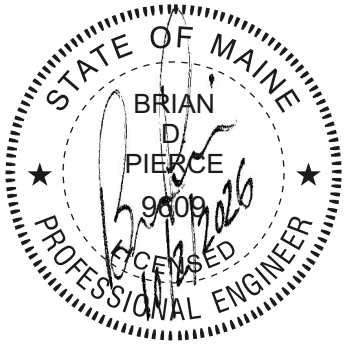
SOLID WASTE MINOR REVISION
LEACHATE TRANSFER SYSTEM UPGRADES
PINE TREE LANDFILL
HAMPDEN, MAINE

Prepared for

NEW ENGLAND WASTE SERVICES OF MAINE, INC.



October 2026

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021

Tel: 207.829.5016 sme-engineers.com

SME
SEVEE & MAHER
ENGINEERS

TABLE OF CONTENTS

Section No.	Title	Page No.
1.0	**INTRODUCTION**	**1**
2.0	**CURRENT SYSTEM CONFIGURATION**	**4**
3.0	**DEMOLITION AND REMOVAL**	**4**
4.0	**LEACHATE MANAGEMENT DURING CONSTRUCTION**	**4**
5.0	**PROPOSED LEACHATE TRANSFER SYSTEM**	**5**
5.1	Leachate Unloading System	5
5.2	Leachate Loading System	6
6.0	**BACKUP POWER**	**7**
7.0	**ANTICIPATED LEACHATE VOLUME**	**7**
7.1	Anticipated PTL Leachate Generation	7
7.2	Anticipated JRL Leachate Deliveries	7
7.3	Anticipated Flow to WWTP From JRL Landfill Expansion	8
7.3.1	Average Daily Traffic Evaluation	8
7.3.2	Peak Daily Traffic Evaluation	9
8.0	**COMBINED LEACHATE DISCHARGE TO SEWER**	**9**
8.1	Required Leachate Storage	10

LIST OF APPENDICES

APPENDIX A PERMIT DRAWINGS
APPENDIX B SPECIFICATIONS
APPENDIX C STORMWATER MANAGEMENT PLAN
APPENDIX D DESIGN CALCULATIONS

LIST OF FIGURES

Figure No.	Title	Page No.
1	SITE LOCATION MAP	3

LIST OF TABLES

Table No.	Title	Page No.
1	SUMMARY OF LEACHATE FLOWS 2021 TO 2025 PINE TREE LANDFILL HAMPDEN, MAINE	7
2	SUMMARY OF LEACHATE FLOWS 2021 TO 2025 JUNIPER RIDGE LANDFILL OLD TOWN, MAINE	8
3	SUMMARY OF LEACHATE FLOWS 2021 TO 2025 PINE TREE AND JUNIPER RIDGE LANDFILLS COMBINED	9

SOLID WASTE MINOR REVISION
LEACHATE TRANSFER SYSTEM UPGRADES
PINE TREE LANDFILL
HAMPDEN, MAINE

1.0 INTRODUCTION

New England Waste Services of Maine, Inc. (NEWSME) a subsidiary of it's parent company Casella Waste Systems, Inc (Casella), the owner and operator of the Pine Tree Landfill (PTL) in Hampden, Maine, is submitting this Solid Waste Minor Revision application to the Maine Department of Environmental Protection (MEDEP) for proposed Leachate Transfer System Upgrades. The project is located adjacent to the landfill and includes relocating the existing leachate loading rack, constructing a leachate unloading area, and rerouting site leachate piping to improve the efficiency of leachate loading and unloading operations. A site plan showing the project location is included as Figure 1.

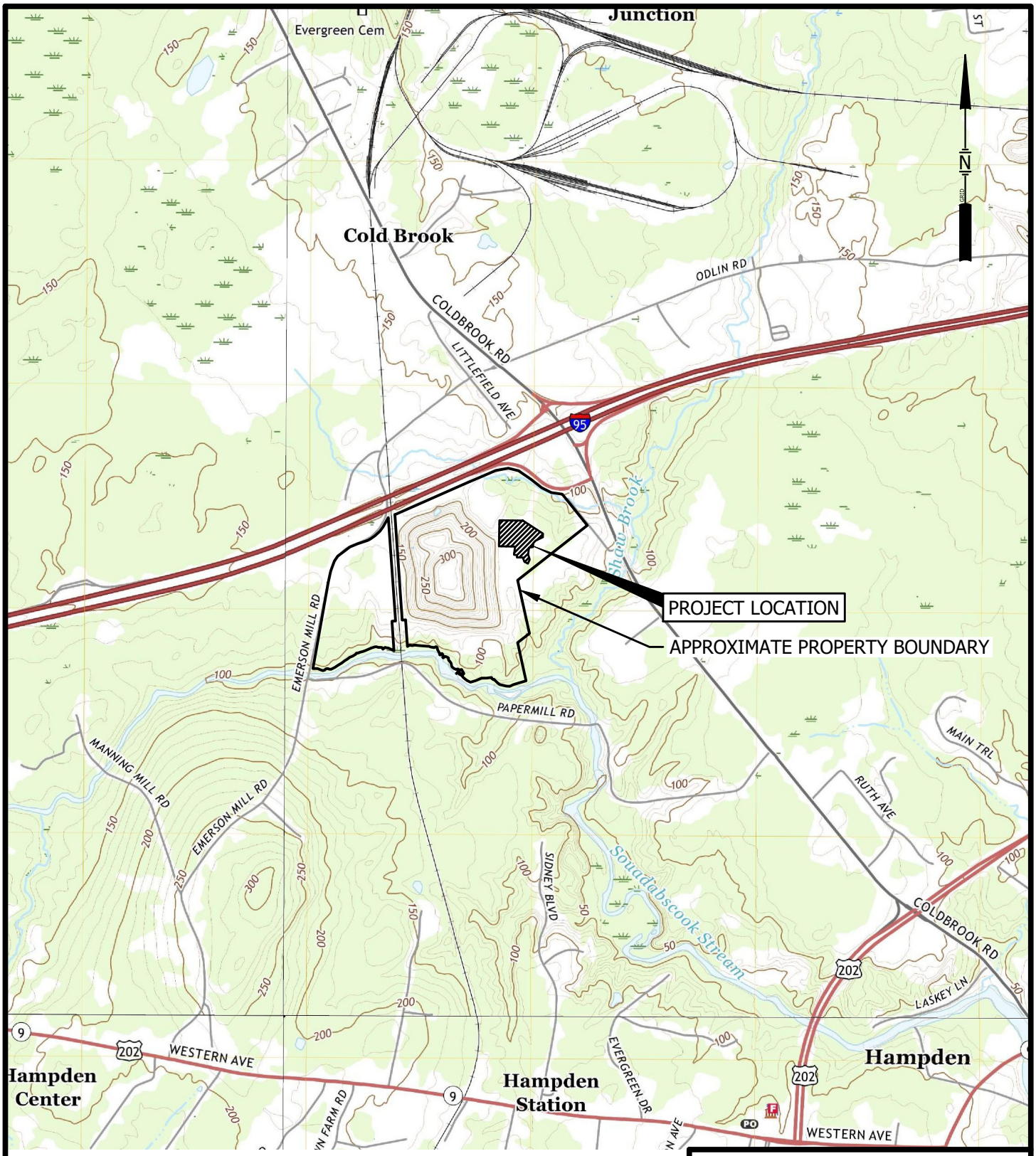
Leachate generated at PTL currently consists of landfill leachate from PTL and collected groundwater from extraction wells and perimeter drains near the landfill. Leachate is conveyed from existing pump stations and groundwater extraction wells through underground piping to an existing aboveground leachate storage tank. From the storage tank, the existing leachate pump station can either discharge leachate to the Town of Hermon sewer system or pump it to tanker trucks at the existing loading rack for transport to and disposal at permitted wastewater treatment facilities (WWTFs). Wastewater discharged to the Hermon sewer flows to the City of Bangor sewer system and is treated at the Bangor Wastewater Treatment Plant (BWTP).

The existing loading rack is seldom used and does not provide an efficient means to remove liquid retained in the pipeline after loading. As a result, the lines must be drained after use to prevent leachate from freezing in the pipeline.

Casella also operates the Juniper Ridge Landfill (JRL) under the subsidiary NEWSME Landfill Operations, LLC. in Old Town, Maine. The proposed transfer system will allow leachate delivered by tanker truck from JRL to be unloaded into the on-site leachate storage tanks. Once received, JRL leachate is mixed with PTL leachate and either discharged to the Hermon sewer or loaded into tanker trucks for transport to a permitted WWTF.

Casella ultimately plans to permit and construct a per- and polyfluoroalkyl substances (PFAS) treatment system for leachate at PTL. The proposed treatment system will reduce PFAS from both PTL and JRL leachate before discharge to the sewer or loading for off-site transport to a permitted WWTF. A permit application for the PFAS treatment system is currently being prepared and is expected to be submitted to MEDEP and the Town later in 2026 or early in 2027. However, the proposed modifications in this upgrade

project are a stand-alone project capable of being permitting, constructed, and operated without the proposed PFAS treatment system.



BASEMAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
BANGOR, ME - 2021
HAMPDEN, ME - 2021
HERMON, ME - 2021
SNOW MOUNTAIN, ME - 2021

1000 0 2000 FEET

DWG: SITELOC LMN: NONE CTB: SME-STD.CTB JOB#: 260565 REV: 9/3/2026

FIGURE 1
SITE LOCATION MAP
PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

SME
SEVEE & MAHER ENGINEERS

C:\Users\sjm\OneDrive - SME\SHAREPOINT\Casella - Pine Tree Landfill - PFAS\Figures\SITELOC.dwg, A_FIGURE 1, 9/3/2026 7:53:19 AM, sjm

2.0 CURRENT SYSTEM CONFIGURATION

Leachate at the PTL is currently pumped from the Secure I, II, and III pump stations and the Phase 6, 7, and 8C pump stations. Collected groundwater is pumped from several extraction wells and the Phase 8C perimeter drain system. These pump stations and extraction wells convey collected groundwater and leachate to the existing leachate storage tank through common dual-containment force mains that cross the project area.

Attached Drawing C-101 in Appendix A shows the leachate transport piping within the project area.

3.0 DEMOLITION AND REMOVAL

Construction of the Leachate Transfer System will require demolition and removal of existing Manhole 2 and Manhole 14 as well as removal of several existing force main pipes within the project area as indicated on Drawing C-101 in Appendix A.

In addition to demolition and removal of the items above, the majority of the force main from Secure III to existing Manhole 2 will be abandoned. Secure III force main will then be rerouted to SMH-17 where flows will be combined with those from the perimeter drain, extraction wells on the south side of the landfill, the Phase 7 and 8C pump stations, and the Secure I pump station. Combining the force mains will allow fewer tie-ins within the proposed vaults and will limit the quantity of pipes that require maintenance and cleaning.

The existing leachate loading rack will be demolished during construction and the force mains and electrical utilities that feed it will be abandoned.

4.0 LEACHATE MANAGEMENT DURING CONSTRUCTION

During leachate transfer facility construction, leachate will be pumped from individual pump stations at the facility and transported to licensed wastewater treatment facilities for disposal as needed.

The existing leachate storage tank will be isolated during construction by closing the valve within the existing valve manhole adjacent to the tank.

The Contractor will provide a leachate management and sequencing plan under the guidelines of:

- Leachate management system shut down time is limited to four days maximum per shut down;
- Every four days, sumps must be dewatered and leachate transported to a licensed disposal location as designated by NEWSME and approved by the Engineer; and

- Between shut down periods, the leachate management system shall be allowed to operate for a minimum of 24 hours.

5.0 PROPOSED LEACHATE TRANSFER SYSTEM

The proposed leachate transfer system is designed to allow secure loading and unloading of leachate at the PTL facility. The purpose of the proposed transfer system upgrade is to allow the unloading of leachate from JRL into the existing leachate storage tank and to make upgrades to the leachate loading system so that leachate from the existing leachate tank can be more easily transferred into tanker trucks for off-site disposal.

5.1 Leachate Unloading System

The leachate unloading system will include construction of new bituminous pavement, a concrete-lined transfer pad, a geomembrane-lined leachate transfer vault, a transfer pump station, and associated force main piping and vaults. The following sections describe the general configuration and function of the system.

Approximately 12,800 square feet of additional bituminous concrete pavement will be constructed to allow tanker truck movement into and out of the leachate transfer area.

Leachate unloading will occur with leachate tank trucks parked on the transfer pad. The transfer pad will be a reinforced concrete pad approximately 30 feet long by 40 feet wide that is designed to convey leachate to the transfer vault in the unlikely event that spills occur on the pad. The combined volume of the transfer pad and Vault exceeds 9,020 gallons (more than 10 percent larger than the size of the largest tanker truck that will deliver leachate from the JRL). A drawing showing the location of the transfer pad is included on Drawing C-102 in Appendix A with details located on Drawing C-303 in Appendix A.

Leachate unloading will begin when leachate tanker trucks drive onto the transfer pad and connect the supplied hose to their truck. After connecting the hose to their truck, the drivers will open the valve on their truck and allow leachate transfer to begin. Leachate from the truck will then flow through the hose to a 6-inch-diameter stainless steel pipe by gravity to a 10,000-gallon high-density polyethylene (HDPE)-lined precast concrete transfer vault. The transfer vault volume is 10,000 gallons and can conservatively accommodate the entire load of leachate from tanker trucks as large as 8,200 gallons, assuming no flow from the pumps (conservative assumption). There will be level monitoring within the transfer vault to monitor liquid level and shut down the system in the event of high liquid levels in the transfer vault. When leachate in the transfer vault reaches 4 feet above the floor of the transfer vault the following will occur:

- A red light will come on adjacent to the truck filling area;
- A motor actuated valve on the 6-inch-diameter stainless steel influent line will close preventing additional leachate from entering the transfer vault through the pipe; and
- NEWSME personnel will receive a high-level warning electronically so that they can identify, diagnose the situation, and make necessary changes necessary before resetting the system and allowing leachate unloading to continue.

Liquid in the transfer vault flows by gravity to the Transfer Pump Station. The Transfer Pump Station is a 7-foot-diameter dual-contained HDPE pump station with two 7.5-HP submersible pumps capable of discharge to the leachate storage tank at a rate of approximately 500 gallons per minute (gpm) with a single pump on. Design calculations related to the Transfer Pump Station are included in Appendix B.

The Transfer Pump Station will convey leachate to the leachate storage tank through the dual-containment HDPE piping system. Each run of the dual containment piping systems will be monitored with a pressure sensor capable of detecting increases in pressure between the carrier pipe (inside pipe that carries the liquid) and the containment pipe (outside pipe) when monitored regularly by NEWSME staff.

Existing manhole structures Manhole 2 and 14 will be replaced with proposed vaults SMH 21 and Vault SMH 22 respectively as part of construction. The concrete vaults will allow connection of new Transfer Pump Station force main with the existing force mains from the Phase 6/Secure II Pump Station, Phase 8C perimeter drain and Secure III force main, and the leachate tank. The new vaults will be watertight precast concrete structures large enough to house and maintain the valves and fittings needed to control the system. Vaults within paved areas on the site will be suitable to withstand HS-25 loading anticipated from the leachate hauling trucks.

5.2 Leachate Loading System

The proposed leachate loading system will include construction of a loading rack with foundation, stairs, loading arm, and a canopy directly adjacent to the transfer pad described above. The following sections describe the general configuration and function of the system.

The proposed leachate loading rack will replace the existing rack and will facilitate tanker truck loading when off-site disposal of leachate is necessary. The new rack will allow safe loading during varying weather conditions. Similar to the current leachate loading system at JRL, truck volumes will be recorded before loading begins, and PTL's control system will be programmed to shut off when the target trucks maximum volume is reached, reducing the potential for leachate overflow onto the containment pad.

Below ground gravity flow piping will be single-wall fused-joint HDPE pipe ranging in size from 4-inches to 12 inches, while force main piping will be dual-walled fused-joint piping ranging in size from 4 inch by 8 inch to 8 inch by 12 inches.

6.0 BACKUP POWER

A backup generator will be installed at the site to supply power suitable to run all leachate transfer operations.

7.0 ANTICIPATED LEACHATE VOLUME

7.1 Anticipated PTL Leachate Generation

Leachate flows from PTL from 2021 through 2025 have ranged from approximately 8.8 to 12 million gallons per year (MGY) with an average of approximately 9.9 MGY as indicated in Table 1.

TABLE 1

SUMMARY OF LEACHATE FLOWS 2021 TO 2025
PINE TREE LANDFILL
HAMPDEN, MAINE

Year	Combined Annual Leachate Volume to Sewer System (gallons)	Combined Average Daily Leachate Volume to Sewer System (gallons)
2021	9,071,859	24,854
2022	8,825,163	24,179
2023	11,979,920	32,822
2024	10,491,659	28,744
2025	9,351,545	25,621
AVERAGE	9,944,029	27,244

The facility's existing approximately 920,000-gallon leachate storage tank stores the site's leachate before discharging to the Town of Hermon sewer system and eventually the City of Bangor sewer system and wastewater treatment plant under permit.

7.2 Anticipated JRL Leachate Deliveries

Leachate flows from the JRL from 2021 through 2025 have ranged from approximately 15.2 to 26.5 MGY with an average of 21.0 MGY as indicated in Table 2.

TABLE 2

SUMMARY OF LEACHATE FLOWS 2021 TO 2025
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

Year	JRL Leachate Volume (gallons)	JRL Average Daily Leachate Volume (gallons)
2021	15,239,342	41,752
2022	18,917,490	51,829
2023	26,531,525	72,689
2024	24,057,700	65,912
2025	20,427,090	55,965
AVERAGE	21,034,629	57,629

JRL has a leachate storage tank with a usable volume of approximately 920,000 gallons that allows "buffering of flows." The maximum daily volume of leachate delivered to the wastewater treatment plant from JRL over the past five years was approximately 280,700 gallons. Assuming 8,000 gallons of leachate per load, this would equate to approximately 7.2 leachate truck loads per day on average with a maximum of 35 loads per day on the busiest day (March 30, 2024).

7.3 Anticipated Flow to WWTP From JRL Landfill Expansion

Leachate modeling performed as part of the JRL's Phase II Expansion predicts average annual leachate generation for the site will be between 16 and 27 MGY depending on the stage of development. Given these volumes, the projected average annual leachate flow during the life of the facility (2028 through approximately 2040) is approximately 20.7 MGY, very similar to the volumes observed from 2021 to 2025 at the JRL. Given the projected average annual volumes above, we believe it likely that the recorded leachate volumes from 2021 to 2025 are a good approximation of the volumes that will be observed over the life of the Phase II expansion.

Assuming that PTL leachate flows range from 9 to 12 MGY, as indicated in Table 1, SME estimates that average combined leachate volumes (JRL and PTL) to treatment would be between 25 and 39 MGY.

7.3.1 Average Daily Traffic Evaluation

Leachate deliveries typically occur Monday through Friday from 1 a.m. to 1 p.m.; given this, we estimate that approximately 10 leachate truck loads per weekday will be delivered to the facility between the hours of approximately 1 a.m. to 1 p.m. From a traffic standpoint, each of the trucks counts as two-passenger car equivalents (PCEs), so there would be an increase in traffic of approximately 40 PCEs per day or 3.33 PCEs per hour.

7.3.2 Peak Daily Traffic Evaluation

Assuming 35 leachate truck deliveries per day over the peak 24-hour period would equate to an increase of approximately 140 PCEs per 24-hours or approximately 5.83 PCEs per hour and far less than MDOT's 100 or more PCE threshold for a Traffic Movement Permit.

In addition to this, the maximum leachate loading rate at JRL is approximately 500 gallons per minute, which fills one 8,000-gallon leachate hauling truck in approximately 16 minutes. Given the time to load the trucks, a theoretical maximum of approximately 4 tanker truck loads could be generated per hour. This equates to a theoretical maximum PCE of approximately 16 PCE per hour, which is far less than MDOT's 100 PCE threshold for a Traffic Movement Permit.

8.0 COMBINED LEACHATE DISCHARGE TO SEWER

Combined leachate discharge from the PTL and the JRL from 2021 through 2025 ranged from approximately 24.2 to 38.5 MGY with an average of approximately 31 MGY as indicated in Table 3.

TABLE 3

SUMMARY OF LEACHATE FLOWS 2021 TO 2025
PINE TREE AND JUNIPER RIDGE LANDFILLS COMBINED

Year	Combined Annual Leachate Volume to Sewer System (gallons)	Combined Average Daily Leachate Volume To Sewer System (gallons)
2021	24,213,918	66,340
2022	27,742,653	76,007
2023	38,511,445	105,511
2024	34,549,359	94,656
2025	29,778,635	81,585
AVERAGE	30,959,202	84,820

Leachate is currently pumped to the sewer system at a rate of approximately 220 gallons per minute. Given this rate, we would anticipate that pumping of combined leachate for approximately 5 to 8 hours per day on average with an average pumping time of approximately 6.4 hours per day.

As part of a demonstration project at PTL, 51 truckloads of leachate from JRL totaling approximately 408,000 gallons of leachate were transferred from JRL to PTL leachate storage tank from June 8, 2026 to June 23, 2026. During this period PTL pumped approximately 676,000 gallons of mixed leachate (PTL and JRL) to the BWTP.

No issues were encountered during the demonstration project and Casella and BWTP personnel discussed the results of the demonstration and believed that the trial was successful in demonstrating that leachate can be treated effectively at the WWTP. Casella has currently suspended the transfer of leachate from

JRL to PTL. Casella will notify MEDEP if they decide to resume the demonstration project. When transfer systems are in place, Casella will work with BWTP to establish discharge limits for the facility.

A Major Site Plan and Conditional Use Permit for development of the Leachate Transfer System Upgrades will be required from the Town of Hampden prior to construction and permits for discharge of wastewater from JRL to the Town of Hermon and BWTP will be required prior to discharge of JRL leachate to the system.

8.1 Required Leachate Storage

Prior permitting documents demonstrated that the existing leachate storage at JRL (approximately 920,000 gallons) and the existing leachate storage at the PTL (approximately 920,000 gallons) are sufficient to meet leachate storage requirements of Chapter 400 and Chapter 401, therefore, no additional leachate storage is proposed for this project. An additional 920,000-gallon leachate storage tank is proposed to be built prior to the Phase II Expansion at the JRL, adding additional leachate storage to the system.

APPENDIX A

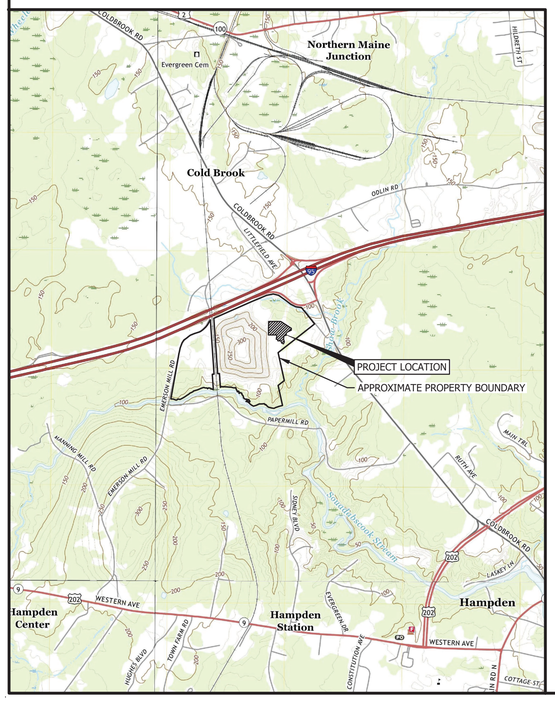
PERMIT DRAWINGS

SME
SEVEE & MAHER
ENGINEERS

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

TITLE	DWG NO
COVER SHEET	
SYMBOLS AND ABBREVIATIONS	C-100
EXISTING CONDITIONS AND DEMOLITION PLAN	C-101
SITE GRADING PLAN	C-102
SITE UTILITIES PLAN	C-103
FORCE MAIN PLAN AND PROFILES	C-200
SECURE III PUMP STATION FORCE MAIN IMPROVEMENTS PLAN AND PROFILE	C-201
SECTIONS AND DETAILS	C-300
SECTIONS AND DETAILS	C-301
SECTIONS AND DETAILS	C-302
SECTIONS AND DETAILS	C-303
SECTIONS AND DETAILS	C-304
EROSION AND SEDIMENTATION CONTROL DETAILS	C-305

LOCATION MAP



SME
SEVEE & MAHER ENGINEERS

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

4 Blanchard Road, PO Box 85A, Cumberland Center, Maine 04021
Phone 207.829.5016 • Fax 207.829.5692 • smemaine.com

STATE OF MAINE
BRIAN D. PIERCE
9609
6/24/2026
REGISTERED PROFESSIONAL ENGINEER

C:\Users\jenn\OneDrive - SME\BASE\PROJECTS\Cassella - Pine Tree Landfill - PFAS\Permit\COVER.dwg, C-000, 6/4/2026 7:32:39 AM, ejm

SYMBOLS

EXISTING	PROPOSED		EXISTING	PROPOSED		EXISTING	PROPOSED	
		NORTH ARROW (GRID)			DRAINAGE COURSE (WITH DIRECTION)	G	G	UNDERGROUND GAS MAIN
DATE		NORTH ARROW (MAGNETIC)			EDGE OF WATER	UCC	UCC	UNDERGROUND COMMUNICATIONS LINE
25	25	CONTOUR LINES			WATER ELEVATION (GROUND OR SURFACE)	UGE	UGE	UNDERGROUND ELECTRICAL LINE
	INV 25.56	SPOT ELEVATION (INVERT ELEVATION)			FENCE LINE (STOCKADE)	OHE	OHE	OVERHEAD ELECTRICAL LINE
		SURVEY BASELINE WITH TRIANGULATION OR INTERSECTION POINT	X X	X X	FENCE LINE (METAL/CHAIN LINK)	OT	OT	OVERHEAD TELEPHONE LINE
		PROPERTY LINE OR RIGHT-OF-WAY			STONE WALL	SS	SS	SANITARY SEWER
		DEED RESTRICTION BOUNDARY			RETAINING WALL	FM	FM	FORCE MAIN
N35°-10'-10"W 251.17	N35°-10'-10"W 251.17	PROPERTY LINE W/ BEARING AND DISTANCE			GUARD RAIL	W	W	WATER MAIN
1	20	CELL DESIGNATION			BUILDING AND STRUCTURES	SD	SD	STORM DRAIN
		BOUNDARY LINE (State, County, Municipality)		2 1 OR 2:1	SLOPE RATIO (HORIZONTAL TO VERTICAL)	UD	UD	UNDERDRAIN
⊡	■	SURVEY MONUMENT	TOP OF SLOPE	TOP OF SLOPE	SLOPES (WITH SLOPE RATIO)	LFG	LFG	LANDFILL GAS
		SURVEY CONTROL			EDGE OF PAVEMENT	LT	LT	LEACHATE TRANSPORT
○	●	PROPERTY PIN, DRILL HOLE, PK, OR STAKE			EDGE OF GRAVEL	LC	LC	LEACHATE COLLECTION
		WOODS OR BRUSH LINE			CONCRETE	LD	LD	LEAK DETECTION
		INDIVIDUAL TREE	B-12 MW-12 P-12	B-12 MW-12 P-12	TEST BORING, MONITORING WELL, OR PIEZOMETER AND NUMBER	GC	GC	GAS COLLECTION
		WETLAND DELINEATED	TP-12	TP-12	TEST PIT AND NUMBER	GT	GT	GAS TRANSPORT
		NRPA STREAM	SW-12	SW-12	SURFACE WATER SAMPLE LOCATION	▷	▶	REDUCER
		BEDROCK OUTCROP			GAS EXTRACTION WELL			MECHANICAL CAP OR PLUG
		SAMPLE SUMP	C	C	GAS CONDENSATE TRAP			COUPLING
		SLOPE INCLINOMETER	KO	KO	LFG KNOCKOUT			BEND
		VIBRATING WIRE SETTLEMENT CELL			GAS WELL HEAD			TEE
		VERTICAL/HORIZONTAL DISPLACEMENT MONUMENT			GAS VENT CAPPED			PIPE TO BE ABANDONED
		VERTICAL DISPLACEMENT MONUMENT			CLEANOUT STRUCTURE			RISER PIPE & INLET GRATE
					MANHOLE			STORM GRATE
					CATCH BASIN			DRAINAGE INLET STRUCTURE
					CULVERT			UNDERDRAIN SUMP
					RIPRAP		LF	LITTER FENCE
					WATER OR GAS VALVE		SF	SILTATION FENCE
					HYDRANT		LOW	LIMIT OF WORK LINE
					WELL		CLL	CLEARING LIMIT LINE
					AIR RELEASE VALVE			100-YEAR FLOODPLAIN
					ELECTRICAL MANHOLE (EMH)			
					UTILITY POLE			
					LIGHT POLE			

NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

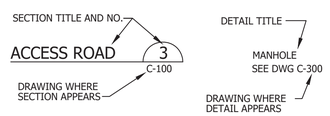
   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY PIPING LOCATIONS AT ALL PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.

TYPICAL ABBREVIATIONS:

ACCMP	ASPHALT COATED CMP	CF	CUBIC FEET	EOP	EDGE OF PAVEMENT	ID	INSIDE DIAMETER	PC	POINT OF CURVE	TAN	TANGENT
ACP	ASBESTOS CEMENT PIPE	CFS	CUBIC FEET PER SECOND	EQUIP	EQUIPMENT	IN OR "	INCHES	PD	PERIMETER DRAIN	TDH	TOTAL DYNAMIC HEAD
AC	ACRE	CI	CAST IRON	EST	ESTIMATED	INV	INVERT	PI	POINT OF INTERSECTION	TEMP	TEMPORARY
AGG	AGGREGATE	CL	CLASS	EXC	EXCAVATE	INV EL	INVERT ELEVATION	PIV	POST INDICATOR VALVE	TYP	TYPICAL
ALUM	ALUMINUM	CONC	CONCRETE	EXIST	EXISTING			PT	POINT OF TANGENT		
APPD	APPROVED	CONST	CONSTRUCTION			LB	POUND	PERF	PERFORATED	UD	UNDERDRAIN
APPROX	APPROXIMATE	CONTR	CONTRACTOR	FI	FIELD INLET	LC	LEACHATE COLLECTION	PP	POWER POLE	V	VOLTS
ARMH	AIR RELEASE MANHOLE	CS	CURB STOP	FG	FINISH GRADE	LD	LEAK DETECTION	PSI	POUNDS PER SQUARE INCH	VA TEE	VALVE ANCHORING TEE
ASB	ASBESTOS	CTR	CENTER	FBRGL	FIBERGLASS	LF	LINEAR FEET	PVC	POLYVINYL CHLORIDE	VERT	VERTICAL
ASP	ASPHALT	CU	COPPER	FDN	FOUNDATION	LOC	LOCATION	PVMT	PAVEMENT	VGC	VERTICAL GRANITE CURB
AUTO	AUTOMATIC	CY	CUBIC YARD	FLEX	FLEXIBLE	LOW	LIMIT OF WORK			WG	WATER GATE
AUX	AUXILIARY			FLG	FLANGE	LT	LEACHATE TRANSPORT	QTY	QUANTITY	W/	WITH
AVE	AVENUE	D	DEGREE OF CURVE	FLR	FLOOR					W/O	WITHOUT
AZ	AZIMUTH	DBL	DOUBLE	FPS	FEET PER SECOND	MH	MANHOLE	RCP	REINFORCED CONCRETE PIPE		
		DEG OR °	DEGREE	FT OR '	FEET	MJ	MECHANICAL JOINT	ROW	RIGHT OF WAY	YD	YARD
BCCMP	BITUMINOUS COATED CMP	DEPT	DEPARTMENT	FTG	FOOTING	MATL	MATERIAL	RAD	RADIUS		
BM	BENCH MARK	DI	DUCTILE IRON			MAX	MAXIMUM	REQD	REQUIRED		
BIT	BITUMINOUS	DIA	DIAMETER	GA	GAUGE	MFR	MANUFACTURE	RT	RIGHT		
BLDG	BUILDING	DIM	DIMENSION	GAL	GALLON	MIN	MINIMUM	RTE	ROUTE		
BOT	BOTTOM	DIST	DISTANCE	GALV	GALVANIZED	MISC	MISCELLANEOUS				
BRG	BEARING	DN	DOWN	GPD	GALLONS PER DAY	MON	MONUMENT	S	SLOPE		
BV	BALL VALVE	DR	DRAIN	GPM	GALLONS PER MINUTE			SCH	SCHEDULE		
		DWG	DRAWING			NITC	NOT IN THIS CONTRACT	SF	SQUARE FEET		
CB	CATCH BASIN			HDPE	HIGH DENSITY POLYETHYLENE	NTS	NOT TO SCALE	SFC	SLIPFORM CONCRETE CURB		
CEN	CENTER	EA	EACH	HORIZ	HORIZONTAL	N/F	NOW OR FORMERLY	SHT	SHEET		
CEM LIN	CEMENT LINED	EG	EXISTING GROUND OR GRADE	HP	HORSEPOWER	NO OR #	NUMBER	SMH	SANITARY MANHOLE		
CMP	CORRUGATED METAL PIPE	ELEC	ELECTRIC	HYD	HYDRANT			ST	STREET		
CO	CLEAN OUT	EL	ELEVATION			OC	ON CENTER	STA	STATION		
		ELB	ELBOW			OD	OUTSIDE DIAMETER	SY	SQUARE YARD		

VIEW MARKERS & IDENTIFICATION



REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE BRIAN D. PIERCE 9609 LICENSED PROFESSIONAL ENGINEER 4/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

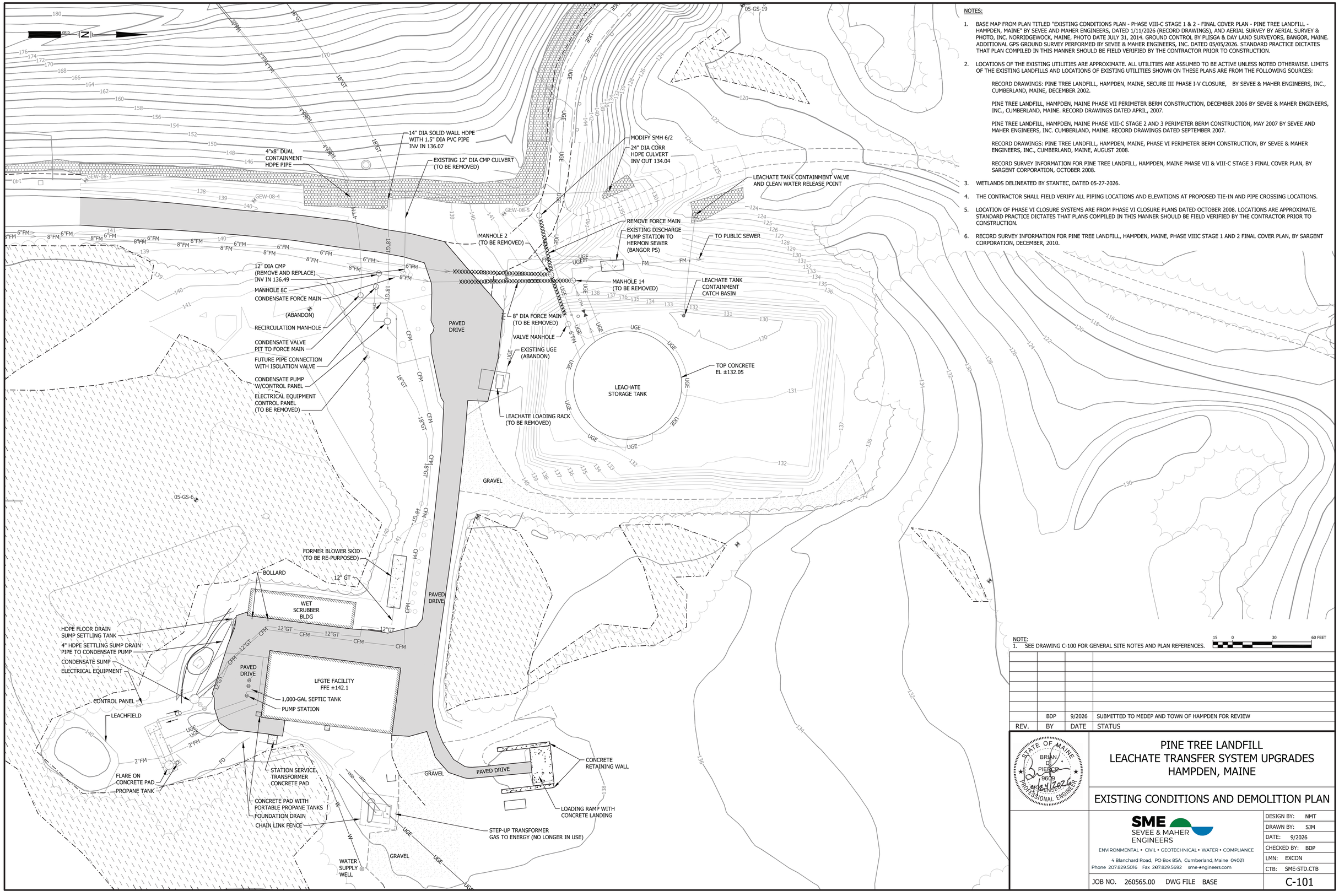
SYMBOLS AND ABBREVIATIONS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 • Fax 207.829.5692 • sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	NONE
CTB:	SME-STD.CTB
JOB NO. 260565	DWG FILE SYMSHT

C-100

C:\Users\jm\OneDrive - SME\SHARED\PINTI\Clients - Pine Tree Landfill - PFAS\Phase5\YMSHT.dwg, C-100, 9/23/2026 11:27:10 AM, sjm



NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

15 0 30 60 FEET

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE BRIAN D PIERCE 9609 LICENSED PROFESSIONAL ENGINEER 9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

EXISTING CONDITIONS AND DEMOLITION PLAN

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	EXCON
CTB:	SME-STD.CTB

JOB NO. 260565.00 DWG FILE BASE

C-101

C:\Users\jim\OneDrive - SME\SHAREPOINT\Casella - Pine Tree Landfill - PFAS\Plans\BASE.dwg C-101 9/22/2026 11:29:24 AM, ejm

LANDFILL LIMIT (TYP)

GRAVEL PAD
TRANSFER PUMP STATION

VAULT
SMH #21
RIM 139.8

SMH 6/2

VAULT
SMH #22

TO PUBLIC SEWER

EXISTING DISCHARGE PUMP STATION
TO HERMON SEWER (BANGOR PS)

6"x10" DIA HDPE FORCE MAIN
FOR FUTURE USE

12" DIA HDPE
DRAIN PIPE

12" DIA HDPE PIPE

VALVE PIT

TRANSFER VAULT
SEE DWG C-301

UTILITY SHED
SEE DWG C-304

BOLLARD (TYP)
SEE DWG C-303

FINISH GRADE (TYP)

EDGE OF PAVEMENT (TYP)

SILT FENCE (TYP)
SEE DWG C-305

CATCH BASIN
RIM 140.3

WETLAND (TYP)
SEE NOTE 3

LEACHATE TRANSFER PAD
SEE DWG C-303

LEACHATE LOADING RACK
SEE DWG C-302

GRADE TRANSFER PAD TO
DRAIN TO CB (TYP)
SEE DWG C-303 FOR
LEACHATE TRANSFER PAD

PROPOSED SPOT ELEVATION
TOP OF PAVEMENT (TYP)

GRIND/RECLAIM
EXISTING PAVEMENT
COMPACT AND REPAVE
EXISTING PAVED AREAS

NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.

3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.

4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.

5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

10 0 20 40 FEET

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D PIERCE
9609
REGISTERED PROFESSIONAL ENGINEER
9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

SITE GRADING PLAN

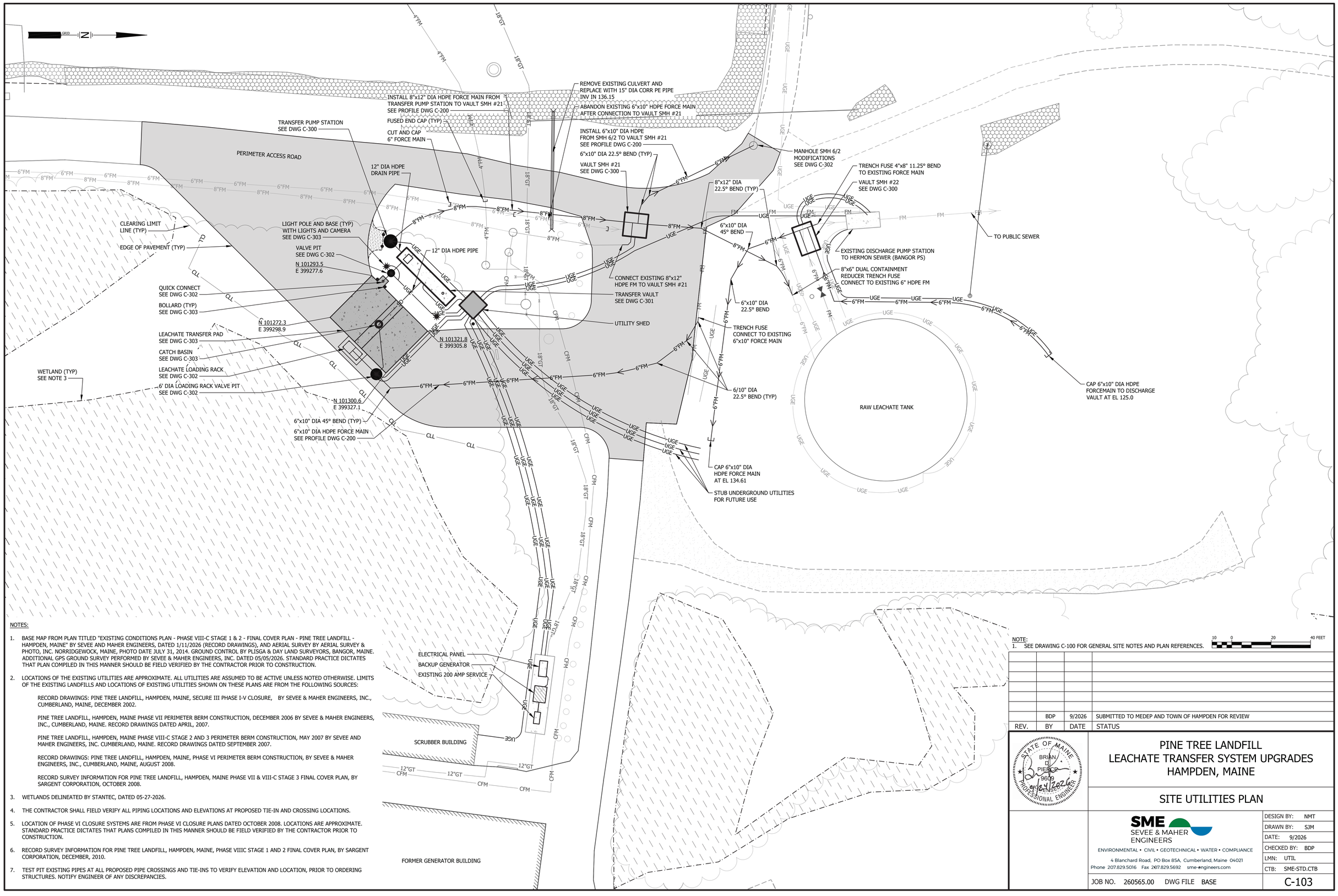
SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	GRAD
CTB:	SME-STD.CTB

JOB NO. 260565.00 DWG FILE BASE

C-102

C:\Users\jim\OneDrive - SME\SHARE\PDXT\Casella - Pine Tree Landfill - PFAS\Plans\BASE.dwg C-102, 9/23/2026 9:27:38 AM, sjm



NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.
7. TEST PIT EXISTING PIPES AT ALL PROPOSED PIPE CROSSINGS AND TIE-INS TO VERIFY ELEVATION AND LOCATION, PRIOR TO ORDERING STRUCTURES. NOTIFY ENGINEER OF ANY DISCREPANCIES.

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

10 0 20 40 FEET

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D PIERCE
9609
LICENSED PROFESSIONAL ENGINEER
9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

SITE UTILITIES PLAN

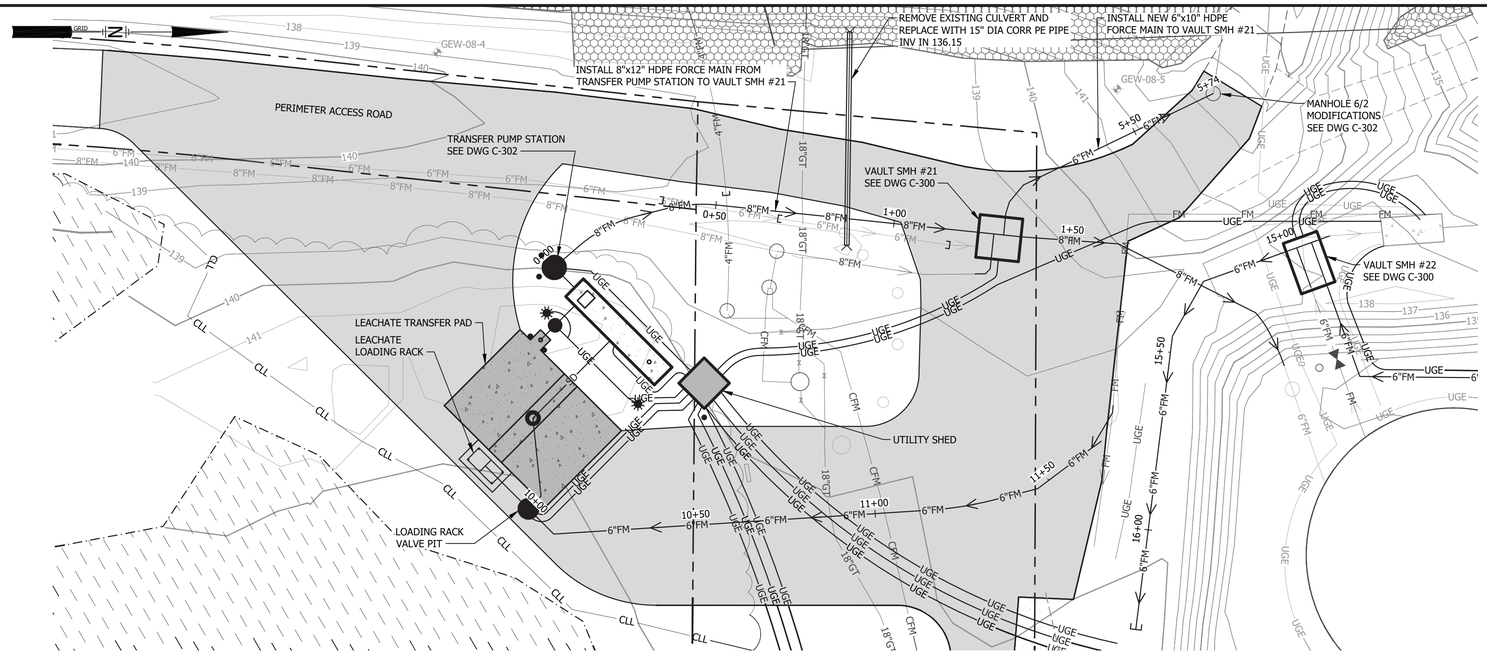
SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	UTIL
CTB:	SME-STD.CTB

JOB NO. 260565.00 DWG FILE BASE

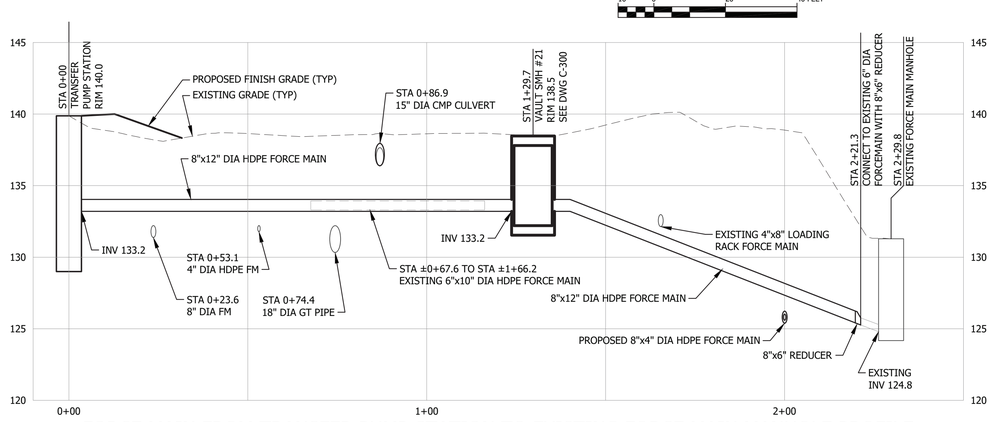
C-103

C:\Users\BP\OneDrive - SME\SHARE\PDXT\Casella - Pine Tree Landfill - PFAS\Plans\BASE.dwg, C-103, 9/23/2026 8:56:51 AM, BP



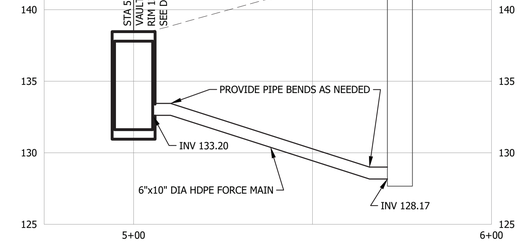
FORCE MAIN PLAN

10 0 20 40 FEET



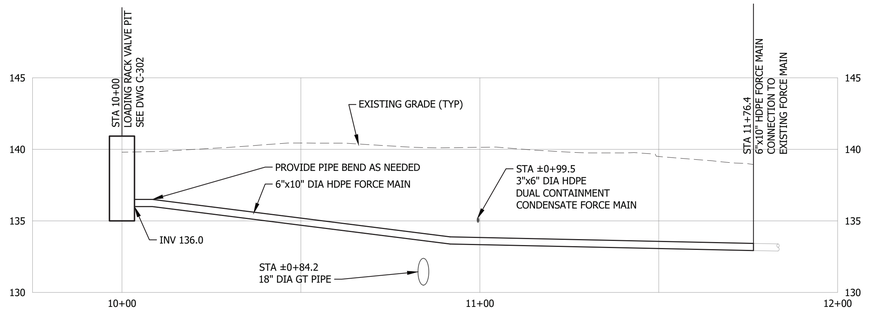
FORCE MAIN FROM TRANSFER PUMP STATION TO EXISTING FORCE MAIN MANHOLE PROFILE

10 0 20 40 FEET (HORZ)
2.5 0 5 10 FEET (VERT)



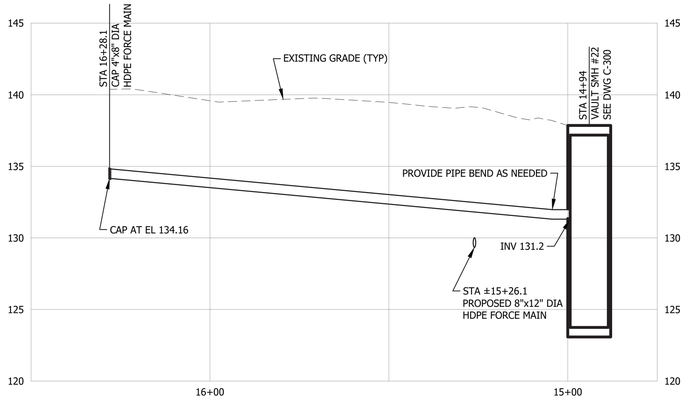
FORCE MAIN FROM VAULT SMH #21 TO EXISTING VAULT SMH 6/2 PROFILE

10 0 20 40 FEET (HORZ)
2.5 0 5 10 FEET (VERT)



FORCE MAIN FROM LOADING RACK VALVE PIT TO EXISTING FORCE MAIN PROFILE

10 0 20 40 FEET (HORZ)
2.5 0 5 10 FEET (VERT)



FORCE MAIN FROM VAULT SMH #22 PROFILE (FOR FUTURE USE)

10 0 20 40 FEET (HORZ)
2.5 0 5 10 FEET (VERT)

NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.
7. TEST PIT EXISTING PIPES AT ALL PROPOSED PIPE CROSSINGS AND TIE-INS TO VERIFY ELEVATION AND LOCATION, PRIOR TO ORDERING STRUCTURES. NOTIFY ENGINEER OF ANY DISCREPANCIES.

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D. PIERCE
9609
LICENSED
PROFESSIONAL ENGINEER
9/24/2026

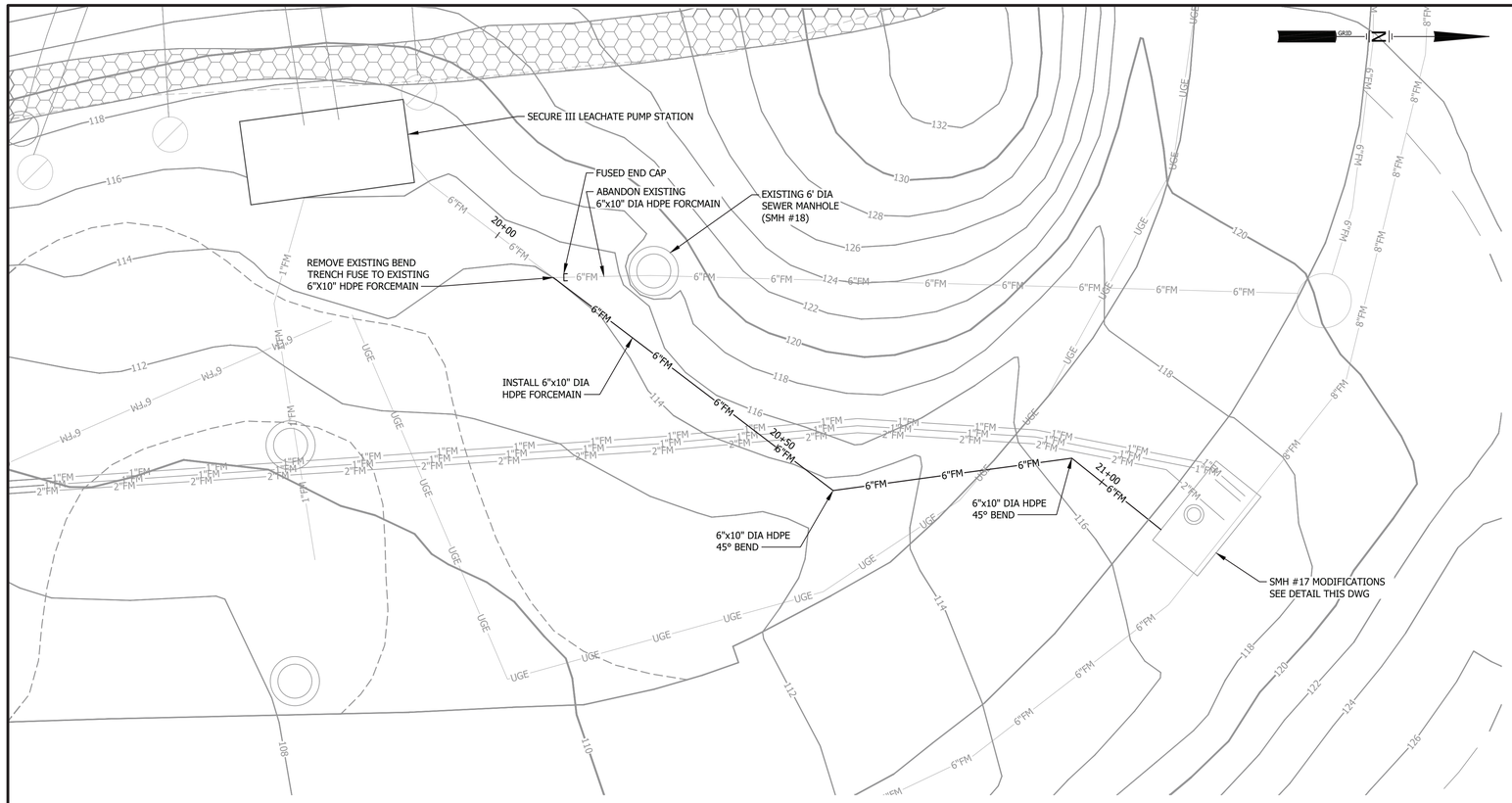
PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

FORCE MAIN PLANS AND PROFILES

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

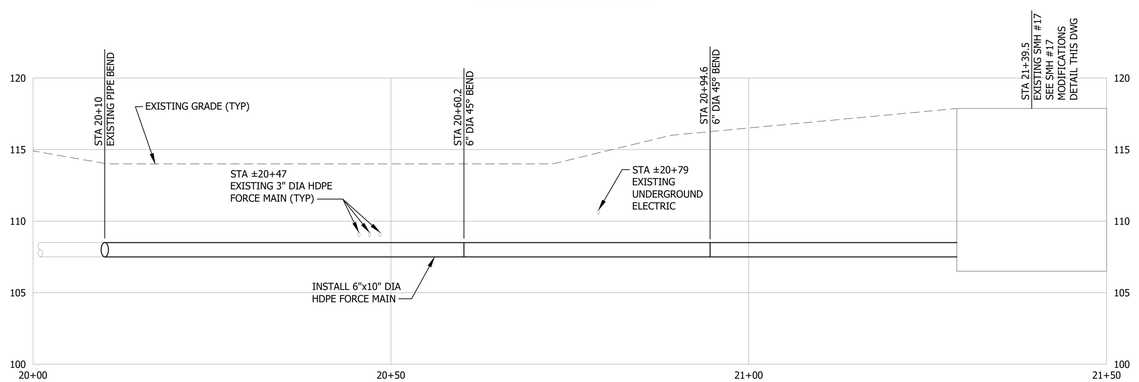
DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	FM PLAN PROF
CTB:	SME-STD.CTB
JOB NO. 260565.00	DWG FILE BASE
	C-200

C:\Users\BP\OneDrive - SME\SHARED\PCDATA\Casella - Pine Tree Landfill - PFAS\Plans\BASE.dwg, C-200, 9/23/2026 8:34:48 AM, bjp



SECURE III PUMP STATION FORCE MAIN IMPROVEMENT PLAN

5 0 10 20 FEET



SECURE III PUMP STATION FORCE MAIN IMPROVEMENT PLAN

5 0 10 20 FEET (HORZ)

2.5 0 5 10 FEET (VERT)

NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

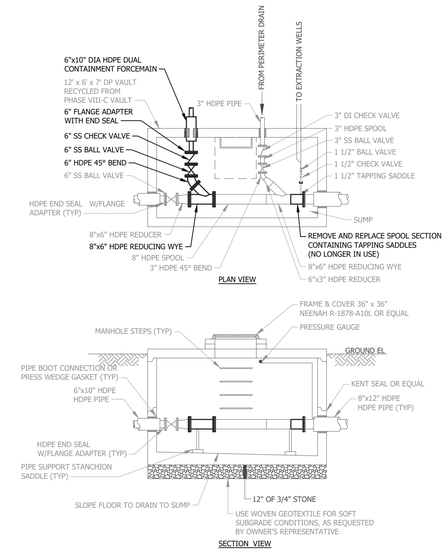
   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.
7. TEST PIT EXISTING PIPES AT ALL STRUCTURES, PROPOSED PIPE CROSSINGS, AND TIE-INS TO VERIFY ELEVATION AND LOCATION, PRIOR TO ORDERING STRUCTURES. NOTIFY ENGINEER OF ANY DISCREPANCIES.



SMH-17 MODIFICATIONS

NTS

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE BRIAN D. PIERCE 9609 LICENSED PROFESSIONAL ENGINEER 9/4/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

SECURE III PUMP STATION FORCE MAIN IMPROVEMENTS PLAN AND PROFILE

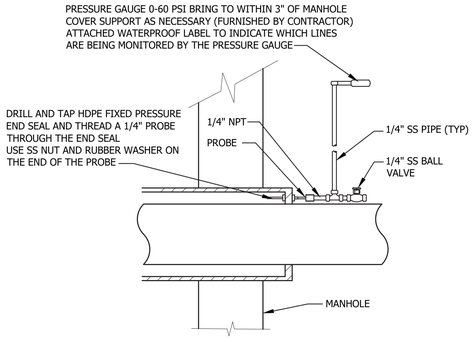
SME SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	FM PLAN PROF
CTB:	SME-STD.CTB

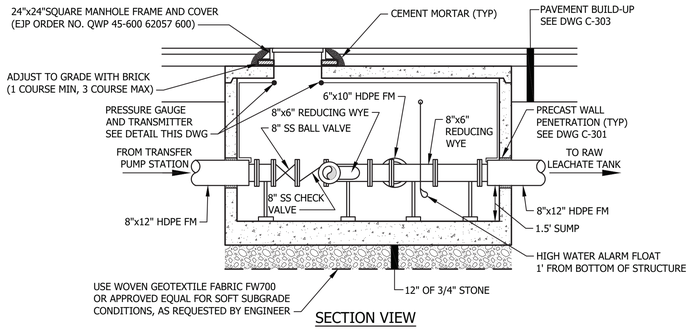
JOB NO. 260565.00 DWG FILE BASE

C-201

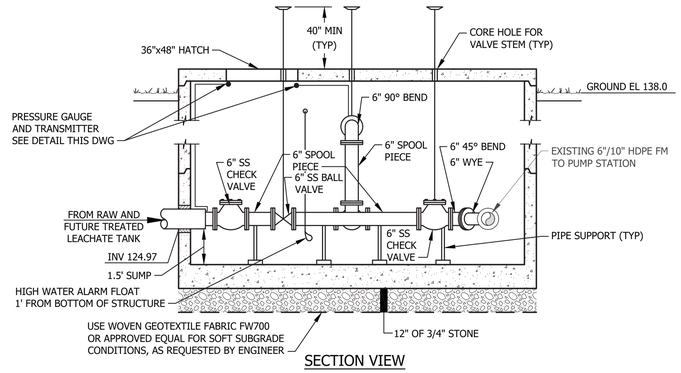
C:\Users\jam\OneDrive - SME\SHARED\PDATA\Civil\Pine Tree Landfill - PFAS\Plans\BASE.dwg C-201, 9/2/2026 11:30:50 AM, kjm



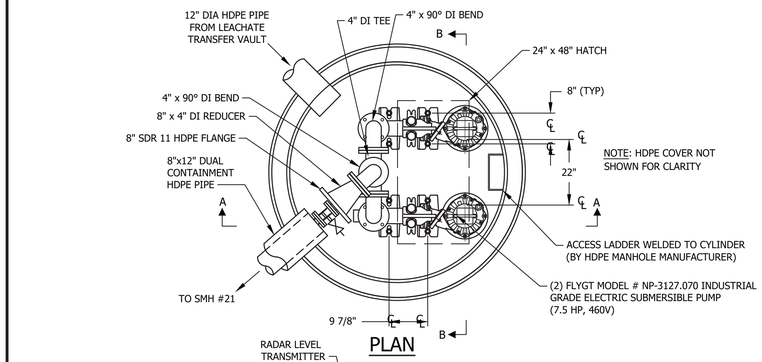
PRESSURE GAUGE AND TRANSMITTER
NTS



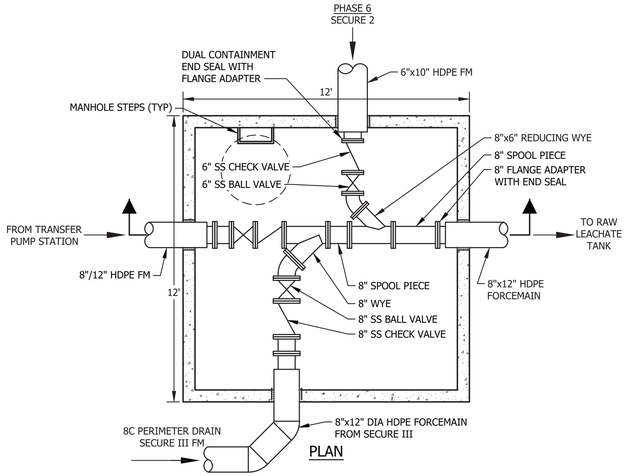
SECTION VIEW



SECTION VIEW

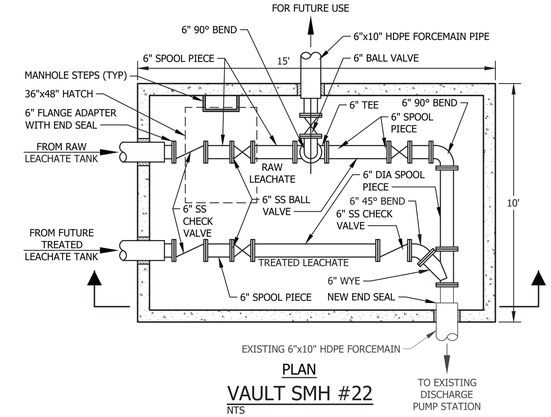


PLAN



PLAN

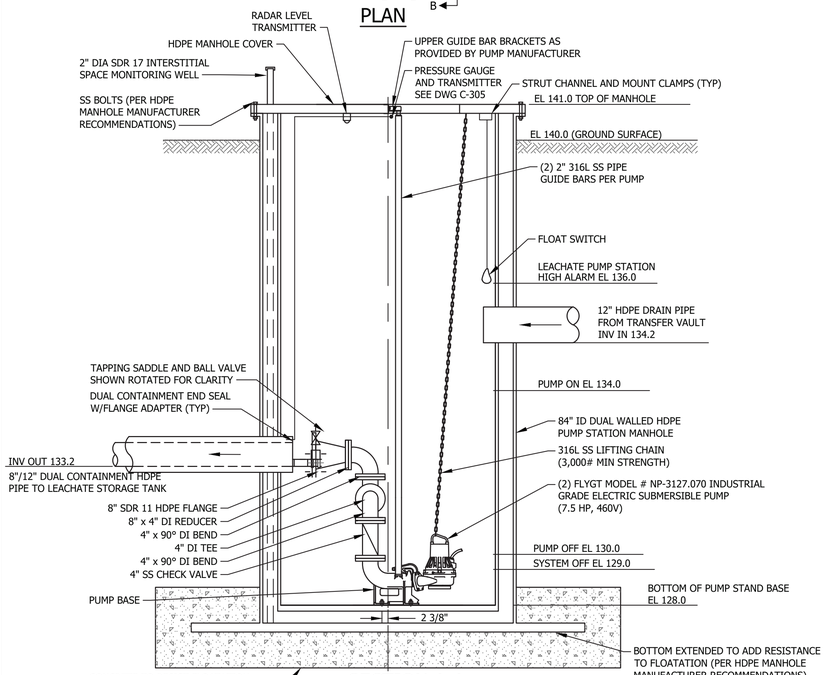
VAULT SMH #21
NTS



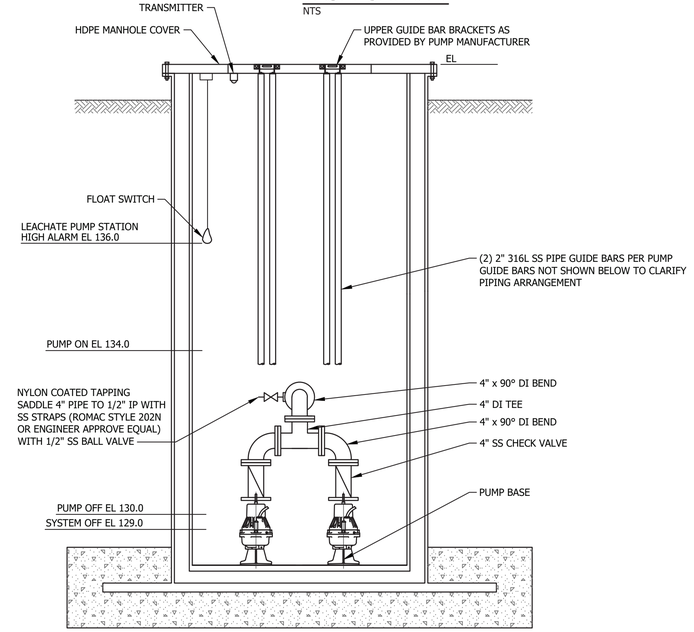
PLAN

VAULT SMH #22
NTS

TO EXISTING DISCHARGE PUMP STATION



SECTION A-A



SECTION B-B

NOTES:
1. ALL INLETS/OUTLETS TO MANHOLE SHOWN ROTATED FOR CLARITY. SEE PLAN VIEW FOR ACTUAL INLET/OUTLET LOCATIONS.
2. CONTRACTOR SHALL PROVIDE DETAILS OF ALL MANHOLE PUMP SYSTEM CONNECTORS FOR APPROVAL, PRIOR TO CONNECTION.
3. PUMP BASE SHALL BE CONNECTED TO THE BASE OF THE PUMP STATION TO CREATE A WATERTIGHT SEAL PER MANUFACTURER'S RECOMMENDATION.

