ARM Group LLC
Engineers and Scientists

July 15, 2026

Roger Bellas
Program Manager
Waste Management Program
Northeast Regional Office
2 Public Square
Wilkes-Barre, PA 18701-1915

Re: Environmental Assessment Letter
Major Permit Modification Application
Southwest Expansion
Commonwealth Environmental Systems Landfill
DEP Application No. 101615-A242
APS No. 1136269 AUTH ID No. 1525113
Foster, Frailey, and Reily Townships
Schuylkill County

Dear Mr. Bellas:

As requested by Commonwealth Environmental Systems, LP (CES), ARM Group (ARM) reviewed the Pennsylvania Department of Environmental Protection (PADEP) Environmental Assessment (EA) Letter, dated April 6, 2026, as related to the CES Southwest Expansion Major Permit Modification (MPM) Application . It is the understanding of ARM and CES that the PADEP requested additional information related to recent leachate hauling activities at the existing landfill be incorporated into the Form 25 for the Southwest Expansion MPM application.

In recent years, leachate hauling occurred at CES to manage leachate volumes within the existing 1.0-million-gallon effluent storage tank at the landfill. To eliminate the need for routine off-site truck hauling of leachate, CES has moved forward with their previously accepted agreement with the Schuylkill County Municipal Authority (SCMA) to directly convey up to an average of 65,000 gallons per day (gpd) (over a 365-day period) of leachate from the existing landfill to the Gordon Wastewater Treatment Plant (WWTP). The successful completion of a pilot program conducted between March and April 2026 ensured that the Gordon WWTP can handle the direct flow of 65,000 gpd of leachate effluent from CES. Since implementing the direct conveyance system, CES has not conducted off-site leachate hauling. As of the date of this response, leachate volumes within the existing effluent storage tank has lowered below the required storage limitations established under 25 Pa. Code § 273.275(b).

CES agrees that routine off-site trucking of leachate should not be considered a long-term operational practice and has no plans to rely on leachate hauling during the remaining life of the existing landfill or the proposed Southwest Expansion. CES will continue to monitor leachate generation and storage capacity to ensure compliance with applicable regulatory requirements. Off-site hauling will be reserved solely for emergency, or unforeseen circumstances, if necessary, to maintain leachate storage below the regulatory limits established by PADEP. The previously submitted Southwest Expansion MPM Application Form 25 was revised to include both the agreement between CES and SCMA related to CES's direct conveyance operation to the Gordon WWTP, and the CES Landfill RO Effluent Discharge Operations Plan which highlights the pilot program completed earlier this year. It is included as an attachment to this letter.

The existing onsite leachate storage and treatment infrastructure (3.0 million-gallons of leachate influent storage, 1.0 million-gallons of leachate effluent storage), combined with the 90,000 gpd of onsite influent leachate treatment and the ability to directly convey an average of 65,000 gpd of leachate effluent to the Gordon WWTP, is sufficient to meet the regulatory requirements included in 25 Pa. Code § 273.275 during the future operation of the CES Southwest Expansion.

Furthermore, an updated CES Process Flow Schematic of the landfill has been included in the revised Form 25. It is representative of the up to date site specific leachate management operations that have been implemented in recent years at the facility, and will continue to be representative of the expected leachate management practices during future operations of the CES Southwest Expansion.

We trust that the included revisions satisfy the requirements and expectations of the department. If you have any further questions or concerns, please do not hesitate to contact the signee at (516) 857-5172 or at tdacosta@armgroup.net.

Respectfully submitted,
ARM Group LLC

Thomas M. DaCosta, P.E.
Project Manager

Attachments:

- Revised Southwest Expansion Form 25

cc: Dominick DeNaples Jr. (dominickd@kslco.com)
Mike Piepoli (mikep@ceslfco.com)
LaBella Associates (crobinson@labellapc.com)
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Schuylkill County (bhetherington@co.schuylkill.pa.us)
Schuylkill County Planning Commission (dssmith@co.schuylkill.pa.us)

FORM 25

Leachate Management – Phase II

2540-PM-BWM0152 6/2005

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised August 2024 (*rev. July 2026*)
DEP USE ONLY
Date Received

FORM 25
LEACHATE MANAGEMENT - PHASE II

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 25, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets should match the "date prepared/revised" on this page.

General References: 273.162, 273.163, 273.271 to 273.275/277.162, 277.163, 277.271 to 277.275, 285.122, 285.123

SECTION A. SITE IDENTIFIER

Applicant/permittee: Commonwealth Environmental Systems, LP

Site Name: Commonwealth Landfill

Facility ID (as issued by DEP): 101615

SECTION B. BASIC TREATMENT METHODS

☒ 1. Discharge to permitted POTW, following pretreatment, if required, by federal, state or local law or by discharge into another permitted treatment facility.

☒ 2. On-site treatment and discharge to stream.

☐ 3. Spray irrigation following treatment.

☒ 4. Other: Effluent Reuse

For Proposed Site: Will permanent leachate pre-treatment method be in-place before placement of waste? ____________

SECTION C. COMPONENTS OF LEACHATE TREATMENT PLAN

Check and/or Describe

1. Estimate of annual leachate quantity and quality and supporting calculations. — See Attachment 25-1
   - ☒ 2. Plans, designs, and cross sections for the proposed collection and handling system. — See Drawing Set
   - ☒ 3. Plans, designs, and cross-sections for on-site leachate treatment or disposal systems. — See Attachment 25-1
   - ☒ 4. Description of on-site treatment system already in operation, including NPDES number, capability to treat leachate, and compliance status under The Clean Streams Law. — See Attachment 25-1
2. If interim vehicular transportation to an off-site treatment facility is proposed, provide:
   - ☐ a. Copy of signed contractual agreement with operator of off -site facility, or — N/A
   - ☐ b. Signed letter of intent from operator of the off-site facility to enter a contractual agreement for leachate treatment. — N/A
   - ☐ c. Copy of signed contractual agreement with the operator of a 2nd off-site facility as backup, or — N/A
   - ☐ d. Signed letter of intent from operator of the 2nd off-site facility to enter a contractual agreement f or leachate treatment. — N/A
   - ☐ e. Additional bond in amount sufficient to pay for the cost of vehicular transportation and off-site leachate treatment until final closure; if off-site treatment is negligent. — N/A
   - ☐ f. Submit plans, designs, and cross-sections for an on site pretreatment facility. — N/A
3. If recirculation of raw or pretreated leachate is proposed in conjunction with another method, describe:
   - ☐ a. Designs and cross-sections of leachate distribution method. — See Attachment 25-1
   - ☐ b. Methods to prevent leachate seeps and breakouts. — See Attachment 25-1
   - ☐ c. Methods to prevent odors, runoff, and ponding. — See Attachment 25-1
   - ☐ 7. Schedule and method for cleaning sludges from the leachate storage and treatment system, and a plan for disposing of such sludges. — See Attachment 25-1
   - ☐ 8. Method for measuring average flow rate of leachate from landfill to leachate storage/treatment system. — See Attachment 25-1
   - ☐ 9. Identify if leachate pumping occurs. — See Attachment 25-1
   - ☐ 10. Plans and designs for secondary containment of underground pipes used for the transport of leachate from the liner system. — See Attachment 25-1

SECTION D. ADDITIONAL INFORMATION

Location in Application

1. Interim Leachate Transportation N/A

Check appropriate items:

- ☒ 1. A permitted and fully operating system for fully pre-treating leachate will be installed before disposal of waste.
- ☒ 2. Direct discharge into a POTW or other permitted treatment facility is attainable within 3 years.
- ☒ 3. Discharge of treated leachate into a receiving stream in a manner consistent with The Clean Stream Law is attainable within 3 years.
- ☐ 4. A leachate recirculation system will be constructed and operated.

2. Leachate Recirculation: (Prohibited, except for landfills with composite liners) See Attachment 25-1

   Describe design of system. Show that there is sufficient municipal waste capacity to absorb leachate and that the area subject to leachate recirculation is underlain by a composite liner. Describe system used to recirculate leachate:

3. Leachate Collection and Storage (for storage impoundments, submit Form 24):
   Design leachate volume (gal./year) See Attachment 25-1

Tanks or Impoundments:

	#1	#2	#3
1. Volume (gallons)	1,500,000	1,500,000	1,000,000
2. Dimensions (feet)	89' Dia. x 32' H	89' Dia. x 32' H	69.15' Dia. x 32' H
3. Freeboard (feet)	2'	2'	2'
4. Function (equalization, storage, etc.)	EQ Storage	EQ Storage	Storage
5. Aeration Capacity	2,000 scfm	2,000 scfm	N/A
6. Detention Time	50 days (Avg.)	50 days (Avg.)	N/A
7. Secondary containment or liner	2,1000,000 gal tank	2,100,000 gal tank	1,500,000 gal tank

FORM 25 – LEACHATE MANAGEMENT PHASE II

TABLE OF CONTENTS

ATTACHMENT 25-1

Narrative Response (*revised July 2026*)

FORM 25 - LEACHATE MANAGEMENT - PHASE II
NARRATIVE

General Information

Commonwealth Environmental Systems, LP (CES) is a privately owned municipal solid waste landfill located in Foster, Frailey, and Reilly Township, Schuylkill County, Pennsylvania. CES is permitted by the Pennsylvania Department of Environmental Protection (PADEP) under Waste Management Permit No. 101615 to receive municipal, commercial, residual, construction/demolition, and special handling wastes. The majority of the waste accepted at the landfill is classified as municipal waste. No hazardous wastes are disposed at CES.

The narrative presented below is intended to show any modifications to the Form 25 that was submitted as part of the original Southwest Expansion Major Permit Modification Application (PMA) submission for Commonwealth Environmental Systems Landfill (CES).

The section designations and numbers used below correspond to section designations and numbers in Form 25 (Leachate Management - Phase II). Unless otherwise noted, Permit Drawing references are to plan maps shown in the set titled "Major Permit Modification Southwest Landfill Expansion" prepared by Labella Associates (Labella), dated August 2024, and included with this Major PMA.

Section B. Basic Treatment Methods

1. **Discharge to permitted POTW, following pretreatment, if required, by federal, state, or local law or by discharge into another permitted treatment facility.**

   The CES Leachate Treatment Plant (LTP) operates under NPDES Permit PA0065307 and has the permitted ability via the NPDES Permit to discharge the effluent to an unnamed tributary of Middle Creek. Treated effluent is also permitted to be used for dust control at the site.

2. **On-site treatment and discharge to stream.**

   The current LTP treatment system has been in operation since 2012 and is designed to treat approximately 90,000 gallons per day (gpd). Currently, intermittent operation of the plant during the week is adequate to handle the present leachate generated by the site. Leachate generated by the landfill is conveyed to two 1.5-million-gallon aerated storage tanks located by the existing leachate treatment plant building. Treatment includes physical/chemical processes followed by membrane filtration using reverse osmosis (RO). Currently, treated effluent is stored in a 1.0-million-gallon storage tank prior to discharge.

   Due to the increase in landfill footprint to the north as proposed as part of this Southwest Expansion, the LTP will need to be relocated at the timing in accordance with the pad development plans. The relocation area is identified on the drawings and is northeast of the existing landfill footprint. The relocated LTP will be commissioned before construction of Pad 6 is completed. The relocated LTP is anticipated to be the same as the exiting LTP, just in a new location and will be capable of handling the same throughput as currently permitted.

3. Spray irrigation following treatment.

N/A

4. Other

Treated effluent can be reused at the facility. See response to C.3 for more information.

An additional option for discharging treated effluent is to discharge to the local wastewater treatment plant. CES has moved forward with the previously accepted agreement with the Schuylkill County Municipal Authority (SCMA) to discharge treated leachate (RO treatment system effluent) to the SCMA Gordon Wastewater Treatment Plant (WWTP). CES uses a dedicated sewer line to convey the treated leachate to the municipal collection system where it is conveyed to the Gordon WWTP for further treatment prior to discharge. A successful pilot program in March and April of 2026 was completed, where a maximum of 65,000 gpd of effluent was conveyed and treated from CES to the Gordon WWTP without any negative operational impacts to the plant. The current agreement with SCMA allows a discharge of up to 65,000 gpd from CES to Gordon WWTP. Please see the Agreement between CES and SCMA to allow the discharge of RO effluent to the Gordon WWTP, as well as the CES Landfill RO Effluent Discharge Operations Plan which highlights the scheduling of the pilot program completed earlier this year in Attachment 25-7.

In recent years, the facility has maintained liquid levels in the existing 1.0 million-gallon effluent storage tank through the use of truck hauling practices. As of March 2026, when the direct sewer connection to the Gordon WWTP became operational, the facility is no longer hauling leachate offsite. The direct sewer connection to the Gordon WWTP allows CES to maintain leachate storage volumes below the 25% regulatory limit. Off-site hauling will be reserved solely for emergency or unforeseen circumstances, if necessary, to maintain leachate storage volume below the regulatory limits established by PADEP.

CES will not regularly haul leachate offsite during operation of the proposed expansion but will utilize it as an option during emergency situations. The existing leachate influent storage available onsite (3.0 million-gallons) and existing leachate effluent storage (1.0 million-gallons) will be sufficient to handle the worst-case leachate generation event during future operation of the proposed Southwest Expansion, and maintain regulatory 30-day storage limits on the influent and effluent tanks. Furthermore, the combined capacity the onsite LTP treatment capacity (90,000 gpd) and direct sewer connection to the Gordon WWTP (65,000 gpd), will allow the facility to maintain regulatory maximum storage limits on the influent and effluent tanks. For more information, see response to C.2 and C.3.

Section C. Components of Leachate Treatment Plan

1. **Estimate of annual leachate quantity and quality and supporting calculations.**

   A Hydrologic Evaluation of Landfill Performance (HELP) Model analysis was conducted to estimate leachate flows as part of this Southwest Expansion PMA.
   The HELP model estimates runoff, drainage, and leachate based on climatic, soil, and design inputs for the facility. Leachate flow estimates were developed for five stages of development: (1) new cell with one (1) 5’ lift and daily cover, (2) a portion of a cell with an average of 25’ of waste and intermediate cover, (3) a portion of a cell with an average of 75’ of waste and intermediate cover, (4) a cell with maximum waste and intermediate cover, and (5) a cell at final elevation and final cap. The worst-case leachate generation scenario for each of the five proposed sumps was estimated based on total acreage of open and partially filled lined cell following pad construction. It was conservatively assumed that no cap or rain cover would be deployed during these worst-case leachate generation scenarios.

HELP Model Estimates for Each Proposed Sump		
Sump SW-1(1)	Newly opened cell with 5’ lift and daily cover	1,698 gal/acre/day
	Cell with 25’ of waste and intermediate cover	-
	Cell with 175’ of waste and intermediate cover	-
	Cell with max waste and intermediate cover	-
	Cell with final cap	-
Sump SW-2(2)	Newly opened cell with 5’ lift and daily cover	1,698 gal/acre/day
	Cell with 25’ of waste and intermediate cover	-
	Cell with 75’ of waste and intermediate cover	-
	Cell with max waste and intermediate cover	-
	Cell with final cap	-
Sump SW-3(3)	Newly opened cell with 5’ lift and daily cover	1,698 gal/acre/day
	Cell with 25’ of waste and intermediate cover	786 – 808 gal/acre/day
	Cell with 75’ of waste and intermediate cover	691 – 700 gal/acre/day
	Cell with max waste and intermediate cover	581 – 624 gal/acre/day
	Cell with final cap	-
Sump SW-4(4)	Newly opened cell with 5’ lift and daily cover	1,698 gal/acre/day
	Cell with 25’ of waste and intermediate cover	766 – 809 gal/acre/day
	Cell with 75’ of waste and intermediate cover	657 – 700 gal/acre/day
	Cell with max waste and intermediate cover	537 – 580 gal/acre/day
	Cell with final cap	-

HELP Model Estimates (cont.)		
Sump SW-5(5)	Newly opened cell with 5’ lift and daily cover	1,698 gal/acre/day
	Cell with 50’ of waste and intermediate cover	-
	Cell with 100’ of waste and intermediate cover	-
	Cell with max waste and intermediate cover	-
	Cell with final cap	-

Footnotes:

(1) The open cell scenario for Pad 2A is the controlling leachate generation scenario for sump SW-1.
(2) The open cell scenario for Pad 3A is the controlling leachate generation scenario for sump SW-2.
(3) The open cell scenario for Pad 4B and partially filled scenario for Pad 4A is the controlling leachate generation scenario for sump SW-3.
(4) The open cell scenario for Pad 5B and the partially filled scenario for Pad 5A is the controlling leachate generation scenario for sump SW-4.
(5) The open cell scenario for Pad 6 is the controlling leachate generation scenario for sump SW-5.

The proposed lined footprint of the Southwest Expansion is approximately 114.66 acres, comprising 10 (ten) pads. The largest amount of open lined cell that will drain to one of the proposed Southwest Expansion sumps will occur at the completion of Pad 2A. The pads vary in size, from 5.38 acres to 16.17 acres. Pad layout and sequencing plans are included with the Permit Drawing set. The worst-case daily leachate flow for a single sump is estimated to be 27,347 gallons and is expected to occur when Pad 5B starts accepting waste. The leachate generated will be transported to five (5) sumps via perforated piping, and subsequently pumped to the existing LTP for treatment. The leachate generation rates during various stages of development for the Southwest Expansion are attached as Attachment 25-5.

2. Plans, designs, and cross sections for the proposed collection and handling system;

Leachate generated from the proposed expansion area will be conveyed to the collection sumps by primary leachate collection and secondary leachate detection pipes. The leachate will be pumped from the sumps via 24” HDPE SDR 11 primary and 18” HDPE SDR 11 secondary sideslope riser pipes. 3” HDPE SDR 11 pipes will carry leachate to the pumphouse within the 24” primary riser pipes, while 2” HDPE SDR 11 pipes will carry leachate to the pumphouse within the 18” secondary riser pipes. Dual-contained leachate forcemains will be used to transfer the leachate from the pumphouses to the existing leachate wet well located on the southeast perimeter of the original landfill, before it is finally pumped to the LTP. A 6” x 10” dual contained HDPE SDR 11 forcemain will carry leachate from SW-1 through SW-4 to the existing leachate wet well, while a 4” x 8” dual contained HDPE SDR 11 forcemain will carry leachate from SW-5 and the northern expansion primary/secondary wet wells to the LTP facility.

To construct the northern footprint of the Southwest Expansion, the existing sideslope riser and pump station that accommodates leachate pumping for the existing northern expansion footprint will be decommissioned and removed. To continue collecting leachate from this footprint, a 4” SCH 80 PVC pipe will be installed beneath the Southwest Expansion northern footprint liner system. The pipe will connect directly to the existing northern expansion footprint sump, where leachate will enter the pipe and be gravity fed to the outside of the proposed Southwest Expansion northern footprint. A primary and secondary wet well will be installed to collect the leachate on the outside of the proposed Southwest Expansion northern footprint, and from there the leachate will be pumped through a forcemain network to the existing wet well on the eastern side of the site before entering the existing LTP. Design calculations for the proposed sumps and pumps can be found in Attachment 25-4.

The details for the proposed collection and handling system are submitted as part of the Permit Drawing set.

3. **Plans, designs, and cross-sections for on-site leachate treatment or disposal systems.**

The detailed plant design has not changed from previously submitted applications to the PADEP. The existing LTP uses reverse osmosis equipment supplied by Rochem Membrane Systems, Inc. (now Ultura Water) to treat the leachate. No design changes to the existing LTP are being proposed as part of this application, the current design was permitted as part of the October 2014 Southern Expansion Reconfiguration Minor Permit Modification. A process schematic of the LTP is provided as Figure 2 in Attachment 25-6.

Leachate from the Southwest Expansion footprint will be conveyed to the existing LTP for treatment. The maximum leachate flow from the proposed expansion is expected to be generated when Pad 2A is active (newly opened cell). The total leachate generated during the worst-case leachate generation scenario is estimated to be 54,412 gallons per day. The current treatment plant is designed to treat 90,000 gpd. Therefore, adequate capacity exists at the existing LTP to handle the anticipated leachate generation. Waste depths, capped areas, and open lined areas were determined from the Pad Sequencing Plans and Capping Plans in this major PMA Drawing Set.

4. **Description of on-site treatment system already in operation, including NPDES number, capability to treat leachate, and compliance status under the Clean Streams Law.**

A major permit modification to replace the treatment facilities with a reverse osmosis system was submitted in 2010. Upon approval, the treatment system was modified in 2012 to allow CES the ability to discharge to a surface water stream. The plant was put into operation in December 2012.

The LTP operates under NPDES Permit PA 0065307 and has the permitted ability via the NPDES Permit to discharge the effluent to an unnamed tributary of Middle Creek. Treated effluent is also permitted to be used for dust control at the site. The plant is designed to treat approximately 90,000 gpd.

Treated effluent is currently approved for discharge to Middle Creek under a NPDES Permit (if certain discharge quality limits are achieved onsite), direct discharge to the SCMA Gordon WWTP, and re-use at the landfill for dust control. As part of the latest renewal effort for the NPDES Permit, CES has requested approval to dispose of the treated effluent on the uncapped landfill areas, to use the effluent for vegetation irrigation of the capped landfill areas, and as IWTP Process water. These inquiries related to the NPDES permit were submitted on February 26, 2026. There are no flow limits on discharge to the Middle Creek or for effluent re-use. The current agreement with SCMA Gordon WWTP allows a discharge of up to 65,000 gpd.

The LTP process flow generally includes the following:

- Two aerated 1.5 MG influent storage tanks
- A pretreatment skid consisting of a 900-gallon rapid mix tank, 900-gallon mix tank, and a 900-gallon flocculation tank. Ferric chloride for coagulation and sodium hydroxide for pH adjustment is added in the rapid mix tank.
- Primary clarification consisting of an 80 gallon per minute inclined plate separator.
- Three sand filters for suspended solids removal.
- pH adjustment in a 5,300 gallon tank.
- Two stage reverse osmosis treatment system, with two treatment tracks.
- A de-gasifier tower to removed carbon dioxide and increase pH.
- pH adjustment if required.
- Ion exchange for cooper removal.
- Zeolite polishing to reduce BOD-5 and NH3-N.
- Storage in a 1.0 MG effluent tank before discharge to an unnamed tributary of Middle Creek.

The plant has adequate capacity to handle the anticipated leachate generation with the addition of the proposed Southwest Expansion. No design changes are being proposed to the existing LTP as part of this major PMA.

5. **If interim vehicular transportation to an off-site facility is proposed, provide details.**

Not applicable.

6. **If recirculation of raw pretreated leachate is proposed in conjunction with another method, describe.**

No changes are proposed to the currently approved leachate handling procedures as part of this major permit modification application. The site does not recirculate raw leachate. RO concentrate from the reverse osmosis membranes can be disposed of in the landfill working face as permitted. The concentrate is stored in tanks at the LTP and applied by tank onto the landfilled waste prior to placement of cover. If necessary, CES can haul RO concentrate to an approved offsite facility for disposal.

7. **Schedule and method for cleaning sludges from the leachate storage and treatment system, and a plan for disposing of such sludges.**

The current approved sludge handling procedures will continue to be followed as part of this major MPA.

8. **Method for measuring average flow rate of leachate from landfill to leachate storage/treatment system.**

Liquid levels in the storage tanks are measured daily to determine the volume stored and available capacity. Leachate flow in and out of the LTP will continue to be measured and recorded.

9. **Identify if leachate pumping occurs.**

   Leachate generated from the proposed Southwest Expansion area will be pumped from collection sumps SW-1 through SW-4 via sideslope risers into the existing leachate wet well. The leachate will be conveyed from the wet well to the storage tanks at the LTP via a dual-contained piping system. The leachate will be transferred from the storage tanks via existing piping to the LTP for treatment before being discharged through a forcemain to the approved discharge point. Leachate collected from sump SW-5 will be pumped via sideslope risers into the proposed primary leachate wet well outside of the Southwest Expansion northern footprint. Leachate from the proposed secondary leachate wet well will also be pumped to this primary leachate wet well. Leachate from the primary leachate wet well will be pumped through a dual-contained piping system to the relocated LTP.

10. **Plans and designs for secondary containment of underground pipes used for the transport of leachate from the liner system.**

    See calculations from Form 24 and details in the Permit Drawing set for more information on the leachate collection and detection pipe network.

Section D. Additional Information

1. **Interim Transportation**

   Not applicable; existing treatment operations will continue to operate as usual.

2. **Leachate Recirculation**

   No changes are proposed to the current approved leachate handling procedures as part of this major permit modification. The site does not recirculate raw leachate. RO concentrate from the reverse osmosis membranes can be disposed of in the landfill as permitted. The concentrate is stored in tanks onsite and applied by tanker onto the landfilled waste prior to placement of cover. CES also possesses the capability to haul RO concentrate to an approved offsite facility for disposal.

3. **Leachate Collection and Storage**

   The site is proposing to utilize existing effluent and influent storage tanks for storage of leachate generated by the proposed Southwest Expansion areas. The site will continue to use Tank #1 and #2 with 1.5 million gallons each for influent storage, along with a 1-million-gallon capacity Tank #3 that has been used for post-treatment effluent storage as approved by the department in a previous application. As development of the expansion continues, the LTP and existing leachate storage tanks will eventually be relocated to the proposed support facility footprint.

The monthly generation, calculated as the worst-case of the maximum leachate generated during the operation of the proposed expansion is 1,632,360 gallons (54,412 gpd). The maximum expected production of leachate from any 30-day period for the life of this expansion will be able to be stored in the existing tank storage (3 million gallons) available on-site. When the existing LTP is relocated during expansion operations, the existing tanks will also be relocated and reinstalled at their existing size and capacity.

4. Groundwater Flow from Groundwater Abatement Area

Groundwater will be pumped from wells in the groundwater abatement area to frac storage tanks. The maximum expected pumping rate is 20,000 gpd. Preliminary testing shows actual yields of approximately 1,000 gpd from the recovery wells. Groundwater collected in the frac tank will be hauled to the leachate storage tanks for treatment in the leachate treatment plant. If there is not enough capacity in the leachate storage tanks, then the groundwater will be hauled to an offsite disposal facility or conveyed to SCMA for treatment and disposal.

ATTACHMENT 25-2

Leachate Quality Data

Q1 2024 Leachate Quality Data

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 02/07/2024
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Northern Expansion

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 33 .671" Longitude: 76° 22' 38 .398"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 1/08/2024; 01/09/2024 Sample Collection Time: 05:58; 06:42

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2401-00240; 2401-00248 Final Lab Analysis Completion Date: 11/19/2024

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.259 mg/L, Oil and Grease: <21.7 mg/L, Chromium, Hexavalent: 1.78 mg/L, Phosphorous: 4.85 mg/L, TKN: 765 mg/L, Total Suspended Solids: 80.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______ Northern Expansion
Sample Date 1/9/2024
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	63,628.26	53.26
Area Drained (acres)	171	25
Ratio (gallons/acre/day)	372.10	2.13

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	3000	485	SM 2320 B
2.*	Ammonia-Nitrogen	p	635.00	56.20	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	3000	485	SM 2320
4.*	Calcium, Total	p	68.00	29.10	EPA 200.7
5.*	Chemical Oxygen Demand	p	2,100.00	189.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	159.00	EPA 300.0
7.*	Magnesium, Total	p	121.00	16.10	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.1	7.5	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.29	6.88	SM 4500-H+B
10.*	Potassium, Total	p	532.00	30.50	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13890	1692	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	1580	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,790.00	188.00	EPA 200.7
14.*	Sulfate, Total	p	312.00	<5.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	49.20	25.60	SM 5310 C
16.	Fluoride	p	0.66		EPA 300.0
17.	Iron, Total	p	11.00		EPA 200.7
18.	Manganese, Total	p	1.45		EPA 200.7
19.	Nitrate-Nitrogen	p	300.00		EPA 300.0

FORM 50

Monitoring Point No
Northern Expansion
Sample Date 1/9/2024
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	0.88		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	5880		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	27		SM 2130 B
24.	Antimony, Total (µg/l)	d	17.60		EPA 200.8
25.	Arsenic, Total (µg/l)		152.00		EPA 200.8
26.	Barium, Total (µg/l)		167.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		274.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	46.30		EPA 200.8
31.	Copper, Total (µg/l)		12.70		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	175.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	80.00		EPA 200.8
39.	Zinc, Total (µg/l)		97.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50.0	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50.0		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50.0		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50.0		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50.0		EPA 8260B
48.	Chlorobenzene (µg/l)		<50.0		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50.0		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50.0		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50.0		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50.0	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50.0		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50.0		EPA 8260B

FORM 50

Monitoring Point No. Northern Expansion
Sample Date: 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichlorobenzene (p-Dichlorobenzene)		<50.0		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50.0	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50.0	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50.0	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50.0		EPA 8260B
66.	cis-1,3-Dichloropropene		<50.0		EPA 8260B
67.	trans-1,3-Dichloropropene		<50.0		EPA 8260B
68.	Ethyl Benzene		<50.0	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50.0		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50.0	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50.0		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50.0		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50.0		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50.0	<1.00	EPA 8260B
81.	Toluene		<50.0	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50.0	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50.0		EPA 8260B
84.	Trichloroethene		<50.0	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Northern Exp.
Sample Date 1/9/2024
I.D. No. 101615

ANALYTE (μg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50.0		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

FORM 50

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	CAS Number

540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 02/07/2024
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone East

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 34 .139" Longitude: 76° 22' 35 .234"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 1/08/2024; 1/09/2024 Sample Collection Time: 05:58; 08:57

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2401-00240; 2401-00250 Final Lab Analysis Completion Date: 1/19/2024

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.259 mg/L, Oil and Grease: <21.7 mg/L, Chromium, Hexavalent: 1.78 mg/L, Phosphorous: 4.85 mg/L, TKN: 765 mg/L, Total Suspended Solids: 80.0 mg/L

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. DZ East
Sample Date 1/9/2024
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	63,628.26	67.11
Area Drained (acres)	171	77
Ratio (gallons/acre/day)	372.10	0.87

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	3000	35.4	SM 2320 B
2.*	Ammonia-Nitrogen	p	635.00	<0.20	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	3000	35.4	SM 2320
4.*	Calcium, Total	p	68.00	21.50	EPA 200.7
5.*	Chemical Oxygen Demand	p	2,100.00	36.10	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	16.80	EPA 300.0
7.*	Magnesium, Total	p	121.00	10.10	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.1	6.8	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.29	5.70	SM 4500-H+B
10.*	Potassium, Total	p	532.00	4.23	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13890	315	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	295	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,790.00	13.40	EPA 200.7
14.*	Sulfate, Total	p	312.00	63.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	49.20	10.50	SM 5310 C
16.	Fluoride	p	0.66		EPA 300.0
17.	Iron, Total	p	11.00		EPA 200.7
18.	Manganese, Total	p	1.45		EPA 200.7
19.	Nitrate-Nitrogen	p	300.00		EPA 300.0

FORM 50

Monitoring Point No ______
DZ East
Sample Date 1/9/2024
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	0.88		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	5880		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	27		SM 2130 B
24.	Antimony, Total (µg/l)	d	17.60		EPA 200.8
25.	Arsenic, Total (µg/l)		152.00		EPA 200.8
26.	Barium, Total (µg/l)		167.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		274.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	46.30		EPA 200.8
31.	Copper, Total (µg/l)		12.70		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	175.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	80.00		EPA 200.8
39.	Zinc, Total (µg/l)		97.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50.0	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50.0		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50.0		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50.0		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50.0		EPA 8260B
48.	Chlorobenzene (µg/l)		<50.0		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50.0		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50.0		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50.0		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50.0	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50.0		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50.0		EPA 8260B

FORM 50

Monitoring Point No. ________
DZ East
Sample Date: 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50.0		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50.0	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50.0	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50.0	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50.0		EPA 8260B
66.	cis-1,3-Dichloropropene		<50.0		EPA 8260B
67.	trans-1,3-Dichloropropene		<50.0		EPA 8260B
68.	Ethyl Benzene		<50.0	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50.0		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50.0	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50.0		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50.0		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50.0		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50.0	<1.00	EPA 8260B
81.	Toluene		<50.0	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50.0	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50.0		EPA 8260B
84.	Trichloroethene		<50.0	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. DZ East
Sample Date 1/9/2024
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50.0		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 12/06/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Cell 5 Leachate Detection Zone

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 14. 461" Longitude: 76° 22' 50.165"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 1/08/2024; 1/09/2024 Sample Collection Time: 05:58; 08:49

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2401-00240; 2401-00246 Final Lab Analysis Completion Date: 01/19/2024

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Cell No. 5
Sample Date 1/9/2024
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	63,628.26	16.69
Area Drained (acres)	171	28
Ratio (gallons/acre/day)	372.10	0.60

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	3000	<20.0	SM 2320 B
2.*	Ammonia-Nitrogen	p	635.00	<2.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	3000	<20.0	SM 2320
4.*	Calcium, Total	p	68.00	13.20	EPA 200.7
5.*	Chemical Oxygen Demand	p	2,100.00	<20.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	<10.00	EPA 300.0
7.*	Magnesium, Total	p	121.00	7.83	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.1	5.9	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.29	4.87	SM 4500-H+B
10.*	Potassium, Total	p	532.00	1.63	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13890	202	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	187	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,790.00	2.54	EPA 200.7
14.*	Sulfate, Total	p	312.00	69.30	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	49.20	7.27	SM 5310 C
16.	Fluoride	p	0.66		EPA 300.0
17.	Iron, Total	p	11.00		EPA 200.7
18.	Manganese, Total	p	1.45		EPA 200.7
19.	Nitrate-Nitrogen	p	300.00		EPA 300.0

Monitoring Point No ______ Cell No. 5
Sample Date 1/9/2024
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	0.88		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	5880		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	27		SM 2130 B
24.	Antimony, Total (µg/l)	d	17.60		EPA 200.8
25.	Arsenic, Total (µg/l)		152.00		EPA 200.8
26.	Barium, Total (µg/l)		167.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		274.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	46.30		EPA 200.8
31.	Copper, Total (µg/l)		12.70		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	175.00		EPA 200.8
'5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	80.00		EPA 200.8
39.	Zinc, Total (µg/l)		97.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50.0	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50.0		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50.0		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50.0		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50.0		EPA 8260B
48.	Chlorobenzene (µg/l)		<50.0		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50.0		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50.0		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50.0		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50.0	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50.0		EPA 8260B
ʼ6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50.0		EPA 8260B

FORM 50

Monitoring Point No.
Cell No. 5
Sample Date: 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50.0		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50.0	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50.0	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50.0	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50.0	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50.0		EPA 8260B
66.	cis-1,3-Dichloropropene		<50.0		EPA 8260B
67.	trans-1,3-Dichloropropene		<50.0		EPA 8260B
68.	Ethyl Benzene		<50.0	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50.0		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50.0	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50.0		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50.0		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50.0		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50.0	<1.00	EPA 8260B
81.	Toluene		<50.0	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50.0	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50.0		EPA 8260B
84.	Trichloroethene		<50.0	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Cell No. 5
Sample Date 1/9/2024
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50.0		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

Monitoring Point No. ________
Sample Date ______________
I.D. No. __________________

FORM 50

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

:540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 02/07/2024
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification: Raw Leachate, Lower Detection Zone, Pumphouse SE-1

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 19 . 59 " Longitude: 76° 21' 59 . 29 "

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 1/08/2024; 1/09/2024 Sample Collection Time: 05:58; 08:01

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2401-00240; 2401-00244-001 Final Lab Analysis Completion Date: 1/19/2024

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.259 mg/L, Oil and Grease: <21.7 mg/L, Chromium, Hexavalent: 1.78 mg/L, Phosphorous: 4.85 mg/L, TKN: 765 mg/L, Total Suspended Solids: 80.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. LDZ Pumphouse SE-1
Sample Date 1/9/2024
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	63,628.26	8.39
Area Drained (acres)	171	22
Ratio (gallons/acre/day)	372.10	0.38

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	3000	2010	SM 2320 B
2.*	Ammonia-Nitrogen	p	635.00	378.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	3000	2010	SM 2320
4.*	Calcium, Total	p	68.00	19.70	EPA 200.7
5.*	Chemical Oxygen Demand	p	2,100.00	158.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	745.00	EPA 300.0
7.*	Magnesium, Total	p	121.00	26.40	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.1	7.9	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.29	7.48	SM 4500-H+B
10.*	Potassium, Total	p	532.00	130.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13890	6000	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	5690	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,790.00	505.00	EPA 200.7
14.*	Sulfate, Total	p	312.00	<5.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	49.20	207.00	SM 5310 C
16.	Fluoride	p	0.66		EPA 300.0
17.	Iron, Total	p	11.00		EPA 200.7
18.	Manganese, Total	p	1.45		EPA 200.7
19.	Nitrate-Nitrogen	p	300.00		EPA 300.0

FORM 50

Monitoring Point No ______
LDZ Pumphouse SE-1
Sample Date 1/9/2024
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	0.88		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	5880		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	27		SM 2130 B
24.	Antimony, Total (µg/l)	d	17.60		EPA 200.8
25.	Arsenic, Total (µg/l)		152.00		EPA 200.8
26.	Barium, Total (µg/l)		167.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		274.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	46.30		EPA 200.8
31.	Copper, Total (µg/l)		12.70		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	175.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	80.00		EPA 200.8
39.	Zinc, Total (µg/l)		97.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50.0	<5.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50.0		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50.0		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50.0		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50.0		EPA 8260B
48.	Chlorobenzene (µg/l)		<50.0		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50.0		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50.0		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50.0		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50.0	<5.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50.0		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50.0		EPA 8260B

FORM 50

Monitoring Point No. LDZ Pumphouse SE-1
Sample Date: 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichlorobenzene (p-Dichlorobenzene)		<50.0		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50.0	<5.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50.0	<5.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50.0	<5.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50.0	<5.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50.0	<5.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50.0		EPA 8260B
66.	cis-1,3-Dichloropropene		<50.0		EPA 8260B
67.	trans-1,3-Dichloropropene		<50.0		EPA 8260B
68.	Ethyl Benzene		<50.0	<5.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50.0		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50.0	<5.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50.0		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50.0		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50.0		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50.0	<5.00	EPA 8260B
81.	Toluene		<50.0	<5.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50.0	<5.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50.0		EPA 8260B
84.	Trichloroethene		<50.0	<5.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. LDZ SE-1
Sample Date 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50.0		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<10.00	EPA 8260B
89.	Xylenes		<150	<15.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

Monitoring Point No. ________
Sample Date ______________
I.D. No. ________________

FORM 50

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 02/07/2024
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification: Raw Leachate, Lower Detection Zone, Pumphouse SE-2

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 12 . 60' Longitude: 76° 21' 54 . 78"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 1/08/2024; 1/09/2024 Sample Collection Time: 05:58; 07:51

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2401-00240; 2401-00244-002 Final Lab Analysis Completion Date: 1/19/2024

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.259 mg/L, Oil and Grease: <21.7 mg/L, Chromium, Hexavalent: 1.78 mg/L,
Phosphorous: 4.85 mg/L, TKN: 765 mg/L, Total Suspended Solids: 80.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. LDZ Pumphouse SE-2
Sample Date 1/9/2024
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	63,628.26	69.86
Area Drained (acres)	171	19
Ratio (gallons/acre/day)	372.10	3.68

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	3000	643	SM 2320 B
2.*	Ammonia-Nitrogen	p	635.00	8.57	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	3000	643	SM 2320
4.*	Calcium, Total	p	68.00	8.28	EPA 200.7
5.*	Chemical Oxygen Demand	p	2,100.00	255.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	91.50	EPA 300.0
7.*	Magnesium, Total	p	121.00	7.25	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.1	7.3	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.29	7.22	SM 4500-H+B
10.*	Potassium, Total	p	532.00	<10.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13890	2000	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	1860	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,790.00	438.00	EPA 200.7
14.*	Sulfate, Total	p	312.00	151.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	49.20	64.30	SM 5310 C
16.	Fluoride	p	0.66		EPA 300.0
17.	Iron, Total	p	11.00		EPA 200.7
18.	Manganese, Total	p	1.45		EPA 200.7
19.	Nitrate-Nitrogen	p	300.00		EPA 300.0

FORM 50

Monitoring Point No ______
LDZ Pumphouse SE-2
Sample Date 1/9/2024
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	0.88		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	5880		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	27		SM 2130 B
24.	Antimony, Total (µg/l)	d	17.60		EPA 200.8
25.	Arsenic, Total (µg/l)		152.00		EPA 200.8
26.	Barium, Total (µg/l)		167.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		274.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	46.30		EPA 200.8
31.	Copper, Total (µg/l)		12.70		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	175.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	80.00		EPA 200.8
39.	Zinc, Total (µg/l)		97.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50.0	<2.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50.0		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50.0		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50.0		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50.0		EPA 8260B
48.	Chlorobenzene (µg/l)		<50.0		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50.0		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50.0		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50.0		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50.0	<2.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50.0		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50.0		EPA 8260B

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FORM 50

Monitoring Point No.
LDZ Pumphouse SE-2
Sample Date: 1/9/2024
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50.0		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50.0	<2.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50.0	<2.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50.0	<2.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50.0	<2.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50.0	<2.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50.0		EPA 8260B
66.	cis-1,3-Dichloropropene		<50.0		EPA 8260B
67.	trans-1,3-Dichloropropene		<50.0		EPA 8260B
68.	Ethyl Benzene		<50.0	<2.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50.0		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50.0	<2.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50.0		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50.0		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50.0		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50.0	<2.00	EPA 8260B
81.	Toluene		<50.0	<2.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50.0	<2.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50.0		EPA 8260B
84.	Trichloroethene		<50.0	<2.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. LDZ SE-2
Sample Date 1/9/2024
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50.0		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<4.00	EPA 8260B
89.	Xylenes		<150	<6.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ________
I.D. No. ________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	CAS Number

Q4 2023 Leachate Quality Data

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/ Revised 12/12/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

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General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Northern Expansion

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 33 .671' Longitude: 76° 22' 38 .398"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 10/24/2023; 10/26/2023 Sample Collection Time: 06:50, 05:28

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2310-00179; 2310-00175 Final Lab Analysis Completion Date: 11/06/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Northern Exp
Sample Date 10/24/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	62,316.30	15.40
Area Drained (acres)	171	28
Ratio (gallons/acre/day)	364.42	0.55

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2120	457	SM 2320 B
2.*	Ammonia-Nitrogen	p	561.00	49.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2120	457	SM 2320
4.*	Calcium, Total	p	69.20	28.00	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,290.00	180.00	SM 5220 D
6.*	Chloride (Cl)	p	1,960.00	126.00	EPA 300.0
7.*	Magnesium, Total	p	107.00	18.50	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.5	7.3	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.40	6.69	SM 4500-H+B
10.*	Potassium, Total	p	471.00	25.60	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13400	1436	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	1400	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,360.00	140.00	EPA 200.7
14.*	Sulfate, Total	p	282.00	<250.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	443.00	52.20	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	4.51		EPA 200.7
18.	Manganese, Total	p	1.25		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

FORM 50

Monitoring Point No ______
Northern Exp
Sample Date 10/24/2023
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<3.75		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6100		SM 2540 C
22.	Tritium (pCi/L)#		-129		SM 2540 C
23.	Turbidity (mg/l)	p	75		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		80.30		EPA 200.8
26.	Barium, Total (µg/l)		131.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		231.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	45.00		EPA 200.8
31.	Copper, Total (µg/l)		20.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	155.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		103.00		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<10	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<10	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
,6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

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FORM 50

Monitoring Point No. ________
Northern Exp
Sample Date: 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<10	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<10	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<10	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<10	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<10	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<10	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<10	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<10	EPA 8260B
81.	Toluene		<50	<10	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<10	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<10	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Northern Exp
Sample Date 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<20	EPA 8260B
89.	Xylenes		<150	<30	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ________
I.D. No. ________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	CAS Number

5̶40-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 12/06/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone East

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 34 . 139 " Longitude: 76° 22' 35 . 234 "

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 10/24/2023;10/26/2023 Sample Collection Time: 1328;0528

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2310-00180; 2310-00175 Final Lab Analysis Completion Date: 11/06/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. East Exp
Sample Date 10/24/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	62,316.3	122.28
Area Drained (acres)	171	77
Ratio (gallons/acre/day)	364.42	1.59

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2120	49.3	SM 2320 B
2.*	Ammonia-Nitrogen	p	561.00	1.45	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2120	49.3	SM 2320
4.*	Calcium, Total	p	69.20	19.00	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,290.00	31.80	SM 5220 D
6.*	Chloride (Cl)	p	1,960.00	<10.00	EPA 300.0
7.*	Magnesium, Total	p	107.00	10.30	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.5	5.7	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.40	5.71	SM 4500-H+B
10.*	Potassium, Total	p	471.00	3.50	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13400	298	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	284	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,360.00	11.70	EPA 200.7
14.*	Sulfate, Total	p	282.00	53.80	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	443.00	14.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	4.51		EPA 200.7
18.	Manganese, Total	p	1.25		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

FORM 50

Monitoring Point No East Exp
10/24/2023
Sample Date
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<3.75		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6100		SM 2540 C
22.	Tritium (pCi/L)#		-129		SM 2540 C
23.	Turbidity (mg/l)	p	75		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		80.30		EPA 200.8
26.	Barium, Total (µg/l)		131.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		231.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	45.00		EPA 200.8
31.	Copper, Total (µg/l)		20.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	155.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		103.00		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

Monitoring Point No. East Exp
10/24/2023
Sample Date:
I.D. No. 101615

FORM 50

	ANALYTE (μg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

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FORM 50

Monitoring Point No EastExp
Sample Date 10/24/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)	<100		EPA 8260B
86.	1,2,3-Trichloropropane	<50		EPA 8260B
87.	Vinyl acetate d	<100		EPA 8260B
88.	Vinyl chloride	<100	<2.00	EPA 8260B
89.	Xylenes	<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively

d = Subtitle D. Appendix I analyte exclusively

All other analytes are common to both lists.

† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ________
I.D. No. ________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 12/06/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Cell 5 Leachate Detection Zone

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 14. 461" Longitude: 76° 22' 50.165"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 10/24/2023, 10/26/2023 Sample Collection Time: 09:00;05:28

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2310-00178; 2310-00175 Final Lab Analysis Completion Date: 11/06/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Cell 5
Sample Date 10/24/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	62,316.30	15.40
Area Drained (acres)	171	28
Ratio (gallons/acre/day)	364.42	0.55

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2120	59.6	SM 2320 B
2.*	Ammonia-Nitrogen	p	561.00	4.80	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2120	59.6	SM 2320
4.*	Calcium, Total	p	69.20	4.72	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,290.00	<20.00	SM 5220 D
6.*	Chloride (Cl)	p	1,960.00	<1.00	EPA 300.0
7.*	Magnesium, Total	p	107.00	3.55	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.5	7.0	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.40	6.62	SM 4500-H+B
10.*	Potassium, Total	p	471.00	1.06	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13400	202	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	199	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,360.00	19.80	EPA 200.7
14.*	Sulfate, Total	p	282.00	26.60	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	443.00	<12.50	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	4.51		EPA 200.7
18.	Manganese, Total	p	1.25		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

Monitoring Point No
Cell 5
Sample Date 10/24/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<3.75		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6100		SM 2540 C
22.	Tritium (pCi/L)#		-129		SM 2540 C
23.	Turbidity (mg/l)	p	75		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		80.30		EPA 200.8
26.	Barium, Total (µg/l)		131.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		231.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	45.00		EPA 200.8
31.	Copper, Total (µg/l)		20.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	155.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		103.00		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
,6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

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FORM 50

Monitoring Point No. ________
Cell 5
Sample Date: 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

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FORM 50

Monitoring Point No. Cell 5
Sample Date 10/24/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively

d = Subtitle D. Appendix I analyte exclusively

All other analytes are common to both lists.

† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/ Revised 12/14/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification: Raw Leachate, Lower Detection Zone, Pumphouse SE-1

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 19 . 59 " Longitude: 76° 21' 59 . 29 "

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 10/24/2023; 10/26/2023 Sample Collection Time: 07:15, 05:28

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2310-00177-001; 2310-00175 Final Lab Analysis Completion Date: 11/06/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Pumphosue SE-1
Sample Date 10/24/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	62,316.30	7.57
Area Drained (acres)	171	22
Ratio (gallons/acre/day)	364.42	0.34

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2120	1840	SM 2320 B
2.*	Ammonia-Nitrogen	p	561.00	389.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2120	1840	SM 2320
4.*	Calcium, Total	p	69.20	17.50	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,290.00	629.00	SM 5220 D
6.*	Chloride (Cl)	p	1,960.00	740.00	EPA 300.0
7.*	Magnesium, Total	p	107.00	28.10	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.5	7.6	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.40	7.41	SM 4500-H+B
10.*	Potassium, Total	p	471.00	119.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13400	5600	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	5400	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,360.00	436.00	EPA 200.7
14.*	Sulfate, Total	p	282.00	<5.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	443.00	188.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	4.51		EPA 200.7
18.	Manganese, Total	p	1.25		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

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Monitoring Point No Pumphouse SE-1
Sample Date 10/24/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<3.75		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6100		SM 2540 C
22.	Tritium (pCi/L)#		-129		SM 2540 C
23.	Turbidity (mg/l)	p	75		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		80.30		EPA 200.8
26.	Barium, Total (µg/l)		131.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		231.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	45.00		EPA 200.8
31.	Copper, Total (µg/l)		20.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	155.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		103.00		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<20.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<20.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. Pumphouse SE-1
Sample Date: 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<20.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<20.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<20.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<20.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<20.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<20.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
71.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<20.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<20.00	EPA 8260B
81.	Toluene		<50	<20.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<20.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<20.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No Pumphouse SE-1
Sample Date 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<40.00	EPA 8260B
89.	Xylenes		<150	<60.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ________
I.D. No. ________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 12/14/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee: Commonwealth Environmental Systems, Inc.

Site Name: CES Landfill

Facility ID (as issued by DEP): 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification: Raw Leachate, Lower Detection Zone, Pumphouse SE-2

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 12 . 60' Longitude: 76° 21' 54 . 78"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 10/24/2023; 10/26/2023 Sample Collection Time: 07:25, 05:28

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2310-00177-002; 2310-00175 Final Lab Analysis Completion Date: 11/06/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.364 mg/L, Oil and Grease: 66.7 mg/L, Chromium, Hexavalent: 2.00 mg/L, Phosphorous: 4.11 mg/L, TKN: 570 mg/L, Total Suspended Solids: 120.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Pumphouse SE-2
Sample Date 10/24/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	62,316.30	32.90
Area Drained (acres)	171	19
Ratio (gallons/acre/day)	364.42	1.73

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2120	506	SM 2320 B
2.*	Ammonia-Nitrogen	p	561.00	7.27	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2120	506	SM 2320
4.*	Calcium, Total	p	69.20	5.04	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,290.00	50.10	SM 5220 D
6.*	Chloride (Cl)	p	1,960.00	19.20	EPA 300.0
7.*	Magnesium, Total	p	107.00	4.43	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.5	7.8	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	8.40	7.03	SM 4500-H+B
10.*	Potassium, Total	p	471.00	3.61	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	13400	1417	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	13500	1370	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,360.00	321.00	EPA 200.7
14.*	Sulfate, Total	p	282.00	162.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	443.00	13.70	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	4.51		EPA 200.7
18.	Manganese, Total	p	1.25		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

Monitoring Point No ______
Pumphouse SE-2
Sample Date 10/24/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<3.75		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6100		SM 2540 C
22.	Tritium (pCi/L)#		-129		SM 2540 C
23.	Turbidity (mg/l)	p	75		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		80.30		EPA 200.8
26.	Barium, Total (µg/l)		131.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		231.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	45.00		EPA 200.8
31.	Copper, Total (µg/l)		20.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	155.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		103.00		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
6.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. Pumphouse SE-2
Sample Date: 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Pumphouse SE-2
Sample Date 10/24/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D, Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________	
Sample Date ____________	
I.D. No. ______________	

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

Q3 2023 Leachate Quality Data

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 09/05/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Northern Expansion

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 33 .671' Longitude: 76° 22' 38 .398"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 07/10/2023; 07/12/2023 Sample Collection Time: 0555; 1436

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2307-00192; 2307-00198 Final Lab Analysis Completion Date: 07/31/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.235 mg/L, Oil and Grease: 33.0 mg/L, Chromium, Hexavalent: 4.88 mg/L, Phosphorous: 7.20 mg/L, TKN: 651 mg/L, Total Suspended Solids: 20.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Northern Expansion
Sample Date 7/12/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	71,153.85	24.31
Area Drained (acres)	171	25
Ratio (gallons/acre/day)	416.10	0.97

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2230	363	SM 2320 B
2.*	Ammonia-Nitrogen	p	643.00	61.30	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2230	363	SM 2320
4.*	Calcium, Total	p	54.70	30.90	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,870.00	157.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	121.00	EPA 300.0
7.*	Magnesium, Total	p	108.00	18.80	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.4	NA	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.88	7.13	SM 4500-H+B
10.*	Potassium, Total	p	490.00	24.80	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14400	1490	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14280	1410	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,470.00	126.00	EPA 200.7
14.*	Sulfate, Total	p	229.00	97.30	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	440.00	43.40	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	5.42		EPA 200.7
18.	Manganese, Total	p	1.00		EPA 200.7
19.	Nitrate-Nitrogen	p	8.43		EPA 300.0

FORM 50

Monitoring Point No ______
Northern Expansion
Sample Date 7/12/2023
I.D. No. 101615

ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20. Phenolics, Total (mg/l)	p	<0.38		EPA 420.1
21. Total Dissolved Solids (mg/l)	p	6460		SM 2540 C
22. Tritium (pCi/L)#		N/A		SM 2540 C
23. Turbidity (mg/l)	p	12		SM 2130 B
24. Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25. Arsenic, Total (µg/l)		115.00		EPA 200.8
26. Barium, Total (µg/l)		123.00		EPA 200.8
27. Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28. Cadmium, Total (µg/l)		<10.00		EPA 200.8
29. Chromium, Total (µg/l)		220.00		EPA 200.8
30. Cobalt, Total (µg/l)	d	39.50		EPA 200.8
31. Copper, Total (µg/l)		14.10		EPA 200.8
32. Lead, Total (µg/l)		<10.00		EPA 200.8
33. Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34. Nickel, Total (µg/l)	d	186.00		EPA 200.8
35. Selenium, Total (µg/l)		<50.00		EPA 200.8
36. Silver, Total (µg/l)		<50.00		EPA 200.8
37. Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38. Vanadium, Total (µg/l)	d	96.90		EPA 200.8
39. Zinc, Total (µg/l)		67.50		EPA 200.8
40. Acetone (µg/l)	d	<200		EPA 8260B
41. Acrylonitrile (µg/l)	d	<100		EPA 8260B
42. Benzene (µg/l)		<50	<1.00	EPA 8260B
43. Bromochloromethane (µg/l)	d	<50		EPA 8260B
44. Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45. Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46. Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47. Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48. Chlorobenzene (µg/l)		<50		EPA 8260B
49. Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50. Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51. 3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52. Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53. 1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54. 1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55. 1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
56. 1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. Northern Expansion
Sample Date: 7/12/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Northern Exp
Sample Date 7/12/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	CAS Number

540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 09/05/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone East

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 34 . 139 " Longitude: 76° 22' 35 . 234 "

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 07/10/2023, 7/14/2023 Sample Collection Time: 0555; 0701

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2307-00192, 2307-00199 Final Lab Analysis Completion Date: 08/02/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.235 mg/L, Oil and Grease: 33.0 mg/L, Chromium, Hexavalent: 4.88 mg/L, Phosphorous: 7.20 mg/L, TKN: 651 mg/L, Total Suspended Solids: 20.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Detection Zone East
Sample Date 7/14/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	71,153.85	69.62
Area Drained (acres)	171	77
Ratio (gallons/acre/day)	416.10	0.90

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2230	44.0	SM 2320 B
2.*	Ammonia-Nitrogen	p	643.00	<0.20	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2230	44.0	SM 2320
4.*	Calcium, Total	p	54.70	27.00	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,870.00	41.80	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	19.30	EPA 300.0
7.*	Magnesium, Total	p	108.00	15.20	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.4	5.8	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.88	5.37	SM 4500-H+B
10.*	Potassium, Total	p	490.00	5.91	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14400	411	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14280	398	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,470.00	16.00	EPA 200.7
14.*	Sulfate, Total	p	229.00	92.10	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	440.00	13.40	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	5.42		EPA 200.7
18.	Manganese, Total	p	1.00		EPA 200.7
19.	Nitrate-Nitrogen	p	8.43		EPA 300.0

Monitoring Point No
Detection Zone East
Sample Date 7/14/2023
I.D. No. 101615

FORM 50

ANALYTE			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<0.38		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6460		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	12		SM 2130 B
24.	Antimony, Total (μg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (μg/l)		115.00		EPA 200.8
26.	Barium, Total (μg/l)		123.00		EPA 200.8
27.	Beryllium, Total (μg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (μg/l)		<10.00		EPA 200.8
29.	Chromium, Total (μg/l)		220.00		EPA 200.8
30.	Cobalt, Total (μg/l)	d	39.50		EPA 200.8
31.	Copper, Total (μg/l)		14.10		EPA 200.8
32.	Lead, Total (μg/l)		<10.00		EPA 200.8
33.	Mercury, Total (μg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (μg/l)	d	186.00		EPA 200.8
35.	Selenium, Total (μg/l)		<50.00		EPA 200.8
36.	Silver, Total (μg/l)		<50.00		EPA 200.8
37.	Thallium, Total (μg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (μg/l)	d	96.90		EPA 200.8
39.	Zinc, Total (μg/l)		67.50		EPA 200.8
40.	Acetone (μg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (μg/l)	d	<100		EPA 8260B
42.	Benzene (μg/l)		<50	<1.00	EPA 8260B
43.	Bromochloromethane (μg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (μg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (μg/l)		<50		EPA 8260B
46.	Carbon Disulfide (μg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (μg/l)		<50		EPA 8260B
48.	Chlorobenzene (μg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (μg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (μg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (μg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (μg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (μg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (μg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (μg/l) (o-Dichlorobenzene)		<50		EPA 8260B
56.	1,3-Dichlorobenzene (μg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. Detection Zone East
Sample Date: 7/14/2023
I.D. No. 101615

ANALYTE (µg/l)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No Detect. Zone East
Sample Date 7/14/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

FORM 50

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	CAS Number

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 09/05/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Cell 5 Leachate Detection Zone

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 14.461" Longitude: 76° 22' 50.165"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 07/10/2023; 7/14/2023 Sample Collection Time: 0555; 0720

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2307-00192; 2307-00197 Final Lab Analysis Completion Date: 08/02/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.235 mg/L, Oil and Grease: 33.0 mg/L, Chromium, Hexavalent: 4.88 mg/L, Phosphorous: 7.20 mg/L, TKN: 651 mg/L, Total Suspended Solids: 20.0 mg/L

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Cell #5
Sample Date 7/14/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	71,153.85	8.30
Area Drained (acres)	171	28
Ratio (gallons/acre/day)	416.10	0.29

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2230	21.0	SM 2320 B
2.*	Ammonia-Nitrogen	p	643.00	1.60	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2230	21.0	SM 2320
4.*	Calcium, Total	p	54.70	10.40	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,870.00	<20.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	<10.00	EPA 300.0
7.*	Magnesium, Total	p	108.00	8.04	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.4	5.7	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.88	5.09	SM 4500-H+B
10.*	Potassium, Total	p	490.00	2.54	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14400	236	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14280	227	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,470.00	4.79	EPA 200.7
14.*	Sulfate, Total	p	229.00	82.90	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	440.00	6.69	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	5.42		EPA 200.7
18.	Manganese, Total	p	1.00		EPA 200.7
19.	Nitrate-Nitrogen	p	8.43		EPA 300.0

FORM 50

Monitoring Point No ______
Cell #5
Sample Date 7/14/2023
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<0.38		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6460		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	12		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		115.00		EPA 200.8
26.	Barium, Total (µg/l)		123.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		220.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	39.50		EPA 200.8
31.	Copper, Total (µg/l)		14.10		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	186.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	96.90		EPA 200.8
39.	Zinc, Total (µg/l)		67.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. Cell #5

Sample Date: 7/14/2023
I.D. No. 101615

ANALYTE (µg/l)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<1.00	EPA 8260B
81.	Toluene		<50	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Cell #5
Sample Date 7/14/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<2.00	EPA 8260B
89.	Xylenes		<150	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

FORM 50

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 09/05/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Southern Expansion Cell #1

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 48° 99' 78. 125" Longitude: 23° 84' 39.118"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 07/10/2023, 7/18/2023 Sample Collection Time: 0555, 1027

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2307-00192, 2307-00196-001 Final Lab Analysis Completion Date: 8/2/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 0.235 mg/L, Oil and Grease: 33.0 mg/L, Chromium, Hexavalent: 4.88 mg/L,
Phosphorous: 7.20 mg/L, TKN: 651 mg/L, Total Suspended Solids: 20.0 mg/L

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Southern Cell #1
Sample Date 7/18/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	71,153.08	10.18
Area Drained (acres)	171	22
Ratio (gallons/acre/day)	416.10	0.46

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2230	898	SM 2320 B
2.*	Ammonia-Nitrogen	p	643.00	167.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2230	898	SM 2320
4.*	Calcium, Total	p	54.70	13.80	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,870.00	2,270.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	250.00	EPA 300.0
7.*	Magnesium, Total	p	108.00	17.00	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.4	7.6	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.88	7.32	SM 4500-H+B
10.*	Potassium, Total	p	490.00	54.10	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14400	2900	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14280	2740	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,470.00	260.00	EPA 200.7
14.*	Sulfate, Total	p	229.00	<50.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	440.00	116.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	5.42		EPA 200.7
18.	Manganese, Total	p	1.00		EPA 200.7
19.	Nitrate-Nitrogen	p	8.43		EPA 300.0

Monitoring Point No ______
Southern Cell #1
Sample Date 7/18/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<0.38		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6460		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	12		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		115.00		EPA 200.8
26.	Barium, Total (µg/l)		123.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		220.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	39.50		EPA 200.8
31.	Copper, Total (µg/l)		14.10		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	186.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	96.90		EPA 200.8
39.	Zinc, Total (µg/l)		67.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<10.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<10.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

FORM 50

Monitoring Point No. ________
Southern Cell #1
Sample Date: 7/18/2023
I.D. No. 101615

ANALYTE (µg/l)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<10.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<10.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<10.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<10.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<10.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<10.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<10.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<10.00	EPA 8260B
81.	Toluene		<50	<10.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<10.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<10.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Southern Cell #1
Sample Date 7/18/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<20.00	EPA 8260B
89.	Xylenes		<150	<30.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ______________
I.D. No. __________________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 09/05/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Southern Expansion Cell #2

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 49 ° 06' 80. 123" Longitude: 23 ° 83' 75. 743"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 07/10/2023; 7/18/2023 Sample Collection Time: 0555; 0940

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2307-00192; 2307-00196-002 Final Lab Analysis Completion Date: 08/02/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments: Cyanide: 0.235 mg/L, Oil and Grease: 33.0 mg/L, Chromium, Hexavalent: 4.88 mg/L,
Phosphorous: 7.20 mg/L, TKN: 651 mg/L, Total Suspended Solids: 20.0 mg/L

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Southern Cell #2
Sample Date 7/18/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flow volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimated weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells which have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	71,153.85	7.32
Area Drained (acres)	171	19
Ratio (gallons/acre/day)	416.10	0.39

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In the leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachate indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point in the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detection zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons per acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachate contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. When MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include the Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	2230	453	SM 2320 B
2.*	Ammonia-Nitrogen	p	643.00	28.50	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	2230	453	SM 2320
4.*	Calcium, Total	p	54.70	6.89	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,870.00	1,980.00	SM 5220 D
6.*	Chloride (Cl)	p	2,030.00	137.00	EPA 300.0
7.*	Magnesium, Total	p	108.00	8.76	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.4	7.4	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.88	7.42	SM 4500-H+B
10.*	Potassium, Total	p	490.00	17.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14400	1797	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14280	1720	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,470.00	281.00	EPA 200.7
14.*	Sulfate, Total	p	229.00	83.30	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	440.00	101.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	5.42		EPA 200.7
18.	Manganese, Total	p	1.00		EPA 200.7
19.	Nitrate-Nitrogen	p	8.43		EPA 300.0

Monitoring Point No ______
Southern Cell #2
Sample Date 7/18/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	<0.38		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6460		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	12		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		115.00		EPA 200.8
26.	Barium, Total (µg/l)		123.00		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		220.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	39.50		EPA 200.8
31.	Copper, Total (µg/l)		14.10		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	186.00		EPA 200.8
5.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	96.90		EPA 200.8
39.	Zinc, Total (µg/l)		67.50		EPA 200.8
40.	Acetone (µg/l)	d	<200		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<100		EPA 8260B
42.	Benzene (µg/l)		<50	<10.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<50		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<50		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<50		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<100		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<50		EPA 8260B
48.	Chlorobenzene (µg/l)		<50		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<100		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<50		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<100		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<50		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<50		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<50	<10.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<50		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<50		EPA 8260B

Monitoring Point No. Southern Cell #2
Sample Date: 7/18/2023
I.D. No. 101615

FORM 50

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<50		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<100		EPA 8260B
59.	Dichlorodifluoromethane	p	<100		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<50	<10.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<50	<10.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<50	<10.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<50	<10.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<50	<10.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<50		EPA 8260B
66.	cis-1,3-Dichloropropene		<50		EPA 8260B
67.	trans-1,3-Dichloropropene		<50		EPA 8260B
68.	Ethyl Benzene		<50	<10.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<200		EPA 8260B
70.	Methyl bromide (Bromomethane)		<100		EPA 8260B
1.	Methyl chloride (Chloromethane)		<100		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<50		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<50	<10.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<200		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<250		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<200		EPA 8260B
77.	Styrene	d	<50		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<50		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<50		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<50	<10.00	EPA 8260B
81.	Toluene		<50	<10.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<50	<10.00	EPA 8260B
83.	1,1,2-Trichloroethane		<50		EPA 8260B
84.	Trichloroethene		<50	<10.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

Monitoring Point No Southern Cell 2
Sample Date 7/18/2023
I.D. No. 101615

FORM 50

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<100		EPA 8260B
86.	1,2,3-Trichloropropane		<50		EPA 8260B
87.	Vinyl acetate	d	<100		EPA 8260B
88.	Vinyl chloride		<100	<20.00	EPA 8260B
89.	Xylenes		<150	<30.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ______________
I.D. No. __________________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

Q2 2023 Leachate Quality Data

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 5/26/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spac provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify t date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Northern Expansion

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 33 .671 " Longitude: 76° 22' 38 .398 "

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 04/10/2023; 4/10/2023 Sample Collection Time: 07:20; 1340

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2304-00172; 2304-00176 Final Lab Analysis Completion Date: 04/25/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 3800 ug/L, Oil and Grease: 142.0 mg/L, Chromium, Hexavalent: 3.6 mg/L,
Phosphorous: 2.11 mg/L, TKN: 604 mg/L, Total Suspended Solids: 40.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Northern Expansion
Sample Date 4/10/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flo volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimate weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells whic have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	80,484.70	85.46
Area Drained (acres)	171	25
Ratio (gallons/acre/day)	470.67	3.42

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In th leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachat indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point i the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detectio zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons pe acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachat contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. Whe MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include th Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	1660	262	SM 2320 B
2.*	Ammonia-Nitrogen	p	542.00	44.30	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	1660	262	SM 2320
4.*	Calcium, Total	p	58.60	64.30	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,480.00	110.00	SM 5220 D
6.*	Chloride (Cl)	p	1,840.00	108.00	EPA 300.0
7.*	Magnesium, Total	p	110.00	33.30	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.0	6.7	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.86	6.44	SM 4500-H+B
10.*	Potassium, Total	p	507.00	31.50	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14600	1838	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14200	1690	EPA 120.1, FIELI
13.*	Sodium, Total	p	1,660.00	163.00	EPA 200.7
14.*	Sulfate, Total	p	318.00	376.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	451.00	50.30	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	14.30		EPA 200.7
18.	Manganese, Total	p	0.75		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

Monitoring Point No ______
Northern Expansion
Sample Date 4/10/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	1.53		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6260		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	28		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		104.00		EPA 200.8
26.	Barium, Total (µg/l)		58.50		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		179.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	40.10		EPA 200.8
31.	Copper, Total (µg/l)		21.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	154.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		330.00		EPA 200.8
40.	Acetone (µg/l)	d	65.0		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<20		EPA 8260B
42.	Benzene (µg/l)		<10	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<10		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<10		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<10		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<20		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<10		EPA 8260B
48.	Chlorobenzene (µg/l)		<10		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<20		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<10		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<20		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<10		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<10		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<10	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<10		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<10		EPA 8260B

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FORM 50

Monitoring Point No. ________
Northern Expansion
Sample Date: 4/10/2023
I.D. No. 101615

ANALYTE (µg/l)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<10		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<20		EPA 8260B
59.	Dichlorodifluoromethane	p	<20		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<10	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<10	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<10	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<10	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<10	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<10		EPA 8260B
66.	cis-1,3-Dichloropropene		<10		EPA 8260B
67.	trans-1,3-Dichloropropene		<10		EPA 8260B
68.	Ethyl Benzene		<10	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<40		EPA 8260B
70.	Methyl bromide (Bromomethane)		<20		EPA 8260B
1.	Methyl chloride (Chloromethane)		<20		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<10		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<10	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<40		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<50		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<40		EPA 8260B
77.	Styrene	d	<10		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<10		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<10		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<10	<1.00	EPA 8260B
81.	Toluene		<10	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<10	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<10		EPA 8260B
84.	Trichloroethene		<10	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No Northern Expansion
Sample Date 4/10/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<20		EPA 8260B
86.	1,2,3-Trichloropropane		<10		EPA 8260B
87.	Vinyl acetate	d	<20		EPA 8260B
88.	Vinyl chloride		<20	<2.00	EPA 8260B
89.	Xylenes		<30	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ____________
I.D. No. ______________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 5/26/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the spaces provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify the date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone East

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 34 .139" Longitude: 76° 22' 35 .234"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 04/10/2023; 4/10/2023 Sample Collection Time: 0720; 1133

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2304-00172; 2304-00177 Final Lab Analysis Completion Date: 4/26/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 3800 ug/L, Oil and Grease: 142.0 mg/L, Chromium, Hexavalent: 3.6 mg/L, Phosphorous: 2.11 mg/L, TKN: 604 mg/L, Total Suspended Solids: 40.0 mg/L

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Eastern Expansion
Sample Date 4/10/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flo volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimate weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells whic have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	80,484.70	470.65
Area Drained (acres)	171	77
Ratio (gallons/acre/day)	470.67	6.11

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In th leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachat indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point i the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detectio zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons pe acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachat contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. Whe MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include th Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	1660	24.4	SM 2320 B
2.*	Ammonia-Nitrogen	p	542.00	1.95	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	1660	24.4	SM 2320
4.*	Calcium, Total	p	58.60	12.40	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,480.00	<20.00	SM 5220 D
6.*	Chloride (Cl)	p	1,840.00	<10.00	EPA 300.0
7.*	Magnesium, Total	p	110.00	7.30	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.0	6.0	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.86	5.64	SM 4500-H+B
10.*	Potassium, Total	p	507.00	2.72	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14600	251	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14200	232	EPA 120.1, FIELI
13.*	Sodium, Total	p	1,660.00	12.90	EPA 200.7
14.*	Sulfate, Total	p	318.00	<50.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	451.00	4.59	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	14.30		EPA 200.7
18.	Manganese, Total	p	0.75		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

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Monitoring Point No ______
Eastern Expansion
Sample Date 4/10/2023
I.D. No. 101615

FORM 50

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	1.53		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6260		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	28		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		104.00		EPA 200.8
26.	Barium, Total (µg/l)		58.50		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		179.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	40.10		EPA 200.8
31.	Copper, Total (µg/l)		21.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	154.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		330.00		EPA 200.8
40.	Acetone (µg/l)	d	65.0		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<20		EPA 8260B
42.	Benzene (µg/l)		<10	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<10		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<10		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<10		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<20		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<10		EPA 8260B
48.	Chlorobenzene (µg/l)		<10		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<20		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<10		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<20		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<10		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<10		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<10	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<10		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<10		EPA 8260B

Monitoring Point No. ________
Eastern Expansion
Sample Date: 4/10/2023
I.D. No. 101615

FORM 50

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<10		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<20		EPA 8260B
59.	Dichlorodifluoromethane	p	<20		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<10	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<10	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<10	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<10	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<10	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<10		EPA 8260B
66.	cis-1,3-Dichloropropene		<10		EPA 8260B
67.	trans-1,3-Dichloropropene		<10		EPA 8260B
68.	Ethyl Benzene		<10	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<40		EPA 8260B
70.	Methyl bromide (Bromomethane)		<20		EPA 8260B
1.	Methyl chloride (Chloromethane)		<20		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<10		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<10	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<40		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<50		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<40		EPA 8260B
77.	Styrene	d	<10		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<10		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<10		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<10	<1.00	EPA 8260B
81.	Toluene		<10	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<10	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<10		EPA 8260B
84.	Trichloroethene		<10	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No Eastern Expansion
Sample Date 4/10/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<20		EPA 8260B
86.	1,2,3-Trichloropropane		<10		EPA 8260B
87.	Vinyl acetate	d	<20		EPA 8260B
88.	Vinyl chloride		<20	<2.00	EPA 8260B
89.	Xylenes		<30	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 5/26/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the space provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify th date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Cell 5 Leachate Detection Zone

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 40° 40' 14. 461" Longitude: 76° 22' 50.165"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 04/10/2023; 4/10/2023 Sample Collection Time: 0720; 1140

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2304-00172; 2304-00175 Final Lab Analysis Completion Date: 4/25/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 3800 ug/L, Oil and Grease: 142.0 mg/L, Chromium, Hexavalent: 3.6 mg/L, Phosphorous: 2.11 mg/L, TKN: 604 mg/L, Total Suspended Solids: 40.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. Cell #5
Sample Date 4/10/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flo volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimate weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells whic have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	80,484.70	19.36
Area Drained (acres)	171	28
Ratio (gallons/acre/day)	470.67	0.69

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In th leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leacha indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detectic zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons pe acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leacha contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. Whe MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include th Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	1660	<20.0	SM 2320 B
2.*	Ammonia-Nitrogen	p	542.00	<4.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	1660	<20.0	SM 2320
4.*	Calcium, Total	p	58.60	7.44	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,480.00	<20.00	SM 5220 D
6.*	Chloride (Cl)	p	1,840.00	<10.00	EPA 300.0
7.*	Magnesium, Total	p	110.00	5.43	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.0	6.1	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.86	5.85	SM 4500-H+B
10.*	Potassium, Total	p	507.00	1.49	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14600	176	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14200	164	EPA 120.1, FIEL
13.*	Sodium, Total	p	1,660.00	7.64	EPA 200.7
14.*	Sulfate, Total	p	318.00	46.80	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	451.00	2.71	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	14.30		EPA 200.7
18.	Manganese, Total	p	0.75		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

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FORM 50

Monitoring Point No ______
Cell #5
Sample Date 4/10/2023
I.D. No. 101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	1.53		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6260		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	28		SM 2130 B
24.	Antimony, Total (μg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (μg/l)		104.00		EPA 200.8
26.	Barium, Total (μg/l)		58.50		EPA 200.8
27.	Beryllium, Total (μg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (μg/l)		<10.00		EPA 200.8
29.	Chromium, Total (μg/l)		179.00		EPA 200.8
30.	Cobalt, Total (μg/l)	d	40.10		EPA 200.8
31.	Copper, Total (μg/l)		21.80		EPA 200.8
32.	Lead, Total (μg/l)		<10.00		EPA 200.8
33.	Mercury, Total (μg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (μg/l)	d	154.00		EPA 200.8
35.	Selenium, Total (μg/l)		<50.00		EPA 200.8
36.	Silver, Total (μg/l)		<50.00		EPA 200.8
37.	Thallium, Total (μg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (μg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (μg/l)		330.00		EPA 200.8
40.	Acetone (μg/l)	d	65.0		EPA 8260B
41.	Acrylonitrile (μg/l)	d	<20		EPA 8260B
42.	Benzene (μg/l)		<10	<1.00	EPA 8260B
43.	Bromochloromethane (μg/l)	d	<10		EPA 8260B
44.	Bromodichloromethane (μg/l)	d	<10		EPA 8260B
45.	Bromoform (Tribromomethane) (μg/l)		<10		EPA 8260B
46.	Carbon Disulfide (μg/l)	d	<20		EPA 8260B
47.	Carbon Tetrachloride (μg/l)		<10		EPA 8260B
48.	Chlorobenzene (μg/l)		<10		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (μg/l)		<20		EPA 8260B
50.	Chloroform (Trichloromethane) (μg/l)	d	<10		EPA 8260B
51.	3-Chloro-1-propene (μg/l)	p	<20		EPA 8260B
52.	Dibromochloromethane (μg/l) (Chlorodibromomethane)		<10		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (μg/l) (DBCP)	d	<10		EPA 8260B
54.	1,2-Dibromoethane (μg/l) (Ethylene dibromide; EDB)		<10	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (μg/l) (o-Dichlorobenzene)		<10		EPA 8260B
56.	1,3-Dichlorobenzene (μg/l) (m-Dichlorobenzene)	p	<10		EPA 8260B

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FORM 50

Monitoring Point No. ________
Cell #5
Sample Date: 4/10/2023
I.D. No. 101615

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<10		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<20		EPA 8260B
59.	Dichlorodifluoromethane	p	<20		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<10	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<10	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<10	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<10	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<10	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<10		EPA 8260B
66.	cis-1,3-Dichloropropene		<10		EPA 8260B
67.	trans-1,3-Dichloropropene		<10		EPA 8260B
68.	Ethyl Benzene		<10	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<40		EPA 8260B
70.	Methyl bromide (Bromomethane)		<20		EPA 8260B
1.	Methyl chloride (Chloromethane)		<20		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<10		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<10	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<40		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<50		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<40		EPA 8260B
77.	Styrene	d	<10		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<10		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<10		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<10	<1.00	EPA 8260B
81.	Toluene		<10	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<10	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<10		EPA 8260B
84.	Trichloroethene		<10	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

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FORM 50

Monitoring Point No Cell #5
Sample Date 4/10/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<20		EPA 8260B
86.	1,2,3-Trichloropropane		<10		EPA 8260B
87.	Vinyl acetate	d	<20		EPA 8260B
88.	Vinyl chloride		<20	<2.00	EPA 8260B
89.	Xylenes		<30	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ______________
I.D. No. ________________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

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COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

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pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 5/26/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the space provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify th date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Southern Expansion Cell #1

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 48° 99' 78. 125" Longitude: 23° 84' 39.118"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 04/10/2023; 4/10/2023 Sample Collection Time: 0720; 1258

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2304-00172; 2304-00174-001 Final Lab Analysis Completion Date: 4/25/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 3800 ug/L, Oil and Grease: 142.0 mg/L, Chromium, Hexavalent: 3.6 mg/L,
Phosphorous: 2.11 mg/L, TKN: 604 mg/L, Total Suspended Solids: 40.0 mg/L

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Cell #1 Northern
Sample Date 4/10/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flo volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimate weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells whic have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	80,484.70	11.08
Area Drained (acres)	171	22
Ratio (gallons/acre/day)	470.67	0.50

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In th leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leachat indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detectic zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons pe acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leachat contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. Whe MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include th Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	1660	1640	SM 2320 B
2.*	Ammonia-Nitrogen	p	542.00	349.00	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	1660	1640	SM 2320
4.*	Calcium, Total	p	58.60	22.10	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,480.00	497.00	SM 5220 D
6.*	Chloride (Cl)	p	1,840.00	580.00	EPA 300.0
7.*	Magnesium, Total	p	110.00	31.60	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.0	7.2	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.86	7.24	SM 4500-H+B
10.*	Potassium, Total	p	507.00	128.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14600	5400	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14200	5140	EPA 120.1, FIELD
13.*	Sodium, Total	p	1,660.00	402.00	EPA 200.7
14.*	Sulfate, Total	p	318.00	<50.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	451.00	166.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	14.30		EPA 200.7
18.	Manganese, Total	p	0.75		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

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FORM 50

Monitoring Point No	Cell #1 Northern
Sample Date	4/10/2023
I.D. No.	101615

	ANALYTE		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	1.53		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6260		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	28		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		104.00		EPA 200.8
26.	Barium, Total (µg/l)		58.50		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		179.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	40.10		EPA 200.8
31.	Copper, Total (µg/l)		21.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	154.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		330.00		EPA 200.8
40.	Acetone (µg/l)	d	65.0		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<20		EPA 8260B
42.	Benzene (µg/l)		<10	1.18	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<10		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<10		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<10		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<20		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<10		EPA 8260B
48.	Chlorobenzene (µg/l)		<10		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<20		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<10		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<20		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<10		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<10		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<10	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<10		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<10		EPA 8260B

Monitoring Point No. ________
Cell #1 Northern
Sample Date: 4/10/2023
I.D. No. 101615

FORM 50

	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichclorobenzene (p-Dichlorobenzene)		<10		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<20		EPA 8260B
59.	Dichlorodifluoromethane	p	<20		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<10	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<10	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<10	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<10	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<10	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<10		EPA 8260B
66.	cis-1,3-Dichloropropene		<10		EPA 8260B
67.	trans-1,3-Dichloropropene		<10		EPA 8260B
68.	Ethyl Benzene		<10	2.27	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<40		EPA 8260B
70.	Methyl bromide (Bromomethane)		<20		EPA 8260B
1.	Methyl chloride (Chloromethane)		<20		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<10		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<10	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<40		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<50		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<40		EPA 8260B
77.	Styrene	d	<10		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<10		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<10		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<10	<1.00	EPA 8260B
81.	Toluene		<10	1.48	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<10	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<10		EPA 8260B
84.	Trichloroethene		<10	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Cell #1 Northern
Sample Date 4/10/2023
I.D. No. 101615

ANALYTE (µg/l unless otherwise indicated)			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<20		EPA 8260B
86.	1,2,3-Trichloropropane		<10		EPA 8260B
87.	Vinyl acetate	d	<20		EPA 8260B
88.	Vinyl chloride		<20	<2.00	EPA 8260B
89.	Xylenes		<30	5.58	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

Analyzed in the 4th calendar quarter only

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

2540-FM-BWM0158 Rev. 10/2010

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

Date Prepared/Revised 5/26/2023
DEP USE ONLY
Date Received

FORM 50
MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

This form must be fully and accurately completed. All required information must be typed or legibly printed in the space provided. If additional space is necessary, identify each attached sheet as Form 50, reference the item number and identify th date prepared. The "date prepared/revised" on any attached sheets needs to match the "date prepared/revised" on this page.

General References: Section 273.255(d) and (e) and 273.276(a)
Federal Regulations, Subtitle D: 258.54 and Appendix I to Part 258.

SECTION A. SITE IDENTIFIER

Applicant/permittee Commonwealth Environmental Systems, Inc.

Site Name CES Landfill

Facility ID (as issued by DEP) 101615

SECTION B. FACILITY INFORMATION

Facility Name: Commonwealth Environmental Systems, Inc.

