CONTRACT DOCUMENTS AND SPECIFICATIONS
2023 INTERMEDIATE COVER INSTALLATION
CITY OF BATH, MAINE
SOLID WASTE LANDFILL

Prepared for

CITY OF BATH, MAINE

February 2023

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021
Phone: 207.829.5016 sme-engineers.com

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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SECTION 00100

INSTRUCTIONS TO BIDDERS

1.0 REQUEST FOR BIDS

The City of Bath, Maine Public Works Department will receive bids for the 2023 Intermediate Cover Installation project at the Solid Waste Landfill until 1:00 p.m. Local Time Thursday February 16, 2023. A pre-bid conference will be held at the Bath Department of Public Works office, followed by a site visit at 10:00 a.m., on Wednesday February 8, 2023. Bids shall be marked "Bath Landfill 2023 Intermediate Cover" and may be submitted to the City of Bath in the following way:

In person
Regular Mail or Overnight Mail:

Bath City Clerk
55 Front St
Bath, Maine 04530

2.0 COPIES OF BIDDING DOCUMENTS

The Bidding Documents consist of the following items:

- The Instructions to Bidders
- Section 01010 – Summary of Work
- Technical Specifications
- Construction Drawings dated February 2023

3.0 QUALIFICATIONS OF BIDDERS

The geomembrane installer and manufacturer must meet the experience requirements presented in Section 1.03 Quality Control in Section 02772.

4.0 MEASUREMENT AND PAYMENT

1. Mobilization

   A. Method of Measurement: The quantity to be measured for payment shall be lump sum.

   B. Payment: Payment for waste grading at a lump sum price shall be full compensation for the delivery of all equipment, tools, incidental items, and materials necessary in the performance of the project, and the removal of same upon the successful completion of the work.

2. Waste Grading

   A. Method of Measurement: The quantity to be measured for payment shall be lump sum in conformance with the grades and details shown on the Contract Drawings.

   B. Payment: Payment for waste grading at a lump sum price shall be full compensation for all equipment, labor, tools, incidental items, and materials for the successful completion of the

work. The work includes but is not limited to: relocating, grading, and shaping waste currently in the operating area to the waste grades shown on the plans.

3. Supply and Install Horizontal LFG Collection Pipe

   A. Method of Measurement: Per foot of installed pipe.

   B Payment: Payment shall be made on a per foot basis, which shall be full compensation for all labor, equipment, and materials necessary to install gas collection trenches, as shown on the Drawings.

This item shall include the complete installation of horizontal LFG collection pipe, including: all excavation, backfilling and grading; excavation and installation of the gas collection trench, including geotextile, porous media and 4-inch-diameter perforated collection pipe; excavation and installation of the 4-inch-diameter solid vacuum pipe and fittings to connect the condensate traps and vacuum header; backfilling of trench; construction and installation of the condensate traps, including excavation and backfill; installation of the wellheads, which will be provided by the City of Bath; and all other work and expense incidental to the construction of collection trenches for which payment is not provided under other items.

4. Supply and Install Horizontal LFG Header Pipe

   A. Method of Measurement: Per foot of installed pipe.

   B Payment: Payment shall be made on a per foot basis, which shall be full compensation for all labor, equipment, and materials necessary to install gas collection pipe, as shown on the Drawings.

This item shall include the complete installation of horizontal LFG header pipe, including: all excavation, backfilling and grading; excavation and installation of the gas vacuum header pipe including, common borrow and 8-inch-diameter solid vacuum header pipe; excavation, and connection to existing 8-inch-diameter landfill gas header pipe with 8-inch by 8-inch by 8-inch tee and electrofusion couplings. Construction of a new 8-inch diameter condensate trap and all other work and expense incidental to the construction of collection trenches for which payment is not provided under other items.

As part of this task, Contractor may be required to expose existing infrastructure that may interfere with the alignment of the gas conveyance pipe at the locations of proposed crossings. Contractor shall provide ENGINEER with survey information of existing infrastructure, including coordinates and elevations relative to the datum(s) defined on the Drawings, in the event conflicts with the existing infrastructure occur during the installation of proposed landfill gas pipe. This Work shall be considered incidental.

5. Supply and Install Drainage System Improvements

   A. Method of Measurement: The quantity to be measured for payment shall be lump sum.

   B Payment: Payment for drainage system improvements at a lump sum price shall be full compensation for all materials, equipment, labor, tools, and incidental items, for the successful completion of the work. The work includes but is not limited to: excavation and backfill, connections to existing leachate control infrastructure, installation of inlet structure, pipe installation, and inlet protection installation, in the locations and at the grades shown on the plans

6. Supply and Install Bedding Layer Material

   A. Method of Measurement: The quantity to be measured for payment shall be cubic yard.

   B. Payment: Payment to furnish and install the bedding layer material shall be cubic yard price for full compensation for transporting to the landfill and placement over the waste as shown on the Contract Drawings, and incidental items shall include all equipment, labor, tools, and materials necessary for the successful completion of the work.

7. Supply and Install Intermediate Geomembrane Cover

   A. Method of Measurement: The quantity to be measured for payment shall be the actual number of square feet of temporary geomembrane cover placed in accordance with the contract documents.

   B. Payment: Payment shall be at the contract unit price per square foot installed which shall be full compensation for transporting geomembrane cover to the landfill, quality control, installation and seaming of the temporary geomembrane cover, anchoring the cover, installation of pipe boots, and incidental work.

8. Incidental Site Work

   A. Method of Measurement: The quantity to be measured for payment shall be lump sum.

   B. Payment: Payment for incidental work at a lump sum price shall be full compensation for installation of drainage piping surface inlets, drainage stone, check dams, assisting geomembrane installation subcontractor, anchor trench, and other incidental items, as shown on the Contract Drawings, and incidental items shall include all equipment, labor, tools, and materials necessary for the successful completion of the work.

5.0 BID FORM

PROJECT IDENTIFICATION: 2023 Intermediate Cover Installation

THIS BID IS SUBMITTED TO: Bath City Clerk
City of Bath
55 Front St
Bath, Maine 04530

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER 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.

All names must be typed or printed in black ink below the signature.

The address and telephone number for the BIDDER must be shown.

Evidence of authority to conduct business in the State of Maine shall be provided.

	ENGINEER'S ESTIMATED QUANTITY	ITEM AND UNIT PRICE BID (in words)	CONTRACTOR'S ESTIMATED QUANTITY	AMOUNT
1	Lump Sum 1	Mobilization. The Sum of $_____ _____ Lump sum	Lump Sum _____	$_____
2	Cubic Yard 8,000	Waste Grading. The Sum of $_____ _____ Lump sum	Cubic Yard _____	$_____
3	Linear Foot 275	Horizontal LFG Header Trenches The Sum of $_____ _____ Lump sum	Linear Foot _____	$_____
4	Lump Sum 1	Drainage System Improvements The Sum of $_____ _____ Lump sum	Lump Sum _____	$_____
5	Cubic Yard 700	Placement of Bedding Layer (Contractor Supplied) The Sum of $_____ _____ Lump sum	Cubic Yard _____	$_____
6	Square Feet 39,160	Temporary Geomembrane Cover Installation The Sum of $_____ _____ per square foot	Square Feet _____	$_____
7	Lump Sum 1	Incidental Site Work including but not limited to; Anchor Trench, Erosion Control, Cleanout Extension and Geomembrane Subcontractor Assistance. The Sum of $_____ _____ Lump sum	Lump Sum _____	$_____
			ITEMS 1 THROUGH 7 TOTAL	$_____

	ENGINEER'S ESTIMATED QUANTITY	ITEM AND UNIT PRICE BID (in words)	CONTRACTOR'S ESTIMATED QUANTITY	AMOUNT
Alternate No. 1 Install 550 LF of Landfill Gas Collection Trench Includes Excavation, Piping, Geotextiles, and Backfill = The Sum of $_____				

BIDDER agrees that the Work will be substantially complete within 35 consecutive calendar days after work starts, and shall begin no later than.