TRANSFER PUMP STATION
NTS

SHOP DRAWINGS:
SUBMIT FOR REVIEW SHOP DRAWINGS OF ALL PRECAST AND HDPE UNITS. MANUFACTURER'S INFORMATION SHALL BE SUBMITTED FOR JOIN SEALANT AND WATERPROOFING. MANUFACTURER SHALL PROVIDE ANTI-FLOTATION DESIGN SHOP DRAWINGS AND CALCULATIONS, INCLUDING ANY EXTENDED BASE SLABS AS NECESSARY, FOR PROPOSED PRECAST UNITS. MANUFACTURER SHALL ASSUME GROUNDWATER LEVELS EQUAL TOP OF GROUND ELEVATIONS AND PROVIDE FOR A 1.2 FACTOR OF SAFETY AGAINST FLOTATION.

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE · BRIAN D. PIERCE · 9609 · LICENSED PROFESSIONAL ENGINEER · 4/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

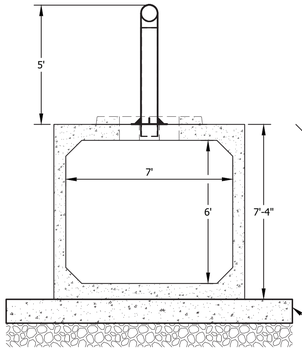
SECTIONS AND DETAILS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

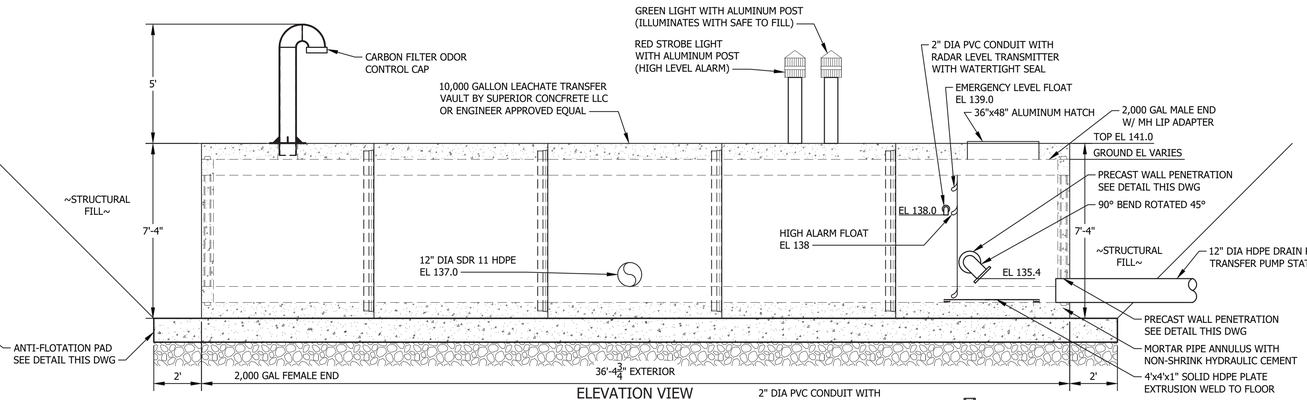
DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB
JOB NO.	260565
DWG FILE	DETAILS

C-300

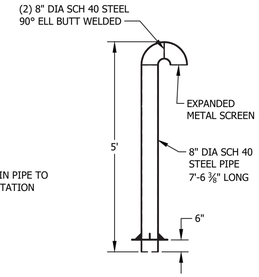
C:\Users\jim\OneDrive - SME\DRAWINGS\PDOT\Cowells - Pine Tree Landfill - PFAS\Plans\DETAILS.dwg, C-300, 3/27/2026 9:36:41 AM, ajm



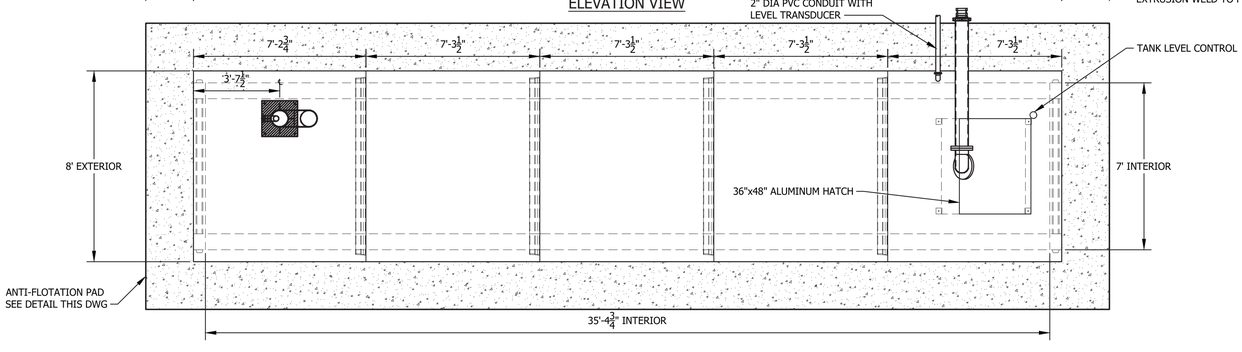
END VIEW



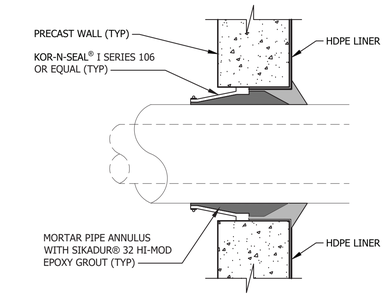
ELEVATION VIEW



VENT PIPE DETAIL

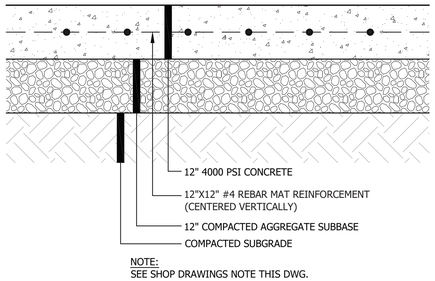


PLAN VIEW



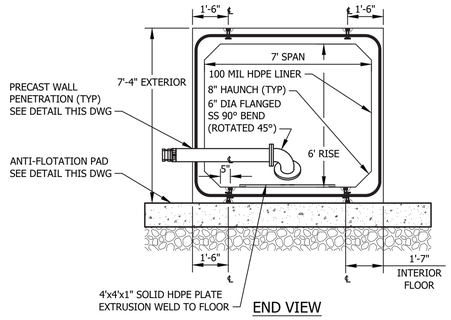
NOTE:
ALTERNATE WALL PENETRATION DETAIL MAY BE USED WITH ENGINEERS APPROVED SUBMITTAL.

PRECAST WALL PENETRATION
NTS

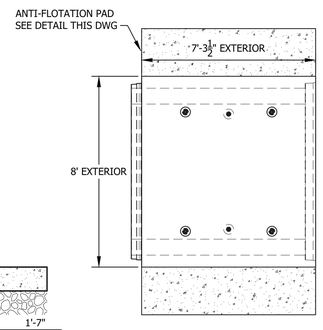


NOTE:
SEE SHOP DRAWINGS NOTE THIS DWG.

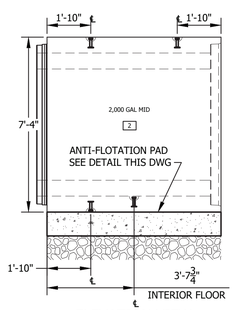
ANTI-FLOTATION PAD
NTS



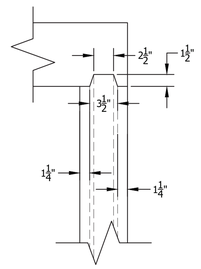
END VIEW



PLAN VIEW



ELEVATION VIEW



KEYWAY DETAIL

NOTES:
1. ALL CONCRETE SHALL ACHIEVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 5,000 PSI.
2. BOX SECTION REINFORCING SHALL BE GRADE 60.
3. EACH JOIN REQURES 2 TUBES OF SIKA-FLEX© 1A.

TRANSFER VAULT
NTS

SHOP DRAWINGS:
SUBMIT FOR REVIEW SHOP DRAWINGS OF ALL PRECAST AND HDPE UNITS. MANUFACTURER'S INFORMATION SHALL BE SUBMITTED FOR JOIN SEALANT AND WATERPROOFING. MANUFACTURER SHALL PROVIDE ANTI-FLOTATION DESIGN SHOP DRAWINGS AND CALCULATIONS, INCLUDING ANY EXTENDED BASE SLABS AS NECESSARY, FOR PROPOSED PRECAST UNITS. MANUFACTURER SHALL ASSUME GROUNDWATER LEVELS EQUAL TOP OF GROUND ELEVATIONS AND PROVIDE FOR A 1.2 FACTOR OF SAFETY AGAINST FLOTATION. CONTRACTOR IS RESPONSIBLE FOR CONNECTION DETAILS FROM THE PAD TO THE VAULT. ANY PLANS SHALL BE STAMPED AND SIGNED BY A MAINE REGISTERED PE.

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D PIERCE
9609
REGISTERED PROFESSIONAL ENGINEER
9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

SECTIONS AND DETAILS

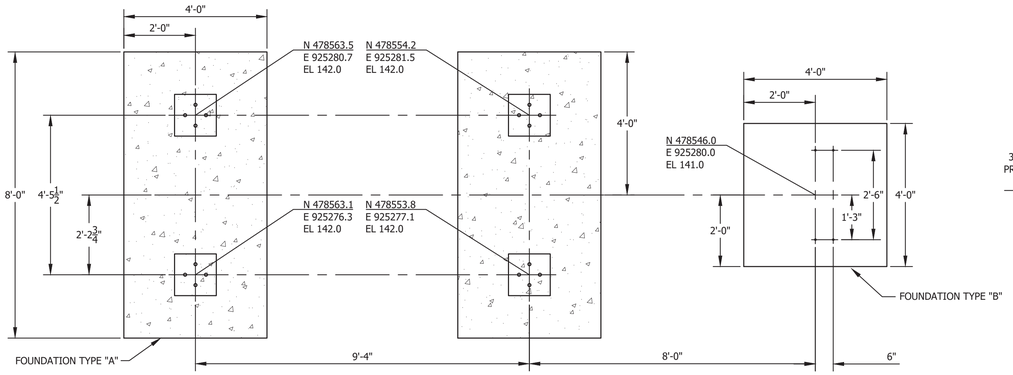
SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB

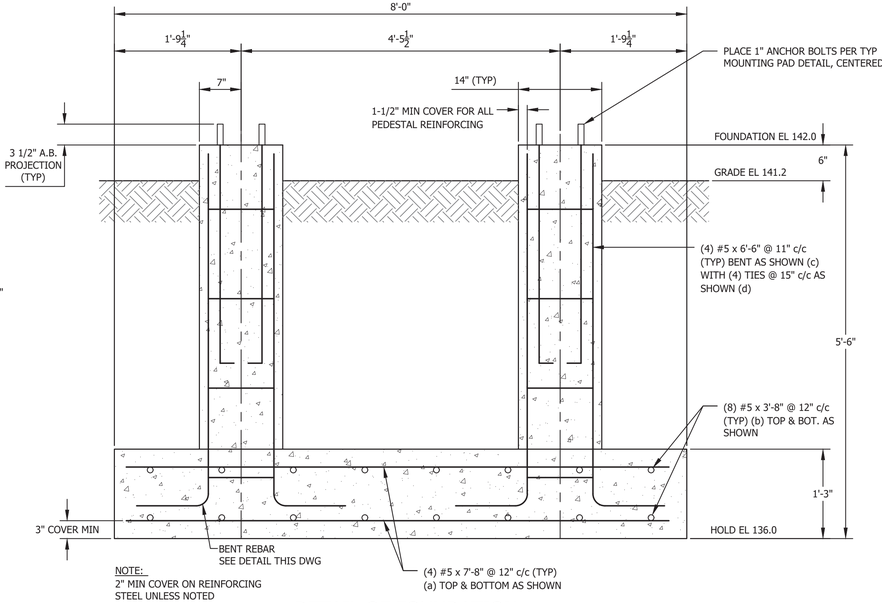
JOB NO. 260565 DWG FILE DETAILS

C-301

C:\Users\jim\OneDrive - SME\SHAREPOINT\Casella - Pine Tree Landfill - PFAS\Plans\DETAILS.dwg, C-301, 9/2/2026 11:44:42 AM, sjm

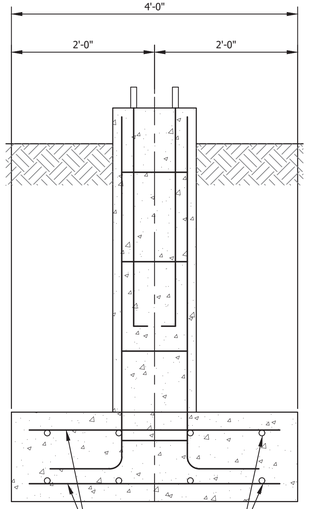


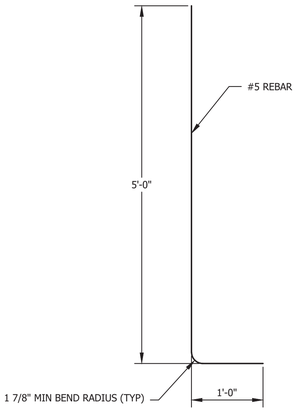
LOADING RACK MOUNTING PAD LOCATION PLAN
NTS



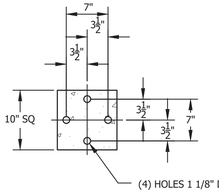
NOTE:
2" MIN COVER ON REINFORCING STEEL UNLESS NOTED

DETAIL OF FOUNDATION
NTS

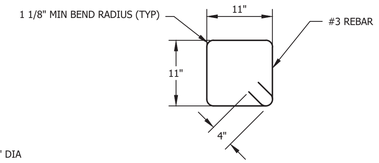




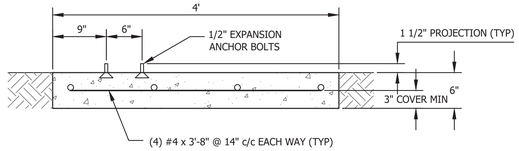
BENT REBAR DETAIL
NTS



MOUNTING PAD DETAIL
NTS



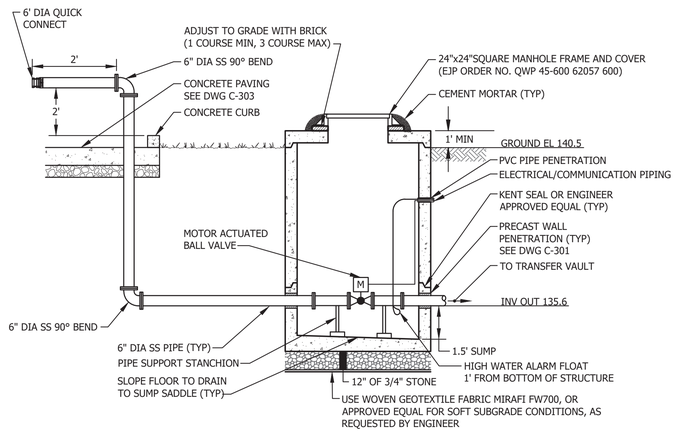
BENT REBAR DETAIL
NTS

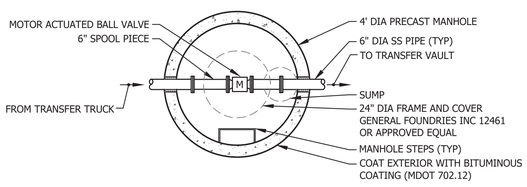


DETAIL OF FOUNDATION
NTS

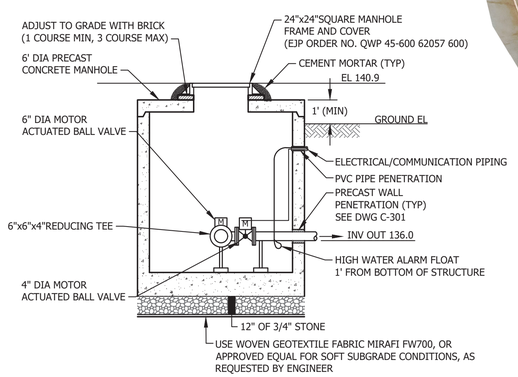
MANHOLE 6/2 MODIFICATIONS
NTS

LEACHATE LOADING RACK/UNLOADING PAD
NTS

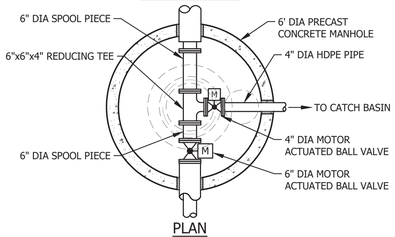




QUICK CONNECT AND MOTOR ACTUATED VALVE PIT
NTS



SECTION VIEW



PLAN
LOADING RACK VALVE PIT
NTS

SHOP DRAWINGS:
SUBMIT FOR REVIEW SHOP DRAWINGS OF ALL PRECAST AND HDPE UNITS. MANUFACTURER'S INFORMATION SHALL BE SUBMITTED FOR JOIN SEALANT AND WATERPROOFING. MANUFACTURER SHALL PROVIDE ANTI-FLOTATION DESIGN SHOP DRAWINGS AND CALCULATIONS, INCLUDING ANY EXTENDED BASE SLABS AS NECESSARY, FOR PROPOSED PRECAST UNITS. MANUFACTURER SHALL ASSUME GROUNDWATER LEVELS EQUAL TOP OF GROUND ELEVATIONS AND PROVIDE FOR A 1.2 FACTOR OF SAFETY AGAINST FLOTATION.

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D. PIERCE
9609
LICENSED
PROFESSIONAL ENGINEER
9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

SECTIONS AND DETAILS

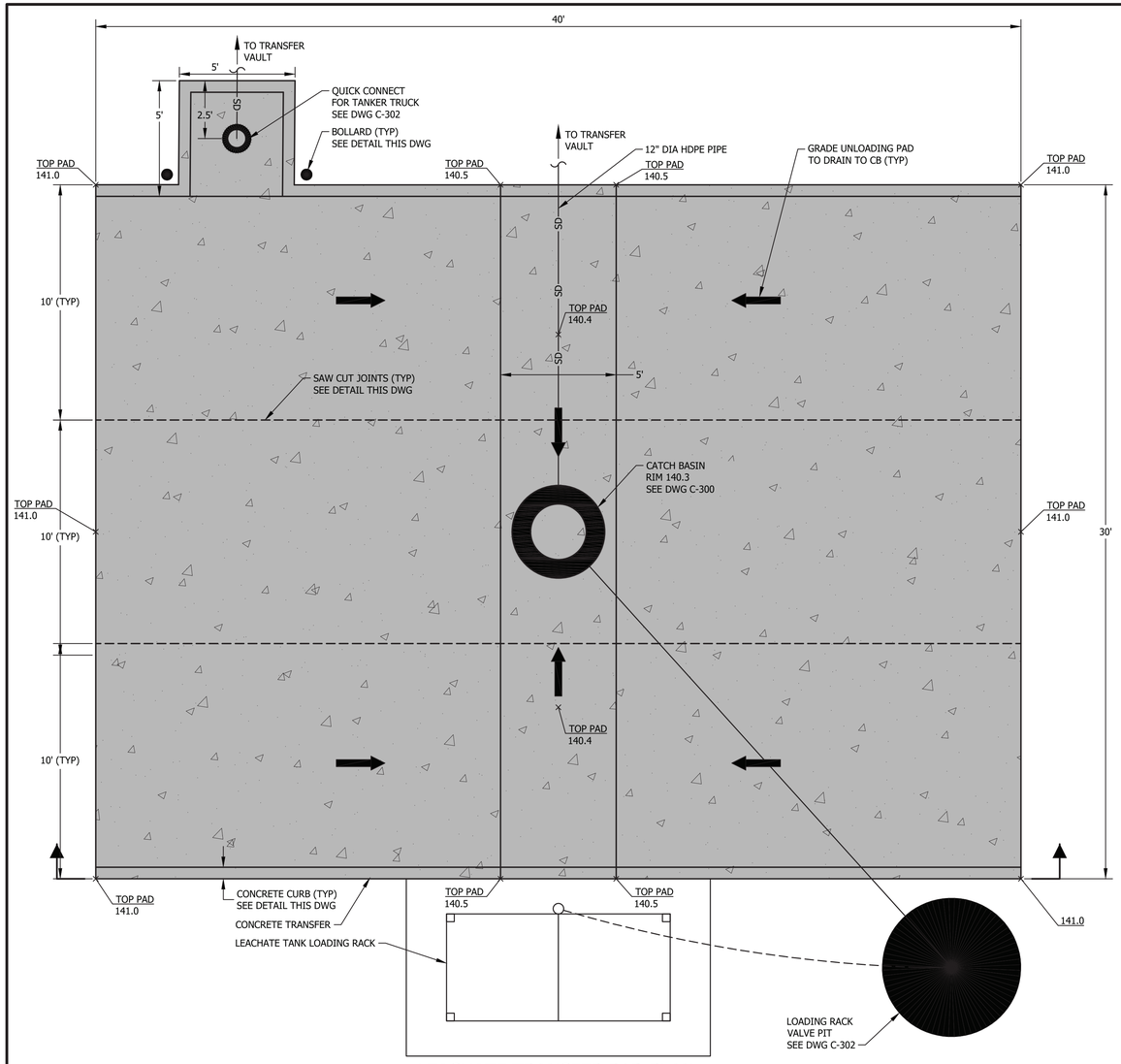
SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB

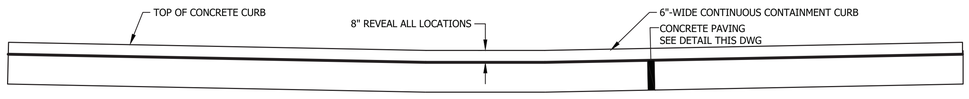
JOB NO. 260565 DWG FILE DETAILS

C-302

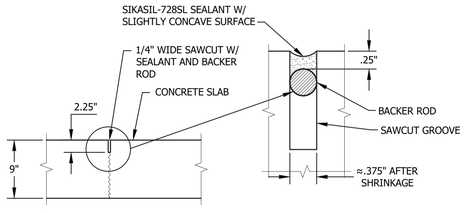
C:\Users\jam\OneDrive - SME\SHARED\POINT\Crawls - Pine Tree Landfill - PRJ\Plans\C8734.5.dwg, C-302, 9/22/2026 11:40:43 AM, sjm



LEACHATE TRANSFER PAD PLAN
NTS

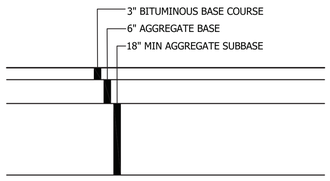


LEACHATE TRANSFER PAD SECTION
NTS

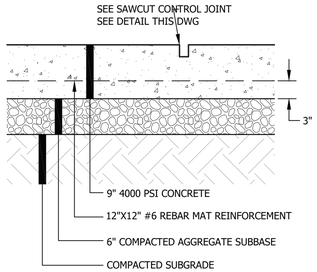


NOTE:
SAW CUT CONTROL JOINTS SHALL BE SPACED NO FURTHER THAN 10 FEET OR LESS APART.

SAWCUT CONTROL JOINT
NTS

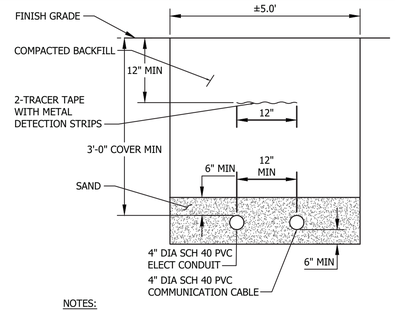


PAVEMENT BUILD-UP
NTS



NOTE:
IMMEDIATELY AFTER FLOAT FINISHING, ROUGHEN TRAFFICKED SURFACE BY BROOMING WITH FIBER-BRISTLE BROOM PERPENDICULAR TO MAIN TRAFFIC DIRECTION.

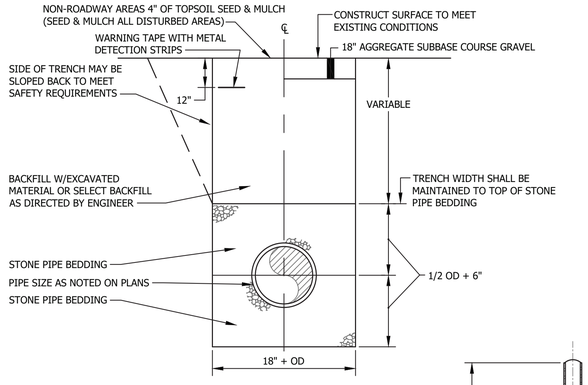
CONCRETE PAVING
NTS



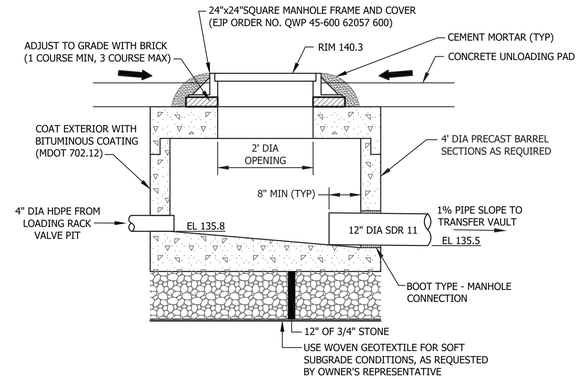
NOTES:

1. FROM POWER POLE TO PUMP STATION INSTALL TWO ELECTRICAL CONDUITS.
2. FROM PUMP STATION TO CLEANING/TIE-IN VAULT TWO ELECTRICAL CONDUITS AND ONE COMMUNICATION CONDUIT.

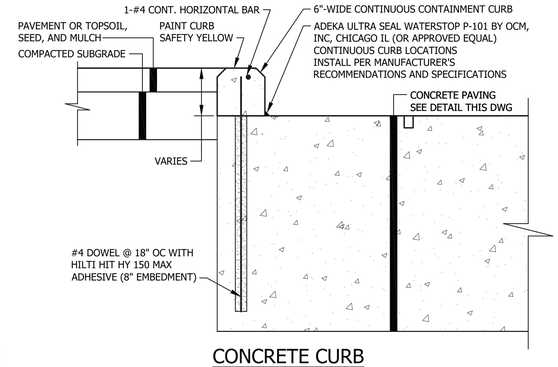
UNDERGROUND COMMUNICATION TRENCH
NTS



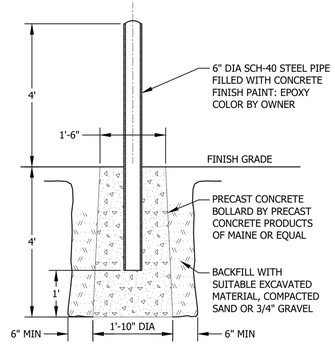
PIPE TRENCH
NTS



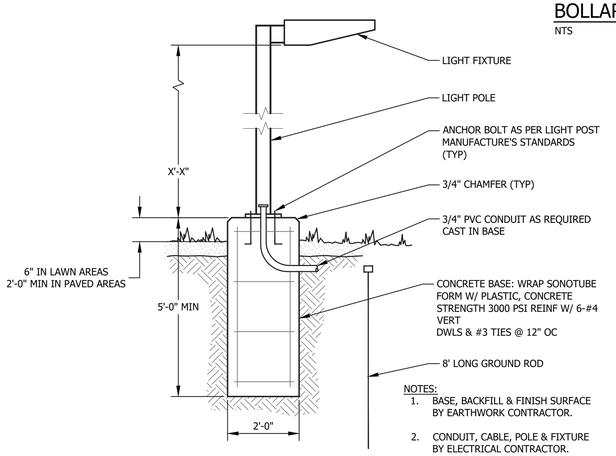
CATCH BASIN
NTS



CONCRETE CURB
NTS



BOLLARD
NTS



NOTES:

1. BASE, BACKFILL & FINISH SURFACE BY EARTHWORK CONTRACTOR.
2. CONDUIT, CABLE, POLE & FIXTURE BY ELECTRICAL CONTRACTOR.

LIGHT POLE AND BASE
NTS

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE · BRIAN D PIERCE · 9609 · PROFESSIONAL ENGINEER · 9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

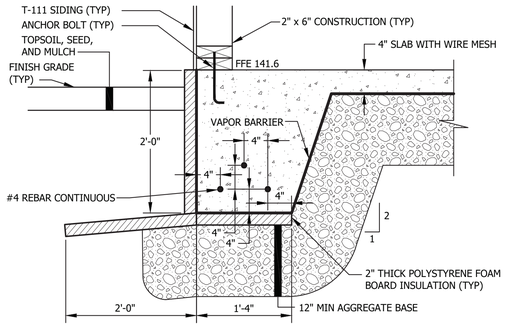
SECTIONS AND DETAILS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB
JOB NO.	260565
DWG FILE	DETAILS

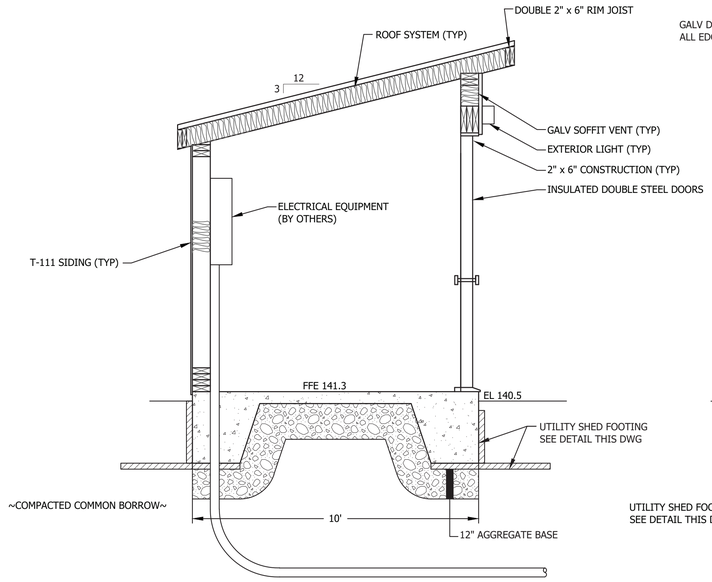
C-303

C:\Users\jim\OneDrive - SME\SHAREPOINT\Cadella - Pine Tree Landfill - FY24\Plans\DETAILS.dwg, C-303, 9/23/2025 11:40:44 AM, sjm

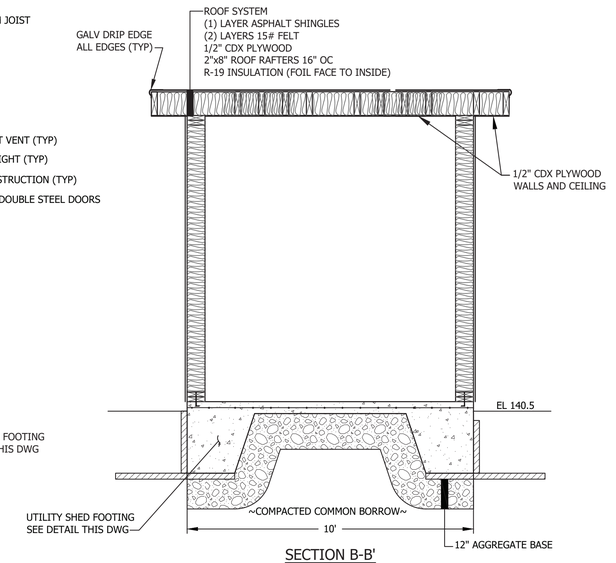


UTILITY SHED FOOTING

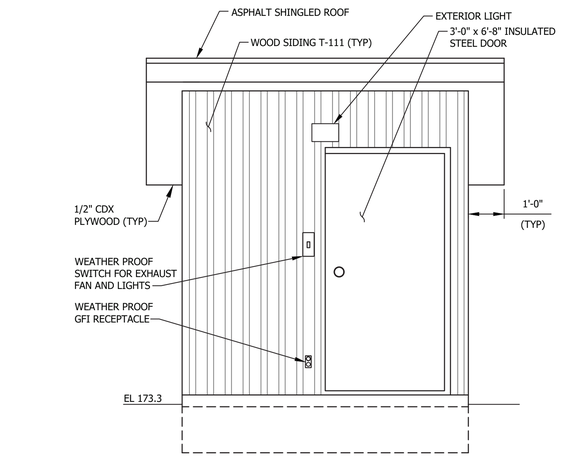
NTS



SECTION A-A'



SECTION B-B'



ELEVATION VIEW

UTILITY SHED

NTS

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE · BRIAN D PIERCE · 9609 · LICENSED PROFESSIONAL ENGINEER · 9/26/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

SECTIONS AND DETAILS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB

JOB NO. 260565 DWG FILE DETAILS

C-304

C:\Users\tgm\OneDrive - SME\BASE\PDOT\Civil\e - Pine Tree Landfill - FFA\LP\Plans\DETAILS.dwg, C-304, 9/22/2026 11:40:44 AM, tgm

A. GENERAL

1. All soil erosion and sediment control will be done in accordance with: (1) the Maine Erosion and Sediment Control Handbook: Best Management Practices, Maine Department of Environmental Protection (MEDEP), October 2016.

2. The site contractor (to be determined) will be responsible for the repair/replacement/maintenance of all erosion control measures until all disturbed areas are stabilized.

3. Disturbed areas will be permanently stabilized within 7 days of final grading. Disturbed areas not to be worked upon within 14 days of disturbance will be temporarily stabilized within 7 days of the disturbance.

4. In all areas, removal of trees, bushes and other vegetation, as well as disturbance of topsoil will be kept to a minimum while allowing proper site operations.

5. Any suitable topsoil will be stripped and stockpiled for reuse as directed by the owner. Topsoil will be stockpiled in a manner such that natural drainage is not obstructed and no off-site sediment damage will result. In any event, stockpiles will not be located within 100 feet of wetlands and will be at least 50 feet upgradient of the stockpile's perimeter silt fence. The sideslopes of the topsoil stockpile will not exceed 2:1. Silt fence will be installed around the perimeter of all topsoil stockpiles. Topsoil stockpiles will be surrounded with siltation fencing and will be temporarily seeded with Aroostook rye, annual or perennial ryegrass within 7 days of formation, or temporarily mulched.

B. TEMPORARY MEASURES

1. STABILIZED CONSTRUCTION ENTRANCE/EXIT

A crushed stone stabilized construction entrance/exit will be placed at any point of vehicular access to the site.

2. SILT FENCE

a. Silt fence will be installed prior to all construction activity, where soil disturbance may result in erosion. Silt fence will be erected at locations shown on the plans and/or downgradient of all construction activity.

b. Silt fences will be removed when they have served their useful purpose, but not before the upgradient areas have been permanently stabilized.

c. Silt fences will be inspected immediately after each rainfall and at least daily during prolonged rainfall. They will be inspected if there are any signs of erosion or sedimentation below them. Any required repairs will be made immediately. If there are signs of undercutting at the center or the edges, or impounding of large volumes of water behind them, they will be replaced with a temporary crushed stone check dam.

d. Sediment deposits will be removed after each storm event if significant build-up has occurred or if deposits exceed half the height of the barrier.

3. STONE CHECK DAMS

Stone check dams will be installed in grass-lined swales and ditches during construction.

4. BARK MULCH SEDIMENT BARRIER

a. Where approved, bark mulch sediment barriers may be used as a substitute for silt fence. See the details in this drawing set for specifications.

b. Rock Filter Berms: To provide more filtering capacity or to act as a velocity check dam, a berm's center can be composed of clean crushed rock ranging in size from the french drain stone to riprap.

5. TEMPORARY SEEDING

Stabilize disturbed areas that will not be brought to final grade for a year or less and reduce problems associated with mud and dust production from exposed soil surface during construction with temporary vegetation.

6. TEMPORARY MULCHING

Use temporary mulch in the following locations and/or circumstances:

- In sensitive areas (within 100 feet of streams, wetlands and in lake watersheds) temporary mulch will be applied within 7 days of exposing spill or prior to any storm event.
- Apply temporary mulch within 14 days of disturbance or prior to any storm event in all other areas.
- Areas which have been temporarily or permanently seeded will be mulched immediately following seeding.
- Areas which cannot be seeded within the growing season will be mulched for over-winter protection and the area will be seeded at the beginning of the growing season.
- Mulch can be used in conjunction with tree, shrub, vine, and ground cover plantings.
- Mulch anchoring will be used on slopes greater than 5 percent in late fall (past September 1), and over-winter (September 1 - April 25).

The following materials may be used for temporary mulch:

a. Hay or Straw material shall be air-dried, free of seeds and coarse material. Apply 2-3 tons/acre or 3 bales (90-130 lbs per 1,000 sf).

b. Erosion Control Mix: It can be used as a stand-alone reinforcement:

- on slopes 2 horizontal to 1 vertical or less;
- on frozen ground or forested areas; and
- at the edge of gravel parking areas and areas under construction.

c. Erosion control mix alone is not suitable:

- on slopes with groundwater seepage;
- at low points with concentrated flows and in gullies;
- at the bottom of steep perimeter slopes exceeding 100 feet in length;
- below culvert outlet aprons; and around catch basins and closed storm systems.

d. Chemical Mulches and Soil Binders: Wide ranges of synthetic spray-on materials are marketed to protect the soil surface. These are emulsions that are mixed with water and applied to the soil. They may be used alone, but most often are used to hold wood fiber, hydro-mulches or straw to the soil surface.

e. Erosion Control Blankets and Mats: Mats are manufactured combinations of mulch and netting designed to retain soil moisture and modify soil temperature. During the growing season (April 25 to August 31) use mats indicated on drawings or North American Green (NAG) C125 BN (or mulch and netting) on:

- the base of grassed waterways;
- steep slopes (15 percent or greater); and
- any disturbed soil within 100 feet of lakes, streams, or wetlands.

During the late fall and winter (September 1 to April 25) use heavy grade mats indicated on drawings for NAG SC250 on all areas noted above plus use lighter grade mats NAG C125BN (or mulch and netting) on:

- sideslopes of grassed waterways; and
- moderate slopes (between 8 and 15 percent).

7. TEMPORARY DUST CONTROL

To prevent the blowing and movement of dust from exposed soil surfaces, and reduce the presence of dust, use water to control dusting by preserving the moisture level in the road surface materials. The use of calcium chloride or any other chemicals for dust control is prohibited

8. CONSTRUCTION DE-WATERING

a. Water from construction de-watering operations shall be cleaned of sediment before reaching wetlands, water bodies, streams or site boundaries. Utilize temporary sediment basins, erosion control soil filter berms backed by staked hay bales, or other approved Best Management Practices (BMP's).

b. In sensitive areas near streams or ponds, discharge the water from the de-watering operation into a temporary sediment basin created by a surrounding filter berm of uncompacted erosion control mix immediately backed by staked hay bales (see the site details). Locate the temporary sediment basin at lease 100 feet from the nearest water body, such that the filtered water will flow through undisturbed vegetated soil areas prior to reaching the water body or property line.

A. PERMANENT MEASURES

1. Riprapped Aprons: All storm drain pipe outlets and the inlet and outlet of culverts will have riprap aprons to protect against scour and deterioration.

2. Topsoil, Seed, and Mulch: All areas disturbed during construction, but not subject to other restoration (paving, riprap, etc.) will be loamed, limed, fertilized, seeded, and mulched.

a. Seeded Preparation: Use stockpiled materials spread to the depths shown on the plans, if available. Approved topsoil substitutes may be used. Grade the site as needed.

b. Seeding will be completed by August 31 of each year. Late season seeding may be done between September 1 and April 25. Areas not seeded or which do not obtain satisfactory growth by August 31, will be seeded with Aroostook Rye or mulched. After November 1, or the first killing frost, disturbed areas will be seeded at double the specified application rates, mulched, and anchored.

PERMANENT SEEDING SPECIFICATIONS

Mixture:	Grassed areas (lbs/acre)
Tall Fescue	54
Creeping Red Fescue	25
Red Top	5
Ladino Clover	13
Annual Ryegrass	8
Birdsfoot Trefoil	5
Timothy	10

c. Mulch in accordance with specifications for temporary mulching.

d. If permanent vegetated stabilization cannot be established due to the season of the year, all exposed and disturbed areas not to undergo further disturbance are to have dormant seeding applied and be temporarily mulched to protect the site.

3. Ditches and Channels: All ditches on-site will be lined with North American Green S75 erosion control mesh (or an approved equal) upon installation of loam and seed.

B. WINTER CONSTRUCTION AND STABILIZATION

1. Winter excavation and earthwork will be completed so as to minimize exposed areas while satisfactorily completing the project. Limit exposed areas to those areas in which work is to occur during the following 15 days and that can be mulched in one day prior to any snow event. All areas will be considered denuded until the subbase gravel is installed in roadway areas or the areas of future loam and seed have been loamed, seeded, and mulched.

Install any added measures necessary to control erosion/sedimentation. The particular measure used will be dependent upon site conditions, the size of the area to be protected, and weather conditions.

To minimize areas without erosion control protection, continuation of earthwork operations on additional areas will not begin until the exposed soil surface on the area being worked has been stabilized.

2. Natural Resource Protection: During winter construction, a double-row of sediment barriers (i.e., silt fence backed with hay bales or erosion control mix) will be placed between any natural resource and the disturbed area. Projects crossing the natural resource will be protected a minimum distance of 100 feet on either side from the resource.

3. Sediment Barriers: During frozen conditions, sediment barriers may consist of erosion control mix berms or any other recognized sediment barriers as frozen soil prevents the proper installation of hay bales or silt fences.

4. Mulching: All areas will be considered to be denuded until seeded and mulched. Hay and straw mulch will be applied at a rate of twice the normal accepted rate.

Mulch will not be spread on top of snow.

After each day of final grading, the area will be properly stabilized with anchored hay or straw or erosion control matting.

Between the dates of September 1 and April 25, all mulch will be anchored by either mulch netting, emulsion chemical, tracking or wood cellulose fiber.

5. Soil Stockpiling: Stockpiles of soil or subsoil will be mulched for over-winter protection with hay or straw at twice the normal rate or with a 4-inch layer of erosion control mix. This will be done within 24 hours of stocking and re-established prior to any rainfall or snowfall. Any soil stockpiles shall not be placed (even covered with mulch) within 100 feet from any natural resources.

6. Seeding: Dormant seeding may be placed prior to the placement of mulch or erosion control blankets. If dormant seeding is used for the site, all disturbed areas will receive 4 inches of loam and seed at an application rate of three times the rate for permanent seeding. All areas seeded during the winter will be inspected in the spring for adequate catch. All areas insufficiently vegetated (less than 85 percent catch) will be revegetated by replacing loam, seed, and mulch.

If dormant seeding is not used for the site, all disturbed areas will be revegetated in the spring.

7. Maintenance: Maintenance measures will be applied as needed during the entire construction season. After each rainfall, snow storm, or period of thawing and runoff, the site contractor will perform a visual inspection of all installed erosion control measures and perform repairs as needed to ensure their continuous function.

Following the temporary and/or final seeding and mulching, the contractor will, in the spring, inspect and repair any damages and/or bare spots. An established vegetative cover means a minimum of 90 percent of areas vegetated with vigorous growth.

A. OVER-WINTER CONSTRUCTION EROSION CONTROL MEASURES

1. Stabilization of Disturbed Soil: By August 31, all disturbed soils on areas having a slope less than 15 percent will be seeded and mulched. If the contractor fails to stabilize these soils by this date, then the contractor shall stabilize the soil for late fall and winter, by using either temporary seeding or mulching.

2. Stabilization of Disturbed Slopes: All slopes to be vegetated will be completed by August 31. The owner will consider any area having a grade greater than 15 percent (6.5H:1V) to be a slope. Slopes not vegetated by August 31 will receive one of the following actions to stabilize the slope for late fall and winter:

a. Stabilize the soil with temporary vegetation and erosion control mesh.
b. Stabilize the slope with erosion control mix.
c. Stabilize the slope with stone riprap.

3. Stabilization of Ditches and Channels: All stone-lined ditches and channels to be used to convey runoff through the winter will be constructed and stabilized by November 15. Grass-lined ditches and channels will be complete by September 15. Grass-lined ditches not stabilized by September 15 shall be lined with either sod or riprap.

E. MAINTENANCE PLAN

1. Routine Maintenance: Inspection will be performed as outlined in the project's Erosion Control Plan. Inspection will be by a qualified person during wet weather to ensure that the facility performs as intended. Inspection priorities will include checking erosion controls for accumulation of sediments.

A. Housekeeping

1. Spill prevention. Controls must be used to prevent pollutants from being discharged from materials on site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation.

2. Groundwater protection. During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials.

3. Fugitive sediment and dust. Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control.

4. Debris and other materials. Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source.

5. Trench or foundation de-watering. Trench de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water must be removed from the ponded area, either through gravity or pumping, and must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the department.

6. Non-stormwater discharges. Identify and prevent contamination by non-stormwater discharges.

7. Additional requirements. Additional requirements may be applied on a site-specific basis.

B. CONSTRUCTION SEQUENCE

It is anticipated that construction will commence upon receipt of all necessary permits and approvals. The following outlines the preliminary construction sequence:

a. Install silt fence and other temporary erosion control measures for the construction of Cell and accessory facilities such as berms, and service roads;

b. Construct upslope stormwater diversion berms, ditches, culvert outlets, and control structures:

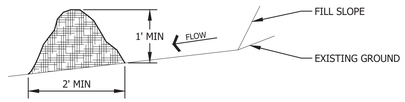
c. Perform site work;

d. Install SMH vaults;

e. Install pump station;

f. Install pipeline;

g. As permanent erosion control measures become stabilized, remove temporary measures (e.g., silt fence, stone check dams).



EROSION CONTROL MIX SEDIMENT BARRIER

NOTES:

1. EROSION CONTROL MIX CAN BE MANUFACTURED ON OR OFF THE SITE. IT MUST CONSIST PRIMARILY OF ORGANIC MATERIAL SEPARATED AT THE POINT OF GENERATION, AND MAY INCLUDE: SHREDDED BARK, STUMP GRINDINGS, COMPOSTED BARK, OR FLUME GRIT AND FRAGMENTED WOOD GENERATED FROM WATER-FLUME LOG HANDLING SYSTEMS. WOOD CHIPS, GROUND CONSTRUCTION DEBRIS, REPROCESSED WOOD PRODUCTS OR BARK CHIPS WILL NOT BE ACCEPTABLE AS THE ORGANIC COMPONENT OF THE MIX. EROSION CONTROL MIX SHALL CONTAIN A WELL-GRADED MIXTURE OF PARTICLE SIZES AND MAY CONTAIN ROCKS LESS THAN 4" IN DIAMETER. EROSION CONTROL MIX MUST BE FREE OF REFUSE, PHYSICAL CONTAMINANTS, AND MATERIAL TOXIC TO PLANT GROWTH.

   THE MIX COMPOSITION SHALL MEET THE FOLLOWING STANDARDS:
   A. ORGANIC MATERIAL: BETWEEN 20% - 100% (DRY WEIGHT BASIS)
   B. PARTICLE SIZE: BY WEIGHT, 100% PASSING 6" SCREEN, 70-85% PASSING 0.75" SCREEN
   C. THE ORGANIC PORTION NEEDS TO BE FIBROUS AND ELONGATED.
   D. LARGE PORTIONS OF SILTS, CLAYS OR FINE SANDS ARE NOT ACCEPTABLE IN THE MIX.
   E. SOLUBLE SALTS CONTENT SHALL BE LESS THAN 4.0 MMHOS/CM.
   F. PH: 5.0 - 8.0

2. ON SLOPES LESS THAN 5% OR AT THE BOTTOM OF SLOPES 2:1 OR LESS UP TO 20 FEET LONG, THE BARRIER MUST CONFORM TO THE ABOVE DIMENSIONS. ON THE LONGER OR STEEPER SLOPES, THE BARRIER SHOULD BE WIDER TO ACCOMMODATE THE ADDITIONAL FLOW.

3. THE BARRIER MUST BE PLACED ALONG A RELATIVELY LEVEL ELEVATION. IT MAY BE NECESSARY TO CUT TALL GRASSES OR WOODY VEGETATION TO AVOID CREATING VOIDS AND BRIDGES THAT WOULD ENABLE FINES TO WASH UNDER THE BARRIER THROUGH THE GRASS BLADES OR PLANT STEMS.

4. LOCATIONS WHERE OTHER BMP'S SHOULD BE USED:
   A. AT LOW POINTS OF CONCENTRATED FLOW
   B. BELOW CULVERT OUTLET APRONS
   C. WHERE A PREVIOUS STAND-ALONE EROSION CONTROL MIX APPLICATION HAS FAILED
   D. AT THE BOTTOM OF STEEP PERIMETER SLOPES THAT ARE MORE THAN 50 FEET FROM TOP TO BOTTOM (LARGE UPGRADIENT WATERSHED)
   E. AROUND CATCH BASINS AND CLOSED STORM DRAIN SYSTEMS.

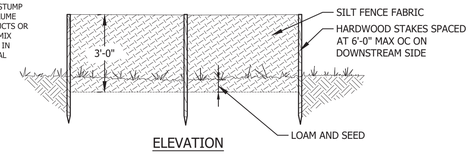
5. THE EROSION CONTROL MIX BARRIERS SHOULD BE INSPECTED REGULARLY AND AFTER EACH LARGE RAINFALL. REPAIR ALL DAMAGED SECTIONS OF BERM IMMEDIATELY BY REPLACING OR ADDING ADDITIONAL MATERIAL PLACED ON THE BERM TO THE DESIRED HEIGHT AND WIDTH.

6. IT MAY BE NECESSARY TO REINFORCE THE BARRIER WITH SILT FENCE OR STONE CHECK DAMS IF THERE ARE SIGNS OF UNDERCUTTING OR THE IMPOUNDMENT OF LARGE VOLUMES OF WATER.

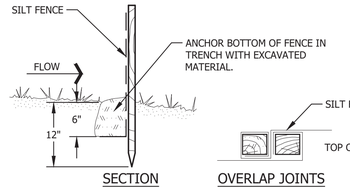
7. SEDIMENT DEPOSITS SHOULD BE REMOVED WHEN THEY REACH APPROXIMATELY ONE-HALF THE HEIGHT OF THE BARRIER.

8. REPLACE SECTIONS OF BERM THAT DECOMPOSE, BECOME CLOGGED WITH SEDIMENT OR OTHERWISE BECOME INEFFECTIVE. THE BARRIER SHOULD BE RESHAPED AS NEEDED.

9. EROSION CONTROL MIX BARRIERS CAN BE LEFT IN PLACE AFTER CONSTRUCTION. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER BARRIER IS NO LONGER REQUIRED SHOULD BE SPREAD TO CONFORM TO THE EXISTING GRADE AND BE SEEDED AND MULCHED. WOODY VEGETATION CAN BE PLANTED INTO THE BARRIERS, OR THEY CAN BE OVER-SEEDED WITH LEGUMES. IF THE BARRIER NEEDS TO BE REMOVED, IT CAN BE SPREAD OUT INTO THE LANDSCAPE.



ELEVATION



SECTION

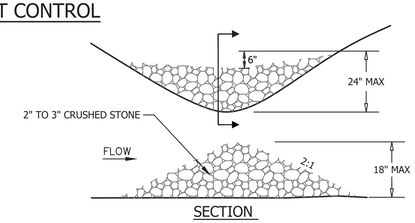
OVERLAP JOINTS

SILT FENCE

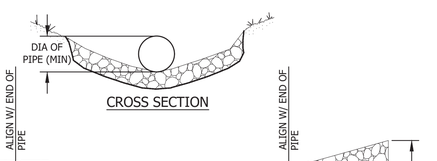
NOTE:
CONTRACTORS OPTION TO USE SEDIMENT BARRIER OR SILT FENCE FOR SLOPE PROTECTION.

SURFACE DRAINAGE SEDIMENT CONTROL

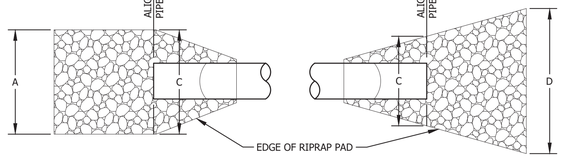
NTS



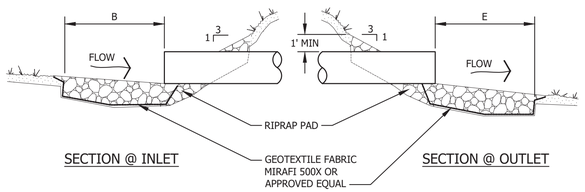
SECTION



CROSS SECTION



PLAN @ INLET PLAN @ OUTLET



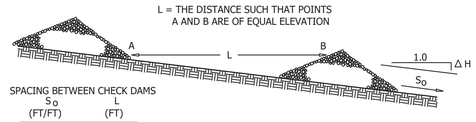
SECTION @ INLET SECTION @ OUTLET

RIPRAP PAD MUST BE INSTALLED WITHIN 48 HOURS OF INSTALLING NEW PIPE OR CULVERT.

PIPE INLET/OUTLET PROTECTION

NTS

L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION



SPACING BETWEEN CHECK DAMS

So (FT/FT)	L (FT)
0.020	75
0.030	50
0.040	40
0.050	30
0.080	20
0.100	10

STONE CHECK DAM

NTS

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D. PIERCE
9609
LICENSED
PROFESSIONAL ENGINEER
9/4/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM
HAMPDEN, MAINE

SECTIONS AND DETAILS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SITE
CTB:	SME-STD.CTB

JOB NO. 260565 DWG FILE DETAILS

C-305

C:\Users\jmm\OneDrive - SME\SHARE\PDWT\Dwells - Pine Tree Landfill - PF\42Plots\ZETALS.dwg C:305, 9/2/2026 11:48:43 AM, sjm

APPENDIX B

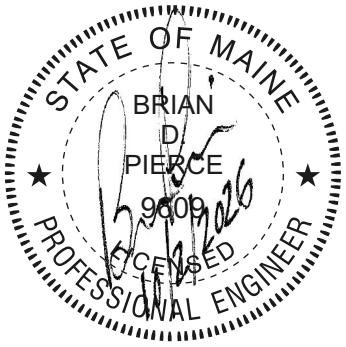
SPECIFICATIONS

SME
SEVEE & MAHER
ENGINEERS

CONTRACT DOCUMENTS AND SPECIFICATIONS
LEACHATE TRANSFER SYSTEM UPGRADES
PINE TREE LANDFILL
HAMPDEN, MAINE

Prepared for

NEW ENGLAND WASTE SERVICES OF MAINE, INC.



October 2026

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021

Tel: 207.829.5016 sme-engineers.com

SME
SEVEE & MAHER
ENGINEERS

TABLE OF CONTENTS

Titles to divisions and paragraphs in these Specifications are introduced merely for convenience, and shall not be taken as a correct or complete segregation of the several units of material and labor. No responsibility, either direct, or implied, is assumed by the Engineer for omissions or duplications by the Contractor, or his subcontractors, due to real or alleged error in arrangement of the matter in these Contract Documents.

If any errors or omissions appear in the Drawings, Specifications, or other documents, the Contractor shall immediately notify the Engineer in writing of such omissions or errors.

A. BID AND CONTRACT DOCUMENTS

Section I	Invitation for Bids
Section II	Instructions to Bidders
Section III	Bid Forms and Bid Form Attachments
Section IV	Technical Specifications
Section V	Contract Drawings (Refer to Attachment 1)
Section VI	CQA Plan (Refer to Appendix B)
Section VII	Construction Agreement and Forms
Section VIII	Performance and Payment Bonds
Section IX	The Agreement Price – Fees, Charges, Rates and Additional Terms and Conditions

B. TECHNICAL SPECIFICATIONS

DIVISION 1 GENERAL REQUIREMENTS

Section 01010	Summary of Work
Section 01012	Health and Safety Plan
Section 01025	Measurement and Payment
Section 01041	Project Coordination
Section 01060	Applicable Codes
Section 01211	Preconstruction Conference
Section 01300	Submittals
Section 01350	Engineer's Field Office
Section 01505	Mobilization
Section 01561	Cleaning
Section 01562	Dust Control
Section 01570	Traffic Control
Section 01600	Material and Equipment
Section 01700	Contract Closeout

DIVISION 2 **SITE WORK**

Section 02015 Subsurface Information
Section 02016 Existing Utilities and Underground Structures
Section 02100 Site Preparation
Section 02200 Earthwork
Section 02220 Erosion Control
Section 02450 Pipe Installation
Section 02466 Polyvinyl Chloride Pipe (Conduits)
Section 02510 Hot Mix Asphalt Pavement
Section 02800 Seeding and Mulching

DIVISION 3 **CONCRETE**

Section 03300 Cast-In-Place Concrete
Section 03420 Precast Concrete Structures

DIVISION 13 **SPECIAL CONSTRUCTION**

Section 13240 High Density Polyethylene Manhole Pump Station

DIVISION 15 **MECHANICAL**

Section 15100 HDPE Pipe and Fittings
Section 15101 PVC Pipe and Fittings
Section 15106 Ductile Iron Pipe and Fittings
Section 15110 Valves and Pipe Accessories
Section 15120 Hydrostatic and Low-Pressure Air Testing of Polyethylene Pipe

APPENDICES (PROVIDED AT LATER DATE)

APPENDIX A PERMITS: APPENDIX A-1 MEDEP SOLID WASTE PERMIT
APPENDIX A-2 TOWN OF HAMPDEN PERMIT
APPENDIX A-3 CITY OF OLD TOWN PLANNING BOARD PERMIT

APPENDIX B QUALITY ASSURANCE/QUALITY CONTROL PLAN

A. BID AND CONTRACT DOCUMENTS

SME
SEVEE & MAHER
ENGINEERS

NOTICE OF AWARD

DESCRIPTION OF WORK: Construction of Leachate Transfer System Upgrades at the Pine Tree Landfill facility in Hampden, Maine.

To:

The Owner has considered the Bid submitted by you on **_____**, for the above described work in response to its Notice and Instructions to Bidders dated **Month Year**.

It is to the best interest of said Owner to accept your Bid in the amount of **(**$**_____.___)**; you are hereby notified that your Bid has been accepted

Dated this **__ day of _____**

New England Waste Services of Maine, Inc.
Owner

By:_____

Title:_____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of
Award is hereby acknowledged this
_____ day of _____, 20__

By:_____

Title:_____

I
INVITATION FOR BIDS

SME
SEVEE & MAHER
ENGINEERS

SECTION I
INVITATION FOR BIDS

I. INVITATION FOR BIDS

Three copies of your sealed proposals for Construction of Leachate Transfer System Upgrades at the Pine Tree Landfill Facility, will be received at the office of New England Waste Services of Maine, Inc. (NEWSME Operations), D/B/A Pine Tree Landfill, in Hampden, Maine,, until **_____ on _____**, and at that time privately opened.

The work consists of the following:

Construction of Leachate Transfer System Upgrades, including: mobilization, erosion control construction and management, dust control; site preparation including clearing and grubbing, abandonment of existing force mains and manholes, reclaiming existing pavement; removal of existing loading rack; construction of the concrete unloading pad; construction of leachate loading rack; grading and paving of access roads including subbase and base gravel; installation of bollards; installation of manholes, valve pits, and catch basin; installation of HDPE-lined transfer vault; installation of 7-foot-diameter dual-contained high-density polyethylene (HDPE) pump station including pumps, piping, instrumentation and electrical work; installation of gravel access to pump station; installation and testing of dual-containment force mains; test pitting new force main locations at existing utilities crossings; tie-ins to existing force mains; Secure III force main improvements; relocation of an extraction well outlet; coordination with owner to isolate existing force mains; installation of electrical and communication conduits; installation of electrical control shed; establishment of site grades; installation of 12-inch HDPE culvert from transfer pad to transfer vault; installation of actuate valves; as-built/record survey; restoration of existing site roadways; and site cleanup.

All bids will remain subject to acceptance for 30 days after the actual date of the bid opening. Complete instructions for filing are included in the Information for Bidders.

NEWSME reserves the right to waive any informality in or to reject any or all proposals, or to accept any bid if deemed to be in the best interest of the Company to do so.

Pine Tree Landfill
Hampden, Maine

II
INSTRUCTIONS TO BIDDERS

SME
SEVEE & MAHER
ENGINEERS

SECTION II

INSTRUCTIONS TO BIDDERS

1. PROPOSALS

A. Receipt and Opening of Bids

Sealed bids will be received until **_____ on _____** at the office of New England Waste Services of Maine, Inc. (NEWSME Operations), D/B/A Pine Tree Landfill, in Hampden, Maine, or at the offices of Sevee & Maher Engineers, Inc. (SME) at 4 Blanchard Road, Cumberland, Maine, and then privately opened and read. Bids delivered to SME should be accompanied by a emailed version of the bid to Wayne Boyd at NEWSME Operations at wayne.boyd@casella.com. The emailed version must exactly match the delivered bid. The envelopes containing three copies of the bids must be sealed, addressed to Purchasing Department, Attn: Wayne Boyd, and designated as:

Leachate Transfer System Upgrades
Pine Tree Landfill
Hampden, Maine 04468
fax (207) 862-2839
phone (207) 862-4200 ext. 224

NEWSME Operations will not consider any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. All bids will remain subject to acceptance for 30 days after the actual date of the bid opening.

B. Preparation of Bid

Each bid must be submitted on the prescribed form to these documents. All blank spaces in the form shall be filled, all copies shall be signed in ink in longhand, and all numbers shall be stated in writing and in figures. The complete form shall be without alterations, or erasures, and no changes shall be made in the phraseology of the form. All bid items shall be considered as a unit, and a bid on all items shall be required in order to be considered. Total base bid shall represent lump sum price to complete all work described by the bid documents. Unit price values shall be used to determine contractor's compensation for extra work not described or shown by the bid documents. Unit prices will not vary due to changes in quantities. Individual bid items may be deleted from the project scope at the discretion of NEWSME Operations. No additional payment of any type or for any reason will be made for items covered by a lump sum price, or adjustment be made for items covered by lump sum price as a result of item deletion. Conditional bids will not be accepted.

C. Bid Documents, Drawings, and Specifications

One set of bid documents, including Drawings and Specifications, will be issued by Sevee & Maher Engineers, Inc. (SME) (termed "the Engineer") to each invited Bidder only, for the purpose of preparing a bid. No partial sets will be issued, nor will drawings or specifications be issued to firms wishing to submit material, equipment or other

sub-bids to invited Bidders. The loaned sets of drawings and specifications shall be returned to the Engineer by unsuccessful Bidders, if so requested.