Sampling Point Identification Raw Leachate, Leachate Detection Zone Southern Expansion Cell #2

Location: County Schuylkill Municipality: Foster Township

Sampling Point: Latitude: 49 ° 06' 80. 123" Longitude: 23 ° 83' 75. 743"

Sampling Method: ☐ Pumped ☐ Bailed ☒ Grab

Sample Field Filtered (must be 0.45 micron)? ☐ Yes ☒ No

Sample Date (mm/dd/yy) 04/10/2023; 04/10/2023 Sample Collection Time: 0720; 1312

Sample Collector's Name: Matt Huda

Sample Collector's Affiliation: Commonwealth Environmental System, Inc.

Laboratory(ies) Performing Analysis: HawkMtn Labs, Inc.

Laboratory Certification Number(s): 40-417

Lab Sample Number(s): 2304-00172; 2304-00176-002 Final Lab Analysis Completion Date: 4/25/2023

Were Any Holding Times Exceeded? ☐ Yes ☒ No If Yes, please explain in comments field.

Name/Affiliation of Person Who Filled Out Form Sarah Gittleman, HawkMtn Labs, Inc.

Comments Cyanide: 3800 ug/L, Oil and Grease: 142.0 mg/L, Chromium, Hexavalent: 3.6 mg/L, Phosphorous: 2.11 mg/L, TKN: 604 mg/L, Total Suspended Solids: 40.0 mg/L

2540-FM-BWM0158 Rev. 10/2010

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTE MANAGEMENT

FORM 50
QUARTERLY MUNICIPAL WASTE LANDFILL LEACHATE ANALYSES

Monitoring Point No. ______
Cell #2 Northern
Sample Date 4/10/2023
I.D. No. 101679

For new facilities and cells as well as existing facilities which were permitted and which received waste after April 9, 1988, discharge flo volume from leachate collection shall be measured daily [273.276(a)(1)]. Discharge flow volume from the detection zone shall be estimate weekly [273.255(d)(2)]. Form 50 is due quarterly after the flow of leachate from the collection system has started. For facilities or cells whic have received no waste since April 9, 1988, detection zone monitoring will meet permit/closure requirements.

FLOW FACTOR	LEACHATE DISCHARGE	DETECTION ZONE DISCHARGE
Volume (average gpd)	80,484.70	7.29
Area Drained (acres)	171	19
Ratio (gallons/acre/day)	470.67	0.77

Once leachate flow begins from a leachate collection system, leachate discharge will be analyzed quarterly for all analytes listed below. In th leachate detection zone, any fluid found in any detection zone monitoring point must be sampled during the initial four quarters for the leacha indicator parameters (designated by *, below) to establish a baseline fluid composition. Thereafter, any fluid detected in each monitoring point the leachate detection zone must be sampled annually for the leachate indicator parameters. Quarterly sampling of the fluid in any detectic zone monitoring point for leachate indicator parameters is required only when the quarterly flow at that monitoring point exceeds 10 gallons pe acre per day (weekly average for the quarter) for the cell(s) served by that monitoring point. If the indicator analytes confirm leacha contamination in the detection zone, the fluid will be analyzed initially within 30 days and thereafter annually for all analytes listed below. Whe MCL's (where established) of any detection zone analytes on this form are exceeded, annual groundwater monitoring must include th Subtitle D detection zone add-on list analytes found on Form 19.

	ANALYTE (mg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
1.*	Alkalinity, Total	p	1660	730	SM 2320 B
2.*	Ammonia-Nitrogen	p	542.00	49.60	SM 4500-NH3 F
3.*	Bicarbonate (as $CaCO_3$)	p	1660	730	SM 2320
4.*	Calcium, Total	p	58.60	9.71	EPA 200.7
5.*	Chemical Oxygen Demand	p	1,480.00	438.00	SM 5220 D
6.*	Chloride (Cl)	p	1,840.00	159.00	EPA 300.0
7.*	Magnesium, Total	p	110.00	12.70	EPA 200.7
8.*	pH, Field, (Standard Units)	p	8.0	7.8	SM 4500-H+B
9.*	pH, Laboratory, (Standard Units)	p	7.86	7.70	SM 4500-H+B
10.*	Potassium, Total	p	507.00	34.00	EPA 200.7
11.*	Specific Conductance, Field (micromhos/cm)	p	14600	2300	SM 2510 B
12.*	Specific Conductance, Laboratory (micromhos/cm)	p	14200	2250	EPA 120.1, FIEL
13.*	Sodium, Total	p	1,660.00	382.00	EPA 200.7
14.*	Sulfate, Total	p	318.00	105.00	EPA 300.0
15.*	Total Organic Carbon (TOC)	p	451.00	129.00	SM 5310 C
16.	Fluoride	p	<2.00		EPA 300.0
17.	Iron, Total	p	14.30		EPA 200.7
18.	Manganese, Total	p	0.75		EPA 200.7
19.	Nitrate-Nitrogen	p	<5.00		EPA 300.0

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Monitoring Point No ______
Cell #2 Northern
Sample Date 4/10/2023
I.D. No. 101615

ANALYTE			LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
20.	Phenolics, Total (mg/l)	p	1.53		EPA 420.1
21.	Total Dissolved Solids (mg/l)	p	6260		SM 2540 C
22.	Tritium (pCi/L)#		N/A		SM 2540 C
23.	Turbidity (mg/l)	p	28		SM 2130 B
24.	Antimony, Total (µg/l)	d	<50.00		EPA 200.8
25.	Arsenic, Total (µg/l)		104.00		EPA 200.8
26.	Barium, Total (µg/l)		58.50		EPA 200.8
27.	Beryllium, Total (µg/l)	d	<10.00		EPA 200.8
28.	Cadmium, Total (µg/l)		<10.00		EPA 200.8
29.	Chromium, Total (µg/l)		179.00		EPA 200.8
30.	Cobalt, Total (µg/l)	d	40.10		EPA 200.8
31.	Copper, Total (µg/l)		21.80		EPA 200.8
32.	Lead, Total (µg/l)		<10.00		EPA 200.8
33.	Mercury, Total (µg/l)	p	<10.00		EPA 200.8
34.	Nickel, Total (µg/l)	d	154.00		EPA 200.8
35.	Selenium, Total (µg/l)		<50.00		EPA 200.8
36.	Silver, Total (µg/l)		<50.00		EPA 200.8
37.	Thallium, Total (µg/l)	d	<10.00		EPA 200.8
38.	Vanadium, Total (µg/l)	d	<50.00		EPA 200.8
39.	Zinc, Total (µg/l)		330.00		EPA 200.8
40.	Acetone (µg/l)	d	65.0		EPA 8260B
41.	Acrylonitrile (µg/l)	d	<20		EPA 8260B
42.	Benzene (µg/l)		<10	<1.00	EPA 8260B
43.	Bromochloromethane (µg/l)	d	<10		EPA 8260B
44.	Bromodichloromethane (µg/l)	d	<10		EPA 8260B
45.	Bromoform (Tribromomethane) (µg/l)		<10		EPA 8260B
46.	Carbon Disulfide (µg/l)	d	<20		EPA 8260B
47.	Carbon Tetrachloride (µg/l)		<10		EPA 8260B
48.	Chlorobenzene (µg/l)		<10		EPA 8260B
49.	Chloroethane (Ethyl Chloride) (µg/l)		<20		EPA 8260B
50.	Chloroform (Trichloromethane) (µg/l)	d	<10		EPA 8260B
51.	3-Chloro-1-propene (µg/l)	p	<20		EPA 8260B
52.	Dibromochloromethane (µg/l) (Chlorodibromomethane)		<10		EPA 8260B
53.	1,2-Dibromo-3-chloropropane (µg/l) (DBCP)	d	<10		EPA 8260B
54.	1,2-Dibromoethane (µg/l) (Ethylene dibromide; EDB)		<10	<1.00	EPA 8260B
55.	1,2-Dichlorobenzene (µg/l) (o-Dichlorobenzene)		<10		EPA 8260B
56.	1,3-Dichlorobenzene (µg/l) (m-Dichlorobenzene)	p	<10		EPA 8260B

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Monitoring Point No. ________
Cell #2 Northern
Sample Date: 4/10/2023
I.D. No. 101615

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	ANALYTE (µg/l)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
57.	1,4-Dichlorobenzene (p-Dichlorobenzene)		<10		EPA 8260B
58.	trans-1,4-Dichloro-2-butene	d	<20		EPA 8260B
59.	Dichlorodifluoromethane	p	<20		EPA 8260B
60.	1,1-Dichloroethane (Ethylidene chloride)		<10	<1.00	EPA 8260B
61.	1,2-Dichloroethane (Ethylene dichloride)		<10	<1.00	EPA 8260B
62.	1,1-Dichloroethene (Vinylidene chloride)		<10	<1.00	EPA 8260B
63.	cis-1,2-Dichloroethene		<10	<1.00	EPA 8260B
64.	trans-1,2-Dichloroethene		<10	<1.00	EPA 8260B
65.	1,2-Dichloropropane (Propylene dichloride)		<10		EPA 8260B
66.	cis-1,3-Dichloropropene		<10		EPA 8260B
67.	trans-1,3-Dichloropropene		<10		EPA 8260B
68.	Ethyl Benzene		<10	<1.00	EPA 8260B
69.	Methyl butyl ketone (2-Hexanone)	d	<40		EPA 8260B
70.	Methyl bromide (Bromomethane)		<20		EPA 8260B
1.	Methyl chloride (Chloromethane)		<20		EPA 8260B
72.	Methylene bromide (Dibromomethane)	d	<10		EPA 8260B
73.	Methylene chloride (Dichloromethane)		<10	<1.00	EPA 8260B
74.	Methyl ethyl ketone (MEK; 2-Butanone)		<40		EPA 8260B
75.	Methyl iodide (Iodomethane)	d	<50		EPA 8260B
76.	4-Methyl-2-pentanone (Methyl isobutyl ketone)		<40		EPA 8260B
77.	Styrene	d	<10		EPA 8260B
78.	1,1,2,2-Tetrachloroethane		<10		EPA 8260B
79.	1,1,1,2-Tetrachloroethane		<10		EPA 8260B
80.	Tetrachloroethene (Perchloroethylene)		<10	<1.00	EPA 8260B
81.	Toluene		<10	<1.00	EPA 8260B
82.	1,1,1-Trichloroethane (Methylchloroform)		<10	<1.00	EPA 8260B
83.	1,1,2-Trichloroethane		<10		EPA 8260B
84.	Trichloroethene		<10	<1.00	EPA 8260B

† Please indicate detection limit if analyte is not detected.

FORM 50

Monitoring Point No. Cell #2 Northern
Sample Date 4/10/2023
I.D. No. 101615

	ANALYTE (µg/l unless otherwise indicated)		LEACHATE DISCHARGE†	DETECTION ZONE DISCHARGE†	ANALYSIS METHOD NUMBER
85.	Trichlorofluoromethane (CFC-11)		<20		EPA 8260B
86.	1,2,3-Trichloropropane		<10		EPA 8260B
87.	Vinyl acetate	d	<20		EPA 8260B
88.	Vinyl chloride		<20	<2.00	EPA 8260B
89.	Xylenes		<30	<3.00	EPA 8260B

p = PADEP 273.284 analyte exclusively
d = Subtitle D. Appendix I analyte exclusively
All other analytes are common to both lists.
† Please indicate detection limit if analyte is not detected.

\# Analyzed in the 4th calendar quarter only

FORM 50

Monitoring Point No. ________
Sample Date ______________
I.D. No. ________________

Qualitatively Identified Organic Compounds

List at least ten volatile organic compounds not otherwise identified in this section. Their identification should be based upon those compounds showing the greatest apparent concentration from the peaks of a mass spectrum of each sample. These ten compounds shall be identified but the concentration of each is not required.

Constituent	**CAS Number**

ATTACHMENT 25-3

Off-site Leachate Treatment Agreements

"Protecting Public Health and the Environment"
600 Wilson Avenue
Newark, NJ 07105
P (973) 344-1800 F (973) 334-2951
www.nj.gov/pvsc
Liquid Waste Acceptance Fax: (973) 466-3194

May 31, 2024

Mr. Dan O'Brien
Commonwealth Environmental Systems, L.P.
99 Commonwealth Road
Hegins, PA 17938

RE: LETTER OF AUTHORIZATION

Dear Mr. O'Brien:

In response to your 5-31-2024 request for an Application for a Letter of Authorization (LOA) to discharge approximately 200,000 gallons of graywater to the Passaic Valley Sewerage Commission (PVSC) treatment works, be advised that PVSC will approve it subject to the following conditions:

1) The source of the waste delivered under this approval shall only be from graywater collected at the Commonwealth Environmental Systems in Hegins, PA.
2) The authorization to discharge hauled waste is effective as of the date of this letter and shall expire on 1-30-2025. You must inform PVSC in advance, if an extension is requested.
3) All PVSC Rules and Regulations shall be adhered to.
4) The rate for the discharge shall be $35.00 per 1,000 gallons. **NOTE**: *PVSC charges by **full** truck capacity unless weight tickets from a **CERTIFIED SCALE** are attached to manifests.*
5) The approval (source) code for this wastewater is **452A**.
6) There shall be no discharging during wet weather events.
7) PVSC cannot accept any ashes, cinders, sand, mud, stones, rocks, straw, shavings, metal, glass, rags, feathers, tar, wood or any other solid or viscous substance capable of causing obstruction to flow in pipes or other interference with the property operation of the sewage works or any waste which is Hazardous as defined by USEPA, NJDEP and/or any other regulatory agency.
8) A $200 fee is required for the issuance of this LOA (see enclosed invoice #LWA-24-1629). **NEW POLICY: LOA Fee *MUST* be paid with first load by check ONLY. Monday through Fridays from 8:00am-4:00pm.**
9) PVSC shall bill the CUSTOMER monthly for charges due on this Agreement. The charges shall be payable upon receipt by the CUSTOMER of the monthly bill. Interest shall accrue at the rate of one- and one-half percent (1½%) per month on charges not paid within forty-five (45) days of the billing date.

Please be further advised that you are required to meet all Federal and State regulations as well, as they relate to this discharge. If you have any questions regarding this matter please feel free to contact me at (973) 466-2569.

Sincerely,
PASSAIC VALLEY SEWERAGE COMMISSION

Cameron Chadwick

Cameron Chadwick
Director of Liquid Waste Acceptance

CC/dt
Enclosure(s)

c: Gregory A. Tramontozzi, Executive Director
Heather Card, Financial Assistant
Dana Toal, LWA Program Analyst
File

PASSAIC VALLEY SEWERAGE COMMISSION
"Protecting Public Health and the Environment"

LWA LOA FEE

Liquid Waste Acceptance
Attention: Dana Toal
600 Wilson Avenue
Newark, NJ 07105-4885
Phone (973) 466-2567 Fax (973) 466-3194

INVOICE # LWA-24-1629
(PLEASE INDICATE INVOICE # ON CHECK)

DATE: 5-31-2024

TO:
Mr. Dan O'Brien
Commonwealth Environmental Systems, L.P.
99 Commonwealth Road
Hegins, PA 17938
PHONE: 570-343-5782 **FAX:** 570-348-3135
CC:

FOR:
Fee for Letter of Authorization (LOA) for Acceptance of Liquid Waste from: Commonwealth Environmental Systems - Hegins, PA
Source Code: 452A

DESCRIPTION	AMOUNT
Fee for Letter of Authorization (LOA) ****FEE MUST ACCOMPANY FIRST LOAD****	$200.00
TOTAL	$200.00

******Please return this form with your payment.******

If you have any questions concerning this, contact (973) 466-2567

Thank you for your business!

OFFICE USE ONLY		
Check Number ______	*Date Received* ______	*Received By* ______

☐ Keystone Sanitary Landfill, Inc.
☐ Keystone Landfill, Inc.
☐ Keystone Quarry, Inc.
☒ Commonwealth Environmental Systems, LP

CES

FAX TRANSMISSION

TO: Dan O'Brien FAX:

FROM: Linda DATE: 8/5/2024

NUMBER OF PAGES (Including Cover): 1

Note: If you have a question or problem regarding this fax transmission, please call (570-343-5782).

Message: CES Leachate hauled to:

① Altoona Water Authority
144 Westerly Treatment Plant Rd RAW
Duncansville PA 16635-7814

② Capital Region Water
Advanced Wastewater Treatment Facility Raw
1662 S Cameron St
Harrisburg PA 17104

③ Petersburg Sewer Authority Raw
6975 Juniata Valley Pike Rd
Alexandria PA 16669

249 Dunham Drive, Dunmore, PA 18512
Phone: (570) 343-5782 Fax: (570) 348-3135

ATTACHMENT 25-4

Collection System Sump and Pump Sizing Calculations

1.0 LEACHATE COLLECTION SYSTEM

1.1 Introduction

The proposed methods and engineering specifications for the collection, management, and disposal of leachate generated within the proposed Southwest Expansion (Expansion) at Commonwealth Environmental Systems Landfill (CES) are presented in this section.

1.2 CES Southern Expansion Leachate Production and Storage Calculations

The USEPA's Hydrologic Evaluation of Landfill Performance (HELP) Model was used to calculate the anticipated peak flow of leachate from each section of the Expansion, and to estimate the average daily leachate production volume during active waste placement. HELP model outputs and data inputs can be found in Attachment 25-5.

The HELP computer model is an industry standard that uses climatological, soil, and landfill design data to predict peak and average daily leachate production. The model uses thirty (30) years of rainfall data from the Hegins, Pennsylvania area to estimate precipitation. HELP model input included the parameters:

- Synthetically generated weather data (i.e., precipitation, temperature, solar radiation, evapotranspiration) representative of Hegins, Pennsylvania.
- Simulated for between 1 and 30 years.
- Lateral drainage volumes are provided in cubic feet from HELP and based on a per acre basis to facilitate rapid comparison of filling sequence effects; volumes were subsequently converted to gallons per minute (gpm) per acre (1 ft^3/day/acre = 5.194×10^{-3} gpm/acre).
- Runs without final cover allowed for zero runoff (i.e. draining to the leachate collection system); runs with final cover or final earthen cover allowed for 100 percent runoff to stormwater management features.
- Although not relevant for the purpose that the model was used for, manufacturing and installation defects were kept to zero (0) per acre each for the geomembrane liner.

Different scenarios were evaluated using the HELP model, using various thicknesses of waste and final cover material, including:

- 25 feet and 75 feet of waste and intermediate cover placed on top of the leachate collection zone aggregate and liner materials in each pad;
- Maximum waste depth and intermediate cover placed on top of the leachate collection zone aggregate and liner materials in each pad. It is conservatively assumed that leachate is still produced by waste depths greater than 100 feet;
- Capped expansion area; and
- 5 feet of waste placed on top of the leachate collection zone aggregate and liner materials to simulate the construction period of subsequent cell lining and the very start of waste placement in each pad.

For the purpose of this analysis, HELP model results in gallons/acre/day were used for the following scenarios: 5 feet of waste in place, 25 feet of waste in place, 75 feet of waste in place, maximum waste depth, and capped landfill. It was conservatively assumed that capped areas of the landfill would generate 20 gallons/acre/day.

The worst-case single sump leachate generation scenario can be modeled when the Phase 5A intermediate grade is completed, and the Phase 5B liner system is opened with little to no waste. The worst-case total landfill expansion leachate generation scenario can be modeled when the Phase 1 intermediate grade is completed, and the Phase 2A liner system is opened with little to no waste. General leachate production rates ranged from 20 gallons/acre/day to 1,698 gallons/acre/day for this worst-case leachate production scenario, calculated using the conditions input for the above scenario. These flows were used to calculate total projected leachate volumes based on the area available for waste disposal; the calculated leachate production volumes are summarized in Table 1 below.

Table 1: Cell Area and Leachate Production Summary

Disposal Area	Liner Area (Acres)	Leachate Production Volumes		
		Worst-Case Average Daily (gpd)	Maximum Daily (gpd)	Average Annual (MG)
Worst-Case Single Sump Leachate Generation (SW-4)	114.66	27,347	306,227	10.0
Worst-Case Expansion Leachate Generation	15.87	54,412	617,865	19.9

Leachate will be conveyed from the Expansion by five sets of riser sump pumps (two primary and one secondary), one set in each of the five proposed sumps. The riser pipes will have a minimum slope of 2% and a maximum slope of 50% (i.e., 2H:1V).

The leachate flow for the secondary pump was determined by conservatively assuming that there will be pinholes in the primary geomembrane liner along the deployed footprint. Over time a very low leachate flow, estimated to be less than 20 gallons/acre/day, will move through the witness zone of the liner system and trickle into the Phase 2 permanent sump. A much lower powered pump was selected for this scenario, as this pump will most likely only cycle on a few times a year at most.

A 6" x 10" HDPE SDR 11 dual contained forcemain for SW-1 through SW-4 sumps will carry leachate from these sumps to the existing leachate wet well on the eastern side of the existing landfill footprint. Two primary and one secondary 4" x 8" HDPE SDR 11 dual contained pipes will be installed beneath the Pad 6 liner system, and will connect the existing northern expansion sump to one primary and one secondary leachate wet well on the outside of the Southwest Expansion footprint. A 4" x 8" HDPE SDR 11 dual contained forcemain for SW-5 and the northern expansion primary and secondary wet wells will carry leachate to the relocated LTP facility.

The riser extensions, riser pipe cleanouts, and force main installation to the existing leachate storage tank will be constructed following installation of the piggyback liner system, but before waste placement occurs within the newly lined areas of the expansion.

A tabulation of selected pumps for each proposed sump and for the northern expansion wet wells are provided in Table 2.

Table 2: Design Pump Rates

Sump No.	Drainage Area (acre)	Average Annual Daily Leachate Generation (gpm)	Peak Daily Leachate Generation (gpm)	Pump ID	Pump Model	HP	Design Pumping Rate (gpm)	Total Head (ft)
SW-1	15.87	18.72	253.11	P-1	EPG 9-4	1.5	60	60
SW-1	15.87	18.72	253.11	P-2	EPG 9-4	1.5	60	60
SW-1	15.87	18.72	253.11	P-3	EPG 5-4	1.0	10	54
SW-2	19.65	14.77	167.89	P-4	EPG 9-4	1.5	30	74
SW-2	19.65	14.77	167.89	P-5	EPG 9-4	1.5	30	74
SW-2	19.65	14.77	167.89	P-6	EPG 5-4	1.0	10	72
SW-3	23.39	18.66	198.35	P-7	EPG 9-4	1.5	40	78
SW-3	23.39	18.66	198.35	P-8	EPG 9-4	1.5	40	78
SW-3	23.39	18.66	198.35	P-9	EPG 5-4	1.0	10	73
SW-4	23.68	18.97	211.44	P-10	EPG 9-4	1.5	40	65
SW-4	23.68	18.97	211.44	P-11	EPG 9-4	1.5	40	65
SW-4	23.68	18.97	211.44	P-12	EPG 5-4	1.0	10	61
SW-5	15.41	18.18	245.78	P-13	EPG 9-4	1.5	40	54
SW-5	15.41	18.18	245.78	P-14	EPG 9-4	1.5	40	54
SW-5	15.41	18.18	245.78	P-15	EPG 5-4	1.0	10	54
North Exp Existing Sump Primary Wet Well	25.17	11.91	69.75	P-16	Stancor SS-50	0.5	30	23
North Exp Existing Sump Secondary Wet Well	25.17	11.91	69.75	P-17	Stancor SS-50	0.5	10	21

ARM GROUP LLC
CES LANDFILL _ SW1
LEACHATE COLLECTION SUMP VOLUME CALCULATIONS

I. Background

The following analysis is provided to determine if the sump volume will accommodate the maximum leachate flow for the landfill expansion. Leachate collected within the sump will be removed using a side slope riser system that will not penetrate the liner system. A submersible pump inside the base of the riser system will convey leachate to the above-ground leachate storage tank. This calcuation will determine whether sufficient storage is available within the sump to allow accumulation of leachate, and to prevent the pump from short-cycling.

II. Design Parameters - Sump

	Units	
Max. Daily Flow Predicted by HELP	gpd	364,320
Max Flow Per Minute	gpm	253
Approximate Area of Sump	ft^2	601.00
Depth of Sump	ft	4
Void Ratio of Stone in Sump, e	-	0.4
Permeability of Stone in Sump, k	cm/sec	0.01
Permeability of Stone above Sump, k	cm/sec	0.01
Min. Slope for Sump Floor	%	2
Min. Operating Depth for Pumps	ft	1
Side Slope of Sump Pit	-	2:1
Sump Bottom Width, a	ft	18
Sump Bottom Length, b	ft	22
Sump Top Width, c	ft	34
Sump Top Length, d	ft	38

III. Calculations

a. Effective Sump, Stone Layer and Sand Layer Volumes

Although the total depth of the sump will be 4.0 ft, the effective volume of the sump will be dictated by the minimum operating depth determined by the pump manufacturer. It is assumed that the minimum operating depth for a horizontal pump is 12 in. (1.0 ft), reducing the effective depth of the sump to 3.0 ft. The following calculations determine the effective volume of voids, and thus the volume available for leachate storage:

Volume of Sump (Truncated Pyramid) = 1/6 x h x (axb +(a+c) x (b+d) +cxd)
Effective Volume of Sump = 2,404.0 ft^3
Effective Volume of Voids in Sump = (Effective Volume of Sump) x (e / (1+ e))
Effective Volume of Voids in Sump = 686.9 ft^3
Effective Volume of Voids in Sump = 5,137.7 gallons

Total Void Volume 687 ft^3
Total Void Volume 5,138 gallons

c. Pump Cycling Rate

Determine the pump flow rate necessary to discharge the volume of the sump in the minimum permitted pump run time, in order to avoid short-cycling, or excessive numbers of pump starts:

Minumum Pump Run Time = 8 minutes (per EPG)
Sump Volume = 5,138 gallons
Maximum Pump Flow rate = 642 gpm

Factor of Safety 2.0
Maximum Pump Flow rate = 321 gpm

IV. Summary

A sump with a bottom area (18'x22') and a top area (34'x36') containing gravel has sufficient capacity to accommodate the peak leachate flow predicted by the HELP Model and, with no inflow, can support two primary pump flow rates, each with a single flow rate of 165 gpm with a safety factor of 2.

V. Recommendations

1. Design assumptions associated with stone permeability and void ratio should be verified before initiating construction activities
2. Verify the pump manufacturer's minimum operating elevation is less than or equal to 1.0 ft.
3. Verify during installation of the pumps that pumps are at horizontal using measurements provided by the transducer.

ARM GROUP LLC
CES LANDFILL _ SW1
LEACHATE COLLECTION SUMP SW1 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1484				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	1537				
H_z, Static Head	53		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	100	riser	True length	-	feet
Force Main length (ft)	4700	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - gpm

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

- h_f = Friction Loss in feet
- Q = Flow in gallons per minute
- C = 130
- d_1 = 2.830 inches
- d_2 = 2.830 inches
- d_3 = 5.350 inches
- Tie in Flow1= 60 gpm
- Tie in Flow2= 80 gpm
- Tie in Flow3= 160 gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	15	ft
Minor losses =	705	ft
Total L=	**115**	**ft**
Total L. of 6"=	**5405**	**ft**

Pump Selection:

60 gpm	**@**	**60**
Pump Model:	**EPG 9-4**	
HP :	1.5	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	42.66	inches
Pump Dia.:	5.25	inches
Unit Weight:	82	lbs

Minor losses:

Fittings and Vales are assumed to be ar pipe segment length: 15%

System Curve

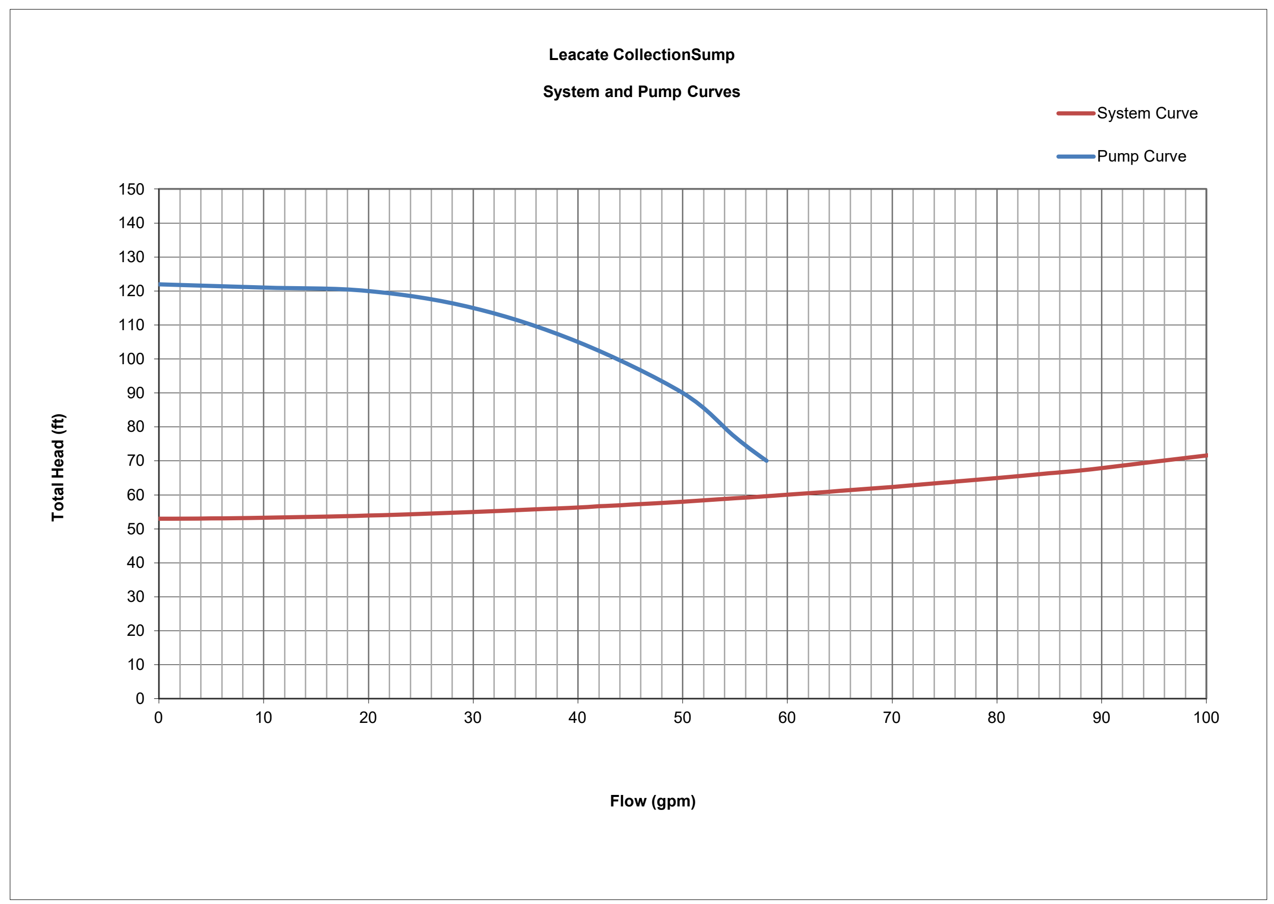
Q (gpm)	3" Piping L = 100 v_1 (ft/s)	3" Piping H_{f1} (feet)	3" Pipe L = 100 v_1 (ft/s)	3" Pipe H_{f1} (feet)	6" Pipe L = 5405 v_1 (ft/s)	6" Pipe H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	53.00	23.00
5	0.26	0.02	0.26	0.02	0.07	0.04	53.07	23.03
10	0.51	0.06	0.51	0.06	0.14	0.14	53.26	23.11
15	0.77	0.12	0.77	0.12	0.21	0.30	53.54	23.24
20	1.02	0.21	1.02	0.21	0.29	0.51	53.92	23.40
25	1.28	0.31	1.28	0.31	0.36	0.76	54.39	23.61
30	1.53	0.44	1.53	0.44	0.43	1.07	54.95	23.85
35	1.79	0.58	1.79	0.58	0.50	1.42	55.59	24.13
38	1.94	0.68	1.94	0.68	0.54	1.66	56.02	24.31
40	2.04	0.75	2.04	0.75	0.57	1.82	56.32	24.44
42	2.14	0.82	2.14	0.82	0.60	1.99	56.63	24.58
45	2.30	0.93	2.30	0.93	0.64	2.27	57.13	24.79
50	2.55	1.13	2.55	1.13	0.71	2.75	58.01	25.18
55	2.81	1.35	2.81	1.35	0.79	3.29	58.98	25.60
60	3.06	1.58	3.06	1.58	0.86	3.86	60.02	26.05
65	3.32	1.83	3.32	1.83	0.93	4.47	61.14	26.54
70	3.57	2.10	3.57	2.10	1.00	5.13	62.34	27.06
75	3.83	2.39	3.83	2.39	1.07	5.83	63.61	27.61
76	3.88	2.45	3.88	2.45	1.08	5.98	63.88	27.72
80	4.08	2.69	4.08	2.69	1.14	6.57	64.96	28.19
85	4.34	3.01	4.34	3.01	1.21	7.35	66.38	28.81
90	4.59	3.35	4.59	3.35	1.28	8.17	67.87	29.46
150	7.65	8.62	7.65	8.62	2.14	21.02	91.26	39.61
200	10.20	14.68	10.20	14.68	2.85	35.79	118.15	51.28
250	12.75	22.18	12.75	22.18	3.57	54.08	151.44	65.72
300	15.30	31.07	15.30	31.07	4.28	75.78	190.93	82.86

350	17.85	41.33	17.85	41.33	5.00	100.79	236.45	102.62
400	20.40	52.91	20.40	52.91	5.71	129.03	287.85	124.93
450	22.95	65.79	22.95	65.79	6.42	160.45	345.03	149.74
500	25.50	79.95	25.50	79.95	7.14	194.98	407.88	177.02

ARM GROUP LLC
CES LANDFILL _ SW1

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 9-4 ft
0	122
10	121
20	120
30	115
40	105
50	90
55	77
58	70



ARM GROUP LLC
CES LANDFILL _ SW1
LEACHATE COLLECTION SUMP SW1 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	**1484**				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	**1537**				
H_z, Static Head	53		Plan length @ slope	**-**	feet
			Slope	**26.57**	degrees
Force Main length (ft)	**100**	riser	True length	-	feet
Force Main length (ft)	**4700**	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	**-**	Acres
HELP model result:	**-**	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083 L \left(\frac{100}{C}\right)^{1.85185} \left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	1.920	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	5	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	160	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	15	ft
Minor losses =	705	ft
Total L=	**115**	**ft**
Total L. of 6"=	**5405**	**ft**

Pump Selection:

10 gpm	**@**	**54**
Pump Model:	**EPG 5-4**	
HP :	1	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	34.9	inches
Pump Dia.:	5.25	inches
Unit Weight:	76	lbs

System Curve

Q (gpm)	2" Piping L = 100 v_1 (ft/s)	H_{f1} (feet)	3" Pipe L = 100 v_1 (ft/s)	H_{f1} (feet)	6" Pipe L = 5405 v_1 (ft/s)	H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	53.00	23.00
5	0.55	0.11	0.26	0.02	0.07	0.04	53.16	23.07
10	1.11	0.38	0.51	0.06	0.14	0.14	53.58	23.25
15	1.66	0.80	0.77	0.12	0.21	0.30	54.22	23.53
20	2.22	1.37	1.02	0.21	0.29	0.51	55.08	23.91
25	2.77	2.07	1.28	0.31	0.36	0.76	56.15	24.37
30	3.32	2.90	1.53	0.44	0.43	1.07	57.41	24.91
35	3.88	3.85	1.79	0.58	0.50	1.42	58.86	25.55
38	4.21	4.49	1.94	0.68	0.54	1.66	59.83	25.96
40	4.43	4.94	2.04	0.75	0.57	1.82	60.51	26.26
42	4.65	5.40	2.14	0.82	0.60	1.99	61.21	26.57
45	4.99	6.14	2.30	0.93	0.64	2.27	62.33	27.05
50	5.54	7.46	2.55	1.13	0.71	2.75	64.34	27.92
55	6.10	8.90	2.81	1.35	0.79	3.29	66.53	28.87
60	6.65	10.45	3.06	1.58	0.86	3.86	68.89	29.90
65	7.20	12.12	3.32	1.83	0.93	4.47	71.43	31.00
70	7.76	13.90	3.57	2.10	1.00	5.13	74.13	32.17
75	8.31	15.79	3.83	2.39	1.07	5.83	77.01	33.42
76	8.42	16.18	3.88	2.45	1.08	5.98	77.61	33.68
80	8.87	17.79	4.08	2.69	1.14	6.57	80.06	34.74
85	9.42	19.90	4.34	3.01	1.21	7.35	83.27	36.14
90	9.97	22.12	4.59	3.35	1.28	8.17	86.64	37.60
150	16.62	56.92	7.65	8.62	2.14	21.02	139.56	60.57
200	22.16	96.92	10.20	14.68	2.85	35.79	200.39	86.97
250	27.70	146.45	12.75	22.18	3.57	54.08	275.71	119.66
300	33.25	205.19	15.30	31.07	4.28	75.78	365.05	158.43

Minor losses:

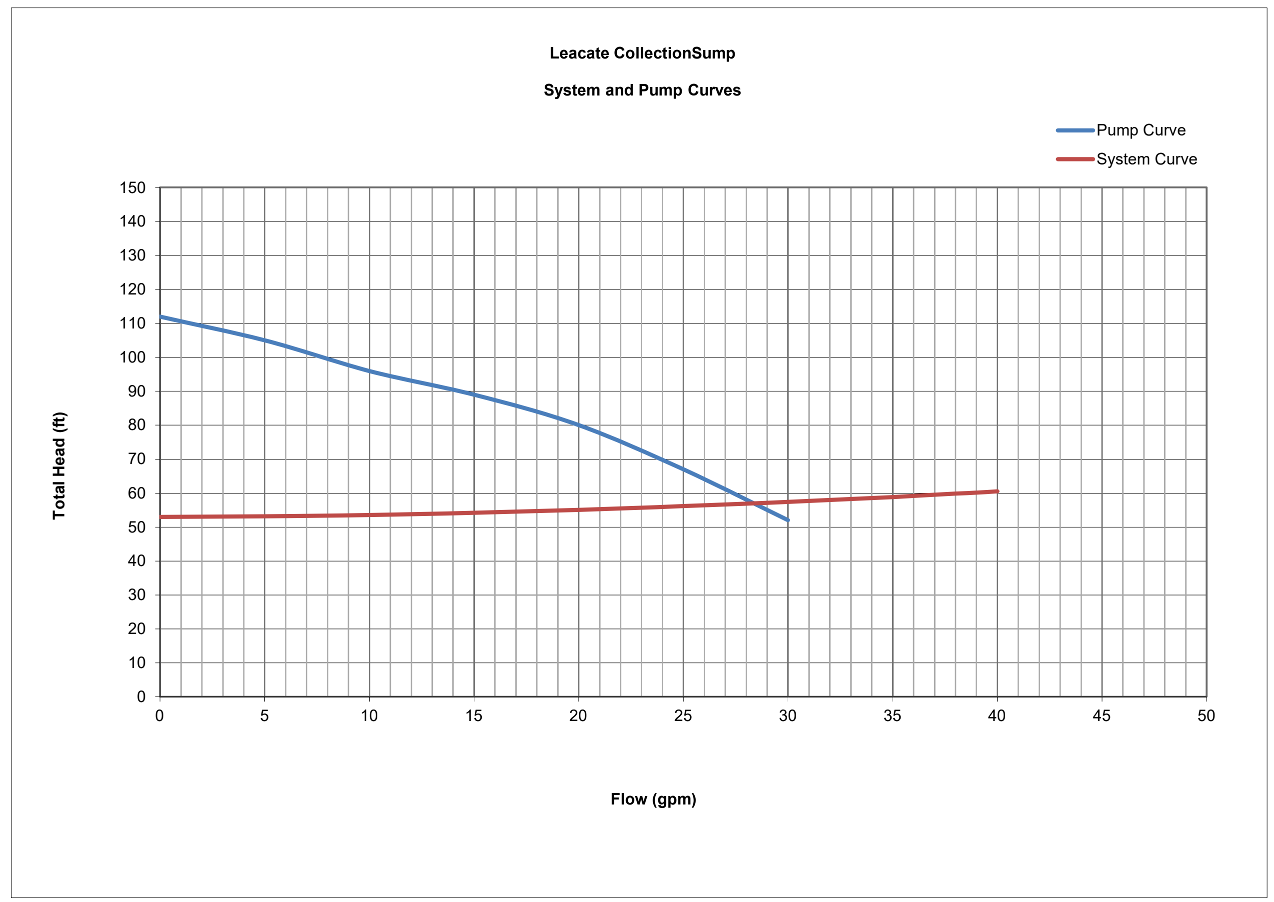
Fittings and Vales are assumed to be ar pipe segment length: 15%

350	38.79	272.91	17.85	41.33	5.00	100.79	468.03	203.12
400	44.33	349.38	20.40	52.91	5.71	129.03	584.33	253.60
450	49.87	434.45	22.95	65.79	6.42	160.45	713.68	309.74
500	55.41	527.94	25.50	79.95	7.14	194.98	855.87	371.45

ARM GROUP LLC
CES LANDFILL _ SW1

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 5-4 ft
0	112
5	105
10	96
15	89
20	80
25	67
30	52



ARM GROUP LLC
CES LANDFILL _ SW2
LEACHATE COLLECTION SUMP VOLUME CALCULATIONS

I. Background

The following analysis is provided to determine if the sump volume will accommodate the maximum leachate flow for the landfill expansion. Leachate collected within the sump will be removed using a side slope riser system that will not penetrate the liner system. A submersible pump inside the base of the riser system will convey leachate to the above-ground leachate storage tank. This calcuation will determine whether sufficient storage is available within the sump to allow accumulation of leachate, and to prevent the pump from short-cycling.