Changes in the Contract Work (addition and deduction) shall be performed at the unit prices, described below. The unit prices are gross prices, including the Contractor's equipment, labor, supervision, material costs, entire mark-up, field or other costs, including General Conditions, fringe benefits, overhead and profit. The BIDDER shall include with their bid a standard rate sheet for labor and equipment.

Item & Price Bid in Words	Unit Price
Bedding Layer Material – Contractor Supplied (CY)	
Waste Grading (HR)	
Drainage Stone (CY)	
HDPE Gas Collection Pipe – 4-inch DR 17 Perforated (LF)	
HDPE Gas Collection Pipe – 8-inch DR 17 Solid (LF)	
Common Excavation (CY)	
Common Borrow (CY)	
Drainage Stone Check Dams (LF)	
Silt Fence (LF)	
Hay Bale (EA)	

SUBMITTED on _____ _____, 2023

BIDDER

Bidder: _____

Authorized Signature:

By _____
(Name of Person Authorized to Sign – Type or Print)

Title: _____

Business address: _____
_____
_____

Phone No. _____

Evidence of authority to conduct business in Maine: _____

6.0 BIDS TO REMAIN SUBJECT TO ACCEPTANCE

Upon bid opening, the Public Works Department will make a bid acceptance/award recommendation to the Bath City Manager and Bath City Council. The City Council is required to authorize the manager to accept the bid prior to a contract execution. It is anticipated the question will be presented to the council for the projects approval on March 1, 2023. Following City Council authorization, the bidders will be notified and a contract will be executed. Bidders shall be aware of this timeline and bid prices shall be valid through the date of the City Council meeting.

7.0 AWARD OF CONTRACT

Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any Bidder if Owner believes that it would not be in the best interest of the City to make an award to that Bidder. The Owner reserves the right to limit the amount of work as necessary based on the amount of available funds.

8.0 SIGNING OF AGREEMENT

Within ten (10) days of receipt of notice to award, the OWNER will submit to BIDDER and BIDDER shall execute an Agreement to perform the work described in the Summary of Work.

9.0 SUBMITTALS

A. Prior to construction the CONTRACTOR shall submit to the OWNER the items identified in Section 1.05 Quality Control Documentation, of Section 02772 of these specifications.

B. SUBMITTAL PROCEDURES:

1. Transmit eight copies of each submittal to the Engineer.
2. No materials covered by submittals shall be stored on-site until submittal for material is approved by the Engineer.
3. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.
4. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.
5. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.
6. Schedule submittals to expedite the project, and deliver to the Engineer. Coordinate submission of related items.
7. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.
8. Provide space for Contractor and Engineer review stamps.
9. Revise and resubmit submittals as required, identify all changes made since previous submittal.
10. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

10.0 SALES AND USE TAXES

Owner is exempt from Maine State Sales and Use Taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Contract Price.

END OF SECTION

SECTION 00500

AGREEMENT

THIS AGREEMENT is dated as of the _____day of _____ in the year 2023, by and between the City of Bath (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

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

ARTICLE 1 - WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is as generally described in Section 01010, Summary of Work.

ARTICLE 2 - ENGINEER

The 2022 Intermediate Cover Installation Project has been designed by Sevee & Maher Engineers, Inc. 4 Blanchard Rd., P.O. Box 85A, Cumberland, Maine 04021. Sevee & Maher Engineers, Inc. is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

ARTICLE 3 - CONTRACT TIME

3.1 The Construction of the Infrastructure Improvements and Intermediate Cover Installation will be substantially complete by _____, 2023.

3.2 Liquidated Damages. OWNER and CONTRACTOR recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 3.1 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. They also recognize the delays, expense and difficulties involved in proving the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay OWNER one-thousand dollars ($1000.00) for each day that expires after the time specified in paragraph 3.1 for the completion of the Infrastructure Improvements and Intermediate Cover Installation.

ARTICLE 4 - CONTRACT PRICE

4.1 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds as follows at the Contract Price agreed upon in the Contractor's Bid Form attached to this Agreement.

ARTICLE 5 - PAYMENT PROCEDURES

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

5.1 Progress Payments; Retainage. OWNER shall make periodic progress payments on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, during construction as provided in paragraphs 5.1.1 and 5.1.2. All such payments will be measured by the schedule of values established in paragraph 2.7 of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

5.1.1 Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below, but, in each case, less the aggregate of payments previously made.

90% of Work completed (with the balance being retainage). If Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, OWNER on recommendation of ENGINEER, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no additional retainage on account of Work completed in which case the remaining progress payments, prior to Substantial Completion, will be in an amount equal to 100% of the Work completed.

100% of materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in paragraph 14.2 of the General Conditions).

5.1.2 Upon Substantial Completion, in an amount sufficient to increase total payments to CONTRACTOR to 98% of the Contract price, less such amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.7 of the General Conditions.

5.2 Final Payment. Upon final completion and acceptance of the Work, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER. Upon substantial completion of the work, retainage in the amount of 2% of the total contract will be retained for a period of one year from the date of substantial completion. In addition to the 2% retainage, the Owner shall retain an amount sufficient to cover the estimated cost of the work still to be completed.

ARTICLE 6 - INTEREST

All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of 1% /month for the Project.

ARTICLE 7 - CONTRACTOR'S REPRESENTATIONS

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

7.1 CONTRACTOR has examined and carefully studied the Contract Documents (including the Addenda listed in paragraph 8) and the other related data identified in the Bidding Documents including "technical data".

7.2 CONTRACTOR has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work.

7.3 CONTRACTOR 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.

7.4 CONTRACTOR has carefully studied all 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. CONTRACTOR acknowledges that such reports and drawings are not Contract Documents and may not be complete for CONTRACTOR's purposes. CONTRACTOR acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to Underground Facilities at or contiguous to the site. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all such additional 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 CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.

7.5 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site that relates to the Work as indicated in the Contract Documents.

7.6 CONTRACTOR has correlated the information known to CONTRACTOR, 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.

7.7 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies that CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 8 - CONTRACT DOCUMENTS

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

8.1 Instruction for Bidders and Bid Form

8.2 Agreement

8.3 Drawings prepared by Sevee & Maher Engineers, Inc., 4 Blanchard Rd., P.O. Box 85A, Cumberland Center, Maine, dated February 2023.

8.4 Specifications prepared or issued by Sevee & Maher Engineers, Inc., 4 Blanchard Rd., P.O. Box 85A, Cumberland Center, Maine 04021, dated February 2023.

There are no Contract Documents other than those listed above in this Article 8. The Contract Documents may only be amended, modified with the approval of the City.

ARTICLE 9 - MISCELLANEOUS

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

9.2 No assignment by a party hereto of any rights under or interests in the Contract Documents will be binding on another party hereto without the written consent of the party sought to be bound; and specifically but without limitation moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

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

9.4 Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provisions or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or by ENGINEER on their behalf.

This Agreement will be effective on _____, 2023.

OWNER: City of Bath, Maine

By: _____

[CORPORATE SEAL]

CONTRACTOR: _____

By: _____

[CORPORATE SEAL]

Attest _____

Address for giving notices

City Hall, 55 Front Street

Bath, Maine 04530

(If OWNER is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Agreement).

Attest _____

Address for giving notices

_____

_____

License No. _____

Agent for service of process:_____

_____

(If CONTRACTOR is corporation, attach evidence of authority to sign)

END OF SECTION

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT: **2023 Intermediate Cover Installation**

DATE OF ISSUANCE: _____

OWNER: **City of Bath, Maine**

OWNER'S Contract No. _____

CONTRACTOR:_____ ENGINEER: **Sevee & Maher Engineers, Inc.**

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

This Certificate of Substantial Completion applies to all work included in the contract,

including all Change Orders.

To OWNER**:** **City of Bath**

And To Contractor: _____

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____
Date of Substantial Completion

The tentative list of items to be completed or corrected is discussed on the following page. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within **Thirty** days of the above date of Substantial Completion.