D. Bidder

(a) Shall carefully examine the documents, the Drawings and the Specifications, shall visit the site and fully inform himself as to all existing and controlling conditions and limitations including availability of materials and labor. A mandatory pre-bid conference for prospective bidders will be held on **_____ at Pine Tree Landfill Site**. The submission of a bid shall be a representation that he has inspected the site and has familiarized himself with all of the controlling conditions. The failure or omission of any Bidder to examine any form, instrument or document shall in no way relieve any Bidder from any obligation in respect to his bid.

(b) Shall notify the Engineer in writing if he finds discrepancies in, or omissions from, the Drawings and/or Specifications, or is in doubt as to their meanings. If an explanation is necessary, a reply will be made by an addendum issued to Bidders. No oral statement shall change the requirements of the Specifications or Drawings unless confirmed in writing.

(c) Shall state the lump sum price for which he will execute and complete each work package and the entire work in accordance with the Drawings, Specifications, and the requirements of the contract.

(d) Work extra to the contract requirements will be done, as outlined in the Bid Form (ref. Section C).

(e) Shall indicate in his bid the portions of the Contract work, if any, which will be subcontracted. The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to NEWSME Operations. A complete list of proposed subcontractors shall be included in the Contractor's bid.

(f) Shall state that he will complete the work of the contract in accordance with the Construction Schedule included as part of the Specifications.

(g) Shall sign his name in the space provided. If the bid is made by a partnership or corporation, the name and address of the partnership or corporation shall be shown, together with the names of the partners or the officers. A bid made by a partnership shall be acknowledged by one of the partners, a bid made by a corporation by one of the authorized officers thereof.

(h) If awarded the contract, will be required to furnish copies of Insurance Certificates endorsed to meet the requirements of the contract.

(i) Each Bidder is urged to submit his best possible price with his bid. Bids will be evaluated and the order placed on the basis of the set of prices received in each Bidder's bid. Adjustment of original bid prices will not be considered after receipt of bids, except as required to adjust for design or scope changes.

F. Time of Completion

Bidder must agree to be substantially complete by **Month, Day, Year**. Construction of Leachate Transfer System Upgrades must be completed by this date and the system must be ready for Maine Department of Environmental Protection approval. Completion of items not necessary for the operation of the system can occur after this date.

NEWSME Operations is in the process of securing all permits necessary to complete the project. The timing for obtaining these permits is unknown and thus a start date for on-site construction cannot be given at this time. NEWSME Operations' goal is to obtain all necessary permits to enable the Contractor to begin the on-site work as early as possible. NEWSME Operations will keep the Contractor informed of the progress made in the project permitting. NEWSME Operations requests that the Contractor provide NEWSME Operations with a Construction Schedule identifying the major construction items and a proposed start date to have the project completed by the dates described in the Bid Schedule.

G. Condition of Work

Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligations to furnish all material, equipment, and labor necessary to carry out the provisions of his Contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruptions of or interference with the work of any other Contractor. The Pine Tree Landfill is an inactive site. However, the Pine Tree Transfer & Recycling Facility uses the same access roads as the Leachate Transfer System Upgrades Project. It is the responsibility of the Contractor to coordinate with the Owner with regard to use of the premises, including haul routes and vehicular access.

H. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any Bidder orally. Every request for such interpretation should be in writing addressed to Sevee & Maher Engineers, Inc., P.O. Box 85A, Cumberland Center, Maine 04021, emailed to **(ptl-upgrades@sme-engineers.com)**, to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), faxed or e-mailed. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the Contract Documents.

I. Laws and Regulations

The Bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

J. Method of Award

If at the time this Contract is to be awarded, the lowest base bid submitted by a reasonable Bidder does not exceed the amount of funds then estimated by NEWSME Operations as available to finance the Contract, the Contract will be awarded on the base bid only. If such bid exceeds said amount, NEWSME Operations may reject all bids or may award the Contract, reducing the amount of unit price work to keep the overall Contract amount within the available funds. NEWSME Operations shall award to the Bidder it judges to be best qualified.

K. Bonds

A Performance and Payment Bond will not be required.

L. Attachment to the Bid Form

The Bidder will attach to his bid form the following:

1. The name of the on-site supervisor(s) whom he proposes to supervise the work, together with a brief resume of past experience.

2. A list of similar projects the Bidder has completed, including the name, address, and telephone number of person familiar with the Bidder's performance.

3. A list of the equipment and personnel which he proposes to use and standard rate sheets.

4. A proposed construction schedule and manpower projection, as explained in Instructions to Bidders, Section F – Time of Completion.

5. Who the Bidder proposes to use as specialty subcontractors.

6. Applicable sales and use taxes shall be included in the lump sum bid price, and the amount so included stated separately.

7. Separate quantity take-off for each bid line item.

M. Alternate Bids

The Bidder is requested to quote this work in strict conformity with this document. However, if for any reason (such as Bidder's method of cost accounting, a special small tool or equipment rental system, etc.) the Bidder wishes to submit an alternate bid, it may be considered.

END OF SECTION

III

BID FORMS AND BID FORM ATTACHMENTS

SME
SEVEE & MAHER
ENGINEERS

SECTION III

BID FORM

BID FOR: LEACHATE TRANSFER SYSTEM UPGRADES PINE TREE LANDFILL HAMPDEN, MAINE

To: Wayne Boyd, General Manager
New England Waste Services of Maine, Inc. (NEWSME Operations)
358 Emerson Mill Road
Hampden, Maine 04444

Date:_____

Proposal of _____ (hereinafter called "Bidder"), a corporation, organized and existing under the laws of the State of _____ _____, a partnership or an individual* doing business as _____, to New England Waste Services of Maine, Inc.(hereinafter called "NEWSME Operations").

Having carefully examined the Instructions to Bidders, the Form of Agreement, the General and Supplementary Conditions, the Bid and Contract Documents and Specifications entitled, Pine Tree Landfill Leachate Transfer System Upgrades, Hampden, Maine and the contract drawings (Issued for Bid _____ _____), project permits, and the Quality Assurance/Quality Control Plan, as well as the site upon which the work is to be performed, and all conditions affecting the prosecution of the work, including the availability of materials and labor:

The UNDERSIGNED proposes and agrees to furnish all materials, labor, equipment, and supervision and perform all operations required to complete the entire scope of work in accordance with the Contract Specifications and Drawings, and all applicable local State and Federal Regulations, within the time set forth therein, for the following prices listed below.

The estimated quantities of materials provided by the Engineer for each bid item are approximate quantities of in-place materials based upon the Engineer's interpretation of the Contract Drawings. This information is provided for informational purposes only and shall not be considered to represent the actual amount of material required to complete the Scope of Work (i.e., quantities of waste, shrinkage, compaction, and incidental materials are not included). The cost for each bid item shall be based upon the Bidder's own interpretation of the existing site conditions, Contract Drawings, and technical specifications, and shall include all materials and incidental items required to complete the Scope of Work.

Errors or omissions of the Engineer's estimated material quantity listed in the Bid Form shall not entitle the Bidder to any adjustment in the Lump Sum Contract price. The Bidder shall list their own material quantities used to prepare the Bid and notify the Owner/Engineer in writing of any significant discrepancies of in-place material quantities prior to submitting the Bid.

Bidder hereby agrees to commence work under this Contract on or before the dates specified in the proposed schedule, provided that NEWSME Operations has issued a Notice to Proceed, and complete work on or before the completion date specified in the Contract Documents.

The pricing contained in this proposal is good until _____.

1. BID ITEMS

A. Bidder agrees to perform all the work, including all incidental labor, materials, and equipment necessary for the satisfactory completion of the work and in full compliance with the contents and intent of the specifications and/or plans of the work, for the following prices listed below.

B. The Contract will be awarded based on the Lump Sum price for the total project. The Lump Sum price will become the contract price. To track costs associated with the project completion the Contractor is required to provide cost information for the individual bid items, that make up the lump sum price. For each item, the Contractor shall provide information on the unit price, and the Contractor's estimated quantities. The price for each item shall be the product of the Contractor's estimated quantities and unit prices. The Engineer's estimated quantities are provided for informational purposes only.

C. Interlineation, alteration or erasure may void the Bid. All prices shall be typewritten or written by hand in ink.

SECTION A

GENERAL CONTRACTOR'S BID VALUES

Item	Description	Engineer's Est. Quantity	Units	Contractor's Est. Quantity	Unit Price[1] ($)	Price ($)
1	Mobilization/Demobilization	1	LS			
2	Construct/Maintain Stormwater Management Features (includes dewatering)	1	LS			
3	Clearing/Grubbing/Site Prep	1	LS			
4	Reclaim Existing Asphalt	9,900	SF			
5	Abandonment and Remove Force Mains (includes capping)		LF			
6	Removal of Manholes 2 and 14	1	LS			
7	Removal of Existing Loading Rack	1	LS			
8	Piezometer Abandonment					
9	Transfer Pad	1	LS			
10	Supply and Install Loading Rack	1	LS			
12	Supply and Install 6"X10" Dual Containment Force Main	278	LF			
12	Supply and Install 8"X12" Dual Containment Force Main	207	LF			
13	Supply and Install 4"X8" Dual Containment Force Main	278	LF			
14	Supply and Install 84" Diameter HDPE Transfer Pump Station	1	LS			
15	Supply and Install SMH 21	1	LS			
16	Supply and Install SMH 22	1	LS			
17	Supply and Install HDPE Lined Transfer Vault	1	LS			
18	Manhole 17 Modifications Improvements	1	LS			
19	New Access Road Paving	12,825	SF			
20	Utility Shed Construction	1	LS			
21	Supply and Install Underground communication and electrical conduits	719	LF			
22	Electrical, Communications, and Instrumentation	1	LS			
23	Construction/Record Survey	1	LS			
24	Sales and Use Tax					
	TOTAL AMOUNT OF BID: (ITEMS 1 THROUGH 24) – BASIS OF AWARD Contract is Lump Sum with progress payments based on work completed per Owner's survey. Total Amount of Bid in Words: _____ _____ _____					

SECTION B

EXTRA WORK UNIT PRICES

Changes in the Contract work shall be performed at the unit prices, described below. The unit prices are gross prices, including the Contractor's equipment, labor, supervision, and materials costs, entire mark-up, field or other costs, including general conditions, fringe benefits, overhead and profit.

Item Description	Units	Unit Price
Grubbing	Acre	
Clearing	Acre	
Common Excavation	C.Y.	
Excavation of Unsuitable Material	C.Y.	
Open Rock Excavation	C.Y.	
Trench Rock Excavation	C.Y.	
Concrete	C.Y	
Aggregate Subbase Material	C.Y.	
Aggregate Base Material	C.Y.	
Granular Backfill	C.Y.	
Hot Mixed Asphalt	T	
Pavement Milling	S.F.	
Common Borrow	CY	
Siltation Fence	L.F.	
Bark Mulch Sediment Barrier	L.F.	
Seed, Fertilizer, Lime, Mulch	Unit	
Topsoil	C.Y.	
Pipe Bedding Stone	C.Y.	
4X8 -inch Dual Containment HDPE Pipe SDR 17 /SDR17	L.F.	
6X10-inch Dual Containment HDPE Pipe SDR 17/SDR17	L.F.	
8X12 -inch Dual Containment HDPE Pipe SDR 17/SDR17	L.F.	
12-inch HDPE Pipe SDR 17 (Solid))	L.F.	
4- inch Sch 40 Conduit	L.F.	

1. Provide your expected start date with a Notice to Proceed on _____.

2. The UNDERSIGNED proposes the following deviations from, and additions, supplements and exceptions to the Specifications, with applicable pricing, on which the Proposal is based, there are no others, and affirms that any provisions in this Proposal inconsistent with the provisions in the Specifications which are not here expressly described or referred to will be construed as though such inconsistent provisions had not been included in this Proposal.

3. The UNDERSIGNED agrees that any changes in the scope of work extra to the contract requirements for which method of payments has not been otherwise established in this Bid will be negotiated on a fixed lump sum basis, unit price basis or cost-plus-percentage basis, as selected by the Owner. When the fixed sum basis or unit price basis is selected for extra work, a breakdown of the sum will be provided as required by the Owner. When the cost-plus-percentage basis is selected for extra or for work performed under allowances, compensation will be paid as follows:

   (a) An amount equal to the total sum of all Reimbursable Costs, as defined in the General Conditions of the Contract. A breakdown of the Reimbursable costs will be provided as required by the owner.
   (b) Plus an amount equal to ____% of Reimbursable Costs, which amount shall be full compensation for all Overhead as defined in the General Conditions of the Contract.
   (c) Plus an amount equal to _____% of the sum of Reimbursable Costs and Overhead, which amount shall be defined as “Fee". A breakdown of the fee will be provided as required by the Owner.
   (d) Extra Work by subcontractors shall not be included in Reimbursable Costs, but shall be handled separately, as stipulated in Paragraph 5 of this Bid.

4. The UNDERSIGNED agrees that only the following portions on the work will be subcontracted, and that the names of subcontractors will be submitted prior to award of contract, in accordance with the General Conditions of the Contract.

_____

_____

_____

_____

_____

5. The UNDERSIGNED agrees that extra work performed by their subcontractors shall be invoiced in the same manner described for the Contractor's extra work, and that the Contractor will compensate the subcontractors accordingly and accept as full payment the invoiced cost plus a charge of _____% for the Contractor’s own services in handling the extra work performed by the subcontractors. All subcontract prices and fees shall be subject to the Owner's prior approval.

6. The UNDERSIGNED agrees to perform work of the Contract during over-time periods for purposes beyond the intent of the Contract, if requested and authorized to do so by the Engineer and be reimbursed for the additional cost as described in the General Conditions of the Contract.

7. The UNDERSIGNED agrees to execute a formal contract for the entire work on the Agreement form provided for that purpose, within ten days after receiving notification the contract has been awarded.

8. The UNDERSIGNED agrees to substantially complete the entire work of the contract in accordance with the Construction Schedule and/or completion dates included in the Specifications.

9. The UNDERSIGNED agrees that all applicable Federal, state and local sales and use taxes and cost of required insurance are included in the proposal as a separate bid item.

10. The UNDERSIGNED agrees in submitting this Bid that the right is reserved by the Owner to reject any or all Bids. It is agreed that this Bid may not be withdrawn for a period of thirty (30) days from the opening date thereof.

11. The UNDERSIGNED acknowledges the receipt of Addendums:

No.	Date	Signature

12. The UNDERSIGNED hereby declares as Bidder, that the only persons or parties interested in this Bid as Principals are those named herein; that this Bid is made without any connections with any other person or parties making a Bid for the same purpose; that this Bid is in all respects fair and without collusion or fraud.

13. The UNDERSIGNED agrees that if the Contract is awarded to them this Bid will be attached as Exhibit A and made a part of the executed Agreement.

_____
(Legal Name of Contracting Firm)

Signed By:_____

Name Typed:_____

Title: _____

Date:_____

Telephone Number:_____

IV
TECHNICAL SPECIFICATIONS

SME
SEVEE & MAHER
ENGINEERS

SECTION IV

TECHNICAL SPECIFICATIONS

The following Sections of the Technical Specifications for the Leachate Transfer System at Pinetree Landfill are incorporated by this reference into this Section of the Contract Documents as fully as if reproduced in their entirety herein.

No.	Title
Section 01010	Summary of Work
Section 01012	Health and Safety Plan
Section 01025	Measurement and Payment
Section 01041	Project Coordination
Section 01060	Applicable Codes
Section 01211	Preconstruction Conference
Section 01300	Submittals
Section 01350	Engineer's Field Office
Section 01505	Mobilization
Section 01561	Cleaning
Section 01562	Dust Control
Section 01570	Traffic Control
Section 01600	Material and Equipment
Section 01700	Contract Closeout
Section 02015	Subsurface Information
Section 02016	Existing Utilities and Underground Structures
Section 02100	Site Preparation
Section 02200	Earthwork
Section 02220	Erosion Control
Section 02450	Pipe Installation
Section 02466	Polyvinyl Chloride Pipe (Gravity Applications)
Section 02510	Hot Mix Asphalt Pavement
Section 02800	Seeding and Mulching
Section 03300	Cast-In-Place Concrete
Section 03420	Precast Concrete Structures
Section 13240	High Density Polyethylene Manhole Pump Station
Section 15100	HDPE Pipe and Fittings
Section 15101	PVC Pipe and Fittings
Section 15106	Ductile Iron Pipe and Fittings
Section 15110	Valves and Pipe Accessories
Section 15120	Hydrostatic and Low-Pressure Air Testing of Polyethylene Pipe

V
CONTRACT DRAWINGS
(REFER TO ATTACHMENT 1)

SME
SEVEE & MAHER
ENGINEERS

SECTION V

CONTRACT DRAWINGS

The following Contract Drawings entitled, "Leachate Transfer System Upgrades, Pine Tree Landfill, Hampden Maine," that were prepared by Engineer are incorporated by this reference into this Attachment as fully as if reproduced in their entirety herein.

Title	**Dwg No.**
COVER SHEET	
SYMBOLS & ABBREVIATIONS	C-100
EXISTING CONDITIONS AND DEMOLITION PLAN	C-101
SITE GRADING PLAN	C-102
SITE UTILITIES PLAN	C-103
FORCE MAIN PLANS AND PROFILES	C-200
SECURE III PUMP STATION FORCE MAIN IMPROVEMENTS PLAN AND PROFILE	C-201
SECTIONS AND DETAILS	C-300
SECTIONS AND DETAILS	C-301
SECTIONS AND DETAILS	C-302
SECTIONS AND DETAILS	C-303
SECTIONS AND DETAILS	C-304
EROSION CONTROL NOTES AND DETAILS	C-305

VI
CQA PLAN
(REFER TO APPENDIX B)

SME
SEVEE & MAHER
ENGINEERS

VII

CONSTRUCTION AGREEMENT AND FORMS

SME
SEVEE & MAHER
ENGINEERS

VIII
PERFORMANCE AND PAYMENT BONDS

SME
SEVEE & MAHER
ENGINEERS

IX
THE AGREEMENT PRICE
FEES, CHARGES, RATES AND ADDITIONAL TERMS AND CONDITIONS

SME
SEVEE & MAHER
ENGINEERS

B. TECHNICAL SPECIFICATIONS

SME
SEVEE & MAHER
ENGINEERS

DIVISION 1
GENERAL REQUIREMENTS

SME
SEVEE & MAHER
ENGINEERS

SECTION 01010

SUMMARY OF WORK

1.01 WORK COVERED BY CONTRACT DOCUMENTS: These Contract Documents define the requirements of the construction of Leachate Transfer System Upgrades at the Pine Tree Landfill site in Hampden, Maine. Work shall include furnishing all materials (including materials source testing as shown on the Project Drawings, equipment, labor, supervision, and performing all operations required to complete the work as shown on the Project Drawings contained herein, and as described in the site's Quality Assurance/Quality Control Plan and the Project Specifications contained herein, and as evidently necessary to complete the work. Work shall include, but not be limited to, the following items:

Construction. Provide the equipment, labor, tools, materials, and supervision necessary for the successful completion of the work as detailed in the Contract Documents. The work includes, but is not limited to, the following:

- Mobilization;
- Site layout;
- Installation and maintenance of all required erosion control measures including dewatering in accordance with Maine Department of Environmental Protection Best Management Practices (MEDEP BMPs);
- Dust control as specified in the Project Specifications;
- Excavate test pits for force main existing utility crossings
- Clear and grub area within limit of work;
- Abandon existing concrete structures and force mains;
- Excavation and grading of the site to base grades as shown on the Project Drawings;
- Place and compact subbase and base gravel as shown on the Project Drawings;
- Milling existing roadways
- Place and finish concrete transfer pad including tanker discharge piping, actuated valve with instrumentation and controls, bollards, catch basin, and culvert;
- Install loading rack including valve pit with actuated valves, instrumentation and controls; actuate valve pit; discharge pipe, and piping and fittings;
- Install a HDPE-lined transfer vault including level sensor, discharge piping, hatch, and vent pipe;
- Install an 84-inch dual-contained HDPE duplex submersible pump station with pumps, level controls and telemetry, valves, and piping;
- Install dual-containment HDPE force mains including bends, end caps, and leak detection appurtenances;
- Make force main tie-ins to existing infrastructure;
- Install electrical power distribution, instrumentation, and control conduits;
- Install light poles with fixtures;
- Install vaults (SMH 21 & 22) including ductile iron piping, fittings, stainless steel ball valves and appurtenances;
- Manhole 17 modifications;
- Relocated existing extraction well outlet pipe to leachate collection clean out across existing gravel access road;
- Install Utility Shed including electrical;
- Install new standby generator and electrical panel
- Install 3 inches of hot-mixed asphalt on reclaimed and new roadways;
- Perform pressure testing of force mains;
- Perform precast structures leak testing;
- Commission and performance testing transfer pump station;

- Restore disturbed surfaces;
- Loam, seed, and mulch all areas required by Project Specifications and all areas disturbed during construction or as directed by on-site Owner's Representative;
- Provide as-built survey by Professional Land Surveyor of finished work including, but not limited to, the following locations: all pipe and conduit locations, all culvert inverts, all manhole inverts and rim elevations, and finish topography on a 50-foot grid;
- Subcontract M.C. Electric to supply and install the electrical, communication, and services required for on-site infrastructure including the leachate transfer pump station and actuated valve pits; supply and install light pole and fixture; supply and install electrical and communications components for the utility shed and supply and install emergency backup generator
- Maintain, repair, replace, and remove (as necessary) all erosion control measures including, but not limited to, siltation fence, hay bales, and stone check dams at the site to control erosion and sedimentation as required by the Project Specifications or as directed by on-site Owner's Representative; and
- Clean-up of the site following successful Contract completion.

1.02 SCHEDULE OF WORK:

A. All phases of the project must be completed within the timeframe noted in the bid documents. The Contractor is encouraged to perform construction activities during normal working hours. The Contractor shall provide a detailed construction schedule to the Owner prior to beginning construction activities on-site.

B. The Contractor shall provide a leachate management and sequencing plan under the guidelines of:
   - Leachate management system shut down time is limited to 4-days maximum per shut down.
   - Every 4 days, sumps must be dewatered and leachate transported to a licensed disposal location as designated by NEWSME and approved by the Engineer.
   - Between shut down periods the leachate management system shall be allowed to operated for a minimum of 24 hours.

1.03 CONTRACTOR USE OF PREMISES:

The Pine Tree Landfill is adjacent to an active transfer and recycling facility that receives wastes on a daily basis. It will be the responsibility of the Contractor to coordinate with NEWSME Operations with regard to use of premises, including haul routes and vehicular access. All details must be established prior to the preconstruction conference and shall be presented to NEWSME Operations at or before the preconstruction conference. The Contractor shall coordinate all construction activities so as not to interfere with active landfilling operations.

The Contractor shall obey all traffic, noise, and dust control policies of the Pine Tree Landfill, including primary access roads.

1.04 PROTECTION OF PROJECT WHILE UNDER CONSTRUCTION:

A. The Contractor will be responsible for providing complete protection of the contract limits of the Project during construction from any acts of nature or man, such as, but not limited to, floods, wind damage, earth slides, and slope failures. Damage to the Project caused by such acts will not be sufficient cause to increase contract costs to the Owner.

B. The Contractor shall take every precaution to ensure that no siltation of stormwater drainage courses occur when working in those areas.

C. The Contractor shall protect existing on-site structures from damage during construction, including: monitoring wells, power lines, maintenance facility, liner systems of existing cells, existing leachate collection and transport systems, and LFG infrastructure, etc.

D. The Contractor shall be responsible for all repairs required to correct damage made to existing on-site structures described above resulting from any construction activity. The Contractor shall also make the necessary repairs to the existing access roads upon completion of the contract work.

1.05 COMPLIANCE WITH ENVIRONMENTAL PERMITS:

A. The Contractor shall comply fully with: Conditions of the MEDEP Board Order, Town of Hampden Permits and Ordinances; MEDEP NRPA Permit By Rule Conditions; MEDEP Construction General Permit; and MEDEP "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices."

END OF SECTION

SECTION 01012

HEALTH AND SAFETY PLAN

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 DESCRIPTION: This work shall consist of preparation of a Health and Safety Plan, submitted prior to the commencement of construction, and statement of safe working procedures.

PART 2 EXECUTION

2.01 HEALTH AND SAFETY PLAN (HASP) REQUIREMENTS:

A. The HASP shall conform to guidance contained in "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" NIOSH/OSHA/USCG/U.S.EPA, October 1985 and 29 CFR 1910 (FR March 6, 1989).

B. The HASP will include, but not be limited to, the following:
   1. Identification of potential hazards
   2. Identification of a site Health and Safety Officer
   3. Air monitoring activities
   4. Personnel protective equipment requirements
   5. Emergency and contingency planning

PART 3 WORK PROCEDURES:

3.01 All work involving excavation below grade or otherwise involving a risk of worker exposure to landfill gases, leachate, or solid waste shall be performed in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations, U.S.EPA Health and Safety Regulations, the Owner’s Site Safety Plan(s), and the Contractor's site Health and Safety Plan.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

1.01 RELATED DOCUMENTS: Contract Drawings, Section 01010 Summary of Work, Bid Form, and General and Supplementary Conditions

1.02 WORK COVERED BY CONTRACT DOCUMENTS:

A. The Contractor shall furnish all labor, materials, tools, equipment, and supervision necessary for complete installation of the work covered by these Contract Documents.

B. Miscellaneous work items necessary to satisfactorily complete the project, and for which no separate payment item is included in the Contract, shall not be measured and paid for separately, but shall be considered as incidental to the Contract Bid Item.

C. The Contractor shall acquaint himself with all work associated with each payment item and shall have no claim for his unfamiliarity with the requirement of various items.

1.03 BASIS OF MEASUREMENT AND PAYMENT:

Item No. 1- Mobilization/Demobilization

Payment of this item requires that the Contractor furnish and/or deliver to the job site all labor, materials, equipment, and temporary support facilities, including, but not limited to, a field office, portable sanitary facilities, utilities, and equipment necessary to perform the required work. This pay item includes the protection of any existing site structures identified on the Contract Drawings. This item shall also include the demobilization/removal of above said items from the site at the completion of work. In addition, the Contractor shall prepare all required written plans and schedules including, but not limited to, initial and progress construction schedules, traffic sequencing plan, and subcontractor work plans.

Item No. 2 – Construct/Maintain Stormwater Management Features

Payment of this item requires that the Contractor shall provide all labor, materials, and equipment to construct the stormwater controls within the limit of work shown on the Contract Drawings including silt fence or ECM berms, and associated structures as identified on the Contract Drawings. This item includes dewatering of excavations and the removal and/or diversion of surface water from the construction area. The Contractor shall maintain a dewatering and stormwater control system so that no sediment-impacted waters are discharged beyond the project limits. This work also includes providing all labor, materials, and equipment for applying water and/or street sweeping to mitigate fugitive dust. The Contractor shall perform a final cleaning of accumulated sediment from the structures at the end of the project.

Item No. 3 – Clearing/Grubbing/Site Preparation

Payment of this item requires that the Contractor shall provide all labor, materials, and equipment to clear vegetation, remove trees, stumps, roots, brush, topsoil, and other organic materials; grubbing of disturbed areas; loading, hauling, and disposing of all removed materials at approved off-site locations. as shown on the Contract Drawings. This work also includes moving boulders with the limits of the Work. The work shall be performed in accordance with the Contract Drawings and Contract Specifications

Item No. 4 – Reclaim Existing Asphalt

Payment of this item requires that the Contractor shall provide all labor, materials, and equipment to mill existing asphalt surface, shim with recycled process asphalt, install 3 inches of 19-mm pavement on the existing roadways as shown on the Contract Drawings or established by the resident engineer. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 5 – Abandonment and Removal of Force Mains

Payment of this item requires that the Contractor shall provide all labor, materials, equipment necessary to either remove or abandon in-place existing force mains as shown on the Contract Drawings. Abandonment shall include capping dual-containment force mains. This work includes excavation and backfilling of the trenches. The Contractor shall be responsible for the off-site disposal of all force mains and appurtenances to be removed. The work includes, but is not limited to, excavation, backfilling, and site restoration. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 6 – Removal of MH #2 and MH # 14

Payment of this item requires that the Contractor provide all labor, material, and equipment to remove and dispose of the manholes including piping and appurtenances. The work includes, but is not limited to, excavation, backfilling, site restoration, and off-site disposal of the structures piping and appurtenances. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 7 – Removal of Existing Loading Rack

Payment of this item requires that the Contractor provide all labor, materials, and equipment to completely remove the existing loading rack including, but not limited to, all piping. valves, loading arm, valve pit, foundation, and appurtenances. The Contractor shall be responsible for the off-site disposal of all materials to be removed. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 8 – Piezometer Abandonment

Payment of this item requires the Contractor retain the services of a competent drilling contractor, to provide all labor, materials, and equipment to abandon existing piezometers, observation wells, and monitoring wells at the location shown on the Contract Drawings and in accordance with the Contract Specifications.

Item No. 9 – Transfer Pad

Payment of this item requires that the Contractor provide all labor, materials, and equipment to construct the concrete transfer pad shown on the Contract Drawings. Work shall include, but is not limited to, base grading, compacted aggregate base installation, concrete slab with reinforcing, concrete curbing installation with reinforcement, saw cutting, tanker unloading discharge piping, actuated valve pit with valve, electrical, communications and control wiring, HDPE-lined catch basin with grate, and catch basin drainage pipe. Catch basin and valve pits require anti-floatation calculations from the supplier. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 10 – Supply and Install Loading Rack

Payment of this item requires that the Contractor provide all labor, materials, equipment, and incidentals necessary to install Leachate Loadout Rack as shown on the Contract Drawings and Specifications. The work shall include but is not limited to concrete foundation, rack, loading arm, actuated valve pit with valve, catch basin and 4” SDR 17 outlet to transfer pad catch basin, communications, control wiring, and all associated appurtenances required for a complete operational installation. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 11 – Supply and Install 6”X10” Dual Containment Force Main (Secure III Pump Station Force Main Improvements)

Payment of this item requires that the Contractor provide all materials, labor, equipment, and incidentals to install force main piping as shown on the Contract Drawings. Work includes, but is not limited to, excavation, pipe bedding, backfill, tie-ins, fittings, adapters, end caps with leak detection monitoring, and pipe pressure testing. The work also includes abandonment of existing 6”X10” force main. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 12 – Supply and Install 8”X12” Dual-Containment Force Main

Payment of this item requires that the Contractor provide all materials, labor, equipment, and incidentals to install force main piping as shown on the Contract Drawings. Work includes, but is not limited to, excavation, pipe bedding, backfill, tie-ins, fittings, adapters and end caps with leak detection monitoring, and pipe pressure testing. The work shall be performed in accordance with the Contract Drawings and Contract Specifications.

Item No. 13 – Supply and Install 4”X8” Dual-Containment Force Main

Payment of this item requires that the Contractor provide all labor and equipment and incidentals to install force main piping as shown on the Contract Drawings. Work includes, but is not limited to, excavation, pipe bedding, backfill, tie-ins, fittings, adapters and end caps with leak detection monitoring, and pipe pressure testing. The work shall be performed in accordance with Contract Drawings and Contract Specifications.

Item No. 14 – Supply and Install 84”-Diameter HDPE Pump Station

Payment of this item requires that the Contractor provide all materials, labor, equipment, and incidentals install the pump station. Work shall include, but is not limited to, excavation bedding, backfilling, structure, submersible pumps, slide rails valves, stainless steel piping, fittings, adapters, electrical, communications, and instrumentation, controls including VFD for pumps, and aluminum access hatch and all associate appurtenances required for a complete operational installation. Anti-floatation calculations are required from the supplier. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 15 – Supply and Install Precast SMH 21

Payment of this item requires that the Contractor provide all labor, materials, and equipment and incidentals to furnish and install a 12’X12’ HS-25 precast vault. The Work shall include, but is not limited to, excavation, backfill, ductile iron piping and fittings, adapters, valves and manhole frame and cover, and all associated appurtenances required for a complete operational installation. The vault shall be designed for HS25 loading and anti-floatation by the supplier. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 16 – Supply and Install Precast SMH 22

Payment of this item requires that the Contractor provide all labor, materials, and equipment and incidentals to furnish and install a 10’X15’ precast vault. The Work shall include, but is not limited to, excavation, backfill, ductile iron piping ,fittings, adapters valves, and aluminum hatch frame and access hatch, and all associated appurtenances required for a complete operational installation. The vault shall be designed for anti-floatation by the supplier. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 17 – Supply and Install HDPE Lined Pre-Cast Transfer Vault

Payment of this item requires that the Contractor provide all labor, materials, equipment, and incidentals to furnish the Transfer Vault as shown on the Contract Drawings. The Work shall include, but is not limited to excavation, backfill, connection to concrete unloading pad culvert, installation of 12”-diameter outlet pipe, installation of 6“ vent pipe, installation of a HDPE sheet splash pad at inlet, installation of an aluminum frame and access hatch, extrusion welding HDPE liner at seams, level sensor, electrical, communication, and control wiring, and all associated appurtenances required for a complete operational installation. The vault shall be designed for anti-floatation by the supplier. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 18 – MH 17 Modifications

Payment of this item requires that the Contractor provide all labor, materials, equipment, and incidentals to make modifications to Secure III MH 17. The Work shall include, but is not limited to, installation of a new stainless steel ball valve, replacement of an 8” HDPE pipe spool section, installation of 6” spool piece, connection to 6”X10” dual-containment force main and all associated appurtenances required. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 19 –Access Road Paving

Payment of this item requires that the Contractor provide all labor, materials, and equipment and incidentals to construct the new paved access roads shown on the Contract Drawings. This work includes excavation, sub-grade preparation, installation of 18" of aggregate subbase gravel and 6" of aggregate base gravel, and 3" of 19-mm HMA, to limits shown on the Contract Drawings. This work includes borrow source characterization testing associated with soil materials used. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 20 – Utility Shed Construction

Payment of this item requires that the Contractor provide all labor, materials, equipment, and incidentals to construct an 10'X10' utility shed. The work includes excavation, aggregate base gravel, vapor barrier, reinforced concrete slab, insulation, outside lighting, electrical and communication wiring, and all associated appurtenances required for a complete operational installation. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 21 – Supply and Install Underground Communication and Electrical Conduits

Payment of this item requires that the Contractor provide all labor, materials, equipment, and incidentals to install 4" PVC electrical and communications conduits. The work includes excavation, sand bedding, compacted backfill, warning tape, and site restoration. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 22 Electrical, Communications, and Controls

Payment of this item requires that the Contractor subcontract M.C. Electric, the work shall include, but not be limited to, the work associated with valves, pumps, electrical, communications and controls, and incidentals required and as shown on the Contract Drawings and Contract Specifications. This item includes electrical and communication work for the transfer pump station including VFD for pumps, pressure transducer to vary frequency of pumps, transfer pad actuated valve, loading rack actuated valves, pressure transducers, , pull boxes, area light with surveillance camera, and standby generator, electrical panel, and all associated incidentals required for a complete operational installation. M.C. Electric shall be responsible for integrating the instrumentation in the Owner's existing system. MC Electric shall also be responsible for specifying wire gauge size, electrical panel size and amperage, generator size, actuate valves, PLC, and control wiring. The work shall be performed in accordance with the Contract Drawings and Specifications.

Item No. 23 – Construction/Record Survey

Payment of the item shall include all equipment, labor, materials, and equipment necessary for successful completion of the work. The location, both horizontal and vertical, of all piping and structures shall be recorded, along with the liner anchor trenches, at an interval of every 50 feet, except at changes in grades or corners where more detail will be required to define the location of the structure. The finished top of leachate collection sand grade shall be surveyed at 50-foot grid except at changes in grades or corners where more detail will be required to define the surface. The information must be provided on an AutoCAD drawing with information placed on separate layers.

Item No. 24 – Sales and Use Tax

Payment of this item requires that the Contractor accurately record and document the applicable sales and use tax for materials used on this project. This information may be requested by the Owner or a State Agency during or upon completion of the project.

1.04 METHOD OF MEASUREMENT AND BASIS OF PAYMENT (UNIT PRICES – ADD):

The following section describes the method of measurement and payment for work which may be necessary in addition to the work associated with the construction of the base bid item described herein and shown on the Contract Drawings. The additional work items shall only be

undertaken upon written approval of the Engineer, and do not include any work items associated with or undertaken as a result of the construction of the base bid item.

A. Grubbing: Measurement of additional grubbing will be the actual additional acreage stripped as measured by horizontal dimensions determined by a field survey. Payment for the accepted quantities of additional clearing and grubbing will be at the unit price per acre.

B. Clearing: Measurement of additional clearing will be the actual additional acreage cleared as measured by horizontal dimensions determined by a field survey. Payment for the accepted quantities of additional clearing will be at the unit price per acre.

C. Common Excavation: Measurement of additional quantities of excavation of material will be measured by the number of cubic yards measured in its original position by cross-sectioning the area prior to and after excavation of the material. Volumes will be computed by the average end area method or by other methods generally recognized as conforming to good engineering practice. Payment for the accepted quantities of additional excavation of material will be at the unit price per cubic yard, including removal from the site and disposal, if necessary.

D. Excavation of Unsuitable Material: Measurement of additional excavation of unsuitable material will be measured by the number of cubic yards measured in its original position by cross-sectioning the area prior to and after excavation of the unsuitable material. Volumes will be computed by the average end area method or by other methods generally recognized as conforming to good engineering practice. Payment for the accepted quantities of additional excavation of unsuitable material will be at the unit price per cubic yard, including removal from the site and disposal, if necessary.

E. Open Rock Excavation: Measurement of open rock excavation shall be measured by cross-sectioning the ledge surface. The depth shall be between the sectioned surface and the proposed subgrade. Volumes will be computed by the average end area method or by other methods generally recognized as conforming to good engineering practice. All over-excavation shall be at the Contractor's expense. Any sections over-excavated shall be brought to grade with crushed stone or glacial till as directed by the Resident Project Representative. Horizontal limits will be as shown on the Contract Drawings or within two feet of proposed precast concrete structures

F. Trench rock excavation: Measurement of trench rock excavation shall be measured on the following basis: The depth will be the vertical distance from the bottom of the pipe bedding to the surface of the ledge, measured on the centerline of the pipe. The trench width shown on the Contract Drawings will be taken as the pay width. All over-excavation shall be at the Contractor's expense. Any areas over-excavated shall be brought to grade with crushed stone.

   Trench rock excavation shall consist of removing hard igneous, metamorphic, and sedimentary rock which cannot be excavated without drilling and blasting or drilling and splitting, and all boulders having a volume of two (2) cubic yards or more. Rock excavation shall be performed mechanically with jackhammer or other excavation equipment. No blasting will be allowed on-site.

   Payment for the accepted quantities of open rock excavation will be at the unit price per cubic yard, including removal from the site and disposal, if necessary.

G. Concrete: Measurement of additional concrete will be the number of cubic yards in-place based on length, width , and depth of the concrete. Payment for the accepted quantities of additional concrete will be at the unit price per cubic yard. Satisfactory completion of this work shall include placement, curing, finishing and testing and other associated work.

H. Aggregate Subbase Material: Measurement of additional aggregate subbase material Additional aggregate subbase material will be the number of cubic yards, in-place, based upon the length, width, and depth of the aggregate subbase material. Payment for the accepted

quantities of additional aggregate subbase material will be at the unit price per cubic yard. Satisfactory completion of this work shall include placement, compaction and testing, and other associated work

I. Aggregate Base Material: Measurement of additional aggregate base material will be the number of cubic yards, in-place, based upon the length, width, and depth of the aggregate base material. Payment for the accepted quantities of additional aggregate base material will be at the unit price per cubic yard. Satisfactory completion of this work shall include placement, compaction and testing, and other associated work

J. Granular Backfill: Measurement of additional granular backfill material will be the number of cubic yards, in-place, based upon the length, width, and depth of the granular backfill material. Payment for the accepted quantities of additional granular backfill material will be at the unit price per cubic yard. Satisfactory completion of this work shall include placement, compaction and testing, and other associated work

K. Hot Mix Asphalt: Payment for additional Hot Mixed Asphalt(HMA) material will be the number of Tons in-place. Payment for the accepted quantities of additional HMA material will be at the unit price per ton. Satisfactory completion of this work shall include placement, compaction and testing, and other associated work.

L. Pavement Milling: Payment for additional pavement milling will be based on the additional square feet based on length and width. This item includes milling and shimming with recycled processed asphalt

M. Common Borrow Material: Payment for additional common borrow material to be used during construction will be the number of cubic yards, in-place, based upon the length, width, and depth of the common borrow material. Payment for the accepted quantities of additional common borrow material will be at the unit price per cubic yard. Satisfactory completion of this work shall include placement, compaction and testing, and other associated work

N. Siltation Fence: Measurement for additional siltation fence shall be by the linear foot installed. The accepted quantity of siltation fence will be paid for at the contract unit price per linear foot, which shall be full compensation for furnishing, placing, maintaining, and removal of the item.

O. Bark Mulch Sediment Barrier: Measurement for additional bark mulch sediment barrier shall be by the linear foot installed. The accepted quantity of bark mulch sediment barrier will be paid for at the contract unit price per linear foot, which shall be full compensation for furnishing, placing, maintaining, and removal of the item.

P. Seed, Fertilizer, Lime, Mulch: Measurement of additional materials needed for seeding including seed, fertilizer, lime, and mulch will be based on field measurement upon establishment of a satisfactory vegetative cover. Additional seeding does not include seeding of areas disturbed as a result of the construction of the base bid item. Seeding includes soil preparation, seed placement, fertilizer, lime, mulch, and erosion control mesh (if required by the Resident Project Representative). Payment for accepted quantities of additional seeding will be based upon the price per unit (1,000 sq ft).

Q. Topsoil: If additional topsoil from on-site sources is required, the quantity shall be based on field measurement in-place. Payment for the accepted quantities of additional topsoil will be at the unit price per cubic yard.

R. Pipe Bedding Stone: Measurement for additional pipe bedding stone shall be per cubic yard of stone placed. The accepted quantity of stone will be paid for at the contract unit price per cubic yard which shall be full compensation for furnishing, placing, and maintaining (as necessary) the stone.

S. 4-inch X 8-inch HDPE Dual Containment Pipe: Measurement for additional pipe shall be along the centerline of the pipe. Payment for the accepted quantity of additional pipe will be made at the unit price per linear foot. Pipe pay items shall include all fittings, bedding materials and testing. No other measurement and payment associated with this item shall be made.

T. 6-inch X 10-inch HDPE Dual Containment Pipe: Measurement for additional pipe shall be along the centerline of the pipe. Payment for the accepted quantity of additional pipe will be made at the unit price per linear foot. Pipe pay items shall include all fittings, bedding materials and testing. No other measurement and payment associated with this item shall be made

U. 8-inch X 12-inch HDPE Dual Containment Pipe (Solid and Perforated): Measurement for additional pipe shall be along the centerline of the pipe. Payment for the accepted quantity of additional pipe will be made at the unit price per linear foot. Pipe pay items shall include all fittings and bedding materials. No other measurement and payment associated with this item shall be made.

V. 12-inch HDPE Pipe: Measurement for additional pipe shall be along the centerline of the pipe. Payment for the accepted quantity of additional pipe will be made at the unit price per linear foot. Pipe pay items shall include all fittings, bedding materials and testing. No other measurement and payment associated with this item shall be made.

W. 4-inch PVC Conduit Pipe: Measurement for additional pipe shall be along the centerline of the pipe. Payment for the accepted quantity of additional pipe will be made at the unit price per linear foot. Pipe pay items shall include all fittings and bedding materials. No other measurement and payment associated with this item shall be made.

1.05 BASIS OF MEASUREMENT AND PAYMENT (DEDUCTIONS):

A. Changes in the contract work which result in reduced work will be measured based on the information shown on the Contract Drawings and at the contract unit prices. Measurements and volumes will be computed based on methods generally recognized as conforming to good engineering practice and acceptable to both the Contractor and the Resident Project Representative.

B. Costs of any conformance or construction testing that fails to meet the Specifications contained herein shall be borne by the Contractor. The price shall include the cost of the failing test and any cost to resample the failing material, including any shipping and handling. The engineer on a monthly basis will forward a bill with a cost breakdown to the Contractor who shall apply these in the monthly requisition for payment as a deduction from the contract work. If the laboratory performing the tests is brought into question by the Contractor or any of his Sub-Contractors, and it is decided to send any further testing to a new laboratory, the Contractor shall bear the cost of all new testing that will be required to demonstrate conformance of a questionable material. These “new” costs shall not be applied to the monthly requisition for payment as a deduction.

C. The Owner shall not pay for any conformance testing beyond the initial testing required to approve a material for use on this project. The Owner shall also not pay for any conformance tests required on construction materials which are required because the Contractor chooses to supply construction materials from more lots than required to meet the square footage testing frequency contained in the Specifications. This does not relieve the requirement that representative samples of material used on the job be tested from each lot. The cost for this additional testing is the responsibility of the Contractor, and will be handled as described in 1.05.B.

1.06 UNIT PRICES: Changes in the contract work shall be performed at the unit prices indicated on the proposal. The unit prices are gross prices, including the Contractor’s equipment, labor,

supervision, and materials costs, entire mark-up, field or other costs, including general conditions, fringe benefits, overhead, and profit.

END OF SECTION

SECTION 01041

PROJECT COORDINATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 GENERAL:

The Contractor shall be responsible for the following:

A. Coordination of all work under the Contract.

B. Compliance with requirements of all public agencies having jurisdiction over construction.

C. Making arrangements, as necessary, for temporary electricity, heat, water, telephone, sanitary facilities, first aid facilities, fire protection, and storage of materials and supplies and for the timely delivery to the job site.

D. Assisting the Quality Assurance Resident Engineer (QARE) as necessary in the review of construction, obtaining material samples, the testing of materials, and construction layout surveys.

E. Maintaining up to date progress records, project schedule, and as-built drawings.

F. Maintaining the project site in a neat condition. Protect all existing structures, including monitoring wells, utility poles, buildings, liner, and leachate collection systems of existing cells, etc., from damage resulting from the Contractors (or their Subcontractors) work on-site.

G. Coordinating with all utilities, and notifying the appropriate owners when work is scheduled in areas that may affect existing utilities.

H. No extra payment shall be made to the Contractor for delays caused by lack of progress, defective workmanship, or rescheduling of work by other contractors, subcontractors, or equipment and material suppliers.

I. Coordinating the work of subcontractors, equipment, and material suppliers.

J. Verifying all field dimensions and notifying the QARE and Engineer in writing of any discrepancies. No additional payment will be allowed because of differences between field dimensions and those shown on the Contract Drawings without notifying the Engineer prior to performing the work.

K. Attendance of weekly progress meetings by Contractor's Superintendent. Meeting will be held in Contractor's construction office, or as indicated on the meeting agenda.

L. Providing a competent and authorized supervisory representative at each work location during all working hours who shall act as the agent of the Contractor. The supervisory representative shall be capable of reading and thoroughly understanding the Drawings and Specifications, with full authority to fulfill the Contractor's duties and responsibilities on the job. If, in the opinion of the Owner, the supervisory representative or any of his successors proves incompetent, not conscientious, or not industrious, then the Contractor shall replace the supervisory representative upon written request of the Owner.

M. The Contractor shall only employ competent individuals on the job. Whenever the Engineer or the Owner notifies the Contractor in writing that, in his opinion, any individual on the job, whether employed by the Contractor or any of the subcontractors imperils the safety of others or is incompetent, unfaithful, disorderly, or otherwise unsatisfactory, such individual shall be discharged from the Contract work and shall not be employed on it, except with the written consent of the Owner.

1.03 PRE-INSTALLATION CONFERENCES:

A. When required in individual specification section, convene a preinstallation conference at work site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Quality Assurance Resident Engineer and Engineer two weeks in advance of meeting date.

D. Prepare agenda, preside at conference, record minutes, and distribute copies within two days after conference to participants, with two copies to Engineer.

E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.04 PLAN PREPARATION

A. When required in the Contract Documents, prepare project plans and submit to the Engineer in the timeline indicated in the referenced document.

END OF SECTION

SECTION 01060

APPLICABLE CODES

PART 1 GENERAL

1.01 RELATED DOCUMENTS: All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this section.

1.02 GENERAL

A. Comply with current edition of all local, State, and federal codes applicable to the proposed construction including but not limited to the following.
   1. OSHA – National Occupational Safety and Health Act
   2. BOCA – Building Officials and Code Administrators – "National Building Code"
   3. Associated General Contractors of America – "Manual of Accident Prevention in Construction"
   4. ASTM – American Society for Testing Materials
   5. AASHTO – American Association of State Highway and Transportation Officials
   6. NFPA – National Fire Prevention Association
   7. Department of Environmental Protection, "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices"
   8. GRI Standards – Geosynthetic Research Institute
   9. MEDEP Solid Waste Management Regulations
   10. MEDEP Maine General Permit for Construction Rules
   11. MEDEP NRPA Permit-by-Rule Standard
   12. Town of Hampden Ordinances

END OF SECTION

SECTION 01211

PRE-CONSTRUCTION CONFERENCE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Summary of Work: Section 01010

1.03 DESCRIPTION

A. Pre-construction Conference:
   1. After Award of Contract and prior to the Notice to Proceed, meet with New England Waste Services of Maine, Inc. (NEWSME Operations), or its representative for a Pre-construction Conference.
   2. The purpose of this conference is to review the principle features of work and to address questions regarding the contract and work site.

B. Minimum Agenda:
   1. Review plans and specifications.
   2. Distribute and discuss.
      a. List of major subcontractors.
      b. Tentative construction schedules.
   3. Critical work sequencing.
   4. Relation and coordination of subcontractors.
   5. Owner-supplied materials.
   6. Designation of responsible personnel.
   7. Protocol for processing field decisions and change orders.
   8. Submittal of shop drawings, project data, and submittals required by the technical specifications.
   9. Use of premises:
      a. Access restrictions.
      b. Office and storage areas.
      c. Owner's requirements.
      d. Ongoing landfill operations.
      e. Roadway maintenance.
   10. Payment and procurements of materials including tax exempt materials.
   11. Safety and first-aid procedures.
   12. Testing of materials.
   13. Estimates for partial payments.
   14. Environmental protection.
   15. Location for disposal of soil stockpile material.
   16. Odor control during construction.
   17. Hours of construction and applicable noise limits.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Quality Assurance/Quality Control Plan: Appendix B

B. Individual Material Specifications in Division 2, Division 3, and Division 15

1.03 SECTION INCLUDES:

A. Definitions

B. Submittal procedures

C. Construction progress schedule

D. Proposed products list

E. Product Data

F. Electronic CAD Files of Project Drawings

G. Shop drawings

H. Samples

I. Other Submittals

J. Test Reports

K. Certificates

L. Manufacturer's instructions

M. Contractor Review

N. Engineer Review

O. Tax Exempt Material

1.04 DEFINITIONS:

A. Action Submittals: Written and graphic information and physical samples that require the Engineer's responsive action.

B. Informational Submittals: Written and graphic information and physical Samples that do not require the Engineer's responsive action. Submittals may be rejected for not complying with requirements.

1.05 SUBMITTAL PROCEDURES:

A. Transmit each submittal electronically to the Engineer at ptl-upgrades@sme-engineers.com on an Engineer accepted form.

B. No materials covered by submittals shall be stored on-site until submittal for material is approved by the Engineer. A Contractor's submittal that has "No Exception Taken" indicates that the Engineer is satisfied that the equipment or material submitted is in compliance with the specifications. Material delivered to and/or stored at the site prior to review by the Engineer shall be at the Contractor's risk.

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

D. Sequentially number the transmittal forms. Re-submissions are to have original number with an alphabetic suffix.

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

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

G. Schedule submittals to expedite the project and deliver to the Engineer. Coordinate submission of related items. The Contractor may be obligated to provide submittals as dictated in the Contract between the Owner and the Contractor.

H. For each submittal for review, allow seven (7) days excluding delivery time to and from the Contractor.

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

J. Provide space for Contractor and Engineer review stamps.

K. Revise and resubmit submittals as required, identifying all changes made since the previous submittal.

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

M. Submittals not requested will not be recognized or processed.

N. Incomplete Submittals: The Engineer will not review incomplete submittals. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of the Engineer.

1.06 CONSTRUCTION PROGRESS SCHEDULE:

A. The Contractor shall prepare and submit detailed progress schedules, schedule of values, shop drawings, and sample submittal schedules to the Engineer for approval in accordance with the General Conditions. The schedule shall be in bar graph form showing material delivery schedules and starting and completion dates for all phases of construction. Times of work shall be as indicated in the Contract or as approved by the Engineer and Owner.

B. If, in the opinion of the Engineer, the Contractor falls behind the progress schedule, the Contractor shall take such steps as may be necessary to improve his progress, which may require him to increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction planned, and to submit for approval such supplementary schedule or schedules as necessary to demonstrate the manner in which the agreed rate to progress will be regained, all without additional cost to the Owner.

1.07 PRODUCT DATA:

A. Product Data: Action Submittal: Submit to the Engineer for review for assessing conformance with information given and design concept expressed in the Contract Documents.

B. If the Contractor proposes to use products which have properties different from what is required by the Specifications, the Contractor shall identify in the submittal, or subsequent written requests, which properties do not meet the Specifications and what specific alternate property is being proposed for the material. The Engineer will only consider alternatives presented in a written form. The Engineer shall review the proposal and determine if the proposed alternative property meets the design intent of the project. The Engineer's approval of an alternate property shall be in writing and only cover the specific property which the Contractor has requested the Engineer evaluate. Under no condition shall the Engineer's approval extend to other properties of the product in question. The Engineer may reject a Contractor request to evaluate an alternate property than specified in project specifications and drawings, without supplying reasoning for doing so.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

1.08 ELECTRONIC CAD FILES OF PROJECT DRAWINGS:

A. Contract Documents are included in portable document or paper format while CAD Files are offered to the Contractor as a convenience.

B. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.

C. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:
   1. Use of files is solely at receiver's risk. The Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in the Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in the Contract Documents, notify the Engineer of the discrepancy and use the information in hard copy Drawings and Specifications.
   2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
   3. User is responsible for removing information not normally provided on Shop Drawings and removing references to the Contract Documents. Shop Drawings submitted with information associated with other trades or with references to the Contract Documents will not be reviewed and will be immediately returned.
   4. Receiver shall not hold the Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
   5. Receiver shall understand that even though Engineer has computer virus scanning software to detect the presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
   6. Receiver shall not hold the Engineer responsible for such viruses or their consequences, and shall hold the Engineer harmless against costs, losses, or damage caused by the presence of computer viruses in files or media.

1.09 SHOP DRAWINGS:

A. Shop Drawings: Action Submittal: Submit to the Engineer for assessing conformance with information given and design concepts expressed in the Contract Documents. Shop Drawings shall be presented in clear and thorough manner.

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

C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a Professional Engineer responsible for designing components shown on Shop Drawings.
   1. Include signed and sealed calculations to support design.
   2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
   3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Submit electronic submittals via email as PDF electronic files to the Engineer by email at ptl-upgrades@sme-engineers.com.

E. After review, distribute in accordance with procedures above.

1.10 SAMPLES:

A. Samples: Action Submittal: Submit to the Engineer for assessing conformance with information given and design concepts expressed in Contract Documents.

B. Include identification on each sample, with full project information.

C. Submit the number of samples specified in individual specification sections (three minimum) ; one of which will be retained by the Engineer.

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

E. Samples will not be used for testing purposes unless specifically stated in individual Specification Sections.

1.11 OTHER SUBMITTALS:

A. Informational Submittal: Submit data for the Engineer's knowledge as the Owner’s Representative or for the Owner’s knowledge.

B. Submit information for assessing conformance with information given and design concept expressed in the Contract Documents.

1.12 TEST REPORTS:

A. Informational Submittal: Submit reports for the Engineer's knowledge as the Owner’s Representative or for the Owner’s knowledge.

B. Submit test reports for information for assessing conformance with information given and design concepts expressed in the Contract Documents.

1.13 CERTIFICATES:

A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Engineer, in quantities specified for Product Data.

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

1.14 MANUFACTURER'S INSTRUCTIONS:

A. Informational Submittal: Submit manufacturers installation instructions for the Engineer’s knowledge as Contract administrator or for the Owner’s knowledge.

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

C. Identify conflicts between manufacturer's instructions and the Contract Documents.

1.15 CONTRACTOR REVIEW:

A. Review for compliance with the Contract Documents and approve submittals before transmitting to the Engineer.

B. Contractor is responsible for:
   1. Determination and verification of materials including manufacturer's catalog numbers.
   2. Determination and verification of field measurements and field construction criteria.
   3. Checking and coordinating information in submittal with requirements of Work and of the Contract Documents.
   4. Determination of accuracy and completeness of dimensions and quantities.
   5. Confirmation and coordination of dimensions and field conditions at the Site.
   6. Construction means, techniques, sequences, and procedures.
   7. Safety precautions.
   8. Coordination and performance of Work of all trades.

C. Stamp, sign or initial, and date each submittal to certify compliance with the requirements of the Contract Documents.

D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from the Engineer.

1.16 ENGINEER REVIEW:

A. Do not make "mass submittals" to the Engineer. "Mass submittals" are defined as six (6) or more submittals or items in one (1) day or 15 or more submittals or items in one week. If "mass submittals" are received, the Engineer's review time stated above will be extended as necessary to perform proper review. The Engineer will review "mass submittals" based on priority determined by the Engineer after consultation with the Owner.

B. Informational submittals and other similar data are for the Engineer's information, do not require the Engineer's responsive action, and will not be reviewed or returned with comment.

C. Submittals made by the Contractor that are not required by the Contract Documents may be returned without action.

D. Submittal approval does not authorize changes to the Contract requirements unless accompanied by a Change Order.

E. The Owner may withhold monies due to the Contractor to cover additional costs beyond the second submittal review.

1.17 TAX EXEMPT MATERIALS:

A. Materials purchased for the leachate transfer pad, leachate pump station, and leachate force main are sales tax-exempt. Upon project completion the Contractor shall submit to the Owner an itemized list of all tax-exempt materials installed as part of the project. The list shall be submitted in an Excel format, include a description of all materials and identify where the materials are used. An example of the table to use for the submittal is provided below and the Contractor shall add additional rows under each category as needed.

EXAMPLE TABLE FOR TAX EXEMPT MATERIALS

Category	Material Purchased	Unit	Qty	Unit Cost	Total	Sales Tax
Loading Rack						
Transfer Pad						
Leachate Force Main and Vaults						

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

SECTION 01350

ENGINEER'S FIELD OFFICE

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 DESCRIPTION:

A. Provide and maintain a field office for exclusive use of the Quality Assurance Resident Engineer (QARE) during the entire life of Contract. The field office and QARE shall not be disturbed, moved or interrupted without Engineer's approval. The building shall be a separate structure or part of a common structure (if approved by the Engineer), located outside of the hard hat area erected on a location approved by Owner and Engineer.

B. Construction Trailer:
   1. Portable or mobile buildings or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.
   2. Structurally sound, secure, weathertight enclosures for office and storage spaces.
   3. Equip door to field office with a closer and a new secure lock and two keys.
   4. Area: Minimum 200 square feet.
   5. Provide lighting, electrical outlets, and automatic heating, cooling ventilating equipment to maintain 68 degrees F heating and 72 degrees F cooling.
   6. Windows: Minimum four, arranged for cross ventilation, minimum total area of 10 percent of floor area, with operable sash and insect screens. Supply sufficient drinking water from approved sources.

C. Furnishings:
   1. One flat top desk, 54x30 inch (minimum), with three drawers.
   2. One drafting table, 36x72 inch (minimum), with one equipment drawer.
   3. One standard four-drawer letter size metal filing cabinet with locks and two keys per lock.
   4. One swivel arm chair.
   5. Four folding chairs.
   6. One drafting stool.
   7. One tackboard, 36x30 inches (minimum).
   8. One large waste basket, approximate size: 15 to 20 gallons.
   9. One desk lamp.
   10. One drafting table lamp.
   11. One broom.
   12. One dust pan.
   13. Sufficient floor sweeping compound for the duration of the Work.
   14. Drinking Water: Provide a sufficient supply of potable water for the duration of the job.
   15. Portable toilet.
   16. Sufficient supply of toilet paper, hand sanitizer, and paper towels for the duration of the Work.
   17. Lockable closet, 36x48 inches (minimum), or other Engineer approved separate locking mechanism for storage of valuable items or required hazardous materials.

18. Wireless internet access with upload and download speeds in accordance with IEEE Standard 802.11ac.

END OF SECTION

SECTION 01505

MOBILIZATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Summary of Work: Section 01010

B. Project Coordination: Section 01041

1.03 GENERAL:

A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site any and all plants and equipment; furnishing and erecting plants, temporary buildings, and other construction facilities; all as required for the proper performance and completion of the work. Mobilization shall include but not be limited to the following items:
   1. Delivery to the site of all Contractors' plants and equipment required for first month operations.
   2. Installing temporary construction power, communications, and lighting facilities as required.
   3. Identifying construction water supply.
   4. Providing a field office for the Contractor and the Engineer, complete with all needed furnishings and utility services.
   5. Providing on-site sanitary facilities and potable water facilities as specified.
   6. Arrangement for and erection of Contractor's work and storage yard.
   7. Submittal of all required insurance certificates and bonds.
   8. Obtaining all required permits.
   9. Posting all OSHA required notices and establishment safety programs.
   10. Having the Contractor's superintendent at the job site full time.
   11. Submittal of Preliminary Construction Schedule.
   12. Maintaining stormwater management log and records.
   13. Submittal of Borrow Source Testing Schedule.
   14. Submittal of materials and equipment which shall include: a complete list of suppliers and/or fabricators; items to be purchased from and/or supplied by such suppliers and/or fabricators; time required for fabrication; and scheduled delivery dates for each item to be purchased and/or supplied, leased, or otherwise used for performance of the Work. This report shall be submitted for review at least 14 days prior to commencement of the Work.

B. Field Offices, Sheds, and Storage Areas:
   1. The Contractor will provide a temporary field office(s). The Contractor shall provide materials, equipment, and furnishings to adequately service the space.
   2. The Contractor will coordinate the office site location with the Owner and will fill and grade the site as necessary in order to provide drainage away from the building.
   3. Field office(s) shall be ready for occupancy before any onsite construction activities begin.

4. The office shall be a portable or mobile building constructed with the floor raised above ground and placed on a solid foundation. Steps and landings shall be provided at entrances. The building shall be structurally sound, secure, and weathertight.
5. The offices shall be provided with adequate insulation, lighting, safety devices, and environmental controls (heating and cooling). The offices shall also be provided with an adequate amount of secure storage space. The offices shall be furnished with, but not limited to, chair, drafting table, a desk, filing cabinet, and bookshelves.
6. The Contractor shall make available safety equipment, which shall include at minimum, high visibility reflective vests or shirts, safety toed shoes, hard hats, and safety glasses.
7. Storage areas and sheds shall be provided, as necessary. Location of storage areas and sheds shall be approved by the Owner.
8. The Contractor shall be responsible for maintaining office spaces, storage sheds, and storage areas in a neat and orderly manner.
9. At completion of work remove buildings, foundations, utility services, storage sheds, and storage areas. Areas shall be restored to pre-construction condition.
10. The Contractor shall provide a portable toilet, which will be provided with regular maintenance and cleaning.

END OF SECTION

SECTION 01561

CLEANING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Summary of Work: Section 01010

B. Project Coordination: Section 01041

C. Cleaning for Specific Products or Work: Specification Section for that work

1.03 DESCRIPTION:

A. Maintain premises and public properties free from accumulations of waste, debris, and rubbish, caused by operations.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces; leave project area clean.

1.04 SAFETY REQUIREMENTS:

A. Standards: Maintain project in accordance with the following safety and insurance standards: Manual of Accident Prevention in Construction (AGC), all applicable requirements of the Occupational Safety and Health Administrations, and the Owner.

B. Conduct cleaning and disposal operations to comply with local, state and federal ordinances and laws, particularly anti-pollution laws.
   1. Do not burn or bury rubbish and waste materials on project site.
   2. Do not dispose of wastes in streams or waterways.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.01 DURING CONSTRUCTION:

A. At reasonable intervals during progress of work, clean site and public properties, and dispose of waste materials, debris, and rubbish.

B. Provide on-site containers for collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris and rubbish from site and legally dispose of in off-site or on-site areas approved by the Owner.

3.02 ADDITIONAL CLEANING REQUIRED

A. Pipe: Flush leachate transport piping before final tie-in and remove debris from collection points as necessary.

B. Manholes: After pipe cleaning and prior to demobilization from the site, remove any debris and sediment from manhole structures.

C. Catch Basins: After pipe cleaning and prior to demobilization from the site, remove any debris and sediment from catch basins within or impacted by the project.

3.03 FINAL CLEANING:

A. Maintain cleaning until project is completed and occupied by Owner.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Site Preparation: Section 02100

B. Earthwork: Section 02200

C. Health and Safety Plan: Section 01012

1.03 DESCRIPTION: This work shall consist of furnishing all labor, materials, and equipment for applying water, and/or street sweeping for dust control in conformity with the Contract Drawings and as specified herein, or as required by the Quality Assurance Resident Engineer (QARE).

PART 2 PRODUCTS

2.01 GENERAL: The water shall not be salt or brackish and shall be free from oil, acid, and injurious alkali or vegetable matter.

2.02 CALCIUM CHLORIDE: Contractor shall not use calcium chloride or other dust control chemicals unless granted permission to do so by the Engineer.

PART 3 EXECUTION

3.01 SPRINKLING: The Contractor shall apply water to roadways and work areas as needed to minimize dust or as instructed by the QARE. Water shall be applied by approved methods and with equipment including a tank with gauge equipped pressure pump and a nozzle-equipped spray bar. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

3.02 STREET SWEEPING: The Contractor shall sweep both internal and external paved roadways whenever instructed by the QARE. The Contractor will immediately clean any soil tracked off-site and take appropriate action to remove soil from vehicle tires prior to traveling on public roads.

END OF SECTION

SECTION 01570

TRAFFIC CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 DESCRIPTION: This work shall consist of furnishing all labor, material, and equipment for traffic control including: signs, barricades and channelization, lighting, flaggers, and other items necessary to effectively control vehicular and pedestrian traffic through the construction period, and maintaining the ability of landfill traffic to continue to access the project area.

Traffic rules and routes within the Owner's facility will be coordinated with the Owner and their designees.

PART 2 PRODUCTS

2.01 Materials used shall meet the requirements of the most current revisions of the Maine Department of Transportation Standard Specifications for Highways and Bridges and the Manual on Uniform Traffic Control Devices.

PART 3 EXECUTION

3.01 Installation of traffic control devices shall be in accordance with the most current revisions of the Maine Department of Transportation Standard Specifications for Highways and Bridges, and the Manual on Uniform Traffic Control Devices.

3.02 Maintain safe operating speeds of all construction equipment and delivery vehicles at all times including, but not limited to, 15 mph on the Pine Tree Landfill access roads.

3.03 Stage all construction equipment at the landfill site. There shall be no vehicle staging or parking on Emerson Mill Road. The use of vehicle engine brakes is forbidden on Emerson Mill Road and the entrance road to the facility.

3.04 Coordinate construction activities with the ongoing operations at the Pine Tree Landfill.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawings) applies to the work specified under this contract.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED SECTIONS:

A. Section 01561: Cleaning

1.03 SECTION INCLUDES:

A. Closeout procedures

B. Final cleaning

C. Adjusting

D. Project record documents

E. Spare parts and maintenance materials

1.04 CLOSEOUT PROCEDURES:

A. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer's inspection.

B. Review Engineer and Contractor project item punch list items.

C. Provide submittals to Engineer that are required by governing or other authorities.

D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.05 FINAL CLEANING:

A. Execute final cleaning prior to final inspection.

B. Clean equipment and fixtures to a sanitary condition.

C. Clean or replace filters of operating equipment.

D. Clean debris from drainage systems.

E. Clean site, sweep paved areas, rake clean landscaped surfaces.

F. Remove waste and surplus materials, rubbish, and construction facilities from the site.

G. Flush underdrain and leachate collection piping upon final tie-in to existing piping systems and remove debris from manhole collection points as necessary.

1.06 ADJUSTING:

A. Adjust operating products and equipment to assure smooth and unhindered operation.

1.07 PROJECT RECORD DOCUMENTS:

A. Maintain on-site, one set of the following record documents; record actual revisions to the work:
   1. Contract Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other Modifications to the Contract.
   5. Reviewed shop drawings, product data, and samples.

B. Store Record Documents separately from documents used for construction.

C. Record information concurrently with construction progress.

D. Specifications: Legibly mark and record at each product section a description of actual products installed, including the following:
   1. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and Modifications.

E. Record Documents and Shop Drawings: Survey the completed project and record the as-built coordinates and elevations of the containment dike corners, leak detection piping at 50-foot intervals and all fittings, leachate collection and transport piping at 50-foot intervals and all fittings, valves, culvert pipe inlets and outlets, and other points as directed by the Owner or Quality Assurance Resident Engineer. Legibly mark each item to record actual construction including:
   1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   3. Field changes of dimension and detail.
   4. Details not on original Contract Drawings.

F. Delete Engineer title block seal from all documents.

G. Submit documents to Engineer with claim for final Application for Payment.

1.08 SPARE PARTS AND MAINTENANCE MATERIALS:

A. Provide products, spare parts, maintenance, and extra materials in quantities as specified in individual specification sections.

B. Deliver to project site and place in location as directed; obtain receipt prior to final payment.

END OF SECTION

DIVISION 2
SITE WORK

SME
SEVEE & MAHER
ENGINEERS

SECTION 02015

SUBSURFACE INFORMATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

1.03 DESCRIPTION:

A. Subsurface explorations were performed at the locations shown on the Contract Drawings and a log of each exploration (boring logs and test pit logs) has been compiled for the purpose of guidance in the design and construction of the project facilities.

B. The logs do not indicate subsurface conditions except at the locations of the exploration (at the time explorations were made) and any interpretation the Contractor may make is their responsibility.

C. Subsurface investigations of the site were made by Sevee & Maher Engineers, Inc., or others (as indicated on the Contract Drawings and/or Logs). The logs present the opinion of the Engineer and shall not be interpreted to prescribe or dictate construction procedures or relieve the Contractor in any way of his responsibility for the construction. Logs of the explorations are contained in Appendix C of this document.

D. The approximate locations of the explorations made during this study are included on the Existing Conditions Plan. The locations were established by field survey (tape and compass) and/or ground survey (total station, global positioning system, or other).

E. The water levels shown on the log at the exploration are based on observations made by the field personnel at the time the explorations were made and may or may not represent the current groundwater surface at the explorations. They are presented only as an observation of the free-standing water surface in the exploration on the date noted.

F. The refusal depths shown at the exploration locations indicate only, that in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe, rod, or sampler was encountered to render further advance impossible or impractical by the procedures and equipment being used. Refusal may indicate bedrock surface, large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects, or a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

G. Additional exploration information may be available for areas outside the project area and can be requested by the Contractor.

END OF SECTION

SECTION 02016

EXISTING UTILITIES AND UNDERGROUND STRUCTURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Site Preparation: Section 02100

B. Earthwork: Section 02200

C. Pipe Installation: Section 02450

1.03 DESCRIPTION:

A. The existing utilities shown on the Contract Drawings are shown diagrammatically and it is not to be inferred that the locations shown are precise.

B. Coordinate with DigSafe Systems, Inc and all applicable non-DigSafe utility owners prior to excavation, whether shown on the Contract Drawings or not.

C. The Contractor shall locate all utilities using a private utility location service if indicated in the Contract Documents.

D. The Contractor will be responsible for any and all damage to existing utilities caused by their efforts.

E. The Contractor will contact the affected utility, Engineer, and Owner as soon as any damage is uncovered.

F. If utilities are damaged, the utility shall make the determination as to who makes the necessary repairs. Repairs will be made to the satisfaction of the utility owner.

G. In areas where existing underground structures are shown or suspected and at all new pipe crossings of existing piping, carefully uncover such structures to such extent as to enable the Quality Assurance Resident Engineer to determine what adjustments, if any, need to be made to accommodate the presence or removal of such structures.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 02015: Subsurface Information

B. Section 02200: Earthwork

C. Section 02220: Erosion Control

D. Section 02771: Textured Geomembrane

E. Appendix C: Test Pits and Boring Logs

1.03 DESCRIPTION OF WORK:

The Contractor shall be responsible for the following items;

A. Work specified in this section shall consist of furnishing all labor, materials, and equipment to prepare the site for subsequent improvements in conformity with the Contract Drawings, and as specified herein.

B. Site Preparation shall include, but is not limited to, the following:
   1. Protection of existing trees.
   2. Smoothing of existing ground surface in areas where topsoil is not removed.
   3. Verification of locations and elevations of all existing facilities within the limits of work and to be connected to.
   4. Protection of existing utilities.
   5. Confirming the location and elevation of benchmarks and control points shown on the Contract Drawings and reporting any inconsistencies to the Engineer immediately and prior to initiating earthwork activities.
   6. Protection of existing structures, buildings, and engineered systems (stormwater management facilities, monitoring wells, landfill gas wells, existing landfill intermediate cover, landfill infrastructure).
   7. Verification of existing utility locations and elevations:
      a The Contractor shall locate and verify the location and invert elevations at all connection points and utilities, as shown on the Contract Drawings. The Contractor shall notify the Engineer of any discrepancies. The Contractor shall be responsible for notifying and obtaining the services of Dig Safe and all applicable non-Dig Safe utility owners to locate existing utilities as necessary.
      b The existing utilities shown on the drawings are shown diagrammatically and are not to be inferred that the locations shown are precise.
      c Coordinate with all applicable utility owners prior to excavation in areas where it is reasonable to expect the presence of existing utilities, whether shown on the drawings or not.

d Accept responsibility for any and all damage to any existing utilities, caused by the Contractor's efforts.
e Contact the effected utility as soon as any damage is uncovered.
f The utility shall make the determination as to who makes the necessary repairs.
g In areas where existing underground structures are shown or suspected carefully uncover such structures to such extent as to enable the Engineer to determine what adjustments if any need to be made to accommodate the presence or removal of such structure.

1.04 JOB CONDITIONS:

The Contractor shall be responsible for the following items;

A. Protection of Existing Facilities: Provide protections necessary to prevent damage to existing facilities indicated to remain. Protect facilities on adjoining properties and on the Owner's property. Restore damaged facilities to their original condition, as acceptable to parties having jurisdiction.

B. Adjoining Property: Confine all operations to the property of the Owner. Protect abutting properties from construction activities at all times.

C. Salvageable Facilities: Carefully remove items indicated to be salvaged, and store on the Owner's premises where indicated, unless otherwise directed.

D. Maintain access to landfill operational cell, landfill gas treatment building, landfill gas flare, leachate storage facility, and leachate loading rack.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

The Contractor shall be responsible for the following items:

3.01 GENERAL:

A. The Contractor will establish limit of work lines as shown on the Contract Drawings, construction lines, and designate the trees, shrubs, plants, and other items to remain.

B. Alignment stakes, grade stakes, witness stakes, boundary markers, benchmarks, and tie points shall be preserved until such time as their usefulness has ceased and permission for their destruction is given by the Engineer.

C. Remove vegetation, facilities, or obstructions interfering with installation of new construction. Remove such items elsewhere on the site or premises as specifically indicated. Removal includes stumps and roots.

D. Carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new construction.

E. Mark and identify existing utilities to be connected into.

3.02 TOPSOIL STRIPPING:

A. Topsoil is defined as friable silt loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, and large stones, and without weeds, roots, and other objectionable material.

B. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with the underlying subsoil or other objectionable material.

C. Remove heavy growths of grass and brush from areas before stripping.

D. Stockpile topsoil on-site in storage piles where directed by Owner. Construct storage piles to freely drain surface water. Seed and mulch stockpiles, with temporary seed mixture in accordance with Contract Documents and the most recent version of the Maine Department of Environmental Protection Best Management Practices.

E. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to the main root system.

F. Dispose of unsuitable material the same as waste material; herein specified

3.03 GRUBBING:

A. Completely remove stumps, roots, heavy turf, and other debris. Disposal of stumps shall be by grinding or chipping and material shall remain on site for use as erosion control material.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place fill material in horizontal layers not exceeding 12-inch loose depth and thoroughly compact to a density equal to adjacent original ground.

3.04 DEMOLITION:

A. Remove existing force mains, pre-cast concrete structures and leachate loading rack as indicated on the Drawings

B. Remove and dispose of all demolished materials off site in accordance with all applicable federal, state, and local regulations.

C. Backfill all excavations resulting from demolition activities with approved common borrow and compact as specified

3.05 DISPOSAL OF WASTE MATERIALS

A. Removal from Owner's Property: Except as otherwise provided, all wood, trash, and debris shall be removed and disposed of by the Contractor. Disposal may be deposited off-site in accordance with all applicable local, state, and federal rules, or on-site as directed by the Owner.

B. Wood Chipping: Wood chipping shall be done with approved equipment capable of reducing woody material to chips not over 1/4 inches in thickness nor over 8 inches long. Chips shall be distributed in a thin layer over the ground surface. Ground cover plants shall not be smothered and drainageways shall not be blocked.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. All work included in the Contract (Contract Documents, Specifications, and Drawing), including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to work specified in this Section.

C. All work performed under this specification shall be performed in accordance with the most recent edition of the Maine Department of Environmental Protection's (MEDEP's) "Maine Erosion and Sediment Control Best Management Practices" (BMPs) and in accordance with the Maine Construction General Permit for the Project.

1.02 DESCRIPTION: This work shall consist of survey layout, excavation, filling, embankment construction, and grading and shall include all hauling, compaction, necessary for construction of the project and disposal of all unsuitable material encountered.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Subsurface Information: Section 02015

B. Site Preparation: Section 02100

C. Erosion Control: Section 02220

D. Pipe Installation: Section 02450

E. Seeding and Mulching: Section 02800

1.04 REFERENCES

The publications listed below are part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Association of State and Highway and Transportation Officials (AASHTO):
   1. AASHTO M145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
   2. AASHTO T 104 Soundness of Aggregates by Use of Sodium Sulfate of Magnesium Sulfate
   3. AASHTO T 289 Determining pH of Soil for Use in Corrosion Testing
   4. AASHTO T 236 Direct Shear Test of Soils Under Consolidated Drained Conditions

B. The American Society for Testing and Materials (ASTM):
   1. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
   2. ASTM D6913 Laboratory Compaction Characteristics of Soil Using Standard Effort
   3. ASTM D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
   4. ASTM D2216 Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
   5. ASTM D2434 Standard Test Method for Permeability of Granular Soils (Constant-Head)
   6. ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

7. ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
8. ASTM D6913 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
9. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
10. ASTM D4373 Standard Test Method for Rapid Determination of Carbonate Content of Soils
11. ASTM D5519 Standard Test Methods for Particle Size Analysis of Natural and Man-made Riprap Materials
12. ASTM D420 Standard Guide for Site Characterization for Engineering Design and Construction Purposes
13. ASTM C702 Standard Practice for Reducing Samples of Aggregate to Testing Size
14. ASTM D422 Standard Test Method for Particle-Size Analysis of Soils

C. OSHA Safety and Health Regulations for Construction, Subpart P Excavations 1926.652 (a-g).

1.05 QUALITY ASSURANCE

A. All work pertaining to this Section shall be done according to the requirements outlined in the Quality Assurance/Quality Control Plan (Appendix B).

B. Codes and Standards: Perform excavation work in compliance with applicable requirements of governing authorities having jurisdiction.

C. Borrow Source Characterization Testing **(By Contractor)**:

1. The following borrow source characterization testing shall be performed on the materials used for the project's earthwork construction. The testing program will assure that borrow materials from on-site or off-site sources meet the requirements of this specification. Borrow source testing shall be performed prior to delivering off-site material to the site and prior to using on-site material for landfill construction. Changes in the borrow source and/or material properties shall be avoided. The Contractor shall employ a soils testing laboratory acceptable to the Engineer to perform soil testing of borrow source materials. Borrow source characterization testing on soil materials shall be done at the following frequencies:

BORROW SOURCE CHARACTERIZATION TESTING

Borrow Material	Testing	Method	Frequency[1]
Bedding Sand	Grain Size	ASTM D6913	1/source
Common Borrow	Grain Size	ASTM D6913	1/source
	Moisture/Density	ASTM D698	1/source
Structural Backfill	Grain Size	ASTM D6913	1/source
	Moisture/Density	ASTM D698	1/source
Pipe Bedding	Grain Size	ASTM D6913	1/source
Aggregate Base and Aggregate Subbase	Grain Size	ASTM D6913	1/2,500 cy
	Moisture/Density	ASTM D1557 (Paved Surfaces) or ASTM D698 (Gravel Surfaces)	1/2,500 cy

Notes:
[1] Minimum of one test per source.

1.06 SUBMITTALS:

A. The Contractor shall supply representative materials for testing as required by the Engineer. The Contractor shall schedule his operation and submissions so the Engineer has sufficient time to perform testing. Failing tests of materials quality, gradation, or field density will be charged to the Contractor and deducted from payments.

B. Test Reports: Submit borrow source test reports directly to the Engineer from the Contractor's testing subcontractor, with copy to the Contractor. If borrow source testing indicates a significant change in material index properties during construction, the in-place material testing specifications described herein shall be modified.

C. Excavation Protection Plan: Describe sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property; include structural calculations to support plan.

1.07 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner and/or the Engineer will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of the Contractor.

Additional test borings and other exploratory operations may be made by the Contractor at no cost to the Owner.

B. Existing Utilities: The Contractor shall contract the services of a private utility location service and/or Dig Safe to locate existing underground utilities in the areas of work, as necessary, or as required by law. In addition, the Contractor is required to collaborate with the Owner to gain supplementary information regarding the location of underground utilities at the site. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

Should uncharted, or incorrectly charted piping or other utilities be encountered during excavation, consult the Utility Owner immediately for directions. Cooperate with the Owner and utilities companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the Utility Owner.

Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.

Demolish and completely remove from the site any existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: Blasting at the Pine Tree Landfill site is not permitted.

D. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights as necessary. Operate any required warning lights as recommended by authorities having jurisdiction. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations. The Contractor shall comply with all applicable rules, procedures and regulations regarding safety as defined by all local, state, and federal agencies, including but not limited to, OWNER'S safety procedures, State of Maine Labor Department Rules, and the Occupational Safety and Health Act (OSHA) Regulations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. Roadways and Parking Lots:

1. Aggregate Subbase: Aggregate subbase shall be soil consisting of hard, durable particles that are free from vegetation, lumps, or balls of clay, and other deleterious substances. Aggregate subbase shall not contain particles of rock which will not pass the 6-inch square mesh sieve. The gradation of the portion passing a 3-inch sieve shall meet the grading requirements of the following table:

	Percent by Weight Passing
Sieve Designation	Square Mesh Sieve
1/4"	25-70
#40	0-30
#200	0- 7

(M.D.O.T. 703.06 b. Type D)

2. Aggregate Base: Shall be crushed rock or soil consisting of hard durable particles which are free from vegetation, organic matter, lumps or balls of clay, and other deleterious substances. The gradation of the base materials shall meet the grading requirements of the following table:

	Percent by Weight Passing
Sieve Designation	Square Mesh Sieve
2"	100
1/2"	45-70
1/4"	30-55
#40	0-20
#200	0- 5

(M.D.O.T. 703.06 a. Type A)

B. Structures:

1. Granular Backfill: Backfill placed within 5 feet of structures shall consist of a well graded sand free of vegetation, organic matter, lumps, or balls of clay and other deleterious substances. The gradation shall meet the grading requirements of the following table:

	Percent by Weight Passing
Sieve Designation	Square Mesh Sieve
3"	100
#40	0- 70
#200	0- 10

(M.D.O.T. 703.19)

C. Pipe Bedding Stone (Solid Wall Pipe): Stone shall be obtained from rock of uniform quality and shall consist of clean, angular fragments of quarried rock free from soft disintegrated pieces or other questionable matter. The material shall meet the following gradation requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
¾”	100
½”	85 -100
3/8”	0 - 15
1”	100
1/2”	90-100
#4	70 – 100
#20	35 – 80
#60	0-40
#100	0-15
#200	0- 7.5

E. Miscellaneous Materials:
   1. Common Borrow: Shall be soil suitable for embankment construction. It shall be free of frozen material, perishable rubbish, peat, organic matter, large rock fragments, or other unsuitable material. AASHTO M145 Classifications A-1 through A-5 may be used. In embankments, the maximum aggregate size shall not exceed twelve (12) inch diameter. In the base grade, fill the maximum aggregate size shall not exceed a three (3) inch diameter. Use of other materials as common borrow is at the discretion of the Engineer and only in approved areas.
   2. Vegetative Soil: Shall be in accordance with Section 02800 – Seeding and Mulching.

2.02 ON-SITE MATERIAL

A. Material on the site is the property of NEWSME and may only be used with the approval of the Engineer and Owner. The Contractor will complete all borrow source testing requirements specified in Table 2-1, if they wish to use any on-site material.

B. Material not incorporated in the work because it is unsuitable will be stockpiled at a location determined by the Owner.
   1. Material designated to be saved by the Engineer or Owner will be stockpiled using MEDEP Erosion Control Best Management Practices (BMPs) for construction, at a location shown on the Drawings or designated by the Owner/Engineer.
   2. Unsuitable material shall consist of grubbings or materials that contain rock of a size that exceeds specifications, organic materials, frozen materials, or other materials of a deleterious nature as deemed by the Engineer.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which excavating, filling, and grading are to be performed and notify the Engineer, in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 EXCAVATION: Excavation consists of removal and disposal of material encountered when establishing required grade elevations. All excavation shall be unclassified and shall include any and

all material encountered. No extra compensation shall be allowed for excavation work covered by the bid proposal.

A. Excavation for Structures: Conform to elevations and dimensions shown within a vertical tolerance of one twentieth (0.05) of a foot and extending a sufficient horizontal distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

Excavation for footings and foundations shall extend to the depth necessary to remove all fill material above the native soils. When the footing and foundation grades extend into native soils, the native soil shall be excavated to the foundation grades specified on the plans.

In excavating for footings and foundations, take care not to disturb the bottom of the excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave a solid base to place concrete.

Rock shattered due to drilling or ripping operations shall be removed. Excess rock excavation shall be filled with Class A or Class B concrete.

B. Excavation for Pavements: Conform to subgrade elevations and dimensions shown, within a vertical tolerance of one-tenth (0.1) of a foot.

C. Excavation for Trenches: Conform to elevations and dimensions within a vertical tolerance of one-tenth (0.1) of a foot. Excavate to the uniform width shown or required for the particular item to be installed. Provide adequate working space for compactive equipment.

Excavate trenches to the depth indicated or required. Carry the depth of trenches for piping to establish the indicated flow lines and invert elevations and provide suitable bedding as specified in paragraph 2.01.C.

Where rock is encountered, carry the excavation one half (0.5) of a foot below the required elevation and backfill with a one half (0.5) of a foot-thick layer of bedding stone or gravel prior to installing pipe.

Grade bottoms of trenches as indicated, notching under pipe joints to provide solid bearing for the entire body of the pipe.

Do not backfill trenches until authorized by the Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

D. Site Excavation: Conform to elevations and dimensions shown within a vertical tolerance of one-tenth (0.1) of a foot. During the excavation to base grade, excavating equipment and trucks are to be kept off the subgrade to minimize disturbance of the subgrade. Excavate to a depth to provide for any subsequent loam, sod, or other specified surface material.

E. Excavation of Unsuitable Material: Shall consist of the excavation and removal of all fill materials including loose, uncompacted soil materials, buried rubber tires and waste, buried vegetation and other organic or inorganic debris, and/or saturated and unsaturated mixtures of soils and organic matter not suitable for foundation or embankment material that may be encountered during the prosecution of the work, or as directed by the Engineer. The excavation shall extend to the limits and depth necessary to remove the unsuitable material as directed by the QARE.

3.03 STABILITY OF EXCAVATIONS: Slope sides of excavations to comply with. OSHA Safety and Health Regulations for Construction, Subpart P Excavations 1926.652 (a-g). Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

3.04 SHORING AND BRACING:

A. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross-braces, in good serviceable condition.

B. The Contractor shall have a competent person as defined in OSHA Safety and Health Regulations for Construction, Subpart C ,General Safety and Health Conditions, 1926.32 (f), on-site during all trenching, shoring and bracing work.

C. The Contractor shall prepare an excavation protection plan under direct supervision of Professional Engineer experienced in design of this Work and licensed at the Project location

D. Sheet, shore, and brace excavations to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

E. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

F. Design sheeting and shoring to be removed at completion of excavation work.

G. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

H. Repair damage to new and existing Work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

I. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls cannot be sloped, provide sheeting and shoring to protect excavation as specified in this section

J. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

3.05 MATERIAL STORAGE: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Seed and mulch stockpiles in accordance with MEDEP BMPs as necessary.

Locate and retain soil materials away from edge of excavations.

Dispose of excess soil material and waste materials as herein specified.

3.06 COLD WEATHER PROTECTION: Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.

3.07 WINTER CONSTRUCTION OF EMBANKMENTS: Frozen material shall not be placed in the embankment or base grade layers. The construction of embankments and base grading may continue during cold weather only when all frozen material in the top of the area to be worked is moved to the waste storage area, or removed from the site, before placing additional material. Winter construction of the compacted barrier soil is prohibited.

Placement of soil fill shall be at the discretion of the Engineer when temperatures are below 30°F. Compaction shall be in accordance with the specified method of soil placement. When the prevailing temperatures are below 30°F, all soil material placed shall have a moisture content at the time of compaction equal to or less than the optimum moisture content.

3.08 CLOSING ABANDONED UNDERGROUND UTILITIES: Close open ends of abandoned underground utilities that are indicated to remain permanently with closures sufficiently strong to withstand pressures that may result after closure.

Close open ends of metallic conduit and pipe with threaded galvanized metal caps or plastic plugs, or other suitable method for the type of material and size of pipe, or as shown on the Contract Drawings. Do not use wood plugs.

Close open ends of plastic PVC pipe abandoned in-place with a permanent plastic PVC plug, or as shown on the Contract Drawings. Pipe end is to be backfilled with bedding sand.

Close open ends of concrete and masonry utilities with not less than 8-inch-thick brick masonry bulkheads, constructed to completely fill the opening.

Wet brick before laying. Lay brick in mortar so as to form a full bed with ends and side joints in one operation. Joints shall be more than three-eighths (3/8) inch wide. Protect fresh masonry from freezing or from rapid drying, as necessary, and maintain protection until mortar has set.

Close HDPE pipes with fused end caps

3.09 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.
   1. In excavations, use satisfactory excavated or borrow material.
   2. Under grassed areas, use satisfactory excavated or borrow material.
   3. In pipe trenches, use material specified in typical trench section.

B. Backfill excavations as promptly as work permits, but not until completion of the following:
   1. Acceptance by Engineer of construction below finish grade including, but not limited to, damp proofing, waterproofing, and perimeter insulation.
   2. Inspection, testing, approval, and recording locations of underground utilities.
   3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in a manner to prevent settlement of structures or utilities,.
   4. Removal of trash, debris, frozen and/or unsuitable materials.

C. Placement and Compaction: Place backfill and fill materials in layers not more than 12 inches compacted depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers,

D. Before compaction, moisten or aerate each layer as necessary to provide the optimum moisture content. Compact each layer to required percentage of maximum dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

   Place backfill and fill materials evenly to required elevations, adjacent to structures. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structure to approximately the same elevation in each lift.

3.10 GRADING:

A. General: Uniformly grade areas within the limits of grading under this section, including adjacent transition areas. Smooth finish surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Compaction: After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.

3.11 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification.

B. Percentage of Maximum Density Requirements: Compact soil to within not less than the following percentages of maximum dry density (determined in accordance with ASTM D 698).

1. Landfill:
   a) Subgrades: Native soils approved to be left in place shall be proof rolled prior to the barrier soil or under drain sand placement. Proof rolling shall include a minimum of three passes of a heavy vibratory compactor. The type and weight of the compactor shall be approved by the Engineer. The Engineer shall recommend removal of any unsatisfactory fill or native material, approve compaction equipment, and observe the compaction effort.

2. Footings and Foundations:
   a. Footings founded on native sands: Compact subgrade with at least six complete passes of an approved vibratory plate.
   b. Compact each layer of granular fill material to at least 95 percent of standard proctor maximum dry density.
3. Structural Slabs: Compact each layer of granular fill material to at least 95 percent of standard proctor maximum dry density.
4. Adjacent to Structures: Within 5 feet of a structure, compact each layer of granular fill material to at least 92 percent of standard proctor maximum dry density.
5. Lawn or Unpaved Areas: Compact each layer backfill or fill material to at least 85 percent of standard proctor maximum dry density.
6. Pavements: Compact subgrade and each layer of gravel borrow, subbase material, and base material to at least 95 percent of modified proctor maximum dry density.
7. Pipe Trenches: Compact bedding material and each layer of backfill to at least 90 percent of standard proctor maximum dry density.

C. Moisture Control: Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in proper quantities to prevent free water appearing on surface during or subsequent to compaction operations.

Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to the specified density.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a satisfactory level.

The Contractor shall protect compacted barrier soil layers from desiccation during dry conditions, the barrier layers shall be kept in a moisture conditioned state as described above. Plans to control compacted clay layer desiccation shall be approved by the Project Manager.

3.12 BASE AND SUBBASE COURSES:

A. General: This work consists of placing aggregate base and subbase material, in layers of specified thickness, over subgrade surface.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Placing: Place subbase and base course material on prepared surfaces in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

When a compacted subbase course is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer shall be more than 12 inches or less than 3 inches in thickness when compacted.

3.13 VEGETATIVE SOIL:

A. General: This work consists of placing vegetative soil of the specified thickness on prepared subgrade in all areas disturbed by construction and not otherwise surfaced or covered by structures and shall be seeded and mulched in accordance with Section 02800 – Seeding and Mulching.

B. Material: Use suitable vegetative soil stripped from the site wherever possible.

C. Placing and Grading: Place vegetative soil to the specified thickness. Grade and rake soil to remove all foreign material and rocks over two (2) inches. Leave the surface uncompacted and track prior to seeding operations.

3.14 FIELD QUALITY CONTROL **(Testing Services by Owner)**:

Quality Control Testing During Construction: The Owner will perform quality control testing of materials used in the work (i.e., Borrow Source Construction Testing and in-place construction testing., The Owner's Representative shall collect representative materials for testing.. The Contractor shall schedule his operation and submissions so the Owner's Representative has sufficient time to perform material quality control testing. Failing quality control tests of materials will be charged to the Contractor and deducted from payments. Quality control procedures outlined in the site's Quality Assurance/Quality Control Plan shall be implemented by the Contractor during construction at the landfill. The Contractor will allow the Owner's testing service to examine and test subgrades and fill layers before further construction work is performed. Test results meeting the requirements of 3.11 herein, shall be obtained prior to placing additional materials.

A. Borrow Source Construction Testing: The following borrow source quality control testing of the barrier soils and granular drainage material shall be required as a minimum. Samples to be tested will be collected by the Owner's Representative. Samples will be taken in accordance with ASTM D420 and C702 from material that has arrived on site.

TABLE 3-1

BORROW SOURCE CONSTRUCTION TESTING

Material	Tests	Frequency
Bedding Sand	Grain Size ASTM D422 or D6913	1/1,000 cy
Common Borrow	Grain Size ASTM D422 or D6913 Moisture/Density ASTM D698	1/1000 cy 1/1000 cy
Granular Backfill	Grain Size ASTM D422 or D6913 Moisture/Density ASTM D698	1/1000 cy 1/1000 cy
Pipe Bedding	Grain Size ASTM D422 or D6913 Moisture/Density ASTM D698	1/1000 cy 1/1000 cy
Aggregate Base and Subbase	Grain Size ASTM D422 or D6913 Moisture/Density ASTM D698 (Gravel Surfaces ASTM D1557 (Paved Surfaces)	1/1000 cy 1/1000 cy y

B. In-Place Construction Testing: The following in-place construction quality control testing shall be performed.

TABLE 3-2

IN-PLACE CONSTRUCTION TESTING

Material	Tests	Frequency
Aggregate Base and Aggregate Subbase	Density ASTM D1557	2/lift
	Moisture Content ASTM D6938	2/lift
	Grainsize ASTM D6913	1/source
Granular backfill	Density ASTM D6938	1 /lift
	Grain size ASTM D6913	1/source
Pipe Beddings	Grain size ASTM D6913	1/source
Bedding Sand	Grain size ASTM D6913	1/source

Perform field density tests in accordance with ASTM D6938 and ASTM D1557/D698 (Nuclear Device), as applicable.

1. Measurement of Soil Thickness and Soil Characteristics:. The thickness of the aggregate subbase and base material shall be recorded once per 100 lineal feet of material placed.
2. The Owner's Representative shall identify test locations. The Contractor shall assist the Owner's Representative in obtaining the required samples. The Owner's Representative shall maintain daily logs of measurements of soil lifts soil characteristics and other observations.
3. Deficient Areas of Work: Contractor placed subgrades and fills that are found deficient by inspection and/or failing quality control testing will be reworked. Subgrades and barrier soils that are below specified density or thickness, will be corrected at the Contractor's expense and the Contractor will reimburse the Owner for additional testing expenses. The Owner has the option of retesting the area in question prior to the Contractor taking corrective action. The deficient area is defined as the area encompassing half the distance from the failing point to surrounding sampling points which satisfactorily meet the testing requirements. The Contractor can elect to rework a rejected area; if it fails again the Contractor must remove the failing material and start anew with new material. The reworked area will be inspected and tested until the area is in conformance. An area which has been rejected for nonconformance due to deficient specified thickness or grading requirements may be reworked by the Contractor until it meets the specification, provided this work does not cause the rejected block to deviate from the other requirements of conformance.

3.15 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

Control of compacted barrier soil layer desiccation shall be in accordance with Section 3.09.C.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations, desiccation, or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction. This work shall be performed at no additional cost to the Owner.

3.16 DISPOSAL OF EXCESS AND WASTE MATERIALS:

Remove waste materials, including unacceptable excavated material, trash and debris, and dispose of off-site in accordance with all local, state, and federal rules and regulations, or in areas designated by Owner/Engineer.

END OF SECTION

SECTION 02220

EROSION CONTROL

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

C. The Project Site-Specific Maine Construction General Permit.

D. All work performed under this specification shall be performed in general accordance with the most recent edition of the Maine Department of Environmental Protection (MEDEP) Maine Erosion and Sediment Control Practices Best Management Practices.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Measurement and Payment: Section 01025

B. Project Coordination: Section 01041

C. Site Preparation: Section 02100

D. Earthwork: Section 02200

E. Seeding and Mulching: Section 02800

1.03 DESCRIPTION OF WORK:

A. Prevention: Take every reasonable precaution and do whatever is necessary to avoid any erosion and to prevent sedimentation of rivers, streams, lakes, reservoirs, impoundments, and drainage ditches and swales.

B. Exposure: The exposure of uncompleted cut slopes, embankments, trench excavations, and site-graded areas shall be kept as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible.

C. Temporary Protection: Should it become necessary to suspend construction for seven days, shape all excavated and graded areas in such a manner that runoff will be intercepted and diverted to points where sediment control structures have been installed. Provide and maintain temporary erosion and sediment control measures, such as berms, dikes, slope drains, silt stops, sedimentation basins, sediment traps, mulching, temporary seeding, stone check dams, and filter berms until permanent drainage facilities or erosion control features have been completed and are operative. The Contractor shall provide temporary seeding, mulching, or other protective coverings to exposed earth surfaces and stockpiles. that are susceptible to erosion and which will be exposed to rain or wind elements for a period of greater than seven days.

D. Handling of Erodible Soils: Erodible soils placed or exposed during the work shall be so handled and treated as to minimize the possibility of its reaching any surface waters. Use diversion channels, dikes, sediment traps, or any other effective control measures.

E. Off-site Erosion Control: The requirements of this Section also apply to Project-related construction activities away from the Project site, such as at borrow pits, off-site storage areas, and haul and work roads.

F. Remedial Action: Should any protective measures employed indicate any deficiencies or erosion taking place, immediately repair erosion control measures or employ different techniques to correct the situation and to prevent subsequent erosion and sedimentation.

G. Discontinuation: Continue temporary erosion and sedimentation control measures until the permanent measures have been sufficiently established and are capable of controlling erosion and sedimentation on their own.

H. Permanent Seeding: At the completion of landfill construction activities, the Contractor shall provide permanent seeding, mulching, or other protective landscape coverings to exposed earth surfaces affected by construction activities, and as shown on the Contact Drawings, and as specified in Section 02800.

I. Inspection: The Contractor shall perform all inspections and documentation required by the project's MEDEP Maine General Construction Permit.

J. Maintenance and Repair: The Contractor shall be responsible for maintenance, and/or repair of all temporary and permanent erosion and sedimentation control measures during construction, including temporary or permanent erosion and sedimentation control measures installed by other subcontractors and used during this project. Inspections will be undertaken by the Contractor's qualified personnel to ensure that controls are correctly functioning, and that additional erosion control measures are installed if needed. Such inspections will occur bi-weekly and after each significant rainfall event (1 inch or more within a 24-hour period) during construction and until permanent erosion and sediment control measures have been properly installed and the site is stabilized. Sediment within sediment control structures shall be removed when the height of the sediment is greater than one-half the depth of the erosion control measure.

1.04 SEDIMENT CONTROL GUIDELINES:

A. Maine Erosion and Sediment Control BMPs (most recent version).

B. Maine Erosion and Sediment Control Practices Field Guide for Contractors (most recent version).

C. MEDEP Natural Resources Protection Act Permit by Rule Standards, Chapter 305.

D. MEDEP – Maine Construction General Permit requirements.

1.05 SUBMITTALS:

A. The Contractor shall furnish to the Engineer, in writing, his plan for dewatering excavations and diverting surface water before beginning the construction work for which the dewatering or diversion is required. Acceptance of this plan will not relieve the Contractor of responsibility for completing the work as specified.

B. Manufacturer's product data sheets, material certifications, and standard manufacturing quality control test data for products listed in Part 2 of this specification.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Handle material in accordance with manufacturer's recommendations. Protect materials from deterioration during delivery, and while stored at the site.

1.07 JOB CONDITIONS: Contractor must examine the subgrade, verify the elevations, observe the conditions under which work is to be performed and notify the Engineer of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

Proceed with and complete the erosion and sedimentation work as rapidly as portions of the site become available, working within the required seasonal limitations.

A. Seeding Seasons: Unless variance is requested in writing and approved by the Engineer, seeding shall be done within the following dates:

Permanent Seeding: April 26 – September 15

Temporary Seeding: September 16 until April 25

Dormant Seeding: At the Contractor's risk, from September 16 until April 25

1.08 QUALITY CONTROL:

A. Source Quality Control:
   1. General: Ship erosion control materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.
   2. Analysis and Standards: Package standard products with the manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemist, wherever applicable or as further specified.
   3. Inspection: The Engineer reserves the right to request manufacturers materials (bags, tags, etc.) of any and all materials to confirm material quality and quantity.

B. Installation Quality Control:
   1. Provide at least one person who shall be present at all times during erosion control installation and who shall be thoroughly familiar with the types of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.
   2. Material manufacturers and vendors shall be reputable, qualified firms regularly engaged in producing the required types of materials.
   3. Protect and maintain all areas disturbed by the work, such that erosion is controlled and sediments are not allowed to flow into any watercourse, onto adjacent properties, or into storm drains.

PART 2 - MATERIALS AND PRODUCTS

2.01 GENERAL:

A. Materials incorporated in erosion control shall be specified in other sections or included herein.

2.02 GRUBBINGS:

A. The top 12 inches of soil removed from areas shown on the Drawings shall be segregated into piles, cleaned sufficiently, and reused in accordance with Section 02200, Earthwork. Any of this soil that is used as vegetative soil shall be tested by a qualified laboratory for the requirements listed for vegetative soil. If the quantity of stockpiled vegetative soil is insufficient, or quality is not in accordance with the requirements for vegetative soil, the Contractor shall provide additional new vegetative soil from an Engineer-approved off-site source as required to complete the work.

2.03 VEGETATIVE SOIL:

A. Vegetative Soil shall be as specified in Seeding and Mulching Specification Section 02800.

2.04 SILTATION FENCE:

A. Siltation fence shall be preassembled fence consisting of synthetic filter fabric reinforced with a supporting mesh and mounted on wood or metal stakes.

B. The fence shall be Envirofence as manufactured by Mirafi, Spun Bond as manufactured by Trevira, or Propex Silt Stop as manufactured by Amoco or approved equal.

2.05 EROSION CONTROL MATTING:

A. Shall be placed on newly loamed and seeded areas as indicated on the Contract Drawings.

B. During fall and winter (see Section 1.07.A) use heavy-grade mats or as recommended by the Engineer on all channel bottoms and slopes greater than 4H:1V. Install mats according to manufacturer's recommendation.

2.06 MULCH:

A. Mulch shall be in accordance with Seeding and Mulching Specification Section 02800.

2.07 HAY BALES:

A. Rectangular-shaped bales of hay or straw weighing at least 40 lbs. free from primary noxious weed seeds and rough or woody materials.

2.08 EROSION CONTROL MIX:

A. Erosion Control Mix shall contain a well-graded mixture of particle-sizes and may contain rocks smaller than 4” diameter. Erosion control mix shall be free of refuse, physical contaminants, and material toxic to plant growth such as ash and yard scrapings. Large portions of silts, clays, or fine sands are not acceptable in the mix. The mix composition should meet the following standards:
   1. The organic matter content should be between 80% and 100% on a dry weight basis;
   2. Particle size by weight should be 100% passing a 4-inch screen and 70% to 85% passing a 0.75” screen;
   3. The organic portion needs to be fibrous and elongated;
   4. Soluble salt content shall be < 4.0 mmhos/cm; and
   5. The pH shall be between 5.0 and 8.0.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall provide for the diversion of clean surface water from the construction areas and install siltation and erosion control structures as shown on the Contract Drawings or as directed by the Engineer or QARE.

B. The Contractor shall provide all materials, equipment, and labor necessary (for the duration of the Contract) for the dewatering of excavations and the removal and/or diversion of surface water from the construction area, and installation of erosion and sedimentation control structures as shown on the Contract Drawings and according to these Specifications, and in accordance with the MEDEP BMPs. The Contractor shall maintain a dewatering and stormwater control system so that no sediment-impacted waters are discharged from the site.

C. The Contractor shall install all siltation fencing, mulches, grasses, seeding, ditches, channels, , grading, and all other work necessary to control water pollution, surface runoff, and soil erosion.

D. The Contractor shall provide temporary seeding, mulching, or other protective coverings to exposed earth surfaces or stockpiles which will be exposed to rain or wind elements through the fall and winter seasons.

E. The Contractor shall maintain all facilities necessary to control water pollution, surface runoff, and soil erosion until permission is given by the Engineer to discontinue the use of the facilities.

F. It shall be the Contractor's responsibility to restore any eroded or damaged surfaces to the design grade with approved material and to keep topsoiled areas in acceptable condition until a sufficient vegetated surface is established and accepted by the Engineer.

3.02 EROSION CONTROL PROVISIONS:

A. The discharge from pumping operations during dewatering operations shall be contained by a dike so constructed as to prevent siltation, and the area at the outlet pipe shall be protected against erosion by the construction of a riprap apron.

B. Prior to removal of sediment control dikes, all retained silt or other materials shall be removed and placed in areas not susceptible to erosion as directed by the Engineer, at no additional cost to the Owner.

3.03 REMOVAL OF TEMPORARY WORKS:

A. After the temporary works have served their purposes, the Contractor shall remove them or level and grade them to the extent required to present a sightly appearance and to prevent any obstruction of the flow of water or any other interference with the operation of or access to the permanent works.

3.04 MAINTENANCE AND ACCEPTANCE:

A. The Contractor shall be responsible for inspection and maintenance of all temporary erosion and sedimentation control measures during construction. Inspections will be undertaken by qualified personnel to ensure that controls are correctly functioning, and that additional erosion control measures are installed if needed. Such inspections will occur bi-weekly and after each significant rainfall event (1 inch or more within a 24-hour period) during construction until permanent erosion control measures have been properly installed and the site is stabilized. Trapped sediment shall be removed when the height of the sediment is greater than one-half the depth of the erosion control measure.

B. The Contractor shall continue to maintain erosion and sedimentation controls until vegetation is suitably established (Seeding and Mulching Specification Section 02800) and the Engineer deems the site stable, at which time all temporary erosion and sediment controls may be removed from the site.

END OF SECTION

SECTION 02450

PIPE INSTALLATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

C. RELATED WORK SPECIFIED ELSEWHERE:
1. Measurement and Payment: Section 01025
2. Project Coordination: Section 01041
3. Earthwork: Section 02200
4. Erosion Control: Section 02220
5. Manholes, Catch Basins, and Drainage Structures: Section 02570
6. HDPE Pipe and Fittings: Section 15100
7. PVC Pipe and Fittings: Section 15101
8. Ductile Iron Pipe and Accessories: Section 15102
9. Valves and Pipe Accessories: Section 15110
10. Pipe Pressure Testing: Section 15120

D. REFERENCES:
1. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
2. ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping

1.02 DESCRIPTION OF WORK:

A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install and test leachate transport piping. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01010 "Summary of Work", or as directed by the Engineer, will apply.

1.03 SUBMITTALS:

A. The Contractor shall furnish material specific submittals (indicated in other specifications) to the Engineer prior to commencing the work. Pipe of the same manufacturer shall be used for each pipe material throughout the project unless approved by the Engineer.

B. The Contractor shall submit to the Engineer a Construction Schedule for pipe installation.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 INSTALLATION:

A. All materials shall be stored and handled in accordance with the manufacturer's recommendations.

B. Excavate, backfill, and compact soils in accordance with Section 02200.

C. Pipe Grade Defined: Pipe grade shall be the invert of the pipe as shown on the Contract Drawings.

D. Pipe Jointing: All joints shall be made in a dry condition (trench, excavation, etc.) and in accordance with the manufacturer's recommendations and the best practices for the type of pipe installed.

E. Pipe Installation:
   1. Pipes shall be of the material, size, and length shown on the Contract Drawings.
   2. Accurately lay to the line and grades as indicated on the Contract Drawings.
   3. The line and grade may be adjusted by the Engineer from that shown on the Drawings to meet field conditions.
   4. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
   5. All pipe trenches shall be kept free of water during pipe laying and other related work. Pipe trenches shall continue to be dewatered until such time as it is safe to allow the water to rise in the excavation.
   6. Ensure pipes stay in correct position while being backfilled.
   7. Pipe testing shall be as indicated in specification Section 15120.
   8. Pipe Bedding and backfill: As specified in Section 02200.
   9. Securely attach each section to the adjoining section by the manufacturer approved method for the type of joint used. Pipe gaskets shall be lubed with joint lubricant prior to installation.
   10. Installation of the culvert shall be from downstream up with bell ends of pipes facing upstream unless approved by the Engineer.
   11. Installation of a culvert shall include pipe joints located at least 5-feet (horizontally) in from the point where fill height over the pipe exceeds 1 foot.
   12. When backfilling a trench, the backfill material placed under the pipe haunches must be thoroughly compacted. This compaction is referred to as "chinking" the pipe, and it is done by angling a shovel handle or spade end down – acting as a compactor rod – and under the pipe to hand–compact the fill directly beneath the pipe. This chinking should be done under the entire length of the pipe while backfilling the bottom half of the pipe.
   13. Complete tie-ins within the trench where possible to prevent overstressing of the pipe and connection.
   14. Notify Quality Assurance Resident Engineer (QARE) prior to pipe installation to allow time for QARE inspection.
   15. Bedrock, Rock and Other: If ledge rock, boulders, rubble, or large stone (greater than 1.5-inch-diameter) are encountered in the trench bottom, excavate a minimum of 6 inches below the pipe bottom and replace with proper pipe bedding material.
   16. Unsuitable Conditions: When trench conditions are unsuitable for pipe placement (i.e., quick, or unstable conditions or conditions that do not allow proper placement), the Contractor shall cease pipe placement and notify the QARE.

F. Pipe Cutting:
   1. Where required, sections of pipe may be cut to provide shorter sections of pipe necessary for the construction. The cutting of the pipe shall be done in accordance with the pipe manufacturer's recommendations.
   2. When permitted and allowed by the pipe manufacturer, the pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. Unless approved by the QARE, the cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

G. Valve Installation: All valves shall be installed in accordance with the specifications for the pipe to which they are to be connected. Valve joints shall be made up in accordance with the Contract Documents. The valves shall bear no stresses due to loads from the adjoining pipe. All valves shall be inspected before installation, and they shall be cleaned and well lubricated prior to installation in the pipeline.

H. Inspection: Pipe installation shall be subject to inspection by the QARE for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the QARE shall be removed and remade to his satisfaction at the Contractor's expense. No pipe shall be backfilled until it has been approved by the QARE prior to backfilling, the contractor shall obtain as-built top of pipe coordinates and elevations at grade changes, fittings, and at least every 50 feet along the length of pipe. Pipe testing shall be performed by the Contractor and observed by the QARE with procedures and documentation in accordance with specification Section 15120.

3.02 PIPE INSULATION:

A. Buried Trench Condition: Install 2-inch-thick x 4-ft-wide Styrofoam SM or XPS insulation as manufactured by Dow Chemical Co., or Engineer approved equal, between pipe and culvert or over pipe when noted on plans or as directed by the QARE. Install insulation over the pipe when there is less than 5 ft of cover between the top of pipe and final ground grade. Install 6 in. above the pipe unless otherwise shown on the Contract Drawings and provide 6-in. sand blanket above and below insulation.

3.03 SPECIAL REQUIREMENTS:

A. Flexible Pipe: In the case of the installation of polyvinyl chloride and HDPE pipe, strict adherence shall be made to the general pipe installation requirements noted in Section 3.01 D, so that the horizontal deflection in these pipes does not exceed 5.0 percent of the pipe diameter being installed or per manufacturers' recommendations and Engineer's approval.

B. Assembling Push-On Joints: Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special nontoxic gasket lubricant uniformly over the inner surface of the gasket which will be in contact with the spigot end of the pipe. The chamfered end of the plain pipe shall be inserted into the gasket and then pushed past it until it seats against the bottom of the socket.

C. Assembling Mechanical Joint Retainer Glands: Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell, and spigot shall be lubricated by being washed with soapy water. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket. After all bolts have been inserted and the nuts have been made finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension by means of a torque wrench.

   The correct range of torque is indicated below:

TORQUE RANGE VALUES

Range of torque	60 to 90 ft-lb

If effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint. Set screws for retainer glands shall be torqued as recommended by the manufacturer.

3.04 ACCEPTANCE:

A. The Engineer reserves the right to accept the pipeline in sections after the satisfactory tests have been completed and approved and to make full use of any part or parts of the system after acceptance of those parts.

B. Until such time as the entire Contract has been accepted by the Engineer, the Contractor shall be held responsible to rectify any leaks, errors, or other poor workmanship which may be discovered and shall make any necessary repairs, alterations, or adjustments as may be required to properly complete the work.

END OF SECTION

SECTION 02466

POLYVINYL CHLORIDE PIPE (Conduits)

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 DESCRIPTION: This work shall consist of furnishing and installation of 4-inch through 48-inch unplasticized polyvinyl chloride (PVC) pressure pipe with integral bell and spigot joints for the conveyance of liquids. This pipe shall meet the standards of AWWA standard C900 PVC Water Distribution Piping and shall be in conformity with the Contract Drawings and as specified herein.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Pipe Installation: Section 02450

C. Measurement and Payment: Section 01025

D. Project Coordination: Section 01041

1.04 REFERENCES:

1. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
2. ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
3. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
4. ASTM D2464 Standard Specification for Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
5. ASTM D2467 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
6. ASTM D2564 Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
7. ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings
8. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
9. ASTM D3915 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds for Plastic Pipe and Fittings Used in Pressure Applications
10. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.05 SUBMITTALS:

A. The Contractor shall submit the name of the manufacturer of pipe and appurtenances to the Engineer prior to commencing work. Pipe of the same manufacturer shall be used throughout the project unless otherwise approved by the Engineer.

B. The Contractor shall submit to the Engineer a Construction Schedule for pipe installation.

C. The Contractor shall submit manufacturer's technical product data including installation instructions for piping joint and fittings. Chemical resistance data shall be provided at the request of the Engineer.

D. The Engineer may request that the manufacturer submit a certification that the products meet requirements in this specification.

1.06 PACKAGING DELIVERY AND HANDLING:

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

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE AND FITTINGS

A. Pipe and fittings shall be manufactured from a PVC compound which meets the requirement of Cell Classification 1245-B PVC as outlined in ASTM D1784.

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

C. Dimension: Pipe Size shall be as indicated on the Contract Drawings. Fittings shall be of the same material and quality as the pipe on which they are installed.

PART 3 EXECUTION

3.01 PIPE HANDLING

PVC pipe and pipe fittings shall be handled according to manufacturer's recommendations. Under no circumstance shall pipe and pipe fittings be dropped or dumped.

3.02 PIPE JOINTING

A. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be incorporated into the work.

B. All joints shall be made in a dry area in accordance with the manufacturer's recommendations and the best practices for material and class of pipe installed. The ends of the pipe shall be wiped clean with a dry cloth before making each joint.

C. Bell ends of pipe shall be installed facing uphill.

D. Solvent cemented joints:
   1. Use a PVC cement which meets ASTM D2564.
   2. Cut pipe to desired length with pipe cutters, hack saw, or cross cut saw.
   3. Ream pipe both internally and externally to remove burrs and ragged edges.
   4. Before making solvent weld joint, be sure all joining surfaces are free of dirt, dust, water, and oil.
   5. The use of a primer before the application of PVC cement is recommended.
   6. Apply primer to both joining surfaces.
   7. Immediately apply a smooth coat of cement to the joining surfaces.

8. Immediately insert the spigot end into the bell end to the full depth of the socket.
9. Turn pipe 1/8 to 1/4 turn in the socket to ensure an even spread of cement.
10. Hold firmly in position for 15 seconds.
11. Allow joint to set according to cement manufacturer's instructions.

3.03 PIPE INSTALLATION AND TESTING

Install pipe in accordance with Section 02450 of these specifications.

3.04 PIPE SYSTEM IDENTIFICATION: All system components shall be identified in accordance with NEWSME standards. Pipe system components shall be labeled at all accessible structures. Pipe labeling shall include labels that identify the type of fluid in the pipe and the normal flow direction of fluid in the pipe network.

END OF SECTION

SECTION 02510

HOT MIX ASPHALT PAVEMENT

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. The most recent version of the State of Maine, Department of Transportation, Standard Specifications (MDOT Specifications), including the most recent Special Provisions changes.

1.03 DESCRIPTION: Furnish all labor, materials, and equipment to install asphalt pavement in conformity with the Contract Drawings and as specified herein.

1.04 REFERENCES

The publications listed below are part of this Technical Specification to the extent referenced. The publications are referred to in the text by the basic designation only.

Maine Department of Transportation Standard Specifications (most recent version)

A. Division 400 – Pavements

B. Division 401 – Hot Mix Asphalt Pavement

C. Division 409 – Bituminous Tack Coat

D. Division 702 – Bituminous Material

E. Division 703 – Aggregates

1.05 QUALITY ASSURANCE:

A. Qualifications of Hot Mix Asphalt Product: Use only materials which are furnished by a bulk hot mix a asphalt producer regularly engaged in production of hot-mix, hot-laid asphalt pavement.

B. Qualifications of Mixing Plant: Mixing plant shall be certified by State of Maine Department of Transportation.

C. Installer: Company specializing in performing work of this section.

D. Qualifications of Testing Agency: Use only recognized commercial testing laboratories with not less than 5 years of experience in conducting tests and evaluations of hot mix asphalt materials and design.

E. Obtain materials from same source throughout.

1.06 SUBMITTALS:

A. Mix Design: Provide the Engineer with an electronic copy of the job mix formula for each course used in the work.

B. Test Reports: Provide the Engineer with an electronic copy of each test described below at the frequency required in paragraph C.
   1. Aggregate Material: Submit laboratory test reports that confirm aggregates used in the hot mix asphalt conform to Section 703 of the MDOT Specifications.
   2. Submit laboratory test reports that asphalt material used in the hot mix asphalt mix conforms to Section 702 of the MDOT Specifications.
   3. In-Place, Compacted Hot Mixed Asphalt Pavement: Submit laboratory test reports of samples cut from the in-place, compacted pavement indicating the percentage of theoretical maximum density (TMD), based on laboratory specimens of the mix combined in the proportions of the job mix formula.

C. Frequency of Testing:
   1. Aggregate Material: Submit laboratory test reports of the stockpiled aggregates initially used in the mix and additional test reports for each change of source.
   2. Hot Mix Asphalt : Submit laboratory test reports for hot mix asphalt used in the initial mix and additional test reports for each change of source.
   3. In-Place, Compacted hot mix asphalt pavement Mix: Submit laboratory test reports at frequencies not less than one of the following:
      a. Every 300 tons placed.
      b. Each day's placement.
      c. Each course, each day's placement.
      d. In-place testing may be waived at the sole discretion of the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Aggregates: Conform to Section 703 of MDOT Specifications.

B. Hot Mix Asphalt Pavement: Conform to Section 702 of MDOT Specifications.

C. Tack Coat: Conform to Section 409 of MDOT Specifications

D. Mixes
   1. Hot Mix Asphalt Paving Mixtures: Designed in accordance with Section 400 of MDOT Specifications
   2. Base Course: HMA 19.0 millimeter (3/4-inch)

PART 3 EXECUTION

3.01 INSTALLATION:

A. Place, hot mixed asphalt pavement in conformance with Section 401 of MDOT Specifications.

B. Single Course Hot Mix Asphalt Paving:

   1. Install pavement in accordance with Maine Department of Transportation standards.

   2. Place hot mix asphalt pavement within 24 hours of applying primer or tack coat.

   3. Place hot mix asphalt pavement wearing course to thickness indicated on Contract Drawings.

3. Compact paving by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
4. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

C. Double Course Hot Mix Asphalt Paving:
1. Place hot mix asphalt pavement binder course within 24 hours of applying primer or tack coat.
2. Place binder course to thickness indicated on Contract Drawings.
3. Place wearing course within 24 hours of placing and compacting binder course. When binder course is placed more than 24 hours before placing wearing course, clean surface and apply tack coat before placing wearing course.
4. Place wearing course to thickness indicated on Contract Drawings.
5. Compact each course by rolling to specified density. Do not displace or extrude paving from position. Hand compact in areas inaccessible to rolling equipment.
6. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

D FIELD QUALITY CONTROL

1. Hot Mix Asphalt Paving Mix Temperature: Measure temperature at time of placement.
2. Hot Mix Asphalt Paving Thickness: ASTM D3549; test one core sample from every 1,000 square yards compacted paving.
3. Hot Mix Paving Density: ASTM D2950 nuclear method; test one location for every 1,000 square yards compacted paving.
4. Field testing may be waived at the sole discretion of the Engineer.

D. TOLERANCES

1. Pavement in area of handicap accessible spaces shall have a maximum slope of 1:48 in any direction.
2. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.
3. Scheduled Compacted Thickness: Within 1/4 inch.
4. Variation from Indicated Elevation: Within 1/2 inch

E. Pavement Repair:
1. Saw edges of existing pavement to provide a vertical bonding face as indicated on the Contract Drawings.
2. Grind surface course 12 inches on either side of repair.
3. Apply a tack coat to the ground edges.
4. Apply hot mix pavement of the same type and thickness of that being repaired.
5. Roller compact both surfaces, compacting the final wear course to meet existing pavement surfaces.

END OF SECTION

SECTION 02800

SEEDING AND MULCHING

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan and Erosion and Sediment Control Plan shall apply to the work specified in this Section.

C. All work performed under this specification shall be performed in accordance with the Maine Department of Environmental Protection (MEDEP) Maine Erosion and Sediment Control Best Management Practices (BMPs) (most recent version).

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Erosion Control: Section 02220

C. Erosion and Sedimentation Control Details as shown on the Contract Drawings

D. Contract Drawings; Erosion and Sedimentation Control Detail Sheet

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to perform seeding and mulching work in conformity with the contract drawings and as specified herein**.** Vegetative soil shall receive seed, fertilizer, lime, and mulch per these specifications**.**

1.04 QUALITY CONTROL:

A. Codes and Standards: Perform work in compliance with applicable requirements of governing authorities having jurisdiction.

B. Testing and Inspection Service: The Contractor shall employ a testing laboratory acceptable to Engineer to perform off-site soil testing of materials at point of source which are contractor supplied. The Contractor shall perform the following analysis on vegetative soil used for landfill construction.

1.05 QUALITY ASSURANCE: If subcontracted, subcontract the seeding work to a single firm specializing in landscape work or as approved by the Engineer.

A. Source Quality Control:
   1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.
   2. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable or as further specified.
   3. The vegetative soil may not be obtained from properties where biosolids were applied.
   4. Grass Seed: All seed shall be certified as to mixture, germination, and purity, as being in conformity with the following requirements:

a. Each variety of seed shall have a percentage of germination of not less than 80, a percentage of purity of not less than 85, and shall have not more than one percent of weed content.
b. All seed shall be from the same or previous year's crop unless recent tests by an approved testing agency demonstrate that older seed meets the above requirements.

5. Inspection: The Engineer reserves the right to inspect any plant materials either at the place of growth or at the site before planting, for compliance with requirements for name, variety, size, and quality.

1.06 SUBMITTALS:

A. Certification: For information only, submit certificates of inspection as required by governmental authorities, and manufacturer's or vendors analysis for soil amendments and fertilizer materials**.** Submit other data substantiating that materials comply with specified requirements at the request of the Engineer.
1. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species at the request of the Engineer**.**

B. Vegetative Soil Source: Before delivery of vegetative soil, the Contractor shall provide a submittal that includes the location of the proposed source, names and addresses of owners, depth to be stripped, crops grown during past two years. The source may not be a former biosolids application site.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer**.** Protect materials from deterioration during delivery, and while stored at the site.

1.08 JOB CONDITIONS: Contractor must examine the subgrade, verify the elevations, observe the conditions under which work is to be performed and notify the Engineers of unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

A. Proceed with and complete the landscape work as rapidly as portions of the site become available, working within the required seasonal limitations**.**

B. Seeding Seasons: Unless variance is requested in writing and approved by the Engineer, seeding shall be done within the following dates:
1. Permanent Seeding: April 26 – September 15
2. Temporary Seeding: September 16 – April 25
3. Dormant Seeding: November 16 – April 25

PART 2 PRODUCTS

2.01 SOIL

A. Vegetative Soil: Vegetative Soil shall be free of particles in excess of 3-inches in the largest dimension, loose, friable and shall be free from refuse, large stones, clods, roots, or other undesirable foreign matter. It shall be reasonably free of weeds, roots, or rhizomes.

B. Vegetative Soil Testing:
Submit representative soil samples of vegetative soil to qualified soil testing laboratory for standard soil analysis (Nitrogen, Potassium, and Phosphorus) to ascertain what

amendments may be necessary to obtain proper tilth, nutrient characteristics, and pH balance in accordance with the following. Provide amendments as necessary at rates indicated on the soil test in accordance with the following criteria:

pH range: 6.0 to 7.5.
Phosphorus/Potassium: Low to Medium range
Soluble Salt: Not greater than 500 ppm

2.02 SOIL AMENDMENTS:

A. Soil Amendments per agronomic soil testing or as follows:
   1. Lime:
      a. Agricultural Ground Limestone: Agricultural ground limestone shall containing not less than 80% of total carbonates, ground so that not less than 100% passes a 10-mesh sieve, not less than 90% passes a 20-mesh sieve, and not less than 50% passes a 100-mesh sieve. Agricultural limestone may be shipped in containers or in bulk. Packaged material shall be delivered in the manufacturers standard containers. The containers shall be new and so constructed to assure safe arrival at the site. The net weight of the content shall not exceed 100-pounds per container. The manufacturers name, a guaranteed analysis, and net weight shall appear on each container. Bulk shipments shall be accompanied by certificates stating manufacturers name, weight, and guaranteed analysis.
      b. Liquid Lime: Liquid lime may be substituted for agricultural limestone when seeding hydraulically. Lime shall be water soluble and contain Elemental Calcium at 19-percent and have Nitrogen 15.5% of which 1% is from Ammoniacal Nitrogen and 14.5% is from Nitrate Nitrogen. Liquid lime shall be delivered in unopen containers. The containers shall include the manufacturers name, guaranteed analysis, and quantity.

   2. Fertilizer: Fertilizer shall contain available elements in conformity with the standards of the Association of Official Agricultural Chemists**.** The fertilizer shall be furnished in unopened bags and shall indicate the weight, contents and guarantee analysis shown thereon or on a securely attached tag, as applicable**.** The selection of fertilizer shall be based on the minimum phosphorus required by the soil as determined by the chemical analysis of soil samples**.** The Contractor shall be responsible for sampling and testing vegetative soil to determine amount of phosphorus required for vegetative growth.
      a. Granular fertilizer shall be a commercial grade fertilizer with percentages recommended by Soil Testing or containing the following percentages of available nutrients by weight:

Nitrogen	23 percent (at least 50 percent slow release)
Phosphoric Acid	As determined by Soil Testing
Potassium	12 percent (40 percent from potassium magnesium sulfate)
Iron	1 percent from iron sulphate

      b. Water soluble fertilizer shall be completely soluble in water, without chlorides or carbonates, containing a color or dye, and contain the following percentages of available nutrients by weight.

Nitrogen	20 percent
Phosphoric Acid	as Determined by Soil Testing
Potassium	20 percent

      c. The Engineer may approve the use of other fertilizers providing they are applied in an acceptable form and meet the total nutrient quantities required for the site.

2.03 GRASS MATERIAL:

A. Grass Seed: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America**.** Provide seed of the grass species, proportions, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified**.** Apply seed of the specified mixture and at the rate indicated on the Contract Drawings.

2.04 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Mulch for Seeded Areas:
   1. Hay or straw mulch shall be used in all mulch applications unless otherwise approved by the Engineer. Hay and straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds and other undesirable material**.** No material shall be used which is too wet, decayed, or compacted as to inhibit even and uniform spreading**.** No chopped hay, grass clippings, or other short fibered material shall be used unless directed. Application rate shall be as indicated on the Contract Drawings.
   2. Cellulose fiber mulch shall consist of wood, recycled paper (35-percent maximum), or humus cellulose fiber containing no materials which will inhibit seed germination or plant growth**.** Sufficient non-toxic water-soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution**.** Cellulose fiber mulch shall be supplied in moisture resistant, sealed bags marked with the manufacturer's name, the air-dry weight, and composition of the contents. Cellulose fiber mulch shall not be applied after August 15.

B. Mulch Binder: Material for mulch binder shall be a commercially developed product for the tacking of hay or straw. Binder shall be free of refuse, physical contaminants, materials toxic to plant growth or asphalt. Paper fiber mulch may be used as a binder at a rate of 5 lb/unit and shall be dyed green. Paper fiber mulch shall be applied hydraulically or Engineer approved equal.

PART 3 - EXECUTION

3.01 SEEDING:

A. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

B. Rates of Application: Rates of application for limestone, fertilizer, and grass seed shall be in accordance with the Contract Drawings.

C. The hydraulic spray method shall be used for seeding all areas unless alternative methods are approved by the Engineer.

D. Seed, Lime, Fertilizer:
   1. All seed, lime, and fertilizer shall be mixed on-site in the presence of the Quality Assurance Resident Engineer (QARE) and bag tags shall be given to the QARE to confirm that the proper amounts of each are added to the soil.
   2. The Contractor shall apply seed, fertilizer, lime, mulch, and tack in the following order:
      a. Apply seed, lime, fertilizer per hydraulic spray method to tracked slopes as indicated below.
      b. Apply hay or straw mulch as indicated below.
      c. Apply mulch binder per hydraulic spray method as indicated below.

E. Application Procedure:
   1. Hydraulic Spray Method: The hydraulic spray method of sowing seed shall be done with an approved machine operated by a competent crew**.** Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the

materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Engineer finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to be abandoned and the balance of the work done as specified under another method.

F. Mulching:
   1. Hay or straw mulch shall be spread evenly and uniformly over any designated areas or as directed by the QARE in the field so to avoid damage to seeded areas. Unless otherwise directed, mulch shall be applied at the rate of 2 to 3 tons per acre or 3 bales (90 to 130 lbs) per 1,000 square feet. Mulch shall cover the ground surface but heavy application of mulch shall be avoided. Lumps and thick mulch material shall be thinned.
   2. Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an acceptable mulch binder at a rate recommended by the manufacturer. Application of a concentrated stream of mulch binder will not be allowed. Other methods of anchoring mulch may be used subject to the approval.
   3. Cellulose fiber mulch shall be applied as waterborne slurry. The cellulose fiber and water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at the rate of not less than 60 pounds of mulch material per 1,000 square feet unit of area.

   4. Cellulose fiber mulch may be mixed with the proper quantities of seed, fertilizer, and agricultural limestone as required, or may be applied separately the next day after seeding.

G. Erosion Control Blanket:
   1. Erosion control blanket shall be placed at locations indicated on Contract Drawings. The anchoring of the blanket shall be as indicated by the manufacturer or as shown on the Contract Drawings.

3.02 MAINTENANCE AND ACCEPTANCE:

A. Seeded Areas:
   1. Maintain seeded areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, acceptable grass growth, free of eroded or bare areas.
   2. Permanent Seeding, April 26 to September 15, Inclusive: The Contractor shall maintain each seeded area until acceptance of the individual area. Maintenance shall consist of providing protection by erecting necessary signs and barriers and by repairing damaged areas as directed. Damaged areas and areas which do not produce a satisfactory stand of grass shall be repaired to re-establish the condition and grade of the area prior to the original seeding and then re-fertilized, reseeded, and re-mulched as specified to produce satisfactory results.
   3. Areas fertilized and seeded by the hydraulic method will be accepted only upon attainment of a reasonable thick uniform stand of not less than 90 percent coverage of permanent grasses, free from sizeable thin or bare spots.
   4. Temporary and Dormant Seeding, September 16 to April 25, Inclusive: Areas not seeded or which do not obtain satisfactory growth by September 16, will be seeded with Winter Rye or mulched at rates previously specified herein. After November 1, or the first killing frost (whichever comes first), disturbed areas shall receive dormant seeding (at double the regular seeding rate) in accordance with MEDEP BMPs and the Contract Drawings.
   5. Seeded areas will be accepted only upon attainment of a reasonably thick, uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots.

3.03 CLEANUP AND PROTECTION: During landscape work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.

A. Protect landscape work and materials from damage due to landscape operation, operations by other contractors, and trades and trespassers**.** Maintain protection during installation and maintenance periods**.** Treat, repair, or replace damaged landscape work as directed.

3.04 RESTORATION: All paved, sod covered, or planted areas, structures, and substructures not specifically provided for in the contract disturbed by the Contractor during the execution of the work shall be restored by the Contractor, in a manner satisfactory to the Engineer, to their original conditions at no additional cost to the Owner.

END OF SECTION

DIVISION 3
CONCRETE

SME
SEVEE & MAHER
ENGINEERS

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Precast Concrete Structures: Section 02570

C. Leachate Collection Pump Station: Section 02732

1.03 REFERENCES

A. ACI 117 Specifications for Tolerances for Concrete Construction and Materials

B. ASTM A82 Standard Specifications for Steel Wire, Plain, for Concrete Reinforcement

C. ASTM C33 Standard Specification for Concrete Aggregate

D. ASTM C94 Standard Specification for Ready Mix Cement

E. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by Pressure Method

F. ASTM C143 Standard Method for Determining Slump of Hydraulic-Cement Concrete

G. ASTM C150 Standard Specification of Portland Cement

H. ASTM A615 Standard Specifications for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

1.04 DESCRIPTION:

A. Furnish and install cast in place concrete shown on the Drawings and specified herein.

1.05 SUBMITTALS

A. The Contractor shall submit the concrete mix design to use for the project.

1.06 QUALITY ASSURANCE:

A. All concrete shall conform to applicable requirements of the ACI Standards for design and construction of concrete work.

B. All concrete shall be minimum 4,000 psi at 28 days unless otherwise specified.

1.07 SHOP DRAWINGS:

A. Provide Shop Drawings in accordance with Section 01300.

1.08 TESTING:

A. Sampling and testing will be at the discretion of the Owner and Engineer.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Concrete:
   1. Cement:
      a. Portland cement conforming to ASTM C150, as revised, Type II.
      b. Use an air entraining admixture conforming to ASTM C260.
      c. Maximum Water-Cementitious Materials Ratio-0.45
   2. Aggregate:
      a. Conform to ASTM C33, as revised.
      b. Sand: Medium with a fineness modulus of 2.3 to 3.1.
      c. Coarse Aggregate: Not to exceed 1-1/2 inches for mass concrete and 3/4 inch for reinforced slabs.
   3. Water: Potable supply.
   4. Mixed Concrete:
      a. Slump limit per ASTM C143 of 2 to 4 inches before adding high-range water-water-reducing agents or plasticizing admixture plus or minus 1 inch.
      b. Air Content: 5-7 percent per ASTM C231 except troweled finished floor not to exceed 3 percent.
   5. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

B. Reinforcing Steel:
   1. As herein used, designates the bars, and rods incorporated in the concrete, but does not include any structural shapes.
   2. Fabrication and placing of all reinforcing steel shall conform to the requirements of the American Concrete Institute, "Building Code Requirements for Reinforced Concrete" (ACI-318).
   3. Reinforcing Steel: Round, deformed steel bars of the intermediate grade Billet Steel with deformations to ASTM Specification A615.
   4. Wire: Conform to the requirements of the "Standard Specifications for Cold-Drawn Steel Wire for Concrete Reinforcement," ASTM Specification A82.
   5. Bars: Cold bent and accurately formed to the dimensions indicated on the Drawings.
   6. Stirrups and Ties:
      a. Bent around a pin having a diameter not less than two times the minimum thickness of the bar.
      b. Bends for Other Bars: Make around a pin having a diameter not less than six (6) times the minimum thickness of the bar.
      c. Do not straighten or re-bend in a manner that will injure the material.
      d. Bars with kinks, or bends not shown on the drawings, shall not be used.
      e. Heating of any bars will be permitted only when the entire operation is approved by the Engineer.

PART 3 EXECUTION

3.01 INSTALLATION:

A. Forms:
1. Design, furnish and erect as necessary to install concrete.
2. Of sufficient strength and rigidity to resist, without bulging, the weight of the concrete, and smooth and free of all irregularities.
3. Form material: Suitable for forms and adequate to retain the concrete to the designed dimensions; tied, clamped, and bolted together as necessary, to prevent the leakage of mortar.
4. Falsework: Rigidly braced against lateral movement, in such a manner that accurate alignment will be assured.
5. Provide for all openings, beams, rebates, chases, slabs, etc., as may be required.
6. Set all sleeves, inserts, etc., for other trades as furnished by them, and in the locations designated by them, and hold by substantial templates.
7. Properly treat with form coating.
8. Forms for Exposed Concrete: Surfaces equal in smoothness to metal or new plywood and joints tightly fitted.
9. Construct all wall forms with clean-out panels, suitably located along the base.
10. Thoroughly clean of foreign material just prior to the placement of concrete.
11. Fit all external corners of exposed concrete with 3/4-inch chamfer strips, except where specifically dimensioned on the drawings.
12. Remove only when approved by the Engineer, and only when the concrete has obtained at least 60 percent of the design strength and is also sufficient strength to support its own weight and the live loads to be placed thereon including backfill.
13. Repair any damage caused by removal of forms.

B. Placement of Reinforcing Steel:
1. When delivered to the job site, pile on wood blocking off the ground and away from earthwork or trenching operations, and cover if necessary to prevent rusting or splashing with mud.
2. Before being positioned, remove loose mill and rust scale and any coatings, including ice, which would destroy or reduce bond with the concrete.
3. Where there is delay in depositing concrete, reinspect, and clean when necessary.
4. Placement of Bars: In accordance with the "Recommended Practice for Placing Reinforcing Bars," as published by the Concrete Reinforcing Steel Institute.
5. Accurately position and secure against displacement by using annealed iron wire ties, or suitable clips, and support by suitable approved metal supports, bolsters, chains, spacers, or hangers.
6. Methods of Support: Approved prior to placement of reinforcing steel.
7. Brick supports for reinforcement in slabs laid on grade: Not permitted.
8. Maximum spacing of ties at intersections: Sixteen (16) inches.
9. Splices: Lap splice with bars placed in contact and wire securely. Minimum overlap of splices shall be 40 times the diameter of the bars.
10. Proposed splices not shown on the drawings. Obtain the Engineer's approval as to location and character of the splices.
11. Avoid splices at points of maximum stress, and if approved at those locations, lap-weld or form as otherwise directed.

C. Depositing Concrete:
1. Do not place until forms and reinforcing are inspected by the Engineer, but such does not constitute a review of structural adequacy of the forms which shall be the responsibility of the Contractor.

2. Place mass concrete where it is to remain immediately after mixing, in no case later than 40 minutes after mixing, distributing it over the area to be covered in layers as directed by the Engineer.
3. Take special care to spade and otherwise thoroughly work the concrete at and near the base of the walls.
4. Work along faces of forms to give a smooth surface, free from voids, or loose aggregate.
5. Limited vibrating may be permitted under the supervision of the Engineer.
6. No segregation will be allowed.
7. Provide spouts or suitable openings in forms where required.
8. Conduct vibration by internal type mechanical vibrators operated only by experienced employees.
9. Thoroughly rod and tamp about embedded materials to secure proper adhesion and to avoid displacement of such materials.

D. Curing:
1. Accomplish by keeping the work wet and covering the concrete surfaces, after stripping and finishing, with wet burlap or some other similar material which will hold water.
2. Keep wet continuously for at least seven (7) days.
3. At no time during these 7 days expose directly to the sun and wind.
4. Accomplish to the complete satisfaction of the Quality Assurance Resident Engineer (QARE).

E. Protection:
1. Heat water and/or aggregate and/or the concrete and/or protect against freezing, to the satisfaction of the Engineer.
2. Do not place on a subgrade that is frozen or contains frozen materials.
3. After being deposited in the forms, keep at a temperature of 50°F, or more, for at least five (5) days.

F. Concrete Sealing:
1. Apply a clear, penetrating silane/siloxane concrete sealer to all exposed concrete surfaces of the leachate unloading pad in accordance with the manufacture's written instruction. (Sikagard 440-HZ od equal)
2. Sealer shall provide resistance to water intrusion, chloride penetration, freeze thaw deterioration, and chemical attacks associated with leachate handling operations
3. Sealer shall be VOC-compliant and shall not alter the appearance of slip resistance of the concrete surface
4. Apply the sealer after the concrete has cured for the period recommended by the manufacturer and prior to placement into service

PART 2 - INSPECTION

G. Notify the QARE of form stripping so as to inspect the concrete work before any sealing, finishing, or backfill are allowed.

H. Replace all defective concrete work with suitable work or repair to the satisfaction of the QARE.

END OF SECTION

SECTION 03420

PRECAST CONCRETE STRUCTURES
GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings, general provisions of Contract, and supplementary general conditions apply to the work specified under this Section.

B. The requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Erosion Control: Section 02220

C. Pipe Installation: Section 02450

D. Cast-in-Place Concrete: Section 03300

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to construct manholes or catch basins, in conformity with the contract drawings and as specified herein.

1.04 REFERENCES:

A. ASTM A48 Standard Specifications for Gray Cast Iron Castings

B. ASTM C32 Standard specification for Sewer Manhole Brick (Made from Clay or Shale)

C. ASTM C478. Standard Specification for Circular Precast Reinforced Concrete Manhole Sections

D. ASTM C858 Standard Specification for Underground Precast Concrete Utility Structures

E. ASTM C990 Standard Specification for Joints of Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

F. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure

G. ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

1.05 SUBMITTALS: The Contractor shall submit to the Engineer electronic copies of shop drawings of all precast units. Manufacturer's information shall be submitted for joint sealants and waterproofing. Manufacturer shall provide anti-floatation design shop drawings and calculations, including any extended base slabs as necessary, for proposed manholes. Manufacturer shall assume groundwater levels equal top of ground elevations and provide for a 1.2 factor of safety against floatation.

PART 2 MATERIALS

2.01 PRECAST MANHOLE AND CATCH BASIN SECTIONS: Precast sections shall be manufactured in accordance with the latest ASTM C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections. Precast manholes and catch basins shall be manufactured with a minimum of 4,000 psi concrete and reinforced for H-20 or HS25 loading.

2.02 PRECAST VAULTS OR UTILITY STRUCTURES: Precast vaults and utility structures shall be manufactured in accordance with the latest version of ASTM C858 Standard Specification for Precast Concrete Utility Structures. Precast vaults shall be manufactured with a minimum of 4,000 psi concrete and reinforced for H-20 loading.

2.03 MORTAR: Cement mortar shall be prepared in the following manner:

A. The cement shall be Type II. The mix shall be one (1) part cement to three (3) parts clean, well graded, hard, durable sand. Hydrated lime may be added to the mixture in an amount not to exceed 15% by weight of the cement. The amount of water shall be only the amount necessary to make a workable mix.

2.04 BRICK: Brick for manholes shall meet the latest version of ASTM C32 Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).

2.05 PRECAST DRYWELL: Precast drywell shall be an American Concrete No. 246160 or Engineer approved equal. No cover is required.

2.06 WATERPROOFING: Waterproofing for manholes shall be either of the following:

A. Asphalt conforming to ASTM D41.

B. Cement base coating suitable for brush coat application.

2.07 FRAMES AND COVERS:

A. All castings shall be made of clean, even grain, gray cast iron or aluminum vault doors. The castings shall be smooth, true to pattern and free from projections, sand holes, warp, and other defects which would interfere with the use of, or impair the serviceability of the castings.

B. The horizontal surface of the cover seat and under surface of the cover which rests upon the cover seat shall be machined on all frames and cover intended for vehicular traffic. After machining it shall be impossible to rock any cover after it has been seated on its associated frame.

C. The iron used for castings shall conform to ASTM A48 for Class 35 gray iron (or greater).

D. Unless otherwise shown on the Drawings, all castings shall be coated with bituminous coating.

E. Manufacturer's name and catalog figure number must be cast on each frame and cover. The work SEWER or STORM must be stamped on the manhole covers as appropriate.

F. Catch basin grates shall be as shown on Contract Drawings or approved equal.

2.08 BUTYL SEALANT

A. Butyl sealant used to seal precast concrete structures including manholes, catch basins and pump stations shall meet , the latest version of ASTM C990.

B. Each manhole, catch basin or pump station shall utilize two (2) strips of sealant between sections.

C. Butyl Sealant shall be as indicated on the Contract Drawings or approved equal.

PART 3 EXECUTION

3.01 FABRICATION:

A. The tongue and groove of manhole and catch basin sections shall be formed of concrete so as to receive a premolded butyl joint sealer. Sections shall be set so as to be vertical and in true alignment.

B. Each section of the precast manhole and catch basin shall have two (2) holes for the purpose of handling and installing. These holes shall be tapered and shall be plugged with mortar after installation.

C. Holes for pipes shall be cast in the base section so that there is a clear distance of 4-1/2" minimum between the inside bottom of the base section and the pipe invert.

D. The joint for the pipe at the base section shall be as indicated on the Contract Drawings or shall consist of (a) rubber gasket anchoring rings cast into the concrete base and hard rubber wedge driven in to compress the gasket around the pipe: or (b) flexible rubber sleeve cast into the base section; or other joint as approved by the Engineer

3.02 INSTALLATION:

A. General:
   1. The excavation shall be properly dewatered while placing bedding material and setting the base or placing concrete. Water stops shall be used at the horizontal joint of cast-in-place manholes and catch basins.
   2. Inlet and outlet stubs shall be connected and sealed as shown on the Drawings.
   3. Barrel sections and cones of the appropriate combination of heights shall then be placed, using manufacturer's recommended procedure for sealing the horizontal joints, and as shown on the Contract Drawings.
   4. A leakage test shall then be made as described in "Leakage Tests."
   5. Following satisfactory completion of the leakage test, the frame and cover shall be placed on the top or some other means of preventing accidental entry by unauthorized persons, children, animals, etc., until the Contractor is ready to make final adjustment to grade.

B. Waterproofing: The waterproofing of the exterior surfaces of manholes shall be one of the following methods:
   1. Bituminous Coating: After the concrete or cement plaster has set, two coats of an approved bituminous waterproofing material shall be applied to all outside surfaces of manholes. Waterproofing material shall be applied by brush or spray at approximate rate of 70 sq. ft./gal., in accordance with the manufacturer's instructions. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first.
   2. Cement Base Coating: Cement base coatings delivered in sealed containers shall be mixed in accordance with the manufacturer's recommendations and applied with a stiff brush in 2 coats. Each coat shall be applied at the rate of 2 lb. per sq. yd.

C. Frames and Covers: Frames shall be set on mortared brick courses true to grade and concentric with the opening. All voids beneath the bottom flange and in the brick courses shall be completely filled to make a watertight fit. a ring of mortar at least 1 inch thick shall be placed around the outside of the bottom flange, extending to the edge of the manhole all around its circumference. The bricks and mortar shall not extend beyond the top of precast concrete cone section.

3.03 ALTER EXISTING MANHOLE, CATCH BASIN, OR PUMP STATION: When altering existing catch basins, manholes or pump stations, the structure shall be dismantled sufficiently to allow reconstruction in accordance with the applicable requirements as shown on the Drawings for

complete pump station and manholes. Each altered manhole or pump station shall be cleaned of all accumulated silt, debris, or foreign matter prior to final acceptance of work.

3.04 VACUUM LEAKAGE TESTS:

A. General:
   1. To be observed by the Engineer on each sewer manhole.
   2. A vacuum test made as described below. Manhole to pipe connection must be a flexible connector to perform this testing.

B. Preparation for Test:
   1. After the manhole has been assembled in place, fill lifting holes and point with an approved non-shrinking mortar.
   2. Perform test prior to placing the shelf and invert and before filling and pointing the horizontal joints, and before backfilling.
   3. If the groundwater table has been allowed to rise above the bottom of the manhole, it must be lowered for the duration of the test.
   4. Plug pipes and other openings into the manhole and the plugs braced to prevent blow out.

C. Test Procedure:
   Vacuum Testing shall be in accordance with ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill
   1. Use manhole vacuum test equipment equal to NPC Systems, Inc., Milford, New Hampshire or Engineer approved equal.
   2. Set tester in place.
   3. Inflate compression band to seal base to structure.
   4. Draw a vacuum of 10-in. Hg.
   5. Close the valve.
   6. Acceptable test: pressure drop of as much as 1 in. Hg is allowable in the time listed on the attached table.
   7. If leakage occurs fill those points with non-shrink grout, allow to set and retest.
   8. Rejected Manholes: Disassemble, reconstruct, or replace as directed by the Engineer.

D. Backfilling: The test may be conducted either before or after backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Quality Assurance Resident Engineer that the water table is below the bottom of the manhole throughout the test.

END OF SECTION

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS
30 TO 120 IN. IN SECONDS

Depth (ft)	Diameter (inch)																
	30	33	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120
	Time, in seconds																
<4	6	7	7	9	10	12	13	15	16	18	19	21	23	24	25	27	29
6	9	10	11	13	15	18	20	22	25	26	29	31	34	36	38	41	43
8	11	12	14	17	20	23	26	29	33	35	38	41	45	48	51	54	57
10	14	15	18	21	25	29	33	36	41	44	48	52	56	60	63	67	71
12	17	18	21	25	30	35	39	43	49	53	57	62	67	71	76	81	85
14	20	21	25	30	35	41	46	51	57	62	67	72	78	83	89	94	100
16	22	24	29	34	40	46	52	58	67	70	76	83	89	95	101	108	114
18	25	27	32	38	45	52	59	65	73	79	86	93	100	107	114	121	128
20	28	30	35	42	50	53	65	72	81	88	95	103	111	119	126	135	142
22	31	33	39	46	55	64	72	79	89	97	105	114	122	131	139	148	156
24	33	36	42	51	59	64	78	87	97	106	114	124	133	143	152	161	170
26	36	39	46	56	64	75	85	94	105	114	124	134	144	155	164	175	185
28	39	42	49	59	69	81	91	101	113	123	133	145	155	167	177	188	199
30	42	45	53	63	74	87	98	108	121	132	143	155	166	178	189	202	213

DIVISION 13
SPECIAL CONSTRUCTION

SME
SEVEE & MAHER
ENGINEERS

SECTION 13240

HIGH DENSITY POLYETHYLENE MANHOLE PUMP STATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any), apply to the work specified in this Section.

B. The requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

C. "Standard Practice for Design of High-Density Polyethylene (HDPE) Manholes for Subsurface Applications" ASTM F1759-97(2018);

1.02 DESCRIPTION: The work of this Section includes furnishing all labor, materials, tools, equipment, and incidentals necessary to furnish and install one dual containment HDPE leachate pumping station, as specified herein and as shown on the Drawings.

1.03 RELATED WORK SPECIFIEDELSEWHERE:

A. Site Preparation: Section 02100

B. Earthwork: Section 02200

C. Erosion Control: Section 02220

D. Pipe Installation: Section 02450

E. Ductile Iron Pipe and Fittings: Section 15102

F. Valves and Pipe Accessories: Section 15110

1.04 DESIGN CRITERIA: The materials and equipment covered by this specification are intended to be standard materials and equipment of proven ability. Equipment shall be designed and constructed in accordance with the best practice of the industry and shall be installed in accordance with the manufacturer's recommendations and the Contract Documents. The specifications call attention to certain features but do not purport to cover all details entering into the construction of the equipment.

1.05 PRODUCT HANDLING: All materials and equipment shall be shipped, stored, handled and installed in such a manner as not to degrade quality, serviceability, or appearance. The equipment shall be stored in a clean, dry location free from construction dust, precipitation, and excess moisture. If stored for more than two weeks, the equipment shall receive all maintenance considerations required by the manufacturer for proper storage of the equipment.

1.06 GUARANTEE: All equipment shall be guaranteed against defects in material and workmanship for a period of one year from date of Owner's final inspection and acceptance to the effect that any defective equipment shall be repaired or replaced without cost or obligation to the Owner.

1.07 SUBMITTALS: Shop drawings, brochures, and samples shall be submitted for all items to be furnished in accordance with the provisions of the General Conditions. Submittals shall include at least the following:

A. Shop Drawings: A complete set of drawings shall be supplied to insure successful installation and operation of the control system. The shop drawings shall consist of all of the following:

1. Sufficient detail to evaluate compliance with these specifications.
2. A detailed component list including manufacturer and catalog number.
3. A custom wiring diagram for this specific application to facilitate and insure accurate field connections to the control panel by electrical installation personnel.
4. A description of operation for the control system.
5. An enclosure dimension print.

B. Brochures and/or catalog cuts.

C. Performance curves.

1.08 QA/QC Certification:

A. The manhole supplier shall submit certification that the HDPE material meets the specifications.

B. The fabricator of the manholes shall submit drawings showing the position of the inlets, outlets, and overall dimensions along with any other special features such as manways, ladders, etc.

C. The fabricator shall submit data indicating that the manholes meet the requirements of ASTM F1759, “Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. The manhole should be proven to have acceptable design for the following areas:

1. Ring compressive strain
2. Combined ring compressive and ring bending strain
3. Ring buckling
4. Axial strain
5. Axial buckling
6. Thickness of the bottom based on depth and groundwater. Thickness should be based on acceptable stress and deflection amounts.
7. Manhole flotation.

D. Calculations supporting these requirements will be part of the submittal package.

E. The fabrication technician shall perform work in accordance to butt fusion of high density polyethylene per ASTM D2657 and for extrusion and hot air welding per ASTM C1147. The fabricator shall submit the written quality assurance program used during fabrication of the manholes. The fabricator may be required to submit their overall QA/QC program for fabricating thermoplastic structures, the welding certification program for the fabrication technician per ASTM C1147 and the facility safety program.

F. The manholes and pipe shall be tested with water or air. The structure shall be determined to be leak free before shipping. A written certification shall be sent to the engineer certifying the manholes are leak free. The test results shall become part of the submittals. An identification plate indicating the job number, testing data, when built and by whom shall be attached to the manhole.

1.09 DESIGN CONDITIONS: The dual containment pump station shall be of high density polyethylene (HDPE) construction, complete with two leachate pumps, motors, piping and valves, entrance hatch, and other necessary appurtenances. All electrical and instrumentation components, pumps and valves are to be supplied and installed by Maine Electric Company, Inc.

PART 2 – PRODUCTS

2.01 HDPE MANHOLE

A. HDPE Material Specifications: The HDPE material supplied under this specification shall be high density, high molecular weight. The HDPE material shall conform to ASTM D3350-02 with minimum cell classification values of 345464C. Earlier versions of this specification will not be accepted.

B. Physical Properties of HDPE Compound:

1. Density: The density shall be no less than 0.955 gms/ccm as referenced in ASTM D1505.
2. Melt Index: The melt index shall be no greater than 0.15 gms/10 minutes when tested in accordance with ASTM D1238-Condition 3.2.3.
3. Flex Modulus: Flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D790.
4. Tensile Strength at Yield: Tensile strength shall be 3,200 to less than 3,500 psi in accordance with ASTM D638.
5. Slow Crack Growth Resistance shall be per ASTM F1473 (PENT. Test). The results shall be greater than 100 hours.
6. Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D2837.

C. HDPE Manhole Construction:

1. The HDPE pump station shall be constructed of HDPE pipe with a nominal ID of 84 inches. The service conditions will determine the class of pipe. Calculations must be provided to verify the wall thickness to be used.
2. The bottom thickness of the pump station will be determined in accordance with ASTM F1759. Calculations must be provided to justify the thickness of the bottom.
3. The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets unless impractical.
4. All manhole connections shall be butt fusion welded, electrofusion welded, or flanged connections.
5. Manholes shall be factory tested with water or with air. The hydrostatic test shall be conducted by filling the structure with water and checking for leaks. Minimum test duration will be one hour. If air is used, 2 to 5 psi shall be used for 30 minutes. Data showing the structure to be leak-free will be supplied. The owner or his representative may request to observe the test.
6. The ladders in the manholes, if specified, shall conform to OSHA requirements.
7. Top of the manholes shall be built to the requirements of the drawings. If air testing is required, flanged tops or manways will be required.
8. When large changes in temperature are expected restraints shall be designed as an integral part of the manhole by the fabricator/manufacturer to prevent strain at the inlets or outlets. These restraints shall be cast into a concrete collar around the pipe. Anti-flotation and/or anti-setting anchor collars, if required, shall be designed as an integral part of the manhole by the fabrication/manufacturer of the manhole. Shop drawings, approved by the specifying engineer, shall be required for restraints, anchors, collars, etc., that are designed by the manhole fabricator/ manufacturer prior to acceptance of the HDPE structure.
9. Internal piping and fittings shall be schedule 10 316L stainless steel

D. Entrance Hatch: The access hatches shall be Model APS 300 (or equal) of the size shown and installed as indicated on the Contract Drawings. The manufacturer shall guarantee proper operation and against defects in material or workmanship for a period of five years. The hatch shall be of aluminum as manufactured by U.S.F. Fabrication Inc, Hialeah, Florida, or equal. The hatch cover shall be single leaf, watertight self-draining type. Door leaf shall be ¼

inch thick aluminum diamond pattern plate capable of withstanding a 300 psf live load. The frame shall be extruded aluminum with an integral anchor flange and door seat on all four (4) sides. The door leaf shall be equipped with a minimum of two stainless steel hinges with stainless steel pins, spring operators to afford easy operation, and an automatic hold-open arm with release handle. Hatch shall be provided with recessed padlock hasp and padlock as manufactured by Corbin (No. 2863, 1/4W) or equal by Schlage (No. 912). Installation shall be in accordance with the manufacturers attached instructions. The access hatch shall be fitted with a permanently installed fall through prevention net system that is easily retractable to allow full access to the space. The safety net shall be manufactured from high strength polyester net that has been tested and certified to meet the current OSHA standard 1926.502 (c)(4)(i) drop test.

2.02 PRESSURE GAUGE:

A. Pressure gauges shall be furnished and installed on the discharge side of all leachate pumps.

B. Pressure shall be transmitted to the gauge by a (diaphragm seal) completely sealed fluid so as no leachate is in contact with the gauge. Fluid shall be a 50 percent mixture of ethylene glycol and water. Pressure gauges shall be protected from excessive line pressures by a stainless steel ball valve installed between the pressure sensor and the pressure gauge.

C. Pressure gauges shall be pressure type with an appropriate operating range and a 4-1/2 inch dial. Gauges shall be ½ inch bourbon tube type and calibrated in psi and the dial shall so indicate. Gauges accuracy of plus of minus ½ percent. Pressure ranges shall be 0 PSIG to 150 PSIG unless otherwise indicated.

2.03 DUAL CONTAINMENT PUMP STATION PUMPS:

The operating condition for each pump shall be 500 gpm at 36 feet TDH. Pumps shall be Flygt Model NP 3127 MT3~ Adaptive 439, with 187 mm. diameter impeller or equivalent. The motor shall be 7.5 HP, 60 Hz, 460V, 3 phase motor. The pump should be Flygts Industrial Grade version which contains cast iron construction with triple coat of epoxy, viton o-rings, 316SS lifting bail, 431SS shaft, 316SS threaded cable entry, and 316SS wear rings. The motor shall not be overloaded at any point on the pump curve above the static head. A 4-inch discharge connection and upper guide bar brackets shall be by Flygt.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Package Pumping Unit: Installation of the pumping station shall be done in accordance with written instructions provided by the manufacturer and as approved by the Engineer.

3.02 CONSTRUCTION PRACTICES:

A. Handling of Manholes: HDPE manholes shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE manholes shall be done in such a manner that there is no damage. Nylon slings are often used.

B. Flanged Connections: Flange adapters (where shown in the drawings) shall be attached to HDPE manhole inlets and outlets stubs during fabrication by butt fusion welding per ASTM D2657. A ductile iron back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern. Check the drawings for materials required for corrosive conditions.

1. Bolts shall be tightened in a “star pattern” to recommended torque values.
2. Bolts must be tightened a second time after 24 hours to ensure a positive seal.
3. Gaskets are not required on HDPE to HDPE connections.

C. Pipe Joining: HDPE pipe shall be joined using butt fusion. All butt fusion welds should be made as described in ASTM D2657. Electrofusion welding can be used for making pipe welds. Hot air and extrusion welding are not permitted for pipe joining. All pipes and fittings welds should be made using a McElroy Manufacturing DataLogger. A record of the temperature, pressure and graph of the fusion cycle shall be maintained by the Contractor.

D. Handling of Fused Pipe: Fused segments of pipe shall be handled so as to avoid damage to the pipe. Limit bending of the pipe welded to fittings or manholes. Nylon slings are preferred.

E. Equipment Mounting: Special provisions must be made when mounting pumps in an HDPE manhole.

3.03 DIRECT BURIAL INSTALLATION:

A. Trench Construction: The trench and trench bottom shall be constructed in accordance with ASTM D2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE manhole shall be installed on a stable base consisting of 12” of Class I materials compacted to 95 percent proctor density per ASTM F1759, Section 4.2. All required safety precautions for manhole installation are the responsibility of the contractor.

B. Embedment Materials: Embedment materials shall be Class I or Class II materials defined by ASTM D2321, Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.

C. Bedding of the manhole shall be performed in accordance with ASTM D2321, Section 7.2. Compaction shall conform to Sections 7.5 and 7.51.

D. Backfilling shall be done to conform to ASTM F1759, Section 4.2, “Design Assumptions”. This specification indicates that backfill shall extend at least 3.5 feet beyond the edge of the manhole for the full height of the manhole and extend laterally to undisturbed soils. Compaction shall be to 90 percent proctor density.

3.04 CLEANUP: Prior to startup and field testing, all foreign matter shall be removed from the pump chamber piping and pumps. Spillage of lubricants used in servicing the system shall be cleaned from all equipment and concrete surfaces.

3.05 MANUFACTURER’S SERVICES ANDSUPERVISION ANDTRAINING: The manufacturer shall provide the services of a factory trained, qualified representative to inspect the completed installation, make all adjustment necessary to place the system in trouble-free operation and instruct the operating personnel in the proper care and operation of the equipment. A minimum of three days shall be provided for installation, startup, and training.

3.05 LUBRICATION REQUIREMENTS: All lubricating oils required for the first year of operation shall be provided for each station.

3.06 FIELDTESTING: Each entire package pumping system shall be field tested as a system using clean fresh water prior to the acceptance of the station. The pumps shall be operated continuously at the design conditions for at least 15 minutes. All systems, controls, and sequences shall be operated and demonstrated as operating as approved. The Contractor shall perform all tests and shall be responsible for all necessary temporary connections, testing equipment, and

utilities and shall provide and dispose of all water used. A factory trained representative shall be present for the testing.

END OF SECTION

DIVISION 15
MECHANICAL

SME
SEVEE & MAHER
ENGINEERS

SECTION 15100

HDPE PIPE AND FITTINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. The requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Pipe Installation: Section 02450

C. Valves and Pipe Accessories: Section 15110

1.03 REFERENCES:

1. ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
2. ASTM D638 Standard Test Method for Tensile Properties of Plastics
3. ASTM D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30C and 30C with a Vitreous Silica Dilatometer.
4. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
5. ASTM D1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastomer
6. ASTM D1505 Standard Test Method for Density of Plastics by the Density-Gradient Technique
7. ASTM D1598 Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
8. ASTM D1603 Standard Test Method for Carbon Black Content in Olefin Plastics
9. ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
10. ASTM D2657 Guideline for Polyolefin Thermoplastic Butt Fusion Heat Welding"
11. ASTM D2837 Method for Obtaining Hydrostatic Design Basis for Thermal Plastic Pipe Materials
12. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
13. ASTM F1248 Standard Test Method for Determination of Environmental Stress Crack Resistance of Polyethylene Pipe (Withdrawn)
14. ASTM F1473 Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
15. Plastic Pipe Institute Technical Release 4 (PPI TR-4)

1.04 DESCRIPTION OF WORK:

A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install and test leachate force main pipes as shown on the Contract Drawings. Only the appropriate

portions of this section pertaining to the specific contract work identified in Section 01010 "Summary of Work", or as directed by the Engineer, will apply.

1.05 SUBMITTALS:

A. The Contractor shall furnish the name of the pipe and fittings manufacturer, to the Engineer prior to commencing the work. Pipe of the same manufacturer shall be used throughout the project.

B. The Contractor shall submit to the Engineer a Construction Schedule for pipe installation.

C. The Contractor shall submit manufacturer's technical product data including chemical resistance data and installation instructions for piping joints and fittings.

D. The Contractor shall submit the Quality Control Documentation as specified in Section 4.0 of the Quality Assurance/Quality Control (QA/QC) Plan, and, if required, a certificate from the pipe manufacturer certifying the product meets the requirements of this specification.

E. The Contractor shall submit to the Engineer documentation demonstrating the pipe welding technicians are certified by the Manufacturer to weld HDPE pipe. The Contractor shall provide the Engineer with butt-fusion procedures, pressures, and temperature for each size and class of pipe used. These procedures, pressures, and temperatures shall be used consistently throughout the project in accordance with the pipe manufacturer’s recommendations.

1.06 MANUFACTURER'S QUALITY ASSURANCE:

A. Pipe and fittings manufacturers shall have an established QA/QC program responsible for inspecting and testing incoming materials and outgoing products. At a minimum incoming polyethylene materials shall be inspected and tested for density per ASTM D1505, melt flow rate per ASTM D1238, and contamination. All incoming materials shall be certified by the supplier.

B. Pipe and fittings manufacturers shall have an established QA program responsible for assuring the long-term performance of materials and products. Representative samples of PE materials shall be tested against the physical property requirements of this specification. Each extrusion line and molding machine shall be qualified to produce pressure rated products by taking representative production samples and performing sustained pressure tests in accordance with ASTM D1598.

C. All outgoing products shall be inspected for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut. QC shall perform tests for density, melt flow rate, carbon content, and carbon dispersion. All fabricated fittings shall be inspected for fusion quality and alignment. The pipe and fitting manufacturer shall maintain internal QA/QC records and shall provide QA/QC information upon request of the Engineer.

1.07 PACKAGING DELIVERY AND HANDLING:

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

PART 2 - PRODUCTS

2.01 HDPE PIPE AND FITTINGS

A. Physical Properties:

Property	Unit	Test Method	Value
Material Listing	-	PPI TR-4	PE 4710
Cell Classification	-	ASTM D3350	PE 445574C
Density	g/cm^3	ASTM D1505	0.941 to 0.955
Melt Index	g/10 min	ASTM D1238	<0.15
Flexural Modulus	psi	ASTM D790	>110,000 and < 160,000
Tensile Strength (yield)	psi	ASTM D638	3,000-3,500
Slow Crack Growth Resistance	hours	ASTM F1473	100
Hydrostatic Design Basis	psi	ASTM D2837	1,600 @ 23° C
UV Stabilizer	% Carbon Black	ASTM D1603	2 to 3
Elastic Modulus	psi	ASTM D638	110,000 to <160,000
Thermal Expansion	1/° F	ASTM D696	8×10^{-5}
Molecular Weight Category	-	-	Extra High

B. General:

1. Materials used to manufacture pipe, fittings, and centralizers supplied under this specification shall be high density, extra high molecular weight polyethylene pipe. The pipe and fittings shall be designated PE 4710 using the cell classification system per ASTM D3350. The pipe and fittings shall be made from the same resin base that meets this specification and provides a minimum Hydrostatic Design Basis (HDB) of 1,600 psi as determined by ASTM D2837.
2. The HDPE pipe and fittings shall be produced by the same manufacturer, from identical materials that meet the requirements of this specification. Exceptions shall be pre-approved by the Engineer.
3. Density of base resin shall be within the limits of 0.941 to 0.955, ASTM D1505 (Test Methods).
4. The HDPE pipe manufactured from materials meeting the specifications of this section shall have an Environmental Stress Crack Resistance of no failures in 10,000 hours (ESCR: Fo >10,000) when tested in accordance with ASTM F1248.
5. Outside diameter of pipe shall conform to International Standard Organization (ISO) recommendations for outside diameters (IPS pipe size).
6. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
7. Perforated pipe shall be provided as indicated on the Contract Drawings. Perforations shall be oriented as shown on the Contract Drawings.
8. HDPE Fittings, molded or fabricated, shall have the same pressure rating and strength as the pipe to which joining is intended. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness specifications of ASTM F714 for the same size pipe to which it is joined. Dual-wall containment fittings shall be fabricated by the manufacturer of the pipe. The manufacturer shall de-rate the fittings used for this project, as necessary. Bends, tees, and wyes shall be manufactured by mitered fabrication and shall meet the pressure rating of the piping system (100 psi). The manufacturer shall have written specifications for all standard mitered fittings establishing QC criteria and tolerances. All dual-wall containment fittings shall have a QC label as approved by the manufacturer. Fitting markings shall include a production code from which the location and date of manufacture can be determined. Upon request, the manufacturer shall provide an explanation of his production code.

9. Centralizers shall be used to support the dual-wall conductor pipe inside the containment pipe and maintain the specified annulus between the conductor pipe and containment pipe in both dual-wall containment fittings and pipe runs. The centralizers shall allow for the passage of fluid flow in the event of conductor pipe failure. Centralizers shall be attached to both the conductor and the containment pipe. Centralizers shall be spaced as recommended by the pipe manufacturer. Spacing of the pipes and centralizers shall be described in the manufacturer's submittal and approved by the Owner's Representative.
10. Marking: Each standard and random length of pipe and fitting in compliance with this standard shall be clearly marked with the following information:
    a. ASTM Standard Designation
    b. Pipe Size
    c. Class and Profile Number
    d. Production Code
    e. Dimension Ratio
11. Dimensions: Pipe Size and DR Rating shall be as shown below:

4"X 8" Dual Containment Pipe	SDR 17 X SDR 17
6" X 10" Dual Containment Pipe	SDR 17 X SDR 17
8"X 12" Dual Containment Pipe	SDR 17 X SDR 17
12" Leachate Gravity Drain	SDR 17
4" Leachate Gravity Drain	SDR 17

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL:

A. Pipe may be rejected for failure to conform to Specifications for the following:
    1. Fractures or cracks sufficient to impair strength, durability, or serviceability of pipe.
    2. Defects indicating improper proportioning, mixing, or molding.
    3. Damaged ends.
    4. Contractor shall provide a pyrometer to record and verify the temperature of heating plate surface (at min of three locations) once every two hours. Maintain records of these temperature measurements including, temperature, date, time, and fusing technician, for the duration of the project. Provide the Engineer with a copy of the temperature measurements.

B. Acceptance of fittings, stubs, or other specifically fabricated pipe sections (e.g., butt-fusion joints) shall be based on visual inspection at the job site and documentation of conformance to these Specifications.

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

3.02 PIPE JOINTING

A. All materials shall be stored and handled in accordance with the manufacturer's recommendations.

B. All joints shall be made in a dry trench or area that is protected from adverse weather or dust, and in accordance with the manufacturer's recommendations and the best practices for class of pipe installed. The ends of the pipe shall be wiped clean with a dry cloth before making each joint.

C. Butt Fusion Joints:
    1. Pipes: Join to one another and to HDPE fittings by thermal butt-fusion in accordance with ASTM D2657 (Reapproved 2023). Dual-wall containment piping systems shall be

manufactured to allow for simultaneous joining with conventional fusion equipment without the use of an annular heating iron.
2. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe.
3. The Contractor shall utilize fusion equipment approved by the pipe manufacturer and personnel trained by the pipe manufacturer representative for all fusion welding.

D. Flange Jointing:
1. Use when connecting or transitioning to flanged steel pipe in manholes or pump stations.
2. Connect slip-on type 316 stainless steel backup flanges and nuts and bolts to flange adapters
3. Butt-fuse fabricated flange adapters to pipe.
4. Observe the following in the connection of flanged joints:
a. Align flanges or flange valve connection to provide tight seal. Provide gaskets if needed to achieve seal for flanged connections.
b. Make flanged connections according to Section 02450.

E. Electro-Fusion Joints:
1. Electro-fusion couplings shall be installed according to the manufacturer's specifications.
2. Joints using electro-fusion couplings shall be performed in the trench so as not to overstress the joint and achieve proper alignment.

F. Stainless Steel Repair Clamp Joints:
1. Stainless steel repair clamps shall be installed according to the manufacturer's specifications.
2. Joints using stainless steel repair clamps shall be performed on connections to existing leachate collection pipes when conditions have been determined to be too wet for electro-fusion coupling installation. Connections shall be in the trench so as not to overstress the joint and achieve proper alignment.

G. General Fusion Procedures Dual Containment Pipe:
1. Several important parameters need to be considered when fusing:
a. Temperature: The required temperature for fusing is recommended to be 500°F, ±10° (260°C, ±6°). Should the temperature be less than that specified, then additional heating time must be allowed. The manufacturer’s policy is to provide two 2-foot (0.6m) segments of pipe to allow a test fusion which ensures the proper fusion parameters are being utilized.
b. Airborne Contaminants: Airborne contaminants can settle on the polyethylene material, heating plate, and cutter. The fusion operator should use extreme care to ensure that all airborne contaminants are removed prior to the facing operation.
c. Cleaning of Pipe Ends: It is extremely important to remove all dirt, mud, grit, oil, water, etc. from the pipe ends. Any contamination can and will transfer to the faces of the heating iron and face plate. Avoid wiping the pipe areas after the facing operation. If shavings or other debris must be removed, use only a clean cotton cloth, as contaminated rags or use of solvents can leave harmful deposits on the fusion zone.
d. Chip Removal: Due to the fact that the annular space between the conductor and containment pipe allows limited area for the facing ribbons, the annular cavity shall be monitored to ensure that chips do not build up and prevent proper facing. Remove all ribbons and chips from the annular and conductor cavities prior to heating the pipe ends.
e. Machine Clearances: The end user will take due care to ensure that clearance between obstructions and the fusion joint are sufficient to allow use of their machine. The varying conventional fusion machines available will require different amounts of clearance space to perform the required fusion. If any questions exist in this area, contact the manufacturer’s technical services department.

f. The heating iron configuration needs to be reviewed to ensure adequate surface area exists to heat both the inner and outer pipe. Some fusion machines do not encompass the range of inner and outer pipe diameters that are available.
g. Maintenance of the fusion machine is the operator's responsibility. It is recommended the heating iron temperature for the entire surface be checked at a minimum, daily with a pyrometer for uniform temperature.
h. The fusion pressure should be calculated by using the recommended interface pressure of 75 psi (0.52 MPa) multiplied by the interfacial areas of the inner and outer pipes combined. The Contractor shall provide a calculation for proposed fusion pressure performed in accordance with the pipe manufacturer's recommendations.

H. Pipe Cutting:
1. Dual containment pipe is manufactured to specific lengths. Due to the extreme importance of the conductor being centralized in the containment pipe, field cutting and fitting is not recommended. If the end user cannot exactly specify the required length, the manufacturer should be alerted to this fact so that they can offer special lengths that may be required to allow the final tie-in. The feature should be recognized at the job onset in order to prevent final tie-in delays.
2. When permitted, sections of pipe may be cut to provide shorter sections of pipe necessary for the construction. The cutting of the pipe shall be done in accordance with the pipe manufacturer's recommendations and subject to the approval of the Engineer. Pipe cutting of dual-containment pipe shall be performed at the risk of the Contractor and shall not relieve the Contractor from obtaining proper fusion of the piping system.
3. When permitted, the pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

I. Inspection: Pipe installation shall be subject to inspection by the Engineer for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Engineer shall be removed and remade to his satisfaction at the Contractor's expense. No pipe will be backfilled until it has been approved by the Engineer.

3.03 PIPE INSTALLATION

A. Install pipe according to Section 02450 of these specifications for trench conditions.

B. Contractor shall label all cleanouts as directed by the Owner.

END OF SECTION

SECTION 15101

PVC PIPE AND FITTINGS

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. The requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Pipe Installation: Section 02450

C. Leachate Collection Pump Station: Section 02732

D. Valves and Pipe Accessories: Section 15110

E. Pipe Pressure Testing: Section 15120

1.03 REFERENCES:

1. ASTM D1784 Standard Specification for Rigid Poly Vinyl Chloride (PVC) Compounds and Chlorinated Poly Vinyl Chloride (CPVC) Compounds
2. ASTM D1785 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
3. ASTM D2464 Standard Specification for Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
4. ASTM D2467 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
5. ASTM D2564 Standard Specification for Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Piping Systems
6. ASTM D2855 Standard Practice for Making Solvent-Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
7. ASTM D3034 Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
8. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
9. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.04 DESCRIPTION OF WORK:

A. Work of this Section shall consist of furnishing all labor, materials, and equipment to install and test PVC pipes as shown on the Contract Drawings and described herein. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01010 "Summary of Work" or as directed by the Engineer, will apply.

1.05 SUBMITTALS:

A. The Contractor shall furnish the name of the pipe and fittings manufacturer, to the Owner's Representative prior to commencing the work. Pipe of the same manufacturer shall be used throughout the project unless approved by Engineer.

B. The Contractor shall submit to the Engineer a Construction Schedule for pipe installation.

C. The Contractor shall submit manufacturer's technical product data including chemical resistance data and installation instructions for piping joints and fittings.

D. The Contractor shall submit the Quality Control Documentation as specified in Section 10 of the QA/QC Plan.

1.06 PACKAGING DELIVERY AND HANDLING:

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

PART 2 PRODUCTS

2.01 PVC PIPE AND FITTINGS

A. Pipe and fittings shall be manufactured from a PVC compound which meets the requirements of Cell Classification 12454-B PVC as outlined in ASTM D1784. Pipe and fittings materials shall be specially formulated with sufficient ultraviolet (UV) screeners to provide for longer term outdoor exposure with no deleterious effects.

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

C. Dimensions: Pipe Size and DR/SCH Rating shall be as shown on the Drawings.

PART 3 EXECUTION

3.01 PIPE HANDLING

PVC pipe and pipe fittings shall be handled according to manufacturer’s recommendations. Under no circumstance shall Pipe and pipe fittings be dropped or dumped.

3.02 PIPE JOINTING

A. All pipes shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be incorporated into the work.

B. All joints shall be made in accordance with the manufacturer's recommendations and the best practices for material and the class of pipe installed. The ends of the pipe shall be wiped clean with a dry cloth before making each joint.

C. Bell ends of pipe shall be installed upstream.

D. Solvent cemented joints:
   1. Use a grade of PVC cement which meets ASTM D2564.
   2. Cut pipe to desired length with pipe cutters, hack saw or crosscut saw.
   3. Ream pipe both internally and externally to remove burs and ragged edges.
   4. Before making a solvent welded joint be sure all joining surfaces are free of dirt, dust, water, and oil.
   5. Use a primer before the application of PVC cement.
   6. Apply primer to both joining surfaces.
   7. Apply a smooth coat of cement to both joining surfaces.

8. Immediately insert the spigot end into the bell end to the full depth of the socket.
9. Turn pipe 1/8 to 1/4 turn in the socket to insure an even spread of cement.
10. Hold firmly in position for 15 seconds.
11. Allow joints to set according to cement manufacturer’s instructions.

E. Pipe Cutting:
1. Where required, sections of pipe may be cut to provide shorter sections of pipe necessary for the construction. The cutting of the PVC pipe shall be done in accordance with the pipe manufacturer's recommendations and subject to the approval of the Engineer.
2. In general, the PVC pipe material shall be cut by using a saw or milling process, approved by the pipe manufacturer and not by using any impact device, such as a hammer and chisel, to break the pipe. The pipe shall be cut, not broken. The cut end of the pipe shall be square to the axis of the pipe and any rough edges ground smooth.

3.03 PIPE INSTALLATION AND TESTING

Install and test pipe in accordance with Section 02450 of these specifications.

END OF SECTION

SECTION 15106

DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. The requirements set forth by the Quality Assurance/Quality Control Plan shall apply to the work specified in this Section..

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A Earthwork: Section 02200

B. Pipe Installation: Section 02450

C. Valves and Pipe Accessories: Section 1511

1.03 REFEERENCES

A. Ductile iron pipe shall conform to the latest edition of:

1. AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast
2. AWWA C104/A21.47 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
3. AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances
5. AWWA C105/A21.5 Polyethylene Encasement for Ductile-Iron Pipe Systems
6. AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
7. AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in.
8. AWWA C153/A21.53 Ductile-Iron Compact Fittings
9. ASTM A536 – Standard Specification for Ductile Iron Castings
10. ASTM F593 – Stainless Steel Bolts, Hex Cap Screws, and Studs
11. ASTM F594 – Stainless Steel Nuts

1.04 DESCRIPTION OF WORK

Work of this Section shall consist of furnishing all labor, materials, and equipment to install and test ductile iron pipe and fittings as shown on the Contract Drawings. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01010 "Summary of Work", or as directed by the Engineer, will apply. .

1.05 SUBMITTALS

A. The Contractor shall furnish the name of the pipe and fittings manufacturer, to the Engineer prior to commencing the work. Pipe of the same manufacturer shall be used throughout the project.

B. The Contractor shall submit to the Engineer a Construction Schedule for pipe installation.

C. The Contractor shall submit manufacturer's technical product data including chemical resistance data and installation instructions for piping joints and fittings.

D. The Contractor shall submit the Quality Control Documentation as specified in the Quality Assurance/Quality Control (QA/QC) Plan, and, if required, a certificate from the pipe manufacturer certifying the product meets the requirements of this specification.

1.06 MANUFACTURER'S QUALITY ASSURANCE

A. Pipe and fittings manufacturers shall have an established QA/QC program to verify compliance with applicable AWWA and ASTM standards. Quality control testing shall in include at a minimum:.

1. Verification of chemical composition.
2. Tensile strength testing.
4. Yield strength testing.
5. Elongation testing.
6. Hydrostatic pressure testing of pipe.
7. Dimensional inspection of pipe, fittings, and flanges.
8. Visual inspection for casting defects, cracks, and surface imperfections.
9. Verification of lining and coating thicknesses.

B. Pipe and fittings shall be clearly marked with the manufacturer's name or trademark, nominal size, pressure class or thickness class, and date or foundry identification as required by the applicable AWWA standards.

C. Upon request, the manufacturer shall furnish certified test reports demonstrating compliance with the specified ASTM and AWWA standards.

1.07 PACKAGING DELIVERY AND HANDLING

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

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials:

1. All materials shall be manufactured by firms regularly engaged in the production of ductile iron pipe and fittings with a minimum of five years documented experience producing products of similar size and service requirements
2. Restrained joint pipe and fittings shall be U.S. Pipe’s TR FLEX Pipe and Fittings or approved equal. Restraint of field cut pipe shall be provided with EBAA pipe restraints, or approved equal.
3. Cement mortar lining (double thickness) and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.
4. Restrained push-on joints for pipe and fittings shall be designed for a water working pressure of 350 pounds per square inch (psi) for diameter sizes 4-inch through 24-inch, and 250 psi for diameter sizes 30-inch through 36-inch.
5. Ductile iron pipe shall conform to the latest specifications as adopted by the American National Standards Institute, Inc., (ANSI) and the American Water Works Association (AWWA). Specifically, ductile iron pipe shall conform to ANSI/AWWA C151/A21.51.

B. Flanged Pipe: Flanged joints shall conform to ANSI/AWWA C110/A21.10 or ANSI B16.1 for fittings and ANSI/AWWA C115/A21.15 for pipe. Flanged joints shall not be used in underground installations except within structures. All flanged joints shall be furnished with 1/8-inch thick red rubber or styrene butadiene rubber gaskets. The bolts shall have American Standard heavy unfinished hexagonal head and nut dimensions all as specified in American Standard for Wrench Head Bolts and Nuts and Wrench Openings (ANSI B18.2). For bolts of 1¾-inches in diameter and larger, bolt studs with a nut on each end are recommended. Material for bolts and nuts shall conform to ASTM A107. Flanged ductile iron pipe and fittings shall be by U.S. Pipe or approved equal.

C. Mechanical Joints: Mechanical joint restraint shall be Megalug Series 1100 produced by EBAA Iron Inc. or approved equal.

2.02 FITTINGS:

A. Ductile Iron Fittings: Standard fittings shall be ductile iron conforming to ANSI/AWWA C110/A21.10. Compact ductile iron fittings shall meet the requirements of ANSI/AWWA C153/A21.53.

1. Working Pressures: Fittings shall be suitable for the following working pressures unless otherwise noted:

Size (inches)	Pressure (psi)	
	Compact Ductile Iron	Standard Ductile Iron
3 – 24	350	350

2. Coating and Lining: The fittings shall be coated with a bituminous coating in accordance with ANSI/AWWA C110/A21.10 and lined inside with cement mortar (double thickness) and seal coated in accordance with ANSI/AWWA C104/A21.4.

2.03 SADDLES:

A. Ductile Iron Service Saddles: The service saddle shall have a ductile iron body per ASTM A536. The saddle shall have an outlet for the service connection that will allow an NPT or AWWA thread to be tapped into it. The saddle shall have one (311) or two (313) carbon steel bales per ASTM A108 (C1018) and be electro-galvanized with dichromate seal per ASTM B633. The nuts shall be cold formed semi-finished heavy hex steel A563 with an electrogalvanized with di-chromate seal per ASTM B633. The washers shall be carbon steel per ASTM A108 and electro-galvanized with dichromate seal per ASTM B633. The gasket shall be a TaperSeal outlet gasket that has a hydro-mechanical lip that seals better on the pipe surface as the line content pressure increases. The gasket shall be made of Nitrile (Buna N) and NSF 61 listed. The gasket shall be compounded to resist: water, oil acids, alkalis, most (aliphatic) hydrocarbon fluids and many other chemicals. The gasket shall have a temperature range of -20ºF to +180ºF. The gasket shall be fully cemented into a cavity to hold it in place around the outlet during installation.

B. Saddles shall be Smith-Blair model 313 or equal.

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

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

1. Fractures or cracks sufficient to impair strength, durability or serviceability of pipe.
2. Defects indicating improper proportioning, mixing, or molding.
3. Damaged ends.

B. Acceptance of fittings, stubs, or other specifically fabricated pipe sections shall be based on visual inspection at the job site and documentation of conformance to these Specifications.

3.02 PIPE JOINTING

A. Mechanical Joints: All components shall be cleaned and lubricated with soapy water prior to assembly. Slip the follower gland and gasket over the pipe plain end making sure the small side of the gasket and lip of the gland face the bell socket. Insert the plain end into socket. Push gasket into position with fingers, gasket should be evenly seated. Slide gland into position, insert bolts and tighten by hand. Bolts are then tightened alternately (across from one another) to the following normal torques:

Bolt Size (inches)	Range of Torque (foot-pound)
5/8	40 – 60
3/4	60 – 90
1	70 – 100
1-1/4	90 - 120

B. Flanged Joints

1. Prior to assembly, flange faces shall be thoroughly cleaned of dirt, oil, rust, scale, and foreign material. Damaged flange faces shall not be used.
2. Flanged joints shall be carefully aligned so that piping is not subjected to excessive stress or strain during assembly. Flange bolt holes shall be properly aligned before installation of bolts.
3. Full-face rubber gaskets shall be centered between flanges and installed in accordance with the gasket manufacturer's recommendations.
4. Bolts and nuts shall be installed and tightened in a progressive crisscross sequence to achieve uniform gasket compression. Tightening shall be performed in multiple stages to the torque recommended by the pipe, fitting, or gasket manufacturer.
5. Bolts shall not be over-tightened. Torque values shall be verified using a calibrated torque wrench. Torgue values shall be according to the gasket manufacturer’s recommended values
6. Pipe supports, restraints, and appurtenances shall be installed as necessary to prevent piping loads from being transmitted through flanged joints.
7. No field drilling, burning, welding, or other modifications to flanges shall be permitted unless specifically approved by the Engineer.
8. Following installation, all flanged joints shall be inspected for proper alignment, gasket seating, and bolt tightness.
8. Piping shall be hydrostatically tested after installation in accordance with the project requirements. Any leaks identified at flanged joints shall be repaired and the piping retested until satisfactory results are obtained.
9. Provide stainless steel bolts, nuts, and washers for all flanged connections located within vaults, manholes, wet wells, or other below-grade structures.
10. Flanged piping shall be supported independently of valves, flow meters, and other equipment to prevent excessive loads on equipment flange

C. Restrained Joints: Assemble and install joints according to the manufacturer's recommendations. The joint shall be thoroughly cleaned and lubricated. Check the retainer ring fastener.

3.03 PIPE INSTALLATION

A. Install pipe according to Section 02450 of these specifications for trench conditions

END OF SECTION

SECTION 15110

VALVES AND PIPE ACCESSORIES

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. The requirements set forth by the Quality Assurance/Quality Control (QA/QC) Plan shall apply to the work specified in this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Pipe Installation: Section 02450

B. Leachate Collection Pump Station Section 02732

C. Manholes, Catch Basins, and Drainage Structures: Section 02570

D. HDPE Pipe and Fittings: Section 15100

E. PVC Pipe and Fittings: Section 15101

F. Pipe Pressure Testing: Section 15120

1.03 REFERENCE:

A. ASTM A536 Standard Specification for Ductile Iron Castings

B. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings

C. ASTM A743 Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application"

1.04 DESCRIPTION OF WORK:

A. Work in this Section shall consist of furnishing all labor, materials, and equipment to install valves, fittings, and other appurtenances. Only the appropriate portions of this section pertaining to the specific contract work identified in Section 01010 "Summary of Work", or as directed by the Engineer, will apply.

B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

1.05 SUBMITTALS:

A. Product Data: Submit Manufacturers shop drawings, technical product data, installation instructions and catalog information for each valve fitting or accessory.

B. The Contractor shall submit the Quality Control Documentation as specified in the QA/QC Plan.

C. Manufacturer's Installation Instructions: Submit hanging or support methods and joining procedures.

PART 2 PRODUCTS

2.01 STAINLESS STEEL BALL VALVES:

A. General: Provide ball valves for the pipe size as indicated on Contract Drawings.
   1. Valves for sizes 3-inch to 12-inch diameter shall be full port, with reinforced polytetrafluoroethylene seats.
   2. The ball shall be 316, stainless steel.
   3. Seals and O-rings shall be constructed of Viton® where possible and applicable.
   4. Flanges shall be drilled according to ANSI B16.5, Class 150.

2.02 PVC BALL VALVES

A. General: Provide ball valves for the pipe size as indicated on the Contract Drawings.
   1. Bodies shall be PVC thermos-plastic.
   2. True union design with two-way blocking capability.
   3. Designed with Teflon seats and Viton® elastomeric backing cushions. Valve seals shall be Viton®
   4. Stem shall have a double O-ring design.

2.03 CHECK VALVES:

A. General: Provide check valves for the pipe size as indicated on the Contract Drawings.

B. Description:
   1. Check valve shall be a rubber flapper swing check valve as manufactured by APCO and be capable of 100 psi operating pressure.
   2. The flapper material shall be Viton A®.
   3. The body shall be stainless steel, and the inside shall be unlined.
   4. Check valves shall be equipped with a backflow device.
   5. The flanges shall be drilled according to ANSI B16.5, Class 150.

2.04 RESILIENT SEATED GATE VALVES:

A. Resilient seated Gate Valves shall be ductile iron body, bronze mounted, with 18-8, 304 stainless steel bolts, resilient wedge gate with two-inch operating nut and a PIV single flange (lug) connection. Valves shall conform in every respect to AWWA C509 Valve shall be MJ-PIV, F-Series Resilient Wedge Valve as Manufactured by Clow or approved equal. Valves shall open left.

B. Valves shall be provided with “O” rings. The design of the valve shall be such that the seal plate can be fitted with new “O” rings while the valve is under pressure in a fully open position.

C. Valves shall have a 100 percent solids thermoset or fusion bonded epoxy protective coating, holiday-free in the waterway, which shall meet all requirements of AWWA C550. The epoxy coating shall not impart taste or odor to the water. The coating shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products under ANSI/NSF Standard 61. The coating shall be applied and cured in strict conformance with the coating manufacturer’s cautions and instructions. The coatings shall be applied by the valve manufacturer under controlled factory conditions and field application is strictly prohibited.

2.05 PIV INDICATOR POST:

A. Indicator post shall be used to actuate and indicate the closed or open status of remotely installed PIV valves.

B. Indicator post and any necessary extensions shall be supplied and installed as shown on the contract drawings. Indicator post supplied shall open in the same direction as the valve and indicate as such. All bolts shall be 316, stainless steel.

2.06 FITTINGS:

A. Fittings shall be flanged ductile iron. All fittings shall be cement lined and coated as specified hereinbefore for ductile iron pipe. Fittings greater than 12 inches shall conform to ANSI A21.10 (AWWA C110) and fittings 12 inches or less shall conform to ANSI A21.11 (AWWA C111). Compact fittings shall be Class 150 conforming to ANSI A21.53 (AWWA C153) and shall be cement lined in compliance with AWWA C104 for fittings 12 inches or less. Compact fittings greater than 12 inches are not acceptable. Fittings shall come complete with gaskets, and 316 stainless steel bolts.

B. Plugs, caps, and blind flanges shall be stainless steel and shall conform to the weights and dimensions shown and be provided complete with all necessary gaskets and 316 stainless steel bolts.

C. All fasteners (nuts and bolts) shall be 316L, stainless steel, and shall be the correct size and dimensions for the size flanges and size of pipe.

2.07 CONCRETE:

A. Concrete used for any purpose such as, but not limited to, thrust restraints, encasements, and chimneys shall have a minimum compressive strength of 3,000 psi and conform to the specifications contained in Section 03300, Cast-in-Place Concrete.

2.08 STAINLESS STEEL REPAIR CLAMPS:

A. Repair clamps shall be as manufactured by Romac Industries.

2.09 PRESSURE TRANSMITTERS:

A. Pressure transmitters shall be installed to monitor the interstitial space of the dual containment system. They shall have an operating pressure range from 0 to 150 psi. The pressure transmitters shall be MBS 33, Cable type, 4-20 mA output, as manufactured by Danfoss.

B. The interstitial space shall be accessed by installing a threaded insert through the end termination or side wall of the containment pipe inside the manhole. The pressure transmitter shall be installed into this threaded insert or a coupling. This shall be done on the lowest end elevation of the pipe run.

C. Threaded connections shall be installed using Teflon tape, or approved sealant.

2.10 PRESSURE GAUGE:

A. Pressure gauges shall be furnished and installed as shown on the contract drawings.

B. Pressure shall be transmitted to the gauge by a (diaphragm seal) completely sealed fluid so no leachate is in contact with the gauge. Fluid shall be a 50 percent mixture of ethylene glycol and water. Pressure gauges shall be protected from excessive line pressures by a stainless-steel ball valve installed between the pressure sensor and the pressure gauge.

C. Pressure gauges shall be pressure type with an appropriate operating range and a 4-1/2-inch dial. Gauges shall be ½ inch bourdon tube type and calibrated in psi and the dial shall so indicate. Gauges accuracy of plus or minus ½ percent. Pressure ranges shall be 0 PSIG to 150 PSIG unless otherwise indicated.

PART 3 EXECUTION

3.01 GENERAL:

A. All materials shall be stored and handled in accordance with the manufacturer's recommendations.

B. Verify piping system is ready for installation.

C. Provide non-conducting dielectric connections whenever joining dissimilar metals.

D. Install valves with stems upright or horizontal, not inverted.

E. Install valves as shown on contract drawings for shut-off and to isolate equipment, part of systems, or vertical risers.

F. Valves and Fittings shall be braced against movement by installation of yoke and stanchions as applicable.

G. Inspection: Pipe installation shall be subject to inspection by the Engineer for quality, adherence to line and grade, jointing, and proper backfill. Any joint not satisfactory to the Engineer shall be removed and remade to his satisfaction at the Contractor's expense. No pipe will be backfilled until it has been approved by the Engineer.

END OF SECTION

SECTION 15120

HYDROSTATIC AND LOW-PRESSURE AIR TESTING OF POLYETHYLENE PIPE

PART 1 GENERAL

1.01 RELATED DOCUMENTS:

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements (if any) apply to the work specified in this Section.

B. Requirements set forth by the Quality Assurance/Quality Control (QA/QC) Plan shall apply to the work specified in this Section.

1.02 RELATED WORK ELSEWHERE

A. Measurement and Payment: Section 01025

B. Project Coordination: Section 01041

C. Earthwork: Section 02200

D. Pipe Installation: Section 02450

E. Manholes, Catch Basins, and Drainage Structures: Section 02570

F. HDPE Pipe and Fittings: Section 15100

G. Valves and Pipe Accessories: Section 15110

1.03 REFERENCE:

A. ASTM F2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure

B. ASTM F1417 Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low Pressure Air

C. Chevron Phillips Performance Pipe Technical Note 802 Leak Testing of Polyethylene Pipe for Municipal and Industrial Applications

1.04 DESCRIPTON OF WORK

A. The work of this section includes the furnishing of all labor, tools, equipment, and materials and performing all operations necessary to pressure test pipe associated with the Project.
   1. For dual-containment HDPE force main pipes, hydrostatic pressure testing shall be performed on the carrier pipe (inner pipe) and low-pressure air testing shall be performed on the containment pipe (outer pipe).
   2. For single wall force main pipes, hydrostatic pressure testing shall be performed on the pipe.
   3. For single-wall gravity drain HDPE pipes, low pressure air or hydrostatic testing may be performed on polyethylene pipes (as chosen by the Contractor).

B. The work of this section shall be coordinated with the Quality Assurance Resident Engineer (QARE). Where conflicts appear between these specifications and ASTM F2164, Technical Note 802, or ASTM F1417 the more stringent requirement shall apply. All hydrostatic and low-pressure air testing shall be done by the Contractor in the presence of the QARE.

PART 2 PRODUCTS

2.01 MATERIALS

A. The temporary pump connections shall be made up of components compatible with test pressures.

B. The Contractor shall provide all necessary equipment (i.e., pumps, flanges, valves, bracing, bulkheads, gauges, etc.) to perform either hydrostatic or low-pressure air tests.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall conduct a hydrostatic or low-pressure air testing on HDPE pipes as indicated in above Section 1.04A. Alternative industry standard leak tests may be considered if submitted to and approved by the Engineer.

B. It shall be the responsibility of the Contractor to ensure that appropriate health and safety precautions are observed before, during, and after hydrostatic or air testing of piping systems. Always take precautions to eliminate hazards to persons near lines being tested. For the entire duration of the procedure only those conducting the test or inspecting the system being tested will be allowed near the section under test. Persons near the testing should be fully aware of the hazards of field testing. All other persons shall be kept at a safe distance. Test sections shall always be under supervision during testing. No one shall be allowed in manholes or in the potential path of expelled equipment during testing.

C. Restraint Against Movement: The Contractor shall take all measures necessary to ensure that all parts of the section and testing equipment (test balls, plugs, end caps, etc.) are restrained against movement should failure occur.

D. Leakage at a joint provides proof that the joint is defective and may fail at any moment. If leakage is observed from a joint, move away immediately and depressurize the test section.

E. Hydrostatic and low-pressure air tests shall be conducted in the presence of the QARE.

3.02 PREPARATION OF THE LINE (HYDROSTATIC AND AIR TESTING – ALL PIPES)

A. Pre-Test Preparation:
   1. Before testing all heat-fusion joints shall be completely cooled and mechanical joints shall be completely assembled with all necessary seals and fasteners installed and tightened.
   2. Flushing, pigging, or other means of cleaning may be required before testing to remove dirt and debris from the pipeline that may damage valves, regulators, etc.
   3. Allow concrete supports and anchors (when used) in the test section to cure until they develop sufficient strength to withstand test pressures and thrust forces.
   4. Restrain all portions of the test section against movement. Temporarily remove, restrain, or isolate expansion joints and expansion compensators before testing.
   5. Isolate the section of pipe to be tested with suitable test plugs or caps.
   6. Trench shall be dewatered to an elevation below the pipe invert during testing.

3.03 HYDROSTATIC PRESSURE TEST OF CARRIER PIPE (INNER PIPE OF DUAL CONTAINMENT FORCEMAIN OR SINGLE WALL FORCE MAIN)

A. Hydrostatic pressure test equipment shall be placed in the elevation of the lowest point of the pipe in the test section and shall be connected to the elevation of the test gauge as directed by the QARE. (Note: one vertical foot of water equals 0.422 psi)

B. Test Section: Testing may be conducted on the entire system or on sections of the system. The test size is determined by the capacity of the filling and pressurizing equipment. Equipment that has inadequate capacity may not be able to complete the test within allowable testing time limits.

C. Test Temperature: Polyethylene piping materials are typically pressure rated at 73 F. At higher temperatures, reduced pressure ratings and test pressures may be required. The Engineer may decide to adjust based on higher or lower temperatures.

D. Maximum Test Pressure: The maximum test pressure shall be 100 psi. Items with lower pressure ratings shall be isolated from those of higher-pressure ratings and tested separately.

E. Primary Testing Procedure: This testing procedure is based on ASTM F2164, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
   1. Test Duration: Test duration depends on test pressure as indicated in the paragraphs below:
      a. When test pressure is between system design pressure and 1.5 times system design pressure the test duration (including pressurization, stabilization, holding time, and depressurization) should not exceed 8 hours.
      b. Before pressure is applied the Contractor shall do the following:
         i. Examine test equipment and all connections to ensure they are in proper operating condition,
         ii. Isolated components are vented to atmosphere, and
         iii. Disconnect or isolate and vent all low-pressure filling lines and systems.
   2. Filling: Fill the test section slowly. Before applying the specified test pressure, air shall be completely expelled from the pipes and valves. After all air has been expelled, the blowoffs can be closed, and the test pressure applied.
   3. Temperature Equalization: Allow test section and liquid to equalize to a common temperature.
   4. Pressurizing – Initial Expansion Phase: When the test section is filled with water and air is purged, gradually increase pressure in the test section to the required test pressure.
      a. If pressure can't be attained or it takes unreasonably long to reach test pressure there is likely excessive leakage, entrapped air, open valving, or equipment testing failure. Discontinue pressurizing and correct issues before continuing.
      b. Add makeup water as needed to maintain maximum test pressure for 4 hours.
   5. Test Phase
      a. Reduce test pressure by 10-psi and monitor pressure for 1 hour. Do not increase pressure or add makeup water.
   6. Pass/Fail Criteria
      a. The test passes if no visual leakage is observed and pressure during the test phase remains steady (within 5% of test phase pressure) for 1 hour test phase period.
   7. Retesting
      a. If retesting is necessary, depressurize the test section and correct faults or leaks in the test section.
      b. The pipe shall be depressurized and allowed to "relax" for 8-hours prior to retesting.
   8. Record Keeping
      a. The Contractor shall record the following testing information and give a copy to the QARE after testing:
         i. Date
         ii. Person Conducting Test
         iii. Test Liquid
         iv. Backflow Prevention Devices (if used)
         v. Weather Condition and Ambient Temperature
         vi. Test Pressure and Time (Begin and End)

vii. Test Gauge Type
viii. Test Gauge Locations
ix. Test Gauge Calibration Record
x. Description of test section (length, elevations, site location, and components)
xi. Description of issues, failures, and corrective actions as necessary

F. Alternate Hydrostatic Testing Procedure: This alternate test procedure consists of two steps. The first step is the initial expansion, and the second step is the test phase. This procedure is based on Chevron Phillips Performance Pipe Technical Note 802 – Leak Testing of Polyethylene Pipe for Municipal and Industrial Applications.
1. Initial Expansion Phase: During the initial expansion of the pipe under test, sufficient make-up water must be added to the system at hourly intervals for three hours to maintain the test pressure. After about four hours, initial expansion should be complete, and the actual test can start.
2. Test Phase: When the test is to begin, the pipe is full of water and is subjected to constant hydrostatic test pressure. The test phase should not exceed three hours, after which time any water deficiency must be replaced and measured. Add and measure the amount of make-up water required to return to the test pressure and compare this to the maximum allowance shown below.

Nominal Pipe Size (inches)	U.S. Gals/100 feet of Pipe[2]			Nominal Pipe Size (inches)	U.S. Gals/100 feet of Pipe[2]		
	1-Hour	2-Hour	3-Hour		1-Hour	2-Hour	3-Hour
2	0.07	0.10	0.16	20	2.80	5.50	8.00
3	0.10	0.15	0.025	22	3.50	7.00	10.50
4	0.13	0.25	0.40	24	4.50	8.90	13.30
5	0.21	0.41	0.62	28	5.50	11.10	16.80
6	0.30	0.60	0.90	30	6.30	12.70	19.20
8	0.50	1.00	1.50	32	7.00	14.30	21.50
10	0.80	1.30	2.10	36	9.00	18.00	27.00
12	1.10	2.30	3.40	42	12.00	23.10	35.30
14	1.40	2.80	4.20	48	15.00	27.00	43.00
16	1.70	3.30	5.00	54	22.00	31.40	51.70
18	2.00	4.30	6.50				

3.04 LOW PRESSURE AIR TEST – CONTAINMENT PIPE (OUTER PIPE OF DUAL WALL PIPE OR GRAVITY PIPE)

A. Contractor shall be responsible for furnishing all labor, materials, and equipment so that such tests can be performed at the times and locations the Engineer and/or QARE deem necessary.

B. Low Pressure Testing Equipment: For making low-pressure air tests, the Contractor shall use equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low-pressure air. The following testing equipment will be required to perform the work:
1. Mechanical or Pneumatic Plugs.
2. Portable Air Compressor with the following:
a. Calibration
b. Oil-free air source
c. Singular control panel containing the following:
i. Main shut off valve
ii. Pressure regulating valve
iii. 9-psi pressure relief valve
iv. Input pressure gauge

v. Continuous monitoring pressure gauge with the following
1) Pressure gauge measuring from 0 to 10 psi
2) 0.1 psi increments
3) Accuracy of 0.04 psi

3. Timer capable of measuring to 0.1 seconds.

C. Low Pressure Testing Setup:
1. See procedures in Section 3.04.B above.
2. One plug shall have an inlet tap or other provision for connecting an air hose to the portable air source.
3. Connect the air hose to the inlet tap and portable air source and control equipment as indicated in Section 3.04.B above.

D. Low Pressure Air Testing Procedures:
1. Pressurization Phase: Low-pressure shall be introduced slowly into the sealed line until the internal air pressure reaches 4.0 psig.
2. Stabilization Phase: After the 4.0 psig pressure is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig for at least 2 minutes. The pressure may drop slightly while the pipe reaches equilibrium but should not drop below 3.5 psig.
3. Test Phase: After equilibrium has been obtained as indicated above, determine the rate of air loss by Time Pressure Drop method indicated below.
4. Time Pressure Drop Method:
a. Add air until the internal pressure of the test section is raised to 4.0 psig and the test section is stabilized as indicated above. Disconnect the air supply and reduce pressure to 3.5 psig before starting the test.
b. Either determine the time required for a 0.5 psig pressure drop or a 1.0 psig pressure drop and compare this interval to the minimum time for the pipe diameter and length indicated in the attached tables.
c. Pass or Fail Criteria: Tests shall be considered passing if the air loss is less than or equal to the specified leakage rate (0.5 psig or 1.0 psig) indicated in the appropriate table above. Sections of pipeline that do not meet these criteria fail and cannot be accepted. When pipeline consists of more than one diameter pipe the test time shall be that of the largest allowable pipe in the section.
d. Test Completion: Upon test completion slowly open the bleeder valve and allow air to escape. Caps and plugs shall not be removed until air pressure in the test section has been reduced to atmospheric pressure.
5. Retesting. Retesting of any pipe section is allowed provided that the Contractor identifies the location of the leakage and repairs the pipe or adjusts the testing equipment as appropriate. If the pipe section fails the test, segmented testing may be utilized to find the location of the leak. Once leaks are located, they should be repaired and retested per this practice.
6. Record Keeping
a. The Contractor shall record the following testing information and give a copy to the QARE after testing:
i. Date
ii. Name of the person conducting test
iii. Weather condition and ambient temperature
iv. Tested pipe location, length, diameter, and components.
v. Test pressure and time (start and end)
vi. Control panel calibration record
vii. Description of issues, failures, and corrective actions as necessary

3.05 ACCEPTANCE:

A. The Engineer reserves the right to accept the pipeline in sections after satisfactory tests have been made and approved, and to make full use of any part or parts of the system after acceptance of those parts.

B. Until such time as the entire Contract has been accepted by the Engineer, the Contractor shall be held responsible to rectify any leaks, errors, or other poor workmanship which may be discovered and shall make any necessary repairs, alterations, or adjustments as may be required to properly complete the work.

END OF SECTION

MINIMUM TIME FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE FOR q = 0.0015

Pipe Diameter (in)	Minimum Time (mins)	Length for Minimum Time (ft)	Time for Longer Length (s)	Specification Time for Length (L) Shown (mins)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:06	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102.33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

Notes:
1. See Practice UNI-B-6.
2. Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 inches in diameter.

MINIMUM TIME FOR A 0.5-PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE FOR Q = 0.0015

Pipe Diameter (in)	Minimum Time (mins)	Length for Minimum Time (ft)	Time for Longer Length (s)	Specification Time for Length (L) Shown (mins)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	0.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	0.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	0.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:20	99	6:837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	61:17
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54
30	14:10	80	10.683 L	17:48	26:43	36:37	44:31	53:25	62:19	71:13	80:07

Notes:

1. Consult with pipe and appurtenance manufacturer for maximum test pressure for pipe size greater than 30 inches in diameter.

APPENDIX A
PERMITS

SME
SEVEE & MAHER
ENGINEERS

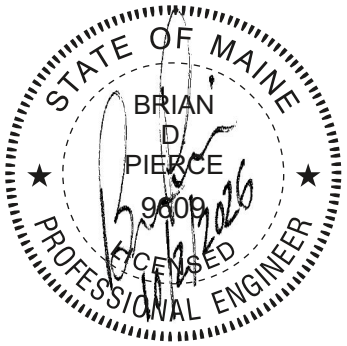
APPENDIX B
QUALITY ASSURANCE/QUALITY CONTROL PLAN

SME
SEVEE & MAHER
ENGINEERS

QUALITY ASSURANCE/QUALITY CONTROL PLAN
LEACHATE TRANSFER SYSTEM UPGRADES
PINE TREE LANDFILL
HAMPDEN, MAINE

Prepared for

NEW ENGLAND WASTE SERVICES OF MAINE, INC.



October 2026

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021

Tel: 207.829.5016 sme-engineers.com

SME
SEVEE & MAHER
ENGINEERS

TABLE OF CONTENTS

Section No.	Title	Page No.
1.0 GENERAL		**1-1**
1.1 Scope		1-1
1.2 Parties		1-1
1.2.1 Site Property Owner		1-2
1.2.2 Project Manager/Resident Project Representative		1-2
1.2.3 Designer		1-3
1.2.4 Construction Quality Assurance Agent and Quality Assurance Resident Engineer		1-3
1.2.5 Soils Quality Assurance Laboratory		1-7
1.3 Communication		1-7
1.3.1 Lines of Communication		1-8
1.3.2 Resolution Meeting		1-8
1.3.3 Pre-Construction Meeting		1-8
1.3.4 Progress Meetings		1-8
2.0 DOCUMENTATION		**2-1**
2.1 Daily Reports		2-1
2.1.1 Construction Quality Assurance		2-1
2.1.2 Report Forms and Installation Logs		2-1
2.2 Testing Reports		2-1
2.2.1 Soils Testing Reports		2-1
2.2.2 Miscellaneous Test Reports		2-2
2.3 Progress Reports		2-2
2.4 Record Drawings		2-2
2.4.1 Construction Record Drawings		2-2
2.5 Final Certification Report		2-2
3.0 SOIL COMPONENTS		**3-1**
3.1 Borrow Materials		3-1
3.2 Material Delivery, Storage, and Processing		3-1
3.3 Subgrade Preparation		3-1
3.4 Placement, Remolding, and Compaction		3-2
3.4.1 Soil Material Placement		3-2
3.4.2 Compaction		3-2
3.5 Quality Assurance Testing and Documentation		3-3
3.5.1 Construction Quality Assurance (CQA) Agent Responsibilities		3-3
3.5.2 Documentation		3-3
4.0 HDPE PIPE, FITTINGS AND APPURTENANCES		**4-1**
4.1 Quality Control Documentation		4-1
4.2 Conformance Testing		4-2
4.2.1 Sampling Procedures		4-2
4.2.2 Test Results		4-3
4.3 Pipe and Fitting Placement		4-3
4.4 Pipe Seams and Fusion Techniques		4-4
4.5 Repairs		4-4
4.6 Manholes, Valves and Other Appurtenances		4-4
4.7 Soil Materials Placement		4-4

QUALITY ASSURANCE/QUALITY CONTROL PLAN

1.0 GENERAL

1.1 Scope

This Quality Assurance/Quality Control Plan (QAP) addresses the quality assurance and quality control of facility components for New England Waste Services of Maine, Inc.'s Leachate Transfer System Upgrades Project at the Pine Tree Landfill in Hampden, Maine including force mains, pump station, concrete transfer pad, leachate loadout rack, precast concrete structures, electrical and communication controls, earthwork, and paving

In the context of this plan, quality assurance refers to means and actions employed to assure conformity of the facility component production and installation with the project-specific QAP, drawings, specifications, and contractual and regulatory requirements. Quality assurance is provided by a party independent from production and installation. Quality control refers only to those actions taken to ensure that materials and workmanship meet the requirements of the plans and specifications. Quality control is provided by the manufacturers and installers of the various components of the facility, and by compliance with applicable sections of the construction specifications contained in the contract documents.

The scope of this QAP applies to characterization of manufacturing, shipment, handling, and installation of facility components. This QAP does not address design guidelines, installation specifications, or selection of facility components. The technical specifications define the quality of materials and workmanship used on the construction of the facility

The QAP is the means to assure the level of material and workmanship used in the construction of the facility components meets or exceeds the requirements of the design specifications and drawings. This QAP was developed based on U.S. Environmental Protection Agency (U.S.EPA) guidance included in "Construction Quality Assurance for Hazardous Waste Landfill Disposal Facilities", U.S.EPA/530-SW-86-031, October 1986, and "Quality Assurance and Quality Control for Waste Containment Facilities," U.S.EPA/600/R-93/182 September 1993.

1.2 Parties

The parties discussed in this section are associated with the ownership, design, manufacture, transportation, installation, and quality assurance of the facility components. The definitions, qualifications, and responsibilities of these parties are outlined in the following subsections.

1.2.1 Site Property Owner

1.2.1.1 Definitions

The Owner of the property at the Pine Tree Landfill site and is New England Waste Services of Maine, Inc. (NEWSME).

1.2.2 Project Manager/Resident Project Representative

1.2.4.1 Definitions

The Project Manager/Resident Project Representative (RPR) is the official representative of NEWSME; in this plan, the term Project Manager/RPR shall apply equally to "Construction Coordinator," i.e., the individual responsible for coordinating construction and quality assurance activities for the project. Project Manager/RPR may also be referred to as the “Owner’s Representative” in other parts of these Bid Documents and Specifications.

1.2.4.2 Responsibilities

The Project manager is responsible for construction quality assurance activities. The Project Manager/RPR is responsible for the organization and implementation of the QAP for the project as outlined in Section 1.1 of this plan.

The Project Manager/RPR shall serve as communications coordinator for the project, initiating the resolution, pre-construction, and construction meetings outlined in Section 1.3. As communications coordinator, the Project Manager/RPR shall serve as a liaison between all parties involved in the project to ensure that communications are maintained.

The Project Manager/RPR shall also be responsible for proper resolution of all quality assurance issues that arise during construction.

1.2.4.3 Qualifications

The selection of the Project Manager/RPR is the direct responsibility of the NEWSME. Qualifications for this position include familiarity with the following:

1. Applicable QAPs;
2. General knowledge of the construction materials and techniques necessary to construct the facility;
3. Applicable regulatory requirements; and
4. Company policies and procedures for project management.

1.2.3 Designer

1.2.5.1 Definitions

The Designer is the individual and/or firm responsible for the preparation of the design, including plans and project-specific technical specifications for the facility components and systems. The Designer may also be referred to as the "Engineer" in other parts of these Bid Documents and Specifications.

1.2.5.2 Responsibilities

The Designer is responsible for performing the engineering design and preparing the associated drawings and specifications for all the components of the pipeline facility. The Designer is responsible for approving all design and specification changes and making design clarifications necessitated during construction of the pipeline and associated facilities. The Designer may attend the resolution and pre-construction meetings outlined in Section 1.3 of this plan upon the request of the Project Manager/RPR.

1.2.5.3 Qualifications

The Designer shall be a qualified engineer, certified or licensed as required by regulation. The Designer shall be familiar with all the pipeline components and applicable regulatory requirements.

1.2.5.4 Submittals

The Designer shall submit the project design drawings and specifications to NEWSME The Designer shall submit completed design clarification forms to NEWSME in a timely manner upon request.

1.2.4 Construction Quality Assurance Agent and Quality Assurance Resident Engineer

1.2.6.1 Definitions

The Construction Quality Assurance Agent (CQA) is a firm independent from NEWSME that shall be responsible for observing and documenting activities related to the quality assurance of all phases of the pipeline and associated construction activities, on behalf of NEWSME. The required staffing level will be a function of the Installer's schedule.

In this QAP, the term Quality Assurance Resident Engineer (QARE) shall be used to designate the engineer in charge of the project-specific quality assurance work. In this QAP, the terms "construction Quality Assurance Agent (CQA)" and "Quality Assurance Resident Engineer" are interchangeable. In some cases, the duties of the QARE described below may be shared by two individuals: A Quality Assurance Managing Engineer located at the headquarters of the CQA, and a Quality Assurance Resident Engineer located at the site. The personnel of the CQA also include

Quality Assurance Monitors who are located at the site for construction observation and documentation. Construction Quality Assurance Agent and Quality Assurance Resident Engineers will also be described in this QAP by the specific tasks they oversee.

1.2.6.2 Responsibilities

The QARE is responsible for observing and documenting activities related to the quality assurance of the production and installation of all leachate transport system components. The QARE is responsible for implementation of the project QAP prepared by the Project Manager/RPR and coordination of the on-site and off-site materials testing program. The QARE is also responsible for issuing a final certification report, sealed by a registered professional engineer, as outlined in Section 2.5 of this QAP.

The specific duties of the QARE personnel are as follows:

1. The QARE:
    a. Reviews all design drawings and specifications.
    b. Reviews other site-specific documentation, including proposed layouts, and manufacturer's and installer's literature.
    c. Develops a site-specific addendum for quality assurance of materials and construction techniques (if necessary) with the assistance of the Project Manager/RPR.
    d. Administers the QAP, e.g., assigns and manages quality assurance personnel, reviews all field reports, and provides engineering review of all quality assurance related issues.
    e. Reviews changes to design drawings and specifications as issued by the Designer.
    f. Acts as the on-site (resident) representative of the Project Manager/RPR.
    g. Familiarizes Quality Assurance Monitors with the site and the project QAP.
    h. Attends quality assurance related meetings, e.g., resolution, pre-construction, daily, and weekly.
    i. Reviews Manufacturer and Installer certifications and documentation and makes appropriate recommendations.
    j. Reviews the Installer's personnel qualifications for conformance with those qualifications pre-approved for work on-site.
    k. Manages the preparation of the as-built drawing(s).
    l. Provides on-site testing of soils for compaction, using Nuclear Methods.
    m. Sampling of on-site soils and other materials and coordinates testing.
    n. Reviews Quality Assurance Monitor's daily reports, logs and photographs.

o. Notes any on-site activities that could result in damage and/or delays.

p. Reports to the Project Manager/RPR, and logs in the daily report, any relevant observations reported by the Quality Assurance Monitors.

q. Prepares his own daily report.

r. Prepares the weekly report of construction activities.

t. Oversees the marking, packaging, and shipping of laboratory test samples.

u. Reviews the results of laboratory testing and makes appropriate recommendations.

v. Designates a qualified Quality Assurance Monitor to represent the QARE whenever he is absent from the site while operations are ongoing.

w. Reports any unapproved deviations from the QAP to the Project Manager/RPR.

x. Prepares the final certification report.

y. Verifies that the supporting soil has met requirements set in Section 3.4.1.

2. The Quality Assurance Monitor:

   a. Monitors, logs, photographs, and/or documents all construction operations. Photographs shall be taken routinely and in critical areas of the installation sequence. These duties shall be assigned by the QARE.

   b. Monitors the following operations for all construction activities.

      (1) Material delivery.

      (2) Unloading and on-site transport and storage.

      (3) Sampling for conformance testing.

      (4) Material placement.

      (5) In-place conformance testing.

      (6) Visual inspection by walkover.

      (7) Construction stability.

   c. Monitors and documents construction operations, including:

      (1) Subgrade preparation, testing, and approval.

      (2) Placement, testing, sampling, and approval of soil materials used to construct the pipeline.

      (4) Installation and testing of piping systems and associated appurtenances.

1.2.6.3 Qualifications

The CQA shall be pre-qualified by NEWSME. The CQA shall be experienced in quality assurance of HDPE leachate transport systems. The CQA shall be experienced in the preparation of quality assurance documentation including: quality assurance forms, reports, certifications, and manuals.

The Quality Assurance Managing Engineer shall be a degreed engineer and be registered as a professional Engineer in the State of Maine. The Quality Assurance Resident Engineer shall be specifically experienced in leachate transport pipeline construction techniques and shall be trained by the CQA in the duties of a QARE.

Quality Assurance Monitors shall be quality assurance personnel who have been specifically trained in the quality assurance of leachate transport pipeline installations.

1.2.6.4 Submittals

Pre-qualification: To be considered for pre-qualification, the CQA must provide the following information:

1. Corporate background and information.
2. Quality assurance capabilities:
    a. A summary of the firm's experience with pipeline construction.
    b. A summary of the firm's experience in quality assurance, including installation quality assurance of similar pipeline construction projects.
    c. A summary of quality assurance documentation and methods used by the firm, including sample quality assurance forms, reports, certifications, and manuals prepared by the firm.
    d. Resumes of key personnel.

Pre-installation: Prior to beginning work on a project, the CQA must provide the Project Manager/RPR with the following information:

1. Resumes of personnel to be involved in the project including QARE, and Quality Assurance Monitors.
2. Proof of professional engineering registration for the engineer to be designated as the Quality Assurance Managing Engineer (QAME).
3. Proof of the required quality assurance experience of the quality assurance personnel.

1.2.5 Soils Quality Assurance Laboratory

1.2.7.1 Definitions

The Soils Quality Assurance Laboratory (SQAL) is a firm, independent from the contractor responsible for conducting tests on construction soils materials taken from the site.

1.2.7.2 Responsibilities

The SQAL shall be responsible for conducting the appropriate laboratory tests as directed by the Soils QARE or CQA. The test procedures shall be done in accordance with the test methods outlined in this QAP and/or the project specifications.

1.2.7.3 Qualifications

The SQAL shall have experience in testing soils and be familiar with American Society for Testing and Materials (ASTM), Federal Test Method Standard (FTMS), and other applicable test standards. The SQAL shall be capable of providing verbal results of destructive seam tests within 24 hours of receipt of test samples and shall maintain that standard throughout the installation. The SQAL shall be approved by the Project Manager/RPR and/or NEWSME.

On-site laboratory facilities may be used by the SQAL, provided they are appropriately equipped and approved by the Soils QARE/CQA and the Project Manager/RPR.

1.2.7.4 Submittals

The SQAL shall submit soil test results to the QARE in written form within 5 days of receipt of test samples unless otherwise specified by the Project Manager/RPR. Soil test results shall typically be provided verbally to the QARE within 24 hours of receipt of test samples, or a time period as dictated by the testing requirements. Written test results shall be in an easily readable format and include references to the standard test methods used.

Written test results shall be in an easily readable format and include references to the standard test methods used.

1.3 Communication

To guarantee a high degree of quality during the construction process and assure a final product that meets all project specifications, clear, open channels of communication are essential. This section discusses appropriate lines of communication and describes all necessary meetings.

1.3.1 Lines of Communication

The QARE shall be capable of direct communication with the Project Manager/RPR at all times. The project manager shall be capable of direct communications with NEWSME and the MEDEP at all times.

1.3.2 Resolution Meeting

Following permit approval and the completion of the construction drawings and specifications for the project, a resolution meeting may be held. If a resolution meeting is required, it is recommended that the meeting include the parties when involved, typically including the Site Property Owner, Site Building Owner, Project Manager/RPR, Designer, QARE, and the NEWSME representative. If necessary, this meeting can be held in conjunction with the pre-construction meeting.

The purpose of this meeting is to establish lines of communication, review construction drawings and specifications for completeness and clarity, begin planning for coordination of tasks, anticipate any problems which might cause difficulties and delays in construction, and review the QAP. Aspects of the design shall be reviewed during this meeting so that clarification and/or design changes may be made before the construction work is bid. In addition, the guidelines regarding quality assurance testing and problem resolution must be known and accepted by all.

The meeting shall be documented by a person designated at the beginning of the meeting, and minutes shall be transmitted to all parties.

1.3.3 Pre-Construction Meeting

A pre-construction meeting shall be held at the site prior to the start of earthwork. Typically, the meeting shall be attended by the Project Manager/RPR, Designer, QARE, and a NEWSME representative. NEWSME or their agent shall notify the MEDEP of the pre-construction meeting 7 days prior to the meeting date so that an MEDEP representative may attend if desired.

Specific topics considered for this meeting include review of the project QAP for any problems or additions. In addition, the responsibilities of each party should be reviewed and understood clearly. The meeting shall be documented by a person designated at the beginning of the meeting, and minutes shall be transmitted to all parties.

1.3.4 Progress Meetings

A bi-weekly progress meeting shall be held between the Contractor, QARE, Project Manager/RPR, and any other concerned parties. This meeting shall discuss current progress, planned activities for the next week, issues requiring resolution, and any new business or revisions to the work. The QARE shall log any problems, decisions, or questions arising at this meeting in his weekly report. If any matter remains unresolved at the end of this meeting, the Project Manager/RPR shall be responsible for the resolution of the matter and the communication of the decision to the appropriate parties.

2.0 DOCUMENTATION

An effective QAP depends largely on identification of the construction activities that shall be monitored, and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The QAREs/CQAs shall document that all requirements in the geosynthetic portions of the project QAP have been addressed and satisfied.

The QAREs/CQAs shall provide the Project Manager/RPR with signed descriptive remarks, data sheets, and checklists to verify that all monitoring activities have been carried out. The QAREs/CQAs shall also maintain at the job site a complete file of the documents which comprise the QAP, including plans and specifications, checklists, test procedures, daily logs, and other pertinent documents.

2.1 Daily Reports

2.1.1 Construction Quality Assurance

Each Construction Quality Assurance Monitor shall complete a daily report and/or logs on prescribed forms outlining the monitoring activities undertaken for that day. The activities undertaken, materials used, location, time, testing done, samples taken, and test results obtained shall be documented. Failed areas shall be identified and the remedial action taken noted. Any problems and/or concerns regarding failed areas shall be noted. The monitor(s) shall also note the equipment used and the work force provided, and any subcontractors, provided during the daily operations. The report must be completed at the end of each monitor's shift, prior to leaving the site, and submitted to the Soils QARE/CQA.

The Soils QARE/CQA will review daily reports submitted by the CQA monitor(s) and incorporate a summary of their reports into the Soils QARE's/CQA's daily report. Any actions requiring action by the Project Manager/RPR shall be clearly identified. The report shall include a summary of quantities of materials installed that day. This report must be completed daily, summarizing the previous day's activities and a copy submitted to the Project Manager/RPR at the beginning of the work day following the report date.

2.1.2 Report Forms and Installation Logs

Each Quality Assurance Monitor shall document construction activities as described above on the pertinent forms or logs attached to the end of this Section.

2.2 Testing Reports

2.2.1 Soils Testing Reports

The on-site testing and laboratory test reports from all sources shall be collected by the QARE. This includes field tests and laboratory tests. A summary list of test samples of pass/fail results shall be prepared by the QARE on an ongoing basis, and submitted with weekly progress reports.

2.2.2 Miscellaneous Test Reports

On-site testing of pressure pipe, manholes, pump stations, leachate storage tank, and other equipment shall be reported on a separate Equipment Test Report Log. Test reports shall be submitted to the QARE as the equipment is tested, and shall be included in weekly progress reports.

2.3 Progress Reports

Progress reports shall be prepared by the QARE and submitted to the Project Manager/RPR. These reports shall be submitted every two weeks, starting the first Friday of construction on-site. This report shall include: test results, submittals and action taken; summary of work progress; upcoming work items for the next two weeks; punchlist items; summary of problems encountered and how the problems were resolved; change order status; and construction stability monitoring results, if applicable. Other items may include delays caused by weather conditions or material shortages.

All QARE's daily reports for the period should be appended to each progress report.

2.4 Record Drawings

2.4.1 Construction Record Drawings

Record drawings shall be prepared by the CQA Agent. The record drawings will incorporate the record drawings prepared by the QARE. The record drawings shall include the above, plus the following information:

1. Horizontal and vertical location of all pipeline components such as: force mains; manholes; roadways; electrical conduits; utilities; and leachate transport system piping. These shall be located relative to the site benchmarks.

Record drawings shall be stamped by a Maine registered professional engineer in employ of the CQA.

2.5 Final Certification Report

A final certification report shall be submitted to NEWSME upon completion of the work. This report shall summarize the activities of the project, and document the aspects of the quality assurance program performed. A copy of the report will be submitted to the MEDEP as part of the construction documentation report.

The final certification report shall include, at a minimum, the following information:

1. Parties and personnel involved with the project.
2. Certification, sealed and signed by a registered professional engineer.

3. Record drawings, sealed and signed by a registered professional engineer.
4. A narrative summary of all phases of the pipeline construction.
5. Copies of applicable specifications.
6. Written clarifications and interpretations of the specifications.
7. Change Orders to specifications.
8. Minutes from pertinent construction meetings.
9. Copies of the following site construction quality assurance records: field compaction testing results; soil material conformance testing results; submittals; pipe testing records; and CQA daily and weekly reports.
10. Copies of photographs taken to document the progression of site construction activities.

The report shall include written certification by the QARE and the Quality Assurance Managing Engineer that the installation was completed in accordance with the project QAP except as noted to the Project Manager/RPR.

3.0 SOIL COMPONENTS

3.1 Borrow Materials

Access Road Base and Subbase Material: Must meet requirements for gradation.

Pipe Bedding: Must meet requirements for gradation.

Electrical/Communications Utility Bedding: Must meet requirements for gradation.

Granular Backfill: Must meet requirements for gradation.

Common Borrow: Must meet requirements as defined by the project specifications.

The soils used in the construction of leachate pipeline construction shall meet the CQC requirements outlined in the specifications. Changes in the materials must be approved by the Project Manager/RPR prior to placement.

3.2 Material Delivery, Storage, and Processing

Material used in the construction of the leachate transfer system will require proper handling in order to assure that the specified design properties are not compromised. The QARE/CQA must observe hauling operations and inspect materials as they are delivered. Loads shall be periodically inspected to assure that contamination is not occurring. Truck dump bodies shall be in clean condition prior to a change of material being handled. Hauling personnel shall be informed by the Contractor of the need to clean dump bodies when appropriate. The QARE/CQA may elect to obtain samples for quality assurance testing. Testing under these circumstances will be at the contractor's expense.

Storage of materials shall be in such a manner so that the material properties will remain uncompromised by contamination until they are used. The QARE/CQA shall instruct the contractor of a storage location. The contractor is responsible for keeping materials from being contaminated. The contractor must take measures to assure stockpiled materials meet the specifications as they are installed. The QARE/CQA may elect to obtain samples for quality assurance testing.

3.3 Subgrade Preparation

Subgrades shall be properly prepared and compacted to the requirements outlined in Project Specification Section 02200. The QARE/CQA is responsible for inspection of the subgrade and identifying areas which will require further compaction. Testing will be done as needed to assure that the subgrade can adequately support the subsequent compacted liner materials. Water should be added or removed to assure optimum compaction effort.

Unacceptable subgrade material is to be removed and replaced with a suitable compacted common borrow. Common borrow used to fill the subgrade is to be approved by the QARE/CQA.

3.4 Placement, Remolding, and Compaction

3.4.1 Soil Material Placement

Placement of soil into a fill is to be done according to the specifications. For embankment and excavation fills, loose lift thicknesses shall not exceed 12 inches for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

Placement of soil materials to compact will not be allowed in weather conditions that adversely affect material compaction. The contractor is responsible for protection of materials being placed and should take necessary measures to protect the materials.

3.4.2 Compaction

Proper compaction of soil materials is dependent upon the correct moisture content of the soil and the compaction effort. The QARE/CQA will be responsible for being familiar with the soil properties being used for pipeline installation. QARE/CQA shall have soils materials tested when their properties are in doubt. The contractor shall be responsible for notifying the QARE/CQA of any changes in soil materials or borrow source. The QARE/CQA may elect to perform additional testing, beyond what is required by the specifications, in order to define the soil properties and determine their acceptability.

The equipment used and the number of passes required to meet the project specifications shall be determined at the beginning of material placement with a minimum number of passes. The QARE/CQA will observe the compactive effort and periodically document the number of passes taken on a given section of soil. The CQA Monitor will measure the moisture/density by nuclear method, as outlined in Section 3.5.1.2 of this plan. Upon passing test results, the CQA Monitor will sample the soil, if necessary, and inform the contractor of the results. Non-passing test results will immediately be reported to the contractor. The contractor can request the area be retested or the area will be reworked by adjusting soil moisture and compactive effort. The QARE/CQA should observe these adjustment measures to assure that they are applied uniformly throughout the failed area. After reworking the soil lift the QARE/CQA will retest the lift. If the moisture density tests pass, the QARE/CQA may sample the area for hydraulic conductivity if required, and the contractor may resume construction. The area will be reworked until passing test results are obtained. The QARE/CQA shall document the efforts required to acquire passing test results in deficient areas.

3.5 Quality Assurance Testing and Documentation

3.5.1 Construction Quality Assurance (CQA) Agent Responsibilities

The CQA will direct the sampling and testing of all soil materials to be used in the construction of the leachate pipeline components. The CQA will observe and document, borrow site material resources and on-site utilization of the soil materials. Duties shall include but not be limited to sampling, testing, observing, and documenting soil material utilization. The CQA shall also approve methods of construction and the equipment used to place and work the soil materials.

3.5.1.1 Quality Assurance Testing

The CQA shall implement the soil testing plan as defined by the construction specifications and the quality assurance manual. Borrow materials shall be sampled and tested by CQA at the required frequency as defined by the QAQC Plan and construction specifications. Tests performed on each soil component shall be approved by the CQA. Borrow materials from the point source shall be sampled and tested at frequency indicated on Section 1.05 of Specification Section 02200.

3.5.1.2 Quality Control Testing

Quality control testing of borrow materials to be used in the construction of the leachate pipeline shall be sampled and tested at the frequency indicated in Section 3.14 of Specification Section 02200. Samples shall be obtained from stockpiles to be shipped to the site or from shipments arriving on-site.

3.5.1.3 Standard In-place Testing

The tests indicated in Section 3.14 of Specification Section 02200 shall be performed to document the soils meets the specified in-place properties. This testing shall be performed by the CQA.

3.5.2 Documentation

All observations, results of field tests performed on-site or off-site and laboratory tests, shall be recorded on suitable data record sheets. At a minimum, the inspection data record sheets shall include the following:

1. Description or title of the inspection activity.
2. Location of the inspection activity or location from which the sample was obtained.
3. Type of tests done or to be done.
4. Recorded observation or test date.
5. Results of the inspection or testing with reference to specifications.
6. Person involved in the inspection.

7. Signature of the CQA resident engineer and review by the CQA Project Manager.

Data record sheets to be utilized in the CQA program shall be approved by the CQA Project Manager.

4.0 HDPE PIPE, FITTINGS AND APPURTENANCES

4.1 Quality Control Documentation

Prior to the installation of any pipe, fittings, and appurtenances at the facility, the contractor shall provide the Engineer with material submittals on the materials to be used in construction of the leachate transport pipeline. Submittals shall be prepared according to the project specifications. The following information shall be available and will be provided to the Engineer or CQA upon request:

1. The origin (resin supplier's name and resin production plant), identification (brand name and number), and production date of the resin.
2. Copies of the quality control certificates issued by the resin supplier.
3. Reports on tests conducted by the Manufacturer to verify that the quality of the resin used to manufacture the HDPE pipe and fittings, meets the specifications.
4. Reports on quality control tests conducted by the Manufacturer to verify that the HDPE pipe and fittings manufactured for the project meets the project specifications.
5. A statement indicating that the amount of reclaimed polymer added to the resin during manufacturing was done with appropriate cleanliness and does not exceed 2 percent by weight.
6. A list of the materials which comprise the HDPE pipe and fittings, expressed in the following categories as percent by weight: polyethylene, carbon black, other additives.
7. A specification for the pipe and fittings which includes all properties contained in the specifications measured using the appropriate test methods.
8. Written certification that minimum values given in the specification are guaranteed by the Manufacturer.
9. Quality control certificates, signed by a responsible party employed by the Manufacturer. The quality control certificates shall include pipe identification numbers, sampling procedures and results of quality control tests. At a minimum, results shall be given for:

    a. Density

    b. Melt flow index

    c. Carbon black content

    Quality control tests shall be performed in accordance with the test methods specified in the specifications, for every 1,000 ft of pipe produced.

The Manufacturer shall identify all pipe according to ASTM D 1248 and ASTM F 714.

The CQA shall review these documents, as requested, and shall report any discrepancies with the above requirements to the Project Manager/RPR. The CQA shall verify that:

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

4.2 Conformance Testing

Upon delivery of the HDPE pipe, the CQA shall inspect the pipe and based on the pipe condition and review of the manufacturer's certification documentation, may elect to sample the pipe for conformance testing. Conformance test samples shall be identified in a manner appropriate for the ASTM standard for HDPE pipe. These samples shall then be forwarded to the QAL for testing to assure conformance to the specifications.

If elected, the following conformance tests shall be performed on the pipe:

1. Physical dimensions by ASTM D 2122
2. Density by ASTM D 1505
3. Plate bearing test by ASTM D 2412
4. Impact resistance by ASTM D 2444

These conformance tests shall be performed in accordance with the test methods specified. Other conformance tests may be required by the Project Manager/RPR.

4.2.1 Sampling Procedures

A lot shall be defined as a group of consecutively numbered pipes from the same manufacturing line. Alternatively, a lot may be designated by the CQA based on a review of all pipe information including quality control documentation and manufacturing records.

Unless otherwise specified, samples shall be taken at a rate of one per lot, not less than one conformance test per 1,000 ft of HDPE pipe.

4.2.2 Test Results

All conformance test results must be reviewed and accepted or rejected by the CQA prior to the deployment of the HDPE pipe.

The CQA shall examine all results from laboratory conformance testing and shall report any nonconformance to the Project Manager/RPR. The CQA shall be responsible for checking that all test results meet or exceed the minimum property values listed in project specifications.

If the Manufacturer has reason to believe that failing tests may be the result of the QAL incorrectly conducting the tests, the Manufacturer may request that the sample in question be retested by the QAL with a technical representative of the Manufacturer present during the testing. This retesting shall be done at the expense of the Manufacturer. Alternatively, the Manufacturer may have the sample retested at two different NEWSME approved independent laboratories at the expense of the manufacturer. If both laboratories produce passing results, the material shall be accepted. If both laboratories do not produce passing results, then the original QAL's test results shall be accepted. The use of these procedures for dealing with failed test results is subject to the approval of the Project Manager/RPR.

If a test result is in nonconformance, all material from the lot represented by the failing test shall be considered out of specification and rejected. Alternatively, at the option of the Project Manager/RPR, additional conformance test samples may be taken to "bracket" the portion of the lot not meeting specification (note that this procedure is valid only when all pipes in the lot are consecutively produced and numbered from one manufacturing line). To isolate the out of specification material, additional samples must be taken from pipes that have pipe numbers immediately adjacent to the pipe that was sampled and failed. If the two additional tests pass, the pipe that represents the initial failed test and the pipe manufactured immediately after that pipe (next larger pipe number) shall be rejected. If one or both of the additional tests fail, then the entire lot shall be rejected or the procedure repeated with two additional tests that bracket a greater number of pipes within the lot.

4.3 Pipe and Fitting Placement

The Installer shall handle all pipe in such a manner as to ensure it is not damaged in any way, and the following shall be complied with:

1. HDPE pipe, fittings, and appurtenances shall be placed as shown in the Contract Drawings, specifications, and/or as directed by the CQA.
2. Piping placed within a trench shall be placed according to the contract drawings. Pipe bedding and backfill shall be done according to the specifications.
3. Pipe fittings shall be installed as shown on the contract drawings and as recommended by the pipe manufacturer and CQA.

4. Solid wall HDPE transport pipe and associated fittings shall be pressure leak tested according to general industry standards. The CQA is responsible for observing and documenting these tests. The installer is responsible for locating and repairing all leaks in such a manner that is acceptable to the CQA.

4.4 Pipe Seams and Fusion Techniques

Butt fusion welding shall be used to seam pipe lengths together and install pipe fittings. Welding shall be done by qualified personnel and according to manufacturer's instructions. The installer shall provide the CQA with documentation of the pipe welder's experience. The CQA shall observe and document welding operations as necessary to assure welding techniques are highest quality.

4.5 Repairs

Any damaged pipe shall be discarded. No repairs shall be allowed.

4.6 Manholes, Valves and Other Appurtenances

Manholes, valves and other appurtenances associated with the piping systems shall be constructed according to the contract drawings and specifications. All connections to piping and/or associated equipment shall be according to the contract drawings and the manufacturer's recommendations. All manholes, valves and other pipe connections shall be leak tested according to general industry standards. The installer is responsible for repair of faulty material and repairs required to provide a leakproof installation. The CQA is responsible for observing and documenting installation and testing necessary to assure installation techniques are highest quality.

4.7 Soil Materials Placement

All soil materials located on top of a pipe shall be placed in such a manner as to ensure:

1. The pipe and underlying materials are not damaged or dislocated.
2. The pipe structural integrity is not compromised.

Unless otherwise specified by the Designer, all lifts of soil material shall be in conformance with the guidelines given in Section 3.

Any noncompliance shall be noted by the CQA and reported to the Project Manager/RPR.

APPENDIX C

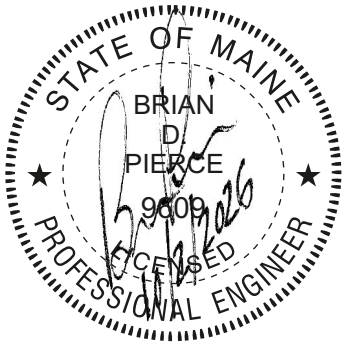
STORMWATER MANAGEMENT PLAN

SME
SEVEE & MAHER
ENGINEERS

STORMWATER MANAGEMENT PLAN
LEACHATE TRANSFER SYSTEM UPGRADES
PINE TREE LANDFILL
HAMPDEN, MAINE

Prepared for

NEW ENGLAND WASTE SERVICES OF MAINE, INC.



October 2026

4 Blanchard Road
P.O. Box 85A
Cumberland, Maine 04021

Tel: 207.829.5016 sme-engineers.com

SME
SEVEE & MAHER
ENGINEERS

TABLE OF CONTENTS

Section No.	Title	Page No.
1.0	**INTRODUCTION**	**1**
2.0	**PROJECT DESCRIPTION**	**1**
3.0	**METHODOLOGY**	**3**
4.0	**PRE DEVELOPMENT CONDITIONS**	**3**
5.0	**POST-DEVELOPMENT CONDITIONS LEACHATE TRANSFER SYSTEM UPGRADES**	**4**
6.0	**STORMWATER QUALITY**	**4**
7.0	**SUMMARY**	**4**

LIST OF APPENDICES

APPENDIX A DRAWINGS D-100 AND D-101

APPENDIX B HYDROCAD PRE- AND POST-CALCULATIONS

STORMWATER MANAGEMENT PLAN
LEACHATE TRANSFER STATION UPGRADES

1.0 INTRODUCTION

This Plan is the Stormwater Management Plan (SMP) for the Leachate Transfer System Upgrades at the Pine Tree Landfill (PTL). New England Waste Services of Maine, Inc. (NEWSME) is the owner and operator of the PTL. The project is located adjacent to the landfill and includes relocating the existing leachate loading rack, constructing a leachate unloading area, and rerouting site leachate piping to improve the efficiency of leachate loading and unloading operations.

Leachate generated at the PTL currently consists of landfill leachate from the PTL and collected groundwater from extraction wells and perimeter drains near the landfill. Leachate is conveyed from existing pump stations and groundwater extraction wells through underground piping to a leachate storage tank. From the storage tank, the existing leachate pump station can either discharge leachate to the Town of Hermon sewer system or pump it to tanker trucks at the existing loading rack for transport to and disposal at permitted wastewater treatment facilities (WWTFs). Wastewater discharged to the Hermon sewer flows to the City of Bangor sewer system and is treated at the Bangor Wastewater Treatment Plant (BWTP).

NEWSME also operates the Juniper Ridge Landfill (JRL) in Old Town, Maine. The proposed transfer system will allow leachate delivered by tanker truck from the JRL to be unloaded into the PTL leachate management system. Once received, JRL leachate is mixed with PTL leachate and either discharged to the Hermon sewer or loaded into tanker trucks for transport to a permitted WWTF.

This SMP, along with the engineering drawings, technical specifications, and design calculations, have been prepared by Sevee & Maher Engineers, Inc. (SME) on behalf of NEWSME for the development of the leachate transfer system. The SMP is for the project area and an extension of the Gas-to-Energy and Landfill Closure SMPs.

2.0 PROJECT DESCRIPTION

The proposed leachate transfer system is designed to allow secure loading and unloading of leachate at the PTL facility. The purpose of the proposed transfer system upgrade is to allow the unloading of leachate from JRL into PTL's existing leachate storage tank and to make upgrades to the leachate loading system so that leachate from the existing leachate tank can be more easily transferred into tanker trucks for off-site disposal.

Approximately 12,800 square feet of additional bituminous concrete pavement will be constructed to allow tanker truck ingress and egress of the leachate transfer area.

Leachate unloading will occur with leachate tanker trucks parked on the proposed transfer pad. The transfer pad will be a 40-feet-long by 30-feet-wide, 9-inch-thick reinforced concrete pad. In the unlikely event that a spill occurs, the pad will be graded to drain to a 4-foot-diameter precast concrete catch basin with frame and grate located in the center of the pad and piped to the transfer vault. A 6-inch stainless steel pipe will run from the transfer vault to the east corner of the unloading pad and be terminated 2 feet above top of pad with a quick connection for unloading leachate tanker trucks from the JRL.

A 7-foot by 8-foot by 35-foot HDPE-lined precast transfer vault will be installed approximately 15 feet northwest of the concrete unloading pad. The transfer vault will include two inlet penetrations, one for the 12-inch drain pipe from the catch basin and one for the 6-inch tanker unloading pipe. The transfer vault will also include one outlet penetration with associated 12-inch diameter HDPE pipe at the bottom of the structure draining to an 84-inch-diameter high-density polyethylene (HDPE) duplex pump station located at the southwest end of the transfer vault. Tanker trucks will unload leachate at a greater rate than the pump station can pump to storage. Therefore, the transfer vault is not intended to store leachate, but to provide a temporary contained structure for the transfer of leachate from the tanker trucks to the pump station and the pump station to the leachate storage tank. The transfer vault will be equipped with level control that will close a motor-actuated valve and prevent trucks from unloading leachate if the level in the vault reaches an elevation of 138.0 (approximately 4-feet above the bottom of the vault), as well as a red alarm light adjacent to transfer pad. The combined volume of the transfer pad and vault exceeds 9,020 gallons to elevation 139.8 (more than 10% greater than the size of the largest tanker truck that will deliver leachate from the JRL).

An 84-inch-diameter HDPE duplex pump station will be equipped with two 7.5-hp pumps and level control with high-water alarm. The pump will discharge leachate at a rate of approximately 500 gpm to the existing leachate storage tank through a 8-inch by 12-inch dual containment HDPE force main.

A force main connection vault will be installed at approximately STA 1+30 (SMH 21) from the transfer pump station to the existing valve manhole at the leachate storage tank. The existing 6-inch by 10-inch HDPE force main from Secure II–Phase 6 will be rerouted to SMH 21 and the existing 8-inch by 12-inch HDPE force main from Secure III will be connected to SMH 21. From SMH 21 the force main will run to a connection prior to a valve manhole at the leachate tank and trench fused to the existing 6-inch by 10-inch force main. Each run of the dual-containment piping systems will be monitored with a pressure sensor capable of detecting increases in pressure between the carrier pipe (inside pipe that carries the leachate) and containment pipe (outside pipe) and monitored regularly by NEWSME staff. Level alarms will also be installed in SMH 21 and SMH 22 to notify NEWSME staff in the event liquids begin to fill the manhole.

The strategy to minimize sediment and erosion within the project limits will include the use of both temporary erosion control measures (e.g., siltation fences, sediment barriers, mulching, and stone check dams) and permanent measures (e.g., existing detention ponds, permanent seeding, and culvert inlet and outlet protection).

3.0 METHODOLOGY

A stormwater model was prepared to compare peak runoff from the 2-year, 10-year, and 25-year/24-hour storm events. The study areas for this project include the northeast corner of the closed landfill which shed to the North Detention Basin and the Gas-to-Energy building area which sheds to Old Cold Brook Road. The peak surface water runoff rates for each subcatchment within the study areas were calculated utilizing a weighted curve number (CN) and time of concentration (T_c) for each subcatchment based on area, hydrologic soil group, cover type, and drainage patterns. Design storm events use the Penobscot South Type II SCS rainfall distribution and Type II antecedent moisture conditions consistent with the current published rainfall distributions of the Hampden area. The HydroCAD computer modeling system by Applied Microcomputer Systems of Chocorua, New Hampshire, was used for model development.

4.0 PRE DEVELOPMENT CONDITIONS

PTL is a 160-acre site located off Emerson Mill Road in Hampden, Maine. Figure 1 is a Site Location map of the PTL and the surrounding facilities. Prior to closure, beginning in 1975, the PTL facility, formerly Sawyer Environmental Recovery Facilities, Inc. (SERF), had been used for disposal of municipal solid waste (MSW) and special solid waste at four licensed disposal facilities. Of the four, three facilities are secure landfills with liners and leachate collection systems.

The pre-development surficial conditions at PTL prior to 1998 are a combination of landfill cover, wooded, roads, crushed gravel layered areas and grassed meadows and field, overlaying surficial soils classified under the hydrologic soil Groups C and D.

Pre-development elevations withing the landfill setting range from 210 to 120 feet Mean Sea Level (MSL). Natural (pre-development surface drainage consists of shallow concentrated flow with some channelization occurring in the lower elevations because of existing swales.

The PTL property has a northern and southern watershed. Within the watersheds there are several subcatchments which flow to five analysis points (AP) around the perimeter of the property. The northern watershed with AP-2 and AP-4 are the two subcatchments analyzed as they include development from this project. AP-2 and AP-4 ultimately flow to Souadabscook Stream. The subcatchments were analyzed at the two discharge points based on the current land use and time of concentration as shown on Drawing D-100.

5.0 POST-DEVELOPMENT CONDITIONS LEACHATE TRANSFER SYSTEM UPGRADES

NEWSME is proposing to construct a leachate transfer system to transfer leachate from the JRL to the PTL for treatment. This project will be located on the east side of the site approximately 1,300 feet from Old Cold Brook Road, directly south of the current leachate storage tank.

The proposed development, as depicted on Drawing D-101, Stormwater Management Plan, Leachate Transfer System Upgrades, will drain to two analysis points, AP-2 and AP-4. Approximately 12,800 square feet of new impervious area is proposed for the project. Approximately 6,100 square feet of new pavement will drain to AP-4 east of the site and approximately 6,700 square feet of new pavement will drain to AP-2 to the north of the site.

The analysis reflects a reduction in the peak runoff rates from the pre-development conditions as shown in the following table.

TABLE 5-1

COMPARISON OF PRE- AND POST-DEVELOPMENT PEAK FLOWS
NORTH AND EAST WATERSHEDS

Analysis Point	Storm Event	Peak Flow (ft^3/sec)	
		Pre-Development	Post-Development
NORTH WATERSHED (ANALYSIS POINT #2)	2-yr/24-hr	33.0	2.4
	10-yr/24-hr	68.3	8.2
	25-yr/24-hr	100.6	94.7
EAST WATERSHED (ANALYSIS POINT #4)	2-yr/24-hr	4.2	3.4
	10-yr/24-hr	10.4	8.6
	25-yr/24-hr	16.4	13.6
Note: In Post-Development stormwater analysis the northern detention basin was conservatively assumed to be full prior to analysis. Field observations indicate the pond is typically at elevation 114 ft.			

6.0 STORMWATER QUALITY

As this project is a landfill project it is only subject to the basic and flooding standard. Area draining to AP-2 will use existing north detention pond utilized by the northern watershed and providing detention for stormwater quality. Flow from SC-1A will sheet flow into adjacent wooded areas.

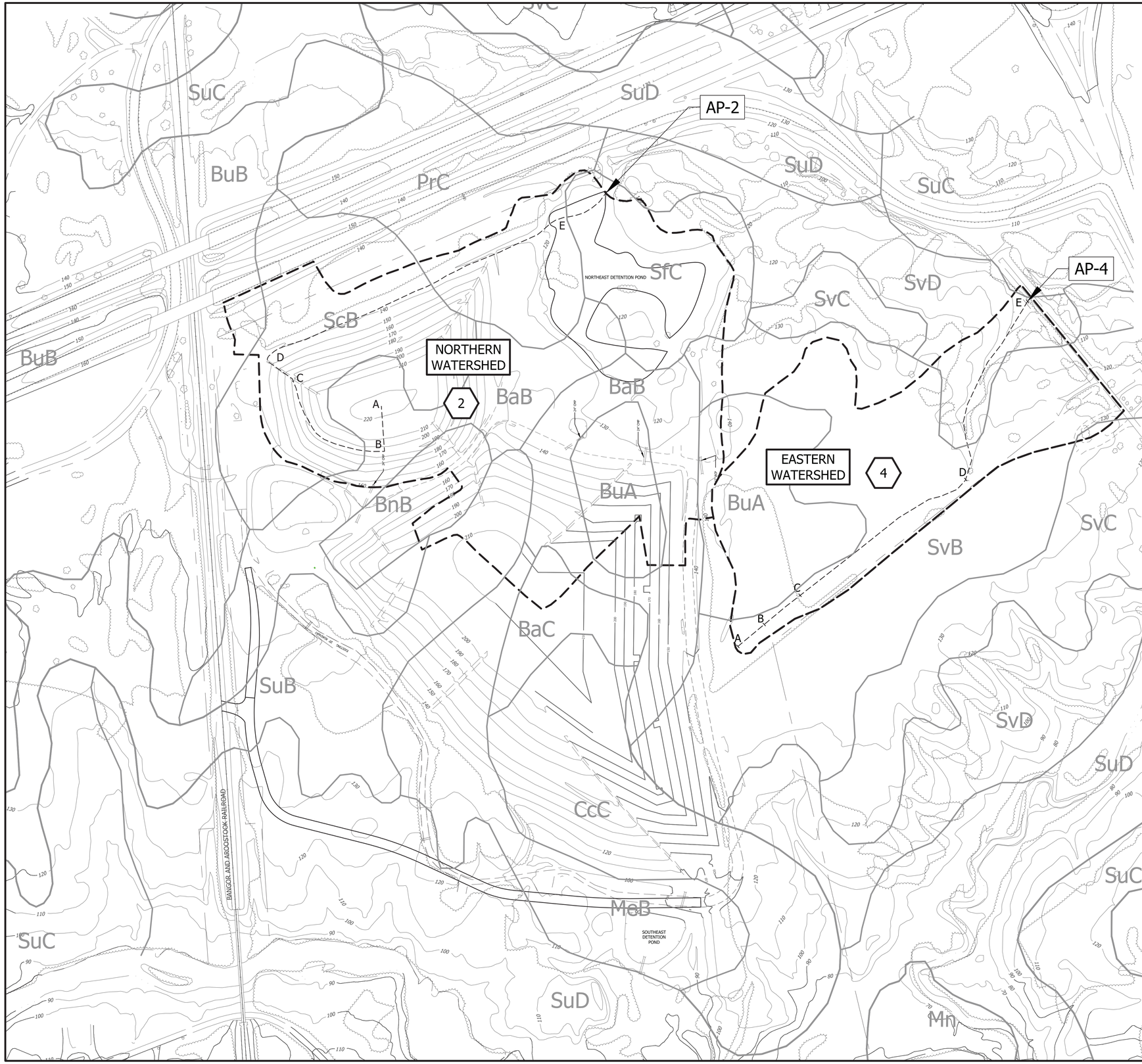
7.0 SUMMARY

Based on the modeling outlined above, it is expected that with the implementation of the stormwater management practices identified, no significant impact on the quantity or quality of downgradient waterbodies is expected, due to stormwater from the proposed project.

APPENDIX A

DRAWINGS D-100 AND D-101

SME
SEVEE & MAHER
ENGINEERS



NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.

STORMWATER MANAGEMENT LEGEND

2	SUBCATCHMENT DESIGNATION
	SUBCATCHMENT BOUNDARY
A — B — C	TIME OF CONCENTRATION SEGMENT DESIGNATION TIME OF CONCENTRATION PATH
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Cf	CHANNEL FLOW
	DRAINAGE REACH
R4	REACH DESIGNATION
P9	POND/STRUCTURE DESIGNATION
tc(1)	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION
	SOIL TYPE BOUNDARY
Sn	SOIL TYPE DESIGNATION

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

75 0 150 300 FEET

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE
BRIAN D PIERCE 9609
REGISTERED PROFESSIONAL ENGINEER
9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

STORMWATER MANAGEMENT PLAN
PRE-DEVELOPMENT CONDITIONS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 • Fax 207.829.5692 • sme-engineers.com

DESIGN BY:	----
DRAWN BY:	----
DATE:	9/2026
CHECKED BY:	----
LMN:	SMP-P
CTB:	SME-STD.CTB

JOB NO. ---- DWG FILE SMP-E

D-100

C:\Users\jen\OneDrive - SME\SHAREPOINT\Casella - Pine Tree Landfill - FY25\Plans\SMP-E.dwg, D-100, 9/23/2026 11:04:50 AM, ejm



NOTES:

1. BASE MAP FROM PLAN TITLED "EXISTING CONDITIONS PLAN - PHASE VIII-C STAGE 1 & 2 - FINAL COVER PLAN - PINE TREE LANDFILL - HAMPDEN, MAINE" BY SEVEE AND MAHER ENGINEERS, DATED 1/11/2026 (RECORD DRAWINGS), AND AERIAL SURVEY BY AERIAL SURVEY & PHOTO, INC. NORRIDGEWOCK, MAINE, PHOTO DATE JULY 31, 2014. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. ADDITIONAL GPS GROUND SURVEY PERFORMED BY SEVEE & MAHER ENGINEERS, INC. DATED 05/05/2026. STANDARD PRACTICE DICTATES THAT PLAN COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. LOCATIONS OF THE EXISTING UTILITIES ARE APPROXIMATE. ALL UTILITIES ARE ASSUMED TO BE ACTIVE UNLESS NOTED OTHERWISE. LIMITS OF THE EXISTING LANDFILLS AND LOCATIONS OF EXISTING UTILITIES SHOWN ON THESE PLANS ARE FROM THE FOLLOWING SOURCES:

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, SECURE III PHASE I-V CLOSURE, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, DECEMBER 2002.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII PERIMETER BERM CONSTRUCTION, DECEMBER 2006 BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE. RECORD DRAWINGS DATED APRIL, 2007.

   PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VIII-C STAGE 2 AND 3 PERIMETER BERM CONSTRUCTION, MAY 2007 BY SEVEE AND MAHER ENGINEERS, INC. CUMBERLAND, MAINE. RECORD DRAWINGS DATED SEPTEMBER 2007.

   RECORD DRAWINGS: PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VI PERIMETER BERM CONSTRUCTION, BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE, AUGUST 2008.

   RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE PHASE VII & VIII-C STAGE 3 FINAL COVER PLAN, BY SARGENT CORPORATION, OCTOBER 2008.
3. WETLANDS DELINEATED BY STANTEC, DATED 05-27-2026.
4. THE CONTRACTOR SHALL FIELD VERIFY ALL PIPING LOCATIONS AND ELEVATIONS AT PROPOSED TIE-IN AND PIPE CROSSING LOCATIONS.
5. LOCATION OF PHASE VI CLOSURE SYSTEMS ARE FROM PHASE VI CLOSURE PLANS DATED OCTOBER 2008. LOCATIONS ARE APPROXIMATE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
6. RECORD SURVEY INFORMATION FOR PINE TREE LANDFILL, HAMPDEN, MAINE, PHASE VIIIC STAGE 1 AND 2 FINAL COVER PLAN, BY SARGENT CORPORATION, DECEMBER, 2010.