II. Design Parameters - Sump

	Units	
Max. Daily Flow Predicted by HELP	gpd	241,920
Max Flow Per Minute	gpm	168
Approximate Area of Sump	ft^2	601.00
Depth of Sump	ft	4
Void Ratio of Stone in Sump, e	-	0.4
Permeability of Stone in Sump, k	cm/sec	0.01
Permeability of Stone above Sump, k	cm/sec	0.01
Min. Slope for Sump Floor	%	2
Min. Operating Depth for Pumps	ft	1
Side Slope of Sump Pit	-	2:1
Sump Bottom Width, a	ft	18
Sump Bottom Length, b	ft	22
Sump Top Width, c	ft	34
Sump Top Length, d	ft	38

III. Calculations

a. Effective Sump, Stone Layer and Sand Layer Volumes

Although the total depth of the sump will be 4.0 ft, the effective volume of the sump will be dictated by the minimum operating depth determined by the pump manufacturer. It is assumed that the minimum operating depth for a horizontal pump is 12 in. (1.0 ft), reducing the effective depth of the sump to 3.0 ft. The following calculations determine the effective volume of voids, and thus the volume available for leachate storage:

Volume of Sump (Truncated Pyramid) = 1/6 x h x (axb +(a+c) x (b+d) +cxd)
Effective Volume of Sump = 2,404.0 ft^3
Effective Volume of Voids in Sump = (Effective Volume of Sump) x (e / (1+ e))
Effective Volume of Voids in Sump = 686.9 ft^3
Effective Volume of Voids in Sump = 5,137.7 gallons

Total Void Volume 687 ft^3
Total Void Volume 5,138 gallons

c. Pump Cycling Rate

Determine the pump flow rate necessary to discharge the volume of the sump in the minimum permitted pump run time, in order to avoid short-cycling, or excessive numbers of pump starts:

Minumum Pump Run Time =	8	minutes	(per EPG)
Sump Volume =	5,138	gallons	
Maximum Pump Flow rate =	**642**	**gpm**	
Factor of Safety	2.0		
Maximum Pump Flow rate =	**321**	**gpm**	

IV. Summary

A sump with a bottom area (18'x22') and a top area (34'x36') containing gravel has sufficient capacity to accommodate the peak leachate flow predicted by the HELP Model and, with no inflow, can support two primary pump flow rates, each with a single flow rate of 165 gpm with a safety factor of 2.

V. Recommendations

1. Design assumptions associated with stone permeability and void ratio should be verified before initiating construction activities
2. Verify the pump manufacturer's minimum operating elevation is less than or equal to 1.0 ft.
3. Verify during installation of the pumps that pumps are at horizontal using measurements provided by the transducer.

ARM GROUP LLC
CES LANDFILL _ SW2
LEACHATE COLLECTION SUMP SW2 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1488					
Discharge Elev.	1515		Slope adjustment:			
Riser Elev.	1560					
H_z, Static Head	72		Plan length @ slope	-	feet	
			Slope	26.57	degrees	
Force Main length (ft)	480	SW2 to SW1	True length	-	feet	
Force Main length (ft)	5500	force main				
			Additional length attributed to slope	-		

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	2.830	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	30	gpm
Tie in Flow2=	60	gpm
Tie in Flow3=	110	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	72	ft
Minor losses =	825	ft
Total L=	**552**	**ft**
Total L. of 6"=	**6325**	**ft**

Pump Selection:

30 gpm	**@**	**74**
Pump Model:	**EPG 9-4**	
HP :	1.5	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	42.66	inches
Pump Dia.:	5.25	inches
Unit Weight:	82	lbs

System Curve

Q (gpm)	3" Piping L = 100 v_1 (ft/s)	H_{f1} (feet)	3" Pipe L = 100 v_1 (ft/s)	H_{f1} (feet)	6" Pipe L = 6325 v_1 (ft/s)	H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	72.00	31.25
5	0.26	0.02	0.26	0.02	0.07	0.05	72.08	31.28
10	0.51	0.06	0.51	0.06	0.14	0.16	72.28	31.37
15	0.77	0.12	0.77	0.12	0.21	0.35	72.59	31.50
20	1.02	0.21	1.02	0.21	0.29	0.59	73.01	31.68
25	1.28	0.31	1.28	0.31	0.36	0.89	73.52	31.91
30	1.53	0.44	1.53	0.44	0.43	1.25	74.13	32.17
35	1.79	0.58	1.79	0.58	0.50	1.67	74.83	32.48
38	1.94	0.68	1.94	0.68	0.54	1.94	75.30	32.68
40	2.04	0.75	2.04	0.75	0.57	2.13	75.63	32.82
42	2.14	0.82	2.14	0.82	0.60	2.33	75.97	32.97
45	2.30	0.93	2.30	0.93	0.64	2.65	76.51	33.21
50	2.55	1.13	2.55	1.13	0.71	3.22	77.48	33.63
55	2.81	1.35	2.81	1.35	0.79	3.84	78.54	34.09
60	3.06	1.58	3.06	1.58	0.86	4.52	79.68	34.58
65	3.32	1.83	3.32	1.83	0.93	5.24	80.91	35.11
70	3.57	2.10	3.57	2.10	1.00	6.01	82.22	35.68
75	3.83	2.39	3.83	2.39	1.07	6.82	83.61	36.28
76	3.88	2.45	3.88	2.45	1.08	6.99	83.89	36.41
80	4.08	2.69	4.08	2.69	1.14	7.69	85.08	36.92
85	4.34	3.01	4.34	3.01	1.21	8.60	86.63	37.60
90	4.59	3.35	4.59	3.35	1.28	9.56	88.26	38.31
110	5.61	4.86	5.61	4.86	1.57	13.86	95.57	41.48
150	7.65	8.62	7.65	8.62	2.14	24.60	113.84	49.41
200	10.20	14.68	10.20	14.68	2.85	41.88	143.24	62.17
250	12.75	22.18	12.75	22.18	3.57	63.29	179.65	77.97

Minor losses:

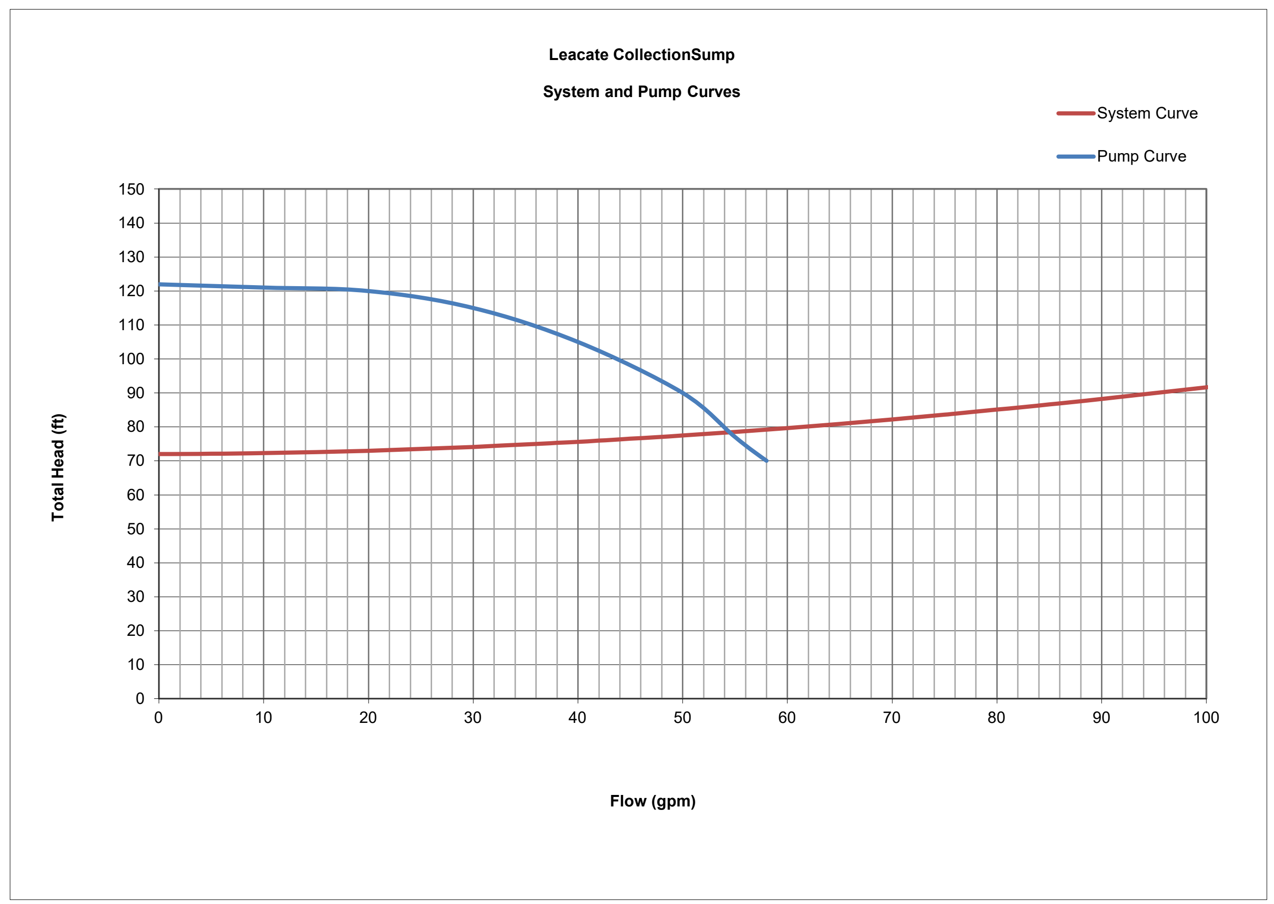
Fittings and Vales are assumed to be ar pipe segment length: 15%

300	15.30	31.07	15.30	31.07	4.28	88.68	222.83	96.71
350	17.85	41.33	17.85	41.33	5.00	117.94	272.60	118.31
400	20.40	52.91	20.40	52.91	5.71	150.99	328.81	142.71
450	22.95	65.79	22.95	65.79	6.42	187.76	391.34	169.84
500	25.50	79.95	25.50	79.95	7.14	228.16	460.06	199.67

ARM GROUP LLC
CES LANDFILL _ SW2

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 9-4 ft
0	122
10	121
20	120
30	115
40	105
50	90
55	77
58	70



ARM GROUP LLC
CES LANDFILL _ SW2
LEACHATE COLLECTION SUMP SW2 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1488				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	1560				
H_z, Static Head	72		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	100	riser	True length	-	feet
Force Main length (ft)	5500	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	1.920	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	5	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	160	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	15	ft
Minor losses =	825	ft
Total L=	**115**	**ft**
Total L. of 6"=	**6325**	**ft**

Pump Selection:

10 gpm @ 72

Pump Model:	**EPG 5-4**	
HP :	1	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	34.9	inches
Pump Dia.:	5.25	inches
Unit Weight:	76	lbs

Minor losses:

Fittings and Vales are assumed to be ar pipe segment length: 15%

System Curve

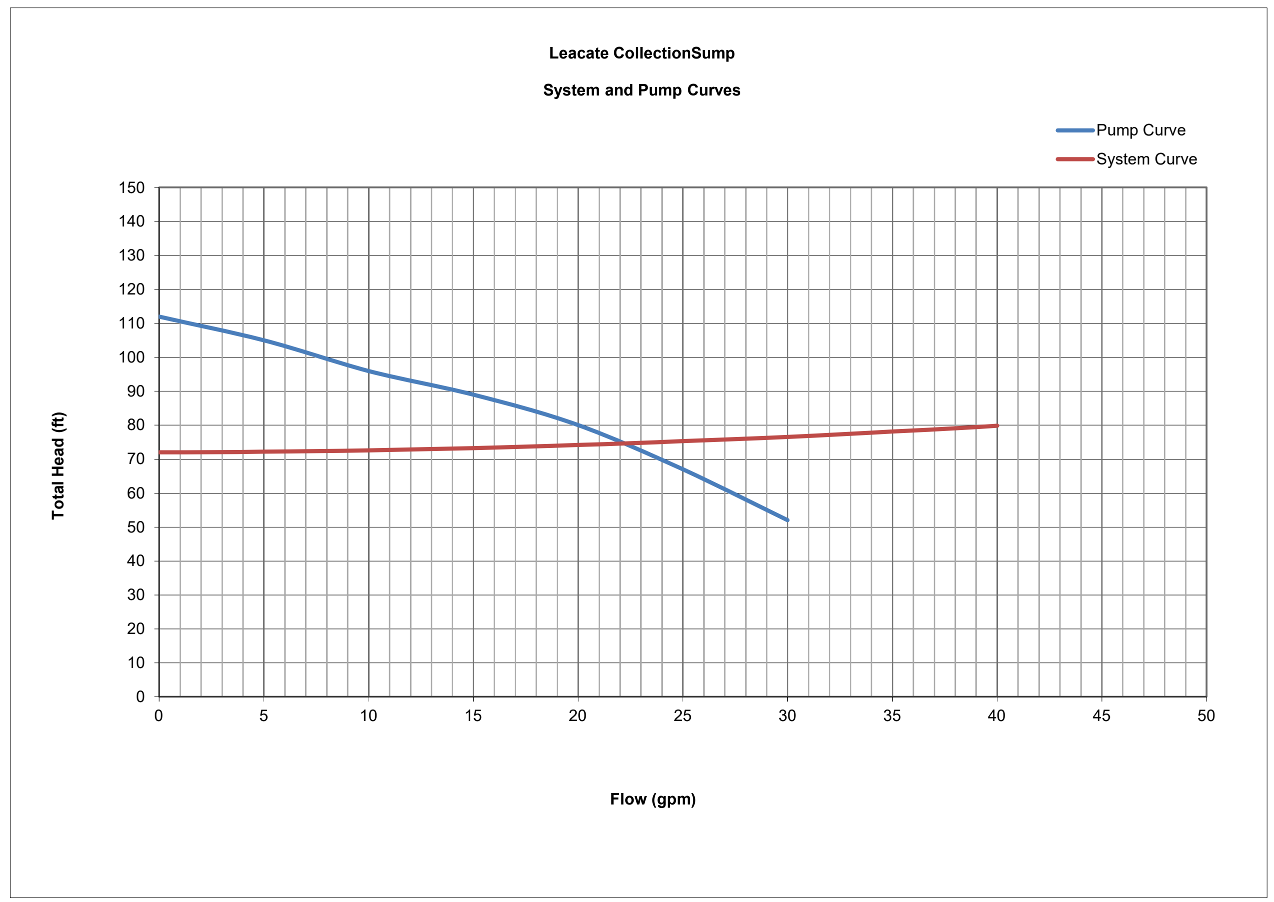
	2" Piping L = 100		**3" Pipe** L = 100		**6" Pipe** L = 6325		(Hf_1+H_z)	
Q (gpm)	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**TDH (feet)**	**Pressure (psi)**
0	0.00	0.00	0.00	0.00	0.00	0.00	72.00	31.25
5	0.55	0.11	0.26	0.02	0.07	0.05	72.17	31.32
10	1.11	0.38	0.51	0.06	0.14	0.16	72.60	31.51
15	1.66	0.80	0.77	0.12	0.21	0.35	73.27	31.80
20	2.22	1.37	1.02	0.21	0.29	0.59	74.17	32.19
25	2.77	2.07	1.28	0.31	0.36	0.89	75.28	32.67
30	3.32	2.90	1.53	0.44	0.43	1.25	76.59	33.24
35	3.88	3.85	1.79	0.58	0.50	1.67	78.10	33.90
38	4.21	4.49	1.94	0.68	0.54	1.94	79.11	34.33
40	4.43	4.94	2.04	0.75	0.57	2.13	79.82	34.64
42	4.65	5.40	2.14	0.82	0.60	2.33	80.55	34.96
45	4.99	6.14	2.30	0.93	0.64	2.65	81.72	35.47
50	5.54	7.46	2.55	1.13	0.71	3.22	83.81	36.37
55	6.10	8.90	2.81	1.35	0.79	3.84	86.09	37.36
60	6.65	10.45	3.06	1.58	0.86	4.52	88.55	38.43
65	7.20	12.12	3.32	1.83	0.93	5.24	91.19	39.58
70	7.76	13.90	3.57	2.10	1.00	6.01	94.01	40.80
75	8.31	15.79	3.83	2.39	1.07	6.82	97.00	42.10
76	8.42	16.18	3.88	2.45	1.08	6.99	97.62	42.37
80	8.87	17.79	4.08	2.69	1.14	7.69	100.17	43.48
85	9.42	19.90	4.34	3.01	1.21	8.60	103.52	44.93
90	9.97	22.12	4.59	3.35	1.28	9.56	107.03	46.45
150	16.62	56.92	7.65	8.62	2.14	24.60	162.14	70.37
200	22.16	96.92	10.20	14.68	2.85	41.88	225.48	97.86
250	27.70	146.45	12.75	22.18	3.57	63.29	303.92	131.90
300	33.25	205.19	15.30	31.07	4.28	88.68	396.95	172.28

350	38.79	272.91	17.85	41.33	5.00	117.94	504.18	218.81
400	44.33	349.38	20.40	52.91	5.71	150.99	625.29	271.38
450	49.87	434.45	22.95	65.79	6.42	187.76	759.99	329.84
500	55.41	527.94	25.50	79.95	7.14	228.16	908.06	394.10

ARM GROUP LLC
CES LANDFILL _ SW2

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 5-4 ft
0	112
5	105
10	96
15	89
20	80
25	67
30	52



ARM GROUP LLC
CES LANDFILL _ SW3
LEACHATE COLLECTION SUMP VOLUME CALCULATIONS

I. Background

The following analysis is provided to determine if the sump volume will accommodate the maximum leachate flow for the landfill expansion. Leachate collected within the sump will be removed using a side slope riser system that will not penetrate the liner system. A submersible pump inside the base of the riser system will convey leachate to the above-ground leachate storage tank. This calcuation will determine whether sufficient storage is available within the sump to allow accumulation of leachate, and to prevent the pump from short-cycling.

II. Design Parameters - Sump

	Units	
Max. Daily Flow Predicted by HELP	gpd	290,880
Max Flow Per Minute	gpm	202
Approximate Area of Sump	ft^2	601.00
Depth of Sump	ft	4
Void Ratio of Stone in Sump, e	-	0.4
Permeability of Stone in Sump, k	cm/sec	0.01
Permeability of Stone above Sump, k	cm/sec	0.01
Min. Slope for Sump Floor	%	2
Min. Operating Depth for Pumps	ft	1
Side Slope of Sump Pit	-	2:1
Sump Bottom Width, a	ft	18
Sump Bottom Length, b	ft	22
Sump Top Width, c	ft	34
Sump Top Length, d	ft	38

III. Calculations

a. Effective Sump, Stone Layer and Sand Layer Volumes

Although the total depth of the sump will be 4.0 ft, the effective volume of the sump will be dictated by the minimum operating depth determined by the pump manufacturer. It is assumed that the minimum operating depth for a horizontal pump is 12 in. (1.0 ft), reducing the effective depth of the sump to 3.0 ft. The following calculations determine the effective volume of voids, and thus the volume available for leachate storage:

Volume of Sump (Truncated Pyramid) =	1/6 x h x (axb +(a+c) x (b+d) +cxd)
Effective Volume of Sump =	2,404.0 ft^3
Effective Volume of Voids in Sump =	(Effective Volume of Sump) x (e / (1+ e))
Effective Volume of Voids in Sump =	686.9 ft^3
Effective Volume of Voids in Sump =	5,137.7 gallons

Total Void Volume	**687**	**ft^3**
Total Void Volume	**5,138**	**gallons**

c. Pump Cycling Rate

Determine the pump flow rate necessary to discharge the volume of the sump in the minimum permitted pump run time, in order to avoid short-cycling, or excessive numbers of pump starts:

Minumum Pump Run Time =	8	minutes	(per EPG)
Sump Volume =	5,138	gallons	
Maximum Pump Flow rate =	**642**	**gpm**	
Factor of Safety	2.0		
Maximum Pump Flow rate =	**321**	**gpm**	

IV. Summary

A sump with a bottom area (18'x22') and a top area (34'x36') containing gravel has sufficient capacity to accommodate the peak leachate flow predicted by the HELP Model and, with no inflow, can support two primary pump flow rates, each with a single flow rate of 165 gpm with a safety factor of 2.

V. Recommendations

1. Design assumptions associated with stone permeability and void ratio should be verified before initiating construction activities
2. Verify the pump manufacturer's minimum operating elevation is less than or equal to 1.0 ft.
3. Verify during installation of the pumps that pumps are at horizontal using measurements provided by the transducer.

ARM GROUP LLC
CES LANDFILL _ SW3
LEACHATE COLLECTION SUMP SW3 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1516				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	1589				
H_z, Static Head	73		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	2130	SW3 to SW2	True length	-	feet
Force Main length (ft)	7670	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	2.830	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	40	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	80	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	320	ft
Minor losses =	1151	ft
Total L=	**2450**	**ft**
Total L. of 6"=	**8821**	**ft**

Pump Selection:

40 gpm	**@**	**78**
Pump Model:	**EPG 9-4**	
HP :	1.5	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	42.66	inches
Pump Dia.:	5.25	inches
Unit Weight:	82	lbs

Minor losses:

Fittings and Vales are assumed to be ar pipe segment length: 15%

System Curve

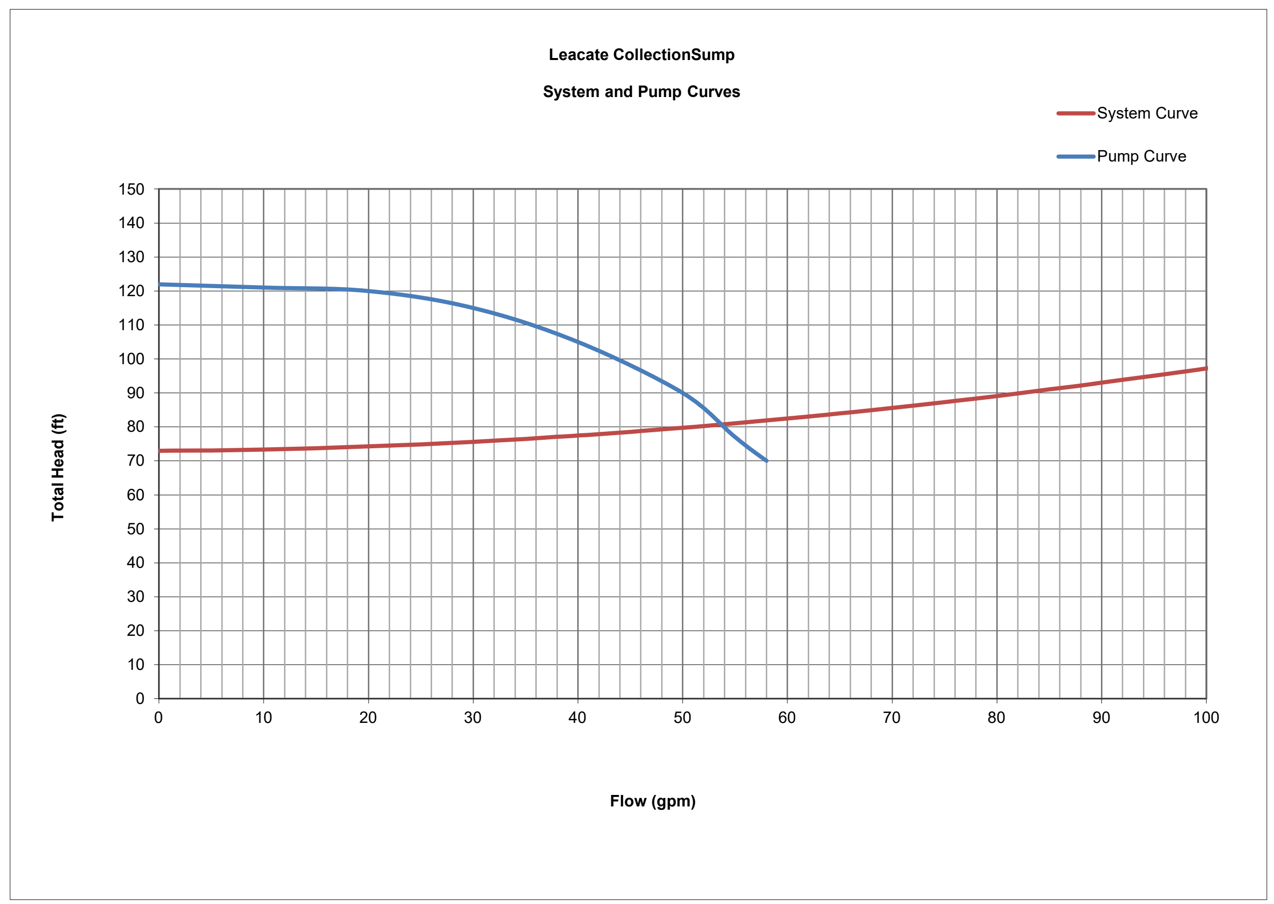
	3" Piping L = 100		3" Pipe L = 100		6" Pipe L = 8821		(Hf_1+H_z)	
Q (gpm)	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**TDH (feet)**	**Pressure (psi)**
0	0.00	0.00	0.00	0.00	0.00	0.00	73.00	31.68
5	0.26	0.02	0.26	0.02	0.07	0.06	73.10	31.72
10	0.51	0.06	0.51	0.06	0.14	0.23	73.34	31.83
15	0.77	0.12	0.77	0.12	0.21	0.48	73.73	32.00
20	1.02	0.21	1.02	0.21	0.29	0.83	74.24	32.22
25	1.28	0.31	1.28	0.31	0.36	1.25	74.87	32.49
30	1.53	0.44	1.53	0.44	0.43	1.75	75.62	32.82
35	1.79	0.58	1.79	0.58	0.50	2.32	76.49	33.20
38	1.94	0.68	1.94	0.68	0.54	2.71	77.06	33.45
40	2.04	0.75	2.04	0.75	0.57	2.97	77.47	33.62
42	2.14	0.82	2.14	0.82	0.60	3.26	77.89	33.80
45	2.30	0.93	2.30	0.93	0.64	3.70	78.56	34.09
50	2.55	1.13	2.55	1.13	0.71	4.49	79.75	34.61
55	2.81	1.35	2.81	1.35	0.79	5.36	81.06	35.18
60	3.06	1.58	3.06	1.58	0.86	6.30	82.46	35.79
65	3.32	1.83	3.32	1.83	0.93	7.30	83.97	36.44
70	3.57	2.10	3.57	2.10	1.00	8.38	85.58	37.14
75	3.83	2.39	3.83	2.39	1.07	9.52	87.30	37.89
76	3.88	2.45	3.88	2.45	1.08	9.75	87.65	38.04
80	4.08	2.69	4.08	2.69	1.14	10.72	89.11	38.67
85	4.34	3.01	4.34	3.01	1.21	12.00	91.02	39.50
90	4.59	3.35	4.59	3.35	1.28	13.33	93.03	40.38
110	5.61	4.86	5.61	4.86	1.57	19.33	102.04	44.29
150	7.65	8.62	7.65	8.62	2.14	34.30	124.54	54.05
200	10.20	14.68	10.20	14.68	2.85	58.41	160.76	69.77
250	12.75	22.18	12.75	22.18	3.57	88.26	205.62	89.24

300	15.30	31.07	15.30	31.07	4.28	123.67	258.82	112.33
350	17.85	41.33	17.85	41.33	5.00	164.48	320.14	138.94
400	20.40	52.91	20.40	52.91	5.71	210.57	389.39	168.99
450	22.95	65.79	22.95	65.79	6.42	261.83	466.42	202.42
500	25.50	79.95	25.50	79.95	7.14	318.18	551.08	239.17

ARM GROUP LLC
CES LANDFILL _ SW3

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 9-4 ft
0	122
10	121
20	120
30	115
40	105
50	90
55	77
58	70



ARM GROUP LLC
CES LANDFILL _ SW3
LEACHATE COLLECTION SUMP SW3 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1516					
Discharge Elev.	1515		Slope adjustment:			
Riser Elev.	1589					
H_z, Static Head	73		Plan length @ slope	-	feet	
			Slope	26.57	degrees	
Force Main length (ft)	100	riser	True length	-	feet	
Force Main length (ft)	7670	force main				
			Additional length attributed to slope	-		

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	1.920	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	5	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	160	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	15	ft
Minor losses =	1151	ft
Total L=	**115**	**ft**
Total L. of 6"=	**8821**	**ft**

Pump Selection:

10 gpm	**@**	**73**
Pump Model:	**EPG 5-4**	
HP :	1	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	34.9	inches
Pump Dia.:	5.25	inches
Unit Weight:	76	lbs

Minor losses:

Fittings and Vales are assumed to be ar pipe segment length: 15%

System Curve

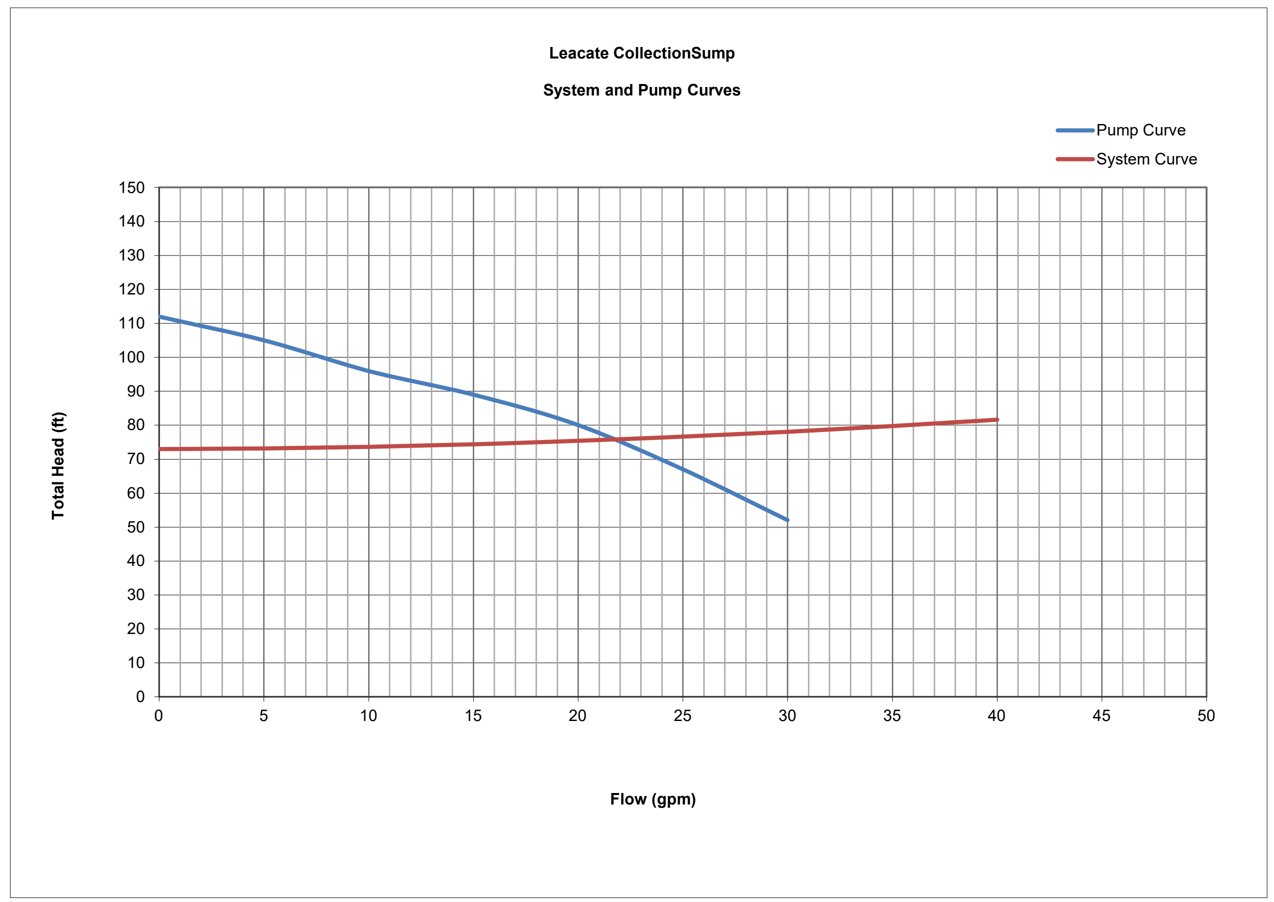
Q (gpm)	2" Piping L = 100 v_1 (ft/s)	H_{f1} (feet)	3" Pipe L = 100 v_1 (ft/s)	H_{f1} (feet)	6" Pipe L = 8821 v_1 (ft/s)	H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	73.00	31.68
5	0.55	0.11	0.26	0.02	0.07	0.06	73.18	31.76
10	1.11	0.38	0.51	0.06	0.14	0.23	73.67	31.97
15	1.66	0.80	0.77	0.12	0.21	0.48	74.41	32.29
20	2.22	1.37	1.02	0.21	0.29	0.83	75.40	32.72
25	2.77	2.07	1.28	0.31	0.36	1.25	76.63	33.26
30	3.32	2.90	1.53	0.44	0.43	1.75	78.08	33.89
35	3.88	3.85	1.79	0.58	0.50	2.32	79.76	34.62
38	4.21	4.49	1.94	0.68	0.54	2.71	80.87	35.10
40	4.43	4.94	2.04	0.75	0.57	2.97	81.66	35.44
42	4.65	5.40	2.14	0.82	0.60	3.26	82.47	35.79
45	4.99	6.14	2.30	0.93	0.64	3.70	83.76	36.35
50	5.54	7.46	2.55	1.13	0.71	4.49	86.08	37.36
55	6.10	8.90	2.81	1.35	0.79	5.36	88.60	38.45
60	6.65	10.45	3.06	1.58	0.86	6.30	91.33	39.64
65	7.20	12.12	3.32	1.83	0.93	7.30	94.25	40.91
70	7.76	13.90	3.57	2.10	1.00	8.38	97.38	42.26
75	8.31	15.79	3.83	2.39	1.07	9.52	100.70	43.70
76	8.42	16.18	3.88	2.45	1.08	9.75	101.38	44.00
80	8.87	17.79	4.08	2.69	1.14	10.72	104.21	45.23
85	9.42	19.90	4.34	3.01	1.21	12.00	107.91	46.83
90	9.97	22.12	4.59	3.35	1.28	13.33	111.81	48.52
150	16.62	56.92	7.65	8.62	2.14	34.30	172.84	75.01
200	22.16	96.92	10.20	14.68	2.85	58.41	243.00	105.46
250	27.70	146.45	12.75	22.18	3.57	88.26	329.89	143.17
300	33.25	205.19	15.30	31.07	4.28	123.67	432.94	187.89

350	38.79	272.91	17.85	41.33	5.00	164.48	551.72	239.44
400	44.33	349.38	20.40	52.91	5.71	210.57	685.86	297.66
450	49.87	434.45	22.95	65.79	6.42	261.83	835.07	362.42
500	55.41	527.94	25.50	79.95	7.14	318.18	999.08	433.60

ARM GROUP LLC
CES LANDFILL _ SW3

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 5-4 ft
0	112
5	105
10	96
15	89
20	80
25	67
30	52



ARM GROUP LLC
CES LANDFILL _ SW4
LEACHATE COLLECTION SUMP VOLUME CALCULATIONS

I. Background

The following analysis is provided to determine if the sump volume will accommodate the maximum leachate flow for the landfill expansion. Leachate collected within the sump will be removed using a side slope riser system that will not penetrate the liner system. A submersible pump inside the base of the riser system will convey leachate to the above-ground leachate storage tank. This calcuation will determine whether sufficient storage is available within the sump to allow accumulation of leachate, and to prevent the pump from short-cycling.

II. Design Parameters - Sump

	Units	
Max. Daily Flow Predicted by HELP	gpd	311,040
Max Flow Per Minute	gpm	216
Approximate Area of Sump	ft^2	601.00
Depth of Sump	ft	4
Void Ratio of Stone in Sump, e	-	0.4
Permeability of Stone in Sump, k	cm/sec	0.01
Permeability of Stone above Sump, k	cm/sec	0.01
Min. Slope for Sump Floor	%	2
Min. Operating Depth for Pumps	ft	1
Side Slope of Sump Pit	-	2:1
Sump Bottom Width, a	ft	18
Sump Bottom Length, b	ft	22
Sump Top Width, c	ft	34
Sump Top Length, d	ft	38

III. Calculations

a. Effective Sump, Stone Layer and Sand Layer Volumes

Although the total depth of the sump will be 4.0 ft, the effective volume of the sump will be dictated by the minimum operating depth determined by the pump manufacturer. It is assumed that the minimum operating depth for a horizontal pump is 12 in. (1.0 ft), reducing the effective depth of the sump to 3.0 ft. The following calculations determine the effective volume of voids, and thus the volume available for leachate storage:

Volume of Sump (Truncated Pyramid) = 1/6 x h x (axb +(a+c) x (b+d) +cxd)
Effective Volume of Sump = 2,404.0 ft^3
Effective Volume of Voids in Sump = (Effective Volume of Sump) x (e / (1+ e))
Effective Volume of Voids in Sump = 686.9 ft^3
Effective Volume of Voids in Sump = 5,137.7 gallons

Total Void Volume 687 ft^3
Total Void Volume 5,138 gallons

c. Pump Cycling Rate

Determine the pump flow rate necessary to discharge the volume of the sump in the minimum permitted pump run time, in order to avoid short-cycling, or excessive numbers of pump starts:

Minumum Pump Run Time = 8 minutes (per EPG)
Sump Volume = 5,138 gallons
Maximum Pump Flow rate = 642 gpm

Factor of Safety 2.0
Maximum Pump Flow rate = 321 gpm

IV. Summary

A sump with a bottom area (18'x22') and a top area (34'x36') containing gravel has sufficient capacity to accommodate the peak leachate flow predicted by the HELP Model and, with no inflow, can support two primary pump flow rates, each with a single flow rate of 165 gpm with a safety factor of 2.

V. Recommendations

1. Design assumptions associated with stone permeability and void ratio should be verified before initiating construction activities
2. Verify the pump manufacturer's minimum operating elevation is less than or equal to 1.0 ft.
3. Verify during installation of the pumps that pumps are at horizontal using measurements provided by the transducer.

