



ECDC Environmental 1111 West Highway 123
East Carbon Utah, 84520
435-888-4451

Div of Waste Management
and Radiation Control

OCT - 2 2018

DSHW-2018-009566

October 1, 2018

Scott Anderson, Director
Department of Environmental Quality
Division of Waste Management and Radiation Control
195 North 1950 West, 2nd Floor
Salt Lake City, UT 84114

Subject: ECDC Environmental, Cell Construction Project Manual Supercell 2,
Phase 2

Dear Mr. Anderson;

Please find enclosed a Project Manual for the next cell construction at ECDC Environmental. The plan is to construct a cell in 2019. Please note; the final cell size may change due to incoming waste volumes. ECDC would like to thank the Division for timely review and acceptance of this submittal.

If additional information is needed, or there are questions or comments I can be reached at 435-888-4115.

Sincerely,

A handwritten signature in black ink, appearing to read "D Olson", written over the word "Sincerely,".

Darin Olson

Div of Waste Management
and Radiation Control

OCT - 2 2018

DHW-2018-009566

**PROJECT MANUAL
SUPERCCELL 2, PHASE 2
ECDC ENVIRONMENTAL LANDFILL**

EAST CARBON, UTAH

SEPTEMBER 2018

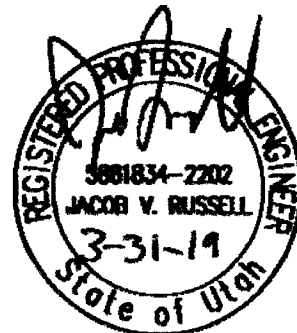
PROJECT NO. AU18.1094

SUBMITTED TO:

**ECDC Environmental Landfill, L.C.
111 West Highway 123
East Carbon, Utah 84520**

PREPARED BY:

**Geo-Logic Associates
143E Spring Hill Drive
Grass Valley, California 95945
(530) 272-2448**



Document 00003

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BIDDING REQUIREMENTS

Document 00004

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INVITATION TO BID

You are invited to prepare a bid for the construction of the **Supercell 2, Phase 2** at the ECDC Environmental Landfill in East Carbon, Utah. The scope of work for this project, which is described in the enclosed bid package, generally consists of excavation and subgrade preparation, engineered fill, installation of geosynthetic clay liner (GCL), HDPE geomembrane, leachate collection system (geocomposite), placement of a protective soil cover layer, stormwater control ditch construction and placement of road base.

It is expected that the work for this project will commence on or about January 15, 2019. The work is to be completed by August 30, 2019. However, excavation to Stockpile may begin in Q4 2018. (i.e., contractor will complete all work necessary for the CQA consultant to complete the liner system certification report). However, greater consideration may be given to the contractor that proposes an accelerated yet reasonable schedule.

Please prepare your bid in accordance with the Bid Package. **The completed Bid Form, Price Lists and bid submittals must be submitted no later than 5:00 p.m. September 21, 2018, via the Republic Services Ariba online bidding system.**

Upon review and evaluation of the submitted bids, we will notify the successful bidder and issue a Notice-to-Proceed. **ECDC Environmental Landfill, L.C. reserves the right to reject any or all bids.** It is the contractor's responsibility to have read and understood all terms and conditions stated in this document. The successful bidder will be required to sign a contractual agreement as shown in this document. Any modifications and/or exceptions to the agreement as shown must be brought to our attention before submittal of the bid. Questions must be submitted to the Republic Services Ariba online bidding system before 5:00 p.m. September 14, 2018.

A Pre-Bid meeting has been scheduled to familiarize bidders with the site and to address questions concerning the project at **1:00 pm on September 11, 2018** at the facility, located at **1111 West Highway 123 East Carbon, Utah 84520.** Attendance is recommended in order to submit a bid.

If you have any questions or comments concerning this project, or to confirm your attendance at the Pre-Bid meeting, please contact **Mr. Darin Olson at 435-888-4115** or dolson@republicservices.com. Your interest in this work is appreciated, and we look forward to receiving your company's bid.

Project timeline (Estimated):

| | |
|------------------------------------|---------------------------|
| Bid Opening | September 10, 2018 |
| Pre-Bid Meeting | September 11, 2018 |
| Question Submittal Deadline | September 14, 2018 |
| Bids Due | September 17, 2018 |
| Project Award | September 28, 2018 |
| Notice to Proceed | October, 2018 |
| Project Completion | August 31, 2019 |

END OF DOCUMENT

Document 00100

INSTRUCTIONS TO BIDDERS

PART 1 - RELATED DOCUMENTS

- 1.01 Document 00020 - Invitation to Bid
- 1.02 Document 00200 - Information Available to Bidders
- 1.03 Document 00300 - Bid Form
- 1.04 Supplements to Bid Form identified in Document 00300 - Bid Form
- 1.05 Document 00500 - Agreement
- 1.06 Document 00700 - General Conditions
- 1.07 Document 00800 - Supplementary Conditions

PART 2 - DEFINITIONS

- 2.01 Definitions set forth in Document 00700 - General Conditions and in other Contract Documents, are applicable to the Bid Documents.
- 2.02 *Addenda*: Written or graphic instruments issued prior to the opening of Bids, which clarify, modify, correct, or change the Bid Documents.
- 2.03 *Alternate Bid*: The monetary amount stated in the Bid for an addition to the Base Bid, if the corresponding addition to the Work, as described in the Bid Documents, is accepted. Each Alternate Bid shall include the cost of effects on adjacent or related components, and the Contractor's overhead and profit.

- 2.04 *Bid Documents*: The Project Manual and Drawings, including Addenda, plus Invitation to Bid, Instructions to Bidders, Information Available to Bidders, and Supplements to Bid Form identified in Document 00300 - Bid Form.
- 2.05 *Bidder*: A person or entity who submits a bid.
- 2.06 *Bid, Offer, Bidding*: The act of submitting a complete and properly signed offer in accordance with these Instructions to Bidders.
- 2.07 *Bid Price*: The monetary amount for performing the Work as identified by the Bidder in Document 00300 - Bid Form, which amount could be a Lump Sum Bid, a Total Unit Price Bid, or a combination of both.
- 2.08 *Base Bid*: The monetary amount stated in the Bid for which the Bidder offers to perform the Work described in the Bid Documents as the base, to which Work may be added for amounts stated in Alternate Bids.
- 2.09 *Total Unit Price Bid*: - The total monetary amount carried forward to Document 00300 - Bid Form, from Document 00405 - Schedule of Unit Price Work which contains prices per unit of measurement for materials, equipment, or services.

PART 3 - EXAMINATION OF BID DOCUMENTS AND

SITE

- 3.01 A complete set of the Bid Documents must be used in preparing Bids. *ECDC Environmental Landfill, L.C.* assumes no responsibility for errors or misinterpretations resulting from the use of an incomplete set of Bid Documents. On receipt of Bid Documents, verify that documents are legible and complete. Compare contents of the Project Manual with Document 00003 - Table of Contents, and compare drawings with Documents 00004 - List of Drawings. Notify the *ECDC Environmental Landfill, L.C.* Project Manager if the documents as issued are incomplete.
- 3.02 Bid Documents are made available only for the purpose of obtaining offers for this Project. Receipt or purchase of Bid Documents does not grant a license for other purposes.
- 3.03 It is the responsibility of the Bidder, before submitting bid to:
1. carefully study the Bid Documents and compare them with each other;
 2. examine the local conditions that may affect cost, progress, performance, or furnishing of the Work;
 3. consider federal, state, and local laws and regulations that may affect cost, progress, performance, or furnishing of the Work;
 4. examine the site and site conditions;
5. examine the Information Available to Bidders listed in Document 00200;
 6. make additional site investigations, at Bidder's own expense, to the extent Bidder deems necessary to ascertain the extent of surface and subsurface conditions and variations thereof;
 7. study and carefully correlate Bidder's personal observations with requirements of the Bid Documents; and
 8. report at once to the *ECDC Environmental Landfill, L.C.* Project Manager any errors, inconsistencies, or ambiguities discovered.
- 3.04 On request in advance, *ECDC Environmental Landfill, L.C.* at its own discretion will provide each Bidder access to the site (as appropriate) to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. A representative of *ECDC Environmental Landfill, L.C.* must be present during such explorations or testing. Bidder shall fill all holes, clean up, and restore the site to its former conditions upon completion of such explorations.
- 3.05 Failure to perform such explorations and tests during the bid period shall not relieve Bidder from responsibility for investigations, interpretations, and proper use of available information in preparation of Bidder's proposal.

3.06 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Part 3 of Instructions to Bidders, that without exception the Bid is premised upon performing and furnishing the Work required by the Bid Documents and such means, methods, techniques, sequences, or procedures of construction as may be indicated in or required by the Bid Documents, and that the Bid Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

PART 4 - QUESTIONS AND INTERPRETATIONS

- 4.01 Direct questions to *ECDC Environmental Landfill, L.C* Project Manager.
- 4.02 Verbal discussions and answers are not binding. Requests from Bidders for clarifications and interpretations of content of documents must be submitted through the Republic Services Ariba online bidding system, by the submittal date indicated.
- 4.03 The reply by the *ECDC Environmental Landfill, L.C.* Project Manager will be by Addendum.
- 4.04 If there is a discrepancy in the specifications and the plans, or between the specifications and the plans, and the Bidder has failed to notify the *ECDC Environmental Landfill, L.C.* Project Manager of the discrepancy prior to bidding so that an Addendum could be issued,

Bidder shall use the larger number, highest cost, best quality, and most restrictive.

PART 5 - ADDENDA

- 5.01 Addenda issued to Bidding Requirements are applicable only during the bidding period. Addenda to the Post-Bid Procedures are applicable only through the issuance of the Notice to Proceed. Any Addenda issued to Contract Forms, Conditions of the Contract, Specifications, or Drawings become a part of the Contract Documents. Include resultant costs in the Bid Price.
- 5.02 Addenda will be issued by the *ECDC Environmental Landfill, L.C.* Project Manager. Copies of each Addendum will be delivered through the Republic Services Ariba online bidding system to all parties recorded by *ECDC Environmental Landfill, L.C.* as having received the Bid Documents.
- 5.03 Each Bidder shall ascertain, prior to submitting a Bid, that the Bidder has received all Addenda issued. The Bidder shall acknowledge their receipt in the place indicated in Document 00300 - Bid Form and through the Republic Services Ariba online bidding system.

PART 6 - SUBSTITUTIONS OF MATERIALS/EQUIPMENT

- 6.01 For products specified by naming one or more manufacturers, or when individual specification sections require a specific construction

method or the use of specific construction equipment, with provision for consideration of substitutions (or equal), as provided in Paragraph 3.6 of Document 00700 - General Conditions, the general contract Bidder may submit requests for pre-bid approval of substitutions, if received by the *ECDC Environmental Landfill, L.C.* Project Manager no later than 10 days before the date set for receipt of Bids.

6.02 The request for substitution shall provide complete information to determine acceptability of such products, in accordance with the provisions of Paragraph 3.6 of Document 00700 - General Conditions.

6.03 The *ECDC Environmental Landfill, L.C.* Project Manager will consider the request for substitution and, if approved, will issue an Addendum to Bidders of record. The Bidder shall base his Bid only on substitutions approved in Addenda. Voluntary substitutions by the Bidder not listed in an Addendum will not be allowed.

6.04 Bidders shall include in their bids the costs of provisions for substitutions approved by Addenda, as stated in Subparagraph 3.6.4 of Document 00700 - General Conditions.

PART 7 - SUBCONTRACTORS, SUPPLIERS, AND

OTHERS

7.01 Bidders may be requested to identify Subcontractors, Suppliers, or other persons or entities proposed for

certain portions of the Work, to be submitted as an Attachment to the Bid Form. Such requests will be made in Part 5 of Document 00300 - Bid Form. *ECDC Environmental Landfill, L.C.* may consider such information in the evaluation of the bids.

7.02 The Bidder's receipt of a Notice of Intent to Award does not constitute approval by *ECDC Environmental Landfill, L.C.* of the Bidder's proposed subcontractors and suppliers *ECDC Environmental Landfill, L.C.* reserves the right to object to a proposed Subcontractor or Supplier for reasonable cause. The procedures for subcontractor and supplier approval are stipulated in Paragraph 5.2 of Document 00700 - General Conditions.

PART 8 - BID COMPLETION AND SUBMISSION

8.01 The Bid Form is available via the Republic Services Ariba online bidding system.

8.13 The Bidders shall attach the following required sections to Republic Services Ariba online bidding system section 3.5 online:

00415 Bidders Proposed
Construction Schedule

00420 Bidders Proposed
Subcontractors and
Suppliers

00425 Bidders Proposed Key
Personnel

PART 9 - MODIFICATION AND WITHDRAWAL OF

BIDS

9.01 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.

PART 10 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

10.01 All Bids will remain subject to acceptance for the period of time indicated in the Bid Form after the day of the Bid opening, but *ECDC Environmental Landfill, L.C.* may, in its sole discretion, release any Bid, prior to that date.

PART 11 - EVALUATION OF BIDS

11.01 *ECDC Environmental Landfill, L.C.* reserves the right to reject any and all Bids, to waive any and all informalities, and to negotiate contract terms with the Successful Bidder. *ECDC Environmental Landfill, L.C.* reserves the right to disregard all nonconforming, nonresponsive, unbalanced, or conditional Bids. Also, *ECDC Environmental Landfill, L.C.* reserves the right to reject the Bid of any Bidder if *ECDC Environmental Landfill, L.C.* believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability, or fails to meet any other standard or criteria of *ECDC Environmental Landfill, L.C.*

11.02 Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of words.

11.03 In evaluating Bids *ECDC Environmental Landfill, L.C.* will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form.

11.04 *ECDC Environmental Landfill, L.C.* may consider operating cost, maintenance requirements, performance data, and guarantees of material or equipment proposed for incorporation in the Work.

11.05 *ECDC Environmental Landfill, L.C.* may conduct such investigations as *ECDC Environmental Landfill, L.C.* deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, and other persons or organizations to perform and furnish the Work in accordance with the Project Manual to *ECDC Environmental Landfill, L.C.*'s satisfaction within the prescribed time.

11.06 If the contract is to be awarded, it will be awarded to the Bidder whose evaluation by *ECDC Environmental*

Landfill, L.C. indicates to *ECDC Environmental Landfill, L.C.* that the award will be in the best interest of the Project.

- 11.07 If the contract is to be awarded, *ECDC Environmental Landfill, L.C.* will provide the Successful Bidder a Notice to Proceed.

END OF DOCUMENT

Document 00200

INFORMATION AVAILABLE TO BIDDERS

1.0 AVAILABILITY

- A. The information described in this document is available for viewing at the ECDC Environmental Landfill office located at 1111 West highway 123, East Carbon, Utah 84520.

2.0 BIDDER RESPONSIBILITIES

- A. ECEC Environmental Landfill, L.C. or the Architect/Engineer shall not be responsible for the accuracy or completeness of such information. Responsibility for the accuracy of the information lies with the preparer.
- B. Bidder shall have full responsibility for the interpretation of the information for his bidding and construction purposes.
- C. Bidder shall have full responsibility for reviewing and verifying such information, for locating underground facilities or existing structures shown or indicated in the Contract Documents, and for coordination of the Work with the owners of such underground facilities or existing structures during construction.

3.0 REPORTS

- A. Project Manual for ECDC Environmental Landfill Supercell 2, Phase 2, September 2018, prepared by Geo-Logic Associates.
- B. Construction Quality Assurance Plan, September 2018, prepared by Geo-Logic Associates.
- C. Hydrogeologic Report, ECDC Environmental Landfill, March 1996, prepared by RB&G Engineering.

END OF DOCUMENT

Document 00300

BID FORM

To: Mr. Darin Olson
1111 West Hwy 123
East Carbon, Utah 84520

Project: Supercell 2, Phase 2 Construction
ECDC Environmental Landfill

Bid Due Date: September 21, 2018 prior to 5:00 p.m.

Bidder: _____

PART 1 OFFER

Having examined the place of the Work and all matters referred to in the Bid Documents and the Contract Documents for the named Project, we the undersigned hereby offer to enter into a Contract to perform the Work for the Bid Price of

_____ Dollars (\$ _____)

Lump Sum Contract. If the Bid is for a single Lump Sum Contract, the Bid Price above is the Total Stipulated Price offered including Cash Allowances, if any.

Unit Price or Combination Lump Sum and the Unit Price Contract. If the Bid is for a Unit Price Contract or a combination of Lump Sum and Unit Price Contract, the Bid Price above is the Base Bid tabulated in Document 00405 - Schedule of Unit Price Work, including Cash Allowances, if any.

Cash Allowances. All Cash Allowances listed in Document 00405 - Schedule of Unit Price Work and described in the Bid Documents are included in the Bid Price.

Changes in Contract Price Due to Variations in Actual Quantities. For items quoted in the supplement to this Bid, Document 00405 - Schedule of Unit Price Work, the Total Unit Price Bid is based in whole or in part on the Unit Prices for the quantity of units for each of the items listed. The Contract Price is subject to change due to variation in the actual quantity of each unit in the completed Work in accordance with the Contract Documents.

Alternate Bids. We will perform Alternate Bid Work as listed in Document 00405 - Schedule of Unit Price Work and described in the Bid Documents for an amount added to the Bid Price for each Alternate Bid that is accepted by ECDC Environmental Landfill L.C.

Period for Bid Acceptance. This offer shall be open to acceptance and is irrevocable for 90 days from the Bid date. That period may be extended by mutual written agreement of ECDC Environmental Landfill L.C. and the Bidder, or as needed to fulfill requirements for Agreement submittals, as discussed in Document 00450 - Post-Bid Procedures. After the Bid Acceptance Period, the Bidder may withdraw without penalty if no mutual agreement can be reached.

PART 2 CONTRACT TIME

If this offer is accepted, we shall meet the following schedule.

- Notice to Proceed - _____
- Start Work on or before - _____
- Substantial Completion of Excavation - _____
- Substantial Completion of Geomembrane Liner - _____
- Substantial Completion of Entire Project - _____
- Final Completion of Entire Project - _____

The Contractor shall perform the contract work between the hours of 6 AM and 6 PM, Monday through Saturday. No work shall be performed on Sundays, without the written permission of ECDC Environmental Landfill L.C.

The Contractor's schedule submitted with his bid shall account for and identify the total number of working days assumed to develop his bid for each month of work. The Contractor's schedule shall account for the anticipated normal weather condition.

PART 3 ADDENDA

The following Addenda have been received. The modifications to the Bid Documents noted therein have been considered and all costs relating thereto are included in the Bid Price:

- | | |
|---------------------------------|---------------------------------|
| Addendum No. _____, dated _____ | Addendum No. _____, dated _____ |
| Addendum No. _____, dated _____ | Addendum No. _____, dated _____ |
| Addendum No. _____, dated _____ | Addendum No. _____, dated _____ |

PART 4 SUPPLEMENT TO THIS BID

If the Bid is for a Unit Price Contract or a combination of Lump Sum and Unit Price Contract, Document 00405 - Schedule of Unit Price Work constitutes a Supplement to the Bid and is included as an integral part of this Bid.

PART 5 ATTACHMENTS TO THIS BID

The following required Attachments to this Bid provide information which may be used by Wasatch Regional Landfill, Inc. for the evaluation of the Bid:

- [] 00415 Bidder's Proposed Construction Schedule
- [] 00420 Bidder's Proposed Subcontractors and Suppliers
- [] 00425 Bidder's Proposed Key Personnel

PART 6 PENALTY FOR DELAY

We agree that time is of the essence and that we will pay ECDC Environmental Landfill L.C. delay penalties in accordance with Paragraph 9.11.1 of the General Conditions and 9.11.2 of the Supplementary Conditions if we fail to meet any of the Substantial Completion or Final Completion dates specified in the Contract Times on this Bid Form.

PART 7 SIGNATURES:

Bidder: _____
(Please print or type the full name of your proprietorship, partnership, corporation or joint venture.*)

By: _____
(Signature of sole proprietor, partner, or authorized officer of corporation.)

Name: _____
(Please print or type name.) (Title)

Address: _____
(Business Address of Bidder, print or type.)

Telephone: _____
(Print or type telephone number.)

** If the Bid is a joint venture, add additional Bid form signature sheets for each member of the joint venture.*

END OF DOCUMENT

Document 00405

SCHEDULE OF UNIT PRICE WORK

This Document, consisting of 2 pages, and Document 405A, constitutes a Supplement to Document 00300 - Bid Form for Supercell 2, Phase 2 Construction, ECDC Environmental Landfill. When a Contract is awarded, this Document becomes a supplement to Document 00500 - Agreement between ECDC Environmental Landfill L.C. and Contractor. Refer to Section 01025 for detail on bid items.

BASE UNIT PRICES FOR:

| ITEM NO. | ITEM DESCRIPTION | UNIT | QTY. | UNIT PRICE IN FIGURES | TOTAL IN FIGURES |
|--|--|-------------|------------------------|-----------------------|------------------|
| SUPERCCELL 2, PHASE 2 EARTHWORK | | | | | |
| 1 | Mobilization/Demobilization | Lump Sum | 1 | | |
| 2 | NPDES | Lump Sum | 1 | | |
| 3 | Surveying and As-built Drawings | Lump sum | 1 | | |
| 4 | Clearing and Stripping | Acre | 4 | | |
| 5 | Fence Removal and Replacement | Lineal Feet | 1,400 | | |
| 6 | Excavation to Engineered Fill – Phase 2 Area | Cubic Yard | 5,100 | | |
| 7 | Excavation to Stockpile ⁽¹⁾ | Cubic Yard | 324,000 ⁽¹⁾ | | |
| 7A | Excavation to Engineered Fill - Cell 10 Area ⁽¹⁾ | Cubic Yard | 294,000 ⁽¹⁾ | | |
| 8 | 3-Foot Thick Compacted Clay Liner, Processing and Placement | Cubic Yard | 460 | | |
| 9 | 3-Foot Thick Compacted Clay Liner Processing and Stockpile | Cubic Yard | 1,000 | | |
| 10 | 3-Inch Thick Soil Cushion - Side Slopes | Cubic Yard | 1,120 | | |
| 11 | 3-Inch Thick Soil Cushion - Floor | Cubic Yard | 4,020 | | |
| 12 | Geosynthetic Subgrade Preparation | Acre | 13 | | |
| 13 | Leachate Collection Gravel | Cubic Yard | 1,370 | | |
| 14 | Screen and Place 2-foot Thick Protective Soil Cover Layer in Phase 2 | Cubic Yard | 33,600 | | |
| 15 | Screen and Stockpile Protective Soil Cover Material for Future | Cubic Yards | 7,700 | | |
| 16 | Permanent Liner Termination | Lineal Feet | 670 | | |

| ITEM NO. | ITEM DESCRIPTION | UNIT | QTY. | UNIT PRICE IN FIGURES | TOTAL IN FIGURES |
|--|--|-------------|---------|-----------------------|--|
| 17 | Temporary Side-slope Liner Termination | Lineal Feet | 340 | | |
| 18 | Temporary Floor Liner Termination | Lineal Feet | 2,000 | | |
| 19 | Temporary Geomembrane Flap Installation and Anchorage | Lineal Feet | 670 | | |
| 20 | 6-Inch Perforated HDPE LCRS Header Pipe | Lineal Feet | 810 | | |
| 21 | 6-Inch Non-Perforated HDPE Header Cleanout Pipe and Support | Lineal Feet | 280 | | |
| 22 | 6-Inch Perforated HDPE LCRS Lateral Pipe | Lineal Feet | 2,660 | | |
| 23 | 12-Inch HDPE Leak Detection Riser Pipe | Lineal Feet | 220 | | |
| 24 | 24-Inch HDPE Sump Riser Pipe | Lineal Feet | 230 | | |
| 25 | Leachate Collection Sump Riser Support | Lump Sum | 1 | | |
| 26 | 12-mil Scrim Reinforced Polyethylene | Lineal Feet | 3,120 | | |
| 27 | Grade 50-Foot Wide Access Road | Lineal Feet | 360 | | |
| 28 | Compacted Aggregate Base for Access Road and Embankments | Cubic Yards | 650 | | |
| SUPERCCELL 2, PHASE 2 GEOSYNTHETICS | | | | | |
| 29 | Geosynthetic Clay Liner | Square Foot | 560,000 | NA | Owner Supplied and Installed by Others |
| 30 | 60-mil Double-Sided Textured Geomembrane | Square Foot | 560,000 | NA | Owner Supplied and Installed by Others |
| 31 | Double-sided Geocomposite | Square Foot | 411,000 | NA | Owner Supplied and Installed by Others |
| 32 | Geotextile Supply (Installation by Contractor included in Bid Item 10) | Square Foot | 50,000 | NA | Owner Supplied and Installed by Contractor |

TOTAL UNIT PRICE BID: = \$ _____

(1) Bid Item 7A is an alternate Bid Item where excavated material would be hauled to Cell 10 and placed as engineered fill. Owner will determine if Bid Item 7 or 7A will be included in the contract prior to execution of the contract.

* The quantities shown herein for engineered fill and stockpiling are for bidding purposes only. Actual quantities will be determined by the pre- and post-construction surveys conducted by the CONTRACTOR.

END OF DOCUMENT

UNIT PRICE LIST – The following unit price list should represent all components of the work, and will be utilized as the basis for determining compensation for change orders, delays, or unspecified extra work items that may arise during the work. The cost indicated for each item will be the total cost of the compensation and will include labor, supervision, overheads, profit and any other costs. Standby will be incurred by COMPANY only if the CONTRACTOR will be unable to work a forty (40) hour week because of COMPANY caused delays. COMPANY will not pay standby time because of inclement weather. Rates for the work performed will be identified in the Agreement. Standby rates cover ownership costs only; costs for profit, labor, and maintenance have been deducted. Standby for rental will be presented by CONTRACTOR for review and approval by COMPANY; only those items identified as rental equipment in the original bid or subsequently approved for project use in writing by COMPANY will be considered. CONTRACTOR to provide formula to calculate standby costs from unit costs to apply for equipment not shown.

| Required | Equipment and Model | Unit Cost (\$/hour) | Stand-by Rate (\$/hour) |
|----------------------------|---------------------|---------------------|-------------------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Labor (by Category) | | | |
| Field Superintendent | | | |
| Equipment Operator | | | |
| | | | |
| | | | |
| | | | |

Note: List all of the equipment required for the execution of this job.

Document 00415

BIDDER'S PROPOSED CONSTRUCTION SCHEDULE

- 1.00 This Document 00415 constitutes an Attachment to Document 00300 - Bid Form.
- 2.00 The information provided by the Bidder in this Document will be one component that ECDC Environmental Landfill L.C. may use to evaluate the Bid.
- 3.00 Bidder proposes the following construction schedule for the major items of the Work. A construction schedule outline in the format of Bidder's choice is attached:

| <u>ACTIVITY</u> | <u>START DATE</u> | <u>COMPLETION DATE</u> |
|-----------------|-------------------|------------------------|
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- 4.00 Upon award of the Contract, the successful Bidder will be required to prepare and submit a construction schedule for the Work to the detail required by the ECDC Environmental Landfill L.C. Project Manager, in accordance with Paragraph 3.11.1 of Document 00700 - General Conditions.

END OF DOCUMENT

Document 00420

BIDDER'S PROPOSED SUBCONTRACTORS AND SUPPLIERS

- 1.00 This Document 00420 constitutes an Attachment to Document 00300 - Bid Form.
- 2.00 The information provided by the Bidder in this Document will be one component that ECDC Environmental Landfill L.C. may use to evaluate the Bid.
- 3.00 Bidder proposes to use the following Subcontractors and Suppliers:

| <u>DESCRIPTION OF WORK</u> | <u>SUBCONTRACTOR</u> | <u>SUPPLIER</u> |
|----------------------------|----------------------|-----------------|
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END OF DOCUMENT

Document 00425

BIDDER'S PROPOSED KEY PERSONNEL

- 1.00 This Document 00425 constitutes an Attachment to Document 00300 - Bid Form.
- 2.00 The information provided by the Bidder in this Document will be one component that ECDC Environmental Landfill L.C. may use to evaluate the Bid.
- 3.00 Bidder proposes to use the following key personnel to manage the Work. Attach resumes for each person:

| | | |
|----------------------------------|--------------------|---------------|
| Project Manager | Location of Office | Telephone No. |
| Project Engineer (if applicable) | Location of Office | Telephone No. |
| Project Business Manager | Location of Office | Telephone No. |
| General Superintendent | Location of Office | Telephone No. |

Indicate who will be the primary contact at the site and in the home office:

- * Home Office Contact
- ** Site Contact

If titles shown above are not appropriate, adjust as needed.

END OF DOCUMENT

CONTRACT FORMS

AGREEMENT FORMS

Document 00500

SAMPLE AGREEMENT BETWEEN

ECDC ENVIRONMENTAL LANDFILL AND CONTRACTOR

AGREEMENT

for

Professional Contracting Services

BONDS AND CERTIFICATES

Document 00610

PERFORMANCE BOND

KNOWN ALL MEN BY THESE PRESENTS:

That _____ (CONTRACTOR) of _____,

a corporation of the state of _____, hereinafter called "Principal", and

(Name of Surety)

Address of Surety)

hereinafter called "Surety", are held and firmly bound unto ECDC Environmental Landfill L.C. hereinafter called "COMPANY" in the sum of _____ dollars (\$_____), in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain Agreement with the COMPANY dated _____, 2018, a copy of which is hereto attached and made a part hereof for the SUPERCELL 2, PHASE 2 CONSTRUCTION AT THE ECDC ENVIRONMENTAL LANDFILL.

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

PROVIDED FURTHER, that said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the Agreement or to the WORK to be performed thereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this BOND, and it does hereby waive notice of any such change or to the WORK or time, alteration, or addition to the terms of the Agreement or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the COMPANY and the Principal shall abridge the right of any beneficiary hereunder, whose Claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ counterparts, each one of which shall be deemed an original, this _____ day of _____, 2018.

ATTEST:

(Principal) For: _____
(Company)

(Principal Secretary) Of: _____

(SEAL) (Address)

(Witness as to Principal)

(Address)

ATTEST:

(Surety) For: _____
(Company)

(Surety Secretary) Of: _____

(Address)

(SEAL)

(Witness as to Principal) (Attorney in Fact)

(Address) (Address)

END OF DOCUMENT

Document 00615

CERTIFICATES OF INSURANCE

THE STATE OF _____ §

§ **KNOW ALL MEN BY THESE PRESENTS:**

THE COUNTY OF _____ §

THAT WE, _____, as

Principal, hereinafter called "Contractor", do hereby hold and will maintain the required coverages as set forth in the Agreement.

CONTRACTOR AS PRINCIPAL

Company Name

By _____

Name:
Title:
Date:

THE FOREGOING ARE ACCEPTED ON BEHALF OF ECDC ENVIRONMENTAL LANDFILL, L.C.

By _____

Name:
Title:
Date:

END OF DOCUMENT

ADMINISTRATIVE FORMS

Document 00650

NOTICE TO PROCEED

Date: _____

To: _____

Address: _____

Project Title: _____

Site Name: _____

Location: _____

You are hereby notified that the Date of Commencement of the Work is _____.
On that date you are to start performing your obligations under the Contract Documents. In
accordance with Article 2 of the Agreement, the Contract Time is _____ days; the
date on which penalties for delay shall commence is established as _____.

A pre-construction conference will be held at __TBD__ AM/PM on __TBD__, 2018 at the ECDC
Environmental Landfill.

Additionally before you may start any Work at the site, you must:

ECDC Environmental Landfill L.C.

BY: _____
Project Manager

cc: _____

END OF DOCUMENT

Document 00655

APPLICATION AND RECOMMENDATION FOR PAYMENT

| | |
|---|---|
| APPLICATION NO. _____ | FOR PERIOD BEGINNING _____ & ENDING _____ |
| CONTRACTOR'S APPLICATION FOR PAYMENT | |
| A. Total Work Completed to Date 1. For Unit Price Work, attach itemized listing of number of units completed to date for each item of the Work identified in Document 00405 or approved Change Orders. 2. For Lump Sum Work, attach percentage complete of each portion of the Work listed in the Schedule of Values. | \$ |
| B. Materials Currently Stored and Not Incorporated Into the Work = _____, X .85 = | \$ |
| C. Total Earnings To Date (A + B) | \$ |
| D. Retainage, as a percentage of Total Work Completed to Date (check one): _____ 10% for Progress Payment _____ 0% for Final Payment _____ Other: _____ | \$ |
| E. Liquidated Damages: _____ Days at \$ _____/Day | \$ |
| F. Total Reductions (D + E) | \$ |
| G. Total Payments Due To Date (C - F) | \$ |
| H. Previous Recommendations for Payment | \$ |
| I. TOTAL AMOUNT DUE CONTRACTOR THIS DATE: | \$ |

| CONTRACT AMOUNT SUMMARY | | CONTRACT TIME SUMMARY | |
|--|----|--------------------------------------|--|
| A. ORIGINAL CONTRACT PRICE | \$ | ORIGINAL CONTRACT TIME | |
| B. Approved Change Orders: | | C. Approved Change Order Extensions: | |
| # _____ \$ _____ | | # _____, _____ days | |
| # _____ \$ _____ | | # _____, _____ days | |
| # _____ \$ _____ | | # _____, _____ days | |
| # _____ \$ _____ | | # _____, _____ days | |
| # _____ \$ _____ | \$ | # _____, _____ days | |
| C. TOTAL CURRENT CONTRACT PRICE | \$ | C. TOTAL CURRENT CONTRACT TIME | |
| D. TOTAL EARNINGS TO DATE | \$ | D. DAYS USED TO DATE | |
| E. PERCENTAGE EARNINGS TO DATE | \$ | E. PERCENTAGE DAYS USED TO DATE | |
| CURRENT CONTRACT SUBSTANTIAL COMPLETION DATE: _____ | | | |
| Contractor's Estimated Substantial Completion Date: _____/_____/_____ | | | |
| (Attach monthly revised construction schedule in accordance with Paragraph 3.11.3 of General Conditions) | | | |

CONTRACTOR'S CERTIFICATION

Contractor hereby certifies that (1) all previous payments received from ECDC Environmental Landfill L.C. for Work completed under this Contract have been applied by Contractor to discharge in full all obligations of Contractor incurred in connection with the Work covered by all previous Applications For Payment, and (2) all materials and equipment incorporated in the completed Work covered by the Application For Payment are free and clear of all liens, claims, security interests, and encumbrances.

 (Contractor)

By: _____

 (Name)

 (Title)

(Date)

RECOMMENDATION FOR PAYMENT

Having reviewed the Contractor's Application for Payment and supporting information, (initial appropriate action)

_____ I recommend payment for the full amount of the application, that is, \$_____.

_____ I recommend payment for a portion of the amount of the application, in the amount of \$_____. Payment for the remaining \$_____ of the application is contingent on receipt of the corrections or additional information marked on the application.

_____ I am returning the Application for Payment to the Contractor for the corrections or additional information marked on the application.

_____ I decline to recommend payment on the basis of the provisions in Paragraph 9.6 of the General Conditions and described more specifically in Attachment A.

By: _____ Date: _____
ECDC Environmental Landfill L.C. Project Manager

END OF DOCUMENT

Document 00675

CHANGE ORDER

To: _____

From: _____

Re: _____

PART 1 - NATURE OF CHANGES

1.01 Brief description of changes in the Work:

1.02 Reason for changes:

1.03 Changes are described in detail in the following attachments, which are hereby made a part of this Change Order:

PART 2 - ADJUSTMENTS TO CONTRACT

2.01 Change to Contract Price

| | <u>Percentage of Original Contract Price</u> | <u>Dollar Amounts, Contract Price</u> |
|-----------------------------|--|---|
| A. Original Contract Price | <u>100%</u> | <u> </u> |
| B. Previous Change Orders | <u> </u> | <u> </u> |
| C. This Change Order | <u> </u> | <u> </u> |
| D. New Total Contract Price | <u> </u> | <u> </u> |

2.01 Change to Contract Time

| | <u>Percentage of Original Contract Time</u> | <u>Date or Days</u> |
|-------------------------------------|---|-----------------------------|
| A. Contract Commencement Date | | <u> </u> |
| B. Original Contract Time | <u>100%</u> | <u> </u> days |
| C. Previous Change Order Extensions | <u> </u> | <u> </u> days |
| D. This Change Order Extension | <u> </u> | <u> </u> days |
| E. New Total Contract Time | <u> </u> | <u> </u> days |
| F. New Substantial Completion Date | | <u> </u> |

PART 3 - CONTRACTOR'S ACCEPTANCE

The undersigned Contractor agrees to perform the changes stipulated in this Change Order and any attachments for the dollar amount indicated and within the contract time indicated.

(Contractor)

By _____
(Signature)

(Printed or Typed Name)

(Title)

(Date)

PART 4 – ECDC ENVIRONMENTAL LANDFILL, L.C. APPROVAL

By _____
(Signature)

(Printed or Typed Name)

(Title)

(Date)

END OF DOCUMENT

CONDITIONS OF THE CONTRACT

Document 00700

GENERAL CONDITIONS

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 *Agreement:* The written and signed Contract Document, Document 00500, between ECDC Environmental Landfill L.C. and the Contractor covering the Work to be performed; other Contract Documents are attachments to the Agreement and are made a part thereof as identified in the Agreement.

1.1.2 *Approve, approved:* The acceptance or ratification by the Project Manager of an action by the Contractor or condition of the Work, provided in writing if required.

1.1.3 *Bonds:* Performance Bond, Payment Bond, and other instruments of surety.

1.1.4 *Conditions of the Contract:* The General Conditions and Supplementary Conditions constitute the part of Contract Documents which define the rights, responsibilities, and relationships of the entities involved in performance of the Contract. Participants in the contract, whose roles are identified in the Conditions of the Contract, include:

- .1 *Owner:* As defined in Article 2;
- .2 *Contractor and Superintendent:* As defined in Article 3;
- .3 ECDC Environmental Landfill L.C. *Project Manager, ECDC Environmental Landfill L.C. Project Engineer and Site Manager:* As defined in Article 4;
- .4 *Architect/Engineer:* As defined in Article 4;
- .5 *Subcontractor and Supplier:* As defined in Article 5; and
- .6 *Subconsultant:* As defined in Article 4.

1.1.5 *Contract:* The Contract Documents form the Contract for Work. The Contract represents the entire and integrated agreement between ECDC Environmental Landfill L.C. and Contractor and supersedes prior negotiations, representations

or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than ECDC Environmental Landfill L.C. and Contractor.

1.1.6 *Contract Documents:* The Agreement between ECDC Environmental Landfill L.C. and Contractor, the portions of the Contractor's Bid attached to the Agreement, and any post-Bid documentation submitted prior to execution when attached to the Agreement; the Bonds, the Conditions of the Contract, the Drawings and Specifications prepared by or approved by ECDC Environmental Landfill L.C., appropriate Addenda, the Notice to Proceed, and other documents as they are specifically enumerated in the Agreement, plus Modifications issued after execution of the Agreement.

1.1.7 *Drawings:* The graphic and pictorial portions of the Contract Documents which define the character and scope of the Work.

1.1.8 *Furnish:* Supply, pay for, and deliver to the Project Site, ready for unloading, unpacking, assembly, and installation.

1.1.9 *General Conditions:* The standard document published by ECDC Environmental Landfill L.C., a part of the Conditions of the Contract.

1.1.10 *General Requirements:* The sections of Division 1 of the Specifications which specify administrative and procedural requirements and temporary facilities required for the Project.

1.1.11 *Install:* Unload, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, clean, protect, and similar operations.

1.1.12 *Modification:* A modification to the Contract Documents, issued by the ECDC Environmental Landfill L.C. Project Manager on or after the Effective Date of the Agreement, is a Change Order, a Work Change Directive, or a written order for a minor change in the Work.

- 1.1.13 *Notice of Intent to Award:* The written notice by ECDC Environmental Landfill L.C. to the apparent successful Bidder stating that upon compliance by the Bidder with the conditions enumerated in the notice, ECDC Environmental Landfill L.C. will sign and award the Contract.
- 1.1.14 *Notice to Proceed:* The written notice by ECDC Environmental Landfill L.C. to Contractor fixing the date on which the Contract Time will commence and on which Contractor shall start to perform Contractor's on-site obligations under the Contract Documents.
- 1.1.15 *Product:* Materials, equipment, or systems incorporated into the Project.
- 1.1.16 *Project:* The total construction of which the Work performed under the Contract Documents may be the whole or part and which may include construction by ECDC Environmental Landfill L.C. or by separate contractors.
- 1.1.17 *Project Manual:* The volume assembled for the Work which includes the Bidding Requirements, sample forms, Conditions of the Contract, and Specifications.
- 1.1.18 *Property:* Lands on which the Work is to be performed and easements for access thereto, and other lands which are designated for use by the Contractor.
- 1.1.19 *Provide:* Furnish and install, complete and ready for the intended use.
- 1.1.20 *Site:* The Property.
- 1.1.21 *Separate Contractor:* A person, firm, or corporation retained by ECDC Environmental Landfill L.C. to perform work on the Property under a separate agreement.
- 1.1.22 *Specifications:* The portion of the Contract Documents, Divisions 1 through 16, consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.
- 1.1.23 *Supplementary Conditions:* The part of the Conditions of the Contract which amends or supplements the General Conditions.
- 1.1.24 *Surety:* The entity that is bound by the Performance Bond, Statutory Payment Bond, One-Year Maintenance Bond, and One-Year Surface Correction Bond, and that is responsible for completion of the Contract, including the correction period, and for payment of debts incurred in fulfilling the Contract. Surety shall include any co-surety or reinsurer, as applicable.
- 1.1.25 *Work:* The entire completed construction required by the Contract Documents, including all labor, materials, equipment, and services provided by Contractor to fulfill Contractor's obligations. The Work may constitute the whole or a part of the Project.
- 1.2 **EXECUTION, CORRELATION AND INTENT**
- 1.2.1 The Agreement shall be signed by ECDC Environmental Landfill L.C. and Contractor as provided in the Contract Documents.
- 1.2.2 Execution of the Contract by Contractor is conclusive that Contractor has carefully examined the Contract Documents, visited the site of the Work, become familiar with local conditions under which the Work is to be performed, and fully informed itself as to conditions and matters which can affect the Work or costs thereof. Contractor further affirms that it has correlated personal observations with requirements of the Contract Documents.
- 1.2.3 The intent of the Contract Documents is for Contractor to include all items necessary for the proper execution and completion of the Work. What is required by one of the Contract Documents shall be as binding as if required by all. Performance by Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the desired results.
- 1.2.4 Reference to standard specifications, manuals, or codes of a technical society, organization, or association, or to laws or regulations of a governmental authority, whether specific or implied, shall mean the latest edition in effect as of the date of receipt of bids, except as may be otherwise specifically stated.
- 1.2.5 No provision of any referenced standard, specification, or manual shall be effective to change the duties and responsibilities of ECDC

- Environmental Landfill L.C., Contractor, or Architect/Engineer or their consultants, employees, or representatives from those set forth in the Contract Documents, nor shall it be effective to assign to Architect/Engineer or its consultants, employees, or representatives any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibilities contrary to provisions of the Contract Documents.
- 1.2.6 The organization of Specifications into divisions, sections, and articles and arrangement of Drawings shall not control Contractor in dividing the Work among Subcontractors or in establishing the extent of work to be performed by any trade.
- 1.2.7 Specifications are written in imperative and streamlined form. This imperative language is directed to the Contractor unless specifically noted otherwise. When written in the streamlined form, the words "shall be" are included by inference where a colon (:) is used within sentences or phrases.
- 1.2.8 Unless otherwise stated in Contract Documents, words which have well-known construction industry technical meanings are used in Contract Documents in accordance with such recognized meanings.
- 1.3 **CONFLICTS, ERRORS, OR DISCREPANCIES**
- 1.3.1 If Contractor finds conflict, error, or discrepancy in the Contract Documents, Contractor shall report to ECDC Environmental Landfill L.C. Project Manager in writing at once, and shall obtain a written interpretation or clarification from Project Manager before proceeding with the Work affected thereby; however, Contractor shall not be liable to ECDC Environmental Landfill L.C. or to Architect/Engineer for failure to report any conflict, error, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof or should reasonably have known thereof.
- 1.4 **OWNERSHIP AND USE OF CONTRACT DOCUMENTS**
- 1.4.1 Drawings, Specifications, and other documents prepared by ECDC Environmental Landfill L.C. or

by Architect/Engineer are instruments of service through which the Work to be executed by Contractor is described.

- 1.4.2 Neither Contractor, nor Subcontractor, nor material or equipment supplier shall own or claim a copyright to the Contract Documents or any part of them.
- 1.4.3 Contract Documents prepared by ECDC Environmental Landfill L.C. or by Architect/Engineer, and copies furnished to Contractor, are for use solely with respect to this Project. They shall not be used by Contractor, Subcontractor, or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of ECDC Environmental Landfill L.C., and Architect/Engineer when applicable.
- 1.4.4 Contractor, Subcontractors, and material and equipment suppliers are granted a limited license to use and reproduce applicable portions of Contract Documents appropriate to and for use in execution of their work under the Contract.
- 1.5 **INTERPRETATION**
- 1.5.1 In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an", but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 - THE OWNER

- 2.1 **DEFINITION**
- 2.1.1 ECDC Environmental Landfill L.C.: The Owner is ECDC Environmental Landfill L.C. or its subsidiary. The term "ECDC Environmental Landfill L.C." means ECDC Environmental Landfill L.C., its subsidiary, or the authorized representative or ECDC Environmental Landfill L.C. or its subsidiary.
- 2.2 **LIMITATIONS ON ECDC ENVIRONMENTAL LANDFILL, L.C. EMPLOYEES**
- 2.2.1 No officer or employee of ECDC Environmental Landfill L.C. is empowered to authorize the Contractor to perform any act contrary to the

- terms of this Contract or the laws and ordinances of the place of the Project.
- 2.3 **INFORMATION AND SERVICES REQUIRED OF ECDC ENVIRONMENTAL LANDFILL, L.C..**
- 2.3.1 ECDC Environmental Landfill L.C., assisted by the Architect/Engineer when employed, will complete an application for building permit, as applicable for the place of the project.
- 2.3.2 Unless otherwise provided in Contract Documents, ECDC Environmental Landfill L.C. will furnish to Contractor one set of Contract Documents. Additional copies will be furnished on Contractor's request at the discretion of the ECDC Environmental Landfill L.C. Project Manager.
- 2.3.3 When necessary for performance of the Work, ECDC Environmental Landfill L.C. will provide surveys describing physical characteristics, legal limitations, legal description of the Project site, and horizontal and vertical control adequate to locate the Project.
- 2.3.4 If ECDC Environmental Landfill L.C. is required, under the Contract Documents, to provide information or services, such will be provided by ECDC Environmental Landfill L.C. with reasonable promptness to avoid delay in orderly progress of the Work.
- 2.3.5 The foregoing are in addition to other duties and responsibilities of ECDC Environmental Landfill L.C. enumerated herein and especially those in respect to Article 6 and Article 9.
- 2.4 **AVAILABILITY OF LANDS**
- 2.4.1 ECDC Environmental Landfill L.C. shall furnish the lands on which the Work is to be performed, easements for access thereto, and such other lands which are designated in the Contract Documents for use by the Contractor. ECDC Environmental Landfill L.C. will obtain and pay for easements for permanent structures and for permanent changes in existing facilities unless otherwise provided in the Contract Documents.
- 2.5 **ECDC ENVIRONMENTAL LANDFILL, L.C. RIGHT TO STOP WORK**
- 2.5.1 If Contractor fails to correct Work which is not in accordance with requirements of the Contract Documents, as required in Paragraphs 12.1.2 and 12.2, or persistently fails to carry out Work in accordance with Contract Documents, ECDC Environmental Landfill L.C., by written order, may order Contractor to stop the Work or any portion thereof until the cause for such order has been eliminated. However, the right of ECDC Environmental Landfill L.C. to stop the Work shall not give rise to a duty on the part of ECDC Environmental Landfill L.C. to exercise this right for the benefit of Contractor or any other person or entity, except to the extent required by Paragraph.
- 2.6 **ECDC ENVIRONMENTAL LANDFILL L.C. RIGHT TO CARRY OUT WORK**
- 2.6.1 If Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails, within a seven-day period after receipt of written notice from ECDC Environmental Landfill L.C., to commence and continue correction of such default or neglect with diligence and promptness, ECDC Environmental Landfill L.C. may, after that seven-day period, give Contractor a second written notice to correct such deficiencies within a second seven-day period. If Contractor, within the second seven-day period after receipt of the second notice, fails to commence and continue to correct any deficiencies, ECDC Environmental Landfill L.C. may correct such deficiencies without prejudice to other remedies ECDC Environmental Landfill L.C. may have, including right of termination under Paragraph 14.1.
- 2.6.2 In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due to Contractor the cost of correcting such deficiencies, including compensation for Architect/Engineer's additional services and expenses made necessary by such default, neglect, or failure. If payments then or thereafter due to Contractor are not sufficient to cover such amounts, Contractor shall pay the difference to ECDC Environmental Landfill L.C.
- 2.6.3 Notwithstanding ECDC Environmental Landfill L.C. right to carry out the Work, maintenance and protection of the Work remain Contractor's responsibility, as provided for in the

Performance Bond and as provided in Paragraph.

submittals approved pursuant to Paragraph 3.14.

ARTICLE 3 - THE CONTRACTOR

3.1 DEFINITION

3.1.1 The Contractor is the person, firm, or corporation identified as such in the Agreement, and is referred to throughout the Contract Documents as if singular in number. The term Contractor means the Contractor or its authorized representative.

3.1.2 Contractor shall maintain an office or agent located near the place of the Project during the period of construction; which location's street address or post office address shall be filed with the ECDC Environmental Landfill L.C. Project Manager.

3.1.3 Contractor shall not let or transfer this Contract without the consent of ECDC Environmental Landfill L.C.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by ECDC Environmental Landfill L.C. pursuant to Paragraph 2.3 and shall report at once to the ECDC Environmental Landfill L.C. Project Manager any discovered errors, inconsistencies, or omissions.

3.2.2 Contractor shall take field measurements and verify field conditions and shall carefully compare such conditions and other information known to Contractor with the Contract Documents before commencing activities. Discrepancies, inconsistencies, or omissions discovered during this process shall be immediately report to the ECDC Environmental Landfill L.C. Project Manager for resolution.

3.2.3 Contractor shall make a reasonable attempt to understand the Contract Documents before requesting interpretation from ECDC Environmental Landfill L.C.

3.2.4 Contractor shall perform the Work in accordance with the Contract Documents and

3.2.5 Contractor shall verify compliance of the Work with Contract Documents before requesting observation by ECDC Environmental Landfill L.C.

3.2.6 Contractor shall give the ECDC Environmental Landfill L.C. Project Manager 48 hour written notice before commencing work or renewing work where work has been stopped. Contractor shall also give the same notice to ECDC Environmental Landfill L.C.'s authorized inspectors.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 Contractor shall supervise, direct, and inspect the Work competently and efficiently, devoting such attention and applying such skills and expertise as necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible and have sole control over the means, methods, techniques, sequences, and procedures of construction, and for coordinating all work under the Contract.

3.3.2 Regardless of inspections by ECDC Environmental Landfill L.C., Contractor is responsible to perform and complete the Work in accordance with the Contract Documents. ECDC Environmental Landfill L.C. has no liability or responsibility to Contractor or Surety for work performed by Contractor which is not in accordance with Contract Documents, regardless of whether discovered during construction or after acceptance of the Work.

3.4 SUPERINTENDENT

3.4.1 Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall have the authority and responsibility to act for Contractor and to represent Contractor. Communications given to the superintendent shall be as binding as if given to Contractor.

3.4.2 Contractor, after Notice of Intent to Award, and prior to beginning field operations, shall furnish to the ECDC Environmental Landfill L.C. Project Manager, in writing, the name and qualifications

- of the person proposed by Contractor to be the superintendent. Contractor shall not assign or substitute any person as superintendent to whom the ECDC Environmental Landfill L.C. Project Manager makes reasonable objection in writing.
- 3.5 LABOR, MATERIALS, AND EQUIPMENT**
- 3.5.1** 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 strict discipline and good order at the site.
- 3.5.2** It is the policy of ECDC Environmental Landfill L.C. to achieve a drug-free workforce and to provide a workplace that is free from the use of illegal drugs, substance abuse, and alcohol abuse. The manufacture, distribution, dispensation, possession (either externally or internally), sale, or use of illegal drugs by Contractor's employees while on duty at ECDC Environmental Landfill L.C. worksites or on ECDC Environmental Landfill L.C. projects is prohibited. Contractor's employees are prohibited from working at ECDC Environmental Landfill L.C. worksites or ECDC Environmental Landfill L.C. projects while impaired by alcohol or under the influence of illegal or illicit substances.
- 3.5.3** Unless otherwise provided in the Contract Documents, Contractor shall furnish and assume full responsibility for materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, transportation temporary facilities, supplies, and other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the Work.
- 3.5.4** Materials and equipment shall be of specified quality and new, except as otherwise provided in the Contract Documents. If required by ECDC Environmental Landfill L.C., Contractor shall furnish satisfactory evidence, including reports of required tests, as to the kind and quality of materials and equipment.
- 3.5.5** Materials and equipment shall be suitably stored in a safe, neat, compact, and protected manner. Materials shall be stored in such a manner to cause the least inconvenience to adjacent property owners, tenants, and the general public, and shall not block access to or be closer than three feet to any fire hydrant. Trees, lawns, walks, drives, streets and other improvements shall be protected from damage by the Work, by materials, earth, debris, water, or otherwise. If private or public property is damaged by Contractor, it shall be restored to original condition or better by Contractor.
- 3.5.6** Contractor shall obtain ECDC Environmental Landfill L.C. approval for storage areas to be used for materials or equipment, for which payment has been requested under the provisions of Paragraph 9.4.3.2. Access to such storage areas, for inspection purposes, shall be provided to designated ECDC Environmental Landfill L.C. representatives. Materials once paid for by ECDC Environmental Landfill L.C. become the property of ECDC Environmental Landfill L.C. and may not be removed from the place of storage, except to the worksite, without ECDC Environmental Landfill L.C. written permission. Contractor's all-risk insurance shall cover all perils including loss or damage to materials during storage, loading, unloading, and transit to the site.
- 3.5.7** Work shall be performed in a thorough, workmanlike manner, notwithstanding any omission from the Specifications or the Drawings. Work not in accordance with the Contract Documents shall be made to conform thereto. Material not in conformance with Contract Documents will be rejected and shall be promptly removed from the site at Contractor's expense.
- 3.6 PRODUCT, CONSTRUCTION METHODS, AND CONSTRUCTION EQUIPMENT SUBSTITUTIONS**
- 3.6.1** For products specified by reference standards or by description only, Contractor may provide any product meeting those standards or description.
- 3.6.2** For products specified by naming one or more manufacturers, with provision for substitutions (or equal), Contractor may submit a request for substitution for any manufacturer not named.
- 3.6.3** When individual specification sections require a specific construction method or the use of

- specific construction equipment, with provision for substitutions (or equal), Contractor may submit a request for any method or equipment not named.
- 3.6.4 Contractor shall document each request for substitution with complete data substantiating compliance of proposed substitution with Contract Documents.
- 3.6.5 A request for substitution constitutes a representation that Contractor:
- .1 has investigated the proposed product, method, or equipment and determined that it meets or exceeds the quality level of the specified product, method or equipment;
 - .2 shall provide the same warranty for the substitution as for the specified product;
 - .3 shall coordinate installation or implementation of the proposed substitution and will make changes to other Work which may be required for the Work to be complete, with no additional cost to ECDC Environmental Landfill L.C.;
 - .4 confirms that cost data is complete and includes all related costs under the Contract Documents;
 - .5 waives Claim for additional cost or time extension which may subsequently become apparent; and
 - .6 shall provide review or redesign services by a licensed Architect/Engineer and shall obtain reapproval and permits from authorities.
- 3.6.6 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, nor will they be considered when acceptance will require revision to the Contract Documents.
- 3.6.7 ECDC Environmental Landfill L.C. has authority to reject any request for substitution.
- 3.7 **CASH ALLOWANCES**

- 3.7.1 Contractor shall include in the Contract Price all allowances stated in the Contract Documents for:
- .1 services, utility relocations, permits, or other such capital costs;
 - .2 materials and equipment.
- Items covered by an allowance shall be supplied for such amounts and by such persons or entities as ECDC Environmental Landfill L.C. may direct, but Contractor shall not be required to employ persons or entities against which Contractor makes reasonable objection.
- 3.7.2 Unless otherwise stated in the Contract Documents:
- .1 materials and equipment under an allowance shall be selected promptly by ECDC Environmental Landfill L.C. within the time limits for processing submittals;
 - .2 allowances shall cover the cost to Contractor of services completed or materials and equipment delivered at the site and all required non-exempt taxes, less applicable trade discounts;
 - .3 Contractor's costs for administering services, unloading and handling products at the site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowance shall be included in the Contract Price and not in the allowance;
 - .4 whenever costs are more than or less than the allowance, the Contract Price shall be adjusted accordingly by Change Order. The amount of the Change Order shall be the difference between actual costs and the amount of the allowance stated in the Contract Documents, and shall balance out all credits due to ECDC Environmental Landfill L.C.
- 3.8 **WARRANTY**
- 3.8.1 Contractor warrants to ECDC Environmental Landfill L.C. that materials and equipment furnished under the Contract will be free of

- defects in title, of good quality, and new unless otherwise required or permitted by the Contract Documents. Contractor further warrants that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with requirements of the Contract Documents.
- 3.8.2 Contractor further warrants that the Work will be free of concentrations of polychlorinated biphenyl (PCB), and other substances defined as hazardous by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or any other applicable law or regulation. Excepted from this warranty, are those hazardous substances specified for use under this Contract.
- 3.8.3 Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered non-conforming Work. Contractor's warranty excludes remedy for damage or defect caused by abuse by person or persons other than those for whom Contractor is responsible, modifications performed by someone other than Contractor, improper or insufficient maintenance by ECDC Environmental Landfill L.C., improper operation, or normal wear and tear under normal usage, and excludes a claim that hazardous material was incorporated into the Work if that material was specified in the Contract Documents. If required by ECDC Environmental Landfill L.C., Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
- 3.8.4 In the event of a defect in a specified product, either during construction or the warranty period, Contractor shall take appropriate measures with the manufacturer of the product to assure correction or replacement of the defective product with minimum delay.
- 3.8.5 Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to ECDC Environmental Landfill L.C. either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first. Such title shall be free and clear of all liens, claims, security interests, or encumbrances. No Work, materials, or equipment covered by an Application for Payment shall be subject to an agreement under which an interest is retained or an encumbrance is attached by the seller, the Contractor, or other party.
- 3.9 *TAXES*
- 3.9.1 Contractor shall pay all sales, consumer, use, and similar taxes for the Work or portions thereof provided by Contractor which are legally enacted when bids are received, whether or not yet effective or merely scheduled to go into effect.
- 3.9.2 Contractor shall obtain and require Subcontractors to obtain, all necessary permits from the State and from local taxing authorities to perform contractual obligations under the Agreement, including sales tax permits.
- 3.10 *PERMITS, FEES, AND NOTICES*
- 3.10.1 Unless otherwise provided in the Contract Documents, Contractor shall secure and pay for all construction permits, licenses, and inspections necessary for proper execution and completion of the Work and which are legally required at the time bids are received.
- 3.10.2 Contractor shall comply with and give notices required by laws, ordinances, rules, regulations, and lawful orders of public authorities bearing on performance of the Work, including Contractor's or Subcontractors' licenses; neither ECDC Environmental Landfill L.C. nor its agents shall be responsible for monitoring Contractor's compliance with this requirement.
- 3.10.3 It is not Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations. However, if Contractor observes that portions of the Contract Documents are at variance therewith, Contractor shall promptly notify the ECDC Environmental Landfill L.C. Project Manager in writing, and necessary changes shall be accomplished by appropriate modification.
- 3.10.4 If Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, rules and regulations without such notice, Contractor shall assume full

- responsibility for such Work and shall bear the attributable costs.
- 3.11 **CONSTRUCTION SCHEDULES**
- 3.11.1 Promptly after award of the Contract, Contractor shall prepare and submit a construction schedule for the Work for the ECDC Environmental Landfill L.C. Project Manager's review. The schedule shall reflect the minimum time required to complete the Project, not to exceed time limits current under the Contract Documents. Contractor shall revise the schedule at appropriate intervals as required by conditions of the Work and the Project. The schedule shall be related to the entire Project to the extent required by Contract Documents. Contractor shall provide for expeditious and practicable execution of the Work.
- 3.11.2 Contractor shall prepare and keep current, and submit for ECDC Environmental Landfill L.C. Project Manager's approval, a schedule of submittals which is coordinated with the construction schedule.
- 3.11.3 Each month, Contractor shall submit to the ECDC Environmental Landfill L.C. Project Manager a copy of the revised construction schedule indicating actual progress, incorporating all applicable changes, and indicating courses of action required to assure Project completion within the Contract Time.
- 3.12 **DOCUMENTS AND SAMPLES AT THE SITE**
- 3.12.1 Contractor shall maintain at the site and make available to the ECDC Environmental Landfill L.C. Project Manager one record copy of Drawings, Specifications, Addenda, Change Orders and other Modifications. Such documents shall be maintained in good order and marked currently to record changes and selections made during construction. In addition, Contractor shall maintain at the site approved Shop Drawings, Product Data, Samples, and similar submittals. These shall be delivered to the ECDC Environmental Landfill L.C. Project Manager prior to final inspection as required in Subparagraph 9.10.3.
- 3.13 **MANUFACTURER'S SPECIFICATIONS**
- 3.13.1 Contractor shall handle and install all materials and perform all work in the manner required by the materials manufacturer. Should the Contract Documents and manufacturer's instructions conflict, Contractor shall report the conflict to the ECDC Environmental Landfill L.C. Project Manager for resolution prior to proceeding with the Work.
- 3.13.2 References to the manufacturer's specifications, manufacturer's directions, or manufacturer's recommendations, shall refer to the referenced manufacturer's current published documents in effect as of the date of receipt of bids, or for Change Orders, as of the date of the Change Order.
- 3.14 **SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**
- 3.14.1 *Shop Drawings:* The drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor, Subcontractor, manufacturer, supplier, or distributor, to illustrate some portion of the Work.
- 3.14.2 *Product Data:* The illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by Contractor to illustrate materials or equipment for some portion of the Work.
- 3.14.3 *Samples:* The physical examples which illustrate materials, equipment, or workmanship, and establish standards by which the work will be judged.
- 3.14.4 Shop Drawings, Product Data, and Samples are not Contract Documents. The purpose of their submittal is to demonstrate, for those portions of the Work for which submittals are required, the way Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the ECDC Environmental Landfill L.C. Project Manager is subject to the limitations of Subparagraph 4.2.4.
- 3.14.5 Contractor shall review, approve, and certify that the content of the submittals conforms to Contract Documents without exception by affixing Contractor's approval stamp and signature, and submit to the ECDC Environmental Landfill L.C. Project Manager the

- Shop Drawings, Product Data, and Samples required by the Contract Documents. Submittals shall be transmitted with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of ECDC Environmental Landfill L.C. or of a separate contractor. Submittals made by Contractor which are not required by the Contract Documents may be returned without action. If, in the opinion of the ECDC Environmental Landfill L.C. Project Manager, the submittals are incomplete, indicate an inadequate understanding of the Work covered by the submittal, or indicate a lack of review by Contractor prior to submittal, the submittal may be returned unchecked to Contractor for correction of deficiencies and subsequent resubmittal.
- 3.14.6 Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, and Samples until the respective submittal has been returned with appropriate action. Such work shall be in accordance with reviewed submittals, unless the submittals are subsequently found to be defective.
- 3.14.7 By approving, certifying, and submitting Shop Drawings, Product Data, and Samples, Contractor represents, and Contractor's stamp of approval shall state, that Contractor has determined and verified materials, quantities, field measurements, and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and the Contract Documents.
- 3.14.8 Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by ECDC Environmental Landfill L.C. or Architect/Engineer's or Subconsultant's review of Shop Drawings, Product Data, or Samples unless Contractor has specifically informed the ECDC Environmental Landfill L.C. Project Manager in writing of such deviation at the time of submittal, and the ECDC Environmental Landfill L.C. Project Manager has given written approval of such deviation. Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, or Samples by ECDC Environmental Landfill L.C. or Architect/Engineer's or Subconsultant's approval thereof.
- 3.14.9 Contractor shall direct specific attention, in writing and on resubmitted Shop Drawings, Product Data, or Samples, to revisions other than those requested by ECDC Environmental Landfill L.C. on previous submittals.
- 3.14.10 Informational submittals upon which ECDC Environmental Landfill L.C. is not expected to take responsive action may be identified in the Contract Documents.
- 3.14.11 When professional certification of performance criteria or materials, systems, or equipment is required by the Contract Documents, ECDC Environmental Landfill L.C. shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.
- 3.14.12 Contractor shall submit Shop Drawings, Product Data, and Samples to the ECDC Environmental Landfill L.C. Project Manager in time to allow a minimum of 30 days for the Project Manager's review prior to the date Contractor needs the reviewed submittals returned. On instructions of ECDC Environmental Landfill L.C. Project Manager, this time may be shortened for a particular job requirement. For product colors or textures to be selected by ECDC Environmental Landfill L.C., submit all samples together to allow the ECDC Environmental Landfill L.C. Project Manager to prepare a complete selection schedule.
- 3.14.13 Submit Shop Drawings, Product Data, and Samples in the forms, quantities, and procedures specified in the Specifications.
- 3.14.14 When Shop Drawings, Product Data, and Samples are required, related work performed prior to review and acceptance of such submittals shall be at Contractor's risk and ECDC Environmental Landfill L.C. shall not be obligated to accept such work if such submittals are later found to be not acceptable.
- 3.15 *USE OF SITE*
- 3.15.1 Contractor shall perform and confine operations at the site to those areas permitted by law,

- ordinances, permits, and the Contract Documents, and shall not unreasonably encumber the site with materials or equipment.
- 3.15.2 In addition to lands provided by ECDC Environmental Landfill L.C. under Paragraph 2.4, Contractor shall provide for all lands and access thereto that may be required for use by Contractor for temporary construction facilities or for storage of materials and equipment, and shall indemnify ECDC Environmental Landfill L.C. during such use as stated in Paragraph 3.21.
- 3.16 **CUTTING AND PATCHING**
- 3.16.1 Contractor shall be responsible for cutting, fitting, and patching necessary to accomplish the Work and shall suitably support, anchor, attach, match, and trim or seal materials to the work of others. Contractor shall coordinate the Work with the work of other contractors to minimize conflicts, as provided in Article 6, Construction by ECDC Environmental Landfill L.C. or by Separate Contractors.
- 3.16.2 Contractor shall not endanger any work by cutting, digging, or other action, and shall not cut or alter the work of other contractors except with the written consent of ECDC Environmental Landfill L.C. and the affected contractor.
- 3.17 **CLEANING**
- 3.17.1 Contractor shall perform a daily clean-up of all dirt, debris, scrap materials, and other disposable items resulting from Contractor's operations, whether on site or off site. Unless otherwise authorized, all streets, access streets, driveways, and walkways shall be kept clean and open at all times.
- 3.17.2 Failure of Contractor to maintain a clean site, including access streets, will be the basis for ECDC Environmental Landfill L.C. to issue a written notice of non-compliance with the Contract. Should that notice to correct not be complied with within 24 hours, ECDC Environmental Landfill L.C. may authorize the necessary clean-up to be performed by others and the cost of such clean-up may be deducted from monies due Contractor.
- 3.17.3 Contractor is responsible for disposal of all waste materials and other excess materials resulting from Contractor's operations.
- 3.18 **SANITATION**
- 3.18.1 Contractor shall provide and maintain sanitary facilities at the jobsite for the use of all construction forces under the Contract.
- 3.19 **ACCESS TO WORK AND INFORMATION**
- 3.19.1 Contractor shall provide ECDC Environmental Landfill L.C., Architect/Engineer, Subconsultants, and governmental agencies with jurisdictional interests, access to the Work in preparation and in progress wherever located. Contractor shall provide proper and safe conditions for such access.
- 3.19.2 Contractor shall furnish to the ECDC Environmental Landfill L.C. Project Manager such information as required respecting the character of the products and the progress and manner of the Work, including information necessary to determine the cost of the Work.
- 3.20 **ROYALTIES, PATENTS, AND TRADE SECRETS**
- 3.20.1 Unless otherwise provided in the Contract Documents, Contractor shall at its cost procure any license or permit which is required for the use of any patented invention, article, process, or means, method, or instrumentality wrought into, used in, upon, or in any way or manner connected with the construction, erection, or maintenance of the Work or any part thereof as embraced in the Contract. Contractor shall pay all fees or royalties required for any such use or license. Such fees shall, unless otherwise provided in these Contract Documents, be included in the Contract Price. Contractor and Surety shall protect and hold harmless ECDC Environmental Landfill L.C. against any and all demands arising from Contractor's failure to comply with this requirement.
- 3.20.2 Alleged ownership by Contractor of trade secrets as to products used in the Work, or the preparation of any mixture for the Work, shall not be recognized by ECDC Environmental Landfill L.C. in the performance of the Contract. ECDC Environmental Landfill L.C. shall at all times have the Right to demand and shall be furnished information concerning materials or samples of ingredients of any materials used or proposed to be used in preparation of the concrete placed or other work to be done.