STORMWATER MANAGEMENT LEGEND

SC-2	SUBCATCHMENT DESIGNATION
	SUBCATCHMENT BOUNDARY
A — B — C	TIME OF CONCENTRATION SEGMENT DESIGNATION TIME OF CONCENTRATION PATH
Sht L=100' S=0.035	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Cf	CHANNEL FLOW
	DRAINAGE REACH
R4	REACH DESIGNATION
P3	POND/STRUCTURE DESIGNATION
tc(2)	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION
	SOIL TYPE BOUNDARY
Sn	SOIL TYPE DESIGNATION

NOTE:
1. SEE DRAWING C-100 FOR GENERAL SITE NOTES AND PLAN REFERENCES.

75 0 150 300 FEET

REV.	BY	DATE	STATUS
	BDP	9/2026	SUBMITTED TO MEDEP AND TOWN OF HAMPDEN FOR REVIEW

STATE OF MAINE BRIAN D. PIERCE 9609 LICENSED PROFESSIONAL ENGINEER 9/24/2026

PINE TREE LANDFILL
LEACHATE TRANSFER SYSTEM UPGRADES
HAMPDEN, MAINE

STORMWATER MANAGEMENT PLAN
POST-DEVELOPMENT CONDITIONS

SME
SEVEE & MAHER ENGINEERS
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland, Maine 04021
Phone 207.829.5016 Fax 207.829.5692 sme-engineers.com

DESIGN BY:	NMT
DRAWN BY:	SJM
DATE:	9/2026
CHECKED BY:	BDP
LMN:	SMP-P
CTB:	SME-STD.CTB

JOB NO. 260565.00 DWG FILE BASE

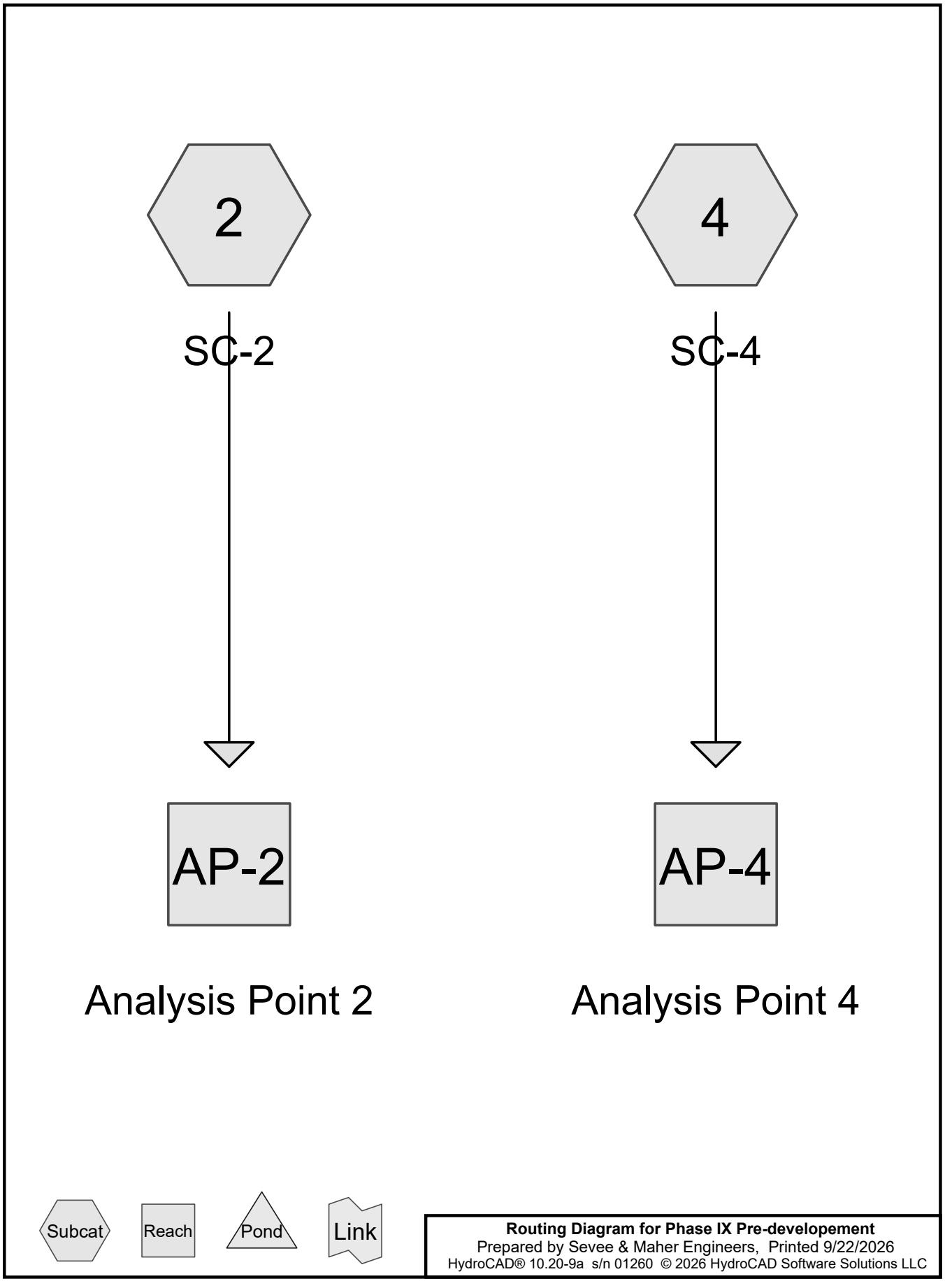
D-101

C:\Users\jen\OneDrive - SME\BASE\POINT\Clients - Pine Tree Landfill - PFAS\Plans\BASE.dwg, D-101, 9/2/2026 11:21:19 AM, sjm

APPENDIX B

HYDROCAD PRE- AND POST-CALCULATIONS

SME
SEVEE & MAHER
ENGINEERS



Routing Diagram for Phase IX Pre-developement
Prepared by Sevee & Maher Engineers, Printed 9/22/2026
HydroCAD® 10.20-9a s/n 01260 © 2026 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year	Type II 24-hr		Default	24.00	1	2.70	2
2	10 Year	Type II 24-hr		Default	24.00	1	3.90	2
3	25 Year	Type II 24-hr		Default	24.00	1	4.90	2

Summary for Subcatchment 2: SC-2

Runoff = 32.97 cfs @ 12.09 hrs, Volume= 2.280 af, Depth> 0.86"
Routed to Reach AP-2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 Year Rainfall=2.70"

	Area (ac)	CN	Description
*	15.060	78	Meadow - Protected (D)
*	0.050	98	Impervious - Road
*	6.570	89	Gravel Laydown & Road (C)
*	5.740	65	Brush - Good (C)
*	1.540	71	Woods - Good (C)
*	1.450	70	Meadow - Good (C)
*	0.880	77	Woods - Good (D)
*	0.370	73	Brush - Good (D)
	31.660	77	Weighted Average
	31.610		99.84% Pervious Area
	0.050		0.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.2500	0.28		**Sheet Flow, A - B**
					Grass: Dense n= 0.240 P2= 2.70"
1.8	520		4.81		**Direct Entry, B - C**
9.0	860		1.59		**Direct Entry, C - D**
0.5	120		4.00		**Direct Entry, D - E**
15.8	1,575	Total			

Summary for Subcatchment 4: SC-4

Runoff = 4.20 cfs @ 12.78 hrs, Volume= 0.812 af, Depth> 0.62"
Routed to Reach AP-4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2 Year Rainfall=2.70"

	Area (sf)	CN	Description
	5,400	98	Building
*	4,160	98	Old Cold Brook Rd
*	9,600	92	Gravel Road
*	3,850	98	Offsite Building and Drive
	187,452	70	Woods, Good, HSG C
	474,726	71	Meadow, non-grazed, HSG C
	685,188	72	Weighted Average
	671,778		98.04% Pervious Area
	13,410		1.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0	150	0.0083	0.05		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
8.8	120	0.0083	0.23		**Shallow Concentrated Flow, segment b-c** Forest w/Heavy Litter Kv= 2.5 fps
8.8	650	0.0067	1.23		**Shallow Concentrated Flow, Segment B-C** Grassed Waterway Kv= 15.0 fps
0.7	620	0.0630	15.05	722.24	**Trap/Vee/Rect Channel Flow, Segment C-D** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
64.3	1,540	Total			

Summary for Reach AP-2: Analysis Point 2

Inflow Area = 31.660 ac, 0.16% Impervious, Inflow Depth > 0.86" for 2 Year event
Inflow = 32.97 cfs @ 12.09 hrs, Volume= 2.280 af
Outflow = 32.97 cfs @ 12.09 hrs, Volume= 2.280 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP-4: Analysis Point 4

Inflow Area = 15.730 ac, 1.96% Impervious, Inflow Depth > 0.62" for 2 Year event
Inflow = 4.20 cfs @ 12.78 hrs, Volume= 0.812 af
Outflow = 4.20 cfs @ 12.78 hrs, Volume= 0.812 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2: SC-2

Runoff = 68.31 cfs @ 12.09 hrs, Volume= 4.556 af, Depth> 1.73"
Routed to Reach AP-2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.90"

	Area (ac)	CN	Description
*	15.060	78	Meadow - Protected (D)
*	0.050	98	Impervious - Road
*	6.570	89	Gravel Laydown & Road (C)
*	5.740	65	Brush - Good (C)
*	1.540	71	Woods - Good (C)
*	1.450	70	Meadow - Good (C)
*	0.880	77	Woods - Good (D)
*	0.370	73	Brush - Good (D)
	31.660	77	Weighted Average
	31.610		99.84% Pervious Area
	0.050		0.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.2500	0.28		**Sheet Flow, A - B**
					Grass: Dense n= 0.240 P2= 2.70"
1.8	520		4.81		**Direct Entry, B - C**
9.0	860		1.59		**Direct Entry, C - D**
0.5	120		4.00		**Direct Entry, D - E**
15.8	1,575	Total			

Summary for Subcatchment 4: SC-4

Runoff = 10.38 cfs @ 12.72 hrs, Volume= 1.784 af, Depth> 1.36"
Routed to Reach AP-4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10 Year Rainfall=3.90"

	Area (sf)	CN	Description
	5,400	98	Building
*	4,160	98	Old Cold Brook Rd
*	9,600	92	Gravel Road
*	3,850	98	Offsite Building and Drive
	187,452	70	Woods, Good, HSG C
	474,726	71	Meadow, non-grazed, HSG C
	685,188	72	Weighted Average
	671,778		98.04% Pervious Area
	13,410		1.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0	150	0.0083	0.05		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
8.8	120	0.0083	0.23		**Shallow Concentrated Flow, segment b-c** Forest w/Heavy Litter Kv= 2.5 fps
8.8	650	0.0067	1.23		**Shallow Concentrated Flow, Segment B-C** Grassed Waterway Kv= 15.0 fps
0.7	620	0.0630	15.05	722.24	**Trap/Vee/Rect Channel Flow, Segment C-D** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
64.3	1,540	Total			

Summary for Reach AP-2: Analysis Point 2

Inflow Area = 31.660 ac, 0.16% Impervious, Inflow Depth > 1.73" for 10 Year event
Inflow = 68.31 cfs @ 12.09 hrs, Volume= 4.556 af
Outflow = 68.31 cfs @ 12.09 hrs, Volume= 4.556 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP-4: Analysis Point 4

Inflow Area = 15.730 ac, 1.96% Impervious, Inflow Depth > 1.36" for 10 Year event
Inflow = 10.38 cfs @ 12.72 hrs, Volume= 1.784 af
Outflow = 10.38 cfs @ 12.72 hrs, Volume= 1.784 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Subcatchment 2: SC-2

Runoff = 100.58 cfs @ 12.08 hrs, Volume= 6.674 af, Depth> 2.53"
Routed to Reach AP-2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Rainfall=4.90"

	Area (ac)	CN	Description
*	15.060	78	Meadow - Protected (D)
*	0.050	98	Impervious - Road
*	6.570	89	Gravel Laydown & Road (C)
*	5.740	65	Brush - Good (C)
*	1.540	71	Woods - Good (C)
*	1.450	70	Meadow - Good (C)
*	0.880	77	Woods - Good (D)
*	0.370	73	Brush - Good (D)
	31.660	77	Weighted Average
	31.610		99.84% Pervious Area
	0.050		0.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	75	0.2500	0.28		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
1.8	520		4.81		**Direct Entry, B - C**
9.0	860		1.59		**Direct Entry, C - D**
0.5	120		4.00		**Direct Entry, D - E**
15.8	1,575	Total			

Summary for Subcatchment 4: SC-4

Runoff = 16.43 cfs @ 12.70 hrs, Volume= 2.727 af, Depth> 2.08"
Routed to Reach AP-4 : Analysis Point 4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25 Year Rainfall=4.90"

	Area (sf)	CN	Description
	5,400	98	Building
*	4,160	98	Old Cold Brook Rd
*	9,600	92	Gravel Road
*	3,850	98	Offsite Building and Drive
	187,452	70	Woods, Good, HSG C
	474,726	71	Meadow, non-grazed, HSG C
	685,188	72	Weighted Average
	671,778		98.04% Pervious Area
	13,410		1.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.0	150	0.0083	0.05		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
8.8	120	0.0083	0.23		**Shallow Concentrated Flow, segment b-c** Forest w/Heavy Litter Kv= 2.5 fps
8.8	650	0.0067	1.23		**Shallow Concentrated Flow, Segment B-C** Grassed Waterway Kv= 15.0 fps
0.7	620	0.0630	15.05	722.24	**Trap/Vee/Rect Channel Flow, Segment C-D** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
64.3	1,540	Total			

Summary for Reach AP-2: Analysis Point 2

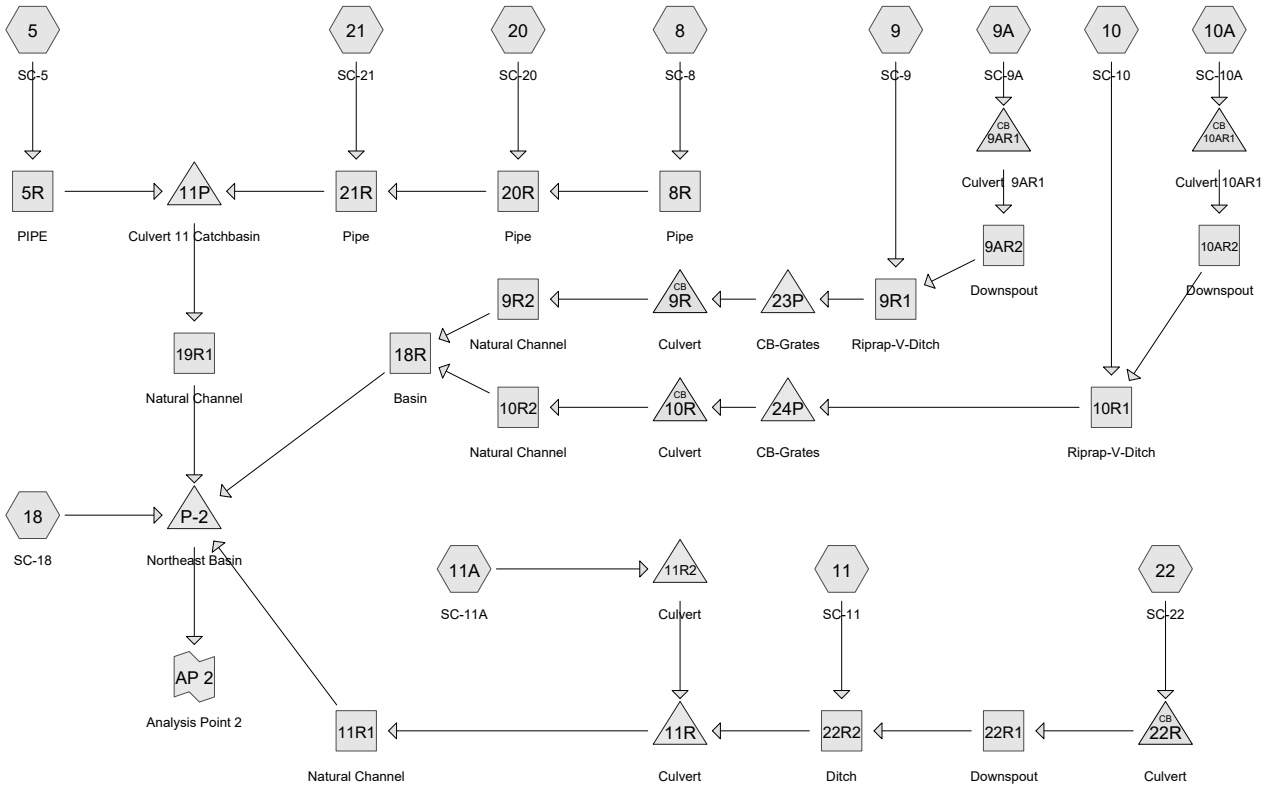
Inflow Area = 31.660 ac, 0.16% Impervious, Inflow Depth > 2.53" for 25 Year event
Inflow = 100.58 cfs @ 12.08 hrs, Volume= 6.674 af
Outflow = 100.58 cfs @ 12.08 hrs, Volume= 6.674 af, Atten= 0%, Lag= 0.0 min

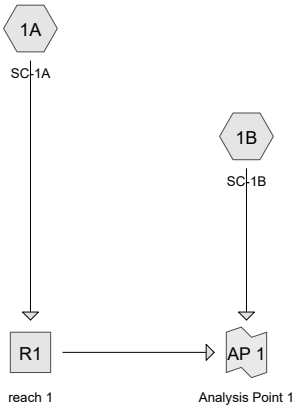
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP-4: Analysis Point 4

Inflow Area = 15.730 ac, 1.96% Impervious, Inflow Depth > 2.08" for 25 Year event
Inflow = 16.43 cfs @ 12.70 hrs, Volume= 2.727 af
Outflow = 16.43 cfs @ 12.70 hrs, Volume= 2.727 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs





Subcat Reach Pond Link

Routing Diagram for Post-PTL-LeachateTransfer

Prepared by Sevee & Maher Engineers, Printed 9/23/2026

HydroCAD® 10.20-9a s/n 01260 © 2026 HydroCAD Software Solutions LLC

Post-PTL-LeachateTransfer

HydroCAD® 10.20-9a s/n 01260 © 2026 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr Storm	Type II 24-hr		Default	24.00	1	2.70	2
2	10-yr Storm	Type II 24-hr		Default	24.00	1	3.90	2
3	25-yr Storm	Type II 24-hr		Default	24.00	1	4.90	2

Summary for Subcatchment 1A: SC-1A

Runoff = 1.31 cfs @ 13.40 hrs, Volume= 0.382 af, Depth= 0.68"
Routed to Reach R1 : reach 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	6,700	98	Gas to Energy Building,Scrubber,Contact Tank, Flare pad
*	16,171	98	Pavement
	143,660	70	Woods, Good, HSG C
	121,603	71	Meadow, non-grazed, HSG C
*	5,843	92	Gravel pad
	293,977	73	Weighted Average
	271,106		92.22% Pervious Area
	22,871		7.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.5	150	0.0083	0.08		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
78.4	962	0.0067	0.20		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.7	48	0.0067	1.23		**Shallow Concentrated Flow, Segment C-D** Grassed Waterway Kv= 15.0 fps
109.6	1,160	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 2.72 cfs @ 12.72 hrs, Volume= 0.522 af, Depth= 0.64"
Routed to Link AP 1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
*	4,160	98	Old Cold Brook Rd
*	3,360	92	existing Gravel Drive
	58,392	70	Woods, Good, HSG C
	351,761	71	Meadow, non-grazed, HSG C
*	3,850	98	Offsite House and drive
*	3,555	98	Pavement
*	4,072	92	Gravel Pad
	429,150	72	Weighted Average
	417,585		97.31% Pervious Area
	11,565		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.4	150	0.0025	0.05		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
10.2	350	0.0067	0.57		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.6	300	0.0400	8.46	112.74	**Parabolic Channel, SegmentC-D** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.040
0.7	510	0.0420	12.29	589.71	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
60.9	1,310	Total			

Summary for Subcatchment 5: SC-5

Runoff = 4.20 cfs @ 11.98 hrs, Volume= 0.197 af, Depth= 0.72"
Routed to Reach 5R : PIPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

Area (sf)	CN	Description
122,213	71	Meadow, non-grazed, HSG C
20,100	89	Gravel roads, HSG C
142,313	74	Weighted Average
142,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	65	0.4600	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	109	0.0500	3.35		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.0	105	0.4000	44.43	78.51	**Pipe Channel, CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
0.5	140	0.0050	4.97	8.78	**Pipe Channel, DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
1.3	516	0.0140	6.53	52.23	**Trap/Vee/Rect Channel Flow, EF** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.025
5.4	935	Total			

Summary for Subcatchment 8: SC-8

Runoff = 2.70 cfs @ 12.02 hrs, Volume= 0.153 af, Depth= 0.64"
Routed to Reach 8R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

Area (sf)	CN	Description
120,391	71	Meadow, non-grazed, HSG C
5,440	89	Gravel roads, HSG C
125,831	72	Weighted Average
125,831		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0800	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.0	17	0.0250	6.08	30.80	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.3	311	0.1900	18.65	298.41	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
9.2	428	Total			

Summary for Subcatchment 9: SC-9

Runoff = 2.85 cfs @ 11.96 hrs, Volume= 0.130 af, Depth= 0.64"
Routed to Reach 9R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	102,351	71	Meadow, non-grazed, HSG C
*	4,456	98	Gravel Road
	106,807	72	Weighted Average
	102,351		95.83% Pervious Area
	4,456		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	80	0.4000	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	140	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	150	0.2480	21.31	340.93	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.3	370	Total			

Summary for Subcatchment 9A: SC-9A

Runoff = 4.79 cfs @ 11.96 hrs, Volume= 0.218 af, Depth= 0.59"
Routed to Pond 9AR1 : Culvert 9AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

Area (sf)	CN	Description
187,734	71	Meadow, non-grazed, HSG C
4,320	89	Gravel roads, HSG C
192,054	71	Weighted Average
192,054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	31	0.1000	0.16		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	123	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.5 & 10.0 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	93	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	110	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
0.4	363	0.1400	16.01	256.16	**Trap/Vee/Rect Channel Flow, E - F** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	720	Total			

Summary for Subcatchment 10: SC-10

Runoff = 2.60 cfs @ 11.96 hrs, Volume= 0.114 af, Depth= 0.77"
Routed to Reach 10R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	74,190	74	>75% Grass cover, Good, HSG C
*	3,200	98	Gravel Road
	77,390	75	Weighted Average
	74,190		95.87% Pervious Area
	3,200		4.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	72	0.4000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	130	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	135	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	337	Total			

Summary for Subcatchment 10A: SC-10A

Runoff = 1.36 cfs @ 11.94 hrs, Volume= 0.056 af, Depth= 0.92"
Routed to Pond 10AR1 : Culvert 10AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	26,298	74	>75% Grass cover, Good, HSG C
*	5,760	98	Gravel Road
	32,058	78	Weighted Average
	26,298		82.03% Pervious Area
	5,760		17.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.4000	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	298	0.0670	24.90	126.07	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.012 Steel, smooth

2.9 348 Total

Summary for Subcatchment 11: SC-11

Runoff = 6.09 cfs @ 11.97 hrs, Volume= 0.284 af, Depth= 0.64"
Routed to Reach 22R2 : Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	228,220	71	Meadow, non-grazed, HSG C
*	5,640	98	Paved Access Road
	233,860	72	Weighted Average
	228,220		97.59% Pervious Area
	5,640		2.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	77	0.3300	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	238	0.0500	8.69	48.87	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 3.0 & 2.0 '/' Top.W=7.50' n= 0.030
0.2	322	0.3300	24.58	393.28	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.8	637	Total			

Summary for Subcatchment 11A: SC-11A

Runoff = 1.71 cfs @ 11.94 hrs, Volume= 0.073 af, Depth= 1.55"
Routed to Pond 11R2 : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
*	0.294	98	Paved Access Road
	0.211	71	Meadow, non-grazed, HSG C
	0.058	96	Gravel surface, HSG C
	0.563	88	Weighted Average
	0.269		47.78% Pervious Area
	0.294		52.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0					**Direct Entry, Direct Entry**

Summary for Subcatchment 18: SC-18

Runoff = 3.04 cfs @ 12.24 hrs, Volume= 0.362 af, Depth= 0.44"
Routed to Pond P-2 : Northeast Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	118,303	70	Woods, Good, HSG C
	302,887	65	Brush, Good, HSG C
*	6,000	98	Gravel Road
	427,190	67	Weighted Average
	421,190		98.60% Pervious Area
	6,000		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.1410	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.8	190	0.0579	3.87		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
18.0	648		0.60		**Direct Entry, C - D**
25.0	923	Total			

Summary for Subcatchment 20: SC-20

Runoff = 0.19 cfs @ 11.96 hrs, Volume= 0.008 af, Depth= 0.59"
Routed to Reach 20R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

Area (sf)	CN	Description
7,413	71	Meadow, non-grazed, HSG C
7,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	60	0.3000	0.29		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	60	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
3.7	120	Total			

Summary for Subcatchment 21: SC-21

Runoff = 0.32 cfs @ 11.99 hrs, Volume= 0.016 af, Depth= 0.59"
Routed to Reach 21R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

Area (sf)	CN	Description
14,397	71	Meadow, non-grazed, HSG C
14,397		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	125	0.3000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.1	23	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
6.4	148	Total			

Summary for Subcatchment 22: SC-22

Runoff = 3.16 cfs @ 11.99 hrs, Volume= 0.160 af, Depth= 0.64"
Routed to Pond 22R : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
	124,583	71	Meadow, non-grazed, HSG C
*	7,000	98	
	131,583	72	Weighted Average
	124,583		94.68% Pervious Area
	7,000		5.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	72	0.1000	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	142	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 10.0 & 2.5 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	60	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	112	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040 Earth, cobble bottom, clean sides
6.7	386	Total			

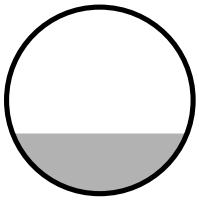
Summary for Reach 5R: PIPE

Inflow Area = 3.267 ac, 0.00% Impervious, Inflow Depth = 0.72" for 2-yr Storm event
Inflow = 4.20 cfs @ 11.98 hrs, Volume= 0.197 af
Outflow = 4.20 cfs @ 11.98 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 8.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.96 fps, Avg. Travel Time= 0.2 min

Peak Storage= 22 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.40'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 18.72 cfs

18.0" Round Pipe
n= 0.011
Length= 44.0' Slope= 0.0227 '/'
Inlet Invert= 133.00', Outlet Invert= 132.00'



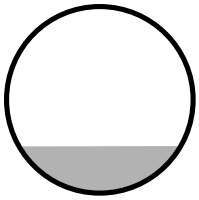
Summary for Reach 8R: Pipe

Inflow Area = 2.889 ac, 0.00% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 2.70 cfs @ 12.02 hrs, Volume= 0.153 af
Outflow = 2.70 cfs @ 12.02 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 20R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 17.49 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.45 fps, Avg. Travel Time= 0.4 min

Peak Storage= 21 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 0.87'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 138.0' Slope= 0.2160 '/'
Inlet Invert= 212.00', Outlet Invert= 182.19'



Summary for Reach 9AR2: Downspout

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 4.79 cfs @ 11.96 hrs, Volume= 0.218 af
Outflow = 4.76 cfs @ 11.97 hrs, Volume= 0.218 af, Atten= 1%, Lag= 0.4 min
Routed to Reach 9R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 6.49 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.90 fps, Avg. Travel Time= 2.0 min

Peak Storage= 167 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.17' , Surface Width= 4.67'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 417.09 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 229.0' Slope= 0.3712 '/'
Inlet Invert= 222.00', Outlet Invert= 137.00'



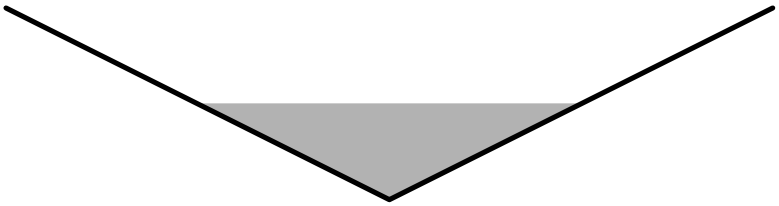
Summary for Reach 9R1: Riprap-V-Ditch

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 0.61" for 2-yr Storm event
Inflow = 7.60 cfs @ 11.97 hrs, Volume= 0.348 af
Outflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.2 min
Routed to Pond 23P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.74 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.5 min

Peak Storage= 101 cf @ 11.97 hrs
Average Depth at Peak Storage= 1.01' , Surface Width= 4.03'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 47.40 cfs

0.00' x 2.00' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 50.0' Slope= 0.0166 '/'
Inlet Invert= 135.53', Outlet Invert= 134.70'



Summary for Reach 9R2: Natural Channel

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 0.61" for 2-yr Storm event
Inflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af
Outflow = 7.58 cfs @ 11.97 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.2 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 5.21 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.56 fps, Avg. Travel Time= 0.9 min

Peak Storage= 123 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 6.71'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 446.98 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 85.0' Slope= 0.1176 '/'
Inlet Invert= 124.00', Outlet Invert= 114.00'



‡

Summary for Reach 10AR2: Downspout

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 0.92" for 2-yr Storm event
Inflow = 1.36 cfs @ 11.94 hrs, Volume= 0.056 af
Outflow = 1.33 cfs @ 11.95 hrs, Volume= 0.056 af, Atten= 2%, Lag= 0.7 min
Routed to Reach 10R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 4.08 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 2.4 min

Peak Storage= 81 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 4.31'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 424.23 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.3840 '/'
Inlet Invert= 238.00', Outlet Invert= 142.00'



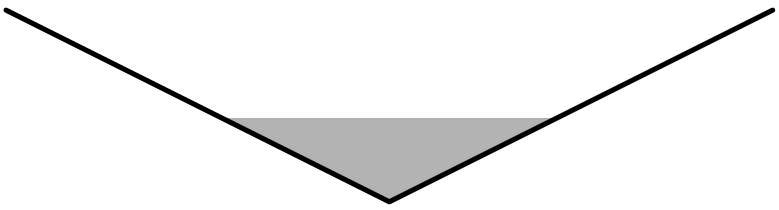
Summary for Reach 10R1: Riprap-V-Ditch

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 0.81" for 2-yr Storm event
Inflow = 3.92 cfs @ 11.96 hrs, Volume= 0.171 af
Outflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af, Atten= 2%, Lag= 0.7 min
Routed to Pond 24P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.51 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 2.5 min

Peak Storage= 219 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.87' , Surface Width= 3.50'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 34.91 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 143.0' Slope= 0.0160 '/'
Inlet Invert= 140.29', Outlet Invert= 138.00'



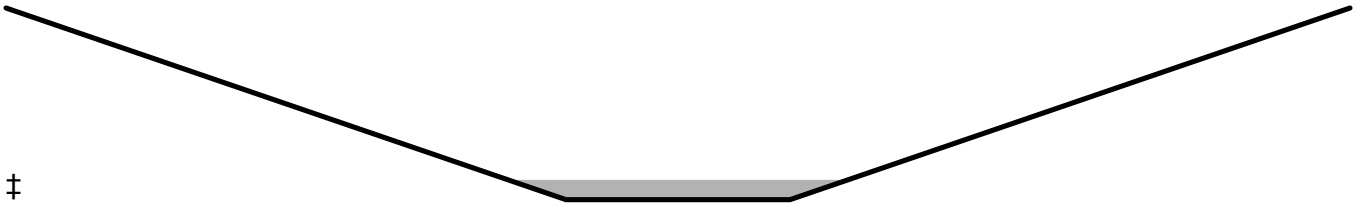
Summary for Reach 10R2: Natural Channel

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 0.81" for 2-yr Storm event
Inflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af
Outflow = 3.82 cfs @ 11.98 hrs, Volume= 0.171 af, Atten= 1%, Lag= 0.5 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.66 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 2.4 min

Peak Storage= 160 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 6.07'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 364.96 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 153.0' Slope= 0.0784 '/'
Inlet Invert= 126.00', Outlet Invert= 114.00'



‡

Summary for Reach 11R1: Natural Channel

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 0.69" for 2-yr Storm event
Inflow = 9.34 cfs @ 12.01 hrs, Volume= 0.517 af
Outflow = 7.48 cfs @ 12.06 hrs, Volume= 0.517 af, Atten= 20%, Lag= 3.2 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.31 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 21.8 min

Peak Storage= 2,750 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 14.71'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 403.99 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 850.0' Slope= 0.0224 '/'
Inlet Invert= 132.00', Outlet Invert= 113.00'



‡

Summary for Reach 18R: Basin

Inflow Area = 9.373 ac, 3.29% Impervious, Inflow Depth = 0.66" for 2-yr Storm event
Inflow = 11.40 cfs @ 11.97 hrs, Volume= 0.519 af
Outflow = 7.87 cfs @ 12.03 hrs, Volume= 0.519 af, Atten= 31%, Lag= 3.4 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 1.05 fps, Min. Travel Time= 7.3 min
Avg. Velocity = 0.28 fps, Avg. Travel Time= 27.1 min

Peak Storage= 3,429 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 19.21'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 126.12 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 459.0' Slope= 0.0022 '/'
Inlet Invert= 114.00', Outlet Invert= 113.00'



‡

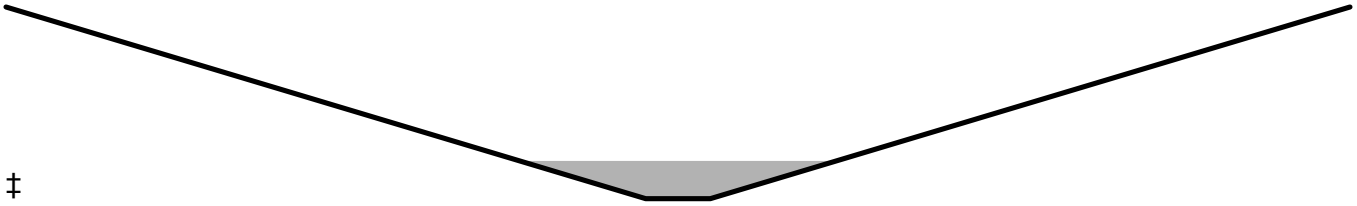
Summary for Reach 19R1: Natural Channel

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 0.68" for 2-yr Storm event
Inflow = 7.04 cfs @ 11.99 hrs, Volume= 0.375 af
Outflow = 6.72 cfs @ 12.01 hrs, Volume= 0.375 af, Atten= 5%, Lag= 1.4 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.90 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 5.2 min

Peak Storage= 797 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 9.79'
Bank-Full Depth= 2.00' Flow Area= 43.6 sf, Capacity= 340.45 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.9 '/' Top Width= 41.60'
Length= 344.0' Slope= 0.0320 '/'
Inlet Invert= 124.00', Outlet Invert= 113.00'



‡

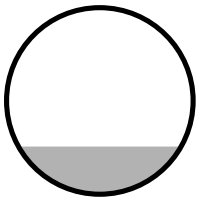
Summary for Reach 20R: Pipe

Inflow Area = 3.059 ac, 0.00% Impervious, Inflow Depth = 0.63" for 2-yr Storm event
Inflow = 2.81 cfs @ 12.02 hrs, Volume= 0.161 af
Outflow = 2.81 cfs @ 12.02 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 21R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 17.70 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.55 fps, Avg. Travel Time= 0.3 min

Peak Storage= 22 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.26' , Surface Width= 0.87'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 137.0' Slope= 0.2160 '/'
Inlet Invert= 182.19', Outlet Invert= 152.60'



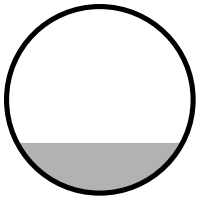
Summary for Reach 21R: Pipe

Inflow Area = 3.389 ac, 0.00% Impervious, Inflow Depth = 0.63" for 2-yr Storm event
Inflow = 3.11 cfs @ 12.02 hrs, Volume= 0.178 af
Outflow = 3.11 cfs @ 12.02 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 18.21 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.74 fps, Avg. Travel Time= 0.2 min

Peak Storage= 17 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.27' , Surface Width= 0.89'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 100.0' Slope= 0.2160 '/'
Inlet Invert= 152.60', Outlet Invert= 131.00'



Summary for Reach 22R1: Downspout

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 3.16 cfs @ 11.99 hrs, Volume= 0.160 af
Outflow = 3.10 cfs @ 12.01 hrs, Volume= 0.160 af, Atten= 2%, Lag= 0.8 min
Routed to Reach 22R2 : Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 5.18 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.64 fps, Avg. Travel Time= 4.0 min

Peak Storage= 236 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 4.56'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 373.39 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 395.0' Slope= 0.2975 '/'
Inlet Invert= 259.00', Outlet Invert= 141.50'



Summary for Reach 22R2: Ditch

Inflow Area = 8.389 ac, 3.46% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 8.92 cfs @ 11.98 hrs, Volume= 0.445 af
Outflow = 8.42 cfs @ 12.00 hrs, Volume= 0.445 af, Atten= 6%, Lag= 1.4 min
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.83 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 7.7 min

Peak Storage= 1,111 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 6.54'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 95.64 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.5 2.0 '/' Top Width= 13.00'
Length= 374.0' Slope= 0.0134 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Summary for Reach R1: reach 1

Inflow Area = 6.749 ac, 7.78% Impervious, Inflow Depth = 0.68" for 2-yr Storm event
Inflow = 1.31 cfs @ 13.40 hrs, Volume= 0.382 af
Outflow = 1.30 cfs @ 13.48 hrs, Volume= 0.382 af, Atten= 0%, Lag= 5.2 min
Routed to Link AP 1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 1.56 fps, Min. Travel Time= 6.8 min
Avg. Velocity = 0.89 fps, Avg. Travel Time= 12.0 min

Peak Storage= 534 cf @ 13.48 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 10.08'
Bank-Full Depth= 3.00' Flow Area= 34.5 sf, Capacity= 457.40 cfs

10.00' x 3.00' deep channel, n= 0.040
Side Slope Z-value= 0.5 '/' Top Width= 13.00'
Length= 640.0' Slope= 0.0484 '/'
Inlet Invert= 128.00', Outlet Invert= 97.00'



Summary for Pond 9AR1: Culvert 9AR1

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 4.79 cfs @ 11.96 hrs, Volume= 0.218 af
Outflow = 4.79 cfs @ 11.96 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.0 min
Primary = 4.79 cfs @ 11.96 hrs, Volume= 0.218 af
Routed to Reach 9AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 230.07' @ 11.96 hrs
Flood Elev= 232.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.00'	**24.0" Round 24-inch HDPE** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 229.00' / 222.00' S= 0.1400 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=4.78 cfs @ 11.96 hrs HW=230.07' TW=222.17' (Dynamic Tailwater)
↑—**1=24-inch HDPE** (Inlet Controls 4.78 cfs @ 2.78 fps)

Summary for Pond 9R: Culvert

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 0.61" for 2-yr Storm event
Inflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af
Outflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.0 min
Primary = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af
Routed to Reach 9R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 129.05' @ 11.97 hrs
Flood Elev= 134.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	127.50'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 127.50' / 124.50' S= 0.0652 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=7.50 cfs @ 11.97 hrs HW=129.03' TW=124.27' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.50 cfs @ 4.24 fps)

Summary for Pond 10AR1: Culvert 10AR1

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 0.92" for 2-yr Storm event
Inflow = 1.36 cfs @ 11.94 hrs, Volume= 0.056 af
Outflow = 1.36 cfs @ 11.94 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 1.36 cfs @ 11.94 hrs, Volume= 0.056 af
Routed to Reach 10AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 243.21' @ 11.94 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	242.50'	**12.0" Round 12-inch HDPE** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 242.50' / 238.50' S= 0.1000 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.36 cfs @ 11.94 hrs HW=243.21' TW=238.08' (Dynamic Tailwater)
↑—**1=12-inch HDPE** (Inlet Controls 1.36 cfs @ 2.27 fps)

Summary for Pond 10R: Culvert

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 0.81" for 2-yr Storm event
Inflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af
Outflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
Primary = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af
Routed to Reach 10R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 130.84' @ 11.97 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.90'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 129.90' / 126.10' S= 0.0760 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=3.81 cfs @ 11.97 hrs HW=130.83' TW=126.20' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.81 cfs @ 3.29 fps)

Summary for Pond 11P: Culvert 11 Catchbasin

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 0.68" for 2-yr Storm event
Inflow = 7.04 cfs @ 11.99 hrs, Volume= 0.375 af
Outflow = 7.04 cfs @ 11.99 hrs, Volume= 0.375 af, Atten= 0%, Lag= 0.0 min
Primary = 7.04 cfs @ 11.99 hrs, Volume= 0.375 af
Routed to Reach 19R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 128.42' @ 11.99 hrs Surf.Area= 13 sf Storage= 30 cf
Flood Elev= 133.00' Surf.Area= 13 sf Storage= 88 cf

Plug-Flow detention time= 0.7 min calculated for 0.375 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (876.1 - 875.8)

Volume	Invert	Avail.Storage	Storage Description
#1	126.00'	88 cf	**4.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	127.00'	**18.0" Round Culvert** L= 138.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 127.00' / 124.00' S= 0.0217 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=6.99 cfs @ 11.99 hrs HW=128.41' TW=124.38' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.99 cfs @ 4.05 fps)

Summary for Pond 11R: Culvert

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 0.69" for 2-yr Storm event
Inflow = 9.46 cfs @ 11.99 hrs, Volume= 0.517 af
Outflow = 9.34 cfs @ 12.01 hrs, Volume= 0.517 af, Atten= 1%, Lag= 0.7 min
Primary = 9.34 cfs @ 12.01 hrs, Volume= 0.517 af
Routed to Reach 11R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 136.50' @ 12.01 hrs Surf.Area= 453 sf Storage= 189 cf
Flood Elev= 140.00' Surf.Area= 2,900 sf Storage= 6,050 cf

Plug-Flow detention time= 0.2 min calculated for 0.517 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (875.1 - 874.9)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	6,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
135.00	0	0	0
136.00	100	50	50
140.00	2,900	6,000	6,050

Device	Routing	Invert	Outlet Devices
#1	Primary	135.00'	**24.0" Round Culvert** L= 150.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 135.00' / 134.00' S= 0.0067 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=9.28 cfs @ 12.01 hrs HW=136.50' TW=132.24' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 9.28 cfs @ 3.68 fps)

Summary for Pond 11R2: Culvert

Inflow Area = 0.563 ac, 52.22% Impervious, Inflow Depth = 1.55" for 2-yr Storm event
Inflow = 1.71 cfs @ 11.94 hrs, Volume= 0.073 af
Outflow = 1.71 cfs @ 11.94 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Primary = 1.71 cfs @ 11.94 hrs, Volume= 0.073 af
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 136.88' @ 11.95 hrs Surf.Area= 9 sf Storage= 4 cf

Plug-Flow detention time= 0.2 min calculated for 0.073 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (816.4 - 816.3)

Volume	Invert	Avail.Storage	Storage Description
#1	136.00'	1,621 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
136.00	0	0	0
137.00	10	5	5
138.00	281	146	151
139.00	2,660	1,471	1,621

Device	Routing	Invert	Outlet Devices
#1	Primary	136.15'	**15.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 136.15' / 135.50' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.70 cfs @ 11.94 hrs HW=136.88' TW=136.24' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.70 cfs @ 2.29 fps)

Summary for Pond 22R: Culvert

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 3.16 cfs @ 11.99 hrs, Volume= 0.160 af
Outflow = 3.16 cfs @ 11.99 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.0 min
Primary = 3.16 cfs @ 11.99 hrs, Volume= 0.160 af
Routed to Reach 22R1 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 269.96' @ 11.99 hrs
Flood Elev= 273.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 269.00' / 259.00' S= 0.2000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=3.13 cfs @ 11.99 hrs HW=269.96' TW=259.14' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.13 cfs @ 2.63 fps)

Summary for Pond 23P: CB-Grates

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 0.61" for 2-yr Storm event
Inflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af
Outflow = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.0 min
Primary = 7.59 cfs @ 11.97 hrs, Volume= 0.348 af
Routed to Pond 9R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 134.73' @ 11.97 hrs Surf.Area= 15 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (880.8 - 880.8)

Volume	Invert	Avail.Storage	Storage Description
#1	134.70'	409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.70	9	0	0
136.70	400	409	409

Device	Routing	Invert	Outlet Devices
#1	Primary	134.60'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.50 cfs @ 11.97 hrs HW=134.73' TW=129.03' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 7.50 cfs @ 1.17 fps)

Summary for Pond 24P: CB-Grates

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 0.81" for 2-yr Storm event
Inflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af
Outflow = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
Primary = 3.85 cfs @ 11.97 hrs, Volume= 0.171 af
Routed to Pond 10R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 137.88' @ 11.97 hrs Surf.Area= 24 sf Storage= 1 cf

Plug-Flow detention time= 0.0 min calculated for 0.170 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (863.3 - 863.2)

Volume	Invert	Avail.Storage	Storage Description
#1	137.80'	450 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
137.80	9	0	0
140.00	400	450	450

Device	Routing	Invert	Outlet Devices
#1	Primary	137.80'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.81 cfs @ 11.97 hrs HW=137.88' TW=130.83' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 3.81 cfs @ 0.93 fps)

Summary for Pond P-2: Northeast Basin

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth = 0.61" for 2-yr Storm event
Inflow = 22.65 cfs @ 12.04 hrs, Volume= 1.773 af
Outflow = 2.39 cfs @ 13.37 hrs, Volume= 1.768 af, Atten= 89%, Lag= 79.9 min
Primary = 2.39 cfs @ 13.37 hrs, Volume= 1.768 af
Routed to Link AP 2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Starting Elev= 116.00' Surf.Area= 3.460 ac Storage= 7.685 af
Peak Elev= 116.19' @ 13.37 hrs Surf.Area= 3.662 ac Storage= 8.381 af (0.696 af above start)
Flood Elev= 116.50' Surf.Area= 4.000 ac Storage= 9.550 af (1.865 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 289.9 min (1,184.3 - 894.4)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	9.550 af	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	2.000	0.000	0.000
114.00	2.150	2.075	2.075
116.00	3.460	5.610	7.685
116.50	4.000	1.865	9.550

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	**9.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=2.39 cfs @ 13.37 hrs HW=116.19' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 2.39 cfs @ 1.43 fps)

Summary for Link AP 1: Analysis Point 1

Inflow Area = 16.601 ac, 4.76% Impervious, Inflow Depth = 0.65" for 2-yr Storm event
Inflow = 3.40 cfs @ 12.87 hrs, Volume= 0.904 af
Primary = 3.40 cfs @ 12.87 hrs, Volume= 0.904 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

Summary for Link AP 2: Analysis Point 2

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth > 0.61" for 2-yr Storm event
Inflow = 2.39 cfs @ 13.37 hrs, Volume= 1.768 af
Primary = 2.39 cfs @ 13.37 hrs, Volume= 1.768 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

Summary for Subcatchment 1A: SC-1A

Runoff = 3.14 cfs @ 13.28 hrs, Volume= 0.819 af, Depth= 1.46"
Routed to Reach R1 : reach 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	6,700	98	Gas to Energy Building,Scrubber,Contact Tank, Flare pad
*	16,171	98	Pavement
	143,660	70	Woods, Good, HSG C
	121,603	71	Meadow, non-grazed, HSG C
*	5,843	92	Gravel pad
	293,977	73	Weighted Average
	271,106		92.22% Pervious Area
	22,871		7.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.5	150	0.0083	0.08		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
78.4	962	0.0067	0.20		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.7	48	0.0067	1.23		**Shallow Concentrated Flow, Segment C-D** Grassed Waterway Kv= 15.0 fps
109.6	1,160	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 6.79 cfs @ 12.66 hrs, Volume= 1.142 af, Depth= 1.39"
Routed to Link AP 1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
*	4,160	98	Old Cold Brook Rd
*	3,360	92	existing Gravel Drive
	58,392	70	Woods, Good, HSG C
	351,761	71	Meadow, non-grazed, HSG C
*	3,850	98	Offsite House and drive
*	3,555	98	Pavement
*	4,072	92	Gravel Pad
	429,150	72	Weighted Average
	417,585		97.31% Pervious Area
	11,565		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.4	150	0.0025	0.05		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
10.2	350	0.0067	0.57		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.6	300	0.0400	8.46	112.74	**Parabolic Channel, SegmentC-D** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.040
0.7	510	0.0420	12.29	589.71	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
60.9	1,310	Total			

Summary for Subcatchment 5: SC-5

Runoff = 9.10 cfs @ 11.97 hrs, Volume= 0.415 af, Depth= 1.52"
Routed to Reach 5R : PIPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

Area (sf)	CN	Description
122,213	71	Meadow, non-grazed, HSG C
20,100	89	Gravel roads, HSG C
142,313	74	Weighted Average
142,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	65	0.4600	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	109	0.0500	3.35		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.0	105	0.4000	44.43	78.51	**Pipe Channel, CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
0.5	140	0.0050	4.97	8.78	**Pipe Channel, DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
1.3	516	0.0140	6.53	52.23	**Trap/Vee/Rect Channel Flow, EF** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.025
5.4	935	Total			

Summary for Subcatchment 8: SC-8

Runoff = 6.30 cfs @ 12.01 hrs, Volume= 0.335 af, Depth= 1.39"
Routed to Reach 8R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

Area (sf)	CN	Description
120,391	71	Meadow, non-grazed, HSG C
5,440	89	Gravel roads, HSG C
125,831	72	Weighted Average
125,831		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0800	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.0	17	0.0250	6.08	30.80	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.3	311	0.1900	18.65	298.41	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
9.2	428	Total			

Summary for Subcatchment 9: SC-9

Runoff = 6.49 cfs @ 11.96 hrs, Volume= 0.284 af, Depth= 1.39"
Routed to Reach 9R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	102,351	71	Meadow, non-grazed, HSG C
*	4,456	98	Gravel Road
	106,807	72	Weighted Average
	102,351		95.83% Pervious Area
	4,456		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	80	0.4000	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	140	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	150	0.2480	21.31	340.93	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.3	370	Total			

Summary for Subcatchment 9A: SC-9A

Runoff = 11.23 cfs @ 11.95 hrs, Volume= 0.487 af, Depth= 1.33"
Routed to Pond 9AR1 : Culvert 9AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

Area (sf)	CN	Description
187,734	71	Meadow, non-grazed, HSG C
4,320	89	Gravel roads, HSG C
192,054	71	Weighted Average
192,054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	31	0.1000	0.16		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	123	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.5 & 10.0 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	93	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	110	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
0.4	363	0.1400	16.01	256.16	**Trap/Vee/Rect Channel Flow, E - F** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	720	Total			

Summary for Subcatchment 10: SC-10

Runoff = 5.45 cfs @ 11.95 hrs, Volume= 0.236 af, Depth= 1.59"
Routed to Reach 10R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	74,190	74	>75% Grass cover, Good, HSG C
*	3,200	98	Gravel Road
	77,390	75	Weighted Average
	74,190		95.87% Pervious Area
	3,200		4.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	72	0.4000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	130	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	135	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	337	Total			

Summary for Subcatchment 10A: SC-10A

Runoff = 2.66 cfs @ 11.94 hrs, Volume= 0.111 af, Depth= 1.81"
Routed to Pond 10AR1 : Culvert 10AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	26,298	74	>75% Grass cover, Good, HSG C
*	5,760	98	Gravel Road
	32,058	78	Weighted Average
	26,298		82.03% Pervious Area
	5,760		17.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.4000	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	298	0.0670	24.90	126.07	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.012 Steel, smooth

2.9 348 Total

Summary for Subcatchment 11: SC-11

Runoff = 13.93 cfs @ 11.96 hrs, Volume= 0.622 af, Depth= 1.39"
Routed to Reach 22R2 : Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	228,220	71	Meadow, non-grazed, HSG C
*	5,640	98	Paved Access Road
	233,860	72	Weighted Average
	228,220		97.59% Pervious Area
	5,640		2.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	77	0.3300	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	238	0.0500	8.69	48.87	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 3.0 & 2.0 '/' Top.W=7.50' n= 0.030
0.2	322	0.3300	24.58	393.28	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.8	637	Total			

Summary for Subcatchment 11A: SC-11A

Runoff = 2.82 cfs @ 11.94 hrs, Volume= 0.124 af, Depth= 2.64"
Routed to Pond 11R2 : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (ac)	CN	Description
*	0.294	98	Paved Access Road
	0.211	71	Meadow, non-grazed, HSG C
	0.058	96	Gravel surface, HSG C
	0.563	88	Weighted Average
	0.269		47.78% Pervious Area
	0.294		52.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0					**Direct Entry, Direct Entry**

Summary for Subcatchment 18: SC-18

Runoff = 9.35 cfs @ 12.21 hrs, Volume= 0.886 af, Depth= 1.08"
Routed to Pond P-2 : Northeast Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	118,303	70	Woods, Good, HSG C
	302,887	65	Brush, Good, HSG C
*	6,000	98	Gravel Road
	427,190	67	Weighted Average
	421,190		98.60% Pervious Area
	6,000		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.1410	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.8	190	0.0579	3.87		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
18.0	648		0.60		**Direct Entry, C - D**
25.0	923	Total			

Summary for Subcatchment 20: SC-20

Runoff = 0.44 cfs @ 11.95 hrs, Volume= 0.019 af, Depth= 1.33"
Routed to Reach 20R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

Area (sf)	CN	Description
7,413	71	Meadow, non-grazed, HSG C
7,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	60	0.3000	0.29		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	60	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
3.7	120	Total			

Summary for Subcatchment 21: SC-21

Runoff = 0.77 cfs @ 11.98 hrs, Volume= 0.037 af, Depth= 1.33"
Routed to Reach 21R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

Area (sf)	CN	Description
14,397	71	Meadow, non-grazed, HSG C
14,397		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	125	0.3000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.1	23	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
6.4	148	Total			

Summary for Subcatchment 22: SC-22

Runoff = 7.27 cfs @ 11.99 hrs, Volume= 0.350 af, Depth= 1.39"
Routed to Pond 22R : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-yr Storm Rainfall=3.90"

	Area (sf)	CN	Description
	124,583	71	Meadow, non-grazed, HSG C
*	7,000	98	
	131,583	72	Weighted Average
	124,583		94.68% Pervious Area
	7,000		5.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	72	0.1000	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	142	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 10.0 & 2.5 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	60	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	112	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040 Earth, cobble bottom, clean sides
6.7	386	Total			

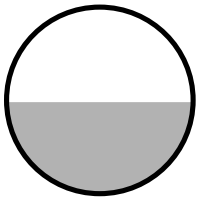
Summary for Reach 5R: PIPE

Inflow Area = 3.267 ac, 0.00% Impervious, Inflow Depth = 1.52" for 10-yr Storm event
Inflow = 9.10 cfs @ 11.97 hrs, Volume= 0.415 af
Outflow = 9.10 cfs @ 11.97 hrs, Volume= 0.415 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 10.49 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.48 fps, Avg. Travel Time= 0.2 min

Peak Storage= 38 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 18.72 cfs

18.0" Round Pipe
n= 0.011
Length= 44.0' Slope= 0.0227 '/'
Inlet Invert= 133.00', Outlet Invert= 132.00'



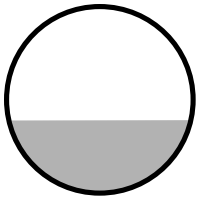
Summary for Reach 8R: Pipe

Inflow Area = 2.889 ac, 0.00% Impervious, Inflow Depth = 1.39" for 10-yr Storm event
Inflow = 6.30 cfs @ 12.01 hrs, Volume= 0.335 af
Outflow = 6.30 cfs @ 12.02 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 20R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 22.20 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 7.68 fps, Avg. Travel Time= 0.3 min

Peak Storage= 39 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.39' , Surface Width= 0.98'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 138.0' Slope= 0.2160 '/'
Inlet Invert= 212.00', Outlet Invert= 182.19'



Summary for Reach 9AR2: Downspout

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 1.33" for 10-yr Storm event
Inflow = 11.23 cfs @ 11.95 hrs, Volume= 0.487 af
Outflow = 11.20 cfs @ 11.96 hrs, Volume= 0.487 af, Atten= 0%, Lag= 0.3 min
Routed to Reach 9R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 8.80 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 1.7 min

Peak Storage= 291 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 5.12'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 417.09 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 229.0' Slope= 0.3712 '/'
Inlet Invert= 222.00', Outlet Invert= 137.00'



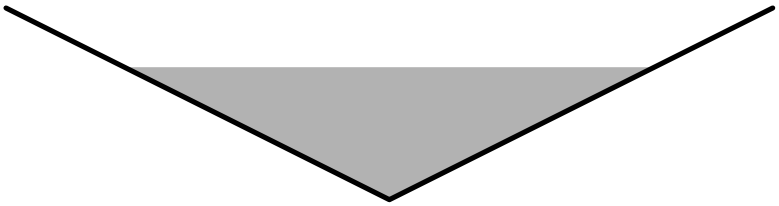
Summary for Reach 9R1: Riprap-V-Ditch

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 17.69 cfs @ 11.96 hrs, Volume= 0.771 af
Outflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 23P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 4.63 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 0.5 min

Peak Storage= 191 cf @ 11.96 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 5.53'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 47.40 cfs

0.00' x 2.00' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 50.0' Slope= 0.0166 '/'
Inlet Invert= 135.53', Outlet Invert= 134.70'



Summary for Reach 9R2: Natural Channel

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af
Outflow = 17.65 cfs @ 11.96 hrs, Volume= 0.771 af, Atten= 0%, Lag= 0.2 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 6.72 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.93 fps, Avg. Travel Time= 0.7 min

Peak Storage= 223 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.43' , Surface Width= 8.28'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 446.98 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 85.0' Slope= 0.1176 '/'
Inlet Invert= 124.00', Outlet Invert= 114.00'



‡

Summary for Reach 10AR2: Downspout

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 1.81" for 10-yr Storm event
Inflow = 2.66 cfs @ 11.94 hrs, Volume= 0.111 af
Outflow = 2.62 cfs @ 11.95 hrs, Volume= 0.111 af, Atten= 1%, Lag= 0.5 min
Routed to Reach 10R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 5.28 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 2.4 min

Peak Storage= 124 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.12' , Surface Width= 4.47'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 424.23 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.3840 '/'
Inlet Invert= 238.00', Outlet Invert= 142.00'



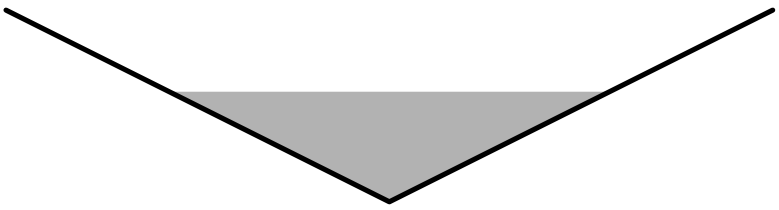
Summary for Reach 10R1: Riprap-V-Ditch

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 1.66" for 10-yr Storm event
Inflow = 8.07 cfs @ 11.95 hrs, Volume= 0.347 af
Outflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af, Atten= 1%, Lag= 0.6 min
Routed to Pond 24P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.02 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 2.2 min

Peak Storage= 378 cf @ 11.96 hrs
Average Depth at Peak Storage= 1.15' , Surface Width= 4.60'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 34.91 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 143.0' Slope= 0.0160 '/'
Inlet Invert= 140.29', Outlet Invert= 138.00'



Summary for Reach 10R2: Natural Channel

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 1.66" for 10-yr Storm event
Inflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af
Outflow = 7.92 cfs @ 11.97 hrs, Volume= 0.347 af, Atten= 1%, Lag= 0.4 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 4.59 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 2.1 min

Peak Storage= 264 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 7.10'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 364.96 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 153.0' Slope= 0.0784 '/'
Inlet Invert= 126.00', Outlet Invert= 114.00'



‡

Summary for Reach 11R1: Natural Channel

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 1.47" for 10-yr Storm event
Inflow = 18.86 cfs @ 12.03 hrs, Volume= 1.096 af
Outflow = 17.40 cfs @ 12.07 hrs, Volume= 1.096 af, Atten= 8%, Lag= 2.8 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.02 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 18.8 min

Peak Storage= 4,900 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 17.54'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 403.99 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 850.0' Slope= 0.0224 '/'
Inlet Invert= 132.00', Outlet Invert= 113.00'



‡

Summary for Reach 18R: Basin

Inflow Area = 9.373 ac, 3.29% Impervious, Inflow Depth = 1.43" for 10-yr Storm event
Inflow = 25.57 cfs @ 11.96 hrs, Volume= 1.118 af
Outflow = 20.24 cfs @ 12.01 hrs, Volume= 1.118 af, Atten= 21%, Lag= 2.7 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 1.38 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 23.0 min

Peak Storage= 6,722 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.84' , Surface Width= 25.04'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 126.12 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 459.0' Slope= 0.0022 '/'
Inlet Invert= 114.00', Outlet Invert= 113.00'



‡

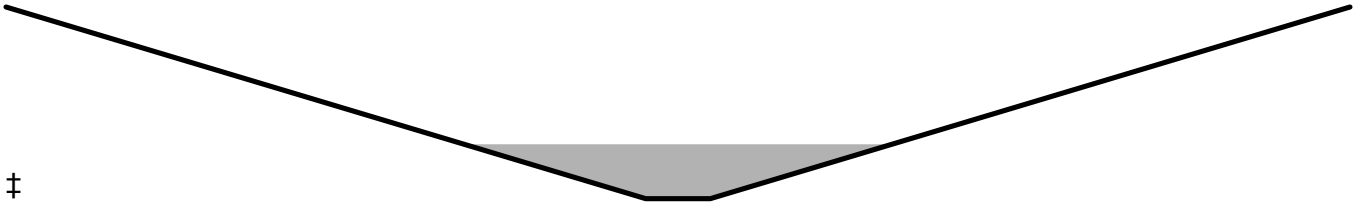
Summary for Reach 19R1: Natural Channel

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 1.45" for 10-yr Storm event
Inflow = 15.91 cfs @ 11.99 hrs, Volume= 0.804 af
Outflow = 15.46 cfs @ 12.00 hrs, Volume= 0.804 af, Atten= 3%, Lag= 1.1 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.59 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 4.4 min

Peak Storage= 1,482 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.57' , Surface Width= 13.21'
Bank-Full Depth= 2.00' Flow Area= 43.6 sf, Capacity= 340.45 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.9 '/' Top Width= 41.60'
Length= 344.0' Slope= 0.0320 '/'
Inlet Invert= 124.00', Outlet Invert= 113.00'



‡

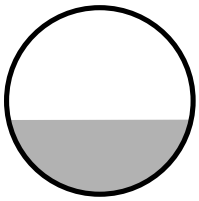
Summary for Reach 20R: Pipe

Inflow Area = 3.059 ac, 0.00% Impervious, Inflow Depth = 1.39" for 10-yr Storm event
Inflow = 6.57 cfs @ 12.01 hrs, Volume= 0.354 af
Outflow = 6.57 cfs @ 12.01 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 21R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 22.43 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 7.81 fps, Avg. Travel Time= 0.3 min

Peak Storage= 40 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.40' , Surface Width= 0.98'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 137.0' Slope= 0.2160 '/'
Inlet Invert= 182.19', Outlet Invert= 152.60'



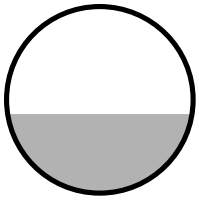
Summary for Reach 21R: Pipe

Inflow Area = 3.389 ac, 0.00% Impervious, Inflow Depth = 1.38" for 10-yr Storm event
Inflow = 7.28 cfs @ 12.01 hrs, Volume= 0.390 af
Outflow = 7.28 cfs @ 12.01 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 23.05 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.04 fps, Avg. Travel Time= 0.2 min

Peak Storage= 32 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.42' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 100.0' Slope= 0.2160 '/'
Inlet Invert= 152.60', Outlet Invert= 131.00'



Summary for Reach 22R1: Downspout

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 1.39" for 10-yr Storm event
Inflow = 7.27 cfs @ 11.99 hrs, Volume= 0.350 af
Outflow = 7.21 cfs @ 12.00 hrs, Volume= 0.350 af, Atten= 1%, Lag= 0.6 min
Routed to Reach 22R2 : Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 7.03 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.88 fps, Avg. Travel Time= 3.5 min

Peak Storage= 405 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.23' , Surface Width= 4.92'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 373.39 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 395.0' Slope= 0.2975 '/'
Inlet Invert= 259.00', Outlet Invert= 141.50'



Summary for Reach 22R2: Ditch

Inflow Area = 8.389 ac, 3.46% Impervious, Inflow Depth = 1.39" for 10-yr Storm event
Inflow = 20.66 cfs @ 11.97 hrs, Volume= 0.972 af
Outflow = 19.95 cfs @ 11.99 hrs, Volume= 0.972 af, Atten= 3%, Lag= 1.2 min
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.66 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 6.3 min

Peak Storage= 2,037 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.90' , Surface Width= 8.06'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 95.64 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.5 2.0 '/' Top Width= 13.00'
Length= 374.0' Slope= 0.0134 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Summary for Reach R1: reach 1

Inflow Area = 6.749 ac, 7.78% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 3.14 cfs @ 13.28 hrs, Volume= 0.819 af
Outflow = 3.12 cfs @ 13.36 hrs, Volume= 0.819 af, Atten= 1%, Lag= 4.3 min
Routed to Link AP 1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.19 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 10.4 min

