ATTACHMENT 8:

REVISED CELL 4 EXPANSION CONSTRUCTION SPECIFICATIONS

Project Manual
For
Cell 4 Expansion Construction

Central Landfill (SW1A007-26)
Matanuska-Susitna Borough, Alaska

Issued For Bid

Rev. No. 0

Project No. 167550

January 2025

BURNS McDONNELL

Burns & McDonnell
8201 Norman Center Drive, Suite 500
Bloomington, MN 55437
Phone: 952-656-6003
Fax: 952-229-2923
www.burnsmcd.com

DOCUMENT 00 01 07 – INDEX AND CERTIFICATION PAGE
SPECIFICATIONS:

DIVISION 00 - CONTRACTUAL/LEGAL

DIVISION 1 - GENERAL REQUIREMENTS

DIVISION 2 – EXISTING CONDITIONS

DIVISION 31 – EARTHWORK

DIVISION 32 – EXTERIOR IMPROVEMENTS

DIVISION 33 – UTILITIES

CONTRACT DRAWINGS

G000 – Cover and Index
G001 – General Notes
G002 – Legend & Abbreviations
G003 – Existing Conditions & Control Points
G005 – General Arrangement
C001 – Demolition Plan
C002 – Top of Liner Plan
C003 – Leachate Piping Plan
C004 – Cross Sections
C005 – Construction Details, 1 of 3
C006 – Construction Details, 2 of 3
C007 – Construction Details, 3 of 3
C008 – GCCS Relocation Plan
C009 – GCCS Relocation Details, 1 of 4
C010 – GCCS Relocation Details, 2 of 4
C011 – GCCS Relocation Details, 3 of 4
C012 – GCCS Relocation Details, 4 of 4
C013 – Miscellaneous Civil Details
C014 – Erosion Control Plan
C015 – Erosion Control Details, Silt Fence 1 of 2
C016 – Erosion Control Details, Silt Fence 2 of 2
C017 – Erosion Control Details, Erosion Control Blanket
C018 – Erosion Control Details, Stabilized Construction Exit

CERTIFICATION:

END OF DOCUMENT 00 01 07

DOCUMENT 00 40 00 – BID FORM

Project Name: Cell 4 Expansion Construction

Contract No: [_____]

BID TO:

Owner: Matanuska Susitna Borough
Purchasing Division
Attn: Dustin Silva
350 E. Dahlia Ave.
Palmer, AK 99645

BID FROM:

Bidder: [_____]
[_____]
[_____]
[_____]

ARTICLE 1 - BIDDER'S INTENT

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid price and within the Bid time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

ARTICLE 2 - TERMS AND CONDITIONS

2.01 Bidder accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the day of Bid opening. Bidder will sign and deliver the required number of counterparts of the Agreement with the Bonds and other documents required by the Bidding Requirements within 15 days after the date of Owner's Notice of Award.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bid Documents, and the following Addenda, receipt of all which is hereby acknowledged:

Number	Date
[_____]	[_____]
[_____]	[_____]
[_____]	[_____]
[_____]	[_____]

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

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

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site; and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site. Bidder acknowledges that such reports and drawings are not Contract Documents and may not be complete for Bidder's purposes. Bidder acknowledges that Owner and Engineer do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Bid Documents with respect to Underground Facilities at or contiguous to the Site.

E. Bidder has obtained and carefully studied [or assumes responsibility for having done so] all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions [surface, subsurface, and Underground Facilities] at or contiguous to the Site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto.

F. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performing and furnishing of the Work in accordance with the times, price, and other terms and conditions of the Contract Documents.

G. Bidder is aware of the general nature of Work to be performed by Owner and others at the Site that relates to Work for which this Bid is submitted as indicated in the Contract Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports, and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

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

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

K. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any person, firm, or a corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 4 - BID PRICE

4.01 Bids will be received on a lump sum basis with unit price adjustments in accordance with the following requirements:

A. Bidders submitting a bid for the Base Bid must also submit a bid for each alternative item.

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

A. LUMP SUM BASE BID PRICE:
Total Price_____

_____ dollars and _____ cents.

B. For the purpose of Bid evaluation, the Bid is to be itemized as follows. Total of Base Bid itemized prices must equal Lump Sum Base Bid Price above. Bidders must complete all items.

Base Bid:

Item	Description	Total Price (F&I)
1	Mobilization/Demobilization/Insurance/Permits	$
2	Surveying & Staking	$
3	Site Health and Safety Plan	$
4	Final Cover Stripping and Stockpiling (Including Removal and Disposal of Existing Geocomposite Drainage Net and Geosynthetic Clay Liner within Cell 2A Final Cover Overlay)	$
5	Remove Drainage Pipe/Install New Drainage Pipe	$
6	Grade to Design Subgrade	$
7	Sand Leveling Course	$
8	Geosynthetic Clay Liner (GCL)	$
9	HDPE and LLDPE Geomembrane Liners (60-mil Double-Sided Textured)	$
10	Geotextiles	$
11	Leachate Collection Piping, Cleanouts, & Appurtenances	$
12	Convert GW-13 to Remote Gas Well	$
13	LFG Piping, Cleanouts, Wellheads, & Appurtenances, GCCS Modifications, and GCCS Expansion	$
14	Granular Drainage Material (Owner Provided Borrow Source)	$
15	Leak Location Survey	$
16	Landfill Limit Markers	$
17	Erosion and Sediment Control	$
18	New Access Road Construction	$
	Total (Firm Fixed Price)	$

C. ADJUSTMENT UNIT PRICE SCHEDULE: In the event the Work indicated or specified in the Contract Documents is increased or decreased, the Lump Sum Bid Price set forth above shall be increased or decreased in accordance with the following Unit Prices. Adjustment Unit Prices are subject to acceptance by Owner, and rejection of one or more Adjustment Unit Prices will not invalidate acceptance of this Bid. Unit price shall be for furnish and install (F&I) prices unless otherwise indicated. **Bidders must complete all items.**

Work Item	Unit	Unit Price
Project Manager Rate	Hour	$
Project Superintendent/Foreman Rate	Hour	$
Heavy Equipment Operator Rate	Hour	$
Laborer Rate	Hour	$

Utility Plumber Rate	Hour	$
Electrician Rate	Hour	$
Equipment – Large Dozer Rate	Hour	$
Equipment – Small Dozer Rate	Hour	$
Equipment – Track Loader Rate	Hour	$
Equipment – Rubber Tired Loader Rate	Hour	$
Equipment – Rubber Tired Backhoe Rate	Hour	$
Equipment – Compactor	Hour	$
Equipment – Articulating Dump Truck	Hour	$
Equipment – Excavator	Hour	$
Sediment Fence	Linear Foot	$
Sediment Control Wattles	Each	$
Erosion Control Matting	Square Foot	$
Seeding, Fertilizing & Mulching	Acre	$
Unsuitable Excavation and Compacted Backfill	Cubic Yard	$
Granular Drainage Material (Owner Furnished)	Cubic Yard	$
Sand Leveling Material	Cubic Yard	$
Topsoil Stripping and Stockpiling	Cubic Yard	$
Topsoil Placement	Cubic Yard	$
Common Excavation	Cubic Yard	$
Controlled/General Fill	Cubic Yard	$
Crushed Surfacing (AkDOT D-1 aggregate)	Cubic Yard	$
Geocomposite Drain Net (GDN), Removal and Disposal of Existing	Square Foot	$
Geocomposite Clay Liner (GCL), Removal and Disposal of Existing	Square Foot	$
Geocomposite Clay Liner (GCL)	Square Foot	$
HDPE 60-mil Texture Geomembrane	Square Foot	$
LLDPE 60-mil Texture Geomembrane	Square Foot	$
Non-Woven Geotextile Filter (4 ounces per square yard)	Square Foot	$
Non-Woven Geotextile Cushion (10 ounces per square yard)	Square Foot	$
Woven Geotextile (AkDOT Type 1)	Square Foot	$
6” Corrugated Plastic Perforated Pipe with Geotextile Sock	Linear Foot	$
HDPE 8” SDR 11 Perforated Piping	Linear Foot	$
HDPE 8” SDR 11 Solid Piping	Linear Foot	$
HDPE 6” SDR 11 Perforated Piping	Linear Foot	$
HDPE 6” SDR 11 Solid Piping	Linear Foot	$
HDPE 4” SDR 11 Solid Piping	Linear Foot	$

Removal of Existing and Installation of Salvaged HDPE 8" SDR 17 Insulated Artic Piping (Aluminum Spir-l-ok Jacket) and Installation Supports	Linear Foot	$
New HDPE 8" SDR 17 Insulated Artic Piping (Aluminum Spir-l-ok Jacket) and Installation Supports	Linear Foot	$
HDPE 4" SDR 17 Insulated Artic Piping (Aluminum Spir-l-ok Jacket) and Installation Supports	Linear Foot	$
QED Model ORP215M Wellhead, Solargaurd flex hose, and Polarguard Insulating Cover (or Engineer-Approved Alternates)	Each	$
7' Long, 4" Diameter, Schedule 40 Galvanized Steel Bollard Filled with Concrete	Each	$

D. SUPPLIERS/MANUFACTURERS: This Bid is based upon furnishing and installing major items of Equipment by the following Suppliers/manufacturers:

No.	Item	Supplier/Manufacturer
1	[_____]	[_____]
2	[_____]	[_____]
3	[_____]	[_____]
4	[_____]	[_____]

E. SUBCONTRACTORS: This Bid is based upon use of the following Subcontractors:

No.	Item	Subcontractor
1	[_____]	[_____]
2	[_____]	[_____]
3	[_____]	[_____]
4	[_____]	[_____]

ARTICLE 5 - CONTRACT TIMES

5.01 Bidder agrees that the Work will be completed within the following time(s):

A. The Work will be Substantially Completed on or before **August 30, 2025** and completed and ready for final payment in accordance with the Owner's General Conditions of the Contract for Construction on or before **September 30, 2025**. Substantial and final completion requirements are described in SECTION 01 78 00.

B. Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified in the Agreement.

ARTICLE 6 - BID CONTENT

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

A. Required Bid security in the form of a Bid Bond in the amount of five percent (5%) of the total Bid price.

B. Required Bidder's Qualification Statement with supporting data.
C. Manufacturer's data where called for in Specifications.
D. A tabulation of Subcontractors and other persons and organizations required to be identified in this Bid.

ARTICLE 7 - COMMUNICATIONS

7.01 Communications concerning this Bid shall be addressed to the Bidder as follows:

Burns & McDonnell Engineering Company, Inc.
Attn: Fred Doran
8201 Norman Center Drive, Suite 500
Bloomington, MN 55437
952-290-6334
fdoran@burnsmcd.com

ARTICLE 8 - TERMINOLOGY

8.01 The terms used in this Bid which are defined in the Owner's General Conditions of the Contract for Construction or Instructions to Bidders will have the meanings assigned to them.

SUBMITTED on [_____], 2024.
State Contractor License No. [_____]. (If applicable)

If Bidder is :

An Individual

Name (type or printed): [_____]

By: [_____] (SEAL)
(Individual's Signature)

Doing business as: [_____]
Business address: [_____]
[_____]

Phone No.: [_____]
FAX No.: [_____]

A Partnership

Partnership Name: [_____] (SEAL)

By: [_____]
(Signature of general partner – attach evidence of authority to sign)

Name (type or printed): [_____]

Business address: [_____]
[_____]

Phone No.: [_____]
FAX No.: [_____]

A Corporation

Corporation Name: [_____] (SEAL)
State of Incorporation: [_____]
Type (General Business, Professional, Service, Limited Liability): [_____
_____]

By: [_____]
(Signature – attach evidence of authority to sign)

Name (type or printed): [_____]

Title: [_____]

(CORPORATE SEAL)
Attest: [_____]
(Signature of Corporate Secretary)

Business address: [_____]
[_____]

Phone No.: [_____]
FAX No.: [_____]

END OF SECTION 00 40 00

DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section summarizes the Work covered in detail in the complete Contract Documents.

B. Owner: Matanuska-Susitna Borough (MSB), Central Landfill, 1201 N 49th State St, Palmer, AK 99645 is contracting for Work described in the Contract Documents.

1. Contract Identification: Cell 4 Expansion Construction
2. Work Site Location: Central Landfill, 1201 N 49th State St, Palmer, AK 99645.

C. Engineer: The Contract Documents were prepared by Burns & McDonnell Engineering Company, Inc., 8201 Norman Center Drive, Suite 500, Bloomington, MN 55437.

D. Contractor: General contractor for the construction of Cell 4 Expansion.

1.02 PROJECT DESCRIPTION:

A. Description of Project: Contractor will construct the Cell 4 Expansion, which includes: stripping and stockpiling topsoil and cover soils within the Cell 2A final cover overlay; removal and disposal of existing subdrain piping, existing geocomposite drainage net (GDN), and existing geosynthetic clay liner (GCL) within the Cell 2A final cover overlay; completing earthwork necessary to establish Cell 4 Expansion subgrade; regrading the existing sand leveling course within Cell 2A final cover overlay, installing GCL, geomembrane liner, geotextile, leachate collection piping, gas collection lateral piping, granular drainage layer, and related items; removal and reinstallation of existing gas collection and control system piping; and construction of perimeter access road and stormwater ditches. All Work under this Contract shall be completed according to the Drawings and Specifications.

1. The “Cell 2A final cover overlay” refers to the 1.28-acre area of Cell 2A that lies within the new Cell 4 Expansion liner area. The Cell 2A final cover area is shown as a gray shaded area on Contract Drawing C001.

B. Work Covered by Contract Documents: The Work under this Contract shall include furnishing and paying for all supervision, labor, tools, materials, transportation, services, and supplies required to complete the Project in accordance with the Contract Documents.

1.03 WORK BY OTHERS:

A. Work by Owner: General activities associated with the operation of a landfill.

B. The site is open daily from 8:00 a.m. to 5:00 p.m.

C. Contractor is required to coordinate all construction work with the Owner’s operations, and to ensure day-to-day operation of Owner’s facilities is not impeded.

1.04 CONTRACTOR'S USE OF PREMISES:

A. Limited Use:

1. Limit use of the premises for storage and execution of the Work to allow for Owner and Operator occupancy. Confine operations to areas within Contract limits indicated. Portions of Site outside the Contract limits shall not be disturbed.

2. Coordinate with other separate contractors and Owner to avoid interference of operations.
3. Conduct operations so as to ensure the least inconvenience to Owner.

B. Contractor shall limit operations to the areas identified on the Drawings. Contractor shall consult with Owner prior to using any other part of the site for construction observations.

C. Normal working hours will be 7 a.m. to 6 p.m. Monday through Saturday and 9 a.m. to 6 p.m. on Sunday. The Contractor may work extended hours with the Owner's written approval.

D. The responsibility for protection and safekeeping of equipment and materials on or near the site will be entirely that of the Contractor. No claim shall be made against the Owner for any reason of any act of any employee or trespasser. It shall be understood that should any occasion arise necessitating use by the Owner of sites occupied by stored materials and equipment, the Contractor shall immediately move the same.

1.05 OWNER'S USE OF PREMISES:

A. Full Owner Occupancy: The Owner will occupy the Site during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations.

B. The Owner or Owner's agent shall operate the facilities after Substantial Completion.

1.06 WORK SEQUENCE:

A. General: Construction sequence shall be determined by Contractor subject to Owner's need for continuous operation of existing facilities.

B. Continuous Service of Existing Facilities: Exercise caution and schedule operations to ensure that functioning of present facilities will not be disrupted. Shutdown of Owner's operating facilities to perform the Work shall be held to a minimum length of time and shall be coordinated with Owner who shall have control over the timing and schedules of such shutdowns.

C. The Owner and Engineer consider the Contractor's schedule and construction sequencing to be paramount for this project to ensure that the Work is properly planned, coordinated, and executed in accordance with the Contract Documents, and that the Owner's needs are maintained.

D. Coordinate schedule and operations with Owner and Engineer.

E. Contractor shall submit progress schedule under provisions of SECTION 01 31 00.

1.07 OWNER-FURNISHED EQUIPMENT AND MATERIALS:

A. Equipment and Materials: The following Equipment and Materials will be furnished and paid for by Owner.

1. "Granular Drainage Material". The Owner will furnish on-site materials to be used for granular drainage material. Contractor shall coordinate use of granular drainage material with Owner. Contractor shall be responsible for loading, hauling material to project site, placement of material, in-place material testing, and stockpile area maintenance and cleanup. This includes cleaning and removing debris along haul roads. Quality control testing shall be completed as specified in SECTION 31 23 17.

2. “Common Backfill/General Fill”. This material is available on-site. This soil is proposed for general grading and backfill. Contractor shall be responsible for material conformance testing, excavation, hauling, and placement of this material as specified in SECTION 31 20 00.
3. “Topsoil”. Topsoil material is available onsite from stripping existing topsoil. Contractor shall be responsible for hauling the material to site and placement of the material as specified in SECTION 31 20 00.

B. Contractor shall obtain approval from Owner prior to using Owner provided material. See SECTION 31 20 00 for site restoration requirements. All other material and equipment shall be supplied by the Contractor. Contractor shall be responsible for excavation, hauling, and placement for all materials as specified in SECTION 31 20 00.

C. Site geologic and engineering reports are available at the Landfill upon request. Interpretation of the data shall be the sole responsibility of the Contractor.

D. Except as explicitly stated, Contractor shall not use, have access to, or plan to use Owner’s equipment, materials, staff, or supplies for any part of the work.

1.08 CONTRACTOR-FURNISHED MATERIAL AND EQUIPMENT

A. Contractor shall be responsible for locating, acquiring, and performing borrow source testing for all off-site materials not mentioned above as well as equipment for the Contract.

B. All gates, barricades, fences, handrails, guardrails, and security required by the Contract or by law and regulation.

C. Sanitary facilities adequate for all workers and complying with all codes and regulations. Contractor shall maintain cleanliness of facility.

D. Shelter and drying facilities for workers if required by codes and regulations.

E. Guards, marks, shields, protective clothing, rain gear, and/or other equipment required by law, ordinance, labor contract, OSHA, and other regulations for the maintenance of health and safety.

F. First aid kits and equipment required by law and regulations.

1.09 MEASUREMENT AND PAYMENT:

A. Lump Sum with Adjustment Unit Price Contracts: All Work indicated and specified in the Contract Documents shall be included in the Lump Sum Contract Price, with adjustments to that price made upon final determination of measurements and in accordance with items and prices stated in "Schedule of Adjustment Unit Prices" in the Agreement.
1. The lump sum contractor price shall constitute full compensation for furnishing all plant, labor, equipment, and materials, and performing all operations required to complete the Work as required. Notwithstanding the omission or mention of any incident or incidental Work, the contract price and payment shall also constitute full compensation for all Work incident or incidental to completion of the item, unless such Work is otherwise specifically mentioned for separate payment under another bid item.
2. All Work shall be included in lump sum contract Prices.

B. Measurement and Payment Schedule:

1. Mobilization/Demobilization/insurance/Permits: Shall be paid for at the applicable contract lump sum price not to exceed 5% of the overall schedule cost. Mobilization consists of preconstruction expenses and the costs of preparatory work and operations, such as moving in personnel and equipment, setting up of temporary offices, facilities and utilities, which occur before 5% of the total original contract is earned from other bid items. Payment will be as follows:
    a. When 5% of the total original contract amount is earned from other bid items, excluding amounts paid for mobilization and materials on hand, 50% of the amount bid for mobilization, or 5% of the total original contract amount, whichever is least, will be paid.
    b. When 10% of the total original contract amount is earned from other bid items, excluding amounts paid for mobilization and materials on hand, the remaining 50% of the amount bid for mobilization, or 5% of the total original contract amount, whichever is the least, will be paid.
    c. No monies for Mobilization will be paid before receipt and acceptance of the preliminary schedules as provided for by the General Conditions.
2. Survey & Staking
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to survey, stake, and provide survey results to Owner and Engineer as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 01 71 23.
3. Site Health and Safety Plan (HASP)
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to furnish a HASP as specified in the Project Specifications, including SECTION 01 35 29.
4. Final Cover Stripping and Stockpiling
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to remove, stockpile, and/or dispose of existing topsoil, existing cover layer, existing GDN, and existing GCL from the existing Cell 2A final cover overlay as shown in the Contract Drawings and as specified in the Project Specifications.
5. Remove Drainage Pipe/Install New Drainage Pipe
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to remove existing subdrainage pipe from the Cell 2A final cover overlay and install new 6” corrugated HDPE perforated pipe with geotextile sock and all connections/fittings as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 33 00 00.
6. Grade to Design Subgrade
    a. No measurement shall apply to the lump sum price.

b. Payment shall be full pay for all labor, tools, materials, and equipment required to prepare subgrade for geosynthetic placement including required excavation or material fill, compaction, and testing within the Cell 4 Expansion area, including all liner termination berms, as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 20 00.

7. Sand Leveling Course
   a. No measurement shall apply to the lump sum price.
   b. Payment shall be full pay for all labor, tools, material, and equipment required to test, furnish, place, and compact sand leveling course material in the Cell 4 Expansion (including regrading the existing sand leveling course within the Cell 2A final cover overlay) as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 20 00.
8. Geosynthetic Clay Liner (GCL)
   a. No measurement shall apply to the lump sum price.
   b. Payment shall be full pay for all labor, tools, material, and equipment required to test, furnish, place, and install GCL material in the Cell 4 Expansion as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 05 19.23.
9. High Density Polyethylene (HDPE) and Linear Low Density Polyethylene (LLDPE) Geomembrane Liners (60-mil Double-Sided Textured)
   a. No measurement shall apply to the lump sum price.
   b. Payment shall be full pay for all labor, tools, materials, and equipment required to:
      (1) Test, furnish, place, and install HDPE geomembrane in the Cell 4 Expansion (outside of Cell 2A final cover overlay) as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 05 19.16.
      (2) Test, furnish, place, and install LLDPE geomembrane in the Cell 4 Expansion (within the Cell 2A final cover overlay) as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 05 19.16.
10. Geotextiles
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to test, furnish, place, and install geotextile cushion fabric (10 oz/sy) and geotextile filter fabric (4 oz/sy) as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 05 19.13.
11. Leachate Collection Piping, Cleanouts, & Appurtenances
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to furnish, place, and install Leachate Collection Piping, cleanouts, and appurtenances, including but not limited to, 8” HDPE standard dimension ratio (SDR) 11 solid pipe, 8” HDPE SDR 11 perforated pipe, pipe bedding, leachate cleanouts, and

appurtenances as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 33 00 00.

12. Covert GW-13 to Remote Gas Well
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to remove, salvage, and redirect Gas Well GW-013 as well as excavate, furnish, place, and install Remote Gas Well GW-013, including but not limited to, 6" HDPE SDR 17 solid pipe, all fittings/appurtenances, salvaged remote gas wellhead, gas lateral cleanout, and concrete block as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 33 00 00.
13. LFG Piping, Cleanouts, Wellheads, & Appurtenances, GCCS Modifications, and GCCS Expansion
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to:
        (1) remove, salvage, reuse and/or store onsite, including but not limited to, GCCS 8" HDPE SDR 17 arctic pipe, 4" HDPE SDR 17 arctic pipe, pipe supports, and all fittings/appurtenances
        (2) furnish, place, and install gas collection piping, cleanouts, wellheads, and appurtenances, including but not limited to, 6" HDPE SDR 11 solid pipe, 6" HDPE SDR 11 perforated pipe, cleanouts, gas lateral wellheads, 8" HDPE SDR 17 arctic pipe, pipe supports, all fittings/appurtenances, and protective bollards.
    c. Work to be completed as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 33 00 00.
14. Granular Drainage Material (Install Owner Provided Material)
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to haul, place, and provide in-place quality control testing of Owner provided granular drainage material as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 23 17.
15. Leak Location Survey
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to perform a leak location survey as well as repair any identified leaks as specified in the Project Specifications, including SECTION 31 05 19.17.
16. Landfill Limit Markers
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, materials, and equipment required to furnish and install landfill limit marker posts as shown in the Contract Drawings and as specified in the Project Specifications.
17. Erosion and Sediment Control
    a. No measurement shall apply to the lump sum price.

b. Payment shall be full pay for all labor, tools, materials, and equipment required to furnish and place topsoil, seed, mulch, silt fence, stabilized construction exit, and other erosion and sedimentation control best management practices as shown in the Contract Drawings, as specified in the Project Specifications, and/or as required to comply with any local, state, and federal regulations.

18. New Access Road Construction
    a. No measurement shall apply to the lump sum price.
    b. Payment shall be full pay for all labor, tools, material, and equipment required to prepare subgrade, install, grade, and compact Type 1 AkDOT woven geotextile and 12" crushed surfacing (AkDOT D-1 aggregate) as shown in the Contract Drawings and as specified in the Project Specifications, including SECTION 31 20 00.

C. Change Orders and Payment Procedures: Stated in the Owner's General Conditions of The Contract for Construction.

1.10 LIST OF DRAWINGS:

A. Contract Drawings:
   1. Each sheet of the Contract Drawings bears the following general title: Cell 4 Expansion Construction.
   2. Individual sheet numbers and titles are as stated on index sheet under "Contract Drawings".

1.11 CONTRACTOR'S WORK PROGRESS

A. If Contractor's actual progress fails to meet that required for completion, Contractor shall increase its work force, equipment, and efforts as required to bring actual progress of the Work into the conformance with planned progress at no additional cost to Owner.

1.12 CONSTRUCTION AND BORROW AREA LIMITS

A. Contractor shall restrict Contractor's operations and storage of materials and equipment to within the construction limits shown on the Contract Drawings unless otherwise approved by Owner. When limits are not shown, Owner or Engineer will define the construction limits in the field when owner believes it is appropriate or upon the reasonable request of Contractor. Contractor shall restore all disturbed areas according to SECTION 32 92 00.

1.13 LINES AND GRADES

A. Owner will provide Contractor with only control point and benchmark information necessary for the construction of the Work. It is Contractor's responsibility to protect the information. The control points and benchmarks are noted on the Contract Drawings. No further information will be provided by the Owner. The Contractor is responsible for establishing additional control for their use. In the event the alignment and grade information is destroyed by Contractor, Owner reserves the right to withhold from payments due to Contractor the reasonable costs involved in resupplying the information.

B. AutoCAD files for the project are available upon request. The Contractor assumes all liability when using the Engineer provided files and any discrepancies shall not be cause for change order(s) on the project.
C. Contractor shall provide all construction survey and layout staking and quality control survey as described in SECTION 01 71 23. Contractor shall retain an independent registered land surveyor licensed in the State of Alaska to complete all construction survey and layout staking.
D. If Contractor covers subgrade, geosynthetics, pipe, and appurtenances before the necessary Quality Control has been performed, Contractor, at Engineer Representative's request, shall uncover, expose, or otherwise make available for observation, inspection, surveying or testing as Engineer's Representative may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. Unless Contractor has given timely notice to Engineer's Representative of intent to cover work and Engineer's Representative fails to act, Contractor shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction.

1.14 STREETS AND HIGHWAYS

A. Contractor shall obtain any permits necessary to haul materials or equipment on public streets and highways. There may be specific restrictions on regional roads during the construction period.
B. Contractor shall be responsible for repair of all streets, highways, and private roads that are damaged by Contractor's operations.
C. Contractor shall provide all traffic control warning devices and procedures required by Owner, Engineer, or other agency or governmental body with jurisdiction over adjacent roadways.
D. Contractor shall provide dust control as necessary at borrow sources, along haul routes, and at the Landfill to minimize public impact and to provide safe travel for others along haul routes.
E. Contractor shall clean all haul routes of materials which have spilled or tracked from Contractor's equipment. At the request of the Owner or Engineer, Contractor shall promptly sweep streets. If streets are not swept within 24 hours, the Owner shall hire a separate subcontractor to sweep the streets. The Contractor shall be responsible for all associated costs.

1.15 PROPERTY DAMAGE

A. Except where covered elsewhere in this Specification, and to the extent of Contractor's liability, Contractor shall restore damaged property to a condition equal to or better than that existing before the damage was done, by repairing, rebuilding, or replacing it as directed, or Contractor shall otherwise make good the damage in an acceptable manner. Contractor shall assume full responsibility for all damages to property of any character, resulting from any act, omission, neglect, or misconduct in the execution or non-execution of the Work.

PART 2 - PRODUCTS - NOT APPLICABLE.

PART 3 - EXECUTION – NOT APPLICABLE.

END OF SECTION 01 11 00

SECTION 01 31 00 - PROJECT MEETINGS, SCHEDULES, AND REPORTS

PART 1 - GENERAL

1.01 SUMMARY: This Section includes the administrative and procedural requirements:

A. Project Meetings:
   1. Preconstruction conference.
   2. Coordination schedules.
   3. Progress meetings.

B. Schedules and Reports:
   1. Initial coordination schedules.
   2. Construction progress schedule.
   3. Procurement schedule.
   4. Construction progress reports.
   5. Schedule of values.
   6. Special Reports.

C. Related Work Specified Elsewhere:
   1. For Submittal Requirements: SECTION 01 33 00.

1.02 COORDINATION:

A. The Contractor shall coordinate the completion of their activities with work performed by the Owner, any other Contractors, and other entities, to facilitate proper installation and construction. This includes all requirements specified in each Section of the contract.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to allow optimum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.
   4. Where availability of space is limited, coordinate installation of different components to allow optimum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of others to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of construction progress schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of Submittals.

5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

1.03 PROJECT MEETINGS:

A. Preconstruction Conference:
   1. Engineer will conduct a virtual meeting within 20 days after the Effective Date of the AGREEMENT to review items stated in the following meeting agenda and to establish a working understanding between the parties as to their relationships during performance of the Work.
   2. Preconstruction conference shall be attended by:
      a. Contractor and Contractor's Superintendent.
      b. Engineer and Resident Project Representative (if any).
      c. Owner's representative(s).
      d. At Owner's option, representatives of principal Subcontractors and Suppliers.
   3. Meeting agenda:
      a. Introduction and designation of personnel representing the parties in the Contract.
      b. Construction schedules.
      c. Project coordination.
      d. Procedures and Processing of:
         (1) Field decisions.
         (2) Substitutions.
         (3) Submittals.
         (4) Change Orders.
         (5) Applications for Payment.
      e. Procedures for testing.
      f. Procedures for maintaining record documents.
      g. Use of Premises:
         (1) Office, work, and storage areas.
         (2) Owner's requirements.
      h. Construction facilities, controls, and construction aids.
      i. Temporary utilities.
      j. Safety and first-aid.
      k. Security
   4. Location of Meeting: Virtual and at or near the Project Site.
   5. Reporting:
      a. Within five working days after the meeting, Engineer will prepare and distribute minutes of the meeting to Owner and Contractor.
      b. Contractor shall provide copies to Subcontractors and major Suppliers.

B. Progress Meetings:
   1. Engineer may schedule and conduct meetings at the Project Site (or via virtual meeting / conference call) at least weekly and at other times requested by Engineer.

Representatives of the Owner, Engineer, and Contractor shall be present at each meeting. With Engineer's concurrence, Contractor may request attendance by representatives of Subcontractors, Suppliers, or other entities concerned with current program or involved with planning, coordination, or performance of future activities. All participants in the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. Contractor and each Subcontractor represented shall be prepared to discuss the current construction progress report and any anticipated future changes to the schedule. Each Subcontractor shall comment on the schedules of Contractor and other Subcontractors and advise if their current progress or anticipated activities are compatible with that Subcontractor's work.
3. If one Subcontractor is delaying another, Contractor shall issue such directions as are necessary to resolve the situation and promote construction progress.
4. Meeting agenda:
    a. Review of construction progress since previous meeting.
    b. Field observations, interface requirements, conflicts.
    c. Updated progress schedule review, including:
        (1) Identification of problems that may impeded planned schedule.
        (2) Corrective measures and procedures to regain planned schedule.
        (3) Effect of proposed changes on progress schedule and coordination.
        (4) Planned progress during succeeding work period (2-week outlook).
        (5) Coordination of projected progress.
    d. Review of submittals schedule and status of submittals.
    e. Review of delivery schedules.
    f. Maintenance of quality and work standards.
    g. Change Orders.
    h. Documentation of information for payment requests.
    i. Coordination with Owner operation.
    j. Safety issues relating to Work.
    k. Other business relating to Work.
5. Location of Meetings: At or near Project Site with virtual/call-in option.
6. Reporting:
    a. Within five working days after the meeting, Engineer will prepare and distribute minutes of the meeting to Owner and Contractor.
    b. Contractor shall distribute copies to principal Subcontractors and Suppliers.

C. Pre-installation Meetings:
1. Contractor shall conduct a preinstallation meeting at the Project Site at least one (1) day before each construction activity that requires coordination with other construction, specifically the installation of the geosynthetic materials.
2. Installer and representatives of manufacturers and fabricators, of products furnished by this Contract or by others, involved in or affected by the installation Work and its coordination or integration with other materials and installations, shall attend the meeting. Advise Engineer of scheduled meeting dates.

3. Review the progress of other construction activities and preparations for the particular activity under consideration at each preinstallation conference, including installation procedures and requirements for the following:
    a. Contract Documents.
    b. Options.
    c. Related Change Orders.
    d. Purchases.
    e. Deliveries.
    f. Shop Drawings, product data, and quality control Samples.
    g. Review of mockups.
    h. Possible conflicts.
    i. Compatibility problems.
    j. Time schedules.
    k. Weather limitations.
    l. Manufacturer's recommendations.
    m. Warranty requirements.
    n. Acceptability of substrates.
    o. Temporary facilities and controls.
    p. Space and access limitations.
    q. Governing regulations.
    r. Safety.
    s. Inspecting and testing requirements.
    t. Required performance results.
    u. Recording requirements.
    v. Protection of construction, personnel, and adjacent work.
    w. Acceptance of previous work prior to installation.
    x. Coordination with Owner operation.
4. Record significant discussions and agreements and disagreements of each conference. Distribute the minutes of the meeting within seven (7) working days after the meeting to everyone concerned, including Owner and Engineer.
    a. Do not proceed with the installation if disagreements arise during the conference which cannot be successfully resolved at the time. Contractor shall take actions necessary to resolve impediments to performance of Work and reconvene the conference at the earliest feasible date.

1.04 SCHEDULES AND REPORTS:

A. Initial Coordination Schedules:
    1. Within ten days after the Effective Date of AGREEMENT, Contractor shall submit to Engineer for review and acceptance.
        a. A preliminary construction progress schedule. The schedule shall show the Work in a horizontal bar chart or other graphic format and indicate the times (number of days or dates) for starting and completing the various stages of the Work including any milestones specified in the Contract Documents.

b. A procurement schedule of Equipment and Materials.
c. A schedule of values for partial pay purposes.
d. A schedule of Submittals, as stated in SECTION 01 33 00.

B. Construction Progress Schedule:
1. After submittal of preliminary construction progress schedule as stated above, submit a detailed construction progress schedule within 30 days after the Effective Date of Agreement. Base the schedule on the preliminary construction progress schedule and incorporate review comments and other feedback. Submit to Engineer for review and acceptance.
2. The schedule shall show the Work in a horizontal bar chart or other graphic format suitable for displaying scheduled and actual progress.
a. The schedule shall indicate phase of the Work, starting date, major milestones, and dates of Substantial Completion and final completion.
b. Breakdown Work phases into separate time bar for each significant construction activity entry, with dates Work is expected to begin and to be completed. Within each time bar, indicate estimated completion percentage in 10% increments.
c. Scale and spacing shall allow room for notations and revisions.
d. Sheet size: Minimum 11 x 17 inches.
3. Provide sub schedules to define in more detail critical portions of schedules, including inspections and tests.
4. Coordinate construction progress schedule with schedule of values, submittal schedule, procurement schedule, progress reports, and payment requests.
5. Engineer will review and comment on construction progress schedule and, upon agreement between Engineer and Contractor on necessary changes:
a. Contractor shall submit electronic copies of the accepted schedule to Engineer. Contractor shall distribute additional copies for Subcontractors and other parties required to comply with scheduled dates, one copy to each party.
6. Revise the construction progress schedule after each meeting, event, or activity where revisions have been recognized and accepted in accordance with the GENERAL CONDITIONS.
7. Update and submit electronic copies to Engineer of the revised schedule at least once each month. Include with construction progress report.

C. Procurement Schedule:
1. After submittal of preliminary procurement schedule as stated above under “Initial Coordination Schedules”, submit a detailed schedule for procurement of Equipment and Materials to be furnished by Contractor, Subcontractors, manufacturers, and Suppliers. Do not include minor items which are known to be regularly stocked by local suppliers or readily available upon short notice. Submit to Engineer for review with the construction progress schedule.
2. Engineer will review and comment on the schedule for procurement, and upon agreement with Contractor concerning any necessary revisions, the schedule will be accepted.

3. Procurement schedule shall coincide with the construction progress schedule, the Submittal schedule, and shall indicate the date each item will be needed at the Site and the time required for delivery after order is placed.
4. Update the accepted schedule for procurement at least once each month to show the status of orders placed, Submittals, and delivery. Submit with the construction progress report.
5. If requested by Engineer, submit copies of purchase orders placed by Contractor or Subcontractors.

D. Construction Progress Reports:
1. Submit a report on actual construction progress on a monthly basis. More frequent reports may be required should the Work fall behind the accepted schedule.
   a. Submit a weekly report to coordinate with and supplement the monthly construction progress report and which details Work scheduled for the following one-week interval, including:
      (1) Work activities which will occur.
      (2) Number and size of crews.
      (3) Construction equipment on Site.
      (4) Major items of Equipment and Material to be installed.
   b. Submitted to Engineer via electronic submittal.
2. Construction progress reports shall consist of the revised construction progress schedule and a narrative report which shall include but not be limited to the following:
   a. Comparison of actual progress to planned progress shown on originally accepted schedule.
   b. Summary of activities completed since the previous construction progress report.
   c. Identification of problem areas.
   d. A description of current and anticipated delaying factors, if any.
   e. Impact of possible delaying factors.
   f. Proposed corrective actions.
3. Submit a construction progress report to Engineer with each application for partial payment. Work reported complete but not readily apparent to Engineer must be substantiated with supporting data when requested by Engineer.
4. If a schedule update reveals that, through no fault of Owner, the Work is likely to be completed later than the Contract completion date, Contractor shall:
   a. Establish a plan for making up lost time.
      (1) Increase number of workers, or
      (2) Increase amount or kinds of tools, or
      (3) Work overtime or additional shifts, or
      (4) A combination of 2 or more of the above 3 actions.
   b. Submit plan to Owner and Engineer before implementing the plan.
   c. Take actions as necessary to get the Work back on schedule at no additional cost to Owner.

E. Schedule of Values:

1. Submit as set forth in GENERAL CONDITIONS, based on the preliminary schedule of values.
2. Coordinate preparation of schedule of values with preparation and content of construction progress schedule.
3. Content:
    a. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
    b. Follow the construction progress schedule breakdown of Work activities as format for listing component items and assigning values.
    c. For each major line item list subvalues of major products or operations under the item.
        (1) Each item shall include a directly proportional amount of the Contractor's overhead and profit.
        (2) For items on which progress payments will be requested for stored materials received, but not installed, break down the value into:
            (a) The cost of the materials, delivered and unloaded, including taxes paid unless taxes are exempted.
            (b) The total installed value.
    d. The sum of all values listed in the schedule shall equal the total Contract Price.

F. Special Reports:
1. When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, response by Contractor's personnel, an evaluation of the results or effects, and similar pertinent information. Advise the Owner in advance when such events are known or predictable.
2. Submit original report to Owner and electronic copy to Engineer.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable

END OF SECTION 01 31 00

SECTION 01 33 00 – SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes definitions, descriptions, transmittal, and review of Submittals.