From the date of Substantial Completion the responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

RESPONSIBILITIES:

OWNER: **Security, operation, safety, maintenance, heat, utilities, and insurance**

CONTRACTOR: **Warranties and guarantees**

The following are provided as a Condition, and are included as part of, the Certificate of Substantial Completion. Owner will retain 5% of the Contract Value until the following punch list items are addressed.

> The Contractor will coordinate and work with the Owner to address the following items related to the east side leachate collection system: a) Clean and smooth the east side drainage channel stone, b) Regrade and place daily cover on the east side slope adjacent to the east side drainage channel, c) Replace the end cap or install a surface water inlet on the north end of the surface water inlet that existed at the start of the project, and d) install a culvert in the berm that covers the east side horizontal gas collection trench where it exits the active landfill.

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on: _____

ENGINEER

By_____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____

CONTRACTOR

By_____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____

OWNER

By_____
(Authorized Signature)

TECHNICAL SPECIFICATIONS

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DIVISION 1 – GENERAL

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ENGINEERS

SECTION 01010

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS: These Contract Documents define the requirements for the construction of the following items at the City of Bath Landfill in Bath, Maine: LFG infrastructure installation, drainage system improvements, and intermediate cover placed over a portion of the western slope in Cell 3.

Work shall include furnishing all materials, labor, supervision, and performing all operations required to complete the work shown on the Drawing and as described in the specifications contained herein, and as evidently necessary to complete the work.

Work shall include, but not be limited to:

- Grading and relocation of waste as necessary to construct berms, drainage areas, and any additional grading shown on the Contract Drawings;
- Furnish all materials, equipment, and labor to install the Cell 3 LFG collection system;
- Furnish and install bedding layer in areas that will receive geomembrane cover;
- Furnish and install drainage piping surface inlets, drainage stone, check dams, assisting geomembrane installation subcontractor, anchor trench, and other incidental items, as shown on the Contract Drawings;
- Installed owner supplied Cell 2 clean out extension;
- Installation of temporary geomembrane cover; and
- Coordination with the City of Bath regarding the division of work performed to accomplish the placement of Intermediate Cover.

The Division of Work is summarized below:

OWNER RESPONSIBILITIES:

The City of Bath will be responsible for the following tasks related to the placement of Intermediate Cover.

- Following execution of a contract with the Contractor, the City will schedule a meeting (or telephone call) with the Contractor to review the division of work, coordinate work tasks, finalize the project schedule, and coordinate work to minimize interference with landfill traffic and landfill operations.

CONTRACTOR RESPONSIBILITIES

The Contractor will be responsible for the following tasks related to the placement of Intermediate cover prior to mobilizing to the Site, the Contractor will meet (or participate in a telephone call) with the Owner to review the division of work, coordinate work tasks, finalize the project schedule, and coordinate work to minimize interference with landfill traffic and landfill operations.

- The Contractor will provide all equipment, labor tools and materials to complete the installation of the LFG infrastructure improvements in accordance with the Drawings and Specifications.
- The Contractor will install sump leachate inlet infrastructure as shown on the Drawings.

- The Contractor will provide all equipment, labor, and tools required to construct landfill access roads as shown on the Drawings.
- The Contractor will provide all equipment, labor, tools, and materials to prepare the site for geomembrane intermediate cover installation including all movement and grading of waste, placement of bedding material and installation of the geomembrane intermediate cover in accordance with the Drawings and the Specifications.
- The Contractor will install and maintain all erosion and sedimentation control systems.
- The Contractor will perform all work in conformance with all OSHA regulations and any additional safety requirements of the Owner.

1.02 SCHEDULE OF WORK: The Contractor and City will mutually agree on a schedule for the work. The Contractor shall coordinate all construction activities so as not to interfere with the City of Bath's landfilling operations. The Contractor's schedule shall describe its plan to coordinate construction activities, and the sequence for making the required modifications and connections to the operational LFG collection system to minimize disruptions with the operation of the landfill.

1.03 CONTRACTOR USE OF PREMISES:

A. The City of Bath Landfill is an active facility that receives waste on a daily basis. It will be the responsibility of the Contractor to coordinate with the Owner with regard to use of premises for storage, including haul routes and vehicular access. **City of Bath Landfill operating hours are Monday through Friday from 07:30 am to 4:00 pm.**

1.04 PROTECTION OF PROJECT WHILE UNDER CONSTRUCTION:

A. During this construction project, the Contractor shall restrict travel over areas of the landfill that are closed and shall not store construction material on closed portions of the landfill. Damage to the landfill cover systems or surface water management infrastructure caused by the Contractor shall be repaired by the Contractor at no cost to the Owner.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Submittal procedures.

B. Construction progress schedule.

C. Proposed products list.

D. Shop drawings.

E. Product data.

F. Samples.

G. Test reports.

H. Manufacturer's instructions.

I. Manufacturer's certificates.

J. Record survey.

1.02 SUBMITTAL PROCEDURES:

A. Transmit each submittal with Engineer accepted form.

B. No materials covered by submittals shall be stored on-site until submittal for material is approved by the Engineer.

C. No work of General Contractor which requires submittals shall proceed until submittals have been reviewed and approved by the Engineer.

D. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

E. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

F. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the work and Contract Documents.

G. Schedule submittals to expedite the project, and deliver to the Engineer. Coordinate submission of related items.

H. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of the completed work.

I. Provide space for Contractor and Engineer review stamps.

J. Revise and resubmit submittals as required, identify all changes made since previous submittal.

K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule within 15 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within ten days.

B. Submit revised Progress Schedules with each Application for Payment.

C. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

D. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

1.04 PROPOSED PRODUCTS LIST:

A. Within 15 days after date of Owner-Contractor Agreement, submit a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer trade name, model or catalog designation, and reference standards.

1.05 SHOP DRAWINGS:

A. Submit in the form of one reproducible transparency.

B. After review, distribute in accordance with Article on Procedures above and for Record Documents.

1.06 PRODUCT DATA:

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer. Submit to Engineer for review, for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents. Provide copies and distribute in accordance with Section 1.03 Submittal Procedures.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturer's standard data to provide information unique to this project.

C. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. After review, distribute in accordance with Section 1.03 above and provide copies for Record Documents.

1.07 SAMPLES:

A. Submit samples to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturer's standard colors, textures, and patterns for Engineer's selection.

C. Include identification on each sample, will full project information.

D. Submit the number or samples specified in individual specification sections; one of which will be retained by Engineer.

E. Reviewed samples which may be used in the work are indicated in individual specification sections.

1.08 TEST REPORTS

A. Submit for Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.09 MANUFACTURER'S INSTRUCTIONS:

A. When specified in individual specification sections, submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturer's instructions and Contract Documents.

C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.10 MANUFACTURER'S CERTIFICATES:

A. When specified in individual specification sections, submit manufacturer's certificate to Engineer for review, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer.

1.11 SUBMITTALS:

A. Prior to construction or the use of the following items within the construction limits of this project, material submittals will be provided to the Owner by the Contractor and approved for use by the Owner.

1. All piping materials including pipe, fittings, etc.
2. All geosynthetic materials including, geomembranes, woven and no-woven fabric, etc.
3. LFG collection trench Porous Media.

B. Project Schedule.

C. Accompany submittal with transmittal letter, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Certification that each document as submitted is complete and accurate.
6. Signature of Contractor, or his authorized representative.

END OF SECTION

DIVISION 2 – SITE WORK

SME
SEVEE & MAHER
ENGINEERS

SECTION 02565

LANDFILL GAS TRENCHES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide all labor, materials, equipment, and incidentals necessary to excavate and backfill trenches for the landfill gas collection trenches as shown on the Drawings and specified herein, including, but not limited to, excavation of waste; installation of fabric; porous media; pipe; compaction of waste; grading; and connection into existing LFG infrastructure.

1.02 SUBMITTALS

A. Contractor shall submit a plan for the installation of landfill gas trenches. This plan shall include information on sequencing, identification of potential hazards, and the measures that will be taken for the protection of individuals who may come in contact with these hazards.