Mixtures once agreed on shall not be changed in any manner without the knowledge and consent of ECDC Environmental Landfill L.C. ECDC Environmental Landfill L.C. will make its best efforts to protect the confidentiality of such proprietary information.

3.21 *INDEMNIFICATION*

3.21.1 CONTRACTOR COVENANTS AND WARRANTS THAT IT WILL PROTECT, DEFEND, AND HOLD HARMLESS ECDC ENVIRONMENTAL LANDFILL L.C., ITS EMPLOYEES, OFFICERS, AND LEGAL REPRESENTATIVE (COLLECTIVELY, "ECDC ENVIRONMENTAL LANDFILL L.C.") FROM ANY AND ALL THIRD PARTY CLAIMS, DEMANDS, AND LIABILITY, INCLUDING DEFENSE COSTS, RELATING IN ANY WAY TO DAMAGES, CLAIMS, OR FINES ARISING BY REASON OF OR IN CONNECTION WITH CONTRACTOR'S ACTUAL OR ALLEGED NEGLIGENCE OR OTHER ACTIONABLE PERFORMANCE OR OMISSION OF CONTRACTOR IN CONNECTION WITH OR DURING THE PERFORMANCE OF THE DUTIES UNDER THIS AGREEMENT. DURING THE PERFORMANCE OF THE WORK AND ~~UP TO A PERIOD OF FIVE YEARS AFTER THE DATE OF FINAL ACCEPTANCE OF THE WORK,~~ ("DURING THE WARRANTY PERIOD AS DEFINED IN THE CONTRACT") CONTRACTOR FURTHER COVENANTS AND AGREES TO PROTECT, DEFEND, INDEMNIFY, AND HOLD HARMLESS ECDC ENVIRONMENTAL LANDFILL L.C. FROM ALL CLAIMS, ALLEGATIONS, FINES, DEMANDS, AND DAMAGES RELATING IN ANY WAY TO THE ACTUAL OR ALLEGED JOINT AND/OR CONCURRENT NEGLIGENCE OF ECDC ENVIRONMENTAL LANDFILL L.C. AND CONTRACTOR, ~~WHETHER CONTRACTOR IS IMMUNE FROM LIABILITY OR NOT.~~

3.21.2 IT IS THE EXPRESSED INTENTION OF THE PARTIES HERETO THAT THE INDEMNITY PROVIDED HEREIN IS AN AGREEMENT BY CONTRACTOR TO INDEMNIFY AND PROTECT ECDC ENVIRONMENTAL LANDFILL L.C. FROM ECDC ENVIRONMENTAL LANDFILL L.C.'S OWN NEGLIGENCE WHERE SAID NEGLIGENCE IS AN ALLEGED OR ACTUAL CONCURRING PROXIMATE CAUSE OF ANY ALLEGED THIRD PARTY HARM.

3.21.3 THE INDEMNITY PROVISION PROVIDED HEREIN SHALL HAVE NO APPLICATION TO ANY CLAIM OR DEMAND WHERE BODILY INJURY, DEATH,

OR DAMAGE RESULTS ONLY FROM THE SOLE NEGLIGENCE OF ECDC ENVIRONMENTAL LANDFILL L.C. UNMIXED WITH ANY FAULT OF THE CONTRACTOR.

3.21.4 NOTWITHSTANDING ANYTHING HEREIN TO THE CONTRARY, THE LIABILITY OF THE CONTRACTOR UNDER THIS INDEMNITY PROVISION SHALL NOT EXCEED \$1,000,000 PER OCCURRENCE.

3.21.5 IN THE EXECUTION OF THE CONTRACT, THE CONTRACTOR MUST COMPLY WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL LAWS, INCLUDING BUT NOT LIMITED TO LAWS CONCERNED WITH LABOR, SAFETY, MINIMUM WAGES, AND THE ENVIRONMENT. THE CONTRACTOR SHALL MAKE HIMSELF FAMILIAR WITH AND AT ALL TIMES SHALL OBSERVE AND COMPLY WITH ALL FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES, AND REGULATIONS WHICH IN ANY MANNER AFFECT THE CONDUCT OF THE WORK, AND SHALL INDEMNIFY AND SAVE HARMLESS ECDC ENVIRONMENTAL LANDFILL L.C. AND THEIR REPRESENTATIVES AGAINST ANY CLAIM ARISING FROM VIOLATION OF ANY SUCH LAW, ORDINANCE OR REGULATION BY HIMSELF OR BY HIS SUBCONTRACTOR OR HIS EMPLOYEES.

3.21.6 IF AND ONLY IF APPLICABLE LAWS AND REGULATIONS PROHIBIT OR LIMIT OWNER'S RIGHT TO REQUIRE CONTRACTOR TO INDEMNIFY OWNER AND ENGINEER AND THEIR CONSULTANTS, AGENTS AND EMPLOYEES FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES ARISING PARTIALLY FROM THEIR OWN NEGLIGENCE, CONTRACTOR'S INDEMNIFICATION OBLIGATIONS WITH RESPECT TO SUCH CLAIMS, DAMAGES, LOSSES AND EXPENSES SHALL BE REDUCED SO THAT CONTRACTOR AND THE INDEMNIFIED PARTIES SHALL EACH BEAR A SHARE OF ANY RESPONSIBILITY FOR SUCH CLAIMS, DAMAGES, LOSSES, AND EXPENSES WHICH IS PROPORTIONATE TO THEIR RESPECTIVE NEGLIGENCE ("CONCURRENET NEGLIGENCE DOES NOT INCLUDE DESIGN").

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.1 *DEFINITIONS*

- 4.1.1 *ECDC Environmental Landfill L.C. Project Manager:* The individual, designated in the Agreement, authorized to represent ECDC Environmental Landfill L.C. and acting directly or through the Project Engineer, Site Manager, Architect/Engineer, or Subconsultants.
- 4.1.2 *Project Engineer:* The authorized representative of the ECDC Environmental Landfill L.C. Project Manager for administration of the Project.
- 4.1.3 *Site Manager:* The authorized on-site representative of the ECDC Environmental Landfill L.C. Project Manager for assistance to the Project Engineer in administration and inspection of the Work.
- 4.1.4 *Architect/Engineer:* The individual who is lawfully licensed to practice architecture or engineering, and is under contract to ECDC Environmental Landfill L.C. to provide professional services as defined in the Contract Documents, under the direction of the ECDC Environmental Landfill L.C. Project Manager, and in making recommendations to ECDC Environmental Landfill L.C. Project Manager. The term Architect/Engineer means the architect or engineer or his or her authorized representative. When an Architect/Engineer is not employed for administration of the Contract, the Project Engineer will perform the duties and responsibilities designated in the Contract Documents for the Architect/Engineer in addition to the usual duties of the Project Engineer.
- 4.1.5 *Subconsultant:* The individual under contract to ECDC Environmental Landfill L.C. or the Architect/Engineer to provide professional support services such as but not limited to control point surveying, construction monitoring, and materials testing, under the direction of ECDC Environmental Landfill L.C. or the Architect/Engineer, and in making recommendations to ECDC Environmental Landfill L.C. The term Subconsultant means the subconsultant or his or her authorized representative.
- 4.1.6 *Underground Facilities:* Pipes, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments and encasements containing such facilities which exist underground for electricity, telephone, cable television, traffic control, or other communications systems; pipes conveying gases, steam, water, liquid petroleum products, sewage, storm drainage, or other liquids.
- 4.1.7 A single individual in the employ of ECDC Environmental Landfill L.C. may concurrently fill and perform the required duties of more than one of the positions of ECDC Environmental Landfill L.C. Project Manager, ECDC Environmental Landfill L.C. Project Engineer, and Site Manager.
- 4.2 **CONTRACT ADMINISTRATION**
- 4.2.1 The ECDC Environmental Landfill L.C. Project Manager will provide administration of the Contract as described in the Contract Documents, and will be ECDC Environmental Landfill L.C. representative during construction, and from time to time during the correction period described in Subparagraph 12.2.2.
- 4.2.2 The ECDC Environmental Landfill L.C. Project Manager, or his designated representative, will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely Contractor's responsibility as provided in Paragraph 3.3 and Article 10. ECDC Environmental Landfill L.C. Project Manager, or designated representative of ECDC Environmental Landfill L.C. Project Manager, will not have control over or charge of and will not be responsible for acts or omission of Contractor, Subcontractor, or their agents or employees, or of any other persons performing portions of the Work.
- 4.2.3 ECDC Environmental Landfill L.C. Project Manager or his designated representative has the right to attend project meetings and visit the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. The ECDC Environmental Landfill L.C. Project Manager will

- not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work.
- 4.2.4 ECDC Environmental Landfill L.C. Project Manager or his designated representative will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- 4.2.4.1 Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details, such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of Contractor.
- 4.2.4.2 The ECDC Environmental Landfill L.C. Project Manager's designated representative's review of submittals shall not relieve Contractor of obligations under Paragraphs 3.3, 3.8, and 3.14. The review will not constitute approval of safety precautions or, unless otherwise specifically stated by the ECDC Environmental Landfill L.C. Project Manager of any construction means, methods, techniques, sequences, or procedures. The ECDC Environmental Landfill L.C. Project Manager's review of a specific item shall not indicate approval of an assembly of which the item is a component.
- 4.2.5 The ECDC Environmental Landfill L.C. Project Manager will prepare Change Orders and Work Change Directives and may authorize minor changes in the Work as provided in Paragraph 7.5.
- 4.2.6 Based on field observations and evaluations, the ECDC Environmental Landfill L.C. Project Manager will process Contractor's Progress Payments, will certify the amounts due the Contractor, and will issue Certificates for Payment in such amounts.
- 4.2.7 The ECDC Environmental Landfill L.C. Project Manager will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, and will receive for ECDC Environmental Landfill L.C. review and records, written warranties and related documents required by the Contract and assembled by Contractor. The ECDC Environmental Landfill L.C. Project Manager will issue a final Certificate for Payment upon compliance with requirements of the Contract Documents.
- 4.2.8 The ECDC Environmental Landfill L.C. Project Manager will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request from Contractor. The ECDC Environmental Landfill L.C. Project Manager's response to such requests will be made with reasonable promptness and within time limits agreed upon. Interpretations and decisions of the ECDC Environmental Landfill L.C. Project Manager will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings.
- 4.2.9 The ECDC Environmental Landfill L.C. Project Manager has authority to reject Work which does not conform to Contract Documents.
- 4.2.10 Whenever the ECDC Environmental Landfill L.C. Project Manager considers it necessary or advisable for implementation of the intent of the Contract Documents, ECDC Environmental Landfill L.C. Project Manager has authority to require additional inspection or testing of the Work in accordance with Subparagraphs 13.5.3 and 13.5.4, whether or not such Work is fabricated, installed, or completed.
- 4.2.11 Neither the authority of ECDC Environmental Landfill L.C. Project Manager nor a decision made in good faith to exercise or not to exercise such authority under this Article 4 shall give rise to a duty or responsibility of the ECDC Environmental Landfill L.C. Project Manager to Contractor, Subcontractors, or their agents or employees, or to other persons performing portions of the Work.
- 4.3 *COMMUNICATIONS IN CONTRACT ADMINISTRATION*
- 4.3.1 Except as otherwise provided in the Contract Documents or when direct communications have been specifically authorized by ECDC Environmental Landfill L.C. Project Manager,

Contractor communication shall be with ECDC Environmental Landfill L.C. Project Manager. Communications by and with the Architect/Engineer shall be through the ECDC Environmental Landfill L.C. Project Manager. Communication with Subconsultants shall be through the ECDC Environmental Landfill L.C. Project Manager. Communications with Subcontractors and material suppliers shall be through Contractor. Communications by and with separate contractors shall be through the ECDC Environmental Landfill L.C. Project Manager.

4.4 CLAIMS

4.4.1 *Definition:* A Claim is a demand or assertion by Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time, or other relief with respect to terms of the Contract. The term Claim also includes other disputes and matters in question between ECDC Environmental Landfill L.C. and the Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims by Contractor shall rest with the Contractor.

4.4.2 *Decision of the ECDC Environmental Landfill L.C. Project Manager:* Claims shall be referred to the ECDC Environmental Landfill L.C. Project Manager for action as provided in Paragraph 4.5. A presentation of a Claim and a decision by the ECDC Environmental Landfill L.C. Project Manager, as provided in Subparagraph 4.5.4, shall be required as a condition precedent to litigation of a Claim between Contractor and ECDC Environmental Landfill L.C. as to all such matters arising prior to the date the final payment is due, regardless of whether such matters relate to execution and progress of the Work or the extent to which the Work has been completed.

4.4.2.1 The decision by the ECDC Environmental Landfill L.C. Project Manager in response to a Claim shall not be a condition precedent to litigation in the event the ECDC Environmental Landfill L.C. Project Manager has failed to render a decision under Subparagraphs 4.5.1 or 4.5.4 within agreed time limits.

4.4.3 *Time Limits on Claims:* Claims by Contractor must be made within 30 days after occurrence of the event giving rise to such Claim.

4.4.4 *Continuing Contract Performance:* Pending final solution of a Claim, unless otherwise agreed in writing, Contractor shall proceed diligently with the performance of the Contract and ECDC Environmental Landfill L.C. shall continue to make payments in accordance with Contract Documents.

4.4.4.1 Pending final resolution of a Claim, and during investigation of conditions, Contractor shall be responsible for the safety and protection of the physical properties and conditions at the site.

4.4.5 *Claims for Concealed or Unknown Conditions.*

4.4.5.1 Concealed or unknown physical conditions include utility lines, man-made structures, storage facilities, hazardous substance, and the like but do not include naturally occurring soil conditions, conditions arising from groundwater, rain or flood, Contractor operations, or the failure of Contractor to properly protect and safeguard subsurface facilities.

4.4.5.2 If conditions are encountered at the worksite which are subsurface, Underground Facilities, or otherwise concealed or unknown conditions which differ materially from

.1 those indicated by Contract Documents; or

.2 conditions which Contractor could have discovered through site inspection, geotechnical testing, or otherwise;

then notice shall be given by Contractor to the ECDC Environmental Landfill L.C. Project Manager in writing before the condition is disturbed, but in no case later than 21 days after Contractor's first observation of the condition. Contractor's failure to provide notice as provided herein shall constitute waiver of Claim.

4.4.5.3 If the ECDC Environmental Landfill L.C. Project Manager determines that conditions differ materially and cause an increase or decrease in Contractor's cost or time required for performance of any part of the Work, ECDC

Environmental Landfill L.C. Project Manager will recommend an adjustment in the Contract Price or the Contract Time, or both, as provided in Article 7, Changes in the Work. If the ECDC Environmental Landfill L.C. Project Manager determines that the conditions at the site are not materially different and that no change in the Contract Price or Contract Time is justified, the ECDC Environmental Landfill L.C. Project Manager shall so notify Contractor in writing, stating the reasons. Claims by Contractor in opposition to such determination must be made within 21 days after ECDC Environmental Landfill L.C. Project Manager has given notice of the decision. If ECDC Environmental Landfill L.C. and Contractor cannot agree on an adjustment to Contract Price or the Contract Time, the adjustment shall be subject to further proceedings pursuant to Paragraph 4.5.

4.4.6 *Claims for Additional Cost:* If Contractor wishes to make Claim for an increase in the Contract Price, written notice shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.4.

4.4.6.1 If Contractor believes additional cost is involved for reasons including but not limited to:

- .1 a written interpretation of the ECDC Environmental Landfill L.C. Project Manager;
- .2 an order by ECDC Environmental Landfill L.C. to stop the Work when the Contractor is not at fault;
- .3 failure of ECDC Environmental Landfill L.C. to make payment;
- .4 suspension of Work by ECDC Environmental Landfill L.C.;
- .5 termination of the Contract by ECDC Environmental Landfill L.C., or;
- .6 other provision herein,

Claims shall be filed in accordance with the procedure established herein.

4.4.6.2 No increase in Contract Price will be allowed for delays or hindrances to the Work, except for direct and unavoidable extra costs to Contractor

caused by the failure of ECDC Environmental Landfill L.C. to provide information or material, if any, which is to be provided by ECDC Environmental Landfill L.C. under the terms of this Contract. Any such price increase shall be subject to the provisions of Article 7.

4.4.6.3 In no instance will ECDC Environmental Landfill L.C. be deemed liable for claims for delay when the Date of Substantial Completion occurs prior to the expiration of the Contract Time.

4.4.7 *Claims for Additional Time:* If Contractor wishes to claim an increase in the Contract Time, written notice shall be given as provided in Paragraph 8.3. In the case of continuing delay, only one Claim is necessary.

4.4.8 *Claims for Injury or Damage to Person or Property:* If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time, not exceeding 21 days after the first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or additional time due to damage or injury is to be asserted, it shall be filed as provided in Subparagraphs 4.4.6 or 4.4.7.

4.5 RESOLUTION OF CLAIMS

4.5.1 The ECDC Environmental Landfill L.C. Project Manager will review Claims and take one or more of the following preliminary actions within 10 days of receipt of a Claim:

- .1 request additional supporting data from the Contractor;
- .2 submit a schedule to Contractor indicating when the ECDC Environmental Landfill L.C. Project Manager expects to take action;
- .3 reject the Claim in whole or in part, stating reasons for rejection;
- .4 recommend approval of the Claim, or;
- .5 suggest a compromise.

The ECDC Environmental Landfill L.C. Project Manager may also, but is not obligated to, notify the Surety of the nature and amount of the Claim.

4.5.2 If a Claim has been resolved, the ECDC Environmental Landfill L.C. Project Manager will prepare or obtain appropriate documentation.

4.5.3 If a Claim has not been resolved, the Contractor shall, within 10 days after receipt of the ECDC Environmental Landfill L.C. Project Manager's preliminary response, take one or more of the following actions:

- .1 submit additional supporting data requested by the ECDC Environmental Landfill L.C. Project Manager;
- .2 modify the initial Claim, or,
- .3 notify the ECDC Environmental Landfill L.C. Project Manager that the initial Claim stands.

4.5.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by Contractor or requested by the ECDC Environmental Landfill L.C. Project Manager, the ECDC Environmental Landfill L.C. Project Manager will render a written decision relative to the Claim, including any change in the Contract Price or the Contract Time or both. The ECDC Environmental Landfill L.C. Project Manager may, but is not obligated to, notify the Surety and request the Surety's assistance in resolving the controversy. ECDC Environmental Landfill L.C. Project Manager's decision shall be final and binding.

not include a separate contractor or Subcontractor of a separate contractor.

5.1.2 *Supplier:* A Supplier is a manufacturer, distributor, materialman, or vendor having a direct agreement with the Contractor or a Subcontractor for furnishing materials, equipment, or services.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 After receipt of Notice of Intent to Award, and within the time period stated in Document 00450 - Post-Bid Procedures, Contractor shall submit in writing to the ECDC Environmental Landfill L.C. Project Manager the names of Subcontractors and Suppliers proposed for each principal portion of the Work, with a description of the work. The ECDC Environmental Landfill L.C. Project Manager will reply to Contractor in writing stating whether or not ECDC Environmental Landfill L.C., after due investigation, has reasonable objection to any such proposed person or entity. Failure of the ECDC Environmental Landfill L.C. Project Manager to reply within seven days shall constitute notice of no reasonable objection.

5.2.2 Contractor shall not contract with a proposed Subcontractor or Supplier to whom the ECDC Environmental Landfill L.C. Project Manager has made reasonable and timely objection.

5.2.3 If the ECDC Environmental Landfill L.C. Project Manager has reasonable objection to a person or entity proposed by Contractor, the Contractor shall propose another to whom ECDC Environmental Landfill L.C. has no reasonable objection.

5.2.4 The Contract Price will be adjusted by the difference in the cost caused by such substitution of a Subcontractor or Supplier, and an appropriate Change Order will be issued.

5.2.5 Contractor shall execute contracts with Suppliers and approved Subcontractors within 30 days after the date of the notice to proceed.

5.2.6 Contractor shall notify ECDC Environmental Landfill L.C. Project Manager of any proposed change of a Subcontractor or Supplier previously accepted by ECDC Environmental Landfill L.C.

ARTICLE 5 - SUBCONTRACTORS AND SUPPLIERS

5.1 DEFINITIONS

5.1.1 *Subcontractor:* A Subcontractor is a person or entity who has a direct or indirect contract with the Contractor or is a person or entity that has a direct or indirect contract with another Subcontractor to perform a portion of the Work at the site. The term "Subcontractor" is referred throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does

5.2.7 Contractor shall not be required to employ any Subcontractor, Supplier, or other persons or entities against whom Contractor has reasonable objection.

5.3 *CONTRACTOR RESPONSIBILITY FOR SUBCONTRACTORS*

5.3.1 Contractor shall be fully responsible to ECDC Environmental Landfill L.C., as may be required by laws and regulations, for all acts and omissions of the Subcontractors, Suppliers, and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with Contractor.

ARTICLE 6 - CONSTRUCTION BY ECDC ENVIRONMENTAL LANDFILL L.C. OR BY SEPARATE CONTRACTORS

6.1 *ECDC ENVIRONMENTAL LANDFILL L.C. RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS*

6.1.1 ECDC Environmental Landfill L.C. reserves the right to perform construction operations related to the Project with ECDC Environmental Landfill L.C. own forces, and to award separate prime contracts in connection with other portions of the Project or other construction or operations on the site under conditions of the Contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If Contractor claims that delay or additional cost is involved because of such action by ECDC Environmental Landfill L.C., Contractor shall make a Claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the construction or operations at the site, the term "Contractor" in the Contract Documents in each case shall mean the entity which executes each separate agreement.

6.1.3 Unless otherwise provided in the Contract Documents, when ECDC Environmental Landfill L.C. performs construction or operations related to the Project with ECDC Environmental Landfill L.C. own forces, ECDC Environmental Landfill L.C. shall have the same rights which apply to Contractor under the Conditions of the Contract.

6.2 *COORDINATION*

6.2.1 ECDC Environmental Landfill L.C. shall provide for coordination of the activities of ECDC Environmental Landfill L.C. own forces and of each separate contractor with the Work of Contractor, who shall cooperate with them. Contractor shall participate with other separate contractors and ECDC Environmental Landfill L.C. in reviewing their construction schedules when directed to do so. Contractor shall make any revisions to the construction schedule and the Contract Price deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by Contractor, separate contractors, and ECDC Environmental Landfill L.C., until subsequently revised.

6.3 *MUTUAL RESPONSIBILITY*

6.3.1 Contractor shall afford to ECDC Environmental Landfill L.C. and to separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall coordinate the construction and operations with other contractors as required by Contract Documents.

6.3.2 If part of Contractor's Work depends on proper execution of construction or operations by ECDC Environmental Landfill L.C. or a separate contractor, Contractor shall, prior to proceeding with the portion of the Work, inspect such other work and promptly report to the ECDC Environmental Landfill L.C. Project Manager apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution of the Work. Failure of the Contractor to so report shall constitute an acknowledgment that ECDC Environmental Landfill L.C. or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to discrepancies or defects not then reasonably discoverable.

6.3.3 Costs caused by delays or by improperly timed activities or non-conforming construction shall be borne by the entity responsible therefore.

6.3.4 Contractor shall promptly remedy damage caused by Contractor to completed or partially

completed construction or to property of ECDC Environmental Landfill L.C. or separate contractor.

6.3.5 Each separate contractor shall have the same responsibilities for cutting and patching as are described in Paragraph 3.16.

6.4 *ECDC ENVIRONMENTAL LANDFILL L.C. RIGHT TO CLEAN UP*

6.4.1 If a dispute arises among the Contractor, separate contractors, and ECDC Environmental Landfill L.C., as to responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.17, ECDC Environmental Landfill L.C. may clean up and allocate the cost among those responsible as the ECDC Environmental Landfill L.C. Project Manager determines.

ARTICLE 7 - CHANGES IN THE WORK

7.1 *CHANGES*

7.1.1 Changes within the scope of the Work may be accomplished after execution of the Agreement without invalidating the Contract and without notice to Contractor's Surety. Such changes may be accomplished by Change Order, Work Change Directive, or order for a minor change in the Work, subject to the limitations in this Article 7 and elsewhere in the Contract Documents.

7.1.2 Contractor shall proceed promptly to execute changes in the Work unless otherwise provided in the Change Order, Work Change Directive, or order for a minor change in the Work.

7.2 *CHANGE ORDERS*

7.2.1 A Change Order is a written instrument prepared by the ECDC Environmental Landfill L.C. Project Manager and signed by the ECDC Environmental Landfill L.C. Project Manager and Contractor, stating their agreement upon the following:

- .1 a change in the Work;
- .2 the amount of adjustment in the Contract Price, if any; and

.3 the extent of the adjustment in the Contract Time, if any.

7.3 *WORK CHANGE DIRECTIVES*

7.3.1 The ECDC Environmental Landfill L.C. Project Manager may, by Work Change Directive, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, stating a proposed basis for adjustment, if any, in contract Price or Contract Time, or both. Contractor shall carry out such directive promptly.

7.3.2 A Work Change Directive cannot change the Contract Price or the Contract Time, but is evidence that the parties agree that the change ordered by the Directive will be incorporated in a subsequently issued Change Order as to its effect, if any, on the Contract Price or the Contract Time.

7.3.3 A Work Change Directive signed by Contractor indicates the agreement of Contractor of the terms therewith, including adjustment in Contract Price and Contract Time or the method for determining them. Agreement on adjustments in Contract Price and Contract Time shall be immediately recorded as a Change Order.

7.3.4 A Work Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

7.4 *ADJUSTMENTS IN CONTRACT PRICE*

7.4.1 Adjustments in Contract Price shall be based on one of the following methods:

- .1 mutual acceptance of a fixed price properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

- .4 as provided in Subparagraph 7.4.2.
- 7.4.2 If Contractor does not respond promptly, or disagrees with the method for adjustment in the Contract Price, the method and the adjustment shall be determined by the ECDC Environmental Landfill L.C. Project Manager on the basis of reasonable expenditures and savings of those performing the work attributable to the change, including, in case of an increase in the Contract Price, an allowance for labor burden and for overhead and profit in the maximum percentages stated in Supplementary Conditions.
- 7.4.2.1 In such case, Contractor shall keep and present, in such form as the ECDC Environmental Landfill L.C. Project Manager may prescribe, an itemized accounting together with appropriate supporting data. Failure to submit such itemized accounting and supporting data within 21 days of a request for such data by the ECDC Environmental Landfill L.C. Project Manager shall constitute waiver of future Claims under this Subparagraph.
- 7.4.2.2 Unless otherwise provided in the Contract Documents, costs for the purposes of this Subparagraph shall be limited to the following:
- .1 costs of labor, including labor burden as stated in Supplementary Conditions for social security, unemployment insurance, customary and usual fringe benefits required by agreement or custom, and workers' compensation insurance;
 - .2 costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
 - .3 rental costs of machinery and equipment, exclusive of hand tools, whether rented from Contractor or others, with prior approval of the ECDC Environmental Landfill L.C. Project Manager;
 - .4 costs of premiums for all bonds and insurance and permit fees related to the Work;
- .5 additional costs of supervision and field office personnel directly attributable to the change; and
- .6 allowances for overhead and profit.
- 7.4.3 The amount of credit to be allowed by Contractor to ECDC Environmental Landfill L.C. for a deletion or change, which deletion or change results in a net decrease in the Contract Price, shall be determined in accordance with Paragraphs 7.4.1, 7.4.2, 7.4.2.1, and 7.4.2.2. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.
- 7.4.4 When Contractor agrees with the determination made by the ECDC Environmental Landfill L.C. Project Manager concerning adjustments in the Contract Price and Contract Time, or ECDC Environmental Landfill L.C. and Contractor otherwise reach agreement upon the adjustments, such agreement shall be immediately recorded by preparation and execution of an appropriate Change Order.
- 7.5 **MINOR CHANGES IN THE WORK**
- 7.5.1 The ECDC Environmental Landfill L.C. Project Manager will have the authority to order minor changes in the Work not involving adjustment in the Contract Price or the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by written order and shall be binding on ECDC Environmental Landfill L.C. and Contractor. Contractor shall carry out such written orders promptly.

ARTICLE 8 - TIME

8.1 **DEFINITIONS**

8.1.1 **Contract Time:** Unless otherwise provided, Contract Time is the number of calendar days stated in the Agreement, including authorized adjustments, allotted in Contract Documents for Substantial Completion of the Work.

8.1.2 **Day:** As used in the Contract Documents, the term shall mean any calendar day of 24 hours measured from midnight to the next midnight unless otherwise specifically defined.

- 8.1.3 *Effective Date of the Agreement:* The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement was countersigned by ECDC Environmental Landfill L.C.
- 8.1.4 *Date of Commencement of the Work:* The date established in the Notice To Proceed. The date shall not be changed by the failure to act of the Contractor or of persons or entities for which Contractor is responsible.
- 8.1.5 *Holiday:* The date established by ECDC Environmental Landfill L.C. as a holiday.
- 8.1.6 *Date of Substantial Completion:* The date certified by the ECDC Environmental Landfill L.C. Project Manager in accordance with Subparagraph 9.10.1.
- 8.2 **PROGRESS AND COMPLETION**
- 8.2.1 Time limits stated in the Contract Documents are the essence of the Contract. By executing the Agreement, Contractor confirms that the Contract Time is a reasonable period for performing the Work.
- 8.2.2 *Computation of Time:* In computing any period of time prescribed or allowed by these General Conditions, the day of the act, event, or default after which the designated period of time begins to run is not to be included. The last day of the period so computed is to be included, unless it is a Sunday or Holiday, in which event the period runs until the end of the next day which is not a Sunday or Holiday. Sundays and Holidays are considered to be calendar days and are to be included in all other time computations relative to the Contract Time.
- 8.2.3 Contractor shall not knowingly, except by agreement or instruction of the ECDC Environmental Landfill L.C. Project Manager in writing, commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11. The date of commencement of the Work shall not be changed by the effective date of such insurance.
- 8.2.4 Contractor shall proceed expeditiously, and without interruption, with adequate forces and shall achieve Substantial Completion within the Contract Time.
- 8.2.5 Should progress of the Work fall behind the Construction Schedule, except for reasons stated in Paragraph 8.3.1, Contractor shall submit a revised Construction schedule to ECDC Environmental Landfill L.C. Project Manager for approval. Contractor shall take action necessary to restore progress to the revised Construction Schedule and shall work such hours, including night shifts and lawful overtime operations, as necessary to achieve Substantial Completion within the Contract Time.
- 8.2.6 Except in connection with safety or protection of persons or Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed Monday through Saturday between the hours of 7:00 am and 7:00 pm. Performance of work between 7:00 pm and 7:00 am, and on Sunday or Holiday, shall not be permitted without consent of the ECDC Environmental Landfill L.C. Project Manager given after 24 hour prior written notice from Contractor.
- 8.2.7 The ECDC Environmental Landfill L.C. Project Manager by Work Change Directive may direct Contractor to take such measures as necessary to expedite construction to achieve Substantial Completion prior to expiration of Contract Time. When the construction time is expedited solely for the convenience of ECDC Environmental Landfill L.C. and not due to Contractor's failure to prosecute timely completion of the Work, then Contractor shall be entitled to an adjustment in the Contract Price equal to actual additional net costs in accordance with Article 7.
- 8.3 **DELAYS AND EXTENSIONS OF TIME**
- 8.3.1 Contractor may request an extension of Contract Time for any delay to the performance of the Agreement that arises from causes beyond the control and without the fault or negligence of Contractor. Examples of these causes are:
- .1 Acts of God or of the public enemy,
 - .2 Acts of the Government in either its sovereign or contractual capacity,
 - .3 Fires,
 - .4 Floods,

- .5 Epidemics,
 - .6 Quarantine restrictions,
 - .7 Strikes,
 - .8 Freight embargoes, and
 - .9 Unusually severe weather.
- Contractor may request an extension of Contract Time for delay if caused by the failure of a Subcontractor or Supplier at any tier to perform or make progress only if the cause of the failure is beyond the control of both Contractor and the Subcontractor or Supplier.
- 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Subparagraph 4.4.8.
 - 8.3.3 Any Claim for extending or shortening the Contract Time shall be based on written notice promptly delivered by the party making the Claim to the other party. The Claim shall accurately describe the occurrence generating the Claim, and a statement of the probable effect on progress of the Work. For Claims where Contract Documents require critical path method schedules, Contractor shall provide a revised critical path method schedule.
 - 8.3.4 Claims for extension of time will be considered only when a written Claim is filed within the time limits stated in Subparagraph 4.4.4 following the last date of the occurrence.
 - 8.3.5 The notice shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant is entitled as a result of the occurrence of said event. When the parties cannot agree, Claims for adjustment in the Contract Time shall be determined by ECDC Environmental Landfill L.C. Project Manager in accordance with Subparagraph 4.5.4.
- 9.1.2 *Lump Sum*: The single amount stated in the bid for completion of all Work to be performed for the entire Contract, or to be performed for a designated portion of the Contract.
 - 9.1.3 *Unit Price*: The amount stated in the bid for an individual, measurable item of work, which when multiplied by the actual quantity incorporated in the Work, amounts to the full compensation for completion of the item including work incidental to it.
- 9.2 UNIT PRICE WORK**
- 9.2.1 Where the Agreement provides that all or part of the Work is based on Unit Prices, initially the Contract Price will include, for all Unit Price work, an amount equal to the sum of the established Unit Prices for each separately identified item of Unit Price work times the estimated quantity of each item listed in the Agreement.
 - 9.2.2 Each unit price shall include an amount to cover Contractor's overhead and profit for each separately identified item.
 - 9.2.3 *Unit Price Quantities*: The quantities indicated in the Agreement are approximations made by ECDC Environmental Landfill L.C. for contracting purposes. No Claim shall be made against ECDC Environmental Landfill L.C. for excess or deficiency therein. Payment at the prices stated in the Agreement shall be in full for the completed Work, and will cover materials, supplies, labor, tools, machinery and all other expenditures incidental to satisfactory completion of the Work.
 - 9.2.4 ECDC Environmental Landfill L.C. may increase or decrease quantities of Work. Contractor will be entitled to payment for the actual quantities of items provided at the unit prices set forth in the Agreement.

ARTICLE 9 - PAYMENTS AND COMPLETION

- 9.1 **DEFINITIONS**
 - 9.1.1 *Contract Price*: Contract Price is that amount stated in the Agreement and, including authorized adjustments, is the total amount payable by ECDC Environmental Landfill L.C. to
- 9.3 **SCHEDULE OF VALUES, FOR LUMP SUM WORK**
 - 9.3.1 For work contracted on a lump sum basis, ten days before the first Application for Payment, the Contractor shall submit to ECDC Environmental Landfill L.C. Project Manager a Schedule of Values allocated to various portions

of the Work, prepared in such form and supported by such data as the ECDC Environmental Landfill L.C. Project Manager may require to substantiate its accuracy. This schedule, as approved by the ECDC Environmental Landfill L.C. Project Manager, shall be used as a basis for reviewing Contractor's Applications for Payment for lump sum work.

9.4 *APPLICATIONS FOR PAYMENT*

9.4.1 Each month, not later than the tenth day of the month, the Contractor shall submit to the ECDC Environmental Landfill L.C. Project Manager, an itemized application for payment for work completed during the previous month.

9.4.2 Such application shall be supported by such data substantiating Contractor's right to payment as the ECDC Environmental Landfill L.C. Project Manager may require.

9.4.3 Subject to provisions of the Contract Documents, the amount of each Application for Payment shall be compiled as follows:

.1 The Contract Price of the Work completed from commencement of the Project through the end of the previous month, as determined by multiplying the number of units completed of each item of the Work by the contract unit price of that item, or by multiplying the percentage of completion of each portion of the Work by the Lump Sum Price allocated to that portion of the Work listed in the Schedule of Values, as applicable.

.2 Plus that portion of the Contract Price, properly substantiated by certified copies of invoices and freight bills, for non-perishable materials and equipment not yet incorporated in the Work but delivered and suitably stored at the site or at another location agreed to by the ECDC Environmental Landfill L.C. Project Manager in writing, for subsequent incorporation into the completed construction, less 15 percent.

.3 Less retainage on the completed work of 10% for progress payments and 0% for Final Payment.

.4 Less Penalties for Delay, as applicable.

.5 Less the total of previous payments made by ECDC Environmental Landfill L.C.

9.5 *RECOMMENDATIONS FOR PAYMENT*

9.5.1 The ECDC Environmental Landfill L.C. Project Manager will, within 10 days after receipt of Contractor's Application for Payment,

.1 Issue a Recommendation for Payment for the full amount of the Application; or

.2 Issue a Recommendation for Payment for a portion of the amount of the Application, and request the Contractor to make corrections or provide additional information to substantiate the remaining portion. Contractor shall make the corrections and provide the additional information, and resubmit the Application for Payment for the remaining portion; or

.3 Return the Application to the Contractor for corrections or additional information. Contractor shall make the corrections and provide the additional information and resubmit the Application for Payment; or

.4 Decline to recommend payment on the basis of the provisions in Paragraph 9.6.

9.5.2 Unless otherwise provided in Contract Documents, payments made on account of operations completed and for materials and equipment stored on or off the site shall be conditioned upon compliance by Contractor with procedures satisfactory to ECDC Environmental Landfill L.C. Project Manager to establish ECDC Environmental Landfill L.C. title to such materials and equipment or otherwise protect ECDC Environmental Landfill L.C. interests. Procedures shall include applicable insurance, storage, and transportation to the site for materials and equipment stored off the site. Contractor is responsible for maintaining

- materials and equipment until Substantial Completion of the Work.
- 9.5.3 Title to all Work covered by the payment passes to ECDC Environmental Landfill L.C. at the time of payment.
- 9.6 *DECISIONS TO WITHHOLD RECOMMENDATION*
- 9.6.1 The ECDC Environmental Landfill L.C. Project Manager may decline to recommend payment and may withhold an application for payment in whole or in part to the extent reasonably necessary to protect ECDC Environmental Landfill L.C., if in the ECDC Environmental Landfill L.C. Project Manager's opinion there is reason to believe that there is:
- .1 non-conforming work not remedied;
 - .2 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
 - .3 damage to ECDC Environmental Landfill L.C. or another contractor;
 - .4 reasonable evidence Work will not be completed within the Contract Time and that the unpaid balance would not be adequate to cover actual and liquidated damages;
 - .5 failure of Contractor to make payments properly to subcontractors or for labor, materials, or equipment; or
 - .6 Contractor's persistent failure to carry out the Work in accordance with the Contract Documents.
- 9.6.2 When the above reasons for withholding recommendation are removed, recommendation will be made for amounts previously withheld.
- 9.7 *PROGRESS PAYMENTS*
- 9.7.1 ECDC Environmental Landfill L.C. will make payment in the amount recommended by ECDC Environmental Landfill L.C. Project Manager within 60 days after the date of receipt of application for payment.
- 9.7.2 ECDC Environmental Landfill L.C. has no obligation to pay or to facilitate the payment to a Subcontractor or Supplier, except as may otherwise be required by law. Contractor will comply with the prompt payment requirements of the place of the project.
- 9.7.2.1 ECDC Environmental Landfill L.C. may, on request and at the discretion of the ECDC Environmental Landfill L.C. Project Manager, furnish to any subcontractor, if practical, information regarding the percentages of completion or the amounts applied for by Contractor, and the action taken thereon by ECDC Environmental Landfill L.C. on account of Work done by such Subcontractor.
- 9.7.3 A Recommendation for Payment, a progress payment, or partial or entire use or occupancy of the Project by ECDC Environmental Landfill L.C., shall not constitute acceptance of work which is not in accordance with the Contract Documents.
- 9.8 *SUBSTANTIAL COMPLETION*
- 9.8.1 The Date of Substantial Completion of the Work or designated portion thereof is the date certified by the ECDC Environmental Landfill L.C. Project Manager that the construction is sufficiently complete in accordance with the Contract Documents so ECDC Environmental Landfill L.C. can occupy or utilize the Work or designated portion thereof for the purpose for which it is intended.
- 9.8.2 When Contractor considers that the Work or a portion thereof is substantially complete, and ECDC Environmental Landfill L.C. agrees, Contractor shall prepare and submit to the ECDC Environmental Landfill L.C. Project Manager a comprehensive list of items to be completed or corrected. Contractor shall proceed promptly to complete and correct the items on the list. Failure to include an item on such list does not alter the responsibility of Contractor to complete the Work in accordance with the Contract Documents.
- 9.8.3 Upon receipt of the Contractor's list, the ECDC Environmental Landfill L.C. Project Manager will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the ECDC Environmental Landfill L.C. Project Manager's inspection discloses any item, whether or not included on the Contractor's list, which is not in

- accordance with the requirements of the Contract Documents, Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item. Contractor shall then submit a request for another inspection by the Project Engineer to determine Substantial Completion. Should any inspection fail to comply with Contractor's claim of Substantial Completion, ECDC Environmental Landfill L.C. may recover the costs of reinspection from Contractor.
- 9.8.4 When the Work or designated portion thereof is determined to be substantially complete, the ECDC Environmental Landfill L.C. Project Manager will prepare a Certificate of Substantial Completion which establishes the Date of Substantial Completion, responsibilities of ECDC Environmental Landfill L.C. and Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which Contractor shall complete all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.
- 9.8.5 Upon Substantial Completion of the Work or designated portion thereof and upon application by Contractor and certification by the ECDC Environmental Landfill L.C. Project Manager, ECDC Environmental Landfill L.C. shall increase payment to Contractor to 98 percent of the Contract Price less accrued Liquidated Damages.
- 9.9 **PARTIAL OCCUPANCY OR USE**
- 9.9.1 ECDC Environmental Landfill L.C. may occupy or use any completed or partially completed portion of the Work at any stage, provided such occupancy or use is consented to by Contractor and the insurer. Consent of Contractor to partial occupancy or use shall not be unreasonably withheld.
- 9.9.2 Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the ECDC Environmental Landfill L.C. Project Manager and Contractor execute a Certificate of Partial Occupancy which will establish the date of partial occupancy, responsibilities of ECDC Environmental Landfill L.C. and Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance. Warranties required by the Contract Documents shall commence on the date of partial occupancy unless otherwise provided in the Certificate of Partial Occupancy.
- 9.9.3 When Contractor considers a portion of the occupied Work subsequently complete, Contractor shall prepare a list and submit it to the Project Engineer as provided under Subparagraph 9.10.2.
- 9.9.4 Immediately prior to such partial occupancy or use, the Project Engineer and Contractor shall jointly inspect the area to be occupied or the portion of the Work to be used in order to determine and record the condition of the Work.
- 9.9.5 Partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with requirements of the Contract Documents.
- 9.9.6 If ECDC Environmental Landfill L.C. and Contractor cannot agree on any matter in Paragraph 9.11, the matter shall be subject to resolution pursuant to a Work Change Directive, Paragraph 7.3.
- 9.10 **FINAL COMPLETION AND FINAL PAYMENT**
- 9.10.1 *Date of Final Completion* is the date certified by the ECDC Environmental Landfill L.C. Project Manager that, to his best information, knowledge, and belief, construction is complete in conformance with Contract Documents. This includes satisfactory completion of all items listed to be completed or corrected as a part of the Certificate of Substantial Completion and submittal and acceptance by ECDC Environmental Landfill L.C. of all closeout submittals required by Contract Documents.
- 9.10.2 Contractor shall review all Contract Documents and inspect the Work. Prior to Contractor notification to ECDC Environmental Landfill L.C. Project Manager that Work is complete and ready for final inspection, Contractor shall submit an affidavit that the Work has been inspected and the Work is complete in

- accordance with requirements of Contract Documents.
- 9.10.3 Within 15 days after receipt of Contractor's written notice that Work is ready for final inspection and acceptance, and on receipt of final Application for Payment, ECDC Environmental Landfill L.C. Project Manager will make such inspection. When ECDC Environmental Landfill L.C. Project Manager finds the Work acceptable under the Contract Documents and the Work fully performed, the ECDC Environmental Landfill L.C. Project Manager will issue a final Certificate of Completion stating that to the best of ECDC Environmental Landfill L.C. Project Manager's knowledge, information, and belief, the Work has been completed in accordance with terms and conditions of the Contract Documents, and will issue a final Recommendation for Payment.
- 9.10.4 Should Work be found not in compliance with requirements of Contract Documents, ECDC Environmental Landfill L.C. Project Manager shall notify Contractor in writing of items of non-compliance. Upon correction of such non-complying items, ECDC Environmental Landfill L.C. Project Manager shall issue a Certificate of Final Completion to Contractor as provided in Paragraph 9.12.3.
- 9.10.5 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the ECDC Environmental Landfill L.C. Project Manager:
- .1 an affidavit that payrolls, invoices for materials and equipment, and other indebtedness of the Contractor connected with the Work (less amounts withheld by ECDC Environmental Landfill L.C.) have been paid or otherwise satisfied; and, if required by ECDC Environmental Landfill L.C. Project Manager, submits further proof including waiver of release of lien or claims from laborers or material or equipment suppliers;
 - .2 a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled, or materially changed, until at least 30 days written notice has been given to ECDC Environmental Landfill L.C.;
 - .3 a written statement that Contractor knows of no substantial reason that the insurance will not be renewable to cover the correction and warranty period required by the Contract Documents;
 - .4 consent of Surety to final payment; and
 - .5 Maintenance Bond and other required bonds, and copies of Record Documents, maintenance manuals, and tests, inspections, and approvals.
- 9.10.6 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of Contractor, or by issuance of Change Orders affecting final completion, and the ECDC Environmental Landfill L.C. Project Manager so confirms, ECDC Environmental Landfill L.C. may, upon application by Contractor and recommendation by the ECDC Environmental Landfill L.C. Project Manager, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted.
- 9.10.6.1 If the remaining balance due for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, Contractor shall submit to ECDC Environmental Landfill L.C. Project Manager the required bonds and the written consent of Surety to payment of the balance due for that portion of the Work fully completed and accepted, prior to recommendation of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.
- 9.10.7 ECDC Environmental Landfill L.C. shall make final payment to Contractor within 60 days after the ECDC Environmental Landfill L.C. Project Manager issues the final Certificate of Completion and the final Recommendation for Payment, subject to limitations, if any, as stated in the Supplementary Conditions.

9.10.8 Acceptance of final payment by Contractor shall constitute a waiver of Claims by the Contractor, except those previously made in writing and identified by Contractor as unsettled at the time of final Application for Payment.

9.11 *DELAY PENALTIES*

9.11.1 The Contractor, the Surety, and ECDC Environmental Landfill L.C. agree that time is of the essence and that failure to complete the Work within Contract Time will cause damages to ECDC Environmental Landfill L.C. and that the actual damages from the harm are difficult to estimate accurately. Therefore, the Contractor, the Surety, and ECDC Environmental Landfill L.C. agree that Contractor and the Surety shall be liable for and shall pay to ECDC Environmental Landfill L.C. a penalty amount stipulated in Supplementary Conditions as penalties for delay and that the amount fixed therein is a reasonable forecast of just compensation to ECDC Environmental Landfill L.C. resulting from failure to complete the Work within Contract Time. The amount stipulated shall be paid for each and every calendar day of delay beyond the Contract Time until the Work is substantially complete.

ARTICLE 10 - SAFETY PRECAUTIONS

10.1 *SAFETY PROGRAMS*

10.1.1 Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract. Contractor shall submit a safety program to the ECDC Environmental Landfill L.C. Project Manager prior to mobilizing the Work, and shall be solely responsible for the safety, efficiency, and adequacy of the ways, means, and methods and for any damage which might result from failure or improper construction, maintenance, or operation performed by Contractor. Contractor shall submit a monthly safety report to the ECDC Environmental Landfill L.C. Project Manager.

10.2 *HAZARDOUS SUBSTANCE*

10.2.1 In the event Contractor encounters on the site material which it is reasonable to believe may be a "hazardous substance" as defined by the

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) or any other applicable law or regulation, Contractor shall immediately stop Work in the area affected and immediately notify the ECDC Environmental Landfill L.C. Project Manager and thereafter confirm such notice in writing.

10.2.2 If, in fact, the material is a "hazardous substance", the Work in the affected area shall not thereafter be resumed, except by Change Order or Work Change Directive, and then only if such Work would not violate applicable laws or regulations.

10.2.3 If the material is not a "hazardous substance", the Work in the affected area shall be resumed.

10.2.4 Contractor shall not be required, pursuant to Article 7, to perform without consent any Work relating to a "hazardous substance" except for those hazardous substances specified for use under this Contract.

10.3 *SAFETY OF THE ENVIRONMENT, PERSONS, AND PROPERTY*

10.3.1 Contractor shall take reasonable precautions for safety and shall provide reasonable protection to prevent damage, injury, or loss from all causes, to:

.1 employees performing the Work or on site, and other persons who may be affected thereby;

.2 the Work including materials and equipment to be incorporated therein, whether in storage (on or off the site), under care, custody, or control of Contractor or Subcontractor;

.3 other property at or adjacent to the site, such as trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal or replacement in the course of construction, and;

.4 Cultural resources and the environment.

10.3.2 Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations, and lawful orders of public authorities bearing

- on the safety of persons, property, or the environment.
- 10.3.3 Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for the safety and protection of persons and property; including posting danger signs and other warnings against hazards; promulgating safety regulations and notifying owners and users of adjacent sites and utilities.
- 10.3.4 Contractor shall recognize the environmental requirements of the Project. Disturbed areas shall be strictly limited to boundaries established by the ECDC Environmental Landfill L.C. Project Manager. Particular attention is drawn to the avoidance of any pollution of on-site or adjacent streams, sewers, wells, or other water sources.
- 10.3.5 Contractor shall use best management practices to minimize erosion of soil and excess runoff of surface or subsurface water from the site, or wind-blown dust or erosion, during the construction period.
- 10.3.6 Contractor shall allow no burning on the site, shall perform all Work in such a manner as required to minimize atmospheric pollution by dust or other contaminants, and shall control noise.
- 10.3.7 When use or storage of hazardous materials or equipment or unusual methods are necessary for execution of the Work, Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.
- 10.3.8 Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by Contract Documents) to property referred to in Subparagraphs 10.3.1.2 and 10.3.1.3, caused in whole or in part by the Contractor, Subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which Contractor is responsible under Subparagraphs 10.3.1.2 and 10.3.1.3, except damage or loss attributable to acts or omissions of ECDC Environmental Landfill L.C., Architect/Engineer, or anyone directly or indirectly employed by

either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of Contractor. The foregoing obligations of the Contractor are in addition to Contractor's obligations under Paragraph 3.21.

- 10.3.9 Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by Contractor to the ECDC Environmental Landfill L.C. Project Manager.

10.4 *EMERGENCIES*

- 10.4.1 In an emergency affecting safety of persons or property, Contractor shall act at the Contractor's discretion to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by Contractor on account of an emergency shall be determined as provided in Article 7.

ARTICLE 11 - INSURANCE AND BONDS

11.1 *GENERAL INSURANCE REQUIREMENTS*

- 11.1.1 With no intent to limit Contractor's liability under the indemnification provisions set forth above, Contractor covenants to provide and maintain in full force and effect during the term of this Contract and all extensions and amendments thereto, at least the following insurance and available limits of liability.

- 11.1.2 If any of the following insurance is written as "claims made" coverage and ECDC Environmental Landfill L.C. is required to be carried as an additional insured, then Contractor's insurance shall include a two-year extended discovery period after the last date that Contractor provides any work under this Contract.

- 11.1.3 "Aggregate" amounts of coverage, for purposes of this agreement, are agreed to be the amounts of coverage available during a fixed 12 month policy period.

11.2 *INSURANCE TO BE PROVIDED BY CONTRACTOR*

- 11.2.1 *Risks and Limits of Liability:* Contractor shall provide at a minimum the insurance coverages

- and limits of liability given in the Agreement (Document 00500).
- 11.2.2 *Form of Policies:* The insurance may be in one or more policies of insurance, the form of which is subject to reasonable approval by ECDC Environmental Landfill L.C.. It is agreed, however, that nothing ECDC Environmental Landfill L.C. does or fails to do with regard to the insurance policies shall relieve Contractor from its duties to provide the required coverage hereunder and ECDC Environmental Landfill L.C. actions or inactions will never be construed as waiving ECDC Environmental Landfill L.C. rights hereunder.
- 11.2.3 *Issuers of Policies:* The issuer of any policy must have a certificate of authority to transact insurance business in the State of the place of the project. Each insurer must be responsible and reputable and must have financial capability consistent with the risks covered. Each insurer shall be subject to approval by ECDC Environmental Landfill L.C. in ECDC Environmental Landfill L.C. sole discretion as to conformance with these requirements, pursuant to subparagraph 11.2.2 above.
- 11.2.4 *Insured Parties:* Each policy, except those for Workers' Compensation and Professional Liability, must name ECDC Environmental Landfill L.C. (and its officers, agents, and employees) as additional insured parties on the original policy and all renewals or replacements during the term of this Contract. ECDC Environmental Landfill L.C. status as an additional insured under the Contractor's insurance does not extend to instances of sole negligence of ECDC Environmental Landfill L.C. unmixed with any fault of the Contractor.
- 11.2.5 *Deductibles:* Contractor shall assume and bear any claims or losses to the extent of any deductible amounts and waives any claim it may ever have for the same against ECDC Environmental Landfill L.C., its officers, agents, or employees.
- 11.2.6 *Cancellation:* Each policy must expressly state that it may not be canceled or non-renewed unless thirty days' advance notice of cancellation is given in writing to ECDC Environmental Landfill L.C. by the insurance company.
- ~~11.2.7 *Subrogation:* Each policy must contain an endorsement to the effect that the issuer waives any claim or right in the nature of subrogation to recover against ECDC Environmental Landfill L.C., its officers, agents, or employees.~~
- 11.2.8 *Endorsement of Primary Insurance:* Each policy must contain an endorsement that such policy is primary insurance to any other insurance available to the Additional Insured with respect to claims arising hereunder.
- 11.2.9 *Liability for Premium:* Contractor shall be solely responsible for payment of all insurance premium requirements hereunder and ECDC Environmental Landfill L.C. shall not be obligated to pay any premiums.
- 11.3 *PROOF OF INSURANCE*
- 11.3.1 Prior to commencing any services and at any time during the term of work under this Contract, Contractor shall furnish ECDC Environmental Landfill L.C. Project Manager with Certificates of Insurance, along with an Affidavit from Contractor confirming that the Certificate accurately reflects the insurance coverage that will be available during the term of the Contract. If requested in writing by the ECDC Environmental Landfill L.C. Project Manager, the Contractor shall furnish the ECDC Environmental Landfill L.C. Project Manager with certified copies of Contractor's actual insurance policies. Failure of Contractor to provide certified copies, as requested, may be deemed in ECDC Environmental Landfill L.C. discretion, to constitute a breach of this Contract.
- 11.3.2 Notwithstanding the proof of insurance requirements set forth above, it is the intention of the parties hereto that Contractor, continuously and without interruption, maintain in force the required insurance coverages set forth above. Failure of Contractor to comply with this requirement shall constitute a default of Contractor allowing ECDC Environmental Landfill L.C., at its option, to immediately suspend or terminate work under this Contract. Contractor agrees that ECDC Environmental

Landfill L.C. shall never be argued to have waived or be estopped to assert its right to terminate this contract hereunder because of any acts or omissions by ECDC Environmental Landfill L.C. regarding its review of insurance documents provided by Contractor, its agents, employees, or assigns.

11.4 PERFORMANCE AND PAYMENT BONDS

11.4.1 For Projects over the value of \$25,000, Contractor shall provide surety bonds covering faithful performance of the Contract and payment of obligations arising thereunder as required in Contract Documents pursuant to the civil statutes of the State of the place of the Project, in the amount of 100 percent of the Contract Price as stipulated in Contract Documents on the date of execution of the Contract in accordance with the conditions stated on the Performance and Payment Bonds, Documents 00610 and 00611. Bonds may be obtained from the Contractor's usual source and the cost thereof shall be included in the Contract Price.

11.5 MAINTENANCE BONDS

11.5.1 *One-Year Maintenance Bond:* Contractor shall provide a bond in accordance with the conditions stated on the One-Year Maintenance Bond, Document 00612, providing for the Contractor's correction, replacement, or restoration of any portion of the Work which is found to be not in compliance with requirements of Contract Documents during the one-year correction period required in Subparagraph 12.2.2.

11.6 SURETY

11.6.1 The Surety on the bonds must be a corporate Surety authorized to conduct insurance business in the State of the place of the Project.

11.6.1.1 If the Surety on the bond is not listed on the current United States Treasury Department number 570 as having an underwriting capability in at least the amount of the bond, and if the bond exceeds 10 percent of the Surety Company's capital and surplus, Surety shall submit written documentation of reinsurance or Contractor must provide an additional Surety bond for the bond amount in

excess of 10 percent of the original Surety's capital and surplus. Documentation of reinsurance shall show that Surety has reinsured the amount of the bond that exceeds 10 percent of its capital and surplus with one or more reinsurers who are duly authorized, accredited, or trusted to do business in the State of the place of the Project. Reinsurers shall meet the same requirements as Surety and shall sign Bonds as co-surety.

11.6.1.2 Each bond must be accompanied by a current power of attorney or other documentary proof that the individual signing the bond on behalf of the Surety has the necessary authority to execute the bond.

11.6.2 Upon request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations under the Contract, Contractor shall promptly furnish a copy of the bonds or shall permit a copy to be made.

11.7 DELIVERY OF BONDS

11.7.1 Contractor shall deliver the required bonds to the ECDC Environmental Landfill L.C. Project Manager within the time limits stated in the Notice of Intent to Award, or if the Work is to be commenced prior thereto in response to a letter of intent, Contractor shall submit bonds prior to commencement of the Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work, including the work of others, is covered by Contractor contrary to the ECDC Environmental Landfill L.C. Project Manager's request or to requirements of the Contract Documents, Contractor shall uncover such work, if required in writing by the ECDC Environmental Landfill L.C. Project Manager, for observation by the ECDC Environmental Landfill L.C. Project Manager. The uncovered work shall be replaced without change to the Contract Price or Contract Time.

12.1.2 If a portion of the Work has been covered which the ECDC Environmental Landfill L.C. Project Manager has not specifically requested to observe prior to it being covered, ECDC Environmental Landfill L.C. Project Manager

may request to see such Work and it shall be uncovered by Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall be charged to ECDC Environmental Landfill L.C. by Change Order. If such Work is not in accordance with the Contract Documents, Contractor shall pay such costs.

12.2 CORRECTION OF WORK

12.2.1 Contractor shall promptly correct or remove Work rejected by the ECDC Environmental Landfill L.C. Project Manager or Work failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor shall bear costs of correcting such rejected Work, including additional testing and inspections and compensation for Architect/Engineer's or subconsultant's services and expenses made necessary thereby.