Peak Storage= 911 cf @ 13.36 hrs
Average Depth at Peak Storage= 0.14' , Surface Width= 10.14'
Bank-Full Depth= 3.00' Flow Area= 34.5 sf, Capacity= 457.40 cfs

10.00' x 3.00' deep channel, n= 0.040
Side Slope Z-value= 0.5 '/' Top Width= 13.00'
Length= 640.0' Slope= 0.0484 '/'
Inlet Invert= 128.00', Outlet Invert= 97.00'



Summary for Pond 9AR1: Culvert 9AR1

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 1.33" for 10-yr Storm event
Inflow = 11.23 cfs @ 11.95 hrs, Volume= 0.487 af
Outflow = 11.23 cfs @ 11.95 hrs, Volume= 0.487 af, Atten= 0%, Lag= 0.0 min
Primary = 11.23 cfs @ 11.95 hrs, Volume= 0.487 af
Routed to Reach 9AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 230.87' @ 11.96 hrs
Flood Elev= 232.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.00'	**24.0" Round 24-inch HDPE** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 229.00' / 222.00' S= 0.1400 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=11.13 cfs @ 11.95 hrs HW=230.85' TW=222.28' (Dynamic Tailwater)
1=24-inch HDPE (Inlet Controls 11.13 cfs @ 3.66 fps)

Summary for Pond 9R: Culvert

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af
Outflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af, Atten= 0%, Lag= 0.0 min
Primary = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af
Routed to Reach 9R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 132.56' @ 11.96 hrs
Flood Elev= 134.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	127.50'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 127.50' / 124.50' S= 0.0652 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=17.62 cfs @ 11.96 hrs HW=132.54' TW=124.43' (Dynamic Tailwater)
1=Culvert (Inlet Controls 17.62 cfs @ 9.97 fps)

Summary for Pond 10AR1: Culvert 10AR1

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 1.81" for 10-yr Storm event
Inflow = 2.66 cfs @ 11.94 hrs, Volume= 0.111 af
Outflow = 2.66 cfs @ 11.94 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min
Primary = 2.66 cfs @ 11.94 hrs, Volume= 0.111 af
Routed to Reach 10AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 243.80' @ 11.94 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	242.50'	**12.0" Round 12-inch HDPE** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 242.50' / 238.50' S= 0.1000 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.65 cfs @ 11.94 hrs HW=243.79' TW=238.12' (Dynamic Tailwater)
↑—**1=12-inch HDPE** (Inlet Controls 2.65 cfs @ 3.37 fps)

Summary for Pond 10R: Culvert

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 1.66" for 10-yr Storm event
Inflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af
Outflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min
Primary = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af
Routed to Reach 10R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 131.53' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.90'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 129.90' / 126.10' S= 0.0760 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=7.97 cfs @ 11.96 hrs HW=131.53' TW=126.31' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.97 cfs @ 4.51 fps)

Summary for Pond 11P: Culvert 11 Catchbasin

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 1.45" for 10-yr Storm event
Inflow = 15.92 cfs @ 11.98 hrs, Volume= 0.805 af
Outflow = 15.91 cfs @ 11.99 hrs, Volume= 0.804 af, Atten= 0%, Lag= 0.1 min
Primary = 15.91 cfs @ 11.99 hrs, Volume= 0.804 af
Routed to Reach 19R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 131.25' @ 11.99 hrs Surf.Area= 13 sf Storage= 66 cf
Flood Elev= 133.00' Surf.Area= 13 sf Storage= 88 cf

Plug-Flow detention time= 0.5 min calculated for 0.804 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (851.5 - 851.3)

Volume	Invert	Avail.Storage	Storage Description
#1	126.00'	88 cf	**4.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	127.00'	**18.0" Round Culvert** L= 138.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 127.00' / 124.00' S= 0.0217 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=15.82 cfs @ 11.99 hrs HW=131.21' TW=124.56' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 15.82 cfs @ 8.95 fps)

Summary for Pond 11R: Culvert

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 1.47" for 10-yr Storm event
Inflow = 21.45 cfs @ 11.99 hrs, Volume= 1.096 af
Outflow = 18.86 cfs @ 12.03 hrs, Volume= 1.096 af, Atten= 12%, Lag= 2.5 min
Primary = 18.86 cfs @ 12.03 hrs, Volume= 1.096 af
Routed to Reach 11R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 138.00' @ 12.03 hrs Surf.Area= 1,498 sf Storage= 1,646 cf
Flood Elev= 140.00' Surf.Area= 2,900 sf Storage= 6,050 cf

Plug-Flow detention time= 0.4 min calculated for 1.096 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (851.4 - 851.0)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	6,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
135.00	0	0	0
136.00	100	50	50
140.00	2,900	6,000	6,050

Device	Routing	Invert	Outlet Devices
#1	Primary	135.00'	**24.0" Round Culvert** L= 150.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 135.00' / 134.00' S= 0.0067 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=18.81 cfs @ 12.03 hrs HW=137.99' TW=132.40' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 18.81 cfs @ 5.99 fps)

Summary for Pond 11R2: Culvert

Inflow Area = 0.563 ac, 52.22% Impervious, Inflow Depth = 2.64" for 10-yr Storm event
Inflow = 2.82 cfs @ 11.94 hrs, Volume= 0.124 af
Outflow = 2.50 cfs @ 11.92 hrs, Volume= 0.124 af, Atten= 11%, Lag= 0.0 min
Primary = 2.50 cfs @ 11.92 hrs, Volume= 0.124 af
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 138.05' @ 12.02 hrs Surf.Area= 397 sf Storage= 167 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (801.6 - 801.3)

Volume	Invert	Avail.Storage	Storage Description
#1	136.00'	1,621 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
136.00	0	0	0
137.00	10	5	5
138.00	281	146	151
139.00	2,660	1,471	1,621

Device	Routing	Invert	Outlet Devices
#1	Primary	136.15'	**15.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 136.15' / 135.50' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.55 cfs @ 11.92 hrs HW=137.35' TW=137.02' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 2.55 cfs @ 2.69 fps)

Summary for Pond 22R: Culvert

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 1.39" for 10-yr Storm event
Inflow = 7.27 cfs @ 11.99 hrs, Volume= 0.350 af
Outflow = 7.27 cfs @ 11.99 hrs, Volume= 0.350 af, Atten= 0%, Lag= 0.0 min
Primary = 7.27 cfs @ 11.99 hrs, Volume= 0.350 af
Routed to Reach 22R1 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 270.92' @ 11.99 hrs
Flood Elev= 273.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 269.00' / 259.00' S= 0.2000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=7.22 cfs @ 11.99 hrs HW=270.90' TW=259.23' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.22 cfs @ 4.08 fps)

Summary for Pond 23P: CB-Grates

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af
Outflow = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af, Atten= 0%, Lag= 0.0 min
Primary = 17.67 cfs @ 11.96 hrs, Volume= 0.771 af
Routed to Pond 9R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 134.83' @ 11.96 hrs Surf.Area= 34 sf Storage= 3 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (854.0 - 854.0)

Volume	Invert	Avail.Storage	Storage Description
#1	134.70'	409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.70	9	0	0
136.70	400	409	409

Device	Routing	Invert	Outlet Devices
#1	Primary	134.60'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.62 cfs @ 11.96 hrs HW=134.83' TW=132.54' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 17.62 cfs @ 1.55 fps)

Summary for Pond 24P: CB-Grates

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 1.66" for 10-yr Storm event
Inflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af
Outflow = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af, Atten= 0%, Lag= 0.0 min
Primary = 7.97 cfs @ 11.96 hrs, Volume= 0.347 af
Routed to Pond 10R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 137.93' @ 11.96 hrs Surf.Area= 33 sf Storage= 3 cf

Plug-Flow detention time= 0.0 min calculated for 0.346 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (841.3 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	137.80'	450 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
137.80	9	0	0
140.00	400	450	450

Device	Routing	Invert	Outlet Devices
#1	Primary	137.80'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.97 cfs @ 11.96 hrs HW=137.93' TW=131.53' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 7.97 cfs @ 1.19 fps)

Summary for Pond P-2: Northeast Basin

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 55.60 cfs @ 12.03 hrs, Volume= 3.904 af
Outflow = 8.18 cfs @ 12.71 hrs, Volume= 3.899 af, Atten= 85%, Lag= 41.0 min
Primary = 8.18 cfs @ 12.71 hrs, Volume= 3.899 af
Routed to Link AP 2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Starting Elev= 116.00' Surf.Area= 3.460 ac Storage= 7.685 af
Peak Elev= 116.42' @ 12.71 hrs Surf.Area= 3.915 ac Storage= 9.256 af (1.571 af above start)
Flood Elev= 116.50' Surf.Area= 4.000 ac Storage= 9.550 af (1.865 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 209.6 min (1,075.9 - 866.2)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	9.550 af	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	2.000	0.000	0.000
114.00	2.150	2.075	2.075
116.00	3.460	5.610	7.685
116.50	4.000	1.865	9.550

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	**9.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=8.18 cfs @ 12.71 hrs HW=116.42' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 8.18 cfs @ 2.18 fps)

Summary for Link AP 1: Analysis Point 1

Inflow Area = 16.601 ac, 4.76% Impervious, Inflow Depth = 1.42" for 10-yr Storm event
Inflow = 8.55 cfs @ 12.79 hrs, Volume= 1.960 af
Primary = 8.55 cfs @ 12.79 hrs, Volume= 1.960 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

Summary for Link AP 2: Analysis Point 2

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth > 1.34" for 10-yr Storm event
Inflow = 8.18 cfs @ 12.71 hrs, Volume= 3.899 af
Primary = 8.18 cfs @ 12.71 hrs, Volume= 3.899 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

Summary for Subcatchment 1A: SC-1A

Runoff = 4.92 cfs @ 13.28 hrs, Volume= 1.239 af, Depth= 2.20"
Routed to Reach R1 : reach 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	6,700	98	Gas to Energy Building,Scrubber,Contact Tank, Flare pad
*	16,171	98	Pavement
	143,660	70	Woods, Good, HSG C
	121,603	71	Meadow, non-grazed, HSG C
*	5,843	92	Gravel pad
	293,977	73	Weighted Average
	271,106		92.22% Pervious Area
	22,871		7.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.5	150	0.0083	0.08		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
78.4	962	0.0067	0.20		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.7	48	0.0067	1.23		**Shallow Concentrated Flow, Segment C-D** Grassed Waterway Kv= 15.0 fps
109.6	1,160	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 10.74 cfs @ 12.66 hrs, Volume= 1.741 af, Depth= 2.12"
Routed to Link AP 1 : Analysis Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
*	4,160	98	Old Cold Brook Rd
*	3,360	92	existing Gravel Drive
	58,392	70	Woods, Good, HSG C
	351,761	71	Meadow, non-grazed, HSG C
*	3,850	98	Offsite House and drive
*	3,555	98	Pavement
*	4,072	92	Gravel Pad
	429,150	72	Weighted Average
	417,585		97.31% Pervious Area
	11,565		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
49.4	150	0.0025	0.05		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
10.2	350	0.0067	0.57		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
0.6	300	0.0400	8.46	112.74	**Parabolic Channel, SegmentC-D** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.040
0.7	510	0.0420	12.29	589.71	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=10.00' D=3.00' Z= 2.0 '/' Top.W=22.00' n= 0.040
60.9	1,310	Total			

Summary for Subcatchment 5: SC-5

Runoff = 13.63 cfs @ 11.97 hrs, Volume= 0.622 af, Depth= 2.28"
Routed to Reach 5R : PIPE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

Area (sf)	CN	Description
122,213	71	Meadow, non-grazed, HSG C
20,100	89	Gravel roads, HSG C
142,313	74	Weighted Average
142,313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	65	0.4600	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	109	0.0500	3.35		**Shallow Concentrated Flow, BC** Grassed Waterway Kv= 15.0 fps
0.0	105	0.4000	44.43	78.51	**Pipe Channel, CD** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
0.5	140	0.0050	4.97	8.78	**Pipe Channel, DE** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
1.3	516	0.0140	6.53	52.23	**Trap/Vee/Rect Channel Flow, EF** Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.025
5.4	935	Total			

Summary for Subcatchment 8: SC-8

Runoff = 9.71 cfs @ 12.01 hrs, Volume= 0.511 af, Depth= 2.12"
Routed to Reach 8R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

Area (sf)	CN	Description
120,391	71	Meadow, non-grazed, HSG C
5,440	89	Gravel roads, HSG C
125,831	72	Weighted Average
125,831		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.0800	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.0	17	0.0250	6.08	30.80	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.3	311	0.1900	18.65	298.41	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
9.2	428	Total			

Summary for Subcatchment 9: SC-9

Runoff = 9.92 cfs @ 11.96 hrs, Volume= 0.433 af, Depth= 2.12"
Routed to Reach 9R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	102,351	71	Meadow, non-grazed, HSG C
*	4,456	98	Gravel Road
	106,807	72	Weighted Average
	102,351		95.83% Pervious Area
	4,456		4.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	80	0.4000	0.34		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	140	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	150	0.2480	21.31	340.93	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.3	370	Total			

Summary for Subcatchment 9A: SC-9A

Runoff = 17.35 cfs @ 11.95 hrs, Volume= 0.750 af, Depth= 2.04"
Routed to Pond 9AR1 : Culvert 9AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

Area (sf)	CN	Description
187,734	71	Meadow, non-grazed, HSG C
4,320	89	Gravel roads, HSG C
192,054	71	Weighted Average
192,054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	31	0.1000	0.16		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	123	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.5 & 10.0 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	93	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	110	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
0.4	363	0.1400	16.01	256.16	**Trap/Vee/Rect Channel Flow, E - F** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	720	Total			

Summary for Subcatchment 10: SC-10

Runoff = 8.07 cfs @ 11.95 hrs, Volume= 0.351 af, Depth= 2.37"
Routed to Reach 10R1 : Riprap-V-Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	74,190	74	>75% Grass cover, Good, HSG C
*	3,200	98	Gravel Road
	77,390	75	Weighted Average
	74,190		95.87% Pervious Area
	3,200		4.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	72	0.4000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.3	130	0.0500	8.60	43.56	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.030
0.1	135	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.0	337	Total			

Summary for Subcatchment 10A: SC-10A

Runoff = 3.83 cfs @ 11.94 hrs, Volume= 0.161 af, Depth= 2.63"
Routed to Pond 10AR1 : Culvert 10AR1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	26,298	74	>75% Grass cover, Good, HSG C
*	5,760	98	Gravel Road
	32,058	78	Weighted Average
	26,298		82.03% Pervious Area
	5,760		17.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.4000	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	298	0.0670	24.90	126.07	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 2.0 & 2.5 '/' Top.W=6.75' n= 0.012 Steel, smooth

2.9 348 Total

Summary for Subcatchment 11: SC-11

Runoff = 21.31 cfs @ 11.96 hrs, Volume= 0.949 af, Depth= 2.12"
Routed to Reach 22R2 : Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	228,220	71	Meadow, non-grazed, HSG C
*	5,640	98	Paved Access Road
	233,860	72	Weighted Average
	228,220		97.59% Pervious Area
	5,640		2.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	77	0.3300	0.31		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.5	238	0.0500	8.69	48.87	**Trap/Vee/Rect Channel Flow, B - C** Bot.W=0.00' D=1.50' Z= 3.0 & 2.0 '/' Top.W=7.50' n= 0.030
0.2	322	0.3300	24.58	393.28	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040
4.8	637	Total			

Summary for Subcatchment 11A: SC-11A

Runoff = 3.76 cfs @ 11.94 hrs, Volume= 0.168 af, Depth= 3.57"
Routed to Pond 11R2 : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (ac)	CN	Description
*	0.294	98	Paved Access Road
	0.211	71	Meadow, non-grazed, HSG C
	0.058	96	Gravel surface, HSG C
	0.563	88	Weighted Average
	0.269		47.78% Pervious Area
	0.294		52.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0					**Direct Entry, Direct Entry**

Summary for Subcatchment 18: SC-18

Runoff = 15.83 cfs @ 12.20 hrs, Volume= 1.417 af, Depth= 1.73"
Routed to Pond P-2 : Northeast Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	118,303	70	Woods, Good, HSG C
	302,887	65	Brush, Good, HSG C
*	6,000	98	Gravel Road
	427,190	67	Weighted Average
	421,190		98.60% Pervious Area
	6,000		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	85	0.1410	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.8	190	0.0579	3.87		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
18.0	648		0.60		**Direct Entry, C - D**
25.0	923	Total			

Summary for Subcatchment 20: SC-20

Runoff = 0.68 cfs @ 11.95 hrs, Volume= 0.029 af, Depth= 2.04"
Routed to Reach 20R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

Area (sf)	CN	Description
7,413	71	Meadow, non-grazed, HSG C
7,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	60	0.3000	0.29		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	60	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
3.7	120	Total			

Summary for Subcatchment 21: SC-21

Runoff = 1.19 cfs @ 11.98 hrs, Volume= 0.056 af, Depth= 2.04"
Routed to Reach 21R : Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

Area (sf)	CN	Description
14,397	71	Meadow, non-grazed, HSG C
14,397		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	125	0.3000	0.33		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.1	23	0.1000	5.09		**Shallow Concentrated Flow, B - C** Unpaved Kv= 16.1 fps
6.4	148	Total			

Summary for Subcatchment 22: SC-22

Runoff = 11.16 cfs @ 11.98 hrs, Volume= 0.534 af, Depth= 2.12"
Routed to Pond 22R : Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs
Type II 24-hr 25-yr Storm Rainfall=4.90"

	Area (sf)	CN	Description
	124,583	71	Meadow, non-grazed, HSG C
*	7,000	98	
	131,583	72	Weighted Average
	124,583		94.68% Pervious Area
	7,000		5.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	72	0.1000	0.19		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 2.70"
0.2	142	0.0500	12.31	173.10	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.50' Z= 10.0 & 2.5 '/' Top.W=18.75' n= 0.022 Earth, clean & straight
0.1	60	0.1000	13.41	134.11	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=0.00' D=1.00' Z= 10.0 '/' Top.W=20.00' n= 0.022 Earth, clean & straight
0.1	112	0.4000	27.06	432.98	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=2.00' Z= 2.0 '/' Top.W=12.00' n= 0.040 Earth, cobble bottom, clean sides
6.7	386	Total			

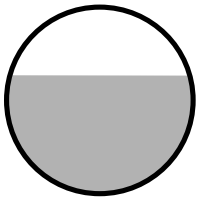
Summary for Reach 5R: PIPE

Inflow Area = 3.267 ac, 0.00% Impervious, Inflow Depth = 2.28" for 25-yr Storm event
Inflow = 13.63 cfs @ 11.97 hrs, Volume= 0.622 af
Outflow = 13.62 cfs @ 11.97 hrs, Volume= 0.622 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 11.54 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.78 fps, Avg. Travel Time= 0.2 min

Peak Storage= 52 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.95' , Surface Width= 1.45'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 18.72 cfs

18.0" Round Pipe
n= 0.011
Length= 44.0' Slope= 0.0227 '/'
Inlet Invert= 133.00', Outlet Invert= 132.00'



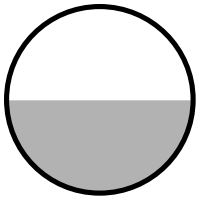
Summary for Reach 8R: Pipe

Inflow Area = 2.889 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-yr Storm event
Inflow = 9.71 cfs @ 12.01 hrs, Volume= 0.511 af
Outflow = 9.71 cfs @ 12.01 hrs, Volume= 0.511 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 20R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 24.85 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.37 fps, Avg. Travel Time= 0.3 min

Peak Storage= 54 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.50' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 138.0' Slope= 0.2160 '/'
Inlet Invert= 212.00', Outlet Invert= 182.19'



Summary for Reach 9AR2: Downspout

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-yr Storm event
Inflow = 17.35 cfs @ 11.95 hrs, Volume= 0.750 af
Outflow = 17.32 cfs @ 11.96 hrs, Volume= 0.750 af, Atten= 0%, Lag= 0.3 min
Routed to Reach 9R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 10.20 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.56 fps, Avg. Travel Time= 1.5 min

Peak Storage= 389 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.36' , Surface Width= 5.44'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 417.09 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 229.0' Slope= 0.3712 '/'
Inlet Invert= 222.00', Outlet Invert= 137.00'



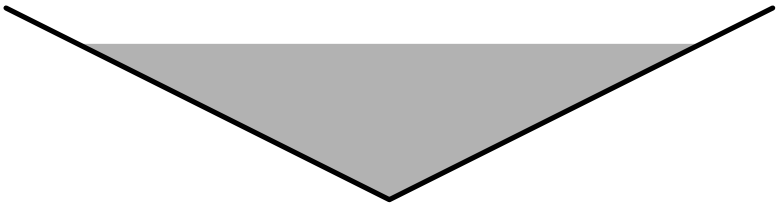
Summary for Reach 9R1: Riprap-V-Ditch

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 2.07" for 25-yr Storm event
Inflow = 27.23 cfs @ 11.96 hrs, Volume= 1.183 af
Outflow = 27.22 cfs @ 11.96 hrs, Volume= 1.183 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 23P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 5.16 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.4 min

Peak Storage= 264 cf @ 11.96 hrs
Average Depth at Peak Storage= 1.62' , Surface Width= 6.50'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 47.40 cfs

0.00' x 2.00' deep channel, n= 0.030 Rubble masonry, cemented
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 50.0' Slope= 0.0166 '/'
Inlet Invert= 135.53', Outlet Invert= 134.70'



Summary for Reach 9R2: Natural Channel

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 2.07" for 25-yr Storm event
Inflow = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af
Outflow = 34.17 cfs @ 11.97 hrs, Volume= 1.186 af, Atten= 0%, Lag= 0.2 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 8.04 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 0.7 min

Peak Storage= 359 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.60' , Surface Width= 10.04'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 446.98 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 85.0' Slope= 0.1176 '/'
Inlet Invert= 124.00', Outlet Invert= 114.00'



‡

Summary for Reach 10AR2: Downspout

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 2.63" for 25-yr Storm event
Inflow = 3.83 cfs @ 11.94 hrs, Volume= 0.161 af
Outflow = 3.79 cfs @ 11.94 hrs, Volume= 0.161 af, Atten= 1%, Lag= 0.4 min
Routed to Reach 10R1 : Riprap-V-Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 6.05 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 2.3 min

Peak Storage= 157 cf @ 11.94 hrs
Average Depth at Peak Storage= 0.15' , Surface Width= 4.58'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 424.23 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 250.0' Slope= 0.3840 '/'
Inlet Invert= 238.00', Outlet Invert= 142.00'



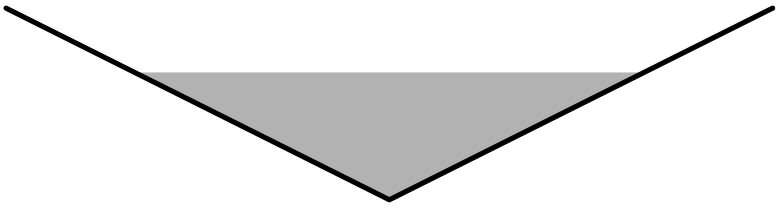
Summary for Reach 10R1: Riprap-V-Ditch

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 2.44" for 25-yr Storm event
Inflow = 11.84 cfs @ 11.95 hrs, Volume= 0.512 af
Outflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af, Atten= 1%, Lag= 0.6 min
Routed to Pond 24P : CB-Grates

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.32 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 2.1 min

Peak Storage= 505 cf @ 11.96 hrs
Average Depth at Peak Storage= 1.33' , Surface Width= 5.31'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 34.91 cfs

0.00' x 2.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 143.0' Slope= 0.0160 '/'
Inlet Invert= 140.29', Outlet Invert= 138.00'



Summary for Reach 10R2: Natural Channel

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 2.44" for 25-yr Storm event
Inflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af
Outflow = 11.67 cfs @ 11.96 hrs, Volume= 0.512 af, Atten= 1%, Lag= 0.3 min
Routed to Reach 18R : Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 5.16 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 1.9 min

Peak Storage= 346 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.38' , Surface Width= 7.82'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 364.96 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 5.0 '/' Top Width= 24.00'
Length= 153.0' Slope= 0.0784 '/'
Inlet Invert= 126.00', Outlet Invert= 114.00'



‡

Summary for Reach 11R1: Natural Channel

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 2.22" for 25-yr Storm event
Inflow = 24.47 cfs @ 12.04 hrs, Volume= 1.656 af
Outflow = 23.27 cfs @ 12.09 hrs, Volume= 1.656 af, Atten= 5%, Lag= 2.8 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 3.30 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.83 fps, Avg. Travel Time= 17.1 min

Peak Storage= 6,000 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.49' , Surface Width= 18.82'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 403.99 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 850.0' Slope= 0.0224 '/'
Inlet Invert= 132.00', Outlet Invert= 113.00'



‡

Summary for Reach 18R: Basin

Inflow Area = 9.373 ac, 3.29% Impervious, Inflow Depth = 2.17" for 25-yr Storm event
Inflow = 45.71 cfs @ 11.97 hrs, Volume= 1.698 af
Outflow = 32.93 cfs @ 12.00 hrs, Volume= 1.698 af, Atten= 28%, Lag= 1.6 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 1.58 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 20.9 min

Peak Storage= 9,566 cf @ 12.00 hrs
Average Depth at Peak Storage= 1.06' , Surface Width= 29.16'
Bank-Full Depth= 2.00' Flow Area= 56.0 sf, Capacity= 126.12 cfs

10.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.0 '/' Top Width= 46.00'
Length= 459.0' Slope= 0.0022 '/'
Inlet Invert= 114.00', Outlet Invert= 113.00'



‡

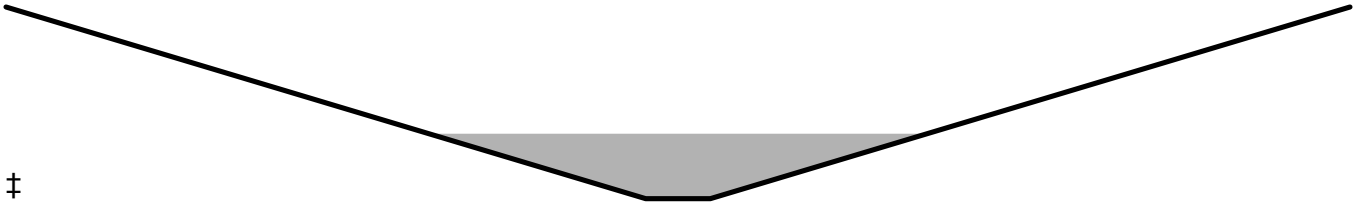
Summary for Reach 19R1: Natural Channel

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 2.19" for 25-yr Storm event
Inflow = 24.28 cfs @ 11.98 hrs, Volume= 1.218 af
Outflow = 23.68 cfs @ 12.00 hrs, Volume= 1.218 af, Atten= 2%, Lag= 1.1 min
Routed to Pond P-2 : Northeast Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 4.00 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 4.1 min

Peak Storage= 2,038 cf @ 12.00 hrs
Average Depth at Peak Storage= 0.68' , Surface Width= 15.45'
Bank-Full Depth= 2.00' Flow Area= 43.6 sf, Capacity= 340.45 cfs

2.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 9.9 '/' Top Width= 41.60'
Length= 344.0' Slope= 0.0320 '/'
Inlet Invert= 124.00', Outlet Invert= 113.00'



‡

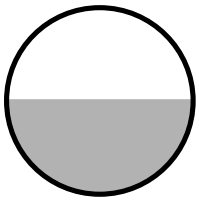
Summary for Reach 20R: Pipe

Inflow Area = 3.059 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-yr Storm event
Inflow = 10.13 cfs @ 12.01 hrs, Volume= 0.540 af
Outflow = 10.13 cfs @ 12.01 hrs, Volume= 0.540 af, Atten= 0%, Lag= 0.1 min
Routed to Reach 21R : Pipe

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 25.10 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.51 fps, Avg. Travel Time= 0.3 min

Peak Storage= 55 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.51' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 137.0' Slope= 0.2160 '/'
Inlet Invert= 182.19', Outlet Invert= 152.60'



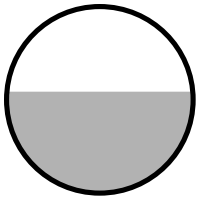
Summary for Reach 21R: Pipe

Inflow Area = 3.389 ac, 0.00% Impervious, Inflow Depth = 2.11" for 25-yr Storm event
Inflow = 11.25 cfs @ 12.01 hrs, Volume= 0.596 af
Outflow = 11.25 cfs @ 12.01 hrs, Volume= 0.596 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 11P : Culvert 11 Catchbasin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 25.77 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.75 fps, Avg. Travel Time= 0.2 min

Peak Storage= 44 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.54' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 19.57 cfs

12.0" Round Pipe
n= 0.011
Length= 100.0' Slope= 0.2160 '/'
Inlet Invert= 152.60', Outlet Invert= 131.00'



Summary for Reach 22R1: Downspout

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 2.12" for 25-yr Storm event
Inflow = 11.16 cfs @ 11.98 hrs, Volume= 0.534 af
Outflow = 11.09 cfs @ 11.99 hrs, Volume= 0.534 af, Atten= 1%, Lag= 0.5 min
Routed to Reach 22R2 : Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 8.15 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.08 fps, Avg. Travel Time= 3.2 min

Peak Storage= 537 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.30' , Surface Width= 5.18'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 373.39 cfs

4.00' x 2.00' deep channel, n= 0.040
Side Slope Z-value= 2.0 '/' Top Width= 12.00'
Length= 395.0' Slope= 0.2975 '/'
Inlet Invert= 259.00', Outlet Invert= 141.50'



Summary for Reach 22R2: Ditch

Inflow Area = 8.389 ac, 3.46% Impervious, Inflow Depth = 2.12" for 25-yr Storm event
Inflow = 31.75 cfs @ 11.97 hrs, Volume= 1.483 af
Outflow = 30.89 cfs @ 11.99 hrs, Volume= 1.483 af, Atten= 3%, Lag= 1.0 min
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 4.14 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 5.7 min

Peak Storage= 2,787 cf @ 11.99 hrs
Average Depth at Peak Storage= 1.14' , Surface Width= 9.11'
Bank-Full Depth= 2.00' Flow Area= 17.0 sf, Capacity= 95.64 cfs

4.00' x 2.00' deep channel, n= 0.035
Side Slope Z-value= 2.5 2.0 '/' Top Width= 13.00'
Length= 374.0' Slope= 0.0134 '/'
Inlet Invert= 140.00', Outlet Invert= 135.00'



Summary for Reach R1: reach 1

Inflow Area = 6.749 ac, 7.78% Impervious, Inflow Depth = 2.20" for 25-yr Storm event
Inflow = 4.92 cfs @ 13.28 hrs, Volume= 1.239 af
Outflow = 4.89 cfs @ 13.32 hrs, Volume= 1.239 af, Atten= 0%, Lag= 2.3 min
Routed to Link AP 1 : Analysis Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Max. Velocity= 2.61 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 9.4 min

Peak Storage= 1,200 cf @ 13.32 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 10.19'
Bank-Full Depth= 3.00' Flow Area= 34.5 sf, Capacity= 457.40 cfs

10.00' x 3.00' deep channel, n= 0.040
Side Slope Z-value= 0.5 '/' Top Width= 13.00'
Length= 640.0' Slope= 0.0484 '/'
Inlet Invert= 128.00', Outlet Invert= 97.00'



Summary for Pond 9AR1: Culvert 9AR1

Inflow Area = 4.409 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-yr Storm event
Inflow = 17.35 cfs @ 11.95 hrs, Volume= 0.750 af
Outflow = 17.35 cfs @ 11.95 hrs, Volume= 0.750 af, Atten= 0%, Lag= 0.0 min
Primary = 17.35 cfs @ 11.95 hrs, Volume= 0.750 af
Routed to Reach 9AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 232.11' @ 11.95 hrs
Flood Elev= 232.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	229.00'	**24.0" Round 24-inch HDPE** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 229.00' / 222.00' S= 0.1400 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=17.16 cfs @ 11.95 hrs HW=232.06' TW=222.36' (Dynamic Tailwater)
↑—**1=24-inch HDPE** (Inlet Controls 17.16 cfs @ 5.46 fps)

Summary for Pond 9R: Culvert

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 2.07" for 25-yr Storm event
Inflow = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af
Outflow = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af, Atten= 0%, Lag= 0.0 min
Primary = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af
Routed to Reach 9R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 143.51' @ 11.97 hrs
Flood Elev= 134.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	127.50'	**18.0" Round Culvert** L= 46.0' Ke= 0.500 Inlet / Outlet Invert= 127.50' / 124.50' S= 0.0652 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=32.07 cfs @ 11.97 hrs HW=142.45' TW=124.58' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 32.07 cfs @ 18.15 fps)

Summary for Pond 10AR1: Culvert 10AR1

Inflow Area = 0.736 ac, 17.97% Impervious, Inflow Depth = 2.63" for 25-yr Storm event
Inflow = 3.83 cfs @ 11.94 hrs, Volume= 0.161 af
Outflow = 3.83 cfs @ 11.94 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.0 min
Primary = 3.83 cfs @ 11.94 hrs, Volume= 0.161 af
Routed to Reach 10AR2 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 244.64' @ 11.94 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	242.50'	**12.0" Round 12-inch HDPE** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 242.50' / 238.50' S= 0.1000 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=3.80 cfs @ 11.94 hrs HW=244.62' TW=238.14' (Dynamic Tailwater)
└**1=12-inch HDPE** (Inlet Controls 3.80 cfs @ 4.83 fps)

Summary for Pond 10R: Culvert

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 2.44" for 25-yr Storm event
Inflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af
Outflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.0 min
Primary = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af
Routed to Reach 10R2 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 132.55' @ 11.96 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.90'	**18.0" Round Culvert** L= 50.0' Ke= 0.500 Inlet / Outlet Invert= 129.90' / 126.10' S= 0.0760 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=11.67 cfs @ 11.96 hrs HW=132.53' TW=126.38' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 11.67 cfs @ 6.60 fps)

Summary for Pond 11P: Culvert 11 Catchbasin

Inflow Area = 6.656 ac, 0.00% Impervious, Inflow Depth = 2.20" for 25-yr Storm event
Inflow = 24.24 cfs @ 11.98 hrs, Volume= 1.218 af
Outflow = 24.28 cfs @ 11.98 hrs, Volume= 1.218 af, Atten= 0%, Lag= 0.0 min
Primary = 24.28 cfs @ 11.98 hrs, Volume= 1.218 af
Routed to Reach 19R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 135.89' @ 11.98 hrs Surf.Area= 13 sf Storage= 88 cf
Flood Elev= 133.00' Surf.Area= 13 sf Storage= 88 cf

Plug-Flow detention time= 0.3 min calculated for 1.217 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (839.2 - 839.1)

Volume	Invert	Avail.Storage	Storage Description
#1	126.00'	88 cf	**4.00'D x 7.00'H Vertical Cone/Cylinder**

Device	Routing	Invert	Outlet Devices
#1	Primary	127.00'	**18.0" Round Culvert** L= 138.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 127.00' / 124.00' S= 0.0217 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=24.24 cfs @ 11.98 hrs HW=135.86' TW=124.67' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 24.24 cfs @ 13.72 fps)

Summary for Pond 11R: Culvert

Inflow Area = 8.952 ac, 6.53% Impervious, Inflow Depth = 2.22" for 25-yr Storm event
Inflow = 31.88 cfs @ 11.98 hrs, Volume= 1.656 af
Outflow = 24.47 cfs @ 12.04 hrs, Volume= 1.656 af, Atten= 23%, Lag= 3.8 min
Primary = 24.47 cfs @ 12.04 hrs, Volume= 1.656 af
Routed to Reach 11R1 : Natural Channel

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 139.36' @ 12.04 hrs Surf.Area= 2,452 sf Storage= 4,339 cf
Flood Elev= 140.00' Surf.Area= 2,900 sf Storage= 6,050 cf

Plug-Flow detention time= 0.8 min calculated for 1.656 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (839.5 - 838.6)

Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	6,050 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
135.00	0	0	0
136.00	100	50	50
140.00	2,900	6,000	6,050

Device	Routing	Invert	Outlet Devices
#1	Primary	135.00'	**24.0" Round Culvert** L= 150.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 135.00' / 134.00' S= 0.0067 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=24.46 cfs @ 12.04 hrs HW=139.36' TW=132.48' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 24.46 cfs @ 7.79 fps)

Summary for Pond 11R2: Culvert

Inflow Area = 0.563 ac, 52.22% Impervious, Inflow Depth = 3.57" for 25-yr Storm event
Inflow = 3.76 cfs @ 11.94 hrs, Volume= 0.168 af
Outflow = 4.56 cfs @ 12.19 hrs, Volume= 0.168 af, Atten= 0%, Lag= 15.2 min
Primary = 4.56 cfs @ 12.19 hrs, Volume= 0.173 af
Routed to Pond 11R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 138.86' @ 12.09 hrs Surf.Area= 2,333 sf Storage= 1,278 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 2.1 min (794.8 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	136.00'	1,621 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
136.00	0	0	0
137.00	10	5	5
138.00	281	146	151
139.00	2,660	1,471	1,621

Device	Routing	Invert	Outlet Devices
#1	Primary	136.15'	**15.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 136.15' / 135.50' S= 0.0108 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.44 cfs @ 12.19 hrs HW=138.26' TW=137.35' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.44 cfs @ 3.62 fps)

Summary for Pond 22R: Culvert

Inflow Area = 3.021 ac, 5.32% Impervious, Inflow Depth = 2.12" for 25-yr Storm event
Inflow = 11.16 cfs @ 11.98 hrs, Volume= 0.534 af
Outflow = 11.16 cfs @ 11.98 hrs, Volume= 0.534 af, Atten= 0%, Lag= 0.0 min
Primary = 11.16 cfs @ 11.98 hrs, Volume= 0.534 af
Routed to Reach 22R1 : Downspout

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 272.51' @ 11.98 hrs
Flood Elev= 273.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	269.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 269.00' / 259.00' S= 0.2000 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=11.10 cfs @ 11.98 hrs HW=272.48' TW=259.29' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 11.10 cfs @ 6.28 fps)

Summary for Pond 23P: CB-Grates

Inflow Area = 6.861 ac, 1.49% Impervious, Inflow Depth = 2.07" for 25-yr Storm event
Inflow = 27.22 cfs @ 11.96 hrs, Volume= 1.183 af
Outflow = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af, Atten= 0%, Lag= 0.7 min
Primary = 33.49 cfs @ 11.97 hrs, Volume= 1.186 af
Routed to Pond 9R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2

Peak Elev= 154.39' @ 11.96 hrs Surf.Area= 400 sf Storage= 409 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (841.2 - 841.1)

Volume	Invert	Avail.Storage	Storage Description
#1	134.70'	409 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
134.70	9	0	0
136.70	400	409	409

Device	Routing	Invert	Outlet Devices
#1	Primary	134.60'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=197.01 cfs @ 11.97 hrs HW=145.10' TW=142.45' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Orifice Controls 197.01 cfs @ 7.84 fps)

Summary for Pond 24P: CB-Grates

Inflow Area = 2.513 ac, 8.19% Impervious, Inflow Depth = 2.44" for 25-yr Storm event
Inflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af
Outflow = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.0 min
Primary = 11.73 cfs @ 11.96 hrs, Volume= 0.512 af
Routed to Pond 10R : Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 137.97' @ 11.96 hrs Surf.Area= 40 sf Storage= 4 cf

Plug-Flow detention time= 0.0 min calculated for 0.512 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (829.9 - 829.9)

Volume	Invert	Avail.Storage	Storage Description
#1	137.80'	450 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
137.80	9	0	0
140.00	400	450	450

Device	Routing	Invert	Outlet Devices
#1	Primary	137.80'	**24.0" Horiz. Orifice/Grate** X 8 rows C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.67 cfs @ 11.96 hrs HW=137.97' TW=132.53' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Weir Controls 11.67 cfs @ 1.35 fps)

Summary for Pond P-2: Northeast Basin

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth = 2.07" for 25-yr Storm event
Inflow = 84.30 cfs @ 12.01 hrs, Volume= 5.989 af
Outflow = 94.66 cfs @ 12.16 hrs, Volume= 5.984 af, Atten= 0%, Lag= 9.0 min
Primary = 94.66 cfs @ 12.16 hrs, Volume= 5.984 af
Routed to Link AP 2 : Analysis Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs / 2
Starting Elev= 116.00' Surf.Area= 3.460 ac Storage= 7.685 af
Peak Elev= 118.08' @ 12.16 hrs Surf.Area= 4.000 ac Storage= 9.550 af (1.865 af above start)
Flood Elev= 116.50' Surf.Area= 4.000 ac Storage= 9.550 af (1.865 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 164.9 min (1,017.6 - 852.7)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	9.550 af	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	2.000	0.000	0.000
114.00	2.150	2.075	2.075
116.00	3.460	5.610	7.685
116.50	4.000	1.865	9.550

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	**9.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 2.0' Crest Height

Primary OutFlow Max=93.73 cfs @ 12.16 hrs HW=118.06' TW=0.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 93.73 cfs @ 5.29 fps)

Summary for Link AP 1: Analysis Point 1

Inflow Area = 16.601 ac, 4.76% Impervious, Inflow Depth = 2.15" for 25-yr Storm event
Inflow = 13.60 cfs @ 12.78 hrs, Volume= 2.980 af
Primary = 13.60 cfs @ 12.78 hrs, Volume= 2.980 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

Summary for Link AP 2: Analysis Point 2

Inflow Area = 34.789 ac, 2.96% Impervious, Inflow Depth = 2.06" for 25-yr Storm event
Inflow = 94.66 cfs @ 12.16 hrs, Volume= 5.984 af
Primary = 94.66 cfs @ 12.16 hrs, Volume= 5.984 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.02 hrs

APPENDIX D

DESIGN CALCULATIONS

SME
SEVEE & MAHER
ENGINEERS

Project Name:	Leachate Transfer System Upgrades
Project Location:	HAMPDEN, MAINE
Project No:	260565
Completed By:	kpn
Date:	5/12/2026
Checked By:	NMT
Date:	9/24/2026

SME
SEVEE & MAHER ENGINEERS

CONTAINMENT PIPE- PE 4710 HDPE SDR 17

Reference:
Handbook of Polyethelene Pipe 2nd Edition 2009
http://www.mcggeotechnical.com/wp-content/uploads/2015/08/MCG-Final-Ms-Study-Report031410.pdf

CALCULATE RING DEFLECTION

EARTH LOADING 6 FT BURIAL DEPTH
CALCULATE LIVE LOAD
assume dual axle tractor hauling 6000 gal triaxle tank

MEDOT legal weight limit total =	80,000	lbs	(H20 Loading)
Axle limit	16,000	lbs	
Weight per tire	1143	lbs	
Assume tire inflation pressure	80	PSI	
Contact area = Wheel Load/ Tire Pressure (in^2)			
Contact area per tire	14.3	in^2	
Two tires per side of axle	28.6	in^2	

Timoshenko's Equation

The Timoshenko Equation gives the soil pressure at a point directly under a distributed surface load, neglecting any pavement.

(3-2)
$$P_L = \frac{I_f W_w}{a_C}\left(1 - \frac{H^3}{(r_T^2 + H^2)^{1.5}}\right)$$

WHERE

P_L = vertical soil pressure due to live load, lb/ft^2
I_f = impact factor
W_W = wheel load, lb
a_C = contact area, ft^2
r_T = equivalent radius, ft
H = depth of cover, ft

The equivalent radius is given by:

(3-3)
$$r_T = \sqrt{\frac{a_C}{\pi}}$$

Wheel load on top of pipe

I_f	1.1		dual axle tractor hauling 6000 gal triaxle tank
W_W	16,000	lbs	See above
a_c	0.20	ft^2	See above
r_T	0.25	ft	
H	6	ft	
P_L	233	PSF	

Wheel load from opposite side

Boussinesq Equation

The Boussinesq Equation gives the pressure at any point in a soil mass under a concentrated surface load. The Boussinesq Equation may be used to find the pressure transmitted from a wheel load to a point that is not along the line of action of the load. Pavement effects are neglected.

(3-4) $$P_L = \frac{3I_f W_w H^3}{2\pi r^5}$$

WHERE

P_L = vertical soil pressure due to live load lb/ft²
W_W = wheel load, lb
H = vertical depth to pipe crown, ft
I_F = impact factor
r = distance from the point of load application to pipe crown, ft

(3-5) $$r = \sqrt{X^2 + H^2}$$

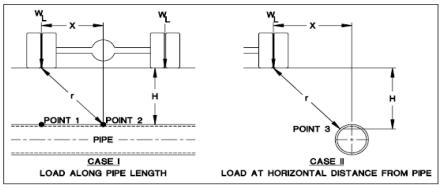


Figure 3-4 Illustration of Boussinesq Point Loading

P_l	vertical soil pressure due to live road	
r	8.9	ft
P_l	32	PSF
Total live load	265	PSF

TABLE 3-2
Typical Impact Factors for Paved Roads

Cover Depth, ft	Impact Factor, I_f
1	1.35
2	1.30
3	1.25
4	1.20
6	1.10
8	1.00

Derived from Illinois DOT dynamic load formula (1996).

Calculate Soil Pressure

(3-1) $$P_E = wH$$

WHERE

P_E = vertical soil pressure due to earth load, psf
W = unit weight of soil, pcf
H = depth of cover, ft

w	125	PCF
H	6	ft
P_E	750	PSF

Total load on pipe

Live load plus soil pressure=	1,015	PSF

CALCULATE RING DEFLECTION

Spangler's Modified Iowa Formula can be written for use with solid wall PE pipe as:

(3-10)

$$\frac{\Delta X}{D_M} = \frac{1}{144}\left(\frac{K_{BED}\, L_{DL}\, P_E + K_{BED} P_L}{\frac{2E}{3}\left(\frac{1}{DR-1}\right)^3 + 0.061 F_S E'} \right)$$

WHERE

ΔX = Horizontal deflection, in

K_{BED} = Bedding factor, typically 0.1

L_{DL} = Deflection lag factor

P_E = Vertical soil pressure due to earth load, psf

P_L = Vertical soil pressure due to live load, psf

E = Apparent modulus of elasticity of pipe material, lb/in²

E' = Modulus of Soil reaction, psi

F_S = Soil Support Factor

RSC = Ring Stiffness Constant, lb/ft

DR = Dimension Ratio, OD/t

D_M = Mean diameter (D_I+2z or D_O-t), in

Z = Centroid of wall section, in

t = Minimum wall thickness, in

D_I = pipe inside diameter, in

D_O = pipe outside diameter, in

B_D	36 in		trench width
K_{BED}	0.1		
L_{DL}	1		
P_E	750	psf	
P_L	265	psf	
E	130000	psi	
E'	2000	psi	
F_S	1		
DR	17		
D_M	12.00	in	
z	11.96	in	
t	0.75	in	
DI	11.16	in	
DO	12.75	in	
ΔX/DM	0.005	0.5 %	OKAY <5.0 %

TABLE 3-7
Values of E' for Pipe Embedment (See Howard [88])

Soil Type-pipe Embedment Material (Unified Classification System)[1]	E' for Degree of Embedment Compaction, lb/in²			
	Dumped	Slight, <85% Proctor, <40% Relative Density	Moderate, 85%-95% Proctor, 40%-70% Relative Density	High, >95% Proctor, >70% Relative Density
Fine-grained Soils (LL > 50)[2] Soils with medium to high plasticity; CH, MH, CH-MH	No data available: consult a competent soils engineer, otherwise, use E' = 0.			
Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with less than 25% coarse grained particles.	50	200	400	1000
Fine-grained Soils (LL < 50) Soils with medium to no plasticity, CL, ML, ML-CL, with more than 25% coarse grained particles; Coarse-grained Soils with Fines, GM, GC, SM, SC[3] containing more than 12% fines.	100	400	1000	2000
Coarse-grained soils with Little or No Fines GW, GP, SW, SP[3] containing less than 12% fines	200	1000	2000	3000
Crushed Rock	1000	3000	3000	3000
Accuracy in Terms of Percentage Deflection[4]	±2%	±2%	±1%	±0.5%

[1] ASTM D-2487, USBR Designation E-3
[2] LL = Liquid Limit
[3] Or any borderline soil beginning with one of these symbols (i.e., GM-GC, GC-SC).
[4] For ±1% accuracy and predicted deflection of 3%, actual deflection would be between 2% and 4%.

Note: Values applicable only for fills less than 50 ft (15 m). Table does not include any safety factor. For use in predicting initial deflections only; appropriate Deflection Lag Factor must be applied for long-term deflections. If embedment falls on the borderline between two compaction categories, select lower E' value, or average the two values. Percentage Proctor based on laboratory maximum dry density from test standards using 12,500 ft-lb/cu ft (598,000 J/m³) (ASTM D-698, AASHTO T-99, USBR Designation E-11). 1 psi = 6.9 KPa.

TABLE 3-9
Values of E'_N, Native Soil Modulus of Soil Reaction, Howard [3]

Native In Situ Soils				
Granular		Cohesive		E'_N (psi)
Std. Pentration ASTM D1586 Blows/ft	Description	Unconfined Compressive Strength (TSF)	Description	
> 0 - 1	very, very loose	> 0 - 0.125	very, very soft	50
1 - 2	very loose	0.125 - 0.25	very soft	200
2 - 4	very loose	0.25 - 0.50	soft	700
4 - 8	loose	0.50 - 1.00	medium	1,500
8 - 15	slightly compact	1.00 - 2.00	stiff	3,000
15 - 30	compact	2.00 - 4.00	very stiff	5,000
30 - 50	dense	4.00 - 6.00	hard	10,000
> 50	very dense	> 6.00	very hard	20,000
Rock	–	–	–	50,000

TABLE 3-10
Soil Support Factor, F_S

E'_N/E'	B_d/D_O 1.5	B_d/D_O 2.0	B_d/D_O 2.5	B_d/D_O 3.0	B_d/D_O 4.0	B_d/D_O 5.0
0.1	0.15	0.30	0.60	0.80	0.90	1.00
0.2	0.30	0.45	0.70	0.85	0.92	1.00
0.4	0.50	0.60	0.80	0.90	0.95	1.00
0.6	0.70	0.80	0.90	0.95	1.00	1.00
0.8	0.85	0.90	0.95	0.98	1.00	1.00
1.0	1.00	1.00	1.00	1.00	1.00	1.00
1.5	1.30	1.15	1.10	1.05	1.00	1.00
2.0	1.50	1.30	1.15	1.10	1.05	1.00
3.0	1.75	1.45	1.30	1.20	1.08	1.00
5.0	2.00	1.60	1.40	1.25	1.10	1.00

E'N/E'= 1.7
B_D/D_O 2.8

CALCULATE COMPRESSIVE RING THRUST

Crushing occurs when the compressive stress in the wall exceeds the compressive yield stress of the pipe material. Equations 3-13 and 3-14 give the compressive stress resulting from earth and live load pressure for conventional extruded DR pipe and for ASTM F894 profile wall PE Pipe:

(3-13) $$S = \frac{(P_E + P_L)\,DR}{288}$$

(3-14) $$S = \frac{(P_E + P_L)\,D_O}{288A}$$

WHERE

P_E = vertical soil pressure due to earth load, psf

P_L = vertical soil pressure due to live-load, psf

S = pipe wall compressive stress, lb/in²

DR = Dimension Ratio, D_O/t

D_O = pipe outside diameter (for profile pipe $D_O = D_I + 2H_P$), in

D_I = pipe inside diameter, in

H_P = profile wall height, in

A = profile wall average cross-sectional area, in²/in
(Obtain the profile wall area from the manufacturer of the profile pipe.)

S=	11.7 PSI
OKAY < 1150 PSI Allowable	

TABLE C.1
Allowable Compressive Stress for 73°F (23°C)

	Pe Pipe Material Designation Code (1)					
	PE 2406		PE3408		PE 4710	
	PE 2708		PE 3608			
			PE 3708			
			PE 3710			
			PE 4708			
	psi	MPa	psi	MPa	psi	MPa
Allowable Compressive Stress	800	5.52	1000	6.90	1150	7.93

(1) See Chapter 5 for an explanation of the PE Pipe Material Designation Code.

CALCULATE: CRITICAL CONSTRAINED BUCKLING PRESSURE

The Moore-Selig Equation for critical buckling pressure follows: (Critical buckling pressure is the pressure at which buckling will occur. A safety factor should be provided.)

(3-29) $$P_{CR} = \frac{2.4\,\varphi\,R_H}{D_M}(EI)^{\frac{1}{3}}(E_S^*)^{\frac{2}{3}}$$

WHERE

P_{CR} = **Critical constrained buckling pressure, psi**

φ = **Calibration Factor, 0.55 for granular soils**

R_H = **Geometry Factor**

E = **Apparent modulus of elasticity of pipe material, psi**

I = **Pipe wall moment of Inertia, in⁴/in (t³/12, if solid wall construction)**

E_S^* = **E_S /(1-μ)**

E_S = **Secant modulus of the soil, psi**

μs = **Poisson's Ratio of Soil (Consult a textbook on soil for values. Bowles (1982) gives typical values for sand and rock ranging from 0.1 to 0.4.)**

The geometry factor is dependent on the depth of burial and the relative stiffness between the embedment soil and the insitu soil. Moore has shown that for deep burials in uniform fills, RH equals 1.0.

PCR=2.4*Ø*RH*(EI)^.3333(E*s)^.66667/DM

PCR		critical constrained buckling pressure (psi)
Ø	0.55	calibration factor, 0.55 for granular soils
RH	1	geometry factor, 1 for granular soils
E	20440	apparnt modulus of elasticity of pipe material,psi
I	0.0034	pipe moment of inertia, (in4/in) (T^3/12)
Es	1000	secant modulus
Es*	1429	=Es/(1-μ)
DM	12.00	mean pipe diameter

Pcr=	57.5	psi	
PE=	7.0		earth pressure plus live load (psi)
Safety Factor= Pcr/PE	8.2		rule of thumb minimum SF 2.5
			okay >2.5

CARRIER PIPE PE4710 HDPE DR21

Check Pressure rating of SDR 17

Maximum pressure calculated (see TDH calculations) =	23.4 PSI
	okay < 125PSI

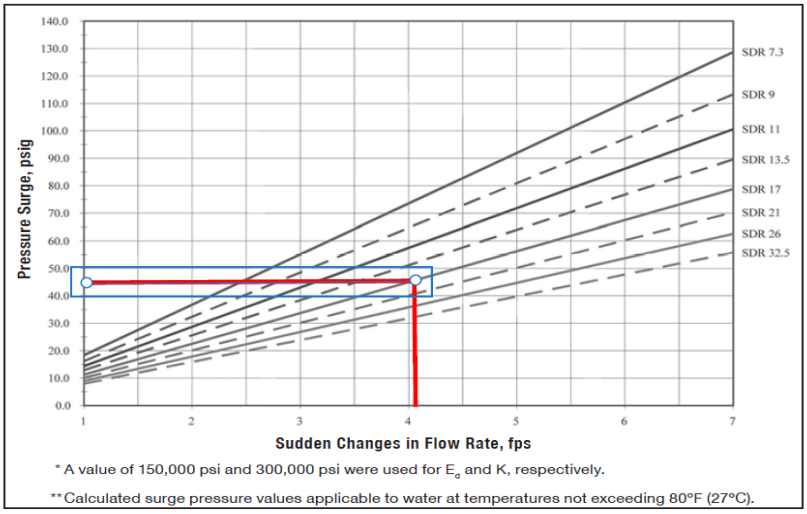
TABLE A.1

Standard Pressure Ratings (PR's) and Standard Pressure Classes (PC's), for Water for 73°F (23°C), for PE Pipes Made to Standard Dimension Ratios

Dimension Ratio (see Note 1)		Standard PR and Standard PC as a Function of the Pipe Material's Recommended Hydrostatic Design Stress (HDS) for Water, at 73°F (23°C)					
DR (Ratio = D_O/t) (Applies to pipes made to controlled outside diameters- D_O)	IDR (Ratio = D_I/t) (Applies to pipes made to controlled inside diameters - D_I)	HDS = 630psi (4.34MPa)		HDS = 800psi (5.52MPa)		HDS = 1000psi (6.90MPa)	
		psig	kPa	Psig	kPa	psig	kPa
32.5	30.5	40	276	50	345	63	434
26.0	24.0	50	345	63	434	80	552
21.0	19.0	63	434	80	552	100	690
17.0	15.0	80	552	100	690	125	862
13.5	11.5	100	690	125	862	160	1103
11.0	9.0	125	862	160	1103	200	1379
9.0	7.0	160	1103	200	1379	250	1724
7.3	5.3	200	1379	250	1724	320	2206

Note 1: While the term, SDR (Standard Dimension Ratio), is an ANSI term, the pipe industry typically uses the term DR as shown in this table.

Check Surge Pressure



* A value of 150,000 psi and 300,000 psi were used for E_d and K, respectively.

** Calculated surge pressure values applicable to water at temperatures not exceeding 80°F (27°C).

Figure 1-1 Sudden Velocity Change vs. Pressure Surge for All PE Pipes

TABLE 1-3A

Allowances for Momentary Surge Pressures Above PR or PC for Pipes Made From PE4710 and PE3710 Materials[1].

Pipe Standard Diameter Ratio (SDR)	Standard Static Pressure Rating (PR) or, Standard Pressure Class (PC) for water @ 73°F, psig	Standard Allowance for Momentary Surge Pressure Above the Pipe's PR or PC			
		Allowance for Recurring Surge		Allowance for Occasional Surge	
		Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps	Allowable Surge Pressure, psig	Resultant Allowable Sudden Change in Velocity, fps
32.5	63	32	4.0	63	8.0
26	80	40	4.5	80	9.0
21	100	50	5.0	100	10.0
17	125	63	5.6	125	11.2
13.5	160	80	6.2	160	12.4
11	200	100	7.0	200	14.0
9	250	125	7.7	250	15.4
7.3	320	160	8.7	320	17.4

1. AWWA C906-07 limits the maximum Pressure Class of PE pipe to the values shown in Table B. At the time of this printing C906 is being revised to allow PC values in Table A to be used for PE3710 and PE4710 materials. Check the latest version of C906

Total Pressure = TDH = Surge Pressure

Surge Pressure =	45 psi	figure 1-1	400 GPM velocity 4.1 fps(see TDH calcs)
Max TDH =	55.8 ft		
	24.2 psi		
Total Pressure =	69.2 psi		
Allowable Surge Pressure	125 psi		
Okay; total surge pressure less than allowable surge pressure			

Sevee & Maher Engineers, Inc.
Cumberland, ME 04021
www.smemaine.com
(207) 829-5016

CLIENT	Casella
PROJECT	PTL PFAS Treatment
DESIGNED BY	KPN
DATE	5/4/2028
CHECKED BY	NMT
DATE	9/24/2026
PROJECT NO.	260566

Purpose: Size Pumps For Leachate Unloaading Pump Station

Assumptions:
1. Minor scaling in pipes
2. Estimate flow from Phase 6 Secure 2 and 8C perimeter drain

Notes:
1. Fricition Loss: Hazen-Williams
2. Nominal ID from JMM HIGH DENSITY POLYETHLENE (HDPE) PE4710 PRODUCT SPECIFICATION
3. Minor Friction Loss: Crane TP-410 typical K-values
4. Elevations: NAVD88

ELEVATION HEAD LOSS

$\Delta h = z_2 - z_1$

z1	Low Pumping Level Elevation	126 ft	
z2	Raw Leachate Storage Tank	152 ft	152 from record drawing floor elevation and adding 20 ft
Δ h	Elevation Head Loss	26 ft	TANK FULL
		16	TANK HALF FULL

FRICTIONAL HEAD LOSS

Hazen Willians Equation

$hf = 10.7 * L * Q^{1.852} / (C^{1.852} * D^{4.87})$

hf	frictional head loss (ft)
L	length of pipe(ft)
C	Hazen- Williams Roughness Coefficient (unit less)
D	inside pipe diameter (ft)

DESCRIPTION	Total Length (ft)	Pipe Flow (gpm)	HW Frict. Factor C	Pipe SDR	Pipe O.D. Nominal (inches)	Pipe ID Average (inches)	Friction Head Loss (feet)
Station to Vault 2	125	100	120	21	8	7.75	0.0
Vault 2 to Raw Leachate Tank	120	200	120	21	8	7.75	0.2
Pump to Force Main	15	100	130			4.03	0.1
(Q=100gpm)						TOTAL	0.31
Pump Station to Tie-in Vault	125	200	120	21	8	7.75	0.2
Vault 2 to Raw Leachate Tank	120	300	120	21	8	7.75	0.3
	15	200	130		4	4.03	0.4
(Q=200gpm)						TOTAL	0.9
Station to Vault 2	125	300	120	17	8	7.75	0.3
Vault 2 to Raw Leachate Tank	120	400	120	17	8	7.75	0.5
Pump to Force Main	15	300	130		4	4.03	0.8
(Q=300gpm)						TOTAL	1.7
Station to Vault 2	125	400	120	17	8	7.75	0.6
Raw Leachate Tank	120	500	120	17	8	7.75	0.8
Pump to Force Main	15	400	130		4	4.03	1.4
(Q=400gpm)						TOTAL	2.8
Pump Station to Vault 2	125	500	120	17	8	7.75	0.9
Vault 2 to Raw Leachate Tank	120	600	120	17	8	7.75	1.2
Pump to Force Main	15	500	130		4	4.03	2.2
(Q=500gpm)						TOTAL	4.2
Pump Station to Vault 2	125	600	120	17	8	7.75	1.2
Vault 2 to Raw Leachate Tank	120	700	120	17	8	7.75	1.5
Pump to Force Main	15	600	130		4	4.03	3.0
(Q=600gpm)						TOTAL	5.8

MINOR HEAD LOSSES

$hm = \Sigma K v^2 / 2g$

hm	minor headloss (ft)
K	loss coefficient (unit less)
g	gravity (32 ft/sec^2)
v	velocity (ft/sec)

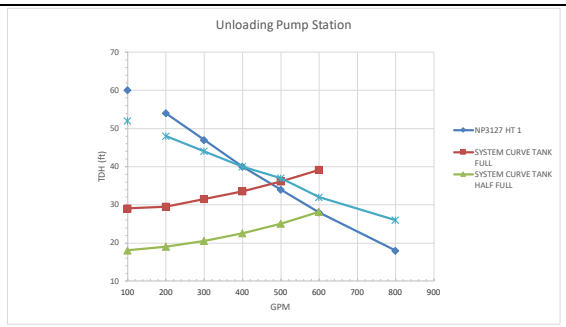
	K values																
	Ck Valve	Quantity	Elbow 90	Quantity	Elbow 45	Quantity	Tee (in-line)	Quantity	Expansion (4X8)	Quantity	Wye	Quantity	Ball Valve	Quantity	Velocity	KLtotal	Fitting Head Loss (ft)
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	0.7	8.04	0.1
Vault 21 to Raw Leachate Tank	2.5	0													1.4	0	0.0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	0.7	6.73	0.0
(Q=100gpm)																TOTAL	0.1
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	1.4	8.04	0.2
Vault 21 to Raw Leachate Tank	2.5	0	0.9	0	0.4	0	1.8		0.56		1		0.07	0	2.0	0	0.0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	1.4	6.73	0.2
(Q=200gpm)																TOTAL	0.4
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	2.0	8.04	0.5
Vault 21 to Raw Leachate Tank	2.5	0	0.9	0	0.4	0	1.8	0	0.56	0	1	0	0.07	0	2.7	0	0.0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	2.0	6.73	0.4
(Q=300gpm)									0.56							TOTAL	1.0
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	2.7	8.04	0.9
Vault 21 to Raw Leachate Tank	2.5	0	0.9	0	0.4	0	1.8	0	0.56	0	1	0	0.07	0	3.4	0	0.0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	2.7	6.73	0.8
(Q=400gpm)																TOTAL	1.7
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	3.4	8.04	1.4
Vault 21 to Raw Leachate Tank	2.5	0	0.9	0	0.4	0	1.8	0	0.56	0	1	0	0.07	0	4.1	0	0.0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	3.4	6.73	1.2
(Q=500gpm)													3.4			TOTAL	2.7
Pump Station to Vault 21	2.5	2	0.9	1	0.4	0	1.8	0	0.56	0	1	2	0.07	2	4.1	8.04	2.1
Vault 21 to Raw Leachate Tank	2.5	0	0.9	0	0.4	0	1.8	0	0.56	0	1	0	0.07	0	4.8	0	0
Pump to Force Main	2.5	1	0.9	2	0.4		1.8	1	0.56	1	1	0	0.07	1	4.1	6.73	1.7
(Q=600gpm)																TOTAL	3.8

TOTAL DYNAMIC HEAD (TDH)

TDH= H_{elev}+H_{fric}+H_{minor}
(SF=1.1)

SYSTEM CURVE TANK FULL	TDH
100 gpm	29.1 ft
200 gpm	29.5 ft
300 gpm	31.5 ft
400 gpm	33.6 ft
500 gpm	36.1 ft
600 gpm	39.2 ft

SYSTEM CURVE TANK HALF FULL	
100 gpm	18.1 ft
200 gpm	19.0 ft
300 gpm	20.5 ft
400 gpm	22.6 ft
500 gpm	25.1 ft
600 gpm	28.2 ft



NP3127 HT 1 Flow (gpm)	Head (ft)	NP3127 MT3
100	60	52
200	54	48
300	47	44
400	40	40
500	34	37
600	28	32
800	18	26

SHAFT HORSEPOWER

SHP=Q*H/3960*n
Q= flow rate (gpm)
H=Total dynamic head
n=pump efficiency 0.6

	SHP
300 GPM	4.0
500 GPM	7.6

HALF FULL

300 GPM	2.6
500 GPM	5.9