1.02 RELATED REQUIREMENTS:

A. SECTION 01 31 00 – "Project Meetings, Schedules, and Reports."
B. SECTION 01 78 00 – "Contract Closeout."

1.03 GENERAL INFORMATION:

A. Definitions:
   1. Shop Drawings, product data, and Samples are technical Submittals prepared by Contractor, Subcontractor, manufacturer, or Supplier and submitted by Contractor to Engineer as a basis for approval of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance, or technical properties, as specified in each Division of the Specifications.
      a. Shop Drawings include custom-prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions, and similar information not in standard printed form applicable to other projects.
      b. Product data includes standard printed information on materials, products, and systems; not custom-prepared for this Project, other than the designation of selections from available choices.
      c. Samples include both fabricated and unfabricated physical examples of materials, products, and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis. Mock-ups are a special form of Samples which are too large to be handled in the specified manner for transmittal of Sample Submittals.
   2. Informational Submittals are those technical reports, administrative Submittals, certificates, and guarantees not defined as Shop Drawings, product data, or Samples.
      a. Technical reports include laboratory reports, tests, technical procedures, technical records, and Contractor's design analysis.
      b. Administrative Submittals are those nontechnical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, Bonds, Project photographs, physical work records, statements of applicability, copies of industry standards, Project record data, schedules, security/protection/safety data, and similar type Submittals.
      c. Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is called for in the Specifications.
   3. Refer to ARTICLES 1.03 and 1.04 of this Part for detailed lists of Submittals and specific requirements.
B. Quality Requirements:
   1. Submittals such as Shop Drawings and product data shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible. Drawings such as reproducibles shall be useable for further reproduction to yield legible hard copy.
   2. Documents submitted to Engineer that do not conform to specified requirements shall be subject to rejection by Engineer, and upon request by Engineer, Contractor shall resubmit conforming documents. If conforming Submittals cannot be obtained, such documents

shall be retraced, redrawn, or photographically restored as may be necessary to meet such requirements. Contractor's (or their Subcontractor's) failure to initially satisfy the legibility quality requirements will not relieve Contractor (or their Subcontractors) from meeting the required schedule for Submittals.

C. Language and Dimensions:
   1. All words and dimensional units shall be in the English language.
   2. Metric dimensional unit equivalents maybe stated in addition to the English units. However, English units of measurement shall prevail.

D. Submittal Completeness:
   1. Submittals shall be complete with respect to dimensions, design criteria, materials of construction, and other information specified to enable Engineer to review the information effectively.
   2. Where standard drawings are furnished which cover a number of variations of the general class of Equipment, each drawing shall be annotated to indicate exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks to indicate variations that do not apply to the Submittal. The use of "highlighting markers" will not be an acceptable means of annotating Submittals. Annotation shall also include proper identification of the Submittal permanently attached to the drawing.
   3. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings. Contractor may use a reproduction of Contract Drawings for erection drawings to indicate information on erection or to identify detail drawing references. Whenever the Drawings are revised to show this additional Contractor information, Engineer's title block shall be replaced with Contractor's title block, and Engineer's professional seal shall be removed from the drawing. Contractor shall revise these erection drawings for subsequent Engineer revisions to the Contract Drawings.

E. Form of Submittals:
   1. Submittals and other Project documents shall be transmitted in electronic format as specified.
      a. Selected Submittals may be provided in paper ("hardcopy") copies with advance approval of Engineer, and using procedures specified herein.
      b. Equipment instruction books and operating manuals shall be provided in paper copies in addition to specified electronic format.
   2. Electronic Format using Engineer's Document Management System:
      a. Scanned Submittals and documents are not acceptable. Transmit Submittal and Project documents in:
         (1) Nonproprietary, native electronic format incorporating any necessary reference files, or
         (2) Adobe *PDF files created directly from native electronic format, or
         (3) Engineer-approved equal.
         (4) Each file will be right reading and orientation the same for all consecutive resubmissions.
         (5) For any given Submittal, the filename and format shall be consistent for initial submission and subsequent revisions of the same. Use consistent naming convention throughout. Reference to revision or dates shall not be included in a filename.
         (6) Nonconforming Submittals are subject to rejection by Engineer.

b. Provide "as-constructed" Submittals, record documents, Equipment instruction books and operating manuals, and other documents in AutoCAD and Adobe *PDF format as required and approved by Owner.
c. Equipment instruction books and operating and maintenance manuals shall be in Adobe *PDF format combined in one pdf file for the complete O&M manual, or divided into pdf files that represent entire volumes (corresponding to hardcopy volumes). The pdf files shall be completely bookmarked with links within the index sheet to the different sections within the manuals/volumes, corresponding to the defined tabs within the hardcopy version.

3. Digital delivery media shall be Engineer's File Transfer Protocol (FTP) site(s). Upon approval from the ENGINEER, the submittals may alternatively be submitted electronically via email correspondence, provided all requirements in the Section are maintained.

1.04 TECHNICAL SUBMITTALS:

A. Items shall include, but not be limited to, the following:
1. Manufacturer's specifications.
2. Catalogs, or parts thereof, of manufactured Equipment.
3. Shop fabrication and erection drawings.
4. General outline drawings of Equipment showing overall dimensions, location of major components, weights, and location of required building openings and floor plates.
5. Detailed Equipment installation drawings, showing foundation details, anchor bolt sizes and locations, baseplate sizes, location of Owner's connections; and all clearances required for erection, operation, and disassembly for maintenance.
6. Schematic diagrams for electrical items, showing external connections, terminal block numbers, internal wiring diagrams and one-line diagrams.
7. Bills of material and spare parts list.
8. Instruction books and operating manuals.
9. Material lists or schedules.
10. Performance tests on Equipment by manufacturers.
11. Concrete mix design information.
12. All drawings, catalogs or parts thereof, manufacturer's specifications and data, Samples, instructions, and other information specified or necessary:
a. For Engineer to determine that Equipment and Materials conform to the design concept and comply with intent of the Contract Documents.
b. For proper erection, installation, operation, and maintenance of Equipment and Materials which Engineer will review for general content but not for basic details.
c. For Engineer to determine what supports, anchorages, structural details, connections, and services are required for Equipment and Materials, and effects on contiguous or related structures and Equipment and Materials.

B. Transmittal of Submittals:
1. All Submittals (Shop Drawings, product data, and Samples) for Equipment and Materials furnished by Contractor, Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor.
2. After checking and verifying all field measurements, transmit all Submittals to Engineer for approval as follows:
a. Submittal Information Block:

(1) Affix to all paper copies whether Submittal is prepared by Contractor, Subcontractor, or Supplier. Use transparent decal type Submittal Information Blocks for Shop Drawings and use gummed paper type for product data and Sample Submittals. All Submittal Information Blocks needed for this Contract will be furnished to Contractor at no charge at the initial coordination conference.

b. Mark each Submittal by Project name and number, Contract title and number, and applicable Specification Section and Article number. Include in the letter of transmittal the Drawing number and title, sheet number (if applicable), revision number, and electronic filename (if applicable). Unidentifiable Submittals will be returned for proper identification.

c. Check and approve Submittals of Subcontractors, Suppliers, and manufacturers prior to transmitting them to Engineer. Contractor's submission shall constitute a representation to Owner and Engineer that Contractor approves Submittals and has determined and verified all design criteria, quantities, dimensions, field construction and installation criteria, materials, catalog numbers, compliance with Laws and Regulations, and similar data, and Contractor assumes full responsibility for doing so; and Contractor has coordinated each Submittal with the requirements of the Work and the Contract Documents.

d. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from requirements of the Contract Documents.

e. Make all modifications noted or indicated by Engineer and return the required number of revised Submittals until approved. Direct specific attention in writing, or on revised Submittals, to changes other than the modifications called for by Engineer on previous Submittals. After paper copy Submittals have been approved, submit copies thereof for final distribution. Previously approved Submittals transmitted for final distribution will not be further reviewed and are not to be revised. If errors are discovered during manufacture or fabrication, correct the Submittal and resubmit for review.

f. Following completion of the Work and prior to final payment, furnish record documents and approved Samples and Shop Drawings necessary to indicate "as constructed" conditions, including field modifications, in the number of copies specified. Furnish additional copies for insertion in Equipment instruction books and operating manuals as required. All such copies shall be clearly marked "PROJECT RECORD."

(1) Submit a final record copy of the Master Field Drawing list which shall indicate the final revision status of each drawing on the list.

g. Keep a copy or sample of each Submittal in good order at the Site.

3. Quantity Requirements:

a. Except as otherwise specified, transmit all Shop Drawings in the following quantities:

(1) Initial Submittal:

(a) Electronic - One copy to Engineer. One copy to Owner.

(2) Resubmittals:

(a) Electronic - One copy to Engineer. One copy to Owner.

(3) Submittal for final distribution:

(a) Electronic - One copy to Engineer. One copy to Owner.

(4) As-constructed documents:

(a) Paper – Two copies to Engineer. Two copies to Owner

(b) Electronic - One copy to Engineer. One copy to Owner.

b. Transmit Submittals of product data as follows:
   (1) Initial Submittal:
      (a) Electronic - One copy to Engineer. One copy to Owner.
   (2) Resubmittals:
      (a) Electronic - One copy to Engineer. One copy to Owner.
   (3) Submittal for final distribution:
      (a) Electronic - One copy to Engineer. One copy to Owner.

c. Transmit Submittals of Material Samples, color charts, and similar items as follows:
   (1) Initial Submittal – Three to Engineer. One to Owner.
   (2) Resubmittal – Three to Engineer. One to Owner.
   (3) Upon approval, One Sample will be returned to Contractor.

d. Transmit Submittals of Equipment instruction books and operating manuals as follows:
   (1) Initial Submittal:
      (a) Electronic - One copy to Engineer. One copy to Owner.
   (2) Resubmittals:
      (a) Electronic - One copy to Engineer. One copy to Owner.
   (3) Submittal for Final Distribution – One paper copy to Engineer. Two paper copies to Owner at, upon Engineer's written authorization.

e. When all Submittals have been updated to "as-constructed" conditions, transmit to Engineer and to Owner in electronic format.

f. Owner may copy and use for internal operations and staff training purposes any and all document Submittals required by this Contract and approved for final distribution, whether or not such documents are copyrighted, at no additional cost to Owner. If permission to copy any such Submittal for the purposes stated is unreasonably withheld from Owner by Contractor or any Subcontractor, manufacturer, or Supplier, Contractor shall provide to Engineer 20 copies plus the number of copies required by Contractor at each final distribution issue.

4. Equipment erection drawings and other Submittals required for installation of Equipment furnished by others under separate contract for installation under this Contract will be transmitted to Contractor by Engineer in the final distribution of such Submittals.

5. Information to Manufacturer's District Office: Contractor shall arrange for manufacturers and Suppliers of Equipment and Materials to furnish copies of all agreements, drawings, specifications, operating instructions, correspondence, and other matters associated with this Contract to the manufacturer's district office servicing Owner. Insofar as practicable, all business matters relative to Equipment and Materials included in this Contract shall be conducted through such local district offices.

C. Engineer's Review:

1. Engineer will review and take appropriate action on Submittals in accordance with the accepted schedule of Submittals. Engineer's review and approval will be only to determine if the items of Equipment and Materials covered by the Submittals will, after installation or incorporation in the Work, conform to information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to design data reflected in Submittals which is peculiarly within the special expertise of Contractor or Contractor's Subcontractors or Suppliers. Review and approval of a component item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval of Shop Drawings, product data, or Samples will not relieve Contractor of responsibility for any deviation from requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission, and Engineer has given written concurrence in and approval of the specific deviation. Approval by Engineer shall not relieve Contractor from responsibility for errors or omissions in Submittals.

D. Submittal Action Stamp:

1. Engineer's review action stamp, appropriately completed, will appear on all Submittals of Contractor when returned by Engineer. Review status designations listed on Engineer's action stamp are defined as follows:

   A - SUBMITTAL APPROVED: Signifies Equipment or Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work. Contractor is to proceed with fabrication or procurement of the items and with related Work. Copies of the Submittal are to be transmitted to Engineer for final distribution.

   B - SUBMITTAL APPROVED AS NOTED (RESUBMIT): Signifies Equipment and Material represented by the Submittal conforms with the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work in accordance with Engineer's notations. Contractor is to proceed with fabrication or procurement of the items and with related Work in accordance with Engineer's notations and is to submit a revised Submittal responsive to notations marked on the returned Submittal or written in the letter of transmittal.

   C - SUBMITTAL RETURNED FOR REVISION (RESUBMIT): Signifies Equipment and Material represented by the Submittal appears to conform with the design concept and comply with the intent of the Contract Documents but information is either insufficient in detail or contains discrepancies which prevent Engineer from completing their review. Contractor is to resubmit revised information responsive to Engineer's annotations on the returned Submittal or written in the letter of transmittal. Fabrication or procurement of items represented by the Submittal and related Work is not to proceed until the Submittal is approved.

   D - SUBMITTAL NOT APPROVED (SUBMIT ANEW): Signifies Equipment and Material represented by the Submittal does not conform with the design concept or comply with the intent of the Contract Documents and is disapproved for use in the Work. Contractor is to provide Submittals responsive to the Contract Documents.

   E - PRELIMINARY SUBMITTAL: Signifies Submittals of such preliminary nature that a determination of conformance with the design concept or compliance with the intent of the Contract Documents must be deferred until additional information is furnished. Contractor is to submit such additional information to permit layout and related activities to proceed.

   F - FOR REFERENCE, NO APPROVAL REQUIRED: Signifies Submittals which are for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, bulletins and similar data, all of which are useful to Engineer or Owner in design, operation, or maintenance, but which by their nature do not constitute a basis

for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. Engineer reviews such Submittals for general content but not for basic details.

G - DISTRIBUTION COPY (PREVIOUSLY APPROVED): Signifies Submittals which have been previously approved and are being distributed to Contractor, Owner, Resident Project Representative, and others for coordination and construction purposes.

E. Instruction Books and Operating Manuals:
   1. In addition to electronic Submittals specified above, Equipment instruction books and operating manuals prepared by the manufacturer shall include the following:
      a. Index and tabs.
      b. Instructions for installation, start-up, operation, inspection, maintenance, parts lists and recommended spare parts, and data sheets showing model numbers.
      c. Applicable drawings.
      d. Warranties and guarantees.
      e. Address of nearest manufacturer-authorized service facility.
      f. All additional data specified.
   2. Information listed above shall be bound into hard-back binders three-ring type. Sheet size shall be 8-1/2 x 11 or folded 11-1/2 x 17. Binder color shall be white. Capacity shall be a minimum of 1-1/2 inches, but sufficient to contain and use sheets with ease.
      a. Provide the following accessories:
         (1) Label holder.
         (2) Business card holder.
         (3) Sheetlifters.
         (4) Horizontal pockets.
      b. The following information shall be imprinted, inserted, or affixed by label on the binder front cover:
         (1) Owner's name.
         (2) Owner's facility or plant name.
         (3) Equipment item name.
         (4) Volume number (if applicable).
         (5) Contract number.
         (6) Manufacturer's name and address.
      c. The following information shall be imprinted, inserted, or affixed by label on the binder spine:
         (1) Equipment item name.
         (2) Owner's name and Owner's facility or plant name.
         (3) Manufacturer's name.
         (4) Contract number.
         (5) Volume number (if applicable).
      d. Submit mockup of cover and spine for Engineer's review.
F. Samples:
   1. Office Samples shall be of sufficient size and quantity to clearly illustrate the following:
      a. Functional characteristics of the product, with integrally related parts and attachment devices.
      b. Full range of color, texture, and pattern.
      c. Material, manufacturer, pertinent catalog number, and intended use.

1.05 INFORMATIONAL SUBMITTALS:

A. Informational Submittals are comprised of technical reports, administrative Submittals, and guarantees which relate to the Work, but do not require Engineer approval prior to proceeding with the Work. Informational Submittals include:
   1. Welder qualification tests.
   2. Welding procedure qualification tests.
   3. Hydrostatic testing of pipes.
   4. Field test reports.
   5. Concrete cylinder test reports.
   6. ASME pressure vessel test reports.
   7. Certification on Materials:
      a. Steel mill tests.
      b. Roofing laboratory tests.
      c. Brick and concrete masonry unit laboratory tests.
      d. Paint laboratory tests.
      e. Metal paneling laboratory tests.
      f. Cement tests.
   8. Soil test reports.
   9. Air handling balancing reports.
   10. Temperature records.
   11. Piping stress analysis.
   12. Shipping or packing lists.
   13. Job progress schedules.
   14. Equipment and Material delivery schedules.
   15. Progress photographs.
   16. Warranties and guarantees.
   17. Fire protection and hydraulic calculations.
   18. Contractor's Health and Safety Plan

B. Transmittal of Informational Submittals:
   1. All informational Submittals furnished by Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor unless otherwise specified.
      a. Identify each informational Submittal by Project name and number, Contract title and number, and Specification Section and Article number marked thereon or in letter of transmittal. Unidentifiable Submittals will be returned for proper identification.
      b. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from requirements of the Contract Documents.
   2. Quantity Requirements:
      a. Technical reports and administrative Submittals except as otherwise specified:
         (1) Electronic: One to Engineer. One to Owner
      b. Written Certificates and Guarantees:
         (1) Paper: Two copies to Owner (only if original required).
         (2) Electronic: One to Engineer. One to Owner.
   3. Test Reports:
      a. Responsibilities of Contractor, Owner, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.

b. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute test reports as follows:
   (1) Owner: One copy.
   (2) Engineer: One copy.
   (3) Resident Project Representative: One copy.
   (4) Contractor: One copy.
   (5) Manufacturer or Supplier: One copy.

C. Engineer's Review:
   1. Engineer will review informational Submittals for indications of Work or Material deficiencies.
   2. Engineer will respond to Contractor on those informational Submittals which indicate Work or Material deficiency.

1.06 REQUIRED SUBMITTALS

A. Items requiring submittal are included on the Submittal List at the end of this Section. There may be additional submittals required not listed below. This list is provided for general submittal guidance.

Submittal List

Section	Article	Submittal Name
01 31 00	1.04	Initial Coordination Schedules, Construction Progress Schedule, Procurement Schedule, Construction Progress Reports, Schedule of Values, Special Reports
01 35 29	1.03B	HASP, Personnel Training Certificates
01 40 00	1.05	Contractor QA/QC Submittals
01 51 00	1.04	Temporary Facilities, Implementation and Termination Schedule
01 71 23	1.03	Surveying Submittals
01 75 00	1.03	System Report
01 78 00	1.02	Substantial Completion Documentation
01 78 00	1.03	Final Completion Documentation
01 78 00	1.04	Record Documents
01 78 00	1.06	Operations and Maintenance Data
02 82 00	1.03	Asbestos Abatement Submittals
31 05 19.13	1.03	Geotextile Submittals
31 05 19.16	1.03B	Geomembrane Pre-Installation Submittals
31 05 19.16	1.03C	Geomembrane Submittals During Installation
31 05 19.16	1.03D	Geomembrane Submittals After Installation
31 05 19.17	1.03	Leak Location Survey Work Plan and Report
31 05 19.23	1.05	GCL Pre- and Post-Installation Submittals

Submittal List

Section	Article	Submittal Name
31 20 00	1.03	Dewatering Plan, Materials Conformance Testing
31 23 17	1.03, 3.02	Granular Drainage Layer Submittals
31 23 33	1.03B	Trenching and Backfilling Submittals
31 25 00	1.04	Erosion Control Submittals
32 92 00	1.03	Vendor Certificates for Seed, Fertilizer, and Mulch
33 00 00	1.04	Utilities Submittals

PART 2 - EXECUTION - NOT APPLICABLE.

PART 3 - EXECUTION - NOT APPLICABLE.

END OF SECTION 01 33 00

SECTION 01 35 29 – SAFETY AND EMERGENCY RESPONSE

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section addresses special procedures and requirements that shall be followed for protection of health and safety of persons at the Project Site.

B. Health and safety requirements established in this Section are based on Site conditions anticipated from available Site data.

1. Procedures are intended for work activities including, but not limited to:
   a. Confined space entry.
   b. Excavation.
2. Procedures are subject to review and revision based on actual conditions encountered at the Site.

C. Construction activities at the Landfill may place Contractor's personnel, personnel of other Contractors hired by Owner to perform Work at site, and public in potentially hazardous situations due to exposure to refuse, contaminated groundwater and soil, leachate and landfill gases.

D. Contractor is responsible for implementation and enforcement of safe Work practices including, but not limited to, protection of personnel as appropriate from exposure to refuse, contaminated groundwater and soil, leachate, and landfill gases; use of trenching, sheeting, shoring, and scaffolding; materials handling and drilling; operation of equipment; and safety of public during progress of Work.

E. Before work at the site proceeds, all personnel involved in performing work activities shall read, understand, and sign the Site-specific health and safety plan (HASP) prepared by Contractor.

F. If Contractor encounters any suspected waste or contaminated soil while excavating according to SECTION 31 20 00, Contractor shall stop work and notify Owner. Contractor shall resume work after notice to proceed is given by Owner.

1.02 REFERENCES:

A. Applicable Regulations:

1. Code of Federal Regulations (CFR):
   a. Title 29, Part 1910 – Occupational Safety and Health Standards.
   b. Title 29, Part 1926 – Safety and Health Regulations for Construction.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 01.

B. Submittals shall include, but are not limited to:

1. Site health and safety plan (HASP).
2. Personnel certificates of 24-hour health and safety training.

1.04 SITE HEALTH AND SAFETY PLAN:

A. General: Contractor shall prepare and submit a Site Health and Safety Plan (HASP) for review by Engineer and Owner. Engineer and Owner will not provide approval of HASP. Submittal of Contractor's HASP shall neither impose on Engineer or Owner responsibility for adequacy of HASP nor relieve Contractor from full responsibility therefore. Engineer and Owner shall be notified in writing and consulted before any changes to HASP are implemented. Contractor shall include as a minimum the items described in the following paragraphs.

B. Key Personnel:
   1. Contractor's Health and Safety Representative (HSR) shall:
      a. Monitor workers' breathing zone and periodically at the Site for combustible gases.
      b. Oversee all operations at the Site.
      c. Maintain proper medical surveillance.
      d. Provide hazard communications to personnel at the Site.
      e. Train personnel in safe operating procedures.
      f. Advise Contractor on health and safety matters.
   2. The HASP shall name the HSR and an alternate, with necessary contact information.

C. Health Risk Analysis: Contractor shall analyze the health risks including, as a minimum, the following hazards which may be encountered at a sanitary landfill.
   1. Chemical exposure risks:
      a. Presence and concentration of hazardous substances.
      b. Health risks associated with substances.
   2. Oxygen deficient environment:
      a. Monitor vicinity of work activities.
      b. Use positive controls such as fans or other equipment that is intrinsically safe for action level conditions.
      c. Personnel evacuation if required.
   3. Potential for creating flammable or combustible atmosphere:
      a. Monitor for methane gas from bacterial action and hydrocarbon mixtures, other organic volatiles, and oxygen level.
      b. Use positive controls and personnel evacuation as required.
   4. Potential for hydrogen sulfide gas
      a. Monitor for hydrogen sulfide gas levels.
      b. Use positive controls and personnel evacuation as required.

D. Training Requirements:
   1. General: Contractor shall provide training for personnel, including supervisors, observers, and workers active on the Site who may possibly be exposed to contaminated material or other potential hazards associated with construction or remediation work. Training in safety precautions, procedures, and personal protective equipment shall comply with, but not be limited to:
      a. 29CFR 1910.1200 – Hazard communication.
      b. 29CFR 1926 Subpart D – Excavations.
   2. Safety training shall be 24-hour minimum.

3. Health and Safety Training: Prior to commencement of work activities, health and safety training shall be conducted by the HSR to review pertinent sections of the HASP.
    a. All workers shall attend.
    b. Personnel not attending shall be given a similar pre-work orientation individually or in groups by the HSR.
    c. If a significant change in on-Site operations occurs during work activities, another Site-specific training session shall be given.
    d. A record of training and attendance shall be provided in the Project Safety log.
4. Training Certification: Contractor shall submit copies of current training certifications for all Project personnel to Owner prior to entry onto the Work Site.

E. Personal Protective Equipment:
1. Contractor shall include in HASP all personal protective equipment (PPE) anticipated for use on Site according to level of protection indicated by health risk analysis.
2. Level D shall be the minimum level of protection set for Site operations.
3. Additional safety equipment needed to perform work safely shall be determined by the Contractor and shall be included in the bid costs.

F. Air Monitoring:
1. Contractor shall conduct air monitoring on Site for protection of personnel from hazardous environment or explosive conditions.
2. Include procedures and protocol for air monitoring in HASP.
3. Document proposed equipment and calibration requirements in HASP.

B. Site Security and Control:
1. Include procedures for Site security and control in HASP.

C. Contingency Plan:
1. HASP shall include a contingency plan for health and safety emergencies.
2. A copy of the contingency plan shall remain on-Site, signed by and available for review by all personnel.

D. Standard Operating Procedures:
1. Contractor shall be familiar with and include in HASP Owner's standard operating procedures (SOP) relevant to work activities performed on Site.

PART 2 - PRODUCTS

2.01 PERSONAL PROTECTIVE EQUIPMENT:

A. Level of Protection. Contractor shall include in HASP all personal protective equipment (PPE) anticipated for use on Site.

B. Level D Protection: Work activities shall begin with Level D protection unless Contractor's preconstruction investigations require additional protective equipment. Level D protection shall consist of:
1. Work uniform.
2. Work boots with steel toe and steel shank.
3. Hard hat, as identified in HASP.
4. High visibility vest.

2.02 COMBUSTABLE GAS INDICATORS:

A. Contractor shall provide a combustible gas indicator (CGI) to measure the lower explosive limit (LEL) of any potentially explosive or flammable gas and the amount (percent) of oxygen in the air. Contractor shall provide a hydrogen sulfide analyzer to measure any hydrogen sulfide gas potentially present.
   1. Set alarm on CGI at 10% of LEL or as required by applicable jurisdictional requirements, which may supersede the information provided herein if more restrictive.
   2. Set hydrogen sulfide alarms as follows:
      a. Set alarm to 10 ppm.

PART 3 - EXECUTION

3.01 AIR MONITORING:

A. Environmental Air Monitoring: All work areas shall be monitored for oxygen and toxic level of contaminants continuously when workers are present.
   1. Comply with action level requirements.
   2. Resolution of hazardous situation may require forced ventilation of workspace.

B. Personnel Air Monitoring: When personnel are working near excavations, Contractor shall implement routine personnel air surveillance for presence of organic vapors, oxygen level, and lower explosive limit (LEL). Air monitoring shall be continuous whenever the presence of hazardous air contaminants at the Site are indicated.

C. Action Levels: The action levels given below are (1) those which are maintained for 10 seconds, or for rapidly fluctuating levels, and (2) the average readings observed over 10 seconds. Applicable jurisdictional requirements may supersede the information provided herein if more restrictive.
   1. Oxygen Monitoring:
      a. 19.5 to 22% Oxygen: Normal operations continue monitoring.
      b. Less than 19.5% Oxygen: Level B PPE (supplied air).
      c. Less than 16.0% Oxygen: Entry prohibited, shut down operations and ventilate area.
      d. Greater than 22% Oxygen: Shut down operations and ventilate area.
   2. Lower Explosive Limit (LEL) Monitoring:
      a. Less than 20% LEL: Normal operations, continue monitoring.
      b. More than or equal 20% LEL: Shut down operations and ventilate area.
   3. Restrictions: Oxygen levels shall be checked before conducting air monitoring for LEL. If oxygen levels are below 16%, LEL readings maybe inaccurate.
      a. LEL monitoring shall not be performed unless oxygen levels exceed 16%.
      b. Oxygen levels shall be raised, when necessary, only by ventilating the area, not by introduction of compressed oxygen.
   4. Hydrogen sulfide monitoring.
      a. Greater than instantaneous 10 ppm: Shut down operations and ventilate area.

3.02 SITE SECURITY AND CONTROL:

E. All supervisors and/or personnel entering the site for the first time in a day to perform work on this project shall first check in at the scale house in order to notify Owner of presence onsite.

3.03 CONTINGENCY PLAN:

A. The following part of the HASP shall be posted in Site construction office trailers, kept in all Site vehicles, and provided to supervisory personnel on Site.

1. Emergency Action – Standard Operating Procedures:
    a. Name, address, and telephone number of the nearest medical treatment facility shall be conspicuously posted. A map and direction for locating the facility, plus the travel time, shall be readily available.
    b. If the facility lacks toxicological capability, arrangements shall be made for consultant services.
    c. Arrangements to quickly obtain ambulance, emergency, fire, and police services. Telephone numbers and procedures for obtaining these services shall be conspicuously posted.
    d. Prior to mobilization at the Site, personal contact shall be made with emergency room personnel, the poison control center, and the local fire department and police. If outside of an established town, contact shall be made with county officials and local emergency services.
    e. An eye wash kit and first aid equipment shall be readily available on Site. Personnel shall have first aid and medical emergency training.
    f. Sufficient water and/or dry chemical fire extinguisher and neutralizing agents shall be maintained on Site to cope with any situation until emergency services can arrive.
2. Medical Emergencies:
    a. For any person who becomes ill or injured on Site and the injury or illness is minor, administer first aid then transport to medical facility for further treatment. If the patient's condition is serious, administer first aid while awaiting ambulance or paramedics.
3. First Aid Measures: If exposure/symptoms occur to personnel on Site, use the following procedures:
    a. Petroleum Products:
        (1) Eye Contact: Flush eye immediately with copious amount of water; repeat until irritation is eliminated. If prolonged irritation occurs for more than 15 minutes, seek medical attention.
        (2) Skin Contact: Wash exposed area with soap and water. If dermatitis or severe reddening occurs, seek medical attention.
        (3) Inhalation: Move person to fresh air. If symptom occurs for more than 15 minutes, seek medical attention.
        (4) Ingestion: Do not induce vomiting, seek immediate medical attention.
4. Site-Specific Information: The following shall be provided on a Site-specific basis:
    a. Nearest Hospital:
        (1) Name.

(2) Address.
(3) Phone number.
(4) Directions from the Site (map attached).

b. Nearest Fire Department:
(1) Phone number.

c. Facility Contact:
(1) Phone number.

d. Other emergency contacts.

5. Flammable Conditions:
a. In the event that combustible vapors are greater than 25% but less than 20% of the LEL in the work area, the following steps shall be taken:
(1) Eliminate all ignition sources.
(2) Use intrinsically safe fan(s) to ventilate the work area.

END OF SECTION 01 35 29

SECTION 01 40 00 – CONTRACTOR QA/QC

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality assurance and quality control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.02 RELATED REQUIREMENTS:

A. For developing a schedule of required tests and inspections: SECTION 01 32 00 – "Construction Progress Schedules and Reports."

B. For specific test and inspection requirements: DIVISIONS 31 through 33 sections.

1.03 REFERENCE STANDARDS:

A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

B. ASTM International (ASTM):

1. E548 - Guide for General Criteria Used for Evaluating Laboratory Competence.

C. Code of Federal Regulations (CFR):

1. 29 CFR 1910, Subpart A, Section 1910.7 - Definition and Requirements for a Nationally Recognized Testing Laboratory (NRTL).

1.04 DEFINITIONS:

A. Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual Equipment and Materials incorporated into the Work and completed construction comply with requirements. Services do not include Contract enforcement activities performed by Engineer.

C. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before Equipment and Materials are incorporated into the Work to verify performance or compliance with specified criteria.
D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
E. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
F. Field Quality Control Testing: Tests and inspections that are performed on Site for installation of the Work and for completed Work, i.e., soil compaction, concrete strength, and weld radiographs.
G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.05 SUBMITTALS:

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
    1. Specification Section number and title.
    2. Description of test and inspection.
    3. Identification of applicable standards.
    4. Identification of test and inspection methods.
    5. Number of tests and inspections required.
    6. Time schedule or time span for tests and inspections.
    7. Entity responsible for performing tests and inspections.
    8. Requirements for obtaining samples.
    9. Unique characteristics of each quality control service.
C. Reports: Arrange for testing agency/laboratory to prepare and submit certified written reports that include the following:
    1. Date of issue.
    2. Project title and number.
    3. Name, address, and telephone number of testing agency.
    4. Dates and locations of samples and tests or inspections.
    5. Names of individuals making tests and inspections.
    6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.06 QUALITY ASSURANCE:

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing Equipment or systems or Material similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing Equipment and Material similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, Equipment, or Material that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP).

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's Equipment, Material, or systems that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.
      b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
      c. When testing is complete, remove test specimens; do not reuse products on Project.
   2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.07 QUALITY CONTROL:

A. Contractor shall maintain a foreman onsite throughout the entire Project as long as there is a presence of any subcontractors onsite completing Work.

B. Contractor shall complete construction activities in accordance with the Project Manual.

C. Contractor shall maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

D. Contractor shall have previous HDPE pipe experience of at least two years.

E. Testing and Inspections:
   1. Owner Responsibilities: Where quality control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
      a. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
      b. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
      c. Costs for retesting and re-inspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.
   2. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality control services specified and those required by authorities having jurisdiction. Perform quality control services required of Contractor by authorities having jurisdiction, whether specified or not.
      a. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality control services. Testing agency shall be acceptable to Engineer and Owner.

b. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality control services are indicated as Contractor's responsibility, submit a certified written report, in 2 copies, of each quality control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

F. Manufacturer’s Instructions:
1. Comply with manufacturer’s instructions in full detail, including each step in sequence.
2. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

G. Manufacturer’s Certificates:
1. When required by individual specifications section, submit manufacturer’s certificate, in duplicate, that products meet or exceed specified requirements.

H. Manufacturer's Field Services:
1. Where indicated or specified in respective Equipment specifications, provide services of an experienced, competent, factory-authorized representative of the manufacturer of each item of Equipment.
2. Arrange for Field Services representative to visit the Site of the Work and inspect, check, adjust as necessary, and approve the Equipment installation, including service connections. Field Services representative shall be represent when Equipment is started up and placed into operation, and shall revisit the Site as often as necessary until problems are corrected, and Equipment installation and operation are acceptable to Engineer and Owner.
3. Submit to Engineer the Field Services representative's completed record forms as required and written report certifying that the Equipment has been properly installed and lubricated; is in accurate alignment; is free from undue stress imposed by connecting piping or anchor bolts; and has been successfully operated under expected full load conditions.

I. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

J. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

K. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project Site.

L. Coordination: Coordinate sequence of activities to accommodate required quality assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

M. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality control services required by the Contract Documents. Submit schedule within 30 days of date established in the Notice to Proceed.
1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS - NOT APPLICABLE.

PART 3 - EXECUTION

3.01 TEST AND INSPECTION LOG:

A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Engineer.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project Site. Post changes and modifications as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.02 REPAIR AND PROTECTION:

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00 – DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.01 SUMMARY:

A. Definitions:

1. Basic contract definitions used in the Contract Documents are defined in the Owner's General Conditions of the Contract for Construction. Definitions and explanations are not necessarily either complete or exclusive, but are general for the Work.
2. General Requirements are the provisions or requirements of DIVISION 01 Sections, and which apply to the entire Work of the Contract.

1.02 RELATED REQUIREMENTS:

A. Specification standards and associations applicable to the Work are specified in each Section.

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATIONS:

A. Specification Format: The Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's (CSI) Section Format and MasterFormat numbering system. Some portions may not fully comply, and no particular significance will be attached to such compliance or noncompliance.

1. Divisions and Sections: For convenience, a basic unit of Specification text is a "Section," each unit of which is numbered and named. These are organized with related Sections, into "Divisions," which are recognized as the present industry consensus on uniform organization and sequencing of Specifications. The Section title is not intended to limit meaning or content of Section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of text.
2. Section Numbering: Used for identification and to facilitate cross-references in Contract Documents. Sections are placed in numeric sequence; however, numbering sequence is not complete, and listing of Sections in Table of Contents at beginning of the Project Manual must be consulted to determine numbers and names of Specification Sections in these Contract Documents.
3. Page Numbering: Numbered independently for each Section. Section number is shown with page number at bottom of each page, to facilitate location of text.
4. Parts: Each Section of Specifications generally has been subdivided into three basic "parts" for uniformity and convenience (PART 1 - GENERAL, PART 2 - PRODUCTS, and PART 3 - EXECUTION). These "Parts" do not limit the meaning of text within. Some Sections may not contain all three "Parts" when some are not applicable, or may contain more than three "Parts" to add clarity to organization of Section.
5. Underscoring of Titles: Used strictly to assist reader of Specification in scanning text for key words in content. No emphasis on or relative importance is intended except where underscoring may be used in body of text to emphasize a duty, critical requirement, or similar situation.
6. Project Identification: Project file number and identification are recorded at bottom of each page of Specifications to minimize possible misuse of Specifications, or confusion with other Project Specifications.

B. Specification Content:
   1. These Specifications apply certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
      a. Imperative and Streamlined Language: These Specifications are written in imperative and abbreviated form. This imperative language of the technical Sections is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall," "the Contractor shall," and "shall be," and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated imperatively or otherwise.
      b. Specifying Methods: The techniques or methods of specifying requirements varies throughout text, and may include "prescriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of Work has no bearing on requirements for another unit of Work.
      c. Overlapping and Conflicting Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, notify Engineer in writing for a decision, which Engineer will render in writing within a reasonable time.
      d. Abbreviations: Throughout the Contract Documents are abbreviations implying words and meanings which shall be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and in conjunction with coordination of Specification requirements with notations on Drawings and in schedules. These are normally defined at first instance of use. Organizational and association names and titles of general standards are also abbreviated.

C. Assignment of Specialists: In certain instances, Specification text requires that specific Work be assigned to specialists in the operations to be performed. These specialists shall be engaged for performance of those units of Work, and assignments are requirements over which Contractor has no choice or option. These assignments shall not be confused with, and are not intended to interfere with, enforcement of building codes and similar regulations governing the Work, local trade and union jurisdictions, and similar conventions. Nevertheless, final responsibility for fulfillment of Contract requirements remains with Contractor.

D. Trades: Except as otherwise specified or indicated, the use of titles such as "carpentry" in Specification text, implies neither that the Work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

1.04 DRAWING SYMBOLS:

A. Except as otherwise indicated, graphic symbols used on Drawings are those symbols recognized in the construction industry for purposes indicated. Refer instances of uncertainty to Engineer for clarification.

1.05 INDUSTRY STANDARDS:

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference and are stated in each Section.
   1. Referenced standards, referenced directly in Contract Documents or by governing regulations, have precedence over non-referenced standards which are recognized in industry for applicability to the Work.
   2. Where compliance with an industry standard is required, the latest standard in effect at time of opening Bids shall govern.
   3. Where an applicable code or standard has been revised and reissued after the effective date of the Contract and before performance of Work affected by the revision, Engineer will decide whether to issue a Change Order to proceed with the revised standard.
   4. In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to Engineer for a decision before proceeding.
   5. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
      a. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from the publication source.

B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

PART 2 - PRODUCTS - NOT APPLICABLE.

PART 3 - EXECUTION - NOT APPLICABLE.

END OF SECTION 01 42 00

SECTION 01 51 00 – TEMPORARY UTILITIES AND FACILITIES

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes requirements of a temporary nature not normally incorporated into final Work. It includes the following:
   1. Utility services.
   2. Construction and support facilities.
   3. Construction aids.
   4. Safety and health.
   5. Fire protection.

1.02 RELATED REQUIREMENTS:

A. SECTION 01 35 29 – Safety and Emergency Response
B. SECTION 01 57 00 – Temporary Barriers and Controls

1.03 REFERENCE STANDARDS:

A. American National Standards Association (ANSI):
   1. A10 Series - Safety Requirements for Construction and Demolition.
B. National Electrical Contractors Association (NECA):
   1. Electrical Design Library - Temporary Electrical Facilities.
C. National Fire Protection Association (NFPA):
   1. 10 - Portable Fire Extinguishers.
   2. 70 - National Electrical Code.
   3. 241 - Safeguarding Construction, Alterations, and Demolition Operations.
D. National Electrical Manufacturers Association (NEMA).
E. Underwriters Laboratories (UL).