12.2.2 *One Year Correction Period:* If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Paragraph 9.10.4, or of other applicable special warranty required by Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, Contractor shall correct the Work promptly after receipt of written notice from ECDC Environmental Landfill L.C. to do so. The period of one year shall be extended with respect to portions of the Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual acceptance of the Work. This obligation under this Subparagraph shall survive acceptance of the Work under the Contract and termination of the Contract.

12.2.3 Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the ECDC Environmental Landfill L.C. Project Manager.

12.2.4 If Contractor does not proceed with correction of such non-conforming Work within the time

fixed by written notice from the ECDC Environmental Landfill L.C. Project Manager, ECDC Environmental Landfill L.C. may correct the non-conforming Work in accordance with Paragraph 2.6, or remove non-conforming Work and store the salvable materials or equipment at the Contractor's expense. If Contractor does not pay costs of such removal and storage within 10 days after written notice, ECDC Environmental Landfill L.C. may upon an additional 10 days written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof after deducting costs and damages that would have been borne by Contractor, including compensation for the services of the Architect/Engineer or subconsultants and expenses made necessary thereby. If such proceeds of the sale do not cover costs which Contractor should have borne, the Contract Price shall be reduced by the deficiency, or Contractor shall pay the difference to ECDC Environmental Landfill L.C.

12.2.5 Contractor shall bear the cost of correcting work originally installed by ECDC Environmental Landfill L.C. or by separate contractors and damaged by the Contractor's correction or removal of Contractor's work. Article 6 describes coordination between the Contractor, ECDC Environmental Landfill L.C., and separate contractors.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If ECDC Environmental Landfill L.C. prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the ECDC Environmental Landfill L.C. Project Manager may do so instead of requiring its removal and correction, in which case the Contract Price will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the law of the State of the place of the project and the charter and ordinances of the City of the place of the

project, where applicable. Venue for any cause of action shall be in Harris County in the State of Texas.

13.2 *SUCCESSORS AND ASSIGNS*

13.2.1 ECDC Environmental Landfill L.C. and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to the other party hereto and to partners, successors, assigns, and legal representatives of such other party in respect to covenants, agreements, and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract in whole or in part without the prior written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the contract.

13.3 *WRITTEN NOTICE*

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the ECDC Environmental Landfill L.C. Project Manager or Contractor at the address given in the Agreement, or if sent by registered or certified mail to the last business address known to the party giving notice.

13.4 *RIGHTS AND REMEDIES*

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.4.2 No act or failure to act by ECDC Environmental Landfill L.C., Architect/Engineer, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such act or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 *TESTS AND INSPECTIONS*

13.5.1 Contractor shall give ECDC Environmental Landfill L.C. and Architect/Engineer timely notice of the time and place where tests and inspections are to be made and shall cooperate

with inspection and testing personnel to facilitate required inspections or tests.

13.5.2 ECDC Environmental Landfill L.C. will employ and pay for the services of an independent testing laboratory to perform inspections or tests required by the Contract Documents except:

- .1 Inspections or tests covered by Paragraph 13.5.3;
- .2 Costs incurred in connection with tests or inspections conducted pursuant to Paragraph 12.2.1; or
- .3 Inspections or tests otherwise specifically provided in the Contract Documents to be paid by Contractor.

13.5.3 Contractor shall be responsible for and shall pay all costs in connection with any inspection or testing required in connection with ECDC Environmental Landfill L.C. acceptance of a supplier of materials or equipment proposed to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

13.5.4 Neither observations by ECDC Environmental Landfill L.C. or Architect/Engineer nor inspections, tests, or approvals by others shall relieve Contractor from Contractor's obligations to perform the Work in accordance with Contract Documents.

13.6 *INTEREST*

13.6.1 No interest will accrue on late payments by ECDC Environmental Landfill L.C. except as provided under Civil Statutes of the State of the place of the project.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 *TERMINATION BY ECDC ENVIRONMENTAL LANDFILL L.C. FOR CAUSE*

14.1.1 ECDC Environmental Landfill L.C. may terminate the Contract if the Contractor:

- .1 persistently or repeatedly refuses or fails to supply enough properly skilled workers or proper materials;

- .2 persistently disregards laws, ordinances, or rules, regulations, or orders of a public authority having jurisdiction; or
 - .3 otherwise is guilty of material breach of a provision of the Contract Documents.
- 14.1.2 When any of the above reasons exists, the ECDC Environmental Landfill L.C. Project Manager may, without prejudice to any other rights or remedies of ECDC Environmental Landfill L.C., and after giving Contractor and Surety seven days written notice, terminate employment of Contractor and may, subject to any prior rights of the Surety:
- .1 request that Surety complete the Work; or
 - .2 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor; and
 - .3 finish the Work by whatever reasonable method the ECDC Environmental Landfill L.C. Project Manager may deem expedient.
- 14.1.3 After receipt of a notice of termination, and except as otherwise directed by the ECDC Environmental Landfill L.C. Project Manager, Contractor shall:
- .1 Stop Work under the Agreement on the date and to the extent specified in the notice of termination;
 - .2 Place no further orders or subcontracts for materials, services, or facilities except as necessary to complete the portion of the Work (if any) under the Agreement which is not terminated;
 - .3 Terminate all orders and subcontracts to the extent that they relate to the performance of Work under the Agreement which is terminated;
 - .4 Assign to ECDC Environmental Landfill L.C. Project Manager, in the manner, at the times, and to the extent directed by the ECDC Environmental Landfill L.C. Project Manager, all of the right, title, and interest of Contractor under the orders and subcontracts so terminated. ECDC Environmental Landfill L.C. shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;
- .5 Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval of the ECDC Environmental Landfill L.C. Project Manager;
- .6 Take such action as may be necessary, or as the ECDC Environmental Landfill L.C. Project Manager may direct, for the protection and preservation of the property related to this Agreement which is in the possession of Contractor, and in which ECDC Environmental Landfill L.C. has or may acquire an interest;
- .7 Secure the Project in a safe state before leaving the site, providing any necessary safety measures, shoring, or other devices.
- 14.1.4 When ECDC Environmental Landfill L.C. terminates the Contract for one of the reasons stated in Subparagraph 14.1.1, Contractor shall not be entitled to receive further payment until the Work is complete, subject to the provisions of Paragraph 14.1.5.
- 14.1.5 If the unpaid balance of the Contract Price exceeds the costs of finishing the Work, including liquidated damages and other amounts due under this Contract, such balance shall be paid to Contractor. If such costs exceed the unpaid balance, Contractor shall pay the difference to ECDC Environmental Landfill L.C. The amount to be paid to Contractor or ECDC Environmental Landfill L.C., as the case may be, shall be certified by the ECDC Environmental Landfill L.C. Project Manager, upon application, and this obligation for payment shall survive termination of the Contract.
- 14.2 **TERMINATION BY ECDC ENVIRONMENTAL LANDFILL L.C. FOR CONVENIENCE**
- 14.2.1 ECDC Environmental Landfill L.C. may, without cause, and without prejudice to any other rights

- or remedies of ECDC Environmental Landfill L.C., terminate employment of Contractor in whole or part by giving Contractor and Surety seven days written notice.
- 14.2.2 After receipt of a notice of termination, and except as otherwise directed by the ECDC Environmental Landfill L.C. Project Manager, Contractor shall conform to the requirements of Paragraph 14.1.3.
- 14.2.3 After receipt of a notice of termination, Contractor shall submit to ECDC Environmental Landfill L.C. its termination claim. Such claim shall be submitted to ECDC Environmental Landfill L.C. promptly, but in no event later than six months from the effective date of termination, unless one or more extensions in writing are granted by the ECDC Environmental Landfill L.C. Project Manager. If Contractor fails to submit its termination claim within the time allowed, ECDC Environmental Landfill L.C. Project Manager shall determine, on the basis of available information, the amount, if any, due to Contractor because of the termination. ECDC Environmental Landfill L.C. shall then pay to Contractor the amount so determined.
- 14.2.4 If ECDC Environmental Landfill L.C. and Contractor fail to agree on the amount to be paid Contractor because of the termination of the Agreement or part thereof, ECDC Environmental Landfill L.C. Project Manager will determine, on the basis of information available to ECDC Environmental Landfill L.C. Project Manager, the amount due (if any) to Contractor by reason of the termination as follows:
- .1 The Contract Price for all Work performed in accordance with Contract Documents up to the date of termination determined in the manner prescribed for monthly payments in Article 9, except no retainage shall be withheld by ECDC Environmental Landfill L.C. either for payment determined by percentage of completion or for materials and equipment delivered to the site, in storage, or in transit.
- .2 Reasonable termination expenses, including the costs for settling and
- paying claims arising out of termination of work under subcontracts and purchase orders, the reasonable cost of preservation and protection of ECDC Environmental Landfill L.C. property after termination (if required) and the cost of Claim preparation. Termination expenses do not include field or central office overhead, salaries of employees of Contractor or litigation costs including attorney fees.
- No amount will be allowed for anticipated profit or central office overhead on the uncompleted Work, or any cost or lost profit for any other business of Contractor alleged to be damaged by the termination.
- 14.2.5 Contractor shall promptly remove from the site construction equipment, tools, and temporary facilities, except such temporary facilities which ECDC Environmental Landfill L.C. Project Manager may wish to purchase and retain.
- 14.2.6 Contractor shall cooperate with ECDC Environmental Landfill L.C. Project Manager during the transition period.
- 14.2.7 ECDC Environmental Landfill L.C. will take possession of the Work and materials delivered to the site, in storage, or in transit as of the date, or dates, specified in the termination notice, and will be responsible for maintenance, utilities, security, and insurance, as stated in the notice of termination.
- 14.3 *SUSPENSION BY ECDC ENVIRONMENTAL LANDFILL L.C. FOR CONVENIENCE*
- 14.3.1 The ECDC Environmental Landfill L.C. Project Manager may, without cause, after giving Contractor and the Contractor's Surety notice, order Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as the ECDC Environmental Landfill L.C. Project Manager may determine.
- 14.3.2 An adjustment shall be made in the Contract Time equivalent to the length of time of the suspension.
- 14.3.3 An adjustment shall be made for the increases in the cost of performance of the Contract, including profit on the increased cost of performance caused by suspension, delay, or

interruption in accordance with Paragraph 7.4.
No adjustment shall be made to the extent:

- .1 that performance is, was, or would have been so suspended, delayed, or interrupted by another cause for which Contractor is responsible; or
- .2 that an adjustment is made or denied under another provision of the Contract.

14.4 *TERMINATION BY CONTRACTOR*

14.4.1 Contractor may terminate the Contract if the Work is stopped for a period of 30 days through no act or fault of Contractor, Subcontractor, or their agents or employees, or any other persons performing portions of the Work under contract with Contractor, for any of the following reasons:

- .1 issuance of an order of a court or other public authority having jurisdiction;
- .2 an act of government, such as a declaration of national emergency, making material unavailable;
- .3 if repeated suspensions, delays or interruptions by ECDC Environmental Landfill L.C. as described in Paragraph 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365 day period, whichever is less.

14.4.2 If the Agreement is terminated pursuant to this provision, Contractor shall file a Claim for termination expenses in accordance with the requirements of Paragraph 14.2.

END OF DOCUMENT

Document 00800

SUPPLEMENTARY CONDITIONS

The following supplements modify Document 00700 - General Conditions. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 7 - CHANGES IN THE WORK: Insert the following paragraphs:

7.4.2.2 ALLOWABLE OVERHEAD AND PROFIT FOR CHANGE ORDERS

The allowable overhead and profit for increase in Contract Price, for costs attributable to changes, shall be:

| | <u>Overhead:</u> | <u>Profit:</u> |
|--|------------------|----------------|
| To Contractor on work by other forces: | 10 percent | 0 percent |
| To First tier Subcontractor on work by his Sub-subcontractors: | 10 percent | 0 percent |
| Work by Contractor and subcontractors for work by their respective forces: | 10 percent | 5 percent |

A maximum of the four listed percentages, not to exceed the percentages shown, is allowed regardless of the number of tier subcontractors. On changes of both increases and decreases of the cost of work, the overhead and profit percentages shall apply on the net increase in direct costs of Contractor or Subcontractor. However, where work of the Contractor or first tier Subcontractor includes both additive and deductive amounts from separate lower tier subcontractors, the percentages will be allowed on the added amounts prior to subtraction of the credit amounts.

ARTICLE 9 - PAYMENTS AND COMPLETION: Insert the following paragraphs:

9.7.2.2 As a record of payment to Subcontractors and Suppliers, the Contractor shall prepare and transmit with each payment a release form providing the name of the Payee and the amount paid. This release form shall include a provision for the Subcontractor or Supplier to sign and date the form upon receipt of payment. On the form, instruct the Payee to return the form immediately to the Contractor. The dated and signed forms shall be attached to the Contractor's estimate for payment or application for payment covering the next billing period.

9.11.2 The amount of penalty for delay provided in General Conditions Paragraph 9.11, payable by Contractor or Contractor's Surety for each and every calendar day of delay beyond the Contract Time until the Work is accepted by ECDC Landfill as substantially complete shall be \$1,000.00 per day.

END OF DOCUMENT

TECHNICAL SPECIFICATIONS

DIVISION 1

GENERAL REQUIREMENTS

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DIVISION 1 - GENERAL REQUIREMENTS

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END OF DOCUMENT

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

- A. This section supplements the requirements specified in the General Conditions and Supplementary Conditions. If the requirements of this section and conditions noted above conflict, the CONTRACTOR shall adhere to the more stringent requirement as determined by the OWNER.
- B. Section Includes:
 - 1. Contract Description
 - 2. Construction Water
 - 3. CONTRACTOR Use of Site
 - 4. Description of Work
 - 5. CONTRACTOR's Work Scope

1.2 CONTRACT DESCRIPTION

- A. Contract Type: Stipulated price as described in the Standard Form of Agreement between OWNER and CONTRACTOR on the Basis of a Stipulated Price.

1.3 CONSTRUCTION WATER

- A. Construction water is available on-site. Construction water can be obtained by the CONTRACTOR from the site construction water pond and/or East Springs as shown on the drawings. CONTRACTOR to verify availability of water and access.
- B. The CONTRACTOR shall be responsible for transporting and/or conveying all required construction water from the available source.

1.4 CONTRACTOR'S USE OF SITE

- A. The CONTRACTOR cannot interfere with ongoing landfill operations, including the allowance of sufficient water supply for dust control and operational measures.

- B. The CONTRACTOR should limit activities to the project area, as shown on the Drawings, stockpiles, staging area, and haul road as identified by the OWNER.

1.5 DESCRIPTION OF WORK

- A. The work to be performed for this contract includes, but is not necessarily limited to, the construction of Supercell 2, Phase 2 at the ECDC Environmental Landfill. Phase 2 is just under 13 acres.

- B. The liner system, from bottom to top, consists of the following constructed layers:

Floor:

- Excavated and prepared subgrade;
- 3-inch minimum soil cushion layer;
- Geosynthetic clay liner (GCL);
- 60-mil textured (both sides) HDPE geomembrane liner;
- Drainage geocomposite;
- Two foot thick protective soil cover layer.

Side Slope:

- Excavated and prepared subgrade or embankment;
- 3-inch minimum soil cushion layer;
- Geosynthetic clay liner (GCL);
- 60-mil textured (both sides) HDPE geomembrane liner;
- Two foot thick protective soil cover layer (placed 10' vertically up side slopes by the CONTRACTOR).

Leachate Collection Sump:

- Excavated and prepared subgrade;
- 3-foot thick clay liner ($\leq 1 \times 10^{-7}$ cm/sec);

- Geosynthetic clay liner (GCL);
- 60-mil textured (both sides) HDPE geomembrane liner;
- Geotextile cushion;
- Secondary leak detection gravel;
- Geotextile filter;
- Geosynthetic clay liner (GCL);
- 60-mil textured (both sides) HDPE geomembrane liner;
- Geotextile cushion;
- Leachate collection gravel;
- Geotextile filter;
- Two foot thick protective soil cover layer.

C. Other Construction Items Include:

- Placement and compaction of engineered fill to create subgrade and embankments;
- Road base for access roads and embankments;
- Fence removal and reconstruction
- Leachate collection pipe, gravel, and geotextile wrap;
- Liner terminations and anchor trenches; and
- Stormwater pond.

All work must be carried out and maintained per the Drawings and Specifications subject to the approval of the Design Engineer and Construction Quality Assurance consultant.

1.6 CONTRACTOR'S WORK SCOPE

- A. CONTRACTOR shall furnish all labor, materials, tools, equipment, supervision, transportation, and installation services required for the following tasks as summarized below, and outlined in the Drawings and Specifications:

1. Excavating and stockpiling soils within the project area to the lines and grades shown on the Drawings. Stockpile locations to be determined by the OWNER.
2. Placement and compaction of engineered fill material to the lines and grades shown on the Drawings within the construction area.
3. Excavating, loading, hauling, processing, moisture conditioning, compacting, and grading of compacted clay liner ($\leq 1 \times 10^{-7}$ cm/sec) in sump.
4. Placement and grading of the soil cushion including excavating, loading, hauling, screening, moisture conditioning, spreading, and placement.
5. Preparing geosynthetic anchor trench including locating, excavating, fill placement, backfilling and compaction, and the installation of markers.
6. Provide all necessary construction staking to lay-out the work and other surveying to compute quantities and prepare as-built drawings for top of subgrade, and operations layer. Prepare all required Record Drawings and surveys necessary to document as-built quantities/conditions. Submit all required Record Drawings to OWNER. Record (as-built) drawings shall be signed and sealed by a Utah Registered Land Surveyor.
7. Supply and installation of leachate collection pipe and gravel, and installation of geotextile wrap – **geotextile supplied by owner.**
8. Supply and installation of geosynthetic clay liner (GCL) – **GCL supplied by owner and installed by others under separate contract.**
9. Placement and grading of the protective cover soil layer over geocomposite and geomembrane, including excavating, loading, hauling, spreading, and placement. Protective cover to be placed on the geocomposite with an excavator to minimize the formation of wrinkles.
10. Supply and installation of 60-mil HDPE geomembrane – **geomembrane supplied by owner and installed by others under separate contract.**
11. Supply and installation of geocomposite – **geocomposite supplied by owner and installed by others under separate contract.**
12. Construction of road base sections for access roads and embankments, including supplying, hauling, spreading, grading, and compacting.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References and abbreviations of various industry associations, trade associations, societies, organizations, and regulatory agencies, as referenced in the Contract Documents.

1.2 DESCRIPTIONS

- A. The Contract Documents contain references to various standard Specifications, codes, practices, and requirements for materials, workmanship, installation inspections, and tests. Which references are published and issued by the organizations, societies, and associations listed below by abbreviation and name. Such references are hereby made a part of the Contract Documents to the extent cited.
- B. Any material, method, or procedure specified by reference to the number, symbol, or title of a specific Specification or standard, such as a Commercial Standard, American National Standard, Federal or State Specification, Industry or Government Code, a trade association code or standard, or other similar standard, shall comply with the requirements of the edition in effect on the date of Notice to Proceed.
- C. The code, specification, or standard referred to, except as modified in these Specifications, shall have full force and effect as though printed in these Specifications. These Specifications and standards are not furnished to bidders since manufacturers and trades involved are assumed to be familiar with their requirements. The OWNER will furnish, upon request, information as to how copies of the Specifications and standards referred to may be obtained.

1.3 ABBREVIATIONS

- A. Whenever in the Contract the following abbreviations are used, their meanings shall be as follows:

AASHTO American Association of State Highway and Transportation Officials

ACI American Concrete Institute

ANSI American National Standards Institute

- ASCE American Society of Civil Engineers
- ASTM American Society for Testing and Materials
- AWWA American Water Works Association
- GRI Geosynthetics Research Institute
- FS Federal Specifications
- NSF National Sanitation Foundation
- OSHA Occupational Safety and Health Administration
- PPI Plastic Pipe Institute

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Measurement and payment methods for contract bid items.

1.2 MEASUREMENT OF QUANTITIES

- A. Performed according to United States Measures.
- B. Based on actual units installed or neat line dimensions of work completed.

1.3 CALCULATION OF QUANTITIES

- A. Progress Payment Quantities:
 - 1. CONTRACTOR will compute all quantities of Work performed, or of materials and equipment delivered to the site for progress payment purposes.
 - 2. OWNER may at any time verify quantities calculated by CONTRACTOR.
- B. Final Payment Quantities: CONTRACTOR will compute all quantities of Work performed, or of materials and equipment delivered and installed for final payment purposes. OWNER may perform an independent computation of all quantities of work performed, and of materials and equipment installed.

1.4 PAYMENT

- A. In accordance with lump sum, unit prices, or force account rates shown on the CONTRACTOR'S final negotiated Bid Schedule.
- B. Includes all costs for overhead and profit and for supplying materials, labor, equipment, and tools, and all applicable Federal, State, County, City, and local taxes, necessary to complete the Work in accordance with the Specifications, Drawings, and Contract Conditions.

1.5 VALUES OF UNIT PRICES

- A. The number of units and quantities contained in the Bid Schedule are approximate only, and final payment will be made for the actual number of units

and quantities incorporated in the work or made necessary to complete the project. All unit and lump prices shall include applicable Federal, State, County, City, and local taxes.

- B. In the event that work and materials or equipment are required to be furnished to a greater or lesser extent than is indicated by the Contract Documents, such work and materials or equipment shall be furnished in greater or lesser quantities.

1.6 CHANGES AND EXTRA WORK

- A. Changes and extra work will be measured and paid for in accordance with the requirements of this Section.

1.7 REJECTED MATERIALS

- A. Quantities of material wasted or disposed in a manner not called for in the Specifications; rejected loads of material, including material rejected after it has been placed by reasons of the failure of CONTRACTOR to conform to the provisions of the Specifications; material not unloaded from the transporting vehicle; material placed outside the limits indicated by the Drawings or established by OWNER; or material remaining on hand after completion of the Work, will not be paid for, and such quantities will not be included in the final total quantities. No compensation will be made for loading, hauling, and disposing of rejected material.

1.8 FORCE ACCOUNT WORK

- A. Payment for Force Account work will be determined as follows:
- B. Labor.
 - 1. Payment for labor will be based on the Force Account Labor Rate Schedule submitted with the bid.
 - 2. Payment constitutes full compensation for labor including wages, benefits, overhead, and profit for each individual.
- C. Equipment.
 - 1. Payment for equipment will be based on the Force Account Equipment Rate Schedule submitted with the bid.
 - 2. Payment constitutes full compensation for supplying equipment and includes all costs for maintenance, fuel, insurance, overhead, profit and

any other costs necessary to provide and operate the equipment.
Payment does not include operator labor cost.

D. Materials.

1. Payment for materials will be paid for at CONTRACTOR's invoiced cost plus 10 percent.
2. Payment will be based on invoices from suppliers documenting cost to CONTRACTOR.
3. Where invoices are not available a unit cost must be approved by the OWNER prior to use of the material.

1.9 PAY ITEMS

A. Supercell 2, Phase 2

1. Mobilization/Demobilization **(Bid Item 1)**
 - a. Measurement by Lump Sum (LS), based on mobilization of equipment and labor to perform work and demobilizing from and cleaning the site after all work and testing has been performed and accepted by the OWNER.
 - b. Payment as follows: 50 percent of lump sum amount upon completion of 10 percent of the work, and 50 percent for demobilization and site cleanup. Payment includes all costs for mobilizing and demobilizing equipment, living expenses, bonds, all required permits, insurance, office and field overhead, geosynthetic installer management, development of work plans, Health and Safety Plans, submittals, and any other administrative costs necessary to complete the work. Includes work described in Sections 01200, 01300, 01310, 01400, 01500, 01560, 01600, 01630, and 01700; as well as management and coordination related to Sections 02771, 02776, 02778, and 02779.
2. NPDES **(Bid Item 2)**
 - a. Measured by Lump Sum (LS).
 - b. Payment includes all costs to prepare and submit the Construction Notice of Intent and to prepare and implement a

Storm Water Pollution Prevention Plan (SWPPP) in accordance
with the requirements of Section 01560.

3. **Surveying and As-built Drawings** **(Bid Item 3)**
 - a. Measured by Lump Sum (LS).
 - b. Payment includes all costs to perform construction control and slope staking, surveys to complete quantities, surveys to document as-built conditions of the construction, and the preparation of Record Drawings as described in Section 01050 and 01052. CONTRACTOR shall provide an estimate of labor hours and expenses with this bid to support the lump sum price.

4. **Clearing and Stripping** **(Bid Item 4)**
 - a. Measured by the Acre (AC). Measurement of clearing and stripping is based on a perimeter survey of the completed clearing limits necessary for construction.
 - b. Payment will be made by the Acre (AC). Payment includes all costs to clear and strip the construction areas and to load, haul, and dispose of debris, as described in Section 02110.

5. **Removal and Replacement of Fence** **(Bid Item 5)**
 - a. Measurement by the Lineal Foot (LF) of the installed fence, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to locate, prepare, grade, supply materials, and install fence as shown on the Drawings. Payment also includes all costs to remove existing fence and dispose of in the landfill.

6. **Excavation to Engineered Fill – Phase 2 Area** **(Bid Item 6)**
 - a. Measured by in-place Cubic Yard (CY). Measurement of in-place engineered fill in the Phase 2 area will be made by comparing pre-construction topography with post-construction topography within the Phase 2 area. Pre-construction topography will be established by field survey of existing grades. Survey will establish existing grades at a maximum 50-foot grid and establish major grade breaks. Post-construction topography will be established by similar survey at a maximum 50-foot grid and also establish

major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval.

- b. Payment will be made by the Cubic Yard (CY). Payment includes all costs to excavate from the Phase 2 area or the OWNER designated borrow area, haul, place, rough grade, process, moisture condition, and compact as described in Sections 02221 and 02222, and as shown on the Drawings.

7. Excavation to Stockpile **(Bid Item 7)**

- a. Measured by the bank Cubic Yard (CY). Measurement of excavation will be made by comparing pre-construction topography of the landfill cell construction area as depicted on the Drawings with post-excavation topography. Pre-construction topography will be established by field survey of existing grades. Survey will establish existing grades at a maximum 50-foot grid and establish major grade breaks. Post-construction topography will be established by similar survey at a maximum 50-foot grid and also establish major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval.
- b. Payment includes all costs to excavate soil within the phase 2 construction area, load, haul, and place in a stockpile as described in Sections 02221 and 02222, and as shown on the Drawings. Payment excludes excavation of material for use as engineered fill which is paid for in item 5.

8. Excavation to Engineered Fill – Cell 10 Area **(Bid Item 7A)**

- a. Measured by in-place Cubic Yard (CY). Measurement of in-place engineered fill in the Cell 10 Area will be made by comparing pre-construction topography with post-construction topography within the Cell 10 area. Pre-construction topography will be established by field survey of existing grades. Survey will establish existing grades at a maximum 50-foot grid and establish major grade breaks. Post-construction topography will be established by similar survey at a maximum 50-foot grid and also establish major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval.
- b. Payment will be made by the Cubic Yard (CY). Payment includes all costs to excavate from the Phase 2 area or the OWNER designated borrow area, haul, place, rough grade, process,

moisture condition, and compact in the Cell 10 area as described in Sections 02221 and 02222, and as shown on the Drawings.

9. **3-Foot Compacted Clay Liner, Processing and Placement (Bid Item 8)**
 - a. Measured by in-place Cubic Yard (CY). Measurement of in-place compacted clay liner will be based on the neat line dimensions shown on the drawings.
 - b. Payment will be made by the Cubic Yard (CY) in-place. Payment includes all costs to furnish equipment and labor to excavate from the borrow pit, crush, screen (1-inch minus), load, haul, process, place in the Phase 2 sump, rough grade, moisture condition and compact as described in Sections 02221 and 02222, and as shown on the Drawings.

10. **3-Foot Compacted Clay Liner, Processing and Stockpile (Bid Item 9)**
 - a. Measured by in-place Cubic Yard (CY). Measurement shall be based on a survey of the processed and stockpiled material. Survey will establish stockpile grades at a maximum 50-foot grid and establish major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval..
 - b. Payment will be made by the Cubic Yard (CY) in-place. Payment includes all costs to furnish equipment and labor to excavate from the borrow pit, crush, screen (1-inch minus), load, haul, and stockpile as described in Sections 02221 and 02222, and as shown on the Drawings.

11. **3-Inch Thick Soil Cushion – Side Slopes (Bid Item 10)**
 - a. Measurement by the Cubic Yard (CY). Measurement shall be based on the surveyed area multiplied by the neat line thickness for the soil cushion layer material meeting the gradation requirements of Section 02222 and as shown on the Drawings. CONTRACTOR will be responsible for verifying specified thickness by survey methods. The CONTRACTOR is also responsible for stockpiling any oversize material from the screening operation as directed by the OWNER. No adjustments will be made in the area for uneven contours.

- b. Payment shall be by the Cubic Yard (CY) in-place. Payment includes all costs to furnish equipment and labor to screen, haul, place, moisture condition, compact, grade and smooth material as soil cushion as shown on the Drawings and as described in Section 02222. Payment also includes all costs to stockpile screened oversized material as directed by OWNER.

12. 3-Inch Thick Soil Cushion - Floor **(Bid Item 11)**

- a. Measurement by the Cubic Yard (CY). Measurement shall be based on the surveyed area multiplied by the neat line thickness for the soil cushion layer material meeting the gradation requirements of Section 02222 and as shown on the Drawings. CONTRACTOR will be responsible for verifying specified thickness by survey methods. The CONTRACTOR is also responsible for stockpiling any oversize material from the screening operation as directed by the OWNER. No adjustments will be made in the area for uneven contours.
- b. Payment shall be by the Cubic Yard (CY) in-place. Payment includes all costs to furnish equipment and labor to screen, haul, place, moisture condition, compact, grade and smooth drum roll material as soil cushion as shown on the Drawings and as described in Section 02222. Payment also includes all costs to stockpile screened oversized material as directed by OWNER.

13. Geosynthetic Subgrade Preparation **(Bid Item 12)**

- a. Measured by the Acre (AC). Measurement based on perimeter survey; sloped areas will be equated based on actual area, not plan area.
- b. Payment shall be by the Acre (AC). Payment includes all costs to complete subgrade preparation for the geosynthetic installation area as described in Section 02223.

14. Leachate Collection Gravel **(Bid Item 13)**

- a. Measurement by the Cubic Yard (CY) of gravel installed, based on the field survey of the installed trenches and sump multiplied by the neat line dimensions shown on the drawings.
- b. Payment shall be by the Cubic Yard (CY). Payment includes all costs to purchase, supply, and install the leachate collection gravel in the pipe trenches and leachate collection sump as shown

on the Drawings and described in Section 02227. Also includes all costs to install OWNER supplied geotextile as shown on the Drawings and described in Sections 02227, 02710, and 02771.

15. **Screen & Place 2-Foot Protective Soil Cover Layer in Phase 2 (Bid Item 14)**
 - a. Measurement by the Cubic Yard (CY). Measurement shall be based on the surveyed area multiplied by the neat line thickness for the protective soil cover layer material meeting the gradation requirements of Section 02222 and as shown on the Drawings. CONTRACTOR will be responsible for verifying specified thickness by survey methods. The CONTRACTOR is also responsible for stockpiling any oversize material from the screening operation as directed by the OWNER. No adjustments will be made in the area for uneven contours.
 - b. Payment shall be by the Cubic Yard (CY) in-place. Payment includes all costs to furnish equipment and labor to screen, haul and place material as protective soil cover layer as shown on the Drawings and as described in Section 02222. Payment also includes all costs to stockpile screened oversized material as directed by OWNER.

16. **Screen and Stockpile Protective Soil Cover Material (Bid Item 15)**
 - a. Measurement by the Cubic Yard (CY). Measurement shall be based on a survey of the screened protective soil cover material. Survey will establish stockpile grades at a maximum 50-foot grid and establish major grade breaks. Calculations will be made on an average end area basis vertically by 2-foot contour interval. The CONTRACTOR is also responsible for stockpiling any oversize material from the screening operation as directed by the OWNER.
 - b. Payment shall be by the Cubic Yard (CY). Payment includes all costs to furnish equipment and labor to screen, haul and stockpile material as protective soil cover layer as shown on the Drawings and as described in Sections 02221 and 02222. Payment also includes all costs to stockpile screened oversized material as directed by OWNER.

17. **Permanent Liner Termination (Bid Item 16)**
 - a. Measurement by the Lineal Foot (LF) of the termination, based on the field survey.

- b. Payment shall be by Lineal Foot (LF). Payment includes all costs to locate, excavate, prepare, shape, backfill, compact, or otherwise construct the termination as shown on the Drawings and described in Section 02222.

18. Temporary Side-Slope Liner Termination **(Bid Item 17)**

- a. Measurement by the Lineal Foot (LF) of the termination, based on the field survey.
- b. Payment shall be by Lineal Foot (LF). Payment includes all costs to locate, excavate, prepare, shape, backfill, compact, or otherwise construct the termination as shown on the Drawings and described in Section 02222. Payment also includes all costs to supply and install Plywood as shown on the Drawings.

19. Temporary Floor Liner Termination **(Bid Item 18)**

- a. Measurement by the Lineal Foot (LF) of the termination, based on the field survey.
- b. Payment shall be by Lineal Foot (LF). Payment includes all costs to locate, excavate, prepare, shape, backfill, compact, or otherwise construct the termination as shown on the Drawings and described in Section 02222. Payment also includes all costs to supply and install Plywood as shown on the Drawings.

20. Temporary Geomembrane Flap Installation and Anchorage **(Bid Item 19)**

- a. Measurement by the Lineal Foot (LF) of the flap, based on the field survey.
- b. Payment shall be by Lineal Foot (LF). Payment includes all costs to move geomembrane flap into position as necessary and anchor, as shown on the Drawings. Flap will be cut, installed, and welded to the primary geomembrane by others prior to placement of the protective soil cover layer.

21. 6-Inch Perforated HDPE LCRS Header Pipe **(Bid Item 20)**

- a. Measurement by the Lineal Foot (LF) of pipe, based on the field survey.
- b. Payment shall be by Lineal Foot (LF). Payment includes all costs to purchase, supply, fusion weld, and install the leachate collection

header pipe as shown on the Drawings and described in Section 02710.

22. **6-Inch Non-Perforated HDPE LCRS Header Cleanout Pipe & Support (Bid Item 21)**
 - a. Measurement by the Lineal Foot (LF) of pipe, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to purchase, supply, fusion weld, and install the non-perforated leachate collection cleanout pipe as shown on the Drawings and described in Section 02710. Also includes all costs to supply and install pipe support as shown on the Drawings.

23. **6-Inch Perforated HDPE LCRS Lateral Pipe (Bid Item 22)**
 - a. Measurement by the Lineal Foot (LF) of pipe, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to purchase, supply, fusion weld, and install the leachate collection lateral pipe as shown on the Drawings and described in Section 02710.

24. **12-Inch HDPE Leak Detection Riser Pipe (Bid Item 23)**
 - a. Measurement by the Lineal Foot (LF) of pipe, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to purchase, supply, fusion weld, and install the non-perforated and perforated leak detection riser pipe sections and fittings in the sump as shown on the Drawings and described in Section 02710.

25. **24-Inch HDPE Sump Riser Pipe (Bid Item 24)**
 - a. Measurement by the Lineal Foot (LF) of pipe, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to purchase, supply, fusion weld, and install the non-perforated and perforated leachate collection riser pipe sections and fittings in the sump as shown on the Drawings and described in Section 02710.

26. **Leachate Collection Sump Riser Support (Bid Item 25)**

- a. Measured by Lump Sum (LS).
 - b. Payment shall be Lump Sum (LS). Payment includes all costs to supply materials, fabricate, paint, and install the leachate collection sump riser support as show on the Drawings. Also includes all costs to furnish all labor and materials for installing support concrete structure and all work necessary including but not limited to, preparing concrete pad with aggregate base, installing rebar, and mounting pipes to riser support as shown on the Drawings.
27. 12-mil Scrim Reinforced Polyethylene **(Bid Item 26)**
- a. Basis of measurement: By the Lineal Foot (LF). Measurement based on an as-built survey of the installed 12-mil scrim reinforced polyethylene.
 - b. Payment will be by the Lineal Foot (LF). Includes all costs to furnish and install 12-mil scrim reinforced polyethylene as shown on the Drawings.
28. Grade 50-Foot Wide Access Road **(Bid Item 27)**
- a. Measurement by the Lineal Foot (LF) of the constructed access road, based on the field survey.
 - b. Payment shall be by Lineal Foot (LF). Payment includes all costs to locate, grade, prepare, shape, backfill, compact, or otherwise construct the access road as shown on the Drawings and described in Sections 02221 and 02222.
29. Compacted Aggregate Base for Access Roads and Embankments **(Bid Item 28)**
- a. Measured by in-place Cubic Yard (CY). Measurement and calculation of in-place road base will be made by surveying the limits of the roads and ramps and multiplying the area times the neat line design thickness shown on the Drawings.
 - b. Payment will be made by the Cubic Yard (CY). Payment includes all costs to purchase, load, haul, place, moisture condition and compact as described in Sections 02222 and 02231, and as shown on the Drawings.
30. Geosynthetic Clay Liner (GCL) **(Bid Item 29, Owner Supplied)
(Installed by Others)**

- a. Measurement by the Square Foot (SF). Measurement by area installed including material in the anchor trenches in accordance with agreement between OWNER and SUPPLIER/INSTALLER, measured by the Square Foot (SF) based on a perimeter survey of the completed installation. No adjustment will be made for uneven contours or for overlap at seams or wastage. No measurement will be made for geosynthetic clay liner lost due to damage resulting from either the fault or the negligence of the CONTRACTOR. The perimeter is defined as the neat line dimension shown on the perimeter details.
 - b. Payment will be by the Square Foot (SF). Payment includes all costs to install GCL as shown on the Drawings and described in Section 02779.
31. 60-mil Double-Sided Textured Geomembrane **(Bid Item 30, Owner Supplied)**
(Installed by Others)
- a. Measurement by the Square Foot (SF). Measurement by area installed including material in the anchor trenches, flaps, and rub sheets in accordance with agreement between OWNER and SUPPLIER/INSTALLER, measured by the square foot (SF) based on a perimeter survey of the completed installation. No adjustment will be made for uneven contours or for overlap at seams, or wastage. No measurement will be made for geomembrane lost due to damage resulting from either the fault or the negligence of the CONTRACTOR. The perimeter is defined as the neat line dimension shown on the perimeter details.
 - b. Payment will be by the Square Foot (SF). Includes all costs to install geomembrane as shown on the Drawings and described in Section 02778.
32. Double-Sided Geocomposite **(Bid Item 31, Owner Supplied)**
(Installed by Others)
- a. Measurement by the Square Foot (SF). Measurement by area installed including anchor trenches in accordance with agreement between OWNER and SUPPLIER/INSTALLER, measured by the square foot (SF) based on a perimeter survey of the completed installation. No adjustment will be made for uneven contours or for overlap at seams or wastage. No measurement will be made

for geocomposite lost due to damage resulting from either the fault or the negligence of the CONTRACTOR. The perimeter is defined as the neat line dimension shown on the perimeter details.

- b. Payment will be by the Square Foot (SF). Includes all costs to install geocomposite as shown on the Drawings and described in Section 02776.

33. Geotextile Supply (Bid Item 32, Owner Supplied)

- a. Measurement by the Square Foot (SF). Measurement based on the neat line design dimensions in accordance with agreement between OWNER and SUPPLIER.
- b. Payment will be by the Square Foot (SF). Includes all costs to supply and deliver geotextile as shown on the Drawings and described in Section 02771. Payment specifically excludes installation which is included in Bid Item 10.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01035
MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Field Orders.
- B. Work Directive Changes.
- C. Change Orders.

1.2 CHANGE PROCEDURES

- A. OWNER will issue Field Orders for minor changes in the Work not involving an adjustment to Contract Price or Contract Time.
- B. OWNER may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required, and the period of time during which the requested price will be considered valid. CONTRACTOR shall prepare and submit a Proposal with estimate within 5 days.
- C. CONTRACTOR may request a change by submitting a Proposal to OWNER, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, the effect on the Contract Price and Contract Time, and a statement describing the effect on Work by separate or other contractors in accordance with Section 00675 within the Project Manual.
- D. OWNER may issue a Work Change Directive for any change which, if not processed expeditiously, might delay the Project. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order.
- E. Changes affecting Contract Price or Contract Time, resulting under paragraphs 1.2 B, C, and D of this Section, will be processed as a Change Order.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements for survey work to be performed by CONTRACTOR to layout Work under this Contract.
- B. Before commencing any surveys, CONTRACTOR will give OWNER two working days advance notice so that OWNER may witness such work.

1.2 RELATED SECTIONS:

- A. Section 01025 – Measurement and Payment.

1.3 DESCRIPTION

- A. Reference points: Reference points to be provided by OWNER pursuant to the General Conditions will include referenced monuments and elevation benchmarks in the vicinity of the Project. If displaced by CONTRACTOR, replacement of these reference points will be at the expense of CONTRACTOR.
- B. CONTRACTOR will furnish all necessary detail surveys including all lines, grades, and elevation appropriate to control construction. At a minimum, construction surveys are required for top of subgrade and top of drainage/operations layer.
- C. Use by OWNER: OWNER may at any time use line and grade points and markers established by CONTRACTOR. CONTRACTOR's surveys are a part of the Work and may be checked by OWNER at any time. CONTRACTOR is responsible for any lines, grades, or measurements which do not comply with specified or proper tolerances, or which are otherwise defective, and for any resultant defects in the Work. CONTRACTOR will be required to conduct re-surveys or check surveys to correct errors indicated by review of the field notebooks or otherwise detected.

1.4 SURVEYS FOR MEASUREMENT FOR PAYMENT

- A. When the Specifications or OWNER require Bid Schedule items of work to be measured by surveying methods, CONTRACTOR will perform the surveys. All such surveys, including control surveys for establishing the measurement reference lines, will be performed by a duly qualified and licensed surveyor in the presence of CONTRACTOR who will provide notice so OWNER may witness the surveying operation. OWNER may independently check calculations of final

quantities for payment purposes. A duplicate of the note reductions and calculations will be given to OWNER. All calculated quantities shall be certified by surveyor as to accuracy.

1.5 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

- A. Perform control traverse field surveys and computations to an accuracy of at least 1:10,000.
- B. The tolerances applicable in setting survey stakes are as set forth below. Such tolerances cannot supersede stricter tolerances required by the Drawings or Specifications, and cannot otherwise relieve the CONTRACTOR of responsibility for measurements in compliance therewith.

| <u>Type of Mark</u> | <u>Horizontal Position</u> | <u>Elevation</u> |
|----------------------------------|----------------------------|------------------|
| Permanent reference points | 1 in 10,000 | ±.01 ft. |
| General excavation and earthwork | 1 in 2,000 | ±.10 ft. |

- C. Tolerances for the thickness of earthen layers shown on Drawings and for elevations shown on the Drawings are ±0.10 foot unless otherwise specified.
- D. Surveyor must be licensed in the State of Utah.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01052

LAYOUT OF WORK AND SURVEYS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes requirements for survey work to be provided by the CONTRACTOR for the following:
 - 1. Setting offset stakes, slope stakes, and grade stakes for field layout of features for performance of the Work.
 - 2. Surveys for measurement of quantities for payment.
 - 3. Record Drawings.

1.2 DESCRIPTION

- A. **Reference Points.** The reference points provided by the OWNER include monuments and elevation bench marks in the vicinity of the Project. If displaced during the project, replacement of these reference points will be at the expense of the CONTRACTOR.
- B. The OWNER reserves the right to perform any desired checking and correction of the CONTRACTOR's layout work relative to OWNER's surveys but this does not relieve the CONTRACTOR of the responsibility for adequate performance of their Work.
- C. **Equipment and Personnel.** Provide instruments and other survey equipment that are accurate, suitable for the surveys required in accordance with recognized professional standards and in proper condition and adjustment at all times. Perform surveys under the direct supervision of a licensed surveyor.
- D. **Field Notes and Records.** Record surveys in field notebooks.
- E. **Use by the OWNER.** The OWNER may at any time use line and grade points and markers established by the OWNER or CONTRACTOR. The CONTRACTOR's surveys are a part of the Work and may be checked by the OWNER or representatives of the OWNER at any time.

1.3 RELATED SECTIONS

- A. Section 01025 - Measurement and Payment

B. Section 01050 – Field Engineering

1.4 SURVEYS FOR LAYOUT AND PERFORMANCE OF WORK

A. CONTRACTOR will perform all surveys for layout of the Work, reduce the field notes, make necessary calculations, and prepare drawings necessary to carry out such work. CONTRACTOR's layout work will include the following:

- 1. Slope staking for cell grading at 50-foot grid and grade breaks.**
- 2. Blue top for landfill subgrade at 50-foot grid and grade breaks.**
- 3. Control staking for protective soil cover layer thickness at 50-foot grid, and grade breaks.**
- 4. Control staking for low permeability soil layer thickness at 5-foot grid, and grade breaks.**
- 5. All as-built surveys specified here in.**
- 6. Surveys to measure completed units of work specified here in.**

B. CONTRACTOR must perform all additional slope staking, off-setting and other control staking necessary to perform the Work.

1.5 SURVEYS FOR RECORD DRAWINGS AND MEASUREMENT FOR PAYMENT

A. Provide the OWNER with as-built Record Drawings that show the following items:

- 1. Topography that depicts the landfill subgrade following excavation and engineered fills.**
- 2. Anchor trench location with survey points every 200 feet and at alignment breaks, such as corners.**
- 3. Limit of geomembrane liner (surface area).**
- 4. Topography that depicts the top of the geosynthetic subgrade, low permeability soil layer, and Protective Soil Cover Layer, including perimeter berms, signed and sealed by a Utah Registered Land Surveyor.**
- 5. Topography of all constructed ditches.**
- 6. Alignment, ends, and invert elevations of fence, pipes and culverts.**

7. Topography that depicts the engineered fill placement of the embankments.
- B. Submit survey information for items listed above to the OWNER before the items are covered.
1. Provide surveys to measure the following items:
 - a. Actual area (corrected for slope) of geosynthetics.
 - b. Length of channels.
 - c. Length of pipes and culverts.
 - d. Volume of excavation and engineered fill.
 - e. Volume of low permeability soil layer in sump.
- C. The OWNER may perform independent checks.
- D. Provide Record Drawings on 22" x 34" size drawings, and on computer disk in AutoCAD version 2017 or later. Use the coordinate system shown on the drawings.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01200
PROJECT MEETINGS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Representatives of CONTRACTOR, subcontractors, and suppliers attending meetings must be authorized to act on behalf of organizations they represent.

1.2 PRE-CONSTRUCTION MEETING

- A. Meeting will be held at a location selected by OWNER.
- B. Attendance:
 - 1. CONTRACTOR's Office Representative.
 - 2. CONTRACTOR's On-Site Field Superintendent.
 - 3. Any Subcontractors or Supplier's representatives whom CONTRACTOR may desire to invite or OWNER may request.
 - 4. ENGINEER's Representatives.
 - 5. OWNER's Representatives. (Includes Design Engineer and CQA Personnel)
- C. A suggested format would include, but not be limited to, the following subjects:
 - 1. Presentation of a proposed construction progress schedule and submittals as required by the Contract Documents.
 - 2. Required bonds and insurance certifications prior to Notice to Proceed.
 - 3. Liquidated Damages.
 - 4. Procedures for handling submittals.
 - 5. Direction of correspondence, and coordinating responsibility between CONTRACTOR and OWNER.
 - 6. Request or scheduling of a weekly job meeting for all involved.
 - 7. Laboratory testing of construction materials.

8. Applications for payment, and progress payment procedures.
 9. Change Order procedures.
 10. OWNER's site regulations.
- D. The meeting will be documented by the OWNER or person designated by the OWNER. Copies of the minutes and relevant documents will be provided to all parties.

1.3 WEEKLY PROGRESS MEETINGS

- A. OWNER'S Representative will schedule and administer progress meetings at a minimum of once per week and such additional meetings as required, or as requested by OWNER.
- B. Attendance:
1. OWNER'S Representative.
 2. ENGINEER, if requested by OWNER'S Representative.
 3. CQA Officer.
 4. CONTRACTOR's superintendent.
 5. Subcontractors as appropriate to agenda.
 6. Suppliers as appropriate to agenda.
- C. Meeting requirements:
1. OWNER'S Representative will administer the following general requirements for progress meetings:
 - a. Prepare agenda for meetings.
 - b. Make physical arrangements for meetings.
 - c. Preside at meetings.
 2. CONTRACTOR will administer the following general requirements for progress meetings:
 - a. Record significant proceedings and decisions of meeting.

- b. Reproduce and distribute copies of meeting record within seven days after each meeting to participants in meeting and to parties affected by decisions made at meeting. Furnish one copy of minutes to participants. Revise and distribute revisions to meeting minutes as necessary.

D. Suggested Agenda:

1. Review and approval of record of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, and conflicts.
4. Problems which impede Work Schedule.
5. Review of off-site delivery schedules.
6. Corrective measures and procedures to regain projected schedule if a review of the schedule deems it necessary.
7. Revisions to Construction Progress Schedule.
8. Coordination of schedules between contractors.
9. Review submittal schedules; expedite as required.
10. Maintenance of quality and safety standards.
11. Pending changes and substitutions.
12. Review proposed changes for effect on construction schedule and completion date, and on other contracts of projects.
13. Review of drawings and specifications that govern the next two weeks of work.
14. Review of bid item quantities relative to original estimates.
15. Review and update of as-built drawings.
16. Other business.

1.4 DAILY PROGRESS MEETINGS

- A. An informal progress meeting will be held daily before the start of work. At a minimum, this meeting will be attended by the OWNER'S Representative and CONTRACTOR's Project Manager or Job Foreman. The purpose of this meeting is to:
1. Review scheduled work activities.
 2. Discuss problems and resolutions.
 3. Review test data.
 4. Discuss the CONTRACTOR's personnel and equipment assignments for the day.
 5. Review the previous day's activities and accomplishments.
- B. This meeting will be documented by the OWNER'S Representative.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Proposed Products list.
- D. Shop Drawings.
- E. Product Data.
- F. Samples.
- G. Manufacturers' installation instructions.
- H. Manufacturers' certificates.

1.2 RELATED SECTIONS

- A. Section 01310 - Construction Schedule
- B. Section 01400 - Quality Control: Manufacturers' field services and reports.
- C. Section 01700 – Contract Closeout: Contract warranties, bonds, manufacturers' certificates, and closeout submittals.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a transmittal form. Provide a minimum of three copies of each submittal. OWNER will retain one copy of each submittal.
- B. Sequentially number the transmittal form. For revised submittals add an alphabetic suffix to the original number.
- C. Identify Project, CONTRACTOR, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply CONTRACTOR's stamp, signed or initialed certifying review, verification of Products required, field dimensions, adjacent construction Work, and

coordination of information, is in accordance with the requirements of the Work and Contract Documents.

- E. Schedule submittals to expedite review by the OWNER and delivery in the time frame specified. Coordinate submission of related items.
- F. Allow 7 calendar days review time for each submittal excluding delivery time to and from the CONTRACTOR.
- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for CONTRACTOR, OWNER and/or OWNER's Representative review stamps.
- I. If revisions and re-submittals are required, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.
- K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 5 days after date of Agreement.
- B. Revise and resubmit as required but no less than every 7 days. The revised schedule must show the original target schedule.
- C. Submit revised schedules during weekly progress meetings. If revisions to the schedule affect work by others (i.e., Liner Installer), the OWNER must be notified two weeks prior to the change. No changes may be initiated without the written approval of the OWNER.
- D. Submit a computer-generated schedule with separate line for each item of Work or operation identifying first work day of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the critical path, start, and finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.

- G. Indicate submittal dates and review periods required for shop drawings, product data, samples, and product delivery dates, including those furnished by OWNER.

1.5 PROPOSED PRODUCTS LIST

- A. Within 5 days after date of OWNER-CONTRACTOR Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 SHOP DRAWINGS

- A. Submit the number of opaque reproductions which CONTRACTOR requires, plus 2 copies which will be retained by OWNER.
- B. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 – CONTRACT CLOSEOUT.

1.7 PRODUCT DATA

- A. Submit the number of copies which the CONTRACTOR requires, plus 2 copies which will be retained by the OWNER.
- B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- C. After review, distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 – CONTRACT CLOSEOUT.

1.8 SAMPLES

- A. Submit a sample of the gravel and any other imported soil material that represents the specified products. Coordinate sample submittals for interfacing work.
- B. For the soil samples, submit each sample in an air-tight sealed bucket and provide at least 50 pounds, unless otherwise stated in the individual specification sections.

- C. Include identification on each sample including source identification and full project information.
- D. Submit the number of samples specified in individual specification sections. The Owner may retain all or a portion of each sample as a record of the submittal.

1.9 MANUFACTURER INSTALLATION INSTRUCTIONS

- A. When specified in individual specification sections, submit three copies of printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to the Owner.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 MANUFACTURER CERTIFICATES

- A. When specified in individual specification sections, submit manufacturer's certificates in specified quantities.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting data, affidavits, certifications, and quality control testing.
- C. Certificates must be specific to the material or product delivered to the site.

END OF SECTION

SECTION 01310
CONSTRUCTION SCHEDULE

PART 1 GENERAL

1.1 DESCRIPTION

- A. Prepare and submit with Bid, a preliminary construction schedule in compliance with Section 01300.
- B. The CONTRACTOR shall provide a schedule demonstrating completion of all work items by project completion date listed in Document 00020 Invitation to Bid.
- C. OWNER will review the preliminary construction schedule and incorporate it into their overall project schedule.

1.2 DELAYS AND RECOVERY

- A. If, at any time during Project, CONTRACTOR fails to complete an activity by its latest scheduled completion date, CONTRACTOR must submit within two working days a written statement as to how and when CONTRACTOR will reorganize work force to return to current construction schedule.
- B. Whenever it becomes apparent from progress evaluation and updated schedule data that milestone completion dates and/or contract completion dates will not be met, some or all of the following actions must be taken:
 - 1. Increase construction staffing in such quantities and crafts to substantially eliminate backlog of work.
 - 2. Increase number of working hours per shift, shifts per work day, work days per week, or amount of construction equipment, or combination of foregoing to substantially eliminate backlog of work.
 - 3. Reschedule work items to achieve concurrence of accomplishment.
- C. Under no circumstances will addition of equipment or construction forces, increasing working hours or any other method, manner or procedure to return to current Construction Progress Schedule be considered justification for contract modification or treated as acceleration.

1.3 PROJECT UPDATES

- A. Update schedule weekly, or as requested by Owner.

- B. Provide details for scheduled activities over the two weeks following the current day of the schedule. Changes affecting work by others shall be addressed per Section 01300, 1.4, C.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Acceptance or quality assurance testing by OWNER.
- B. Quality control testing by CONTRACTOR.
- C. Certificates of compliance.

1.2 SOURCE OF MATERIALS

- A. CONTRACTOR must notify OWNER in writing of the sources from which it proposes to obtain material requiring approval, certification, or testing. Such notification must be made as soon as possible after award of Contract but no later than 5 days after receipt of the Notice to Proceed.

1.3 ACCEPTANCE TESTING OR QUALITY ASSURANCE TESTING

- A. Acceptance testing is the testing of materials prior to their use in the Work and also any testing deemed necessary by OWNER for acceptance of the completed Work. OWNER will perform acceptance testing of materials and workmanship in accordance with the Contract Documents and reserves the right to perform additional testing at any time to determine conformance with the requirements of the Contract Documents.
- B. Acceptance testing by OWNER is not to be considered as a replacement for control testing conducted by CONTRACTOR or a manufacturer producing materials for CONTRACTOR. Acceptance testing will be at the expense of OWNER.

1.4 QUALITY CONTROL TESTING

- A. Quality control testing is the testing of materials prior to their delivery from a manufacturer, or during construction, such as geomembrane liner seam testing, and such other tests as are specified in the various sections of the Specifications to ensure compliance with the Contract Documents. CONTRACTOR must assume full responsibility for control testing and give sufficient notice to OWNER to permit it to witness the tests. Control testing is at the expense of CONTRACTOR and where specifically required, performed by an independent testing firm.

- B. Submit the name, address, and qualifications, together with the scope of proposed services, of the proposed testing firm(s) submit to OWNER for approval at least 5 days prior to the scheduled commencement of any work involving such testing.
- C. Within five days after completion of testing performed by or for CONTRACTOR, submit test results to OWNER. Identify test reports with the information specified for samples in Section 01300 and additionally, the name and address of the organization performing the test, and the date of the tests.

1.5 CERTIFICATES OF COMPLIANCE

- A. CONTRACTOR may use certificates of compliance for certain materials and products in lieu of the specified sampling and testing procedures. Submit certificates required to demonstrate proof of materials compliance with specification requirements. Submit certificates in duplicate with each lot of material delivered to the Work or prior to delivery as required by the Contract. The lots so certified must be clearly identified by the certificate. Certificates must be signed by an authorized representative of the producer or manufacturer, and state that the material complies in all respects with the requirements of the Contract Documents. In the case of multiple shipments, each shipment must be accompanied or preceded by a Certificate of Compliance.
- B. The Certificate of Compliance must be accompanied by a certified copy of tests results or state that such test results are on file with the producer or manufacturer and must be furnished to OWNER on request. The certificate must give the information specified for samples in Section 01300, the name and address of the organization performing the tests, the date of the tests, and the quantity of material shipped.
- C. Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance does not relieve CONTRACTOR of responsibility for incorporating material in the Work which conforms to the requirements of the Contract. Any such material not conforming to such requirements will be subject to rejection, whether in place or not.
- D. OWNER reserves the right to refuse to permit the use of certain materials on the basis of a Certificate of Compliance.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction facilities required for the construction of the permanent facilities specified under the Scope of Work of this Contract.
- B. Construction facilities include furnishing of all equipment, materials, tools, accessories, incidentals, labor, and performing all work for the installation of equipment and for construction of facilities, including their maintenance, operation, and removal, if required, at the completion of the Work under the Contract.

1.2 RELATED SECTIONS

- A. Section 01560 – Temporary Controls.

1.3 DEFINITION

- A. Construction facilities include, but are not be limited to, the following temporary offices, utilities, equipment, materials, facilities, areas, and services:
 - 1. Field Office (Optional)
 - 2. Parking Areas
 - 3. Temporary Roads
 - 4. Storage of Materials and Equipment
 - 5. Construction Equipment
 - 6. Temporary Sanitary Facilities
 - 7. Temporary Electric Power
 - 8. Temporary Water
 - 9. First Aid Facilities
 - 10. Security

1.4 REFERENCES

- A. Construct/install, maintain and operate construction facilities in accordance with the applicable federal, state, and local laws, rules, and regulations.

1.5 GENERAL REQUIREMENTS

- A. CONTRACTOR is responsible for furnishing, installing, constructing, operating, maintaining, removing and disposing of the construction related facilities, as specified in this Specification, and as required by OWNER for the completion of the Work under the Contract.
- B. Locate and maintain construction facilities in a clean, safe and sanitary condition at all times until completion of the Contract.
- C. The requirements specified herein are in addition to any requirements specified elsewhere in the Contract Documents. Construction facilities must meet the requirements for all-weather service.
- D. Minimize land disturbances related to the construction facilities to the greatest extent possible and restore land to the extent reasonable and practical, to its original contours by grading to provide positive drainage and by seeding the area to match with existing vegetation, or as specified elsewhere. All debris or other disturbances resulting from the CONTRACTOR's actions shall be removed by the CONTRACTOR to the satisfaction of the OWNER.
- E. Design and construct utilities to provide uninterrupted service.

1.6 FIELD OFFICE

- A. CONTRACTOR may provide an office for his own staff.
- B. The location of the office must be approved by OWNER.

1.7 PARKING AREAS

- A. OWNER will provide parking area for maintenance and delivery vehicles, the OWNER's, ENGINEER's, and CONTRACTOR's representatives, and other authorized visitors.

1.8 TEMPORARY ROADS

- A. General.

1. Temporary roads are existing roads that are improved or new roads constructed by CONTRACTOR for convenience of CONTRACTOR in the performance of the Work under the Contract.
2. Coordinate construction with OWNER.
3. If applicable, coordinate all road construction activities with local utilities, fire and police departments.
4. Keep erosion to a minimum and maintain suitable grade and radii of curves to facilitate ease of movement of vehicles and equipment.
5. Furnish and install longitudinal and cross drainage facilities including, but not limited to, the ditches, structures, pipes and the like.
6. Clean equipment so that mud or dirt is not carried onto public roads. Clean any mud or dirt transported by equipment onto paved roads both on site and off site.

1.9 STORAGE OF MATERIALS AND EQUIPMENT

- A. Make arrangements for storage areas for materials and equipment. Locations and configurations of such facilities are subject to the acceptance of OWNER.
- B. Confine all operations, including storage of materials, to approved area. CONTRACTOR is liable for any and all damage caused during such use of property of the OWNER or others. Store materials in accordance with manufacturer's instructions when applicable.
- C. Store construction materials and equipment within boundaries of designated areas. Storage of gasoline or similar fuels must conform to state and local regulations and be limited to the areas approved for this purpose by the OWNER.

1.10 CONSTRUCTION EQUIPMENT

- A. Erect, equip, and maintain all construction equipment in accordance with all applicable statutes, laws, ordinances, rules, and regulations of OWNER or other authority having jurisdiction.
- B. Provide and maintain scaffolding, staging, runways, hoists, barricades, and similar equipment required for performance of the Contract. Provide hoists or similar equipment with operators and signals, as required.

- C. Provide, maintain, and remove upon completion of the Work, all temporary rigging, scaffolding, hoisting equipment, debris boxes, barricades around openings and excavations, fences, ladders, and all other temporary work, as required for all work hereunder unless otherwise directed by OWNER.
- D. Construction equipment and temporary work must conform to all the requirements of state, county, local authorities, OSHA, and underwriters which pertain to operation, safety, and fire hazard. Furnish and install all items necessary for conformity with such requirements, whether or not called for under separate sections of these Specifications.

1.11 TEMPORARY SANITARY FACILITIES

- A. Provide temporary sanitary facilities for use by all employees and persons engaged in the work, including subcontractors, their employees and authorized visitors.
- B. Sanitary facilities include enclosed chemical toilets and washing facilities. These facilities must meet the requirements of local public health standards. Open pit or trench latrines are not permitted.
- C. Locate sanitary facilities as approved by OWNER, and maintain in a sanitary condition during the entire course of the work.

1.12 TEMPORARY ELECTRIC POWER (Optional)

- A. Provide and maintain during the course and progress of the Work all electrical power and wiring requirements to facilitate the work of all trades and services associated with the work. Make arrangements with the applicable serving utility company or provide generators and pay all charges for providing and maintaining electrical service including usage costs at the site unless otherwise approved by the OWNER. Furnish all temporary wiring, feeders, and connections.
- B. Routing of temporary conductors, including welding leads, must not create a safety hazard nor interfere with operation and maintenance of existing facilities.
- C. Install all temporary wiring in accordance with the applicable requirements of the local electrical code.
- D. Provide power and lighting to field office, and for Work as required, at no extra cost to OWNER.

1.13 TEMPORARY WATER

- A. Potable water is not available on-site. Refer to Section 01010 for construction water.
- B. Make all arrangements for water needs from an off-site supplier for emergencies.

1.14 FIRST AID FACILITIES

- A. Provide first aid equipment and supplies to serve all CONTRACTOR personnel at the site.

1.15 SECURITY

- A. Make all necessary provisions and be responsible for the security of the Work and the site until final inspection and acceptance of the Work unless otherwise approved by the OWNER. In no case shall the OWNER be responsible for the security of the CONTRACTOR's supplies, property, or equipment.

1.16 SHUT-DOWN TIME OF SERVICES

- A. Do not disconnect or shut down any part of existing utilities and services, except by express permission of OWNER.