ARM GROUP LLC
CES LANDFILL _ SW4
LEACHATE COLLECTION SUMP SW4 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1516				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	1576				
H_z, Static Head	60		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	620	SW2 to SW1	True length	-	feet
Force Main length (ft)	7610	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	2.830	inches
d_2 =	3.630	inches
d_3 =	5.350	inches
Tie in Flow1=	40	gpm
Tie in Flow2=	80	gpm

And:

Flow area, A =	0.0719	sq. ft.
L =	-	ft
Minor losses =	93	ft
Minor losses =	1142	ft
Total L=	**713**	**ft**
Total L. of 6"=	**8752**	**ft**

Pump Selection:

40 gpm	**@**	**65**
Pump Model:	**EPG 9-4**	
HP :	1.5	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	42.66	inches
Pump Dia.:	5.25	inches
Unit Weight:	82	lbs

System Curve

Q (gpm)	3" Piping L = 100 v_1 (ft/s)	3" Piping H_{f1} (feet)	4" Pipe L = 713 v_1 (ft/s)	4" Pipe H_{f1} (feet)	6" Pipe L = 8752 v_1 (ft/s)	6" Pipe H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	60.00	26.04
5	0.26	0.02	0.16	0.03	0.07	0.06	60.11	26.09
10	0.51	0.06	0.31	0.12	0.14	0.23	60.41	26.22
15	0.77	0.12	0.47	0.26	0.21	0.48	60.86	26.41
20	1.02	0.21	0.62	0.44	0.29	0.82	61.47	26.68
25	1.28	0.31	0.78	0.67	0.36	1.24	62.22	27.00
30	1.53	0.44	0.93	0.93	0.43	1.73	63.10	27.39
35	1.79	0.58	1.09	1.24	0.50	2.31	64.13	27.83
38	1.94	0.68	1.18	1.44	0.54	2.68	64.81	28.13
40	2.04	0.75	1.24	1.59	0.57	2.95	65.29	28.33
42	2.14	0.82	1.30	1.74	0.60	3.23	65.78	28.55
45	2.30	0.93	1.40	1.97	0.64	3.67	66.57	28.89
50	2.55	1.13	1.55	2.40	0.71	4.46	67.99	29.51
55	2.81	1.35	1.71	2.86	0.79	5.32	69.53	30.17
60	3.06	1.58	1.86	3.36	0.86	6.25	71.19	30.90
65	3.32	1.83	2.02	3.90	0.93	7.25	72.98	31.67
70	3.57	2.10	2.17	4.47	1.00	8.31	74.88	32.50
75	3.83	2.39	2.33	5.08	1.07	9.44	76.91	33.38
76	3.88	2.45	2.36	5.20	1.08	9.68	77.33	33.56
80	4.08	2.69	2.48	5.72	1.14	10.64	79.05	34.31
85	4.34	3.01	2.64	6.40	1.21	11.90	81.32	35.29
90	4.59	3.35	2.79	7.11	1.28	13.23	83.69	36.32
110	5.61	4.86	3.41	10.31	1.57	19.18	94.34	40.95
150	7.65	8.62	4.65	18.30	2.14	34.04	120.96	52.50
200	10.20	14.68	6.20	31.16	2.85	57.95	163.79	71.09
250	12.75	22.18	7.75	47.09	3.57	87.57	216.84	94.11

Minor losses:

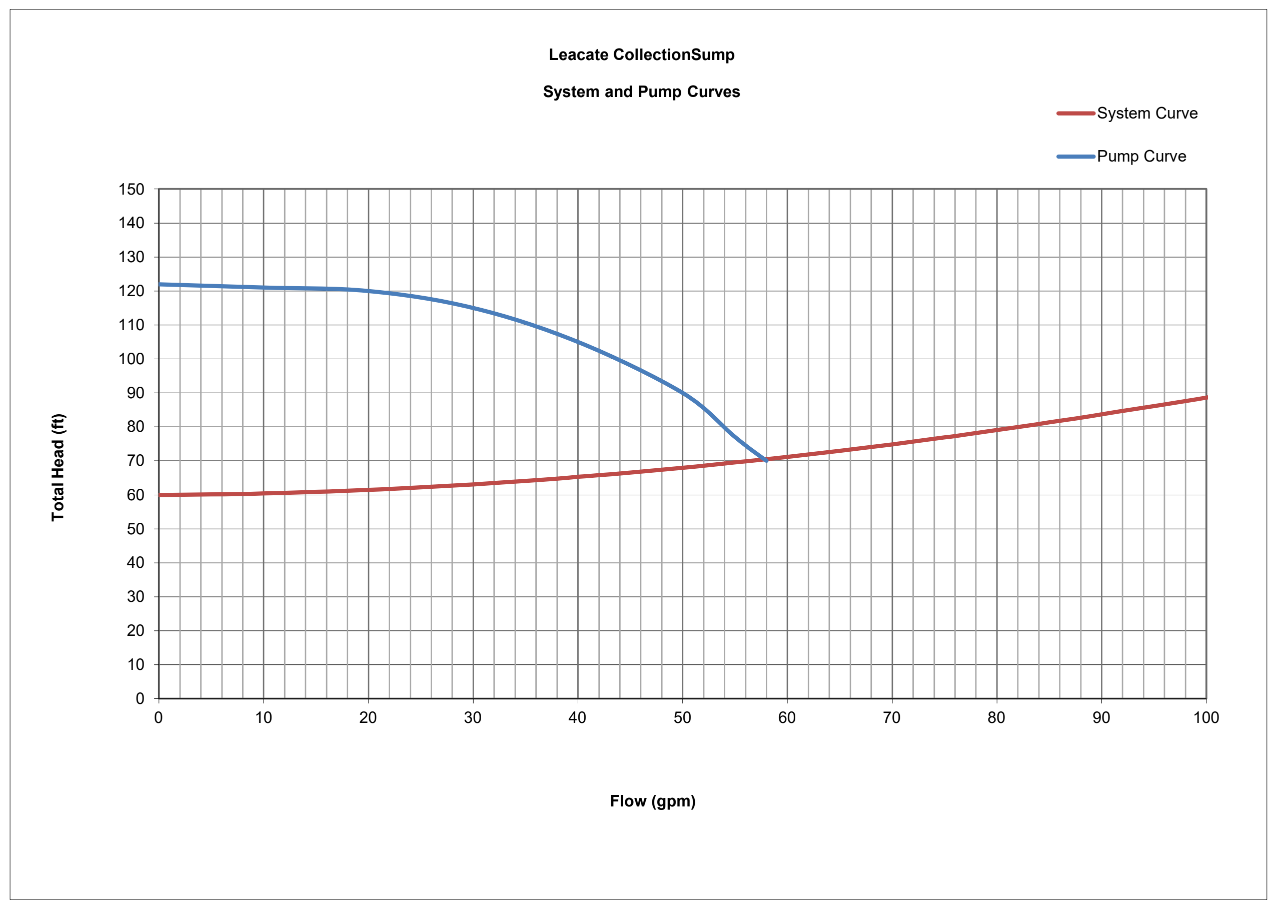
Fittings and Vales are assumed to be ar
pipe segment length: 15%

300	15.30	31.07	9.30	65.98	4.28	122.70	279.76	121.41
350	17.85	41.33	10.85	87.76	5.00	163.19	352.28	152.89
400	20.40	52.91	12.40	112.35	5.71	208.92	434.18	188.43
450	22.95	65.79	13.95	139.70	6.42	259.79	525.28	227.97
500	25.50	79.95	15.50	169.77	7.14	315.69	625.41	271.43

ARM GROUP LLC
CES LANDFILL _ SW4

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 9-4 ft
0	122
10	121
20	120
30	115
40	105
50	90
55	77
58	70



ARM GROUP LLC
CES LANDFILL _ SW4
LEACHATE COLLECTION SUMP SW4 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	**1516**					
Discharge Elev.	1515		Slope adjustment:			
Riser Elev.	**1576**					
H_z, Static Head	60		Plan length @ slope	**-**	feet	
			Slope	**26.57**	degrees	
Force Main length (ft)	**620**	SW4 to SW3	True length	-	feet	
Force Main length (ft)	**7610**	force main				
			Additional length	-		
			attributed to slope	-		

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Pump Selection:

10 gpm	**@**	**61**
Pump Model:	**EPG 5-4**	
HP :	1	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	34.9	inches
Pump Dia.:	5.25	inches
Unit Weight:	76	lbs

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	2.830	inches
d_2 =	2.830	inches
d_3 =	5.350	inches
Tie in Flow1=	5	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	160	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	93	ft
Minor losses =	1142	ft
Total L=	**713**	**ft**
Total L. of 6"=	**8752**	**ft**

System Curve

Q (gpm)	2" Piping L = 100 v_1 (ft/s)	2" Piping H_{f1} (feet)	4" Pipe L = 713 v_1 (ft/s)	4" Pipe H_{f1} (feet)	6" Pipe L = 8752 v_1 (ft/s)	6" Pipe H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	0.00	0.00	0.00	0.00	60.00	26.04
5	0.26	0.02	0.26	0.11	0.07	0.06	60.19	26.12
10	0.51	0.06	0.51	0.41	0.14	0.23	60.69	26.34
15	0.77	0.12	0.77	0.87	0.21	0.48	61.47	26.68
20	1.02	0.21	1.02	1.48	0.29	0.82	62.50	27.13
25	1.28	0.31	1.28	2.23	0.36	1.24	63.78	27.68
30	1.53	0.44	1.53	3.13	0.43	1.73	65.30	28.34
35	1.79	0.58	1.79	4.16	0.50	2.31	67.05	29.10
38	1.94	0.68	1.94	4.85	0.54	2.68	68.21	29.60
40	2.04	0.75	2.04	5.33	0.57	2.95	69.03	29.96
42	2.14	0.82	2.14	5.83	0.60	3.23	69.88	30.33
45	2.30	0.93	2.30	6.63	0.64	3.67	71.23	30.91
50	2.55	1.13	2.55	8.05	0.71	4.46	73.64	31.96
55	2.81	1.35	2.81	9.60	0.79	5.32	76.27	33.10
60	3.06	1.58	3.06	11.28	0.86	6.25	79.11	34.33
65	3.32	1.83	3.32	13.08	0.93	7.25	82.16	35.66
70	3.57	2.10	3.57	15.01	1.00	8.31	85.42	37.07
75	3.83	2.39	3.83	17.05	1.07	9.44	88.88	38.57
76	3.88	2.45	3.88	17.47	1.08	9.68	89.60	38.89
80	4.08	2.69	4.08	19.21	1.14	10.64	92.54	40.16
85	4.34	3.01	4.34	21.49	1.21	11.90	96.41	41.84
90	4.59	3.35	4.59	23.89	1.28	13.23	100.47	43.60
150	7.65	8.62	7.65	61.46	2.14	34.04	164.11	71.23
200	10.20	14.68	10.20	104.65	2.85	57.95	237.28	102.98
250	12.75	22.18	12.75	158.13	3.57	87.57	327.88	142.30
300	15.30	31.07	15.30	221.56	4.28	122.70	435.33	188.94

Minor losses:

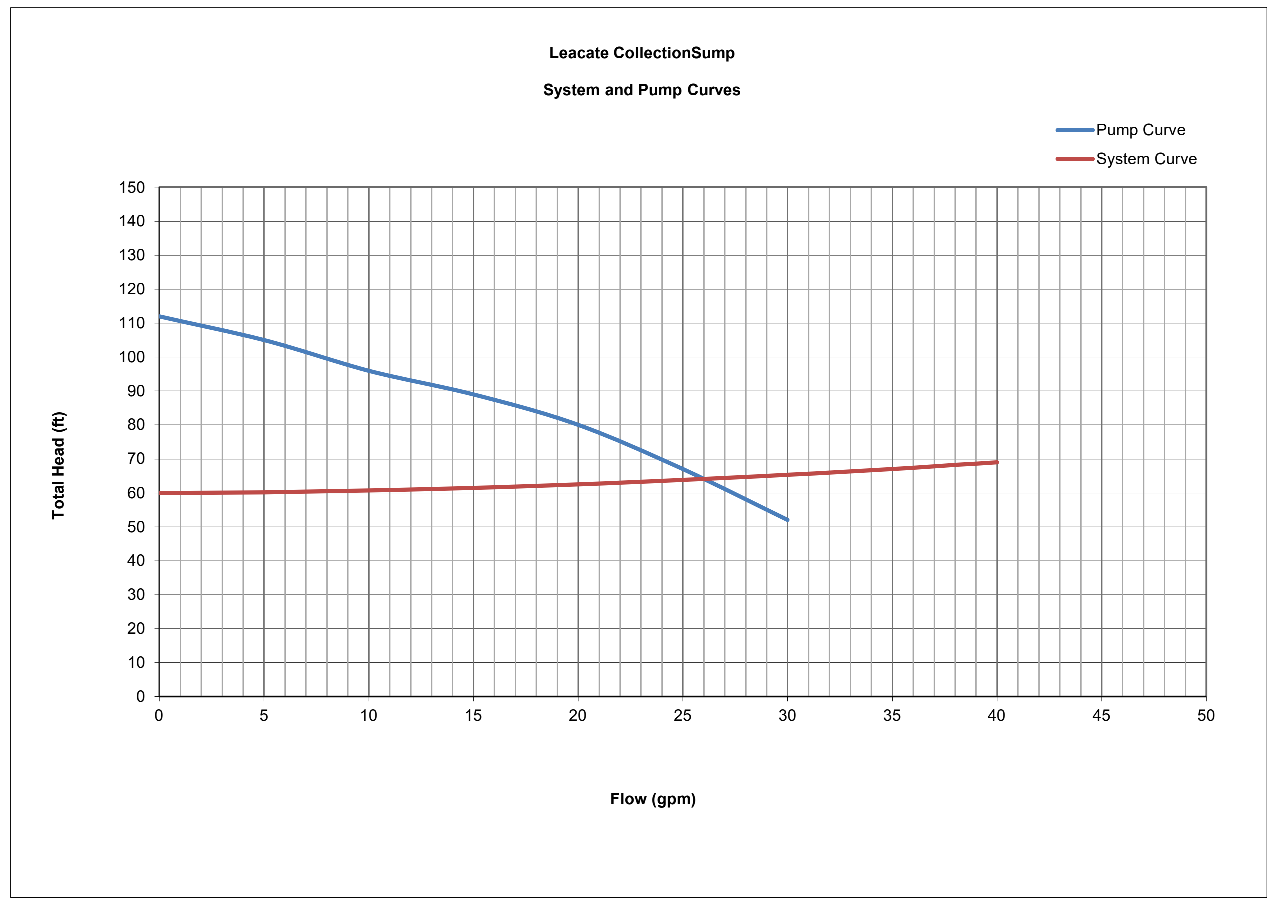
Fittings and Vales are assumed to be ar
pipe segment length: 15%

350	17.85	41.33	17.85	294.67	5.00	163.19	559.19	242.69
400	20.40	52.91	20.40	377.25	5.71	208.92	699.08	303.40
450	22.95	65.79	22.95	469.09	6.42	259.79	854.67	370.93
500	25.50	79.95	25.50	570.05	7.14	315.69	1025.69	445.15

ARM GROUP LLC
CES LANDFILL _ SW4

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 5-4 ft
0	112
5	105
10	96
15	89
20	80
25	67
30	52



ARM GROUP LLC
CES LANDFILL _ SW5
LEACHATE COLLECTION SUMP VOLUME CALCULATIONS

I. Background

The following analysis is provided to determine if the sump volume will accommodate the maximum leachate flow for the landfill expansion. Leachate collected within the sump will be removed using a side slope riser system that will not penetrate the liner system. A submersible pump inside the base of the riser system will convey leachate to the above-ground leachate storage tank. This calcuation will determine whether sufficient storage is available within the sump to allow accumulation of leachate, and to prevent the pump from short-cycling.

II. Design Parameters - Sump

	Units	
Max. Daily Flow Predicted by HELP	gpd	352,800
Max Flow Per Minute	gpm	245
Approximate Area of Sump	ft^2	601.00
Depth of Sump	ft	4
Void Ratio of Stone in Sump, e	-	0.4
Permeability of Stone in Sump, k	cm/sec	0.01
Permeability of Stone above Sump, k	cm/sec	0.01
Min. Slope for Sump Floor	%	2
Min. Operating Depth for Pumps	ft	1
Side Slope of Sump Pit	-	2:1
Sump Bottom Width, a	ft	18
Sump Bottom Length, b	ft	22
Sump Top Width, c	ft	34
Sump Top Length, d	ft	38

III. Calculations

a. Effective Sump, Stone Layer and Sand Layer Volumes

Although the total depth of the sump will be 4.0 ft, the effective volume of the sump will be dictated by the minimum operating depth determined by the pump manufacturer. It is assumed that the minimum operating depth for a horizontal pump is 12 in. (1.0 ft), reducing the effective depth of the sump to 3.0 ft. The following calculations determine the effective volume of voids, and thus the volume available for leachate storage:

Volume of Sump (Truncated Pyramid) =	1/6 x h x (axb +(a+c) x (b+d) +cxd)	
Effective Volume of Sump =	2,404.0	ft^3
Effective Volume of Voids in Sump =	(Effective Volume of Sump) x (e / (1+ e))	
Effective Volume of Voids in Sump =	686.9	ft^3
Effective Volume of Voids in Sump =	5,137.7	gallons

Total Void Volume	**687**	**ft^3**
Total Void Volume	**5,138**	**gallons**

c. Pump Cycling Rate

Determine the pump flow rate necessary to discharge the volume of the sump in the minimum permitted pump run time, in order to avoid short-cycling, or excessive numbers of pump starts:

Minumum Pump Run Time =	8	minutes	(per EPG)
Sump Volume =	5,138	gallons	
Maximum Pump Flow rate =	**642**	**gpm**	
Factor of Safety	2.0		
Maximum Pump Flow rate =	**321**	**gpm**	

IV. Summary

A sump with a bottom area (18'x22') and a top area (34'x36') containing gravel has sufficient capacity to accommodate the peak leachate flow predicted by the HELP Model and, with no inflow, can support two primary pump flow rates, each with a single flow rate of 165 gpm with a safety factor of 2.

V. Recommendations

1. Design assumptions associated with stone permeability and void ratio should be verified before initiating construction activities
2. Verify the pump manufacturer's minimum operating elevation is less than or equal to 1.0 ft.
3. Verify during installation of the pumps that pumps are at horizontal using measurements provided by the transducer.

ARM GROUP LLC
CES LANDFILL _ SW5
LEACHATE COLLECTION SUMP SW5 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1560				
Discharge Elev.	1524		Slope adjustment:		
Riser Elev.	1604				
H_z, Static Head	44		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	400	upto wet well	True length	-	feet
Force Main length (ft)	1900	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	2.830	inches
d_2 =	2.830	inches
d_3 =	3.630	inches
Tie in Flow1=	40	gpm
Tie in Flow2=	110	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	60	ft
Minor losses =	285	ft
Total L=	**460**	**ft**
Total L. of 6"=	**2185**	**ft**

Pump Selection:

40 gpm	**@**	**54**
Pump Model:	**EPG 9-4**	
HP :	1.5	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	42.66	inches
Pump Dia.:	5.25	inches
Unit Weight:	82	lbs

System Curve

	3" Piping L = 100		3" Pipe L = 460		4" Pipe L = 2185		(Hf_1+H_z)	
Q (gpm)	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**TDH (feet)**	**Pressure (psi)**
0	0.00	0.00	0.00	0.00	0.00	0.00	44.00	19.10
5	0.26	0.02	0.26	0.07	0.16	0.10	44.19	19.18
10	0.51	0.06	0.51	0.26	0.31	0.37	44.70	19.40
15	0.77	0.12	0.77	0.56	0.47	0.79	45.47	19.74
20	1.02	0.21	1.02	0.95	0.62	1.35	46.51	20.19
25	1.28	0.31	1.28	1.44	0.78	2.04	47.79	20.74
30	1.53	0.44	1.53	2.02	0.93	2.86	49.31	21.40
35	1.79	0.58	1.79	2.69	1.09	3.80	51.07	22.16
38	1.94	0.68	1.94	3.13	1.18	4.42	52.23	22.67
40	2.04	0.75	2.04	3.44	1.24	4.86	53.05	23.02
42	2.14	0.82	2.14	3.76	1.30	5.32	53.90	23.39
45	2.30	0.93	2.30	4.27	1.40	6.05	55.25	23.98
50	2.55	1.13	2.55	5.19	1.55	7.35	57.67	25.03
55	2.81	1.35	2.81	6.20	1.71	8.77	60.31	26.17
60	3.06	1.58	3.06	7.28	1.86	10.30	63.16	27.41
65	3.32	1.83	3.32	8.44	2.02	11.94	66.22	28.74
70	3.57	2.10	3.57	9.68	2.17	13.69	69.48	30.15
75	3.83	2.39	3.83	11.00	2.33	15.56	72.95	31.66
76	3.88	2.45	3.88	11.27	2.36	15.95	73.67	31.97
80	4.08	2.69	4.08	12.39	2.48	17.53	76.62	33.25
85	4.34	3.01	4.34	13.86	2.64	19.61	80.49	34.93
90	4.59	3.35	4.59	15.41	2.79	21.80	84.56	36.70
100	5.10	4.07	5.10	18.73	3.10	26.49	93.29	40.49
110	5.61	4.86	5.61	22.34	3.41	31.60	102.80	44.61
150	7.65	8.62	7.65	39.65	4.65	56.09	148.36	64.39
200	10.20	14.68	10.20	67.51	6.20	95.50	221.70	96.22
250	12.75	22.18	12.75	102.02	7.75	144.31	312.51	135.63
300	15.30	31.07	15.30	142.94	9.30	202.21	420.22	182.38

Minor losses:

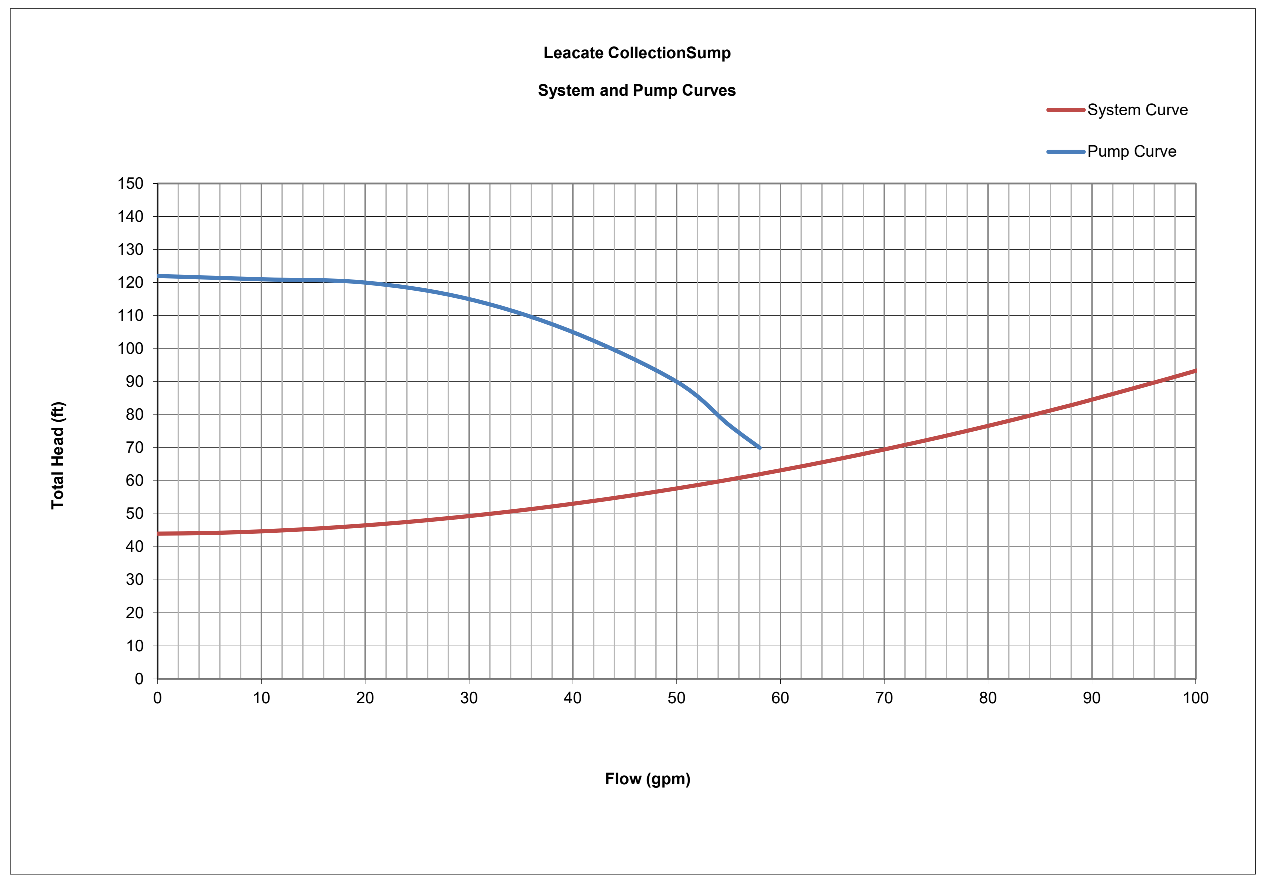
Fittings and Vales are assumed to be ai
pipe segment length: 15%

346.00	17.65	40.46	17.65	186.11	10.73	263.28	533.85	231.69
394.00	20.10	51.45	20.10	236.68	12.22	334.80	666.93	289.45

ARM GROUP LLC
CES LANDFILL _ SW5

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 9-4 ft
0	122
10	121
20	120
30	115
40	105
50	90
55	77
58	70



ARM GROUP LLC
CES LANDFILL _ SW5
LEACHATE COLLECTION SUMP SW5 - SYSTEM HEAD CALCULATIONS: FINAL CONDITION

Conditions

Intake Elev.	1484				
Discharge Elev.	1515		Slope adjustment:		
Riser Elev.	1537				
H_z, Static Head	53		Plan length @ slope	-	feet
			Slope	26.57	degrees
Force Main length (ft)	400	riser	True length	-	feet
Force Main length (ft)	1900	force main			
			Additional length attributed to slope	-	

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	-	
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Peak flow: - **gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.
Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f =	Friction Loss in feet	
Q =	Flow in gallons per minute	
C =	130	
d_1 =	1.920	inches
d_2 =	2.830	inches
d_3 =	3.630	inches
Tie in Flow1=	5	gpm
Tie in Flow2=	80	gpm
Tie in Flow3=	160	gpm

And:

Flow area, A =	0.0437	sq. ft.
L =	-	ft
Minor losses =	60	ft
Minor losses =	285	ft
Total L=	**460**	**ft**
Total L. of 6"=	**2185**	**ft**

Pump Selection:

10 gpm	**@**	**54**
Pump Model:	**EPG 5-4**	
HP :	1	1x230V,60hz
Speed:	-	rpm
Discharge Dia.:	1.5	inches, NPT
Pump Height:	34.9	inches
Pump Dia.:	5.25	inches
Unit Weight:	76	lbs

System Curve

	2" Piping L = 100		3" Pipe L = 460		6" Pipe L = 2185		$(H_{f1}+H_z)$	
Q (gpm)	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**v_1 (ft/s)**	**H_{f1} (feet)**	**TDH (feet)**	**Pressure (psi)**
0	0.00	0.00	0.00	0.00	0.00	0.00	53.00	23.00
5	0.55	0.11	0.26	0.07	0.16	0.10	53.28	23.12
10	1.11	0.38	0.51	0.26	0.31	0.37	54.02	23.44
15	1.66	0.80	0.77	0.56	0.47	0.79	55.16	23.94
20	2.22	1.37	1.02	0.95	0.62	1.35	56.67	24.60
25	2.77	2.07	1.28	1.44	0.78	2.04	58.55	25.41
30	3.32	2.90	1.53	2.02	0.93	2.86	60.77	26.38
35	3.88	3.85	1.79	2.69	1.09	3.80	63.34	27.49
38	4.21	4.49	1.94	3.13	1.18	4.42	65.04	28.23
40	4.43	4.94	2.04	3.44	1.24	4.86	66.24	28.75
42	4.65	5.40	2.14	3.76	1.30	5.32	67.49	29.29
45	4.99	6.14	2.30	4.27	1.40	6.05	69.46	30.15
50	5.54	7.46	2.55	5.19	1.55	7.35	73.00	31.68
55	6.10	8.90	2.81	6.20	1.71	8.77	76.86	33.36
60	6.65	10.45	3.06	7.28	1.86	10.30	81.02	35.16
65	7.20	12.12	3.32	8.44	2.02	11.94	85.50	37.11
70	7.76	13.90	3.57	9.68	2.17	13.69	90.27	39.18
75	8.31	15.79	3.83	11.00	2.33	15.56	95.35	41.38
76	8.42	16.18	3.88	11.27	2.36	15.95	96.40	41.84
80	8.87	17.79	4.08	12.39	2.48	17.53	100.72	43.71
85	9.42	19.90	4.34	13.86	2.64	19.61	106.38	46.17
90	9.97	22.12	4.59	15.41	2.79	21.80	112.33	48.75
150	16.62	56.92	7.65	39.65	4.65	56.09	205.66	89.26
200	22.16	96.92	10.20	67.51	6.20	95.50	312.93	135.81
250	27.70	146.45	12.75	102.02	7.75	144.31	445.78	193.47
300	33.25	205.19	15.30	142.94	9.30	202.21	603.34	261.85
350	38.79	272.91	17.85	190.11	10.85	268.93	784.96	340.67
400	44.33	349.38	20.40	243.39	12.40	344.30	990.07	429.69

Minor losses:

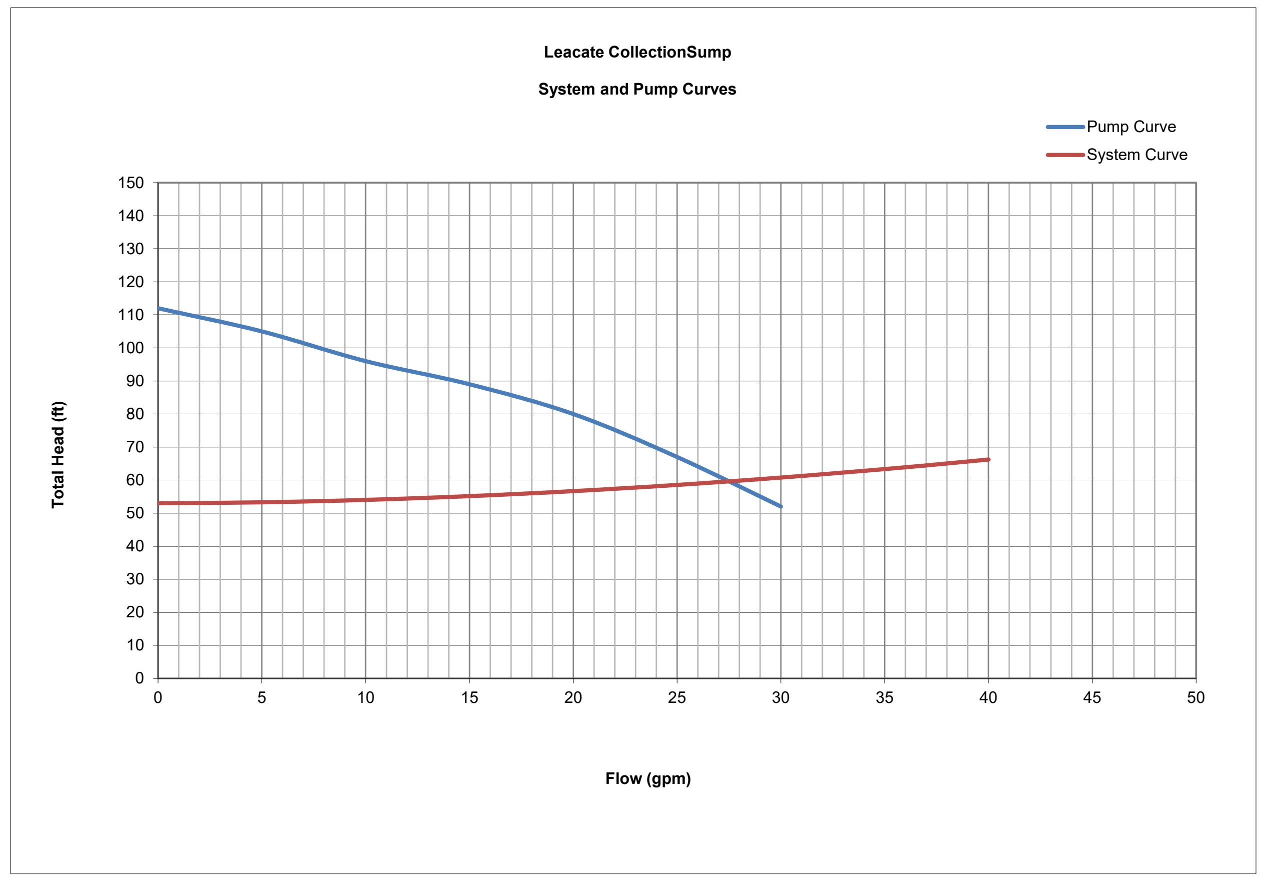
Fittings and Vales are assumed to be a
pipe segment length: 15%

450	49.87	434.45	22.95	302.64	13.95	428.12	1218.20	528.70
500	55.41	527.94	25.50	367.77	15.50	520.25	1468.97	637.53

ARM GROUP LLC
CES LANDFILL _ SW5

LEACHATE COLLECTION SUMP - SYSTEM AND PUMP CURVES: FINAL CONDITION

Flow gpm	EPG 5-4 ft
0	112
5	105
10	96
15	89
20	80
25	67
30	52



ARM GROUP LLC
CES LANDFILL _ PRIMARY WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Volume (gallons)	350.00
Volume (CF)	46.79144385

pump off (ft from bottom of Wet Well) =	2
pump on (ft from top of Wet Well or gs) =	8.1
stick up (ft from ground) =	0.83

Wet Well D (in)	Wet Well ID (in)	Wet Well ID (ft)	A (SF)	material	liquid level (ft)	depth of Wet Well (ft)
24	21.007	1.751	2.406	HDPE SDR 17	19.45	30.38
26	22.759	1.897	2.824	HDPE SDR 17	16.57	27.50
28	24.508	2.042	3.274	HDPE SDR 17	14.29	25.22
30	26.258	2.188	3.759	HDPE SDR 17	12.45	23.38
32	28.010	2.334	4.277	HDPE SDR 17	10.94	21.87
34	29.760	2.480	4.828	HDPE SDR 17	9.69	20.62
36	31.510	2.626	5.413	HDPE SDR 17	8.64	19.57
42	37.760	3.147	7.773	HDPE SDR 21	6.02	16.95
48	43.154	3.596	10.152	HDPE SDR 21	4.61	15.54
54	48.549	4.046	12.849	HDPE SDR 21	3.64	14.57
60	60.000	5.000	19.625	spirolite	2.38	13.31
72	72.000	6.000	28.260	spirolite	1.66	12.59
84	84.000	7.000	38.465	spirolite	1.22	12.15
96	96.000	8.000	50.240	spirolite	0.93	11.86
108	108.000	9.000	63.585	spirolite	0.74	11.67
120	120.000	10.000	78.500	spirolite	0.60	11.53

Sumarized Wet Well Sizing

Inflow	=	70	gpm
Number of Pumps	=	2	Lead and Lag
Peak Flow, Qpk	=	70	gpm
Pumping rate per pump	=	240	gpm
storage volume	=	350	gallons
(5-minutes running time)		47	ft3
Wet well diameter	=	6	ft.
Wet well surface area	=	28	sf.
Min. depth required	=	2.00	ft.
Active Storage volume, V	=	57	ft3
	=	423	gal

						Inflow into Wet Well							
Influent From	**To**	**Event**			**Duration (min)**	**GPM - IN**	**GAL - IN**	**LIQUID - IN (FT)**	**Elev- IN**	**GPM - OUT**	**GAL - OUT**	**LIQUID - OUT (FT)**	**Elev - Out**
		Sump											
CES Existing Sump, Primary 4" Gravity Leachate	Relocated LTP	On			5	70	350.00	0.00	0.00	0	0	0	0
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00

ARM GROUP LLC
CES LANDFILL _ PRIMARY WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Conditions

Pump Elev.	1540.6		Slope adjustment:		
Discharge Elev.	1524				
High Point Elev.	1560		Plan length @ slope	0	feet
H_z, Static Head	19.4		Slope	26.57	degrees
Force Main length	1900	to tank	True length	0	feet
Height of tank	34	feet			
			Additional length attributed to slope	-	
Total length	1934				

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	Run 1	
Average Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Average flow:	**-**	**gpm**
Peak flow:	**70.00**	**gpm**

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.
Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f = Friction Loss in feet
Q = Flow in gallons per minute
C = 130
d_1 = 3.630 inches
d_2 = 3.630 inches

And:

Flow area, A = 0.0719 sq. ft.
L = 1934 ft
Minor losses = 290 ft
Total L= 2224 ft
Total L. in Wet Well=

Pump Selection:

30 gpm @ 23 feet TDH

Pump Model:	**SS-50**	Stancor
hp :	0.5	1ph
Discharge Dia.:	2	inches
Pump Height:	26.28	inches
Pump Dia.:	4.5	inches

System Curve

	In Wet Well 4" Pipe L = 2224		(Hf_1+H_z)	
Q (gpm)	**v_1 (ft/s)**	**H_{f1} (feet)**	**TDH (feet)**	**Pressure (psi)**
0	0.00	0.00	19.40	8.42
10	0.31	0.38	19.78	8.58
20	0.62	1.37	20.77	9.02
30	0.93	2.91	22.31	9.68
40	1.24	4.95	24.35	10.57
50	1.55	7.48	26.88	11.67
60	1.86	10.48	29.88	12.97
70	2.17	13.94	33.34	14.47
80	2.48	17.85	37.25	16.16
90	2.79	22.19	41.59	18.05
100	3.10	26.97	46.37	20.12
110	3.41	32.17	51.57	22.38
120	3.72	37.78	57.18	24.82
130	4.03	43.81	63.21	27.44
140	4.34	50.25	69.65	30.23
150	4.65	57.09	76.49	33.20
160	4.96	64.33	83.73	36.34
170	5.27	71.97	91.37	39.65
180	5.58	80.00	99.40	43.14
190	5.89	88.41	107.81	46.79
200	6.20	97.21	116.61	50.61

Minor losses:

Fittings and Vales are assumed to be an additional percent of the total pipe segment length: 15%

Minimum Sump Volume:

$$T(\min) = \frac{V(\min)}{Q(in)} + \frac{V(\min)}{Q(out)-Q(in)} \rightarrow V_{\min} = \frac{T_{\min} x Q_{out}}{4}$$

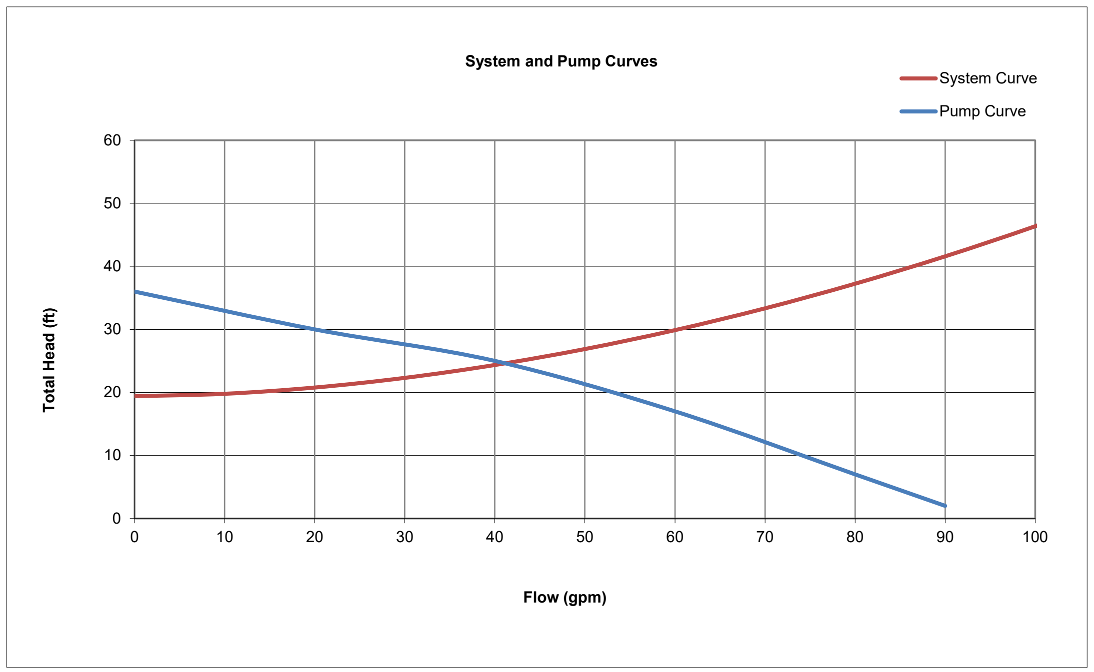
Based on minimum pump run time of 5-20 minutes, 5 minutes and no additional inflow:

T_{min}= 5 min (based on 6 starts/hour)
Q_{out}= 30 gpm
V_{min}= 150 gallons
V_{min}= 20 cu.ft.

20 cu.ft. << 57 cu.ft. OK

ARM GROUP LLC
CES LANDFILL _ WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Flow gpm	SS-50 ft
0	36
20	30
40	25
60	17
80	7
90	2



ARM GROUP LLC
CES LANDFILL _ SECONDARY WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Volume (gallons)	50.00
Volume (CF)	6.684491979
pump off (ft from bottom of Wet Well) =	2
pump on (ft from top of Wet Well or gs) =	8.1
stick up (ft from ground) =	0.83

Wet Well D (in)	Wet Well ID (in)	Wet Well ID (ft)	A (SF)	material	liquid level (ft)	depth of Wet Well (ft)
24	21.007	1.751	2.406	HDPE SDR 17	2.78	13.71
26	22.759	1.897	2.824	HDPE SDR 17	2.37	13.30
28	24.508	2.042	3.274	HDPE SDR 17	2.04	12.97
30	26.258	2.188	3.759	HDPE SDR 17	1.78	12.71
32	28.010	2.334	4.277	HDPE SDR 17	1.56	12.49
34	29.760	2.480	4.828	HDPE SDR 17	1.38	12.31
36	31.510	2.626	5.413	HDPE SDR 17	1.23	12.16
42	37.760	3.147	7.773	HDPE SDR 21	0.86	11.79
48	43.154	3.596	10.152	HDPE SDR 21	0.66	11.59
54	48.549	4.046	12.849	HDPE SDR 21	0.52	11.45
60	60.000	5.000	19.625	spirolite	0.34	11.27
72	72.000	6.000	28.260	spirolite	0.24	11.17
84	84.000	7.000	38.465	spirolite	0.17	11.10
96	96.000	8.000	50.240	spirolite	0.13	11.06
108	108.000	9.000	63.585	spirolite	0.11	11.04
120	120.000	10.000	78.500	spirolite	0.09	11.02

Sumarized Wet Well Sizing

Inflow	=	10	gpm
Number of Pumps	=	2	Lead and Lag
Peak Flow, Qpk	=	10	gpm
Pumping rate per pump	=	240	gpm
storage volume	=	50	gallons
(5-minutes running time)		7	ft3
Wet well diameter	=	5	ft.
Wet well surface area	=	20	sf.
Min. depth required	=	0.50	ft.
Active Storage volume, V	=	10	ft3
	=	73	gal

						Inflow into Wet Well								
Influent From	**To**	**Event**			**Duration (min)**	**GPM - IN**	**GAL - IN**	**LIQUID - IN (FT)**	**Elev- IN**	**GPM - OUT**	**GAL - OUT**	**LIQUID - OUT (FT)**	**Elev - Out**
		Sump											
CES Existing Sump, Secondary 4" Gravity Leachate	Relocated LTP	On			5	10	50.00	0.00	0.00	0	0	0	0
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00
					0	0	0.00	0.00	0.00	0	0	0.00	0.00

ARM GROUP LLC
CES LANDFILL _SECONDARY WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Conditions

Pump Elev.	1540.6		Slope adjustment:		
Discharge Elev.	1524				
High Point Elev.	1560				
H_z, Static Head	19.4		Plan length @ slope	0	feet
			Slope	26.57	degrees
Force Main length	1900	to tank	True length	0	feet
Height of tank	34	feet			
			Additional length attributed to slope	-	
Total length	1934				

The Hazen-Williams formula is used to determine friction loss in the piping system under a range of flow conditions.