1.03 CONSTRUCTION MONITORING

A. Prior to and during trench installation and backfill, the Contractor shall cooperate fully in providing all information required and allow Engineer sufficient time to make necessary observations.

PART 2 - PRODUCTS

2.01 GENERAL

A. All porous media, unless otherwise specified, shall be substantially free from organic materials, wood, trash, and other objectionable materials.

PART 3 - EXECUTION

3.01 GENERAL EXCAVATION BELOW GRADE

A. Contractor shall plan and perform all Landfill Gas Trench installation activities to prevent damage to existing structures, safeguard people and property, minimize disruptions to site traffic, protect the structures to be installed, and provide safe working conditions in compliance with local safety regulations and provisions of the Occupational Safety and Health Act (OSHA).

B. Excavation shall be made to the elevations and dimensions shown on the Drawings. Excavate sufficient material to provide suitable room for construction providing bracing and support as required.

3.02 EXCAVATION IN WASTE

A. Contractor shall take safety precautions during construction activities that conform to all OSHA regulations and the safety requirements of Owner and the Specifications.

B. Trenches shall be excavated to the depths, widths, and alignments shown on the Drawings.

C. Contractor shall separate cover soil from excavated refuse to the extent possible. Excavated material not suitable for re-use as trench backfill shall be transported to the working face of the landfill as directed by the Owners Representative.

D. Pockets of perched leachate may be encountered during waste excavation activities. Contractor shall immediately notify Owner and Engineer when leachate is encountered. Engineer will provide Contractor with written directions on how to manage the leachate in narrative and/or drawing form. Potential leachate management techniques may include one or a combination of the following.

1. Backfilling the affected area.
2. Realigning the trench.
3. Installing a French drain.

E. To the extent possible, the trench invert shall slope uniformly as indicated on the Drawings. Deviations of slope from the design Drawings and Specifications shall immediately be brought to the attention of the Engineer.

F. Contractor shall not excavate more trench than can be backfilled in one day after placement of the pipe. Excavations shall not be left open overnight.

G. Compaction of material used for trench backfill shall be by mechanical means. Engineer reserves the right to disapprove any device or method deemed of inadequate capacity.

END OF SECTION

SECTION 02772

TEMPORARY GEOMEMBRANE COVER
(HIGH DENSITY POLYETHYLENE)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract apply to work of this section.

1.02 DESCRIPTION OF WORK: Extent of temporary flexible membrane cover work is shown on the Contract Drawing. The temporary geomembrane material shall be 30-mil textured HDPE geomembrane with smooth edges. The contractor may propose the use of an alternative to the 30-mil textured HDPE membrane. The alternate must meet the requirements of this section and be approved by the Owner's Representative.

1.03 QUALITY CONTROL:

A. Manufacturer's Experience: The manufacturer supplying the membrane shall be GRI certified and shall satisfactorily demonstrate previous experience by letter of certification. Certification shall indicate that the manufacturer has produced, and has in service in similar applications for a period of not less than one (1) year, at least five (5) million sq ft of HDPE material meeting these Specifications.

B. Installer's Experience: The Installer proposing to install the lining shall satisfactorily demonstrate previous experience by letter of certification. Certification shall indicate the Installer's successful past installation of at least 5,000,000 sq ft of HDPE membrane lining.

Installation shall be performed under the direction of a single installation supervisor who shall remain on site and be in responsible charge throughout the liner installation, including subgrade acceptance, liner layout, seaming, testing repairs, and all other activities contracted for with the Installer. The installation supervisor shall have supervised the installation of at least 5,000,000 sf of polyethylene geomembrane. Actual seaming shall be performed under the direction of a master seamer who may be the same person as the installation supervisor, and who has a minimum of 1,000,000 sf polyethylene geomembrane seaming experience using the same type of seaming apparatus as that specified in this project. No seaming may be done by any individual with less than 500,000 sf of polyethylene geomembrane seaming experience. The installation supervisor or master seamer must be on site whenever seaming takes place.

1.04 SPECIAL PRODUCT WARRANTY: (Furnished by Liner Manufacturer)

A. Manufacturer's Guarantee: The manufacturer of the membrane liner shall enter into agreement with the Owner guaranteeing the membrane as follows:

The manufacturer warrants the HDPE liner which is manufactured, sold as first quality, and installed with technical assistance and/or by an approved installation contractor to be (1) furnished free of manufacturing defects in workmanship or material for a period of one year from the time of delivery with the basis for judgment of defects being the applicable product specifications in effect at the time the order was placed unless modified by mutual written agreement; (2) shall not develop cracks/holes which go completely through the

membrane due to the effects of normal service for a period of twenty (20) years from the date of delivery. "Normal service" does not include physical damage caused by acts of God, casualty, or catastrophe such as (but not limited to) earthquakes, fire, explosion, floods, lightning, piercing hail, tornadoes, corrosive air pollution, mechanical abuse by machinery, equipment, people or animals, or excessive flexures, pressures or stress from any source other than faulty installation, and (3) immune to chemical attack and degradation by chemicals, specified in the manufacturer's literature, as compatible with, and as not having an adverse effect on the membrane; and (4) immune to chemicals tested by the manufacturer for the Owner.

Should defects or weathering degradation within the scope of the above warranty occur, the manufacturer shall refund to the purchaser-user the pro-rata part for the unexpired term of the warranty of the purchaser-user's original cost of such product, or will supply repair or replacement materials at the then-current price. In the event the manufacturer supplies repair or replacement materials, against the then- current price, the manufacturer will credit the lesser of (1) the pro-rata part of the original sales price of the material so repaired or replaced for the unelapsed period of the warranty, or (2) the pro-rata part of the then-current price of the material so repaired or replaced to the unelapsed period of the warranty. The warranty shall continue in effect on the repaired or replaced material for the unelapsed term of the original warranty. To enable the manufacturer's technical staff to properly determine the cause of any alleged defect and to take appropriate steps to effect timely corrective measures if such defect is within the warranty, any claim for alleged breach of warranty will be made and presented in writing to manufacturer and the installing Contractor within thirty (30) days after the alleged defect was first noticed.

1.05 QUALITY CONTROL DOCUMENTATION

A. Product Data: Prior to the installation of any geomembrane, the manufacturer or Installer shall provide the Owner’s Representative with the following information:

1. Written certification that minimum roll values are guaranteed by the Manufacturer.
2. Quality control certificates, signed by a responsible party employed by the Manufacturer. Each quality control certificate shall include roll identification numbers, sampling procedures, and results of quality control tests. At a minimum, results shall be given for:

    a. Density
    b. Carbon black content
    c. Carbon black dispersion
    d. Thickness
    e. Asperity
    f. Tensile properties
    g. Tear resistance
    h. Puncture resistance

    These quality control tests shall be performed in accordance with the test methods specified in the specifications, for every 50,000 ft^2 of geomembrane produced.

The Manufacturer shall identify all rolls and/or panels of geomembranes with the following:

1. Manufacturer's name
2. Product identification

3. Thickness
4. Roll number
5. Roll dimensions

B. Product Review: The Owner's Representative shall verify that:

1. Property values certified by the Manufacturer meet all of its guaranteed specifications.
2. Measurements of properties by the Manufacturer are properly documented and that the test methods used are acceptable.
3. Quality control certificates have been provided at the specified frequency for all rolls, and that each certificate identifies the rolls related to it.
4. Roll packages are appropriately labeled.