1.04 SUBMITTALS:

A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.
B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work.

1.05 QUALITY ASSURANCE:

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
   1. Building Code requirements.
   2. Health and safety regulations.
   3. Utility company regulations.
   4. Police, Fire Department, and rescue squad rules.
   5. Environmental protection regulations.
   6. Project permit requirements.

B. Standards:
   1. Comply with NFPA 10 and 241, and ANSI A10 Series standards "Temporary Electrical Facilities."
   2. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.06 PROJECT CONDITIONS:

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of the permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the Site.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT:

A. Provide new materials and equipment. If acceptable to Engineer, undamaged previously used materials and equipment in serviceable condition may be used. Provide materials and equipment suitable for the use intended, of capacity for required usage, and meeting applicable codes and standards. Comply with requirements of DIVISIONS 01 through 33.

B. Water: Provide potable water approved by local health authorities.

C. Water Hoses: Provide heavy-duty, abrasion-resistant, flexible rubber hoses with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

D. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

E. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

F. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixtures where exposed to moisture.

G. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

H. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-

rated, Class ABC, dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for the exposures. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.01 TEMPORARY UTILITIES:

A. General:

1. Furnish, install, and maintain temporary utilities required for adequate construction, safety, and security. Modify, relocate, and extend systems as Work progresses. Repair damage caused by installation or use of temporary facilities. Grade the areas of Site affected by temporary installations to required elevations and grades, and clean the area. Remove on completion of Work or until service or facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
2. The types of temporary construction utilities and facilities required include, but not by way of limitation, water distribution, drainage, dewatering equipment, enclosure of Work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and roads.
3. Inspect and test each service before placing temporary utilities in use. Arrange for required inspections and tests by governing authorities, and obtain required certifications and permits for use.
4. Materials used for temporary service shall not be used in the permanent system unless so specified or acceptable to Engineer.

B. Because of operational requirements, Owner may restrict or curtail Contractor's use of electric power, water, compressed air, and gas. If these utilities are critical to Contractor's operations and completion of the Contract on the agreed schedule, Contractor shall consider furnishing alternate sources for its own use. Restriction or curtailment of these utilities shall not be a basis for a claim against Owner or an extension of the agreed schedule.

3.02 TEMPORARY ELECTRICITY AND LIGHTING:[RH1][RH2]

A. New Service:

1. Arrange with utility company and provide service required for power and lighting or utilize portable power generators, as necessary.
2. Connect temporary service in a manner directed by utility company officials. Provide separate meter for metering of power used by all entities authorized to be at or perform Work at the Project Site.
3. The electric service shall be of sufficient capacity and characteristics for the various construction tools, machinery, lights, heating and air conditioning, pumps, and other tools required by Contractor and its Subcontractors.
4. Provide weatherproof, grounded, power distribution system sufficient to accommodate construction operations requiring power, use of power tools, electrical heating, and lighting. Provide overload protection. Locate multiple outlets spaced so that entire area of construction can be reached by power tools on a single extension cord of 100-foot

maximum length. Supply power for electric welding, if any, from either temporary power distribution system or by engine-driven, power-generator sets at Contractor's option.

5. Provide all necessary temporary wiring, panelboards, switches, outlets, and other devices so that power and lighting is available throughout the construction area. Include meters, transformers, overload protection disconnects, automatic ground fault interrupters, and main distribution switch gear. Include overcurrent protection on all conductors of the temporary system.
6. Provide adequate artificial lighting for all areas of Work when natural light is not adequate for Work.
    a. Sufficient light shall be provided for general construction areas and floor areas, with additional sufficient lighting for specific tasks and to meet safety requirements.

B. Use of Existing System:
1. Owner's existing system shall not be used for temporary electricity.

C. Costs of Installation and Operation:
1. Pay fees and charges for permits and applications.
2. Pay costs of installation, maintenance, removal of temporary services, and restoration of any permanent facilities used.
3. Pay costs of electrical power used.
4. Obtain and pay costs for temporary easements required across properties other than that of Owner.

3.03 TEMPORARY HEAT AND VENTILATION:

A. General:
1. Provide temporary heat, ventilation, and cooling as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage. Protect from adverse affects of low temperatures or high humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
2. Methods of heating and fuel shall be suitable for particular purposes. Portable heaters shall be standard approved units with controls.

B. Use of Existing Systems:
1. Existing systems shall not be used for temporary heating, cooling, or ventilating.

C. Costs of Installation and Operation:
1. Pay fees and charges for applications, permits, and inspections.
2. Pay costs of installation, operation, maintenance, removal of equipment, and restoration of existing or permanent facilities if used.
3. Pay cost of power and fuel used.

3.04 TEMPORARY WATER: NON-POTABLE

A. Provide and pay for water for Contractor's operations necessary for construction of the Project. Contractor operations shall not waste water.

B. If any bodies of water are utilized as a water source, observe all ordinances and regulations regarding protection and payment for these water sources. Contractor shall obtain all permits necessary for obtaining water.

C. Use of Existing System:
   1. Owner's existing system shall not be used for temporary water.

3.05 TEMPORARY GAS: NOT APPLICABLE

3.06 TEMPORARY SANITARY FACILITIES:

A. Contractor-Furnished Facilities:
   1. Furnish, install, and maintain temporary sanitary facilities for use through construction period. Remove on completion of Work.
   2. Provide for all construction workers under this Contract and representatives at the Site.
   3. Toilet facilities shall be of the chemical, aerated recirculation, or combustion type, properly vented, and fully enclosed with a glass- fiber-reinforced polyester shell or similar nonabsorbent material.
   4. Drinking Water Fixtures: Provide containerized tap-dispenser type drinking water units.
   5. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide appropriate covered waste containers for used material.
   6. Wash Facilities: Install potable water-supplied wash facilities at locations convenient to construction personnel involved in the handling of compounds and materials where wash-up is necessary to maintain a safe, healthy and sanitary condition. Where recommended or required by governing authorities and regulations or recognized standards provide emergency safety showers, emergency eye-wash fountains, showers, and similar facilities. Dispose of drainage properly. Supply soap and other cleaning compounds appropriate for each condition.

B. Use of Existing Facilities:
   1. Existing restrooms facilities shall not be used.

3.07 SEWERS AND DRAINAGE:

A. General: Where sewers or drainage facilities are not available for discharge of effluent, provide containers to remove and dispose of effluent off the Site in a lawful manner.

3.08 TEMPORARY CONSTRUCTION AIDS:

A. General:
   1. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.
   2. Materials may be new or used, must be suitable for the intended purpose, and meet the requirements of applicable codes, regulations, and standards.

3.09 TEMPORARY ENCLOSURES: NOT APPLICABLE[RH3]

3.10 TEMPORARY SAFETY AND HEALTH:

A. General: Contractor shall be solely responsible for initiating, maintaining, and supervising all safety and health precautions and programs in connection with the Work. Contractor shall take all necessary precautions for the safety of, and shall provide necessary protections to prevent injury or loss to, all employees on the Work and other persons and organizations who may be affected thereby.

3.11 TEMPORARY FIRE PROTECTION:

A. General:
   1. Contractor shall be responsible for development of a fire prevention and protection program for all Work under this Contract.
   2. The program shall comply with the applicable provisions for safety and protection specified in the Contract Documents and with applicable parts of the NFPA 10 and 241.
   3. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near such usable stairwell.
   4. Store combustible materials in containers in fire-safe locations.
   5. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
   6. Provide supervision of welding operations and similar sources of fire ignition.
   7. Post warning and instructions at each extinguisher location, and instruct construction personnel on proper use of extinguishers and other available facilities at Project Site. Post local fire department telephone number on or near each telephone instrument at Project Site.

3.12 INSTALLATION AND REMOVAL:

A. Relocation: Relocate construction aids as required by progress of construction, storage limitations, or Work requirements and to accommodate requirements of Owner and other contractors at the Site.

B. Removal: Remove temporary materials, equipment, and services when construction needs can be met and allowed by use of permanent construction, or at completion of the Project.

C. Repair: Clean and repair damage caused by installation or by use of temporary facilities.
   1. Remove foundations and underground installations for construction aids.
   2. Grade the areas of the Site affected by temporary installations to required elevations and clean the area.

END OF SECTION 01 51 00

SECTION 01 57 00 - TEMPORARY BARRIERS AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes General Requirements for:
   1. Safety and protection of Work.
   2. Safety and protection of existing property.
   3. Barriers.
   4. Security.
   5. Environmental controls.
   6. Access roads and parking areas.
   7. Traffic control and use of roadways.

1.02 RELATED REQUIREMENTS:

A. SECTION 01 10 00 - "Summary" for work restrictions and limitations.

PART 2 - PRODUCTS – NOT APPLICABLE

PART 3 - EXECUTION

3.01 SAFETY AND PROTECTION OF WORK AND PROPERTY:

A. General:
   1. Contractor shall be responsible for the protection of all existing site features (including but not limited to wells, probes, leachate and gas infrastructure, utilities, etc.). In the event that any existing site feature is damaged, Contractor shall be liable for repair at no cost to Owner.
   2. Provide for the safety and protection of the Work and of Materials and Equipment to be incorporated therein, whether in storage on or off the Site. Provide protection at all times against rain, wind, storms, frost, freezing, condensation, or heat so as to maintain all Work and Equipment and Materials free from injury or damage. At the end of each day, all new Work likely to be damaged shall be appropriately protected.
   3. Notify Engineer immediately at any time operations are stopped due to conditions which make it impossible to continue operations safely or to obtain proper results.
   4. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations, pits, trenches, and manholes free of water.

B. Protection of Installed Work:
   1. Protect installed Work and provide special protection where specified in individual specifications sections.
   2. Furnish temporary and removable protection for installed products. Control activity in immediate work area to minimize damage.
   3. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.
   4. Prohibit traffic from landscaped areas.

5. The Contractor will be liable for all costs associated with repair, replacement, and environmental remediation if the Engineer determines there has been damage caused by Contractor's operations.

C. Property Other than Owner's:
   1. Provide for the safety and protection of property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction. Report immediately to the owners thereof and promptly repair damage to existing facilities resulting from construction operations.
   2. Names and telephone numbers of representatives of agencies and utilities having jurisdiction over streets and utilities in the Work area can be obtained from Engineer for the agencies listed below. Concerned agencies or utilities shall be contacted a minimum of 24 hours prior to performing Work, closing streets and other traffic areas, or excavating near underground utilities or pole lines.
      a. Water.
      b. Gas.
      c. Sanitary sewers.
      d. Storm drains.
      e. Pipeline companies.
      f. Telephone.
      g. Electric.
      h. Municipal streets.
      i. State highways.
      j. County engineer.
      k. Fire.
      l. Police.
   3. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.
   4. Where fences are to be breached on private property, the owners thereof shall be contacted and arrangements made to ensure proper protection of any livestock or other property thus exposed.
   5. The applicable requirements specified for protection of the Work shall also apply to the protection of existing property of others.
   6. Before acceptance of the Work by Owner, restore all property affected by Contractor's operations to the original or better condition.

D. Access:
   1. Coordinate schedule of infrastructure installation in existing roadways, parking lots and other general use areas at the Site. Provide adequate barriers, signage, and personnel to inform Owner's staff and the Owner's customers of temporary routes and use areas to accommodate construction activities. Certain circumstances may require work outside of normal business hours.

3.02 BARRIERS:

A. General:

1. Furnish, install, and maintain suitable visible barriers as required to prevent public entry, protect the public, and to protect the Work, existing facilities, trees, and plants from construction operations. Remove when no longer needed or at completion of Work.
2. Materials may be new or used, suitable for the intended purpose, but shall not violate requirements of applicable codes and standards or regulatory agencies.
3. Barriers shall be of a neat and reasonable uniform appearance, adequate for the required purposes.
4. Maintain barriers in good repair and clean condition for adequate visibility. Relocate barriers as required by progress of Work.
5. Repair damage caused by installation and restore area to original or better condition. Clean the area.

3.03 SECURITY AND PROTECTION FACILITIES INSTALLATION:

A. Coordinate with Owner's Site security program.

B. All Site gates used by Contractor must be locked when Contractor is not onsite. Contractor shall prevent the public from entering the Site outside of normal hours.

3.04 ENVIRONMENTAL CONTROLS:

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Section 01 10 00 - "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1. Do not commence parts of Work until corresponding temporary drainage features and measures are in place to handle all forms of surface and subsurface drainage.
2. Provide methods to control surface water to prevent damage to the Project, the Site, or adjoining properties.
3. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
    a. Hold the areas of bare soil exposed at one time to a minimum.
    b. Provide temporary control measures such as berms, dikes, and drains.

c. Protect Site from puddling, ponding or running water.

4. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
5. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater. Dewater and dispose of water in a manner that will not cause injury to public or private property.
6. Treat and dispose of surface runoff water in a manner to prevent flooding, erosion, sedimentation, or other damage to any portion of the Site or to adjoining areas, and in a manner acceptable to authorities having jurisdiction.
7. Control surface water to prevent run-on into new liner areas and leachate collection system during construction of the Project.
8. Periodically inspect earthwork and protective measures to detect evidence of erosion and sedimentation. Promptly apply corrective measures.
9. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
10. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
11. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control:
1. Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
2. Provide methods to control surface water to prevent damage to the Project, the Site, or adjoining properties.
3. Provide temporary control measures such as berms, dikes, and drains.
4. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
5. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.
6. Provide temporary drainage where the roofing or similar waterproof deck construction is completed prior to the connection and operation of the permanent drainage piping system.

E. Control of Leachate:
1. Contractor shall be liable for all environmental remediation costs due to leachate contamination if the Owner determines there has been damage caused by the Contractor’s operations.

F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

G. Noise Control:
1. Provide methods, means and facilities to minimize noise from construction operations.

2. Contractor hours of operation may be limited to Landfill hours of operation if noise complaints are received.

H. Dust Control:
   1. Provide positive methods and apply dust control materials to minimize raising dust from construction operations; and to prevent airborne dust from dispersing into the atmosphere.
   2. Utilize watering trucks to dampen dry soil materials to control dust.
   3. Do not waste water.
   4. Contractor shall obtain permission from Owner prior to starting dust control activities.
   5. Dust control shall continue, if necessary, until such time as the Work areas have been restored. Owner reserves the right to require Contractor to provide more or less dust control.

I. Debris Control and Clean-Up:
   1. Keep the premises free at all times from accumulations of debris, waste materials, and rubbish caused by construction operations and employees. Responsibilities shall include:
      a. Adequate trash receptacles about the Site, emptied promptly when filled.
      b. Periodic cleanup to avoid hazards or interference with operations at the Site and to maintain the Site in a reasonably neat condition.
      c. Remove waste materials, debris, and rubbish from Work area periodically and dispose of in the Landfill, as directed by Owner/Operator, unless waste type is not accepted by the Landfill facility, in which case, Contractor shall dispose of materials, debris, or rubbish off-site where approved by law.
   2. Prohibit overloading of trucks to prevent spillages on access and haul routes. Provide periodic inspection of traffic areas to enforce requirements.
   3. Final cleanup is specified in Section 01 78 00 - CONTRACT CLOSEOUT.

J. Pollution Control:
   1. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of hazardous or toxic substances from construction operations.
   2. Provide equipment and personnel, perform emergency measures required to contain any spillages, and remove contaminated soils or liquids.
   3. Take special measures to prevent harmful substances from entering public waters, sanitary, or storm sewers.
   4. Water Pollution Control:
      a. Assure that sediment, debris, petroleum, chemicals, leachate, or other contaminants will not enter existing drainage facilities and channels. Use construction methods that will prevent entrance of pollutants and wastes into existing streams, rivers, lakes and flowing and dry watercourses.
      b. Obtain legal disposal sites and dispose of pollutants and wastes in a legal manner.
      c. Respond immediately to emergencies as directed when water quality of existing streams, rivers, lakes and flowing and dry watercourses is threatened. Take

corrective action to remove or contain pollutants until a permanent solution is determined.

5. Air Pollution Control: Equipment and vehicles that exhibit excessive exhausts emissions due to poor engine adjustments or inefficient operation will not be permitted to operate until corrective repairs or adjustments are made.

3.05 STAGING AREAS

A. Coordinate staging area location with Owner.
B. Store materials and equipment in the Contractor's staging area.

3.06 ACCESS ROADS AND PARKING AREAS:

A. Existing On-Site Roads:
   1. Designated existing on-Site roads may be used for construction traffic.
      a. Provide temporary additional roads as needed for required construction access.
      b. Maintain existing construction, and restore to original, better, or specified condition at completion of Work.
      c. Do not allow heavy vehicles or construction equipment in parking areas.

3.07 TRAFFIC CONTROL AND USE OF ROADWAYS:

A. Traffic Control:
   1. Provide, operate, and maintain equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at Site entrances, on-Site access roads, and parking areas. This includes traffic signals and signs, flagmen, flares, lights, barricades, and other devices or personnel as necessary to adequately protect the public.
   2. Submit a Traffic Control Plan to Engineer for review fourteen (14) working days in advance of any hauling operation.
   3. Provide for unimpeded access by emergency traffic, such as police, fire, and disaster units at all times. The Contractor will be liable for damages resulting from failure to provide such access.
   4. Remove temporary equipment and facilities when no longer required. Restore grounds to original, better, or specified condition when no longer required.
   5. Provide and maintain suitable detours or other temporary expedients if necessary.
   6. Bridge over open trenches where necessary to maintain traffic.
   7. Consult with governing authorities to establish public thoroughfares which will be used as haul routes and Site access. All operations shall meet the approval of owners or agencies having jurisdiction.
B. Maintenance of Roadways:
   1. Repair roads, walkways, and other traffic areas damaged by operations. Keep traffic areas as free as possible of excavated materials and maintain in a manner to eliminate dust, mud, and hazardous conditions.
   2. All operations and repairs shall meet the approval of owners or agencies having jurisdiction.

3.08 RAILROAD SERVICE: NOT APPLICABLE

END OF SECTION 01 57 00

SECTION 01 60 00 – EQUIPMENT AND MATERIALS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements governing Contractor's selection of products for use in the Project.

1.02 RELATED REQUIREMENTS:

A. The following Sections contain requirements that relate to this Section:
B. For the applicability of industry standards to products specified: DIVISIONS 1 through 33.
C. For submittal of Contractor's construction progress schedule and the Submittal schedule: SECTIONS 01 31 00 and 01 33 00.

1.03 DEFINITIONS:

A. Definitions used in this Article are not intended to change the meaning of other terms used in these Contract Documents, such as "specialties," "systems," "structures," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
    1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "Material," "Equipment," "system," and terms of similar intent.
        a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
    2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
    3. "Equipment" is a product with operational or nonoperational parts, whether motorized, or manually operated, that may require service connections, such as wiring or piping.

1.04 SUBMITTALS:

A. Submittals for products are specified in Section 01 33 00 and in applicable Sections of DIVISIONS 1 through 33.

1.05 QUALITY ASSURANCE:

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
    1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete Project requirements in a timely manner, consult with Engineer to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

C. Nameplates: Along with required labels and operating data, manufacturer or producer's nameplates, imprints, or trademarks may be placed on surfaces exposed to view.
   1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated Equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
      a. Name of product and manufacturer including address (and telephone number).
      b. Model and serial number.
      c. Capacity.
      d. Speed.
      e. Ratings.

D. Electronic Equipment Compliance:
   1. Contractor warrants that all equipment, devices, items, systems, software, hardware, or firmware provided shall properly, appropriately, and consistently function and accurately process date and time data (including without limitation: calculating, comparing, and sequencing). This warranty supersedes anything in the Specifications or other Contract Documents which might be construed inconsistently. This warranty is applicable whether the equipment, device, item, system, software, hardware, or firmware is specified with or without reference to a manufacturer's name, make, or model number.

1.06 TRANSPORTATION AND SHIPMENT:

A. Shipment Preparation:
   1. Contractor shall require manufacturers and Suppliers to prepare products for shipment in a manner to facilitate unloading and handling, and to protect against damage, deterioration, or unnecessary exposure to the elements in transit and storage. Provisions for protection shall include the following:
      a. Crates or other suitable packaging materials.
      b. Covers and other means to prevent corrosion, moisture damage, mechanical injury, and accumulation of dirt in motors, electrical equipment, and machinery.
      c. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel.
      d. Grease packing or oil lubrication in all bearings and similar items.

B. Marking: Each product item shall be tagged or marked as identified in the delivery schedule or on Submittals. Complete packing lists and bills of material shall be included with each shipment. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
   1. Schedule delivery to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Allow ample time to avoid delay of the Work.
   2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to the Site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. Inspect shipment to assure:
      a. Product complies with requirements of Contract Documents and reviewed Submittals.
      b. Quantities are correct.
      c. Containers and packages are intact and labels are legible.
      d. Products are properly protected and undamaged.
   5. Store products at the Site in a manner that will facilitate inspection and measurement of quantity or counting of units. Mark deliveries of component parts of Equipment to identify the Equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units.
   6. Store heavy Materials away from the Project structure in a manner that will not endanger the supporting construction.
   7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, and with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
   8. Protect motors, electrical Equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter.
   9. Protect exposed machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds.
   10. Protect bearings and similar items with grease packing or oil lubrication.
   11. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation.
   12. Provide equipment and personnel necessary to unload and handle products, by methods to prevent damage or soiling to products, or packaging.
   13. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points.
   14. Provide additional protection to surrounding surfaces as necessary to prevent damage.

B. Handling:

1. Provide equipment and personnel necessary to unload and handle products, by methods to prevent damage or soiling to products, or packaging.
2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points.
3. Provide additional protection to surrounding surfaces as necessary to prevent damage.

C. Maintenance of Storage:
1. Inspect stored products on a scheduled basis.
2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained.
3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.
4. For mechanical and electrical Equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service Equipment on a regularly scheduled basis.

D. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from subsequent construction operations. Remove coverings when no longer needed or as specified.

PART 2 - PRODUCTS

2.01 PRODUCT SELECTION:

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise specified or indicated, new at the time of installation.
1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Continued Availability: Where, because of the nature of its application, Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard products for which the manufacturer has published assurances that the products and its parts are likely to be available to Owner at a later date.
4. Conform to applicable Specifications, codes, standards, and regulatory agencies.
5. Comply with size, make, type, and quality specified, or as specifically approved in writing by Engineer.
6. Manufactured and Fabricated Products:
    a. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
    b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
    c. Equipment and Materials shall be suitable for service conditions intended.
    d. Equipment capacities, sizes, and dimensions indicated or specified shall be adhered to unless variations are specifically approved in writing by Engineer.

e. Provide labels and nameplates where required by regulatory agencies or to state identification and essential operating data.

7. Do not use products for any purpose other than that for which designed.
8. To the fullest extent possible, provide products of the same kind from a single source.

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS:

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place except as required for proper movement and performance, and accurately located and aligned with other Work.
   1. Obtain and distribute copies of manufacturer's printed instructions and recommendations if not a part of Submittals, containers, or packaging to parties involved in the installation, including a copy to Engineer and Resident Project Representative.
   2. Maintain one complete set of instructions at the Site during installation and until completion.
   3. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00

SECTION 01 71 23 – CONSTRUCTION LAYOUT AND SURVEYING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section describes Contractor's construction survey responsibilities.

1.02 RELATED REQUIREMENTS:

A. General Responsibilities: GENERAL CONDITIONS
B. Submittals: SECTION 01 33 00.
C. Site Preparation and Earthwork: SECTION 31 20 00
D. Utilities: SECTION 33 00 00.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 01.
B. Required Submittals include, but are not limited to:
    1. Name, address, and telephone number of surveyor, to be submitted prior to beginning survey work.
    2. All field notes required for determining progress pay estimates.
    3. Survey data and plan drawings required to verify constructed thicknesses of liner components.
    4. As-built surveying and drafting.

1.04 QUALITY ASSURANCE:

A. Surveyor Qualifications: Engage an independent land surveyor registered in the state of Alaska to perform required land surveying services.
B. Furnish competent personnel, equipment, tools, stakes, and other materials as required for properly staking out the Work.

PART 2 - PRODUCTS – NOT APPLICABLE.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. All Work shall be done to the lines, elevations, and grades indicated in the Contract Drawings. Contractor shall utilize global positioning system (GPS) technology for completion of work to ensure accuracy in grading and alignments.
B. Benchmark monuments and other control points for horizontal and vertical control shall be establish by Contractor, as necessary, prior to the start of construction activities.
C. All established monuments, benchmarks, reference points, stakes, and other control points shall be carefully preserved by Contractor:
    1. Promptly replace lost or destroyed Project control points at no additional cost to Owner.
    2. Furnish survey control points as required to complete construction activities.
    3. Contractor shall be responsible for any construction errors or loss of time resulting from loss or disturbance of control points.

D. Contractor shall notify Owner in writing of benchmarks, reference lines, or other control points which may have been disturbed or which appear to be off line or grade.

3.02 PERFORMANCE:

A. Contractor shall complete the layout of the Work from the control points and shall be responsible for all measurements that may be required for execution of the Work to the location and limits prescribed in the Contract Documents, subject to such modification as may be required to meet changed conditions in the Work.
B. Perform all surveys required for determining quantities for progress payment estimates.
C. The existence and location of Underground Facilities, utilities, and other construction indicated as existing are not guaranteed by Owner or Engineer. Before beginning Site work, investigate and verify the existence and location of Underground Facilities and other construction.
D. Locations shown on plans are approximate unless specific dimensions are indicated. Do not vary from specified dimensions. Immediately notify the Engineer of observed variations between dimensions on plans and actual conditions found at Site. Establish unspecified dimensions as necessary to conform to those dimensions specified on the Contract Drawings.

3.03 AS-BUILT SURVEYING AND DRAFTING

A. The Contractor shall provide all surveying necessary to record the construction of these facilities.
B. The Contractor shall provide all surveying necessary to accurately measure the pipe and all fittings installed.
C. The Contractor shall be responsible for verifying that features are being installed at the correct location and elevation, per the Contract Drawings.
D. Contractor shall provide real time measurements of the elevations as described below.
E. The Engineer will check the location and elevation of constructed features on an as-required basis.
F. Layout Tolerances.
    1. Subgrades General: plus 0.0 feet, minus 0.2-feet, minimum drainage slope to be maintained where shown on Contract Drawings.
    2. Sand Leveling Course: plus 0.2 feet, minus 0-feet (6-inch minimum).
    3. Granular Drainage Material: plus 0.25-feet, minus 0-feet (18-inch minimum)
    4. Inverts: ±0.10 ft.
    5. Northing and Eastings: ±0.25 feet.
G. Quality Control Surveys
    1. Contractor shall check their work during construction and notify Engineer of any deviations from Contract Drawings.
    2. Establish a uniform grid over the liner placement area not to exceed 50 feet between grid points and at all slope breaks.
        a. In addition, establish grid points, as a minimum, at the top, mid-point, and base of all side slopes within the liner placement area.
        b. In addition, any points or features as requested by Engineer.

3. Perform a survey and determine vertical elevations to the nearest 0.01 foot for the following surfaces (for Cell 4 Expansion construction, including Cell 2A final cover overlay):
    a. Top of the liner subgrade surface (not applicable to Cell 2A final cover overlay).
    b. Top of the sand leveling course layer.
    c. Top of the granular drainage material layer.
4. Submit surveys in a tabulated format that includes coordinate location, elevation, and point description for approval by Engineer. Surveyor shall include calculated depth of each layer in submittal.
    a. Engineer shall have 48 hours to review and confirm quality control surveys are within tolerance. Contractor may not proceed with subsequent liner construction without confirmation of quality control surveys.
5. Submit plan drawings indicating each grid point and the vertical elevations, so that verification of required thickness can be made.
    a. The plan drawings shall be sealed by a land surveyor registered in the state of Alaska.

H. Record Surveys:
1. Survey all geosynthetic material anchor trench locations at 25-foot maximum intervals (including where material breaks from the flat portion run-out to enter the trench and the back side of the trench).
2. Survey leachate collection and landfill gas trenches every 25 lineal feet. Record coordinates and inverts of each pipe fitting, including, but not limited to, bends, elbows, tees, wyes, and valves.
3. Survey all new underground utilities, piping, and electrical conduits, at 25 lineal foot maximum intervals, and at any change in direction. Record coordinates and inverts of each pipe fitting, including, but not limited to, bends, elbows, tees, wyes, and valves.
4. Survey all grading work completed, including but not limited to any topsoil placed, aggregate material placed, stockpiles utilized, stormwater diversion, or roadways built.
5. Survey all other miscellaneous work completed, including but not limited to manholes, fence, signs, bollards, etc.
6. Survey any previously undocumented utility or underground structure encountered during the course of the Work.

I. As-Recorded Drawing(s):
1. Format shall be AutoCAD Release 2023 or compatible file.
2. Submit AutoCAD topographical map, including electronic file, of all disturbed areas. Topographic map shall have 5-foot interval index contours and 1-foot interval intermediate contours. Contours shall be two dimensional polylines with elevations.
3. Submit AutoCAD topographical surface and map for:
    a. MSW Cell 4 Expansion subgrade.
    b. MSW Cell 4 Expansion sand leveling course.
    c. MSW Cell 4 Expansion granular drainage material layer.
    d. All other areas disturbed as part of this project.

4. Submit as-recorded plan with installed geosynthetic anchor trench locations, piping locations, electrical locations, and other features surveyed as part of this project as defined in this section. Include coordinates and inverts of each pipe fitting, including but not limited to: bends, elbows, tees, wyes, and valves.
5. Submit a sealed electronic (PDF) version of the As-Recorded Drawing(s), as well as the point file for all of the survey shots taken. Point file shots shall be labeled in a clear and understandable manner signifying the purpose of the shot.

3.04 FIELD QUALITY ASSURANCE:

A. Owner reserves the right to field check by survey the Work completed by the Contractor.

END OF SECTION 01 71 23

SECTION 01 78 00 – CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for Contract closeout including, but not limited to, the following:
   1. Inspection procedures.
   2. Project record document submittal.
   3. Instruction book and operating manual submittal.
   4. Submittal of warranties.
   5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections of the Specifications.

C. Related Work Specified Elsewhere:
   1. SECTION 01 33 00 – Submittals
   2. SECTION 01 75 00 – Manufacturer's Field Service

1.02 SUBSTANTIAL COMPLETION:[HRC(1]

A. Substantial Completion shall be defined at which time the Owner can occupy and fully operate the work area, including, but not limited to, leachate and landfill gas collection system[RH2]. No temporary systems will be allowed. All piping must be jetted/cleaned per SECTION 33 00 00.[KT3]

B. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete.
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price.
      b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete.
   2. Advise Owner of pending insurance changeover requirements.
   3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents.
   4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra stock, and similar items.
   7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete start-up testing of systems and instruction of Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the Site, along with mockups, construction tools, and similar elements.

C. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Project Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued.
   1. Engineer will repeat inspection when requested and assured by Contractor that the Work is complete.
   2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.03 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
   2. Submit an updated final statement, accounting for final additional changes to the Contract Price.
   3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed, and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
   4. Submit consent of surety to final payment.
   5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   6. Submit all State required certificates.
   7. Submit a final liquidated damages settlement statement.

B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.
   1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   2. If necessary, reinspection will be repeated.

1.04 RECORD DOCUMENT SUBMITTALS:

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for Engineer's reference during normal working hours.

B. Contractor shall submit record documents ten (10) days prior to project close-out.

C. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
   1. Record information concurrently with construction progress.
   2. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "PROJECT RECORD" in neat, large, printed letters.
   3. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings.
   4. Note related Change Order numbers where applicable.
   5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
   6. Upon completion of the Work, submit record drawings to Engineer for Owner's records.
   7. Include the following:
      a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
      b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of construction.
      c. Where Submittals are used for mark-up, record a cross-reference at corresponding location on Drawings.
      d. Field changes of dimension and detail.
      e. Changes made by Change Order or other Modifications.
      f. Details not on original Contract Drawings.

D. Record Specifications: Maintain one complete copy of the Project Manual including Addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction.
   1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
   2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
   3. Note related record drawing information and product data.
   4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records.
   5. Include the following:
      a. Manufacturer, trade name, catalog number, and Supplier of each product and item of Equipment actually installed, particularly optional and substitute items.
      b. Changes made by Addendum, Change Order, or other Modifications.

c. Related Submittals.

E. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
   1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
   2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
   3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records.

G. Instruction Books and Operating Manuals: Organize operation and maintenance data into suitable sets of manageable size as specified in SECTION 01 33 00.

H. Electronic Documentation:
   1. In addition to paper copies, provide electronic versions of record documents showing "as-recorded" conditions in AutoCAD Release 2018 in accordance with SECTION 01 71 23.

I. Warranties and Bonds: Specified in SECTION 01 33 00.

1.05 SPARE PARTS:

A. Products Required:
   1. Provide to Owner the quantities of products, spare parts, maintenance tools, and maintenance materials specified in individual Sections, in addition to that required for completion of Work.
   2. Products shall be identical to those installed in the Work. Include quantities required from Supplier or manufacturer of original purchase to avoid variations in manufacture.

B. Storage, Maintenance:
   1. Coordinate with Owner. Deliver and unload spare products to Owner at Project Site and obtain receipt prior to final payment.
   2. For portions of the Work accepted and occupied by Owner prior to Substantial Completion, deliver the applicable spare products to Owner at time of acceptance. Obtain receipt.
   3. Maintain spare products in original containers with labels intact and legible, until delivery to Owner.

1.06 OPERATIONS AND MAINTENANCE DATA

A. Submit electronically prior to start-up of equipment for review and approval by the Engineer.

B. After approval and prior to start-up of equipment, submit three sets, bound in 8-1/2 x 11-inch text pages, three-D-size-ring binders with durable plastic covers. Equipment shall not be started unless operation and maintenance manual is on-site.

C. Prepare binder covers with printed title “OPERATION AND MAINTENANCE INSTRUCTIONS”, title of project, and subject matter of binder when multiple binders are required.
D. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
E. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper.
F. Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
    1. Significant design criteria;
    2. List of equipment;
    3. Parts list for each component;
    4. Operating instructions;
    5. Maintenance instructions for equipment and systems; and
    6. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES:

A. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
    1. Instruction books and operating manuals.
    2. Record documents.
    3. Spare parts and materials.
    4. Tools.
    5. Lubricants and Fuels.
    6. Identification systems.
    7. Control sequences.
    8. Hazards, hazardous chemicals data sheets.
    9. Cleaning.
    10. Warranties and bonds.
    11. Maintenance agreements and similar continuing commitments.
B. As part of instruction for operating Equipment, demonstrate the following procedures:
    1. Start-up and Shutdown.
    2. Emergency operations.
    3. Noise and vibration adjustments.

4. Safety procedures.
5. Economy and efficiency adjustments.
6. Effective energy utilization.

C. Manufacturer's Field Services: Specified in SECTION 01 75 00.

3.02 FINAL CLEANING:

A. General: Contractor shall keep the Site premises free from accumulations of waste materials, rubbish, and other debris resulting from the Work. Regular Site cleaning is included in SECTION 01 57 00.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Final Completion.
   a. Clean surfaces exposed to view, remove labels that are not permanent labels, remove stains and foreign substances.
   b. Clean debris from drainage systems.
   c. Clean the Site of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted to a smooth, even-textured surface.
2. Remove temporary structures, tools, equipment, supplies, and surplus materials.
3. Remove temporary protection devices and facilities which were installed to protect previously completed Work.
4. Special Cleaning: Cleaning for specific units of Work is specified in applicable Sections of Specifications.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.

1. Extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner.

E. Repairs:

1. Repair damaged protective coated surfaces.
2. Repair roads, walks, fences, and other items damaged or deteriorated because of construction operations.
3. Restore all ground areas affected by construction operations.

END OF SECTION 01 78 00

SECTION 01 78 36 – WARRANTIES

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers standard warranties on products and special warranties.
   1. Refer to the GENERAL CONDITIONS for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. SECTION 01 33 00 – Submittals
   2. SECTION 01 78 00 – Contract Closeout
   3. DIVISIONS 2 through 33 – Specific requirements for warranties on products and installations specified to be warranted

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve Suppliers, manufacturers, and Subcontractors required to countersign special warranties with Contractor.

1.02 WARRANTY REQUIREMENTS:

A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted construction.

B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse: Expressed warranties made to Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the Law. Expressed warranty periods shall not be interpreted as limitations on the time in which Owner can enforce such other duties, obligations, rights, or remedies.
   1. Rejection of Warranties: Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, Owner reserves the right to refuse to accept the Work, until Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.03 SUBMITTALS:

A. Submit written warranties to Engineer prior to the date certified for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the Date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of Engineer.

1. When a designated portion of the Work is completed and occupied or used by Owner, by separate agreement with Contractor during the construction period, submit properly executed warranties to Engineer within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require Contractor, or Contractor and a Subcontractor, Supplier, or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by required parties. Submit a draft to Owner, through Engineer, for approval prior to final execution.

1. Refer to DIVISIONS 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion, compile two copies of each required warranty properly executed by Contractor, or by Contractor and a Subcontractor, Supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Contract Documents.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 01 78 36

SECTION 02 82 00 - ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the handling of suspect asbestos-containing material and waste potentially contaminated with asbestos. Suspect asbestos-containing materials may be encountered during excavation activities within the limits of the Landfill.

B. The asbestos is of the following type(s):

1. Chrysotile.
2. Amosite.
3. Crocidolite.

C. A Certified Alaska Asbestos Contractor shall be present on site during all waste excavation. If suspect asbestos containing material is identified, then handle suspect asbestos containing material in accordance with this specification and all applicable rules and regulations.

D. If suspect asbestos containing material is identified, handle suspect asbestos containing material in accordance with this specification and all applicable rules and regulations.

1.02 QUALITY ASSURANCE:

A. Comply with requirements and specifications of Environmental Protection Agency (EPA) regulations, Occupational Safety & Health Administration (OSHA) regulations, State of Alaska Occupational Safety and Health Asbestos Regulations, and Alaska Department of Enviormental Conservation (ADEC) Regulations.

B. All persons performing excavations shall be qualified to perform such work. Submit such evidence that all workers have attended training courses associated with asbestos handling and are certified if required by regulation. Submit prior asbestos handling (for landfill construction and excavation) project references.

C. Contractor shall conduct air monitoring if required by applicable regulations. Air monitoring shall be performed by independent industrial hygienist/laboratory. Air monitoring personnel shall be a certified asbestos contractor.

1. Contractor shall be responsible for obtaining approval for disposal at an approved waste disposal site. The Owner’s Central Landfill is approved to accept asbestos. The tipping fee for suspect asbestos-containing materials and other on-site waste materials encountered during excavations is $0. Disposal shall be coordinated with OWNER.

1.03 SUBMITTALS:

A. Submit schedule and detailed procedure to be used in the handling of waste potentially contaminated with asbestos including decontamination of personnel and equipment used during the project.

B. Submit evidence of worker training completion and required certifications.

C. Submit listing of previous landfill construction projects including owners' names and contact information where asbestos was properly handled.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Provide equipment and materials as required by regulations to seal off area, remove asbestos, ventilate, clean area, and dispose of asbestos and waste.

B. Provide proper worker protection as required. Eye protection and hard hats shall be available as appropriate.

C. Provide proper protective clothing as required for Owner representative(s).

D. Provide procedures for evacuation of injured workers. Aid for a seriously injured worker shall not be delayed for reasons of decontamination.