1.17 MAINTENANCE

- A. Maintain all construction facilities, utilities, temporary roads, services to office, and the like in good working condition as required by OWNER during the term of the Contract.

1.18 STATUS AT COMPLETION

- A. Upon completion of the Work, or prior thereto, when so required by OWNER:
 - 1. Repair damage to roads caused by or resulting from the CONTRACTOR's work.
 - 2. Remove and dispose of all construction facilities including office trailers, and other facilities and utilities including all concrete foundations. Similarly, return all areas utilized for temporary facilities to substantially their near original, natural state, or as otherwise indicated or directed.

- B. Obliterate temporary roads built for CONTRACTOR's convenience and restore the area to near original conditions to the extent practicable unless otherwise approved by the OWNER.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01560
TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary controls required during the term of the Contract for the protection of the environment and the health and safety of workers and general public.
- B. Furnishing all equipment, materials, tools, accessories, incidentals, and labor, and performing all work for the installation of equipment and construction of facilities, including their maintenance and operation during the term of the Contract.
- C. Temporary controls include, but are not limited, to the following:
 - 1. Dust Control
 - 2. Pollution Control
 - 3. Traffic and Safety Controls
- D. Perform work as specified in this Specification and as required by OWNER. Maintain equipment and accessories in clean, safe and sanitary condition at all times until completion of the Contract.

1.2 RELATED SECTIONS

- A. Section 01500 — Construction Facilities.

1.3 DUST CONTROL

- A. Provide dust control measures if specified in the Contract. The CONTRACTOR shall obtain a dust control permit from Tooele County, if applicable.
- B. Dust control consists of transporting water, furnishing required equipment, additives, accessories and incidentals, carrying out proper and efficient measures wherever and as often as necessary to reduce dust nuisance, and to prevent dust originating from construction operations throughout the duration of the Contract, as required by OWNER.

- C. Apply water by means of pressure-type distributors or pipelines equipped with a spray system or hoses with nozzles that will insure a uniform application of water.
- D. Provide all equipment used for the application of water with a positive means of shut-off.
- E. Unless otherwise permitted by OWNER or unless all the water is applied by means of pipelines, provide at least one operations mobile unit with a minimum capacity of 3,500 gallons for applying water at the site during construction.

1.4 POLLUTION CONTROL

- A. Erosion Control: Control sediment transport on sloped surfaces. Submit a NOI as required by NPDES regulations. CONTRACTOR shall prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) which complies with all requirements of the applicable stormwater NPDES permit for construction activities.
- B. Pollution of Waterways: Perform work using methods that prevent entrance or accidental spillage of solid or liquid matter, contaminants, debris and other objectionable pollutants and wastes into streams, watercourses, flowing or dry, and underground water sources. Such pollutants and wastes will include, but will not be restricted to refuse, earth and earth products, garbage, cement, concrete, sewage effluent, industrial waste, radioactive substances, hazardous chemicals, oil and other petroleum products, aggregate processing tailings, and mineral salts. Dispose of pollutants and wastes in accordance with applicable permit provisions or in a manner acceptable to and approved by the OWNER.
- C. Storage and Disposal of Petroleum Products:
 - 1. Petroleum products covered by this section include gasoline, diesel fuel, lubricants, heating oils, and refined and used oil. During project construction, store all petroleum products in such a way as to prevent contamination of all ground and surface waters.
 - 2. Lubricating oil may be brought into the project area in steel drums or other means, as CONTRACTOR elects. Store used lubricating oil in steel drums, or other approved means, and return to the supplier for disposal. Do not burn or otherwise disposed of at the project area.
 - 3. If the total capacity volume of stored petroleum products is greater than 1,320 gallons in total and/or 660 gallons in any single container and these products are stored above ground, CONTRACTOR shall prepare and

adhere to a Spill Prevention Control and Countermeasure Plan (SPCC Plan) in accordance with applicable EPA and other state regulations.

- D. All chemicals stored on-site must be appropriately labeled as to its content and hazard rating.

1.5 TRAFFIC AND SAFETY CONTROLS

- A. Post construction areas and roads with traffic control signs or devices used for protection of workmen, the public and equipment. The signs or devices must conform to the American National Standards Institute, Manual on Uniform Traffic Control Devices for Streets and Highways.
- B. Remove signs or traffic control devices as soon as they have served their purpose. It is particularly important to remove any markings on road surfaces which under conditions of poor visibility could cause a driver to turn off the road or into traffic moving in the opposite direction.
- C. Barricades for protection of employees must conform to the portions of the American National Standards Institute, Manual on Uniform Traffic Control Devices for Streets and Highways, relating to barricades.
- D. Material Haul on Public Roads: Follow all requirements stated in the permits for using public roads for hauling materials to the site.
- E. Provide flag persons, properly equipped with International Orange protective clothing and flags, as necessary, to direct or divert pedestrian or vehicular traffic.
- F. Construct and maintain fences, planking, barricades, lights, shoring, and warning signs as required by local authorities, federal and state safety ordinances, and as required to protect OWNER's property from injury or loss, and as necessary for the protection of the public, and provide walks around any obstructions made in a public place for carrying on the Work covered in this Contract. Leave all such protection in place and maintained until removal is authorized.
- G. Guard and protect all workers, pedestrians, and the public from excavations, blasting operations, construction equipment, all obstructions, and other dangerous items or areas by means of adequate railings, guard rails, temporary walks, barricades, warning signs, sirens, directional signs, overhead protection, planking, decking, danger lights, etc.

1.6 MAINTENANCE

- A. Maintain all temporary controls in good working conditions during the term of the Contract for the safe and efficient transport of equipment and supplies, and for construction of permanent works, as required by OWNER.

1.7 STATUS AT COMPLETION

- A. Upon completion of the Work, or prior thereto, when so required by OWNER, remove all temporary controls and restore disturbed areas as required by OWNER.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- C. Storage and protection.

1.2 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacturer, for similar components.

1.3 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, and/or damage.
- D. Any damaged materials, whether as originally shipped or as a result of handling, shall be replaced at no additional cost to the OWNER and with no extension of contract time.

1.4 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight,

climate controlled enclosures.

- B. For exterior storage of fabricated products, place aboveground on sloped supports, if in accord with manufacturer's handling instructions.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- H. Any products that become damaged during storage shall be replaced at no additional cost to the OWNER and with no extension of contract time.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.1 SUMMARY

This Section describes CONTRACTOR procedures for securing approval of proposed product options and substitutions.

1.2 PRODUCT OPTIONS

- A. The Contract is based on standards of quality established in the Contract Documents.
 - 1. In agreeing to the terms and conditions of the Contract, the CONTRACTOR has accepted a responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.
 - 2. The OWNER does not agree to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.
- B. Materials and/or methods specified by name:
 - 1. Where materials and/or methods are specified by naming one single manufacturer and/or model number, without stating that equal products will be considered, only the material and/or method named is approved for incorporation into the Work.
 - 2. Should the CONTRACTOR demonstrate to the approval of the OWNER that a specified material or method was ordered in a timely manner and will not be available in time for incorporation into this Work, the CONTRACTOR shall submit to the OWNER such data on proposed substitute materials and/or methods as are needed to help the OWNER determine suitability of the proposed substitution.
- C. Where materials and/or methods are specified by name and/or model number, followed by the words "or an equal approved in advance by the OWNER" or similar wording:

1. The material and/or method specified by name establishes the required standard of quality;
 2. Materials and/or methods proposed by the CONTRACTOR to be used in lieu of materials and/or methods so specified by name must in all ways be equal or exceed the qualities of the named materials and/or methods;
- D. The following products do not require further approval except for interface within the Work:
1. Products specified by reference to standard specifications such as ASTM and similar standards;
 2. Products specified by manufacturer's name and catalog model number.
- E. Where the phrase "or equal," or "or equal as approved by the OWNER," occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved in writing for this Work by the OWNER.
- F. The decision of the OWNER shall be final.

1.3 DELAYS

- A. Delays in construction arising by virtue of the non-availability of a specified material and/or method will not be considered by the OWNER as justifying of the agreed Time of Completion.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Preparation, maintenance, completion, and submission of all project record drawings, specifications and related documents.

1.2 RELATED SECTIONS

- A. Section 01300 - Submittals.
- B. Section 01560 - Temporary Controls.

1.3 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintain at the job site one copy of the following Project or Contract Documents for record purposes:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and Work Change Directives.
 - 5. Field Orders.
 - 6. Reviewed Shop Drawings.
 - 7. Clarifications or Explanatory Drawings and Specifications.
 - 8. Inspection Reports.
 - 9. Laboratory Test Records.
 - 10. Field Test Records.
- B. Store documents used for record purposes in the field office or other approved location, apart from documents used for construction.
- C. File documents in accordance with the Construction Specification sections.

- D. Maintain documents in clean, dry, legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by the OWNER and his authorized representatives.

1.4 RECORD DRAWINGS

A. Project Drawings:

1. Maintain record drawings of all work and subcontracts continuously as the job progresses. Keep a separate set of prints, for this purpose only and at the job site at all times.
2. Keep these drawings up-to-date.
3. During the course of construction identify on the drawings, the actual locations for all runs of mechanical and electrical work, including all site utilities and services installed underground or otherwise concealed. Show deviations from the drawings in detail. Locate all main runs, whether piping, or drain lines by dimension and elevation.
4. During the course of the construction record as-built information outlined in Section 01052.
5. Deliver the final and record set of "as-built" drawings to the OWNER prior to the OWNER's acceptance of the Project.

B. Addenda and Change Orders:

1. Incorporate changes to the Drawings affected by Addenda, Change Orders, or Field Orders. Identify change by Addendum, Change Order, or Field Order number and effective date.
2. When revised drawings are issued as the basis of or along with addenda or change order, incorporate these revised drawings into the record set with appropriate annotation.

C. Shop Drawings:

1. Collect and maintain one complete set of reviewed shop drawings, including manufacturer's printed catalog cuts and data, for record purposes.

2. Shop drawings must be filed and maintained separate from project drawings. Shop drawings must be filed in 9 inch by 12 inch file folders to the greatest extent possible and be indexed in accordance with the format as herein specified.

1.5 RECORD SPECIFICATIONS

A. Project Specifications:

1. Information, changes, and notes must be recorded in the specifications in blank areas, such as page margins or the backs of opposite pages, or on separate sheets inserted in the binder. All such information, changes, and notes must be recorded with red pen or red typewriter ribbon.
2. In each section, in an appropriate location, record the manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
3. The record specifications book must be complete and include all documents and forms listed under Bidding Requirements, Contract Forms, Contract Conditions, and Specifications.

B. Addenda, Change Orders, Work Change Directives, and Field Orders

1. All Addenda, Change Orders, Work Change Directives, and Field Orders must be incorporated into the front of the specifications book in reverse chronological order. Use appropriate page dividers to identify addenda, change orders, and to separate addenda from the specifications.
2. In addition, the changes to the specifications effected by Addenda, Change Order, Work Change Directives, or Field Order must be annotated on the affected page or pages of the specifications, or adjacent thereto.

1.6 SUBMISSION OF DOCUMENTS

- A. At completion of the project, and before submitting invoice for final payment, deliver record documents to OWNER.
- B. Record documents must be delivered neatly and efficiently packaged.
- C. Submission of record documents must be accompanied with a transmittal letter, in triplicate, containing the following information:
 1. Date of submission.

2. Project title and number.
3. CONTRACTOR's name and address.
4. Title and number of each record document. (Shop drawings may be grouped in basic categories or divisions of work.)
5. Certification that each document as submitted is complete and accurate.
6. Signature of CONTRACTOR or his authorized representative.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

DIVISION 2

SITework

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SECTION 02110
CLEARING AND STRIPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Clearing and stripping grass and other organic material from landfill phase construction area as defined on the Drawings.
- B. Stockpiling stripped material.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that any existing plant life designated to remain is tagged and identified.
- B. Verify plants to be salvaged are tagged or identified.

3.2 PROTECTION

- A. Protect plant growth and any features designated to remain.
- B. Protect survey benchmarks from damage or displacement.

3.3 STRIPPING FOR LANDFILL PHASE

- A. Strip grass, roots, organic soils, and other deleterious materials prior to excavating.
- B. Strip to a maximum depth of 6 inches below existing ground surface.
- C. Transport and place all materials in the designated stockpile location on the Drawings or as directed by the OWNER, and in accordance with Section 02221.

END OF SECTION

SECTION 02221

EXCAVATING AND STOCKPILING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Excavating soil to construct the landfill subgrade, and obtaining soils for engineered fill, protective soil cover, soil cushion, and anchor trench backfill and stockpiling surplus soils.
- B. Excavating to construct stormwater collection pond.

1.2 RELATED SECTIONS

- A. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- B. Section 02223 – Geosynthetic Subgrade Preparation.
- C. Section 02248 – Compacted Clay Liner.
- C. Section 02776 - Drainage Geocomposite.
- D. Section 02778 - Geomembrane.
- E. Section 02779 - Geosynthetic Clay Liner.

PART 2 PRODUCTS

2.1 ENGINEERED FILL

- A. Soil meeting requirements of Section 02222, Part 2.1.

2.2 PROTECTIVE SOIL COVER

- A. Soil meeting requirements of Section 02222, Part 2.2.

2.3 SOIL CUSHION

- A. Soil meeting requirements of Section 02222, Part 2.3.

2.4 ANCHOR TRENCH BACKFILL

- A. Soil meeting requirements of Section 02222, Part 2.4

2.4 SURPLUS SOILS

- A. Remaining soils excavated.

PART 3 EXECUTION

3.1 PREPARATION

- A. Set required lines, levels, contours, and datum by construction staking.
- B. Locate, identify, and protect existing phase areas.
- C. Notify utility company to locate utilities, if applicable.
- D. Provide for dust control.
- E. Protect benchmarks, existing structures, and fences from excavation equipment and vehicular traffic.
- F. Coordinate operations with landfilling operations.
- G. Provide for dewatering as necessary for finish excavation and fill placement.
- H. CONTRACTOR shall note that topography shown on the Drawings may differ from topography at time of construction. The CONTRACTOR shall perform a pre-commencement survey to document site conditions prior to starting work.

3.2 EXCAVATION

- A. Excavate soil and rock as required to the lines, grades, and elevations to construct the landfill, roads, surface waste drainage systems, and other structures as necessary as shown on the Drawings.
- B. Machine grade slopes and base to design grades, in preparation for GCL placement.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- D. Remove lumped subsoil, rocks with sharp edges, boulders, and rock larger than 1 inch in largest dimension from completed subgrade elevation.
- E. Notify OWNER of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

- F. Correct areas over excavated by placing engineered fill per Section 02222 and as approved by the OWNER.
- G. Selectively excavate engineered fill, protective soil cover, soil cushion, and anchor trench backfill and stockpile near the landfill phase area.
- H. Haul remaining material, surplus soils, to stockpile(s) designated by OWNER.

3.3 SOIL STOCKPILING

- A. Coordinate selective soil stockpiling with OWNER.
- B. Place soil such that maximum slope is 3H:1V, and minimum slope is 5 percent.
- C. Placement and mass configuration of soil stockpiles shall be performed at the direction of the OWNER.
- D. Provide uniform final graded surface for the surplus soil stockpile.

3.5 FIELD QUALITY ASSURANCE

- A. Field quality assurance (QA) will be performed in accordance with the Construction Quality Assurance (CQA) Plan.
- B. The OWNER may perform testing to determine the conformance of the materials with the Specifications and Drawings.

END OF SECTION

SECTION 02222

ENGINEERED FILL, PROTECTIVE SOIL COVER, SOIL CUSHION, AND ANCHOR TRENCH BACKFILL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Engineered Fill Placement.
- B. Production and placement of Protective Soil Cover.
- C. Production and placement of Soil Cushion.
- D. Backfill for Anchor Trench.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02223 - Geosynthetic Subgrade Preparation.
- C. Section 02248 – Compacted Clay Liner.
- D. Section 02774 – Drainage Geocomposite.
- E. Section 02778 - Geomembrane.
- F. Section 02779 - Geosynthetic Clay Liner.

1.3 REFERENCES

- A. ASTM C-136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D-422 - Standard Test Method for Particle-Size Analysis of Soil.
- C. ASTM D-698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D. ASTM D-1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- E. ASTM D-2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

- F. ASTM D-2487 - Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- G. ASTM D-2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- H. ASTM D-3017 - Standard Test Method of Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

PART 2 PRODUCTS

2.1 ENGINEERED FILL

- A. Soil obtained from landfill excavation areas associated with landfill construction and from other borrow areas as directed by the OWNER.
- B. Free of organic material.
- C. Maximum particle dimension: 6 inches.
- D. Free of frozen material, ice, snow, or excessive moisture.

2.2 PROTECTIVE SOIL COVER

- A. Soils obtained from landfill excavation areas associated with landfill construction and from other borrow areas as directed by the OWNER.
- B. Maximum particle size of 1 inch.
- C. Be relatively uniform in gradation and free of rocks with sharp edges that could damage the geosynthetics.

2.3 SOIL CUSHION

- A. Soils obtained from landfill excavation areas associated with landfill construction and from other borrow areas as directed by the OWNER.
- B. Maximum particle size 1 inch.
- C. Be relatively uniform in gradation and free of rocks with sharp edges that could damage the geosynthetics.

2.4 ANCHOR TRENCH BACKFILL

- A. Select soils obtained from landfill excavation areas associated with landfill construction and from other borrow areas as directed by the OWNER.
- B. Free of organic material.
- C. Maximum particle size 3 inch.

PART 3 EXECUTION

3.1 ENGINEERED FILL PREPARATION

- A. Scarify subgrade soils to a 6-inch depth prior to soil placement.
- B. Prior to placement of engineered fill, verify that no substantial thickness of loose or uncompacted soil is present in the fill area.
- C. Begin engineered fill only when the ENGINEER has accepted the underlying subgrade.

3.2 ENGINEERED FILL PLACEMENT

- A. Place engineered fill to the lines and grades shown on the Drawings.
- B. Place in loose lift thickness not exceeding 8 inches.
- C. Compact each lift to a minimum of 95 percent relative compaction at a moisture content of $\pm 4\%$ of optimum as determined by ASTM D698. Completed lifts of fill cannot yield under equipment loads.
- D. Moisture conditioned and smooth-drum rolled as specified in Section 02223 – Liner Subgrade Preparation.
- E. Grade final surface to a vertical tolerance of ± 0.1 foot.

3.3 PLACEMENT OF PROTECTIVE SOIL COVER LAYER

- A. Screen material of oversize materials if necessary to achieve the particle size requirements described in paragraph 2.2.
- B. Verify that geosynthetic installations have been completed in accordance with deployment, seaming, and testing requirements.

- C. Spread and place the protective soil cover layer material using low ground pressure dozers. Rubber tired equipment, such as scrapers, motor graders and water trucks may not operate on the drainage layer without prior approval of the specified equipment or unless there is a minimum 24 inches of material covering the HDPE liner and the ground pressure at the liner interface does not exceed 20 psi.
- D. Place using an excavator bucket directly on geocomposite to prevent the propagation of wrinkles. Alternative equipment may be used with prior written approval of the OWNER or ENGINEER.
- E. Spread and place using low ground pressure dozers and graders. Alternative equipment may be used with prior approval of the OWNER or ENGINEER. Alternative equipment may require increased thicknesses of haul routes over installed geosynthetics.
- F. Place without damaging underlying geosynthetics. The CONTRACTOR shall repair any damage at no additional cost to the OWNER.
- G. Place material during the cool part of the day when the liner is relatively tight and free of wrinkles.
- H. Place material in an uphill direction.

3.4 SOIL CUSHION PLACEMENT

- A. Place soil cushion to the lines and grades shown on the Drawings.
- B. Place in a single loose lift.
- C. Compact to a minimum of 95 percent relative compaction at a moisture content of $\pm 4\%$ of optimum as determined by ASTM D698. Completed lifts of fill cannot yield under equipment loads.
- D. Moisture conditioned and smooth-drum rolled as specified in Section 02223 – Geosynthetic Subgrade Preparation.
- E. Grade final surface to a vertical tolerance of ± 0.1 foot.

3.5 BACKFILL FOR ANCHOR TRENCH

- A. Begin only when geosynthetic installations have been completed in accordance with deployment and seaming criteria.

- B. Place earthfill to the lines and grades shown on the Drawings.
- C. Place in loose lift thickness not exceeding 12 inches.
- D. Compact each lift by wheel rolling with rubber-tired equipment or using approved compaction equipment.
- E. Do not damage geosynthetic installation.

3.5 FIELD QUALITY ASSURANCE

- A. Field quality assurance (QA) will be performed in accordance with the Construction Quality Assurance (CQA) Plan.
- B. The OWNER will determine optimum moisture content and maximum density for all engineered fills in accordance with ASTM D-698.
- C. The OWNER will determine in-place density and moisture content of the engineered fill by one or more of the following methods or approved equal: ASTM D-1556, ASTM D-2216, ASTM D-2922, and ASTM D-3017.
- D. The OWNER may perform additional testing to determine the conformance of the materials with these Specifications and the Drawings.
- E. The OWNER may perform sampling and testing of excavated materials as they are stockpiled.
- F. The CONTRACTOR shall cooperate fully with the OWNER in performance of sampling and testing. Include costs for assistance in unit or lump sum prices.

END OF SECTION

SECTION 02223

GEOSYNTHETIC SUBGRADE PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Final grading and compaction of finished subgrade in preparation for geomembrane and GCL placement.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- C. Section 02248 – Compacted Clay Liner.
- D. Section 2778 – Geomembrane.
- E. Section 02779 - Geosynthetic Clay Liner.

1.3 REFERENCES

- A. ASTM D-698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- B. ASTM D-1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
- C. ASTM D-2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
- D. ASTM D-2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D-2937 - Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
- F. ASTM D-3017 - Standard Test Method of Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

PART 2 PRODUCTS

2.1 LINER SUBGRADE

- A. The liner subgrade shall be smooth drum rolled to provide firm smooth surface.
- B. The liner subgrade shall not contain any deleterious materials, debris, organic matter, ice, snow or frozen material.
- C. The subgrade soils shall have a maximum particle size of 1 inch at the subgrade surface and in the uppermost lift adjacent to the liner materials.

2.2 SOURCE QUALITY CONTROL

- A. Perform quality control planning and procedures to assure that deleterious materials are not incorporated into engineered fill.
- B. Coordinate source quality control program with OWNER.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is complete and in compliance with slopes and dimensions shown on the Drawings.
- B. Examine surface to determine whether unsuitable materials are present.
- C. Verify surface is free of ponded water before geomembrane or GCL is placed.
- D. The subgrade surface will be examined and accepted in writing by the liner INSTALLER and OWNER prior to placement of geosynthetics.

3.2 FIELD QUALITY ASSURANCE

- A. Field quality assurance (QA) will be performed in accordance with the Construction Quality Assurance (CQA) Plan.
- B. The OWNER may perform additional testing to determine the conformance of the materials with these Specifications and the Drawings.

3.3 FINISHED GRADING AND COMPACTION OF COMPOSITE LINER SUBGRADE

- A. Moisture condition subgrade, if necessary, and smooth drum roll the material to provide smooth firm surface.

- B. Finish grade soil within a vertical tolerance of ± 0.1 feet of design grade.
- C. Subgrade shall be steel-drum rolled to a smooth and level surface.
- D. Surface shall be free of stones or protrusions greater than 1-inch diameter and organics or other deleterious material.
- E. Fill voids and cracks.
- F. Ruts shall be limited to 1-inch maximum depth.
- G. After proof-rolling and compacting with a smooth drum roller, the Owner or Owner's representative will accept the liner subgrade surface if the surface is smooth, firm, and no materials greater than one inch in dimension are visible and no soft areas are present.

END OF SECTION

SECTION 02227

LEACHATE COLLECTION GRAVEL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of granular drainage materials for the leachate collection and recovery system (LCRS) trenches and sump.
- B. Work includes furnishing, loading, hauling, and placing the drainage materials.

1.2 RELATED SECTIONS

- A. Section 02711 - Polyethylene Pipe.
- B. Section 02771 - Geotextile.
- C. Section 02776 - Drainage Geocomposite.
- C. Section 02778 - Geomembrane.

1.3 REFERENCES

- A. ASTM C-136 - Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D-2434 - Standard Method for Permeability of Granular Soils (Constant Head).
- C. ASTM D-2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).

1.4 SUBMITTALS

- A. Submit a 50-pound representative sample of the proposed granular drainage material within 10 days after contract award.

PART 2 PRODUCTS

2.1 DRAINAGE SUMP GRAVEL

- A. Material obtained and imported from off-site.
- B. Free of organic or other deleterious material.
- C. Having a hydraulic conductivity greater than or equal to 0.5 cm/sec when placed in accordance with this specification
- D. Rounded to sub-rounded gravel.
- E. Required gradations as shown in Table 02227-1.

**TABLE 02227-1
LCRS SUMP DRAINAGE GRAVEL GRADATION**

| U.S. SIEVE SIZE | PERCENT PASSING |
|-----------------|-----------------|
| 1½-inch | 100 |
| ½-inch | 0-5 |
| No. 200 | 0-2 |

- F. The permeability specification controls over the gradation specification.
- G. Material must be hard, durable and not subject to grain crushing.

PART 3 EXECUTION

3.1 PLACEMENT

- A. Place materials only when underlying excavations, foundations, and geosynthetic installations are complete and accepted by OWNER in accordance with Specifications.
- B. Install geotextile, then place the gravel to lines and grades shown on the Construction Drawings.
- C. Place drainage gravel to the thickness and detail shown on the Construction Drawings.
- D. Spread and place materials in a single lift meeting the minimum depth shown on the Construction Drawings.

- E. Place in an uphill or cross-slope direction (not in a downhill direction) to prevent putting tension in the underlying geosynthetics.
- F. Place in the cooler part of the day when underlying geosynthetics contain minimal wrinkles; however, granular material shall not be placed on geosynthetics that are under tension and/or are exhibiting trampolining.
- G. Place in a manner that prevents the development of wrinkles in the underlying geosynthetics in front of the advancing granular material. Remove wrinkles in a manner approved by the ENGINEER. If folding does occur, repair at no additional cost to the OWNER.
- H. Do not cause underlying geosynthetics to bridge across ditch or pipe alignments. If bridging does occur, repair at no additional cost to the OWNER.
- I. Do not damage underlying geosynthetic materials or piping installations. If damage does occur, repair at no additional cost to the OWNER.

3.2 LEACHATE COLLECTION AND PIPE INSTALLATION

- A. Comply with Section 02711 for assembly of pipe runs.
- B. Install to the lines and grades shown on the Construction Drawings.

3.3 FIELD QUALITY CONTROL

- A. Prior to beginning drainage layer material placement, demonstrate that placement techniques will not damage the underlying geomembrane material. Demonstrate this by constructing test fill over all affected geosynthetic types in an area not part of final construction.
- B. Do not use pointed stakes as grade control devices. Only use devices that will not puncture underlying geomembrane.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

3.4 FIELD QUALITY ASSURANCE

- A. Sampling and testing of materials to determine material type may be performed by the OWNER at the stockpile, at the material source, or at the place of use in accordance with the CQA Plan.
- B. The OWNER will perform gradation tests of materials before and during placement in accordance with ASTM C-136.

- C. The OWNER will perform permeability tests of materials before and during placement operations in accordance with ASTM D-2434.
- D. Assist the OWNER as necessary in collecting material samples and conducting tests.
- E. OWNER reserves the option of waving gradation specifications if products submitted by CONTRACTOR meet design intent.

END OF SECTION

SECTION 02230

SURFACE WATER DRAINAGE SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Installation of associated appurtenances associated with the surface water drainage systems at the site as defined on the Drawings.

1.2. RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.

PART 2 PRODUCTS

2.1 SOIL BACKFILL

- A. Soil backfill materials shall conform to the requirements of engineered fill in accordance with Section 02222.

PART 3 EXECUTION

3.1 PREPARATION

- A. Set required lines, levels, contours, and datum by construction staking.
- B. Notify utility company to locate utilities, if applicable.
- C. Provide for dust control.
- D. Protect bench marks, existing structures, and fences from excavation equipment and vehicular traffic.
- E. Coordinate operations with landfilling operations.
- F. Provide for dewatering as necessary for finish excavation and place fill.
- G. Note that topography shown on the Drawings may differ from topography at time of construction. A pre-construction survey shall be performed by the CONTRACTOR to document site conditions prior to starting work.

3.2 PROTECTION

- A. Protect structures, plants, and any existing features designated to remain.

- B. Protect survey benchmarks from damage or displacement.

3.3 INSTALLATION OF DRAINAGE STRUCTURES

- A. Excavate the drainage pond to the lines, grades, and dimensions shown on the Drawings.
- B. CONTRACTOR shall take care as to not damage the structures during installation and compaction. Any damage shall be repaired or the materials replaced (if necessary) by the CONTRACTOR at no additional cost to the OWNER.

END OF SECTION

SECTION 02231

AGGREGATE BASE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Placing and grading aggregate base course.
- B. Application of magnesium chloride binding and dust control agent.

1.2 RELATED SECTIONS

- A. Section 02222 – Engineered Fill, Protective Cover Soil, Soil Cushion, and Anchor Trench Backfill.

1.3 REFERENCES

- A. ASTM D-698 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures.
- B. ASTM D-2922 Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- C. ASTM D-3017 Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
- D. ASTM C-136 Standard Test Method for Sieve Analysis for Fine and Coarse Aggregates.
- E. Utah Department of Transportation Standard Specifications, Section 02721 – Untreated Base Course.

PART 2 PRODUCTS

2.1 AGGREGATE BASE

- A. Obtained from off-site source.
- B. In accordance with Utah Department of Transportation Standard Specifications, Section 02721 – Untreated Base Course for 1" Aggregate Base.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the substrate has been inspected, the grades and elevations are correct, and the surface is suitable for aggregate placement.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, to a minimum depth of 4 inches, reshaping, and re-compacting to a minimum of 95% of maximum dry density as detailed by ASTM D 698.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 AGGREGATE PLACEMENT

- A. Spread aggregate over prepared substrate in maximum 6 or 8-inch un-compacted lifts.
- B. Steel drum roller compact to the thickness shown on the Drawings at 95% of maximum dry density as detailed by ASTM D-698.
- C. Level and contour surfaces to elevations and grades indicated on Drawings.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4 TOLERANCES

- A. Flatness: Maximum variation of ½ inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within ½ inch.
- C. Variation From Design Elevation: Within 0.1 inch.

3.5 QUALITY ASSURANCE VERIFICATION TESTING

- A. The OWNER's representative will perform the following quality assurance testing during road base placement.

1. Moisture-density relations (ASTM D-698) to determine the maximum dry density and optimum moisture content for road base material.
 2. Nuclear density and moisture content (ASTM D-2992 and ASTM D-3017) to verify relative compaction.
 3. Sieve Analysis (ASTM C-136) to verify product gradation requirements for road base.
- B. Cooperate with the OWNER's representative in performance of quality assurance verification testing.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

END SECTION

SECTION 02248
COMPACTED CLAY LINER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The processing and placement of compacted clay liner within the leachate collection sump. Clay liner material obtained from an off-site borrow source.

1.2 RELATED SECTIONS

- A. Section 02221 – Excavation and Stockpiling.
- B. Section 02222 – Engineered Fill and Protective Soil Cover, Soil Cushion and Anchor Trench Backfill.
- C. Section 02223 – Geosynthetic Subgrade Preparation.

1.3 REFERENCES

- A. Construction Quality Assurance Plan.
- B. Latest version of American Society for Testing and Materials standards:
 - 1. ASTM D-422 – Standard Method for Particle-Size Analysis of Soils.
 - 2. ASTM D-698 – Test Method for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using a 5.5-lb Rammer and 12-inch Drop.
 - 3. ASTM D-1140 – Standard Test Method for Amount of Material in Soils Finer than the No. 200 Sieve.
 - 4. ASTM D-1556 – Standard Test Method for determining soil density, Sand Cone Method.
 - 5. ASTM D-1587 – Standard Practice for Thin-Walled Tube Sampling of Soils.
 - 6. ASTM D-2216 – Standard Test Method for determining water content of soil aggregate mixtures.
 - 7. ASTM D-2434 – Standard Test Method for Permeability of Granular Soils (Constant Head).
 - 8. ASTM D-2487 – Classification of soils for engineering purposes (Unified Soil Classification System).

9. ASTM D-2488 – Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
 10. ASTM D-2922 – Standard Test Method for Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).
 11. ASTM D-2937 – Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method.
 12. ASTM D-3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 13. ASTM D-4220 – Standard Practices for Preserving and Transporting Soil Samples.
 14. ASTM D-4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
 15. ASTM D-5080 – Standard Test Method for Rapid Determination of Percent Compaction.
 16. ASTM D-5084 – Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
- C. Daniel, D.E. and R.M. Koerner, (1993), Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities, EPA/600/R-93/182.

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit a written workplan for excavation, processing (particle size reduction), moisture conditioning, mixing, placement, and compaction of clay liner to the OWNER's representative for review and approval prior to low permeability soil placement. The plan shall include as a minimum the following:
1. Method and personnel responsible for identifying and selecting lay liner materials and sequencing of placement.
 2. Method of processing the clay liner material. Low Permeability material will be obtained from an off-site clay borrow source, located 13 miles south west of the landfill. Previous cells have been constructed by processing and moisture conditioning the clay material with a pugmill. Alternative methods such as a rototiller (asphalt reclaimer) can be proposed.

3. Equipment (number, type, method of operation, and duration) for:

- a. Excavating
- b. Processing (particle size reduction)
- c. Moisture conditioning
- d. Mixing
- e. Placement
- f. Compaction
- g. Trimming
- h. Surface maintenance
- i. Surveying

- B. The CONTRACTOR shall notify the OWNER in writing a minimum of 7 days prior to starting construction of the compacted low permeability soil layer. The notice shall state the material to be used, the equipment to be used, the date and time that placement operations will start, and the name of the person in the field who will be in charge of the construction of the compacter clay liner.
- C. If work is interrupted for reasons other than inclement weather, the CONTRACTOR shall notify the OWNER's representative a minimum of 24 hours prior to the resumption of work.

1.5 CONSTRUCTION QUALITY ASSURANCE

- A. Construction of the compacted clay shall be monitored as outlined in the CQA Plan.
- B. The CONTRACTOR shall be aware of the activities outlined in the CQA Plan and shall account for these activities in the construction schedule.
1. The proposed minimum testing frequencies for CQA are presented in the CQA Plan. Actual test frequencies may vary, CQA testing, or lack thereof, does not relieve the CONTRACTOR from its responsibility to complete the Work in accordance with the Specifications.
 2. Sampling locations shall be selected by the OWNER's representative. If necessary, the location of routine in-place moisture content and dry unit weight tests shall be determined using a non-biased sampling plan.
 3. Undisturbed compacted clay material samples for laboratory permeability testing shall be taken in accordance with ASTM D-1587 with

the assistance of the CONTRACTOR such that the sample tube is inserted vertically into the compacted clay with a continuous smooth stroke. This may require use of the CONTRACTOR's equipment as reaction frames for pushing sampling tubes.

4. Additional testing may be performed at the OWNER's representative's discretion.
- C. If a defective area is discovered in the compacted clay, the OWNER's representative shall determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the OWNER's representative shall determine the extent of the defective area by additional tests, observations, a review of records, or other means that the OWNER's representative deems appropriate.
- D. After determining the extent and nature of the defect, the OWNER's representative shall notify the CONTRACTOR and schedule retests when the defective area has been corrected.

PART 2 PRODUCTS

2.1 CLAY LINER MATERIAL

- A. Clay liner soil shall consist of relatively homogeneous material, obtained from an OWNER provided offsite location.
- B. Clay liner soil shall be free of gypsum, ferrous, calcareous concretions, roots debris, foreign objects, excess silt, and organics.
- C. Clay liner soil shall be classified according to the Unified Soil Classification System as ML, MH, CL or CH having a maximum particle size of 1-inch, with a minimum percent passing the No. 200 sieve of 50 percent by weight.
- D. Clay liner soil shall not be gap-graded or susceptible to piping.
- E. Clay liner soil shall have an *in situ* permeability equal to or less than 1×10^{-7} cm/sec as measured in the laboratory by ASTM D-5084 when compacted to a minimum 95 percent relative compaction and at least 3 percent above optimum moisture content as determined by ASTM D-698.
- F. Substandard soils shall be segregated at the source and will not be permitted at the work area. Any substandard materials shall be removed from the work area by the CONTRACTOR at no additional cost to the OWNER.

PART 3 EXECUTION

3.1 FAMILIARIZATION

- A. Prior to implementing any work of this section, the CONTRACTOR shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this section and the CQA Plan. Placement of clay liner shall not commence until all material test data have been certified or approved by the CQA firm and approved by the OWNER's representative.
- B. Prior to implementing work of this section, the CONTRACTOR shall carefully inspect the installed work of all other sections and verify that all such work is completed to the point where the installation of this section may properly commence without adverse impact.
- C. If the CONTRACTOR has concerns regarding the installed work of other sections of the site, the CONTRACTOR shall notify the CQA ENGINEER and the OWNER in writing within 48 hours of the site visit. Failure to notify the OWNER or CQA ENGINEER prior to installation of the compacted clay liner will be construed as CONTRACTOR's acceptance of the related work of all other sections.
- D. The CONTRACTOR shall verify that the as-built subgrade has been surveyed to sufficient accuracy and approved by the ENGINEER prior to placement of any compacted clay liner material.

3.2 CLAY LINER SOIL PLACEMENT

- A. The construction of the compacted clay shall be monitored as outlined in the CQA Plan.
- B. CONTRACTOR shall not place clay liner until after completion of any pre-requisite testing by a third party CQA laboratory retained by OWNER, when such test is required.
- C. The CONTRACTOR shall construct the compacted clay liner to the grades, slopes and elevations shown on the construction drawings and as specified in this section.
- D. The CONTRACTOR shall construct the compacted clay on a firm, compacted subgrade. Clay liner shall not be placed prior to approval and acceptance by CQA Monitor of the underlying subgrade.
- E. The compacted clay material shall be spread and compacted in lifts not to exceed a compacted thickness of 6 inches. Hauling and spreading equipment shall not be considered compaction equipment. CONTRACTOR shall place layers of clay liner materials to form a continuous monolithic liner. If a lift of compacted clay liner material dries out during placement operations, the CONTRACTOR shall scarify,

- moisture condition the dry soil and recompact and retest the lift prior to placement of additional lifts. If a lift of compacted clay liner material becomes overly wet due to precipitation or over watering, the CONTRACTOR shall allow the wet soil to dry or remove the materials before placement of additional lifts.
- F. Prior to compaction, the CONTRACTOR shall process the compacted clay by disc-harrowing or an approved equivalent method to a homogeneous consistency without clods which are not easily broken by the compaction process.
 - G. Lifts shall be compacted with an appropriate penetrating-foot compactor subject to approval from the CQA inspection personnel.
 - H. Equipment or truck traffic will not be permitted on the surface during the period between scarifying and placement of the following lift.
 - I. Unless otherwise modified by the ENGINEER, the clay liner will be compacted to a minimum value of 95 percent relative compaction at a moisture content a least 3 percent over optimum as determined by ASTM D-698. The moisture content of the material shall be uniform and homogeneous throughout the clay layer being tested. If dry zones are encountered within the clay liner materials, they shall be moisture conditioned and mixed with the surrounding materials.
 - J. Prior to placement of a lift of fill, the previous compacted lift shall be thoroughly scarified to provide good bonding between lifts. Scarification shall be accomplished by raking with a grader, disking, or an alternate method approved by the ENGINEER.
 - K. At the beginning of each day's work, the previously placed compacted clay shall be observed by the CQA ENGINEER. The CQA ENGINEER may specify scarification of the top surface of soil and/or recompaction as necessary in the judgment of the CQA ENGINEER to obtain the compaction criteria and provide a suitable surface for the next lift. This work will be performed at no cost to the OWNER.
 - L. The compacted clay material shall have appropriate moisture content during the time the compactor is working the soil. The CONTRACTOR shall spray the soil with a sufficient quantity of clean water and mix the water into the soil to bring the soil to a uniform, proper moisture content.
 - M. If the clay cannot be conditioned to meet specifications, it shall be removed and replaced by Contractor at no cost to the OWNER. If the test pad should prove unsatisfactory, adjustments to the construction and/or compaction procedure shall be made and agreed upon by the ENGINEER, the CQA MONITOR, and the CONTRACTOR. Additional test fills shall be constructed using the adjusted construction procedures and evaluated for conformance with the specification requirements.

- N. No compacted clay shall be placed over a lift which has not been tested and approved by the CQA ENGINEER. Should the field test indicate that the density and moisture of any layer of compacted clay, or portion thereof, is below the required dry unit weight and moisture, the particular layer, or portion thereof, shall be reworked or removed at no extra cost to the OWNER.
- O. The daily work area will extend a distance no greater than necessary to maintain moist soil conditions and continuous operations. Desiccation sand crusting of the lift surface shall be avoided as much as possible.
- P. If desiccation and crusting of the lift surface occurs before placement of the next lift, this area will be sprinkled with water and then scarified and recompactd and tested for water content to ensure uniform moisture before placement of a subsequent lift.
- Q. Transition from full depth liner to beginning of adjacent new section will be accomplished by sloping (cutting back) the end of a full depth section at 3H:1V or flatter for tying in a new lift as shown on the construction drawings.
- R. No frozen or thawing compacted clay material shall be placed, spread or compacted.
- S. No compacted clay liner material shall be placed, spread or compacted while the subgrade is frozen or thawing, during unfavorable weather conditions, or during periods of precipitation.
- T. Hand compaction at the proper moisture content shall be used in all locations around penetrations, corners, appurtenances, etc., in order to achieve the specified dry unit weight and moisture content. Care shall be taken to protect piping.
- U. The same material and compaction methods as outlined in this section shall be used to replace unacceptable zones detected by the CQA ENGINEER.
- V. The compacted clay surface shall be made smooth and free from ruts or indentations at the end of every working day when precipitation is forecast and/or at the completion of compaction operations in that area.
- W. The CONTRACTOR shall finish each day's work with a smooth roller to create a smooth surface which will promote surface water run-off and minimize moisture penetration.
- X. After completion of a segment of compacted clay liner, but before installation of the overlying material, the top of the clay will be surveyed to ensure that the specified thickness of the compacted clay liner has been achieved, the top of the clay liner slopes across the cell at the grades specified, and the top of the clay liner

in the leachate collection sump area is at the grades and elevations specified on the drawings.

- Y. Any holes in the compacted clay liner shall be backfilled with similar clay materials or with granulated or powdered bentonite. The backfill materials shall be compacted in loose lift thicknesses no greater than 8 inches.
- Z. All grade stakes shall be removed upon the achievement of final grade. Holes remaining after removal of grade stakes shall be backfilled with bentonite powder or granules.
- AA. The laboratory permeability test results shall be less than 1×10^{-7} cm/sec prior to acceptance of the compacted clay liner.

3.3 PRODUCT PROTECTION AND REPAIRS

- A. The CONTRACTOR shall use all means necessary to protect all prior work, including all material and completed work of other sections from damage including but not limited to desiccation from drying, saturation from ponding of water, erosion from runoff, and general construction damage from equipment.
- B. The CQA ENGINEER shall identify all areas requiring repair by the CONTRACTOR.
- C. In the event of damage, the CONTRACTOR shall immediately make all repairs and replacements necessary to the approval of the CQA ENGINEER and at no cost to the OWNER.
- D. A repair on the clay liner shall be performed in accordance with the requirements of this section.

3.4 ACCEPTANCE

- A. CONTRACTOR retains all ownership and responsibility for the clay liner until acceptance by the OWNER.
- B. OWNER will accept the clay liner when the work is complete, all final as-built surveys have been performed, all required field and laboratory testing is complete, and all other necessary documentation from the CQA ENGINEER demonstrates compliance with these specifications.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. As needed the installation of the following.
 - 1. Silt Fence.
 - 2. Straw Bale Barrier.
- B. Areas to receive erosion and sediment controls shall be determined in the field as needed by the OWNER.
- C. Areas requiring erosion and sediment control will include the soil stockpile.

1.2 RELATED SECTIONS

- A. Section 02221 – Excavating and Stockpiling.
- B. Section 02222 – Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.

1.3 REQUIREMENTS

- A. Meet regulatory requirements, for construction of this project. Implement erosion control practices and procedures. If the erosion control measures are inadequately maintained, or are found to be inadequate in the field, install additional measures to prevent sediment laden runoff from leaving the site.

1.4 SEQUENCING AND SCHEDULING

- A. All erosion control features must be approved by the OWNER before beginning site earthwork.
- B. Route runoff from cleared or disturbed areas. Route through temporary sediment traps, straw bale barriers, or silt fences. Place erosion control facilities prior to any earthwork, clearing, and grubbing. It is preferable for construction to progress in an upstream direction starting with downstream erosion control facilities as the first items of construction.
- C. Stabilize disturbed ground at the end of each work day. Perform surface roughening immediately upon reaching final grade of non-lined areas by uniformly

track-walking up and down the slope with a crawler tractor or sheepsfoot roller, leaving a pattern of cleat imprints that parallel the slope contours. Implement permanent soil stabilization and erosion/sedimentation controls upon reaching final grade.

- D. Notify the OWNER of any soils showing signs of erosion.
- E. Ensure that all waters from any dewatering operations reaching existing water courses meet or exceed the existing quality of the water course.

1.5 REMOVAL OF EROSION CONTROL FACILITIES

- A. Remove all temporary control facilities, 30 days after final completion of work or upon approval of OWNER. Dispose of used silt fence and supports, straw bales, and sediment traps. Costs for removal of erosion control features are incidental, and shall be included in lump sum or unit costs. Final payment will not be released until this work is completed.

PART 2 PRODUCTS

2.1 GENERAL

- A. Product specifications described below pertain to erosion control facilities shown on the Construction Drawings.

2.2 SILT FENCE

- A. Woven geotextile supplied in minimum 3.5 foot widths and meeting the requirements of Table 02270-1:

**TABLE 02270-1
 WOVEN GEOTEXTILE PROPERTIES**

| TEST | TEST DESIGNATION | UNIT | REQUIREMENT |
|-------------------------|------------------|-------------------|-------------|
| Grab Tensile Elongation | D-4632 | % | 50 - 114 |
| Grab Tensile Strength | D-4632 | lbs | 100 min. |
| Puncture Resistance | D-4833 | lbs | 60 min. |
| Permitivity | D-4491 | Sec ⁻¹ | 0.1 - 0.5 |
| Apparent Opening Size | D-4751 | mm | 0.5 - 0.85 |
| Burst Strength | D-3786 | psi | 190 min. |

- B. Support Fence: 2-inch by 2-inch by 14-gage wire mesh fencing in 3-foot-wide rolls.
- C. Posts: 2-inch by 2-inch by 4.5-foot-long standard (or better) hardwood posts, or 4.5-foot-long steel fence posts weighing 1.33 pounds per linear foot.
- D. Fasteners: Heavy duty wire staples at least 1-inch-long, tie wires, or hog rings.
- E. Gravel Backfill: LCRS Granular Material.

2.3 STRAW BALE BARRIER

- A. Bales: Straw bales, minimum size 15-inch x 15-inch x 36 inch.
- B. Posts: Per 2.2.C.

PART 3 EXECUTION

3.1 PREPARATION AND APPLICABILITY

- A. CONTRACTOR will hydroseed all exposed soil surfaces not to receive any type of liner or finish course once finish grading is complete.

3.2 SILT FENCE INSTALLATION

- A. Drive fence posts a minimum of 18 inches below the soil surface elevation (outside of finish cover system) at a maximum spacing of 6 feet in areas requiring silt fence. The fence line should be at a constant elevation for each continuous length of silt fence.
- B. Place wire mesh support fencing and fabric back-to-back (fabric on the upslope side) and extend 12 inches into the trench, leaving 24 inches of fencing and fabric above ground level. Fasten filter fabric and wire mesh support fencing to posts using heavy-duty 1-inch wire staples for wood posts, or wire rings for steel posts. At each post, place fasteners at the top of the fence, at ground level, and halfway in between.
- C. Join wire support fence ends by overlapping a minimum of 6-inches and connecting the two sections with wire rings in four places. If fabric joints are necessary, cut the wire support fence, sandwich the wire and fabric ends between two wood posts, and bind the posts tightly together.
- D. Lengthwise along the top of the silt fence and at ground level, tie fabric to wire support fencing with wire rings at a maximum spacing of 3 feet. Backfill trench with LCRS drainage gravel material.

3.3 STRAW BALE BARRIER CONSTRUCTION

- A. Excavate a one bale wide strip of soil 4-inches-deep, perpendicular to the flow direction in the channel. Remove all grass and other materials that may allow underflow.
- B. Install straw bales end-to-end, with the bindings oriented horizontally around the sides of the bales. Anchor each bale into trench. Push bales together as firmly as possible.
- C. Chink the gaps between bales with straw to prevent water from escaping between bales. This must be done carefully to avoid separating the bales. Place and compact excavated soils against the upstream side of the straw bale barrier to a height of 4 inches to prevent piping under bales.

3.4 MAINTENANCE

- A. **General Requirements:** Observe the facilities during the first storm following construction to ensure that the facilities are properly located, constructed, and operating as designed. Maintain and repair facilities as needed to ensure that they continue to work as designed.
- B. **Silt Fence:** Check for sagging fences, torn fabric, and signs of erosion and/or sedimentation down slope of the fence. Make repairs as necessary. If the silt fence fails due to storm water runoff inundating the fence, construct additional erosion and sediment control measures to remove sediment from and convey the runoff to downstream drainage facilities. Remove accumulated sediment behind silt fences whenever it reaches approximately one-third the height of the fence.
- C. **Temporary Sediment Traps:** Remove sediment before it reaches the rock weir outlet. The trap bottom may be over-excavated to provide additional sediment storage.
- D. **Straw Bale Barrier:** Check for undercutting, damaged bales, evidence of erosion or sedimentation between bales, and "end run" erosion at the ends of the barrier. Make repairs, replace bales, and remove sediment before it reaches approximately one-half the height of the barrier.

END OF SECTION

SECTION 02710

POLYETHYLENE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnish and install High Density Polyethylene (HDPE) solid pipe, HDPE perforated pipe, and associated pipe fittings for leachate collection and removal system (LCRS), per the construction plans. Pipe sizes are shown on the plans and Standard Dimensional Ratio (SDR) are shown on Part 2.1.C.

1.2 RELATED SECTIONS

- A. Section 02222 – Engineered Fill, Operations Layer, Soil Cushion, and Anchor Trench Backfill.
- B. Section 02227 – Leachate Collection Gravel.
- C. Section 02771 - Geotextile.
- D. Section 02774 - Drainage Geocomposite.
- E. Section 02778 - Geomembrane.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM).
 - 1. ASTM D-638 - Standard Test Method for Tensile Properties of Plastics.
 - 2. ASTM D-696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics.
 - 3. ASTM D-746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
 - 4. ASTM D-790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - 5. ASTM D-1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
 - 6. ASTM D-1248 - Specification for Polyethylene Plastics Molding and Extrusion Materials.

7. ASTM D-1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 8. ASTM D-1525 - Standard Test Method for Vicat Softening Temperature of Plastics.
 9. ASTM D-1599 - Standard Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing and Fittings.
 10. ASTM D-1603 - Standard Test Method for Carbon Black in Olefin Plastics.
 11. ASTM D-1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
 12. ASTM D-2122 - Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
 13. ASTM D-2240 - Standard Test Method for Rubber Property Durometer Hardness.
 14. ASTM D-2657 - Practice for Heat Joining of Polyolefin Pipe and Fittings.
 15. ASTM D-2837 - Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.
 16. ASTM D-3035 - Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
 17. ASTM D-3261 - Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 18. ASTM D-3350 - Specification for Polyethylene Plastics Pipe and Fittings Materials.
 19. ASTM D-4218 - Standard Test Method for Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique.
 20. ASTM F-1248 - Determination of Environmental Stress Crack Resistance (ESCR) of Polyethylene Pipe.
 21. ASTM F-714 - Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- B. National Sanitation Foundation (NSF). NSF Standard Number 14 -Plastics Piping Components and Related Materials.

- C. PPI -Plastic Pipe Institute.
- D. ANSI -American National Standards Institute.

1.4 SUBMITTALS

- A. Submit with each shipment of pipe to site, MANUFACTURER'S certification of compliance with specified requirements of this Section. Submit catalog cut sheet of pipe and fittings to be supplied prior to commencing work.
- B. Provide written certification for qualified HDPE pipe fusion welders.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. High density polyethylene (HDPE) manufactured for pipe meeting the following minimum standards.
 - 1. Material Designation: PE 3608/PE 3408.
 - 2. Cell Classification: 345464 C.
- B. All pipe sizes shown on the Construction Drawings and specified in this Section reference nominal diameter, unless otherwise indicated on the Construction Drawings or in this Section. Pipe sizing and workmanship to be in accordance with ASTM F-714 and ASTM D-3035.
- C. SDR 11, unless otherwise shown
- D. Conforming to the minimum requirements of Table 02710-1.

**TABLE 02710-1
 POLYETHYLENE PIPE MATERIAL PROPERTIES**

| PROPERTY | ASTM TEST DESIGNATION | UNIT | REQUIREMENTS |
|---|-----------------------|--------------------|--------------|
| Density | D-1505 | gm/cm ³ | 0.955 min. |
| Melt Index | D-1238 | gm/10 minutes | 0.1 (typ). |
| Flexural Modulus | D-790 | psi | 110,000 min. |
| Tensile Strength | D-638 | psi | 3,000 min. |
| Hydrostatic Design Basis at 73°F (23°C) | D-2837 | psi | 1,600 (typ.) |
| UV Stabilizer | D-1603 | % Carbon Black | 2% to 3% |

| PROPERTY | ASTM TEST DESIGNATION | UNIT | REQUIREMENTS |
|-------------------------------|-----------------------|----------|-------------------------|
| Elastic Modulus | D-638 | psi | 110,000 min. |
| Brittleness Temperature | D-746 | °F | -103°F (typ.) |
| PENT | F-1473 | hours | 100 min. |
| Thermal Expansion Coefficient | D-696 | in/in/°F | 1x10 ⁻⁴ max. |

- E. Containing no recycled compound except that generated in the Manufacturer's own plant and from resin of the same specification from the same raw material supplier.
- F. Resin for pipe and fittings to be listed by both N.S.F. and P.P.I. and manufactured in accordance with ASTM D-3350 and ASTM F-714.
- G. Homogeneous throughout and free of visible cracks, holes (except where specified or shown), foreign inclusions or other injurious defects. Being uniform in color, capacity, density, and other physical properties.
- H. Provide pipe with the following information continuously marked on the pipe or spaced at intervals not exceeding 5 feet.
 1. Name and/or trademark of the pipe manufacturer.
 2. Nominal pipe size.
 3. Standard Dimensional Ratio (SDR).
 4. PE 3608 or PE3408.
 5. Manufacturer's Standard Reference.
 6. A production code from which the date and place of manufacture can be determined.

2.2 FITTINGS

- A. Provide fittings, manufactured from the same class of materials and fully compatible with the HDPE pipe.
- B. Provide fittings manufactured in accordance with ASTM D-3350 and ASTM D-3261. Provide fabricated fittings with pressure ratings matching or exceeding the HDPE

pipe.

2.3 PERFORATED PIPE

- A. Pipe perforation details are shown on the Construction Drawings.
- B. Remove all drill hole filings from the interior of the pipe prior to installation. OWNER will visually inspect all pipe prior to installation, fusion welding or slip coupling.

PART 3 EXECUTION

3.1 PIPE INSTALLATION GENERAL REQUIREMENTS

- A. When shipping, delivering, and installing pipe, fittings, and accessories, do so in such manner to ensure a sound, undamaged installation.
- B. Provide adequate storage for all materials and equipment delivered to the job site.
- C. Handle and store pipe and fittings in accordance with the Manufacturer's recommendations.

3.2 PLACING AND LAYING PIPE

- A. Provide required maintenance of all such materials and equipment used to handle, place, and lay pipe.
- B. Follow the Manufacturer's recommendations when hauling, unloading and stringing the pipe.
- C. Take precautions to prevent damage to the pipe.
- D. Do not push, pull, or drag pipe and fittings over sharp projections, or drop, or have objects dropped on the pipe and fittings.
- E. Inspect for defects before and during installation. Remove any piping showing kinks, buckles, cuts, gouges, or any other damage, which in the opinion of the OWNER will affect performance of the pipe.
- F. Replace material found to be defective before or after laying with sound material at no additional expense to the OWNER.
- G. Carefully lower pipe and accessories into the trench or onto the geosynthetics.
- H. Under no circumstances drop or dump materials into the trench or onto the pipe or geosynthetics.

- I. Rest the full length of each section of pipe solidly upon the pipe bedding, or on rub-sheets.
- J. Take up or relay pipe that has had the grade disturbed while joining or laying the pipe.

3.3 JOINING PIPE

- A. Join the HDPE pipe by the method of thermal butt or side wall fusion, as outlined in ASTM D-2657. Perform fusion joining of pipe and fittings in accordance with the procedures established by the pipe MANUFACTURER. Of particular importance is the use of proper interface pressures and heater plate temperatures.
- B. Use fusion pressures, temperatures, and cycle times according to pipe Manufacturer's recommendations. Only use personnel adequately trained and qualified in the technique involved.
- C. Do not perform pipe fusion in water or when trench conditions are unsuitable for the work. Keep water out of the trench until joining is completed. Secure open ends of pipe and close valves when work is not in progress, so that no trench water, earth, animals, or other substance will enter the pipe or fittings. Plug, cap or valve off pipe ends left for future connections as shown on the Construction Drawings.
- D. Clear and grade fusion welding sites, if necessary, to provide enough space for pipe storage and fusion equipment. Keep the site free of rocks, stumps and debris which could cut, scar, or gouge the pipe. In order to allow the joining operation to continue in adverse weather conditions, a shelter may be required for the joining machine. Particular caution should be exercised to prevent water from entering the inside of the pipe and from coming in contact with the heater plate.
- E. Polyethylene Fusion Qualification: All pipe fusion welding must be performed by the supplier, or a factory supplied and/or certified fusion welding operator.
- F. Provide for instruction, testing, and installation training sessions as required to obtain training for welding personnel, including quality control personnel, in polyethylene fusion machine operation, instruction and familiarization with HDPE pipe and fitting fusion for the project. Only fully trained personnel will be allowed to perform the installation, supervision, or inspection of polyethylene-fusion joints. Submit to the OWNER, prior to beginning fusion welding, a list of those personnel authorized, instructed and certified for polyethylene fusion. Make all on-site training sessions conducted during the work available to quality assurance personnel at no charge to the OWNER.
- G. Training: Provide assistance from the manufacturer/supplier in instructing welding

personnel in proper fusion welding procedures and techniques. Notifications will be required in writing, listing the names of those persons so familiarized. A Manufacturer's representative shall be certified in writing by the MANUFACTURER to be technically qualified and experienced in fusion welding of HDPE pipe.

- H. After completion of the pipe fusion welding, the CONTRACTOR shall ream the inside of the pipes such that the inside bead of the weld is removed and the interior is smooth.
- I. When two pipes of different diameters must be joined, the CONTRACTOR shall join the pipe with an appropriate transition fitting. Transition fittings shall be beveled and reamed, if necessary, to provide a relatively smooth inner surface at the joint.

END OF SECTION

SECTION 02771

GEOTEXTILE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnishing and installation of geotextile.

1.2 RELATED SECTIONS

- A. Section 02222 – Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- A. Section 02227 - Leachate Collection Gravel.
- B. Section 02710 – Polyethylene Pipe.
- C. Section 02774 - Drainage Geocomposite.

1.3 REFERENCES

- A. GRI GT12(a) - Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials.
- B. GRI GT13 - Test Methods and Properties for Geotextiles Used as Separation Between Subgrade Soil and Aggregate.
- C. ASTM D-885 - Methods for Testing Industrial Filament Yarns Made From Man-made Fibers.
- D. ASTM D-1777 - Method for Measuring Thickness of Textile Materials.
- E. ASTM D-4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water.
- F. ASTM D-4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.
- G. ASTM D-4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- H. ASTM D-4595 - Standard Test Method for Tensile Properties by the Wide-width Strip Method.

- I. ASTM D-4632 - Standard Test Method for Breaking Load and Elongation of Geotextiles (grab method).
- J. ASTM D-4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- K. ASTM D-4833 - Standard Test Method for Index Puncture Resistance of Geotextiles and Geotextile-Related Products.
- L. ASTM D-5216 - Standard Test Method for Mass Per Unit Area (weight) of Woven Fabric.
- M. ASTM D-6241 - Standard Test Method for Index Puncture Strength of Geotextiles.

1.4 DEFINITIONS

- A. **MANUFACTURER:** Responsible for the production of geotextile rolls
- B. **INSTALLER:** The party responsible for field handling, storing, deploying, repairing, anchoring, and any other aspects of installing the geotextile
- C. **Construction Quality Assurance Consultant (CQAC):** The party, independent from the manufacturer or installer, responsible for observing and documenting activities related to the quality assurance of the production and installation of the geosynthetic components of the geotextile. Also responsible for issuing a construction monitoring report, and certification sealed by a Registered Professional ENGINEER

1.5 SUBMITTALS

- A. Submit, prior to confirmation of OWNER-CONTRACTOR Agreement, samples and complete description of geotextile fabric proposed for use that meets or exceeds the requirements of this section. Include certified minimum property values and test methods used to obtain property values. Also include production capacity available and projected delivery dates.
- B. Submit, prior to installation, written instructions for storage, handling installation, and seaming of proposed geotextile.
- C. Submit, prior to installation, written instructions for repair of geotextile.
- D. Submit, prior to delivery, manufacturer's certificates of compliance with specified product requirements. This submittal includes Manufacturer's Quality Control (MQC) testing certificates signed by a responsible party. Include lot, batch, and

roll numbers, sampling procedures, test procedures, and test results. (Refer to paragraph 2.4 of this section).

- E. **Warranty:** Submit to OWNER prior to installation, manufacturers, and installers written warranty against product and installation defects. Limits of liability must be accepted by the OWNER. Rinse

PART 2 PRODUCTS

2.1 GENERAL

- A. Products comprised of non-woven, needle punched polypropylene or polyester fabric; oriented into a staple network that maintains its structure during handling, placement, and long-term service.
- B. The product cannot be heat burnished.
- C. Resistant to soil and leachate chemicals.
- D. New product made from virgin materials.

2.2 GEOTEXTILE

- A. Geotextile used for filtration shall conform to the minimum average roll values (MARV), as defined in Table 02771-1.

**TABLE 02771-1
 GEOTEXTILE PROPERTIES**

| TEST | TEST DESIGNATION | REQUIREMENT |
|-----------------------------|------------------|------------------------------------|
| Mass per Unit Area | ASTM D5261 | 8 oz/yd ² |
| Grab Tensile and Elongation | ASTM D4632 | Minimum 205 lbs and 50% |
| CBR Puncture Resistance | ASTM D6241 | Minimum 535 lbs |
| Trapezoidal Tear | ASTM D4533 | Minimum 85 lbs |
| Water Flow | ASTM D4491 | Minimum 90 gal/min/ft ² |
| Apparent Opening Size | ASTM D4751 | < No. 80 U.S. opening size |
| UV Resistance | ASTM D4355 | 70/500 %/hours |

2.3 MANUFACTURER SOURCE QUALITY CONTROL

- A. The MANUFACTURER shall sample and test the geotextiles at a minimum of once for every 100,000 sq. ft. (10,000 sq. m). Test results shall demonstrate that the material conforms to all requirements in Part 2.2 of this Section except for UV Resistance, which shall be certified by the MANUFACTURER.
- B. OWNER will reject rolls for which quality control requirements are not met.
- C. Certify the quality of the rolls of geotextile.
- D. Provide quality control certificates for each lot and each shift's production. The quality control certificates must include:
 - 1. Roll numbers and identification.
 - 2. Sampling procedures.
 - 3. Results of quality control tests, including a description of test methods used.