PART 2 – PRODUCTS

2.01 HIGH DENSITY POLYETHYLENE (HDPE) MEMBRANE:

A. General: The materials supplied under these Specifications shall be first quality products designed and manufactured specifically for the purposes of this work, and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes**.**

B. Description of Textured HDPE Material: Textured HDPE shall be used as the temporary liner for the landfill Cells**.** The membrane shall be a high-density polyethylene (HDPE) of 30-mils thickness containing no additives, fillers or extenders**.** The lining material shall be manufactured a minimum of 20 feet seamless widths, and have the following physical characteristics:

TABLE 1

Test	Test Designation	30-mil Requirement
Sheet thickness, textured (with smooth edges)	ASTM D 5994	30-mils ±10% for individual for 8 out of 10 values 30-mils ±15% for individual for any of the 10 values
Asperity height	ASTM D 7466	16-mil
Density	ASTM D 1505	min. 0.940
Tensile strength yield	ASTM D 6693-01	min. 63 lb per in. width
Tensile strength at break	ASTM D 6693-01	min. 45 lb per in. width
Elongation at yield	ASTM D 6693-01	min. 12 percent
Elongation at break	ASTM D 6693-01	min. 100 percent
Tear resistance	ASTM D 1004	min. 21 lb
Puncture resistance	ASTM D 4833	min. 45 lb
Environmental stress crack	ASTM D 5397-99	500 hrs
Carbon black content	ASTM D 4218	2 to 3 percent
Carbon black dispersion	ASTM D 5596-94	Categories 1, 2, or 3
HDPE Seam Properties Shear Strength	ASTM D 6392-99	57 lbs/in
Peel adhesion fusion	ASTM D 6392-99	45 lbs/in
Peel adhesion extrusion	ASTM D 6392-99	39 lbs/in

In addition, the geomembrane shall be produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter, and shall not have striations, pinholes or bubbles on the surface.

C. Extrusion Joining Resin: Resin for extrusion joining sheets shall be HDPE and produced from the same material as the sheet resin**.** Physical properties shall be the same as those of the resin used in the manufacture of the co-extruded liner**.** The resin shall be supplied in black and/or natural color**.** Natural resin shall be colored black through addition of 2.0 to 3.0 percent master batch colorant before use**.**

D. Documentation: Prior to delivery of the geomembrane to the job site, the Installer shall be required to provide the Owner with quality control certificates that the geomembrane was tested in accordance with Part 4**.** These quality control certificates shall be signed by responsible parties employed by the manufacturer**.**

E. Roll Identification: Each roll shall have permanently affixed both inside and outside the roll the following information: name of manufacturer; date of manufacture; resin batch code; thickness of the material; roll number; roll length; and roll width**.**

2.02 MISCELLANEOUS MATERIALS:

A. Pipe Boots, Vents, and Patches: All such devices shall be of the same material as the lining or a compatible approved equal**.**

B. Mechanical Fastenings: Mechanical fastenings shall be of the material, size, and type as detailed on the plans or approved shop drawings**.**

PART 3 - EXECUTION

3.01 SHIPPING AND HANDLING: Each roll shall be prominently identified in the same fashion as the sheet within and showing the date of shipment. Until installed, the rolls shall be stored on pallets and shall be protected from the direct rays of the sun under a light-colored heat-reflective opaque cover in a manner that provides a free-flowing air space.

3.02 SURFACE PREPARATION:

A. Conditions: Surfaces to be lined shall be smooth and free of all angular rocks, sticks, vegetation, roots, sharp objects or debris of any kind**.** The surface shall provide a firm, unyielding foundation, consisting of sand or suitable borrow material**.** No standing water or excessive moisture shall be allowed**.**

B**.** Acceptance: The Installer shall certify in writing to the Owner that the surface to be lined is acceptable**.** Submittal of written acceptance may proceed incrementally according to installation schedule**.** No geomembrane shall be placed on subgrade deemed unsuitable by the Installer/or Owner's Representative or the Geosynthetic Quality Assurance Resident Engineer (QARE)**.**

3.03 ANCHOR TRENCH: Excavation, backfill and compaction of the anchor trench will be the responsibility of the Installer. The anchor trench shall be excavated along the lines shown on the design drawings. The length of open trench should not exceed the amount of liner to be placed in a two (2) day period unless approval has been provided by Owner or Owner's testing agency.

The anchor trench shall be partially backfilled during geomembrane panel placement; however the anchor trench shall not be compacted until the geomembrane has experienced sufficient expansion/contraction cycles. Compaction of the anchor trench backfill shall be performed using manually operated compaction equipment. Backfill shall be placed in lifts not greater than 12 inches in loose thickness and shall be compacted to a minimum wet density of 125 pcf. Owner's Representative shall approve backfill material prior to anchor trench placement, and must be notified prior to compaction.

3.04 FIELD SEAMS: The Geosynthetic Quality Assurance Resident Engineer (QARE) can, at his sole discretion, not allow any individual seamer or seaming equipment to be used for the project, based on observations made in the field. The Geosynthetic QARE will notify the Installer of the individual or seaming equipment that may not be used on the project and the reason or steps necessary to demonstrate the person or equipment acceptance on the job. The Installer shall have no recourse for this decision against the Owner, Engineer, or other parties.

A. Layout: Overlap panels in shingle style from high to low elevation**.** Minimize and/or avoid horizontal seams whenever possible**.** To the extent practical, align panels at tie-in locations to minimize seam repairs/patching**.**

B. Preparation: All areas which are to become seam interfaces shall be cleaned of dust and dirt**.** When extrusion joining is required, the slick surfaces of the HDPE sheet which are to become seam interfaces shall be prepared by sanding or grinding (perpendicular to the seam) to a depth of less than .005 in. before joining the sheets**.** Field joints shall not take place unless the sheet is dry**.**

C. Seaming Methods: Installer shall submit to the Owner, prior to construction, a list of the seaming equipment and testing equipment, including manufacturer and model number, which will be used on-site**.** Field seams shall be made by overlapping adjacent sheets a minimum of 3 in. and a maximum of 6 in. and using one of the following seaming techniques:

Hot Air/Hot Wedge: Hot air/hot wedge technique shall be made by either a nozzle which directs hot air between the sheets or a hot metal surface in contact between the sheets**.** Each seaming unit must include a thermometer giving the temperature of the machine at the nozzle or metal surface**.** The seaming unit shall maintain a recordable temperature determined by on-site conditions and shall not vary by more than 50 deg. F above, or below the recommended seaming temperature**.** The overlapped sheets are then pressed together by mechanical means**.** Seaming equipment that makes a split hot wedge seam will be the preferred method of seaming; single hot wedge seaming will be allowed only with the approval of the Owner**.**

Extrusion Bonding: Extrusion and fusion bonding will be limited to areas where hot wedge cannot be used, such as pipe boots, and to any necessary repairs**.** The use of extrusion and fusion bonding as the primary seaming method will be allowed only with the approval of the Owner**.** The joining procedure shall consist of softening the liner material by heated air**.** The temperature of the air impinging on the sheet for this purpose shall range from 420 deg. F to 680 deg. F**.** The exact temperature used shall be determined by the installation supervisor**.** Directly following the application of heat, a one and one-half inch minimum width strip of the same high-density polyethylene resin from which the sheet is made shall be extruded between the overlapped sheets**.** The temperature of the resin as it emerges from the extrusion die shall range from 428 deg. F to 536 deg. F**.** The overlapped sheets shall be firmly pressed together by mechanical means to form the extrusion joint**.**

Fusion Bonding: Extrusion and fusion bonding will be limited to areas where hot wedge cannot be used, such as pipe boots, and to any necessary repairs**.** The major seaming of the liner will be done with hot wedge**.** Fusion bonding shall be by means of a homogeneous overlap extrusion fusion process which provides continuous dynamic integration of the extrudate bead with the lining material**.** The composition of the extrudate shall be identical to the lining material**.** The seaming unit shall be capable of continuously monitoring and controlling the temperature of the extrudate and the zone of contact where the machine is actually fusing the lining material**.** Temperature of the extrudate shall range from 428 deg. F to 536 deg. F**.**

D. Seaming Wrinkles: Fishmouths or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle, back into the panel so as to affect a flat overlap**.** The cut fishmouths or wrinkles shall be seamed as well as possible, and shall then be patched with an oval or round patch extending a minimum of 6 in. beyond the cut in all directions**.**

E. Repairs: Any required repair of scratches >10% of the sheet thickness and small holes in the liner surface shall be made with the extrusion hand welder**.** Liner material shall be cleaned of all dirt, dust and other foreign material, all smooth HDPE surfaces roughened, air heated to the prescribed temperature, and a strip of HDPE resin extruded over the hole to produce an extruded welded repair**.**

F. Quality of Workmanship: All joints, on completion of the work, shall be tightly bonded**.** Any lining surface showing injury due to crimping, scuffing, penetration by foreign objects or distress from rough subgrade shall, as directed by the Owner's Representative, be replaced or covered and sealed with an additional layer of HDPE of the proper size**.** The Installer shall inspect the final installation and any defects shall be repaired and tested until satisfactory**.**

G. No seaming shall be allowed if the Geosynthetic QARE is not on-site**.**

3.05 MECHANICAL FASTENINGS AND PATCHES:

The geomembrane shall be installed around any pipes, concrete structures or other penetrations through the geomembrane in accordance with the Specifications shown on the Drawings. Prior to the start of construction, the Installer may provide, for the approval of the Owner, alternate installation methods or details to successfully perform geomembrane termination.