Hazen-Williams Formula:

$$h_f = 0.002083L\left(\frac{100}{C}\right)^{1.85185}\left(\frac{1}{d^{4.8655}}\right)$$

Where:

h_f = Friction Loss in feet
Q = Flow in gallons per minute
C = 130
d_1 = 2.830 inches
d_2 = 2.830 inches

And:

Flow area, A =	0.0437	sq. ft.
L =	1934	ft
Minor losses =	290	ft
Total L=	2224	ft
Total L. in Wet Well=		

Design Flow:

Landfill Liner Area:	-	Acres
HELP model result:	Run 1	
Average Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd
Peak Flow based on HELP Model	-	gal/acre/day
Leachate generation:	-	gpd

Design Flow Conditions

Average flow:	**-**	**gpm**
Peak flow:	**10.00**	**gpm**

Pump Selection:

10 gpm @ 21 feet TDH

Pump Model:	**SS-50**	Stancor
hp :	0.5	1ph
Discharge Dia.:	2	
Pump Height:	26.28	inches
Pump Dia.:	4.5	inches

System Curve

Q (gpm)	In Wet Well 3" Pipe L = 2224 v_1 (ft/s)	H_{f1} (feet)	(Hf_1+H_z) TDH (feet)	Pressure (psi)
0	0.00	0.00	19.40	8.42
10	0.51	1.28	20.68	8.97
20	1.02	4.61	24.01	10.42
30	1.53	9.76	29.16	12.66
40	2.04	16.62	36.02	15.63
50	2.55	25.12	44.52	19.32
60	3.06	35.19	54.59	23.69
70	3.57	46.81	66.21	28.73
80	4.08	59.92	79.32	34.43
90	4.59	74.51	93.91	40.76
100	5.10	90.55	109.95	47.72
110	5.61	108.01	127.41	55.30
120	6.12	126.87	146.27	63.48
130	6.63	147.12	166.52	72.27
140	7.14	168.74	188.14	81.65
150	7.65	191.71	211.11	91.62
160	8.16	216.02	235.42	102.17
170	8.67	241.66	261.06	113.30
180	9.18	268.62	288.02	125.00
190	9.69	296.88	316.28	137.26
200	10.20	326.43	345.83	150.09

Minor losses:

Fittings and Vales are assumed to be an additional percent of the total pipe segment length: 15%

Minimum Sump Volume:

$$T(\min) = \frac{V(\min)}{Q(in)} + \frac{V(\min)}{Q(out) - Q(in)} \rightarrow V_{\min} = \frac{T_{\min} x Q_{out}}{4}$$

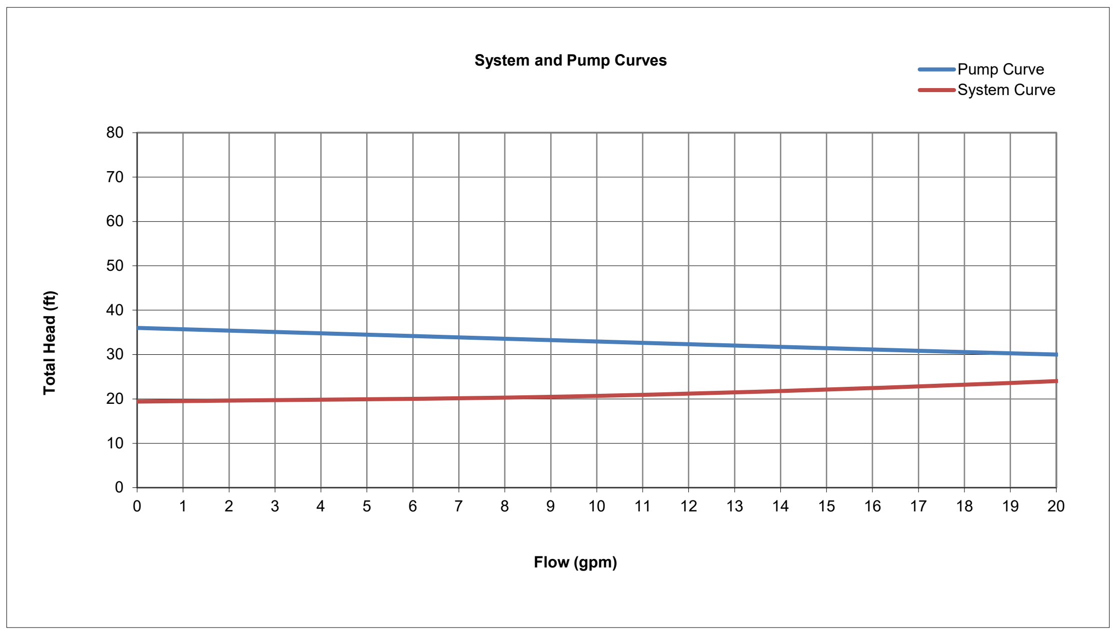
Based on minimum pump run time of 5-20 minutes, 5 minutes and no additional inflow:

T_{min}=	5	min (based on 6 starts/hour)
Q_{out}=	10	gpm
V_{min}=	50	gallons
V_{min}=	7	cu.ft.

7 cu.ft. << 10 cu.ft. OK

ARM GROUP LLC
CES LANDFILL _ SECONDARY WET WELL FOR NORTHERN EXPANSION SUMP DRAINAGE
LEACHATE COLLECTION SUMP WET WELL - SYSTEM HEAD CALCULATIONS: WORST-CASE CONDITION

Flow gpm	SS-50 ft
0	36
20	30
40	25
60	17
80	7
90	2

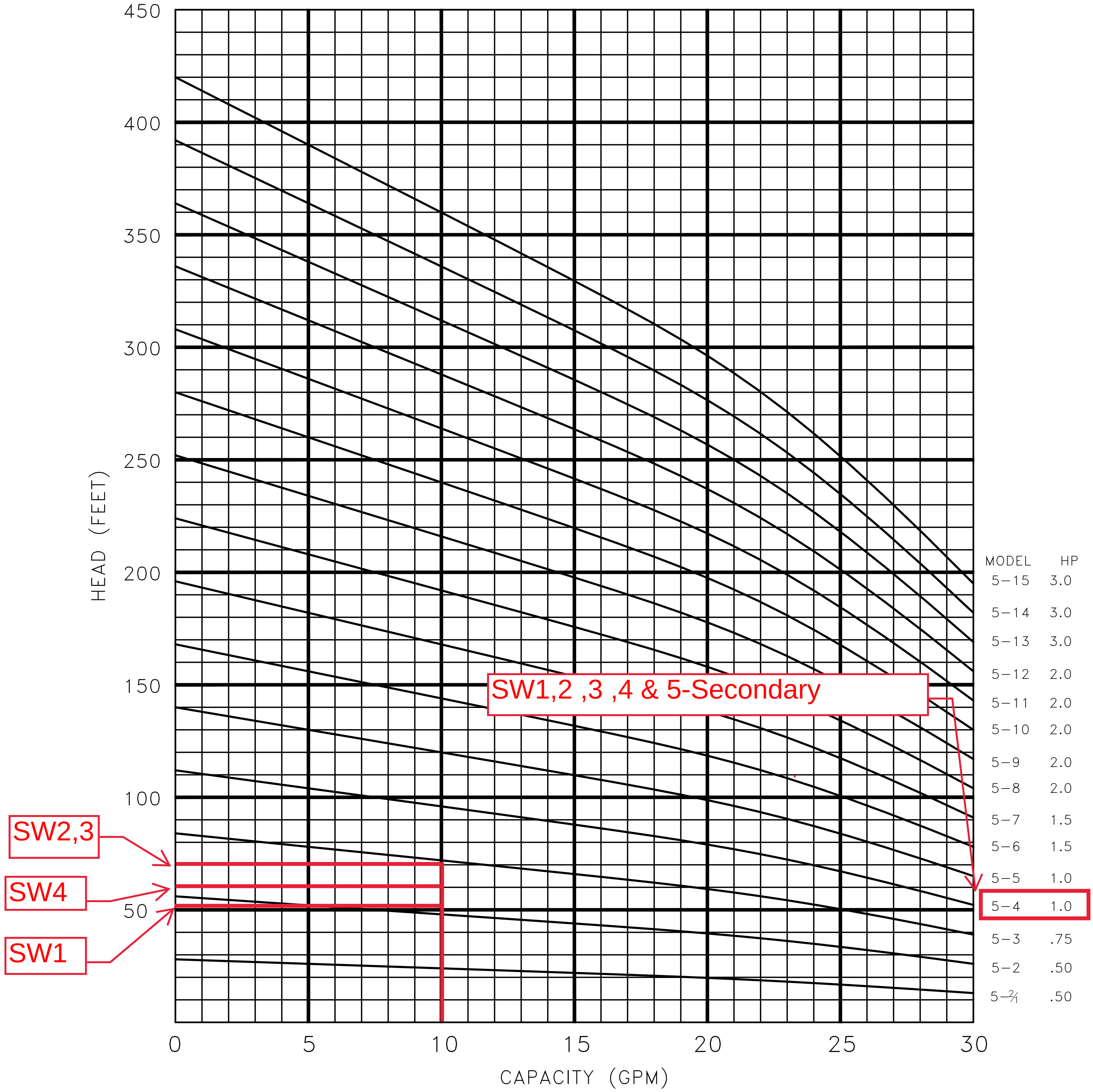


Pump Curves

SERIES 5 SurePump™

Flow Range 15–30 GPM

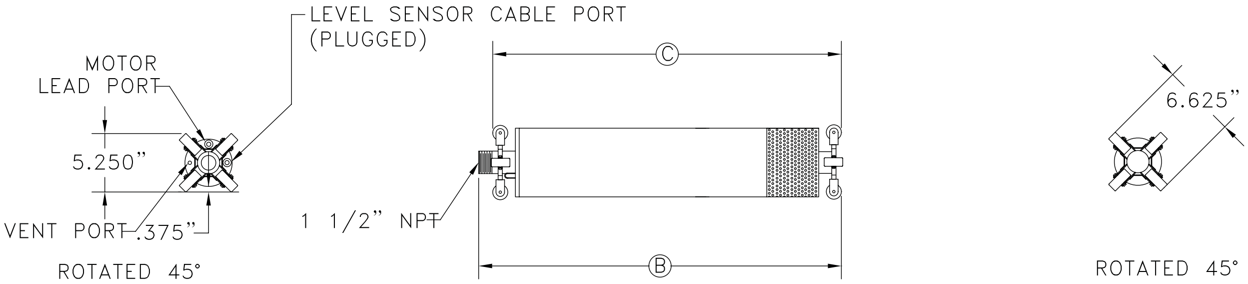
60 Hz



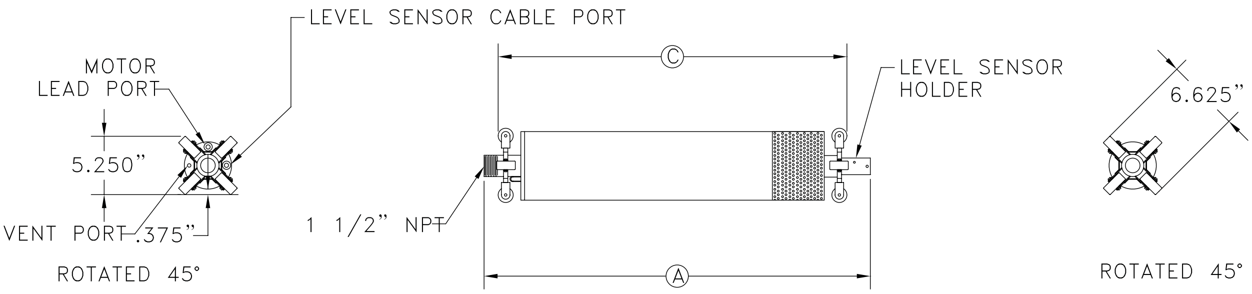
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

05773–0000

SERIES 5 SIZE 4 SUMP DRAINER



WSD



WSDPT

MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT	
						WSD	WSDPT
5-2	0.50	1	31.02	29.90	29.15	61.47	66.47
5-2	0.50	3	31.02	29.90	29.15	61.47	66.47
5-3	0.75	1	32.98	31.86	31.11	66.24	71.24
5-3	0.75	3	32.98	31.86	31.11	66.24	71.24
5-4	1.00	1	34.90	33.78	33.03	70.98	75.98
5-4	1.00	3	34.90	33.78	33.03	70.98	75.98
5-5	1.00	1	35.73	34.61	33.86	71.88	76.88
5-5	1.00	3	35.73	34.61	33.86	71.88	76.88
5-6	1.50	1	38.43	37.31	36.56	79.22	84.22
5-6	1.50	3	36.56	35.44	34.69	72.77	77.77
5-7	1.50	1	39.26	38.14	37.39	80.12	85.12
5-7	1.50	3	37.39	36.27	35.52	73.67	78.67
5-8	2.00	1	41.59	40.47	39.72	85.17	90.17
5-8	2.00	3	40.09	38.97	38.22	81.01	86.01

MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT	
						WSD	WSDPT
5-9	2.00	1	42.42	41.30	40.55	86.07	91.07
5-9	2.00	3	40.92	39.80	39.05	81.90	86.90
5-10	2.00	1	43.25	42.13	41.38	86.96	91.96
5-10	2.00	3	41.75	40.63	39.88	82.80	87.80
5-11	2.00	1	44.08	42.96	42.21	87.86	92.86
5-11	2.00	3	42.58	41.46	40.71	83.69	88.69
5-12	2.00	1	44.91	43.79	43.04	88.75	93.75
5-12	2.00	3	53.41	52.29	51.54	92.35	97.35
5-13	3.00	1	54.24	53.12	52.37	119.24	124.24
5-13	3.00	3	51.24	50.12	49.37	105.91	110.91
5-14	3.00	1	55.07	53.95	53.20	120.14	125.14
5-14	3.00	3	52.07	50.95	50.20	106.81	111.81
5-15	3.00	1	55.90	54.78	54.03	121.03	126.03
5-15	3.00	3	52.90	51.78	51.03	107.70	112.70

NOTE: ALL DIMENSIONS ARE IN INCHES.

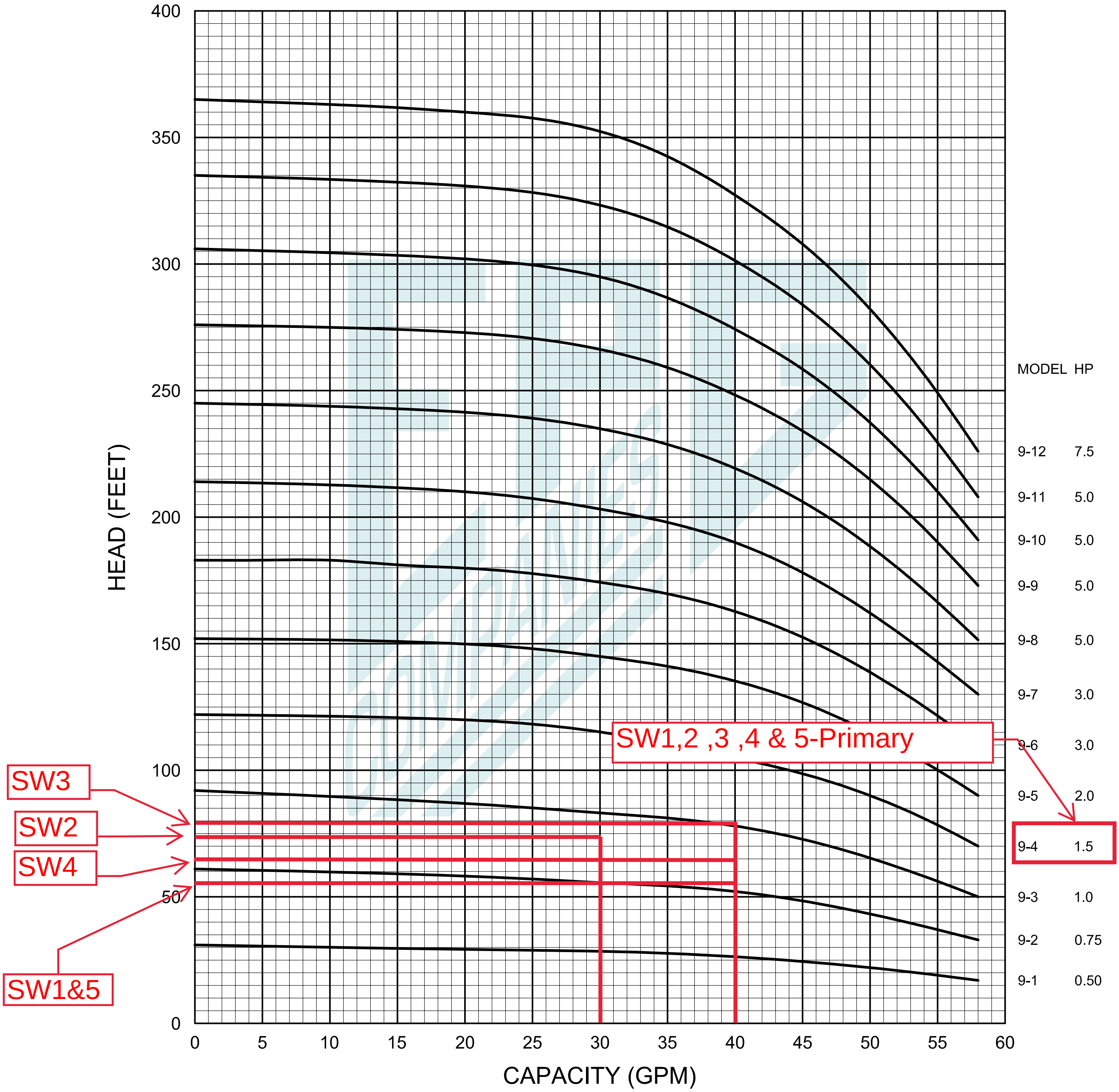
*SHIPPING WEIGHT INCLUDES
WSD: CRATE, 50' OF 14-4 MOTOR LEAD, 50' OF 1/8" SS CABLE.
WSDPT: CRATE, 50' OF 14-4 MOTOR LEAD, 50' OF 1/8" SS CABLE, LEVEL SENSOR AND CABLE.

05773-0010

Series 9 SurePump™

Flow Range 20 - 50 GPM

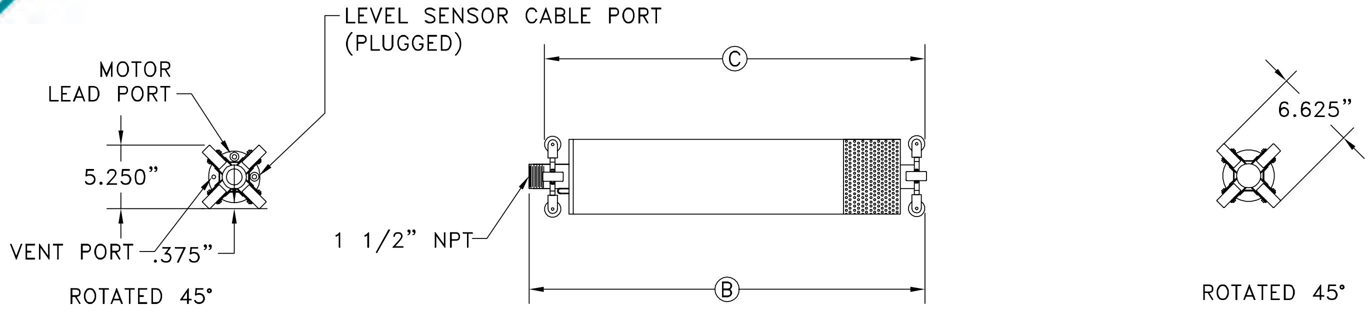
60 Hz



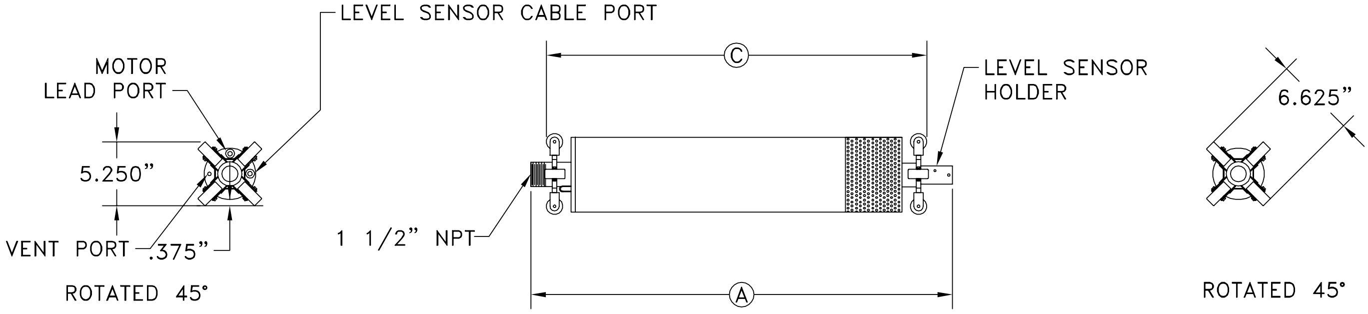
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

09949-0000

SERIES 9 SIZE 4 SUMP DRAINER



WSD



WSDPT

MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT WSD	WSDPT
9-1	0.50	1	32.66	31.54	30.79	62.79	67.79
9-1	0.50	3	32.66	31.54	30.79	62.79	67.79
9-2	0.75	1	35.76	34.64	33.89	68.95	68.95
9-2	0.75	3	35.76	34.64	33.89	68.95	68.95
9-3	1.00	1	38.82	37.71	36.95	75.08	80.08
9-3	1.00	3	38.82	37.71	36.95	75.08	80.08
9-4	1.50	1	42.66	41.54	40.79	77.36	82.36
9-4	1.50	3	40.79	39.67	38.92	77.36	82.36
9-5	2.00	1	46.13	45.01	44.26	86.09	91.09
9-5	2.00	3	44.63	43.51	42.76	79.64	84.64
9-6	3.00	1	56.19	55.07	54.32	92.53	97.53
9-6	3.00	3	53.19	52.07	51.32	88.37	93.37

MODEL	HP	PHASE	A	B	C	*APPROX. SHIPPING WEIGHT WSD	WSDPT
9-7	3.00	1	58.16	57.04	56.29	94.81	99.81
9-7	3.00	3	55.16	54.01	53.29	90.65	95.65
9-8	5.00	1	66.13	65.01	64.26	126.69	131.69
9-8	5.00	3	60.13	59.01	58.26	113.36	118.36
9-9	5.00	1	68.10	66.98	66.23	128.97	133.97
9-9	5.00	3	62.10	60.98	60.23	115.64	120.64
9-10	5.00	1	70.07	68.95	68.20	150.91	155.91
9-10	5.00	3	64.07	62.95	62.20	131.25	136.25
9-11	5.00	1	72.04	70.92	70.17	153.19	158.19
9-11	5.00	3	66.04	64.92	64.17	133.53	138.53

NOTE: ALL DIMENSIONS ARE IN INCHES.

*SHIPPING WEIGHT INCLUDES
WSD: CRATE, 50' OF 14-4 MOTOR LEAD, 50' OF 1/8" SS CABLE.
WSDPT: CRATE, 50' OF 14-4 MOTOR LEAD, 50' OF 1/8" SS CABLE, LEVEL SENSOR AND CABLE.

09949-0010

EPG Companies Inc.
19900 County Rd. 81
Maple grove MN 55311

STANCOR Pump & Control Solutions	**TECHNICAL DATA**	**AVENGER SERIES**	**SS-50**
	Dwg: DS-A07-001 **Rev:** 4 **Date:** 11/17		

MOTOR SPECIFICATIONS

Motor Design	Induction
Motor Type	Enclosed submersible
Insulation Class	Class B
Motor Protection	Bi-metallic Thermal Switch
Bi-Metallic Temp Trip	120° C ± 5° C
Service Factor	1.15
Voltage Tolerance	± 10% from nominal

MOTOR DATA, 60Hz

Model	Phase	Output Power BHP	Volts	Full Load Amps	Locked Rotor Amps	NEMA Code Letter	Power Factor 100% Load	Motor Efficiency 100% Load	Pole/ Speed (rpm)
SS-50	1	0.5	115	8	40	L	0.957	0.571	2/3450
	1	0.5	208	4.4	22	L	0.964	0.583	2/3450
	1	0.5	230	4	20	L	0.990	0.597	2/3450
	3	0.5	208	3.1	15.5	M	0.804	0.612	2/3450
	3	0.5	230	2.8	14	M	0.792	0.675	2/3450
	3	0.5	460	1.4	7	M	0.854	0.595	2/3450
	3	0.5	575	1.2	6	N	0.783	0.668	2/3450

MATERIALS OF CONSTRUCTION

Upper Motor Lid	AISI Stainless Steel 316
Motor Housing	AISI Stainless Steel 316
Oil Chamber	AISI Stainless Steel 316
Volute	AISI Stainless Steel 316
External Hardware	AISI 316 Stainless Steel
O-Rings	FKM
Motor Shaft	AISI Stainless Steel 316 (in pumped media)
Upper Bearing	Single row, doubled sealed
Lower Bearing(s)	Single row, doubled sealed
Upper Shaft Seal	CA/CE (carbon/ceramic)
Lower Shaft Seal	SIC/SIC (silicon carbide/silicon carbide)
Impeller	AISI Stainless Steel 316

DIMENSIONS, WEIGHT, AND MISC.

Pump weight single phase	29lbs (13kg)
Pump weight three phase	29lbs (13kg
Maximum submergence	33 feet (10m)
Discharge size, standard	2 inch NPS female vertical
Maximum temp. of pumped fluid	104°F (40°C)
Free Passage size	1.38” (35mm)

CABLE SPECIFICATIONS 60Hz

MODEL	PHASE/VOLTAGE	POWER CABLE	LENGTH	OUTER JACKET
SS-50	1Ø-115V	SJTOW 16/3	33' (10m)	PVC
	1Ø-208V	SJTOW 16/3	33' (10m)	PVC
	1Ø-230V	SJTOW 16/3	33' (10m)	PVC
	3Ø-208V	STOW 16/4	33' (10m)	PVC
	3Ø-230V	STOW 16/4	33' (10m)	PVC
	3Ø-460V	STOW 16/4	33' (10m)	PVC
	3Ø-575V	STOW 16/4	33' (10m)	PVC

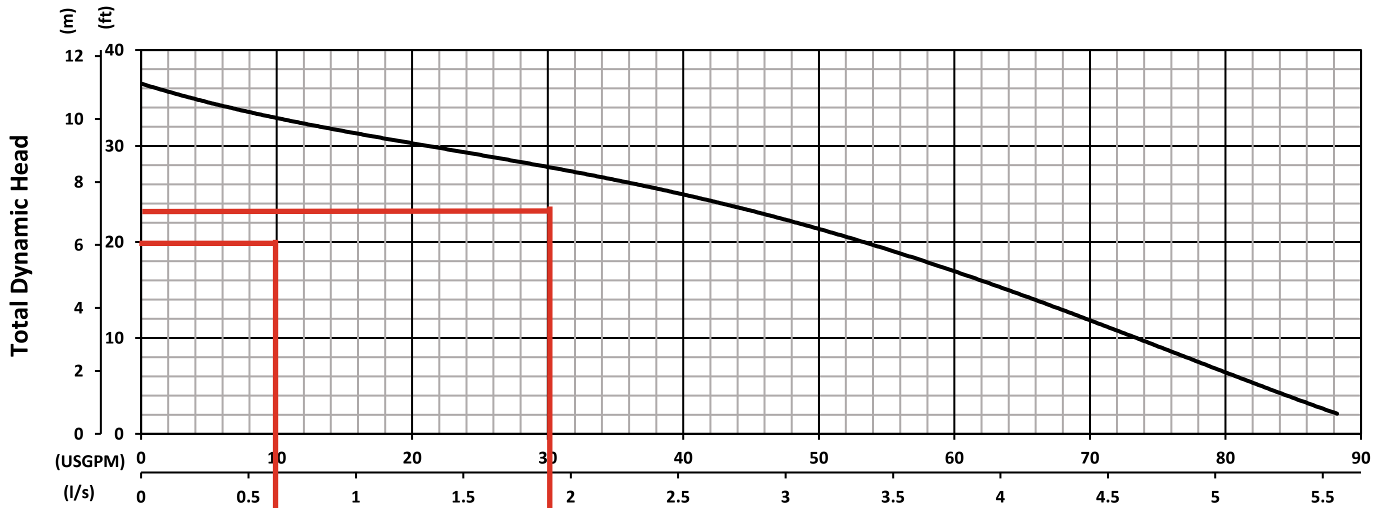
Power cable suitable for all standard voltages listed in “MOTOR DATA” section.

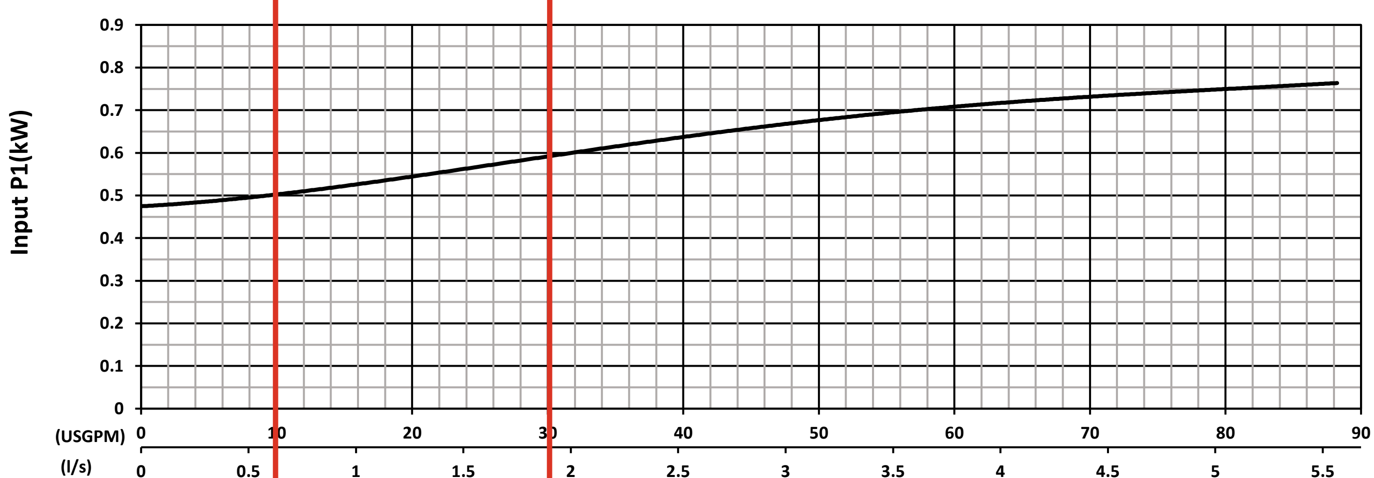
Document valid only for pump with serial number 1327-001 and up.
Refer to previous document revision for earlier serial number.

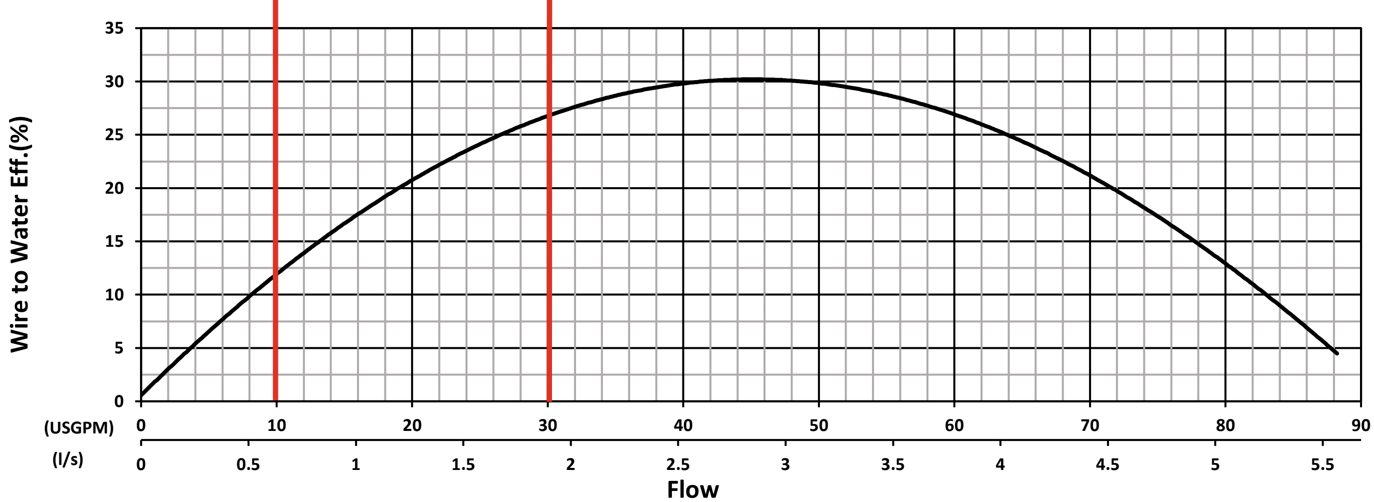
Specifications subject to change without notice

STANCOR Pump & Control Solutions

PERFORMANCE CURVE		Avenger Series SS-50	
Dwg: DS-A07-003	Rev: 4	Date:	12/29/2017







Test Standard : HI 11.6 Gr 3B
Tested with water at 20°C

Pump Performance Test - Dual Units

Frequency	60 Hz
Pump Speed	3450 RPM
Impeller	Ø89.5mm

Specifications subject to change without notice

ATTACHMENT 25-5

HELP Model Outputs and Data Summary Tables

SUMP SW-1 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 1 Flat SG w/5 ft Waste **Simulated On:** 5/14/2024 13:08

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	5	%
Drainage Length	=	200	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	5	%
Drainage Length	=	600	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water
were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	80.8	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 1 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 13:09

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0857]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0003	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9084]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 1 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 13:09

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0178	---
Location of maximum head in Layer 2	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)
Minimum vegetation soil water	0.0770	(vol/vol)

SUMP SW-1 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 1 3_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 13:49

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	130	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	130	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.2	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 1 3_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:50

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 1 3_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:50

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0019	---
Location of maximum head in Layer 2	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)
Minimum vegetation soil water	0.0770	(vol/vol)

SUMP SW-1 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 1 2_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 13:28

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	115	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	115	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.5	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for: Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for: Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 1 2_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:29

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 1 2_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:29

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0013	---
Location of maximum head in Layer 2	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)
Minimum vegetation soil water	0.0770	(vol/vol)

SUMP SW-1 WORST-CASE LEACHATE GENERATION

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	9.56	792,336.62	5,927,089.55	1,698.48	16,238.60	11.28
3:1 SG	0	82,880.4	3.90	323,233.56	2,417,954.94	1,698.48	6,624.53	4.60
2:1 SG	0	82,880.4	2.41	199,741.76	1,494,172.16	1,698.48	4,093.62	2.84
Totals			**15.87**	**1,315,311.95**	**9,839,216.65**		**26,956.76**	**18.72**

Sump SW-1 Leachate Generation - Peak Daily Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	9.56	29,351.28	219,562.80	22,965.22	152.47
3:1 SG	0	3,070.2	3.90	11,973.85	89,570.60	22,965.22	62.20
2:1 SG	0	3,070.2	2.41	7,399.22	55,350.04	22,965.22	38.44
Totals			**15.87**	**48,724.35**	**364,483.43**		**253.11**

SUMP SW-2 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 2 Flat SG w/5 ft Waste **Simulated On:** 7/2/2024 8:51

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	5	%
Drainage Length	=	200	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	5	%
Drainage Length	=	365	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	80.8	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 2 Flat SG w/5 ft Waste
Simulated on: 7/2/2024 8:52

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0857]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0003	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9084]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 2 Flat SG w/5 ft Waste
Simulated on: 7/2/2024 8:52

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0178	---
Location of maximum head in Layer 2	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)
Minimum vegetation soil water	0.0770	(vol/vol)

SUMP SW-2 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 2 3_1 SG w/5 ft Waste **Simulated On:** 5/15/2024 9:15

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	45	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	45	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	83.2	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 2 3_1 SG w/5 ft Waste
Simulated on: 5/15/2024 9:16

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 2 3_1 SG w/5 ft Waste
Simulated on: 5/15/2024 9:16

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0007	---
Location of maximum head in Layer 2	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-2 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 2 2_1 SG w/5 ft Waste **Simulated On:** 5/15/2024 9:47

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	110	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	110	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.6	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 2 2_1 SG w/5 ft Waste
Simulated on: 5/15/2024 9:47

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 2 2_1 SG w/5 ft Waste
Simulated on: 5/15/2024 9:47

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0012	---
Location of maximum head in Layer 2	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)
Minimum vegetation soil water	0.0770	(vol/vol)

SUMP SW-2 WORST-CASE LEACHATE GENERATION

Leachate Production Summary Table

Sump SW-2 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	6.83	566,073.13	4,234,521.09	1,698.48	11,601.43	8.06
3:1 SG	0	82,880.4	1.50	124,320.60	929,982.67	1,698.48	2,547.90	1.77
2:1 SG	0	82,880.4	4.19	347,268.88	2,597,751.59	1,698.48	7,117.13	4.94
Totals			**12.52**	**1,037,662.61**	**7,762,255.35**		**21,266.45**	**14.77**

Sump SW-2 Leachate Generation - Peak Daily Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	6.83	20,969.58	156,863.38	22,965.22	108.93
3:1 SG	0	1,774.0	1.50	2,661.07	19,906.17	13,269.86	13.82
2:1 SG	0	2,073.3	4.19	8,687.27	64,985.32	15,508.55	45.13
Totals			**12.52**	**32,317.93**	**241,754.87**		**167.89**

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 Flat SG w/5 ft Waste **Simulated On:** 5/15/2024 13:40

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	3	%
Drainage Length	=	200	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	3	%
Drainage Length	=	400	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	79.7	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 Flat SG w/5 ft Waste
Simulated on: 5/15/2024 13:40

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0857]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0004	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9084]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 Flat SG w/5 ft Waste
Simulated on: 5/15/2024 13:41

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0296	---
Location of maximum head in Layer 2	0.38 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 3_1 SG w/5 ft Waste **Simulated On:** 5/15/2024 13:51

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.9	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 3_1 SG w/5 ft Waste
Simulated on: 5/15/2024 13:52

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 3_1 SG w/5 ft Waste
Simulated on: 5/15/2024 13:52

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	0.000		0.0000
Subprofile1			
Drainage collected from Layer 2	0.8458		3,070.2
Percolation/leakage through Layer 4	0.000000		0.0000
Average head on Layer 3	0.1643		---
Maximum head on Layer 3	0.0009		---
Location of maximum head in Layer 2	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 5	0.0000		0.0000
Percolation/leakage through Layer 6	0.000000		0.0000
Average head on Layer 6	0.0000		---
Maximum head on Layer 6	0.0000		---
Location of maximum head in Layer 5	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)	
Minimum vegetation soil water	0.0770	(vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 2_1 SG w/5' Waste **Simulated On:** 7/2/2024 9:49

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	160	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	160	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.2	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 2_1 SG w/No Waste
Simulated on: 7/2/2024 9:50

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 2_1 SG w/No Waste
Simulated on: 7/2/2024 9:50

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0018	---
Location of maximum head in Layer 2	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 25’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title:	Sump 3 Flat SG w/Low Waste (25...	**Simulated On:**	7/19/2024 7:49

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	5	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	5	%
Drainage Length	=	1050	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 Flat SG w/Low Waste (25ft)
Simulated on: 7/19/2024 7:50

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	10.8694	[3.6661]	39,456.1	23.41
Percolation/leakage through Layer 5	0.000000	[0]	0.0007	0.00
Average Head on Top of Layer 4	0.0059	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8033	[3.3219]	2,915.9	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 Flat SG w/Low Waste (25ft)
Simulated on: 7/19/2024 7:50

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1641	595.6
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0353	---
Maximum head on Layer 4	0.0035	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 25’ Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 3_1 SG w/Low Waste (25f... **Simulated On:** 7/17/2024 7:58

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	40	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	40	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 3_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:00

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.192	[4]	55,146.6	32.72
Evapotranspiration	19.872	[2.819]	72,136.9	42.80
Subprofile1				
Lateral drainage collected from Layer 3	10.5602	[3.6289]	38,333.7	22.75
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0057	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8021	[3.2572]	2,911.5	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 3_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:00

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	2.820		10,235.0
Subprofile1			
Drainage collected from Layer 3	0.1631		592.0
Percolation/leakage through Layer 5	0.000000		0.0000
Average head on Layer 4	0.0332		---
Maximum head on Layer 4	0.0001		---
Location of maximum head in Layer 3	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 6	0.0000		0.0000
Percolation/leakage through Layer 7	0.000000		0.0000
Average head on Layer 7	0.0000		---
Maximum head on Layer 7	0.0000		---
Location of maximum head in Layer 6	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)	
Minimum vegetation soil water	0.1870	(vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 25’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title:	Sump 3 2_1 SG w/Low Waste (25f...	**Simulated On:**	7/17/2024 8:06

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	75	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	75	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.2	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 2_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:06

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.011	[3.983]	54,491.0	32.33
Evapotranspiration	19.859	[2.819]	72,088.0	42.77
Subprofile1				
Lateral drainage collected from Layer 3	10.7537	[3.6583]	39,035.8	23.16
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0058	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8027	[3.3138]	2,913.9	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 2_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:07

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.805	10,181.2
Subprofile1		
Drainage collected from Layer 3	0.1656	601.2
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0335	---
Maximum head on Layer 4	0.0002	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 75’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 Flat SG w/Med Waste (75... **Simulated On:** 7/19/2024 7:56

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	5	%
Drainage Length	=	700	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	5	%
Drainage Length	=	700	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	200.877	inches
Total Initial Water	=	200.877	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 Flat SG w/Med Waste (75ft)
Simulated on: 7/19/2024 7:57

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	9.4078	[4.8739]	34,150.5	20.26
Percolation/leakage through Layer 5	0.000001	[0]	0.0019	0.00
Average Head on Top of Layer 4	0.0051	[0.0026]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.2649	[4.9557]	8,221.5	4.88

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 Flat SG w/Med Waste (75ft)
Simulated on: 7/19/2024 7:57

