 104°F.
- Between ambient temperatures of 40°F and 50°F, seaming is possible if the geomembrane is preheated by either sun or hot air device, and if there is no cooling of the geomembrane to below 50°F resulting from wind.
- In all cases, the geomembrane seam areas shall be dry and protected from rain and wind.

The CQA Consultant shall verify that methods used by the Installer for seaming at ambient temperatures below 40°F or above 104°F will produce seams that are entirely equivalent to seams produced at ambient temperatures between 40°F and 104°F and protect the overall quality of the geomembrane. The CQA Consultant shall monitor that seaming conducted during abnormal weather conditions is performed in accordance with the methods approved by the Design Engineer.

6.7.5 Overlapping and Temporary Bonding

The CQA Consultant shall monitor that:

- the panels of geomembrane have a finished overlap of a minimum of 4 in. for both extrusion and fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam;
- no solvent or adhesive is used; and
- 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 spot welding apparatus is controlled such that the geomembrane is not damaged.

6.7.6 Trial Seams

The CQA Consultant shall verify that the Installer performs trial seam tests in accordance with Section 02770 of the Technical Specifications. The CQA Consultant shall observe and document the Installer's trial seam testing procedures. The trial seam samples shall be assigned an identification number and marked accordingly by the CQA Consultant. Each sample shall be

marked with the date, time, machine temperature(s) and setting(s), number of seaming unit, and name of seaming technician. Trial seam samples shall be maintained until destructive seam testing of the applicable seams are tested and pass.

6.7.7 General Seaming Procedures

No geomembrane seaming shall be performed unless the CQA Consultant is on-site. The CQA Consultant shall monitor the general seaming procedure used by the installer as follows:

- If required for fusion welding, a movable protective layer of plastic will 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.
- If required, a firm substrate shall be provided by using a flat board, a conveyor belt, or similar hard surface directly under the seam overlap to achieve proper support.
- 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. beyond the cut in all directions.
- If seaming operations are carried out at night, adequate illumination shall be provided by the Contractor/Installer to the satisfaction of the CQA Consultant.
- Seaming shall extend to the outside edge of panels to be placed in the anchor trench.

6.7.8 Nondestructive Seam Continuity Testing

The CQA Consultant shall monitor that the Installer shall nondestructively test all field seams over their full length using a vacuum test unit or air pressure test (for double fusion seams only). Spark testing will be performed if the seam cannot be tested using the vacuum or air pressure test methods. The purpose of nondestructive tests is to check the continuity of seams. Continuity testing shall be carried out as the seaming work progresses, not at the completion of all field seaming. The CQA Consultant shall:

- monitor nondestructive testing;
- document the results of the nondestructive testing; and
- inform the Contractor and Construction Manager of any noncompliance.

Any required seam repairs shall be made in accordance with the Technical Specifications. The CQA Consultant shall:

- observe the repair procedures;
- observe the retesting procedures; and
- document the results.

The seam number, date of observation, dimensions and/or descriptive location of the seam length tested, name of person performing the test, and outcome of the test shall be recorded by the CQA Consultant.

6.7.9 Destructive Testing

Destructive seam testing shall be performed during the geomembrane installation. The purpose of this testing is to evaluate seam strength. Destructive seam testing shall be done as the seaming work progresses, not at the completion of all field seaming.

6.7.9.1 Location and Frequency

The CQA Consultant shall select all destructive seam test sample locations. Sample locations shall be established as follows.

- A minimum frequency of one test location per 500 ft of seam length. This minimum frequency is to be determined as an average taken throughout the entire facility. This minimum frequency will be supplemented with additional testing for seams made outside the normal ambient temperature range of 40°F to 104°F.
- Test locations shall be determined during seaming at the CQA Consultant's discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds, or any other potential cause of imperfect welding.

The Installer shall not be informed in advance of the locations where the seam samples will be taken.

6.7.9.2 Sampling Procedures

Destructive seam testing shall be performed as the seaming progresses in order to obtain the Geosynthetic CQA Laboratory test results before the geomembrane is covered by overlying materials. The CQA Consultant shall:

- observe sample cutting;
- assign a number to each sample and mark it accordingly; and
- record sample location on geomembrane panel layout drawing.

All holes in the geomembrane resulting from destructive seam test sampling shall be immediately repaired in accordance with repair procedures described in Section 02770 of the Technical Specifications. The continuity of the new seams in the repaired area shall be nondestructively tested as described in this Section.

6.7.9.3 Size of Samples

At a given sampling location, two types of samples (field test samples and laboratory test samples) shall be taken. First, a minimum of two field samples or test strips should be taken for field testing. Each of these test strips shall be 1 in. wide by 12 in. long, with the seam centered parallel to the width. The distance between these two specimens shall be 42 in. If both specimens pass the field test described in this Section, a second full laboratory destructive sample shall be taken for testing by the Geosynthetics CQA Laboratory.

The full destructive sample shall be located between the two field test strips. The sample shall be 12 in. wide by 42 in. long with the seam centered lengthwise. The sample shall be cut into three parts and distributed as follows:

- one 12 in. by 12 in. portion to the Installer;
- one 12 in. by 12 in. portion to the Construction Manager for archive storage; and
- one 12 in. by 18 in. portion for Geosynthetics CQA Laboratory testing.

6.7.9.4 Field Testing

The test strips shall be tested in the field, for peel adhesion, using a gauged tensiometer. In addition to meeting the strength requirements outlined in Appendix B, all specimens shall exhibit a Film Tear Bond and shall not fail in the weld. If any field test sample fails to meet these requirements, the destructive sample has failed.

The CQA Consultant shall witness all field tests and mark all samples and portions with their number. The CQA Consultant shall also log the date, number of seaming unit, seaming technician identification, destructive sampling, and pass or fail description.

6.7.9.5 Geosynthetics CQA Laboratory Testing

Destructive test samples shall be tested by the Geosynthetics CQA Laboratory. Testing shall include "Bonded Seam Strength" and "Peel Adhesion" (ASTM D 6932). The minimum acceptable values to be obtained in these tests are presented in Appendix B. At least five specimens shall be tested for each test method. Specimens shall be selected alternately by test from the samples (i.e., peel, shear, peel, shear...). Both the inside and outside tracks of the double

track fusion seams shall be tested for peel adhesion. A passing test shall meet the minimum required values in at least four out of five specimens.

The Geosynthetics CQA Laboratory shall provide test results no more than 24 hours after they receive the samples. The CQA Site Manager shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Construction Manager.

6.7.9.6 Procedures for Destructive Test Failure

The following procedures shall apply whenever a sample fails a destructive test, whether that test was conducted in the field or by the Geosynthetics CQA Laboratory. The CQA Consultant will monitor that the Installer follows one of the two options below:

- The Installer can reconstruct the seam (e.g., remove the old seam and re-seam) between any two passed destructive test locations or between points judged by the CQA Consultant to represent conditions of the failed seam (e.g., a tie-in seam or a seam made by the apparatus and/or operator used in the failing seam);or
- The Installer can trace the welding path to an intermediate location a minimum of 10 ft from the point of the failed test in each direction and take a small sample for additional field testing in accordance with the destructive test procedure at each location. If these additional isolation samples pass the field test, then full laboratory samples are taken at both locations. If these laboratory samples meet the specified strength criteria, then the seam is reconstructed between these locations. If either sample fails, then the process is repeated to establish the zone in which the seam should be reconstructed or repaired.

All failed seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken or the entire seam is reconstructed and retested. In cases exceeding 150 ft of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing. Repairs shall be made in accordance with this section. The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

6.8 Defects and Repairs

6.8.1 Identification

All seams and non-seam areas of the geomembrane shall be examined by the CQA Consultant for identification of defects, holes, blisters, undispersed raw materials and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane shall be clean at the time of examination. The

Construction Manager shall require the geomembrane surface to be broomed or washed by the Contractor if the amount of dust or mud inhibits examination.

6.8.2 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, shall be repaired by the geosynthetics Installer in accordance with Section 02770 of the Technical Specifications. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the Installer and CQA Consultant.

In addition, the following conditions shall be monitored by the CQA Consultant:

- surfaces of the geomembrane which are to be repaired shall be abraded no more than one hour prior to the repair;
- all surfaces must be clean and dry at the time of the repair;
- all seaming equipment used in repairing procedures must be approved;
- the repair procedures, materials, and techniques shall be approved by the CQA Consultant in advance of the specific repair;
- patches or caps shall extend at least 6 in. beyond the edge of the defect, and all corners of patches shall be rounded with a radius of at least 3 in.; and
- the geomembrane below large caps should be appropriately cut to avoid water or gas collection between the two sheets.

6.8.3 Verification of Repairs

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using approved methods. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant or as specified in Table 6-2. The CQA Consultant shall observe all non-destructive testing of repairs and shall record the number of each repair, date, and test outcome.

6.9 Electrical Leak Detection Testing

Electrical leak detection testing of the primary geomembrane liner and the geomembrane cap shall be conducted as supplemental CQC testing by the Contractor. This testing shall be conducted in a manner to protect the installation of geomembrane and GCL components of the liner and final cover system. The Contractor shall perform the work, document the results of the work, and delineate and repair detected leaks.

The CQC Consultant will monitor the Contractor's electrical leak detection testing of primary geomembrane liner and the geomembrane cap. The CQC Consultant will:

- confirm adequate water supply and pressure during the testing;
- maintain a location map delineating areas completed by electrical leak detection testing;
- document monitoring of the electrical leak detection testing; and
- inform the Contractor and Construction Manager of any non-compliance.

The CQC Consultant will confirm that any required repairs are made in accordance with Section 02770 of the Technical Specifications and Section 6.8 of this CQA Plan.

6.10 Liner System Acceptance

The Contractor shall retain all responsibility for the geosynthetics until acceptance by the Construction Manager. The terms for the liner system acceptance are described in Section 02770 of the Technical Specifications.

6.11 Materials in Contact with the Geomembrane

The procedures outlined in this section are intended to assure that the installation of materials in contact with the geomembrane do not cause damage. Additional quality assurance and quality control procedures are necessary to assure that systems built with these materials will be constructed in such a way to ensure proper performance.

6.11.1 Soils

The CQA Consultant shall monitor that the Contractor takes all necessary precautions to ensure that the geomembrane is not damaged during its installation, during the installation of other components of the liner and the final cover systems, or by other construction activities. The CQA Consultant shall monitor the following:

- placement of protective soil materials above the geomembrane which shall not proceed at an ambient temperature below 40°F or above 104°F unless otherwise approved by the Construction Manager;
- soil placement operations above the geomembrane shall be performed by the Contractor to minimize wrinkles in the geomembrane;
- equipment used for placing soil shall not be driven directly on the geomembrane;

- a minimum soil thickness of 1 ft is maintained between a light, track-mounted dozer (e.g., having a maximum ground pressure of 5 psi) and the geomembrane;
- a minimum soil thickness of 3 ft is maintained between rubber-tired vehicles and the geomembrane; and
- soil thickness shall be greater than 3 ft in heavily trafficked areas such as access ramps.

6.11.2 Appurtenances

The CQA Consultant shall monitor that:

- installation of the geomembrane in appurtenant areas, and connection of geomembrane to appurtenances have been made in accordance with the Construction Drawings and Technical Specifications;
- extreme care is taken by the Installer when seaming around appurtenances since neither non-destructive nor destructive testing may be feasible in these areas; and
- the geomembrane has not been visibly damaged when making connections to appurtenances.

TABLE 6-1
GEOMEMBRANE CONFORMANCE
TESTING REQUIREMENTS

TEST NAME	TEST METHOD	MINIMUM TESTING FREQUENCY⁽¹⁾
Specific Gravity	ASTM D 792 Method A or ASTM D 1505	1 test per 100,000 ft ²
Thickness	ASTM D 5199 or ASTM D 5994	1 test per 100,000 ft ²
Tensile Strength at Yield	ASTM D 638	1 test per 100,000 ft ²
Tensile Strength at Break	ASTM D 638	1 test per 100,000 ft ²
Elongation at Yield	ASTM D 638	1 test per 100,000 ft ²
Elongation at Break	ASTM D 638	1 test per 100,000 ft ²
Carbon Black Content	ASTM D 1603 or D 4218	1 test per 100,000 ft ²
Carbon Black Dispersion	ASTM D 5596	1 test per 100,000 ft ²
Interface Shear Strength ⁽²⁾	ASTM D 5321	1 sandwich test per cell (per case)

Notes:

1. Test shall be performed at a frequency of one per lot or at listed frequency, whichever is greater. A lot shall be as defined by ASTM D 4354.
2. Interface shear strength testing shall be performed in accordance with Section 02790 of the Technical Specifications.

TABLE 6-2
GEOMEMBRANE SEAM
TESTING REQUIREMENTS

TEST NAME	TEST METHOD	MINIMUM TESTING FREQUENCY
Peel Adhesion of Seam	ASTM D 6392 ^(1,3)	1 test every 500 ft
Bonded Seam Strength	ASTM D 6392 ^(2,3)	1 test every 500 ft
Vacuum Testing Welded Seams	—	100 percent of extrusion welds
Air Pressure Testing Welded Seams	—	100 percent of fusion welds

Notes:

1. For peel adhesion, seam separation shall not extend more than 10 percent into the seam interface. Testing shall be discontinued when the sample has visually yielded.
2. For shear tests, the sheet shall yield before failure of the seam.
3. For either test, sample failure shall be a Film Tear Bond (FTB) as outlined in NSF 54, Appendix A.

7 GEOSYNTHETIC CLAY LINER

7.1 Introduction

The CQA Consultant shall perform conformance testing and monitor the installation of the geosynthetic clay liner (GCL) as required by Section 02780 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the GCL with the requirements of the Technical Specifications shall be performed by the CQA Consultant in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 7-1.

7.2 Transportation, Handling, and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the GCL on-site. The Construction Manager shall designate a GCL storage location. Handling of the rolls shall be performed in a competent manner such that damage does not occur to the GCL or its protective wrapping. Any protective wrapping that is damaged or stripped off the rolls shall be repaired immediately to the satisfaction of the CQA Consultant. During transportation, handling, and storage the GCL rolls will be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Upon delivery of the GCL at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and
- rolls that include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the GCL on-site is adequate and does not pose any risk of damage to the GCL when used properly.

7.3 Conformance Testing

7.3.1 Sampling Procedures

Upon delivery of the rolls of GCL, the CQA Consultant will assure that samples are removed and forwarded to the Geosynthetic CQA Laboratory for testing of conformance to both the Technical Specifications and the list of guaranteed properties provided by the Manufacturer. Conformance samples will be 3 ft long by the roll width. The CQA Consultant will mark the

machine direction on the samples with a waterproof marker, and tape or otherwise secure the cut edges of the sample to eliminate the loss of the granular bentonite. The required minimum sampling frequencies are provided in Table 7-1. The rolls shall be immediately re-wrapped and replaced in their shipping trailers or in the temporary field storage area. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

7.3.2 Testing Procedure

Conformance testing of the GCL materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the GCL conformance test procedures listed in Table 7-1 shall be performed by the Geosynthetics CQA Laboratory.

7.3.3 Test Results

The CQA Consultant will examine all results from laboratory conformance testing and will report any non-conformance to the Construction Manager. The GCL conformance test results shall meet or exceed the minimum property values presented in Section 02780 of the Technical Specifications.

7.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with GCL conformance failures.

7.4 Surface Preparation

The GCL shall not be placed on surfaces which are softened due to high water content or cracked due to desiccation. The CQA Consultant and the Installer will jointly verify that the surface on which the GCL will be installed is acceptable. The Contractor shall comply with the surface preparation and acceptance requirements identified in Section 02200 of the Technical Specifications. Additionally, the surface shall contain no loose stones and no ruts greater than 1-in. depth. The CQA Consultant shall notify the Contractor of any observed change in the supporting soil condition that may require repair work and verify that compacted soil repair work is completed in accordance with the requirements of the Technical Specifications of this CQA Plan.

7.5 Placement

The CQA Consultant shall verify that the Installer has taken all necessary precautions to protect the underlying subgrade during GCL deployment operations. The CQA Consultant shall verify that all GCL is handled in such a manner as to ensure they are not damaged in any way, and the following conditions are met:

- in the present of wind, all GCL are weighted with sandbags or the equivalent;
- GCL is kept continually under tension to minimize the presence of wrinkles;
- GCL is cut using a utility blade in a manner recommended by the Manufacturer;
- during placement, care is taken not to entrap fugitive stones or other debris under the GCL;
- the exposed GCL is protected from damage in heavily trafficked areas;
- a visual examination of the GCL is carried out over the entire surface, after installation, to assure that damaged areas, if any, are identified and repaired; and
- if a white colored GCL is used, precautions are taken against “snow blindness” of personnel.

7.6 Overlaps

The CQA Consultant shall monitor and verify the GCL overlapping procedures conform to the requirements of Section 02780 of the Technical Specifications. GCL panels shall be overlapped at a minimum of 6 in. along panel sides, if applicable, and a minimum of 12 in. along panel ends. Dry bentonite powder shall be applied along seam overlaps or other perforations of GCL in accordance with the GCL manufacturer’s recommendations.

7.7 Repair

The CQA Consultant shall monitor the repair of any holes or tears in the GCL or the geotextile backing. Repairs shall be made by placing a patch made from the same type GCL over the damaged area. On slopes greater than 5 percent, the patch shall overlap the edges of the hole or tear by a minimum of 2 ft in all directions. On slopes, 5 percent or flatter, the patch shall overlap the edges of the hole or tear by a minimum of 1 ft in all directions. The patch shall be secured to the satisfaction of the CQA Consultant to avoid shifting during soil placement or covering with another geosynthetic.

TABLE 7-1
GCL CONFORMANCE
TESTING REQUIREMENTS

TEST NAME	TEST METHOD	MINIMUM TESTING FREQUENCY
Hydraulic Conductivity	ASTM D 5887	1 test per 100,000 ft ²
Interface Shear Strength	ASTM D 6243	1 test per interface per 10 acres

Notes:

1. Testing shall be performed at a frequency of one per lot or at listed frequency, whichever is greater. A lot is defined by ASTM D 4354.

8 GEOTEXTILES

8.1 Introduction

The CQA Consultant shall monitor the installation of geotextile filters and separators as required by Section 02720 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the geotextiles with the requirements of the Technical Specifications shall be performed by the CQA Consultant in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 8-1.

8.2 Transportation, Handling, and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geotextile on-site. The Construction Manager shall designate a geotextile storage location. During transportation, handling, and storage, the geotextile shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Handling of the geotextile rolls shall be performed in a competent manner such that damage does not occur to the geotextile or to its protective wrapping. Rolls of geotextiles shall not be stacked upon one another to the extent that deformation of the core occurs or to the point where accessibility can cause damage in handling. Furthermore, geotextile rolls shall be stacked in such a way that access for conformance sampling is possible. Protective wrappings shall be removed less than one hour prior to unrolling the geotextile. After unrolling, a geotextile shall not be exposed to ultraviolet light for more than 15 calendar days or the Manufacturer's recommended exposure period, whichever is more stringent.

Outdoor storage of geotextile rolls shall not exceed the Manufacturers recommendations or longer than six months, whichever is less. For storage periods longer than six months, a temporary enclosure shall be placed over the rolls, or they shall be moved to an enclosed facility. The location of temporary field storage shall not be in areas where water can accumulate. The rolls shall be elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and

- rolls that include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the geotextiles on-site is adequate and does not pose any risk of damage to the geotextiles when used properly.

8.3 Conformance Testing

8.3.1 8.3.1 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first 3 feet. Unless otherwise specified, samples shall be 3 feet long by the roll width. The required minimum geotextile conformance sampling frequencies are provided in Table 8-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The geotextile rolls which are sampled shall be immediately rewrapped in their protective coverings to the satisfaction of the CQA Consultant.

8.3.2 8.3.2 Testing Procedure

Conformance testing of the geotextile materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the Manufacturer's list of minimum average roll values. As a minimum, the geotextile conformance test procedures listed in Table 8-1 shall be performed by the Geosynthetics CQA Laboratory.

8.3.3 8.3.3 Test Results

The CQA Consultant shall review all laboratory conformance test results and verify compliance of the test results with the property values specified in Section 02720 of the Technical Specifications prior to deployment of the geotextiles. Any non-conformance shall be reported to the Construction Manager.

8.3.4 8.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA Laboratory with the Manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the Manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls that fall numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geotextile conformance failures.

8.4 Placement

The CQA Consultant shall monitor the placement of all geotextiles to ensure they are not damaged in any way, and the following conditions are met.

- On slopes, the geotextiles shall be securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geotextile in tension.
- In the presence of wind, all geotextiles shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover material.
- Trimming of the geotextiles shall be performed using only an upward cutting hook blade. Special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.
- The CQA Consultant shall monitor that the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geotextile.
- During placement of geotextiles, care shall be taken not to entrap stones, excessive dust, or moisture that could generate clogging of drains or filters.
- A visual examination of the geotextile shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

8.5 Seams and Overlaps

All geotextile filters shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped 6 inches prior to seaming. No horizontal seams shall be allowed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e. seams shall be along, not across, the slope), except as part of a patch.

Sewing shall be done using polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile. The seams shall be sewn using a single row type "401" two-thread chainstitch. The CQA Consultant shall monitor the geotextile seaming procedures to verify that seams and overlaps are in accordance with Section 02720 of the Technical Specifications.

Geotextile separators and cushion layers may be overlapped a minimum of 2 ft in lieu of sewing.

8.6 Repair

The CQA Consultant shall monitor that any holes or tears in the geotextile are repaired as follows:

- On-slopes: A patch made from the same geotextile is double seamed into place (with each seam 1/4 in. to 3/4 in. apart and no closer than 1 in. from any edge) with a minimum 12-in. overlap. Should any tear exceed 50 percent of the width of the roll, that roll shall be removed from the slope and replaced.
- Non-slopes: A patch made from the same geotextile is sewn in place with a minimum of 12 in. overlap in all directions away from the repair area.

Care shall be taken to remove any soil or other material which may have penetrated the torn geotextile. The CQA Consultant shall observe all repairs and assure that any non-compliance with the above requirements is corrected.

8.7 Placement of Soil Materials

The CQA Consultant shall monitor the Contractor's placement of all materials located on top of a geotextile, to verify:

- that no damage occurs to the geotextile;
- that no shifting of the geotextile from its intended position occurs and underlying materials are not exposed or damaged;

- that excess tensile stress does not occur in the geotextile; and
- that equipment ground pressure on geotextiles overlying geomembranes does not exceed those specified in Section 02720 of the Technical Specifications.

Soil backfilling or covering of the geotextile with another geosynthetic shall be completed within 15 days or the manufacturer's specified exposure period. On side slopes, soil layers shall be placed over the geotextile from the bottom of the slope upward.

TABLE 8-1
GEOTEXTILE CONFORMANCE
TESTING REQUIREMENTS

TEST NAME	TEST METHOD	MINIMUM TESTING FREQUENCY⁽⁴⁾
Mass per Unit Area	ASTM D 5261	1 test per 100,000 ft ²
Grab Strength	ASTM D 4632 ⁽¹⁾	1 test per 100,000 ft ²
Trapezoidal Tear Strength	ASTM D 4533 ⁽²⁾	1 test per 100,000 ft ²
Static Puncture Strength	ASTM D 6241	1 test per 100,000 ft ²
Apparent Opening Size ⁽⁵⁾	ASTM D 4751	1 test per 100,000 ft ²
Permittivity ⁽⁵⁾	ASTM D 4491	1 test per 100,000 ft ²

Notes:

1. Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
2. Minimum value measured in machine and cross machine direction.
3. Tension testing machine with a 1.75-inch diameter ring clamp, the steel ball being replaced with 0.31-inch diameter solid steel cylinder with a flat tip centered within the ring clamp.
4. Testing shall be performed at a frequency of one per lot or at listed frequency, whichever is greater. A lot is defined by ASTM 4354.
5. Apparent opening size and permittivity testing to be performed on geotextiles used for filtration applications only (i.e., geotextile separators between liner protective layer and leachate collection and sump gravel materials).

9 GEOCOMPOSITES

9.1 Introduction

The CQA Consultant shall perform conformance testing and shall monitor the installation of the geocomposite drainage layers as required by Section 02740 of the Technical Specifications and this CQA Plan. The testing used to evaluate the conformance of the geocomposite drainage layers with the requirements of the Technical Specifications shall be performed by the CQA Consultant in accordance with the current versions of the ASTM or other applicable test procedure indicated in Table 9-1.

9.2 Transportation, Handling and Storage

The CQA Consultant shall monitor the transportation, handling, and storage of the geocomposite on-site. The Construction Manager shall designate a geocomposite storage location. During transportation, handling, and storage, the geocomposite shall be protected from ultraviolet light exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

Handling of the geocomposite rolls shall be performed in a competent manner such that damage does not occur to the geocomposite or to its protective wrapping. Rolls of geocomposite shall not be stacked upon one another to the extent that deformation of the roll occurs or to the point where accessibility can cause damage in handling. Furthermore, geocomposite rolls shall be stacked in such a way that access for conformance sampling is possible. Protective wrappings shall be removed less than one hour prior to unrolling the geocomposite. After unrolling, a geocomposite shall not be exposed to ultraviolet light for more than 15 calendar days or the manufacturer's recommended exposure period, whichever is more stringent.

Outdoor storage of geocomposite rolls shall not exceed the Manufacturer's recommendations or longer than six months whichever is less. For storage periods longer than six months a temporary enclosure shall be placed over the rolls, or they shall be moved to an enclosed facility. The location of temporary field storage shall not be in areas where water can accumulate. The rolls shall be elevated off the ground to prevent contact with ponded water.

Upon delivery at the site, the Contractor, Installer, and CQA Consultant shall conduct an inspection of the rolls for defects and damage. This inspection shall be conducted without unrolling the materials unless defects or damages are found or suspected. The CQA Consultant shall indicate to the Construction Manager:

- rolls, or portions thereof, which should be rejected and removed from the site because they have severe flaws; and

- rolls which include minor repairable flaws.

The CQA Consultant shall also monitor that equipment used to handle the geocomposites on-site is adequate and does not pose any risk of damage to the geocomposites when used properly.

9.3 Conformance Testing

9.3.1 Sampling Procedures

Samples shall be taken across the entire width of the roll and shall not include the first 3 ft. Unless otherwise specified, samples shall consist of one section 3 ft long by the roll width for geonet and geocomposite testing and one section 10 ft long cut 1 ft from the edge of the geonet for testing of the unbonded geotextiles. The required minimum geocomposite conformance sampling frequencies are provided in Table 9-1. The CQA Consultant shall mark the machine direction on the samples with an arrow and affix a label, tag, or otherwise mark each sample with the following information:

- date sampled;
- project number;
- lot/batch number and roll number;
- conformance sample number; and
- CQA personnel identification.

The geocomposite rolls which are sampled shall be immediately rewrapped in their protective coverings to the satisfaction of the CQA Consultant.

9.3.2 Testing Procedure

Conformance testing of the geocomposite materials delivered to the site will be conducted to ensure compliance with both the Technical Specifications and the manufacturer's list of minimum average roll values. As a minimum, the geotextile, geonet, and geocomposite conformance test procedures listed in Table 9-1 shall be performed by the Geosynthetics CQA Laboratory.

9.3.3 9.3.3 Test Results

The CQA Consultant shall review all laboratory conformance test results and verify compliance of the test results with the specified values in Section 02740 of the Technical Specifications prior to deployment of the geocomposites. Any non-conformance shall be reported to the Construction Manager.

9.3.4 9.3.4 Conformance Test Failure

In the case of failing test results, the Contractor may request that another sample from the failing roll be retested by the Geosynthetics CQA laboratory with the manufacturer's technical representative present during the test procedure. If the retest fails or if the option to retest is not exercised, then two isolation conformance samples shall be obtained by the CQA Consultant. These isolation samples shall be taken from rolls, which have been determined by correlation with the manufacturer's roll number, to have been manufactured prior to and after the failing roll. This method for choosing isolation rolls for testing should continue until passing tests are achieved. All rolls which fail numerically between the passing roll numbers shall be rejected. The CQA Consultant will verify that the Contractor has replaced all rejected rolls. The CQA Consultant shall document all actions taken in conjunction with geocomposite conformance failures.

9.4 Placement

The CQA Consultant shall monitor the placement of all geocomposites to ensure they are not damaged in any way, and the following conditions are met.

- On slopes, the geocomposites shall be securely anchored in the anchor trench and then deployed down the slope in such a manner as to continually keep the geocomposites in tension.
- In the presence of wind, all geocomposites shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with earth cover material.
- Trimming of the geocomposites shall be performed using only an upward cutting hook blade. Special care must be taken to protect other materials from damage which could be caused by the cutting of the geocomposites.
- The CQA Consultant shall monitor that the Installer is taking necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- During placement of geocomposites, care shall be taken not to entrap stones, soil, excessive dust, or moisture that could damage the geomembrane, generate clogging of drains or filters, or hamper subsequent drainage operations.
- A visual examination of the geocomposite shall be carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, (e.g., stones, sharp objects, small tools, sandbags, etc.) are present.

9.5 Joining, Seams, and Overlaps

The components of the geocomposite (e.g., geotextile, geotextile) shall be seamed, joined, and overlapped to like components in adjacent geocomposites. Lower geotextile components of the geocomposites shall be overlapped such that the component has a minimum overlap of four inches. Adjacent edges of geonet component along the length of the geocomposite should be overlapped a minimum 2-3 in. and joined by tying the geonet together with white or yellow plastic fasteners or polymeric thread. Geonet for adjoining geocomposite panels (end to end) along the roll width should be shingled down in direction of slope and overlapped a minimum of 12 in. Upper geotextile components of the geocomposites shall be continuously sewn (i.e., spot sewing is not allowed). Geotextiles shall be overlapped 6 in. prior to sewing. No horizontal seams shall be allowed on side slopes that are steeper than 10 horizontal to 1 vertical (i.e. seams shall be along, not across, the slope), except as part of a patch.

Sewing of geotextiles shall be done using polymeric thread with chemical and ultraviolet resistance properties equal to or exceeding those of the geotextile. The seams shall be sewn using a single row type "401" two-thread chainstitch. The CQA Consultant shall monitor the geotextile seaming and geonet tying procedures to verify that joining, seams, and overlaps are in accordance with Section 02740 of the Technical Specifications.

9.6 Repair

The CQA Consultant shall monitor that any holes or tears in the geocomposite are repaired as follows:

- A patch made from the same geocomposite will be secured into place by tying fasteners through the bottom geotextile and the geonet of the patch, and through the top geotextile and geonet.
- The patch will extend 2 ft beyond the edges of the hole or tear.
- The patch will be secured every 6 in. and heat sealed to the top geotextile of the geocomposite needing repair.
- If the hole or tear is more than 50 percent of the width of the roll, the damaged area should be cut out and the two portions of the geocomposite will be joined.

Care shall be taken to remove any soil or other material which may have penetrated the torn geocomposite component. The CQA Consultant shall observe any repair and assure that any non-compliance with the above requirements is corrected.

9.7 Placement of Soil Materials

The CQA Consultant shall monitor the Contractor's placement of all soil materials located on top of a geocomposite, to verify:

- that no damage occurs to the geocomposite;
- that no shifting of the geocomposite from its intended position occurs and underlying materials are not exposed or damaged;
- that excess tensile stress does not occur in the geocomposite; and
- that equipment ground pressure on geocomposites overlying geomembranes does not exceed those specified in Section 02740 of the Technical Specifications.

Soil backfilling or covering of the geocomposite shall be completed within 15 days or the manufacturer's recommended exposure period. On side slopes soil layers shall be placed over the geocomposite from the bottom of the slope upward.

TABLE 9-1
GEOCOMPOSITE CONFORMANCE
TESTING REQUIREMENTS

TEST NAME	TEST METHOD	MINIMUM TESTING FREQUENCY ⁽³⁾
<u>Geotextile Components</u>		
Mass per Unit Area	ASTM D 5261	1 test per 100,000 ft ²
Grab Strength	ASTM D 4632 ⁽¹⁾	1 test per 100,000 ft ²
Trapezoidal Tear Strength	ASTM D 4533 ⁽²⁾	1 test per 100,000 ft ²
Static Puncture Strength	ASTM D 6241	1 test per 200,000 ft ²
Apparent Opening Size	ASTM D 4751	1 test per 100,000 ft ²
Permittivity	ASTM D 4491	1 test per 100,000 ft ²
<u>Geocomposite</u>		
Transmissivity ⁽⁴⁾	ASTM D 4716	1 test per 100,000 ft ²
Peel Strength	ASTM F 904	1 test per 100,000 ft ²
Interface Shear Strength	ASTM D 5321	1 test per interface per 10 acres

Notes:

1. Minimum of values measured in machine and cross machine directions with 1 inch clamp on Constant Rate of Extension (CRE) machine.
2. Minimum value measured in machine and cross machine direction.
3. Testing shall be performed at a frequency of one per lot or at listed frequency, whichever is greater. A lot is defined by ASTM 4354.
4. Transmissivity testing shall be performed in accordance with Section 02740 of Technical Specifications.

10 HDPE PIPES AND FITTINGS

10.1 Introduction

The CQA Consultant shall monitor the installation of ancillary materials such as HDPE pipes and fittings for the landfill gas collection and transmission systems as required by Section 15051 of the Technical Specifications, the Construction Drawings and this CQA Plan.

10.2 Butt-Fusion Welding Process

The CQA Consultant shall monitor the assembling of lengths of HDPE pipe into suitable installation lengths by the butt-fusion process. Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. Butt-fusion welding of the HDPE pipes and fittings shall be performed by the Contractor in accordance with the pipe manufacturer's recommendations as to equipment and technique.

10.3 Electro-Fusion Welding Process

When specifically approved in writing by the Construction Manager, Field Engineering, and Project QA Managers, HDPE pipes may be joined using an electrofusion coupling. An electrofusion coupling for any application other than surface water management pipes is prohibited except for joining perforated pipe to solid pipe at liner penetration boxes. The CQA Consultant shall monitor the assembling of lengths of HDPE pipe into suitable installation lengths by the butt-fusion process. Butt-fusion means the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. Butt-fusion welding of the HDPE pipes and fittings shall be performed by the Contractor in accordance with the pipe manufacturer's recommendations as to equipment and technique.

10.4 Transportation, Handling and Storage

The pipe is to be bundled together with plastic straps for bulk handling and shipment. The packing shall be such that either forklifts or cranes equipped with slings can be used for safe handling. The pipe shall be segregated by wall thickness and diameter.

The CQA Consultant shall monitor the offloading of the pipe to assure that handling is done in a competent manner and that the pipes are not placed in areas where water can accumulate. The pipe shall not be stacked more than three high or in such a manner that could cause damage to the pipe. Furthermore, the pipe shall be stacked in such a manner that access for any

conformance sampling is possible. Outdoor storage should be no longer than 12 months. For outdoor storage periods longer than 12 months a temporary covering shall be placed over the pipes, or they shall be moved to within an enclosed facility.

10.5 Installation

The CQA Consultant shall monitor that care is taken during installation of the pipes such that they will not be cut, kinked, or otherwise damaged. Ropes, fabric, or rubber-protected slings and straps shall be used by the Contractor when installing pipes. The use of chains, cables, or hooks inserted into the pipe ends shall not be allowed.

The Contractor shall install the pipe and fittings in such a manner that the materials are not damaged. Slings for handling the pipe shall not be positioned at butt-fused joints of HDPE pipes. Sections of the pipes with deep cuts and/or gouges shall be removed, and the ends of the pipeline rejoined. Care shall be exercised when lowering pipe into the trench to prevent damage or twisting of the pipe.

The CQC Contractor will be present during HDPE pipes and fittings installation to confirm compliance with Section 02605 of the Technical Specifications and Contract Drawings.

10.4.1 Liner Penetration Box Installation

The CQC Contractor will monitor installation and testing of liner penetration boxes to confirm compliance with Section 13005 Part 3.04 of the Technical Specifications and with Contract Drawings.

10.6 Field Testing of Work Products

The CQA Consultant shall verify that the Contractor has performed the applicable pre-testing procedures required by Section 02715 of the Technical Specifications prior to initiating any hydrostatic or low-pressure air testing of the solid HDPE pipes during installation. Pressure testing of liner penetration boxes will be in accordance with Section 13005 Part 3.03 of the Technical Specifications. Hydrostatic pressure testing shall be the preferred method of pressure testing. A pneumatic pressure testing method may be used when approved in writing by the Construction Manager. The CQA Consultant shall monitor the Contractor's activities associated with all testing activities and will confirm that the Contractor follows the procedures required in the specifications. The CQA Consultant shall either record the test results or observe the Contractor recording the results and review the results upon submittal by the Contractor.

10.7 Deficiencies, Problems, and Repairs

The CQA Consultant shall report any deficiencies or noncompliance in the construction to the Contractor. The extent of deficiencies will be evaluated by observations, review of records, or other means deemed appropriate by the Construction Manager.

The Contractor shall correct the deficiency to the satisfaction of the CQA Consultant. All retests or subsequent re-evaluations recommended by the CQA Consultant must be verified to confirm that the deficiency has been corrected before any additional work is performed by the Contractor in the area of the deficiency.

11 MECHANICAL AND ELECTRICAL

11.1 Introduction

The CQA Consultant shall monitor the materials used in and installation of all mechanical and electrical systems to assure compliance with the Technical Specifications and approved submittals. The mechanical and electrical systems include, but are not limited to, the following:

- leachate sump pumps, and associated connections and wiring;
- overhead/buried power distribution system, power wiring, including power circuit connections for pump motors, and equipment mounting boards;
- instrumentation including level transducers, flow meters, and pressure gauges; and
- temporary support facilities for electric, water, and sanitary sewer services.

11.2 Related Construction Drawings and Technical Specifications

The mechanical work performed by the Contractor shall comply with the Construction Drawings, Technical Specifications, and approved submittals. These specifications shall be referenced for specific details of the mechanical equipment requirements and installation. The electrical work performed by the Contractor shall comply with Construction Drawings, Technical Specifications, and approved submittals. These specifications shall be referenced for specific details of the electrical requirements and installation.

11.3 Codes, Rules, Inspections, and Workmanship

The CQA Consultant shall monitor the work of the Contractor in the installation of all mechanical and electrical appurtenances in accordance with national codes and other regulations or authorities having jurisdiction over the work. The CQA Consultant shall observe and document construction acceptance testing procedures performed by the Contractor.

11.4 Record Drawings

The CQA Consultant shall monitor the maintenance by the Contractor of a set of prints on which the actual installation of all mechanical and electrical work shall be accurately shown, indicating any variation from Construction Drawings or approved submittals. Changes in layout or circuitry shall be clearly and completely indicated as the work progresses. These progress prints

shall be inspected by the Design Engineer and Construction Manager and used to determine the progress of mechanical and electrical work.

At the completion each phase of the work, the CQA Consultant shall obtain from the Contractor a set of record drawings of the work to include marked-up prints showing the dimensioned location of all underground systems.

12 CONCRETE

12.1 Introduction

This CQA Consultant shall monitor the construction and perform conformance testing of all concrete materials and finished products to assure compliance with Section 03300 of the Technical Specifications and the Construction Drawings.

12.2 Inspections

The CQA Consultant shall monitor concrete workmanship to assure that the Contractor does not place concrete until foundations, forms, reinforcing steel, pipes, conduits, sleeves, anchors, hangers, inserts, and other work required to be built into concrete has been inspected and approved by the Construction Manager. The Contractor is required to notify the Construction Manager and CQA Consultant at least 24 hours in advance of concrete placement activities for scheduling of the inspection activities described above.

12.3 Field Quality Control Testing

Performance testing of placed concrete shall be the responsibility of the CQA Consultant. The concrete test program shall meet the following requirements:

- Concrete samples will be obtained by the CQA Consultant at a frequency of one set of standard cylindrical test specimens for the first 5 cubic yards (yd³) and every 25 yd³ of concrete or any portion of thereafter for each structure. For each work shift, when concrete is delivered, at least one set of specimens will be made. A set of test specimens will consist of at least three standard cylinders. Each set of test specimens will be tested for 2-day, 7-day, and 28-day compressive strength, and a fourth cylinder will be held in reserve.
- Compressive strengths shall be determined from the standard test specimens taken according to ASTM C 31 and ASTM C 172 and cured and tested in accordance with ASTM C 39. Core drilling, if required, and testing will be in accordance with ASTM C 94.
- If required by the Design Engineer, slump and air content shall be determined with no less frequency than that of casting strength specimen sets. Air content and slump shall be determined in accordance with ASTM C 231 and ASTM C 143, respectively.

The CQA Consultant shall be responsible for reporting all test results to the Contractor and the Construction Manager. Materials determined by the Construction Manager to fail the requirements of the Construction Drawings and Technical Specifications shall be rejected.

13 ROAD CONSTRUCTION

13.1 Introduction

The CQA Consultant shall monitor, and test materials used in the construction of the various roads to assure compliance with Construction Drawings and Technical Specifications.

13.2 Subgrade Preparation

In-place moisture/density testing by nuclear methods (ASTM D 6938) shall be performed by the CQA Consultant for all compacted fill materials. Fill placement and compaction shall be conducted in accordance with Section 02230 of the Technical Specifications. For road subgrades, nuclear moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal ft per lift or as directed by the Engineer. The CQA Consultant shall monitor the Contractor's proof rolling of cut sections.

13.3 Subbase Layer

The CQA Consultant shall monitor and test the subbase layer to ensure it is constructed to the thickness, grades and density as required by the Construction Drawings and the Technical Specifications. Moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal feet per lift or as directed by the Engineer.

13.4 Base Layer

The CQA Consultant shall monitor the base aggregate to ensure it is constructed to the thickness, grades, and density as required by the Construction Drawings and the Technical Specifications. Moisture/density tests shall be performed at a minimum frequency of 1 test per 200 lineal feet per lift or as directed by the Engineer Conformance Testing

13.5 Quality Control Testing

Quality control testing of the materials used in construction of the roads shall be the responsibility of the CQA Consultant. The frequency of CQA testing for the subbase aggregate and base aggregate materials is as follows:

- particle size analysis (ASTM C136) at a frequency of one test per 5,000 yd³; and
- density and moisture (ASTM D 6938) at a frequency of one test per 200 lineal feet per lift.

Requirements for in-situ density of base aggregates shall be defined during the compaction of a test strips. The base aggregate shall be compacted in accordance with the requirements of Section 02230 of the Technical Specifications.

13.6 Repairs

If a defective area is discovered, the CQA Consultant will evaluate the extent and nature of the defect. After this determination the Contractor shall correct the deficiency to the satisfaction of the Construction Manager. The Contractor shall not perform additional work in the area until the Construction Manager approves the correction of the defect. In the event of damage, the Contractor shall immediately make repairs and replacements as necessary to the satisfaction of the Construction Manager.

14 GENERAL SITE WORK

14.1 Introduction

The CQA Consultant shall monitor the activities that are to be performed for various general site work items including, but not limited to riprap, erosion and sediment control, and vegetation for compliance with the Construction Drawings and Technical Specifications.

14.2 Conformance Testing

Conformance testing of materials to ensure compliance with the Construction Drawings and Technical Specifications shall be performed by the CQA Consultant at the discretion of the Construction Manager. If nonconformances or other deficiencies are found by the CQA Consultant in the Contractor's materials or completed work, the Contractor will be required to repair or replace the deficiency at no cost. Any noncompliant items shall be reported to the Construction Manager.

APPENDIX A

CQA FORMS AND LOG



DAILY FIELD REPORT

PROJECT: _____		
LOCATION: _____	PROJECT NO.: _____	TASK NO.: _____
DESCRIPTION: _____		Date: _____

COPY TO: _____	PER: _____
----------------	------------



WEEKLY FIELD REPORT

PROJECT: _____
LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ WEEK ENDING: _____

COPY TO: _____ PER: _____



DETERMINATION OF DENSITY (DRIVE CYLINDER)

(ASTM D 2937)

PROJECT: _____
 LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
 DESCRIPTION: _____ DATE: ____ day _____ month _____ year
 SOURCE: _____

SPECIFICATION REQUIREMENTS:
 MATERIAL TYPE: FILL SUBGRADE SUBBASE CLAY OTHER: _____
 % COMPACTION: _____ MOISTURE CONTENT RANGE: _____
 TEST LOCATION: _____ TEST NO. _____

FIELD TEST DATA -- ASTM D2937				QA ID: _____		
CYL HT 1 (IN): _____		CYL HT 2 (IN): _____		CYL DIA 2 (IN): _____		
CYL DIA 1 (IN): _____						
A	CYLINDER NO.: _____	VOLUME ⁽¹⁾ (cf)	#DIV/0!	E	WET UNIT WEIGHT = D/A (lbs)	#DIV/0!
B	WEIGHT OF SAMPLE & CYLINDER	(lbs)		F	DRY UNIT WEIGHT = E/(1 + (T/100)) (pcf)	#DIV/0!
C	WEIGHT OF CYLINDER	(lbs)		G	PERCENT COMPACTION = F/L (%)	#DIV/0!
D	WEIGHT OF WET SAMPLE = B - C	(lbs)	0.00	H	PASS/FAIL	

NOTE 1. CYLINDER VOLUME IS OBTAINED BY MEASURING THE HEIGHT AND DIAMETER, OF FOUR EQUALLY SPACED POINTS, TO AN ACCURACY OF 0.01-IN., AND CALCULATING THE VOLUME USING AVERAGE HEIGHT AND DIAMETER

FIELD MOISTURE CONTENT -- ASTM D2216				QA ID: _____		
O	WT. OF TARE NO. _____	(gm)	#DIV/0!	R	WT. OF WATER = P - Q (lbs)	0.0
P	WT. OF WET SOIL & TARE	(gm)		S	WT OF DRY SOIL = Q - O (pcf)	0.0
Q	WT. OF DRY SOIL & TARE	(gm)		T	MOISTURE CONTENT = (R/S)X100	#DIV/0!

PROCTOR TEST DATA [L] MAXIMUM DRY UNIT WT. (pcf) _____ (M) OPT. MOIST. CONTENT (%) _____

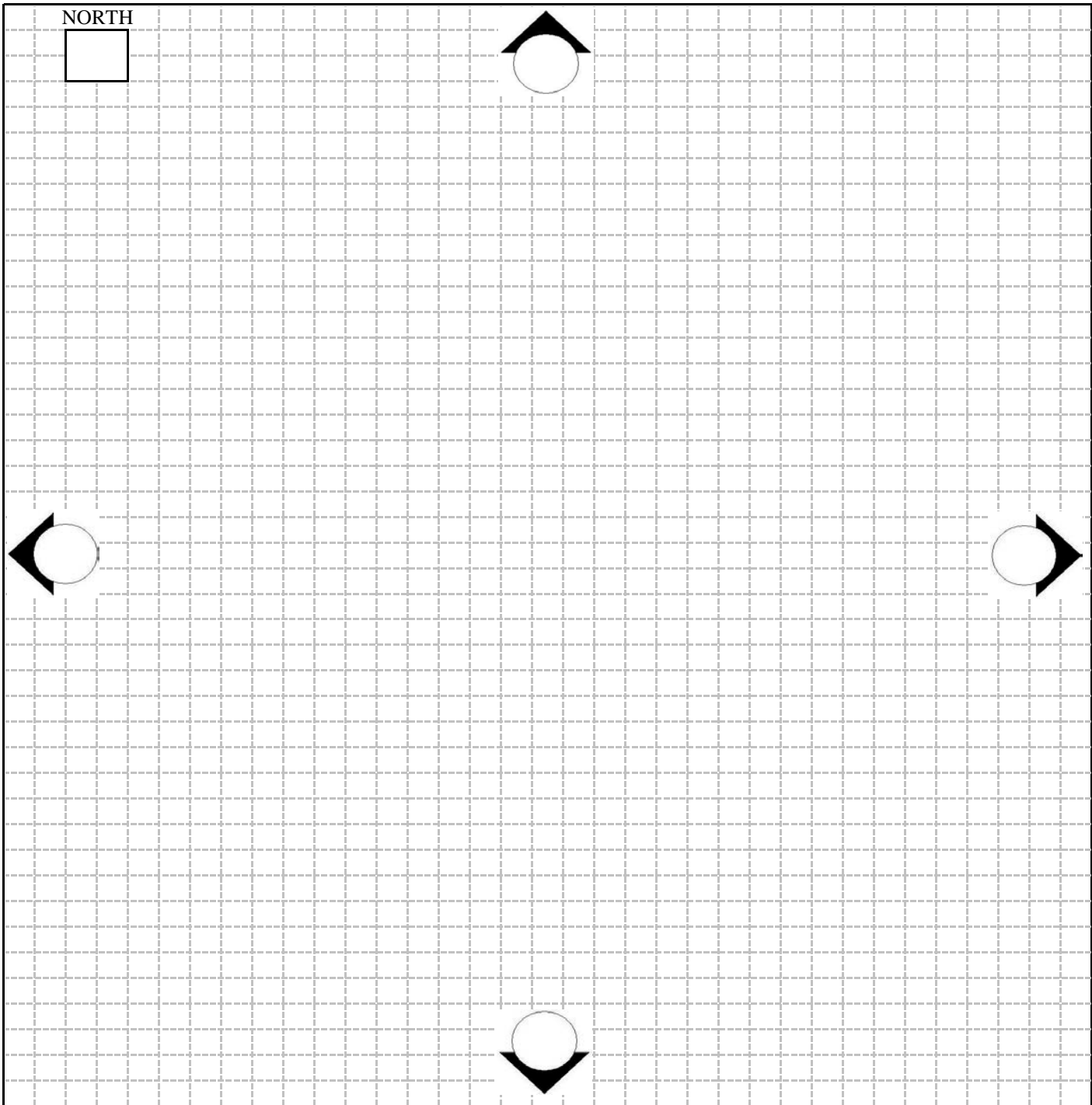
COMPARISON WITH NUCLEAR GAUGE - ASTM D 6938				QA ID: _____		
U	DELTA MOISTURE CONTENT = T - X	#DIV/0!	X	FDT MOISTURE CONTENT	(%)	#DIV/0!
V	FDT WET UNIT WT.	(pcf)	Y	FDT DRY UNIT WT.	(pcf)	#DIV/0!
W	DELTA DRY UNIT WT. = F - Y	#DIV/0!				