All clamps, bolts, nuts, gaskets or other materials used to secure the geomembrane shall be compatible with and have a lifespan at least equal to that of the geomembrane.

Care shall be taken to protect the underside of the geomembrane from damage due to settling at any underbedding to concrete transition.

Extreme care shall be taken while welding around any penetration or similar structure since destructive testing is not likely to be possible in such areas. All seaming in these areas shall be performed by the Installer's Master Seamer and the operations shall be observed on a full-time basis by the Owner's Representative.

3.06 SEAMING WEATHER CONDITIONS:

A. Normal Weather Conditions: The normal required weather conditions for seaming are as follows:

1. Ambient temperature between 32°F (0°C) and 104°F (40°C).
2. Dry conditions, i.e. no precipitation or other excessive moisture, such as fog or dew.
3. No excessive winds.

The Installer shall verify that these weather conditions are fulfilled. Ambient temperature shall be measured by the Owner's Representative in the area in which the panels are to be placed. The Owner's Representative will then decide if the installation is to be stopped or special procedures used.

B. Cold Weather Conditions: To assure a quality installation, if seaming is conducted when the ambient temperature is below 32°F (0°C), the following conditions must be met:

1. Geomembrane surface temperatures shall be determined by the Owner's Representative at intervals of at least once per 100 foot of seam length to determine if preheating is required. For extrusion welding, preheating is required if the surface temperature of the geomembrane is below 32°F (0°C).
2. Preheating may be waived by the Owner's Representative based on a recommendation from the Owner's Representative, if the Installer demonstrates to the Owner's Representative's satisfaction that welds of equivalent quality may be obtained without preheating at the expected temperature of installation.
3. If preheating is required, the Owner's Representative shall inspect all areas of geomembrane that have been preheated by a hot air device prior to seaming, to assure that they have not been overheated.
4. Care shall be taken to confirm that the surface temperatures are not lowered below the minimum surface temperatures specified for welding due to winds or other adverse conditions. It may be necessary to provide wind protection for the seam area.
5. All preheating devices shall be approved prior to use by the Owner's Representative.
6. Sheet grinding may be performed before preheating, if applicable.
7. Trial seaming shall be conducted under the same ambient temperature and preheating conditions as the actual seams. Under cold weather conditions, new trial seams shall be conducted if the ambient temperature drops by more than 5°F from the initial trial seam test conditions.

C. Warm Weather Conditions: At ambient temperatures above 104°F, no seaming of the geomembrane shall be permitted unless the Installer can demonstrate to the satisfaction of the Owner's Representative that geomembrane seam quality is not compromised.

Trial seaming shall be conducted under the same ambient temperature conditions as the actual seams.

At the option of the Geosynthetic QARE, additional destructive tests may be required for any suspect areas.

3.07 DEFECTS AND REPAIRS:

A. Identification: All seams and non-seam areas of the geomembrane shall be examined by the Owner's Representative for identification of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be cleaned by the Installer if the amount of dust or mud inhibits examination.

B. Evaluation. Each suspect location both in seam and non-seam areas shall be repaired by the Installer.

C. Repair Procedures: Any portion of the geomembrane exhibiting a flaw shall be repaired. Several procedures exist for the repair of these areas.

1. The repair procedures available include:

a. Patching, used to repair large holes, tears, undispersed raw materials, and contamination by foreign matter.
b. Spot welding or seaming, used to repair small tears, pinholes, or other minor, localized flaws.

2. For any repair method, the following provisions shall be satisfied:

a. Surfaces of the geomembrane which are to be repaired using extrusion methods shall be abraded no more than one hour prior to the repair.
b. All surfaces shall be clean and dry at the time of the repair.
c. All seaming equipment used in repairing procedures shall be approved by the Owner's Representative.
d. Patches or caps shall extend at least 6 inches beyond the edge of the defect, and all corners of patches shall be rounded with a radius of approximately 3 inches.

3.08 GEOMEMBRANE ANCHORING:

The quality assurance procedures indicated in this Section are intended only to assure that the installation of anchoring material does not damage the geomembrane.

A. Anchor Trench:

1. The anchor trench shall be backfilled with excavated material and compacted. The backfill material shall have a minimum wet density of 125 pcf.

PART 4 - QUALITY ASSURANCE

4.01 QUALITY ASSURANCE DURING MANUFACTURE AND UPON DELIVERY:

Random sampling shall be performed by the Manufacturer throughout the production run at a minimum frequency of once per 50,000 sq ft of geomembrane to verify the following properties:

Thickness	ASTM D 5994
Asperity Height	ASTM D 7466
Carbon Black Content	ASTM D 4218
Carbon Black Dispersion	ASTM D 5596
Grab Tensile Strength	ASTM D 6693
Elongation at Peak Strength	ASTM D 6693
Tear Resistance	ASTM D 1004
Puncture Resistance	ASTM D 4833

Sheet thickness shall be monitored continuously during manufacture and shall be nominal thickness ±10% across the sheet.

Rolls not satisfying the specifications shall be rejected. The Manufacturer shall provide certification of testing as described in Part 2.

4.02 QUALITY ASSURANCE DURING INSTALLATION:

A. The Owner's Representative shall visually inspect the geomembrane and seams as it is being installed and shall have the discretion to direct the Installer to repair seams or other defects in the installation observed during the visual inspection.

B. Inspection and Acceptance: As the work progresses, the Owner's Representative shall document all locations requiring repair work and shall verify and document that all repairs have been successfully made by the Installer**.**

The entire geomembrane surface shall be examined by the Owner's Representative to confirm that it is free of any defects, holes, blisters, undispersed raw materials, or contamination by foreign matter. The geomembrane surface shall be cleaned by the Installer, if required so that it is free of dust, mud, debris or any other material which may inhibit a thorough examination of the surface. Any suspect areas shall be clearly marked by the Owner's Representative and repaired by the Installer

C. Overburden: The Owner's Representative shall identify any large wrinkles that may have been built into the geomembrane. Any such wrinkle not built in to accommodate thermal contraction of the geomembrane prior to placement of the overburden shall be cut and repaired by the Installer.

The Owner's Representative shall identify any slope toe, declivity, or other surface transitions that might result in bridging of the geomembrane during placement of the overburden. Any such area shall be cut and repaired by the Installer.

4.03 COMPLETION OF WORK:

A. Requirements: The installation of the geomembrane shall be considered totally complete when: all required deployment, seaming, repairs, and site clean-up have been completed by the Installer; the Installer has submitted all the required quality control certificates to the Owner; and the Owner and/or his Representative is satisfied that the geomembrane has been installed in accordance with the above Specifications.

END OF SECTION

DIVISION 15 – MECHANICAL

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ENGINEERS

SECTION 15210

HIGH DENSITY POLYETHYLENE (HDPE) PIPE, FITTINGS, AND APPURTENANCES

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Contractor shall provide all labor, materials, equipment, and incidentals necessary to install HDPE pipe, and fittings for the landfill gas extraction system, and drainage improvements as shown on the Drawings and specified herein. Contractor shall also pressure test all non-perforated pipe related to Landfill Gas.