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1539	558.8
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0303	---
Maximum head on Layer 4	0.0114	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with 75’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 2_1 SG w/Med Waste (75f... **Simulated On:** 7/17/2024 8:08

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	75	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	75	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.2	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	200.877	inches
Total Initial Water	=	200.877	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 2_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:09

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.011	[3.983]	54,491.0	32.33
Evapotranspiration	19.859	[2.819]	72,088.0	42.77
Subprofile1				
Lateral drainage collected from Layer 3	9.2930	[4.8568]	33,733.6	20.02
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0050	[0.0026]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.2634	[4.9133]	8,216.1	4.88

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 2_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:09

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.805	10,181.2
Subprofile1		
Drainage collected from Layer 3	0.1596	579.3
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0328	---
Maximum head on Layer 4	0.0002	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with Max Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 Flat SG w/High Waste (1... **Simulated On:** 7/19/2024 7:58

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	1320	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	5	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	5	%
Drainage Length	=	500	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	292.857	inches
Total Initial Water	=	292.857	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 Flat SG w/High Waste (110ft)
Simulated on: 7/19/2024 7:59

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	8.3866	[5.4226]	30,443.4	18.06
Percolation/leakage through Layer 5	0.000000	[0]	0.0006	0.00
Average Head on Top of Layer 4	0.0045	[0.0029]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.2861	[5.8785]	11,928.6	7.08

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 Flat SG w/High Waste (110ft)
Simulated on: 7/19/2024 7:59

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1595	578.9
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0324	---
Maximum head on Layer 4	0.0034	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Cell with Max Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 3 2_1 SG w/High Waste (11... **Simulated On:** 7/17/2024 8:10

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	1320	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	15	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	15	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.5	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	292.857	inches
Total Initial Water	=	292.857	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 3 2_1 SG w/High Waste (110t)
Simulated on: 7/17/2024 8:11

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.589	[4.011]	56,586.5	33.58
Evapotranspiration	19.745	[2.822]	71,675.4	42.53
Subprofile1				
Lateral drainage collected from Layer 3	7.8084	[5.2825]	28,344.6	16.82
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0042	[0.0029]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.2843	[5.5249]	11,922.2	7.07

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 3 2_1 SG w/High Waste (110t)
Simulated on: 7/17/2024 8:11

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.847	10,334.6
Subprofile1		
Drainage collected from Layer 3	0.1519	551.5
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0325	---
Maximum head on Layer 4	0.0000	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

SUMP SW-3 WORST-CASE LEACHATE GENERATION

Leachate Production Summary Table

Sump SW-3 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	8.81	730,176.12	5,462,096.70	1,698.48	14,964.65	10.39
	25	39,456.1	4.18	164,926.41	1,233,735.21	808.58	3,380.10	2.35
	75	34,150.5	3.77	128,747.24	963,096.24	699.85	2,638.62	1.83
	110	30,443.4	1.42	43,229.57	323,379.61	623.88	885.97	0.62
3:1 SG	0	82,880.4	1.16	96,141.24	719,186.40	1,698.48	1,970.37	1.37
	25	38,333.7	0.66	25,300.23	189,258.83	785.58	518.52	0.36
	75	-	-	-	-	-	-	-
	110	-	-	-	-	-	-	-
2:1 SG	0	-	-	-	-	-	-	-
	25	39,035.8	1.97	76,900.53	575,255.91	799.97	1,576.04	1.09
	75	33,733.6	1.37	46,215.04	345,712.53	691.31	947.16	0.66
	110	28,344.6	0.05	1,417.23	10,601.62	580.87	29.05	0.02
Totals			**23.39**	**1,313,053.60**	**9,822,323.05**		**26,910.47**	**18.69**

Sump SW-3 Leachate Generation - Peak Daily Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	8.81	27,048.61	202,337.68	22,965.22	140.51
	25	595.6	4.18	2,489.55	18,623.11	4,454.98	12.93
	75	558.8	3.77	2,106.70	15,759.18	4,179.86	10.94
	110	578.9	1.42	822.06	6,149.45	4,330.30	4.27
3:1 SG	0	3,070.2	1.15	3,530.75	26,411.84	22,965.22	18.34
	25	592.0	0.66	390.70	2,922.62	4,427.91	2.03
	75	-	-	-	-	-	-
	110	-	-	-	-	-	-
2:1 SG	0	-	-	-	-	-	-
	25	601.2	1.97	1,184.27	8,858.93	4,496.61	6.15
	75	579.3	1.37	793.62	5,936.68	4,333.04	4.12
	110	551.5	0.05	27.57	206.27	4,125.05	0.14
Totals			**23.38**	**38,393.83**	**287,205.76**		**199.45**

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 Flat SG w/5 ft Waste **Simulated On:** 5/14/2024 11:17

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	3	%
Drainage Length	=	200	ft

Layer 3
Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	3	%
Drainage Length	=	350	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	80.5	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 11:18

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0857]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0004	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9084]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 11:18

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0296	---
Location of maximum head in Layer 2	0.38 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 3_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 14:23

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.9	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 3_1 SG w/5 ft Waste

Simulated on: 5/14/2024 14:24

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 3_1 SG w/5 ft Waste
Simulated on: 5/14/2024 14:24

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	0.000		0.0000
Subprofile1			
Drainage collected from Layer 2	0.8458		3,070.2
Percolation/leakage through Layer 4	0.000000		0.0000
Average head on Layer 3	0.1643		---
Maximum head on Layer 3	0.0009		---
Location of maximum head in Layer 2	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 5	0.0000		0.0000
Percolation/leakage through Layer 6	0.000000		0.0000
Average head on Layer 6	0.0000		---
Maximum head on Layer 6	0.0000		---
Location of maximum head in Layer 5	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)	
Minimum vegetation soil water	0.0770	(vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 5’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 2_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 12:48

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	200	ft

Layer 3
Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	200	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 2_1 SG w/5 ft Waste

Simulated on: 5/14/2024 12:49

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 2_1 SG w/5 ft Waste
Simulated on: 5/14/2024 12:49

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0022	---
Location of maximum head in Layer 2	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 25' Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 Flat SG w/Low Waste (25... **Simulated On:** 7/19/2024 8:04

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	3	%
Drainage Length	=	85	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	3	%
Drainage Length	=	85	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.2	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 Flat SG w/Low Waste (25ft)
Simulated on: 7/19/2024 8:05

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.011	[3.983]	54,491.0	32.33
Evapotranspiration	19.859	[2.819]	72,088.0	42.77
Subprofile1				
Lateral drainage collected from Layer 3	10.7537	[3.6584]	39,035.8	23.16
Percolation/leakage through Layer 5	0.000000	[0]	0.0005	0.00
Average Head on Top of Layer 4	0.0058	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8027	[3.3139]	2,913.9	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 Flat SG w/Low Waste (25ft)
Simulated on: 7/19/2024 8:05

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.805	10,181.2
Subprofile1		
Drainage collected from Layer 3	0.1656	601.2
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0335	---
Maximum head on Layer 4	0.0025	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 25’ Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 3_1 SG w/Low Waste (25f... **Simulated On:** 7/17/2024 8:19

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.5	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 3_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:19

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.589	[4.011]	56,586.5	33.58
Evapotranspiration	19.745	[2.822]	71,675.4	42.53
Subprofile1				
Lateral drainage collected from Layer 3	10.2911	[3.5398]	37,356.7	22.17
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0056	[0.0019]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8017	[3.1747]	2,910.1	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 3_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:19

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	2.847		10,334.6
Subprofile1			
Drainage collected from Layer 3	0.1622		589.0
Percolation/leakage through Layer 5	0.000000		0.0000
Average head on Layer 4	0.0330		---
Maximum head on Layer 4	0.0001		---
Location of maximum head in Layer 3	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 6	0.0000		0.0000
Percolation/leakage through Layer 7	0.000000		0.0000
Average head on Layer 7	0.0000		---
Maximum head on Layer 7	0.0000		---
Location of maximum head in Layer 6	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)	
Minimum vegetation soil water	0.1870	(vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 25’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 2_1 SG w/Low Waste (25f... **Simulated On:** 7/17/2024 8:25

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	200	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	69.477	inches
Total Initial Water	=	69.477	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 2_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:25

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	10.8694	[3.6661]	39,456.1	23.41
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0059	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8033	[3.3219]	2,915.9	1.73

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 2_1 SG w/Low Waste (25ft)
Simulated on: 7/17/2024 8:25

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1641	595.6
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0353	---
Maximum head on Layer 4	0.0004	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 75’ Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 Flat SG w/Med Waste (75... **Simulated On:** 7/19/2024 8:06

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	3	%
Drainage Length	=	100	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	3	%
Drainage Length	=	100	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	200.877	inches
Total Initial Water	=	200.877	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 Flat SG w/Med Waste (75ft)
Simulated on: 7/19/2024 8:07

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	9.4087	[4.875]	34,153.6	20.27
Percolation/leakage through Layer 5	0.000000	[0]	0.0005	0.00
Average Head on Top of Layer 4	0.0051	[0.0026]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.2640	[4.9558]	8,218.3	4.88

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 Flat SG w/Med Waste (75ft)
Simulated on: 7/19/2024 8:07

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	2.791		10,132.9
Subprofile1			
Drainage collected from Layer 3	0.1539		558.8
Percolation/leakage through Layer 5	0.000000		0.0000
Average head on Layer 4	0.0303		---
Maximum head on Layer 4	0.0027		---
Location of maximum head in Layer 3	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 6	0.0000		0.0000
Percolation/leakage through Layer 7	0.000000		0.0000
Average head on Layer 7	0.0000		---
Maximum head on Layer 7	0.0000		---
Location of maximum head in Layer 6	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)	
Minimum vegetation soil water	0.1870	(vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 75' Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 3_1 SG w/Med Waste (75f... **Simulated On:** 7/17/2024 8:21

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.5	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	200.877	inches
Total Initial Water	=	200.877	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 3_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:21

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.589	[4.011]	56,586.5	33.58
Evapotranspiration	19.745	[2.822]	71,675.4	42.53
Subprofile1				
Lateral drainage collected from Layer 3	8.8305	[4.7905]	32,054.8	19.02
Percolation/leakage through Layer 5	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 4	0.0048	[0.0026]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.2622	[4.7768]	8,212.0	4.87

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 3_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:21

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.847	10,334.6
Subprofile1		
Drainage collected from Layer 3	0.1470	533.6
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0326	---
Maximum head on Layer 4	0.0001	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with 75’ Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 2_1 SG w/Med Waste (75f... **Simulated On:** 7/17/2024 8:26

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	175	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	175	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	200.877	inches
Total Initial Water	=	200.877	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 2_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:27

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	9.4087	[4.875]	34,153.6	20.27
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0051	[0.0026]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.2640	[4.9558]	8,218.3	4.88

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 2_1 SG w/Med Waste (75ft)
Simulated on: 7/17/2024 8:27

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	2.791		10,132.9
Subprofile1			
Drainage collected from Layer 3	0.1539		558.8
Percolation/leakage through Layer 5	0.000000		0.0000
Average head on Layer 4	0.0303		---
Maximum head on Layer 4	0.0004		---
Location of maximum head in Layer 3	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 6	0.0000		0.0000
Percolation/leakage through Layer 7	0.000000		0.0000
Average head on Layer 7	0.0000		---
Maximum head on Layer 7	0.0000		---
Location of maximum head in Layer 6	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)	
Minimum vegetation soil water	0.1870	(vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with Max Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 Flat SG w/High Waste (1... **Simulated On:** 7/19/2024 8:08

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	1560	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	3	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	10	Holes/Acre
FML Installation Defects	=	10	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	3	%
Drainage Length	=	500	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	345.417	inches
Total Initial Water	=	345.417	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 Flat SG w/High Waste (130ft)
Simulated on: 7/19/2024 8:08

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,826.9	31.94
Evapotranspiration	19.926	[2.818]	72,329.8	42.92
Subprofile1				
Lateral drainage collected from Layer 3	7.8017	[5.5717]	28,320.1	16.80
Percolation/leakage through Layer 5	0.000000	[0]	0.0008	0.00
Average Head on Top of Layer 4	0.0042	[0.003]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.8710	[5.9726]	14,051.9	8.34

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 Flat SG w/High Waste (130ft)
Simulated on: 7/19/2024 8:09

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1599	580.4
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0329	---
Maximum head on Layer 4	0.0056	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with Max Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 4 3_1 SG w/High Waste (13... **Simulated On:** 7/17/2024 8:23

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	1560	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	20	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.5	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	345.417	inches
Total Initial Water	=	345.417	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 3_1 SG w/High Waste (130ft)
Simulated on: 7/17/2024 8:23

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.589	[4.011]	56,586.5	33.58
Evapotranspiration	19.745	[2.822]	71,675.4	42.53
Subprofile1				
Lateral drainage collected from Layer 3	7.2244	[5.3941]	26,224.6	15.56
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0039	[0.0029]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.8684	[5.7797]	14,042.2	8.33

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 3_1 SG w/High Waste (130ft)
Simulated on: 7/17/2024 8:23

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.847	10,334.6
Subprofile1		
Drainage collected from Layer 3	0.1530	555.5
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0320	---
Maximum head on Layer 4	0.0001	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Cell with Max Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE

HELP MODEL VERSION 4.0 BETA (2018)

DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title:	Sump 4 2_1 SG w/High Waste (13…	**Simulated On:**	7/17/2024 8:28

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)

CL - Clay Loam

Material Texture Number 11

Thickness	=	12	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)

Municipal Solid Waste (MSW) (900 pcy)

Material Texture Number 18

Thickness	=	1560	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer

Coarse Gravel

Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	50	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	50	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.3	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	345.417	inches
Total Initial Water	=	345.417	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 4 2_1 SG w/High Waste (130ft)
Simulated on: 7/17/2024 8:29

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	15.192	[4]	55,146.6	32.72
Evapotranspiration	19.872	[2.819]	72,136.9	42.80
Subprofile1				
Lateral drainage collected from Layer 3	7.4935	[5.4301]	27,201.5	16.14
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0041	[0.0029]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.8688	[5.8653]	14,043.7	8.33

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 4 2_1 SG w/High Waste (130ft)
Simulated on: 7/17/2024 8:29

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	2.820		10,235.0
Subprofile1			
Drainage collected from Layer 3	0.1574		571.2
Percolation/leakage through Layer 5	0.000000		0.0000
Average head on Layer 4	0.0323		---
Maximum head on Layer 4	0.0001		---
Location of maximum head in Layer 3	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 6	0.0000		0.0000
Percolation/leakage through Layer 7	0.000000		0.0000
Average head on Layer 7	0.0000		---
Maximum head on Layer 7	0.0000		---
Location of maximum head in Layer 6	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)	
Minimum vegetation soil water	0.1870	(vol/vol)	

SUMP SW-4 WORST-CASE LEACHATE GENERATION

Leachate Production Summary Table

Sump SW-4 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	7.00	580,162.64	4,339,917.93	1,698.48	11,890.19	8.26
	25	39,035.8	1.35	52,698.33	394,210.90	799.97	1,080.03	0.75
	75	34,153.6	1.92	65,574.99	490,535.03	699.92	1,343.93	0.93
	130	28,320.1	4.37	123,758.74	925,779.64	580.37	2,536.38	1.76
3:1 SG	0	82,880.4	1.61	133,437.41	998,181.12	1,698.48	2,734.74	1.90
	25	37,356.7	0.09	3,362.10	25,150.25	765.56	68.90	0.05
	75	32,054.8	0.12	3,846.57	28,774.38	656.90	78.83	0.05
	130	26,224.6	0.27	7,080.63	52,966.82	537.42	145.11	0.10
2:1 SG	0	82,880.4	2.36	195,597.69	1,463,172.33	1,698.48	4,008.69	2.78
	25	39,456.1	2.64	104,164.05	779,201.20	808.58	2,134.80	1.48
	75	34,153.6	1.67	57,036.58	426,663.28	699.92	1,168.94	0.81
	130	27,201.5	0.28	7,616.43	56,974.83	557.44	156.10	0.11
Totals			**23.68**	**1,334,336.17**	**9,981,527.69**		**27,346.65**	**18.99**

Sump SW-4 Leachate Generation - Peak Daily Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	7.00	21,491.52	160,767.74	22,965.22	111.64
	25	601.2	1.35	811.55	6,070.84	4,496.61	4.22
	75	558.8	1.92	1,072.91	8,025.89	4,179.86	5.57
	130	580.4	4.37	2,536.49	18,974.27	4,341.64	13.18
3:1 SG	0	3,070.2	1.61	4,943.05	36,976.58	22,965.22	25.68
	25	589.0	0.09	53.01	396.51	4,405.37	0.28
	75	533.6	0.12	64.04	479.03	3,991.66	0.33
	130	555.5	0.27	149.98	1,121.95	4,155.07	0.78
2:1 SG	0	3,070.2	2.36	7,245.71	54,201.69	22,965.22	37.64
	25	558.8	2.64	1,475.25	11,035.60	4,179.86	7.66
	75	558.8	1.67	933.20	6,980.86	4,179.86	4.85
	130	571.2	0.28	159.95	1,196.50	4,272.93	0.83
Totals			**23.68**	**40,936.66**	**306,227.47**		**212.66**

SUMP SW-5 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, Flat Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 5 Flat SG w/5 ft Waste **Simulated On:** 5/14/2024 13:20

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	4	%
Drainage Length	=	200	ft

Layer 3

Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	4	%
Drainage Length	=	1000	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	80.7	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 5 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 13:21

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0857]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0003	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9084]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 5 Flat SG w/5 ft Waste
Simulated on: 5/14/2024 13:21

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0223	---
Location of maximum head in Layer 2	0.02 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-5 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 3 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
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Title: Sump 5 3_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 13:23

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 3
Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	33	%
Drainage Length	=	60	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.9	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 5 3_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:24

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 5 3_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:24

	Peak Values for Years 1 - 30*		
	(inches)		(cubic feet)
Precipitation	3.58		13,004.7
Runoff	0.000		0.0000
Subprofile1			
Drainage collected from Layer 2	0.8458		3,070.2
Percolation/leakage through Layer 4	0.000000		0.0000
Average head on Layer 3	0.1643		---
Maximum head on Layer 3	0.0009		---
Location of maximum head in Layer 2	0.00	(feet from drain)	
Subprofile2			
Drainage collected from Layer 5	0.0000		0.0000
Percolation/leakage through Layer 6	0.000000		0.0000
Average head on Layer 6	0.0000		---
Maximum head on Layer 6	0.0000		---
Location of maximum head in Layer 5	0.00	(feet from drain)	
Other Parameters			
Snow water	6.4240		23,319.2
Maximum vegetation soil water	0.6710	(vol/vol)	
Minimum vegetation soil water	0.0770	(vol/vol)	

SUMP SW-5 WORST-CASE LEACHATE GENERATION

Cell with 5' Waste Depth, 2 to 1 Subgrade

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: Sump 5 2_1 SG w/5 ft Waste **Simulated On:** 5/14/2024 13:52

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	60	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 2
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	50	%
Drainage Length	=	150	ft

Layer 3
Type 4 - Flexible Membrane Liner
HDPE Membrane
Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 4

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 5

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	50	%
Drainage Length	=	150	ft

Layer 6

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	82.2	
Fraction of Area Allowing Runoff	=	0	%
Area projected on a horizontal plane	=	1	acres

Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.657	inches
Upper Limit of Evaporative Storage	=	2.013	inches
Lower Limit of Evaporative Storage	=	0.231	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	14.121	inches
Total Initial Water	=	14.121	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: Sump 5 2_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:53

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	0.000	[0]	0.0000	0.00
Evapotranspiration	23.396	[3.245]	84,926.5	50.39
Subprofile1				
Lateral drainage collected from Layer 2	22.8321	[5.0815]	82,880.4	49.18
Percolation/leakage through Layer 4	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 3	0.0124	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 5	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 6	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 6	0.0000	[0]	---	---
Water storage				
Change in water storage	0.1988	[1.9083]	721.8	0.43

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: Sump 5 2_1 SG w/5 ft Waste
Simulated on: 5/14/2024 13:53

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	0.000	0.0000
Subprofile1		
Drainage collected from Layer 2	0.8458	3,070.2
Percolation/leakage through Layer 4	0.000000	0.0000
Average head on Layer 3	0.1643	---
Maximum head on Layer 3	0.0017	---
Location of maximum head in Layer 2	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 5	0.0000	0.0000
Percolation/leakage through Layer 6	0.000000	0.0000
Average head on Layer 6	0.0000	---
Maximum head on Layer 6	0.0000	---
Location of maximum head in Layer 5	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.6710 (vol/vol)	
Minimum vegetation soil water	0.0770 (vol/vol)	

SUMP SW-5 WORST-CASE LEACHATE GENERATION

Leachate Production Summary Table

Sump SW-5 Leachate Generation - Annual Average Generation

	Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	9.18	760,842.07	5,691,493.94	1,698.48	15,593.13	10.83
3:1 SG	0	82,880.4	1.98	164,103.19	1,227,577.12	1,698.48	3,363.22	2.34
2:1 SG	0	82,880.4	4.25	352,241.70	2,634,950.90	1,698.48	7,219.04	5.01
Totals			**15.41**	**1,277,186.96**	**9,554,021.96**	**5,095.44**	**26,175.40**	**18.18**

Sump SW-5 Leachate Generation - Peak Daily Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	9.18	28,184.59	210,835.41	22,965.22	146.41
3:1 SG	0	3,070.2	1.98	6,079.03	45,474.30	22,965.22	31.58
2:1 SG	0	3,070.2	4.25	13,048.42	97,608.98	22,965.22	67.78
Totals			**15.41**	**47,312.05**	**353,918.69**	**68,895.67**	**245.78**

TOTAL EXPANSION THROUGH PAD 1

Leachate Production Summary Table

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	**Leachate Collected (CF/Acre)**	**Acres**	**Leachate Collected (CF)**	**Leachate Collected (gal)**	**Leachate Generation (gal/acre/day)**	**Leachate Generation (gal/day)**	**Leachate Generation (gal/min)**
SG	0	82,880.4	3.25	269,361.23	2,014,961.89	1,698.48	5,520.44	3.83

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	**Leachate Collected (CF/Acre)**	**Acres**	**Leachate Collected (CF)**	**Leachate Collected (gal)**	**Leachate Generation (gal/acre/day)**	**Leachate Generation (gal/day)**	**Leachate Generation (gal/min)**
SG	0	82,880.4	3.47	287,594.91	2,151,359.31	1,698.48	5,894.14	4.09

Totals			**6.72**	**556,956.13**	**4,166,321.21**		**11,414.58**	**7.93**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	0	3,070.2	3.25	9,978.21	74,642.16	22,965.22	51.83

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	0	3,070.2	3.47	10,653.65	79,694.86	22,965.22	55.34

Totals			**6.72**	**20,631.86**	**154,337.03**		**107.18**

TOTAL EXPANSION THROUGH PAD 2A

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	9.56	792,336.40	5,927,087.91	1,698.48	16,238.60	11.28
3:1 SG	0	82,880.4	3.90	323,233.47	2,417,954.27	1,698.48	6,624.53	4.60
2:1 SG	0	82,880.4	2.41	199,741.71	1,494,171.74	1,698.48	4,093.62	2.84
Totals			**15.87**	**1,315,311.58**	**9,839,213.93**		**26,956.75**	**18.72**

Southern Expansion Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	200	20,903.3	40.50	846,584.09	6,332,888.76	428.37	17,350.38	12.05

Original Landfill Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	75	34,153.6	5.39	184,088.14	1,377,074.89	699.92	3,772.81	2.62
SG	200	20,903.3	14.78	308,950.93	2,311,113.48	428.37	6,331.82	4.40

Totals			**76.54**	**2,654,934.74**	**19,860,291.06**		**54,411.76**	**37.79**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	9.56	29,351.28	219,562.80	22,965.22	152.47
3:1 SG	0	3,070.2	3.90	11,973.85	89,570.60	22,965.22	62.20
2:1 SG	0	3,070.2	2.41	7,399.22	55,350.04	22,965.22	38.44
Totals			**15.87**	**48,724.35**	**364,483.43**		**253.11**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	200	558.3	40.50	22,609.24	169,128.87	4,175.73	117.45

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	75	558.8	5.39	3,011.96	22,531.02	4,179.86	15.65
SG	200	558.3	14.78	8,250.98	61,721.60	4,175.73	42.86

Totals			**76.54**	**82,596.53**	**617,864.93**		**429.07**

TOTAL EXPANSION THROUGH PAD 2B

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	4.22	349,755.19	2,616,350.52	1,698.48	7,168.08	4.98
	25	39,035.8	2.51	97,979.86	732,940.26	799.97	2,008.06	1.39
	75	34,153.6	5.02	171,451.29	1,282,544.70	699.92	3,513.82	2.44
	175	23,553.3	2.07	48,755.29	364,714.91	482.68	999.22	0.69
3:1 SG	0	82,880.4	1.16	96,141.24	719,186.40	1,698.48	1,970.37	1.37
	25	37,356.7	2.00	74,713.31	558,894.35	765.56	1,531.22	1.06
	75	32,054.8	1.11	35,580.81	266,162.97	656.90	729.21	0.51
	175	23,553.3	1.29	30,383.73	227,286.11	482.68	622.70	0.43
2:1 SG	0	82,880.4	-	-	-	1,698.48	-	-
	25	39,456.1	1.50	59,184.12	442,727.95	808.58	1,212.95	0.84
	75	34,153.6	0.37	12,636.85	94,530.19	699.92	258.99	0.18
	175	22,431.6	-	-	-	459.69	-	-
Totals			**21.25**	**976,581.69**	**7,305,338.37**		**20,014.63**	**13.90**

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	28.87	557,576.02	4,170,958.31	395.79	11,427.28	7.94
Capped	-	976.0	25.87	25,249.12	188,876.53	20.00	517.47	0.36
Totals			**54.74**	**582,825.14**	**4,359,834.84**		**11,944.75**	**8.29**

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	**976.0**	**20.23**	**19,744.48**	**147,698.97**	**20.00**	**404.65**	**0.28**

Totals			**96.22**	**1,579,151.32**	**11,812,872.18**		**32,364.03**	**22.48**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3070.2	4.22	12,956.32	96,919.98	22,965.22	67.31
	25	601.2	2.51	1,508.89	11,287.26	4,496.61	7.84
	75	558.8	5.02	2,805.20	20,984.37	4,179.86	14.57
	175	558.7	2.07	1,156.56	8,651.67	4,179.26	6.01
3:1 SG	0	3,070.2	1.16	3,561.45	26,641.51	22,965.22	18.50
	25	589.0	2.00	1,177.91	8,811.35	4,405.37	6.12
	75	533.6	1.11	592.35	4,431.05	3,991.66	3.08
	175	578.6	1.29	746.42	5,583.61	4,328.08	3.88
2:1 SG	0	3,070.2	-	-	-	22,965.22	-
	25	558.8	1.50	838.21	6,270.23	4,179.86	4.35
	75	558.8	0.37	206.76	1,546.66	4,179.86	1.07
	175	542.3	-	-	-	4,056.30	-
Totals			**21.25**	**25,550.06**	**191,127.68**		**132.73**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	28.87	15,518.04	116,082.99	4,020.61	80.61
SG	-	20.0	25.87	517.40	3,870.42	149.60	2.69
Totals			**54.74**	**16,035.44**	**119,953.41**		**83.30**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	-	**20.0**	**20.23**	**404.60**	**3,026.62**	**149.60**	**2.10**

Totals			**96.22**	**41,990.09**	**314,107.71**		**218.13**

TOTAL EXPANSION THROUGH PAD 3A

Leachate Production Summary Table

	Sump SW-1 Leachate Generation - Annual Average Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	25	39,035.8	3.21	125,304.92	937,345.91	799.97	2,568.07	1.78
	75	34,153.6	4.76	162,571.34	1,216,118.09	699.92	3,331.83	2.31
	200	20,903.3	1.48	30,936.90	231,424.08	428.37	634.04	0.44
3:1 SG	25	37,356.7	1.38	51,552.18	385,637.10	765.56	1,056.54	0.73
	75	32,054.8	0.64	20,515.06	153,463.34	656.90	420.45	0.29
	200	20,903.3	1.18	24,665.91	184,513.80	428.37	505.52	0.35
2:1 SG	25	39,456.1	0.41	16,176.99	121,012.31	808.58	331.54	0.23
	75	34,153.6	0.05	1,707.68	12,774.35	699.92	35.00	0.02
	200	20,903.3	-	-	-	428.37	-	-
Capped	-	976.0	8.14	7,944.64	59,430.03	20.00	162.82	0.11
Totals			**13.11**	**433,430.99**	**3,242,288.97**		**8,882.98**	**6.17**

	Sump SW-2 Leachate Generation - Annual Average Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	6.83	566,073.13	4,234,521.09	1,698.48	11,601.43	8.06
3:1 SG	0	82,880.4	1.50	124,320.60	929,982.67	1,698.48	2,547.90	1.77
2:1 SG	0	82,880.4	4.19	347,268.88	2,597,751.59	1,698.48	7,117.13	4.94
Totals			**12.52**	**1,037,662.61**	**7,762,255.35**		**21,266.45**	**14.77**

	Original Landfill Footprint Leachate Generation - Annual Average Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	3.97	76,673.95	573,560.95	395.79	1,571.40	1.09
Capped	-	976.0	21.99	21,462.24	160,548.70	20.00	439.86	0.31
Totals			**25.96**	**98,136.19**	**734,109.65**		**2,011.26**	**1.40**

	Southern Expansion Footprint Leachate Generation - Annual Average Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	6.10	117,811.35	881,290.12	395.79	2,414.49	1.68
Capped	-	976.0	47.88	46,730.88	349,571.26	20.00	957.73	0.67
Totals			**53.98**	**164,542.23**	**1,230,861.38**		**3,372.22**	**2.34**

Totals			**105.57**	**1,733,772.02**	**12,969,515.35**	**-**	**35,532.92**	**24.68**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	25	601.2	3.21	1,929.69	14,435.11	4,496.61	10.02
	75	558.8	4.76	2,659.91	19,897.53	4,179.86	13.82
	200	558.3	1.48	826.21	6,180.51	4,175.73	4.29
3:1 SG	25	589.0	1.38	812.76	6,079.83	4,405.37	4.22
	75	533.6	0.64	341.53	2,554.84	3,991.66	1.77
	200	558.3	1.18	658.74	4,927.71	4,175.73	3.42
2:1 SG	25	558.8	0.41	229.11	1,713.86	4,179.86	1.19
	75	558.8	0.05	27.94	209.01	4,179.86	0.15
	200	558.3	-	-	-	4,175.73	-
Capped	-	20.0	8.14	162.80	1,217.83	149.60	0.85
Totals			**13.11**	**7,485.90**	**55,998.39**		**38.89**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	6.83	20,969.58	156,863.38	22,965.22	108.93
3:1 SG	0	3,070.2	1.50	4,605.33	34,450.23	22,965.22	23.92
2:1 SG	0	3,070.2	4.19	12,864.21	96,230.97	22,965.22	66.83
Totals			**12.52**	**38,439.12**	**287,544.58**		**199.68**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	3.97	2,133.93	15,962.92	4,020.61	11.09
Capped	-	20.0	21.99	439.80	3,289.93	149.60	2.28
Totals			**25.96**	**2,573.73**	**19,252.85**		**13.37**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	6.10	3,278.84	24,527.41	4,020.61	17.03
Capped	-	20.0	47.88	957.60	7,163.35	149.60	4.97
Totals			**53.98**	**4,236.44**	**31,690.75**		**22.01**

Totals			**105.57**	**52,735.19**	**394,486.58**	**-**	**273.95**

TOTAL EXPANSION THROUGH PAD 3B

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	25	39,262.7	0.13	5,104.16	38,181.74	804.62	104.61	0.07
	75	33,962.5	0.96	32,603.98	243,894.71	696.00	668.20	0.46
	140	27,072.6	3.05	82,571.55	617,678.07	554.80	1,692.27	1.18
3:1 SG	25	37,356.7	0.09	3,362.10	25,150.25	765.56	68.90	0.05
	75	32,848.9	0.15	4,927.34	36,859.05	673.18	100.98	0.07
	140	25,959.1	1.42	36,861.91	275,746.27	531.98	755.47	0.52
2:1 SG	25	39,456.1	0.14	5,523.85	41,321.28	808.58	113.21	0.08
	75	33,550.1	0.24	8,052.02	60,233.33	687.55	165.02	0.11
	140	26,660.3	-	-	-	546.35	-	-
Capping	-	976.0	15.07	14,708.32	110,025.87	20.00	301.44	0.21
Totals			**21.25**	**193,715.23**	**1,449,090.56**		**3,970.11**	**2.76**

Sump SW-2 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	6.41	531,263.22	3,974,124.84	1,698.48	10,888.01	7.56
	25	39,262.7	2.13	83,629.64	625,593.12	804.62	1,713.95	1.19
	75	33,962.5	1.54	52,302.22	391,247.76	696.00	1,071.91	0.74
	140	27,072.6	3.16	85,549.54	639,954.99	554.80	1,753.30	1.22
3:1 SG	0	82,880.4	0.72	59,673.87	446,391.56	1,698.48	1,222.99	0.85
	25	61,412.0	0.05	3,070.60	22,969.70	1,258.53	62.93	0.04
	75	32,848.9	0.19	6,241.30	46,688.13	673.18	127.91	0.09
	140	25,959.1	1.28	33,227.64	248,560.02	531.98	680.99	0.47
2:1 SG	0	82,880.4	-	-	-	1,698.48	-	-
	25	62,165.5	1.90	118,114.47	883,557.59	1,273.97	2,420.71	1.68
	75	33,550.1	1.50	50,325.15	376,458.29	687.55	1,031.39	0.72
	140	26,660.3	0.77	20,528.41	153,563.15	546.35	420.72	0.29
Totals			**19.65**	**1,043,926.05**	**7,809,109.14**		**21,394.82**	**14.86**

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	25.27	24,663.52	184,495.94	20.00	505.47	0.35
Totals			**25.27**	**24,663.52**	**184,495.94**		**505.47**	**0.35**

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	55.13	53,806.88	402,503.41	20.00	1,102.75	0.77
Totals			**55.13**	**53,806.88**	**402,503.41**		**1,102.75**	**0.77**

Totals			**121.30**	**1,316,111.68**	**9,845,199.06**	**-**	**26,973.15**	**18.73**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	25	569.4	0.13	74.03	553.77	4,259.46	0.38
	75	539.7	0.96	518.11	3,875.70	4,036.91	2.69
	140	574.5	3.05	1,752.17	13,107.14	4,297.12	9.10
3:1 SG	25	589.0	0.09	53.01	396.51	4,405.37	0.28
	75	536.3	0.15	80.44	601.76	4,011.43	0.42
	140	567.4	1.42	805.72	6,027.19	4,244.20	4.19
2:1 SG	25	558.8	0.14	78.23	585.22	4,179.86	0.41
	75	522.4	0.24	125.38	937.90	3,907.65	0.65
	140	513.6	-	-	-	3,841.89	-
Capping	-	20.0	15.07	301.40	2,254.63	149.60	1.57
Totals			**21.25**	**3,788.48**	**28,339.81**		**19.68**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	6.41	19,680.09	147,217.31	22,965.22	102.23
	25	569.4	2.13	1,212.92	9,073.28	4,259.46	6.30
	75	539.7	1.54	831.13	6,217.27	4,036.91	4.32
	140	574.5	3.16	1,815.36	13,579.85	4,297.12	9.43
3:1 SG	0	3,070.2	0.72	2,210.56	16,536.11	22,965.22	11.48
	25	838.9	0.05	41.94	313.76	6,274.78	0.22
	75	536.3	0.19	101.89	762.22	4,011.43	0.53
	140	567.4	1.28	726.28	5,432.96	4,244.20	3.77
2:1 SG	0	3,070.2	-	-	-	22,965.22	-
	25	843.1	1.90	1,601.84	11,982.62	6,306.20	8.32
	75	522.4	1.50	783.62	5,861.88	3,907.65	4.07
	140	513.6	0.77	395.49	2,958.46	3,841.89	2.05
Totals			**19.65**	**29,401.13**	**219,935.72**		**152.73**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	25.27	505.40	3,780.65	149.60	2.63
Totals			**25.27**	**505.40**	**3,780.65**		**2.63**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	55.13	1,102.60	8,248.02	149.60	5.73
Totals			**55.13**	**1,102.60**	**8,248.02**		**5.73**

Totals			**121.30**	**34,797.61**	**260,304.21**	**-**	**180.77**

TOTAL EXPANSION THROUGH PAD 4A

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	215	19,313.3	5.33	102,940.08	770,045.30	395.79	2,109.71	1.47
3:1 SG	215	18,191.6	1.43	26,014.04	194,598.50	372.80	533.15	0.37
2:1 SG	215	18,191.6	-	-	-	372.80	-	-
Capped	-	976.0	14.49	14,142.24	105,791.30	20.00	289.84	0.20
Totals			**21.25**	**143,096.36**	**1,070,435.10**		**2,932.70**	**2.04**

Sump SW-2 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	2.43	201,399.32	1,506,571.51	1,698.48	4,127.59	2.87
	25	39,262.7	2.77	108,757.79	813,564.76	804.62	2,228.94	1.55
	75	33,962.5	2.35	79,811.83	597,033.92	696.00	1,635.71	1.14
	215	19,313.3	4.15	80,150.35	599,566.23	395.79	1,642.65	1.14
3:1 SG	0	82,880.4	0.18					
	25	37,356.7	0.08	2,988.53	22,355.77	765.56	61.25	0.04
	75	32,848.9	0.10	3,284.89	24,572.70	673.18	67.32	0.05
	215	17,806.1	0.56	9,971.40	74,591.28	364.90	204.36	0.14
2:1 SG	0	82,880.4	0.56					
	25	39,456.1	0.45	17,755.24	132,818.39	808.58	363.89	0.25
	75	33,550.1	0.09	3,019.51	22,587.50	687.55	61.88	0.04
	215	26,660.3	-	-	-	546.35	-	-
Capped	-	976.0	9.10	8,881.60	66,438.98	20.00	182.02	0.13
Totals			**22.82**	**516,020.45**	**3,860,101.02**		**10,575.62**	**7.34**

Sump SW-3 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	10.66	883,504.82	6,609,075.01	1,698.48	18,107.05	12.57
3:1 SG	0	82,880.4	1.03	85,366.79	638,587.92	1,698.48	1,749.56	1.21
2:1 SG	0	82,880.4	3.24	268,532.42	2,008,762.01	1,698.48	5,503.46	3.82
Totals			**14.93**	**1,237,404.03**	**9,256,424.95**		**25,360.07**	**17.61**

Original Landfill Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	14.00	270,386.71	2,022,633.06	395.79	5,541.46	3.85
Capped	-	976.0	18.10	17,665.60	132,147.86	20.00	362.05	0.25
Totals			**32.10**	**288,052.31**	**2,154,780.92**		**5,903.51**	**4.10**

Southern Expansion Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	5.66	109,313.48	817,721.65	395.79	2,240.33	1.56
Capped	-	976.0	48.70	47,531.20	355,558.07	20.00	974.13	0.68
Totals			**54.36**	**156,844.68**	**1,173,279.72**		**3,214.46**	**2.23**

Totals			**145.46**	**2,341,417.83**	**17,515,021.71**		**47,986.36**	**33.32**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	215	537.5	5.33	2,864.95	21,431.32	4,020.61	14.88
3:1 SG	215	579.8	1.43	829.14	6,202.43	4,337.06	4.31
2:1 SG	215	579.8	-	-	-	4,337.06	-
Capped	-	20.0	14.49	289.80	2,167.85	149.60	1.51
Totals			**21.25**	**3,983.90**	**29,801.61**		**20.70**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	2.43	7,460.63	55,809.37	22,965.22	38.76
	25	569.4	2.77				
	75	539.7	2.35	1,268.28	9,487.39	4,036.91	6.59
	215	537.5	4.15	2,230.68	16,686.68	4,020.61	11.59
	0	3,070.2	0.18				
3:1 SG	25	589.0	0.08	47.12	352.45	4,405.37	0.24
	75	536.3	0.10	53.63	401.17	4,011.43	0.28
	215	534.3	0.56	299.21	2,238.22	3,996.54	1.55
	0	3,070.2	0.56				
2:1 SG	25	558.8	0.45	251.46	1,881.07	4,179.86	1.31
	75	522.4	0.09	47.02	351.71	3,907.65	0.24
	215	513.6	-	-	-	3,841.89	-
Capped	-	20.0	9.10	182.00	1,361.45	149.60	0.95
Totals			**22.82**	**11,840.02**	**88,569.52**		**61.51**

Sump SW-3 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	10.66	32,728.52	244,826.30	22,965.22	170.02
3:1 SG	0	3,070.2	1.03	3,162.32	23,655.82	22,965.22	16.43
2:1 SG	0	3,070.2	3.24	9,947.50	74,412.50	22,965.22	51.68
Totals			**14.93**	**45,838.34**	**342,894.62**		**238.12**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	14.00	7,525.20	56,292.41	4,020.61	39.09
Capped	-	20.0	18.10	362.00	2,707.95	149.60	1.88
Totals			**32.10**	**7,887.20**	**59,000.36**		**40.97**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	5.66	3,042.33	22,758.22	4,020.61	15.80
Capped	-	20.0	48.70	974.00	7,286.03	149.60	5.06
Totals			**54.36**	**4,016.33**	**30,044.24**		**20.86**

Totals			**145.46**	**73,565.79**	**550,310.35**		**382.16**

TOTAL EXPANSION THROUGH PAD 4B

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	21.25	20,740.00	155,145.97	20.00	425.06	0.30
Totals			**21.25**	**20,740.00**	**155,145.97**		**425.06**	**0.30**