2.4 LABELING

- A. Mark or tag geotextile rolls with the following information:
 - 1. Manufacturer's name.
 - 2. Product identification.
 - 3. Lot number or date
 - 4. Roll number
 - 5. Roll dimensions
- B. Mark special handling requirements on rolls.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to installation of geotextile, examine underlying construction for conformance with specifications.

3.2 PROTECTION

- A. When placing any materials over geotextile ensure the following:
 - 1. No damage to geotextile.
 - 2. No slippage of geotextile on underlying layers.
 - 3. No excessive tensile stresses in the geotextile.
- B. Ensure that geotextile filter is covered within 30 days.

3.3 DELIVERY, STORAGE, AND HANDLING

- A. Protect geotextile from ultraviolet light exposure, precipitation, inundation, mud, dirt, dust, puncture, cutting, and other damaging or deleterious condition.
- B. Ship geotextile in closed trailer.
- C. Immediately restore damaged protective covering.

3.4 DEPLOYMENT

- A. Follow Manufacturer's recommendations, standards, and guidelines.
- B. Roll geotextile down slope keeping the geotextile sheet in sufficient tension to prevent folds and wrinkles.
- C. Temporarily secure geotextile in-place with sandbags, or equivalent, to ballast during deployment. Leave ballast in place until geotextile is covered with succeeding construction layer.
- D. Cut geotextile using approved cutter only. Take care to protect other in-place geosynthetic materials when cutting geotextile.
- E. Do not trap excessive dust, stones, or moisture in geotextile that could damage or clog drains or filters, or hamper subsequent seaming.
- F. Examine geotextile over entire completed surface to ensure that no potentially harmful foreign objects, such as needles, are present. Remove any foreign objects.

3.5 SEAMS AND OVERLAPS

- A. Overlap geotextile as required by the seaming technique and as recommended by Manufacturer prior to seaming.

- B. For slopes steeper than 10 percent, sew all seams for geotextile.
- C. All seams shall be either "double prayer" or "single J" seam.
- D. Ensure that no soil materials are inadvertently inserted beneath the seams of geotextiles.
- E. For slopes less than 10 percent, geotextiles can be either sewn as indicated above, or heat welded.
- F. Heat welded seaming shall be performed in a manner that does not damage the underlying geosynthetics and prevents burn-outs in the geotextile. All damage geosynthetics and burn-outs shall be repaired as provided in these specifications.
- G. Sew with polymeric thread having chemical resistance and strength properties equal to or exceeding those of geotextile.
- H. For sewing, use a 401 two-thread chain stitch, or equivalent.

3.6 REPAIRS

- A. Repair holes or tears in geotextiles with a patch from the same geotextile material, by sewing or heat welding (as described above) in place with a minimum seam overlap of 12 inches in all directions.
- B. Sew the geotextile within 1 inch of the outside edge of the patch materials.
- C. If tear exceeds 50 percent of the roll width, remove and replace the roll.
- D. No patches will be allowed within 1 inch of a panel edge.
- E. Remove any soil or other material which may have penetrated the torn geotextile.
- F. Notify OWNER of all repairs.

3.7 FIELD QUALITY ASSURANCE

- A. Samples of geotextile delivered to the site shall be collected for conformance testing at a minimum frequency of one (1) per hundred thousand (100,000) square feet of geotextile, to determine product compliance with specified values.
- B. Samples will be taken across the entire width excluding the first 3 feet of the roll unless otherwise approved. Sample size will be 3-feet-long by the roll width.

- C. The CQA consultant shall observe all repair operations.

3.8 ACCEPTANCE

- A. CONTRACTOR retains all ownership and responsibility for geotextiles until acceptance by OWNER.
- B. OWNER accepts geotextiles when all the following have been completed:
 - 1. The installation is complete.
 - 2. Documentation of installation is complete including the CQA consultant's final report.
 - 3. Verification of the adequacy of all seams and repairs, including associated testing, is complete.
 - 4. Written certification documents have been received by the OWNER.

END OF SECTION

SECTION 02776

DRAINAGE GEOCOMPOSITE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnishing all labor, materials and equipment necessary for installing the Drainage Geocomposite for the site in accordance with the Specifications and the Drawings.
- B. Geocomposite described in this section will be geonet with geotextile heat bonded on both sides prior to delivery to the site. This combination, which is pre-fabricated in the plant prior to shipment to the site, is termed as double-Sided Drainage Geocomposite.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- C. Section 02778 - Geomembrane.

1.3 REFERENCES

- A. GRI GC7 - Standard Guide for the Determination of Adhesion and Bond Strength of Geocomposites.
- B. ASTM D-792 - Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- C. ASTM D-1603 - Standard Test Method for Carbon Black in Olefin Plastics.
- D. ASTM D-4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
- E. ASTM D-4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
- F. ASTM D-4716 - Standard Test Method for Constant Head Hydraulic Transmissivity of Geotextiles and Geotextile Related Products.

- G. ASTM D-4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- H. ASTM D-4833 - Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
- I. ASTM D-4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- J. ASTM D-5035 - Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Strip Method).
- K. ASTM D-5199 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
- L. ASTM D-5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles.

1.4 DEFINITIONS

- A. **Batch:** A quantity of resin, usually the capacity of one railcar, used in the fabrication of high density polyethylene (HDPE) geocomposite. A roll number corresponding to the particular quantity of resin used will identify the finished product.
- B. **Construction Quality Assurance Consultant (CQAC):** The party, independent from MANUFACTURER or INSTALLER, that is responsible for observing and documenting activities related to the quality assurance of production and installation of the geosynthetic components of the lining system.
- C. **Construction Quality Assurance (CQA) Laboratory:** The party, independent from the OWNER, MANUFACTURER, Fabricator, and INSTALLER, responsible for conducting tests on samples of geosynthetics obtained at the site.
- D. **Construction Quality Assurance (CQA) Monitor:** The site representative of the CQAC.
- E. **Fabricator:** The party responsible for the fabrication of geocomposite panels constructed from rolls received from the MANUFACTURER.
- F. **Geocomposite MANUFACTURER:** The party responsible for the production of the geocomposite rolls from resin and for the quality control of the resin.
- G. **Geocomposite Subsurface:** The surface on which the geocomposite lies.

- H. **INSTALLER:** The party responsible for field handling, transporting, storing, deploying, seaming, temporarily restraining (against wind), and installing the geocomposite.

1.5 SUBMITTALS

- A. **Product Data:** Submit the following to the OWNER prior to confirmation of OWNER CONTRACTOR Agreement.

1. **Resin Data.**

- a. Statement of production date or dates.
- b. Certification stating that the resin meets the product requirements (see Part 2.3).
- c. Certification stating that all resin is from the same MANUFACTURER.
- d. Copy of quality control certificates issued by MANUFACTURER.
- e. Test reports from MANUFACTURER.

2. **Geocomposite Rolls.**

- a. Statement of production date or dates, and MANUFACTURER's certificates for each day's production.
- b. Laboratory test results and certification stating that the geocomposite meets the product requirements of Part 2.
- c. Certification stating that all geocomposite rolls are furnished by one supplier, and that all rolls are manufactured from one resin type obtained from one resin supplier.
- d. Copy of quality control certificates issued by MANUFACTURER and including designation of test methods used. Also include roll numbers, batch numbers, lot numbers, and roll identification.
- e. Test reports from the MANUFACTURER.
- f. Geocomposite delivery, storage, and handling instructions.
- g. Geocomposite installation instructions.

1.6 QUALIFICATIONS

- A. MANUFACTURER/Fabricator/Installation Qualifications
- B. INSTALLER: Must have successfully installed a minimum of 1,000,000 square feet of drainage geocomposite with documented references.

1.7 QUALITY ASSURANCE

- A. The OWNER will engage and pay for the services of (1) Construction Quality Assurance Consultant (CQAC), and (2) Construction Quality Assurance (CQA) Laboratory for monitoring the quality of geocomposite.

1.8 DELIVERY, STORAGE, AND HANDLING (MANUFACTURER)

- A. General: Conform to the MANUFACTURER's requirements.
- B. Delivery.
 - 1. Deliver materials to the site only after the OWNER accepts required submittals.
 - 2. Separate damaged rolls from undamaged rolls and store at locations designated by the OWNER until OWNER determines proper disposition of material.
 - 3. OWNER will determine if rolls considered damaged.
 - 4. Deliver in rolls, do not fold.
- C. Storage on Site: (INSTALLER).
 - 1. Store geocomposite rolls in the space allocated by the OWNER.
 - 2. Store geocomposite rolls to protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage.
 - 3. Store geocomposite rolls on prepared surface (not on wooden pallets).
 - 4. Stack geocomposite rolls as per the manufacturer's recommendation.
- D. Handling on Site: (INSTALLER).
 - 1. Use appropriate handling equipment to load, move, and deploy geocomposite rolls. Appropriate handling equipment includes cloth

chokers and spreader bars for loading, and spreader and roll bars for deployment. Dragging panels on ground surface will not be permitted.

2. Do not fold geocomposite; folded material will be rejected.
3. CONTRACTOR is responsible for off loading, storage, and transporting material from storage area to installation site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Submit substitutions in accordance with Section 01630, Product Options and Substitutions.

2.2 GEOCOMPOSITE LABELING

- A. Provide the following information on geocomposite roll labels:
 1. Length, width, and weight.
 2. Name of MANUFACTURER and Fabricator.
 3. Directions for unrolling.
 4. Product identification; lot number, batch number, and roll number.

2.3 GEONET

- A. The resin shall be first quality High Density Polyethylene (HDPE), manufactured specifically for producing geonet for use in drainage systems. Mixing of different resin types, recycled materials, or seconds will not be allowed.
- B. The geonet shall meet the following requirements unless otherwise approved:

**TABLE 02774-1
 GEONET PROPERTIES**

| TEST | TEST DESIGNATION | REQUIREMENT |
|--|------------------|--------------------------------|
| Density ⁽¹⁾ | ASTM 1505 | Minimum 0.94 g/cm ³ |
| Carbon Black | ASTM D-4218 | 2% to 3% |
| Tensile Strength | ASTM D-7179 | Minimum 45 lbs/in |
| Thickness | ASTM D-5199 | Minimum 200 mil |
| Notes: (1) Measured on resin prior to addition of carbon black. Maximum 0.950 g/cm ³ with carbon black. | | |

2.4 GEOTEXTILE

- A. Geotextile used for filtration conforming to the following minimum average roll values (MARV) as defined by the Federal Highway Administration for the following properties listed:

**TABLE 02774-2
 GEOTEXTILE PROPERTIES**

| TEST | TEST DESIGNATION | REQUIREMENT |
|-----------------------------|------------------|------------------------------------|
| Mass per Unit Area | ASTM D-5261 | 8 oz/yd ² |
| Grab Tensile and Elongation | ASTM D-4632 | Minimum 220 lbs and 50% |
| CBR Puncture Resistance | ASTM D-6241 | Minimum 600 lbs |
| Trapezoidal Tear | ASTM D-4533 | Minimum 90 lbs |
| Water Flow | ASTM D-4491 | Minimum 95 gal/min/ft ² |
| Apparent Opening Size | ASTM D-4751 | < No. 80 U.S. opening size |

2.5 GEOCOMPOSITE

- A. Geonet shall be heat bonded to one layer of geotextile.
- B. No delamination (separation between the geonet and geotextile) greater than 6 square feet area within a 6-foot radius of any point shall be allowed.
- C. Unlaminated edge: 12" MAX allowable.
- D. The geocomposite shall meet the following requirements unless approved otherwise:

**TABLE 02774-3
 GEOCOMPOSITE PROPERTIES**

| TEST | TEST DESIGNATION | REQUIREMENT |
|---|------------------|--|
| Hydraulic Transmissivity ⁽¹⁾ | ASTM D4716 | 1x10 ⁻⁴ m ² /sec |
| Ply Adhesion | ASTM D7005 | Minimum 0.5 lbs/in, Average 1.0 lbs/in (1-minute test) |

Note: (1) Geocomposite measured at a load of 10,000 psf and a gradient of 0.1 sandwiched between steel plates.

2.6 MANUFACTURER SOURCE QUALITY CONTROL

- A. Perform the following quality control tests at the manufacturing plant or other laboratories on geonet, geotextile, and geocomposite products:

**TABLE 02774-4
 MANUFACTURER'S QUALITY CONTROL TESTING REQUIREMENTS**

| TEST | TEST DESIGNATION | FREQUENCY (SEE FOOTNOTES) |
|--|------------------|------------------------------|
| Geonet | | |
| Density | ASTM 1505 | (2) |
| Carbon Black | ASTM D-4218 | (2) |
| Tensile Strength | ASTM D-7179 | (2) |
| Thickness | ASTM D-5199 | (2) |
| Geotextile | | |
| Mass per Unit Area | ASTM D-5261 | (3) |
| Grab Tensile and Elongation | ASTM D-4632 | (3) |
| CBR Puncture Resistance | ASTM D-6241 | (3) |
| Water Flow | ASTM D-4491 | (1) |
| Apparent Opening Size | ASTM D-4751 | (1) |
| Geocomposite | | |
| Ply Adhesion | ASTM D-7005 | (2) |
| Hydraulic Transmissivity | ASTM D-4716 | (1) |
| Notes: (1) One per 540,000 square feet produced or one per resin batch, whichever results in the greatest number of tests. (2) One per 50,000 square feet produced or one per resin batch, whichever results in the greatest number of tests. (3) One per 90,000 square feet produced or one per resin batch, whichever results in the greatest number of tests. | | |

PART 3 EXECUTION

3.1 PREPARATION

- A. After the CQA Consultant and the OWNER approve the geocomposite, it shall be placed over the geomembrane as shown on the Drawings.
- B. Installation shall be in accordance with the MANUFACTURER's instructions and these Specifications. Where a conflict arises, these Specifications will prevail.

3.2 GEOCOMPOSITE INSTALLATION

A. Deployment.

1. Deploy with the geonet side in contact with the geomembrane.
2. Daily Panel Deployment: Deploy no more panels in one shift than can be secured during that same shift.
3. Do not damage geocomposite by handling, by trafficking, leakage of hydrocarbons, or any other means.
4. Unroll geocomposite panels using methods that will not damage, stretch or crimp geocomposite. Protect underlying surface from damage.
5. Do not allow any vehicular traffic directly on geocomposite.
6. Visually inspect geocomposite for imperfections. Mark faulty or suspect areas for repair.

B. Connections (net) shall be overlapped a minimum of 6-inches along the length and one foot along the width.

C. Connections (net) shall be made using nylon ties secured at three-foot intervals along the length and 1-foot centers along the width.

D. Edge of geotextile shall be sewn for the entire length of geotextile. No geonet shall be exposed.

E. Defects and Repairs.

1. Examine areas of the geocomposite for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geocomposite must be clean at the time of the examination.
2. Damaged geocomposite shall be removed and repaired according to Part 3.4 of this Section.

3.3 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

A. MANUFACTURER, Fabricator, INSTALLER, and CONTRACTOR, will participate and conform with all terms and requirements of the Owners construction quality assurance program. The CONTRACTOR is responsible for assuring this participation.

- B. Field construction quality control and quality assurance requirements shall be performed as specified in the CQA Plan.
- C. The OWNER may perform additional testing to determine the conformance of the materials with these Specifications and the Drawings.

3.4 REPAIR PROCEDURES

- A. Remove damaged geocomposite and replace with acceptable geocomposite materials if damage cannot be satisfactorily repaired.
- B. Repair, removal, and replacement are at CONTRACTOR's expense if the damage results from the CONTRACTOR's, INSTALLER's, or the CONTRACTOR's subcontractor activities.
- C. Repair any portion of the geocomposite exhibiting a flaw. Agreement upon the appropriate repair method will be determined between the OWNER's Representative, the CQAC and the INSTALLER. Repair procedures available include:
 - 1. Patching: Used to repair large holes, tears, by overlapping geocomposite 6-inches in all directions and tying.

3.5 GEOCOMPOSITE ACCEPTANCE

- A. CONTRACTOR retains all ownership and responsibility for the geocomposite until acceptance by the OWNER.
- B. OWNER will accept geocomposite installation when:
 - 1. All required documentation from the MANUFACTURER, Fabricator, and INSTALLER has been received and accepted.
 - 2. The installation is finished.

END SECTION

SECTION 02778

GEOMEMBRANE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section includes furnishing and installing double-side textured HDPE geomembrane for the landfill composite liner in accordance with the Specifications and the Construction Drawings.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- C. Section 02776 - Drainage Geocomposite.
- D. Section 02779 – Geosynthetic Clay Liner.

1.3 REFERENCES

- A. GRI-GM 11 - Accelerated Weathering of Geomembranes using a Fluorescent UVA Condensation
- B. GRI-GM 12 - Measurement of the Asperity Height of Textured Geomembranes Using a Depth Gage.
- C. GRI-GM 13 - Standard Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
- D. ASTM D-746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
- E. ASTM D-792 - Standard Test Methods for Specific Gravity (Relative Density) and Density of Plastics by Displacement.
- F. ASTM D-1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
- G. ASTM D-1238 - Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.

- H. ASTM D-1505 - Standard Test Method for Density of Plastics by the Density Gradient Technique.
- I. ASTM D-1603 - Standard Test Method for Carbon Black in Olefin Plastics.
- J. ASTM D-3895 - Standard Test Method for Copper Induced Oxidative Induction Time of Polyolefins by Thermal Analysis.
- K. ASTM D-4833 - Standard Test Method for Index Puncture of Geotextiles, Geomembranes, and Related Products.
- L. ASTM D-4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- M. ASTM D-5199 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
- N. ASTM D-5397 - Standard Test Method for Evaluation of Stress Crack of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
- O. ASTM D-5617 - Test Method for Multi-Axial Tension Test for Geosynthetics.
- P. ASTM D-5596 - Standard Test Method for Microscopic Evaluation of Dispersion of Carbon Black in Polyolefin Geosynthetics.
- Q. ASTM D-5885 - Standard Test Method for Oxidation Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry.
- R. ASTM D-5994 - Standard Test Method for Measuring Core Thickness of Textured Geomembranes.
- S. ASTM D-6243 - Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method.
- T. ASTM D-6392 - Standard Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.
- U. ASTM D-6693 - Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.

1.4 DEFINITIONS

- A. **Batch:** A quantity of resin, usually the capacity of one rail car, used in the manufacture of high density polyethylene (HDPE) geomembrane sheet. A roll

number corresponding to the particular lot of resin used will identify the finished sheet.

- B. **Bridging:** The condition when geomembrane becomes suspended over its subgrade due to contraction of the material or poor installation.
- C. **Construction Quality Assurance Consultant (CQAC):** The party, independent from MANUFACTURER or INSTALLER, that is responsible for observing and documenting activities related to the quality assurance of production and installation of the geosynthetic components of the lining system.
- D. **Construction Quality Assurance (CQA) Laboratory:** The party, independent from the OWNER, MANUFACTURER, Fabricator, and INSTALLER, responsible for conducting tests on samples of geosynthetics obtained at the site.
- E. **Construction Quality Assurance (CQA) Monitor:** The site representative of the CQAC.
- F. **Extrudate:** The molten polymer that is emitted from an extruder during seaming using either extrusion fillet or extrusion flat methods. The polymer is initially in the form of a ribbon rod, bead or pellets.
- G. **Fabricator:** The party responsible for the fabrication of geomembrane panels constructed from rolls received from the MANUFACTURER.
- H. **Geomembrane MANUFACTURER:** The party responsible for the production of the geomembrane rolls from resin and for the quality of the resin.
- I. **Geomembrane:** An essentially impermeable membrane used as a solid or liquid barrier. Synonymous term for flexible membrane liner (FML).
- J. **Geomembrane Subsurface:** The soil or geosynthetic surface on which the geomembrane lies.
- K. **INSTALLER:** The party responsible for field handling, transporting, storing, deploying, seaming, temporary restraining (against wind), and installation of the geomembrane.
- L. **Panel:** The unit area of geomembrane that will be seamed in the field. A panel is identified as a roll or portion of a roll without any seams.

1.5 PRE-CONSTRUCTION SUBMITTALS (MANUFACTURER AND INSTALLER)

- A. **Submit the following to the OWNER, 7 days prior to receiving material at site.**

- B. Resin Data. (MANUFACTURER)**
1. Statement of production date or dates.
 2. Certification stating that the resin meets the product requirements of Part 2.2.
 3. Certification stating that all resin is from the same MANUFACTURER.
 4. Copy of the quality control certificates issued by MANUFACTURER.
 5. Test reports from MANUFACTURER.
- C. Geomembrane Roll. (MANUFACTURER)**
1. Statement of production date or dates.
 2. Laboratory test results and certification stating that the geomembrane meets the product requirements of Part 2.3.
 3. Certification stating that all geomembrane rolls are furnished by one supplier, and that all rolls are manufactured from one resin type obtained from one resin supplier.
 4. Copy of quality control certificates issued by MANUFACTURER.
 5. Test reports from the MANUFACTURER.
 6. Typical test results of complete notched constant tensile load test (ASTM D-5397) for specified resin and sheet thickness.
 7. Statement certifying that no reclaimed polymer is added to the resin.
 8. Statement listing percentages of processing aids, antioxidants, and other additives other than carbon black added to or in the resin.
 9. Geomembrane delivery, storage, and handling instructions.
 10. Geomembrane installation instructions.
 11. Sample warranties for review.
- D. Extrudate Beads and/or Rod. (MANUFACTURER)**
1. Statement of the production date or dates.

2. Laboratory certification stating that the extrudate meets the product requirements of Part 2.4.
 3. Certification stating that one MANUFACTURER manufactures all extrudate and one supplier supplies the resin.
 4. Copy of the quality control certificates issued by MANUFACTURER.
 5. Test reports from the MANUFACTURER.
 6. Certification stating that the extrudate bead or rod resin is the same type, from the same MANUFACTURER and compatible with the resin used to manufacture the geomembrane supplied for this project.
- E. Schedules and Drawings (INSTALLER).
1. Work schedule: Submit the installation schedule one week prior to installation. Include hours worked per day, per week and per shift. Indicate all weather delays built into schedule.
 2. Installation layout drawings: Two weeks prior to installation of geomembrane, submit drawings showing the panel layout indicating both fabricated (if applicable) and field seams, and details not conforming to the Construction Drawings. All proposed rolls and panels shall be of sufficient length to match the project requirements and prevent horizontal seams on the side slopes of the project area. Therefore, unless otherwise shown on the Construction Drawings, rolls shall be produced and delivered and panels subsequently cut to a sufficient length to reach from 5 feet past the top (crest) hinge line of the slope to 5 feet past the bottom (toe) of the slope or the end of the anchor trench run-out whichever is greater. Upon acceptance of the panel layout, use these drawings for installation of geomembrane.
- F. Qualifications (INSTALLER).
1. Submit, two weeks prior to installation, the name of INSTALLER, and resume of installation supervisor/field ENGINEER to be assigned to the project.
 2. Submit, two weeks prior to installation, resume of master seamer(s).
 3. Equipment and Personnel: Submit the following two weeks prior to installation: (INSTALLER).
 - a. Equipment list stating quantity and types.

- b. List of personnel to perform field seaming operations.

1.6 SUBMITTALS DURING CONSTRUCTION (INSTALLER)

- A. Submit quality control documentation prepared during the installation.
- B. Submit daily prior to the start of installation, subgrade acceptance certificate signed by the installation supervisor for each area to be covered by geosynthetics.

1.7 SUBMIT UPON COMPLETION OF THE INSTALLATION (INSTALLER)

- A. Certificate stating the liner has been installed in accordance with the Construction Drawings and Specifications.
- B. The warranty obtained from the MANUFACTURER/Fabricator and the installation warranty.
- C. As built drawings showing location of panels, seams, repairs, patches, and destructive samples, including measurements.
- D. Copies of seam test results and statistical analysis of each welder's performance.

1.8 QUALIFICATIONS

- A. **INSTALLER:** Must have successfully installed a minimum of 10,000,000 square feet of welded polyethylene geomembrane with documented references.
- B. **Master Welder Qualifications:** Must have completed a minimum of 5,000,000 square feet of polyethylene geomembrane seaming work using the type of seaming apparatus proposed for use on this project.
- C. **Other Seamer's Qualifications:** Must have seamed a minimum of 1,000,000 square feet of HDPE geomembrane.

1.9 QUALITY ASSURANCE

- A. The OWNER will engage and pay for the services of (1) Construction Quality Assurance Consultant (CQAC), and (2) Construction Quality Assurance (CQA) Laboratory for monitoring the quality and installation of geomembrane material being installed unless otherwise specified.

1.10 DELIVERY, STORAGE, AND HANDLING (MANUFACTURER)

- A. **General:** Conform to the MANUFACTURER's requirements.

B. Delivery.

1. Deliver materials to the site only after the OWNER accepts required submittals.
2. Separate damaged rolls from undamaged rolls and store at locations designated by the OWNER until OWNER determines proper disposition of material.
3. OWNER will determine the extent of damage to geomembrane.
4. Deliver in rolls, do not fold.

C. Storage on Site: (INSTALLER).

1. Store geomembrane rolls in the space allocated by the OWNER.
2. Store geomembrane rolls to protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage.
3. Store geomembrane rolls on prepared surface (not on wooden pallets).
4. Stack geomembrane no more than three rolls high.

D. Handling on Site: (INSTALLER).

1. Use appropriate handling equipment to load, move, or deploy geomembrane rolls. Appropriate handling equipment includes cloth chokers and spreader bar for loading, spreader, and roll bars for deployment. Dragging panels on ground surface will not be permitted.
2. Do not fold geomembrane material; folded material will be rejected.
3. CONTRACTOR is responsible for off loading, storage, and transporting material from storage area to installation site.

1.11 WARRANTY (MANUFACTURER)

- A. Provide MANUFACTURER's warranty for geomembrane material in compliance with provisions of the Conditions of the Contract. Provide a minimum 20 year pro rata warranty for the material against deterioration due to exposure to the elements, either exposed or buried. The warranty for material must cover costs of material replacement and installation; assuming the area is rendered in a clean, dry, unencumbered condition. In the event the area cannot be rendered as such, compensation for defective material will be provided to the OWNER on**

a pro rata basis for the estimated cost to the OWNER at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third party INSTALLER.

- B. Installation: Provide an installation warranty for geomembrane material in compliance with the conditions of the Contract. Provide a minimum of 2 year, non-pro rata warranty for the installation against defects.

PART 2 PRODUCTS (MANUFACTURER)

2.1 GEOMEMBRANE RESIN

- A. High Density Polyethylene (HDPE), new, first quality, and manufactured specifically for producing HDPE geomembrane.
- B. Do not mix resin types during manufacturing.
- C. Do not use recycled materials or seconds in manufacturing.
- D. Meeting the following requirements unless otherwise approved:

**TABLE 02778-1
 HDPE RESIN PROPERTIES**

| TEST | TEST DESIGNATION | REQUIREMENT |
|--|---------------------|--------------------------------|
| Density ⁽¹⁾ | ASTM D-792 Method B | Minimum 0.94 g/cm ³ |
| Notes: (1) Measured on resin prior to addition of carbon black. Greater than 0.940 g/cm ³ with carbon black. | | |

2.2 DOUBLE-SIDE TEXTURED HIGH-DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE

- A. Manufacturing.
 - 1. The resin supplied for the geomembrane will consist of compounded polyethylene specifically produced for geomembrane production and shall not include pipe resin or other resins not formulated for hydraulic containment. No recycled polymers or polymers mixed with other types of resin shall be accepted unless the recycling program has been approved the plant inspected by the ENGINEER.
 - 2. Use only resins and additives produced in the United States, Canada or Western Europe from approved suppliers and manufacturers. All resin, masterbatch, anti-oxidant and other additives, as well as the complete formulation, to be approved by the ENGINEER

3. The base resin is to be pure material with no modifications. Factory blending of resins will only be allowed if the facility has been inspected and approved by the ENGINEER and in which case only when fully automated batching and control systems are used.
4. All resin for each type of geomembrane shall be manufactured by one single MANUFACTURER, and supplied by one single supplier. Each type of additive will also be manufactured and supplied by one single supplier.
5. The additive package, at a minimum, must include: carbon black, antioxidants and a HALS component. Non-slip agents shall not be used. The total combined percentage for all the additives, including carbon black, antioxidants, HALS, and others, shall be less than 3.5% of the geomembrane weight. From this 3.5%, no more than 1% shall correspond to additives other than carbon black.
6. All the additives shall be uniformly dispersed throughout the geomembrane. Additives shall not be extractable under water by leaching. There shall be no visual streaking or variation in additive distribution or dispersion.
7. Do not exceed a combined maximum total of 1 percent by weight of additives other than carbon black or pigment.
8. The geomembrane shall be produced in rolls, and shall be free of holes, bumps, and not dispersed material, cuts, bents, and any other signs of foreign material. Every roll shall be identified with labels that supply information as to the thickness, length, width, roll number, and plant location.
9. Separation in plane (SIP) shall be examined during tensile testing. SIP is not allowed. Any rolls presenting SIP will be rejected.
10. The MANUFACTURER shall carry out laboratory tests on the geomembrane's quality control, in the frequency indicated in these specifications. The MANUFACTURER will certify that the proposed material complies with the requirements for the stress crack resistance due to environmental efforts. The most recent stress crack resistance testing results shall be enclosed with a MANUFACTURER'S certification, in order to verify that the supplied product fulfills the project requirements.
11. The HDPE geomembrane shall meet the minimum average roll values (MARV) and requirements Table 02778-2 for double sided textured geomembrane, unless otherwise specified or approved. Manufacturing

quality control (MQC) testing shall be conducted at the stated frequencies.

12. The minimum square footage of geomembrane delivered to the project from a single batch or lot shall be 75,000 square feet to control the cost of conformance sampling and testing. The cost of additional conformance testing performed as a result of a delivered.

**TABLE 02778-2
PROPERTIES FOR 60 MIL TEXTURED DOUBLE-SIDED HDPE GEOMEMBRANE**

| TEST | TEST DESIGNATION | REQUIREMENT | MQC TEST FREQUENCY |
|--|---|---|------------------------------|
| Sheet Thickness | ASTM D-5994 | Minimum average of 60 mils minus 5% (nominal). Lowest individual for 8 out of 10 values is 60 mils minus 10%. Lowest individual for any of the 10 values is 60 mils minus 15%. | One per roll |
| Sheet Density | ASTM D-792 Method B | 0.940 to 0.950 g/cm ³ | 50,000 sq ft ⁽⁵⁾ |
| Oxidation Induction Time of Polyolefins ⁽¹⁾ | ASTM D-3895, 200°C, 1 atm or ASTM 5885 | Minimum 100 minutes Minimum 400 minutes | 250,000 sq ft ⁽⁶⁾ |
| Tensile Strength at Yield | ASTM D6693, Type IV, 2 ipm | Minimum 132 lbs/in-width | 50,000 sq ft ⁽⁵⁾ |
| Elongation at Yield | ASTM D-6693, Type IV, 2 ipm, 1.3 in. gage length | Minimum 13% | 50,000 sq ft ⁽⁵⁾ |
| Tensile Strength at Break | ASTM D-6693, Type IV, 2 ipm | Minimum 132 lbs/in-width | 50,000 sq ft ⁽⁵⁾ |
| Elongation at Break | ASTM D-6693, Type IV, 2 ipm, 2.0 in. gage length | Minimum 350% | 50,000 sq ft ⁽⁵⁾ |
| Tear Resistance | ASTM D-1004, Die C | Minimum 45 lbs | 50,000 sq ft ⁽⁵⁾ |
| Puncture Resistance | ASTM D-4833 | Minimum 120 lbs | 50,000 sq ft ⁽⁵⁾ |

| TEST | TEST DESIGNATION | REQUIREMENT | | MQC TEST FREQUENCY |
|---|---|--|---|-----------------------------|
| Stress Crack Resistance (SP-NCTL) | ASTM D-5397 Appendix | 500 hrs. | | One test per formulation |
| Carbon Black Content | ASTM D-4218 | 2% to 3% | | 50,000 sq ft ⁽⁵⁾ |
| Carbon Black Dispersion | ASTM D-5596 | 9 of 10 different views in Categories 1 or 2, and 1 of 10 in Category 3. | | 50,000 sq ft ⁽⁵⁾ |
| Asperity Height ⁽³⁾ | ASTM D-7466 | 20 mils (8 of 10 readings ≥20 mils, and lowest individual reading ≥ 16 mils) | | One per roll |
| Post Peak Shear Strength ⁽⁷⁾ | ASTM D-5321 (against soil) ASTM D-6243 (against GCL) | <u>Confining Stress</u> (lbs/ft ²) | <u>Shear Stress</u> (lbs/ft ²) | One per project |
| | | 2,000 | 576 | |
| | | 4,000 | 935 | |
| | | 8,000 | 1,561 | |
| | | 12,000 | 1,700 | |

Notes:

- (1) The MANUFACTURER has the option to select either one of the OIT methods listed to evaluate the antioxidant content in the geomembrane.
- (2) The single point NCTL test is not appropriate for testing geomembranes with irregular rough surfaces. The test shall be conducted on smooth edge of textured rolls or on smooth sheets made from the same formulation as the textured material being evaluated.
- (3) The ENGINEER may accept a lower value if it can be demonstrated that the proposed lower asperity height can achieve the interface strengths specified.
- (4) UV resistance is based on percent retained value regardless of the original HP-OIT value.
- (5) One test per 50,000 square feet or one per resin batch, whichever results in the greater number tests.
- (6) One test per 250,000 square feet or a minimum of one per project, whichever results in the greater number of tests.
- (7) Manufacturer is not required to certify the interface value. Requirements apply to the post-peak HDPE –GCL and HDPE geocomposite interface strength at 3 inches of displacement and performed in general accordance with Part 2.7 of Section 02778 these specifications.

2.3 EXTRUDATE ROD OR BEAD

- A. Meeting the geomembrane MANUFACTURER requirements.
- B. Made from same resin as the geomembrane.
- C. Thoroughly disperse additives throughout rod or bead.

- D. Containing 2 to 3 percent carbon black.
- E. Free of contamination by moisture or foreign matter.

2.4 GEOMEMBRANE LABELING

- A. Provide the following information on geomembrane roll labels.
 - 1. Length, width, and weight.
 - 2. Name of manufacturer and fabricator.
 - 3. Directions for unrolling, if necessary.
 - 4. Product identification; batch number, and roll number.

2.5 WELDING EQUIPMENT FOR INSTALLATION

- A. Maintain sufficient operational seaming apparatus to continue work without delay.
- B. Use power source capable of providing constant voltage under combined line load.
- C. Provide protective lining and splash pad large enough to catch spilled fuel under electric generator, if located on liner.
- D. Tensiometers capable of measuring seam strength, calibrated and accurate within 2 pounds. Tensiometers to be calibrated within 12 months of start of project.
- E. Dies for cutting seam samples.

2.6 MANUFACTURER SOURCE QUALITY CONTROL

- A. Perform the quality control tests listed in Table 02778-1, 02778-2, and 02778-3 at the manufacturing plant on geomembrane products.

2.7 SHEAR STRENGTH TESTING REQUIREMENTS

- A. Upon award of the contract, the MANUFACTURER and/or INSTALLER shall provide to the third-party laboratory a minimum 3-foot by the roll width sample of the geomembrane and other geosynthetics for the project for testing of the interface strength between the overlying and underlying soil and/or geosynthetic materials for the project.

- B. Upon award of the contract, the CONTRACTOR shall provide to the third party laboratory a 50 pound sample of each soil, sand, or gravel material to be used in contact with the geomembrane for testing of the interface strength.
- C. The following interfaces shall be tested for the project:
 - 1. 60-mil textured HDPE geomembrane surface against the reinforced GCL.
 - 2. 60-mil textured HDPE geomembrane surface against the double sided geocomposite.
- D. Prior to performing the shear testing, the third party laboratory shall sample and test textured geomembrane for asperity height, geocomposite ply adhesion, and GCL peel strength in accordance the product Specifications.
- E. The testing of the interfaces shall be performed by the third party laboratory in general accordance with ASTM D-5321 and D-6243 using properly calibrated equipment and shall incorporate the following test parameters unless otherwise approved by the ENGINEER.
 - 1. Interface strength shall be determined using 3 test specimens tested under the normal loads shown in Table 02778-2. These normal loads shall be used for the consolidation loading.
 - 2. The test against the soil shall be set up with the geomembrane securely clamped to the bottom box and the soil material placed in the upper box of the direct shear apparatus.
 - 3. The test against the geocomposite material shall be set up with the geomembrane clamped to the upper box and the geocomposite securely clamped in the bottom box of the direct shear apparatus.
 - 4. The test against the GCL material shall be set up with the geomembrane clamped to the upper box and the GCL securely clamped in the bottom box of the direct shear apparatus with the non-woven geotextile in contact with the geomembrane.
 - 5. The geomembrane shall be supported in the box using a rigid substrate with the contact unit consisting of a truss plate or other high friction grip plate approved by the ENGINEER.
 - 5. The geocomposite and GCL to be tested in contact with the geomembrane shall be supported in the box using a rigid substrate with the contact unit consisting of a truss plate or other high friction grip plate approved by the ENGINEER.

6. Unless otherwise specified by the ENGINEER, the soil layer to be tested in contact with the geomembrane shall be a minimum of 1 inch thick, compacted to a minimum of 90 percent relative compaction at optimum moisture content based on ASTM D-1557. The remaining portion of the upper box may be filled with a relatively free-draining sand, gravel, or porous rigid material to allow for proper drainage in accordance with ASTM D-5321 and D-6243.
7. Each specimen used for geomembrane to soil or GCL interface testing shall be consolidated for minimum of 24 hours prior to shearing. A minimum 1 hr seating time may be used for the geomembrane to geocomposite test.
8. All specimens shall be tested in a flooded condition.
9. Flooding shall be performed immediately after the placement of the initial consolidating load and shall be maintained throughout the specimen consolidation and testing period.
10. Each specimen shall be sheared at a maximum strain rate of 0.04 inches per minute for geomembrane in contact with soil or GCL and at 0.4 inches per minute for geomembrane in contact with geocomposite.
11. The shear load and the shear displacement shall be logged continuously throughout the duration of the test.
12. Each test shall be terminated after 3 inches of displacement. The third party laboratory shall note if the test was terminated for any cause prior to reaching the 3-inch requirement.
13. At the completion of the test, the third party laboratory shall photograph or otherwise record the location where shearing occurred, and the general conditions of the samples. The third party laboratory shall also sample and measure the final moisture content of the soil.
14. The results of the test shall be reported in graphical and tabular forms including:
 - a. shear force versus shear displacement curves for all normal loads;
 - b. peak and post-peak or residual (at 3 inches shear displacement) shear strengths versus normal stress curves;
 - c. best-fit straight lines to the shear versus normal stress curves;

- d. actual values of normal stresses along with peak and post-peak shear strengths for each normal load;
- e. friction angle and adhesion determined from the best fits to peak and post-peak shear strengths versus normal stress curves; and,
- f. friction angles determined as the Secant to the specified normal stress point on the actual peak and the post-peak shear strength versus normal stress curves.

PART 3 EXECUTION (INSTALLER)

3.1 DELIVERY, STORAGE, AND HANDLING (MANUFACTURER)

- A. General: Conform to the MANUFACTURER's requirements.
- B. Delivery.
 - 1. Deliver materials to the site only after the OWNER accepts required submittals.
 - 2. Separate damaged rolls from undamaged rolls and store at locations designated by the OWNER until OWNER determines proper disposition of material.
 - 3. OWNER will determine the extent of damage to geomembrane.
 - 4. Deliver in rolls, do not fold.
- C. Storage on Site: (INSTALLER).
 - 1. Store geomembrane rolls in the space allocated by the OWNER.
 - 2. Store geomembrane rolls to protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage.
 - 3. Store geomembrane rolls on prepared surface (not on wooden pallets).
 - 4. Stack geomembrane no more than three rolls high.
- E. Handling on Site: (INSTALLER).
 - 1. Use appropriate handling equipment to load, move, or deploy geomembrane rolls. Appropriate handling equipment includes cloth chokers and spreader bar for loading, spreader, and roll bars for deployment. Dragging panels on ground surface will not be permitted.

2. Do not fold geomembrane material; folded material will be rejected.
3. CONTRACTOR is responsible for off loading, storage, and transporting material from storage area to installation site.

3.2 EXAMINATION OF GEOMEMBRANE SUBSURFACE

- A. Verify that the clay liner has been installed, tested, and approved prior to placement of the geomembrane.

3.3 PREPARATION

- A. Repair damage caused to the underlying materials during deployment.
- B. Round edges of anchor trenches.

3.4 PERFORM TRIAL SEAM WELDS AS FOLLOWS:

- A. Perform trial welds on samples of geomembrane to verify the performance of welding equipment, seaming methods, and conditions.
- B. No seaming equipment or welder will be allowed to perform production welds until equipment and welders have successfully completed trial weld.
- C. Frequency of trial welds:
 1. Minimum of two trial welds per day per equipment and welder, with one prior to the start of work and one at mid shift.
 2. When directed by the CQA Monitor.
 3. Every two hours when using a wedge weld to weld across seams.
 4. Minimum one trial weld per person per shift.
 5. When ambient temperature changes more than 20°F since previous trial weld.
- D. Make trial welds in the same surroundings and environmental conditions as the production welds, i.e., in contact with subgrade.
- E. Make trial weld sample at least 2 feet long, 3 feet long for double wedge welding machines and 12 inches wide with the seam centered lengthwise.
- F. Cut two test strips from opposite ends of the trial weld using a punch press with a 1-inch by 6-inch cutting die.

- G. Test specimens for peel adhesion and shear strength in general accordance with ASTM D-6392 in the presence of the CQAC.
- H. A specimen is considered passing when the following results are achieved. For double wedge welding, both welds must pass in peel and shear.
 - 1. The break is a film tear bond (FTB).
 - 2. The break is ductile.
 - 3. The peel strength is a minimum of 70 percent of the specified sheet strength at yield for wedge welds or flat welds and a minimum of 60 percent of the specified sheet strength at yield for extrusion welds.
 - 4. There is no more than 10 percent separation of the weld. For wedge welds, the width of the weld must be equal to the width of the nip roller.
 - 5. The shear strength is 90 percent of the specified sheet strength at yield for all weld types. Minimum elongation between the grips is 2 inches based on an initial grip separation of 2 inches from the edge of the weld.
- I. Repeat the trial weld in its entirety when any of the trial weld samples fail in either peel or shear.
- J. When repeated trial welds fail, do not use welding apparatus and welder until deficiencies or conditions are corrected and two consecutive successful trial welds are achieved.
- K. Maintain an up-to-date and complete record of the trial welds on an appropriate trial weld log form. Log shall include the date, time, QC technician, welder, welding machine number, ambient temperature, speed, and pass/fail results.

3.5 DEPLOYMENT

- A. **Ambient conditions:** Give careful consideration to the timing and temperature during deployment. Ideally, deployment, welding, and covering would all occur at the same temperature. In a practical sense, the CONTRACTOR should strive to perform these activities within as narrow a temperature range as practical, and avoid these activities during peak hot or cold conditions.
- B. **Panel Identification:** Assign each panel an identifying code number or letter consistent with the CONTRACTOR's submitted panel layout drawing. The coding is subject to approval by the CQA Monitor.

- C. Daily Panel Deployment: Deploy no more panels in one shift than can be welded or secured during that same day.
- D. Do not deploy in the presence of excessive moisture, precipitation, ponded water, or high winds.
- E. Do not damage geomembrane by driving on the geomembrane, handling, trafficking, or leakage of hydrocarbons or any other means.
- F. Do not wear damaging shoes or engage in activities that could damage the geomembrane.
- G. Unroll geomembrane panels using methods that will not damage, stretch or crimp geomembrane. Protect underlying surface from damage.
- H. Use methods that minimize wrinkles and differential wrinkles between adjacent panels.
- I. Place ballast on geomembrane to prevent uplift from wind.
- J. Use ballast that will not damage geomembrane such as sand bags.
- K. Protect the geomembrane in areas of equipment or repeated foot traffic by placing protective cover which is compatible with and will not damage geomembrane.
- L. Repair damage to the subgrade or other underlying materials prior to completing deployment of the geomembrane.
- M. Do not allow any vehicular traffic directly on unprotected geomembrane.
- N. Remove wrinkled or folded material.
- O. Visually inspect geomembrane for imperfections. Mark faulty or suspect areas for repair.
- P. Install material to account for shrinkage and contraction while avoiding wrinkles. Install material stress-free with no bridging before it is covered. Add material such as compensation wrinkles at the toe of the slope as needed to avoid bridging.
- Q. Before wrinkles fold over, attempt to push them out. For wrinkles that cannot be pushed out, cut them out and repair cuts prior to burial or at the direction of the OWNER.

- R. Immediately after panels running through drainage swales or other low points are welded, place sandbags end-to-end along the entire length of the bottom hinge lines to prevent geomembrane stress bridging.

3.6 SEAM LAYOUT

- A. Orient the seams parallel to line of a maximum slope (i.e., orient down not across slope).
- B. Minimize the number of field seams in corners, odd-shaped geometric locations and outside corners.
- C. Unless otherwise approved by the ENGINEER, do not place horizontal seams on slopes steeper than 6 to 1, horizontal to vertical, and keep horizontal seams (seams running approximately parallel to slope contours) at least 5 feet away from toe or crest of slope.
- D. Use seam numbering system compatible with panel number system.
- E. Shingle panels on all slopes and grades as directed by OWNER.

3.7 SEAM WELDING PERSONNEL

- A. Provide at least one welder (master welder) meeting the experience requirements of these Specifications.
- B. Qualify personnel performing welding operations by experience and by successfully passing field welding tests performed on site.
- C. The master welder will provide direct supervision over other welders.

3.8 SEAM WELDING EQUIPMENT

- A. Extrusion welder: equipped with gauges showing temperatures in extruder apparatus at the barrel and at the nozzle. Temperature at nozzle may be measured by external temperature gauges.
- B. Hot wedge welder: Automated variable speed vehicular mounted devices equipped with devices adjusting and giving temperatures of the wedges. Pressure controlled by spring, pneumatic, or other system that allows for variation in sheet thickness. Rigid frame fixed position equipment is not acceptable.
- C. Maintain adequate quality of welding apparatus in order to avoid delaying the project.

- D. Use power source capable of providing constant voltage under combined line load.

3.9 GENERAL WELDING PROCEDURES

- A. Do not commence welding with welding equipment until the trial weld test sample, made by that equipment, passes the test weld.
- B. Clean all geomembrane surface of grease, moisture, dust, dirt, debris, or other foreign material.
- C. Overlap panels a minimum of 3 inches for extrusion welding and 4 inches for hot wedge welding.
- D. Do not use solvents or adhesives.
- E. Provide adequate material on each weld to allow peel testing of both sides of double wedge weld and extrusion welds.
- F. Extend welding to the outside edge of all panels.
- G. If required, provide a firm substrate by using a flat board, a conveyor belt, or similar hard surface directly under the weld overlap to achieve firm support.
- H. Provide adequate illumination if welding operations are carried out at night.
- I. Cut fishmouths or wrinkles along the ridge of the wrinkle in order to achieve a flap overlap. Extrusion weld the cut fishmouths or wrinkles where the overlap is more than 3 inches. When there is less than 3 inches overlap, patch with an oval or round patch extending a minimum of 6 inches beyond the cut in all directions.
- J. Log the following every two hours:
 - 1. Temperature directly on the geomembrane surface being welded.
 - 2. Extrudate temperatures in barrel and at nozzle (extrusion welder).
 - 3. Operating temperature of hot wedge (hot wedge welder) and any pressure adjustments made.
 - 4. Preheat temperature.
 - 5. Speed of hot wedge welder in feet per minute.
- K. Weld only when ambient temperature, measured 6 inches above the geomembrane is between 40°F and 110°F.

- L. If the INSTALLER wishes to use methods which may allow seaming at ambient temperatures below 40°F or above 110°F, then the INSTALLER shall demonstrate and certify that such methods produce seams which are entirely equivalent to seams produced at ambient temperatures above 40°F and below 110°F, and that the overall quality of the geomembrane is not adversely affected. Then, the temperatures in the above quality assurance procedure shall be modified accordingly.

3.10 EXTRUSION TYPE OF WELDING

- A. Use procedures to tack-weld adjacent panels together that do not damage the geomembrane and allow quality control tests to be performed.
- B. Purge welding apparatus of heat-degraded extrudate before welding. Dispose of heat-degraded extrudate off of the liner surface.
- C. Bevel the top edges of the top geomembrane a minimum of 45° and full thickness of the geomembrane before extrusion welding.
- D. Clean seam welding surfaces of oxidation by disc grinder or equivalent not more than 30 minutes before extruding weld. Change grinding discs frequently. Do not use clogged discs.
- E. Do not remove more than 4 mils of material when grinding.
- F. Grind across, not parallel to, welds.
- G. Cover entire width of grind area with extrudate.
- H. When restarting welding, grind ends of all welds that are more than five minutes old.

3.11 HOT WEDGE (FUSION) WELDING

- A. Place a smooth insulating plate or fabric beneath hot welding apparatus after usage so as to not damage the geomembrane.
- B. Protect against moisture build-up between panels.
- C. If welding cross seams, conduct field test welds at least every two hours, otherwise, once prior to start of work and once at mid-day.
- D. Bevel edges of top and bottom panels on cross seams.
- E. Do not weld on geomembrane until equipment has passed trial weld test.

- F. Extrusion-weld a repair patch over all seam intersections.

3.12 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. MANUFACTURER and INSTALLER will participate in and conform with all terms and requirements of the OWNER's quality control and quality assurance program as described here in and in the CQA Plan. The CONTRACTOR is responsible for assuring this participation. Quality control and quality assurance requirements are as specified in this paragraph.

3.13 DEFECTS AND REPAIRS

- A. Examine all welds and non-weld areas of the geomembrane for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of the examination.
- B. Repair and non-destructively test each suspect location both in weld and non-weld areas. Do not cover geomembrane at locations which have been repaired until test results with passing values are available.
- C. Extrusion weld a patch over all "cross" or "tee" welds.

3.14 CONFORMANCE TESTING (CQA LABORATORY)

- A. Allow 7 days for conformance testing following the date material is available to the CQA Laboratory.
- B. Perform conformance testing on geomembrane rolls.
- C. Obtain 3-foot samples across entire roll width not including the first 3 feet of material. CQA Monitor will obtain samples with assistance from CONTRACTOR.
- D. Forward samples to Construction Quality Assurance Laboratory.
- E. Test samples for conformance with the Specifications and guaranteed properties in accordance with the CQA Plan.

3.15 FIELD TESTING (INSTALLER)

- A. General: Non-destructively test all field seams over their full length using a vacuum test unit, air pressure (for double fusion seams only), spark testing, or other approved methods. Perform testing as the seaming progresses and not at the completion of all the field seaming. Complete all required repairs in accordance with this specification.

- B. Maintain an up-to-date and complete record of all seam field testing and repairs. The record shall include the seam number, length, welding date, welding time, QC technician, welder, machine number, non-destructive test date, pass/fail results, and repair information.
- C. Vacuum box testing equipment for extrusion welds
 - 1. A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole, or valve assembly, and a vacuum gauge.
 - 2. A vacuum pump assembly equipped with a pressure control.
 - 3. A rubber pressure/vacuum hose with fittings and connections.
 - 4. A soapy solution and an applicator.
- D. Vacuum box test procedures
 - 1. Place the box over the wetted seam area (soapy solution).
 - 2. Ensure that a leak-tight seal is created.
 - 3. Energize the vacuum pump and reduce the vacuum box pressure to approximately 10 inches of mercury, i.e., 5 psi gauge.
 - 4. Examine the geomembrane through the viewing window for the presence of soap bubbles for a period of not less than 10 seconds.
 - 5. All areas where soap bubbles appear shall be marked and repaired in accordance with repair procedures described in this specification.
- E. Air pressure testing equipment for seaming processes producing a double seam with an enclosed open channel.
 - 1. An air pump (manual or motor driven) equipped with a pressure gauge capable of generating and sustaining a pressure over 40 psi and mounted on a cushion to protect the geomembrane.
 - 2. A rubber hose with fittings and connections.
 - 3. A sharp hollow needle, or other approved pressure feed device.
 - 4. A pressure gauge with an accuracy of plus or minus 1 psi.
- F. Air pressure test procedures.

1. Seal both ends of the welded seam to be tested.
 2. Insert needle or other approved pressure feed device into the tunnel created by the weld.
 3. Energize the air pump to a minimum pressure of 30 psi or 1/2 psi per mil of liner thickness, whichever is greater, close valve and sustain pressure for at least 5 minutes.
 4. If loss of pressure exceeds 3 psi (10 mm mercury), or otherwise approved, or does not stabilize, locate faulty area and repair in accordance with repair procedures described in this Specification.
 5. Puncture opposite end of seam to release air. If blockage is present, locate and test seam on both sides of blockage.
 6. Remove needle or other approved pressure feed device and seal the penetration holes.
- G. Spark testing equipment and materials for penetrations or other difficult areas not accessible for vacuum box testing.
1. 24 gauge copper wire.
 2. Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing visible arc up to 3/4 inch from copper wire.
- H. Spark testing procedures
1. Place copper wire within 1/4 inch of the edge of extrusion seam or clamp seal.
 2. Pass electrode over seam or clamp area and observe for spark. If a spark is detected perform a repair.

3.16 SEAM DESTRUCTIVE TESTING (CQAC AND THE INSTALLER)

- A. Destructive testing of the field production seams will be performed on-site under the supervision of the CQAC or at the CQA Laboratory using a calibrated tensiometer.
- B. Specimens will be tested for peel adhesion and shear strength in general accordance with ASTM D-6392.

- C. Sampling and testing will be conducted at the frequency and in the manner described in the CQA Plan.
- D. The INSTALLER shall cut samples at locations designated by the CQAC as the welding progresses in accordance with the following criteria.
 - 1. The CQAC shall initially mark the sample location and the INSTALLER shall cut a one-inch wide strip from each end of the proposed sample location and test these for peel in the field.
 - 2. Unless otherwise directed by the CQAC, samples shall be a minimum 12 inches wide by 18 inches long with the seam centered lengthwise. Additional sample materials maybe obtained for archive at the OWNER's request and for testing by the INSTALLER.
 - 3. Upon passing results of the initial peel test coupons, the INSTALLER shall cut the main sample out of the seam divide it into three parts for distribution as follows:
 - a. One portion for the INSTALLER: 12 inches by 12 inches.
 - b. One portion for the CQAC: 12 inches by 18 inches.
 - c. One portion to the OWNER for archive storage: minimum 12 inches by 12 inches.
 - 4. Upon failing results of the initial peel test coupons, the INSTALLER shall follow the failed test procedures outlined in this Section.
- E. A sample shall pass when all coupons meet the criteria described in these Specifications.
- F. The INSTALLER and CONTRACTOR shall verify that passing test results have been obtained before the geomembrane is covered.
- G. If any destructive test sample fails, the INSTALLER shall follow the failed test procedures outlined in this Section.

3.17 FAILED WELD PROCEDURES

- A. Follow these procedures when there is a destructive test failure. Procedures apply when the test failure is determined by the CQAC, the INSTALLER, or using a field tensiometer. Follow one of the following two options:
 - 1. First Option.

- a. Reconstruct or cap strip the seam between any two passing test locations. Can not extrusion weld flap.
2. Second Option.
- a. Trace the weld at least 10 feet minimum in both directions from the location of the failed test, or to the end of the weld.
 - b. Obtain a small sample at both locations for an additional field test.
 - c. If these additional test samples pass field tests, then take laboratory samples.
 - d. If the laboratory samples pass, then reconstruct the weld or cap between the two test sample locations that bracket the failed test location.
 - e. If any sample fails, then repeat the process to establish the zone in which the weld must be reconstructed.
- B. Whenever a sample fails, also provide additional testing for seams that were welded by the same welder, welding apparatus, and welded during the same time shift.

3.18 ACCEPTABLE WELDED SEAMS

- A. Bracketed by two locations from which samples have passed destructive tests.
- B. For reconstructed seams exceeding 50 feet, a sample taken from within the reconstructed weld passes destructive testing.

3.19 REPAIR PROCEDURES

- A. Remove damaged geomembrane and replace with acceptable geomembrane materials if damage cannot be satisfactorily repaired.
- B. Repair, removal, and replacement is at CONTRACTOR's expense if the damage results from the CONTRACTOR's, INSTALLER's, or the CONTRACTOR's subcontractor activities.
- C. Repair any portion of the geomembrane exhibiting a flaw, or failing a destructive, non-destructive test, or found during the geomembrane leak location testing survey. Agreement upon the appropriate repair method will be determined between the CQAC'S Representative and the

INSTALLER. Do not commence welding on the liner until trial weld test sample, made by that equipment and operator, passes the trial weld test. Repair procedures available include:

1. **Patching:** Used to repair large holes (over 3/8-inch diameter), tears (over 2 inches long), undispersed raw materials, contamination by foreign matter, and to cover cross and tee connections.
2. **Abrading and re-welding:** Used to repair small sections of seams.
3. **Spot welding or seaming:** Used to repair small tears (less than 2 inches long), pin holes or other minor, localized flaws.
4. **Capping:** Used to repair large lengths of failed seams.
5. **Removing the seam and replacing with a strip of new material.**

D. In addition, satisfy the following procedures:

1. **Abrade geomembrane surfaces to be repaired (extrusion welds only) no more than one (1) hour prior to the repair.**
2. **Clean and dry all surfaces at the time of repair.**
3. **The repair procedures, materials, and techniques must be accepted in advance of the specific repair by the CQAC's Representative and INSTALLER.**
4. **Extend patches or caps at least 6 inches beyond the edge of the defect, and round all corners of material to be patched and the patches to a radius of at least 3 inches.**
5. **Unless otherwise instructed by the CQAC, cut geomembrane below large caps to avoid water or gas collection between the sheets.**

E. Verification of repair:

1. **Number and log each patch repair.**
2. **Non-destructively test each repair using methods specified in this Section.**
3. **Destructive tests may be required at the discretion of the CQAC's Representative.**
4. **Reconstruct repairs until tests indicate passing results.**

3.20 GEOMEMBRANE ACCEPTANCE

- A. CONTRACTOR retains all ownership and responsibility for the geomembrane until acceptance by the OWNER.
- B. OWNER will accept geomembrane installation when:
 - 1. All required documentation from the MANUFACTURER, fabricator, and INSTALLER has been received and accepted.
 - 2. The installation is finished.
 - 3. Test reports verifying completion of all field seams and repairs, including associated geomembrane leak detection testing, have been provided in accordance with these Specifications.
 - 4. Written certification documents and drawings have been received by the OWNER.

END OF SECTION

SECTION 02779

GEOSYNTHETIC CLAY LINER

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Section includes furnishing and installing geosynthetic clay liner.

1.2 RELATED SECTIONS

- A. Section 02221 - Excavating and Stockpiling.
- B. Section 02222 - Engineered Fill, Protective Soil Cover, Soil Cushion, and Anchor Trench Backfill.
- C. Section 02223 - Geosynthetic Subgrade Preparation.
- D. Section 02778 - Geomembrane.

1.3 REFERENCES

- A. GRI-GCL3 - Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners.
- B. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- C. ASTM D422 - Standard Test Method for Particle-Size Analysis of Soil.
- D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- E. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film or Sheeting.
- F. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-aggregate Mixtures.
- G. ASTM D4354 - Standard Practice for Sampling of Geosynthetics for Testing.
- H. ASTM D4632 - Standard Test Method for Breaking Load and Elongation of Geotextiles.

- I. ASTM D4643 - Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
- J. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics.
- K. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- L. ASTM D5084 - Standard Test Method of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter.
- M. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geotextiles and Geomembranes.
- N. ASTM D5261 - Standard Test Method for Measuring Mass Per Unit Area of Geotextiles.
- O. ASTM D5887 - Standard Test Method for Measurement of Index Flux Through Saturated Geosynthetic Clay Liner Specimens Using a Flexible Wall Permeameter.
- P. ASTM D5888 - Standard Guide for Storage and Handling of Geosynthetic Clay Liners.
- Q. ASTM D5889 - Standard Practice for Quality Control of Geosynthetic Clay Liners.
- R. ASTM D5890 - Standard Test Method for Swell Index of Clay Mineral Component of Geosynthetic Clay Liners.
- S. ASTM D5891 - Standard Test Method for Fluid Loss of Clay Components of Geosynthetic Clay Liners.
- T. ASTM D5993 - Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.
- U. ASTM D6102 — Standard Guide for Installation of Geosynthetic Clay Liners.
- V. ASTM D6141 — Standard Guide for Screening the Clay Portion of a GCL for Chemical Compatibility to Liquids.
- W. ASTM D6243 - Standard Test Method for Determining the Internal and Interface Shear Resistance of Geosynthetic Clay Liner by the Direct Shear Method.

- X. ASTM D6693 - Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
- Y. ASTM D6766 — Standard Test Method for Evaluation of Hydraulic Properties of Geosynthetic Clay Liners Permeated with Potentially Incompatible Liquids.
- Z. ASTM D6768 — Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

1.4 DEFINITIONS

- A. Bentonite: Clay soil, comprised primarily of sodium montmorillonite, characterized by high-swelling potential and low-hydraulic conductivity.
- B. Construction Quality Assurance Consultant (CQAC): The OWNER or the monitoring firm responsible for implementation of the CQA plan.
- C. Construction Quality Assurance (CQA) Laboratory: The party, independent from the OWNER, MANUFACTURER, Fabricator, and INSTALLER, responsible for conducting tests on samples of geosynthetics obtained at the site. Also referred to as the Geosynthetics Laboratory.
- D. Construction Quality Assurance (CQA) Officer: The professional representative of the CQA monitoring firm who shall be responsible for implementation of the CQA plan.
- E. Construction Quality Assurance (CQA) Monitor: Site representative of the CQA Monitor responsible for documenting field observations and tests.
- F. ENGINEER: The individual or firm responsible for the design and preparation of the Drawings and Specifications.
- G. Geomembrane: An essentially impermeable synthetic membrane used as a solid or liquid barrier. Synonymous term for flexible membrane liner (FML).
- H. Geosynthetic Clay Liner (GCL): Relatively thin factory-manufactured liner material consisting of bentonite supported by textile backing or geomembrane held together by needling, stitching, or chemical adhesives.
- I. INSTALLER: The party responsible for field handling, transporting, storing, deploying, and temporary restraining (against wind) of the GCL.
- J. Lot: Group of consecutively numbered rolls from the same manufacturing line.

- K. **GCL MANUFACTURER (MANUFACTURER):** The party responsible for the production and quality of GCL.
- L. **Minimum Average Roll Value (MARV):** Minimum value of a limited series of tests that represents a value two standard deviations lower than the overall average value. Ninety-five percent of any individual samples will have values greater than the MARV for any given property.
- M. **Textile Backing (textile or geotextile):** Geosynthetic support material consisting of woven slit film, needle-punched nonwoven, or spunlaced polymer fabric, used for supporting bentonite in a GCL.

1.5 PRE-CONSTRUCTION SUBMITTALS

- A. **Product Data (MANUFACTURER):** Submit the following 7 days prior to shipping material to the site.
 - 1. **Textile Backing:**
 - a. Certification stating that the textiles meet the product requirements (Table 02779-1).
 - b. Copy of quality control tests performed by textile supplier (if different from GCL MANUFACTURER).
 - c. Copy of quality control tests performed by GCL MANUFACTURER.
 - 2. **Bentonite:**
 - a. Certification stating that the bentonite meets the product requirements (Table 02779-1).
 - b. Copy of quality control tests performed by bentonite supplier.
 - c. Copy of quality control tests performed by GCL MANUFACTURER.
 - 3. **GCL:**
 - a. Certification stating that the GCL meets the product requirements (Table 02779-1).
 - b. Copy of quality control tests performed by GCL MANUFACTURER.
 - c. Permeability testing on typical product by independent laboratory (not necessarily for product delivered to site).

- d. Laboratory test data on typical product for:
 - 1) Swell.
 - 2) Permeability of overlapped GCL.
 - 3) Freeze-thaw behavior of GCL.
 - e. The MANUFACTURER shall submit a certificate of compliance for the GCL to the ENGINEER for approval at least 14 days before the required delivery of the material. If the asperity height of the geomembrane is proposed to be less than the specified value, the certificate of compliance shall include shear strength test results conducted by a third-party soils laboratory for the GCL - geomembrane interface per ASTM D6243. The shear strengths must meet or exceed the minimum post-peak shear strength parameters presented in Section 02778, Table 02778-2 and tested in general conformance with Part 2.8 of Section 02778. The certificate of compliance does not need to include the certification of the interface shear strength if the asperity height requirement is not proposed to be modified.
4. Qualifications (INSTALLER):
 - a. Submit, three weeks prior to installation, name of INSTALLER, resume of installation supervisor/field ENGINEER to be assigned to the project, and list of projects completed by INSTALLER that involved GCLs.
 5. Quality Control Plan and Installation Procedures (MANUFACTURER):
 - a. Submit, three weeks prior to installation, copy of MANUFACTURER's quality control plan including list of quality control tests performed and typical testing frequencies.
 - b. Submit, three weeks prior to installation, recommended installation procedures.
- B. Submit, upon completion of the installation, MANUFACTURER's product warranty against MANUFACTURER defects (material not in compliance with this specification). The warranty shall cover the full material replacement cost not including installation.

1.6 QUALIFICATIONS

- A. Product shall be obtained from a MANUFACTURER listed in Section 2.1 or a MANUFACTURER-approved distributor.
- B. INSTALLER shall meet the following requirements:
 - 1. Have experience in similar capacity involving GCLs on at least 3 landfill projects and have installed a minimum of 500,000 square feet of GCL.

1.7 QUALITY ASSURANCE

- A. The OWNER will engage and pay for the services of (1) Construction Quality Assurance Consultant (CQAC) and (2) Construction Quality Assurance (CQA) Laboratory for monitoring the quality and installation of the GCL unless otherwise specified.
- B. The MANUFACTURER shall not charge any time or material expenses to the OWNER, related to a plant visit during manufacturing.
- C. The INSTALLER shall aid the OWNER in product sampling by providing personnel and equipment necessary to move, cut, and protect GCL rolls.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. General: Conform to the MANUFACTURER's requirements unless otherwise specified.
- B. Delivery:
 - 1. Deliver materials to the site only after the OWNER accepts required submittals.
 - 2. Material shall be covered with a waterproof, tightly fitting, plastic covering resistant to ultraviolet degradation.
 - 3. Ship less than one month prior to scheduled installation.
 - 4. Each roll shall be marked with the following information:
 - a. MANUFACTURER's name.
 - b. Product identification.
 - c. Lot and roll numbers.

d. Roll dimensions and weight.

C. Storage:

1. Store rolls in space allocated by the OWNER. Space should be at high-ground level or elevated aboveground surface. Follow storage procedures outlined in ASTM D5888.
2. Stack no more than 3 rolls high.
3. Protect rolls from precipitation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.
4. Preserve integrity and readability of roll labels.

D. Handling:

1. Use appropriate handling equipment following MANUFACTURER's recommendations to load, move, or deploy GCL rolls.
2. Handling of rolls shall be done in a competent manner such that damage does not occur to the product or to its protective wrapping. Follow handling procedures outlined in ASTM D5888.
3. Damage to protective covering due to mishandling or sampling must be repaired immediately. Repairs shall be such that the GCL roll is protected from moisture or other deleterious conditions.
4. INSTALLER is responsible for off-loading, storage, and transporting material from storage area to installation site.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Name, address, and telephone number of MANUFACTURER's given below (product names are shown in parenthesis):

1. Colloid Environmental Technologies Company (CETCO), 1500 West Shure Drive, Arlington Heights, IL 60004, (800) 527-9948. (Bentomat).
2. GSE, 19103 Gundle Road, Houston, TX 77073, (800) 435-2008.
3. AGRU/America, Inc., 600 Rockmead, Suite 300, Kingwood, Texas 77339, (800) 373-2478.

- B. Material may be provided by a different office than shown above or by a MANUFACTURER-approved distributor.
- C. Products other than those shown above may be used only with written pre-bid authorization from the ENGINEER.

2.2 BENTONITE

- A. Supplied in granular form.
- B. Meet the requirements of Table 02779-1.

**TABLE 02779-1
 PROPERTIES FOR BENTONITE**

| TEST | TEST DESIGNATION ⁽¹⁾ | REQUIREMENT |
|--|---------------------------------|---------------------|
| Bentonite | | |
| Swell Index | ASTM D5890 | 24 ml / 2 g minimum |
| Fluid Loss | ASTM D5891 | Maximum 18 ml |
| Notes: (1) Alternate tests are allowed only with prior written approval of ENGINEER. | | |

2.3 GEOTEXTILE BACKING

- A. Both geotextiles shall be needle-punched nonwoven or other product approved by the OWNER.
- B. Meet the requirements of Table 02779-2.

**TABLE 02779-2
 PROPERTIES FOR GEOTEXTILE**

| TEST | TEST DESIGNATION ⁽¹⁾ | REQUIREMENT |
|--|---------------------------------|-------------------------|
| Geotextile⁽²⁾ | | |
| Mass Per Unit Area | ASTM D5261 | >5.0 oz/yd ² |
| Grab Strength | ASTM D4632 | >40 lbs ⁽²⁾ |
| Notes: (1) Alternate tests are allowed only with prior written approval of ENGINEER. | | |
| (2) Required values for geotextile are MARV. | | |
| (3) Measured in weakest direction. | | |

2.4 REINFORCED NEEDLE PUNCHED GCL

- A. Consists of bentonite encapsulated by a non-woven geotextile and a woven geotextile.
- B. Continuous waterproof laplines and matchlines shall be printed directly on the geotextile-type GCL at 6 and 9 inches from the edges of the rolls, respectively.
- C. Wrapped around structurally sound core that can support weight of GCL without excessive bending or buckling. The core shall be accessible to stingers or rods placed full-length within the core.
- D. Geotextiles shall be needle-punched or lock-stitched together through the bentonite layer to form a stable composite. Adhesives may be used in addition to, but not in lieu of, needle-punching, or lock-stitching.
- E. Continuously inspected for presence of needles and certified to be "needle-free."
- F. Meet the requirements of Table 02779-3.

**TABLE 02779-3
 PROPERTIES FOR REINFORCED GEOSYNTHETIC CLAY LINER**

| TEST | TEST DESIGNATION ⁽¹⁾ | REQUIREMENT |
|---|---------------------------------|--|
| GCL⁽²⁾ | | |
| Dried Clay Mass Per Unit Area | ASTM D5993 | >0.85 lbs ⁽³⁾ |
| Peel Strength | ASTM D6496 | >3.5 lbs/inch |
| Tensile Strength | ASTM D6768 | >30 lb/inch |
| Hydraulic Conductivity | ASTM D5887 | Maximum 5.0×10^{-9} cm/sec ⁽⁴⁾ |
| Notes: (1) Alternate tests are allowed only with prior written approval of ENGINEER. (2) Required values for GCL are MARV. (3) Weight of GCL minus weight of geotextiles and corrected to 0 percent bentonite moisture content. (4) Measured under 5 psi confining pressure and 2 psi head pressure. | | |

2.5 MANUFACTURER SOURCE QUALITY CONTROL

- A. Perform the quality control tests at the frequencies shown on Table 02779-5.
- B. Supply copies of testing to the OWNER.

**TABLE 02779-5
 MANUFACTURER'S TESTING FOR GEOSYNTHETIC CLAY LINER**

| TEST | FREQUENCY ⁽¹⁾ |
|---|---------------------------|
| Bentonite⁽²⁾ | |
| Swell Index | 1 per 100 tons |
| Fluid Loss | 1 per 100 tons |
| Geotextile | |
| Mass Per Unit Area | 1 per 200,000 square feet |
| Grab Strength | 1 per 200,000 square feet |
| GCL | |
| Dried Clay Mass Per Unit Area | 1 per 40,000 square feet |
| Peel Strength | 1 per 100,000 square feet |
| Hydraulic Conductivity ⁽³⁾ | 1 per 500,000 square feet |
| Notes: (1) One test per quantity indicated; minimum one test per lot. (2) Frequencies based on material with ten percent moisture content. (3) Minimum of two tests for permeability. | |

PART 3 EXECUTION

3.1 PREPARATION OF FOUNDATION

- A. Conformance testing of the GCL shall be performed and approved by the OWNER in accordance with the CQA plan.
- B. The liner subgrade shall be prepared as specified in Section 02223.

3.2 DEPLOYMENT

- A. General:
 - 1. Deploy only after the OWNER and the INSTALLER accept the foundation.
 - 2. Do not allow foot traffic on the GCL if the material is at the moisture content of 35 percent or greater.
 - 3. Deploy manually or by use of spreader bar attached to loader or backhoe.
 - 4. Take care not to entrap objects or moisture beneath GCL.

5. Beginning deployment implies acceptance of subgrade by the INSTALLER.
- B. Vehicular traffic shall not be allowed on the GCL without the expressed written consent of the ENGINEER.
- C. The installer shall not drag the GCL over areas that may damage the GCL, dislodge stones, or entrap materials such as rocks, sticks, grass, etc. beneath the GCL.
- D. The installer shall place a rub sheet of smooth HDPE geomembrane or other acceptable material over areas that may damage the GCL or entrap foreign materials during deployment.

3.3 JOINING

- A. Overlaps:
 1. Using the lapline and matchline as guides, overlap a minimum of 6 inches along length.
 2. Overlap a minimum of 12 inches at ends of rolls and in sump areas (if applicable) until covering the liner with soil.
 3. Overlaps or seams are not allowed perpendicular to slopes greater than 10 percent. In these areas GCLs must be placed in one piece along the entire slope, unless otherwise approved by the OWNER.
- B. Seams:
 1. Spread loose bentonite or bentonite paste at the rate of 4 ounces per lineal foot of overlap. Bentonite along overlaps is not required if MANUFACTURER can document that the permeability at the overlaps is no greater than the permeability of the GCL material (5×10^{-9} cm/sec). Approval to forego the use of additional bentonite along seams must be received in writing from the ENGINEER before installation begins.
 2. Bentonite shall be same material used in the GCL.
 3. Use lime spreader if powdered bentonite is used to reduce wind-blown particles.
 4. Do not sew or use mechanical connections (except for repairs).

3.4 RESTRAINING AND PROTECTING

- A. Restrain GCL against wind using sandbags filled with fine-grained material.
- B. Sandbags must remain until GCL is covered.
- C. GCL must be covered with geomembrane the day it is installed. If overlying geomembrane is not seamed the same day, the OWNER may request geomembrane edges to be pulled back to inspect GCL at no additional cost to OWNER. Torn, punctured, or hydrated material shall be removed and replaced in accordance with Section 3.5 at no additional cost to OWNER.
- D. The bentonite material that becomes hydrated to a moisture content greater than 40 percent before being covered by a seamed geomembrane will be rejected. Rejected material shall be removed and replaced at no additional cost to the OWNER.

3.5 REPAIR PROCEDURES

- A. Remove punctured, torn, or hydrated material.
- B. Cover area with same type of GCL material with same side up.
- C. Overlap defective area by a minimum of 12 inches in all directions.
- D. Adhesion tape may be used to keep patch in place.
- E. Apply loose bentonite as with normal overlaps at 4 ounces per linear foot.

3.6 FIELD QUALITY CONTROL AND QUALITY ASSURANCE

- A. General:
 - 1. Field quality control is the responsibility of the INSTALLER who must document that the installation proceeds in accordance with this specification.
 - 2. Field quality assurance is the responsibility of the OWNER who is assisted by the INSTALLER.
- B. The INSTALLER and OWNER shall inspect:
 - 1. The underlying surface for entrapped particles that may impact the GCL.
 - 2. The surface of the GCL for needles, punctures, tears, thinning, or other evidence of that the material may not meet specification requirements.

3. The GCL for evidence of premature hydration such as wet areas or swelling. Hydrated areas shall be removed and replaced with unhydrated material.
 4. Overlaps using the laplines and matchlines as a guide. The OWNER shall periodically measure the distance of the laplines and matchlines from the edge of the GCL.
 5. The bentonite seam (if necessary) to check the location of the seams over the overlap and the amount of bentonite being used.
 6. The OWNER must approve each section of the GCL before the GCL is covered.
- C. The INSTALLER shall aid the OWNER in collecting samples for testing:
1. Any roll that cannot be identified shall be rejected.
 2. Samples shall be taken at a minimum frequency of one sample per 100,000 square feet.
 3. A minimum of one sample shall be taken from each lot.
 4. Sample shall be a minimum of two feet long and run the entire width of the roll.
 5. Mark the roll number and machine direction on each sample.
- D. Laboratory Testing:
1. The following laboratory tests shall be conducted, according to the test methods on Table 02779-4.
 - a. Moisture content.
 - b. Mass per unit area.
 - c. Peel strength.
 - d. Permeability.
 2. The test results shall be evaluated according to ASTM D4759.
 3. Testing shall be performed by a qualified laboratory.

3.7 ACCEPTANCE

- A. CONTRACTOR shall retain ownership and responsibility of GCL until acceptance by the OWNER.
- B. OWNER will accept GCL installation when:
 - 1. All required documentation from the MANUFACTURER and INSTALLER has been received and accepted.
 - 2. Test reports verifying material properties have been received and accepted.
 - 3. The OWNER has completed final inspection and any noted defects have been repaired.

END OF SECTION

ATTACHMENTS

ATTACHMENT 1

CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN

**CONSTRUCTION QUALITY ASSURANCE / QUALITY
CONTROL PLAN
SUPERCCELL 2, PHASE 2**

ECDC ENVIRONMENTAL LANDFILL

**SEPTEMBER 2018
PROJECT NO. AU18.1094**

SUBMITTED TO:

**Republic Services, Inc.
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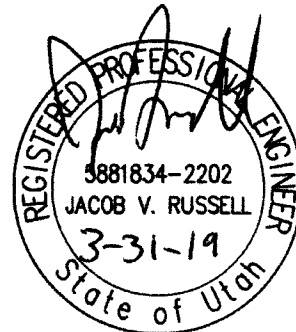


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APPENDICES

Appendix A CQA Forms

1.0 CONSTRUCTION QUALITY ASSURANCE / QUALITY CONTROL

1.1 Introduction and Scope

This plan describes the liner system construction quality assurance and quality control (CQA/QC) requirements for Supercell 2, Phase 2 at the ECDC Environmental Landfill. CQA/QC refers to the duties of a third party CQA/QC Consultant hired by the Owner and the QC representatives of the contractor to monitor, inspect, and evaluate materials and workmanship during construction. The CQA/QC activities document the compliance of the Contractor with the Drawings and Specifications for the construction that has been approved by the Utah Department of Environmental Quality, Division of Waste Management and Radiation Control (UDEQ). For the purposes of this construction project and consistency with the Specifications, the following references shall refer to the people or groups as listed below:

1. *Owner or Company* refers to ECDC Environmental Landfill.
2. *Owner's representative* refers to either employees of ECDC Environmental Landfill or persons hired by the Owner to act as his or her representative during the construction project.
3. *CQA/QC Consultant* refers to an independent third party firm hired by the Owner to perform CQA/CQC during the construction project.
4. *CQA/QC Officer* refers to the licensed professional ultimately responsible for the CQA/CQC activities.
5. *CQA/QC Monitor* refers the person or persons responsible for monitoring and documenting the day to day CQA activities.
6. *Engineer* refers to the person or company responsible for the construction Drawings and Specifications.
7. *Contractor* refers to the company hired by the Owner to perform the construction activities.
8. *Geosynthetics Installer* refers to the firm hired by the Owner to install the geosynthetic material.

The overall goal of this CQA/QC Plan is to assure that proper construction techniques and procedures are used and that the project is built in accordance with the project Drawings and Specifications. The intent is to identify and define problems that may occur during construction and to verify that these problems are corrected before construction is complete. A written final report prepared by the CQA/QC Consultant will be prepared summarizing the construction activities and verifying that the installation was performed in general accordance with the project Drawings and Specifications.

All quality assurance activities shall be conducted in accordance with this CQA/QC Plan, and with the Drawings and Specifications. Where there is a discrepancy, the Specifications shall

govern unless otherwise specified by the Company and approved by UDEQ. The CQA/QC Monitor shall observe all field installation activities. The CQA/QC Consultant shall be responsible for ensuring that the proper number of personnel are on site and capable of observing construction activities as described in this document. The CQA/QC Monitor shall be present during all phases of construction that require CQA/QC observation. Documentation shall meet the requirements of this Plan and the Specifications.

1.2 Duties of CQA/QC Personnel

It is the duty and responsibility of the CQA/QC Consultant to implement the elements of this CQA/QC Plan in order to ensure that the construction and installation of the composite liner system at the site is performed in accordance with the approved Construction Drawings and Specifications, Utah Regulations, and 40 CFR 258 (Subtitle D). The CQA/QC personnel shall make every effort to communicate in an efficient and effective manner to the Contractor's representatives on issues concerning testing and observation procedures and results of materials or *in situ* tests performed.

The CQA/QC Consultant is not in a position to direct construction activities, but is encouraged to give advice to the Contractor, its employees, or the Company on items that may improve the quality or speed progress of the construction. As described previously, for the purposes of consistency with the Specifications, the Company may also be referred to as the Owner.

The CQA/QC Consultant and its representatives shall make every effort to furnish test results to the Contractor in a prompt manner. Test results shall be signed by both the CQA/QC Consultant and the contractor and made available to UDEQ within 1 week after completion of the test. The representatives of the CQA/QC Consultant shall report to the Company any nonconformance items that cannot be resolved promptly.

The CQA/QC monitor will be on site at all times during the construction project to ensure that all aspects of construction are monitored and documented.

1.3 Personnel Qualifications

1.3.1 CQA/QC Officer

The CQA/QC Officer will have formal academic training in civil engineering or a closely related discipline and will be a registered civil engineer in the State of Utah. The CQA/QC Officer will have experience in earthworks construction, landfill design and construction, and geomembrane and leachate collection system installations. The CQA/QC Officer will have practical technical and managerial experience that will allow the CQA/QC Plan to be properly implemented. The CQA/QC Officer must be able to communicate effectively with the Company personnel and the Contractor so that there will be a clear understanding of construction activities and the CQA/QC Plan.

1.3.2 CQA/QC Monitor

The CQA/QC Monitors will have formal training and practical experience in inspecting and testing earthworks construction, geosynthetic installations, and leachate collection system installations, including conducting and recording inspection activities, preparing daily reports, and performing field testing. In addition, knowledge shall be required of the specific field practices and construction techniques for landfill liner construction and all codes and regulations involving material handling, observation of testing procedures, equipment, and reporting procedures.

2.0 MEETINGS

2.1 General

Throughout the entire construction and installation of the liner system, close communication between all parties involved with the project is essential. In order to coordinate activities between the Company, CQA/QC Consultant, and Contractor, as well as set up proper lines of authority and reporting, meetings shall be held before and during construction. The type and purpose of meetings to be held for this project are described in this section.

2.2 Preconstruction Meeting

A preconstruction meeting shall be held prior to project start-up. The parties that shall attend this meeting are the Company, Contractor, and CQA/QC Consultant. The Company will notify UDEQ of the preconstruction meeting, although regulatory attendance is not mandatory. The purpose of this meeting is to:

1. Review the project Drawings and Specifications.
2. Review project tasks and responsibilities.
3. Review project schedule.
4. Review lines of communication and authority.
5. Review reporting and documenting procedures.
6. Review testing equipment and test methods.
7. Review protocol for submittal of CQA/QC conformance testing data sheets.
8. Conduct a site inspection to review work areas, lay-down areas, stockpile areas, access roads, and related project issues.

The CQA/QC Consultant shall document the preconstruction meeting and copies shall be provided to all persons present at the meeting and UDEQ. Preconstruction meeting documentation shall become part of the project documents.

2.3 Daily Progress Meetings

A progress meeting shall be held before the start of each construction shift. The daily progress meetings shall be attended by the CQA/QC Monitor and the Contractor. The purpose of this meeting shall be to:

1. Review the proposed activities scheduled by the Contractor for the day.
2. Discuss any problems or deficiencies that have arisen during construction.
3. Review the results of any test data.
4. Discuss the Contractor's deployment of personnel and equipment.
5. Review the previous day's activities including the effectiveness of procedures taken to alleviate any deficiencies.

All progress meetings shall be documented by the CQA/QC Monitor on his daily field construction inspection report.

2.4 Weekly Progress Meetings

Progress meeting will be held at the beginning or end of each week to review the previous week's activities or progress, discuss present and future work, and discuss any current or potential construction problems. At a minimum the CQA/QC Monitor, a Company representative, the Contractor, and all active subcontractors shall attend. If necessary, the CQA/QC Officer shall also attend. The Company will notify UDEQ of the progress meetings, although regulatory attendance is not mandatory. All weekly progress meetings will be documented by the CQA/QC Monitor who will transmit minutes by the end of the second working day to all parties including UDEQ.

2.5 Work Deficiency Meetings

As needed, meetings shall be held to discuss specific problems or deficiencies that occur during construction that cannot be easily resolved. Work deficiency meetings shall be attended by the CQA/QC Monitor, CQA/QC Officer, the Company, and the Contractor. The Company will notify UDEQ of any work deficiency meetings, although regulatory attendance is not mandatory. The purpose of these meetings is to:

1. Identify the nature and extent of the problem;
2. Discuss the means necessary to correct the deficiency or problem; and
3. Provide a solution to the problem and determine how the corrective action shall be implemented.

3.0 DESIGN CHANGES

3.1 Minor Design Changes

Minor changes to the Drawings and Specifications may be necessary to maintain or enhance quality during the project or to make adjustments to unforeseen field conditions. Minor changes must be approved by the Engineer.

Procedures for providing minor changes include the following:

1. The need for a design change may become apparent during the course of construction of the project and a request for a change may be initiated by any individual associated with the project.
2. All proposed design changes must be approved by the Engineer and submitted to the CQA/CQC Officer with necessary documentation supporting the change for approval. All design changes must meet the intended quality and technical requirements of the design.
3. Approved changes will be distributed to the Owner, CQA/CQC Monitor, CQA/CQC Officer, Contractor, Geosynthetics Installer, and the UDEQ.
4. Minor changes will not apply for changes that decrease the environmental protection of the unit such as decreasing the number or thickness of liners, decreasing the number of sumps, changing the synthetic liner materials, etc.

3.2 Major Design Changes

Major changes to the plans and Specifications are unlikely to occur but may become necessary during the course of construction. Major changes may include elimination of landfill design components and drainage features and addition or changes to liner components and the extent of liner installation. The following procedures will be implemented for all major changes:

1. A special meeting will be scheduled immediately with the UDEQ to discuss the need for the change.
2. Owner and Engineer will both attend the meeting to present the basis for the change. Requested changes and supporting documentation will be provided at the meeting.
3. Major changes will not be implemented without the express written approval from the UDEQ.
4. Copies of approved changes will be distributed to Owner, Engineer, CQA/CQC Monitor, CQA/CQC Officer, Contractor, Geosynthetics Installer, and UDEQ.

4.0 EARTHWORK CQA/QC

4.1 General

This section outlines the requirements for earthwork CQA/QC operations for the construction of Supercell 2, Phase 2. Earthwork includes, but is not limited to: (1) excavation, stockpiling,

and borrow area; (2) engineered fill placement; (3) soil cushion layer placement (4) geosynthetic subgrade preparation; (5) clay liner for sump; (6) anchor trench excavation and backfilling; (7) leachate collection and removal system installation; (8) placement of the protective soil cover, and (9) surface water drainage structures. Specifically excluded from this section are the GCL liner installation, geomembrane installation, geocomposite placement, and geotextile placement, which are addressed within Sections 5, 6, 7, and 8 of this CQA/QC Plan. The CQA/QC Monitor shall verify that the Contractor has conducted all surveying and As-Built Drawing preparation as required by the Specifications.

4.2 Excavation, Stockpiling, and borrow area

The excavated materials shall be stockpiled in a location as directed by the CQA/QC Monitor or Company Representative. The Monitor shall observe that the stockpiles conform to the requirements of the Specifications. During the borrow area clearing and grubbing, the CQA/QC Monitor shall observe and document the activities.

4.3 Engineered Fill Placement

The CQA/QC Monitor shall verify that the embankment, roadways, ramp, and other engineered fills are placed to the approximate lines and grades shown on the Drawings. Prior to engineered fill placement, the CQA/QC Monitor shall observe and document the clearing, grubbing, and proof rolling as part of the foundation preparation.

The CQA/QC Monitor shall observe and document material placement and compaction. The relative compaction of each lift may be tested for nuclear density and moisture in accordance with ASTM D-2922 and ASTM D-3017. The maximum density of the soils will be determined as per ASTM D-698 in accordance with the Drawings and Specifications. Sand cone testing shall be conducted as a check to the nuclear density testing in accordance with ASTM D-1556. The testing frequency requirements of the engineered fill are included in Table 1. Results of all field testing shall be provided to the regulating agency within 2 days of test completion.

**TABLE 1
 ENGINEERED FILL TESTING FREQUENCY**

| TEST | MINIMUM FREQUENCY OF TESTING ⁽¹⁾ |
|---|---|
| Moisture Density D-698 | One per material type |
| Particle Size D-422 or C-136 | One per material type |
| Nuclear Density and Moisture D-2922/D-3017 | One per 1,000 cy |
| Moisture Content D-2216 | One per 10,000 cy |
| Sand Cone D-1556 | One per 20,000 cy |

Note: ¹ These testing frequencies may be increased at the discretion of Engineer.

Upon completion of engineered fill, the CQA/QC Monitor shall verify that survey had been performed by licensed surveyor to verify line and grade.

4.4 Soil Cushion Layer

The CQA/QC Monitor shall verify the soil cushion layer is placed to the approximate lines and grades shown on the Drawings. Prior to soil cushion layer placement, the CQA/QC Monitor shall observe and document the layer is suitable for geosynthetic installation as part of geosynthetic subgrade preparation.

The CQA/QC Monitor shall observe and document material placement and compaction including loose lifts not exceeding the thickness stated in the Specifications. The relative compaction will be tested for nuclear density and moisture in accordance with ASTM D-2922 and ASTM D-3017. The maximum density of the soils will be determined as per ASTM D-698 in accordance with the Drawings and Specifications. Sand cone testing shall be conducted as a check to the nuclear density testing in accordance with ASTM D-1556. The testing frequency requirements of the soil cushion layer are included in Table 2. Results of all field testing shall be provided to the regulating agency within 2 days of test completion.

TABLE 2
SOIL CUSHION LAYER TESTING FREQUENCY

| TEST | MINIMUM FREQUENCY OF TESTING ⁽¹⁾ |
|---|---|
| Moisture Density D-698 | One per material type |
| Particle Size D-422 or C-136 | One per material type |
| Nuclear Density and Moisture D-2922/D-3017 | One per 500 cy |
| Moisture Content D-2216 | One per 10 nuclear tests |
| Sand Cone D-1556 | One per 20 nuclear tests |

Note: ¹These testing frequencies may be increased at the discretion of Engineer.

Upon completion of soil cushion layer, the CQA/QC Monitor shall verify that survey had been performed by licensed surveyor to verify line and grade.

4.5 Geosynthetic Subgrade preparation

The geosynthetic subgrade proof-rolling, smooth-drum compaction, and other preparation activities shall be observed by the CQA/QC Monitor as required by the Specifications and this CQA/QC Plan.

The completed subgrade for the geosynthetics liner shall be inspected by the CQA/QC Monitor, Contractor, and Geosynthetics Installer (Installer) to ensure that it will provide a firm and relatively smooth base for construction of the liner system in accordance with the Drawings and Specifications. Any areas observed to be excessively soft during proof-rolling should be excavated and reworked or removed and suitable materials placed by the Contractor in accordance with the project Specifications. If replacement fill is thicker than 6 inches, fill shall be treated as engineered fill or soil cushion layer and tested accordingly. At the conclusion of the subgrade preparation, the CQA/QC Monitor shall record on an appropriate form that the subgrade is acceptable to the Installer for placement of the overlying geosynthetic materials.

4.6 Clay Liner

4.6.1 Pre-Construction

Pre-construction CQA activities include inspection of clay liner borrow as described in the following section.

Clay Liner Borrow

All clay liner materials shall be inspected to document that they are uniform and as specified in the design documents. Material inspection shall continue throughout the liner construction period. If liner material is obtained on-site, the inspections can be performed as the material is excavated or as it is placed in the stockpile. Visual observation and classification of the excavated soils will be performed as described in the Specifications. Unsuitable material shall be rejected. For borrow areas containing non-uniform materials, substandard soil material shall be segregated as it is excavated. CQA personnel shall observe segregation operations carefully to document that only suitable material is retained for liner construction. Changes in color or texture may be indicative of a change in soil type or soil moisture content. The soil shall be inspected for roots, stumps, large rocks, and other deleterious materials.

A sufficient number of samples of the liner material, as determined by the CQA Engineer, shall be tested prior to the delivery and preparation of the liner material to document that material properties are within the range stated in the Specifications. The tests to be conducted are presented in Table 3. If the material proposed to be used for construction is different than the material used to establish the placement Specifications, the Design Engineer shall be contacted to evaluate the need for additional pre-construction testing and modified placement Specifications.

**TABLE 3
 CONSTRUCTION QUALITY CONTROL AND
 QUALITY ASSURANCE TESTING OF BORROW AREA CLAY LINER**

| TEST | METHOD | MINIMUM FREQUENCY OF TESTING |
|---|-------------|------------------------------|
| Visual Classification | ASTM D-2488 | Continues |
| Atterberg Limits | ASTM D-4318 | One per material type |
| Particle Size Analysis | ASTM D-422 | One per material type |
| Moisture-Density Relationships – Standard Proctor | ASTM D-698 | One per material type |

4.6.2 Construction

To document that proper construction practices are followed, CQA personnel shall observe the liner material placement, moisture conditioning, and compaction process. During material placement the following shall be documented:

- Roots, rocks, rubbish, off-spec soil, or other deleterious materials are removed from the liner material.
- Changes in soil characteristics are identified that may necessitate a change in construction Specifications.

- Liner material is spread adequately to obtain complete coverage and the specified maximum loose lift thickness.
- Oversize clods in the liner material are reduced in size.
- Specified soil amendments are spread and incorporated to obtain uniform distribution of the specified amount throughout the liner material.
- Water is adequately spread and incorporated to obtain full penetration through clods and uniform distribution of the specified water content.
- Soil moisture content is adjusted appropriately in the event of a rain or drought during construction.
- Significant water loss and desiccation cracking before and after compaction is prevented through the use of water application, covering, rolling with a smooth-drum roller, or other application and preservation methods.

During the clay liner compaction process the following shall be documented:

- The specified soil density, water content, and permeability throughout each completed lift is achieved. This will be documented by the use of laboratory and field tests.
- Permeability values obtained from relatively undisturbed soil liner samples are consistent with values obtained from pre-construction testing (if performed). Permeability testing sample locations are staggered from lift to lift so holes do not align vertically.
- Penetrations or holes resulting from the collection of soil samples or the use of density or moisture probes are repaired using the same or other suitable materials as approved by the Engineer.
- Compacted lifts are tied together by scarifying the top of each lift prior to applying the following lift.
- Snow is removed prior placement of the next lift.
- Sufficient liner strength to maintain stable sidewalls and to supply a stable base for supporting overlying materials is maintained while achieving minimum specified density. Density is monitored with density testing accordance with the procedures outlined in Table 4. Additional tests may be conducted as requested by the CQA personnel.
- Geosynthetic installation to prevent desiccation of clay liner material after completion of the liner is placed in a timely manner where necessary.
- Equipment traffic is routed and controlled such that accidental damage of installed portions of the soil liner is prevented.

Climatic conditions shall be taken into consideration when choosing construction methods. Construction methods may be altered during and just after a rainfall, during very hot or windy conditions, or during freezing weather. For example, more compactive effort must be applied

to achieve the same density as soil temperature falls. In very dry weather, the surface water content of each compacted fill layer can be altered in a very short time by drying, making continuous watering and blending necessary. Atmospheric conditions shall be observed and recorded by CQA personnel, and appropriate actions shall be taken when weather conditions change.

At locations where field testing indicates densities below the requirements of the Specifications, the failing area shall be reworked. For soil liners where the field testing indicates the moisture content is below or above the requirements, the area shall be scarified, moisture conditioned, and re-compacted.

Testing of the compacted clay liner shall be performed in accordance with Table 4. Thin-walled (Shelby) tube samples of the in-place clay liner shall be obtained at the frequency indicated in Table 4. Additional samples may be obtained at the discretion of the CQA Engineer. Laboratory permeability tests shall be conducted on these samples to document compliance with the Specifications. CQA personnel shall periodically monitor the soil liner surface for desiccation and irregularities to document compliance with the specifications.

TABLE 4
CONSTRUCTION QUALITY CONTROL AND
QUALITY ASSURANCE TESTING OF COMPACTED CLAY LINER

| TEST | METHOD | MINIMUM FREQUENCY OF TESTING ⁽¹⁾ |
|--|------------------|---|
| Moisture Content | ASTM D-2216 | Minimum of 2 tests |
| Moisture-Density Relationships – Nuclear Gauge | ASTM D-2922/3017 | Minimum of 5 tests |
| Drive Cylinder (ASTM D-2937) Density | ASTM D-2937 | Minimum of 2 tests |
| Permeability – Flexible Wall | ASTM D-5084 | Minimum of 2 tests |

Note: ¹These testing frequencies may be increased at the discretion of Engineer.

4.6.3 Post-Construction

Immediately before placement of any other materials, the clay liner shall be inspected for cracks, holes, defects, or any other features that may increase its field permeability. All defective areas shall be removed and replaced or repaired. If the underlying foundation is defective (soft or wet), then this material also shall be removed and the resultant volume replaced. Inspection shall document that there is continuity between the repaired and unaffected areas.

The CQA Engineer shall coordinate with the surveyor to confirm that minimum design thicknesses and grades are achieved prior to placement of any additional material over the soil liner. A systematic grid survey shall be used to confirm minimum liner thicknesses and lines and grades for the top of the soil liner as provided in the Specifications.

4.7 Anchor Trench Excavation and Backfilling

The CQA/QC Monitor shall verify that the anchor trenches are excavated to the approximate lines and grades shown on the Drawings. The CQA/QC Monitor shall observe trench excavation to ensure it has been excavated only the distance required to carry out the synthetic liner and GCL installation in an expeditious manner. The CQA/QC Monitor shall verify that the leading edges of the anchor trenches are rounded to minimize sharp bends in the liner material.

The CQA/QC Monitor shall observe the backfill compaction and placement of soil in lifts to ensure that the work is performed in accordance with the Drawings and Specifications. The CQA/QC Monitor shall observe that the placement and compaction techniques employed by the Contractor to ensure that any damage (if it occurs) to the liner or GCL is recorded and repaired as necessary. Any damage to the synthetic materials shall be immediately repaired in accordance with this CQA/QC Plan and the Specifications. The Contractor shall be responsible for reworking and recompacting any areas that do not appear to be compacted properly as determined by the CQA/QC Monitor.

4.8 Leachate Collection and Removal System (LCRS)

4.8.1 General

This section sets forth the requirements for the CQA/QC testing and observation requirements for installing the LCRS components detailed on the Construction Drawings and Specifications. This work includes the materials for the leachate collection pipe installation (more specifically, leachate collection gravel, and piping for the sump). Geotextile wrap CQA procedures are included in Section 8 of this CQA plan. The Contractor shall furnish submittals in compliance with this plan and conditions of warranty prior to construction for review by the CQA/QC Officer and CQA/QC Monitor. The Contractor shall also prepare and submit a time schedule for installation, including complete testing and acceptance of materials prior to construction.

4.8.2 Leachate Collection Piping

The Contractor shall provide a copy of the piping manufacture's data for this project prior to construction for review by the CQA/QC Monitor and CQA/QC Officer. Materials shall be delivered to the site only after the CQA/QC Monitor receives and approves the required submittals.

The CQA/QC Monitor shall ensure that the materials were packaged and shipped by appropriate means so that no damage was caused to the materials delivered to the site. Off-loading shall be done in the presence of the CQA/QC Monitor and any damage during off-loading shall be documented by the CQA/QC Monitor and the Contractor. The CQA/QC Monitor shall keep a log of all piping delivered to the site on a log of piping received form.

Damaged materials shall be separated from undamaged materials until the CQA/QC Monitor

determines proper disposition of the material. Final authority on the determination of damage shall be the CQA/QC Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the Owner.

The piping shall be stored on a prepared surface approved by the CQA/QC Monitor and shall be protected from puncture, precipitation, dirt, grease, water, mechanical abrasions, or other damage. The CQA/QC Monitor shall observe that the Contractor uses appropriate handling equipment to load, move, or deploy the material to ensure that no damage is caused to the materials during handling of the piping.

No leachate collection piping shall be placed until the synthetic liner has been installed and approved by the CQA/QC Monitor. The CQA/QC Monitor shall observe placement to ensure that no materials are placed in a manner that could damage the underlying geomembrane liner. The CQA/QC Monitor shall record all observed damages and clearly mark their location for scheduled repair.

4.8.3 Leachate Collection Gravel

The Contractor shall provide samples of the leachate collection gravel material to the CQA/QC Monitor for conformance testing. As described in the Specifications, this conformance testing shall include, but may not be limited to, sieve analysis (ASTM D-422) and permeability (ASTM D-2434). Conformance testing shall be performed at a frequency of one test per 500 cubic yards of delivered material or one per source, whichever results in the greater number of tests.

No leachate collection gravel material shall be placed until the synthetic liner and leachate collection pipes have been installed and approved by the CQA/QC Monitor. The CQA/QC Monitor shall observe placement so that no materials are placed over wrinkles in the underlying geosynthetic liner materials and to ensure that the leachate collection piping is not damaged. The Contractor shall schedule placement of the leachate collection gravel material during cooler parts of the day in the event of warm weather in order to avoid placement of drainage materials when the liner is wrinkled. The CQA/QC Monitor shall record all observed damages and clearly mark their location for scheduled repair.

4.9 Protective Soil Cover

The CQA/QC Monitor shall perform visual observation and obtain samples for conformance testing on the protective cover soil layer materials in accordance with the Specifications prior to installation. This conformance testing may include, but not be limited to, sieve analysis (ASTM D-422) at a minimum frequency of 1 test per 5,000 cy to verify that oversize materials are not placed directly on the drainage geocomposite or geomembrane liner.

The CQA/QC Monitor shall observe the placement of the protective soil cover layer material to ensure that the Contractor follows the procedures described in the Specifications. The CQA/QC

Monitor also need to review equipment list proposed for placement. No protective soil cover layer material shall be placed until the synthetic liner and leachate collection geocomposite and geotextile have been installed and approved by the CQA/QC Monitor. The CQA/QC Monitor shall continuously observe placement of the protective soil cover layer so that no materials are placed over wrinkles in the underlying geosynthetics. The thickness of the protective soil cover layer shall also be observed to ensure compliance with the Specifications. The CQA/QC Monitor shall verify that the protective soil cover layer is placed in an up slope direction.

The Contractor shall schedule placement of the protective soil cover layer material during cooler parts of the day in the event of warm weather in order to avoid placement of materials when the liner is wrinkled. All observed damages shall be recorded by the CQA/QC Monitor and their location clearly marked for scheduled repair.

4.10 Surface Water Drainage Structures

The CQA/QC Monitor shall observe the installation of the surface water drainage structures for the proposed work in accordance with the Specifications and Drawings. Surface water drainage structures may include, but would not be limited to drainage channels, ponds, culverts, drop inlets, and risers. The CQA/QC Monitor shall test or otherwise review the test data for materials to be supplied by the Contractor in accordance with the Specifications. Materials requiring testing may include, but would not be limited to engineered fill, trench bedding and backfill, filter drain rock, and erosion control materials (rip rap etc.).

5.0 GEOSYNTHETIC CLAY LINER (GCL) CQA/QC

5.1 General

This section describes the observation and testing procedures required for the installation of the GCL. To monitor compliance, a quality assurance program shall be implemented that includes material conformance testing and construction observation. Conformance testing refers to those activities that can take place prior to geosynthetic installation. Construction observation testing includes those activities that occur during geosynthetics installation.

5.2 Shipping and Handling

The Contractor shall provide a copy of the QC certificates for production of each GCL roll manufactured for this project prior to construction for review by the CQA/QC Monitor and CQA/QC Officer. The certificate of compliance for the GCL must be received prior to installation as required by the Specifications. Materials shall be delivered to the site only after the CQA/QC Consultant or the Company receives, reviews, and approves the required submittals.

The Contractor is responsible for the transportation, off-loading, and storage of the GCL. The materials shall be packaged and shipped by appropriate means so that no damage is caused and shall be delivered to the site only after the CQA/QC Monitor receives and approves the

required submittals. Off-loading shall be performed in the presence of the CQA/QC Monitor and any damage during off-loading shall be documented by him. The CQA/QC Monitor shall keep a log of all GCL delivered to the site on the appropriate form for review by the CQA/QC Officer.

5.3 GCL Conformance Testing

Immediately after delivery or at the point of manufacture and approval of required manufacturer's quality control data, the CQA/QC Monitor shall obtain 1 geosynthetic clay liner sample per 100,000 square feet, or 1 sample per lot, whichever results in the greater number of conformance tests. This sampling frequency may be increased as deemed necessary by the Company. Samples shall be forwarded to a qualified Third Party Laboratory for testing. The CQA/QC Consultant shall obtain test results in accordance with the Specifications prior to GCL deployment.

The CQA/QC Monitor shall review and summarize the test results and forward the test results and summary to the CQA/QC Officer within 24 hours of receipt. Deficiencies shall be handled in accordance with Section 9. At a minimum, the GCL shall be tested for the following:

1. Mass per Unit Area (ASTM D-5993)
2. Moisture content (ASTM D-2216)
3. Peel Strength (ASTM D-4632, modified)
4. Permeability (ASTM D-5084)
5. Interface Shear (ASTM D-6243) GCL and geomembrane interface shall be tested in accordance with the Specifications.

The number of specimens tested per conformance sample shall be in accordance with the respective ASTM Standard. All relevant ASTM Standards shall be readily available for review. The CQA/QC Monitor will review all test results and shall report any non-conformance to the CQA/QC Officer, the Company, and to the Contractor.

5.4 GCL Installation

5.4.1 Subgrade Surface Preparation

Prior to GCL installation, the CQA/QC Monitor shall verify that the following subgrade surface preparation activities are performed:

1. The Contractor has completed the required surveying of all lines and grades by a qualified surveyor;
2. The subgrade has been graded and rolled in accordance with the Documents, Specifications, and CQA/QC Plan;

3. The Contractor has verified, in writing, that the subgrade is acceptable for GCL installation;
4. The supporting surface does not contain rocks, other protrusions, or debris per the Specifications that could damage the GCL;
5. No excessively soft areas or depressions that could damage the GCL are present; and
6. All construction stakes and hubs have been removed.

5.4.2 GCL Panel Placement

The CQA/QC Monitor shall give each panel an identification number, which shall be agreed to and used by the CQA/QC Monitor and the Contractor. The CQA/QC Monitor shall establish a chart showing correspondence between roll numbers and panel numbers. The CQA/QC Monitor shall record the panel number on the Geosynthetic Clay Liner Panel Deployment Log. During panel placement, the CQA/QC Monitor shall:

1. Observe the GCL as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.). Verify that all repairs are made in accordance with the Specifications.
2. Observe that equipment used does not travel on or damage the GCL by handling, trafficking, or by other means.
3. Observe that people working on the GCL do not smoke, wear shoes that could damage the GCL, or engage in any activities that could damage the GCL.
4. Observe that the GCL is anchored to prevent movement by the wind (the Contractor is responsible for any damage resulting to or from wind blown geosynthetics).
5. Observe there are no rocks, construction debris, or other items beneath the GCL which could cause damage and verify that the surface beneath the GCL has not deteriorated since previous acceptance.
6. Observe that the GCL is not dragged across the ground surface. If the GCL is dragged across the ground surface, it shall be inspected for damage and entrapped deleterious materials and repaired or rejected, if necessary.
7. Record weather conditions including temperature, approximate as wind, and humidity. Information shall be recorded at appropriate intervals throughout the day. The GCL shall not be deployed in the presence of moisture (fog, dew, mist, rain, etc.).

The CQA/QC Monitor shall inform the CQA/QC Officer and the Company if the above conditions are not met.

5.4.3 Field Seaming and Repairs

During GCL placement, the CQA/QC Monitor shall verify that the Contractor performs the

following activities for the GCL:

1. The seams are overlapped in accordance with the Drawings and Specifications.
2. Bentonite is spread along the seam in accordance with the manufacturer's recommendations, Drawings, and Specifications.

The CQA/QC Monitor shall observe the placement and seaming activities for the GCL and document all areas that require repair prior to placement of the overlying materials. All repairs are to be performed by the Contractor in accordance with the manufacturer's recommendations, the Drawings, and Specifications.

5.5 GCL Acceptance

The Contractor shall be responsible for maintaining the GCL (or portions thereof) until final acceptance by the CQA/QC Monitor. The CQA/QC Monitor shall recommend final acceptance when all seaming is complete, the Contractor has supplied all documentation, and all laboratory testing is complete and satisfactory. Prior to final acceptance, the Contractor, CQA/QC Monitor, and the Company (if necessary) shall review the installation of the GCL (or portions thereof) for completeness. Any areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA/QC Monitor for correction by the Contractor. When all repairs have been completed, the CQA/QC Monitor shall release the GCL (or portions thereof) for installation of overlying materials.

The Contractor shall retain ownership of the GCL liner throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

6.0 GEOMEMBRANE CQA/QC

6.1 General

This section sets forth the requirements for the CQA/QC testing and observation requirements for installing the geomembrane materials detailed on the Drawings and Specifications. This work includes the manufacturer's QC testing, conformance testing, shipping and handling, deployment, seaming, repairs, and non-destructive and destructive testing of the geomembrane liner. The Contractor shall furnish submittals in compliance with this Plan and conditions of warranty prior to construction for review by the CQA/QC Officer and CQA/QC Monitor.

6.2 Shipping and Handling

The Contractor shall provide a copy of the QC certificates for production of each geomembrane roll manufactured for this project prior to construction for review by the CQA/QC Monitor and CQA/QC Officer. The certificate of compliance for the geomembrane must be received prior to installation as required by the Specifications. Materials shall be delivered to the site only after

the CQA/QC Consultant receives and approves the required submittals.

The Contractor is responsible for the transportation, off-loading, and storage of the geomembrane. The materials shall be packaged and shipped by appropriate means so that no damage is caused and shall be delivered to the site only after the CQA/QC Monitor receives and approves the required submittals. Off-loading shall be performed in the presence of the CQA/QC Monitor and any damage during off-loading shall be documented by him. The CQA/QC Monitor shall keep a log of all geomembrane delivered to the site on the appropriate form for review by the CQA/QC Officer.

Damaged materials shall be separated from undamaged materials until the CQA/QC Monitor and CQA/QC Officer determine proper disposition of the material. Final authority on the determination of damage shall be the CQA/QC Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the Company.

6.3 Geomembrane Conformance Testing

After delivery or at the point of manufacture, the CQA/QC Monitor shall obtain one geomembrane sample per 100,000 square feet delivered for conformance testing. The CQA/QC Monitor shall identify the roll numbers of the geomembrane, which are tested for conformance on the log of geomembrane received form. The samples shall be delivered to the third party geosynthetics laboratory to determine that the geomembrane properties conform to the requirements given in the Specifications. The CQA/QC Monitor shall review all test results and report any non-conformance test results to the Contractor and the CQA/QC Officer. Third party geosynthetics testing shall be performed by a qualified laboratory. Results of all geomembrane conformance testing shall be provided to the regulating agency within 2 days of receiving test results.

The CQA/QC Monitor shall collect samples for conformance testing across the entire width of the roll. This conformance sample shall not include the first 3 feet of the roll.

The conformance samples shall be three feet wide by the roll width in length. The CQA/QC Monitor shall mark on each roll the manufacturer's name, product identification, lot number, roll number, and roll dimensions. The Contractor shall provide the personnel and equipment to obtain the sample in the presence of the CQA/QC Monitor. No material shall be deployed until the CQA/QC Monitor receives passing conformance values and approves the liner for installation.

The conformance testing shall include the following parameters:

1. Thickness (ASTM D-5994);
2. Sheet Density (ASTM D-792 or ASTM D-1505);

3. Tensile Properties (ASTM D-6693);
4. Carbon Black (ASTM D-1603);
5. Carbon Dispersion (ASTM D-5596);
6. Asperity Height (ASTM D-7466); and
7. Interface Shear (ASTM D-6243) GCL vs. geomembrane and geomembrane vs. geocomposite interfaces shall be tested in accordance with the specifications.

6.4 Geomembrane Placement

Prior to placing the geomembrane panels, the Contractor and CQA/QC Monitor shall observe and verify that the GCL or clay liner has been properly placed and accepted. Once the GCL or clay liner has been approved, deployment of the geomembrane may begin. The Contractor's QC Technician shall give each panel an identification number that shall be used by all parties. The CQA/QC Monitor shall record the placement of each panel on a geomembrane panel deployment log form to be reviewed by the CQA/QC Officer. The CQA/QC Monitor shall observe that the Contractor has provided sufficient slack in the geomembrane to allow for contraction due to cold temperatures. The CQA/QC Monitor shall record the ambient temperatures during seaming operations. As the geomembrane panels are deployed in the field, the CQA/QC Monitor shall observe and verify the following:

1. That the GCL or clay liner has not deteriorated between acceptance and geomembrane panel placement.
2. That the equipment used to transport and deploy the geomembrane does not damage it, the GCL, or clay liner.
3. That there are no significant defects present in the sheet. Small defects shall be marked, along with the type of repair required (extrudate, patch, etc.).
4. That the sheet is not deployed under adverse weather conditions such as fog, rain, or high winds.
5. That the equipment and deployment methods do not cause excessive wrinkling of the geomembrane and that the sheet is not dragged along a rough surface. If the liner is dragged, the CQA/QC Monitor shall inspect the underside of the material for damage.
6. That personnel do not engage in activities that could damage the geomembrane.
7. That the Contractor's QC personnel properly record identification information including roll number, panel number, seam number, date, etc.

The CQA/QC Monitor shall record all of the above information in daily reports and log sheets and shall inform all parties of any deviations.

6.5 Geomembrane Test Welds

The Contractor shall conduct field test welds on pieces of scrap liner prior to production welding. The CQA/QC Monitor shall verify that the Contractor conducts test welds in accordance with the Specifications.

The CQA/QC Monitor shall record the shear and peel test results for the test weld coupons on a geomembrane start-up trial weld log form. The Contractor shall not begin welding of field seams unless the CQA/QC Monitor has verified that the trial welds are acceptable. Once a welding technician has been approved on a specific welding apparatus, he may not change machines without first passing a test weld on the new equipment.

6.6 Seaming of the Geomembrane

The CQA/QC Monitor shall verify that the geomembrane is seamed between the ambient temperatures described within the Specifications. The CQA/QC Monitor shall measure and record the temperature in accordance with the Specifications.

The CQA/QC Monitor shall verify that the geomembrane is not being deployed during precipitation, in the presence of excessive moisture, in areas of ponded water, or in the presence of excessive winds.

The Contractor's QC Technician and the CQA/QC Monitor shall verify that geomembrane seams are oriented parallel to the maximum slope direction and that a seam numbering system compatible with the panel numbering system is used. The CQA/QC Monitor shall verify that the Contractor has taken the following steps prior to seaming the geomembrane:

1. That the liner surface has been cleaned of all foreign material including dirt, dust, debris, moisture, or oil.
2. That grinding has been performed to remove the oxidation (extrusion welds only).
3. That all areas where the sheet thickness has been thinned below the specified value from grinding are patched by the Contractor.
4. That any bead grooves are covered with single extrudate.
5. That wrinkles and fishmouths are cut out and the edges overlapped properly.
6. That all seaming takes place over a firm, dry surface.
7. That when the ambient temperature is below the prescribed temperature, a hot air device is used for preheating in front of the welder.
8. That the approved type and quantity of welding devices are used on the job.
9. That extrusion welders are purged of heat degraded material prior to use.
10. That for cross or tee seams, the edge of the seam is ground to a smooth incline.

11. That the seam numbering system and welding procedures agreed upon at the preconstruction meeting are strictly followed.

The CQA/QC Monitor shall record the above information in his daily reports along with panel placement and seaming log forms to be reviewed by the CQA/QC Officer.

6.7 Extrusion Welding

For extrusion welding, the CQA/QC Monitor shall observe that the welding devices are purged of heat-degraded extrudate as described in the Specifications. All purged extrudate shall be disposed of off the liner. Each extruder shoe shall be inspected daily for wear to assure that its offset is equal to the liner thickness. All worn or damaged shoes or other parts shall be repaired. The CQA/QC Monitor shall verify that no equipment is allowed to begin welding until the test weld, made by that equipment, passes the weld test. All test weld results shall be reviewed and recorded by the CQA/QC Monitor.

6.8 Hot Wedge (Fusion) Welding

For hot wedge (fusion) welding, the CQA/QC Monitor shall verify that the welding devices are automated, vehicular mounted, and equipped with gauges giving applicable speed, temperatures, and pressures. The speed, temperature, and pressure of the welding device should be determined during the test welding conducted prior to seaming of the panels. If welding cross seams, field test welds shall be conducted at least every 2 hours or as described in the Specifications.

6.9 Nondestructive Testing of Geomembrane Seams

Prior to the start of construction, the Contractor shall submit to the CQA/QC Officer for approval as per the specifications a procedure for nondestructive testing of all field seams. When the seaming and testing begin in the field, the CQA/QC Monitor shall record the results of the geomembrane QC conducted by the Contractor on a geomembrane installer's field QC log form.

6.10 Vacuum Box Testing

For nondestructive seam testing, all extrusion welded field seams shall be tested over their full length using vacuum box test units. The vacuum testing shall be performed by the Contractor's QC Technician under the observation of the CQA/QC Monitor. The CQA/QC Monitor does not need to observe each vacuum box test, but shall check periodically on the methods and equipment used and record all results. The CQA/QC Monitor shall verify that the tests are conducted concurrently with the field seaming and that the vacuum box assembly consists of a rigid box with a transparent viewing window and a vacuum gauge. The CQA/QC Monitor shall verify that the Contractor's procedure for vacuum testing is as follows:

1. Clean window, gasket surfaces, and check box for leaks.
2. Energize vacuum pump and set to the proper pressure as required by the Specifications.
3. Place soapy solution on section of seam to be tested.
4. Place box over wetted area and press down.
5. Close bleed valve, open vacuum valve, and ensure that a leak tight seal is created.
6. Examine the length of weld through the viewing window for bubbles for the period described in the Specifications.
7. If no bubbles appear, the vacuum valve should be closed, the bleed valve opened, and the box should be moved to the next adjoining area with the specified overlap.
8. Areas where soap bubbles are detected shall be marked, repaired, and retested.

6.11 Air Pressure Testing

If the double hot wedge seaming system is employed, air pressure testing shall be used. The CQA/QC Monitor shall observe that air pressure testing is conducted by the Contractor as follows:

1. Seal both ends of the seam to be tested.
2. Insert a hollow needle or other approved pressure feed device into the tunnel created by the double hot wedge and insert a protective cushion between the air pump and geomembrane.
3. Energize the air pump to the pressure specified, close the valve, and sustain the pressure for the specified time period.
4. Check the entire seam being tested for indications that it has been fully pressurized. This shall be accomplished by opening the air channel at the opposite end of the seam and observing a loss of pressure.
5. If a loss of pressure exceeds the specified value or does not stabilize, locate the faulty area and repair.
6. Remove the approved pressure feed device and seal.

At a minimum the opening of the air channel of each seam shall be observed by the CQA/QC Monitor. Should a loss of pressure be detected along a seam, the faulty area shall be identified, repaired, and re-tested as provided within the Specifications.

If blockage occurs along the seam, the area shall also be identified, repaired and re-tested. The Contractor shall be responsible for all costs associated with the seam repair. The results of both vacuum box and air pressure testing shall be recorded on the seam and panel QC form by the CQA/QC Monitor for review by the CQA/QC Officer.

6.12 Destructive Testing of Geomembrane Seams

The CQA/QC Monitor shall determine the location of all destructive tests. The CQA/QC Monitor shall obtain a minimum of one sample per 500 feet of seam. The Contractor shall repair any suspicious looking welds before release of a seam for destructive sampling. Destructive samples shall be cut by the Contractor as the installation progresses and not at the completion of the project. The Contractor's QC Technician shall mark all destructive samples with consecutive numbers along with the seam number. The CQA/QC Monitor shall keep a log with the date, time, location, seaming technician, apparatus, temperature, and pass or fail criteria. The CQA/QC Monitor shall verify that all destructive sample holes are repaired immediately by the Contractor.

The Contractor's QC Technician shall cut destructive samples at locations selected by the CQA/QC Monitor. The CQA/QC Monitor shall:

1. Mark each sample with the seam number, and the adjoining panel numbers.
2. Record the sample location on the geomembrane panel deployment log form and the geomembrane field seaming log form.
3. Record the sample location and reason for taking the sample (random sample, poor welding, etc.).

6.13 Repairs to the Geomembrane

For final seaming inspection, the CQA/QC Monitor and Contractor shall check the seams and surface of the geomembrane for defects, holes, blisters, undispersed raw materials, or signs of contamination by foreign matter. If dirt inhibits inspections, the Contractor shall brush, blow, or wash the geomembrane surface as required. The CQA/QC Monitor shall decide if cleaning the geomembrane surface and welds is needed to facilitate inspection. Repair areas shall be distinctively marked with a description of the required type of repair.

The CQA/QC Monitor shall verify that all identified holes, tears, blisters, undispersed raw materials, and contamination by foreign matter are patched. The CQA/QC Monitor shall verify that patches are not cut with the repair sheet in contact with the geomembrane and that the patches are extrusion welded to the geomembrane and then vacuum tested. The result of the vacuum test for the repair shall be marked by the Contractor's QC Technician with the date of the test and name of the tester on the sheet. Holes less than a quarter of an inch may be sealed with extrudate as described in the Specifications. The CQA/QC Monitor shall record all repair areas on the repair log form.

6.14 Geomembrane Final Walk-through

The Contractor shall be responsible for maintaining the geomembrane (or portions thereof) until final acceptance by the CQA/QC Monitor. The CQA/QC Monitor shall recommend final

acceptance when all seams have passed destructive testing, the Contractor has supplied all documentation, and all field and laboratory testing is complete and satisfactory. Prior to final acceptance, the Contractor, CQA/QC Officer, CQA/QC Monitor, and the Company shall review the installation of the geomembrane (or portions thereof) for completeness. Any areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA/QC Monitor for correction by the Contractor. When all repairs have been completed, the CQA/QC Monitor shall release the geomembrane (or portions thereof) for installation of overlying materials.

The contractor shall retain ownership of the liner throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

7.0 GEOCOMPOSITE CQA/QC

7.1 General

This section sets forth the requirements for the CQA/QC testing and observation requirements for installing the geocomposite detailed on the Drawings and Specifications. Geocomposite may be used as an option to the separate product geonet and geotextile drainage layer. The Contractor shall furnish submittals in compliance with this manual and conditions of warranty prior to construction for review by the CQA/QC Officer and CQA/QC Monitor. He shall also prepare and submit a time schedule for installation, including complete testing and acceptance of materials prior to construction.

7.2 Geocomposite Shipping and Handling

The Contractor shall provide a copy of the certificate of compliance and the QC certificates for production of each geocomposite roll manufactured for this project prior to construction for review by the CQA/QC Monitor and CQA/QC Officer. Materials shall be delivered to the site only after the CQA/QC Consultant or the Company receives, reviews, and approves the required submittals.

The CQA/QC Monitor shall ensure that the materials were packaged and shipped by appropriate means so that no damage was caused to the materials delivered to the site. Off-loading shall be done in the presence of the CQA/QC Monitor and any damage during off-loading shall be documented by the CQA/QC Monitor and the Contractor. The CQA/QC Monitor shall keep a log of all geocomposite delivered to the site on a geocomposite receiving log form.

Damaged materials shall be separated from undamaged materials until the CQA/QC Monitor determines proper disposition of material. Final authority on the determination of damage shall be the CQA/QC Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the Company.

The geocomposite shall be stored on a prepared surface approved by the CQA/QC Monitor and shall be protected from puncture, precipitation, dirt, grease, water, mechanical abrasions, excessive heat, ultraviolet light exposure or other damage. The CQA/QC Monitor shall observe that the Contractor uses appropriate handling equipment to load, move or deploy the material to ensure that no damage is caused to the materials during handling of the geocomposite.

7.3 Geocomposite Conformance Testing

After delivery or at point of manufacture, the CQA/QC Monitor shall obtain one geocomposite sample per 100,000 square feet delivered. The CQA/QC Monitor shall identify the roll numbers of the geocomposite that are tested for conformance on the log of geocomposite received form. The samples shall be delivered to the geosynthetics laboratory to determine that the geocomposite properties conform to the requirements given in the Specifications. The CQA/QC Monitor shall review all test results and report any non-conformance test results to the Contractor and the CQA/QC Officer.

The CQA/QC Monitor shall collect samples for conformance testing across the entire width of the roll, but shall not include the first 3 feet of the roll. The conformance samples shall be 3 feet wide by the roll width in length. The CQA/QC Monitor shall mark on each roll the Manufacturer's name, product identification, lot number, roll number, and roll dimensions.

The Contractor shall provide the personnel and equipment to obtain the sample in the presence of the CQA/QC Monitor. The geosynthetics laboratory shall conduct the following conformance tests on the geocomposite:

1. Transmissivity: (ASTM D-4716); and
2. Ply Adhesion: (GRI GC7).

7.4 Geocomposite Installation

The CQA/QC Monitor shall not allow installation of the geocomposite until all conformance testing has been completed and passing results have been obtained. During geocomposite placement, the CQA/QC Monitor shall:

1. Observe the geocomposite as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.);
2. Observe that equipment used does not damage the underlying geomembrane;
3. Observe that people working on the geocomposite do not engage in activities that could damage it;
4. Verify that the geocomposite is anchored to prevent movement by the wind (the Contractor is responsible for any damage resulting to or from wind blown geocomposite);

5. Observe that the seams are overlapped and seamed in accordance with the project Specifications;
6. Observe that the Contractor has repaired any holes or tears in the geocomposite; and
7. During installation, the Contractor and CQA/QC Monitor shall inspect the geocomposite as it is deployed for the presence of foreign materials and needles.

If any needles or other materials which the CQA/QC Monitor feels may be detrimental to the underlying synthetic liner are present within the geotextile component of the geocomposite, the roll shall be rejected and shipped off-site permanently and the Contractor shall replace any rejected material at no additional cost to the Company. The CQA/QC Monitor shall notify the Contractor of any problem areas and observe and inspect the repair. The CQA/QC Monitor shall record all of the above information on log sheets and in daily reports.

7.5 Geocomposite Acceptance

The Contractor shall be responsible for maintaining the geocomposite (or portions thereof) until final acceptance by the CQA/QC Monitor. The CQA/QC Monitor shall recommend final acceptance when all seaming has been completed, the Contractor has supplied all documentation, and all laboratory testing is complete and satisfactory. Prior to final acceptance, the Contractor, CQA/QC Monitor, and the Company (if necessary) shall review the installation of the geocomposite (or portions thereof) for completeness. Any areas that are found to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA/QC Monitor for correction by the Contractor. When all repairs have been completed, the CQA/QC Monitor shall release the geocomposite (or portions thereof) for installation of overlying materials.

The Contractor shall retain ownership of the geocomposite throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

8.0 GEOTEXTILE CQA/QC

8.1 General

This section sets forth the requirements for the CQA/QC testing and observation requirements for installing the geotextile detailed on the Drawings and Specifications. The Contractor shall furnish submittals in compliance with this manual and conditions of warranty prior to construction for review by the CQA/QC Officer and CQA/QC Monitor. The Contractor shall also prepare and submit a time schedule for installation, including complete testing and acceptance of materials prior to construction.

8.2 Geotextile Shipping and Handling

The Contractor shall provide a copy of the certificate of compliance and the QC certificates for

production of each geotextile roll manufactured for this project prior to construction for review by the CQA/QC Monitor and CQA/QC Officer. Materials shall be delivered to the site only after the CQA/QC Consultant or the Company receives, reviews, and approves the required submittals.

The CQA/QC Monitor shall ensure that the materials were packaged and shipped by appropriate means so that no damage was caused to the materials delivered to the site. Off-loading shall be done in the presence of the CQA/QC Monitor and any damage during off-loading shall be documented by the CQA/QC Monitor and the Contractor. The CQA/QC Monitor shall keep a log of all geotextile delivered to the site on a geotextile receiving log form.

Damaged materials shall be separated from undamaged materials until the CQA/QC Monitor determines proper disposition of material. Final authority on the determination of damage shall be the CQA/QC Monitor. The Contractor shall replace damaged or unacceptable material at no cost to the Company.

The geotextile shall be stored on a prepared surface approved by the CQA/QC Monitor and shall be protected from puncture, precipitation, dirt, grease, water, mechanical abrasions, excessive heat, ultraviolet light exposure or other damage. The CQA/QC Monitor shall observe that the Contractor uses appropriate handling equipment to load, move or deploy the material to ensure that no damage is caused to the material during handling of the geotextile.

8.3 Geotextile Conformance Testing

After delivery or at point of manufacture, the CQA/QC Monitor shall obtain one geotextile sample per 100,000 square feet delivered. The CQA/QC Monitor shall identify the roll numbers of the geotextile which are tested for conformance on the log of geotextile received form. The samples shall be delivered to the geosynthetics laboratory to determine that the geotextile properties conform to the requirements given in the Specifications. The CQA/QC Monitor shall review all test results and report any non-conformance test results to the Contractor and the CQA/QC Officer.

The CQA/QC Monitor shall collect samples for conformance testing across the entire width of the roll, but shall not include the first 3 feet of the roll. The conformance samples shall be 3 feet wide by the roll width in length. The CQA/QC Monitor shall mark on each roll the Manufacturer's name, product identification, lot number, roll number, and roll dimensions.

The Contractor shall provide the personnel and equipment to obtain the sample in the presence of the CQA/QC Monitor. The geosynthetics laboratory shall conduct the following conformance test on the geotextile:

1. Grab strength (ASTM D-4632)
2. Mass Per unit area (ASTM D-5261)

3. Permittivity (ASTM D-4491)
4. AOS (ASTM D-4751)
5. Puncture Resistance (ASTM D-4833)
6. Trapezoidal Tear (ASTM D-4533)

8.4 Geotextile Installation

The CQA/QC Monitor shall not allow installation of the geotextile until all conformance testing has been completed and passing results have been obtained. During geotextile placement, the CQA/QC Monitor shall:

1. Observe the geotextile as it is deployed and record all defects and disposition of the defects (panel rejected, patch installed, etc.).
2. Observe that equipment used does not travel on or damage the underlying geomembrane or geonet.
3. Observe that people working on the geotextile do not engage in activities that could damage it.
4. Verify that the geotextile is anchored to prevent movement by the wind (the Contractor is responsible for any damage resulting to or from wind blown geotextile).
5. Observe that the seams are overlapped and seamed in accordance with the project Specifications.
6. Observe that the Contractor has repaired any holes or tears in the geotextile.
7. During installation, the Contractor and CQA/QC Monitor shall inspect the geotextile as it is deployed for the presence of foreign materials and needles.

If any needles or other materials which the CQA/QC Monitor feels may be detrimental to the underlying synthetic liner are present within the geotextile, the roll shall be rejected and shipped off-site permanently and the Contractor shall replace any rejected material at no additional cost to the Company. The CQA/QC Monitor shall notify the Contractor of any problem areas and observe and inspect the repair. The CQA/QC Monitor shall record all of the above information on log sheets and in daily reports.

8.5 Geotextile Acceptance

The Contractor shall be responsible for maintaining the geotextile (or portions thereof) until final acceptance by the CQA/QC Monitor. The CQA/QC Monitor shall recommend final acceptance when all seaming has been completed, the Contractor has supplied all documentation, and all laboratory testing is complete and satisfactory. Prior to final acceptance, the Contractor, CQA/QC Monitor, and the Company (if necessary) shall review the installation of the geotextile (or portions thereof) for completeness. Any areas that are found

to deviate from the intended design, are incomplete, or in need of repair shall be recorded by the CQA/QC Monitor for correction by the Contractor. When all repairs have been completed, the CQA/QC Monitor shall release the geotextile (or portions thereof) for installation of overlying materials.

The Contractor shall retain ownership of the geotextile throughout the installation of overlying materials as defined within his scope of work and until the project is complete.

9.0 WORK DEFICIENCIES

When deficiencies are discovered, the CQA/QC Monitor shall immediately determine the nature and extent of the problem, notify the Contractor of the problem, and complete the required documentation. The CQA/QC Monitor shall notify the Contractor within 1/2 hour of discovering any deficiency or at the earliest time possible. If the deficiency will cause significant construction delays or require substantial rework, the CQA/QC Monitor shall notify the Company and the CQA/QC Officer.

The Contractor shall correct the deficiency to the satisfaction of the CQA/QC Monitor. If the Contractor is unable to correct the problem, the CQA/QC Monitor shall be asked to develop and recommend a solution to the CQA/QC Officer for his approval.

The corrected deficiency shall be retested before the Contractor performs additional work. All retests and the steps taken to correct the problem shall be documented by the CQA/QC Monitor on a field construction inspection report and on construction problem and solution data sheet forms.

10.0 DOCUMENTATION

10.1 Daily Records

At a minimum, daily records shall consist of field notes, a summary of the daily construction activities, associated testing activities, and observation and data sheets. All project records shall be maintained in a well organized project file at the job site and shall be available for review by the CQA/QC Officer, Contractor, the Company, and jurisdictional agencies at all times. The CQA/QC Officer shall review the reports and field notes prepared by the CQA/QC Monitor. Daily reports shall be provided to the regulating agency within 2 working days. The CQA/QC Monitor's daily summary report shall be available to the CQA/QC Officer and the Contractor for review and shall include the following information:

1. Date, project name, and location;
2. Weather data;
3. A description of on-going construction;

4. A summary of test results identified as passing, failing, or in the event of a failed test, retests;
5. Off-site materials received including geosynthetics or drainage materials, plus status of certificates or off-site testing for the materials;
6. A summary of decisions regarding acceptance of the work and/or corrective actions taken; and
7. The signature of the CQA/QC Monitor.

10.2 Observation and Test Data Sheets

The CQA/QC Monitor shall prepare observation and data sheets during all phases of construction of the liner system for review by the CQA/QC Officer. Observation and data sheets for this project may include, but may not be limited to the following:

1. Field Construction Inspection Reports;
2. Nuclear Field Density Data Sheets;
3. Field Density Summary;
4. Soil Laboratory Test Data Sheet (Sieve, Proctor, and Moisture Content);
5. Acceptance of Prepared Liner Subgrade Forms;
6. Log of Geomembrane Received;
7. Log of GCL Received;
8. Log of Geocomposite Received;
9. Log of Geotextile Received;
10. Log of Piping Received;
11. GCL Panel Deployment Log;
12. Geomembrane Field Seaming and Nondestructive Test Log;
13. Geomembrane Panel Deployment Log;
14. Geomembrane Start-up Trial Weld Log;
15. Geomembrane Panel Acceptance Form;
16. Geomembrane Repair Log;
17. Geomembrane Destructive Seam Strength Test Results; and
18. Photograph Log.

Additional observation and data sheets may be required. All entries shall be clear and legible. All documentation should be dated and signed or initialed clearly by the CQA/QC Monitor.

10.3 Weekly Progress Reports

The CQA/QC Monitor shall prepare a weekly progress report summarizing the construction quality assurance activities for the preceding period. The CQA/QC Officer shall review the daily reports and summaries of observation and data sheets in addition to the weekly progress reports. The CQA/QC Officer shall discuss progress and the results of all testing and CQA/QC observation and documentation with the CQA/QC staff to ensure that the construction is of excellent quality. Weekly progress reports shall be provided to the regulating agency within two days of the end of the construction week.

10.4 Design Change Reports

Design and Specification changes may be required during construction. In such cases, procedures outlined in Section 3 shall be followed. Documentation of design changes shall be included in the final report.

10.5 Construction Difficulty Reports

In the event that the Contractor has extreme difficulty in the performance of any specified activities required, a special report shall be prepared to address the problem(s). The Company, the Contractor, CQA/QC Monitor, and CQA/QC Officer and Designer (if needed), shall meet to discuss any problems encountered and to address the solution. If changes to the construction Specifications are required, the CQA/QC Consultant, UDEQ, and the Company shall be notified and approve any changes in writing.

10.6 Final Report

At the completion of the project, the CQA/QC Consultant shall prepare a final construction documentation report suitable for presentation to UDEQ. Copies of all reports and test results prepared by the CQA/QC Monitor shall be submitted to the CQA/QC Officer for review. Copies of all the documents shall be maintained at the CQA/QC Consultant's office. This report shall verify that the work has been performed in compliance with the Drawings and the Specifications. At a minimum this report shall contain:

1. A summary of all construction activities;
2. All test results;
3. All logs, forms, and reports;
4. A description of significant construction problems and the resolution of these problems;
5. A list of changes (if any) from the Drawings and Specifications and the justification for these changes; and

6. A statement signed and sealed by a professional civil engineer registered in the State of Utah verifying that the project was constructed in general accordance with the Drawings and Specifications.

10.7 As-Built Drawings

A set of As-Built, or Record, Drawings shall be prepared by the Contractor during the course of construction as required by the Specifications. The As-Built Drawings shall accurately locate all construction items including the location of piping and the extent of lining and collection system components, etc. This information shall be included into the Final Construction Documentation Report.

APPENDIX A

CQA FORMS

MEETING MINUTES

| | | | |
|--------------------|-------|-----------------|-------|
| PROJECT NAME | _____ | DATE OF MEETING | _____ |
| PROJECT NO. | _____ | PREPARED BY | _____ |
| MEETING NAME _____ | | | |
| ATTENDANCE | NAME | ORGANIZATION | |
| | _____ | _____ | |
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| | _____ | _____ | |
| SUBJECTS | | | |
| | | | |

WEEKLY CONSTRUCTION FIELD REPORT

| | | | |
|--|-----------------------|--------------------------------------|--------------|
| Project Name: | Project No. | Weekly Field Report Sequence Number: | |
| Location of Work: | Client Or Manager | Date Period: | |
| General Contractor: | Liner Contractor: | Project Engineer: | Reviewed By: |
| General Foreman: | Liner Superintendent: | Other: | |
| Source and Description of Fill Material: | Weather: | CQA Technician: | |
| Equipment on site: | | | |

NOTES (Describe construction and CQA completed during the week):

Prepared By:

DAILY CONSTRUCTION FIELD REPORT

| | | | |
|--|-----------------------|-------------------------------------|------------------|
| Project Name: | Project No. | Daily Field Report Sequence Number: | |
| Location of Work: | Client Or Manager | Date: | Day of The Week: |
| General Contractor: | Liner Contractor: | Project Engineer: | |
| General Foreman: | Liner Superintendent: | Other: | |
| Source and Description of Fill Material: | Weather: | CQA Technician: | |
| Equipment on site: | | | |

NOTES (Describe work completed during the day, any problems and their solutions):

Prepared By:

GEOSYNTHETIC RECEIVING AND MANUFACTURING/CONFORMANCE LOG

(one type of material per sheet)

Project Name: _____

Material Type: _____

Project No: _____

Review by: _____

| Receiving Date | Production Date | Shipping Date | Lot Number | Roll Number | Sheet Area (sf) | MQC Received Date | MQC Results (P/F) | CQA Conformance Test Date Ship (or NP if not perform) | Conformance Results (P/F or NA) | Approved for Installation (Y/N) | Storage Location |
|----------------|-----------------|---------------|------------|-------------|-----------------|-------------------|-------------------|---|---------------------------------|---------------------------------|------------------|
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SUBGRADE ACCEPTANCE FORM

Project Name

Location

Installer Name

Area To Be Accepted

I THE UNDERSIGNED, DULY AUTHORIZED REPRESENTATIVE OF THE INSTALLER DO HEREBY ACCEPT THE SUBGRADE SURFACE CONDITION AND SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY AND SUITABILITY IN ACCORDANCE WITH THESE SPECIFICATIONS FROM THIS DATE TO COMPLETION OF THIS INSTALLATION. I DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONDITIONS OR CHARACTER OF THE SUBSURFACE SOIL.

NAME (PRINT) SIGNATURE TITLE DATE

WITNESSED BY GLA Associates:

NAME (PRINT) SIGNATURE TITLE DATE

PANEL DEPLOYMENT LOG

Project Name: _____

Project No.: _____

Material Type: _____

Primary Secondary Other

| Date | Panel No. | Roll No. | Width | Dimensions (LXW) | Area (FT ²) | Location | Remarks |
|------|-----------|----------|-------|------------------|-------------------------|----------|---------|
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TOTAL THIS PAGE _____ SF
CUMULATIVE TOTAL _____ SF

START-UP(TRIAL) WELD LOG

Project Name: _____ Project No.: _____

Material _____ [] Primary [] Secondary [] Other

| Sample | Date | Time (min/pm) | Operator | Machine No. | Extrusion/Fusion | Temp. | Speed | Amb. Temp. | Pass/Fail |
|--------|------|---------------|----------|-------------|------------------|-------|-------|------------|-----------|
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SUBGRADE ACCEPTANCE FORM

Project Name

Location

Installer Name

Area To Be Accepted

I THE UNDERSIGNED, DULY AUTHORIZED REPRESENTATIVE OF THE INSTALLER DO HEREBY ACCEPT THE SUBGRADE SURFACE CONDITION AND SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY AND SUITABILITY IN ACCORDANCE WITH THESE SPECIFICATIONS FROM THIS DATE TO COMPLETION OF THIS INSTALLATION. I DO NOT ACCEPT ANY RESPONSIBILITY FOR THE CONDITIONS OR CHARACTER OF THE SUBSURFACE SOIL.

NAME (PRINT)

SIGNATURE

TITLE

DATE

WITNESSED BY GLA Associates:

NAME (PRINT)

SIGNATURE

TITLE

DATE



GEOMEMBRANE SEAMING LOG

Project Name: _____

Material Type: _____

Project No.: _____

Primary Secondary Other

| WELDING DATA | | | | | | | | | | TEST DATA | | | | | |
|--------------|----------|------------------|-------------------|------------|---------------|---------|-------|-------|-----------|-----------|------------------------|----------------|------------|-------------|-------------|
| Weld Date | Seam No. | Seam Length (ft) | Cumm. Length (ft) | Time am/pm | Operator Name | Machine | | | Amb. Temp | Test Date | Test Type ¹ | Pressure (psi) | Time (min) | Results P/F | CQA Monitor |
| | | | | | | No. | Temp. | Speed | | | | | | | |
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Note 1: AT - Air Test
 ST- Spark Test
 VT - Vacuum Test

| Remarks |
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GOMEMBRANE REPAIR LOG

Project Name: _____

Material Type: _____

Project No.: _____

Primary Secondary Other

| Repair # | Seam/ Panel | Location | Description | REPAIR | | | TEST | | | |
|----------|----------------|----------|-------------|--------|---------|----------|------|-------|---------------|----------------|
| | | | | Date | Equip # | Operator | Date | Type* | Pass/ Fail | COA Monitor |
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*VT - VACUUM TEST
SP - SPARK TEST
AL - AIR LANCE

Geo-Logic ASSOCIATES

BONDED SEAM STRENGTH TEST RESULTS (ASTM D6392)

PROJECT:

GEO-LOGIC JOB NO.:

TESTED BY:

REPORT DATE:

CHECKED BY:

CLIENT JOB NO.:

TABLE I - SHEAR

| SEAM ID | | THICKNESS | | BONDED SEAM STRENGTH (SHEAR) | | |
|------------|----------|-----------|--------------|------------------------------|------------|----------------|
| SAMPLE NO. | SEAM NO. | TOP (mil) | BOTTOM (mil) | LOAD (ppi) | BREAK TYPE | DUCTILE YES/NO |
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TABLE II - PEEL

| SEAM ID | | THICKNESS | | SEAM PEEL ADHESION | | |
|------------|----------|-----------|--------------|--------------------|------------|----------------|
| SAMPLE NO. | SEAM NO. | TOP (mil) | BOTTOM (mil) | LOAD (ppi) | BREAK TYPE | DUCTILE YES/NO |
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Geomembrane Type:

Liner Mfr:

Seaming Method:

Seaming Temp. °F:

Field Seam Date:

Curing Time (if appl)

Tensile Machine Model:

Crosshead Speed:

Grip Surface Texture:

Seaming Apparatus ID:

Grip Dimensions:

Seamer ID:

PROJECT SPECIFICATIONS:

SHEAR _____ pounds/inch (psi)

PEEL _____ pounds/inch (psi)

THICKNESS _____ mils

MASTER SOILS TESTING LOG

Project Name: _____

Project No: _____

Review by: _____

| Sample No. | Date Sampled | Moisture Content microwave, w_m (D4643) | Moisture Content Oven, w_o (D2216) | Atterberg Limits, LL, PI (D4318) | Particle Size (-#200) (D422) | Modified Proctor, DD_{max} , W_{opt} (D1557) | Constant Head Permeability, k (D2434) | Test Results | Notes |
|------------|--------------|---|--------------------------------------|----------------------------------|------------------------------|--|---|--------------|-------|
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MOISTURE CONTENT

Project Name: _____

Project Number: _____

| Test No. | Date | Drying Method | Tare No. | Tare Mass (g) | Tare + Wet Soil Mass (g) | Tare + Dry Soil Mass (g) | Mass of Water (g) | Dry Soil Mass (g) | Water Content (%) | Tested By | Notes |
|----------|------|---------------|----------|---------------|--------------------------|--------------------------|-------------------|-------------------|-------------------|-----------|-------|
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Checked By: _____

SUMMARY OF MOISTURE CONTENT CORRELATION

Project Name: _____

Project No.: _____

Reviewed by: _____

| Nuclear Gauge | | Oven | | Microwave | | Remarks |
|---------------|--------------|----------|--------------|-----------|--------------|---------|
| Test No. | Moisture (%) | Test No. | Moisture (%) | Test No. | Moisture (%) | |
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Project Name: _____
Project No.: _____
Reviewed by: _____

| Test No. | Date | Northing | Easting | Elevation | Sample No | Maximum Dry Density (pcf) | Optimum Moisture Content (%) | Source Depth (in) | Density Count | Moisture Count | Wet Density (pcf) | Moisture Content (%) | Dry Density (pcf) | % Comp | P/F | Notes |
|----------|------|----------|---------|-----------|-----------|---------------------------|------------------------------|-------------------|---------------|----------------|-------------------|----------------------|-------------------|--------|-----|-------|
|----------|------|----------|---------|-----------|-----------|---------------------------|------------------------------|-------------------|---------------|----------------|-------------------|----------------------|-------------------|--------|-----|-------|

Project Name: _____
 Project No.: _____
 Reviewed by: _____

| | | | | | | | | | |
|-------------------------------------|--|--|--|--|--|--|--|--|--|
| Date | | | | | | | | | |
| Test No. | | | | | | | | | |
| Corresponding Nuclear Test No | | | | | | | | | |
| Sand Density (g/cm ³) | | | | | | | | | |
| Volume of Cone (cm ³) | | | | | | | | | |
| Weight of Sand in Cone | | | | | | | | | |
| DENSITY | | | | | | | | | |
| Tare No. | | | | | | | | | |
| Tare Weight (g) | | | | | | | | | |
| Tare + Wet Soil (g) | | | | | | | | | |
| Wet Soil Mass (g): | | | | | | | | | |
| Cone + Sand Initial (g) | | | | | | | | | |
| Cone + Sand Final (g) | | | | | | | | | |
| Sand Used (Gross) (g) | | | | | | | | | |
| Sand Used (Net) (g)* | | | | | | | | | |
| Volume of Hole (cm ³)** | | | | | | | | | |
| Wet Density (pcf)*** | | | | | | | | | |
| WATER CONTENT | | | | | | | | | |
| Tare No. | | | | | | | | | |
| Tare mass (g): | | | | | | | | | |
| Tare + Wet Soil mass (g): | | | | | | | | | |
| Tare + Dry Soil mass (g): | | | | | | | | | |
| Weight of Water (g) | | | | | | | | | |
| Dry Soil mass (g): | | | | | | | | | |
| Water Content (%): | | | | | | | | | |
| Notes | | | | | | | | | |

*Sand Used (Net) = Sand Used (Gross) - Weight of Sand in Cone
 ** Volume of hole = (Sand Used (net) / sand density)
 *** Wet Density = (Wet Soil Mass/Volume of Hole) x 62.4 pcf

CONTROL NO. _____

VECTOR IDENTIFICATION NO. _____

Calibration Procedure No. : **CB- 1.15**

Calibration Date: _____

Next Due Date: _____

Equipment or Standards Used for Calibration:

Scale or Balance No.: _____ Last Calibration Date: _____

Unit Wt. Bucket No.: _____ Last Calibration Date: _____

Unit Wt. Bucket Vol.: (x) _____ cm³

Procedure:

Vector determines the density (mass / vol) of sand used for calibration of Sand Cone Devices and used for determining the volume of holes for ASTM D-1556, by pouring the sand into a calibrated Unit wt. bucket with a known volume.

Calibration:

Detailed calibration procedures can be found in the Calibration Manual. See the referenced CB number.

| Trial No. | Mass of Sand and Bucket, g (a) | Mass of Bucket, g (b) | Mass of Sand, g (a-b) = c | SAND DENSITY g / cm ³ (c / x) |
|-----------|--------------------------------|-----------------------|---------------------------|--|
| 1 | _____ | _____ | _____ | _____ |
| 2 | _____ | _____ | _____ | _____ |
| 3 | _____ | _____ | _____ | _____ |

Test temperature, C: _____ Average = _____ g/cc _____ pcf

Note: The above individual trials shall agree within 1% of the average. Temperature shall be 20° +/- 2° C

Source of Sand: _____ Type of Sand: _____

Date Purchased: _____

Performed By: _____ Date: _____

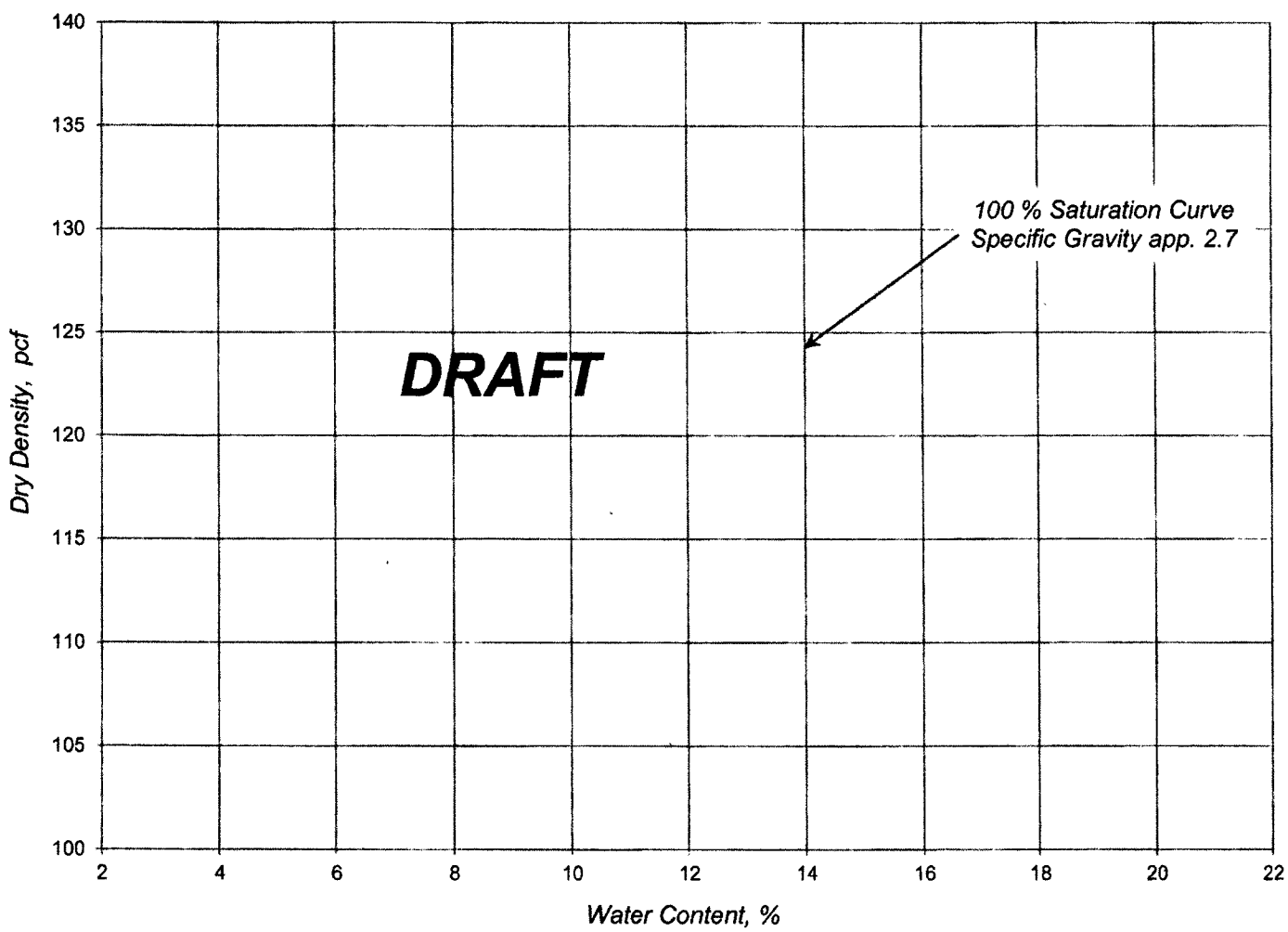
Reviewed By: _____ Date: _____

(1/10 ft. = 2831.7cm³) (1/3 ft. = 9439cm³) (1/2 ft. = 14158cm³)

These results apply only to the above listed samples. The data and information are proprietary and can not be released without authorization of Vector Engineering Inc. By accepting the data and results represented on this page, client agrees to limit the liability of Vector Engineering, Inc from Client and all other parties claims arising out of the use of this data to the cost for the respective test(s) represented here, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit

TEST REPORT ASTM D - 1557

Client: ### Project No. 0.00 Lab Log No. 0
 Project Name: ### Report Date: January 0, 1900



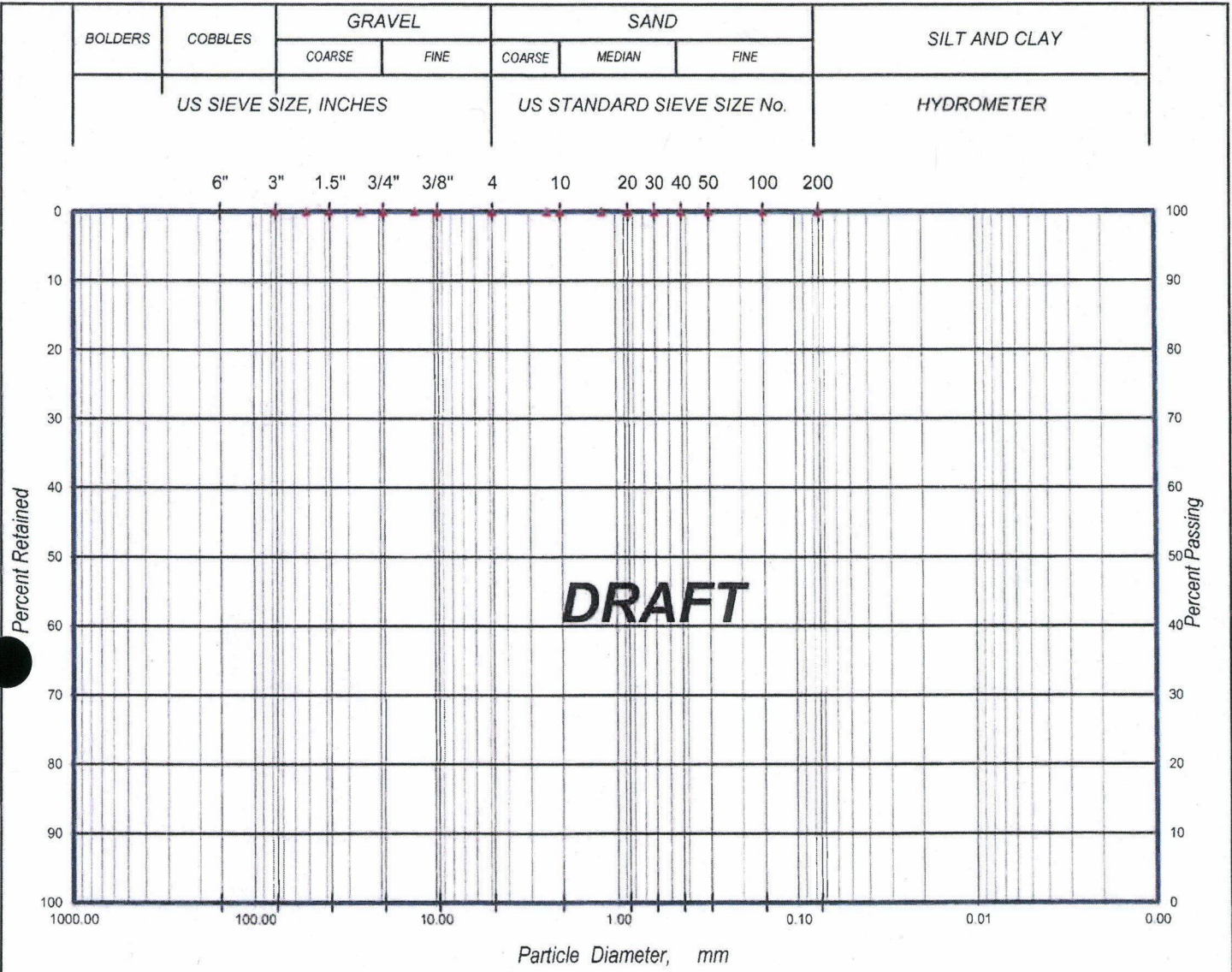
| Symbol | Lab No. | Sample Identification | Description | Maximum Dry Density | | Optimum Water Content % |
|--------|---------|-----------------------|-------------|---------------------|---------------------|-------------------------|
| | | | | pcf | kg / m ³ | |
| ■ | 0 | (Rec'd 2/9/02) | 0 | #VALUE! | #VALUE! | #VALUE! |

Corrected Values For Oversized Particles, per ASTM D-4718
 ■ 0 with 0 Percent + 3/4" Gravel, the maximum Dry Density =

Note: The test was conducted as method A with percent retained on the no. 4 sieve (minus 3/4")

These results apply only to the above listed samples. The data and information are proprietary and can not be released without authorization of Vector Engineering Inc. By accepting the data and results represented on this page, client agrees to limit the liability of Vector Engineering, Inc from Client and all other parties claims arising out of the use of this data to the cost for the respective test(s) represented here, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit

Client: _____ Project No: _____ Lab Sample No: **N/A**
 Project Name: _____ Report Date: _____



| Symbol | Sample ID | Description | % Gravel | % Sand | % Silt - Clay |
|--------|-----------|-------------|----------|--------|---------------|
| ▲ | | | 0.0 | 0.0 | 100.0 |

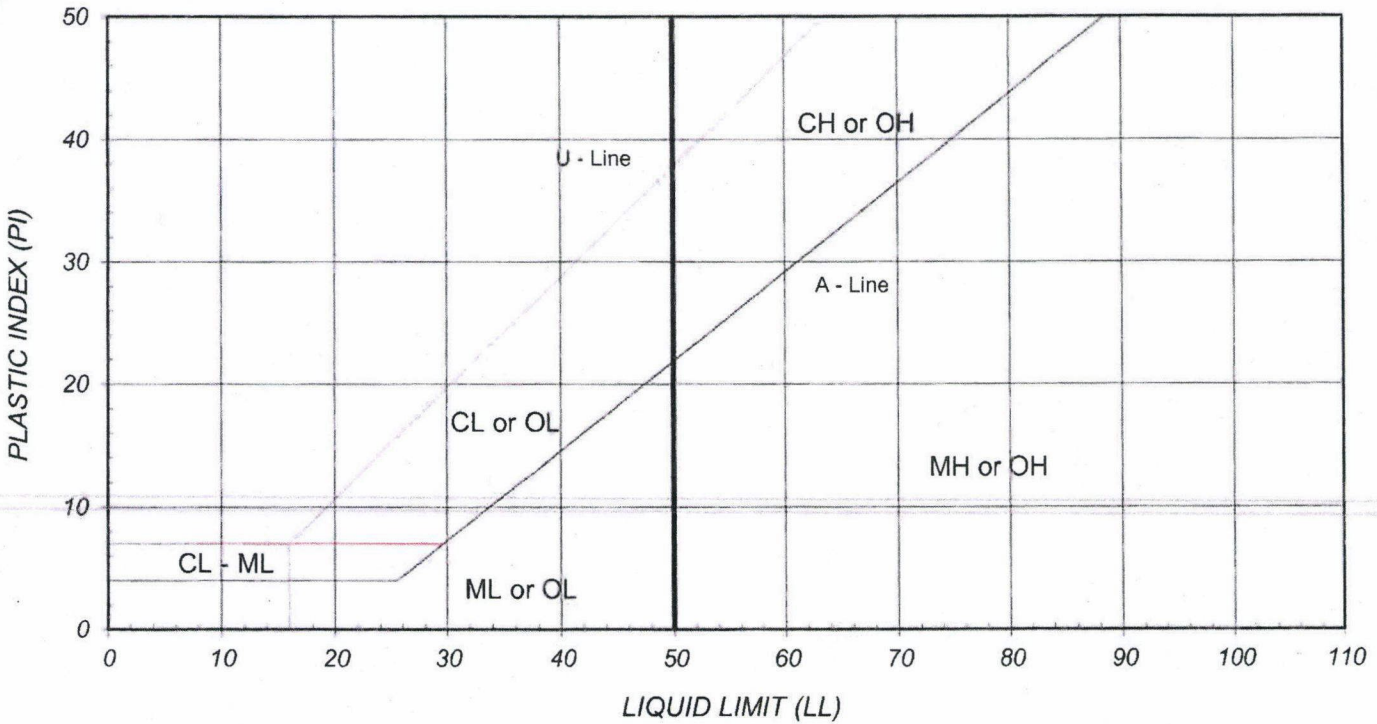
Size Passing, mm $D_{60} =$ N/A $D_{30} =$ N/A $D_{10} =$ N/A
 Coefficient of Curvature, $C_c:$ N/A Coefficient of Uniformity, $C_u:$ N/A Fineness Modulus = 0.00

These results apply only to the above listed samples. The data and information are proprietary and can not be released without authorization of Vector Engineering Inc. By accepting the data and results represented on this page, client agrees to limit the liability of Vector Engineering, Inc. from Client and all other parties claims arising out of the use of this data to the cost for the respective test(s) represented here, and Client agrees to indemnify and hold harmless Vector from and against all liability in excess of the aforementioned limit.

Client: _____ Project No: _____ Lab Log No: _____
Project Name: _____ Report Date: _____

| LSN | SYMBOL | SAMPLE IDENTIFICATION | SAMPLE DESCRIPTION | UNIFIED SYMBOL | LIQUID LIMIT | PLASTIC LIMIT | PLASTIC INDEX |
|--------------------------------------|--------|-----------------------|--------------------|----------------|--------------|---------------|---------------|
| <h1 style="color: green;">DRAFT</h1> | | | | | | | |

PLASTICITY CHART



These results apply only to the above listed samples. The data and information are proprietary and can not be released without authorization of Vector Engineering Inc.

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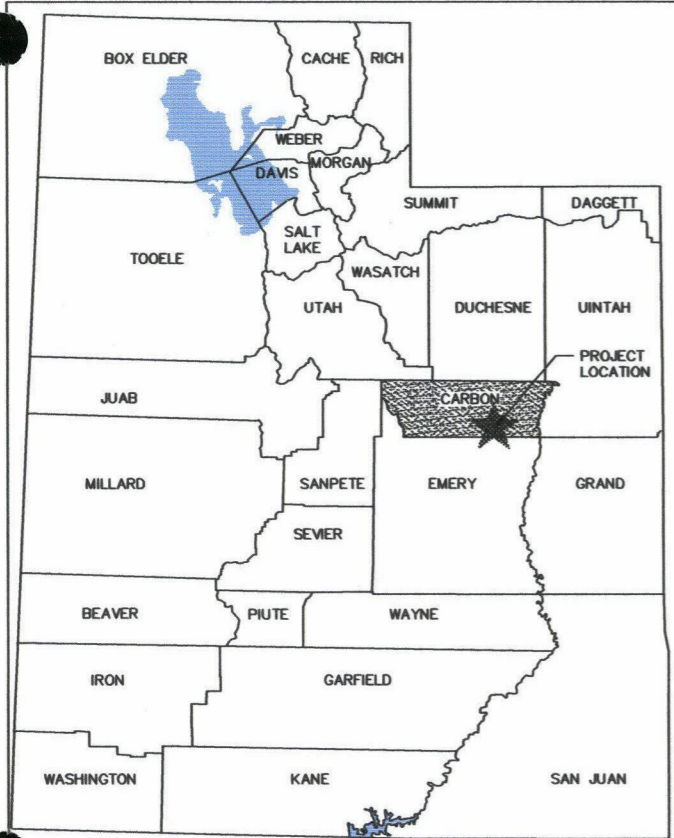
ATTACHMENT 2

REDUCED CONSTRUCTION DRAWINGS

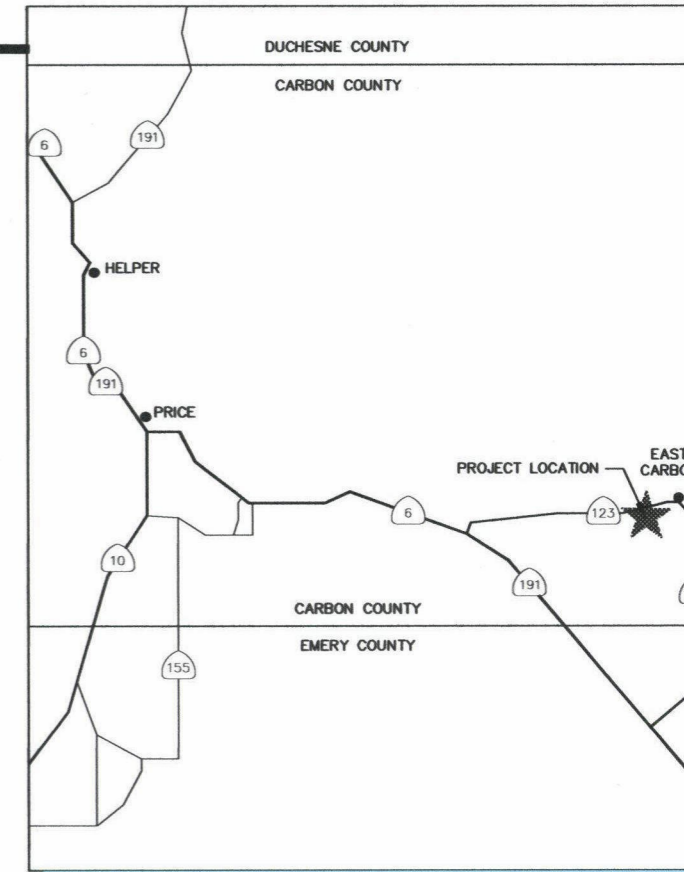
ECDC ENVIRONMENTAL LANDFILL SUPER CELL 2 PHASE 2 DESIGN

PREPARED FOR:

ECDC ENVIRONMENTAL, L.C.



UTAH COUNTIES



REGIONAL MAP

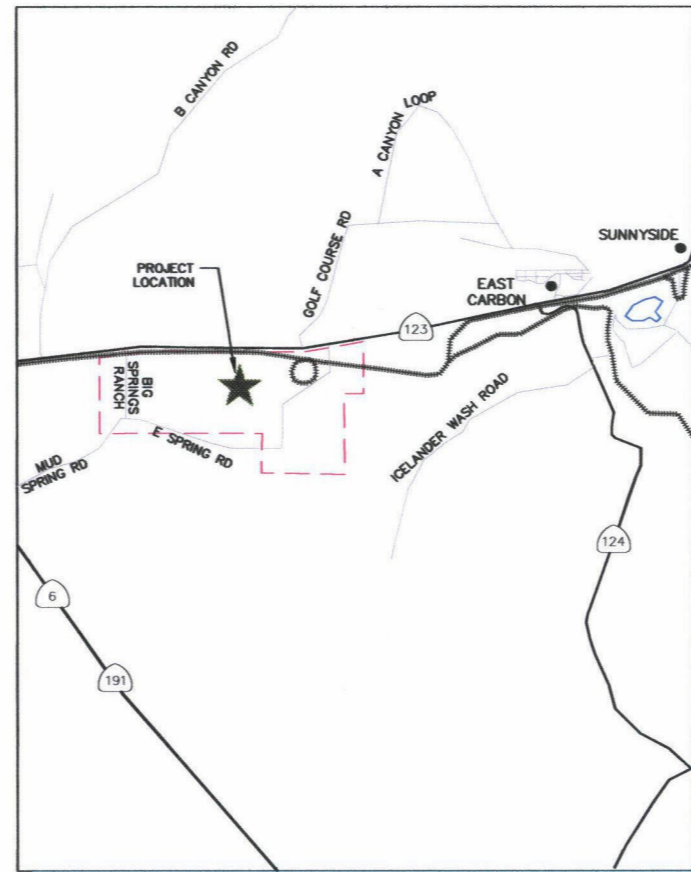
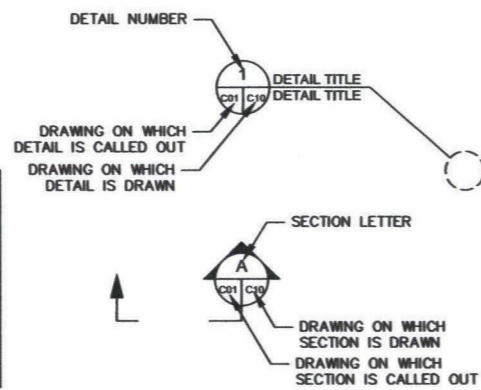
DRAWING INDEX

| DRAWING NUMBER | TITLE AND DESCRIPTION | LATEST REVISION NUMBER | LATEST REVISION DATE |
|----------------|---------------------------------|------------------------|----------------------|
| GENERAL | | | |
| G01 | TITLE PAGE | 0 | 09/04/18 |
| G02 | SITE PLAN & EXISTING CONDITIONS | 0 | 09/04/18 |
| CIVIL | | | |
| C01 | SUBGRADE & LINER PLAN | 0 | 09/04/18 |
| C02 | STOCKPILE PLAN | 0 | 09/04/18 |
| C02-C09 | RESERVED | | |
| C10 | DETAILS | 0 | 09/04/18 |
| C11 | DETAILS | 0 | 09/04/18 |
| C12 | DETAILS | 0 | 09/04/18 |
| C13 | DETAILS | 0 | 09/04/18 |
| C14 | DETAILS | 0 | 09/04/18 |
| C15 | DETAILS | 0 | 09/04/18 |
| C16 | DETAILS | 0 | 09/04/18 |
| C17 | DETAILS | 0 | 09/04/18 |

ABBREVIATIONS

| | | | |
|------|---------------------------|------|--------------|
| DIA | DIAMETER | NTS | NOT TO SCALE |
| FT | FEET | OC | ON CENTER |
| HDPE | HIGH DENSITY POLYETHYLENE | oz | OUNCE |
| MAX | MAXIMUM | PERF | PERFORATED |
| MIN | MINIMUM | % | PERCENT |
| NIC | NOT IN CONTRACT | TYP | TYPICAL |
| NIS | NOT IN SECTION | | |

SYMBOLS

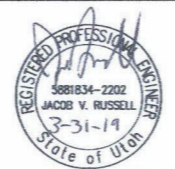


VICINITY MAP

NOTES:
1. PIPE BENDS AND GEOSYNTHETICS ARE SHOWN NTS.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



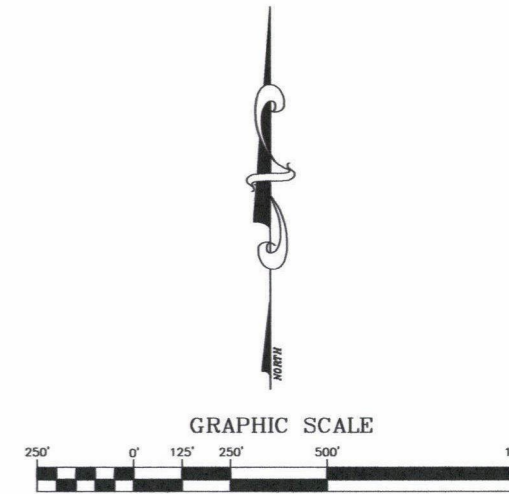
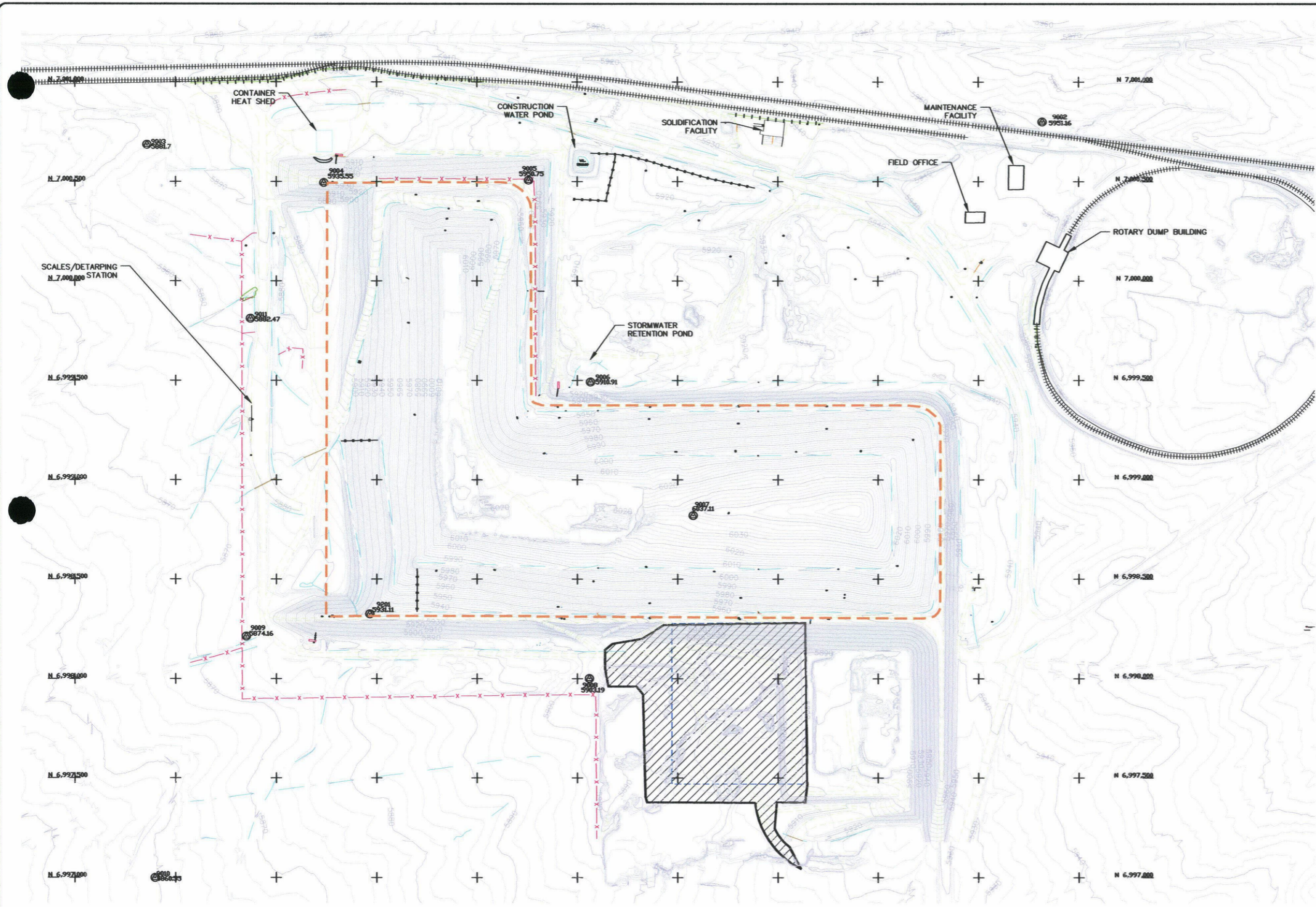
Geo-Logic ASSOCIATES
 143E Spring Hill Dr, Grass Valley, California 95945
 geo-logic.com | 530.272.2448

ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 TITLE PAGE

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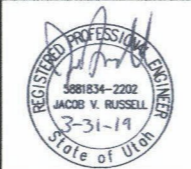
- LEGEND**
- 5000 — EXISTING 10 FT CONTOUR
 - 5000 — EXISTING 2 FT CONTOUR
 - — EXISTING ROAD
 - x-x-x- EXISTING FENCE
 - o-o-o- EXISTING DOWNDRAIN/CULVERT
 - ▨ USED LANDFILL FOOTPRINT
 - ▭ LIMITS OF SUPER CELL PHASE 2 CONSTRUCTION
 - - - - - PROPOSED LINER LIMITS
 - ||||| RAILROAD
 - ⊙ 1009 6037.11 CONTROL POINT



NOTES:
 1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 19, 2015, UPDATED WITH AERIAL SURVEY BY COOPER AERIAL SURVEY CO. ON MARCH 2018.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|------|-------------------------|----------|-------------|------------|-------------|
| 00/04/18 | | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |
| | | | | | | |
| | | | | | | |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



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 geo-logic.com | 530.272.2448

ECDC ENVIRONMENTAL, L.C.

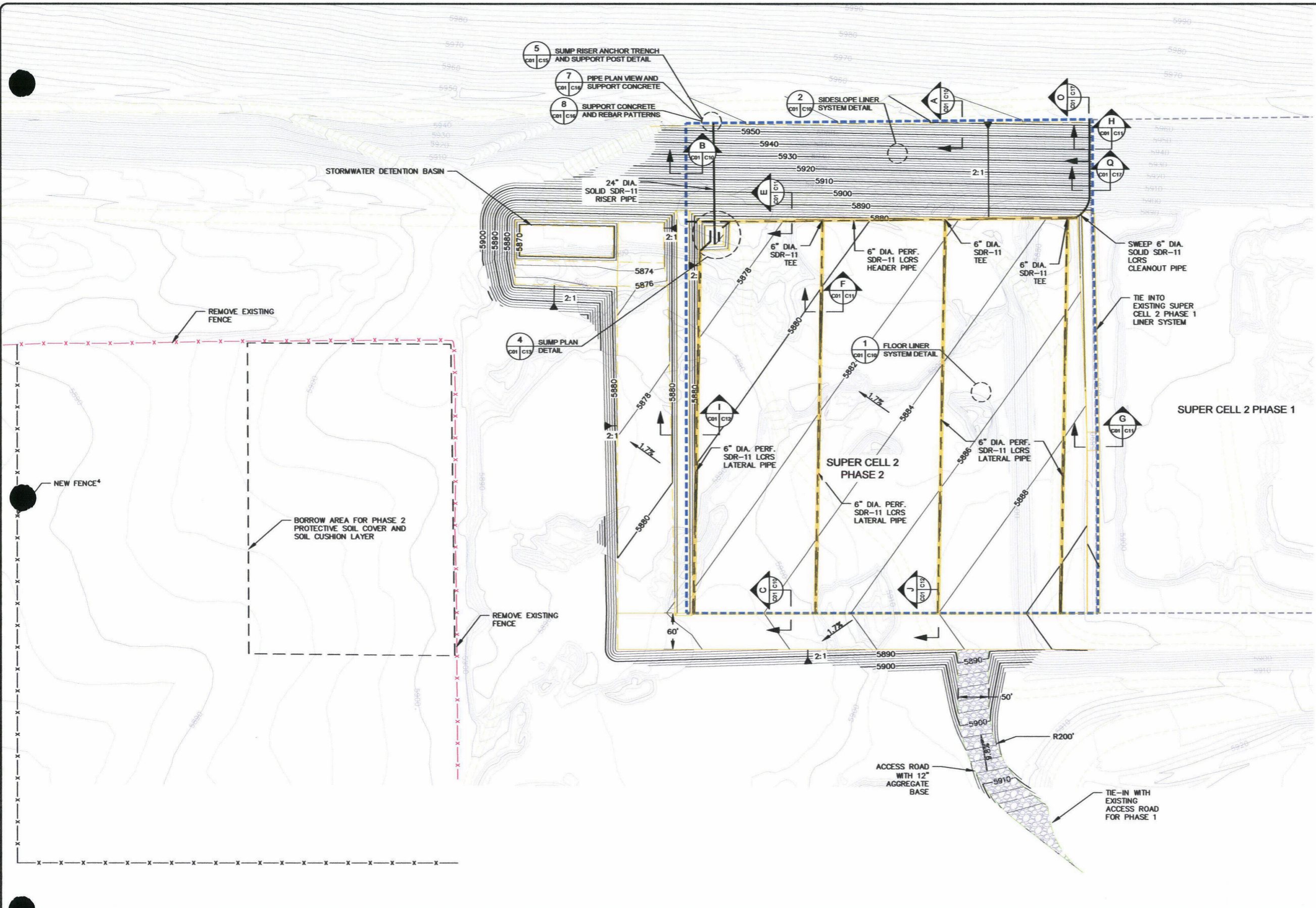
ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 SITE PLAN & EXISTING CONDITIONS

DRAWING NO. GO
 PROJECT NO. AU1810

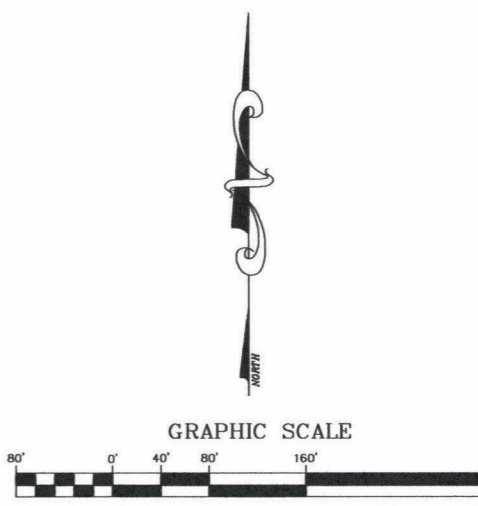
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ISSUED FOR CONSTRUCTION

LOCATION: NA 8000 8016 AUG 16 1084 00 S:\proj\8000\8016\Phase 2\Phase 2\Subgrade & Liner\Subgrade & Liner.dwg DATE: 8/29/2018 3:50 PM PLOT SCALE = 1:8.68489546 PLOTTED BY: STEPHANIE HAMILTON



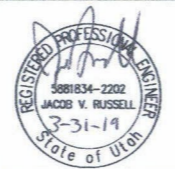
- LEGEND**
- EXISTING MAJOR CONTOUR³
 - EXISTING MINOR CONTOUR³
 - EXISTING PAVED ROAD
 - EXISTING UNPAVED ROAD
 - x-x-x- EXISTING FENCE
 - PROPOSED 10' MAJOR CONTOUR²
 - PROPOSED 2' MINOR CONTOUR²
 - PROPOSED HINGE LINES
 - PROPOSED ROAD
 - - - EXISTING LINER LIMITS
 - - - PROPOSED LINER LIMITS
 - - - PROPOSED LCRS PIPE
 - x-x-x- PROPOSED FENCE
 - - - PROPOSED BORROW AREA



- NOTES:**
1. EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 12, 2018.
 2. DIGITAL SURFACES OF THE GRADING PLANS MAY BE PROVIDED TO CONTRACTOR. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY IRREGULARITIES OR DEVIATIONS BETWEEN THE GRADING PLANS OR CONSTRUCTION COORDINATES AND THE DIGITAL SURFACE, AND SHALL NOTIFY ENGINEER OF THE DEVIATIONS PRIOR TO CONSTRUCTION.
 3. CONTRACTOR SHALL BE AWARE THAT SUPER CELL 2 PHASE 2 MAY BE UNDER EXCAVATION BY OTHERS UP TO THE DATE OF THE START OF THIS CONTRACT. EARTHWORKS QUANTITIES MAY VARY AND SHALL BE VERIFIED BY CONTRACTOR PRIOR TO THE START OF CONSTRUCTION. CONTRACTOR SHALL PROVIDE A BASELINE TOPOGRAPHIC SURVEY MAP PRIOR TO THE START OF CONSTRUCTION.
 4. TYPE A FENCE TO BE SUPPLIED AND INSTALLED PER UTAH DEPARTMENT OF TRANSPORTATION STANDARD DRAWING FG2A. INSTALL LINE BRACE IN THE MIDDLE OF EACH SECTION RUN.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



Geo-Logic ASSOCIATES

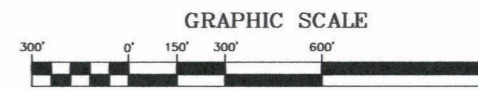
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ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 SUBGRADE & LINER PLAN

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LOCATION: \\A:\EPCO\2018\AU18\1024.00_SuperCell_2_Phase_2\Drawings\ENV\SuperCell_2_Phase_2\Stockpile_Plan.dwg DATE: 8/19/2018 5:45 PM PLOT SCALE = 1:8.66489546 PLOTTED BY: STEPHANIE HAMILTON



| LEGEND | |
|--------|-------------------------------------|
| | EXISTING MAJOR CONTOUR ¹ |
| | EXISTING MINOR CONTOUR ¹ |
| | EXISTING PAVED ROAD |
| | EXISTING UNPAVED ROAD |
| | EXISTING FENCE |

- NOTES:
- EXISTING TOPOGRAPHY BASED ON AERIAL SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 12, 2018 FOR THE NORTH AREA (AREA OF SUPER CELL 2); TOPOGRAPHY BASED ON A SURVEY BY COOPER AERIAL SURVEYS CO. ON MARCH 19, 2018 FOR THE SOUTHERN AREA (CELL 10B AREA).
 - CONTRACTOR WILL BE PROVIDED WITH ELECTRONIC FILES INCLUDING 2-FT CONTOURS AND 3D BREAKLINES FOR REFERENCE.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|------|-------------------------|----------|-------------|------------|-------------|
| 09/04/18 | | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



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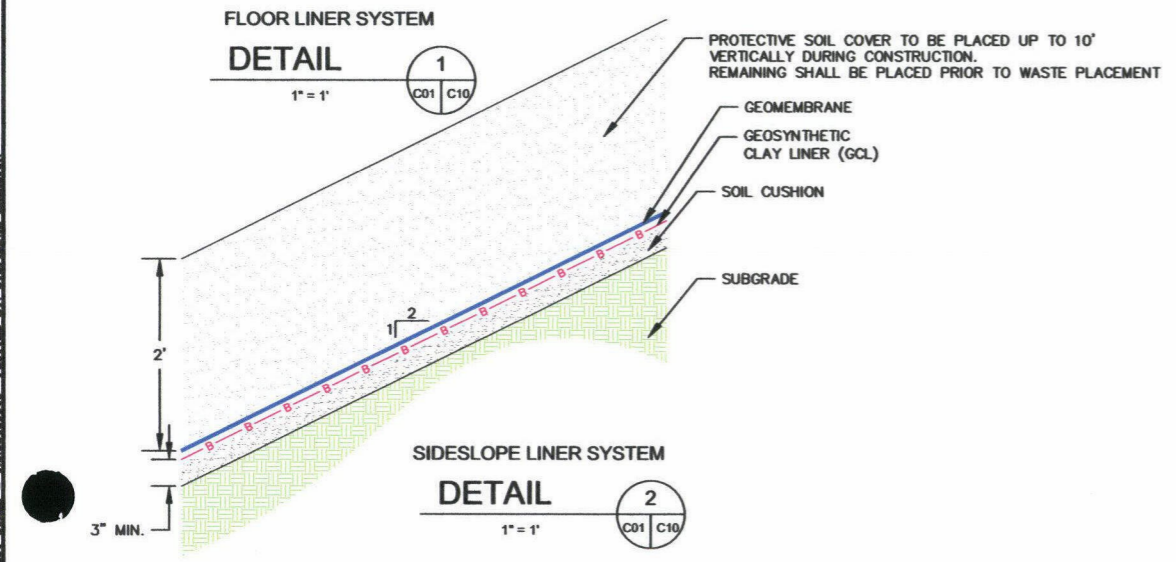
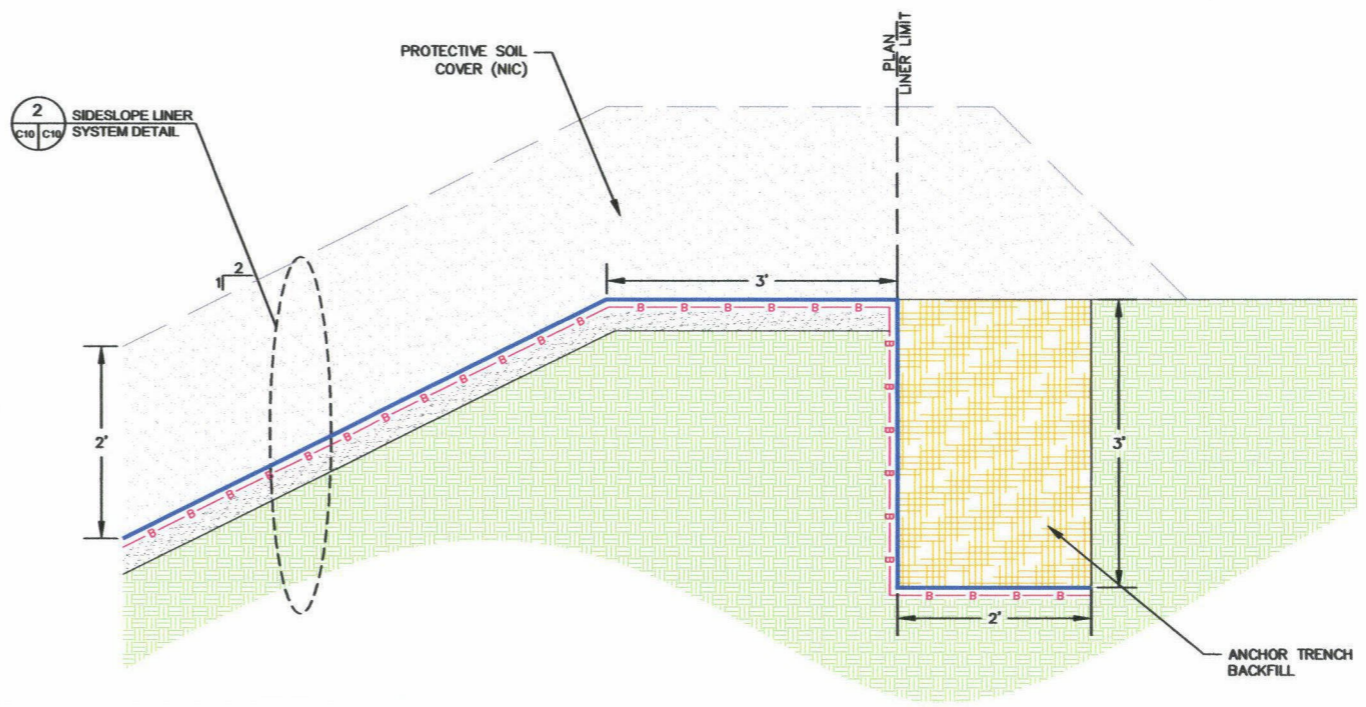
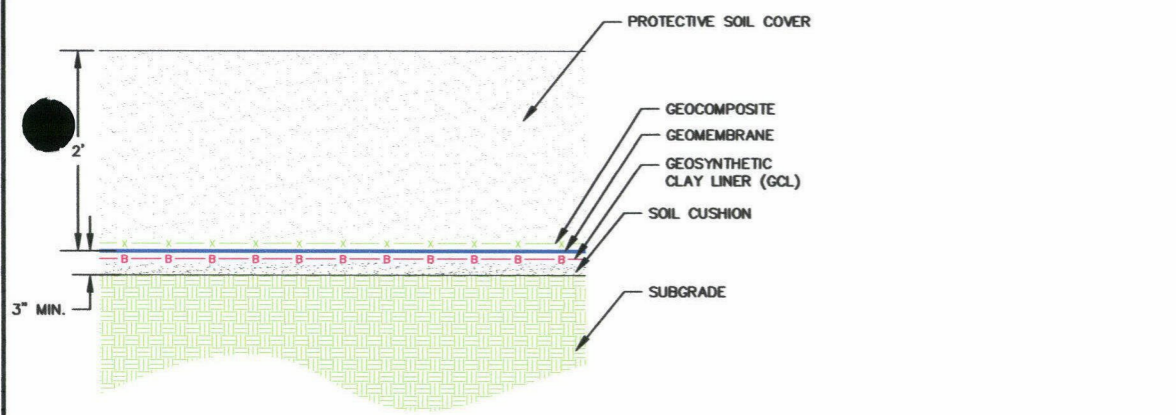
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 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 STOCKPILE PLAN

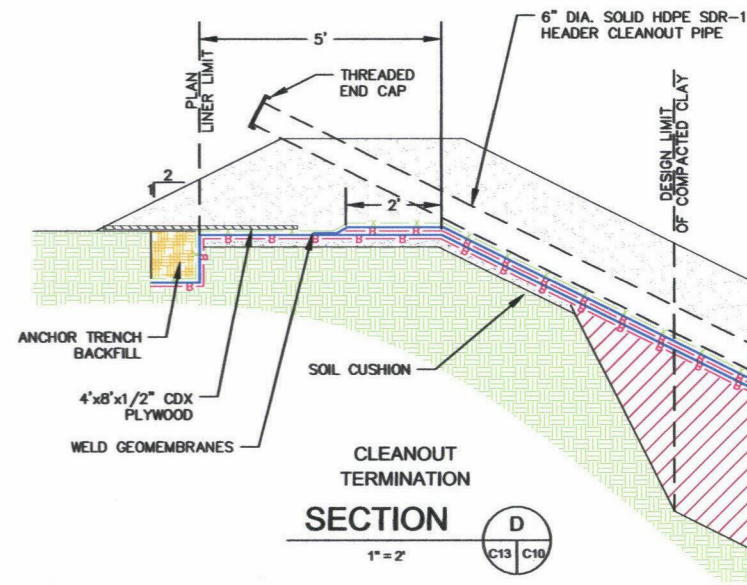
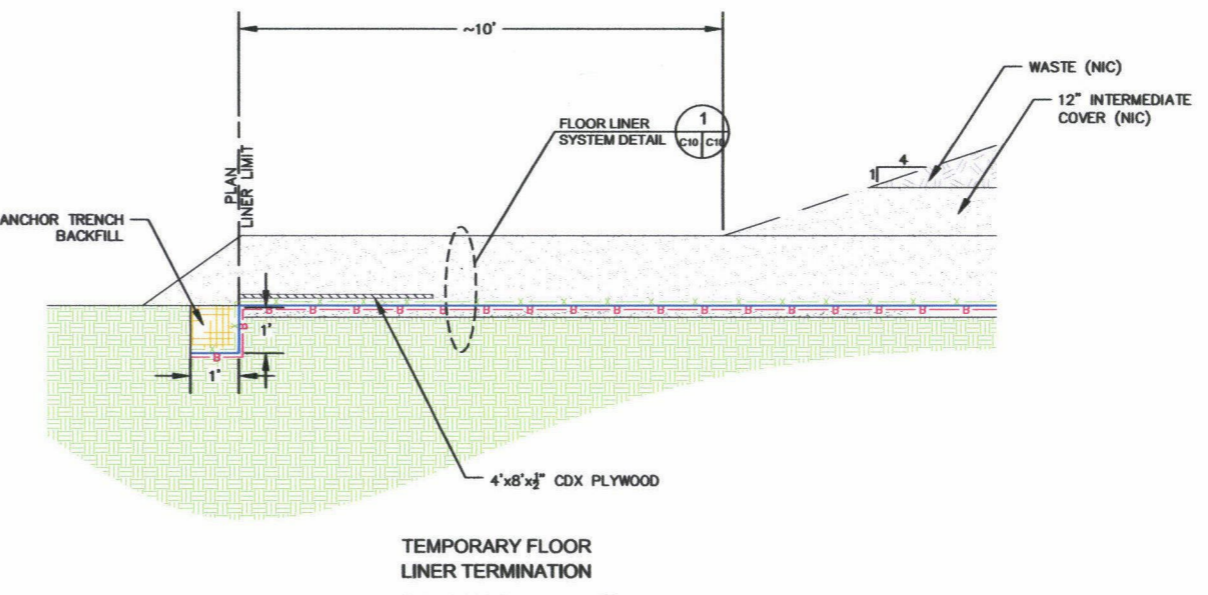
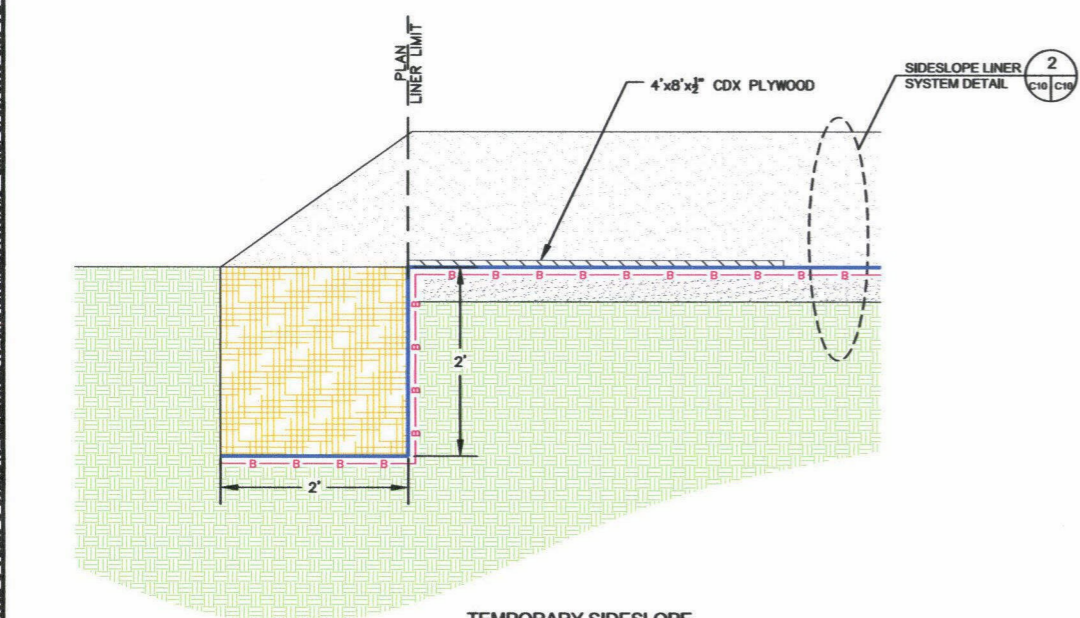
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LOCATION: NA 8250 8016 AU16.1064.00 SuperCell 2 Phase 2 Design & Construction C10.dwg DATE: 8/29/2018 3:51 PM PLOT SCALE = 1:2.56499546 PLOTTED BY: STEPHANIE HAMILTON

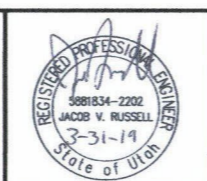


PERMANENT LINER TERMINATION SECTION A
1" = 1"



| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



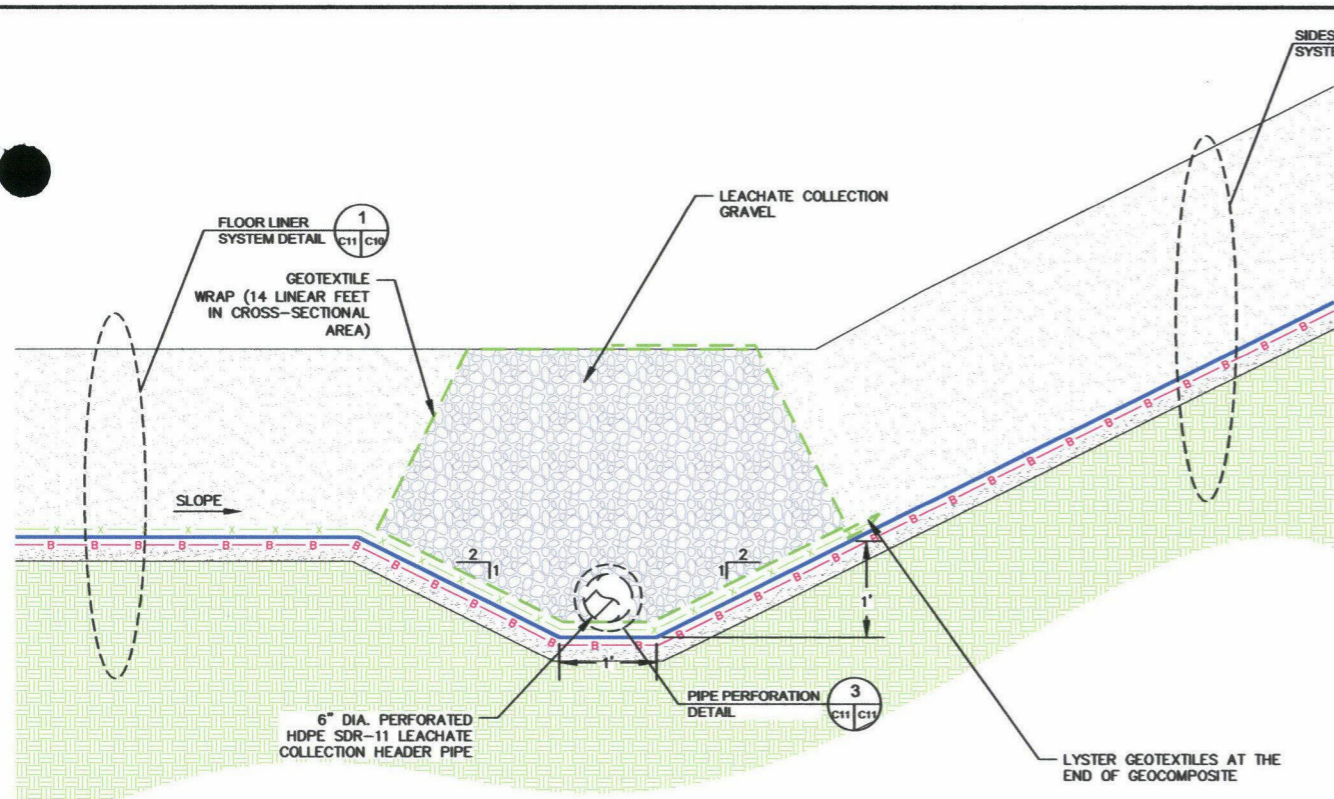
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ECDC ENVIRONMENTAL, L.C.

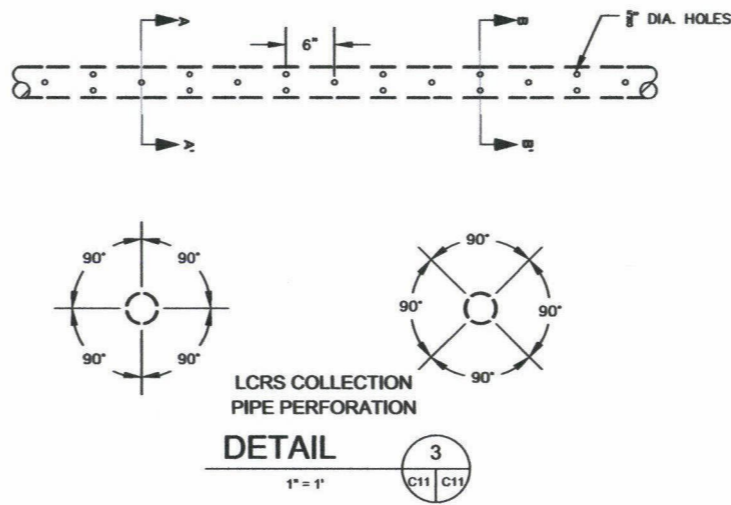
ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

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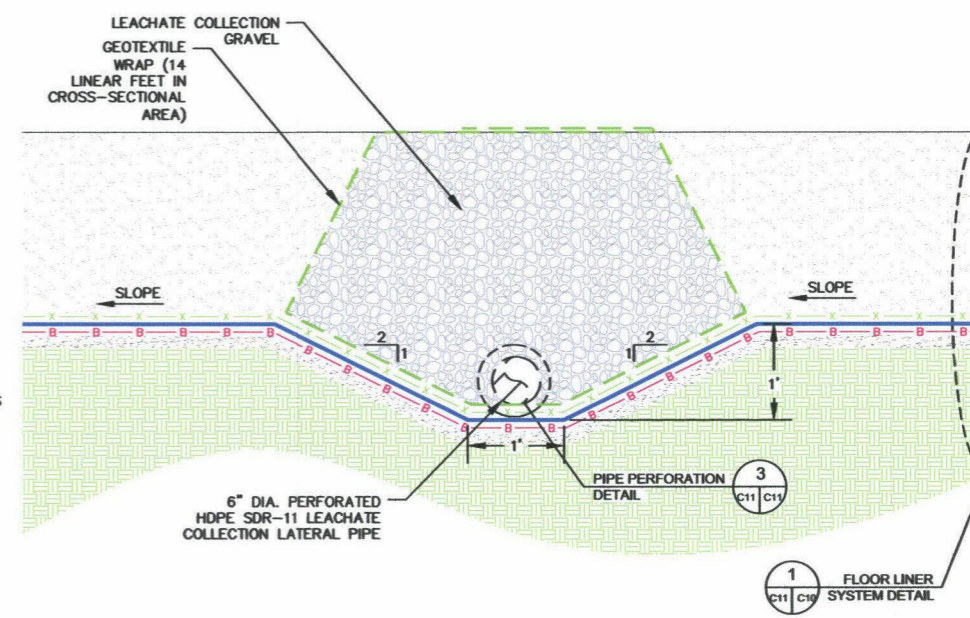
LOCATION: NA 82016 AU16.1064.00_SuperCell_2_Phase_2_Design.dwg DATE: 8/29/2018 3:51 PM PLOT SCALE = 1:2.58489546 PLOTTED BY: STEPHANIE HAMILTON



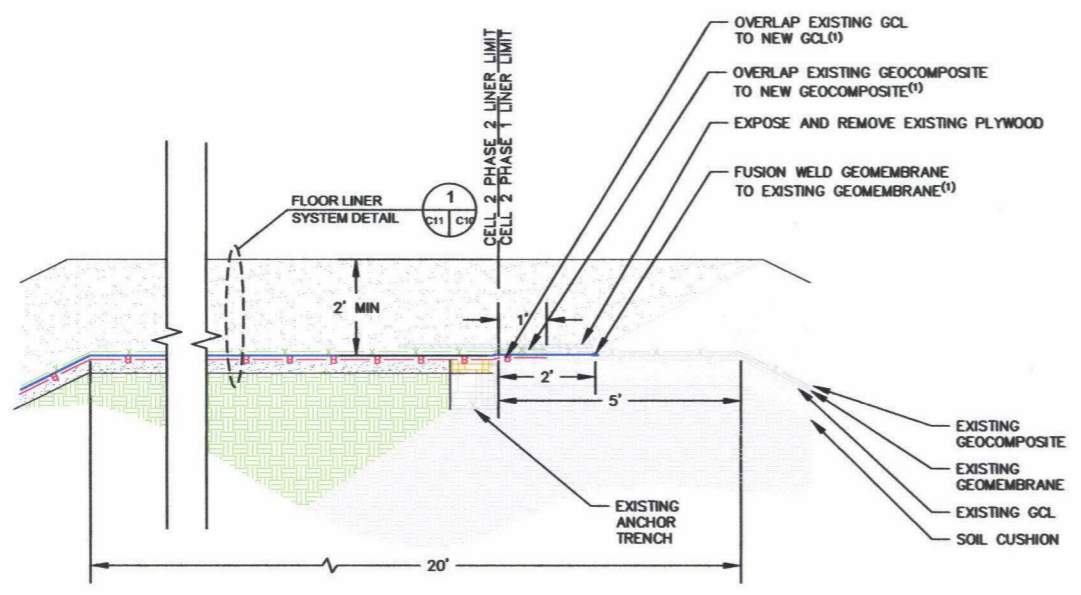
NORTH FLOOR TO SIDESLOPE LINER SYSTEM
TRANSITION WITH GRAVEL WINDOW
SECTION E
1" = 1"



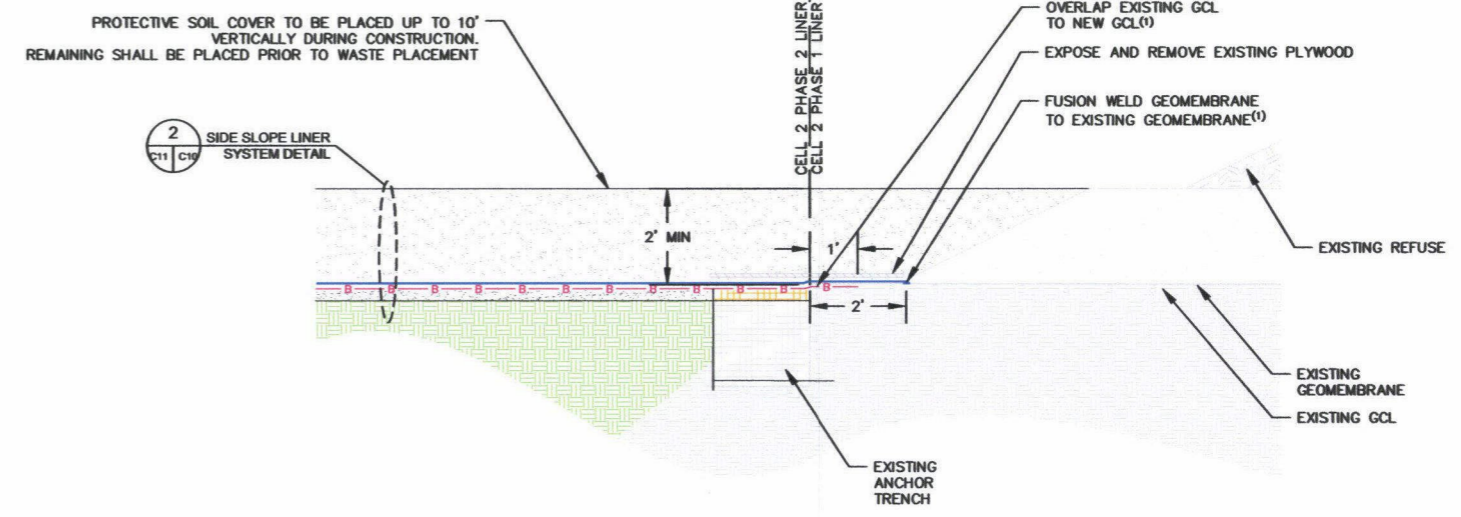
LCRS COLLECTION PIPE PERFORATION
DETAIL 3
1" = 1"



LCRS PIPE WITH GRAVEL WINDOW (TYP)
SECTION F
1" = 1"



TIE-IN TO EXISTING FLOOR LINER TERMINATION
SECTION G
1" = 2"

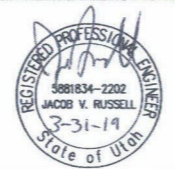


TIE-IN TO EXISTING SIDESLOPE LINER TERMINATION
SECTION H
1" = 2"

NOTES:
1. VERIFY EXISTING LINER ELEVATIONS. IF DIFFERENT, ENGINEER.

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|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
DESIGNED BY: SAH
DRAWN BY: SAH
CHECKED BY: JVR
APPROVED BY: JVR



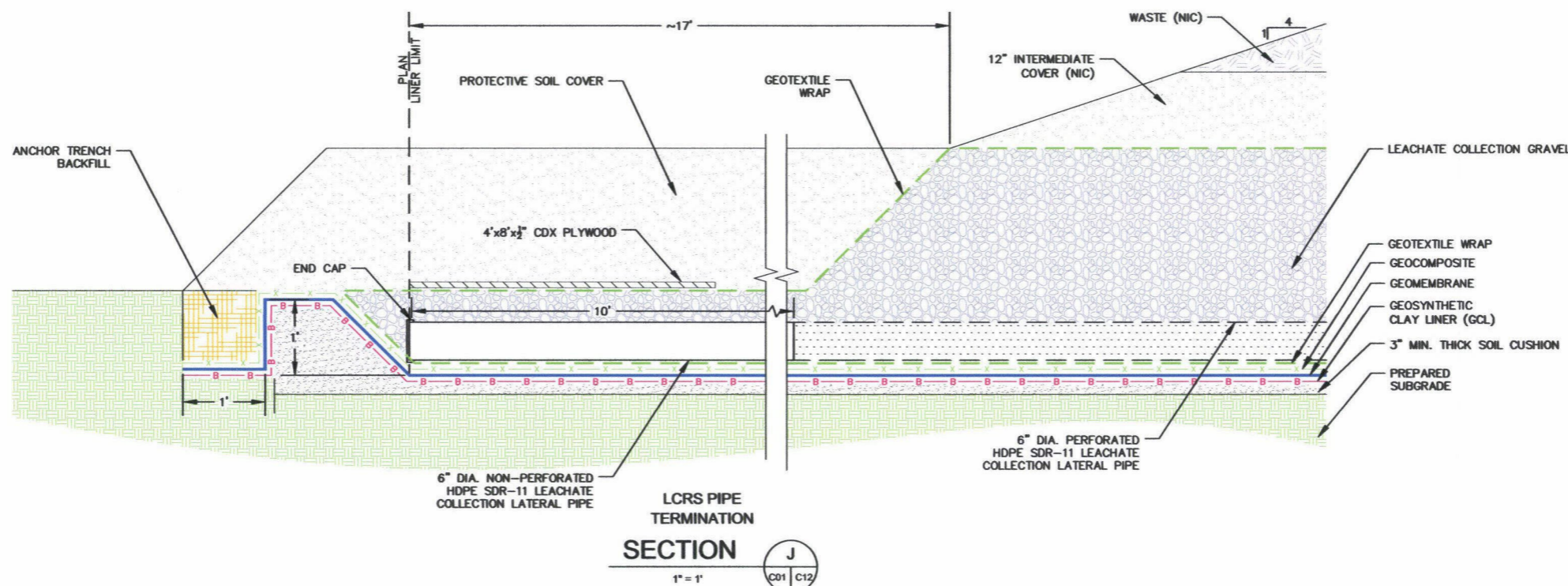
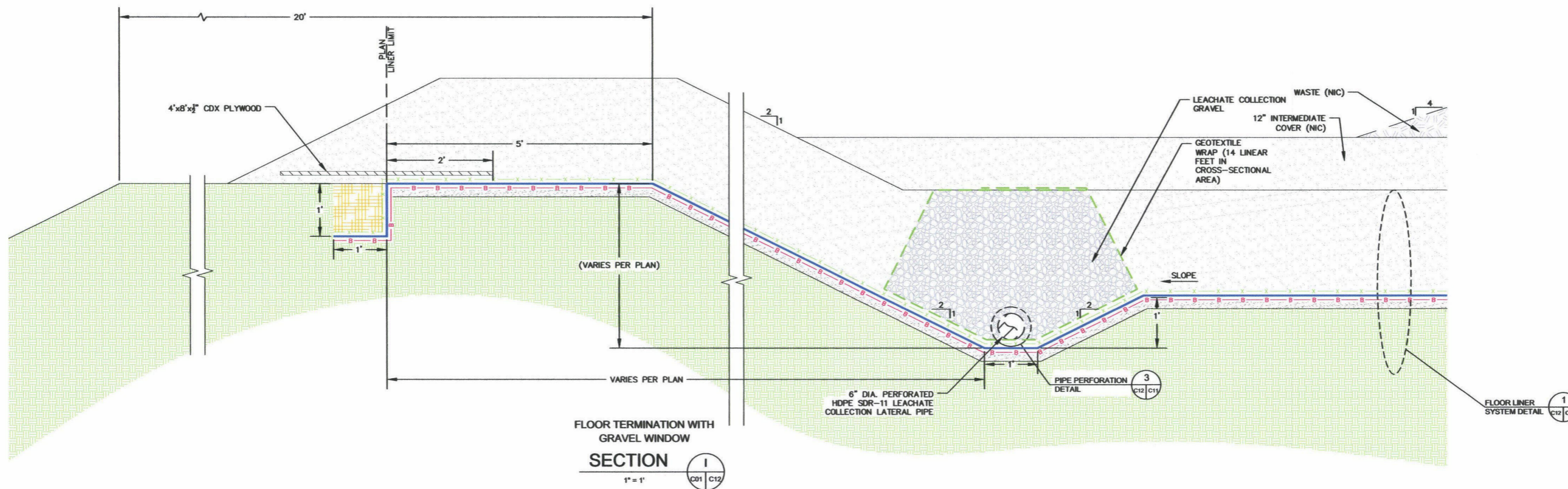
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ECDC ENVIRONMENTAL LANDFILL
SUPER CELL 2 PHASE 2
EAST CARBON, UTAH
DETAILS

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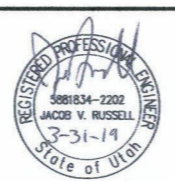
ISSUED FOR CONSTRUCTION



LOCATION: NA EDCO 8016 AUI6.1064.00_SuperCell_2_Phase_2_Perform_S_BusinessPlan.dwg DATE: 8/29/2018 10:11 PM PLOT SCALE = 1:2.04489546 PLOTTED BY: STEPHANIE HAMILTON

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
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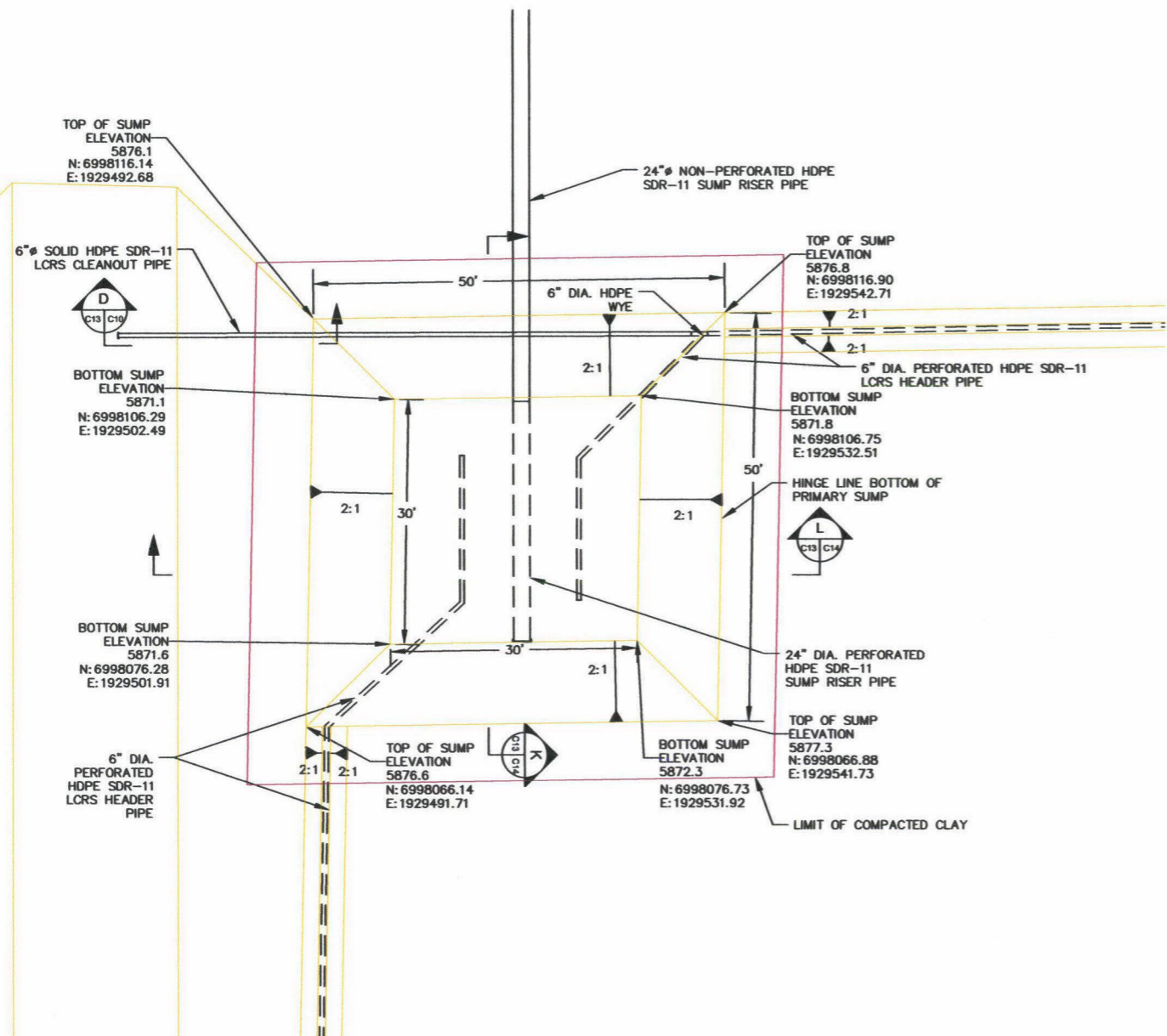
ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

DRAWING NO. C1
 PROJECT NO. AU1810

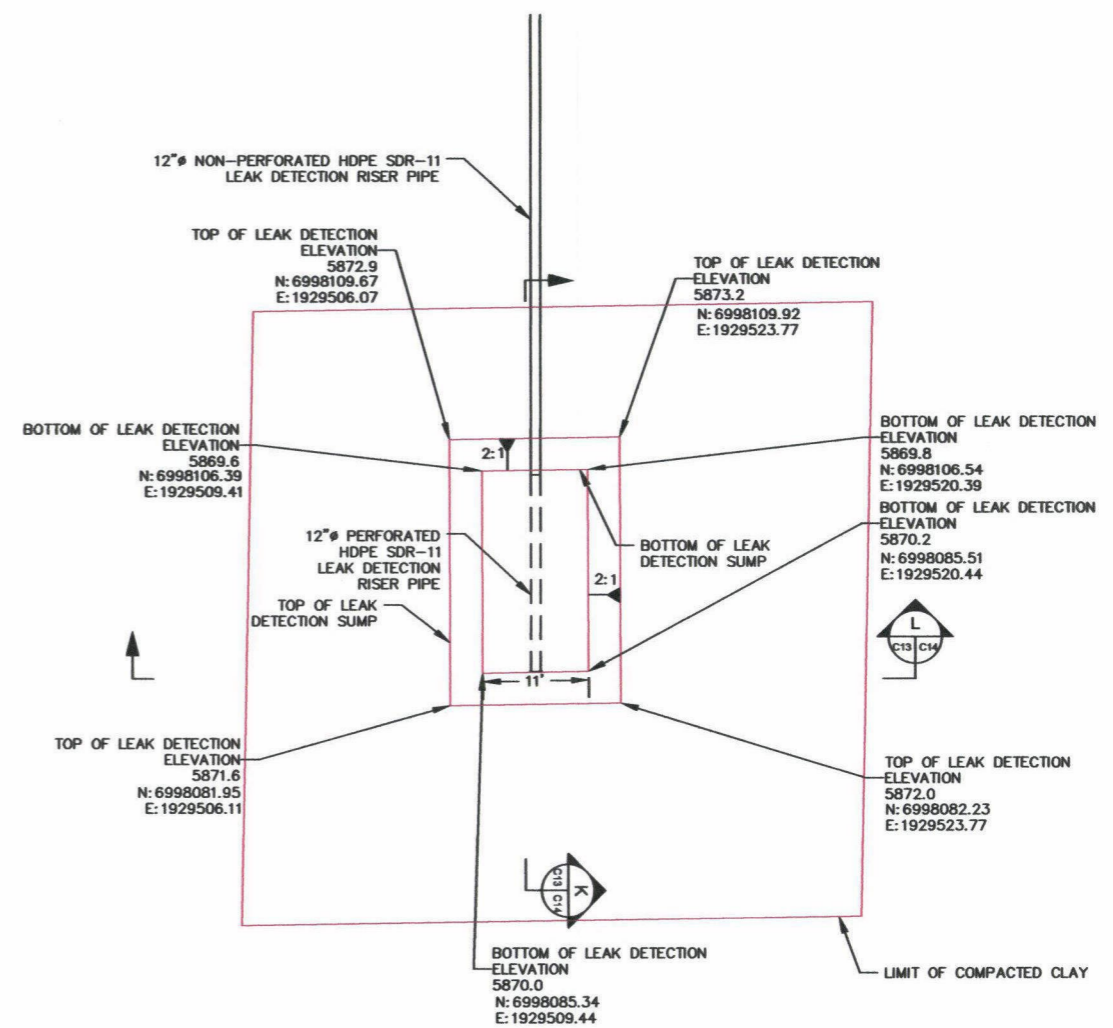
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LOCATION: NA 82000 8018 AU18.1004.00 Source: & Phase 2 Design & Construction - Civil/Drainage/Collection - DATE: 8/28/2018 3:51 PM PLOT SCALE = 1:8.6489546 PLOTTED BY: STEPHANIE HANFORD



LCRS SUMP



LEAK DETECTION SUMP

SUMP PLAN
DETAIL
 1" = 10' 4
C01 C13

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
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 APPROVED BY: JVR



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ECDC
ENVIRONMENTAL, L.C.

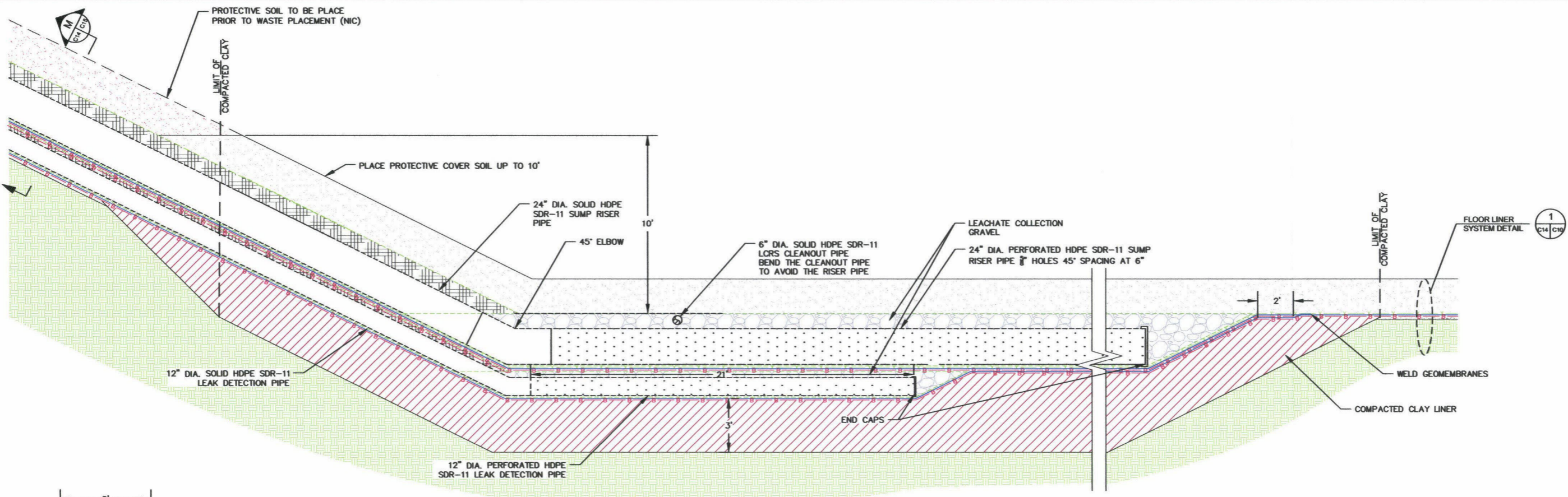
ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

DRAWING
 C1
 PROJECT
 AU1810

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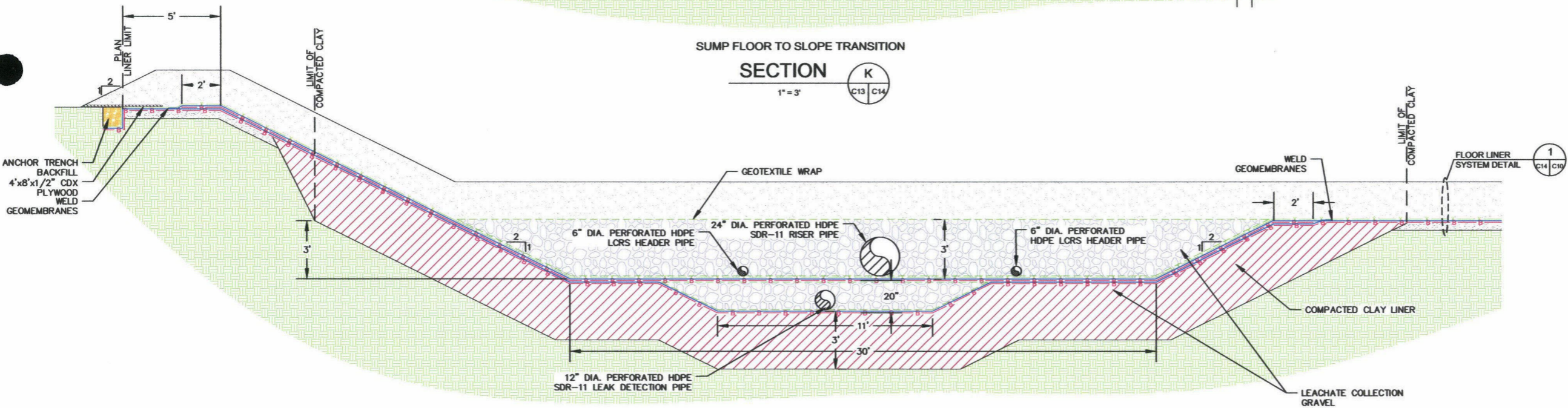
ISSUED FOR CONSTRUCTION

LOCATION: NA 1805 2018 AUG 10 09 50:00 SuperCell 2 Phase 2 Detail 1.1 - Civil/Design/C10.dwg DATE: 8/19/2018 8:58 PM PLOT: SCALE = 1:8.64489546 PLOTTED BY: STEPHANIE HANAYON



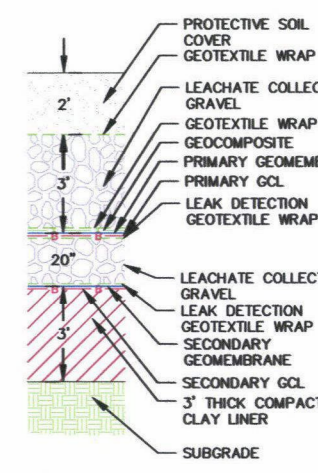
SUMP FLOOR TO SLOPE TRANSITION

SECTION K
1" = 3'



SUMP FLOOR

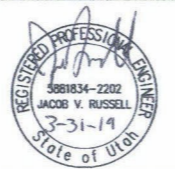
SECTION L
1" = 3'



SUMP LINER SYSTEM

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
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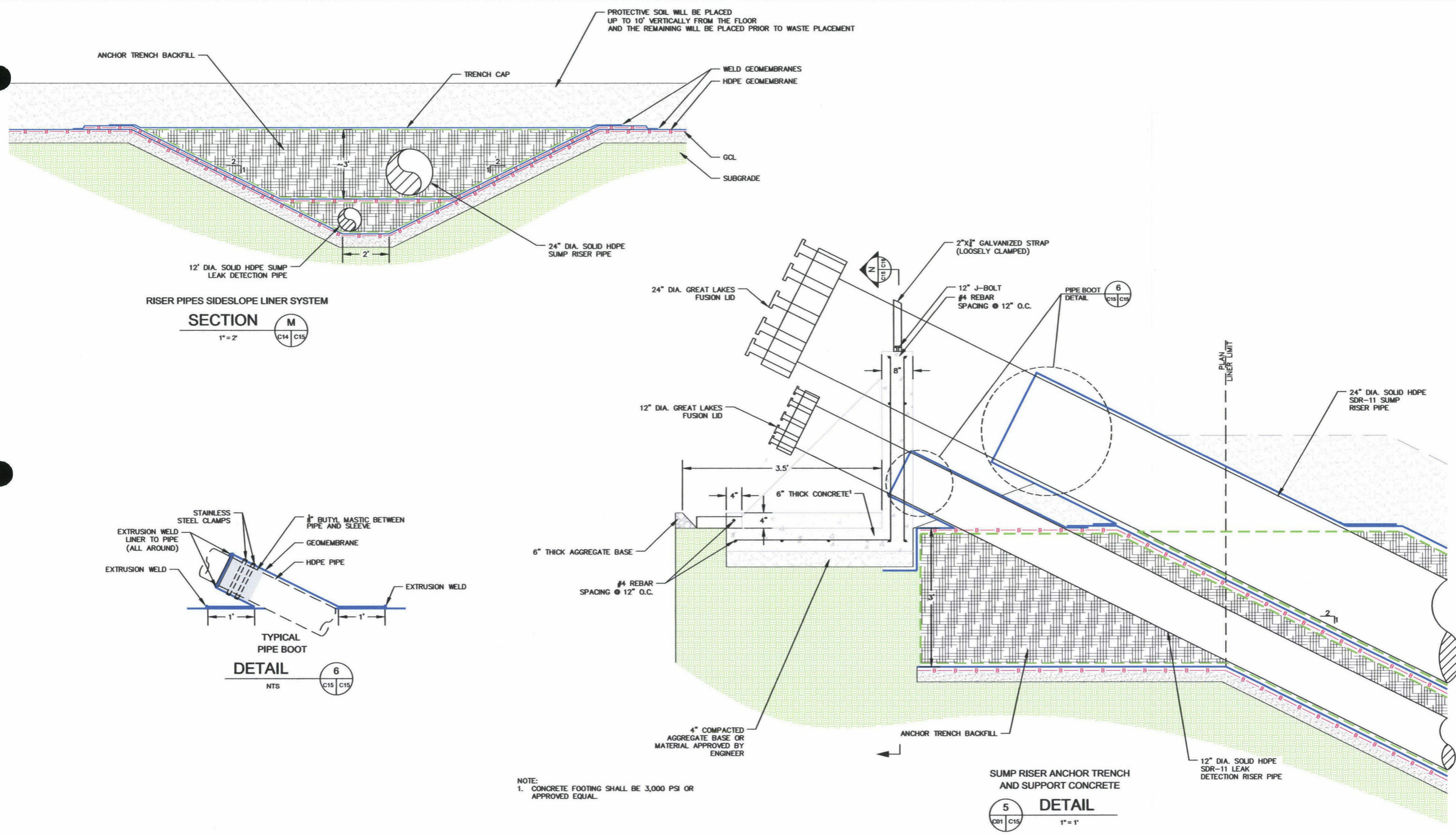
ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

DRAWING NO. C1
 PROJECT NO. AU1810

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ISSUED FOR CONSTRUCTION

LOCATION: KA 2018.AU18.1084.00_SuperCell_2_Phase_2_EastCarbon_Utah.ecd Environmental.L.C. DATE: 8/29/2018 3:58 PM PLOT SCALE = 1:2.56480546 PLOTTED BY: STEPHANIE HAMILTON



RISER PIPES SIDESLOPE LINER SYSTEM
SECTION M
1" = 2'

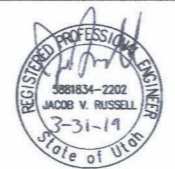
DETAIL 6
NTS

DETAIL 5
1" = 1'

NOTE:
1. CONCRETE FOOTING SHALL BE 3,000 PSI OR APPROVED EQUAL.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |
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DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
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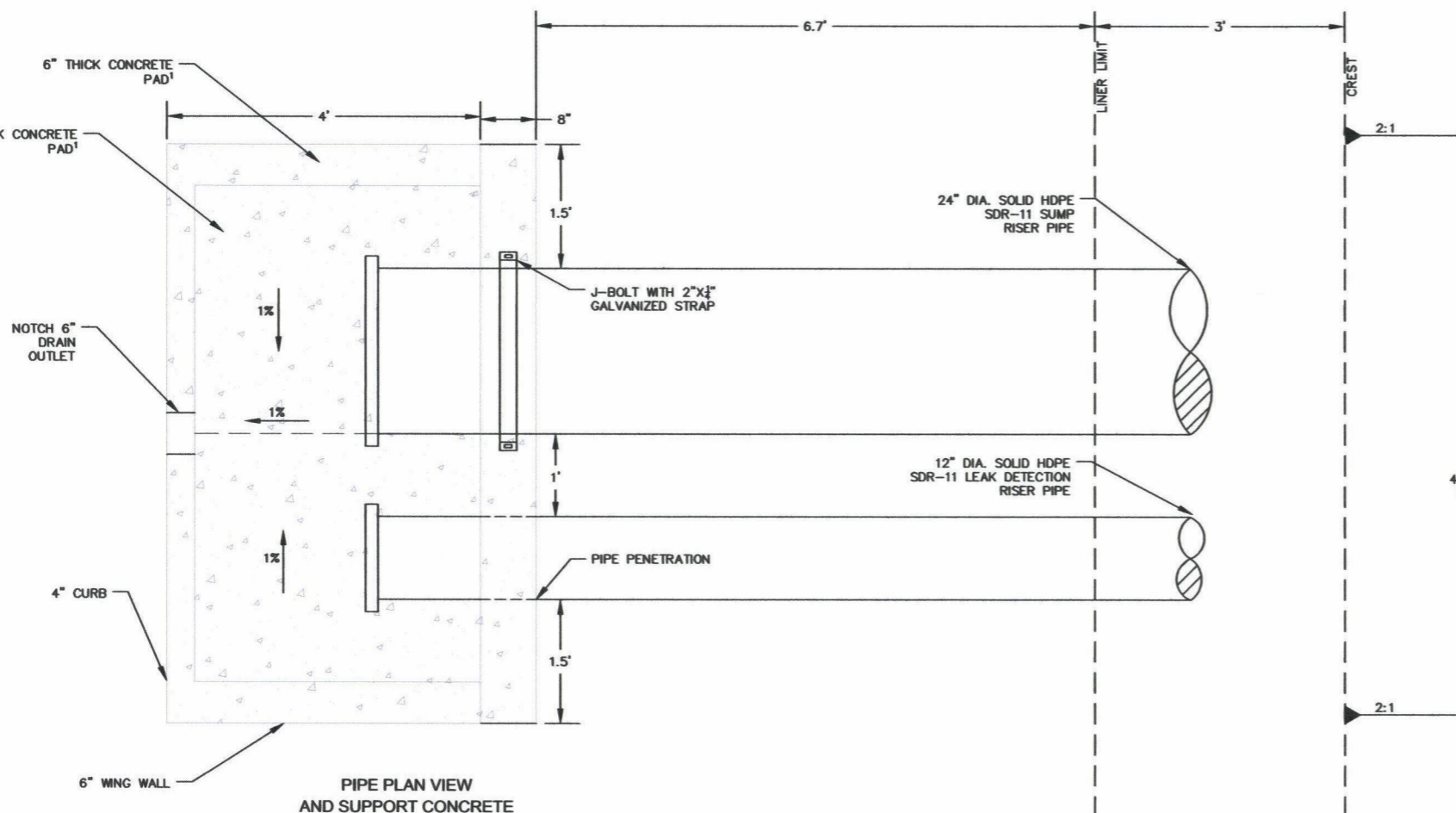


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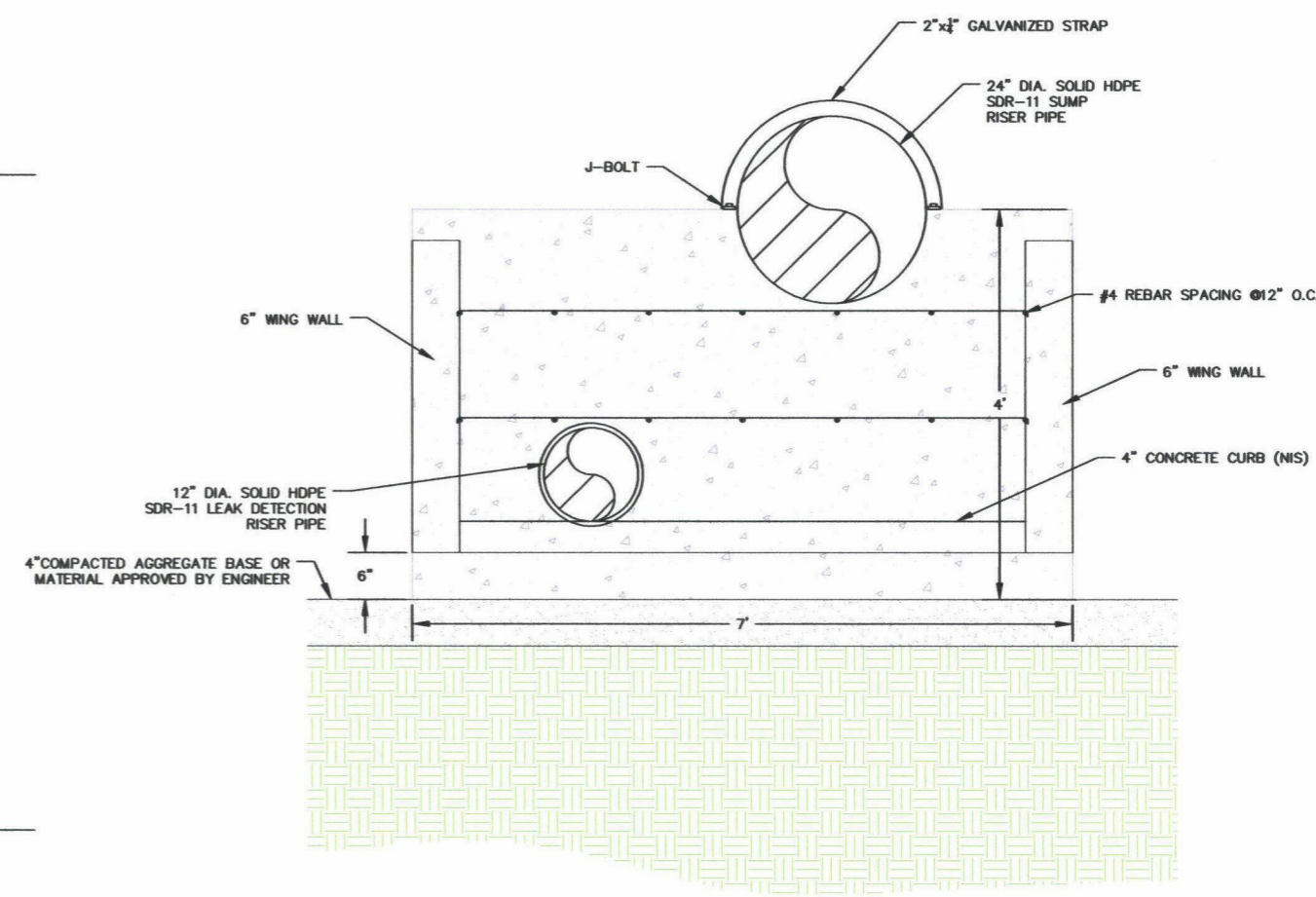
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

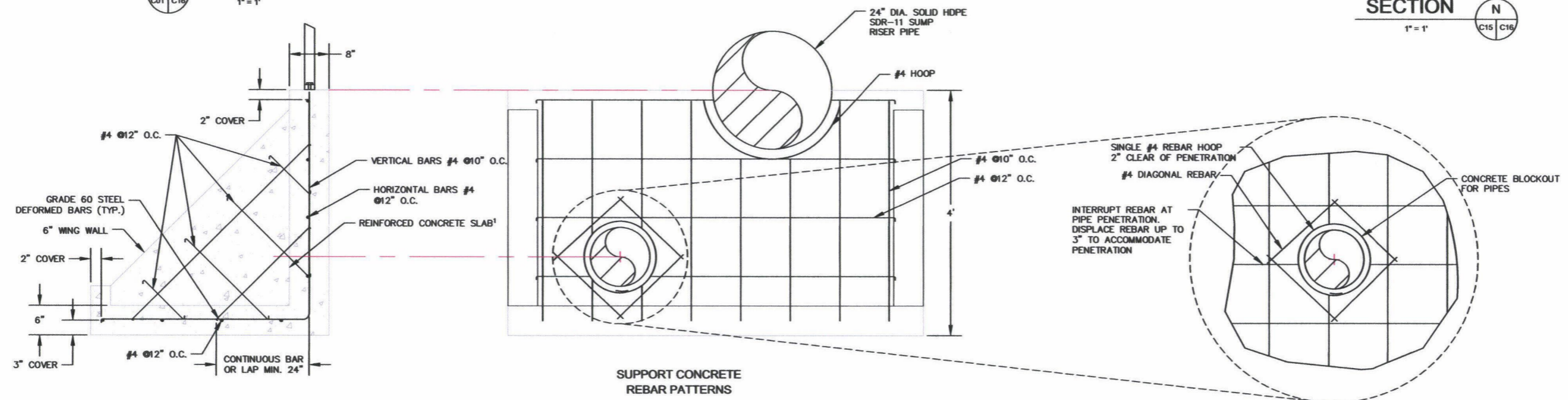
LOCATION: NA 10000 2018 AU18.1004-00_SuperCell 2 Phase 2 Detail 8 - Reinforced Concrete Support Detail 8 - 09/04/2018 11:58 AM DATE: 8/19/2018 11:58 AM PLOT SCALE = 1/8"=1'-0" PLOTTED BY: STEPHANIE HANFORD



PIPE PLAN VIEW AND SUPPORT CONCRETE DETAIL
 7
 C01 C16
 1" = 1"



SUMP RISER CONCRETE SUPPORT SECTION
 N
 C15 C16
 1" = 1"

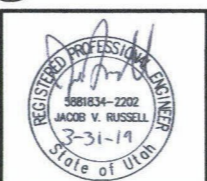


SUPPORT CONCRETE REBAR PATTERNS DETAIL
 8
 C01 C16
 1" = 1"

NOTE:
 1. CONCRETE FOOTING SHALL BE 3,000 PSI APPROVED EQUAL.

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|----------|-------------------------|----------|-------------|------------|-------------|
| | 09/04/18 | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
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 APPROVED BY: JVR



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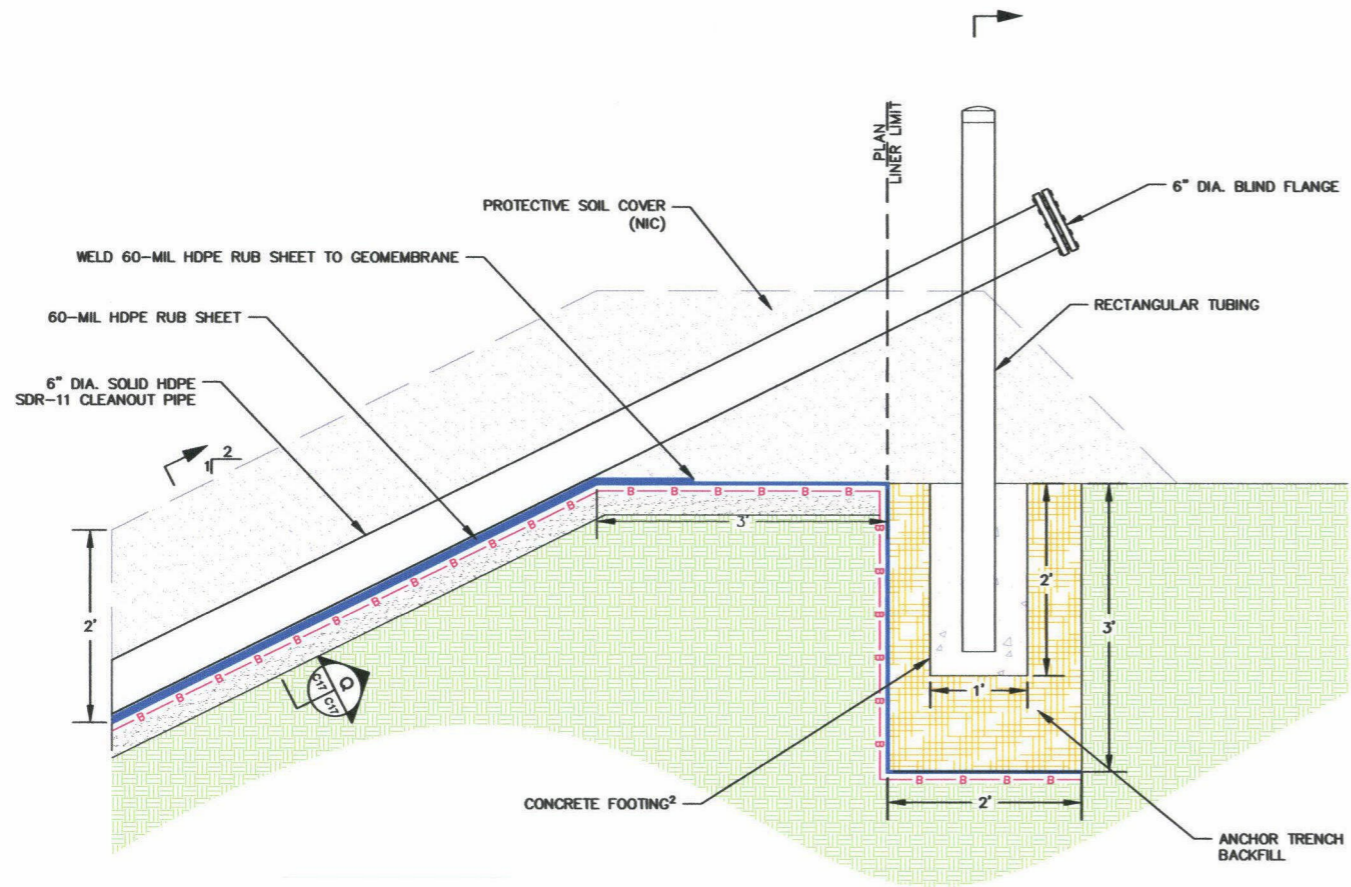
ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
DETAILS

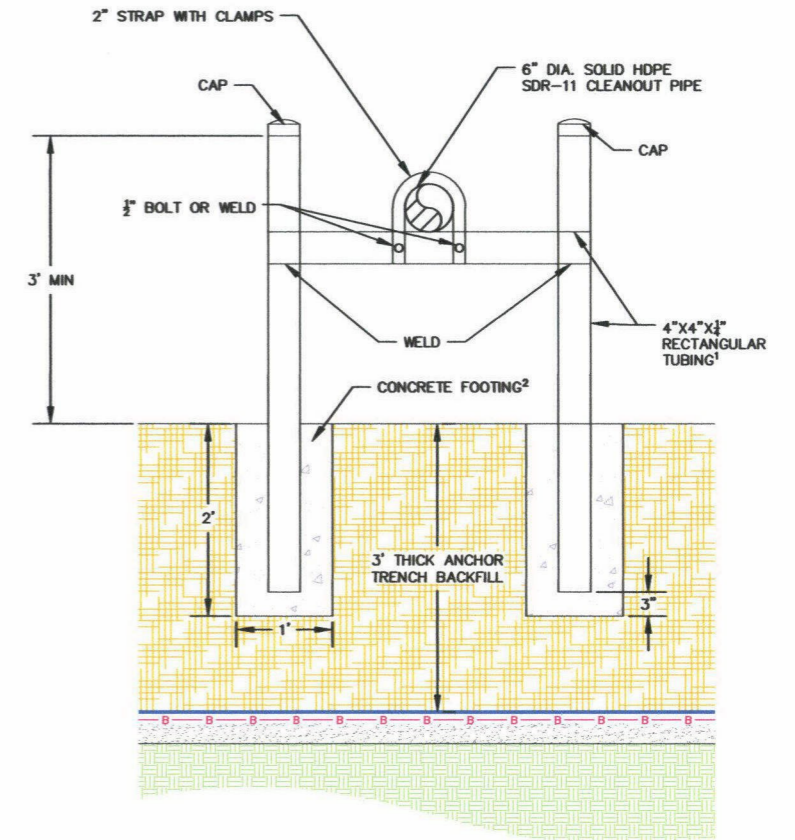
DRAWING
 C1
 PROJEC
 AU1810

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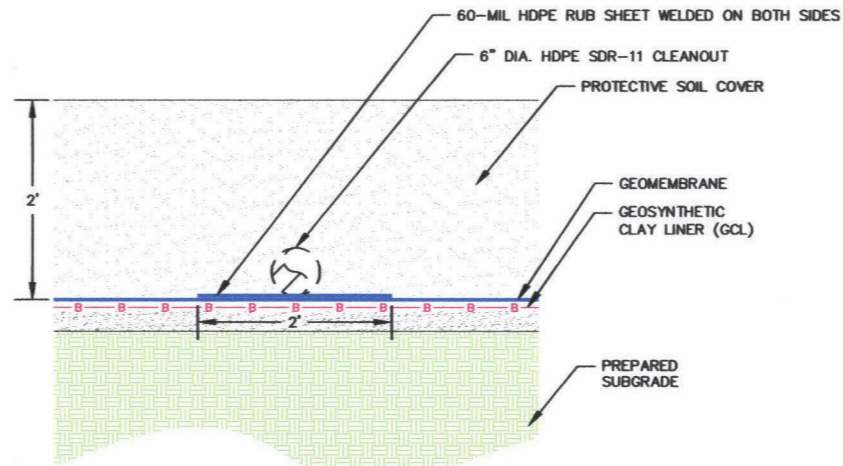
ISSUED FOR CONSTRUCTION



SIDESLOPE CLEANOUT TERMINATION
SECTION O
1" = 1" (C01 C17)



6" DIA. CLEANOUT PIPE WITH ANCHOR TRENCH SUPPORT POST
SECTION P
1" = 1" (C17 C17)



CLEAN OUT PIPE ON SIDESLOPE
SECTION Q
1" = 1" (C01 C17)

- NOTE:
1. EXPOSED STEEL PORTION SHALL BE PAINTED WITH REFLECTIVE YELLOW COATING.
 2. CONCRETE FOOTING SHALL BE 3,000 PSI APPROVED EQUAL.

LOCATION: NA 8018 AU18.1054.00_SuperCell_2_Phase_2_Perform\G_Burrows\A1_C17\A\Drawings\C10.dwg DATE: 9/29/2018 9:58 PM PLOT SCALE = 1:6489546 PLOTTED BY: STEPHANIE HAMMON

| REV. NO. | DATE | DESCRIPTION | DRAWN BY | DESIGNED BY | CHECKED BY | APPROVED BY |
|----------|------|-------------------------|----------|-------------|------------|-------------|
| 00/04/18 | | ISSUED FOR CONSTRUCTION | SAH | SAH | JVR | JVR |
| | | | | | | |
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| | | | | | | |

DATE OF ISSUE: 09/04/2018
 DESIGNED BY: SAH
 DRAWN BY: SAH
 CHECKED BY: JVR
 APPROVED BY: JVR



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ECDC ENVIRONMENTAL, L.C.

ECDC ENVIRONMENTAL LANDFILL
 SUPER CELL 2 PHASE 2
 EAST CARBON, UTAH
 DETAILS

DRAWING NO. C17
 PROJECT NO. AU181054

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