COMMENTS



PANEL LAYOUT DETAIL

PROJECT: _____
LOCATION: _____ PROJECT NO.: _____ TASK NO.: _____
DESCRIPTION: _____ YEAR: _____
INSTALLER: _____ PRODUCT TYPE: _____
 PRIMARY SECONDARY OTHER _____ QA ID: _____



SYMBOLS

	S11/P12	SECONDARY/PRIMARY GEOMEMBRANE PANEL NUMBER		
	NDT =	NONDESTRUCTIVE TEST		
	VT =	VACUUM TEST		
	AT =	AIR TEST		
	LEACHATE COLLECTION PIPE		GEOSYNTHETIC CLAY LINER (GCL)	
	TOE OF SLOPE		GEOGRID	
	CREST OF SLOPE		GEONET	
	ANCHOR TRENCH		GEOTEXTILE	
			GEONET COMPOSITE LAYER	
	CAPPED SEAM (FUSION)		NDT TESTED	
	DESTRUCTIVE SAMPLE (DS) LOCATION P=PRIMARY S=SECONDARY		(FAILED)	
			(PASSED)	
			NDT TESTED	
	EXTRUSION WELD REPAIR		NDT TESTED	
	COUPON SAMPLE LOCATION		NDT TESTED	
	PATCH REPAIR LOCATION (EXTRUSION)		NDT TESTED	
	PIPE PENETRATION		SUMP AREA	
	THICKNESS MEASUREMENT			
	ADJACENT PANEL REFERENCE			

SECTION 00850
DRAWINGS INDEX

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6	LANDFILL CELL 3 ACCESS RAMP
7	LCS AND LDS ENLARGED PLAN
8	CONSTRUCTION CONTROL POINT DATA
9	LANDFILL CROSS SECTIONS
10	LINER SYSTEM DETAILS
11	LEACHATE COLLECTION SYSTEM (LCS) DETAILS
12	LEACHATE DETECTION SYSTEM (LDS) DETAILS
13	LINER PENETRATION DETAILS
14	LCS AND LDS DETAILS 1
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22	LEACHATE DETECTION CONTROL PANEL DETAILS
23	STORM WATER POLLUTION PREVENTION PLAN
24	STORM WATER POLLUTION PREVENTION DETAILS

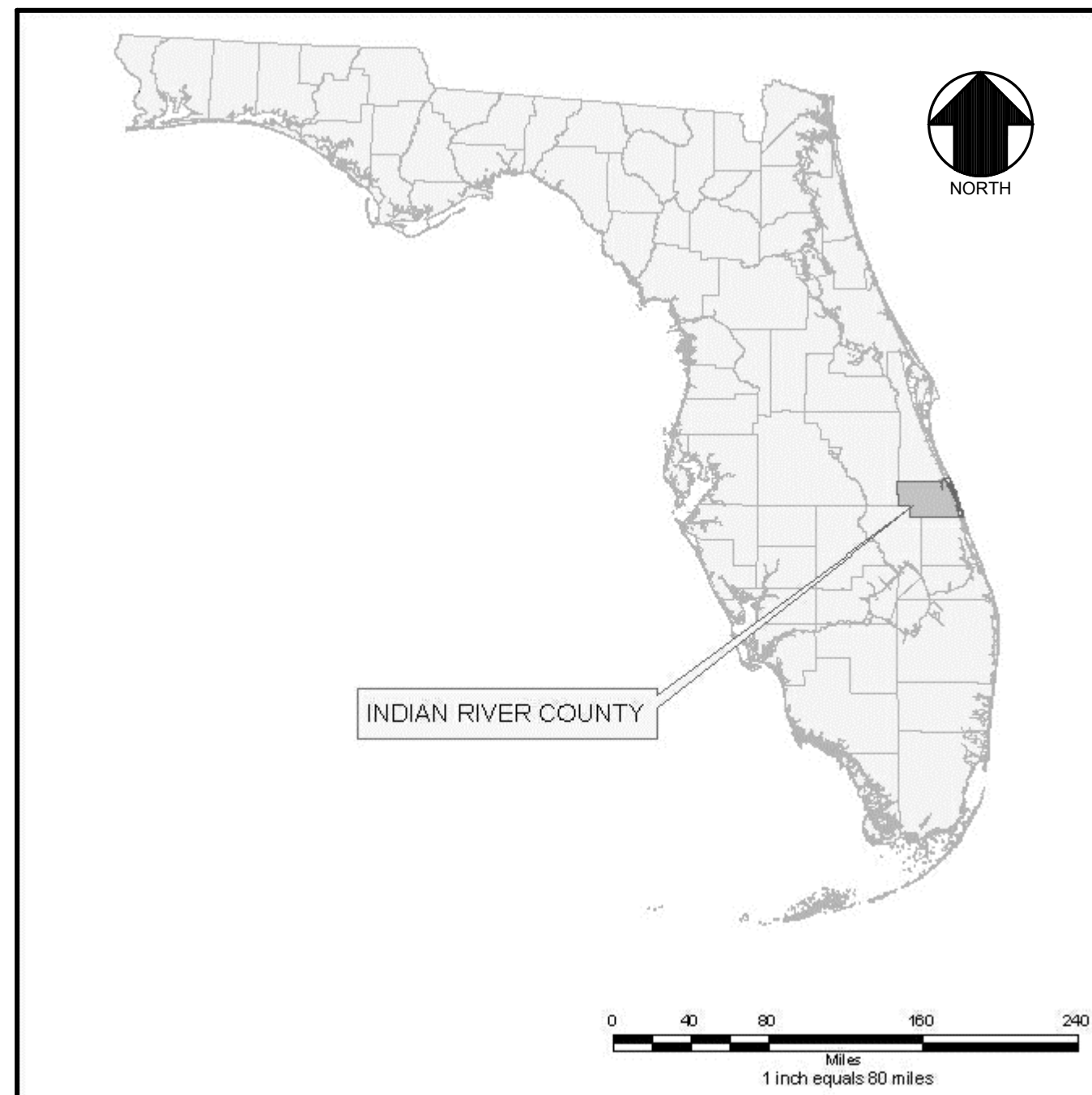
****END OF SECTION****

INDIAN RIVER COUNTY, FLORIDA

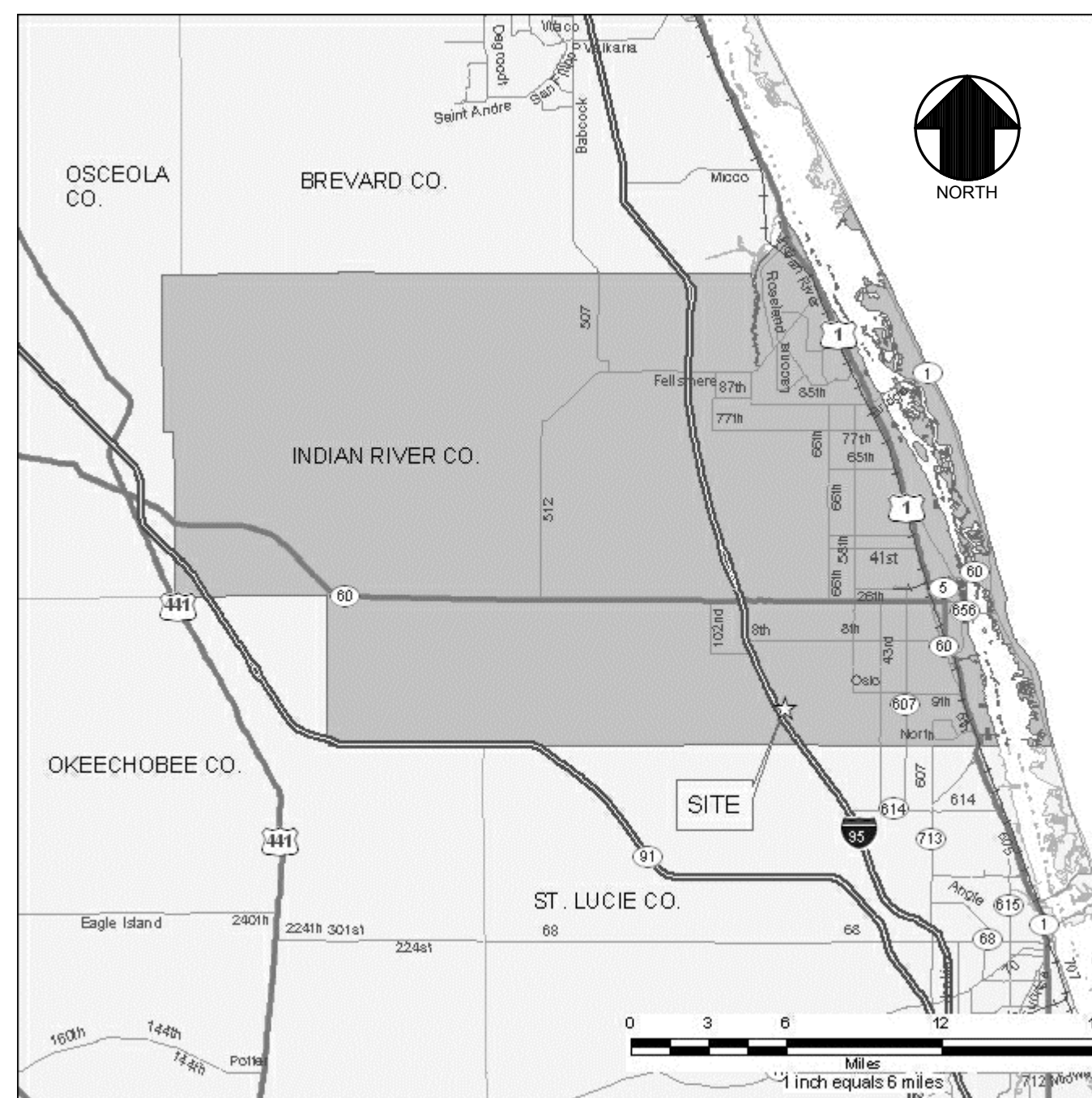
SOLID WASTE DISPOSAL DISTRICT

PHASE II - CELL 3

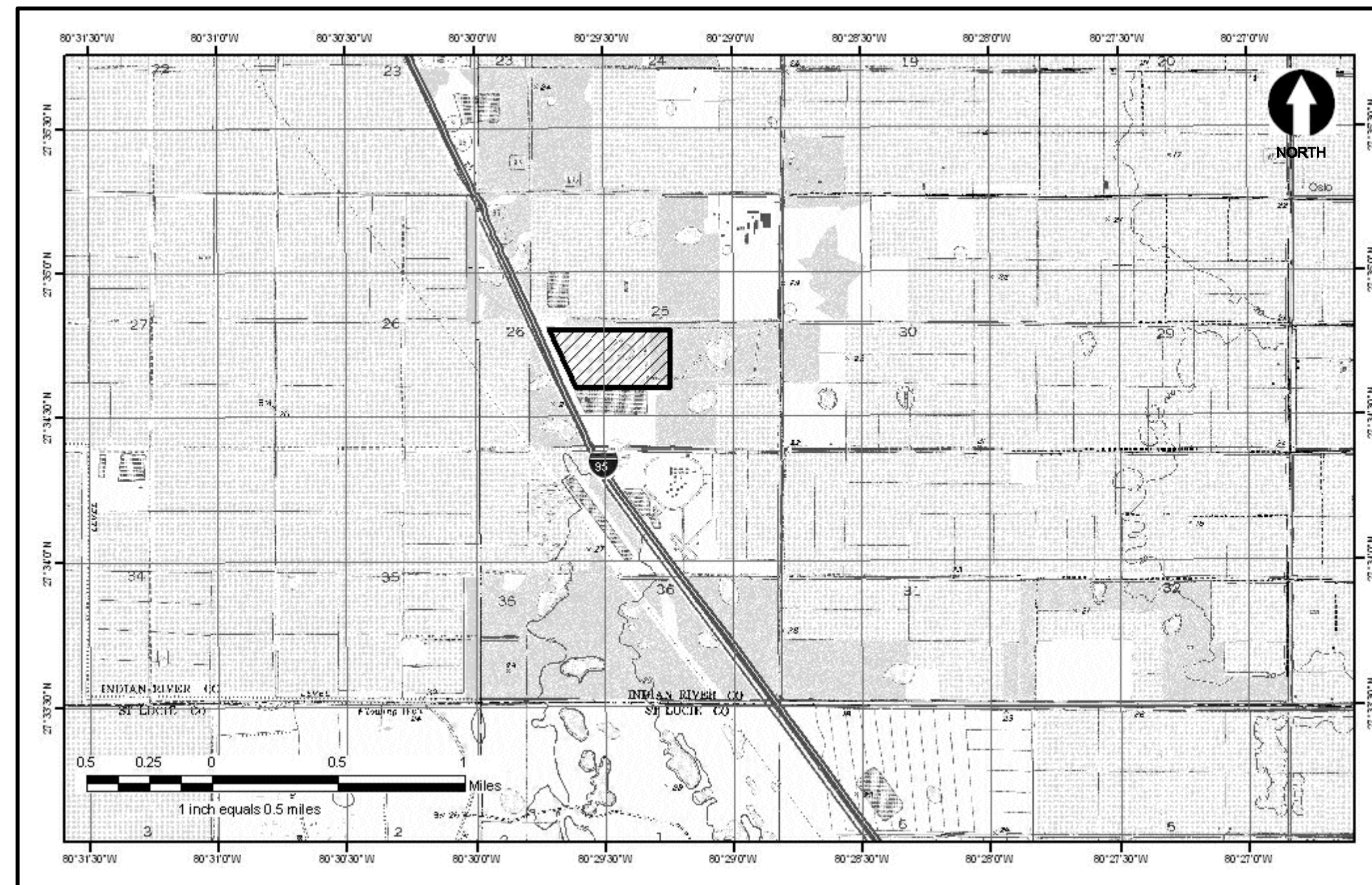
INDIAN RIVER COUNTY LANDFILL CONSTRUCTION DRAWINGS NOVEMBER 2023



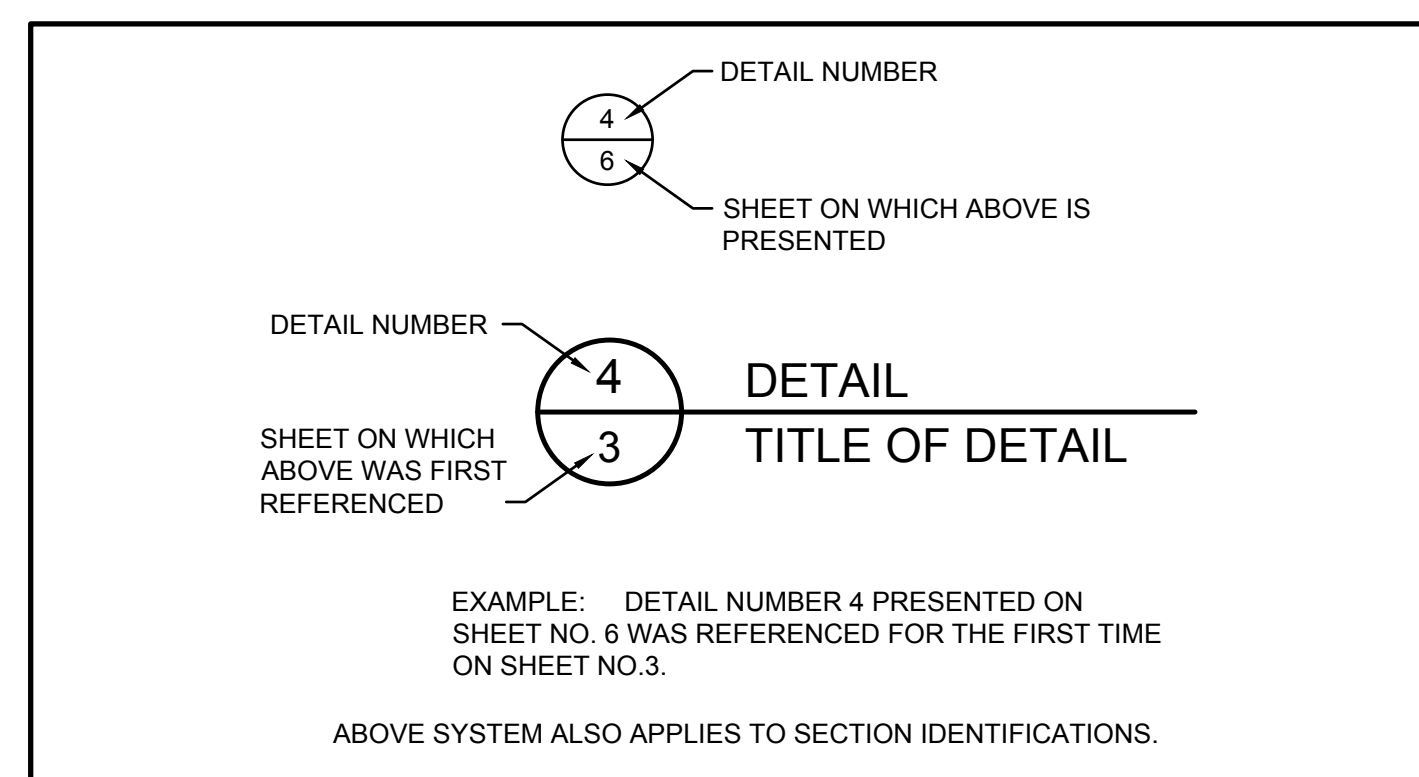
STATE MAP



LOCATION MAP



VICINITY MAP



DETAIL / SECTION IDENTIFICATION LEGEND

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DRAWING NO.	DRAWING TITLE
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5	TOP OF LINER PROTECTIVE COVER GRADING PLAN
6	LANDFILL CELL 3 ACCESS ROAD
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8	CONSTRUCTION CONTROL POINT DATA
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24	STORMWATER POLLUTION PREVENTION DETAILS

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT

1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321		1325 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112	
TITLE: TITLE SHEET			
PROJECT: PHASE II - CELL 3 CONSTRUCTION			
SITE: INDIAN RIVER COUNTY LANDFILL			
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SIGNATURE	DATE	DESIGN BY: KBT	DATE: NOVEMBER 2023
		DRAWN BY: JJV	PROJECT NO.: FL9363A
		CHECKED BY: TC	FILE: FL9363A-C01
		REVIEWED BY: SA	DRAWING NO.:
		APPROVED BY: KBT	1 OF 24



INDIAN RIVER COUNTY LANDFILL

1325 74th AVENUE SW
VERO BEACH, FLORIDA 32968 USA
(772) 770-5112



GEOSYNTEC CONSULTANTS



1200 RIVERPLACE BLVD. SUITE 710
JACKSONVILLE, FLORIDA 32207
(904) 858-1818

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NOT FOR CONSTRUCTION

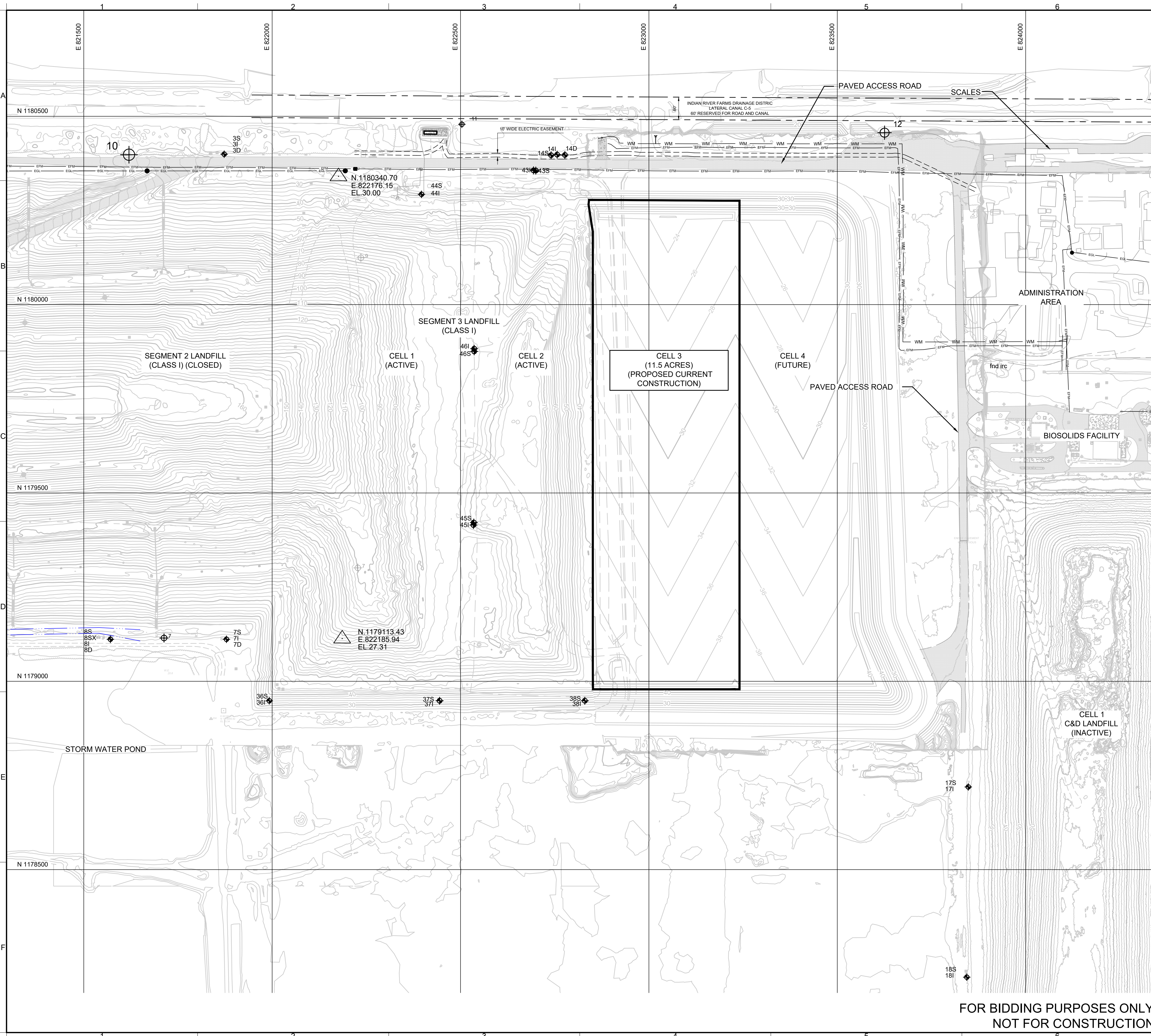
GENERAL NOTES:

1. THE SCOPE OF THE WORK INCLUDES THE FOLLOWING:
 - CLEARING, GRUBBING, AND/OR STRIPPING THE CONSTRUCTION AREA AS DIRECTED BY THE ENGINEER OR THE OWNER;
 - USE OF APPROPRIATE DUST CONTROL MEASURES DURING EARTHWORK OPERATIONS;
 - FURNISH MATERIALS FOR GENERAL/STRUCTURAL FILL THAT MEETS THE TECHNICAL SPECIFICATIONS, PLACEMENT AND COMPACTION TO THE TOP OF LINER SUBBASE GRADES SHOWN ON THE CONSTRUCTION DRAWINGS;
 - PROOFROLLING OF COMPACTED OR PREPARED LINER SUBBASE SURFACE PRIOR TO PLACEMENT OF THE GEOSYNTHETICS LINER;
 - CONSTRUCTION OF CELL 3 - SEGMENT 3 EXPANSION DOUBLE LINER SYSTEM, INCLUDING ANCHOR TRENCH AND TEMPORARY INTERCELL BERM/RAIN FLAPS;
 - CONSTRUCTION OF EROSION AND SEDIMENT CONTROL STRUCTURES (INCLUDING SILT CHECK DAMS, STRAW BALE BARRIERS IN PERIMETER DITCHES, AND SILT FENCE) AS NECESSARY TO FACILITATE CONSTRUCTION AND MINIMIZE EROSION DURING STORM EVENTS; AND
 - CLEARING, GRUBBING, EXCAVATION, BACKFILLING, COMPACTION, GRADING, AND PROOFROLLING NECESSARY TO FACILITATE CONSTRUCTION OF PREVIOUSLY MENTIONED COMPONENTS OF PHASE II CELL 3 - SEGMENT 3 EXPANSION.
2. HORIZONTAL COORDINATES VALUES ARE BASED UPON THE NORTH AMERICAN DATA OF 1983 (NAD83), ADJUSTED TO 1999 COORDINATE SYSTEM, FLORIDA EAST ZONE.
3. CONTOURS AND SPOT ELEVATION ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
4. THE CONTRACTOR SHALL ABIDE BY THE SITE HEALTH AND SAFETY PLAN.
5. THE CONTRACTOR SHALL PERFORM ALL SURVEYING FOR CONSTRUCTION CONTROL UNDER THE SUPERVISION OF A LICENSED SURVEYOR REGISTERED IN THE STATE OF FLORIDA.
6. LOCATION OF ALL UTILITIES, STRUCTURES AND OTHER FEATURES ARE SHOWN ACCORDING TO THE INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE DRAWINGS. CONTRACTOR SHALL VERIFY THE EXISTING CONDITIONS AND LOCATE ALL UNDERGROUND UTILITIES INCLUDING THE EXISTING GRAVITY LINE (EGL) AND EXISTING FORCE MAIN (EFM).
7. THE CONTRACTOR SHALL ESTABLISH ON SITE OFFICE AND PERSONNEL FACILITIES AND SHALL BE RESPONSIBLE FOR UTILITY CONNECTIONS.
8. THE CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE OF ANY CHANGES IN FIELD CONDITIONS SINCE THE DATE OF THE AERIAL PHOTOGRAPHY, WHICH MAY AFFECT THE DESIGN GRADES PRESENTED IN THESE DRAWINGS. ANY MODIFICATION TO THE DESIGN GRADES AS A RESULT OF THE CHANGES IN FIELD CONDITIONS SHALL BE AT THE APPROVAL OF THE ENGINEER.
9. THE CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES IDENTIFIED IN THE INFORMATION PRESENTED IN THESE DRAWINGS PRIOR TO PROCEEDING WITH ANY CONSTRUCTION ACTIVITY IN AREAS THAT DISCREPANCIES HAVE BEEN IDENTIFIED.
10. THE CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE OF ANY FIELD CONDITION THAT MAY IMPEDE THE CONTRACTOR FROM ACHIEVING THE DESIGN GRADES PRESENTED ON THESE DRAWINGS. ANY MODIFICATION TO THE DESIGN GRADES SHALL BE AT THE APPROVAL OF THE OWNER OR THE ENGINEER.
11. THE CONTRACTOR SHALL DISCUSS LOCATION OF MATERIALS STOCKPILES WITH THE OWNER'S REPRESENTATIVE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION AND MAINTENANCE OF TEMPORARY ROADS AT THE SITE NECESSARY FOR CONSTRUCTION ACTIVITIES INCLUDED IN THIS PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION OF TEMPORARY CROSSING TO THE EXCAVATED MATERIAL STOCKPILE AREAS.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTION OF TEMPORARY DIVERSION BERMS, BEYOND WHAT IS SHOWN ON THESE DRAWINGS, TO CONTROL SURFACE WATER RUNOFF FROM SURROUNDING AREAS ONTO THE CONSTRUCTION SITE. THE LOCATION AND DIMENSIONS OF DIVERSION BERMS MUST BE APPROVED BY THE OWNER'S REPRESENTATIVE PRIOR TO THE CONSTRUCTION OF DIVERSION BERMS.
14. DETAILS ARE SHOWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS, WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY. MATERIAL THICKNESSES ARE MINIMUMS, AND TOLERANCES SHALL BE WITHIN THE LIMITS GIVEN IN THE TECHNICAL SPECIFICATIONS AND CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN.
15. THE 3H:1V SIDESLOPE AND BASE OF PHASE II CELL 3 SHALL HAVE A LINER SYSTEM CONSISTING, FROM BOTTOM TO TOP, OF: (1) 6-IN THICK PREPARED SUBBASE LAYER (THIS WILL REQUIRE REGRADING AND SITE PREPARATION ONLY); (2) GEOSYNTHETIC CLAY LINER; (3) SECONDARY 60-MIL THICK TEXTURED HDPE GEOMEMBRANE; (4) SECONDARY GEOCOMPOSITE DRAINAGE LAYER; (5) PRIMARY 60-MIL THICK TEXTURED HDPE GEOMEMBRANE; (6) PRIMARY GEOCOMPOSITE DRAINAGE LAYER; AND (7) 2-FT THICK MINIMUM LINER PROTECTIVE LAYER.
16. THE NONWOVEN GEOTEXTILE SHALL BE SEAMED USING TERASYN SUPPLIED BY ATLANTIC THREAD & SUPPLY CO., INC. (1-800-847-1001) OR APPROVED EQUAL. THE THREAD AND SEAM SHALL PROVIDE A MINIMUM SEAM STRENGTH OF 220 LB/IN.
17. THE THICKNESS OF THE LINER PROTECTIVE LAYER SHALL BE 2 FT MINIMUM ON THE 3H:1V SIDESLOPE AND AT THE BASE OF PHASE II CELL 3. MEASUREMENTS OF LINER PROTECTIVE LAYER THICKNESS SHALL BE BASED ON BEFORE AND AFTER SURVEYS CONDUCTED BY A REGISTERED LAND SURVEYOR IN THE STATE OF FLORIDA. THE BEFORE SURVEY FOR THE LINER PROTECTIVE LAYER SHALL BE THE TOP OF PRIMARY GEOCOMPOSITE DRAINAGE LAYER SURVEY.
18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING AND DISPOSING OF DEBRIS THAT RESULT FROM CONSTRUCTION ACTIVITIES INCLUDED IN THIS PROJECT, AT THE COMPLETION OF THE PROJECT, TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE, AND AT NO COST TO THE OWNER.
19. CONSTRUCTION MUST BE CONSISTENT WITH THE PERMIT ISSUED BY THE STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION DIVISION OF WASTE MANAGEMENT FOR INDIAN RIVER COUNTY LANDFILL. THE ENGINEER MUST CERTIFY EACH PHASE OF CONSTRUCTION.
20. THE CONTRACTOR SHALL BECOME THOROUGHLY FAMILIAR WITH THE PROJECT SPECIFICATIONS, THE CONSTRUCTION QUALITY ASSURANCE PLAN, AND THE CONSTRUCTION DRAWINGS PRIOR TO THE COMMENCEMENT OF THE PROJECT. THE CONTRACTOR SHALL INFORM THE OWNER'S REPRESENTATIVE IN WRITING OF ANY CONCERNS ABOUT THE INFORMATION PRESENTED IN THESE DOCUMENTS. FAILURE TO NOTIFY THE OWNER'S REPRESENTATIVE OR CONTINUANCE WITH CONSTRUCTION ACTIVITIES WILL BE CONSTRUED AS CONTRACTOR'S ACCEPTANCE OF THE INFORMATION PRESENTED IN THESE DOCUMENTS.
21. NECESSARY BARRICADES, SIGNS, AND OTHER TRAFFIC CONTROL METHODS AS NEEDED FOR THE PROTECTION AND SAFETY OF THE PUBLIC SHALL BE PROVIDED AND MAINTAINED THROUGHOUT THE CONSTRUCTION ALONG INTERIOR ROADWAYS.

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-	11/8/2023	ISSUE FOR BID	JJV	KBT	
REV	DATE	DESCRIPTION	DRN	APP	
					
		1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321		1325 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112	
TITLE: GENERAL NOTES					
PROJECT: PHASE II - CELL 3 CONSTRUCTION					
SITE: INDIAN RIVER COUNTY LANDFILL					
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.			DESIGN BY: KBT	DATE: NOVEMBER 2023	
SIGNATURE			DRAWN BY: JJV	PROJECT NO.: FL9363A	
DATE			CHECKED BY: TC	FILE: FL9363A-C02	
KWASI BABU-TWENBOAH LICENSE NO. 42460			REVIEWED BY: SA	DRAWING NO.:	
			APPROVED BY: KBT	2	OF 24

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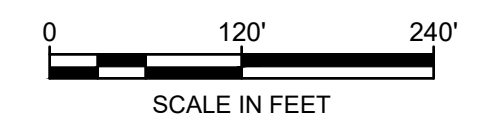
LEGEND