1.02 SUBMITTALS

A. Manufacturing data listing resin type, cell classification, stock density, melt flow, flexural modulus, tensile strength, and coloration.

B. Pipe Dimensions:

1. Average outside diameter.
2. Average inside diameter.
3. Minimum and average wall thickness.
4. Flare outside diameter.
5. Pitch.
6. Approximate weight in pounds per foot.

C. Manufacturer's instructions for fusing joints.

D. Pressure test Report for each piping system tested.

E. Submittals shall be in accordance with Section 01300.

1.03 QUALITY ASSURANCE

A. The pipe, fittings, and valve manufacturers shall have an established quality assurance (QA) program responsible for inspecting incoming and outgoing materials. At a minimum, incoming PE materials shall be inspected for density per ASTM D 1505, melt flow rate per ASTM D 1238, and contamination. The supplier shall certify all incoming PE materials.

B. The pipe, fittings, and valve manufacturers shall have an established QA program responsible for assuring the long-term performance of materials and products. Representative samples of PE materials shall be tested against the physical property requirements of this specification. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production samples and performing sustained pressure tests in accordance with ASTM D 1598.

C. QA testing for representative pipe and fitting samples shall include:

Test	Standard	Pipe	Fittings
Ring ESCR	ASTM F 1248	Yes	Not Applicable
Sustained pressure at 176°F / 725 psi hoop stress	ASTM D 1598	Yes (f_0>100 h)	Yes (f_0>100 h)
Sustained pressure at 73°F / 1600 psi hoop stress	ASTM D 1598	Yes (f_0>1,000 h)	Yes (f_0>1,000 h)

D. All outgoing materials shall be inspected for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. Quality Control (QC) shall perform tests of density, melt flow rate, carbon content, and carbon dispersion. In addition, samples of the pipe provided shall be tested for hoop tensile strength and ductility by either quick burst per ASTM D 1599 or ring tensile per ASTM D 2290. Molded fittings shall be subject to x-ray inspection for voids, and tests for knit line strength. All fabricated fittings shall be inspected for fusion quality and alignment.

E. The pipe and fitting manufacturer shall maintain permanent QC and QA records.

F. If manufacturer's test data is inadequate or unavailable, then Owner reserves right to reject or require additional tests to satisfy material requirements. The cost of these tests shall be borne by Contractor.

G. Work shall comply with codes and standards of the Plastic Pipe Institute (PPI).

1.04 DELIVERY, STORAGE, AND HANDLING

A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport by commercial carrier. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations, and the requirements of this Section.

B. Pipe Storage:

1. Store or stack pipe to prevent damage from marring, crushing or puncture. Limit maximum stacking height to 6 feet or manufacturer's recommended maximum height, whichever is less.
2. Store in accordance with manufacturer's recommendations.

C. Pipe Handling:

1. Protect pipe from excessive heat or harmful chemicals.
2. Handle pipe and use equipment needed to avoid gouging of the pipe surfaces.

PART 2 - PRODUCTS

2.01 PHYSICAL PROPERTIES

A. Materials used for the manufacture of PE pipe and fittings shall meet the following physical property requirements:

Property	Unit	Test Procedure	Value
Material Designation	-	PPI/ASTM	–
PPI Material Listing	-	PPI TR-4	PE 3408
Material Classification	-	ASTM D 1248	III C 5 P34
Cell Classification	-	ASTM D 3350	345434C or 355434C
Density	g/cm3	ASTM D 1505	>0.941
Melt Index [E]	g/10 min	ASTM D 1238	<0.15
Flexural Modulus	psi	ASTM D 790	>110,000 and <160,000
Tensile Strength	psi	ASTM D 638	3,000 to 3,500
ESCR [C]	hours	ASTM D 1693	f_0>5000
HDB	psi	ASTM D 2837	1,600 23 C
UV Stabilizer [C]	% Carbon Black	ASTM D 1603	2 to 3
Elastic Modulus	psi	ASTM D 638	110,000
Brittleness Temperature	°F	ASTM D 746	<-180
Vicat Softening Temperature	°F	ASTM D 1525	255
Thermal Expansion	in/in/ °F	ASTM D 696	8 x 10E-5
Hardness	Shore D	ASTM D 2240	64
Molecular Weight Category	-	-	Extra High

B. There shall be no evidence of splitting, cracking, or breaking when the pipe is tested.

C. Ring Stiffness Constant (RSC) values for the pipe shall be 90 percent of the nominal.

D. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

E. Clean rework or recycled material generated by the manufacturer's own production may be used so long as the pipe or fittings produced meet all the requirements of this Section.

2.02 PIPE AND FITTINGS

A. Dimensions:

1. Pipe Dimensions: The nominal inside diameter of the pipe shall be true to the specified pipe size in accordance with ASTM D 2513. Standard laying lengths shall be 40 feet + 2 inches.
2. Dimensions of fittings conforming to standard dimensions and tolerances in accordance with ASTM D 3261.
3. Pipe and fittings shall be SDR-17 unless otherwise noted.

B. Pipe and fittings shall be produced by the same manufacturer and from identical materials meeting the requirements of this Section. Special or custom fittings may be exempted from this requirement.

C. Pipe and fittings shall be pressure rated to meet the service pressure requirements specified. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the joining pipe.

D. Molded fittings will be required for use on all non-perforated sections of the Landfill Gas System and shall meet the requirements of ASTM D 3261 and this Section. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the diameter and wall thickness specifications of the mating system pipe. Fitting markings shall

include a production code that identifies the location and date of manufacture. Upon request, the manufacturer shall provide an explanation of his production code.

E. Marking:

1. Each standard and random length of pipe and fitting shall be clearly marked with the following information:
   a. Manufacturer's Name or Trademark;
   b. ASTM Standard Designation;
   c. Nominal Pipe Size;
   d. Class & Profile Number;
   e. Production Code, including Extrusion Date, and Lot or Batch Number; and
   f. Standard Dimension Ratio.

F. The pipe and fitting manufacturer shall certify that samples of his production pipe have undergone stress regression testing, evaluation, and validation in accordance with ASTM D 2837 and PPI TR-3. Under these procedures, the minimum hydrostatic design basis shall be certified by the pipe and fitting manufacturer to be 1600 psi at 73.4° F and 800 psi at 140° F.

G. Material shall be listed in the name of the pipe and fitting manufacturer by the Plastics Pipe Institute (PPI) in PPI TR-4 with the following Standard Grade ratings:

		73.4º F	140º F
1.	Hydrostatic Design Basis (HDB)	1,600 psi	800 psi
2.	Hydrostatic Design Stress (HDS)	800 psi	400 psi

H. PPI material listing in the name of the resin supplier is not acceptable in meeting this requirement.

I. Inspection Requirements:

1. Certification: As the basis of the acceptance of the material, the manufacturer shall furnish a certificate of conformance of this Section upon request. When prior agreement is being made in writing between Contractor and the manufacturer, the manufacturer shall furnish other conformance certification in the form of affidavit of conformance, test results, or copies of test reports.

J. Physical Test Requirements

1. Sampling: The selection of the sample of pipe shall be as agreed upon by Contractor and the manufacturer. In case of no prior agreement, any sample selected by the manufacturer shall be deemed adequate.
2. Sample size for flattening test will be one sample per size and class of pipe per project.
3. Conditioning: Conditioning of samples prior to and during test shall be as agreed upon by Contractor and manufacturer. In case of no prior agreement, the conditioning procedure used by the manufacturer shall be deemed adequate.

K. Test Methods

1. Flattening: Three specimens of pipe, a minimum of 12 inches long, shall be flattened between parallel plates in a suitable press until the distance between the plates is 40 percent of the outside diameter of the pipe. The rate of loading shall be uniform and such

that the compression is completed within 2 to 5 minutes. Remove the load, and examine the specimens for splitting cracking or breaking.

2. Pipe Ring Stiffness Constant: The pipe ring stiffness constant shall be determined utilizing procedures similar to those outlined in ASTM D 2412. The stiffness of HDPE pipe is defined in terms of the load, applied between parallel plates, which causes 1 percent reduction of pipe diameter. Test specimens shall be a minimum of two pipe diameters or 4 feet in length, whichever is less.