2.02 SPECIFIC REQUIREMENTS: All materials and equipment shall comply, at a minimum, with all articles of this Specification, relevant federal, state, and local codes, and industry standards.

A. Contractor shall provide a Certified Alaska Asbestos Contractor during waste excavation to identify any suspect asbestos containing material.

B. Respiratory Protection:

1. Types of Respirators: Provide workers with OSHA-recommended respirators and approved by NIOSH for asbestos in accordance with exposure levels. The minimum protection allowable shall be provided by a half-mask air-purifying respirator with HEPA filters. When these respirators do not provide adequate protection, full-facepiece, air-purifying or powered air purifying respirators, or supplied air systems shall be used.
2. Respirator Use: Store filter cartridges in a place and manner that they cannot become contaminated with asbestos. Install new cartridges each time a worker enters the removal area.

C. Minimum requirements for containment and transportation of asbestos:

1. Plastic Sheeting or Bags: Polyethylene or equivalent with a thickness of at least 6 mils for all applications. The use of double impermeable bags of at least 6 mil thickness or their functional equivalent is required. Piping or other long objects containing asbestos shall be cut and packaged into lengths of no more than 5 feet. The Contractor shall coordinate disposal time and location with the Landfill Supervisor.
2. Wetting Agent or Surfactant: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or equivalent; mixed in the proportion of one ounce of surfactant per five gallons of water. The material shall be odorless, nontoxic, nonirritating, and noncarcinogenic. Apply as a mist using a low-pressure sprayer recommended by the surfactant Manufacturer.
3. Tape and Glue: Capable of sealing plastic joints and attaching plastic to finished surfaces without damage when they are removed. The bonding strength and resulting seal integrity shall not be affected by mist or water, encapsulating agent, or any other materials to be used in the work area.
4. Warning Signs and Labels: As required and complying with federal, state, or local codes and regulations.
5. Waste Containers and Transportation: Suitable for loading, temporary storage, transit, and unloading of contaminated waste without exposure to persons, or emissions to the

atmosphere. Transportation methods shall comply with the provisions of EPA and with any hazardous waste regulations for temporary storage, transport, and disposal.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Post caution signs.

3.02 METHOD OF BULK REMOVAL:

A. Methods for removal shall include, but not necessarily be limited to, procedures described in the following paragraphs.

B. Spray asbestos containing material with wetting agent to reduce the release of fibers. Saturate the material repeatedly during working process to maintain wet conditions and to prevent excess emission of airborne fibers.

C. Load waste into enclosed trucks or roll-off dumpster lined with polyethylene. Wrap waste with polyethylene into a polyethylene "burrito."

3.03 RECORDING OF ASBESTOS REMOVED:

A. Establish and maintain a system or log showing the following:

1. The number of trucks and other containers, and sealed packages loaded onto the truck for each trip to the working face.

3.04 AIR MONITORING:

A. Air monitoring shall be conducted by an independent Industrial Hygienist employed by the Contractor if suspect asbestos containing materials are handled to ensure compliance with codes, regulations, and ordinances.

1. Air monitoring will be conducted at the following intervals and in each work area:
   a. Prior to start of work to identify fiber levels of ambient air.
   b. During the work process to identify fiber levels inside and outside the work areas. This includes personnel monitoring in the work area. If air monitoring shows that airborne concentrations are in excess of allowable limits, stop work and correct the condition causing the increase.
2. Minimum number of air monitors and number of samples shall be as recommended by EPA.
3. Monitoring Results: Fiber counting shall be completed and results (including sample number, location, activity, flow rate, sample time, fibers counted, and calculated fiber concentrations) will be provided to the Industrial Hygienist, who shall notify the Owner and Contractor (and Engineer) immediately of any excess exposures to asbestos fibers.

3.05 FINAL WORK AREA CLEAN-UP, DECONTAMINATION, AND WASTE DISPOSAL:

A. General Requirements: After all asbestos-containing or contaminated materials have been removed, remove all wastes and perform a final clean-up and decontamination of each work area. Final cleaning shall be performed only after all waste is packaged and removed.

B. Waste Disposal:
   1. Definition: Asbestos wastes are defined as all building materials, insulation, disposable clothing and protective equipment, plastic sheeting and tape, exhaust systems or vacuum filters, or any Contractor or Owner equipment which has been contaminated with asbestos and cannot be completely cleaned by vacuuming followed by washing.
   2. Handle, package, store, transport, and dispose of all asbestos wastes as specified in this Section.
   3. Promptly place all waste material in plastic lined enclosed trucks or roll-off dumpsters. Count or measure the volume of each filled container and maintain a written record of such for inspection by Owner.
   4. Affix warning labels, having waterproof print and permanent adhesive, to the lid and/or sides of all containers. Warning labels shall be conspicuous and legible and contain the proper wording.
   5. Thoroughly wet all waste when packaged. When a waste container is full, securely seal.
   6. Waste Container Removal and Disposal documentation:
      a. To comply with the requirement that waste disposal at the working face be documented, remove waste containers from work areas only under the observation of Owner; and complete a waste disposal documentation form or log for each load of waste removed from an area.
      b. Transport the waste to the approved disposal site, and complete or obtain all required licenses, manifests, dump slips, or other forms. Copies of all forms or licenses shall be given to Owner prior to any payments for Work completed.

C. Nonasbestos Related Clean-Up Work:
   1. Periodically accomplish removal of non-asbestos-related debris, resultant dirt, and surplus or damaged materials to keep the Project Site reasonably clean. Periodic cleaning shall encompass removal of tools not in active use, and other equipment no longer needed.
   2. Upon completion of the work, remove all temporary construction, facilities, and unused materials, and restore the buildings and premises to a neat and clean condition.

END OF SECTION 02 82 00

DIVISION 31 – EARTHWORK

SECTION 31 05 19.13 – GEOTEXTILE

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes geotextile to be used as indicated in the Contract Drawings:

B. Related Work Specified Elsewhere:

1. SECTION 31 05 19.16 – HDPE and LLDPE Geomembrane Liner
2. SECTION 31 20 00 – Site Preparation and Earthwork
3. SECTION 31 23 17 – Granular Drainage Material
4. SECTION 33 00 00 – Utilities

1.02 REFERENCES:

A. Applicable Standards:

1. American Society for Testing and Materials (ASTM):
   a. D3776 – Test Methods for Mass per Unit Area (Weight) of Woven Fabric.
   b. D3786 – Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting Strength Tester Method.
   c. D3787 – Test Method for Bursting Strength of Knitted Goods: Constant Rate of Traverse Ball Burst Test.
   d. D4355 – Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Are Type Apparatus).
   e. D4491 – Test Method for Water Permeability of Geotextiles by Permittivity.
   f. D4533 – Test Method for Trapezoid Tearing Strength of Geotextiles.
   g. D4632 – Test Method for Grab Breaking Load and Elongation of Geotextiles.
   h. D4751 – Test Method for Determining the Apparent Opening Size of a Geotextile.
   i. D4833 – Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
   j. D5261 – Test Method for Measuring Mass per Unit Area of Geotextiles.
   k. D5321 – Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Includes, but not limited to, the following:

1. Product Data: Specifications, installation instructions, and general recommendations from materials manufacturer of geotextile filter fabric. Specification sheets shall give full details of minimum physical properties and test methods used.
2. Chemical resistance data.
3. Verification that manufacturer's quality control includes inspection for broken needles where appropriate before material leaves manufacturer's plant.

4. Geotextile manufacturer's quality control certificates for each roll of geotextile delivered to the Project Site. The quality control certificates shall be submitted prior to installation and include material components listed in paragraph 2.01, this Section.
5. For proposed geotextile materials, a sample of product must be provided for interface friction angle testing per ASTM D5321.
    a. This sample shall be provided directly to testing laboratory: TRI Environmental, Inc., located in Austin, TX.
    b. Contractor shall be responsible for the cost of this testing.
    c. Contractor shall be responsible for providing a representative granular drainage material sample to the laboratory. Sample may be obtained from the Landfill.
    d. Interfaces required to be tested are:
        (1) Granular drainage material – nonwoven geotextile cushion interface.
            (a) Granular drainage material shall be as specified in SECTION 31 23 17.
            (b) Consolidation/seat time shall be one hour.
            (c) The interface testing condition shall be wet.
            (d) Displacement rate shall be 0.04 inches per minute.
            (e) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
            (f) Testing requirements are:
                1) Peak Strength: minimum friction angle of 33 degrees and minimum 0 psf adhesion
                2) Residual Strength: minimum friction angle of 33 degrees and minimum 0 psf adhesion.
        (2) Nonwoven geotextile cushion – textured HDPE geomembrane interface
            (a) Refer to SECTION 31 05 19.16, Part 1.03B(2)(a)
        (3) Nonwoven geotextile cushion – textured LLDPE geomembrane interface
            (a) Refer to SECTION 31 05 19.16, Part 1.03B(3)(a)

1.04 QUALITY ASSURANCE:

A. All geotextile conformance test data as well as geotextile manufacturer quality control testing shall meet or exceed requirements of paragraphs 1.03B(5)(d) and 2.01 of this Section. Any materials that do not conform to these requirements shall be retested or rejected at the direction of Engineer.
    1. Geotextile that is rejected shall be removed from the Project Site and replaced at Contractor's expense. Sampling and conformance testing of geotextile supplied as required for rejected material shall be performed at Contractor's expense.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Supply geotextiles in rolls wrapped in impermeable and opaque protective covers. Mark or tag with the following information:
    1. Manufacturer's name.

2. Product identification.
3. Lot number.
4. Roll dimensions.

B. During shipment and storage, protect geotextile from ultraviolet exposure, precipitation or other inundation, mud, dirt, dust, puncture, cutting or other damaging or deleterious conditions. Handle geotextiles in such a manner to ensure they are not damaged in any way.

C. Receive, store, and handle geotextile materials as recommended by manufacturer. Completely cover all materials while being stored on-Site prior to use.

D. Damaged material on rolls shall be cut out and removed from the Site.

PART 2 - PRODUCTS

2.01 FABRIC:

A. Geotextile Filter:

1. Non-woven, polypropylene, or polyester fabric meeting the following specifications:
   a. Material: Nonwoven needle punched polypropylene or polyester
   b. Mass/Unit Area: ASTM D5261, 4 oz/yd^2
   c. Grab Tensile Strength: ASTM D4632, 120 pounds
   d. Elongation at Failure: ASTM D4632, 50%
   e. Apparent Opening Size: ASTM D4751, 70 sieve
   f. CBR Puncture Strength: ASTM D6241, 300 pounds
   g. Trapezoid Tear Strength: ASTM D4533, 50 pounds
   h. Ultraviolet Light Resistance: ASTM D4355, 70%
   All values are minimum average roll values except UV resistance; it is a minimum value.

B. Geotextile Cushion:

1. Non-woven, polypropylene, or polyester fabric meeting the following specifications:
   a. Material: Nonwoven needle punched polypropylene or polyester
   b. Mass/Unit Area: ASTM D5261, 16 oz/yd^2
   c. Grab Tensile Strength: ASTM D4632, 370 pounds
   d. Elongation at Failure: ASTM D4632, 50%
   e. CBR Puncture Strength: ASTM D6241, 900 pounds
   f. Trapezoid Tear Strength: ASTM D4533, 145 pounds
   g. Ultraviolet Light Resistance: ASTM D4355, 70%
   All values are minimum average roll values except UV resistance; it is a minimum value.

C. Woven Geotextile:

1. Type 1 geotextile in accordance with Alaska Department of Transportation (AKDOT) standard specification 729-2.01.1 and Table 729-1.

D. Provide geotextile of generic type specified and tested to show compliance with specified performances.

E. Geotextile shall be manufactured of new, first quality products designed and manufactured specifically for the purpose of filtering out soil fines while maintaining good drainage characteristics.
F. Geotextile shall be so produced as to be free of tears, punctures, or any sign of contamination by foreign matter. Any such defect shall be repaired in accordance with the manufacturer's recommendations. Geotextile must be uniform in thickness with a maximum 10% deviation from the nominal thickness. Edges shall be straight and free of nicks and cuts.
G. The manufacturer shall provide the Engineer with a Quality Assurance document stating that material delivered to the site meets or exceeds the minimum average roll values as specified.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Install geotextile and all accessories in accordance with these Specifications and Contract Drawings.
B. Install geotextile on prepared surface or within trench using careful procedures with minimum handling. Unroll panels as close to their final position as possible.
C. Seaming of Geotextile:
    1. Geotextile panels shall be overlapped a minimum of 6 inches before sewing.
    2. Geotextile panels shall be joined by sewing geotextile panels together with a thread made of the same material as the geotextile. For woven geotextile, a 24 inch overlap may be used if sewing is not feasible.
        a. Thread shall be of such color that it is easily distinguished from geotextile.
        b. Stitch density shall be 4 to 6 stitches per inch of seam.
        c. Stitch type shall be double thread lock.
        d. Seam type shall be the flat or "prayer" type.
    3. Geotextile shall not be heat seamed.
D. Adhere to the following stipulations while working on or near geotextile:
    1. No smoking shall be allowed.
    2. No glass or metal containers or other sharp objects shall be used.
    3. No construction installation equipment shall pass over any exposed fabric surface.
    4. Remove snow and water from the ground surface prior to fabric installation.
    5. Cover the geotextile within 5 days after placement.
    6. Placement of the cover soil shall be by low pressure equipment (2-4 psi). Place cover soil in the direction of seam overlaps and in a manner that does not pull, separate, or puncture geotextile. Spreading and/or hauling equipment shall not be allowed to make sudden stops or sharp turns when spreading cover soil.

END OF SECTION 31 05 19.13

SECTION 31 05 19.16 – HDPE AND LLDPE GEOMEMBRANE LINER

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes linear low-density polyethylene (LLDPE) geomembrane liner and high density polyethylene (HDPE) geomembrane liner including all necessary and incidental items as detailed or required to complete the installation in accordance with the Contract Drawings and these Specifications.

B. Related Work Specified Elsewhere:

1. SECTION 31 05 19.13 – Geotextile.
2. SECTION 31 05 19.17 – Leak Location Survey.
3. SECTION 31 05 19.23 – Geosynthetic Clay Liner.
4. SECTION 31 20 00 – Site Preparation and Earthwork.

1.02 REFERENCES:

A. American Society for Testing and Materials (ASTM):

1. D638/D638M - Test Method for Tensile Properties of Plastics.
2. D746 - Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
3. D792 - Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
4. D1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
5. D1238 - Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
6. D1505 - Test Method for Density of Plastics by the Density-Gradient Technique.
7. D1603 - Test Method for Carbon Black in Olefin Plastics.
8. D3895 - Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry.
9. D4437 - Practice for Determining the Integrity of Field Seams Used in Joining Flexible Polymeric Sheet Geomembranes.
10. D4833 - Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
11. D5199 - Thickness of Geomembrane.
12. D5321 – Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear.
13. D5397 - Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test.
14. D5596 - Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics.
15. D5994 - Test Method for Measuring the Core Thickness of Textured Geomembranes.
16. D6243 – Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.
17. D6392 – Test Method for Determining the Integrity of Nonreinforced Geomembrane Seams Produced Using Thermo-Fusion Methods.

18. D6693 – Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes.
19. D7466 – Test Method for Measuring the Asperity Height of Textured Geomembrane

B. U.S. Environmental Protection Agency (EPA):
1. EPA/530/SW-91/051 - Technical Guidance Document: Inspection Techniques for the Fabrication of Geomembrane Field Seams.

C. Geosynthetic Research Institute (GRI):
1. Standard GM13 – Test Properties, Testing Frequency and Recommended Warranty for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.
2. Standard GM17 – Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes
3. Standard GM19a – Seam Strength and Related Properties of Thermally Bonded Homogeneous Polyolefin Geomembranes/Barriers.
4. Standard GM10 – Specification for the Stress Crack Resistance of HDPE Geomembrane Sheet.

1.03 SUBMITTALS:

A. Submit as specified in SECTION 01 33 00.

B. Submittals required prior to installation:
1. Required for both LLDPE and HDPE
a. Manufacturer certification of having successfully manufactured 10 million square feet of respective geomembrane liner for hydraulic containment purposes using smooth and textured geomembranes.
b. Panel layout drawings. Indicate installation layout, field seams, and penetrations. Seams should generally follow the direction of the slope.
c. Qualifications certifying Geomembrane Installer has installed a combined total of 5 million square feet of respective smooth and textured geomembrane.
d. Manufacturer's certification that Geomembrane Installer is approved or licensed to install manufacturer's geomembrane.
e. A list of three projects on which Geomembrane Installer successfully installed respective geomembrane liner. Include name and telephone of each project owner.
f. A written certification provided by geomembrane manufacturer stating the producer, product designation, batch number, and production data of all resin used in manufacture of all geomembrane materials shipped to the Site. This certification shall be submitted to Engineer prior to shipment of geomembrane. Geomembrane will not be accepted unless all required certifications for the resin have been received by Engineer.
g. Submit quality control certificates provided by geomembrane manufacturer for geomembrane delivered to Project Site prior to installation. Quality control certificates shall indicate geomembrane complies with specified material requirements and sampling frequencies outlined in Table 3, this Section
h. Submit quality assurance testing results, as identified in Part 1.04

i. Approximately two weeks prior to geomembrane shipment, provide geomembrane panel layout drawing.
j. Provide Geomembrane Installer's quality control manual to include, but not be limited to, seam sampling, testing, and documentation of all installation and testing activities required by these Specifications.
k. Manufacturer's and Geomembrane Installer's written warranty and guarantees as outlined in ARTICLE 1.07, this Section.
l. Certifications and calibration charts (current within 6 months prior to Effective Date of Agreement) for all testing apparatus and gauges to be used by Geomembrane Installer.
m. Approximately two weeks prior to arrival at the Site, provide Geomembrane Installer personnel resumes in accordance with Part 3.01.A.

2. Required for HDPE only.
   a. For proposed geomembrane materials, a sample of product must be provided for interface friction angle testing per ASTM D5321 or ASTM D6243 as appropriate.
      (1) This sample shall be provided directly to testing laboratory: TRI Environmental, Inc., located in Austin, TX.
      (2) Contractor shall be responsible for the cost of this testing.
      (3) Interfaces required to be tested are:
         (a) Textured HDPE geomembrane – GCL interface.
            1) GCL shall be as specified in SECTION 31 05 19.23.
            2) Consolidation/seat time shall be 24 hours.
            3) The interface testing condition shall be wet.
            4) Displacement rate shall be 0.04 inches per minute.
            5) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
            6) Testing requirements are:
               a) Peak Strength: minimum friction angle of 21 degrees and minimum 160 psf adhesion.
               b) Residual Strength: minimum friction angle of 13 degrees and minimum 0 psf adhesion.
         (b) Nonwoven geotextile cushion – textured HDPE geomembrane interface.
            1) Nonwoven geotextile cushion shall be as specified in SECTION 31 05 19.13.
            2) Consolidation/seat time shall be one hour.
            3) The interface testing condition shall be wet.
            4) Displacement rate shall be 0.04 inches per minute.
            5) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
            6) Testing requirements are:

a) Peak Strength: minimum friction angle of 25 degrees and minimum 160 psf adhesion.
b) Residual Strength: minimum friction angle of 17 degrees and minimum 0 psf adhesion.

(4) Provide results to Engineer for review and acceptance.

b. Certification and supporting test data stating that resin used for geomembrane and extrudate rod production meets or exceeds the requirements of Table 1, this Section.

3. Required for LLDPE only
   a. For proposed geomembrane materials, a sample of product must be provided for interface friction angle testing per ASTM D5321 or ASTM D6243 as appropriate.
      (1) This sample shall be provided directly to testing laboratory: TRI Environmental, Inc., located in Austin, TX.
      (2) Contractor shall be responsible for the cost of this testing.
      (3) Interfaces required to be tested are:
         (a) Textured LLDPE geomembrane – GCL interface.
            1) GCL shall be as specified in SECTION 31 05 19.23.
            2) Consolidation/seat time shall be 24 hours.
            3) The interface testing condition shall be wet.
            4) Displacement rate shall be 0.04 inches per minute.
            5) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
            6) Testing requirements are:
               a) Peak Strength: minimum friction angle of 21 degrees and minimum 160 psf adhesion.
               b) Residual Strength: minimum friction angle of 13 degrees and minimum 0 psf adhesion.
         (b) Nonwoven geotextile cushion – textured LLDPE geomembrane interface.
            1) Nonwoven geotextile cushion shall be as specified in SECTION 31 05 19.13.
            2) Consolidation/seat time shall be one hour.
            3) The interface testing condition shall be wet.
            4) Displacement rate shall be 0.04 inches per minute.
            5) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
            6) Testing requirements are:
               a) Peak Strength: minimum friction angle of 25 degrees and minimum 160 psf adhesion.
               b) Residual Strength: minimum friction angle of 17 degrees and minimum 0 psf adhesion.
      (4) Provide results to Engineer for review and acceptance.

b. Certification and supporting test data stating that resin used for geomembrane production meets or exceeds the requirements of Table 2, this Section.
c. Submit quality control certificates provided by geomembrane manufacturer for geomembrane delivered to Project Site prior to installation. Quality control certificates shall indicate geomembrane complies with specified material requirements and sampling frequencies outlined in Table 3, this Section.

C. Submittals required during installation:
1. Trial weld and field seam test results as specified herewith.
2. Daily subgrade acceptance certification as specified herewith.

D. Submittals required after installation:
1. Record Drawings: Record drawings accurately showing panel layout and identification and changes from the approved installation drawings. The record drawings shall be to scale and include identification and location of each repair, cap strip, penetration, boot, and sample taken from the installed geomembrane. The record drawings shall be submitted before the geomembrane is covered or as approved by Engineer.
2. Seam test results (destructive and nondestructive). Test shall be identified by date of sample, date of test, sample location, name of individual and organization who performed the test, and standard test method used.
3. Welding log record.
4. Log of geomembrane repairs.
5. Warranties for product and installation.

1.04 QUALITY ASSURANCE:

A. Quality assurance conformance testing of the geomembrane liner will be performed by an independent laboratory, and cost will be paid by Contractor. Conformance sampling shall be completed at a minimum frequency of one sample every 100,000 square feet of geomembrane to be delivered and at least one sample per lot or batch as directed by Engineer. Conformance testing shall be performed prior to shipment to job Site.
1. Conformance testing of HDPE geomembrane shall include, but not be limited to, the following properties (refer to Table 3):
a. Density, ASTM D792/ASTM D1505.
b. Melt Flow Index, ASTM D1238.
c. Thickness, ASTM D5199 (smooth)/ASTM D5994 (textured).
d. Tensile Properties, ASTM D6693.
e. Tear Resistance, ASTM D1004.
f. Puncture Resistance, ASTM D4833.
g. Carbon Black Content, ASTM D1603/D4218.
h. Carbon Black Dispersion, ASTM D5596.
i. Asperity Height, ASTM D7466.
2. Conformance testing of LLDPE geomembrane shall include, but not be limited to, the following properties (refer to Table 3):
a. Density, ASTM D1505.
b. Thickness, ASTM D5199/D5994.

c. Tensile Properties, ASTM D638.
d. Tear Resistance, ASTM D1004.
e. Puncture Resistance, ASTM D4833
f. Carbon Black Content, ASTM D1603.
g. Carbon Black Dispersion, ASTM D5596.

3. Engineer may revise the test methods used for determination of conformance properties to allow for use of improved methods.
4. Samples: Take across the entire width of the roll (exclusive of first 3-feet); 3-feet wide; one per lot/batch or one per 100,000 square feet, whichever results in the greatest number of tests. Engineer shall identify sample locations.
5. Test Results: One copy of test results shall be submitted to Contractor within two days of receipt by Engineer. Engineer will immediately report any non-conformance to Contractor.

B. Geomembrane conformance test data and geomembrane manufacturer quality control testing shall meet or exceed requirements outlined in Tables 1 and 3 of this Section for HDPE and Tables 2 and 3 of this Section for LLDPE prior to installation. Materials that do not conform to these requirements shall be retested or rejected at the direction of Engineer.
1. Geomembrane that is rejected shall be removed from the Project Site and replaced at Contractor's expense. Sampling and conformance testing of geomembrane supplied to replace rejected material shall be performed by Engineer at Contractor's expense.

C. Engineer, to Owner's account, will furnish a Construction Quality Assurance (CQA) program. One or more CQA Monitors will be on-Site during geomembrane installation.

D. Contractor shall arrange for Geomembrane Installer to provide one or more Construction Quality Control (CQC) Managers to monitor installation, testing, and documentation of geomembrane installation. CQA Monitor and CQC Manager will coordinate all activities relating to the installation, testing, and documentation.
1. Installation documentation shall be recorded by the CQC personnel.

1.05 OPERATING CONDITIONS:

A. The geomembrane liner shall be manufactured for use under the following conditions:
1. Geomembrane material will be exposed to direct sunlight and ultraviolet rays during the construction period.
2. Wind velocity of 0 to 70 miles per hour can occur.
3. Ambient air temperatures at Site location to range from -50^{o}F to 110^{o}F.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Receive, store, and handle geomembrane lining materials as recommended by manufacturer. Cover all materials completely while stored on Site prior to use. Geomembrane shall be marked and tagged with the following information:
1. Manufacturer’s name.
2. Product identification and lot number.
3. Roll number and dimensions.

B. Store geomembrane to protect from puncture, dirt, grease, water, moisture, mud, mechanical abrasions, excessive heat or other damage. Store geomembrane on prepared flat surface. Surface should be suitably prepared so that no stones or rough objects that may damage the geomembrane are present. Storage location shall be selected in an area of higher ground so that standing water cannot accumulate.
C. Do not stack geomembrane more than 3 rolls high. Suitable means of securing the rolls should be used such that shifting, abrasion or other adverse movement does not occur.
D. Do not fold geomembrane material.
E. Use appropriate handling equipment for deployment.
F. Geomembrane damaged during handling shall be repaired to the satisfaction of the Owner. Geomembrane irreparably damaged, as determined by Owner, shall be immediately removed from the site and replaced. Repair, removal, and replacement shall be solely at Contractor's expense.
G. Protect geomembrane from damage due to animals.
H. All welding material shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, manufacturer's mark number, and complete directions for storage.
I. Damaged material on rolls shall be cut out and removed from the Site.

1.07 WARRANTY:

A. Furnish a written warranty from the geomembrane manufacturer for a useful life of not less than 20 years from the date of installation, covering the geomembrane liner material under the specified operating conditions.
B. Furnish as a minimum, a 2-year, nonpro rata warranty from the Geomembrane Installer for the installation against defects.
C. Such written warranties shall provide for the repair and/or replacement of any defect or defective areas of geomembrane, or compensation for defective work, upon written notification and demonstration by Owner of the specific nonconformance of the geomembrane or installation with the Contract Specifications. Compensation for defective material shall be provided to Owner on a pro rata basis for the estimated cost to Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party installer.
D. Contractor shall be responsible for obtaining any necessary guarantees or certifications from geomembrane manufacturer and Geomembrane Installer and submitting them to Engineer and Owner prior to installation of geomembrane liner.

PART 2 - PRODUCTS

2.01 MANUFACTURES:

A. Approved manufactuers are:
   1. Solmax
   2. Agru Aamerica, Inc.
   3. Or Engineer-approved alternate manufactuer

2.02 LINER MATERIAL:

A. Geomembrane Resin:

1. HDPE or LLDPE, new, first quality, compounded, and manufactured specifically for producing HDPE or LLDPE geomembrane, respectively.
2. Resin types shall not be mixed during manufacturing.
3. Recycled materials or seconds shall not be used in geomembrane manufacturing.
4. Table 1 lists the required HDPE resin properties

Table 1 – Properties for HDPE Resin

Test	Test Designation	Requirement
Specific Gravity [1]	ASTM D1505	≥0.932 g/cc
Melt Index	ASTM D1238, Condition E	Max. 1 gram per 10 minutes
OIT	ASTM D3895 (1 atm/200°C)	≥100 minutes

[1] Measure on pure resin without additives.

5. Table 2 lists the required LLDPE resin properties.

Table 2 – Properties for LLDPE Resin

Test	Test Designation	Requirement
Specific Gravity [1]	ASTM D1505	0.92 to 0.938 g/cc
Melt Index	ASTM D1238, Condition E	Max. 1 gram per 10 minutes
OIT	ASTM D3895 (1 atm/200°C)	≥100 minutes

[1] Measure on pure resin without additives.

B. Geomembrane Manufacturing:

1. The material for the primary geomembrane liner in Cell 4 Expansion shall be textured (both sides) 60 mil high density Polyethylene (HDPE). Textured surface shall be co-extruded. No spray-on textured surface shall be allowed. Surface texturing material shall be of the same type of polymer and formulation as the base sheet polymer and formulation.
2. The material for the geomembrane above the Cell 2A piggyback area of the Cell 4 Expansion shall be textured (both sides) 60 mil thickness linear low-density polyethylene (LLDPE). Textured surface shall be co-extruded. No spray-on textured surface shall be allowed. Surface texturing material shall be of the same type of polymer and formulation as the base sheet polymer and formulation.
3. Do not exceed a combined maximum total of 1.0% for HDPE and 1.5% for LLDPE by weight of additives other than carbon black or pigment. Identify percentage of processing aids, antioxidants, and other additives other than carbon black.
4. Do not exceed 4% by weight of finished geomembrane for total combined processing aids, antioxidants, carbon black, and other additives.
5. All additives for UV protection, thermal stability, color texturing, or processing agents shall not "bloom" to the surface over time or inhibit welding.
6. Use materials produced in the United States or Canada.

7. Provide finished product free from blemishes, holes, pin holes, bubbles, blisters, excessive gels, undispersed resins or carbon black, contamination by foreign matter, and nicks or cuts on edges.
8. Identify each roll with labels indicating roll number, dimensions, and manufacturer.
9. Table 3 below lists required HDPE and LLDPE geomembrane properties.
10. No factory seaming of HDPE geomembrane panels will be accepted, except where indicated in the Contract Documents for specialty prefabrications.
11. No factory seaming of LLDPE geomembrane panels will be accepted.
12. All compound ingredients (raw material) for HDPE and LLDPE geomembrane shall be sampled and tested by geomembrane manufacturer.
    a. Furnish a test result summary to Engineer to verify compliance with specified material requirements and sampling frequencies outlined in Table 3, this Section.
    b. Furnish summary of test results reflecting actual test frequencies to Engineer prior to or coincident with shipment of geomembrane to the Project Site.
13. Select liner sheets in maximum possible length of roll to minimize seaming.
    a. Minimum width of sheet shall be 22 feet.

Table 3 – Required Physical Properties of 60 mil HDPE and LLDPE Textured Geomembrane [1]

Property	Testing Frequency (see note)	Test Method [2]	HDPE Requirement	LLDPE Requirement
Sheet Thickness	Per roll	ASTM D5994 (textured)	nominal 60 mils ± 5% with minimum avg 60 mils	nominal 60 mils ± 5% with minimum avg 60 mils
Asperity Height (textured)	Every second roll	ASTM D7466	Minimum 16 mils	Minimum 16 mils
Specific Gravity	(3)	ASTM D1505/D792	Min. Avg. 0.940 g/cc	Max. 0.939 g/cc
Carbon Black Content	(3)	ASTM D1603/D4218	2 to 3%	2 to 3%
Carbon Black Dispersion	(3)	ASTM D5596	9 (Cat 1 or 2), 1 (Cat 3)	9 (Cat 1 or 2), 1 (Cat 3)
Tensile Strength at Yield	(3)	ASTM D6693	Min. Avg. 126 lb/in. width	-
Tensile Strength at Break	(3)	ASTM D6693	Min. Avg. 90 lb/in. width	Min. Avg. 90 lb/in. width
Elongation at Yield	(3)	ASTM D6693	Min. Avg. 12%	-
Elongation at Break	(3)	ASTM D6693	Min. Avg. 100%	Min. Avg. 250%
Tear Resistance	(3)	ASTM D1004	Min. Avg. 42 lb	Min. Avg. 33 lb
Puncture Resistance	(3)	ASTM D4833	Min. Avg. 90 lb	Min. Avg. 66 lb
Axi-Symmetric Break Resistance Strain	One per lot or batch (railcar)	ASTM D5617	-	Min. 30%
Stress Crack Resistance[4]	per GRI-GM10	ASTM D5397	Min. 500 hr.	-
Standard Oxidative Induction Time	One per lot or batch (railcar)	ASTM D3895	Min. Avg. 100 minutes	Min. Avg. 100 minutes
Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces	One per interface	ASTM D5321/D6243	See 1.03B(2)(a)	See 1.03B(3)(a)

Notes: 1. The required physical properties specified herein may be revised by Engineer to reflect new or revised test methods or to conform with improvements of current practices.

2. Number of specimens per test established in applicable test method unless otherwise noted.

3. One per 100,000 square feet or one per resin batch, whichever results in the greatest number of tests.

4. Test should be conducted on smooth edges of textured rolls or on smooth sheets made from the same formulation as being used for the textured sheet materials.

5. Min. Avg. value designates the lowest acceptable property value for an individual roll.

2.03 EXTRUDATE ROD OR BEAD:

A. Shall meet geomembrane manufacturer requirements.
B. Shall be made from same resin as geomembrane.
C. Additives shall be thoroughly dispersed throughout the rod or bead.
D. Additives shall include 2 to 3% carbon black.
E. Shall be free of contamination by moisture or foreign debris.

2.04 WELDING EQUIPMENT:

A. Supply seam welding accessories meeting the following requirements:
    1. Maintain sufficient operational seaming apparatus to continue work without delay.
    2. Use a power source capable of providing constant voltage under combined line load.
    3. Provide a protective lining and splash pad large enough to catch spilled fuel under the power generator, if located on the geomembrane liner.
    4. Provide tensiometers capable of measuring seam strength, calibrated and accurate to within 2 pounds.

PART 3 - EXECUTION

3.01 INSTALLATION - GEOMEMBRANE PREPARATION AND DEPLOYMENT:

A. Approximately two weeks prior to arrival at the Site, provide Geomembrane Installer personnel resumes demonstrating compliance with the following requirements:
    1. A minimum of one field superintendent per shift shall be designated by the Geomembrane Installer and approved by Engineer.
        a. Each field superintendent for HDPE installation shall have a minimum of one year of field experience in installing HDPE geomembranes.
        b. Each field superintendent for LLDPE installation shall have a minimum of one year of field experience in installing non-HDPE geomembranes.
        c. Any change or replacement of superintendents during the project shall be approved in advance by Engineer.
    2. Each seaming crew shall have a designated foreman, who shall have a minimum of one-million square feet of geomembrane installation experience using the same type of seaming apparatus to be used for this work and shall provide direct supervision with seaming crew.
B. Prior to scheduled geomembrane installation, the Contractor, Engineer, Geomembrane Installer, and Construction Quality Assurance personnel shall attend a preinstallation meeting at the Project Site. This meeting shall be scheduled by Engineer after receipt of field layout drawings.
    1. Contractor shall be represented by the Project field superintendent.
    2. At the preinstallation meeting, Site safety rules of operation, quality assurance, quality control, record keeping, scheduling, and methods of installation shall be discussed.
C. Daily field records shall be maintained by Contractor of actual placement of each panel, certificates of subgrade acceptance, panel numbers placed, seams welded, destructive samples taken, field tests for peel and shear, trial weld test results, and nondestructive test results.

1. Submit a copy of each day's field records to Engineer or his representative no later than the following work day.

D. Prepare the surfaces that are to receive the geomembrane in accordance with the Contract Drawings and Specifications. Install geomembrane only on new or existing GCL that has been approved in writing by the CQA Monitor.
   1. Place geomembrane on GCL according to these Specifications and free of rutting greater than 1-inch deep, sharp elevation changes, or other evidence of damage caused by vehicle traffic, erosion, or other causes.
   2. Report areas exhibiting deficient subgrade surface to Engineer.

E. Panel placement, seam welding technique, placement, and welding schedule shall minimize potential for accumulation of water beneath geomembrane.
   1. Any water ponded beneath geomembrane after geomembrane has been installed, due to Contractor's failure to minimize potential for accumulation of water, shall be removed by Contractor at no cost to Owner.
   2. Soil subgrade or GCL that has become excessively moist, soft, or unsuitable to perform its intended function shall be removed and replaced by Contractor at his expense.

F. Construction or vehicular traffic upon exposed geomembrane shall be limited to lightweight, low pressure, rubber-tired equipment subject to the approval of CQA monitor.

G. Extreme care shall be taken by personnel while handling, unwrapping, transporting, positioning, and seaming geomembrane. Damage to geomembrane incurred during construction shall be repaired or replaced at Contractor's expense.
   1. Store geomembrane in a suitable area adjacent to or on the Work Site. Geomembrane delivered with folds or creases of any kind shall be rejected and removed from the Site.
   2. Protect geomembrane during storage so roll labels remain intact and readable. Any roll of geomembrane that has no label or label is damaged or otherwise illegible may be rejected by CQA monitor.

H. Provide temporary anchorage of geomembrane during installation. Any geomembrane exhibiting damage from wind or other causes prior to acceptance by Owner shall be removed by Contractor at no cost to Owner.

I. Contractor shall excavate, maintain, and backfill the geomembrane liner termination trench. Liner termination trench shall be "daylighted" to allow drainage while trench is open.

J. Install geomembrane so as to minimize "trampolining" of the geomembrane at toe of slopes.

K. Extrusion or fusion welds of adjacent panels shall extend continuously along full length of panels and anchor trench.

L. Deploy and seam geomembrane panels in order to assure adequate, well distributed slack exists to account for expansion or contraction of geomembrane.

M. Orient seams in a direction parallel to the line of maximum subgrade slope and place panels in a manner that minimizes number and length of field seams.

N. If lateral or horizontal seams cannot be avoided, place geomembrane panels on slopes such that "upstream" panel forms the upper panel and overlaps "downstream" panel in order to minimize infiltration potential.

O. All longitudinal seams shall be at least 20-feet from toe and top of side slopes.

3.02 INSTALLATION - PRODUCTION SEAMING OF GEOMEMBRANE:

A. All seaming, sealing, and welding material shall be of same materials and have same properties as geomembrane, where applicable.

B. No production seaming shall commence until trial seaming as outlined in ARTICLE 3.03, this Part, is successfully completed and approved by CQA Monitor.

C. CQA Monitor and Owner, in conjunction with Geomembrane Installer, will establish Site-specific limits of weather conditions including, but not limited to, temperature, humidity, precipitation, and wind speed and direction within which geomembrane panel placement and seaming can be conducted. In the absence of Site-specific criteria, the following limitations shall apply:

1. Seaming shall not be conducted during precipitation, such as rain, snow, sleet, dew, or fog, in or below the seam area.
2. Seaming shall not be conducted in presence of high winds, when dirt or debris is blown into seam areas, or when seam temperatures cannot be adequately monitored and controlled.
3. Seaming shall not be conducted when ambient temperature falls below 35°F unless approved by CQA Monitor. In order for seaming to be approved, Geomembrane Installer shall be required, at a minimum, to perform an additional trial seam to demonstrate conformance with these Specifications. CQA monitor reserves the right to require additional destructive seam testing when seaming is conducted at ambient temperatures below 35°F.
    a. Geomembrane Installer shall be prepared to preheat seam area prior to production seaming in accordance with geomembrane manufacturer's recommendations.
4. Seaming shall not be conducted when ambient temperature exceeds 104°F unless approved by CQA Monitor.

D. For purposes of monitoring production geomembrane seaming, ambient temperature shall be measured by CQA Monitor.

1. Record ambient temperature at multiple locations along the seam at a distance of 6 inches above geomembrane surface.

E. Use lap joints to weld panels of geomembrane together in the field.

1. Use a minimum overlap of 3 inches.
2. Seams shall be fusion (double wedge) or extrusion-welded and as prescribed by EPA530/SW-91/051.
3. Hold panels in position in a manner approved by CQA Monitor to prevent movement during welding and maintain a flat lap of panels.
4. Prepare weld area to provide a suitable surface for adherence to panels to be welded.
5. Weld area shall be free of dirt, dust, moisture, or other foreign material, and the cleaning process shall be approved by CQA Monitor.
6. Apply the weld as soon as is practical after preparation and cleaning is completed.
7. No glue or tape shall be used to temporarily hold panels together before welding.
8. No solvents shall be used to clean panels prior to welding.

F. Seam all geomembrane panels on the same day panels are deployed.

G. Folds, wrinkles, or "fish-mouths" shall not be allowed within seam area.
   1. Where wrinkles or folds occur, the material shall be cut and overlapped, and a patch shall be applied.

H. Extrusion Type Welding:
   1. To tack bond adjacent panels together, use procedures that do not damage geomembrane.
   2. Purge welding apparatus of heat-degraded extrudate before welding.
   3. Bevel top edges of geomembrane a minimum of 45° and full thickness of geomembrane before extrusion welding.
   4. Clean seam welding surfaces of oxidation by disc grinder or equivalent not more than 15 minutes before extrusion welding.
      a. Change grinding discs frequently.
      b. Do not use clogged discs.
      c. Do not remove more than 4 mils of material when grinding.
      d. Grind across, not parallel to, welds.
      e. Cover entire width of grind area with extrudate.
   5. When restarting welding, grind ends of all welds that are more than 5 minutes old.

I. Application of a bead of extrudate over damaged geomembrane (bead repairs) shall be prohibited, except where explicitly approved by CQA monitor.
   1. Repair surface defects, tears, punctures, and similar damage using additional geomembrane material as a patch extending beyond the repair area at least 6 inches in all directions.
   2. The CQC Manager shall maintain a record of all repairs and patches.

J. Fusion seams shall not be repaired by placing extrusion welds directly over previously seamed areas. Repair fusion seams by using a patch or cap strip.

K. The CQA Monitor may require repair or replacement of any area where excessive grinding, overheating, or unacceptable preparation, seaming, or testing techniques are observed. Such repair or replacement may be required even if samples removed from affected areas pass destructive peel or shear testing.
   1. All repairs shall be completed by Geomembrane Installer at no additional expense to Owner.
   2. All patches for repair of the geomembrane shall have rounded corners such that the repair may be completed with a continuous extrusion weld.

L. Geomembrane areas showing damage due to excessive scuffing, puncture, or distress from any cause shall be replaced or repaired.

M. Where repairs are necessary along LLDPE to HDPE geomembrane welds, LLDPE repair requirements shall be used.

3.03 GEOMEMBRANE SEAMING - TRIAL WELDS AND TRIAL WELD SAMPLING:

A. The CQC Manager shall be responsible for performing field testing of all trial welds. The CQC Manager shall submit for Engineer's review and approval a trial weld quality control testing program.

B. Trial welds shall be performed for each welder whenever any of the following conditions occur:

1. Shift start-up.
2. Four hours of continuous welder operation.
3. "Cold" restart of the welder.
4. Change in welding operator.
5. Significant change in ambient temperatures.
6. Change in type of geomembrane being welded (i.e. switching from LLDPE to HDPE).
7. Before an LLDPE to HDPE geomembrane weld is completed.
8. As required by CQA Monitor.

C. Trial welds shall be at least 10 feet in length for fusion welds and at least 5 feet in length for extrusion welds.
   1. Conduct trial welds using same personnel, equipment, material, and seaming parameters as will be used during production seaming.
   2. An LLDPE to HDPE trial weld must be completed before an LLDPE to HDPE production seam is completed.
   3. Make trial welds at location of production seams.

D. Conduct sampling of trial welds from center two-thirds of final seam length.

E. Trial seam test specimens shall be tested in peel and shear in accordance with the approved quality control testing program.
   1. Test minimum of 5 specimens for each trial seam, 2 in shear and 3 in peel.
   2. Qualification criteria for all destructive trial weld testing shall meet locus-of break criteria and the minimum peel and shear values specified in ARTICLE 3.04 of this Part for all 5 trial weld specimens.
   3. For double-track fusion welded seams, both welds shall meet the locus-of-break criteria and peel strength criteria.
   4. For trial weld of HDPE geomembrane to LLDPE geomembrane, the weld shall meet the locus-of break criteria and minimum peel and shear strength values for LLDPE welds as specified in ARTICLE 3.04 of this section for all 5 trial weld specimens.

F. Trial weld test results shall meet the above criteria prior to performing any installation production welding. This may require repeating the trial seam process.
   1. Results of trial weld tests shall be noted in CQC Manager's trial weld test log.
   2. Furnish a copy of the test log to Engineer not later than the following work day.

G. For trial weld of HDPE geomembrane fusion welded to LLDPE geomembrane, LLDPE trial weld requirements shall be used.

3.04 GEOMEMBRANE SEAMING - PRODUCTION SEAM TESTING:

A. All field seams shall be nondestructively tested 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 seaming progresses and not at completion of all field seaming. Complete required repairs in accordance with this Specification.
   1. Vacuum Testing:
      a. Conduct with the following equipment:
         (1) 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. Box dimensions shall be small enough so testing can be accomplished over odd-shaped surfaces.
(2) Vacuum pump assembly equipped with a pressure control.
(3) Rubber pressure/vacuum hose with fittings and connections.
(4) Soapy solution and an applicator.

b. Test procedures:
(1) Place the box over seam area wetted with soapy solution.
(2) Ensure that a leak-tight seal is created.
(3) Energize vacuum pump and reduce vacuum box pressure to approximately 10 inches of mercury (5 psig).
(4) Examine geomembrane through viewing window for presence of soap bubbles for a period of not less than 10 seconds.
(5) Mark all defective areas where soap bubbles appear and repair.

2. Air pressure testing for seaming processes producing a double seam with an enclosed channel:
a. Conduct with the following equipment:
(1) Air pump (manual or motor driven) equipped with a pressure gauge capable of generating and sustaining a pressure over 30 psi and mounted on a cushion to protect geomembrane.
(2) Rubber hose with fittings and connections.
(3) Sharp hollow needle, or other approved pressure feed device.
(4) Pressure gauge with an accuracy of one psi.
(5) Installer shall have a minimum of five calibrated pressure gauges onsite.

b. Test Procedures:
(1) Seal both ends of welded seam to be tested.
(2) Insert needle or other approved pressure feed device into tunnel created by weld.
(3) Energize 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 2 psi or pressure does not stabilize, locate defective area and repair.
(5) Puncture opposite end of seam to release air. If blockage is present (air is not released), locate and test seam on both sides of blockage.
(6) Remove needle or other approved pressure feed device and seal penetration holes.

3. Spark testing for penetrations or other difficult areas not accessible for vacuum testing:
a. Conduct with following equipment and materials:
(1) 24-gage 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.

b. Test Procedures:

(1) Place copper wire within 1/4-inch of edge of extrusion seam.
(2) Pass electrode over seam and observe for spark. If spark is observed, perform repair.

B. Where practical, sample ends of production seams at panel ends.
1. Perform field destructive testing for these samples on-Site using test method and approval criteria outlined in this Specification for trial weld samples.
2. If end samples do not meet acceptance criteria stated for trial welds, the CQA Monitor will require CQC Manager to sample additional locations on the same seam and/or adjacent seams for laboratory destructive testing.

C. Obtain samples of production welds suitable for destructive testing at locations determined by CQA Monitor.
1. Frequency of sampling will be based on the following criteria:
a. A minimum of one sample per 500 linear feet of seam.
b. Significant changes in weather conditions.
2. Each sample shall be 42 inches long and 12 inches wide.
a. Production seam shall be centered relative to sample width dimension of 12 inches.
b. Each destructive sample will be cut into three specimens, two at 12"x12" and one 12"x18".
c. One 12"x12" specimen will be retained by Contractor, one 12"x12" specimen will be retained by Owner, and the 12"x18" specimen will be sent to an independent third-party laboratory.
d. Additional destructive samples may be obtained as determined by CQA Monitor.

D. Field Testing:
1. Test 1-inch-wide strips in the field (5 peel and 5 shear). Quantitatively test each specimen for peel and seam strength (shear) by ASTM D6392 for HDPE and ASTM D4437 for LLDPE.
2. All test specimens must meet the requirements of Section 3.04F.
3. Field testing must pass prior to the sample being sent to the laboratory.

E. Repair of production seam where destructive samples were obtained shall be as specified by ARTICLE 3.02, this Part. Each repair seam shall be nondestructively tested by the CQC Manager.

F. For HDPE to HDPE connection, the weld in the destructive sample shall be laboratory tested in peel and shear (ASTM D6392). Qualification criteria for all destructive seam testing meet locus-of-break and load criteria specified herein.
1. Five specimens from each laboratory destructive test sample shall be tested for shear strength using ASTM D6392.
a. The load at failure shall be at least 120 lb/in or equivalently, a minimum of 95% of the yield strength (in pounds per inch width) of the parent geomembrane material (smooth and textured) as specified in Table 2, this Section.
b. Failures exhibited in areas prepared by grinding outside of extruded areas of extrusion seams may require resampling and retesting.

2. At least five specimens from each laboratory destructive test sample shall be tested for peel adhesion using ASTM D6392.
    a. The load at failure for fusion welds shall be at least 91 lb/in or equivalently, 72% of yield strength (in pounds per inch width) of the parent geomembrane material as specified in Table 2, this Section.
    b. At least 78 lb/in or equivalently, 62% of yield strength for extrusion welds.
    c. Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code):
        (1) Hot Wedge: AD and AD-Brk > 25%
        (2) Extrusion Fillet: AD1, AD2, and AD-WLD
3. In order for the destructive sample to be considered qualified, all 5 of the 5 peel and 5 of the 5 shear specimens shall meet all load and locus-of-break criteria specified herein.

G. For LLDPE to LLDPE and LLDPE to HDPE connections, the weld in the destructive sample shall be laboratory tested in peel and shear (ASTM D6392). Qualification criteria for all destructive seam testing shall meet locus-of-break and load criteria specified herein.
1. Five specimens from each laboratory destructive test sample shall be tested for shear strength using ASTM D6392.
    a. The load at failure shall be at least 90 pounds per inch (lb/in) width.
    b. Failures exhibited in areas prepared by grinding outside of extruded areas of extrusion seams may require resampling and retesting.
2. At least five specimens from each laboratory destructive test sample shall be tested for peel adhesion using ASTM D6392.
    a. The load at failure for fusion welds shall be at least 75 pounds per inch width.
    b. The load at failure for extrusion welds shall be at least 66 pounds per inch width.
    c. Regarding the locus-of-break patterns of the different seaming methods in shear and peel, the following are unacceptable break codes per their description in ASTM D6392 (in this regard, SIP is an acceptable break code):
        (1) Hot Wedge: AD and AD-Brk > 25%
        (2) Extrusion Fillet: AD1, AD2, and AD-WLD
3. In order for the destructive sample to be considered qualified, all 5 of the 5 peel and 5 of the 5 shear specimens shall meet all load and locus-of-break criteria specified herein.

H. Destructive laboratory testing and associated costs shall be paid for by the Contractor. The Contractor will express mail the sample to the laboratory. The laboratory will provide peel and shear test results by facsimile during the day following the removal of the destructive sample from the production seam. The CQC Manager shall be responsible for all sampling and repair of sample locations for laboratory and field destructive testing.

I. Should test results of any destructive test sample not meet criteria outlined in these Specifications, the CQC Manager shall obtain additional test samples a distance of approximately 10 feet in both directions from the original sample for laboratory destructive testing. All resampling, repairing, and retesting shall be the responsibility of Contractor and shall be performed by the independent third-party laboratory at Contractor's expense.

1. In order to be considered qualified, each failed destructive seam sample shall be bounded by two passing destructive seam samples.
2. Alternatively, the entire length of seam in question may be repaired by placement of a cap strip.

J. The CQA Monitor or Owner may require additional random samples be taken for destructive testing in areas that visually appear defective or not in conformance with these Specifications. Testing the samples and repairing the sample areas shall be the responsibility of CQC Manager.

K. A final visual examination of all welds and in-place geomembrane will be completed by CQA Monitor.
1. Contractor shall repair, in accordance with these Specifications, any area designated by CQA Monitor as not in accordance with the Specifications.
2. Contractor shall be responsible for cleaning, sweeping, or other measures necessary to provide a thoroughly visible geomembrane surface for CQA Monitor's inspection.
3. CQA Monitor's inspection will be performed following a complete inspection and approval by Contractor's designated quality control technician.

3.05 GEOMEMBRANE ACCEPTANCE

A. The Contractor/Installer shall retain all ownership for the geomembrane until final acceptance by the Owner. The geomembrane liner shall be accepted by the Owner when all the following conditions are met:
1. Installation is complete, including repairs.
2. Documentation of the adequacy of all field seams and repairs, including associated testing, is complete.
3. Certification, including Record Drawings, is provided by the Contractor to the Engineer.
4. Confirmation by Engineer that liner installation has been completed in substantial conformance with Specifications and Contract Documents.

END OF SECTION 31 05 19.16

SECTION 31 05 19.17 – LEAK LOCATION SURVEY

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. The leak location survey shall be conducted after the drainage materials are installed over the geomembrane in Cell 4B Expansion to detect leaks resulting from construction damage caused during placement of the drainage material layer.

B. Requirements for performance of a geomembrane leak location survey using electrical methods for post-geomembrane installation performance for a single geomembrane covered with earth materials and underlain by earth materials.

C. Requirement to perform a geomembrane leak location survey after drainage material is placed on the geomembrane.

D. The optimum performance of a geomembrane leak location survey using electrical methods requires the conductive media above and below the geomembrane to be electrically isolated from each other except through the leaks being located in the geomembrane. It is also necessary to have a continuous electrically conducting pathway through an electrically conducting material above the geomembrane, through the leaks, and through an electrically conducting media under the geomembrane.

E. Related Work Specified Elsewhere:

1. SECTION 31 05 19.16 – HDPE and LLDPE Geomembrane Liner
2. SECTION 31 20 00 – Site Preparation and Earthwork
3. SECTION 31 23 17 – Granular Drainage Layer

1.02 REFERENCES

A. ASTM D6747 – Standard Guide for Selection of Techniques for Electrical Detection of Potential Leak Paths in Geomembranes

B. ASTM D7007 – Standard Practices for Locating Leaks in Geomembranes Covered with Water or Earth Materials

1.03 SUBMITTALS

A. Contractor shall submit a Leak Location Survey Work Plan to the Engineer for approval in accordance with SECTION 01 33 00. The Leak Location Survey Work Plan shall include:

1. Qualifications of the proposed leak location contractor to include then number of years the leak location contractor has performed the proposed survey method;
2. Resumes of proposed on-site supervisors;
3. Description of the proposed survey method, and procedures;
4. Required site preparations;
5. Estimated duration of survey;
6. Quality control and field calibration procedures;
7. A list of projects demonstrating the qualifications and experience where the proposed leak location contractor and leak location supervisor has met the requirements of Paragraph 2.01 of this section.

8. Sample of a final report (per ASTM D7007) provided by the leak location contractor following the completion of the survey.

1.04 CONSTRUCTION QUALITY ASSURANCE

A. The leak location survey shall be observed by the Engineer. The Contractor shall notify the Engineer of testing schedule in advance.
B. The Contractor shall be aware of the leak detection activities outlined herein and shall account for these activities in the construction schedule.
C. The leak location survey shall not be performed in adverse weather conditions that may affect equipment testing capabilities.

PART 2 - PRODUCTS

2.01 LEAK LOCATION CONTRACTOR AND SUPERVISOR QUALIFICATIONS

A. The leak location contractor shall have qualifications and experience in conducting the proposed survey method including having tested a minimum of 8,000,000 square feet of geomembrane liner within the previous three years. In addition, the leak location surveys must be supervised by a professional or technician with a minimum of three years of liner testing experience using the proposed leak location survey method. The leak location supervisor must be onsite full-time during the performance of the leak location survey.
B. The leak location contractor shall measure data in accordance with ASTM D7007, which may include audio indications of the signal level, manual measurements with manual reocrding of data, and automated digital data acquisition.

PART 3 - EXECUTION

3.01 INFORMATION REQUIRED

A. The Engineer shall provide the leak location contractor with drawings showing:
   1. All layers constituting the lining system.
   2. Details of all liner penetrations.
   3. Peripheral details, including welds to adjacent lining systems.
   4. Structures and obstructions above the liner.
   5. Electrical equipment above the geomembrane.

3.02 SITE PREPARATION

A. Leak location contractor will identify actions required by Contractor to prepare the site for the leak location survey.
B. Contractor shall ensure that the earth materials above and below the geomembrane contains sufficient moisture to conduct a leak location survey. Typically, a moisture content of the earth material layer of one to two percent by weight is sufficient to conduct the survey. If the moisture content of the earth material layer is not sufficient per the requirements of the leak location contractor, then the Contractor shall add sufficient water to the earth materials as required.

C. Contractor shall provide electrical isolation around the perimeter of the area being surveyed for leaks. Electrical isolation is achieved by leaving approximately a one-foot wide area of dry geomembrane exposed around the perimeter of the section or leaving a minimum of six-inches of bare liner protruding from the back-filled anchor trench. Any other electrically conducting paths through the geomembrane such as metal pipes, battens, or concrete structures should be likewise isolated.

3.03 EXECUTION

A. The leak location contractor shall inspect the site prior to commencing the survey to ensure all site preparations are completed and the site conditions are appropriate for conducting the leak location survey.

B. Any discrepancy in the required site preparation described in the Leak Location Survey Work Plan or site conditions shall be reported to the Contractor for corrective or appropriate action.

C. After the earth materials are added above the geomembrane, conduct a leak location survey on the earth materials using the procedures for surveys with earth materials covering the geomembrane described in the latest version of ASTM D7007. Various types of data acquisition may be used, including audio inidcations of the signal level, manual measurements with manual recording of data, and automated digital data acquisition.

D. The leak location contractor shall inform the Engineer and mark the locations of all identified or indicated leaks with flags, spray paint, or written coordinates.

E. Contractor shall be responsible for excavating the granular drainage material and repairing the identified leaks in the geomembrane.

3.04 REPORTING

A. Provide a written report within 14 calendar days of completion of the leak location survey field work as described in ASTM D7007.

END OF SECTION 31 05 19.17

SECTION 31 05 19.23 – GEOSYNTHETIC CLAY LINER

PART 1 - GENERAL

1.01 SUMMARY

A. This Section defines requirements for the manufacture, supply, installation, and quality control (QC) of geosynthetic clay liners (GCL).

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D5888 – Standard Guide for Storage and Handling of Geosynthetic Clay Liners.
   2. ASTM D6243 – Test Method for Determining the Internal and Interface Shear Strength of Geosynthetic Clay Liner by the Direct Shear Method.

B. Geosynthetic Institute
   1. GRI-GCL3, Standard Specification for "Test Methods, Required Properties, and Testing Frequencies for Geosynthetic Clay Liners (GCLs)."

1.03 DEFINITIONS:

A. Bentonite: Clay soil, comprised primarily of sodium montmorillonite, characterized by high swelling potential and low hydraulic conductivity.

B. Construction Quality Assurance (CQA) Officer: The professional representative of the CQA monitoring firm who will be responsible for implementing the CQA plan.

C. CQA Monitor: Site representative of the CQA firm responsible for documenting field observations and tests.

D. Engineer: The individual or firm responsible for the design and preparation of the Contract Drawings and Specifications.

E. GCL: Relatively thin factory-manufactured liner material consisting of bentonite supported by textiles or geomembrane held together by needling, stitching, or chemical adhesives.

F. Installer: The party responsible for field handling, transporting, storing, deploying, and temporary restraining (against wind) of the GCL.

G. Lot: Group of consecutively numbered rolls from the same manufacturing line.

H. Manufacturer: The party responsible for the production and quality of GCL.

I. 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.

J. Textile Backing (textile or geotextile): Geosynthetic support material consisting of woven slit film, needle-punched nonwoven, or spunlaced polymer fabric, used for securing bentonite in a GCL.

1.04 QUALIFICATIONS

A. The GCL manufacturer shall have produced a minimum of 10,000,000 square feet of the product to be supplied for the Project.

B. The Installer is responsible for field handling, deploying, and seaming the GCL. Installer shall meet one of the following requirements:
   1. The Installer shall have installed the proposed GCL for at least 5 completed projects having a total minimum area of 10,000,000 square feet, and
   2. The CQC Manager shall have provided CQC management during installation of GCL for at least 5 completed projects having a total minimum area of 2,000,000 square feet, or
   3. Provide a Manufacturer's representative, with field experience on at least 5 completed projects, to be onsite for a minimum of 3-days until the Installer has demonstrated capability.

1.05 SUBMITTALS

A. Unless otherwise stated below, all GCL submittals shall be submitted to the Engineer a minimum of 14 calendar days prior to GCL shipment. GCL will not be accepted for installation until all required submittals have been received by Engineer.

B. Submit in accordance with SECTION 01 33 00 - Submittals:
   1. Manufacturer's, Installer's, and QC laboratory's qualification statements.
   2. GCL manufacturer information including: company name, address, website.
   3. Product Data: Specifications, installation instructions, and general recommendations from the manufacturer of GCL. Cut sheets shall give full details of minimum physical properties and test methods used.
   4. Certificates issued by the raw material supplier used to manufacture the GCL including the production dates of the raw material.
   5. GCL manufacturer's quality control (MQC) certificates for each shift's production of GCL. GCL shall be tested according to the test methods and frequencies listed in Table 1(b) of GRI-GCL3 and the MQC certificates shall contain test results of all properties listed in Table 1(b) of GRI-GCL3. The Engineer reserves the right to refuse use of any GCL supplied without the proper quality control documentation at no cost to the Owner.
   6. Installer's quality control manual to include documentation of all installation, testing, and seaming activities.
   7. Panel layout drawing showing the proposed installation layout identifying field seams and including areas such as sumps and pipe penetrations. Each panel shall be assigned an identification number. The layout shall be drawn to scale for use as a construction plan and shall include dimensions, details, etc. Any proposed variance or deviation from the Drawings of Specifications shall be submitted to the ENGINEER in writing.
   8. As-constructed panel drawings referenced to the coordinate system shown on the Contract Drawings.
   9. Manufacturer's and Installer's written warranties.
   10. For proposed GCL materials, a sample of product must be provided for interface friction angle testing per ASTM D6243.
      a. This sample shall be provided directly to testing laboratory: TRI Environmental, Inc., located in Austin, TX.
      b. Contractor shall be responsible for the cost of this testing.

c. Contractor shall be responsible for providing a representative sand leveling course material sample to the laboratory.
d. Interfaces required to be tested are:
   (1) GCL internal shear strength
      (a) Consolidation/seat time shall be 24 hours.
      (b) The interface testing condition shall be wet.
      (c) Displacement rate shall be 0.004 inches per minute.
      (d) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
      (e) Testing requirements are:
         1). Peak Strength: minimum friction angle of 16 degrees and minimum 750 psf adhesion.
         2). Residual Strength: minimum friction angle of 6 degrees and minimum 240 psf adhesion.
   (2) GCL – sand leveling course interface.
      (a) Sand leveling course material shall be as specified in Section 31 20 00.
      (b) Consolidation/seat time shall be 24 hours.
      (c) The interface testing condition shall be wet.
      (d) Displacement rate shall be 0.04 inches per minute.
      (e) Confining stresses to be utilized for testing shall be 2,000 psf, 4,000 psf, and 8,000 psf.
      (f) Testing requirements are:
         1). Peak Strength: minimum friction angle of 33 degrees and minimum 0 psf adhesion.
         2). Residual Strength: minimum friction angle of 33 degrees and minimum 0 psf adhesion.
   (3) Textured HDPE geomembrane – GCL interface
      (a) Refer to Section 31 05 19.16, Part 1.03B(2)(a)
   (4) Textured LLDPE geomembrane – GCL interface
      (a) Refer to Section 31 05 19.16, Part 1.03B(3)(a)

1.06 QUALITY ASSURANCE

A. All work shall be constructed, monitored, and tested in compliance with the requirements of these Specifications and the CQA Plan. The Contractor shall participate in and comply with all items in these Specifications.
B. All GCL manufacturer quality control (MQC) testing shall meet or exceed the requirements of Part 2 of this Section. Any materials that do not conform to these requirements shall be retested or rejected at the direction of Engineer. GCL that is rejected shall be removed from the Project Site and replaced at Contractor's expense.
C. Engineer will establish a Construction Quality Assurance (CQA) program. One or more representatives will be on-site during GCL installation.
D. Contractor shall arrange for Installer to provide one or more Construction Quality Control (CQC) Managers to monitor installation, testing, and documentation of GCL installation. The

Engineer and CQC Manager will coordinate all activities relating to the installation, testing, and documentation.

E. Prior to scheduled GCL installation, the Contractor, Engineer, Installer, and CQC Manager shall attend a preinstallation meeting at the Project Site. This meeting shall be scheduled by the Engineer after receipt of panel layout drawings.
   1. Contractor shall be represented by the Project field superintendent.
   2. At the pre-installation meeting, Site safety rules of operation, quality assurance, quality control, record keeping, scheduling, and methods of installation shall be discussed.

F. Daily field records shall be maintained by Installer of actual placement of each panel, certificates of subgrade acceptance, panel numbers placed, seams welded, destructive samples taken, repairs, field tests for peel and shear, trial weld test results, and nondestructive test results.

G. CQC Manager shall submit a copy of each day's field records to Engineer no later than the following workday.

H. Documentation shall be recorded by the CQC Manager on forms similar to those presented in the CQA Plan.

1.07 DELIVERY, STORAGE, AND HANDLING:

A. Receive, store, and handle GCL materials as recommended by manufacturer and in accordance with ASTM D5888. Cover all materials completely while stored on Site prior to use.

B. Delivery:
   1. Deliver materials to the Site only after the Engineer accepts required Submittals.
   2. The Engineer shall be present during delivery and unloading of the GCL.
   3. All rolls of GCL delivered to the Site shall be identified by the GCL manufacturer at the factory with the following:
      a. Manufacturer’s name.
      b. Product identification.
      c. Lot number.
      d. Roll number.
      e. Roll dimensions.
   4. Rolls or pallets without proper identification shall be subject to rejection.

C. Storage:
   1. Temporary storage at the project site shall be on a level surface, free of sharp objects where water cannot accumulate. If necessary, elevate rolls above ground surface to prevent water run-on.
   2. The GCL shall be protected from puncture, cutting, abrasion, excessive heat or cold, dirt, mud, or any other damaging or deleterious conditions.
   3. Storage shall not result in crushing the core of roll goods or flattening of the rolls. Rolls shall not be stored more than two high.
   4. Palleted materials shall be stored on level surfaces and shall not be stacked on top of one another.

5. GCL shall be covered with a waterproof, tightly-fitting, plastic covering resistant to ultraviolet degradation. Damage to protective covering due to mishandling or sampling shall be repaired immediately.
6. An additional (secondary) layer plastic sheeting shall be utilized to encapsulate stacked rolls. Encapsulation of stored materials shall be maintained through the completion of the project.
7. Preserve integrity and readability of roll labels.
8. Damaged GCL shall be removed from the Site and replaced with GCL that meets the specified requirements at no additional cost to Owner.
9. Bagged bentonite material shall be stored and tarped next to GCL rolls unless other more protective measures are available. Bags shall be stored on pallets or other suitably dry surface which will prevent pre-hydration.

D. Handling:
1. Use appropriate handling equipment to load, move, or deploy GCL rolls.
   a. As a minimum, use support pipe of sufficient strength to support the GCL rolls during transportation and deployment, of sufficient length to go through the entire roll core, mounted on a forklift or lifted with a wide spreader bar.
      (1) If a spreader bar is used, it shall be wide enough to prevent damage to the edges of the rolls from the lifting strap or chain.
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.
3. Damage to protective covering due to mishandling or sampling shall be repaired immediately. Repairs shall be such that the GCL roll is protected from moisture or other deleterious conditions.
4. Contractor is responsible for off-loading, storage, and transporting material from storage area to installation Site.

1.08 WARRANTY:

A. The GCL manufacturer shall furnish to the Owner a 10-year written warranty provided against defects in material from the date of installation. Warranty conditions concerning limits of liability will be evaluated and must be acceptable to the Owner.

B. The Installer shall furnish to the Owner a 2-year warranty against defects in workmanship. Warranty conditions concerning limits of liability will be evaluated and must be acceptable to the Owner.

C. Such written warranties shall provide for the repair and/or replacement of any defect or defective areas of GCL or compensation for defective work, upon written notification and demonstration by Owner of the specific nonconformance of the GCL or installation with the Specifications. Compensation for defective material shall be provided to Owner for the estimated cost to Owner at that time of supplying and installing material to a clean, dry, and unencumbered condition by a third-party installer.

D. Contractor shall be responsible for obtaining any necessary guarantees or certifications from GCL manufacturer and Installer and submitting them to Engineer and Owner prior to installation of GCL.

PART 2 - PRODUCTS

2.01 GEOSYNTHETIC CLAY LINER:

A. GCL shall be a manufactured product consisting of a sodium montmorillonite clay (bentonite) layer encapsulated by two, 6 ounce per square yard nonwoven geotextiles in a manner to ensure bentonite is not displaced or thinned during handling. Geotextiles shall be reinforced (needle-punched or lock-stitched together) through the bentonite layer to form a stable composite.

B. GCL shall meet the minimum property requirements for a GT-Related Reinforced GCL as stated in Table 1(b) of the Geosynthetic Institute GRI GCL3 Standard Specification for "Test Methods, Required Properties, and Testing Frequencies for Geosynthetic Clay Liners (GCLs)."

C. Continuous waterproof lap lines and match lines shall be printed directly on the GCL at 6 to 9-inches from the edges of the rolls, respectively.

D. GCL product shall be CETCO (BENTOMAT DN) or Solmax (Bentoliner NW). No other GCLs will be considered.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Each day during placement of GCL, the Installer shall certify in writing that the surface on which the GCL shall be installed is acceptable. In so doing the Installer shall assume full liability for the accepted surface.

B. It shall be the Installer's responsibility to maintain and protect the subgrade in the condition that was originally accepted, prior to GCL deployment, until accepted by the Engineer.

3.02 PREPARATION OF SUBGRADE AND SAND LEVELING COURSE:

A. Subgrade and sand leveling course shall be complete to lines and grades shown on the Drawings and prepared as specified in Section 31 20 00 – Site Preparation and Earthwork.

B. Verify the liner termination trench system has been excavated to the depth and width shown on the Contract Drawings prior to placement. Trench corners should be slightly rounded. The trench should be clear of rocks, sticks, roots, and other debris.

3.03 GCL DEPLOYMENT:

A. Deploy only after subgrade and sand leveling course are accepted by Engineer.

B. Deploy manually or by use of spreader bar attached to loader or backhoe with support rod through entire roll width.

C. Take care not to entrap objects or moisture beneath GCL.

D. The beginning of deployment implies acceptance of subgrade by Installer.

E. All GCL shall be placed and maintained flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels.

F. Areas of the GCL that become hydrated prior to being covered by the overlying geomembrane shall be removed and replaced. Hydrated GCL is defined as material which has become soft as

determined by squeezing the material with finger pressure or material which has exhibited swelling.

G. On side slopes, the GCL shall be anchored at the top and rolled down the slope to continually maintain tension in the GCL panel and prevent loss of bentonite.

H. No construction equipment shall operate directly on the GCL during installation without approval from the Engineer. Low-ground pressure vehicles, such as ATVs, may be approved for use in deployment of the overlying geomembrane. The Contractor shall submit the type of vehicle, ground-pressure, and tire tread type to the Engineer for approval.

I. Dragging GCL panels over the ground surface shall be minimized. Edges shall be pulled tight to maximize contact and to smooth out wrinkles or creases.

J. During windy conditions, the GCL edges shall be weighted down, if necessary, with enough filled sandbags or underlying soil material to prevent damage to the GCL.

K. Do not install GCL during periods of rain or in areas of ponded water or unusually moist soils.

L. The GCL shall be sealed around any penetrations and embedded structures in accordance with the Contract Drawings and the GCL manufacturer's recommendations.

M. Cover GCL before the end of each working day. No GCL shall be left exposed overnight. The exposed edge of the GCL shall be covered by geomembrane, a temporary tarpaulin, or other such water-resistant sheeting until the next working day.

N. Install in accordance with ASTM D6102.

O. End-of-panel seams should also be located at least 5 feet from the toe and crest of slopes steeper than 5H:1V.

P. A slip sheet shall be placed over the GCL in order to allow the geomembrane to slide into its proper position. Once the overlying geomembrane is properly positioned, the slip-sheet shall be carefully removed paying close attention to avoiding any movement to the geomembrane.

Q. Displaced panels shall be adjusted to the correct position and orientation. The adjusted panel shall then be inspected for any geotextile damage or bentonite loss. Damage shall be repaired by the above procedure.

3.04 JOINING:

A. Overlaps:
   1. Using the lap line and match line as guides, overlap a minimum of 6 inches along length.
   2. Overlap a minimum of 12 inches along width and in sump areas.
   3. Overlaps or seams are not allowed perpendicular to slopes greater than 10%. In these areas, GCLs shall be placed in one piece along the entire slope.

B. Seams:
   1. If required by the Manufacturer, granular bentonite of the same type as the bentonite used for the GCL shall be placed along the entire overlap width at a minimum rate of 4 ounces per linear foot or as recommended by the Manufacturer.
   2. Use lime spreader for powder bentonite to reduce wind-blown particles.
   3. Do not sew or use mechanical connections (except for repairs).

3.05 RESTRAINING AND PROTECTING:

A. Restrain GCL against wind using sandbags filled with fine-grained material.

B. Sandbags shall remain until GCL is covered.
C. Only those GCL panels which can be anchored and covered in the same day shall be unpackaged and installed. Torn, punctured, or hydrated material as a result of not covering shall be removed and replaced in accordance with Part 3.5 at no additional cost to Owner.
D. Trimming of GCL and placement of granular bentonite shall be done to avoid contamination of drainage materials by bentonite particles.

3.06 REPAIR PROCEDURES:

A. Remove punctured or 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.

3.07 ACCEPTANCE:

A. CONTRACTOR shall retain ownership and responsibility of GCL until acceptance by 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 Engineer has completed final inspection and any noted defects have been repaired.

END OF SECTION 31 05 19.23

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY:

A. WORK INCLUDES:
   1. Protection of existing facilities and improvements, including vegetation designated to remain.
   2. Clear site of vegetation, including grubbing.
   3. Disposal.

B. Related Work Specified Elsewhere:
   1. SECTION 31 20 00 – Site Preparation and Earthwork

1.02 DEFINITIONS

A. “Clearing” shall include the removal and disposal of vegetative growth such as trees, shrubs, brush and other vegetation, boulders/rocks, down timber, rotten wood, rubbish, and other objectionable materials, except such objects that are designated to remain. It shall include but not be limited to the removal of lumber, trash piles, non-permanent structures, and other obstructions interfering with the construction.

B. “Grubbing” shall include the removal and disposal of stumps, roots, vegetative matter, sod, topsoil, and structures in or upon the ground, the removal of which is not prescribed as Clearing.

1.03 REGULATORY REQUIREMENTS

A. Conform to applicable federal, state, and county regulations regarding health, safety, and public welfare for the disposal of debris.

B. Coordinate clearing work with utility companies, as appropriate.

PART 2 - PRODUCTS: NOT USED

PART 3 - EXECUTION

3.01 PREPARATION

A. Contractor shall stake clearing limits and obtain Owner’s approval prior to clearing and grubbing. In no case shall clearing extend beyond construction limits flagged for the project.

B. Verify that existing features outside designated work areas are tagged or identified to be protected and preserved.

3.02 PROTECTION

A. Locate, identify, and protect utilities, monitoring wells and gas probes from damage. Regardless of the cooperation of affected agencies and utilities, the Contractor shall be responsible for any damage to services and utilities that are attributable to its operations, and shall be responsible for the necessary repairs thereto.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect all section, subdivision, plat, property corner, and any official monuments or benchmarks. In the event any such monument or marker and casing is disturbed as a result of

the Contractor's operations, the Owner will replace or reset the monument or marker and deduct cost of such work from Contractor's progress payments and Contract Amount.

3.03 CLEARING, GRUBBING, AND STRIPPING

A. Clear, grub, and strip areas as required for access to site and execution of Work, including areas noted for material stockpiles and borrow areas.

B. Completely remove grasses and other vegetative material from areas designated to be cleared and grubbed.

C. Stripping:

1. Remove topsoil from areas within limits of the landfill cell, excavation, trenching, borrow, and areas designated to receive embankment and compacted fill or excavation as follows:
    a. Scrape areas clean of all brush, grass, weeds, roots, and other materials.
    b. Strip to depth of approximately 6 inches or to a sufficient depth to remove excessive roots in heavy vegetation or brush areas and as required to segregate topsoil.
    c. Stockpile topsoil in areas designated where it will not interfere with construction operations or existing facilities. Stockpiled topsoil shall be reasonably free of subsoil, debris, and stones larger than 2-inch diameter.

D. Clear surface rock, undergrowth, and deadwood without disturbing subsoil.

3.04 DEWATERING

A. Contractor shall complete dewatering activities as specified in SECTION 31 20 00.

3.05 DISPOSAL

A. The Contractor and Contractor shall be responsible for disposing of removed debris, rock, and vegetation.

B. The Contractor must conform to applicable federal, state, and county regulations regarding health, safety, and public welfare for the disposal of debris.

END OF SECTION 31 10 00

SECTION 31 20 00 - SITE PREPARATION AND EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes Site preparation activities and certain items of earthwork common to other related Work.

B. Related Work Specified Elsewhere:

1. SECTION 31 10 00 – Site Clearing
2. SECTION 31 23 17 – Granular Drainage Material
3. SECTION 31 23 33 – Trenching and Backfilling
4. SECTION 31 25 00 – Erosion and Sedimentation Control

1.02 REFERENCES:

A. Applicable Standards:

1. American Society for Testing and Materials (ASTM):
   a. D698 – Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb. Rammer and 12-in. Drop. (5-point method)
   b. D2216 – Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.
   c. D2434-06 – Test Method for Permeability of Granular Soils (Constant Head).
   d. D2487 – Standard Practice for Classification of Soils for Engineering Purposes.
   e. D2488 – Practice for Description and Identification of Soils (Visual-Manual Procedure).
   f. D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
   g. D6938 – Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
2. Alaska Department of Transportation (AkDOT) Alaska Test Methods (ATM):
   a. ATM 203 – Organic Content of Soils

1.03 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Dewatering Plan.

C. Materials conformance testing (where applicable).

1.04 QUALITY ASSURANCE:

A. Sampling and Testing:

1. Tests to determine conformance with all requirements of this Specification for quality and properties of all Contractor -secured materials, including borrow materials proposed for use, shall be performed by an independent, commercial laboratory retained and compensated by Contractor, and approved by Engineer.
2. When incorporating materials into the Project, quality control testing will be performed during construction by a testing laboratory retained and compensated by Contractor.

PART 2 - PRODUCTS

2.01 SUBGRADE

A. Existing topsoil and vegetation shall be removed prior to establishment of subgrade. Subgrades shall be established using General Fill.

B. Subgrade shall have no organic matter, debris, sticks, roots, sharp objects, protuberances, or weed growth. Maximum rock size shall be 2-inch in diameter. Maximum clod size shall be 3-inch in diameter.

C. No standing water or excessive moisture shall be present.

D. Contractor shall provide in-place testing as outlined in paragraph 3.03 of this Section.

2.02 GRANULAR DRAINAGE MATERIAL: SEE SECTION 31 23 17.

2.03 GENERAL FILL (OWNER PROVIDED):

A. Borrow material obtained from on-site; free of shale, friable material, debris; maximum grain size no larger than 3-inches. Material locations shall be approved by the Owner prior to use.

B. Contractor shall provide source testing of material prior to placement.

2.04 PIPE AND STRUCTURAL BEDDING:

A. Material:

1. Natural or processed granular material; free of organic matter, free from sharp, angular pieces; well rounded to subround particles; graded in accordance with ASTM D422 or D6913, within the following limits:

Sieve Size	Percent Passing
3/8-inch	100
No. 200	0-10

B. Contractor shall provide source testing of material prior to placement.

2.05 SAND LEVELING COURSE MATERIAL:

A. Material:

1. Screened pit run sand; free of organic matter, free from sharp, angular pieces; well rounded to subround particles; graded in accordance with ASTM D422 or D6913, within the following limits:

Sieve Size	Percent Passing
No. 4	100
No. 16	60-100
No. 200	0-3

B. Contractor shall provide source testing of material prior to placement.

2.06 CRUSHED SURFACING (GRADATION D-1):

A. Manufactured Gradation D-1 aggregate meeting the general requirements of AkDOT Standard Specifications Section 703. Recycled, crushed concrete meeting this gradation is NOT an acceptable substitute.

B. Contractor shall provide source testing of material prior to placement.

2.07 TOPSOIL (OWNER PROVIDED):

A. Onsite topsoil obtained from stripping existing topsoil.

B. If additional topsoil is required, Contractor shall furnish a topsoil meeting the general requirements of AkDOT Standard Specifications Section 726. Contractor shall provide source testing of material brought in from offsite prior to placement.

2.08 RIPRAP:

A. Shall be as specified on the Drawings.

B. Contractor shall provide source material testing for this product.

PART 3 - EXECUTION

3.01 SITE PREPARATION:

A. Site Clearing: perform in accordance with SECTION 31 10 00.

3.02 EARTHWORK:

A. Excavation:

1. Perform excavation as indicated or as required to complete the Work.
2. It shall be the responsibility of the Contractor to maintain safe excavations during construction.
3. Excavation consists of open-cut excavation and removal of all types of material encountered when establishing required subgrade and finished grade. No rock excavation is expected; accordingly, no distinction shall be made for rock excavation.
4. Unauthorized excavation consists of removal of materials beyond indicated subgrade/grade or finished elevations or dimensions without specific direction of Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be at Contractor's expense. Remedial measures shall be as follows:
   a. Under footing, foundation bases, or other structures: Fill unauthorized excavation by extending bottom elevation of footings, base or structure to excavation bottom, without altering required top excavation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
   b. Elsewhere: Backfill and compact unauthorized excavations with specified Common Backfill, as determined by Engineer. Compact to a density not less than that specified for the subsequent material layers.
5. Dewatering:
   a. General:

(1) Contractor shall submit dewatering plan to Engineer seven days prior to commencing excavation for approval.
(2) Provide dewatering system of a sufficient size and capacity as required to control ground and surface water flow into the excavation and to allow all Work to be installed in a dry condition.
(3) Control, by acceptable means, all water regardless of source and be fully responsible for disposal of the water.
(4) Confine all discharge piping and/or ditches to the available easement or to additional easement obtained by Contractor. Provide all necessary means for disposal of the water, including the obtaining of all necessary permits and of additional easement at no additional cost to Owner.
(5) Install, operate, and maintain the dewatering system required to control surface and/or groundwater.
(6) Control grading around excavations to prevent surface water from flowing into excavation areas.
(7) Pump as required to continually maintain all excavations and trenches free of water or mud from any source, and discharge to approved drains or channels. Commence when water first appears and continue until Work is complete.
(8) French drains shall not be used.
(9) Minimize the amount of turbidity or silty water entering surface water per project SWPPP. Methods to minimize sediment from entering a surface water may include:
    (a) Construction of a detention basin.
    (b) Use of a portable detention basin.
    (c) Pump turbid waters away from surface.
(10) Do not allow water discharge to run over roads, parking areas, or work areas where water or ice could cause a hazardous condition.
(11) No additional payment will be made for any supplemental measures to control seepage, groundwater, or artesian head.

b. Leachate:
(1) During construction, Contractor shall be responsible for any and all leachate encountered including incidental storm water management. Contractor shall notify the Owner prior to exposing existing geomembrane liner and shall limit the time frame between exposing the existing geomembrane liner and placing/connecting the new geomembrane liner. Contractor shall coordinate leachate disposal with Owner.
(2) The Contractor shall be responsible for keeping leachate (and stormwater) from entering the construction area upon commencement of construction activities until acceptance of final completion.
(3) No additional payment will be made for the control of leachate encountered during construction.

c. Damages:

(1) Contractor shall be responsible for and shall repair without cost to Owner any damage to work in place, other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, and the excavation, including, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.

(2) Remove subgrade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to Owner.

d. Maintaining Excavation in Dewatered Condition:

(1) Dewatering shall be a continuous operation. Interruptions due to power outages, or any other reason shall not be permitted.

(2) Subsequent to completion of excavation and during the installation of all Work in the excavated area, Contractor shall maintain the excavation in a dewatered condition.

e. System Removal:

(1) Contractor shall remove all dewatering equipment from the Site, including related temporary electrical service.

(2) Removal work required under this paragraph does not include any of the site cleanup work as required elsewhere in these Specifications.

6. Stockpiling:

a. Construct stockpiles and spoils piles in accordance with the AkDOT Standard Specifications Section 305 as modified herein.

b. Stockpile in amounts sufficient for and in a manner to segregate materials suitable for the following:

(1) Topsoiling.

(2) Constructing embankments and fills.

(3) Backfilling.

(4) Waste only.

c. Do not obstruct or prevent access to:

(1) Roads and driveways.

(2) Utility control devices.

(3) Ditches or natural drainage channels.

d. Perform in a manner to avoid endangering the Work, stability of banks or structures, or health of trees and shrubs to be saved.

e. Locate stockpiles as directed by Engineer or Owner. Do not exceed 25-feet height of piles unless permitted by Engineer. Place, grade, and shape stockpiles for proper drainage. Do not exceed 2 horizontal to 1 vertical slopes for stockpiles.

f. Provide sediment fences and barriers to prevent loss of material or movement outside the stockpile limits, as necessary.

g. Maintain safe distance between toe of stockpile and edge of excavation or trench.

h. Stockpile in other areas or off Site when adjacent structures, easement limitations, or other restrictions prohibit sufficient storage adjacent to the Work. Off-Site areas shall be arranged for by Contractor at no additional cost to Owner.

7. Waste Materials:
   a. Waste materials as described for purposes of this Contract within this Section consist of deleterious soils, rock, and other materials considered unacceptable for compaction or placement fill, and which are not environmentally contaminated. Waste materials shall not include environmental pollutants, hazardous substances, contaminated products, by-products, samples, or waste materials of any kind that are regulated under environmental laws.
   b. Remove waste materials from Work area as excavated.
   c. Deposit such materials in locations and within areas designated by Engineer and as indicated.
   d. Place excavated rock in the interior of waste area fills so that it will not be exposed to view.
   e. Grade waste areas and leave them free draining and with an orderly and neat appearance.

B. Embankment:
   1. Construct embankments to the contours and elevations indicated, using suitable approved material from excavations and borrow areas:
      a. Borrow:
         (1) Refers to all fill materials and topsoil.
         (2) Borrow shall include all excavating, handling, and final disposal of materials as specified.
         (3) Borrow areas shall be:
            (a) As indicated.
            (b) Arranged for by Contractor at no additional cost to Owner.
            (c) Subject to approval.
         (4) Material removed from borrow areas shall be as approved.
         (5) Leave borrow areas graded to drain and to present a neat appearance.
      b. Compaction:
         (1) Compact embankments using equipment as required to obtain reasonable uniformity.
         (2) Except as indicated otherwise, compact embankments to 95% of maximum dry density within the moisture content range from 3% below optimum to 3% above optimum. Optimum moisture and maximum density shall be as determined by ASTM D698.
         (3) Compaction shall be as obtained by normal methods and equipment during the placing and grading of layers and to the minimum density specified for particular locations.
         (4) Moisture content shall be that required to obtain specified compaction of the soil:

(a) Perform moisture curing by wetting or drying of the material as required to attain required compaction criteria.

(5) Achieve minimum densities specified.

c. Placement:

(1) Place fill material in 4-inch to 8-inch layers in areas requiring a high degree of compaction and in 8-inch to 12-inch layers in other embankment areas.

(2) Place embankment only on subgrades approved by Engineer.

(3) Do not place snow, ice, or frozen earth in fill; do not place fill on a frozen surface.

C. Rough Grading:

1. All areas within the Project, including excavated and filled sections, and adjacent transition areas shall be reasonably smooth, compacted, and free from irregular surface changes.
2. Degree of finish shall be that ordinarily obtained from blade grader or scraper operations, except as otherwise specified.
3. Finished rough grades shall generally be not more than 0.5 foot above or below established grade or approved cross sections with due allowance for topsoil and sod.
4. Finish all ditches, swales, and gutters to drain readily.
5. Unless otherwise indicated, slope the subgrade evenly to provide drainage away from building walls in all directions at a grade not less than 1/4 inch per foot.
6. Provide roundings at top and bottom of banks and at other breaks in grade.

D. Subgrades:

1. General:
   a. Excavate or fill as required to construct subgrades to the elevations and grades indicated.
   b. Remove all unsuitable material and replace with approved fill materials.
      (1) Fill shall be placed and compacted in accordance with embankment requirements.
   c. Perform all wetting, drying, shaping, and compacting required to prepare a suitable subgrade.
      (1) Compact top 12 inches of subgrade to 95% minimum of maximum dry density with moisture content maintained within 3% of optimum.
   d. Exposed area to receive fill, backfill, or embankment shall be proof-rolled to detect localized zones of excessively wet, unstable, organic, or low bearing capacity materials to the extent as follows:
      (1) Proof-roll as a single-pass operation with conventional compaction equipment during subgrade preparation and prior to placement of fill, and as a spot check process without the need for complete coverage per unit area of tire. Soft spots will be over excavated, backfilled and compacted with suitable material.
2. Subgrade for Fills and Embankment: Roughen by discing or scarifying. Wet or dry top 6 inches, as required, to bond with fill or embankment.

E. Sand Leveling Course:
   1. Cell 4 Expansion outside of Cell 2A final cover overlay:
      a. Place only after subgrade has been accepted by Engineer.
      b. Place sand leveling course over prepared subgrade with a surface soil temperature at or above 35° F.
      c. Place in a single compacted smooth lift.
      d. Finish surface by rolling once with a steel drum roller.
   2. Cell 4 Expansion within of Cell 2A final cover overlay:
      a. Remove any unsuitable materials discovered in existing sand leveling course after removing the existing GCL.
      b. Add additional material as needed to create a consistent surface free of ruts or gaps in the sand.
      c. Finish surface by rolling once with a steel drum roller.

F. Topsoiling:
   1. Includes placement of topsoil on all areas not specified to receive paving or other surface treatment (including borrow or waste areas), or as otherwise indicated.
   2. Materials:
      a. Those obtained from excavation which are most suitable and stockpiles for such purpose:
         (1) Topsoil shall be a fertile, friable, and loamy soil of uniform quality, free from materials such as hard clods, stiff clay, stone with any dimension greater than 1 inch, and similar impurities. Relatively free from grass, roots, weeds, and other objectionable plant material.
      b. Borrow when required.
   3. Subgrade Treatment:
      a. Clear Site of vegetation heavy enough to interfere with proper grading and tillage operations.
      b. Clear surfaces of all stones or other objects larger than 3 inches in thickness or diameter, all roots, brush, wire, grade stakes, or other objectionable material.
      c. Loosen subgrade by discing or scarifying to a depth of 2 inches wherever compacted by traffic or other causes to permit bonding of the topsoil to the subgrade.
   4. Placement of Topsoil:
      a. Distribute over required areas without compaction in upper 1 foot, other than that obtained with spreading equipment.
      b. To extent material is available within following limits:
         (1) Topsoil shall be placed at six-inch minimum depth.
         (2) Shape cuts, fills, and embankments to contours indicated.
         (3) Grade to match contours of adjacent areas and permit good, natural drainage. Provide gentle mound over trenches.
   5. Maintenance:
      a. After topsoil has been spread, clear surface of stones or other objects larger than 1 inch in thickness or diameter and all other objects that might interfere with planting and maintenance operations.

b. Protect topsoiled areas from the elements until grass is established and repair eroded areas as required.
c. Keep paved areas clean. Promptly remove topsoil or other dirt dropped upon surfacing.

G. Crushed Surfacing:
1. Compact to AkDOT Specification 301-3.03 Shaping and Compaction of Aggregate Base and Surface Course standards. Depth as shown on Drawings.

3.03 FIELD QUALITY CONTROL:
1. Coordinate survey and testing with Owner and Engineer. Do not complete further excavation or material placement until all surveying and testing necessary have been completed and checked by the Engineer.
2. Surveying shall be completed in accordance with SECTION 01 71 23.
3. Field inspection and testing will be performed by Contractor.
4. Tests and analysis of fill material will be performed in accordance with ASTM D698.
5. Compaction testing will be performed in accordance with ASTM D6938.
6. Compaction testing will be performed on both fill and cut areas as determined necessary by the Owner.
7. If tests indicate Work does not meet specified compaction requirements, Contractor shall remove and replace or recompact. Retesting costs shall be charged to Contractor and deducted from future payments.
8. To establish acceptability of material, tests shall be performed for each soil type in accordance with the following standards:
   a. Subgrade:
      (1) Prior to Placement (Contractor Provided):
         (a) Particle Size Distribution (ASTM D422) – 1 test/acre.
         (b) Soil Classification and Description (ASTM D2487/D2488) – 1 test/acre.
         (c) Moisture Density Relationship (ASTM D698) – 1 test/acre.
         (d) Moisture Content (ASTM D2216) – 1 test/acre
      (2) In-Place Soil Testing (Contractor Provided):
         (a) In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (ASTM D6938) – 1 test/acre
   b. Sand Leveling Course:
      (1) Prior to Placement (Contractor Provided):
         (a) Particle Size Distribution (ASTM D422) – 1 test/acre.
   c. Granular Drainage Material – per SECTION 31 23 17.
   d. General Fill/Backfill:
      (1) Prior to Placement (Contractor Tested):
         (a) Particle Size Distribution (ASTM D422 or D6913) – 1 test/source or change within source.
      (2) In-Place Soil Testing (Contractor Provided):

(a) In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (ASTM D6938) – 1 test/acre/2-ft of fill.

e. Pipe and Structural Bedding:
   (1) Prior to Placement (Contractor Tested):
      (a) Particle Size Distribution (ASTM D422 or D6913) – 1 test/source or change within source.

f. Crushed Surfacing (Gradation D-1):
   (1) Prior to Placement (Contractor Tested):
      (a) Particle Size Distribution (ASTM D422 or D6913) – 1 test/source or change within source.

g. Topsoil (if brought in from offsite):
   (1) Prior to Placement (Contractor Tested):
      (a) Particle Size Distribution (ASTM D422 or D6913) – 1 test/source or change within source.
      (b) Organic Content of Soils (ATM 203) – 1 test/source or change within source.

h. Riprap:
   (1) Prior to Placement (Contractor Tested):
      (a) Particle Size Distribution (ASTM D422 or D6913) – 1 test/source or change within source.

3.04 PROTECTION OF THE WORK:

A. Maintenance:
   1. Protect newly graded and topsoiled areas from actions of the elements.
   2. Fill and repair settling or erosion occurring prior to landscaping and reestablish grades to the required elevations and slopes.

B. Correction of Backfill Settlement:
   1. Under provisions of the guarantee, Contractor is responsible for correcting any settlement of backfill and damages created thereby within 1 year after acceptance of the Work.
   2. Make repairs within 10 days from and after due notification by Owner of backfill settlement and resulting damage.
   3. Make own arrangements for access to the Site for purposes of repair.

END OF SECTION 31 20 00

SECTION 31 23 17 – GRANULAR DRAINAGE MATERIAL

PART 1 - GENERAL

1.01 SECTION INCLUDES:

A. Construction of an 18-inch-thick granular drainage material for the Cell 4 Expansion.

B. Related Work Specified Elsewhere:

1. SECTION 01 71 23 – Construction Layout and Surveying
2. SECTION 31 05 19.13 – Geotextile
3. SECTION 31 05 19.16 – HDPE and LLDPE Geomembrane Liner
4. SECTION 31 05 19.17 – Leak Location Survey

1.02 REFERENCES:

A. ASTM D2434 – Permeability of Granular Soils.

B. ASTM D2487 – Classification of Soils for Engineering Purposes.

C. ASTM D2488 – Practice for Description and Identification of Soils (Visual-Manual Procedure).

D. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

1.03 SUBMITTALS:

A. Submit per SECTION 01 33 00:

1. The manner and method of installing the granular drainage layer prior to beginning construction of the drainage layer.
2. In place quality control testing.

PART 2 - PRODUCTS

2.01 GRANULAR DRAINAGE MATERIAL (FURNISHED BY OWNER)

A. Granular drainage material will be furnished by Owner.

B. Material shall consist of durable, well-rounded gravel, free from sharp, angular pieces, and free of fines, organic matter, and other deleterious material.

C. Granular drainage material shall be graded in accordance with ASTM D422 or ASTM D6913 within the following limits:

1. Gradation:

Sieve Size	Percent Passing
2-inch	100
1-inch	40-70
1/2-inch	0-10
No. 4	0-5

2. Permeability: $\geq 1 \times 10^{-1}$ cm/sec or greater.

D. Owner will provide source material testing for granular drainage material.

E. The Contractor is responsible for placement of the material to the specified requirements.

F. Any areas not meeting the construction standards shall be reworked at the Contractor's expense.
G. The Owner or Engineer reserves the option to inspect and reject unsuitable materials.
H. Contractor shall be responsible for maintaining roads free of material in accordance with SECTION 01 11 00.
I. Contractor shall be responsible for any damages in accordance with SECTION 01 11 00.

PART 3 - EXECUTION

3.01 GRANULAR DRAINAGE MATERIAL LAYER CONSTRUCTION

A. The Contractor shall submit source material testing results prior to delivery of material to demonstrate conformance to material specifications. Prior to placement, Engineer may request testing of stockpiles if material degradation is observed.
B. The Contractor shall clean the geomembrane/geotextile cushion surface of all loose soil and debris before initiating placement of the granular drainage layer.
C. The Contractor shall place the granular drainage layer above the geomembrane/geotextile cushion as shown on the Contract Drawings.
D. The Contractor shall submit to the Engineer the manner and method of installing the granular drainage material prior to beginning installation. The granular drainage material shall be carefully placed to avoid damaging the geomembrane/geotextile cushion.
E. Tracked construction equipment shall not be operated directly upon the geomembrane/geotextile cushion. A minimum fill thickness of 12-inches is required prior to operation of low ground pressure tracked vehicles over the geomembrane/geotextile cushion. Abrupt turning and pivoting of tracked vehicles shall be avoided to prevent tracks from displacing the fill and damaging the geosynthetics.
F. Maintain 3-feet of cover over geomembrane/geotextile cushion in areas of haul roads, stockpiles, and in areas of equipment with operating weight exerting greater than 60 psi contact pressure.
G. Material shall be placed at the outer edges of the liner and graded toward the center of the cell by "low ground pressure" tracked equipment, to eliminate equipment traffic on the liner. Only tracked type construction equipment with ground pressure less than 5 psi shall be used to place fill over geomembrane/geotextile cushion. Any damage to the geosynthetics will be repaired at the Contractor's expense.
H. Thickness of granular drainage layer shall not vary by minus 0 percent or plus 0.25 feet of the plan thicknesses.
I. Placement should be performed to minimize wrinkles. Equipment operators should be briefed on method of placement and affects to thermal expansion and contraction of the liner.
J. If a wrinkle forms, every effort should be made to smooth the wrinkle out. The Engineer or Owner may direct the Contractor to work on other areas until more favorable conditions exist for placement of the granular drainage material.
K. Contractor shall install granular drainage materials in accordance with the geomembrane manufacturer’s recommendations.
L. Material shall be placed in uniform, uncompacted lifts of 18-inches minimum.

M. Material is not compacted. Track cleat marks in final lift to be perpendicular to slope direction.
N. Granular drainage material shall be placed above and below piping as indicated on the Contract Drawings.

3.02 QUALITY CONTROL

A. Source Testing (Prior to Placement)
   1. The following testing procedures will be performed for verification of the Owner provided material:
      a. Particle size distribution (ASTM D422 or D6913) – 1 test per 2,500 CY (3 minimum)
      b. Soil classification and description (ASTM D2487/D2488) – 1 test per 2,500 CY (3 minimum)
      c. Soil permeability (ASTM D2434) – 1 test per 2,500 CY (3 minimum)
   2. Source testing of granular drainage material will be conducted by the Owner.
B. In-Place Field Inspection and Testing
   1. Permeability (ASTM D2434) – 1 per project.
      a. Minimum required permeability after installation: $1x10^{-1}$ cm/sec.
   2. In-Place Field testing will be conducted by the Contractor.
C. Drainage Layer Thickness
   1. The Contractor will verify the thickness of the granular drainage layer in accordance with SECTION 01 71 23. The thickness of materials over pipe shall be field verified.
   2. The Contractor shall prepare a record drawing showing the location and thickness of the granular drainage material and submit to the Engineer as required in SECTION 01 71 23.
   3. The Contractor shall place additional granular drainage material in any area showing a deficiency and re-survey those areas at no cost to the Owner.
D. If material testing indicates that the specified requirements are not being met, the Contractor shall remove and replace the non-conforming area. All cost associated with the remedial work, including re-testing costs, shall be borne by the Contractor.

3.03 LEAK LOCATION SURVEY

A. Upon completion of granular drainage material placement on top of the installed geomembrane/geotextile cushion for Cell 4 Expansion, the Contractor shall complete a geomembrane leak location survey. Refer to SECTION 31 05 19.17 for Leak Location Survey Specifications.

END OF SECTION 31 23 17

SECTION 31 23 33 – TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes:
   1. Excavation, sheeting, bracing, and all operations necessary for the preparation of trenches for bedding of pipes and pipe appurtenances.
   2. Pipe embedments and encasements.
   3. Backfilling of trenches.

B. Related Work Specified Elsewhere:
   1. SECTION 31 20 00 – Site Preparation and Earthwork
   2. SECTION 33 00 00 – Utilities

1.02 REFERENCES:

A. Applicable Standards:
   1. American Society for Testing and Materials (ASTM):
      a. As specified herein.
   2. Occupational Safety and Health Administration (OSHA):
      a. Part 1926 – Safety and Health Regulations for Construction.

1.03 SUBMITTALS:

A. Submit as specified in SECTION 01 33 00.

B. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as "OSHA Part 1926" or successor regulations, which require design by a registered professional engineer, submit (for information only and not for Engineer approval) the following:
   1. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.
   2. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.

PART 2 - PRODUCTS

2.01 PIPE AND STRUCTURAL BEDDING: SEE SECTION 31 20 00

2.02 TRENCH BACKFILL MATERIALS (GENERAL FILL):

A. Obtain from the following:
   1. Trenches and other excavations included in this Project.
   2. Borrow from location as indicated by Owner.
   3. As specified for pipe embedment.
   4. Combination of above.

B. Free from organic matter, refuse, ashes, cinders, frozen, or other unsuitable material.

C. Gravel, rock, or shale particle size limited as follows:
   1. Not to exceed 2 inches in greatest dimension within 12 inches of pipe or conduit and 18 inches of trench.
   2. Gravel, rock, or shale not allowed within 12 inches of buried cable.
   3. Maximum dimension one-half the depth of layer to be compacted in other areas.
D. Contain sufficient fine materials to provide a dense mass free of voids and capable of satisfactory compaction.
E. Have moisture content enabling satisfactory placement and compaction.

PART 3 - EXECUTION

3.01 TRENCHING:

A. Equipment and Methods:
   1. Types of Equipment and methods may be at Contractor's option, where structures or other facilities are not endangered.
   2. Equipment and methods shall be subject to approval of jurisdictional agency where stability or usefulness of other facilities may be impaired.
   3. Perform by hand methods when required to save or protect, culverts, utilities, or other
B. Side Walls:
   1. Make vertical or slope within specified trench-width limitations below a horizontal plane 12 inches above top of pipe.
   2. Vertical or stepped as required for stability, above a horizontal plane 12 inches above top of pipe.
   3. Excavate without undercutting.
C. Trench Depth:
   1. Depth shall be sufficient to provide the minimum bedding requirements for the pipe being placed.
   2. Do not exceed the indicated depth where conditions of bottom are satisfactory.
   3. Increase depth as necessary to remove unsuitable supporting materials.
D. Trench Bottom:
   1. Protect and maintain when suitable natural materials are encountered.
   2. Remove rock fragments and materials disturbed during excavation or raveled from trench walls.
E. Trench Width:
   1. Excavate trench to a width which will permit satisfactory jointing of the pipe and thorough tamping of the bedding.
   2. Maximum trench width shall not exceed maximum indicated on the Construction Plans.
F. Test Pits:
   1. Excavate test pits sufficiently in advance of trenching to enable adequate planning of construction procedure.
   2. Locate as follows:
      a. Where interference or conflict with other utilities or structures could affect alignment of pipe.

3. With lateral dimension not less than minimum trench width specified for location excavated.
4. To depth required to obtain information desired.

G. Dewatering:
1. Control grading around trenches to prevent surface water from flowing into excavated trench areas.
2. Drain or pump as required to continually maintain, including days not normally worked, all excavations free of water or mud from any source, and discharge to approved drains or channels. Commence when water first appears and continue as required to keep trench free of standing water during entire time trench is open.
3. Use pumps of adequate capacity to ensure rapid drainage of area, and construct and use drainage channels and subdrains with sumps as required.
4. When water is found in the trench, remove unsuitable excessively wet subgrade materials and replace with approved fill material as directed by Engineer and at no additional cost to Owner.

3.02 BACKFILLING:

A. Placement:
1. Complete promptly after approval to proceed:
a. Upon completion of pipe embedment.
2. Place in layers of thickness within compacting ability of equipment used.

B. Compaction:
1. Topsoil: Material is not compacted. Track cleat marks in final lift to be perpendicular to slope direction.
2. Trenches shall be compacted to a minimum of 90% standard proctor density. Acceptable moisture contents shall be +/- 3% of optimum moisture content, unless otherwise approved by the Engineer, and shall be controlled by the Contractor in order to meet the compaction requirements specified herein.
3. Perform at moisture content necessary to achieve required results with equipment used.
4. Perform with spreading equipment supplemented by hand-operated equipment and rollers as required to obtain density specified.
5. Accomplish without inundation or flooding.
6. Backfill failing to meet required densities shall be removed or scarified, recompacted, and retested as necessary to achieve specified results. All costs for reworked areas shall be borne by the Contractor at no cost to the Owner.

3.03 WASTE TRENCHING, BACKFILLING, AND TRANSPORT

A. Remote Gas Well Conversions
1. Waste excavated during the installation of remote gas well conversions may be backfilled in the remote gas well trench after placement of pipe and bedding materials.
2. Waste backfill shall extend from the top of pipe bedding material to no more than two feet below existing ground.
3. The final two feet of backfill shall consist of replacement of existing final cover material.

B. Excavated Waste Transport

1. Contractor is responsible for transport of surplus excavated waste material to the active working face of Cell 4 for disposal. Coordinate waste disposal with Owner.

3.04 FIELD QUALITY CONTROL:

A. Compaction: Contractor shall, through services of an independent laboratory, test all trench-stabilization material, granular pipe embedment, earth-pipe embedment, and trench backfill to determine conformance with specified moisture-density relationships.

1. Pipe embedment and trench backfill shall be tested at a minimum of every 500-foot of trench (each) or as directed by the Engineer.

END OF SECTION 31 23 33

SECTION 31 25 00 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.01 SUMMARY:

A. Sediment fence.
B. Erosion control blankets.
C. Vehicle tracking control.
D. Temporary erosion control measures.

1.02 RELATED SECTIONS

A. SECTION 01 51 00 – Temporary Facilities and Controls
B. SECTION 31 20 00 – Site Preparation and Earthwork
C. SECTION 32 92 00 – Seeding
D. SECTION 33 00 00 – Utilities

1.03 QUALITY CONTROL

A. Comply with the requirements specified herein and applicable federal, state and county permits, licenses, and authorizations.

1.04 SUBMITTALS

A. Submit the following under provisions of SECTION 01 33 00:
    1. Silt Fence: Manufacturer's catalog literature and product specifications.
    2. Erosion Control Blankets: Manufacturer's catalog literature and product specifications on erosion control matting and fastening devices.
    3. Dust Control Plan: Submit within 14 days after Notice to Proceed. The Dust Control Plan must address all phases of construction.

PART 2 - PRODUCTS

2.01 SILT FENCE

A. Filter Fabric
    1. Provide filter fabric composed of strong, rot-proof, woven or non-woven polymeric fibers oriented into a stable network such that the fibers retain their relative positions with respect to each.
    2. Provide filter fabric free of any chemical treatment or coating which may significantly reduce permeability and flaws and defects which could significantly alter its physical properties.
    3. Provide filter fabric with ultraviolet ray inhibitors and stabilizers.
    4. Slit film woven fabric will not be allowed.
    5. Provide standard strength filter fabric that meets the following physical property requirements (values indicated are minimum average fill values):

Property	Value	Test Method
Grab Tensile Strength	110 lbs. Min	ASTM D4632
Apparent Opening Size (AOS)	20-40	ASTM D4751 Based on U.S. Std Sieves
Ultraviolet Stability	70% minimum at 500 hours	ASTM D4355
Water Flow Rate	30 gal/min/SF minimum	ASTM D4491

B. Posts: 4-inch x 4-inch wood posts (Type B), 2-inch x 4-inch wood posts (Type A), standard or better; or steel fence posts.
C. Wire Mesh Fabric: 2-inch x 2-inch x 14 gauge

2.02 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be a matrix of long-fibered mulch held by netting on one or both sides or sewn through the filler in accordance with AKDOT Section 727 – Stabilization Material.
B. Staples used to anchor the erosion control blanket shall be no longer than 6-inches in length from top to bottom after bending.

2.03 VEHICLE TRACKING CONTROL

A. Vehicle tracking control shall be per Alaska SWPPP Guide BMP 23.00 Stabilized Construction Exit.
B. Tracking controls shall be placed at all site access points and consist of 1.5-3 inch clean aggregate.
C. Tracking controls should be a minimum of 50 feet in length.

PART 3 - EXECUTION

3.01 GENERAL

A. Construct or maintain, as required, the erosion/sedimentation control facilities, shown on the Drawings and in accordance with Alaska Department of Transporation standard specifcations and details, in such a manner as to ensure that sediment-laden water does not enter the drainage system or violate applicable water standards.
B. The erosion and sedimentation control facilities shown on the Contract Drawings are the minimum requirements for anticipated site conditions. Upgrade, during the construction period, erosion and sedimentation control facilities (e.g. add sumps, relocate ditches, and sediment fence, etc.) as needed for unexpected storm events.
C. Inspect all erosion control measures immediately after each rainfall, and at least daily during prolonged rainfall. Make any repairs immediately.

3.02 SILT FENCE

A. Place in accordance to manufacturer’s recommendations.

B. Place as indicated on Contract Drawings.
C. Upon completion of project, or when directed by the Owner or Engineer, remove and dispose of sediment fences.

3.03 EROSION CONTROL BLANKET

A. Place in accordance to manufacturer's recommendations.
B. Place as indicated on Contract Drawings.

3.04 VEHICLE TRACKING CONTROL

A. Vehicle tracking control(s) shall be installed prior to any major earth disturbance activities.

3.05 TEMPORARY EROSION CONTROL MEASURES

A. Employ temporary erosion control measures as required to maintain and protect work in progress on the landfill site. The temporary erosion control measures may include, but shall not be limited to the following:
    1. Diversion ditches and berms.
    2. Protective plastic sheeting.
    3. Silt fencing.

END OF SECTION 31 25 00

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 92 00 - SEEDING AND SODDING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes seedbed preparation, seeding, sodding, mulching, and fertilizing of areas indicated and/or disturbed by Contractor's construction activities.

1.02 REFERENCES:

A. Applicable Standards:
   1. AkDOT Standard Specifications for Highway Construction:
      a. Section 618 – Seeding
      b. Section 712-2.01 – Water
      c. Section 724 – Seed
      d. Section 725 – Fertilizer
      e. Section 727 – Soil Stabilization Material

1.03 SUBMITTALS:

A. Submit in accordance with SECTION 01 33 00.

B. Certificates: Includes, but not limited to, the following:
   1. Seed, fertilizer, and mulch shall be accompanied by certificate from vendor that product meets requirements of these Specifications.

PART 2 - PRODUCTS

2.01 FERTILIZER:

A. Fertilizer shall be in accordance with AkDOT Specification 725-2.02 and 726-2.01.

B. Ferilizer shall be supplied in tablet or other form of controlled release with a minium of two growing season release periods.

C. Deliver to Site in labeled bags or containers.

2.02 SEED (GENERAL):

A. Seed shall conform to all applicable laws of the State of Alaska.

B. Seed shall be labeled according to the U.S. Department of Agriculture Federal Seed Act and shall be furnished in containers with tags showing seed mixture, purity, germination, weed content, name of seller, and date on which seed was tested.
   1. Seed mixture shall be applied at the following rate and meet the following minimum percentage requirements for as outlined in AkDOT Specification 724-2.02.
   2. Moldy seed or seed that has been damaged in storage shall not be used.

2.03 MULCH:

A. Mulch shall be in accordance with AkDOT Specification 727-2.01. Mulch shall be used on seeded areas where erosion mats are not used.

2.04 EROSION-CONTROL (MATTING):

A. Erosion control matting shall be in accordance with AkDOT Specification 727-2.02 and anchored in place with staples meeting the requirements in AkDOT Specification 272-2.03.

PART 3 - EXECUTION

3.01 SEEDBED PREPARATION:

A. Dispose of any growth, rocks, or other obstructions which might interfere with tilling, seeding, or later maintenance operations.

B. Thoroughly loosen and pulverize topsoil to a depth of at least 3 inches. Minimum depth of topsoil at seeded areas shall be 6 inches.

C. Maintain tilled areas until seeded and mulched to provide a smooth area with no gullies or depressions.

3.02 APPLICATION - FERTILIZER:

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply fertilizer at the rate of 350 pounds per acre to properly prepared seedbeds.

C. Apply fertilizer no more than 48-hours prior to seeding.

3.03 APPLICATION - SEED:

A. Dry Seeding: Accomplish sowing by use of approved equipment, having drills no more than 4 inches apart.

1. Drill seed to an average depth of 1/2-inch.
2. Overlap successive seed strips to provide uniform coverage. Repeat where skipped areas appear after a show of green.
3. Cover seed with soil to an average depth of 1/4-inch by raking or other approved methods.

B. Hydraulic Seeding: Mix seed with water and constantly agitate. Do not add seed to water more than 4 hours before application.

1. On slopes flatter than 2 horizontal to 1 vertical, apply seed separately from fertilizer. Mechanically incorporate fertilizer into the soil prior to seeding activities. Cover seed with either hydraulic mulch or soil. If hydraulic mulching is not used, cover seed with soil to an average depth of 1/4-inch by raking or other approved methods.
2. On slopes 2 horizontal to 1 vertical and steeper, seed and fertilizer may be applied in a single operation. Incorporation into the soil will not be required. Hydraulic mulching will be required.

C. Do not sow immediately following rain, when ground is too dry, or during windy periods.

D. Apply water with a fine spray immediately.

3.04 APPLICATION - MULCH:

A. Apply a mulch covering to all seeded areas within 24 hours after seeding. Mulch not required on areas that are to be covered by an excelsior blanket or by an erosion-control fabric. Jute netting alone will not be considered an erosion-control fabric.

B. Apply mulch at the rate of 2 tons per acre by means of a mechanical spreader or other approved methods.
C. Immediately following the application of the mulch, water the seeded area in one watering, at a rate of 120 gallons per 1,000 square feet. Perform so as not to cause erosion or damage to the seeded surface.

3.05 APPLICATION - EROSION CONTROL:

A. Roll matting loosely over the required areas. Lifting and stretching of the material will not be permitted.
B. Secure matting by staples spaced as per manufacturer's recommendations.
C. Lap joints in the direction of water flow with at least a 4-inch overlap.
D. Any seeded or mulched areas disturbed by the installation of the erosion-control fabric shall be repaired at the Contractor's expense.

3.06 SCHEDULE:

A. Follow AkDOT Specification 618-3.02, “Seeding Seasons”.
B. If seeding before May 15 or after August 15, seeding must meet Engineer approval.

3.07 MAINTENANCE:

A. Erect and maintain signs or barricades to exclude traffic from seeded areas.
B. Seeded Areas: Perform maintenance for a period of one year after planting. unless the desired cover is obtained in a shorter time and the shortening of the period of Contractor's responsibility is authorized.
    1. The one-year period shall begin immediately upon written notification from the Engineer of the acceptance of intial seeding and planting for the entire project. The one-year establishment period shall end one calendar year after acceptance of intitial seeding and platning.
    2. Prior to acceptance, repair at Contractor's expense any portion of the seeded surface which becomes gullied or otherwise damaged, or destroyed.
    3. To be acceptable, seeded areas shall have a good, uniform color and sturdy growth with no bare soil spots, over a minimum of 98 percent of the area seeded.

3.08 MEASUREMENT AND PAYMENT:

A. Time of Completion: Completion time for seeding shall not apply to provisions for liquidated damages with respect to Contract completion time. A $2,000 retainage shall be withheld from final payment by the Owner and shall be paid to the Contractor following establishment period and final acceptance of the seeded area.
B. The Contractor shall meet with the Owner for the purpose of joint inspection of the project one year following the initial seeding acceptance. Conditions unsatisfactory to the Owner shall be corrected by the Contractor within a 10-day period immediately following the inspection. Failure to comply with corrective steps shall constitute justification for the Owner to take corrective steps and to deduct all costs thereof from any monies due the Contractor. At the end

of the establishment period, seeded areas that do not show normal growth rate shall be replaced.

END OF SECTION 32 92 00

DIVISION 33 – UTILITIES

SECTION 33 00 00 – UTILITIES

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes utility systems including but not limited to: pipe, culverts, fittings, valves, and appurtenances.

B. Related Work Specified Elsewhere:

1. SECTION 02 82 00 – Asbestos Abatement
2. SECTION 31 05 19.13 – Geotextile
3. SECTION 31.05 19.16 – HDPE and LLDPE Geomembrane
4. SECTION 31.05.19.23 – Geosynthetic Clay Liner
5. SECTION 31 20 00 – Site Preparation and Earthwork
6. SECTION 31 23 33 – Trenching and Backfilling

1.02 REGULATORY REQUIREMENTS

A. Conform to applicable local building and electrical code requirements for materials and installation of the Work in this Section.

1.03 REFERENCES:

A. American National Standards Institute (ANSI):

1. B16.5 – Carbon Steel Pipe Flanges and Flanged Fittings, Class 150.

B. American Society for Testing and Materials (ASTM):

1. D638 – Test Method for Tensile Properties of Plastics.
2. D790 – Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
3. D1238 – Measuring Flow Rates of Thermoplastics by Extrusion Plastometer.
4. D1505 – Test Method for Density of Plastics by the Density-Gradient Technique.
5. D1693 – Test Method for Environmental Stress-Cracking of Ethylene Plastics.
6. D2513 – Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.
7. D3035 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
8. D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene Plastic Pipe and Tubing.
9. D3350 – Polyethylene Plastics Pipe and Fittings Materials.
10. F714 – Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
11. F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

1.04 SUBMITTALS:

A. Submit as specified in DIVISION 1.

B. Submit the following for acceptance:

1. Manufacturer's product data for all materials specified in Part 2 of this Section. Product data shall identify model numbers, dimensions, accessories, and any other information necessary to demonstrate conformance with the requirements of this Section.
2. Scaled Shop Drawings showing all metal, HDPE, and other fabrication details for all piping connections, assemblies, or products.

C. Certificates and Affidavits:
1. Prior to shipment, furnish affidavit of compliance with applicable standards.
2. Provide documentation of field testing including date, time, witnesses, and test results.
3. Contractor shall certify that personnel to perform fusion joining have received factory training.

D. Submit utility survey requirements per SECTION 01 71 23. Specifically, survey all new underground utilities and piping at 25 lineal foot maximum intervals and at any change in direction. Record coordinates and inverts of each pipe fitting, including, but not limited to, bends, elbows, tees, wyes, and valves.

E. Project Record Documents in accordance with provisions of SECTION 01 78 00.

1.05 QUALITY ASSURANCE:

A. Manufacturer:
1. Experienced in the design and manufacture of pipe, fittings, specials, or appurtenances for a minimum period of 5 years.
2. Experienced in the design, manufacture, and commercial supplying of the specific size and type of pipe for a minimum of 1 year.

B. Contractor shall certify manufacturer has the above minimum experience requirements.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Do not damage the pipe or other materials by impact, bending, compression, or abrasion during handling and storage.

B. Store pipe on a flat surface which provides even support for the barrel with ends overhanging.

C. Do not stack pipe higher than 5 feet.

D. Use only nylon protected slings or hands to handle pipe. Do not use hooks or bare cables.

PART 2 - PRODUCTS

2.01 DESIGN REQUIREMENTS:

A. Furnish pipe and fittings of materials, wall type, joint types, and sizes as indicated or specified. Furnish maximum pipe lengths produced by the manufacturer.

B. Pipe Marking: All pipe and fittings shall be marked conforming to the applicable standard specification under which the pipe is manufactured and as otherwise specified.

C. Furnish special fittings or adapters as required to join two pipes, fittings, or accessories of dissimilar material.

2.02 WELLHEAD:

A. Wellheads shall be QED Model Number ORP215M vertical wellheads, or Engineer-approved alternate, as indicated in the Contract Drawings.

B. Furnish QED Polargaurd™ Insulating Wellhead Cover (or Engineer-approved alternate) for each wellhead.

C. Equipment manufacturer shall be ISO 9001 certified and shall have a proven performance of not less than six years in actual landfill services

2.03 HIGH DENSITY POLYETHYLENE (HDPE) PIPE:

A. Exposure: Buried and exposed.

B. Materials:

1. Requirements: The HDPE pipe and fittings shall be made from a high density, extra high molecular weight material with a broad range molecular weight distribution designated as a PE 4710 with ASTM D3350 cell classification number of 445474C as manufactured by:
   a. Driscopipe.
   b. Isco Industries
   c. Plexco.
   d. Engineer-approved equivalent.
2. Pipe shall have impact strengths greater than 7 ft-lb/in. at 73°F when tested in accordance with ASTM D256 (Standard Test Method for the Izod Pendulum Resistance of Plastics).
3. Pipe shall have a maximum deflection of 5%.
4. Cell Classification Description (445474C):

Cell Classification	Property	Cell Classification Limits
4	Density per ASTM D1505, gm/cm^3	>0.947-0.955
4	Melt index per ASTM D1238, gm/10 min	< 0.15
5	Flexural Modulus per ASTM D790, psi	110,000 - <160,000
4	Tensile Strength per ASTM D638, psi	3000 - <3500
7	Environmental Stress Crack Resistance per ASTM D1693, Failure$_{\%}$ = hours	500
4	Hydrostatic Design Basis, psi	1600
C	Hydrostatic Design Basis, psi	Black with 2% to 3% Carbon Black

C. Manufacturing Requirements:

1. All pipe shall be made from virgin material, or from rework compound obtained from the manufacturer's own production of the same formulation.

2. Pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other defects.
3. Pipe shall be uniform in color, opacity, density, and other physical properties.
4. Pipe sizes 6-inch IPS through 54-inch IPS shall be manufactured to ASTM F714; 1/2-inch IPS through 6-inch IPS shall be manufactured to ASTM D3035.
5. Electrofusion couplings shall be manufactured per ASTM F1055.

D. Perforated Pipe:
1. Pipe perforation pattern shall be as shown on the Contract Drawings.
2. Remove burrs in pipe sections at hole locations.

E. Pipe shall have the diameters and SDR in accordance with the following applications. Pipe supplied under this specification shall have an IPS (Iron Pipe Size) nominal outside diameter (OD). List is not all encompassing, refer to drawings for all pipe sizing.

Application	Pipe Diameter	SDR
Leachate Collection Piping within Cell 4 Expansion (Perforated and Solid)	8”	11
Leachate Cleanout Piping within Cell 4 Expansion (Solid)	6”	11
Landfill Gas Lateral (GL) Piping within Cell 4 Expansion (perforated and solid)	6”	11
Landfill Gas Lateral (GL) Piping within Cell 4 Expansion (solid)	4”	11
Landfill Gas Header Pipe – Insulated Arctic Piping (Aluminum Spir-l-ok Jacket)	8”	17

2.04 HDPE FITTINGS:

A. Fittings shall be supplied by the same manufacturer and from the same resin as the pipe and all fittings shall match the size and SDR rating of the receiving pipe.

B. Elbows, straight and reducing tees, reducers, and stub ends shall be factory-fabricated with plain ends for butt fusion per ASTM D3261.

C. Molded fittings shall be manufactured to ASTM D2513.

D. Installation guidelines shall follow manufacturer's recommendations unless stated otherwise.

E. Flange Connections
1. Flange joints are made using molded flange adapters which butt fuse to the pipe. A back-up ring is fitted behind the flange adapter sealing surface flange, and is bolted to the mating flange.
2. Back-up rings and bolts
   a. In above ground service, back-up ring and bolt materials are to be ductile iron and galvanized steel.
   b. In below ground service (including manholes), back-up ring and bolt material shall be stainless steel.

c. One edge of the back-up ring bore must be chamfered. This edge fits against the back of the sealing surface flange.

3. Gaskets shall be made from Viton (full faced, minimum 1/8-inch)
4. Unions, couplings, and saddle fittings
   a. All fittings are to be joined by heat fusion following manufacturer's recommendations and ASTM procedures.
5. Flange plates shall be as indicated on the Contract Drawings.

2.05 STAINLESS STEEL PIPE:

A. Stainless steel (SST or SS) pipe: ASTM A312.
   1. Type 316 and 316, Schedule 10S
   2. Dimensions and fittings as shown on the Contract Drawings.

2.06 POLYVINYL CHLORIDE (PVC) PIPE:

A. PVC Pipe and Fittings: ASTM Cell classification 12454 (Formerly designated as Type 1, Grade 1) normal impact Schedule 80 PVC pipe conforming to ASTM D1784 and D1785.
B. Fittings shall be cell classification 12354 conforming to ASTM D2467 or ASTM D2464. CPVC pipe and fittings shall be used in place of PVC for high-temperature applications and for exterior piping exposed to sunlight.

2.07 VALVES:

A. General
   1. Valves shall be furnished with ends suitable for use with type of pipe indicated on the Contract Drawings and as specified herein.
      a. Flanged ends shall conform to ANSI B16.1, Class 125 drilling.
      b. Mechanical joint ends shall conform to provisions of ANSI 21.10
      c. Push-on joint shall conform to ANSI 21.11
   2. Similar type valves shall be of the same manufacturer.
   3. Valves shall be marked to fully identify the type of valve, size, manufacturer, and pressure rating.
B. LFG Manifold Isolation Valves:
   1. The 8-inch flanged gas manifold isolation valves shall be Series 2500 Ductile Iron Resilient Wedge gate valves as manufactured by American Flow Control or pre-approved equal. The valves shall be fusion bonded epoxy coated on the interior and exterior with a wedge of ductile iron encapsulated with nitrile rubber. Gaskets shall be pressure energized O-rings and the stem shall have replaceable triple O-ring seals. Each isolation valve shall be fitted with a 2-inch DI operating nut on the riser stem, cast iron riser pipe as shown in the Drawings.

2.08 PERFORATED INTERCEPT SUBDRAIN PIPE:

A. Perforated intercept subdrain pipe shall be a 6" diameter, perforated, corrugated HDPE with a geotextile filter sock. All fittings required for a complete system shall be provided by the same manufacturer.

2.09 FLANGES, UNIONS, COUPLINGS AND SADDLE FITTINGS:

A. Flanges
   1. Flange joints in HDPE pipe are made using HDPE flange adapters which are butt fused to pipe. A back up ring is fitted behind the flange adapter sealing surface flange and is bolted to the mating flange. All flange gaskets shall be Viton. Flange back-up rings may be Cast (CI), Ductile (DI), or Stainless Steel.
   2. One edge of the backup ring bore must be radiuses or chamfered. This edge fits against the back of the sealing surface flange.

B. Unions, couplings, and saddle fittings
   1. All fittings are to be joined by heat fusion following manufacturers and ASTM procedures.

2.10 PIPE SUPPORTS:

A. Fabricated from zinc-coated metal framing channels and fittings as supplied by Unistrut, Superstrut, or equal.

2.11 GROUT:

A. Non-metallic Shrinkage-Resistant Group: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.
   1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
      a. Euco N.S.; Euclid Chemical Co.
      b. Crystex; L&M Construction Chemicals.
      c. Masterflow 713; Master Builders
      d. Five Star Grout; U.S. Grout Corp.
      e. Upcon; Upco Chem. Div., USM Corp.
      f. Propak; Protex Industries, Inc.
      g. Set Non-Shrink; Set Products, Inc.

2.12 FASTENER AND HARDWARE

A. Hex bolts, washers and nuts shall be Zinc Galvanized Grade 5.

2.13 APPURTENANCES:

A. Hardware and Fasteners: All above grade fasteners shall be Grade 2 zinc plated carbon steel. Permanent underground fasteners shall be 304 stainless steel. All threaded connections shall be made using Jet-Lube® Silver Plus or KOPR anti-seize compound or approved equal. Coat all threads with anti-seize compound prior to assembly.

B. Flexible Couplings for Pressure Pipe: Transition and straight couplings shall be Romac Industries, Inc., Style 501 flexible coupling or equal.

C. Clamp Coupling: Single-band clamp designed for corrosive environments with stainless steel type 304 band, lugs, bridge plate, and bolts. Rockwell Model 304 or approved equal.

D. Manhole Adaptors (Waterstops): Elastomeric rings designed to stop water leakage at pipe penetration of vault walls. Fernco or similar.
E. Insulating flange coupling adaptor shall be Rockwell 933 or approved equal with EPDM gasket and insulating boot.
F. Insulating Coupling: Insulating coupling shall be Rockwell 438 or approved equal with EPDM gasket and insulating boot.
G. HDPE to SST Transition Fittings shall be the same diameter and SDR of the HDPE pipe, stainless steel 316.
H. Cam and groove fittings shall be the same diameter as the pipe, stainless steel 316, attached to HDPE to SST transition fitting w/ male NPT. Coupling shall be SST type A cam and groove adapter with SST Type DC cam and groove dust cap.

PART 3 - EXECUTION

3.01 PREPARATION

A. Prepare the trench cut and excavation base and grades. Shore all trenches in accordance with the requirements of SECTION 31 23 33.
B. Where necessary, hand trim excavation to required elevations. Correct over-excavation as specified in SECTION 31 20 00.

3.02 INSTALLATION – PIPE:

A. Use equipment, methods, and materials ensuring installation to lines and grades indicated.
    1. Maintain within tolerances specified or acceptable laying schedule.
        a. Alignment: ±1-inch per 100 feet in open cut.
        b. Grade: ±1-inch per 100 feet.
    2. Do not lay on blocks.
    3. Obtain acceptance of method proposed for transfer of line and grade from control to the Work.
B. Install pipe of size, materials, strength class, and joint type with embedment indicated for plan location.
C. Insofar as possible, commence laying at downstream end of line.
D. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during installation and at discontinuance of installation.
    1. Close open ends of pipe with snug-fitting closures.
    2. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate.
    3. Remove water, sand, mud, and other undesirable materials from trench before removal of end cap.
E. Brace or anchor as required to prevent displacement after establishing final position.
F. Perform only when weather and trench conditions are suitable. Do not lay in water.
G. Take adequate precaution when hazardous atmospheres might be encountered.
H. HDPE Pipe:
    1. Conform to manufacturer’s recommendations for allowable bending of HDPE Pipe.

2. Maintain minimum 6-foot depth of cover for all pipe located outside the landfill liner, unless otherwise shown on the Contract Drawings.
3. Join lengths using butt fusion method following manufacturer's recommendations. Minimize bead formation; remove welding beads from interior of pipes where possible. Join pipe to valves and fittings using bolted flanged joints.
4. Join lengths using electrofusion welding methods to eliminate fusion ridge following manufacturer's recommendations where specified on the drawings. Minimize gaps between pipe lengths.
5. Provide concrete thrust blocks, as detailed on Drawings, as required to restrain forcemain pipe and joints.
6. Conform to manufacturer's recommendations for allowable bending of HDPE pipe, but do not use less than 40 pipe diameters as the minimum bending radius.

I. Contractor shall fuse pipe in final location to the extent possible. Contractor shall not be allowed to "drag" long lengths of fused pipe around site.

3.03 JOINTING – HDPE PIPE:

A. Heat Fusion Procedures:
1. All joining of HDPE pipe and fittings shall follow the general guidelines given in ASTM D2657 and specific guidelines set forth in the manufacturer's recommendations.

B. Special Provisions for Joining High Density Polyethylene Pipe:
1. Heat fusion joining and other procedures necessary for correct assembly of polyethylene pipe and fittings shall be done by manufacturer-trained personnel using tools approved by the pipe manufacturer.
2. Joint strength must be equal to that of adjacent pipe.
3. External appearance of fusion bead shall be smooth with bead width in accordance with pipe manufacturer's recommendations.
4. Remove welding beads from interior of pipes where possible.
5. A trial fusion shall be made each day to check required heating times for prevailing ambient temperatures and other weather conditions.
6. A pipe cutter shall be used for squaring pipe ends or facing tool for joining.
7. Remove the sharp outer edge on the outside diameter surface on all pipe sizes for socket fusion joint.
8. Remove any burrs from inside of pipe ends. Both ends of pipe to be joined shall be clean, dry, and free of foreign substance.
9. Fusion machine shall be the type used for fusing pipe ends together.
10. The machine shall be equipped with a powered facing unit to prepare pipe ends.
11. Heating plate shall be electrically heated and thermostatically controlled having a temperature gauge to monitor temperature.
12. Direct Burial: The temperature of the pipe shall be approximately the same as the soil at the installed depth before completing the tie-in.
13. At joints connected to piping systems or fittings of other materials by a flange assembly, the pipe adjacent to these joints shall be supported on either side of the flange assembly:
    a. For a distance of one pipe diameter, or

b. Not more than 12 inches from joint, or
c. Whichever is greater.

3.04 COLD WEATHER FUSION – HDPE PIPE:

A. In cold weather, below 55°F, pipe diameters and socket fitting ends will contract. Keep fittings in a temperature controlled area.
B. Remove all frost, ice, or snow from outside and inside surfaces to be fused. Wipe dry with clean cloth.
C. Shield area to be fused with wind break or temporary enclosure.
D. Only electrically heated fusion tools shall be used for cold weather fusion.
E. Trial melt patterns shall be made on the pipe under field conditions to establish required melt time.
F. Only after establishing proper cold weather melt-time cycle, shall the fusion operation be allowed to begin.

3.05 CUTTING – PIPE:

A. Cut in neat manner without damage to pipe.
B. Observe Specifications regarding joint locations.
C. Cut plastic pipe square with saw or pipe cutter designed specifically for the material.
D. Bevel the end in accordance with the manufacturer's recommendations.
E. Remove burrs and wipe off all dust and dirt from the jointing surfaces.

3.06 INSTALLATION – VALVES:

A. Before installation, valves will be carefully cleaned of foreign materials, and be inspected in open and closed positions. Unless otherwise indicated, valves will be installed with the stem vertical. Horizontal valves will be installed in such a manner that adequate clearance is provided for operation. Installation practices will conform to manufacturer’s recommendations.

3.07 INSTALLATION – APPURTENANCES:

A. Install system appurtenances in accordance with manufacturer’s written instructions and recommendations.
B. Orient handhole vaults vertically to allow cleanout access to pipe.

3.08 INSTALLATION OF IDENTIFICATION:

A. Install detectable marking tape during backfilling of trench for piping outside landfill footprint. Locate 6 to 8 inches below finished grade, directly over pipe.

3.09 FIELD CLEANING AND TESTING:

A. Necessary precautions shall be taken to prevent joints from moving or separating while the piping systems are being tested.
B. Cleaning and Jetting:
   1. All piping shall be cleaned to remove welding slag, dirt, construction debris, and other foreign material and jetted with clean water at a minimum of 2000 pounds per square

inch at a water delivery of 80 gallons per minute. Contractor shall supply water for cleaning at no additional cost.

2. Water and debris shall be removed from the sump using a jet/vac-truck.
3. All pipe cleaning and jetting shall be conducted in the presence of the Engineer. No section shall proceed without the prior approval of the Engineer. The Engineer shall receive 24-hour notice for all cleaning and jetting.
4. Piping must be cleaned/jetted prior to placement of pump within sump.

C. Non-Perforated Pipe Air Pressure Testing:

1. The sections shall be installed in a permanent manner, no temporary connections or systems will be accepted. Each system shall be successfully tested as specified herein. Defects that appear as a result of testing shall be corrected and the system or section shall be retested at no cost to the Owner.
2. Pipe shall be air pressure tested at 5 psig for a minimum of two (2) hours. Any drop in pressure during the test period greater than 0.2 psig will result in test failure. Contractor must inspect and repair piping, joints, etc. until the specified piping passes the test. All piping must be restrained to avoid movement during test. Contractor is responsible for all safety, compliance, and procedures during test. Contractor is responsible for blind flanges, gaskets, hardware, etc. as required to seal the piping network and conduct the test.
3. All pressure testing to be conducted in the presence of the Engineer. No test shall proceed without the prior approval of the Engineer. The Engineer shall receive 24-hour notice for all testing. Contractor to provide written results of pressure testing to the Engineer.

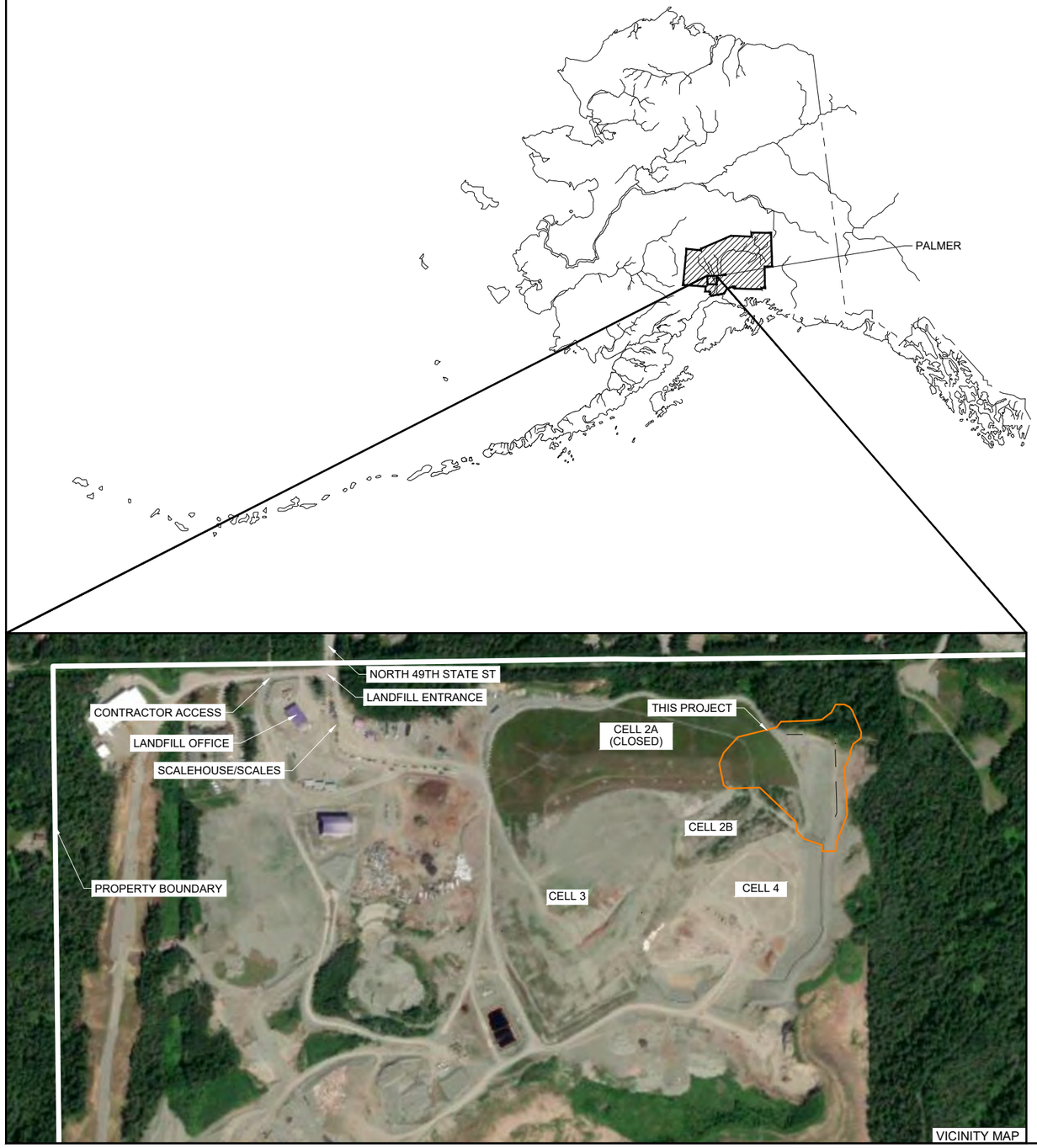
END OF SECTION 33 00 00

ATTACHMENT 9:

CELL 4 EXPANSION PERFMIT REFERENCE DRAWINGS

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE

MATANUSKA-SUSITNA BOROUGH
PUBLIC WORKS DEPARTMENT

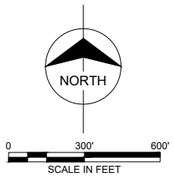


VICINITY MAP

CENTRAL LANDFILL
CELL 4 EXPANSION CONSTRUCTION
PERMIT REFERENCE DRAWINGS
AUGUST 2024

PERMIT NUMBER: SW-1A0007-26

SHEET INDEX	
SHEET	TITLE
G000	COVER AND INDEX
G001	GENERAL NOTES
G002	LEGEND & ABBREVIATIONS
G003	EXISTING CONDITIONS & CONTROL POINTS
G004	GENERAL ARRANGEMENT
C001	DEMOLITION PLAN
C002	TOP OF LINER PLAN
C003	LEACHATE PIPING PLAN
C004	CROSS SECTIONS
C005	CONSTRUCTION DETAILS, 1 OF 3
C006	CONSTRUCTION DETAILS, 2 OF 3
C007	CONSTRUCTION DETAILS, 3 OF 3
C008	GCCS RELOCATION PLAN
C009	GCCS RELOCATION DETAILS, 1 OF 4
C010	GCCS RELOCATION DETAILS, 2 OF 4
C011	GCCS RELOCATION DETAILS, 3 OF 4
C012	GCCS RELOCATION DETAILS, 4 OF 4
C013	MISCELLANEOUS CIVIL DETAILS
C014	EROSION CONTROL PLAN
C015	EROSION CONTROL DETAILS, SILT FENCE 1 OF 2
C016	EROSION CONTROL DETAILS SILT FENCE 2 OF 2
C017	EROSION CONTROL DETAILS, EROSION CONTROL BLANKET
C018	EROSION CONTROL DETAILS, STAB. CONST. EXIT



Burns & McDonnell Engineering Co, Inc.
License No. AECC322

LEGEND

PLAN:

- CLF-9 — ACTIVE MONITORING WELL
- CLF-1 — INACTIVE MONITORING WELL
- CP — SURVEY CONTROL POINT
- CLFP-1 — LANDFILL GAS MONITORING PROBE
- GV-1 — LANDFILL GAS VENT
- GW-1 — LANDFILL GAS WELL
- RW 3-1 — VERTICAL RECIRCULATION WELL
- POWER POLE
- LIGHT FIXTURE
- BUILDING/STRUCTURE
- EXISTING 2 FOOT CONTOURS
- 160 — EXISTING 10 FOOT CONTOURS
- DESIGN 2 FOOT CONTOURS
- 310 — DESIGN 10 FOOT CONTOURS
- X X X — EXISTING FENCE
- PROPERTY BOUNDARY
- CONSTRUCTION LIMITS
- PAVED ROAD
- UNPAVED ROAD
- OHE — OVERHEAD ELECTRIC
- UE — UNDERGROUND ELECTRIC
- GCCS — EXISTING GAS COLLECTION AND CONTROL SYSTEM PIPING
- GCCS — GAS COLLECTION AND CONTROL SYSTEM PIPING
- GL — EXISTING GAS LATERAL PIPING
- GL — GAS LATERAL PIPING
- 4 IN — 4" CONDENSATE FORCE MAIN
- LCP — EXISTING LEACHATE COLLECTION PIPING
- LCP — LEACHATE COLLECTION PIPING
- RL RL — EXISTING LEACAHTE RECIRCULATION LATERAL
- EL EL — EXISTING EDGE OF LINER
- EL EL — EDGE OF LINER
- CELL BOUNDARY
- CHANNEL DRAIN
- EDGE OF ROAD
- SILT FENCE
- EXISTING CELL 2A SUBDRAIN PIPE
- TRAILS
- BURIED CULVERT
- TREE LINE
- FINAL COVER
- WETLANDS

SECTION:

- ALUMINUM
- CONCRETE
- GRAVEL / AGGREGATE
- TOP SOIL
- GENERAL FILL
- EXISTING REFUSE AND DAILY COVER
- INTERMEDIATE COVER
- EXISTING COVER SOIL
- GRANULAR DRAINAGE MATERIAL
- CUSHION / SAND
- PIPE INSULATION
- NATIVE SOIL
- REMOVE AND SALVAGE EXISTING FEATURE
- GRASS / NATIVE VEGETATION
- EXISTING GROUND SURFACE
- GEOMEMBRANE LINER
- GEOTEXTILE FILTER / CUSHION
- GEOCOMPOSITE DRAINAGE NET
- GCL (GEOSYNTHETIC CLAY LINER)
- PLYWOOD
- EROSION CONTROL MATTING
- SAND DRAINAGE MATERIAL

ABBREVIATIONS

ADEC	ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AkDOT	ALASKA DEPARTMENT OF TRANSPORTATION
APPROX, ~	APPROXIMATE, APPROXIMATELY
C&D	CONSTRUCTION AND DEMOLITION
CL	CENTER LINE
CLF	CENTRAL LANDFILL
CP	CONTROL POINT
CS	CONDENSATE SUMP
DEG, °	DEGREE
DIA. OR Ø	DIAMETER
DWG	DRAWING
E	EASTING
ESMT	EASEMENT
EW	EACH WAY
FT	FEET
GALV	GALVANIZED
GCCS	LANDFILL GAS COLLECTION & CONTROL SYSTEM
GCL	GEOSYNTHETIC CLAY LINER
GDN	GEOCOMPOSITE DRAINAGE NET
GL	GAS LATERAL
GV	GAS VENT
GW	GAS WELL
HDPE	HIGH DENSITY POLYETHYLENE
IPS	IRON PIPE SIZE
L.F., LF	LINEAR FEET
LFG	LANDFILL GAS
LLDPE	LINEAR LOW DENSITY POLYETHYLENE
MAX	MAXIMUM
MIL	MILLI-INCH
MAX.	MINIMUM
MSB	MATANUSKA-SUSITNA BOROUGH
N	NORTHING
NO.	NUMBER
NPT	NATIONAL PIPE THREAD
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OZ	OUNCE
PCF	POUNDS PER CUBIC FOOT
PERF	PERFORATED
PVC	POLYVINYL CHLORIDE
RGW	REMOTE GAS WELL
RL	RECIRCULATION LATERAL
RW	RECIRCULATION WELL
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SST / S.S.	STAINLESS STEEL
ST.	STREET
SUBD	SUBDIVISION
SWPPP	STORMWATER POLLUTION PREVENTION PLAN
TYP.	TYPICAL
UE	UNDERGROUND ELECTRIC
W/	WITH

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE

Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

MATANUSKA-SUSITNA BOROUGH, ALASKA

CENTRAL LANDFILL (SW1A007-26)
CELL 4 EXPANSION CONSTRUCTION
PERMIT REFERANCE DRAWINGS
LEGEND & ABBREVIATIONS

project	contract
167550	AUTHORIZATION #14

drawing **G002** – rev. **0**

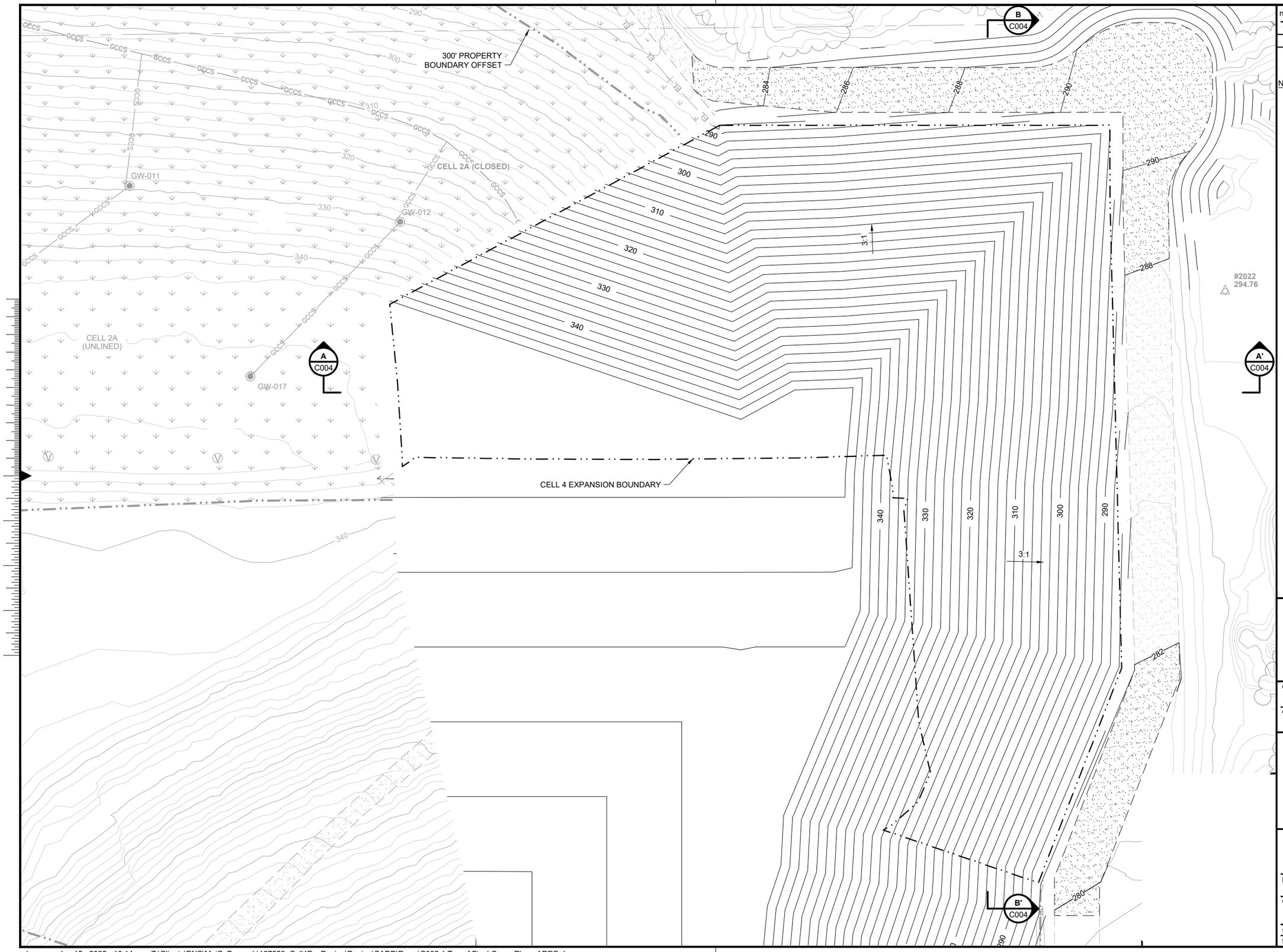
sheet of sheets

file G002 LEGEND & ABBREVIATIONS - ADEC.DWG

STATE OF ALASKA 49TH — Fredrick Doran — No. CE 18533 — REGISTERED PROFESSIONAL ENGINEER — 9/12/2024

Millimeters / Inches — Scale For Microfilming

rcheaman Aug 20, 2024 - 2:37pm - Z:\Clients\ENS\MatSuBorough\167550_Cell4ExpDesign\Design\CADD\Dwgs\G002 Legend & Abbreviations - ADEC.dwg



no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE
	1/13/25	RCH	FJD	PERMIT REFERENCE

NOTES:

1. EXISTING SITE FEATURES SHOWN PROVIDED BY MSB.
2. EXISTING SITE TOPOGRAPHY CREATED FROM VARIOUS SURVEYS. MOST RECENT SURVEY OF THE CELL 4 EXPANSION AREA CREATED FROM DRAFT LIDAR DATA FLOWN IN THE FALL OF 2019 BY MSB, THE ACCURACY OF THE DATA IS NOT GUARANTEED.
3. DESIGN CONTOURS REPRESENT TOP OF FINAL COVER AND HAUL ROAD GRADES.
4. TOP OF FINAL COVER IS DESIGNED TO BE 2'-6" ABOVE TOP OF FINAL INTERMEDIATE COVER. TOP OF FINAL INTERMEDIATE COVER IS DESIGN TO MAXIMIZE AIRSPACE WHILE NOT EXCEEDING AN EXTERIOR SIDE SLOPE OF 3:1 OR THE PERMITTED MAXIMUM ELEVATION OF 348.5 FT AMSL.
5. CONTOUR INTERVAL IS TWO FEET.
6. REFER TO CELL 4 EXPANSION CONSTRUCTION DRAWINGS DATED AUGUST 2024 FOR REFERENCE CALLOUTS NOT INCLUDED IN THIS DRAWING SET.

BURNS McDONNELL

Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

MATANUSKA-SUSITNA BOROUGH, ALASKA

CENTRAL LANDFILL (SW1A007-26)
CELL 4 EXPANSION CONSTRUCTION
PERMIT REFERENCE DRAWINGS
TOP OF FINAL COVER PLAN

project	contract
167550	AUTHORIZATION #14

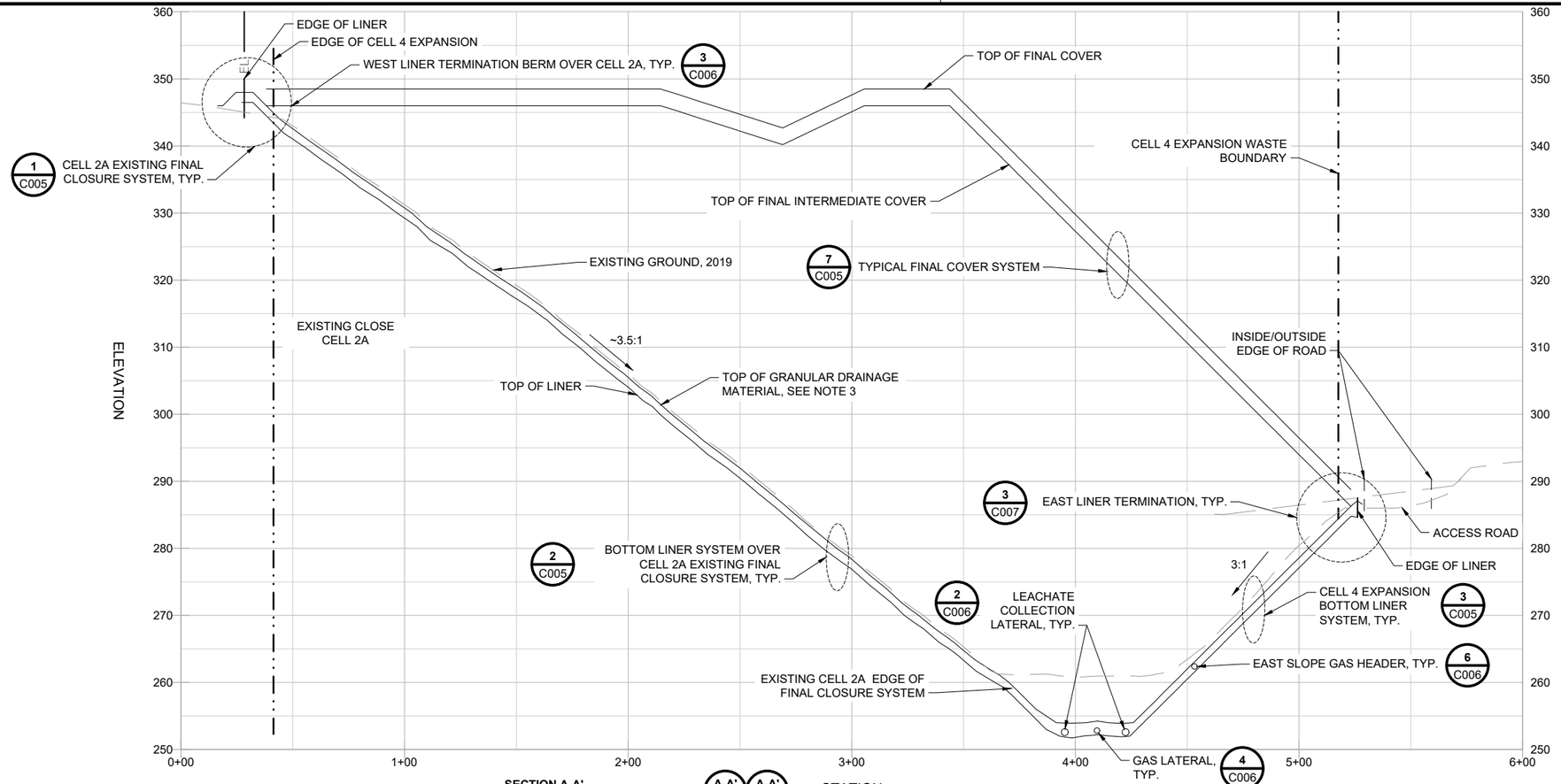
drawing **C002.1** rev. **0**

sheet of sheets

file C002.1 TOP OF FINAL COVER PLAN - ADEC.DWG

Scale For Microfilming
Millimeters
Inches

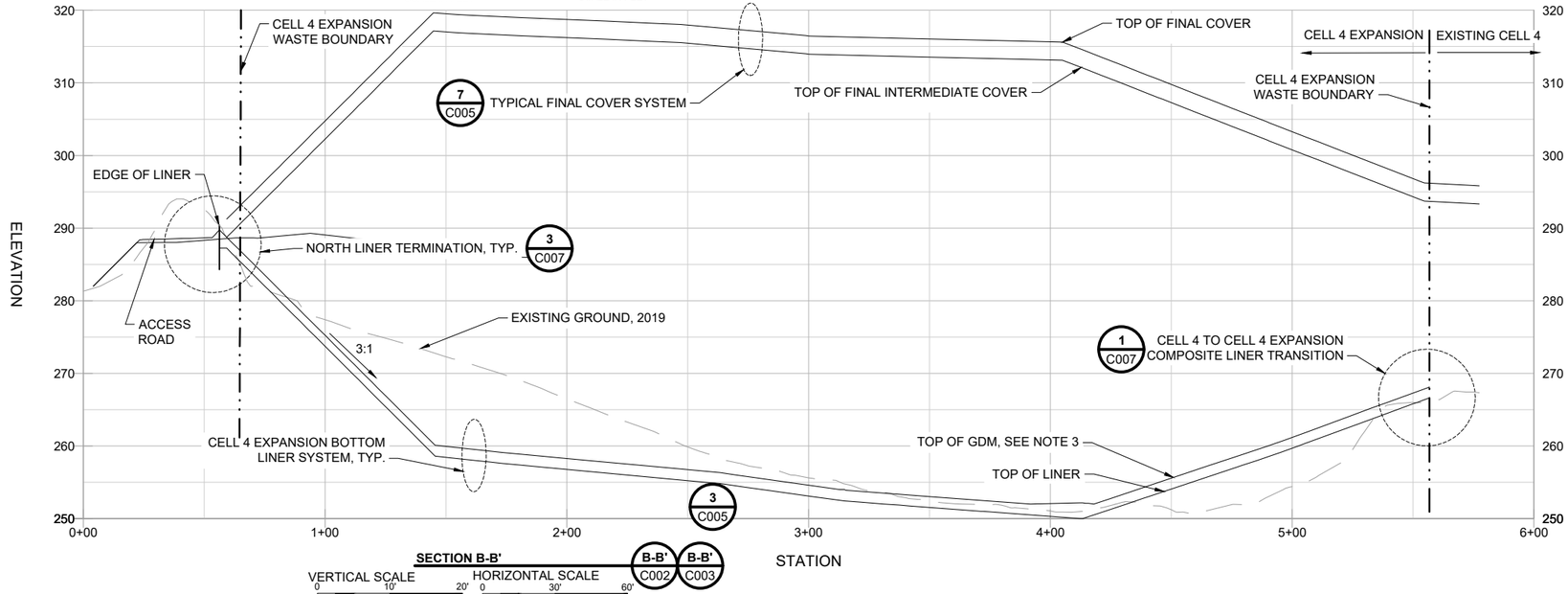
rcheaman Jan 15, 2025 - 10:14am - Z:\Clients\ENS\MatSuBorough\167550_Cell4ExpDesign\Design\CADD\Dwgs\C002.1 Top of Final Cover Plan - ADEC.dwg



SECTION A-A' A-A' C002 A-A' C003

VERTICAL SCALE 0 10' 20' SCALE IN FEET

HORIZONTAL SCALE 0 30' 60' SCALE IN FEET



SECTION B-B' B-B' C002 B-B' C003

VERTICAL SCALE 0 10' 20' SCALE IN FEET

HORIZONTAL SCALE 0 30' 60' SCALE IN FEET

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE

NOTES:

1. EXISTING SITE FEATURES SHOWN PROVIDED BY MSB.
2. EXISTING SITE TOPOGRAPHY CREATED FROM VARIOUS SURVEYS. MOST RECENT SURVEY OF THE CELL 4 EXPANSION AREA CREATED FROM DRAFT LIDAR DATA FLOWN IN THE FALL OF 2019 BY MSB, THE ACCURACY OF THE DATA IS NOT GUARANTEED.
3. GDM SHALL BE MINIMUM THICKNESS OF 1'-6". DESIGN CONTOURS SHOWN REPRESENT 1'-6" OF GDM ABOVE DESIGNED TOP OF LINER GRADES. REFER TO C006 FOR DETAIL GRADING INFORMATION.
4. REFER TO CELL 4 EXPANSION CONSTRUCTION DRAWINGS DATED AUGUST 2024 FOR REFERENCE CALLOUTS NOT INCLUDED IN THIS DRAWING SET.

BURNS McDONNELL

Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

MATANUSKA-SUSITNA BOROUGH, ALASKA

CENTRAL LANDFILL (SW-1A007-26)

CELL 4 EXPANSION CONSTRUCTION PERMIT REFERENCE DRAWINGS CROSS SECTIONS

project	contract
167550	AUTHORIZATION #14

drawing **C004** rev. **0**

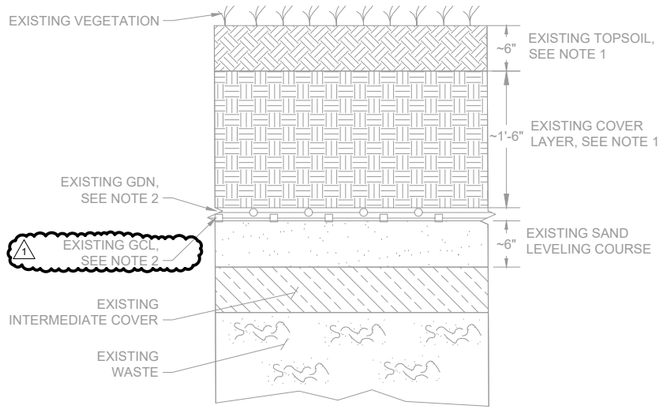
sheet of sheets

file C004 CROSS SECTIONS - ADEC.DWG

STATE OF ALASKA 49TH Fred S. Doran No. CE 18538 REGISTERED PROFESSIONAL ENGINEER 9/12/2024

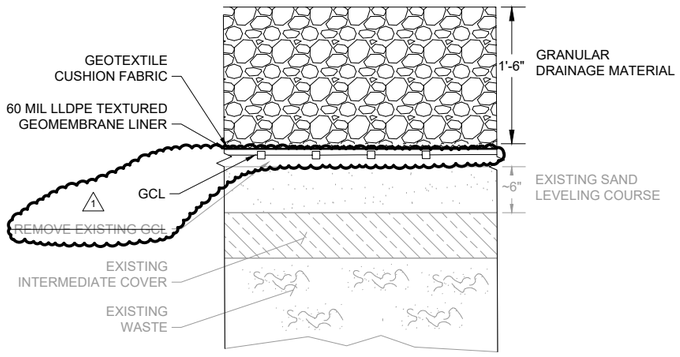
Scale For Microfilming: Millimeters / Inches

rcheaman Aug 21, 2024 - 11:56am - Z:\Clients\ENS\MatSuBorough\167550_Cell4ExpDesign\Design\CADD\Dwgs\C004 Cross Sections - ADEC.dwg



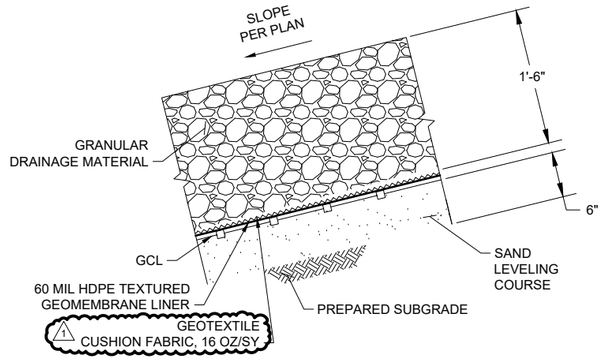
TYPICAL CELL 2A EXISTING FINAL CLOSURE SYSTEM
SCALE: NTS

1 C004 | 1 C006 | 1 C010



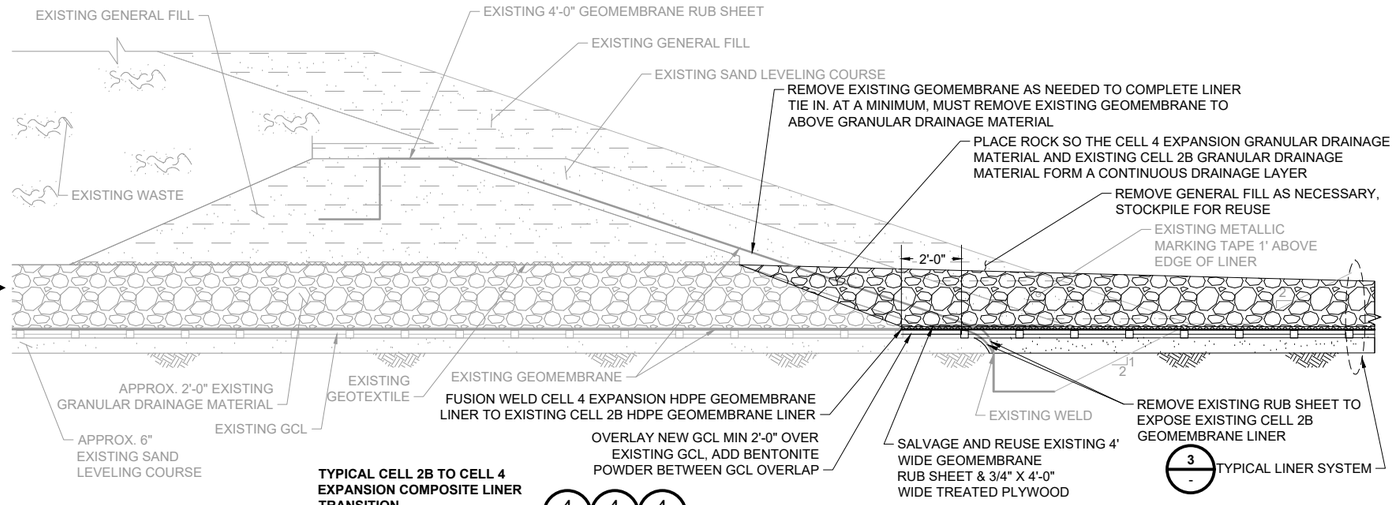
TYPICAL BOTTOM LINER SYSTEM OVER CELL 2A EXISTING FINAL CLOSURE SYSTEM
SCALE: NTS

2 C004 | 2 C006 | 2 C007 | 2 C009



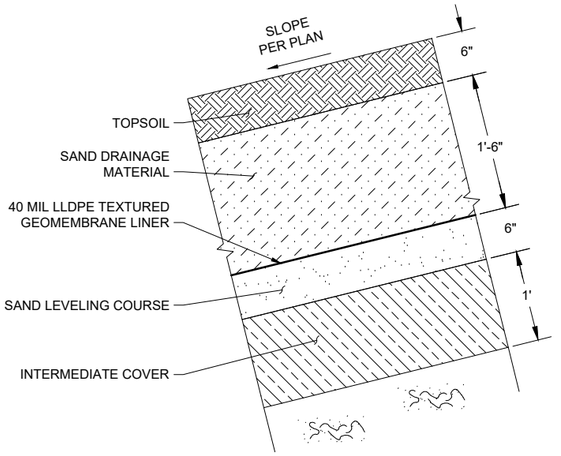
TYPICAL CELL 4 EXPANSION BOTTOM LINER SYSTEM
SCALE: NTS

3 - | 3 C004 | 3 C006 | 3 C007



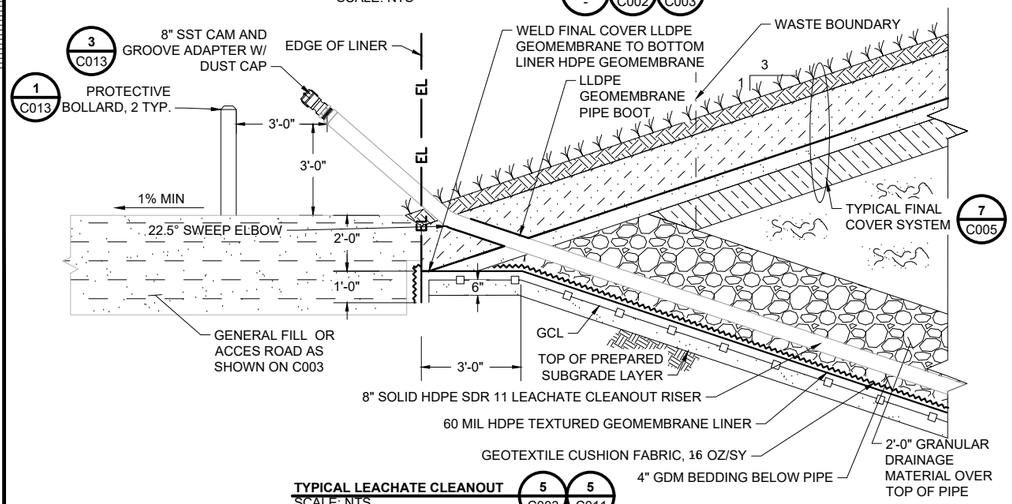
TYPICAL CELL 2B TO CELL 4 EXPANSION COMPOSITE LINER TRANSITION
SCALE: NTS

4 - | 4 C002 | 4 C003



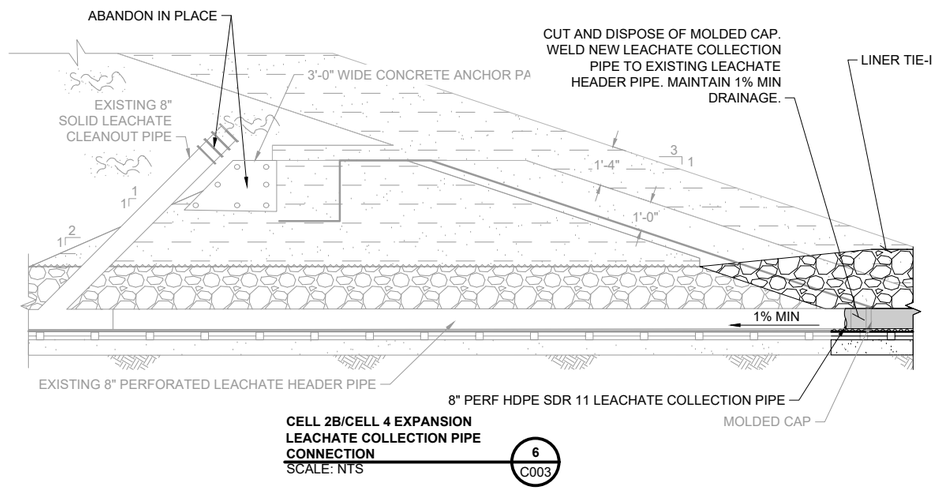
TYPICAL FINAL COVER SYSTEM
SCALE: NTS

7 - | 7 C006



TYPICAL LEACHATE CLEANOUT
SCALE: NTS

5 C003 | 5 C011



CELL 2B/CELL 4 EXPANSION LEACHATE COLLECTION PIPE CONNECTION
SCALE: NTS

6 C003

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE
1	1/13/25	RCH	FJD	PERMIT REFERENCE

NOTES:

1. EXISTING TOP SOIL AND COVER SOIL TO BE REMOVED AND STOCKPILED IN COORDINATION WITH THE OWNER. THESE SOILS MAY BE REUSED FOR THIS PROJECT AS NEEDED.
2. EXISTING GCL AND GDN TO BE REMOVED WITH THE CELL 2A FINAL COVER OVERLAY AREA. (1)
3. ~~INTEGRITY OF GCL SHALL BE MAINTAINED. PATCH GCL AS REQUIRED TO MAINTAIN UNDAMAGED LAYER ON EXISTING CELL 2A SLOPE BENEATH CELL 4 EXPANSION.~~
4. ~~CONTRACTOR SHALL PROTECT EXISTING GCL FROM HYDRATION. IF THE CQA MONITOR DETERMINES AREA(S) OF EXISTING GCL TO BE IN UNACCEPTABLE CONDITION, THE CONTRACTOR SHALL REMOVE, DISPOSE, AND REPLACE GCL WITH NEW GCL IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.~~
5. REFER TO CELL 4 EXPANSION CONSTRUCTION DRAWINGS DATED AUGUST 2024 FOR REFERENCE CALLOUTS NOT INCLUDED IN THIS DRAWING SET.

BURNS McDONNELL

Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

Matanuska-Susitna Borough, Alaska

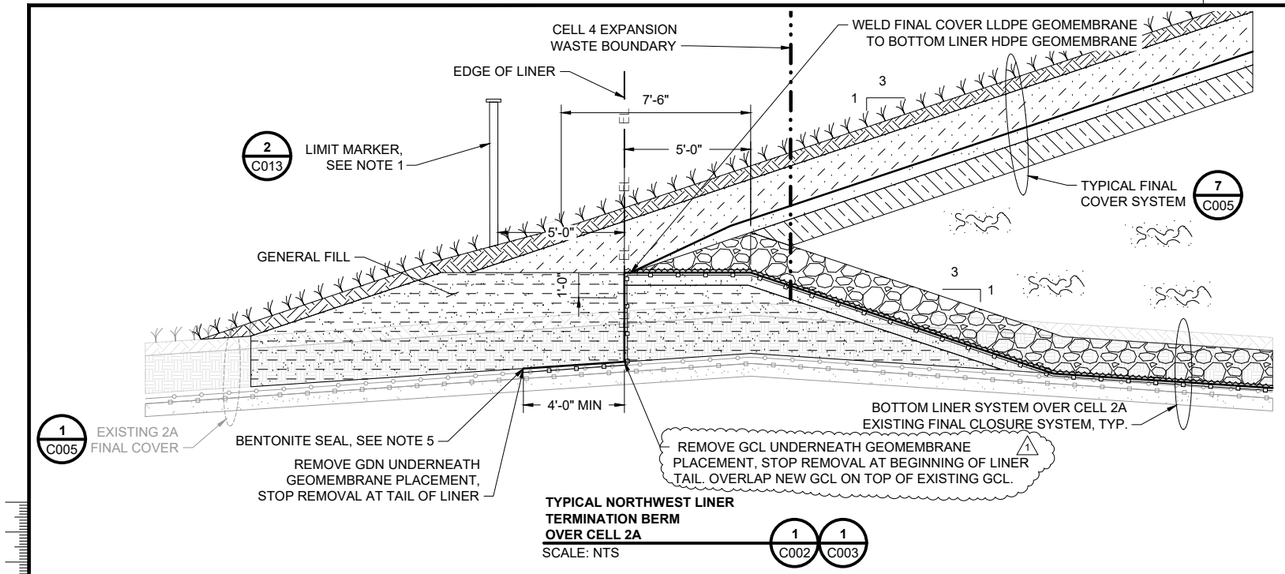
CENTRAL LANDFILL (SW1A007-26)
CELL 4 EXPANSION CONSTRUCTION
PERMIT REFERENCE DRAWINGS
CONSTRUCTION DETAILS, 1 OF 3

project	contract
167550	AUTHORIZATION #14

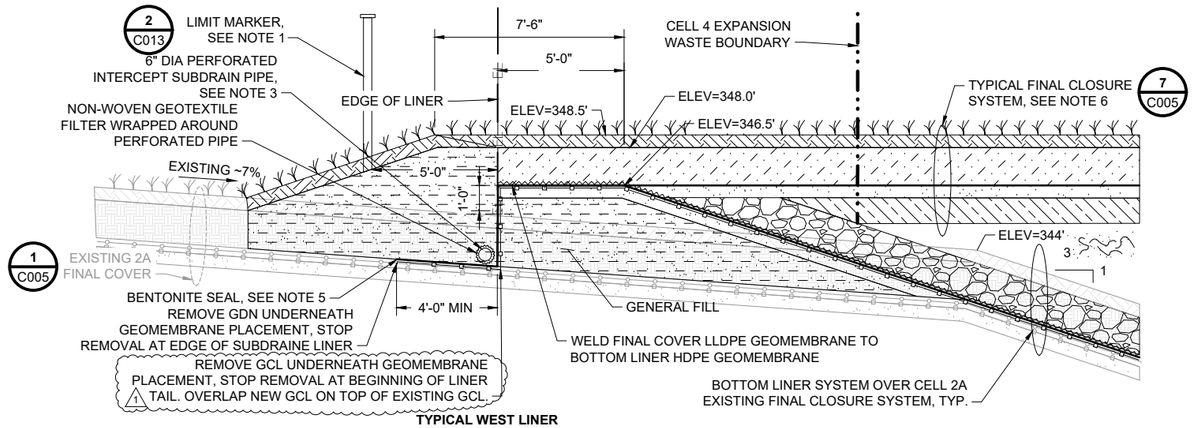
drawing **C005** – rev. **0**

sheet of sheets
file C005 CONSTRUCTION DETAILS, 1 OF 3 - ADEC.DWG

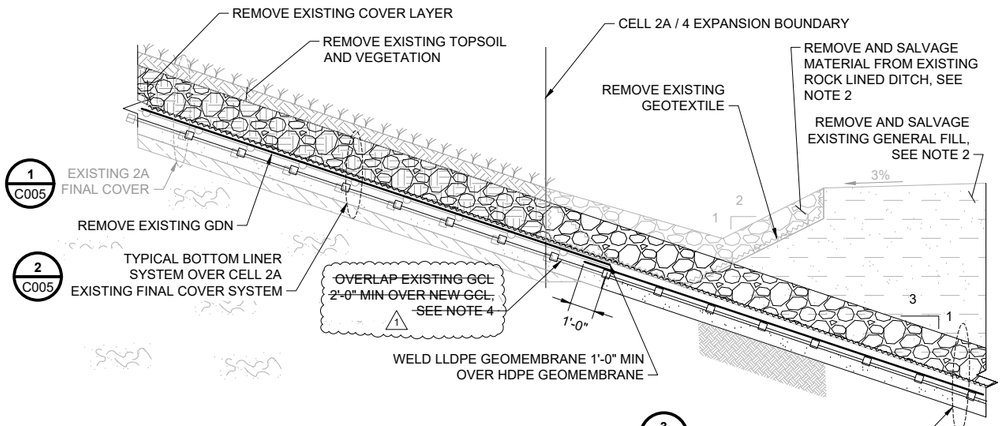
Millimeters
Scale For Microfilming
Inches



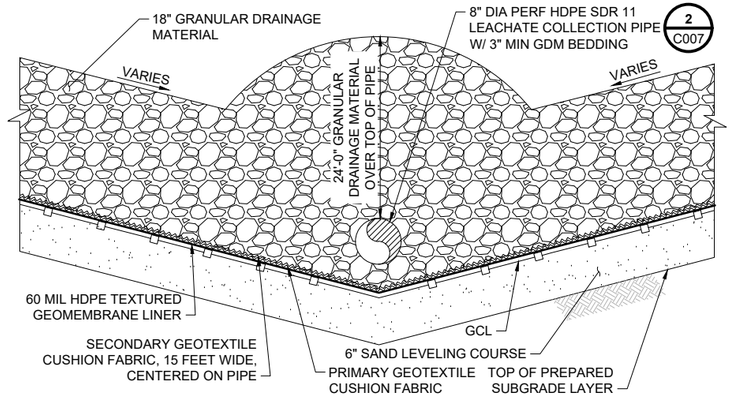
TYPICAL NORTHWEST LINER TERMINATION BERM OVER CELL 2A 1 C002 1 C003
SCALE: NTS



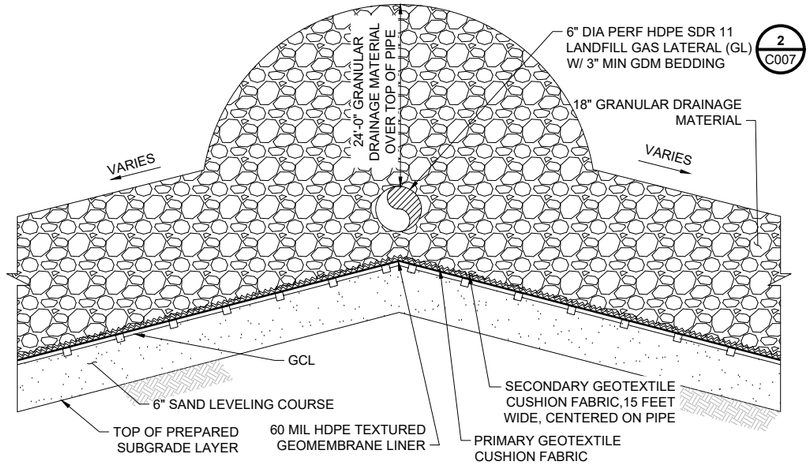
TYPICAL WEST LINER TERMINATION BERM OVER CELL 2A 3 C002 3 C003 3 C004
SCALE: NTS



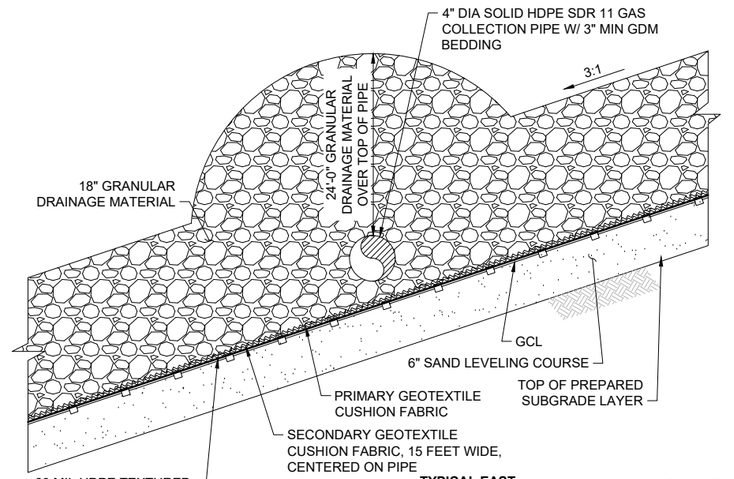
TYPICAL CELL 2A TO CELL 4 EXPANSION COMPOSITE LINER TRANSITION 5 C002
SCALE: NTS



TYPICAL LEACHATE COLLECTION LATERAL 2 C003 2 C004
SCALE: 1"=10'



TYPICAL GAS LATERAL 4 C004 4 C008
SCALE: 1"=10'



TYPICAL EAST SLOPE GAS HEADER 6 C004 6 C008
SCALE: 1"=10'

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE
1	1/13/25	RCH	FJD	PERMIT REFERENCE

NOTES:

1. LIMIT MARKER SHALL BE PLACED EVERY 100-FEET ALONG THE CELL BOUNDARY. LIMIT MARKERS SHALL BE OFFSET 5 FEET TO THE OUTSIDE OF THE EDGE OF LINER ON TOP OF THE 2A PIGGYBACK. LIMIT MARKERS SHALL BE PLACED 1 FOOT OUTSIDE THE EDGE OF LINER BOUNDARY ON THE ACCESS ROAD PERIMETER.
2. SALVAGE ROCK AND GENERAL FILL, COORDINATE WITH OWNER.
3. CONNECT 6" DIA. PERFORATED INTERCEPT SUBDRAIN PIPE INTO EXISTING 6" DIA. NON-PERFORATED INTERCEPT SUBDRAIN PIPE, SEE C003 FOR INTERCEPT SUBDRAIN PIPE AND CONNECTION LOCATIONS.
4. 1 ~~UNCOVER EAST EDGE OF CELL 2A GCL TO EXPOSE A MINIMUM OF 2'-0" OF EXISTING GCL. OVERLAY EXISTING GCL ON TOP OF NEW GCL WITH A MINIMUM OF 2'-0". PLACE POWDERED BENTONITE BETWEEN GCL OVERLAP.~~
5. SPREAD BENTONITE ON TOP OF LLDPE GEOMEMBRANE 12" WIDE, 1" DEEP, CENTERED ALONG EDGE OF LINER.
6. TOP OF FINAL COVER DESIGN GRADES SLOPE DOWNWARD INTO THE PAGE.
7. REFER TO CELL 4 EXPANSION CONSTRUCTION DRAWINGS DATED AUGUST 2024 FOR REFERENCE CALLOUTS NOT INCLUDED IN THIS DRAWING SET.

BURNS McDONNELL
Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

MATANUSKA-SUSITNA BOROUGH, ALASKA

CENTRAL LANDFILL (SW1A007-26)
CELL 4 EXPANSION CONSTRUCTION PERMIT REFERENCE DRAWINGS CONSTRUCTION DETAILS, 2 OF 3

project	contract
167550	AUTHORIZATION #14

drawing **C006** rev. **0**

sheet of sheets

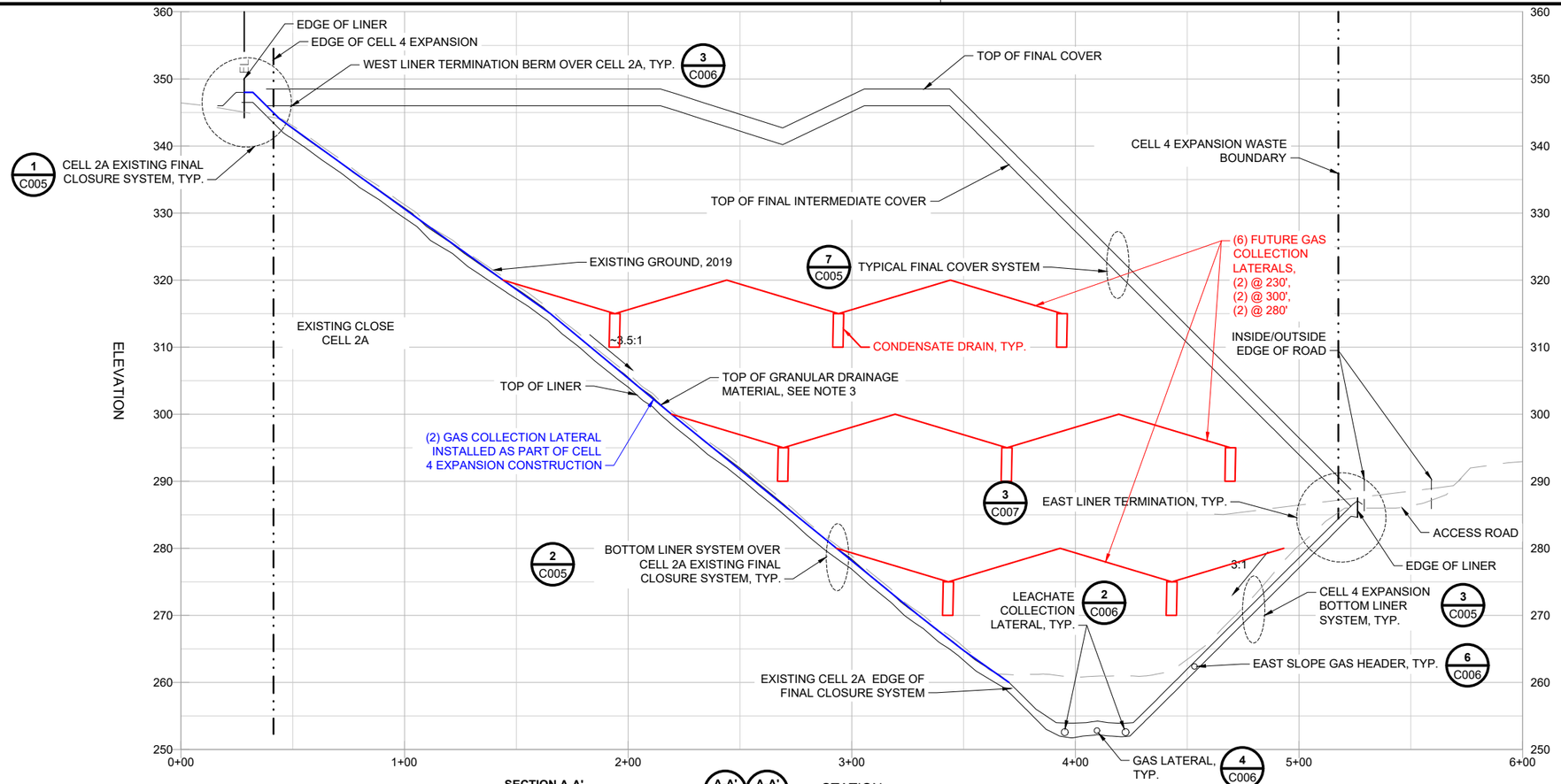
file C006 CONSTRUCTION DETAILS, 2 OF 3 - ADEC.DWG

Scale For Microfilming: Millimeters / Inches

ATTACHMENT 10:

MARKUP OF DRAWING C004.1

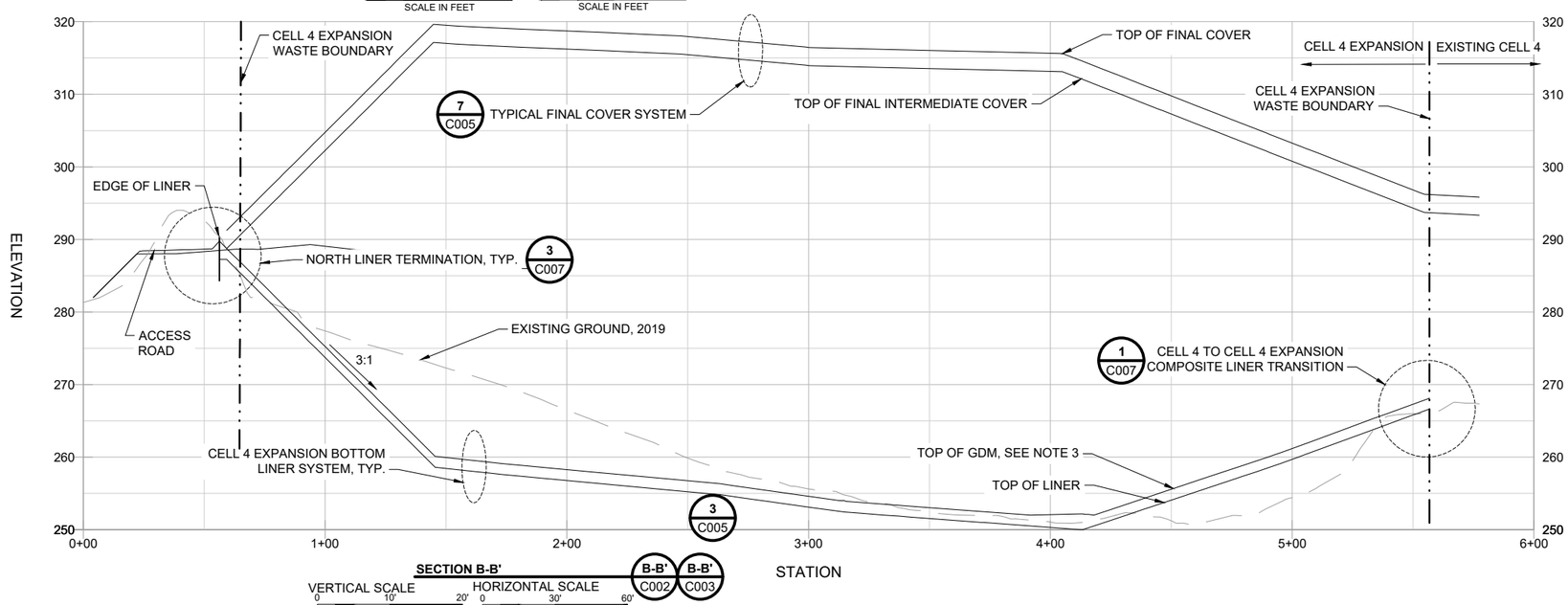
(PROPOSED GAS COLLECTION LATERAL LOCATIONS)



SECTION A-A' A-A' C002 A-A' C003

VERTICAL SCALE 0 10' 20' SCALE IN FEET

HORIZONTAL SCALE 0 30' 60' SCALE IN FEET



SECTION B-B' B-B' C002 B-B' C003

VERTICAL SCALE 0 10' 20' SCALE IN FEET

HORIZONTAL SCALE 0 30' 60' SCALE IN FEET

no.	date	by	ckd	description
0	8/23/24	RCH	FJD	PERMIT REFERENCE
	1/13/25	RCH	FJD	PERMIT REFERENCE

NOTES:

1. EXISTING SITE FEATURES SHOWN PROVIDED BY MSB.
2. EXISTING SITE TOPOGRAPHY CREATED FROM VARIOUS SURVEYS. MOST RECENT SURVEY OF THE CELL 4 EXPANSION AREA CREATED FROM DRAFT LIDAR DATA FLOWN IN THE FALL OF 2019 BY MSB, THE ACCURACY OF THE DATA IS NOT GUARANTEED.
3. GDM SHALL BE MINIMUM THICKNESS OF 1'-6". DESIGN CONTOURS SHOWN REPRESENT 1'-6" OF GDM ABOVE DESIGNED TOP OF LINER GRADES. REFER TO C006 FOR DETAIL GRADING INFORMATION.
4. REFER TO CELL 4 EXPANSION CONSTRUCTION DRAWINGS DATED AUGUST 2024 FOR REFERENCE CALLOUTS NOT INCLUDED IN THIS DRAWING SET.

BURNS McDONNELL

Burns & McDonnell Engineering Co, Inc.
LICENSE NO. AECC322

date	detailed
AUGUST 2024	R. HEAMAN
designed	checked
M. AULT	F. DORAN

MATANUSKA-SUSITNA BOROUGH, ALASKA

CENTRAL LANDFILL (SW-1A007-26)

CELL 4 EXPANSION CONSTRUCTION
PERMIT REFERENCE DRAWINGS
CROSS SECTIONS

project	contract
167550	AUTHORIZATION #14

drawing **C004** – rev. **0**

sheet of sheets

file C004 CROSS SECTIONS - ADEC.DWG

Scale For Microfilming: Millimeters / Inches

Cell 4 Expansion Design Approval Letter from ADEC

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

DIVISION OF ENVIRONMENTAL HEALTH
Solid Waste Program

555 Cordova Street
Anchorage, AK 99501
Phone: 907.269.7626
Fax: 907.269.7510
www.dec.alaska.gov

Delivered Electronically

January 24, 2025

Jeff Smith
Solid Waste Division Manager
Matanuska-Susitna Borough
350 East Dahlia Avenue
Palmer, Alaska 99645

Subject: MSB Palmer Central Landfill, Cell 4 Expansion, Design Approval

Dear Mr. Smith:

The Alaska Department of Environmental Conservation (ADEC) Solid Waste Program has reviewed the design information submitted by Matanuska Susitna Borough (MSB) and Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) for the Cell 4 Expansion design at the Palmer Central Landfill (PCL). The proposed design was originally submitted to ADEC on September 12, 2024. ADEC staff provided initial review of the proposed design in a letter dated November 18, 2024. ADEC staff met with MSB and Burns & McDonnell staff on Dec 13, 2024, to discuss the review comments, and a Response to Cell 4 Expansion Design Review Comments letter was submitted to ADEC on January 15, 2025.

ADEC has determined the Cell 4 expansion design adequately complies with the cell design regulation for a Class I Municipal Solid Waste Landfill. **The design is approved as submitted and construction may proceed.**

ADEC requests the following:

- Please submit an as-built survey and documentation of any variation from the submitted design when construction of the Cell 4 expansion is complete.

Please note that prior to disposing waste in the new cell, a permit application that is updated to reflect changes to facility design, operations, closure costs and financial assurance must be submitted for ADEC's review. When the revised permit application has been finalized, a 30-day public notice will be required. Additional time may be needed to respond to public comments prior to ADEC approving the permit modification. Please allow at least 90 days for the process.

Also note that prior to recirculating leachate in the new cell, a modification to the Research, Development and Demonstration permit must be applied for and approved. This modification will also require a 30-day public notice.

A person authorized under a provision of 18 AAC 15 may request an informal review of a contested decision by the Division Director in accordance with 18 AAC 15.185 and/or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. See DEC's "Appeal a DEC Decision" web page https://dec.alaska.gov/commish/review-guidance/ for access to the required forms and guidance on the appeal process. Please provide a courtesy copy of the adjudicatory hearing request

in an electronic format to the parties required to be served under 18 AAC 15.200. Requests must be submitted no later than the deadline specified in 18 AAC 15.

Thank you for working with ADEC to design landfill cells that satisfy ADEC human health and the environment requirements. Please contact Annemieke Powers at (907) 269-7626 or by email at annemieke.powers@alaska.gov if you have any questions or require any additional information.

Sincerely,

Annemieke Powers
Environmental Program Specialist III