- 110 — EXISTING GROUND ELEVATION (FEET, NGVD)
- ==== PAVED ROAD
- - - - UNPAVED ROAD
- ~~~~~ TREE LINE
- UTILITY POLE
- - - - CULVERT
- N 1178500
E 824000 STATE PLANE COORDINATES
- WM EXISTING WATERMAIN
- EGL EXISTING GRAVITY LINE
- EFU EXISTING FORCEMAIN
- MH 9 EXISTING MANHOLE
- ⊕ 14 EXISTING GAS MONITORING PROBE
- ⊕ 19S
⊕ 19I EXISTING GROUNDWATER MONITORING WELL

BENCHMARKS

- △ N 1180340.70 E 822176.15 ELEV. 30.00
- △ N 1179113.43 E 822185.94 ELEV. 27.31

- NOTES:**
- TOPOGRAPHIC INFORMATION OUTSIDE THE ACTIVE LANDFILL AREA WAS OBTAINED FROM SURVEY PREPARED BY ALERT 5 INTERNATIONAL & MASTELLER, COMPLETED IN DECEMBER 2022.
 - EXISTING WASTE ELEVATION WAS OBTAINED FROM SURVEY PREPARED BY ALERT 5 INTERNATIONAL & MASTELLER, MOLER & TAYLOR INC., DATED NOVEMBER 2021, AND CERTIFIED BY AREA OF INTEREST SOLUTIONS, INC.
 - THE GRADES SHOWN FOR CELL 3 ARE THE PROPOSED TOP OF LINER SUBBASE WHICH IS CURRENTLY UNDER CONSTRUCTION. THE OWNER WILL PROVIDE THE CONTRACTOR WITH AS-BUILT SURVEYS FOR USE IN PREPARING THE GRADES SHOWN ON SHEET 4.
 - HORIZONTAL COORDINATES VALUES ARE BASED UPON THE NORTH AMERICAN DATA OF 1983 (NAD83), ADJUSTED TO 1999 COORDINATE SYSTEM, FLORIDA EAST ZONE.
 - CONTOURS AND SPOT ELEVATION ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).



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-	11/8/2023	ISSUE FOR BID	JJV	KBT

1200 RIVERPLACE BOULEVARD, SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PHONE: 904.858.1818 - FAX: 904.396.1143
CERTIFICATE OF AUTHORIZATION NO. 4321

1325 74th AVENUE SW
VERO BEACH, FLORIDA 32968 USA
PHONE: 772.770.5112

TITLE: EXISTING SITE CONDITIONS

PROJECT: PHASE II - CELL 3 CONSTRUCTION

SITE: INDIAN RIVER COUNTY LANDFILL

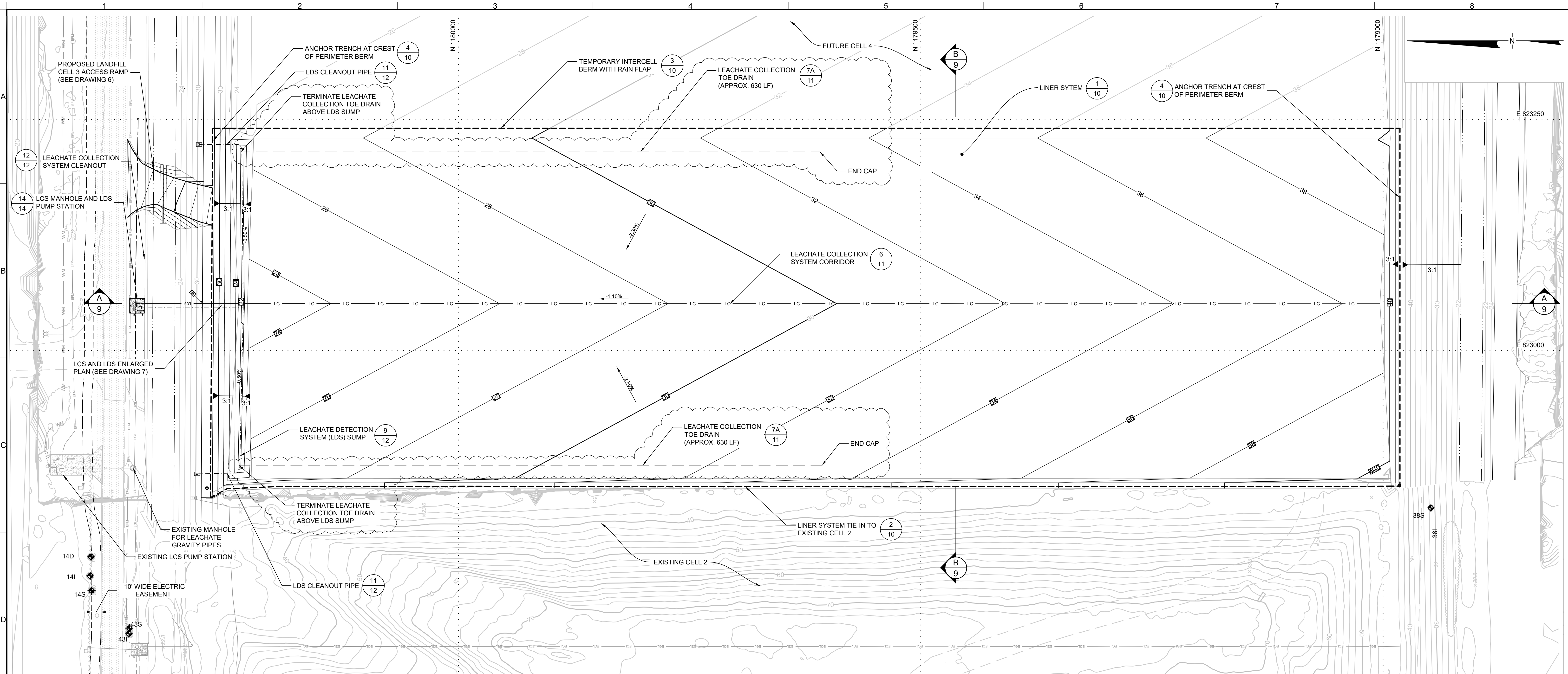
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DRAWN BY:	JJV	PROJECT NO.:	FL9363A
CHECKED BY:	TC	FILE:	FL9363A-C03
REVIEWED BY:	SA	DRAWING NO.:	
APPROVED BY:	KBT		3 OF 24

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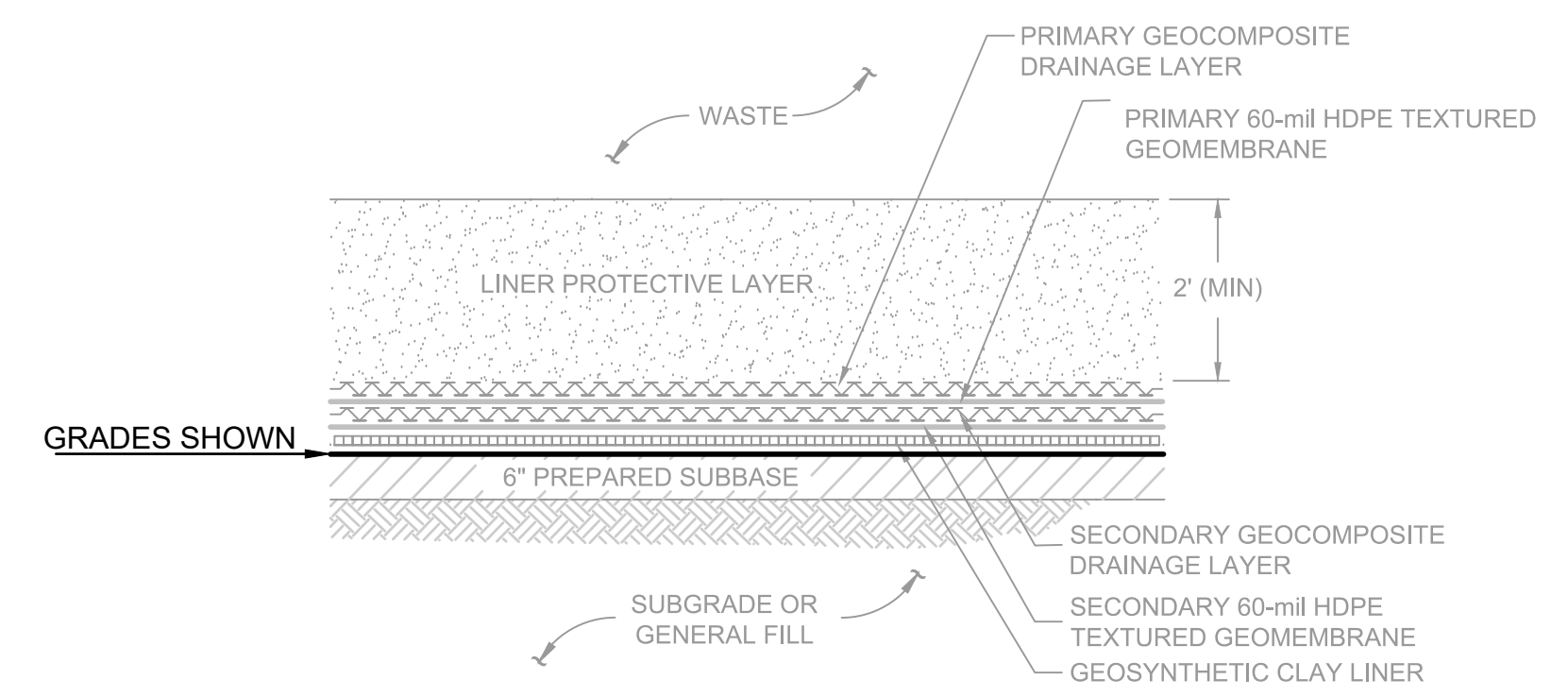
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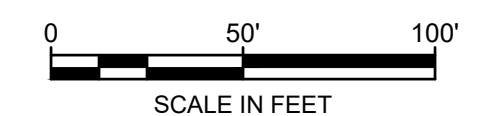
LEGEND

- EXISTING GROUND ELEVATION (FEET, NGVD)
- PROPOSED TOP OF LINER ELEVATION (FEET, NGVD)
- PERIMETER ELEVATION (PHASE I GRADES) (FEET, NGVD)
- PAVED ROAD
- EXISTING PERIMETER ROAD AND UNPAVED ROAD
- UTILITY POLE
- EXISTING GROUNDWATER MONITORING WELL
- CULVERT
- STATE PLANE COORDINATES
- EXISTING WATERMAIN
- EXISTING GRAVITY LINE
- PERIMETER CHANNEL BOTTOM
- PROPOSED LEACHATE GRAVITY PIPE
- PROPOSED LEACHATE COLLECTION CORRIDOR
- PROPOSED LEACHATE COLLECTION SYSTEM (LCS) PIPE
- PROPOSED LEACHATE DETECTION SYSTEM (LDS) PIPE
- PROPOSED LIMIT OF LINER
- CONSTRUCTION CONTROL POINT (WILL BE GENERATED FOR CONSTRUCTION SET)



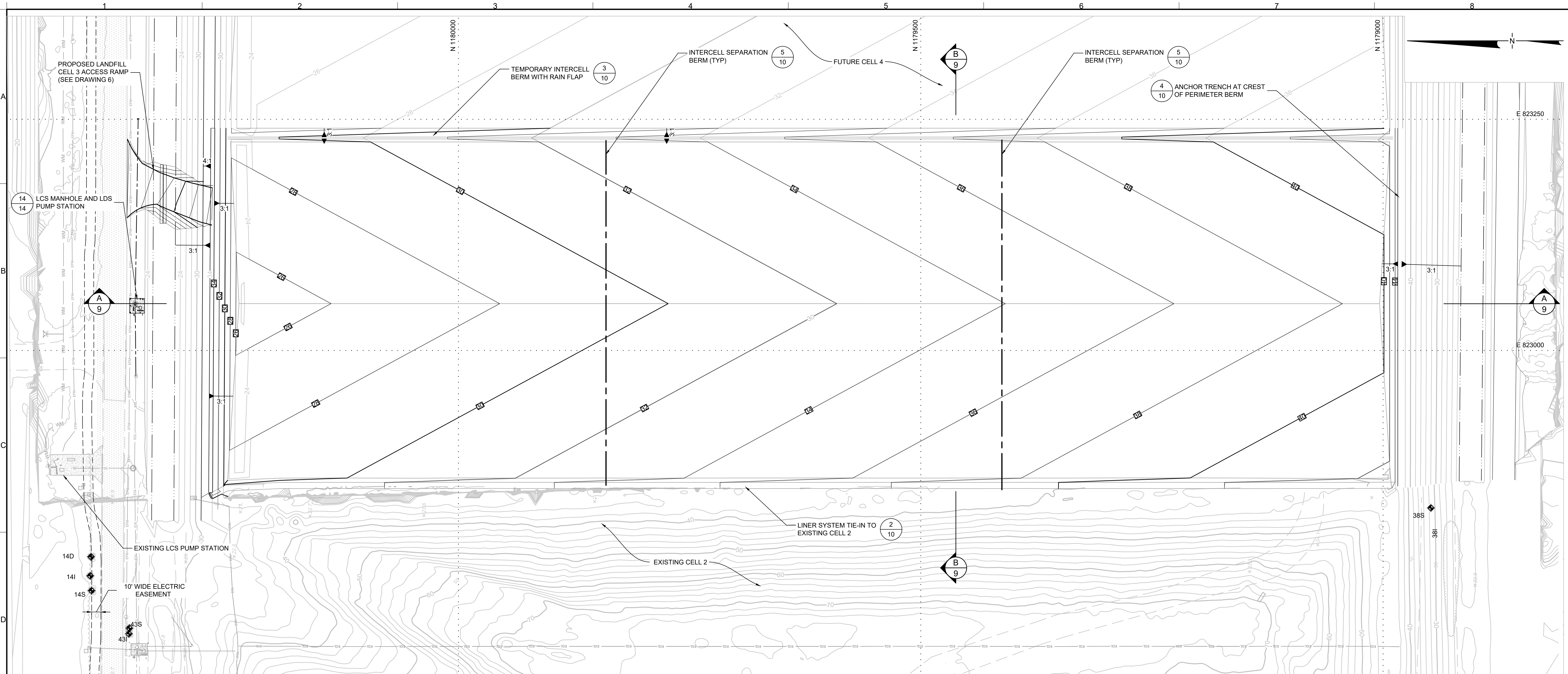
**GRADING KEY MAP
LINER SYSTEM AT BASE**
SCALE: 1" = 2'

- NOTES:**
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 4. GRADES SHOWN HERE ARE THE TOP OF LINER SUBBASE. THESE WERE COMPLETED AS PART OF PHASE I CELL 3-4 CONSTRUCTION. CONTRACTOR SHALL USE AS-BUILT DRAWINGS TO VERIFY THAT THE PROPOSED GRADES ARE MET; OTHERWISE PERFORM REGRADING AND SITE PREPARATION (FILL OR CUT) TO MEET THE PROPOSED GRADES SHOWN HEREIN.
 5. TOE DRAIN IS CURRENTLY PENDING PERMIT MODIFICATION APPROVAL BY FDEP.



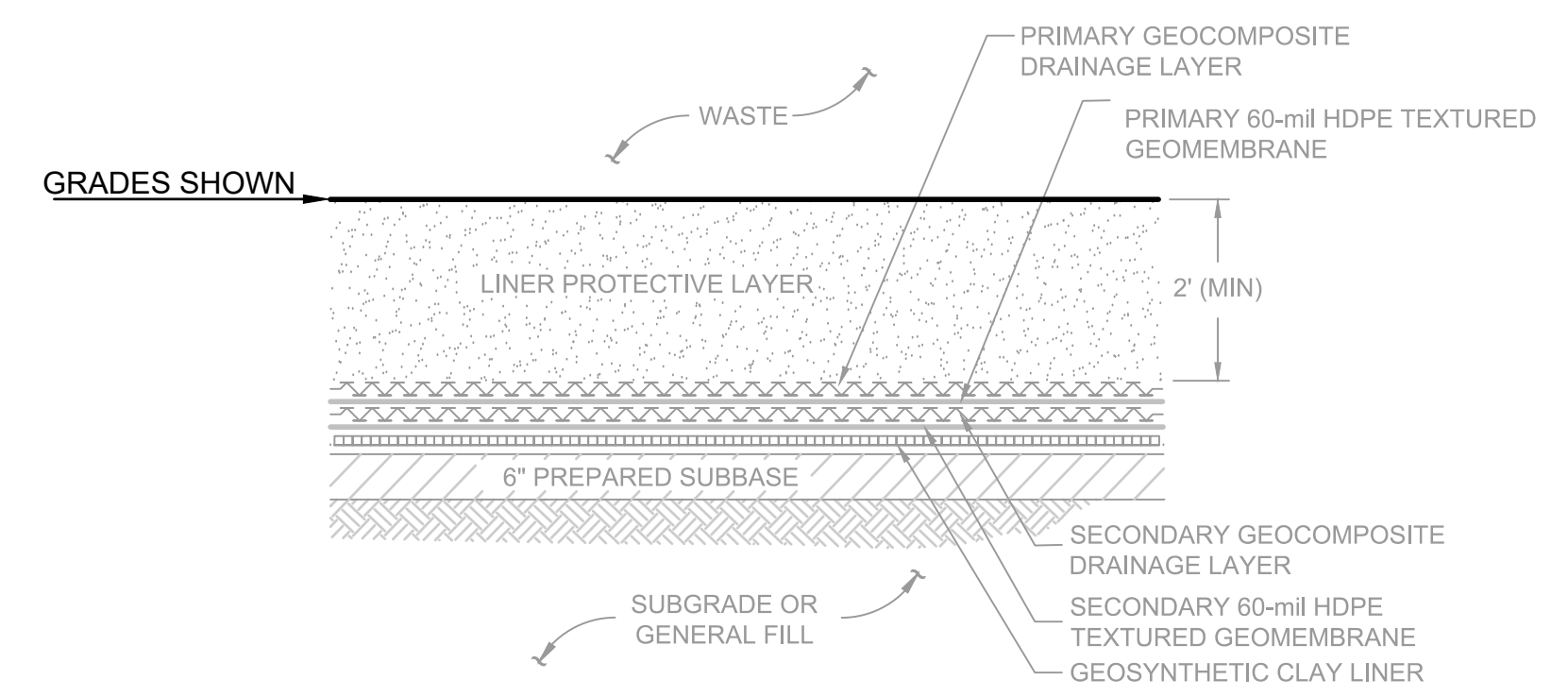
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-	11/8/2023	ISSUE FOR BID				JJV	KBT		
1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321									
1225 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112									
TITLE: TOP OF SUBBASE GRADING PLAN									
PROJECT: PHASE II - CELL 3 CONSTRUCTION									
SITE: INDIAN RIVER COUNTY LANDFILL									
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DRAWN BY: JJV PROJECT NO.: FL9363A					CHECKED BY: TC FILE: FL9363A-C06				
REVIEWED BY: SA DRAWING NO.:					APPROVED BY: KBT		4 OF 24		
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LEGEND

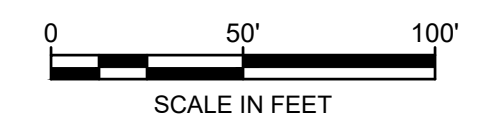
- EXISTING GROUND ELEVATION (FEET, NGVD)
- PROPOSED TOP OF LINER PROTECTIVE LAYER ELEVATION (FEET, NGVD)
- PERIMETER ELEVATION (PHASE I GRADES) (FEET, NGVD)
- PAVED ROAD
- EXISTING PERIMETER ROAD AND UNPAVED ROAD
- UTILITY POLE
- EXISTING GROUNDWATER MONITORING WELL
- CULVERT
- STATE PLANE COORDINATES
- EXISTING WATERMAIN
- EXISTING GRAVITY LINE
- PERIMETER CHANNEL BOTTOM
- PROPOSED LEACHATE GRAVITY PIPE
- CONSTRUCTION CONTROL POINT (WILL BE GENERATED FOR CONSTRUCTION SET)



**GRADING KEY MAP
LINER SYSTEM AT BASE**
SCALE: 1" = 2'

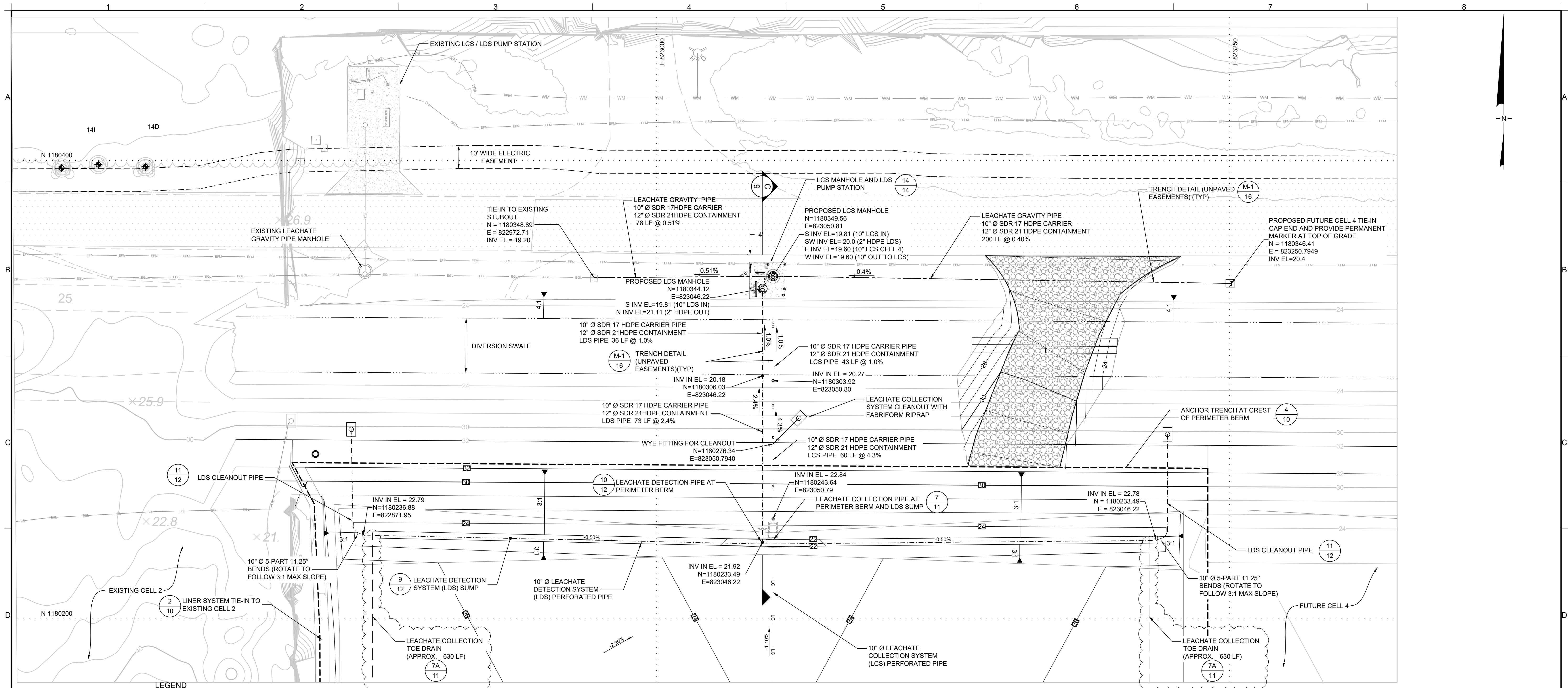
NOTES:

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4. GRADES SHOWN HERE ARE THE TOP OF LINER SUBBASE. THESE WERE COMPLETED AS PART OF PHASE I CELL 3-4 CONSTRUCTION. CONTRACTOR SHALL USE AS-BUILT DRAWINGS TO VERIFY THAT THE PROPOSED GRADES ARE MET; OTHERWISE PERFORM REGRADING AND SITE PREPARATION (FILL OR CUT) TO MEET THE PROPOSED GRADES SHOWN HEREIN.



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1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321					1325 74th AVENUE SW VERO BEACH, FLORIDA 33568 USA PHONE: 772.770.5112				
TITLE: TOP OF LINER PROTECTIVE COVER GRADING PLAN									
PROJECT: PHASE II - CELL 3 CONSTRUCTION									
SITE: INDIAN RIVER COUNTY LANDFILL									
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.			DESIGN BY:	KBT	DATE:	NOVEMBER 2023			
SIGNATURE			DRAWN BY:	JJV	PROJECT NO.:	FL9363A			
DATE			CHECKED BY:	TC	FILE:	FL9363A-C07			
KWASI BADU-TWENGOAH LICENSE NO. 42460			REVIEWED BY:	SA	DRAWING NO.:	5 OF 24			
			APPROVED BY:	KBT					

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LEGEND

- EXISTING GROUND ELEVATION (FEET, NGVD)
- PROPOSED TOP OF LINER ELEVATION (FEET, NGVD)
- PERIMETER ELEVATION (PHASE I GRADES) (FEET, NGVD)
- PAVED ROAD
- EXISTING PERIMETER ROAD AND UNPAVED ROAD
- UTILITY POLE
- EXISTING GROUNDWATER MONITORING WELL
- CULVERT
- STATE PLANE COORDINATES
- EXISTING WATERMAIN
- EXISTING GRAVITY LINE
- PERIMETER CHANNEL BOTTOM
- PROPOSED LEACHATE GRAVITY PIPE
- PROPOSED LEACHATE COLLECTION CORRIDOR
- PROPOSED LEACHATE COLLECTION SYSTEM (LCS) PIPE
- PROPOSED LEACHATE DETECTION SYSTEM (LDS) PIPE
- PROPOSED LIMIT OF LINER
- CONSTRUCTION CONTROL POINT (WILL BE GENERATED FOR CONSTRUCTION SET)



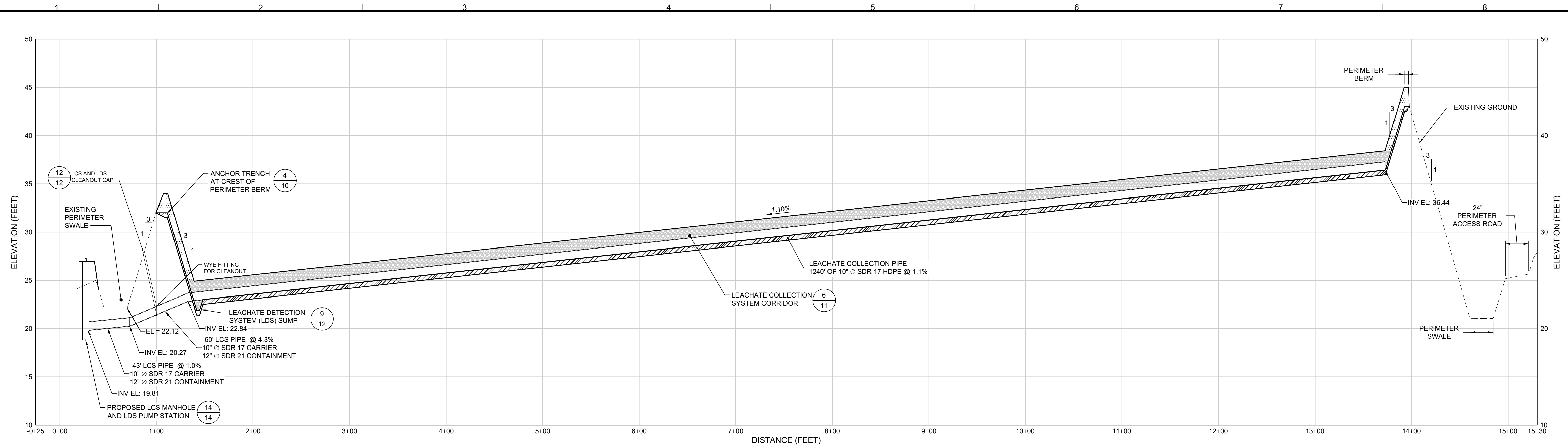
NOTES:

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5. TOE DRAIN IS CURRENTLY PENDING PERMIT MODIFICATION APPROVAL BY FDEP.

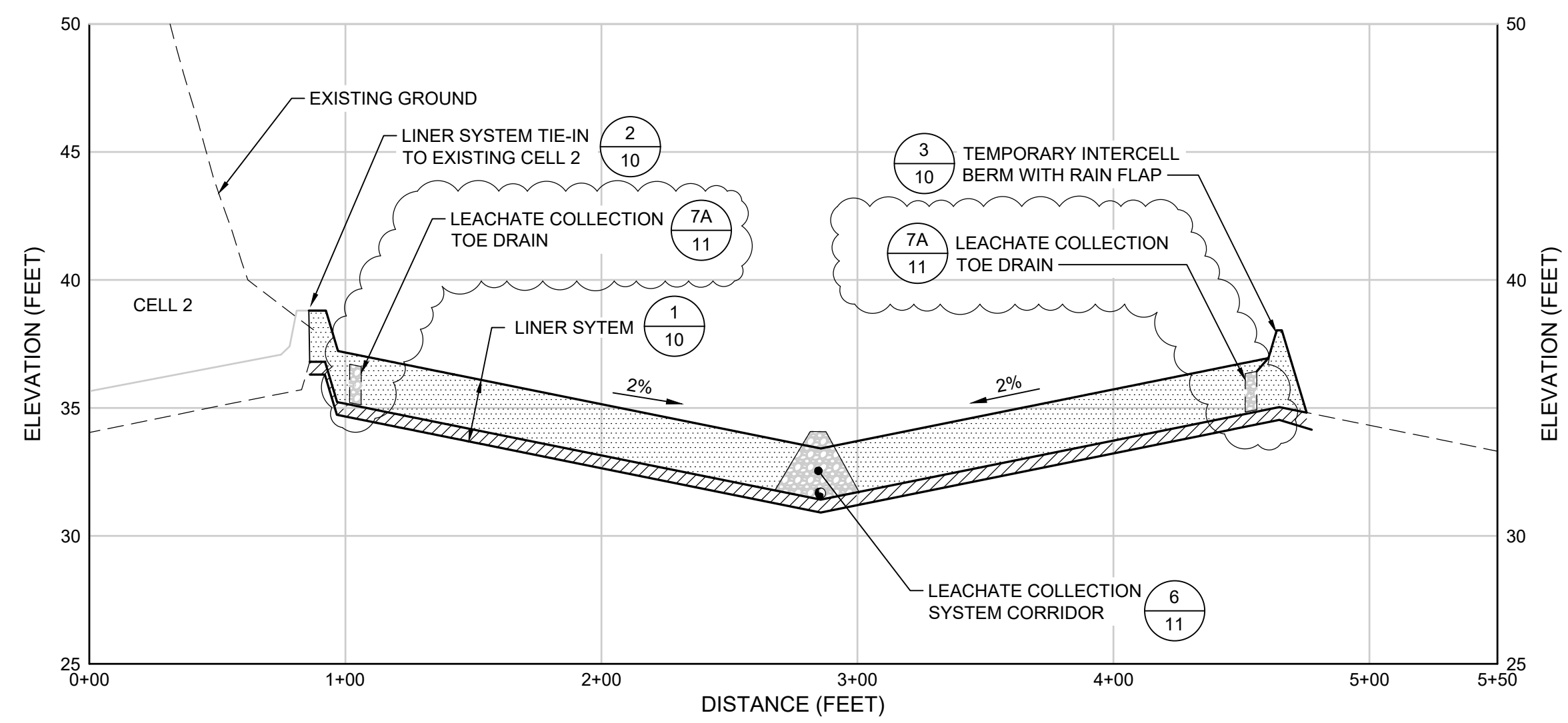
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-	11/8/2023	ISSUE FOR BID				JJV	KBT		
1200 RIVERPLACE BOULEVARD, SUITE 210 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321									
TITLE: LCS AND LDS ENLARGED PLAN					PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL									
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.									
SIGNATURE		DATE		DESIGN BY: KBT		DATE: NOVEMBER 2023			
DRAWN BY: JJV		PROJECT NO.: FL9363A		CHECKED BY: TC		FILE: FL9363A-C14			
REVIEWED BY: SA		DRAWING NO.:		APPROVED BY: KBT		7 OF 24			
KWASI BADIU-TWENGOAH LICENSE NO. 42460									

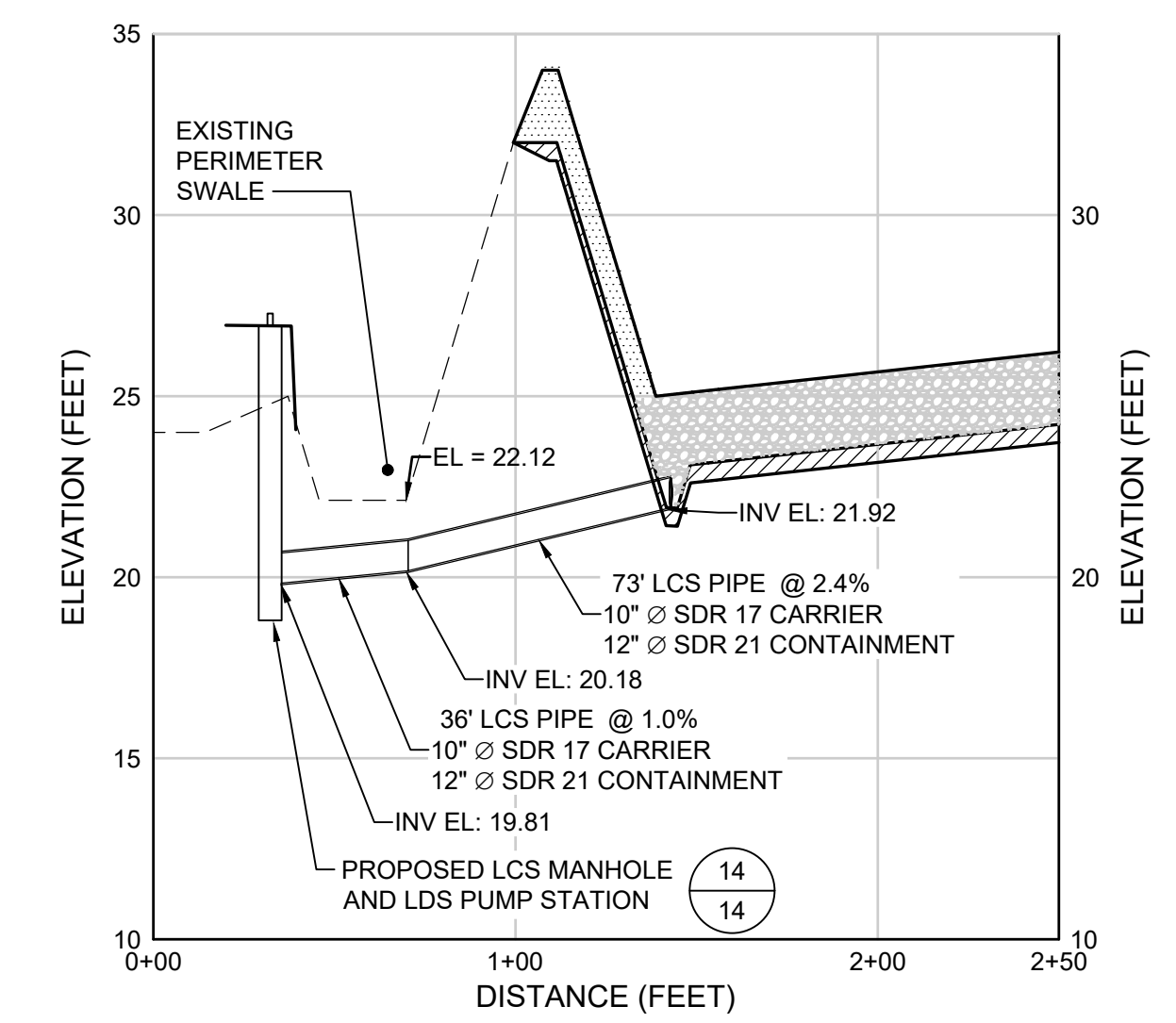
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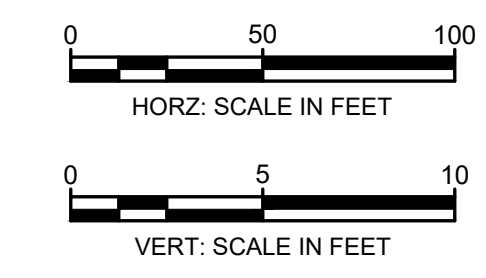
A SECTION
4 SECTION A (ALONG LEACHATE COLLECTION CORRIDOR)
SCALE: 1" = 50' HORIZONTAL 1" = 5' VERTICAL



B SECTION
4 SECTION B (WEST - EAST)
SCALE: 1" = 50' HORIZONTAL 1" = 5' VERTICAL



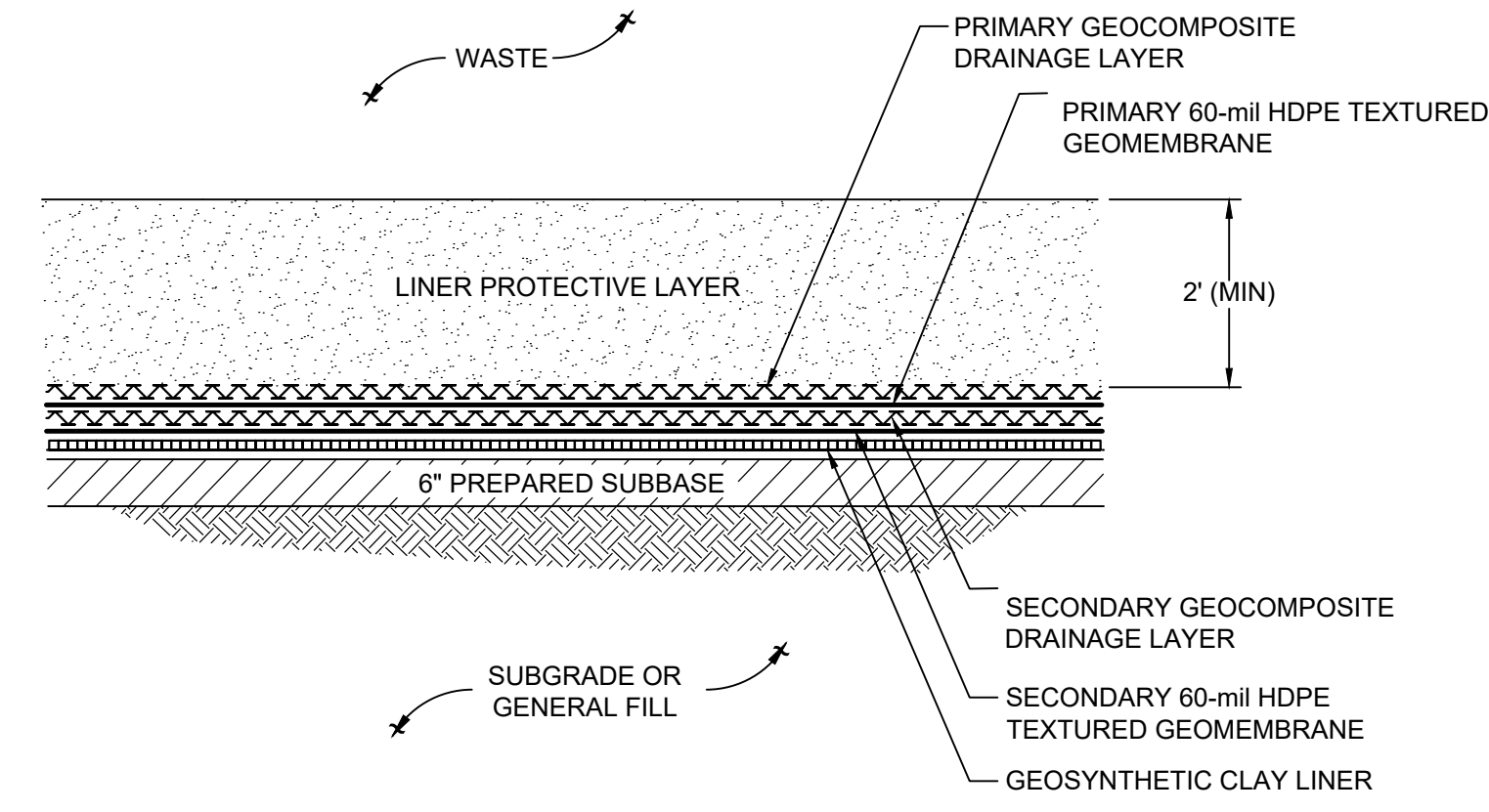
C SECTION
7 SECTION C (LEACHATE DETECTION SYSTEM OUTLET)
SCALE: 1" = 50' HORIZONTAL 1" = 5' VERTICAL



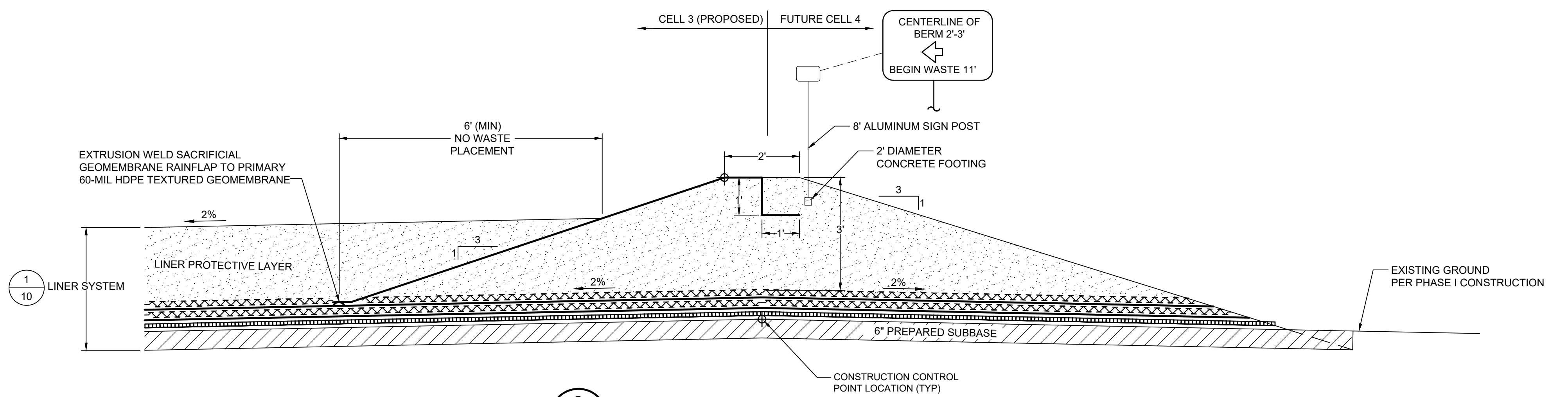
- NOTE:
- TYPE OF STABILIZER MATERIAL USED AND METHOD OF PLACEMENT FOR EACH SHALL MEET THE REQUIREMENTS OF THE TECHNICAL SPECIFICATIONS IN THE BID DOCUMENTS.
 - GEOTEXTILES SHALL BE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS.
 - TOE DRAIN IS CURRENTLY PENDING PERMIT MODIFICATION APPROVAL BY THE FDEP.

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 1325 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112					
TITLE: LANDFILL CROSS SECTIONS					
PROJECT: PHASE II - CELL 3 CONSTRUCTION					
SITE: INDIAN RIVER COUNTY LANDFILL					
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: KBT DRAWN BY: JJV CHECKED BY: TC REVIEWED BY: SA APPROVED BY: KBT	DATE: NOVEMBER 2023 PROJECT NO.: FL9363A FILE: FL9363A-C10 DRAWING NO.: 9 OF 24		

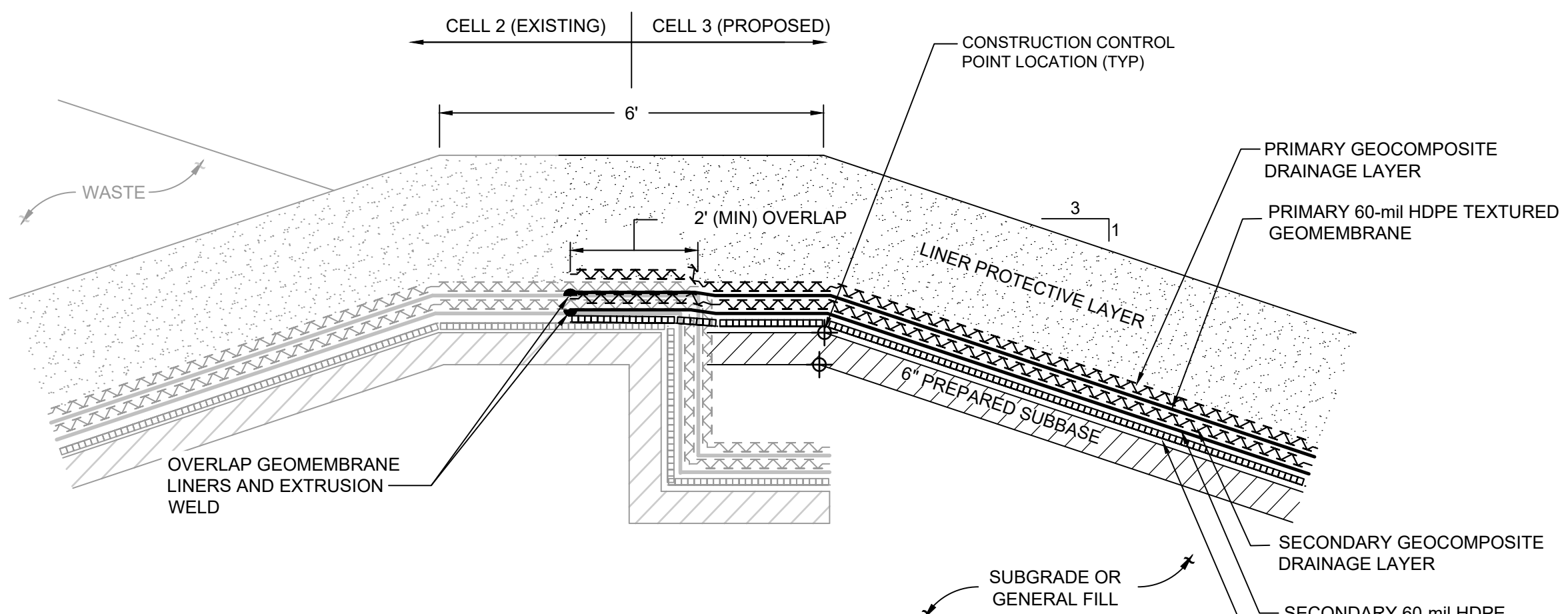
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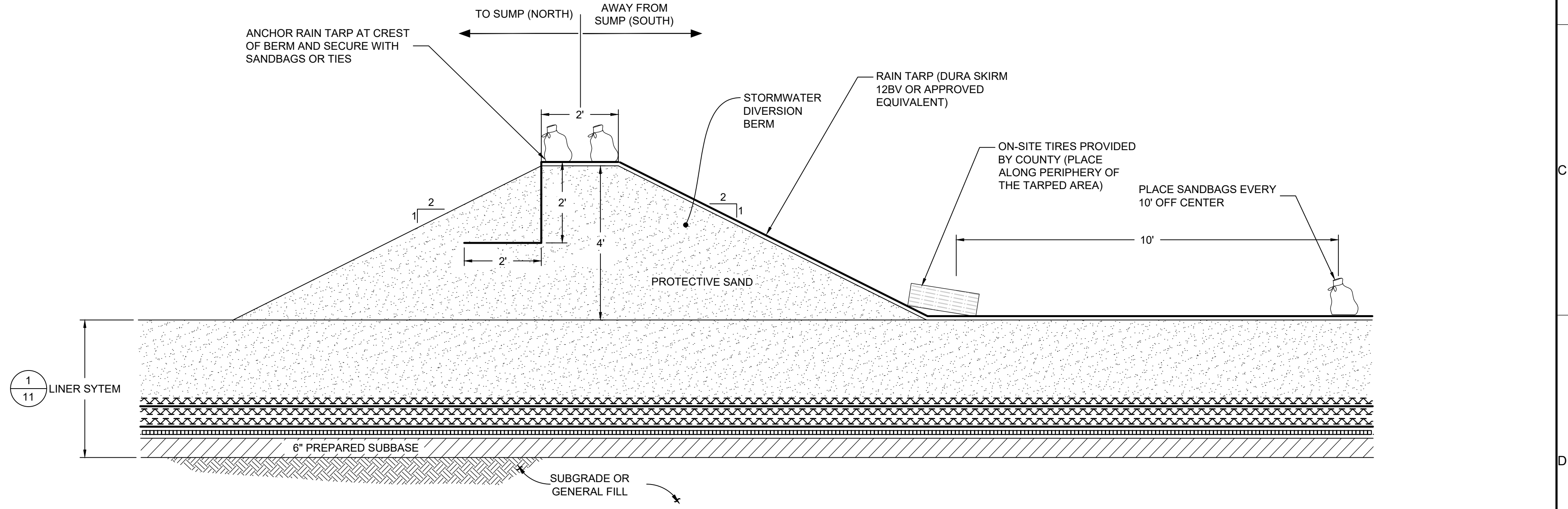
1
4 DETAIL (TYPICAL)
LINER SYSTEM
SCALE: 1" = 2'



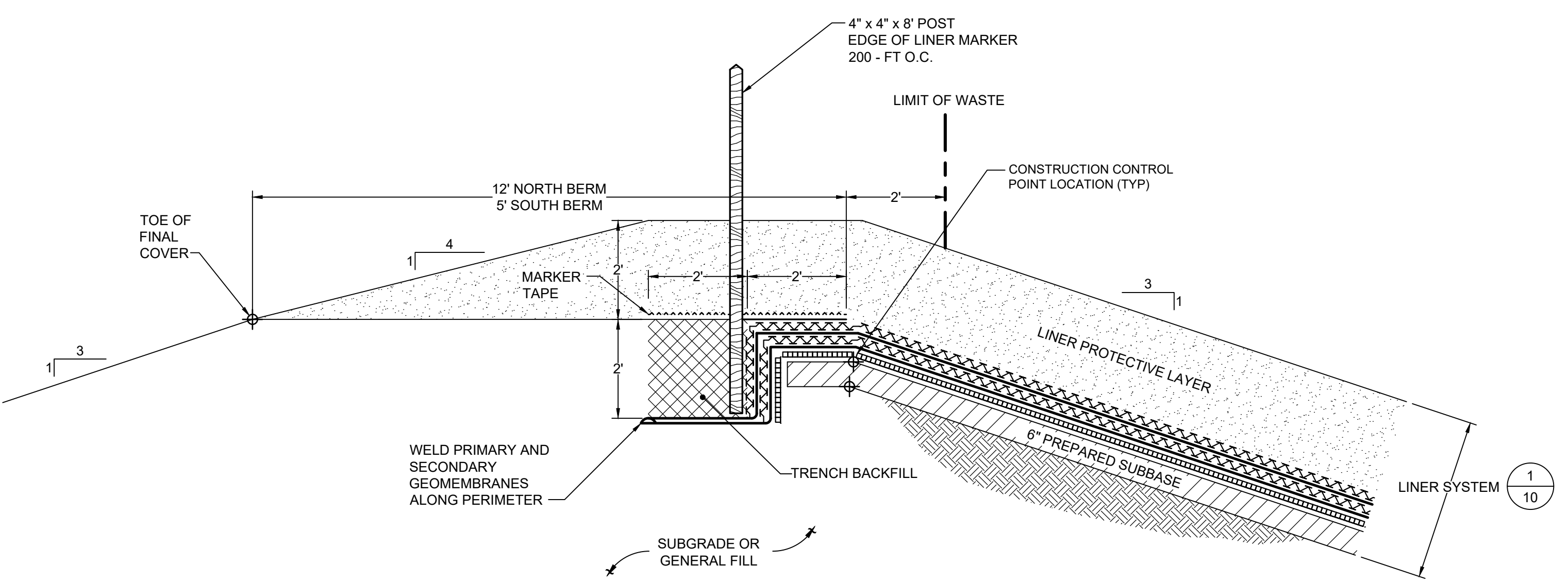
3
5 DETAIL
TEMPORARY INTERCELL BERM WITH RAIN FLAP
SCALE: 1" = 2'



2
4 DETAIL (TYPICAL)
LINER SYSTEM TIE-IN TO EXISTING CELL 2
SCALE: 1" = 2'



5
5 DETAIL
INTERCELL SEPARATION BERM
SCALE: 1" = 2'



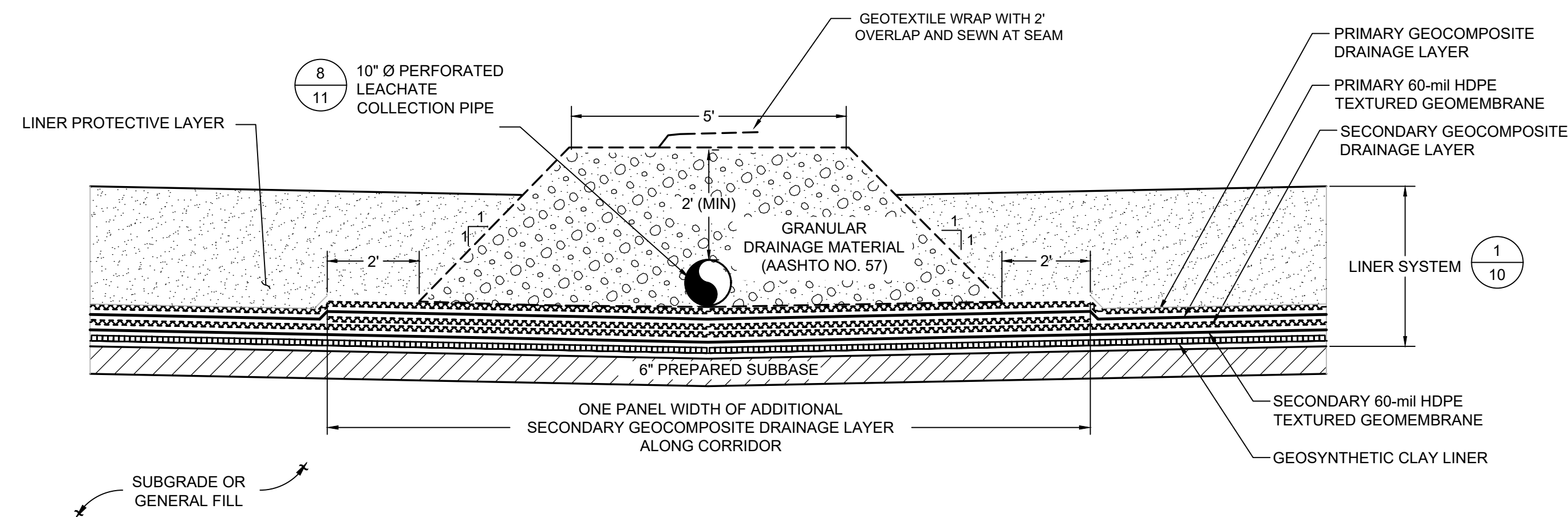
4
4 DETAIL (TYPICAL)
ANCHOR TRENCH AT CREST OF PERIMETER BERM
SCALE: 1" = 2'

- NOTES:
1. DETAILS ARE SHOWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS, WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY. MATERIAL THICKNESSES ARE MINIMUMS, AND TOLERANCES SHALL BE WITHIN THE LIMITS OUTLINED IN THE TECHNICAL SPECIFICATIONS AND CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN.
 2. SUBBASE SHALL BE PREPARED AS DESCRIBED IN THE TECHNICAL SPECIFICATIONS AND THE CQA PLAN.
 3. MATERIAL AND INSTALLATION SPECIFICATIONS / REQUIREMENTS FOR THE LINER SYSTEM AND LEACHATE COLLECTION/DETECTION SYSTEM GEOSYNTHETIC COMPONENTS ARE DESCRIBED IN THE TECHNICAL SPECIFICATIONS AND THE CQA PLAN.

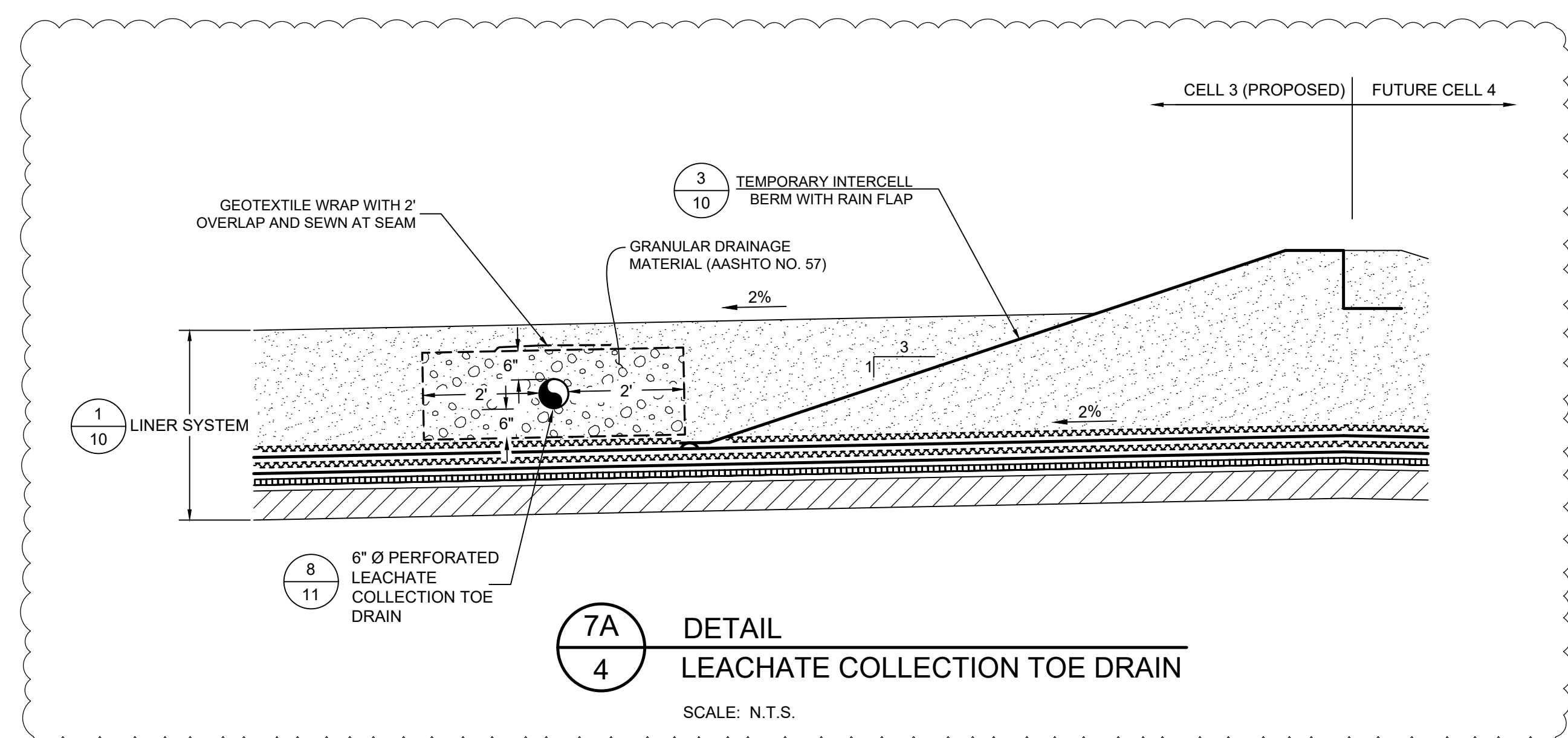
REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT
<p>Geosyntec consultants</p> <p>1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321</p>				
<p>1325 74th AVENUE SW VERO BEACH, FLORIDA 33968 USA PHONE: 772.770.5112</p>				
<p>TITLE: LINER SYSTEM DETAILS</p>				
<p>PROJECT: PHASE II - CELL 3 CONSTRUCTION</p>				
<p>SITE: INDIAN RIVER COUNTY LANDFILL</p>				
<p>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</p>		<p>DESIGN BY: KBT</p>	<p>DATE: NOVEMBER 2023</p>	
<p>SIGNATURE</p>		<p>DRAWN BY: JJV</p>	<p>PROJECT NO.: FL9363A</p>	
<p>DATE</p>		<p>CHECKED BY: TC</p>	<p>FILE: FL9363A-C11</p>	
<p>KWASI BABU-TWENGOAH LICENSE NO. 42460</p>		<p>REVIEWED BY: SA</p>	<p>DRAWING NO.:</p>	
		<p>APPROVED BY: KBT</p>	<p>10 OF 24</p>	

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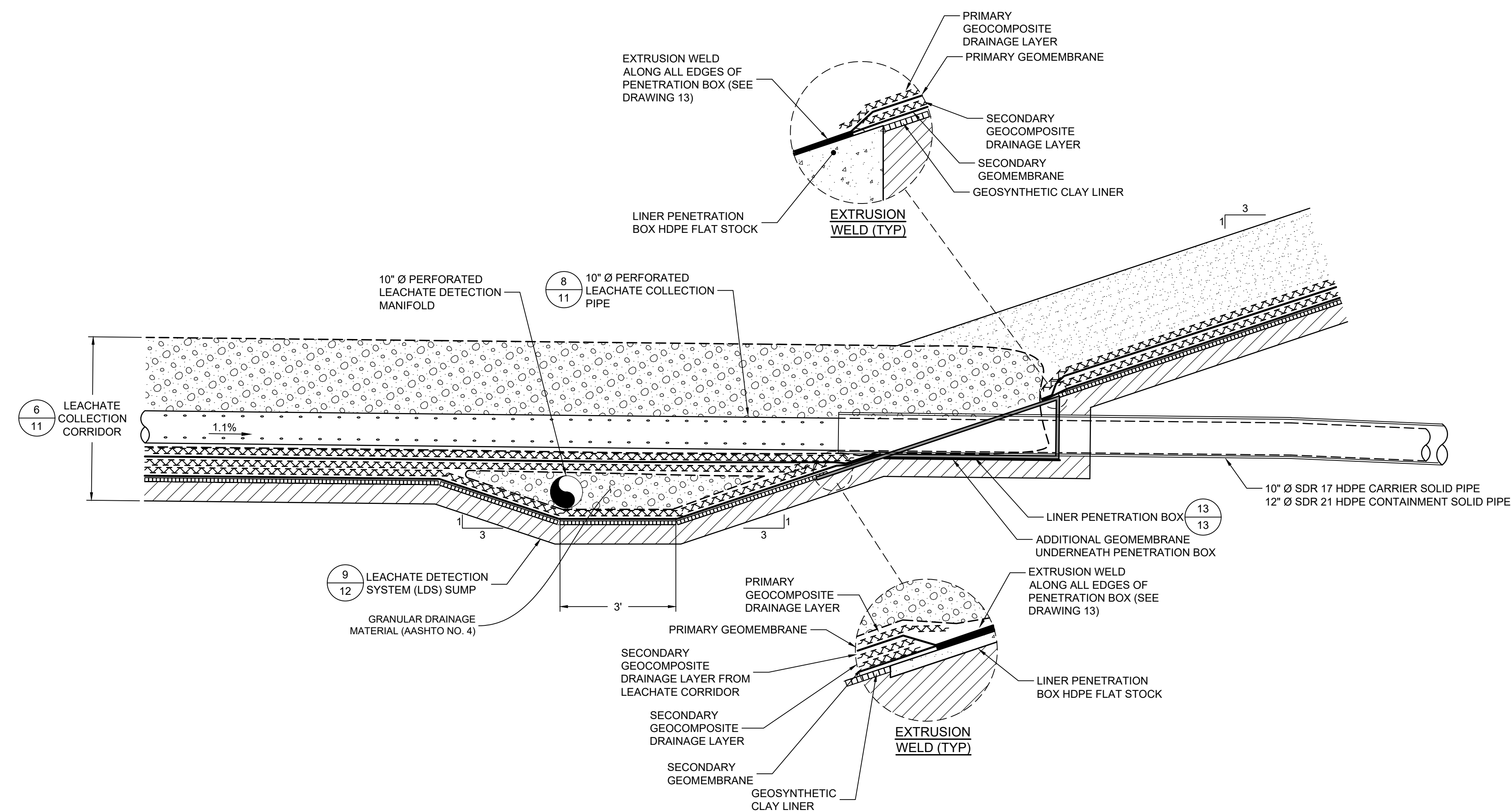
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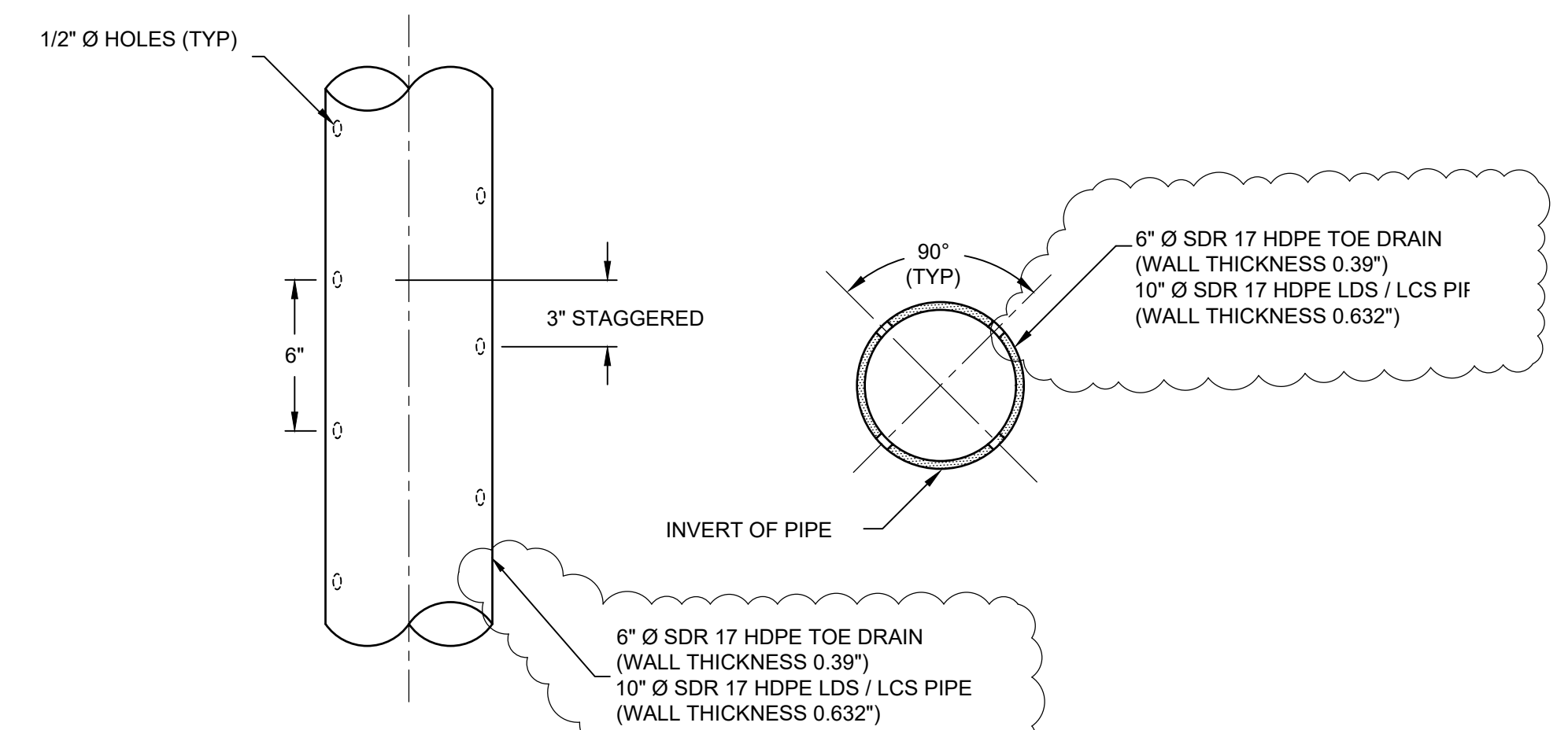
6 **5** **DETAIL**
LEACHATE COLLECTION SYSTEM CORRIDOR
 SCALE: NOT TO SCALE (N.T.S.)



7A **4** **DETAIL**
LEACHATE COLLECTION TOE DRAIN
 SCALE: N.T.S.



7 **11** **DETAIL**
LEACHATE COLLECTION PIPE AT PERIMETER BERM AND LDS SUMP
 SCALE: N.T.S.



8 **11** **DETAIL**
LCS AND LDS COLLECTION PIPE PERFORATIONS
 SCALE: N.T.S.

- NOTES:
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 - SUBBASE SHALL BE PREPARED AS DESCRIBED IN THE TECHNICAL SPECIFICATIONS AND THE COA PLAN.
 - MATERIAL AND INSTALLATION SPECIFICATIONS / REQUIREMENTS FOR THE LINER SYSTEM AND LEACHATE COLLECTION/DETECTION SYSTEM GEOSYNTHETIC COMPONENTS ARE DESCRIBED IN THE TECHNICAL SPECIFICATIONS AND THE COA PLAN.
 - TOE DRAIN IS CURRENTLY PENDING PERMIT MODIFICATION APPROVAL BY THE FDEP.

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT

1200 RIVERPLACE BOULEVARD, SUITE 710
 JACKSONVILLE, FLORIDA 32207 USA
 PHONE: 904.858.1818 - FAX: 904.396.1143
 CERTIFICATE OF AUTHORIZATION NO. 4321

1325 74th AVENUE SW
 VERO BEACH, FLORIDA 32968 USA
 PHONE: 772.770.5112

TITLE: **LEACHATE COLLECTION SYSTEM (LCS) DETAILS**

PROJECT: **PHASE II - CELL 3 CONSTRUCTION**

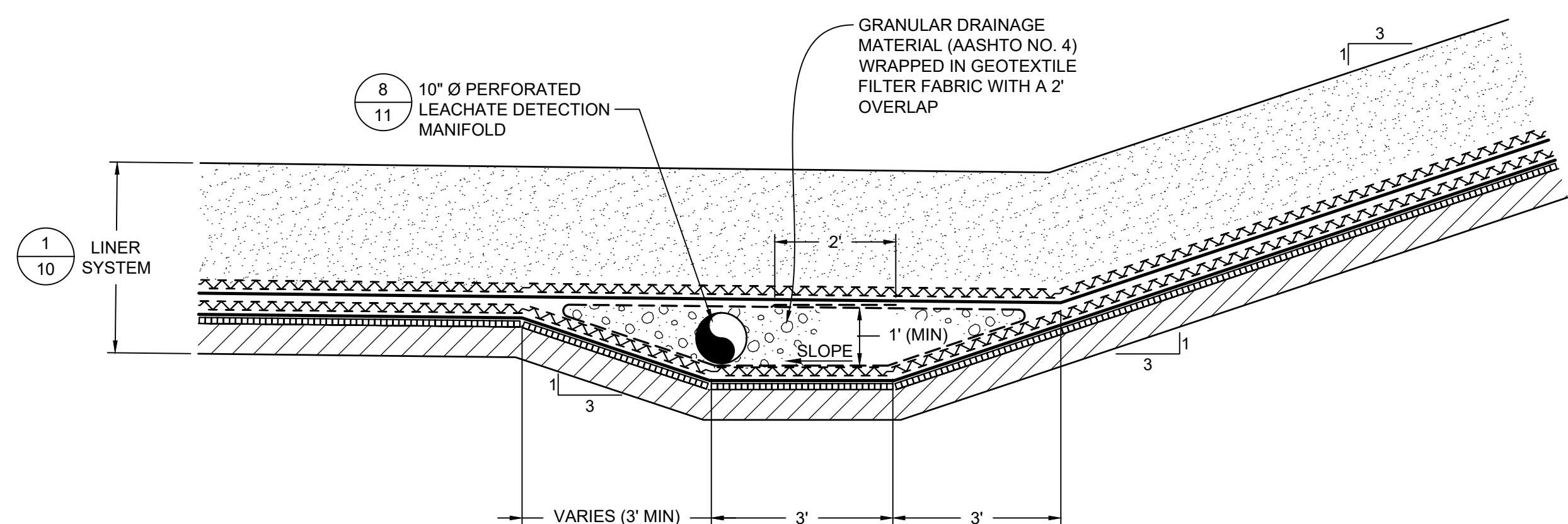
SITE: **INDIAN RIVER COUNTY LANDFILL**

DESIGN BY: KBT	DATE: NOVEMBER 2023
DRAWN BY: JJV	PROJECT NO.: FL9363A
CHECKED BY: TC	FILE: FL9363A-C12
REVIEWED BY: SA	DRAWING NO.:
APPROVED BY: KBT	11 OF 24

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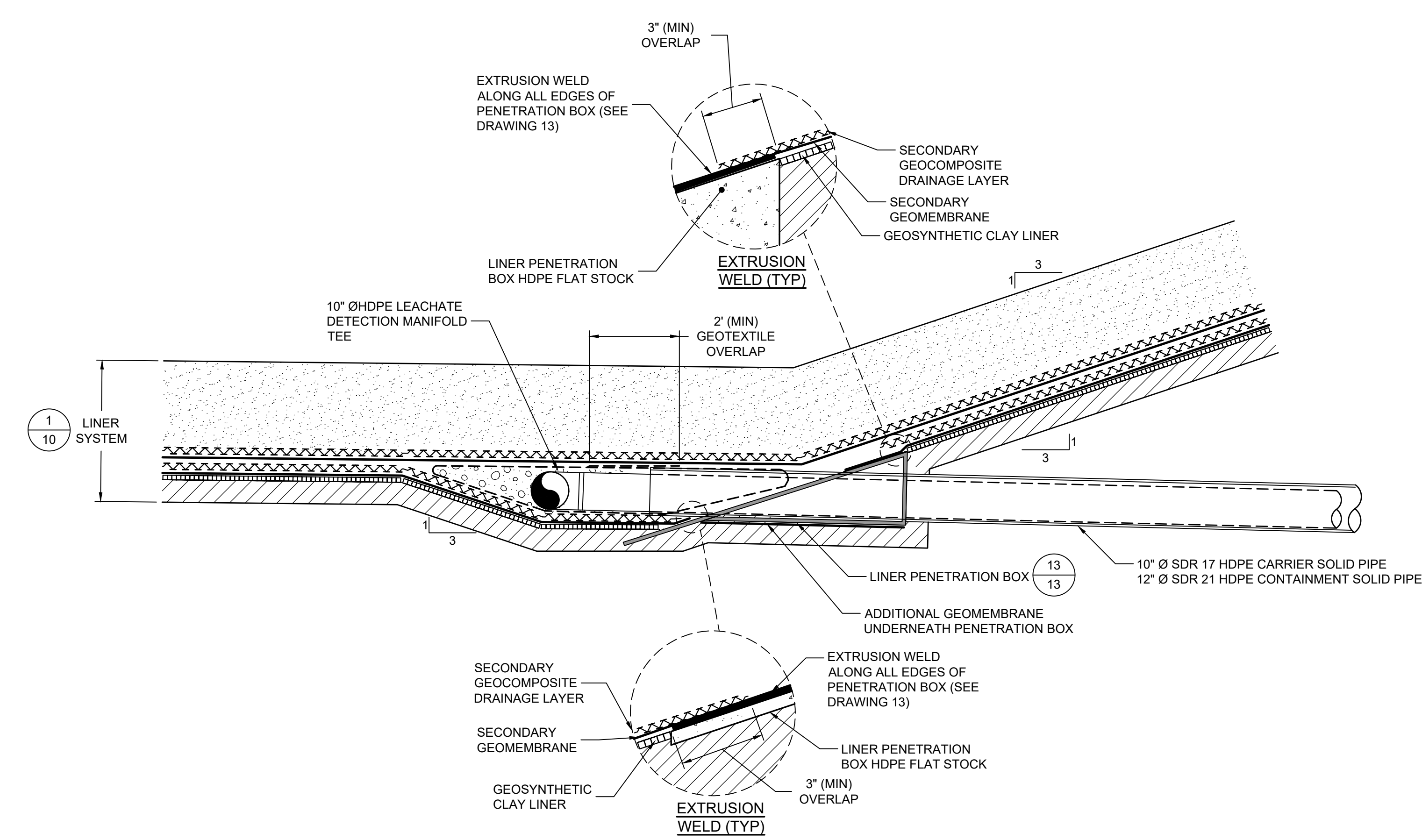
SIGNATURE _____ DATE _____
 KWASI BABU-TWENBOAH LICENSE NO. 42460

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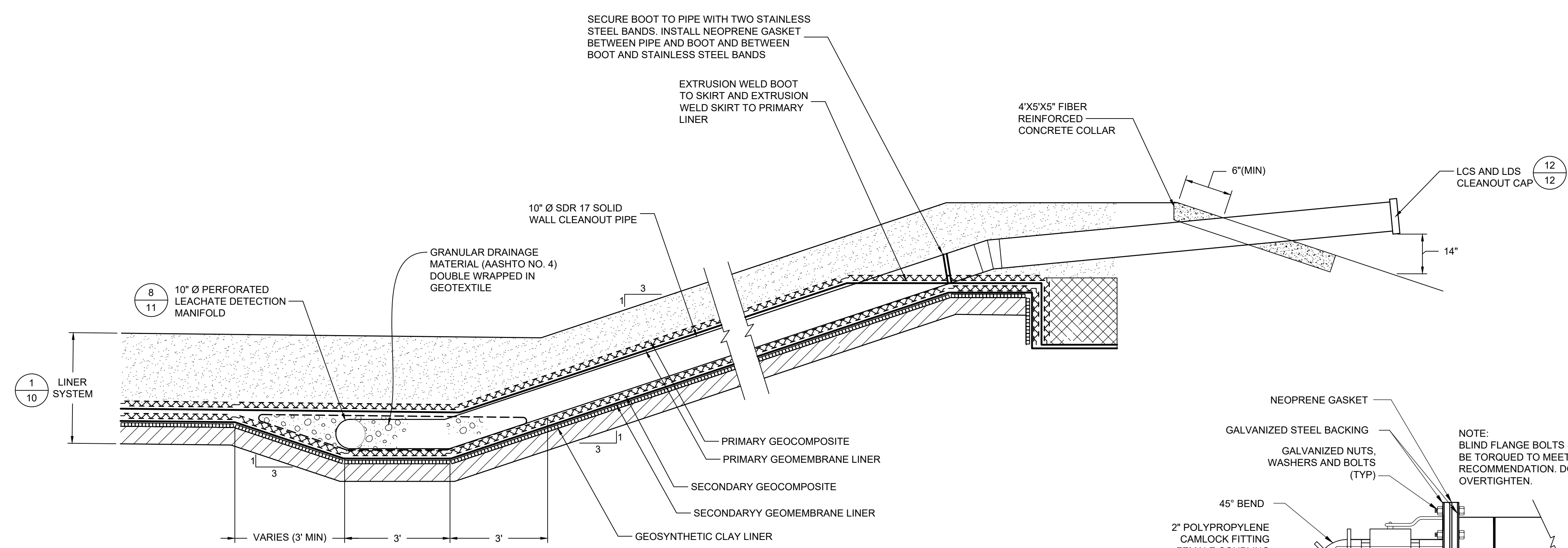


- NOTES:**
1. WRAP DETECTION SUMP GRANULAR DRAINAGE MATERIAL (AASHTO NO. 4) WITH GEOTEXTILE TO PROTECT UPPER AND LOWER LINER.
 2. PROVIDE DOUBLE GEOCOMPOSITE UNDER PRIMARY COLLECTION SYSTEM MANIFOLD GRANULAR DRAINAGE MATERIAL ENVELOPE AS SHOWN.
 3. GEOSYNTHETIC CLAY LINER TO BE PLACED DIRECTLY UNDER SECONDARY LINER.
 4. OVERLAP GEOTEXTILE A MINIMUM OF 24" OVER GRANULAR DRAINAGE MATERIAL, AND SECURE ALONG LENGTH OF SEAM.

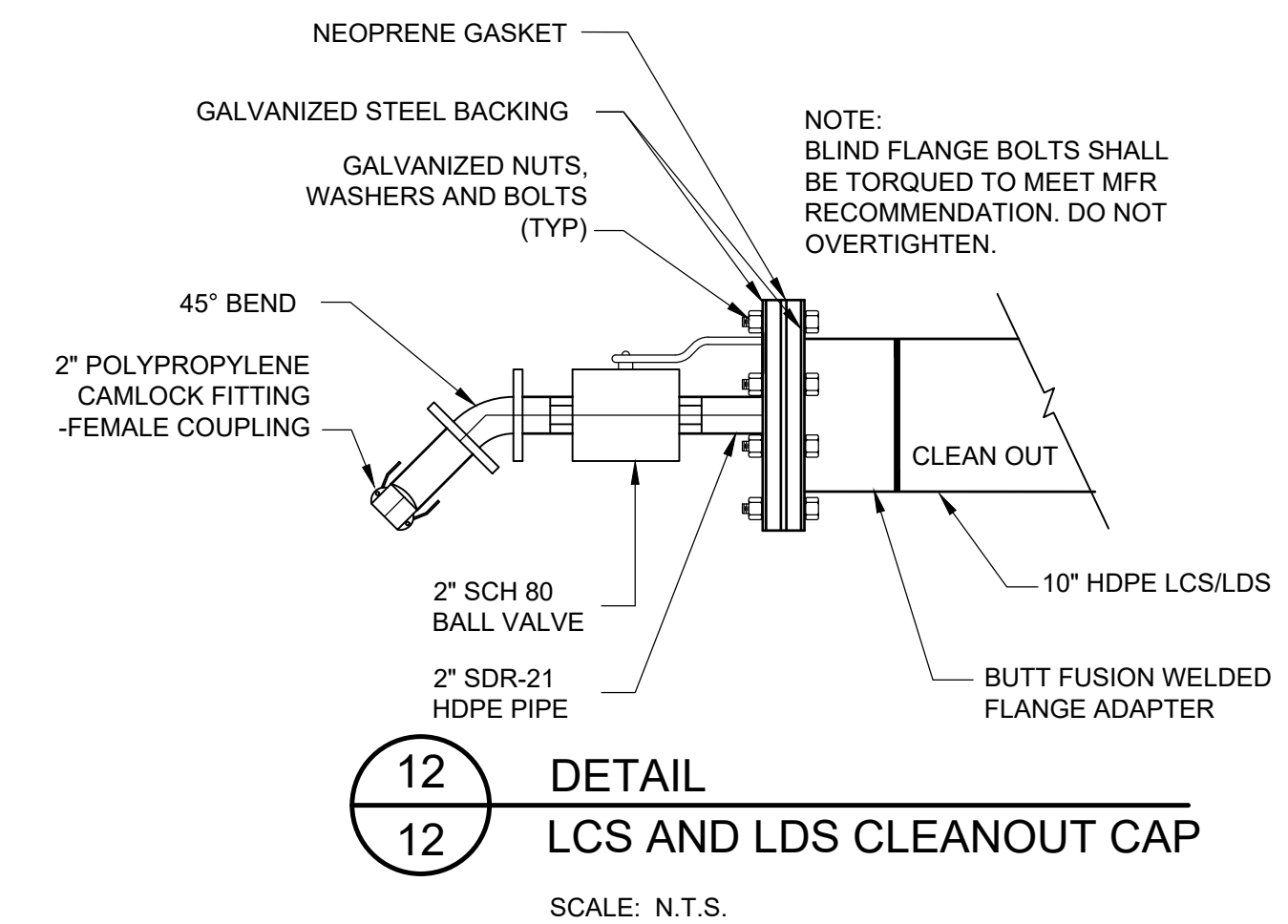
9 SECTION
7 LEACHATE DETECTION SYSTEM (LDS) SUMP
 SCALE: NOT TO SCALE



10 DETAIL
7 LEACHATE DETECTION PIPE AT PERIMETER BERM
 SCALE: N.T.S.





11 DETAIL
4 LDS CLEANOUT PIPE
 SCALE: N.T.S.



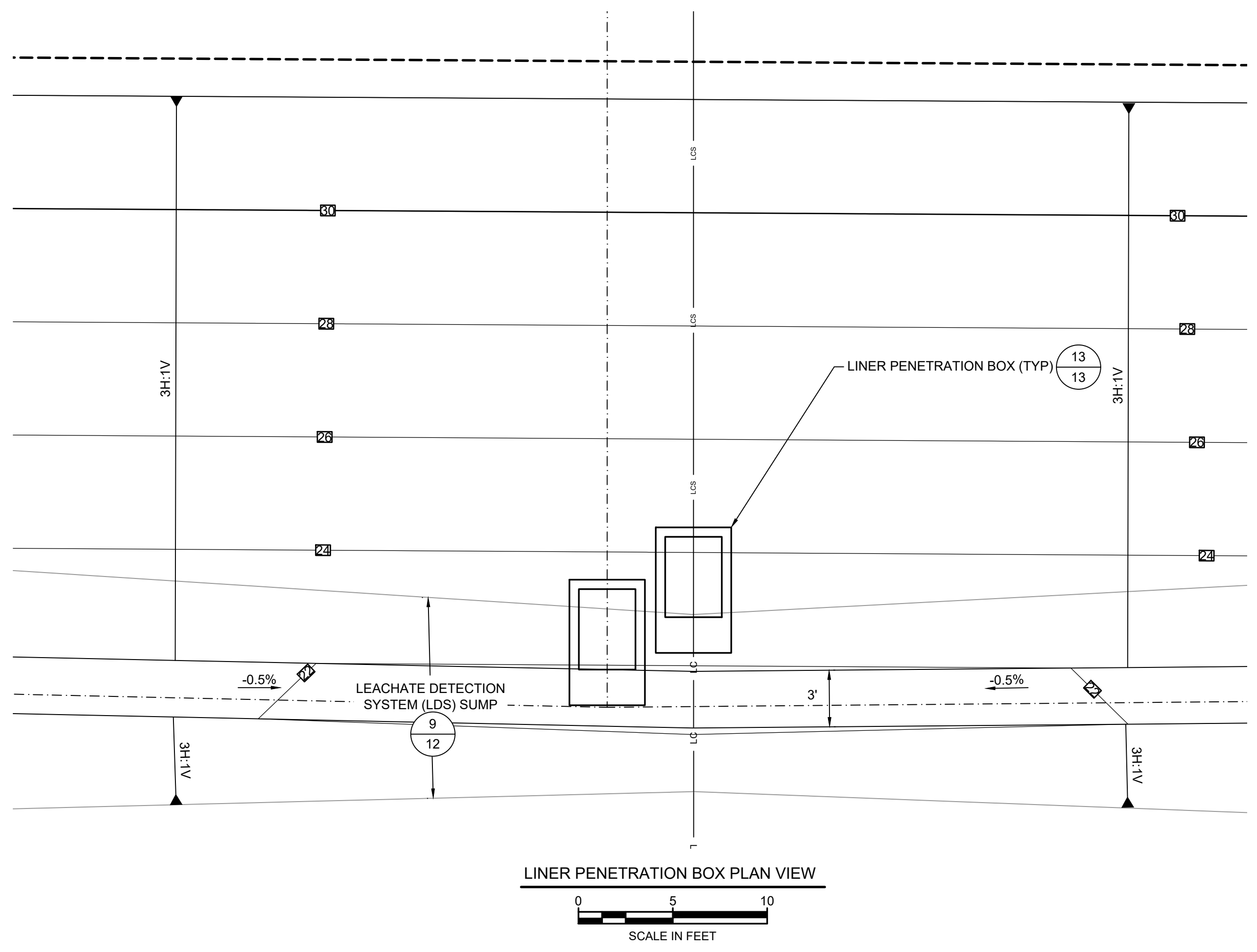
12 DETAIL
12 LCS AND LDS CLEANOUT CAP
 SCALE: N.T.S.

- NOTES:**
1. DETAILS ARE SHOWN TO SCALE AS NOTED EXCEPT FOR GEOSYNTHETICS, WHICH ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY. MATERIAL THICKNESSES ARE MINIMUMS, AND TOLERANCES SHALL BE WITHIN THE LIMITS OUTLINED IN THE TECHNICAL SPECIFICATIONS AND CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN.
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 3. MATERIAL AND INSTALLATION SPECIFICATIONS / REQUIREMENTS FOR THE LINER SYSTEM AND LEACHATE COLLECTION/DETECTION SYSTEM GEOSYNTHETIC COMPONENTS ARE DESCRIBED IN THE TECHNICAL SPECIFICATIONS AND THE CQA PLAN.

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1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321				
1325 74th AVENUE SW VERO BEACH, FLORIDA 33968 USA PHONE: 772.770.5112				
LEACHATE DETECTION SYSTEM (LDS) DETAILS				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.				
SIGNATURE		DESIGN BY: KBT	DATE: NOVEMBER 2023	
DATE		DRAWN BY: JJV	PROJECT NO.: FL9363A	
KWASI BABUTWIENBOAH LICENSE NO. 42460		CHECKED BY: TC	FILE: FL9363A-C13	
		REVIEWED BY: SA	DRAWING NO.:	
		APPROVED BY: KBT	12 OF 24	

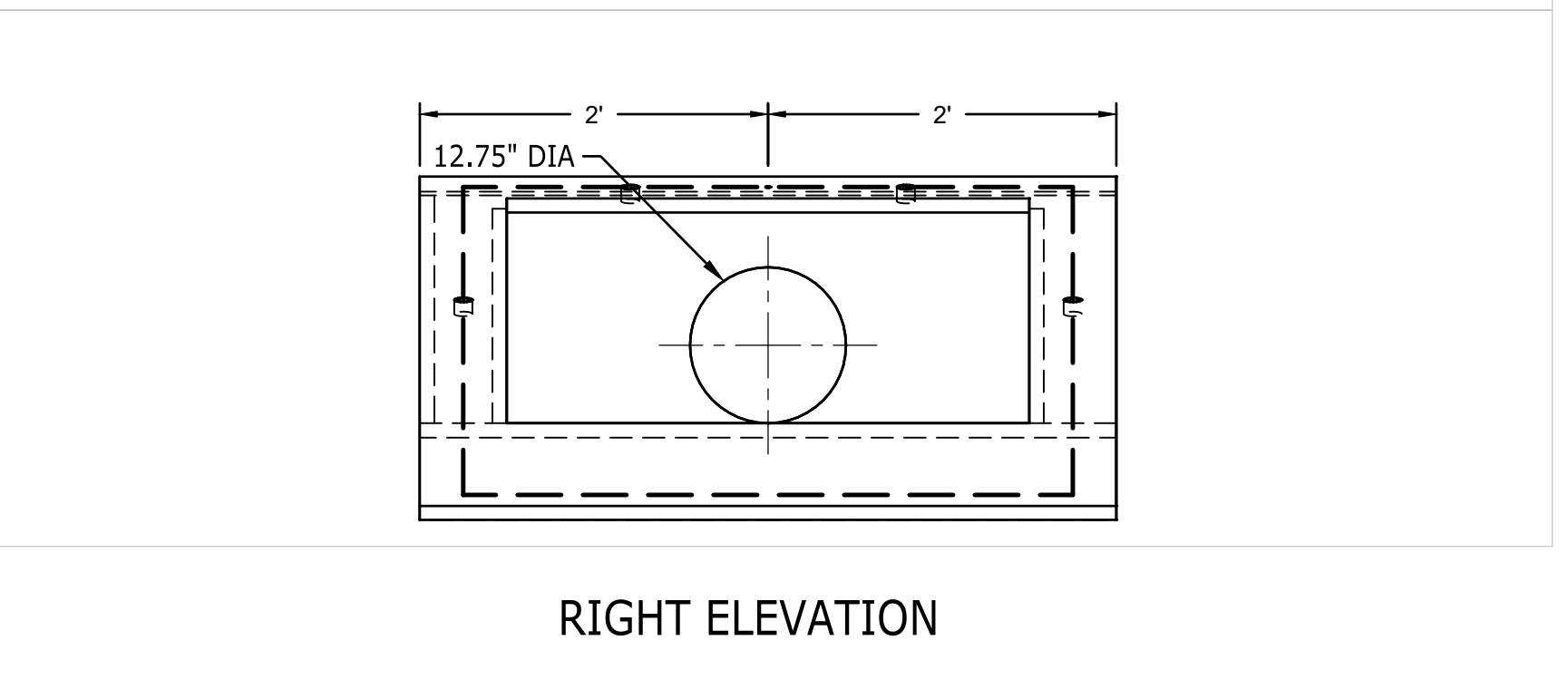
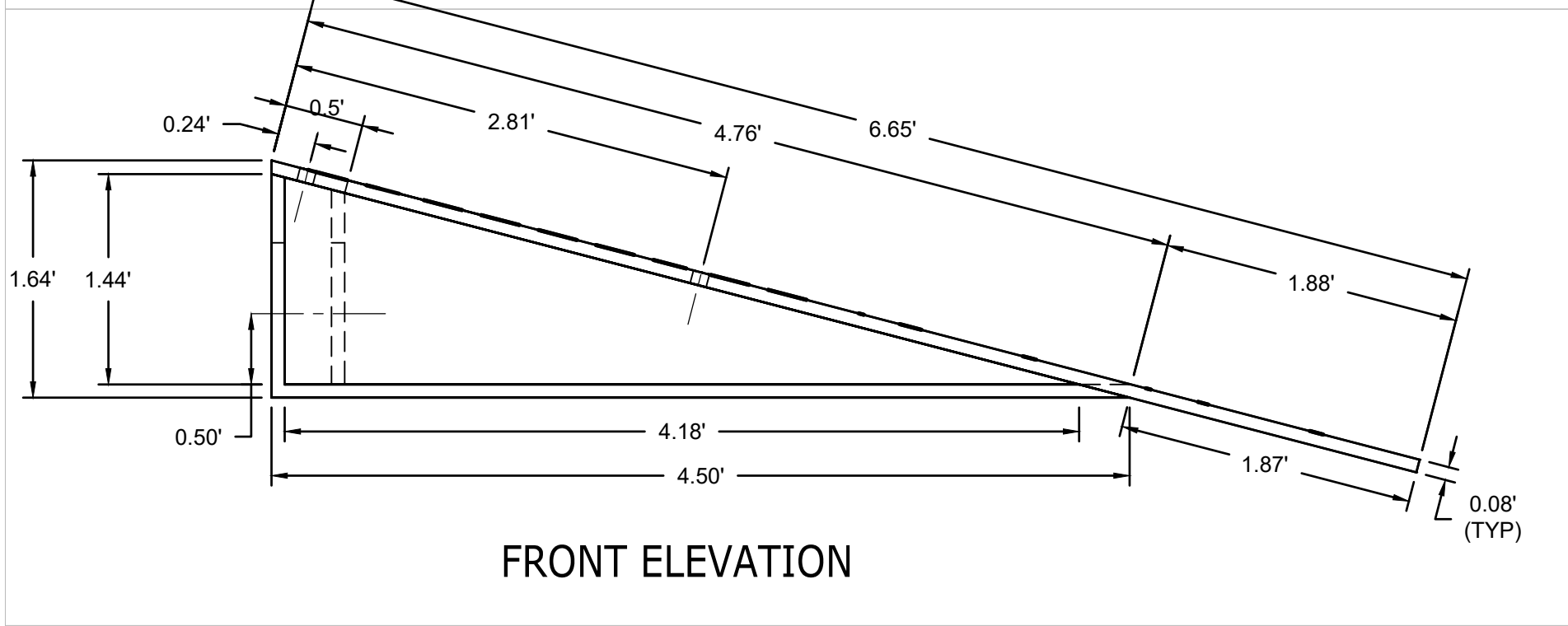
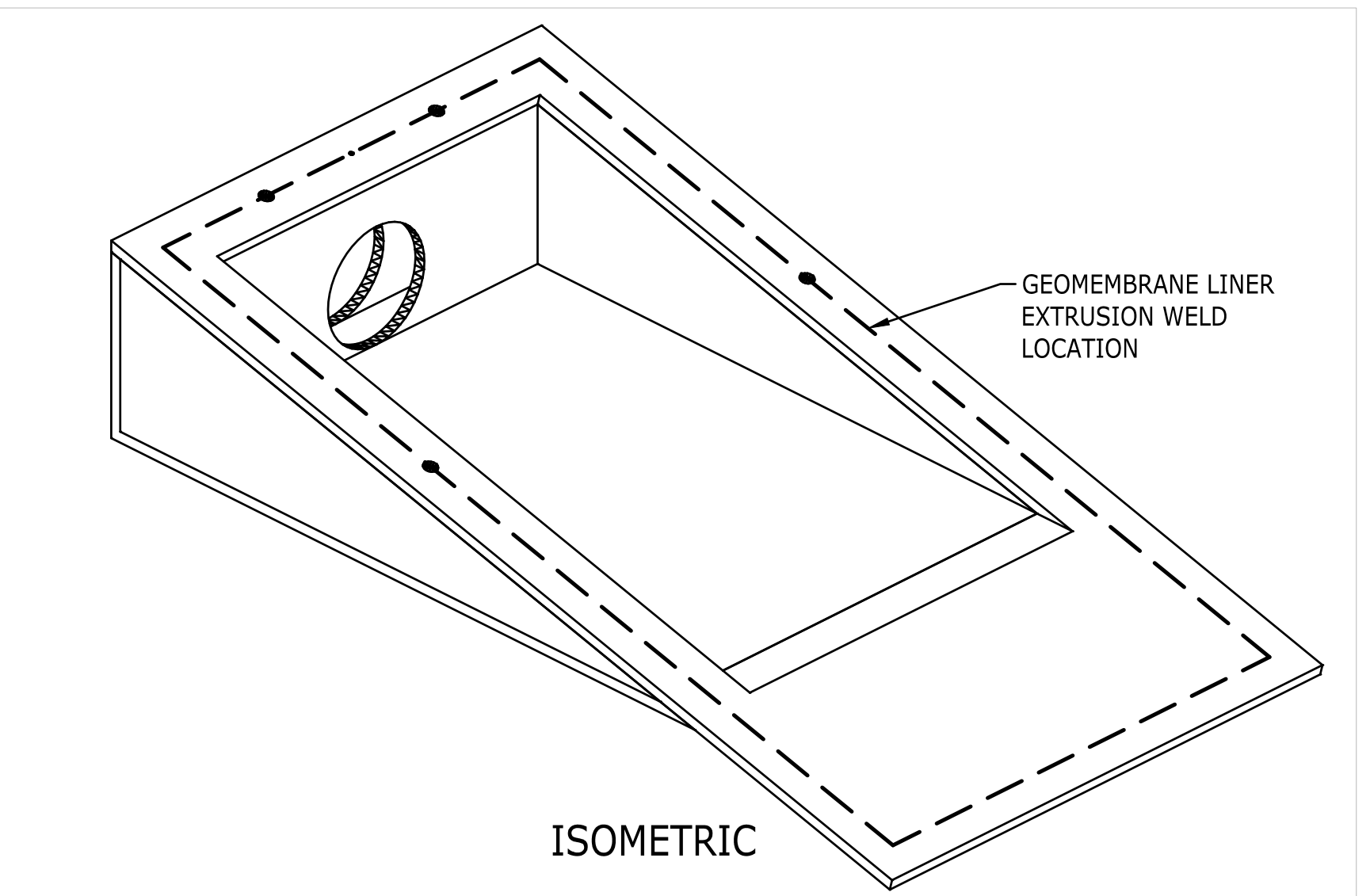
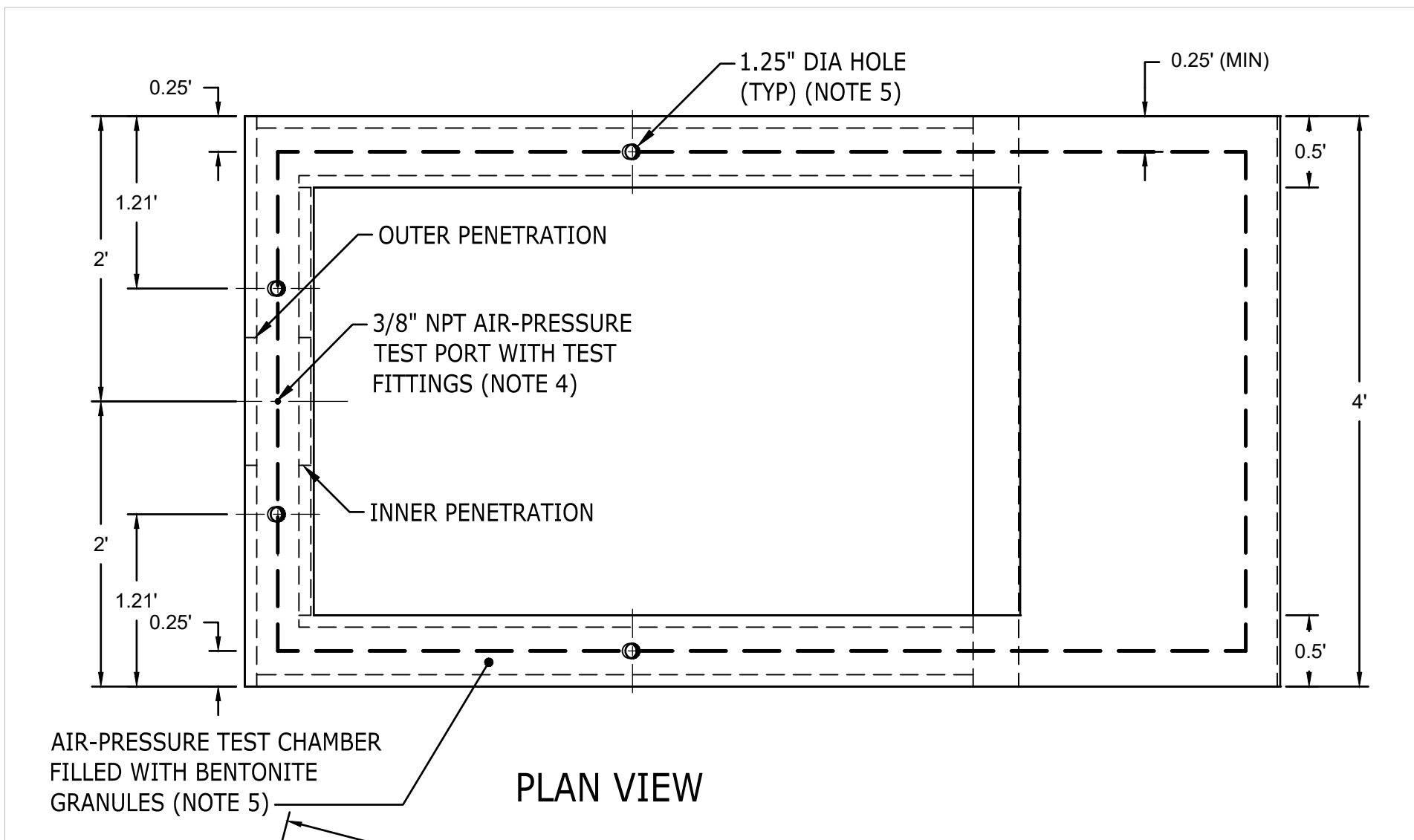
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LEGEND

	PROPOSED TOP OF LINER ELEVATION (FEET, NGVD)
	PROPOSED LEACHATE COLLECTION CORRIDOR
	PROPOSED LEACHATE COLLECTION SYSTEM (LCS) PIPE
	PROPOSED LEACHATE DETECTION SYSTEM (LDS) PIPE
	PROPOSED LIMIT OF LINER
	CONSTRUCTION CONTROL POINT (WILL BE GENERATED FOR CONSTRUCTION SET)



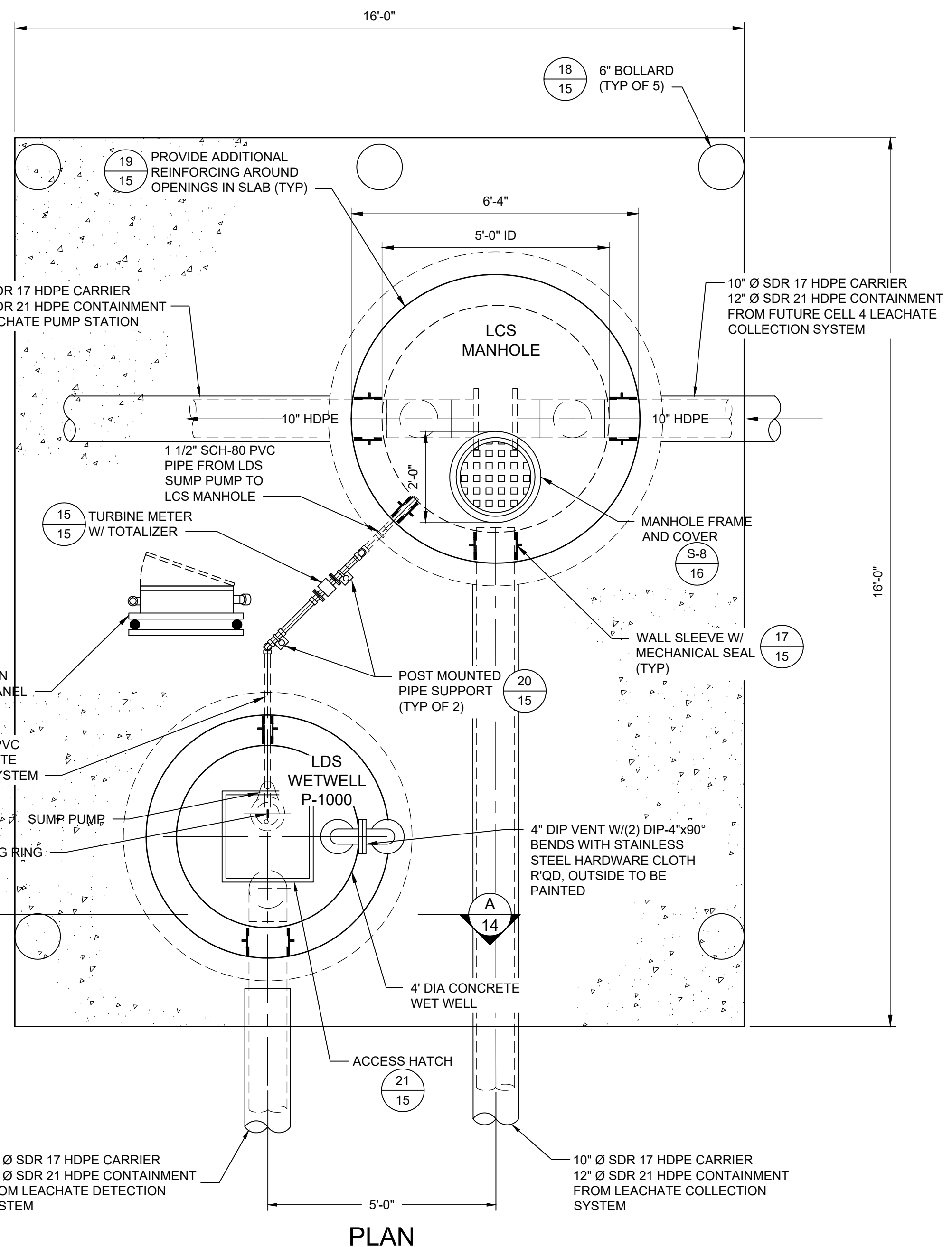
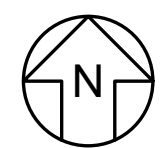
- NOTES:**
- LINER PENETRATION BOXES WILL BE CONSTRUCTED USING 1-INCH THICK FLAT STOCK AND IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 13005.
 - TEN-INCH PIPE SEGMENTS AND SOLID END TERMINATIONS WILL BE FACTORY WELDED TO LINER PENETRATION BOXES WITH LENGTHS SHOWN AND TESTED IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 13005. WELDS WILL BE TESTED PRIOR TO DELIVERY IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 02770.
 - GEOMEMBRANE LINER EXTRUSION WELD LOCATION IS NOT SHOWN ON FRONT ELEVATION OF LINER PENETRATION BOXES FOR CLARITY.
 - LINER PENETRATION BOXES AND ATTACHED CONTAINMENT PIPING WILL BE AIR-PRESSURE TESTED IN THE FIELD AFTER INSTALLATION AND WILL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION 13005.
 - AIR-PRESSURE TEST CHAMBER WILL BE BACKFILLED WITH BENTONITE GRANULES USING 1.25-INCH DIA HOLES AFTER AIR-PRESSURE TESTING IS COMPLETED. EACH HOLE WILL BE SEALED WITH HDPE EXTRUDATE AFTER BENTONITE FILLING IS COMPLETED.
 - THE LINER PENETRATION BOX IS APPLICABLE WHERE THE LCS AND LDS DRAINAGE CORRIDORS INTERCEPTS THE LINER SIDESLOPE AT A NEAR-PERPENDICULAR ANGLE.

13 **DETAIL**
13 **LINER PENETRATION BOX**
 SCALE: N.T.S

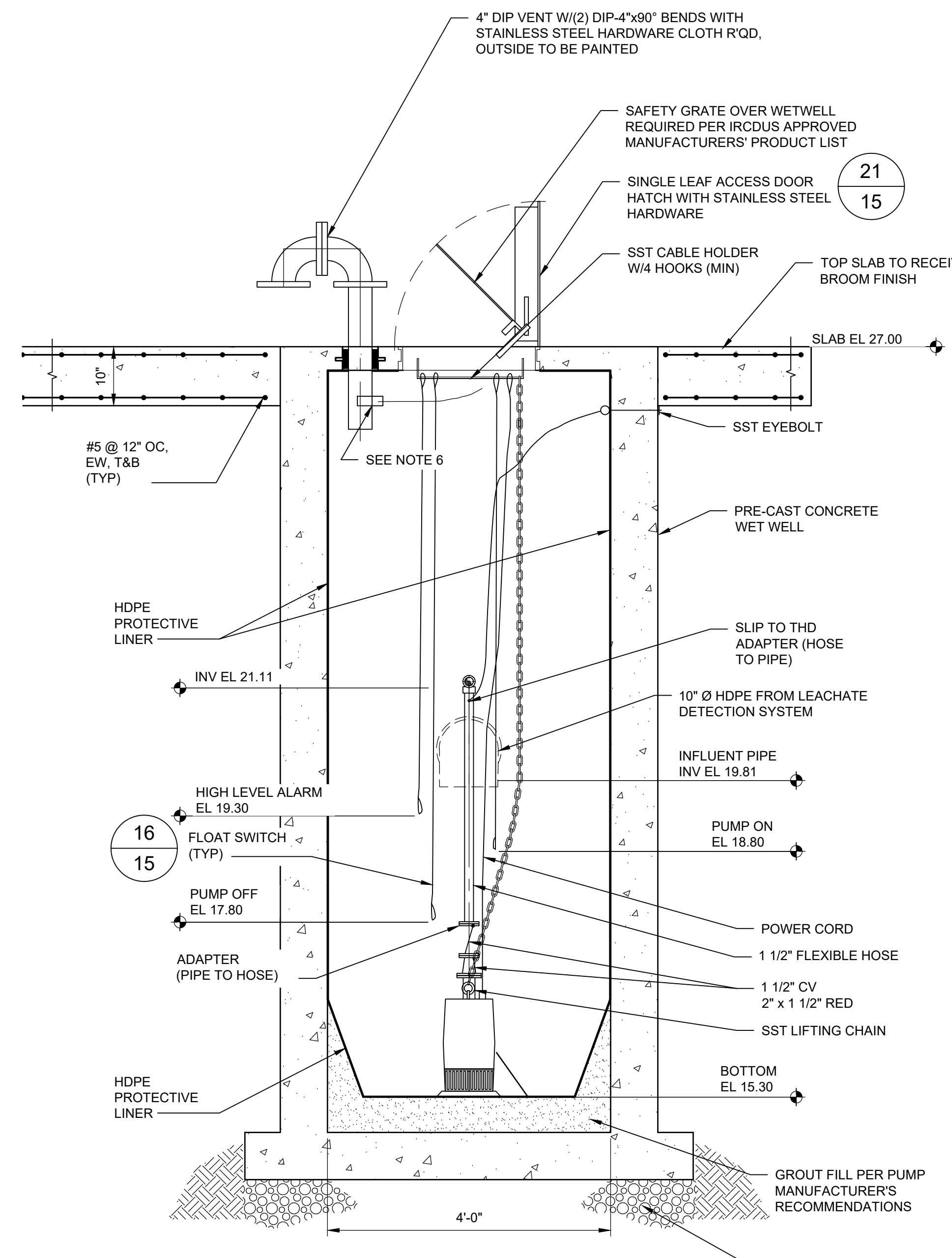
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TITLE: LINER PENETRATION DETAILS				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: KBT	DATE: NOVEMBER 2023	
		DRAWN BY: JVJ	PROJECT NO.: FL9363A	
		CHECKED BY: TC	FILE: FL9363A-C13A	
		REVIEWED BY: SA	DRAWING NO.:	
		APPROVED BY: KBT	13	24
SIGNATURE _____ DATE _____ KWASI BABU-TWENGOBAH LICENSE NO. 42460				

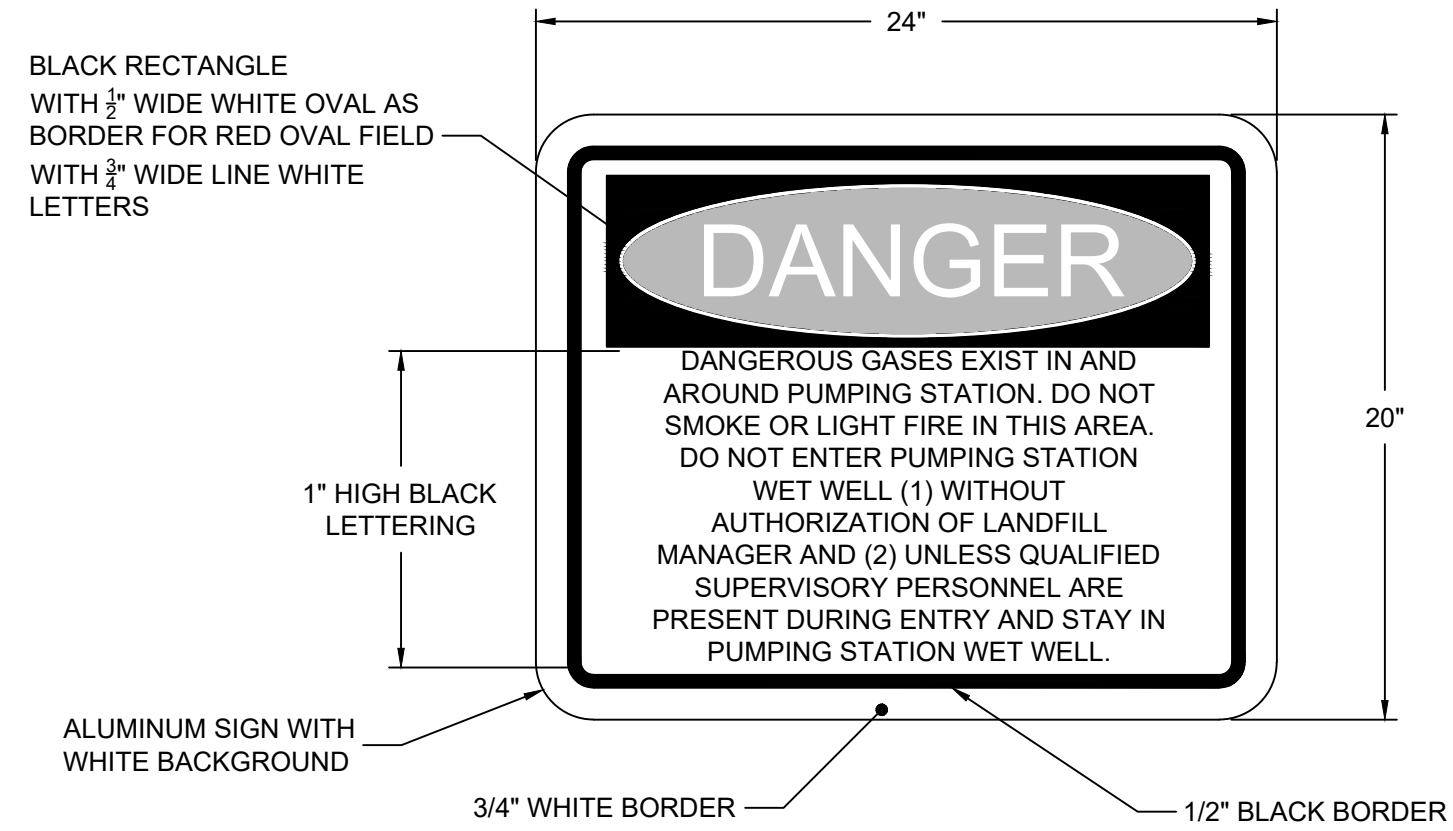
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14 **14** **DETAIL**
LCS MANHOLE AND LDS PUMP STATION
SCALE: NOT TO SCALE



A **14** **DETAIL**
LDS MANHOLE SECTION
SCALE: NOT TO SCALE



- NOTES:**
1. ALL SIGNS SHALL BE SECURED TO POST WITH SS HARDWARE.
 2. IN ADDITION TO THE WARNING AND PUMP STATION NUMBER SIGNS ON THE SOUTHERN SIDE, THE CONTRACTOR SHALL INSTALL NO SMOKING, CONFINED SPACE ENTRY AND METHANE GAS HAZARD SIGNS AT EACH PUMP STATION. THESE 10"x14" SIGNS SHALL BE OSHA COMPLIANT AND MADE OF ALUMINUM.
 3. CONTRACTOR TO SUBMIT PROPOSED SIGNS FOR APPROVAL IN ACCORDANCE WITH SECTION 01300.
 4. MOUNT SIGNS IN ACCORDANCE WITH FDOT STANDARD 700-010, SLIP BASE AND FOUNDATION DETAIL ?

15 **14** **DETAIL**
WARNING SIGN
SCALE: N.T.S.

WET WELL GENERAL NOTES:

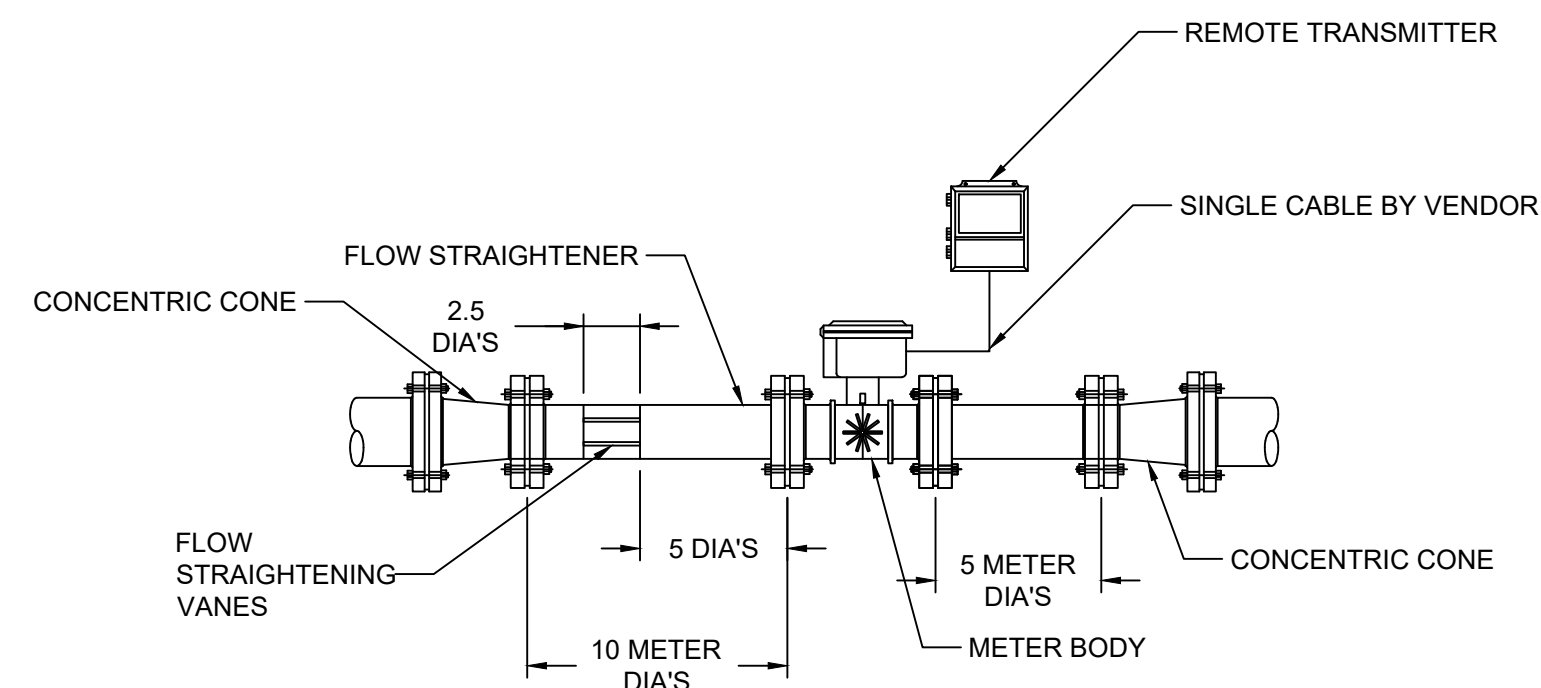
1. ALL EQUIPMENT, ANCHOR BOLT SIZES, LOCATIONS, CLEARANCES, ETC. SHALL BE IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND THE APPROVED SHOP DRAWINGS.
2. ALL STRUCTURES SHALL HAVE HDPE PROTECTIVE LINER INSTALLED.
3. ALL BACKFILL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH THE SPECIFICATIONS.
4. CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF ALL TRADES AND SUBCONTRACTORS.
5. SEE ELECTRICAL DRAWINGS FOR LOCATION OF ELECTRICAL/ CONTROL PANEL AND CONNECTING CONDUITS.
6. CONTRACTOR TO PROTECT WET WELL LINER/COATING DURING INSTALLATION AND REPAIR AS DIRECTED.
7. HATCH COVERS SHALL BE H-20 RATED AND PROVIDE UNRESTRICTED VERTICAL ACCESS TO PUMPS AND VALVES.
8. PROVIDE NON-SHRINK GROUT AT ALL OPENINGS INTO THE STRUCTURES.
9. CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS AGAINST FLOATAION OF WET WELL UNTIL ALL BACKFILL IS IN PLACE.
10. CAST-IN-PLACE CONCRETE SHALL BE 4500 PSI AND PRECAST CONCRETE SHALL BE 5000 PSI. SEE SPECIFICATIONS 03300 AND 02605, RESPECTIVELY.
11. REINFORCING STEEL SHALL BE GRADE 60 FABRICATED AND PLACED IN ACCORDANCE WITH ACI CODE SPLICES AND SHALL BE SIX (6) TIMES THE BAR DIAMETER NUMBER SIZE OR 18" MINIMUM UNLESS OTHERWISE NOTED (STAG. SPL., TYP).
12. ALL BACKFILL AROUND THE PUMP STATION SITE SHALL BE COMPACTED @ 98% OF MAXIMUM DENSITY, PER ASTM D1557. COMPACT TO A DEPTH OF AT LEAST ONE FOOT BELOW SLAB ON GRADE.
13. CHAMFER EXPOSED CONCRETE EDGES 3/4" (TYP).
14. ALL PIPING AT THE PUMP STATION SITE SHALL BE RESTRAINED.
15. STAINLESS STEEL CABLE HOLDER SHALL BE LOCATED ON OPPOSITE SIDE OF WETWELL FROM THE INFLUENT PIPE.
16. BUOYANCY CALCULATIONS SHALL BE REQUIRED FOR ALL PUMP STATIONS ALONG WITH THE REQUIRED PUMP STATION CALCULATIONS.
17. MAINTAIN MINIMUM OF 6" BETWEEN ANY PIPING, FITTINGS ETC. AND PRECAST CONCRETE.
18. A SAFETY GRATE WITH STAINLESS STEEL HARDWARE IS REQUIRED FOR ALL WETWELLS PER IRCBUS APPROVED MANUFACTURERS' PRODUCT LIST
19. STAINLESS STEEL LIFTING BAILS SHALL BE USED FOR PUMPS IN LIFT STATIONS.
20. ALL HARDWARE TO BE 316 STAINLESS STEEL.
21. FOR CLEAR COVER REQUIREMENTS FOR CAST-IN-PLACE CONCRETE REINFORCEMENT, REFER TO SPECIFICATION 03300.
22. ASSUME ALLOWABLE BEARING PRESSURE FOR CAST-IN-PLACE SLAB ON GRADE OVER PREPARED SUBGRADE PER NOTES ABOVE: 1000 PSF.
23. PRECAST WETWELL SHALL BE DESIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF FLORIDA AS REQUIRED BY SPECIFICATION 02605.

NOTES:

1. SEE ELECTRICAL PLANS FOR INFORMATION ON PANELS, WIRING, FPL METER, SERVICE DISCONNECT, AND CONDUITS TO WETWELLS.
2. PROVIDE FLAT AREA ON BOTTOM FOR PUMP.
3. PROVIDE ADEQUATE LENGTHS OF HOSE TO ALLOW EASY REMOVAL OF THE LDS PUMP.
4. SEE SPECIFICATIONS FOR PROTECTIVE LINER DETAILS.
5. IF UNSTABLE MATERIAL IS PRESENT, OVER EXCAVATE 3'-0" AND BACKFILL WITH 3.0 FOOT DEPTH OF FDOT NO. 57 GRAVEL.
6. OPENINGS FOR CONDUITS. SEE ELECTRICAL PLANS FOR DETAILS. PENETRATIONS SHALL BE SEALED IN ACCORDANCE WITH THE SPECIFICATIONS.
7. DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.

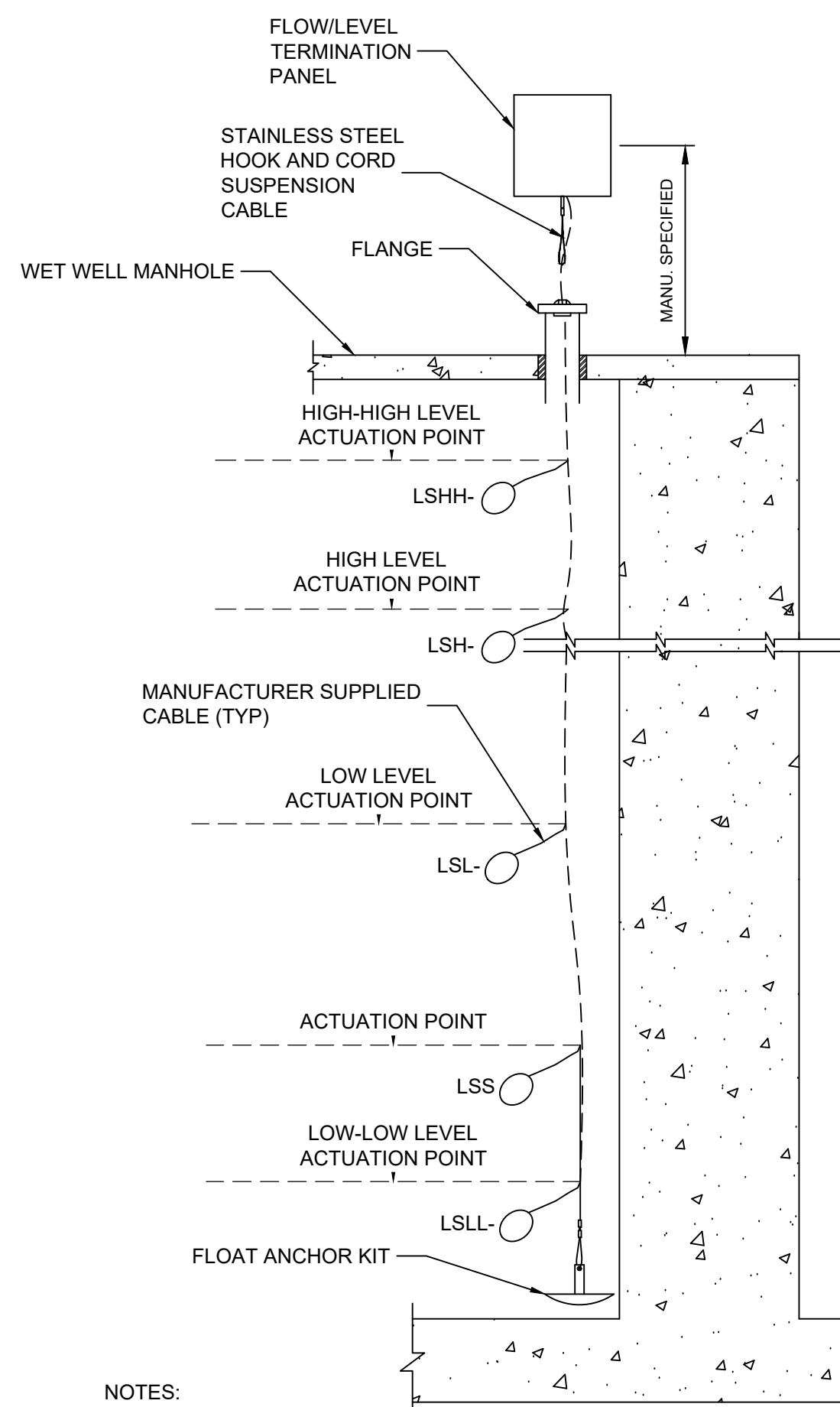
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1325 74th AVENUE SW VERO BEACH, FLORIDA 33968 USA PHONE: 772.770.5112				
TITLE: LCS AND LDS DETAILS 1				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.				
DESIGN BY:	KBT	DATE:	NOVEMBER 2023	
DRAWN BY:	JJV	PROJECT NO.:	FL9363A	
CHECKED BY:	TC	FILE:	FL9363A-C15	
REVIEWED BY:	SA	DRAWING NO.:	14 OF 24	
APPROVED BY:	KBT			
SIGNATURE _____ DATE _____ KWASI BADU-TWENGOAH LICENSE NO. 42460				

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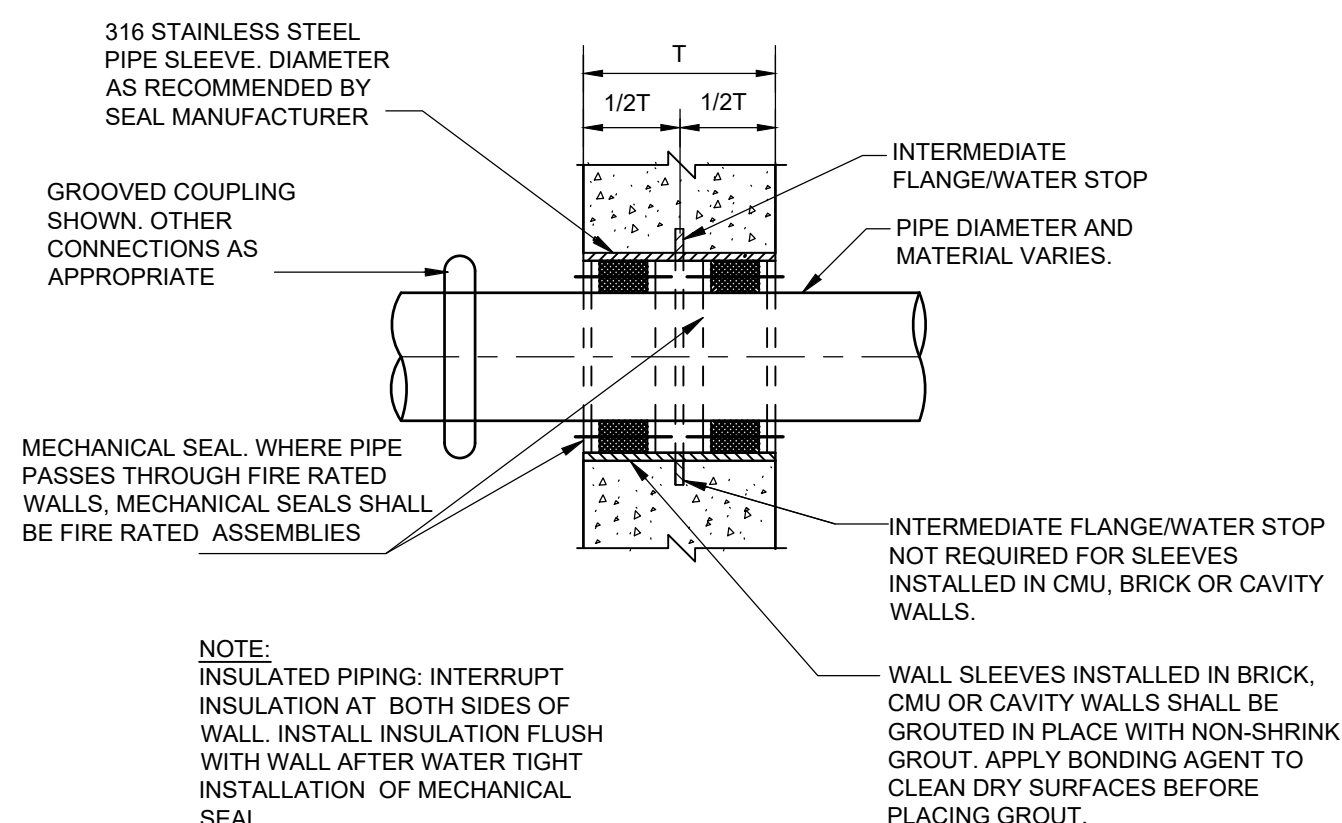
16 DETAIL
14 TURBINE FLOW METER

SCALE: NOT TO SCALE (N.T.S.)



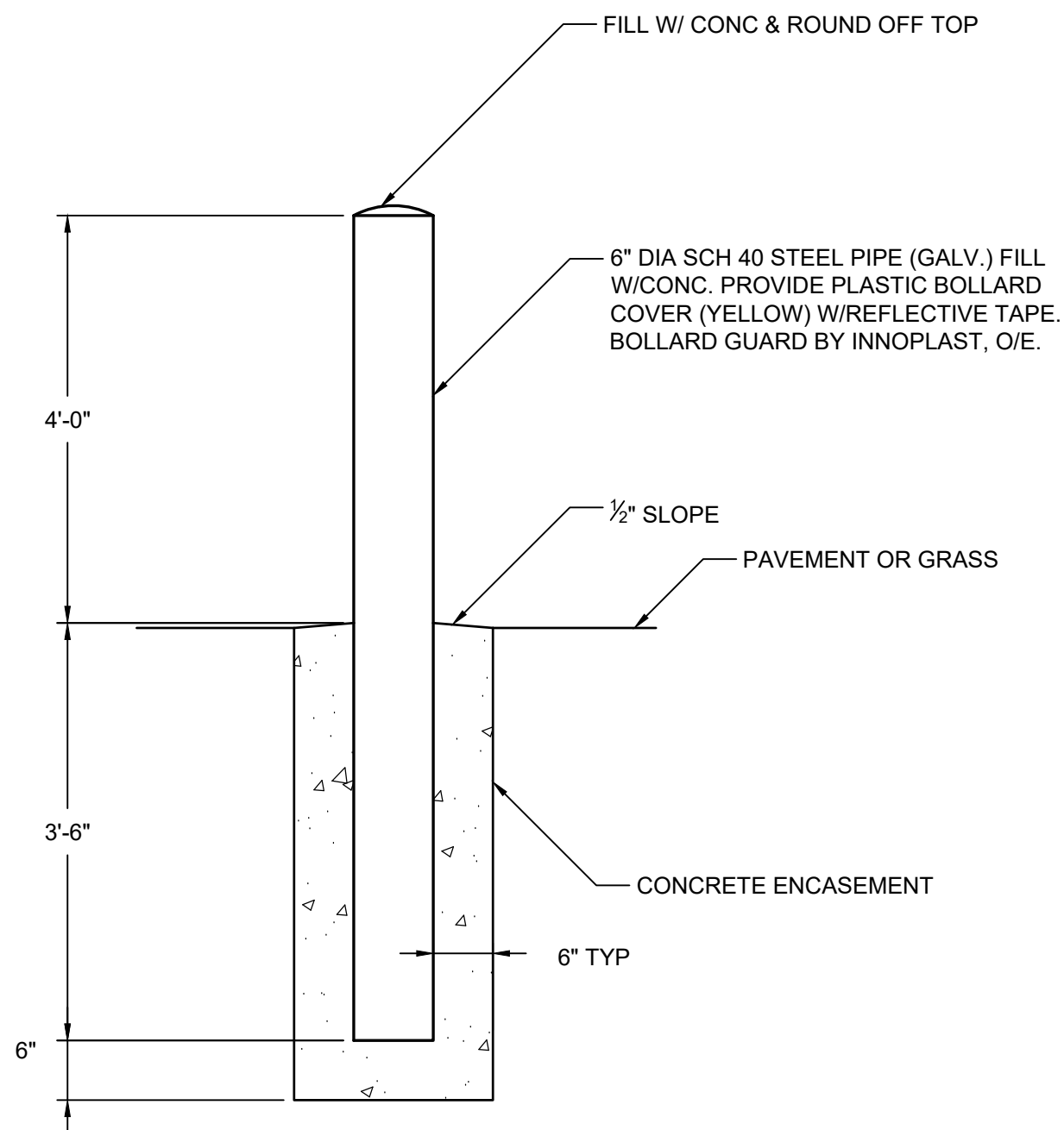
17 DETAIL
15 FLOAT SWITCH (CABLE SUSPENSION)

SCALE: N.T.S.



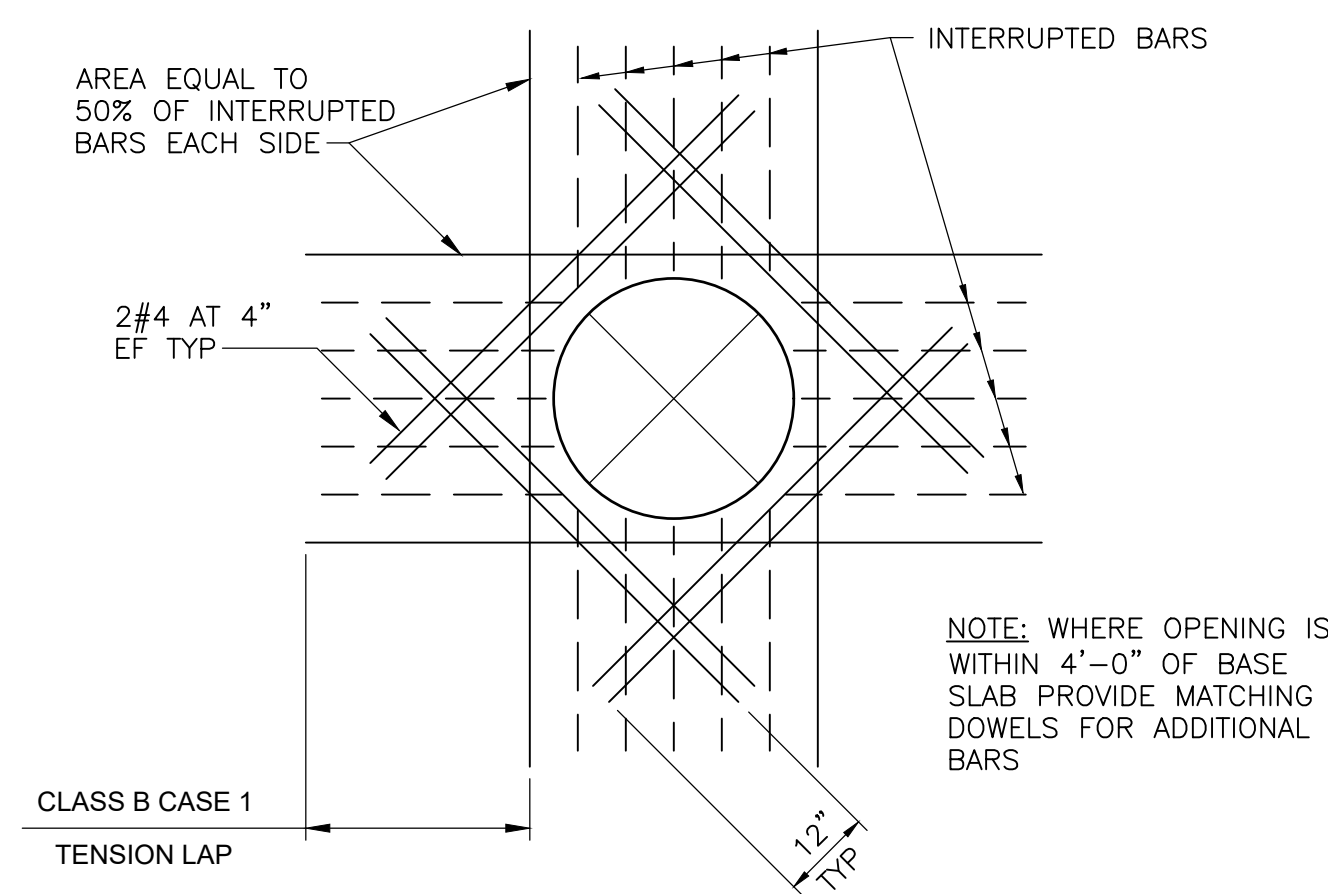
18 DETAIL
15 WALL SLEEVE WITH MECH. SEAL

SCALE: N.T.S.



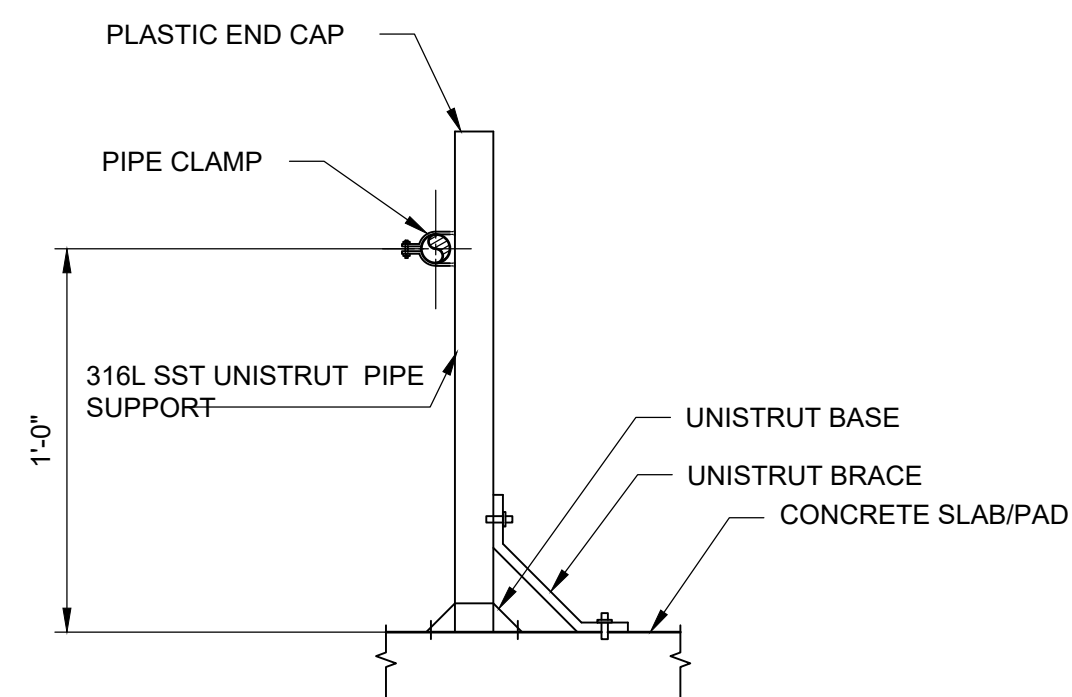
19 DETAIL
15 BOLLARD POST

SCALE: N.T.S.



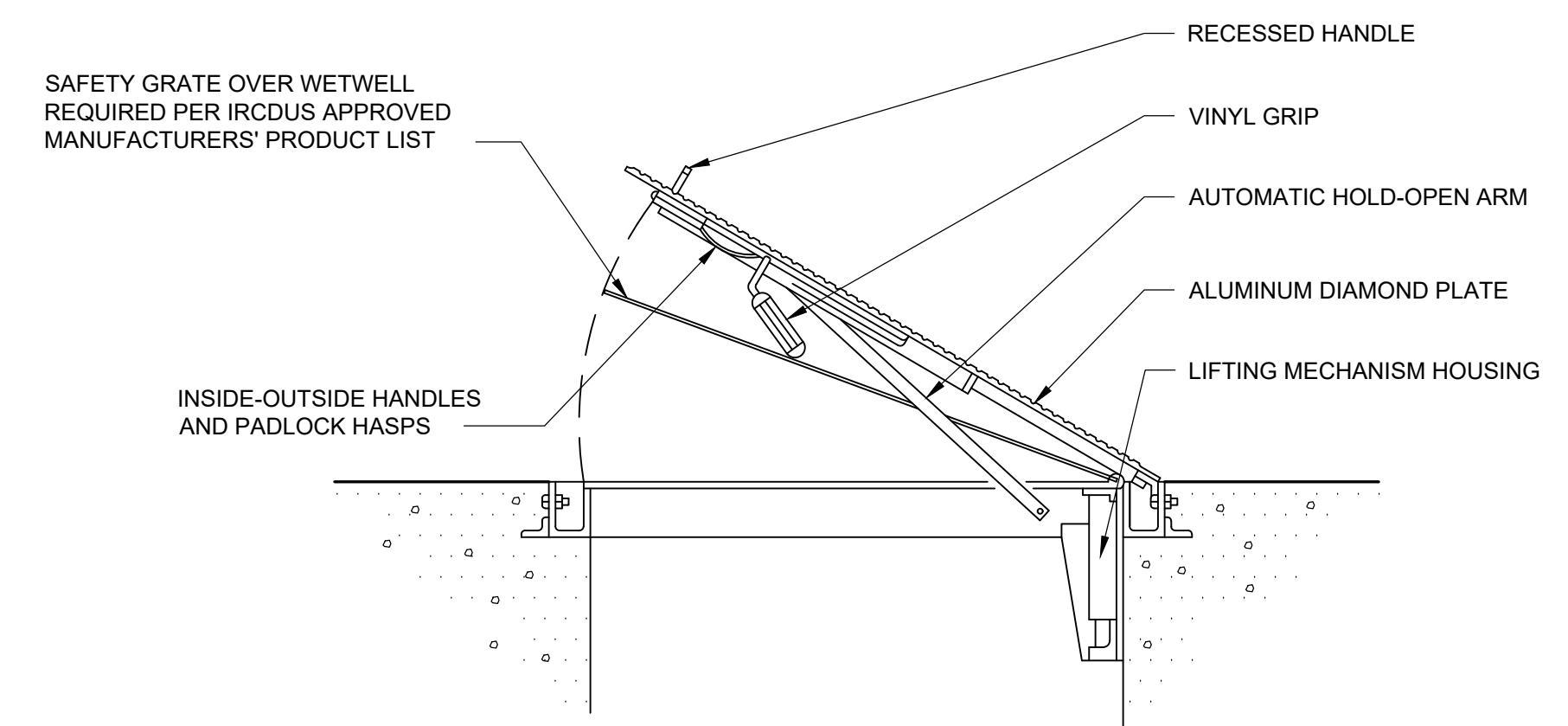
20 DETAIL
14 REINFORCEMENT AROUND OPENINGS(2)

SCALE: N.T.S.



21 DETAIL
14 POST MOUNTED PIPE SUPPORT

SCALE: N.T.S.



SINGLE LEAF HATCH

HATCH NOTES

1. ALUMINUM HATCHES TO BE SUPPLIED WITH STAINLESS STEEL HARDWARE.
2. ALL HATCHES TO BE SUPPLIED WITH SAFETY CHAINS. CORNER POST WITH FLOOR INSERTS MUST ALSO BE PROVIDED FOR SINGLE LEAF HATCHES.
3. HATCHES TO OPEN AWAY FROM ELECTRICAL PANEL.

HATCH SCHEDULE					
QUANTITY	LOCATION	SIZE	LEAF	DRAIN	REMARKS
1	LDS WET WELL	2'-0" x 2'-0"	SINGLE	YES	SPRING ASSIST, H-20 RATING
1	LCS WET WELL	4'-0" x 2'-1"	SINGLE	YES	SPRING ASSIST, H-20 RATING

22 DETAIL
14 TYPICAL HATCH DETAILS AND SCHEDULE

SCALE: N.T.S.

NOTES:

1. DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT

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TITLE: LCS AND LDS DETAILS 2

PROJECT: PHASE II - CELL 3 CONSTRUCTION

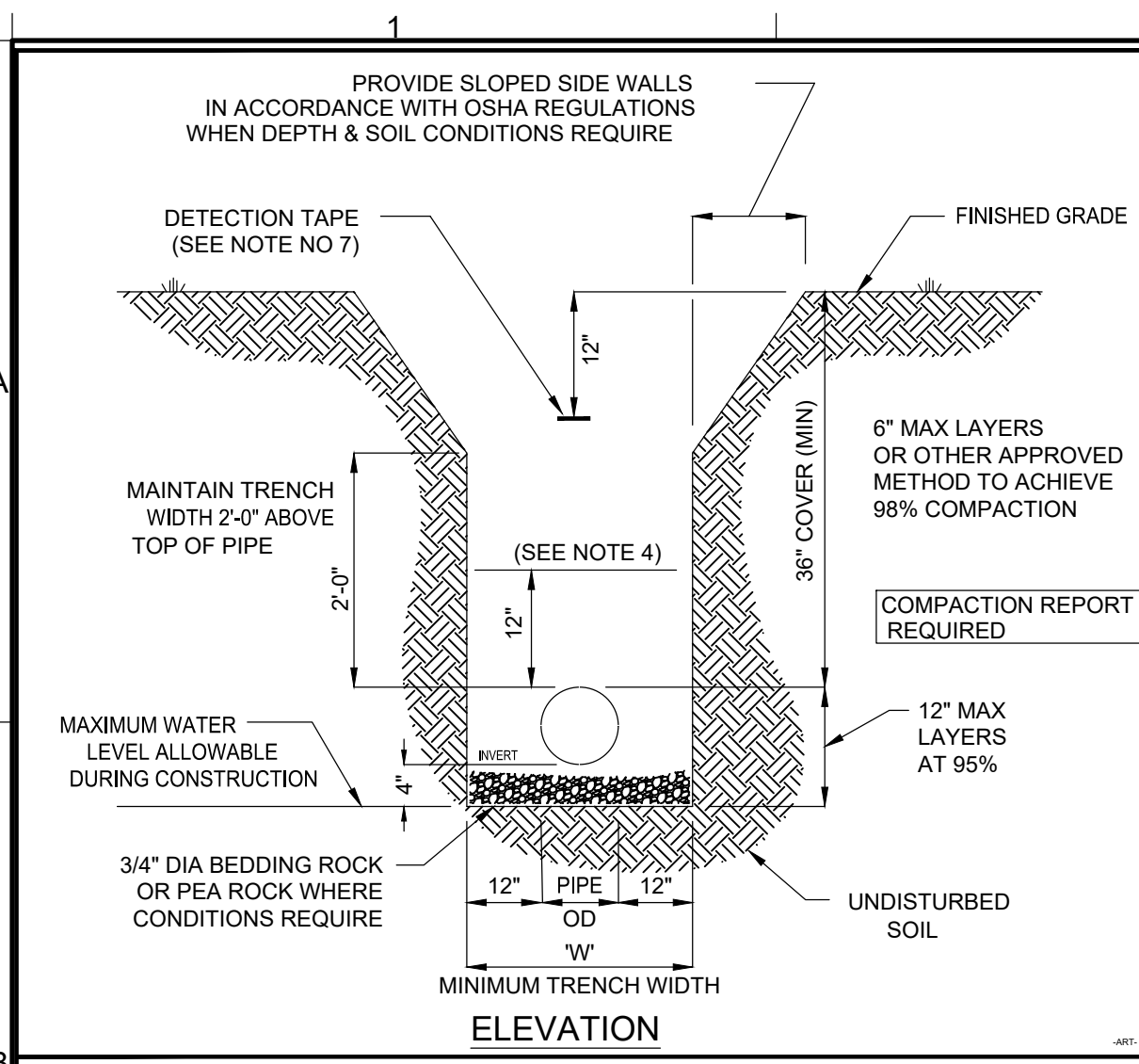
SITE: INDIAN RIVER COUNTY LANDFILL

DESIGN BY: KBT	DATE: NOVEMBER 2023
DRAWN BY: JJV	PROJECT NO.: FL9363A
CHECKED BY: TC	FILE: FL9363A-C16
REVIEWED BY: SA	DRAWING NO.: 15 OF 24
APPROVED BY: KBT	

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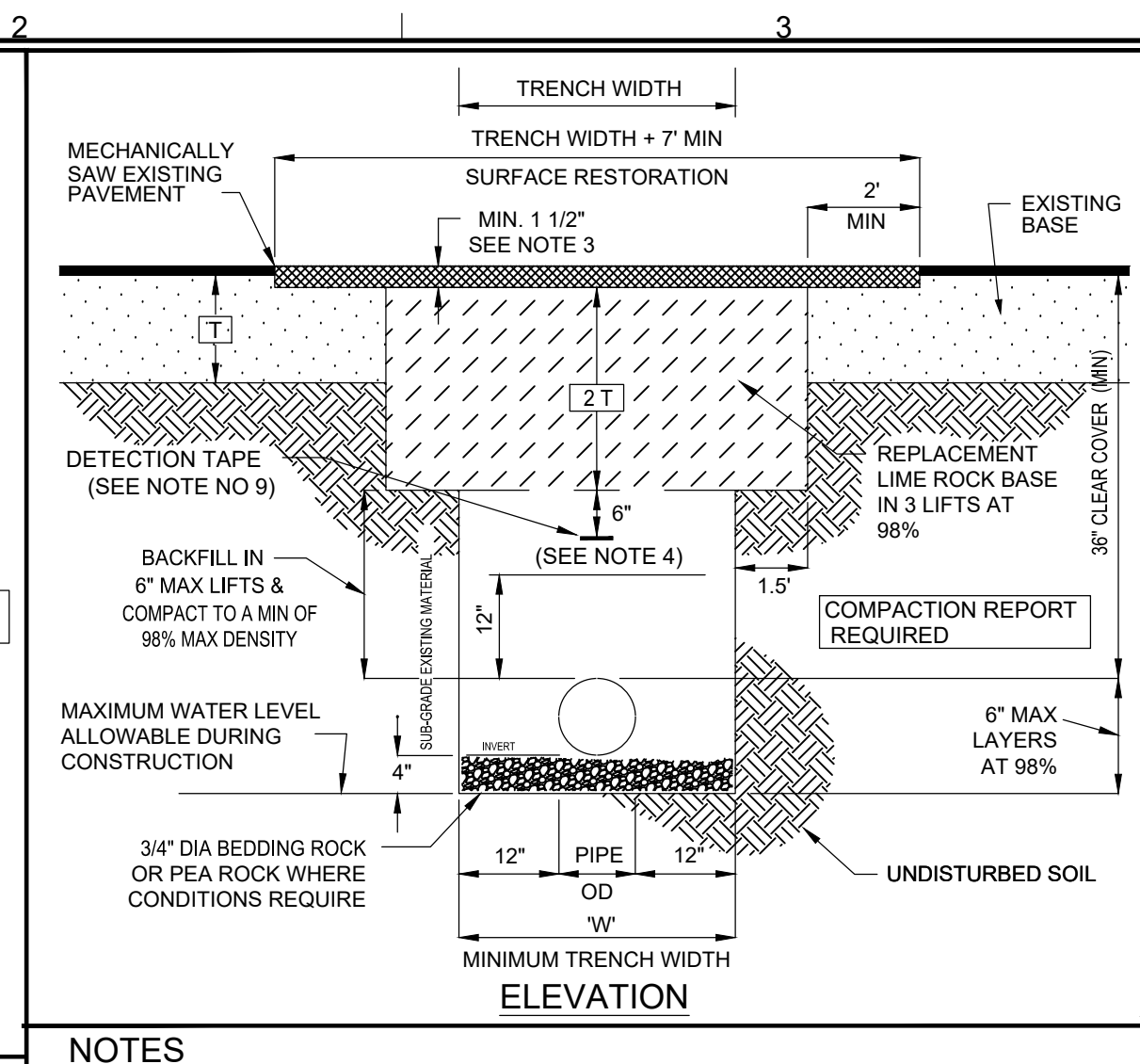
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KWASI BADU-TWENEBRAH LICENSE NO. 42460

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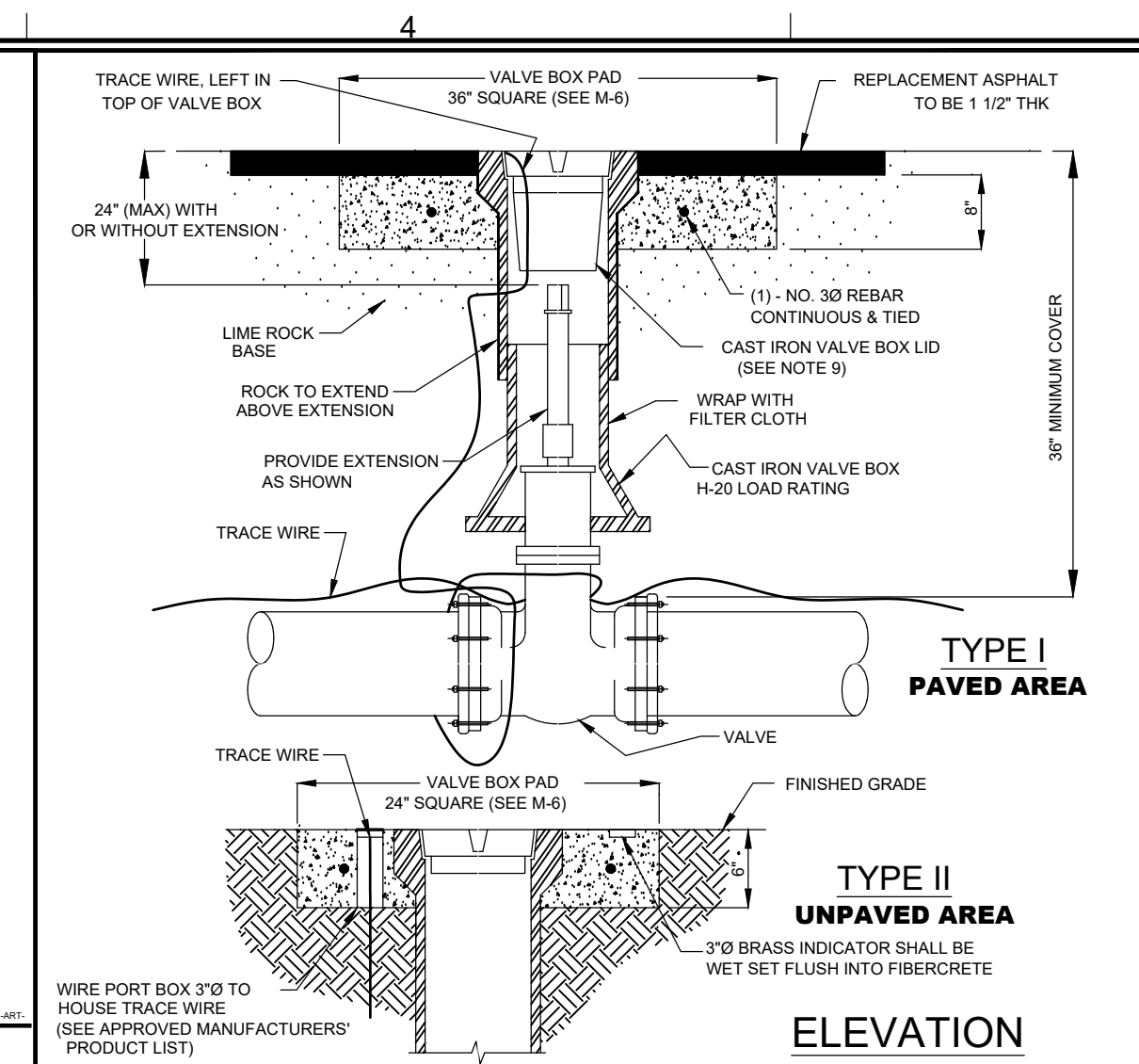
NOTES

- WHERE SOIL CONDITIONS CANNOT BE MAINTAINED AS SHOWN ABOVE, PROVIDE METHOD OF CONSTRUCTION TO IRCUDS FOR APPROVAL.
- SHEETING WILL BE REQUIRED AS DETERMINED IN THE FIELD IN ACCORDANCE WITH OSHA REGULATIONS. COMPACTION PERCENTAGES SHOWN REFER TO AASHTO T-180 MODIFIED PROCTOR METHOD.
- MECHANICAL COMPACTION NOT ALLOWED BELOW THIS LEVEL OTHER THAN HAND VIBRATORY MEANS. COMPACTION REPORTS REQUIRED.
- MINIMUM TRENCH WIDTH "W" = PIPE O.D. PLUS 2'-0".
- 2" DETECTION TAPE WITH METALLIC BACKING TO BE INSTALLED OVER MAIN 6" BELOW BOTTOM OF BASE COURSE. TAPE TO BE MARKED "CAUTION-WATER LINE BELOW", "CAUTION-FORCE MAIN BELOW", OR "CAUTION-REUSE MAIN BELOW". TRACE WIRE SHALL BE USED CONTINUOUSLY ON ALL PIPE. SEE TRACE WIRE DETAIL M-13.
- ALL RESTORATION IN EXCESS OF 12" OR RIGHT-OF-WAYS OR WHEN REQUIRED BY OTHER JURISDICTIONAL AGENCIES SHALL CONFORM TO IRCUDS SPECIFICATIONS OR THE OTHER JURISDICTIONAL AGENCY SPECIFICATION, WHICHEVER IS MORE STRINGENT.
- ALL PIPE TO BE LOCATED A MINIMUM OF 5' O.C. (TYPICAL) FROM EDGE OF PAVEMENT. PER FDOT INDEX 105.
- EXCAVATABLE FLOWABLE FILL IS ALLOWED WITH PRIOR APPROVAL OF PROPOSED MATERIAL STRENGTH BY COUNTY PUBLIC WORKS ENGINEER OR DESIGNER.



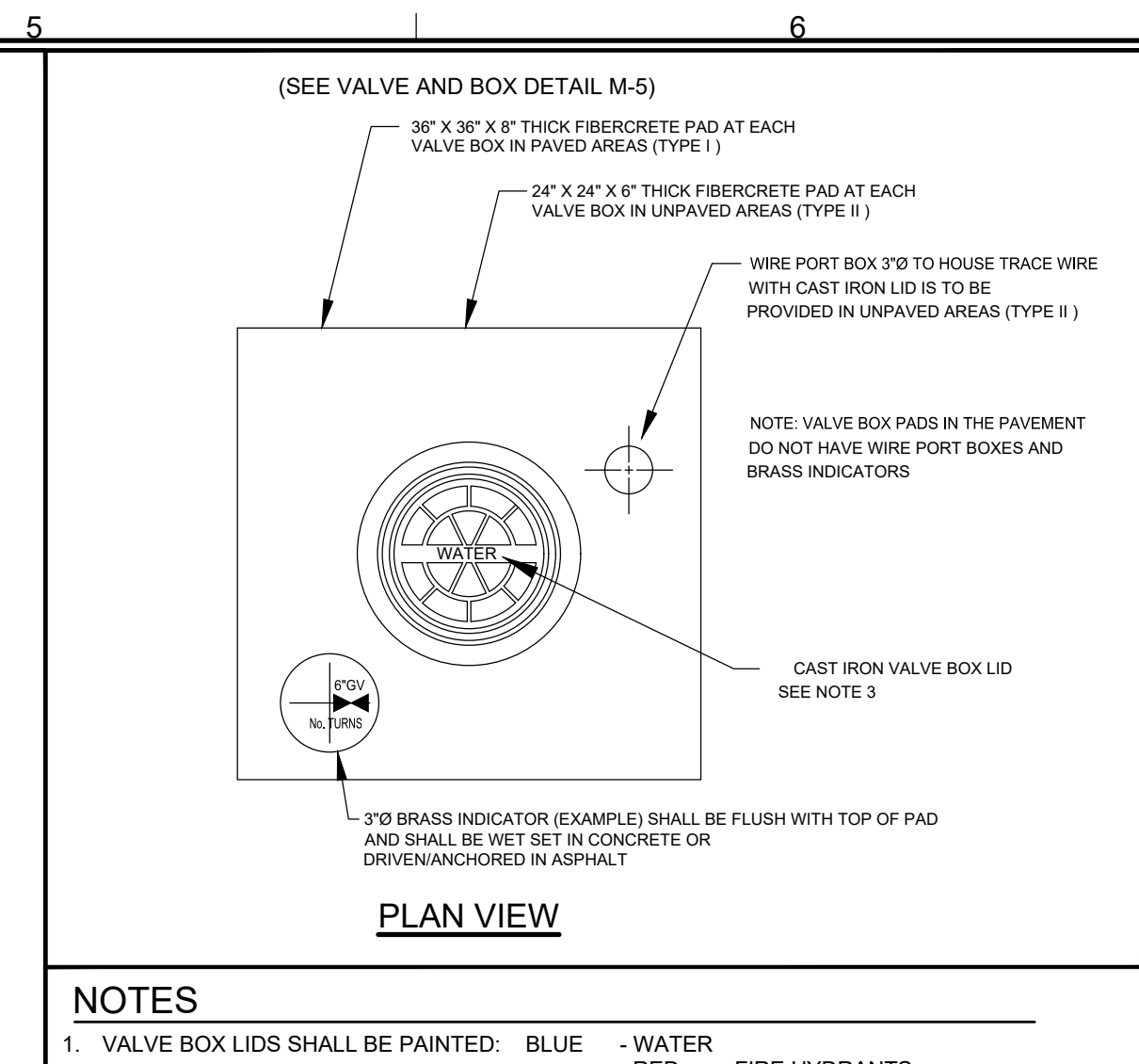
NOTES

- WHERE SOIL CONDITIONS CANNOT BE MAINTAINED AS SHOWN ABOVE, PROVIDE METHOD OF CONSTRUCTION TO IRCUDS FOR APPROVAL.
- SHEETING WILL BE REQUIRED AS DETERMINED IN THE FIELD IN ACCORDANCE WITH OSHA REGULATIONS.
- NEW SURFACE MATERIALS SHALL BE CONSISTENT IN DEPTH WITH EXISTING MATERIALS AND SHALL HAVE LAPPED JOINTS. (1-1/2" MIN. THK) PAVEMENT MATERIAL TYPE TO BE SPECIFIED.
- MECHANICAL COMPACTION NOT ALLOWED BELOW THIS LEVEL OTHER THAN HAND VIBRATORY MEANS.
- COMPACTION PERCENTAGES SHOWN REFER TO AASHTO T-180 MODIFIED PROCTOR METHOD.
- ALL ROADWAY RESTORATION SHALL COMPLY WITH INDIAN RIVER COUNTY PUBLIC WORKS/FDOT STANDARDS (SEE PUBLIC WORKS FOR TYPICAL CONSTRUCTION DRAWINGS).
- COMPACTION REPORTS REQUIRED BY IRCUDS.
- MINIMUM TRENCH WIDTH "W" = PIPE O.D. PLUS 2'-0".
- 2" DETECTION TAPE WITH METALLIC BACKING TO BE INSTALLED OVER MAIN 6" BELOW BOTTOM OF BASE COURSE. TAPE TO BE MARKED "CAUTION-WATER LINE BELOW", "CAUTION-FORCE MAIN BELOW", OR "CAUTION-REUSE MAIN BELOW". TRACE WIRE SHALL BE USED CONTINUOUSLY ON ALL PIPE. SEE TRACE WIRE DETAIL M-13.
- COMPACT SHOULDER TO A MINIMUM OF 98% OF MAXIMUM DENSITY IN RIGHT-OF-WAY.
- ALL PIPE TO BE LOCATED A MINIMUM OF 5' O.C. (TYPICAL) FROM EDGE OF PAVEMENT. ALL RESTORATION (SODDING) SHALL BE PER FDOT INDEX 105.
- EXCAVATABLE FLOWABLE FILL IS ALLOWED WITH PRIOR APPROVAL OF PROPOSED MATERIAL STRENGTH BY COUNTY PUBLIC WORKS ENGINEER OR DESIGNER.



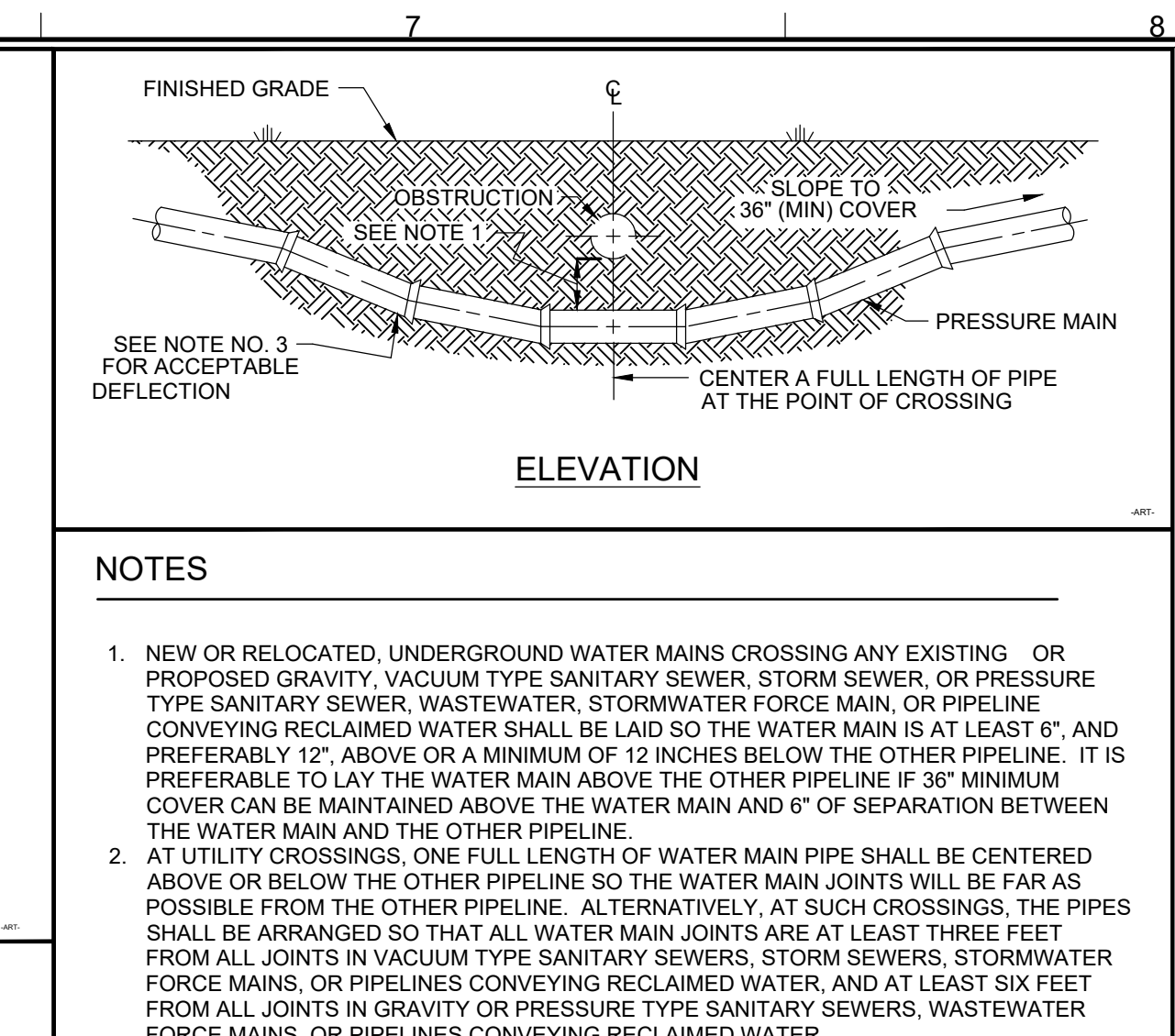
NOTES

- ALL VALVE BOXES SHALL BE SHAFT/SCREW TYPE OR SHAFT/SLIP TYPE AND CANNOT REST ON THE VALVE.
- ALL VALVE BOLTS SHALL BE STAINLESS STEEL WITH BRASS NUTS.
- PERMANENT LAND MARKERS ARE TO BE INSTALLED ADJACENT TO ALL VALVES IN UNPAVED AREAS AS DIRECTED BY IRCUDS. (SEE PERMANENT LAND MARKER DETAIL M-9)
- ALL VALVES REQUIRE STATE PLANE COORDINATES.
- TRACE WIRE IS REQUIRED. (SEE TRACE WIRE DETAIL M-13)
- REFLECTIVE MARKERS ARE TO BE LOCATED IN ROADWAY FOR ALL VALVES. (DETAIL W-1)
- REFLECTIVE MARKERS FOR:
 - FIRE HYDRANT - BLUE
 - WATER MAIN VALVE - WHITE
 - FORCE MAIN VALVE - GREEN
 - REUSE MAIN VALVE - PURPLE
 - BROKE - BROWN
- REFLECTIVE MARKERS SHALL NOT BE PLACED IN BIKE LANES.
- VALVE BOX LID LOCATED IN PAVEMENT SHALL BE A MINIMUM 24 LBS. WITH A MINIMUM 6" LONG THROAT.
- VALVE BOX SHALL COMPLY WITH FDOT STANDARDS AS APPLICABLE.
- VALVE EXTENSIONS OVER 36" REQUIRE IRCUDS ENGINEERING APPROVAL.
- VALVE SPACING ON WATER MAINS SHALL NOT EXCEED 1,000' MAXIMUM.



NOTES

- VALVE BOX LIDS SHALL BE PAINTED:
 - BLUE - WATER
 - RED - FIRE HYDRANTS
 - GREEN - FORCE MAINS
 - PURPLE - REUSE MAINS
 - BROWN - BRINE
- IN UNPAVED AREAS (SEE M-5, TYPE II) A BRASS VALVE INDICATOR IS TO BE PROVIDED WITH ENGRAVED DIAGRAM OF VALVE LOCATION AND DESCRIPTION. (SEE EXAMPLE ABOVE) INDICATOR SHALL BE FLUSH WITH VALVE PAD.
- VALVE BOX LID LOCATED IN PAVEMENT SHALL BE A CAST IRON, STAY-PUT COVER, MINIMUM 24 LBS. WITH A MINIMUM 6" LONG THROAT AND SHALL BE MARKED WITH RAISED LETTERS: "WATER", "SEWER", "BRINE", OR "REUSE WATER" AS APPLICABLE.
- VALVE BOX SHALL COMPLY WITH FDOT STANDARDS AS APPLICABLE.
- NO VALVE RINGS ARE TO BE USED.
- IN TYPE I PAVED AREAS, THE VALVE BOX PAD TOP ELEVATION SHALL BE EVEN WITH THE ROCK GRADE TO ALLOW BOTH LAYERS OF ASPHALT TO COVER THE VALVE BOX PAD WITH THE FINAL ASPHALT LAYER FLUSH WITH THE TOP OF THE VALVE BOX. (SEE VALVE AND BOX DETAIL M-5)



NOTES

- NEW OR RELOCATED, UNDERGROUND WATER MAINS CROSSING ANY EXISTING OR PROPOSED GRAVITY, VACUUM TYPE SANITARY SEWER, STORM SEWER, OR PRESSURE TYPE SANITARY SEWER, WASTEWATER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING RECLAIMED WATER SHALL BE LAID SO THE WATER MAIN IS AT LEAST 6", AND PREFERABLY 12", ABOVE OR A MINIMUM OF 12 INCHES BELOW THE OTHER PIPELINE. IT IS PREFERABLE TO LAY THE WATER MAIN ABOVE THE OTHER PIPELINE IF 36" MINIMUM COVER CAN BE MAINTAINED ABOVE THE WATER MAIN AND 6" OF SEPARATION BETWEEN THE WATER MAIN AND THE OTHER PIPELINE.
- AT UTILITY CROSSINGS, ONE FULL LENGTH OF WATER MAIN PIPE SHALL BE CENTERED ABOVE OR BELOW THE OTHER PIPELINE SO THE WATER MAIN JOINTS WILL BE FAR AS POSSIBLE FROM THE OTHER PIPELINE. ALTERNATIVELY AT SUCH CROSSINGS, THE PIPES SHALL BE ARRANGED SO THAT ALL WATER MAIN JOINTS ARE AT LEAST THREE FEET FROM ALL JOINTS IN VACUUM TYPE SANITARY SEWERS, STORM SEWERS, STORMWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER, AND AT LEAST SIX FEET FROM ALL JOINTS IN GRAVITY OR PRESSURE TYPE SANITARY SEWERS, WASTEWATER FORCE MAINS, OR PIPELINES CONVEYING RECLAIMED WATER.
- CONSTRUCT STANDARD CROSSING NOT TO EXCEED 75% OF THE MANUFACTURER'S MAXIMUM JOINT DEFLECTION.
- OTHER METHODS OF RESTRAINT MAY BE USED AS APPROVED BY IRCUDS IN LIEU OF DEFLECTING THE PIPE AS SHOWN ABOVE.
- TRACER WIRE SHALL BE INSTALLED ABOVE THE PIPE. (SEE DETAIL M-13)
- ALL WATER AND SEWER PIPING SHALL BE LOCATED A MINIMUM HORIZONTAL SEPARATION EQUAL TO THE DEPTH OF THE PIPE PLUS THE DIAMETER OF THE PIPE FROM ANY PERMANENT ABOVE GROUND STRUCTURES (I.E. WALLS, TREES, TRANSFORMER PADS, ETC.) AND A MINIMUM HORIZONTAL SEPARATION EQUAL TO FOUR (4) FEET FROM ANY UNDERGROUND UTILITIES (I.E. GAS MAINS, TELEPHONE LINES, CABLE LINES, IRRIGATION MAINS, ETC.)

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

TRENCH DETAIL (UNPAVED EASEMENTS)

DRAWING NO. **M-1**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

TRENCH DETAIL (PAVED AREAS & SHOULDERS)

DRAWING NO. **M-2**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

VALVE AND BOX

DRAWING NO. **M-5**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

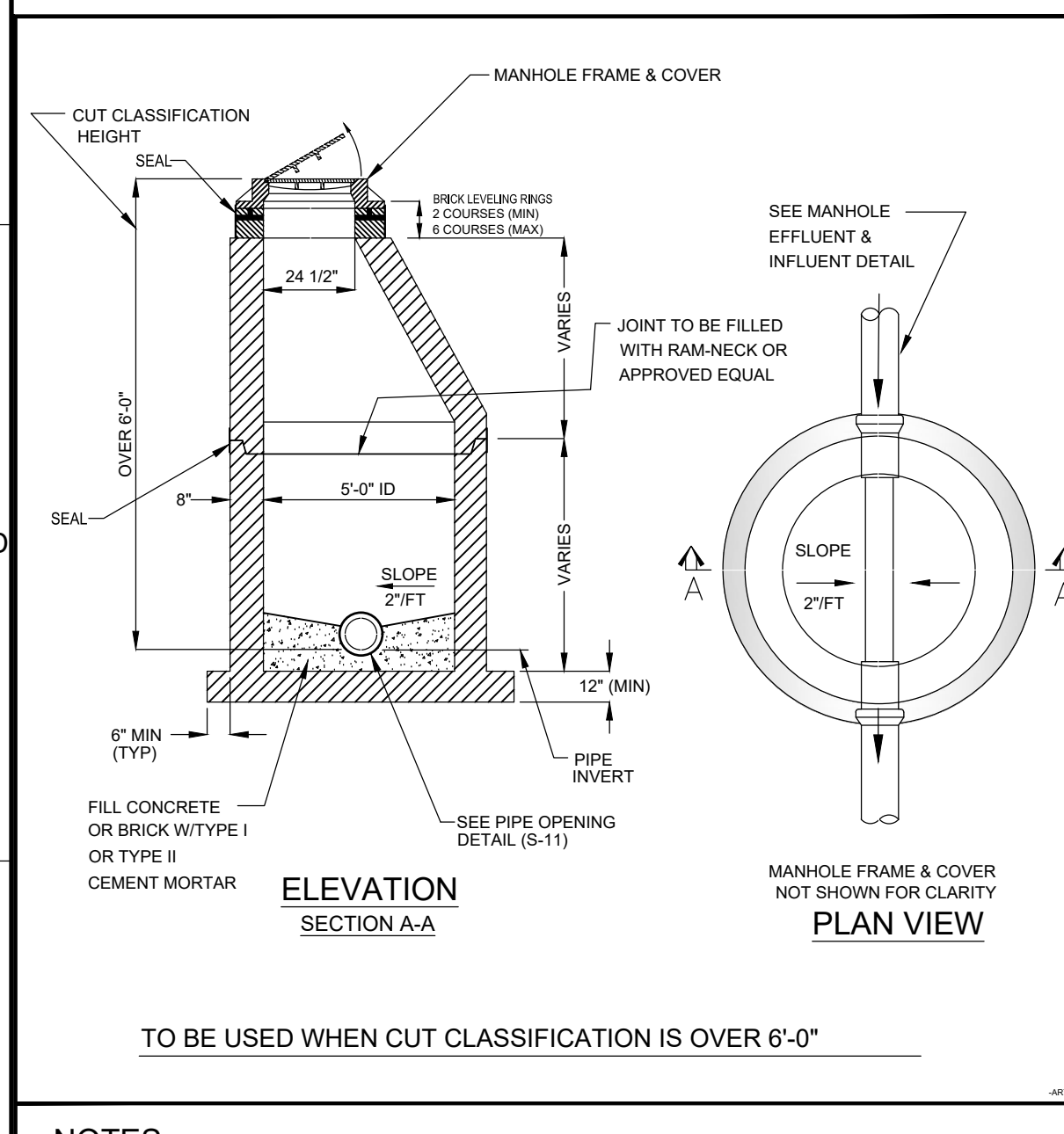
VALVE BOX PAD

DRAWING NO. **M-6**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

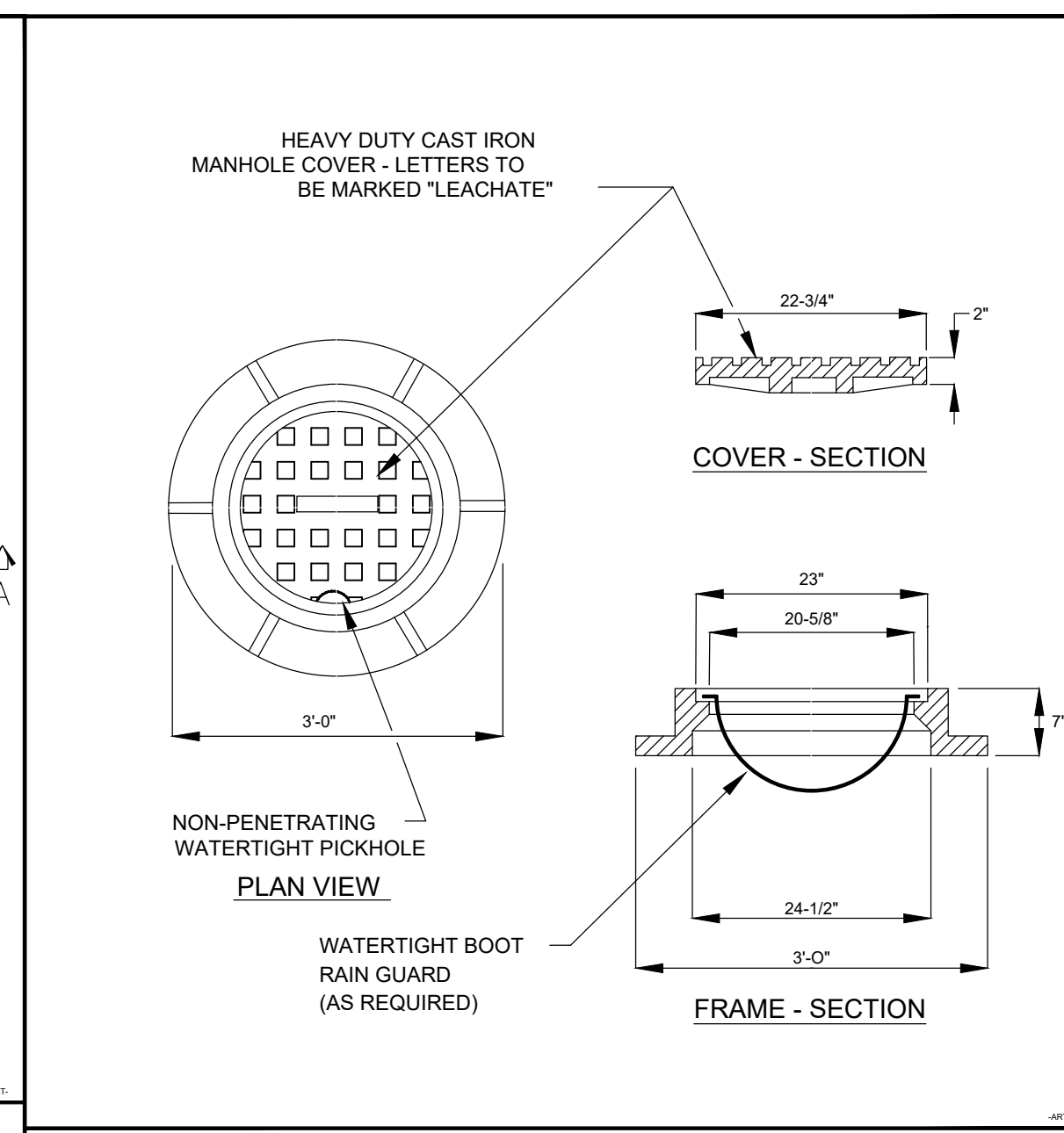
UTILITY CROSSINGS

DRAWING NO. **M-4**



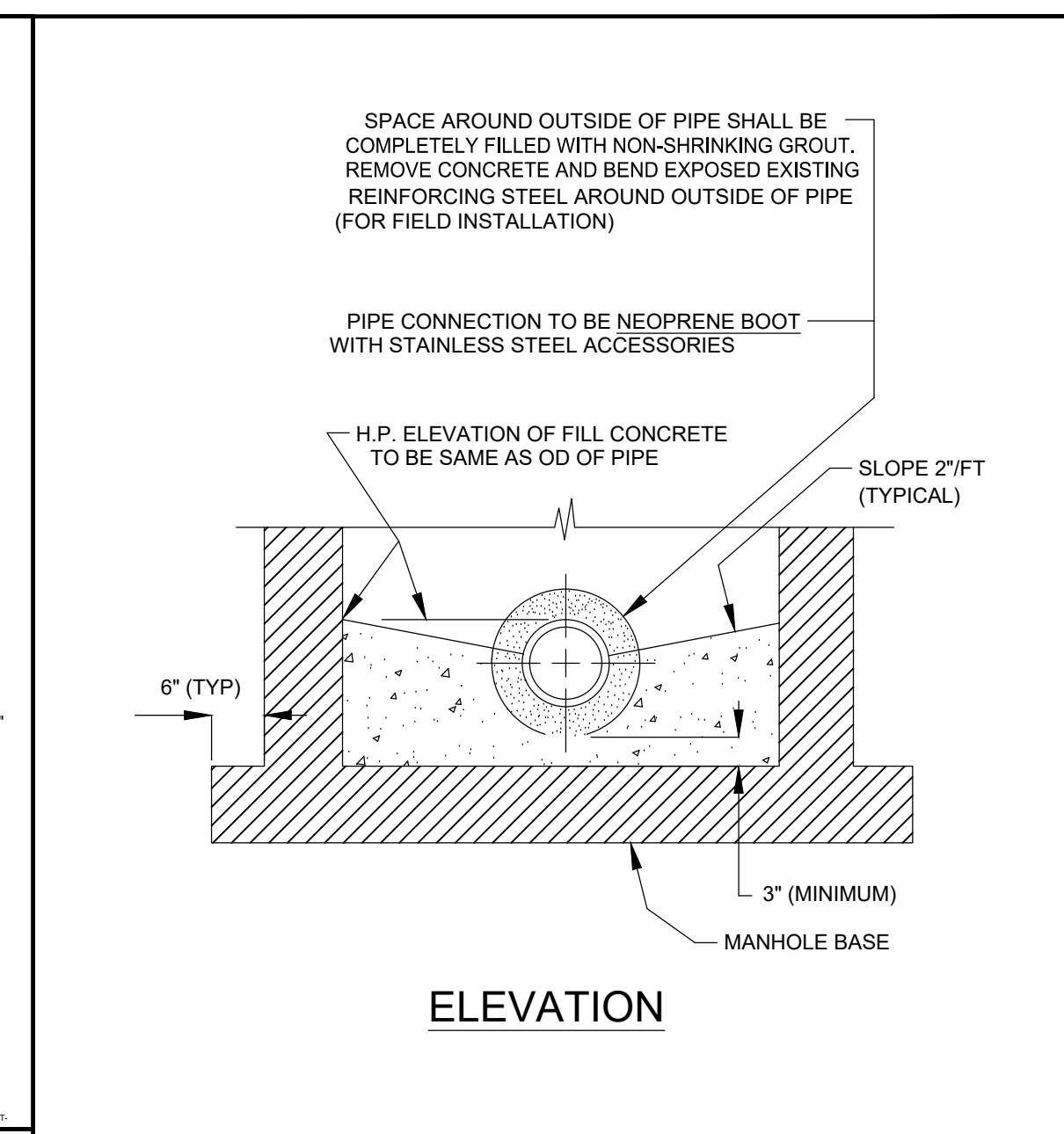
NOTES

- SEE MANHOLE SPECIFICATIONS ON DRAWING NO. S-5
- SEE STANDARD MANHOLE CASTING DRAWING NO. S-4
- SEE PIPE OPENING DETAIL DRAWING NO. S-11
- SEE MANHOLE EFFLUENT & INFLUENT DETAIL DRAWING NO. S-12
- SEAL SHALL BE USED AT ALL JOINTS. SEE DRAWING S-5, NOTE 20.



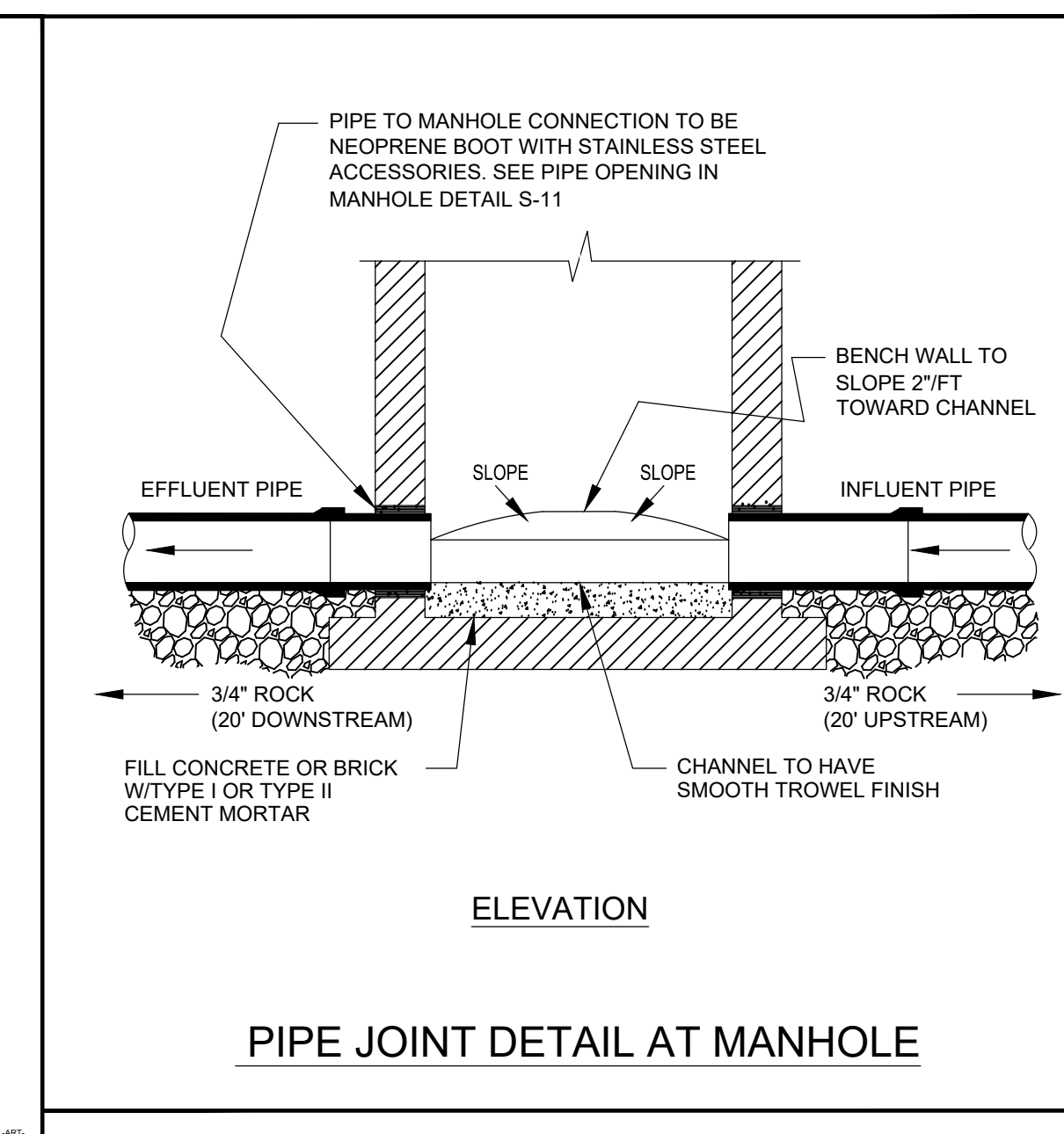
NOTES

- A WATERTIGHT BOOT RAIN GUARD SHALL BE PROVIDED FOR ALL MANHOLE FRAME/COVERS AND APPROVED BY INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES.
- ALL MATERIALS ARE TO BE PER IRCUDS APPROVED MANUFACTURERS' PRODUCT LIST.
- A U.S. FOUNDRY 420 RING AND "C" COVER IS SHOWN IN ABOVE DRAWING.



NOTES

- SEE MANHOLE SPECIFICATIONS ON DRAWING NO. S-5, NOTES 2,4,5,7,10, AND 16.
- ALL MATERIALS ARE TO BE PER IRCUDS APPROVED MANUFACTURERS' PRODUCT LIST.



NOTE

- PIPE JOINT DETAIL IS TYPICAL FOR ALL PIPE TO MANHOLE CONNECTIONS.
- ALL MATERIALS ARE TO BE PER IRCUDS APPROVED MANUFACTURERS' PRODUCT LIST.
- 3/4" ROCK TO BE USED AS BEDDING FOR 20' UPSTREAM AND DOWNSTREAM OF MANHOLE.
- SEE MANHOLE SPECIFICATIONS ON DRAWING S-5, NOTE 16.

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

MANHOLE STANDARD-DEEP

DRAWING NO. **S-8**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

STANDARD MANHOLE CASTING

DRAWING NO. **S-4**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

PIPE OPENING IN MANHOLE DETAIL

DRAWING NO. **S-11**

INDIAN RIVER COUNTY DEPARTMENT OF UTILITY SERVICES

MANHOLE INFLUENT & EFFLUENT PIPING DETAIL

DRAWING NO. **S-12**

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT

Geosyntec consultants

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TITLE: **LCS AND LDS DETAILS 3**

PROJECT: **PHASE II - CELL 3 CONSTRUCTION**

SITE: **INDIAN RIVER COUNTY LANDFILL**

DESIGN BY: KBT DATE: NOVEMBER 2023

DRAWN BY: JJV PROJECT NO.: FL9363A

CHECKED BY: TC FILE: FL9363A-C16A

REVIEWED BY: SA DRAWING NO.: 16 OF 24

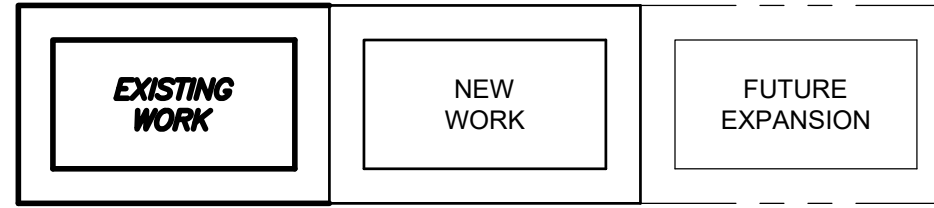
APPROVED BY: KBT

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ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION																
	CB	LOW VOLTAGE AIR OR MOLDED CASE CIRCUIT BREAKER, 3 POLE UNLESS OTHERWISE NOTED.																
		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON-REVERSING UNLESS OTHERWISE NOTED: *FVR - FULL VOLTAGE REVERSING RVNR - REDUCED VOLTAGE NON-REVERSING RVAT - REDUCED VOLTAGE AUTOTRANSFORMER RVSS - REDUCED VOLTAGE SOLID STATE																
		NON-FUSIBLE DISCONNECT SWITCH, (NEMA 4XSS) 600 VOLT, 3 POLE *AMPERE RATING NOTED IF OTHER THAN 30A (DIAGRAMMATICALLY SHOWN, CONTRACTOR SHALL FIELD LOCATE)																
	T	TRANSFORMER, RATINGS AND CONNECTIONS AS NOTED, UNLESS OTHERWISE NOTED ON THE SINGLE LINE DIAGRAMS. ALL DRY TYPE TRANSFORMERS SERVICING ADMINISTRATIVE AND LABORATORY SPACES SHALL HAVE A K FACTOR OF 4. ISOLATION TRANSFORMERS SHALL HAVE A K-20 RATING																
		CURRENT TRANSFORMER *QUANTITY A = PRIMARY AMPERES																
		POTENTIAL TRANSFORMER *QUANTITY V = PRIMARY VOLTAGE																
	G	GENERATOR, RATINGS AND CONNECTIONS AS NOTED																
		AUTOMATIC OR MANUAL TRANSFER SWITCH NO. 1 (ATS-1), (MITS-1) "N" INDICATES NORMAL OR PREFERRED SOURCE "S" INDICATES STANDBY OR ALTERNATE SOURCE 100A INDICATES CONTINUOUS CURRENT RATING																
	M	MOTOR, NUMERAL INDICATES HORSEPOWER																
		PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY CLOSED																
		PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN, NORMALLY OPEN																
	ES	EMERGENCY STOP PUSHBUTTON WITH RED MUSHROOM HEAD OPERATOR (MAINTAINED CONTACT)																
	PBL	START-STOP PUSHBUTTON CONTROL STATION (MOMENTARY CONTACT) WITH LOCKOUT DEVICE ON STOP																
	PBM	START-STOP PUSHBUTTON CONTROL STATION, MAINTAINED CONTACT WITH LOCKOUT DEVICE ON STOP																
	S/S	OFF/ON SELECTOR SWITCH																
	LR	LOCAL/REMOTE SELECTOR SWITCH																
		3 POSITION SELECTOR SWITCH, MAINTAINED CONTACT O-OPEN X-CLOSED <table border="1"> <thead> <tr> <th>POSITION</th> <th>TOP CONTACT</th> <th>MIDDLE CONTACT</th> <th>BOTTOM CONTACT</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>X</td> <td>O</td> <td>O</td> </tr> <tr> <td>B</td> <td>O</td> <td>X</td> <td>O</td> </tr> <tr> <td>C</td> <td>O</td> <td>O</td> <td>X</td> </tr> </tbody> </table> NAMEPLATE (A/B/C) HOA - HAND/OFF/AUTO HOR - HAND/OFF/REMOTE LOR - LOCAL/OFF/REMOTE	POSITION	TOP CONTACT	MIDDLE CONTACT	BOTTOM CONTACT	A	X	O	O	B	O	X	O	C	O	O	X
POSITION	TOP CONTACT	MIDDLE CONTACT	BOTTOM CONTACT															
A	X	O	O															
B	O	X	O															
C	O	O	X															
	GDVF #	GAS DETECTOR / VENTILATION FAILURE ALARM # INDICATES TYPE OF UNIT 1=MASTER, 2=REMOTE																
		MOTOR STARTER COIL, NUMBER AS INDICATED TO DENOTE INTERLOCKING ONLY																
		CONTROL RELAY COIL, NUMBER AS INDICATED																

ONE LINE OR CONTROL DIAGRAM	PLAN	DESCRIPTION
		PILOT LIGHT, COLOR AS NOTED *R - RED G - GREEN B - BLUE W - WHITE A - AMBER
		PILOT LIGHT, PUSH-TO-TEST TYPE, COLOR AS NOTED ABOVE.
	* - ##	FIELD INSTRUMENT, TAG NO. AS INDICATED * INDICATES INSTRUMENT TYPE DEFINED ON LOOP SHEETS OR P & ID ## INDICATES LOOP NO.
	LS OR ■	LIQUID LEVEL (FLOAT) SWITCH
	PS OR ■	PRESSURE OR VACUUM SWITCH
	TS OR (T) OR ■	TEMPERATURE SWITCH OR THERMOSTAT
	FS OR ■	FLOW SWITCH (AIR, WATER, ETC.)
	ZS OR ■	POSITION (LIMIT) SWITCH
	WS OR ■	TORQUE SWITCH
		CONDUCTORS OR CONDUITS CROSSING PATHS BUT NOT CONNECTED
		CONDUCTORS ELECTRICALLY CONNECTED
	S	SOLENOID VALVE
		LIGHTNING ARRESTER
		GROUND OR GROUND ROD
		FUSE, AMPERE RATING AS NOTED
	HTR	STRIP HEATER OR HEATING ELEMENT
		INDUCTOR
		CONTACT, NORMALLY OPEN (NO)
		CONTACT, NORMALLY CLOSED (NC)
		OVERLOAD RELAY HEATER
		KEY INTERLOCK
	TB	TERMINAL OR TEST BLOCK
	RTD	RESISTANCE TEMPERATURE DETECTOR
	VE OR - -	VIBRATION DETECTOR
	DM	DAMPER MOTOR
	ETM	ELAPSED TIME METER
		MOTOR OPERATED VALVE OR GATE
		INDICATES LIMITS OF ELECTRICAL EQUIPMENT OR WIRING ENCLOSURE



SYMBOL	DESCRIPTION
	INCANDESCENT, COMPACT FLUORESCENT OR H.I.D. TYPE LIGHTING FIXTURE "A" - FIXTURE TYPE (SEE LIGHTING FIXTURE SCHEDULE) "b" - CONTROLLED BY SWITCH "b" "3" - CIRCUIT NUMBER
	HOME RUN TO DESIGNATED EQUIPMENT. BRANCH CIRCUIT CONDUIT WITH 2 NO. 12 AWG BRANCH CIRCUIT CONDUCTORS AND 1 NO. 12 AWG GROUND CONDUCTOR UNLESS OTHERWISE NOTED. NUMBER OF ARROWS INDICATE NUMBER OF CIRCUITS. FOR MINIMUM SIZE CONDUIT PERMITTED REFER TO THE SPECIFICATIONS.
	CONDUIT CONCEALED IN WALL, IN SLAB ABOVE, ABOVE CEILING, IN OR BELOW FLOOR OR UNDERGROUND.
	CONDUIT RUN EXPOSED. RUN PARALLEL OR PERPENDICULAR TO STRUCTURE OR WALL.
	"X" INDICATES EXPLOSION PROOF CONDUIT SEAL FITTING.
	CONCRETE ENCASED DUCTBANK. WIDTH VARIES, SEE DUCTBANK SECTION/DETAILS FOR REQUIREMENTS AND WIDTH
	CONDUIT STUBBED OUT AND CAPPED
	DENOTES A QUANTITY OF TWO (2) 3-INCH CONDUITS EACH CONTAINING THREE NO. 3/0 AWG CONDUCTORS AND 1 NO. 2 AWG GROUND CONDUCTOR.
	DENOTES A QUANTITY OF TWO INSTRUMENT CABLES. EACH CABLE TO CONSIST OF TWO NO. 16 AWG CONDUCTORS TWISTED TOGETHER AND COVERED WITH A METALLIC SHIELD AND AN OVERALL PROTECTIVE JACKET. REFER TO THE SPECIFICATIONS FOR THE EXACT CABLE TO BE PROVIDED.
	SAME AS ABOVE EXCEPT CABLE TO CONSIST OF THREE NO. 16 AWG CONDUCTORS TWISTED, SHIELDED AND COVERED WITH AN OVERALL PROTECTIVE JACKET. REFER TO THE SPECIFICATIONS FOR THE EXACT CABLE TO BE PROVIDED.
	THREE 4-INCH CONDUITS
	FLEXIBLE METAL CONDUIT "WHIP" (3/4" C., 2#12, 1#12G UNLESS OTHERWISE NOTED) FOR RECESSED LIGHTING FIXTURES AND LIQUID TIGHT MOTOR CONNECTIONS
	CONDUIT SEAL FITTING SHOWN IN OTHER THAN CODE REQUIRED LOCATIONS.
	INDICATES MOTOR STARTER AND/OR MOTOR CONTROL EQUIPMENT WITHIN THE ENCLOSURE.
	SINGLE POLE SWITCH "a" INDICATES FIXTURES CONTROLLED.
	POWER PANELBOARD (PP) OR DISTRIBUTION PANELBOARD (DP)
	DUPEX RECEPTACLE, 20A, 120V, 2P, 3W * GFCI - GROUND FAULT CIRCUIT INTERRUPTER TYPE WP - WEATHERPROOF T - TRANSIENT VOLTAGE SURGE SUPPRESSOR IC - ISOLATED GROUND 4 - CIRCUIT NUMBER
	JUNCTION BOX
	PULL BOX
	TERMINAL CABINET
	OCCUPANCY SENSOR
	PHOTOCELL
	EMERGENCY EYEWASH/SHOWER ALARM STATION WITH FLOW SWITCH(ES)
	INDICATED EQUIPMENT AND MATERIALS TO BE DEMOLISHED
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4 CONSTRUCTION (OR GASKETED AND SUITABLE FOR USE IN A WET LOCATION WHERE NEMA STANDARDS DO NOT APPLY) UNLESS OTHERWISE NOTED.
	INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL CONFORM TO N.E.C. REQUIREMENTS FOR THE HAZARDOUS AREA CLASSIFICATION SHOWN.
	GROUND SYSTEM GRID OR LOOP, 36" BELOW FINISHED GRADE UNLESS OTHERWISE NOTED.
	EXOTHERMIC WELD CONNECTION
	3/4" x 10'-0" GROUND ROD, UNLESS SPECIFIED OTHERWISE.
	GROUND ROD TEST WELL STATION (SEE DETAIL SHEET FOR REQUIREMENTS)
	CHEMICAL GROUND ROD

ABBREVIATIONS	
A	AMPS
AC	ALTERNATING CURRENT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AL	ALUMINUM
AIC	AMPERE INTERRUPTING CAPACITY
AMP	AMPERE
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
BKR	BREAKER
C	CONDUIT
CB	CIRCUIT BREAKER
CGD	COMBUSTIBLE GAS DETECTOR
CKT	CIRCUIT
CP	CONTROL PANEL
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH/CONTROL STATION
CU	COPPER
CWS	CONDUIT WALL SEAL
DIA	DIAMETER
DMU	DIGITAL METERING UNIT
DN	DOWN
EC	EMPTY CONDUIT
ELEC	ELECTRICAL
ELEV	ELEVATION
EM	EMERGENCY
ENCL	ENCLOSURE OR ENCLOSED
EQUIP	EQUIPMENT
EX	EXISTING
FU	FUSE
GCP	GENERATOR CONTROL PANEL
GEN	GENERATOR
G, GND	GROUND
GFI	GROUND FAULT INTERRUPTER
HH	HANDHOLE
HT	HEIGHT
HP	HORSEPOWER
HZ	HERTZ
ID	IDENTIFICATION
INSTR	INSTRUMENT
K	KILO (PREFIX)
kcmil	1000 CIRCULAR MILS
KVA	KILOVOLT AMPERES
KW	KILOWATTS
LTG	LIGHTING
LV	LOW VOLTAGE
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MFR	MANUFACTURER
MIN	MINIMUM
MLO	MAIN LUGS ONLY
MTD	MOUNTED
N	NEUTRAL
NC	NORMALLY CLOSED
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
OH	OVERHEAD
PB	PULL BOX
OL	OVERLOAD
PCP	PUMP CONTROL PANEL
PH	PHASE
PMH	POWER MANHOLE
PNL	PANEL OR PANELBOARD
PR	PAIR
PRI	PRIMARY
PVC	POLYVINYL CHLORIDE
RECP	RECEPTACLE
REQD	REQUIRED
QTY	QUANTITY
SA	SURGE ARRESTER
SEC	SECONDS OR SECONDARY
SH	SHIELDED/SPACE HEATER
SHH	SIGNAL HANDHOLE
SPD	SURGE PROTECTIVE DEVICE
SS	STAINLESS STEEL
SV	SOLENOID VALVE
SW	SWITCH
TC	TIME TO CLOSE OR TRAY CABLE
TO	TIME TO OPEN
TS	TWISTED SHIELDED/THERMAL SWITCH
TYP	TYPICAL
UG	UNDERGROUND
V	VOLTS
VA	VOLT AMPS
W	WATTS, WIDTH, WITH, WIRE
WP	WEATHERPROOF
XP	EXPLOSION PROOF
XFMR	TRANSFORMER

NOTES:

- DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
- THIS IS A STANDARD LEGEND. SOME SYMBOLS MAY NOT APPEAR ON THESE DRAWINGS.
- IN GENERAL CONDUIT ROUTING FOR EQUIPMENT AND DEVICES IS NOT SHOWN ON THE PLANS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTING ALL CONDUITS WHICH SHALL INCLUDE CONDUITS SHOWN ON ONE-LINE AND RISER DIAGRAMS AND HOME-RUNS SHOWN ON PLAN DRAWINGS. REFER TO SPECIFICATIONS FOR MATERIALS AND INSTALLATION REQUIREMENTS.
- THE WIRING DIAGRAMS, QUANTITY AND SIZE OF WIRES AND CONDUITS REPRESENT A SUGGESTED ARRANGEMENT BASED UPON SELECTED STANDARD COMPONENTS OF ELECTRICAL EQUIPMENT. MODIFICATIONS ACCEPTABLE TO THE ENGINEER MAY BE MADE BY THE CONTRACTOR TO ACCOMMODATE EQUIPMENT ACTUALLY PURCHASED. THE BASIC SEQUENCE AND METHOD OF CONTROL MUST BE MAINTAINED AS INDICATED ON THE DRAWINGS AND/OR SPECIFICATIONS.
- ALL CONDUITS SHALL BE INSTALLED CONCEALED UNLESS OTHERWISE NOTED.
- INTERPRETATION OF ELECTRICAL DRAWINGS: CIRCUIT IDENTIFICATION, ROUTING, AND SIZES OF CONDUITS AND WIRES ARE SHOWN ON THE FOLLOWING DRAWINGS:
 - A. POWER ONE LINE DIAGRAMS: POWER, CONTROL AND SIGNAL WIRING REQUIREMENTS FOR ELECTRICAL DISTRIBUTION EQUIPMENT AND UTILIZATION EQUIPMENT POWERED FROM SWITCHGEAR, SWITCHBOARDS, MOTOR CONTROL CENTERS AND MAJOR POWER DISTRIBUTION PANELBOARDS ARE TYPICALLY SHOWN ON THE ONE LINE DIAGRAMS. THE PARAMETERS IDENTIFIED ON THE ONE LINE DIAGRAMS ARE: CIRCUIT IDENTIFICATION, CIRCUIT ORIGIN AND DESTINATION, CONDUIT SIZE, WIRE SIZE AND QUANTITY FOR COMPLETE CIRCUIT LENGTH, AND AUXILIARY DEVICES ASSOCIATED WITH THE CONTROL/PROTECTION OF THE POWERED EQUIPMENT.
 - B. INSTRUMENTATION AND CONTROL RISER DIAGRAMS: POWER, CONTROL, SIGNAL AND DATA HIGHWAY WIRING REQUIREMENTS FOR INSTRUMENTS AND CONTROL DEVICES CONTROLLED/MONITORED FROM INSTRUMENTATION AND CONTROL PANELS SUCH AS RTUS, PLCs, TERMINAL CABINETS, AND REMOTE I/O PANELS ARE TYPICALLY SHOWN ON THE INSTRUMENTATION AND CONTROL ONE LINE DIAGRAMS. THE PARAMETERS IDENTIFIED ON THE ONE LINE DIAGRAMS ARE: CIRCUIT IDENTIFICATION, CIRCUIT ORIGIN AND DESTINATION, CONDUIT SIZE, WIRE SIZE, QUANTITY AND TYPE FOR COMPLETE CIRCUIT LENGTH, AND AUXILIARY DEVICES ASSOCIATED WITH THE CONTROL/PROTECTION OF THE POWERED EQUIPMENT.
 - C. FLOOR PLANS: FOR DETERMINING THE LENGTH OF CIRCUITS LOCATED WITHIN STRUCTURES, FLOOR PLANS SHOW THE LOCATION OF ELECTRICAL DISTRIBUTION EQUIPMENT, CONTROL PANELS, UTILIZATION EQUIPMENT, INSTRUMENTS, ANGLIARY EQUIPMENT AND DEVICES AND THE ANTICIPATED PENETRATION LOCATIONS WHERE CONDUITS EXIT/ENTER THE STRUCTURE. HOMERUNS MAY ALSO BE SHOWN FROM MISCELLANEOUS EQUIPMENT NOT SHOWN ON A ONE LINE OR RISER DIAGRAM.
 - D. SITE PLANS: FOR DETERMINING THE LENGTH OF CIRCUITS EXTERIOR TO STRUCTURES AND TO IDENTIFY THE SPECIFIC REQUIREMENTS OF THE UNDERGROUND CONDUITS OR DUCT BANKS, SITE PLANS SHOW THE GENERAL ROUTING OF UNDERGROUND CONDUITS AND DUCT BANKS WITH SECTIONS INDICATING THE CONDUIT SIZE, ARRANGEMENT AND CIRCUIT ROUTING.
 - E. NOTE THAT CONDUIT SIZE WITHIN STRUCTURE IS INDICATED ON ONE-LINE DIAGRAM AND UNDERGROUND SIZE IS INDICATED ON DUCT BANK SECTIONS.

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT

1200 RIVERPLACE BOULEVARD, SUITE 710
JACKSONVILLE, FLORIDA 32207 USA
PHONE: 904.858.1818 - FAX: 904.396.1143
CERTIFICATE OF AUTHORIZATION NO. 4321

1325 74th AVENUE SW
VERO BEACH, FLORIDA 33968 USA
PHONE: 772.770.5112

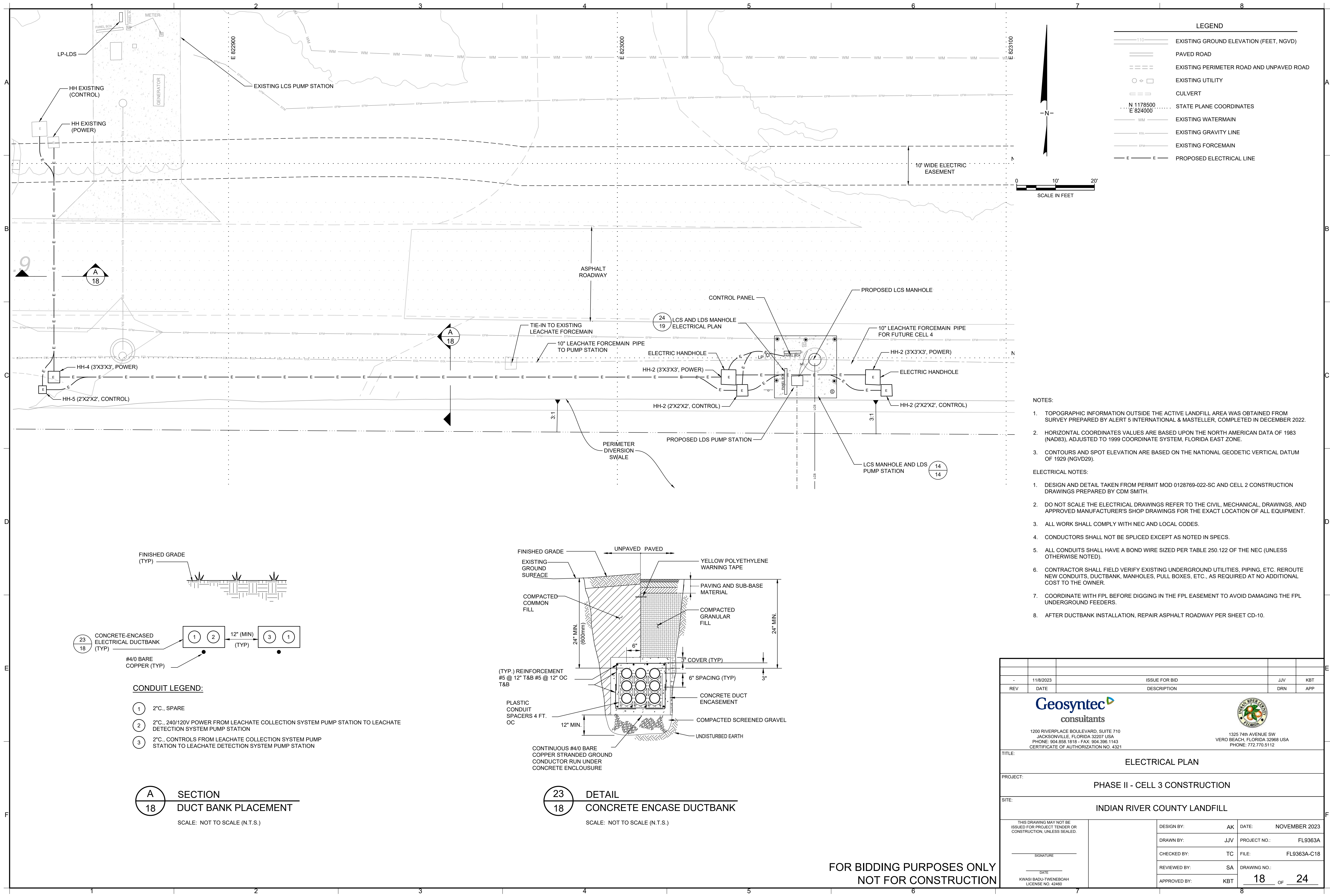
TITLE: **ELECTRICAL SYMBOLS, ABBREVIATIONS, AND NOTES**

PROJECT: **PHASE II - CELL 3 CONSTRUCTION**

SITE: **INDIAN RIVER COUNTY LANDFILL**

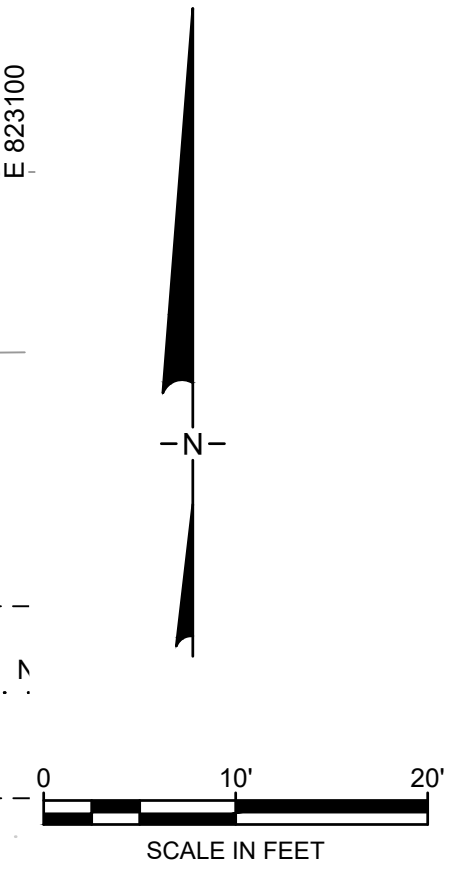
DESIGN BY:	AK	DATE:	NOVEMBER 2023
DRAWN BY:	JJV	PROJECT NO.:	FL9363A
CHECKED BY:	TC	FILE:	FL9363A-C19
REVIEWED BY:	SA	DRAWING NO.:	
APPROVED BY:	KBT		17 OF 24

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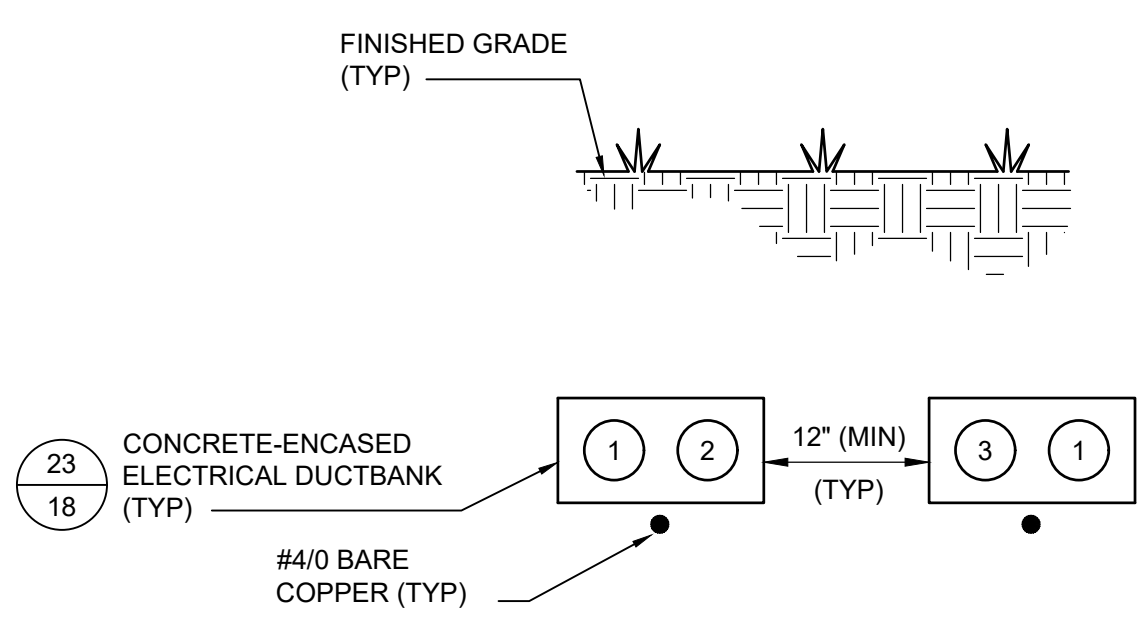


LEGEND

- 110 — EXISTING GROUND ELEVATION (FEET, NGVD)
- ==== PAVED ROAD
- - - - EXISTING PERIMETER ROAD AND UNPAVED ROAD
- ○ ○ ○ EXISTING UTILITY
- — — — CULVERT
- N 1178500 E 824000 STATE PLANE COORDINATES
- WM — EXISTING WATERMAIN
- EGL — EXISTING GRAVITY LINE
- EFM — EXISTING FORCEMAIN
- E — E — PROPOSED ELECTRICAL LINE

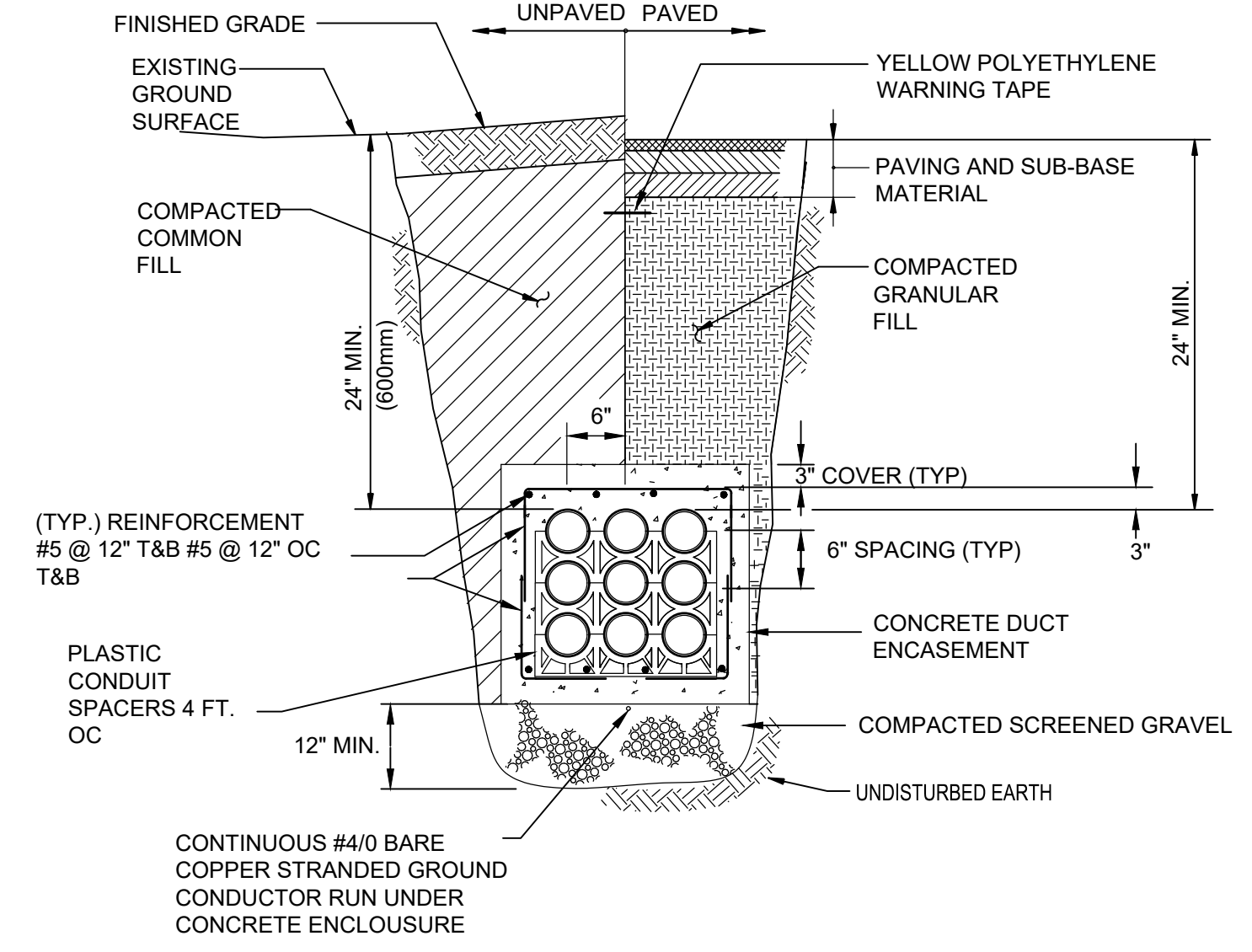


- NOTES:**
- TOPOGRAPHIC INFORMATION OUTSIDE THE ACTIVE LANDFILL AREA WAS OBTAINED FROM SURVEY PREPARED BY ALERT S INTERNATIONAL & MASTELLER, COMPLETED IN DECEMBER 2022.
 - HORIZONTAL COORDINATES VALUES ARE BASED UPON THE NORTH AMERICAN DATA OF 1983 (NAD83), ADJUSTED TO 1999 COORDINATE SYSTEM, FLORIDA EAST ZONE.
 - CONTOURS AND SPOT ELEVATION ARE BASED ON THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
- ELECTRICAL NOTES:**
- DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
 - DO NOT SCALE THE ELECTRICAL DRAWINGS REFER TO THE CIVIL, MECHANICAL, DRAWINGS, AND APPROVED MANUFACTURER'S SHOP DRAWINGS FOR THE EXACT LOCATION OF ALL EQUIPMENT.
 - ALL WORK SHALL COMPLY WITH NEC AND LOCAL CODES.
 - CONDUCTORS SHALL NOT BE SPLICED EXCEPT AS NOTED IN SPECS.
 - ALL CONDUITS SHALL HAVE A BOND WIRE SIZED PER TABLE 250.122 OF THE NEC (UNLESS OTHERWISE NOTED).
 - CONTRACTOR SHALL FIELD VERIFY EXISTING UNDERGROUND UTILITIES, PIPING, ETC. REROUTE NEW CONDUITS, DUCTBANK, MANHOLES, PULL BOXES, ETC., AS REQUIRED AT NO ADDITIONAL COST TO THE OWNER.
 - COORDINATE WITH FPL BEFORE DIGGING IN THE FPL EASEMENT TO AVOID DAMAGING THE FPL UNDERGROUND FEEDERS.
 - AFTER DUCTBANK INSTALLATION, REPAIR ASPHALT ROADWAY PER SHEET CD-10.



- CONDUIT LEGEND:**
- ① 2" C., SPARE
 - ② 2" C., 240/120V POWER FROM LEACHATE COLLECTION SYSTEM PUMP STATION TO LEACHATE DETECTION SYSTEM PUMP STATION
 - ③ 2" C., CONTROLS FROM LEACHATE COLLECTION SYSTEM PUMP STATION TO LEACHATE DETECTION SYSTEM PUMP STATION

A
18 SECTION
DUCT BANK PLACEMENT
SCALE: NOT TO SCALE (N.T.S.)



23
18 DETAIL
CONCRETE ENCASE DUCTBANK
SCALE: NOT TO SCALE (N.T.S.)

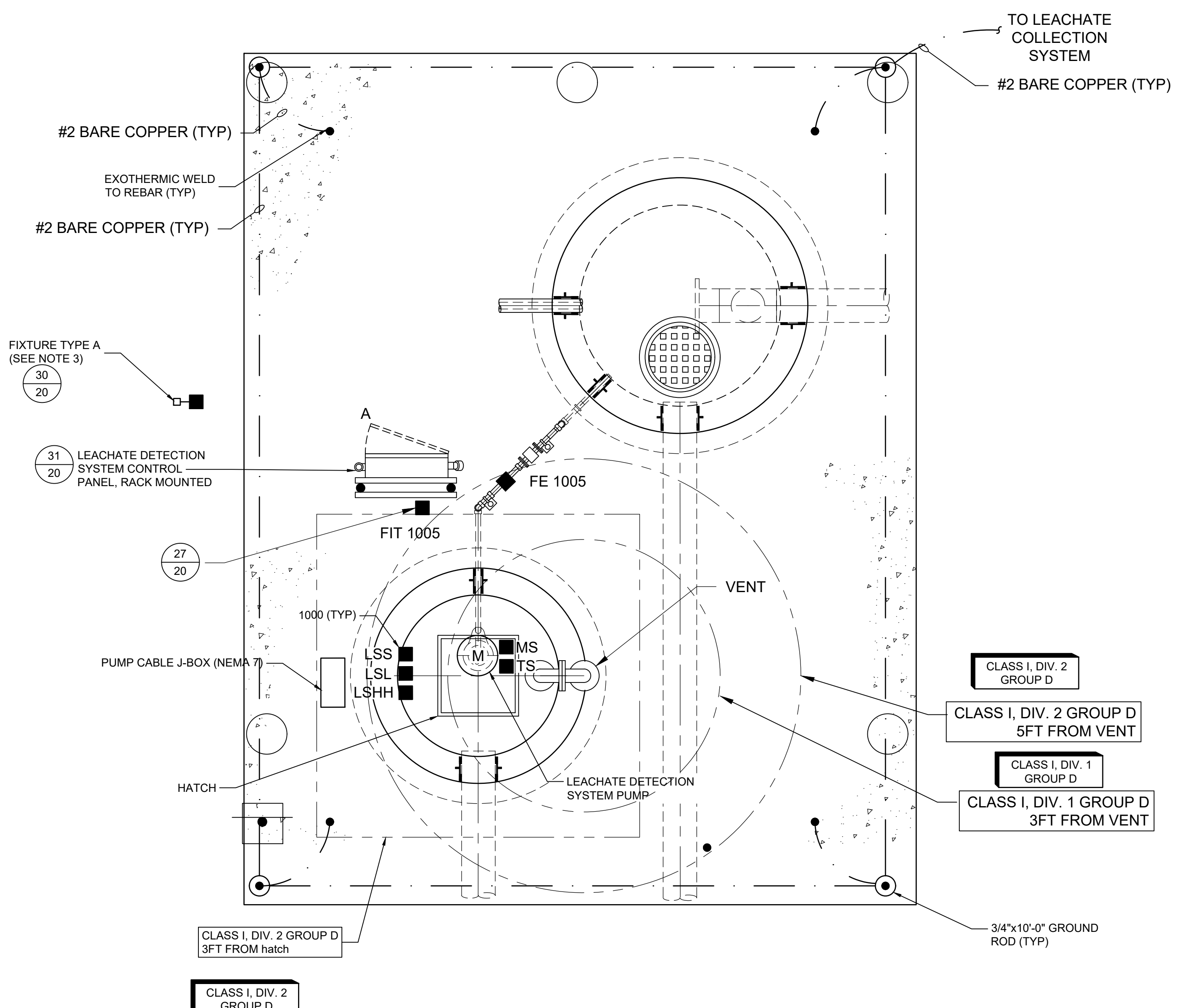
REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT
 1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321				
 1325 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112				
TITLE: ELECTRICAL PLAN				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.				
DESIGN BY: AK		DATE: NOVEMBER 2023		
DRAWN BY: JJV		PROJECT NO.: FL9363A		
CHECKED BY: TC		FILE: FL9363A-C18		
REVIEWED BY: SA		DRAWING NO.:		
APPROVED BY: KBT		18 OF 24		

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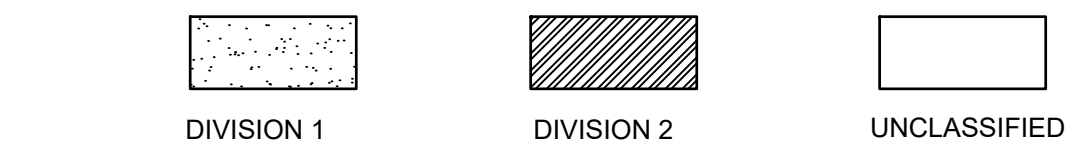
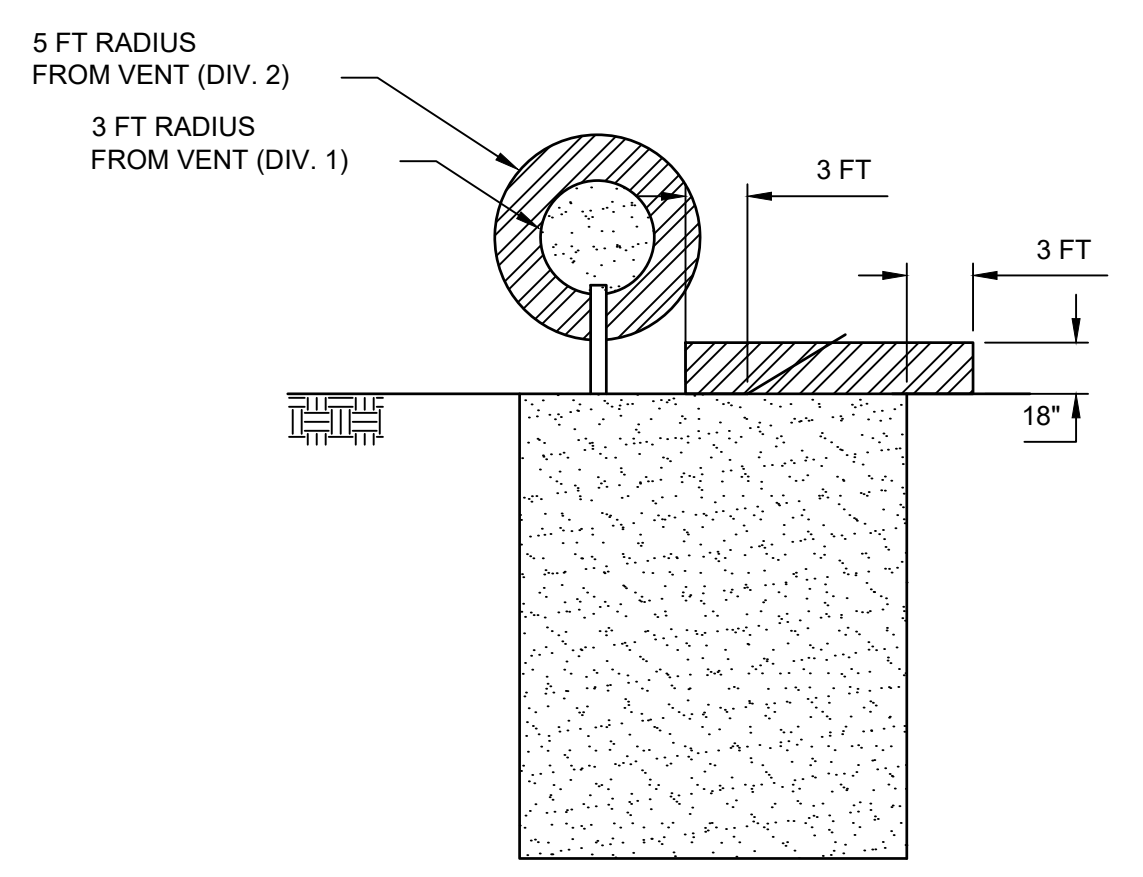
ACCDoc\Geosyntec\INDIAN RIVER COUNTY OF CELL 3\Project Files\DRAWINGS\SP1\9363A-C18.dwg

1 2 3 4 5 6 7 8

A B C D E F



24 **DETAIL**
18 **LCS AND LDS MANHOLE ELECTRICAL PLAN**
 SCALE: NOT TO SCALE (N.T.S.)



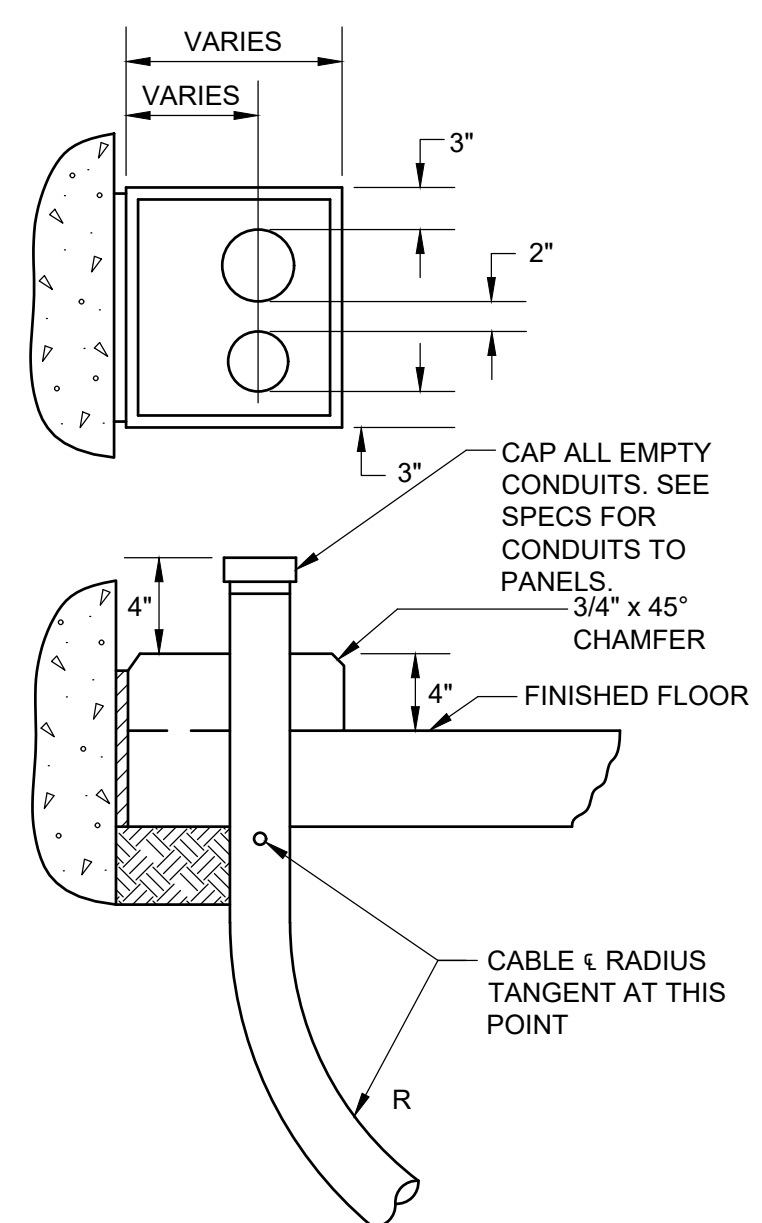
25 **DETAIL**
19 **LCS AND LDS PUMP STATION WET WELL**
 SCALE: N.T.S.

- NOTES:**
- DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
 - REFER TO THE RISER DIAGRAMS, SHEET 21, FOR CONDUIT AND WIRE REQUIREMENTS.
 - POLE MOUNTED LED LIGHT FIXTURE, 96 LED's (13936 LUMENS, 135 LUMENS PER WATT) DIE CAST ALUMINUM HOUSING WITH INTEGRAL COOLING FINS, TWO-PIECE DIE CAST ALUMINUM DRIVER COMPARTMENT SEALED WITH A ONE-PIECE SILICONE GASKET, IES FULL CUTOFF OPTICS, DARK SKY CERTIFIED, SILVER METALLIC POLYESTER POWDER COAT FINISH, 350 mA HIGH-PERFORMANCE LED DRIVER, L70 AT 90,000+ IN 25° C ENVIRONMENTS, 90% POWER FACTOR, UNIVERSAL VOLTAGE (120-277V), 10KV SURGE PROTECTOR, TERMINAL BLOCK SUPPLIED AS STANDARD, TYPE III LIGHT DISTRIBUTION, CRI OF 75 FOR 5000K, ROUND POLE PLATE ADAPTER, PHOTOCELL CONTROL, ETL LISTED FOR WET LOCATIONS, IP65 RATED, DLC LISTED, 5 YEAR WARRANTY ON ENTIRE SYSTEM. VISIONAIRE LIGHTING: VLX LED SERIES VLX-1-T3-96LC-3-4K-UNV-AM-SL.

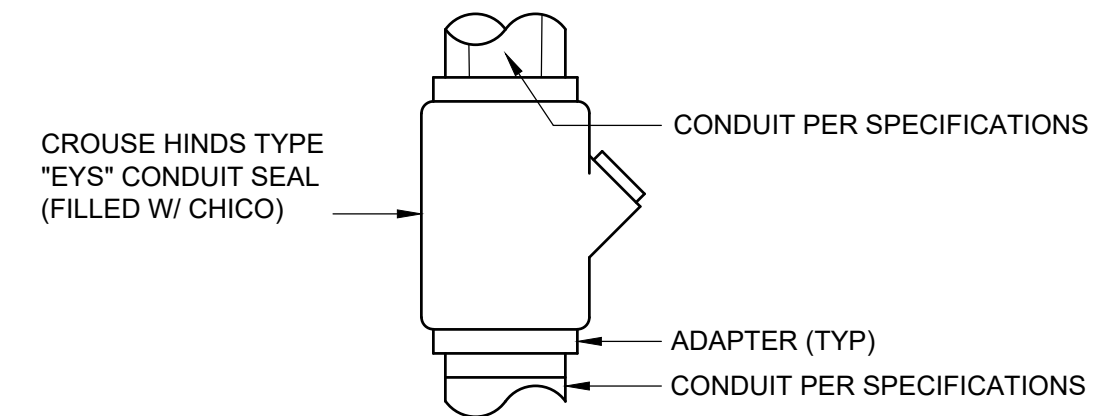
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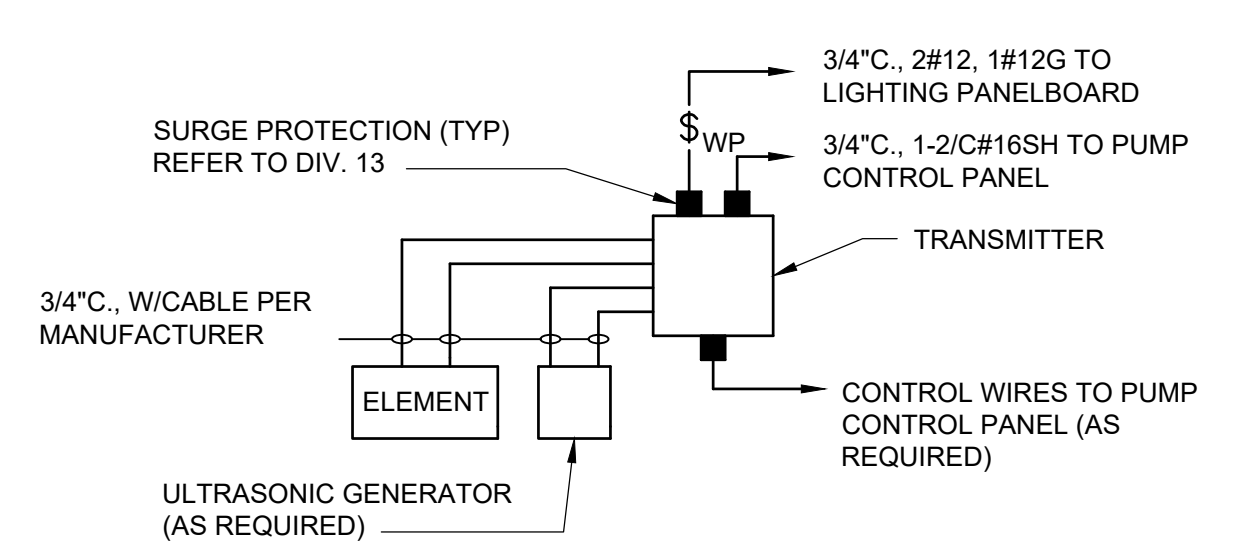
REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT
<p>1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321</p> <p>1325 74th AVENUE SW VERO BEACH, FLORIDA 33968 USA PHONE: 772.770.5112</p>				
TITLE: ELECTRICAL DETAILS I				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: AK	DATE: NOVEMBER 2023	
SIGNATURE		DRAWN BY: JJV	PROJECT NO.: FL9363A	
DATE		CHECKED BY: TC	FILE: FL9363A-C20	
KWASI BADU-TWENBOAH LICENSE NO. 42460		REVIEWED BY: SA	DRAWING NO.:	
		APPROVED BY: KBT	19 OF 24	



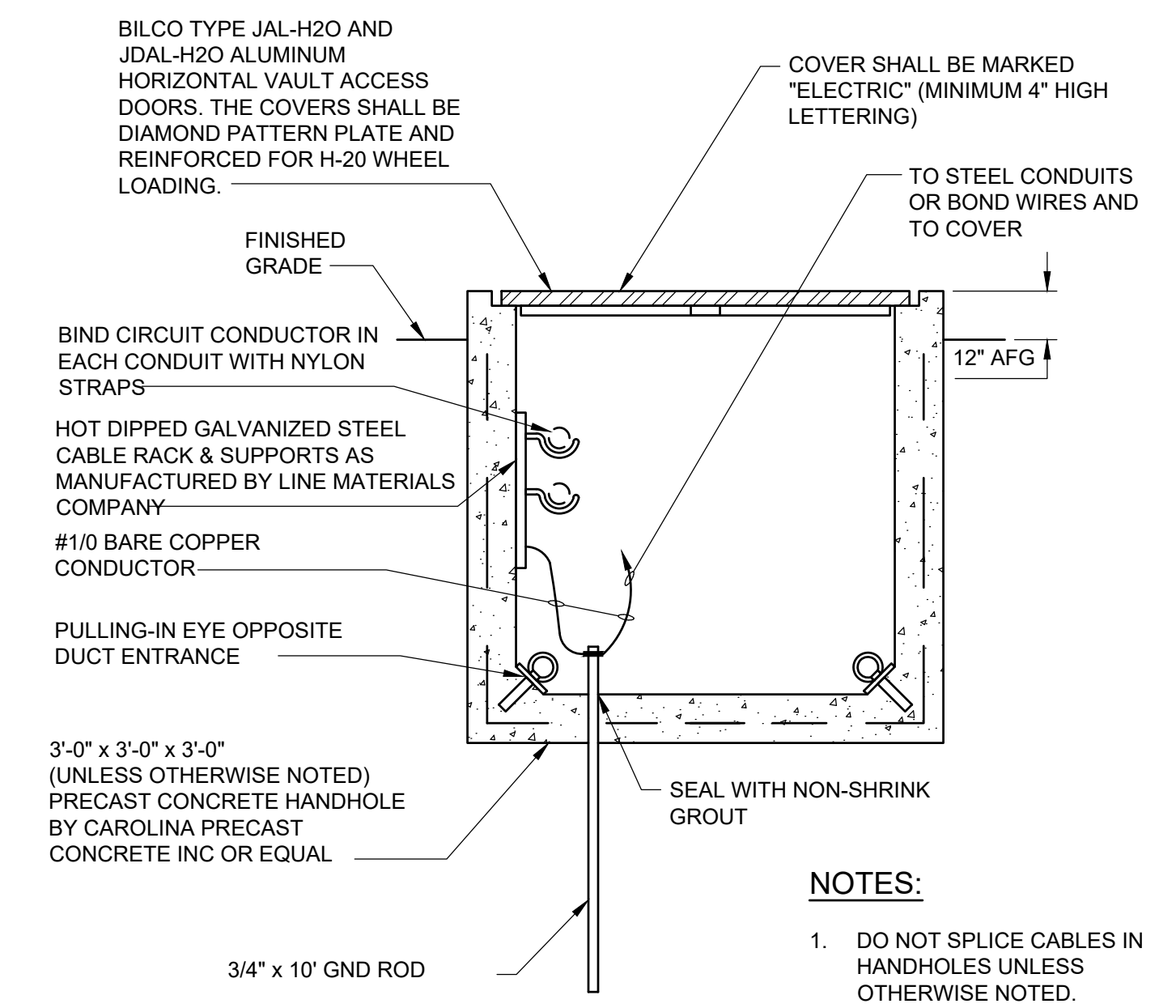
26
20 **DETAIL**
TYPICAL CONDUIT THROUGH SLAB
SCALE: NOT TO SCALE (N.T.S.)



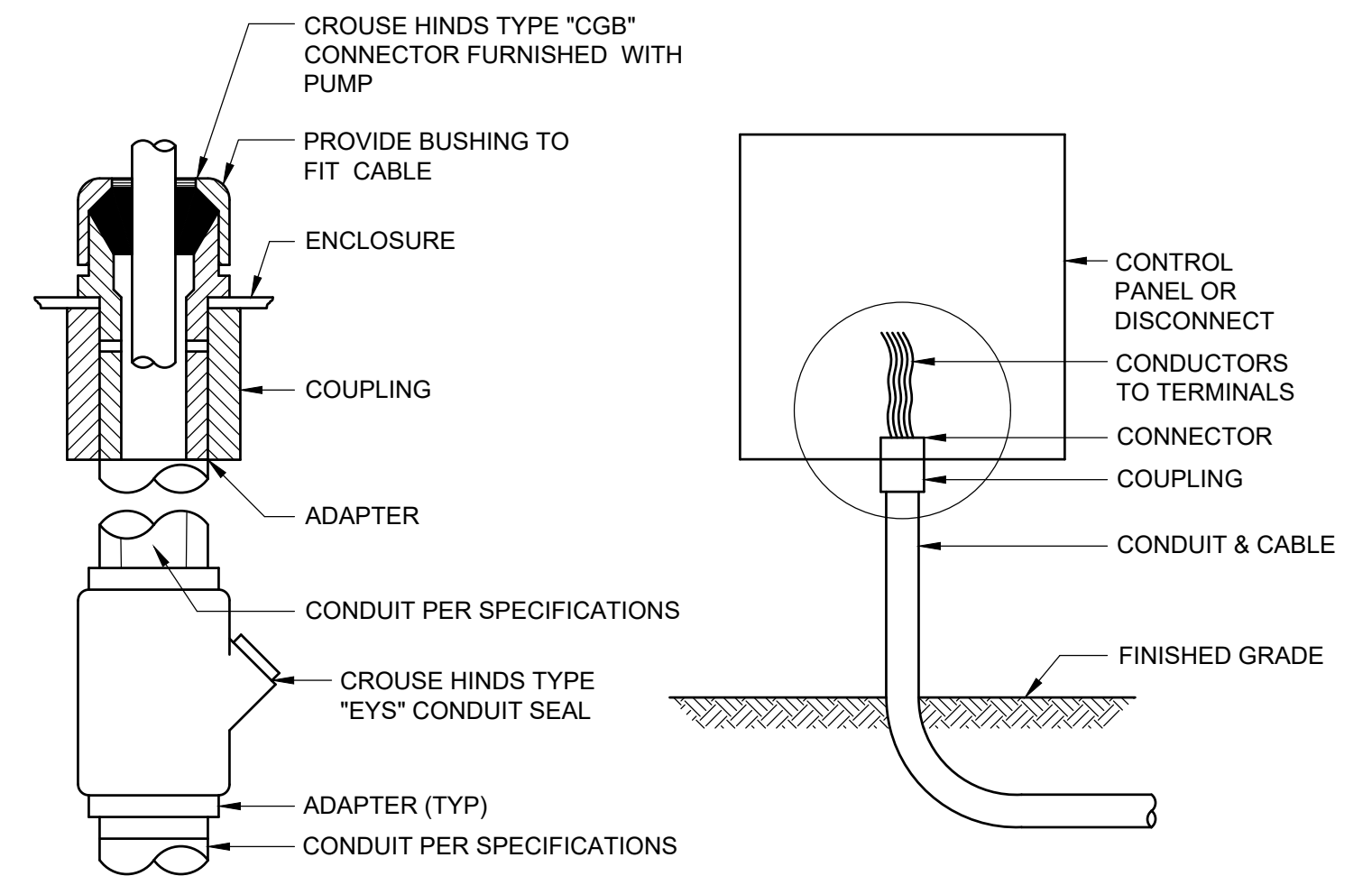
27
20 **DETAIL**
CONDUIT SEAL CONNECTION
SCALE: NOT TO SCALE (N.T.S.)



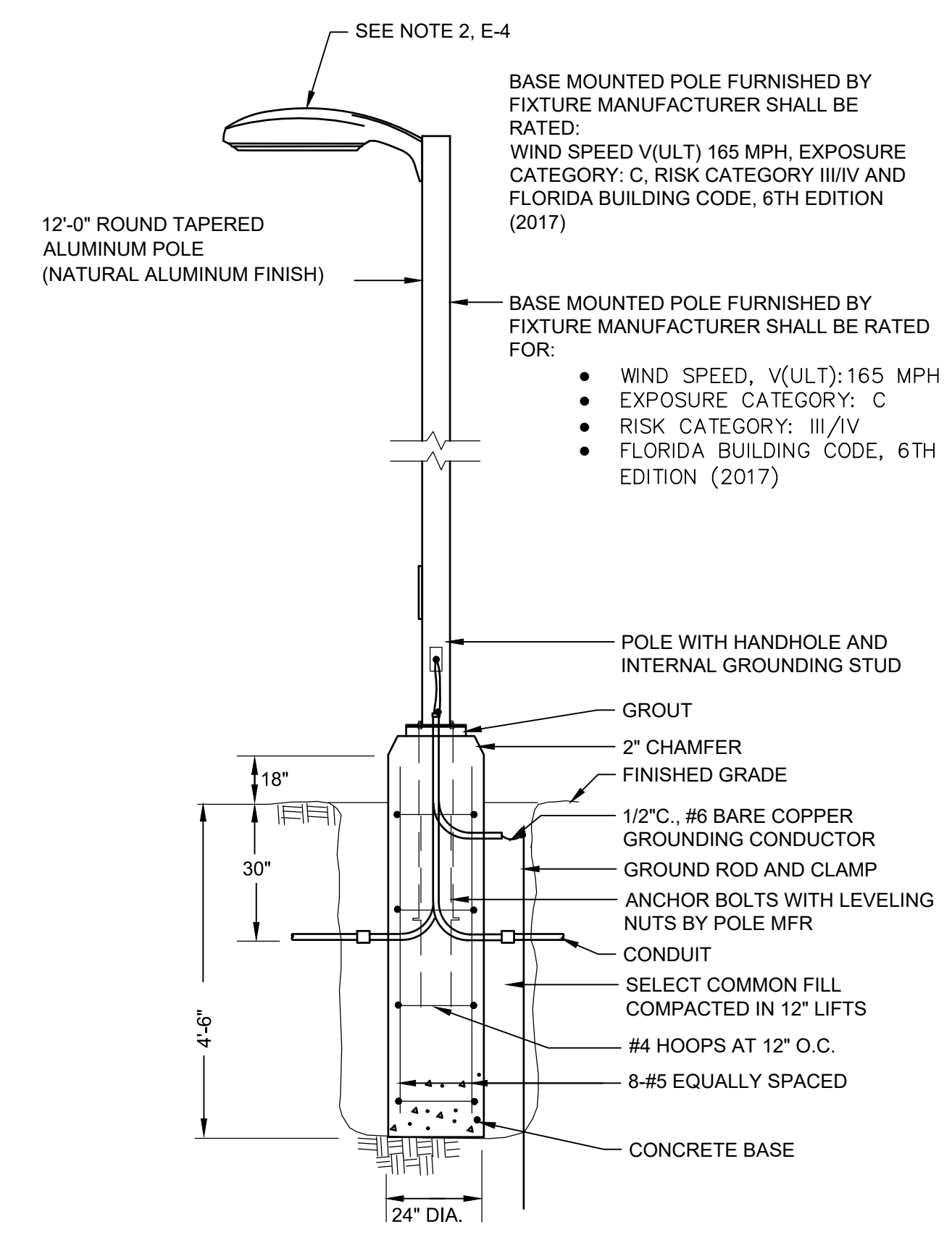
28
20 **DETAIL**
TYPICAL TRANSMITTER
SCALE: N.T.S.



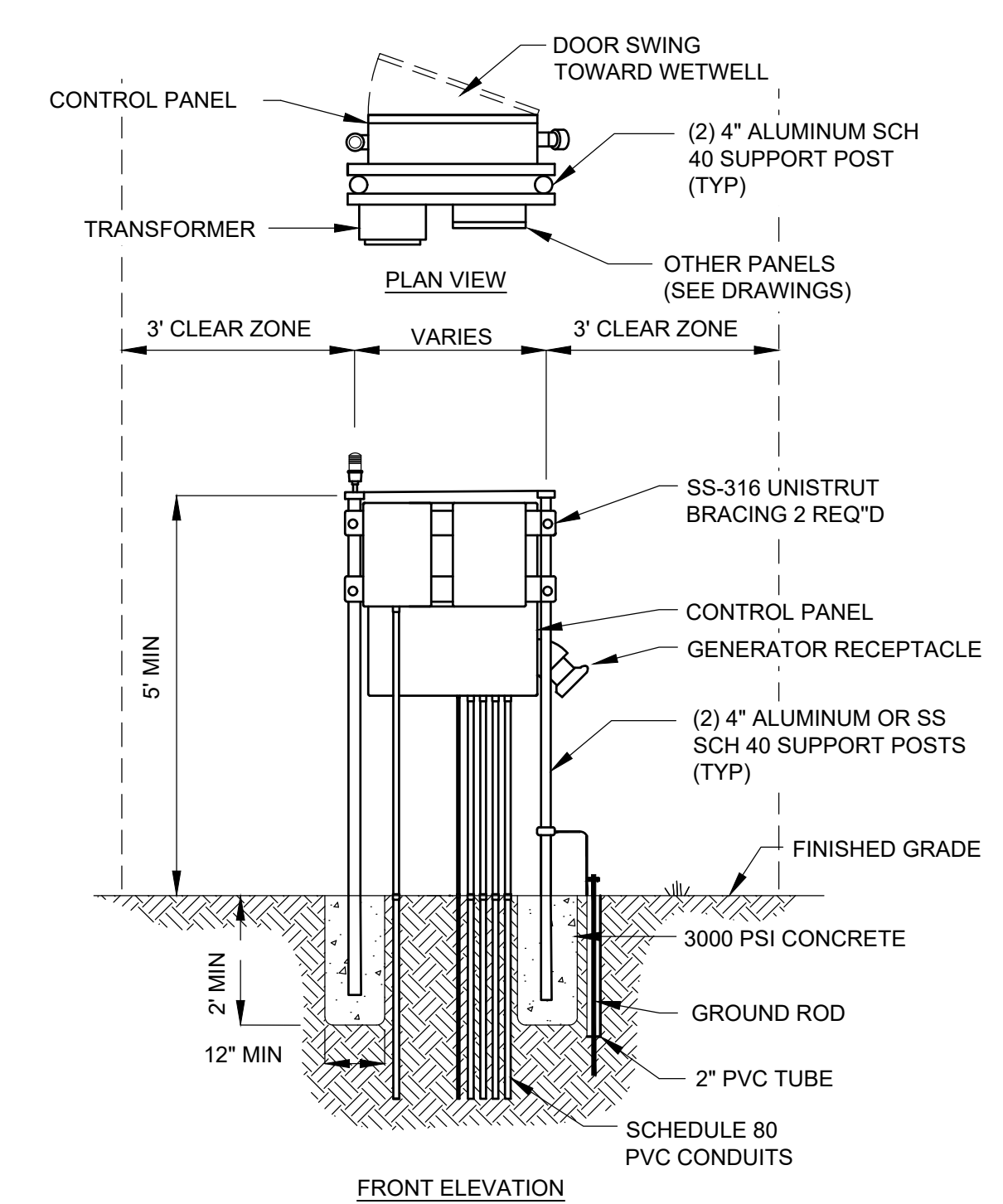
29
20 **DETAIL**
ELECTRICAL HANDHOLE
SCALE: N.T.S.



30
20 **DETAIL**
WATER-TIGHT CONNECTION
SCALE: N.T.S.





31
20 **DETAIL**
POLE MOUNTED FIXTURE (TYPE A)
SCALE: N.T.S.



32
20 **DETAIL**
PANEL MOUNTING RACK
SCALE: N.T.S.

- NOTES:**
- DO NOT SPLICE CABLES IN HANDHOLES UNLESS OTHERWISE NOTED.
 - ALL MOUNTING HARDWARE SHALL BE 316 SS.
 - HANDHOLES TO BE PLACED ON 6" BASE OF NO. 57 STONE.

- NOTES:**
- DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
 - REFER TO THE RISER DIAGRAMS, SHEET 21, FOR CONDUIT AND WIRE REQUIREMENTS.
 - POLE MOUNTED LED LIGHT FIXTURE. 96 LED's (13936 LUMENS, 135 LUMENS PER WATT) DIE CAST ALUMINUM HOUSING WITH INTEGRAL COOLING FINS, TWO-PIECE DIE CAST ALUMINUM DRIVER COMPARTMENT SEALED WITH A ONE-PIECE SILICONE GASKET, IES FULL CUTOFF OPTICS, DARK SKY CERTIFIED, SILVER METALLIC POLYESTER POWDER COAT FINISH, 350 mA HIGH-PERFORMANCE LED DRIVER, L70 AT 90,000+ IN 25° C ENVIRONMENTS, 90% POWER FACTOR, UNIVERSAL VOLTAGE (120-277V), 10kV SURGE PROTECTOR, TERMINAL BLOCK SUPPLIED AS STANDARD, TYPE III LIGHT DISTRIBUTION, CRI OF 75 FOR 5000K, ROUND POLE PLATE ADAPTER, PHOTOCCELL CONTROL, ETL LISTED FOR WET LOCATIONS, IP65 RATED, DLC LISTED, 5 YEAR WARRANTY ON ENTIRE SYSTEM. VISIONAIRE LIGHTING: VLX LED SERIES VLX-1-T3-96LC-3-4K-UNV-AM-SL.

REV	DATE	DESCRIPTION	DRN	APP	
-	11/8/2023	ISSUE FOR BID	JJV	KBT	
 					
ELECTRICAL DETAILS II					
PHASE II - CELL 3 CONSTRUCTION					
INDIAN RIVER COUNTY LANDFILL					
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: AK DRAWN BY: JJV CHECKED BY: TC REVIEWED BY: SA APPROVED BY: KBT	DATE: NOVEMBER 2023 PROJECT NO.: FL9363A FILE: FL9363A-C21 DRAWING NO.: 20 OF 24	SIGNATURE _____ DATE _____ KWASI BABU-TWENGOBAH LICENSE NO. 42460	

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AC:\Drawings\INDIAN RIVER COUNTY\CELL 3\Project Files\Drawings\SI\18053A-C21.dwg

NOTES:

- DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0126769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
- INSTALLATION SHALL MEET NEC ARTICLES 500 AND 501 FOR CLASSIFIED AREAS.
- ADD CIRCUIT 9 TO EXISTING LDS PANEL.

CONDUIT AND WIRE LEGEND (NUMBERS REFERENCE THIS SHEET ONLY)	
NO.	DESCRIPTION
①	1"., WITH CABLE PER MFR
②	3/4"., 6#14, 1#12G
③	2"., CABLE PER TCU MFR
④	3/4"., 2#12, 1#12G
⑤	3/4"., 4#14, 1#12G
⑥	3/4"., #6 BARE COPPER TO GROUND



LEACHATE COLLECTION/DETECTION SYSTEM CONTROL AND INSTRUMENTATION
RISER DIAGRAM

30 AMP MAIN BREAKER 100 AMP BUS RATING 120/240 VOLTS				PANELBOARD LP-LDS 12 POLES 60 Hz.				LOCATION: LEACHATE DETECTION SYSTEM ENCLOSURE RATING: NEMA 4X MOUNTING: RACK			
CIRCUIT NO.	DESCRIPTION	LOAD KVA		BREAKER AMPS/POLES	NOTES	CIRCUIT NO.	DESCRIPTION	LOAD KVA		BREAKER AMPS/POLES	NOTES
		LINE 1	LINE 2					LINE 1	LINE 2		
1	FIT-1005	0.1		20 /1	1	2	SPARE			20 /1	
3	LIGHT		0.1	20 /1	1	4	SPARE			20 /1	
5	RECEPTACLE	0.2		20 /1	1	6	SPARE			20 /1	
7	PANEL LDS		0.5	30 /1	2	8	SPARE			20 /1	
9	CELL 3 LDS PANEL (NOTE 3)	0.5		30 /1	2	10	SURGE PROTECTOR			15 /2	
11	SPARE			20 /1		12					
TOTAL LINE KVA THIS SIDE		0.3	0.6			TOTAL LINE KVA THIS SIDE		0	0		
						TOTAL KVA PER LINE		0.3	0.6		
						TOTAL KVA		0.9			

NOTES:
1. BRANCH CIRCUIT WIRING: 3/4" C, 2#12 & 1#12G

NOTES CONT.:
2. BRANCH CIRCUIT WIRING: 3/4" C, 2#10 & 1#10G

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-	11/8/2023	ISSUE FOR BID	JJV	KBT

1200 RIVERPLACE BOULEVARD, SUITE 710
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PHONE: 904.858.1818 - FAX: 904.396.1143
CERTIFICATE OF AUTHORIZATION NO. 4321

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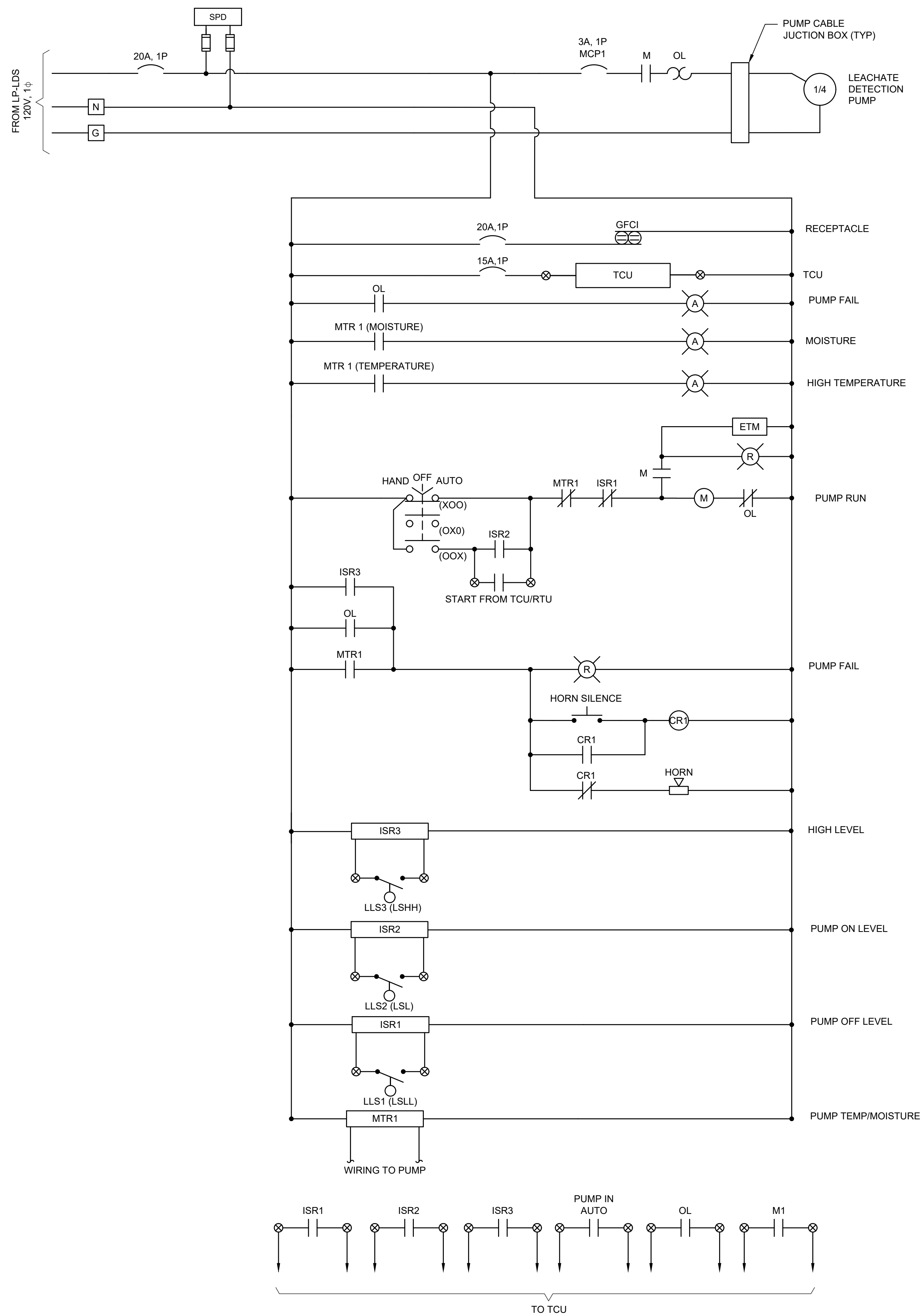
TITLE: **ELECTRICAL RISER DIAGRAMS**

PROJECT: **PHASE II - CELL 3 CONSTRUCTION**

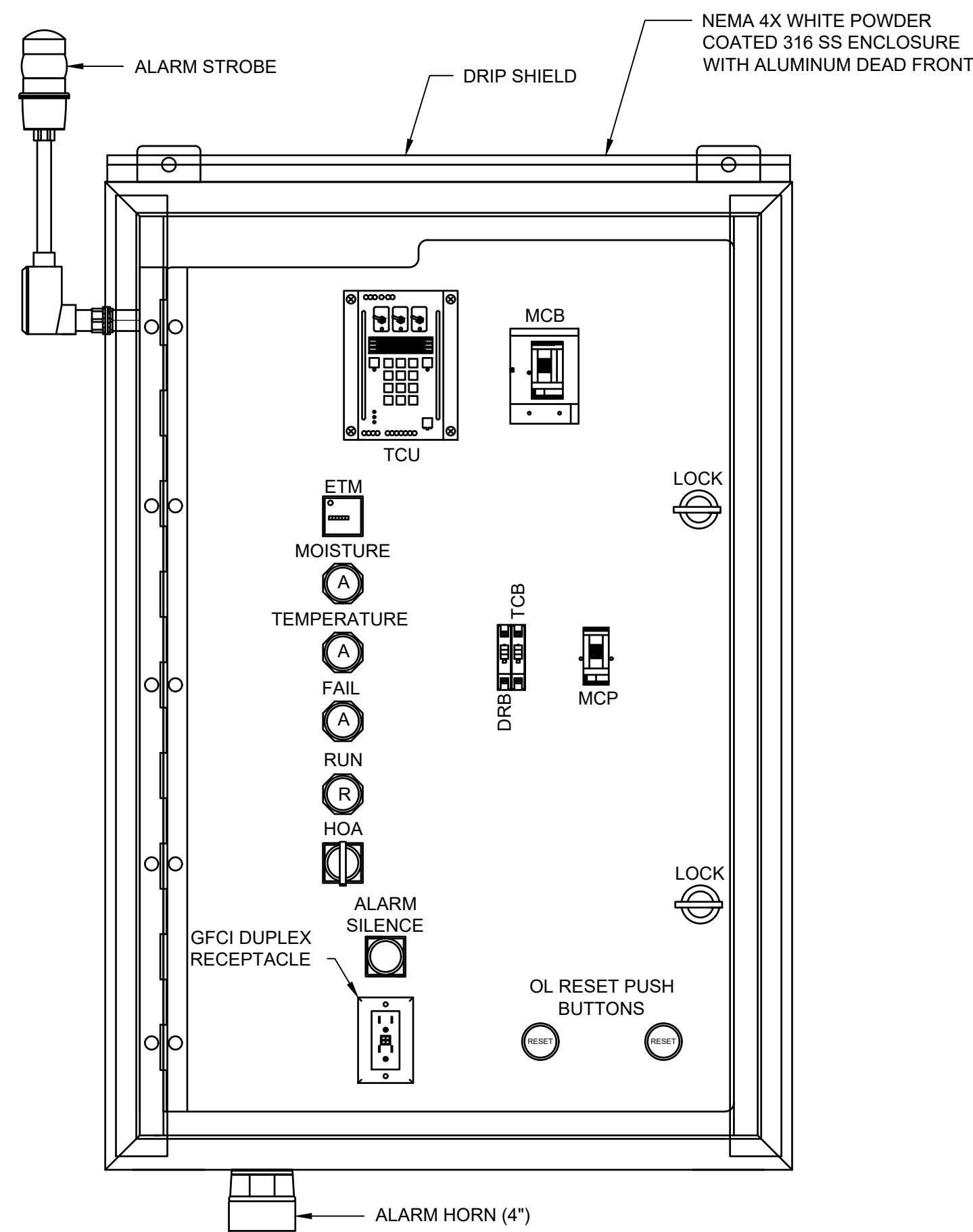
SITE: **INDIAN RIVER COUNTY LANDFILL**

DESIGN BY:	AK	DATE:	NOVEMBER 2023
DRAWN BY:	JJV	PROJECT NO.:	FL9363A
CHECKED BY:	TC	FILE:	FL9363A-C22
REVIEWED BY:	SA	DRAWING NO.:	
APPROVED BY:	KBT		21 OF 24

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LEACHATE DETECTION SYSTEM CONTROL PANEL
CONTROL DIAGRAM



LEACHATE DETECTION SYSTEM CONTROL PANEL
PANEL LAYOUT

PUMP CONTROL PANEL ABBREVIATIONS

- A ALARM INDICATOR
- CPT CONTROL POWER TRANSFORMER
- CR* CONTROL RELAY NO.*
- DRB DUPLEX RECEPTACLE BREAKER
- ETM ELAPSED TIME METER
- GCB GENERATOR CIRCUIT BREAKER
- GFDR GROUND FAULT DUPLEX RECEPTACLE
- GND GROUND
- GR GENERATOR RECEPTACLE
- HOA HANDS-OFF-AUTOMATIC SELECTOR
- ISR INTRINSICALLY SAFE RELAY
- LLS LIQUID LEVEL SWITCH
- LSHH LEVEL SWITCH HIGH HIGH
- LSH LEVEL SWITCH HIGH
- LSLL LEVEL SWITCH LOW LOW
- LSL LEVEL SWITCH LOW
- LDSCP LEACHATE DETECTION SYSTEM CONTROL PANEL
- LOSCP LEACHATE COLLECTION SYSTEM CONTROL PANEL
- MCB MAIN CIRCUIT BREAKER
- MCP MOTOR CIRCUIT PROTECTOR
- MTR MOTOR MOISTURE/TEMPERATURE RELAY
- N NEUTRAL
- OL OVERLOAD RELAY
- PCP PUMP CONTROL PANEL
- PM PHASE MONITOR
- R PUMP RUN INDICATORS (PUSH-TO-TEST)
- SS STAINLESS STEEL
- TB TERMINAL BLOCK
- TCB TCU CIRCUIT BREAKER
- TCU DATA FLOW SYSTEMS TCU-001 PUMP CONTROLLER
- SPD SURGE PROTECTIVE DEVICES

NOTES:

1. DESIGN AND DETAIL TAKEN FROM PERMIT MOD 0128769-022-SC AND CELL 2 CONSTRUCTION DRAWINGS PREPARED BY CDM SMITH.
2. CONTROL PANEL SHALL MEET APPLICABLE REQUIREMENTS OF SECTION 16191, PARAGRAPH 2.02.B.
3. REFER TO PROCESS DIAGRAMS FOR AND SECTION 11207 FOR ADDITIONAL OPERATION AND CONTROL REQUIREMENTS.
4. ALL CONDUITS SHALL ENTER/EXIT THROUGH BOTTOM OF PUMP CONTROL PANEL.
5. THE BOTTOM OF PUMP CONTROL PANEL SHALL BE 36" ABOVE FINISHED SLAB.

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT
<p>1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321</p> <p>1325 74th AVENUE SW VERO BEACH, FLORIDA 32968 USA PHONE: 772.770.5112</p>				
TITLE: LEACHATE DETECTION CONTROL PANEL DETAILS				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: AK	DATE: NOVEMBER 2023	
SIGNATURE		DRAWN BY: JJV	PROJECT NO.: FL9363A	
DATE		CHECKED BY: TC	FILE: FL9363A-C23	
KWASI BADU-TWENBOAH LICENSE NO. 42460		REVIEWED BY: SA	DRAWING NO.:	
		APPROVED BY: KBT	22	OF 24

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THE CONTRACTOR IS RESPONSIBLE FOR EMPLOYING ANY AND ALL MEASURES TO PREVENT EROSION, SEDIMENTATION, AND THE RELEASE OF TURBID DISCHARGES FROM THE CONSTRUCTION SITE PER LOCAL, STATE, AND FEDERAL REQUIREMENTS.

THE CONTRACTOR IS RESPONSIBLE FOR DEVELOPING AND IMPLEMENTING A STORMWATER POLLUTION PREVENTION PLAN (SWPPP). THE SWPPP SHALL BE SUBMITTED TO THE OWNER FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION ACTIVITIES. THE COMPLETE AND FINAL SWPPP SHALL INCLUDE THE SITE PLAN, EROSION CONTROL PLAN, A NARRATIVE DESCRIPTION, PROJECT NOTES, CONTACT INFORMATION AND SWPPP COMPLIANCE AGREEMENTS FOR ALL CONTRACTORS AND SUBCONTRACTORS, A COPY OF THE GENERIC PERMIT FOR STORMWATER DISCHARGE FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES, COPY OF INSPECTION AND CORRECTIVE ACTION REPORTS AND SWPPP AMENDMENTS MADE DURING CONSTRUCTION. THIS SWPPP PLAN SHEET IS INTENDED TO BE DISPLAYED ONSITE TO MEET NPDES NOI REQUIREMENTS. THE CONTRACTOR SHOULD MODIFY THIS SWPPP THROUGHOUT CONSTRUCTION AS SITE CONDITIONS CHANGE.

THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THE RESPONSIBLE PARTY OR SUBCONTRACTOR ACCOUNTABLE FOR IMPLEMENTING EACH MEASURE DESCRIBED IN THE SWPPP AND DELEGATING SWPPP RESPONSIBILITIES. THE CONTRACTOR MUST PREPARE AND SIGN THE FOLLOWING CERTIFICATION: "I CERTIFY UNDER PENALTY OF LAW THAT I UNDERSTAND, AND SHALL COMPLY WITH, THE TERMS AND CONDITIONS OF THE STATE OF FLORIDA GENERIC PERMIT FOR STORMWATER DISCHARGE FROM LARGE AND SMALL CONSTRUCTION ACTIVITIES AND THIS STORMWATER POLLUTION PREVENTION PLAN PREPARED THEREUNDER." ALL SUBCONTRACTORS ARE REQUIRED TO SIGN A COPY OF THE CERTIFICATION AND ALL CERTIFICATIONS ARE TO BE HELD BY THE CONTRACTOR AS PART OF THE COMPLETE SWPPP.

THE CONTRACTOR SHALL DEVELOP AND APPROVE A STORMWATER POLLUTION PREVENTION PLAN IN ACCORDANCE WITH THE GENERAL REQUIREMENTS AND/OR ANY SPECIAL CONDITIONS OF ALL PERMITS WHICH AUTHORIZE THE CONSTRUCTION OF THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING, MONITORING AND MODIFYING THE SWPPP FOR CONSTRUCTION ACTIVITIES TO MEET CHANGING PROJECT SITE CONDITIONS.

THE CONTRACTOR SHALL APPLY FOR AND COMPLY WITH A GENERIC PERMIT FOR STORMWATER DISCHARGE FROM THE LARGE AND SMALL CONSTRUCTION SITES FROM THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION (FDEP) ALL FEES SHALL BE PAID BY THE CONTRACTOR

1.0 SITE DESCRIPTION: EXISTING SOLID WASTE DISPOSAL SITE/INDUSTRIAL FACILITY.

1.A NATURE OF CONSTRUCTION ACTIVITY:

A LANDFILL EXPANSION VIA CONSTRUCTION OF A NEW CELL, SEGMENT 3 CELL 2, AND THE PARTIAL CLOSURE OF AN EXISTING CELL, SEGMENT 2, ARE PROPOSED.

1.B SEQUENCE OF MAJOR SOIL DISTURBING ACTIVITIES:

THE CONTRACTOR SHALL PROVIDE A DETAILED SEQUENCE OF CONSTRUCTION FOR ALL CONSTRUCTION ACTIVITIES AS REQUIRED BY CONDITION OF PERMIT. THE CONTRACTOR SHALL IDENTIFY THE SEQUENCE OF MAJOR ACTIVITIES FOR CONTROLLING EROSION AND TRAPPING SEDIMENT.

FOR EACH CONSTRUCTION PHASE, INSTALL PERIMETER CONTROLS PRIOR TO OTHER WORK FOR THE CONSTRUCTION PHASE. REMOVE PERIMETER CONTROLS ONLY AFTER ALL UPSTREAM AREAS ARE STABILIZED AND A WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.

1.C AREA ESTIMATES:

TOTAL SITE AREA: 275 ACRES
TOTAL AREA TO BE DISTURBED: APPROXIMATELY 45 ACRES

1.D RUNOFF DATA:

APPROXIMATE RUNOFF COEFFICIENTS:
BEFORE: 0.9
AFTER: 0.9

SOILS DATA: SEE GEOTECHNICAL ENGINEERING REPORT: "INDIAN RIVER COUNTY PROPOSED NEW LANDFILL AREA" PREPARED BY KSM ENGINEERING AND TESTING DATED OCTOBER 18, 2017.

OUTFALL INFORMATION: CONTROL STRUCTURE WITH PIPE CONNECTION - NO CHANGES PROPOSED

STRUCTURE(S) NUMBER(S): 1
RECEIVING WATER BODIES: INDIAN RIVER FARMS WATER CONTROL DISTRICT'S C-6 CANAL TO THE INDIAN RIVER LAGOON

1.E SITE MAP:

- DRAINAGE PATTERNS: DISTURBED AREA TO BE GRADED TO DRAIN TO PROPOSED STRUCTURES. STORMWATER STRUCTURES WILL DISCHARGE TO THE EXISTING SWALES AND INTERIOR DITCH AND WILL FOLLOW THE EXISTING DRAINAGE PATTERN.

- APPROXIMATE SLOPES: THE SITE GRADES AND SLOPES ARE PRESENTED IN THE DRAINAGE PLAN SHEET.

- AREAS OF SOIL DISTURBANCE: ALL AREAS WITHIN THE LIMITS OF CONSTRUCTION AS SHOWN ON SITE PLAN.
- AREAS NOT TO BE DISTURBED: AREAS OUTSIDE LIMITS OF CONSTRUCTION.
- AREAS TO BE STABILIZED: TEMPORARY STABILIZATION PRACTICES ARE REQUIRED FOR AREAS OF TEMPORARY SOIL DISTURBANCE. PERMANENT STABILIZATION IS SHOWN ON THE PAVING, DRAINAGE AND PIPING PLAN SHEET.

2.0 CONTROLS

2.A EROSION AND SEDIMENT CONTROLS:

THE CONTRACTOR SHALL DEVELOP A SWPPP FOR REVIEW AND APPROVAL BY OWNER TO MANAGE THE STORMWATER RUNOFF TO MINIMIZE EROSION AND TRANSPORT OF SEDIMENTS. AS WORK PROGRESSES, THE CONTRACTOR SHALL MODIFY THE PLAN TO ADAPT TO SEASONAL VARIATION, CHANGES IN CONSTRUCTION ACTIVITIES, AND THE NEED FOR BETTER PRACTICES.

ABSOLUTELY NO WORK WILL BE ALLOWED WITHIN ANY CONSERVATION AREA, BUFFER AREA, MITIGATION AREA OR DESIGNATED WETLAND AREA, UNLESS OTHERWISE SPECIFICALLY DESCRIBED BY THE CONSTRUCTION PLANS AND GRANTED BY PERMIT FROM GOVERNMENTAL AGENCY HAVING JURISDICTION OVER THE PROJECT.

PRIOR TO CLEARING AND GRUBBING, THE LIMITS OF CONSTRUCTION SHALL BE CLEARLY MARKED ALONG THE PROPOSED RIGHT OF WAY LINE TO PROTECT NATURAL AREAS FROM ENCRoACHMENT OF CONSTRUCTION ACTIVITIES.

ALL FILL EMBANKMENT AND GRADED AREAS SHALL BE PROTECTED AGAINST EROSION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE STABILITY OF EMBANKMENTS AND SHALL REPLACE ANY PORTION, WHICH IN THE OPINION OF THE ENGINEER, HAS BECOME DISPLACED DUE TO EROSION OR DUE TO CARELESSNESS OR NEGLIGENCE ON THE PART OF THE CONTRACTOR.

2.A.1 STABILIZATION PRACTICES:

THE CONTRACTOR SHALL DESCRIBE THE STABILIZATION PRACTICES PROPOSED TO CONTROL EROSION. THE CONTRACTOR SHALL INITIATE ALL STABILIZATION MEASURES AS SOON AS PRACTICAL, BUT IN NO CASE MORE THAN 7 DAYS, IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. THE STABILIZATION PRACTICES SHALL INCLUDE AT LEAST THE FOLLOWING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

TEMPORARY:

- ARTIFICIAL COVERINGS.
- SOD.

PERMANENT:

- SOD IN ACCORDANCE WITH PLANS. ALL PLANS 3:1 (H:V) AND STEEPER TO BE SODDED SHALL RECEIVE STAKED SOD.

2.A.2 STRUCTURAL PRACTICES:

THE CONTRACTOR SHALL DESCRIBE THE PROPOSED STRUCTURAL PRACTICES TO CONTROL OR TRAP SEDIMENT AND OTHERWISE PREVENT THE DISCHARGE OF POLLUTANTS FROM EXPOSED AREAS OF THE SITE. SEDIMENT CONTROLS SHALL BE IN PLACE BEFORE DISTURBING SOIL UPSTREAM OF THE CONTROL. THE STRUCTURAL PRACTICES SHALL INCLUDE AT LEAST THE FOLLOWING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

TEMPORARY:

- SILT FENCE IN ACCORDANCE WITH F.D.O.T. DESIGN STANDARD INDEX 102.
- SANDBAGS TO CONTROL EROSION AND TRAP SILT.
- INLET PROTECTION IN ACCORDANCE WITH F.D.O.T. DESIGN STANDARD INDEX 102.
- SEDIMENT BASIN: TEMPORARY STAGING AREAS TO INCLUDE TEMPORARY SEDIMENTATION BASINS.
- STORMWATER CONVEYANCE: STABILIZED CHANNEL TO CONVEY RUNOFF AND CONTROL VELOCITIES
- FLOATING TURBIDITY BARRIER IN ACCORDANCE WITH F.D.O.T. DESIGN STANDARD INDEX 103.
- SLOPE CONTROLS SUCH AS EROSION CONTROL BLANKETS OR TACKIFIERS ON STEEP SLOPES.

PERMANENT:

- SOD IN ACCORDANCE WITH PLANS. ALL PLANS 3:1 (H:V) AND STEEPER TO BE SODDED SHALL RECEIVE STAKED SOD.

2.B STORMWATER MANAGEMENT:

THE FACILITIES HAVE BEEN PERMITTED BY THE FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION AND THE UNITED STATES ARMY CORPS OF ENGINEERS.

2.C OTHER CONTROLS:

2.C.1 WASTE DISPOSAL:

THE CONTRACTOR SHALL DESCRIBE THE PROPOSED METHODS TO PREVENT THE DISCHARGE OF SOLID MATERIALS, INCLUDING BUILDING MATERIALS, TO WATERS OF THE UNITED STATES. THE PROPOSED METHODS SHALL INCLUDE AT LEAST THE FOLLOWING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

- PROVIDING LITTER CONTROL AND COLLECTION WITHIN THE PROJECT DURING CONSTRUCTION ACTIVITIES.
- DISPOSING OF ALL FERTILIZER OR OTHER CHEMICAL CONTAINERS ACCORDING TO EPA'S STANDARD PRACTICES AS DETAILED BY THE MANUFACTURER.
- DISPOSING OF SOLID MATERIALS INCLUDING BUILDING AND CONSTRUCTION MATERIALS OFF THE PROJECT SITE BUT NOT IN SURFACE WATERS, OR WETLANDS.

2.C.2 OFFSITE VEHICLE TRACKING & DUST CONTROL:

THE CONTRACTOR SHALL DESCRIBE THE PROPOSED METHODS FOR MINIMIZING OFFSITE VEHICLE TRACKING OF SEDIMENTS AND GENERATING DUST. THE PROPOSED METHODS SHALL INCLUDE AT LEAST THE FOLLOWING, UNLESS OTHERWISE APPROVED BY THE ENGINEER.

- COVERING LOADED HAUL TRUCKS WITH TARPAULINS.
- REMOVING EXCESS DIRT FROM ROADS DAILY.
- STABILIZING CONSTRUCTION ENTRANCES ACCORDING TO FDOT DESIGN STANDARDS.
- USING ROADWAY SWEEPERS DURING DUST GENERATING ACTIVITIES SUCH AS EXCAVATION AND MILLING OPERATIONS, IF APPLICABLE.

2.C.3 STATE AND LOCAL REGULATIONS FOR WASTE DISPOSAL, SANITARY SEWER, OR SEPTIC TANK REGULATIONS:

THE CONTRACTOR SHALL DESCRIBE THE PROPOSED PROCEDURES TO COMPLY WITH APPLICABLE STATE AND LOCAL REGULATIONS FOR WASTE DISPOSAL, AND SANITARY SEWER OR SEPTIC SYSTEMS.

2.C.4 FERTILIZERS AND PESTICIDES:

THE CONTRACTOR SHALL DESCRIBE THE PROCEDURES FOR APPLYING FERTILIZERS AND PESTICIDES. THE PROPOSED PROCEDURES SHALL COMPLY WITH APPLICABLE SUBSECTIONS OF SECTION 570 OF THE SPECIFICATIONS.

2.C.5 TOXIC SUBSTANCES:

THE CONTRACTOR SHALL PROVIDE A LIST OF TOXIC SUBSTANCES THAT ARE LIKELY TO BE USED ON THE JOB AND PROVIDE A PLAN ADDRESSING THE GENERATION, APPLICATION, MIGRATION, STORAGE AND DISPOSAL OF THESE SUBSTANCES.

2.C.6 STATE AND LOCAL PLANS AND PERMITS TO BE OBTAINED:

- FLORIDA DEPT. OF ENVIRONMENTAL PROTECTION (FDEP) ENVIRONMENTAL RESOURCE PERMIT MODIFICATION: CONTRACTOR TO CONFIRM CONSTRUCTION IS AUTHORIZED.
- FDEP NOTICE OF INTENT FOR STORMWATER DISCHARGE (NPDES); CONTRACTOR TO OBTAIN.
- THE CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, INSTALLATION, PERMITTING AND OPERATION OF AN ADEQUATE DEWATERING SYSTEM TO DEWATER EXCAVATIONS FOR CONSTRUCTION IF REQUIRED.
- CONTRACTOR TO OBTAIN ST. JOHNS RIVER WATER MANAGEMENT DISTRICT PERMIT FOR DEWATERING.
- A DEWATERING PLAN SHALL BE DEVELOPED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL. PRIOR TO THE INITIATION OF ANY DEWATERING.
- THE CONTRACTOR SHALL COMPLETE AND FILE A NOTICE OF INTENT (NOI) FORM AT LEAST 48 HOURS PRIOR TO ANY CONSTRUCTION ACTIVITIES ON THE SITE.
- WHEN ALL DISTURBED SOILS HAVE BEEN STABILIZED AND TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES HAVE BEEN REMOVED, THIS CONSTITUTES "ELIMINATION OF STORMWATER DISCHARGES ASSOCIATED WITH THE CONSTRUCTION ACTIVITIES". AT THIS TIME THE CONTRACTOR SHALL COMPLETE AND FILE A NOTICE OF TERMINATION (NOT) TO THE APPROPRIATE PERMITTING AGENCIES. PRIOR TO SUBMITTING A NOI, THE CONTRACTOR SHALL OBTAIN WRITTEN ACCEPTANCE FROM THE OWNER CONFIRMING FINAL STABILIZATION.

3.0 MAINTENANCE/INSPECTION PROCEDURES:

THE CONTRACTOR SHALL PROVIDE A PLAN FOR MAINTAINING AND INSPECTING ALL EROSION AND SEDIMENT CONTROLS THROUGHOUT CONSTRUCTION. THE MAINTENANCE PLAN SHALL, AT A MINIMUM, COMPLY WITH THE FOLLOWING:

- NO MORE THAN 10 ACRES OF THE SITE SHALL BE DENUDED AT ONE TIME WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
- ALL CONTROL MEASURES SHALL BE INSPECTED BY THE CONTRACTOR. THE PERSON RESPONSIBLE FOR THE DAY TO DAY SITE OPERATION OR SOMEONE APPOINTED BY THE CONTRACTOR, AT LEAST ONCE A WEEK AND FOLLOWING ANY STORM EVENT OF 0.25 INCHES OR GREATER.
- ALL TURBIDITY CONTROL MEASURES SHALL BE MAINTAINED IN GOOD WORKING ORDER IF A REPAIR IS NECESSARY, IT WILL BE INITIATED WITHIN 24 HOURS OF REPORT.
- BUILT UP SEDIMENT SHALL BE REMOVED FROM SILT FENCE WHEN IT HAS REACHED ONE-THIRD THE HEIGHT OF THE FENCE.
- SILT FENCE SHALL BE INSPECTED FOR DEPTH OF SEDIMENT, TEARS, TO SEE IF THE FABRIC IS SECURELY ATTACHED TO THE FENCE POSTS, AND TO SEE THAT THE FENCE POSTS ARE FIRMLY IN THE GROUND.
- DIVERSION DIKES/SWALES SHALL BE INSPECTED AND ANY BREACHES PROMPTLY REPAIRED.
- STABILIZED AREAS SHALL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND HEALTHY GROWTH.
- REPAIR ALL OTHER BMPs IMMEDIATELY FOLLOWING DAMAGE OR DISPLACEMENT.
- MONITOR FLOATING TURBIDITY BARRIERS TO ASSURE THEY ARE WORKING AS INTENDED.
- A MAINTENANCE INSPECTION REPORT SHALL BE MADE AFTER EACH INSPECTION. THE REPORTS SHALL BE KEPT ON SITE DURING CONSTRUCTION AND AVAILABLE UPON REQUEST TO THE OWNER, ENGINEER OR ANY FEDERAL, STATE OR LOCAL AGENCY APPROVING SEDIMENT AND EROSION PLANS, OR STORM WATER MANAGEMENT PLANS. THE REPORTS SHALL BE MADE AND RETAINED AS PART OF THE STORM WATER POLLUTION PREVENTION PLAN. THEN REPORTS SHALL IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE.
- THE CONTRACTOR WILL SELECT UP TO THREE INDIVIDUALS WHO WILL BE RESPONSIBLE FOR INSPECTIONS, MAINTENANCE AND REPAIR ACTIVITIES, AND FILLING OUT THE INSPECTION AND MAINTENANCE REPORT.
- PERSONNEL SELECTED FOR INSPECTION AND MAINTENANCE RESPONSIBILITIES WILL RECEIVE TRAINING FROM THE CONTRACTOR. THEY WILL BE TRAINED IN ALL THE INSPECTION AND MAINTENANCE PRACTICES NECESSARY FOR KEEPING THE EROSION AND SEDIMENT CONTROLS USED ONSITE IN GOOD WORKING ORDER.



4.0 NON-STORMWATER DISCHARGES:

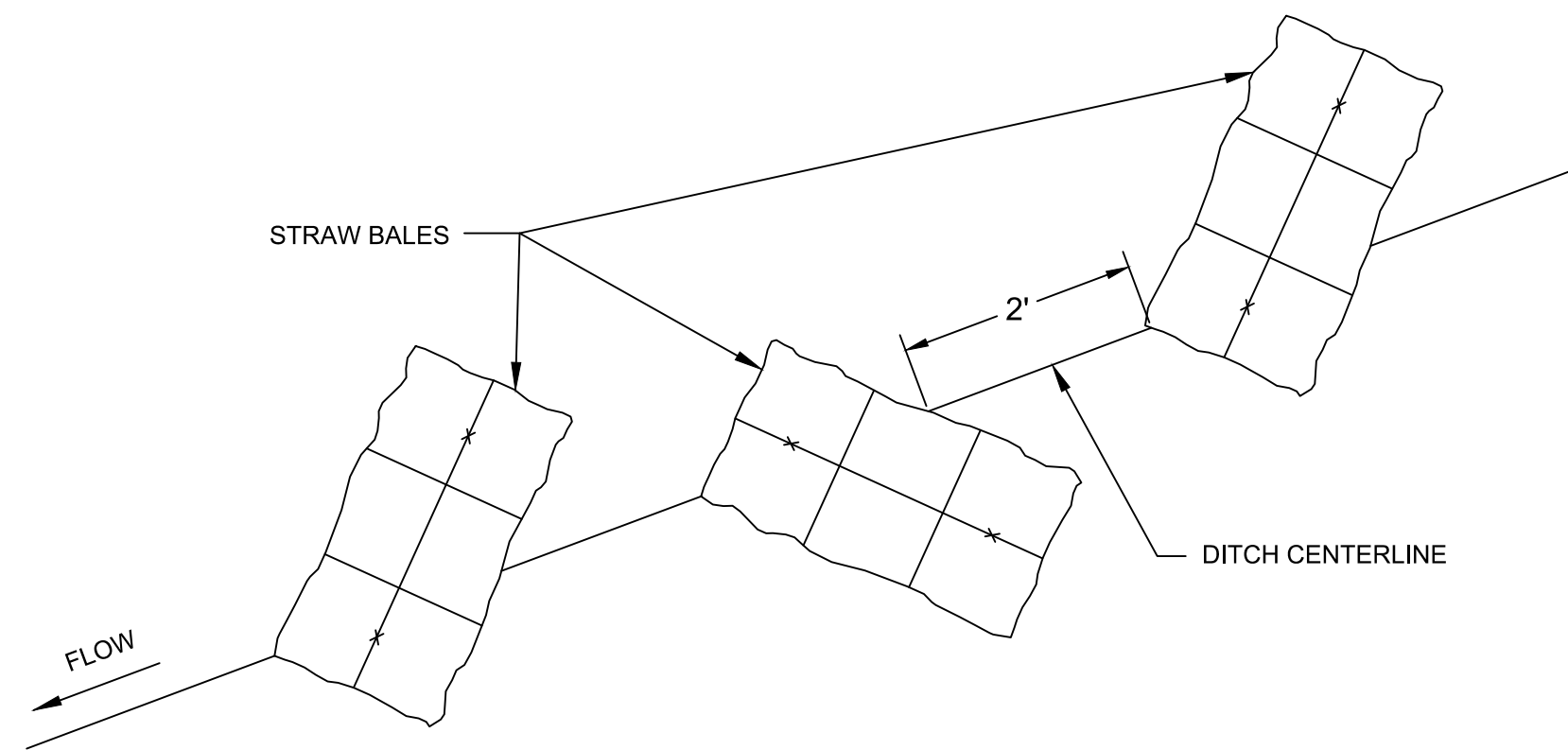
THE CONTRACTOR SHALL IDENTIFY ALL ANTICIPATED NON-STORMWATER DISCHARGES (EXCEPT FLOWS FROM FIRE FIGHTING ACTIVITIES). THE CONTRACTOR SHALL DESCRIBE THE PROPOSED MEASURES TO PREVENT POLLUTION OF THESE NON-STORMWATER DISCHARGES. IF THE CONTRACTOR ENCOUNTERS CONTAMINATED SOIL OR GROUNDWATER NOT INDICATED ON THE CONSTRUCTION DRAWINGS, ALL CONSTRUCTION ACTIVITIES SHALL STOP, AND THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF RECORD FOR FURTHER INSTRUCTIONS.

NON-STORMWATER DISCHARGES FOR THIS PROJECT ARE EXPECTED TO INCLUDE UNCONTAMINATED GROUNDWATER (FROM DEWATERING EXCAVATION), PAVEMENT WASH WATER (WHERE NO SPILLS OR LEAKS OF TOXIC OR HAZARDOUS SUBSTANCES HAVE OCCURRED) AND ANY WATER USED FOR DUST CONTROL. IF SAID DISCHARGES DO OCCUR, THEY WILL BE DIRECTED TO THE STORMWATER POND PRIOR TO DISCHARGE. TURBID UNTREATED WATER FROM THE STORMWATER POND SHALL NOT BE DISCHARGED INTO RECEIVING WATERS. TURBID AND OTHER NON-STORMWATER DISCHARGES SHALL BE TREATED SO AS TO NOT ALLOW A DISCHARGE OF POLLUTED STORMWATER. APPROPRIATE TREATMENT MAY INCLUDE TURBIDITY CONTROLS, SETTLING PONDS, THE PROPER USE OF FLOCCULATING AGENTS, OR OTHER APPROPRIATE MEANS.

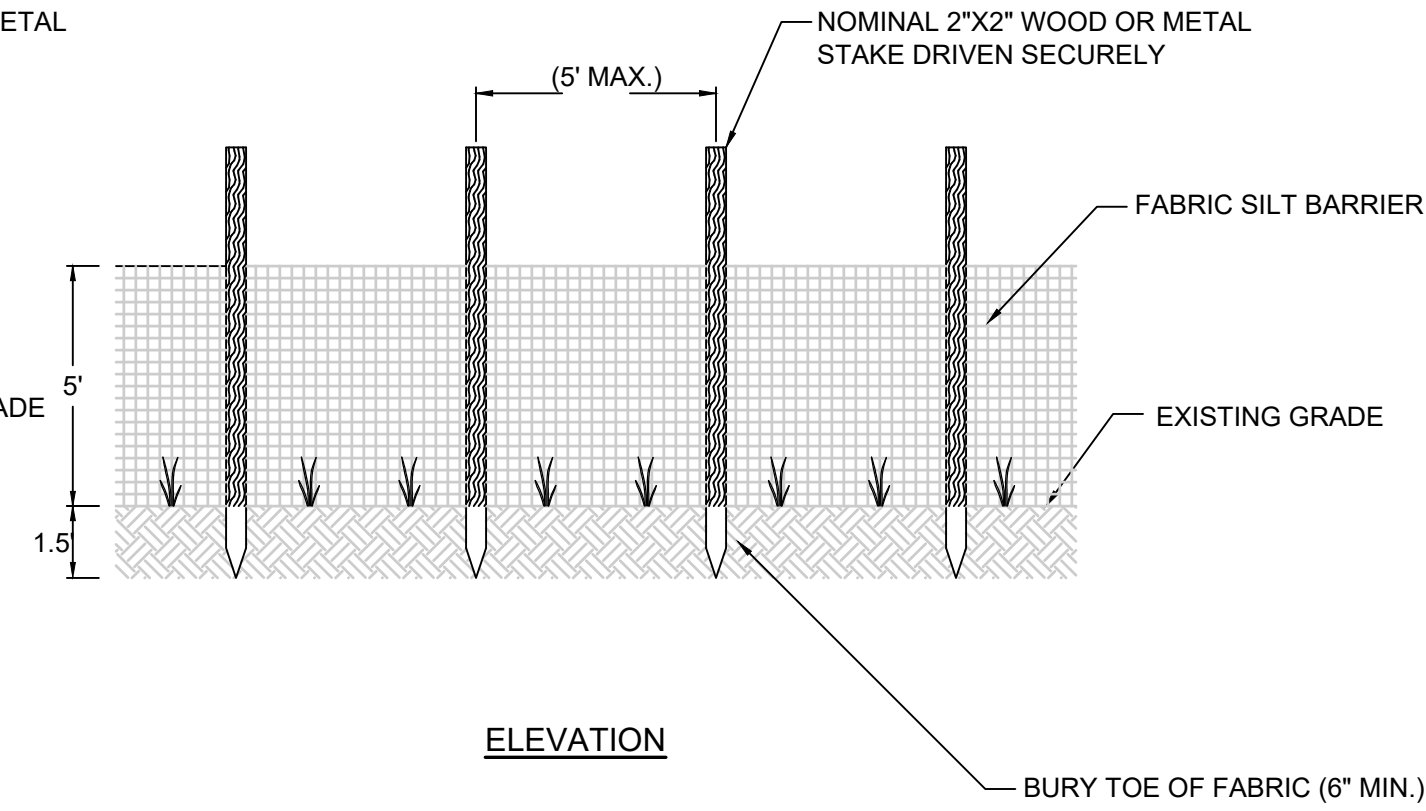
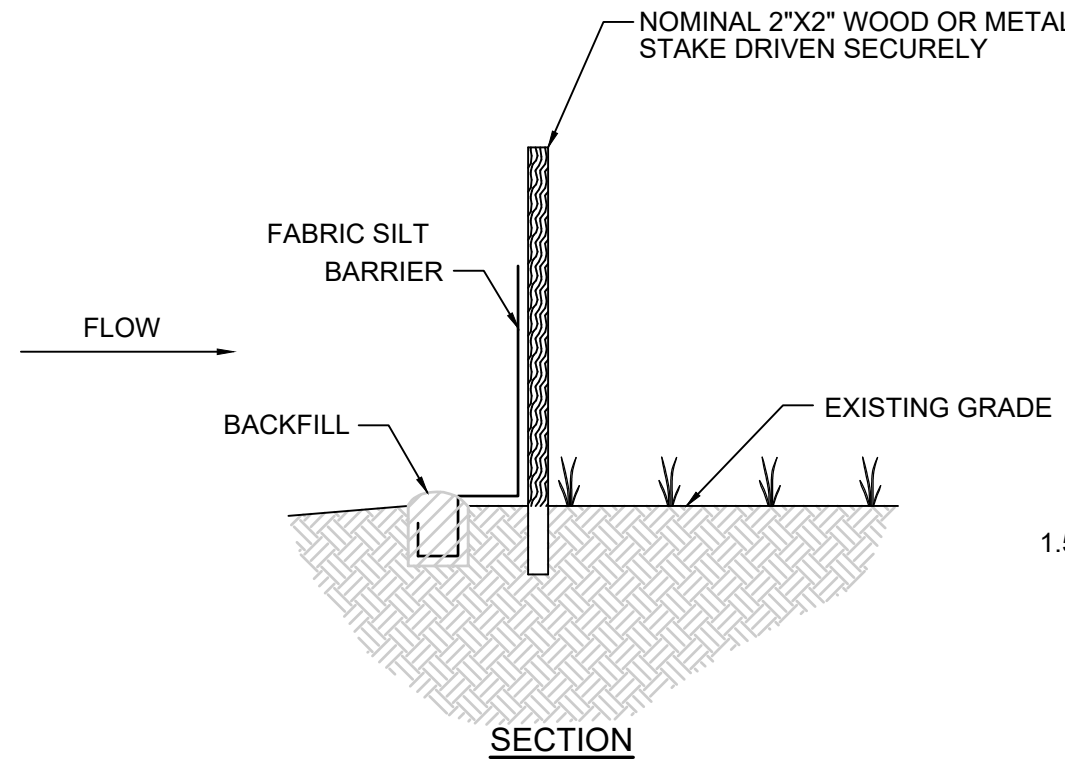
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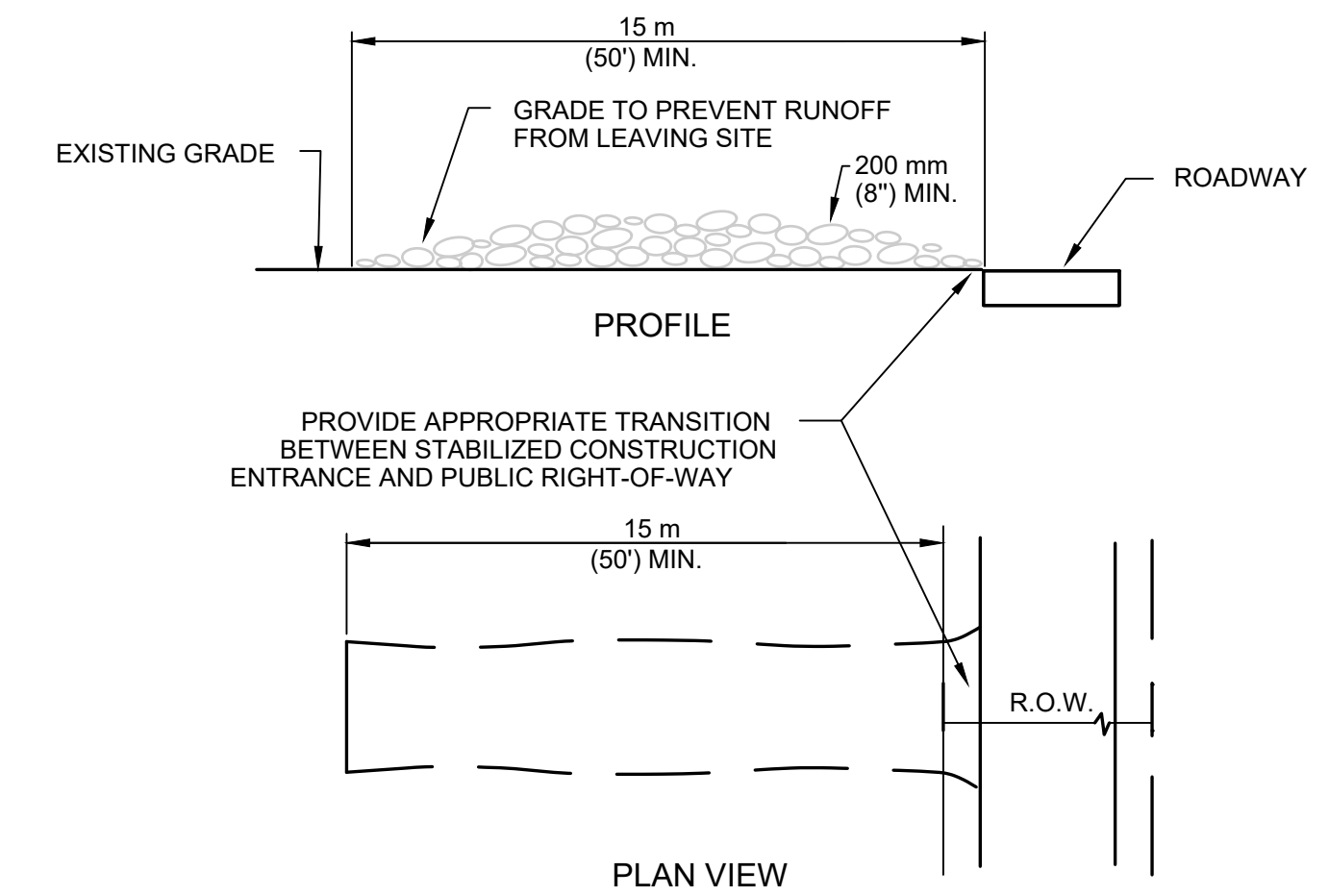
-	11/8/2023	ISSUE FOR BID	JJV	KBT	
REV	DATE	DESCRIPTION	DRN	APP	
					
		1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321		1325 74th AVENUE SW VERO BEACH, FLORIDA 32969 USA PHONE: 772.770.5112	
TITLE: STORM WATER POLLUTION PREVENTION PLAN					
PROJECT: PHASE II - CELL 3 CONSTRUCTION					
SITE: INDIAN RIVER COUNTY LANDFILL					
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.		DESIGN BY: KBT	DATE: NOVEMBER 2023		
SIGNATURE		DRAWN BY: JJV	PROJECT NO.: FL9363A		
DATE		CHECKED BY: TC	FILE: FL9363A-C17		
KWASI BADU-TWENEGRAH LICENSE NO. 42460		REVIEWED BY: SA	DRAWING NO.:		
		APPROVED BY: KBT	<u>23</u> OF <u>24</u>		



32
24 DETAIL
SILT CHECK DAM (TYPICAL)
(NOTE 1)
SCALE: NOT TO SCALE (N.T.S.)

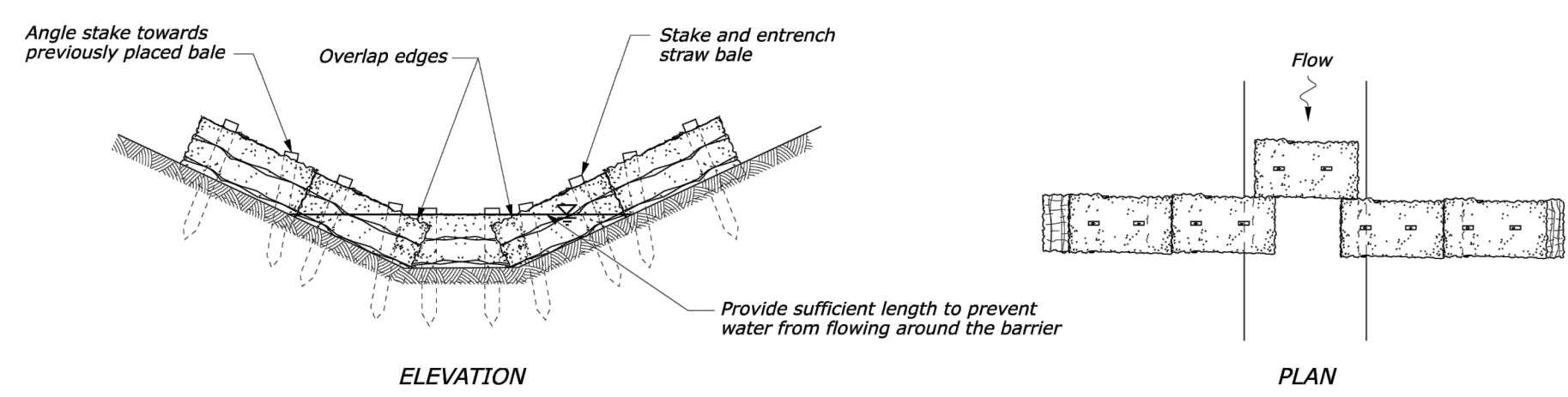


33
24 DETAIL
SILT FENCE (TYPICAL)
(NOTE 2)
SCALE: N.T.S.

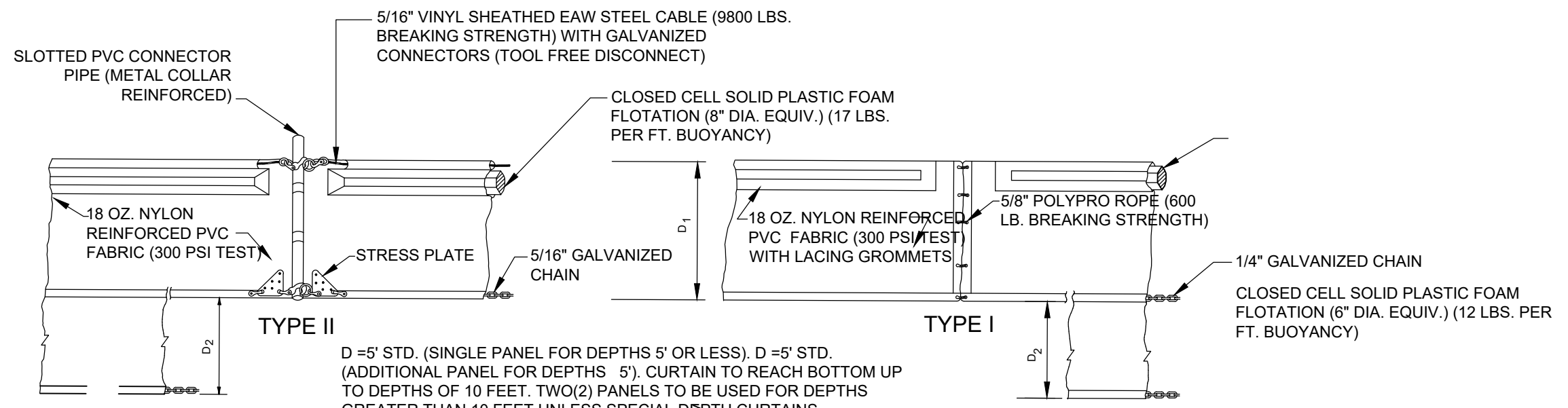


- NOTES:
1. STONE SIZE: 75-125 mm (3-5") OPEN GRADED ROCK.
 2. LENGTH: AS EFFECTIVE BUT NOT LESS THAN 15 m (50').
 3. THICKNESS: NOT LESS THAN 200 mm (8").
 4. WIDTH: NOT LESS THAN FULL WIDTH OF ALL POINTS OF INGRESS/EGRESS.
 5. WASHING: WHEN NECESSARY, VEHICLE WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC ROADWAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE AND DRAINS INTO AN APPROVED TRAP OR SEDIMENT BASIN. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING ANY STORM DRAIN, DITCH OR WATERCOURSE USING APPROVED METHODS.
 6. MAINTENANCE: THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADWAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AS WELL AS REPAIR AND CLEAN OUT OF ANY MEASURE DEVICES USED TO TRAP SEDIMENT. ALL SEDIMENTS THAT IS SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC ROADWAY MUST BE REMOVED IMMEDIATELY.
 7. DRAINAGE: ENTRANCE MUST BE PROPERLY GRADED OR INCORPORATE A DRAINAGE SWALE TO PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.

34
24 DETAIL
STABILIZED CONSTRUCTION ENTRANCE AND EXIT
SCALE: N.T.S.



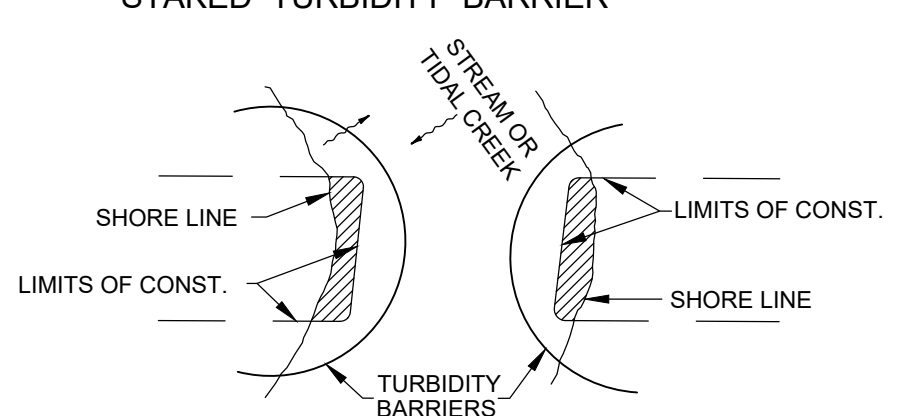
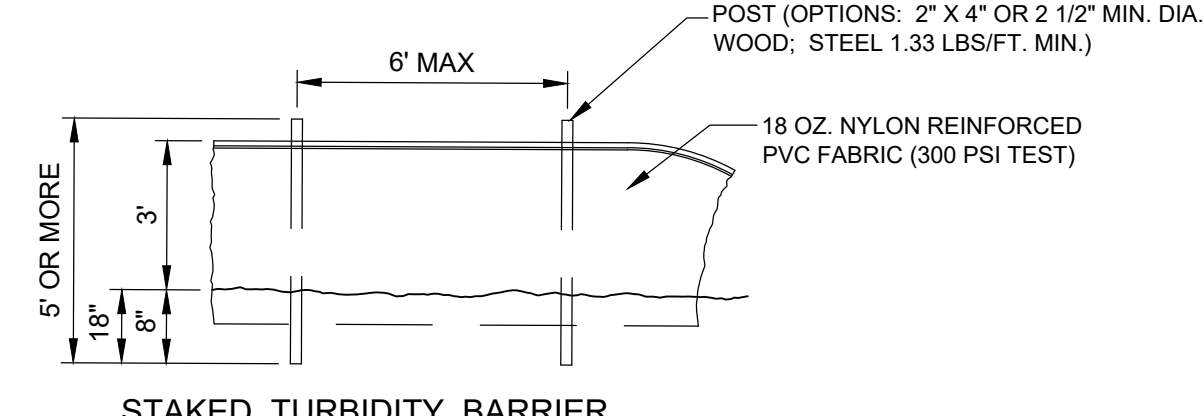
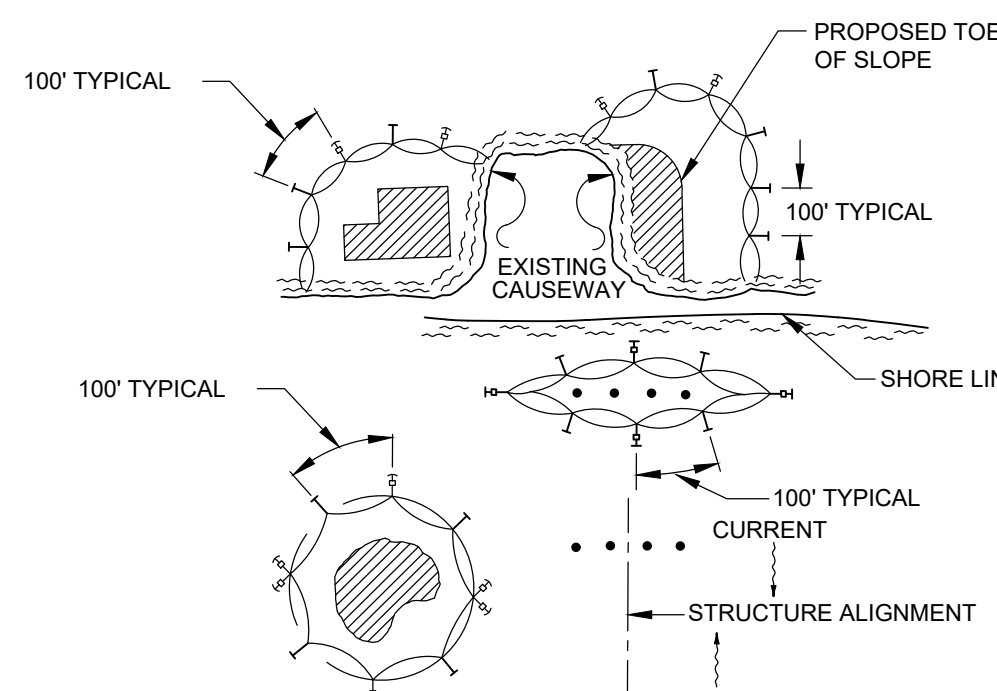
35
24 DETAIL
STRAW BALE BARRIER IN DITCH
(NOTE 3)
SCALE: N.T.S.



- LEGEND
- PILE LOCATIONS
 - ▨ DREDGE OR FILL AREA
 - ⊙ MOORING BUOY/WANCHOR
 - ANCHOR
 - ↔ BARRIER MOVEMENT DUE TO CURRENT ACTION

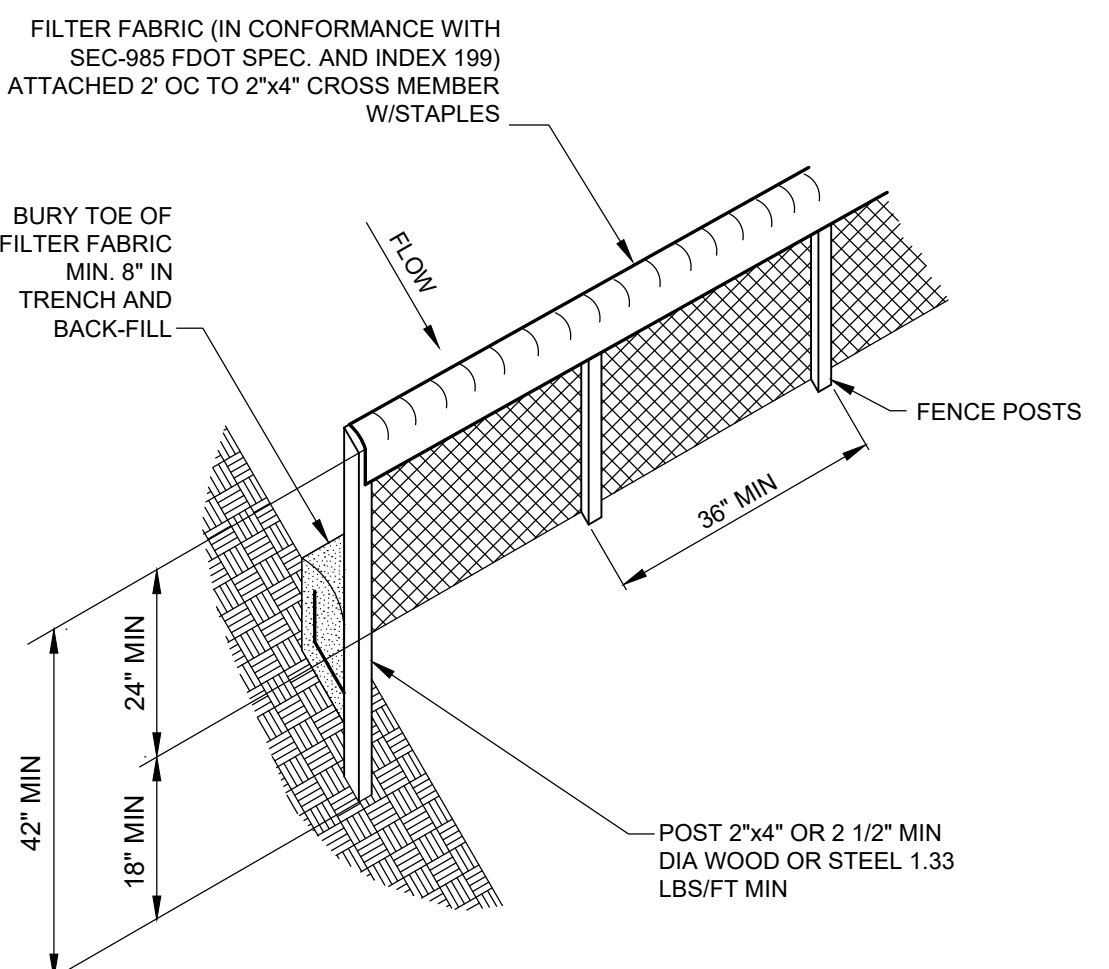
- GENERAL NOTES
1. FLOATING TURBIDITY BARRIERS ARE TO BE PAID FOR UNDER THE CONTRACT UNIT PRICE FOR FLOATING TURBIDITY BARRIER, LF.
 2. STAKED TURBIDITY BARRIERS ARE TO BE PAID FOR UNDER THE CONTRACT UNIT PRICE FOR STAKED TURBIDITY BARRIER, LF.

FLOATING TURBIDITY BARRIERS



NOTE:
TURBIDITY BARRIERS FOR FLOWING STREAMS AND TIDAL CREEKS MAY BE EITHER FLOATING, OR STAKED TYPES OR ANY COMBINATIONS OF TYPES THAT WILL SUIT SITE CONDITIONS AND MEET EROSION CONTROL AND WATER QUALITY REQUIREMENTS. THE BARRIER TYPE(S) WILL BE AT THE CONTRACTORS OPTION UNLESS OTHERWISE SPECIFIED IN THE PLANS, HOWEVER PAYMENT WILL BE UNDER THE PAY ITEM(S) ESTABLISHED IN THE PLANS FOR FLOATING TURBIDITY BARRIER AND/OR STAKED TURBIDITY BARRIER. POSTS IN STAKED TURBIDITY BARRIERS TO BE INSTALLED IN VERTICAL POSITION UNLESS OTHERWISE DIRECTED BY THE ENGINEER.

36
24 DETAIL
TURBIDITY BARRIER
SCALE: N.T.S.



37
24 DETAIL
STAKED SILT FENCE
SCALE: N.T.S.

- NOTE:
1. SILT CHECK DAMS SHALL BE PLACED EVERY 100' ALONG THE DRAINAGE DITCH ON SOUTH SIDE OF THE VERTICAL EXPANSION ACCESS ROAD.
 2. SILT FENCE SHALL BE PLACED WITHIN 100' OF ALL DISTURBED AREAS UNTIL COMPLETION OF CONSTRUCTION.
 3. STRAW BALE BARRIERS SHALL BE INSTALLED EVERY 200' WITHIN THE PERIMETER DITCH.

REV	DATE	DESCRIPTION	DRN	APP
-	11/8/2023	ISSUE FOR BID	JJV	KBT
<p>Geosyntec consultants</p> <p>1200 RIVERPLACE BOULEVARD, SUITE 710 JACKSONVILLE, FLORIDA 32207 USA PHONE: 904.858.1818 - FAX: 904.396.1143 CERTIFICATE OF AUTHORIZATION NO. 4321</p> <p>1325 74th AVENUE SW VERO BEACH, FLORIDA 33968 USA PHONE: 772.770.5112</p>				
TITLE: STORMWATER POLLUTION PREVENTION DETAILS				
PROJECT: PHASE II - CELL 3 CONSTRUCTION				
SITE: INDIAN RIVER COUNTY LANDFILL				
<p>THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.</p> <p>DESIGN BY: KBT DATE: NOVEMBER 2023</p> <p>DRAWN BY: JJV PROJECT NO.: FL9363A</p> <p>CHECKED BY: TC FILE: FL9363A-C27</p> <p>REVIEWED BY: SA DRAWING NO.: 24 OF 24</p> <p>APPROVED BY: KBT</p>				

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SECTION 00901

APPROVED PERMITS

Phase 2 – Cell 3 Construction

NO. Permit & Description

- 1 Indian River County Landfill Facility – Class I Construction and Operation Permit, Modified Permit No. 0128769-033-MM issued on November 11, 2022 from previous Permit No. 0128769-022-SC and 0128769-023-SO is Complete, by Florida Department of Environmental Protection Central District Office.

- 2 Indian River County Landfill (IRCL) – Environmental Resource Permit Extension File No. EM 31-0163429-010 for previously issued Permit No. ERP 31-0163429-009-EM, was Modified and Permit Extension Issued to Indian River County Solid Waste Disposal District, Permitting Authority: Florida Department of Environmental Protection Central District Office, August 8, 2015.

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