Sump SW-2 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	2.43	201,399.32	1,506,571.51	1,698.48	4,127.59	2.87
3:1 SG	0	82,880.4	0.18					
2:1 SG	0	82,880.4	0.56					
Capped	-	976.0	19.65	19,178.40	143,464.39	20.00	393.05	0.27
Totals			**22.82**	**220,577.72**	**1,650,035.90**		**4,520.65**	**3.14**

Sump SW-3 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	8.81	730,176.12	5,462,096.70	1,698.48	14,964.65	10.39
	25	39,456.1	4.18	164,926.41	1,233,735.21	808.58	3,380.10	2.35
	75	34,150.5	3.77	128,747.24	963,096.24	699.85	2,638.62	1.83
	110	30,443.4	1.42	43,229.57	323,379.61	623.88	885.97	0.62
3:1 SG	0	82,880.4	1.15	95,312.43	712,986.52	1,698.48	1,953.39	1.36
	25	38,333.7	0.66	25,300.23	189,258.83	785.58	518.52	0.36
	75	-	-	-	-	-	-	-
	110	-	-	-	-	-	-	-
2:1 SG	0	-	-	-	-	-	-	-
	25	39,035.8	1.97	76,900.53	575,255.91	799.97	1,576.04	1.09
	75	33,733.6	1.37	46,215.04	345,712.53	691.31	947.16	0.66
	110	28,344.6	0.05	1,417.23	10,601.62	580.87	29.05	0.02
Totals			**23.38**	**1,312,224.80**	**9,816,123.16**		**26,893.49**	**18.68**

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	32.69	31,905.44	238,669.27	20.00	653.89	0.45
Totals			**32.69**	**31,905.44**	**238,669.27**		**653.89**	**0.45**

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	55.13	53,806.88	402,503.41	20.00	1,102.75	0.77
Totals			**55.13**	**53,806.88**	**402,503.41**		**1,102.75**	**0.77**

Totals			**155.27**	**1,639,254.83**	**12,262,477.72**	**-**	**33,595.83**	**23.33**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	21.25	425.00	3,179.22	149.60	2.21
Totals			**21.25**	**425.00**	**3,179.22**		**2.21**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	2.43	7,460.63	55,809.37	22,965.22	38.76
	0	3,070.2	0.18				
Capped	0	3,070.2	0.56				
	-	20.0	19.65	393.00	2,939.84	149.60	2.04
Totals			**22.82**	**7,853.63**	**58,749.22**		**40.80**

Sump SW-3 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	8.81	27,048.61	202,337.68	22,965.22	140.51
	25	595.6	4.18	2,489.55	18,623.11	4,454.98	12.93
	75	558.8	3.77	2,106.70	15,759.18	4,179.86	10.94
	110	578.9	1.42	822.06	6,149.45	4,330.30	4.27
3:1 SG	0	3,070.2	1.15	3,530.75	26,411.84	22,965.22	18.34
	25	592.0	0.66	390.70	2,922.62	4,427.91	2.03
	75	-	-	-	-	-	-
	110	-	-	-	-	-	-
2:1 SG	0	-	-	-	-	-	-
	25	601.2	1.97	1,184.27	8,858.93	4,496.61	6.15
	75	579.3	1.37	793.62	5,936.68	4,333.04	4.12
	110	551.5	0.05	27.57	206.27	4,125.05	0.14
Totals			**23.38**	**38,393.83**	**287,205.76**		**199.45**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	32.69	653.80	4,890.76	149.60	3.40
Totals			**32.69**	**653.80**	**4,890.76**		**3.40**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	55.13	1,102.60	8,248.02	149.60	5.73
Totals			**55.13**	**1,102.60**	**8,248.02**		**5.73**

Totals			**155.27**	**48,428.85**	**362,272.98**	**-**	**251.58**

TOTAL EXPANSION THROUGH PAD 5A

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	215	19,313.3	3.20	61,802.68	462,316.13	395.79	1,266.62	0.88
3:1 SG	215	18,191.6	0.54	9,823.48	73,484.75	372.80	201.33	0.14
2:1 SG	215	18,191.6	-	-	-	372.80	-	-
Capped	-	976.0	17.51	17,089.76	127,840.28	20.00	350.25	0.24
Totals			**21.25**	**88,715.92**	**663,641.16**		**1,818.19**	**1.26**

Sump SW-2 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	25	39,262.7	-	-	-	804.62	-	-
	75	33,962.5	0.66	22,415.24	167,677.61	696.00	459.39	0.32
	215	19,313.3	11.53	222,682.77	1,665,782.80	395.79	4,563.79	3.17
3:1 SG	25	37,356.7	-	-	-	765.56	-	-
	75	32,848.9	-	-	-	673.18	-	-
	215	17,806.1	1.00	17,806.08	133,198.71	364.90	364.93	0.25
2:1 SG	25	39,456.1	0.60	23,673.65	177,091.18	808.58	485.18	0.34
	75	33,550.1	0.51	17,110.55	127,995.82	687.55	350.67	0.24
	215	26,660.3	-	-	-	546.35	-	-
Capped	-	976.0	9.06	8,842.56	66,146.94	20.00	181.22	0.13
Totals			**23.36**	**312,530.84**	**2,337,893.06**		**6,405.19**	**4.45**

Sump SW-3 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	25	39,262.7	2.94	115,432.45	863,494.72	804.62	2,365.74	1.64
	75	33,962.5	5.19	176,265.27	1,318,555.75	696.00	3,612.48	2.51
	215	19,313.3	10.13	195,644.10	1,463,519.49	395.79	4,009.64	2.78
3:1 SG	25	37,356.7	1.19	44,454.42	332,542.14	765.56	911.07	0.63
	75	32,848.9	0.08	2,627.91	19,658.16	673.18	53.86	0.04
	215	17,806.1	0.48	8,546.92	63,935.38	364.90	175.17	0.12
2:1 SG	25	39,456.1	1.97	77,728.48	581,449.38	808.58	1,593.01	1.11
	75	33,550.1	1.37	45,963.64	343,831.91	687.55	942.01	0.65
	215	26,660.3	0.05	1,333.01	9,971.63	546.35	27.32	0.02
Totals			**23.40**	**667,996.20**	**4,996,958.57**		**13,690.30**	**9.51**

Sump SW-4 Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	7.66	634,863.69	4,749,110.19	1,698.48	13,011.26	9.04
3:1 SG	0	82,880.4	0.49	40,611.38	303,794.25	1,698.48	832.31	0.58
2:1 SG	0	82,880.4	4.58	379,592.13	2,839,546.30	1,698.48	7,779.58	5.40
Totals			**12.73**	**1,055,067.20**	**7,892,450.74**		**21,623.15**	**15.02**

Original Landfill Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	21.78	420,644.47	3,146,639.14	395.79	8,620.93	5.99
Capped	-	976.0	16.52	16,123.52	120,612.31	20.00	330.44	0.23
Totals			**38.30**	**436,767.99**	**3,267,251.45**		**8,951.37**	**6.22**

Southern Expansion Footprint Leachate Generation - Annual Average Generation

	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	0.26	5,021.47	37,563.19	395.79	102.91	0.07
Capped	-	976.0	54.87	53,553.12	400,605.16	20.00	1,097.55	0.76
Totals			**55.13**	**58,574.59**	**438,168.34**		**1,200.46**	**0.83**

Totals			**174.17**	**2,619,652.73**	**19,596,363.31**	-	**53,688.67**	**37.28**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
	215	537.5	3.20	1,720.05	12,866.84	4,020.61	8.94
	215	579.8	0.54	313.10	2,342.18	4,337.06	1.63
	215	579.8	-	-	-	4,337.06	-
Capped	-	20.0	17.51	350.20	2,619.68	149.60	1.82
Totals			**21.25**	**2,383.35**	**17,828.69**		**12.38**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	25	569.4	-				
	75	539.7	0.66	356.20	2,664.54	4,036.91	1.85
	215	537.5	11.53	6,197.54	46,360.82	4,020.61	32.20
3:1 SG	25	589.0	-	-	-	4,405.37	-
	75	536.3	-	-	-	4,011.43	-
	215	534.3	1.00	534.30	3,996.82	3,996.54	2.78
2:1 SG	25	558.8	0.60	335.28	2,508.09	4,179.86	1.74
	75	522.4	0.51	266.43	1,993.04	3,907.65	1.38
	215	513.6	-	-	-	3,841.89	-
Capped	-	20.0	9.06	181.20	1,355.47	149.60	0.94
Totals			**23.36**	**7,870.95**	**58,878.78**		**40.89**

Sump SW-3 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	25	569.4	2.94				
	75	539.7	1.19	642.24	4,804.25	4,036.91	3.34
	215	537.5	1.97	1,058.90	7,921.15	4,020.61	5.50
3:1 SG	25	589.0	5.19	3,056.67	22,865.45	4,405.37	15.88
	75	536.3	0.08	42.90	320.94	4,011.43	0.22
	215	534.3	1.37	731.99	5,475.64	3,996.54	3.80
2:1 SG	25	558.8	10.13	5,660.70	42,344.95	4,179.86	29.41
	75	522.4	0.48	250.76	1,875.80	3,907.65	1.30
	215	513.6	0.05	25.68	192.11	3,841.89	0.13
Totals			**23.40**	**11,469.83**	**85,800.29**		**59.58**

Sump SW-4 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	7.66	23,517.86	175,925.84	22,965.22	122.17
3:1 SG	0	3,070.2	0.49	1,504.41	11,253.74	22,965.22	7.82
2:1 SG	0	3,070.2	4.58	14,061.59	105,188.03	22,965.22	73.05
Totals			**12.73**	**39,083.87**	**292,367.62**		**203.03**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	21.78	11,707.06	87,574.90	4,020.61	60.82
Capped	-	20.0	16.52	330.40	2,471.56	149.60	1.72
Totals			**38.30**	**12,037.46**	**90,046.47**		**62.53**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	0.26	139.75	1,045.43	4,020.61	0.73
Capped	-	20.0	54.87	1,097.40	8,209.12	149.60	5.70
Totals			**55.13**	**1,237.15**	**9,254.55**		**6.43**

Totals			**174.17**	**74,082.61**	**554,176.40**	-	**384.84**

TOTAL EXPANSION THROUGH PAD 5B

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	21.25	20,740.00	155,145.97	20.00	425.06	0.30

Sump SW-2 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	19.65	19,178.40	143,464.39	20.00	393.05	0.27

Sump SW-3 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	25	39,035.8	0.10	3,903.58	29,200.81	799.97	80.00	0.06
	75	34,153.6	0.54	18,442.97	137,962.98	699.92	377.98	0.26
	130	28,320.1	2.51	71,083.39	531,740.71	580.37	1,456.82	1.01
3:1 SG	25	37,356.7	0.08	2,988.53	22,355.77	765.56	61.25	0.04
	75	32,054.8	0.18	5,769.86	43,161.56	656.90	118.25	0.08
	130	26,224.6	0.31	8,129.62	60,813.75	537.42	166.61	0.12
2:1 SG	25	39,456.1	0.17	6,707.53	50,175.83	808.58	137.47	0.10
	75	34,153.6	0.40	13,661.46	102,194.80	699.92	279.99	0.19
	130	27,201.5	-	-	-	557.44	-	-
Capping	-	976.0	19.11	18,651.36	139,521.86	20.00	382.25	0.27
Totals			**23.40**	**149,338.30**	**1,117,128.08**		**3,060.62**	**2.13**

Sump SW-4 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	7.00	580,162.64	4,339,917.93	1,698.48	11,890.19	8.26
	25	39,035.8	1.35	52,698.33	394,210.90	799.97	1,080.03	0.75
	75	34,153.6	1.92	65,574.99	490,535.03	699.92	1,343.93	0.93
	130	28,320.1	4.37	123,758.74	925,779.64	580.37	2,536.38	1.76
3:1 SG	0	82,880.4	1.61	133,437.41	998,181.12	1,698.48	2,734.74	1.90
	25	37,356.7	0.09	3,362.10	25,150.25	765.56	68.90	0.05
	75	32,054.8	0.12	3,846.57	28,774.38	656.90	78.83	0.05
	130	26,224.6	0.27	7,080.63	52,966.82	537.42	145.11	0.10
2:1 SG	0	82,880.4	2.36	195,597.69	1,463,172.33	1,698.48	4,008.69	2.78
	25	39,456.1	2.64	104,164.05	779,201.20	808.58	2,134.80	1.48
	75	34,153.6	1.67	57,036.58	426,663.28	699.92	1,168.94	0.81
	130	27,201.5	0.28	7,616.43	56,974.83	557.44	156.10	0.11
Totals			**23.68**	**1,334,336.17**	**9,981,527.69**		**27,346.65**	**18.99**

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	50.62	49,405.12	369,575.96	20.00	1,012.54	0.70

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	55.13	53,806.88	402,503.41	20.00	1,102.75	0.77

Totals			**193.73**	**1,626,804.87**	**12,169,345.51**		**33,340.67**	**23.15**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	21.25	425.00	3,179.22	149.60	2.21

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	19.65	393.00	2,939.84	149.60	2.04

Sump SW-3 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	25	601.2	0.10	60.12	449.69	4,496.61	0.31
	75	558.8	0.54	301.75	2,257.28	4,179.86	1.57
	130	580.4	2.51	1,456.89	10,898.27	4,341.64	7.57
3:1 SG	25	589.0	0.08	47.12	352.45	4,405.37	0.24
	75	533.6	0.18	96.06	718.55	3,991.66	0.50
	130	555.5	0.31	172.20	1,288.16	4,155.07	0.89
2:1 SG	25	558.8	0.17	95.00	710.63	4,179.86	0.49
	75	558.8	0.40	223.52	1,672.06	4,179.86	1.16
	130	571.2	-	-	-	4,272.93	-
Capping	-	20.0	19.11	382.20	2,859.05	149.60	1.99
Totals			**23.40**	**2,834.85**	**21,206.15**		**14.73**

Sump SW-4 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	7.00	21,491.52	160,767.74	22,965.22	111.64
	25	601.2	1.35	811.55	6,070.84	4,496.61	4.22
	75	558.8	1.92	1,072.91	8,025.89	4,179.86	5.57
	130	580.4	4.37	2,536.49	18,974.27	4,341.64	13.18
3:1 SG	0	3,070.2	1.61	4,943.05	36,976.58	22,965.22	25.68
	25	589.0	0.09	53.01	396.51	4,405.37	0.28
	75	533.6	0.12	64.04	479.03	3,991.66	0.33
	130	555.5	0.27	149.98	1,121.95	4,155.07	0.78
2:1 SG	0	3,070.2	2.36	7,245.71	54,201.69	22,965.22	37.64
	25	558.8	2.64	1,475.25	11,035.60	4,179.86	7.66
	75	558.8	1.67	933.20	6,980.86	4,179.86	4.85
	130	571.2	0.28	159.95	1,196.50	4,272.93	0.83
Totals			**23.68**	**40,936.66**	**306,227.47**		**212.66**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	50.62	1,012.40	7,573.28	149.60	5.26

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	55.13	1,102.60	8,248.02	149.60	5.73

Totals			**193.73**	**46,704.51**	**349,373.98**		**242.62**

TOTAL EXPANSION THROUGH PAD 6

Leachate Production Summary Table

Sump SW-1 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	1.10	21,244.67	158,921.17	395.79	435.40	0.30
Capped	-	976.0	20.15	19,666.40	147,114.89	20.00	403.05	0.28
Totals			**21.25**	**40,911.07**	**306,036.06**		**838.45**	**0.58**

Sump SW-2 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	22.64	22,096.64	165,294.35	20.00	452.86	0.31

Sump SW-3 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	23.39	22,828.64	170,770.09	20.00	467.86	0.32

Sump SW-4 Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Capped	-	976.0	23.68	23,111.68	172,887.37	20.00	473.66	0.33

Sump SW-5 Leachate Generation - Annual Average Generation								
	Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
Flat SG	0	82,880.4	9.18	760,841.86	5,691,492.37	1,698.48	15,593.13	10.83
3:1 SG	0	82,880.4	1.98	164,103.15	1,227,576.78	1,698.48	3,363.22	2.34
2:1 SG	0	82,880.4	4.25	352,241.60	2,634,950.17	1,698.48	7,219.04	5.01
Totals			**15.41**	**1,277,186.61**	**9,554,019.32**	**5,095.44**	**26,175.40**	**18.18**

Original Landfill Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	200	20,903.3	35.84	749,174.66	5,604,215.64	428.37	15,354.02	10.66
Capped	-	976.0	46.28	45,169.28	337,889.68	20.00	925.73	0.64
Totals			**82.12**	**794,343.94**	**5,942,105.32**		**16,279.74**	**11.31**

Southern Expansion Footprint Leachate Generation - Annual Average Generation								
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
SG	215	19,313.3	1.71	33,025.81	247,050.18	395.79	676.85	0.47
Capped	-	976.0	53.42	52,137.92	390,018.73	20.00	1,068.54	0.74
Totals			**55.13**	**85,163.73**	**637,068.91**		**1,745.39**	**1.21**

Totals			**243.62**	**2,265,642.31**	**16,948,181.40**		**46,433.37**	**32.25**

Sump SW-1 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	1.10	591.27	4,422.97	4,020.61	3.07
Capped	-	20.0	20.15	403.00	3,014.65	149.60	2.09
Totals			**21.25**	**994.27**	**7,437.62**		**5.17**

Sump SW-2 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	22.64	452.80	3,387.18	149.60	2.35

Sump SW-3 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	23.39	467.80	3,499.39	149.60	2.43

Sump SW-4 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Capped	-	20.0	23.68	473.60	3,542.77	149.60	2.46

Sump SW-5 Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
Flat SG	0	3,070.2	9.18	28,184.59	210,835.41	22,965.22	146.41
3:1 SG	0	3,070.2	1.98	6,079.03	45,474.30	22,965.22	31.58
2:1 SG	0	3,070.2	4.25	13,048.42	97,608.98	22,965.22	67.78
Totals			**15.41**	**47,312.05**	**353,918.69**	**68,895.67**	**245.78**

Original Landfill Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	200	558.3	35.84	20,007.78	149,668.61	4,175.73	103.94
Capped	polyline	20.0	46.28	925.60	6,923.97	149.60	4.81
Totals			**82.12**	**20,933.38**	**156,592.58**		**108.74**

Southern Expansion Footprint Leachate Generation - Peak Daily Generation							
	Average Waste Depth (ft)	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/min)
SG	215	537.5	1.71	919.15	6,875.72	4,020.61	4.77
Capped	-	20.0	53.42	1,068.40	7,992.19	149.60	5.55
Totals			**55.13**	**1,987.55**	**14,867.90**		**10.32**

Totals			**243.62**	**72,621.45**	**543,246.14**		**377.25**

EXISTING NORTHERN EXPANSION SUMP PIPE PENETRATION

Cell with 25' Waste Depth

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: CES LF + New Exp (GCL Lined) F... **Simulated On:** 3/13/2024 7:40

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	24	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	300	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	72.273	inches
Total Initial Water	=	72.273	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/Low Waste
Simulated on: 3/13/2024 7:41

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,824.5	31.94
Evapotranspiration	19.929	[2.815]	72,341.4	42.93
Subprofile1				
Lateral drainage collected from Layer 3	10.8162	[3.6206]	39,262.7	23.30
Percolation/leakage through Layer 5	0.000000	[0]	0.0002	0.00
Average Head on Top of Layer 4	0.0058	[0.002]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	0.8540	[3.4174]	3,100.0	1.84

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/Low Waste

Simulated on: 3/13/2024 7:42

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1569	569.4
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0310	---
Maximum head on Layer 4	0.0017	---
Location of maximum head in Layer 3	0.00	(feet from drain)
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00	(feet from drain)
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640	(vol/vol)
Minimum vegetation soil water	0.1870	(vol/vol)

EXISTING NORTHERN EXPANSION SUMP PIPE PENETRATION

Cell with 75' Waste Depth

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: CES LF + New Exp (GCL Lined) F... **Simulated On:** 3/13/2024 7:32

Layer 1

Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	24	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2

Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	900	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3

Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	203.673	inches
Total Initial Water	=	203.673	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/Med Waste
Simulated on: 3/13/2024 7:34

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,824.5	31.94
Evapotranspiration	19.929	[2.815]	72,341.4	42.93
Subprofile1				
Lateral drainage collected from Layer 3	9.3561	[4.9208]	33,962.5	20.15
Percolation/leakage through Layer 5	0.000000	[0]	0.0002	0.00
Average Head on Top of Layer 4	0.0051	[0.0027]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	2.3141	[5.0849]	8,400.3	4.98

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/Med Waste
Simulated on: 3/13/2024 7:35

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1487	539.7
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0284	---
Maximum head on Layer 4	0.0016	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

EXISTING NORTHERN EXPANSION SUMP PIPE PENETRATION

Cell with 125’ Waste Depth

HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE
HELP MODEL VERSION 4.0 BETA (2018)
DEVELOPED BY USEPA NATIONAL RISK MANAGEMENT RESEARCH LABORATORY

Title: CES LF + New Exp (GCL Lined) F... **Simulated On:** 3/13/2024 7:25

Layer 1
Type 1 - Vertical Percolation Layer (Cover Soil)
CL - Clay Loam
Material Texture Number 11

Thickness	=	24	inches
Porosity	=	0.464	vol/vol
Field Capacity	=	0.31	vol/vol
Wilting Point	=	0.187	vol/vol
Initial Soil Water Content	=	0.233	vol/vol
Effective Sat. Hyd. Conductivity	=	6.40E-05	cm/sec

Layer 2
Type 1 - Vertical Percolation Layer (Waste)
Municipal Solid Waste (MSW) (900 pcy)
Material Texture Number 18

Thickness	=	1500	inches
Porosity	=	0.671	vol/vol
Field Capacity	=	0.292	vol/vol
Wilting Point	=	0.077	vol/vol
Initial Soil Water Content	=	0.219	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E-03	cm/sec

Layer 3
Type 2 - Lateral Drainage Layer
Coarse Gravel
Material Texture Number 43

Thickness	=	18	inches
Porosity	=	0.667	vol/vol
Field Capacity	=	0.032	vol/vol
Wilting Point	=	0.013	vol/vol
Initial Soil Water Content	=	0.032	vol/vol
Effective Sat. Hyd. Conductivity	=	6.70E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 4

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre
FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Layer 5

Type 3 - Barrier Soil Liner

Bentonite (High)

Material Texture Number 17

Thickness	=	0.5	inches
Porosity	=	0.75	vol/vol
Field Capacity	=	0.747	vol/vol
Wilting Point	=	0.4	vol/vol
Initial Soil Water Content	=	0.75	vol/vol
Effective Sat. Hyd. Conductivity	=	3.00E-09	cm/sec

Layer 6

Type 2 - Lateral Drainage Layer

Drainage Net (0.5 cm)

Material Texture Number 20

Thickness	=	6	inches
Porosity	=	0.85	vol/vol
Field Capacity	=	0.01	vol/vol
Wilting Point	=	0.005	vol/vol
Initial Soil Water Content	=	0.005	vol/vol
Effective Sat. Hyd. Conductivity	=	1.00E+01	cm/sec
Slope	=	10	%
Drainage Length	=	200	ft

Layer 7

Type 4 - Flexible Membrane Liner

HDPE Membrane

Material Texture Number 35

Thickness	=	0.6	inches
Effective Sat. Hyd. Conductivity	=	2.00E-13	cm/sec
FML Pinhole Density	=	0	Holes/Acre

FML Installation Defects	=	0	Holes/Acre
FML Placement Quality	=	3	Good

Note: Initial moisture content of the layers and snow water were specified by the user.

General Design and Evaporative Zone Data

SCS Runoff Curve Number	=	95.1	
Fraction of Area Allowing Runoff	=	100	%
Area projected on a horizontal plane	=	1	acres
Evaporative Zone Depth	=	3	inches
Initial Water in Evaporative Zone	=	0.699	inches
Upper Limit of Evaporative Storage	=	1.392	inches
Lower Limit of Evaporative Storage	=	0.561	inches
Initial Snow Water	=	0	inches
Initial Water in Layer Materials	=	335.073	inches
Total Initial Water	=	335.073	inches
Total Subsurface Inflow	=	0	inches/year

Note: SCS Runoff Curve Number was calculated by HELP.

Evapotranspiration and Weather Data

Station Latitude	=	40.68	Degrees
Maximum Leaf Area Index	=	0	
Start of Growing Season (Julian Date)	=	121	days
End of Growing Season (Julian Date)	=	273	days
Average Wind Speed	=	7	mph
Average 1st Quarter Relative Humidity	=	61	%
Average 2nd Quarter Relative Humidity	=	65	%
Average 3rd Quarter Relative Humidity	=	76	%
Average 4th Quarter Relative Humidity	=	69	%

Note: Evapotranspiration data was obtained for Pottsville, Pennsylvania

Normal Mean Monthly Precipitation (inches)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
2.947447	2.416858	3.701201	3.186903	3.975449	4.916228
4.051812	4.289329	4.823011	4.665089	3.97445	3.478862

Note: Precipitation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Normal Mean Monthly Temperature (Degrees Fahrenheit)

Jan/Jul	Feb/Aug	Mar/Sep	Apr/Oct	May/Nov	Jun/Dec
33.5	32.9	43.3	54.4	65.9	75.1
79.9	76.8	68.9	55.9	45.6	37.8

Note: Temperature was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28
Solar radiation was simulated based on HELP V4 weather simulation for:
Lat/Long: 40.68/-76.28

Average Annual Totals Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/High Waste
Simulated on: 3/13/2024 7:27

	Average Annual Totals for Years 1 - 30*			
	(inches)	[std dev]	(cubic feet)	(percent)
Precipitation	46.43	[5.83]	168,528.7	100.00
Runoff	14.828	[3.976]	53,824.5	31.94
Evapotranspiration	19.929	[2.815]	72,341.4	42.93
Subprofile1				
Lateral drainage collected from Layer 3	7.8960	[5.6174]	28,662.6	17.01
Percolation/leakage through Layer 5	0.000000	[0]	0.0001	0.00
Average Head on Top of Layer 4	0.0043	[0.003]	---	---
Subprofile2				
Lateral drainage collected from Layer 6	0.0000	[0]	0.0000	0.00
Percolation/leakage through Layer 7	0.000000	[0]	0.0000	0.00
Average Head on Top of Layer 7	0.0000	[0]	---	---
Water storage				
Change in water storage	3.7742	[6.0717]	13,700.2	8.13

* Note: Average inches are converted to volume based on the user-specified area.

Peak Values Summary

Title: CES LF + New Exp (GCL Lined) Flat SG w/High Waste
Simulated on: 3/13/2024 7:27

	Peak Values for Years 1 - 30*	
	(inches)	(cubic feet)
Precipitation	3.58	13,004.7
Runoff	2.791	10,132.9
Subprofile1		
Drainage collected from Layer 3	0.1410	512.0
Percolation/leakage through Layer 5	0.000000	0.0000
Average head on Layer 4	0.0289	---
Maximum head on Layer 4	0.0015	---
Location of maximum head in Layer 3	0.00 (feet from drain)	
Subprofile2		
Drainage collected from Layer 6	0.0000	0.0000
Percolation/leakage through Layer 7	0.000000	0.0000
Average head on Layer 7	0.0000	---
Maximum head on Layer 7	0.0000	---
Location of maximum head in Layer 6	0.00 (feet from drain)	
Other Parameters		
Snow water	6.4240	23,319.2
Maximum vegetation soil water	0.4640 (vol/vol)	
Minimum vegetation soil water	0.1870 (vol/vol)	

EXISTING NORTHERN EXPANSION SUMP PIPE PENETRATION

Leachate Production Summary Table

Original Northern Expansion Pipe Penetration Leachate Generation - Annual Average Generation								
	Waste Depth	Leachate Collected (CF/Acre)	Acres	Leachate Collected (CF)	Leachate Collected (gal)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
OG North Exp	25	39,262.7	6.28	246,569.76	1,844,469.86	804.62	5,053.34	3.51
	75	33,962.5	9.17	311,436.13	2,329,704.00	696.00	6,382.75	4.43
	125	28,662.6	9.73	278,887.10	2,086,220.37	587.39	5,715.67	3.97
Totals			**25.18**	**836,892.98**	**6,260,394.23**	**2,088.00**	**17,151.77**	**11.91**

Original Northern Expansion Pipe Penetration Leachate Generation - Peak Daily Generation								
	Waste Depth	Leachate Collected (CF/Acre/day)	Acres	Leachate Collected (CF/day)	Leachate Collected (gal/day)	Leachate Generation (gal/acre/day)	Leachate Generation (gal/day)	Leachate Generation (gal/min)
OG North Exp	25	569.4	6.28	3,575.83	26,749.08	4,259.11	26,749.08	18.58
	75	530.9	9.17	4,868.35	36,417.81	3,971.13	36,417.81	25.29
	125	512.0	9.73	4,981.76	37,266.15	3,829.76	37,266.15	25.88
Totals			**25.18**	**13,425.95**	**100,433.04**	**12,060.00**	**100,433.04**	**69.75**

ATTACHMENT 25-6

Leachate Treatment Plant Process Schematic (*revised July 2026*)

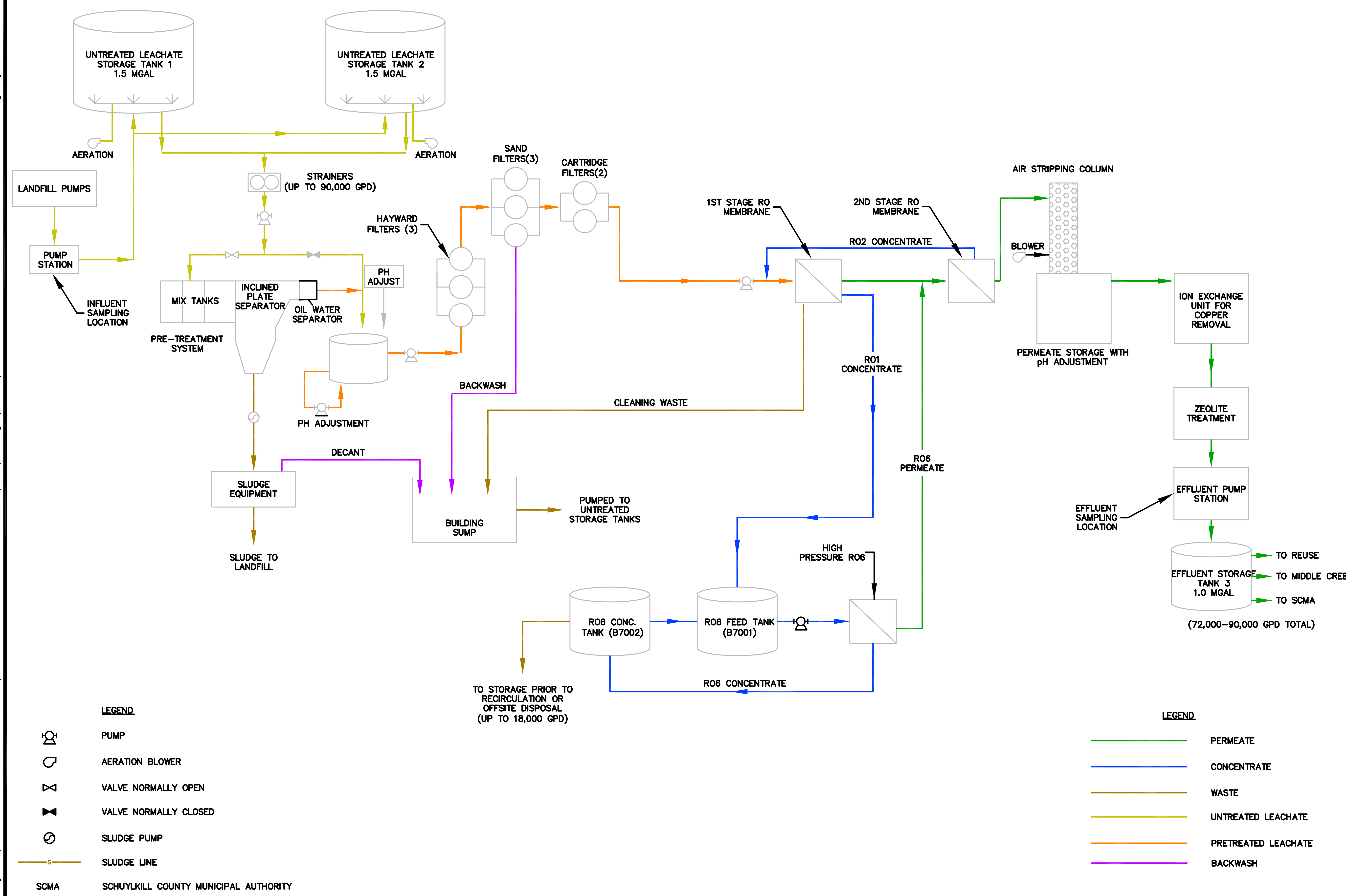

FIGURE 6
PROCESS FLOW SCHEMATIC

NPDES PERMIT RENEWAL APPLICATION
COMMONWEALTH ENVIRONMENTAL SYSTEMS, L.P.
99 COMMONWEALTH AVENUE, HEGINS, PA 17938
FOSTER TOWNSHIP, SCHUYLKILL COUNTY

DRAWN BY: RLP	CHECKED BY: JLT
DATE: 08/18/2025	PROJECT NO: 011035.097
DRAWING SCALE: NOT TO SCALE	

HEADQUARTERS PHILADELPHIA REGION
P. O. Box 468
6912 Old Easton Road
Pipersville, PA 18947

APPALACHIAN REGIONAL OFFICE
P. O. Box 794
8000 Coombs Farm Drive
Morgantown, WV 26505

EARTHRES
ENGINEERING FOR SUCCESS™
www.earthres.com

ATTACHMENT 25-7

CES – SCMA Agreement and Pilot Work Plan (*added July 2026*)

Derenzo & Zerbe

Attorneys at Law

Ronald T. Derenzo
Joseph G. Zerbe

111 East Market Street
P.O. Box 207
Pottsville, Pennsylvania 17901
-- --- --
Telephone (570) 622-1947
Fax (570) 622-3261

76 Tulpehocken Street
Pine Grove, PA 17963
(570) 345-8885

MEMORANDUM

TO: David Leung, Dave Holley and Frank Zukas

FROM: Ron Derenzo

DATE: 4/3/07

RE: SCMA - CES

Gentlemen:

Enclosed for each of you is a fully executed counterpart of the First Addendum dated March 21, 2007, to the Agreement dated December 16, 1998.

Ron

FIRST ADDENDUM TO AGREEMENT

THIS FIRST ADDENDUM TO AGREEMENT, dated the 21st day of March, 2007, by and between SCHUYLKILL COUNTY MUNICIPAL AUTHORITY ("Authority"), a municipal authority organized and existing under the laws of the Commonwealth of Pennsylvania; and COMMONWEALTH ENVIRONMENTAL SYSTEMS ("CES"), a Pennsylvania limited partnership.

WHEREAS, the parties hereto entered into an Agreement dated December 16, 1998 (the "Agreement"), with respect to the Authority providing sewer service for the CES Landfill and residents of the Township of Foster, Schuylkill County, Pennsylvania; and

WHEREAS, CES has requested certain revisions and amendments to Paragraphs 2.03(a) and 4.01 of said Agreement, as more fully set forth herein, and the Authority is agreeable to such revisions and amendments.

NOW, THEREFORE, WITNESSETH, the parties hereto, for and in consideration of the mutual promises herein contained, agree as follows:

1. The recitals set forth hereinabove are incorporated herein by reference.

2. Paragraph 2.03(a) of the Agreement dated December 16, 1998, is amended and revised so as to provide as follows:

> "(a) The Authority agrees to design and construct the expanded Gordon Plant and Expanded Sewer Line to accommodate CES Effluent to be discharged from the CES Landfill and to be delivered, via the CES Effluent Transportation Line, to the connection manhole located in the Schuylkill Highridge Business Park into the Authority Sewer System. The Authority agrees to expand the Gordon Plant by an amount of not less than 200,000 gpd capacity. The Authority shall make available for the use of CES an average daily flow of 65,000 gpd up to a maximum daily flow of 100,000 gpd."

3. Paragraph 4.01 of the Agreement dated December 16, 1998, is amended and revised so as to provide as follows:

> "4.01 ACCEPTANCE OF CES EFFLUENT
>
> The Authority will accept, at the interconnection point in the Schuylkill Highridge Business Park, up to 65,000 gpd of wastewater effluent, averaged over a 365-day period. Such effluent shall include only wastewater generated by the operations of CES Landfill. CES shall not be permitted, without the consent of the Authority, to accept wastewater effluent from any other sources for disposal into the Authority Sewer System. The Authority shall only be obliged to accept CES Effluent generated solely from operations of the Landfill site."

4. Except as amended and revised herein, all other terms and conditions of the said Agreement dated December 16, 1998, shall remain in full force and effect.

5. This Agreement shall be binding upon and inure to the benefit of the parties hereto, their respective successors and assigns.

6. The parties hereto intend to be legally bound hereby.

IN WITNESS WHEREOF, SCHUYLKILL COUNTY MUNICIPAL AUTHORITY and COMMONWEALTH ENVIRONMENTAL SYSTEMS have caused this First Addendum to Agreement to be executed in their respective names as of the day and year first above written.

ATTEST:	SCHUYLKILL COUNTY MUNICIPAL AUTHORITY
Charles R. Miller	BY: Richard E. Funk
ATTEST:	COMMONWEALTH ENVIRONMENTAL SYSTEMS
David [illegible]	BY: [illegible]

APPROVED AND AGREED TO BY SCHUYLKILL ECONOMIC DEVELOPMENT CORPORATION THIS 21st DAY OF March, 2007.

ATTEST:	SCHUYLKILL ECONOMIC DEVELOPMENT CORPORATION
Letitia L. Reiser	BY: Frank J. Zukas President

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY
221 S. CENTRE STREET
POTTSVILLE, PA 17901
(570) 622-8240; FAX: (570) 622-8248

CES Landfill RO Effluent Discharge Operations Plan

October 27, 2025

Initial Discharge/Pilot Run

- Week 1
  - SCMA will be notified 1 week prior to initial discharge.
  - Discharge will begin on a Monday or Tuesday.
  - Initial discharge will be approximately 10,000 gallons at a continuous flow rate over a 24-hour period.
  - SCMA will monitor the collection system and WWTP for any abnormal operating conditions (AOCs).
- Week 2
  - SCMA will communicate with CES on Monday, to advise if any AOCs were observed. If no AOCs, discharge of 10,000 gallons per day, at a continuous flow rate, may begin for 2 consecutive days.
  - Discharge to commence Monday or Tuesday.
  - SCMA will monitor the collection system and WWTP for any AOCs.
- Week 3
  - SCMA will communicate with CES on Monday, to advise if any AOCs were observed. If no AOCs, discharge of 10,000 gallons per day, at a continuous flow rate, may begin for 5 consecutive days.
  - Discharge to commence Monday or Tuesday.
  - SCMA will monitor the collection system and WWTP for any AOCs.
- Week 4
  - SCMA will communicate with CES on Monday, to advise if any AOCs were observed. If no AOCs, discharge of 10,000 gallons per day, at a continuous flow rate, may begin on a routine daily basis.
  - SCMA will monitor the collection system and WWTP for any AOCs.
- Week 5
  - SCMA will communicate with CES on Monday, to advise if any AOCs were observed. If no AOCs, daily flow rate may increase 10,000 gallons each day. Total daily flow shall not exceed 100,000 gallons per day or 65,000 gallons per day averaged over a 365-day period, as per the existing agreement.
  - SCMA will monitor the collection system and WWTP for any AOCs.

Routine Discharge

- SCMA requests notification 24 hours (minimum) prior to initiating a new discharge event. SCMA will provide approval for the discharge based on current operating conditions of SCMA's wastewater system.
- A new routine discharge event is to be established utilizing the steps outlined above, unless agreed otherwise by both SCMA and CES.
- It is currently unknown if the SCMA WWTP will need an adjustment period (flow rate increased over time) or if flows can be initiated at max volume. This procedure will be refined over time as additional information becomes available.

General Notes

- CES will halt or reduce discharge at the request of SCMA. Potential causes for a request to stop discharging include weather events, equipment failures, RO effluent not meeting SCMA pre-treatment standards, any observed SCMA wastewater treatment system AOCs, etc.
- If SCMA requests CES to halt RO discharge due to an AOC, SCMA will advise CES as to the nature and timing of the AOC.
- CES will notify SCMA when discharge flow is being halted.
- If CES is discharging RO effluent, the sample station located near SR901 shall be operational and collecting samples unless otherwise agreed by SCMA and CES. SCMA shall have access to the site and will collect samples to be held for a minimum of seven days. The collected samples may be analyzed to help determine if an observed AOC is the result of RO discharge. Samples may also be analyzed routinely as need for informational purposes.
- This operations plan is not an amendment to the existing agreement.

Contact Information

- Beginning and ending a discharge event – Group email all of the following SCMA staff.
  - Jesse Weiss, Operations Manager, jweiss@scmawater.com 570-728-5480.
  - Steve Ulceski, Chief Wastewater Operator, sulceski@scmawater.com 570-789-4722.
  - Dave Lubinsky, Assistant Chief Wastewater Operator, dlubinsky@scmawater.com 570-789-3369.
  - Jake Brensinger, Chief Wastewater Collection Operator, jbrensinger@scmawater.com 570-789-3422.
    - Any of the listed staff are authorized to respond with permission to discharge.
  - **(Add CES contacts/info authorized to request a discharge event)**
- SCMA wastewater 24/7 emergency contacts.
  - Wastewater pager, 570-628-7009. This pager is carried 24/7 by the on-call Wastewater Chief operator. Enter a phone number and press #, your call will be returned. This process if for true emergencies only.
  - SCMA answering service is also available after hours, 570-622-8240. State the reason for the call and they will have the appropriate SCMA staff return your call.
- CES 24/7 emergency contact.
  - **(Add CES emergency contact info/methods)**