2.03 GASKETS AND HARDWARE

A. All gaskets shall be Viton. Joint hardware shall be Type 304 stainless steel.

2.04 ISOLATION VALVE **(N.I.T.C)**

A. Contractor shall furnish and install gate valves as indicated on the Drawings.

B. Valve shaft, stem, seat, bearings, handles, gear operator with hand wheel, and valve body shall be corrosion resistant.

C. The stem extension and outer protective casing shall be constructed of steel.

D. The exposed portion of the stem extension shall be painted with two coats of orange enamel paint.

E. Flanges shall be as indicated on the Drawings.

PART 3 – EXECUTION

3.01 FIELD QUALITY CONTROL

A. Pipe may be rejected for failure to conform to any of the following:

1. Fractures or cracks passing through pipe wall, except single crack not exceeding 2-inches in length at either end of pipe, which shall be cut off and discarded. All pipes within one shipment shall be rejected if defects exist in more than five (5) percent of shipment or delivery.
2. Cracks sufficient to impair strength, durability, or service ability of pipe.
3. Defects indicating improper proportioning, mixing, and molding.
4. Damaged ends, where such damage prevents making satisfactory joint.
5. Damage due to handling or installation. Scratches and gouges exceeding five (5) percent of the wall thickness shall be considered excessive, and may be rejected by Engineer or Owner.

B. Acceptance of fittings, stubs, or other specially fabricated pipe sections shall be based on visual inspection by Engineer and documentation of conformance to this Section.

C. Prior to backfilling trench Contractor shall obtain as-built top of pipe coordinates and elevations at grade changes, terminations, fittings, and at least every 50 feet along the pipe.

3.02 INSTALLATION

A. Trench, backfill, and compact in accordance with Section 02565.

B. Heat Fusion of Pipe:

1. Weld pipe in accordance with manufacturer's recommendation for butt fusion methods. The pipe manufacturer shall certify fusion operators.
2. Butt fusion equipment for joining procedures shall be capable of meeting conditions recommended by pipe manufacturer including, but not limited to, temperature requirements, alignment, and fusion pressures.
3. Branch saddle fusions shall be joined in accordance with manufacturer's recommendations and procedures. Branch saddle fusion equipment shall be of a size to facilitate saddle fusion within the trench. Extrusion welds shall not be allowed.
4. For cleaning pipe ends, solutions such as detergents and solvents, when required, shall be used in accordance with manufacturer's recommendations. Solvents shall not be used unless approved by Owner.
5. Do not bend pipe to greater degree than minimum radius recommended by manufacturer for type and grade.
6. Do not subject pipe to strains that will overstress or buckle pipe or impose excessive stress on joints.
7. Before butt fusing pipe, observe inside of each pipe length for presence of dirt, sand, mud, shavings, and other debris or animals. Remove debris from pipe prior to fusing.
8. Cap open ends of fused pipe at end of each working day to prevent entry by animals, debris, or stormwater.
9. Use compatible fusion techniques when polyethylenes of different melt indexes are fused together. Refer to manufacturer's specifications for compatible fusion.

C. Flange Jointing:

1. Use on flanged pipe connection sections.
2. Convoluted stainless steel backup rings shall be used for joining HDPE pipes below grade, and epoxy-coated carbon steel backup flanges shall be used above grade.
3. Butt-fuse fabricated flange adapters to pipe or use electrofusion couplings.
4. Observe the following precautions in connection of flange joints:
   Use full-face Viton gaskets only.
   All fasteners and back-up rings shall be Type 18-8 or Type 304 stainless steel below grade, and zinc-plated steel above grade.
   c. Align flanges or flange/valve connections to provide tight seal. Gaskets are required for flange/valve connections.
   d. U.S. Standard round washers may be used on some flanges when in accordance with manufacturer's recommendations. Bolts shall be lubricated in accordance with manufacturer's recommendations.
   e. Torque flange bolts in sequence and in accordance with manufacturer's recommendations. Do not over-torque bolts. Contractor shall use a torque wrench to tighten all flange fasteners.
5. Pull bolt down by degrees to uniform torque in accordance with manufacturer's recommendations.
6. Protect below grade bolts and flanges by covering with a 6-mil thick PE wrap. Duct tape wrap to HDPE pipe.
7. Electrofusion couplers, where used, shall be installed per manufacturer's specifications. The outside diameter of the HDPE pipe and face shall be prepared in accordance with manufacturer's recommendations prior to installing the coupler.

B. Pipe Placement:

1. Grade control equipment shall be of the type to accurately maintain design grades and slopes during installation of pipe.
2. Unless otherwise specifically stated, install pipe in accordance with manufacturer's recommendations.
3. Maximum lengths of fused pipe to be handled as one section shall not exceed 400 feet and shall be placed according to the manufacturer's recommendations as to pipe size, pipe SDR, and topography so as not to cause excessive gouging or surface abrasion.
4. Cap pipe sections longer than single joint (usually 40 feet) on both ends during placement except during fusing operations.
5. Remove dirt or debris from inside of pipe before backfilling.
6. Notify Engineer prior to installing pipe into trench and allow time for observation. Contractor shall correct irregularities identified during observation.
7. Complete connections within trench whenever possible to prevent overstressed connections.
8. Allow pipe sufficient time to adjust to trench temperature prior to testing, fusion welding, making segment connections, or backfilling activity.
9. To reduce branch saddle stress, install saddles at slope equal to and continuous with connecting pipe.
10. Install reducers adjacent to laterals and tees unless directed otherwise.

3.03 PIPE TESTING

A. Contractor shall perform a pneumatic test of the non-perforated pipe and fittings after placement in the trench, in accordance with manufacturer's recommendations, and prepare a test report.

B. Pipes shall be pressure tested in presence of Engineer.

C. Pneumatic testing shall be performed as follows:

1. The test period at the test pressure shall last no more than 10 minutes.
2. Provide all necessary connections, bulkheads, flanges, valves, bracing, and blocking, as well as all required test equipment.
3. Test pressure gauge shall have a maximum range of no more than 30 psig, with minor gradations no greater than 0.2 psig.
4. Pipe to be tested shall be exposed in the trench, except bends, reduced pressure rated fittings and components, which shall be buried or restrained. Flange connections shall be visible to check for leaks.
5. Test pressure shall be 10 psig.
6. Acceptance
    a. Test shall be accepted if the pressure drop over 10 minutes is less than 5 percent of the pressure at the beginning of the test period.

D. Test Report

1. Engineer shall prepare and submit test report using the attached forms for each pipe system tested to Owner. Include following information in test report.
    a. Date of test.
    b. Description and identification of pipe system tested.
    c. Type of test performed.

d. Test fluid.
e. Test pressure.
f. Results of test.
g. Type and location of leaks detected.
h. Corrective action taken to repair leaks.
i. Results of retesting.
j. Name of person performing test.

END OF SECTION 15210

ATTACHMENT 1 TO SECTION 15210
PIPE AIR PRESSURE TEST LOG

SME SEVEE & MAHER ENGINEERS		Project No.:	
		Project Name:	
		Project Location:	
		Weather:	
Contractor:		Test No.:	
SME Personnel:		Person/Company Performing the Test:	
Date of Test:		Time of Test:	Finish:
Pipe Length: ft.	Pipe Diameter: in.	Pipe Material:	Pipe SDR/Sch.:
Rated Working Pressure:		Test Pressure: psi	
Location/designation of pipe tested:			

t Time (min.)	T Pipe Temperature (ºC)	P_t Pressure Gauge Reading (psig)	P_c Pressure Drop (%)
0			
5			
10			
15			
30			
60			

Pass	Fail	Retest?	Yes	No

Description of leaks and repairs of retested pipe segments:

P_c = Percent Pressure Drop $\frac{P_o - P_t}{P_o} \times 100$

P_o = Initial Pressure Gauge Reading
P_t = Pressure Gauge Reading at Time *t*

Comments:

Signature: