JUNIPER RIDGE LANDFILL EXPANSION APPLICATION
VOLUME IV
OPERATIONS MANUAL

Submitted by:

STATE OF MAINE BUREAU OF GENERAL SERVICES,
as Owner
and
NEWSME LANDFILL OPERATIONS, LLC,
as Operator

July 2015

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

GUY H.
COTE, JR.
No. 5144

7/2/15

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JUNIPER RIDGE LANDFILL EXPANSION
APPLICATION
VOLUME IV
OPERATIONS MANUAL

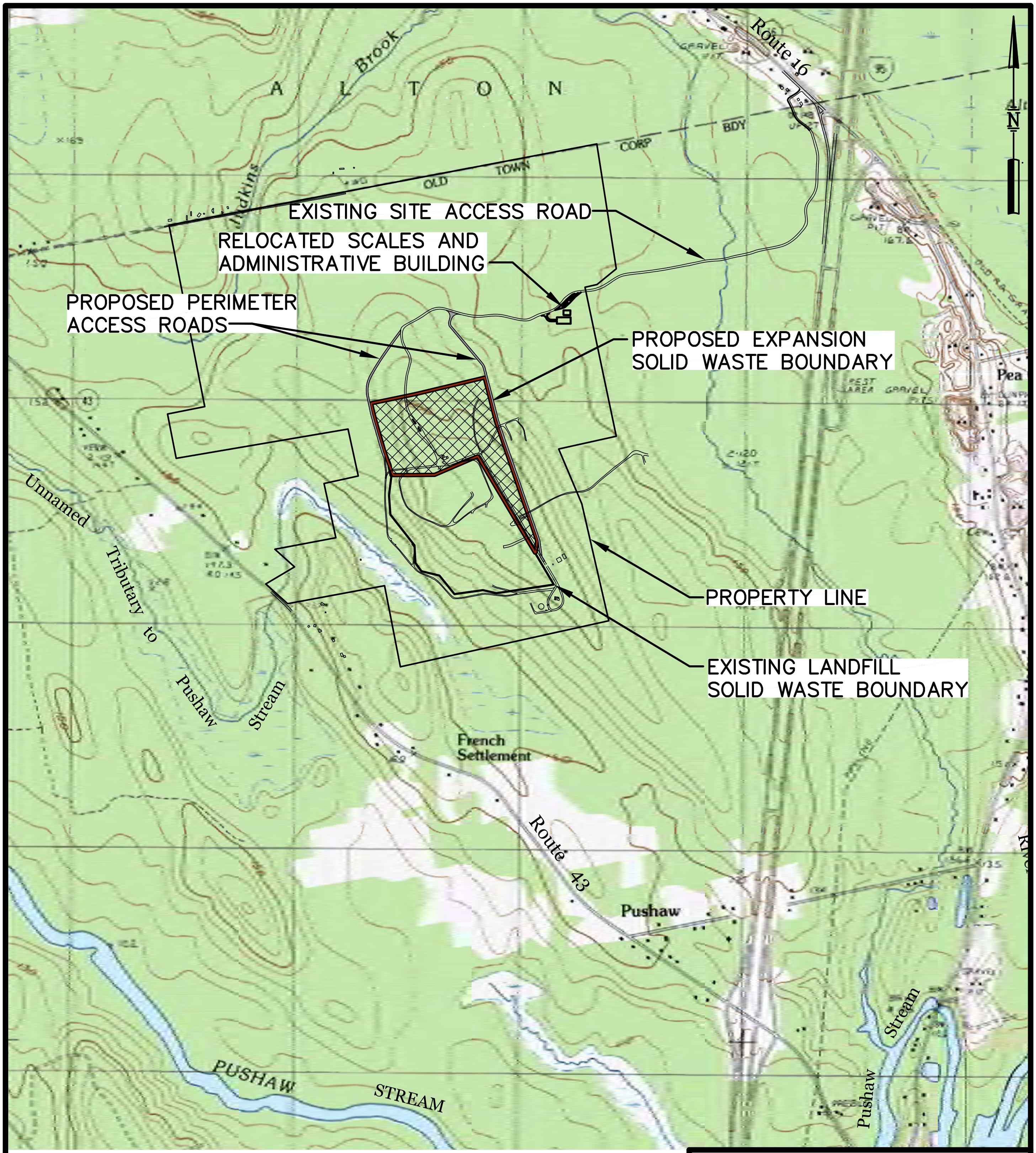
1.0 INTRODUCTION

This document is an amended version of the current Operations Manual (NEWSME 2015) for the Juniper Ridge Landfill (JRL). The amendments relate to the JRL Expansion Application (Expansion). This document is being submitted as part of the Expansion Application pursuant to 06-092-CMR 401.2.L of the Maine Solid Waste Management Rules (Rules). The current JRL and the Expansion are located off Route 16 in Old Town, Maine (Figure 1-1) and are owned by the Maine Bureau of General Services (BGS) and operated by NEWSME Landfill Operations, LLC (NEWSME), a subsidiary of New England Waste Services of ME.

Landfill operations at the JRL are regulated pursuant to the Rules, Chapters 400, 401, and 405 administered by the Maine Department of Environmental Protection (MEDEP). The JRL is licensed by the MEDEP. A listing of JRL MEDEP operating permits may be found in Appendix A. Copies of JRL permits are kept on file in NEWSME’s Environmental Compliance Manager’s (ECM) Office, and are available for viewing during normal business hours.

06-092-CMR 401.4.A of the Rules requires NEWSME to update this Manual on an annual basis to reflect changes that occur during the landfill licensing and construction process and to reflect the current operational practices at the JRL facility. The last update was completed in April of 2015, and addresses the current operations of the 68 acre JRL.

This Manual addresses the operations of the Expansion which will include six new landfill cells and will expand the landfill solid waste boundary by 54 acres. The majority of the current operating policies and procedures will be followed during the development of the Expansion cells. As such, much of this Manual is consistent with the current Manual. However, changes have been made to those portions of the Manual which will change as a result of the Expansion. For example, the cell development plans contained in this document are for the



NOTE:

BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLE
OLD TOWN, MAINE–1988

1000 0 2000 4000 FEET

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FIGURE 1–1
SITE LOCATION MAP
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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Expansion cells, including detailed development plans for Cell 11, the first of the Expansion's cells. Unless otherwise specified, references in the Manual to JRL or the landfill should be deemed to include both the existing landfill and the Expansion.

1.1 Site History

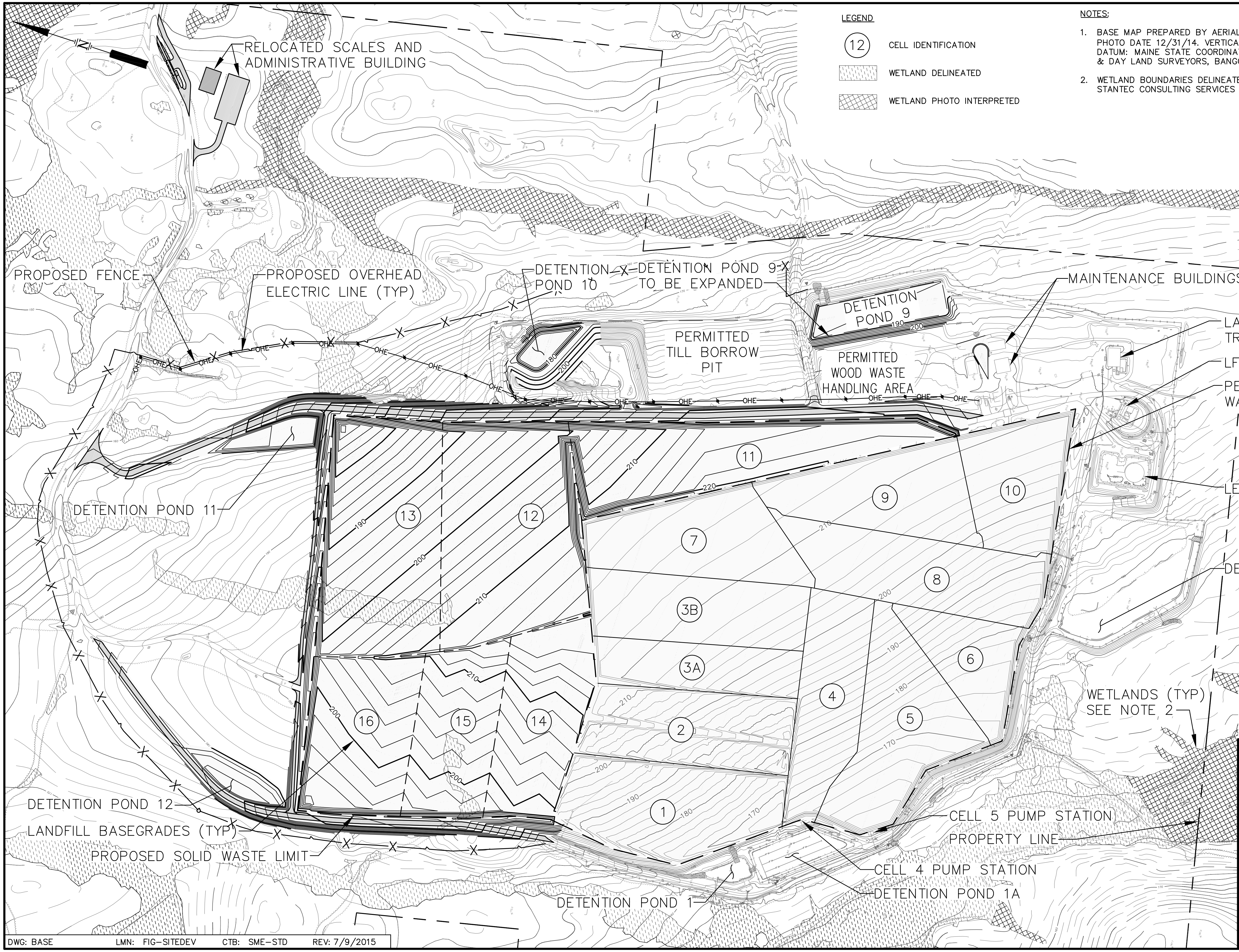
The JRL was originally owned and operated by Fort James Operating Company (Fort James) (formerly known as James River Paper Company) and subsequently by Georgia-Pacific Corporation (GP).

The landfill has been designed and constructed as a secure waste disposal facility in that the groundwater beneath and adjacent to the site is protected by a composite liner and a leachate collection system for the existing JRL cells and a double liner system with a leak detection system for the Expansion cells. Leachate generated at the site is collected, stored, and transported to the Expera, Specialty Solutions, Old Town LLC wastewater treatment plant located in Old Town for treatment. Additionally, JRL maintains an Industrial Wastewater Discharge Permit with the City of Brewer's Water Pollution Control Facility as a backup disposal site, as needed.

The JRL was originally operated by Fort James/GP between December 1996 and February 2004. On February 5, 2004 the operating licenses of the JRL were transferred to the Maine State Planning Office (SPO) as part of a purchase and sales agreement between the State of Maine and Fort James/GP. On February 5, 2004, the State of Maine through the State Planning Office also finalized an operating services agreement with NEWSME for the operation of the JRL.

The facility was originally permitted for the disposal of pulp and papermaking residuals from the Fort James/GP's Old Town mill (primarily wastewater treatment plant sludge), bottom ash from Lincoln Pulp & Paper, and burn pile ash from the City of Old Town transfer station. In addition to the waste streams historically disposed of at the landfill, the landfill is now permitted to receive non-hazardous solid waste streams generated in Maine (ref. Solid Waste Amendment Order S-020700-WD-N-A).

JRL's permitted solid waste footprint currently consists of approximately 68 acres. The proposed landfill expansion to the north of the existing landfill will expand the solid waste footprint to a total of 122 acres. The existing landfill infrastructure also includes a 2-mile primary access road, an administration building, a maintenance building, a storage shed, a scalehouse, a former leachate storage pond now used for stormwater detention, a leachate storage tank, three leachate pump stations, two leachate haul truck loading racks, multiple detention/sedimentation ponds, a construction material laydown area, a landfill gas flare, Thiopaq and SulfaTreat gas scrubbing systems, a storage/processing pad for clean wood debris and railroad ties, and a perimeter access road. A Gas to Energy Plant is also proposed for the site and is anticipated to online by 2017. With the Expansion, the majority of the site infrastructure will remain. However, at the time Cell 12 of the Expansion is constructed, the scale house and administration building will be relocated from their present location to the location shown on Figure 1-1. The overall site development, including the Expansion cells, are shown on Figure 1-2.



LEGEND

(12)	CELL IDENTIFICATION
▨	WETLAND DELINEATED
▩	WETLAND PHOTO INTERPRETED

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.
2. WETLAND BOUNDARIES DELINEATED BY WOODLOT ALTERNATIVES, INC. IN 2004 AND STANTEC CONSULTING SERVICES 2008, 2014 AND 2015.

FIGURE 1–2
SITE DEVELOPMENT PLAN
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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2.0 CERTIFIED COPIES AND ANNUAL REVIEW

NEWSME maintains a total of seven certified copies of this Operations Manual. A "Certified Copy" is defined in 06-092-CMR 400.1.X of the Rules as "a copy of the Department approved Operations Manual implemented by the Owner/Operator of a landfill facility that is assigned to be updated and tracked by a person specified by the Owner/Operator." That person for JRL is the ECM. Certified copies of the Operations Manual are distributed to the MEDEP (3 copies), the City of Old Town (1 copy), NEWSME's Site Supervisor (1 copy), the BGS (1 copy), and 1 copy is maintained by NEWSME's ECM. In addition, digital copies are also provided with each physical copy, and a digital control and original copy are maintained by the ECM.

06-092-CMR 401.4.A(2) of the Rules requires that the certified copies of the Manual reflect operational changes made at the facility, and that these changes be distributed to those individuals whose job assignments require them to be aware of the changes. At a minimum, the Manual is reviewed by NEWSME on an annual basis and updated as necessary to reflect changes to the facility. Annual updates to the certified copies are provided to the parties listed above via the Annual Report to be incorporated into each Manual. These changes/additions should be placed in each Manual by responsible individuals.

NEWSME also performs an annual self-audit of landfill operations as required by 06-092-CMR 401.4.D(1)(b) of the Rules. Included in Appendix B is a compliance self-audit checklist that is used for the audit. A copy of the completed audit is included with the Annual Report submitted to the MEDEP.

3.0 OPERATOR TRAINING AND CERTIFICATION

As required by 06-092-CMR 401.4.B of the Rules, NEWSME provides a minimum of 8 hours training annually to at least two key personnel in the landfill operations, and has key personnel maintain a valid certification as a Manager of Landfill Operations from the Solid Waste Association of North America (SWANA) or equivalent certification. Trained individuals include the ECM, Site Supervisor, and the Landfill General Manager. The topics covered for the site-specific training are presented in the outline contained in Appendix C. The training addresses issues relating to landfill operations and the regulatory requirements for the landfill facility. Documentation of training for the key personnel is kept on file at the facility for a minimum of five years. The documentation includes the name of the individual(s), his/her position, the type of training and the date training took place.

4.0 JRL ORGANIZATIONAL STRUCTURE

4.1 Organization Responsibilities

Proper operation and maintenance of the landfill facilities are the responsibility of NEWSME and its employees. Other entities indirectly involved with the landfill operation include the BGS, the MEDEP, and the City of Old Town. Specific employees of NEWSME involved with landfill operation and maintenance, along with the responsibilities of each employee and other relevant entities, are described in the following paragraphs:

- BGS. Maine Bureau of General Services (BGS) is the owner and licensee of the landfill.[1]

- NEWSME. NEWSME is the operator of the landfill and is responsible for the operation and maintenance of the landfill. NEWSME is the full-time employer of the Landfill Supervisor, equipment operators, laborers, and any other personnel deemed necessary to operate the landfill. The General Manager, Environmental Compliance Manager, and Environmental Technician are also employed by NEWSME. NEWSME is a wholly-owned subsidiary of New England Waste Services, of ME, Inc.

- MEDEP. MEDEP is responsible for licensing, assistance, inspection, interpretation, and enforcement of solid waste management laws and regulations. MEDEP maintains a knowledgeable staff that provides advice on the design and operation of solid waste facilities throughout the State of Maine. In addition to assistance, MEDEP inspects the facility on a regular basis to ensure that operations are in conformance with current laws and regulations.

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[1] Pursuant to P.L. Chapter 655, Sec GC-69, on July 1, 2012, the Bureau of General Services in the Department of Administrative and Financial Services became the owner and licensee of JRL.

- City of Old Town Code Enforcement Officer. The City of Old Town Code Enforcement Officer (CEO) is responsible for enforcing the City of Old Town's ordinances, and conditions in Planning Board approvals.

4.2 Personnel and Responsibilities

Specific employees of NEWSME responsible for operation of the landfill include the General Manager, Environmental Compliance Manager, Environmental Technician, Site Safety Officer, Landfill Supervisor, Lead Scale Master, Equipment Operators, Mechanics, and Laborers. Each position has the following responsibilities for operations of the facility:

General Manager. The General Manager of NEWSME has overall responsibility for supervision and management of site operations, staffing, construction, budgets, and compliance. With respect to the landfill operation, the General Manager's responsibilities include the following:

- Maintain liaison with the MEDEP, the BGS and the City of Old Town to ensure that the landfill is being operated in accordance with state & local requirements.
- Address staffing and equipment needs of the facility and establish budgets for its operations.
- Coordinate construction activities.

Environmental Compliance Manager (ECM). The ECM is responsible for the site's compliance with state, federal and local permits and licenses, applicable federal regulations, site inspections, approving waste streams, state and federal reporting, and environmental training. The ECM also acts as a MEDEP contact for waste acceptance, inspections, permitting, and reporting.

Environmental Technician (ET): The ET is responsible for the inspection & maintenance of the various environmental systems (leachate, gas collection, storm water controls, etc.). Additionally, the ET performs the various facility inspections, sampling, and data collection for reporting purposes.

Site Safety Officer. The Site Safety Officer is responsible for coordinating all safety related issues at the JRL site, including safety training, addressing safety issues, and updating the Site Safety Manual.

Landfill Supervisor. The Landfill Supervisor is responsible for coordinating landfill operations. It is the supervisor's responsibility to ensure that the facility is operating properly and is in compliance with current laws and regulations. Supervisor responsibilities include site maintenance and waste placement, street sweeping, mowing, erosion control, odor control and gas management, and stormwater and leachate collection system maintenance, and site repairs.

Lead Scale Master. The Lead Scale Master is responsible for supervising state-certified scales, scale personnel, and 24-hour site security.

Equipment Operators. The Equipment Operator's duties include operating necessary equipment to transport, place, and compact wastes placed in the landfill, apply daily cover, complete road construction, install gas collection infrastructure, and perform general site construction. Heavy equipment operation, general knowledge of earthwork and road construction, and the ability to perform routine maintenance and make minor repairs to equipment are desirable skills for an equipment operator.

Mechanics. The Mechanic's duties include repair of landfill operating equipment and mechanical infrastructure, and the ability to operate necessary equipment to transport, place, and compact wastes placed in the landfill, apply daily cover, complete road construction, install gas collection infrastructure, and perform general site construction, should it be necessary.

Laborers. The Laborer's duties can vary depending on the need, but include installation, maintenance, and troubleshooting of gas collection infrastructure, landfill equipment operation, various site construction activities, landfill monitoring under the supervision of a site environmental technician, and general landfill site upkeep and cleanliness.

In addition, NEWSME may elect to conduct certain operational functions by contract with local contractors. Such functions may include, but are not necessarily limited to, construction of landfill cells, roads, stormwater structures, and placement of temporary and final landfill cover systems. A responsible NEWSME employee (i.e., supervisor or operator) will be on-site during all operating hours.

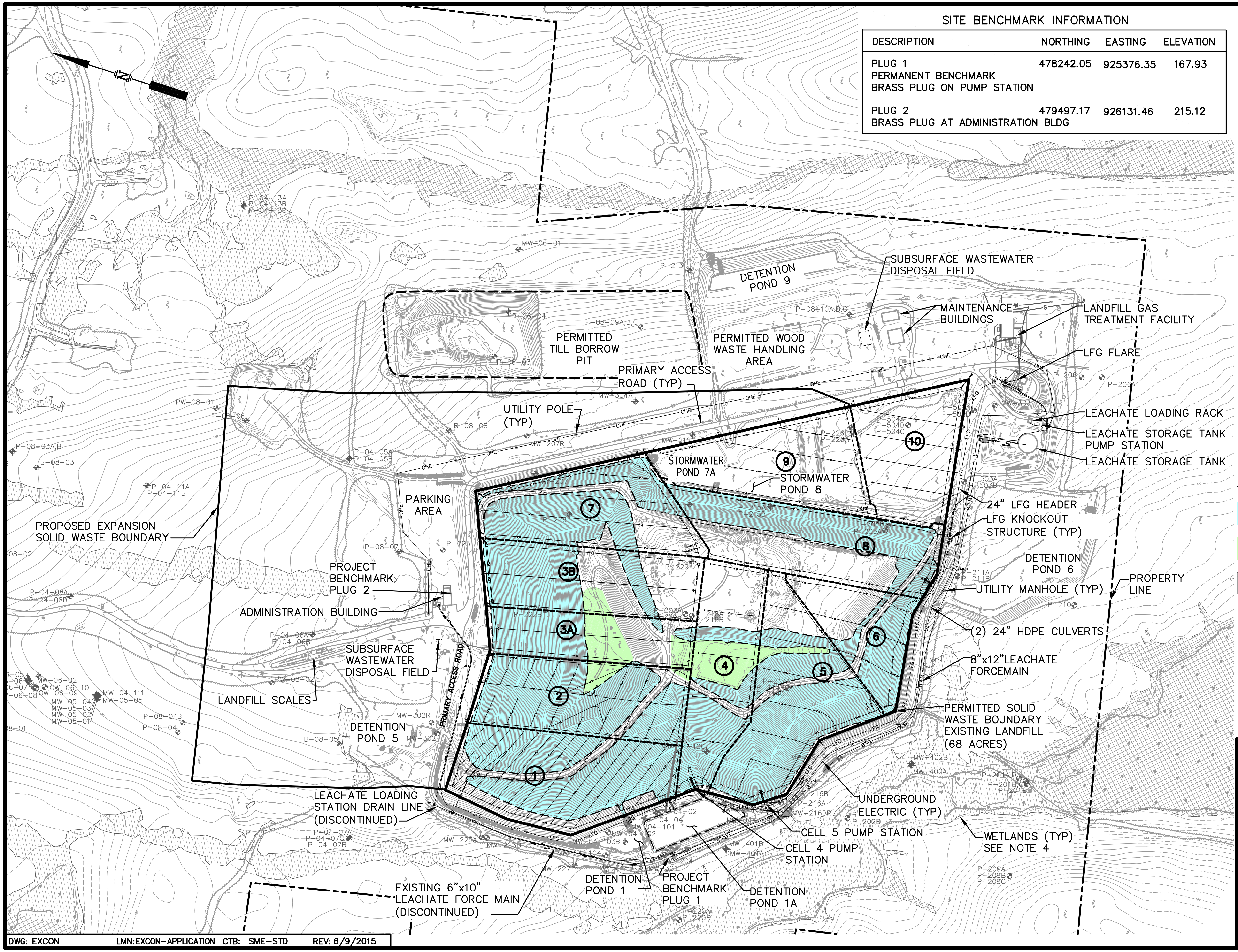
5.0 JRL DEVELOPMENT OVERVIEW

This section provides a general overview of the entire JRL development with specific cell development plans related to the Expansion found in Appendix D of this Manual.

5.1 Cell Construction

JRL's permitted solid waste footprint currently consists of approximately 68 acres. The proposed Expansion to the north of the existing landfill will expand the solid waste footprint to a total of approximately 122 acres. The current MEDEP permitted solid waste footprint at JRL consists of 68 acres with approximately 10 base cells. Additional development occurs on top of the base cells up to a final elevation of 390 feet. The Expansion consists of six cells (i.e., Cells 11 through 16) that also will be developed up to final elevation of 390 feet. Figure 5-1 depicts the currently permitted portions of the landfill and the Expansion solid waste boundary. Portions of landfill cells are generally constructed by excavating to depths of approximately 5 to 15 feet, while other areas of the cells may receive backfill in order to achieve the proper base grading of the cell. As required by Condition 15 of the Department Order #S-020700-WD-N-A dated April 9, 2014 at least 6 months prior to constructing a new landfill cell, a detailed design package, consisting of a Design Report and technical plans and specifications is prepared and submitted to MEDEP for approval as part of a condition compliance Permit Application. Once the landfill cell construction is complete, a Construction Documentation Report is prepared and also submitted to MEDEP. These practices will continue for the Expansion cells. Typical cell construction details may be found in the facility's MEDEP Permit Application Design Reports, and in the Construction Documentation Reports prepared for each individual cell. Complete copies of the Landfill's Permit Applications, including the Design Report and the Construction Documentation Reports for the individual cells are kept at the facility's Administration building.

Existing permitted landfill Cells 1 through 10 are constructed with underdrain systems to relieve upward groundwater pressure as appropriate. The cells constructed to date have a composite liner system consisting of an 80-mil HDPE flexible membrane liner overlying a geocomposite clay liner and 2 feet of low permeability material to achieve a combined hydraulic conductivity of 2.9×10^{-9} cm/sec. The cells also contain a leachate collection system consisting of a 12-inch



SITE BENCHMARK INFORMATION

DESCRIPTION	NORTHING	EASTING	ELEVATION
PLUG 1 PERMANENT BENCHMARK BRASS PLUG ON PUMP STATION	478242.05	925376.35	167.93
PLUG 2 BRASS PLUG AT ADMINISTRATION BLDG	479497.17	926131.46	215.12

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.
2. LOCATIONS OF EXISTING UNDERGROUND UTILITIES INCLUDING ELECTRICAL AND PIPING BASED ON FIELD SURVEY DURING CONSTRUCTION OF EXISTING CELLS AND RELATED INFRASTRUCTURE. CONTRACTOR SHOULD FIELD VERIFY THE EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
3. EXISTING TOPOGRAPHY SHOWN AT 2-FOOT INTERVALS. EXISTING TOPOGRAPHY SHOWN ON THE DRAWINGS REPRESENT GRADES AT THE TIME OF THE SURVEY. CONTRACTOR SHOULD FIELD VERIFY THE EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
4. WETLAND BOUNDARIES DELINEATED BY WOODLOT ALTERNATIVES, INC. IN 2004 AND STANTEC CONSULTING SERVICES 2008, 2014 AND 2015.
5. BORINGS & TEST PIT LOCATIONS ARE APPROXIMATE AND BASED ON FIELD SURVEY BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE.
6. ONLY LEACHATE COLLECTION SYSTEM COMPONENTS WITHIN THE EXISTING LANDFILL LIMITS ARE SHOWN ON THIS DRAWING.

LEGEND

🟦	INTERMEDIATE GEOMEMBRANE COVER
🟩	INTERMEDIATE SOIL COVER
▨	WETLAND
⑩	CELL IDENTIFICATION

200 0 400 FEET

FIGURE 5–1
EXISTING CONDITIONS PLAN
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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\\Nserver\cfs\Casella\OldTownLandfill\Expansion\9.35MCY-Expansion\Acad\Figures\EXCON.dwg, 6/9/2015 12:55:26 PM, paf layer of granular material with an average hydraulic conductivity of $1x10^{-2}$ cm/sec, a geocomposite drainage net, and a piping network consisting of 6- and 8-inch diameter collection laterals, spaced at approximately 100 to 200 feet on center, that connect to 8-inch and 12-inch diameter collection header pipes.

Landfill Expansion Cells 11 through 16 will also be constructed as secure solid waste landfill cells but with two liners, a primary and a secondary, a leak detection system, leachate and gas collection and transport systems, and intermediate and final cover systems. Under the entire base of the Expansion an imported soil layer, consisting of one foot of compacted clay, will be installed to provide a uniform, low hydraulic conductive soil layer under the secondary liner. A granular underdrain collection system will be installed under 12.7 acres of the Expansion where the landfill base is located below the site's phreatic surface (water table).

Leachate generated within the JRL cells is handled by leachate sumps which are designed and constructed to handle the leachate flow from one or a series of cells. Pump stations are designed and constructed at each sump to accommodate the predicted volume of leachate from the collection area. Each pump station transfers the leachate to a 921,000-gallon aboveground storage tank for temporary storage prior to trucking the leachate off-site for treatment.

A more detailed description of the design and construction of the facility's leachate collection & storage systems may be found in the Construction Documentation Reports for the individual cells, which may be found on file with the Environmental Compliance Manager.

5.2 Landfill Cell Intermediate Cover

As each base landfill cell reaches its interim operational grade, operations are moved into a new cell, then intermediate closure instituted. Intermediate closure generally consists of installing vertical landfill gas (LFG) collection wells, shaping all surface areas to appropriate grades, then installing the intermediate cover systems. Intermediate cover systems usually consist of a soft waste (ash or wood fines) or sand layer, then 18 inches of till or a 40-mil geomembrane cover. If till is utilized, the final surface is seeded and mulched to establish a growth for sedimentation and erosion control purposes. Stormwater controls are designed and constructed to handle clean stormwater runoff from the intermediate cover. The base cells' second elevation filling, and the Expansion cells will follow this intermediate cover practice.

5.3 Final Cover System

The proposed final cover system for the landfill will use similar engineered components (i.e., textured geomembrane), and earthen materials (i.e., granular drainage sand, clays/till barrier soil, and vegetative cover soil) that will be used in the landfill construction. Placement of the proposed final cover system will comply with the similar material installation specifications and follow the same quality control/quality assurance protocol as used for the cell construction. The final cover system proposed for the landfill is as follows: (from the top down)

- 12 inches of a vegetative cover soil;
- 12 inches drainage sand;
- 40-mil HDPE textured geomembrane liner; and
- 24 inches of barrier soil layer.

Prior to placing any final cover material, detailed design drawings and technical specifications will be prepared and submitted to MEDEP for review and approval prior to the placement of final cover at the site. The borrow source materials used for closure will be obtained from permitted sources.

5.4 Stormwater/Erosion Control Systems

Since the original permit application (August 1991), there have been a number of stormwater and erosion and sedimentation control plans developed and implemented at the JRL in accordance with the facility's operating permits and with MEDEP Best Management Practices for Stormwater and Erosion Control. A copy of the Stormwater Management, Erosion and Sedimentation Control Plans for the Expansion, which considers the entire site development, is contained in Appendix F of this Manual.

6.0 JRL DEVELOPMENT PLANS

This section describes the general development of landfill cells and includes the conceptual development of the Expansion cells. The Expansion's cell development plans may be found in Appendix D of this Manual. Detailed cell development plans, and landfill gas infrastructure plans for Cell 11, the first of the Expansion cells, are also contained in Appendix D. The detailed cell development plans for the remaining Expansion cells will be developed as part of the detailed design of the individual landfill cells and submitted to MEDEP prior to construction of the cells.

6.1 Permitted Landfill Cell Development

Each of the permitted landfill base cell (cells 1 through 10) will generally be filled to an approximate elevation of 325 feet-MSL before operations move into the next cell. Operations will commence on the second elevation once enough base cells are constructed to provide adequate operational area to final elevation. Operations begin in each new landfill cell by placing a soft layer (approximately 5 feet in depth) of approved waste material. If operations are not going to move into a newly constructed cell prior to the winter months, a frost layer consisting of two feet of bark (or other approved material) is placed over the cell to protect the liner systems until the soft layer can be placed. As the soft layer is placed in the cell, an access road is constructed with tipping pads to accommodate waste deliveries. As elevations in the cell increase, varying access road configurations are utilized to allow safe access into the active portions of the cell for depositing wastes.

The landfill cells are built sequentially in lifts to allow for proper commingling and compaction of the wastes. Section 7.0 of this Manual provides more specific details pertaining to the waste placement operations. As each cell is filled, a series of lateral gas collection systems are installed at specific elevations in order to control fugitive landfill gas (LFG) emissions and potentially resulting odors. Vertical landfill gas wells are usually installed on certain side slopes that have reached their final grades and on top of each cell after interim or final grade. In order to assure proper leachate drainage within the cell, a series of collection structures and drainage piping is installed while the cell is being filled with wastes. This generally consists of a series of vertical chimneys (tire chips) within the interior of the waste mass and extensions of the leachate collection system piping to collect contaminated stormwater at higher elevations around the inside perimeter of the cell. More detailed discussions on LFG and leachate collection systems may be found in Section 7.0 of this Manual.

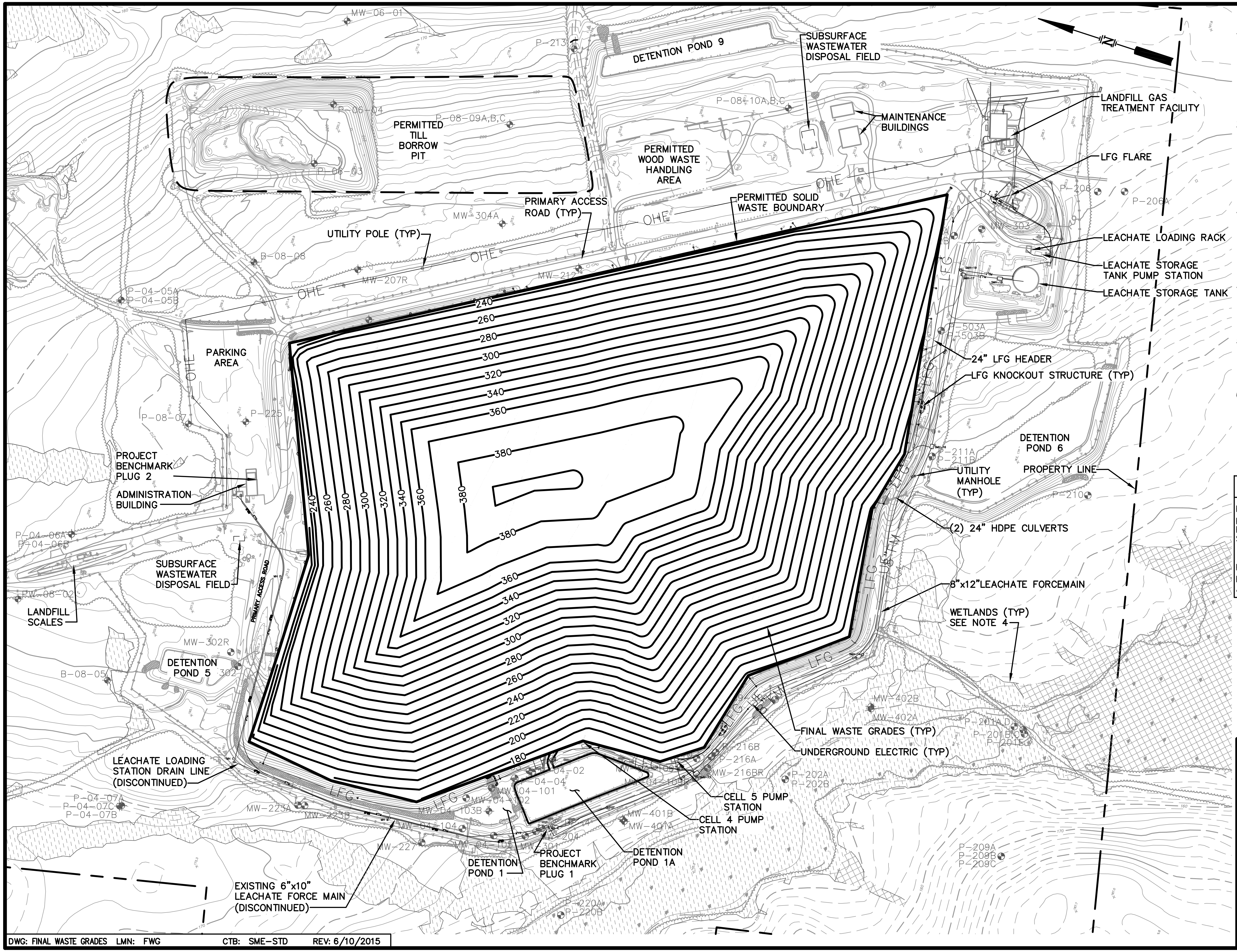
Development and operations of the existing permitted JRL cells will be done in a sequential manner as shown on their Cell Development Plans contained in the current site Operations Manual (i.e., NEWSME, 2015). The plans have been designed to meet the standards in Chapter 401.2.D(6) of the Rules. As the various phases of the landfill are developed, intermediate and/or final cover will be applied to those areas of the cells, which have reached interim or final grades, respectively.

Operating areas of the existing landfill Cells 1 through 8 are developed in two phases. The first phase includes waste filling from the bottom of the cell to approximately an elevation of 325 feet-MSL. The second phase (i.e., second elevation) will be developed over previously developed landfill cells and do not require additional liner construction. Landfill Cells 9 and 10, as shown on Figure 5-1, will require additional liner construction and will be filled in general accordance with the conceptual waste filling plans for these cells contained in the current site Operations Manual.

The last phase of permitted landfill waste filling will include filling over the eastern and northern outer waste side slopes of the existing landfill cells to achieve the final waste grades as shown on Figure 6-1. It is NEWSME's intent to fill this capacity in conjunction with filling of the Expansion cells described in Section 6.2.

6.2 Expansion Cell Development

NEWSME will construct and operate the Expansion in a sequential manner, consisting of constructing and operating a series of six landfill cells. Each landfill cell is sized to have approximately two years of capacity so new cell construction is anticipated to occur every two years. The cell development concept also incorporates a phased final cover construction over the existing and future JRL landfill cells. The cover construction will generally occur in those



DWG: FINAL WASTE GRADES LMN: FWG CTB: SME-STD REV: 6/10/2015

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NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.
2. LOCATIONS OF EXISTING UNDERGROUND UTILITIES INCLUDING ELECTRICAL AND PIPING BASED ON FIELD SURVEY DURING CONSTRUCTION OF EXISTING CELLS AND RELATED INFRASTRUCTURE. CONTRACTOR SHOULD FIELD VERIFY THE EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
3. EXISTING TOPOGRAPHY SHOWN AT 2-FOOT INTERVALS. EXISTING TOPOGRAPHY SHOWN ON THE DRAWINGS REPRESENT GRADES AT THE TIME OF THE SURVEY. CONTRACTOR SHOULD FIELD VERIFY THE EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
4. WETLAND BOUNDARIES DELINEATED BY WOODLOT ALTERNATIVES, INC. IN 2004 AND STANTEC CONSULTING SERVICES 2008, 2014 AND 2015.
5. BORINGS & TEST PIT LOCATIONS ARE APPROXIMATE AND BASED ON FIELD SURVEY BY SEVEE & MAHER ENGINEERS, INC., CUMBERLAND, MAINE.
6. ONLY LEACHATE COLLECTION SYSTEM COMPONENTS WITHIN THE EXISTING LANDFILL LIMITS ARE SHOWN ON THIS DRAWING.

SITE BENCHMARK INFORMATION

DESCRIPTION	NORTHING	EASTING	ELEVATION
PLUG 1 PERMANENT BENCHMARK BRASS PLUG ON PUMP STATION	478242.05	925376.35	167.93
PLUG 2 BRASS PLUG AT ADMINISTRATION BLDG	479497.17	926131.46	215.12

LEGEND

▨ WETLAND

150 0 300 FEET

FIGURE 6-1
EXISTING PERMITTED LANDFILL
FINAL WASTE GRADES
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

SME
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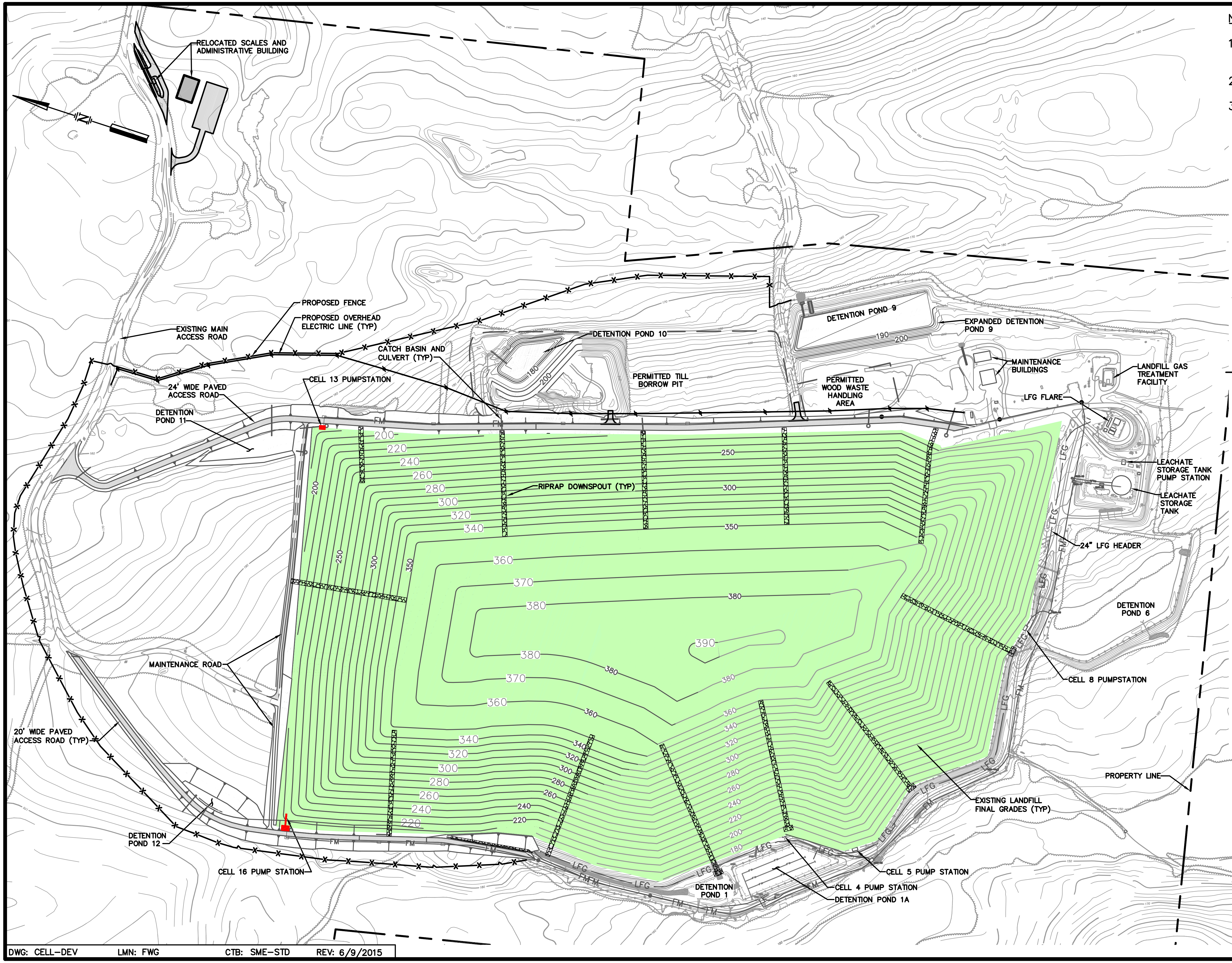
years when cell construction is not occurring. The actual timing for both cells and cover construction will depend on the yearly capacity consumption reviews and the projection of when new cell disposal capacity will be needed. Operations begin in each new landfill cell by placing a soft layer (approximately 5 feet in depth) of approved waste material. If operations are not going to move into a newly constructed cell prior to the winter months, a frost layer consisting of two feet of bark (or other approved material) is placed over the cell to protect the liner systems until the soft layer can be placed. As the soft layer is placed in the cell, an access road is constructed with tipping pads to accommodate waste deliveries. As elevations in the cell increase, varying access road configurations are utilized to allow safe access into the active portions of the cell for depositing wastes.

NEWSME anticipates construction of the first cell (i.e., Cell 11), of the six planned cells, during the 2018 construction season to be available for use in 2019. Appendix D includes the cell development plans for Cell 11 and an overall conceptual cell development plan for the landfill expansion (Cells 11 through 16). Typical operational development details for the Expansion cells are included in Appendix E. The final waste grades for the entire facility, including the Expansion cells, are shown on Figure 6-2.



DWG: CELL–DEV LMN: FWG CTB: SME–STD REV: 6/9/2015

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NOTES

1. GRADES SHOWN IN CELL REPRESENT BASE CELL GRADES PRIOR TO WASTE FILLING.
2. FINAL GRADES REPRESENT TOP OF WASTE.
3. SEE ATTACHED TABLE FOR SUMMARY OF STORMWATER CULVERTS, CATCH BASINS AND DITCHES.

LEGEND

🟩	AREAS OF FINAL COVER
🟥	PERMANENT PUMP STATION
—FM—	LEACHATE TRANSPORT FORCEMAIN

200 0 400 FEET

FIGURE 6–2
FINAL WASTE GRADES
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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7.0 OPERATING PROCEDURES

This section describes standard operating procedures for the JRL facility in accordance with Rules Chapter 401.4(C).

7.1 Acceptable Solid Wastes and Waste Characterization

JRL is licensed to accept in-state non-hazardous waste streams as identified in its operating permits and licenses. Acceptable wastes are commingled within the active cells of the landfill. The ongoing landfill operations at the JRL have demonstrated that the wastes received for disposal are compatible with the existing landfill's liner system. The waste streams are also compatible with each other as demonstrated by the historical commingling of these waste streams. The JRL waste stream currently consists mainly of the following types of non-hazardous waste materials:

- Construction & Demolition Debris (CDD)
- Front-End Process Residuals (FEPR)
- Municipal Solid Waste Incinerator Ash and Multi-Fuel Boiler Ash
- CDD Processing Fines
- Oversized Bulky Wastes
- Municipal Wastewater Treatment Plant Sludge
- Industrial Wastewater Treatment Plant Sludge
- Contaminated Soils
- Oil Spill Debris
- Municipal Solid Waste[2]
- Miscellaneous Special Wastes

Table 7-1 is a summary of wastes accepted at the JRL.

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[2] Per Department Order #S-020700-WD-BC-A, existing JRL may accept up to 81,800 tons of non-bypass MSW until March 31, 2018. After that date this application is only proposing to accept MSW that has been bypassed from MSW Incinerators.

Miscellaneous non-hazardous waste streams at the JRL include, but are not limited to, the following:

TABLE 7-1

SUMMARY OF WASTES ACCEPTED AT JUNIPER RIDGE LANDFILL

Air & Water Filtration Media	Municipal Solid Waste (MSW) / MSW Bypass
Approved Land Utilization Wastes	Municipal Solid Waste Ash
Asbestos (Non-friable)	Non-Hazardous Chemical Related Products
Biomass Boiler Ash	Oversized Bulky Wastes
Biomedical Incinerator Ash	Pigeon Waste
Burned RR Ties & Associated Ash	Pulp & Paper Mill Sludge
Catch Basin Grit	Sandblast Grit
Clean Wood Open Burn Ash	Spoiled Foods
Construction & Demolition Debris	Sulfur Scrubbing Residue
Dredged Spoils From Waterways	Treated Biomedical Waste
Dried Paint Residue & Related Debris	Urban Fill-type Soils
Filter Press Cake & Collagen Scrapings	Virgin Petroleum Contaminated Soil & Debris
Fossil Fuel Boiler Ash	Waste Oil Contaminated Soil & Debris (Oily Debris)
Gasoline Contaminated Soil & Debris, Surface Spill	Wastewater Treatment Plant Sludge
Gasoline Contaminated Soil & Debris (UST)	Water Treatment Plant Sludge
Grit Screening Waste	
Laundry Sludge	
Leather Scrap Wastes	
Municipal Solid Waste (MSW) / MSW Bypass	
Municipal Solid Waste Ash	

In addition to the above blanket waste streams, JRL can accept individually permitted wastes approved at the facility, typically from one-time events. These permits can be found on file with the ECM.

The procedures for characterizing, (i.e., testing) and accepting waste streams at the JRL are identified in the facility Solid Waste Characterization Plan included as Appendix G of this Manual. The plan includes acceptance criteria for both individual permits and blanket permit approvals of wastes. Records of waste acceptance data will be kept on file and made available for viewing by MEDEP during normal business hours. Additionally, waste activity reports are submitted to the MEDEP, BGS, and the City of Old Town on a monthly basis that provide pertinent data regarding all waste deliveries to the facility for the previous month. The monthly report data includes the following information:

- Date of delivery
- Approval (manifest) number
- Waste description
- Quantity delivered in tons
- Transporter name
- Generator name
- Waste origin (Maine County)

7.2 Facility Access/Hours of Operations

Access to the facility is achieved through a gated primary access road that enters the site from Route 16 in Alton, Maine, ensuring that access is controlled. The paved site access road is approximately 2 miles in length between Route 16 and the entrance into the permitted boundary of the landfill. NEWSME has located a scale and attendant facility at the entrance to the landfill that is currently occupied 24 hours per day, and seven days per week.

The gate at the entrance to the landfill is closed and locked during extended periods when wastes are not being delivered to the facility. The access road is maintained by landfill personnel and remains accessible for traffic year round. Only authorized employees of NEWSME and certain contractors have unrestricted access to the landfill facility. All others are required to receive clearance through NEWSME Administration or the Scale House Attendant. Required signs are posted at the entrance to the facility near the scale house. While operating hours at the landfill may vary from season to season, the normal hours of operation at the facility are:

- Monday through Friday………6:00 AM - 6:00 PM
- Saturday & Sunday…………..7:30 AM – 2:30 PM

Some waste streams (i.e., PERC ash) may require 24 hour per day disposal service. Delivery of these wastes, and minimum landfill operations to place these wastes, may occur outside of the standard hours of operations.

NEWSME maintains the site's internal access roads to prevent the accumulation of dust, mud, and waste on public roads. Maintenance activities include sweeping, applying water and/or calcium chloride to the internal gravel roadways to prevent dust generation and maintaining gravel roadway surfaces to prevent mud accumulation on public roads.

With the exception of trucks carrying CDD and MSW (existing landfill only) or MSW Bypass, only waste hauling vehicles with pre-approved materials will be allowed access to the landfill. Waste hauling vehicles will be monitored by the scale house and landfill operators upon entry to the landfill and during off-loading in order to assure that no unacceptable wastes are present and materials are as identified, described, and certified.

7.3 Open Burning

Open burning of waste or any other material is strictly prohibited at the JRL Facility. Use of open flames for construction related activity is by permit only, obtained through NEWSME's Site Safety Officer.

7.4 Hot Loads

In the event that a hot load is delivered to the JRL, the waste will be managed in accordance with 06-092-CMR 401.4.C(4) of the Maine Solid Waste Rules. A separate gravel or ash pad area will be sited within the confines of the operating cell in order to properly manage hot loads. The material will be offloaded onto the pad and handled appropriately to allow cooling. Burning material will be extinguished immediately by applying a water spray as necessary or covering with soil-based material to smother the flames. Once the material has cooled, it will be transferred to the active disposal area of the cell to be commingled with the other wastes or used as daily cover material.

7.5 Setbacks and Buffer Strips

The existing Facility and the Expansion have been sited to minimize adverse effects on the existing natural environment and to not adversely affect existing uses, scenic characteristics, or natural resources of the neighboring locality.

NEWSME will maintain the existing natural buffer strips between the facility's solid waste boundaries and public roads, property boundaries, and residences, as approved in the original License. Activities such as additional tree clearing or disturbance of vegetation will not occur without first obtaining approval from the MEDEP. The current and proposed setbacks to the solid waste boundary meet or are superior to the required MEDEP criteria, as follows:

	Current Setback	**Expansion Setback**	**MEDEP Minimum Setback**
Public Roads	2,000 feet	2,400 feet	300 feet
Private Residences	1,500 feet	2,100 feet	1,000 feet
Private Water Supply	1,500 feet	2,100 feet	1,000 feet
Surface Water	300 feet	950 feet	100 feet
Airport	+/- 13,000 feet	+/- 13,000 feet	5,000-10,000 feet
Property Boundary	500 feet	420 feet	300 feet

7.6 Cell Development Plans

Conceptual Cell Development Plans for the Expansion cells are provided in Appendix D. These plans show the sequence for development of the facility including placement of cover materials. Detailed cell construction and operational plans will be prepared for each cell prior to placing waste into the cells. The detailed Cell Development Plans for Cell 11, the first of the Expansion cells, is included in Appendix D. The detailed cell development plans for the remaining Expansion cells will be prepared as part of the detailed design of the cells and included in the Operations Manual, and subsequent annual reports showing the Cell Development, based upon the approved landfill design. The plans will cover two years of landfill operations and include specific information on waste lift thickness and sequencing of waste placement in the individual cells.

7.7 Compaction (Waste Placement)

Waste entering the landfill will be unloaded either at a designated unloading area within the landfill or directly into the active face as directed by the landfill operator. Traveling over the base of the landfill by trucks shall be done only in areas where more than 5 feet of waste has been placed. Waste shall be placed in the landfill in a manner that enables the operator to commingle the waste. Like waste loads shall be evenly distributed throughout the landfilling area. Wastes shall be placed and spread using a solid waste compactor and bulldozer, in layers 1 to 2 feet thick, to optimize waste density and compaction effort.

After the waste is placed, it will be compacted using a solid waste compactor. A minimum of three successive passes shall be made over the entire waste area to be compacted. Additional passes may be required to acquire the proper compaction. As waste is placed and compacted, the side slopes are created using appropriate stable waste. Outer side slopes shall be graded 3H: 1V using ash or other approved material. Inner waste side slopes can be graded 2H: 1V with ash or CDD processing fines or other approved material. Lifts of waste shall be placed in this manner in each cell.

Several operational details are common to all waste placement within the landfill, as follows:

- First, all outer waste side slopes shall be graded to achieve a final grade of 3 feet horizontal to 1-foot vertical (3H: 1V). The outer side slopes are defined as the slope emanating from the top of the perimeter drainage stone at the perimeter dikes.

- Second, sludges or other low-strength wastes shall not be placed closer than 50 feet from the exterior side slopes unless they are mixed with higher strength wastes such as construction and demolition debris, ash, etc. At a minimum, these wastes shall be placed no closer than 25 feet from the exterior side slopes of the facility, when mixed with the higher strength wastes to a consistency that landfill compaction equipment can travel over the mixed waste after it has been placed.

- Third, the daily working open waste placement area shall be limited to 1 acre or less, if possible. The area containing daily cover materials shall be limited to 10 acres or less, if possible.

- Fourth, prior to waste placement over the bottom of the cell, a 5-foot-thick layer of FEPR, MSW incinerator ash, or other approved “soft” waste shall be spread over the leachate collection sand to stabilize it. The leachate sump areas shall receive 4 to 6 feet of tire chips or other free-draining “soft” waste prior to other waste placement.

- Fifth, construction and demolition debris and OBW shall not be disposed of closer than 5 feet from the liner. Construction and demolition debris shall not be disposed of closer than one foot, and OBW shall not be disposed of closer than two feet and five feet, from the outer waste top and side slopes, respectively.

- Sixth, the waste shall be graded in the active fill area to promote positive surface water drainage to the exterior of the cell, where it can be collected and transported to the leachate collection sump. Waste setbacks, at a minimum of 2 feet, shall be maintained at the outer edge of the waste to contain surface water runoff, to allow it to infiltrate into the waste and/or flow into the drainage columns.

- Seventh, the waste placed below landfill access roads built on the exterior waste slopes shall be high shear strength waste, such as construction and demolition debris. The waste has adequate strength if it can be piled, while maintaining sideslopes of 1 Horizontal to 1 Vertical. High strength wastes would not include materials such as sludge or other high moisture content materials.

- Eighth, as outside slopes are brought to final waste grade, they shall be temporarily covered with a minimum 18-inch intermediate soil cover or a minimum (30-mil) temporary synthetic cover as soon as practical to control leachate generation and odor, to the extent permitted by seasonal conditions.

At the completion of each cell, the outer side slopes shall be covered with intermediate cover. Other areas to be temporarily closed shall be graded and covered with intermediate cover, so that clean water is shed from the landfill area. If an intermediate soil cover is utilized, it shall be seeded and mulched as soon as practical in accordance with MEDEP's Best Management Practices for Erosion and Sedimentation Control (BMPs). Typical operational development details (i.e., cell access road entrance, waste setbacks, operation berms, etc.) are attached in Appendix E.

Any portions of the landfill reaching final grade, and the area not being proposed for future expansion or development, shall be formally closed in accordance with 06-092-CMR 401.5.B of the Maine Solid Waste Rules upon approval of the closure design plan by MEDEP.

7.8 Cover

Three types of cover will be utilized on the landfill: daily, intermediate, and final cover. Only cover materials previously approved by the MEDEP will be utilized. Prior to installation of any cover material, the waste will be inspected for proper compaction, grade, and ability to shed water. The operator will examine the waste surface to be covered. Areas found to be soft or unstable will be corrected by recompaction and/or reinforcement with more stable waste. The operator may be required to cut and/or fill to acquire the grades necessary to shed water off the landfill once the cover is installed. Prior to placement of intermediate or final cover, the waste grades will be set to direct runoff to storm water controls, such as storm water diversion berms, diversion ditches, riprap downspouts, and riprap ditches. The prepared waste grades will be leveled. The waste surface shall be examined for protruding objects that may inadvertently puncture the membrane cover.

7.8.1 Daily Cover. Cover will be placed daily over all areas receiving front-end process residue (FEPR), MSW Bypass, Municipal Wastewater Sludge and other wastes with odor generating potential. Daily cover will primarily consist of 9 inches of ash, CDD processing fines, wood chips, short-paper-fiber, contaminated soil, or other soil-related materials. The purpose of the daily cover will be to control odors, windblown litter, and to restrict the attraction of birds.

7.8.2 Intermediate Cover. Intermediate cover will be placed on areas that have reached interim grades where no additional wastes will be placed for a period of six months. The cover will consist of a MEDEP approved synthetic membrane material (minimum 30-mil) or 18 inches of soil-based material having a minimum of 35 percent fines and no rocks greater than 4 inches. If soil is used, it will be placed, compacted, seeded, and mulched in accordance with the MEDEP's BMPs. This cover is meant to allow the diversion of clean surface water runoff from the areas of the landfill that have reached operational final grade. Areas that will receive intermediate cover at the end of each cell construction are shown on the Cell Development Plans in Appendix D.

7.8.3 Final Cover. Final cover will be applied in a sequence described in the Cell Development Plans (Appendix D). The cover will comply with the design standards contained in 06-092-CMR 401.5.E of the Regulations. Prior to the placement of final cover, detailed design plans will be submitted to the MEDEP for approval as required in the Maine Solid Waste Rules.

7.9 Stormwater Management and Erosion Control

Stormwater management and erosion control practices are implemented at JRL in accordance with the MEDEP Best Management Practices as part of the routine operations at the site. The management of stormwater and erosion control is also addressed at the JRL with each design report and set of construction documents prepared for individual cell development at the site.

Stormwater drainage, detention, and collection structures are inspected on a weekly basis as part of the routine inspection of the facility. The inspections are performed by the Landfill Supervisor, the Environmental Technician, and/or the Environmental Manager. Any damage to stormwater structures identified during these inspections is remedied as soon as practical. Drainage restrictions that develop over time are abated on an ongoing basis to maximize the efficiency of stormwater structures and conveyance systems.

Erosion control measures undertaken at the facility during the placement of intermediate cover material are provided through a combination of temporary and permanent features such as seeding and mulching and the use of hay bales, stone check dams, riprap, and erosion control matting. A copy of the Expansion's Stormwater Management and Erosion & Sedimentation Control Plans are contained in Appendix F of this Manual.

7.10 Leachate Management

Leachate generated on-site will be contained, collected and stored on-site until it can be transported off-site for proper treatment. Leachate is collected within the landfill cells by a series of collection and transport pipes that are provided with cleanouts along the perimeter of the cell. Leachate is then directed to an internal sump and pumped directly to the on-site 921,000-gallon aboveground storage tank. The storage tank will be the primary source of leachate storage.

The leachate storage tank is an 81-foot diameter by 25-foot high, 921,000-gallon aboveground steel storage tank with a glass interior coating. Beneath the base of the tank is a geocomposite clay liner (GCL), a granular drainage layer, and a concrete tank foundation with leak detection pipes. The pipes provide a location to monitor potential leaks from within the storage tank. The tank is equipped with a galvanic anode cathodic protection system that is designed to protect the wetted portion of the tank. The tank is also equipped with level controls that will automatically cut off power to the pumps if the tank becomes full, and will then restart the pumps when the tank capacity becomes available. Both audible and visual alarms will sound when pumps are cutoff. An overflow structure is also provided as a backup to the automatic control systems. The aboveground leachate storage tank is contained within a secondary containment dike that is also lined with a geosynthetic clay liner. The secondary containment dike is sized to provide 110 percent of the tank's capacity. The leachate tank is inspected on a regular basis as described in Section 8.0. An Operations and Maintenance Manual is attached in Appendix H for the leachate storage tank.

Recently, operations have demonstrated that the leachate holding tank has adequate capacity to handle site leachate generation. Therefore, the original leachate storage pond is now used to manage stormwater at the site. This is also the case during the Expansion development.

The leachate collection and transport system is also designed such that if failure of particular components of the system occurs, a contingency plan can be implemented to contain and store leachate until the appropriate repairs can be made. A summary of potential failure modes and responses are summarized below.

Failure Mode	Response Plan
Plugging of leachate collection or transport piping, resulting in leachate head build-up in leachate collection layer.	Pipes would be cleaned by either water jetting or acid cleaning.
Malfunction of leachate pumps in internal sumps resulting in ponding of water within the sumps.	Pump can be removed from sumps and replaced with new pump.
Power failure such that pump cannot be operated.	A site backup generator is utilized to supply power to pump stations.
High leachate flows sustained for a long period of time such that the on-site leachate storage capacity is exceeded.	Increase the number of leachate trucks hauling leachate from the site. Alternatively, the leachate can be recirculated into the landfill.

Systems will be monitored according to the schedule found in Section 8.0 (Inspections). Leachate will be loaded into tank trucks and transported to the Expera, Specialty Solutions Old Town LLC wastewater treatment plant facility (or to the City of Brewer's Pollution Abatement facility) for proper treatment.

7.11 Landfill Gas Management

NEWSME has installed an active gas management system at JRL. The site's gas management system includes a candle stick flare and an active gas collection (both horizontal and vertical) piping system. As each cell reaches its final grade, and intermediate or final cover is applied, a gas control system is installed to properly manage gas generation from within the cell. A copy of the Landfill Gas Infrastructure Plan and Operations & Maintenance Manual may be found in Appendix J. Appendix D contains the plans for the installation of the landfill gas infrastructure for Cell 11.

Monitoring gases in ambient air at the JRL site is performed for two reasons: (1) for employees' safety when working in or around confined spaces, including leachate manholes and pump stations; and (2) to evaluate the potential for migration of landfill gases away from the landfill site. The NEWSME Site Safety Officer is responsible for coordinating any activities associated with confined spaces. The potential for landfill gas to migrate away from the landfill is evaluated through sampling of the site monitoring wells, and at selected gas monitoring locations around the site property boundaries.

06-092-CMR 401.4.C(11) of the Rules requires that methane concentration around the landfill be monitored on a quarterly basis. The Rules also require that immediately upon detection of explosive gas levels exceeding 25 percent of the lower explosive limit for the gases in the landfill structures or 100 percent of the lower explosive limit for the gases at the property boundary, the operator shall take necessary steps to protect human health and notify the MEDEP. The Rules also require the operator to record the methane level, the time the MEDEP was notified and the protective steps taken at the time of detection. In addition within 60 days of detection, the operator shall implement a remediation plan to control the release of gases. The plan must be submitted to the MEDEP.

7.11.1 Location. Monitoring of gas associated with the JRL's confined-space-entry program will be done as outlined in the Landfill Safety Manual. Generally, sampling will be done within the confined space prior to entering the area. The monitoring of landfill gases to evaluate their potential migration from the site is also done in the site monitoring wells and at stationary H_2S monitoring locations inside and outside of the site property boundaries (ref. Odor Control Plan, Appendix K).

7.11.2 Frequency. For entry into confined spaces, the monitoring shall be done as outlined in the JRL Site Safety Manual. In the monitoring wells, the sampling frequency shall be four times per year with three of the sampling events occurring during the groundwater sample collection. During sample collection, the wellhead shall be monitored for explosive gas and volatile organic compounds using a meter such as a Landtec GEM meter.

7.12 Inspections

In order to assure proper operations at the landfill, NEWSME will perform routine inspections and monitoring at the site. Various components of the facility will be inspected as part of the routine operations, while others will be inspected and documented at a specific frequency. Facility inspections and maintenance is discussed in greater detail in Section 8.0.

7.13 Dust Control

Dust control measures will be implemented at the facility by utilizing water spray trucks to wet secondary roads during dry weather months, and a road sweeper to minimize dirt buildup on paved roadways. Additional measures such as applying calcium chloride may be required on an as needed basis. Dust control measures will be applied as weather permits. The primary access road to the facility has been paved in order to reduce dust generation near local residences.

7.14 Equipment

Equipment will be maintained in proper working order with preventative maintenance completed regularly. Equipment is cleaned on a regular basis to prevent clogging of engine compartments or radiators with dirt or solid waste, which could cause overheating of equipment or fires. Equipment shall be regularly inspected to ensure that safety and noise control devices work properly. Back-up equipment is readily available through local equipment suppliers if it is required. Typical equipment used in the landfill operations is listed in Table 7-2.

TABLE 7-2

TYPICAL LANDFILL EQUIPMENT INVENTORY

- Two compactors – such as Caterpillar 826, and 836
- One excavator such as John Deere 270
- Two dozers such as John Deere 850
- One on-site haul truck such as John Deer 400D
- One front-end loader such as Caterpillar 966G

7.15 Fire Protection

Fire protection and prevention measures applicable to the facility are as follows:

1. NEWSME will be responsible for the development of a fire-protection program and will provide necessary firefighting equipment.
2. Access to all available firefighting equipment will be maintained.
3. Firefighting equipment will be conspicuously located.
4. Firefighting equipment will be periodically inspected and maintained in operating condition. Defective equipment will be immediately replaced.

Landfill personnel shall be made aware of potential fire danger at the landfill site and shall be prepared to act quickly to contain a fire.

To Prevent Fire:

1. An operable, portable, chemical fire extinguisher will be placed in an easily accessible location on site vehicles.
2. An operable fire extinguisher will be readily accessible at site buildings.
3. A hot-load area will be provided for depositing smoldering materials.
4. A stockpile of soil-based material will be available for use in covering smoldering materials and hot ashes.

5. Storage of combustible material (e.g., paints or fuels) will be located securely away from equipment operations.
6. Smoking shall not be allowed in any active portions of the landfill and shall only be allowed in safe designated smoking areas.
7. A telephone or radio will be kept in an easily accessible place with the telephone numbers of the local fire, police, and ambulance prominently displayed.
8. Protective gear will be available to site personnel.
9. Application of a daily cover material will serve as a firebreak.

In the event of a fire, site personnel shall act immediately to contain the fire and take the following steps:

1. Contact the Old Town Fire and Police Departments immediately.
2. Clear the site of users.
3. If the burning material can be pulled away from the working area, do so.
4. Remove combustible materials in the immediate area to a safe distance from the burning materials. Remember that the point of smoke emergence from a subsurface fire is not necessarily near the source of the fire. Smoke will follow the route of greatest permeability.
5. Cover the burning materials with ash, soil, or other acceptable material. The use of large quantities of water to smother and cool a landfill fire is not always successful, but may be used as a first step to prevent the spreading of flames.

7.16 Hazardous and Special Waste Handling and Exclusion Plan

JRL is not permitted to accept hazardous or toxic substances and can only dispose of MEDEP approved non-hazardous in-state solid or special wastes. Because JRL receives wastes such as MSW (existing only), MSW bypass and CDD from non-regulated residential sources, there is always the possibility that an unacceptable material may be found in the waste stream. Due to this possibility, NEWSME has instituted a waste inspection plan in order to assure that unacceptable materials are kept out of the incoming waste streams to the fullest extent possible. The waste inspection plan may be found in Appendix L.

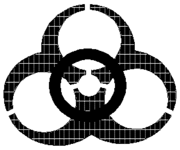
7.16.1 Identification of Hazardous and Non-permitted Special Waste. Only haulers with wastes that have been pre-approved for disposal at the landfill are allowed access to the site. The scale house operator verifies that each load of waste material has been approved for disposal at the site. Deliveries entering the JRL that do not require pre-approval (i.e., MSW (existing JRL only), MSW bypass, CDD) are monitored closely by NEWSME staff from arrival to offloading. As with every load, the landfill operators scan the deliveries as each load is being offloaded in order to assure that hazardous materials are not present. The waste is generally spread in 1- to 2-foot lifts such that non-permitted materials will be more easily noticed. If a suspected non-permitted special or hazardous waste is observed during this process, the operator will stop operations and safely inspect the suspicious material to verify its acceptability. The driver of the vehicle that delivered the material will not be allowed to leave the landfill until it has been determined that the material is acceptable. The operator will try to safely identify labeling; determine if the waste is a solid, liquid, or gas; and estimate the quantity and condition of the material. If in the attendant’s judgment the material in question could be hazardous, the landfill supervisor will be notified and the area will be secured and evacuated. Three of the more obvious hazardous materials that may pose a risk to personnel, if they should come into contact are as follows:

Non-Treated Biomedical Waste

Blood or body-fluid-containing material. Needles or any sharp material (i.e., broken glass or any material that can cause puncture).

> Danger: The danger of a biohazard could result in contacting the HIV or HBV virus. Any red trash bag that comes from doctors’ offices that has bio-hazardous material inside will have a biohazard symbol on the outside of the bag. Employees are advised that if they come across a red bag with this symbol on the side, they shall NOT pick it up.

The symbol looks like this:



Flammable Substances

Flammables can come from many different sources, from paint thinners to containers of gasoline. Employees are advised to be aware of the smell of vapors and the type of symbols on the label.

Danger: Fires and burns.

Corrosive Materials

Corrosive materials can be very dangerous. They can cause serious burns, if you should come into direct contact. Battery acid in containers, leaking or not, is dangerous. Some cleaning fluids can be corrosive.

Danger: Serious burns.

Hazardous Materials Mixed With Construction & Demolition Debris

If personnel come in contact with any hazardous material, they will need to isolate it. If it is still in the container or on the truck, it will be the responsibility of the generator or the hauler to take the material with them when they leave the landfill.

If the material has been unloaded and the employees have not been exposed, they shall isolate the material by rope or hazard tape. They will then contact the ECM and ET, so that they can further identify the material, if necessary. If necessary, an appropriate hazardous materials contractor will be called in to manage and dispose of the material.

If the employees have been exposed to the material, they will be sent to NEWSME's preferred health care provider. The material will be identified as soon as possible and the information will be sent to the health care provider. NEWSME will then identify the source of the material and take action to correct the problem, including turning over the matter to the authorities. Costs for cleanup will be the responsibility of the generator.

7.16.2 Handling of Hazardous or Non-permitted Special Waste. At JRL, non-permitted materials that are visually identifiable as posing no immediate threat to employees will be segregated and removed to containers supplied by the facility. Unidentified potentially hazardous materials will be left where discovered and the Landfill Supervisor, ECM, and/or ET will be contacted to coordinate the proper handling and disposal of the material. If it has been determined by the ECM that a hazardous waste is, or has the potential to impact human health or the environment through leakage, they will, in addition, immediately notify MEDEP's Emergency Spill Unit (1-800-482-0777), the National Response Center (1-800-424-8802), the Old Town Fire Department (207-827-3400), and the Maine State Police (1-800-452-4664).

7.16.3 Storage, Transportation, and Disposal of Hazardous or Non-permitted Special Waste. Storage of non-permitted wastes at the landfill is not allowed by NEWSME. Visually identifiable non-hazardous waste will be removed and immediately directed to appropriate solid waste containers. The ECM will be responsible for coordinating disposal of the material. Only personnel from companies contracted with NEWSME (e.g., Clean Harbors, EPI) who are trained in the proper handling and management of hazardous waste will be permitted to perform cleanup or decontamination of hazardous waste on-site. They will provide the necessary protective clothing, breathing apparatus, containment and removal equipment, and other supplies appropriate to the handling of the hazardous waste involved.

Interim on-site storage of hazardous waste will not be utilized. Containers for the containment and removal of hazardous waste will have warning labels as required. The removal contractor will be responsible for removing contaminated clothing and disposables from the JRL site along with the hazardous waste. Arrangements for transport and ultimate disposal of potentially hazardous materials will be undertaken immediately by the ECM. Only transporters certified in the transportation of hazardous materials and licensed disposal sites will be employed.

7.16.4 Emergency Notification Procedures. Emergency notifications from the landfill will be made to the Landfill Supervisor via radio communication, cellular phone, telephone maintained in the landfill's equipment garage, or any other appropriate means. Subsequently, the ECM and General Manager will be notified by the Landfill Supervisor. The following telephone numbers are available at JRL for responsible personnel to use in emergency situations:

- MEDEP Bureau of Remediation and Waste Management: 941-4570
- MEDEP Emergency Spill Number: 1-800-482-0777
- National Response Center: 1-800-424-8802
- Old Town Fire Department: 827-3400 or 911
- Old Town Police Department: 827-3400 or 911
- Ambulance: 827-3400 or 911
- Maine State Police: 1-800-452-4664
- Maine Poison Center: 1-800-442-6305
- Eastern Maine Medical Center: 973-7000

7.16.5 Written Reports. Within 15 days of any incident involving a hazardous material, a written report will be filed with the MEDEP Bureau of Remediation and Solid Waste Management, and will include the following information:

- date and time of incident,

- location,
- description of unacceptable material,
- amount of unacceptable material,
- cause of incident,
- corrective actions taken,
- clean-up methods used,
- disposition of recovered material,
- list of agencies notified, and
- time agencies responded on-site.

Please reference Appendix M, Facility Notification Procedures, for complete emergency notification details.

7.17 Litter Control Plan

NEWSME places daily cover on all active portions of the landfill at the end of each workday to control windblown litter. A series of litter control fences are also installed around each active operating area of the facility to manage and control litter. NEWSME also contracts with a temporary labor agency that provides routine litter patrols that pickup and clean around the facility on an as needed basis.

7.18 Environmental Monitoring Plan

The Expansion Environmental Monitoring Plan (EMP) for the JRL facility is found in Appendix I of this Manual. This plan describes the proposed monitoring locations, analytical parameters and sampling and reporting procedures associated with the Expansion.

7.19 Geotechnical Monitoring Plan

The current Geotechnical Monitoring Plan for the JRL may be found in Appendix N of this Manual.

7.20 Operation Records

Operational records will be maintained for the facility and will primarily consist of the following:

- Waste types and volumes received
- Equipment operation and maintenance
- Leachate management
- Inspection reports
- Equipment and personnel
- Unusual operating events

In addition, copies of annual reports submitted to the Department shall be kept on file and/or made available electronically, as requested.

7.21 Operation of Waste Storage and Processing Areas

Only MEDEP approved waste storage and/or processing areas are allowed outside of the landfill's solid waste boundary. JRL has a MEDEP approved clean wood waste storage pad located adjacent to the current solid waste boundary. Clean wood waste, clean construction debris, brush, stumps, and railroad ties are received at the location, then the wood waste is chipped or shredded for use at the landfill or for wood fuel.

7.22 Vector Control

Vectors are controlled at JRL by assuring that all waste materials within the active portions of the landfill are appropriately covered each workday. Additionally, NEWSME maintains a contract with Modern Pest Control to supply vector control services on an ongoing basis. Birds are controlled by regularly deploying lethal depredation methods, as well as, non-lethal methods to scare the birds off the site.

7.23 Additional Requirements for Disposal of Asbestos

JRL only accepts non-friable asbestos, primarily consisting of roofing, siding, and soil contaminated with non-friable material. The non-friable asbestos received at the JRL facility is handled in accordance with MEDEP Asbestos Management Rules, then deposited in the landfill and covered to prevent airborne contaminants during compaction.

7.24 Winter Weather Operations

During winter operations, special planning and scheduling considerations by the Landfill Supervisor and equipment operator will be required. Snow removal, shorter days, placement of temporary cover, removal of temporary diversion berms, and equipment preparation and starting are the major considerations that shall be planned.

Prior to and during landfill operating hours, the access road, perimeter road, and interior roads shall be plowed and sanded. Special consideration shall be given to sharp curves and narrow perimeter roads to prevent users from sliding into the perimeter ditches.

Installation of intermediate cover material during the winter months shall be avoided, unless damaged areas require immediate attention or nuisance odors dictate response actions. If the installation of intermediate cover is required in the winter months, it will be necessary to remove accumulated snow from the waste surface prior to application of the cover. Safety of the workers deploying the cover material will require special attention. The nature of the synthetic material and frozen and slippery surfaces will dictate installation procedures.

Operations of the leachate collection and transport system are of particular importance during the winter months. Facility staff shall pay close attention to the performance of the system. Prior to the onset of cold weather, the operator shall ensure that an adequate frost protection layer is placed over the leachate collection systems (in a new cell not being operated) in order to provide an insulating layer to keep the system from freezing. Also, surface water drainage and leachate structures shall be kept clear of snow and ice such that they remain free flowing, particularly during spring thaw conditions.

7.25 Odor Control

NEWSME has developed an Odor Control Plan to manage and mitigate nuisance odors at JRL. The current version of the JRL Odor Control Plan may be found in Appendix K.

7.26 Liner Action Plan

The Expansion cells have a dedicated leak detection system which is used to monitor the performance of the primary liner system. A Liner Action Plan (LAP) which describes the procedures to monitor the leak detection system and appropriate, trigger response activities in the event a leak of potentially significant environmental consequences is included in Appendix P.

8.0 FACILITY INSPECTION AND MAINTENANCE

Proper operations of the landfill require that routine inspection and monitoring be performed on-site to ensure that facility components are operating properly. This section describes the schedule and procedures that the operator shall follow to keep the landfill functioning as designed. These recommended schedules for inspection and monitoring are considered a minimum. If unusual events or observations occur, the operator shall check systems that may be affected prior to resuming normal operations. Inspection forms for the JRL facility are included in Appendix O. The following descriptions explain the components of the facility that shall be checked.

8.1 Inspection Frequency

Table 8-1 summarizes the items to be checked and the inspection frequency for the various landfill facilities and components. In addition, NEWSME personnel shall observe site conditions and report immediately unusual conditions to the Landfill Supervisor as part of routine operations. Included in Appendix O are inspection checklists for the various site facilities. The completed checklists shall be maintained on file at the facility. The remainder of this section describes what shall be checked for the individual locations at the facility.

TABLE 8-1

FREQUENCY OF ROUTINE LANDFILL SYSTEM INSPECTIONS

	Weekly	**Monthly**	**Quarterly**	**Annual**[1]
Leachate Collection Piping and Inlet Structures			X	
Leak Detection System		X		
Surface Water Inlets & Outlets	X			
Pump Stations	X			
Force Main Pressure Gauges, Air Release, Valves and Sewer Manholes			X	X
Gas Management Piping		X		
Leachate Force Main Shut Off Valves				X
Surface Drainage Ditches & Downspouts	X			
Access Roads – Mud	X			
Access Roads - Pavement/Rutting	X			
Landfill Covers				
Daily Cover	X			
Intermediate Cover	X	X		
Final Cover			X	
Erosion Control Structures	X			
Leachate Storage Tank and Loading Facilities	X			
Stormwater Detention Basin	X			

Note:
1. Annual inspection to be performed at location which require confined space entry procedures

8.2 Leachate Collection and Leak Detection

Inspection of the leachate collection, and leak detection piping system shall include regular observation of the ditches within the landfill cell for signs of ponding leachate, and review of the pumping volumes at both the leak detection and leachate pump stations for indications of unusual changes in volume that are not the result of weather conditions. If restrictions of leachate flow are indicated by either of these inspection methods, clean-out covers along the leachate lines shall be removed and the inspector will listen for the sounds of flowing fluids. This may give an indication of the location of any blockages. When a blockage is located, the affected lines shall be cleaned utilizing conventional sewer cleaning equipment. If increase flows are noted in the leak detection system the cleanouts for the leak detection system should be used to check for potential sources of the increased leak detection flows. This can be done by using a camera inserted in the leak detection pipes through the cleanouts to observe leachate flows. Other sources of flow to the leak detection system should also be investigated. This includes but is not limited to damage to the liner system along the perimeter of the landfill.

8.3 Former Leachate Pond Leak Detection

Inspection of the former leachate pond's leak detection and underdrain system shall include observations of the system outlets for flow and monitoring water quality of the discharge on a monthly basis for field parameters, as described in the site's current EMP.

While the former leachate pond is no longer being utilized for the storage of leachate, it will be used for stormwater management.

8.4 Pump Stations and Force Mains

Pump station inspections shall include: observation of the control panel to assure that pumps and the flow meter are operating correctly, operating valves to assure they are functioning, and observation of the flow into the station, the condition of the equipment and supports (i.e., corrosion or loose connections), and the operation of the flow meter. During the inspection, power to the pumps will be shut off and all gate-type valves within and entering the station will be opened and closed (or closed and opened) to keep the closure mechanisms from freezing due to corrosion. The operation will be done in a manner that will not result in a discharge of leachate to the environment.

Force main inspection shall consist of a check of the pressure gauges (where applicable) at each manhole in the force mains, and confirmation that the air release valves are working. A high reading in the pressure gauges may be indicative of a leak in the force main. Any leakage detected shall be reported immediately to the ECM. If a high gauge reading is noted, the pressure between the pipes shall be released and a check made to see if the pressure is the result of a leak. If not, the gauge shall be replaced and rechecked daily until the problem is identified and solved, or until the high pressures are no longer noted. If the high pressure is the result of a leak, the affected pipeline shall be repaired.

8.5 Leachate Storage Tank and Loading Rack

The leachate storage tank and associated systems shall be inspected for possible leaks, corrosion of tank parts, icing of inlets and outlets, uneven settlement of tank foundation, and erosion or damage to the secondary containment system. Apparent structural failure of the tank and/or the foundation shall be reported immediately to the General Manager. Leaks detected shall be reported to the ECM. The leachate storage tank is equipped with leak detection piping at the base of the tank. These leak detection pipes shall be checked for sign of leakage. If any fluid is observed in the piping system it shall be reported immediately to the ECM. The specific conductance of the fluid shall also be measured. An Operations and Maintenance Manual for the leachate storage tank is attached in Appendix H.

8.6 Annual Inspection of Leachate and Leak Detection Collection Piping and Leachate Transport Piping

NEWSME will complete an annual inspection of the leachate and leak detection collection and leachate transport lines. The inspection will include a systematic review of the flow data from the facility, and visual inspection of the inlets and outlets of the piping systems and manual opening and closing of the leachate control valves. If these inspections suggest blockage is occurring in these lines, the lines will be cleaned using conventional sewer cleaning equipment. Notwithstanding, NEWSME will implement a periodic cleaning of the leachate collection and transport piping systems on-site. Leachate lines will be cleaned at a minimum once every five years during operation. If necessary, more frequent cleaning will occur.

8.7 Active Gas Management System

Gas piping system components consist of laterals and gas extraction wells, horizontal gas collection, gas conveyance piping, knockout structures, and a blower and flare station. Inspection and maintenance of this system shall be done in accordance with the active gas monitoring and maintenance manual included as Appendix J.

8.8 Surface Drainage System and Erosion Control

The surface drainage systems around the perimeter of the landfill shall be inspected for sediment or vegetation buildup and undermining of the ditches, which could adversely affect the flow of water in the ditch.

The upslope stormwater diversion ditches and berms shall be checked regularly to ensure that they are conveying water away from operational areas of the landfill. The entire length of these facilities shall be checked for signs of ponding water or breaches in the temporary covers. Repairs shall be made to the area as soon as possible.

8.9 Stormwater Detention Basins

The storm water detention basins require weekly inspections. Inlets into the basin shall be free of litter, silt, and other debris that may block the inlets. Silt that builds up in the base of the basin shall be removed on as needed to maintain State of Maine Stormwater BMPs. Silt shall not be allowed to build up and smother vegetation. The detention basin outlet control structure shall be kept free of litter, silt, and other debris that may block the openings.

8.10 Access Roads

Access roads will require inspections for breakup of the paved road surface or rutting of gravel access ways. Repairs to the access roads will be made as necessary. Periodic sweeping will prevent mud from being tracked onto site access roads.

8.11 Daily Cover

The daily cover shall be inspected at the beginning of each operational day for its effectiveness in controlling odors and windblown debris. If the cover material is not effectively controlling these conditions, changes shall be made to the type or amount of daily cover being used.

8.12 Intermediate Cover

Intermediate cover shall be inspected regularly. Inspections of any synthetic materials shall include observations of rips or holes and anchoring of material. Holes shall be repaired with a patch or seam stitching. The repairs shall be done by an individual with prior experience or training in the handling of this material. If the intermediate cover is soil, it shall be checked for presence of erosion or vegetation kill.

8.13 Landfill Expansion Cells – Leak Detection System

The Expansion cells will have leak detection systems. These systems will allow the performance of the primary liner to be monitored. This section describes the layout of the Expansion's proposed leak detection system, and leak detection monitoring program. The base cells of the JRL Expansion have been designed with a leak detection system located between the primary and secondary liners. This system is the main means for monitoring the performance of the primary liner system. The leak detection system consists of components similar to the leachate collection system. Over the base of the cells, the leak detection system consists of a geocomposite drainage net and one foot of sand; collection pipes are located in the sand. On the sideslope areas, the leak detection system consists of a geocomposite drainage net. The discharge and collection of the leak detection system fluid for the Expansion cells will occur in the individual cells' pump stations. Monitoring of leak detection flows, leak action rates, response actions and reporting requirements for the Expansion cells' leak detection system are defined in the LAP included in Appendix P.

9.0 RECORDKEEPING AND TRAINING

As part of landfill operations, records shall be kept of various site activities (Table 9-1). The purposes of the record keeping are to allow future strategic site planning and to comply with the MEDEP reporting requirements.

TABLE 9-1

OPERATION RECORDS SCHEDULE

	Daily	**Weekly**	**Monthly**	**Annual**
Waste volumes	X		(tabulated)	(tabulated)
Waste disposal area			X	
Equipment inspection	X			
Leachate flow			X	(tabulated)
Gas flows			X	
In-place volume survey				(as needed)
Unusual operating events				(tabulated as required)
Operator training			X	
Leak detection System			X[1]	

Note:

1. See LAP included in Appendix P.

9.1 Construction

Construction activities related to major improvements to the landfill associated with operation of the cells shall be documented by preparing as-built drawings and a final construction report, which contains all quality assurance/QC testing, and documenting of the construction site activities.

Construction activities include a new landfill area, final covers, pump stations, force mains, or other components of the landfill. Copies of construction reports will be kept on file by the ECM.

9.2 Operations

Records of the landfill operation shall be maintained as described in the following subsections and according to the schedule shown in Table 9-1. These records shall be kept up to date and available for review by MEDEP. Typical reporting forms used at the landfill may be found in Appendix O.

9.2.1 Waste Volumes. A record of the quantity of wastes and cover material placed at the landfill will be maintained based on the volume or weight of materials brought to the landfill. These records will be tabulated on a monthly basis by waste category and origin, and included in the annual report for the facility. The in-place and remaining available volume of the landfill will be estimated by a topographic survey of the facility, typically each quarter. This survey will provide a check on the amount of material landfilled, as well as provide an estimate of the amount of consolidation that has occurred, and document the portion of the landfill used. This information will be used to project the remaining life in the cells.

9.2.2 Equipment Operation and Maintenance. Verbal reports describing equipment problems that may affect the operation or environmental integrity of the landfill, either by the nature of the problem or by delays caused as a result of the problem, will be reviewed with the General Manager during routine operation meetings.

9.2.3 Leachate Management. Leachate flows shall be reviewed as a check on the operation of the facility. An annual summation of the amount of leachate pumped from the leachate systems will be included in the annual report. Problems with the leachate collection system that may result in a discharge of leachate to the environment will be promptly reported to the General Manager and ECM, who will report discharges to MEDEP.

9.2.4 Inspection Reports. The ECM and ET are responsible for completing inspections of the site and its various components. Copies of the inspection reports will be maintained by the ECM.

9.2.5 Unusual Operating Events. A record of any unusual operating events such as fires; significant deviations from the operating plan; spills of waste, fuel, or hydraulic fluid; or reports of any accidents at the landfill facility will be made by the Landfill Supervisor, and a copy sent to the ECM and General Manager. If any of these events cause an adverse environmental impact, the ECM or General Manager will promptly notify MEDEP. Significant deviations from the operating plan will be included in the annual report to MEDEP.

9.2.6 Leak Detection Monitoring. The leak response and reporting requirements for the Expansion cells are described in the LAP. The LAP for the JRL may be found in Appendix P of this Manual.

9.3 Annual Report

An annual report will be prepared and submitted to MEDEP, and will include the following information:

- a summary of the type, quantity, and origin of waste required,
- estimates of the capacity of the landfill used during the past year and the remaining capacity,
- a description and estimate of the amount of cover material used in the past year,
- a description of changes in the Operations Manual during the past year,
- proposed changes to the Operations Manual or other aspects of the landfill's operations,
- a summary of leachate quality and quantity, including a comparison with the previous year's data,
- a summary of the leak detection system monitoring,
- a summary of any changes made or proposed to either the Environmental Monitoring Plan or the Geotechnical Monitoring Plan,
- a summary of landfill gas monitoring, including a comparison with the previous year's data,
- a summary of the periodic facility systems inspections,
- a summary of geotechnical monitoring for the year,

- an internal evaluation of the landfill's operations to verify that the facility is operating in compliance with the Operations Manual and other applicable requirements,
- a summary of spills, fires, accidents, and unusual events that occurred at the landfill in the past year,
- updated Cell Development Plans for subsequent two-year periods, as needed, highlighting any changes to the approved plan,
- copies of reports prepared in accordance with the JRL's Hazardous and Special Waste Exclusion Plan,
- results from the inspections and testing required by the facility's permit, including a report stating the date and findings associated with the annual inspection and cleaning, if necessary, of the leachate collection, detection, and transport systems, and
- a description of system failures and documentation of repair measures.

The appropriate annual report fee shall be submitted, as determined by the MEDEP.

9.4 Operations Manual Control Copy

To record changes to operating procedures at the JRL, a copy of the Operations Manual, updated with any changes in landfill operations, will be kept at the ECM's office. The ECM will also be responsible for assuring that all facility personnel are made aware of MEDEP approved changes to the Operations Manual.

10.0 ACCIDENT PREVENTION AND SAFETY

NEWSME maintains a Landfill Safety Manual that can be found in the Site Supervisor's Office. Personnel associated with operation of the landfill shall be familiar with the Manual. Questions related to site safety and accident prevention shall be directed to the NEWSME Site Safety Officer.

11.0 EMERGENCY PROCEDURES

Emergency procedures can be found in Appendix M, Facility Notification Procedures. These procedures also can be adapted to other similar possible emergencies.

12.0 COMPLAINT MANAGEMENT AND RESPONSE PLAN

NEWSME has a dedicated incoming phone line for complaints from the public related to any aspect of the JRL operations. The complaint number is 207-394-4376. The scale house operator answers this number during working hours 7 days per week. During non-working hours, the complaint line is transferred to a dedicated cellular phone in the possession of the on-call response individual. The following information will be gathered from any users of the complaint number:

- Name, address, and telephone number
- The type of complaint (odor, noise, lighting, dust, etc).
- What time of day did they first experience the source of their complaint
- Whether or not the source of the complaint was experienced at their residence

After this information is received, the NEWSME staff taking the call will immediately relay the information to the appropriate complaint response personnel (during working hours). During after hours, the designated response individual will be responsible for handling the complaint. An available member of the complaint response group will respond to complaints during working hours, as deemed necessary. If a return call has been requested, the on call landfill staff will first telephone the person initiating the complaint. If a meeting has been requested, the landfill staff will ask permission to go to the residence to evaluate site-specific information.

Whether or not the landfill personnel meets directly with the individual initiating the complaint, the landfill personnel upon receiving the call from the scale house operator will immediately gather and record the following information at the JRL site and vicinity as relevant to the complaint:

For odor complaints:

- Time of arrival at the location of the complaint (if applicable)
- Recorded wind direction and speed at the landfill
- H2S level registered at the complaint address, if site visit is performed

- Observation of unusual conditions present at the landfill prior to or during the time of the complaint

For all complaints:

- Scale house records regarding truck activity if complaint is noise.
- Observed lighting conditions if complaint is lighting.
- Actions taken to remedy cause of the complaint.
- Resolution of the complaint.
- Time and comments made in reporting back to caller.
- Comments made by caller during final exchange.

If a complaint about dust, litter, and debris is received at JRL, the General Manager will, within 24 hours of receiving the complaint, be responsible for reviewing the operations to determine the source of the dust emissions. Once the source is determined, the General Manager will direct the action required to rectify the problem. If the source of the dust is from a paved surface, the surface will be swept. If the source is from a mineral surface, water will be applied to the surface. The General Manager will assess the dust emission source and determine if routine preventive measures are required to prevent future emissions.

If a complaint about light levels at the site is received by NEWSME, the General Manager will be responsible for determining the source of the light overspill. Corrective action such as turning off unneeded lights, reducing the light wattage, or adding additional cutoffs will be directed by the General Manager if deemed necessary.

If a complaint about pests around the site is received, within 48 hours of receiving the complaint the General Manager will address the issue (e.g., contact a licensed exterminator to rectify the immediate problem) if deemed necessary. The General Manager will also review the operating procedures to determine if operational changes are required to prevent future problems.

If a complaint about noise is received by NEWSME, the General Manager will be responsible to investigate the complaint and determine the source of the noise. Once the source is determined, the General Manager will review the operating procedures to assure that the equipment is in good mechanical condition, and is being operated properly.

NEWSME is required to operate its facilities in accordance with noise regulations in MEDEP's Solid Waste Rules. These regulations limit the hourly equivalent operating sound limit to 60 dBA during daytime hours from 7:00 a.m. to 7:00 p.m. and 50 dBA during nighttime hours from 7:00 p.m. to 7:00 a.m. at protected locations (i.e., properties occupied by residences).

If the General Manager determines that the facilities are being operated in accordance with the conditions of its approvals, and a second noise complaint is presented to NEWSME from the same complainant, the General Manager will, within 7 days of receiving the complaint, engage a noise consultant to measure ambient sound level at the location of the complainant's residence. If the sound level is within the regulatory limits, no further action is required by NEWSME. If it is found that the facilities are not operating under approved regulatory limits, NEWSME will, within 7 days of receiving the complaint, retain a noise consultant to evaluate the operations and determine what corrective steps are required to bring the facilities into compliance with the noise regulations. The corrective action shall be undertaken as soon as practical but in no case greater than 90 days from receipt of the noise consultant's report, sound levels will be retested within 7 days of completing the corrective action to verify the effectiveness of the corrective action.

APPENDIX A

MEDEP OPERATING PERMITS

JUNIPER RIDGE LANDFILL
MDEP SOLID WASTE PERMITS
VOLUME I

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
1	S-20700-7A-A-N	07/28/1993	ORIGINAL LICENSE
2	S-020700-WD-H-M	07/21/1999	SEDIMENTATION POND #2
3	S-020700-WZ-I-N	10/01/1999	PILOT PROJECT-STABILITY
4	S-020700-WD-J-M	06/07/2000	CELL 2 CONSTRUCTION
5	S-020700-WD-K-M	05/30/2001	CELL 2 OPERATION
6	S-020700-WD-N-A	04/09/2004	LICENSE AMENDMENT
7	S-020700-WD-O-M	03/12/2004	ADDITIONAL ASH SOURCES
8	S-020700-WD-P-M	06/13/2005	CELL 3A CONSTRUCTION
9	S-020700-WD-R-M	05/01/2006	STORMWATER IMPROVEMENTS
10	S-020700-WD-S-M	07/27/2006	CELL 3B CONSTRUCTION
11	S-020700-WT-V-N	09/14/2006	SO. PARIS TANNERY SLUDGE
12	S-020700-WT-Y-N	02/20/2007	BRUNSWICK NAS SOILS
13	S-020700-WT-Z-M	03/14/2006	SO. PARIS TANNERY REVISION
14	S-020700-WD-LC-M	03/10/2008	LFG MANAGEMENT EXPANSION
15	S-020700-WT-AC-M	02/05/2008	BRUNSWICK NAS SOILS
16	S-020700-WD-AB-M	06/30/2008	CELL 4 CONSTRUCTION
17	S-020700-WH-AF-E	04/22/2009	SOLID WASTE TRANSFER STATION
18	S-020700-WD-T-C	06/15/2009	CONDITION #21 COMPLIANCE
19	S-020700-WD-AH-M	06/19/2009	CELL 5 CONSTRUCTION
20	S-020700-WT-AI-N	09/17/2009	BANGOR DREDGED SPOILS
21	S-020700-WT-AL-N	11/04/2009	BREWER LEAD IMPACTED SOIL
22	S-020700-WU-AN-N	03/01/2010	PTW OILY DEBRIS
23	S-020700-WT-AQ-N	04/15/2010	BNAS LEAD PAINT SOIL
24	S-020700-WU-AP-N	05/21/2010	PTL SULFUR WASTES
25	S-020700-WU-AJ-N	06/30/2010	BIOMEDICAL WASTE
26	S-020700-WT-AR-N	07/21/2010	HOWLAND TANNERY SLUDGE
27	S-20700-WD-AO-M	08/13/2010	CELL 6 CONSTRUCTION
28	S-020700-WD-W-M	09/10/2010	MSW BYPASS LIMIT (Soft Layer)
29	S-020700-WH-AV-M	10/28/2011	SOLID WASTE TRANSFER STATION-MINOR REVISION
30	S-020700-WD-AT-M	06/24/2011	CELL 7 CONSTRUCTION
31	S-02077-WD-AY-M	09/04/12	JRL, CELL 8 CONSTUCTION
32	S-020700-WD-AE-M	10/09/12	INTERMEDIATE COVER CHG
33	S-020700-WD-AG-M	10/09/12	CONDITION 7 – LEACHATE POND UNDERDRAIN DISCHARGE
34	S-020700-WD-BC-A	12/20/13	MSW AMENDMENT
35	S-020700-WD-BF-C	02/27/14	CONDITION COMPLIANCE 6 & 7 MSW ACCEPTANCE

JUNIPER RIDGE LANDFILL

VECTOR CONTROL PERMITS

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
A	MB670894-0	Renewed Annually	US FISH & WILDLIFE DEPREDATION PERMIT
B	U00606	Renewed Every 3-Years	EXPLOSIVES PERMIT BIRD BANGERS & POPPERS

LEACHATE DISPOSAL PERMIT

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
C	37-2679-07	03/03/2013	CITY OF BREWER INDUSTRIAL WASTEWATER DISCHARGE PERMIT

MDEP STORMWATER PERMIT

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
D	MER05B477	01/03/2006	INDUSTRIAL STORMWATER PERMIT

JUNIPER RIDGE LANDFILL

MDEP AIR LICENSING PERMITS

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
E	A-921-70-A-I	12/20/2005	TITLE V AIR LICENSE
F	A-921-70-A-I	12/06/2007	OPERATION OF FLARE #3
G	A-921-70-A-I	03/19/2008	OPERATION OF FLARES #2 & #3 TOGETHER
H	A-921-77-2-A	11/26/12	LICENSE AMENDMENT BACT
I	A-921-77-3-M	02/13/14	MINOR REVISION (THIOPAQ)
J	A-921-75-D-X	02/13/14	SALES AND USE TAX EXEMPTION CERTIFICATION
K	A-921-77-4-M	05-09-14	MINOR REVISION (MONITORING/SAMPLING)

JUNIPER RIDGE LANDFILL

MDEP SOLID WASTE PERMITS

VOLUME II

TAB #	PERMIT NUMBER	ISSUE DATE	DESCRIPTION
1	S-020700-WD-BH-C	10/07/14	SPECIAL CONDITIONS 21, 22, 23 NOISE AND VISUAL
2	S-020700-WD-BE-M	03-03-15	MINOR REVISION – LANDFILL GAS TREATMENT FACILITY
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IN THE MATTER OF

STATE OF MAINE, ACTING THROUGH THE	)	SOLID WASTE ORDER
STATE PLANNING OFFICE	)	
OLD TOWN, PENOBSCOT COUNTY, MAINE	)	
VERTICAL INCREASE and	)	
ADDITIONAL WASTE STREAMS	)	
#S-020700-WD-N-A	)	
(APPROVAL WITH CONDITIONS)	)	AMENDMENT

Pursuant to the provisions of Resolve 2003, Chapter 93; 38 M.R.S.A. Section 1301 et seq.; and 06-096 CMR Chapter 400 et seq., Solid Waste Management Regulations, effective September 6, 1999, the Department of Environmental Protection ("Department") has considered the application of the State of Maine, acting through the State Planning Office, with its supportive data, staff review comments, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. APPLICATION SUMMARY

   A. Application: The State of Maine, State Planning Office ("SPO" or "the applicant") is applying for an amendment to the original license for the West Old Town Landfill ("WOTL" or "the landfill"); SPO seeks to increase the approved final elevation of the landfill without increasing the horizontal footprint of the landfill, and to dispose of additional waste streams in the landfill.

   B. History: The WOTL was licensed by the Board of Environmental Protection on July 28, 1993 as a 15-cell generator-owned landfill for the disposal of pulp and papermaking residuals generated at the Fort James Operating Company's mill in Old Town. Summaries of information on the siting and design of the landfill are contained in the landfill license, DEP #S-020700-7A-A-N ("the original license"). The licensed footprint of the WOTL, including the accessory structures, is approximately 68 acres; it sits on a parcel of land approximately 780 acres in size.

      In summary, the landfill is situated on an area of deep glacial till soils with an average fines content of 58% passing the No. 200 sieve. The average till thickness is approximately 30 feet, and after excavation and grading to the proposed base grades of the landfill a minimum of 10 feet of soil above bedrock will remain in all areas. The bedrock consists of metasediments that are generally competent and occasionally fractured; there was no mapped or observed faulting in the bedrock beneath the site. The site does not overlay, or lie adjacent to, a mapped significant sand and gravel aquifer, nor a mapped high-yield bedrock zone. The proposed facility was found not to cause an unreasonable threat to a significant sand and gravel aquifer, or to a fractured bedrock aquifer. The closest water supply well is located approximately 1500 feet west of the site across a bog and stream, and on the other side of a topographic ridge. The landfill was located on the property in an area where seepage gradients and the site's topography hydraulically isolate it from the regional ground water systems and existing water supplies.

The landfill began operation in December 1996, and cells 1 and 2 have been developed. In addition to the wastes from the Old Town Mill, bottom ash from the Lincoln Pulp and Paper Mill in Lincoln, Maine and burn pile ash from the City of Old Town's transfer station are licensed for disposal in the landfill. Fort James Operating Company is a wholly owned subsidiary of Georgia-Pacific Corporation ("GPC"). The landfill has a composite liner system, and leachate is stored in a pond with a double liner system. Approximately 300,000 tons of waste has been disposed in the landfill. No complaints from the public about any aspect of the landfill's operation were received by the Department prior to the submission of this application.

In April 2003 GPC shut down 2 tissue machines and 13 converting lines at its Old Town Mill. Through negotiations with the Office of the Governor, GPC agreed to continue operation of its mill in Old Town, Maine under certain conditions. One of the conditions was that the State of Maine purchase the company's West Old Town Landfill, and provide disposal capacity for the mill's wastes for a 30 year period. In June 2003, following a public hearing before the Legislature's Natural Resources Committee, the Maine Legislature passed Resolve 2003, Chapter 93 ("the Resolve"). The Resolve authorized SPO to purchase the WOTL from Fort James Operating Company, and to enter into any contracts necessary for the operation of the landfill; however, the landfill will continue to be owned and controlled by the State. SPO initiated a competitive bid process to select a long-term operator for the landfill. On August 18, 2003, SPO notified Casella Waste Systems, Inc. ("Casella") that it had been selected to be the long-term operator of the landfill, pending successful negotiation of mutually agreeable terms. Actual operations will be by NEWSME Landfill Operations, LLC ("NEWSME Operations"), a company in which New England Waste Services of ME, Inc., a Casella subsidiary, holds the sole membership interest. In accordance with the intent of the Resolve and the terms of the State's Request for Proposals ("RFP"), the operation of the landfill will remain revenue-neutral to the State.

SPO, Fort James Operating Company and GPC signed a purchase and sales agreement, dated November 20, 2003, for transfer of the ownership of the West Old Town Landfill from Fort James Operating Company to SPO; the purchase and sales agreement was executed on February 5, 2004. In addition, SPO and Casella signed an Operating Services Agreement ("OSA") on February 5, 2004. The purchase and sales agreement and the OSA state that the pulp and paper mill wastes currently licensed for disposal in the landfill will continue to be disposed in the landfill for at least 30 years, and that SPO will seek permits to expand the capacity of the landfill. Under the terms of the OSA between SPO and Casella, Casella will pay all costs associated with development, operational and closure/post-closure activities at the landfill.

On October 21, 2003, following public notice as required by 06-096 CMR Chapter 2, the Department issued conditional approval for the transfer of the licenses for the WOTL from Fort James Operating Company to the SPO (DEP #S-020700-WR-M-T and #L-019015-TH-C-T); the transfer became effective when the sale of the landfill to SPO occurred on February 5, 2004. No appeals were filed from this approval.

C. <u>Summary of Proposal:</u> SPO proposes to increase the licensed final elevation of the landfill from 270 feet (which would be about 60 feet above the original ground surface) to 390 feet. This vertical increase would result in the disposal capacity of the landfill being increased from the original estimate of 3.3 million cubic yards to an estimated 10 million cubic yards. In addition to the wastes currently disposed in the landfill (sludge from Fort James' Old Town Mill and ash from Lincoln Pulp & Paper), SPO proposes to dispose of the waste streams generated in Maine that are currently accepted for disposal at the Pine Tree Landfill in Hampden, Maine. These waste streams are the following: construction and demolition debris; the residues (ash, front-end process residue and oversized bulky wastes) generated by municipal solid waste ("MSW") incinerators located in Maine; a limited amount of MSW bypass from the incinerators; water/wastewater treatment plant sludge; and smaller amounts of miscellaneous non-hazardous wastes. The proposed vertical increase is expected to provide disposal capacity for approved waste streams for up to 15 years. After construction of a new cell is completed during the summer of 2004 and the additional wastes begin coming to the facility, the applicant estimates approximately 450,000 tons of waste per year will be disposed in the landfill; in the future, that quantity is estimated to potentially increase to 540,000 tons per year. In accordance with the RFP and the OSA between SPO and Casella, waste that is generated outside Maine will not be accepted at the landfill.

The applicant proposes to modify the approved design of the facility by using clay as the earthen part of the composite liner instead of glacial till; by placing a foot of compacted clay beneath the undeveloped portions of the landfill's footprint; by eliminating liner penetrations associated with the leachate removal system and instead installing leachate collection sumps and removal pumps above the liner system; by adding an above-ground storage tank to be used as the primary leachate containment system; and by installing an active gas extraction system as the landfill is developed. To increase the capacity of the landfill, an elevated soil berm will be constructed around the perimeter of the landfill, with the interior toe of the berm within the currently licensed solid waste boundary. The western portion of the berm will be mechanically stabilized using reinforcing geogrids.

The proposal is described in an application dated October 2003 and submitted to the Department on October 30, 2003, and includes several additional submittals prepared in response to comments on the application.

The application was accepted for processing on November 21, 2003. In addition to meetings held with municipal officials to discuss traffic impacts associated with the facility, a public informational meeting on the application was held on January 21, 2004. A written summary of the questions asked and the answers provided during the public informational meeting is part of the record. A draft license was made available to the public on February 17, 2004. The Department received written comments on the draft license and also participated in a public informational session on February 24, 2004; written comments submitted during that session are included in the record. The Department held 2 days of public sessions on the proposed project on March 29 and 30, 2004. Testimony under oath was accepted, and the sessions were recorded and transcribed. The transcriptions and copies of written comments submitted at these sessions are included in the record. The record was closed to receipt of comments on the application at the close of the last session held on March 30, 2004. The Department prepared a written summary of comments received throughout the processing of the application; this summary is included in the record. The application was reviewed by staff of the Department's Bureau of Remediation and Waste Management, staff of the Maine Department of Transportation, and the outside consulting firm Terrence J. DeWan & Associates. Mr. DeWan's firm provided the review of the updated visual impact assessment through a contract with the Department.

The Department finds that the applicant has provided a plan for all aspects of the development of the additional landfill capacity within the licensed footprint. As is typical, the applicant has not provided the detailed design packages required for construction. The applicable detailed design packages required by the Solid Waste Management Regulations ("Rules") and any information specifically described in the finding of facts below must be reviewed and approved by the Department prior to construction of the individual cells and any new ancillary structures for the landfill.

The Department received numerous comments from the public on the application, and on the State's transaction with GPC as a whole. Many of these comments, both in opposition to and in support of the transaction, were received on aspects of the transaction that are outside the purview of the Department's authority, and thus the Department cannot make findings of fact or conclusions of law on these issues. These aspects included the following issues: the legislative process, ending in the Resolve that authorized the purchase of the landfill; the RFP and bidding process that resulted in the selection of Casella as the operator of the landfill; the terms of the Purchase and Sales Agreement between GPC and the State of Maine, acting through the State Planning Office; the terms of the OSA between SPO and Casella; the establishment and duties of the Citizens Advisory Committee established by the Resolve; the host community benefits offered by SPO and/or Casella; the effect of the project on property values in the area; and the 80,000 pound weight limit on trucks using I-95, which results in heavy trucks using local roads.

The Department finds that this application for a vertical increase in the final elevation of the existing landfill is not an expansion of the landfill because solid waste will not be disposed beyond the boundaries previously licensed by the Department for solid waste disposal in the original license. The Department recognizes that under the terms of the RFP and the OSA, an application to the Department for an expansion of the landfill is required to be submitted. However, the applicant has not submitted an application for expansion or yet discussed its plans for submission of an expansion application; and thus no comments relating to development of the landfill facility beyond the vertical increase described in this application can be considered at this time.

2. PUBLIC PARTICIPATION

The Department received timely requests for a public hearing from the following 5 persons: the Town of Alton, Bruce Sidell, Oscar Emerson, William Lippincott, and the Maine Peoples Alliance. 06-096 CMR Chapter 2.7 states, in part, that "A request for a public hearing on an application must be received by the Department, in writing, no later than 20 days after the application is accepted for processing." The application was accepted for processing on November 21, 2003; thus, the 20 day period ended on December 11, 2003. On January 28, 2004, the Department notified all 5 persons that their requests did not include conflicting technical information, and thus their requests were denied because they failed to meet the standard for a public hearing in 06-096 CMR Chapter 2.7. The Department also received a timely request from the City of Brewer that the Board of Environmental Protection assume jurisdiction of the project and hold a public hearing; the City of Brewer withdrew its request on January 28, 2004 after its concerns with the traffic impacts associated with the project were addressed.

As noted in Finding of Fact #1.C, above, many comments were received by the Department that cannot be considered because they fall outside the Department's purview.

The majority of the remaining comments from people opposed to the project focused on issues related to traffic movement, ground water quality, visual impact of the facility, odors, the types of wastes to be accepted at the facility and Casella's civil and criminal record.

The majority of the remaining comments from people supporting the project focused on it being an existing and operating, well-sited landfill, and Casella's excellent records of operating facilities in their areas. Commentors also note that area residents' concerns were addressed during the original siting and licensing of the landfill, that operation of the landfill to date has not been problematic, and that the landfill will provide needed disposal capacity for the state.

As noted in Finding of Fact #1.C, above, the Department participated in several public meetings on the project: meetings were held on December 8, 2003 and December 16, 2003 with municipal officials to discuss the traffic impacts from the project; public informational meetings were held on January 21, 2004, February 24, 2004, March 29, 2004 and March 30, 2004.

Where applicable, comments on the project that are within the Department's purview are addressed in the appropriate findings of fact, below. In addition, a written summary of comments received throughout the processing of the application is included in the record.

3. DESCRIPTION OF SPO/CASELLA RELATIONSHIP

As described in Finding of Fact #1.B., above, the State of Maine SPO is the owner of the landfill and the applicant for this application. SPO advertised an RFP to operate the landfill. At the conclusion of that process, Casella was selected to be the long-term operator of the landfill. Actual operations will be by NEWSME Operations, a company in which a Casella subsidiary holds the sole membership interest. The terms and conditions of NEWSME Operations' operation of the landfill are established by the OSA, dated February 5, 2004, between SPO and Casella.

While SPO retains control of the landfill, in accordance with the Resolve and the OSA, Casella/NEWSME Operations will pay all costs associated with the development, operation, closure and post-closure care of the landfill. In addition, Casella/NEWSME Operations will establish and maintain financial assurance for the landfill sufficient to meet the closure and post-closure care provisions of the Rules, assume liability for the landfill under both the current (including past actions by GPC) and future conditions, and assure that adequate disposal capacity is provided for the wastes currently disposed in the landfill for a 30 year period.

Condition #6 of the order transferring the landfill licenses (DEP #S-020700-WR-M-T, dated October 21, 2003) from Fort James Operating Company to SPO requires that if Casella or a subsidiary of Casella is replaced as the operator, prior to finalization of a new OSA SPO must submit to the Department for its review and approval information on the financial capacity of the new operator, information on the financial assurance to be provided by the new operator consistent with Chapter 400.11 of the Rules or successor regulations in effect at that time, and information on the technical ability of the new operator.

The Department finds that in many instances the responsibility for submittals required by this license are placed on Casella/NEWSME Operations (or a successor operator) by the OSA. Therefore, reference to the applicant in this license refers to both SPO and Casella/NEWSME Operations (or a successor operator).

4. FINANCIAL CAPACITY

A. Funding for development, operation, closure and post-closure care of the facility: Under the provisions of the RFP and the OSA, Casella/NEWSME Operations is required to fund future development and operation of the landfill, and closure and post-closure care of the landfill. The application includes a letter demonstrating that monies are available to fund the construction proposed for 2004; thereafter evidence of financial capacity for construction costs is proposed to be demonstrated prior to each subsequent construction activity. Funds to cover facility operations and maintenance will be generated from facility tipping fees. Financial assurance will be provided as described in Finding of Fact #4.B, below. The Department finds that the applicant has demonstrated that it has the financial capacity to undertake the proposed project consistent with the State's environmental standards and laws with regards to the construction planned for 2004 and the operation of the landfill. The Department further finds that the applicant must demonstrate financial capacity for costs associated with construction of each additional cell; the information must be included in the detailed design package as required in Finding of Fact #11, below.

B. Financial Assurance: Casella/NEWSME Operations affirmed in a letter dated October 22, 2003 that it will initially fund a closure/post-closure care account through a trust account funded by a surety bond. In accordance with Chapter 400.11 of the Rules, the financial assurance mechanism will be submitted to the Department for its review and approval; the amount of the financial assurance will be based on the costs of a third party closing any developed areas of the landfill that have not received final cover, and conducting post-closure care and maintenance of the facility for at least 30 years after closure of the facility, in accordance with the Rules. The amount of financial assurance necessary to meet these requirements, and any changes in the financial assurance mechanism, will be calculated and adjusted annually during the operational period, and reported in the annual report for the facility. The Department finds that Casella/NEWSME Operations, as the operator of the facility and as required by the OSA, will provide financial assurance sufficient to ensure that funds are available to pay for the anticipated costs of compliance with all facility closure, post-closure maintenance, and post-closure monitoring requirements for a period of at least 30 years after closure of the facility, provided the financial assurance package submitted to the Department for its review and approval meets requirements of the Rules and Casella/NEWSME Operations updates it in accordance with the Rules on an annual basis.

5. TECHNICAL ABILITY

A. Description of Experience: The applicant provided information demonstrating the technical ability of both SPO and the selected operator, Casella, its subsidiary NEWSME, and NEWSME Operations. The application describes SPO's experience in siting, designing and licensing the Carpenter Ridge Landfill. It also describes the solid waste expertise of Casella and its subsidiaries, and its consultants and legal counsel. The application indicates the personnel currently responsible for operations at the Pine Tree Landfill in Hampden, Maine will be responsible for fulfilling the operating services contract at this landfill; the Pine Tree Landfill is consistently operated in substantial compliance with its licenses and the Rules.

The applicant retained a number of consultants in developing the application. Sevee & Maher Engineers, Inc. ("SME"), a firm specializing in waste management issues, was the primary consultant for the project. The applicant also retained SMRT, Inc. to prepare the visual impact portion of the application; Richard E. Wardwell, P.E., Ph.D. for work on the geotechnical aspects of the application; Sanborn Head & Associates for work on the active gas management system for the landfill; Eaton Traffic Engineering to prepare the traffic assessment portion of the application; Acentech Incorporated to prepare the section of the application that addresses potential noise impacts; and Odor Science & Engineering, Inc. for work on odor control measures for the facility.

The Department finds that the combination of SPO and NEWSME Operations personnel and the consultants retained by the applicant have the technical ability to develop the project in a manner consistent with State standards and laws.

B. Civil/Criminal Disclosure Statement: The applicant provided civil and criminal disclosure statements prepared in accordance with Chapter 400.12 of the Rules for SPO and Casella, including its subsidiaries and the individuals required to disclose under that regulation, in the transfer application approved by the Department on October 21, 2003; the Department did not require the applicant to provide another copy of that information in this application.

The Department received comments from the public on alleged environmental violations by Casella. Department staff ("staff") requested that Casella respond to the listing of violations; Casella provided information on each of the alleged violations. Letters from municipal and county officials praising Casella's management of many of the facilities listed in the comments have been submitted. Staff also contacted environmental enforcement staff in states where the violations were alleged to occur and discussed the list provided by the public. Staff comments that based on those conversations, and the submittals from Casella and the municipal and county employees, there is no reason to withhold this license due to Casella's civil or criminal record. Staff's evaluation of the nature, substance and severity of the violations, and state and local officials' assessment of Casella's willingness to correct violations demonstrate that, where Casella is found to have violated regulatory or license criteria, it will complete any required corrective actions.

The Department finds that the applicant filed an accurate Criminal/Civil Record, prepared in accordance with Chapter 400.12 of the Rules. The Department finds that the applicant has shown that past violations of certain environmental laws, as described in the application, will not prevent SPO from owning and controlling, and NEWSME Operations from operating, the landfill as proposed in this application in compliance with Maine laws and regulations in that Casella/NEWSME Operations has conducted the required corrective actions to resolve its previous violations.

6. TITLE, RIGHT OR INTEREST

The Department finds that the applicant has provided evidence of its interest in this project by submitting a copy of the purchase and sales agreement, dated November 20, 2003, between SPO and Fort James Operating Company. The closing on the transfer of the landfill property occurred on February 5, 2004. In accordance with Condition #2 of the transfer order (DEP #S-020700-WR-M-T, dated October 21, 2003), SPO submitted a copy of the deed to the landfill property within 30 days of its entry in the Penobscot County Registry of Deeds.

7. GEOLOGY AND HYDROGEOLOGY

A detailed description of the geology and hydrogeology of the site is contained in the original license; a summary of the siting characteristics is found in Finding of Fact #1.B, above. As confirmed during preparation of the application, the geologic and hydrogeologic characteristics of the site have not changed since the issuance of the original order and thus are not subject to the siting criteria of these Rules; however, in accordance with the Rules, the application addresses any impact the existing facility is having on water quality, affirms that groundwater flow directions and the upward seepage gradients have not changed in a significant way that would invalidate the landfill design assumptions, provides a calculation of time of travel to sensitive receptors from the bottom of the landfill and the leachate storage system, and includes a contaminant transport analysis.

A. Groundwater Flow Directions: Attachment 8 of the application includes a review of all groundwater data that has been collected at the site from 1991 when the original application was filed through September 2003. The applicant's consultant for this review, SME, reviewed the available groundwater information, and concluded that the phreatic groundwater surface has not significantly changed since the original application. Groundwater passing beneath the landfill continues to remain within the landfill property prior to discharge. Based on the orientation of bedrock foliation, it is suggested that the primary horizontal direction of groundwater flow in the bedrock is more or less the same direction as the interpreted direction of horizontal flow in the overburden. Groundwater in the bedrock continues to be interpreted as discharging into the stream along the westerly side of the landfill, due to the presence of a topographic hill south of the stream which significantly reduces the possibility of groundwater movement beyond it. The review of the information on vertical seepage gradients indicates groundwater continues to migrate downward in the upper portions of the site and tends overall to migrate upwards in the lower portions of the site.

All staff comments on the groundwater flow information for the site have been addressed. Based on the additional information submitted in support of the application on November 21, 2003, staff agree with SME's conclusions on groundwater flow directions and vertical seepage gradients.

The Department finds that the findings in the original license regarding the direction of groundwater flow have not changed as a result of the construction and operation of the existing landfill.

B. Existing Groundwater Quality: As noted in Finding of Fact #7.A, Attachment 8 of the application includes a review of all water quality data that has been collected at the site from 1991 when the original application was filed through September 2003. The site is currently monitored by 12 groundwater monitoring wells; the results from the 12 monitoring wells were analyzed for statistically significant increases. Nine of the 12 wells were found to have one or more parameters that varied over time based on the statistical analyses; of these 9 wells, SME concluded that only one, MW-204, was potentially affected by leachate. SME concluded the changes found in the other 8 wells were caused by well installation trauma or a source other than leachate in the groundwater, based on its review of the parameters for which a statistically significant change was found. With regards to the water quality changes noted in MW-204, SME noted that the well is a shallow till well located immediately adjacent to the leachate pond and the manhole used for emptying of the leachate pond for annual inspection. SME concluded the changes in MW-204 were likely attributable to small leachate spills in the vicinity of the manhole and leachate pond during emptying of the leachate pond for annual inspections, rather than directly into groundwater from the landfill or the leachate pond. SME's basis for its conclusions are described in detail in the application.

Staff conducted a comprehensive review of all water quality information available for the site, including the same historic water quality results compiled by GPC's water quality sampling consultant that were reviewed by SME in the application, the data gathered by the consultant GPC hired to perform a baseline analysis of conditions on the property just prior to its purchase by SPO, and data gathered from monitoring wells installed in January and February 2004 to resolve the source of changes in groundwater quality discussed during the review of the application. In an initial review memorandum dated December 16, 2003, staff noted that the water quality changes have occurred in 3 monitoring wells: MW-204, MW-223B, and MW-302. Staff agreed that the sources of changes noted in these wells could be those operational issues identified by SME in its report, but that the applicant had not provided sufficient evidence to conclude the landfill or the leachate pond were not the sources.

In response to the initial staff review memorandum, the applicant and GPC provided additional information concerning operational anomalies at the site, and 7 additional groundwater monitoring wells were installed by the applicant at the facility. Five of the wells are located between the landfill boundary and the leachate pond, and 2 of the wells are located downgradient of the leachate pond and/or in the vicinity of manhole #1. Staff oversaw the installation of the wells by the consultant, and staff took independent split samples from the wells. Up to 4 rounds of data have been collected from the new wells. Additional samples from the landfill underdrain, the leachate pond underdrain, and the leak detection system for the leachate pond were also taken during this period. Based on the information in Attachment 8 of the application and the new information gathered during review of the application, staff comment that, within the limitations of the data, a leak in the landfill liner system is not the source of the water quality changes noted in the initial staff memorandum regarding this project. Staff comment that the sources of the water quality changes are likely due to operational practices related to leachate management, such as the small surface spills documented to have occurred in the past. Staff recommend several operational changes which will eliminate the release of leachate. The applicant has agreed to the changes. Staff further recommend that additional investigations be conducted in Spring 2004 to monitor the performance of the facility's existing detention ponds, and that the ponds be included in the surface water quality monitoring program for the facility. The applicant submitted on April 1, 2004 a workplan for the additional investigation in the areas of the detention ponds; the workplan is under review by staff. Staff comment that the approved workplan should be revised to address staff recommendations and implemented as approved.

The Department finds that the subtle changes in groundwater quality observed in monitoring wells MW-204, MW-223B and MW-302 do not appear to be caused by leakage through the landfill liner system. The Department also finds that the applicant must submit to the Department for review and approval changes to the operations manual that address all staff recommendations; complete the investigation in the areas around and beneath detention ponds 1 and 2 in accordance with the workplan approved by the Department; and include the ponds in the surface water quality monitoring program for the facility. The Department further finds that the facility is not contaminating groundwater in that no primary drinking water standards have been exceeded, and no statistically significant changes in measured parameters indicating a deterioration in water quality have been demonstrated through an assessment monitoring program.

The Department received many comments from the public in reaction to staff's initial memorandum regarding the water quality assessment; no independent information on water quality was submitted by the public. The Department finds that, as noted in this finding, the comments on existing water quality have been addressed by the additional information gathered during the review process. The Department also received comments from the public on the hydrologic connection between the landfill and the City of Old Town's drinking water supply. As described in Finding of Fact #1.B, above, the facility is hydraulically isolated from private drinking water supplies in the area of the landfill. The City of Old Town's public drinking water supply is wells located in Stillwater and along Spring Street; there is no direct hydraulic connection between these wells and the groundwater beneath the landfill. The Department finds that the landfill does not pose an unreasonable threat to the public drinking water supply.

C. Existing Surface Water Quality: Attachment 8 also includes a review of the surface water quality data that has been collected at the site from 1991 when the original application was filed through September 2003. There are 3 surface water monitoring points (SW-1, SW-2 and SW-3) along the unnamed stream on the westerly boundary of the facility. The report notes that there were no apparent or significant changes in water quality at these locations. This stream is the sensitive receptor for the landfill; see Finding of Fact #7.D, below. Although labeled as a surface water monitoring location, SW-4 is actually the sampling manhole for the cells 1 and 2 underdrains; the report notes that the data from this monitoring point is comparable to upgradient monitoring locations. There are 3 surface water monitoring points along the entrance road into the landfill (SW-AR1, SW-AR2 and SW-AR3); the results from these locations also show no changes in water quality data over time. Staff concur with the applicant's conclusions regarding the historical surface water quality monitoring results.

The Department received comments from the public that baseline testing for biological indicators of water quality should be done at the site.

The Department finds that the facility is not contaminating surface water. The Department further finds that baseline surface water quality was established in accordance with the Rules before the landfill was developed and that the Rules do not include provisions for biological indicators testing.

D. Updated Time of Travel Calculations and Contaminant Transport Analysis: Updated time of travel calculations for the landfill prepared in accordance with the Rules are found in Section 7 of the application. Using available water level information collected at the site since 1991, the applicant calculated groundwater time-of-travel from the bottom of the landfill liner systems to the sensitive receptor for the site – the unnamed stream along the westerly boundary. The updated contaminant transport analysis, also prepared in accordance with the Rules, assesses the potential for an unreasonable threat to the unnamed stream at the westerly boundary of the landfill, and identifies operational and monitoring measures that would be utilized to ensure protection of the stream if contaminants were released to groundwater beyond the engineered systems.

The report modeled contaminant transport from within 3 areas of the landfill, the leachate storage tank, and the leachate force main in hypothetical failure scenarios. The results demonstrate that even under the unrealistic failure scenarios required to be modeled, the sensitive receptor in the vicinity of the landfill will not be threatened.

In response to initial staff comments on the time-of-travel calculations and contaminant transport analysis, SME recalculated some of the travel time analyses and hypothetical leachate containment system failure analyses for the entire flow path to the unnamed stream to the west, using the groundwater velocities in the bedrock submitted in the original application. Staff comment that the revised calculations show that the regulatory time frames are met.

The Department received comments from the public that the bedrock underneath the landfill is "cracked". The Department finds that the entire State of Maine is underlain by fractured bedrock. The Rules require a detailed evaluation of underlying fractured bedrock aquifers to determine that a facility will not pose an unreasonable threat to an underlying fractured bedrock aquifer.

The Department finds that the applicant has demonstrated that the time of travel to the sensitive receptor for the landfill is greater than 6 years, and greater than 3 years for the proposed leachate force main and storage tank. The Department also finds that the contaminant transport analysis demonstrates that contaminant releases from the area within the solid waste boundary or the leachate management system will not pose an unreasonable threat to sensitive receptors.

8. WATER QUALITY MONITORING

The proposed environmental monitoring plan ("EMP") for the facility was prepared in accordance with the Rules and is found in Appendix H of the application. The applicant proposes to continue monitoring groundwater at the existing 12 monitoring wells, surface water at the existing 6 monitoring points, the underdrains for the landfill and the leachate pond at the existing 2 surface water points, and leachate quality. Monitoring will be done 3 times per year, using low flow methodology. The applicant proposed to continue monitoring for the existing detection monitoring list for the landfill, plus sulfide during the spring and fall sampling events, and for parameters on the expanded list for the landfill during the summer sampling event. The EMP describes the sampling procedures to be used, the quality assurance/quality control program, the submission of the data to the Department, and procedures for the abandonment of wells.

Staff proposed several revisions to the EMP to clarify that the EMP will require ongoing revisions as the facility is developed. Although the results from the new groundwater monitoring wells described in Finding of Fact #7.B, above, appear to corroborate the applicant's conclusions as to the source of the slight changes in existing water quality, staff recommend that assessment monitoring be initiated at monitoring wells MW-204, MW-302, MW-223B, MW-212 and MW-303 during the Spring 2004 sampling event and that new monitoring locations in the area of the detention ponds be added to the assessment monitoring program after their installation. Staff further recommend that the 3 new clusters of monitoring wells proposed in the application be installed in Spring 2004, and that new monitoring wells #DP-4, #P-04-02 and #P-04-04 and the 2 existing detention ponds be included in the detection monitoring program. Staff further recommend that the underdrain for the landfill be added to the EMP for the facility; all landfill underdrain discharge locations should be monitored monthly for the field parameters in Appendix A, Column 1 of Chapter 405 of the Rules, and be sampled 3 times per year for the facility's suite of detection parameters at the same time as the other monitoring locations.

Staff also comment that the existing underdrains for the landfill and the leachate pond are directed through manholes where water quality monitoring can be conducted. The system allows for the removal of the water into the leachate containment system instead of discharge into the stormwater structures if the water quality results indicate it should not be discharged. Staff recommended, based on investigations done in January and February 2004 that the underdrain for the leachate pond be routed into the leachate pond. A pump has been installed in manhole #MH 7 and this underdrain discharge is being directed to the leachate pond. Staff also recommend that the underdrain for the existing leachate pond be sampled weekly throughout 2004, and an analysis of the results be included in the 2004 annual report for the facility.

The Department finds that the applicant has proposed an EMP prepared in accordance with the Rules. The Department further finds that the applicant must update the EMP on an ongoing basis as recommended by staff, beginning with the submittal of the 2003 Annual Report. The Department also finds that assessment monitoring must be initiated at existing monitoring wells MW-204, MW-302, MW-223B, MW-212 and MW-303 during the Spring 2004 sampling event; that the new monitoring locations in the area of the detention ponds be included in the assessment monitoring program beginning with the Summer 2004 sampling event; and that the new monitoring wells #DP-4, #P-04-02 and #P-04-04 and the 2 existing detention ponds must be included in the detection monitoring program in addition to the 3 new clusters of monitoring wells proposed in the application to be installed in Spring 2004. The Department also finds that the underdrain for the landfill must be added to the EMP for the facility; all landfill underdrain discharge locations must be monitored monthly for the field parameters in Appendix A, Column 1 of Chapter 405 of the Rules, and be sampled 3 times per year for the facility's suite of detection parameters at the same time as the other monitoring locations. The Department also finds that the underdrain for the leachate pond has been routed into the leachate pond, and that the leachate pond underdrain water quality must be sampled weekly throughout the rest of 2004 and an analysis of the results be included in the 2004 annual report for the facility. The Department also finds that the proposed construction at the facility will not affect the ability to monitor water quality at the facility site.

9. LANDFILL DESIGN

A. Summary of Current Design: The design of the facility is described in the original license and the construction documentation for cells 1 and 2. Cells 1 and 2 of the landfill have been developed; a temporary geomembrane intermediate cover has been placed on cell 1 and cell 2 is currently operational. The approved composite liner system for these cells consists of, from top to bottom, a 15-inch drainage sand leachate collection system with perforated collection pipes (underlain by a drainage geocomposite in cell 2); an 80-mil textured high-density polyethylene ("HDPE") geomembráne; a geosynthetic clay liner ("GCL"), and 24 inches of recompacted glacial till with a maximum hydraulic conductivity of 3x10^{-6} cm/sec. A groundwater underdrain system consisting of a 6-ounce non-woven geotextile, 12 inches of drainage sand with collection pipes, and another 6-ounce non-woven geotextile underlies most areas under these cells. Leachate is conveyed by gravity to a leachate storage pond located outside the western boundary of the landfill. Leachate is transported from the pond via a force main to a loading rack where it is loaded into tank trucks for transport and subsequent treatment and disposal at the Old Town Mill's wastewater treatment facility. The pond has a double liner system, consisting of two 80 mil HDPE geomembranes, with a drainage geocomposite and sand leak detection layer in between. The secondary geomembrane is underlain by a GCL and 2 feet of recompacted glacial till with a maximum hydraulic conductivity of 3x10^{-6} cm/sec. Landfill gas is passively vented to the atmosphere.

B. General Description of Proposed Design: As noted above, cells 1 and 2 have already been developed. The waste currently in these cells will be excavated and mixed with incoming waste to improve the geotechnical stability characteristics of the existing sludge (see Finding of Fact #10.A, below) and then cells 1 and 2 will be refilled. The leachate collection, liner, and underdrain system for cells 1 and 2 will continue in service. Cells 3 through 8 will be located on the base grade for the landfill, and cells 9, 10 and 11 will be developed over cells 1 through 8. To accommodate the proposed vertical increase in the final elevation, a berm will be constructed around the perimeter of the landfill as it is developed. The berm will be constructed entirely of soil, except for the western portion of the berm which is proposed to have mechanically stabilized exterior grades. The landfill will be developed in a sequential manner as shown on the cell development plan for the facility.

All base grade cells will include a liner system overlain by a leachate collection system. The original liner system has been modified through the use of compacted clay rather than compacted glacial till for the soil component of the composite liner system. Instead of the pipe liner penetrations currently used to convey leachate from cells 1 and 2 (which will be removed and repaired as part of cell 4 construction), cells 3 through 8 will have leachate collection sumps and pumps located above the liner system. A groundwater underdrain system will underlie the liner system for cells 3 through 8. Gas produced by the landfill will be burned off initially through the use of passive flares. When the gas produced is of sufficient quantity and quality to support combustion, an active gas extraction system will be installed as described in Finding of Fact #9.E. The cells will be developed sequentially, and intermediate or final cover will be placed as the cells are filled. The leachate from the landfill will be conveyed through a force main to a new above-ground storage tank with the existing leachate pond used only as a backup system. The stored leachate will be emptied into tank trucks for transport to the Old Town Mill's wastewater treatment plant. In the future, the leachate may be transported to the City of Old Town's wastewater treatment plant via a new sewer line along Route 43, after studies of the treatment plant, and any necessary upgrades identified in the studies, are completed and if the City of Old town approves the acceptance of the leachate. As described more fully in this finding and in Finding of Fact #11, below, detailed design packages will be submitted to the Department for review and approval prior to each construction project at the facility.

The Department received comments from the public regarding bioreactor (wet cell) landfills. Commentors suggested that the Department require that landfill cells constructed under this license utilize wet cell technology. The Department finds that the applicant did not propose and the Rules do not require an applicant to consider the use of wet cell technology. Furthermore, the United States Environmental Protection Agency published a Final Rule in the Federal Register on March 22, 2004 entitled Research, Development, and Demonstration Rule (RD&D) for municipal solid waste landfills. The effective date of this rule is April 21, 2004. This rule addresses design and operational criteria variances that are necessary in order to develop information on bioreactor landfills. The applicant has provided correspondence dated April 5, 2004 documenting its willingness to explore the feasibility of wet cell or bioreactor technology.

C. Liner System and Perimeter Berm: The liner system proposed for the base grade cells of the landfill will consist of, from top to bottom: a leachate collection layer consisting of 12 inches of drainage sand with perforated HDPE collection pipes over a drainage geocomposite; an 80-mil HDPE textured geomembrane; a GCL; and one foot of compacted clay with a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec. The liner system will be underlain by an additional foot of compacted clay with a maximum hydraulic conductivity of $1x10^{-7}$ cm/sec. Three internal leachate sumps will be constructed to collect all leachate generated by both the existing and new cells. The existing leachate transport pipes that penetrate the liner system to convey leachate to the storage pond will be removed and the liner repaired and tested. The landfill liner will be underlain by a groundwater underdrain system consisting of twelve inches of sand with perforated HDPE collection pipes. The underdrain system is designed with groundwater quality monitoring sumps.

As noted previously, a berm is proposed to be constructed around the perimeter of the landfill. The berm is required to achieve the increase in the final elevation of the landfill. It will be constructed entirely of soil, except for the western portion where it is proposed to have mechanically stabilized exterior grades due to wetland setback limitations. The interior of the berm will have 3 horizontal to 1 vertical sideslopes. The exterior sideslopes where the berm will be constructed entirely of soil will have 2 horizontal to 1 vertical grades. The mechanically stabilized earthen ("MSE") portions of the berm will have 1 horizontal to 3 vertical sideslopes. The height of the berm will vary from 19 feet along the western side to 30 feet along the eastern side of the landfill. The top surface of the berm will be approximately 44 feet wide. A 20-foot wide access road, surface water drainage ditches and the valve houses for the leachate pumping stations will be located on the top of the berm. The berm will be constructed in phases concurrent with cell development. Geotechnical analyses of the berm, for both short- and long-term conditions, demonstrate that it will remain stable with the appropriate factors of safety; see Finding of Fact #10.C, below.

Staff comment that all issues raised in initial review memoranda regarding the liner system and the perimeter berm have been satisfactorily resolved, provided that the detailed design packages to be submitted prior to each construction project address all staff recommendations regarding the design, the technical specifications, and the construction quality assurance plan as agreed to in SME's January 22, 2004 responses to the comments provided in 3 initial engineering review memoranda by staff.

The Department finds that the liner system and the perimeter berm proposed by the applicant are designed in accordance with the Rules, provided that the detailed design packages to be submitted to the Department for review and approval prior to each construction project address all staff recommendations on the design, the technical specifications, and the construction quality assurance plan as agreed to in SME's January 22, 2004 responses to the comments provided in 3 initial engineering review memoranda by staff.

D. <u>Leachate Collection, Conveyance and Storage System:</u> The leachate collection system for the base grade cells will consist of a 12-inch layer of drainage sand (drainage stone on the top 10 feet of the sideslopes) with perforated leachate collection pipes, a drainage geocomposite, several leachate collection inlets, and tee connections on the leachate collection system cleanouts. The inlets and tee connections will help facilitate leachate drainage during operations, including the development of upper lifts. Pressure transducers will be placed within each base grade cell in order to monitor the performance of the leachate collection system.

Leachate will be collected within the perforated pipes, directed to sumps, and pumped through a double-walled force main to an above ground storage tank. The existing leachate storage pond will be used for back-up storage capacity with the leachate flows pumped directly to it if the leachate storage tank is full.

The applicant proposes to construct a new 81-foot diameter by 25-foot high above-ground tank with a capacity of 900,000 gallons for the storage of leachate generated by the landfill. The tank will be underlain by a leak detection system and a secure secondary containment structure sized to contain 110 percent of the maximum tank storage capacity. An assessment of the quantity of leachate anticipated to be generated by the landfill was completed. Based on a comparison with data from another facility, SME concluded that the modeling parameters used to estimate leachate provided a good representation of actual leachate generation rates. The anticipated leachate production rates during the period identified as having the highest leachate volume were used to size the leachate collection, conveyance and storage structures. From the storage tank, leachate will be loaded into tank trucks and transported to the Old Town Mill's wastewater treatment facility.

Staff comment that all issues raised in initial engineering review memoranda regarding the leachate collection, conveyance and storage systems have been satisfactorily resolved, provided the detailed design packages submitted to the Department for review and approval prior to each construction project address all staff recommendations regarding the design, the technical specifications, and the construction quality assurance plan as agreed to in SME's January 22, 2004 responses to the comments provided in 3 initial engineering review memoranda by staff.

The Department finds that the applicant has proposed leachate collection, conveyance and storage systems designed in accordance with the Rules, provided that the detailed design packages to be submitted to the Department for review and approval prior to each construction project address all staff recommendations regarding the design, the technical specifications, and the construction quality assurance plan as agreed to in SME's January 22, 2004 responses to the comments provided in 3 initial engineering review memoranda by staff.

E. Gas Management System: The applicant proposes to install an active gas extraction system within the landfill. The primary purpose of the system is to control emissions of landfill gas from the landfill to provide compliance with current Title V New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) requirements. A secondary benefit of the system is the control of potential landfill odors. The system will be installed sequentially during site development.

The active gas extraction system will consist of vertical gas extraction wells, and may be supplemented by horizontal collector pipes as needed, along with the associated header and lateral piping to transport the gas to a blower and flare station. The blower and flare station will be constructed near the area where the leachate storage tank is proposed to be located. Condensate from the gas management system will be pumped directly into the leachate management system, both at the cell 4/5 leachate collection sump and the leachate storage tank.

Staff comment that the active gas extraction system was sized, and the installation timing of the components proposed, in part, on the projected disposal rates in the application. To ensure the effectiveness of the active gas extraction system, staff comment that each year's annual report should include an evaluation of the of the sizing and the installation timing of the system components over the reporting period, and an evaluation of the effectiveness of the system based on the quantities and types of wastes projected for the next year.

In response to staff comments, the applicant has committed to an accelerated schedule for installation of the active gas extraction system. During initial operations in cell 3, the applicant proposes to install passive flares. The location and number of passive flares will be included in the detailed design package for cell 3 submitted to the Department for review and approval. The applicant proposes to monitor the passive flare locations for gas flow rate, and concentrations of methane, carbon dioxide, and oxygen. Once the monitoring data shows that the gas is of a sufficient quality and quantity to support combustion with an active gas management system, the applicant will finalize the design of the active gas management system, including a schedule for installation of the system. Furthermore, the applicant proposes to install gas collection infrastructure to provide the ability to collect gas generated from solid waste in place for 12 months or longer through either vertical extraction wells or horizontal collectors, or a combination thereof.

The applicant will install temporary connections to the active gas management system components at the time of construction if the necessary infrastructure is not in place to accommodate the planned permanent connections. The applicant also proposes to use a portable blower and flare unit if the permanent blower and flare station has not been constructed at the time it is initially needed.

In response to staff comments regarding access to the well-heads on areas that have received intermediate cover, the applicant stated that soil intermediate cover will be utilized as the primary option. This will allow operating personnel to have safe access to the well-heads to monitor and balance the well-field. The applicant further stated that temporary geomembrane tarps will be a secondary option, and acknowledged that protection of the well-heads and safe access provisions, particularly during the winter months, will be necessary if temporary geomembrane tarps are utilized. Staff comment that well-head protection and access provisions need to be submitted to the Department if temporary geomembrane tarps are utilized for intermediate cover.

The applicant proposes to submit the operating plan for the gas management system with the appropriate annual report. Staff comment that the operational procedures for the gas management system, inclusive of monitoring, record-keeping, and reporting procedures for both the well-field, and the blower and flare unit, should be submitted with the detailed design package for construction of the system.

The Department finds that the applicant has demonstrated that the active gas extraction system proposed for phased construction in the landfill is designed to reduce fugitive emissions of landfill gas and control odors associated with the landfill, provided the detailed design package to be submitted to the Department for review and approval prior to each phase of construction addresses staff recommendations regarding the design, the technical specifications, and the construction quality assurance plan as agreed to in Sanborn Head & Associates' ("SHA") submittal dated January 21, 2004 and the applicant's letter dated February 4, 2004, provided the active gas system operating plan, inclusive of monitoring, record-keeping and reporting procedures, is submitted for review and approval with the detailed design packages; provided that each year's annual report includes an evaluation of the of the sizing and the installation timing of the active gas system components over the reporting period, and an evaluation of the effectiveness of the system based on the quantities and types of wastes projected for the next year;_and provided plans are submitted to the Department for review and approval detailing the provisions to be utilized to protect the well-heads and provide safe access to the well-heads if temporary geomembrane tarps are utilized for intermediate cover.

F. Closure Design: The applicant proposes to construct a phased final cover system throughout the operational life of the landfill as areas of the landfill with no plans for future waste placement are filled to final grade. The proposed cover system will meet the applicable requirements of the Rules for a secure landfill that govern at the time of closure. Prior to the placement of final cover on any area, the applicant will submit the detailed design package and supporting information on the design required by the applicable requirements in Chapter 401.5 of the Rules to the Department for review and approval. The Department finds that the applicant has proposed to apply a phased final cover system in accordance with the Rules, provided the detailed design packages for the placement of phased final cover are reviewed and approved by the Department prior to each application of final cover. The Department further finds that the applicant must submit to the Department for its review and approval a final closure plan for the landfill, prepared in accordance with the Rules in effect at that time, and complete final closure of the landfill in accordance with the approved final closure plan. As required by the Rules, the final closure plan must include a post-closure monitoring and maintenance plan covering a period of at least 30 years following closure. The Department also finds that the post-closure monitoring and maintenance plan must be revised throughout the post-closure period to comply with any changes in the post-closure monitoring and maintenance requirements of the Rules. The Department further finds that post-closure monitoring and maintenance requirements do not automatically cease after 30 years; they must continue to be met until the Department approves their cessation.

10. SETTLEMENT AND GEOTECHNICAL STABILITY

A. Test Plot Program: GPC has been conducting a pilot project at the existing landfill since October 1999. The purpose of the project is to evaluate the short-term stability of the sludge in the field, and to evaluate operational issues associated with the initial loss of shear strength in the sludge. The consultant for the pilot project is Richard E. Wardwell, P.E., Ph.D. ("REW"). The applicant retained REW to evaluate the settlement and stability aspects of this application in part because of his working knowledge of the characteristics of the sludge already disposed in cells 1 and 2 of the landfill. Based on the Department's recommendations, due to geotechnical stability concerns, the applicant proposed to remove the existing sludge and mix it with other incoming wastes (including new sludge from the Old Town Mill) in order to improve its geotechnical characteristics.

Originally the applicant proposed to mix no more than 15% of the existing and new sludge by volume into the incoming waste. Stability of the waste at this percentage would meet the regulatory criteria, but it was predicted to take several years to complete the mixing process and require a large operating area. The large operating area would result in greater leachate production and an increase in potential odor generation. The applicant now proposes to determine the optimum ratio at which the existing sludge can be mixed with the incoming waste and still achieve deposit stability by constructing an initial test plot in the existing, unused area of cell 2. The test plot construction is expected to take at least 6 weeks to complete, and will require a total of approximately 98,000 cubic yards of waste. Of this amount, approximately 60% of the waste will be diverted from the Pine Tree Landfill in Hampden and the remaining 40% will be existing and new sludge. It is important for the test plot program to operate through the spring thaw period because this has been observed to be the most biologically and chemically active time in the existing sludge. As a result, the amount of waste delivered to the landfill for mixing with the sludge will exceed the projected rate of filling at the landfill for this time period.

The test plot is proposed to consist of 3 sections; in each of the 3 sections the existing sludge will be mixed with incoming waste at different ratios (20%, 40% and 60% sludge to other wastes). The test plot has been designed to mimic actual operating conditions and will provide necessary information on the operating criteria that will be used to effectively run the landfill. In addition to gathering data for the stability evaluation through instruments installed in the test plot, air monitoring (oxygen, methane, and hydrogen sulfide) will be conducted. Based on the findings of the test plot program, the need to re-assess geotechnical stability will be evaluated, a finalized geotechnical monitoring plan for the facility will be prepared, the operating requirements for cell 3 will be finalized, and an odor control plan for sludge excavation and mixing will be prepared. All of the above will be submitted to the Department for review and approval.

The Department finds that the use of the proposed test plot program to determine the optimum rate at which the existing sludge can be excavated and mixed with incoming waste will result in a stable landfill configuration provided operations are conducted in accordance with approved recommendations from the program. The Department further finds that it is acceptable for the applicant to divert the necessary quantity of any waste delivered to PTL to the WOTL for use in the test plot within the time frame needed for completion, as outlined in the description of the test plot program proposal.

B. Settlement Analysis: Short and long-term settlement was analyzed to assure that load and non-load related strains associated with primary compression and waste decomposition will not be detrimental to the performance of the proposed liner, leachate collection, underdrain, and final cover system. Liner, leachate collection, and underdrain system settlement was evaluated considering the elastic deformation of the subgrade soils. Cover system settlement was estimated from the projected secondary compression of the mixed solid waste using coefficients that have been observed for similar waste streams at a similar facility. The Department finds that the applicant demonstrated that the landfill liner, leachate collection, underdrain, and final cover systems will maintain their integrity and performance at the maximum predicted settlements.

C. Geotechnical Stability Analysis: Geotechnical stability analyses for the proposed vertical increase at the landfill were completed in accordance with the Rules. The stability assessment analyzed potential failure planes through the foundation soils and along liner and cover system interfaces. The minimum required factors of safety were achieved for all identified critical failure planes. The need to re-assess geotechnical stability will be evaluated once the findings of the test plot program described in Finding of Fact #10.A, above, are available. Stability of the MSE berm was also evaluated and the minimum required factors of safety were achieved. The Department finds that the applicant has demonstrated that the landfill, including the MSE berm, will meet or exceed the minimum required factors of safety during construction, operation and the post-closure periods under both static and seismic conditions, provided an appropriate ratio of sludge to other incoming waste is chosen and approved by the Department through an evaluation of the findings of the test plot program.

D. Settlement and Stability Monitoring Plan: After completion of the test plot program described in Finding of Fact #10.A, above, the applicant will prepare and submit to the Department for review and approval a proposed geotechnical monitoring plan that will include the proposed waste mixing procedures for cells 1, 2 and 3 as well as routine operational stability monitoring. The applicant also proposes periodic settlement monitoring of completed cells to determine site specific compression coefficients, and monitoring and observations of the final cover system, to confirm that total and differential strains are within tolerable limits. The Department finds that the applicant has proposed to provide a plan to monitor stability and settlement during construction, operational and post-closure periods, and report the results to the Department, including an interpretation of the results by a qualified geotechnical engineer. The Department also finds that the applicant proposes to prepare and submit the geotechnical monitoring plan for the landfill to the Department for review and approval once the findings of the test plot program have been evaluated.

11. CONSTRUCTION

The landfill, and some of the proposed ancillary structures, will be constructed over time, as capacity is needed. New cells will be constructed by a general contractor who can demonstrate familiarity and experience with the various aspects of landfill construction, and by subcontractors with specialized experience in the installation of geosynthetics.

The applicant has prepared a preliminary construction quality assurance ("CQA") plan that establishes the requirements for CQA testing and installation oversight of all construction materials to assure that the design specifications and performance requirements are achieved during construction. Geosynthetics and soil components will be tested, certified, and inspected by qualified CQA personnel independent of SPO, NEWSME Operations and any contractor hired for the project.

CQA personnel will provide on-going, thorough project documentation during construction. Daily and weekly reports will be prepared and provided to the Department. A final construction report will be prepared and submitted for Department review and approval within 45 days of the conclusion of each construction project.

Following installation of the leachate collection system, the applicant proposes to conduct an electric leak location survey of the geomembrane liner to assure that it was not damaged during overburden placement. Electric leak location is an innovative quality assurance technology developed to detect any breaches in the geomembrane after placement of the protective layer (once the greatest potential for damage to the geomembrane has passed). It is accomplished by impressing a voltage across the geomembrane then scanning the surface for current flow. The geomembrane is an insulator and will not allow current to pass through it unless a hole is present. If a hole is found, it will be exposed, repaired, and retested before the liner system is placed into service.

The applicant has prepared preliminary construction contract documents as part of the application. Prior to construction of each cell, the applicant will provide the Department for review and approval a detailed design package which will include design details and calculations, a complete set of project specific construction contract bid documents, including drawings, technical specifications, contract administrative documents, and the construction quality assurance plan for that project.

The applicant proposes to initiate construction of the test plot program described in Finding of Fact #10.A, above, shortly after approval of this application is received. The test plot construction is anticipated to take at least 6 weeks to complete. The findings of the test plot program will then be used to evaluate the need for additional geotechnical stability analyses, to finalize the operating requirements for cells 1, 2 and 3, to finalize a geotechnical monitoring plan for the facility, and to develop an odor control plan for sludge excavation and mixing operations. Staff comment that all recommendations regarding the construction, operation, and monitoring of the test plot have been adequately addressed, provided the work is completed as described in REW's work plan as revised in REW's submittal dated January 16, 2004.

The detailed design package for cell 3, and the new leachate storage tank and ancillary structures, are expected to be submitted to the Department for review and approval in Spring 2004. It will include the technical specifications, construction drawings, construction quality assurance plans, and construction monitoring and documentation provisions required by the Rules. It will include all information recommended by staff during review of the application, as agreed to in SME's submittal dated January 22, 2004 and as responded to in staff memoranda dated January 26, 28, and 30, 2004.

Construction of cells 4 through 11, inclusive of the leachate management system for the cells, is expected to proceed sequentially. The applicant proposes to submit to the Department for review and approval the detailed design package for each of these cells at least 6 months prior to the date planned for initiation of operation. Each detailed design package will include the technical specifications, construction drawings, a construction quality assurance plan, and the construction monitoring and documentation provisions required by the Rules. Each detailed design package will include all information recommended by staff during review of the application as agreed to in SME's submittal dated January 22, 2004 and as responded to in staff memoranda dated January 26, 28 and 30, 2004. Staff further comment that, if the Rules applicable to any aspect of construction of the landfill cells change during the development of the landfill, the applicant should be required to address the new design requirements in the subsequent detailed design submittals.

Construction of the perimeter berm, including the MSE berm, is expected to proceed sequentially as the landfill cells are developed. A detailed design for the construction of the perimeter berm in the area of cell construction will be included in the detailed design package submitted for construction of the individual cells. Staff comment that all issues identified in the review of the application have been satisfactorily addressed, provided all recommendations in staff memoranda are addressed as agreed to in SME's submittal dated January 22, 2004 and as responded to in staff memoranda dated January 26, 28 and 30, 2004. Staff further comment that, if the Rules applicable to any aspect of construction of the perimeter berm change during the development of the landfill, the applicant should be required to address the new design requirements in the subsequent detailed design packages.

Construction of the active gas extraction system is expected to occur on an annual basis. The details for the following year's installation are proposed to be described in the annual report for the facility, and in detailed design packages provided to the Department for review and approval prior to construction. Staff comment that all issues identified in the review of the application have been satisfactorily addressed, provided all recommendations in the staff memoranda are addressed as agreed to in SHA's submittal dated January 21, 2004 and the applicant's letter dated February 4, 2004, provided the active gas system operating and monitoring plans are submitted with the detailed design package, and provided plans are submitted detailing the provisions to be utilized to protect the well-heads and provide safe access to the well-heads if temporary geomembrane is utilized as intermediate cover. Staff further comment that, if the Rules applicable to any aspect of construction of the active gas extraction system change during the development of the landfill, the applicant should be required to address the new design requirements in the subsequent detailed design packages.

Construction of the phased final cover will occur as areas of the landfill are filled to the proposed final grade. Prior to the placement of final cover on any area, the applicant will submit to the Department for review and approval a detailed design package to include the detailed construction plans, technical specifications, a construction quality assurance plan, and supporting information on the design as required by the applicable provisions of Chapter 401.5 of the Rules. Staff comment that all issues identified in the review of the application have been satisfactorily addressed, provided all recommendations in staff memoranda are addressed as agreed to in SME's submittal dated January 22, 2004 and as responded to in staff memoranda dated January 26, 28 and 30, 2004. Staff further comment that, if the Rules applicable to any aspect of the placement of phased final cover change during the development of the landfill, the applicant should be required to address the new closure requirements in the subsequent phased final cover submittals. Staff comment that the applicant must also submit to the Department for its review and approval a final closure plan for the landfill, prepared in accordance with the Rules in effect at that time, and complete final closure of the landfill in accordance with the approved final closure plan. As required by the Rules, the final closure plan should include a post-closure monitoring and maintenance plan covering a period of at least 30 years following closure. The post-closure monitoring and maintenance plan should be revised throughout the post-closure period to comply with any changes in the post-closure monitoring and maintenance requirements of the Rules.

The Department finds that the applicant has addressed all aspects of the construction and closure of the proposed vertical increase of the landfill, provided detailed design packages are submitted to the Department for review and approval prior to the initiation of any construction project, and provided the various ongoing construction activities described in this finding are designed, constructed, monitored, operated, closed, and monitored and maintained during the post-closure period in accordance with the application, staff recommendations on the application and responses to staff recommendations submitted by the applicant and its consultants in submittals dated January 16, 2004; January 21, 2004; January 22, 2004; and February 4, 2004. The Department also finds that, as recommended in Finding of Fact #4.A, above, the applicant must include a demonstration of financial capacity for costs associated with construction of cells 4 through 11 as part of the detailed design packages for these cells. The Department further finds that, if the Rules applicable to any aspect of construction or post-closure care of the vertical increase of the landfill and its ancillary structures change during the development of the landfill, the applicant must address the new requirements in subsequent submittals.

12. OPERATIONS

The applicant proposes to continue using the current operations manual for the landfill until the completion of construction of cell 3. The current operations manual for the facility includes the detailed operating requirements specific to the GPC waste characteristics and generation rates. Until the time cell 3 is available for disposal, only the wastes currently approved for disposal will be landfilled, except during the construction of the test plot program described in Finding of Fact #10.A, above. Operational criteria specific to the test plot program have been reviewed and found to be acceptable by staff.

The applicant proposes to update the operations manual to reflect the proposed waste characteristics, generation rates, mixing requirements, and cell development sequence and provide it to the Department for review and approval prior to the commencement of waste placement in cell 3. A conceptual cell development plan for the proposed life of the landfill was included in the application; staff comment that all recommendations regarding the conceptual cell development plan have been adequately addressed provided the plan is revised as described in SME's January 22, 2004 submittal. The applicant proposes to provide a detailed cell development plan, covering the first 2 years of operations, for the landfill prior to the commencement of filling in cell 3, and provide it to the Department for review and approval. As required by the Rules, proposed revisions to the operations manual, including the annually updated cell development plan, will be included in the facility's annual report, and the operations manual will be revised to comply with any changes in the operating requirements in the Rules. The operations manual will again be updated and submitted to the Department for review and approval following completion of the test plot program and prior to the excavation of sludge from cells 1 and 2.

The hours of operation for the landfill are proposed to be 6 AM to 8 PM on weekdays and 8 AM to 4 PM on weekends, although Casella's contract with PERC requires that the landfill be available for disposal of its residues outside the normal business hours. The operations manual for the facility addresses basic functions such as the maintenance of the access road, and includes the many plans and provisions for the orderly operation of the landfill addressed throughout this order.

The Department finds that the operations manual was prepared in substantial accordance with the Rules, and that it provides the information necessary to enable supervisory and operating personnel, and persons evaluating the operation of the landfill, to determine the sequence of operation, policies and procedures for the landfill, as well as the monitoring, maintenance, inspection and legal requirements that must be met for the operation of the landfill on an ongoing basis, provided the operations manual is revised prior to the commencement of waste placement in cell 3 and as recommended by staff. The revisions to the operations manual must include the following information: the conceptual and detailed cell development plans;, and changes made to address staff recommendations as agreed to in SME's January 22, 2004 submittal addressing staff memoranda. The operations manual must be updated again to incorporate changes needed to address the findings of the test plot program. All changes to the operations manual are to be submitted to the Department for review and approval, and implemented as approved by the Department.

13. ACCEPTABLE WASTES

A. Waste Types and Sources: The landfill is currently licensed to accept pulp and paper mill wastewater treatment plant sludge from the Old Town Mill, smaller quantities of other special wastes from the Old Town Mill (lime wastes and grit, woodwaste and inert debris, soil and sawdust contaminated with non-hazardous process chemicals, virgin oily contaminated debris, sand from sandfilters, and non-hazardous sandblast grit), flyash from Lincoln Pulp and Paper, and burn pile ash from the City of Old Town's transfer station.

This application proposes to add the solid wastes approved for disposal at Pine Tree Landfill in Hampden that are generated in Maine, including solid waste from all 4 licensed incinerators, to the list of wastes acceptable for disposal in the landfill. The wastes proposed to be added would consist primarily of front-end process residue ("FEPR") from PERC in Orrington, Maine and Maine Energy in Biddeford, Maine; oversized bulky wastes; MSW bypassed from incinerators located in Maine; construction and demolition debris; ash from incinerators located in Maine; and water/wastewater treatment sludge. Small quantities of other miscellaneous non-hazardous waste streams are also listed in the application for disposal in the landfill. There are 34 wastes listed in the miscellaneous category; in total, they are anticipated to equal approximately 50,000 tons per year. In addition, Appendix K of the application includes a listing of the generator, type of solid waste and permit number of several individually permitted wastes currently approved at Pine Tree Landfill that the applicant proposes to accept at WOTL. The yearly quantity of solid waste to be accepted at the landfill is not expected to exceed 540,000 tons per year.

The applicant has committed to the same limitations on MSW accepted for disposal at WOTL as at Pine Tree Landfill. Department License #S-001987-WD-QA-M, issued to Pine Tree Landfill on February 26, 2002, limits the MSW Pine Tree Landfill is allowed to accept to unprocessed MSW bypass from the following sources: the PERC incinerator in Orrington and the Maine Energy incinerator in Biddeford; waste delivered under an interruptible contract with PERC; or waste delivered in excess of processing capacity at other MSW incinerators in Maine. An annual limit of 310,000 tons on the amount of unprocessed MSW destined for Maine Energy, and then incinerated at Maine Energy or bypassed to Pine Tree Landfill, was selected. This is not the annual amount of MSW anticipated to come to Pine Tree Landfill and/or the WOTL from Maine Energy; this is the maximum total amount of unprocessed MSW destined for Maine Energy that will be delivered to all 3 Casella owned or operated disposal facilities: Maine Energy, Pine Tree Landfill and WOTL. Unprocessed MSW from Maine Energy is only bypassed to a landfill for disposal during temporary shutdowns for repairs or maintenance, and when the amount of contracted waste exceeds the plant's capacity. Conditions #2 through 7 of that license specify the limitations and parameters under which Pine Tree Landfill can accept MSW from the Maine incinerators.

In accordance with the RFP and OSA, the applicant will not accept solid wastes generated from out-of-state sources at the WOTL. The applicant proposes to manifest all wastes brought to the facility for disposal, including those not required to be manifested by law. The Department finds that the monthly activity reports submitted to the Department must be designed to provide the data needed for determining the quantities of the various waste types, and their sources, delivered to the landfill. The Department further finds that the applicant must submit an application to the Department for review and approval prior to accepting for disposal any waste not listed in the application.

The Department received comments from the public regarding specific wastes and whether they would be regarded as in state or out of state waste. The Department responded that FEPR and ash from incinerators in Maine, as well as a limited amount of bypass, would be considered waste generated in Maine, but that waste delivered from out of state to another facility (such as a transfer station, or a compost facility if no processing occurs) for transfer to WOTL in its original form would be considered waste generated outside Maine. As noted above, the amount of bypassed MSW from the incinerators will be limited and the amount of MSW bypassed from Maine Energy, also owned by Casella, will in addition be tied to production at Maine Energy. The applicant has committed, in a letter dated March 9, 2004, that no out of state MSW will be bypassed to the landfill, and that waste from the tipping floor of any of the incinerators will not be transported to the landfill if it contains any out of state waste. The Department also received comments that the landfill would be required to accommodate MSW from the closure of existing municipal landfills due to Department violations; as noted above, MSW will be accepted only from the 4 incinerators in Maine. Additional sources of MSW would require Department review and approval prior to acceptance for disposal.

B. Waste Characterization and Compatibility: The procedures for characterizing the solid wastes accepted at the landfill are identified in the Solid Waste Characterization Plan for the facility; the plan is located in Appendix K of the application and will be part of the facility's operations manual. The facility proposes to accept non-hazardous wastes for disposal using the same procedure as approved for Pine Tree Landfill. The wastes fall into 2 categories: those accepted on an ongoing basis under general permitting requirements for specific categories of wastes and those accepted under individual permits. Each waste required to be characterized by the Rules has a testing frequency, list of parameters to be tested for, and the acceptance criteria for each parameter, based on the requirements of Chapter 405 of the Rules. Copies of all analyses will be kept on file at the facility and may be viewed during normal business hours. The wastes proposed for disposal in the landfill have been demonstrated to be compatible with each other and the liner and leachate collection system components at Pine Tree Landfill; the same materials are proposed to be used in the construction of cells 3 through 11 at WOTL.

The Department received several comments related to the waste characterization process and its reliability in terms of keeping hazardous wastes out of the facility. The Department finds that the waste characterization plan proposed for use at WOTL provides adequate provisions for the testing of wastes coming into the landfill and a proven, reliable method of keeping hazardous waste from being disposed. The Department further finds that the proposed waste streams are compatible with each other and the components of the landfill system.

C. Reporting Requirements: As described in Finding of Fact #13.A, above, the Department finds that a monthly summary of the wastes accepted for disposal will be submitted to the Department, and the monthly activity reports submitted to the Department must be designed to provide the data needed for determining the quantities of the various waste types, and their sources, delivered to the landfill. As found in Finding of Fact #13.A, above, the Department finds that the information on the source and quantity of MSW accepted for disposal is to be reported to the Department on both a monthly and an annual basis, as follows:

1. The monthly reports on the wastes accepted for disposal at the landfill shall include the amount and source of unprocessed MSW accepted for disposal;

2. The total amount of (a) unprocessed MSW incinerated at Maine Energy and (b) MSW bypassed from Maine Energy for disposal at the WOTL and at Pine Tree Landfill's Secure III Landfill Expansion shall not exceed 310,000 tons in any calendar year, unless changes in conditions or circumstances occur that cause the Department to revise this cap; and

3. In addition to the specific requirements of Chapter 401.4(D) of the Rules, the annual reports for the facility submitted to the Department shall include the amount of unprocessed MSW received at WOTL from each of the approved sources, including statements from the incinerators providing an estimate of the percentage of the MSW that originated outside Maine.

14. AIR QUALITY

A. Fugitive Dust: To control fugitive dust from unpaved access roads, the applicant will apply water and/or calcium chloride to the road surfaces on an as-needed basis. The applicant also proposes to pave an additional portion of the access road from where it begins at Route 16 such that the first one-half mile of the road will be paved. If necessary to control dust, the applicant has also committed to pave an additional portion of the access road. The applicant has committed to daily cleaning of the paved surface using a street sweeper. The Department received comments on existing dust control methods and the potential for additional problems with fugitive dust emissions associated with the increased traffic at the landfill entrance. The Department finds that the dust control measures proposed by the applicant are sufficient to control fugitive dust. However, the Department also finds that if staff find that operation of the landfill as proposed unreasonably adversely affects air quality additional fugitive dust control measures will be required.

B. <u>Landfill Gas:</u> The applicant proposes to install an active gas extraction system for control of fugitive emissions of gas generated by the landfill. Passive flares will be installed initially and monitored to determine when the gas quantity and quality is adequate to support combustion. At that time the detailed design of the active gas extraction system will be prepared and the system installed. (See Finding of Fact #9.E, above.) The Department finds that the applicant has proposed adequate measures to control fugitive emissions of gas from the landfill.

C. <u>Odor Control:</u> The applicant proposes to use several mechanisms to control odors associated with the facility; an odor assessment, including proposed odor control mechanisms, prepared by Odor Science & Engineering, Inc., is included in Attachment 7 of the application. As fully described in Finding of Fact #9.E, above, one of the benefits of the proposed gas management system is the control of potential landfill odor. The applicant will also employ operational practices, including the use of a portable odor neutralizer system and minimization of the active working face of the landfill. Odors associated with the leachate will be minimized by the use of an above-ground leachate storage tank instead of the existing open leachate pond. The applicant has committed to odor training of its landfill personnel, the implementation of a community odor complaint response plan, and to the installation of perimeter hydrogen sulfide monitoring instruments. The applicant will also monitor odors during the sludge mixing test plot program, described in Finding of Fact #10.A, above, and will prepare a detailed odor control plan for sludge excavation and mixing operations following completion of the program and prior to full-scale operations.

The Department received comments from the public that odors from the existing landfill have been a problem. Staff comment that, prior to the submission of this application, no odor complaints about this facility were received by the Department.

The Department finds that the applicant has proposed odor control mechanisms sufficient to control nuisance odors. However, the Department also finds that if staff find that operation of the landfill as proposed unreasonably adversely affects air quality additional odor control measures will be required. The Department further finds that the applicant must submit to the Department for review and approval the following information on the perimeter hydrogen sulfide monitoring program prior to implementation of the program: the number and locations of instruments, based on meteorological conditions; system security measures; monitoring program details and responsibilities; and reporting procedures.

15. TRAFFIC MOVEMENT

The parcel of land which includes the landfill is located between Routes 43 and 16. Although the landfill is located much closer to Route 43 than to Route 16, it is accessed from Route 16 by a road into the property that existed at the time of the original licensing. A large wetland exists between the landfill and Route 43; the applicant does not propose to change the access to the landfill from Route 16 to Route 43 now or in the future. The access road intercepts Route 16 approximately 600 feet west of I-95.

At the time this application was filed, approximately 16 trucks were hauling sludge from the Old Town Mill, ash from Lincoln Pulp & Paper, leachate from the landfill back to the Old Town Mill's wastewater treatment plant, and gravel during the peak hour; approximately one-half of these vehicles were hauling gravel to the landfill for use as daily cover.

Attachment 4 of this application contains a new traffic assessment prepared by Eaton Traffic Engineering in accordance with the Rules.

With the increased use proposed by the applicant, approximately 30 total vehicles (9 of them passenger vehicles) will enter the landfill during the peak hour at the initial projected waste acceptance rate of 450,000 tons/year, and up to 35 total vehicles (still 9 of them passenger vehicles) will enter the landfill during the peak hour at the highest projected waste acceptance rate of 540,000 tons/year. These peak numbers include the current vehicles, except that the gravel deliveries will cease.

The total daily number of trucks anticipated to enter the facility on a daily basis is 108 at the 450,000 tons/year rate of waste acceptance. The total daily number of trucks at the 540,000 tons/year rate is 140 trucks per day. The existing daily trips into the landfill are estimated at 45-50 trips per day.

The trucks hauling wastes that are currently disposed at the landfill are expected to continue using the same haul routes; likewise, the trucks hauling leachate to the Old Town Mill's wastewater treatment plant will continue using the same routes.

A major haul route for transporting waste in trucks weighing over 80,000 pounds from Pine Tree Landfill to WOTL is identified in the application; the route includes roads within Hampden, Bangor, Brewer, Eddington, Bradley, Milford and Old Town. During the peak hour, the number of over 80,000 pound trucks is anticipated to be 7 at 450,000 tons/year and up to 10 at 540,000 tons/year. The major haul route identified for trucks and other vehicles weighing less than 80,000 pounds is I-95; the remaining new traffic associated with the project would use I-95 to deliver waste to the landfill, and all empty trucks would use I-95 on their return trip.

The Maine Department of Transportation ("MDOT") was asked to review the traffic section of the application; it reviewed high crash locations, roadway geometrics, traffic volumes and traffic signal progression along the identified route. The volume of traffic associated with the landfill falls far below the threshold for review of the project under MDOT's Chapter 305 "Rules and Regulations Pertaining to Traffic Movement Permits", effective May 20, 2000; that threshold is 100 or more passenger car equivalent vehicles during the peak hour. In a memorandum dated December 12, 2003 MDOT concluded that the route identified in the application was acceptable in terms of geometrics, traffic volumes, and economic feasibility, but that an alternative route identified in the MDOT memorandum as Alternative 1 was more desirable. The only difference in the two routes was the bridge used to cross the Penobscot River from Bangor into Brewer.

In response to numerous comments on traffic associated with the project, MDOT staff identified in a memorandum received by the Department on February 4, 2004 a total of 5 routes (plus I-95 for the less than 80,000 pound vehicles) that could safely accommodate the number, weight and types of vehicles transporting waste to and from the facility from the south or west. Each of the routes have minor deficiencies; however, since the drivers are likely to make their choices of routes depending on the time of day, day of the week or time of year, all of the routes are viable alternatives over which trucks now travel. MDOT noted that all of the identified routes can handle traffic generated by the landfill, and that the functionality of any of the 6 routes will not be negatively affected by the landfill's traffic.

MDOT also reviewed the Route 16/landfill access road intersection. It concluded that there is adequate sight distance for the posted speed of Route 16, and that no turn lanes are needed. No high crash locations within the immediate vicinity of the site were identified. MDOT did recommend that overhead lights be installed at the entrance to the facility to make it easier for trucks to locate the entrance.

As noted above, the Department received many comments from the public on the proposed haul route for the facility. Many commentors requested that the Department require that all haulers use I-95 to access the facility; other commentors expressed concern over increased traffic, and associated road damage and other safety and esthetic impacts, through their neighborhood.

The only change proposed to the 10,950 foot long, 24 foot-wide mostly gravel access road into the site is an extension of the paved section from the first 500 feet to the first one-half mile of the road. If necessary to control dust, the applicant has also committed to pave an additional portion of the access road. A scale, and a small scale house, are proposed to be constructed approximately 250 feet from the landfill perimeter security fence; parking will be provided at this location for only the scale house operator. The gravel parking area at the operations office will be expanded to approximately 4,000 square feet to provide parking for up to 20 cars. The perimeter access road for the landfill is proposed to be located on top of the perimeter berm described in Finding of Fact #9.C, above. Gravel maintenance roads will also be provided for access to the leachate pond pump station, the leachate storage tank and the blower and flare for the active gas extraction system.

The Department finds that the applicant has made adequate provisions for the safe and uncongested movement of traffic of all types into, out of, and within the facility, provided it installs overhead lights, or another effective lighting system, at the entrance to the facility to make it easier for trucks to locate the entrance. The Department further finds that it is outside its purview to require that waste haulers using this facility limit their truck weights to 80,000 pounds and use I-95 as the only haul route for the facility, and affirms MDOT's statement that there is an affirmative right for all individuals and entities, public and private, domestic or commercial, to travel on all State and State Aid Highways in Maine.

16. EXISTING USES AND SCENIC CHARACTER

A. Visual Analysis: The original application included a visual impact assessment report prepared by Environmental Analysis and Design. In summary, the report concluded that the landfill would not have an unreasonable adverse effect on the scenic character of the area because of its limited viewshed, small visual magnitude and its low visual contrast.

Attachment 5 of this application contains an updated visual impact assessment report prepared by SMRT, Inc. in accordance with the Rules. The consultant evaluated the proposal in terms of unreasonable interference with views from established public viewing areas as well as other potential viewshed locations. The applicant states that the landfill will not be visible from an established public viewing areas as defined by the Rules or any new viewsheds. As predicted in the original application, people traveling on Route 43 in a northerly direction will be able to see the landfill along an approximately 3/8 mile long stretch; the view will last about 21 seconds if the viewer is driving the speed limit. The applicant has offered to plant a tree screen along this stretch if permission is granted by the landowner.

The Department received written comments from a Route 43 resident who owns property and a business off Route 43. The commentor noted that the landfill is currently visible from Route 43, in contradiction to the original visual assessment, and that the landfill would be visible from Route 43, Route 16, I-95 and at other points within Old Town if the Department did not limit the height of the landfill. He commented that the proposed final elevation would be 150 feet higher than the highest point in Old Town (Fairdale Hill, at 240 feet).

The Department retained Terrence J. DeWan & Associates, Inc. ("tjd&a") to perform an independent review of SMRT, Inc.'s updated assessment. Tjd&a's report, dated February 6, 2004, confirms the results of SMRT, Inc.'s assessment. It also makes several suggestions for making the updated visual impact assessment a stand-alone document, and for providing corroborative information on the conclusions reached in the SMRT, Inc. report. At staff's request, tjd&a also responded to written comments from the Route 43 resident. Although tjd&a agrees with some of the commentor's statements, tjd&a concludes that the proposed increase in the landfill's height will not unreasonably adversely affect the use of the resident's property or other existing uses in the area.

The Department finds that the design of the project continues to take into account the scenic character of the surrounding area, and that the development has been located and screened to minimize its visual impact, but that the visibility of the landfill would be lessened if the section of Route 43 where the landfill is visible is screened. The Department finds that the development will not have an unreasonable effect on the scenic character of the surrounding area, provided the results of a future visual analysis, performed when the final elevation of the landfill reaches 330 feet, agree with the projections provided in the application, and provided the applicant negotiates in good faith with the Route 43 landowner for permission to plant a tree screen in the location identified in the visual impact assessment.

B. Noise: The original application included a noise study prepared by Acentech Incorporated ("Acentech"). In summary, the study demonstrated that the noise standards of the applicable Rules would be met by the implementation of several noise abatement measures during construction and operation, and that noise would be reduced by atmospheric adsorption and the proposed buffer strips around the facility. As a check on the actual noise levels from the facility, the Department placed Condition #7 in the original license. The condition required that noise studies be performed within the first month of operation, and again within the first month of operation of cell 4 of the landfill. The noise study performed when the landfill became operational demonstrated the facility was operating within the noise limits; cell 4 has not been developed.

The applicant retained Acentech to address noise impacts associated with the proposed facility. A copy of Acentech's report is contained in Attachment 6 of the application. The noise study modeled the projected noise levels from the landfill operating equipment to the nearest property boundary and the nearest residence; the study demonstrated that the facility will comply with the 60 dBA day time noise standards of the Rules. Between 7 p.m. and 7 a.m., the 50 dBA night time standards of the Rules apply, and the applicant will limit the spreading and compacting equipment to 1 compactor and 1 dozer or loader if necessary to meet the noise standards. (The landfill is proposed to operate between 6 a.m. and 8 p.m. on weekdays.)

The Department finds that the noise study for the proposed facility indicates that it will not generate excessive noise at the property boundary or at any protected location as defined by the Rules. However, the Department also finds that the applicant must perform 2 additional noise studies to confirm the model used in the study: one within the first month of operation of cell 3, and the other within the first month of operation of cell 9. If the actual noise limits are above the limits in the Rules, additional noise measures must be promptly implemented to meet the requirements of the Rules.

C. Existing Uses and Conditions: The portions of the 780 acre parcel that are currently undeveloped will not be altered, and the current allowed uses of the property by the public described in Finding of Fact #24 of the original order will be allowed to continue. The Department finds that its original finding that the facility will not unreasonably interfere with existing uses and conditions, and has enhanced values in some areas, is not changed.

17. STORMWATER MANAGEMENT

The Department found in the original license that the project is not located on a floodplain. The applicant has provided an updated stormwater management plan for the proposed facility, prepared in accordance with the Rules and the three general objectives of the Department's *Stormwater Management for Maine: Best Management Practices* (MDEP, 2003): effective drainage, flood prevention and erosion control. The plan is contained in Section 5.7 of the application.

The proposed stormwater management measures, which include the erosion and sedimentation control plan for the facility (see Finding of Fact #18, below), will assure that peak runoff rates for the post-development conditions at the site will be equal to or less than the peak runoff rates for the site's pre-development (prior to 1991) conditions. A major consideration in the grading and layout of the landfill in the original application was the minimization of wetlands impact; the same consideration was applied to the vertical increase of the landfill proposed in this application. Existing drainage courses will be utilized where feasible; no surface water drainage outlet structures from the developed site will discharge concentrated flows directly onto abutting properties. Where necessary, the runoff from the developed site will discharge into detention or sedimentation basins that will attenuate peak flow rates to the unnamed tributary feeding Pushaw Stream, located at the lowest elevation of the facility. This runoff will be only from areas outside the landfill footprint and from landfill areas that have received final or intermediate cover material. Runoff from areas where waste is exposed or has received only daily cover is considered leachate and is handled within the leachate collection and conveyance systems.

A drumlin oriented in a northwest to southeast direction effectively divides the 780-acre parcel into 4 major watersheds: northeast, northwest, southeast and southwest. The Department received comments from the public that the ditches on the Stagecoach Road contain runoff contaminated by the existing landfill. Staff comment that the Stagecoach Road is located in the northwest watershed of the parcel. The landfill is located in the southwest watershed of the parcel, and runoff from this watershed drains to a wetland area that serves as the headwater of an unnamed tributary that empties into Pushaw Stream, not towards the Stagecoach Road.

The Department has also received comments from the public that contaminated runoff from the landfill can flow into ditches along Route 43 and onto property across Route 43. Staff comment that water in the unnamed stream directly downgradient of the landfill has been consistently sampled at least 3 times per year since 1991; no changes in surface water quality have been observed. Staff also comment that no analyses or other documentation of contamination of ditches in either area was submitted to the Department.

Staff comment that all issues raised in the initial engineering review memorandum regarding the provisions for stormwater management have been satisfactorily resolved.

The Department finds that the facility's stormwater management plan will control run-on and run-off; and infiltrate, detain or retain water falling on the facility site during a storm of intensity up to and including a 25-year, 24-hour event such that the rate of flow of stormwater from the facility after construction does not exceed the rate of outflow of stormwater from the facility prior to construction of the facility. The Department also finds that the preponderance of the evidence indicates that runoff from the landfill is not impacting ditches along Route 43 or the Stagecoach Road.

18. EROSION AND SEDIMENTATION CONTROL

The application contains an erosion and sedimentation control plan prepared in accordance with the *Maine Erosion and Sedimentation Control Best Management Practices* (MDEP, 2003) and the requirements of the Rules. The plan is contained in Appendix F of the application. The plan includes the construction of two new stormwater detention ponds, several new drainage structures (ditches, catch basins and culverts), and it addresses the inclusion of terrace drainage swales and downchutes on the landfill cover system. To minimize erosion during construction and operation, both temporary and permanent erosion control measures will be used. All measures will be continuously monitored and all necessary maintenance will be performed to assure that the measures are functioning properly. In response to staff comments, the applicant confirmed that the design of construction-related erosion and sedimentation control systems will be included in the detailed design package for each phase of the landfill development. For all cells other than cell 3, which will utilize the existing sedimentation control structures, it is anticipated that water generated within the cell construction area will be contained within that landfill cell, thus allowing sediment to settle out within the cell before being pumped out. If necessary, additional sediment removal techniques will be employed.

The Department finds that ongoing construction of the proposed facility will not cause unreasonable sedimentation or erosion of soil, provided the erosion and sedimentation control plan is implemented as described in the application, and as amended during the review of the detailed design package submitted for the Department's review and approval prior to each phase of landfill construction.

19. RECYCLING AND SOURCE REDUCTION

The landfill will accept only solid waste that is subject to recycling and source reduction programs at least as effective as those imposed by State law. The recycling and source reduction programs included in the OSA will affect the region served by the landfill and the rest of the state, and includes several innovative recycling initiatives that will advance the State's solid waste management policy.

In signing the OSA, Casella agreed, in part, to use its best efforts to operate the landfill following the State's solid waste management hierarchy. Specific actions listed in the OSA include the following:

A. Implementation of a technology for recovery and recycling of all color glass containers so that glass does not require separation by color in order to be recycled;

B. Work with the Municipal Review Committee ("MRC"), which represents over 160 municipalities that are limited partners in PERC and/or users of PERC, to:

   1. through Casella's Fairfield County Recycling Division, analyze and develop the best collection, processing and marketing options for paper recycling;
   2. help develop organics recycling programs that enhance or expand current practices of MRC members;
   3. develop a program to collect, store and process (where applicable) universal wastes and mercury containing products; and
   4. develop programs to identify, collect and properly dispose of household hazardous wastes;

C. Work with the MRC and appropriate research facilities to assess the viability of using Maine-developed ablation technology as a source of air emission control for biomass boilers combusting up to 50% clean wood from construction and demolition debris ("CDD") as a fuel source, as proposed for new GPC biomass boiler; and

D. Expand the CDD processing capability of Casella and its affiliates to achieve a decrease in CDD waste volume requiring disposal with a focus on recovering the clean CDD wood waste that would assist in meeting the biomass fuel commitment of the OSA. Other recyclable materials, including cardboard, aggregate and metals, would be separated and utilized in other applications.

The Department finds that the provisions of 38 M.R.S.A. §1310-N(5) and the Rules are not applicable to this application because it is not an application for a new landfill or an expansion of an existing landfill. (See Finding of Fact #1.C, above.) However, to address public comments on the need for additional recycling rather than additional disposal capacity, the applicant submitted a summary of the recycling initiatives included in its response to the RFP and in the OSA.

20. PROTECTED NATURAL RESOURCES

The original application, and the application submitted to the Army Corps of Engineers, included an extensive wetlands study of the property. The original licenses permitted the filling of 8.84 acres of wetlands, and contained a compensation plan for the activity. Condition #4 of the original license required that the original licensee submit annual reports on the restoration and enhancement projects in the compensation plan for a 3 year period; compliance with this condition has been demonstrated.

No additional wetland areas will be impacted by the proposed project. However, the reconstruction of the access road from the landfill berm to the existing leachate pump station, and the construction of the leachate force main will include construction activities within 75 feet of the upland boundary of the forested wetland to the west of the site, and thus the applicant will file Permit By Rule applications under the Department's Chapter 305, Sections 4 and 9, Regulations prior to this construction, and will comply with the standards in the regulations.

The Department finds that the proposed facility will not unreasonably adversely effect protected natural resources in that no new impact on protected natural resources will occur, provided that the applicant obtains, and complies with the standards of, permits-by-rule under 06-096 CMR Chapter 305.4 and 305.9.

21. SETBACKS AND BUFFERS

The setbacks to public roads, private residences, public and private water supplies protected natural resources, airports and the property boundary are not changed as a result of this proposal, and thus continue to exceed the setbacks set forth in the Rules. As required by Condition #9 of the original license, the 100 foot forested buffer between the western side of the facility between the landfill and the emergent wetland to the southwest of the facility will be maintained. The

Department finds that Finding of Fact #22 of the original license, which sets forth required buffers, is not changed by this proposal.

22. UTILITIES

On site single-phase power is supplied from Route 16 via buried electrical lines. Potable water will continue to be provided by an on-site well. On-site sanitary wastewater treatment is provided by a licensed subsurface wastewater disposal facility. The applicant proposes to upgrade the facility from 113 gallons/day to 420 gallons/day; a copy of the HH200 form for the upgraded facility is contained in Attachment 10 of the application. As described in Finding of Fact #9.D, above, leachate will initially be trucked to the Old Town Mill's wastewater treatment plant, but may be transported via sewer line or truck to the City of Old Town Wastewater treatment plant in the future, if the necessary upgrades are made and the City of Old Town is willing. The Department finds that the applicant has provided for adequate utilities and the proposed facility will not have an unreasonable adverse effect on existing or proposed utilities in the municipality or area served by the utilities.

23. ALL OTHER FINDINGS OF THE ORIGINAL ORDER

The Department finds that all of the remaining Findings of Fact of the original license will be unchanged by the proposed amendment for a vertical increase, in that the horizontal footprint of the landfill will be unchanged by the proposal.

BASED on the above Findings of Fact, the Department CONCLUDES the following:

1. The applicant has provided adequate evidence of financial capacity and technical ability to meet air and water pollution control standards, provided an acceptable package for financial assurance is submitted and maintained, and provided evidence of financial capacity for construction of each cell is provided as part of the detailed design package submitted prior to each construction season.

2. The information submitted by the applicant and supplied by state and local officials regarding Casella's previous violations of certain environmental laws, as described in the civil and criminal record for SPO and Casella/NEWSME

Operations, demonstrates that Casella has willingly conducted all required corrective actions; thus the civil and criminal record does not provide a basis to deny approval for SPO to own and control, and NEWSME Operations to operate, the landfill as proposed in this application in compliance with Maine laws and regulations.

3. The applicant has provided adequate evidence of title, right or interest in the parcel of property containing the existing landfill.

4. The proposed vertical increase of the landfill will not pose an unreasonable risk that a discharge to a significant groundwater aquifer will occur in that the landfill is not located over a significant sand and gravel aquifer and the proposed vertical increase of the landfill does not pose an unreasonable threat to the quality of a significant sand and gravel aquifer which it does not overlie, or to an underlying fractured bedrock aquifer, in that soils under the landfill and the proposed design of the vertical increase, combined with the groundwater flow conditions, provide adequate protection to water quality.

5. The proposed vertical increase of the landfill will not pollute any waters of the State, contaminate the ambient air, constitute a hazard to health and welfare, or create a nuisance, provided the environmental monitoring plan for the landfill is updated in accordance with staff recommendations, and provided the landfill is constructed, operated, closed and monitored and maintained throughout the post-closure period in accordance with staff recommendations and the approved design and then-current operational standards, including reporting requirements. Compliance with the intent of the Solid Waste Management Regulations has been affirmatively demonstrated.

6. The applicant has adequately addressed the settlement and stability of the landfill, provided it monitors the facility in accordance with an approved settlement and stability monitoring plan that incorporates all recommendations made by staff.

7. The applicant has made adequate provisions for traffic movement of all types into, out of and within the development area, provided overhead lights, or another effective lighting system as approved by the Department, are installed at the

entrance to the access road prior to the operation of cell 3. The traffic increases attributable to operation of the landfill will not result in unreasonable congestion or unsafe conditions on a road in the vicinity of the project.

8. The applicant has made adequate provisions for fitting the development harmoniously into the existing natural environment and the development will not adversely affect the existing uses, scenic character, or natural resources in the municipality or in neighborhood municipalities provided the landfill is properly operated, properly closed, and properly cared for after closure, all in accordance with then-current regulatory requirements; that the applicant obtains the necessary Natural Resource Protection permit-by-rules before construction of the MSE berm; and provided the results of future visual and noise analyses confirm the projections contained in the application.

9. The proposed change in the landfill will not cause unreasonable erosion of soil or sediment, nor inhibit the natural transfer of soil. The applicant has made adequate provisions for controlling erosion and managing stormwater, provided the approved stormwater management plan and erosion control plan are fully implemented.

10. The applicant has made adequate provisions for utilities, including water supplies, sewerage facilities, solid waste disposal and roadways required for the development, and the landfill will not have an unreasonable adverse effect on existing or proposed utilities in the City of Old Town, the Town of Alton, or the area served by those services.

THEREFORE the Department APPROVES the above noted application of the STATE OF MAINE, ACTING THROUGH THE STATE PLANNING OFFICE, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations.

1. The Standard Conditions of Approval, a copy attached as Appendix A.

2. The applicant shall take all necessary actions to ensure that its activities or those of its agents do not result in unnecessary or noticeable erosion of soils on site during construction or operation of the facility.

3. Prior to May 15, 2004, the applicant shall submit a financial assurance package for closure and post-closure care to the Department for review and approval that meets requirements of the Rules. The applicant shall implement the approved package. The approved financial assurance package shall be updated on an annual basis by the applicant in accordance with the Rules.

4. The applicant shall complete the investigation in the areas around and beneath detention ponds 1 and 2 in accordance with the workplan approved by the Department.

5. The applicant shall update the EMP on an ongoing basis as recommended by staff, beginning with the submittal of the 2003 Annual Report. Monitoring of detention ponds 1 and 2, and monitoring wells #DP-4, #P-04-02, and #P-04-04 shall be added to the EMP. The 3 new well clusters proposed in the application shall be installed in locations approved by the Department, and added to the monitoring program for the facility. All landfill underdrain discharge locations shall be added to the monitoring program for the facility; they shall be monitored monthly for the field parameters in Appendix A, Column 1 of Chapter 405 of the Rules, and sampled 3 times per year for the facility's suite of detection parameters at the same time as the other monitoring locations.

6. The applicant shall initiate assessment monitoring in accordance with the Rules at monitoring wells MW-204, MW-302, MW-223B, MW-212 and MW-303 during the Spring 2004 sampling event. New wells installed in accordance with Condition #4, above, shall be included in the assessment monitoring program during the Summer 2004 sampling event.

7. The applicant shall continue to route the discharge from the leachate pond underdrain into the leachate storage pond until the Department authorizes a resumption of the surface discharge. The leachate pond underdrain water quality shall be sampled weekly throughout the rest of 2004 for field parameters including pH, specific conductivity and temperature, and an analysis of the results shall be included in the 2004 annual report for the facility. The analysis of the results shall include a proposal for future monitoring at this location, and the

necessary changes to the EMP. After review and approval by the Department, the changes shall be incorporated into the EMP and implemented as approved.

8. The applicant shall construct the sludge mixing test plot in accordance with the proposed plan, as revised in accordance with staff recommendations. At least 60 days prior to landfilling of sludge from cells 1 and 2 with other waste outside of the test plot, the applicant shall propose to the Department for review and approval, based on the findings of the test plot program, a ratio of existing and new sludge to incoming waste to be placed in cells 1, 2 and 3, detailed procedures for mixing the waste streams, and an odor control and monitoring plan for sludge excavation and mixing operations.

9. At least 60 days prior to landfilling of sludge from cells 1 and 2 with other waste outside of the test plot, the applicant shall submit to the Department for review and approval, based on the findings of the test plot program, an updated geotechnical stability analysis and a finalized geotechnical monitoring plan for the landfill.

10. At least 45 days prior to the commencement of waste placement in cell 3, the applicant shall submit to the Department for review and approval an updated operations manual, including a finalized conceptual cell development plan for the life of the landfill and a detailed cell development plan for the next 2 years of operation. The updated operations manual shall address all staff recommendations as agreed to in SME's January 22, 2004 submittal addressing staff memoranda. The operations manual shall be updated again following completion of the test plot program and prior to excavation of sludge from cells 1 and 2. All changes to the operations manual for the facility are to be implemented as approved by the Department.

11. The applicant shall include in each of the facility's annual reports proposed revisions to the operations manual, including an annually updated cell development plan. Each year's annual report shall also include an evaluation of the sizing and the installation timing of the active gas extraction system components over the reporting period, and an evaluation of the effectiveness of the system based on the quantities and types of wastes projected for the next year.

The operations manual shall be revised as conditions dictate and to comply with any changes in the operating requirements in the Rules.

12. Prior to the commencement of operations in cell 3, the applicant shall install overhead lights, or another lighting system that identifies the entrance road into the facility, at the entrance to the facility.

13. The applicant shall obtain prior to construction of the MSE berm, and comply with the standards of during construction, permits-by-rule under 06-096 CMR Chapter 305.4 and 305.9.

14. At least 60 days prior to the planned commencement of operations in cell 3, the applicant shall submit to the Department for review and approval the following information on the perimeter hydrogen sulfide monitoring program: the number and locations of instruments, based on meteorological conditions; system security measures; monitoring program details and responsibilities; and reporting procedures.

15. At least 6 months prior to the planned commencement of operation of new cells or other structures, the applicant shall submit to the Department for review and approval detailed design packages for each construction activity. The detailed design packages shall include a complete set of project specific contract bid documents, including construction drawings, technical specifications, contract administrative documents, construction monitoring and documentation provisions, construction quality assurance plans, erosion and sedimentation control plans, and the following information:

    A. For the landfill cells other than cell 3, the perimeter berm, the leachate storage tank and the ancillary structures, the detailed design packages shall also address all staff recommendations regarding the design, the technical specifications, the construction drawings, and the construction quality assurance plan as agreed to in SME's January 22, 2004 responses to the comments provided in 3 initial engineering review memoranda by staff. In addition, the applicant shall include a demonstration of financial capacity for costs associated with the construction of each cell developed after cell 3.;

B. For the active gas extraction system, the detailed design package shall also address staff recommendations regarding the design, the technical specifications, the construction drawings, and the construction quality assurance plan as agreed to in SHA's submittal dated January 21, 2004 and the applicant's letter dated February 4, 2004. The detailed design package for the initial construction of the active gas extraction system shall also include the active gas system operating plan, inclusive of monitoring, record-keeping, and reporting procedures; and the provisions to be implemented to protect and provide safe access to the well-heads if temporary geomembrane tarps are proposed for intermediate cover; and

C. For the phased final cover system, the detailed design package shall include the supporting information required by the applicable provisions of Chapter 401.5 of the Rules, and address the recommendations in staff memoranda as agreed to in SME's submittal dated January 22, 2004 and as responded to in staff memoranda dated January 26, 28 and 30, 2004.

If the Rules applicable to any aspect of the design and construction of the vertical increase of the landfill and its ancillary structures change during the development of the landfill, the applicant shall address the new requirements in subsequent submittals.

16. With regards to the acceptance of MSW for disposal, consistent with its proposal, the applicant:

A. shall not dispose of unprocessed MSW from any source other than bypass from the following sources: PERC incinerator in Orrington and the Maine Energy incinerator in Biddeford; waste delivered under an interruptible contract with PERC; or waste delivered in excess of processing capacity at other MSW incinerators in Maine;

B. shall not accept waste from an incinerator without verifiable authorization from either the owner/operator of an incinerator or from a regulatory entity with jurisdiction over the incinerator that a bypass has been called or, for holders of interruptible contracts, the contracts have been interrupted in accordance with the contractual provisions;

C. shall limit the total amount of (a) unprocessed MSW incinerated at Maine Energy and (b) MSW bypassed from Maine Energy for disposal at the WOTL and at Pine Tree Landfill's Secure III Landfill Expansion to no more than 310,000 tons in any calendar year, unless changes in conditions or circumstances occur that cause the Department to revise this cap; and

D. shall notify the Department if waste deliveries in excess of processing capacity at MSW incinerators continue from a particular incinerator for a period exceeding 1 week, and provide such information as the Department may request to demonstrate that the deliveries are due to either planned outages or unplanned production problems.

17. The monthly activity reports submitted to the Department by the applicant shall provide the data needed to determine the quantities of the various waste types, and their sources, delivered to the landfill. The monthly reports on the wastes accepted for disposal at the landfill shall include the amount and source of unprocessed MSW accepted for disposal.

18. Prior to accepting for disposal any waste not listed in the application, the applicant shall submit an application for tbe new waste to the Department for review and approval.

19. The applicant shall include in the annual reports for the facility submitted to the Department, in addition to the specific requirements of Chapter 401.4(D) of the Rules, the amount of unprocessed MSW received at WOTL from each of the approved sources.

20. If Department staff find that operation of the landfill as proposed unreasonably adversely results in unreasonable odors or fugitive dust emissions, the Department shall require additional odor control measures or fugitive dust control measures at the facility.

21. The applicant shall perform 2 additional noise studies in accordance with the provisions of the Rules: one within the first month of operation of cell 3, and the other within the first month of operation of cell 9. The results of each of the noise studies shall be submitted to the Department for its review and comment within 2 weeks of completion. If the actual noise levels are above the limits prescribed in the Rules, additional noise measures shall be implemented to meet the requirements of the Rules within 1 month of the submittal of the noise study.

22. The applicant shall conduct a future visual analysis, performed when the final elevation of the landfill reaches 330 feet, and demonstrate that the results agree with the projections provided in the application. If that demonstration cannot be made, the applicant shall propose alternative mechanisms for meeting the visual impact standards of the Rules within 1 month of the date of the visual analysis.

23. The applicant shall negotiate in good faith with the Route 43 landowner for permission to plant a tree screen in the location identified in the visual impact assessment.

24. The applicant shall submit the detailed construction plans for the placement of phased final cover to the Department for its review and approval at least 90 days prior to each application of final cover. In addition, the applicant shall submit to the Department for its review and approval a final closure plan for the landfill, prepared in accordance with the Rules in effect at that time, and complete final closure of the landfill in accordance with the approved final closure plan. The final closure plan shall include a post-closure monitoring and maintenance plan covering a period of at least 30 years following closure. The post-closure monitoring and maintenance plan shall be revised throughout the post-closure period to comply with changes in site conditions or any changes in

the post-closure monitoring and maintenance requirements of the Rules. Post-closure monitoring and maintenance shall continue until the Department approves its cessation.

DONE AND DATED AT AUGUSTA, MAINE THIS 9th DAY

OF April, 2004.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Dawn R Gallagher
Dawn R. Gallagher, Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

Date of initial receipt of application: October 30, 2003
Date application accepted for processing: November 21, 2003

Date filed with Board of Environmental Protection:

XCD51106/cwd

APPENDIX B

COMPLIANCE SELF-AUDIT CHECKLIST

JUNIPER RIDGE LANDFILL
COMPLIANCE SELF-AUDIT EVALUATION
REPORT YEAR

This Compliance Self-Audit Evaluation is to be used to perform an annual audit of landfill operations as required by of Chapter 401, Section 4.D. (1) (b) of the State of Maine Solid Waste Management Rules. The purpose of this audit is to verify general compliance with the site operations manual, licenses and regulatory requirements. Qualified facility personnel performed the audit.

Facility Name………………. **Juniper Ridge Landfill**

Location……………………. **Old Town, Maine**

Audit for Calendar Year…..

Compliance Auditor……….. **Jeremy M Labbe**

Title…………………………. **Environmental Manager**

Signature of Auditor……….

GENERAL EVALUATION:

1. Are active facility licenses kept on file at the facility?

2. Do the facility licenses have special license conditions relating to landfill operations?

3. What pending licenses or approvals were sought from the MEDEP at the time of this audit.

4. Date of payment of MEDEP Annual License Fee.

5. Date of submittal of previous MEDEP Annual Report & Fee.

6. Does the facility have a Host Community Agreement in-place and on file?

7. Does the facility have a current liability insurance policy in-place and on file at the facility?

8. Has the facility submitted an executed financial assurance instrument for closure and post closure care along with updated closure/post closure cost estimates to the MEDEP?

9. Last date a certified copy of the facility Operations Manual was updated.

10. MEDEP approval date of last updated Operations Manual.

11. Number and locations of the Certified Copies of the Operations Manual.

12. Operational personnel who received landfill training during audit year.

13. Are only solid wastes or special wastes as allowed in the landfill's current license accepted and are those wastes handled as described in the landfill's Operations Manual?

14. Are solid wastes and special wastes permitted for acceptance characterized on an ongoing basis in conformance with the characterization plan approved by the Department?

15. **Is access to the facility controlled so that the public is not exposed to potential health and safety hazards and access is only permitted when an attendant is on duty?**

16. **Are the hours of operation and other limitations for access and use prominently posted at the entrance to the landfill?**

17. **Are the access roads within the facility maintained?**

18. **Are any access roads into the active cell of the landfill constructed and maintained to prevent migration of leachate outside of the cell.**

19. **Is a road maintenance program appropriately implemented to prevent the accumulation of dust, mud, or wastes from the facility access, public, or private roads?**

20. **Are the appropriate signs posted or other approved means implemented to indicate clearly where solid waste is to be unloaded and the location of any separate handling areas?**

21. **Are the setbacks and buffer strips approved by the Department being maintained?**

22. **Are the cell development plans up-to-date and submitted with the annual report?**

23. **Is compaction performed at least once per operating day and more often as necessary unless otherwise approved by the Department?**

24. **Has cover been placed as outlined in the operations manual?**

25. **Have storm water management and erosion control measures been implemented as outlined in the operations manual?**

26. **Are leachate management systems including collection, transport, storage, and pumping systems maintained in accordance with the site Operations Manual?**

27. Are landfill gas systems installed and maintained as outlined in the Operations Manual?

28. Is a methane gas-monitoring program implemented to verify the concentration of explosive gases generated by the landfill, and if an exceedance is triggered, appropriate steps are taken to protect human health and the Department notified of the occurrence and the protective steps that were taken?

29. Are routine inspections of the landfill facilities performed as outlined in the Operations Manual, and are records of the inspections kept on file at the facility?

30. Does the facility have a fire protection plan in-place and is it outlined in the operations manual?

31. Does the facility have a hazardous and special waste handling and exclusion plan and is it implemented at the facility?

32. Does the facility have a litter control plan and is it implemented as outlined in the Operations Manual?

33. Has the Environmental Monitoring Program been implemented as outlined in the Operations Manual?

34. Environmental sampling events being conducted as required and results reported to the MEDEP.

35. Are waste staging and storage areas maintained as outlined in the Operations Manual?

36. Is a vector control program in-place and implemented as outlined in the operations manual?

37. Does the facility accept asbestos wastes?

APPENDIX C

OPERATOR TRAINING PROGRAM OUTLINE

CASELLA WASTE SYSTEMS
ANNUAL TRAINING SCHEDULE
Safety / Compliance

The following schedule is provided as a guideline for completion of all required annual review and updates.

	Landfill / GTE	MRF / Transfer Station	Hauling	Mechanics	Industrial Solutions	Administrative
January	Hazard Communication (GHS) / Compressed Gases / Landfill Gasses/Landfill Heavy Equipment / Pre-Use Inspections / Intro. To Landfill Operations & Safety	Hazard Communication (GHS) Safe Operation / Used Oil / Compressed Gases	Hazard Communication (GHS) Safe Operation / Used Oil / Compressed Gases	Hazard Communication (GHS) Safe Operation / Used Oil & Filters / Compressed Gases	Hazard Communication (GHS) / Safe Operation / Compressed Gases	Hazard Communication (GHS)
February	Lockout-Tagout / Confined Space / LOTO Observation Forms Complete Machine Guarding / Articulated Loader & Skidsteer Safety	Lockout-Tagout / Confined Space / LOTO Observation Forms Complete Machine Guarding	Lockout-Tagout / Confined Space / LOTO Observation Forms Complete Machine Guarding	Lockout-Tagout / Confined Space / LOTO Observation Forms Complete Machine Guarding	Lockout-Tagout / Confined Space / LOTO Observation Forms Complete / Machine Guarding	Lockout-Tagout / Confined Space Awareness
March	Bloodborne Pathogens Accident & Injury Reporting / Universal & E-Waste / Bulldozer Operation	Bloodborne Pathogens Accident & Injury Reporting / Universal & E-Waste	Bloodborne Pathogens Accident & Injury Reporting / Universal & E-Waste	Bloodborne Pathogens Accident & Injury Reporting / Shop Rags	Bloodborne Pathogens Accident & Injury Reporting / Universal & E-Waste / HAZWOPER & RCRA	Bloodborne Pathogens Accident & Injury Reporting
April	Emergency Response / Emergency Action Plan / SWPPP & SPCC / Mounting & Dismounting / Compactor Operation / LF Emergency Action Plan	Emergency Response / Emergency Action Plan / SWPPP & SPCC Mounting & Dismounting	Emergency Response / Emergency Action Plan / SWPPP & SPCC Mounting & Dismounting	Emergency Response / Emergency Action Plan / SWPPP & SPCC Mounting & Dismounting	Host Facility Emergency Response & Action Plan / Spill Response Mounting & Dismounting	Emergency Response / Emergency Action Plan
May	PPE and Seat Belt Policy / Safe Lifting / Fall Protection (if applicable) / Heat Stress / Chainsaw Safety / Towing Stuck Vehicles / Excavator	PPE and Seat Belt Policy Safe Lifting Fall Protection (if applicable) Heat Stress	PPE and Seat Belt Policy Safe Lifting Fall Protection (if applicable) Heat Stress	PPE and Seat Belt Policy Safe Lifting Fall Protection (if applicable) Heat Stress	PPE and Seat Belt Policy Safe Lifting Fall Protection (if applicable) Heat Stress	Safe Lifting Heat Stress
June	Fire Extinguisher Use / Fire Safety Plan Equipment Fire Procedures General / Sexual Harassment Policy / LF Fire Procedures / General Safety Program	Fire Extinguisher Use / Fire Safety Plan Equipment Fire Procedures General / Sexual Harassment Policy	Fire Extinguisher Use / Fire Safety Plan Equipment Fire Procedures General / Sexual Harassment Policy	Fire Extinguisher Use / Fire Safety Plan Equipment Fire Procedures General / Sexual Harassment Policy	Fire Extinguisher Use / Fire Safety Plan Equipment Fire Procedures General / Sexual Harassment Policy	Fire Extinguisher Use / Fire Safety Plan General/Sexual Harassment Policy
July	Forklift Training Bobcat Training / Radioactive Material / Bird Control Training / Leachate Breakout / Tip Policy / Communication / Driver Safety / Off-loading Trucks / Cell	Forklift Training Bobcat Training / Radioactive Material	Smith System Backing Helper Safety / Vehicle Riding Positions / Overhead Clearance / Radioactive Material	Forklift Training Bobcat Training / Lead Acid Batteries	Forklift Training Bobcat Training / Cell Phone Use / Lead Acid Batteries	Regulatory Contact Procedures
August	Welding Safety / Hot Work Permits Flammable and Combustible Liquids Unacceptable Waste / Hydrogen Sulfide & Methane Safety	Welding Safety / Hot Work Permits Flammable and Combustible Liquids Unacceptable Waste	Welding Safety / Hot Work Permits Flammable and Combustible Liquids Unacceptable Waste	Welding Safety / Hot Work Permits Flammable and Combustible Liquids Unacceptable Waste	Welding Safety / Hot Work Permits Flammable and Combustible Liquids Unacceptable Waste	Unacceptable Waste
September	Workplace Violence / Stress Management / CFC Training / LF Spill Procedures / Excavation & Trenching / Battery Disconnect Policy	Workplace Violence Stress Management CFC Training	Workplace Violence Stress Management CFC Training	Workplace Violence Stress Management CFC Training/Used Antifreeze	Workplace Violence / Stress Management / Baler & Grinder Safety	Workplace Violence Stress Management
October	Portable Power & Hand Tool Safety Cold Stress / High Visibility Clothing / Mounting, Dismounting & Landfill Walking / Waste Inspection	Portable Power & Hand Tool Safety / Electrical Safety / Cold Stress / High Visibility Clothing / Waste Inspection	Portable Power & Hand Tool Safety / Electrical Safety / Cold Stress / High Visibility Clothing / Waste Inspection	Portable Power & Hand Tool Safety / Electrical Safety / Cold Stress / High Visibility Clothing / Waste Inspection	Portable Power & Hand Tool Safety / Electrical Safety / Cold Stress / High Visibility Clothing / Waste Inspection	Cold Stress / Electrical Safety / Waste Inspection
November	Portable Ladder Safety / Cranes, Hoist, Chains, Slings / Jacks & Jack Stands / Slips, Trips & Falls / Blocking & Cribbing	Portable Ladder Safety Cranes, Hoist, Chains, Slings Jacks & Jack Stands / Slips, Trips & Falls	Smith System "5-Keys" to Safe Driving Smith System Backing / Slips, Trips & Falls	Portable Ladder Safety Cranes, Hoist, Chains, Slings Jacks & Jack Stands / Slips, Trips & Falls	Portable Ladder Safety Cranes, Hoist, Chains, Slings / Slips, Trips & Falls	General Office Safety / Slips, Trips & Falls
December	Facility & Equipment Inspection and Documentation Procedures / Wheel Berms & Stops / Asbestos / Special Waste	Facility & Equipment Inspection and Documentation Procedures Asbestos / Special Waste	Facility & Equipment Inspection and Documentation Procedures Asbestos / Special Waste	Facility & Equipment Inspection and Documentation Procedures Asbestos / Special Waste / Parts Washer	Facility & Equipment Inspection and Documentation Procedures / Production Waste & Needle Safety (BD Locations) / Special Waste	Home & Office Holiday Safety

Last Updated: 2/27/2015

Calendar Year 2014

APPENDIX D

CELL DEVELOPMENT PLANS

JUNIPER RIDGE LANDFILL
CELL 11 DEVELOPMENT

1.0 CELL 11 SYSTEM OVERVIEW

Cell 11 is approximately 9.5 acres in size and is located east of the existing Cells 7 and 9. Cell 11 is planned to be constructed in 2018 to be available for waste placement in 2019. The Cell 11 liner system will consist of a composite primary liner, a leak detection system, and a secondary liner. The composite primary liner will consist of the following components:

- An 80-mil high-density polyethylene (HDPE) textured geomembrane;
- A geosynthetic clay liner (GCL); and
- A 12-inch clay barrier soil layer (hydraulic conductivity (K) less than or equal to $1x10^{-7}$ cm/sec).

The leak detection system will consist of the following components:

- A 12-inch layer of sand ($K \geq 1x10^{-3}$ cm/sec);
- A network of 6-inch diameter perforated HDPE pipe;
- A geocomposite drainage net; and
- A dedicated leak detection pump system.

The leak detection system has been designed to detect leaks, within 30 days. The secondary liner will consist of a 60-mil HDPE textured geomembrane. Directly below the secondary liner system will be 12 inches of clay with a hydraulic conductivity (K) less than or equal to $1x10^{-7}$ cm/sec.

The Cell 11 leachate collection system consists of a 12-inch layer of granular material with a hydraulic conductivity greater than $5\ x10^{-3}$ cm/sec, perforated HDPE laterals (minimum diameter 6 inches) and a perimeter transport pipe (minimum diameter 8 inches), stone pipe filters, and a drainage geocomposite. The leachate collection system is a gravity drain system which flows to the Cell 11 temporary collection sump and pump system located at the northeast corner of the cell. Clean outs are provided for the Cell 11 leachate laterals, and perimeter transport piping. Existing Cell 7 and Cell 9 leachate header cleanouts will be extended from west to east across Cell 11 to the perimeter berm to provide access to these pipes for cleaning.

The Cell 11 leachate pump system consists of a primary 5 horsepower pump located in the bottom of the sump, and a secondary 5 horsepower pump located in the riser pipe on the sideslope. The primary pump has the ability to pump design flows, while the secondary pump serves as a backup pump to the primary pump. Both pumps are piped through a header system to a dual-containment leachate force main located in the perimeter berm. The force main allows the leachate to be pumped from the Cell 11 sump to the 921,000-gallon aboveground storage tank for temporary storage prior to trucking the leachate off-site for treatment.

Liquids that collect in the Cell 11 leak detection layer drain to the leak detection sump, located on the northeast side of the cell. The sump has a 1 horsepower pump that pumps liquids into the leachate collection sump. The leak detection pump system is equipped with a flow meter and sample port to monitor leak detection flows and water quality. The leak detection system has the hydraulic capacity to transmit the predicted flows associated with the Expansion's primary liner action leakage rate and rapid and large leakage rate.

2.0 CELL 11 DEVELOPMENT

Initial conditions prior to waste placement into Cell 11 is shown on Figure 1. After the initial placement of the 5-foot soft/ frost protection layer within Cell 11, waste placement and operations of Cell 11 will be performed in accordance with the operating procedures contained in Section 7.0 of the Operations Manual. The various phases of waste placement are shown on Figures 2 through 6. Associated operational details such as the cell access road ramp, perimeter berm intermediate cover, leachate collection inlet, temporary up-slope stormwater diversion berm, temporary mid-slope intermediate berm, chimney drain, downspout, and plunge pool are shown on Figures E-1, E-2 and E-3 in Appendix E. Access to the cell will initially be from the north end of Cell 11 and will be constructed over the perimeter berm as detailed on Figure E-2.

Portions of Cell 11 waste placement will piggy-back onto the eastern waste slope of Cells 7 and 9. Prior to filling against the eastern sideslope of the existing cells, temporary cover materials will be removed to the height of the next waste lift and up-slope stormwater diversion berms will be constructed to divert clean stormwater runoff away from the active operating area as detailed on Figure E-2. During the initial waste placement, operations along the perimeter of Cell 11 the waste will be placed as shown in the detail on Figure E-2 to allow infiltration and stormwater that comes in contact with exposed waste into the perimeter drainage stone or sand. This area will become a temporary stormwater drainage ditch when the intermediate geomembrane cover is installed on the first stage which will direct stormwater to perimeter berm down spouts and plunge pools shown on Figure 1. As the soft layer is placed, chimney drains will be installed at the locations shown on Figure 1 to increase the draining capacity of the waste mass. The chimney drains will be constructed of tire shreds and piping through the 5-foot soft waste layer only to minimize the gas emissions from these structures.

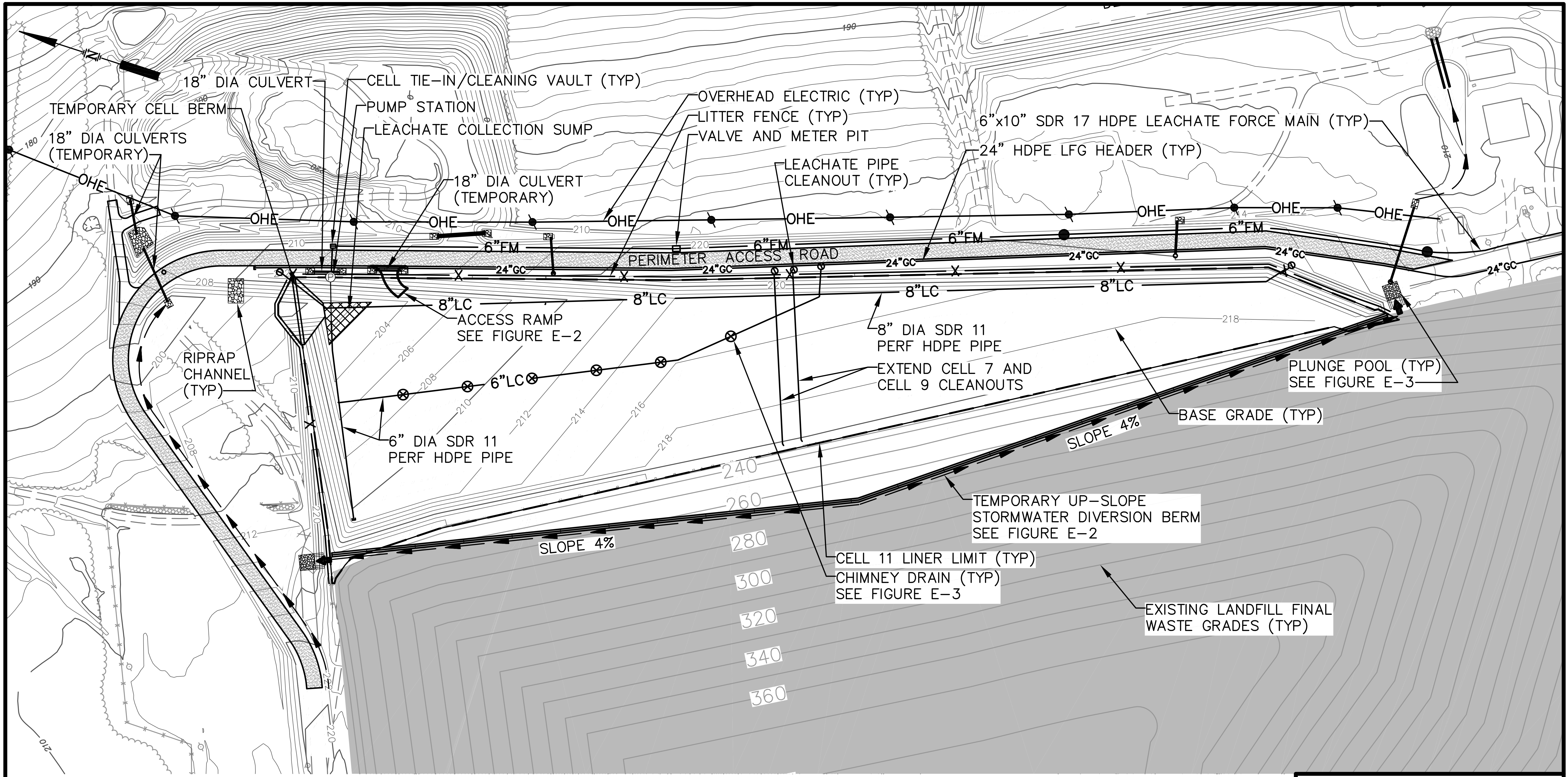
Waste placement operations in Cell 11 will progress until Stage 1 grades are achieved as shown on Figure 2. At the completion of the filling of Stage 1 and prior to Stage 2 filling, mid-slope intermediate berms, leachate transport piping and leachate collection inlets will be located as shown on Figure 3. Horizontal gas collection trenches will be installed and connected to the site's gas management infrastructure and intermediate geomembrane cover will be placed on the sideslopes of Stage 1. Runoff from the intermediate geomembrane covering the sideslopes of Stage 1 will flow via a temporary stormwater ditch to ditches constructed along the inside edge of the perimeter berm of Cell 11 as previously described. The runoff will then be conveyed by way of perimeter downspouts to the stormwater structures located outside of the cell. The perimeter downspout locations are shown on Figure 3 and will be constructed of geomembrane and will include a riprap plunge pool at the bottom of the slope.

Operational controls and waste filling will progress for Stages 2, 3, 4, and 5 (as shown on Figures 3, 4, 5, and 6 respectively). As the waste elevation approaches the final elevation in each stage the mid-slope intermediate berms, leachate transport piping, leachate collection inlets, landfill gas infrastructure and intermediate geomembrane cover are installed to be ready for the operation of the next stage. The filling of Stages 2, 3, 4, and 5 will include the construction of the landfill access road which incorporates 2-foot high berms on the outside edge of the road and a 2-foot deep stormwater ditch on the inside edge of the road and graded as shown on Figures 2 through 6. The waste below the landfill access road and any berms constructed of waste must be a high shear strength waste such as construction and demolition debris. High strength waste is defined as waste with adequate strength that it can be piled while maintaining sideslopes of 1 horizontal to 1 vertical. High strength wastes would not include materials such as sludges or other high moisture content materials.

The stormwater ditch along the roadway in the previously filled stages will be lined with temporary geomembrane cover. The stormwater ditch will direct clean runoff from the upper part of the covered landfill via culverts to the lower portion of the landfill where it is directed to the roadside ditch located along the perimeter access road. Upon completion of the cell development stages of Cell 11, intermediate cover will be in place over the entire waste surface of the developed area and maintained until the final cover is constructed over this area.

3.0 LANDFILL GAS INFRASTRUCTURE PLACEMENT

The landfill gas infrastructure will be placed as described in Appendix J of the Operations Manual and as shown on the Cell 11 Landfill Gas System Expansion Drawings in Appendix D of the Operations Manual.



LEGEND

▨	AREA WITH GEOMEMBRANE INTERMEDIATE COVER
——LC——	EXISTING LEACHATE COLLECTION PIPING
——→	CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
⬇	PERIMETER BERM DOWNSPOUT
⊗	CHIMNEY DRAIN
▨——●	CATCH BASIN AND CULVERT WITH RIPRAP APRON
▨——▨	CULVERT WITH RIPRAP APRON

NOTES:

1. TOPOGRAPHY SHOWN OUTSIDE THE LIMIT OF LANDFILL FROM AERIAL SURVEY & PHOTO, NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14.
2. BASEGRADES WITHIN CELL 11 LIMITS REPRESENT BASE GRADES PRIOR TO PLACEMENT OF THE IMPORTED CLAY LAYER AND CONSTRUCTION OF LINER SYSTEM.
3. JUNIPER RIDGE LANDFILL IS AN ACTIVE LANDFILL FACILITY AND TOPOGRAPHY WITHIN ACTIVE LIMITS OF CELL ARE SUBJECT TO CHANGE.
4. A FIVE FOOT/SOFT LAYER/FROST PROTECTION LAYER SHALL BE PLACED OVER THE LEACHATE COLLECTION SYSTEM

75 0 150 FEET

FIGURE 1
CELL 11 DEVELOPMENT
INITIAL CONDITIONS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

DWG: C11-CELLDEV LMN: INITIAL CTB: SME-STD REV: 6/22/2015

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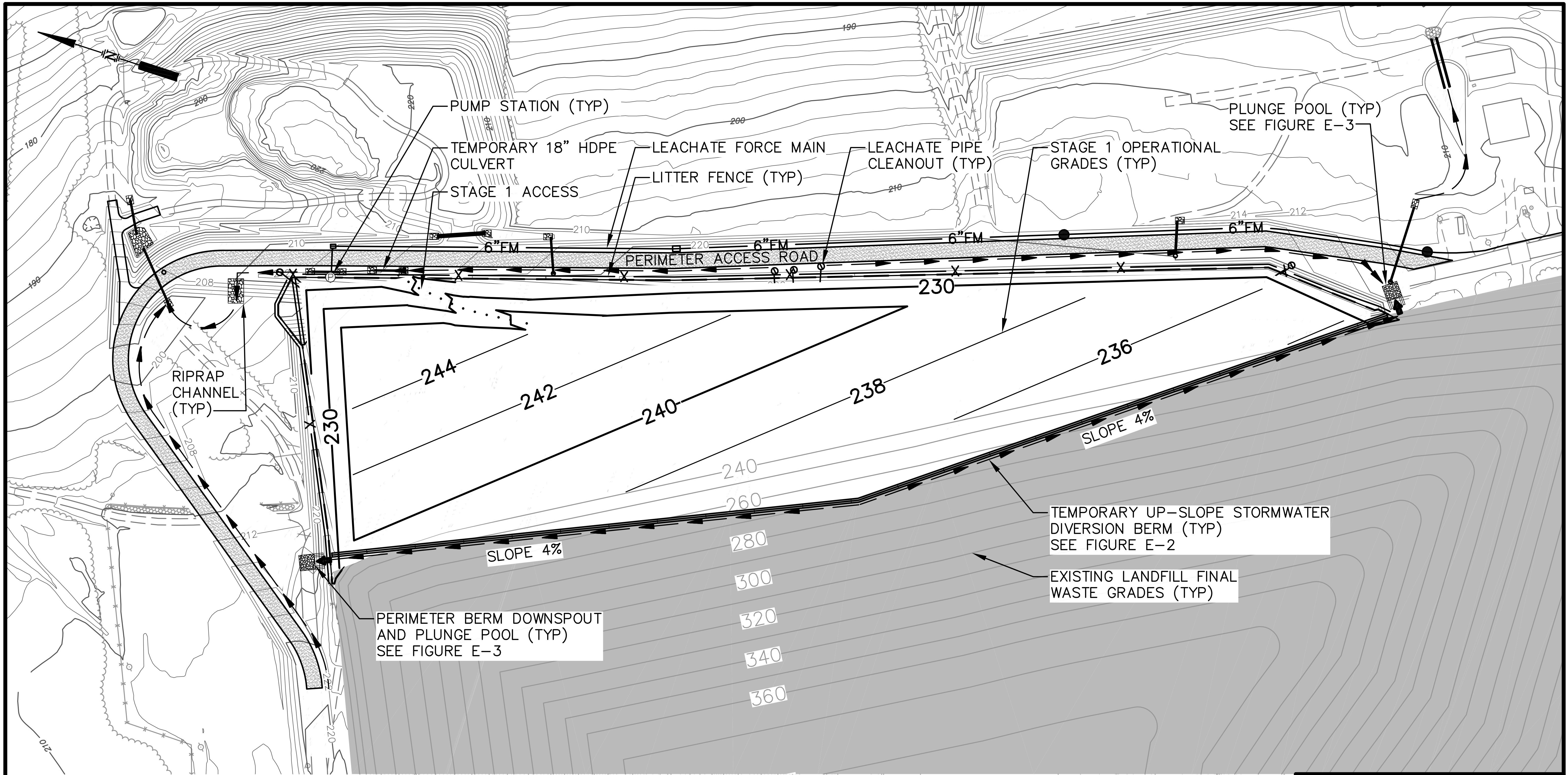

LEGEND

- ▨ AREA WITH GEOMEMBRANE INTERMEDIATE COVER
- —LC— EXISTING LEACHATE COLLECTION PIPING
- → CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
- ⬇ PERIMETER BERM DOWNSPOUT
- ⊗ CHIMNEY DRAIN
- ▨—● CATCH BASIN AND CULVERT WITH RIPRAP APRON
- ▨—▨ CULVERT WITH RIPRAP APRON
- · · · · · · CELL ACCESS ROAD

NOTES:

1. TOPOGRAPHY SHOWN OUTSIDE THE LIMIT OF LANDFILL FROM AERIAL SURVEY & PHOTO, NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14.
2. BASEGRADES WITHIN CELL 11 LIMITS REPRESENT BASE GRADES PRIOR TO PLACEMENT OF THE IMPORTED CLAY LAYER AND CONSTRUCTION OF LINER SYSTEM.
3. JUNIPER RIDGE LANDFILL IS AN ACTIVE LANDFILL FACILITY AND TOPOGRAPHY WITHIN ACTIVE LIMITS OF CELL ARE SUBJECT TO CHANGE.

75 0 150 FEET

FIGURE 2
CELL 11 DEVELOPMENT
STAGE 1
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

DWG: C11-CELLDEV LMN: STAGE 1 CTB: SME-STD REV: 6/22/2015

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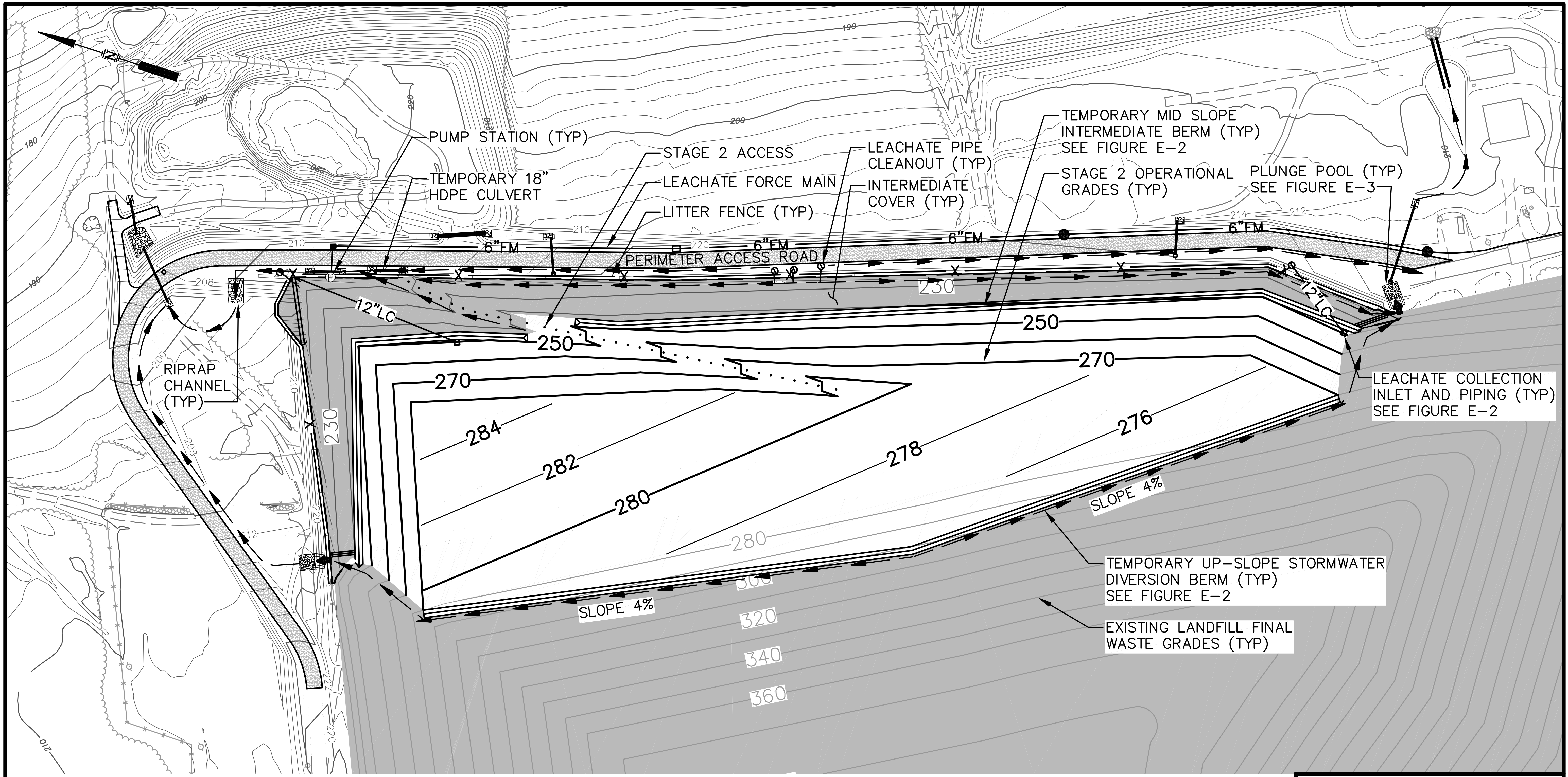

LEGEND

▨ AREA WITH GEOMEMBRANE INTERMEDIATE COVER
——LC—— EXISTING LEACHATE COLLECTION PIPING
→ CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
⬇ PERIMETER BERM DOWNSPOUT
⊗ CHIMNEY DRAIN
▨——● CATCH BASIN AND CULVERT WITH RIPRAP APRON
▨——▨ CULVERT WITH RIPRAP APRON
· · · · · · CELL ACCESS ROAD

NOTES:

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2. BASEGRADES WITHIN CELL 11 LIMITS REPRESENT BASE GRADES PRIOR TO PLACEMENT OF THE IMPORTED CLAY LAYER AND CONSTRUCTION OF LINER SYSTEM.
3. JUNIPER RIDGE LANDFILL IS AN ACTIVE LANDFILL FACILITY AND TOPOGRAPHY WITHIN ACTIVE LIMITS OF CELL ARE SUBJECT TO CHANGE.

75 0 150 FEET

FIGURE 3
CELL 11 DEVELOPMENT
STAGE 2
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

DWG: C11-CELLDEV LMN: STAGE 2 CTB: SME-STD REV: 6/22/2015

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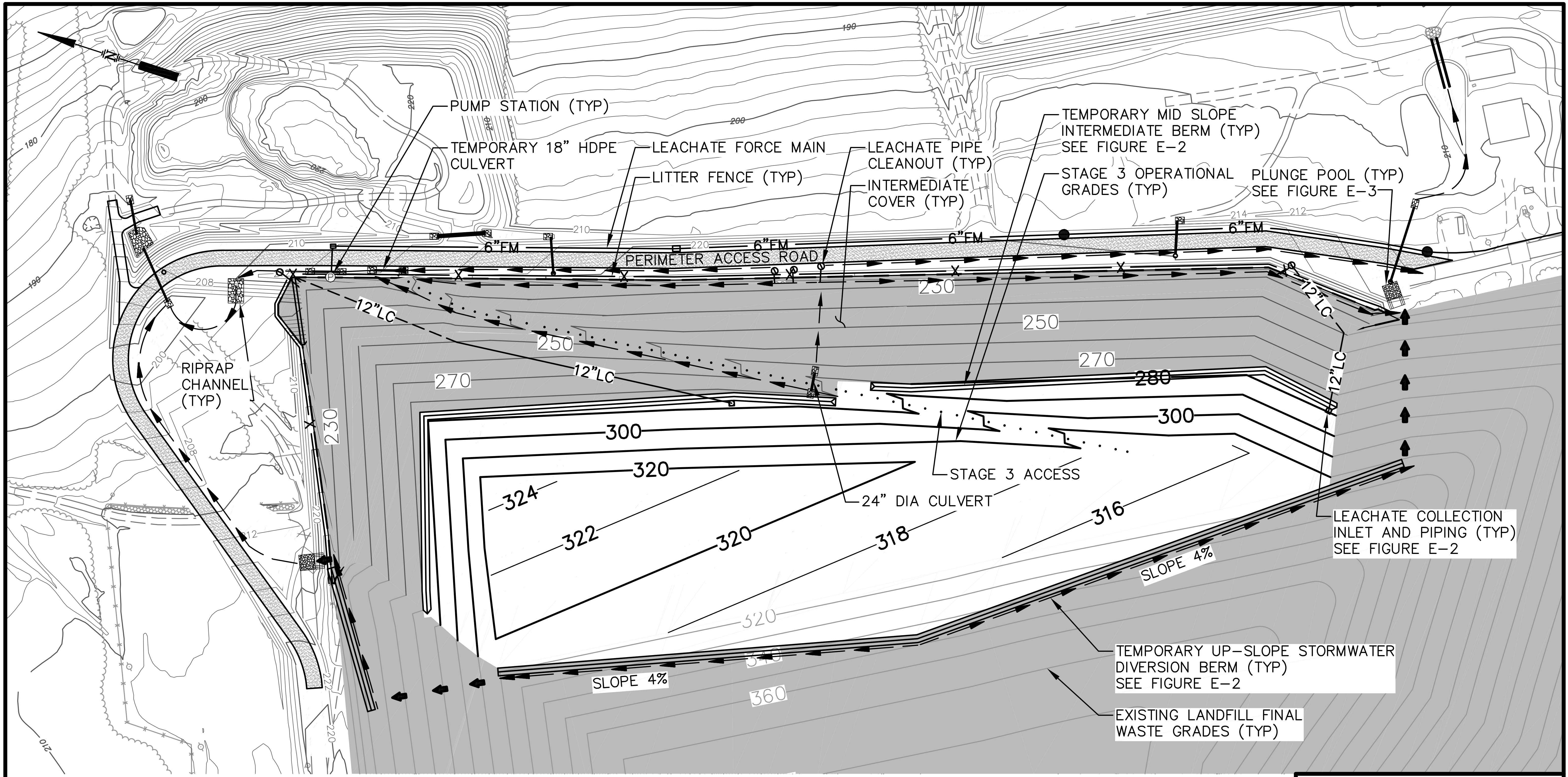

LEGEND

▨	AREA WITH GEOMEMBRANE INTERMEDIATE COVER
—LC—	EXISTING LEACHATE COLLECTION PIPING
→	CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
⬇	PERIMETER BERM DOWNSPOUT
⊗	CHIMNEY DRAIN
▨—●	CATCH BASIN AND CULVERT WITH RIPRAP APRON
▨—▨	CULVERT WITH RIPRAP APRON
· · · · · ·	CELL ACCESS ROAD

NOTES:

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3. JUNIPER RIDGE LANDFILL IS AN ACTIVE LANDFILL FACILITY AND TOPOGRAPHY WITHIN ACTIVE LIMITS OF CELL ARE SUBJECT TO CHANGE.

75 0 150 FEET

FIGURE 4
CELL 11 DEVELOPMENT
STAGE 3
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

DWG: C11-CELLDEV LMN: STAGE 3 CTB: SME-STD REV: 6/22/2015

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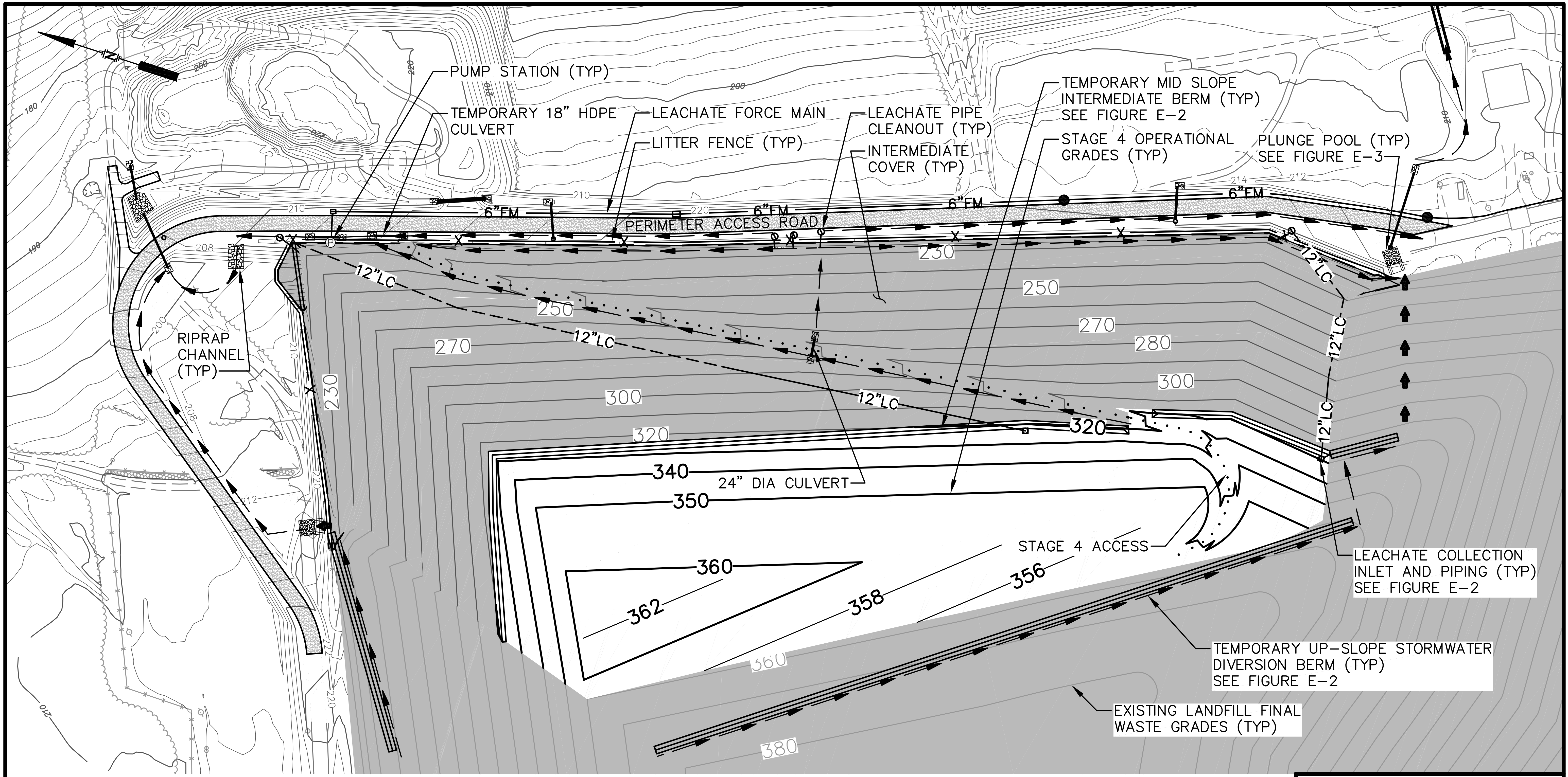

LEGEND

▨	AREA WITH GEOMEMBRANE INTERMEDIATE COVER
——LC——	EXISTING LEACHATE COLLECTION PIPING
→	CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
⬇	PERIMETER BERM DOWNSPOUT
⊗	CHIMNEY DRAIN
▨——●	CATCH BASIN AND CULVERT WITH RIPRAP APRON
▨——▨	CULVERT WITH RIPRAP APRON
· · · · · ·	CELL ACCESS ROAD

NOTES:

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75 0 150 FEET

FIGURE 5
CELL 11 DEVELOPMENT
STAGE 4
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

DWG: C11-CELLDEV LMN: STAGE 4 CTB: SME-STD REV: 6/22/2015

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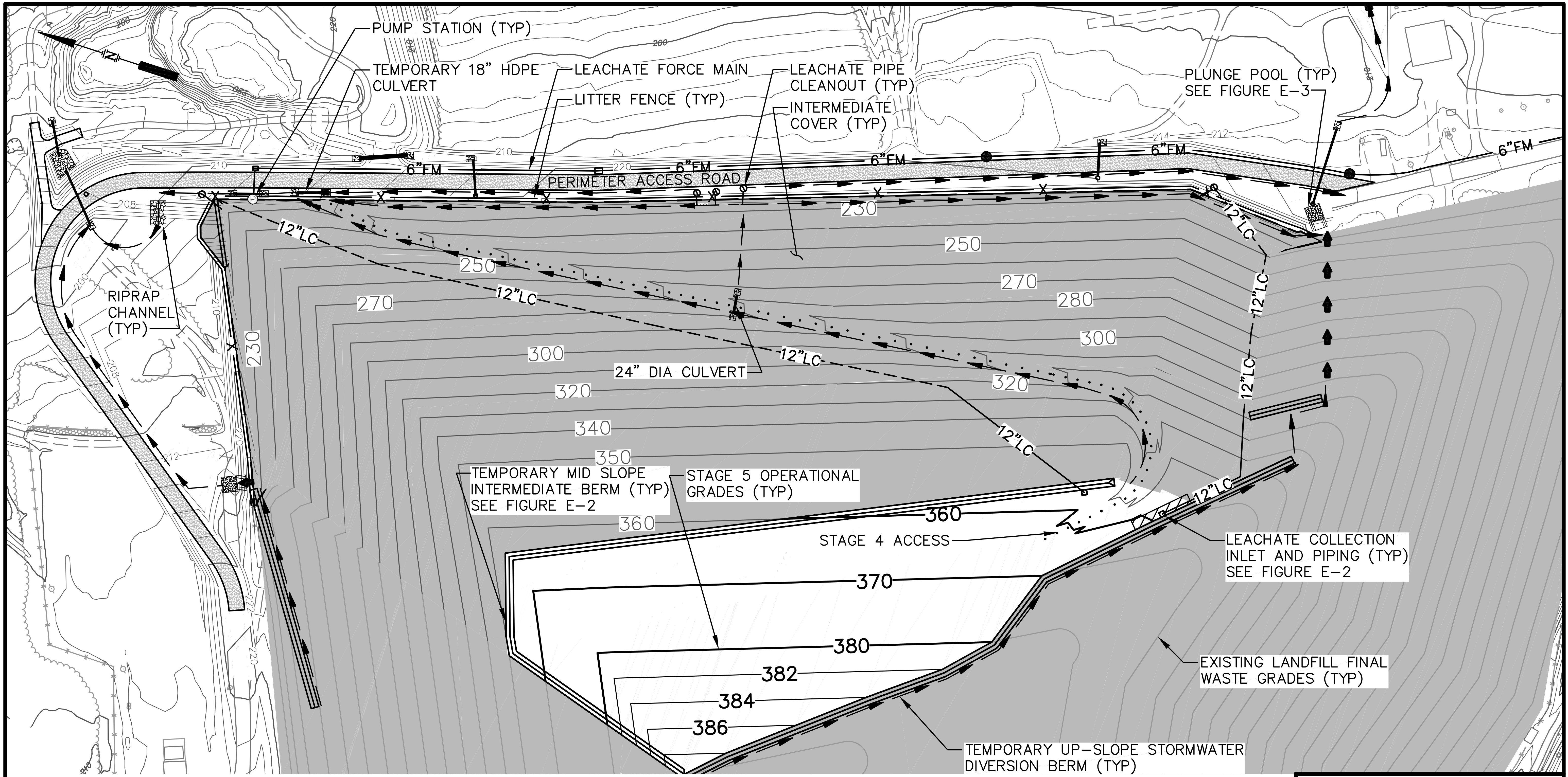

LEGEND

▨	AREA WITH GEOMEMBRANE INTERMEDIATE COVER
—LC—	EXISTING LEACHATE COLLECTION PIPING
→	CLEAN STORMWATER DITCH AND DIRECTION OF FLOW
⬇	PERIMETER BERM DOWNSPOUT
⊗	CHIMNEY DRAIN
▨—●	CATCH BASIN AND CULVERT WITH RIPRAP APRON
▨—▨	CULVERT WITH RIPRAP APRON
· · · · · ·	CELL ACCESS ROAD

NOTES:

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2. BASEGRADES WITHIN CELL 11 LIMITS REPRESENT BASE GRADES PRIOR TO PLACEMENT OF THE IMPORTED CLAY LAYER AND CONSTRUCTION OF LINER SYSTEM.
3. JUNIPER RIDGE LANDFILL IS AN ACTIVE LANDFILL FACILITY AND TOPOGRAPHY WITHIN ACTIVE LIMITS OF CELL ARE SUBJECT TO CHANGE.

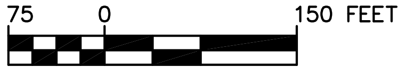

FIGURE 6
CELL 11 DEVELOPMENT
STAGE 5
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

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DWG: C11-CELLDEV LMN: STAGE 5 CTB: SME-STD REV: 6/22/2015

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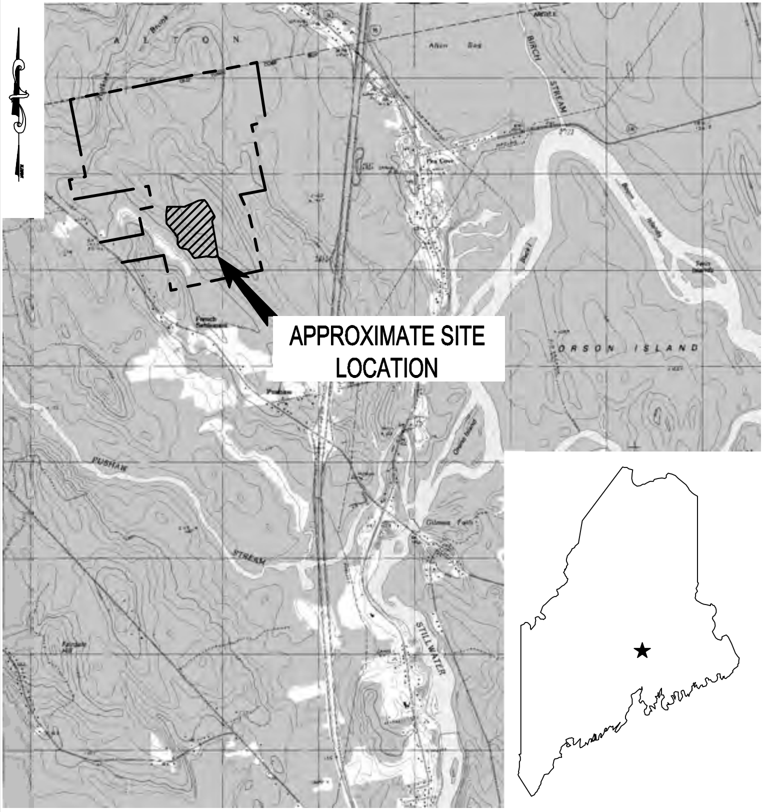
CELL 11 LANDFILL GAS SYSTEM EXPANSION DRAWINGS

JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE
JUNE 2015



FROM: USGS TOPOGRAPHIC MAP- OLD TOWN, MAINE (1988)

LOCUS PLAN

SCALE: 1"=1000'

SHEET INDEX

SHEET 1	EXISTING CONDITIONS PLAN
SHEET 2	LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 1
SHEET 3	LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 2
SHEET 4	LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 3
SHEET 5	LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 4
SHEET 6	LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 5
SHEET 7	CROSS SECTION
SHEETS 8-11	DETAILS

Eric S. Steinhauser
10809

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

PREPARED FOR:

NEW ENGLAND WASTE SERVICES

NEWSME LANDFILL OPERATIONS, LLC

JUNIPER RIDGE LANDFILL

OLD TOWN, MAINE

PREPARED BY:

SANBORN HEAD

20 FOUNDRY STREET, CONCORD, NEW HAMPSHIRE 03301
(603) 229-1900 FAX (603) 229-1919

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PROJ.#: 2536.27 "CELL 11 LANDFILL GAS SYSTEM EXPANSION DRAWINGS, JUNIPER RIDGE LANDFILL, OLD TOWN, MAINE" JUNE 2015.

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NOTES:

1. THE EXISTING LANDFILL GAS EXTRACTION SYSTEM INFRASTRUCTURE FEATURES SHOWN ARE BASED ON A COMBINATION OF DESIGN AND AS-BUILT DOCUMENTATION AVAILABLE TO SANBORN, HEAD & ASSOCIATES, INC. (SANBORN HEAD). ACTUAL LOCATIONS OF INDIVIDUAL FEATURES MAY BE DIFFERENT THAN SHOWN.
2. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., OF NORRIDGEWOCK, MAINE. PHOTO DATE DECEMBER 31, 2014. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.

LEGEND:

EXISTING

——190——	10-FOOT CONTOUR
———	2-FOOT CONTOUR
— — —	LIMIT OF WASTE CONTAINMENT
— - —	CELL LIMIT
- - -	EDGE OF ROAD
———	LANDFILL GAS CONVEYANCE PIPE
- - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)
⌒⌒⌒	TREELINE
—+—	FENCE LINE
⊕ GW-9	LANDFILL GAS EXTRACTION WELL
⊖ GCT-21	COLLECTION TRENCH WELLHEAD
⊖	COLLECTION TRENCH TERMINATION
⊐	PIPE END CAP
⊘	LEACHATE COLLECTION PIPE CLEANOUT
☐	LEACHATE COLLECTION INLET
⊙	LANDFILL GAS EXTRACTION WELLHEAD
▨	RIPRAP

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MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN ||| HEAD

GRAPHICAL SCALE
100' 50' 0 100' 200'

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

EXISTING CONDITIONS PLAN

PROJECT NUMBER:
2536.27

SHEET NUMBER:
1 OF 11

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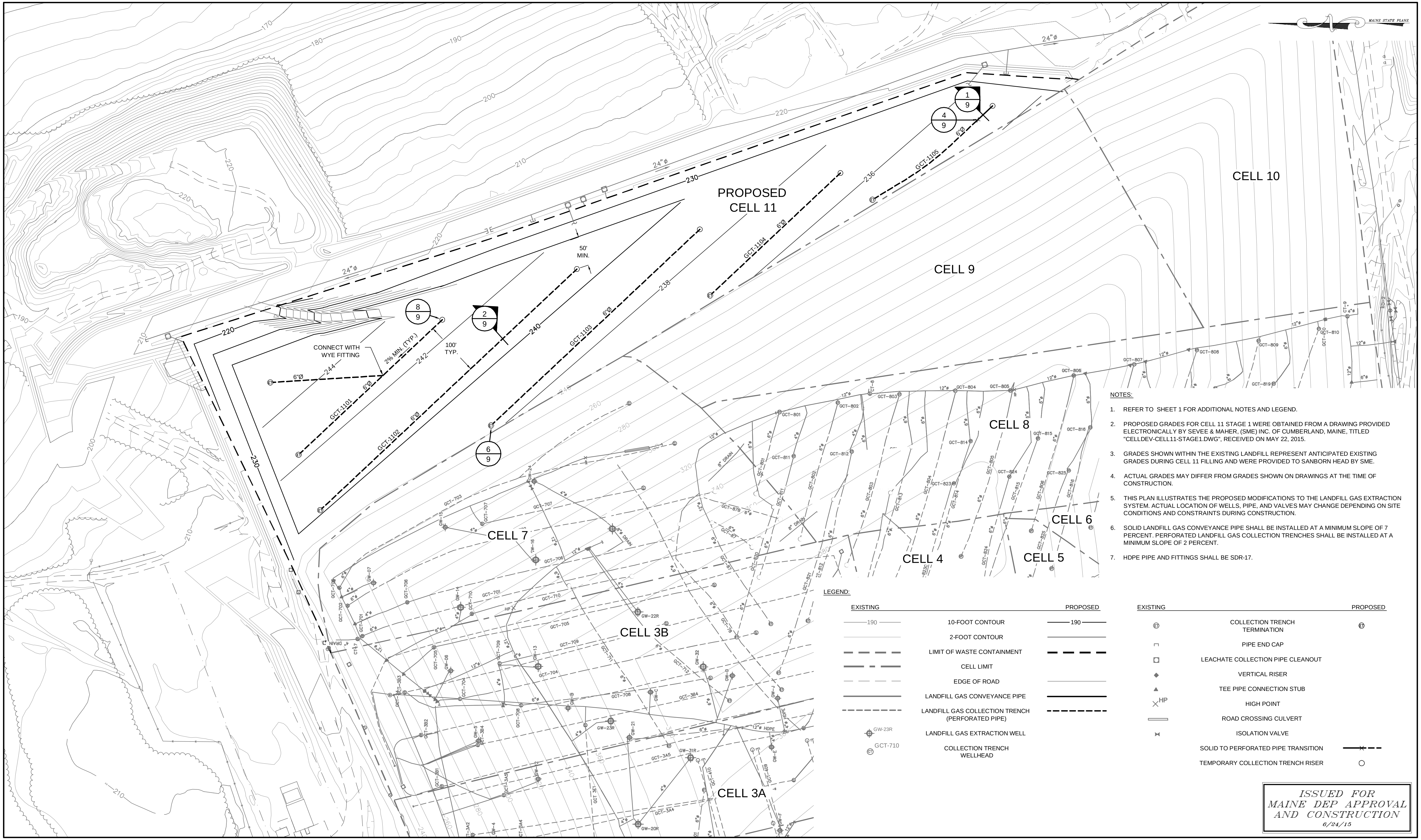


NOTES:

1. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.
2. PROPOSED GRADES FOR CELL 11 STAGE 1 WERE OBTAINED FROM A DRAWING PROVIDED ELECTRONICALLY BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE, TITLED "CELLDEV-CELL11-STAGE1.DWG", RECEIVED ON MAY 22, 2015.
3. GRADES SHOWN WITHIN THE EXISTING LANDFILL REPRESENT ANTICIPATED EXISTING GRADES DURING CELL 11 FILLING AND WERE PROVIDED TO SANBORN HEAD BY SME.
4. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.
5. THIS PLAN ILLUSTRATES THE PROPOSED MODIFICATIONS TO THE LANDFILL GAS EXTRACTION SYSTEM. ACTUAL LOCATION OF WELLS, PIPE, AND VALVES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION.
6. SOLID LANDFILL GAS CONVEYANCE PIPE SHALL BE INSTALLED AT A MINIMUM SLOPE OF 7 PERCENT. PERFORATED LANDFILL GAS COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2 PERCENT.
7. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

LEGEND:

EXISTING		PROPOSED
190	10-FOOT CONTOUR	190
—	2-FOOT CONTOUR	—
— — —	LIMIT OF WASTE CONTAINMENT	— — —
— - —	CELL LIMIT	
— — —	EDGE OF ROAD	—
—	LANDFILL GAS CONVEYANCE PIPE	—
- - - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)	- - - -
⊕ GW-23R	LANDFILL GAS EXTRACTION WELL	
Ⓒ GCT-710	COLLECTION TRENCH WELLHEAD	

EXISTING		PROPOSED
Ⓔ	COLLECTION TRENCH TERMINATION	Ⓔ
⊓	PIPE END CAP	
▣	LEACHATE COLLECTION PIPE CLEANOUT	
◆	VERTICAL RISER	
▲	TEE PIPE CONNECTION STUB	
×HP	HIGH POINT	
▭	ROAD CROSSING CULVERT	
⋈	ISOLATION VALVE	
	SOLID TO PERFORATED PIPE TRANSITION	—×- -
	TEMPORARY COLLECTION TRENCH RISER	○

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN ||| HEAD

GRAPHICAL SCALE
80' 40' 0' 80' 160'

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

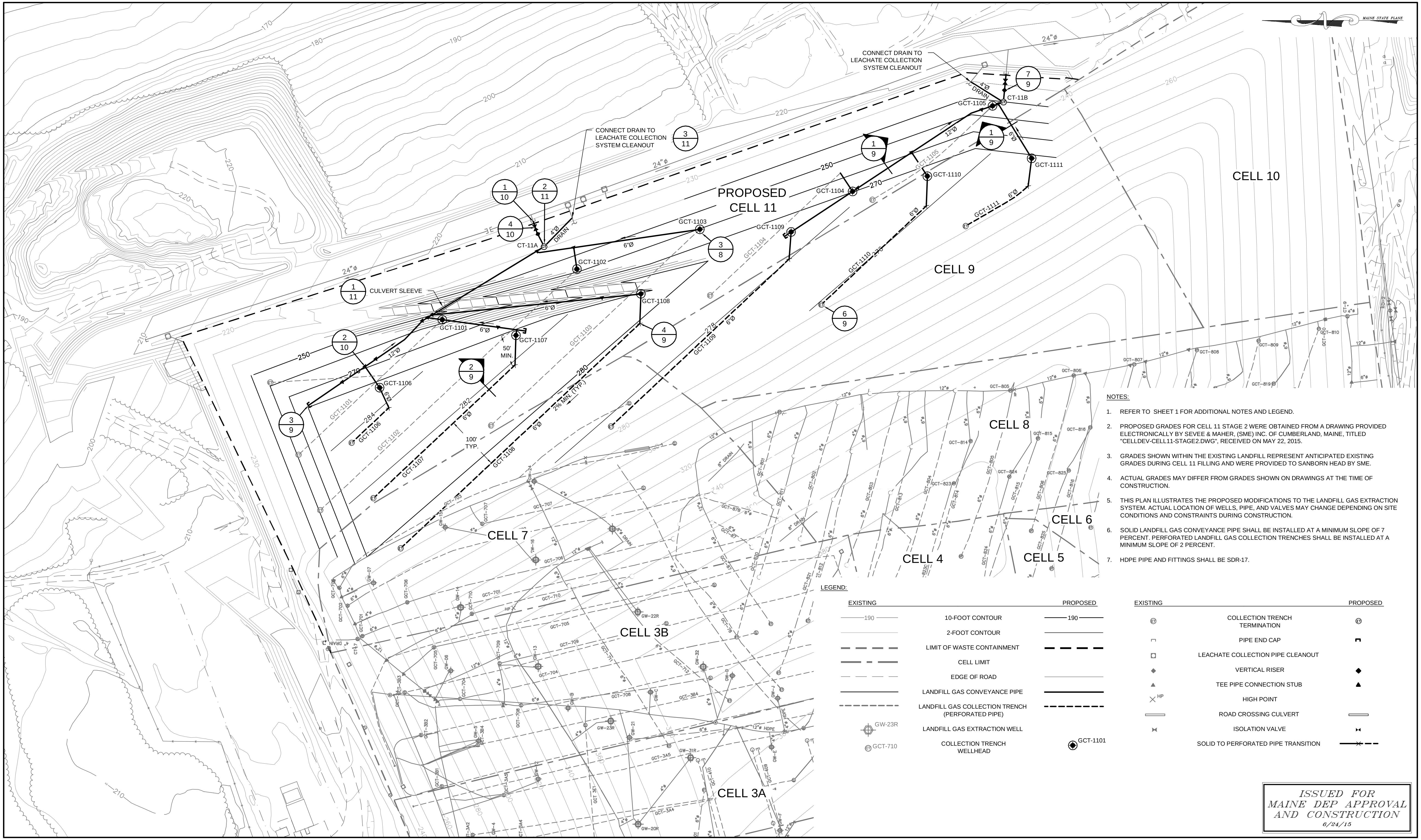
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

LFG INFRASTRUCTURE
DEVELOPMENT PLAN - STAGE 1

PROJECT NUMBER:
2536.27

SHEET NUMBER:
2 OF 11



NOTES:

1. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.
2. PROPOSED GRADES FOR CELL 11 STAGE 2 WERE OBTAINED FROM A DRAWING PROVIDED ELECTRONICALLY BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE, TITLED "CELLDEV-CELL11-STAGE2.DWG", RECEIVED ON MAY 22, 2015.
3. GRADES SHOWN WITHIN THE EXISTING LANDFILL REPRESENT ANTICIPATED EXISTING GRADES DURING CELL 11 FILLING AND WERE PROVIDED TO SANBORN HEAD BY SME.
4. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.
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7. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

LEGEND:

EXISTING		PROPOSED
—190—	10-FOOT CONTOUR	—190—
—	2-FOOT CONTOUR	—
— — —	LIMIT OF WASTE CONTAINMENT	— — —
— - —	CELL LIMIT	
- - -	EDGE OF ROAD	—
—	LANDFILL GAS CONVEYANCE PIPE	—
- - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)	- - -
GW-23R	LANDFILL GAS EXTRACTION WELL	
GCT-710	COLLECTION TRENCH WELLHEAD	GCT-1101

EXISTING		PROPOSED
ET	COLLECTION TRENCH TERMINATION	ET
⊓	PIPE END CAP	⊓
▢	LEACHATE COLLECTION PIPE CLEANOUT	
◆	VERTICAL RISER	◆
▲	TEE PIPE CONNECTION STUB	▲
× HP	HIGH POINT	
▭	ROAD CROSSING CULVERT	▭
⋈	ISOLATION VALVE	⋈
	SOLID TO PERFORATED PIPE TRANSITION	—×- -

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN ||| HEAD

GRAPHICAL SCALE
80' 40' 0' 80' 160'

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

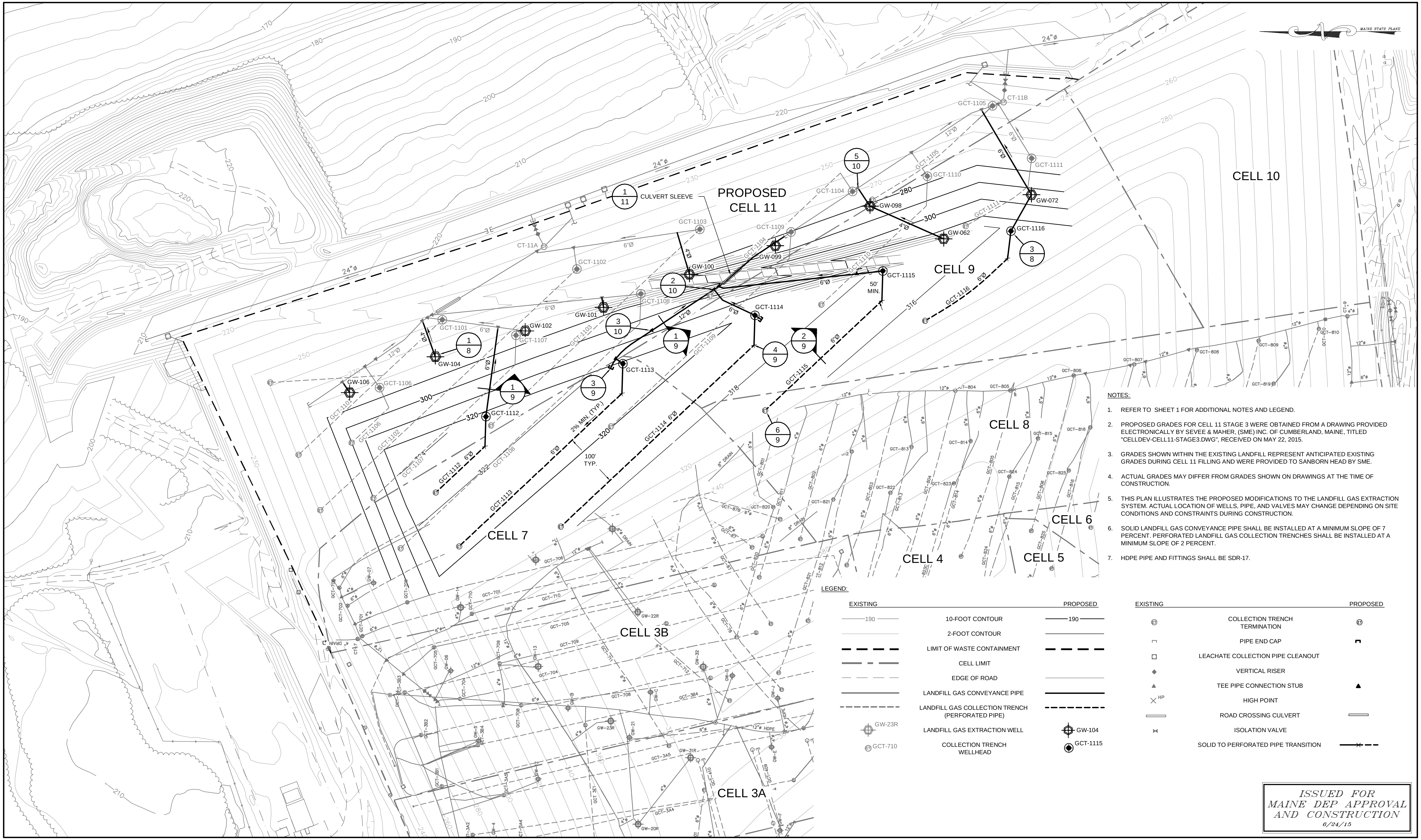
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

LFG INFRASTRUCTURE
DEVELOPMENT PLAN - STAGE 2

PROJECT NUMBER:
2536.27

SHEET NUMBER:
3 OF 11



NOTES:

1. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.
2. PROPOSED GRADES FOR CELL 11 STAGE 3 WERE OBTAINED FROM A DRAWING PROVIDED ELECTRONICALLY BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE, TITLED "CELLDEV-CELL11-STAGE3.DWG", RECEIVED ON MAY 22, 2015.
3. GRADES SHOWN WITHIN THE EXISTING LANDFILL REPRESENT ANTICIPATED EXISTING GRADES DURING CELL 11 FILLING AND WERE PROVIDED TO SANBORN HEAD BY SME.
4. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.
5. THIS PLAN ILLUSTRATES THE PROPOSED MODIFICATIONS TO THE LANDFILL GAS EXTRACTION SYSTEM. ACTUAL LOCATION OF WELLS, PIPE, AND VALVES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION.
6. SOLID LANDFILL GAS CONVEYANCE PIPE SHALL BE INSTALLED AT A MINIMUM SLOPE OF 7 PERCENT. PERFORATED LANDFILL GAS COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2 PERCENT.
7. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

LEGEND:

EXISTING		PROPOSED
—190—	10-FOOT CONTOUR	—190—
——	2-FOOT CONTOUR	——
— — —	LIMIT OF WASTE CONTAINMENT	— — —
— - —	CELL LIMIT	
– – –	EDGE OF ROAD	——
——	LANDFILL GAS CONVEYANCE PIPE	——
- - - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)	- - - -
⌖ GW-23R	LANDFILL GAS EXTRACTION WELL	⌖ GW-104
⊙ GCT-710	COLLECTION TRENCH WELLHEAD	◉ GCT-1115

EXISTING		PROPOSED
ⓔ	COLLECTION TRENCH TERMINATION	ⓔ
⊓	PIPE END CAP	⊓
▢	LEACHATE COLLECTION PIPE CLEANOUT	
◆	VERTICAL RISER	
▲	TEE PIPE CONNECTION STUB	▲
× HP	HIGH POINT	
▭	ROAD CROSSING CULVERT	▭
⋈	ISOLATION VALVE	
	SOLID TO PERFORATED PIPE TRANSITION	—×- -

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN | HEAD

GRAPHICAL SCALE
80' 40' 0' 80' 160'

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

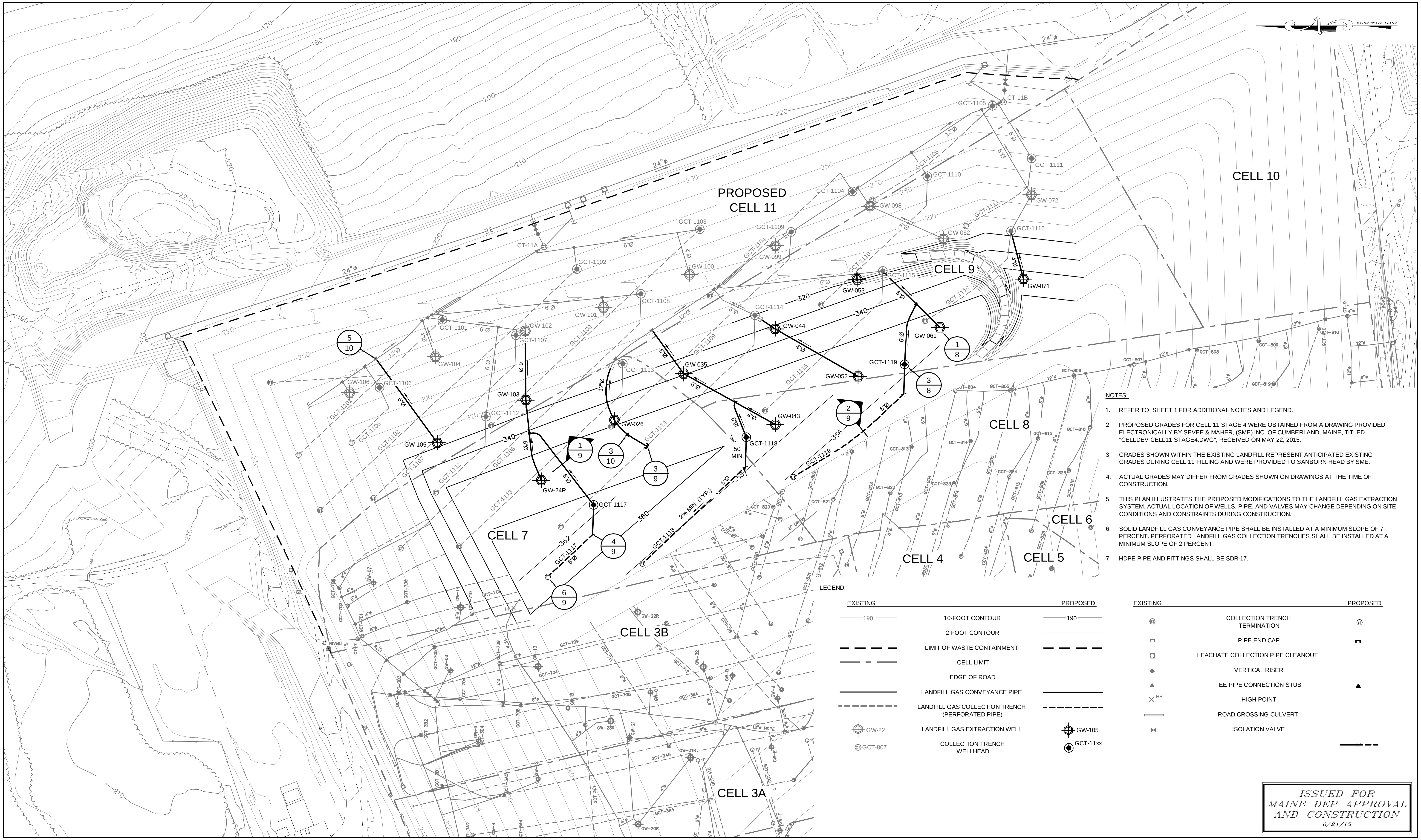
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

LFG INFRASTRUCTURE
DEVELOPMENT PLAN - STAGE 3

PROJECT NUMBER:
2536.27

SHEET NUMBER:
4 OF 11



NOTES:

1. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.

2. PROPOSED GRADES FOR CELL 11 STAGE 4 WERE OBTAINED FROM A DRAWING PROVIDED ELECTRONICALLY BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE, TITLED "CELLDEV-CELL11-STAGE4.DWG", RECEIVED ON MAY 22, 2015.

3. GRADES SHOWN WITHIN THE EXISTING LANDFILL REPRESENT ANTICIPATED EXISTING GRADES DURING CELL 11 FILLING AND WERE PROVIDED TO SANBORN HEAD BY SME.

4. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.

5. THIS PLAN ILLUSTRATES THE PROPOSED MODIFICATIONS TO THE LANDFILL GAS EXTRACTION SYSTEM. ACTUAL LOCATION OF WELLS, PIPE, AND VALVES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION.

6. SOLID LANDFILL GAS CONVEYANCE PIPE SHALL BE INSTALLED AT A MINIMUM SLOPE OF 7 PERCENT. PERFORATED LANDFILL GAS COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2 PERCENT.

7. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

LEGEND:

EXISTING		PROPOSED
— 190 —	10-FOOT CONTOUR	— 190 —
—	2-FOOT CONTOUR	—
— — —	LIMIT OF WASTE CONTAINMENT	— — —
— - —	CELL LIMIT	
– – –	EDGE OF ROAD	—
—	LANDFILL GAS CONVEYANCE PIPE	—
- - - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)	- - - -
⊕ GW-22	LANDFILL GAS EXTRACTION WELL	⊕ GW-105
ⓒ GCT-807	COLLECTION TRENCH WELLHEAD	◉ GCT-11xx

EXISTING		PROPOSED
ⓔ	COLLECTION TRENCH TERMINATION	ⓔ
⊓	PIPE END CAP	⊓
▣	LEACHATE COLLECTION PIPE CLEANOUT	
◆	VERTICAL RISER	
▲	TEE PIPE CONNECTION STUB	▲
× HP	HIGH POINT	
▭	ROAD CROSSING CULVERT	
⋈	ISOLATION VALVE	—×- -

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN HEAD

GRAPHICAL SCALE
80' 40' 0' 80' 160'

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

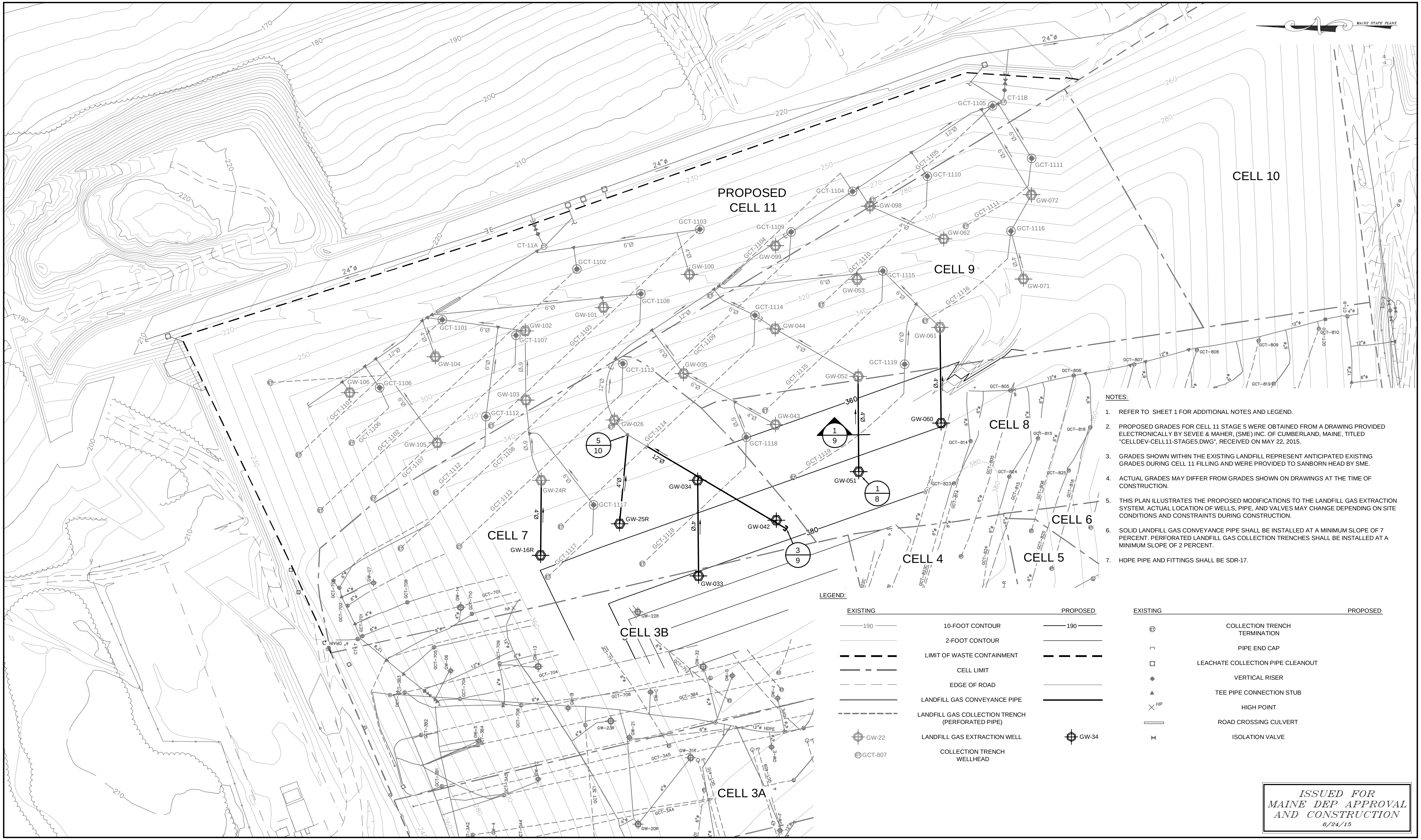
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

LFG INFRASTRUCTURE
DEVELOPMENT PLAN - STAGE 4

PROJECT NUMBER:
2536.27

SHEET NUMBER:
5 OF 11



NOTES:

1. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.
2. PROPOSED GRADES FOR CELL 11 STAGE 5 WERE OBTAINED FROM A DRAWING PROVIDED ELECTRONICALLY BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE, TITLED "CELLDEV-CELL11-STAGE5.DWG", RECEIVED ON MAY 22, 2015.
3. GRADES SHOWN WITHIN THE EXISTING LANDFILL REPRESENT ANTICIPATED EXISTING GRADES DURING CELL 11 FILLING AND WERE PROVIDED TO SANBORN HEAD BY SME.
4. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.
5. THIS PLAN ILLUSTRATES THE PROPOSED MODIFICATIONS TO THE LANDFILL GAS EXTRACTION SYSTEM. ACTUAL LOCATION OF WELLS, PIPE, AND VALVES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION.
6. SOLID LANDFILL GAS CONVEYANCE PIPE SHALL BE INSTALLED AT A MINIMUM SLOPE OF 7 PERCENT. PERFORATED LANDFILL GAS COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2 PERCENT.
7. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

LEGEND:

EXISTING		PROPOSED
—190—	10-FOOT CONTOUR	—190—
——	2-FOOT CONTOUR	——
— — —	LIMIT OF WASTE CONTAINMENT	— — —
— - —	CELL LIMIT	
— — —	EDGE OF ROAD	——
——	LANDFILL GAS CONVEYANCE PIPE	——
- - - -	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)	
⌖ GW-22	LANDFILL GAS EXTRACTION WELL	⌖ GW-34
CT GCT-807	COLLECTION TRENCH WELLHEAD	

EXISTING		PROPOSED
ET	COLLECTION TRENCH TERMINATION	
⊓	PIPE END CAP	
▣	LEACHATE COLLECTION PIPE CLEANOUT	
◆	VERTICAL RISER	
▲	TEE PIPE CONNECTION STUB	
× HP	HIGH POINT	
▭	ROAD CROSSING CULVERT	
⋈	ISOLATION VALVE	

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN HEAD

GRAPHICAL SCALE
80' 40' 0' 80' 160'

STATE OF MAINE
Eric S. Steinhauser
10809
PROFESSIONAL ENGINEER

NO.	DATE	DESCRIPTION	BY

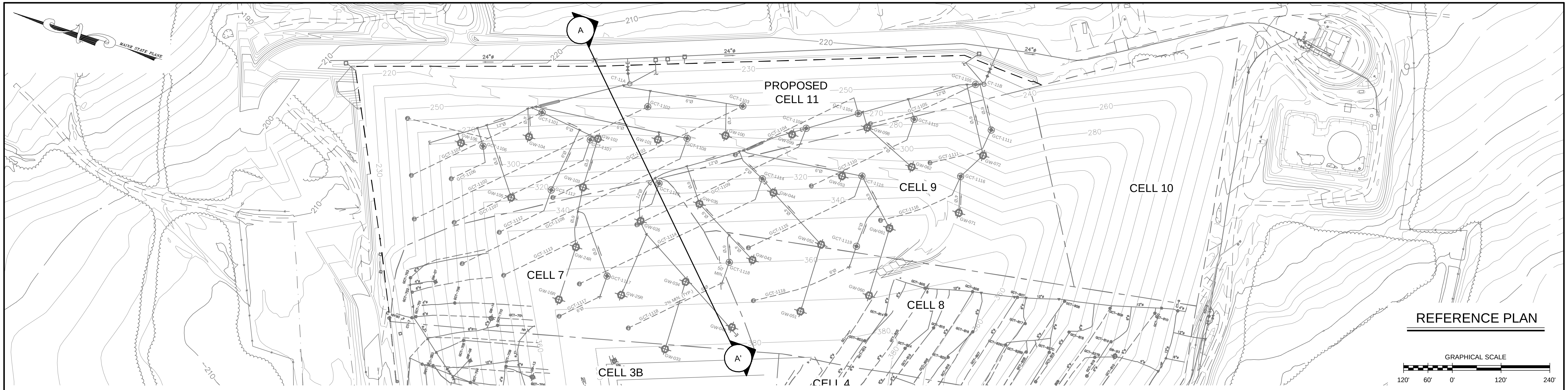
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

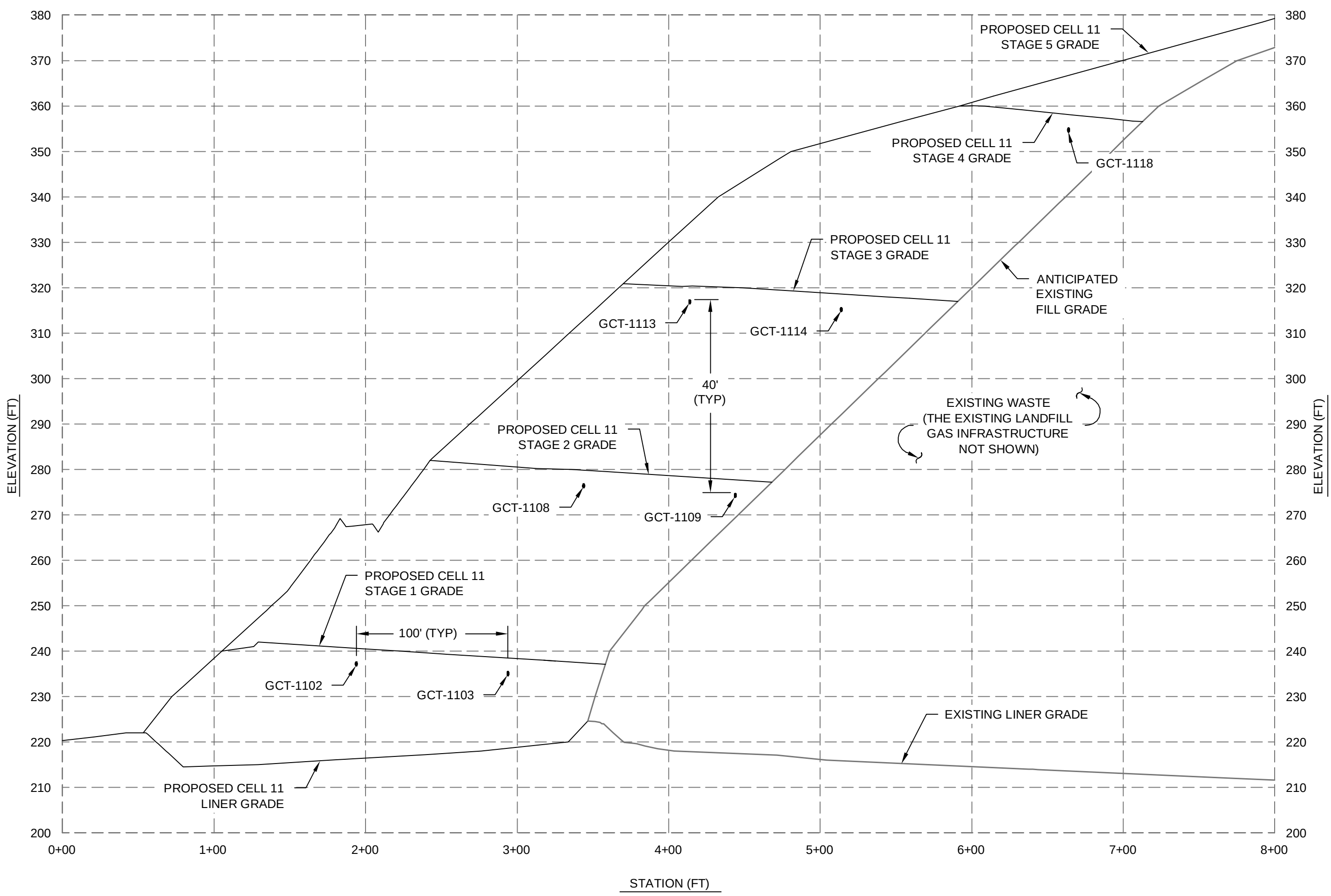
LFG INFRASTRUCTURE DEVELOPMENT PLAN - STAGE 5

PROJECT NUMBER: 2536.27

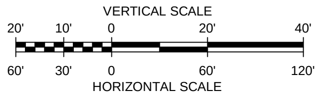
SHEET NUMBER: 6 OF 11



REFERENCE PLAN



SECTION A-A'



NOTES:

1. THE CROSS SECTION SHOWN ON THIS SHEET ILLUSTRATES THE PROPOSED LAYOUT AND SPACING OF GAS COLLECTION TRENCHES IN CELL 11. ACTUAL GRADES MAY DIFFER FROM THE GRADES SHOWN AT THE TIME OF CONSTRUCTION. THE LOCATIONS OF COLLECTION TRENCHES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION. VERTICAL WELLS ARE NOT SHOWN ON THE CROSS SECTION FOR CLARITY.
2. REFER TO SHEET 1 FOR ADDITIONAL NOTES AND LEGEND.

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN HEAD

SCALE AS NOTED

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

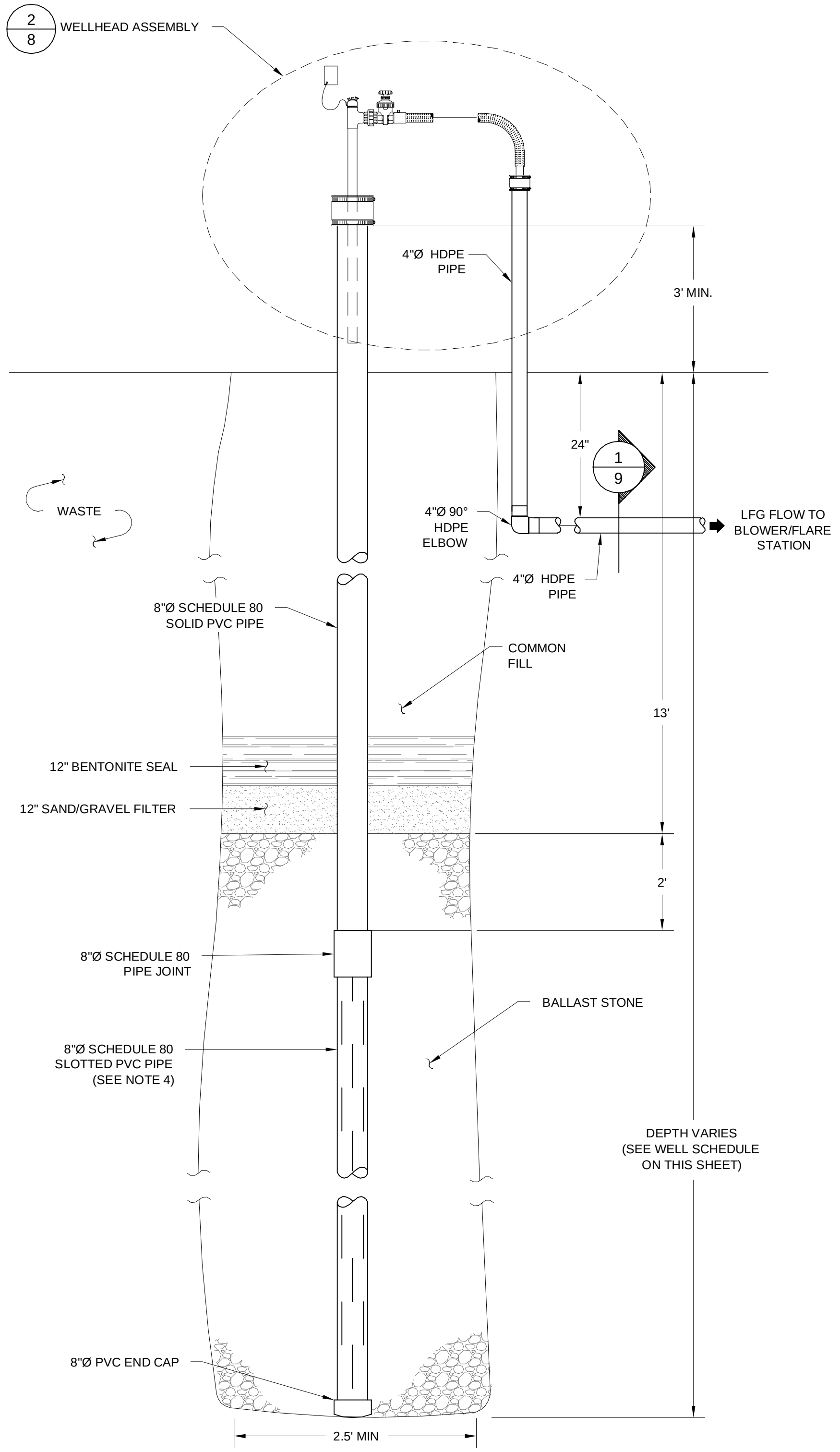
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

CROSS SECTION

PROJECT NUMBER:
2536.27

SHEET NUMBER:
7 OF 11



1 LFG EXTRACTION WELL DETAIL

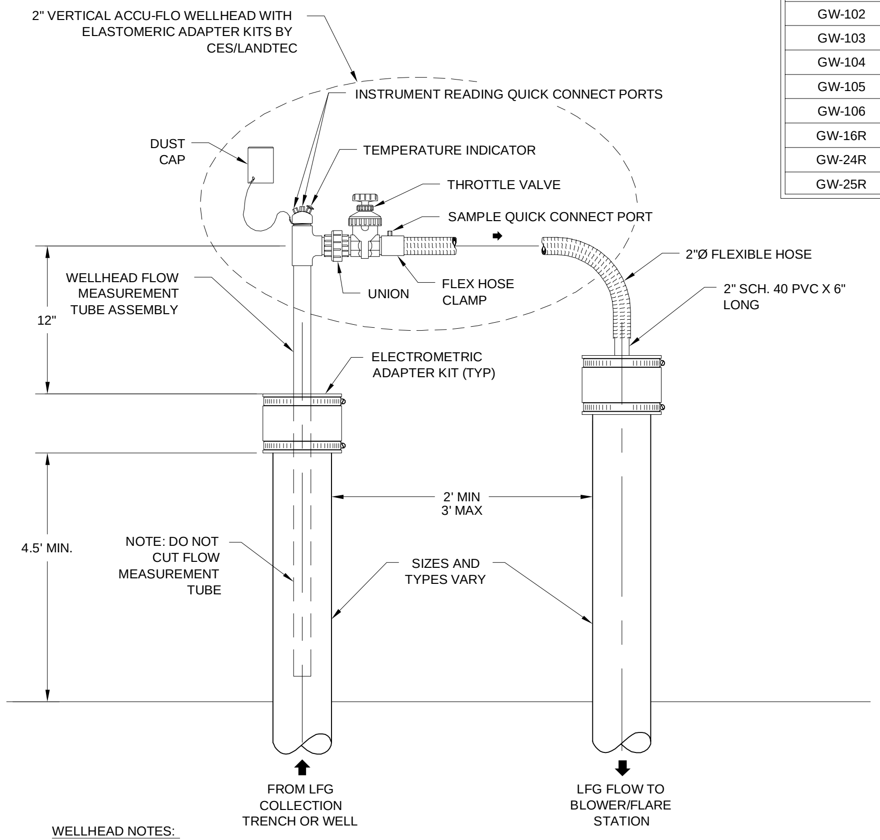
NOT TO SCALE

NOTES:

1. ALL HDPE PIPE SHALL BE SDR-17, UNLESS OTHERWISE NOTED.
2. ALL SOLID HDPE PIPE SHALL BE BUTT-FUSION WELDED UNLESS OTHERWISE INDICATED OR AN ALTERNATIVE IS APPROVED BY THE ENGINEER.
3. COVER SOLID HDPE PIPE ON LANDFILL SLOPES WITH MINIMUM 2 FEET OF SOIL AND STABILIZE AGAINST EROSION.
4. PIPE PERFORATED WITH SLOTS ⅛" TO ¼" WIDE BY 8" LONG. FOUR SLOTS PER ROW SPACED 90° APART, WITH ADJACENT ROWS OFFSET BY 45°.

WELL SCHEDULE NOTES:

1. LFG EXTRACTION WELLS SHALL BE INSTALLED WITHIN ONE FOOT OF LISTED LOCATIONS.
2. A TEMPORARY BENCHMARK WITH ELEVATION SHALL BE ESTABLISHED AT EACH WELL PRIOR TO DRILLING.
3. 15 FEET OF SOLID RISER IS TO BE PROVIDED BELOW INTERMEDIATE COVER GRADES. THE INTENT IS TO PROVIDE 3 FEET OF STICK UP ABOVE FILL GRADES.
4. ELEVATIONS SHALL BE CONFIRMED AGAINST AS-BUILT TOP OF PRIMARY SAND GRADES AND FILL GRADES PRIOR TO CONSTRUCTION.



WELLHEAD NOTES:

A. CES-LANDTEC ACCU-FLOW WELLHEAD SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL. INSTRUCTIONS SHALL BE THOROUGHLY READ BEFORE ATTEMPTING ASSEMBLY AND INSTALLATION OF WELLHEAD.

B. WELLHEAD AND FLOW MEASUREMENT TUBE ASSEMBLY SHALL BE COMPATIBLE WITH CES-LANDTEC GEM-2000 (LANDFILL GAS INSTRUMENT).

C. FOR FLEXIBLE CONNECTIONS TO PIPE, USE ONLY "IPS WELD-ON 795" PLASTIC PIPE CEMENT OR EQUAL APPROVED BY THE ENGINEER.

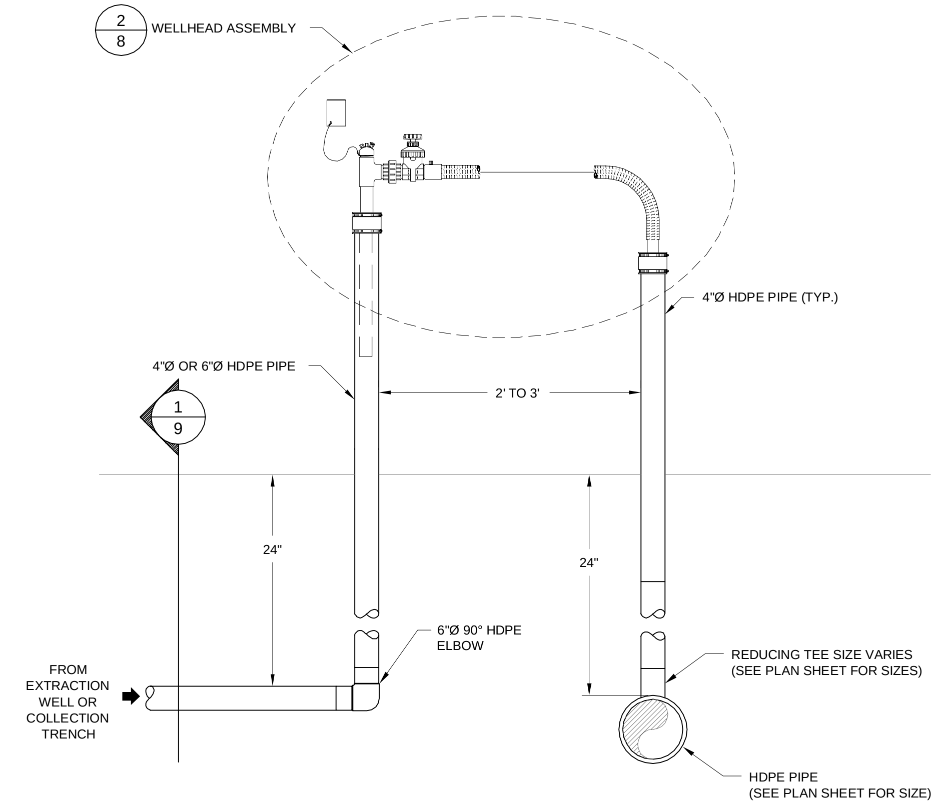
D. WARNING: DO NOT CUT THE FLOW MEASUREMENT TUBE ASSEMBLY. FAILURE TO HEED THIS WARNING WILL RESULT IN A DAMAGED OR INOPERATIVE WELLHEAD AND VOID THE WARRANTY. SUCH DAMAGE WOULD REQUIRE REPLACEMENT OF THE WELLHEAD AT THE CONTRACTOR'S EXPENSE.

E. ALLOW SUFFICIENT SLACK IN FLEX HOSE FOR PIPE EXPANSION AND CONTRACTION; AN EXTRA 8 TO 12 INCHES IS RECOMMENDED.

2 WELLHEAD ASSEMBLY DETAIL

NOT TO SCALE

WELL SCHEDULE										
WELL DESIGNATION	NORTHING	EASTING	BOTTOM OF WASTE (FT)	TOP OF EXISTING WASTE (FT)	TOTAL WELL DEPTH (FT)	BOTTOM OF WELL SCREEN (FT)	TOP OF WELL SCREEN (FT)	SCREEN LENGTH (FT)	TOP OF CASING ELEV. (FT)
GW-026	478922.2	926825.3	217.1	349.1	116.9	232.1	334.1	101.9	352.1
GW-033	478769.9	926542.9	214.8	380.4	150.6	229.8	365.4	135.6	383.4
GW-034	478771.5	926716.1	214.3	364.4	135.1	229.3	349.4	120.1	367.4
GW-035	478796.8	926909.2	217.6	339.1	106.6	232.6	324.1	91.6	342.1
GW-042	478629.0	926643.7	212.0	376.0	149.0	227.0	361.0	134.0	379.0
GW-043	478630.6	926816.9	213.5	359.6	131.1	228.5	344.6	116.1	362.6
GW-044	478631.1	926990.1	215.3	332.2	101.8	230.3	317.2	86.8	335.2
GW-051	478479.8	926731.7	210.8	372.7	146.8	225.8	357.7	131.8	375.7
GW-052	478480.9	926903.9	214.7	356.4	126.7	229.7	341.4	111.7	359.4
GW-053	478482.6	927079.8	214.5	320.6	91.1	229.5	305.6	76.1	323.6
GW-060	478330.7	926819.7	209.7	369.4	144.7	224.7	354.4	129.7	372.4
GW-061	478332.7	926992.9	211.8	353.0	126.1	226.8	338.0	111.1	356.0
GW-062	478326.0	927153.1	213.2	315.0	86.8	228.2	300.0	71.8	318.0
GW-071	478181.5	927080.5	210.5	345.0	119.4	225.5	330.0	104.4	348.0
GW-072	478167.1	927233.0	212.3	293.9	66.6	227.3	278.9	51.6	296.9
GW-098	478459.4	927212.4	220.9	281.5	45.6	235.9	266.5	30.6	284.5
GW-099	478630.8	927140.8	219.9	284.9	50.0	234.9	269.9	35.0	287.9
GW-100	478786.2	927088.7	218.6	283.9	50.3	233.6	268.9	35.3	286.9
GW-101	478941.9	927028.9	217.8	285.4	52.6	232.8	270.4	37.6	288.4
GW-102	479083.5	926986.5	217.0	282.9	50.8	232.0	267.9	35.8	285.9
GW-103	479082.4	926861.4	221.5	322.1	85.6	236.5	307.1	70.6	325.1
GW-104	479246.4	926939.8	213.0	278.4	50.4	228.0	263.4	35.4	281.4
GW-105	479243.1	926784.1	218.5	327.4	93.9	233.5	312.4	78.9	330.4
GW-106	479401.5	926874.9	209.8	280.5	55.7	224.8	265.5	40.7	283.5
GW-16R	479055.8	926580.2	216.3	367.5	136.2	231.3	352.5	121.2	370.5
GW-24R	479054.6	926716.2	217.6	354.8	122.2	232.6	339.8	107.2	357.8
GW-25R	478912.8	926637.2	215.2	367.1	136.9	230.2	352.1	121.9	370.1



3 COLLECTION TRENCH WELLHEAD

NOT TO SCALE

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN | HEAD

SCALE AS NOTED

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

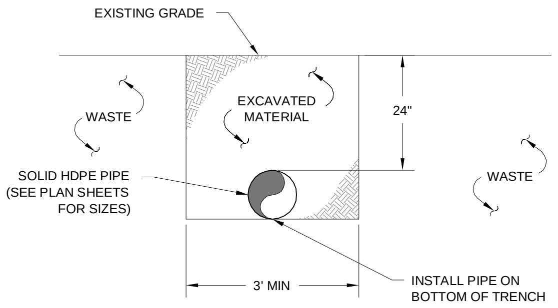
DRAWN BY: R.CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

DETAILS

PROJECT NUMBER:
2536.27

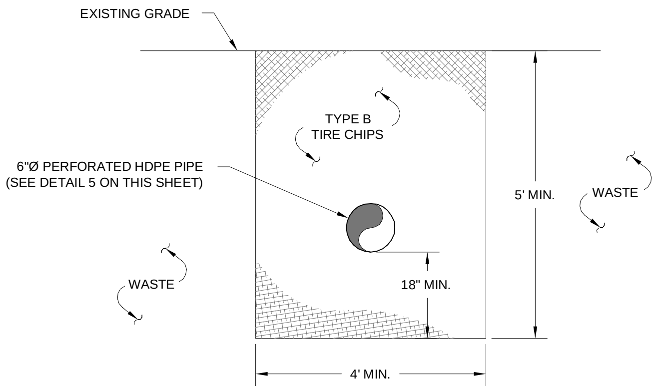
SHEET NUMBER:
8 OF 11



SOLID PIPE TRENCH

1

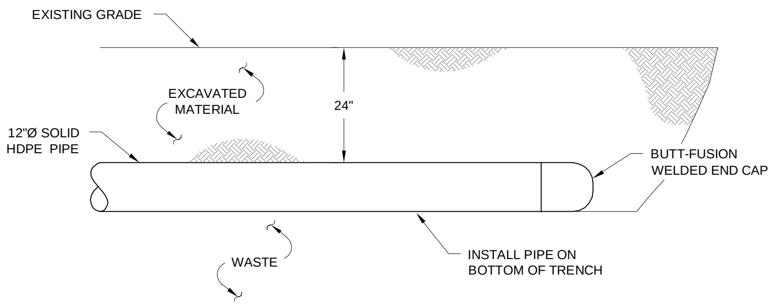
NOT TO SCALE



PERFORATED PIPE TRENCH

2

NOT TO SCALE



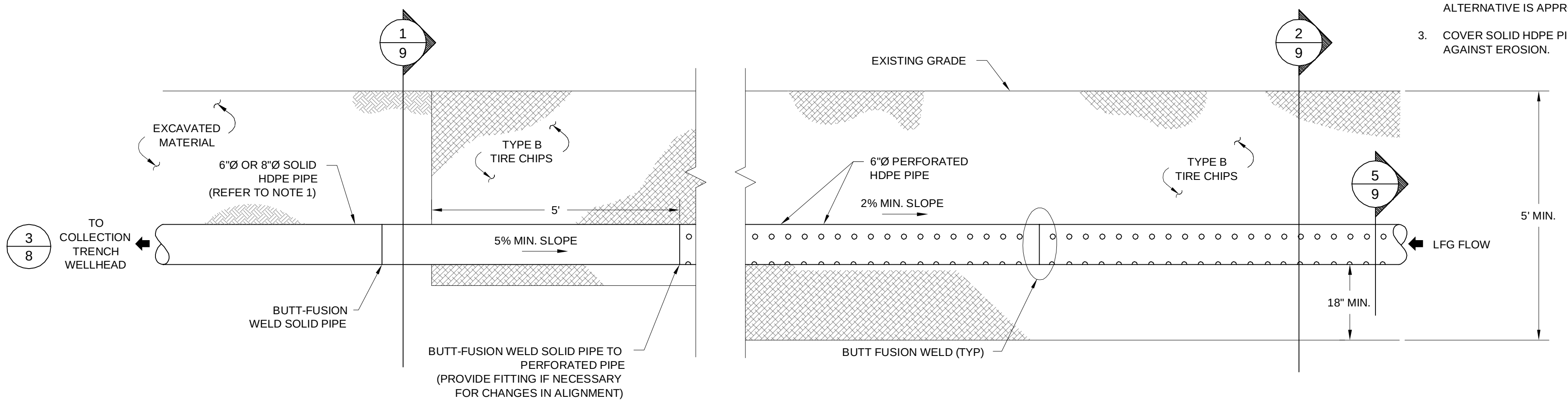
TEMPORARY PIPE TERMINATION

3

NOT TO SCALE

NOTES:

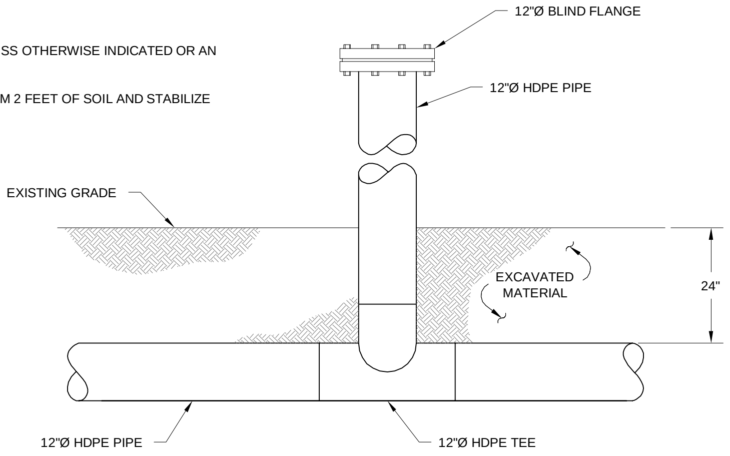
1. ALL HDPE PIPE SHALL BE SDR-17.
2. ALL SOLID HDPE PIPE SHALL BE BUTT-FUSION WELDED UNLESS OTHERWISE INDICATED OR AN ALTERNATIVE IS APPROVED BY THE ENGINEER.
3. COVER SOLID HDPE PIPE ON LANDFILL SLOPES WITH MINIMUM 2 FEET OF SOIL AND STABILIZE AGAINST EROSION.



LFG COLLECTION TRENCH TRANSITION

4

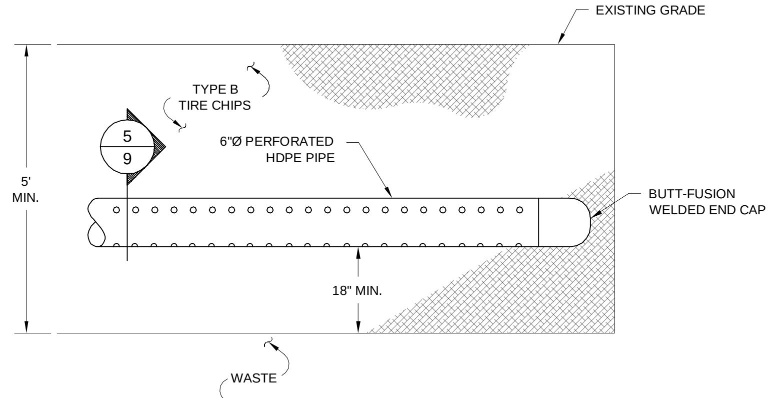
NOT TO SCALE

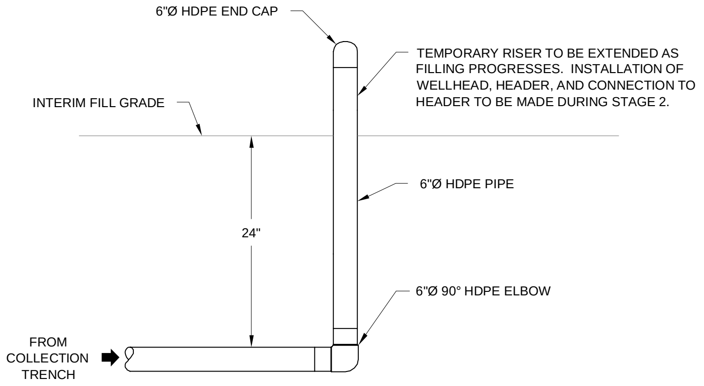


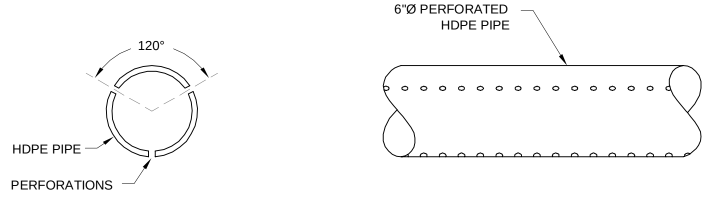
VERTICAL RISER

7

NOT TO SCALE







NOTE:

1. HOLES SHALL BE 1/2"Ø DRILLED HOLES SPACED 12" APART ALONG THE LENGTH OF THE PIPE OR APPROVED EQUIVALENT BY OWNER.

TYPICAL PERFORATED PIPE

5

NOT TO SCALE

COLLECTION TRENCH TERMINATION

6

NOT TO SCALE

TEMPORARY COLLECTION TRENCH RISER

8

NOT TO SCALE

ISSUED FOR MAINE DEP APPROVAL AND CONSTRUCTION
6/24/15

SANBORN HEAD

SCALE AS NOTED

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

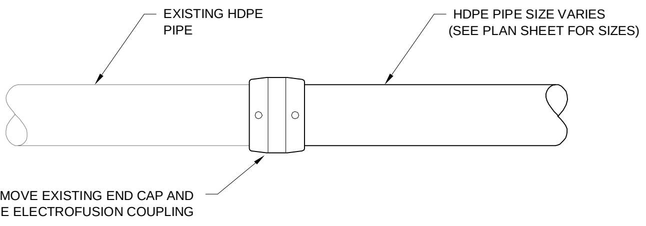
DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

DETAILS

PROJECT NUMBER:
2536.27

SHEET NUMBER:
9 OF 11



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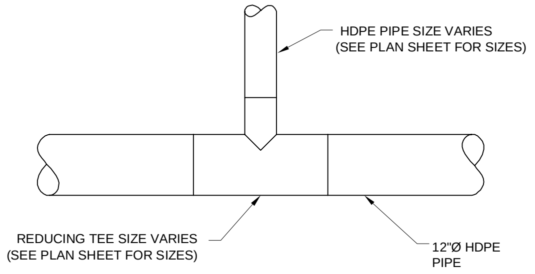

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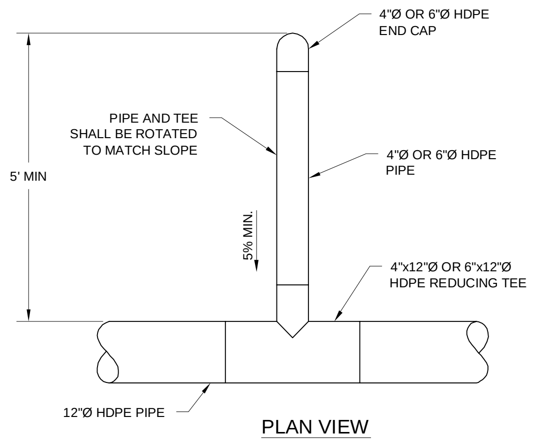

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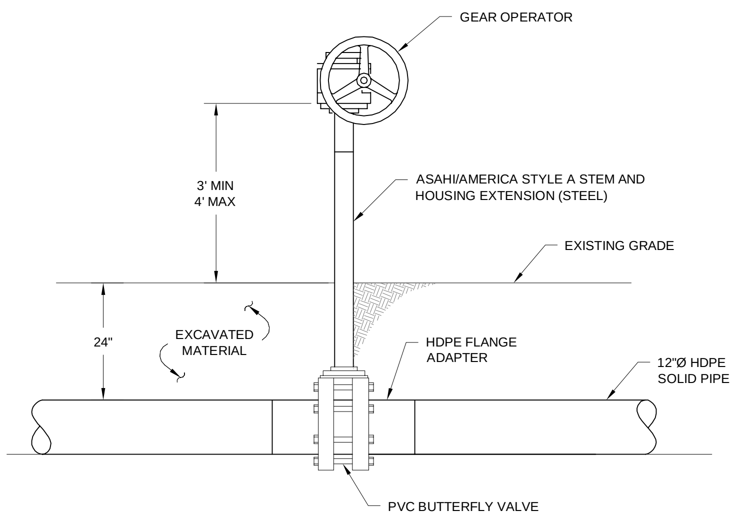

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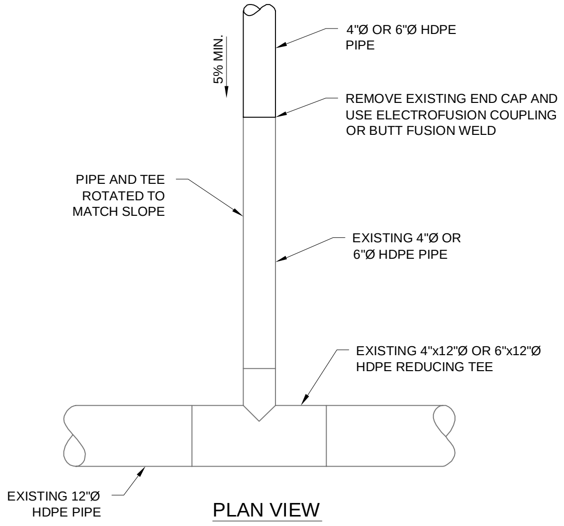

5

CONNECTION TO TEE PIPE STUB

NOT TO SCALE

NOTES:

1. ALL HDPE PIPE SHALL BE SDR-17.
2. ALL SOLID HDPE PIPE SHALL BE BUTT-FUSION WELDED UNLESS OTHERWISE INDICATED OR AN ALTERNATIVE IS APPROVED BY THE ENGINEER.
3. COVER SOLID HDPE PIPE ON LANDFILL SLOPES WITH MINIMUM 2 FEET OF SOIL AND STABILIZE AGAINST EROSION.

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN HEAD

SCALE AS NOTED

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

DETAILS

PROJECT NUMBER:
2536.27

SHEET NUMBER:
10 OF 11

IMAGES: E:\Steinhauser-ME.tif
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CTB FILE: SHA Standard.ctb
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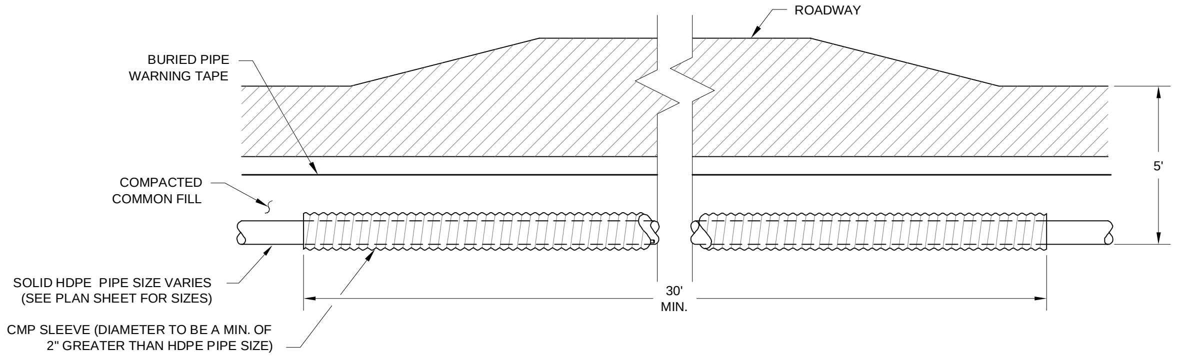

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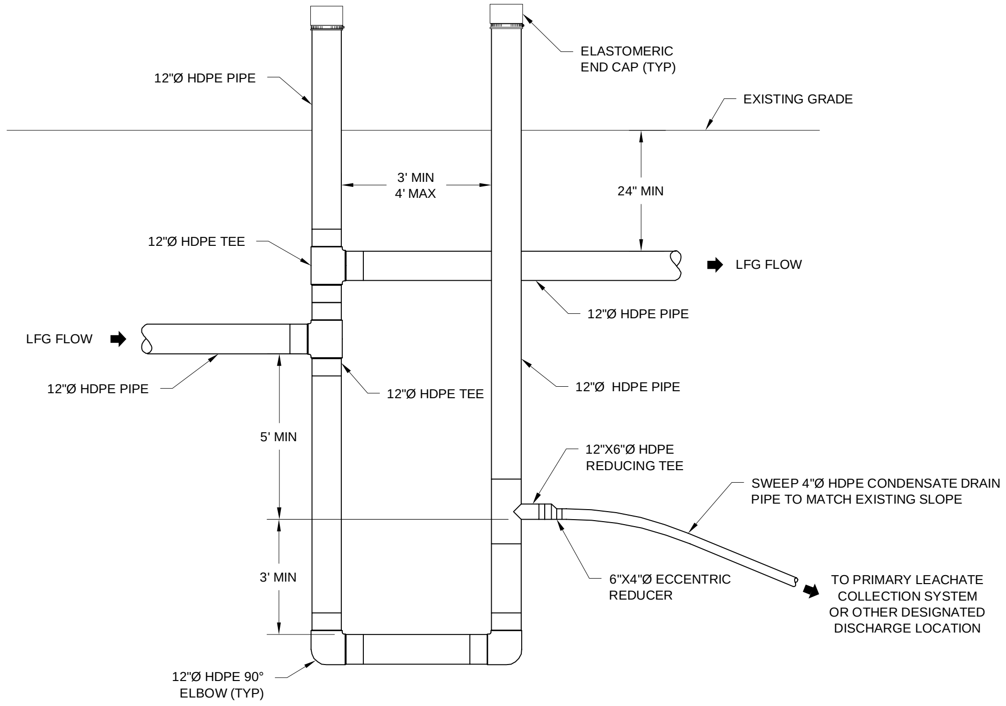
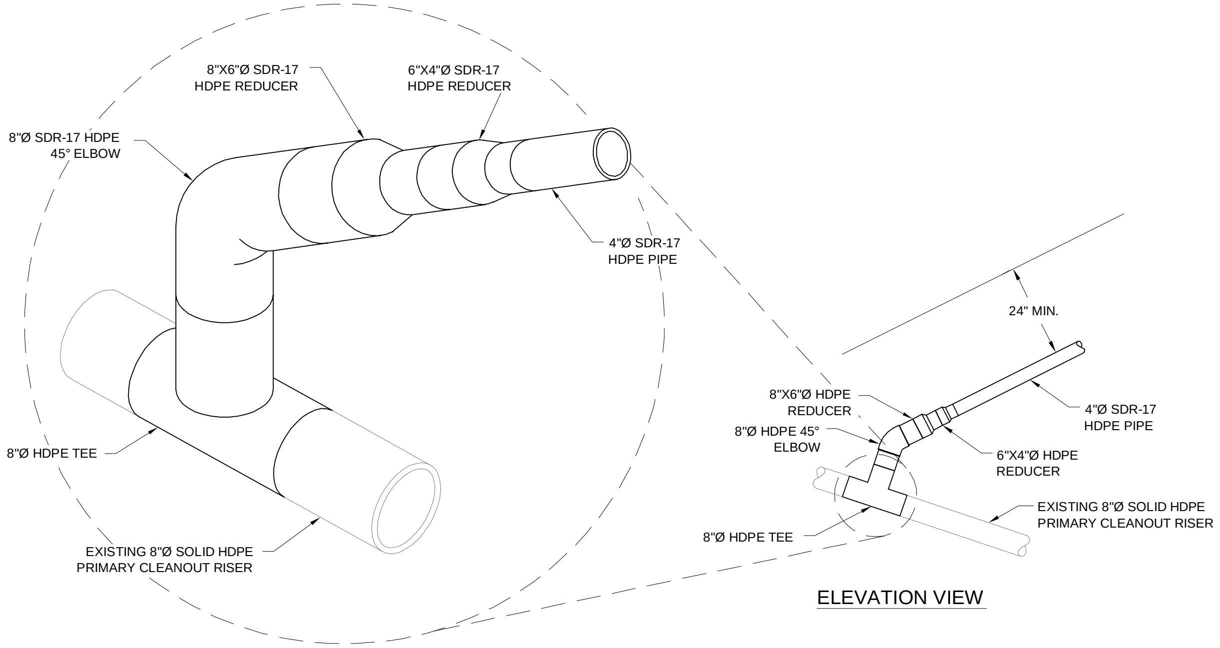


2 CONDENSATE TRAP

NOT TO SCALE



3 CONDENSATE DRAIN PIPE CONNECTION TO LEACHATE COLLECTION INLET/CLEANOUT SECTION

NOT TO SCALE

NOTES:

1. ALL HDPE PIPE SHALL BE SDR-17.
2. ALL SOLID HDPE PIPE SHALL BE BUTT-FUSION WELDED UNLESS OTHERWISE INDICATED OR AN ALTERNATIVE IS APPROVED BY THE ENGINEER.
3. COVER SOLID HDPE PIPE ON LANDFILL SLOPES WITH MINIMUM 2 FEET OF SOIL AND STABILIZE AGAINST EROSION.

ISSUED FOR
MAINE DEP APPROVAL
AND CONSTRUCTION
6/24/15

SANBORN HEAD

SCALE AS NOTED

Eric S. Steinhauser
10809

NO.	DATE	DESCRIPTION	BY

DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: R. CLAY
PIC: E. STEINHAUSER
DATE: JUNE 2015

CELL 11 LFG SYSTEM EXPANSION DRAWINGS
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

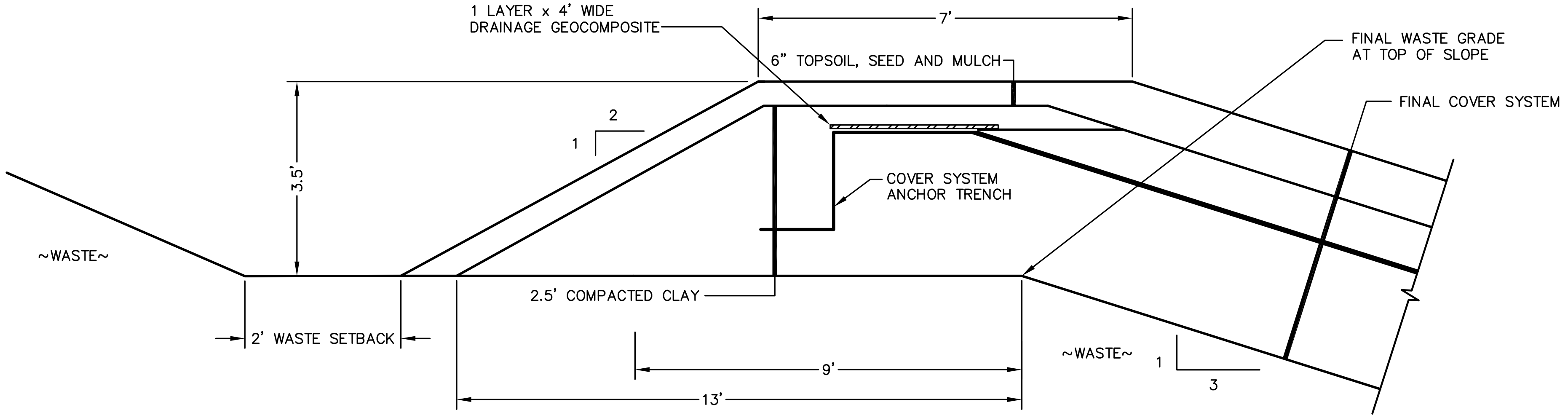
DETAILS

PROJECT NUMBER:
2536.27

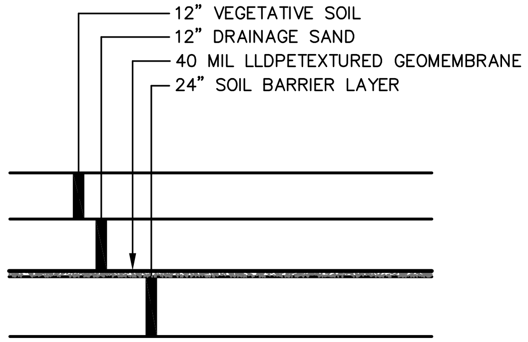
SHEET NUMBER:
11 OF 11

APPENDIX E

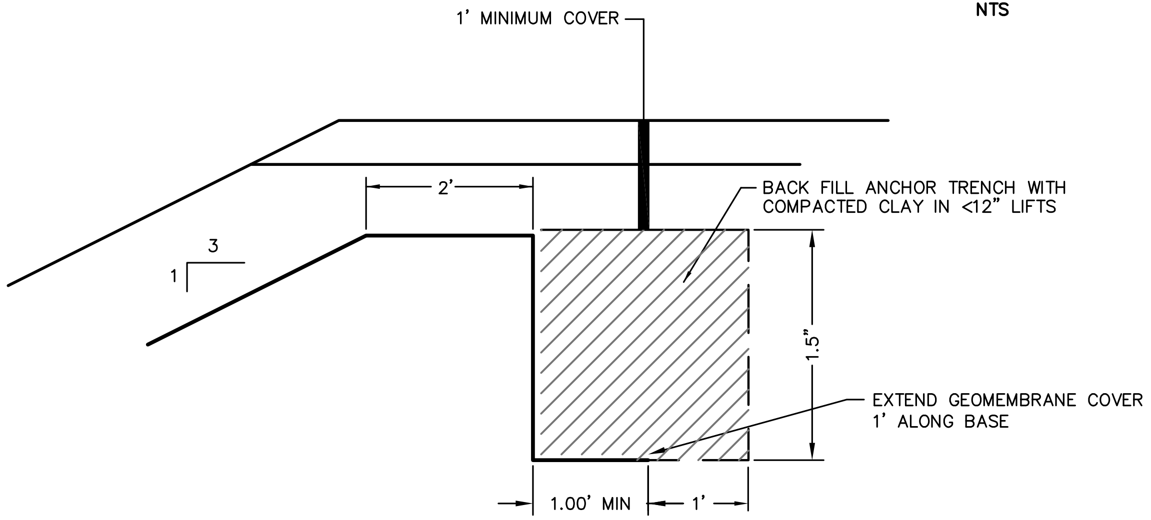
TYPICAL OPERATIONAL DEVELOPMENT DETAILS



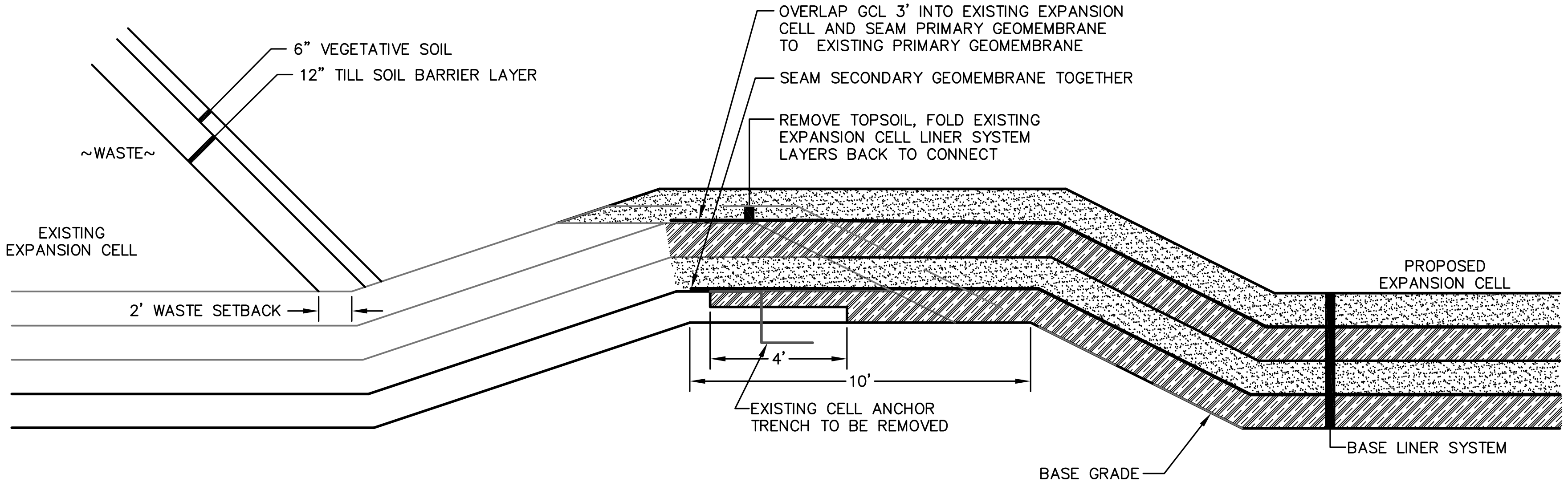
FINAL COVER TERMINATION AT TOP OF SLOPES (TYP)
NTS



FINAL COVER SYSTEM
NTS



COVER SYSTEM ANCHOR TRENCH AT TOP OF SLOPES AND SIDESLOPE PERIMETER BERMS (TYP)
NTS



INTERMEDIATE BERM BASE LINER CONNECTION
NTS

FIGURE E–1
TYPICAL DEVELOPMENT DETAILS
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: C11–CELLDEV LMN: NONE CTB: SME–STD REV: 6/22/2015

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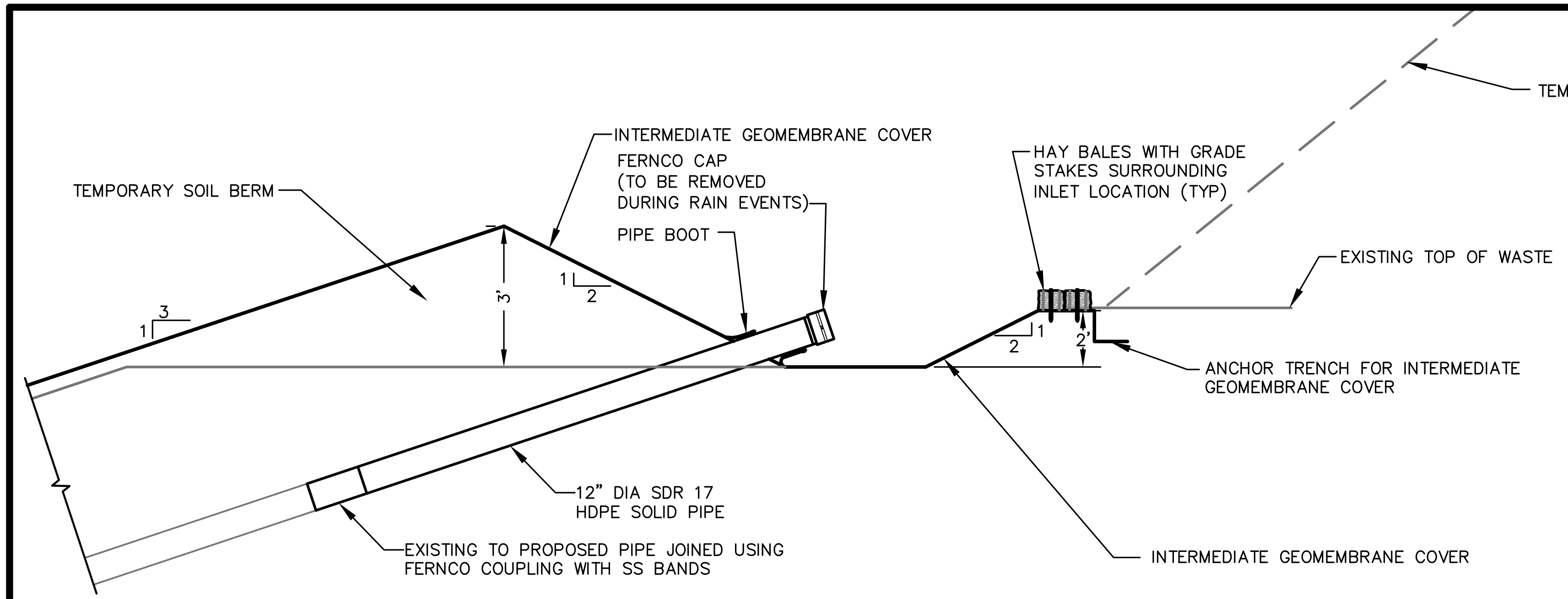
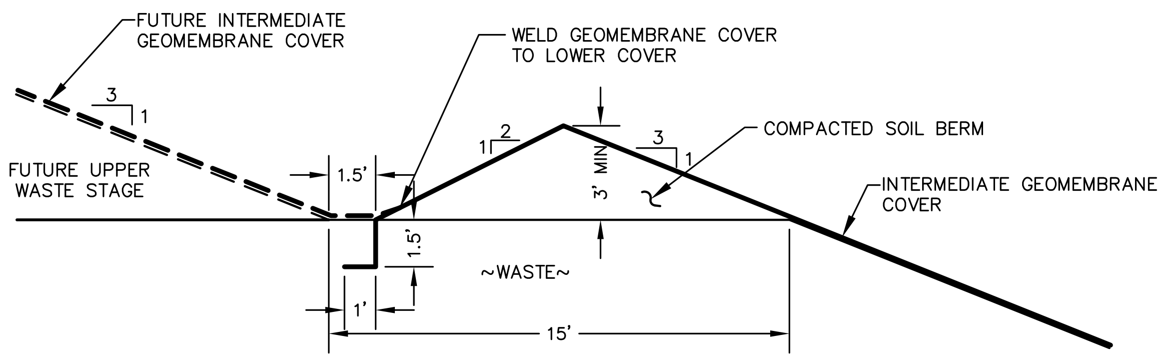
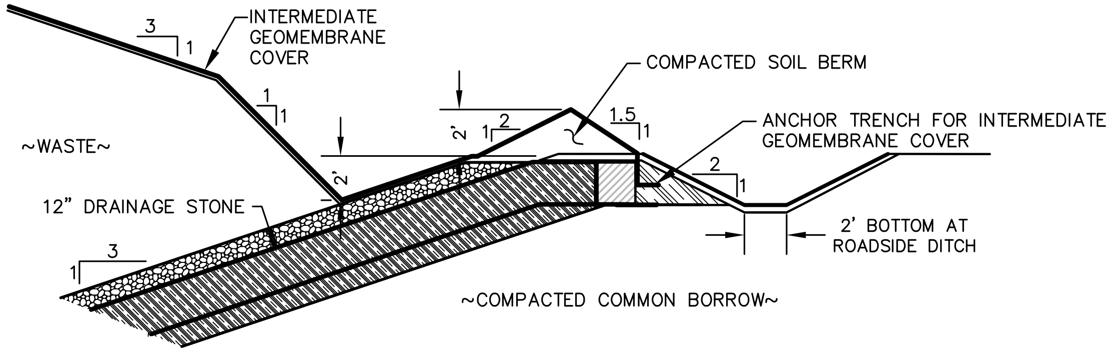


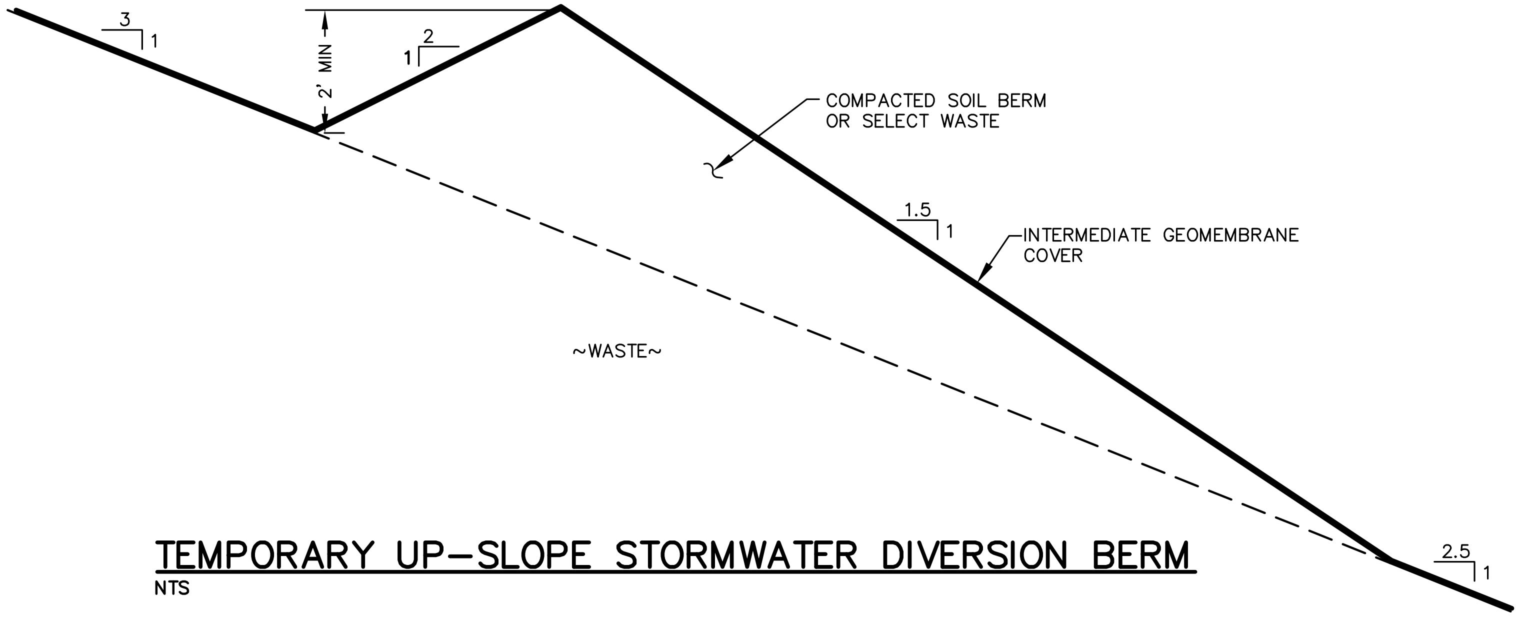
LEACHATE COLLECTION INLET
NTS



TEMPORARY MID-SLOPE INTERMEDIATE BERM
NTS



PERIMETER BERM INTERMEDIATE GEOMEMBRANE COVER DETAIL
NTS



TEMPORARY UP-SLOPE STORMWATER DIVERSION BERM
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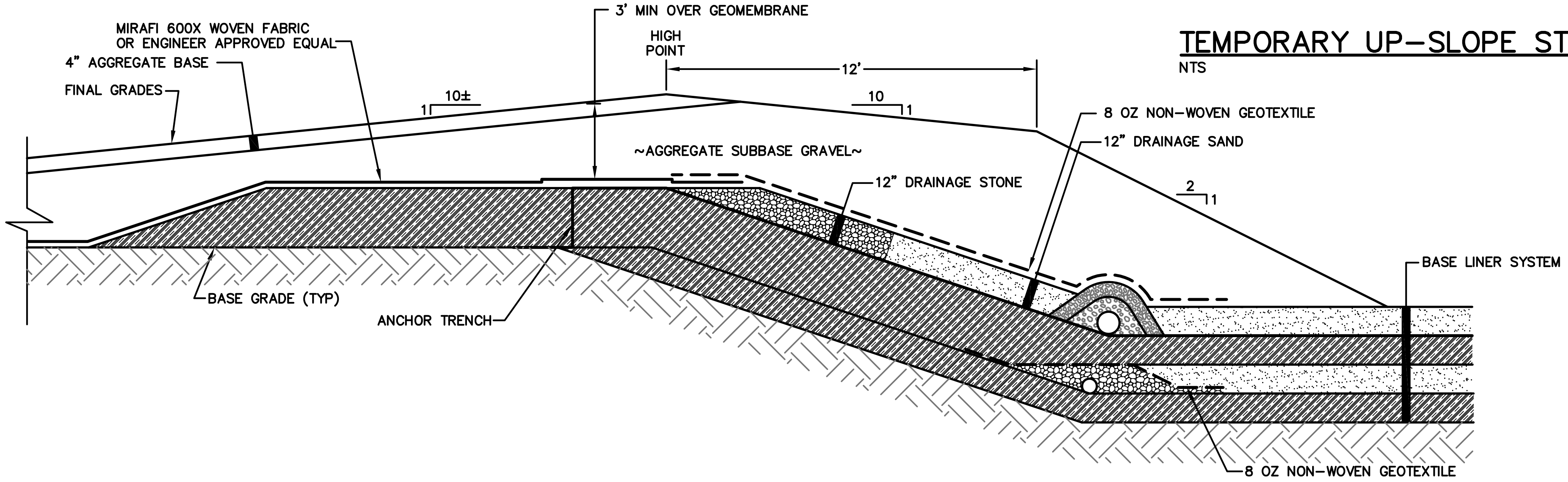

CELL ACCESS ROAD ENTRANCE RAMP (TYP)
NTS

FIGURE E-2
TYPICAL DEVELOPMENT DETAILS
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: C11-CELLDEV	LMN: NONE	CTB: SME-STD	REV: 6/22/2015

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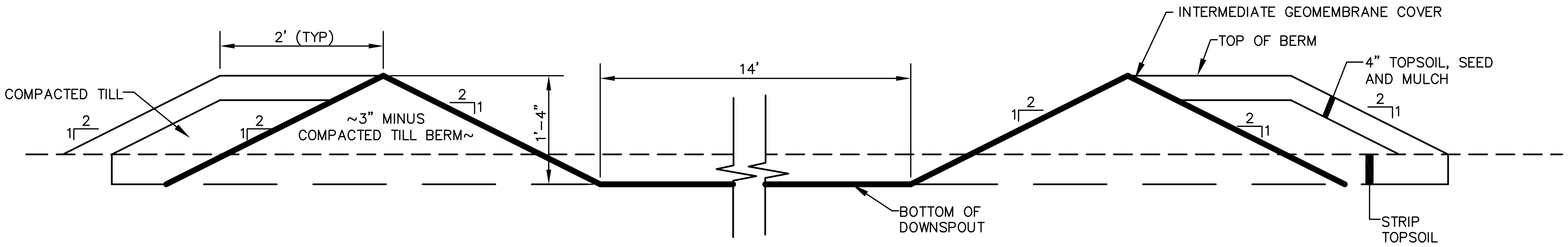
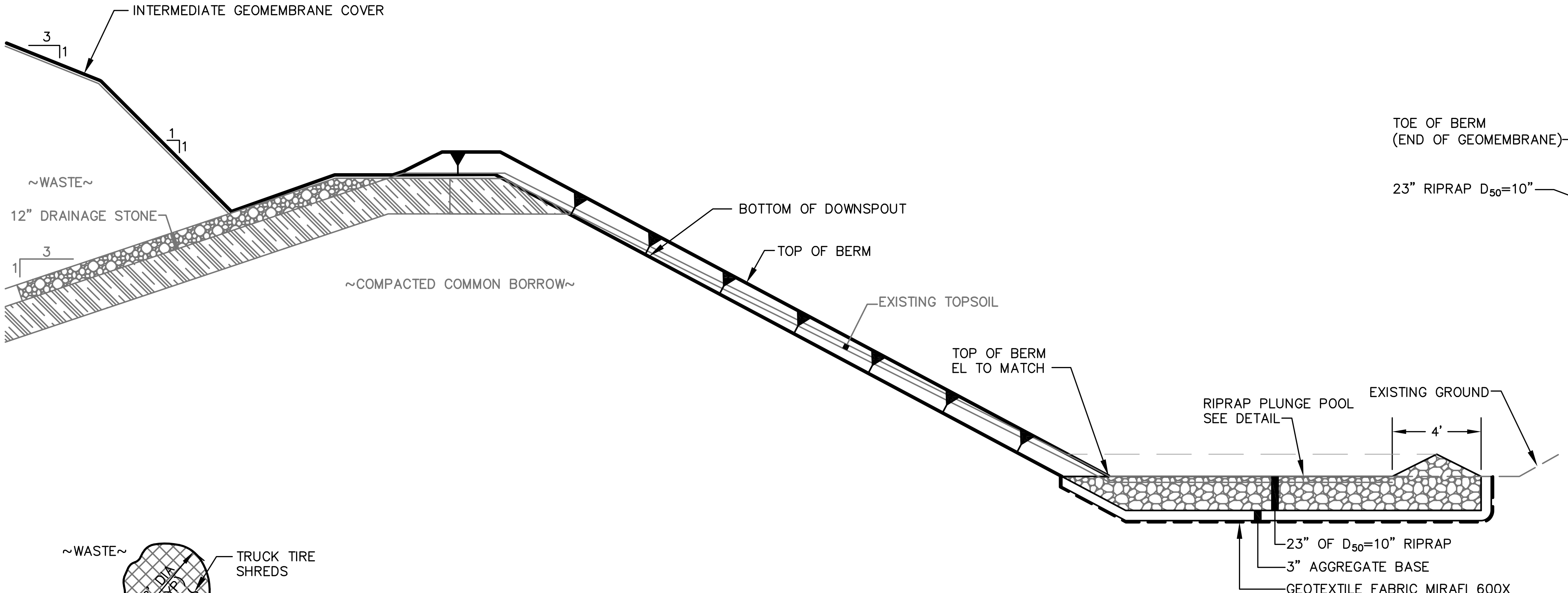


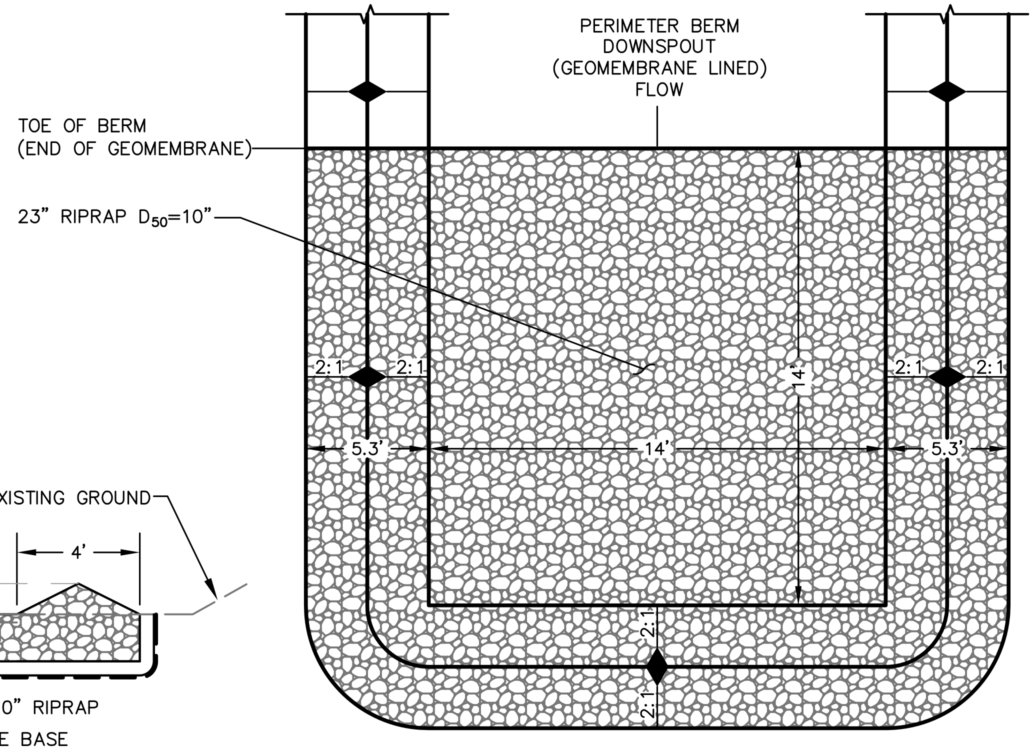
DOWNSPOUT SECTION

NTS



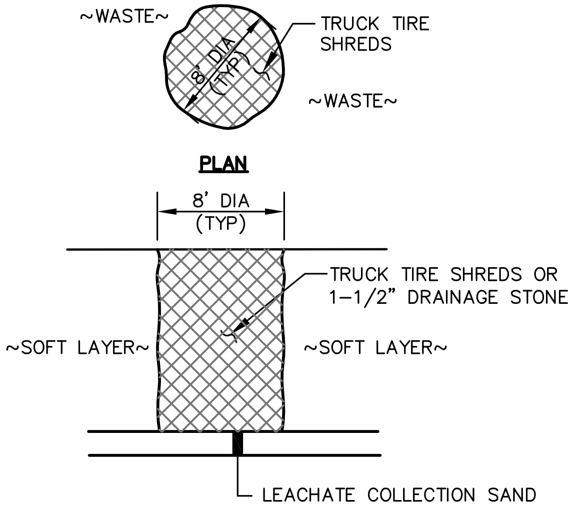
PERIMETER BERM DOWNSPOUT PROFILE

NTS



PLUNGE POOL

NTS



NOTE:
CHIMNEY DRAINS TO BE LOCATED
AS SHOWN ON FIGURE 1

CHIMNEY DRAIN

NTS

FIGURE E–3
TYPICAL DEVELOPMENT DETAILS
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: C11–CELLDEV LMN: NONE CTB: SME–STD REV: 6/22/2015

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APPENDIX F

STORMWATER MANAGEMENT AND EROSION CONTROL PLANS

JUNIPER RIDGE LANDFILL EXPANSION STORMWATER MANAGEMENT PLAN

Submitted by:

STATE OF MAINE BUREAU OF GENERAL SERVICES
as Owner
and
NEWSME LANDFILL OPERATIONS, LLC,
as Operator

July 2015

GUY H.
COTE, JR.
No. 5144
6/24/15

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STORMWATER MANAGEMENT PLAN
JUNIPER RIDGE LANDFILL EXPANSION

1.0 INTRODUCTION

This narrative outlines the project concepts and design criteria for preparing this Stormwater Management Plan associated with the proposed landfill Expansion at the Juniper Ridge Landfill in Old Town Maine (Expansion) (See Figure 1-1). The project will require approval of the Maine Department of Environmental Protection Bureau of Waste Management.

The Plan has been prepared to address the standards and submission requirements of Chapter 400 Section 4.M including the following objectives:

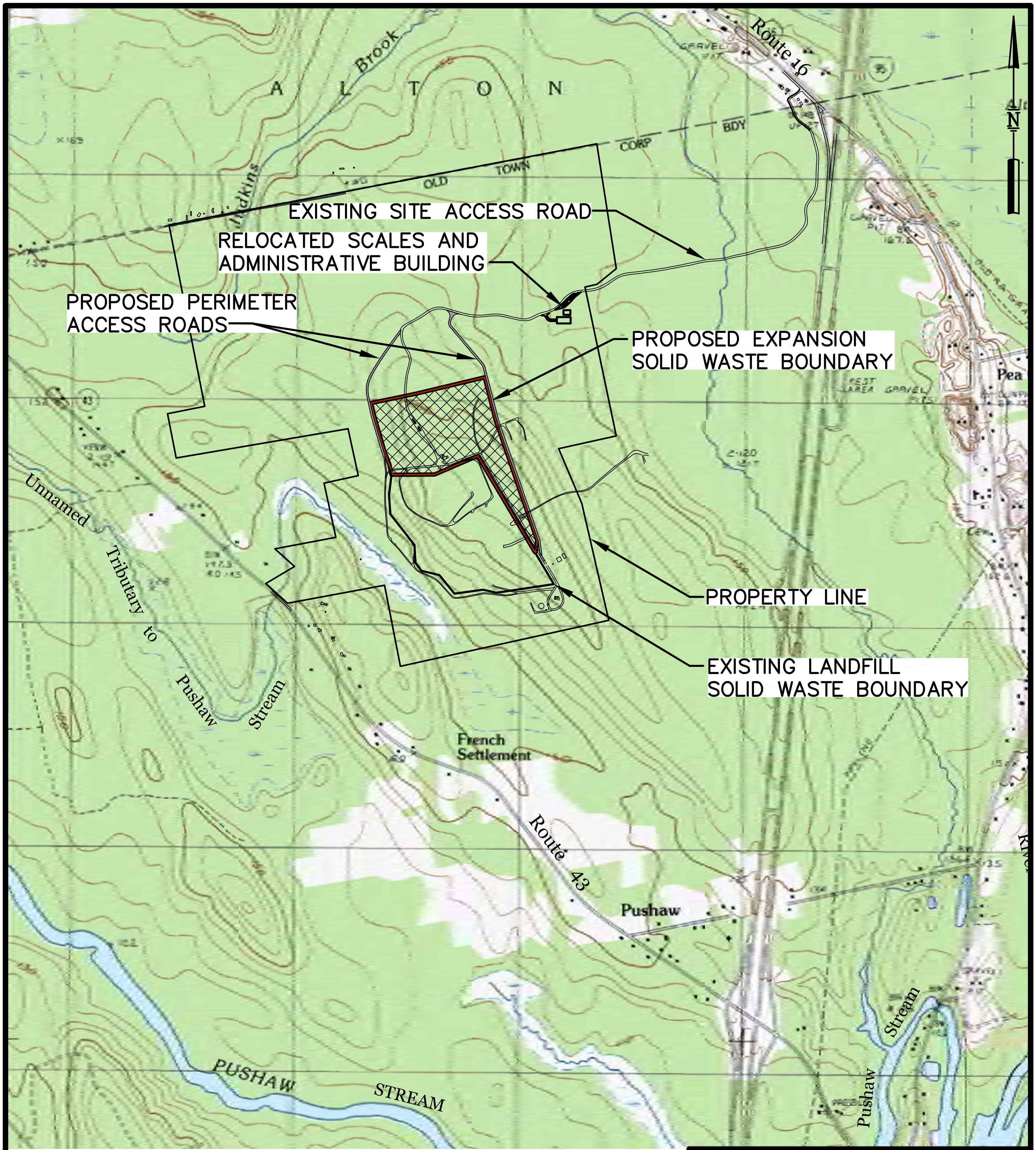
1. The solid waste facility may not unreasonably cause or increase flooding to on-site or adjacent properties;
2. The solid waste facility may not create an unreasonable flood hazard; and,
3. The solid waste facility may have no unreasonable effect on run-on, run-off and/or infiltration relationships.

The proposed development is not located within the watershed of a “lake most at risk from new development” or an “urban impaired stream” as defined by Chapter 502 of MDEP’s Rules for stormwater rules; therefore, the Expansion does not need to comply with Chapter 500 stormwater requirements for water quality.

Erosion control measures for the Expansion are addressed in the Expansion Application Erosion and Sedimentation Control Plan.

2.0 SITE DESCRIPTION

The existing landfill and the Expansion are located on an approximately 780-acre parcel of land located approximately one mile west of Interstate 95 in Old Town, Maine.



NOTE:

BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLE
OLD TOWN, MAINE–1988

1000 0 2000 4000 FEET

DWG: SITELOC LMN: SITELOC CTB: SME-STD REV: 6/9/2015

FIGURE 1–1
SITE LOCATION MAP
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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The existing landfill consists of the previously permitted 68-acre solid waste footprint (of which approximately 60 acres are currently developed or undergoing development), the former leachate pond (which has been repurposed to contain stormwater and renamed to Pond 1A), leachate storage tank, maintenance building, scale house (to be relocated as part of the Expansion), landfill gas flare, office building, soil borrow areas, soil stockpile areas, stormwater detention ponds, parking areas, access roads and other grassed areas (i.e., berm slopes, laydown areas, etc.).

The Expansion will be adjacent to and generally north of the existing landfill and will expand the solid waste footprint by about 54 acres. The total facility site, including supporting site infrastructure (e.g., access roads, stormwater management ponds, etc.) will be approximately 74 acres.

3.0 SITE SETTING

The majority of the parcel is wooded, with hardwoods predominating in the upper elevations, and softwoods predominating in the lower elevations. The parcel is irregularly shaped and the existing landfill is positioned in the southern portion of the parcel. A drumlin oriented in a northwest to southeast direction effectively divides the parcel into four watersheds, east, northeast, northwest, and southwest. The area analyzed for each of the watersheds is approximately 346, 26, 271, and 240 acres, respectively, in the predevelopment conditions. The northeast and the northwest watersheds both contribute to Judkins Brook and eventually Birch Stream. These watersheds will not be affected by the Expansion. The southwest watershed contributes to an unnamed tributary to Pushaw Stream, and the east watershed drains to an unnamed and unmapped tributary of Judkins Brook. Both Birch Stream and Pushaw Stream are tributaries to the Stillwater River which flows to the Penobscot River. For the purpose of estimating pre-development flows, two of the four watersheds (i.e., the east and southwest) are further broken down into subcatchments with five analysis points, which represent the locations where stormwater flows across the site's property boundary. The points of analysis are labeled as Analysis Points 1 through 5 as shown on Drawing D-100 in Appendix A, and Drawing D-101 in Appendix B. Flows from Subcatchments 1 and 2 contribute to southwestern watershed, Subcatchment 3 contributes to the northwest watershed, and Subcatchments 4 and 5 contribute to the east watershed.

The ground elevation within the Expansion area currently ranges from approximately 170 to 215 feet MSL. The Expansion area is mostly wooded with a mixed stand of hardwood and softwood overlying underbrush along the forest floor. The existing ground within the Expansion area slopes radially from the top of the drumlin toward the property boundary at grades varying from 1 to 20 percent. Surface drainage within the Expansion area consists of sheet and shallow concentrated flow with some channelization occurring in existing roadside ditches.

The surficial soils at the site are primarily Plaisted and Howland series along with some Monarda, Buxton, and Scantic, as shown on Figure 3-1. Surficial soils at the site were delineated based on mapping shown on the Soil Conservation Service Medium Intensity Soils Survey for Penobscot County. Table 3-1 shows the hydrologic soil group (HSG) for the various soil series at the site.

The grading and layout of the proposed facility was undertaken with a major consideration being to minimize impacts to wetland areas. Existing drainage courses will be utilized where feasible to convey stormwater from the developed site. No surface drainage outlet structures from the developed site will discharge concentrated flows directly onto abutting properties. Where necessary, the runoff from the developed site will discharge into detention basins that will attenuate peak flows rates to the unnamed tributary feeding Pushaw Stream or to wooded areas which eventually drain to a tributary of Judkins Brook.

TABLE 3-1

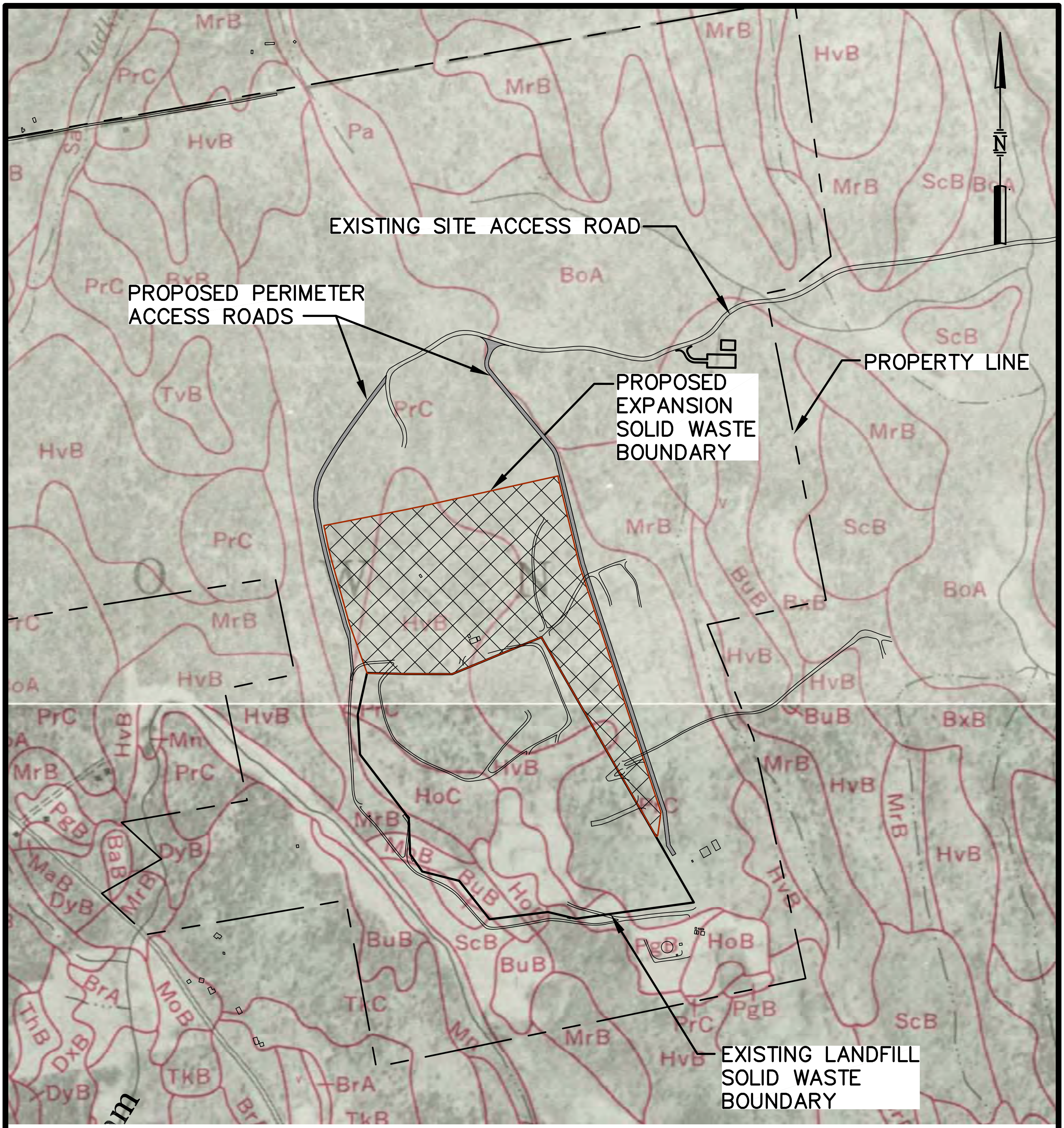
SITE SURFICIAL SOIL SUMMARY

Soil Series	Hydrologic Soil Group	Runoff Curve No.	Description
Plaisted	C	70/71	Woods, good condition/Meadow
Howland	C	70/71	Woods, good condition/Meadow
Monarda	D	77/78	Woods, good condition/Meadow
Buxton	C	70/71	Woods, good condition/Meadow
Scantic	D	77/78	Woods, good condition/Meadow
Landfill Cover	C	71	Meadow
Gravel Surfaces	C/D	89/91/96	Gravel Roads, Pads, Berms
Buildings/Roofs/Pond/ Paved Surfaces	NA	98	Impervious Surface

4.0 WATERSHED STORMWATER FLOWS

The pre-development and post-development surface water peak runoff rates were evaluated for the watersheds in which the Expansion is included. Stormwater flows were calculated for 2-year, 10-year, and 25-year/24-hour storm events using a computer stormwater modeling system entitled *Hydrocad* by Applied Microcomputer Systems of Chocorua, New Hampshire. A 24-hour/Type III Soil Conservation Service (SCS) rainfall distribution with antecedent moisture condition (AMC) 2 was used to model the runoff characteristics of the site.

The pre-development conditions used in this analysis represent site conditions prior to construction of the existing 68-acre landfill. The pre-development analysis was based on a previous version from the West Old Town Landfill License Amendment Application stormwater management report completed by Sevee & Maher Engineers, Inc. (SME) in October 2003; however, the area of analysis was increased to include the developed areas of the Expansion. The pre-development drainage boundaries are shown on pre-development stormwater Drawing D-100 located in Appendix A.



MAPPING SOURCE
NATURAL RESOURCES CONSERVATION SERVICE, WEB SOIL SURVEY OF PENOBSCOT COUNTY, MAINE, 2014.

LEGEND

BoA	BIDDEFORD MUCKY PEAT
BuB	BUXTON SILT LOAM
HoC	HOWLAND GRAVELLY LOAM
HvB	HOWLAND VERY STONY LOAM
MoB	MONARDA SILT LOAM
MrB	MONARDA–BURNHAM COMPLEX
PgB	PLAISTED GRAVELLY LOAM
PrC	PLAISTED VERY STONY LOAM
ScB	SCANTIC SILT LOAM

500 0 1000 2000 FEET

FIGURE 3–1
MEDIUM INTENSITY SOIL TYPES
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

SME
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DWG: SOILS LMN: SOILS CTB: SITELOC REV: 6/17/2015

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The post-development conditions consist of the final cover conditions for the entirety of the existing landfill, as well as the Expansion and associated infrastructure plus existing site facilities. The post-development drainage condition is shown on the post-development stormwater Drawing D-101 located in Appendix B.

There are five points of analysis for stormwater quantity in pre-development and post-development conditions. The points of analysis are at points where defined channels within each subcatchment cross the property boundary. The points of analysis are labeled as Analysis Points 1 through 5 on Drawing D-100 in Appendix A, and Drawing D-101 in Appendix B. Flow from Subcatchments 1 and 2 contribute to southwestern watershed flows, Subcatchment 3 contributes to the northwest watershed flows, and Subcatchments 4 and 5 contribute to east side watershed flows.

A weighted (average) curve number (CN) was calculated for each subcatchment based upon the land use, and the hydrologic soil group within each subcatchment. Times of concentration (T_c) and travel time (T_t) for each subcatchment were calculated based upon SCS methodology and on-site observations of existing travel paths. Peak runoff rates were calculated for the 2-, 10-, and 25-year storm events. HydroCad output sheets and calculations for pre-development and post-development conditions are contained in Appendices A and B, respectively.

4.1 Pre-Development Conditions

The cover types of the existing site are primarily woods (hardwood and softwood), with underbrush overlaying surficial soils classified under the hydrologic soil Groups C and D. Other cover types for the pre-development conditions analysis include historic roadways with HSGs of C or D as well as existing water bodies. The subcatchment boundaries were delineated based on review of topographic mappings and by means of aerial photography both of which predated the construction of the previously permitted 68-acre solid waste landfill.

A summary of the peak pre-development stormwater flows for the five analysis points are included in Table 4-1. HydroCad output sheets and calculations for pre-development stormwater flow conditions are contained in Appendix A.

4.2 Post-Development Conditions

Post-development assumes final cover conditions for the entirety of the existing landfill as well as the Expansion. To analyze the post-development conditions at the site, the watersheds containing the limits of development of the existing landfill and proposed Expansion were divided into 33 subcatchments. Subcatchments were named using the number of the analysis point that it contributes to, followed by a unique letter. The subcatchments in the post-development stormwater analysis are: SC-1A through 1J, SC-2A through 2C, SC-3, SC-4A through 4O, SC-5, and SC-P1A, the subcatchment representing Pond 1A (see Appendix B, Drawing D-101). The limits of these subcatchments were established by the design of future surface water drainage control elements of the site (i.e., landfill terrace ditches, sideslope ditches, perimeter ditches, downspouts, and culvert / catch basin locations) and in part by the existing surface water drainage channels topographically downgradient of the proposed facility that will continue to be utilized to convey stormwater. Subcatchments 1B, 1D, 1E, 1G, 1H, 1I, 2B, and 4G through 4L represent the watersheds associated with the final cover landfill boundary (i.e., inside the perimeter access road). Subcatchments 1A, 1C, 1F, 1J, 2A, 2C, 3, 4A, 4B, 4C, 4D, 4E, 4F, 4M, 4N, 4O, 5, and P1A represent the watersheds outside the perimeter access road. A weighted runoff curve number for each subcatchment was determined as described earlier in Section 4.0. A curve number of 71 was applied to areas of the landfill with soil cover, which can be described as a meadow (with good crop conditions) and Type C hydrologic soil characteristics. Curve numbers ranging from 89 to 98 were applied to areas of the development containing gravel or paved access roads dependent upon the underlying soil characteristics and roadway surface. A curve number of 71 was applied to unpaved developed areas that will not be regularly mowed (i.e., grassed perimeter road sideslopes) which can be described as meadow and Type C hydrologic soil characteristics. Assuming all roadways at the site are paved is a conservative assumption that will allow the owner the flexibility of paving or not paving areas as they choose without affecting stormwater systems. Time of concentrations (T_c) and time of travel (T_t) for the post-development subcatchments were determined by a detailed analysis of the final cover conditions, (i.e., a flow analysis of the terrace ditch, sideslope ditch, and perimeter ditch system within the landfill limits) and upon a flow analysis of the existing stormwater drainage channels below the landfill limits. The area defined by the boundaries of Pond P1A was included in the post-development analysis (Subcatchment P1A) because the pond is no longer being used to store leachate and will continue to be utilized for stormwater detention going forward. Peak rates of runoff were calculated for the 2-, 10-, and 25-year storm events. A summary of the post-development peak stormwater flows are included in Table 4-1. HydroCAD output sheets and calculations for the post-development conditions are contained in Appendix B.

TABLE 4-1

SUMMARY OF PEAK FLOWS

Analysis Point	**Peak Flow (cfs)**					
	Pre-Development			**Post-Development**		
	2-Year	**10-Year**	**25-Year**	**2-Year**	**10-Year**	**25-Year**
1	29.5	92.6	130.9	16.2	50.4	68.3
2	10.2	26.6	36.0	9.8	24.6	33.2
3	29.1	74.1	100.3	29.1	74.1	100.3
4	36.1	92.1	124.5	33.4	84.7	112.5
5	6.2	14.6	19.3	5.7	13.4	17.7

Note
Peak flow of analysis point after routing through detention pond and/or reaches.

As designed, peak runoff rates for the post-development conditions at the site during storms of intensities up to and including the 25-year/24-hour storm event will be less than the peak runoff rates for the site's pre-development conditions.

5.0 STORMWATER DETENTION

A comparison of the pre-development and post-development conditions of the site indicated the potential for increases in the post-development peak flows for the 2-, 10-, and 25-year storm events. To attenuate the increase peak flows during post-development final cover conditions, detention structures were designed to release stormwater at rates such that post-development rates do not exceed the pre-development peak rates.

5.1 Existing Detention Ponds to Remain in Final Conditions

Summaries for each existing detention pond to be utilized as well as the proposed ponds for post-development final cover conditions are listed below. The detention ponds', detention times, and storm storage curves are provided in Appendix C-1 and their locations shown on the Final Site Drainage Plan contained in Appendix D.

Post-development pond routing calculations were made using HydroCad software and are contained in Appendix B.

Detention Pond 1A

Post-development runoff from subcatchments SC-1I and SC-P1A (10.8 acres) will flow into the Detention Pond 1A at the western end of the landfill adjacent to Detention Pond 1. Detention Pond 1A is lined and is approximately 43,000 square feet in size and has a total depth of 8 feet, however it was assumed that the water level was 2 feet from the top of the pond (164.0 feet) for the HydroCAD analysis of post-development stormwater conditions. Detention Pond 1A has a total of 6 acre-ft of storage capacity with approximately 1.8 acre-ft of storage above the assumed water elevation. Detention Pond 1A will outlet via a broad crested weir into Detention Pond 1.

Detention Pond 1

Post-development runoff from subcatchments SC-1B and 1D (24.6 acres) as well as outflow from the Detention Pond 1A will flow into the existing Detention Pond 1. Detention Pond 1 is approximately 25,000 square feet in size, 5 feet deep with 3:1 sideslopes, and has a total volume capacity of approximately 2.1 acre-ft. The pond is unlined, surrounded by an 8-foot wide earthen berm, with an emergency spillway, and contains a combination outlet structure consisting of a 6-foot diameter drop inlet with a 30-inch outlet barrel and a 3-inch diameter orifice opening. This detention pond also served as a sedimentation pond during the site's initial years of development. Steps will be taken to convert the pond structure from a sedimentation pond to a detention pond during Cell 15 construction. These steps include:

- Removal of all sediment within the pond necessary to reach the design base elevation of the detention pond and disposal of the removed sediment within the limits of the landfill;

- Permanently block off all openings located on the 6-foot diameter drop outlet structure that are associated with sedimentation control (i.e., 3-inch diameter orifice opening);

- Open the 6-inch diameter stormwater control orifice located on the 6-foot diameter drop outlet structure; and

- Create an additional 12-inch diameter stormwater control orifice on the 6-foot diameter drop outlet structure at the same elevation as the 30-inch outlet barrel invert

The composite outlet structure of Detention Pond 1 consists of a 6-foot diameter drop inlet with a 30-inch diameter outlet barrel approximately 75 feet long and a 6-inch diameter orifice opening. As referenced above, a second 12-inch diameter orifice shall be added to the outlet structure at the same elevation as the 30-inch diameter outlet barrel invert. The 12-inch orifice is needed to accommodate additional inflow diverted to Detention Pond 1 from the Detention Pond 1A outlet. Without the 12-inch orifice, the runoff from subcatchments SC-1B and 1D along with the outflow from Detention Pond 1A would combine to exceed the storage capacity of Detention Pond 1 during a 25-yr storm and cause a backup of stormwater into Detention Pond 1A. The addition of the 12-inch orifice allows the 2-yr, 10-yr, and 25-yr storms to be controlled through the orifices without flow backing up into the Detention Pond 1A. A pond routing computation of Detention Pond 1 was performed with consideration to peak runoff rates, detention pond storage volume, and the performance of the composite outlet structure.

Detention Pond 2

Detention Pond 2 has a pond storage volume of approximately 1.1 acre-feet and receives flow from subcatchment SC-1E (10.7 acres). The primary outlet structure for Detention Pond 2 was designed to decrease peak flows for 2-year, 10-year, and 25-year storm frequency events. The primary outlet structure for Detention Pond 2 is a 4-foot diameter precast concrete catch basin with a 15-inch diameter inlet orifice to restrict flow. The 15-inch diameter orifice controls peak flows from the 2-year, 10-year, and 25-year storms without any flow through the grate on top of the structure. Flows entering the 4-foot diameter outlet structure through the 15-inch opening are then conveyed to a level spreader by a 24-inch diameter culvert. The emergency condition is assumed to be plugging of the 15-inch orifice, in which case the grate on the top of the structure is utilized to control the peak 25-year storm flow into the structure, which then flows out the 24-inch diameter discharge pipe. During the emergency condition, over 1 foot of freeboard is maintained between the peak water level over the grate and the top of the pond.

Detention Pond 6

Detention Pond 6 is designed to convey stormwater flows from the 2-, 10-, and 25-year/24-hour storm events with water at the elevation of the primary outlet without discharge to the pond emergency spillway. The primary outlet structures for this pond include a pond underdrain system with a 6-inch diameter outlet pipe and a 24-inch diameter outlet culvert. The pond underdrain system consists of approximately 200 feet of 6-inch diameter perforated pipe backfilled with stone and wrapped in a filter geotextile. This underdrain system will allow filtering of stormwater seepage in the bottom of the pond prior to discharge during low flow conditions. The 6-inch diameter outlet pipe (located 2 feet above the pond bottom) will allow metering of flow from the pond so that a plug-flow detention time of 24 hours is obtained for the 10-year/24-hour storm event. The 24-inch diameter outlet culvert allows controlled discharge to a level lip spreader during storm events with a large quantity of runoff. The emergency spillway for the pond is a riprap lined channel that was designed to pass the 25-year/24-hour storm event with at least one foot of freeboard, assuming that the starting water level within the ponds is at the principal spillway elevation (i.e., the invert of the 24-inch diameter culvert outlet) and no discharge occurs from the primary outlets (i.e., the underdrain system, 6-inch and 24-inch pipes). Detention Pond 6 has a pond storage volume of approximately 8.8 acre-feet below the emergency spillway primary outlet (elev. 179.0). During post-development conditions, Pond 6 will receive flow from subcatchments SC-1G, SC-1H and SC-1J (22.6 acres).

Detention Pond 9

Detention Pond 9 is located east of the previously permitted landfill and permitted wood waste handling area and it will remain in place for the life of the Expansion. This pond collects stormwater from subcatchments SC-4A, 4B, 4C, and 4D (14.5 acres), which consist of the borrow storage yard, existing wood waste handling area and maintenance area, landfill operations and construction laydown areas, and landfill gas treatment and future power generation facilities. This pond has an outlet structure consisting of a 12-inch diameter plastic pipe. The outlet pipe discharges to a level spreader which spreads flow through a wooded area east of the pond. The emergency spillway for this pond is a 10-foot wide grass-lined spillway. This pond also has a sand filter underdrain system which consists of approximately 200 feet of 6-inch diameter perforated pipe backfilled with stone and wrapped in a filter geotextile. This underdrain system allows filtering of stormwater seepage in the bottom of the pond prior to discharge during low flow conditions. The post-development conditions result in additional stormwater flows routed into Detention Pond 9 (runoff from SC-4K and 4L – 18.4 acres total). The pond will be modified to accommodate the additional stormwater flows. The footprint of the pond will be increased by enlarging the pond limits to the west. The proposed modification to Detention Pond 9 will increase its total storage volume from 2.3 acre-feet to 5.1 acre-feet below the emergency spillway outlet (elev. 190.5). This pond modification will be made during the construction of Cell 11. The previously described control structures (12-inch diameter CPP with level spreader, emergency spillway, and sand filter underdrain) will remain unchanged. The 6-inch diameter outlet pipe (located 1.7 feet above the pond bottom) was installed with a valve to meter flow out of the pond if necessary. The pond was designed to have a minimum plug flow detention time of 24 hours with the metering valve open on the 6-inch outlet for the 2-year/24-hour storm. In the case of the modified Detention Pond 9, the entire volume of water generated by a 2-year/24-hour storm can be stored in the pond without any outflow when the metering valve is closed. The 6-inch outlet pipe will control the peak flow from the 2-year/24-hour storm when the metering valve is open. The peak flows from the 10-year and 25-year storms will utilize the 12-inch diameter outlet pipe without any discharge to the pond emergency spillway. The emergency spillway for the modified pond is a riprap-lined channel that was designed to pass the 100-year/24-hour storm event with at least one foot of freeboard.

5.2 Proposed Detention Ponds

Proposed detention ponds were designed to provide detention and sedimentation during cell construction, operations, and post-closure conditions. To allow sedimentation, each pond was designed to allow 24 hours (minimum) of plug flow detention time during the 2-year/24-hour storm event. Design calculations for each pond including plug-flow detention time and stage-storage curves, are included in Appendix C. Each outlet culvert will have anti-seep collars to minimize “piping” of water along the outside of the outlet pipe. An anti-seep collar design for each detention pond outlet culvert is located in Appendix C-2. Each outlet culvert discharges to a riprap lined plunge pool and a level lip spreader. Plunge pools were designed to meet the requirements of *Maine Erosion and Sedimentation Control (MESC) BMPs* (SCS 3/2003). Design calculations for riprap plunge pools and level lip spreaders are included in Appendix C. Details for the detention pond structures are on Drawing C-306 included in Appendix D.

<u>5.2.1 Detention Pond 10</u>. Detention Pond 10 is a new pond to be located in the permitted till borrow pit east of Cell 12 and will be constructed as part of the Cell 12 construction project. During post-development conditions Pond 10 will receive flow from subcatchments SC-4I, 4IA, 4J and 4O (28.3 acres). The pond’s footprint is roughly 21,000 square feet and its design capacity is 3.6 acre-feet. The primary outlet structures for this pond include a pond underdrain system, a 6-inch diameter outlet pipe, and a 6-foot diameter drop inlet with an 18-inch diameter outlet culvert and one 6-inch orifice. The pond underdrain system consists of approximately 250 feet of 6-inch diameter perforated pipe backfilled with stone and wrapped in a filter geotextile. This underdrain system will allow filtering of stormwater seepage in the bottom of the pond prior to discharge during low flow conditions. The 6-inch diameter outlet pipe (located 1.2 feet above the pond bottom) will be installed with a valve to meter flow out of the pond if necessary. The pond was designed to have a minimum plug flow detention time of 24 hours with the metering valve open on the 6-inch outlet for the 2-year/24-hour storm. The 6-inch outlet pipe will control the flow of the 2-year/24-hour storm. The 6-inch diameter orifice on the drop inlet and the grate atop the drop inlet will control the peak flows from the 10-year and 25-year/24-hour storms while maintaining a minimum of 0.5 feet of freeboard between peak water elevations and the emergency spillway elevation. The 18-inch diameter outlet culvert allows controlled discharge to a level lip spreader during storm events with a large quantity of runoff. The emergency spillway for the pond is a riprap-lined channel that was designed to pass the 100-year/24-hour storm event with at least one foot of freeboard. In accordance with MESC BMP’s the Detention Pond 10 emergency spillway was designed with its invert 2 feet below the berm top elevation.

<u>5.2.2 Detention Pond 11</u>. Detention Pond 11 is a proposed detention pond located adjacent to Cell 13 in the northeast corner of the site. This pond shall be constructed currently with the construction of the remainder of the eastern side perimeter roadway, which is planned to occur

as part of Cell 12 construction. During post-development conditions of the proposed Expansion, Pond 11 will receive flow from subcatchments SC-4G, 4H, 4HA, and 4M (22.1 acres). The proposed pond's footprint is approximately 40,000 square feet and the storage capacity is 1.9 acre-feet. The primary outlet structures for this pond include a pond underdrain system, a 6-inch diameter outlet pipe, and a 6-foot diameter drop inlet with an 18-inch diameter outlet culvert and one 6-inch orifice. The pond underdrain system consists of approximately 130 feet of 6-inch diameter perforated pipe backfilled with stone and wrapped in a filter geotextile. This underdrain system will allow filtering of stormwater seepage in the bottom of the pond prior to discharge during low flow conditions. The 6-inch diameter outlet pipe (located 0.6 feet above the pond bottom) will be installed with a valve to meter flow out of the pond if necessary. The pond was designed to have a minimum plug flow detention time of 24 hours with the metering valve open on the 6-inch outlet for the 2-year/24-hour storm. In the case of Detention Pond 11, the entire volume of water generated by a 2-year/24-hour storm can be stored in the pond without any outflow when the metering valve is closed. The 6-inch outlet pipe will control the peak flow from the 2-year/24-hour storm when the metering valve is open. The 6-inch orifice will control flow from the 10-year and 25-year/24-hour storms while maintaining a minimum of 0.5 feet of freeboard between peak water elevations and the grate atop the drop inlet. The pond will utilize the grate on the 4-foot drop structure as the pond's emergency spillway due to the presence of an adjacent road. The emergency spillway for the pond was designed to pass the 100-year/24-hour storm event with at least one foot of freeboard between the peak water elevation and the top of the adjacent road.

5.2.3 Detention Pond 12. Detention Pond 12 is a proposed detention pond located adjacent to Cell 16 in the northwest corner of the proposed development area. This pond shall be constructed concurrently with Cell 16. During post-development conditions, Pond 11 will receive flow from subcatchments SC-2B and 2C (16.7 acres). The proposed pond's footprint is approximately 29,000 square feet and the storage capacity is 1.7 acre-feet. The primary outlet structures for this pond include a pond underdrain system, a 6-inch diameter outlet pipe, and a 6-foot diameter drop inlet with an 18-inch diameter outlet culvert and one 8-inch orifice. The pond underdrain system consists of approximately 115 feet of 6-inch diameter perforated pipe backfilled with stone and wrapped in a filter geotextile. This underdrain system will allow filtering of stormwater seepage in the bottom of the pond prior to discharge during low flow conditions. The 6-inch diameter outlet pipe (located 1.5 feet above the pond bottom) will be installed with a valve to meter flow out of the pond if necessary. The pond was designed to have a minimum plug flow detention time of 24 hours with the metering valve open on the 6-inch outlet for the 2-year/24-hour storm. In the case of Detention Pond 12, the entire volume of water generated by a 2-year/24-hour storm can be stored in the pond without any outflow when the metering valve is closed. The 6-inch outlet pipe will control the peak flow from the 2-year and 10-year/24-hour storms when the metering valve is open. The 8-inch orifice will control flow from the 25-year/24-hour storm while maintaining a minimum of 0.5 feet of freeboard between the peak water elevation and the grate atop the drop inlet. The pond will utilize the grate on the 4-foot drop structure as the pond's emergency spillway due to the presence of an adjacent road. The emergency spillway for the pond was designed to pass the 100-year/24-hour storm event with at least one foot of freeboard between the peak water elevation and the top of the adjacent road.

6.0 EXISTING DRAINAGE FACILITIES

In addition to ponds described above, there are several existing drainage structures within the proposed landfill project site. Several roadway culverts (30 inches and smaller) presently exist, crossing at various locations along the perimeter access road. Existing culverts that will remain in place were included in the stormwater routing analysis.

7.0 PROPOSED DRAINAGE FACILITIES

Surface water runoff from covered portions of the Expansion and areas adjacent to the Expansion perimeter access road will be conveyed on the Landfill project site by a series of drainage structures consisting of ditches, catch basins, storm drains, and culverts. Locations of the site ditches, catch basins, and culverts are shown on the Drawing C-107 included in Appendix D and summarized on Table 7-1. These structures were sized to convey peak flow rates during the 24-hour/25-year rainfall event.

The design capacity of the stormwater drainage structures is based on SCS TR20 methodology. Culverts and catch basins have been sized using a computer stormwater modeling system entitled *Hydrocad* by Applied Microcomputer Systems of Chocorua, New Hampshire*.* Ditches have been sized using the *Hydraulic Design Series No. 4, Design of Roadside Drainage Channels (Mannings Equation)*. Ditch linings, level lip spreaders, culvert inlet and outlet protection, and emergency spillways have been designed using SCS guidance found in the *Maine Erosion and Sediment Control BMPs* (SCS, 3/2003*)*. These calculations are found in the Appendices of the Expansion Erosion and Sedimentation Control Plan.

New culverts will be smooth high-density polyethylene (HDPE) and have diameters ranging from 18 to 36 inches. The culverts were designed with riprap aprons at inlet and riprap-lined aprons or plunge pools at outlet. Riprap for culvert inlet and outlet protection D-50 rating (i.e., 50 percent of riprap) ranges from 4 to 10 inches. Culvert outflows will be placed through level lip spreaders or vegetated swales.

The site stormwater drainage ditches (toe ditch) around the Expansion perimeter will be turf lined grass channels with a minimum base width of 2 feet, depth of 2 feet, and maximum sideslopes of 2H:1V. Terrace drain swales on the sideslopes of the landfill cover will be turf-lined ‘v’-channels with a depth of 1 foot, pitch of 5 percent (typical), and maximum sideslopes of 2H:1V. Downspouts on the landfill cover will be lined with riprap (D50 of 8 inches) and have a base width of 4 feet, depth of 2 feet, and maximum sideslopes of 2H:1V. Surface water ditches will have a minimum base width of 2 feet, depth of 2 feet and maximum sideslopes of 2H:1V.

TABLE 7-1

SUMMARY OF STORMWATER CULVERTS, STORM DRAINS, CATCH BASINS, DITCHES

Culverts	Diameter (in.)	Material	Length (ft.)	Slope (%)	Inv. In.	Inv. Out
EC-D-1G	24 (2)	CMP	56	0.018	183.0	182.0
C-2BA	36	HDPE	40	0.008	203.2	202.9
C-2BB	24	HDPE	96	0.010	195.0	194.0
C-4BA	24	HDPE	78	0.009	204.4	203.7
C-4BB	24	HDPE	78	0.009	204.4	203.7
C-4F	18	HDPE	78	0.04	165.0	162.0
C-4G	24	HDPE	36	0.028	175.0	174.0
C-4HA	18	HDPE	40	0.025	201.9	200.9
C-4HB	18	HDPE	101	0.025	178.5	176.0
C-4I	18	HDPE	80	0.131	202.5	192.0
C-4IA	18	HDPE	40	0.023	212.9	212.2
C-4JA	18	HDPE	60	0.028	214.0	212.3
C-4JB	24	HDPE	73	0.021	211.5	210.0
C-4JC	24	HDPE	73	0.021	211.5	210.0
C-4K	24	HDPE	51	0.043	216.5	214.3
C-4L	18	HDPE	121	0.017	213.0	211.0
C-4N	18	HDPE	33	0.030	184.0	183.0

Catch Basin	Basin Dia. (ft)	Grate Opening (in.)	Depth (ft)	Culvert Dia. (in.)
CB-2BB	4	30	7.2	24
CB-4G	4	24	8	24
CB-4HB	4	24	6.9	18
CB-4I	4	24	7.1	18
CB-4JA	4	24	6.7	18
CB-4K	4	30	5.5	24
CB-4L	4	24	4	18

Ditch	Base Width (ft.)	Depth (ft.)	Sideslope Z-Value ('/')	Lining
Ditch to Detention Pond 10	2	2	2	Segments 1&2: NAG S75 erosion Mat Segment 3: Riprap (D50=4", t=9")
Detention Pond 10 Emergency Spillway	10	2	2	Riprap (D50=4", t=9")
Perimeter (toe)	2'	2'	2 '/'	NAG S75 erosion mat
Maintenance Road Ditch	2'	3'	2 '/'	NAG S75 erosion mat
Terrace Drain	0' - V-ditch	2	2 '/'	NAG C125BN erosion mat
Downspouts	4'	2'	2 '/'	Riprap (D50=8", t=18")

Notes:

1. Existing culverts to remain for Post Development condition.
2. Location of structures shown on Drawing C-107 contained in Appendix D.

Terrace drain swales were uniformly sized based on the largest contributing drainage area and minimum expected slope. Riprap sizing is based on the maximum longitudinal slope. Rock chutes (riprap terrace downspouts) are uniformly sized for capacity based on the largest contributing drainage area and riprap size based on contributing area and slope. Computer software entitled HYDRAIN 6.01 (1996), Integrated Drainage Design Computer System, from the Federal Highway Administration (FHWA) has been utilized to size the riprap for downspouts and ditches. Computer software entitled Erosion Control Materials Design Software (ECMDS) Version 4.3 (2003) from the North American Green Co. (N.A.G.) has been was utilized to determine temporary erosion matting for turf-lined and vegetated ditches.

The HYCHL Module of the FHWA HYDRAIN 6.01 software and the ECMDS software is designed to provide recommendations to the user for effective temporary and permanent erosion protection of stormwater ditches and channels conveying intermittent, concentrated, uniform water flows. The channel lining analysis and performance evaluations are conducted using the maximum shear stress (tractive force) method as outlined in the Federal Highway Administration's HEC-15. The stability check for channel lining materials is based on its capability to physically survive and effectively control soil loss on the channel surface under the calculated shear stresses for a specified flow period.

APPENDIX A

PRE-DEVELOPMENT STORMWATER ANALYSIS

TIME OF CONCENTRATION

SUBCATCHMENT 1A
A – B: Sht L=50', S=0.010
B – C: DIRECT ENTRY
C – D: ShC L=1530', S=0.040
D – E: DIRECT ENTRY

SUBCATCHMENT 1B
A – B: Sht L=50', S=0.010
B – C: ShC L=1300', S=0.050
C – D: DIRECT ENTRY

SUBCATCHMENT 1C
A – B: Sht L=50', S=0.010
B – C: ShC L=490', S=0.0055
C – D: DIRECT ENTRY
D – E: DIRECT ENTRY

SUBCATCHMENT 1D
A – B: Sht L=50', S=0.010
B – C: ShC L=1840', S=0.0304
C – D: DIRECT ENTRY

SUBCATCHMENT SC–2
A – B: Sht L=150', S=0.020
B – C: ShC L=1375', S=0.023
C – D: DIRECT ENTRY L=1215'

SUBCATCHMENT SC–3
A – B: Sht L=150', S=0.020
B – C: ShC L=1120', S=0.005
C – D: DIRECT ENTRY L=3070'

SUBCATCHMENT SC–4
A – B: Sht L=150', S=0.027
B – C: ShC L=2780', S=0.0157
C – D: DIRECT ENTRY L=1590'
D – E: DIRECT ENTRY L=760'
E – F: DIRECT ENTRY L=965'

SUBCATCHMENT SC–5
A – B: Sht L=150', S=0.013
B – C: ShC L=1930', S=0.011
C – D: DIRECT ENTRY L=275'

LEGEND

1B	SUBCATCHMENT DESIGNATION
— — —	SUBCATCHMENT BOUNDARY
A B C ├–┼–┤	TIME OF CONCENTRATION SEGMENT DESIGNATION TIME OF CONCENTRATION PATH
▬ ▬	WATERSHED BOUNDARY
——	HYDROLOGIC SOIL GROUP BOUNDARY
HSG D	HYDROLOGIC SOIL GROUP DESIGNATION
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Ch	CHANNEL FLOW
—►—►	DRAINAGE REACH
R–1H	REACH DESIGNATION (HYDROCAD)
DP–1	POND/STRUCTURE DESIGNATION (HYDROCAD)
tc①	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO, NORRIDGEWOCK, MAINE. PHOTO DATE DECEMBER 31, 2014. VERTICAL DATUM MAINE STATE COORDINATE SYSTEM EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY, BANGOR, MAINE.
2. HYDROLOGIC SOIL GROUP DATA INTERPRETED FROM SOIL SURVEY OF PENOBSCOT COUNTY, MAINE, BY U.S. DEPT. OF AGRICULTURE SOIL CONSERVATION SERVICE DECEMBER 1970. MAPS 203 AND 213.
3. SUBCATCHMENTS BASED ON TOPOGRAPHY OF SITE PRIOR TO ANY DEVELOPMENT WHICH PREDATES THE TOPOGRAPHY SHOWN.

150 0 300 600 FEET

REV.	BY	DATE	STATUS
		1/1/07	SUBMITTED TO CLIENT

JUNIPER RIDGE LANDFILL
EXPANSION PROJECT
OLD TOWN, MAINE

STORMWATER MANAGEMENT PLAN
PRE–DEVELOPMENT ANALYSIS

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
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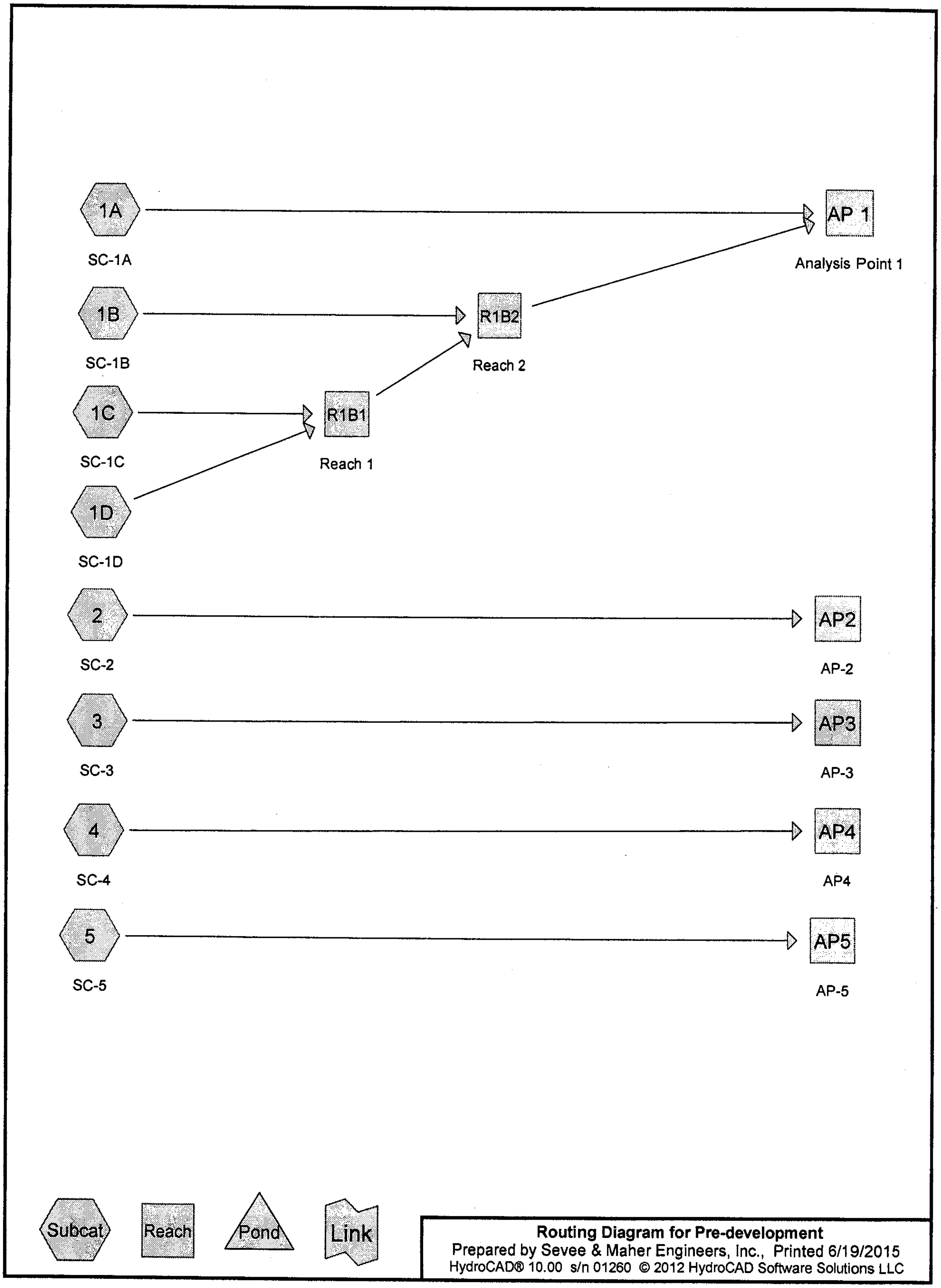
DESIGN BY: HME
DRAWN BY: HME
DATE: 4/08
CHECKED BY:
LMN:
CTB: SMP

JOB NO. 08097.00 DWG FILE SMP–PRE

D–100



Routing Diagram for Pre-development
Prepared by Sevee & Maher Engineers, Inc., Printed 6/19/2015
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.330	98	Existing Water Body (3)
1.600	98	Existing Waterbody (2)
0.950	71	Meadow, non-grazed, HSG C (3)
0.320	98	Paved Areas (New) (3)
2.140	93	Paved roads w/open ditches, 50% imp, HSG D (3, 5)
503.481	70	Woods, Good, HSG C (1A, 1B, 1C, 1D, 2, 3, 4, 5)
345.129	77	Woods, Good, HSG D (1A, 1B, 1C, 1D, 2, 3, 4, 5)

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchr Numbers
0.000	0.000	0.000	0.000	2.330	2.330	Existing Water Body	
0.000	0.000	0.000	0.000	1.600	1.600	Existing Waterbody	
0.000	0.000	0.950	0.000	0.000	0.950	Meadow, non-grazed	
0.000	0.000	0.000	0.000	0.320	0.320	Paved Areas (New)	
0.000	0.000	0.000	2.140	0.000	2.140	Paved roads w/open ditches, 50% imp	
0.000	0.000	503.481	345.129	0.000	848.610	Woods, Good	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: SC-1A Runoff Area=66.270 ac 0.00% Impervious Runoff Depth>0.58"
Flow Length=1,580' Tc=64.5 min CN=71 Runoff=14.56 cfs 3.211 af

Subcatchment 1B: SC-1B Runoff Area=32.390 ac 0.00% Impervious Runoff Depth>0.67"
Flow Length=1,350' Tc=61.4 min CN=73 Runoff=8.79 cfs 1.798 af

Subcatchment 1C: SC-1C Runoff Area=33.510 ac 0.00% Impervious Runoff Depth>0.54"
Flow Length=540' Tc=53.1 min CN=70 Runoff=7.55 cfs 1.520 af

Subcatchment 1D: SC-1D Runoff Area=46.550 ac 0.00% Impervious Runoff Depth>0.62"
Flow Length=1,890' Tc=66.2 min CN=72 Runoff=11.03 cfs 2.414 af

Subcatchment 2: SC-2 Runoff Area=61.430 ac 2.60% Impervious Runoff Depth>0.65"
Flow Length=2,738' Tc=127.3 min CN=73 Runoff=10.22 cfs 3.326 af

Subcatchment 3: SC-3 Runoff Area=270.330 ac 1.32% Impervious Runoff Depth>0.62"
Flow Length=4,335' Tc=240.2 min CN=73 Runoff=29.11 cfs 13.855 af

Subcatchment 4: SC-4 Runoff Area=306.400 ac 0.00% Impervious Runoff Depth>0.63"
Flow Length=6,254' Tc=209.4 min CN=73 Runoff=36.11 cfs 15.981 af

Subcatchment 5: SC-5 Runoff Area=39.070 ac 0.37% Impervious Runoff Depth>0.77"
Flow Length=2,355' Tc=192.1 min CN=76 Runoff=6.20 cfs 2.493 af

Reach AP 1: Analysis Point 1 Inflow=29.50 cfs 8.776 af
Outflow=29.50 cfs 8.776 af

Reach AP2: AP-2 Inflow=10.22 cfs 3.326 af
Outflow=10.22 cfs 3.326 af

Reach AP3: AP-3 Inflow=29.11 cfs 13.855 af
Outflow=29.11 cfs 13.855 af

Reach AP4: AP4 Inflow=36.11 cfs 15.981 af
Outflow=36.11 cfs 15.981 af

Reach AP5: AP-5 Inflow=6.20 cfs 2.493 af
Outflow=6.20 cfs 2.493 af

Reach R1B1: Reach 1 Avg. Flow Depth=0.68' Max Vel=1.36 fps Inflow=18.27 cfs 3.933 af
n=0.030 L=1,850.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=15.50 cfs 3.815 af

Reach R1B2: Reach 2 Avg. Flow Depth=0.78' Max Vel=1.47 fps Inflow=20.68 cfs 5.613 af
n=0.030 L=570.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=20.49 cfs 5.565 af

Summary for Subcatchment 1A: SC-1A

Runoff = 14.56 cfs @ 12.99 hrs, Volume= 3.211 af, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

Area (ac)	CN	Description
58.220	70	Woods, Good, HSG C
8.050	77	Woods, Good, HSG D
66.270	71	Weighted Average
66.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
12.3					**Direct Entry, Segment ID: B-C**
7.9	1,530	0.0400	3.22		**Shallow Concentrated Flow, Segment ID: C-D** Unpaved Kv= 16.1 fps
13.5					**Direct Entry, Segment ID: D-E**
64.5	1,580	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 8.79 cfs @ 12.92 hrs, Volume= 1.798 af, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

	Area (ac)	CN	Description
*	17.167	70	Woods, Good, HSG C
*	15.223	77	Woods, Good, HSG D
	32.390	73	Weighted Average
	32.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.0	1,300	0.0500	3.60		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.6					**Direct Entry, Segment ID: C-D**
61.4	1,350	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 7.55 cfs @ 12.84 hrs, Volume= 1.520 af, Depth> 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

	Area (ac)	CN	Description
*	32.888	70	Woods, Good, HSG C
*	0.622	77	Woods, Good, HSG D
	33.510	70	Weighted Average
	33.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.8	490	0.0055	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
11.0					**Direct Entry, Segment ID: C-D**
4.5					**Direct Entry, Segment ID: D-E**
53.1	540	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 11.03 cfs @ 13.01 hrs, Volume= 2.414 af, Depth> 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

	Area (ac)	CN	Description
*	30.196	70	Woods, Good, HSG C
*	16.354	77	Woods, Good, HSG D
	46.550	72	Weighted Average
	46.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
10.9	1,840	0.0304	2.81		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.5					**Direct Entry, Segment ID: C-D**
66.2	1,890	Total			

Summary for Subcatchment 2: SC-2

Runoff = 10.22 cfs @ 13.87 hrs, Volume= 3.326 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

Area (ac)	CN	Description
39.630	70	Woods, Good, HSG C
20.200	77	Woods, Good, HSG D
1.600	98	Existing Waterbody
61.430	73	Weighted Average
59.830		97.40% Pervious Area
1.600		2.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
60.4	1,375	0.0230	0.38		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
10.6	1,213		1.90		**Direct Entry, Segment C-D (STWC, 0.008)**
127.3	2,738	Total			

Summary for Subcatchment 3: SC-3

Runoff = 29.11 cfs @ 15.72 hrs, Volume= 13.855 af, Depth> 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
*	2.330	98	Existing Water Body
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
	0.950	71	Meadow, non-grazed, HSG C
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4: SC-4

Runoff = 36.11 cfs @ 15.13 hrs, Volume= 15.981 af, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

Area (ac)	CN	Description
150.370	77	Woods, Good, HSG D
156.030	70	Woods, Good, HSG C
306.400	73	Weighted Average
306.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.7	150	0.0270	0.09		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
148.4	2,789	0.0157	0.31		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
209.4	6,254	Total			

Summary for Subcatchment 5: SC-5

Runoff = 6.20 cfs @ 14.76 hrs, Volume= 2.493 af, Depth> 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Yr Rainfall=2.70"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
31.520	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
39.070	76	Weighted Average
38.925		99.63% Pervious Area
0.145		0.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Reach AP 1: Analysis Point 1

Inflow Area = 178.720 ac, 0.00% Impervious, Inflow Depth > 0.59" for 2-Yr event
Inflow = 29.50 cfs @ 13.55 hrs, Volume= 8.776 af
Outflow = 29.50 cfs @ 13.55 hrs, Volume= 8.776 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: AP-2

Inflow Area = 61.430 ac, 2.60% Impervious, Inflow Depth > 0.65" for 2-Yr event
Inflow = 10.22 cfs @ 13.87 hrs, Volume= 3.326 af
Outflow = 10.22 cfs @ 13.87 hrs, Volume= 3.326 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: AP-3

Inflow Area = 270.330 ac, 1.32% Impervious, Inflow Depth > 0.62" for 2-Yr event
Inflow = 29.11 cfs @ 15.72 hrs, Volume= 13.855 af
Outflow = 29.11 cfs @ 15.72 hrs, Volume= 13.855 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

Inflow Area = 306.400 ac, 0.00% Impervious, Inflow Depth > 0.63" for 2-Yr event
Inflow = 36.11 cfs @ 15.13 hrs, Volume= 15.981 af
Outflow = 36.11 cfs @ 15.13 hrs, Volume= 15.981 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: AP-5

Inflow Area = 39.070 ac, 0.37% Impervious, Inflow Depth > 0.77" for 2-Yr event
Inflow = 6.20 cfs @ 14.76 hrs, Volume= 2.493 af
Outflow = 6.20 cfs @ 14.76 hrs, Volume= 2.493 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

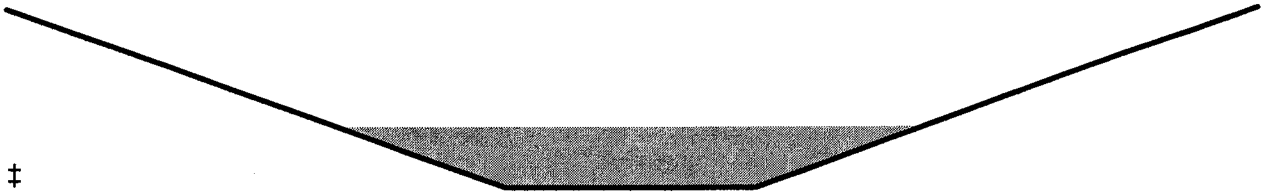
Summary for Reach R1B1: Reach 1

Inflow Area = 80.060 ac, 0.00% Impervious, Inflow Depth > 0.59" for 2-Yr event
Inflow = 18.27 cfs @ 12.92 hrs, Volume= 3.933 af
Outflow = 15.50 cfs @ 13.62 hrs, Volume= 3.815 af, Atten= 15%, Lag= 41.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.36 fps, Min. Travel Time= 22.6 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 38.4 min

Peak Storage= 21,074 cf @ 13.24 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,850.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 146.30'



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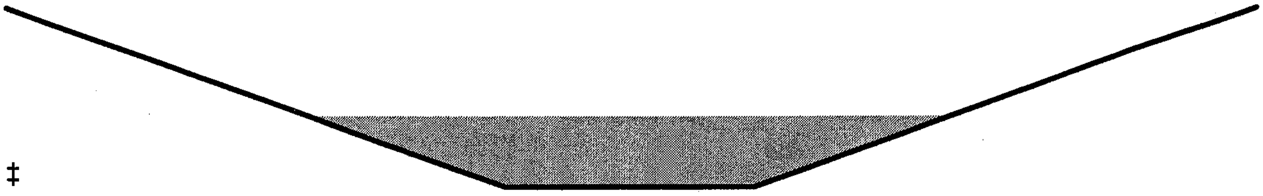
Summary for Reach R1B2: Reach 2

Inflow Area = 112.450 ac, 0.00% Impervious, Inflow Depth > 0.60" for 2-Yr event
Inflow = 20.68 cfs @ 13.52 hrs, Volume= 5.613 af
Outflow = 20.49 cfs @ 13.71 hrs, Volume= 5.565 af, Atten= 1%, Lag= 11.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.47 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 10.6 min

Peak Storage= 7,939 cf @ 13.60 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 570.0' Slope= 0.0020 '/'
Inlet Invert= 146.30', Outlet Invert= 145.16'



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                    Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
                          Runoff by SCS TR-20 method, UH=SCS
        Reach routing by Stor-Ind+Trans method  -  Pond routing by Stor-Ind method

Subcatchment1A: SC-1A             Runoff Area=66.270 ac  0.00% Impervious  Runoff Depth>1.44"
                          Flow Length=1,580'  Tc=64.5 min  CN=71  Runoff=40.77 cfs  7.940 af

Subcatchment1B: SC-1B             Runoff Area=32.390 ac  0.00% Impervious  Runoff Depth>1.57"
                          Flow Length=1,350'  Tc=61.4 min  CN=73  Runoff=22.82 cfs  4.250 af

Subcatchment1C: SC-1C             Runoff Area=33.510 ac  0.00% Impervious  Runoff Depth>1.38"
                            Flow Length=540'  Tc=53.1 min  CN=70  Runoff=22.00 cfs  3.845 af

Subcatchment1D: SC-1D             Runoff Area=46.550 ac  0.00% Impervious  Runoff Depth>1.50"
                          Flow Length=1,890'  Tc=66.2 min  CN=72  Runoff=29.72 cfs  5.834 af

Subcatchment2: SC-2               Runoff Area=61.430 ac  2.60% Impervious  Runoff Depth>1.54"
                         Flow Length=2,738'  Tc=127.3 min  CN=73  Runoff=26.63 cfs  7.899 af

Subcatchment3: SC-3              Runoff Area=270.330 ac  1.32% Impervious  Runoff Depth>1.48"
                        Flow Length=4,335'  Tc=240.2 min  CN=73  Runoff=74.13 cfs  33.230 af

Subcatchment4: SC-4              Runoff Area=306.400 ac  0.00% Impervious  Runoff Depth>1.50"
                        Flow Length=6,254'  Tc=209.4 min  CN=73  Runoff=92.12 cfs  38.214 af

Subcatchment5: SC-5               Runoff Area=39.070 ac  0.37% Impervious  Runoff Depth>1.72"
                         Flow Length=2,355'  Tc=192.1 min  CN=76  Runoff=14.61 cfs  5.590 af

Reach AP 1: Analysis Point 1                                     Inflow=92.64 cfs  21.615 af
                                                                Outflow=92.64 cfs  21.615 af

Reach AP2: AP-2                                                   Inflow=26.63 cfs  7.899 af
                                                                 Outflow=26.63 cfs  7.899 af

Reach AP3: AP-3                                                  Inflow=74.13 cfs  33.230 af
                                                                Outflow=74.13 cfs  33.230 af

Reach AP4: AP4                                                   Inflow=92.12 cfs  38.214 af
                                                                Outflow=92.12 cfs  38.214 af

Reach AP5: AP-5                                                   Inflow=14.61 cfs  5.590 af
                                                                 Outflow=14.61 cfs  5.590 af

Reach R1B1: Reach 1             Avg. Flow Depth=1.16'  Max Vel=1.83 fps  Inflow=50.91 cfs  9.679 af
            n=0.030  L=1,850.0'  S=0.0020 '/'  Capacity=149.69 cfs  Outflow=45.97 cfs  9.498 af

Reach R1B2: Reach 2             Avg. Flow Depth=1.33'  Max Vel=1.98 fps  Inflow=62.14 cfs  13.747 af
              n=0.030  L=570.0'  S=0.0020 '/'  Capacity=149.69 cfs  Outflow=61.72 cfs  13.675 af
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Summary for Subcatchment 1A: SC-1A

Runoff = 40.77 cfs @ 12.92 hrs, Volume= 7.940 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

Area (ac)	CN	Description
58.220	70	Woods, Good, HSG C
8.050	77	Woods, Good, HSG D
66.270	71	Weighted Average
66.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
12.3					**Direct Entry, Segment ID: B-C**
7.9	1,530	0.0400	3.22		**Shallow Concentrated Flow, Segment ID: C-D** Unpaved Kv= 16.1 fps
13.5					**Direct Entry, Segment ID: D-E**
64.5	1,580	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 22.82 cfs @ 12.88 hrs, Volume= 4.250 af, Depth> 1.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

	Area (ac)	CN	Description
*	17.167	70	Woods, Good, HSG C
*	15.223	77	Woods, Good, HSG D
	32.390	73	Weighted Average
	32.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.0	1,300	0.0500	3.60		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.6					**Direct Entry, Segment ID: C-D**
61.4	1,350	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 22.00 cfs @ 12.78 hrs, Volume= 3.845 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

	Area (ac)	CN	Description
*	32.888	70	Woods, Good, HSG C
*	0.622	77	Woods, Good, HSG D
	33.510	70	Weighted Average
	33.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.8	490	0.0055	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
11.0					**Direct Entry, Segment ID: C-D**
4.5					**Direct Entry, Segment ID: D-E**
53.1	540	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 29.72 cfs @ 12.93 hrs, Volume= 5.834 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

	Area (ac)	CN	Description
*	30.196	70	Woods, Good, HSG C
*	16.354	77	Woods, Good, HSG D
	46.550	72	Weighted Average
	46.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
10.9	1,840	0.0304	2.81		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.5					**Direct Entry, Segment ID: C-D**
66.2	1,890	Total			

Summary for Subcatchment 2: SC-2

Runoff = 26.63 cfs @ 13.75 hrs, Volume= 7.899 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

Area (ac)	CN	Description
39.630	70	Woods, Good, HSG C
20.200	77	Woods, Good, HSG D
1.600	98	Existing Waterbody
61.430	73	Weighted Average
59.830		97.40% Pervious Area
1.600		2.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
60.4	1,375	0.0230	0.38		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
10.6	1,213		1.90		**Direct Entry, Segment C-D (STWC, 0.008)**
127.3	2,738	Total			

Summary for Subcatchment 3: SC-3

Runoff = 74.13 cfs @ 15.27 hrs, Volume= 33.230 af, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
*	2.330	98	Existing Water Body
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
	0.950	71	Meadow, non-grazed, HSG C
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4: SC-4

Runoff = 92.12 cfs @ 14.91 hrs, Volume= 38.214 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

Area (ac)	CN	Description
150.370	77	Woods, Good, HSG D
156.030	70	Woods, Good, HSG C
306.400	73	Weighted Average
306.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.7	150	0.0270	0.09		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
148.4	2,789	0.0157	0.31		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
209.4	6,254	Total			

Summary for Subcatchment 5: SC-5

Runoff = 14.61 cfs @ 14.71 hrs, Volume= 5.590 af, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.10"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
31.520	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
39.070	76	Weighted Average
38.925		99.63% Pervious Area
0.145		0.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Reach AP 1: Analysis Point 1

Inflow Area = 178.720 ac, 0.00% Impervious, Inflow Depth > 1.45" for 10-Yr event
Inflow = 92.64 cfs @ 13.25 hrs, Volume= 21.615 af
Outflow = 92.64 cfs @ 13.25 hrs, Volume= 21.615 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: AP-2

Inflow Area = 61.430 ac, 2.60% Impervious, Inflow Depth > 1.54" for 10-Yr event
Inflow = 26.63 cfs @ 13.75 hrs, Volume= 7.899 af
Outflow = 26.63 cfs @ 13.75 hrs, Volume= 7.899 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: AP-3

Inflow Area = 270.330 ac, 1.32% Impervious, Inflow Depth > 1.48" for 10-Yr event
Inflow = 74.13 cfs @ 15.27 hrs, Volume= 33.230 af
Outflow = 74.13 cfs @ 15.27 hrs, Volume= 33.230 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

Inflow Area = 306.400 ac, 0.00% Impervious, Inflow Depth > 1.50" for 10-Yr event
Inflow = 92.12 cfs @ 14.91 hrs, Volume= 38.214 af
Outflow = 92.12 cfs @ 14.91 hrs, Volume= 38.214 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: AP-5

Inflow Area = 39.070 ac, 0.37% Impervious, Inflow Depth > 1.72" for 10-Yr event
Inflow = 14.61 cfs @ 14.71 hrs, Volume= 5.590 af
Outflow = 14.61 cfs @ 14.71 hrs, Volume= 5.590 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

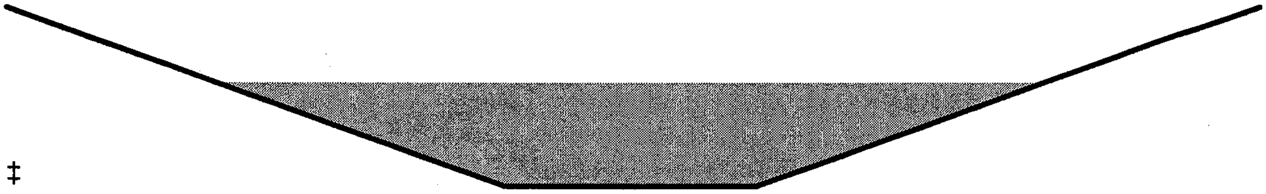
Summary for Reach R1B1: Reach 1

```
Inflow Area =     80.060 ac,  0.00% Impervious,  Inflow Depth >  1.45"   for  10-Yr event
Inflow      =     50.91 cfs @  12.86 hrs,  Volume=         9.679 af
Outflow     =     45.97 cfs @  13.36 hrs,  Volume=         9.498 af,  Atten= 10%,  Lag= 30.2 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 16.8 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 31.8 min

Peak Storage= 46,438 cf @ 13.08 hrs
Average Depth at Peak Storage= 1.16'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,850.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 146.30'



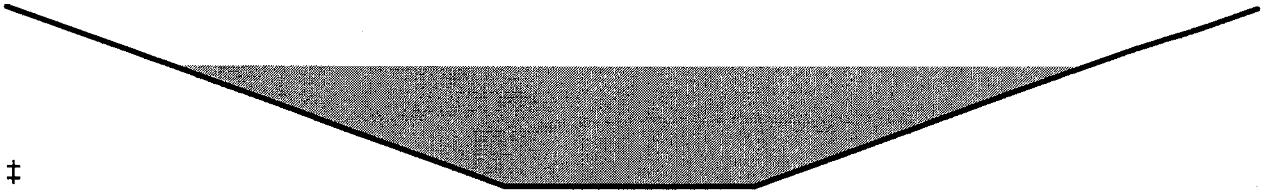
Summary for Reach R1B2: Reach 2

```
Inflow Area =    112.450 ac,  0.00% Impervious,  Inflow Depth >  1.47"   for  10-Yr event
Inflow      =     62.14 cfs @  13.26 hrs,  Volume=        13.747 af
Outflow     =     61.72 cfs @  13.40 hrs,  Volume=        13.675 af,  Atten= 1%,  Lag= 8.6 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.98 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 8.9 min

Peak Storage= 17,767 cf @ 13.32 hrs
Average Depth at Peak Storage= 1.33'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 570.0' Slope= 0.0020 '/'
Inlet Invert= 146.30', Outlet Invert= 145.16'



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: SC-1A Runoff Area=66.270 ac 0.00% Impervious Runoff Depth>1.93"
Flow Length=1,580' Tc=64.5 min CN=71 Runoff=55.97 cfs 10.685 af

Subcatchment1B: SC-1B Runoff Area=32.390 ac 0.00% Impervious Runoff Depth>2.09"
Flow Length=1,350' Tc=61.4 min CN=73 Runoff=30.76 cfs 5.651 af

Subcatchment1C: SC-1C Runoff Area=33.510 ac 0.00% Impervious Runoff Depth>1.86"
Flow Length=540' Tc=53.1 min CN=70 Runoff=30.43 cfs 5.206 af

Subcatchment1D: SC-1D Runoff Area=46.550 ac 0.00% Impervious Runoff Depth>2.01"
Flow Length=1,890' Tc=66.2 min CN=72 Runoff=40.50 cfs 7.804 af

Subcatchment2: SC-2 Runoff Area=61.430 ac 2.60% Impervious Runoff Depth>2.05"
Flow Length=2,738' Tc=127.3 min CN=73 Runoff=36.03 cfs 10.515 af

Subcatchment3: SC-3 Runoff Area=270.330 ac 1.32% Impervious Runoff Depth>1.97"
Flow Length=4,335' Tc=240.2 min CN=73 Runoff=100.29 cfs 44.356 af

Subcatchment4: SC-4 Runoff Area=306.400 ac 0.00% Impervious Runoff Depth>2.00"
Flow Length=6,254' Tc=209.4 min CN=73 Runoff=124.52 cfs 50.967 af

Subcatchment5: SC-5 Runoff Area=39.070 ac 0.37% Impervious Runoff Depth>2.25"
Flow Length=2,355' Tc=192.1 min CN=76 Runoff=19.28 cfs 7.326 af

Reach AP 1: Analysis Point 1 Inflow=130.92 cfs 29.050 af
Outflow=130.92 cfs 29.050 af

Reach AP2: AP-2 Inflow=36.03 cfs 10.515 af
Outflow=36.03 cfs 10.515 af

Reach AP3: AP-3 Inflow=100.29 cfs 44.356 af
Outflow=100.29 cfs 44.356 af

Reach AP4: AP4 Inflow=124.52 cfs 50.967 af
Outflow=124.52 cfs 50.967 af

Reach AP5: AP-5 Inflow=19.28 cfs 7.326 af
Outflow=19.28 cfs 7.326 af

Reach R1B1: Reach 1 Avg. Flow Depth=1.36' Max Vel=2.00 fps Inflow=69.81 cfs 13.009 af
n=0.030 L=1,850.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=63.99 cfs 12.799 af

Reach R1B2: Reach 2 Avg. Flow Depth=1.56' Max Vel=2.16 fps Inflow=86.96 cfs 18.449 af
n=0.030 L=570.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=86.38 cfs 18.365 af

Summary for Subcatchment 1A: SC-1A

Runoff = 55.97 cfs @ 12.90 hrs, Volume= 10.685 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

Area (ac)	CN	Description
58.220	70	Woods, Good, HSG C
8.050	77	Woods, Good, HSG D
66.270	71	Weighted Average
66.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
12.3					**Direct Entry, Segment ID: B-C**
7.9	1,530	0.0400	3.22		**Shallow Concentrated Flow, Segment ID: C-D** Unpaved Kv= 16.1 fps
13.5					**Direct Entry, Segment ID: D-E**
64.5	1,580	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 30.76 cfs @ 12.86 hrs, Volume= 5.651 af, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

	Area (ac)	CN	Description
*	17.167	70	Woods, Good, HSG C
*	15.223	77	Woods, Good, HSG D
	32.390	73	Weighted Average
	32.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.0	1,300	0.0500	3.60		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.6					**Direct Entry, Segment ID: C-D**
61.4	1,350	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 30.43 cfs @ 12.76 hrs, Volume= 5.206 af, Depth> 1.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

	Area (ac)	CN	Description
*	32.888	70	Woods, Good, HSG C
*	0.622	77	Woods, Good, HSG D
	33.510	70	Weighted Average
	33.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.8	490	0.0055	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
11.0					**Direct Entry, Segment ID: C-D**
4.5					**Direct Entry, Segment ID: D-E**
53.1	540	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 40.50 cfs @ 12.92 hrs, Volume= 7.804 af, Depth> 2.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

	Area (ac)	CN	Description
*	30.196	70	Woods, Good, HSG C
*	16.354	77	Woods, Good, HSG D
	46.550	72	Weighted Average
	46.550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	50	0.0100	0.03		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
10.9	1,840	0.0304	2.81		**Shallow Concentrated Flow, Segment ID: B-C** Unpaved Kv= 16.1 fps
24.5					**Direct Entry, Segment ID: C-D**
66.2	1,890	Total			

Summary for Subcatchment 2: SC-2

Runoff = 36.03 cfs @ 13.73 hrs, Volume= 10.515 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

Area (ac)	CN	Description
39.630	70	Woods, Good, HSG C
20.200	77	Woods, Good, HSG D
1.600	98	Existing Waterbody
61.430	73	Weighted Average
59.830		97.40% Pervious Area
1.600		2.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
60.4	1,375	0.0230	0.38		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
10.6	1,213		1.90		**Direct Entry, Segment C-D (STWC, 0.008)**
127.3	2,738	Total			

Summary for Subcatchment 3: SC-3

Runoff = 100.29 cfs @ 15.24 hrs, Volume= 44.356 af, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
*	2.330	98	Existing Water Body
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
	0.950	71	Meadow, non-grazed, HSG C
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4: SC-4

Runoff = 124.52 cfs @ 14.88 hrs, Volume= 50.967 af, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

Area (ac)	CN	Description
150.370	77	Woods, Good, HSG D
156.030	70	Woods, Good, HSG C
306.400	73	Weighted Average
306.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.7	150	0.0270	0.09		**Sheet Flow, Segment A-B** Woods: Light underbrush n= 0.400 P2= 2.70"
148.4	2,789	0.0157	0.31		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
209.4	6,254	Total			

Summary for Subcatchment 5: SC-5

Runoff = 19.28 cfs @ 14.70 hrs, Volume= 7.326 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Yr Rainfall=4.80"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
31.520	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
39.070	76	Weighted Average
38.925		99.63% Pervious Area
0.145		0.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Reach AP 1: Analysis Point 1

```
Inflow Area =     178.720 ac,  0.00% Impervious,  Inflow Depth >  1.95"   for  25-Yr event
Inflow      =     130.92 cfs @  13.19 hrs,  Volume=        29.050 af
Outflow     =     130.92 cfs @  13.19 hrs,  Volume=        29.050 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: AP-2

```
Inflow Area =      61.430 ac,  2.60% Impervious,  Inflow Depth >  2.05"   for  25-Yr event
Inflow      =      36.03 cfs @  13.73 hrs,  Volume=        10.515 af
Outflow     =      36.03 cfs @  13.73 hrs,  Volume=        10.515 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: AP-3

```
Inflow Area =     270.330 ac,  1.32% Impervious,  Inflow Depth >  1.97"   for  25-Yr event
Inflow      =     100.29 cfs @  15.24 hrs,  Volume=        44.356 af
Outflow     =     100.29 cfs @  15.24 hrs,  Volume=        44.356 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

```
Inflow Area =     306.400 ac,  0.00% Impervious,  Inflow Depth >  2.00"   for  25-Yr event
Inflow      =     124.52 cfs @  14.88 hrs,  Volume=        50.967 af
Outflow     =     124.52 cfs @  14.88 hrs,  Volume=        50.967 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: AP-5

```
Inflow Area =      39.070 ac,  0.37% Impervious,  Inflow Depth >  2.25"   for  25-Yr event
Inflow      =      19.28 cfs @  14.70 hrs,  Volume=         7.326 af
Outflow     =      19.28 cfs @  14.70 hrs,  Volume=         7.326 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

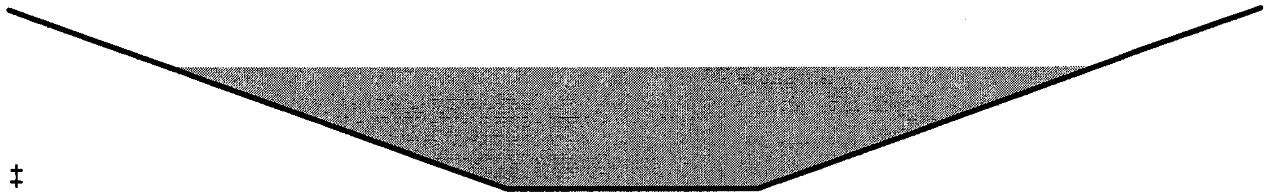
Summary for Reach R1B1: Reach 1

```
Inflow Area =      80.060 ac,  0.00% Impervious,  Inflow Depth >  1.95"   for  25-Yr event
Inflow      =      69.81 cfs @  12.85 hrs,  Volume=        13.009 af
Outflow     =      63.99 cfs @  13.30 hrs,  Volume=        12.799 af,  Atten= 8%,  Lag= 27.5 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.00 fps, Min. Travel Time= 15.4 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 29.9 min

Peak Storage= 59,202 cf @ 13.05 hrs
Average Depth at Peak Storage= 1.36'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,850.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 146.30'



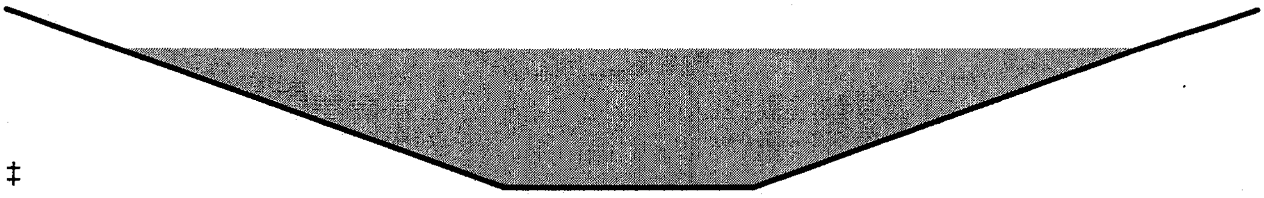
Summary for Reach R1B2: Reach 2

```
Inflow Area =     112.450 ac,  0.00% Impervious,  Inflow Depth >  1.97"   for  25-Yr event
Inflow      =      86.96 cfs @  13.20 hrs,  Volume=        18.449 af
Outflow     =      86.38 cfs @  13.34 hrs,  Volume=        18.365 af,  Atten= 1%,  Lag= 7.9 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.16 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 8.4 min

Peak Storage= 22,774 cf @ 13.26 hrs
Average Depth at Peak Storage= 1.56'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 570.0' Slope= 0.0020 '/'
Inlet Invert= 146.30', Outlet Invert= 145.16'



APPENDIX B

POST-DEVELOPMENT STORMWATER ANALYSIS

TIME OF CONCENTRATION

SUBCATCHMENT 1A
A – B: Sht L=150', S=0.020
B – C: Direct Entry, L=1840'
C – D: Direct Entry, L=260'

SUBCATCHMENT 1B
A – B: Sht L=150', S=0.050
B – C: ShC L=185', S=0.100
C – D: Ch L=390', S=0.050
D – E: Ch L=560', S=0.330

SUBCATCHMENT 1C
A – B: Sht L=150', S=0.035
B – C: ShC L=230', S=0.013
C – D: Direct Entry

SUBCATCHMENT 1D
A – B: Sht L=150', S=0.050
B – C: ShC L=160', S=0.100
C – D: Ch L=200', S=0.050
D – E: Ch L=605', S=0.330

SUBCATCHMENT 1E
A – B: Sht L=150', S=0.100
B – C: ShC L=150', S=0.150
C – D: Ch L=93', S=0.050
D – E: Ch L=517', S=0.330

SUBCATCHMENT 1F
A – B: Sht L=100', S=0.010
B – C: Sht L=17', S=0.330
C – D: ShC L=300, S=0.019
D – E: ShC L=1649', S=0.050
E – F: Direct Entry

SUBCATCHMENT 1G
A – B: Sht L=150', S=0.100
B – C: ShC L=62', S=0.100
C – D: ShC L=90', S=0.330
D – E: Ch L=140', S=0.500
E – F: Ch L=415', S=0.330

SUBCATCHMENT 1H
A – B: Sht L=150', S=0.330
B – C: Ch L=610', S=0.030

SUBCATCHMENT 1i
A – B: Sht L=150', S=0.050
B – C: ShC L=150', S=0.100
C – D: Ch L=220', S=0.050
D – E: Ch L=570', S=0.330

SUBCATCHMENT 1J
A – B: Sht L=100', S=0.040
B – C: ShC L=123', S=0.057
C – D: Ch L=370', S=0.019

SUBCATCHMENT 2A
A – B: Sht L=150', S=0.030
B – C: ShC L=540', S=0.020
C – D: ShC L=530', S=0.009
D – E: Cf L=1213', S=0.008

SUBCATCHMENT 2B
A – B: Sht L=150', S=0.050
B – C: ShC L=190', S=0.100
C – D: Ch L=430', S=0.050
D – E: Ch L=450', S=0.330

SUBCATCHMENT 2C
A – B: Sht L=150', S=0.013
B – C: ShC L=290', S=0.024
C – D: Ch L=260', S=0.011

SUBCATCHMENT 3
A – B: Sht L=150', S=0.020
B – C: ShC L=1120', S=0.005
C – D: Direct Entry, L=3070'

SUBCATCHMENT 4A
A – B: Sht L=150', S=0.017
B – C: ShC L=160', S=0.041
C – D: ShC L=70', S=0.043

SUBCATCHMENT 4B
A – B: Sht L=24', S=0.020
B – C: Sht L=19', S=0.500
C – D: ShC L=584', S=0.014
D – E: Ch L=40', S=0.025

SUBCATCHMENT 4C
A – B: Sht L=61', S=0.020
B – C: Sht L=61', S=0.020
C – D: ShC L=374', S=0.011

SUBCATCHMENT 4D
A – B: Sht L=125', S=0.022
B – C: Sht L=25', S=0.052
C – D: ShC L=270', S=0.019
D – E: ShC L=40', S=0.330
E – F: ShC L=100', S=0.015
F – G: ShC L=258', S=0.003

SUBCATCHMENT 4E
A – B: Sht L=150', S=0.013
B – C: ShC L=2625', S=0.019
C – D: Direct Entry L=1590'
D – E: Direct Entry, L=760'
E – F: Direct Entry, L=960'

SUBCATCHMENT 4F
A – B: Sht L=140', S=0.028
B – C: ShC L=1067', S=0.029
C – D: Ch L=20', S=0.021

SUBCATCHMENT 4G
A – B: Sht L=100', S=0.050
B – C: Sht L=50', S=0.100
C – D: ShC L=150', S=0.100
D – E: Ch L=130', S=0.050
D – F: Ch L=500', S=0.330

SUBCATCHMENT 4H
A – B: Sht L=75', S=0.100
B – C: Sht L=75', S=0.330
C – D: ShC L=150', S=0.330
D – E: Ch L=290', S=0.050
E – D: Ch L=240', S=0.330

SUBCATCHMENT 4HA
A – B: Sht L=140', S=0.330

SUBCATCHMENT 4i
A – B: Sht L=150', S=0.050
B – C: ShC L=200', S=0.100
C – D: Ch L=290', S=0.050
D – E: Ch L=440', S=0.330

SUBCATCHMENT 4iA
A – B: Sht L=140', S=0.333

SUBCATCHMENT 4J
A – B: Sht L=150', S=0.050
B – C: ShC L=200', S=0.100
C – D: Ch L=270', S=0.050
D – E: Ch L=430', S=0.330

SUBCATCHMENT 4K
A – B: Sht L=150', S=0.050
B – C: ShC L=270', S=0.055
C – D: Ch L=270', S=0.050
D – E: Ch L=410', S=0.330

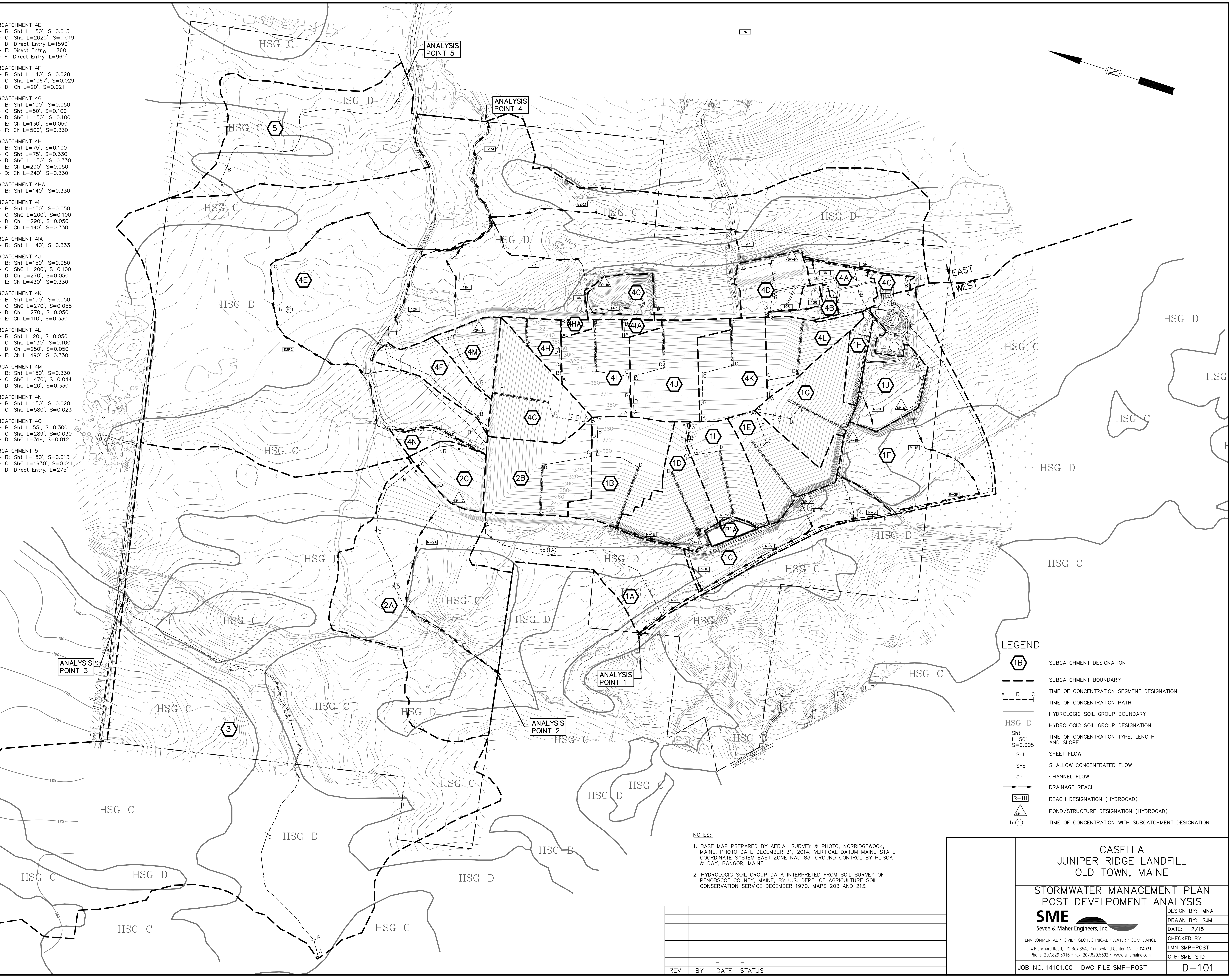
SUBCATCHMENT 4L
A – B: Sht L=20', S=0.050
B – C: ShC L=130', S=0.100
C – D: Ch L=250', S=0.050
D – E: Ch L=490', S=0.330

SUBCATCHMENT 4M
A – B: Sht L=150', S=0.330
B – C: ShC L=470', S=0.044
C – D: ShC L=20', S=0.330

SUBCATCHMENT 4N
A – B: Sht L=150', S=0.020
B – C: ShC L=580', S=0.023

SUBCATCHMENT 4O
A – B: Sht L=55', S=0.300
B – C: ShC L=289', S=0.030
C – D: ShC L=319, S=0.012

SUBCATCHMENT 5
A – B: Sht L=150', S=0.013
B – C: ShC L=1930', S=0.011
C – D: Direct Entry, L=275'



LEGEND

1B	SUBCATCHMENT DESIGNATION
— — —	SUBCATCHMENT BOUNDARY
A B C	TIME OF CONCENTRATION SEGMENT DESIGNATION
├ – + – ┤	TIME OF CONCENTRATION PATH
——	HYDROLOGIC SOIL GROUP BOUNDARY
HSG D	HYDROLOGIC SOIL GROUP DESIGNATION
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Ch	CHANNEL FLOW
——►——►	DRAINAGE REACH
R–1H	REACH DESIGNATION (HYDROCAD)
DP–1	POND/STRUCTURE DESIGNATION (HYDROCAD)
tc①	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO, NORRIDGEWOCK, MAINE. PHOTO DATE DECEMBER 31, 2014. VERTICAL DATUM MAINE STATE COORDINATE SYSTEM EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY, BANGOR, MAINE.
2. HYDROLOGIC SOIL GROUP DATA INTERPRETED FROM SOIL SURVEY OF PENOBSCOT COUNTY, MAINE, BY U.S. DEPT. OF AGRICULTURE SOIL CONSERVATION SERVICE DECEMBER 1970. MAPS 203 AND 213.

REV.	BY	DATE	STATUS
	–	–	

CASELLA
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

STORMWATER MANAGEMENT PLAN
POST DEVELPOMENT ANALYSIS

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland Center, Maine 04021
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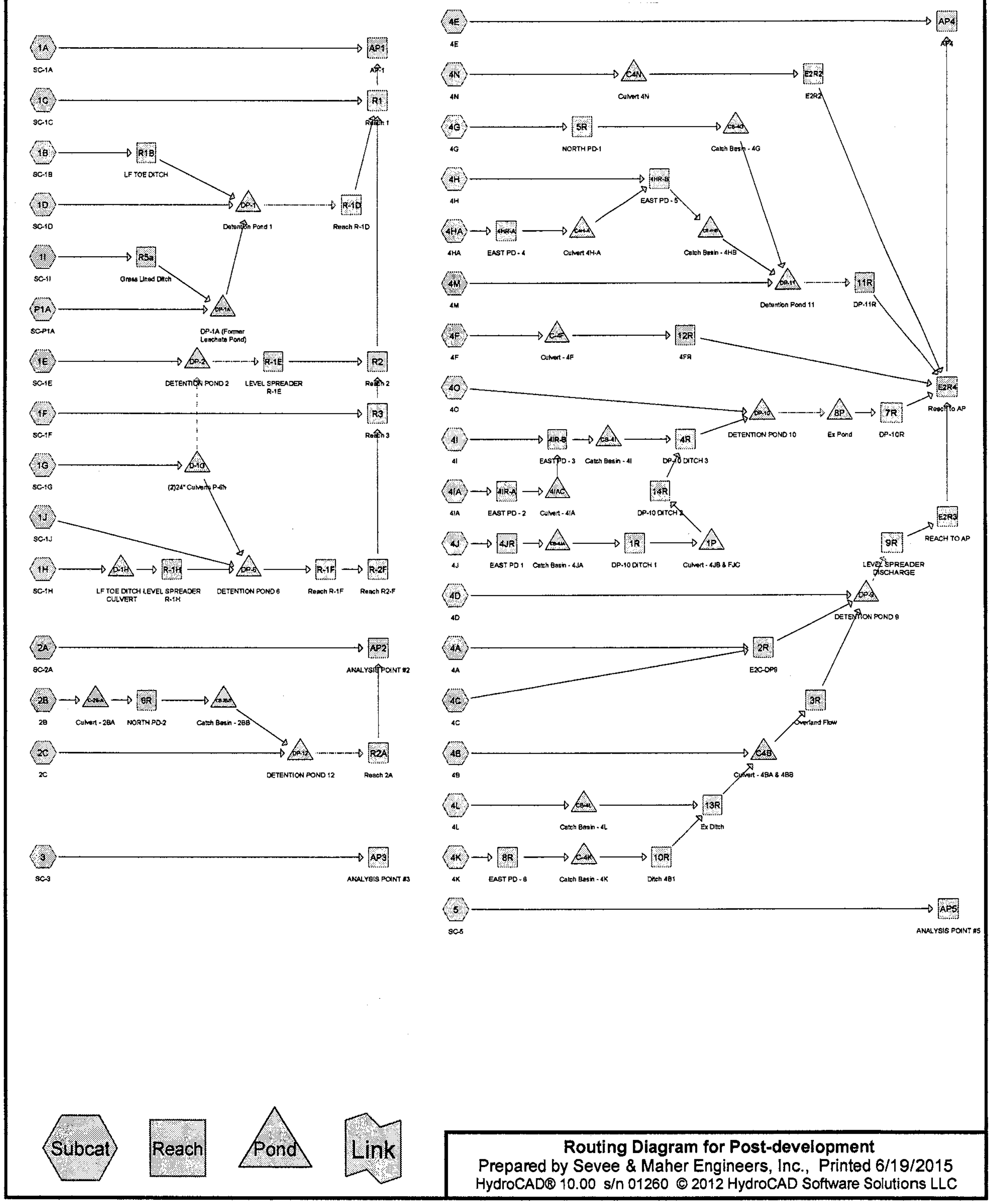
DESIGN BY: MNA
DRAWN BY: SJM
DATE: 2/15
CHECKED BY:
LMN: SMP–POST
CTB: SME–STD

JOB NO. 14101.00 DWG FILE SMP–POST

D–101



Routing Diagram for Post-development
Prepared by Sevee & Maher Engineers, Inc., Printed 6/19/2015
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.157	74	>75% Grass cover, Good, HSG C (4A, 4B, 4C, 4D)
4.940	70	Brush, Fair, HSG C (4B, 4O)
0.250	98	Building/Concrete Slabs (4C)
0.400	98	Detention Pond 10 (4O)
2.330	98	Existing Water Body (3)
1.600	98	Existing Waterbody (2A)
2.133	91	Gravel (4D)
1.300	96	Gravel Road (1A, 1C)
2.470	96	Gravel Road/Berm (1D, 1E, 1G, 1H)
0.876	96	Gravel Road/Pad (1F, 1J)
0.456	91	Gravel Roads (4C)
2.126	89	Gravel roads, HSG C (4A, 4B, 4D, 4F, 4M, P1A)
0.600	98	Impervious / Structures (1F)
142.422	71	Meadow, non-grazed, HSG C (1A, 1B, 1C, 1D, 1E, 1F, 1G, 1H, 1I, 1J, 2A, 2B, 3, 4A, 4G, 4H, 4HA, 4I, 4IA, 4J, 4K, 4L, 4N)
11.170	78	Meadow, non-grazed, HSG D (1A, 1C, 1F)
0.333	79	Pasture/grassland/range, Fair, HSG C (P1A)
0.380	98	Paved Area (New) (2A)
0.320	98	Paved Areas (New) (3)
0.800	98	Paved and Gravel Shoulder (4O)
3.940	98	Paved roads w/curbs & sewers, (4E)
1.184	98	Paved roads w/curbs & sewers, HSG C (1F, 4A, 4B, 4C, 4D)
2.140	93	Paved roads w/open ditches, 50% imp, HSG D (3, 5)
1.634	98	Pond (4D)
1.145	98	Pond and Liner (P1A)
1.653	98	Pond water surface (1J)
0.800	78	Pond, Meadow HSG D (1D)
0.111	98	ROOF (4A, 4B)
1.560	98	Water Surface, HSG C (2C, 4M)
4.280	70	Woods, Good HSG C (1J)
324.010	70	Woods, Good, HSG C (1A, 1C, 1F, 2A, 2C, 3, 4E, 4F, 4M, 4N, 5)
333.995	77	Woods, Good, HSG D (1A, 1C, 1F, 2A, 3, 4E, 5)

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchr Numbers
0.000	0.000	5.157	0.000	0.000	5.157	>75% Grass cover, Good	
0.000	0.000	4.940	0.000	0.000	4.940	Brush, Fair	
0.000	0.000	0.000	0.000	0.250	0.250	Building/Concrete Slabs	
0.000	0.000	0.000	0.000	0.400	0.400	Detention Pond 10	
0.000	0.000	0.000	0.000	2.330	2.330	Existing Water Body	
0.000	0.000	0.000	0.000	1.600	1.600	Existing Waterbody	
0.000	0.000	0.000	0.000	2.133	2.133	Gravel	
0.000	0.000	0.000	0.000	1.300	1.300	Gravel Road	
0.000	0.000	0.000	0.000	2.470	2.470	Gravel Road/Berm	
0.000	0.000	0.000	0.000	0.876	0.876	Gravel Road/Pad	
0.000	0.000	0.000	0.000	0.456	0.456	Gravel Roads	
0.000	0.000	2.126	0.000	0.000	2.126	Gravel roads	
0.000	0.000	0.000	0.000	0.600	0.600	Impervious / Structures	
0.000	0.000	142.422	11.170	0.000	153.592	Meadow, non-grazed	
0.000	0.000	0.333	0.000	0.000	0.333	Pasture/grassland/range, Fair	
0.000	0.000	0.000	0.000	0.380	0.380	Paved Area (New)	
0.000	0.000	0.000	0.000	0.320	0.320	Paved Areas (New)	
0.000	0.000	0.000	0.000	0.800	0.800	Paved and Gravel Shoulder	
0.000	0.000	1.184	0.000	0.000	1.184	Paved roads w/curbs & sewers	
0.000	0.000	0.000	0.000	3.940	3.940	Paved roads w/curbs & sewers,	
0.000	0.000	0.000	2.140	0.000	2.140	Paved roads w/open ditches, 50% imp	
0.000	0.000	0.000	0.000	1.634	1.634	Pond	
0.000	0.000	0.000	0.000	1.145	1.145	Pond and Liner	
0.000	0.000	0.000	0.000	1.653	1.653	Pond water surface	
0.000	0.000	0.000	0.800	0.000	0.800	Pond, Meadow	
0.000	0.000	0.000	0.000	0.111	0.111	ROOF	
0.000	0.000	1.560	0.000	0.000	1.560	Water Surface	
0.000	0.000	328.290	333.995	0.000	662.285	Woods, Good	

Time span=0.00-168.00 hrs, dt=0.05 hrs, 3361 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: SC-1A Runoff Area=23.080 ac 0.00% Impervious Runoff Depth=0.72"
Flow Length=2,249' Slope=0.0260 '/' Tc=88.1 min CN=74 Runoff=5.38 cfs 1.392 af

Subcatchment 1B: SC-1B Runoff Area=13.169 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,282' Tc=17.5 min CN=71 Runoff=5.43 cfs 0.652 af

Subcatchment 1C: SC-1C Runoff Area=13.300 ac 0.00% Impervious Runoff Depth=0.87"
Flow Length=380' Tc=68.3 min CN=77 Runoff=4.61 cfs 0.963 af

Subcatchment 1D: SC-1D Runoff Area=10.620 ac 0.00% Impervious Runoff Depth=0.68"
Flow Length=1,117' Tc=16.9 min CN=73 Runoff=5.34 cfs 0.601 af

Subcatchment 1E: SC-1E Runoff Area=10.745 ac 0.00% Impervious Runoff Depth=0.64"
Flow Length=910' Tc=12.7 min CN=72 Runoff=5.49 cfs 0.569 af

Subcatchment 1F: SC-1F Runoff Area=31.220 ac 3.52% Impervious Runoff Depth=0.82"
Flow Length=2,066' Tc=73.2 min CN=76 Runoff=9.57 cfs 2.130 af

Subcatchment 1G: SC-1G Runoff Area=11.290 ac 0.00% Impervious Runoff Depth=0.64"
Flow Length=857' Tc=12.7 min CN=72 Runoff=5.77 cfs 0.598 af

Subcatchment 1H: SC-1H Runoff Area=3.030 ac 0.00% Impervious Runoff Depth=1.09"
Flow Length=759' Tc=15.4 min CN=81 Runoff=2.81 cfs 0.275 af

Subcatchment 1I: SC-1I Runoff Area=9.334 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,084' Tc=16.8 min CN=71 Runoff=3.92 cfs 0.462 af

Subcatchment 1J: SC-1J Runoff Area=360,761 sf 19.96% Impervious Runoff Depth=0.87"
Flow Length=593' Tc=33.0 min CN=77 Runoff=4.30 cfs 0.599 af

Subcatchment 2A: SC-2A Runoff Area=54.143 ac 3.66% Impervious Runoff Depth=0.72"
Flow Length=2,435' Tc=126.1 min CN=74 Runoff=9.80 cfs 3.266 af

Subcatchment 2B: 2B Runoff Area=13.996 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,218' Tc=17.6 min CN=71 Runoff=5.75 cfs 0.693 af

Subcatchment 2C: 2C Runoff Area=6.181 ac 10.68% Impervious Runoff Depth=0.68"
Flow Length=702' Tc=80.7 min CN=73 Runoff=1.40 cfs 0.350 af

Subcatchment 3: SC-3 Runoff Area=270.330 ac 1.32% Impervious Runoff Depth=0.68"
Flow Length=4,335' Tc=240.2 min CN=73 Runoff=29.11 cfs 15.297 af

Subcatchment 4A: 4A Runoff Area=4.518 ac 7.22% Impervious Runoff Depth=0.87"
Flow Length=379' Tc=5.1 min CN=77 Runoff=4.37 cfs 0.327 af

Subcatchment 4B: 4B Runoff Area=2.330 ac 11.29% Impervious Runoff Depth=0.97"
Flow Length=667' Tc=13.2 min CN=79 Runoff=2.01 cfs 0.189 af

Subcatchment 4C: 4C
Runoff Area=1.287 ac 24.86% Impervious Runoff Depth=1.41"
Flow Length=496' Tc=15.4 min CN=86 Runoff=1.58 cfs 0.151 af

Subcatchment 4D: 4D
Runoff Area=6.660 ac 26.58% Impervious Runoff Depth=1.48"
Flow Length=824' Tc=33.9 min CN=87 Runoff=6.17 cfs 0.821 af

Subcatchment 4E: 4E
Runoff Area=247.915 ac 1.59% Impervious Runoff Depth=0.77"
Flow Length=6,090' Tc=225.6 min CN=75 Runoff=32.46 cfs 15.916 af

Subcatchment 4F: 4F
Runoff Area=6.771 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=1,228' Tc=68.8 min CN=70 Runoff=1.30 cfs 0.313 af

Subcatchment 4G: 4G
Runoff Area=12.750 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=929' Tc=17.1 min CN=71 Runoff=5.29 cfs 0.631 af

Subcatchment 4H: 4H
Runoff Area=3.400 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=823' Tc=11.9 min CN=71 Runoff=1.61 cfs 0.168 af

Subcatchment 4HA: 4HA
Runoff Area=0.780 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=142' Slope=0.3300 '/' Tc=6.7 min CN=71 Runoff=0.44 cfs 0.039 af

Subcatchment 4I: 4I
Runoff Area=9.930 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,082' Tc=17.1 min CN=71 Runoff=4.12 cfs 0.492 af

Subcatchment 4IA: 4IA
Runoff Area=0.940 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=136' Slope=0.3333 '/' Tc=6.4 min CN=71 Runoff=0.54 cfs 0.047 af

Subcatchment 4J: 4J
Runoff Area=12.310 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,051' Tc=17.2 min CN=71 Runoff=5.10 cfs 0.610 af

Subcatchment 4K: 4K
Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=1,095' Tc=18.4 min CN=71 Runoff=4.40 cfs 0.538 af

Subcatchment 4L: 4L
Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=896' Tc=14.1 min CN=71 Runoff=3.34 cfs 0.371 af

Subcatchment 4M: 4M
Runoff Area=5.352 ac 16.82% Impervious Runoff Depth=0.77"
Flow Length=642' Tc=53.5 min CN=75 Runoff=1.86 cfs 0.344 af

Subcatchment 4N: 4N
Runoff Area=1.921 ac 0.00% Impervious Runoff Depth=0.59"
Flow Length=730' Tc=30.5 min CN=71 Runoff=0.64 cfs 0.095 af

Subcatchment 4O: 4O
Runoff Area=5.100 ac 23.53% Impervious Runoff Depth=0.87"
Flow Length=663' Tc=14.2 min CN=77 Runoff=3.75 cfs 0.369 af

Subcatchment 5: SC-5
Runoff Area=35.960 ac 0.40% Impervious Runoff Depth=0.82"
Flow Length=2,355' Tc=192.1 min CN=76 Runoff=5.71 cfs 2.453 af

Subcatchment P1A: SC-P1A
Runoff Area=65,400 sf 76.26% Impervious Runoff Depth=2.06"
Tc=0.0 min CN=94 Runoff=4.03 cfs 0.258 af

Reach 1R: DP-10 DITCH 1
Avg. Flow Depth=0.33' Max Vel=2.32 fps Inflow=5.08 cfs 0.610 af
n=0.025 L=101.0' S=0.0079 '/' Capacity=128.49 cfs Outflow=5.02 cfs 0.610 af

```
Reach 2R: E2C-DP9                    Avg. Flow Depth=0.30'  Max Vel=3.49 fps  Inflow=5.47 cfs  0.478 af
                n=0.022  L=590.0'  S=0.0169 '/'  Capacity=488.04 cfs  Outflow=5.13 cfs  0.478 af

Reach 3R: Overland Flow              Avg. Flow Depth=0.13'  Max Vel=9.99 fps  Inflow=7.52 cfs  1.099 af
                n=0.035  L=168.0'  S=0.0554 '/'  Capacity=119.87 cfs  Outflow=7.51 cfs  1.099 af

Reach 4HR-A: EAST PD - 4             Avg. Flow Depth=0.10'  Max Vel=1.88 fps  Inflow=0.44 cfs  0.039 af
                n=0.025  L=288.0'  S=0.0247 '/'  Capacity=119.08 cfs  Outflow=0.41 cfs  0.039 af

Reach 4HR-B: EAST PD - 5             Avg. Flow Depth=0.20'  Max Vel=3.75 fps  Inflow=1.82 cfs  0.207 af
                n=0.025  L=425.0'  S=0.0438 '/'  Capacity=158.67 cfs  Outflow=1.79 cfs  0.207 af

Reach 4IR-A: EAST PD - 2             Avg. Flow Depth=0.12'  Max Vel=1.80 fps  Inflow=0.54 cfs  0.047 af
                n=0.025  L=330.0'  S=0.0176 '/'  Capacity=100.55 cfs  Outflow=0.50 cfs  0.047 af

Reach 4IR-B: EAST PD - 3             Avg. Flow Depth=0.41'  Max Vel=3.98 fps  Inflow=4.59 cfs  0.538 af
                n=0.025  L=210.0'  S=0.0224 '/'  Capacity=113.47 cfs  Outflow=4.54 cfs  0.538 af

Reach 4JR: EAST PD 1                 Avg. Flow Depth=0.46'  Max Vel=3.81 fps  Inflow=5.10 cfs  0.610 af
                n=0.025  L=183.0'  S=0.0180 '/'  Capacity=101.85 cfs  Outflow=5.07 cfs  0.610 af

Reach 4R: DP-10 DITCH 3              Avg. Flow Depth=0.49'  Max Vel=6.32 fps  Inflow=9.29 cfs  1.147 af
                n=0.025  L=260.0'  S=0.0462 '/'  Capacity=162.94 cfs  Outflow=9.21 cfs  1.147 af

Reach 5R: NORTH PD-1                 Avg. Flow Depth=0.40'  Max Vel=4.57 fps  Inflow=5.29 cfs  0.631 af
                n=0.025  L=936.0'  S=0.0299 '/'  Capacity=131.18 cfs  Outflow=5.14 cfs  0.631 af

Reach 6R: NORTH PD-2                 Avg. Flow Depth=0.60'  Max Vel=2.93 fps  Inflow=5.70 cfs  0.693 af
                  n=0.025  L=364.0'  S=0.0080 '/'  Capacity=67.70 cfs  Outflow=5.61 cfs  0.693 af

Reach 7R: DP-10R                     Avg. Flow Depth=0.19'  Max Vel=1.50 fps  Inflow=0.74 cfs  1.035 af
              n=0.045  L=1,130.0'  S=0.0248 '/'  Capacity=88.21 cfs  Outflow=0.74 cfs  1.035 af

Reach 8R: EAST PD - 6                Avg. Flow Depth=0.37'  Max Vel=2.06 fps  Inflow=4.40 cfs  0.538 af
                  n=0.025  L=360.0'  S=0.0056 '/'  Capacity=25.35 cfs  Outflow=4.33 cfs  0.538 af

Reach 9R: LEVEL SPREADER             Avg. Flow Depth=0.04'  Max Vel=0.06 fps  Inflow=0.05 cfs  0.399 af
                  n=0.800  L=273.0'  S=0.0623 '/'  Capacity=11.46 cfs  Outflow=0.05 cfs  0.395 af

Reach 10R: Ditch 4B1                 Avg. Flow Depth=0.50'  Max Vel=2.76 fps  Inflow=4.22 cfs  0.538 af
                  n=0.025  L=352.0'  S=0.0085 '/'  Capacity=70.02 cfs  Outflow=4.17 cfs  0.538 af

Reach 11R: DP-11R                    Avg. Flow Depth=0.19'  Max Vel=1.21 fps  Inflow=0.61 cfs  1.030 af
              n=0.045  L=1,050.0'  S=0.0162 '/'  Capacity=71.30 cfs  Outflow=0.61 cfs  1.030 af

Reach 12R: 4FR                       Avg. Flow Depth=0.29'  Max Vel=1.38 fps  Inflow=1.29 cfs  0.313 af
              n=0.045  L=1,523.0'  S=0.0131 '/'  Capacity=64.21 cfs  Outflow=1.17 cfs  0.313 af

Reach 13R: Ex Ditch                  Avg. Flow Depth=0.59'  Max Vel=3.47 fps  Inflow=6.52 cfs  0.910 af
                  n=0.030  L=225.0'  S=0.0164 '/'  Capacity=81.05 cfs  Outflow=6.47 cfs  0.910 af
```

```
Reach 14R: DP-10 DITCH 2              Avg. Flow Depth=0.38'  Max Vel=4.82 fps  Inflow=5.03 cfs  0.610 af
                         n=0.025  L=434.0'  S=0.0357 '/'  Capacity=143.33 cfs  Outflow=4.97 cfs  0.610 af

Reach AP1: AP-1                                                               Inflow=16.15 cfs  5.749 af
                                                                             Outflow=16.15 cfs  5.749 af

Reach AP2: ANALYSIS POINT #2                                                   Inflow=9.80 cfs  4.150 af
                                                                              Outflow=9.80 cfs  4.150 af

Reach AP3: ANALYSIS POINT #3                                                  Inflow=29.11 cfs  15.297 af
                                                                             Outflow=29.11 cfs  15.297 af

Reach AP4: AP4                                                                Inflow=33.41 cfs  18.774 af
                                                                             Outflow=33.41 cfs  18.774 af

Reach AP5: ANALYSIS POINT #5                                                   Inflow=5.71 cfs  2.453 af
                                                                              Outflow=5.71 cfs  2.453 af

Reach E2R2: E2R2                      Avg. Flow Depth=0.04'  Max Vel=0.20 fps  Inflow=0.64 cfs  0.095 af
                       n=0.080  L=4,356.0'  S=0.0094 '/'  Capacity=132.12 cfs  Outflow=0.09 cfs  0.095 af

Reach E2R3: REACH TO AP               Avg. Flow Depth=0.06'  Max Vel=0.41 fps  Inflow=0.05 cfs  0.395 af
                        n=0.045  L=2,170.0'  S=0.0074 '/'  Capacity=48.12 cfs  Outflow=0.05 cfs  0.391 af

Reach E2R4: Reach to AP               Avg. Flow Depth=0.20'  Max Vel=0.57 fps  Inflow=1.62 cfs  2.863 af
                         n=0.080  L=963.0'  S=0.0094 '/'  Capacity=131.94 cfs  Outflow=1.60 cfs  2.858 af

Reach R-1D: Reach R-1D                Avg. Flow Depth=0.11'  Max Vel=0.95 fps  Inflow=1.15 cfs  0.695 af
                          n=0.060  L=370.0'  S=0.0324 '/'  Capacity=67.93 cfs  Outflow=1.15 cfs  0.695 af

Reach R-1E: LEVEL SPREADER R-1E       Avg. Flow Depth=0.14'  Max Vel=1.64 fps  Inflow=3.92 cfs  0.569 af
                         n=0.060  L=210.0'  S=0.0690 '/'  Capacity=135.95 cfs  Outflow=3.90 cfs  0.569 af

Reach R-1F: Reach R-1F                Avg. Flow Depth=0.00'  Max Vel=0.00 fps  Inflow=0.00 cfs  0.000 af
                          n=0.060  L=940.0'  S=0.0170 '/'  Capacity=49.21 cfs  Outflow=0.00 cfs  0.000 af

Reach R-1H: LEVEL SPREADER R-1H       Avg. Flow Depth=0.05'  Max Vel=1.50 fps  Inflow=2.78 cfs  0.275 af
                         n=0.030  L=170.0'  S=0.0471 '/'  Capacity=411.95 cfs  Outflow=2.73 cfs  0.275 af

Reach R-2F: Reach R2-F                Avg. Flow Depth=0.00'  Max Vel=0.00 fps  Inflow=0.00 cfs  0.000 af
                         n=0.030  L=735.0'  S=0.0020 '/'  Capacity=151.21 cfs  Outflow=0.00 cfs  0.000 af

Reach R1: Reach 1                    Avg. Flow Depth=0.64'  Max Vel=1.17 fps  Inflow=12.53 cfs  4.357 af
                       n=0.030  L=700.0'  S=0.0016 '/'  Capacity=132.69 cfs  Outflow=12.37 cfs  4.357 af

Reach R1B: LF TOE DITCH               Avg. Flow Depth=0.54'  Max Vel=3.22 fps  Inflow=5.43 cfs  0.652 af
                          n=0.040  L=540.0'  S=0.0278 '/'  Capacity=79.00 cfs  Outflow=5.35 cfs  0.652 af

Reach R2: Reach 2                    Avg. Flow Depth=0.54'  Max Vel=1.20 fps  Inflow=10.32 cfs  2.699 af
                     n=0.030  L=1,050.0'  S=0.0020 '/'  Capacity=149.69 cfs  Outflow=9.88 cfs  2.699 af

Reach R2A: Reach 2A                   Avg. Flow Depth=0.05'  Max Vel=0.35 fps  Inflow=0.51 cfs  0.885 af
                   n=0.060  L=1,960.0'  S=0.0138 '/'  Capacity=1,358.84 cfs  Outflow=0.49 cfs  0.884 af
```

Reach R3: Reach 3 Avg. Flow Depth=0.52' Max Vel=1.17 fps Inflow=9.57 cfs 2.130 af
n=0.030 L=800.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=9.24 cfs 2.130 af

Reach R5a: Grass Lined Ditch Avg. Flow Depth=0.21' Max Vel=4.30 fps Inflow=3.92 cfs 0.462 af
n=0.025 L=200.0' S=0.0500 '/' Capacity=572.96 cfs Outflow=3.88 cfs 0.462 af

Pond 1P: Culvert - 4JB & FJC Peak Elev=210.75' Storage=215 cf Inflow=5.02 cfs 0.610 af
24.0" Round Culvert x 2.00 n=0.011 L=73.0' S=0.0137 '/' Outflow=5.03 cfs 0.610 af

Pond 4IAC: Culvert - 4IA Peak Elev=213.23' Storage=112 cf Inflow=0.50 cfs 0.047 af
18.0" Round Culvert n=0.011 L=40.0' S=0.0175 '/' Outflow=0.45 cfs 0.047 af

Pond 8P: Ex Pond Peak Elev=171.98' Storage=3,312 cf Inflow=0.74 cfs 1.103 af
Outflow=0.74 cfs 1.035 af

Pond C-2B-A: Culvert - 2BA Peak Elev=204.21' Storage=365 cf Inflow=5.75 cfs 0.693 af
Primary=5.70 cfs 0.693 af Secondary=0.00 cfs 0.000 af Outflow=5.70 cfs 0.693 af

Pond C-4F: Culvert - 4F Peak Elev=165.58' Storage=0.007 af Inflow=1.30 cfs 0.313 af
18.0" Round Culvert n=0.011 L=78.0' S=0.0385 '/' Outflow=1.29 cfs 0.313 af

Pond C-4K: Catch Basin - 4K Peak Elev=220.30' Storage=924 cf Inflow=4.33 cfs 0.538 af
Outflow=4.22 cfs 0.538 af

Pond C4B: Culvert - 4BA & 4BB Peak Elev=205.34' Storage=13 cf Inflow=7.52 cfs 1.099 af
24.0" Round Culvert x 2.00 n=0.011 L=78.0' S=0.0090 '/' Outflow=7.52 cfs 1.099 af

Pond C4H-A: Culvert 4H-A Peak Elev=202.17' Storage=190 cf Inflow=0.41 cfs 0.039 af
18.0" Round Culvert n=0.011 L=40.0' S=0.0250 '/' Outflow=0.30 cfs 0.039 af

Pond C4N: Culvert 4N Peak Elev=184.40' Storage=0.001 af Inflow=0.64 cfs 0.095 af
18.0" Round Culvert n=0.011 L=33.0' S=0.0303 '/' Outflow=0.64 cfs 0.095 af

Pond CB-2B-B: Catch Basin - 2BB Peak Elev=200.21' Storage=4 cf Inflow=5.61 cfs 0.693 af
Outflow=5.61 cfs 0.693 af

Pond CB-4G: Catch Basin - 4G Peak Elev=181.40' Storage=92 cf Inflow=5.14 cfs 0.631 af
Outflow=5.14 cfs 0.631 af

Pond CB-4HB: Catch Basin - 4HB Peak Elev=183.50' Storage=12 cf Inflow=1.79 cfs 0.207 af
Outflow=1.77 cfs 0.207 af

Pond CB-4I: Catch Basin - 4I Peak Elev=207.97' Storage=0.003 af Inflow=4.54 cfs 0.538 af
Outflow=4.54 cfs 0.538 af

Pond CB-4JA: Catch Basin - 4JA Peak Elev=219.09' Storage=0.003 af Inflow=5.07 cfs 0.610 af
Outflow=5.08 cfs 0.610 af

Pond CB-4L: Catch Basin - 4L Peak Elev=215.30' Storage=458 cf Inflow=3.34 cfs 0.371 af
Outflow=3.31 cfs 0.371 af

```
Pond D-1G: (2)24" Culverts P-6h           Peak Elev=183.81'  Storage=136 cf   Inflow=5.77 cfs  0.598 af
                        Primary=5.72 cfs  0.598 af  Secondary=0.00 cfs  0.000 af  Outflow=5.72 cfs  0.598 af

Pond D-1H: LF TOE DITCH - CULVERT         Peak Elev=183.84'  Storage=372 cf   Inflow=2.81 cfs  0.275 af
                        18.0" Round Culvert  n=0.013  L=60.0'  S=0.0083 '/'  Outflow=2.78 cfs  0.275 af

Pond DP-1: Detention Pond 1             Peak Elev=162.46'  Storage=31,388 cf  Inflow=10.24 cfs  1.253 af
                        Primary=1.15 cfs  0.695 af  Secondary=0.00 cfs  0.000 af  Outflow=1.15 cfs  0.695 af

Pond DP-10: DETENTION POND 10           Peak Elev=177.58'  Storage=43,962 cf  Inflow=12.05 cfs  1.516 af
 Primary=0.00 cfs  0.000 af  Secondary=0.74 cfs  1.103 af  Tertiary=0.00 cfs  0.000 af  Outflow=0.74 cfs  1.103 af

Pond DP-11: Detention Pond 11            Peak Elev=165.43'  Storage=33,880 cf  Inflow=7.66 cfs  1.182 af
                        Primary=0.00 cfs  0.000 af  Secondary=0.61 cfs  1.030 af  Outflow=0.61 cfs  1.030 af

Pond DP-12: DETENTION POND 12            Peak Elev=185.69'  Storage=31,513 cf  Inflow=5.88 cfs  1.043 af
                        Primary=0.00 cfs  0.000 af  Secondary=0.51 cfs  0.885 af  Outflow=0.51 cfs  0.885 af

Pond DP-1A: DP-1A (Former Leachate      Peak Elev=164.81'  Storage=213,981 cf  Inflow=5.05 cfs  0.720 af
                                                                            Outflow=0.00 cfs  0.000 af

Pond DP-2: DETENTION POND 2               Peak Elev=163.37'  Storage=4,359 cf  Inflow=5.49 cfs  0.569 af
                                                                            Outflow=3.92 cfs  0.569 af

Pond DP-6: DETENTION POND 6             Peak Elev=174.86'  Storage=67,549 cf  Inflow=11.00 cfs  1.472 af
                        Primary=0.00 cfs  0.000 af  Secondary=0.82 cfs  1.472 af  Outflow=0.82 cfs  1.472 af

Pond DP-9: DETENTION POND 9            Peak Elev=188.57'  Storage=103,321 cf  Inflow=16.58 cfs  2.398 af
 Primary=0.00 cfs  0.000 af  Secondary=0.05 cfs  0.399 af  Tertiary=0.00 cfs  0.000 af  Outflow=0.05 cfs  0.399 af
```

Summary for Subcatchment 1A: SC-1A

Runoff = 5.38 cfs @ 13.29 hrs, Volume= 1.392 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	10.120	70	Woods, Good, HSG C
	9.500	77	Woods, Good, HSG D
	2.560	71	Meadow, non-grazed, HSG C
	0.400	78	Meadow, non-grazed, HSG D
*	0.500	96	Gravel Road
	23.080	74	Weighted Average
	23.080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	150	0.0260	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
21.0	1,839		1.46		**Direct Entry, Segment ID: B-C**
16.4	260		0.26		**Direct Entry, Segment ID: C-D**
88.1	2,249	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 5.43 cfs @ 12.29 hrs, Volume= 0.652 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
13.169	71	Meadow, non-grazed, HSG C
13.169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	183	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.9	392	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	557	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.5	1,282	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 4.61 cfs @ 12.99 hrs, Volume= 0.963 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	6.100	77	Woods, Good, HSG D
	0.720	70	Woods, Good, HSG C
	3.100	78	Meadow, non-grazed, HSG D
	2.580	71	Meadow, non-grazed, HSG C
*	0.800	96	Gravel Road
	13.300	77	Weighted Average
	13.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	150	0.0350	0.06		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.6	230	0.0133	0.58		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
16.7					**Direct Entry, Segment ID: C-D**
68.3	380	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 5.34 cfs @ 12.27 hrs, Volume= 0.601 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	9.230	71	Meadow, non-grazed, HSG C
*	0.590	96	Gravel Road/Berm
*	0.800	78	Pond, Meadow HSG D
	10.620	73	Weighted Average
	10.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	159	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	203	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	605	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035

```
  16.9   1,117   Total
```

Summary for Subcatchment 1E: SC-1E

```
Runoff    =      5.49 cfs @  12.21 hrs,  Volume=         0.569 af,  Depth=  0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr  2-yr Storm Rainfall=2.70"

  Area (ac)   CN   Description
    10.495    71   Meadow, non-grazed, HSG C
*    0.250    96   Gravel Road/Berm
    10.745    72   Weighted Average
    10.745         100.00% Pervious Area

   Tc  Length   Slope  Velocity  Capacity  Description
 (min)  (feet)  (ft/ft)  (ft/sec)     (cfs)
  11.3     150  0.1000      0.22            Sheet Flow, Segment ID: A-B
                                            Grass: Dense  n= 0.240  P2= 2.70"
   0.9     150  0.1500      2.71            Shallow Concentrated Flow, Segment ID: B-C
                                            Short Grass Pasture  Kv= 7.0 fps
   0.2      93  0.0500      6.94     79.81  Trap/Vee/Rect Channel Flow, Segment ID: C-D
                                            Bot.W=0.00'  D=1.00'  Z= 3.0 & 20.0 '/'  Top.W=23.00'
                                            n= 0.030
   0.3     517  0.3300     28.92    520.47  Trap/Vee/Rect Channel Flow, Segment ID: D-E
                                            Bot.W=5.00'  D=2.00'  Z= 2.0 '/'  Top.W=13.00'
                                            n= 0.035
  12.7     910  Total
```

Summary for Subcatchment 1F: SC-1F

```
Runoff    =      9.57 cfs @  13.08 hrs,  Volume=         2.130 af,  Depth=  0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr  2-yr Storm Rainfall=2.70"

  Area (ac)   CN   Description
    13.200    77   Woods, Good, HSG D
     7.250    70   Woods, Good, HSG C
     7.670    78   Meadow, non-grazed, HSG D
     1.500    71   Meadow, non-grazed, HSG C
*    0.500    96   Gravel Road/Pad
*    0.600    98   Impervious / Structures
     0.500    98   Paved roads w/curbs & sewers, HSG C
    31.220    76   Weighted Average
    30.120         96.48% Pervious Area
     1.100         3.52% Impervious Area
```

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.08		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	17	0.3300	0.23		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
2.4	300	0.0190	2.07		**Shallow Concentrated Flow, Segment ID: C-D** Grassed Waterway Kv= 15.0 fps
24.6	1,649	0.0500	1.12		**Shallow Concentrated Flow, Segment ID D-E** Woodland Kv= 5.0 fps
24.5					**Direct Entry, Segment ID: E-F**
73.2	2,066	Total			

Summary for Subcatchment 1G: SC-1G

Runoff = 5.77 cfs @ 12.21 hrs, Volume= 0.598 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	10.860	71	Meadow, non-grazed, HSG C
*	0.430	96	Gravel Road/Berm
	11.290	72	Weighted Average
	11.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	150	0.1000	0.22		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
0.5	62	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	90	0.3300	4.02		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.3	140	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	415	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
12.7	857	Total			

Summary for Subcatchment 1H: SC-1H

Runoff = 2.81 cfs @ 12.22 hrs, Volume= 0.275 af, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
1.200	96	Gravel Road/Berm
3.030	81	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150	0.3300	0.36		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
8.4	609	0.0300	1.21		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
15.4	759	Total			

Summary for Subcatchment 1I: SC-1I

Runoff = 3.92 cfs @ 12.27 hrs, Volume= 0.462 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
9.334	71	Meadow, non-grazed, HSG C
9.334		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.1	146	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	218	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	570	0.3300	27.25	817.65	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 5.0 '/' Top.W=25.00' n= 0.035
16.8	1,084	Total			

Summary for Subcatchment 1J: SC-1J

Runoff = 4.30 cfs @ 12.50 hrs, Volume= 0.599 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
*	186,445	70	Woods, Good HSG C
	85,939	71	Meadow, non-grazed, HSG C
*	16,377	96	Gravel Road/Pad
*	72,000	98	Pond water surface
	360,761	77	Weighted Average
	288,761		80.04% Pervious Area
	72,000		19.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	100	0.0400	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
1.7	123	0.0569	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
0.5	370	0.0189	12.43	801.88	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=3.00' Z= 10.0 & 3.0 '/' Top.W=41.00' n= 0.022 Earth, clean & straight
33.0	593	Total			

Summary for Subcatchment 2A: SC-2A

Runoff = 9.80 cfs @ 13.86 hrs, Volume= 3.266 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	27.993	70	Woods, Good, HSG C
	21.380	77	Woods, Good, HSG D
	2.790	71	Meadow, non-grazed, HSG C
*	0.380	98	Paved Area (New)
	1.600	98	Existing Waterbody
	54.143	74	Weighted Average
	52.163		96.34% Pervious Area
	1.980		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	150	0.0300	0.05		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
25.4	538	0.0200	0.35		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
37.5	534	0.0090	0.24		**Shallow Concentrated Flow, Segment C-D** Forest w/Heavy Litter Kv= 2.5 fps
15.3	1,213	0.0080	1.32	52.99	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=0.00' D=2.00' Z= 10.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
126.1	2,435	Total			

Summary for Subcatchment 2B: 2B

Runoff = 5.75 cfs @ 12.29 hrs, Volume= 0.693 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
13.996	71	Meadow, non-grazed, HSG C
13.996		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	187	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	431	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	450	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.6	1,218	Total			

Summary for Subcatchment 2C: 2C

Runoff = 1.40 cfs @ 13.20 hrs, Volume= 0.350 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
5.521	70	Woods, Good, HSG C
0.660	98	Water Surface, HSG C
6.181	73	Weighted Average
5.521		89.32% Pervious Area
0.660		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.2	289	0.0242	0.78		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.2	263	0.0114	0.53		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
80.7	702	Total			

Summary for Subcatchment 3: SC-3

Runoff = 29.11 cfs @ 15.72 hrs, Volume= 15.297 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
	0.950	71	Meadow, non-grazed, HSG C
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
*	2.330	98	Existing Water Body
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4A: 4A

Runoff = 4.37 cfs @ 12.09 hrs, Volume= 0.327 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	0.740	89	Gravel roads, HSG C
	1.955	74	>75% Grass cover, Good, HSG C
*	0.088	98	ROOF
	1.497	71	Meadow, non-grazed, HSG C
	0.238	98	Paved roads w/curbs & sewers, HSG C
	4.518	77	Weighted Average
	4.192		92.78% Pervious Area
	0.326		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	150	0.0167	0.71		**Sheet Flow, Segment A-B** n= 0.023 P2= 2.70"
0.8	159	0.0410	3.26		**Shallow Concentrated Flow, Segment B-C** Unpaved Kv= 16.1 fps
0.8	70	0.0429	1.45		**Shallow Concentrated Flow, Segment C-D** Short Grass Pasture Kv= 7.0 fps
5.1	379	Total			

Summary for Subcatchment 4B: 4B

Runoff = 2.01 cfs @ 12.20 hrs, Volume= 0.189 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	1.040	70	Brush, Fair, HSG C
*	0.023	98	ROOF
	0.640	89	Gravel roads, HSG C
	0.387	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved roads w/curbs & sewers, HSG C
	2.330	79	Weighted Average
	2.067		88.71% Pervious Area
	0.263		11.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0200	0.95		**Sheet Flow, Segment AB** Smooth surfaces n= 0.011 P2= 2.70"
0.8	19	0.5000	0.41		**Sheet Flow, Segment BC** Grass: Short n= 0.150 P2= 2.70"
11.9	584	0.0137	0.82		**Shallow Concentrated Flow, Segment CD** Short Grass Pasture Kv= 7.0 fps
0.1	40	0.0250	7.14	85.66	**Trap/Vee/Rect Channel Flow, Segment DE** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035
13.2	667	Total			

Summary for Subcatchment 4C: 4C

Runoff = 1.58 cfs @ 12.22 hrs, Volume= 0.151 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

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  Area (ac)   CN   Description
      0.511   74   >75% Grass cover, Good, HSG C
      0.070   98   Paved roads w/curbs & sewers, HSG C
*     0.250   98   Building/Concrete Slabs
*     0.456   91   Gravel Roads
      1.287   86   Weighted Average
      0.967        75.14% Pervious Area
      0.320        24.86% Impervious Area

   Tc  Length    Slope  Velocity  Capacity  Description
(min)  (feet)  (ft/ft)  (ft/sec)     (cfs)
  0.9      61   0.0200      1.14            Sheet Flow, Segment A-B
                                            Smooth surfaces  n= 0.011   P2= 2.70"
 10.5      61   0.0200      0.10            Sheet Flow,
                                            Grass: Dense  n= 0.240   P2= 2.70"
  4.0     374   0.0107      1.55            Shallow Concentrated Flow, Grassed waterway
                                            Grassed Waterway  Kv= 15.0 fps
 15.4     496  Total
```

Summary for Subcatchment 4D: 4D

```
Runoff    =      6.17 cfs @  12.47 hrs,  Volume=       0.821 af,  Depth=  1.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr  2-yr Storm Rainfall=2.70"

  Area (ac)   CN   Description
      0.453   89   Gravel roads, HSG C
*     2.133   91   Gravel
      2.304   74   >75% Grass cover, Good, HSG C
*     1.634   98   Pond
      0.136   98   Paved roads w/curbs & sewers, HSG C
      6.660   87   Weighted Average
      4.890        73.42% Pervious Area
      1.770        26.58% Impervious Area

   Tc  Length    Slope  Velocity  Capacity  Description
(min)  (feet)  (ft/ft)  (ft/sec)     (cfs)
 18.0     125   0.0216      0.12            Sheet Flow, Segment A-B
                                            Grass: Dense  n= 0.240   P2= 2.70"
  0.5      25   0.0520      0.78            Sheet Flow, Segment B-C
                                              n= 0.023   P2= 2.70"
  2.0     270   0.0190      2.22            Shallow Concentrated Flow, Segment C-D
                                            Unpaved  Kv= 16.1 fps
  0.2      44   0.3300      4.02            Shallow Concentrated Flow, Segment D-E
                                            Short Grass Pasture  Kv= 7.0 fps
  2.0     102   0.0150      0.86            Shallow Concentrated Flow, Segment E-F
                                            Short Grass Pasture  Kv= 7.0 fps
 11.2     258   0.0030      0.38            Shallow Concentrated Flow, Segment F-G
                                            Short Grass Pasture  Kv= 7.0 fps
 33.9     824  Total
```

Summary for Subcatchment 4E: 4E

Runoff = 32.46 cfs @ 15.30 hrs, Volume= 15.916 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	152.615	77	Woods, Good, HSG D
	91.360	70	Woods, Good, HSG C
*	3.940	98	Paved roads w/curbs & sewers,
	247.915	75	Weighted Average
	243.975		98.41% Pervious Area
	3.940		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
127.0	2,625	0.0190	0.34		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
225.6	6,090	Total			

Summary for Subcatchment 4F: 4F

Runoff = 1.30 cfs @ 13.07 hrs, Volume= 0.313 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
6.691	70	Woods, Good, HSG C
0.080	89	Gravel roads, HSG C
6.771	70	Weighted Average
6.771		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	144	0.0280	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
20.9	1,067	0.0290	0.85		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.3	17	0.0210	0.97	19.47	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.250
68.8	1,228	Total			

Summary for Subcatchment 4G: 4G

Runoff = 5.29 cfs @ 12.28 hrs, Volume= 0.631 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
12.750	71	Meadow, non-grazed, HSG C
12.750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	98	0.0500	0.15		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.8	52	0.1000	0.18		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
1.1	150	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	133	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	496	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	929	Total			

Summary for Subcatchment 4H: 4H

Runoff = 1.61 cfs @ 12.20 hrs, Volume= 0.168 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
3.400	71	Meadow, non-grazed, HSG C
3.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	75	0.1000	0.19		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.0	75	0.3300	0.31		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	150	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.7	285	0.0500	6.92	76.15	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 2.0 & 20.0 '/' Top.W=22.00' n= 0.030 Short grass
0.1	238	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00'

					n= 0.035
11.9	823	Total			

Summary for Subcatchment 4HA: 4HA

Runoff = 0.44 cfs @ 12.12 hrs, Volume= 0.039 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
0.780	71	Meadow, non-grazed, HSG C
0.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	142	0.3300	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4I: 4I

Runoff = 4.12 cfs @ 12.28 hrs, Volume= 0.492 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
9.930	71	Meadow, non-grazed, HSG C
9.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	200	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	290	0.0500	11.02	506.75	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=2.00' Z= 3.0 & 20.0 '/' Top.W=46.00' n= 0.030
0.3	442	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	1,082	Total			

Summary for Subcatchment 4IA: 4IA

Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.047 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
0.940	71	Meadow, non-grazed, HSG C
0.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	136	0.3333	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4J: 4J

Runoff = 5.10 cfs @ 12.28 hrs, Volume= 0.610 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
12.310	71	Meadow, non-grazed, HSG C
12.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	202	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.6	270	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	429	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.2	1,051	Total			

Summary for Subcatchment 4K: 4K

Runoff = 4.40 cfs @ 12.30 hrs, Volume= 0.538 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
10.870	71	Meadow, non-grazed, HSG C
10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
2.7	268	0.0555	1.65		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.6	267	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	410	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
18.4	1,095	Total			

Summary for Subcatchment 4L: 4L

Runoff = 3.34 cfs @ 12.23 hrs, Volume= 0.371 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
7.500	71	Meadow, non-grazed, HSG C
7.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	23	0.0500	0.12		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
9.9	127	0.1000	0.21		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	252	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	494	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
14.1	896	Total			

Summary for Subcatchment 4M: 4M

Runoff = 1.86 cfs @ 12.80 hrs, Volume= 0.344 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
4.262	70	Woods, Good, HSG C
0.900	98	Water Surface, HSG C
0.190	89	Gravel roads, HSG C
5.352	75	Weighted Average
4.452		83.18% Pervious Area
0.900		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.9	150	0.0333	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
7.5	474	0.0440	1.05		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	18	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
53.5	642	Total			

Summary for Subcatchment 4N: 4N

Runoff = 0.64 cfs @ 12.50 hrs, Volume= 0.095 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
0.743	70	Woods, Good, HSG C
1.178	71	Meadow, non-grazed, HSG C
1.921	71	Weighted Average
1.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	150	0.0200	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
9.0	580	0.0233	1.07		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
30.5	730	Total			

Summary for Subcatchment 4O: 4O

Runoff = 3.75 cfs @ 12.21 hrs, Volume= 0.369 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (ac)	CN	Description
	3.900	70	Brush, Fair, HSG C
*	0.800	98	Paved and Gravel Shoulder
*	0.400	98	Detention Pond 10
	5.100	77	Weighted Average
	3.900		76.47% Pervious Area
	1.200		23.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	55	0.3000	0.28		**Sheet Flow, SEGMENT AB** Grass: Dense n= 0.240 P2= 2.70"
4.0	289	0.0300	1.21		**Shallow Concentrated Flow, SEGMENT BC** Short Grass Pasture Kv= 7.0 fps
6.9	319	0.0120	0.77		**Shallow Concentrated Flow, SEGMENT CD** Short Grass Pasture Kv= 7.0 fps
14.2	663	Total			

Summary for Subcatchment 5: SC-5

Runoff = 5.71 cfs @ 14.76 hrs, Volume= 2.453 af, Depth= 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
28.410	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
35.960	76	Weighted Average
35.815		99.60% Pervious Area
0.145		0.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Subcatchment P1A: SC-P1A

Runoff = 4.03 cfs @ 12.00 hrs, Volume= 0.258 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Storm Rainfall=2.70"

	Area (sf)	CN	Description
*	49,872	98	Pond and Liner
	1,012	89	Gravel roads, HSG C
	14,516	79	Pasture/grassland/range, Fair, HSG C
	65,400	94	Weighted Average
	15,528		23.74% Pervious Area
	49,872		76.26% Impervious Area

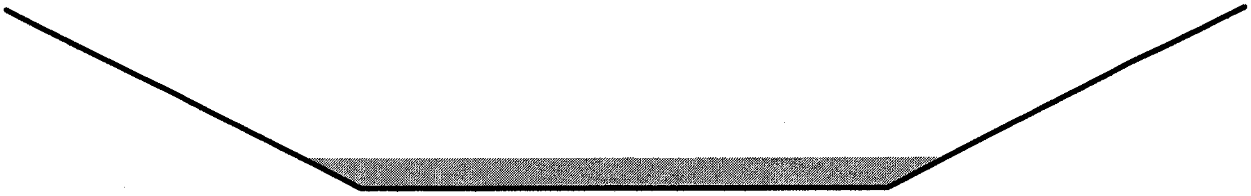
Summary for Reach 1R: DP-10 DITCH 1

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 5.08 cfs @ 12.31 hrs, Volume= 0.610 af
Outflow = 5.02 cfs @ 12.34 hrs, Volume= 0.610 af, Atten= 1%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.32 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 1.9 min

Peak Storage= 220 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 128.49 cfs

6.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 101.0' Slope= 0.0079 '/'
Inlet Invert= 212.30', Outlet Invert= 211.50'



Summary for Reach 2R: E2C-DP9

Inflow Area = 5.805 ac, 11.13% Impervious, Inflow Depth = 0.99" for 2-yr Storm event
Inflow = 5.47 cfs @ 12.10 hrs, Volume= 0.478 af
Outflow = 5.13 cfs @ 12.19 hrs, Volume= 0.478 af, Atten= 6%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.49 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 8.4 min

Peak Storage= 871 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 3.00' Flow Area= 39.0 sf, Capacity= 488.04 cfs

4.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 590.0' Slope= 0.0169 '/'
Inlet Invert= 200.00', Outlet Invert= 190.00'

Summary for Reach 3R: Overland Flow

Inflow Area = 20.700 ac, 1.27% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 7.52 cfs @ 12.48 hrs, Volume= 1.099 af
Outflow = 7.51 cfs @ 12.49 hrs, Volume= 1.099 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 9.99 fps, Avg. Travel Time= 0.3 min

Peak Storage= 127 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.87 cfs

Custom stage-perimeter table, n= 0.035 Earth, dense weeds
100 Intermediate values determined by Multi-point interpolation
Length= 168.0' Slope= 0.0554 '/'
Inlet Invert= 201.30', Outlet Invert= 192.00'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	12.0	12.0	2,016	119.87

Summary for Reach 4HR-A: EAST PD - 4

Inflow Area = 0.780 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 0.44 cfs @ 12.12 hrs, Volume= 0.039 af
Outflow = 0.41 cfs @ 12.20 hrs, Volume= 0.039 af, Atten= 7%, Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.88 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 6.2 min

Peak Storage= 64 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.08 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 288.0' Slope= 0.0247 '/'
Inlet Invert= 209.00', Outlet Invert= 201.90'

Summary for Reach 4HR-B: EAST PD - 5

Inflow Area = 4.180 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 1.82 cfs @ 12.21 hrs, Volume= 0.207 af
Outflow = 1.79 cfs @ 12.27 hrs, Volume= 0.207 af, Atten= 2%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.75 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 5.4 min

Peak Storage= 203 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 158.67 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 425.0' Slope= 0.0438 '/'
Inlet Invert= 201.90', Outlet Invert= 183.30'

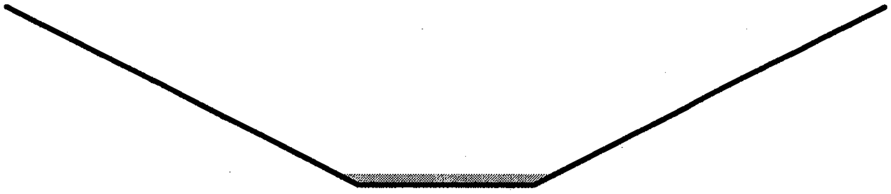
Summary for Reach 4IR-A: EAST PD - 2

Inflow Area = 0.940 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 0.54 cfs @ 12.11 hrs, Volume= 0.047 af
Outflow = 0.50 cfs @ 12.21 hrs, Volume= 0.047 af, Atten= 7%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.80 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 8.0 min

Peak Storage= 92 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 100.55 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 330.0' Slope= 0.0176 '/'
Inlet Invert= 218.70', Outlet Invert= 212.90'



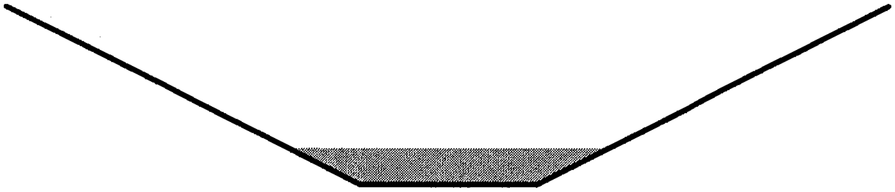
Summary for Reach 4IR-B: EAST PD - 3

Inflow Area =	10.870 ac,	0.00% Impervious,	Inflow Depth = 0.59"	for 2-yr Storm event	
Inflow =	4.59 cfs @	12.27 hrs, Volume=	0.538 af		
Outflow =	4.54 cfs @	12.31 hrs, Volume=	0.538 af,	Atten= 1%,	Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.98 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 2.3 min

Peak Storage= 241 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 113.47 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 210.0' Slope= 0.0224 '/'
Inlet Invert= 212.20', Outlet Invert= 207.50'



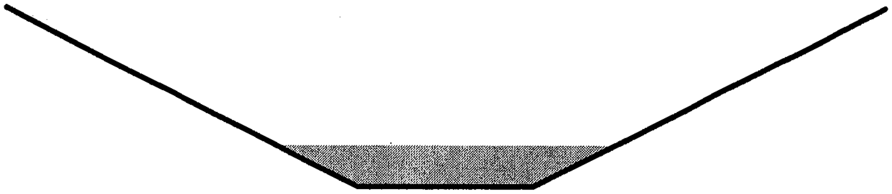
Summary for Reach 4JR: EAST PD 1

Inflow Area =	12.310 ac,	0.00% Impervious,	Inflow Depth = 0.59"	for 2-yr Storm event	
Inflow =	5.10 cfs @	12.28 hrs, Volume=	0.610 af		
Outflow =	5.07 cfs @	12.31 hrs, Volume=	0.610 af,	Atten= 1%,	Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 1.9 min

Peak Storage= 245 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.85 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 183.0' Slope= 0.0180 '/'
Inlet Invert= 222.00', Outlet Invert= 218.70'



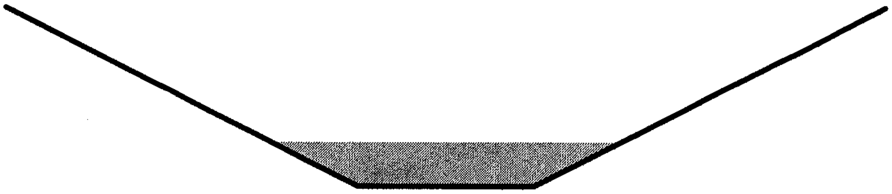
Summary for Reach 4R: DP-10 DITCH 3

Inflow Area = 23.180 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 9.29 cfs @ 12.36 hrs, Volume= 1.147 af
Outflow = 9.21 cfs @ 12.39 hrs, Volume= 1.147 af, Atten= 1%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.32 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.49 fps, Avg. Travel Time= 1.7 min

Peak Storage= 381 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 162.94 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 260.0' Slope= 0.0462 '/'
Inlet Invert= 191.00', Outlet Invert= 179.00'



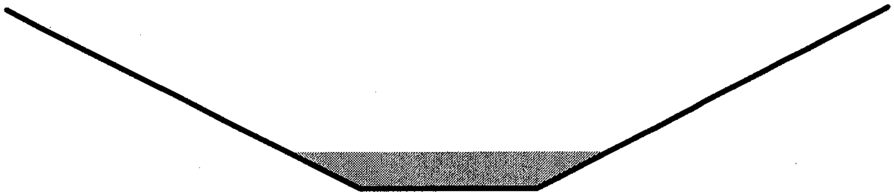
Summary for Reach 5R: NORTH PD-1

Inflow Area = 12.750 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 5.29 cfs @ 12.28 hrs, Volume= 0.631 af
Outflow = 5.14 cfs @ 12.39 hrs, Volume= 0.631 af, Atten= 3%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.57 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 8.6 min

Peak Storage= 1,055 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 131.18 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 936.0' Slope= 0.0299 '/'
Inlet Invert= 210.00', Outlet Invert= 182.00'



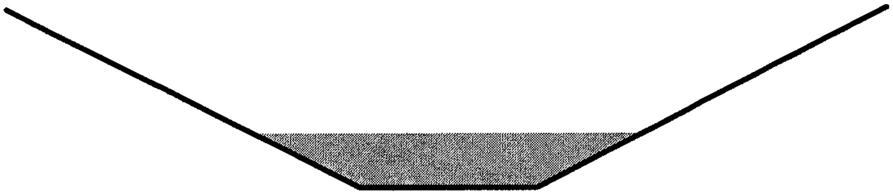
Summary for Reach 6R: NORTH PD-2

Inflow Area =	13.996 ac,	0.00% Impervious,	Inflow Depth =	0.59"	for 2-yr Storm event
Inflow =	5.70 cfs @	12.31 hrs, Volume=		0.693 af	
Outflow =	5.61 cfs @	12.38 hrs, Volume=		0.693 af, Atten= 2%, Lag= 3.9 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 5.0 min

Peak Storage= 701 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 67.70 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 364.0' Slope= 0.0080 '/'
Inlet Invert= 202.90', Outlet Invert= 200.00'



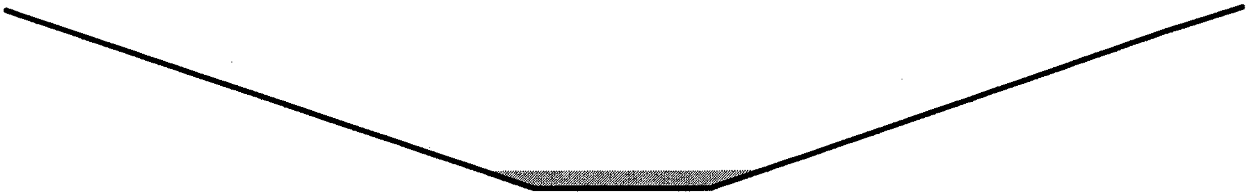
Summary for Reach 7R: DP-10R

Inflow Area =	28.280 ac,	4.24% Impervious,	Inflow Depth >	0.44"	for 2-yr Storm event
Inflow =	0.74 cfs @	17.94 hrs, Volume=		1.035 af	
Outflow =	0.74 cfs @	18.29 hrs, Volume=		1.035 af, Atten= 0%, Lag= 21.3 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.50 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 33.0 min

Peak Storage= 561 cf @ 18.08 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 88.21 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,130.0' Slope= 0.0248 '/'
Inlet Invert= 170.00', Outlet Invert= 142.00'



Summary for Reach 8R: EAST PD - 6

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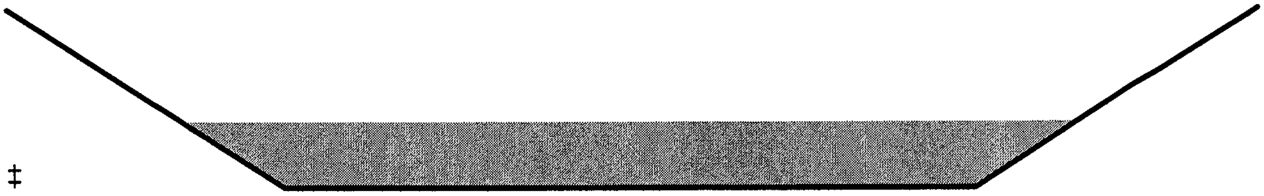
Inflow Area =       10.870 ac,  0.00% Impervious,  Inflow Depth =  0.59"   for  2-yr Storm event
Inflow      =        4.40 cfs @  12.30 hrs,  Volume=          0.538 af
Outflow     =        4.33 cfs @  12.39 hrs,  Volume=          0.538 af,  Atten= 2%,  Lag= 5.2 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 8.6 min

Peak Storage= 758 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 25.35 cfs

5.00' x 1.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 9.00'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 222.00', Outlet Invert= 220.00'



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Summary for Reach 9R: LEVEL SPREADER DISCHARGE

```
Inflow Area =       33.165 ac,  8.08% Impervious,  Inflow Depth >  0.14"   for  2-yr Storm event
Inflow      =        0.05 cfs @  24.97 hrs,  Volume=          0.399 af
Outflow     =        0.05 cfs @  27.93 hrs,  Volume=          0.395 af,  Atten= 1%,  Lag= 177.4 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.06 fps, Min. Travel Time= 78.7 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 98.0 min

Peak Storage= 249 cf @ 26.62 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 11.46 cfs

20.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 273.0' Slope= 0.0623 '/'
Inlet Invert= 180.00', Outlet Invert= 163.00'

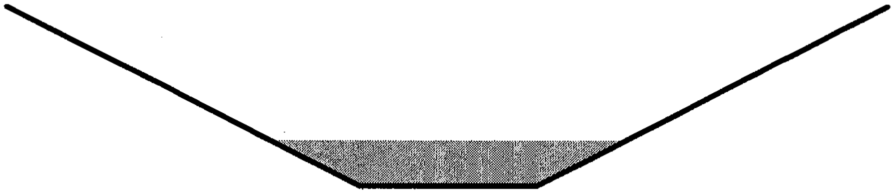
Summary for Reach 10R: Ditch 4B1

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 4.22 cfs @ 12.45 hrs, Volume= 0.538 af
Outflow = 4.17 cfs @ 12.51 hrs, Volume= 0.538 af, Atten= 1%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.76 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 5.5 min

Peak Storage= 535 cf @ 12.47 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 70.02 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 352.0' Slope= 0.0085 '/'
Inlet Invert= 213.50', Outlet Invert= 210.50'



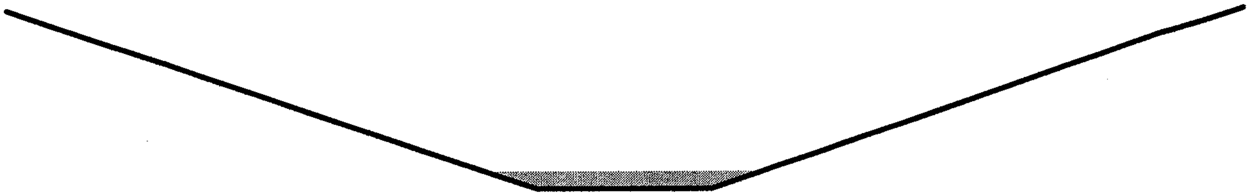
Summary for Reach 11R: DP-11R

Inflow Area = 22.282 ac, 4.04% Impervious, Inflow Depth > 0.55" for 2-yr Storm event
Inflow = 0.61 cfs @ 17.82 hrs, Volume= 1.030 af
Outflow = 0.61 cfs @ 18.23 hrs, Volume= 1.030 af, Atten= 0%, Lag= 24.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.21 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 33.9 min

Peak Storage= 525 cf @ 17.99 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 71.30 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,050.0' Slope= 0.0162 '/'
Inlet Invert= 158.00', Outlet Invert= 141.00'



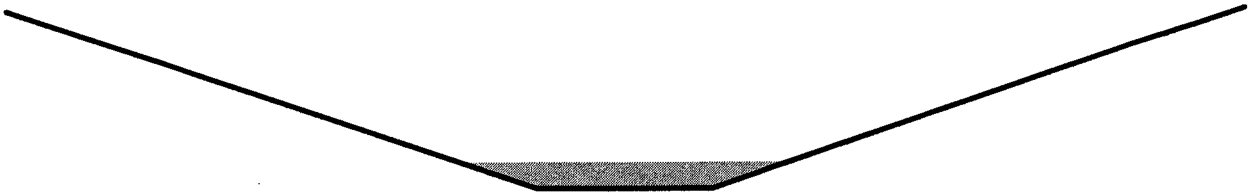
Summary for Reach 12R: 4FR

Inflow Area = 6.771 ac, 0.00% Impervious, Inflow Depth = 0.55" for 2-yr Storm event
Inflow = 1.29 cfs @ 13.12 hrs, Volume= 0.313 af
Outflow = 1.17 cfs @ 13.68 hrs, Volume= 0.313 af, Atten= 10%, Lag= 33.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 18.4 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 45.2 min

Peak Storage= 1,291 cf @ 13.37 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 64.21 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,523.0' Slope= 0.0131 '/'
Inlet Invert= 161.00', Outlet Invert= 141.00'



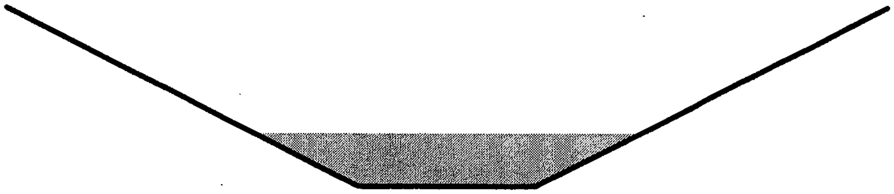
Summary for Reach 13R: Ex Ditch

Inflow Area = 18.370 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 6.52 cfs @ 12.47 hrs, Volume= 0.910 af
Outflow = 6.47 cfs @ 12.50 hrs, Volume= 0.910 af, Atten= 1%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.47 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 2.7 min

Peak Storage= 421 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 81.05 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 225.0' Slope= 0.0164 '/'
Inlet Invert= 209.70', Outlet Invert= 206.00'



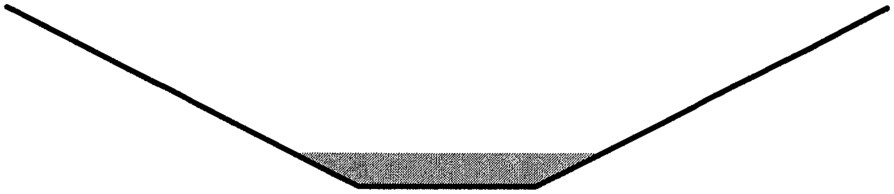
Summary for Reach 14R: DP-10 DITCH 2

Inflow Area =	12.310 ac,	0.00% Impervious,	Inflow Depth = 0.59"	for 2-yr Storm event
Inflow =	5.03 cfs @	12.35 hrs, Volume=	0.610 af	
Outflow =	4.97 cfs @	12.40 hrs, Volume=	0.610 af, Atten= 1%, Lag= 2.9 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.82 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.99 fps, Avg. Travel Time= 3.6 min

Peak Storage= 451 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 143.33 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 434.0' Slope= 0.0357 '/'
Inlet Invert= 209.00', Outlet Invert= 193.50'



Summary for Reach AP1: AP-1

Inflow Area =	135.571 ac,	2.88% Impervious,	Inflow Depth = 0.51"	for 2-yr Storm event
Inflow =	16.15 cfs @	13.88 hrs, Volume=	5.749 af	
Outflow =	16.15 cfs @	13.88 hrs, Volume=	5.749 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: ANALYSIS POINT #2

```
Inflow Area =      74.320 ac,  3.55% Impervious,  Inflow Depth >  0.67"   for  2-yr Storm event
Inflow     =        9.80 cfs @  13.86 hrs,  Volume=         4.150 af
Outflow    =        9.80 cfs @  13.86 hrs,  Volume=         4.150 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: ANALYSIS POINT #3

```
Inflow Area =     270.330 ac,  1.32% Impervious,  Inflow Depth =  0.68"   for  2-yr Storm event
Inflow     =       29.11 cfs @  15.72 hrs,  Volume=        15.297 af
Outflow    =       29.11 cfs @  15.72 hrs,  Volume=        15.297 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

```
Inflow Area =     340.334 ac,  2.56% Impervious,  Inflow Depth >  0.66"   for  2-yr Storm event
Inflow     =       33.41 cfs @  15.30 hrs,  Volume=        18.774 af
Outflow    =       33.41 cfs @  15.30 hrs,  Volume=        18.774 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: ANALYSIS POINT #5

```
Inflow Area =      35.960 ac,  0.40% Impervious,  Inflow Depth =  0.82"   for  2-yr Storm event
Inflow     =        5.71 cfs @  14.76 hrs,  Volume=         2.453 af
Outflow    =        5.71 cfs @  14.76 hrs,  Volume=         2.453 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

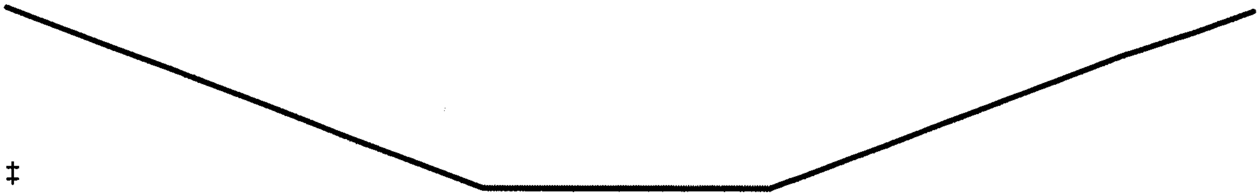
Summary for Reach E2R2: E2R2

```
Inflow Area =       1.921 ac,  0.00% Impervious,  Inflow Depth =  0.59"   for  2-yr Storm event
Inflow     =        0.64 cfs @  12.52 hrs,  Volume=         0.095 af
Outflow    =        0.09 cfs @  21.62 hrs,  Volume=         0.095 af,  Atten= 86%,  Lag= 546.4 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.20 fps, Min. Travel Time= 364.8 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 525.4 min

Peak Storage= 1,963 cf @ 15.54 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 132.12 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 4,356.0' Slope= 0.0094 '/'
Inlet Invert= 182.00', Outlet Invert= 141.00'



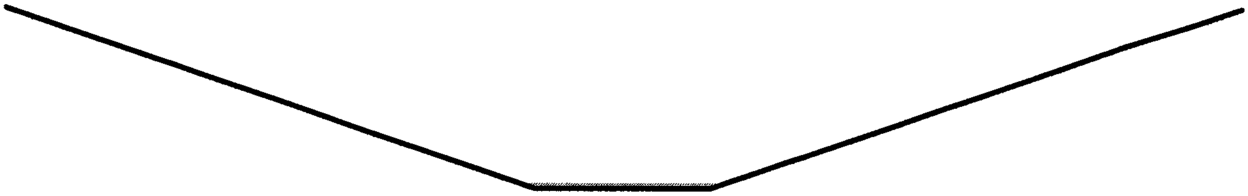
Summary for Reach E2R3: REACH TO AP

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth > 0.14" for 2-yr Storm event
Inflow = 0.05 cfs @ 27.93 hrs, Volume= 0.395 af
Outflow = 0.05 cfs @ 31.30 hrs, Volume= 0.391 af, Atten= 1%, Lag= 202.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 88.8 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 107.6 min

Peak Storage= 279 cf @ 29.82 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 48.12 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 2,170.0' Slope= 0.0074 '/'
Inlet Invert= 158.00', Outlet Invert= 142.00'



Summary for Reach E2R4: Reach to AP

Inflow Area = 92.419 ac, 5.17% Impervious, Inflow Depth > 0.37" for 2-yr Storm event
Inflow = 1.62 cfs @ 16.50 hrs, Volume= 2.863 af
Outflow = 1.60 cfs @ 17.65 hrs, Volume= 2.858 af, Atten= 1%, Lag= 69.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.57 fps, Min. Travel Time= 28.4 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 68.3 min

Peak Storage= 2,723 cf @ 17.17 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 131.94 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 963.0' Slope= 0.0094 '/'
Inlet Invert= 142.00', Outlet Invert= 132.96'

Summary for Reach R-1D: Reach R-1D

Inflow Area = 34.624 ac, 3.31% Impervious, Inflow Depth = 0.24" for 2-yr Storm event
Inflow = 1.15 cfs @ 15.38 hrs, Volume= 0.695 af
Outflow = 1.15 cfs @ 15.56 hrs, Volume= 0.695 af, Atten= 0%, Lag= 10.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.95 fps, Min. Travel Time= 6.5 min
Avg. Velocity = 0.25 fps, Avg. Travel Time= 24.3 min

Peak Storage= 446 cf @ 15.46 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 67.93 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 370.0' Slope= 0.0324 '/'
Inlet Invert= 159.00', Outlet Invert= 147.00'

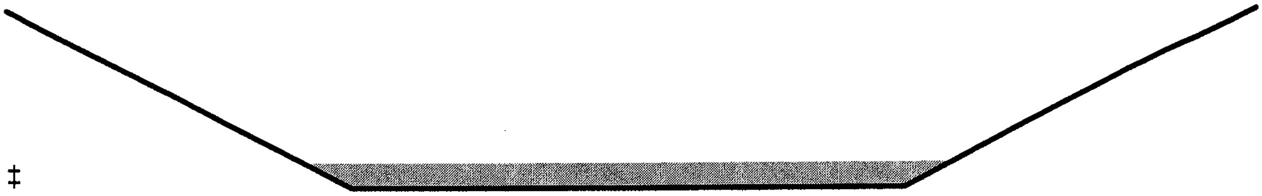
Summary for Reach R-1E: LEVEL SPREADER R-1E

Inflow Area = 10.745 ac, 0.00% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 3.92 cfs @ 12.40 hrs, Volume= 0.569 af
Outflow = 3.90 cfs @ 12.46 hrs, Volume= 0.569 af, Atten= 1%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.64 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 7.9 min

Peak Storage= 500 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 26.0 sf, Capacity= 135.95 cfs

16.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 36.00'
Length= 210.0' Slope= 0.0690 '/'
Inlet Invert= 161.50', Outlet Invert= 147.00'



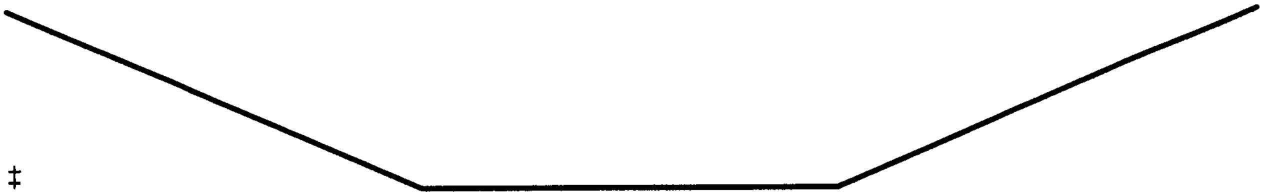
Summary for Reach R-1F: Reach R-1F

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.00" for 2-yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 49.21 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 940.0' Slope= 0.0170 '/'
Inlet Invert= 167.50', Outlet Invert= 151.50'



Summary for Reach R-1H: LEVEL SPREADER R-1H

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth = 1.09" for 2-yr Storm event
Inflow = 2.78 cfs @ 12.25 hrs, Volume= 0.275 af
Outflow = 2.73 cfs @ 12.31 hrs, Volume= 0.275 af, Atten= 2%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.50 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 5.1 min

Peak Storage= 312 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 1.00' Flow Area= 44.0 sf, Capacity= 411.95 cfs

34.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 54.00'
Length= 170.0' Slope= 0.0471 '/'
Inlet Invert= 182.00', Outlet Invert= 174.00'

Summary for Reach R-2F: Reach R2-F

```
Inflow Area =      22.602 ac,  7.31% Impervious,  Inflow Depth =  0.00"   for  2-yr Storm event
Inflow     =        0.00 cfs @   0.00 hrs,  Volume=          0.000 af
Outflow    =        0.00 cfs @   0.00 hrs,  Volume=          0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 151.21 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 735.0' Slope= 0.0020 '/'
Inlet Invert= 151.50', Outlet Invert= 150.00'

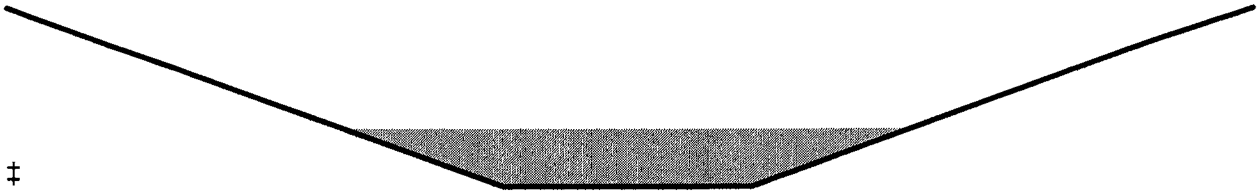
Summary for Reach R1: Reach 1

```
Inflow Area =     112.491 ac,  3.46% Impervious,  Inflow Depth =  0.46"   for  2-yr Storm event
Inflow     =       12.53 cfs @  13.74 hrs,  Volume=          4.357 af
Outflow    =       12.37 cfs @  14.03 hrs,  Volume=          4.357 af,  Atten= 1%,  Lag= 17.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.17 fps, Min. Travel Time= 10.0 min
Avg. Velocity = 0.20 fps, Avg. Travel Time= 57.6 min

Peak Storage= 7,397 cf @ 13.86 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 132.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 700.0' Slope= 0.0016 '/'
Inlet Invert= 146.30', Outlet Invert= 145.20'



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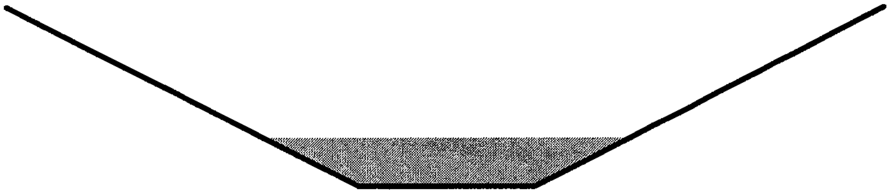
Summary for Reach R1B: LF TOE DITCH

```
Inflow Area =      13.169 ac,   0.00% Impervious,  Inflow Depth =  0.59"   for  2-yr Storm event
Inflow      =       5.43 cfs @  12.29 hrs,  Volume=          0.652 af
Outflow     =       5.35 cfs @  12.37 hrs,  Volume=          0.652 af,  Atten= 1%,  Lag= 5.1 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.22 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.30 fps, Avg. Travel Time= 6.9 min

Peak Storage= 896 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.54'
Defined Flood Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs

2.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 540.0' Slope= 0.0278 '/'
Inlet Invert= 181.00', Outlet Invert= 166.00'



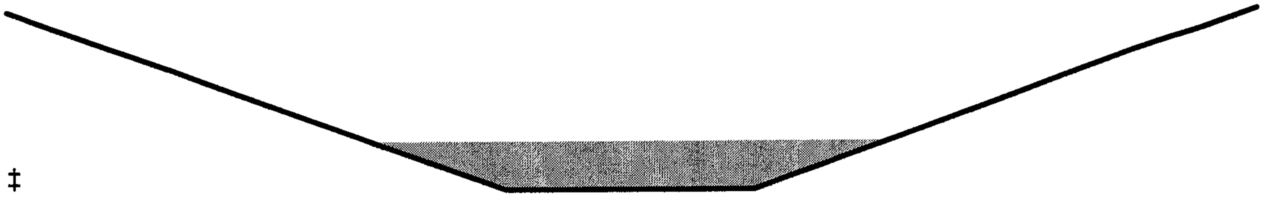
Summary for Reach R2: Reach 2

```
Inflow Area =      64.567 ac,   4.26% Impervious,  Inflow Depth =  0.50"   for  2-yr Storm event
Inflow      =      10.32 cfs @  13.37 hrs,  Volume=          2.699 af
Outflow     =       9.88 cfs @  13.80 hrs,  Volume=          2.699 af,  Atten= 4%,  Lag= 25.5 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.20 fps, Min. Travel Time= 14.6 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 49.5 min

Peak Storage= 8,672 cf @ 13.55 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,050.0' Slope= 0.0020 '/'
Inlet Invert= 148.40', Outlet Invert= 146.30'



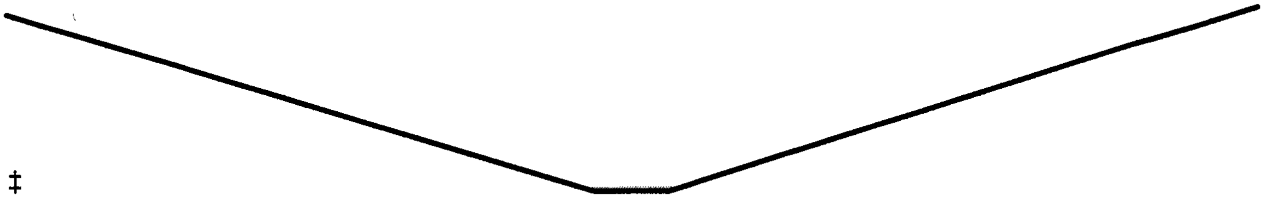
Summary for Reach R2A: Reach 2A

```
Inflow Area =     20.177 ac,  3.27% Impervious, Inflow Depth >  0.53"   for 2-yr Storm event
Inflow      =      0.51 cfs @  18.19 hrs, Volume=         0.885 af
Outflow     =      0.49 cfs @  21.60 hrs, Volume=         0.884 af, Atten= 4%, Lag= 204.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 93.1 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 152.9 min

Peak Storage= 2,756 cf @ 20.05 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 450.0 sf, Capacity= 1,358.84 cfs

25.00' x 2.00' deep channel, n= 0.060
Side Slope Z-value= 100.0 '/' Top Width= 425.00'
Length= 1,960.0' Slope= 0.0138 '/'
Inlet Invert= 179.00', Outlet Invert= 152.00'



Summary for Reach R3: Reach 3

```
Inflow Area =     53.822 ac,  5.11% Impervious, Inflow Depth =  0.47"   for 2-yr Storm event
Inflow      =      9.57 cfs @  13.08 hrs, Volume=         2.130 af
Outflow     =      9.24 cfs @  13.40 hrs, Volume=         2.130 af, Atten= 4%, Lag= 19.5 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.17 fps, Min. Travel Time= 11.4 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 32.7 min

Peak Storage= 6,300 cf @ 13.21 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 800.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 148.40'

‡

Summary for Reach R5a: Grass Lined Ditch

```
Inflow Area =      9.334 ac,  0.00% Impervious, Inflow Depth =  0.59"   for  2-yr Storm event
Inflow      =      3.92 cfs @  12.27 hrs, Volume=        0.462 af
Outflow     =      3.88 cfs @  12.30 hrs, Volume=        0.462 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.30 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.71 fps, Avg. Travel Time= 1.9 min

Peak Storage= 181 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 572.96 cfs

4.00' x 3.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 200.0' Slope= 0.0500 '/'
Inlet Invert= 176.00', Outlet Invert= 166.00'
```

Summary for Pond 1P: Culvert - 4JB & FJC

```
Inflow Area =     12.310 ac,  0.00% Impervious, Inflow Depth =  0.59"   for  2-yr Storm event
Inflow      =      5.02 cfs @  12.34 hrs, Volume=        0.610 af
Outflow     =      5.03 cfs @  12.35 hrs, Volume=        0.610 af, Atten= 0%, Lag= 0.8 min
Primary     =      5.03 cfs @  12.35 hrs, Volume=        0.610 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 210.75' @ 12.35 hrs   Surf.Area= 530 sf   Storage= 215 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min ( 901.7 - 900.9 )

Volume     Invert    Avail.Storage  Storage Description
  #1       210.00'        3,853 cf  Custom Stage Data (Prismatic)Listed below (Recalc)
```

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	43	0	0
212.00	1,340	1,383	1,383
213.00	3,600	2,470	3,853

Device	Routing	Invert	Outlet Devices
#1	Primary	210.00'	**24.0" Round Culvert X 2.00** L= 73.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 210.00' / 209.00' S= 0.0137 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=5.02 cfs @ 12.35 hrs HW=210.75' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 5.02 cfs @ 2.33 fps)

Summary for Pond 4IAC: Culvert - 4IA

Inflow Area = 0.940 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 0.50 cfs @ 12.21 hrs, Volume= 0.047 af
Outflow = 0.45 cfs @ 12.26 hrs, Volume= 0.047 af, Atten= 9%, Lag= 3.3 min
Primary = 0.45 cfs @ 12.26 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 213.23' @ 12.26 hrs Surf.Area= 421 sf Storage= 112 cf

Plug-Flow detention time= 9.5 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 9.5 min (904.7 - 895.2)

Volume	Invert	Avail.Storage	Storage Description
#1	212.90'	1,559 cf	**2.00'W x 125.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	212.90'	**18.0" Round Culvert - 4IA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 212.90' / 212.20' S= 0.0175 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.45 cfs @ 12.26 hrs HW=213.23' (Free Discharge)
↑—**1=Culvert - 4IA** (Inlet Controls 0.45 cfs @ 1.55 fps)

Summary for Pond 8P: Ex Pond

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth > 0.47" for 2-yr Storm event
Inflow = 0.74 cfs @ 17.84 hrs, Volume= 1.103 af
Outflow = 0.74 cfs @ 17.94 hrs, Volume= 1.035 af, Atten= 0%, Lag= 5.8 min
Primary = 0.74 cfs @ 17.94 hrs, Volume= 1.035 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 171.98' @ 17.94 hrs Surf.Area= 4,583 sf Storage= 3,312 cf

Plug-Flow detention time= 489.8 min calculated for 1.035 af (94% of inflow)

```
Center-of-Mass det. time= 107.3 min ( 2,455.6 - 2,348.3 )

Volume      Invert    Avail.Storage  Storage Description
  #1        171.20'        4,765 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation       Surf.Area       Inc.Store      Cum.Store
   (feet)          (sq-ft)     (cubic-feet)   (cubic-feet)
   171.20            3,900               0              0
   172.00            4,600           3,400          3,400
   172.30            4,500           1,365          4,765

Device  Routing         Invert  Outlet Devices
  #1    Primary        171.90'  12.0' long  x 1.0' breadth Broad-Crested Rectangular Weir
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                2.50  3.00
                                Coef. (English) 2.69  2.72  2.75  2.85  2.98  3.08  3.20  3.28  3.31
                                3.30  3.31  3.32

Primary OutFlow  Max=0.74 cfs @ 17.94 hrs  HW=171.98'  (Free Discharge)
   1=Broad-Crested Rectangular Weir (Weir Controls 0.74 cfs @ 0.77 fps)
```

Summary for Pond C-2B-A: Culvert - 2BA

```
Inflow Area =      13.996 ac,   0.00% Impervious,  Inflow Depth =  0.59"   for  2-yr Storm event
Inflow      =       5.75 cfs @  12.29 hrs,  Volume=          0.693 af
Outflow     =       5.70 cfs @  12.31 hrs,  Volume=          0.693 af,  Atten= 1%,  Lag= 1.4 min
Primary     =       5.70 cfs @  12.31 hrs,  Volume=          0.693 af
Secondary   =       0.00 cfs @   0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 204.21' @ 12.31 hrs   Surf.Area= 737 sf   Storage= 365 cf

Plug-Flow detention time= 0.6 min calculated for 0.693 af (100% of inflow)
Center-of-Mass det. time= 0.6 min ( 896.9 - 896.3 )

Volume      Invert    Avail.Storage  Storage Description
  #1        203.50'        1,859 cf  2.00'W x 150.00'L x 2.00'H Prismatoid  Z=2.0

Device  Routing         Invert  Outlet Devices
  #1    Primary        203.20'  36.0"  Round Culvert - 2BA
                                L= 40.0'   CPP, mitered to conform to fill,  Ke= 0.700
                                Inlet / Outlet Invert= 203.20' / 202.90'   S= 0.0075 '/'   Cc= 0.900
                                n= 0.011,  Flow Area= 7.07 sf
  #2    Secondary      205.00'  4.0' long  x 2.0' breadth Southern Ditch High Water Outlet X 0.00
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                                2.50  3.00  3.50
                                Coef. (English) 2.54  2.61  2.61  2.60  2.66  2.70  2.77  2.89  2.88
                                2.85  3.07  3.20  3.32
```

Primary OutFlow Max=5.67 cfs @ 12.31 hrs HW=204.20' (Free Discharge)
↑—**1=Culvert - 2BA** (Barrel Controls 5.67 cfs @ 4.09 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=203.50' (Free Discharge)
↑—**2=Southern Ditch High Water Outlet**(Controls 0.00 cfs)

Summary for Pond C-4F: Culvert - 4F

Inflow Area = 6.771 ac, 0.00% Impervious, Inflow Depth = 0.55" for 2-yr Storm event
Inflow = 1.30 cfs @ 13.07 hrs, Volume= 0.313 af
Outflow = 1.29 cfs @ 13.12 hrs, Volume= 0.313 af, Atten= 1%, Lag= 3.1 min
Primary = 1.29 cfs @ 13.12 hrs, Volume= 0.313 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 165.58' @ 13.12 hrs Surf.Area= 0.017 ac Storage= 0.007 af

Plug-Flow detention time= 6.7 min calculated for 0.313 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (954.8 - 948.0)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	0.047 af	**4.00'W x 96.00'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**18.0" Round Culvert - 4F** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 165.00' / 162.00' S= 0.0385 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.29 cfs @ 13.12 hrs HW=165.58' (Free Discharge)
↑—**1=Culvert - 4F** (Inlet Controls 1.29 cfs @ 2.05 fps)

Summary for Pond C-4K: Catch Basin - 4K

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 4.33 cfs @ 12.39 hrs, Volume= 0.538 af
Outflow = 4.22 cfs @ 12.45 hrs, Volume= 0.538 af, Atten= 3%, Lag= 3.4 min
Primary = 4.22 cfs @ 12.45 hrs, Volume= 0.538 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 220.30' @ 12.45 hrs Surf.Area= 3,417 sf Storage= 924 cf

Plug-Flow detention time= 6.1 min calculated for 0.538 af (100% of inflow)
Center-of-Mass det. time= 6.1 min (911.7 - 905.6)

Volume	Invert	Avail.Storage	Storage Description
#1	220.00'	3,865 cf	**5.00'W x 550.00'L x 1.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	216.50'	**24.0" Round Culvert - 4K** L= 51.0' CPP, square edge headwall, Ke= 0.500

```
                             Inlet / Outlet Invert= 216.50' / 214.30'   S= 0.0431 '/'   Cc= 0.900
                             n= 0.011,  Flow Area= 3.14 sf
 #2    Device 1     220.00'  30.0" Horiz. Orifice/Grate   C= 0.600
                             Limited to weir flow at low heads

Primary OutFlow Max=4.21 cfs @ 12.45 hrs  HW=220.30'   (Free Discharge)
↑—1=Culvert - 4K (Passes 4.21 cfs of 25.31 cfs potential flow)
   ↑—2=Orifice/Grate (Weir Controls 4.21 cfs @ 1.79 fps)
```

Summary for Pond C4B: Culvert - 4BA & 4BB

```
Inflow Area =     20.700 ac,   1.27% Impervious,  Inflow Depth =   0.64"    for  2-yr Storm event
Inflow       =     7.52 cfs @   12.48 hrs,  Volume=          1.099 af
Outflow      =     7.52 cfs @   12.48 hrs,  Volume=          1.099 af,  Atten= 0%,  Lag= 0.0 min
Primary      =     7.52 cfs @   12.48 hrs,  Volume=          1.099 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 205.34' @ 12.48 hrs   Surf.Area= 28 sf   Storage= 13 cf

Plug-Flow detention time= 0.0 min calculated for 1.098 af (100% of inflow)
Center-of-Mass det. time= 0.0 min ( 903.6 - 903.6 )

Volume        Invert      Avail.Storage   Storage Description
   #1        204.40'          11,197 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation          Surf.Area          Inc.Store          Cum.Store
    (feet)             (sq-ft)      (cubic-feet)       (cubic-feet)
    204.40                   0                 0                  0
    206.00                  47                38                 38
    208.00               5,375             5,422              5,460
    209.00               6,100             5,738             11,197

Device    Routing            Invert    Outlet Devices
   #1     Primary           204.40'    24.0"  Round Culvert - 4B X 2.00
                                       L= 78.0'   CPP, projecting, no headwall,  Ke= 0.900
                                       Inlet / Outlet Invert= 204.40' / 203.70'   S= 0.0090 '/'   Cc= 0.900
                                       n= 0.011,  Flow Area= 3.14 sf

Primary OutFlow Max=7.49 cfs @ 12.48 hrs  HW=205.33'   (Free Discharge)
↑—1=Culvert - 4B (Inlet Controls 7.49 cfs @ 2.60 fps)
```

Summary for Pond C4H-A: Culvert 4H-A

```
Inflow Area =      0.780 ac,   0.00% Impervious,  Inflow Depth =   0.59"    for  2-yr Storm event
Inflow       =     0.41 cfs @   12.20 hrs,  Volume=          0.039 af
Outflow      =     0.30 cfs @   12.33 hrs,  Volume=          0.039 af,  Atten= 28%,  Lag= 7.8 min
Primary      =     0.30 cfs @   12.33 hrs,  Volume=          0.039 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
```

Peak Elev= 202.17' @ 12.33 hrs Surf.Area= 862 sf Storage= 190 cf

Plug-Flow detention time= 24.1 min calculated for 0.039 af (100% of inflow)
Center-of-Mass det. time= 23.8 min (917.6 - 893.8)

Volume	Invert	Avail.Storage	Storage Description
#1	201.90'	3,419 cf	**2.00'W x 280.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	201.90'	**18.0" Round Culvert - 4HA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 201.90' / 200.90' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.29 cfs @ 12.33 hrs HW=202.17' (Free Discharge)
↳**1=Culvert - 4HA** (Inlet Controls 0.29 cfs @ 1.39 fps)

Summary for Pond C4N: Culvert 4N

Inflow Area = 1.921 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 0.64 cfs @ 12.50 hrs, Volume= 0.095 af
Outflow = 0.64 cfs @ 12.52 hrs, Volume= 0.095 af, Atten= 0%, Lag= 1.0 min
Primary = 0.64 cfs @ 12.52 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 184.40' @ 12.52 hrs Surf.Area= 0.004 ac Storage= 0.001 af

Plug-Flow detention time= 2.8 min calculated for 0.095 af (100% of inflow)
Center-of-Mass det. time= 2.8 min (911.1 - 908.3)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	0.015 af	**2.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	184.00'	**18.0" Round 18-in Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.00' / 183.00' S= 0.0303 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.63 cfs @ 12.52 hrs HW=184.40' (Free Discharge)
↳**1=18-in Culvert** (Inlet Controls 0.63 cfs @ 1.69 fps)

Summary for Pond CB-2B-B: Catch Basin - 2BB

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 5.61 cfs @ 12.38 hrs, Volume= 0.693 af
Outflow = 5.61 cfs @ 12.38 hrs, Volume= 0.693 af, Atten= 0%, Lag= 0.0 min
Primary = 5.61 cfs @ 12.38 hrs, Volume= 0.693 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Peak Elev= 200.21' @ 12.38 hrs Surf.Area= 408 sf Storage= 4 cf

Plug-Flow detention time= 0.0 min calculated for 0.693 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (902.6 - 902.5)

Volume	Invert	Avail.Storage	Storage Description
#1	200.20'	2,459 cf	**2.00'W x 200.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	195.00'	**24.0" Round Culvert - 2BB** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 195.00' / 194.00' S= 0.0104 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	200.00'	**30.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=10.83 cfs @ 12.38 hrs HW=200.21' (Free Discharge)
↰**1=Culvert - 2BB** (Passes 10.83 cfs of 31.04 cfs potential flow)
  ↰**2=Orifice/Grate** (Orifice Controls 10.83 cfs @ 2.21 fps)

Summary for Pond CB-4G: Catch Basin - 4G

Inflow Area =	12.750 ac,	0.00% Impervious,	Inflow Depth = 0.59"	for 2-yr Storm event
Inflow =	5.14 cfs @	12.39 hrs, Volume=	0.631 af	
Outflow =	5.14 cfs @	12.39 hrs, Volume=	0.631 af,	Atten= 0%, Lag= 0.3 min
Primary =	5.14 cfs @	12.39 hrs, Volume=	0.631 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 181.40' @ 12.39 hrs Surf.Area= 322 sf Storage= 92 cf

Plug-Flow detention time= 0.4 min calculated for 0.631 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (905.8 - 905.4)

Volume	Invert	Avail.Storage	Storage Description
#1	181.00'	1,256 cf	**2.00'W x 71.00'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	175.00'	**24.0" Round Culvert - 4G** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.00' / 174.00' S= 0.0278 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	181.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.13 cfs @ 12.39 hrs HW=181.40' (Free Discharge)
↰**1=Culvert - 4G** (Passes 5.13 cfs of 35.14 cfs potential flow)
  ↰**2=Orifice/Grate** (Weir Controls 5.13 cfs @ 2.06 fps)

Summary for Pond CB-4HB: Catch Basin - 4HB

Inflow Area = 4.180 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 1.79 cfs @ 12.27 hrs, Volume= 0.207 af
Outflow = 1.77 cfs @ 12.28 hrs, Volume= 0.207 af, Atten= 1%, Lag= 0.1 min
Primary = 1.77 cfs @ 12.28 hrs, Volume= 0.207 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 183.50' @ 12.28 hrs Surf.Area= 72 sf Storage= 12 cf

Plug-Flow detention time= 0.2 min calculated for 0.207 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (901.7 - 901.5)

Volume	Invert	Avail.Storage	Storage Description
#1	183.30'	359 cf	**2.00'W x 25.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 2	183.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	178.50'	**18.0" Round Culvert - 4HB** L= 101.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 178.50' / 176.00' S= 0.0248 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.76 cfs @ 12.28 hrs HW=183.49' (Free Discharge)
↑—**2=Culvert - 4HB** (Passes 1.76 cfs of 17.53 cfs potential flow)
  ↑—**1=Orifice/Grate** (Weir Controls 1.76 cfs @ 1.44 fps)

Summary for Pond CB-4I: Catch Basin - 4I

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 4.54 cfs @ 12.31 hrs, Volume= 0.538 af
Outflow = 4.54 cfs @ 12.31 hrs, Volume= 0.538 af, Atten= 0%, Lag= 0.3 min
Primary = 4.54 cfs @ 12.31 hrs, Volume= 0.538 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 207.97' @ 12.31 hrs Surf.Area= 0.009 ac Storage= 0.003 af

Plug-Flow detention time= 1.4 min calculated for 0.538 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (899.9 - 899.1)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	0.029 af	**2.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	202.50'	**18.0" Round Culvert - 4I** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 202.50' / 192.00' S= 0.1313 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	207.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.51 cfs @ 12.31 hrs HW=207.96' TW=193.96' (TW follows 14.00' below HW)
↑—**1=Culvert - 4I** (Passes 4.51 cfs of 18.47 cfs potential flow)
  ↑—**2=Orifice/Grate** (Weir Controls 4.51 cfs @ 1.97 fps)

Summary for Pond CB-4JA: Catch Basin - 4JA

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 5.07 cfs @ 12.31 hrs, Volume= 0.610 af
Outflow = 5.08 cfs @ 12.31 hrs, Volume= 0.610 af, Atten= 0%, Lag= 0.3 min
Primary = 5.08 cfs @ 12.31 hrs, Volume= 0.610 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 219.09' @ 12.31 hrs Surf.Area= 0.009 ac Storage= 0.003 af

Plug-Flow detention time= 0.6 min calculated for 0.609 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (898.8 - 898.2)

Volume	Invert	Avail.Storage	Storage Description
#1	218.70'	0.032 af	**2.00'W x 113.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	214.00'	**18.0" Round Culvert - 4JA** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.00' / 212.30' S= 0.0283 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	218.70'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.04 cfs @ 12.31 hrs HW=219.09' TW=212.09' (TW follows 7.00' below HW)
↑—**1=Culvert - 4JA** (Passes 5.04 cfs of 17.73 cfs potential flow)
  ↑—**2=Orifice/Grate** (Weir Controls 5.04 cfs @ 2.05 fps)

Summary for Pond CB-4L: Catch Basin - 4L

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 0.59" for 2-yr Storm event
Inflow = 3.34 cfs @ 12.23 hrs, Volume= 0.371 af
Outflow = 3.31 cfs @ 12.26 hrs, Volume= 0.371 af, Atten= 1%, Lag= 2.1 min
Primary = 3.31 cfs @ 12.26 hrs, Volume= 0.371 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 215.30' @ 12.26 hrs Surf.Area= 1,596 sf Storage= 458 cf

Plug-Flow detention time= 4.2 min calculated for 0.371 af (100% of inflow)
Center-of-Mass det. time= 4.2 min (897.2 - 893.0)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	3,683 cf	**30.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert 4L** L= 121.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 211.00' S= 0.0165 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	215.00'	**24.0" Horiz. Orifice-Top of catch basin** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.27 cfs @ 12.26 hrs HW=215.29' (Free Discharge)
└─**1=Culvert 4L** (Passes 3.27 cfs of 10.57 cfs potential flow)
  └─**2=Orifice-Top of catch basin** (Weir Controls 3.27 cfs @ 1.77 fps)

Summary for Pond D-1G: (2)24" Culverts P-6h

Inflow Area = 11.290 ac, 0.00% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 5.77 cfs @ 12.21 hrs, Volume= 0.598 af
Outflow = 5.72 cfs @ 12.21 hrs, Volume= 0.598 af, Atten= 1%, Lag= 0.4 min
Primary = 5.72 cfs @ 12.21 hrs, Volume= 0.598 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 183.81' @ 12.21 hrs Surf.Area= 326 sf Storage= 136 cf
Flood Elev= 185.00' Surf.Area= 800 sf Storage= 805 cf

Plug-Flow detention time= 0.5 min calculated for 0.598 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (888.1 - 887.6)

Volume	Invert	Avail.Storage	Storage Description
#1	183.00'	3,305 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
183.00	10	0	0
184.00	400	205	205
186.00	1,200	1,600	1,805
187.00	1,800	1,500	3,305

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	**24.0" Round (2)24"-Culvert X 2.00** L= 56.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.00' S= 0.0179 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	184.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=5.65 cfs @ 12.21 hrs HW=183.80' (Free Discharge)
↑—**1=(2)24"-Culvert** (Barrel Controls 5.65 cfs @ 3.54 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=183.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond D-1H: LF TOE DITCH - CULVERT

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth = 1.09" for 2-yr Storm event
Inflow = 2.81 cfs @ 12.22 hrs, Volume= 0.275 af
Outflow = 2.78 cfs @ 12.25 hrs, Volume= 0.275 af, Atten= 1%, Lag= 1.7 min
Primary = 2.78 cfs @ 12.25 hrs, Volume= 0.275 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 183.84' @ 12.25 hrs Surf.Area= 259 sf Storage= 372 cf
Flood Elev= 186.00' Surf.Area= 858 sf Storage= 1,323 cf

Plug-Flow detention time= 6.3 min calculated for 0.275 af (100% of inflow)
Center-of-Mass det. time= 6.1 min (863.2 - 857.1)

Volume	Invert	Avail.Storage	Storage Description
#1	183.00'	1,323 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
183.00	24	0	0
186.00	858	1,323	1,323

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	**18.0" Round Culvert-C-1H** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 183.00' / 182.50' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.78 cfs @ 12.25 hrs HW=183.84' (Free Discharge)
↑—**1=Culvert-C-1H** (Barrel Controls 2.78 cfs @ 3.92 fps)

Summary for Pond DP-1: Detention Pond 1

Inflow Area = 34.624 ac, 3.31% Impervious, Inflow Depth = 0.43" for 2-yr Storm event
Inflow = 10.24 cfs @ 12.33 hrs, Volume= 1.253 af
Outflow = 1.15 cfs @ 15.38 hrs, Volume= 0.695 af, Atten= 89%, Lag= 183.0 min
Primary = 1.15 cfs @ 15.38 hrs, Volume= 0.695 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 162.46' @ 15.38 hrs Surf.Area= 14,359 sf Storage= 31,388 cf

Plug-Flow detention time= 430.2 min calculated for 0.695 af (55% of inflow)
Center-of-Mass det. time= 297.7 min (1,193.7 - 896.1)

```
Volume     Invert    Avail.Storage  Storage Description
  #1       160.00'     115,245 cf   Custom Stage Data (Prismatic)Listed below

Elevation       Surf.Area       Inc.Store      Cum.Store
   (feet)          (sq-ft)   (cubic-feet)   (cubic-feet)
  160.00          10,750              0              0
  162.00          13,540         24,290         24,290
  164.00          17,070         30,610         54,900
  165.00          19,300         18,185         73,085
  166.00          21,310         20,305         93,390
  167.00          22,400         21,855        115,245

Device  Routing       Invert  Outlet Devices
  #1    Primary      162.00'  30.0" Round 30" Culvert
                              L= 75.0'  CMP, projecting, no headwall,  Ke= 0.900
                              Inlet / Outlet Invert= 162.00' / 159.50'  S= 0.0333 '/'  Cc= 0.900
                              n= 0.012,  Flow Area= 4.91 sf
  #2    Device 1     162.00'  12.0" Vert. Orifice on side  C= 0.600
  #3    Device 1     162.00'  6.0" Vert. Orifice on side  C= 0.600
  #4    Device 1     165.50'  72.0" Horiz. Orifice-Top of drop inlet  C= 0.600
                              Limited to weir flow at low heads
  #5    Secondary    166.00'  40.0' long  x 16.0' breadth Broad-Crested Rectangular Weir
                              Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                              Coef. (English)  2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63

Primary OutFlow Max=1.15 cfs @ 15.38 hrs  HW=162.46'  (Free Discharge)
 └─1=30" Culvert (Inlet Controls 1.15 cfs @ 1.83 fps)
     ├─2=Orifice on side (Passes < 0.83 cfs potential flow)
     ├─3=Orifice on side (Passes < 0.44 cfs potential flow)
     └─4=Orifice-Top of drop inlet ( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=160.00'  (Free Discharge)
 └─5=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Summary for Pond DP-10: DETENTION POND 10

```
Inflow Area =      28.280 ac,  4.24% Impervious,  Inflow Depth =  0.64"   for  2-yr Storm event
Inflow      =     12.05 cfs @  12.36 hrs,  Volume=        1.516 af
Outflow     =      0.74 cfs @  17.84 hrs,  Volume=        1.103 af,  Atten= 94%,  Lag= 328.8 min
Primary     =      0.00 cfs @   0.00 hrs,  Volume=        0.000 af
Secondary   =      0.74 cfs @  17.84 hrs,  Volume=        1.103 af
Tertiary    =      0.00 cfs @   0.00 hrs,  Volume=        0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00'  Surf.Area= 0 sf  Storage= 0 cf
Peak Elev= 177.58' @ 17.84 hrs  Surf.Area= 21,167 sf  Storage= 43,962 cf
Flood Elev= 181.00'  Surf.Area= 28,500 sf  Storage= 128,200 cf

Plug-Flow detention time= 1,554.9 min calculated for 1.103 af (73% of inflow)
Center-of-Mass det. time= 1,451.8 min ( 2,348.3 - 896.5 )
```

```
Volume     Invert    Avail.Storage   Storage Description
  #1      175.00'      157,950 cf    Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area        Inc.Store      Cum.Store
    (feet)        (sq-ft)     (cubic-feet)   (cubic-feet)
  175.00           7,900                0              0
  176.00          18,000           12,950         12,950
  178.00          22,000           40,000         52,950
  180.00          26,000           48,000        100,950
  182.00          31,000           57,000        157,950

Device  Routing         Invert  Outlet Devices
  #1    Device 3       179.00'  48.0" Horiz. Orifice/Grate  C= 0.600
                                Limited to weir flow at low heads
  #2    Device 3       178.00'  6.0" Vert. 6-in Orifice  C= 0.600
  #3    Primary        175.20'  18.0"  Round 18-in Primary Culvert
                                L= 52.0'  CPP, square edge headwall,  Ke= 0.500
                                Inlet / Outlet Invert= 175.20' / 172.00'  S= 0.0615 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 1.77 sf
  #4    Secondary      173.50'  5.8"  Round 6-in Culvert
                                L= 60.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 173.50' / 172.30'  S= 0.0200 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.18 sf
  #5    Device 4       177.00'  5.8" Horiz. Orifice Top  C= 0.600  Limited to weir flow at low heads
  #6    Device 4       176.20'  1.5" Vert. Orifice Side  C= 0.600
  #7    Tertiary       180.00'  10.0' long  x 22.0' breadth E-Spillway Weir
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                Coef. (English) 2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=175.00'  (Free Discharge)
 └─3=18-in Primary Culvert ( Controls 0.00 cfs)
    ├─1=Orifice/Grate ( Controls 0.00 cfs)
    └─2=6-in Orifice ( Controls 0.00 cfs)

Secondary OutFlow Max=0.74 cfs @ 17.84 hrs  HW=177.58'  (Free Discharge)
 └─4=6-in Culvert (Passes 0.74 cfs of 1.37 cfs potential flow)
    ├─5=Orifice Top (Orifice Controls 0.67 cfs @ 3.68 fps)
    └─6=Orifice Side (Orifice Controls 0.07 cfs @ 5.53 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=175.00'  (Free Discharge)
 └─7=E-Spillway Weir ( Controls 0.00 cfs)
```

Summary for Pond DP-11: Detention Pond 11

```
Inflow Area =     22.282 ac,   4.04% Impervious,  Inflow Depth =   0.64"   for  2-yr Storm event
Inflow      =      7.66 cfs @  12.40 hrs,  Volume=          1.182 af
Outflow     =      0.61 cfs @  17.82 hrs,  Volume=          1.030 af,  Atten= 92%,  Lag= 325.1 min
Primary     =      0.00 cfs @   0.00 hrs,  Volume=          0.000 af
Secondary   =      0.61 cfs @  17.82 hrs,  Volume=          1.030 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
```

```
Peak Elev= 165.43' @ 17.82 hrs   Surf.Area= 27,580 sf   Storage= 33,880 cf

Plug-Flow detention time= 1,598.2 min calculated for 1.030 af (87% of inflow)
Center-of-Mass det. time= 1,537.9 min ( 2,445.3 - 907.4 )

Volume      Invert    Avail.Storage   Storage Description
  #1       163.00'       211,750 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store      Cum.Store
    (feet)           (sq-ft)    (cubic-feet)   (cubic-feet)
   163.00            2,000              0              0
   164.00           10,900          6,450          6,450
   166.00           34,300         45,200         51,650
   168.00           39,800         74,100        125,750
   170.00           46,200         86,000        211,750

Device   Routing         Invert   Outlet Devices
  #1     Device 3       167.50'   6.0" Vert. 6-In Orifice Side (Riser)  C= 0.600
  #2     Device 3       168.40'   48.0" Horiz. Grate Top (Riser)  C= 0.600
                                  Limited to weir flow at low heads
  #3     Primary        164.30'   18.0"  Round 18-In Culvert
                                  L= 92.0'   CPP, projecting, no headwall,  Ke= 0.900
                                  Inlet / Outlet Invert= 164.30' / 162.00'   S= 0.0250 '/'   Cc= 0.900
                                  n= 0.011,  Flow Area= 1.77 sf
  #4     Secondary      161.50'   5.8"  Round 6-In Culvert
                                  L= 137.0'   CPP, projecting, no headwall,  Ke= 0.900
                                  Inlet / Outlet Invert= 161.50' / 160.00'   S= 0.0109 '/'   Cc= 0.900
                                  n= 0.011,  Flow Area= 0.18 sf
  #5     Device 4       165.10'   5.8" Horiz. Orifice Top (6-in Culv)  C= 0.600
                                  Limited to weir flow at low heads
  #6     Device 4       164.00'   1.5" Vert. Orifice Side (6-in Culv) X 1.50  C= 0.600

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=163.00'  (Free Discharge)
└─3=18-In Culvert ( Controls 0.00 cfs)
   ├─1=6-In Orifice Side (Riser) ( Controls 0.00 cfs)
   └─2=Grate Top (Riser) ( Controls 0.00 cfs)

Secondary OutFlow Max=0.61 cfs @ 17.82 hrs  HW=165.43'  (Free Discharge)
└─4=6-In Culvert (Passes 0.61 cfs of 1.03 cfs potential flow)
   ├─5=Orifice Top (6-in Culv) (Orifice Controls 0.50 cfs @ 2.75 fps)
   └─6=Orifice Side (6-in Culv) (Orifice Controls 0.10 cfs @ 8.43 fps)
```

Summary for Pond DP-12: DETENTION POND 12

```
Inflow Area =      20.177 ac,   3.27% Impervious,  Inflow Depth =  0.62"   for  2-yr Storm event
Inflow      =       5.88 cfs @  12.39 hrs,  Volume=          1.043 af
Outflow     =       0.51 cfs @  18.19 hrs,  Volume=          0.885 af,  Atten= 91%,  Lag= 347.6 min
Primary     =       0.00 cfs @   0.00 hrs,  Volume=          0.000 af
Secondary   =       0.51 cfs @  18.19 hrs,  Volume=          0.885 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
```

Peak Elev= 185.69' @ 18.19 hrs Surf.Area= 26,018 sf Storage= 31,513 cf

Plug-Flow detention time= 1,647.6 min calculated for 0.884 af (85% of inflow)
Center-of-Mass det. time= 1,581.2 min (2,498.6 - 917.4)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	205,300 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
184.00	11,200	0	0
186.00	28,700	39,900	39,900
188.00	40,200	68,900	108,800
190.00	56,300	96,500	205,300

Device	Routing	Invert	Outlet Devices
#1	Device 3	188.00'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#2	Device 3	186.80'	**8.0" Vert. 8-In Orifice (Riser Side)** C= 0.600
#3	Primary	184.50'	**18.0" Round 18- In Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.50' / 180.00' S= 0.0563 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Device 6	185.50'	**5.8" Horiz. Orifice Top (6-in Pipe)** C= 0.600 Limited to weir flow at low heads
#5	Device 6	184.50'	**1.5" Vert. Orifice (Side of 6-in) X 2.00** C= 0.600
#6	Secondary	181.50'	**6.0" Round 6-In Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0234 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=184.00' (Free Discharge)
└**3=18- In Culvert** (Controls 0.00 cfs)
  ├**1=Grate Top (Riser)** (Controls 0.00 cfs)
  └**2=8-In Orifice (Riser Side)** (Controls 0.00 cfs)

Secondary OutFlow Max=0.51 cfs @ 18.19 hrs HW=185.69' (Free Discharge)
└**6=6-In Culvert** (Passes 0.51 cfs of 1.48 cfs potential flow)
  ├**4=Orifice Top (6-in Pipe)** (Orifice Controls 0.39 cfs @ 2.12 fps)
  └**5=Orifice (Side of 6-in)** (Orifice Controls 0.13 cfs @ 5.12 fps)

Summary for Pond DP-1A: DP-1A (Former Leachate Pond)

Inflow Area =	10.835 ac,	10.57% Impervious, Inflow Depth =	0.80"	for 2-yr Storm event
Inflow =	5.05 cfs @	12.27 hrs, Volume=	0.720 af	
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 164.00' Surf.Area= 37,429 sf Storage= 182,617 cf
Peak Elev= 164.81' @ 25.65 hrs Surf.Area= 39,695 sf Storage= 213,981 cf (31,364 cf above start)
Flood Elev= 166.00' Surf.Area= 43,000 sf Storage= 263,046 cf (80,429 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	263,046 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	24,139	0	0
160.00	27,981	52,120	52,120
162.00	32,544	60,525	112,645
163.00	34,985	33,765	146,410
164.00	37,429	36,207	182,617
166.00	43,000	80,429	263,046

Device	Routing	Invert	Outlet Devices
#1	Primary	165.60'	**18.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.00' (Free Discharge)
↳**1=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Summary for Pond DP-2: DETENTION POND 2

Inflow Area = 10.745 ac, 0.00% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 5.49 cfs @ 12.21 hrs, Volume= 0.569 af
Outflow = 3.92 cfs @ 12.40 hrs, Volume= 0.569 af, Atten= 29%, Lag= 11.7 min
Primary = 3.92 cfs @ 12.40 hrs, Volume= 0.569 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 162.30' Surf.Area= 2,326 sf Storage= 956 cf
Peak Elev= 163.37' @ 12.40 hrs Surf.Area= 3,640 sf Storage= 4,359 cf (3,402 cf above start)
Flood Elev= 166.60' Surf.Area= 12,071 sf Storage= 28,956 cf (27,999 cf above start)

Plug-Flow detention time= 60.2 min calculated for 0.547 af (96% of inflow)
Center-of-Mass det. time= 32.2 min (919.9 - 887.6)

Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	47,648 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,957	0	0
164.00	4,419	6,376	6,376
166.00	10,150	14,569	20,945
168.00	16,553	26,703	47,648

Device	Routing	Invert	Outlet Devices
#1	Primary	162.30'	**24.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.30' / 162.00' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	162.30'	**15.0" Vert. Orifice** C= 0.600
#3	Device 1	166.30'	**48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.92 cfs @ 12.40 hrs HW=163.37' (Free Discharge)
↑—**1=Culvert** (Passes 3.92 cfs of 4.88 cfs potential flow)
  ↑—**2=Orifice** (Orifice Controls 3.92 cfs @ 3.52 fps)
  └—**3=Grate** (Controls 0.00 cfs)

Summary for Pond DP-6: DETENTION POND 6

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.78" for 2-yr Storm event
Inflow = 11.00 cfs @ 12.31 hrs, Volume= 1.472 af
Outflow = 0.82 cfs @ 16.92 hrs, Volume= 1.472 af, Atten= 93%, Lag= 276.7 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.82 cfs @ 16.92 hrs, Volume= 1.472 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 174.00' Surf.Area= 25,931 sf Storage= 29,566 cf
Peak Elev= 174.86' @ 16.92 hrs Surf.Area= 41,554 sf Storage= 67,549 cf (37,983 cf above start)
Flood Elev= 180.00' Surf.Area= 130,159 sf Storage= 496,644 cf (467,078 cf above start)

Plug-Flow detention time= 1,153.1 min calculated for 0.794 af (54% of inflow)
Center-of-Mass det. time= 628.6 min (1,512.9 - 884.3)

Volume	Invert	Avail.Storage	Storage Description
#1	172.00'	783,647 cf	**Detention Pond (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
172.00	3,635	0	0
174.00	25,931	29,566	29,566
176.00	62,168	88,099	117,665
178.00	93,326	155,494	273,159
180.00	130,159	223,485	496,644
182.00	156,844	287,003	783,647

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**24.0" Round Outlet Culvert** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 178.00' / 168.00' S= 0.1429 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	169.00'	**6.0" Round Outlet Culvert 6"** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 169.00' / 168.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 2	174.00'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	179.00'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir**

```
                  Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
                  Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=174.00'  (Free Discharge)
 1=Outlet Culvert ( Controls 0.00 cfs)

Secondary OutFlow Max=0.82 cfs @ 16.92 hrs HW=174.86'  (Free Discharge)
 2=Outlet Culvert 6" (Passes 0.82 cfs of 1.47 cfs potential flow)
   3=Orifice (Orifice Controls 0.82 cfs @ 4.47 fps)
 4=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)
```

Summary for Pond DP-9: DETENTION POND 9

```
Inflow Area =     33.165 ac,  8.08% Impervious, Inflow Depth =  0.87"   for 2-yr Storm event
Inflow      =     16.58 cfs @  12.44 hrs, Volume=        2.398 af
Outflow     =      0.05 cfs @  24.97 hrs, Volume=        0.399 af, Atten= 100%, Lag= 751.5 min
Primary     =      0.00 cfs @   0.00 hrs, Volume=        0.000 af
Secondary   =      0.05 cfs @  24.97 hrs, Volume=        0.399 af
Tertiary    =      0.00 cfs @   0.00 hrs, Volume=        0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.57' @ 24.97 hrs  Surf.Area= 80,617 sf  Storage= 103,321 cf
Flood Elev= 191.00'  Surf.Area= 91,210 sf  Storage= 312,840 cf

Plug-Flow detention time= 3,910.1 min calculated for 0.399 af (17% of inflow)
Center-of-Mass det. time= 3,748.6 min ( 4,626.7 - 878.2 )

Volume      Invert    Avail.Storage  Storage Description
  #1       187.00'       404,050 cf  Detention Pond (Prismatic)Listed below

 Elevation       Surf.Area      Inc.Store       Cum.Store
   (feet)          (sq-ft)    (cubic-feet)    (cubic-feet)
   187.00          35,200               0               0
   188.00          78,220          56,710          56,710
   190.00          86,700         164,920         221,630
   192.00          95,720         182,420         404,050

Device  Routing        Invert   Outlet Devices
  #1    Primary       189.50'   12.0" Round 12-In Outlet Culvert
                                L= 48.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 189.50' / 180.50'  S= 0.1875 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.79 sf
  #2    Secondary     184.21'   5.8" Round 6-In Culvert
                                L= 60.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 184.21' / 180.50'  S= 0.0618 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.18 sf
  #3    Device 2      188.70'   5.8" Horiz. Orifice  C= 0.600  Limited to weir flow at low heads
  #4    Device 2      188.30'   1.5" Vert. Orifice X 2.00  C= 0.600
  #5    Tertiary      190.50'   10.0' long x 22.0' breadth Broad-Crested Rectangular Weir
                                Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
                                Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
```

```
Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=187.00'  (Free Discharge)
└─1=12-In Outlet Culvert ( Controls 0.00 cfs)

Secondary OutFlow Max=0.05 cfs @ 24.97 hrs  HW=188.57'  (Free Discharge)
└─2=6-In Culvert (Passes 0.05 cfs of 1.41 cfs potential flow)
   ├─3=Orifice ( Controls 0.00 cfs)
   └─4=Orifice (Orifice Controls 0.05 cfs @ 2.17 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=187.00'  (Free Discharge)
└─5=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Time span=0.00-168.00 hrs, dt=0.05 hrs, 3361 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: SC-1A Runoff Area=23.080 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=2,249' Slope=0.0260 '/' Tc=88.1 min CN=74 Runoff=13.58 cfs 3.212 af

Subcatchment1B: SC-1B Runoff Area=13.169 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,282' Tc=17.5 min CN=71 Runoff=15.37 cfs 1.606 af

Subcatchment1C: SC-1C Runoff Area=13.300 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=380' Tc=68.3 min CN=77 Runoff=10.58 cfs 2.095 af

Subcatchment1D: SC-1D Runoff Area=10.620 ac 0.00% Impervious Runoff Depth=1.60"
Flow Length=1,117' Tc=16.9 min CN=73 Runoff=13.91 cfs 1.416 af

Subcatchment1E: SC-1E Runoff Area=10.745 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=910' Tc=12.7 min CN=72 Runoff=14.84 cfs 1.371 af

Subcatchment1F: SC-1F Runoff Area=31.220 ac 3.52% Impervious Runoff Depth=1.82"
Flow Length=2,066' Tc=73.2 min CN=76 Runoff=22.65 cfs 4.723 af

Subcatchment1G: SC-1G Runoff Area=11.290 ac 0.00% Impervious Runoff Depth=1.53"
Flow Length=857' Tc=12.7 min CN=72 Runoff=15.60 cfs 1.440 af

Subcatchment1H: SC-1H Runoff Area=3.030 ac 0.00% Impervious Runoff Depth=2.21"
Flow Length=759' Tc=15.4 min CN=81 Runoff=5.84 cfs 0.557 af

Subcatchment1I: SC-1I Runoff Area=9.334 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,084' Tc=16.8 min CN=71 Runoff=11.05 cfs 1.138 af

Subcatchment1J: SC-1J Runoff Area=360,761 sf 19.96% Impervious Runoff Depth=1.89"
Flow Length=593' Tc=33.0 min CN=77 Runoff=9.83 cfs 1.305 af

Subcatchment2A: SC-2A Runoff Area=54.143 ac 3.66% Impervious Runoff Depth=1.67"
Flow Length=2,435' Tc=126.1 min CN=74 Runoff=24.61 cfs 7.535 af

Subcatchment2B: 2B Runoff Area=13.996 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,218' Tc=17.6 min CN=71 Runoff=16.29 cfs 1.706 af

Subcatchment2C: 2C Runoff Area=6.181 ac 10.68% Impervious Runoff Depth=1.60"
Flow Length=702' Tc=80.7 min CN=73 Runoff=3.65 cfs 0.824 af

Subcatchment3: SC-3 Runoff Area=270.330 ac 1.32% Impervious Runoff Depth=1.60"
Flow Length=4,335' Tc=240.2 min CN=73 Runoff=74.13 cfs 36.035 af

Subcatchment4A: 4A Runoff Area=4.518 ac 7.22% Impervious Runoff Depth=1.89"
Flow Length=379' Tc=5.1 min CN=77 Runoff=9.95 cfs 0.712 af

Subcatchment4B: 4B Runoff Area=2.330 ac 11.29% Impervious Runoff Depth=2.04"
Flow Length=667' Tc=13.2 min CN=79 Runoff=4.38 cfs 0.397 af

Subcatchment 4C: 4C Runoff Area=1.287 ac 24.86% Impervious Runoff Depth=2.64"
Flow Length=496' Tc=15.4 min CN=86 Runoff=2.96 cfs 0.283 af

Subcatchment 4D: 4D Runoff Area=6.660 ac 26.58% Impervious Runoff Depth=2.73"
Flow Length=824' Tc=33.9 min CN=87 Runoff=11.31 cfs 1.514 af

Subcatchment 4E: 4E Runoff Area=247.915 ac 1.59% Impervious Runoff Depth=1.74"
Flow Length=6,090' Tc=225.6 min CN=75 Runoff=77.97 cfs 35.990 af

Subcatchment 4F: 4F Runoff Area=6.771 ac 0.00% Impervious Runoff Depth=1.40"
Flow Length=1,228' Tc=68.8 min CN=70 Runoff=3.79 cfs 0.788 af

Subcatchment 4G: 4G Runoff Area=12.750 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=929' Tc=17.1 min CN=71 Runoff=14.99 cfs 1.554 af

Subcatchment 4H: 4H Runoff Area=3.400 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=823' Tc=11.9 min CN=71 Runoff=4.54 cfs 0.415 af

Subcatchment 4HA: 4HA Runoff Area=0.780 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=142' Slope=0.3300 '/' Tc=6.7 min CN=71 Runoff=1.24 cfs 0.095 af

Subcatchment 4I: 4I Runoff Area=9.930 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,082' Tc=17.1 min CN=71 Runoff=11.68 cfs 1.211 af

Subcatchment 4IA: 4IA Runoff Area=0.940 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=136' Slope=0.3333 '/' Tc=6.4 min CN=71 Runoff=1.51 cfs 0.115 af

Subcatchment 4J: 4J Runoff Area=12.310 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,051' Tc=17.2 min CN=71 Runoff=14.45 cfs 1.501 af

Subcatchment 4K: 4K Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=1,095' Tc=18.4 min CN=71 Runoff=12.44 cfs 1.325 af

Subcatchment 4L: 4L Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=896' Tc=14.1 min CN=71 Runoff=9.51 cfs 0.914 af

Subcatchment 4M: 4M Runoff Area=5.352 ac 16.82% Impervious Runoff Depth=1.74"
Flow Length=642' Tc=53.5 min CN=75 Runoff=4.51 cfs 0.777 af

Subcatchment 4N: 4N Runoff Area=1.921 ac 0.00% Impervious Runoff Depth=1.46"
Flow Length=730' Tc=30.5 min CN=71 Runoff=1.78 cfs 0.234 af

Subcatchment 4O: 4O Runoff Area=5.100 ac 23.53% Impervious Runoff Depth=1.89"
Flow Length=663' Tc=14.2 min CN=77 Runoff=8.61 cfs 0.803 af

Subcatchment 5: SC-5 Runoff Area=35.960 ac 0.40% Impervious Runoff Depth=1.82"
Flow Length=2,355' Tc=192.1 min CN=76 Runoff=13.44 cfs 5.440 af

Subcatchment P1A: SC-P1A Runoff Area=65,400 sf 76.26% Impervious Runoff Depth=3.42"
Tc=0.0 min CN=94 Runoff=6.50 cfs 0.428 af

Reach 1R: DP-10 DITCH 1 Avg. Flow Depth=0.60' Max Vel=3.31 fps Inflow=14.21 cfs 1.501 af
n=0.025 L=101.0' S=0.0079 '/' Capacity=128.49 cfs Outflow=14.10 cfs 1.501 af

Reach 2R: E2C-DP9 Avg. Flow Depth=0.48' Max Vel=4.49 fps Inflow=12.00 cfs 0.995 af
n=0.022 L=590.0' S=0.0169 '/' Capacity=488.04 cfs Outflow=11.40 cfs 0.995 af

Reach 3R: Overland Flow Avg. Flow Depth=0.35' Max Vel=9.99 fps Inflow=21.25 cfs 2.637 af
n=0.035 L=168.0' S=0.0554 '/' Capacity=119.87 cfs Outflow=21.22 cfs 2.637 af

Reach 4HR-A: EAST PD - 4 Avg. Flow Depth=0.19' Max Vel=2.69 fps Inflow=1.24 cfs 0.095 af
n=0.025 L=288.0' S=0.0247 '/' Capacity=119.08 cfs Outflow=1.17 cfs 0.095 af

Reach 4HR-B: EAST PD - 5 Avg. Flow Depth=0.37' Max Vel=5.30 fps Inflow=5.42 cfs 0.510 af
n=0.025 L=425.0' S=0.0438 '/' Capacity=158.67 cfs Outflow=5.29 cfs 0.510 af

Reach 4IR-A: EAST PD - 2 Avg. Flow Depth=0.23' Max Vel=2.55 fps Inflow=1.51 cfs 0.115 af
n=0.025 L=330.0' S=0.0176 '/' Capacity=100.55 cfs Outflow=1.41 cfs 0.115 af

Reach 4IR-B: EAST PD - 3 Avg. Flow Depth=0.71' Max Vel=5.36 fps Inflow=12.92 cfs 1.325 af
n=0.025 L=210.0' S=0.0224 '/' Capacity=113.47 cfs Outflow=12.84 cfs 1.325 af

Reach 4JR: EAST PD 1 Avg. Flow Depth=0.79' Max Vel=5.10 fps Inflow=14.45 cfs 1.501 af
n=0.025 L=183.0' S=0.0180 '/' Capacity=101.85 cfs Outflow=14.35 cfs 1.501 af

Reach 4R: DP-10 DITCH 3 Avg. Flow Depth=0.84' Max Vel=8.43 fps Inflow=26.13 cfs 2.826 af
n=0.025 L=260.0' S=0.0462 '/' Capacity=162.94 cfs Outflow=25.93 cfs 2.826 af

Reach 5R: NORTH PD-1 Avg. Flow Depth=0.70' Max Vel=6.16 fps Inflow=14.99 cfs 1.554 af
n=0.025 L=936.0' S=0.0299 '/' Capacity=131.18 cfs Outflow=14.64 cfs 1.554 af

Reach 6R: NORTH PD-2 Avg. Flow Depth=1.02' Max Vel=3.88 fps Inflow=15.99 cfs 1.706 af
n=0.025 L=364.0' S=0.0080 '/' Capacity=67.70 cfs Outflow=15.76 cfs 1.706 af

Reach 7R: DP-10R Avg. Flow Depth=0.53' Max Vel=2.60 fps Inflow=4.95 cfs 3.144 af
n=0.045 L=1,130.0' S=0.0248 '/' Capacity=88.21 cfs Outflow=4.91 cfs 3.143 af

Reach 8R: EAST PD - 6 Avg. Flow Depth=0.67' Max Vel=2.90 fps Inflow=12.44 cfs 1.325 af
n=0.025 L=360.0' S=0.0056 '/' Capacity=25.35 cfs Outflow=12.21 cfs 1.325 af

Reach 9R: LEVEL SPREADER Avg. Flow Depth=0.25' Max Vel=0.17 fps Inflow=0.99 cfs 2.949 af
n=0.800 L=273.0' S=0.0623 '/' Capacity=11.46 cfs Outflow=0.99 cfs 2.943 af

Reach 10R: Ditch 4B1 Avg. Flow Depth=0.87' Max Vel=3.69 fps Inflow=11.94 cfs 1.325 af
n=0.025 L=352.0' S=0.0085 '/' Capacity=70.02 cfs Outflow=11.80 cfs 1.325 af

Reach 11R: DP-11R Avg. Flow Depth=0.28' Max Vel=1.49 fps Inflow=1.18 cfs 2.687 af
n=0.045 L=1,050.0' S=0.0162 '/' Capacity=71.30 cfs Outflow=1.18 cfs 2.686 af

Reach 12R: 4FR Avg. Flow Depth=0.53' Max Vel=1.89 fps Inflow=3.77 cfs 0.788 af
n=0.045 L=1,523.0' S=0.0131 '/' Capacity=64.21 cfs Outflow=3.57 cfs 0.788 af

Reach 13R: Ex Ditch Avg. Flow Depth=1.00' Max Vel=4.62 fps Inflow=18.62 cfs 2.240 af
n=0.030 L=225.0' S=0.0164 '/' Capacity=81.05 cfs Outflow=18.53 cfs 2.240 af

Reach 14R: DP-10 DITCH 2 Avg. Flow Depth=0.65' Max Vel=6.49 fps Inflow=14.07 cfs 1.501 af
n=0.025 L=434.0' S=0.0357 '/' Capacity=143.33 cfs Outflow=13.95 cfs 1.501 af

Reach AP1: AP-1 Inflow=50.41 cfs 13.974 af
Outflow=50.41 cfs 13.974 af

Reach AP2: ANALYSIS POINT #2 Inflow=24.63 cfs 9.905 af
Outflow=24.63 cfs 9.905 af

Reach AP3: ANALYSIS POINT #3 Inflow=74.13 cfs 36.035 af
Outflow=74.13 cfs 36.035 af

Reach AP4: AP4 Inflow=84.71 cfs 45.769 af
Outflow=84.71 cfs 45.769 af

Reach AP5: ANALYSIS POINT #5 Inflow=13.44 cfs 5.440 af
Outflow=13.44 cfs 5.440 af

Reach E2R2: E2R2 Avg. Flow Depth=0.08' Max Vel=0.32 fps Inflow=1.77 cfs 0.234 af
n=0.080 L=4,356.0' S=0.0094 '/' Capacity=132.12 cfs Outflow=0.34 cfs 0.234 af

Reach E2R3: REACH TO AP Avg. Flow Depth=0.31' Max Vel=1.07 fps Inflow=0.99 cfs 2.943 af
n=0.045 L=2,170.0' S=0.0074 '/' Capacity=48.12 cfs Outflow=0.99 cfs 2.936 af

Reach E2R4: Reach to AP Avg. Flow Depth=0.52' Max Vel=0.97 fps Inflow=9.18 cfs 9.788 af
n=0.080 L=963.0' S=0.0094 '/' Capacity=131.94 cfs Outflow=8.62 cfs 9.779 af

Reach R-1D: Reach R-1D Avg. Flow Depth=0.28' Max Vel=1.66 fps Inflow=5.91 cfs 2.573 af
n=0.060 L=370.0' S=0.0324 '/' Capacity=67.93 cfs Outflow=5.91 cfs 2.573 af

Reach R-1E: LEVEL SPREADER R-1E Avg. Flow Depth=0.21' Max Vel=2.11 fps Inflow=7.89 cfs 1.371 af
n=0.060 L=210.0' S=0.0690 '/' Capacity=135.95 cfs Outflow=7.88 cfs 1.371 af

Reach R-1F: Reach R-1F Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.060 L=940.0' S=0.0170 '/' Capacity=49.21 cfs Outflow=0.00 cfs 0.000 af

Reach R-1H: LEVEL SPREADER R-1H Avg. Flow Depth=0.08' Max Vel=2.01 fps Inflow=5.77 cfs 0.557 af
n=0.030 L=170.0' S=0.0471 '/' Capacity=411.95 cfs Outflow=5.67 cfs 0.557 af

Reach R-2F: Reach R2-F Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=735.0' S=0.0020 '/' Capacity=151.21 cfs Outflow=0.00 cfs 0.000 af

Reach R1: Reach 1 Avg. Flow Depth=1.13' Max Vel=1.60 fps Inflow=38.57 cfs 10.762 af
n=0.030 L=700.0' S=0.0016 '/' Capacity=132.69 cfs Outflow=38.22 cfs 10.762 af

Reach R1B: LF TOE DITCH Avg. Flow Depth=0.92' Max Vel=4.29 fps Inflow=15.37 cfs 1.606 af
n=0.040 L=540.0' S=0.0278 '/' Capacity=79.00 cfs Outflow=15.08 cfs 1.606 af

Reach R2: Reach 2 Avg. Flow Depth=0.87' Max Vel=1.56 fps Inflow=26.10 cfs 6.094 af
n=0.030 L=1,050.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=25.30 cfs 6.094 af

Reach R2A: Reach 2A Avg. Flow Depth=0.08' Max Vel=0.48 fps Inflow=1.34 cfs 2.371 af
n=0.060 L=1,960.0' S=0.0138 '/' Capacity=1,358.84 cfs Outflow=1.33 cfs 2.370 af

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Reach R3: Reach 3                        Avg. Flow Depth=0.81'  Max Vel=1.50 fps  Inflow=22.65 cfs  4.723 af
                          n=0.030  L=800.0'  S=0.0020 '/'  Capacity=149.69 cfs  Outflow=22.18 cfs  4.723 af

Reach R5a: Grass Lined Ditch             Avg. Flow Depth=0.38'  Max Vel=6.16 fps  Inflow=11.05 cfs  1.138 af
                          n=0.025  L=200.0'  S=0.0500 '/'  Capacity=572.96 cfs  Outflow=10.99 cfs  1.138 af

Pond 1P: Culvert - 4JB & FJC                    Peak Elev=211.35'  Storage=648 cf  Inflow=14.10 cfs  1.501 af
                 24.0" Round Culvert x 2.00  n=0.011  L=73.0'  S=0.0137 '/'  Outflow=14.07 cfs  1.501 af

Pond 4IAC: Culvert - 4IA                         Peak Elev=213.49'  Storage=236 cf  Inflow=1.41 cfs  0.115 af
                       18.0" Round Culvert  n=0.011  L=40.0'  S=0.0175 '/'  Outflow=1.33 cfs  0.115 af

Pond 8P: Ex Pond                               Peak Elev=172.19'  Storage=4,248 cf  Inflow=4.96 cfs  3.212 af
                                                                            Outflow=4.95 cfs  3.144 af

Pond C-2B-A: Culvert - 2BA                    Peak Elev=205.04'  Storage=1,200 cf  Inflow=16.29 cfs  1.706 af
                 Primary=15.99 cfs  1.706 af  Secondary=0.00 cfs  0.000 af  Outflow=15.99 cfs  1.706 af

Pond C-4F: Culvert - 4F                        Peak Elev=166.07'  Storage=0.018 af  Inflow=3.79 cfs  0.788 af
                       18.0" Round Culvert  n=0.011  L=78.0'  S=0.0385 '/'  Outflow=3.77 cfs  0.788 af

Pond C-4K: Catch Basin - 4K                   Peak Elev=220.60'  Storage=2,052 cf  Inflow=12.21 cfs  1.325 af
                                                                           Outflow=11.94 cfs  1.325 af

Pond C4B: Culvert - 4BA & 4BB                     Peak Elev=206.18'  Storage=92 cf  Inflow=21.27 cfs  2.637 af
                 24.0" Round Culvert x 2.00  n=0.011  L=78.0'  S=0.0090 '/'  Outflow=21.25 cfs  2.637 af

Pond C4H-A: Culvert 4H-A                         Peak Elev=202.39'  Storage=414 cf  Inflow=1.17 cfs  0.095 af
                       18.0" Round Culvert  n=0.011  L=40.0'  S=0.0250 '/'  Outflow=0.96 cfs  0.095 af

Pond C4N: Culvert 4N                           Peak Elev=184.69'  Storage=0.003 af  Inflow=1.78 cfs  0.234 af
                       18.0" Round Culvert  n=0.011  L=33.0'  S=0.0303 '/'  Outflow=1.77 cfs  0.234 af

Pond CB-2B-B: Catch Basin - 2BB                  Peak Elev=200.44'  Storage=121 cf  Inflow=15.76 cfs  1.706 af
                                                                           Outflow=15.73 cfs  1.706 af

Pond CB-4G: Catch Basin - 4G                     Peak Elev=181.93'  Storage=331 cf  Inflow=14.64 cfs  1.554 af
                                                                           Outflow=14.58 cfs  1.554 af

Pond CB-4HB: Catch Basin - 4HB                      Peak Elev=183.70'  Storage=29 cf  Inflow=5.29 cfs  0.510 af
                                                                            Outflow=5.29 cfs  0.510 af

Pond CB-4I: Catch Basin - 4I                  Peak Elev=208.33'  Storage=0.007 af  Inflow=12.84 cfs  1.325 af
                                                                           Outflow=12.83 cfs  1.325 af

Pond CB-4JA: Catch Basin - 4JA                Peak Elev=219.58'  Storage=0.009 af  Inflow=14.35 cfs  1.501 af
                                                                           Outflow=14.21 cfs  1.501 af

Pond CB-4L: Catch Basin - 4L                      Peak Elev=215.59'  Storage=946 cf  Inflow=9.51 cfs  0.914 af
                                                                            Outflow=9.37 cfs  0.914 af
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Pond D-1G: (2)24" Culverts P-6h Peak Elev=184.43' Storage=416 cf Inflow=15.60 cfs 1.440 af
Primary=15.45 cfs 1.440 af Secondary=0.00 cfs 0.000 af Outflow=15.45 cfs 1.440 af

Pond D-1H: LF TOE DITCH - CULVERT Peak Elev=184.35' Storage=594 cf Inflow=5.84 cfs 0.557 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0083 '/' Outflow=5.77 cfs 0.557 af

Pond DP-1: Detention Pond 1 Peak Elev=164.02' Storage=55,211 cf Inflow=28.22 cfs 3.131 af
Primary=5.91 cfs 2.573 af Secondary=0.00 cfs 0.000 af Outflow=5.91 cfs 2.573 af

Pond DP-10: DETENTION POND 10 Peak Elev=179.16' Storage=79,803 cf Inflow=32.93 cfs 3.629 af
Primary=3.56 cfs 1.042 af Secondary=1.40 cfs 2.169 af Tertiary=0.00 cfs 0.000 af Outflow=4.96 cfs 3.212 af

Pond DP-11: Detention Pond 11 Peak Elev=166.87' Storage=82,513 cf Inflow=21.28 cfs 2.841 af
Primary=0.00 cfs 0.000 af Secondary=1.18 cfs 2.687 af Outflow=1.18 cfs 2.687 af

Pond DP-12: DETENTION POND 12 Peak Elev=186.96' Storage=70,200 cf Inflow=16.74 cfs 2.530 af
Primary=0.09 cfs 0.026 af Secondary=1.25 cfs 2.344 af Outflow=1.34 cfs 2.371 af

Pond DP-1A: DP-1A (Former Leachate Peak Elev=165.63' Storage=247,127 cf Inflow=12.96 cfs 1.566 af
Outflow=0.33 cfs 0.110 af

Pond DP-2: DETENTION POND 2 Peak Elev=164.71' Storage=11,544 cf Inflow=14.84 cfs 1.371 af
Outflow=7.89 cfs 1.371 af

Pond DP-6: DETENTION POND 6 Peak Elev=176.12' Storage=127,302 cf Inflow=26.87 cfs 3.302 af
Primary=0.00 cfs 0.000 af Secondary=1.29 cfs 3.302 af Outflow=1.29 cfs 3.302 af

Pond DP-9: DETENTION POND 9 Peak Elev=189.59' Storage=187,879 cf Inflow=38.75 cfs 5.146 af
Primary=0.03 cfs 0.012 af Secondary=0.96 cfs 2.937 af Tertiary=0.00 cfs 0.000 af Outflow=0.99 cfs 2.949 af

Summary for Subcatchment 1A: SC-1A

Runoff = 13.58 cfs @ 13.22 hrs, Volume= 3.212 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
10.120	70	Woods, Good, HSG C
9.500	77	Woods, Good, HSG D
2.560	71	Meadow, non-grazed, HSG C
0.400	78	Meadow, non-grazed, HSG D
* 0.500	96	Gravel Road
23.080	74	Weighted Average
23.080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	150	0.0260	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
21.0	1,839		1.46		**Direct Entry, Segment ID: B-C**
16.4	260		0.26		**Direct Entry, Segment ID: C-D**
88.1	2,249	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 15.37 cfs @ 12.26 hrs, Volume= 1.606 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
13.169	71	Meadow, non-grazed, HSG C
13.169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	183	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.9	392	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	557	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.5	1,282	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 10.58 cfs @ 12.95 hrs, Volume= 2.095 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	6.100	77	Woods, Good, HSG D
	0.720	70	Woods, Good, HSG C
	3.100	78	Meadow, non-grazed, HSG D
	2.580	71	Meadow, non-grazed, HSG C
*	0.800	96	Gravel Road
	13.300	77	Weighted Average
	13.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	150	0.0350	0.06		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.6	230	0.0133	0.58		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
16.7					**Direct Entry, Segment ID: C-D**
68.3	380	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 13.91 cfs @ 12.25 hrs, Volume= 1.416 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	9.230	71	Meadow, non-grazed, HSG C
*	0.590	96	Gravel Road/Berm
*	0.800	78	Pond, Meadow HSG D
	10.620	73	Weighted Average
	10.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	159	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	203	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	605	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035

16.9	1,117	Total

Summary for Subcatchment 1E: SC-1E

Runoff = 14.84 cfs @ 12.19 hrs, Volume= 1.371 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	10.495	71	Meadow, non-grazed, HSG C
*	0.250	96	Gravel Road/Berm
	10.745	72	Weighted Average
	10.745		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	150	0.1000	0.22		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
0.9	150	0.1500	2.71		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	93	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	517	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
12.7	910	Total			

Summary for Subcatchment 1F: SC-1F

Runoff = 22.65 cfs @ 13.00 hrs, Volume= 4.723 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	13.200	77	Woods, Good, HSG D
	7.250	70	Woods, Good, HSG C
	7.670	78	Meadow, non-grazed, HSG D
	1.500	71	Meadow, non-grazed, HSG C
*	0.500	96	Gravel Road/Pad
*	0.600	98	Impervious / Structures
	0.500	98	Paved roads w/curbs & sewers, HSG C
	31.220	76	Weighted Average
	30.120		96.48% Pervious Area
	1.100		3.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.08		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	17	0.3300	0.23		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
2.4	300	0.0190	2.07		**Shallow Concentrated Flow, Segment ID: C-D** Grassed Waterway Kv= 15.0 fps
24.6	1,649	0.0500	1.12		**Shallow Concentrated Flow, Segment ID D-E** Woodland Kv= 5.0 fps
24.5					**Direct Entry, Segment ID: E-F**
73.2	2,066	Total			

Summary for Subcatchment 1G: SC-1G

Runoff = 15.60 cfs @ 12.19 hrs, Volume= 1.440 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	10.860	71	Meadow, non-grazed, HSG C
*	0.430	96	Gravel Road/Berm
	11.290	72	Weighted Average
	11.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	150	0.1000	0.22		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
0.5	62	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	90	0.3300	4.02		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.3	140	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	415	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
12.7	857	Total			

Summary for Subcatchment 1H: SC-1H

Runoff = 5.84 cfs @ 12.22 hrs, Volume= 0.557 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
1.200	96	Gravel Road/Berm
3.030	81	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150	0.3300	0.36		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
8.4	609	0.0300	1.21		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
15.4	759	Total			

Summary for Subcatchment 1I: SC-1I

Runoff = 11.05 cfs @ 12.25 hrs, Volume= 1.138 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
9.334	71	Meadow, non-grazed, HSG C
9.334		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.1	146	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	218	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	570	0.3300	27.25	817.65	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 5.0 '/' Top.W=25.00' n= 0.035
16.8	1,084	Total			

Summary for Subcatchment 1J: SC-1J

Runoff = 9.83 cfs @ 12.47 hrs, Volume= 1.305 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (sf)	CN	Description
*	186,445	70	Woods, Good HSG C
	85,939	71	Meadow, non-grazed, HSG C
*	16,377	96	Gravel Road/Pad
*	72,000	98	Pond water surface
	360,761	77	Weighted Average
	288,761		80.04% Pervious Area
	72,000		19.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	100	0.0400	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
1.7	123	0.0569	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
0.5	370	0.0189	12.43	801.88	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=3.00' Z= 10.0 & 3.0 '/' Top.W=41.00' n= 0.022 Earth, clean & straight
33.0	593	Total			

Summary for Subcatchment 2A: SC-2A

Runoff = 24.61 cfs @ 13.74 hrs, Volume= 7.535 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	27.993	70	Woods, Good, HSG C
	21.380	77	Woods, Good, HSG D
	2.790	71	Meadow, non-grazed, HSG C
*	0.380	98	Paved Area (New)
	1.600	98	Existing Waterbody
	54.143	74	Weighted Average
	52.163		96.34% Pervious Area
	1.980		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	150	0.0300	0.05		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
25.4	538	0.0200	0.35		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
37.5	534	0.0090	0.24		**Shallow Concentrated Flow, Segment C-D** Forest w/Heavy Litter Kv= 2.5 fps
15.3	1,213	0.0080	1.32	52.99	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=0.00' D=2.00' Z= 10.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
126.1	2,435	Total			

Summary for Subcatchment 2B: 2B

Runoff = 16.29 cfs @ 12.26 hrs, Volume= 1.706 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
13.996	71	Meadow, non-grazed, HSG C
13.996		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	187	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	431	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	450	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.6	1,218	Total			

Summary for Subcatchment 2C: 2C

Runoff = 3.65 cfs @ 13.14 hrs, Volume= 0.824 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
5.521	70	Woods, Good, HSG C
0.660	98	Water Surface, HSG C
6.181	73	Weighted Average
5.521		89.32% Pervious Area
0.660		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.2	289	0.0242	0.78		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.2	263	0.0114	0.53		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
80.7	702	Total			

Summary for Subcatchment 3: SC-3

Runoff = 74.13 cfs @ 15.27 hrs, Volume= 36.035 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
	0.950	71	Meadow, non-grazed, HSG C
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
*	2.330	98	Existing Water Body
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4A: 4A

Runoff = 9.95 cfs @ 12.08 hrs, Volume= 0.712 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	0.740	89	Gravel roads, HSG C
	1.955	74	>75% Grass cover, Good, HSG C
*	0.088	98	ROOF
	1.497	71	Meadow, non-grazed, HSG C
	0.238	98	Paved roads w/curbs & sewers, HSG C
	4.518	77	Weighted Average
	4.192		92.78% Pervious Area
	0.326		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	150	0.0167	0.71		**Sheet Flow, Segment A-B** n= 0.023 P2= 2.70"
0.8	159	0.0410	3.26		**Shallow Concentrated Flow, Segment B-C** Unpaved Kv= 16.1 fps
0.8	70	0.0429	1.45		**Shallow Concentrated Flow, Segment C-D** Short Grass Pasture Kv= 7.0 fps
5.1	379	Total			

Summary for Subcatchment 4B: 4B

Runoff = 4.38 cfs @ 12.19 hrs, Volume= 0.397 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	1.040	70	Brush, Fair, HSG C
*	0.023	98	ROOF
	0.640	89	Gravel roads, HSG C
	0.387	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved roads w/curbs & sewers, HSG C
	2.330	79	Weighted Average
	2.067		88.71% Pervious Area
	0.263		11.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0200	0.95		**Sheet Flow, Segment AB** Smooth surfaces n= 0.011 P2= 2.70"
0.8	19	0.5000	0.41		**Sheet Flow, Segment BC** Grass: Short n= 0.150 P2= 2.70"
11.9	584	0.0137	0.82		**Shallow Concentrated Flow, Segment CD** Short Grass Pasture Kv= 7.0 fps
0.1	40	0.0250	7.14	85.66	**Trap/Vee/Rect Channel Flow, Segment DE** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035
13.2	667	Total			

Summary for Subcatchment 4C: 4C

Runoff = 2.96 cfs @ 12.21 hrs, Volume= 0.283 af, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	0.511	74	>75% Grass cover, Good, HSG C
	0.070	98	Paved roads w/curbs & sewers, HSG C
*	0.250	98	Building/Concrete Slabs
*	0.456	91	Gravel Roads
	1.287	86	Weighted Average
	0.967		75.14% Pervious Area
	0.320		24.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0200	1.14		**Sheet Flow, Segment A-B** Smooth surfaces n= 0.011 P2= 2.70"
10.5	61	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
4.0	374	0.0107	1.55		**Shallow Concentrated Flow, Grassed waterway** Grassed Waterway Kv= 15.0 fps
15.4	496	Total			

Summary for Subcatchment 4D: 4D

Runoff = 11.31 cfs @ 12.46 hrs, Volume= 1.514 af, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	0.453	89	Gravel roads, HSG C
*	2.133	91	Gravel
	2.304	74	>75% Grass cover, Good, HSG C
*	1.634	98	Pond
	0.136	98	Paved roads w/curbs & sewers, HSG C
	6.660	87	Weighted Average
	4.890		73.42% Pervious Area
	1.770		26.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	125	0.0216	0.12		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
0.5	25	0.0520	0.78		**Sheet Flow, Segment B-C** n= 0.023 P2= 2.70"
2.0	270	0.0190	2.22		**Shallow Concentrated Flow, Segment C-D** Unpaved Kv= 16.1 fps
0.2	44	0.3300	4.02		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
2.0	102	0.0150	0.86		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
11.2	258	0.0030	0.38		**Shallow Concentrated Flow, Segment F-G** Short Grass Pasture Kv= 7.0 fps
33.9	824	Total			

Summary for Subcatchment 4E: 4E

Runoff = 77.97 cfs @ 15.24 hrs, Volume= 35.990 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (ac)	CN	Description
	152.615	77	Woods, Good, HSG D
	91.360	70	Woods, Good, HSG C
*	3.940	98	Paved roads w/curbs & sewers,
	247.915	75	Weighted Average
	243.975		98.41% Pervious Area
	3.940		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
127.0	2,625	0.0190	0.34		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
225.6	6,090	Total			

Summary for Subcatchment 4F: 4F

Runoff = 3.79 cfs @ 12.98 hrs, Volume= 0.788 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
6.691	70	Woods, Good, HSG C
0.080	89	Gravel roads, HSG C
6.771	70	Weighted Average
6.771		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	144	0.0280	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
20.9	1,067	0.0290	0.85		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.3	17	0.0210	0.97	19.47	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.250
68.8	1,228	Total			

Summary for Subcatchment 4G: 4G

Runoff = 14.99 cfs @ 12.25 hrs, Volume= 1.554 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
12.750	71	Meadow, non-grazed, HSG C
12.750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	98	0.0500	0.15		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.8	52	0.1000	0.18		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
1.1	150	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	133	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	496	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	929	Total			

Summary for Subcatchment 4H: 4H

Runoff = 4.54 cfs @ 12.18 hrs, Volume= 0.415 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
3.400	71	Meadow, non-grazed, HSG C
3.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	75	0.1000	0.19		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.0	75	0.3300	0.31		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	150	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.7	285	0.0500	6.92	76.15	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 2.0 & 20.0 '/' Top.W=22.00' n= 0.030 Short grass
0.1	238	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00'

					n= 0.035
11.9	823	Total			

Summary for Subcatchment 4HA: 4HA

Runoff = 1.24 cfs @ 12.11 hrs, Volume= 0.095 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
0.780	71	Meadow, non-grazed, HSG C
0.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	142	0.3300	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4I: 4I

Runoff = 11.68 cfs @ 12.25 hrs, Volume= 1.211 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
9.930	71	Meadow, non-grazed, HSG C
9.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	200	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	290	0.0500	11.02	506.75	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=2.00' Z= 3.0 & 20.0 '/' Top.W=46.00' n= 0.030
0.3	442	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	1,082	Total			

Summary for Subcatchment 4IA: 4IA

Runoff = 1.51 cfs @ 12.10 hrs, Volume= 0.115 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
0.940	71	Meadow, non-grazed, HSG C
0.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	136	0.3333	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4J: 4J

Runoff = 14.45 cfs @ 12.26 hrs, Volume= 1.501 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
12.310	71	Meadow, non-grazed, HSG C
12.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	202	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.6	270	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	429	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.2	1,051	Total			

Summary for Subcatchment 4K: 4K

Runoff = 12.44 cfs @ 12.27 hrs, Volume= 1.325 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
10.870	71	Meadow, non-grazed, HSG C
10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
2.7	268	0.0555	1.65		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.6	267	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	410	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
18.4	1,095	Total			

Summary for Subcatchment 4L: 4L

Runoff = 9.51 cfs @ 12.21 hrs, Volume= 0.914 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
7.500	71	Meadow, non-grazed, HSG C
7.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	23	0.0500	0.12		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
9.9	127	0.1000	0.21		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	252	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	494	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
14.1	896	Total			

Summary for Subcatchment 4M: 4M

Runoff = 4.51 cfs @ 12.76 hrs, Volume= 0.777 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
4.262	70	Woods, Good, HSG C
0.900	98	Water Surface, HSG C
0.190	89	Gravel roads, HSG C
5.352	75	Weighted Average
4.452		83.18% Pervious Area
0.900		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.9	150	0.0333	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
7.5	474	0.0440	1.05		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	18	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
53.5	642	Total			

Summary for Subcatchment 4N: 4N

Runoff = 1.78 cfs @ 12.46 hrs, Volume= 0.234 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
0.743	70	Woods, Good, HSG C
1.178	71	Meadow, non-grazed, HSG C
1.921	71	Weighted Average
1.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	150	0.0200	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
9.0	580	0.0233	1.07		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
30.5	730	Total			

Summary for Subcatchment 4O: 4O

Runoff = 8.61 cfs @ 12.20 hrs, Volume= 0.803 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
3.900	70	Brush, Fair, HSG C
* 0.800	98	Paved and Gravel Shoulder
* 0.400	98	Detention Pond 10
5.100	77	Weighted Average
3.900		76.47% Pervious Area
1.200		23.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	55	0.3000	0.28		**Sheet Flow, SEGMENT AB** Grass: Dense n= 0.240 P2= 2.70"
4.0	289	0.0300	1.21		**Shallow Concentrated Flow, SEGMENT BC** Short Grass Pasture Kv= 7.0 fps
6.9	319	0.0120	0.77		**Shallow Concentrated Flow, SEGMENT CD** Short Grass Pasture Kv= 7.0 fps
14.2	663	Total			

Summary for Subcatchment 5: SC-5

Runoff = 13.44 cfs @ 14.71 hrs, Volume= 5.440 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
28.410	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
35.960	76	Weighted Average
35.815		99.60% Pervious Area
0.145		0.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Subcatchment P1A: SC-P1A

Runoff = 6.50 cfs @ 12.00 hrs, Volume= 0.428 af, Depth= 3.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Storm Rainfall=4.10"

	Area (sf)	CN	Description
*	49,872	98	Pond and Liner
	1,012	89	Gravel roads, HSG C
	14,516	79	Pasture/grassland/range, Fair, HSG C
	65,400	94	Weighted Average
	15,528		23.74% Pervious Area
	49,872		76.26% Impervious Area

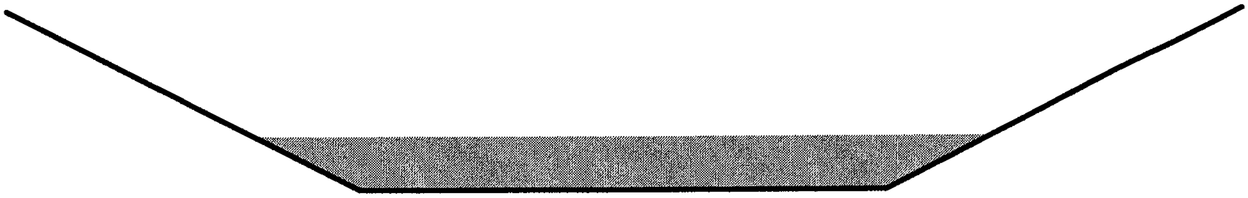
Summary for Reach 1R: DP-10 DITCH 1

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 14.21 cfs @ 12.30 hrs, Volume= 1.501 af
Outflow = 14.10 cfs @ 12.31 hrs, Volume= 1.501 af, Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 1.5 min

Peak Storage= 432 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 128.49 cfs

6.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 101.0' Slope= 0.0079 '/'
Inlet Invert= 212.30', Outlet Invert= 211.50'



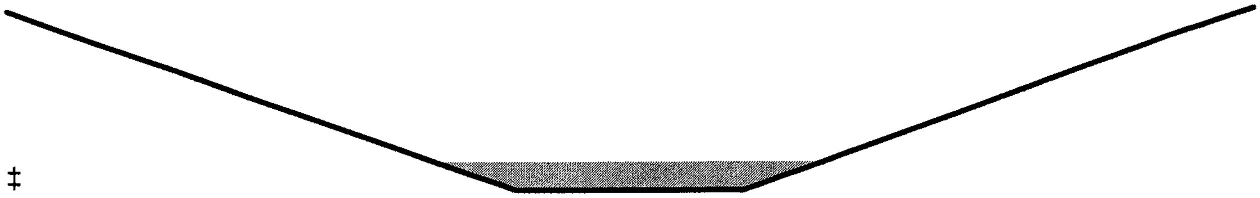
Summary for Reach 2R: E2C-DP9

Inflow Area = 5.805 ac, 11.13% Impervious, Inflow Depth = 2.06" for 10-yr Storm event
Inflow = 12.00 cfs @ 12.09 hrs, Volume= 0.995 af
Outflow = 11.40 cfs @ 12.16 hrs, Volume= 0.995 af, Atten= 5%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.49 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,521 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 3.00' Flow Area= 39.0 sf, Capacity= 488.04 cfs

4.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 590.0' Slope= 0.0169 '/'
Inlet Invert= 200.00', Outlet Invert= 190.00'



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Summary for Reach 3R: Overland Flow

Inflow Area = 20.700 ac, 1.27% Impervious, Inflow Depth = 1.53" for 10-yr Storm event
Inflow = 21.25 cfs @ 12.39 hrs, Volume= 2.637 af
Outflow = 21.22 cfs @ 12.39 hrs, Volume= 2.637 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 9.99 fps, Avg. Travel Time= 0.3 min

Peak Storage= 357 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.87 cfs

Custom stage-perimeter table, n= 0.035 Earth, dense weeds
100 Intermediate values determined by Multi-point interpolation
Length= 168.0' Slope= 0.0554 '/'
Inlet Invert= 201.30', Outlet Invert= 192.00'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	12.0	12.0	2,016	119.87

Summary for Reach 4HR-A: EAST PD - 4

Inflow Area = 0.780 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.24 cfs @ 12.11 hrs, Volume= 0.095 af
Outflow = 1.17 cfs @ 12.16 hrs, Volume= 0.095 af, Atten= 6%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.69 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 5.3 min

Peak Storage= 127 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.08 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 288.0' Slope= 0.0247 '/'
Inlet Invert= 209.00', Outlet Invert= 201.90'

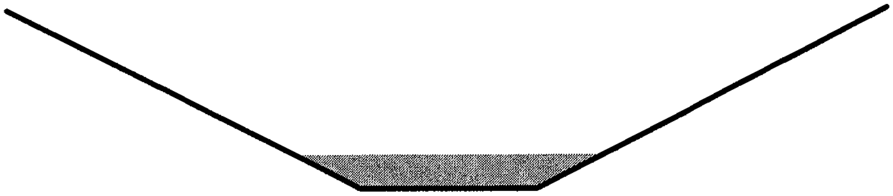
Summary for Reach 4HR-B: EAST PD - 5

Inflow Area = 4.180 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 5.42 cfs @ 12.19 hrs, Volume= 0.510 af
Outflow = 5.29 cfs @ 12.23 hrs, Volume= 0.510 af, Atten= 2%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.30 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.62 fps, Avg. Travel Time= 4.4 min

Peak Storage= 434 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 158.67 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 425.0' Slope= 0.0438 '/'
Inlet Invert= 201.90', Outlet Invert= 183.30'



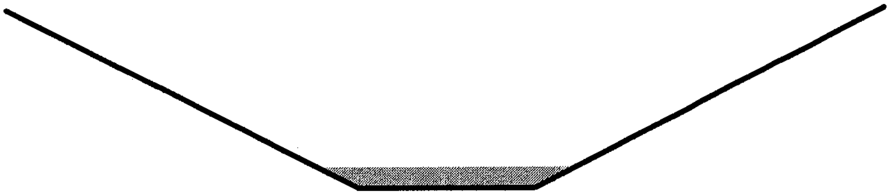
Summary for Reach 4IR-A: EAST PD - 2

Inflow Area = 0.940 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.51 cfs @ 12.10 hrs, Volume= 0.115 af
Outflow = 1.41 cfs @ 12.17 hrs, Volume= 0.115 af, Atten= 7%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.55 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.85 fps, Avg. Travel Time= 6.5 min

Peak Storage= 185 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 100.55 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 330.0' Slope= 0.0176 '/'
Inlet Invert= 218.70', Outlet Invert= 212.90'



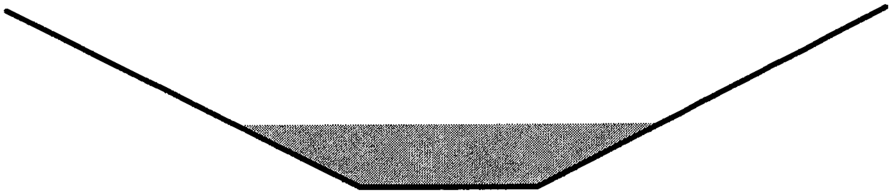
Summary for Reach 4IR-B: EAST PD - 3

Inflow Area =	10.870 ac,	0.00% Impervious, Inflow Depth = 1.46"	for 10-yr Storm event	
Inflow =	12.92 cfs @	12.25 hrs, Volume=	1.325 af	
Outflow =	12.84 cfs @	12.27 hrs, Volume=	1.325 af,	Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.36 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.88 fps, Avg. Travel Time= 1.9 min

Peak Storage= 507 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 113.47 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 210.0' Slope= 0.0224 '/'
Inlet Invert= 212.20', Outlet Invert= 207.50'



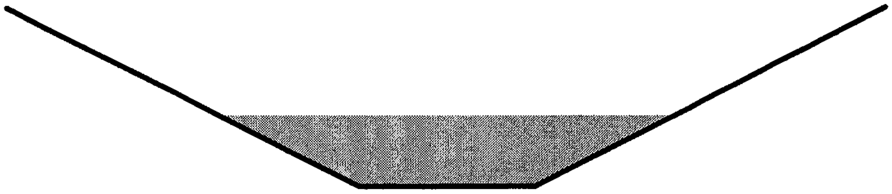
Summary for Reach 4JR: EAST PD 1

Inflow Area =	12.310 ac,	0.00% Impervious, Inflow Depth = 1.46"	for 10-yr Storm event	
Inflow =	14.45 cfs @	12.26 hrs, Volume=	1.501 af	
Outflow =	14.35 cfs @	12.27 hrs, Volume=	1.501 af,	Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.10 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 1.5 min

Peak Storage= 518 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.85 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 183.0' Slope= 0.0180 '/'
Inlet Invert= 222.00', Outlet Invert= 218.70'



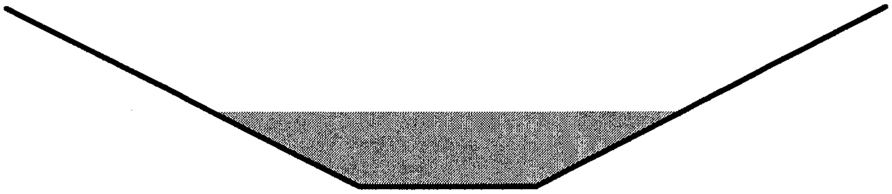
Summary for Reach 4R: DP-10 DITCH 3

Inflow Area = 23.180 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 26.13 cfs @ 12.32 hrs, Volume= 2.826 af
Outflow = 25.93 cfs @ 12.33 hrs, Volume= 2.826 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.43 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.10 fps, Avg. Travel Time= 1.4 min

Peak Storage= 805 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 162.94 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 260.0' Slope= 0.0462 '/'
Inlet Invert= 191.00', Outlet Invert= 179.00'



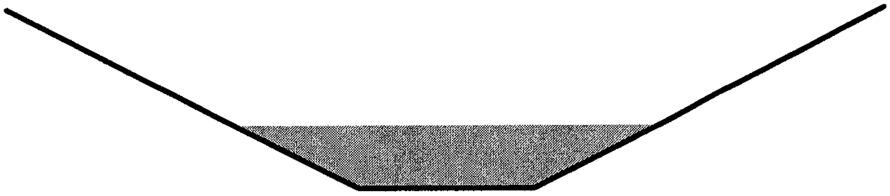
Summary for Reach 5R: NORTH PD-1

Inflow Area = 12.750 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 14.99 cfs @ 12.25 hrs, Volume= 1.554 af
Outflow = 14.64 cfs @ 12.33 hrs, Volume= 1.554 af, Atten= 2%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.16 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 2.28 fps, Avg. Travel Time= 6.8 min

Peak Storage= 2,233 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 131.18 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 936.0' Slope= 0.0299 '/'
Inlet Invert= 210.00', Outlet Invert= 182.00'



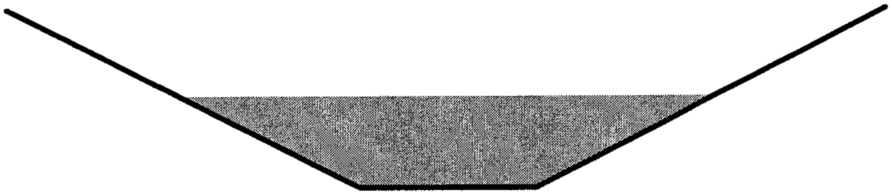
Summary for Reach 6R: NORTH PD-2

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 15.99 cfs @ 12.29 hrs, Volume= 1.706 af
Outflow = 15.76 cfs @ 12.34 hrs, Volume= 1.706 af, Atten= 1%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.88 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.52 fps, Avg. Travel Time= 4.0 min

Peak Storage= 1,493 cf @ 12.31 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 67.70 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 364.0' Slope= 0.0080 '/'
Inlet Invert= 202.90', Outlet Invert= 200.00'



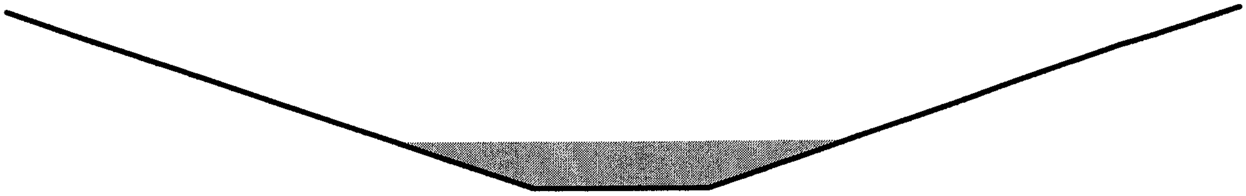
Summary for Reach 7R: DP-10R

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth > 1.33" for 10-yr Storm event
Inflow = 4.95 cfs @ 13.57 hrs, Volume= 3.144 af
Outflow = 4.91 cfs @ 13.81 hrs, Volume= 3.143 af, Atten= 1%, Lag= 14.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.60 fps, Min. Travel Time= 7.2 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 27.9 min

Peak Storage= 2,132 cf @ 13.69 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 88.21 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,130.0' Slope= 0.0248 '/'
Inlet Invert= 170.00', Outlet Invert= 142.00'



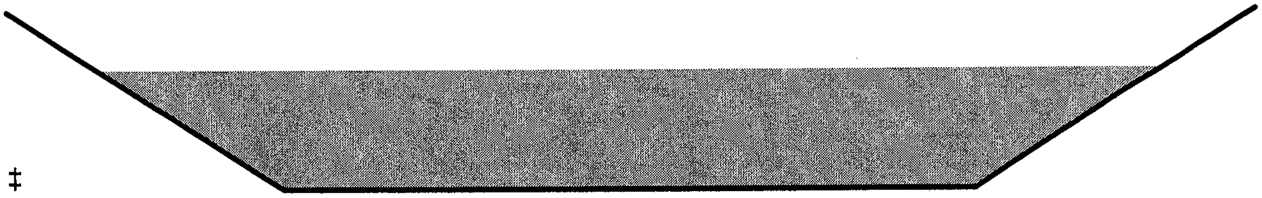
Summary for Reach 8R: EAST PD - 6

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 12.44 cfs @ 12.27 hrs, Volume= 1.325 af
Outflow = 12.21 cfs @ 12.34 hrs, Volume= 1.325 af, Atten= 2%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 6.6 min

Peak Storage= 1,527 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 25.35 cfs

5.00' x 1.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 9.00'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 222.00', Outlet Invert= 220.00'



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Summary for Reach 9R: LEVEL SPREADER DISCHARGE

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth > 1.07" for 10-yr Storm event
Inflow = 0.99 cfs @ 23.58 hrs, Volume= 2.949 af
Outflow = 0.99 cfs @ 24.30 hrs, Volume= 2.943 af, Atten= 0%, Lag= 43.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.17 fps, Min. Travel Time= 26.3 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 53.9 min

Peak Storage= 1,567 cf @ 23.86 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 11.46 cfs

20.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 273.0' Slope= 0.0623 '/'
Inlet Invert= 180.00', Outlet Invert= 163.00'

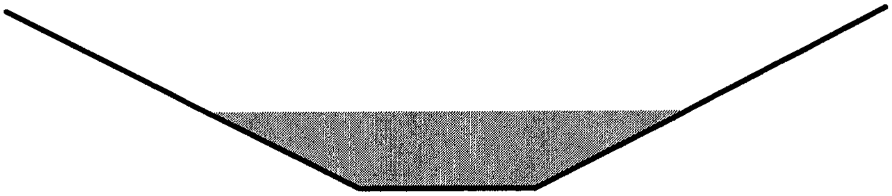
Summary for Reach 10R: Ditch 4B1

Inflow Area =	10.870 ac,	0.00% Impervious,	Inflow Depth = 1.46"	for 10-yr Storm event	
Inflow =	11.94 cfs @	12.38 hrs, Volume=	1.325 af		
Outflow =	11.80 cfs @	12.43 hrs, Volume=	1.325 af,	Atten= 1%,	Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.69 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 4.4 min

Peak Storage= 1,138 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 70.02 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 352.0' Slope= 0.0085 '/'
Inlet Invert= 213.50', Outlet Invert= 210.50'



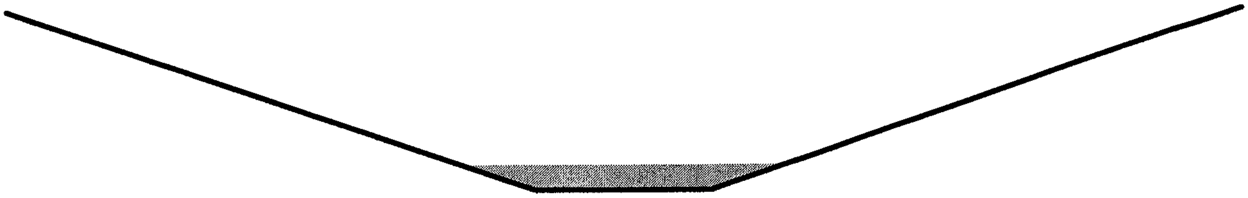
Summary for Reach 11R: DP-11R

Inflow Area =	22.282 ac,	4.04% Impervious,	Inflow Depth > 1.45"	for 10-yr Storm event	
Inflow =	1.18 cfs @	17.92 hrs, Volume=	2.687 af		
Outflow =	1.18 cfs @	18.26 hrs, Volume=	2.686 af,	Atten= 0%,	Lag= 20.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.49 fps, Min. Travel Time= 11.8 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 27.4 min

Peak Storage= 831 cf @ 18.06 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 71.30 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,050.0' Slope= 0.0162 '/'
Inlet Invert= 158.00', Outlet Invert= 141.00'



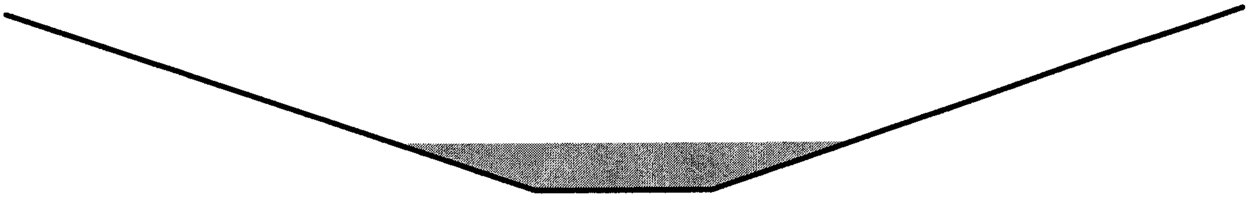
Summary for Reach 12R: 4FR

Inflow Area = 6.771 ac, 0.00% Impervious, Inflow Depth = 1.40" for 10-yr Storm event
Inflow = 3.77 cfs @ 13.04 hrs, Volume= 0.788 af
Outflow = 3.57 cfs @ 13.44 hrs, Volume= 0.788 af, Atten= 5%, Lag= 24.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.89 fps, Min. Travel Time= 13.4 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 37.2 min

Peak Storage= 2,873 cf @ 13.22 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 64.21 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,523.0' Slope= 0.0131 '/'
Inlet Invert= 161.00', Outlet Invert= 141.00'



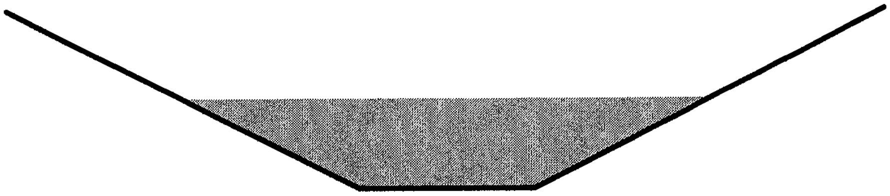
Summary for Reach 13R: Ex Ditch

Inflow Area = 18.370 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 18.62 cfs @ 12.38 hrs, Volume= 2.240 af
Outflow = 18.53 cfs @ 12.40 hrs, Volume= 2.240 af, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.62 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.71 fps, Avg. Travel Time= 2.2 min

Peak Storage= 906 cf @ 12.39 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 81.05 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 225.0' Slope= 0.0164 '/'
Inlet Invert= 209.70', Outlet Invert= 206.00'



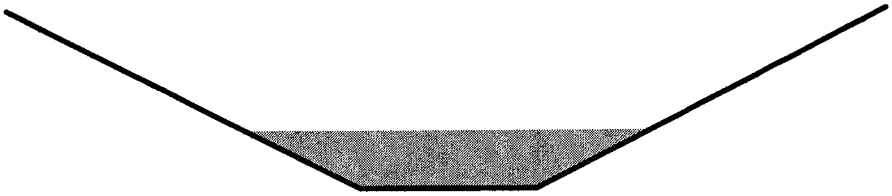
Summary for Reach 14R: DP-10 DITCH 2

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 14.07 cfs @ 12.32 hrs, Volume= 1.501 af
Outflow = 13.95 cfs @ 12.36 hrs, Volume= 1.501 af, Atten= 1%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.49 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.51 fps, Avg. Travel Time= 2.9 min

Peak Storage= 939 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 143.33 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 434.0' Slope= 0.0357 '/'
Inlet Invert= 209.00', Outlet Invert= 193.50'



Summary for Reach AP1: AP-1

Inflow Area = 135.571 ac, 2.88% Impervious, Inflow Depth = 1.24" for 10-yr Storm event
Inflow = 50.41 cfs @ 13.50 hrs, Volume= 13.974 af
Outflow = 50.41 cfs @ 13.50 hrs, Volume= 13.974 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: ANALYSIS POINT #2

Inflow Area = 74.320 ac, 3.55% Impervious, Inflow Depth = 1.60" for 10-yr Storm event
Inflow = 24.63 cfs @ 13.74 hrs, Volume= 9.905 af
Outflow = 24.63 cfs @ 13.74 hrs, Volume= 9.905 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: ANALYSIS POINT #3

Inflow Area = 270.330 ac, 1.32% Impervious, Inflow Depth = 1.60" for 10-yr Storm event
Inflow = 74.13 cfs @ 15.27 hrs, Volume= 36.035 af
Outflow = 74.13 cfs @ 15.27 hrs, Volume= 36.035 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

Inflow Area = 340.334 ac, 2.56% Impervious, Inflow Depth > 1.61" for 10-yr Storm event
Inflow = 84.71 cfs @ 15.06 hrs, Volume= 45.769 af
Outflow = 84.71 cfs @ 15.06 hrs, Volume= 45.769 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: ANALYSIS POINT #5

Inflow Area = 35.960 ac, 0.40% Impervious, Inflow Depth = 1.82" for 10-yr Storm event
Inflow = 13.44 cfs @ 14.71 hrs, Volume= 5.440 af
Outflow = 13.44 cfs @ 14.71 hrs, Volume= 5.440 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach E2R2: E2R2

Inflow Area = 1.921 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.77 cfs @ 12.47 hrs, Volume= 0.234 af
Outflow = 0.34 cfs @ 17.42 hrs, Volume= 0.234 af, Atten= 81%, Lag= 297.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 223.8 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 484.8 min

Peak Storage= 4,526 cf @ 13.69 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 132.12 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 4,356.0' Slope= 0.0094 '/'
Inlet Invert= 182.00', Outlet Invert= 141.00'

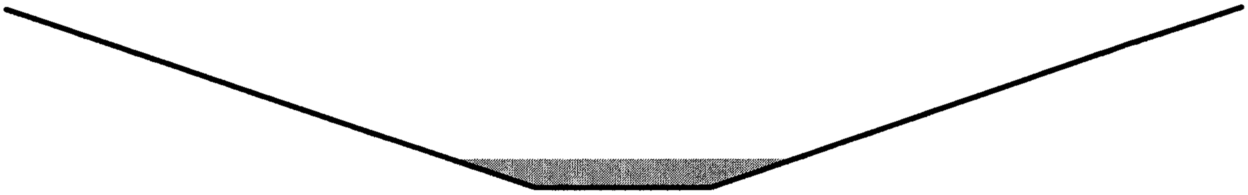
Summary for Reach E2R3: REACH TO AP

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth > 1.06" for 10-yr Storm event
Inflow = 0.99 cfs @ 24.30 hrs, Volume= 2.943 af
Outflow = 0.99 cfs @ 25.22 hrs, Volume= 2.936 af, Atten= 0%, Lag= 55.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.07 fps, Min. Travel Time= 33.7 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 63.8 min

Peak Storage= 2,012 cf @ 24.66 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 48.12 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 2,170.0' Slope= 0.0074 '/'
Inlet Invert= 158.00', Outlet Invert= 142.00'



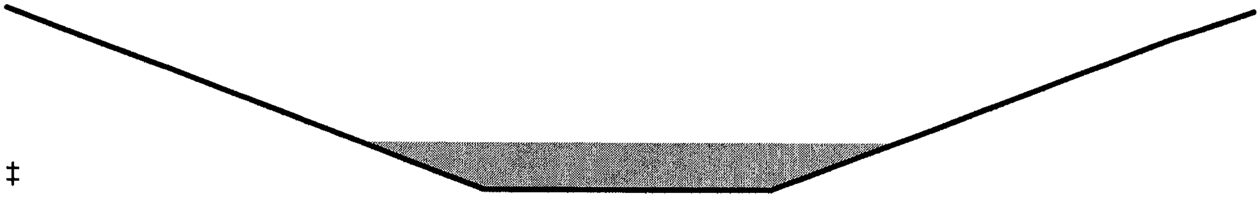
Summary for Reach E2R4: Reach to AP

Inflow Area = 92.419 ac, 5.17% Impervious, Inflow Depth > 1.27" for 10-yr Storm event
Inflow = 9.18 cfs @ 13.66 hrs, Volume= 9.788 af
Outflow = 8.62 cfs @ 14.22 hrs, Volume= 9.779 af, Atten= 6%, Lag= 33.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.97 fps, Min. Travel Time= 16.5 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 49.2 min

Peak Storage= 8,549 cf @ 13.94 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 131.94 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 963.0' Slope= 0.0094 '/'
Inlet Invert= 142.00', Outlet Invert= 132.96'



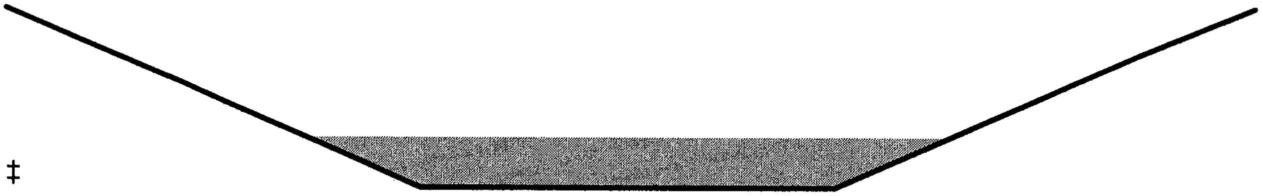
Summary for Reach R-1D: Reach R-1D

Inflow Area = 34.624 ac, 3.31% Impervious, Inflow Depth = 0.89" for 10-yr Storm event
Inflow = 5.91 cfs @ 13.04 hrs, Volume= 2.573 af
Outflow = 5.91 cfs @ 13.15 hrs, Volume= 2.573 af, Atten= 0%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.66 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 0.29 fps, Avg. Travel Time= 20.9 min

Peak Storage= 1,314 cf @ 13.09 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 67.93 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 370.0' Slope= 0.0324 '/'
Inlet Invert= 159.00', Outlet Invert= 147.00'



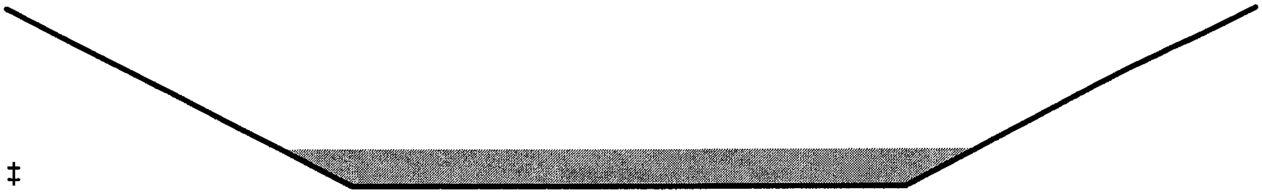
Summary for Reach R-1E: LEVEL SPREADER R-1E

Inflow Area = 10.745 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-yr Storm event
Inflow = 7.89 cfs @ 12.47 hrs, Volume= 1.371 af
Outflow = 7.88 cfs @ 12.51 hrs, Volume= 1.371 af, Atten= 0%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.11 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 6.6 min

Peak Storage= 783 cf @ 12.49 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 26.0 sf, Capacity= 135.95 cfs

16.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 36.00'
Length= 210.0' Slope= 0.0690 '/'
Inlet Invert= 161.50', Outlet Invert= 147.00'



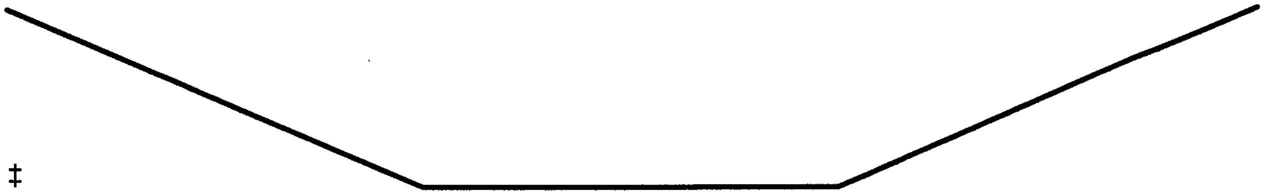
Summary for Reach R-1F: Reach R-1F

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.00" for 10-yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 49.21 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 940.0' Slope= 0.0170 '/'
Inlet Invert= 167.50', Outlet Invert= 151.50'



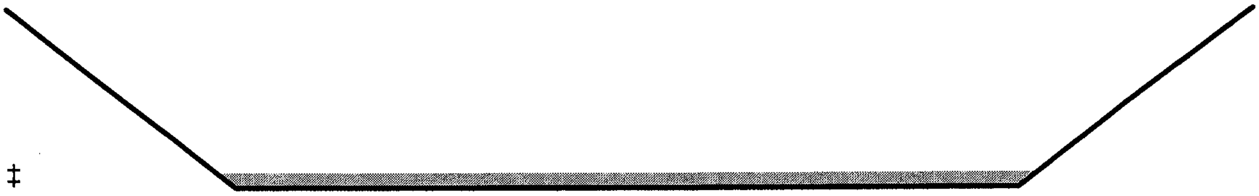
Summary for Reach R-1H: LEVEL SPREADER R-1H

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth = 2.21" for 10-yr Storm event
Inflow = 5.77 cfs @ 12.24 hrs, Volume= 0.557 af
Outflow = 5.67 cfs @ 12.28 hrs, Volume= 0.557 af, Atten= 2%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 4.7 min

Peak Storage= 488 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 1.00' Flow Area= 44.0 sf, Capacity= 411.95 cfs

34.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 54.00'
Length= 170.0' Slope= 0.0471 '/'
Inlet Invert= 182.00', Outlet Invert= 174.00'



Summary for Reach R-2F: Reach R2-F

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.00" for 10-yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 151.21 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 735.0' Slope= 0.0020 '/'
Inlet Invert= 151.50', Outlet Invert= 150.00'

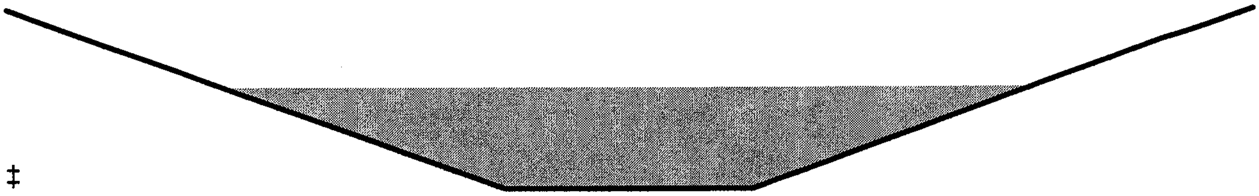
Summary for Reach R1: Reach 1

Inflow Area = 112.491 ac, 3.46% Impervious, Inflow Depth = 1.15" for 10-yr Storm event
Inflow = 38.57 cfs @ 13.37 hrs, Volume= 10.762 af
Outflow = 38.22 cfs @ 13.59 hrs, Volume= 10.762 af, Atten= 1%, Lag= 13.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.60 fps, Min. Travel Time= 7.3 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 51.9 min

Peak Storage= 16,759 cf @ 13.46 hrs
Average Depth at Peak Storage= 1.13'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 132.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 700.0' Slope= 0.0016 '/'
Inlet Invert= 146.30', Outlet Invert= 145.20'



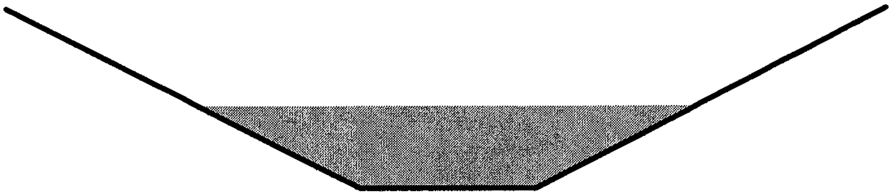
Summary for Reach R1B: LF TOE DITCH

```
Inflow Area =     13.169 ac,   0.00% Impervious,  Inflow Depth =  1.46"   for  10-yr Storm event
Inflow      =     15.37 cfs @  12.26 hrs,  Volume=          1.606 af
Outflow     =     15.08 cfs @  12.32 hrs,  Volume=          1.606 af,  Atten= 2%,  Lag= 3.9 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.29 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.63 fps, Avg. Travel Time= 5.5 min

Peak Storage= 1,906 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.92'
Defined Flood Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs

2.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 540.0' Slope= 0.0278 '/'
Inlet Invert= 181.00', Outlet Invert= 166.00'



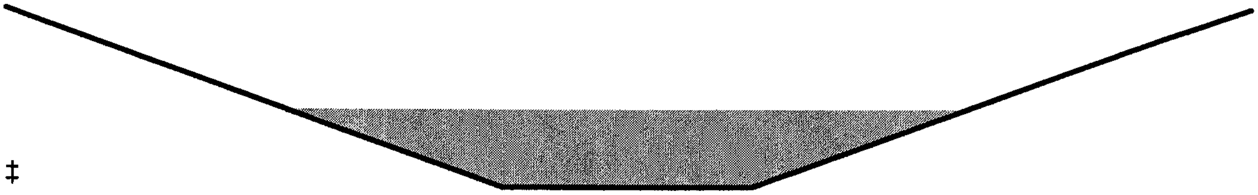
Summary for Reach R2: Reach 2

```
Inflow Area =     64.567 ac,   4.26% Impervious,  Inflow Depth =  1.13"   for  10-yr Storm event
Inflow      =     26.10 cfs @  13.15 hrs,  Volume=          6.094 af
Outflow     =     25.30 cfs @  13.49 hrs,  Volume=          6.094 af,  Atten= 3%,  Lag= 20.3 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.56 fps, Min. Travel Time= 11.2 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 42.2 min

Peak Storage= 17,037 cf @ 13.30 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,050.0' Slope= 0.0020 '/'
Inlet Invert= 148.40', Outlet Invert= 146.30'



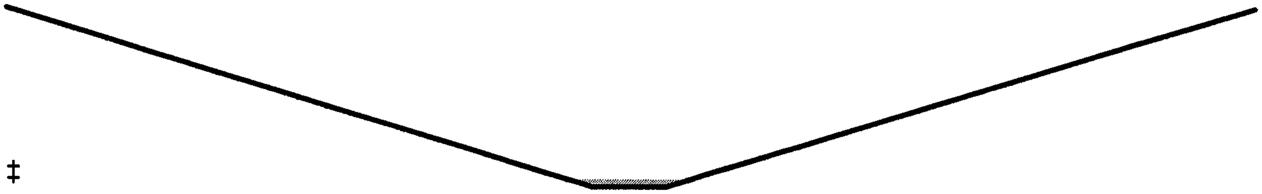
Summary for Reach R2A: Reach 2A

Inflow Area = 20.177 ac, 3.27% Impervious, Inflow Depth > 1.41" for 10-yr Storm event
Inflow = 1.34 cfs @ 17.11 hrs, Volume= 2.371 af
Outflow = 1.33 cfs @ 19.17 hrs, Volume= 2.370 af, Atten= 1%, Lag= 123.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.48 fps, Min. Travel Time= 68.2 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 136.7 min

Peak Storage= 5,426 cf @ 18.03 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00' Flow Area= 450.0 sf, Capacity= 1,358.84 cfs

25.00' x 2.00' deep channel, n= 0.060
Side Slope Z-value= 100.0 '/' Top Width= 425.00'
Length= 1,960.0' Slope= 0.0138 '/'
Inlet Invert= 179.00', Outlet Invert= 152.00'



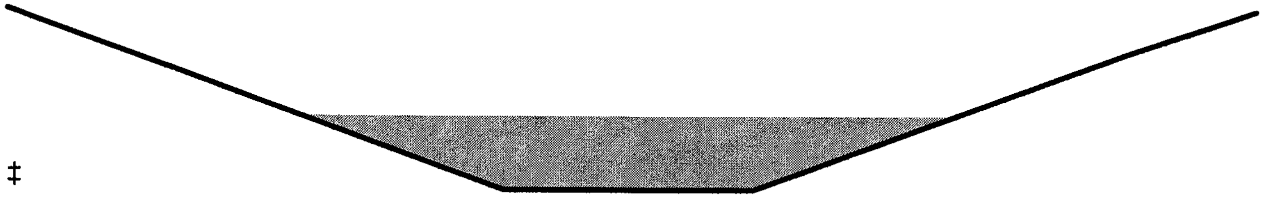
Summary for Reach R3: Reach 3

Inflow Area = 53.822 ac, 5.11% Impervious, Inflow Depth = 1.05" for 10-yr Storm event
Inflow = 22.65 cfs @ 13.00 hrs, Volume= 4.723 af
Outflow = 22.18 cfs @ 13.27 hrs, Volume= 4.723 af, Atten= 2%, Lag= 16.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.50 fps, Min. Travel Time= 8.9 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 27.2 min

Peak Storage= 11,795 cf @ 13.13 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 800.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 148.40'



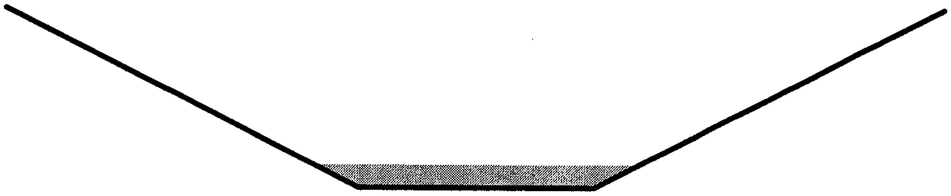
Summary for Reach R5a: Grass Lined Ditch

Inflow Area = 9.334 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 11.05 cfs @ 12.25 hrs, Volume= 1.138 af
Outflow = 10.99 cfs @ 12.26 hrs, Volume= 1.138 af, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.16 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.21 fps, Avg. Travel Time= 1.5 min

Peak Storage= 359 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 572.96 cfs

4.00' x 3.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 200.0' Slope= 0.0500 '/'
Inlet Invert= 176.00', Outlet Invert= 166.00'



Summary for Pond 1P: Culvert - 4JB & FJC

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 14.10 cfs @ 12.31 hrs, Volume= 1.501 af
Outflow = 14.07 cfs @ 12.32 hrs, Volume= 1.501 af, Atten= 0%, Lag= 0.9 min
Primary = 14.07 cfs @ 12.32 hrs, Volume= 1.501 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 211.35' @ 12.32 hrs Surf.Area= 918 sf Storage= 648 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.8 min (871.0 - 870.2)

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	3,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	43	0	0
212.00	1,340	1,383	1,383
213.00	3,600	2,470	3,853

Device	Routing	Invert	Outlet Devices
#1	Primary	210.00'	**24.0" Round Culvert X 2.00** L= 73.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 210.00' / 209.00' S= 0.0137 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=13.97 cfs @ 12.32 hrs HW=211.34' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 13.97 cfs @ 3.11 fps)

Summary for Pond 4IAC: Culvert - 4IA

Inflow Area = 0.940 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.41 cfs @ 12.17 hrs, Volume= 0.115 af
Outflow = 1.33 cfs @ 12.21 hrs, Volume= 0.115 af, Atten= 6%, Lag= 2.4 min
Primary = 1.33 cfs @ 12.21 hrs, Volume= 0.115 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 213.49' @ 12.21 hrs Surf.Area= 555 sf Storage= 236 cf

Plug-Flow detention time= 6.5 min calculated for 0.115 af (100% of inflow)
Center-of-Mass det. time= 6.5 min (869.8 - 863.3)

Volume	Invert	Avail.Storage	Storage Description
#1	212.90'	1,559 cf	**2.00'W x 125.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	212.90'	**18.0" Round Culvert - 4IA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 212.90' / 212.20' S= 0.0175 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.31 cfs @ 12.21 hrs HW=213.48' (Free Discharge)
↑—**1=Culvert - 4IA** (Inlet Controls 1.31 cfs @ 2.05 fps)

Summary for Pond 8P: Ex Pond

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth > 1.36" for 10-yr Storm event
Inflow = 4.96 cfs @ 13.51 hrs, Volume= 3.212 af
Outflow = 4.95 cfs @ 13.57 hrs, Volume= 3.144 af, Atten= 0%, Lag= 3.4 min
Primary = 4.95 cfs @ 13.57 hrs, Volume= 3.144 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 172.19' @ 13.57 hrs Surf.Area= 4,538 sf Storage= 4,248 cf

Plug-Flow detention time= 170.1 min calculated for 3.143 af (98% of inflow)

Center-of-Mass det. time= 24.5 min (1,612.8 - 1,588.3)

Volume	Invert	Avail.Storage	Storage Description
#1	171.20'	4,765 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.20	3,900	0	0
172.00	4,600	3,400	3,400
172.30	4,500	1,365	4,765

Device	Routing	Invert	Outlet Devices
#1	Primary	171.90'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=4.95 cfs @ 13.57 hrs HW=172.19' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 4.95 cfs @ 1.44 fps)

Summary for Pond C-2B-A: Culvert - 2BA

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 16.29 cfs @ 12.26 hrs, Volume= 1.706 af
Outflow = 15.99 cfs @ 12.29 hrs, Volume= 1.706 af, Atten= 2%, Lag= 1.6 min
Primary = 15.99 cfs @ 12.29 hrs, Volume= 1.706 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 205.04' @ 12.29 hrs Surf.Area= 1,273 sf Storage= 1,200 cf

Plug-Flow detention time= 0.8 min calculated for 1.706 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (867.7 - 866.9)

Volume	Invert	Avail.Storage	Storage Description
#1	203.50'	1,859 cf	**2.00'W x 150.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	203.20'	**36.0" Round Culvert - 2BA** L= 40.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 203.20' / 202.90' S= 0.0075 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Secondary	205.00'	**4.0' long x 2.0' breadth Southern Ditch High Water Outlet X 0.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=15.89 cfs @ 12.29 hrs HW=205.03' (Free Discharge)
↑—**1=Culvert - 2BA** (Barrel Controls 15.89 cfs @ 5.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=203.50' (Free Discharge)
↑—**2=Southern Ditch High Water Outlet**(Controls 0.00 cfs)

Summary for Pond C-4F: Culvert - 4F

Inflow Area =	6.771 ac,	0.00% Impervious,	Inflow Depth = 1.40"	for 10-yr Storm event	
Inflow =	3.79 cfs @	12.98 hrs,	Volume=	0.788 af	
Outflow =	3.77 cfs @	13.04 hrs,	Volume=	0.788 af,	Atten= 1%, Lag= 3.6 min
Primary =	3.77 cfs @	13.04 hrs,	Volume=	0.788 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 166.07' @ 13.04 hrs Surf.Area= 0.025 ac Storage= 0.018 af

Plug-Flow detention time= 4.8 min calculated for 0.788 af (100% of inflow)
Center-of-Mass det. time= 4.9 min (922.1 - 917.3)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	0.047 af	**4.00'W x 96.00'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**18.0" Round Culvert - 4F** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 165.00' / 162.00' S= 0.0385 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=3.77 cfs @ 13.04 hrs HW=166.07' (Free Discharge)
↑—**1=Culvert - 4F** (Inlet Controls 3.77 cfs @ 2.78 fps)

Summary for Pond C-4K: Catch Basin - 4K

Inflow Area =	10.870 ac,	0.00% Impervious,	Inflow Depth = 1.46"	for 10-yr Storm event	
Inflow =	12.21 cfs @	12.34 hrs,	Volume=	1.325 af	
Outflow =	11.94 cfs @	12.38 hrs,	Volume=	1.325 af,	Atten= 2%, Lag= 2.5 min
Primary =	11.94 cfs @	12.38 hrs,	Volume=	1.325 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 220.60' @ 12.38 hrs Surf.Area= 4,088 sf Storage= 2,052 cf

Plug-Flow detention time= 4.7 min calculated for 1.325 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (878.4 - 873.8)

Volume	Invert	Avail.Storage	Storage Description
#1	220.00'	3,865 cf	**5.00'W x 550.00'L x 1.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	216.50'	**24.0" Round Culvert - 4K** L= 51.0' CPP, square edge headwall, Ke= 0.500

			Inlet / Outlet Invert= 216.50' / 214.30' S= 0.0431 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	220.00'	**30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.87 cfs @ 12.38 hrs HW=220.60' (Free Discharge)
└─**1=Culvert - 4K** (Passes 11.87 cfs of 26.62 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 11.87 cfs @ 2.53 fps)

Summary for Pond C4B: Culvert - 4BA & 4BB

Inflow Area = 20.700 ac, 1.27% Impervious, Inflow Depth = 1.53" for 10-yr Storm event
Inflow = 21.27 cfs @ 12.38 hrs, Volume= 2.637 af
Outflow = 21.25 cfs @ 12.39 hrs, Volume= 2.637 af, Atten= 0%, Lag= 0.5 min
Primary = 21.25 cfs @ 12.39 hrs, Volume= 2.637 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 206.18' @ 12.39 hrs Surf.Area= 539 sf Storage= 92 cf

Plug-Flow detention time= 0.0 min calculated for 2.636 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (872.7 - 872.7)

Volume	Invert	Avail.Storage	Storage Description
#1	204.40'	11,197 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
204.40	0	0	0
206.00	47	38	38
208.00	5,375	5,422	5,460
209.00	6,100	5,738	11,197

Device	Routing	Invert	Outlet Devices
#1	Primary	204.40'	**24.0" Round Culvert - 4B X 2.00** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 204.40' / 203.70' S= 0.0090 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=21.19 cfs @ 12.39 hrs HW=206.18' (Free Discharge)
└─**1=Culvert - 4B** (Inlet Controls 21.19 cfs @ 3.59 fps)

Summary for Pond C4H-A: Culvert 4H-A

Inflow Area = 0.780 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.17 cfs @ 12.16 hrs, Volume= 0.095 af
Outflow = 0.96 cfs @ 12.24 hrs, Volume= 0.095 af, Atten= 18%, Lag= 4.8 min
Primary = 0.96 cfs @ 12.24 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Peak Elev= 202.39' @ 12.24 hrs Surf.Area= 1,120 sf Storage= 414 cf

Plug-Flow detention time= 15.8 min calculated for 0.095 af (100% of inflow)
Center-of-Mass det. time= 15.9 min (878.4 - 862.4)

Volume	Invert	Avail.Storage	Storage Description
#1	201.90'	3,419 cf	**2.00'W x 280.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	201.90'	**18.0" Round Culvert - 4HA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 201.90' / 200.90' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.95 cfs @ 12.24 hrs HW=202.39' (Free Discharge)
↑—**1=Culvert - 4HA** (Inlet Controls 0.95 cfs @ 1.88 fps)

Summary for Pond C4N: Culvert 4N

Inflow Area = 1.921 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 1.78 cfs @ 12.46 hrs, Volume= 0.234 af
Outflow = 1.77 cfs @ 12.47 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.9 min
Primary = 1.77 cfs @ 12.47 hrs, Volume= 0.234 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 184.69' @ 12.47 hrs Surf.Area= 0.006 ac Storage= 0.003 af

Plug-Flow detention time= 2.0 min calculated for 0.234 af (100% of inflow)
Center-of-Mass det. time= 2.0 min (880.9 - 878.9)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	0.015 af	**2.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	184.00'	**18.0" Round 18-in Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.00' / 183.00' S= 0.0303 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.77 cfs @ 12.47 hrs HW=184.69' (Free Discharge)
↑—**1=18-in Culvert** (Inlet Controls 1.77 cfs @ 2.23 fps)

Summary for Pond CB-2B-B: Catch Basin - 2BB

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 15.76 cfs @ 12.34 hrs, Volume= 1.706 af
Outflow = 15.73 cfs @ 12.35 hrs, Volume= 1.706 af, Atten= 0%, Lag= 0.5 min
Primary = 15.73 cfs @ 12.35 hrs, Volume= 1.706 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Peak Elev= 200.44' @ 12.35 hrs Surf.Area= 597 sf Storage= 121 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (872.0 - 872.0)

Volume	Invert	Avail.Storage	Storage Description
#1	200.20'	2,459 cf	**2.00'W x 200.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	195.00'	**24.0" Round Culvert - 2BB** L= 96.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 195.00' / 194.00' S= 0.0104 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	200.00'	**30.0" Horiz. Orifice/Grate** C= 0.600

Primary OutFlow Max=15.70 cfs @ 12.35 hrs HW=200.44' (Free Discharge)
↑—**1=Culvert - 2BB** (Passes 15.70 cfs of 31.88 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 15.70 cfs @ 3.20 fps)

Summary for Pond CB-4G: Catch Basin - 4G

Inflow Area =	12.750 ac,	0.00% Impervious, Inflow Depth =	1.46"	for 10-yr Storm event
Inflow =	14.64 cfs @	12.33 hrs, Volume=	1.554 af	
Outflow =	14.58 cfs @	12.35 hrs, Volume=	1.554 af,	Atten= 0%, Lag= 1.3 min
Primary =	14.58 cfs @	12.35 hrs, Volume=	1.554 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 181.93' @ 12.35 hrs Surf.Area= 580 sf Storage= 331 cf

Plug-Flow detention time= 0.4 min calculated for 1.554 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (873.9 - 873.5)

Volume	Invert	Avail.Storage	Storage Description
#1	181.00'	1,256 cf	**2.00'W x 71.00'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	175.00'	**24.0" Round Culvert - 4G** L= 36.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.00' / 174.00' S= 0.0278 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	181.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=14.55 cfs @ 12.35 hrs HW=181.93' (Free Discharge)
↑—**1=Culvert - 4G** (Passes 14.55 cfs of 36.82 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 14.55 cfs @ 4.63 fps)

Summary for Pond CB-4HB: Catch Basin - 4HB

Inflow Area = 4.180 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 5.29 cfs @ 12.23 hrs, Volume= 0.510 af
Outflow = 5.29 cfs @ 12.23 hrs, Volume= 0.510 af, Atten= 0%, Lag= 0.1 min
Primary = 5.29 cfs @ 12.23 hrs, Volume= 0.510 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 183.70' @ 12.23 hrs Surf.Area= 96 sf Storage= 29 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (868.9 - 868.7)

Volume	Invert	Avail.Storage	Storage Description
#1	183.30'	359 cf	**2.00'W x 25.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 2	183.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	178.50'	**18.0" Round Culvert - 4HB** L= 101.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 178.50' / 176.00' S= 0.0248 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=5.23 cfs @ 12.23 hrs HW=183.70' (Free Discharge)
↑—**2=Culvert - 4HB** (Passes 5.23 cfs of 17.95 cfs potential flow)
  ↑—**1=Orifice/Grate** (Weir Controls 5.23 cfs @ 2.07 fps)

Summary for Pond CB-4I: Catch Basin - 4I

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-yr Storm event
Inflow = 12.84 cfs @ 12.27 hrs, Volume= 1.325 af
Outflow = 12.83 cfs @ 12.27 hrs, Volume= 1.325 af, Atten= 0%, Lag= 0.3 min
Primary = 12.83 cfs @ 12.27 hrs, Volume= 1.325 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 208.33' @ 12.27 hrs Surf.Area= 0.013 ac Storage= 0.007 af

Plug-Flow detention time= 1.0 min calculated for 1.325 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (869.2 - 868.6)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	0.029 af	**2.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	202.50'	**18.0" Round Culvert - 4I** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 202.50' / 192.00' S= 0.1313 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	207.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.69 cfs @ 12.27 hrs HW=208.33' TW=194.33' (TW follows 14.00' below HW)
↑—**1=Culvert - 4I** (Passes 12.69 cfs of 19.17 cfs potential flow)
  ↑—**2=Orifice/Grate** (Weir Controls 12.69 cfs @ 2.79 fps)

Summary for Pond CB-4JA: Catch Basin - 4JA

Inflow Area =	12.310 ac,	0.00% Impervious,	Inflow Depth = 1.46"	for 10-yr Storm event
Inflow =	14.35 cfs @	12.27 hrs, Volume=	1.501 af	
Outflow =	14.21 cfs @	12.30 hrs, Volume=	1.501 af,	Atten= 1%, Lag= 1.4 min
Primary =	14.21 cfs @	12.30 hrs, Volume=	1.501 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 219.58' @ 12.30 hrs Surf.Area= 0.015 ac Storage= 0.009 af

Plug-Flow detention time= 0.5 min calculated for 1.500 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (868.7 - 868.2)

Volume	Invert	Avail.Storage	Storage Description
#1	218.70'	0.032 af	**2.00'W x 113.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	214.00'	**18.0" Round Culvert - 4JA** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.00' / 212.30' S= 0.0283 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	218.70'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=14.18 cfs @ 12.30 hrs HW=219.58' TW=212.58' (TW follows 7.00' below HW)
↑—**1=Culvert - 4JA** (Passes 14.18 cfs of 18.70 cfs potential flow)
  ↑—**2=Orifice/Grate** (Orifice Controls 14.18 cfs @ 4.51 fps)

Summary for Pond CB-4L: Catch Basin - 4L

Inflow Area =	7.500 ac,	0.00% Impervious,	Inflow Depth = 1.46"	for 10-yr Storm event
Inflow =	9.51 cfs @	12.21 hrs, Volume=	0.914 af	
Outflow =	9.37 cfs @	12.23 hrs, Volume=	0.914 af,	Atten= 1%, Lag= 1.3 min
Primary =	9.37 cfs @	12.23 hrs, Volume=	0.914 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 215.59' @ 12.23 hrs Surf.Area= 1,695 sf Storage= 946 cf

Plug-Flow detention time= 3.1 min calculated for 0.914 af (100% of inflow)
Center-of-Mass det. time= 3.1 min (866.8 - 863.6)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	3,683 cf	**30.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

```
Device  Routing       Invert  Outlet Devices
  #1    Primary      213.00'  18.0" Round Culvert 4L
                              L= 121.0'  CMP, square edge headwall,  Ke= 0.500
                              Inlet / Outlet Invert= 213.00' / 211.00'  S= 0.0165 '/'  Cc= 0.900
                              n= 0.011,  Flow Area= 1.77 sf
  #2    Device 1     215.00'  24.0" Horiz. Orifice-Top of catch basin  C= 0.600
                              Limited to weir flow at low heads

Primary OutFlow Max=9.27 cfs @ 12.23 hrs  HW=215.59'  (Free Discharge)
 └─1=Culvert 4L (Passes 9.27 cfs of 11.54 cfs potential flow)
    └─2=Orifice-Top of catch basin (Weir Controls 9.27 cfs @ 2.51 fps)
```

Summary for Pond D-1G: (2)24" Culverts P-6h

```
Inflow Area =     11.290 ac,   0.00% Impervious,  Inflow Depth =   1.53"    for  10-yr Storm event
Inflow      =     15.60 cfs @   12.19 hrs,  Volume=          1.440 af
Outflow     =     15.45 cfs @   12.20 hrs,  Volume=          1.440 af,  Atten= 1%,  Lag= 0.6 min
Primary     =     15.45 cfs @   12.20 hrs,  Volume=          1.440 af
Secondary =        0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 184.43' @ 12.20 hrs   Surf.Area= 573 sf   Storage= 416 cf
Flood Elev= 185.00'   Surf.Area= 800 sf   Storage= 805 cf

Plug-Flow detention time= 0.5 min calculated for 1.440 af (100% of inflow)
Center-of-Mass det. time= 0.4 min ( 859.9 - 859.5 )

Volume       Invert    Avail.Storage   Storage Description
  #1        183.00'         3,305 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation        Surf.Area          Inc.Store        Cum.Store
    (feet)           (sq-ft)       (cubic-feet)     (cubic-feet)
   183.00                10                  0                0
   184.00               400                205              205
   186.00             1,200              1,600            1,805
   187.00             1,800              1,500            3,305

Device  Routing       Invert  Outlet Devices
  #1    Primary      183.00'  24.0" Round (2)24"-Culvert X 2.00
                              L= 56.0'  CMP, projecting, no headwall,  Ke= 0.900
                              Inlet / Outlet Invert= 183.00' / 182.00'  S= 0.0179 '/'  Cc= 0.900
                              n= 0.025  Corrugated metal,  Flow Area= 3.14 sf
  #2    Secondary    184.50'  10.0' long  x 4.0' breadth Broad-Crested Rectangular Weir
                              Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60  1.80  2.00
                              2.50  3.00  3.50  4.00  4.50  5.00  5.50
                              Coef. (English) 2.38  2.54  2.69  2.68  2.67  2.67  2.65  2.66  2.66
                              2.68  2.72  2.73  2.76  2.79  2.88  3.07  3.32
```

Primary OutFlow Max=15.44 cfs @ 12.20 hrs HW=184.43' (Free Discharge)
↑—**1=(2)24"-Culvert** (Barrel Controls 15.44 cfs @ 4.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=183.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond D-1H: LF TOE DITCH - CULVERT

```
Inflow Area =      3.030 ac,  0.00% Impervious, Inflow Depth =  2.21"   for  10-yr Storm event
Inflow     =      5.84 cfs @  12.22 hrs, Volume=          0.557 af
Outflow    =      5.77 cfs @  12.24 hrs, Volume=          0.557 af, Atten= 1%, Lag= 1.4 min
Primary    =      5.77 cfs @  12.24 hrs, Volume=          0.557 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 184.35' @ 12.24 hrs Surf.Area= 399 sf Storage= 594 cf
Flood Elev= 186.00' Surf.Area= 858 sf Storage= 1,323 cf

Plug-Flow detention time= 4.6 min calculated for 0.557 af (100% of inflow)
Center-of-Mass det. time= 4.5 min (840.9 - 836.5)

Volume	Invert	Avail.Storage	Storage Description
#1	183.00'	1,323 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
183.00	24	0	0
186.00	858	1,323	1,323

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	**18.0" Round Culvert-C-1H** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 183.00' / 182.50' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.73 cfs @ 12.24 hrs HW=184.34' (Free Discharge)
↑—**1=Culvert-C-1H** (Barrel Controls 5.73 cfs @ 4.55 fps)

Summary for Pond DP-1: Detention Pond 1

```
Inflow Area =     34.624 ac,  3.31% Impervious, Inflow Depth =  1.09"   for  10-yr Storm event
Inflow     =     28.22 cfs @  12.29 hrs, Volume=          3.131 af
Outflow    =      5.91 cfs @  13.04 hrs, Volume=          2.573 af, Atten= 79%, Lag= 45.1 min
Primary    =      5.91 cfs @  13.04 hrs, Volume=          2.573 af
Secondary  =      0.00 cfs @   0.00 hrs, Volume=          0.000 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 164.02' @ 13.04 hrs Surf.Area= 17,108 sf Storage= 55,211 cf

Plug-Flow detention time= 222.9 min calculated for 2.573 af (82% of inflow)
Center-of-Mass det. time= 138.3 min (1,023.4 - 885.1)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	115,245 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	10,750	0	0
162.00	13,540	24,290	24,290
164.00	17,070	30,610	54,900
165.00	19,300	18,185	73,085
166.00	21,310	20,305	93,390
167.00	22,400	21,855	115,245

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**30.0" Round 30" Culvert** L= 75.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 162.00' / 159.50' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	162.00'	**12.0" Vert. Orifice on side** C= 0.600
#3	Device 1	162.00'	**6.0" Vert. Orifice on side** C= 0.600
#4	Device 1	165.50'	**72.0" Horiz. Orifice-Top of drop inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	166.00'	**40.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.91 cfs @ 13.04 hrs HW=164.02' (Free Discharge)
- **1=30" Culvert** (Passes 5.91 cfs of 16.20 cfs potential flow)
  - **2=Orifice on side** (Orifice Controls 4.66 cfs @ 5.93 fps)
  - **3=Orifice on side** (Orifice Controls 1.26 cfs @ 6.40 fps)
  - **4=Orifice-Top of drop inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=160.00' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond DP-10: DETENTION POND 10

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth = 1.54" for 10-yr Storm event
Inflow = 32.93 cfs @ 12.31 hrs, Volume= 3.629 af
Outflow = 4.96 cfs @ 13.51 hrs, Volume= 3.212 af, Atten= 85%, Lag= 72.2 min
Primary = 3.56 cfs @ 13.51 hrs, Volume= 1.042 af
Secondary = 1.40 cfs @ 13.51 hrs, Volume= 2.169 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 179.16' @ 13.51 hrs Surf.Area= 24,319 sf Storage= 79,803 cf
Flood Elev= 181.00' Surf.Area= 28,500 sf Storage= 128,200 cf

Plug-Flow detention time= 773.3 min calculated for 3.211 af (88% of inflow)
Center-of-Mass det. time= 720.9 min (1,588.3 - 867.4)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	157,950 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	7,900	0	0
176.00	18,000	12,950	12,950
178.00	22,000	40,000	52,950
180.00	26,000	48,000	100,950
182.00	31,000	57,000	157,950

Device	Routing	Invert	Outlet Devices
#1	Device 3	179.00'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	178.00'	**6.0" Vert. 6-in Orifice** C= 0.600
#3	Primary	175.20'	**18.0" Round 18-in Primary Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.20' / 172.00' S= 0.0615 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	173.50'	**5.8" Round 6-in Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.50' / 172.30' S= 0.0200 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	177.00'	**5.8" Horiz. Orifice Top** C= 0.600 Limited to weir flow at low heads
#6	Device 4	176.20'	**1.5" Vert. Orifice Side** C= 0.600
#7	Tertiary	180.00'	**10.0' long x 22.0' breadth E-Spillway Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

```
Primary OutFlow Max=3.52 cfs @ 13.51 hrs HW=179.16' (Free Discharge)
└─3=18-in Primary Culvert (Passes 3.52 cfs of 15.24 cfs potential flow)
   ├─1=Orifice/Grate (Weir Controls 2.62 cfs @ 1.31 fps)
   └─2=6-in Orifice (Orifice Controls 0.90 cfs @ 4.59 fps)

Secondary OutFlow Max=1.40 cfs @ 13.51 hrs HW=179.16' (Free Discharge)
└─4=6-in Culvert (Passes 1.40 cfs of 1.59 cfs potential flow)
   ├─5=Orifice Top (Orifice Controls 1.30 cfs @ 7.08 fps)
   └─6=Orifice Side (Orifice Controls 0.10 cfs @ 8.20 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─7=E-Spillway Weir ( Controls 0.00 cfs)
```

Summary for Pond DP-11: Detention Pond 11

```
Inflow Area =    22.282 ac,  4.04% Impervious, Inflow Depth =  1.53"   for  10-yr Storm event
Inflow      =   21.28 cfs @  12.35 hrs, Volume=        2.841 af
Outflow     =    1.18 cfs @  17.92 hrs, Volume=        2.687 af, Atten= 94%, Lag= 334.6 min
Primary     =    0.00 cfs @   0.00 hrs, Volume=        0.000 af
Secondary =      1.18 cfs @  17.92 hrs, Volume=        2.687 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2

```
Peak Elev= 166.87' @ 17.92 hrs   Surf.Area= 36,691 sf   Storage= 82,513 cf

Plug-Flow detention time= 1,190.5 min calculated for 2.686 af (95% of inflow)
Center-of-Mass det. time= 1,163.6 min ( 2,040.7 - 877.1 )

Volume      Invert    Avail.Storage  Storage Description
  #1       163.00'       211,750 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation        Surf.Area        Inc.Store       Cum.Store
   (feet)           (sq-ft)      (cubic-feet)     (cubic-feet)
   163.00            2,000                0               0
   164.00           10,900            6,450           6,450
   166.00           34,300           45,200          51,650
   168.00           39,800           74,100         125,750
   170.00           46,200           86,000         211,750

Device  Routing        Invert   Outlet Devices
  #1    Device 3      167.50'   6.0" Vert. 6-In Orifice Side (Riser)  C= 0.600
  #2    Device 3      168.40'   48.0" Horiz. Grate Top (Riser)  C= 0.600
                                Limited to weir flow at low heads
  #3    Primary       164.30'   18.0"  Round 18-In Culvert
                                L= 92.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 164.30' / 162.00'  S= 0.0250 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 1.77 sf
  #4    Secondary     161.50'   5.8"  Round 6-In Culvert
                                L= 137.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 161.50' / 160.00'  S= 0.0109 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.18 sf
  #5    Device 4      165.10'   5.8" Horiz. Orifice Top (6-in Culv)  C= 0.600
                                Limited to weir flow at low heads
  #6    Device 4      164.00'   1.5" Vert. Orifice Side (6-in Culv) X 1.50  C= 0.600

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=163.00'   (Free Discharge)
 └─3=18-In Culvert ( Controls 0.00 cfs)
     ├─1=6-In Orifice Side (Riser) ( Controls 0.00 cfs)
     └─2=Grate Top (Riser) ( Controls 0.00 cfs)

Secondary OutFlow Max=1.18 cfs @ 17.92 hrs  HW=166.87'   (Free Discharge)
 └─4=6-In Culvert (Barrel Controls 1.18 cfs @ 6.41 fps)
     ├─5=Orifice Top (6-in Culv) (Passes < 1.18 cfs potential flow)
     └─6=Orifice Side (6-in Culv) (Passes < 0.15 cfs potential flow)
```

Summary for Pond DP-12: DETENTION POND 12

```
Inflow Area =     20.177 ac,   3.27% Impervious,  Inflow Depth =   1.50"   for  10-yr Storm event
Inflow      =     16.74 cfs @   12.36 hrs,  Volume=          2.530 af
Outflow     =      1.34 cfs @   17.11 hrs,  Volume=          2.371 af,  Atten= 92%,  Lag= 285.2 min
Primary     =      0.09 cfs @   17.11 hrs,  Volume=          0.026 af
Secondary =        1.25 cfs @   17.11 hrs,  Volume=          2.344 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
```

Peak Elev= 186.96' @ 17.11 hrs Surf.Area= 34,237 sf Storage= 70,200 cf

Plug-Flow detention time= 1,073.7 min calculated for 2.370 af (94% of inflow)
Center-of-Mass det. time= 1,042.8 min (1,930.3 - 887.5)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	205,300 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
184.00	11,200	0	0
186.00	28,700	39,900	39,900
188.00	40,200	68,900	108,800
190.00	56,300	96,500	205,300

Device	Routing	Invert	Outlet Devices
#1	Device 3	188.00'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#2	Device 3	186.80'	**8.0" Vert. 8-In Orifice (Riser Side)** C= 0.600
#3	Primary	184.50'	**18.0" Round 18- In Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.50' / 180.00' S= 0.0563 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Device 6	185.50'	**5.8" Horiz. Orifice Top (6-in Pipe)** C= 0.600 Limited to weir flow at low heads
#5	Device 6	184.50'	**1.5" Vert. Orifice (Side of 6-in) X 2.00** C= 0.600
#6	Secondary	181.50'	**6.0" Round 6-In Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0234 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf

Primary OutFlow Max=0.09 cfs @ 17.11 hrs HW=186.96' (Free Discharge)
↑—**3=18- In Culvert** (Passes 0.09 cfs of 8.79 cfs potential flow)
  ↑—**1=Grate Top (Riser)** (Controls 0.00 cfs)
  └—**2=8-In Orifice (Riser Side)** (Orifice Controls 0.09 cfs @ 1.37 fps)

Secondary OutFlow Max=1.25 cfs @ 17.11 hrs HW=186.96' (Free Discharge)
↑—**6=6-In Culvert** (Passes 1.25 cfs of 1.70 cfs potential flow)
  ↑—**4=Orifice Top (6-in Pipe)** (Orifice Controls 1.07 cfs @ 5.82 fps)
  └—**5=Orifice (Side of 6-in)** (Orifice Controls 0.18 cfs @ 7.46 fps)

Summary for Pond DP-1A: DP-1A (Former Leachate Pond)

Inflow Area = 10.835 ac, 10.57% Impervious, Inflow Depth = 1.73" for 10-yr Storm event
Inflow = 12.96 cfs @ 12.25 hrs, Volume= 1.566 af
Outflow = 0.33 cfs @ 22.79 hrs, Volume= 0.110 af, Atten= 97%, Lag= 632.3 min
Primary = 0.33 cfs @ 22.79 hrs, Volume= 0.110 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 164.00' Surf.Area= 37,429 sf Storage= 182,617 cf
Peak Elev= 165.63' @ 22.79 hrs Surf.Area= 41,956 sf Storage= 247,127 cf (64,510 cf above start)
Flood Elev= 166.00' Surf.Area= 43,000 sf Storage= 263,046 cf (80,429 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 544.3 min (1,386.4 - 842.1)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	263,046 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	24,139	0	0
160.00	27,981	52,120	52,120
162.00	32,544	60,525	112,645
163.00	34,985	33,765	146,410
164.00	37,429	36,207	182,617
166.00	43,000	80,429	263,046

Device	Routing	Invert	Outlet Devices
#1	Primary	165.60'	**18.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=0.19 cfs @ 22.79 hrs HW=165.63' (Free Discharge)
↳**1=Broad-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.41 fps)

Summary for Pond DP-2: DETENTION POND 2

Inflow Area = 10.745 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-yr Storm event
Inflow = 14.84 cfs @ 12.19 hrs, Volume= 1.371 af
Outflow = 7.89 cfs @ 12.47 hrs, Volume= 1.371 af, Atten= 47%, Lag= 16.8 min
Primary = 7.89 cfs @ 12.47 hrs, Volume= 1.371 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 162.30' Surf.Area= 2,326 sf Storage= 956 cf
Peak Elev= 164.71' @ 12.47 hrs Surf.Area= 6,452 sf Storage= 11,544 cf (10,588 cf above start)
Flood Elev= 166.60' Surf.Area= 12,071 sf Storage= 28,956 cf (27,999 cf above start)

Plug-Flow detention time= 37.5 min calculated for 1.349 af (98% of inflow)
Center-of-Mass det. time= 24.6 min (884.1 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	47,648 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,957	0	0
164.00	4,419	6,376	6,376
166.00	10,150	14,569	20,945
168.00	16,553	26,703	47,648

Device	Routing	Invert	Outlet Devices
#1	Primary	162.30'	**24.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.30' / 162.00' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	162.30'	**15.0" Vert. Orifice** C= 0.600
#3	Device 1	166.30'	**48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.89 cfs @ 12.47 hrs HW=164.71' (Free Discharge)
↑—**1=Culvert** (Passes 7.89 cfs of 16.52 cfs potential flow)
  ↑—**2=Orifice** (Orifice Controls 7.89 cfs @ 6.43 fps)
  └—**3=Grate** (Controls 0.00 cfs)

Summary for Pond DP-6: DETENTION POND 6

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 1.75" for 10-yr Storm event
Inflow = 26.87 cfs @ 12.26 hrs, Volume= 3.302 af
Outflow = 1.29 cfs @ 17.77 hrs, Volume= 3.302 af, Atten= 95%, Lag= 331.1 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 1.29 cfs @ 17.77 hrs, Volume= 3.302 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 174.00' Surf.Area= 25,931 sf Storage= 29,566 cf
Peak Elev= 176.12' @ 17.77 hrs Surf.Area= 64,099 sf Storage= 127,302 cf (97,736 cf above start)
Flood Elev= 180.00' Surf.Area= 130,159 sf Storage= 496,644 cf (467,078 cf above start)

Plug-Flow detention time= 1,263.3 min calculated for 2.622 af (79% of inflow)
Center-of-Mass det. time= 953.2 min (1,812.4 - 859.2)

Volume	Invert	Avail.Storage	Storage Description
#1	172.00'	783,647 cf	**Detention Pond (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
172.00	3,635	0	0
174.00	25,931	29,566	29,566
176.00	62,168	88,099	117,665
178.00	93,326	155,494	273,159
180.00	130,159	223,485	496,644
182.00	156,844	287,003	783,647

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**24.0" Round Outlet Culvert** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 178.00' / 168.00' S= 0.1429 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	169.00'	**6.0" Round Outlet Culvert 6"** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 169.00' / 168.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 2	174.00'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	179.00'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir**

```
                  Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
                  Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=174.00' (Free Discharge)
└─1=Outlet Culvert ( Controls 0.00 cfs)

Secondary OutFlow Max=1.29 cfs @ 17.77 hrs HW=176.12' (Free Discharge)
├─2=Outlet Culvert 6" (Passes 1.29 cfs of 1.61 cfs potential flow)
│ └─3=Orifice (Orifice Controls 1.29 cfs @ 7.02 fps)
└─4=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Summary for Pond DP-9: DETENTION POND 9

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Inflow Area =     33.165 ac,  8.08% Impervious, Inflow Depth =  1.86"   for 10-yr Storm event
Inflow      =    38.75 cfs @  12.38 hrs, Volume=         5.146 af
Outflow     =     0.99 cfs @  23.58 hrs, Volume=         2.949 af, Atten= 97%, Lag= 672.1 min
Primary     =     0.03 cfs @  23.58 hrs, Volume=         0.012 af
Secondary   =     0.96 cfs @  23.58 hrs, Volume=         2.937 af
Tertiary    =     0.00 cfs @   0.00 hrs, Volume=         0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 189.59' @ 23.58 hrs  Surf.Area= 84,965 sf  Storage= 187,879 cf
Flood Elev= 191.00'  Surf.Area= 91,210 sf  Storage= 312,840 cf

Plug-Flow detention time= 1,926.1 min calculated for 2.949 af (57% of inflow)
Center-of-Mass det. time= 1,808.6 min ( 2,664.1 - 855.5 )

Volume     Invert    Avail.Storage  Storage Description
   #1      187.00'      404,050 cf  Detention Pond (Prismatic)Listed below

 Elevation       Surf.Area      Inc.Store      Cum.Store
    (feet)         (sq-ft)   (cubic-feet)   (cubic-feet)
    187.00          35,200              0              0
    188.00          78,220         56,710         56,710
    190.00          86,700        164,920        221,630
    192.00          95,720        182,420        404,050

Device  Routing        Invert  Outlet Devices
   #1   Primary       189.50'  12.0" Round 12-In Outlet Culvert
                               L= 48.0'  CPP, projecting, no headwall, Ke= 0.900
                               Inlet / Outlet Invert= 189.50' / 180.50'  S= 0.1875 '/'  Cc= 0.900
                               n= 0.011, Flow Area= 0.79 sf
   #2   Secondary     184.21'  5.8" Round 6-In Culvert
                               L= 60.0'  CPP, projecting, no headwall, Ke= 0.900
                               Inlet / Outlet Invert= 184.21' / 180.50'  S= 0.0618 '/'  Cc= 0.900
                               n= 0.011, Flow Area= 0.18 sf
   #3   Device 2      188.70'  5.8" Horiz. Orifice  C= 0.600  Limited to weir flow at low heads
   #4   Device 2      188.30'  1.5" Vert. Orifice X 2.00  C= 0.600
   #5   Tertiary      190.50'  10.0' long x 22.0' breadth Broad-Crested Rectangular Weir
                               Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
                               Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
```

```
Primary OutFlow Max=0.03 cfs @ 23.58 hrs  HW=189.59'  (Free Discharge)
└─1=12-In Outlet Culvert (Inlet Controls 0.03 cfs @ 0.81 fps)

Secondary OutFlow Max=0.96 cfs @ 23.58 hrs  HW=189.59'  (Free Discharge)
└─2=6-In Culvert (Passes 0.96 cfs of 1.58 cfs potential flow)
   ├─3=Orifice  (Orifice Controls 0.83 cfs @ 4.54 fps)
   └─4=Orifice  (Orifice Controls 0.13 cfs @ 5.34 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=187.00'  (Free Discharge)
└─5=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Time span=0.00-168.00 hrs, dt=0.05 hrs, 3361 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: SC-1A Runoff Area=23.080 ac 0.00% Impervious Runoff Depth=2.21"
Flow Length=2,249' Slope=0.0260 '/' Tc=88.1 min CN=74 Runoff=18.21 cfs 4.242 af

Subcatchment1B: SC-1B Runoff Area=13.169 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,282' Tc=17.5 min CN=71 Runoff=21.08 cfs 2.158 af

Subcatchment1C: SC-1C Runoff Area=13.300 ac 0.00% Impervious Runoff Depth=2.46"
Flow Length=380' Tc=68.3 min CN=77 Runoff=13.85 cfs 2.723 af

Subcatchment1D: SC-1D Runoff Area=10.620 ac 0.00% Impervious Runoff Depth=2.12"
Flow Length=1,117' Tc=16.9 min CN=73 Runoff=18.76 cfs 1.880 af

Subcatchment1E: SC-1E Runoff Area=10.745 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=910' Tc=12.7 min CN=72 Runoff=20.18 cfs 1.831 af

Subcatchment1F: SC-1F Runoff Area=31.220 ac 3.52% Impervious Runoff Depth=2.37"
Flow Length=2,066' Tc=73.2 min CN=76 Runoff=29.90 cfs 6.170 af

Subcatchment1G: SC-1G Runoff Area=11.290 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=857' Tc=12.7 min CN=72 Runoff=21.20 cfs 1.924 af

Subcatchment1H: SC-1H Runoff Area=3.030 ac 0.00% Impervious Runoff Depth=2.81"
Flow Length=759' Tc=15.4 min CN=81 Runoff=7.45 cfs 0.709 af

Subcatchment1I: SC-1I Runoff Area=9.334 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,084' Tc=16.8 min CN=71 Runoff=15.16 cfs 1.530 af

Subcatchment1J: SC-1J Runoff Area=360,761 sf 19.96% Impervious Runoff Depth=2.46"
Flow Length=593' Tc=33.0 min CN=77 Runoff=12.86 cfs 1.695 af

Subcatchment2A: SC-2A Runoff Area=54.143 ac 3.66% Impervious Runoff Depth=2.21"
Flow Length=2,435' Tc=126.1 min CN=74 Runoff=33.02 cfs 9.952 af

Subcatchment2B: 2B Runoff Area=13.996 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,218' Tc=17.6 min CN=71 Runoff=22.34 cfs 2.294 af

Subcatchment2C: 2C Runoff Area=6.181 ac 10.68% Impervious Runoff Depth=2.12"
Flow Length=702' Tc=80.7 min CN=73 Runoff=4.92 cfs 1.094 af

Subcatchment3: SC-3 Runoff Area=270.330 ac 1.32% Impervious Runoff Depth=2.12"
Flow Length=4,335' Tc=240.2 min CN=73 Runoff=100.29 cfs 47.866 af

Subcatchment4A: 4A Runoff Area=4.518 ac 7.22% Impervious Runoff Depth=2.46"
Flow Length=379' Tc=5.1 min CN=77 Runoff=12.99 cfs 0.925 af

Subcatchment4B: 4B Runoff Area=2.330 ac 11.29% Impervious Runoff Depth=2.63"
Flow Length=667' Tc=13.2 min CN=79 Runoff=5.65 cfs 0.511 af

Subcatchment 4C: 4C Runoff Area=1.287 ac 24.86% Impervious Runoff Depth=3.28"
Flow Length=496' Tc=15.4 min CN=86 Runoff=3.66 cfs 0.352 af

Subcatchment 4D: 4D Runoff Area=6.660 ac 26.58% Impervious Runoff Depth=3.38"
Flow Length=824' Tc=33.9 min CN=87 Runoff=13.92 cfs 1.876 af

Subcatchment 4E: 4E Runoff Area=247.915 ac 1.59% Impervious Runoff Depth=2.29"
Flow Length=6,090' Tc=225.6 min CN=75 Runoff=103.71 cfs 47.271 af

Subcatchment 4F: 4F Runoff Area=6.771 ac 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,228' Tc=68.8 min CN=70 Runoff=5.26 cfs 1.066 af

Subcatchment 4G: 4G Runoff Area=12.750 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=929' Tc=17.1 min CN=71 Runoff=20.57 cfs 2.089 af

Subcatchment 4H: 4H Runoff Area=3.400 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=823' Tc=11.9 min CN=71 Runoff=6.28 cfs 0.557 af

Subcatchment 4HA: 4HA Runoff Area=0.780 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=142' Slope=0.3300 '/' Tc=6.7 min CN=71 Runoff=1.70 cfs 0.128 af

Subcatchment 4I: 4I Runoff Area=9.930 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,082' Tc=17.1 min CN=71 Runoff=16.02 cfs 1.627 af

Subcatchment 4IA: 4IA Runoff Area=0.940 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=136' Slope=0.3333 '/' Tc=6.4 min CN=71 Runoff=2.07 cfs 0.154 af

Subcatchment 4J: 4J Runoff Area=12.310 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,051' Tc=17.2 min CN=71 Runoff=19.82 cfs 2.017 af

Subcatchment 4K: 4K Runoff Area=10.870 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=1,095' Tc=18.4 min CN=71 Runoff=17.06 cfs 1.781 af

Subcatchment 4L: 4L Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=896' Tc=14.1 min CN=71 Runoff=13.04 cfs 1.229 af

Subcatchment 4M: 4M Runoff Area=5.352 ac 16.82% Impervious Runoff Depth=2.29"
Flow Length=642' Tc=53.5 min CN=75 Runoff=5.98 cfs 1.020 af

Subcatchment 4N: 4N Runoff Area=1.921 ac 0.00% Impervious Runoff Depth=1.97"
Flow Length=730' Tc=30.5 min CN=71 Runoff=2.43 cfs 0.315 af

Subcatchment 4O: 4O Runoff Area=5.100 ac 23.53% Impervious Runoff Depth=2.46"
Flow Length=663' Tc=14.2 min CN=77 Runoff=11.26 cfs 1.044 af

Subcatchment 5: SC-5 Runoff Area=35.960 ac 0.40% Impervious Runoff Depth=2.37"
Flow Length=2,355' Tc=192.1 min CN=76 Runoff=17.74 cfs 7.107 af

Subcatchment P1A: SC-P1A Runoff Area=65,400 sf 76.26% Impervious Runoff Depth=4.11"
Tc=0.0 min CN=94 Runoff=7.72 cfs 0.514 af

Reach 1R: DP-10 DITCH 1 Avg. Flow Depth=0.71' Max Vel=3.65 fps Inflow=19.17 cfs 2.017 af
n=0.025 L=101.0' S=0.0079 '/' Capacity=128.49 cfs Outflow=19.11 cfs 2.017 af

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Reach 2R: E2C-DP9                Avg. Flow Depth=0.55'  Max Vel=4.87 fps  Inflow=15.53 cfs  1.277 af
                       n=0.022  L=590.0'  S=0.0169 '/'  Capacity=488.04 cfs  Outflow=14.74 cfs  1.277 af

Reach 3R: Overland Flow          Avg. Flow Depth=0.49'  Max Vel=9.99 fps  Inflow=29.11 cfs  3.521 af
                       n=0.035  L=168.0'  S=0.0554 '/'  Capacity=119.87 cfs  Outflow=29.07 cfs  3.521 af

Reach 4HR-A: EAST PD - 4           Avg. Flow Depth=0.22'  Max Vel=2.98 fps  Inflow=1.70 cfs  0.128 af
                        n=0.025  L=288.0'  S=0.0247 '/'  Capacity=119.08 cfs  Outflow=1.60 cfs  0.128 af

Reach 4HR-B: EAST PD - 5           Avg. Flow Depth=0.44'  Max Vel=5.84 fps  Inflow=7.49 cfs  0.685 af
                        n=0.025  L=425.0'  S=0.0438 '/'  Capacity=158.67 cfs  Outflow=7.36 cfs  0.685 af

Reach 4IR-A: EAST PD - 2           Avg. Flow Depth=0.27'  Max Vel=2.82 fps  Inflow=2.07 cfs  0.154 af
                        n=0.025  L=330.0'  S=0.0176 '/'  Capacity=100.55 cfs  Outflow=1.94 cfs  0.154 af

Reach 4IR-B: EAST PD - 3         Avg. Flow Depth=0.83'  Max Vel=5.84 fps  Inflow=17.71 cfs  1.781 af
                       n=0.025  L=210.0'  S=0.0224 '/'  Capacity=113.47 cfs  Outflow=17.60 cfs  1.781 af

Reach 4JR: EAST PD 1             Avg. Flow Depth=0.93'  Max Vel=5.56 fps  Inflow=19.82 cfs  2.017 af
                       n=0.025  L=183.0'  S=0.0180 '/'  Capacity=101.85 cfs  Outflow=19.70 cfs  2.017 af

Reach 4R: DP-10 DITCH 3          Avg. Flow Depth=0.98'  Max Vel=9.15 fps  Inflow=35.39 cfs  3.798 af
                       n=0.025  L=260.0'  S=0.0462 '/'  Capacity=162.94 cfs  Outflow=35.24 cfs  3.798 af

Reach 5R: NORTH PD-1             Avg. Flow Depth=0.82'  Max Vel=6.71 fps  Inflow=20.57 cfs  2.089 af
                       n=0.025  L=936.0'  S=0.0299 '/'  Capacity=131.18 cfs  Outflow=20.17 cfs  2.089 af

Reach 6R: NORTH PD-2             Avg. Flow Depth=1.18'  Max Vel=4.22 fps  Inflow=21.89 cfs  2.294 af
                        n=0.025  L=364.0'  S=0.0080 '/'  Capacity=67.70 cfs  Outflow=21.59 cfs  2.294 af

Reach 7R: DP-10R                 Avg. Flow Depth=0.93'  Max Vel=3.56 fps  Inflow=18.32 cfs  4.357 af
                      n=0.045  L=1,130.0'  S=0.0248 '/'  Capacity=88.21 cfs  Outflow=15.92 cfs  4.356 af

Reach 8R: EAST PD - 6            Avg. Flow Depth=0.80'  Max Vel=3.20 fps  Inflow=17.06 cfs  1.781 af
                        n=0.025  L=360.0'  S=0.0056 '/'  Capacity=25.35 cfs  Outflow=16.80 cfs  1.781 af

Reach 9R: LEVEL SPREADER           Avg. Flow Depth=0.39'  Max Vel=0.22 fps  Inflow=2.04 cfs  4.456 af
                          n=0.800  L=273.0'  S=0.0623 '/'  Capacity=11.46 cfs  Outflow=2.04 cfs  4.450 af

Reach 10R: Ditch 4B1             Avg. Flow Depth=1.01'  Max Vel=4.01 fps  Inflow=16.45 cfs  1.781 af
                        n=0.025  L=352.0'  S=0.0085 '/'  Capacity=70.02 cfs  Outflow=16.25 cfs  1.781 af

Reach 11R: DP-11R                  Avg. Flow Depth=0.31'  Max Vel=1.57 fps  Inflow=1.42 cfs  3.639 af
                       n=0.045  L=1,050.0'  S=0.0162 '/'  Capacity=71.30 cfs  Outflow=1.42 cfs  3.638 af

Reach 12R: 4FR                     Avg. Flow Depth=0.62'  Max Vel=2.07 fps  Inflow=5.21 cfs  1.066 af
                       n=0.045  L=1,523.0'  S=0.0131 '/'  Capacity=64.21 cfs  Outflow=4.99 cfs  1.066 af

Reach 13R: Ex Ditch              Avg. Flow Depth=1.19'  Max Vel=5.06 fps  Inflow=26.42 cfs  3.010 af
                        n=0.030  L=225.0'  S=0.0164 '/'  Capacity=81.05 cfs  Outflow=26.19 cfs  3.010 af
```

```
Reach 14R: DP-10 DITCH 2             Avg. Flow Depth=0.76'  Max Vel=7.05 fps  Inflow=19.00 cfs  2.017 af
                          n=0.025  L=434.0'  S=0.0357 '/'  Capacity=143.33 cfs  Outflow=18.85 cfs  2.017 af

Reach AP1: AP-1                                                               Inflow=68.29 cfs  19.050 af
                                                                             Outflow=68.29 cfs  19.050 af

Reach AP2: ANALYSIS POINT #2                                                  Inflow=33.15 cfs  13.180 af
                                                                             Outflow=33.15 cfs  13.180 af

Reach AP3: ANALYSIS POINT #3                                                 Inflow=100.29 cfs  47.866 af
                                                                            Outflow=100.29 cfs  47.866 af

Reach AP4: AP4                                                               Inflow=112.52 cfs  61.081 af
                                                                            Outflow=112.52 cfs  61.081 af

Reach AP5: ANALYSIS POINT #5                                                  Inflow=17.74 cfs  7.107 af
                                                                             Outflow=17.74 cfs  7.107 af

Reach E2R2: E2R2                     Avg. Flow Depth=0.11'  Max Vel=0.38 fps  Inflow=2.43 cfs  0.315 af
                        n=0.080  L=4,356.0'  S=0.0094 '/'  Capacity=132.12 cfs  Outflow=0.53 cfs  0.315 af

Reach E2R3: REACH TO AP              Avg. Flow Depth=0.46'  Max Vel=1.32 fps  Inflow=2.04 cfs  4.450 af
                         n=0.045  L=2,170.0'  S=0.0074 '/'  Capacity=48.12 cfs  Outflow=2.03 cfs  4.443 af

Reach E2R4: Reach to AP              Avg. Flow Depth=0.75'  Max Vel=1.19 fps  Inflow=20.22 cfs  13.818 af
                         n=0.080  L=963.0'  S=0.0094 '/'  Capacity=131.94 cfs  Outflow=17.37 cfs  13.809 af

Reach R-1D: Reach R-1D               Avg. Flow Depth=0.32'  Max Vel=1.81 fps  Inflow=7.74 cfs  4.068 af
                          n=0.060  L=370.0'  S=0.0324 '/'  Capacity=67.93 cfs  Outflow=7.74 cfs  4.068 af

Reach R-1E: LEVEL SPREADER R-1E      Avg. Flow Depth=0.23'  Max Vel=2.26 fps  Inflow=9.55 cfs  1.847 af
                         n=0.060  L=210.0'  S=0.0690 '/'  Capacity=135.95 cfs  Outflow=9.54 cfs  1.847 af

Reach R-1F: Reach R-1F               Avg. Flow Depth=0.00'  Max Vel=0.00 fps  Inflow=0.00 cfs  0.000 af
                          n=0.060  L=940.0'  S=0.0170 '/'  Capacity=49.21 cfs  Outflow=0.00 cfs  0.000 af

Reach R-1H: LEVEL SPREADER R-1H      Avg. Flow Depth=0.09'  Max Vel=2.19 fps  Inflow=7.28 cfs  0.709 af
                         n=0.030  L=170.0'  S=0.0471 '/'  Capacity=411.95 cfs  Outflow=7.17 cfs  0.709 af

Reach R-2F: Reach R2-F               Avg. Flow Depth=0.00'  Max Vel=0.00 fps  Inflow=0.00 cfs  0.000 af
                         n=0.030  L=735.0'  S=0.0020 '/'  Capacity=151.21 cfs  Outflow=0.00 cfs  0.000 af

Reach R1: Reach 1                    Avg. Flow Depth=1.30'  Max Vel=1.73 fps  Inflow=52.38 cfs  14.808 af
                         n=0.030  L=700.0'  S=0.0016 '/'  Capacity=132.69 cfs  Outflow=52.01 cfs  14.808 af

Reach R1B: LF TOE DITCH              Avg. Flow Depth=1.07'  Max Vel=4.66 fps  Inflow=21.08 cfs  2.158 af
                          n=0.040  L=540.0'  S=0.0278 '/'  Capacity=79.00 cfs  Outflow=20.70 cfs  2.158 af

Reach R2: Reach 2                    Avg. Flow Depth=1.02'  Max Vel=1.71 fps  Inflow=36.10 cfs  8.017 af
                       n=0.030  L=1,050.0'  S=0.0020 '/'  Capacity=149.69 cfs  Outflow=35.21 cfs  8.017 af

Reach R2A: Reach 2A                  Avg. Flow Depth=0.11'  Max Vel=0.57 fps  Inflow=2.44 cfs  3.228 af
                     n=0.060  L=1,960.0'  S=0.0138 '/'  Capacity=1,358.84 cfs  Outflow=2.38 cfs  3.227 af
```

Reach R3: Reach 3 Avg. Flow Depth=0.93' Max Vel=1.62 fps Inflow=29.90 cfs 6.170 af
n=0.030 L=800.0' S=0.0020 '/' Capacity=149.69 cfs Outflow=29.33 cfs 6.170 af

Reach R5a: Grass Lined Ditch Avg. Flow Depth=0.45' Max Vel=6.83 fps Inflow=15.16 cfs 1.530 af
n=0.025 L=200.0' S=0.0500 '/' Capacity=572.96 cfs Outflow=15.08 cfs 1.530 af

Pond 1P: Culvert - 4JB & FJC Peak Elev=211.64' Storage=944 cf Inflow=19.11 cfs 2.017 af
24.0" Round Culvert x 2.00 n=0.011 L=73.0' S=0.0137 '/' Outflow=19.00 cfs 2.017 af

Pond 4IAC: Culvert - 4IA Peak Elev=213.60' Storage=302 cf Inflow=1.94 cfs 0.154 af
18.0" Round Culvert n=0.011 L=40.0' S=0.0175 '/' Outflow=1.82 cfs 0.154 af

Pond 8P: Ex Pond Peak Elev=172.57' Storage=4,765 cf Inflow=16.88 cfs 4.425 af
Outflow=18.32 cfs 4.357 af

Pond C-2B-A: Culvert - 2BA Peak Elev=205.43' Storage=1,750 cf Inflow=22.34 cfs 2.294 af
Primary=21.89 cfs 2.294 af Secondary=0.00 cfs 0.000 af Outflow=21.89 cfs 2.294 af

Pond C-4F: Culvert - 4F Peak Elev=166.34' Storage=0.025 af Inflow=5.26 cfs 1.066 af
18.0" Round Culvert n=0.011 L=78.0' S=0.0385 '/' Outflow=5.21 cfs 1.066 af

Pond C-4K: Catch Basin - 4K Peak Elev=220.74' Storage=2,659 cf Inflow=16.80 cfs 1.781 af
Outflow=16.45 cfs 1.781 af

Pond C4B: Culvert - 4BA & 4BB Peak Elev=206.89' Storage=1,124 cf Inflow=29.93 cfs 3.521 af
24.0" Round Culvert x 2.00 n=0.011 L=78.0' S=0.0090 '/' Outflow=29.11 cfs 3.521 af

Pond C4H-A: Culvert 4H-A Peak Elev=202.49' Storage=527 cf Inflow=1.60 cfs 0.128 af
18.0" Round Culvert n=0.011 L=40.0' S=0.0250 '/' Outflow=1.33 cfs 0.128 af

Pond C4N: Culvert 4N Peak Elev=184.82' Storage=0.004 af Inflow=2.43 cfs 0.315 af
18.0" Round Culvert n=0.011 L=33.0' S=0.0303 '/' Outflow=2.43 cfs 0.315 af

Pond CB-2B-B: Catch Basin - 2BB Peak Elev=200.83' Storage=412 cf Inflow=21.59 cfs 2.294 af
Outflow=21.51 cfs 2.294 af

Pond CB-4G: Catch Basin - 4G Peak Elev=182.69' Storage=921 cf Inflow=20.17 cfs 2.089 af
Outflow=19.65 cfs 2.089 af

Pond CB-4HB: Catch Basin - 4HB Peak Elev=183.80' Storage=40 cf Inflow=7.36 cfs 0.685 af
Outflow=7.36 cfs 0.685 af

Pond CB-4I: Catch Basin - 4I Peak Elev=208.90' Storage=0.016 af Inflow=17.60 cfs 1.781 af
Outflow=17.28 cfs 1.781 af

Pond CB-4JA: Catch Basin - 4JA Peak Elev=220.31' Storage=0.022 af Inflow=19.70 cfs 2.017 af
Outflow=19.17 cfs 2.017 af

Pond CB-4L: Catch Basin - 4L Peak Elev=215.82' Storage=1,341 cf Inflow=13.04 cfs 1.229 af
Outflow=12.24 cfs 1.229 af

Pond D-1G: (2)24" Culverts P-6h Peak Elev=184.67' Storage=561 cf Inflow=21.20 cfs 1.924 af
Primary=19.42 cfs 1.908 af Secondary=1.63 cfs 0.015 af Outflow=21.06 cfs 1.924 af

Pond D-1H: LF TOE DITCH - CULVERT Peak Elev=184.69' Storage=746 cf Inflow=7.45 cfs 0.709 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0083 '/' Outflow=7.28 cfs 0.709 af

Pond DP-1: Detention Pond 1 Peak Elev=165.13' Storage=75,820 cf Inflow=38.52 cfs 4.626 af
Primary=7.74 cfs 4.068 af Secondary=0.00 cfs 0.000 af Outflow=7.74 cfs 4.068 af

Pond DP-10: DETENTION POND 10 Peak Elev=179.51' Storage=88,504 cf Inflow=44.00 cfs 4.842 af
Primary=15.37 cfs 2.131 af Secondary=1.51 cfs 2.294 af Tertiary=0.00 cfs 0.000 af Outflow=16.88 cfs 4.425 af

Pond DP-11: Detention Pond 11 Peak Elev=167.75' Storage=115,942 cf Inflow=28.67 cfs 3.795 af
Primary=0.17 cfs 0.076 af Secondary=1.25 cfs 3.562 af Outflow=1.42 cfs 3.639 af

Pond DP-12: DETENTION POND 12 Peak Elev=187.48' Storage=88,740 cf Inflow=23.02 cfs 3.388 af
Primary=0.99 cfs 0.501 af Secondary=1.45 cfs 2.727 af Outflow=2.44 cfs 3.228 af

Pond DP-1A: DP-1A (Former Leachate Peak Elev=165.68' Storage=249,629 cf Inflow=17.45 cfs 2.044 af
Outflow=1.16 cfs 0.587 af

Pond DP-2: DETENTION POND 2 Peak Elev=165.54' Storage=17,590 cf Inflow=21.80 cfs 1.847 af
Outflow=9.55 cfs 1.847 af

Pond DP-6: DETENTION POND 6 Peak Elev=176.58' Storage=163,071 cf Inflow=34.84 cfs 4.313 af
Primary=0.00 cfs 0.000 af Secondary=1.42 cfs 4.313 af Outflow=1.42 cfs 4.313 af

Pond DP-9: DETENTION POND 9 Peak Elev=190.04' Storage=225,513 cf Inflow=50.65 cfs 6.673 af
Primary=0.86 cfs 0.727 af Secondary=1.18 cfs 3.729 af Tertiary=0.00 cfs 0.000 af Outflow=2.04 cfs 4.456 af

Summary for Subcatchment 1A: SC-1A

Runoff = 18.21 cfs @ 13.21 hrs, Volume= 4.242 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	10.120	70	Woods, Good, HSG C
	9.500	77	Woods, Good, HSG D
	2.560	71	Meadow, non-grazed, HSG C
	0.400	78	Meadow, non-grazed, HSG D
*	0.500	96	Gravel Road
	23.080	74	Weighted Average
	23.080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
50.7	150	0.0260	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
21.0	1,839		1.46		**Direct Entry, Segment ID: B-C**
16.4	260		0.26		**Direct Entry, Segment ID: C-D**
88.1	2,249	Total			

Summary for Subcatchment 1B: SC-1B

Runoff = 21.08 cfs @ 12.25 hrs, Volume= 2.158 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
13.169	71	Meadow, non-grazed, HSG C
13.169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	183	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.9	392	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	557	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.5	1,282	Total			

Summary for Subcatchment 1C: SC-1C

Runoff = 13.85 cfs @ 12.94 hrs, Volume= 2.723 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	6.100	77	Woods, Good, HSG D
	0.720	70	Woods, Good, HSG C
	3.100	78	Meadow, non-grazed, HSG D
	2.580	71	Meadow, non-grazed, HSG C
*	0.800	96	Gravel Road
	13.300	77	Weighted Average
	13.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.0	150	0.0350	0.06		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.6	230	0.0133	0.58		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
16.7					**Direct Entry, Segment ID: C-D**
68.3	380	Total			

Summary for Subcatchment 1D: SC-1D

Runoff = 18.76 cfs @ 12.24 hrs, Volume= 1.880 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	9.230	71	Meadow, non-grazed, HSG C
*	0.590	96	Gravel Road/Berm
*	0.800	78	Pond, Meadow HSG D
	10.620	73	Weighted Average
	10.620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	159	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	203	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	605	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035

16.9	1,117	Total

Summary for Subcatchment 1E: SC-1E

Runoff = 20.18 cfs @ 12.19 hrs, Volume= 1.831 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	10.495	71	Meadow, non-grazed, HSG C
*	0.250	96	Gravel Road/Berm
	10.745	72	Weighted Average
	10.745		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	150	0.1000	0.22		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
0.9	150	0.1500	2.71		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	93	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	517	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
12.7	910	Total			

Summary for Subcatchment 1F: SC-1F

Runoff = 29.90 cfs @ 12.99 hrs, Volume= 6.170 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	13.200	77	Woods, Good, HSG D
	7.250	70	Woods, Good, HSG C
	7.670	78	Meadow, non-grazed, HSG D
	1.500	71	Meadow, non-grazed, HSG C
*	0.500	96	Gravel Road/Pad
*	0.600	98	Impervious / Structures
	0.500	98	Paved roads w/curbs & sewers, HSG C
	31.220	76	Weighted Average
	30.120		96.48% Pervious Area
	1.100		3.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0100	0.08		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
1.2	17	0.3300	0.23		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
2.4	300	0.0190	2.07		**Shallow Concentrated Flow, Segment ID: C-D** Grassed Waterway Kv= 15.0 fps
24.6	1,649	0.0500	1.12		**Shallow Concentrated Flow, Segment ID D-E** Woodland Kv= 5.0 fps
24.5					**Direct Entry, Segment ID: E-F**
73.2	2,066	Total			

Summary for Subcatchment 1G: SC-1G

Runoff = 21.20 cfs @ 12.19 hrs, Volume= 1.924 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	10.860	71	Meadow, non-grazed, HSG C
*	0.430	96	Gravel Road/Berm
	11.290	72	Weighted Average
	11.290		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.3	150	0.1000	0.22		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
0.5	62	0.1000	2.21		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	90	0.3300	4.02		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.3	140	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	415	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
12.7	857	Total			

Summary for Subcatchment 1H: SC-1H

Runoff = 7.45 cfs @ 12.21 hrs, Volume= 0.709 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
1.830	71	Meadow, non-grazed, HSG C
1.200	96	Gravel Road/Berm
3.030	81	Weighted Average
3.030		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	150	0.3300	0.36		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
8.4	609	0.0300	1.21		**Shallow Concentrated Flow, Segment B-C** Short Grass Pasture Kv= 7.0 fps
15.4	759	Total			

Summary for Subcatchment 1I: SC-1I

Runoff = 15.16 cfs @ 12.24 hrs, Volume= 1.530 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
9.334	71	Meadow, non-grazed, HSG C
9.334		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.1	146	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	218	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	570	0.3300	27.25	817.65	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 5.0 '/' Top.W=25.00' n= 0.035
16.8	1,084	Total			

Summary for Subcatchment 1J: SC-1J

Runoff = 12.86 cfs @ 12.47 hrs, Volume= 1.695 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (sf)	CN	Description
*	186,445	70	Woods, Good HSG C
	85,939	71	Meadow, non-grazed, HSG C
*	16,377	96	Gravel Road/Pad
*	72,000	98	Pond water surface
	360,761	77	Weighted Average
	288,761		80.04% Pervious Area
	72,000		19.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.8	100	0.0400	0.05		**Sheet Flow, Segment ID: A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
1.7	123	0.0569	1.19		**Shallow Concentrated Flow, Segment ID: B-C** Woodland Kv= 5.0 fps
0.5	370	0.0189	12.43	801.88	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=3.00' Z= 10.0 & 3.0 '/' Top.W=41.00' n= 0.022 Earth, clean & straight
33.0	593	Total			

Summary for Subcatchment 2A: SC-2A

Runoff = 33.02 cfs @ 13.71 hrs, Volume= 9.952 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	27.993	70	Woods, Good, HSG C
	21.380	77	Woods, Good, HSG D
	2.790	71	Meadow, non-grazed, HSG C
*	0.380	98	Paved Area (New)
	1.600	98	Existing Waterbody
	54.143	74	Weighted Average
	52.163		96.34% Pervious Area
	1.980		3.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.9	150	0.0300	0.05		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
25.4	538	0.0200	0.35		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
37.5	534	0.0090	0.24		**Shallow Concentrated Flow, Segment C-D** Forest w/Heavy Litter Kv= 2.5 fps
15.3	1,213	0.0080	1.32	52.99	**Trap/Vee/Rect Channel Flow, Segment D-E** Bot.W=0.00' D=2.00' Z= 10.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
126.1	2,435	Total			

Summary for Subcatchment 2B: 2B

Runoff = 22.34 cfs @ 12.26 hrs, Volume= 2.294 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
13.996	71	Meadow, non-grazed, HSG C
13.996		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.4	187	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	431	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	450	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.6	1,218	Total			

Summary for Subcatchment 2C: 2C

Runoff = 4.92 cfs @ 13.12 hrs, Volume= 1.094 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
5.521	70	Woods, Good, HSG C
0.660	98	Water Surface, HSG C
6.181	73	Weighted Average
5.521		89.32% Pervious Area
0.660		10.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
6.2	289	0.0242	0.78		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
8.2	263	0.0114	0.53		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
80.7	702	Total			

Summary for Subcatchment 3: SC-3

Runoff = 100.29 cfs @ 15.24 hrs, Volume= 47.866 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	162.090	70	Woods, Good, HSG C
	102.790	77	Woods, Good, HSG D
	0.950	71	Meadow, non-grazed, HSG C
*	0.320	98	Paved Areas (New)
	1.570	93	Paved roads w/open ditches, 50% imp, HSG D
	0.280	93	Paved roads w/open ditches, 50% imp, HSG D
*	2.330	98	Existing Water Body
	270.330	73	Weighted Average
	266.755		98.68% Pervious Area
	3.575		1.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.3	150	0.0200	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
105.2	1,116	0.0050	0.18		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
78.7	3,069		0.65		**Direct Entry, Segment C-D (STWC, 0.001)**
240.2	4,335	Total			

Summary for Subcatchment 4A: 4A

Runoff = 12.99 cfs @ 12.08 hrs, Volume= 0.925 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	0.740	89	Gravel roads, HSG C
	1.955	74	>75% Grass cover, Good, HSG C
*	0.088	98	ROOF
	1.497	71	Meadow, non-grazed, HSG C
	0.238	98	Paved roads w/curbs & sewers, HSG C
	4.518	77	Weighted Average
	4.192		92.78% Pervious Area
	0.326		7.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	150	0.0167	0.71		**Sheet Flow, Segment A-B** n= 0.023 P2= 2.70"
0.8	159	0.0410	3.26		**Shallow Concentrated Flow, Segment B-C** Unpaved Kv= 16.1 fps
0.8	70	0.0429	1.45		**Shallow Concentrated Flow, Segment C-D** Short Grass Pasture Kv= 7.0 fps
5.1	379	Total			

Summary for Subcatchment 4B: 4B

Runoff = 5.65 cfs @ 12.19 hrs, Volume= 0.511 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	1.040	70	Brush, Fair, HSG C
*	0.023	98	ROOF
	0.640	89	Gravel roads, HSG C
	0.387	74	>75% Grass cover, Good, HSG C
	0.240	98	Paved roads w/curbs & sewers, HSG C
	2.330	79	Weighted Average
	2.067		88.71% Pervious Area
	0.263		11.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	24	0.0200	0.95		**Sheet Flow, Segment AB** Smooth surfaces n= 0.011 P2= 2.70"
0.8	19	0.5000	0.41		**Sheet Flow, Segment BC** Grass: Short n= 0.150 P2= 2.70"
11.9	584	0.0137	0.82		**Shallow Concentrated Flow, Segment CD** Short Grass Pasture Kv= 7.0 fps
0.1	40	0.0250	7.14	85.66	**Trap/Vee/Rect Channel Flow, Segment DE** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.035
13.2	667	Total			

Summary for Subcatchment 4C: 4C

Runoff = 3.66 cfs @ 12.21 hrs, Volume= 0.352 af, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	0.511	74	>75% Grass cover, Good, HSG C
	0.070	98	Paved roads w/curbs & sewers, HSG C
*	0.250	98	Building/Concrete Slabs
*	0.456	91	Gravel Roads
	1.287	86	Weighted Average
	0.967		75.14% Pervious Area
	0.320		24.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0200	1.14		**Sheet Flow, Segment A-B** Smooth surfaces n= 0.011 P2= 2.70"
10.5	61	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.70"
4.0	374	0.0107	1.55		**Shallow Concentrated Flow, Grassed waterway** Grassed Waterway Kv= 15.0 fps
15.4	496	Total			

Summary for Subcatchment 4D: 4D

Runoff = 13.92 cfs @ 12.46 hrs, Volume= 1.876 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	0.453	89	Gravel roads, HSG C
*	2.133	91	Gravel
	2.304	74	>75% Grass cover, Good, HSG C
*	1.634	98	Pond
	0.136	98	Paved roads w/curbs & sewers, HSG C
	6.660	87	Weighted Average
	4.890		73.42% Pervious Area
	1.770		26.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	125	0.0216	0.12		**Sheet Flow, Segment A-B** Grass: Dense n= 0.240 P2= 2.70"
0.5	25	0.0520	0.78		**Sheet Flow, Segment B-C** n= 0.023 P2= 2.70"
2.0	270	0.0190	2.22		**Shallow Concentrated Flow, Segment C-D** Unpaved Kv= 16.1 fps
0.2	44	0.3300	4.02		**Shallow Concentrated Flow, Segment D-E** Short Grass Pasture Kv= 7.0 fps
2.0	102	0.0150	0.86		**Shallow Concentrated Flow, Segment E-F** Short Grass Pasture Kv= 7.0 fps
11.2	258	0.0030	0.38		**Shallow Concentrated Flow, Segment F-G** Short Grass Pasture Kv= 7.0 fps
33.9	824	Total			

Summary for Subcatchment 4E: 4E

Runoff = 103.71 cfs @ 15.07 hrs, Volume= 47.271 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	152.615	77	Woods, Good, HSG D
	91.360	70	Woods, Good, HSG C
*	3.940	98	Paved roads w/curbs & sewers,
	247.915	75	Weighted Average
	243.975		98.41% Pervious Area
	3.940		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	150	0.0133	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
127.0	2,625	0.0190	0.34		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
17.7	1,592		1.50		**Direct Entry, Segment C-D (STWC,0.0031)**
7.9	760		1.60		**Direct Entry, Segment D-E (STWC,0.005)**
6.7	963		2.40		**Direct Entry, Segment E-F (STWC, 0.0125)**
225.6	6,090	Total			

Summary for Subcatchment 4F: 4F

Runoff = 5.26 cfs @ 12.96 hrs, Volume= 1.066 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
6.691	70	Woods, Good, HSG C
0.080	89	Gravel roads, HSG C
6.771	70	Weighted Average
6.771		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
47.6	144	0.0280	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
20.9	1,067	0.0290	0.85		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.3	17	0.0210	0.97	19.47	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=4.00' D=2.00' Z= 3.0 '/' Top.W=16.00' n= 0.250
68.8	1,228	Total			

Summary for Subcatchment 4G: 4G

Runoff = 20.57 cfs @ 12.25 hrs, Volume= 2.089 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
12.750	71	Meadow, non-grazed, HSG C
12.750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	98	0.0500	0.15		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.8	52	0.1000	0.18		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
1.1	150	0.1000	2.21		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.3	133	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	496	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	929	Total			

Summary for Subcatchment 4H: 4H

Runoff = 6.28 cfs @ 12.17 hrs, Volume= 0.557 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
3.400	71	Meadow, non-grazed, HSG C
3.400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	75	0.1000	0.19		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
4.0	75	0.3300	0.31		**Sheet Flow, B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	150	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.7	285	0.0500	6.92	76.15	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=0.00' D=1.00' Z= 2.0 & 20.0 '/' Top.W=22.00' n= 0.030 Short grass
0.1	238	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00'

					n= 0.035
11.9	823	Total			

Summary for Subcatchment 4HA: 4HA

Runoff = 1.70 cfs @ 12.10 hrs, Volume= 0.128 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
0.780	71	Meadow, non-grazed, HSG C
0.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	142	0.3300	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4I: 4I

Runoff = 16.02 cfs @ 12.25 hrs, Volume= 1.627 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
9.930	71	Meadow, non-grazed, HSG C
9.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	200	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	290	0.0500	11.02	506.75	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=2.00' Z= 3.0 & 20.0 '/' Top.W=46.00' n= 0.030
0.3	442	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.1	1,082	Total			

Summary for Subcatchment 4IA: 4IA

Runoff = 2.07 cfs @ 12.10 hrs, Volume= 0.154 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
0.940	71	Meadow, non-grazed, HSG C
0.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	136	0.3333	0.35		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"

Summary for Subcatchment 4J: 4J

Runoff = 19.82 cfs @ 12.25 hrs, Volume= 2.017 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
12.310	71	Meadow, non-grazed, HSG C
12.310		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
1.5	202	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.6	270	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	429	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
17.2	1,051	Total			

Summary for Subcatchment 4K: 4K

Runoff = 17.06 cfs @ 12.27 hrs, Volume= 1.781 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
10.870	71	Meadow, non-grazed, HSG C
10.870		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	150	0.0500	0.17		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
2.7	268	0.0555	1.65		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.6	267	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.2	410	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
18.4	1,095	Total			

Summary for Subcatchment 4L: 4L

Runoff = 13.04 cfs @ 12.21 hrs, Volume= 1.229 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
7.500	71	Meadow, non-grazed, HSG C
7.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	23	0.0500	0.12		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 2.70"
9.9	127	0.1000	0.21		**Sheet Flow, Segment ID: B-C** Grass: Dense n= 0.240 P2= 2.70"
0.6	252	0.0500	6.94	79.81	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=0.00' D=1.00' Z= 3.0 & 20.0 '/' Top.W=23.00' n= 0.030
0.3	494	0.3300	28.92	520.47	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=5.00' D=2.00' Z= 2.0 '/' Top.W=13.00' n= 0.035
14.1	896	Total			

Summary for Subcatchment 4M: 4M

Runoff = 5.98 cfs @ 12.75 hrs, Volume= 1.020 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
4.262	70	Woods, Good, HSG C
0.900	98	Water Surface, HSG C
0.190	89	Gravel roads, HSG C
5.352	75	Weighted Average
4.452		83.18% Pervious Area
0.900		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
45.9	150	0.0333	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
7.5	474	0.0440	1.05		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	18	0.3300	4.02		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
53.5	642	Total			

Summary for Subcatchment 4N: 4N

Runoff = 2.43 cfs @ 12.45 hrs, Volume= 0.315 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
0.743	70	Woods, Good, HSG C
1.178	71	Meadow, non-grazed, HSG C
1.921	71	Weighted Average
1.921		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	150	0.0200	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 2.70"
9.0	580	0.0233	1.07		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
30.5	730	Total			

Summary for Subcatchment 4O: 4O

Runoff = 11.26 cfs @ 12.20 hrs, Volume= 1.044 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (ac)	CN	Description
	3.900	70	Brush, Fair, HSG C
*	0.800	98	Paved and Gravel Shoulder
*	0.400	98	Detention Pond 10
	5.100	77	Weighted Average
	3.900		76.47% Pervious Area
	1.200		23.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	55	0.3000	0.28		**Sheet Flow, SEGMENT AB** Grass: Dense n= 0.240 P2= 2.70"
4.0	289	0.0300	1.21		**Shallow Concentrated Flow, SEGMENT BC** Short Grass Pasture Kv= 7.0 fps
6.9	319	0.0120	0.77		**Shallow Concentrated Flow, SEGMENT CD** Short Grass Pasture Kv= 7.0 fps
14.2	663	Total			

Summary for Subcatchment 5: SC-5

Runoff = 17.74 cfs @ 14.70 hrs, Volume= 7.107 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

Area (ac)	CN	Description
7.260	70	Woods, Good, HSG C
28.410	77	Woods, Good, HSG D
0.290	93	Paved roads w/open ditches, 50% imp, HSG D
35.960	76	Weighted Average
35.815		99.60% Pervious Area
0.145		0.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.9	150	0.0130	0.04		**Sheet Flow, Segment A-B** Woods: Dense underbrush n= 0.800 P2= 2.70"
122.7	1,930	0.0110	0.26		**Shallow Concentrated Flow, Segment B-C** Forest w/Heavy Litter Kv= 2.5 fps
2.5	275		1.80		**Direct Entry, Segment C-D (STWC, 0.007)**
192.1	2,355	Total			

Summary for Subcatchment P1A: SC-P1A

Runoff = 7.72 cfs @ 12.00 hrs, Volume= 0.514 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Storm Rainfall=4.80"

	Area (sf)	CN	Description
*	49,872	98	Pond and Liner
	1,012	89	Gravel roads, HSG C
	14,516	79	Pasture/grassland/range, Fair, HSG C
	65,400	94	Weighted Average
	15,528		23.74% Pervious Area
	49,872		76.26% Impervious Area

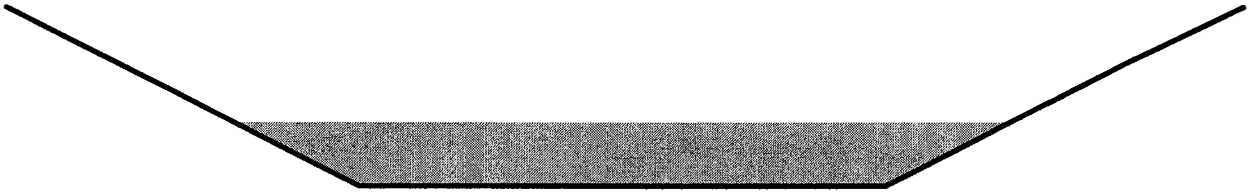
Summary for Reach 1R: DP-10 DITCH 1

```
Inflow Area =    12.310 ac,  0.00% Impervious, Inflow Depth =  1.97"   for 25-yr Storm event
Inflow     =    19.17 cfs @  12.31 hrs, Volume=        2.017 af
Outflow    =    19.11 cfs @  12.32 hrs, Volume=        2.017 af, Atten= 0%, Lag= 0.7 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.65 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 1.4 min

Peak Storage= 531 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 128.49 cfs

6.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 14.00'
Length= 101.0' Slope= 0.0079 '/'
Inlet Invert= 212.30', Outlet Invert= 211.50'



Summary for Reach 2R: E2C-DP9

```
Inflow Area =     5.805 ac, 11.13% Impervious, Inflow Depth =  2.64"   for 25-yr Storm event
Inflow     =    15.53 cfs @  12.09 hrs, Volume=        1.277 af
Outflow    =    14.74 cfs @  12.15 hrs, Volume=        1.277 af, Atten= 5%, Lag= 3.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.87 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 6.6 min

Peak Storage= 1,827 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 3.00' Flow Area= 39.0 sf, Capacity= 488.04 cfs

4.00' x 3.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 590.0' Slope= 0.0169 '/'
Inlet Invert= 200.00', Outlet Invert= 190.00'

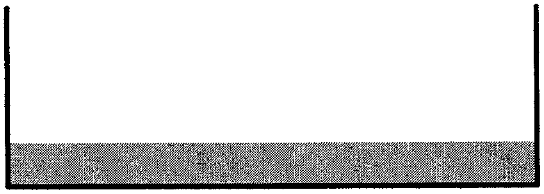
Summary for Reach 3R: Overland Flow

Inflow Area = 20.700 ac, 1.27% Impervious, Inflow Depth = 2.04" for 25-yr Storm event
Inflow = 29.11 cfs @ 12.40 hrs, Volume= 3.521 af
Outflow = 29.07 cfs @ 12.41 hrs, Volume= 3.521 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.99 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 9.99 fps, Avg. Travel Time= 0.3 min

Peak Storage= 490 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.87 cfs

Custom stage-perimeter table, n= 0.035 Earth, dense weeds
100 Intermediate values determined by Multi-point interpolation
Length= 168.0' Slope= 0.0554 '/'
Inlet Invert= 201.30', Outlet Invert= 192.00'



Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	12.0	12.0	2,016	119.87

Summary for Reach 4HR-A: EAST PD - 4

Inflow Area = 0.780 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 1.70 cfs @ 12.10 hrs, Volume= 0.128 af
Outflow = 1.60 cfs @ 12.16 hrs, Volume= 0.128 af, Atten= 6%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 4.9 min

Peak Storage= 158 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 119.08 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 288.0' Slope= 0.0247 '/'
Inlet Invert= 209.00', Outlet Invert= 201.90'

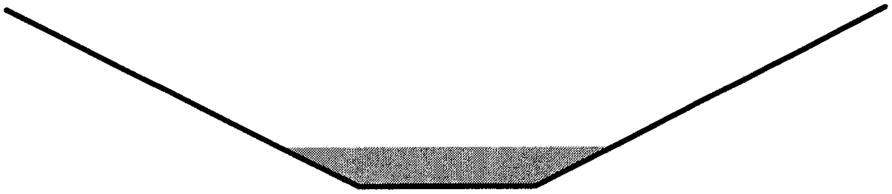
Summary for Reach 4HR-B: EAST PD - 5

Inflow Area =	4.180 ac,	0.00% Impervious,	Inflow Depth = 1.97"	for 25-yr Storm event	
Inflow =	7.49 cfs @	12.18 hrs,	Volume=	0.685 af	
Outflow =	7.36 cfs @	12.22 hrs,	Volume=	0.685 af,	Atten= 2%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.74 fps, Avg. Travel Time= 4.1 min

Peak Storage= 545 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 158.67 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 425.0' Slope= 0.0438 '/'
Inlet Invert= 201.90', Outlet Invert= 183.30'



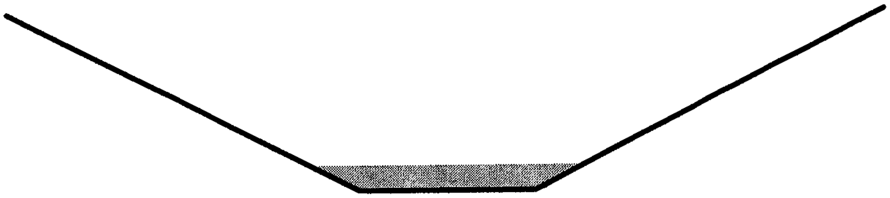
Summary for Reach 4IR-A: EAST PD - 2

Inflow Area =	0.940 ac,	0.00% Impervious,	Inflow Depth = 1.97"	for 25-yr Storm event	
Inflow =	2.07 cfs @	12.10 hrs,	Volume=	0.154 af	
Outflow =	1.94 cfs @	12.16 hrs,	Volume=	0.154 af,	Atten= 6%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.82 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 6.0 min

Peak Storage= 231 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 100.55 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 330.0' Slope= 0.0176 '/'
Inlet Invert= 218.70', Outlet Invert= 212.90'



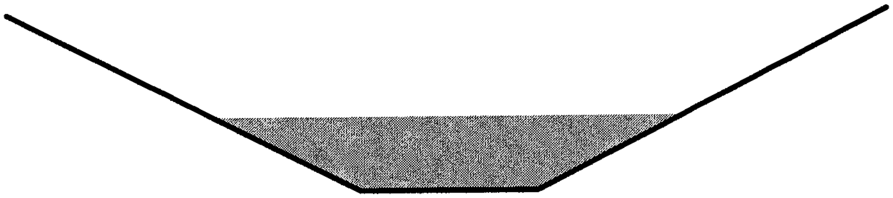
Summary for Reach 4IR-B: EAST PD - 3

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 17.71 cfs @ 12.24 hrs, Volume= 1.781 af
Outflow = 17.60 cfs @ 12.26 hrs, Volume= 1.781 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.84 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 1.7 min

Peak Storage= 638 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 113.47 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 210.0' Slope= 0.0224 '/'
Inlet Invert= 212.20', Outlet Invert= 207.50'



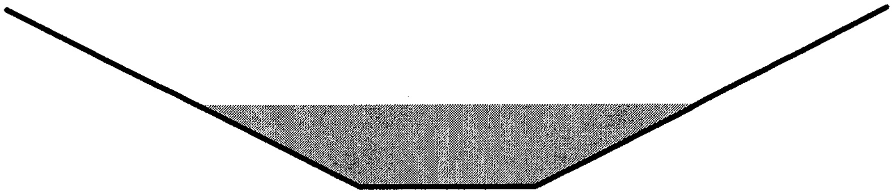
Summary for Reach 4JR: EAST PD 1

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 19.82 cfs @ 12.25 hrs, Volume= 2.017 af
Outflow = 19.70 cfs @ 12.27 hrs, Volume= 2.017 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.56 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.19 fps, Avg. Travel Time= 1.4 min

Peak Storage= 653 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.93'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.85 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 183.0' Slope= 0.0180 '/'
Inlet Invert= 222.00', Outlet Invert= 218.70'



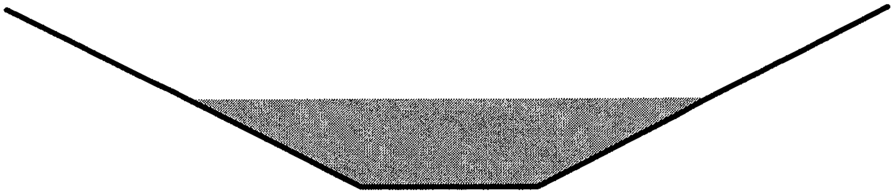
Summary for Reach 4R: DP-10 DITCH 3

```
Inflow Area =       23.180 ac,   0.00% Impervious,  Inflow Depth =   1.97"    for  25-yr Storm event
Inflow      =      35.39 cfs @   12.33 hrs,  Volume=          3.798 af
Outflow     =      35.24 cfs @   12.34 hrs,  Volume=          3.798 af,  Atten= 0%,  Lag= 0.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.15 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.34 fps, Avg. Travel Time= 1.3 min

Peak Storage= 1,005 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.98'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 162.94 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 260.0' Slope= 0.0462 '/'
Inlet Invert= 191.00', Outlet Invert= 179.00'



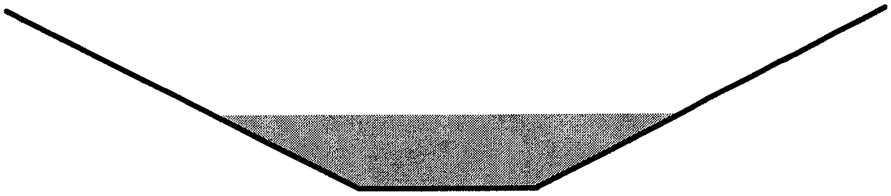
Summary for Reach 5R: NORTH PD-1

```
Inflow Area =       12.750 ac,   0.00% Impervious,  Inflow Depth =   1.97"    for  25-yr Storm event
Inflow      =      20.57 cfs @   12.25 hrs,  Volume=          2.089 af
Outflow     =      20.17 cfs @   12.32 hrs,  Volume=          2.089 af,  Atten= 2%,  Lag= 4.3 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.71 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 2.45 fps, Avg. Travel Time= 6.4 min

Peak Storage= 2,816 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 131.18 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 936.0' Slope= 0.0299 '/'
Inlet Invert= 210.00', Outlet Invert= 182.00'



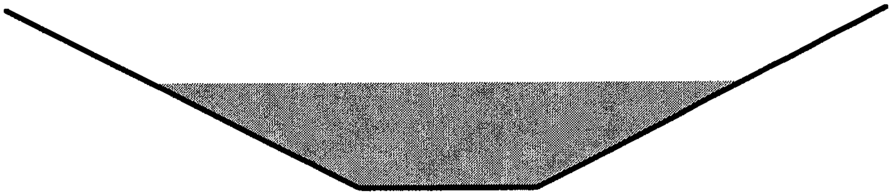
Summary for Reach 6R: NORTH PD-2

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 21.89 cfs @ 12.28 hrs, Volume= 2.294 af
Outflow = 21.59 cfs @ 12.33 hrs, Volume= 2.294 af, Atten= 1%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.22 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.64 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,884 cf @ 12.30 hrs
Average Depth at Peak Storage= 1.18'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 67.70 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 364.0' Slope= 0.0080 '/'
Inlet Invert= 202.90', Outlet Invert= 200.00'



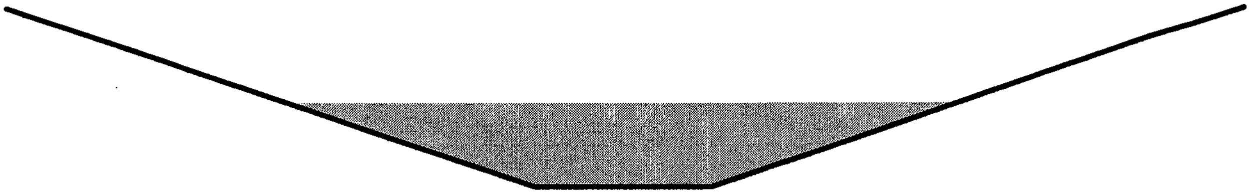
Summary for Reach 7R: DP-10R

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth > 1.85" for 25-yr Storm event
Inflow = 18.32 cfs @ 12.75 hrs, Volume= 4.357 af
Outflow = 15.92 cfs @ 12.96 hrs, Volume= 4.356 af, Atten= 13%, Lag= 12.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 27.0 min

Peak Storage= 5,071 cf @ 12.87 hrs
Average Depth at Peak Storage= 0.93'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 88.21 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,130.0' Slope= 0.0248 '/'
Inlet Invert= 170.00', Outlet Invert= 142.00'



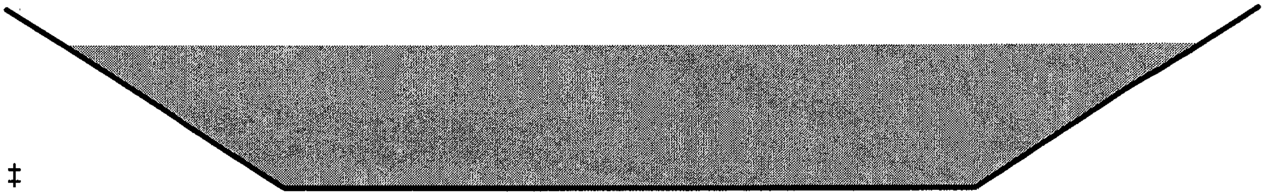
Summary for Reach 8R: EAST PD - 6

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 17.06 cfs @ 12.27 hrs, Volume= 1.781 af
Outflow = 16.80 cfs @ 12.32 hrs, Volume= 1.781 af, Atten= 2%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.20 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 6.1 min

Peak Storage= 1,899 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 1.00' Flow Area= 7.0 sf, Capacity= 25.35 cfs

5.00' x 1.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 9.00'
Length= 360.0' Slope= 0.0056 '/'
Inlet Invert= 222.00', Outlet Invert= 220.00'



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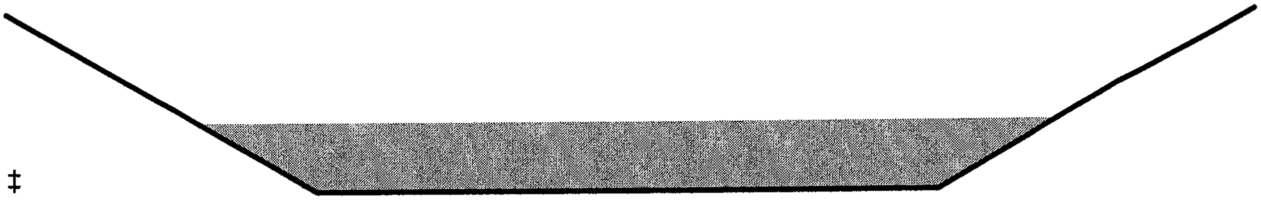
Summary for Reach 9R: LEVEL SPREADER DISCHARGE

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth > 1.61" for 25-yr Storm event
Inflow = 2.04 cfs @ 18.50 hrs, Volume= 4.456 af
Outflow = 2.04 cfs @ 19.12 hrs, Volume= 4.450 af, Atten= 0%, Lag= 37.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Max. Velocity= 0.22 fps, Min. Travel Time= 20.5 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 48.7 min

Peak Storage= 2,507 cf @ 18.78 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 30.0 sf, Capacity= 11.46 cfs

20.00' x 1.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 273.0' Slope= 0.0623 '/'
Inlet Invert= 180.00', Outlet Invert= 163.00'



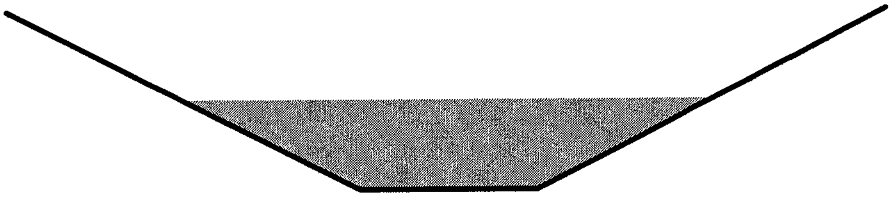
Summary for Reach 10R: Ditch 4B1

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 16.45 cfs @ 12.37 hrs, Volume= 1.781 af
Outflow = 16.25 cfs @ 12.41 hrs, Volume= 1.781 af, Atten= 1%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.01 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 4.1 min

Peak Storage= 1,436 cf @ 12.39 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 70.02 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 352.0' Slope= 0.0085 '/'
Inlet Invert= 213.50', Outlet Invert= 210.50'



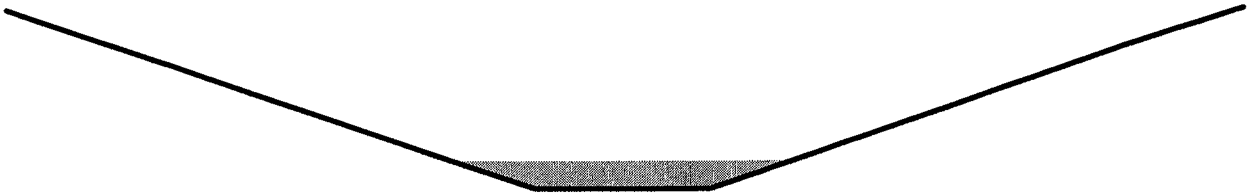
Summary for Reach 11R: DP-11R

Inflow Area = 22.282 ac, 4.04% Impervious, Inflow Depth > 1.96" for 25-yr Storm event
Inflow = 1.42 cfs @ 18.07 hrs, Volume= 3.639 af
Outflow = 1.42 cfs @ 18.39 hrs, Volume= 3.638 af, Atten= 0%, Lag= 19.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.57 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 24.9 min

Peak Storage= 950 cf @ 18.20 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 71.30 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,050.0' Slope= 0.0162 '/'
Inlet Invert= 158.00', Outlet Invert= 141.00'



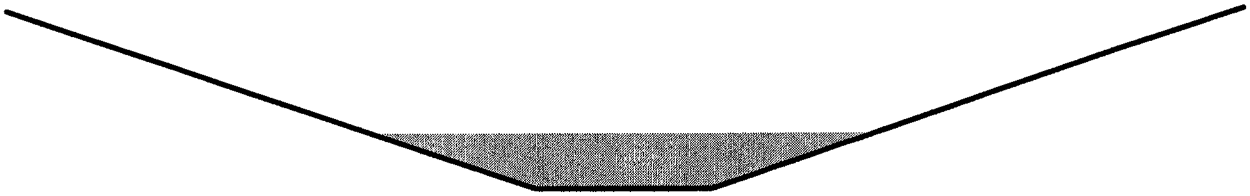
Summary for Reach 12R: 4FR

Inflow Area = 6.771 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr Storm event
Inflow = 5.21 cfs @ 13.04 hrs, Volume= 1.066 af
Outflow = 4.99 cfs @ 13.40 hrs, Volume= 1.066 af, Atten= 4%, Lag= 21.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 12.2 min
Avg. Velocity = 0.73 fps, Avg. Travel Time= 34.9 min

Peak Storage= 3,665 cf @ 13.20 hrs
Average Depth at Peak Storage= 0.62'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 64.21 cfs

2.00' x 2.00' deep channel, n= 0.045
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,523.0' Slope= 0.0131 '/'
Inlet Invert= 161.00', Outlet Invert= 141.00'



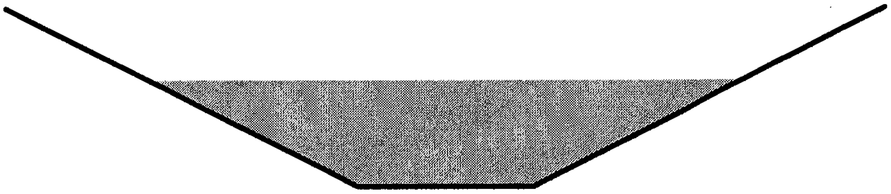
Summary for Reach 13R: Ex Ditch

Inflow Area = 18.370 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 26.42 cfs @ 12.35 hrs, Volume= 3.010 af
Outflow = 26.19 cfs @ 12.37 hrs, Volume= 3.010 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.06 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.83 fps, Avg. Travel Time= 2.0 min

Peak Storage= 1,173 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.19'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 81.05 cfs

2.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 225.0' Slope= 0.0164 '/'
Inlet Invert= 209.70', Outlet Invert= 206.00'



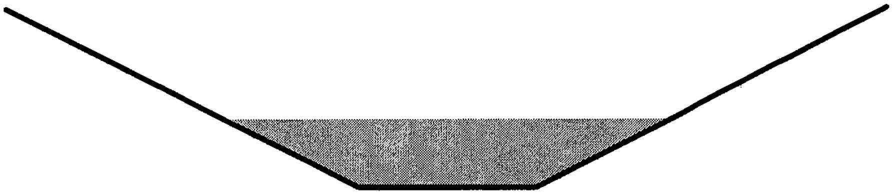
Summary for Reach 14R: DP-10 DITCH 2

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 19.00 cfs @ 12.34 hrs, Volume= 2.017 af
Outflow = 18.85 cfs @ 12.37 hrs, Volume= 2.017 af, Atten= 1%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.05 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 2.71 fps, Avg. Travel Time= 2.7 min

Peak Storage= 1,168 cf @ 12.35 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 143.33 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 434.0' Slope= 0.0357 '/'
Inlet Invert= 209.00', Outlet Invert= 193.50'



Summary for Reach AP1: AP-1

Inflow Area = 135.571 ac, 2.88% Impervious, Inflow Depth = 1.69" for 25-yr Storm event
Inflow = 68.29 cfs @ 13.48 hrs, Volume= 19.050 af
Outflow = 68.29 cfs @ 13.48 hrs, Volume= 19.050 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP2: ANALYSIS POINT #2

```
Inflow Area =     74.320 ac,  3.55% Impervious,  Inflow Depth =  2.13"   for  25-yr Storm event
Inflow     =     33.15 cfs @  13.73 hrs,  Volume=        13.180 af
Outflow    =     33.15 cfs @  13.73 hrs,  Volume=        13.180 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP3: ANALYSIS POINT #3

```
Inflow Area =    270.330 ac,  1.32% Impervious,  Inflow Depth =  2.12"   for  25-yr Storm event
Inflow     =    100.29 cfs @  15.24 hrs,  Volume=        47.866 af
Outflow    =    100.29 cfs @  15.24 hrs,  Volume=        47.866 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP4: AP4

```
Inflow Area =    340.334 ac,  2.56% Impervious,  Inflow Depth >  2.15"   for  25-yr Storm event
Inflow     =    112.52 cfs @  15.04 hrs,  Volume=        61.081 af
Outflow    =    112.52 cfs @  15.04 hrs,  Volume=        61.081 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach AP5: ANALYSIS POINT #5

```
Inflow Area =     35.960 ac,  0.40% Impervious,  Inflow Depth =  2.37"   for  25-yr Storm event
Inflow     =     17.74 cfs @  14.70 hrs,  Volume=         7.107 af
Outflow    =     17.74 cfs @  14.70 hrs,  Volume=         7.107 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Summary for Reach E2R2: E2R2

```
Inflow Area =      1.921 ac,  0.00% Impervious,  Inflow Depth =  1.97"   for  25-yr Storm event
Inflow     =      2.43 cfs @  12.46 hrs,  Volume=         0.315 af
Outflow    =      0.53 cfs @  16.57 hrs,  Volume=         0.315 af,  Atten= 78%,  Lag= 246.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 189.0 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 470.8 min

Peak Storage= 6,027 cf @ 13.43 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 132.12 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 4,356.0' Slope= 0.0094 '/'
Inlet Invert= 182.00', Outlet Invert= 141.00'

‡

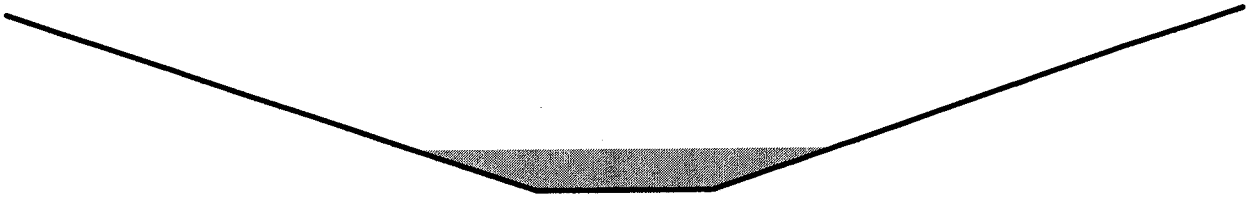
Summary for Reach E2R3: REACH TO AP

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth > 1.61" for 25-yr Storm event
Inflow = 2.04 cfs @ 19.12 hrs, Volume= 4.450 af
Outflow = 2.03 cfs @ 20.00 hrs, Volume= 4.443 af, Atten= 0%, Lag= 52.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.32 fps, Min. Travel Time= 27.5 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 58.6 min

Peak Storage= 3,358 cf @ 19.54 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 48.12 cfs

2.00' x 2.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 2,170.0' Slope= 0.0074 '/'
Inlet Invert= 158.00', Outlet Invert= 142.00'



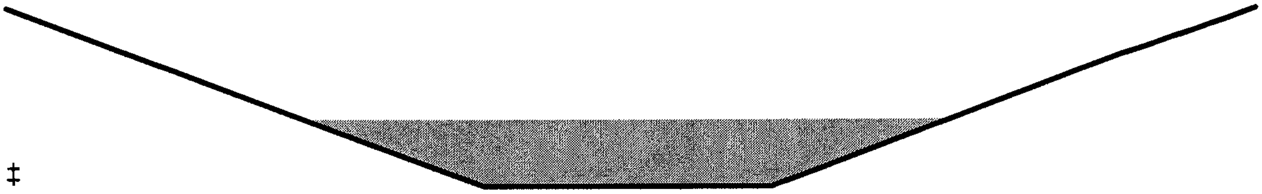
Summary for Reach E2R4: Reach to AP

Inflow Area = 92.419 ac, 5.17% Impervious, Inflow Depth > 1.79" for 25-yr Storm event
Inflow = 20.22 cfs @ 12.99 hrs, Volume= 13.818 af
Outflow = 17.37 cfs @ 13.49 hrs, Volume= 13.809 af, Atten= 14%, Lag= 29.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.19 fps, Min. Travel Time= 13.5 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 45.2 min

Peak Storage= 14,050 cf @ 13.26 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 131.94 cfs

12.00' x 2.00' deep channel, n= 0.080
Side Slope Z-value= 10.0 '/' Top Width= 52.00'
Length= 963.0' Slope= 0.0094 '/'
Inlet Invert= 142.00', Outlet Invert= 132.96'



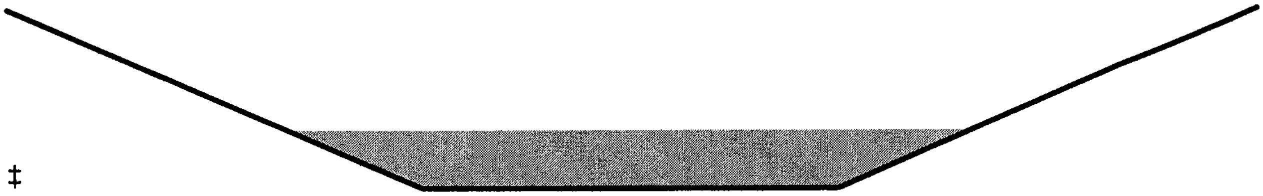
Summary for Reach R-1D: Reach R-1D

Inflow Area =	34.624 ac,	3.31% Impervious, Inflow Depth = 1.41"	for 25-yr Storm event	
Inflow =	7.74 cfs @	13.03 hrs, Volume=	4.068 af	
Outflow =	7.74 cfs @	13.13 hrs, Volume=	4.068 af,	Atten= 0%, Lag= 5.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.81 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 19.7 min

Peak Storage= 1,580 cf @ 13.07 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 67.93 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 370.0' Slope= 0.0324 '/'
Inlet Invert= 159.00', Outlet Invert= 147.00'



Summary for Reach R-1E: LEVEL SPREADER R-1E

Inflow Area =	10.745 ac,	0.00% Impervious, Inflow Depth = 2.06"	for 25-yr Storm event	
Inflow =	9.55 cfs @	12.50 hrs, Volume=	1.847 af	
Outflow =	9.54 cfs @	12.54 hrs, Volume=	1.847 af,	Atten= 0%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 6.1 min

Peak Storage= 887 cf @ 12.51 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 26.0 sf, Capacity= 135.95 cfs

16.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 36.00'
Length= 210.0' Slope= 0.0690 '/'
Inlet Invert= 161.50', Outlet Invert= 147.00'

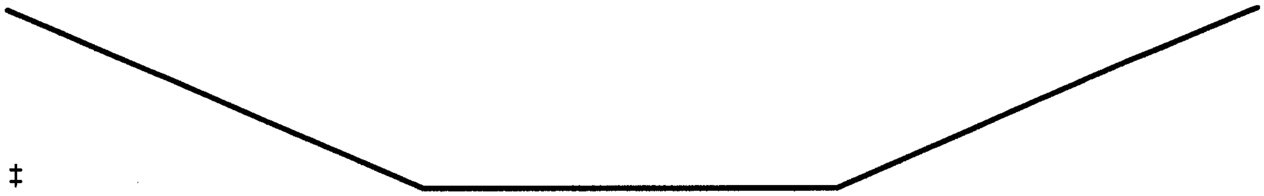
Summary for Reach R-1F: Reach R-1F

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.00" for 25-yr Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 20.0 sf, Capacity= 49.21 cfs

10.00' x 1.00' deep channel, n= 0.060
Side Slope Z-value= 10.0 '/' Top Width= 30.00'
Length= 940.0' Slope= 0.0170 '/'
Inlet Invert= 167.50', Outlet Invert= 151.50'



Summary for Reach R-1H: LEVEL SPREADER R-1H

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth = 2.81" for 25-yr Storm event
Inflow = 7.28 cfs @ 12.25 hrs, Volume= 0.709 af
Outflow = 7.17 cfs @ 12.28 hrs, Volume= 0.709 af, Atten= 2%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.19 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 4.5 min

Peak Storage= 562 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 44.0 sf, Capacity= 411.95 cfs

34.00' x 1.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 54.00'
Length= 170.0' Slope= 0.0471 '/'
Inlet Invert= 182.00', Outlet Invert= 174.00'

Summary for Reach R-2F: Reach R2-F

```
Inflow Area =     22.602 ac,  7.31% Impervious,  Inflow Depth =  0.00"   for  25-yr Storm event
Inflow      =      0.00 cfs @   0.00 hrs,  Volume=         0.000 af
Outflow     =      0.00 cfs @   0.00 hrs,  Volume=         0.000 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 151.21 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 735.0' Slope= 0.0020 '/'
Inlet Invert= 151.50', Outlet Invert= 150.00'

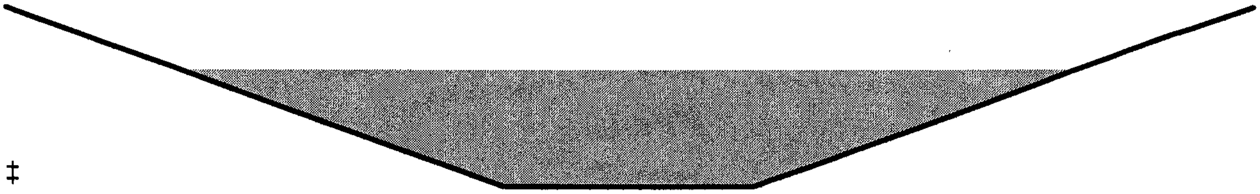
Summary for Reach R1: Reach 1

```
Inflow Area =    112.491 ac,  3.46% Impervious,  Inflow Depth =  1.58"   for  25-yr Storm event
Inflow      =     52.38 cfs @  13.38 hrs,  Volume=        14.808 af
Outflow     =     52.01 cfs @  13.58 hrs,  Volume=        14.808 af,  Atten= 1%,  Lag= 11.8 min
```

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.73 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 49.5 min

Peak Storage= 21,013 cf @ 13.46 hrs
Average Depth at Peak Storage= 1.30'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 132.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 700.0' Slope= 0.0016 '/'
Inlet Invert= 146.30', Outlet Invert= 145.20'



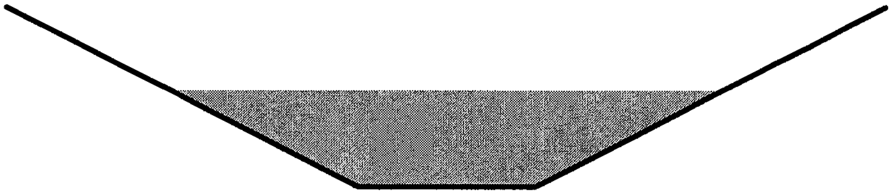
Summary for Reach R1B: LF TOE DITCH

Inflow Area =	13.169 ac,	0.00% Impervious, Inflow Depth = 1.97"		for 25-yr Storm event
Inflow =	21.08 cfs @	12.25 hrs, Volume=	2.158 af	
Outflow =	20.70 cfs @	12.31 hrs, Volume=	2.158 af,	Atten= 2%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.66 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 5.1 min

Peak Storage= 2,407 cf @ 12.28 hrs
Average Depth at Peak Storage= 1.07'
Defined Flood Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.00 cfs

2.00' x 2.00' deep channel, n= 0.040 Winding stream, pools & shoals
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 540.0' Slope= 0.0278 '/'
Inlet Invert= 181.00', Outlet Invert= 166.00'



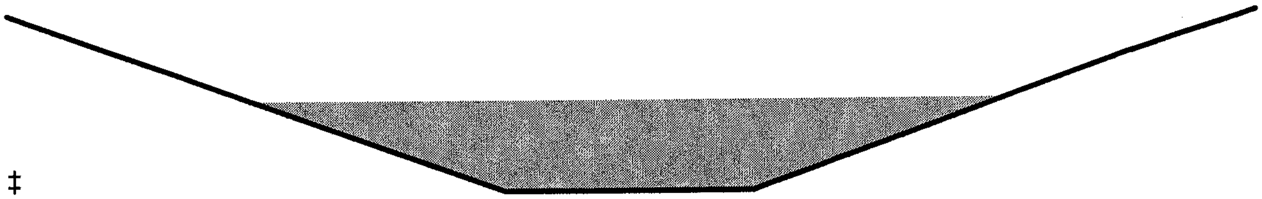
Summary for Reach R2: Reach 2

Inflow Area =	64.567 ac,	4.26% Impervious, Inflow Depth = 1.49"		for 25-yr Storm event
Inflow =	36.10 cfs @	13.19 hrs, Volume=	8.017 af	
Outflow =	35.21 cfs @	13.49 hrs, Volume=	8.017 af,	Atten= 2%, Lag= 17.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.71 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 39.7 min

Peak Storage= 21,682 cf @ 13.32 hrs
Average Depth at Peak Storage= 1.02'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 1,050.0' Slope= 0.0020 '/'
Inlet Invert= 148.40', Outlet Invert= 146.30'



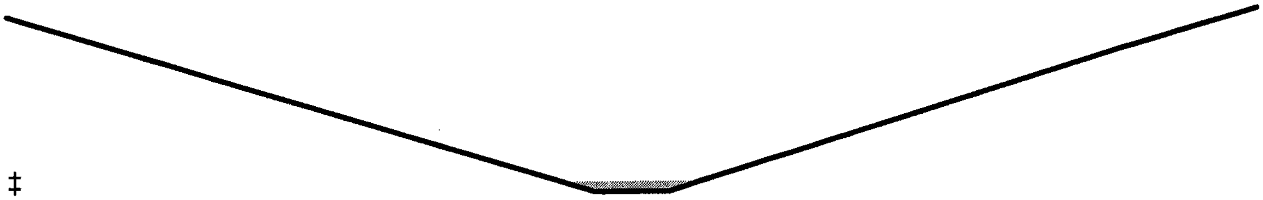
Summary for Reach R2A: Reach 2A

Inflow Area = 20.177 ac, 3.27% Impervious, Inflow Depth > 1.92" for 25-yr Storm event
Inflow = 2.44 cfs @ 15.88 hrs, Volume= 3.228 af
Outflow = 2.38 cfs @ 17.79 hrs, Volume= 3.227 af, Atten= 2%, Lag= 114.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.57 fps, Min. Travel Time= 57.1 min
Avg. Velocity = 0.25 fps, Avg. Travel Time= 131.9 min

Peak Storage= 8,164 cf @ 16.84 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 450.0 sf, Capacity= 1,358.84 cfs

25.00' x 2.00' deep channel, n= 0.060
Side Slope Z-value= 100.0 '/' Top Width= 425.00'
Length= 1,960.0' Slope= 0.0138 '/'
Inlet Invert= 179.00', Outlet Invert= 152.00'



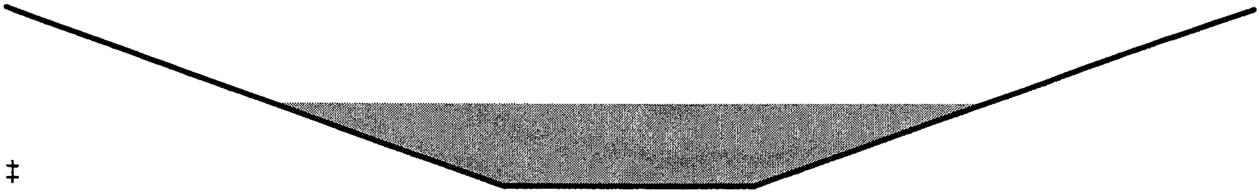
Summary for Reach R3: Reach 3

Inflow Area = 53.822 ac, 5.11% Impervious, Inflow Depth = 1.38" for 25-yr Storm event
Inflow = 29.90 cfs @ 12.99 hrs, Volume= 6.170 af
Outflow = 29.33 cfs @ 13.24 hrs, Volume= 6.170 af, Atten= 2%, Lag= 15.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 8.2 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 25.5 min

Peak Storage= 14,458 cf @ 13.11 hrs
Average Depth at Peak Storage= 0.93'
Bank-Full Depth= 2.00' Flow Area= 60.0 sf, Capacity= 149.69 cfs

10.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 10.0 '/' Top Width= 50.00'
Length= 800.0' Slope= 0.0020 '/'
Inlet Invert= 150.00', Outlet Invert= 148.40'



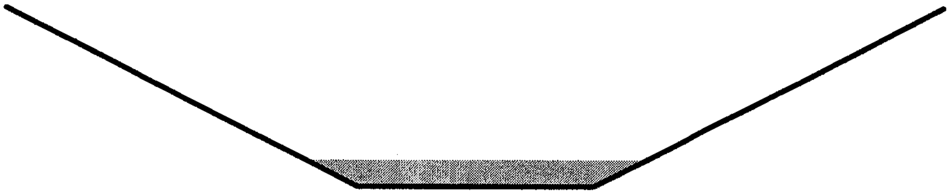
Summary for Reach R5a: Grass Lined Ditch

Inflow Area = 9.334 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 15.16 cfs @ 12.24 hrs, Volume= 1.530 af
Outflow = 15.08 cfs @ 12.26 hrs, Volume= 1.530 af, Atten= 1%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.83 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.38 fps, Avg. Travel Time= 1.4 min

Peak Storage= 444 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 3.00' Flow Area= 30.0 sf, Capacity= 572.96 cfs

4.00' x 3.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 200.0' Slope= 0.0500 '/'
Inlet Invert= 176.00', Outlet Invert= 166.00'



Summary for Pond 1P: Culvert - 4JB & FJC

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 19.11 cfs @ 12.32 hrs, Volume= 2.017 af
Outflow = 19.00 cfs @ 12.34 hrs, Volume= 2.017 af, Atten= 1%, Lag= 1.2 min
Primary = 19.00 cfs @ 12.34 hrs, Volume= 2.017 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 211.64' @ 12.34 hrs Surf.Area= 1,107 sf Storage= 944 cf

Plug-Flow detention time= 0.8 min calculated for 2.017 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (861.9 - 861.1)

Volume	Invert	Avail.Storage	Storage Description
#1	210.00'	3,853 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
210.00	43	0	0
212.00	1,340	1,383	1,383
213.00	3,600	2,470	3,853

Device	Routing	Invert	Outlet Devices
#1	Primary	210.00'	**24.0" Round Culvert X 2.00** L= 73.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 210.00' / 209.00' S= 0.0137 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf

Primary OutFlow Max=18.92 cfs @ 12.34 hrs HW=211.64' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 18.92 cfs @ 3.44 fps)

Summary for Pond 4IAC: Culvert - 4IA

```
Inflow Area =      0.940 ac,  0.00% Impervious, Inflow Depth =  1.97"   for 25-yr Storm event
Inflow      =      1.94 cfs @  12.16 hrs, Volume=        0.154 af
Outflow     =      1.82 cfs @  12.20 hrs, Volume=        0.154 af, Atten= 6%, Lag= 2.4 min
Primary     =      1.82 cfs @  12.20 hrs, Volume=        0.154 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 213.60' @ 12.20 hrs Surf.Area= 614 sf Storage= 302 cf

Plug-Flow detention time= 5.8 min calculated for 0.154 af (100% of inflow)
Center-of-Mass det. time= 5.8 min (859.6 - 853.8)

Volume	Invert	Avail.Storage	Storage Description
#1	212.90'	1,559 cf	**2.00'W x 125.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	212.90'	**18.0" Round Culvert - 4IA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 212.90' / 212.20' S= 0.0175 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.82 cfs @ 12.20 hrs HW=213.60' (Free Discharge)
↑—**1=Culvert - 4IA** (Inlet Controls 1.82 cfs @ 2.25 fps)

Summary for Pond 8P: Ex Pond

```
Inflow Area =     28.280 ac,  4.24% Impervious, Inflow Depth >  1.88"   for 25-yr Storm event
Inflow      =     16.88 cfs @  12.75 hrs, Volume=        4.425 af
Outflow     =     18.32 cfs @  12.75 hrs, Volume=        4.357 af, Atten= 0%, Lag= 0.1 min
Primary     =     18.32 cfs @  12.75 hrs, Volume=        4.357 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 172.57' @ 12.75 hrs Surf.Area= 4,500 sf Storage= 4,765 cf

Plug-Flow detention time= 123.8 min calculated for 4.355 af (98% of inflow)

Center-of-Mass det. time= 15.8 min (1,420.6 - 1,404.8)

Volume	Invert	Avail.Storage	Storage Description
#1	171.20'	4,765 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.20	3,900	0	0
172.00	4,600	3,400	3,400
172.30	4,500	1,365	4,765

Device	Routing	Invert	Outlet Devices
#1	Primary	171.90'	**12.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=18.31 cfs @ 12.75 hrs HW=172.57' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 18.31 cfs @ 2.28 fps)

Summary for Pond C-2B-A: Culvert - 2BA

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 22.34 cfs @ 12.26 hrs, Volume= 2.294 af
Outflow = 21.89 cfs @ 12.28 hrs, Volume= 2.294 af, Atten= 2%, Lag= 1.7 min
Primary = 21.89 cfs @ 12.28 hrs, Volume= 2.294 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 205.43' @ 12.28 hrs Surf.Area= 1,533 sf Storage= 1,750 cf

Plug-Flow detention time= 0.9 min calculated for 2.294 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (858.9 - 858.0)

Volume	Invert	Avail.Storage	Storage Description
#1	203.50'	1,859 cf	**2.00'W x 150.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	203.20'	**36.0" Round Culvert - 2BA** L= 40.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 203.20' / 202.90' S= 0.0075 '/' Cc= 0.900 n= 0.011, Flow Area= 7.07 sf
#2	Secondary	205.00'	**4.0' long x 2.0' breadth Southern Ditch High Water Outlet X 0.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Primary OutFlow Max=21.74 cfs @ 12.28 hrs HW=205.42' (Free Discharge)
↑—**1=Culvert - 2BA** (Barrel Controls 21.74 cfs @ 5.40 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=203.50' (Free Discharge)
↑—**2=Southern Ditch High Water Outlet**(Controls 0.00 cfs)

Summary for Pond C-4F: Culvert - 4F

Inflow Area = 6.771 ac, 0.00% Impervious, Inflow Depth = 1.89" for 25-yr Storm event
Inflow = 5.26 cfs @ 12.96 hrs, Volume= 1.066 af
Outflow = 5.21 cfs @ 13.04 hrs, Volume= 1.066 af, Atten= 1%, Lag= 4.5 min
Primary = 5.21 cfs @ 13.04 hrs, Volume= 1.066 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 166.34' @ 13.04 hrs Surf.Area= 0.029 ac Storage= 0.025 af

Plug-Flow detention time= 4.5 min calculated for 1.066 af (100% of inflow)
Center-of-Mass det. time= 4.5 min (912.7 - 908.1)

Volume	Invert	Avail.Storage	Storage Description
#1	165.00'	0.047 af	**4.00'W x 96.00'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	165.00'	**18.0" Round Culvert - 4F** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 165.00' / 162.00' S= 0.0385 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=5.20 cfs @ 13.04 hrs HW=166.34' (Free Discharge)
↑—**1=Culvert - 4F** (Inlet Controls 5.20 cfs @ 3.12 fps)

Summary for Pond C-4K: Catch Basin - 4K

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 16.80 cfs @ 12.32 hrs, Volume= 1.781 af
Outflow = 16.45 cfs @ 12.37 hrs, Volume= 1.781 af, Atten= 2%, Lag= 2.5 min
Primary = 16.45 cfs @ 12.37 hrs, Volume= 1.781 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 220.74' @ 12.37 hrs Surf.Area= 4,409 sf Storage= 2,659 cf

Plug-Flow detention time= 4.3 min calculated for 1.781 af (100% of inflow)
Center-of-Mass det. time= 4.3 min (868.6 - 864.3)

Volume	Invert	Avail.Storage	Storage Description
#1	220.00'	3,865 cf	**5.00'W x 550.00'L x 1.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	216.50'	**24.0" Round Culvert - 4K** L= 51.0' CPP, square edge headwall, Ke= 0.500

```
                               Inlet / Outlet Invert= 216.50' / 214.30'   S= 0.0431 '/'   Cc= 0.900
                               n= 0.011,  Flow Area= 3.14 sf
  #2    Device 1       220.00'  30.0" Horiz. Orifice/Grate   C= 0.600
                               Limited to weir flow at low heads

Primary OutFlow  Max=16.33 cfs @ 12.37 hrs  HW=220.74'  (Free Discharge)
 └─1=Culvert - 4K  (Passes 16.33 cfs of 27.23 cfs potential flow)
    └─2=Orifice/Grate  (Weir Controls 16.33 cfs @ 2.81 fps)
```

Summary for Pond C4B: Culvert - 4BA & 4BB

```
Inflow Area =      20.700 ac,   1.27% Impervious,  Inflow Depth =   2.04"    for  25-yr Storm event
Inflow      =      29.93 cfs @   12.35 hrs,  Volume=          3.521 af
Outflow     =      29.11 cfs @   12.40 hrs,  Volume=          3.521 af,  Atten= 3%,  Lag= 3.0 min
Primary     =      29.11 cfs @   12.40 hrs,  Volume=          3.521 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 206.89' @ 12.40 hrs   Surf.Area= 2,406 sf   Storage= 1,124 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min ( 863.5 - 863.3 )

Volume        Invert     Avail.Storage   Storage Description
  #1          204.40'       11,197 cf    Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation         Surf.Area         Inc.Store         Cum.Store
    (feet)           (sq-ft)      (cubic-feet)      (cubic-feet)
    204.40                 0                 0                 0
    206.00                47                38                38
    208.00             5,375             5,422             5,460
    209.00             6,100             5,738            11,197

Device   Routing          Invert   Outlet Devices
  #1     Primary          204.40'  24.0"  Round Culvert - 4B X 2.00
                                   L= 78.0'   CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 204.40' / 203.70'   S= 0.0090 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 3.14 sf

Primary OutFlow  Max=29.08 cfs @ 12.40 hrs  HW=206.88'  (Free Discharge)
 └─1=Culvert - 4B  (Inlet Controls 29.08 cfs @ 4.63 fps)
```

Summary for Pond C4H-A: Culvert 4H-A

```
Inflow Area =       0.780 ac,   0.00% Impervious,  Inflow Depth =   1.97"    for  25-yr Storm event
Inflow      =       1.60 cfs @   12.16 hrs,  Volume=          0.128 af
Outflow     =       1.33 cfs @   12.23 hrs,  Volume=          0.128 af,  Atten= 17%,  Lag= 4.2 min
Primary     =       1.33 cfs @   12.23 hrs,  Volume=          0.128 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
```

Peak Elev= 202.49' @ 12.23 hrs Surf.Area= 1,230 sf Storage= 527 cf

Plug-Flow detention time= 14.1 min calculated for 0.128 af (100% of inflow)
Center-of-Mass det. time= 14.2 min (867.2 - 853.0)

Volume	Invert	Avail.Storage	Storage Description
#1	201.90'	3,419 cf	**2.00'W x 280.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	201.90'	**18.0" Round Culvert - 4HA** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 201.90' / 200.90' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.32 cfs @ 12.23 hrs HW=202.49' (Free Discharge)
↳**1=Culvert - 4HA** (Inlet Controls 1.32 cfs @ 2.06 fps)

Summary for Pond C4N: Culvert 4N

Inflow Area = 1.921 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 2.43 cfs @ 12.45 hrs, Volume= 0.315 af
Outflow = 2.43 cfs @ 12.46 hrs, Volume= 0.315 af, Atten= 0%, Lag= 0.9 min
Primary = 2.43 cfs @ 12.46 hrs, Volume= 0.315 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 184.82' @ 12.46 hrs Surf.Area= 0.006 ac Storage= 0.004 af

Plug-Flow detention time= 1.8 min calculated for 0.315 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (871.8 - 870.0)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	0.015 af	**2.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	184.00'	**18.0" Round 18-in Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.00' / 183.00' S= 0.0303 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=2.42 cfs @ 12.46 hrs HW=184.82' (Free Discharge)
↳**1=18-in Culvert** (Inlet Controls 2.42 cfs @ 2.44 fps)

Summary for Pond CB-2B-B: Catch Basin - 2BB

Inflow Area = 13.996 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 21.59 cfs @ 12.33 hrs, Volume= 2.294 af
Outflow = 21.51 cfs @ 12.35 hrs, Volume= 2.294 af, Atten= 0%, Lag= 1.2 min
Primary = 21.51 cfs @ 12.35 hrs, Volume= 2.294 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

```
Peak Elev= 200.83' @ 12.35 hrs   Surf.Area= 914 sf   Storage= 412 cf

Plug-Flow detention time= 0.1 min calculated for 2.293 af (100% of inflow)
Center-of-Mass det. time= 0.1 min ( 862.9 - 862.8 )

Volume     Invert    Avail.Storage   Storage Description
  #1       200.20'        2,459 cf   2.00'W x 200.00'L x 2.00'H Prismatoid  Z=2.0

Device   Routing          Invert   Outlet Devices
  #1     Primary          195.00'  24.0"  Round Culvert - 2BB
                                   L= 96.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 195.00' / 194.00'   S= 0.0104 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 3.14 sf
  #2     Device 1         200.00'  30.0" Horiz. Orifice/Grate   C= 0.600

Primary OutFlow Max=21.51 cfs @ 12.35 hrs  HW=200.83'  (Free Discharge)
↑—1=Culvert - 2BB (Passes 21.51 cfs of 33.24 cfs potential flow)
   ↑—2=Orifice/Grate (Orifice Controls 21.51 cfs @ 4.38 fps)
```

Summary for Pond CB-4G: Catch Basin - 4G

```
Inflow Area =      12.750 ac,   0.00% Impervious,  Inflow Depth =   1.97"    for  25-yr Storm event
Inflow      =     20.17 cfs @   12.32 hrs,  Volume=          2.089 af
Outflow     =     19.65 cfs @   12.36 hrs,  Volume=          2.089 af,  Atten= 3%,  Lag= 2.5 min
Primary     =     19.65 cfs @   12.36 hrs,  Volume=          2.089 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 182.69' @ 12.36 hrs   Surf.Area= 983 sf   Storage= 921 cf

Plug-Flow detention time= 0.4 min calculated for 2.089 af (100% of inflow)
Center-of-Mass det. time= 0.4 min ( 864.4 - 864.0 )

Volume     Invert    Avail.Storage   Storage Description
  #1       181.00'        1,256 cf   2.00'W x 71.00'L x 2.00'H Prismatoid  Z=3.0

Device   Routing          Invert   Outlet Devices
  #1     Primary          175.00'  24.0"  Round Culvert - 4G
                                   L= 36.0'   CPP, square edge headwall,  Ke= 0.500
                                   Inlet / Outlet Invert= 175.00' / 174.00'   S= 0.0278 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 3.14 sf
  #2     Device 1         181.00'  24.0" Horiz. Orifice/Grate   C= 0.600
                                   Limited to weir flow at low heads

Primary OutFlow Max=19.55 cfs @ 12.36 hrs  HW=182.67'  (Free Discharge)
↑—1=Culvert - 4G (Passes 19.55 cfs of 39.07 cfs potential flow)
   ↑—2=Orifice/Grate (Orifice Controls 19.55 cfs @ 6.22 fps)
```

Summary for Pond CB-4HB: Catch Basin - 4HB

Inflow Area = 4.180 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 7.36 cfs @ 12.22 hrs, Volume= 0.685 af
Outflow = 7.36 cfs @ 12.22 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.1 min
Primary = 7.36 cfs @ 12.22 hrs, Volume= 0.685 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 183.80' @ 12.22 hrs Surf.Area= 109 sf Storage= 40 cf

Plug-Flow detention time= 0.1 min calculated for 0.685 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (859.2 - 859.0)

Volume	Invert	Avail.Storage	Storage Description
#1	183.30'	359 cf	**2.00'W x 25.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Device 2	183.30'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	178.50'	**18.0" Round Culvert - 4HB** L= 101.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 178.50' / 176.00' S= 0.0248 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=7.23 cfs @ 12.22 hrs HW=183.80' (Free Discharge)
↳**2=Culvert - 4HB** (Passes 7.23 cfs of 18.15 cfs potential flow)
  ↳**1=Orifice/Grate** (Weir Controls 7.23 cfs @ 2.31 fps)

Summary for Pond CB-4I: Catch Basin - 4I

Inflow Area = 10.870 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 17.60 cfs @ 12.26 hrs, Volume= 1.781 af
Outflow = 17.28 cfs @ 12.29 hrs, Volume= 1.781 af, Atten= 2%, Lag= 1.9 min
Primary = 17.28 cfs @ 12.29 hrs, Volume= 1.781 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 208.90' @ 12.29 hrs Surf.Area= 0.018 ac Storage= 0.016 af

Plug-Flow detention time= 0.9 min calculated for 1.781 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (860.0 - 859.4)

Volume	Invert	Avail.Storage	Storage Description
#1	207.50'	0.029 af	**2.00'W x 100.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	202.50'	**18.0" Round Culvert - 4I** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 202.50' / 192.00' S= 0.1313 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	207.60'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=17.20 cfs @ 12.29 hrs HW=208.89' TW=194.89' (TW follows 14.00' below HW)
└─**1=Culvert - 4I** (Passes 17.20 cfs of 20.21 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 17.20 cfs @ 5.47 fps)

Summary for Pond CB-4JA: Catch Basin - 4JA

Inflow Area = 12.310 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 19.70 cfs @ 12.27 hrs, Volume= 2.017 af
Outflow = 19.17 cfs @ 12.31 hrs, Volume= 2.017 af, Atten= 3%, Lag= 2.5 min
Primary = 19.17 cfs @ 12.31 hrs, Volume= 2.017 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 220.31' @ 12.31 hrs Surf.Area= 0.023 ac Storage= 0.022 af

Plug-Flow detention time= 0.6 min calculated for 2.017 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (859.7 - 859.2)

Volume	Invert	Avail.Storage	Storage Description
#1	218.70'	0.032 af	**2.00'W x 113.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	214.00'	**18.0" Round Culvert - 4JA** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 214.00' / 212.30' S= 0.0283 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	218.70'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=19.10 cfs @ 12.31 hrs HW=220.29' TW=213.29' (TW follows 7.00' below HW)
└─**1=Culvert - 4JA** (Passes 19.10 cfs of 20.03 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 19.10 cfs @ 6.08 fps)

Summary for Pond CB-4L: Catch Basin - 4L

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 1.97" for 25-yr Storm event
Inflow = 13.04 cfs @ 12.21 hrs, Volume= 1.229 af
Outflow = 12.24 cfs @ 12.25 hrs, Volume= 1.229 af, Atten= 6%, Lag= 2.9 min
Primary = 12.24 cfs @ 12.25 hrs, Volume= 1.229 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 215.82' @ 12.25 hrs Surf.Area= 1,773 sf Storage= 1,341 cf

Plug-Flow detention time= 2.9 min calculated for 1.229 af (100% of inflow)
Center-of-Mass det. time= 2.9 min (857.7 - 854.8)

Volume	Invert	Avail.Storage	Storage Description
#1	215.00'	3,683 cf	**30.00'W x 50.00'L x 2.00'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	213.00'	**18.0" Round Culvert 4L** L= 121.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 213.00' / 211.00' S= 0.0165 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	215.00'	**24.0" Horiz. Orifice-Top of catch basin** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=12.23 cfs @ 12.25 hrs HW=215.82' (Free Discharge)
↑—1=**Culvert 4L** (Inlet Controls 12.23 cfs @ 6.92 fps)
  ↑—2=**Orifice-Top of catch basin** (Passes 12.23 cfs of 13.67 cfs potential flow)

Summary for Pond D-1G: (2)24" Culverts P-6h

Inflow Area = 11.290 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-yr Storm event
Inflow = 21.20 cfs @ 12.19 hrs, Volume= 1.924 af
Outflow = 21.06 cfs @ 12.19 hrs, Volume= 1.924 af, Atten= 1%, Lag= 0.5 min
Primary = 19.42 cfs @ 12.19 hrs, Volume= 1.908 af
Secondary = 1.63 cfs @ 12.19 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 184.67' @ 12.19 hrs Surf.Area= 667 sf Storage= 561 cf
Flood Elev= 185.00' Surf.Area= 800 sf Storage= 805 cf

Plug-Flow detention time= 0.4 min calculated for 1.923 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (851.3 - 850.9)

Volume	Invert	Avail.Storage	Storage Description
#1	183.00'	3,305 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
183.00	10	0	0
184.00	400	205	205
186.00	1,200	1,600	1,805
187.00	1,800	1,500	3,305

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	**24.0" Round (2)24"-Culvert X 2.00** L= 56.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 183.00' / 182.00' S= 0.0179 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	184.50'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=19.33 cfs @ 12.19 hrs HW=184.66' (Free Discharge)
↑—**1=(2)24"-Culvert** (Inlet Controls 19.33 cfs @ 3.46 fps)

Secondary OutFlow Max=1.55 cfs @ 12.19 hrs HW=184.66' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.55 cfs @ 0.96 fps)

Summary for Pond D-1H: LF TOE DITCH - CULVERT

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth = 2.81" for 25-yr Storm event
Inflow = 7.45 cfs @ 12.21 hrs, Volume= 0.709 af
Outflow = 7.28 cfs @ 12.25 hrs, Volume= 0.709 af, Atten= 2%, Lag= 2.0 min
Primary = 7.28 cfs @ 12.25 hrs, Volume= 0.709 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 184.69' @ 12.25 hrs Surf.Area= 494 sf Storage= 746 cf
Flood Elev= 186.00' Surf.Area= 858 sf Storage= 1,323 cf

Plug-Flow detention time= 4.0 min calculated for 0.709 af (100% of inflow)
Center-of-Mass det. time= 4.0 min (833.6 - 829.5)

Volume	Invert	Avail.Storage	Storage Description
#1	183.00'	1,323 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
183.00	24	0	0
186.00	858	1,323	1,323

Device	Routing	Invert	Outlet Devices
#1	Primary	183.00'	**18.0" Round Culvert-C-1H** L= 60.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 183.00' / 182.50' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=7.26 cfs @ 12.25 hrs HW=184.69' (Free Discharge)
↑—**1=Culvert-C-1H** (Inlet Controls 7.26 cfs @ 4.11 fps)

Summary for Pond DP-1: Detention Pond 1

Inflow Area = 34.624 ac, 3.31% Impervious, Inflow Depth = 1.60" for 25-yr Storm event
Inflow = 38.52 cfs @ 12.28 hrs, Volume= 4.626 af
Outflow = 7.74 cfs @ 13.03 hrs, Volume= 4.068 af, Atten= 80%, Lag= 44.9 min
Primary = 7.74 cfs @ 13.03 hrs, Volume= 4.068 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 165.13' @ 13.03 hrs Surf.Area= 19,571 sf Storage= 75,820 cf

Plug-Flow detention time= 185.8 min calculated for 4.068 af (88% of inflow)
Center-of-Mass det. time= 126.3 min (1,019.5 - 893.1)

```
Volume      Invert    Avail.Storage   Storage Description
  #1        160.00'     115,245 cf    Custom Stage Data (Prismatic)Listed below

 Elevation        Surf.Area        Inc.Store      Cum.Store
   (feet)           (sq-ft)      (cubic-feet)   (cubic-feet)
   160.00           10,750                0              0
   162.00           13,540           24,290         24,290
   164.00           17,070           30,610         54,900
   165.00           19,300           18,185         73,085
   166.00           21,310           20,305         93,390
   167.00           22,400           21,855        115,245

Device   Routing        Invert   Outlet Devices
  #1     Primary       162.00'   30.0" Round 30" Culvert
                                 L= 75.0'  CMP, projecting, no headwall,  Ke= 0.900
                                 Inlet / Outlet Invert= 162.00' / 159.50'  S= 0.0333 '/'  Cc= 0.900
                                 n= 0.012,  Flow Area= 4.91 sf
  #2     Device 1      162.00'   12.0" Vert. Orifice on side  C= 0.600
  #3     Device 1      162.00'   6.0" Vert. Orifice on side  C= 0.600
  #4     Device 1      165.50'   72.0" Horiz. Orifice-Top of drop inlet  C= 0.600
                                 Limited to weir flow at low heads
  #5     Secondary     166.00'   40.0' long  x 16.0' breadth Broad-Crested Rectangular Weir
                                 Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                 Coef. (English) 2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63

Primary OutFlow Max=7.74 cfs @ 13.03 hrs  HW=165.13'  (Free Discharge)
 └─1=30" Culvert (Passes 7.74 cfs of 25.61 cfs potential flow)
    ├─2=Orifice on side (Orifice Controls 6.14 cfs @ 7.81 fps)
    ├─3=Orifice on side (Orifice Controls 1.61 cfs @ 8.18 fps)
    └─4=Orifice-Top of drop inlet ( Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=160.00'  (Free Discharge)
 └─5=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Summary for Pond DP-10: DETENTION POND 10

```
Inflow Area =     28.280 ac,   4.24% Impervious,  Inflow Depth =   2.05"   for  25-yr Storm event
Inflow      =    44.00 cfs @   12.31 hrs,  Volume=          4.842 af
Outflow     =    16.88 cfs @   12.75 hrs,  Volume=          4.425 af,  Atten= 62%,  Lag= 26.0 min
Primary     =    15.37 cfs @   12.75 hrs,  Volume=          2.131 af
Secondary =       1.51 cfs @   12.75 hrs,  Volume=          2.294 af
Tertiary    =     0.00 cfs @    0.00 hrs,  Volume=          0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00'  Surf.Area= 0 sf  Storage= 0 cf
Peak Elev= 179.51' @ 12.75 hrs  Surf.Area= 25,024 sf  Storage= 88,504 cf
Flood Elev= 181.00'  Surf.Area= 28,500 sf  Storage= 128,200 cf

Plug-Flow detention time= 587.4 min calculated for 4.423 af (91% of inflow)
Center-of-Mass det. time= 546.3 min ( 1,404.8 - 858.5 )
```

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	157,950 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	7,900	0	0
176.00	18,000	12,950	12,950
178.00	22,000	40,000	52,950
180.00	26,000	48,000	100,950
182.00	31,000	57,000	157,950

Device	Routing	Invert	Outlet Devices
#1	Device 3	179.00'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	178.00'	**6.0" Vert. 6-in Orifice** C= 0.600
#3	Primary	175.20'	**18.0" Round 18-in Primary Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.20' / 172.00' S= 0.0615 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	173.50'	**5.8" Round 6-in Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.50' / 172.30' S= 0.0200 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	177.00'	**5.8" Horiz. Orifice Top** C= 0.600 Limited to weir flow at low heads
#6	Device 4	176.20'	**1.5" Vert. Orifice Side** C= 0.600
#7	Tertiary	180.00'	**10.0' long x 22.0' breadth E-Spillway Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=16.06 cfs @ 12.75 hrs HW=179.51' (Free Discharge)
└─**3=18-in Primary Culvert** (Inlet Controls 16.06 cfs @ 9.09 fps)
  ├─**1=Orifice/Grate** (Passes < 15.05 cfs potential flow)
  └─**2=6-in Orifice** (Passes < 1.06 cfs potential flow)

Secondary OutFlow Max=1.51 cfs @ 12.75 hrs HW=179.51' (Free Discharge)
└─**4=6-in Culvert** (Passes 1.51 cfs of 1.64 cfs potential flow)
  ├─**5=Orifice Top** (Orifice Controls 1.40 cfs @ 7.63 fps)
  └─**6=Orifice Side** (Orifice Controls 0.11 cfs @ 8.68 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**7=E-Spillway Weir** (Controls 0.00 cfs)

Summary for Pond DP-11: Detention Pond 11

Inflow Area =	22.282 ac,	4.04% Impervious, Inflow Depth = 2.04"	for 25-yr Storm event
Inflow =	28.67 cfs @	12.35 hrs, Volume=	3.795 af
Outflow =	1.42 cfs @	18.07 hrs, Volume=	3.639 af, Atten= 95%, Lag= 343.1 min
Primary =	0.17 cfs @	18.07 hrs, Volume=	0.076 af
Secondary =	1.25 cfs @	18.07 hrs, Volume=	3.562 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 167.75' @ 18.07 hrs Surf.Area= 39,116 sf Storage= 115,942 cf

Plug-Flow detention time= 1,275.7 min calculated for 3.639 af (96% of inflow)
Center-of-Mass det. time= 1,252.9 min (2,120.8 - 867.9)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	211,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	2,000	0	0
164.00	10,900	6,450	6,450
166.00	34,300	45,200	51,650
168.00	39,800	74,100	125,750
170.00	46,200	86,000	211,750

Device	Routing	Invert	Outlet Devices
#1	Device 3	167.50'	**6.0" Vert. 6-In Orifice Side (Riser)** C= 0.600
#2	Device 3	168.40'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#3	Primary	164.30'	**18.0" Round 18-In Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.30' / 162.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	161.50'	**5.8" Round 6-In Culvert** L= 137.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 160.00' S= 0.0109 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	165.10'	**5.8" Horiz. Orifice Top (6-in Culv)** C= 0.600 Limited to weir flow at low heads
#6	Device 4	164.00'	**1.5" Vert. Orifice Side (6-in Culv) X 1.50** C= 0.600

Primary OutFlow Max=0.17 cfs @ 18.07 hrs HW=167.75' (Free Discharge)
└─**3=18-In Culvert** (Passes 0.17 cfs of 11.04 cfs potential flow)
  ├─**1=6-In Orifice Side (Riser)** (Orifice Controls 0.17 cfs @ 1.71 fps)
  └─**2=Grate Top (Riser)** (Controls 0.00 cfs)

Secondary OutFlow Max=1.25 cfs @ 18.07 hrs HW=167.75' (Free Discharge)
└─**4=6-In Culvert** (Barrel Controls 1.25 cfs @ 6.84 fps)
  ├─**5=Orifice Top (6-in Culv)** (Passes < 1.44 cfs potential flow)
  └─**6=Orifice Side (6-in Culv)** (Passes < 0.17 cfs potential flow)

Summary for Pond DP-12: DETENTION POND 12

Inflow Area = 20.177 ac, 3.27% Impervious, Inflow Depth = 2.01" for 25-yr Storm event
Inflow = 23.02 cfs @ 12.36 hrs, Volume= 3.388 af
Outflow = 2.44 cfs @ 15.88 hrs, Volume= 3.228 af, Atten= 89%, Lag= 211.3 min
Primary = 0.99 cfs @ 15.88 hrs, Volume= 0.501 af
Secondary = 1.45 cfs @ 15.88 hrs, Volume= 2.727 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs

Peak Elev= 187.48' @ 15.88 hrs Surf.Area= 37,220 sf Storage= 88,740 cf

Plug-Flow detention time= 917.5 min calculated for 3.228 af (95% of inflow)
Center-of-Mass det. time= 891.6 min (1,770.2 - 878.5)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	205,300 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
184.00	11,200	0	0
186.00	28,700	39,900	39,900
188.00	40,200	68,900	108,800
190.00	56,300	96,500	205,300

Device	Routing	Invert	Outlet Devices
#1	Device 3	188.00'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#2	Device 3	186.80'	**8.0" Vert. 8-In Orifice (Riser Side)** C= 0.600
#3	Primary	184.50'	**18.0" Round 18- In Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.50' / 180.00' S= 0.0563 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Device 6	185.50'	**5.8" Horiz. Orifice Top (6-in Pipe)** C= 0.600 Limited to weir flow at low heads
#5	Device 6	184.50'	**1.5" Vert. Orifice (Side of 6-in) X 2.00** C= 0.600
#6	Secondary	181.50'	**6.0" Round 6-In Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0234 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf

```
Primary OutFlow Max=0.99 cfs @ 15.88 hrs  HW=187.48'  (Free Discharge)
└─3=18- In Culvert (Passes 0.99 cfs of 10.04 cfs potential flow)
   ├─1=Grate Top (Riser) ( Controls 0.00 cfs)
   └─2=8-In Orifice (Riser Side) (Orifice Controls 0.99 cfs @ 2.84 fps)
```

```
Secondary OutFlow Max=1.45 cfs @ 15.88 hrs  HW=187.48'  (Free Discharge)
└─6=6-In Culvert (Passes 1.45 cfs of 1.77 cfs potential flow)
   ├─4=Orifice Top (6-in Pipe) (Orifice Controls 1.24 cfs @ 6.78 fps)
   └─5=Orifice (Side of 6-in) (Orifice Controls 0.20 cfs @ 8.23 fps)
```

Summary for Pond DP-1A: DP-1A (Former Leachate Pond)

```
Inflow Area =     10.835 ac, 10.57% Impervious, Inflow Depth =  2.26"   for 25-yr Storm event
Inflow      =    17.45 cfs @  12.25 hrs, Volume=          2.044 af
Outflow     =     1.16 cfs @  15.89 hrs, Volume=          0.587 af, Atten= 93%, Lag= 218.4 min
Primary     =     1.16 cfs @  15.89 hrs, Volume=          0.587 af
```

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 164.00' Surf.Area= 37,429 sf Storage= 182,617 cf
Peak Elev= 165.68' @ 15.89 hrs Surf.Area= 42,122 sf Storage= 249,629 cf (67,013 cf above start)
Flood Elev= 166.00' Surf.Area= 43,000 sf Storage= 263,046 cf (80,429 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 298.1 min (1,134.3 - 836.2)

Volume	Invert	Avail.Storage	Storage Description
#1	158.00'	263,046 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
158.00	24,139	0	0
160.00	27,981	52,120	52,120
162.00	32,544	60,525	112,645
163.00	34,985	33,765	146,410
164.00	37,429	36,207	182,617
166.00	43,000	80,429	263,046

Device	Routing	Invert	Outlet Devices
#1	Primary	165.60'	**18.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=1.14 cfs @ 15.89 hrs HW=165.68' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.14 cfs @ 0.75 fps)

Summary for Pond DP-2: DETENTION POND 2

Inflow Area = 10.745 ac, 0.00% Impervious, Inflow Depth = 2.06" for 25-yr Storm event
Inflow = 21.80 cfs @ 12.19 hrs, Volume= 1.847 af
Outflow = 9.55 cfs @ 12.50 hrs, Volume= 1.847 af, Atten= 56%, Lag= 18.6 min
Primary = 9.55 cfs @ 12.50 hrs, Volume= 1.847 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 162.30' Surf.Area= 2,326 sf Storage= 956 cf
Peak Elev= 165.54' @ 12.50 hrs Surf.Area= 8,830 sf Storage= 17,590 cf (16,633 cf above start)
Flood Elev= 166.60' Surf.Area= 12,071 sf Storage= 28,956 cf (27,999 cf above start)

Plug-Flow detention time= 35.3 min calculated for 1.825 af (99% of inflow)
Center-of-Mass det. time= 25.1 min (875.0 - 849.9)

Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	47,648 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,957	0	0
164.00	4,419	6,376	6,376
166.00	10,150	14,569	20,945
168.00	16,553	26,703	47,648

```
Device  Routing      Invert  Outlet Devices
  #1    Primary     162.30'  24.0" Round Culvert
                             L= 40.0'  CPP, square edge headwall,  Ke= 0.500
                             Inlet / Outlet Invert= 162.30' / 162.00'  S= 0.0075 '/'  Cc= 0.900
                             n= 0.013  Corrugated PE, smooth interior,  Flow Area= 3.14 sf
  #2    Device 1    162.30'  15.0" Vert. Orifice   C= 0.600
  #3    Device 1    166.30'  48.0" Horiz. Grate   C= 0.600   Limited to weir flow at low heads

Primary OutFlow Max=9.55 cfs @ 12.50 hrs  HW=165.54'  (Free Discharge)
 └─1=Culvert (Passes 9.55 cfs of 22.12 cfs potential flow)
    ├─2=Orifice (Orifice Controls 9.55 cfs @ 7.78 fps)
    └─3=Grate ( Controls 0.00 cfs)
```

Summary for Pond DP-6: DETENTION POND 6

```
Inflow Area =      22.602 ac,   7.31% Impervious,  Inflow Depth =   2.29"   for  25-yr Storm event
Inflow      =      34.84 cfs @  12.27 hrs,  Volume=         4.313 af
Outflow     =       1.42 cfs @  18.23 hrs,  Volume=         4.313 af,  Atten= 96%,  Lag= 357.5 min
Primary     =       0.00 cfs @   0.00 hrs,  Volume=         0.000 af
Secondary   =       1.42 cfs @  18.23 hrs,  Volume=         4.313 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 174.00'  Surf.Area= 25,931 sf  Storage= 29,566 cf
Peak Elev= 176.58' @ 18.23 hrs  Surf.Area= 71,266 sf  Storage= 163,071 cf  (133,505 cf above start)
Flood Elev= 180.00'  Surf.Area= 130,159 sf  Storage= 496,644 cf  (467,078 cf above start)

Plug-Flow detention time= 1,400.4 min calculated for 3.633 af (84% of inflow)
Center-of-Mass det. time= 1,130.4 min ( 1,982.0 - 851.6 )

Volume     Invert    Avail.Storage   Storage Description
  #1      172.00'       783,647 cf   Detention Pond (Prismatic)Listed below

 Elevation        Surf.Area       Inc.Store       Cum.Store
    (feet)          (sq-ft)    (cubic-feet)    (cubic-feet)
    172.00            3,635               0               0
    174.00           25,931          29,566          29,566
    176.00           62,168          88,099         117,665
    178.00           93,326         155,494         273,159
    180.00          130,159         223,485         496,644
    182.00          156,844         287,003         783,647

Device  Routing      Invert  Outlet Devices
  #1    Primary     178.00'  24.0" Round Outlet Culvert
                             L= 70.0'  CPP, projecting, no headwall,  Ke= 0.900
                             Inlet / Outlet Invert= 178.00' / 168.00'  S= 0.1429 '/'  Cc= 0.900
                             n= 0.012,  Flow Area= 3.14 sf
  #2    Secondary   169.00'  6.0" Round Outlet Culvert 6"
                             L= 80.0'  CPP, projecting, no headwall,  Ke= 0.900
                             Inlet / Outlet Invert= 169.00' / 168.00'  S= 0.0125 '/'  Cc= 0.900
                             n= 0.012,  Flow Area= 0.20 sf
  #3    Device 2    174.00'  5.8" Horiz. Orifice  C= 0.600  Limited to weir flow at low heads
  #4    Secondary   179.00'  10.0' long x 22.0' breadth Broad-Crested Rectangular Weir
```

```
                                   Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                   Coef. (English) 2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=174.00'  (Free Discharge)
 └─1=Outlet Culvert ( Controls 0.00 cfs)

Secondary OutFlow Max=1.42 cfs @ 18.23 hrs  HW=176.58'  (Free Discharge)
 ├─2=Outlet Culvert 6" (Passes 1.42 cfs of 1.66 cfs potential flow)
 │  └─3=Orifice (Orifice Controls 1.42 cfs @ 7.74 fps)
 └─4=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)
```

Summary for Pond DP-9: DETENTION POND 9

```
Inflow Area =      33.165 ac,  8.08% Impervious,  Inflow Depth =  2.41"   for  25-yr Storm event
Inflow      =      50.65 cfs @  12.39 hrs,  Volume=         6.673 af
Outflow     =       2.04 cfs @  18.50 hrs,  Volume=         4.456 af,  Atten= 96%,  Lag= 366.8 min
Primary     =       0.86 cfs @  18.50 hrs,  Volume=         0.727 af
Secondary   =       1.18 cfs @  18.50 hrs,  Volume=         3.729 af
Tertiary    =       0.00 cfs @   0.00 hrs,  Volume=         0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.04' @ 18.50 hrs   Surf.Area= 86,892 sf   Storage= 225,513 cf
Flood Elev= 191.00'   Surf.Area= 91,210 sf   Storage= 312,840 cf

Plug-Flow detention time= 1,615.4 min calculated for 4.455 af (67% of inflow)
Center-of-Mass det. time= 1,513.6 min ( 2,361.6 - 848.1 )

Volume      Invert    Avail.Storage   Storage Description
    #1     187.00'       404,050 cf   Detention Pond (Prismatic)Listed below

 Elevation        Surf.Area       Inc.Store       Cum.Store
    (feet)          (sq-ft)    (cubic-feet)    (cubic-feet)
    187.00           35,200               0               0
    188.00           78,220          56,710          56,710
    190.00           86,700         164,920         221,630
    192.00           95,720         182,420         404,050

Device   Routing          Invert   Outlet Devices
   #1    Primary         189.50'   12.0" Round 12-In Outlet Culvert
                                   L= 48.0'  CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 189.50' / 180.50'   S= 0.1875 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 0.79 sf
   #2    Secondary       184.21'   5.8" Round 6-In Culvert
                                   L= 60.0'  CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 184.21' / 180.50'   S= 0.0618 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 0.18 sf
   #3    Device 2        188.70'   5.8" Horiz. Orifice   C= 0.600   Limited to weir flow at low heads
   #4    Device 2        188.30'   1.5" Vert. Orifice X 2.00   C= 0.600
   #5    Tertiary        190.50'   10.0' long  x 22.0' breadth Broad-Crested Rectangular Weir
                                   Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                   Coef. (English) 2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63
```

```
Primary OutFlow Max=0.86 cfs @ 18.50 hrs  HW=190.04'  (Free Discharge)
└─1=12-In Outlet Culvert (Inlet Controls 0.86 cfs @ 1.98 fps)

Secondary OutFlow Max=1.18 cfs @ 18.50 hrs  HW=190.04'  (Free Discharge)
└─2=6-In Culvert  (Passes 1.18 cfs of 1.65 cfs potential flow)
   ├─3=Orifice  (Orifice Controls 1.02 cfs @ 5.58 fps)
   └─4=Orifice  (Orifice Controls 0.15 cfs @ 6.24 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs  HW=187.00'  (Free Discharge)
└─5=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

APPENDIX C

DETENTION POND DESIGN

C-1 DETENTION TIME AND STAGE STORAGE CURVES

Summary for Pond DP-1: Detention Pond 1

Inflow Area = 34.624 ac, 3.31% Impervious, Inflow Depth = 0.43" for 2-yr Storm event
Inflow = 10.24 cfs @ 12.33 hrs, Volume= 1.253 af
Outflow = 1.15 cfs @ 15.38 hrs, Volume= 0.695 af, Atten= 89%, Lag= 183.0 min
Primary = 1.15 cfs @ 15.38 hrs, Volume= 0.695 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 162.46' @ 15.38 hrs Surf.Area= 14,359 sf Storage= 31,388 cf

Plug-Flow detention time= 430.2 min calculated for 0.695 af (55% of inflow)
Center-of-Mass det. time= 297.7 min (1,193.7 - 896.1)

Volume	Invert	Avail.Storage	Storage Description
#1	160.00'	115,245 cf	**Custom Stage Data (Prismatic)**Listed below

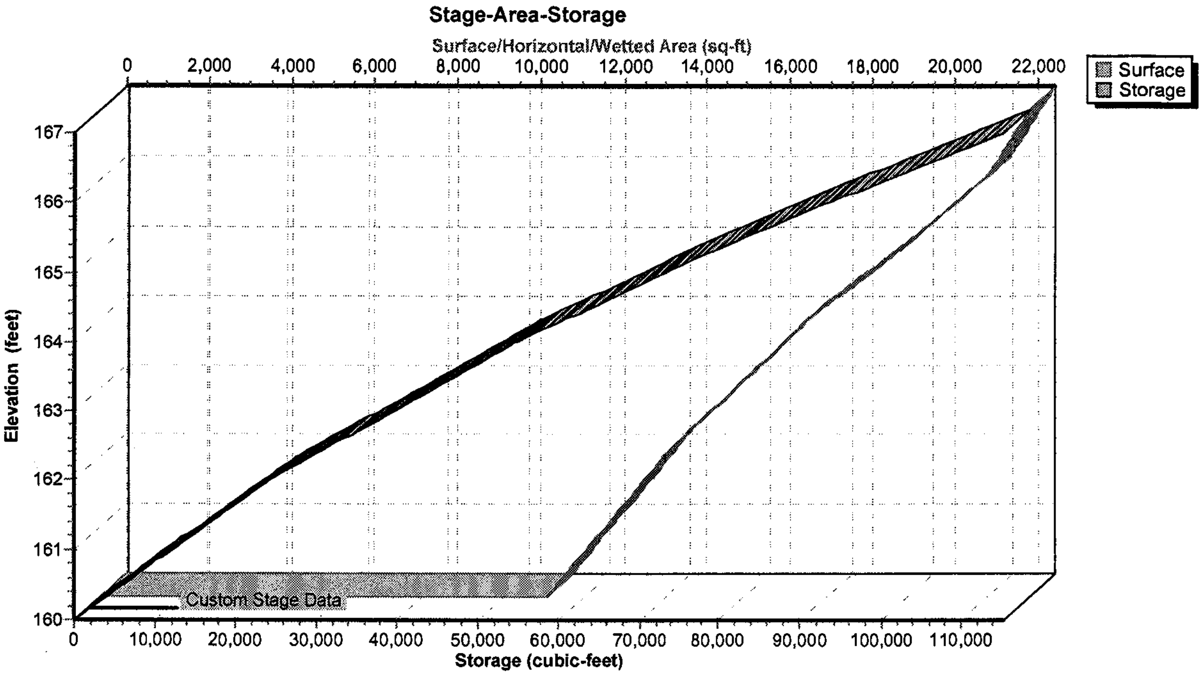
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
160.00	10,750	0	0
162.00	13,540	24,290	24,290
164.00	17,070	30,610	54,900
165.00	19,300	18,185	73,085
166.00	21,310	20,305	93,390
167.00	22,400	21,855	115,245

Device	Routing	Invert	Outlet Devices
#1	Primary	162.00'	**30.0" Round 30" Culvert** L= 75.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 162.00' / 159.50' S= 0.0333 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	162.00'	**12.0" Vert. Orifice on side** C= 0.600
#3	Device 1	162.00'	**6.0" Vert. Orifice on side** C= 0.600
#4	Device 1	165.50'	**72.0" Horiz. Orifice-Top of drop inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	166.00'	**40.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.15 cfs @ 15.38 hrs HW=162.46' (Free Discharge)
└─**1=30" Culvert** (Inlet Controls 1.15 cfs @ 1.83 fps)
  ├─**2=Orifice on side** (Passes < 0.83 cfs potential flow)
  ├─**3=Orifice on side** (Passes < 0.44 cfs potential flow)
  └─**4=Orifice-Top of drop inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=160.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond DP-1: Detention Pond 1



Summary for Pond DP-1A: DP-1A (Former Leachate Pond)

```
Inflow Area =     10.835 ac, 10.57% Impervious, Inflow Depth =  0.80"   for 2-yr Storm event
Inflow      =      5.05 cfs @  12.27 hrs, Volume=         0.720 af
Outflow     =      0.00 cfs @   0.00 hrs, Volume=         0.000 af,  Atten= 100%,  Lag= 0.0 min
Primary     =      0.00 cfs @   0.00 hrs, Volume=         0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Starting Elev= 164.00'  Surf.Area= 37,429 sf  Storage= 182,617 cf
Peak Elev= 164.81' @ 25.65 hrs  Surf.Area= 39,695 sf  Storage= 213,981 cf  (31,364 cf above start)
Flood Elev= 166.00'  Surf.Area= 43,000 sf  Storage= 263,046 cf  (80,429 cf above start)

Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= (not calculated: no outflow)

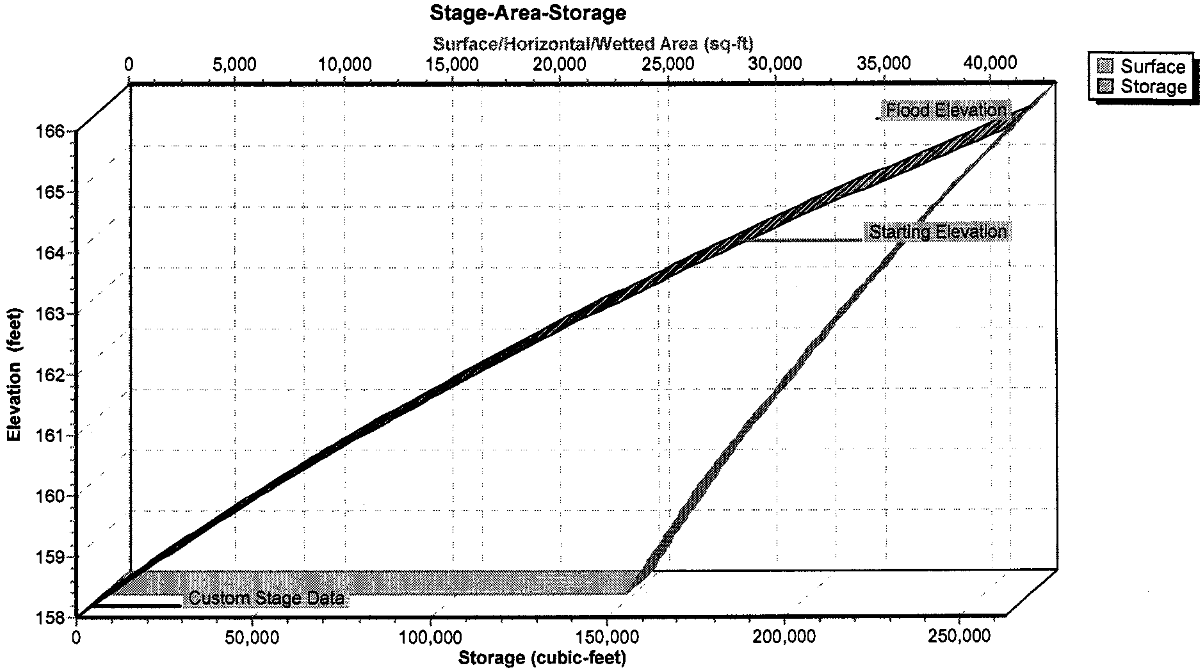
Volume     Invert    Avail.Storage  Storage Description
  #1      158.00'      263,046 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

 Elevation      Surf.Area        Inc.Store       Cum.Store
   (feet)         (sq-ft)      (cubic-feet)    (cubic-feet)
   158.00          24,139                0               0
   160.00          27,981           52,120          52,120
   162.00          32,544           60,525         112,645
   163.00          34,985           33,765         146,410
   164.00          37,429           36,207         182,617
   166.00          43,000           80,429         263,046

Device   Routing        Invert   Outlet Devices
  #1     Primary       165.60'   18.0' long  x 12.0' breadth Broad-Crested Rectangular Weir
                                 Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                 Coef. (English)  2.57  2.62  2.70  2.67  2.66  2.67  2.66  2.64

Primary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=164.00'  (Free Discharge)
└─1=Broad-Crested Rectangular Weir( Controls 0.00 cfs)
```

Pond DP-1A: DP-1A (Former Leachate Pond)



Summary for Pond DP-2: DETENTION POND 2

Inflow Area =	10.745 ac,	0.00% Impervious, Inflow Depth =	0.64"	for 2-yr Storm event
Inflow =	5.49 cfs @	12.21 hrs, Volume=	0.569 af	
Outflow =	3.92 cfs @	12.40 hrs, Volume=	0.569 af,	Atten= 29%, Lag= 11.7 min
Primary =	3.92 cfs @	12.40 hrs, Volume=	0.569 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 162.30' Surf.Area= 2,326 sf Storage= 956 cf
Peak Elev= 163.37' @ 12.40 hrs Surf.Area= 3,640 sf Storage= 4,359 cf (3,402 cf above start)
Flood Elev= 166.60' Surf.Area= 12,071 sf Storage= 28,956 cf (27,999 cf above start)

Plug-Flow detention time= 60.2 min calculated for 0.547 af (96% of inflow)
Center-of-Mass det. time= 32.2 min (919.9 - 887.6)

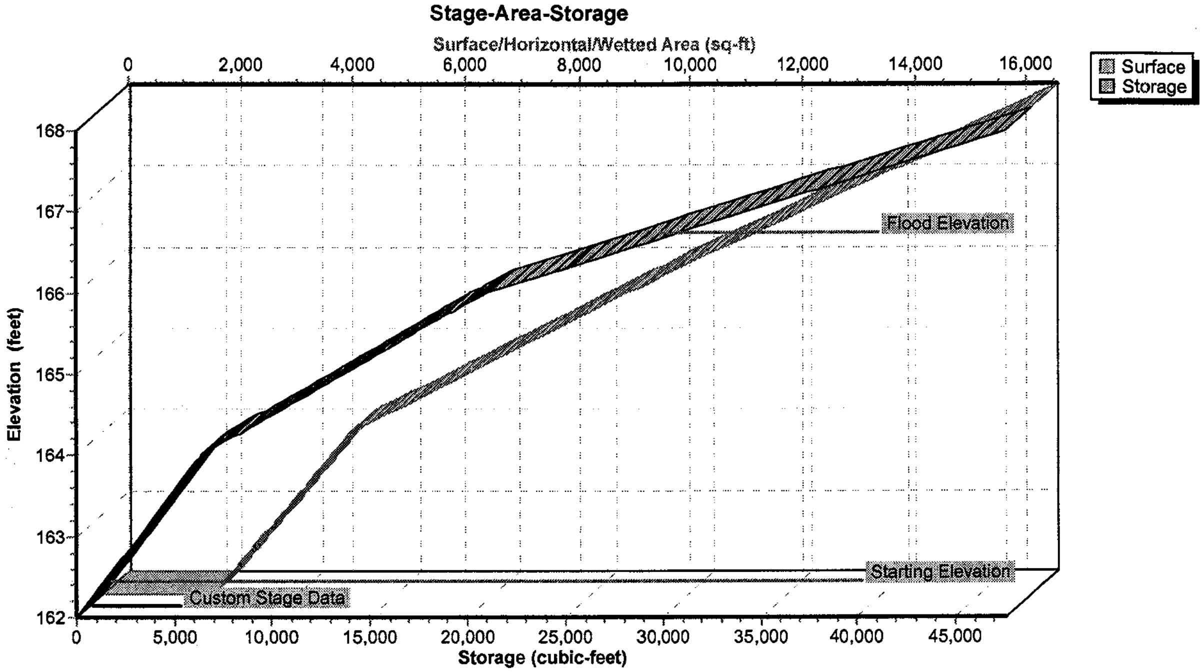
Volume	Invert	Avail.Storage	Storage Description
#1	162.00'	47,648 cf	**Custom Stage Data (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
162.00	1,957	0	0
164.00	4,419	6,376	6,376
166.00	10,150	14,569	20,945
168.00	16,553	26,703	47,648

Device	Routing	Invert	Outlet Devices
#1	Primary	162.30'	**24.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 162.30' / 162.00' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	162.30'	**15.0" Vert. Orifice** C= 0.600
#3	Device 1	166.30'	**48.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.92 cfs @ 12.40 hrs HW=163.37' (Free Discharge)
└─**1=Culvert** (Passes 3.92 cfs of 4.88 cfs potential flow)
 ├─**2=Orifice** (Orifice Controls 3.92 cfs @ 3.52 fps)
 └─**3=Grate** (Controls 0.00 cfs)

Pond DP-2: DETENTION POND 2



Summary for Pond DP-6: DETENTION POND 6

Inflow Area = 22.602 ac, 7.31% Impervious, Inflow Depth = 0.78" for 2-yr Storm event
Inflow = 11.00 cfs @ 12.31 hrs, Volume= 1.472 af
Outflow = 0.82 cfs @ 16.92 hrs, Volume= 1.472 af, Atten= 93%, Lag= 276.7 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.82 cfs @ 16.92 hrs, Volume= 1.472 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Starting Elev= 174.00' Surf.Area= 25,931 sf Storage= 29,566 cf
Peak Elev= 174.86' @ 16.92 hrs Surf.Area= 41,554 sf Storage= 67,549 cf (37,983 cf above start)
Flood Elev= 180.00' Surf.Area= 130,159 sf Storage= 496,644 cf (467,078 cf above start)

Plug-Flow detention time= 1,153.1 min calculated for 0.794 af (54% of inflow)
Center-of-Mass det. time= 628.6 min (1,512.9 - 884.3)

Volume	Invert	Avail.Storage	Storage Description
#1	172.00'	783,647 cf	**Detention Pond (Prismatic)**Listed below

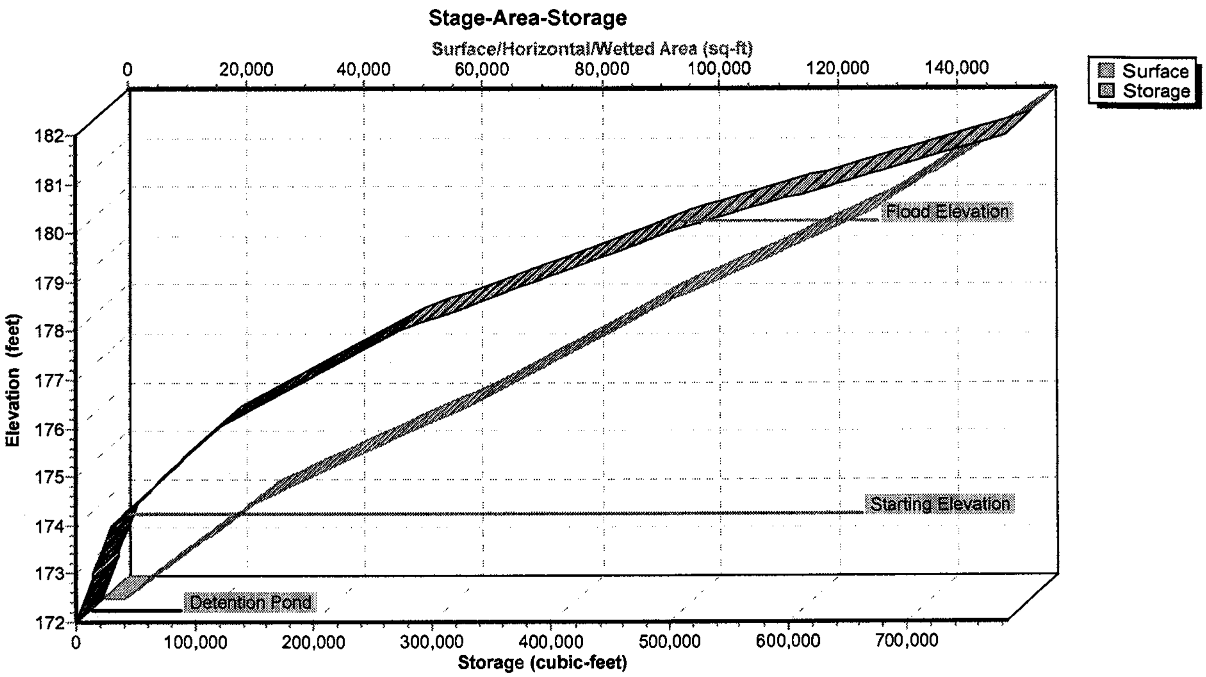
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
172.00	3,635	0	0
174.00	25,931	29,566	29,566
176.00	62,168	88,099	117,665
178.00	93,326	155,494	273,159
180.00	130,159	223,485	496,644
182.00	156,844	287,003	783,647

Device	Routing	Invert	Outlet Devices
#1	Primary	178.00'	**24.0" Round Outlet Culvert** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 178.00' / 168.00' S= 0.1429 '/' Cc= 0.900 n= 0.012, Flow Area= 3.14 sf
#2	Secondary	169.00'	**6.0" Round Outlet Culvert 6"** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 169.00' / 168.00' S= 0.0125 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#3	Device 2	174.00'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Secondary	179.00'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=174.00' (Free Discharge)
└─**1=Outlet Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.82 cfs @ 16.92 hrs HW=174.86' (Free Discharge)
├─**2=Outlet Culvert 6"** (Passes 0.82 cfs of 1.47 cfs potential flow)
│ └─**3=Orifice** (Orifice Controls 0.82 cfs @ 4.47 fps)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DP-6: DETENTION POND 6



Summary for Pond DP-9: DETENTION POND 9

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth = 0.87" for 2-yr Storm event
Inflow = 16.58 cfs @ 12.44 hrs, Volume= 2.398 af
Outflow = 0.05 cfs @ 24.97 hrs, Volume= 0.399 af, Atten= 100%, Lag= 751.5 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.05 cfs @ 24.97 hrs, Volume= 0.399 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 188.57' @ 24.97 hrs Surf.Area= 80,617 sf Storage= 103,321 cf
Flood Elev= 191.00' Surf.Area= 91,210 sf Storage= 312,840 cf

Plug-Flow detention time= 3,910.1 min calculated for 0.399 af (17% of inflow)
Center-of-Mass det. time= 3,748.6 min (4,626.7 - 878.2)

Volume	Invert	Avail.Storage	Storage Description
#1	187.00'	404,050 cf	**Detention Pond (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
187.00	35,200	0	0
188.00	78,220	56,710	56,710
190.00	86,700	164,920	221,630
192.00	95,720	182,420	404,050

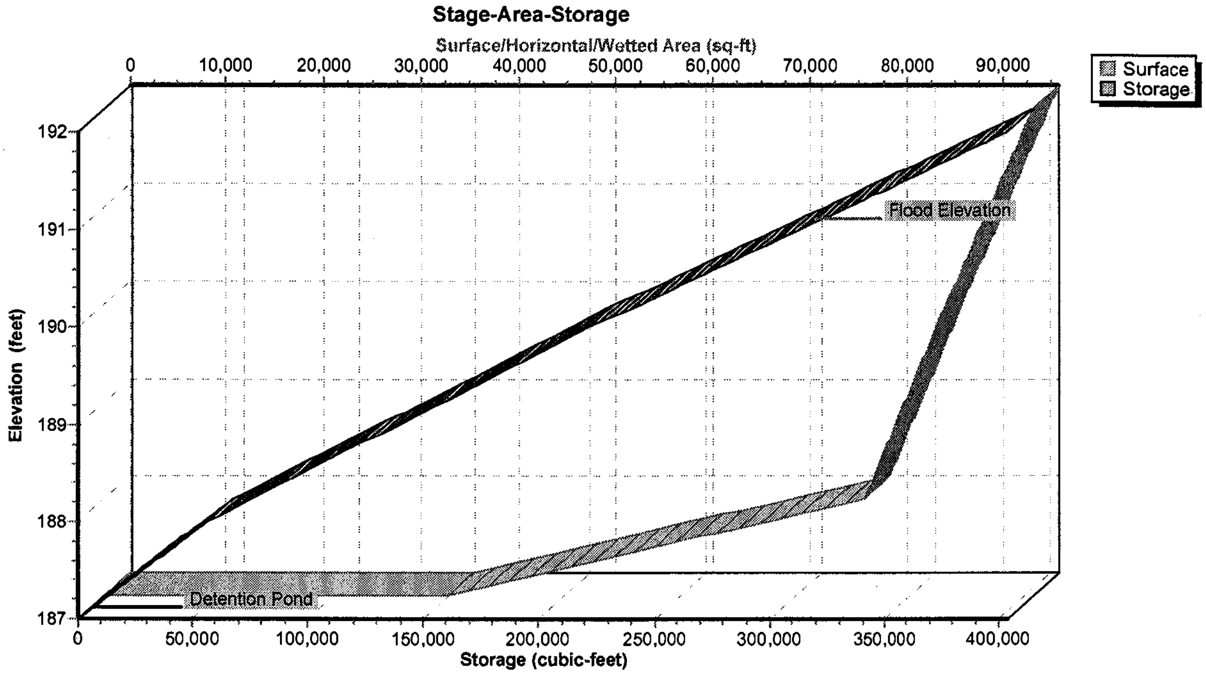
Device	Routing	Invert	Outlet Devices
#1	Primary	189.50'	**12.0" Round 12-In Outlet Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 189.50' / 180.50' S= 0.1875 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Secondary	184.21'	**5.8" Round 6-In Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.21' / 180.50' S= 0.0618 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#3	Device 2	188.70'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	188.30'	**1.5" Vert. Orifice X 2.00** C= 0.600
#5	Tertiary	190.50'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.00' (Free Discharge)
└─**1=12-In Outlet Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.05 cfs @ 24.97 hrs HW=188.57' (Free Discharge)
└─**2=6-In Culvert** (Passes 0.05 cfs of 1.41 cfs potential flow)
  ├─**3=Orifice** (Controls 0.00 cfs)
  └─**4=Orifice** (Orifice Controls 0.05 cfs @ 2.17 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=187.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond DP-9: DETENTION POND 9



Summary for Pond DP-10: DETENTION POND 10

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 12.05 cfs @ 12.36 hrs, Volume= 1.516 af
Outflow = 0.74 cfs @ 17.84 hrs, Volume= 1.103 af, Atten= 94%, Lag= 328.8 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.74 cfs @ 17.84 hrs, Volume= 1.103 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 177.58' @ 17.84 hrs Surf.Area= 21,167 sf Storage= 43,962 cf
Flood Elev= 181.00' Surf.Area= 28,500 sf Storage= 128,200 cf

Plug-Flow detention time= 1,554.9 min calculated for 1.103 af (73% of inflow)
Center-of-Mass det. time= 1,451.8 min (2,348.3 - 896.5)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	157,950 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	7,900	0	0
176.00	18,000	12,950	12,950
178.00	22,000	40,000	52,950
180.00	26,000	48,000	100,950
182.00	31,000	57,000	157,950

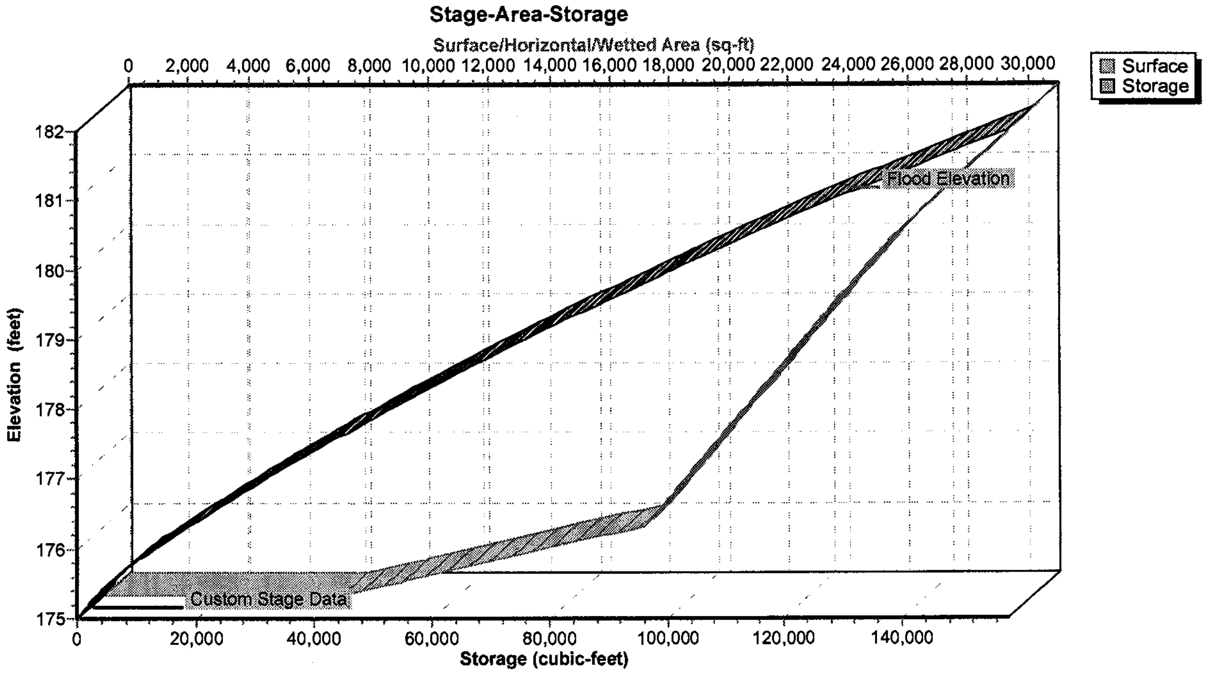
Device	Routing	Invert	Outlet Devices
#1	Device 3	179.00'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	178.00'	**6.0" Vert. 6-in Orifice** C= 0.600
#3	Primary	175.20'	**18.0" Round 18-in Primary Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.20' / 172.00' S= 0.0615 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	173.50'	**5.8" Round 6-in Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.50' / 172.30' S= 0.0200 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	177.00'	**5.8" Horiz. Orifice Top** C= 0.600 Limited to weir flow at low heads
#6	Device 4	176.20'	**1.5" Vert. Orifice Side** C= 0.600
#7	Tertiary	180.00'	**10.0' long x 22.0' breadth E-Spillway Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**3=18-in Primary Culvert** (Controls 0.00 cfs)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=6-in Orifice** (Controls 0.00 cfs)

Secondary OutFlow Max=0.74 cfs @ 17.84 hrs HW=177.58' (Free Discharge)
└─**4=6-in Culvert** (Passes 0.74 cfs of 1.37 cfs potential flow)
  ├─**5=Orifice Top** (Orifice Controls 0.67 cfs @ 3.68 fps)
  └─**6=Orifice Side** (Orifice Controls 0.07 cfs @ 5.53 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**7=E-Spillway Weir** (Controls 0.00 cfs)

Pond DP-10: DETENTION POND 10



Summary for Pond DP-11: Detention Pond 11

Inflow Area = 22.282 ac, 4.04% Impervious, Inflow Depth = 0.64" for 2-yr Storm event
Inflow = 7.66 cfs @ 12.40 hrs, Volume= 1.182 af
Outflow = 0.61 cfs @ 17.82 hrs, Volume= 1.030 af, Atten= 92%, Lag= 325.1 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.61 cfs @ 17.82 hrs, Volume= 1.030 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 165.43' @ 17.82 hrs Surf.Area= 27,580 sf Storage= 33,880 cf

Plug-Flow detention time= 1,598.2 min calculated for 1.030 af (87% of inflow)
Center-of-Mass det. time= 1,537.9 min (2,445.3 - 907.4)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	211,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

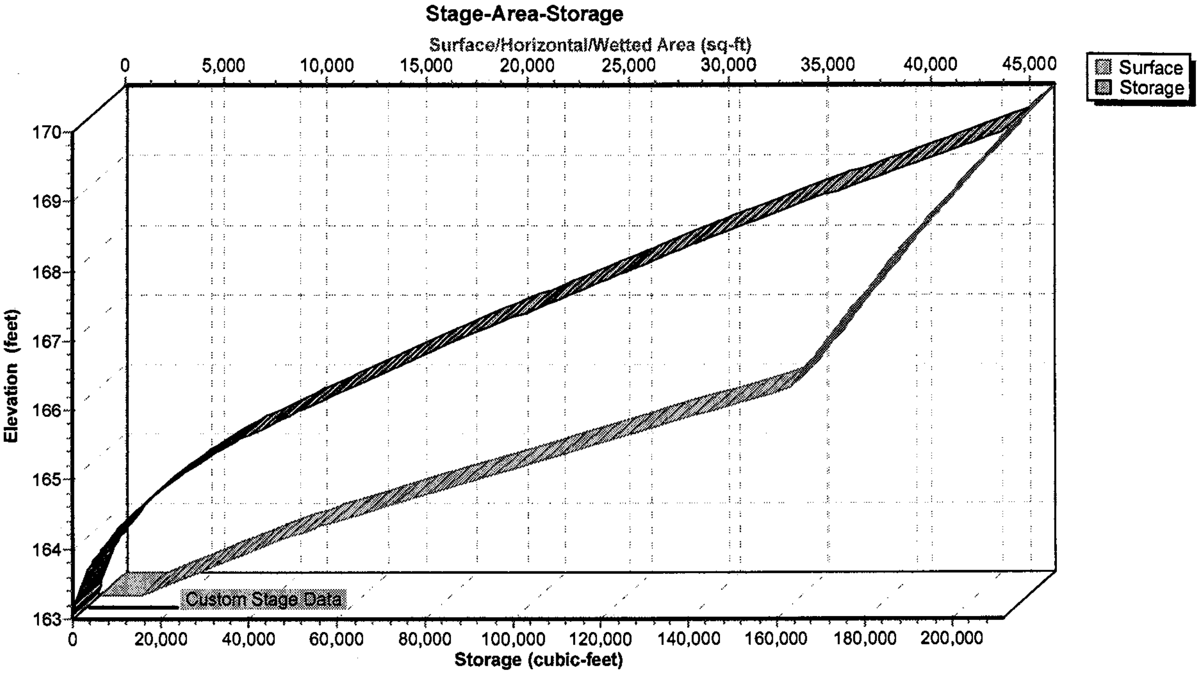
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	2,000	0	0
164.00	10,900	6,450	6,450
166.00	34,300	45,200	51,650
168.00	39,800	74,100	125,750
170.00	46,200	86,000	211,750

Device	Routing	Invert	Outlet Devices
#1	Device 3	167.50'	**6.0" Vert. 6-In Orifice Side (Riser)** C= 0.600
#2	Device 3	168.40'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#3	Primary	164.30'	**18.0" Round 18-In Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.30' / 162.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	161.50'	**5.8" Round 6-In Culvert** L= 137.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 160.00' S= 0.0109 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	165.10'	**5.8" Horiz. Orifice Top (6-in Culv)** C= 0.600 Limited to weir flow at low heads
#6	Device 4	164.00'	**1.5" Vert. Orifice Side (6-in Culv) X 1.50** C= 0.600

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=163.00' (Free Discharge)
↑—**3=18-In Culvert** (Controls 0.00 cfs)
  ↑—**1=6-In Orifice Side (Riser)** (Controls 0.00 cfs)
  └—**2=Grate Top (Riser)** (Controls 0.00 cfs)

Secondary OutFlow Max=0.61 cfs @ 17.82 hrs HW=165.43' (Free Discharge)
↑—**4=6-In Culvert** (Passes 0.61 cfs of 1.03 cfs potential flow)
  ↑—**5=Orifice Top (6-in Culv)** (Orifice Controls 0.50 cfs @ 2.75 fps)
  └—**6=Orifice Side (6-in Culv)** (Orifice Controls 0.10 cfs @ 8.43 fps)

Pond DP-11: Detention Pond 11



Summary for Pond DP-12: DETENTION POND 12

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Inflow Area =     20.177 ac,  3.27% Impervious, Inflow Depth =  0.62"   for 2-yr Storm event
Inflow      =      5.88 cfs @  12.39 hrs, Volume=          1.043 af
Outflow     =      0.51 cfs @  18.19 hrs, Volume=          0.885 af, Atten= 91%, Lag= 347.6 min
Primary     =      0.00 cfs @   0.00 hrs, Volume=          0.000 af
Secondary   =      0.51 cfs @  18.19 hrs, Volume=          0.885 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 185.69' @ 18.19 hrs  Surf.Area= 26,018 sf  Storage= 31,513 cf

Plug-Flow detention time= 1,647.6 min calculated for 0.884 af (85% of inflow)
Center-of-Mass det. time= 1,581.2 min ( 2,498.6 - 917.4 )

Volume     Invert    Avail.Storage  Storage Description
  #1       184.00'      205,300 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

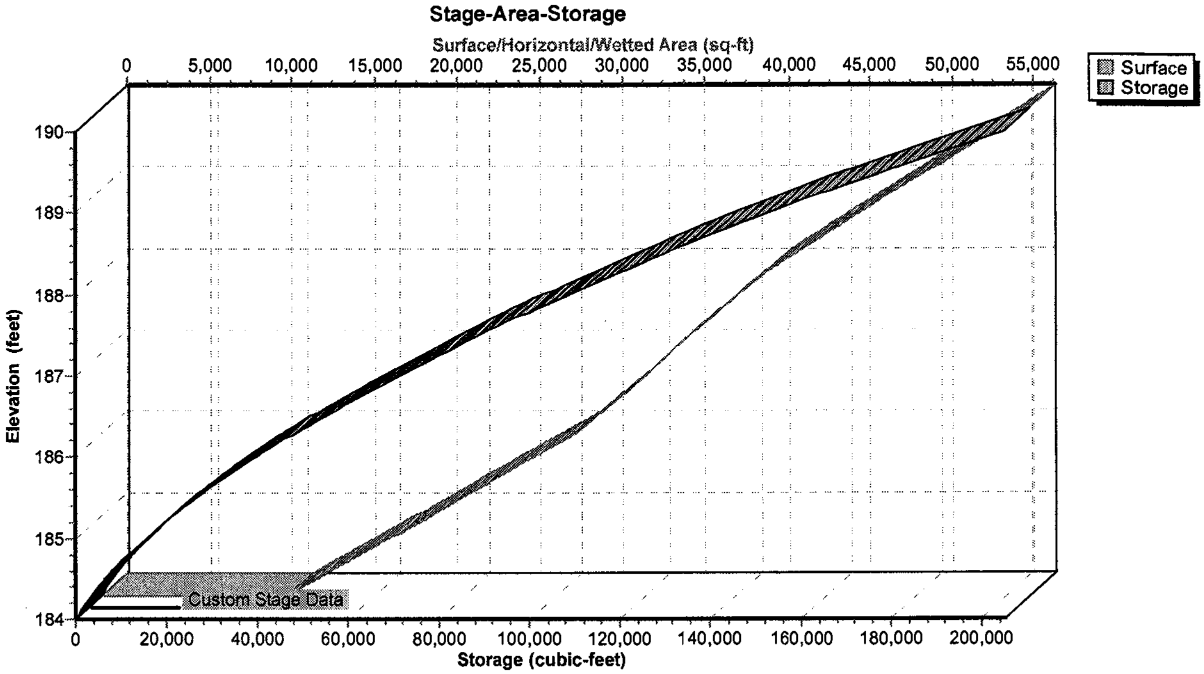
 Elevation      Surf.Area      Inc.Store      Cum.Store
    (feet)        (sq-ft)    (cubic-feet)   (cubic-feet)
    184.00         11,200              0              0
    186.00         28,700         39,900         39,900
    188.00         40,200         68,900        108,800
    190.00         56,300         96,500        205,300

Device  Routing        Invert   Outlet Devices
  #1    Device 3      188.00'   48.0" Horiz. Grate Top (Riser)  C= 0.600
                                Limited to weir flow at low heads
  #2    Device 3      186.80'   8.0" Vert. 8-In Orifice (Riser Side)  C= 0.600
  #3    Primary       184.50'   18.0"  Round 18- In Culvert
                                L= 80.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 184.50' / 180.00'  S= 0.0563 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 1.77 sf
  #4    Device 6      185.50'   5.8" Horiz. Orifice Top (6-in Pipe)  C= 0.600
                                Limited to weir flow at low heads
  #5    Device 6      184.50'   1.5" Vert. Orifice (Side of 6-in) X 2.00  C= 0.600
  #6    Secondary     181.50'   6.0"  Round 6-In Culvert
                                L= 64.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 181.50' / 180.00'  S= 0.0234 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.20 sf

Primary OutFlow  Max=0.00 cfs @ 0.00 hrs  HW=184.00'  (Free Discharge)
 └─3=18- In Culvert ( Controls 0.00 cfs)
    ├─1=Grate Top (Riser) ( Controls 0.00 cfs)
    └─2=8-In Orifice (Riser Side) ( Controls 0.00 cfs)

Secondary OutFlow  Max=0.51 cfs @ 18.19 hrs  HW=185.69'  (Free Discharge)
 └─6=6-In Culvert (Passes 0.51 cfs of 1.48 cfs potential flow)
    ├─4=Orifice Top (6-in Pipe) (Orifice Controls 0.39 cfs @ 2.12 fps)
    └─5=Orifice (Side of 6-in) (Orifice Controls 0.13 cfs @ 5.12 fps)
```

Pond DP-12: DETENTION POND 12



C-2 ANTI-SEEP COLLAR & FLOTATION DESIGN

Pipe Anti-Seep Collar Design

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/10/2015
Chk. By: PCM

OBJECTIVE: Design anti-seep collars for dentention pound pipe outlets.

DESIGN CRITERIA

1. Reference is Maryland Specifications for Soil Erosion and Sediment Control, Maryland Department of Environment, 1994.

DESIGN ANALYSIS

Step 1: Calculate Length of Pipe In Saturated Zone (LS) (See table below and attached sketches)

Ls = Length of Pipe in Saturated Zone (ft)
Y = Distance in feet from upstream invert of pipe to highest normal water level expected to occur during life of structure. Usually top of riser. (ft)
S_0 = Slope of Pipe(ft/ft)
Z = slope of upstream embakment as a ratio of Z feet horizontal to one foot vertical. (In this case approximately one due to outlet structure)
U = Upstream invert of pipe (feet)
H = Highest normal water level expected (feet)
N = Number of Collars
D = Collar Size (ft)
LS = $Y(z+4)/(1-4S_0)$

Step 2: Determine Number and Size of Anti-Seep Collar to be used. (See attached Table 16 and Calculations)

Step 3: Choose one size for anti-seep collars that will fit all situations

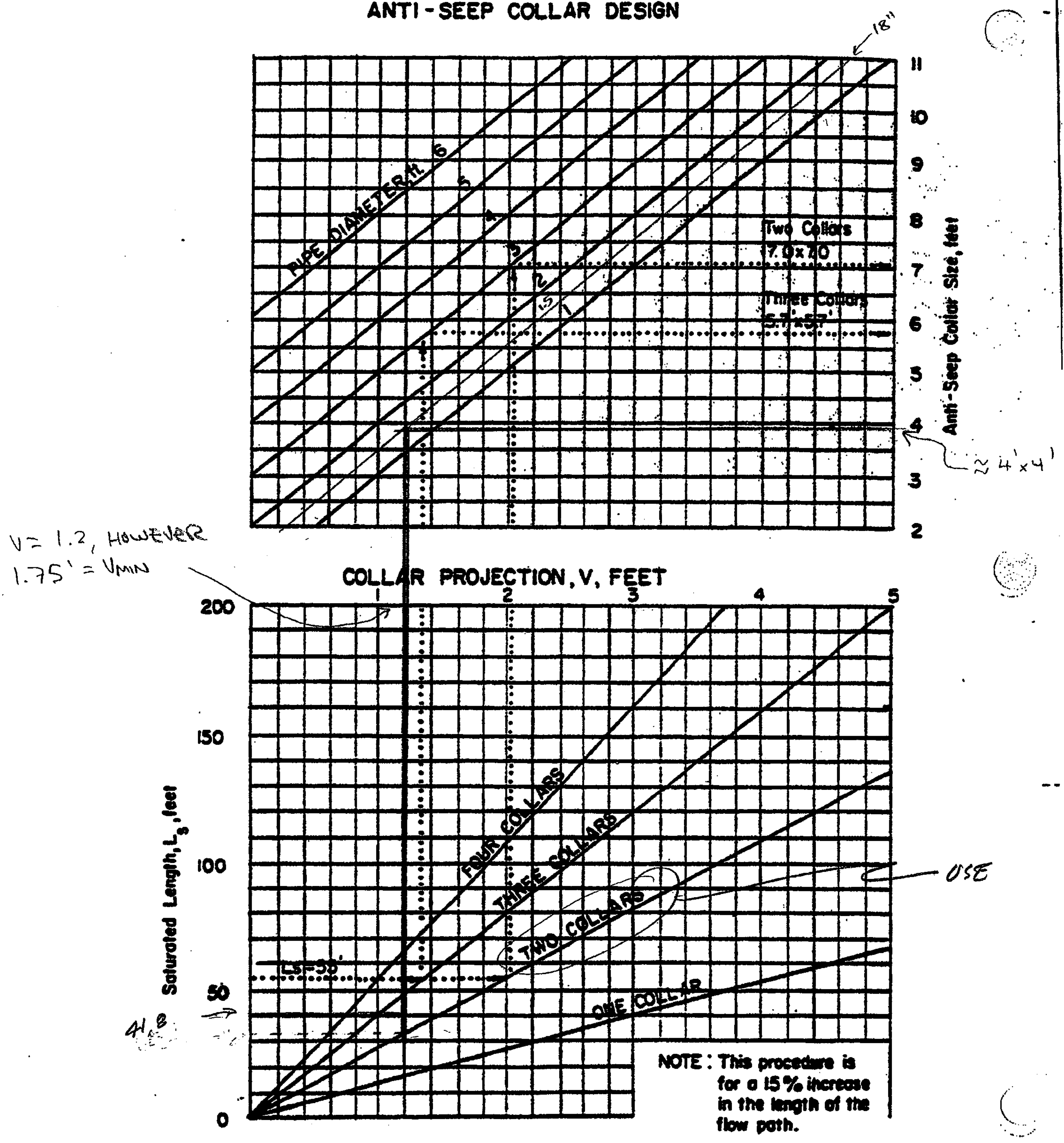
All Anti-Seep Collars shall extend beyond pipe by 1.75' (minimum).

JUNIPER RIDGE LANDFILL EXPANSION
DETENTION POND OCS TABLE

POND I.D.	FLOOD ELEV		STRUCTURE		OUTLET PIPE		ANTI SEEP		
DP-10	POND BOTTOM	175.00	DIA.	4-FOOT	DIA.	18-INCH	Ls=Y(Z+4)/(1-4So)	41.8	Ls=SATURATED LENGTH (ft)
	POND BERM	182.00	TOP ELEV	179.00	INLET ELEV	175.20	V =	1.75	V = Collar Projection (ft), Table 16
	2 YEAR	177.60	ORIFICE DIA.	6-INCH	OUTLET ELEV	172.00	N =	2	N = # of Collars, Table 16
	10 YEAR	179.20	ORIFICE ELEV	178.00	LENGTH (FT)	52	SIZE	4-FEET	Table 16
	25 YEAR	179.50	SPILLWAY ELEV	180.00	SLOPE	0.0615	SPACING=Ls/(N+1)	14	
									USE 2 COLLARS,4.0-FEET, S=11'
DP-11	POND BOTTOM	163.00	DIA.	4-FOOT	DIA.	18-INCH	Ls=Y(Z+4)/(1-4So)	36.9	Ls=SATURATED LENGTH (ft)
	POND BERM	170.30	TOP ELEV	168.40	INLET ELEV	164.30	V =	1.75	V = Collar Projection (ft), Table 16
	2 YEAR	165.43	ORIFICE DIA.	6-INCH	OUTLET ELEV	162.00	N =	2	N = # of Collars, Table 16
	10 YEAR	166.87	ORIFICE ELEV	167.50	LENGTH (FT)	92	SIZE	4-FEET	Table 16
	25 YEAR	167.75	SPILLWAY ELEV	168.40	SLOPE	0.0250	SPACING=Ls/(N+1)	12	
									USE 2 COLLARS, 4.0-FEET, S=10'
DP-12	POND BOTTOM	184.00	DIA.	4-FOOT	DIA.	18-INCH	Ls=Y(Z+4)/(1-4So)	31.4	Ls=SATURATED LENGTH (ft)
	POND BERM	190.30	TOP ELEV	188.00	INLET ELEV	184.50	V =	1.75	V = Collar Projection (ft), Table 16
	2 YEAR	185.69	ORIFICE DIA.	8-INCH	OUTLET ELEV	180.00	N =	2	N = # of Collars, Table 16
	10 YEAR	186.96	ORIFICE ELEV	186.80	LENGTH (FT)	80	SIZE	4-FEET	Table 16
	25 YEAR	187.48	SPILLWAY ELEV	188.00	SLOPE	0.0563	SPACING=Ls/(N+1)	10	
									USE 2 COLLARS, 4.0-FEET, S=10'

Table 16

ANTI-SEEP COLLAR DESIGN



NOTE: This procedure is for a 15% increase in the length of the flow path.

POND	OUTLET DIA	Ls
DP-10	18"	41.8 ←MAX
DP-11	18"	36.9
DP-12	18"	31.4

Structure Flotation Design

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/9/2015
Chk. By: PCM

DP-10

OBJECTIVE: Design Detention Pond Outlet Structures to Resist Floatation.

DESIGN CRITERIA

1. Design Outlet Structures to resist flotation neglecting all soil friction along sides of structure (conservative).

DESIGN ANALYSIS

Outlet Structure	25-YR EL (ft)	INV OUT (ft)	BARREL TOP (ft)	HYDRAULIC DIFF. (ft)
DP-10	179.50	175.20	179.00	3.80

Step 2: Calculate uplift on structure.

Calculate Weight of Water Displaced

Difference = 3.80 ft (Max anticipated water height - Inv. Out Elev)
Sump Depth = 0.5 ft
Thickness of Structure Bottom = 6 Inches
Thickness of Concrete Fill = 6 Inches
Total Depth = 5.30 ft
Unit Weight of Water = 62.4 lb/ft^3
Pressure at Total Depth = 331 lb/ft^2
Manhole Outer Dia. = 4.83 ft
Pi = 3.1416
Manhole Outer Area = 18.32 ft^2
Total Uplift Pressure = Pressure at Total Depth x $A_{manhole}$
Total Uplift Pressure = **6,060** lb

top concrete fill: 174.70
bot concrete fill: 174.20

Step 3: Determine Weight of Structure without concrete footing:

Frame and Grate Weight = 0 lb
Cover Thickness = 0 Inches
Cover Weight = 0 lb
Concrete Bottom Weight= 2748 lb
Concrete Barrel Weight = 863 lb/vft
Barrel Top El = 179.00 ft
Barrel Bottom El = 174.7 ft
Difference = 4.3 ft
Weight of Barrels = 3713 lb
Manhole Inner Dia. = 4.0 ft
Pi = 3.1416
Manhole Inner Area = 12.57 ft^2
Volume Displaced in Sump = 6.28 ft^3
Weight of Water in Sump = 392 lb
Total Structure Weight = **6,853** lb

Unit Weight of Water = 62.4 lb/ft^3
Unit Weight of Concrete = 150 lb/ft^3

Differential = 794 lb

Factor of Safety = **1.13** (Desired Factor of Safety is 1.1)
No concrete fill required

Structure Flotation Design

DP-11

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/11/2015
Chk. By: PCM

OBJECTIVE: Design Detention Pond Outlet Structures to Resist Floatation.

DESIGN CRITERIA

1. Design Outlet Structures to resist flotation neglecting all soil friction along sides of structure (conservative).

DESIGN ANALYSIS

Outlet Structure	25-YR EL (ft)	INV OUT (ft)	BARREL TOP (ft)	HYDRAULIC DIFF. (ft)
DP-11	167.75	164.30	168.40	4.10

Step 2: Calculate uplift on structure.

Calculate Weight of Water Displaced

Difference = 4.10 ft (Max anticipated water height - Inv. Out Elev)
Sump Depth = 0.3 ft
Thickness of Structure Bottom = 6 Inches
Thickness of Concrete Fill = 6 Inches
Total Depth = 5.40 ft
Unit Weight of Water = 62.4 lb/ft^3
Pressure at Total Depth = 337 lb/ft^2
Manhole Outer Dia. = 4.83 ft
Pi = 3.1416
Manhole Outer Area = 18.32 ft^2
Total Uplift Pressure = Pressure at Total Depth x $A_{manhole}$
Total Uplift Pressure = **6,174** lb

top concrete fill: 164.00
bot concrete fill: 163.50

Step 3: Determine Weight of Structure without concrete footing:

Frame and Grate Weight = 0 lb
Cover Thickness = 0 Inches
Cover Weight = 0 lb
Concrete Bottom Weight= 2748 lb
Concrete Barrel Weight = 863 lb/vft
Barrel Top El = 168.40 ft
Barrel Bottom El = 164.0 ft
Difference = 4.4 ft
Weight of Barrels = 3799 lb
Manhole Inner Dia. = 4.0 ft
Pi = 3.1416
Manhole Inner Area = 12.57 ft^2
Volume Displaced in Sump = 3.77 ft^3
Weight of Water in Sump = 235 lb
Total Structure Weight = **6,783** lb

Unit Weight of Water = 62.4 lb/ft^3
Unit Weight of Concrete = 150 lb/ft^3

Differential = 609 lb

Factor of Safety = **1.10** (Desired Factor of Safety is 1.1)
No concrete fill required

Structure Flotation Design

DP-12

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/3/2015
Chk. By: PCM

OBJECTIVE: Design Detention Pond Outlet Structures to Resist Floatation.

DESIGN CRITERIA

1. Design Outlet Structures to resist flotation neglecting all soil friction along sides of structure (conservative).

DESIGN ANALYSIS

Outlet Structure	25-YR EL (ft)	INV OUT (ft)	BARREL TOP (ft)	HYDRAULIC DIFF. (ft)
DP-12	187.48	184.50	188.00	3.50

Step 2: Calculate uplift on structure.

Calculate Weight of Water Displaced

Difference = 3.50 ft (Max anticipated water height - Inv. Out Elev)
Sump Depth = 0.5 ft
Thickness of Structure Bottom = 6 Inches
Thickness of Concrete Fill = 6 Inches
Total Depth = 5.00 ft
Unit Weight of Water = 62.4 lb/ft^3
Pressure at Total Depth = 312 lb/ft^2
Manhole Outer Dia. = 4.83 ft
Pi = 3.1416
Manhole Outer Area = 18.32 ft^2
Total Uplift Pressure = Pressure at Total Depth x $A_{manhole}$
Total Uplift Pressure = 5,717 lb

top concrete fill: 184.00
bot concrete fill: 183.50

Step 3: Determine Weight of Structure without concrete footing:

Frame and Grate Weight = 0 lb
Cover Thickness = 0 Inches
Cover Weight = 0 lb
Concrete Bottom Weight= 2748 lb
Concrete Barrel Weight = 863 lb/vft
Barrel Top El = 188.00 ft
Barrel Bottom El = 184.0 ft
Difference = 4 ft
Weight of Barrels = 3454 lb
Manhole Inner Dia. = 4.0 ft
Pi = 3.1416
Manhole Inner Area = 12.57 ft^2
Volume Displaced in Sump = 6.28 ft^3
Weight of Water in Sump = 392 lb
Total Structure Weight = 6,594 lb

Unit Weight of Water = 62.4 lb/ft^3
Unit Weight of Concrete = 150 lb/ft^3

Differential = 877 lb

Factor of Safety = **1.15** (Desired Factor of Safety is 1.1)
No concrete fill required

C-3 PLUNGE POOL DESIGN

PLUNGE POOL DESIGN

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/3/2015
Chk. By:

OBJECTIVE: Design plunge pool to protect the outlet of culverts from scour and deterioration.

REFERENCES:

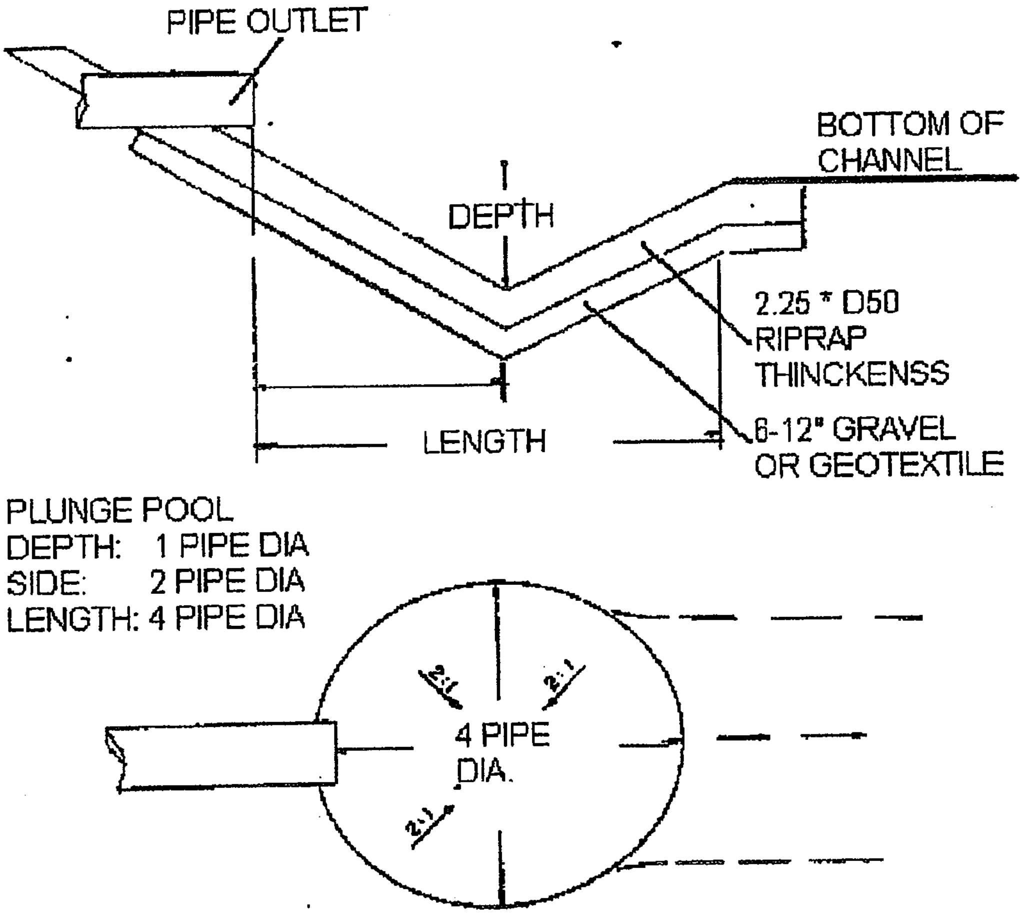
1. Maine Department of Environmental Protection, Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices, March 2003
2. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.0, Chocorua, New Hampshire, 2001

DESIGN PROCEDURE:

1. Use design flows for 25-year, 24-hour storm event and attached Outlet Plunge Pool table to determine plunge pool dimensions and riprap size.

SUMMARY OF RESULTS:

				Riprap			
Plunge Pool Designation	Flow From	Q_{25} (cfs)	Culvert Dia. (in)	D_{50} (in)	Thickness (in)	Length (ft)	Width (ft)
10	Pond DP-10	16.9	18	8	18	6	6
11	Pond DP-11	1.4	18	4	9	6	6
12	Pond DP-12	2.4	18	4	9	6	6



OUTLET PLUNGE POOL

OUTLET PROTECTION

FOR A PIPE FLOWING FULL WITH LOW TAILWATER

RIPRAP SIZE - D50 (Inches)

DISCHARGE	PIPE DIAMETER											
	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	4											
5cfs	4											
8cfs	5	4										
10cfs	6	5	4									
12cfs	8	6	6									
15cfs	8	6	8	5								
17cfs		8	8	5								
20cfs		10	10	6	5							
25cfs		12	12	6	6							
30cfs				8	8	6						
40cfs				12	10	8	6					
50cfs				16	12	10	8	6				
60cfs				18	16	12	10	8				
70cfs					18	15	12	8				
80cfs					20	16	15	10	8			
90cfs						18	16	12	10			
100cfs						20	18	12	10			
125cfs						24	20	16	12	10		
150cfs							24	20	16	12	10	
200cfs								24	20	18	15	12

MINIMUM LENGTH OF APRON (FEET)

DISCHARGE	PIPE DIAMETER											
	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	8											
5cfs	8											
8cfs	11	10										
10cfs	14	12	10									
15cfs	18	16	14	12								
20cfs		18	18	16	12							
30cfs			22	20	18	16						
40cfs			26	24	24	20	18					
50cfs				26	26	24	22	18				
70cfs					30	30	28	25				
100cfs						36	36	33	27			
150cfs						42	42	42	38	33	28	
200cfs								48	45	42	37	32

From USDA Soild Conservation Service

C-4 LEVEL SPREADER DESIGN

Standard Level Spreader Design

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/10/2015
Chk. By:

OBJECTIVE: Design level spreaders in accordance with Erosion and Sediment Control Standards.

DESIGN CRITERIA

1. Level Spreader Length shall be such that flow from the spreader during the 10-year storm event does not exceed 0.25 cfs per linear foot of spreader. Minimum length = 15'

DESIGN ANALYSIS

Level Spreader Designation	Discharge From	Q_{10} (cfs)	Rqd Rate (cfs/ft)	Min. Rqd. Length (ft)	Specified Length (ft)
10	Pond DP-10	4.9	0.25	19.8	20
11	Pond DP-11	1.2	0.25	4.7	15
12	Pond DP-12	1.3	0.25	5.4	15

C-5 EMERGENCY SPILLWAY DESIGN

EMERGENCY SPILLWAY EVALUATION
EXPANDED POND 9

Summary for Pond DP-9: DETENTION POND 9

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth = 3.25" for 100-yr Storm event
Inflow = 64.87 cfs @ 12.43 hrs, Volume= 8.970 af
Outflow = 4.63 cfs @ 16.13 hrs, Volume= 6.741 af, Atten= 93%, Lag= 222.2 min
Primary = 2.32 cfs @ 16.13 hrs, Volume= 2.271 af
Secondary = 1.40 cfs @ 16.13 hrs, Volume= 4.277 af
Tertiary = 0.91 cfs @ 16.13 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.60' @ 16.13 hrs Surf.Area= 89,426 sf Storage= 276,765 cf
Flood Elev= 191.00' Surf.Area= 91,210 sf Storage= 312,840 cf

Plug-Flow detention time= 1,283.3 min calculated for 6.741 af (75% of inflow)
Center-of-Mass det. time= 1,194.6 min (2,034.4 - 839.8)

Volume	Invert	Avail.Storage	Storage Description
#1	187.00'	404,050 cf	**Detention Pond (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
187.00	35,200	0	0
188.00	78,220	56,710	56,710
190.00	86,700	164,920	221,630
192.00	95,720	182,420	404,050

Device	Routing	Invert	Outlet Devices
#1	Primary	189.50'	**12.0" Round 12-In Outlet Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 189.50' / 180.50' S= 0.1875 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Secondary	184.21'	**5.8" Round 6-In Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.21' / 180.50' S= 0.0618 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#3	Device 2	188.70'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	188.30'	**1.5" Vert. Orifice X 2.00** C= 0.600
#5	Tertiary	190.50'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

192.0 = TOP OF BERM
190.6 = 100 YR PEAK
1.4 ' = FREEBOARD

Primary OutFlow Max=2.32 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
└─**1=12-In Outlet Culvert** (Inlet Controls 2.32 cfs @ 2.96 fps)

Secondary OutFlow Max=1.40 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
└─**2=6-In Culvert** (Passes 1.40 cfs of 1.73 cfs potential flow)
  ├─**3=Orifice** (Orifice Controls 1.22 cfs @ 6.64 fps)
  └─**4=Orifice** (Orifice Controls 0.18 cfs @ 7.21 fps)

Tertiary OutFlow Max=0.90 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 0.90 cfs @ 0.87 fps)

EMERGENCY SPILLWAY EVALUATION
POND 10

Summary for Pond DP-10: DETENTION POND 10

Inflow Area = 28.280 ac, 4.24% Impervious, Inflow Depth = 2.84" for 100-yr Storm event
Inflow = 59.36 cfs @ 12.35 hrs, Volume= 6.692 af
Outflow = 27.71 cfs @ 12.72 hrs, Volume= 6.274 af, Atten= 53%, Lag= 22.0 min
Primary = 18.03 cfs @ 12.72 hrs, Volume= 3.582 af
Secondary = 1.74 cfs @ 12.72 hrs, Volume= 2.452 af
Tertiary = 7.94 cfs @ 12.72 hrs, Volume= 0.240 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 180.44' @ 12.72 hrs Surf.Area= 27,104 sf Storage= 112,674 cf
Flood Elev= 181.00' Surf.Area= 28,500 sf Storage= 128,200 cf

Plug-Flow detention time= 439.2 min calculated for 6.272 af (94% of inflow)
Center-of-Mass det. time= 408.3 min (1,259.2 - 850.9)

Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	157,950 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	7,900	0	0
176.00	18,000	12,950	12,950
178.00	22,000	40,000	52,950
180.00	26,000	48,000	100,950
182.00	31,000	57,000	157,950

Device	Routing	Invert	Outlet Devices
#1	Device 3	179.00'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	178.00'	**6.0" Vert. 6-in Orifice** C= 0.600
#3	Primary	175.20'	**18.0" Round 18-in Primary Culvert** L= 52.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 175.20' / 172.00' S= 0.0615 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	173.50'	**5.8" Round 6-in Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.50' / 172.30' S= 0.0200 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	177.00'	**5.8" Horiz. Orifice Top** C= 0.600 Limited to weir flow at low heads
#6	Device 4	176.20'	**1.5" Vert. Orifice Side** C= 0.600
#7	Tertiary	180.00'	**10.0' long x 22.0' breadth E-Spillway Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

182.0 = TOP OF BERM
180.4 = 100 YR PEAK
1.6 ' = FREEBOARD

```
Primary OutFlow  Max=18.03 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
 └─3=18-in Primary Culvert (Inlet Controls 18.03 cfs @ 10.20 fps)
    ├─1=Orifice/Grate  (Passes < 70.84 cfs potential flow)
    └─2=6-in Orifice  (Passes < 1.40 cfs potential flow)

Secondary OutFlow  Max=1.74 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
 └─4=6-in Culvert  (Barrel Controls 1.74 cfs @ 9.51 fps)
    ├─5=Orifice Top  (Passes < 1.64 cfs potential flow)
    └─6=Orifice Side  (Passes < 0.12 cfs potential flow)

Tertiary OutFlow  Max=7.82 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
 └─7=E-Spillway Weir  (Weir Controls 7.82 cfs @ 1.79 fps)
```

EMERGENCY SPILLWAY EVALUATION
POND 11

Summary for Pond DP-11: Detention Pond 11

Inflow Area =	22.282 ac,	4.04% Impervious,	Inflow Depth = 2.83"	for 100-yr Storm event	
Inflow =	42.15 cfs @	12.30 hrs,	Volume=	5.252 af	
Outflow =	3.99 cfs @	15.24 hrs,	Volume=	5.094 af,	Atten= 91%, Lag= 176.4 min
Primary =	2.67 cfs @	15.24 hrs,	Volume=	1.081 af	
Secondary =	1.32 cfs @	15.24 hrs,	Volume=	4.013 af	

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 168.53' @ 15.24 hrs Surf.Area= 41,482 sf Storage= 147,109 cf

Plug-Flow detention time= 1,111.8 min calculated for 5.093 af (97% of inflow)
Center-of-Mass det. time= 1,096.9 min (1,954.3 - 857.4)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	211,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	2,000	0	0
164.00	10,900	6,450	6,450
166.00	34,300	45,200	51,650
168.00	39,800	74,100	125,750
170.00	46,200	86,000	211,750

Device	Routing	Invert	Outlet Devices
#1	Device 3	167.50'	**6.0" Vert. 6-In Orifice Side (Riser)** C= 0.600
#2	Device 3	168.40'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#3	Primary	164.30'	**18.0" Round 18-In Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.30' / 162.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	161.50'	**5.8" Round 6-In Culvert** L= 137.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 160.00' S= 0.0109 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	165.10'	**5.8" Horiz. Orifice Top (6-in Culv)** C= 0.600 Limited to weir flow at low heads
#6	Device 4	164.00'	**1.5" Vert. Orifice Side (6-in Culv) X 1.50** C= 0.600

Primary OutFlow Max=2.66 cfs @ 15.24 hrs HW=168.53' (Free Discha
└─**3=18-In Culvert** (Passes 2.66 cfs of 12.52 cfs potential flow)
    ├─**1=6-In Orifice Side (Riser)** (Orifice Controls 0.83 cfs @ 4.24 fps)
    └─**2=Grate Top (Riser)** (Weir Controls 1.83 cfs @ 1.16 fps)

170. = TOP OF ROAD
168.5 = 100 YR PEAK
1.5 ' = FREEBOARD

Secondary OutFlow Max=1.32 cfs @ 15.24 hrs HW=168.53' (Free Discharge)
└─**4=6-In Culvert** (Barrel Controls 1.32 cfs @ 7.19 fps)
    ├─**5=Orifice Top (6-in Culv)** (Passes < 1.64 cfs potential flow)
    └─**6=Orifice Side (6-in Culv)** (Passes < 0.19 cfs potential flow)

EMERGENCY SPILLWAY EVALUATION
POND 12

Summary for Pond DP-12: DETENTION POND 12

```
Inflow Area =     20.177 ac,   3.27% Impervious,  Inflow Depth =  2.80"    for  100-yr Storm event
Inflow      =     32.91 cfs @  12.35 hrs,  Volume=          4.700 af
Outflow     =      5.20 cfs @  14.55 hrs,  Volume=          4.540 af,  Atten= 84%,  Lag= 132.4 min
Primary     =      3.54 cfs @  14.55 hrs,  Volume=          1.439 af
Secondary   =      1.65 cfs @  14.55 hrs,  Volume=          3.101 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 188.13' @ 14.55 hrs   Surf.Area= 41,214 sf   Storage= 113,928 cf

Plug-Flow detention time= 756.5 min calculated for 4.538 af (97% of inflow)
Center-of-Mass det. time= 739.3 min ( 1,611.6 - 872.3 )

Volume      Invert     Avail.Storage   Storage Description
  #1       184.00'        205,300 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

Elevation        Surf.Area        Inc.Store        Cum.Store
   (feet)          (sq-ft)     (cubic-feet)     (cubic-feet)
  184.00            11,200                0                0
  186.00            28,700           39,900           39,900
  188.00            40,200           68,900          108,800
  190.00            56,300           96,500          205,300

Device   Routing          Invert   Outlet Devices
  #1     Device 3        188.00'   48.0" Horiz. Grate Top (Riser)  C= 0.600
                                   Limited to weir flow at low heads
  #2     Device 3        186.80'   8.0" Vert. 8-In Orifice (Riser Side)  C= 0.600
  #3     Primary         184.50'   18.0"  Round 18- In Culvert
                                   L= 80.0'   CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 184.50' / 180.00'   S= 0.0563 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 1.77 sf
  #4     Device 6        185.50'   5.8" Horiz. Orifice Top (6-in Pipe)  C= 0.600
                                   Limited to weir flow at low heads
  #5     Device 6        184.50'   1.5" Vert. Orifice (Side of 6-in) X 2.00  C= 0.600
  #6     Secondary       181.50'   6.0"  Round 6-In Culvert
                                   L= 64.0'   CPP, projecting, no headwall,  Ke= 0.900
                                   Inlet / Outlet Invert= 181.50' / 180.00'   S= 0.0234 '/'   Cc= 0.900
                                   n= 0.011,  Flow Area= 0.20 sf

Primary OutFlow Max=3.51 cfs @ 14.55 hrs  HW=188.13'   (Free Discharge)
  └─3=18- In Culvert (Passes 3.51 cfs of 11.39 cfs potential flow)
      ├─1=Grate Top (Riser) (Weir Controls 1.84 cfs @ 1.16 fps)
      └─2=8-In Orifice (Riser Side) (Orifice Controls 1.67 cfs @ 4.80 fps)

Secondary OutFlow Max=1.65 cfs @ 14.55 hrs  HW=188.13'   (Free Discharge)
  └─6=6-In Culvert (Passes 1.65 cfs of 1.85 cfs potential flow)
      ├─4=Orifice Top (6-In Pipe) (Orifice Controls 1.43 cfs @ 7.80 fps)
      └─5=Orifice (Side of 6-in) (Orifice Controls 0.22 cfs @ 9.09 fps)
```

190.0 = TOP OF ROAD
188.1 = 100 YR PEAK
1.9 ' = FREEBOARD

APPENDIX D

FINAL SITE DRAINAGE PLAN AND DETENTION POND DETAILS

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. SITE BENCHMARK INFORMATION:

   PLUG 1 IS A BRASS PLUG ON FORMER LEACHATE POND PUMP STATION LOCATED AT COORDINATES NORTHING 478242.05, EASTING 925376.35 ELEVATION 167.93

2. WETLAND BOUNDARIES DELINEATED BY WOODLOT ALTERNATIVES, INC. IN 2004 AND STANTEC CONSULTING SERVICES 2008, 2014 AND 2015.

3. PERMITTED LANDFILL FINAL WASTE GRADES REPRESENT GRADES PRIOR TO CONSTRUCTION OF FINAL COVER SYSTEM.

4. PROPOSED FINAL WASTE GRADES REPRESENT GRADES PRIOR TO CONSTRUCTION OF FINAL COVER SYSTEM.

5. CULVERT SCHEDULE IS SHOWN ON DRAWING C-306. CULVERT SCHEDULE INCLUDES CULVERTS FOR DETENTION BASIN OUTLET STRUCTURES.

75 0 150 300 FEET

		7/15	ISSUED FOR MEDEP SOLID WASTE PERMIT APPLICATION
REV.	BY	DATE	STATUS

JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

FINAL SITE DRAINAGE PLAN

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Phone 207.829.5016 · Fax 207.829.5692 · www.smemaine.com

DESIGN BY: PCM
DRAWN BY: SJM
DATE: 3/4/2015
CHECKED BY:
LMN: FINAL-DRAIN
CTB: SME-STD

JOB NO. 14101.00 DWG FILE BASE

C-107

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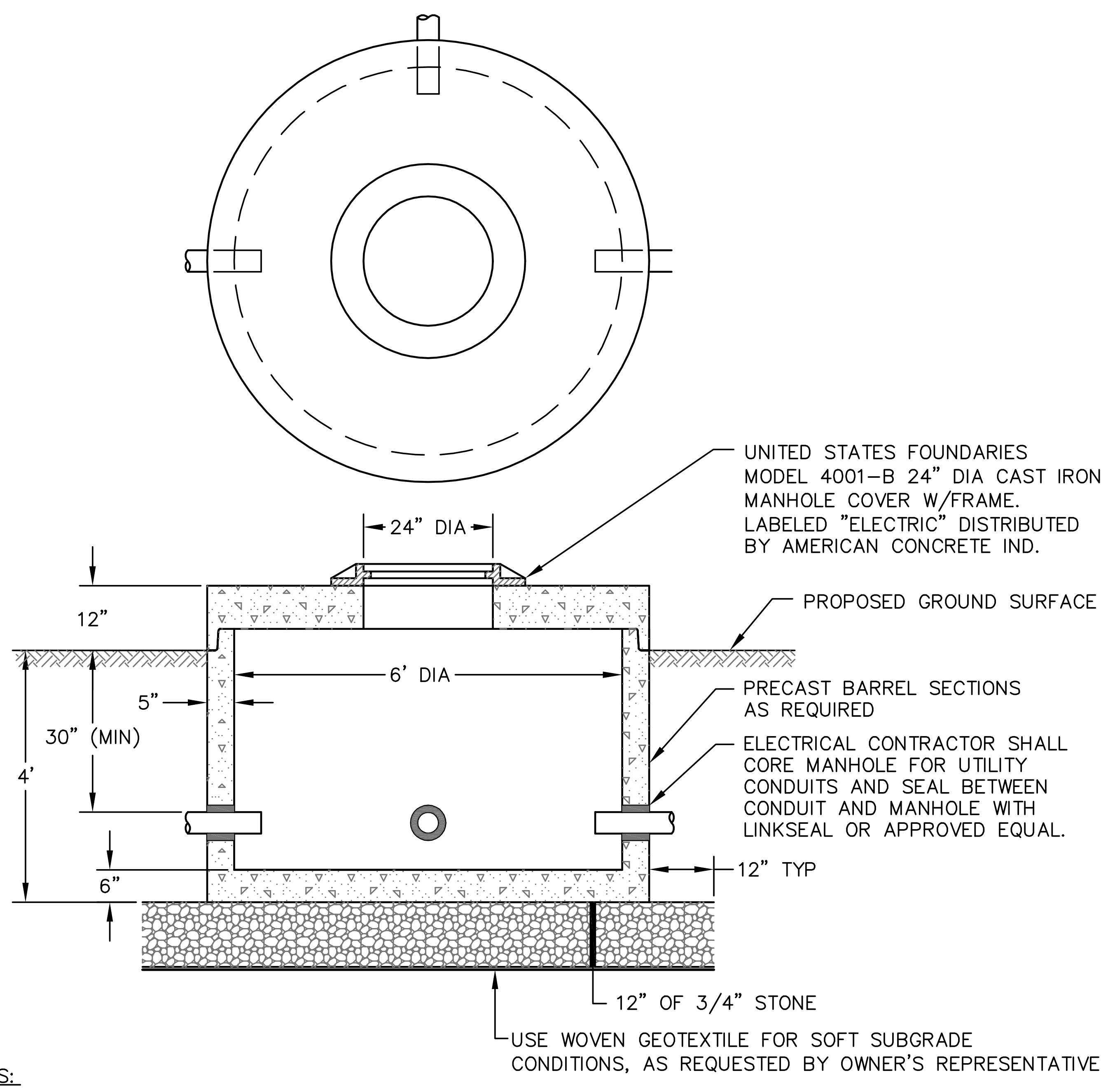


NOTES:

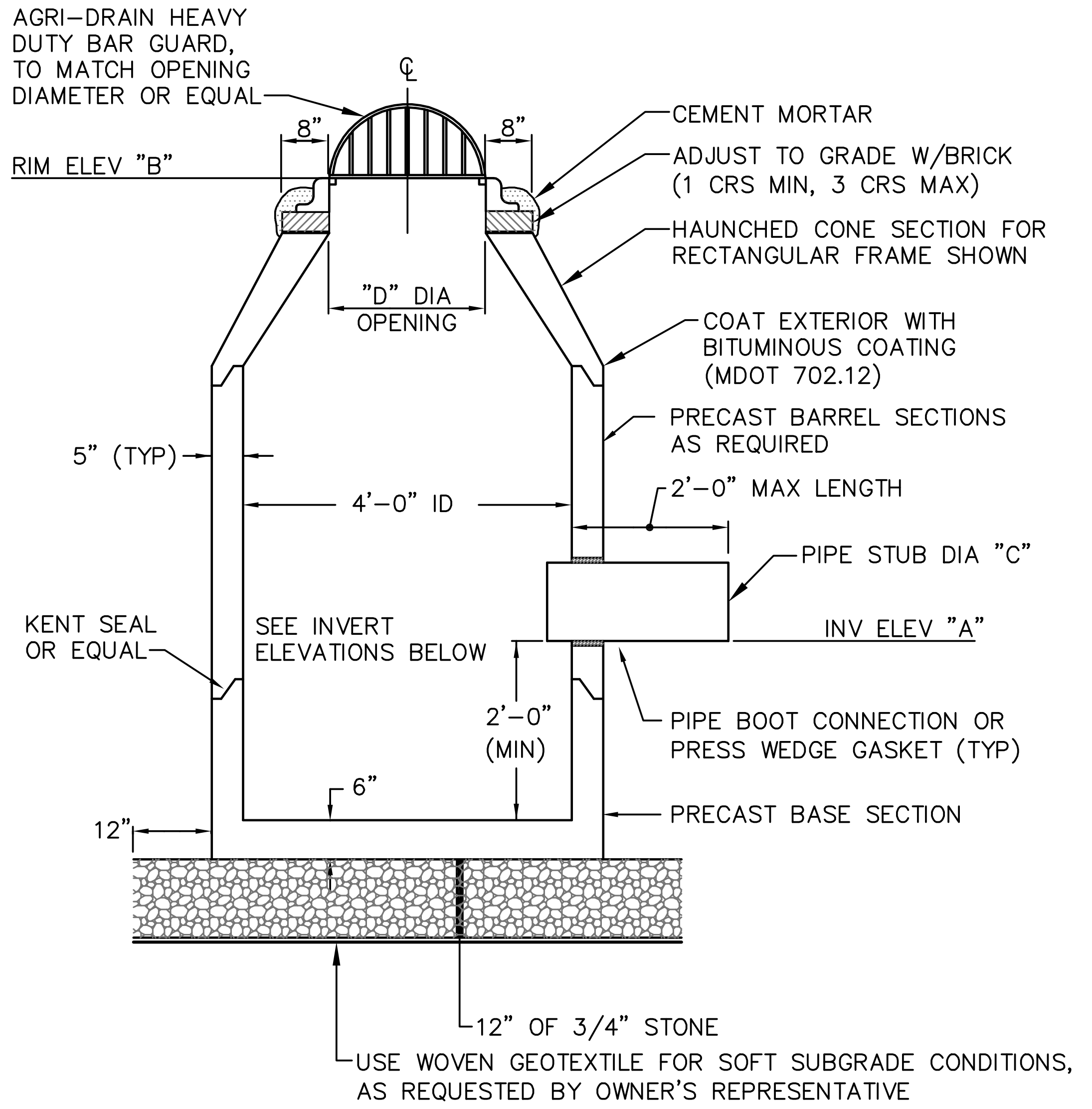
1. 6' DIA MANHOLE AS MANUFACTURED BY AMERICAN CONCRETE INDUSTRIES OR ENGINEER APPROVED EQUAL.
2. 4000 PSI CONCRETE AT 28 DAYS.
3. DESIGNED FOR H-20 WHEEL LOADING.
4. CONFORMS TO ASTM C-478 SPECIFICATIONS.
5. REINFORCED TO 0.12 IN SQ/LF.
6. SHIPLAP JOINTS SEALED WITH BUTYL RUBBER.
7. EXTERIOR COATED WITH ASPHALTIC PROTECTIVE DAMPROOFING.
8. BOTTOM MIN 5'-0" BELOW FINISH GRADE.
9. PRECAST CONCRETE VAULT MANUFACTURER TO PROVIDE ANTI-FLOATATION EXTENDED BASE SLAB AS NECESSARY. ANTI-FLOATATION DESIGN AND SHOP DRAWINGS SHALL BE PREPARED BY THE MANUFACTURER AND SUBMITTED TO THE ENGINEER FOR APPROVAL.

ELECTRIC UTILITY MANHOLE

NTS

CATCH BASIN SCHEDULE A

CATCH BASIN DESIGNATION	PIPE INV EL "A" (FT)	RIM EL "B" (FT)	PIPE DIA "C" (IN)	TOP OPENING DIA "D" (IN)
CB-2BB	195.0	201.0	24"	30"
CB-4G	175.0	181.0	24"	24"
CB-4HB	178.5	184.0	18"	24"
CB-4I	202.5	208.0	18"	24"
CB-4JA	214.0	219.5	18"	24"



CATCH BASINS 2BB, 4G, 4HB, 4I, & 4JA

NTS

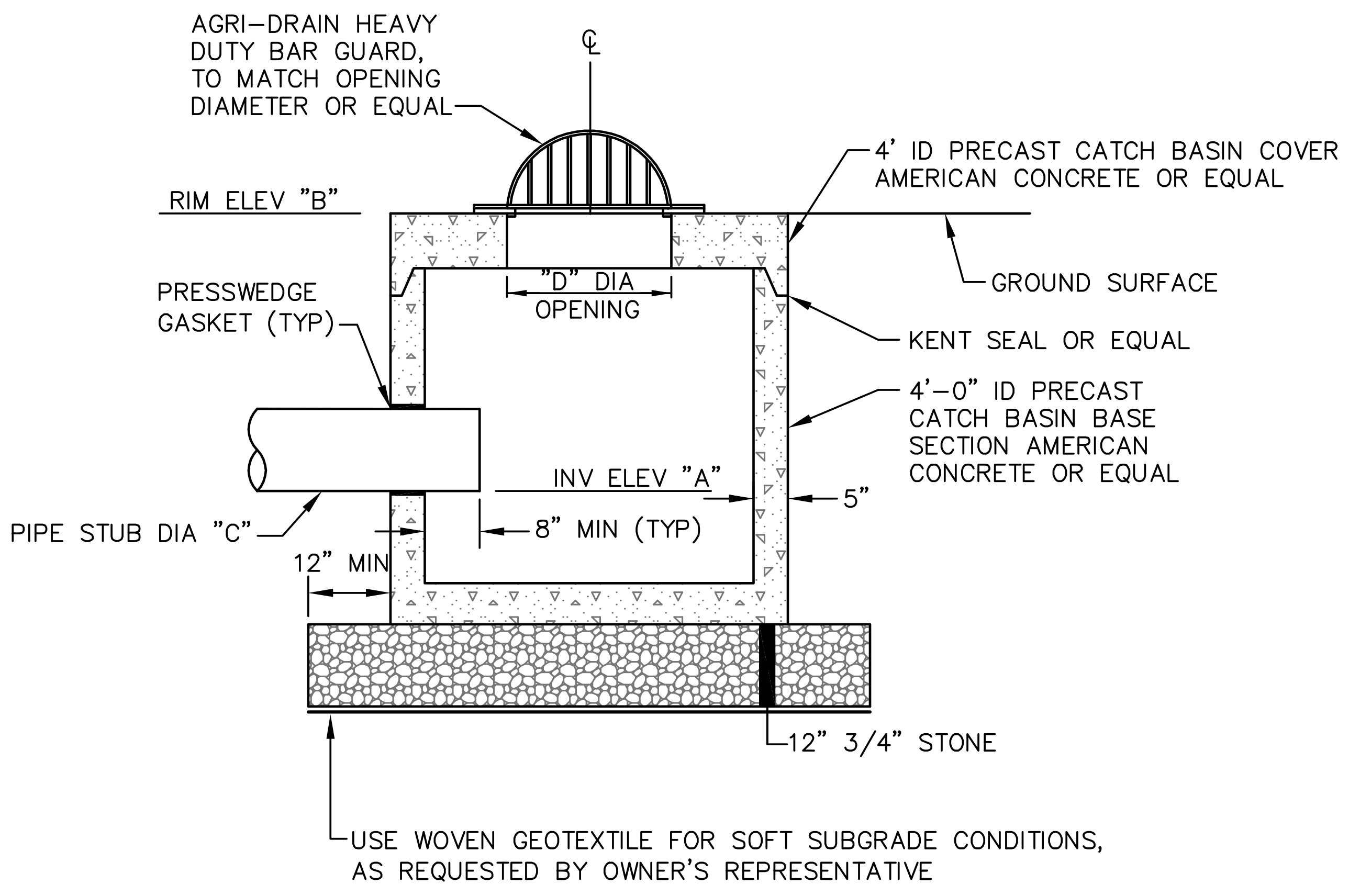
CULVERTS	DIAMETER (IN)	LENGTH (FT)	SLOPE (FT/FT)	INV IN (FT)	INV OUT (FT)
C-2BA	24.00	40.00	0.02	203.90	203.00
C-2BB	24.00	96.00	0.01	195.00	194.00
C-4BA	24.00	78.00	0.01	204.40	203.70
C-4BB	24.00	78.00	0.01	204.40	203.70
C-4F	18.00	78.00	0.01	163.00	162.00
C-4G	24.00	36.00	0.03	175.00	174.00
C-4HA	18.00	40.00	0.03	203.50	202.50
C-4HB	18.00	101.00	0.03	178.50	176.00
C-4I	18.00	80.00	0.13	202.50	192.00
C-4IA	18.00	40.00	0.02	214.80	213.90
C-4JA	18.00	60.00	0.07	214.00	210.00
C-4JB	24.00	73.00	0.02	211.50	210.00
C-4JC	24.00	73.00	0.02	211.50	210.00
C-4K	24.00	51.00	0.04	216.50	214.30
C-4L	18.00	121.00	0.02	213.00	211.00
C-4N	18.00	33.00	0.03	184.00	183.00

CULVERT SCHEDULE

NTS

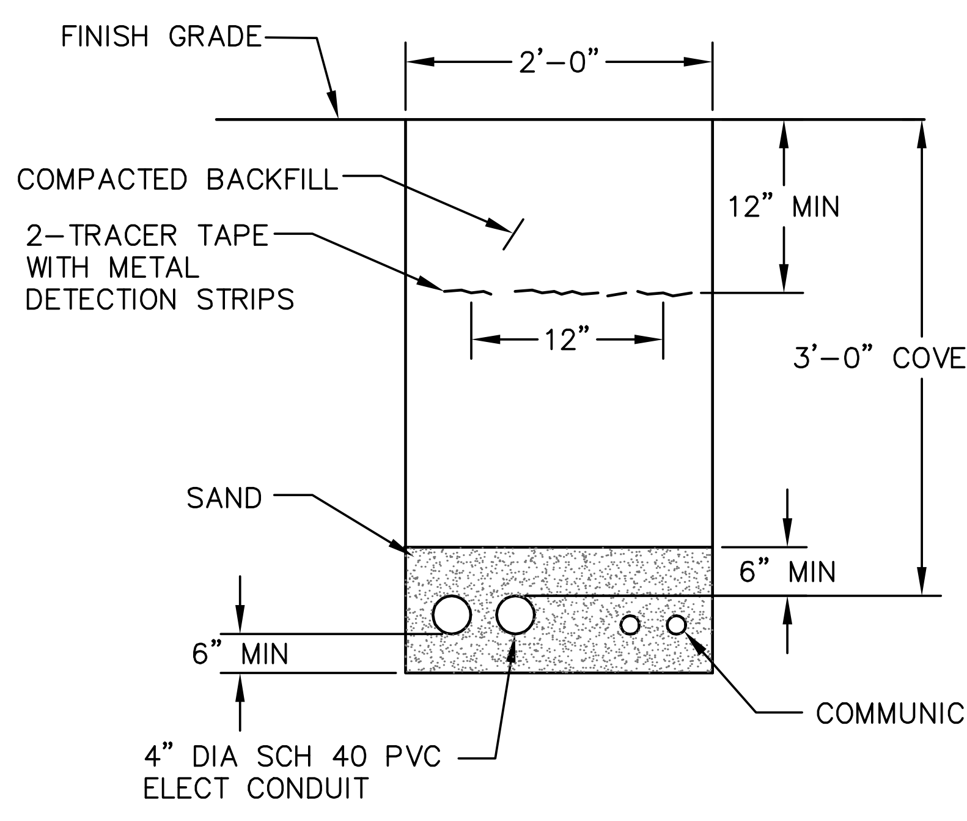
CATCH BASIN SCHEDULE B

CATCH BASIN DESIGNATION	PIPE INV EL "A" (FT)	RIM EL "B" (FT)	PIPE DIA "C" (IN)	TOP OPENING DIA "D" (IN)
CB-4K	216.5	220.0	24"	30"
CB-4L	213.0	215.0	18"	24"



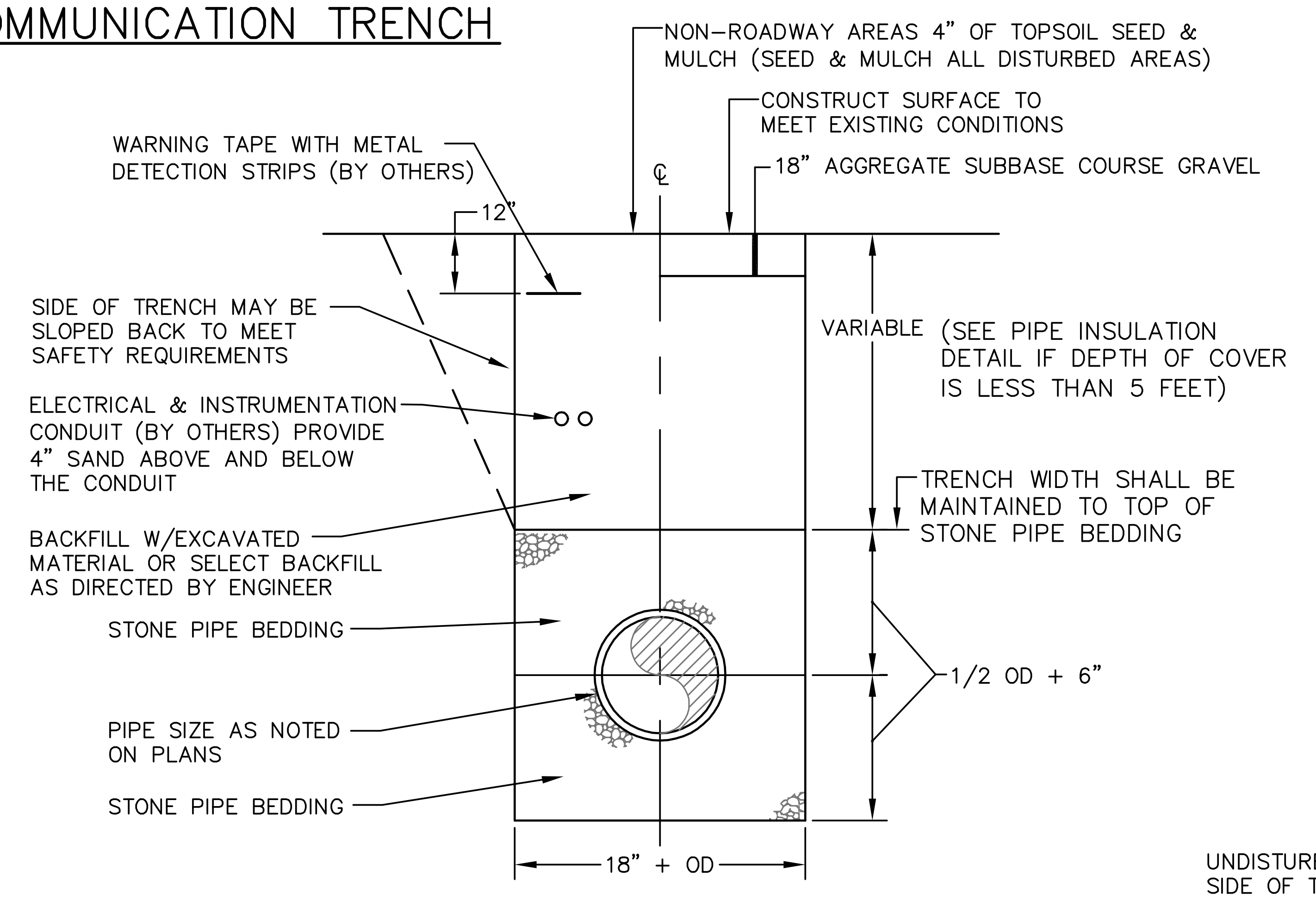
CATCH BASINS 4K & 4L

NTS



UNDERGROUND ELECTRIC AND COMMUNICATION TRENCH

NTS

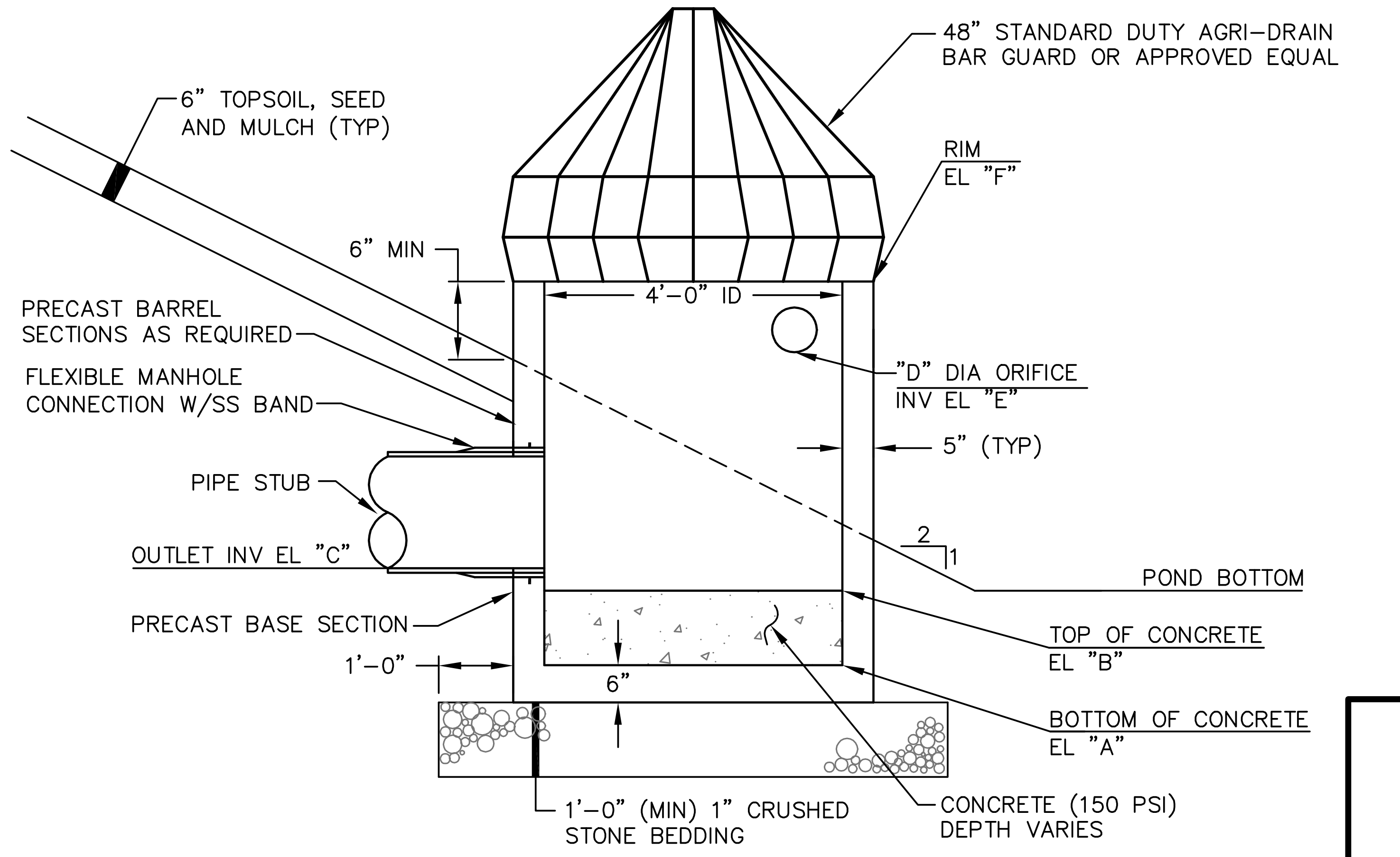


PIPE TRENCH

NTS

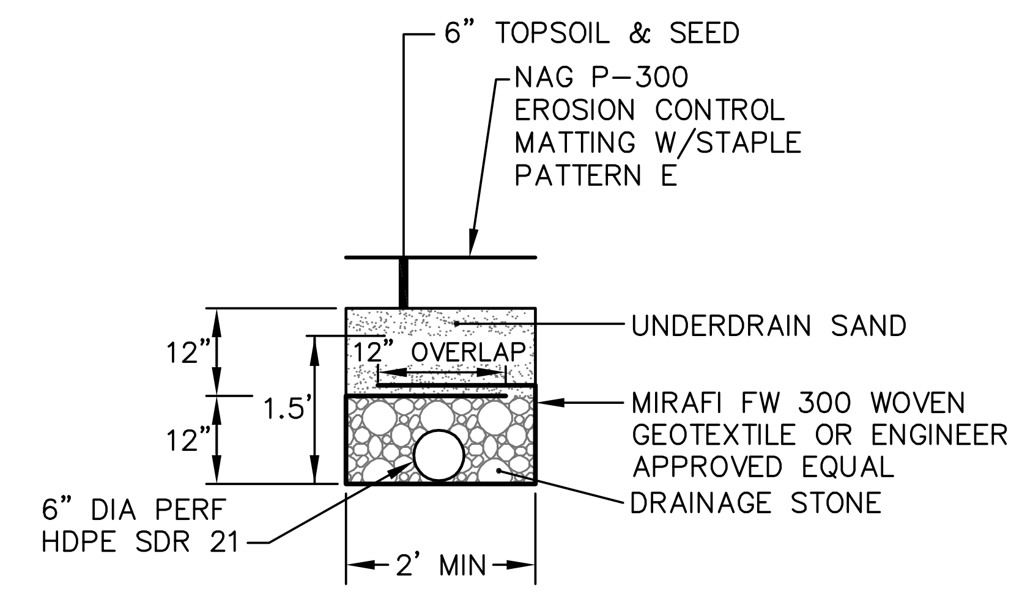
OUTLET CONTROL STRUCTURE SCHEDULE

STRUCTURE DESIGNATION	BOTTOM OF CONCRETE EL "A" (FT)	TOP OF CONCRETE EL "B" (FT)	OUTLET INV EL "C" (FT)	ORIFICE DIA "D" (IN)	ORIFICE INV EL "E" (FT)	RIM EL "F" (FT)	OUTLET (C) CULVERT DIAMETER (IN)	CULVERT LENGTH (FT)	CULVERT SLOPE (FT/FT)
DP-10	174.2	174.7	175.2	6	178.3	179.0	18 HDPE	52	0.06
DP-11	163.5	164.0	164.3	6	167.5	168.4	18 HDPE	92	0.03
DP-12	183.5	184.0	184.5	8	186.8	188.0	18 HDPE	80	0.06



OUTLET CONTROL STRUCTURE

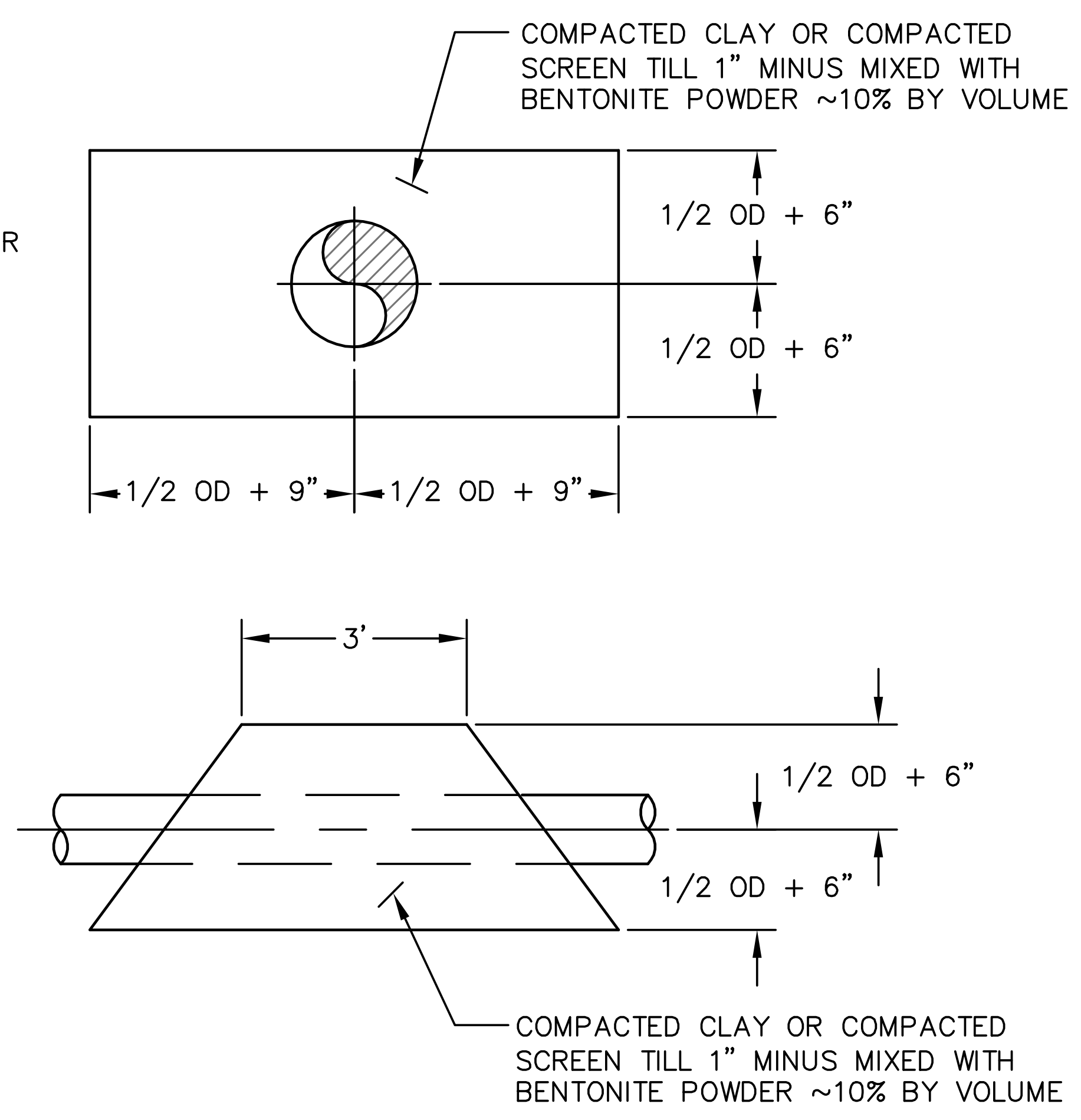
NTS



POND UNDERDRAIN

NTS

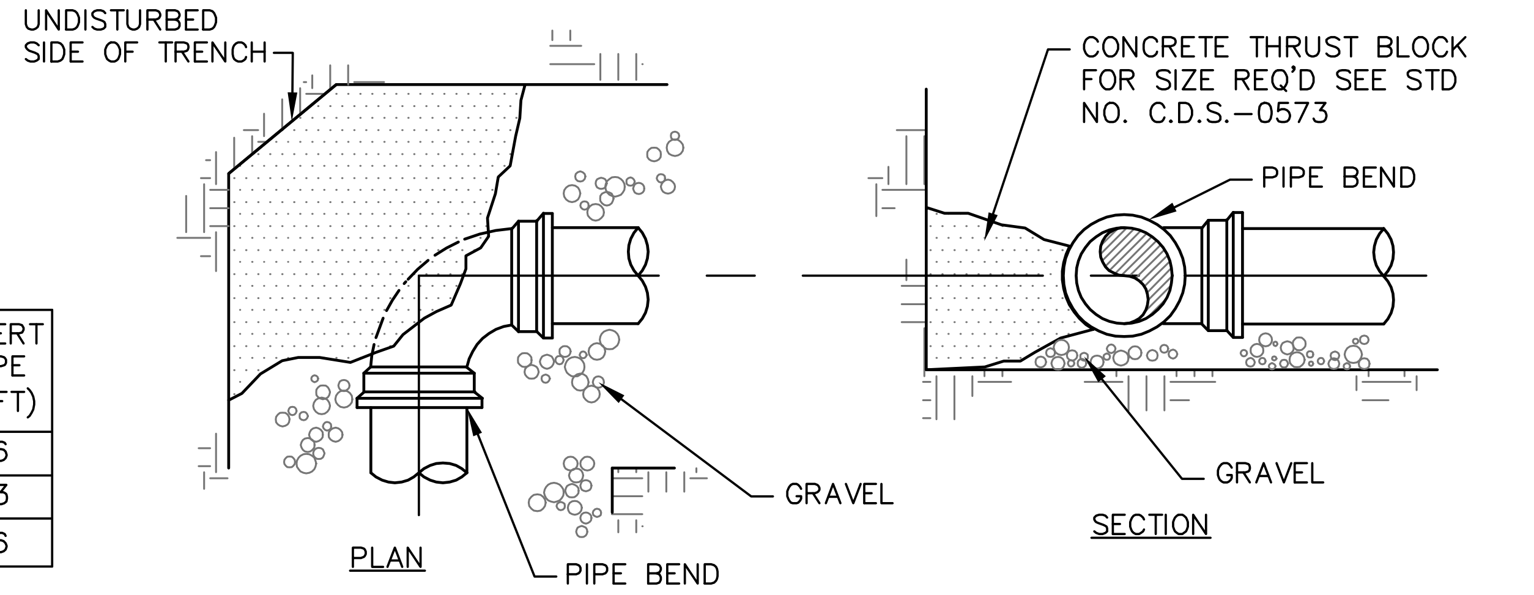
NOTE: DAMS SPACED AT 150' ALONG FORCE MAIN AND AT LOCATION SHOWN ON PLAN DRAWINGS



PIPE DAM

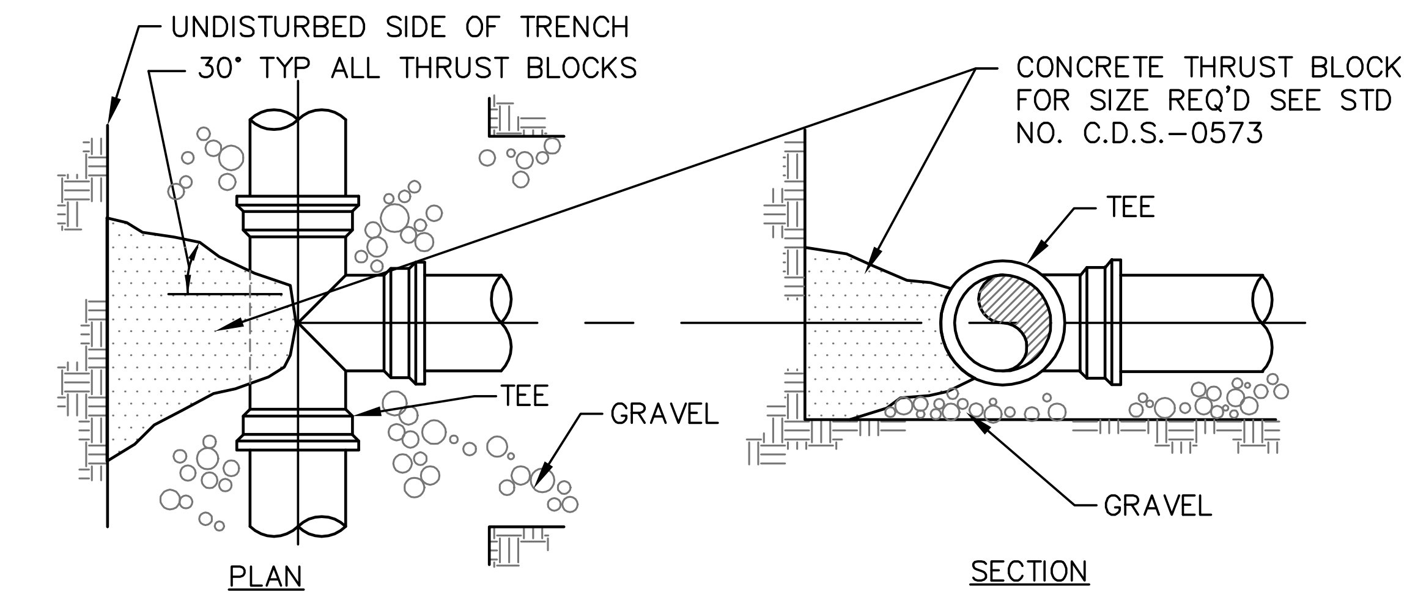
NTS

SIZE REQUIREMENTS FOR CONCRETE THRUST BLOCKS					
		BEARING ON UNDISTURBED SOIL (SQ FT)			
FITTINGS		90° BENDS	45° BENDS	TEES & PLUGS	HYDRANTS
PIPE SIZE	4"	2.0	1.0	1.0	N/A
	6"	3.0	2.0	2.0	6.0
	8"	5.0	3.0	4.0	N/A
	10"	7.0	4.0	5.0	N/A
	12"	10.0	6.0	7.0	N/A
	14"	13.0	7.0	10.0	N/A
	16"	17.0	9.0	12.0	N/A



TYPICAL THRUST BLOCK PLACEMENT ON BENDS

NTS



TYPICAL THRUST BLOCK PLACEMENT ON TEES

NTS

REV.	BY	DATE	STATUS
		7/15	ISSUED FOR MEDEP SOLID WASTE PERMIT APPLICATION

JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

SECTIONS AND DETAILS

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DESIGN BY: PCM
DRAWN BY: SJM
DATE: 12/5/2014
CHECKED BY:
LMN: NONE
CTB: SME-STD

JOB NO. 14101.00 DWG FILE DETAILS

C-306

JUNIPER RIDGE LANDFILL
EXPANSION
EROSION SEDIMENTATION CONTROL PLAN

Submitted by:

STATE OF MAINE BUREAU OF GENERAL SERVICES
as Owner
&
NEWSME LANDFILL OPERATIONS, LLC,
as Operator

July 2015

STATE OF MAINE
GUY H.
COTE, JR.
No. 5144
LICENSED
PROFESSIONAL ENGINEER

SME
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JUNIPER RIDGE LANDFILL
EXPANSION
EROSION SEDIMENTATION CONTROL PLAN

1.0 INTRODUCTION

This erosion and sedimentation control plan (ESCP) for the Juniper Ridge Landfill (JRL) expansion (Expansion) located in Old Town, Maine was designed to comply with the requirements of 6-096 CMR, Chapter 400 Section 4.J of the Maine Solid Waste Management Rules.

This plan has been prepared to address the standards and submission requirements of including the following:

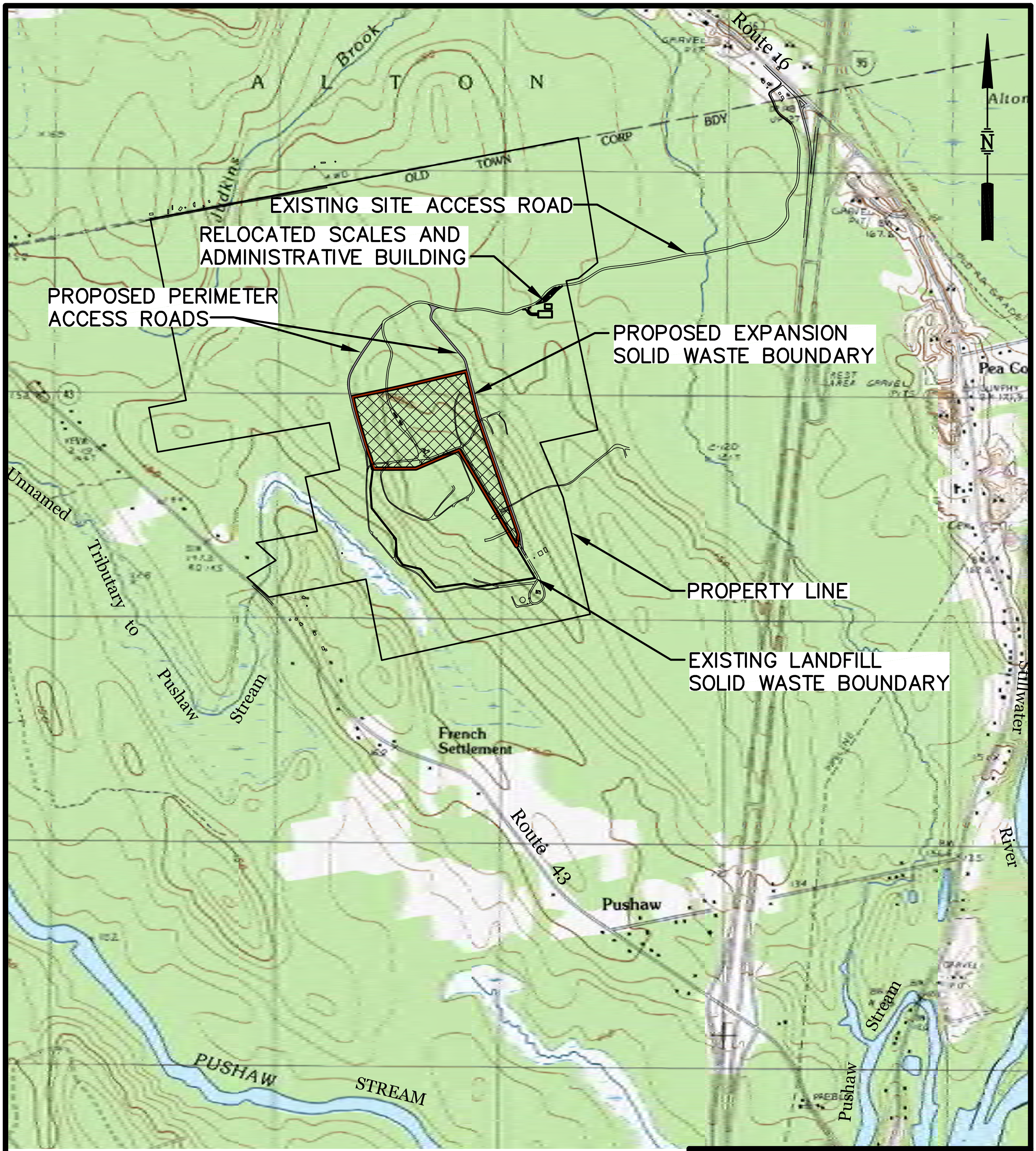
1. That the facility be located on soils suitable for their intended purpose, and
2. That the facility not cause unreasonable sedimentation or erosion of soil.

2.0 SITE DESCRIPTION

The existing landfill and the Expansion are located on an approximately 780-acre parcel of land located approximately one mile west of Interstate 95 in Old Town, Maine.

The existing landfill consists of the previously permitted 68-acre solid waste footprint (of which approximately 60 acres are currently developed or undergoing development), the former leachate pond (which has been repurposed to contain stormwater and renamed to Pond 1A), leachate storage tank, maintenance building, scale house (to be relocated as part of the expansion), landfill gas flare, office building, soil borrow areas, soil stockpile areas, stormwater detention ponds, parking areas, access roads and other grassed areas (i.e., berm slopes, laydown areas, etc.).

The Expansion will be adjacent to and generally north of the existing landfill and will expand the solid waste footprint by about 54 acres. The total facility site, including supporting site



BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLE:
OLD TOWN, MAINE–1988

1000 0 2000 4000 FEET

FIGURE 1–1
SITE LOCATION MAP
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: SITELOC LMN: SITELOC CTB: SITELOC REV: 5/26/2015

\\Nserver\cfs\Casella\OldTownLandfill\Expansion\9.35MCY-Expansion\Acad\Figures\SITELOC.dwg, 6/17/2015 1:11:17 PM, paf infrastructure (e.g., access roads, stormwater management ponds, etc.) will be approximately 74 acres.

The development of the Expansion is projected to begin in 2018 and will be constructed in a phased fashion over an approximate 10 year period. As the project progresses, subsequent landfill cells will be constructed and intermediate or final cover will be placed on landfill cells filled to capacity. Additional accessory land development around the perimeter of the Expansion will include; additional stormwater detention ponds, a perimeter berm with a paved access road, electric utilities, leachate force mains and a gas header pipe located within the eastern perimeter berm.

Detention ponds will be used for sediment control and to decrease peak flows prior to discharge. Stormwater discharge from the ponds will be spread using level lip spreaders to limit erosion associated with the point discharge.

3.0 SITE SETTING

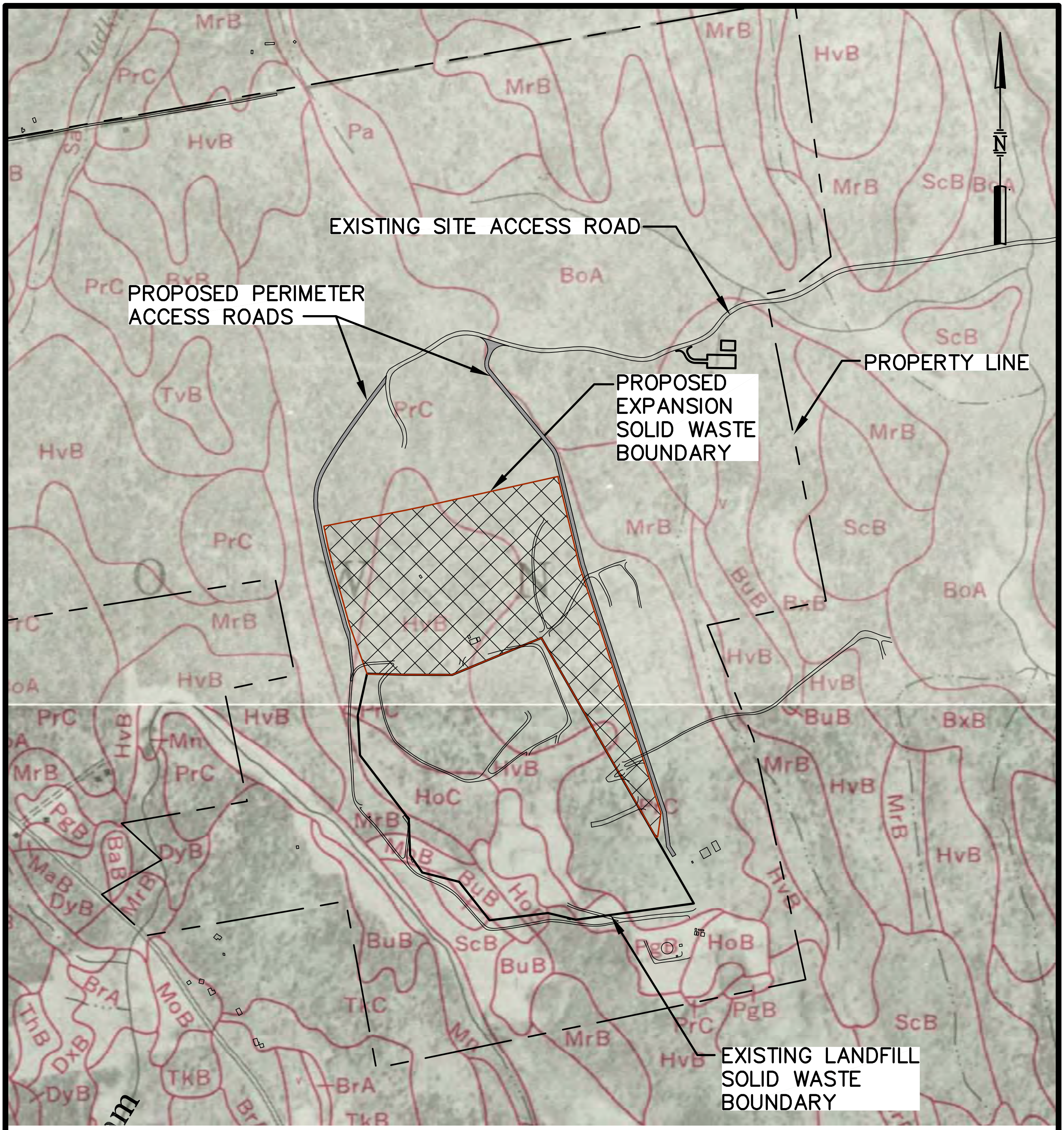
The majority of the 780 acre parcel is wooded, with hardwoods predominating in the upper elevations, and softwoods predominating in the lower elevations. The parcel is irregularly shaped and the existing landfill is positioned in the southern portion of the parcel. A drumlin oriented in a northwest to southeast direction effectively divides the parcel into four watersheds, east, northeast, northwest, and southwest. The area analyzed for each of the watersheds is approximately 346, 26, 271, and 240 acres respectively in the predevelopment conditions. The northeast and the northwest watersheds both contribute to Judkins Brook and eventually Birch Stream. These watersheds will not be affected by the Expansion. The southwest watershed contributes to an unnamed tributary to Pushaw Stream, and the east watershed drains to an unnamed and unmapped tributary to Judkins Brook. Both Birch Stream and Pushaw Stream are tributaries to the Stillwater River which flows to the Penobscot River. For the purpose of estimating pre-development flows, two of the four watersheds are further broken down into subcatchments with five analysis points, which represent the locations where stormwater flows across the site's property boundary. The points of analysis are labeled as Analysis Points 1 through 5 on Drawing D-101 in Appendix A. Flow from Subcatchments 1 and 2 contribute to southwestern watershed flows, Subcatchment 3 contributes to the northwest watershed flows, and Subcatchments 4 and 5 contribute to the east watershed flows. The location of stormwater control structures are shown on Drawing C-107 included in Appendix A.

As stated, a portion of the Expansion is located within several watersheds that will eventually drain to unnamed tributaries of Pushaw Stream and Judkins Brook. This project is not within the direct watershed of lakes most at risk for new development or an urban impaired stream, as listed in Appendices A and B of the Maine Department of Environmental Protection (MDEP) Rules 6-096 CMR, Chapter 502: *Direct Watersheds of Lakes Most At Risk from New Development and Urban Impaired Streams.*.

The ground elevation within the Expansion area currently ranges from approximately 170 to 215 feet MSL. The Expansion area is mostly wooded with a mixed stand of hardwood and softwood overlying underbrush along the forest floor. The existing ground within the Expansion area slopes radially from the top of the drumlin toward the property boundary at grades varying from 1 to 20 percent. Surface drainage within the Expansion area consists of sheet and shallow concentrated flow with some channelization occurring in existing roadside ditches.

The surficial soils at the site are primarily Plaisted and Howland series along with some Monarda, Buxton, and Scantic, as shown on Figure 3-1. Surficial soils at the site were delineated based on mapping shown on the Soil Conservation Service Medium Intensity Soils Survey for Penobscot County. Table 3-1 shows the hydrologic soil group (HSG) for the various soil series at the site.

On-site observations within the landfill site have not identified areas that would be prone or highly susceptible to erosion (i.e., exposed sideslopes). A review of the SCS soils mapping did not identify the presence of highly erodible soils in close proximity to the Expansion.



MAPPING SOURCE
NATURAL RESOURCES CONSERVATION SERVICE, WEB SOIL SURVEY OF PENOBSCOT COUNTY, MAINE, 2014.

LEGEND

BoA	BIDDEFORD MUCKY PEAT
BuB	BUXTON SILT LOAM
HoC	HOWLAND GRAVELLY LOAM
HvB	HOWLAND VERY STONY LOAM
MoB	MONARDA SILT LOAM
MrB	MONARDA–BURNHAM COMPLEX
PgB	PLAISTED GRAVELLY LOAM
PrC	PLAISTED VERY STONY LOAM
ScB	SCANTIC SILT LOAM

500 0 1000 2000 FEET

FIGURE 3–1
MEDIUM INTENSITY SOIL TYPES
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: SOILS LMN: SOILS CTB: SITELOC REV: 6/17/2015

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TABLE 3-1

SITE SURFICIAL SOIL SUMMARY

Soil Series	Hydrologic Soil Group	Runoff Curve No.	Description
Plaisted	C	70/71	Woods, good condition/Meadow
Howland	C	70/71	Woods, good condition/Meadow
Monarda	D	77/78	Woods, good condition/Meadow
Buxton	C	70/71	Woods, good condition/Meadow
Scantic	D	77/78	Woods, good condition/Meadow
Landfill Cover	C	71	Meadow
Gravel Surfaces	C/D	89/91/96	Gravel Roads, Pads, Berms
Buildings/Roofs/Pond/ Paved Surfaces	NA	98	Impervious Surface

An emergent marsh area that forms the headwaters to an unnamed tributary that feeds the Pushaw Stream is downgradient and to the southwest of the Expansion. The marsh can be classified as in good condition and stable with a heavy growth of marsh grasses and no apparent signs of erosion problems. A minimum 100-foot wooded buffer will also be maintained between any site development and the emergent wetland marsh to the west of the existing landfill.

The grading and layout of the proposed facility was undertaken with a major consideration being to minimize impacts to wetland areas. Existing drainage courses will be utilized where feasible to convey stormwater from the developed site. No surface drainage outlet structures from the developed site will discharge concentrated flows directly onto abutting properties. Where necessary, the runoff from the developed site will discharge into detention basins that will attenuate peak flows rates to the unnamed tributaries feeding Pushaw Stream and Judkins Brook.

4.0 EXISTING AND PROPOSED DRAINAGE FACILITIES

4.1 Existing Drainage Facilities

There are several existing drainage structures within the existing landfill project site. The locations of these drainage structures are shown on Drawing C-107 in Appendix A.

Detention Pond 1 currently functions as a detention and sedimentation basin during the landfill operational life. The modifications to Detention Pond 1 as part of the Expansion will involve enlarging the flow control orifice located on the side of the existing composite outlet control structure and adding a second orifice to the structure prior to final closure of the site. This is a result of converting the existing pond from a sedimentation pond to a detention pond (as described in the Expansion Application Stormwater Management Plan) and also due to diverting flow from Detention Pond 1A into Detention Pond 1. The existing pond itself does not require any modifications and can adequately accommodate the peak flow both during and after Expansion development. Detention Pond 1 is located to the west of the existing landfill cells and will remain in operation throughout the Expansion development.

Detention Pond 1A is the pond that was formerly used to store leachate adjacent to Detention Pond 1. The pond is an existing pond that does not require modification. It is currently being used as a stormwater detention pond and will remain a detention pond throughout the life of the facility. Detention Pond 1A will outlet via a broad crested weir into Detention Pond 1.

Detention Ponds 2 and 6 are additional existing detention ponds located to the south of the existing landfill that will remain in place for the life of the facility. There are no proposed modifications to either Pond 2 or Pond 6 as part of the proposed Expansion.

Detention Pond 9 is an existing detention pond located east of the previously permitted landfill and permitted wood handling area and it will remain in place for the life of the facility. As part of the proposed Expansion, this detention pond will be enlarged to increase storage below the emergency spillway outlet (elev. 190.5) from 2.3 acre-feet to 5.1 acre-feet. The existing pond outlets will remain in place without modification.

Existing Detention Pond 5 is located in the northwest of the existing landfill. This pond will be removed as the western portion of the Expansion is developed.

A more thorough description of the outlet structures of existing detention ponds is presented in the Expansion Application Stormwater Management Plan.

4.2 Proposed Drainage Facilities

Proposed drainage facilities used to effectively manage stormwater associated with the Expansion will include grass lined and riprap lined channels, catch basins, culverts, storm drains, detention ponds, riprap aprons, riprap plunge pools and level spreaders.

Stormwater runoff from the developed and covered areas of the Expansion will be conveyed by a series of drainage structures consisting of ditches, catch basins, culverts as summarized on Table 4-1. Locations of the proposed permanent ditches, catch basins, and culverts are shown on Drawing C-107 included in Appendix A. The post-development stormwater analysis Drawing D-101 located in Appendix A shows the drainage area for each of the above-mentioned structures. A printout of the post-development stormwater analysis is included in Appendix B of the Expansion Stormwater Management Plan. These structures were sized to handle the projected peak flows resulting from the 24-hour/25-year rainfall event.

The design capacity of the stormwater drainage structures was based on SCS TR20 methodology. Culverts and catch basins were sized using a computer stormwater modeling system entitled *Hydrocad* by Applied Microcomputer Systems of Chocorua, New Hampshire. Ditches were sized using the *Hydraulic Design Series No. 4, Design of Roadside Drainage Channels (Mannings Equation)*. Ditch linings, culvert inlet and outlet protection were designed using SCS guidance found in the *Maine Erosion and Sediment Control BMPs* (SCS, 3/2003). These calculations are attached in Appendix B of the application. Calculations for the proposed pond level lip spreaders, plunge pools, and emergency spillways are included in Appendix B.

New culverts will be high-density polyethylene (HDPE) pipe and have diameters ranging from 18 to 36 inches. The culverts were designed with riprap aprons at inlet and riprap-lined aprons or plunge pools at outlet. Riprap for culvert inlet and outlet protection D-50 rating (i.e., 50 percent of riprap) ranges from 4 to 10 inches. Culvert outflows will be routed through level lip spreaders or vegetated swales.

The site stormwater drainage ditches (toe ditch) around the Expansion perimeter will be turf lined grass channels with a minimum base width of 2 feet, depth of 2 feet, and maximum sideslopes of 2H:1V.

Riprap downspouts on the landfill cover will be lined with riprap (D50 of 8 inches) and have a base width of 4 feet, depth of two feet, and maximum sideslopes of 2H:1V. Surface water ditches will have a minimum base width of 2 foot, depth of 2 feet and maximum sideslopes of 2H: 1V.

Terrace drain swales on the sideslopes of the landfill cover will be turf-lined ‘v’-channels with a depth of 1 foot, pitch of 5 percent (typical), and maximum sideslopes of 2H:1V. Terrace drain swales were uniformly sized based on the largest contributing drainage area and minimum expected slope. Riprap sizing was based on the maximum longitudinal slope. Rock chutes (riprap terrace downspouts) were uniformly sized for capacity based on the largest contributing drainage area and riprap size based on contributing area and slope. Computer software entitled HYDRAIN 6.01 (1996), Integrated Drainage Design Computer System, from the Federal Highway Administration (FHWA) was utilized to size the riprap for downspouts and ditches. Computer software entitled Erosion Control Materials Design Software (ECMDS) Version 4.2 (2002) from the North American Green Co. (N.A.G.) was utilized to determine temporary erosion matting for turf-lined and vegetated ditches.

TABLE 4-1

SUMMARY OF STORMWATER CULVERTS, STORM DRAINS, CATCH BASINS, DITCHES

Structures Culvert	Diameter (in.)	Material	Length (ft.)	Slope (%)	Inv. In Elev.	Inv. Out Elev.
EC-D-1G	24 (2)	CMP	56	0.018	183.0	182.0
C-2BA	36	HDPE	40	0.008	203.2	202.9
C-2BB	24	HDPE	96	0.010	195.0	194.0
C-4BA	24	HDPE	78	0.009	204.4	203.7
C-4BB	24	HDPE	78	0.009	204.4	203.7
C-4F	18	HDPE	78	0.04	165.0	162.0
C-4G	24	HDPE	36	0.028	175.0	174.0
C-4HA	18	HDPE	40	0.025	201.9	200.9
C-4HB	18	HDPE	101	0.025	178.5	176.0
C-4I	18	HDPE	80	0.131	202.5	192.0
C-4IA	18	HDPE	40	0.023	212.9	212.2
C-4JA	18	HDPE	60	0.028	214.0	212.3
C-4JB	24	HDPE	73	0.021	211.5	210.0
C-4JC	24	HDPE	73	0.021	211.5	210.0
C-4K	24	HDPE	51	0.043	216.5	214.3
C-4L	18	HDPE	121	0.017	213.0	211.0
C-4N	18	HDPE	33	0.030	184.0	183.0

Catch Basin	Basin Dia. (ft)	Grate Opening (in.)	Depth (ft)	Culvert Dia. (in.)
CB-2BB	4	30	7.2	24
CB-4G	4	24	8	24
CB-4HB	4	24	6.9	18
CB-4I	4	24	7.1	18
CB-4JA	4	24	6.7	18
CB-4K	4	30	5.5	24
CB-4L	4	24	4	18

Ditch	Base Width (ft)	Depth (ft.)	Sideslope Z-Value ('/')	Lining
Ditch to Detention Pond 10	2	2	2	Segments 1&2: NAG S75 Erosion Mat Segment 3: Riprap (D50=4", t=9")
Detention Pond 10 Emergency Spillway	10	2	2	Riprap (D50=4", t=9")
Perimeter (toe)	2	2	2	NAG S75 Erosion Mat
Maintenance Road Ditch	2	3	2	NAG S75 Erosion Mat
Terrace Drain	0' - V-ditch	2	2	NAG C125BN Erosion Mat
Downspouts	4	2	2	Riprap (D50=8", t=18")

Note:
Location of structures shown on Drawing C-107 contained in Appendix A.

The HYCHL Module of the FHWA HYDRAIN 6.01 software and the ECMDS software is designed to provide recommendations to the user for effective temporary and permanent erosion protection of stormwater ditches and channels conveying intermittent, concentrated, uniform water flows. The channel lining analysis and performance evaluations are conducted using the maximum shear stress (tractive force) method as outlined in the Federal Highway Administration's HEC-15. The stability check for channel lining materials is based on its capability to physically survive and effectively control soil loss on the channel surface under the calculated shear stresses for a specified flow period.

The proposed detention ponds (Detention Ponds 10, 11, and 12) were designed to provide flow control and sedimentation during construction. To allow sedimentation each pond was designed to allow 24-hours (minimum) of plug flow detention time during the 2-year/24-hour storm event. Proposed Detention Ponds 10, 11, and 12 will each have a composite outlet structure consisting of a 4-foot diameter drop inlet with a side-mounted orifice which will discharge to an 18-inch diameter HDPE outlet culvert. Each outlet culvert will have anti-seep collars to minimize "piping" of water along the outside of the outlet pipe. Each culvert outlet discharges to a riprap lined plunge pool. From this plunge pool, stormwater discharges will flow to level lip spreaders which will discharge to the adjacent wooded buffer areas. Plunge pools and level spreaders were designed to meet the requirements of *Maine Erosion and Sedimentation Control (MESC) BMP's* (SCS 3/2003). Detention Pond 10 will have a riprap lined channel emergency spillway designed to pass the 100-year/24-hour storm event with at least one foot of freeboard.

Detention Ponds 11 and 12 will be adjacent to proposed roadways and thus will utilize the grate atop each of the 4-foot diameter drop structures to allow flow into the outlet culvert during emergency conditions, rather than a traditional emergency spillway. The emergency spillways for theses ponds were designed to pass the 100-year/24-hour storm event with at least one foot of freeboard.

Design calculations for the ponds including riprap plunge pools, level spreaders, anti-seep collars, and emergency spillways are included in the Expansion Stormwater Management Plan Appendix C.

5.0 TIMING AND SEQUENCE OF LAND DISTURBANCE ACTIVITIES

The proposed timing and sequence of land disturbance activities associated with the Expansion cell construction, landfill operations, and cover placement is anticipated to be as follows:

a. Install silt fence and other temporary erosion control measures for the construction of the cell and accessory facilities such as detention ponds, berms, and service roads;
b. Clear and grub cell area;
c. Construct upslope stormwater diversion berms, ditches, culvert outlets, and outlet control structures (if necessary);
d. Construct service road(s) (if necessary);
e. Construct cell, cover system or perform construction required for landfill operations; and,
f. As permanent erosion control measures become stabilized, remove temporary measures (e.g., silt fence, stone check dams).

Site construction activities will follow the landfill construction drawings and specifications that will contain detailed requirements for Erosion and Sedimentation control. These requirements are as discussed in Section 6.0 of this plan.

6.0 EROSION CONTROL MEASURES

To minimize erosion during Expansion cell construction, operations, and cover placement temporary and permanent erosion control measures will be implemented. Temporary measures (e.g., silt fences, temporary seeding, mulching, and stone check dams) and permanent measures (e.g., downspouts, sedimentation basins, permanent seeding, mulching, and culvert inlet and outlet protection) will be monitored on a regular basis. The contractor and/or landfill operator (whichever entity is performing the construction activity) will ensure that structures are functioning properly, and will perform necessary maintenance. Construction project technical specifications will contain an Erosion and Sedimentation control section. A typical specification that will be used on the project is contained in Appendix C.

6.1 Temporary Erosion Control

The greatest potential for erosion will occur during grubbing and grading operations. This is when stumps and topsoil are removed from the site, the base grades prepared, and perimeter dikes constructed. Before beginning the grubbing phase, a siltation fence will be placed. In addition, stone check dams will be installed in newly created surface water drainage ditches. Once the perimeter dikes, culverts, ditches, and roadway embankments are completed, they will be mulched and seeded within seven days of final grading. Areas that are disturbed and cannot be completed for periods of more than 15 days will receive temporary seeding. The seeding specifications are included on Table 6-1.

6.2 Permanent Erosion Control

Permanent erosion control measures will be implemented during Expansion cell construction, Expansion operation and cover placement. During landfill operations, stormwater falling within the open area of the landfill cell will be collected internally and treated as leachate. Surface water within the active cell will be collected internally within the cells and directed to the Cell's leachate sump.

Upon reaching final grade, the landfill sideslope cover will be applied. Once the cover has been applied, if soil cover is used, the cover will be seeded and mulched to minimize erosion. Seeding of the cover with the permanent seeding mixture will be done within 15 days of placing the cover material.

TABLE 6-1

SEEDING SPECIFICATIONS

Permanent Seeding (120 lbs/acre)		**Temorary Seeding (120 lbs/acre)**
Tall Fescue	54 lbs/acre	Aroostook Rye
Red Fescue	25 lbs/acre	
Red Top	5 lbs/acre	
Ladino Clover	13 lbs/acre	
Annual Ryegrass	8 lbs/acre	
Birdsfoot Trefoil	5 lbs/acre	
Timothy	10 lbs/acre	
Fertilizer: Apply 1,300 pounds per acre of 10-10-10 fertilizer or equivalent per acre (29.8 lbs/1,000 sq. ft). Lime: Apply liquid limestone at a rate of 3 tons per acre (138-lbs./1,000 sq. ft.). Mulch: Mulch with weed-free hay or straw at 2.0 – 3.0 tons per acre with tack or 300 lbs./acre fiber mulch.		

Seeding operations typically occur no later than October 1st, at which time the soil shall be protected with mulch consisting of either hay or straw and the temporary seed mixture. The mulch may be required to be secured with either netting or twine. Seeding operations shall be done on 100-by-100-foot blocks. Problem areas and continually eroding areas shall be repaired immediately, and in these areas temporary erosion control blankets shall be used. The blankets shall conform and be installed in accordance with the manufacturers recommendations. Silt fence shall also be installed at the toe of slopes of greater than 100 feet in length where intermediate cover has been applied. Ditches constructed to convey water off the intermediate cover shall be protected with stone check dams. Details of erosion control fencing, stone check dams and other erosion control measures are shown on the typical erosion control drawing included in Appendix C. The sedimentation ponds and drainage ditches shall be cleaned and repaired as necessary.

6.3 Standard Erosion Control Procedures

In addition to these measures, the following erosion control procedures will be implemented during Expansion cell construction, operations and cover placement:

a. Soil erosion and sediment control measures will be performed in accordance with procedures outlined in the *Maine Erosion and Sediment Control BMPs* (SCS, 3/2003).

b. Removal of trees, brush, and other vegetation, as well as disturbance of soil, will be kept to a minimum during site development.

c. Usable topsoil will be stripped and stockpiled for reuse. Excess topsoil will be stockpiled on-site or removed from the project site and disposed of, or reused, in an approved manner. Topsoil needed for on-site reuse will be stockpiled on-site for use in final grading. Topsoil will be stockpiled such that natural drainage is not obstructed and no off-site sediment damage will result. Sideslopes of the stockpiled topsoil will not exceed 2H:1V and the stockpile will be surrounded with a siltation fence. Topsoil stockpiles will be temporarily seeded with Aroostook Rye or Annual Ryegrass within 15 days of formation, or temporarily mulched if seeding cannot be done within the recommended seeding dates.

d. The site will be brought to approximate finish grades and stabilized without extended delays. This includes the application of mulch to surfaces designated for revegetation and placement of riprap where shown. Erosion and sedimentation control measures such as bark mulch sediment barriers, stone check dams, and a silt fence will be installed as shown, and/or adjusted to suit construction after a cut or fill slope has been created.

e. The silt fence will be inspected after each rainfall and at least daily during prolonged rainfall. Required repairs will be made. Sediment deposits will be removed periodically from the upstream side of the silt barriers and will be spread and stabilized in site areas not subject to erosion. The silt fence will be replaced, as necessary, to provide proper filtering action.

f. Riprap required at culverts will consist of fieldstone or rough unhewn quarrystone of approximately rectangular shape. Stones will be of a size as noted on the construction drawings.

g. Following final grading, all graded or disturbed areas, not to be used as gravel roadways, parking areas, or landfill structures will be spread with a minimum compacted depth of 6 inches of topsoil and seeded to provide a permanent vegetative cover.

h. All areas receiving topsoil will be seeded. Seeding normally will occur between April 30 and September 30. Surface water runoff control measures (e.g., drainage ditches, berms, and culverts) will be constructed before seeding; all grading also will be performed before seeding. The top layer of soil will be loosened by raking, discing, or other acceptable means before seeding. Application rates for the lime, fertilizer, seed, and mulch are as presented on Table 6-1. The seed will be applied uniformly with a cyclone seeder, drill, cultipack seeder, or hydroseeder. Seed will not be planted if there is danger of frost shortly after seed germination. Maximum seeding depth is 1/4-inch when using methods other than hydroseeding.

i. Wood fiber cellulose mulch or hay mulch will be spread uniformly upon completion of the seedbed preparation, liming, fertilization, and seeding. The mulch may be anchored in place by uniformly applying an acceptable mulch binder such a Curasol or Terratac.

j. If germination is unsuccessful (i.e., less than 75-percent catch) within 30 days of seeding or there is unsatisfactory growth in the next year, the area will be reseeded in accordance with seeding specifications described herein.

7.0 MAINTENANCE

7.1 Routine Maintenance

Inspection shall be performed annually by a qualified person during wet weather to assure that the erosion/sediment control system performs as intended. Inspection priorities shall include checking erosion controls for accumulation of sediments.

Maintenance of the detention ponds will be a continuous process that involves routine inspections of the inlet structures, containment dikes, and outlet structures. At least once annually, sediment will be removed from the ponds and deposited within the limits of the landfill where future erosion of the sediment is unlikely.

7.2 Grassed Areas

Lime according to a soil test as necessary.

8.0 INSPECTIONS

Inspections will be undertaken by the Landfill Operator to assure that temporary and permanent erosion and sedimentation controls are properly installed and 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.

9.0 CONCLUSION

The foregoing measures and controls will help to assure that no unreasonable erosion of soil or sediment will occur as a result of the development or operation of the facilities.

APPENDIX A

POST-DEVELOPMENT STORMWATER ANALYSIS DRAWING D-101 AND FINAL SITE DRAINAGE PLAN DRAWING C-107

TIME OF CONCENTRATION

SUBCATCHMENT 1A
A – B: Sht L=150', S=0.020
B – C: Direct Entry, L=1840'
C – D: Direct Entry, L=260'

SUBCATCHMENT 1B
A – B: Sht L=150', S=0.050
B – C: ShC L=185', S=0.100
C – D: Ch L=390', S=0.050
D – E: Ch L=560', S=0.330

SUBCATCHMENT 1C
A – B: Sht L=150', S=0.035
B – C: ShC L=230', S=0.013
C – D: Direct Entry

SUBCATCHMENT 1D
A – B: Sht L=150', S=0.050
B – C: ShC L=160', S=0.100
C – D: Ch L=200', S=0.050
D – E: Ch L=605', S=0.330

SUBCATCHMENT 1E
A – B: Sht L=150', S=0.100
B – C: ShC L=150', S=0.150
C – D: Ch L=93', S=0.050
D – E: Ch L=517', S=0.330

SUBCATCHMENT 1F
A – B: Sht L=100', S=0.010
B – C: Sht L=17', S=0.330
C – D: ShC L=300, S=0.019
D – E: ShC L=1649', S=0.050
E – F: Direct Entry

SUBCATCHMENT 1G
A – B: Sht L=150', S=0.100
B – C: ShC L=62', S=0.100
C – D: ShC L=90', S=0.330
D – E: Ch L=140', S=0.500
E – F: Ch L=415', S=0.330

SUBCATCHMENT 1H
A – B: Sht L=150', S=0.330
B – C: Ch L=610', S=0.030

SUBCATCHMENT 1i
A – B: Sht L=150', S=0.050
B – C: ShC L=150', S=0.100
C – D: Ch L=220', S=0.050
D – E: Ch L=570', S=0.330

SUBCATCHMENT 1J
A – B: Sht L=100', S=0.040
B – C: ShC L=123', S=0.057
C – D: Ch L=370', S=0.019

SUBCATCHMENT 2A
A – B: Sht L=150', S=0.030
B – C: ShC L=540', S=0.020
C – D: ShC L=530', S=0.009
D – E: Cf L=1213', S=0.008

SUBCATCHMENT 2B
A – B: Sht L=150', S=0.050
B – C: ShC L=190', S=0.100
C – D: Ch L=430', S=0.050
D – E: Ch L=450', S=0.330

SUBCATCHMENT 2C
A – B: Sht L=150', S=0.013
B – C: ShC L=290', S=0.024
C – D: Ch L=260', S=0.011

SUBCATCHMENT 3
A – B: Sht L=150', S=0.020
B – C: ShC L=1120', S=0.005
C – D: Direct Entry, L=3070'

SUBCATCHMENT 4A
A – B: Sht L=150', S=0.017
B – C: ShC L=160', S=0.041
C – D: ShC L=70', S=0.043

SUBCATCHMENT 4B
A – B: Sht L=24', S=0.020
B – C: Sht L=19', S=0.500
C – D: ShC L=584', S=0.014
D – E: Ch L=40', S=0.025

SUBCATCHMENT 4C
A – B: Sht L=61', S=0.020
B – C: Sht L=61', S=0.020
C – D: ShC L=374', S=0.011

SUBCATCHMENT 4D
A – B: Sht L=125', S=0.022
B – C: Sht L=25', S=0.052
C – D: ShC L=270', S=0.019
D – E: ShC L=40', S=0.330
E – F: ShC L=100', S=0.015
F – G: ShC L=258', S=0.003

SUBCATCHMENT 4E
A – B: Sht L=150', S=0.013
B – C: ShC L=2625', S=0.019
C – D: Direct Entry L=1590'
D – E: Direct Entry, L=760'
E – F: Direct Entry, L=960'

SUBCATCHMENT 4F
A – B: Sht L=140', S=0.028
B – C: ShC L=1067', S=0.029
C – D: Ch L=20', S=0.021

SUBCATCHMENT 4G
A – B: Sht L=100', S=0.050
B – C: Sht L=50', S=0.100
C – D: ShC L=150', S=0.100
D – E: Ch L=130', S=0.050
D – F: Ch L=500', S=0.330

SUBCATCHMENT 4H
A – B: Sht L=75', S=0.100
B – C: Sht L=75', S=0.330
C – D: ShC L=150', S=0.330
D – E: Ch L=290', S=0.050
E – D: Ch L=240', S=0.330

SUBCATCHMENT 4HA
A – B: Sht L=140', S=0.330

SUBCATCHMENT 4i
A – B: Sht L=150', S=0.050
B – C: ShC L=200', S=0.100
C – D: Ch L=290', S=0.050
D – E: Ch L=440', S=0.330

SUBCATCHMENT 4iA
A – B: Sht L=140', S=0.333

SUBCATCHMENT 4J
A – B: Sht L=150', S=0.050
B – C: ShC L=200', S=0.100
C – D: Ch L=270', S=0.050
D – E: Ch L=430', S=0.330

SUBCATCHMENT 4K
A – B: Sht L=150', S=0.050
B – C: ShC L=270', S=0.055
C – D: Ch L=270', S=0.050
D – E: Ch L=410', S=0.330

SUBCATCHMENT 4L
A – B: Sht L=20', S=0.050
B – C: ShC L=130', S=0.100
C – D: Ch L=250', S=0.050
D – E: Ch L=490', S=0.330

SUBCATCHMENT 4M
A – B: Sht L=150', S=0.330
B – C: ShC L=470', S=0.044
C – D: ShC L=20', S=0.330

SUBCATCHMENT 4N
A – B: Sht L=150', S=0.020
B – C: ShC L=580', S=0.023

SUBCATCHMENT 4O
A – B: Sht L=55', S=0.300
B – C: ShC L=289', S=0.030
C – D: ShC L=319, S=0.012

SUBCATCHMENT 5
A – B: Sht L=150', S=0.013
B – C: ShC L=1930', S=0.011
C – D: Direct Entry, L=275'

LEGEND

1B	SUBCATCHMENT DESIGNATION
— — —	SUBCATCHMENT BOUNDARY
A B C	TIME OF CONCENTRATION SEGMENT DESIGNATION
├—┼—┤	TIME OF CONCENTRATION PATH
———	HYDROLOGIC SOIL GROUP BOUNDARY
HSG D	HYDROLOGIC SOIL GROUP DESIGNATION
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Ch	CHANNEL FLOW
→→	DRAINAGE REACH
R–1H	REACH DESIGNATION (HYDROCAD)
DP–1	POND/STRUCTURE DESIGNATION (HYDROCAD)
tc①	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO, NORRIDGEWOCK, MAINE. PHOTO DATE DECEMBER 31, 2014. VERTICAL DATUM MAINE STATE COORDINATE SYSTEM EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY, BANGOR, MAINE.
2. HYDROLOGIC SOIL GROUP DATA INTERPRETED FROM SOIL SURVEY OF PENOBSCOT COUNTY, MAINE, BY U.S. DEPT. OF AGRICULTURE SOIL CONSERVATION SERVICE DECEMBER 1970. MAPS 203 AND 213.

REV.	BY	DATE	STATUS
		–	–

CASELLA
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

STORMWATER MANAGEMENT PLAN
POST DEVELPOMENT ANALYSIS

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
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DESIGN BY: MNA
DRAWN BY: SJM
DATE: 2/15
CHECKED BY:
LMN: SMP–POST
CTB: SME–STD

JOB NO. 14101.00 DWG FILE SMP–POST

D–101

LEGEND

▨	WETLAND DELINEATED
▩	WETLAND PHOTO INTERPRETED

NOTES:

1. BASE MAP PREPARED BY AERIAL SURVEY & PHOTO INC., NORRIDGEWOCK, MAINE. PHOTO DATE 12/31/14. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE. STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. SITE BENCHMARK INFORMATION:

   PLUG 1 IS A BRASS PLUG ON FORMER LEACHATE POND PUMP STATION LOCATED AT COORDINATES NORTHING 478242.05, EASTING 925376.35 ELEVATION 167.93

2. WETLAND BOUNDARIES DELINEATED BY WOODLOT ALTERNATIVES, INC. IN 2004 AND STANTEC CONSULTING SERVICES 2008, 2014 AND 2015.
3. PERMITTED LANDFILL FINAL WASTE GRADES REPRESENT GRADES PRIOR TO CONSTRUCTION OF FINAL COVER SYSTEM.
4. PROPOSED FINAL WASTE GRADES REPRESENT GRADES PRIOR TO CONSTRUCTION OF FINAL COVER SYSTEM.
5. CULVERT SCHEDULE IS SHOWN ON DRAWING C-306. CULVERT SCHEDULE INCLUDES CULVERTS FOR DETENTION BASIN OUTLET STRUCTURES.

REV.	BY	DATE	STATUS
		7/15	ISSUED FOR MEDEP SOLID WASTE PERMIT APPLICATION

JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

FINAL SITE DRAINAGE PLAN

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL · CIVIL · GEOTECHNICAL · WATER · COMPLIANCE
4 Blanchard Road, PO Box 85A, Cumberland Center, Maine 04021
Phone 207.829.5016 · Fax 207.829.5692 · www.smemaine.com

DESIGN BY: PCM
DRAWN BY: SJM
DATE: 3/4/2015
CHECKED BY:
LMN: FINAL-DRAIN
CTB: SME-STD

JOB NO. 14101.00 DWG FILE BASE

C-107

APPENDIX B

EROSION CONTROL DESIGN

APPENDIX B-1

GRASS DITCH LINING DESIGN

GRASS CHANNEL DESIGN

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 3/12/2015
Chk. By: PCM

OBJECTIVE: Design channel with adequatelining to convey stormwater flows from 25-year, 24-hour storm event assuming full grass cover and 2-year, 24-hour storm event assuming bare ditch condition.

REFERENCES:

1. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.0, Chocorua, New Hampshire, 2001
2. North American Green Erosion Control Material Design Software.
3. Maine Erosion and Sedimentation Control BMP's, MEDEP, March 2003.

DESIGN PROCEDURE:

1. Determine peak stormwater flows from 2-year and 25-year, 24-hour storm event using TR-20. Evaluate permanent and temporary channel lining using maximum flow rate.

SUMMARY OF RESULTS:

GRASS DITCH	FLOW FROM	SLOPE (MAX.) (ft/ft)	Q_2 (cfs)	Q_{25} (cfs)	Bottom Width (ft)	Side Slopes (H:1V)	Temp. Lining	Permanent Lining
NPD-1	North Perimeter Ditch 1	0.0299	5.2	20.2	2	2	NAG S75	Grass Only
NPD-2	North Perimeter Ditch 2	0.0027	5.3	22.1	2	2	NAG S75	Grass Only
EPD-1	East Perimeter Ditch 1	0.0075	5.0	19.5	2	2	NAG S75	Grass Only
EPD-2	East Perimeter Ditch 2	0.0157	0.5	1.9	2	2	NAG S75	Grass Only
EPD-3	East Perimeter Ditch 3	0.0167	4.5	17.6	2	2	NAG S75	Grass Only
EPD-4	East Perimeter Ditch 4	0.0191	0.4	1.6	2	2	NAG S75	Grass Only
EPD-5	East Perimeter Ditch 5	0.0350	2.0	7.7	2	2	NAG S75	Grass Only
EPD-6	East Perimeter Ditch 6	0.0056	4.4	16.9	2	2	NAG S75	Grass Only
DP-10-1	DP-10 Ditch 1	0.0079	4.9	19.0	2	2	NAG S75	Grass Only
DP-10-2	DP-10 Ditch 2	0.0362	4.9	18.7	2	2	NAG S75	Grass Only
4B-1	Ditch 4B-1	0.0085	4.2	16.3	2	2	NAG S75	Grass Only
MRD-1	Maintenance Road Ditch	0.0194	5.1	19.7	2	2	NAG S75	Grass Only

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www.nagreen.com

Erosion Control Materials Design Software
Version 5.0

Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: North Perimeter Ditch – PERMANENT LINING

Discharge	22.1
Peak Flow Period	1
Channel Slope	0.0299
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Clay Loam

DITCH	Q_{25}	SLOPE
NPD-1	20.2	0.0299
NPD-2	22.1	0.0027

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern	
Unreinforced Vegetation	Straight	22.1 cfs	3.87 ft/s	1.26 ft	0.055	4.2 lbs/ft2	2.35 lbs/ft2	1.78	STABLE	--	✓
Underlying Substrate	Straight	22.1 cfs	3.87 ft/s	1.26 ft	--	0.05 lbs/ft2	0.048 lbs/ft2	1.04	STABLE	--	✓

∴ GRASS LINED OKAY FOR PERMANENT LINING

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: North Perimeter Ditch - TEMP. LINING

Discharge	5.3
Peak Flow Period	1
Channel Slope	0.0299
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegtation Type	
Vegetation Density	
Soil Type	

DITCH	Q_2	SLOPE
NPD-1	5.2	0.0299
NPD-2	5.3	0.0027

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	5.3 cfs	2.72 ft/s	0.61 ft	0.053	1.55 lbs/ft2	1.13 lbs/ft2	1.37	STABLE	D

✓

∴ S75 w/ STAPLE PATTERN D

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: East Perimeter Ditch — PERMANENT LINING

Discharge	19.5
Peak Flow Period	1
Channel Slope	0.035
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Clay Loam

DITCH	Q_{25}	SLOPE
EPD-1	19.5	0.0075
EPD-2	1.9	0.0157
EPD-3	17.6	0.0167
EPD-4	1.6	0.0191
EPD-5	7.7	0.035
EPD-6	16.9	0.0056

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern	
Unreinforced Vegetation	Straight	19.5 cfs	3.91 ft/s	1.16 ft	0.056	4.2 lbs/ft2	2.52 lbs/ft2	1.66	STABLE	--	✓
Underlying Substrate	Straight	19.5 cfs	3.91 ft/s	1.16 ft	--	0.05 lbs/ft2	0.049 lbs/ft2	1.01	STABLE	--	✓

∴ GRASS LINED OKAY FOR PERMANENT LINING

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: East Perimeter Ditch - TEMP. LINING

Discharge	5
Peak Flow Period	1
Channel Slope	0.035
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegtation Type	
Vegetation Density	
Soil Type	

DITCH	Q_2	SLOPE
EPD-1	5.0	0.0075
EPD-2	0.5	0.0157
EPD-3	4.5	0.0167
EPD-4	0.4	0.0191
EPD-5	2.0	0.035
EPD-6	4.4	0.0056

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	5 cfs	2.79 ft/s	0.57 ft	0.053	1.55 lbs/ft2	1.24 lbs/ft2	1.25	STABLE	D

✓

∴ S75 w/ STAPLE PATTERN D

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: DP-10 Ditch - PERMANENT LINING

Discharge	19.0
Peak Flow Period	1
Channel Slope	0.0362
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Clay Loam

DITCH	Q_{25}	SLOPE	
DP10-1	19.0	0.0079	GRASS
DP-10-2	18.7	0.0362	
DP-10-3	33.82	0.0462	RIPRAP

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern	
Unreinforced Vegetation	Straight	19 cfs	3.92 ft/s	1.13 ft	0.056	4.2 lbs/ft2	2.56 lbs/ft2	1.64	STABLE	--	✓
Underlying Substrate	Straight	19 cfs	3.92 ft/s	1.13 ft	--	0.05 lbs/ft2	0.05 lbs/ft2	1.01	STABLE	--	✓

∴ GRASS LINED OKAY FOR PERMANENT LINING OF SEGMENTS 1 & 2

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: DP-10 Ditch – TEMP. LINING

Discharge	4.9
Peak Flow Period	1
Channel Slope	0.0362
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegtation Type	
Vegetation Density	
Soil Type	

DITCH	Q_2	SLOPE	
DP-10-1	4.9	0.0079	GRASS
DP-10-2	4.9	0.0362	
DP-10-3	8.68	0.0462	RIPRAP

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	4.9 cfs	2.8 ft/s	0.56 ft	0.054	1.55 lbs/ft2	1.27 lbs/ft2	1.23	STABLE	D

✓

∴ S75 w/ STAPLE PATTERN D FOR
SEGMENTS 1 & 2

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: Ditch 4B-1 – PERMANENT LINING

Discharge	16.3
Peak Flow Period	1
Channel Slope	0.0085
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Clay Loam

DITCH	Q_{25}	SLOPE
4B-1	16.3	0.0085

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern	
Unreinforced Vegetation	Straight	16.3 cfs	1.93 ft/s	1.61 ft	0.067	4.2 lbs/ft2	0.86 lbs/ft2	4.9	STABLE	--	✓
Underlying Substrate	Straight	16.3 cfs	1.93 ft/s	1.61 ft	--	0.05 lbs/ft2	0.012 lbs/ft2	4.29	STABLE	--	✓

∴ GRASS LINED OKAY FOR PERMANENT LINING

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: Ditch 4B-1 – TEMP. LINING

Discharge	4.2
Peak Flow Period	1
Channel Slope	0.0085
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegtation Type	
Vegetation Density	
Soil Type	

DITCH	Q_2	SLOPE
4B-1	4.2	0.0085

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	4.2 cfs	1.68 ft/s	0.73 ft	0.05	1.55 lbs/ft2	0.38 lbs/ft2	4.03	STABLE	D

✓

∴ S75 w/ STAPLE PATTERN D

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: Maintenance Road Ditch – PERMANENT LINING

Discharge	19.65
Peak Flow Period	1
Channel Slope	0.0194
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Clay Loam

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern	
Unreinforced Vegetation	Straight	19.65 cfs	3.04 ft/s	1.37 ft	0.059	4.2 lbs/ft2	1.65 lbs/ft2	2.54	STABLE	--	✓
Underlying Substrate	Straight	19.65 cfs	3.04 ft/s	1.37 ft	--	0.05 lbs/ft2	0.029 lbs/ft2	1.7	STABLE	--	✓

∴ Grass Lined OKAY for PERMANENT LINING

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Project Name: Juniper Ridge Landfill
Project Number: 60548
Channel Name: Maintenance Road Ditch — TEMP. LINING

Discharge	5.14
Peak Flow Period	1
Channel Slope	0.0194
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegtation Type	
Vegetation Density	
Soil Type	

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	5.14 cfs	2.34 ft/s	0.66 ft	0.051	1.55 lbs/ft2	0.8 lbs/ft2	1.94	STABLE	D

✓

∴ S75 w/ STAPLE PATTERN D

APPENDIX B-2

RIPRAP DITCH LINING DESIGN

RIPRAP CHANNEL DESIGN

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/11/2015
Chk. By:

OBJECTIVE: Design channel with adequatelining to convey stormwater flows from 25-year, 24-hour storm event assuming full grass cover.

REFERENCES:

1. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.0, Chocorua, New Hampshire, 2001
2. Channel Design Program HYCHL Version 6.1
3. Maine Erosion and Sedimentation Control BMP's, MEDEP, March 2003.

DESIGN PROCEDURE:

1. Determine peak stormwater flows for 25-year, 24-hour storm event using TR-20. (See Attached Hydrocad Printouts). Evaluate permanent channel lining using maximum flow rate.

SUMMARY OF RESULTS:

							Riprap	
RIPRAP DITCH	FLOW FROM	SLOPE (MAX.) (ft/ft)	Q_2 (cfs)	Q_{25} (cfs)	Bottom Width (feet)	Side Slopes (H:1V)	D_{50} (inches)	Thickness (inches)
DP-10-3	DITCH DP-10 SECTION 3	0.0462	9.3	35.4	2	2	4	9
Emerg Spillway	DP-10	0.33	NA	8.0	10	2	4	9

```
******  HYCHL  ****** (Version 6.1) ******               Date 06-02-2015

 Commands Read From File: C:\HCHL\D-1B.CHL

       JOB DP-10-3
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.0462 35.4
       TRP 2       2       2
 ** LEFT SIDE SLOPE    2.0 AND RIGHT SIDE SLOPE    2.0
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)    2.00
       LRR 0.33    2 42     2.65   .15
 ** D50 (ft)     .33
 ** ANGLE OF REPOSE (DEGREES)   42.00
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .150
       END
***************END OF COMMAND FILE************
```

$D_{50} = 4''$

```
 DP-10-3
 ------------
 INPUT REVIEW
 ------------
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):              35.40
       CHANNEL SHAPE:                     TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):                   .046
 -----------------------------------------
 HYDRAULIC CALCULATIONS USING NORMAL DEPTH
 -----------------------------------------

                           DESIGN      MAXIMUM
                           ------      -------
 FLOW (cfs)                 35.40       27.31
 DEPTH (ft)                  1.46        1.32
 AREA (ft^2)                 7.21        6.09
 WETTED PERIMETER (ft)       8.54        7.88
 HYDRAULIC RADIUS (ft)        .84         .77
 VELOCITY (ft/s)             4.91        4.49
 MANNINGS N (LOW FLOW)        .058        .060
 REYNOLDS NUMBER (10^5)       .43

 ------------------
 STABILITY ANALYSIS
 ------------------

                     LINING    PERMIS SHR   CALC. SHR  STAB.
   CONDITION         TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
   ---------         ------    ----------   ---------  ------   -------
  BOTTOM; STRAIGHT  RIPRAP         5.10       4.22      1.21    STABLE
  SIDE; STRAIGHT    RIPRAP         3.79       3.12      1.21    STABLE

*** NORMAL END OF HYCHL ***
```

$D_{50} = 4''$ OK

Summary for Pond DP-10: DETENTION POND 10

```
[62] Hint: Exceeded Reach 4R OUTLET depth by 0.72' @ 12.85 hrs

Inflow Area =     28.280 ac,  4.24% Impervious, Inflow Depth =  2.84"   for 100-yr Storm event
Inflow      =     59.36 cfs @  12.35 hrs, Volume=         6.692 af
Outflow     =     27.71 cfs @  12.72 hrs, Volume=         6.274 af, Atten= 53%, Lag= 22.0 min
Primary     =     18.03 cfs @  12.72 hrs, Volume=         3.582 af
Secondary   =      1.74 cfs @  12.72 hrs, Volume=         2.452 af
Tertiary    =      7.94 cfs @  12.72 hrs, Volume=         0.240 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00'  Surf.Area= 0 sf  Storage= 0 cf
Peak Elev= 180.44' @ 12.72 hrs  Surf.Area= 27,104 sf  Storage= 112,674 cf
Flood Elev= 181.00'  Surf.Area= 28,500 sf  Storage= 128,200 cf

Plug-Flow detention time= 439.2 min calculated for 6.272 af (94% of inflow)
Center-of-Mass det. time= 408.3 min ( 1,259.2 - 850.9 )

Volume      Invert    Avail.Storage  Storage Description
   #1      175.00'       157,950 cf  Custom Stage Data (Prismatic)Listed below (Recalc)

Elevation          Surf.Area        Inc.Store      Cum.Store
  (feet)             (sq-ft)      (cubic-feet)   (cubic-feet)
   175.00              7,900                 0              0
   176.00             18,000            12,950         12,950
   178.00             22,000            40,000         52,950
   180.00             26,000            48,000        100,950
   182.00             31,000            57,000        157,950

Device  Routing         Invert   Outlet Devices
   #1   Device 3       179.00'   48.0" Horiz. Orifice/Grate  C= 0.600
                                 Limited to weir flow at low heads
   #2   Device 3       178.00'   6.0" Vert. 6-in Orifice  C= 0.600
   #3   Primary        175.20'   18.0"  Round 18-in Primary Culvert
                                 L= 52.0'  CPP, square edge headwall,  Ke= 0.500
                                 Inlet / Outlet Invert= 175.20' / 172.00'  S= 0.0615 '/'  Cc= 0.900
                                 n= 0.011,  Flow Area= 1.77 sf
   #4   Secondary      173.50'   5.8"  Round 6-in Culvert
                                 L= 60.0'  CPP, projecting, no headwall,  Ke= 0.900
                                 Inlet / Outlet Invert= 173.50' / 172.30'  S= 0.0200 '/'  Cc= 0.900
                                 n= 0.011,  Flow Area= 0.18 sf
   #5   Device 4       177.00'   5.8" Horiz. Orifice Top  C= 0.600  Limited to weir flow at low heads
   #6   Device 4       176.20'   1.5" Vert. Orifice Side  C= 0.600
   #7   Tertiary       180.00'   10.0' long  x 22.0' breadth E-Spillway Weir
                                 Head (feet)  0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                 Coef. (English)  2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63
```

100 year storm
flow into riprap
channel

```
Primary OutFlow  Max=18.03 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─3=18-in Primary Culvert (Inlet Controls 18.03 cfs @ 10.20 fps)
   ├─1=Orifice/Grate (Passes < 70.84 cfs potential flow)
   └─2=6-in Orifice (Passes < 1.40 cfs potential flow)

Secondary OutFlow  Max=1.74 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─4=6-in Culvert (Barrel Controls 1.74 cfs @ 9.51 fps)
   ├─5=Orifice Top (Passes < 1.64 cfs potential flow)
   └─6=Orifice Side (Passes < 0.12 cfs potential flow)

Tertiary OutFlow  Max=7.82 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─7=E-Spillway Weir (Weir Controls 7.82 cfs @ 1.79 fps)
```

```
 ******  HYCHL  ****** (Version 6.1) ******   Date 02-26-2015
DETENTION POND #10 EMERGENCY SPILLWAY RIPRAP CHANNEL

Commands Read From File: C:\HCHL\DP-10.CHL

       JOB DP-10 SPILLWAY
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.33    8
       TRP 10      3       3
 ** LEFT SIDE SLOPE    3.0 AND RIGHT SIDE SLOPE    3.0
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)   10.00
       LRR 0.33   2 0 2.65   0.15
 ** D50 (ft)     .33                                 D50 = 4 INCHES
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .150
       END
***************END OF COMMAND FILE************

 DP-10 SPILLWAY
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     40.95
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):             8.00
       CHANNEL SHAPE:                     TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):                 .330
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                  8.00
 MAX DEPTH (ft)               .09
 AREA (ft^2)                 1.20
 WETTED PERIMETER (ft)      10.73
 HYDRAULIC RADIUS (ft)        .11
 AVG VELOCITY (ft/s)         6.69
 MANNINGS EQUIVALENT         .127
 Davg / D50                   .34
 FROUDE NUMBER               3.87
 REYNOLDS NUMBER (10^5)       .43
 ------------------
 STABILITY ANALYSIS
 ------------------

                     LINING    PERMIS SHR   CALC. SHR  STAB.
    CONDITION        TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR    REMARKS
    ---------        ------    ----------   ---------  ------    ------
-
   BOTTOM; STRAIGHT   RIPRAP         5.10       1.91      2.67    STABLE
   SIDE; STRAIGHT     RIPRAP         4.46       1.62      2.76    STABLE
  *** NORMAL END OF HYCHL ***
```

DOWNSPOUT RIPRAP SIZING:

SUBCATCHMENT	DOWNSPOUT SLOPE	25-YEAR Q (CFS)
1B	0.33	21.2
1D	0.33	18.84
1E	0.33	20.23
1G	0.33	21.25
1I	0.33	15.23
2B	0.33	22.49
4G	0.33	20.62
4H	0.33	6.34
4I	0.33	16.02
4J	0.33	19.91
4K	0.33	17.14
4L	0.33	13.11
MAX =	**0.33**	**22.49**

```
       ******  HYCHL  ****** (Version 6.1) ******                Date 02-11-2015

 Commands Read From File: C:\CHANNEL.CHL

       JOB DOWNSPOUT
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.33    22.49
 *** WARNING:  DATA IS OUT OF REASONABLE RANGE
       TRP 4      2      2
 ** LEFT SIDE SLOPE    2.0 AND RIGHT SIDE SLOPE    2.0
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)    4.00
       LRR 0.67   2 42     2.65   0.15
 ** D50 (ft)     .67
 ** ANGLE OF REPOSE (DEGREES)    42.00
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .150
       END
***************END OF COMMAND FILE************
```

MAX DOWNSPOT
Q25

D50 = 8-INCHES

```
 DOWNSPOUT
 ------------
 INPUT REVIEW
 ------------
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):          22.49
       CHANNEL SHAPE:                   TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):               .330
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                  22.49
 MAX DEPTH (ft)                .42
 AREA (ft^2)                  2.05
 WETTED PERIMETER (ft)        5.89
 HYDRAULIC RADIUS (ft)         .35
 AVG VELOCITY (ft/s)         10.98
 MANNINGS EQUIVALENT          .039
 Davg / D50                    .54
 FROUDE NUMBER                2.98
 REYNOLDS NUMBER (10^5)       1.25
 ------------------
 STABILITY ANALYSIS
 ------------------

                         LINING    PERMIS SHR   CALC. SHR  STAB.
    CONDITION            TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
    ---------            ------   -----------   ---------  ------   -------
  BOTTOM; STRAIGHT     RIPRAP        10.35         8.68      1.19   STABLE ✓
  SIDE; STRAIGHT       RIPRAP         7.70         6.68      1.15   STABLE ✓

 *** NORMAL END OF HYCHL ***
```

D50 = 8-INCHES OKAY
FOR ALL DOWNSPOUTS

APPENDIX B-3

CULVERT INLET/OUTLET DESIGN

RIPRAP APRON DESIGN

Project Name: Juniper Ridge Landfill
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/11/2015
Chk. By: Pcm

OBJECTIVE: Design culvert outlet protection to protect the outlet of culverts from scour and deterioration.

REFERENCES:

1. Maine Department of Environmental Protection, Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices, March 2003
2. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.0, Chocorua, New Hampshire, 2001

DESIGN PROCEDURE:

1. Use design flows for 25-year, 24-hour storm event and attached Outlet Protection table to determine apron dimensions and riprap size.

SUMMARY OF RESULTS:

Riprap Apron Designation	Flow From	Q_{25} (cfs)	Culvert Dia. (in)	D_{50} (in)	Thickness (in)	Length (ft)	Width (ft)
2BA	Culvert 2BA	22	24	8	18	18	20
2BB	Culvert 2BB	22	24	6	14	18	20
4BA	Culvert 4BA	15	24	5	12	12	14
4BB	Culvert 4BB	15	24	5	12	12	14
4F	Culvert 4F	5	18	4	9	10	12
4G	Culvert 4G	20	24	5	12	12	14
4HA	Culvert 4HA	2	18	4	9	10	12
4HB	Culvert 4HB	7	18	4	9	10	12
4I	Culvert 4I	17	18	10	23	18	20
4IA	Culvert 4IA	2	18	4	9	10	12
4JA	Culvert 4JA	19	18	10	23	18	20
4JB	Culvert 4JB	9	24	5	12	12	14
4JC	Culvert 4JC	9	24	5	12	12	14
4K	Culvert 4K	17	24	5	12	12	14
4L	Culvert 4L	12	18	8	18	14	16
4N	Culvert 4N	2	18	4	9	10	12

OUTLET PROTECTION
FOR A PIPE FLOWING FULL WITH LOW TAILWATER

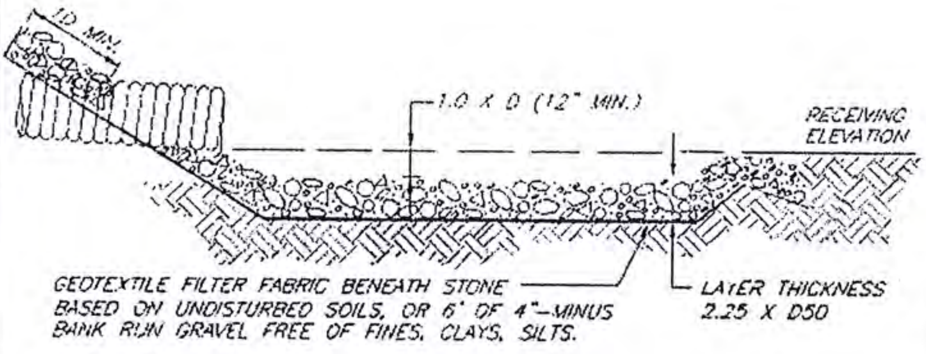
RIPRAP SIZE - D50 (Inches)
PIPE DIAMETER

DISCHARGE	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	4											
5cfs	4											
8cfs	5	4										
10cfs	6	5	4									
12cfs	8	6	6									
15cfs	8	6	8	5								
17cfs		8	8	5								
20cfs		10	10	6	5							
25cfs		12	12	6	6							
30cfs				8	8	6						
40cfs				12	10	8	6					
50cfs				16	12	10	8	6				
60cfs				18	16	12	10	8				
70cfs					18	15	12	8				
80cfs					20	16	15	10	8			
90cfs						18	16	12	10			
100cfs						20	18	12	10			
125cfs						24	20	16	12	10		
150cfs							24	20	16	12	10	
200cfs								24	20	18	15	12

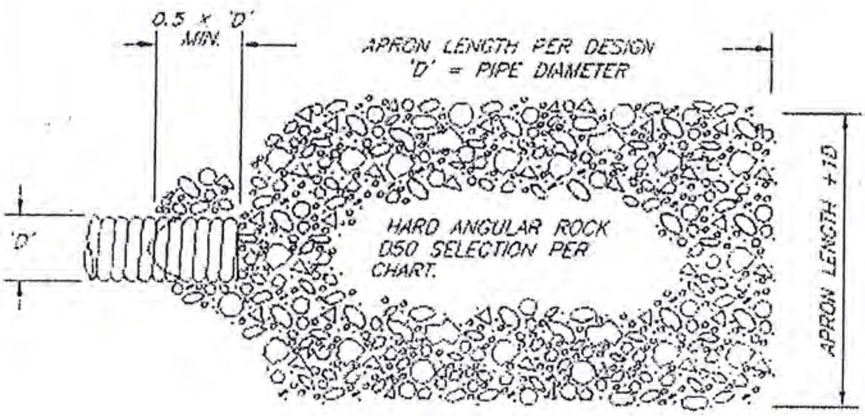
MINIMUM LENGTH OF APRON (FEET)
PIPE DIAMETER

DISCHARGE	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	8											
5cfs	8											
8cfs	11	10										
10cfs	14	12	10									
15cfs	18	16	14	12								
20cfs		18	18	16	12							
30cfs			22	20	18	16						
40cfs			26	24	24	20	18					
50cfs				26	26	24	22	18				
70cfs					30	30	28	25				
100cfs						36	36	33	27			
150cfs						42	42	42	38	33	28	
200cfs								48	45	42	37	32

From USDA Solid Conservation Service



SECTION



PLAN

NOTES:

1. CONSULT WITH IF&W IF FISH PASSAGE WILL BE INHIBITED DURING LOW FLOWS.
2. REFER TO DESIGN NOTES AND LIMITATIONS IN TEXT ON PIPE OUTLET PROTECTION.
3. IN DEFINED CHANNELS, APRON SHALL EXTEND FULL WIDTH OF BOTTOM AND ONE FOOT ABOVE MAX. TAILWATER OR UP TO BANK FULL, WHICHEVER IS LESS.

PIPE OUTLET PROTECTION

FILE: OUTLETAPRON

APPENDIX B-4

LEVEL LIP SPREADER DESIGN

Standard Level Spreader Design

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/10/2015
Chk. By:

OBJECTIVE: Design level spreaders in accordance with Erosion and Sediment Control Standards.

DESIGN CRITERIA

1. Level Spreader Length shall be such that flow from the spreader during the 10-year storm event does not exceed 0.25 cfs per linear foot of spreader. Minimum length = 15'

DESIGN ANALYSIS

Level Spreader Designation	Discharge From	Q_{10} (cfs)	Rqd Rate (cfs/ft)	Min. Rqd. Length (ft)	Specified Length (ft)
10	Pond DP-10	4.9	0.25	19.8	20
11	Pond DP-11	1.2	0.25	4.7	15
12	Pond DP-12	1.3	0.25	5.4	15

APPENDIX B-5

PLUNGE POOL DESIGN

PLUNGE POOL DESIGN

Project Name: Juniper Ridge
Project Location: Old Town, ME
Project No: 14101.00
Comp By: MNA
Date: 2/3/2015
Chk. By: PCM

OBJECTIVE: Design plunge pool to protect the outlet of culverts from scour and deterioration.

REFERENCES:

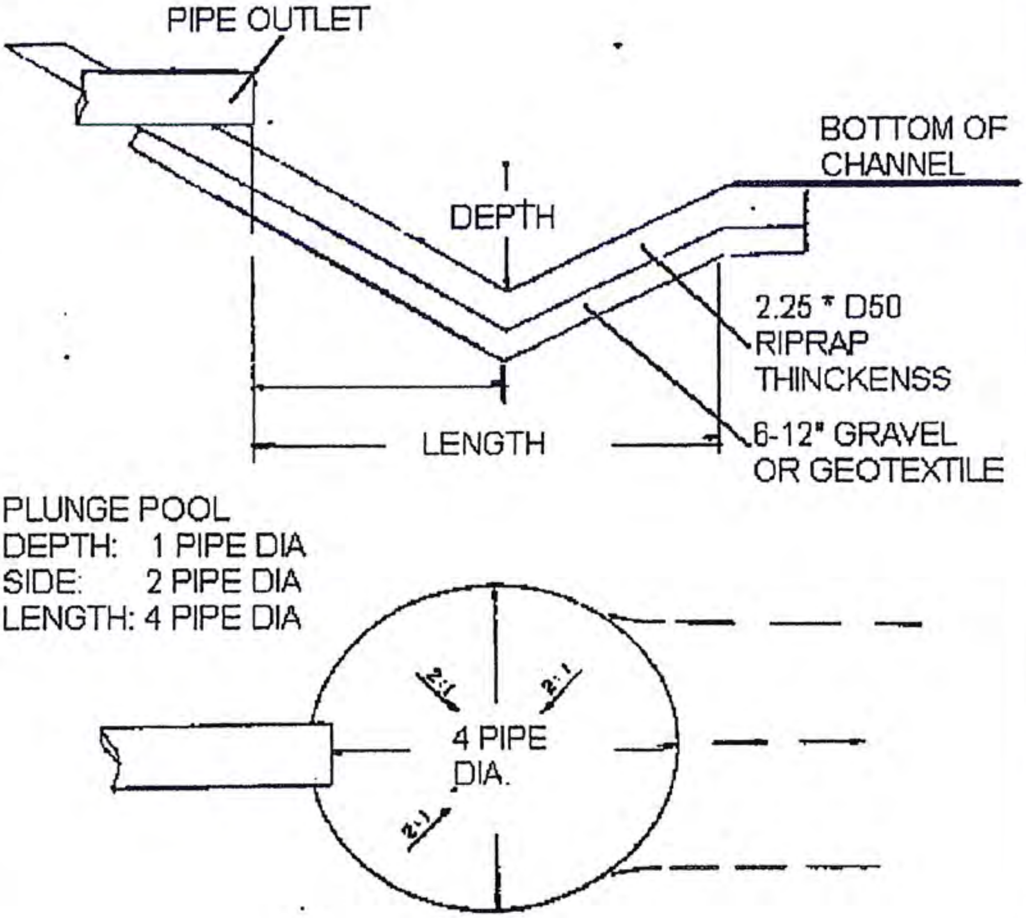
1. Maine Department of Environmental Protection, Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices, March 2003
2. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.0, Chocorua, New Hampshire, 2001

DESIGN PROCEDURE:

1. Use design flows for 25-year, 24-hour storm event and attached Outlet Plunge Pool table to determine plunge pool dimensions and riprap size.

SUMMARY OF RESULTS:

				Riprap			
Plunge Pool Designation	Flow From	Q_{25} (cfs)	Culvert Dia. (in)	D_{50} (in)	Thickness (in)	Length (ft)	Width (ft)
10	Pond DP-10	16.9	18	8	18	6	6
11	Pond DP-11	1.4	18	4	9	6	6
12	Pond DP-12	2.4	18	4	9	6	6



OUTLET PLUNGE POOL

OUTLET PROTECTION
FOR A PIPE FLOWING FULL WITH LOW TAILWATER

RIPRAP SIZE - D50 (inches)
PIPE DIAMETER

DISCHARGE	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	4											
5cfs	4											
8cfs	5	4										
10cfs	6	5	4									
12cfs	8	6	6									
15cfs	8	6	8	5								
17cfs		8	8	5								
20cfs		10	10	6	5							
25cfs		12	12	6	6							
30cfs				8	8	6						
40cfs				12	10	8	6					
50cfs				16	12	10	8	6				
60cfs				18	16	12	10	8				
70cfs					18	15	12	8				
80cfs					20	16	15	10	8			
90cfs						18	16	12	10			
100cfs						20	18	12	10			
125cfs						24	20	16	12	10		
150cfs							24	20	16	12	10	
200cfs								24	20	18	15	12

MINIMUM LENGTH OF APRON (FEET)
PIPE DIAMETER

DISCHARGE	12"	15"	18"	21"	24"	27"	30"	36"	42"	48"	54"	60"
3cfs	8											
5cfs	8											
8cfs	11	10										
10cfs	14	12	10									
15cfs	18	16	14	12								
20cfs		18	18	16	12							
30cfs			22	20	18	16						
40cfs			26	24	24	20	18					
50cfs				26	26	24	22	18				
70cfs					30	30	28	25				
100cfs						36	36	33	27			
150cfs						42	42	42	38	33	28	
200cfs								48	45	42	37	32

From USDA Solid Conservation Service

APPENDIX B-6

EMERGENCY SPILLWAY DESIGN

EMERGENCY SPILLWAY EVALUATION
EXPANDED POND 9

Summary for Pond DP-9: DETENTION POND 9

Inflow Area = 33.165 ac, 8.08% Impervious, Inflow Depth = 3.25" for 100-yr Storm event
Inflow = 64.87 cfs @ 12.43 hrs, Volume= 8.970 af
Outflow = 4.63 cfs @ 16.13 hrs, Volume= 6.741 af, Atten= 93%, Lag= 222.2 min
Primary = 2.32 cfs @ 16.13 hrs, Volume= 2.271 af
Secondary = 1.40 cfs @ 16.13 hrs, Volume= 4.277 af
Tertiary = 0.91 cfs @ 16.13 hrs, Volume= 0.193 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 190.60' @ 16.13 hrs Surf.Area= 89,426 sf Storage= 276,765 cf
Flood Elev= 191.00' Surf.Area= 91,210 sf Storage= 312,840 cf

Plug-Flow detention time= 1,283.3 min calculated for 6.741 af (75% of inflow)
Center-of-Mass det. time= 1,194.6 min (2,034.4 - 839.8)

Volume	Invert	Avail.Storage	Storage Description
#1	187.00'	404,050 cf	**Detention Pond (Prismatic)**Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
187.00	35,200	0	0
188.00	78,220	56,710	56,710
190.00	86,700	164,920	221,630
192.00	95,720	182,420	404,050

Device	Routing	Invert	Outlet Devices
#1	Primary	189.50'	**12.0" Round 12-In Outlet Culvert** L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 189.50' / 180.50' S= 0.1875 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Secondary	184.21'	**5.8" Round 6-In Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.21' / 180.50' S= 0.0618 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#3	Device 2	188.70'	**5.8" Horiz. Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	188.30'	**1.5" Vert. Orifice X 2.00** C= 0.600
#5	Tertiary	190.50'	**10.0' long x 22.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

192.0 = TOP OF BERM
190.6 = 100 YR PEAK
1.4 ' = FREEBOARD

Primary OutFlow Max=2.32 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
- **1=12-In Outlet Culvert** (Inlet Controls 2.32 cfs @ 2.96 fps)

Secondary OutFlow Max=1.40 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
- **2=6-In Culvert** (Passes 1.40 cfs of 1.73 cfs potential flow)
  - **3=Orifice** (Orifice Controls 1.22 cfs @ 6.64 fps)
  - **4=Orifice** (Orifice Controls 0.18 cfs @ 7.21 fps)

Tertiary OutFlow Max=0.90 cfs @ 16.13 hrs HW=190.60' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 0.90 cfs @ 0.87 fps)

EMERGENCY SPILLWAY EVALUATION
POND 10

Summary for Pond DP-10: DETENTION POND 10

```
Inflow Area =    28.280 ac,  4.24% Impervious, Inflow Depth =  2.84"   for 100-yr Storm event
Inflow      =    59.36 cfs @  12.35 hrs, Volume=        6.692 af
Outflow     =    27.71 cfs @  12.72 hrs, Volume=        6.274 af, Atten= 53%, Lag= 22.0 min
Primary     =    18.03 cfs @  12.72 hrs, Volume=        3.582 af
Secondary   =     1.74 cfs @  12.72 hrs, Volume=        2.452 af
Tertiary    =     7.94 cfs @  12.72 hrs, Volume=        0.240 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Starting Elev= 170.00'  Surf.Area= 0 sf  Storage= 0 cf
Peak Elev= 180.44' @ 12.72 hrs  Surf.Area= 27,104 sf  Storage= 112,674 cf
Flood Elev= 181.00'  Surf.Area= 28,500 sf  Storage= 128,200 cf

Plug-Flow detention time= 439.2 min calculated for 6.272 af (94% of inflow)
Center-of-Mass det. time= 408.3 min ( 1,259.2 - 850.9 )

Volume     Invert    Avail.Storage  Storage Description
  #1      175.00'      157,950 cf   Custom Stage Data (Prismatic)Listed below (Recalc)

Elevation      Surf.Area       Inc.Store       Cum.Store
  (feet)         (sq-ft)     (cubic-feet)    (cubic-feet)
  175.00           7,900               0               0
  176.00          18,000          12,950          12,950
  178.00          22,000          40,000          52,950
  180.00          26,000          48,000         100,950
  182.00          31,000          57,000         157,950

Device  Routing        Invert   Outlet Devices
  #1    Device 3      179.00'   48.0" Horiz. Orifice/Grate  C= 0.600
                                Limited to weir flow at low heads
  #2    Device 3      178.00'   6.0" Vert. 6-in Orifice  C= 0.600
  #3    Primary       175.20'   18.0"  Round 18-in Primary Culvert
                                L= 52.0'  CPP, square edge headwall,  Ke= 0.500
                                Inlet / Outlet Invert= 175.20' / 172.00'  S= 0.0615 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 1.77 sf
  #4    Secondary     173.50'   5.8"  Round 6-in Culvert
                                L= 60.0'  CPP, projecting, no headwall,  Ke= 0.900
                                Inlet / Outlet Invert= 173.50' / 172.30'  S= 0.0200 '/'  Cc= 0.900
                                n= 0.011,  Flow Area= 0.18 sf
  #5    Device 4      177.00'   5.8" Horiz. Orifice Top  C= 0.600  Limited to weir flow at low heads
  #6    Device 4      176.20'   1.5" Vert. Orifice Side  C= 0.600
  #7    Tertiary      180.00'   10.0' long  x 22.0' breadth E-Spillway Weir
                                Head (feet) 0.20  0.40  0.60  0.80  1.00  1.20  1.40  1.60
                                Coef. (English) 2.68  2.70  2.70  2.64  2.63  2.64  2.64  2.63
```

182.0 = TOP OF BERM
180.4 = 100 YR PEAK
1.6 ' = FREEBOARD

```
Primary OutFlow Max=18.03 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─3=18-in Primary Culvert (Inlet Controls 18.03 cfs @ 10.20 fps)
   ├─1=Orifice/Grate  (Passes < 70.84 cfs potential flow)
   └─2=6-in Orifice  (Passes < 1.40 cfs potential flow)

Secondary OutFlow Max=1.74 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─4=6-in Culvert (Barrel Controls 1.74 cfs @ 9.51 fps)
   ├─5=Orifice Top  (Passes < 1.64 cfs potential flow)
   └─6=Orifice Side  (Passes < 0.12 cfs potential flow)

Tertiary OutFlow Max=7.82 cfs @ 12.72 hrs  HW=180.44'  (Free Discharge)
└─7=E-Spillway Weir  (Weir Controls 7.82 cfs @ 1.79 fps)
```

EMERGENCY SPILLWAY EVALUATION
POND 11

Summary for Pond DP-11: Detention Pond 11

Inflow Area = 22.282 ac, 4.04% Impervious, Inflow Depth = 2.83" for 100-yr Storm event
Inflow = 42.15 cfs @ 12.30 hrs, Volume= 5.252 af
Outflow = 3.99 cfs @ 15.24 hrs, Volume= 5.094 af, Atten= 91%, Lag= 176.4 min
Primary = 2.67 cfs @ 15.24 hrs, Volume= 1.081 af
Secondary = 1.32 cfs @ 15.24 hrs, Volume= 4.013 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 168.53' @ 15.24 hrs Surf.Area= 41,482 sf Storage= 147,109 cf

Plug-Flow detention time= 1,111.8 min calculated for 5.093 af (97% of inflow)
Center-of-Mass det. time= 1,096.9 min (1,954.3 - 857.4)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	211,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	2,000	0	0
164.00	10,900	6,450	6,450
166.00	34,300	45,200	51,650
168.00	39,800	74,100	125,750
170.00	46,200	86,000	211,750

Device	Routing	Invert	Outlet Devices
#1	Device 3	167.50'	**6.0" Vert. 6-In Orifice Side (Riser)** C= 0.600
#2	Device 3	168.40'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#3	Primary	164.30'	**18.0" Round 18-In Culvert** L= 92.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.30' / 162.00' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Secondary	161.50'	**5.8" Round 6-In Culvert** L= 137.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 160.00' S= 0.0109 '/' Cc= 0.900 n= 0.011, Flow Area= 0.18 sf
#5	Device 4	165.10'	**5.8" Horiz. Orifice Top (6-in Culv)** C= 0.600 Limited to weir flow at low heads
#6	Device 4	164.00'	**1.5" Vert. Orifice Side (6-in Culv) X 1.50** C= 0.600

170. = TOP OF ROAD
168.5 = 100 YR PEAK
1.5 ' = FREEBOARD

Primary OutFlow Max=2.66 cfs @ 15.24 hrs HW=168.53' (Free Discha
└─**3=18-In Culvert** (Passes 2.66 cfs of 12.52 cfs potential flow)
  ├─**1=6-In Orifice Side (Riser)** (Orifice Controls 0.83 cfs @ 4.24 fps)
  └─**2=Grate Top (Riser)** (Weir Controls 1.83 cfs @ 1.16 fps)

Secondary OutFlow Max=1.32 cfs @ 15.24 hrs HW=168.53' (Free Discharge)
└─**4=6-In Culvert** (Barrel Controls 1.32 cfs @ 7.19 fps)
  ├─**5=Orifice Top (6-in Culv)** (Passes < 1.64 cfs potential flow)
  └─**6=Orifice Side (6-in Culv)** (Passes < 0.19 cfs potential flow)

EMERGENCY SPILLWAY EVALUATION
POND 12

Summary for Pond DP-12: DETENTION POND 12

Inflow Area = 20.177 ac, 3.27% Impervious, Inflow Depth = 2.80" for 100-yr Storm event
Inflow = 32.91 cfs @ 12.35 hrs, Volume= 4.700 af
Outflow = 5.20 cfs @ 14.55 hrs, Volume= 4.540 af, Atten= 84%, Lag= 132.4 min
Primary = 3.54 cfs @ 14.55 hrs, Volume= 1.439 af
Secondary = 1.65 cfs @ 14.55 hrs, Volume= 3.101 af

Routing by Stor-Ind method, Time Span= 0.00-168.00 hrs, dt= 0.05 hrs
Peak Elev= 188.13' @ 14.55 hrs Surf.Area= 41,214 sf Storage= 113,928 cf

Plug-Flow detention time= 756.5 min calculated for 4.538 af (97% of inflow)
Center-of-Mass det. time= 739.3 min (1,611.6 - 872.3)

Volume	Invert	Avail.Storage	Storage Description
#1	184.00'	205,300 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
184.00	11,200	0	0
186.00	28,700	39,900	39,900
188.00	40,200	68,900	108,800
190.00	56,300	96,500	205,300

Device	Routing	Invert	Outlet Devices
#1	Device 3	188.00'	**48.0" Horiz. Grate Top (Riser)** C= 0.600 Limited to weir flow at low heads
#2	Device 3	186.80'	**8.0" Vert. 8-In Orifice (Riser Side)** C= 0.600
#3	Primary	184.50'	**18.0" Round 18- In Culvert** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 184.50' / 180.00' S= 0.0563 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#4	Device 6	185.50'	**5.8" Horiz. Orifice Top (6-in Pipe)** C= 0.600 Limited to weir flow at low heads
#5	Device 6	184.50'	**1.5" Vert. Orifice (Side of 6-in) X 2.00** C= 0.600
#6	Secondary	181.50'	**6.0" Round 6-In Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 181.50' / 180.00' S= 0.0234 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf

Primary OutFlow Max=3.51 cfs @ 14.55 hrs HW=188.13' (Free Discharge)
└─**3=18- In Culvert** (Passes 3.51 cfs of 11.39 cfs potential flow)
  ├─**1=Grate Top (Riser)** (Weir Controls 1.84 cfs @ 1.16 fps)
  └─**2=8-In Orifice (Riser Side)** (Orifice Controls 1.67 cfs @ 4.80 fps)

190.0 = TOP OF ROAD
188.1 = 100 YR PEAK
1.9 ' = FREEBOARD

Secondary OutFlow Max=1.65 cfs @ 14.55 hrs HW=188.13' (Free Discharge)
└─**6=6-In Culvert** (Passes 1.65 cfs of 1.85 cfs potential flow)
  ├─**4=Orifice Top (6-in Pipe)** (Orifice Controls 1.43 cfs @ 7.80 fps)
  └─**5=Orifice (Side of 6-in)** (Orifice Controls 0.22 cfs @ 9.09 fps)

APPENDIX C

TYPICAL CONSTRUCTION EROSION AND SEDIMENTATION CONTROL SPECIFICATIONS AND DRAWING C-308

SECTION 02220

EROSION CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and General Terms and Conditions as outlined in Section 1 of the Construction Agreement and Division-1 Specification sections, apply to work of this section. The Juniper Ridge Landfill, MEDEP approved Erosion and Sedimentation Control Plan.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Site Preparation: Section 02100

B. Earthwork: Section 02200

C. Seeding and Mulching: Section 02800

1.03 DESCRIPTION OF WORK:

A. The Contractor shall provide all materials, equipment, and labor necessary for the dewatering of excavations and the removal and/or diversion of surface water from the construction area, and installation of siltation and erosion control structures as shown on the plans and according to these Specifications, and in accordance with the MEDEP "Best Management Practices" – March 2003 for erosion and sedimentation control.

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 siltation and erosion control structures as shown on the plans and according to these Specifications, and in accordance with the MEDEP "Best Management Practices" – March 2003 for erosion and sedimentation control. The Contractor shall maintain a dewatering and stormwater control system so that no sediment impacted waters are discharged west of the access road at the southwestern end of the site.

C. The Contractor shall build all drains and do all ditching, pumping, bailing, and all other work necessary to keep the excavation clear of groundwater, or storm water during the progress of the work and until the finished work is safe from damage. The Contractor shall make provisions on the site to detain and filter water from the excavation operation so that sediments from the dewatering operation are contained. In no case will direct discharge from the dewatering operations to off-site drainage facilities be allowed.

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

E. The Contractor shall provide temporary seeding, mulching, or other protective coverings to exposed earth surfaces and stockpiles which will be exposed to rain or wind elements for a period of greater than seven days.

F. The Contractor shall provide siltation fences, riprap, and/or stone check dams in the newly constructed drainage ditches for temporary sediment control as shown on the Contract Drawings.

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

H. The Contractor shall be responsible for inspection, maintenance, and/or repair of all temporary erosion and sedimentation control measures during construction, including temporary erosion and sedimentation control measures installed by others and used during this project. Inspections will be undertaken by qualified personnel to ensure that controls are correctly functioning, and that additional erosion control measures are in installed if needed. Such inspections will occur bi-weekly and after each significant rain fall 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.

1.04 SEDIMENT CONTROL GUIDELINES:

A. Maine Erosion and Sedimentation Control BMPs, January 2006.

B. State of Maine Department of Environmental Protection Natural Resources Protection Act Permit by Rule Standards Chapter 305 (effective February 1989, revised April 1992).

C. 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.

PART 2 - PRODUCTS

2.01 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 equivalent.

2.02 EROSION CONTROL BLANKET:

A. Shall be placed on newly topsoiled and seeded areas as indicated on the Contract Drawings. The matting type shall be that which is specified on the contract drawings, or an approved equal.

2.03 RIPRAP STONE:

1. Riprap shall be a graded mixture of angular stones such that 50 percent of the mixture by volume shall be greater than the stated D_{50} size as indicated on the Contract Drawings.

   Stones used for riprap shall consist of sound durable angular rock which will not become disintegrated by exposure to the action of water or weather. Either field stone or rough unhewn quarry stone may be used. Stones shall weigh from 10 lbs to 200 lbs except that when available suitable stones weighing more than 200 lbs may be used. Approximately 50 percent of the stones by volume shall exceed a unit weight of 25 lbs. Stone particle size may not be greater than 1.5 times the stated D_{50} size.

2. Exposed Stone: The exposed stones for riprap shall be angular and as nearly rectangular in cross-section as practicable. Rounded boulders or cobbles will not be permitted.

3. Bedding Stone: Material for bedding shall be aggregate base material conforming to Specification 02200, Earthwork; Section 2.01A.2.

4. Riprap Geotextile Filter: The geotextile used in the construction of riprap ditches, spillways, aprons, and plunge pools shall meet Specification 02272 Part 2.01.A (5a).

2.04 STONE CHECK DAMS:

A. Stone for check dams shall consist of a mixture of angular stones having a particle size of between 2 inch and 3 inch. The check dams shall be installed at locations as indicated on the drawings and shall be constructed as detailed on the drawings.

B. Exposed Stone: The exposed stones for the check dams shall be angular and as nearly rectangular in cross-section as practicable. Rounded stone will not be permitted. The stone shall consist of durable stones that will not disintegrate by exposure to the action of water or weather.

PART 3 - EXECUTION

3.01 GENERAL

A. The Contractor shall provide for the diversion of clean surface water from uncapped open areas of the landfill for the duration of the construction project.

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 siltation and erosion control structures as shown on the plans and according to these Specifications, and in accordance with the MEDEP "Best Management Practices" – January 2006 for erosion and sedimentation control. The Contractor shall maintain a dewatering and stormwater control system so that no sediment impacted waters are discharged west of the access road at the southwestern end of the site.

C. The Contractor shall provide for the dewatering of excavations and the diversion of surface water from the construction areas and install siltation and erosion control measures as necessary in accordance with MEDEP BMPs.

D. The Contractor shall build all drains, dikes, and sediment basins, install all siltation fencing, mulches, grasses, seeding, ditches, channels, riprap, grading, and all other work necessary to control water pollution, surface runoff, and soil erosion.

E. 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.

F. 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.

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 of the outlet pipe shall be protected against erosion by flowing water by the construction of a rock or timber apron.

B. Prior to removal of sediment control dikes all retained silt or other materials shall be removed and placed within landfill limits in areas not susceptible to erosion, 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 PLACEMENT OF EROSION CONTROL BLANKET: Erosion control blanket shall be placed at locations indicated on Contract Drawings. The anchoring of the blanket shall be in accordance with manufacturer's recommendations or as directed by the Engineer or Owner's Representative.

3.05 PLACEMENT OF RIPRAP: Riprap shall be placed full depth in one operation without special handwork, shall be approximately true to the required slope line and grade, and be uniform in appearance. Larger stones shall be placed at the base of the slope. The stones shall be placed on close contact with the longer axis perpendicular to the plane of the slope and so as to stagger joints. The openings between the stones shall be filled with spall, or gravel and rocks securely rammed into place. Placement of riprap shall include the placement of all bedding materials and geotextiles required as shown on the Contract Drawings.

3.06 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 in installed if needed. Such inspections will occur bi-weekly and after each significant rain fall 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 then one-half the depth of the erosion control measure.

END OF SECTION

SECTION 02800

SEEDING AND MULCHING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and General Terms and Conditions as outlined in Section 1 of the Construction Agreement and Division-1 Specification sections, apply to work of this section. All work performed under this specification shall be performed in accordance with the Maine Department of Environmental Protection (MEDEP) Maine Erosion and Sedimentation Control Plan: Best Management Practices (BMPs) (March 2003).

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200
B. Erosion Control: Section 02220
C. Erosion and Sedimentation Control Details Drawings C-308

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. Excavation, filling, and grading required to achieve elevations shown on the Drawings are not specified in this Section. Refer to Section 02200, Earthwork. Topsoil shall be placed to a compacted depth of 4 inches over exterior cell containment dikes and all disturbed areas (excluding the landfill's access road). Topsoil shall receive seed, fertilizer, lime, and mulch per these specifications. Only work described in Section 01010 "Summary of Work" or specifically identified by the Owner's Representative should be considered part of this Contract.

1.04 QUALITY ASSURANCE: If subcontracted, subcontract the seeding work to a single firm specializing in landscape work.

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. Topsoil: Before delivery of topsoil, furnish written statement giving location of properties from which topsoil is to be obtained, names and addresses of owners, depth to be stripped, and crops grown during past 2 years, if requested by the Engineer.

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.

1.05 SUBMITTALS

A. Certification: For information only, submit 2 copies of 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.

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.

1.06 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.

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

Proceed with and complete the landscape 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:

Seeding: April 1 - September 15

PART 2 - PRODUCTS

2.01 TOPSOIL (STRIPPINGS): Loam or approved topsoil removed within the confines of the project area shall be segregated into piles, cleaned sufficiently and reused in accordance with Section 02200, Earthwork. If quantity of stockpiled topsoil is insufficient, or quality is not in accordance with the requirements for new topsoil, the Contractor shall provide additional new topsoil from approved sources off the site as required to complete landscape work.

Provide new topsoil as required which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free or roots, stumps, stones larger than 2" in any dimension, and other extraneous or toxic matter harmful to plant growth. Mulch peat or other excessively acidic soil shall not be used. Sand, silt, and clay contents comprising existing or new topsoil shall fall within the following ranges.

Sand	50%-70%
Silt	2%-40%
Clay	10%-28%

Submit representative soil samples of topsoil from offsite sources to qualified soil testing laboratory 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:

Organic Matter: Greater than 3% organic matter (by weight)

pH range: 6.0 to 7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results and seed requirements.

Phosphorus/Potassium: Low to medium range

Soluble Salt: Not greater than 500 ppm

Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes.

A. Soil Amendments:

1. Lime: Natural limestone containing not less than 90% 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.

2. Fertilizer: Fertilizer shall contain available elements in conformity with the standards of the Association of Official Agricultural Chemists. The fertilizer 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 topsoil to determine amount of phosphorus required for growing of grass.

    a. Granular fertilizer shall be a commercial grade fertilizer containing the following percentages of available nutrients by weight:

Nitrogen	10 percent
Phosphoric Acid	10 percent
Potash	10 percent

    b. Water soluble fertilizer shall be completely soluble in water and contain the following percentages of available nutrients by weight. It shall contain a coloring agent.

Nitrogen	16 percent
Phosphoric Acid	To Be Determined by Contractor
Potash	16 percent

The Engineer may approve the use of other fertilizers providing they contain an equivalent amount of nutrients in an acceptable form.

2.02 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 at the rate of 120 lbs/acre.

The seed mixtures shall consist of seeds proportioned by weight as follows:

Tall Fescue	54 lbs/acre
Creeping Red Fescue	25 lbs/acre
Red Top	5 lbs/acre
Ladino Clover	13 lbs/acre
Annual Ryegrass	8 lbs/acre
Birdsfoot Trefoil	5 lbs/acre
Timothy	10 lbs/acre

2.03 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Mulch for Seeded Areas:

1. Hay or 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.

2. Cellulose fiber mulch shall consist of natural wood, recycled paper of 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.

B. Mulch Binder: Material for mulch binder may be binder or tackifier of a type acceptable to the Engineer and may be diluted with water to assure even distribution. Other types of approved mulch binders may be used when authorized by the Engineer.

PART 3 - EXECUTION

3.01 TOPSOIL PLACEMENT: Placement of topsoil shall be performed in a uniform manner, with no clumps or clods. It shall be the Contractor's responsibility to restore to the line, grade, and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until turf is established and accepted by the Engineer.

A. Grading: Previously established grades on the areas to be topsoiled shall be maintained according to the approved plan.

B. Liming: Where the pH of subsoil is 6.0 or less, ground agricultural limestone shall be spread in accordance with the soil texture or the vegetative establishment practice being used.

C. Bonding: After the areas to be topsoiled have been brought to grade, and immediately prior to spreading the topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 2 inches to ensure bonding with subsoil.

D. Placement: Topsoil shall not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or proposed sodding or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 4 inches. Any irregularities in the surface resulting from topsoil placement or other operations shall be corrected in order to prevent the formation of depressions and/or water pockets. It is necessary to compact the topsoil enough to ensure good contact with the underlying soil and to obtain a uniform firm seedbed for the establishment of a high maintenance turf. However, undue compaction is to be avoided as it increases runoff velocity and volume, and prevents seed germination.

3.02 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 Drawing C-308 of the Construction Drawings.

C. The hydraulic spray method shall be used for seeding all areas unless alternative methods are approved by the Engineer.

D. 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.

E. Mulching:

1. 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.

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.

2. Hay or straw mulch shall be spread evenly and uniformly over any designated areas or as directed by the Engineer 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. Too heavy application of mulch shall be avoided. Lumps and thick mulch material shall be thinned.

   Unless otherwise authorized, the mulch shall be anchored in place by uniformly applying an acceptable mulch binder at a rate of 10 to 13 gallons per 1000 sq. ft. Application of a concentrated stream of mulch binder will not be allowed. Asphalt mulch binder may be omitted when authorized and when there is a danger of the asphalt defacing the surface of nearby structures, houses, vehicles or other objects. Other methods of anchoring mulch may be used subject to the approval.

3.03 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 or eroded or bare areas.

2. Seeding, April 1 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 refertilized, reseeded and remulched as specified to produce satisfactory results.

   Areas fertilized and seeded by the hydraulic method will be accepted only upon attainment of a reasonable thick uniform stand of not less than 80 percent coverage of permanent grasses, free from sizeable thin or bare spots.

3. Seeding, September 16 to March 31, Inclusive: Areas not seeded or which do not obtain satisfactory growth by October 1, will be seeded with Aroostook Rye or mulched at rates previously specified herein. After November 1, or the first killing frost, disturbed areas shall receive dormant seeding (at double the regular seeding rate) in accordance with MEDEP BMPs and Drawing C-308.

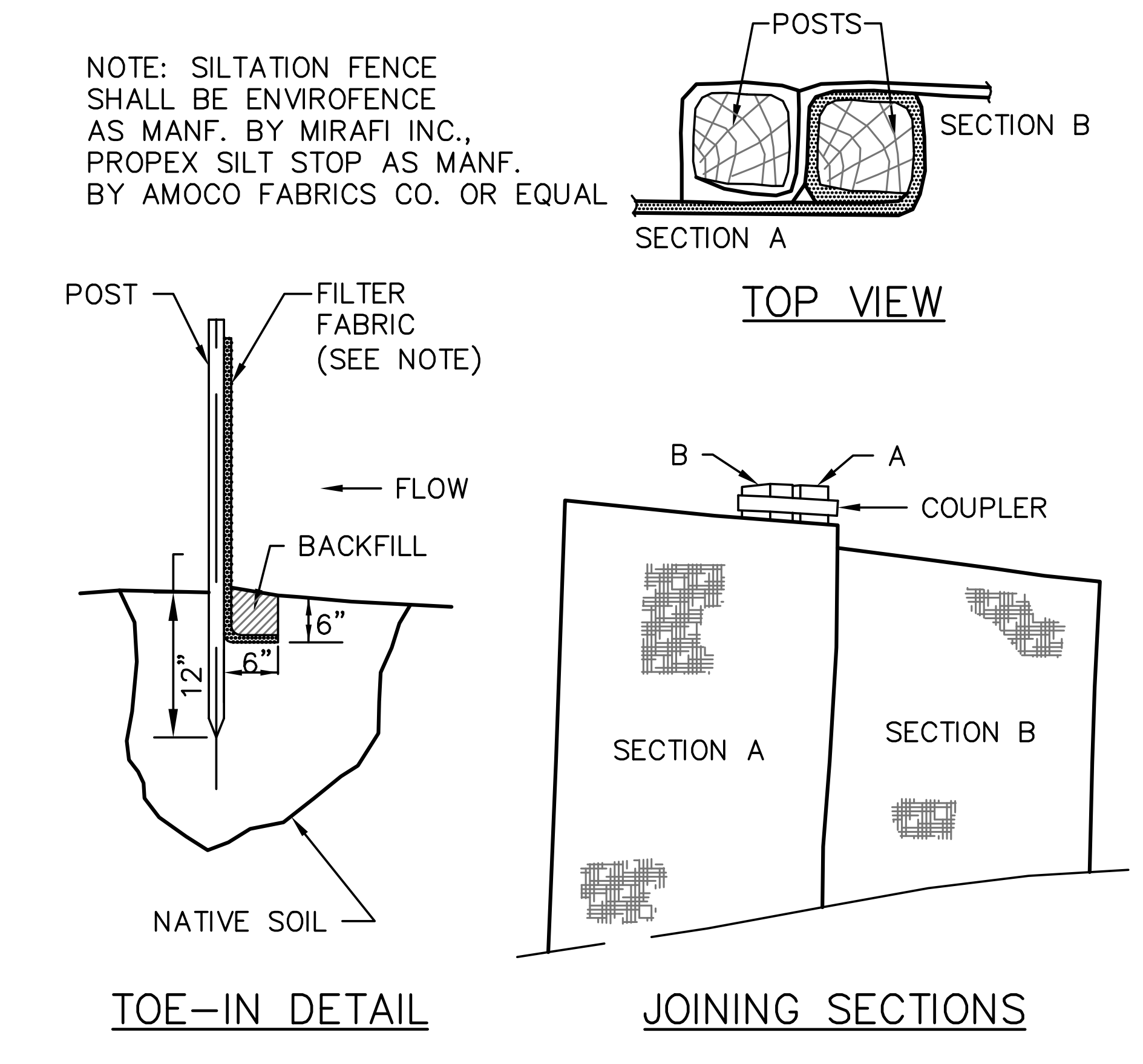
4. Seeded areas will be accepted only upon attainment of a reasonably thick, uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots.

3.04 CLEANUP AND PROTECTION: During landscape work, store materials and equipment where directed. Keep pavements clean and work area in an orderly condition.

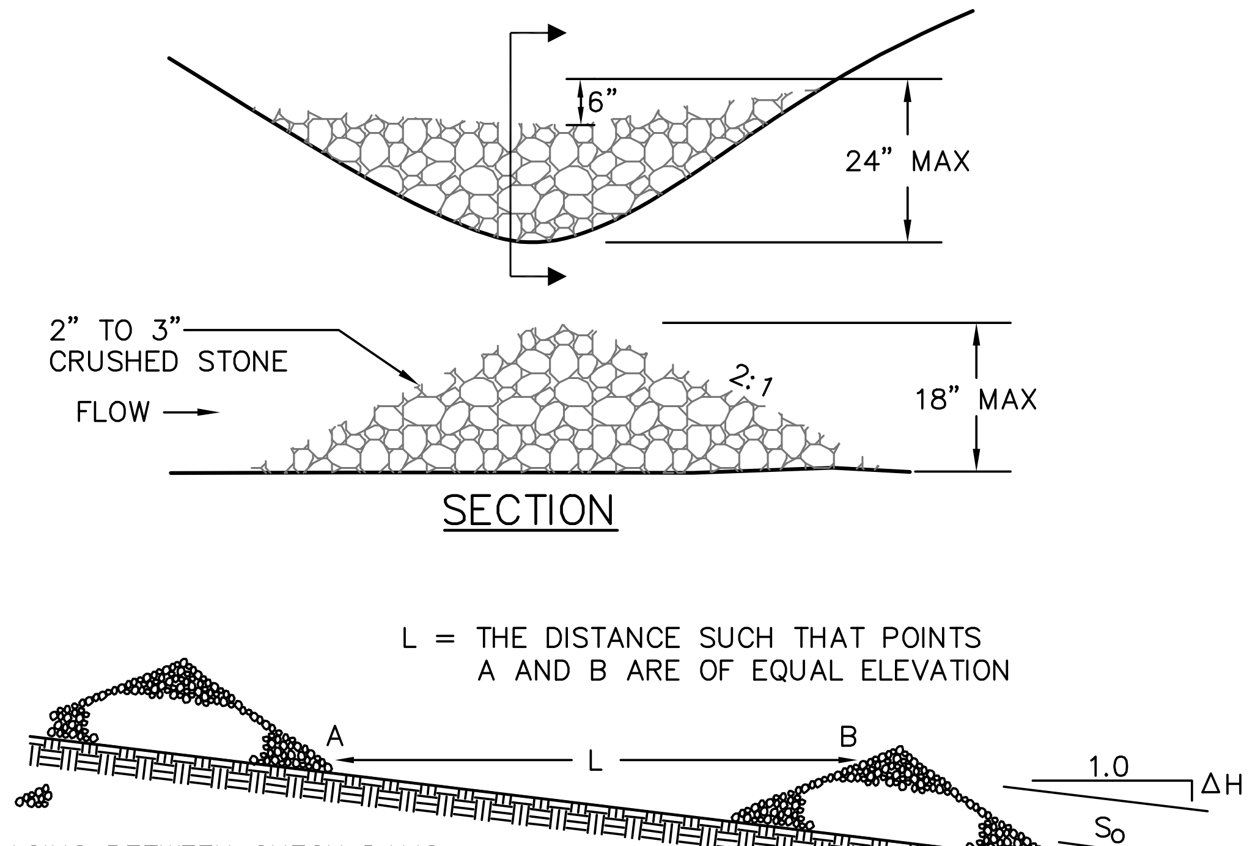
Protect landscape work and materials from damage due to landscape operation, operations by other contractors, and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.05 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



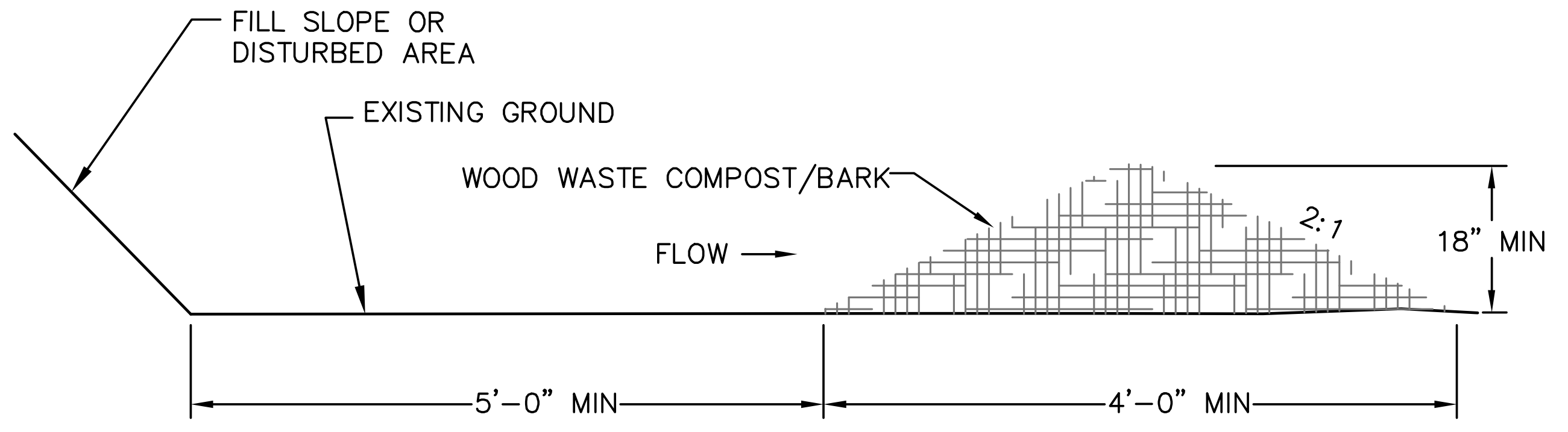
SILTATION FENCE
NTS



SPACING BETWEEN CHECK DAMS

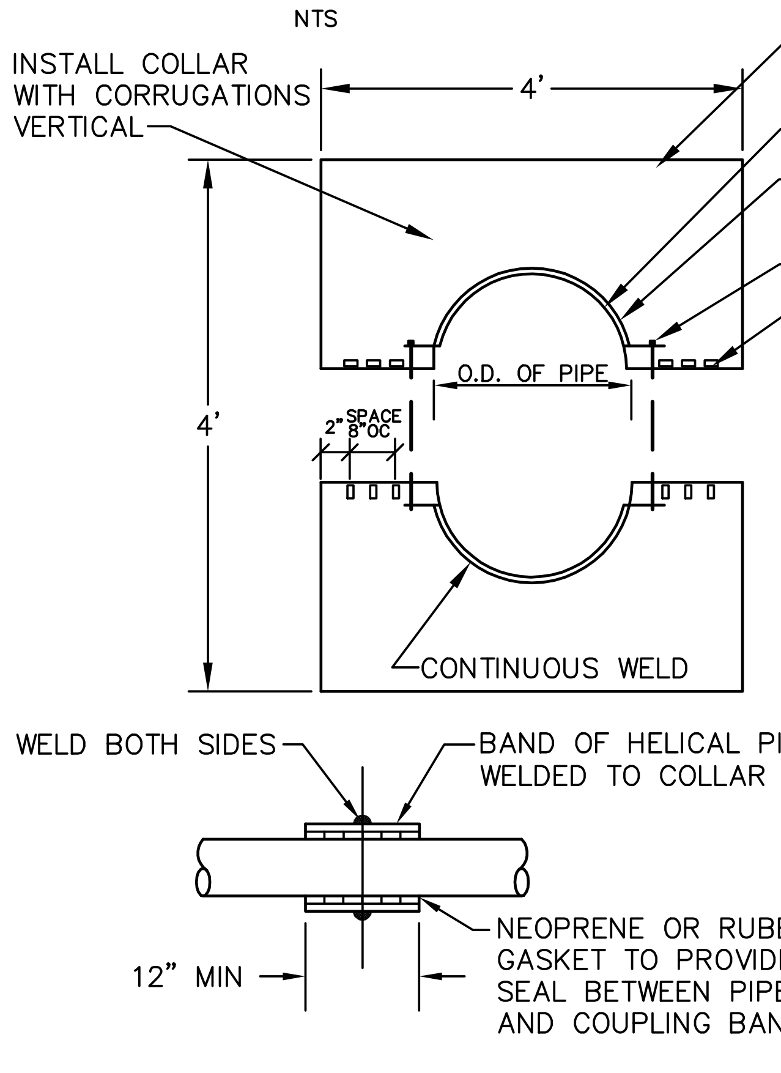
S_o (FT/FT)	L (FT)
0.020	75
0.030	50
0.040	40
0.050	30
0.080	20
0.100	10

STONE CHECK DAM
NTS



NOTE:
BARK MULCH SEDIMENT BARRIERS MAY BE USED AS AN ALTERNATE TO SILT FENCE WHEN APPROVED BY THE ENGINEER.

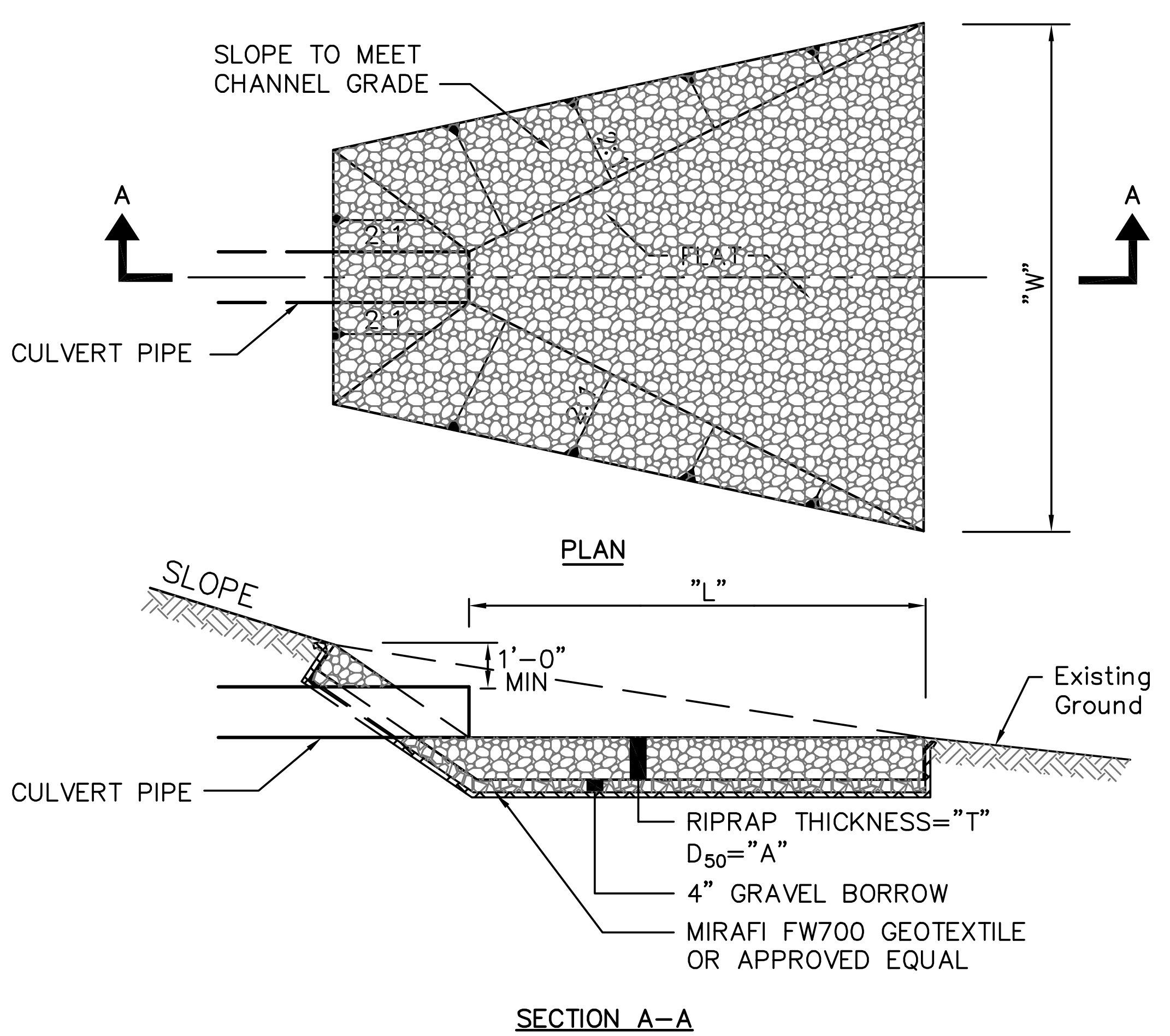
BARK MULCH SEDIMENT BARRIER
NTS



DETENTION POND #	OUTLET PIPE DIA (IN)	PIPE LENGTH (FT)	SATURATED LENGTH (FT)	# OF COLLARS	SPACING (FT)
DP-10	18	70	32	2	11
DP-11	18	92	30	2	10
DP-12	18	80	31	2	10

NOTES:
1. UNASSEMBLED COLLAR SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PARTS.
2. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
3. RIPLEY'S DAM BY MCRIP MANUFACTURING MAY BE USED WITH ENGINEERS APPROVAL PROVIDING THAT LENGTH AND WIDTH OF COLLAR IS EQUAL TO OR GREATER THAN THAT SPECIFIED IN THE DETAIL.

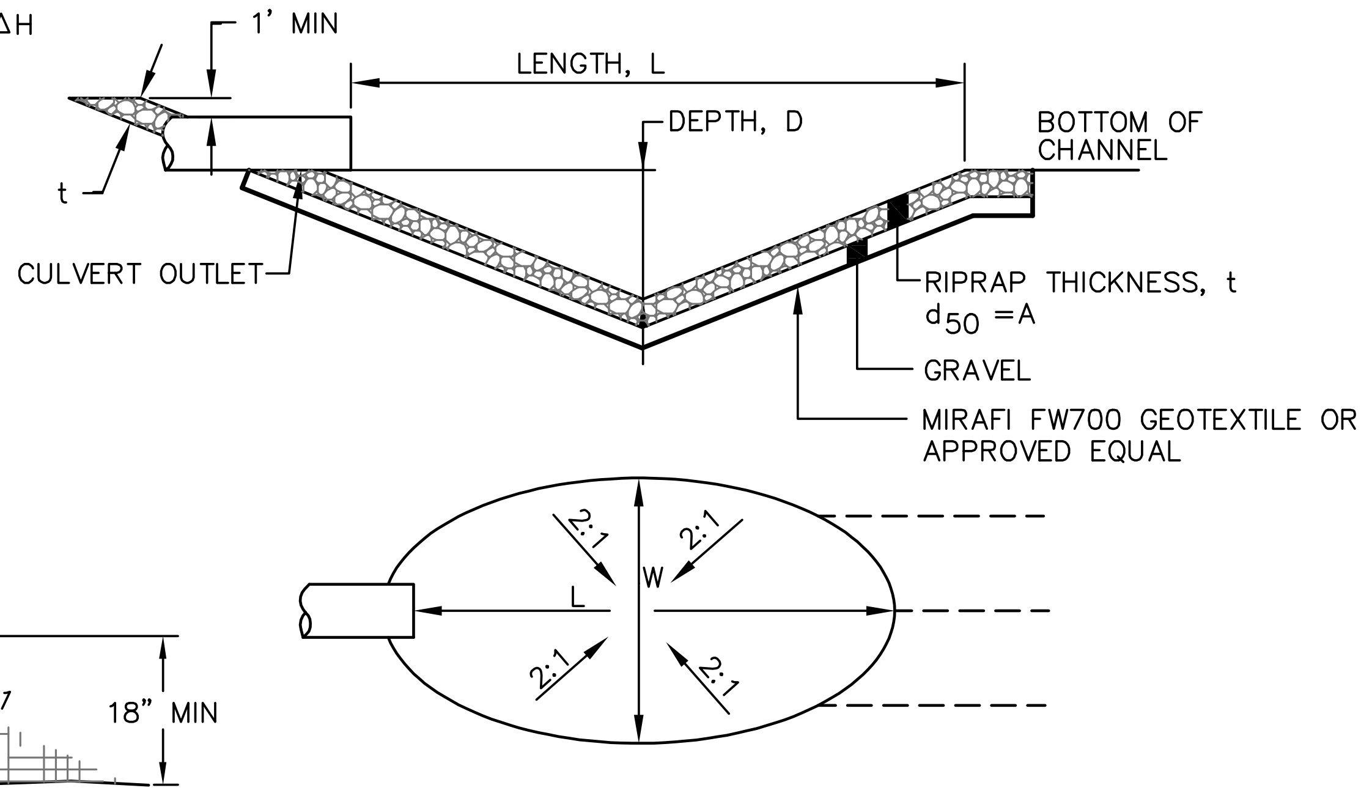
ANTI-SEEP COLLAR
NTS



SECTION A-A

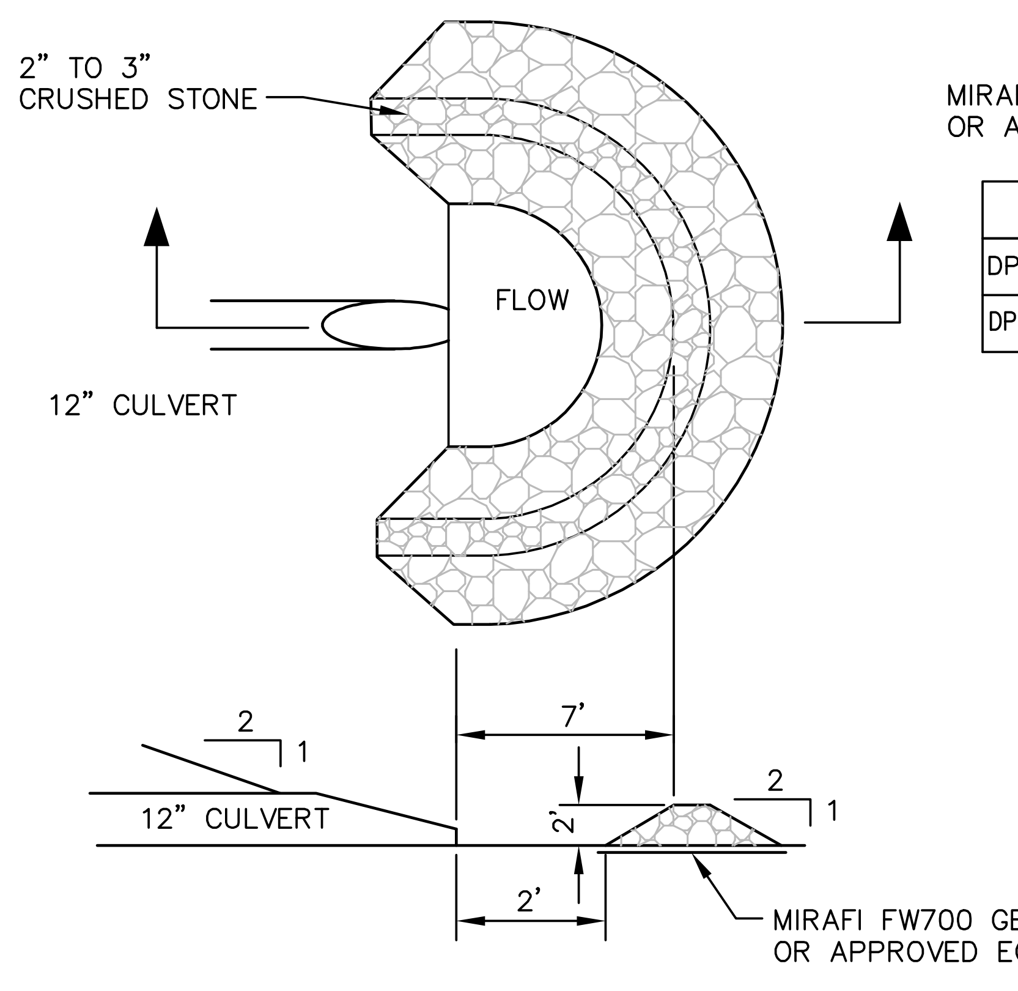
CULVERT OUTLET	L (FT)	W (FT)	A (d_{50}) IN.	t (IN)
2BA	18	20	8	18
2BB	18	20	6	14
4BA	12	14	5	12
4BB	12	14	5	12
4F	10	12	4	9
4G	12	14	5	12
4HA	10	12	4	9
4HB	10	12	4	9
4I	18	20	10	23
4IA	10	12	4	9
4JA	18	20	10	23
4JB	12	14	5	12
4JC	12	14	5	12
4K	12	14	5	12
4L	14	16	8	18
4N	10	12	4	9

RIPRAP APRON
NTS

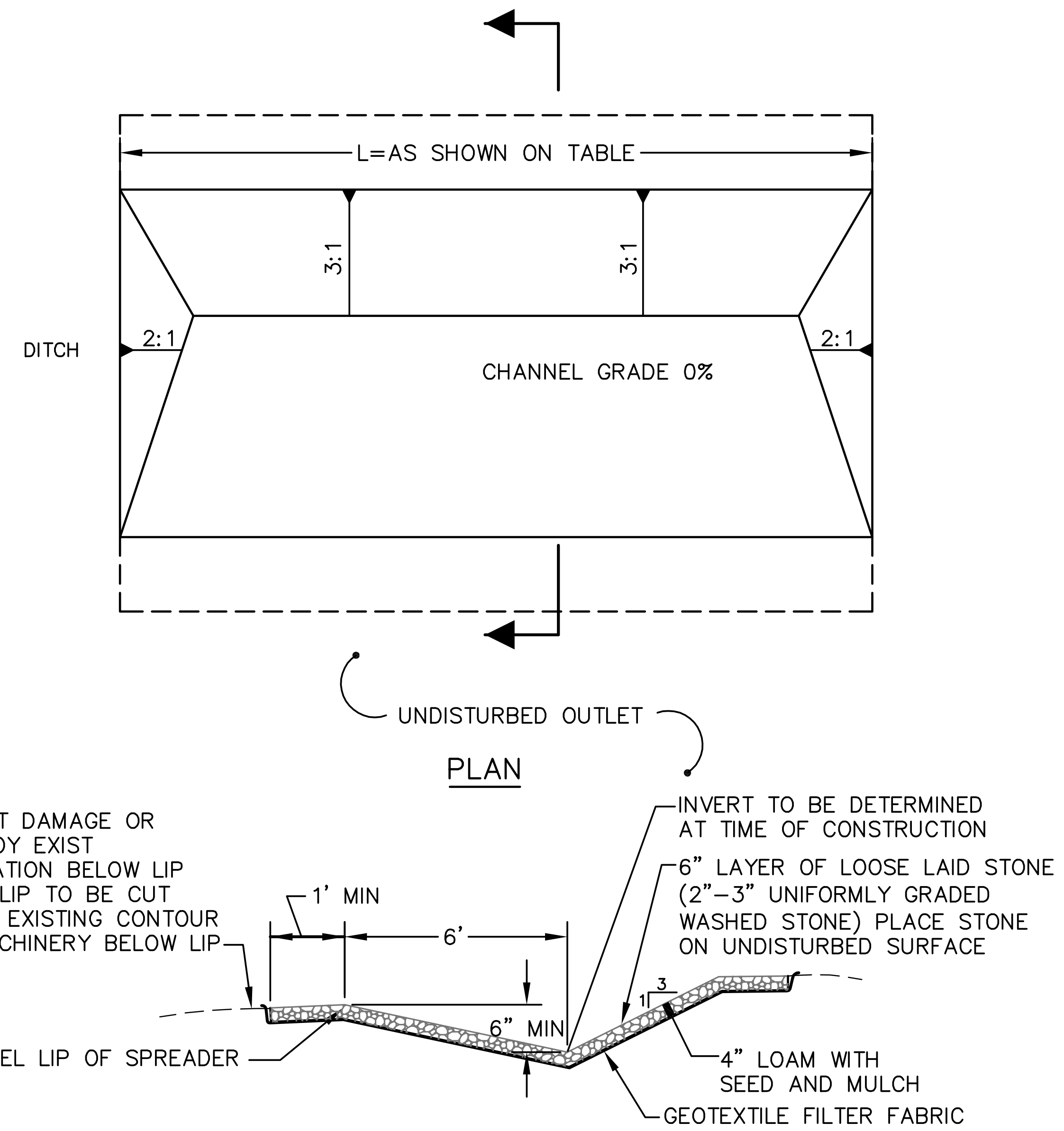


CULVERT OUTLET	L (FT)	W (FT)	A (d_{50}) IN.	t (IN)	D (FT)
DP-10	6	6	8	18	1.5
DP-11	6	6	4	9	1.5
DP-12	6	6	4	9	1.5

RIPRAP PLUNGE POOL
NTS



RIPRAP CULVERT INLET PROTECTION (TEMPORARY)
NTS

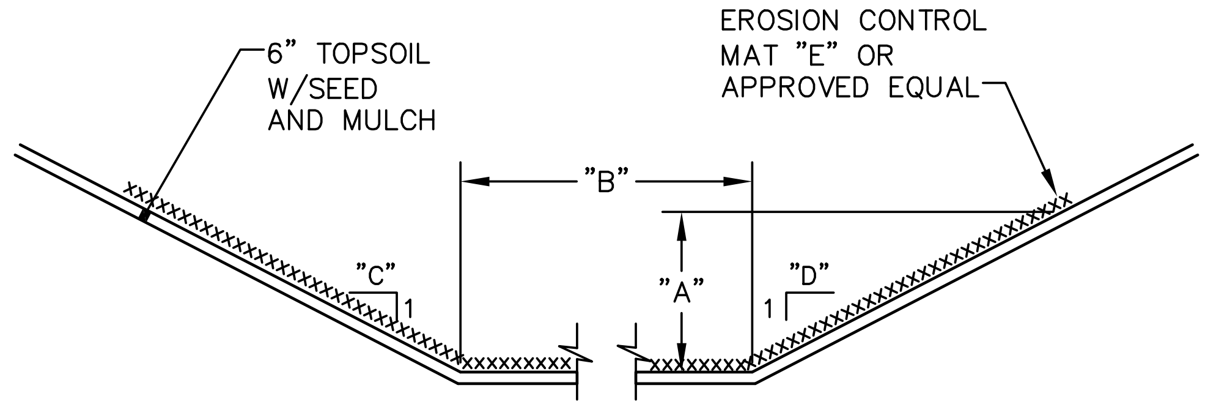


SECTION

NOTES:
1. CONSTRUCT LEVEL LIP ON ZERO PERCENT GRADE TO INSURE UNIFORM SPREADING OF SEDIMENT – FREE RUNOFF (CONVERTING CHANNEL FLOW TO SHEET FLOW).
2. LAST 20 FT OF DRAINAGE DITCH NOT TO EXCEED 1% GRADE

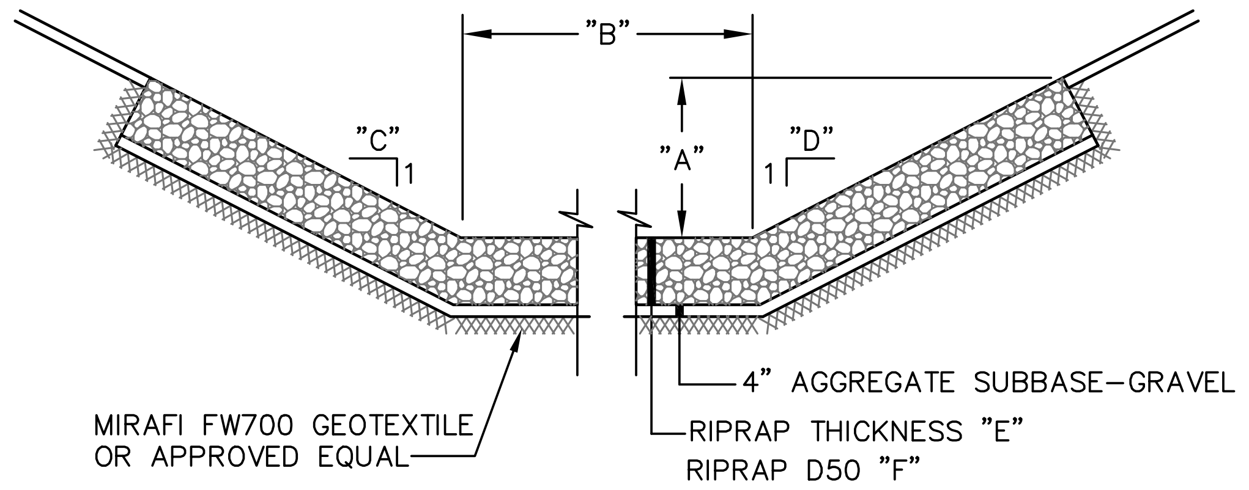
LEVEL SPREADER	LENGTH, L (FT)
DP-10	20
DP-11	15
DP-12	15

LEVEL SPREADER
NTS



DITCH	"A"	"B"	"C"	"D"	"E"
TOE DITCH	2'	2'	2'	2'	NAG S75
DP-10 DITCH SEGMENTS 1 & 2	2'	2'	2'	2'	NAG S75
DITCH 4B-1	2'	2'	2'	2'	NAG S75
MAINTENANCE ROAD DITCH	3'	2'	2'	2'	NAG S75

GRASS DITCH
NTS



DITCH	"A"	"B"	"C"	"D"	"E"	"F"
DP-10 DITCH SEGMENT 3	2'	2'	2'	2'	9"	4"
DP-10 EMERGENCY SPILLWAY	2'	10'	2'	2'	9"	4"

RIPRAP DITCH
NTS

EROSION AND SEDIMENTATION CONTROL TEMPORARY AND PERMANENT

A. GENERAL

1. Soil erosion and sediment control will be done in accordance with the Maine Erosion and Sediment Control: Best Management Practices, Maine Department of Environmental Protection, March 2003.

2. The contractor 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, shall be temporarily stabilized within 7 days of the disturbance.

4. 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. Suitable topsoil will be stripped and stockpiled for reuse in final grading. Topsoil will be stockpiled in a manner such that natural drainage is not obstructed and no off-site sediment damage will result. If a stockpile is necessary, the side slopes 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 temporarily seeded with Aroostook rye, annual or perennial ryegrass, within 7 days of formation, or temporarily mulched if seeding cannot be done within the recommended seeding dates. Recommended seeding dates and application rates are as follows:

* Aroostook Rye: Recommended Seeding Dates: 9/15 – 11/1
Application Rate: 112 lbs/acre

* Annual Ryegrass: Recommended Seeding Dates: 4/1 – 7/1
Application Rate: 40 lbs/acre

* Perennial Ryegrass: Recommended Seeding Dates: 8/15 – 9/15
Application Rate: 40 lbs/acre

Mulch:

o Hay or Straw: Application Rate: 1.5 – 2.0 tons/acre. Anchor with mulch netting (installed per manufacturer's recommendations)

o Wood Fiber Cellulose: Application Rate: 4,000 lbs/acre. Anchoring not required

B. TEMPORARY MEASURES

1. Silt Fence

(a) Silt fence will be installed prior to and downgradient of all construction activity where soil disturbance may result in erosion.

(b) The height of a silt fence will not exceed 36 inches.

(c) Unless a prefabricated system is utilized, the filter fabric will be purchased in a continuous roll cut to the length of the barrier to avoid the use of joints. When joints are necessary, filter cloth will be spliced together only at a support post, with a minimum 6-inch overlap, and securely sealed.

(d) Posts will be spaced a maximum of 10 feet apart at the barrier location and driven securely into the ground (minimum of 12 inches). When extra strength fabric is used without the wire support fence, post spacing will not exceed 6 feet.

(e) A trench will be excavated approximately 6 inches wide and 6 inches deep along the line of posts and upgradient from the barrier.

(f) The fabric will not extend more than 36 inches above the original ground surface. Filter fabric will not be stapled to existing trees.

(g) When extra strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated. In such a case, the filter fabric will be stapled or wired directly to the posts with all other provisions of item (f) applying.

(h) The trench will be backfilled and the soil compacted over the filter fabric.

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

(j) Silt fences will be inspected immediately after each rainfall, which exceeds 1 inch in a 24-hour period, and at least daily during prolonged rainfall. If there are any signs of erosion or sedimentation below them, appropriate repairs will be made. 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.

(k) Should the fabric on a silt fence decompose or become ineffective prior to the end of the expected usable life, and the barrier still be necessary, the fabric will be replaced promptly.

(l) Sediment deposits should be removed after each storm event if significant buildup has occurred or if deposits exceed 15 inches in depth.

(m) In lieu of providing the 4" x 4" trench for conditions of frozen ground, severe rocky soil or hummucky conditions with large roots, or other prohibitive conditions. A wood waste compost/bark mulch filler berm may be used in such situations.

2. Stone Check Dams

(a) Stone check dams should be constructed of 2 to 3 inch stone. The stone should be placed according to the configuration shown on the detail. Hand or mechanical placement will be necessary to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges.

(b) Check dams should be installed as the swale is being constructed.

(c) Sediment will be removed from behind the check dams when it has accumulated to one half of the original height of the dam.

(d) Check dams will be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dams will be seeded and mulched immediately after the check dams are removed.

(e) Regular inspections will be made to ensure that the center of the dam is lower than the edges. Erosion caused by high flows around the edges of the dam will be corrected. If evidence of siltation in the water is apparent downstream from the check dam, the check dam will be inspected and adjusted. Check dams will be checked for sediment accumulation after each significant rainfall.

CONSTRUCTION SEQUENCE

1. Construct temporary sediment and erosion control facilities. Erosion and sediment measures shall be installed prior to any earth moving operation in the area of work.
2. All permanent ditches are to be stabilized with vegetation or stone check dams prior to directing runoff to them.
3. Inspect and maintain all erosion and sediment control measures.
4. Complete permanent erosion control measures which may include seeding, mulching, and landscaping.
5. Remove all temporary erosion control measures.
6. Each stage will be stabilized prior to initiating the next stage.
7. Any exposed areas will be hay mulched prior to winter shutdown, if necessary.

EROSION CONTROL MEASURES

1. The smallest practical area of land shall be exposed to construction at any one time.
2. The temporary erosion control measures shall be maintained until permanent erosion control measures are present.
3. All areas disturbed by construction shall have available loam placed before seeding (or an acceptable alternative).
4. After construction is terminated, all temporary erosion control measures shall be removed and accumulated sediment disposed of in a secure location.
5. Mulch shall be mowings of acceptable herbaceous growth, free from noxious weeds or woody stems, and shall be dry.

3. Wood Waste Compost/Bark Mulch Filter Berms

(a) The filter berm shall consist of an approved wood waste compost/bark mulch mix or recycled composted bark flume grit and fragmented wood generated from water-flume log handling systems or small shredding of stumpage (6 inches long x 1/2" dia.). The mixture needs to be a well-graded blend of organic and mineral substance. The composition is usually manufactured on or off site and by blending it with a well graded sand and gravel. The objective is a tight, heavy, non-erodible mixture that is not composed of one uniform material, i.e. just bark mulch will not suffice. Comparable composted mixes can be used upon approval of the Department of Environmental Protection, Bureau of Land and Water Quality.

(b) The mix shall conform to the following standards:

* Moisture Content 30 – 60%
* PH-5.0-8.0
* Screen Size – 100% less than 3" max.; 70% less than one inch.
* No less than 40% organic material (dry weight) by loss of ignition.
* No stones larger than 2 inch diameter.
* Silts, clays or sugar sands are not acceptable in the mix.

(c) Installation and Size of Berm:

The dimensions of the berm are more a function of the strength of the material than the flows (forces) it will encounter. At a minimum the berm shall be 4 feet wide and 18 inches high. The berm shall be placed, uncompacted along a relatively level contour. Wherever possible the existing surface must be scoured and the mixture keyed in like any other sediment control measure.

(d) Maintenance:

All deficiencies shall be immediately corrected with additional material place on top of the berm to reach the desired height. When the berm is decomposed, clogged with sediment, eroded, or becomes ineffective, it shall be replaced.

(e) Clean up and Retrieval:

At the end of the job, an erosion control berm shall be removed or spread out so that the native earth can be seen below.

(f) 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. The rocks shall be laid on geotextile to facilitate removal and the geotextile shall be wrapped over the core layer of stone and then covered with another layer of erosion control mix. The center core of stone shall be approx. 12 inches high or two-thirds the height of the filter berm. Rock filter berms shall be a minimum of 18 inches high by 4 feet wide.

4. Stabilized Construction Entrance

(a) Aggregate size: Use 2 inch stone, or reclaimed or recycled concrete equivalent.

(b) Aggregate thickness: Not less than eight inches.

(c) Width: 16 foot minimum, but not less than the full width of where ingress or egress occurs.

(d) Length: as required, but not less than 50 feet.

(e) Geotextile: To be placed over the entire area to be covered with aggregate. Piping of surface water under entrance shall be provided as required. All piping is impossible, a mountable berm with 5:1 slopes will be permitted.

(f) Criteria for Geotextile: The filter cloth shall be woven or NON-WOVEN fabric consisting only of continuous chain polymeric filaments or yards of polyester. The fabric shall be inert to commonly encountered chemicals, hydrocarbons, mildew and rot resistant.

(1) Acceptable materials are Trivira Spunbound 1135, Mirafi 600X, or equivalent.
(2) Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

(g) Maintenance: The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way. When washing is required, it shall be done in on an area stabilized with aggregate which drains into an approved sediment trapping device. All sediment shall be prevented from entering storm drains, ditches, or waterways.

5. Erosion Control Mats

(a) During the growing season (April 15 to September 15) use mats specified in the drawings or, if not specifically identified, use North American Green S75 or equal or mulch with netting on:

* The base of grassed waterways and steep slopes (>15 percent)
* Any disturbed soil within 100 feet of streams and wetlands.

During the late fall and winter (September 15 to April 15) use heavy grade mats specified in the drawings or, if not specifically specified, use North American Green SC150 or equal on all areas noted above, plus use lighter grade mats or mulch with netting on:

* Sideslopes of grassed waterways
* Moderate slopes (>8 percent)

(2) Install mats in accordance with manufacturers' recommendations.

C. PERMANENT MEASURES

1. Riprapped Aprons and Plunge Pools

(a) Construct riprapped aprons in accordance with the details shown on the drawings.

(b) Stone for riprap will consist of sub-angular field stone or rough unhewn quarry stone. The stone will be hard and of such quality that it will not disintegrate on exposure to water or weathering, be chemically stable and suitable in all other respects for the purpose intended. The bulk specific gravity (saturated surface-dry basis) of the individual stones will be at least 2.5.

(c) The riprap should be placed so that it produces a dense well-graded mass of stone with a minimum of voids. The desired distribution of stones throughout the mass may be obtained by selective loading at the quarry, controlled clumping of successive loads during final placing, or by combination of these methods. The riprap should be placed to its full thickness on one operation. The riprap should not be placed in layers. The riprap should not be placed by dumping into chutes or similar methods which are likely to cause segregation of the various stone sizes. Care should be taken not to dislodge the underlying material when placing the stones.

The finished slope should be free of pockets of small stone or clusters of large stones. Hand placing may be necessary to achieve the required grades and a good distribution of stone sizes. Final thickness of the riprap blanket should be within plus or minus 1/4 of the specified thickness.

(d) Riprap will be inspected periodically to determine if high flows have caused scour beneath the riprap or dislodged any of the stone. If repairs are needed, they should be accomplished immediately.

2. Topsoil, Seed, Mulch

(a) Topsoil: Use stockpiled materials spread to the depths shown on the plans, if available. Approved topsoil substitutes may be used (refer to Section C-2 of Erosion and Sediment Control BMP, see Note 2).

(b) Seeding should be completed by August 15 of each year. Late season seeding may be done between August 15 and September 15. Areas not seeded or which do not obtain satisfactory growth by October 1, will be seeded with Aroostook Rye or mulched at rates previously specified herein. After November 1, or the first killing frost, disturbed areas should be treated as specified in (c) below.

SEEDING SPECIFICATIONS

Permanent Seeding (120 lbs/acre)		Temporary Seeding (120 lbs/acre)
Tall Fescue	54 lbs/acre	(Aroostook Rye 100%)
Red Fescue	25 lbs/acres	
Red Top	5 lbs/acres	
Ladino Clover	13 lbs/acre	
Annual Ryegrass	8 lbs/acre	
Birdsfoot Trefoil	5 lbs/acre	
Timothy	10 lbs/acre	

(2) Fertilizer: Apply 1300 pounds per acre of 10-10-10 fertilizer or equivalent per acre (29.8 lbs/1,000 sq. ft.).

(3) Lime: Apply ground limestone at a rate of 3 tons per acre (138 lbs/1,000 sq. ft.).

(4) Mulch: Mulch with hay or straw at 2.0 – 3.0 tons per acre, or 2-3 bales per 1,000 sq. ft.

Anchor mulch with mulch netting installed per manufacturer's recommendations.

(c) 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. The following methods may be used to perform a dormant seeding:

(1) Prepare the seedbed, add the required amounts of lime and fertilizer, then mulch and anchor. After the first killing frost and before snow fall, broadcast or hydroseed the selected seed mixture. Double the regular seeding rates for this type seeding.

(2) When soil conditions permit, between the first killing frost and before snow fall, prepare the seedbed, lime and fertilize, apply the selected seed mixture, and mulch and anchor. Double the regular seeding rates for this type of seeding.

Dormant seedings need to be anchored extremely well on slopes, ditch bases and areas of concentrated flows.

Dormant seeding requires inspection and reseeding as needed in the spring. All areas where cover is inadequate must be immediately reseeded and mulched as soon as possible.

(3) Erosion Control Mats

(a) During the growing season (April 15-Sept 15) use mats indicated on drawings or, if not specified use North American Green S75 or equal or mulch with netting on:

* The base of grassed waterways
* Steep slopes (>15%)
* Any disturbed soil within 100 feet of lakes, streams and wetlands

During the late fall and winter (Sept 15-April 15) use heavy grade mats indicated on drawings or, if not specified use North American Green SC150 or equal on all areas noted above plus use lighter grade mats or mulch with netting on:

* Side slopes of grassed waterways
* Moderate slopes (>8%)

(b) Install mats in accordance with manufacturers' recommendations.

3. Lined Ditches

On designated ditches, use reinforced mats (North American Green as specified or approved equal) as permanent stabilization. Install mats in accordance with manufacturers' recommendations.

D. 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 detention ponds, berms, and service roads;

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

c. Clear and grub Cell areas;

d. Construct service road;

e.. Construct Cell base grade and underdrain system;

f. Construct Cell liner system, and leachate collection system;

g. Operate Cell;

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

i. Install intermediate and final cover on cells filled to capacity in areas shown in the Cell Development Plans – Appendix C of this application.

E. CONSTRUCTION INSPECTIONS

Inspections will be undertaken by qualified personnel to ensure that temporary and permanent erosion and sedimentation controls are properly installed and 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.

REV.	BY	DATE	STATUS
		7/15	ISSUED FOR MEDEP SOLID WASTE PERMIT APPLICATION

JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

SECTIONS AND DETAILS

SME
Sevee & Maher Engineers, Inc.
ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE
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DESIGN BY: PCM
DRAWN BY: SJM
DATE: 12/5/2014
CHECKED BY:
LMN: NONE
CTB: SME-STD

JOB NO. 14101.00 DWG FILE DETAILS

C-308

APPENDIX G

WASTE CHARACTERIZATION AND ACCEPTANCE PLAN

JUNIPER RIDGE LANDFILL

-SPECIAL WASTE CHARACTERIZATION PROGRAM-

1.0 HISTORY:

The Juniper Ridge Landfill's (JRL) Special Waste Characterization Program is designed to operate in compliance with the Maine Solid Waste Rules as they pertain to non-hazardous solid waste landfills (Subtitle D). The special waste approval process and analytical requirements are based upon criteria laid out in various MDEP blanket permits and a number of individual generator permits.

2.0 WASTE CHARACTERIZATION PROCESS FOR FIRST TIME WASTES:

Before a special waste may be accepted for disposal it must first be analyzed in order to assure that it is not classified as a hazardous waste. In most cases, the generator is responsible for assuring that a representative sample is obtained, and then analyzed according to the requirements of the applicable license held by JRL. The Environmental Compliance Manager (ECM) is responsible for supplying the generator with the appropriate analytical requirements. If a particular waste does not fit within an existing blanket or individual permit, then a new permit must be obtained from the MDEP prior to accepting the waste.

When a generator contacts the ECM regarding the acceptance of a new (first time) waste, the following process takes place prior to allowing the waste into the landfill:

- The ECM initially ascertains whether the type of waste is acceptable or unacceptable according to current licensed conditions.
- If the waste is found to be acceptable and fits within one the facility's blanket permits, then the ECM informs the generator of the analytical requirements. This information is conveyed to the generator by completing the Waste Approval and Certification Form, and forwarding it to the generator via email, fax or mail.
- The generator has a representative sample of the waste analyzed (by a certified laboratory) for the parameters checked-off on page-2 of the Waste Approval and Certification Form.
- When the generator receives the test results they forward the lab results, along with the completed & signed Waste Approval and Certification Form to the ECM.
- The ECM reviews the test results and ascertains whether or not they fall within the allowable limits as specified in the license(s). At this point, the waste is either approved for landfill disposal or rejected if the results exceed any regulatory limit.
- When a waste is approved, the generator is notified of the ongoing testing frequencies as applicable.
- Copies of the approval form and lab tests are forwarded to the scales, so that manifesting and scheduling may be arranged prior to shipment.

3.0 WASTE CHARACTERIZATION PROCESS FOR ONGOING WASTES:

A number of ongoing special wastes will be accepted at JRL, with the majority of the wastes fitting within a particular blanket permit category. Additionally, numerous generators (in state only) who had previously held an individual permit for disposal at Pine Tree Landfill are allowed to dispose of their waste(s) at JRL.

A special waste acceptance list has been developed that tracks ongoing special waste generators and the status of their analytical requirements. This list is continuously updated as generators submit updated analyticals as required. The ECM is responsible for updating this list regularly and assuring that the scales and sales/dispatch staff has a current copy. The facility does not accept any special waste from a listed generator unless they have an acceptance status of “ok” for their category of waste.

When an active special waste generator has an approaching analysis due date, the ECM notifies the generator to remind them that a new analysis will be required prior to their next delivery of waste. The scales attendant also reminds the generator when they call to schedule a delivery.

When a generator contacts the ECM or scales regarding the scheduling of an ongoing waste delivery, the following process takes place prior to allowing the waste into the landfill:

- The ECM and/or scale attendant verifies whether or not the generator has a current approval (updated analyticals) for the particular waste. If the waste has a current (unexpired) approval, it may be immediately accepted at the landfill.
- If the generator needs to provide an updated analytical for the waste, the generator samples the waste and has the necessary analyticals performed as required.
- The generator forwards the test results to the ECM for approval.
- The ECM approves or rejects the waste based upon the analytical results.
- When a waste is approved, the ECM updates the waste acceptance list information for the particular generator, and then forwards an updated copy to the scales and sales/dispatch staff. The generator is then notified of their acceptance status.
- The waste may be accepted anytime following this process.

4.0 JUNIPER RIDGE LANDFILL BLANKET CATEGORY PERMITS:

The below listed blanket category wastes have received MDEP approval for acceptance at JRL contingent upon successfully meeting all acceptance criteria:

- Front-end process residue (FEPR) from municipal solid waste incinerators.
- Oversized bulky wastes such as mattresses, furniture, and brown goods.
- Construction and demolition debris (CDD residuals).
- Biomass and fossil fuel boiler ashes
- Municipal clean wood wastes open burn ash
- Wood boiler ashes
- Municipal solid waste incinerator ash
- Biomedical incinerator ash
- Pulp and paper mill sludges
- Publicly owned sewage treatment plant sludges
- Sand blast grit
- Soil contaminated with waste oil from an underground storage tank
- Soil contaminated with waste oil from a surface spill
- Soil contaminated with virgin gasoline from an underground storage tank
- Soil contaminated with virgin gasoline from a surface spill or storage area
- Soil contaminated with a virgin petroleum product from an underground storage tank
- Soil contaminated with a virgin petroleum product from a surface spill
- Filter press cake and collagen scrapings from raw leather tanning.
- High vanadium ash.

4.0 JUNIPER RIDGE LANDFILL BLANKET CATEGORY PERMITS (cont.):

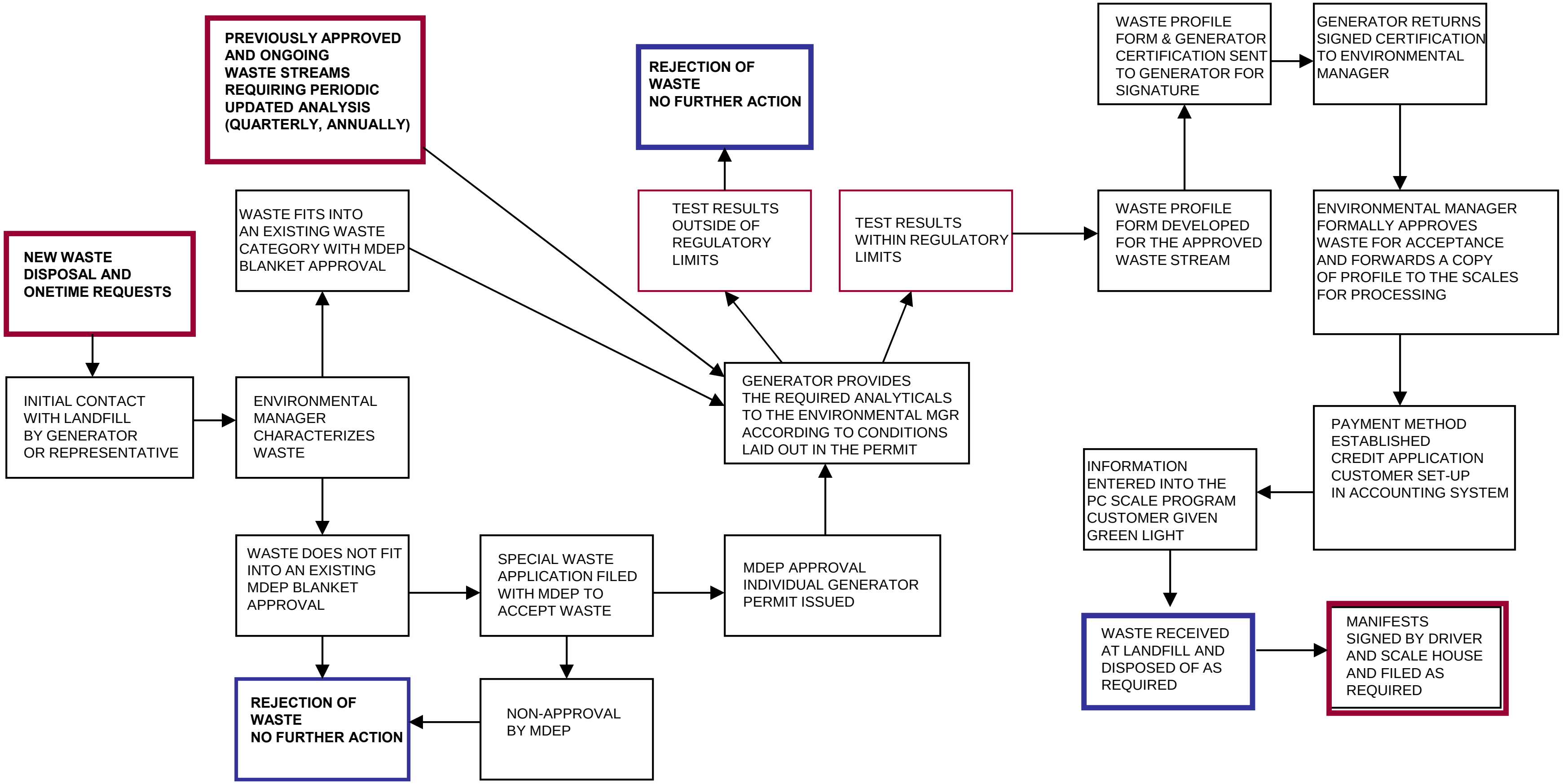
- Filter press cake and collagen scrapings from raw leather tanning.
- High vanadium ash.
- Dewatered commercial and industrial laundry sludges.
- Leather scrap waste from the leather tanning and finishing industry.
- Pigeon waste.
- Ambient water and air filtration media.
- Off-specification, spent, spilled and/or discarded non-hazardous commercial chemical products.
- Virgin oil-contaminated soil disposal from surface spill sources.
- Burned railroad ties and associated ash.
- Water treatment plant sludges.
- Dredged spoils.
- Urban fill contaminated soil & debris.

5.0 LIST OF ACCEPTABLE & UNACCEPTABLE WASTES:

Found below is a general listing of acceptable and unacceptable waste streams at JRL Most special wastes must be analyzed and approved prior to acceptance. Any waste not found on this list may still be unacceptable dependant upon the individual characteristics of the waste.

ACCEPTABLE WASTES	UNACCEPTABLE WASTES
BURN PILE ASH AND/OR HOT LOADS AREA ASH	REGULATED HAZARDOUS WASTES
CATCH BASIN GRIT & STREET SWEEPINGS	REGULATED UNIVERSAL WASTES
CDD PROCESSING RESIDUE - BULKY WASTE	LIQUID WASTES
CDD PROCESSING RESIDUE - FINES	WASTE OIL
COAL, OIL & MULTIFUEL BOILER ASH	BIOMEDICAL-RELATED WASTES
CONTAMINATED SOIL & DEBRIS	DEAD ANIMALS
CRUSHED GLASS	APPLIANCES & WHITE GOODS
FEPR	ITEMS CONTAINING CFC'S OR HCFC'S
INDUSTRIAL WWTP SLUDGE	ABANDONED OR JUNK VEHICLES
LEATHER SCRAPS	AUTOMOTIVE BATTERIES
LIME MUD AND GRIT	FLAMMABLE & COMBUSTIBLE MATERIALS
MIXED CDD	PAINTS & STAINS
MSW	PROPANE CYLINDERS
MSW BYPASS	NON-APPROVED SPECIAL WASTES
MSW INCINERATOR ASH	FRIABLE ASBESTOS MATERIALS
MUNICIPAL WWTP/POTW SLUDGE	
NON FRIABLE ASBESTOS	
NON-HAZARDOUS CHEMICAL RELATED	
OIL SPILL DEBRIS	
PULP MILL WASTE	
SANDBLAST GRIT	
SHORT-PAPER FIBER	
SPOILED FOODS	
SULFUR SCRUBBING RESIDUES	
TIRES OVERSIZED TIRE CHIP	
TIRES TYPE B TIRE CHIPS	
TREATED BIOMEDICAL WASTE	
URBAN FILL SOIL & DEBRIS	
WOOD FROM CDD	
WWTP GRIT SCREENINGS	

-JUNIPER RIDGE LANDFILL-
WASTE CHARACTERIZATION & ACCEPTANCE FLOW DIAGRAM



NEW WASTE DISPOSAL AND ONETIME REQUESTS

INITIAL CONTACT WITH LANDFILL BY GENERATOR OR REPRESENTATIVE

ENVIRONMENTAL MANAGER CHARACTERIZES WASTE

WASTE FITS INTO AN EXISTING WASTE CATEGORY WITH MDEP BLANKET APPROVAL

PREVIOUSLY APPROVED AND ONGOING WASTE STREAMS REQUIRING PERIODIC UPDATED ANALYSIS (QUARTERLY, ANNUALLY)

WASTE DOES NOT FIT INTO AN EXISTING MDEP BLANKET APPROVAL

REJECTION OF WASTE NO FURTHER ACTION

SPECIAL WASTE APPLICATION FILED WITH MDEP TO ACCEPT WASTE

NON-APPROVAL BY MDEP

MDEP APPROVAL INDIVIDUAL GENERATOR PERMIT ISSUED

GENERATOR PROVIDES THE REQUIRED ANALYTICALS TO THE ENVIRONMENTAL MGR ACCORDING TO CONDITIONS LAID OUT IN THE PERMIT

TEST RESULTS OUTSIDE OF REGULATORY LIMITS

REJECTION OF WASTE NO FURTHER ACTION

TEST RESULTS WITHIN REGULATORY LIMITS

WASTE PROFILE FORM DEVELOPED FOR THE APPROVED WASTE STREAM

WASTE PROFILE FORM & GENERATOR CERTIFICATION SENT TO GENERATOR FOR SIGNATURE

GENERATOR RETURNS SIGNED CERTIFICATION TO ENVIRONMENTAL MANAGER

ENVIRONMENTAL MANAGER FORMALLY APPROVES WASTE FOR ACCEPTANCE AND FORWARDS A COPY OF PROFILE TO THE SCALES FOR PROCESSING

PAYMENT METHOD ESTABLISHED CREDIT APPLICATION CUSTOMER SET-UP IN ACCOUNTING SYSTEM

INFORMATION ENTERED INTO THE PC SCALE PROGRAM CUSTOMER GIVEN GREEN LIGHT

WASTE RECEIVED AT LANDFILL AND DISPOSED OF AS REQUIRED

MANIFESTS SIGNED BY DRIVER AND SCALE HOUSE AND FILED AS REQUIRED

TOM GILBERT – OCTOBER 2010

JUNIPER RIDGE LANDFILL
List of Unacceptable Wastes

- **Any Material Regulated as a "Hazardous" Waste**
- **Out of State Waste**
- Paints
- Chemicals
- Any Liquid Wastes
- Waste Oil
- Medical-Related Wastes
- Pathological Wastes
- Dead Animals
- Abandoned or Junk Vehicles
- Municipal solid wastes (MSW) (only acceptable as a bypass)
- Friable Asbestos Materials
- Other Non-Approved Wastes

Universal Wastes such as:

- Fluorescent Lamps
- Mercury Vapor Tubes
- Light Ballasts Containing PCB's
- Batteries
- Computer Monitors (CRT's)
- Television Sets
- Mercury Thermostats/Switches
- Mercury Thermometers

Appliances such as:

- Washer Machines
- Dryers
- Stoves/Ranges
- Dishwashers
- Microwaves

Items containing CFC's or HCFC's (chlorofluorocarbons) (hydrochlorofluorocarbons) such as:

- Refrigerators
- Air Conditioners
- Freezers
- Dehumidifiers
- Water Coolers
- Other Refrigerated Items

Special Wastes:

- Any Waste Material Not Receiving Prior Approval from Environmental Manager

JUNIPER RIDGE LANDFILL
List of Acceptable Wastes

- Non-Friable Asbestos Materials
- Construction & Demolition Debris
- Wood Fines
- Biomass & Fossil Fuel Boiler Ash
- Municipal Clean Wood Burn Ash
- Wood Boiler Ash
- Municipal Waste Incinerator Ash
- Biomedical Incinerator Ash
- Treated Biomedical Waste
- Wastewater Treatment Plant Sludge
- Water Treatment Plant Sludge
- Pulp & Paper Sludge
- Short-Paper Fiber Sludge
- Sand Blast Grit
- Sulfur Scrubbing Residue
- Pigeon Droppings
- Oil Contaminated Soil
- Gasoline Contaminated Soil
- Oily Debris
- Leather Scraps
- Commercial Laundry Sludge
- Catch Basin Grit
- Front-End Process Residue
- Oversized Bulky Wastes
- Municipal Solid Waste – Bypass & Soft Layer
- Non-Hazardous Chemical Wastes
- Spoiled Food-Related Wastes
- Clean Wood Debris (for beneficial use)
- Wood Brush & Stumps (for grinding)
- Other Special Wastes

Special Waste Acceptance - Analytical Requirements (MDEP Blanket Permits)

WASTE SYSTEMS

JUNIPER RIDGE LANDFILL
2828 Bennoch Road
Old Town, Maine 04468
Tel: (207) 394-4372
Fax: (207) 394-4373

-FACILITY CONTACTS-
Wayne Boyd, General Mgr. 207- 862-4200, ext. 224
Tracy Flagg, 207-862-4200, ext.245
Wendy Plissey, 207-862-4200, ext. 221

	TCLP Metals (1311)	*TCLP-Lead Only (1311) 7420/6010*	*TCLP-Benzene Only (1311) 8260*	*TCLP Vanadium (1311) 7910/7911*	*TCLP Volatiles (1311) 8260*	*TCLP Semi-Volatiles (1311) 8270*	*TCLP Pesticides (1311) 8082*	*TCLP Herbicides (1311) 8150*	*TOX (9020B/9022) or 8260*	*Flashpoint (1010)*	*pH (Corrosivity) (9045C)*	*Total PCB's (8082)*	*Sulfide Reactivity (7.3.4.2)*	*Dioxins and Furans (SW-846)*	*Cyanide Reactivity (7.3.3.2)*	*Chloride (9056) SW8*	*Phosphorus (4500P) STM*	*% Carbon (D5291)*	*% Moisture/Free Liquids (9095A)*	
Ash Related Wastes																				***Sampling Requirements & Notes***
Wood\Biomass Boiler Ash	X																			Initially, then annually for <200 tons per year, quarterly >200 TPY
Fossil Fuel Boiler Ash	X			X																Initially, then annually for <200 tons per year, quarterly >200 TPY
Clean Wood Open Burn Ash	X																			Initially, then annually for <200 TPY, otherwise every 200 tons.
Municipal Solid Waste Ash (MSW)	X													X						Initially, then every 200 tons for first 1000 tons, or quarterly if more frequent.
Biomedical Incinerator Ash	X																			Initially, then every 100 tons or annually, whichever is more frequent.
Burned RR ties & associated ash	X				X	X						X								Initially, then every 250 tons.
Contaminated Soil and Debris																				
Gasoline Contaminated Soil & Debris (UST)		X																		One per source or 500 tons, whichever is more frequent.
Gasoline Contam. Soil/Debris Surface Spill		X	X																	One per source or 500 tons, whichever is more frequent.
Waste Oil Contaminated (Oily Debris)	X				X	X	X	X	X	X	X	X	X		X					One per source or 250 tons, whichever is more frequent.
Urban Fill Type Soils & Debris	X				X	X	X	X		X	X	X	X		X					Once per 250 tons <1000 tons, once per 500 tons >1000 tons w/no fewer than 4
Dredged Spoils From Waterways	X				X	X	X	X				X	X							Initially, then every 250 tons
Virgin Petroleum Product Contaminated Debris	X																			One per source or 500 tons, whichever is more frequent or a MDEP Spill Letter.
Sludges& Related Wastes																				
Filter Press Cake & Collagen Scrapings	X				X	X	X	X												Initially, then TCLP-metals only on an annual basis.
Pulp & Papermill Sludge	X				X	X														Initially, then quarterly for TCLP-metals and annually for TCLP-Vols. & Semivols..
Public Waste Treatment Plant Sludge	X				X	X														Initially, then quarterly for TCLP-metals and annually for TCLP-Vols. & Semivols..
Commercial & industrial laundry sludge	X				X	X	X	X					X							Initially, then TCLP-metals only on an annual basis.
Water Treatment Plant Sludge	X				X	X	X	X					X							Initially, then annually thereafter.
Miscellaneous Special Wastes																				
Sandblast Grit	X																			Initially, then annually <50 tons, per event 50-100 tons, >100 tons every 500 tons
Asbestos (non-friable type only)																				Managed in accordance with Maine asbestos rules
Leather Scrap Wastes	X																			Initially, then annually.
Dried Paint Residue & Related Debris	X				X					X			X							Initially, then annually.
Construction & Demolition Debris																				No analysis required, if not contaminated with regulated substances.
Catch Basin Grit																				No analysis required, if not contaminated with regulated substances.
Air & Water Filtration Media																				No analysis required, if not contaminated with regulated substances.
Approved Land Utilization Wastes																				No analysis required, if material fits DEP land utilization criteria.
Front-End Process Residue (FEPR)																				No analysis required.
Oversized Bulky Wastes																				No analysis required.
Pigeon Waste																				No analysis required. Waste must be wet down and contained .
Non-Hazardous Chemical Products																				No analysis required if msds available to confirm non-hazardous status.
Municipal Solid Waste (MSW)																				No analysis required

*Note: Virgin petroleum product contaminated soil & debris may be disposed of without the normal analyticals
if the cleanup is supervised by the Maine DEP and a spill letter of authorization to accept is provided.

Print Form

casella

Special Waste Characterization Profile

I. REQUESTED DISPOSAL FACILITY

II. GENERATOR INFORMATION

Generator Name ____________________

Contact Name ____________________

Title ____________________

Email ____________________

Phone ____________ Fax ____________

Generator Site Description ____________________

____

Generator Site Address

____
STREET

____
CITY STATE ZIP

III. CUSTOMER INFORMATION ☐ same as above

Customer Name ____________________

Billing Address:

____
STREET

____
CITY STATE ZIP

Contact Name ____________________

Email ____________________

Phone ____________ Fax ____________

IV. CONSULTANT/REPRESENTATIVE

Name ____________________

Mailing Address:

____
STREET

____
CITY STATE ZIP

Contact Name ____________________

Email ____________________

Phone ____________ Fax ____________

V. WASTE INFORMATION

Common Waste Name/Description ____________________

Description of waste generation process/source:

Physical consistency ____________________

Odor? ☐ No ☐ Yes (specify) ____________ Flammable: ☐ No ☐ Yes

pH Range: ______ to ______ Moisture Content ____________ ☐ N/A (solid)

Is the waste classified as a 'listed' or 'characteristic' hazardous waste as defined by the USEPA, State of origin, or State where disposed? ☐ No ☐ Yes (specify)

Physical constituents (e.g. Soil, wood, ash):

Constituent	Approximate %

Describe all hazardous or nuisance properties associated with the waste:

Does the waste require any special handling or disposal procedures? ☐ No ☐ Yes (please explain)

VI. ESTIMATED WASTE QUANTITY & DELIVERY FREQUENCY

☐ One Time ☐ Recurring

Estimated Annual Amount: ____________ ☐ tons ☐ cubic yards

Approximate Density: _______ tons/cubic yard

Delivery Frequency

☐ Daily ☐ Weekly ☐ Monthly ☐ Quarterly ☐ Annually ☐ Other (specify if known) ____________________

Delivery Method

☐ Roll-off ☐ Packer truck ☐ Tractor Trailer ☐ Other (specify) ____________

Hauler Name ____________________

Permit No. ____________________

Phone ____________ Fax ____________

Hauler's Address:

____
STREET

____
CITY STATE ZIP

Completed by Casella Staff. Generator must obtain and provide Casella with the analytical reports prescribed below.

VII. ANALYTICAL REQUIREMENTS

Generator must submit the following analytical reports:

- ☐ None
- ☐ Material Safety Data Sheets (MSDS)
- ☐ TCLP Metals
- ☐ TCLP Lead
- ☐ TCLP Benzene
- ☐ TCLP Vanadium
- ☐ TCLP Volatile Organics
- ☐ TCLP Semi-volatile Organics
- ☐ TCLP Pesticides
- ☐ TCLP Herbicides
- ☐ Total Organic Halogens (TOX)
- ☐ Total PCBs
- ☐ Ignitability/Flashpoint
- ☐ Sulfide Reactivity
- ☐ Cyanide Reactivity
- ☐ Dioxins & Furans
- ☐ Chloride
- ☐ % Carbon
- ☐ % Moisture
- ☐ Phosphorus
- ☐ pH/Corrosivity
- ☐ Other (specify) ____________________

*Sample(s) must be analyzed in accordance with the most recently approved EPA method(s) for solid wastes and testing performed by a State-certified laboratory.

Quantity Approved for Disposal _______ tons
Waste Category (PC Scales): _________________________

VIII. GENERATOR CERTIFICATION

I hereby certify that:

(1) All information submitted on this form and on supplemental materials is complete and accurate to the best of my knowledge and ability to determine;

(2) The information provided herein, including any supplemental information, such as laboratory analytical results, MSDS, etc., accurately describes the waste stream to be delivered to the facility and that all known or suspected hazards have been disclosed.

(3) I understand that, once the waste stream is approved by Casella based on this information, any deviation in the source, composition, constituents or characteristics of the waste stream from the information described herein, may render the waste stream unacceptable for disposal, at the sole discretion of Casella. I further understand that any deviation from the information contained herein will require immediate notification to the disposal facility and cessation of disposal.

____ ________________________________ ________________________________ _________
Signature of Generator's Authorized Representative Printed Name Title Date

IX. APPROVAL STATUS

The above waste stream has been approved for disposal at the facility designated on this profile. The terms of acceptance at the designated facility are based upon the waste being representative of the laboratory results provided by the generator or their representative.

Approved by:

________________________________ ____________________________ ____ __________
Printed Name Title Signature Date

JUNIPER RIDGE LANDFILL
TEST PARAMETERS AND ACCEPTABLE REGULATORY LEVELS

PARAMETER	- REGULATORY LIMITS -			
TCLP Metals	**mg/L**	**ug/L**	**mg/kg**	**ug/kg**
TCLP-Arsenic	5	5000	100	100000
TCLP-Barium	100	100000	2000	2000000
TCLP-Cadmium	1	1000	20	20000
TCLP-Chromium	5	5000	100	100000
TCLP-Lead	5	5000	100	100000
TCLP-Mercury	0.2	200	4	4000
TCLP-Selenium	1	1000	20	20000
TCLP-Silver	5	5000	100	100000
TCLP-Vanadium	200	200000	4000	4000000
TCLP Volatile Organics (VOC)	**mg/L**	**ug/L**	**mg/kg**	**ug/kg**
Benzene	0.5	500	10	10000
Chloroform	6	6000	120	120000
2-Butanone (MEK)	200	200000	4000	4000000
Vinyl Chloride	0.2	200	4	4000
Carbon Tetrachloride	0.5	500	10	10000
1,2-dichloroethane	0.5	500	10	10000
Tetrachloroethylene	0.7	700	14	14000
Chlorobenzene	100	100000	2000	2000000
1,1-dichloroethylene	0.7	700	14	14000
Trichloroethene	0.5	500	10	10000
TCLP Semi-Volatile Organics	**mg/L**	**ug/L**	**mg/kg**	**ug/kg**
Cresol	200	200000	4000	4000000
P-Cresol	200	200000	4000	4000000
Hexachlorobenzene	0.13	130	2.6	2600
Nitrobenzene	2	2000	40	40000
2,4,5-Trichlorophenol	400	400000	8000	8000000
M-Cresol	200	200000	4000	4000000
1,4-dichlorbenzene	7.5	7500	150	150000
Hexachloro-1,3-dutadiene	0.5	500	10	10000
Pentachlorophenol	100	100000	2000	2000000
2,4,6-Trichlorophenol	2	2000	40	40000
O-Cresol	200	200000	4000	4000000
2,4-dinitrotoluene	0.13	130	2.6	2600
Hexachloroethane	3	3000	60	60000
Pyridine	5	5000	100	100000
TCLP Pesticides	**mg/L**	**ug/L**	**mg/kg**	**ug/kg**
Chlordane	0.03	30	0.6	600
Methoxychlor	10	10000	200	200000
Endrin	0.02	20	0.4	400
Toxaphene	0.5	500	10	10000
Heptachlor	0.008	8	0.16	160
Heptachlor Epoxide	0.008	8	0.16	160
Lindane	0.4	400	8	8000
TCLP Herbicides	**mg/L**	**ug/L**	**mg/kg**	**ug/kg**
2,4-D	10	10000	200	200000
2,4,5-TP (Silvex)	1	1000	20	20000
Other	**mg/L**		**mg/kg**	
PCB's	50			
Sulfide Reactivity	25		500	
Cyanide Reactivity	12.5		250	
Ignitability/Flashpoint	>140 Deg. F			
Chloride	No Limit			
% Moisture (free liquids)	No Free Flowing Liquids			
pH (corrosivity)	2.0 - 12.5 units			
Phosphorus	No Limit			
% Carbon	No Limit			
Total Organic Halides (TOX)	1,000			

(excel\Analytical Limits)

JUNIPER RIDGE LANDFILL
SPECIAL WASTE APPROVAL LIST

GENERATOR NAME	PROFILE #	T PERSON	PHONE #	WASTE DESCRIPTION	ANALYSIS DUE DATE	UPCOMING DUE DATE	DUE	REMINDER NOTICE SENT	ACCEPTANCE STATUS
BANGOR WWTP	8119	Tom Hambr	992-4474	GRIT SCREENING	04/24/15			OK	OK
BANGOR WWTP/CASELLA ORGA	8114	Tom Hambr	992-4474x4	SLUDGE	06/30/18			OK	OK
BREWER, CITY OF/CASELLA ORG	8115	Mary Warin	781-5011x2	WWTP SLUDGE	Ongoing-NEO			OK	OK
CITY OF OLD TOWN	9419	Steve Lane	827-3970	SLUDGE	03/31/15			OK	OK
CITY OF OLD TOWN-INDIAN ISLA	9421			SLUDGE	no testing required			OK	OK
DOVER-FOXCROFT, TOWN OF	8634	Joe Sands	564-3318	WOOD ASH	08/08/15			OK	OK
GENERAL ELECTRIC	8501	Greg Lincol	941-2544	SAND BLAST GRIT	04/23/15			OK	OK
GENERAL ELECTRIC	8422	Greg Lincol	941-2544	EDM SLUDGE	no testing required			OK	OK
GREENVILLE POWER	6472	Mary Warin	781-5011x2	WOOD ASH	Ongoing-NEO			OK	OK
HOULTON WATER COMPANY	8148	Mary Warin	781-5011x2	WWTP SLUDGE	Ongoing-NEO			OK	OK
INTERNATIONAL PAPER	8035	Mary Warin	781-5011x2	WOOD ASH	Ongoing-NEO			OK	OK
JACKSON LABS	8599	Brian Fanch	288-6256	INCINERATOR ASH	11/18/15			OK	OK
JONESBORO	7023	Mary Warin	781-5011x2	ASH	Ongoing-NEO			OK	OK
JONESBORO	8160	Mary Warin	781-5011x2	SIDESTREAM SLUDGE	Ongoing-NEO			OK	OK
KING BROTHERS	8467	Dan Ireland	794-6168	WOOD ASH	11/03/15			OK	OK
LEWISTON WWTP	8099	Mary Warin	773-1122x1	WWTP SLUDGE	Ongoing-NEO			OK	OK
LINCOLN PULP & TISSUE	6922	Dennis McC	794-0600	FLY ASH & TDF ASH	03/31/15			OK	OK
LINCOLN PULP & TISSUE	8815	Bruce Alber	794-0600	ASSORT. MILL WASTE	Ongoing Permit			OK	OK
LUNDER MANUFACTURING/PTW	8069	Bill Bennett		LEATHERSCRAPS	10/29/15			OK	OK
MATTAWAMKEAG, TOWN OF	8130	Dan Ireland	290-6168	WOOD ASH	06/30/15			OK	OK
ME.TPKE.AUTHORITY				SAND BLAST GRIT	Ongoing Permit			OK	OK
NATIONAL STARCH	6981	Mary Warin	781-5011x2	WOOD ASH	Ongoing-NEO			OK	OK
NEW ENGLAND ORGANICS	N/A			WWTP SLUDGE	Ongoing-NEO			OK	OK
OWL'S HEAD TRANSFER STATION	8701	Josh Wellm	223-4112	WOOD ASH	09/24/15			OK	OK
PERC	3328			FEPR	Ongoing Permit			OK	OK
PERC	3432			MUNICIPAL ASH	Ongoing Permit			OK	OK
PERC	8014			OVERSIZED BULKY WASTES	Ongoing Permit			OK	OK
PERC	N/A			PROCESS WATER SLUDGE	Ongoing Permit			OK	OK
PINE TREE WASTE-ALL DIVISION	N/A			OIL SPILL DEBRIS	Ongoing Permit			OK	OK
PORTLAND WATER DISTRICT	8049	Mary Warin	781-5011x2	WWTP SLUDGE	Ongoing-NEO			OK	OK
ROCKLAND MARINE	8131	Jim Corcora	594-7860	SAND BLAST GRIT	09/16/15			OK	OK
SAPPI WESTBROOK	6780			BOILER ASH	Ongoing-NEO			OK	OK
SOUTH THOMASTON	9046	Josh Wellm	223-4112	BURN PILE ASH	09/24/15			OK	OK
TOWN OF BURLINGTON/LOWELL	8602	Rollie Mino	951-6607 ce	WOOD ASH	06/03/15			OK	OK
TOWN OF ORONO	9420	Joe Madiga	866-5069	SLUDGE	06/30/15			OK	OK
U M O	8668	Chuck Spald	581-4079	BOILER ASH	Ongoing Permit			OK	OK
ULTRAPOWER	6546	Mary Warin	781-5011x2	WOOD ASH	Ongoing-NEO			OK	OK
UNIFIRST/PORTLAND	8552	William Gra	797-4006	LAUNDRY SLUDGE	03/24/15			OK	OK
WEST ENFIELD ENERGY				WOOD BOILER ASH	Ongoing-NEO			OK	

APPENDIX H

OPERATIONS AND MAINTENANCE MANUAL – LEACHATE STORAGE TANK

OPERATION and MAINTENANCE MANUAL

AQUASTORE®
Tanks

Water Storage Tanks

Waste Treatment Tanks

Landfill Leachate Storage Tanks

Trickling Filter Shells

This operator's manual is intended to be a guide for the safe and efficient operation of your Engineered Storage Products Company (ESPC) Aquastore® water storage tank, waste treatment tank, or trickling filter shell. This manual is considered as a portion of the equipment and should accompany the equipment.

Installation and service of Aquastore brand equipment is the responsibility of an authorized independent Aquastore tank dealer and the equipment owner/operator and not the manufacturer, ESPC.

ESPC is continually improving its products. Accordingly, ESPC reserves the right to change design and/or specifications without notice.

APPROVED
By
Date 12/21/04
New England Tank Systems, Inc.

NOTICE: The information contained herein is general in nature and is drawn from sources deemed to be reliable. It is intended for general information purposes only.

The results obtained by the use of these products are dependent upon strict adherence to manufacturer's instructions for proper operation of the equipment as outlined in the appropriate operator's manual. In all instances the employment of good management practices in circumstances not specifically referenced in such manuals is required.

CAUTION:
Before using any equipment manufactured or distributed by ESPC, you should thoroughly study and understand the appropriate Operator's Manual. If you do not have an Operator's Manual for a particular item of equipment, one can be obtained through your authorized independent Aquastore tank dealer. Decals as illustrated and placed on the equipment provide important safety and operating instructions which you should follow whenever using the products.

Your right to copy this manual is limited by copyright law. Making copies, adaptations, or compilation works without prior explicit written permission of ESPC is strictly prohibited by law and constitutes a violation of the law.

Aquastore tanks are designed and manufactured by Engineered Storage Products Company, 345 Harvestore Drive, DeKalb, Illinois 60115. These tanks have been designed to specifications supplied by the tank purchaser and/or his specifying engineer. Specific design constraints have been provided by the specifying party including, but not limited to: the density of the stored product, the location of the overflow devices, the filling and emptying means, the design codes controlling the design of the tank, etc. This specific information has been supplied as an integral part of the submittal package prior to the construction process. You must consider this information as part of your operation and maintenance review.

Specific procedures may need to be generated by you as the tank operator based on a specific need of you, your employees, and others involved in the maintenance and use of this tank. Use of this tank for purposes other than those specified in the original design documents may void your warranty, damage the tank, and/or create the risk of personal injuries or death. Should you have need for specific information not available to you from your files, please contact the installing dealer and/or ESPC at the address provided.

SECTION 1 - SAFETY GUIDELINES

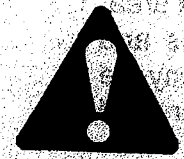
Aquastore tanks are used for many purposes and can be incorporated into larger storage or process systems. Therefore, other safety related guidelines, in addition to those presented in this section, may be appropriate for your installation. You or your system designers are in the best position to make these recommendations.

1. GENERAL

Access to all Aquastore tanks must be limited to authorized personnel. To deter vandalism or tampering, the owner operator should implement appropriate security measures including, but not limited to: enclosing the tank area with a fence, providing lighting at tank ladders and platforms, installing an alarm system and/or a ladder gate. If the tank has a roof, keep the top manway locked. This manway should be opened by authorized personnel only.

When entering a tank it is your responsibility to comply with the following safety information topics.

RECOGNIZE SAFETY INFORMATION



Look for this symbol, it means...
Attention! Be alert!
Your safety is involved!

DANGER:
Tanks may be considered to be "confined spaces" under certain local, state and/or national regulations and standards. You should establish and implement a confined space entry safety program to conform with such regulations, standards, and reasonable safety measures. ESPC cannot design a program to suit your specific needs and situation.

Many well conceived confined space safety programs include the following:

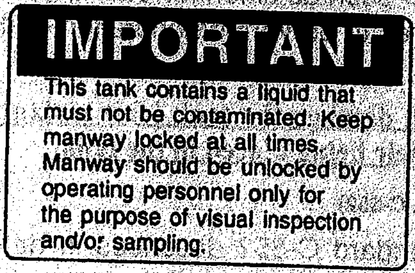
1. Identification of the existence of a "confined space" and the hazard(s) associated with that confined space, i.e., a confined space has a restricted means for entry or exit and has the potential for containing a hazardous atmosphere or other dangerous condition;
2. Restrictions on access to a confined space so that only properly instructed and properly equipped personnel enter the confined space;
3. The use of various equipment and procedures to control the hazard presented by the confined space, i.e., the use of retrieval lines, respirators or special protective clothing;
4. The presence of an attendant outside the confined space to maintain contact with personnel inside the confined space and to monitor events; and
5. Access to properly trained rescue personnel and rescue equipment.

⚠ **DANGER:**
Flammable, explosive, or lethal gasses may be present in and around certain tanks. Do not smoke or allow open flames or sparks in the tank area. Fire or explosion may result. Use an approved breathing apparatus and protective clothing when dangerous gases are being handled or may be present in or around the tank. Failure to heed may cause serious personal injury or death.

2. SAFETY DECALS

The safety decals that are located on the types of tanks covered in this manual are illustrated on the following page. You should inspect each decal or safety sign at least annually. Those which are worn, missing or illegible must be replaced by you. Use the attached graphic display to aid in your inspection. Contact your authorized independent Aquastore tank dealer if new decals are required.

WATER STORAGE TANK DECAL

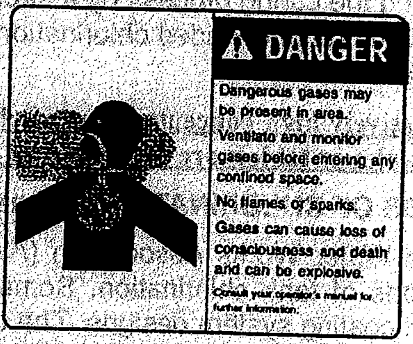


IMPORTANT

This tank contains a liquid that must not be contaminated. Keep manway locked at all times. Manway should be unlocked by operating personnel only for the purpose of visual inspection and/or sampling.

Part No. 257249-000

ALL TANKS



⚠ DANGER

Dangerous gases may be present in area.

Ventilate and monitor gases before entering any confined space.

No flames or sparks.

Gases can cause loss of consciousness and death and can be explosive.

Consult your operator's manual for further information.

Part No. 262778-000

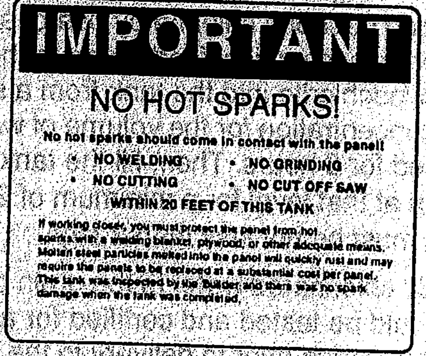
ALL TANKS

⚠WARNING

Do not cut holes in or make attachments to any part of this tank without prior approval of a qualified structural engineer. Failure to heed this warning may result in structural failure, collapse, personal injury or death.

Part No. 260581-000

ALL TANKS



IMPORTANT

NO HOT SPARKS!

No hot sparks should come in contact with the panel!

- NO WELDING
- NO GRINDING
- NO CUTTING
- NO CUT OFF SAW

WITHIN 20 FEET OF THIS TANK

If working closer, you must protect the panel from hot sparks with a welding blanket, plywood, or other adequate means. Molten steel particles melted into the panel will quickly rust and may require the panels to be replaced at a substantial cost per panel. This tank was inspected by the Builder and there was no spark damage when the tank was completed.

Part No. 262166-000

SECTION 2 - SANITIZATION - (DESCRIBED FOR POTABLE WATER STORAGE TANKS)

1. FORMS OF CHLORINE

Various forms of chlorine are used for the purpose of sanitizing potable water tanks. Aquastore tanks are constructed using a joint sealant which can be substantially degraded during the curing process by a strong oxidizer such as chlorine. Care must be taken to follow the recommended chlorination procedures to prevent deterioration of the tank joint sealant.

NOTE: **Excessively high concentrations of chlorine will damage the tank joint sealant if granules or tablets are not dissolved prior to their being placed in the tank.**

2. METHODS OF CHLORINATION (REFERENCE AWWA C-652)

The American Water Works Association (AWWA) Standard C-652 describes in detail several methods of tank chlorination. Some are more or less appropriate depending upon tank and coating system designs. The chlorination of a tank after construction and prior to being placed in service needs to be coordinated with your authorized independent Aquastore tank dealer. Specific criteria apply to the cure time requirements for structure sealants prior to the first filling and/or sanitization process.

a. The recommended method for chlorination of an Aquastore tank and the method preferred by many tank operators is to fill the tank with potable water to approximately 5% of its volume. Add sufficient available chlorine to this water to attain a 50 milligrams/liter (mg/l) available chlorine level. The chlorine can be added by: injecting gaseous chlorine by use of a gas-flow chlorinator; introducing sodium hypochlorite by chemical feed pump to the inflowing water; or pouring dissolved sodium hypochlorite into the tank from a side manway or roof hatch. Never exceed 50 mg/l concentration for the volume of water actually in the tank. This solution is to be retained for 6 hours. Then, fill the tank to the overflow level with potable water and retain at that level for a minimum of 24 hours. The free chlorine residual after 24 hours must be not less than 2 mg/l.

   The highly chlorinated water in the drain piping must then be purged. The remaining water should be tested and certified for acceptable quality according to local health department codes prior to delivery to the distribution system.

b. As an alternative method, the tank can be filled with potable water to the overflow level. Enough chlorine must be added so that the available chlorine concentration shall be 10 mg/l at the end of 6 hours, but at no time should the concentration exceed 50 mg/l. The chlorine can be added by injecting gaseous chlorine or introducing sodium hypochlorite by chemical feed pump to assure uniform mixing.

   After six hours, the chlorine residual should be reduced to not more than 2 mg/l by a combination of additional holding time and/or draining and refilling the tank with potable water having a lower chlorine residual. The water must then be tested for acceptable quality according to local health department code prior to delivery to the distribution system.

Care should be taken when handling any chemical. Only experienced personnel should attempt to chlorinate the tank contents. Use the utmost care and check local codes prior to disposal of chlorinated water.

SECTION 3 - WINTER OPERATION

1. MINIMIZE ICE FORMATION

Ice formation in water tanks can cause extensive damage. Interior sealer or coating damage may result from the abrasive action and/or impact of an ice cap moving within the tank with changing water levels.

CAUTION:
The formation of ice in a tank can result in damage to the tank, its roof (if applicable) and its accessories. The owner/operator must take appropriate steps to limit the formation of ice in the tank.

In any tank, catastrophic structural failure can result from the tremendous forces of ice expansion or the loads created by the weight of ice. Internal accessories, level gauges, overflow weirs, etc., can be ripped from tank walls causing structural damage.

To avoid this type of damage you must limit the formation of ice. There are various devices available to assist in this process, including the use of insulation to control heat loss. It is the owner's responsibility to determine if the use of this tank requires such devices.

The most widely used method to control ice in potable water tanks is to keep turning over the tank contents. It is recommended that pumping schedules be maintained so that water is kept moving during periods of lowest demand. On a daily basis, at least one third of the tank volume should be turned over. If necessary, water may have to be discharged to allow fresh, warmer water to be added. Take care to discharge water in an appropriate manner.

Additionally, on tanks supplied with a roof, roof damage can occur when ice formations come in contact with the roof. To help minimize the chance of this type of damage, the high water level in the tank should be lowered during the winter months to keep ice formations from contacting the roof.

2. THAWING A FROZEN TANK

A tank which has frozen has a high risk of structural damage. A tank which is no longer operational because of excessive ice buildup must be thawed immediately to limit further damage.

The tank thawing process itself can create substantial risks. Experienced contractors should be employed to carry out the work, usually under the guidance of a consulting engineer. If the tank has experienced an extensive ice buildup requiring a thawing-out process, it should be drained and inspected for damage at the earliest opportunity. Your authorized independent Aquastore tank dealer can make this inspection and perform repairs at your direction.

SECTION 4 - INSPECTION and MAINTENANCE

Inspection and maintenance are important parts of the use of every piece of equipment. Your ESPC manufacturer's warranty may provide for certain maintenance responsibilities as conditions of your warranty. You should carefully review the terms of that document. In addition, the following listed steps will help you provide for the minimum maintenance needs of your equipment.

1. INSPECTION and MAINTENANCE DOCUMENTATION

Many successful tank operators have found a maintenance log document to be helpful. Often, forms fulfilling this purpose already exist within the owner's system and can simply be adapted for this use. The frequency, type of activity, and identity of persons performing maintenance should be reflected in the document. Generate a format that best serves your purposes, with the understanding that such a log will be most helpful to you in providing for the successful operation of your tank. Additional information can also be found in the **Aquastore Tank Maintenance Awareness Review**; part number 265307-000.

2. TANK CLEANING

Potable water tanks should be drained and cleaned at least annually to prevent accumulation of silt and sediment which may affect water quality and damage water meters, valves, etc. Normally a water hose with line pressure water is sufficient. Hot water or cleaning additives are not recommended. Do not use high pressure water.

A plan should be established for maintaining adequate water supply during the time the tank is out of service for routine inspection and cleaning. Cleaning schedules may also be appropriate for other types of Aquastore tanks.

3. VISUAL INSPECTION

At the time of the regular tank cleaning, a visual inspection must be made to check the glass coated sheets for any evidence of physical damage. Repairs should be made according to instructions found in the **Manufacturer's Procedure for the Touch-Up and Care of the Glass Coating on Aquastore Tanks**; part number 266468-000. If structural damage is found, contact your authorized independent Aquastore tank dealer for recommended repair methods.

4. LADDERS AND PLATFORMS

Ladder, ladder cage, and platform connection brackets must be visually inspected for corrosion or damage at each use. Replace damaged brackets if required. Ladder rungs should also be visually inspected to assure they are safe for use. If a safety climbing device was specified, follow the manufacturer's instructions on proper care and use.

The installation or use of fixed interior ladders is not recommended as they are susceptible to corrosion and ice damage.

5. VENTILATION FOR ROOFED TANKS

The tank vent is provided to prevent damage to the tank from pressure and/or vacuum created by normal filling and emptying of the tank. It is designed to prevent most birds, insects and debris from entering the tank.

The vent screen must be inspected at least annually. It must be cleared of leaves and debris which would prevent it from functioning properly. The screen can be cleaned by removing the four (4) bolts that secure the top cover. (Two 9/16" wrenches are required.) Lift off the cover and clean the screen thoroughly with a soft brush. Reinstall the cover by reversing the above procedure.

6. OVERFLOW PIPE

Overflow pipes can become clogged with debris. To prevent entry of birds or small animals, the discharge ends should be screened, provided with a flap valve, or other method of closure. The overflow pipe should be kept clear and checked regularly to be certain it operates freely.

7. CATHODIC PROTECTION SYSTEM

Some Aquastore tanks include a manufacturer supplied cathodic protection corrosion control system. In order to comply with warranty requirements, this system must be checked on a periodic basis, and results of all checks must be retained. Your authorized independent Aquastore tank dealer can advise you of the inspections required as they apply to the warranty provided with this tank.

8. GRAFFITI AND VANDALISM

Aquastore sheets can usually be wiped clean of painted-on graffiti without damaging the coating. A hydrocarbon solvent paint remover wiped on the graffiti with a cloth should be sufficient to thoroughly remove painted-on graffiti. If not, a stiff brush can be used to remove paint. Follow label instructions for the paint remover being used, then wash the cleaned area with mild detergent and water. The coating typically does not suffer any damage from organic solvents. Avoid prolonged contact between the solvent and any sealant.

9. DOME ROOF

Some Aquastore tanks include a dome supplied by ESPC. The dome must be inspected annually in order to comply with warranty requirements. Inspect the flashing, batten bar screws, and the handrail for loose and missing hardware. Tighten loose hardware and replace missing hardware as necessary.

Aquastore® Tank Inspection and Maintenance Awareness Review

It is important that tank inspection and maintenance be included as part of your system operation. There are many tank types available, and since they are utilized for a number of purposes, we recommend that you review your intended use with your authorized independent Aquastore tank dealer. As noted below, every Aquastore tank will require periodic inspection and maintenance. You will need to design your system to accommodate those inspection and maintenance requirements.

Exterior and interior inspections and maintenance are needed to keep your Aquastore tank in proper operating condition.

- **Exterior**
  This type of inspection is to be performed yearly and focuses on the exterior portions of the tank. You can do this type of inspection while the tank is in service.
- **Interior**
  This type of inspection is to be performed at least every five (5) years and focuses on the interior portions of the tank. You perform this type of inspection while the tank is *out of service*.

Exterior Inspection (Yearly)

You should inspect the exterior of your tank on a yearly basis. The focus of this section is on those portions of the tank that can be inspected from the exterior, while the tank is in service.

1. Inspect all safety and information related decals for legibility.
2. Inspect overflow pipes, overflow weirs, and pipe terminations to assure that they will perform their design function.
3. Inspect the tank ventilation systems, including screens designed to prevent birds, insects, and debris from entering the tank.
4. Inspect the exterior coating of the tank for possible damage.
5. Inspect ladders, locks, platforms, ladder cages, and safety climbing devices (if specified) for corrosion and/or damage.

For each of the above items you should perform any necessary maintenance and repairs as part of the inspection process.

APPENDIX I

ENVIRONMENTAL MONITORING PLAN

JUNIPER RIDGE LANDFILL EXPANSION APPLICATION
ENVIRONMENTAL MONITORING PLAN

Submitted by:
STATE OF MAINE BUREAU OF GENERAL SERVICES
As Owner
&
NEWSME LANDFILL OPERATIONS, LLC,
As Operator

July 2015

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No. 5144
LICENSED
PROFESSIONAL ENGINEER
6/24/15

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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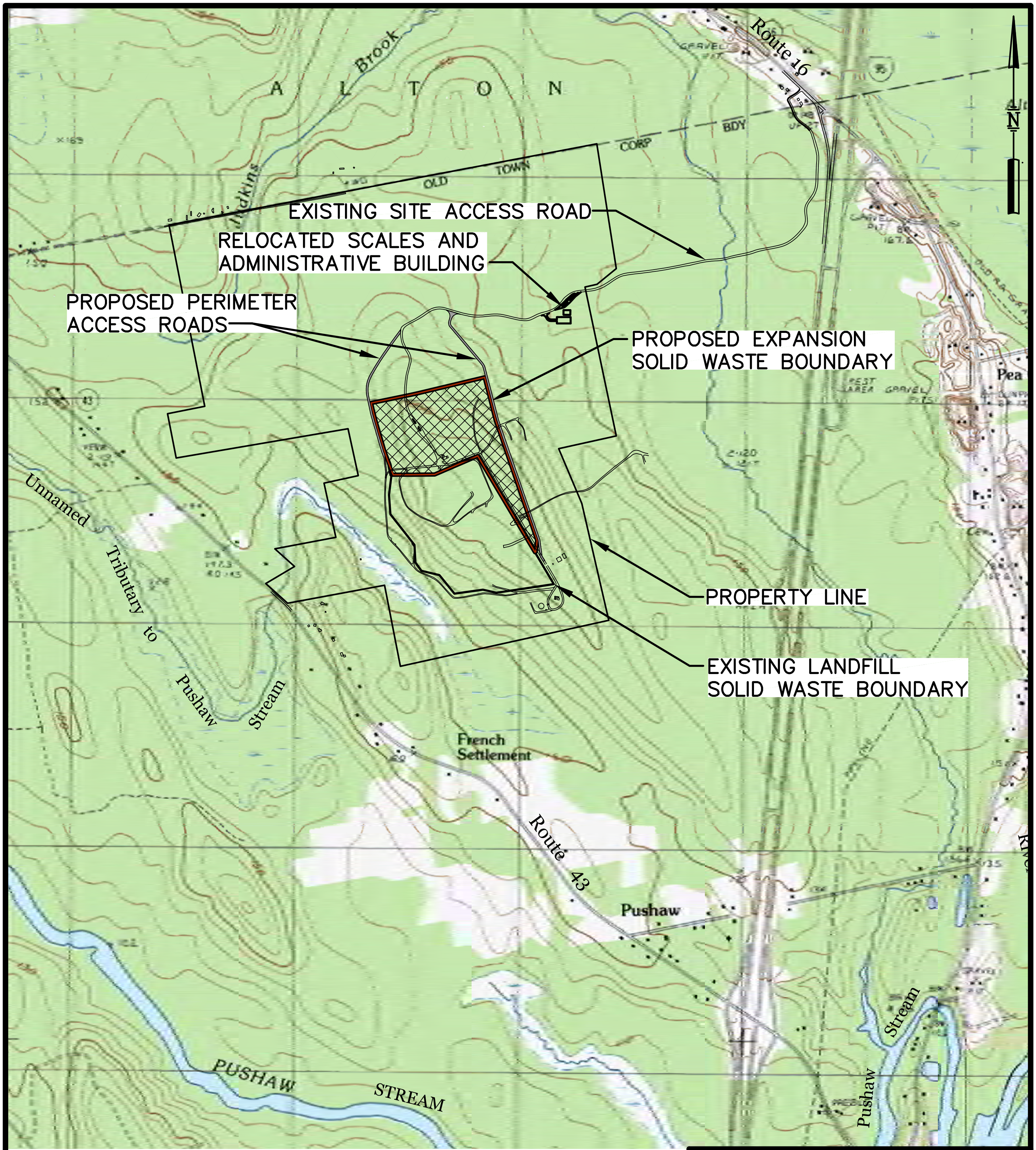
1.0 INTRODUCTION

This document is the Juniper Ridge Landfill (JRL) Environmental Monitoring Plan (EMP) which summarizes the locations, parameters, sampling procedures and analytical techniques proposed to monitor groundwater, surface water, leachate, and landfill gas around the Expansion of the JRL (see Figure 1-1). This document was written as the companion to the current JRL EMP (SME 2015). These two documents will be combined at the time the proposed Expansion is approved by MEDEP as part of the annual revisions to the EMP as required by the Section 401.4.D.4.g of the Maine Solid Waste Management Rules (Rules).



NOTE:

BASE MAP ADAPTED FROM 7.5 MIN USGS TOPOGRAPHIC QUADRANGLE OLD TOWN, MAINE–1988

1000 0 2000 4000 FEET

FIGURE 1–1
SITE LOCATION MAP
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: SITELOC LMN: SITELOC CTB: SME–STD REV: 6/9/2015

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2.0 OBJECTIVES OF THE ENVIRONMENTAL MONITORING PROGRAM

The purposes of monitoring program are as follows:

- to routinely characterize and evaluate groundwater and surface water, in the vicinity of the proposed Expansion Landfill;
- to evaluate the performance of the primary liner systems including routine characterization of the proposed Expansion cell's leak detection fluids; and
- to routinely characterize and evaluate the quality and quantity of leachate generated at the site.

3.0 MONITORING LOCATIONS AND FREQUENCY

The Expansion will include the establishment of a total of 43 monitoring locations consisting of: (1) background and downgradient piezometers and wells; (2) additional surface water sampling points; and (3) leak detection and underdrain monitoring points. Since the Expansion will be developed in a series of cells beginning in 2018, and continuing for a period of about 10 to 12 years, the locations included in the monitoring program will be phased as landfill development proceeds. These monitoring locations are summarized in Table 3-1 and Table 3-2 and their locations are shown on Figure 3-1. The facility's environmental monitoring program sample collection frequency is described in Table 3-3.

3.1 Groundwater Monitoring

The JRL groundwater monitoring locations, related to the proposed Expansion are described in Table 3-1 and are shown on Figure 3-1. These locations will include observation wells (designated as OW-XXX) and monitoring wells (designated as MW-XXX). The observation wells located immediately adjacent to the Expansion boundary are closely spaced and will be monitored for both analytical and field parameters as described in Section 4.0. The monitoring wells are located further from the landfill boundary between the Expansion boundary and the sensitive receptors. The groundwater monitoring locations have been located based upon the hydrogeologic site characterization work. Groundwater monitoring locations will be sampled three times a year (tri-annually) during the spring, summer, and fall seasons for the monitoring parameters list established for the Expansion as described in Section 4.0 and Table 4-1.

3.2 Surface Water Monitoring

The JRL surface water monitoring locations for the Expansion are described in Table 3-2 and are shown on Figure 3-1. The Expansion surface water monitoring locations consist of two (2) sample points located northeast and northwest of the proposed Expansion. Surface water monitoring locations are sampled three times a year (tri-annually) during the spring, summer, and fall seasons for the detection monitoring parameter list established for the site as described in Section 4.0 and Table 4-1.

3.3 Leak Detection and Underdrain Monitoring

The JRL leak detection and underdrain water monitoring locations for the Expansion are described in Table 3-2 and are shown on Figure 3-1. The Expansion leak detection monitoring locations consist of the sampling port on the discharge line at each Expansion cell leak detection pump station. The underdrain sampling location will be at the discharge pipe for the underdrain located on the eastern side of the site (see Figure 3-1). The leak detection pump stations and underdrain will be sampled for the complete list of parameters included in Table 4-1 once per year and for field parameters only for two additional sampling rounds. The same sampling program will be followed for the underdrain and leak detection locations during the operational life of the individual cells. The leak detection locations will also be tested monthly for specific conductance and flow. The results of the monthly monitoring of the leak detection system will be compared to Action Levels defined in the Expansion's Liner Action Plan. If these action levels are exceeded the monitoring parameters may be expanded as described in the Plan.

TABLE 3-1

EXPANSION GROUNDWATER MONITORING WELLS

Landfill Expansion Boundary	Monitoring Well	Geologic Unit Screened	Tentative Screen Interval Depth (feet bgs)
Background	MW-206	Overburden	15 - 20
Background	P-206A	Bedrock	85.5 - 90.5
Background	MW-04-09A	Shallow Bedrock	36 - 39
Background	MW-04-09B	Overburden	13 - 15.5
Eastern	MW-501	Shallow Bedrock	57 - 67
	MW-06-01	Overburden	10 - 20
	MW-502	Bedrock	36 - 46
	MW-503	Bedrock	65 - 75
	OW-601A	Bedrock	88 - 98
	OW-601B	Overburden	51 - 61
	OW-602A	Bedrock	52 - 62
	OW-603B	Overburden	34 - 44
	OW-604A	Bedrock	39 - 49
	OW-605A	Bedrock	32 - 42
	OW-606A	Bedrock	44 - 54
	OW-606B	Overburden	7 - 17
	OW-06-03	Overburden	10 - 15
Northern	MW-504A	Bedrock	117 - 127
	MW-504B	Bedrock	69 - 79
	MW-505	Bedrock	76 - 86
	MW-506	Bedrock	55 - 65
	OW-607B	Overburden	61 - 71
	OW-608A	Bedrock	69 - 79
	OW-608B	Overburden	32 - 42
	OW-609B	Overburden	19 - 29
	OW-04-11A	Overburden	48 - 49
	OW-04-11B	Overburden	9 - 10
Western	MW-507	Bedrock	33 - 43
	MW-508	Bedrock	40 - 50
	OW-610A	Bedrock	27 - 37
	OW-611A	Bedrock	31 - 41
	OW-04-07A	Bedrock	73 - 83
	OW-04-07B	Bedrock	24.5 - 25.5

Notes:

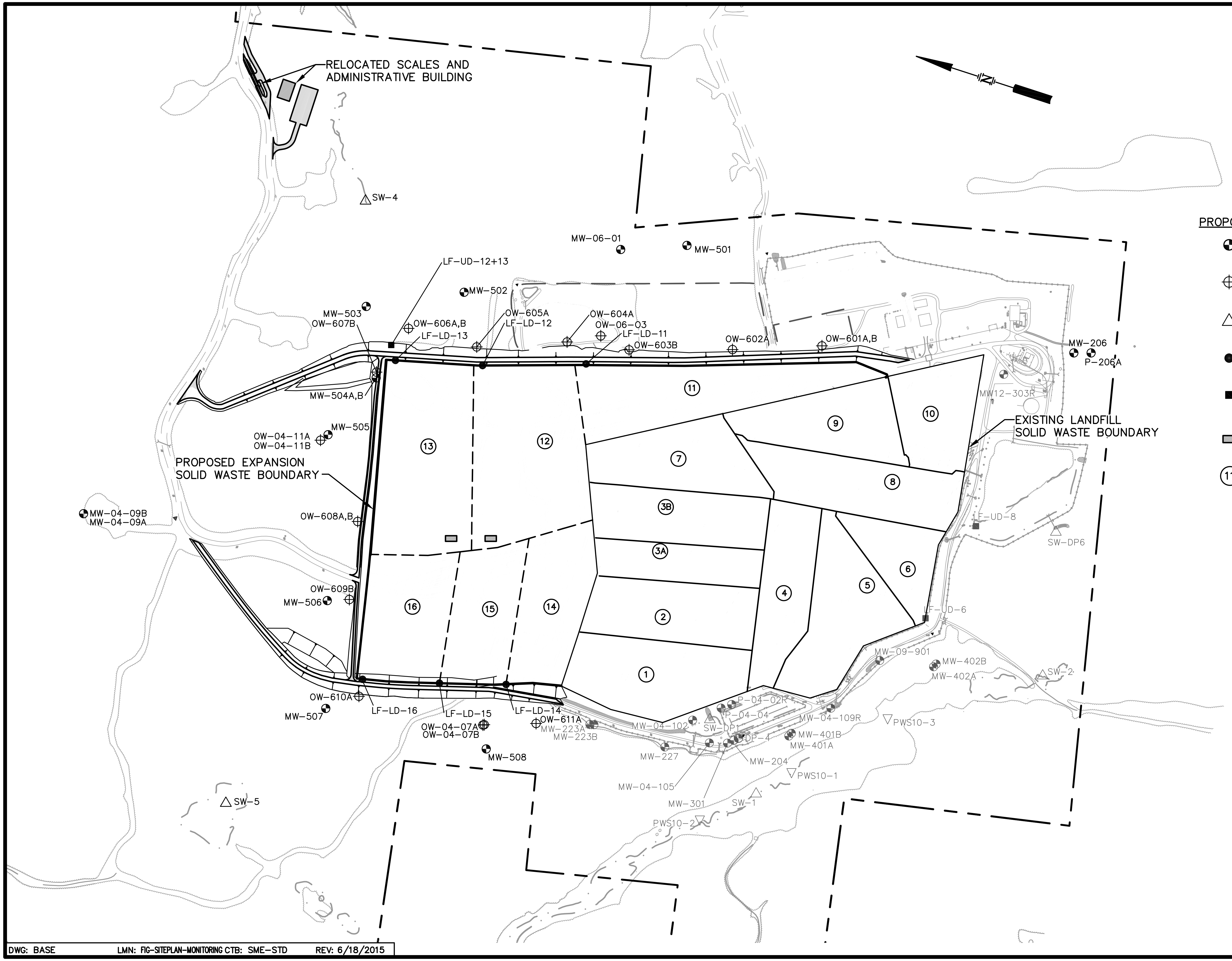
1. Well screen intervals for new wells and piezometers are preliminary and based on: site lithology; 10-foot long screens; overburden screens are two feet above bedrock; and bedrock screens are 25 to 35 feet below bedrock surface.

TABLE 3-2

SURFACE WATER, LEACHATE, UNDERDRAIN, AND LEAK DETECTION MONITORING LOCATIONS

Location Designation	Water Body Description	Collection Method	Position Relative To Landfill	First Recorded	Current Status
SW-4	Surface water feature which drains to unnamed tributary to Judkins Brook East	Grab	Downgradient	NA	To Be Established
SW-5	Surface water feature which drains to unnamed tributary of Pushaw Stream West	Grab	Downgradient	NA	To Be Established
LF-UD-12+13	Cell 12 +13 Underdrain	Grab	Underdrain discharge on Eastern side of Cell 13	NA	To Be Established
LF-LD-11	Cell 11 Leak Detection System	Grab	Eastern Perimeter Dike	NA	To Be Established
LF-LD-12	Cell 12 Leak Detection System	Grab	Eastern Perimeter Dike Leak Detection	NA	To Be Established
LF-LD-13	Cell 13 Leak Detection System	Grab	Eastern Perimeter Dike Leak Detection	NA	To Be Established
LF-LD-14	Cell 14 Leak Detection System	Grab	Western Perimeter Dike Leak Detection	NA	To Be Established
LF-LD-15	Cell 15 Leak Detection System	Grab	Western Perimeter Dike Leak Detection	NA	To Be Established
LF-LD-16	Cell 16 Leak Detection System	Grab	Western Perimeter Dike Leak Detection	NA	To Be Established

Acronyms:
SW-5 – Surface Water Sample Location
LF-UD-12 + 13– Landfill Underdrain Sample Location
LF-LD-11 – Landfill Leak Detection System Sample Location
NA – Not analyzed



LEGEND

PROPOSED		EXISTING
◒	GROUNDWATER SAMPLING LOCATION	◒
⊕	OBSERVATION WELL LOCATION	
△	SURFACE WATER SAMPLING LOCATION	△
●	LEAK DETECTION SAMPLING LOCATION	
■	UNDERDRAIN SAMPLING LOCATION	■
▭	TRANSDUCER LOCATION TO MONITOR GROUNDWATER LEVEL BELOW LANDFILL	
⑪	LANDFILL CELL NUMBERS	

NOTES

1. PW-08-01 TO BE CONVERTED TO MW-504A,B
2. BACKGROUND WATER QUALITY MONITORING WILL BE MONITORED AT MW-206, P-206A, MW-04-09B AND MW-04-09A

250 0 500 FEET

FIGURE 3-1
ENVIRONMENTAL MONITORING LOCATIONS
JUNIPER RIDGE LANDFILL EXPANSION
OLD TOWN, MAINE

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DWG: BASE LMN: FIG-SITEPLAN-MONITORING CTB: SME-STD REV: 6/18/2015

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TABLE 3-3

SAMPLING FREQUENCY

Sample Type	**Location**	**Monitoring Location**	**Characterization Monitoring**[1]	**Monitoring: Detection (D) Field Parameters (FP)**			**Parameters Monthly**[3]
				Spring	**Summer**	**Fall**	
Groundwater	Background	MW-206		D	D	D	
		P-206A					
		MW-04-09A	X	D	D	D	
		MW-04-09B	X	D	D	D	
	Eastern	MW-501	X	D	D	D	
		MW-06-01	X	D	D	D	
		MW-502	X	D	D	D	
		MW-503	X	D	D	D	
		OW-601A	X	FP	D	FP	
		OW-601B	X	FP	D	FP	
		OW-602A	X	FP	D	FP	
		OW-603B	X	FP	D	FP	
		OW-604A	X	FP	D	FP	
		OW-605A	X	FP	D	FP	
		OW-606A	X	FP	D	FP	
		OW-606B	X	FP	D	FP	
		OW-06-03	X	FP	D	FP	
	Northern	MW-504A	X	D	D	D	
		MW-504B	X	D	D	D	
		MW-505	X	D	D	D	
		MW-506	X	D	D	D	
		OW-607B	X	FP	D	FP	
		OW-608A	X	FP	D	FP	
		OW-608B	X	FP	D	FP	
		OW-609B	X	FP	D	FP	
		OW-04-11A	X	FP	D	FP	
		OW-04-11B	X	FP	D	FP	
	Western	MW-507	X	D	D	D	
		MW-508	X	D	D	D	
		OW-610A	X	FP	D	FP	
		OW-611A	X	FP	D	FP	
		OW-04-07A	X	FP	D	FP	
		OW-04-07B	X	FP	D	FP	
Surface Water		SW-4	X	D	D	D	
		SW-5	X	D	D	D	
Leak Detection[2]		LF-LD-11	X		D		X
		LF-LD-12	X		D		X
		LF-LD-13	X		D		X
		LF-LD-14	X		D		X
		LF-LD-15	X		D		X
		LF-LD-16	X		D		X
		LF-LD-11	X		D		X
Underdrain		LF-UD-12+13	X		D		X

Notes
1. Characterization monitoring (four rounds): as contained in Table 4-1. Characterization monitoring will begin prior to waste placement in the Expansion cells.
2. Casella (Juniper Ridge personnel) will complete monthly underdrain and leak detection monitoring.
3. Monthly parameters include: flow and specific conductance.

X = sampled

3.4 Leachate Monitoring

No change to leachate sampling location or frequency. The leachate will be sampled at the leachate storage tank.

3.5 Leak Detection Monitoring

The leak detection discharge location for each cell is shown on Figure 3-1 and described in Table 3-2 will be monitored for three times per year. The leak detection discharge location will also be monitored monthly for flow and specific conductance to monitor the performance of the primary liner system.

3.6 Underdrain Monitoring

An underdrain drainage system consisting of sand, stone, and collection piping will be installed beneath portions of the liner systems of Cells 12 and 13. The underdrain pipe discharge location is shown on Figure 3-1 and described in Table 3-2. The underdrain discharge location is monitored one time per year as part of the facility's detection monitoring program, and monthly for specific conductance and flow.

3.7 Landfill Gas Monitoring

Gas monitoring at the JRL will be performed three times per year (tri-annually) at the groundwater monitoring locations shown on Figure 3-1. The groundwater monitoring location will be monitored for methane equivalent, hydrogen sulfide, oxygen and carbon dioxide.

4.0 SELECTION OF MONITORING PARAMETERS

The environmental monitoring program of the JRL was initiated in March 1990 as part of the landfill site search study performed by SME for Fort James Paper Company of Old Town, Maine. The parameters included for the characterization and detection monitoring have been established based on the ongoing water quality monitoring at the JRL. This list of parameters was last updated in 2015 (SME 2015) with input from MEDEP. Subsequent changes may be made to the facility's detection monitoring program based upon MEDEP's and SME's recommendations.

Water quality and leachate parameters, analytical method references, and practical quantitation limits are presented in Table 4-1. The analytical laboratory will utilize the practices and procedures described in Test Methods for Evaluating Solid Waste (OSWER, SW-846, Third Edition, as revised); Methods for Chemical Analysis of Water and Wastes (EMSL, U.S.EPA 600/4-79/020, revised March 1983); and Standard Methods for the Examination of Water and Wastewater(19th Edition, 1995).

TABLE 4-1

ANALYTICAL PROGRAM

Water Quality Parameter	**Method**	**PQL[1] (mg/l)**
TDS	STM 2540C	10
TSS	STM 2540D	4
Ammonia (NH3-N)	STM 4500 NH3 E	0.5
Arsenic (As)	SW846/6010B/3010A	0.005
Calcium (Ca)	SW846/6010B/3010A	0.3
Iron (Fe)	SW846/6010B/3010A	0.05
Magnesium (Mg)	SW846/6010B/3010A	0.3
Manganese (Mn)	SW846/6010B/3010A	0.05
Potassium (K)	SW846/6010B/3010A	0.3
Sodium (Na)	SW846/6010B/3010A	0.3
Total Organic Carbon (TOC)	SW846/9060A	2.0
Chloride (Cl^-)	SW846/E300/9056	1.0
Sulfate (SO_4)	SW846/E300/9056	2.0
Volatile Organic Compounds (VOCs)[3]	U.S.EPA 8260B	0.001 – 0.01
Sulfide	SW846/9030B	2.5
Total Kjeldahl Nitrogen (TKN)[4]	STM 4500 NH_3E	0.3
Total Phosphorous[5]	U.S.EPA 365.3	0.04
BOD[6]	STM 5210B	5
Copper (Cu)	SW846/6010B/3010A	0.003
Bromide	SW9056	0.1
Nitrate & Nitrite	EPA 353.2	0.05
Total Alkalinity	STM 2320B	1.5
<u>Field Parameters</u>		
Groundwater Elevation	Field Measurement	NA
Specific Conductance	Field Measurement	NA
Dissolved Oxygen	Field Measurement	NA
pH	Field Measurement	NA
Temperature	Field Measurement	NA
Turbidity	Field Measurement (APHA 2130)	NA
Eh	Field Measurement	NA
Monitoring Well Pumping Rate	Field Measurement	NA
Surface Water Flow Rate	Field Measurement	NA
Field Observations	Field Observations	NA

<u>Notes</u>:

1. Practical Quantitation Limits (PQLs) have been defined by U.S.EPA as up to 10 times the method or instrument detection limit and therefore may vary between laboratories.
2. NA = Not Applicable.
3. VOCs are the 47 organic constituents listed in Appendix I of 40 CFR Part 258. PQLs for VOCs are reported as µg/L. After two round of Characterization monitoring these compounds will only be sampled in the landfill leachate on a routine basis.
4. Monitoring wells and leachate only.
5. Surface waters and underdrain only.
6. Surface waters only.

<u>Method Reference</u>: The analytical methods selected are presented in <u>Test Methods for Evaluating Solid Waste</u>, OSWER, SW-846, Third Edition, as revised; Methods <u>for Chemical Analysis of Water and Wastes</u>, EMSL, EPA-600/4-79-020, revised March 1983; and <u>Standard Methods for the Examination of Water and Wastewater</u>, APHA, 19th Edition, 1995. Equivalent and appropriate analytical methods may be substituted with Juniper Ridge Landfill approval, e.g. manual for automated and vice versa.

5.0 SAMPLING PROCEDURES

This section describes the protocols involved in sampling groundwater, surface water, leachate, leak detection, and underdrains at the JRL.

5.1 Groundwater Sampling

Upon arrival at each sampling location, the sampling personnel will observe the physical condition of the monitoring wells. The inspection will include checking the condition of the ground surface seal and the well guard pipe to ascertain any evidence of frost-heaving, cracks, or vandalism. The condition of the monitoring well will be recorded on the field data records. Periodically, the area around the well may have to be cleared of weeds or other materials prior to beginning this sampling activity.

Following inspection of the sampling location, the water level in the well casing will be measured by lowering a clean electronic sounding probe into the well until contact is made with the water surface. The distance from the reference elevation to the water contact will be entered in the field records. Water levels in the monitoring wells will be determined to the nearest 0.01 foot. In all cases, the depth to water will be referenced to the top of the polyvinyl chloride (PVC) well casing (i.e. permanently marked measurement reference point). In cases where water is flowing from the well casing, the water level will be noted as such. Upon removal of the water level probe, it will be decontaminated as described in Subsection 6.1.

5.1.1 Low-flow Sampling Procedure. The low-flow sampling procedure, which uses flow rates of 100 to 200 milliliters per minute (mL/min), will be used to collect the water quality samples from monitoring wells at the site. The objective of the sampling is to minimize the drawdown and disturbance in the well in order to obtain a sample that is representative of the in situ water chemistry. SME will performed a low-flow groundwater sampling assessment during the first monitoring event for each groundwater monitoring location as they are added to the monitoring program. The low-flow sampling criteria for each monitoring well will be determined by implementing the assessment procedure summarized in Appendix A of this EMP. Table 5-1 will be updated to reflect these analyses. As new monitoring wells are installed, the associated well installation diagrams will be incorporated into Appendix B.

Sampling equipment for each monitoring location will consist of a peristaltic pump with dedicated tubing in each monitoring well. Monitoring wells with static water levels greater than 25 feet below ground surface will be sampled using a dedicated bladder pump. Equipment used to measure field parameters must be calibrated on a daily basis.

Dedicated sampling tubing will be placed in the well a minimum of 24 hours before sampling. The bottom of the tubing or pump inlet will be positioned at the middle of the screened interval, or in the middle of the water column if the water table is in the well screen. Tubing, pumps, or measuring devices will not be placed into the water column within 24 hours of sampling or during sampling of the well.

TABLE 5-1

LOW-FLOW SAMPLING CRITERIA

Monitoring Well	Sampling Equipment	Screened Zone[1] (ft below ground)	Well Diameter (in.)	Recommended Flow Rate (ml/min)	Results of Low-Flow Rate Sampling Assessment	Recommended Sample Collection Criteria
MW-206	peristaltic pump w/ dedicated tubing	15.0 – 20.0	2	100	Grab	3TV, CS, MFP
P-206A	peristaltic pump w/ dedicated tubing	85.5 – 90.5	3/4	100	STD	STD, 3MR, CS
MW-04-09A	peristaltic pump w/ dedicated tubing	36 – 39	1			
MW-04-09B	peristaltic pump w/ dedicated tubing	13 – 15.5	1			
MW-501	peristaltic pump w/ dedicated tubing	57 – 67	2			
MW-06 -01	peristaltic pump w/ dedicated tubing	10 – 20	2			
MW-502	peristaltic pump w/ dedicated tubing	36 – 46	2			
MW-503	peristaltic pump w/ dedicated tubing	65– 75	2			
OW-601A	dedicated bladder pump	88 – 98	1			
OW-601B	peristaltic pump w/ dedicated tubing	51 – 61	1			
OW-602A	peristaltic pump w/ dedicated tubing	52 – 62	1			
OW-603B	peristaltic pump w/ dedicated tubing	34 – 44	1			
OW-604A	peristaltic pump w/ dedicated tubing	39 – 49	1			
OW-605A	peristaltic pump w/ dedicated tubing	32 – 42	1			
OW-606A	peristaltic pump w/ dedicated tubing	44 – 54	1			
OW-606B	peristaltic pump w/ dedicated tubing	7 – 17	1			
OW-06-03	peristaltic pump w/ dedicated tubing	10 – 15	1			
MW-504A	peristaltic pump w/ dedicated tubing	117 – 127	2			
MW-504B	peristaltic pump w/ dedicated tubing	69 – 79	2			
MW-505	peristaltic pump w/ dedicated tubing	76 – 86	2			
MW-506	peristaltic pump w/ dedicated tubing	55 – 65	2			
OW-607B	peristaltic pump w/ dedicated tubing	61 – 71	1			
OW-608A	peristaltic pump w/ dedicated tubing	69 – 79	1			
OW-608B	peristaltic pump w/ dedicated tubing	32 – 42	1			
OW-609B	peristaltic pump w/ dedicated tubing	19 – 29	1			

TABLE 5-1 (cont'd)

LOW-FLOW SAMPLING CRITERIA

Monitoring Well	Sampling Equipment	Screened Zone[1] (ft below ground)	Well Diameter (in.)	Recommended Flow Rate (ml/min)	Results of Low-Flow Rate Sampling Assessment	Recommended Sample Collection Criteria
OW-04-11A	peristaltic pump w/ dedicated tubing	48 –49	1			
OW-04-11B	peristaltic pump w/ dedicated tubing	9 – 10	1			
MW-507	peristaltic pump w/ dedicated tubing	33 – 43	2			
MW-508	peristaltic pump w/ dedicated tubing	40 – 50	2			
OW-610A	peristaltic pump w/ dedicated tubing	27 – 37	1			
OW-611A	peristaltic pump w/ dedicated tubing	31 – 41	1			
OW-04-07A	peristaltic pump w/ dedicated tubing	73 – 83	1			
OW-04-07B	peristaltic pump w/ dedicated tubing	24.5 – 25.5	1			

Notes:

1. These are approximate screen lengths. Exact numbers will replace these upon well installation.

Sample collection criteria designations:

3MR: 3-Minute interval field parameter readings to verify field parameter stabilization.
1TV: Purge 1 tubing volume at low flow rate.
CS: Collect sample.
MFP: Measure field parameters.
STD: Standard low-flow sampling procedure.
NA: Not applicable.

Procedure for Wells Where Drawdown Stabilizes.

1. Low flow rates will be used for purging, as specified in Table 5-1.

2. Water level measurements must be recorded at five-minute intervals until drawdown stabilization has been achieved. The static water level and the pumping start time must be recorded as the first reading on the second page of the Monitoring Well Sample Purging Form (see Appendix C). All subsequent field measurements will also be recorded on the Monitoring Well Sample Purging Form.

3. Until drawdown stabilizes, field parameters (i.e. pH, specific conductance, and turbidity) must be monitored and recorded at 10-minute intervals.

4. Once drawdown stabilization is achieved and two successive 10-minute interval field parameter measurements meet the conditions listed below, complete stabilization will be verified by three successive field parameter measurements at 3-minute intervals, which also meet the conditions listed below:

   pH: ± 0.1 standard pH unit with respect to previous pH measurement;
   Specific conductance: ± 5% of previous measurement
   Turbidity: ± 10% of previous measurement when turbidity is above 10 nephelometer turbidity units (NTU)
   ±1 NTU with respect to previous measurement when turbidity is below 10 NTU
   Dissolved oxygen: ±1 mg/L when D.O. is greater than 1 mg/L; ±0.1 mg/L when D.O. is less than 1 mg/L

   Note: It is possible for the field parameters to stabilize prior to or at the same time as the drawdown.

5. Once complete stabilization has been achieved and a complete set of field readings has been measured (i.e. temperature, pH, specific conductance, turbidity, and DO), the samples will be collected in appropriately preserved containers. The sampling personnel will complete and attach labels to each sample container for the location of interest. Table 5-2 presents the minimum information to be supplied on each container. Samples will be obtained directly from the pump discharge line. Following completion of sampling, the monitoring well will be secured with protective devices and the field instrumentation will be decontaminated as described in Subsection 6.1.

TABLE 5-2

SAMPLE LABEL INFORMATION

Site Name
Sample Location
Sampler Name/Company
Sample Collection Date
Sample Collection Time
Analyses to be Performed
Preservative Used

Procedure for Wells Where Drawdown Does Not Stabilize

1. Purge one tubing volume at the flow rate specified in Table 5-1.

2. Collect samples in appropriately preserved and labeled containers as previously described.

3. Measure field parameters (i.e. temperature, pH, specific conductance, turbidity, and DO) as soon as possible after sample collection.

4. Following completion of sampling, secure the monitoring well with protective devices and decontaminate the field instrumentation as described in Subsection 6.1.

5.2 Surface Water Sampling Procedure

Surface water will be collected in the following manner:

1. Collect the sample by immersing the sample bottle not more than 1 foot below the water surface. If a stream is being sampled, the sample will be upstream of the sampler with the opening of the sampling device oriented upstream, but avoiding floating debris.

2. Directly fill the appropriate sample containers from the sampling device if needed.

3. If possible, measure the following parameters in the water body, not the sample:

   - temperature
   - pH
   - specific conductance
   - DO
   - turbidity

   If direct measurement is not possible, these parameters will be measured from water remaining in the sampling device or another sample bottle. This information will be recorded in the sample data record, sample labels will be completed, and the chain-of-custody (COC) procedures will be initiated.

4. Estimate surface water flow rate. The surface water flow rate will be measured at all surface water sample locations. The flow rate will be determined by measuring the depth of flow and correlating the depth of flow to a stage-discharge curve. A stage-discharge curve will be calculated for each location using the geometry of the channel or culvert and applying an open-channel flow equation (i.e., Manning's equation). The stage-discharge curves for each surface water sampling location will be included on the Surface Water Sample Data Record for each sampling location.

5. Complete the Surface Water/Leachate Sample Data Record (see Appendix C).

5.3 Leachate, Leak Detection, and Underdrain Sampling Procedure

Leachate, leak detection, and underdrain samples will be collected in the following manner:

The samples of the leachate, and leak detection fluids will be collected from the sampling ports installed at the leachate and leak detection pump stations. Samples of the underdrain water quality will be collected from the discharge end of the underdrain pipe.

For all leachate, leak detection, and underdrain samples, measure the following parameters in a separate sample bottle:

- temperature
- pH
- specific conductance
- DO
- turbidity
- total alkalinity

The flow rate for leachate and leak detection systems will be read from the pump station flow meter and in the underdrain discharge pipe will be measured by timing the filling of a container of known volume, if possible, or by approximating the flow level in the discharge pipe and calculating the flow using a stage-discharge curve (Manning’s equation) as described in Section 5.2.

This information will be recorded in the Surface Water/Leachate Sample Data Record (see Appendix C), sample labels will be completed, and the COC procedures will be initiated.

5.4 Sample Volume, Preservation, and Holding Times

Obtaining required sample volumes and observation of procedures for sample preservation and allowable holding times are necessary to yield test results that will be representative of site conditions. Table 5-3 summarizes the sample volume, preservation, and holding time requirements for parameters to be collected.

TABLE 5-3

SAMPLE HANDLING, PRESERVATION, AND HOLDING TIME

Parameters[1]	Container	Preservation	Holding Time (days)
TKN	250 ml (P)	4°C, H_2SO_4 to pH <2	28
Metals	250 ml (P)	HNO_3 to pH <2	180
TOC	40 ml (G)	4°C, H_2SO_4 to pH <2	28
TDS, TSS, Cl^-, SO_4, NO_3 –N, HCO3Total Alkalinity, Bromide	1,000 ml (P)	4°C	2
COD/Ammonia/TKN	250 ml (P)	4°C H_2SO_4 to pH <2	28
BOD	500 ml (P)	4°C	1
Tannin/LigninNO_2-N, NO_3-N	250 ml (P)	4°C H_2SO_4 to pH <2	728
Total Phosphorous	250 ml (P)	4°C, H_2SO_4 to pH <2	28
Sulfide	250 ml (P)	4°C, NaOH, ZNAC	28
VOCs	40 ml (G)x3	4°C, HCL, pH <2	14

Notes:
1. Parameter combinations and sample volume requirements may vary between laboratories.
2. Holding times are calculated from the time of sample collection. The most restrictive holding time is presented for each parameter group.
3. G = Glass
   P = Plastic

5.4.1 Sample Volume. A minimum sample volume must be obtained from each monitoring location to allow the laboratory to perform the required testing. Table 5-3 presents the minimum sample volumes and container composition required for the monitoring program.

5.4.2 Sample Preservation. Preservation of collected samples is accomplished by refrigerating samples at 4 degrees Celsius (°C) and, in some cases, by acidification. (Aqueous samples scheduled for metals analyses need not be refrigerated.)

Table 5-3 summarizes preservation requirements for each sample. When acidification is required, disposable pipettes will be used to introduce the preservative into the sample container. After adding the appropriate amount of preservative to the sample container, the container will be capped and gently inverted several times to mix the preservative and the sample. Samples will be spot-checked with a pH meter or pH paper to confirm that the preservation procedure is adequate. In no case will the pH meter be introduced into the sample bottle. A portion of the bottle contents will be poured into a separate clean container and the pH will be verified. In most cases, bottles will arrive from the laboratory prepreserved.

Physical preservation of the samples will be accomplished by storing the filled sample bottles in covered insulated coolers constructed of impact resistant plastic. Efforts will be made to pack the coolers so that sample bottles are not subject to movement or breakage (see Subsection 7.2).

5.4.3 Holding Times. Analytical testing of samples must be completed within specified holding times to yield representative results. Table 5-3 summarizes the maximum allowable holding time for each sample type. In preparing for each sampling episode, the sampling personnel will prepare schedules that will permit adequate laboratory notification and sample delivery to allow testing within the allowable holding times.

5.5 Standard Gas Monitoring Procedure

Landfill gas will be monitored at the wellhead of the monitoring wells, (see Figure 3-1) three times per year, using a hand-held meter such as a GEM 2000 Combustible Gas Indicator, or similar equipment.   The meter will be calibrated to a methane standard in accordance with the manufacturer's instructions. The monitoring procedure is as follows:

1. Note the weather conditions at the time of sampling.
2. Remove the protective cap from the monitoring well.
3. Insert the meter's inlet tube approximately two inches into the top of the monitoring well. Set the operation mode of the meter to measure percent gas (methane equivalent) by volume. Measure the percent methane equivalent by volume and record the measurement on the Gas Monitoring Form (see Appendix C).

4. If the meter indicates less than 5 percent methane equivalent by volume, set the operation mode of the meter so that it measures in percent Lower Explosive Limit (LEL). Measure the percentage of the LEL for methane and record the measurement on the Gas Monitoring Form. (Note: The LEL for methane is 5 percent by volume or 50,000 parts per million.)
5. Measurements recorded as the percentage of the LEL for methane will be converted to percent methane equivalent by volume using the following calculation:

   LEL Conversion: (%LEL/100) x 5 = % Volume
6. Purge the instrument with fresh air in accordance with the manufacturer's instructions.
7. Proceed with the well purging and sampling procedure specified in Section 5.0.

5.6 Sampling Quality Control

Sampling quality control (QC) will include the proper decontamination of sampling equipment prior to use; regular calibration of field equipment to measure temperature, pH, DO, turbidity, and specific conductance; collection of duplicate samples for laboratory testing; and analysis of trip blanks when sampling for volatile organic compounds (VOCs).

5.6.1 Equipment Blanks. Dedicated tubing will be used at the current monitoring well locations, thereby eliminating the need for equipment blanks. Dedicated equipment also will be used in the proposed monitoring wells installed during development of the proposed phases.

5.62 Duplicate Samples. Duplicate samples will be collected at a rate of 10 percent during each sampling event. The duplicate sample identification will be such that the sampling location is unknown to the laboratory. The duplicate will be analyzed for the same parameters as its companion sample.

5.6.3 Trip Blanks. Trip blanks are required to detect additional sources of contamination that might potentially influence VOC concentrations reported in actual samples both quantitatively and qualitatively. A trip blank consists of a set of sample bottles filled at the laboratory with laboratory demonstrated analyte-free water. The following requirements will be observed:

- Trip blanks must be handled, transported, and analyzed in the same manner as the VOC samples acquired that day, except that the sample containers themselves are not opened in the field. Rather, they just travel with the sample collector.
- The temperature of the trip blanks must be maintained at 4°C while on-site and during shipment.

6.0 DECONTAMINATION OF EQUIPMENT

Decontamination of sampling equipment is required both before initiation of sampling and between each sample location to minimize the potential for cross-contamination of samples with the analytes of interest. When conducting decontamination activities, as well as when handling cleaned equipment prior to and during sampling, clean nitrile or PVC gloves will be worn to further reduce potential for contamination.

6.1 Field Instrumentation

Field instrumentation (i.e. pH, specific conductance, D.O., turbidity, and temperature probes) under no circumstances, will be introduced into a sampling device or sample bottle. However, to minimize latent influences between sampling locations, the probes and flow-through cell will be rinsed with clean water and, when appropriate, wiped dry with clean paper towels. The electronic water level probe will be introduced into monitoring wells prior to the purging process. Upon extraction from each well, the probe and associated electronic leads will be washed with consecutive rinses of clean water.

6.2 Sampling Equipment

A peristaltic pump with dedicated tubing will be used at most well locations, thereby eliminating the need for sampling equipment decontamination. One monitoring well is sampled using a bladder pump, which also contains dedicated tubing.

7.0 SAMPLE CUSTODY

Sample COC procedures will be followed during sample collection and handling activities in both the field and laboratory operations. These procedures ensure that each sample is accounted for at all times. To maintain the highest degree of control in sample handling, preprinted labels will be used so that all necessary information is retained with the sample. COC records will be used to maintain control over sample access during and after shipment from the location of sample collection. Additionally, proper completion of field sample logs, accession books, tracking sheets, and extraction logs by appropriate field and laboratory personnel will provide for thorough monitoring of the samples from collection through analysis and final report generation.

The objective of sample identification, COC, and monitoring procedures is to ensure that:

- All samples collected for analysis are uniquely labeled for identification purposes throughout the analytical process.
- Samples are correctly analyzed and results are traceable to field records.
- Important sample characteristics are preserved.
- Samples are protected from loss, damage, or tampering.
- Any alteration of samples (e.g. preservation or damage due to shipment or other processes) is documented.
- A record of sample integrity and analytical fate is established.

Samples to be collected from the Landfill will be identified in accordance with SME's standard procedure. A copy of the sample identification procedure is in Appendix D.

7.1 Sample Monitoring Forms

The use of forms accomplishes one or more of the specific objectives of sample custody, identification, or control. Standard SME forms will be utilized as discussed in the following subsections. These include the COC Record, Monitoring Well Sample Purging Form, Surface Water Sample Data Record, and the Instrument Calibration Form. A copy of each form is in Appendix C.

7.1.1 Chain-of-Custody Record. The COC Record (see Appendix D) is completed in the field by the person physically in charge of sample collection. The COC Record must be completed prior to shipment of samples to the laboratory. The COC Record contains information on the date and time of sample collection, the sampler, the project name and number, the laboratory project number, the number of containers of each sample being shipped, and an itemization of the analyses requested for each sample, together with any remarks about the sample prior to shipment. The COC Record is enclosed with the samples after it has been signed by the sampler. It is then signed each time possession of the samples changes, with the signatures of the people relinquishing and receiving the sample, as well as the time of exchange, indicated on the form.

7.1.2 Monitoring Well, Surface Water, and Leachate Monitoring Forms. The Monitoring Well Sample Purging Form, Surface Water, and Leachate Monitoring Forms (see Appendix C) will be completed in the field by the person placed in charge of sample collection. These forms correlate the assigned sample bottle designation to a specific well or sample location or other distinguishing feature or attribute (e.g., duplicate sample). The forms also list pertinent sampling information that must be recorded at the time of sample collection (e.g. day and time of sampling, and pH, specific conductance, temperature, DO, and turbidity measurements).

7.1.3 Instrument Calibration Form. Field instrument calibration procedures will be recorded on the Instrument Calibration Form (see Appendix C) on a daily basis.

7.2 Packing and Shipping

In addition to sample collection and preservation requirements, especially the maintenance of sample temperatures at 4°C until extraction or analysis, samples will be packed and shipped so as to maintain the sample container integrity and the health and safety of sample transporters.

Sample containers are generally packed in picnic coolers for shipment. Bottles will be packed tightly so that no motion is possible. Styrofoam, vermiculite, and "bubble-pack" are suitable in most cases. (High-hazard samples require different packing.) Ice is placed in double Ziploc® bags and added to the cooler, along with all paperwork in a separate Ziploc® bag. The cooler top is then taped shut. Custody seals and taping of coolers may be required for certain samples.

The standard procedures for shipping environmental samples to the analytical laboratory are as follows:

1. All shipping of environmental samples must be done via Federal Express or an equivalent overnight delivery service.

2. If prompt shipping and laboratory receipt of the samples cannot be guaranteed (i.e. Sunday arrival), the samplers will be responsible for proper storage of the samples until suitable transportation arrangements can be made.

The laboratory must be kept informed of all field sampling activities. This communication is critical to allow the laboratory enough time to prepare for arrival of the samples. The samples are shipped to the laboratory together with the COC documents.

8.0 QUALITY ASSURANCE/QUALITY CONTROL

Quality assurance (QA)/QC is an integral part of this sampling and analytical program to allow assessment of the adequacy of analytical results for their intended use. QA/QC activities associated with sampling include the use of standardized collection procedures and sample data records (as described previously), calibration of field instruments, and COC procedures. Analytical QA/QC involves the use of approved analytical protocols by qualified laboratories. Analytical data quality is assessed through review of method-specified QC data, to be delivered along with the analytical results.

8.1 Data Validation

The following data validation methods will be used to verify the accuracy and precision of the reported results:

- Chain of Custody for each sample is continuous and included with report.
- Verification that all sample holding times were met.
- TDS/specific conductance calculated. Samples outside range (0.55 – 0.75) identified.
- Calculation and tabulation of relative percent differences. Values >10 percent reported.
- Identification of values falling outside of historical (>5 sample rounds) range.
- Identification of parameters present in equipment blanks:
    - Not applicable: dedicated equipment used for all samples.
- Identification of parameters present in trip blanks:
- Identification of wells whose depths have changed since construction.

8.2 Statistical Analysis

Where data is sufficient, statistical analysis of the sample data from each monitoring well will be completed and reported annually. The statistical analysis will consist of box and whisker plots which will be used to identify trends in the data. The box and whisker plots will graphically illustrate the annual ranges and medians for each parameter’s analytical result. Calculation of the median values will exclude outliers which are defined as a data point that falls at least three standard deviations from the rest of the data for the year. A trend line for parameters will be developed from the median values using a fast Fourier transform. Parameters will be plotted which are indicative of the leachate quality or the geochemical effects of the leachate in the natural soils or bedrock.

9.0 REPORTING REQUIREMENTS

Monitoring data will be submitted to MEDEP within 30 days of the NEWSME's receipt of the evaluation of laboratory results. This data transmittal will also include a tabulation (in electronic format) of the monthly measurements of the landfill's underdrain system. A report summarizing the results of the environmental monitoring program, historical data summaries, including analytical and field data in an electronic format, statistical analyses, and recommendations for any proposed changes will be submitted to MEDEP annually.

10.0 WELL ABANDONMENT PROCEDURE

Some monitoring wells and piezometers designated for sampling by this EMP will be abandoned as construction progresses. They will be sealed in a manner appropriate to geologic conditions at each location, as follows:

1. Remove all material installed in the original borehole, including casing, screen, and annular materials, to the greatest extent possible.

2. Seal the borehole by pressure injection from bottom to top with cement bentonite or other appropriate material to within 5 feet of the ground surface. The upper 5 feet may be backfilled with native material and the entire site must be restored to a safe condition.

3. Document the abandonment through a written description of the procedures, drilling methods and depths, borehole depth, and volume and type of sealant used.

REFERENCES

Sevee & Maher Engineers, Inc. (SME), 2015. Environmental Monitoring Plan Juniper Ridge Landfill, Old Town, Maine, Revised March 2015.

APPENDIX A

LOW-FLOW GROUNDWATER SAMPLING ASSESSMENT AND SAMPLING PROCEDURE

LOW-FLOW GROUNDWATER SAMPLING ASSESSMENT AND SAMPLING PROCEDURE

OBJECTIVES

To perform both a low-flow sampling assessment and to sample each individual well at the same time the assessment is being performed.

SAMPLING PROCEDURES

The following sampling procedures should be followed for this Low Flow Assessment/ Sampling Event:

1. Obtain static water level.
2. Begin pumping the well at a flow rate of 200 ml/min. In the event the well drawdown is equal or greater than 1 foot during a five minute period, the flow rate will be reduced to 100 ml/min.
3. During the first ten minutes of pumping, the water level measurements should be taken at two minute intervals. A set of field parameters should be taken at the five and ten minute marks.
4. Both field parameters and water level measurements will then be measured at five minute intervals. These five minute readings will continue until one of the four conditions described below are met. Once one of the following four conditions are met, a complete set of field measurements will be obtained (i.e., temperature, pH, specific conductance, dissolved oxygen, and turbidity) prior to filling the sample bottles. All samples will be obtained through the peristaltic pump. None of the samples will be filtered. Once sampling is complete, obtain a bottom depth from the well (annual requirement) and lock the well.

Condition 1

Both field parameters and water levels stabilize within 30 minutes. The stabilization criteria is listed below.

Complete stabilization will be verified by three successive field parameter and water level measurements at 3-minute intervals, which meet the following criteria::

pH:	± 0.1 standard pH unit with respect to previous pH measurement
Specific conductance:	± 5% of previous measurement
Turbidity:	± 10% of previous measurement when turbidity is above 10 nephelometer turbidity units (NTU)
	± 1 NTU with respect to previous measurement when turbidity is below 10 NTU

Condition 2

A drawdown of three feet from the static water level has occurred.

Condition 3

A time period of 30 minutes has elapsed and the field parameter stabilization listed in Condition 1 has been met.

Condition 4

A time period of one hour has elapsed without field parameter or water level stabilization.

5. A note should be made that in rare cases, the water level in the well being sampled may drawdown and approach the tubing inlet. If the field sampler feels that he may not be able to obtain the appropriate sample volume from the well due to this condition, the sampler should use his best judgement and collect the water sample prior to meeting any of the four conditions listed above.

6. Sampling procedure should be documented and duplicated for all successive sampling rounds.

APPENDIX B

MONITORING WELL INSTALLATION DIAGRAMS
(New Wells and Piezometers to be added when installed)

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT Sevee & Maher Engineering, Inc.

SHEET 1 OF 3

HOLE NO. P-04-07 ~~P-04-03~~

DRILLER Tom Schaefer

PROJECT NAME West Old Town Landfill, 03076.09

LINE & STATION

M.T.B. JOB NUMBER 04-095-A

LOCATION Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	NQ2
SIZE I.D.	4"	1 3/8"	2"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE 07/22/04 Start

DATE 07/28/04 Finish

SURFACE ELEVATION

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
Auger											0.2	Topsoil
"	1D	2"	24"	22"	2.0	3	3	9	20		0.5	Gray Brown Fine Sandy Silt
"												Mottled Silty Fine Sand,
"	2D	2"	24"		4.0	28	46	32	32		3.0	w/Little Coarse Sand & Gravel
130	3D	2"	10"		4.8	24	50					Olive Silty Fine Sand
Spun											4.0	w/Little Coarse Sand, Gravel & Cobbles
Casing												Olive Silty Fine Sand,
											4.8	w/Little Coarse Sand & Gravel
	1R	3"	4.5'	4.5'	11.5	100%						
	2R	3"	5.0'	5.0'	16.5	100%						
	3R	3"	5.0'	5.0'	21.5	100%						
												Rock
	4R	3"	5.0'	5.0'	26.5	100%						
	5R	3"	5.0'	5.0'	31.5	100%						
	6R	3"	5.0'	5.0'	36.5	100%						

SAMPLES

D = SPLIT SPOON R = ROCK CORE

C = 2" SHELBY TUBE

S = 3" SHELBY TUBE V = VANE TEST

U = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:

☒ DRILLER-VISUALLY

☐ SOIL TECHNICIAN-VISUALLY

☐ LABORATORY TESTS

REMARKS:
Washed ahead from 4.0' to 7.0';
Artesian Pressure @ 25.0'

HOLE NO. P-04-03

MAINE TEST BORINGS, INC. BREWER, MAINE 04412	CLIENT Sevee & Maher Engineering, Inc.	SHEET 2 OF 3 HOLE NO. ~~P-04-03~~ P-04-07
DRILLER Tom Schaefer	PROJECT NAME West Old Town Landfill, 03076.09	LINE & STATION
M.T.B. JOB NUMBER 04-095-A	LOCATION Old Town, ME	OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	NQ2
SIZE I.D.	4"	1 3/8"	2"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE	DATE
07/22/04 Start	07/28/04 Finish

SURFACE ELEVATION

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
	7R	3"	5.0'	5.0'	41.5	100%						
	8R	3"	5.0'	4.0'	46.5	80.%						
	9R	3"	4.2'	4.7'	50.7	111.9%						
	10R	3"	4.3'	5.0'	55.0	116.3%						
	11R	3"	3.2'	3.2'	58.2	100%						Rock
	12R	3"	5.0'	5.0'	63.2	100%						
	13R	3"	5.0'	4.8'	68.2	96%						
	14R	3"	5.0'	5.2'	73.2	104%						
	15R	3"	4.5'	4.5'	77.7	100%						

SAMPLES
D = SPLIT SPOON R = ROCK CORE
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE V = VANE TEST
U = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
☒ DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

REMARKS:
Washed ahead from 4.0' to 7.0';
Artesian Pressure @ 25.0'

HOLE NO. P-04-03

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT Sevee & Maher Engineering, Inc.

SHEET 3 OF 3

HOLE NO. P-04-07 ~~P-04-03~~

DRILLER Tom Schaefer

PROJECT NAME West Old Town Landfill, 03076.09

LINE & STATION

M.T.B. JOB NUMBER 04-095-A

LOCATION Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	NQ2
SIZE I.D.	4"	1 3/8"	2"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE	DATE
07/22/04	07/28/04
Start	Finish

SURFACE ELEVATION

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
	16R	3"	5.0'	5.0'	82.7	100%						
	17R	3"	5.0'	5.0'	87.7	100%						
	18R	3"	5.0'	4.8'	92.7	96%						Rock
	19R	3"	4.8'	5.0'	97.5	104%						
	20R	3"	5.0'	4.9'	102.5	98%						
	21R	3"	5.0'	4.8'	107.5	96%					107.5	

Bottom of Boring @ 107.5'
Piezometer Installed @ 83.0'
Piezometer Installed @ 25.4'

SAMPLES

D = SPLIT SPOON	R = ROCK CORE
C = 2" SHELBY TUBE	V = VANE TEST
S = 3" SHELBY TUBE	
U = 3½" SHELBY TUBE	

SOIL CLASSIFIED BY:

- ☒ XX DRILLER-VISUALLY
- ☐ SOIL TECHNICIAN-VISUALLY
- ☐ LABORATORY TESTS

REMARKS:
Washed ahead from 4.0' to 7.0';
Artesian Pressure @ 25.0'

HOLE NO. P-04-03

PROJECT West Old Town Landfill Extension **JOB NO.** 03076.09 **BORING NO.** P-04-07 Piezometers A&B

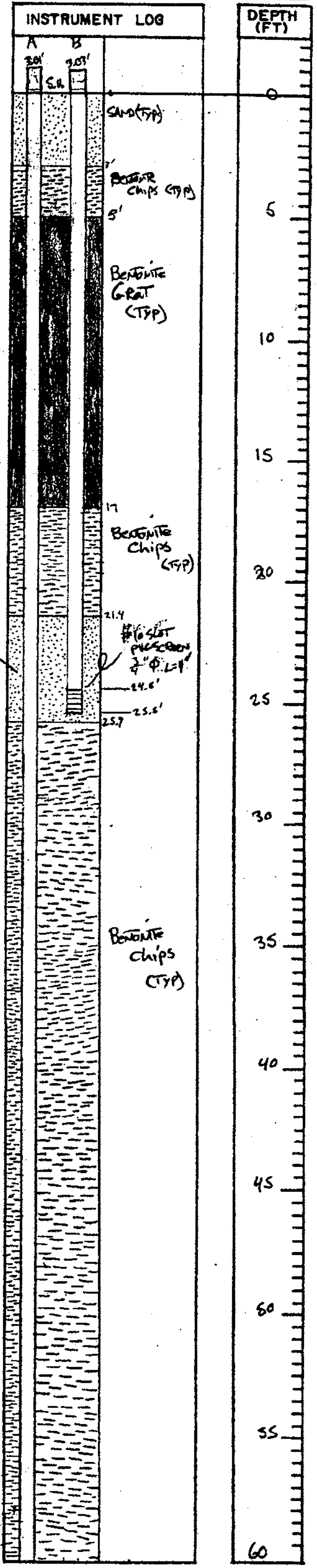
DATE COMPLETED 7/29/04 **DATE WELLS INSTALLED** 7/28/04 **DRILLING METHOD** Wash-Rotary

GROUND SURFACE ELEVATION (FT) 174.6' **DRILLING CONTRACTOR** M.T.B **LOGGED BY** T. Riley / JES

BOREHOLE DIAMETER (IN) 4.5" O.D. / 3.5" O.D. in Rock **ROCK CORE DIAMETER (IN.)** 2" **SHEET** 1 **OF** 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N	RQD	% Passing #200 Screen	Water Content %	
0	1D	0-0.3' TOPSOIL Gray Brown Fine Sandy Silt Mottled Silty Fine Sand with Little Coarse Sand and Gravel 2'	29		60.2%	11.6%	
	2D	MOTTLED BROWN SILT ... increased Gravel CONTENT (BASAL TILL) 4'	64				
5	3D	Olive Silty Fine Sand w/ Little Coarse Sand + Gravel 4.4'	50/0.3'		60%	11.4%	
		— RollerCone. - No Sample.					
10	1R	DARK GRAY PHYLLITE AND GRAY SILTSTONE		100%			
15	2R	... WX		100%			
20	3R			88%			
25	4R	... FRACTURE ZONE 25.5'		20%			
30	5R	GRAY META-GRAYWACKE		100%			
35	6R			86%			
40	7R	... OCCASIONAL PHYLLITE LAYERS		90%			
45	8R			93%			
50	9R			87%			
	10R	... WX ZONE		90%			
55	11R			67%			
60		(Bedrock)					

INSTRUMENT LOG

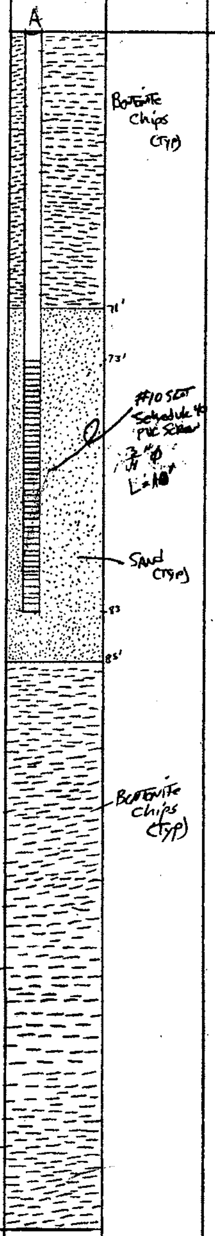


NOTES

PROJECT West Old Town Landfill Extension		**JOB NO.** 03076.09		**BORING NO.** P-04-07	
DATE COMPLETED 7/29/04		**DATE WELLS INSTALLED** 7/28/04		**DRILLING METHOD** Wash-Rotary	
GROUND SURFACE ELEVATION (FT) 174.1'		**DRILLING CONTRACTOR** M.T.D		**LOGGED BY** T. Riley / JES	
BOREHOLE DIAMETER (IN) 4.5" O.D. / 3.5" O.D. in Rock		**ROCK CORE DIAMETER (IN.)** 2"			**SHEET** 2 **OF** 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	RQD				
60	12R	METAGRAY-WACKE	82%				
65	13R	WITH PHYLLITE INTERBEDDING	100%				
70	14R		100%				
75	15R		75%				
80	16R		78%				
85	17R		96%				
90	18R		100%				
95	19R		100%				
100	20R		100%				
105	21R		100%				
		107.5' (Bedrock) B.O.E.					

INSTRUMENT LOG



NOTES

5/90

SEVEE & MAHER ENGINEERS

MAINE TEST BORINGS, INC. **BREWER, MAINE 04412**	CLIENT Sevee & Maher Engineering, Inc.	SHEET 1 OF 2 HOLE NO. P-04-09
DRILLER Tom Schaefer	PROJECT NAME West Old Town Landfill, 03076.09	LINE & STATION
M.T.B. JOB NUMBER 04-095-A	LOCATION Old Town, ME	OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL	DATE	DATE
TYPE	HW	SS	NQ2	08/02/04 Start	08/03/04 Finish
SIZE I.D.	4"	1 3/8"	2"	SURFACE ELEVATIC	
HAMMER WT.	300#	140#			
HAMMER FALL	16"	30"			

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
Auger											0.3	Topsoil
"	1D	2"	24"		2.0	1	2	2	10			
"												
"	2D	2"	24"		4.0	14	35	33	40			
25												
3	3D	2"	24"		6.0	12	17	23	28			
5												
9	4D	2"	17"		7.4	29	45	50				
17												Olive Silty Fine Sand,
22	5D	2"	24"		10.0	21	30	51	48			w/Little Coarse Sand & Gravel,
2												w/Trace of Cobbles
7	6D	2"	24"		12.0	17	34	47	40			
27												
52	7D	2"	24"		14.0	21	28	29	37			
135												
14	8D	2"	17"		15.4	25	33	50				
16												
14	9D	2"	20"		17.7	14	18	33	50		18.0	
20	10D	2"	11"		18.9	22	50				18.9	Gray Fine Sandy Silt w/Trace of Gravel
50											19.9	Boulder
Spun	11D	2"	10"		20.8	30	50					
Casing												
"	12D	2"	11"		22.9	35	50					Gray Fine Sandy Silt w/Some Gravel & Cobbles
"												
"											25.0	
"	13D	2"	8"		25.7	35	50					
"												
"												Gray Silty Very Fine Sand
"	14D	2"	6"		28.5	125						w/Little M/C Sand,
"												Some Gravel & Cobbles
"	D	2"	2"	0"	30.2	50						
"	15D	2"	7"		31.6	55	50				31.6	
	1R	3"	3.0'	3.0'	35.1	100%						
												Rock
	2R	3"	4.9'	4.9'	40.0	100%						

SAMPLES

D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3½" SHELBY TUBE

R = ROCK CORE
V = VANE TEST

SOIL CLASSIFIED BY:

☒ DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

REMARKS:
4" Casing refusal @ 19.2', Boulder from 18.9' to 19.9', Went open hole to 25.0', some cave in, Changed over to 3" casing & spun 3" casing to 28.0', pulled 4" casing out

HOLE NO. P-04-09

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT Sevee & Maher Engineering, Inc.

SHEET 2 OF 2

HOLE NO. P-04-09

DRILLER Tom Schaefer

PROJECT NAME West Old Town Landfill, 03076.09

LINE & STATION

M.T.B. JOB NUMBER 04-095-A

LOCATION Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	NQ2
SIZE I.D.	4"	1 3/8"	2"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE 08/02/04 Start

DATE 08/03/04 Finish

SURFACE ELEVATIO

CASING BLOWS PER FOOT	SAMPLE NO.	SAMPLE O.D.	SAMPLE PEN.	SAMPLE REC.	SAMPLE DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
												Rock
	3R	3"	5.0'	5.0'	45.0	100%						
	R	3"	2.0'	0.0'	47.0	0%	Very	Hard	Rock		47.0	
												Bottom of Boring @ 47.0' Piezometer Installed @ 39.0' Piezometer Installed @ 15.0'

SAMPLES

D = SPLIT SPOON	R = ROCK CORE
C = 2" SHELBY TUBE	V = VANE TEST
S = 3" SHELBY TUBE	
U = 3½" SHELBY TUBE	

SOIL CLASSIFIED BY:

☒ DRILLER-VISUALLY

☐ SOIL TECHNICIAN-VISUALLY

☐ LABORATORY TESTS

REMARKS:
4" Casing refusal @ 19.2', Boulder from 18.9' to 19.9', Went open hole to 25.0', some cave in, Changed over to 3" casing & spun 3" casing to 28.0', pulled 4" casing out

HOLE NO. P-04-09

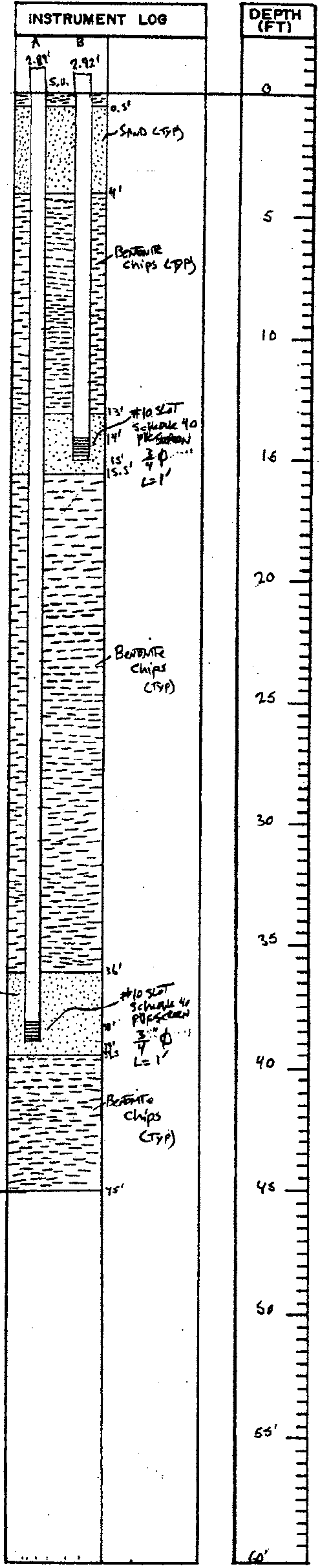
PROJECT West Old Town Landfill Expansion **JOB NO.** 03076.09 **BORING NO.** P-04-09

DATE COMPLETED 8/5/04 **DATE WELLS INSTALLED** 8/5/04 **DRILLING METHOD** Wash-Rotary

GROUND SURFACE ELEVATION (FT) 167.0' **DRILLING CONTRACTOR** M.T.B **LOGGED BY** T. Riley / JES

BORING DIAMETER (IN) 4.5" O.D. / 3.5" O.D. in Rock. **ROCK CORE DIAMETER (IN.)** 2" **SHEET** 1 **OF** 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N	RQD	% Passing #200 Screen	Water Content %	
0	1D	0-0.3' Topsoil	12				
	2D		73				
5	3D	Olive Silty Fine Sand with Little Gravel, Coarse Sand and A Trace of Cobbles.	51		51.4%	11.4%	
	4D		50/0.4'				
10	5D		99				
	6D		87				
	7D		66				
15	8D		50/0.4'				
	9D		50/0.2'				
	10D	19'	50/0.4'				
20		20' Boulder					
	11D		50/0.3'				
		Gray Fine Sandy Silt/Clay with Some Gravel and Cobbles					
	12D		50/0.4'				
25	13D		50/0.2'				
	14D	Gray Very Silty Very Fine Sand w/ Little Medium to Coarse Sand and Some Gravel and Cobbles	125/2.5'		46.9%	13.0%	
30	15D	31.6' (Basal Till)	55/0.1'				
35	1R	Interbedded Phyllite, Siltstone, Metagraywacke		50%			
	2R			50%			Sand (Typ) Kf= 9.7×10^{-6} cm/s
40	3R	Meta-Graywacke		100%			
45		45' (Bedrock) B.O.E.					
50							
55							
60							



NOTES

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT Sevee & Maher Engineering, Inc.

SHEET 1 OF 2

HOLE NO. P-04-11

DRILLER Tom Schaefer

PROJECT NAME West Old Town Landfill, 03076.09

LINE & STATION

M.T.B. JOB NUMBER 04-095-B

LOCATION Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS
09/08/04 7:15am Water @ 1.2', Hole Depth=10.9';
09/09/04 7:30am Water @ 3.8', Hole depth= 39.5'

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	HQ
SIZE I.D.	4"	1 3/8"	2.5"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE	DATE
09/07/04	09/09/04
Start	Finish

SURFACE ELEVATION

CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER				VANE READING
	NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	0-6	6-12	12-18	18-24	
Auger										
"	1D	2"	24"		2.0	1	3	2	2	
"										
"	2D	2"	17"		3.4	6	27	50		
62										
15	3D	2"	14"		5.2	28	70	50		
28										
34	4D	2"	17"		7.4	35	60	50		
25	5D	2"	2"		8.2	50				
52										
15	6D	2"	23"		10.9	38	40	52	50	
18										
23										
27	7D	2"	24"		14.0	20	45	45	52	
30	D	2"	0"	0"	14.0	25				
29	8D	2"	10"		15.8	38	50			
40										
31										
92	9D	2"	8"		18.7	30	50			
54										
25										
22	10D	2"	23"		21.9	24	47	58	50	
25										
25	11D	2"	24"		24.0	20	40	53	46	
18										
17	12D	2"	24"		26.0	20	35	35	40	
18										
29	13D	2"	22"		27.8	22	48	68	50	
78										
122	14D	2"	16"		29.3	38	42	50		
53										
45	15D	2"	12"		32.0	32	70			
48	D	2"	0"	0"	33.0	25				
105										
190	16D	2"	6"		34.5	75				
68										
45	17D	2"	6"		36.5	80				
165										
25										
58	18D	2"	6"		39.5	85				

DEPTH	STRATUM DESCRIPTION
0.2	Topsoil
2.0	Brown Fine Sandy Silt
5.2	Brown Silty F/M Sand, w/Little Coarse Sand, w/Trace of Gravel
14.0	Brown Silty F/M Sand, w/Some Coarse Sand & Gravel, w/Trace of Cobbles
20.5	Brown Silty F/M Sand, w/Some Coarse Sand, Gravel & Cobbles, w/Trace of Clay
22.0	Brown Silty F/M Sand, w/Little Coarse Sand, Gravel & Cobbles
28.0	Brown Silty Fine Sand, w/Fine Sandy Silt & F/M Sand Layers
29.0	Brown Silty Fine Sand w/Little Gravel
36.0	Brown Silty Gravelly Sand w/Some Cobbles
	Olive Silty Cobbley Gravelly Sand

SAMPLES

D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3½" SHELBY TUBE
R = ROCK CORE
V = VANE TEST

SOIL CLASSIFIED BY:

☒ XX DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

REMARKS:
Washed ahead from 5.0' to 28.0' and from 30.0' to 50.0'

HOLE NO. P-04-11

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT Sevee & Maher Engineering, Inc.

SHEET 2 OF 2

HOLE NO. P-04-11

DRILLER Tom Schaefer

PROJECT NAME West Old Town Landfill, 03076.09

LINE & STATION

M.T.B. JOB NUMBER 04-095-B

LOCATION Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS
09/08/04 7:15am Water @ 1.2', Hole Depth=10.9';
09/09/04 7:30am Water @ 3.8', Hole depth= 39.5'

	CASING	SAMPLER	CORE BARREL
TYPE	HW	SS	HQ
SIZE I.D.	4"	1 3/8"	2.5"
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE	DATE
09/07/04	09/09/04
Start	Finish

SURFACE ELEVATION

CASING BLOWS PER FOOT	SAMPLE					BLOWS PER 6" ON SAMPLER				VANE READING	DEPTH	STRATUM DESCRIPTION
	NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	0-6	6-12	12-18	18-24			
35												
45	19D	2"	12"		41.5	40	78					
80												
60	20D	2"	6"		43.5	110						
80												
40	D	2"	24"	0"	45.2	100						Olive Silty Cobbley Gravelly Sand
58	22D	2"	7"		46.6	60	50					
80												
42	23D	2"	6"		48.5	85						
45												
	24D	2"	6"		50.5	90,					50.5	
												Bottom of Boring @ 50.5'
												Caved @ 50.0'
												Piezometer Installed @ 49.5'
												Piezometer Installed @ 10.0'

SAMPLES
D = SPLIT SPOON R =ROCK CORE
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE V = VANE TEST
U = 3½" SHELBY TUBE

SOIL CLASSIFIED BY:
☒ DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

REMARKS:
Washed ahead from 5.0' to 28.0' and from 30.0' to 50.0'

HOLE NO. P-04-11

PROJECT West Oldtown Landfill Expansion
JOB NO. 030760.09
BORING NO. P-04-11 Piezometers A+B

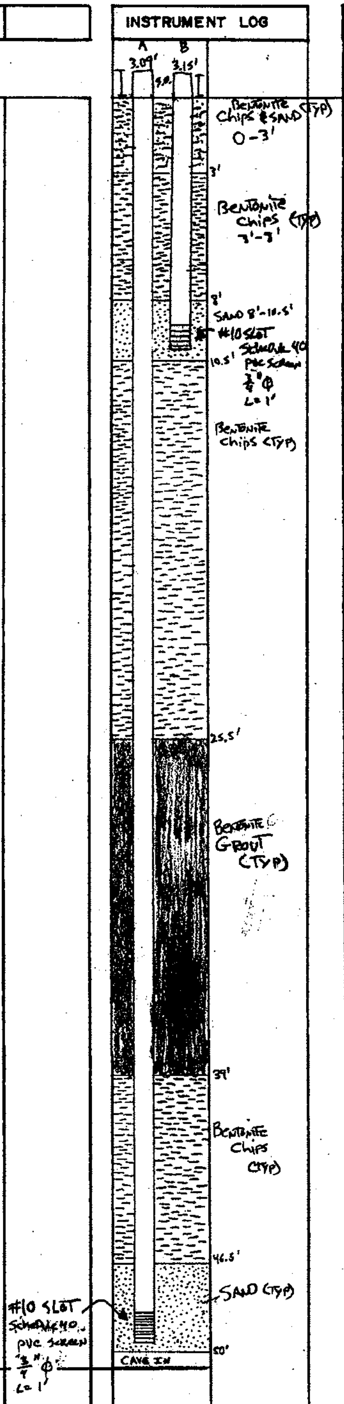
DATE COMPLETED 9/8/04
DATE WELLS INSTALLED 9/9/04
DRILLING METHOD Wash-Rotary

GROUND SURFACE ELEVATION (FT) 107.0'
DRILLING CONTRACTOR M.T.B
LOGGED BY T. Riley / JCS

BOREHOLE DIAMETER (IN.) 4.5" O.D.
ROCK CORE DIAMETER (IN.) N/A
SHEET 1 **OF** 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N	% Passing #200 Screen	Water Content %			DEPTH (FT)
0	1D	0-0.2' TOPSOIL Brown Sandy Silt 2'	4					
	2D	Brown Silt / Clay w/ Little Coarse Sand and A Trace of Gravel.	50/0.4'					
5	[illegible]	4'	68/0.2'	55.1%	13.2%			5
	4D		50/0.4'					
	[illegible]		50/0.2'					
10	6D		50/0.4'					10
	7D		97					
15	8D		50/0.3'					15
	9D	... Becoming Clayey	50/0.2'					
20	10D	22'	50/0.4'					20
	11D	Brown Silt / Clay w/ Fine Sandy Silt and Fine To Medium Sand Layers.	99					
25	12D		75	50.3%	20.6%			25
	13D		50/0.3'					
	14D	29'	50/0.3'					
30	15D	Brown Silt gravely Sand with some Cobbles.	102					30
35	16D		75/0.5'					35
	17D	36'	80/0.5'					
40	18D	Olive very Silty to clayey Cobbley Gravely Sand.	85/0.6'					40
	19D		118	32.9%	10.4%			
	20D		110/0.5'					
45	21D		100/0.2'					45
	22D		50/0.1'					
	23D		85/0.5'					
50	24D	50.5' B.O.E. (BASAL TILL)	90/0.5'					50
55								65
60								60

INSTRUMENT LOG



NOTES

MAINE TEST BORINGS, INC. **BREWER, MAINE 04412**	CLIENT Sevee & Maher Engineering, Inc.	SHEET 1 OF 1 HOLE NO. MW06-01
RILLER Darrel McKeen	PROJECT NAME Landfill	LINE & STATION
.T.B. JOB NUMBER 06-044	LOCATION Old Town, ME	OFFSET

ROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL	DATE	DATE
TYPE	HW	SS		2/28/06 Start	2/28/06 Finish
SIZE I.D.	4"	1 3/8"		SURFACE ELEVATIC	
HAMMER WT.	300#	140#			
HAMMER FALL	16"	30"			

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
Auger											0.3	Topsoil
"											2.0	Brown Silty Sand w/Trace of Cobbles
"												
"	1D	2"	24"		4.0	4	5	8	18			Gray Brown Sandy Clayey Silt w/Trace of Gravel
"												
"	2D	2"	12"		6.0	45	50				6.0	
"											6.5	Cobble
"												
"												
"												Gray Brown Sandy Clayey Silt w/Trace of Gravel
30												
100	3D	2"	24"		12.0	24	27	63	30			
95											13.0	
80												
85												
90												
90	4D	2"	24"		17.0	13	11	11	12			Brown Gravelly Sand w/Trace of Silt
85												
80												
80												
	5D	2"	24"		22.0	19	17	16	17		22.0	
												Bottom of Boring @ 22.0' 2" PVC Well Installed @ 20.0'

SAMPLES

D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3½" SHELBY TUBE
R = ROCK CORE
V = VANE TEST

SOIL CLASSIFIED BY:

☒ XX DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

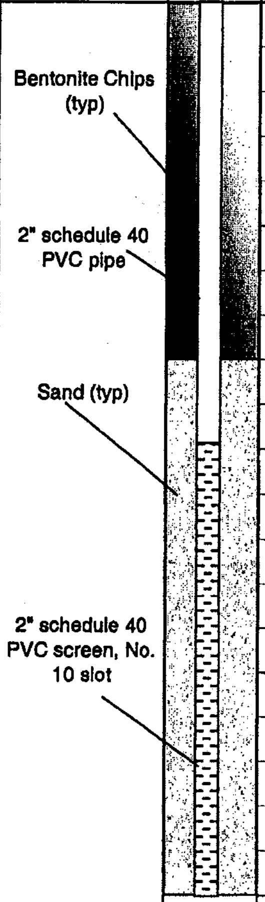
REMARKS:
Washed ahead from 10.0' to 15.0'

HOLE NO. MW06-01

PROJECT: WOTL Expansion
JOB NO.: 05055.00
BORING NO.: MW-06-01
DATE STARTED: 2-28-06
DATE FINISHED: 3-1-06
DRILLING METHOD: Auger (0-5 ft) Drive & Wash (5-20 ft)
GROUND SURFACE ELEVATION (FT): 163.3
DRILLING CONTRACTOR: Maine Test Borings
LOGGED BY: JAB
BOREHOLE DIA. (IN): 4
ROCK CORE DIA. (IN): NA
SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	Blows/ .5'	Recovery (%)	DEPTH (FT)
		0.3 ft Topsoil			
	D-1	(BASAL TILL)	4-5-8-18	100	
5					5
	D-2		45-50	100	
10					10
	D-3		24-27-63-30	10	
		Brown gravelly silt transitioning to silty gravel transitioning to silty sand with trace of cobble			
15					15
				12	
	D-4		13-11-11-12		
20					20
	D-5	22 ft BOE (COBBLE ZONE)	15-11-16-17	90	

WELL LOG



NOTES:

Artesian flow through casing @ 15'

MAINE TEST BORINGS, INC.
BREWER, MAINE 04412

CLIENT
Sevee & Maher Engineering, Inc.

SHEET 1 OF 1

HOLE NO. ~~P06-01~~ P-06-03

DRILLER
Darrel McKeen

PROJECT NAME
Landfill

LINE & STATION

M.T.B. JOB NUMBER
06-044

LOCATION
Old Town, ME

OFFSET

GROUND WATER OBSERVATIONS

	CASING	SAMPLER	CORE BARREL
TYPE	NW	SS	
SIZE I.D.	3"	1 3/8"	
HAMMER WT.	300#	140#	
HAMMER FALL	16"	30"	

DATE	DATE
3/1/06 Start	3/1/06 Finish

SURFACE ELEVATIO

CASING BLOWS PER FOOT	SAMPLE NO.	O.D.	PEN.	REC.	DEPTH @ BOT.	BLOWS PER 6" ON SAMPLER 0-6	6-12	12-18	18-24	VANE READING	DEPTH	STRATUM DESCRIPTION
Auger											0.3	Topsoil
"												
"												
"	1D	2"	24"		4.0	15	26	45	40			
"												
Wash												
Ahead	2D	2"	17"		6.4	23	50	100				
"												
"												Brown Gravelly Silty Sand w/Trace of Cobbles
"												
"												
"	3D	2"	24"		12.0	27	30	40	64			
"												
"												
"												
	4D	2"	24"		17.0	19	30	33	55		17.0	
												Bottom of Boring @ 17.0'
												3/4" PVC Well Installed @ 15.0'

SAMPLES
D = SPLIT SPOON
C = 2" SHELBY TUBE
S = 3" SHELBY TUBE
U = 3½" SHELBY TUBE
R = ROCK CORE
V = VANE TEST

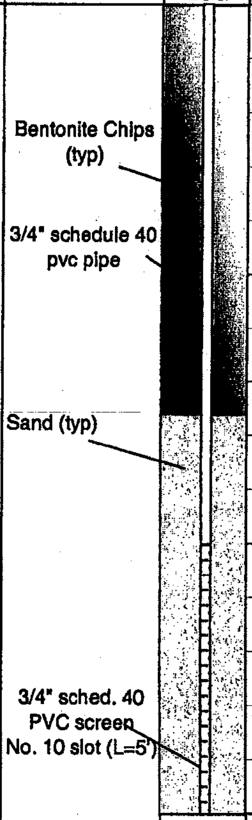
SOIL CLASSIFIED BY:
☒ XX DRILLER-VISUALLY
☐ SOIL TECHNICIAN-VISUALLY
☐ LABORATORY TESTS

REMARKS:

HOLE NO. P06-01

PROJECT: WOTL Expansion
JOB NO.: 05055.00
BORING NO.: P-06-03
DATE STARTED: 2-27-06
DATE FINISHED: 2-28-06
DRILLING METHOD: Auger (0-5 ft) Drive & Wash (5-15 ft)
GROUND SURFACE ELEVATION (FT): 198.9
DRILLING CONTRACTOR: Maine Test Borings
LOGGED BY: JAB / JES
BOREHOLE DIA. (IN): 3
ROCK CORE DIA. (IN): NA
SHEET 1 OF 1

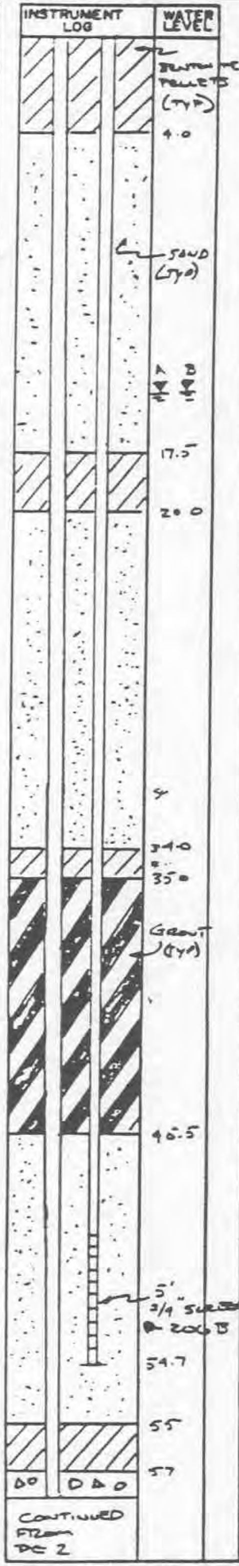
DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	Blows/ .5'	Recovery (%)		WELL LOG	DEPTH (FT)
		0.3 ft Topsoil					
	D-1		15-26-45-40	100			
5							5
	D-2	Brown sandy gravelly silt, transitioning to gravelly √, silty sand @ 12'	23-50-100/.4'	79			
10							10
	D-3	(BASAL TILL)	27-30-40-64	100			
15		•• SANDY ZONE					15
	D-4	17 ft BOE	19-30-33-55	85			



NOTES:

PROJECT West Old Town Landfill
JOB NO. 9006
BORING NO. B206
DATE COMPLETED 05 08 90
WELLS INSTALLED B206 A & B
DRILLING METHOD Washed Boring
GROUND SURFACE ELEVATION (FT) 201.5
DRILLER Maine Test Borings
LOGGED BY KAN
BOREHOLE DIAMETER (IN) 0-15' 4.5" O.D. 19-70.5 3.5" O.D.
ROCK CORE DIAMETER (IN.) 2.0 I.D.
SHEET 1 OF 2

SAMPLE NO.	MATERIAL DESCRIPTION	N	MC(%)	% PASSING #200	ATTERBERG LIMIT	PERMEABILITY (FT/DAY)
	0.5' TOPSOIL					
1D	Brown Sandy Gravelly Silt-Clay w/ Cobbles (Basal Till)	11				
2D		69				
3D		122				
4D		145				
5D		100				
6D		180	10			K_U= 0.00074
D	11.6		11		LL=22 PI=6	K_U= 0.00028
7D	Brownish Gray Sandy Gravelly Silt-Clay Trace of Cobbles (Basal Till)	167				
8D		135				
9D		106				
10D		114	11	60		
11D		—	11	57		
12D	22.5 [illegible]	197		30		
13D	Gray Sandy Gravelly Silt-Clay w/ Cobbles (Basal Till)	212		62		
14D		100	8	59		
15D				50		
16D	Brown Silty Gravelly Sand Trace of Cobbles (Washed Till)	—				
	30.0					
17D	32.6	130				
18D	Brown Gravelly Sand some silt trace of cobbles w/ silty sand layers	190		12		
19D		195		23		
20D		113	22	10		K_R=0.59
21D	41.5	122		10		
22D	Brown very silty gravelly sand has till-like appearance	99	17	10		
23D		111	17	9		
24D		106	18	10		
25D	49.0	96		8		
26D	Black to Gray Silty Sand	110		12		K_F≥7.0
27D	54.0	110	21	14		
28D	Brown Silt			67		
29D	Brown Silty Gravelly Sand	—		24		
		200				
30D		136	8	9		
31D	(Washed Till)	237		11		

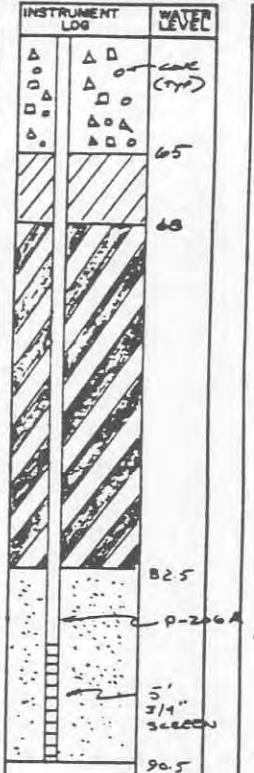


NOTES

Revised as per inter correspond

PROJECT West- Old Town Landfill
JOB NO. 9006
BORING NO. B206
DATE COMPLETED 05.08.90
WELLS INSTALLED P-206 A & B
DRILLING METHOD WASHED BORING
GROUND SURFACE ELEVATION (FT) 201.5
DRILLER MAINE TEST BORINGS
LOGGED BY KPN
JGB
BOREHOLE DIAMETER (IN) 0-13' 4.5" O.D
13-70.5' 3.5" O.D.
ROCK CORE DIAMETER (IN.) 2.0 I.D.
SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N	MC(%)	% PASS #200	ATTERBERG LIMIT	PERMEABILITY (FT/DAY)
	32D	BROWN GRAVELLY SAND SOME SILT TRACE OF COBBLES W/ SILTY SAND LAYERS (WASHED TILL)	182	9	10		
65	33D		118		11		
		69.9					
70	1-R	RQD=100% INTERBEDDED METAGRAY WACKE AND PHYLLITE (BEDROCK)					
75	2-R	RQD: 96%					
80	3-R	RQD: 28%					
85	4-R	RQD=68% ... MANY PEGMATITE VEINS					K_F= 0.027
90	5-R	90.5					
		B.O.E.					
95							



DEPTH (FT)
65
70
75
80
85
90
95

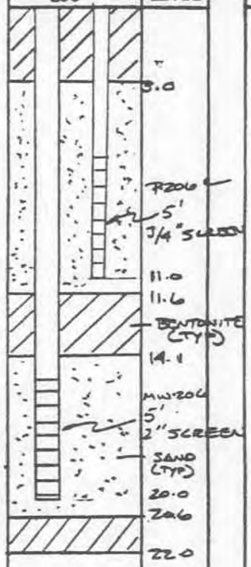
NOTES

5/90

SEVEE & MAHER ENGINEERS

PROJECT West Old Town Landfill
JOB NO. 2006
BORING NO. B206 A
DATE COMPLETED 05.10.90
WELLS INSTALLED MW206 PZ206 C
DRILLING METHOD Washed Boring
GROUND SURFACE ELEVATION (FT) 201.2
DRILLER Maine Test Borings
LOGGED BY KPN
BOREHOLE DIAMETER (IN) 4.5 O.D.
ROCK CORE DIAMETER (IN.) ——
SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N	MC(%)	% PASS #200	ATTERBERG LIMIT	PERMEABILITY (FT/DAY)	INSTRUMENT LOG	WATER LEVEL	DEPTH (FT)
5 10		Brown Sandy Gravelly Silt-Clay trace of cobbles (Basal Till)					K_F = 0.035			5 10
		11.9								
15 20		Brownish-Gray Sandy Gravelly Silt-Clay w/ cobbles (Basal Till)					K_P = 0.00096			15 20
		22.0								
25		B.O.E.								25



NOTES

5/90

SEVEE & MAHER ENGINEERS

APPENDIX C

SAMPLE MONITORING FORMS

CHAIN-OF-CUSTODY RECORD

PAGE ____ OF ____

SEVEE & MAHER ENGINEERS, INC. • P.O. BOX 85A • 4 BLANCHARD ROAD • CUMBERLAND CENTER, MAINE 04021 • (207)829-5016 • FAX (207)829-5692

CLIENT:

PROJECT NAME:

PROJECT/ P.O. #:

REPORT TO:

ADDRESS:

INVOICE TO:

ADDRESS:

SAMPLED BY: (PRINT)

SAMPLER SIGNATURE:

FILTERED (Y/N)

PRESERVED

ANALYSIS REQUIRED

LEGEND FOR PRESERVATIVE

1 – 4° CELSIUS
2 – HCL
3 – HNO_3
4 – H_2SO_4
5 – $Na_2SO_3 + H_2SO_4$
6 – NaOH

ITEM NO.	SAMPLE IDENTIFICATION	DATE	TIME	COMPOSITE OR GRAB	W-WATER L-LIQUID S-SOLID	TOTAL NUMBER OF CONTAINERS									REMARKS	LAB SAMPLE #
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:

D:\FORM\ACAD\SME11 REV.1/3/95

A CHAIN OF CUSTODY IS REQUESTED WITH EACH SET OF SAMPLES

GAS MONITORING FORM

SITE: JUNIPER RIDGE LANDFILL

PROJECT NO.:______________________________________

DATE: ____________________________

WEATHER:____

METER ID:_________________________

CALIBRATION GAS:___________________________________

VENT IDENTIFICATION NUMBER	TIME OF READING	METHANE EQUIVALENT		METHANE EQUIVALENT AMBIENT		H_2S	H_2S AMBIENT	O_2	CO_2	COMMENTS
		% LEL	% VOLUME	% LEL	% VOLUME	ppm	ppm			

LEL CONVERSION: (%LEL/100) x 5 = %VOLUME

Sampler Signature:____

Ambient readings for % LEL and H_2S should be taken next to the sample site prior to the reading taken at the sample site

Attention: If your % Methane reading equals 0, please write 0.1US as your reading

US – Not detected above the reported reporting limit determined by interpreted instrument specification

\\\\Nserver\cfs\SME\Clerical\FORMS\Gas Vent Monitoring Forms\GasVentMonitoringForm-JRL.doc
July 21, 2015

FIELD INSTRUMENT CALIBRATION
DAILY OPERATING LOG

CLIENT:

PROJECT SITE:

DATE/TIME:

JOB NUMBER:

Meter Set	INSTRUMENT	MODEL ID NUMBER	UNIT ID NUMBER	STANDARD(S) USED	STANDARD(S) CHECK	CALIBRATION OR OFFSET CALCULATED	OPERATOR INITIALS
A	pH	Cole Palmer Acorn pH 6	Box:	7.0 pH		NA	
	Specific Conductivity	Cole Palmer Acorn Con 5	Box:	447 Microsiemens		NA	
	Turbidity	LaMotte 2020 Turb.Meter	Box:	1.0 &10.0 NTU		NA	
	ORP	Cole Palmer pH Series 20	Probe: Box:	4 & 7 Quinhydrone	4 - 7 -		
B	pH	Cole Palmer Acorn pH 6	Box:	7.0 pH		NA	
	Specific Conductivity	Cole Palmer Acorn Con 5	Box:	447 Microsiemens		NA	
	Turbidity	LaMotte 2020 Turb.Meter	Box:	1.0 &10.0 NTU		NA	
	ORP	Cole Palmer pH Series 20	Probe: Box:	4 & 7 Quinhydrone	4 - 7 -		

ADDITIONAL NOTES:

FLOW CELL METERS

SEVEE & MAHER ENGINEERS, INC.
November 12, 2001
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MONITORING WELL SAMPLE PURGING FORM

(page ____ of ____)

SITE: ______________________ PROJECT NO: __________ DATE: ______________

SAMPLE LOCATION: ______________ WEATHER: ______________________

SAMPLE ID: ___ _____ __ _____ START TIME: __________ END: __________

(DUPS) ___ _____ __ _____ TRIP BLANK ID: ___ _____ __ _____

___ _____ __ _____

WELL DEPTH: ______________ FT
( ) TOP OF WELL ( ) TOP OF CASING
( ) MEASURED ( ) HISTORICAL

WATER DEPTH: ______________ FT
( ) TOP OF WELL ( ) TOP OF CASING
( ) MEASURED ( ) HISTORICAL

CONDITION OF WELL:
SURFACE SEAL: ( ) GOOD ( ) CRACKED
( ) OTHER: __________
PROTECTIVE CASING: ( ) LOCKED
( ) NO LOCK
( ) SECURE
( ) NEEDS REPAIR (ABLE TO MOVE)

TUBING INLET (TPVC) __________
TUBING DIAMETER __________ (ID)
SCREENED INTERVAL (TPVC) ______ TO ______

WELL: ( ) CAP ( ) NO CAP
WELL MATL: ( ) PVC ( ) SS ( ) OTHER: __________

PUMPING START TIME: ______________ PUMPING END TIME: ______________

EQUIPMENT DECONTAMINATION

PURGING	SAMPLING	
( )	( )	PERISTALTIC PUMP ISCO
( )	( )	PERISTALTIC PUMP GEOTECH
( )	( )	SUBMERSIBLE PUMP
( )	( )	BLADDER PUMP
( )	( )	AIR LIFT PUMP
( )	( )	BAILER I.D. __________
( )	( )	LDPE/SILICON TUBING
( )	( )	TEFLON/SILICON TUBING
( )	( )	IN-LINE FILTER
( )	( )	DEDICATED SIL. TUBING
( )	( )	DEDICATED POLY. TUBING

DECONTAMINATION FLUIDS USED

( ) DISTILLED/DEIONIZED WATER
( ) TAP WATER
( ) NON-PHOSPHATE DETERGENT
( ) 10% NITRIC ACID
( ) HIGH-PRESSURE STEAM CLEAN
( ) ______________________

AMOUNT OF WATER CONTAINED IN DEDICATED SYSTEM: ______________________
AMOUNT OF WATER PURGED PRIOR TO GRAB SAMPLE COLLECTION: ______________

NOTES: ____

____

____

____

SAMPLED BY: ______________________

MONITORING WELL SAMPLE PURGING FORM - PART II

(page ____ of ___)

SITE: ______________________________ DATE: ____________________

SAMPLE LOCATION: ____________________ ORP OFFSET: __________ mV

Elapsed Time (min)	Liters Pumped	Flow Rate (ml/min)	WL TPVC (ft)	WL Top of Casing (ft)	Turb (1)	pH (2)	Spec Cond (3)	Temp °C (4)	DO (5)	ORP (6)	Comments
Unit ID Number:											
Model ID :											

NOTES:

(1) TURBIDITY (NTU)
(2) pH (STD UNITS)
(3) SPECIFIC CONDUCTANCE (umhos/cm @25C)
(4) TEMPERATURE (C)
(5) DISSOLVED OXYGEN (ppm)
(6) UNADJUSTED OXIDATION REDUCTION POTENTIAL (+- mV)

SEVEE & MAHER ENGINEERS, INC.
SAMPLE DATA RECORD
SURFACE WATER

SITE ID: ______________________ SAMPLE DATE / TIME :______________

SAMPLE LOCATION: ______________________ SAMPLER :______________

SAMPLE ID ______________ WATER BODY SAMPLED ______________

SAMPLE COLLECTION METHOD DEPTH @ SAMPLE SITE ______________

______________________ DEPTH OF SAMPLE ______________

DECON (Y/N) ______________ FLOW RATE/VELOCITY ______________

SAMPLE APPEARANCE/ODOR ______________________________

TEMPERATURE __________C E_H __________mV

CONDUCTIVITY __________μmhos/cm E_H OFFSET __________mV

DISS. OX. __________mg/L PHENOLTHALIEN ALKALINITY _____ (# of drops) x
_____ (mg/L per drop) =
_____ mg/L

TURBIDITY __________NTU

TOTAL ALKALINITY _____ (# of drops) x
_____ (mg/L per drop) =
_____ mg/L

pH __________

INSTRUMENTS CALIBRATED (date) ______________________

DUPLICATE SAMPLE COLLECTED (Y/N) _________ IF YES, SAMPLE ID ______________

SAMPLE BOTTLES FILLED (ID) ______________________(SEE COC)

NOTES:

LOCATION SKETCH:

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January 31, 2000

(page_____of_____)

SEVEE & MAHER ENGINEERS, INC.
SAMPLE DATA RECORD
SURFACE WATER/LEACHATE

SITE ID: ____________________ SAMPLE DATE: ____________________

SAMPLE LOCATION: ____________________ SAMPLE TIME: ____________________

SAMPLE ID ____________________ WATER BODY/STRUCTURE SAMPLED ____________________

SAMPLE COLLECTION METHOD DEPTH @ SAMPLE SITE ____________________

____________________ DEPTH OF SAMPLE ____________________

DECON (Y/N) ____________________ FLOW RATE/VELOCITY ____________________

SAMPLE APPEARANCE/ODOR ____________________

TEMPERATURE __________C pH ____________________

CONDUCTIVITY __________µmhos/cm E_H ____________________mV

DISS. OX. ____________________mg/L E_H OFFSET ____________________mV

TURBIDITY ____________________NTU

INSTRUMENTS CALIBRATED (date) ____________________

DUPLICATE SAMPLE COLLECTED (Y/N) __________ IF YES, SAMPLE ID ____________________

SAMPLE BOTTLES FILLED (ID) ____________________(SEE COC)

NOTES:

SAMPLER:

LOCATION SKETCH

SW0298.DOC
February 2, 1998

FIELD INSTRUMENT CALIBRATION
DAILY OPERATING LOG

CLIENT:

DATE/TIME:

PROJECT SITE:

JOB NUMBER:

Meter Set	INSTRUMENT	MODEL ID NUMBER	UNIT ID NUMBER	STANDARD(S) USED FOR CALIBRATION*[1]	WAS CALIBRATION SUCCESSFULLY COMPLETED? (IF YES, PLACE ✔IN APPROPRIATE AREA) (For ORP, Place Results Of Calibration In Appropriate Box)	MIDDAY STANDARD(S) CHECK*[1] (Check off Appropriate Standard if Meter is in Calibration		OPERATOR INITIALS
						Standard	Reading	
A	pH	YSI PRO PLUS	SME001	______ ______ ______	4___ reading________ 7___ reading________ 10___ reading________	_____ _____ _____	______ ______ ______	
	Specific Conductivity	YSI PRO PLUS	SME001	____ Microsiemens	____ reading________	_____ Microsiemens	______	
	DO	YSI PRO PLUS	SME001	___ 100% ___ ZERO	_____100% reading________ _____ZERO reading________	100%	______	
	ORP	YSI PRO PLUS	SME001	240 Mv ORP Solution	_____240 Mv Reading_______	240 Mv ORP	______	
	Turbidity	LaMotte 2020we	Box:	___1.0 NTU ___10 NTU	____reading ____reading	___1 NTU ___10 NTU	___1 NTU ___10 NTU	
B	pH	YSI PRO PLUS	SME002	______ ______ ______	4___ reading________ 7___ reading________ 10___ reading________	_____ _____ _____	______ ______ ______	
	Specific Conductivity	YSI PRO PLUS	SME002	____ Microsiemens	____ reading________	_____ Microsiemens	______	
	DO	YSI PRO PLUS	SME002	___ 100% ___ ZERO	_____100% reading________ _____ZERO reading________	100%	______	
	ORP	YSI PRO PLUS	SME002	240 Mv ORP Solution	_____240 Mv Reading_______	240 Mv ORP	______	
	Turbidity	LaMotte 2020we	Box:	___1.0 NTU ___10 NTU	____reading ____reading	___1 NTU ___10 NTU	___1 NTU ___10 NTU	

*[1] Calibration of meters is completed once daily before work starts – a standards check for pH, conductivity and turbidity should be completed midway through each day or if a particular field value falls outside of historic ranges.

ADDITIONAL NOTES:

APPENDIX D

IDENTIFICATION OF ENVIRONMENTAL SAMPLES

IDENTIFICATION OF ENVIRONMENTAL SAMPLES

PURPOSE

To uniquely and systematically identify the source of environmental samples within a designated site, especially those destined for chemical analysis. The structure of the identification system is selected to be compatible with computerized database management.

SCOPE

This procedure should be utilized whenever environmental samples are collected for either physical or chemical analysis.

PROCEDURE

The sample identification system consists of 9 alphanumeric characters in four information groups:

SAMPLE IDENTIFICATION EXAMPLE

```
12-345-6-789
-- --- - ---
GW-101-1-0A6
```

Type	GW (see type codes below)
Horizontal Locator	101 (corresponds to boring, well ID or other location)
Vertical Locator	A (A = deepest well in a cluster)
Serial Code	0A6 (computer generated unique serial code)

If only one character is needed in a multi-character field, the character should be right-justified and the leading spaces filled with an X for alphanumeric fields or zeros (0) for numeric fields.

Type: The two-character sample type code identifies the general sourcc type and media of the sample. The physical location coordinates are addressed in the horizontal and vertical codes.

Standard sample type codes are:

GW - groundwater
SW - surface water
WW - wastewater
DW - drinking water
WS - water supply
LT - leachate
PC - primary clarifier effluent
SC - secondary clarifier effluent
DF - drilling fluid
BS - blank, sampler
BB - blank, bailer
BU - blank, tubing
BL - blank, lot
BF - blank, filtration
BT - blank, trip
BP - blank, pump

SL - sludge
SD - sediment
WT - waste
WP - wipe
AA - ambient air, grab sample
LA - ambient air, long-term sample
SG - soil gas
LV - landfill vent gas
TP - test pit
SS - surface soil
SB - soil boring
RC - rock core
DC - drum cuttings
TE - treated effluent
RI - raw influent
RW - raw water

Horizontal Locator: Also known as the "sampling point," this code locates the sampling/exploration on the surface of the site (x, y coordinates). The horizontal locator allows designation of a variety of samples (e.g. AA, SS, SB, MW) all from the same point on site. Two approaches may be used:

(1) a number sequence for the exploration (e.g. MW-010). For wells and borings it is important to note that a boring #10 which subsequently has a monitoring well installed has the same horizontal locator, #10.

(2) use of a grid system. If a sampling program utilizes a grid system, as surface soil sampling often does, it is recommended that the grid system be used for all horizontal locations. A three-character grid system allows about 2,600 locations (A00 through Z99).

Vertical Locator: The vertical locator is primarily used for water samples taken from monitoring well clusters. The convention used is a capital letter where "A" represents the deepest well in the cluster. "B" and "C" would represent progressively less deep wells in the same cluster. Soil samples will not use the vertical locator in the sample ID. Depths for soil samples are recorded as field data and this space contains an X.

Serial Code: The sample serial code is generated by the computer sample tracking program when a planned sample is entered into the database. The serial code is unique for each sample on a given site. The serial code is made up of numeric characters [0-9] and alphanumeric characters

[A-J] and is a sequential numbering using a base 20 numeric system. The first sample entered into the tracking program receives the code "001", the tenth sample "00A", the twentieth sample "010" and so on. In this way over 8,000 unique sample codes can be generated in the three character group. Sample codes are never reissued even if a sample has been dropped from the plan. The last 1,000 serial codes are reserved for contingency samples, that is those samples which are not planned but are collected due to some technical decision made in the field.

APPENDIX J

GAS MONITORING OPERATIONS AND MAINTENANCE MANUAL

Operations and Maintenance Manual
Landfill Gas Management System
Juniper Ridge Landfill
Old Town, Maine

Prepared for
New England Waste Services of ME, Inc.

Prepared by
Sanborn, Head & Associates, Inc.

File 2536.27
June 2015

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1.0 INTRODUCTION

This manual describes operations and maintenance procedures related to the landfill gas management system at the Juniper Ridge Landfill (JRL) in Old Town, Maine. The landfill is owned by the State of Maine; however, the facility, and landfill gas, is managed by NEWSME Landfill Operations, LLC (NEWSME). The objectives of the landfill gas management system are to: (i) control odors emanating from the landfill; and (ii) to comply with the federal and state requirements regarding landfill gas emissions.

Currently, JRL has an active landfill gas management system installed in all constructed landfill cells that have reached the necessary grade to initiate installation.

Individuals designated to operate and maintain the landfill gas management system are properly trained with respect to the potential hazards of landfill gas and the proper operating procedures for the site-specific equipment. This manual is a general guide and is not intended to be a substitute for proper hands-on training in operations, regulatory requirements, and site-specific safety activities that may be required by various local, state, and/or federal agencies.

Landfill operations staff should become familiar with the properties of landfill gas and related hazards discussed below, and should receive proper training, which may include lockout/tag out procedures as well as electrical and pneumatic safety procedures.

2.0 CHARACTERISTICS OF LANDFILL GAS AND POTENTIAL HAZARDS

2.1 Landfill Gas Characteristics

Landfill gas is generated when anaerobic bacteria consume organic matter in waste. Landfill gas is chiefly composed of methane and carbon dioxide with lesser amounts of oxygen, nitrogen, and water vapor and trace amounts of hydrogen, ethane, hydrogen sulfide, and volatile organic compounds (VOCs). Oxygen and nitrogen are typically present because of air entrained in the landfill (air is approximately 21 percent oxygen and 79 percent nitrogen). Air entrainment in landfills occurs either during placement of waste, from atmospheric weather effects, because of landfill gas management system operations, or diffusion into the landfill. Typical ranges of constituent concentrations in landfill gas are presented in Table 1.

Important landfill gas characteristics are provided below.

- Landfill gas is primarily comprised of methane (typically about 55 percent) and carbon dioxide (typically about 45 percent).

- Landfill gas has relatively high moisture content; cooling generally results in the formation of condensate.

- Landfill gas is flammable and explosive in the range of 5 to 15 percent in air.

- Landfill gas may migrate through surrounding soils, within open conduits, and trench backfill.

- Landfill gas may accumulate in confined spaces.

- Landfill gas has a specific gravity that is usually close to that of air.

- Within the landfill, the typical temperature range for landfill gas is 16 degrees (°) to 58° Celsius (C) (60° to 120° Fahrenheit (F)).

- Component gases (methane, carbon dioxide, water vapor and others) tend to stay together, but may separate through soil and liquid contact.

- Secondary constituents (trace gases) may cause nuisance odors, environmental pollution, and may create a health risk.

The flammable range of methane is approximately 5 to 15 percent (by volume) in air. The lower limit of 5 percent is referred to as the Lower Explosive Limit (LEL); the upper limit of 15 percent is referred to as the Upper Explosive Limit (UEL). The specific gravity of methane and carbon dioxide are 0.55 and 1.52, respectively. However, the specific gravity of landfill gas is close to that of air, and it should not be assumed that methane gas would rise. The landfill gas mixture may be lighter or heavier than air and its behavior will be dictated by its overall composition.

Methane and carbon dioxide are odorless gasses. However, landfill gas has its own characteristic odor due to the presence of trace compounds in the gas. Some of the most significant examples of the classes of odor causing trace constituents include esters, phenols, organic acids, solvents, and sulfur compounds (including mercaptans). However, landfill gas may not always exhibit an identifiable odor because the odor carrying trace components may be stripped off because of movement through cover or adjacent soil.

Landfill gas levels can be monitored using various meters. At a minimum, LEL, percent methane, percent oxygen, and percent hydrogen sulfide should be measured at any location where there is potential for landfill gas to be present and where personnel could be exposed to landfill gas.

Personnel should take immediate action to evacuate the area, if monitoring results indicate:

- The LEL is 50 percent or higher (2.5 percent methane by volume);
- The concentration of oxygen is lower than 19.5 percent; or
- The concentration of hydrogen sulfide is more than 5 parts per million (ppm).

2.2 Potential Hazards to Personnel

Landfill operations staff should be familiar with the following types of hazards related to the presence of landfill gas and landfill gas condensate, and the appropriate and safe procedures to identify and avoid them.

Methane is a colorless, odorless, flammable, and potentially explosive gas that may be emitted into the atmosphere as landfill gas together with other volatile trace gases. Landfill gas, which may contain other gases, may migrate through soil and bedrock into surrounding areas or contact groundwater where it may adversely affect the environment. Landfill gas may travel long distances underground and accumulate underneath and in structures and confined or enclosed spaces creating a potential explosion hazard. Carbon dioxide, the other major component of landfill gas, is colorless, odorless, and non-combustible.

2.2.1 Respiratory Hazards

Methane and carbon dioxide are asphyxiates. A potential hazard posed by landfill gas is oxygen deficiency, which may cause asphyxiation. As landfill gas builds up it displaces air, hence reducing the amount of oxygen that can be inhaled by a person. An oxygen deficient atmosphere exists when the oxygen comprises 19.5 percent or less of the air. It is imperative that confined space regulations and procedures be followed before personnel enter confined spaces or locations where an oxygen deficient atmosphere could exist. Under certain circumstances, special “permitted entry” requirements apply.

Potentially lethal concentrations of hydrogen sulfide (H_2S) may be present at landfills, particularly at landfills that receive a significant quantity of construction and demolition (C&D) debris. Personnel must always be alert for the hazards presented by H_2S. H_2S is a colorless, toxic flammable gas, which at low concentrations has an offensive odor similar to that of rotten eggs. Sense of smell can be lost within 2 to 15 minutes of exposure to H_2S.

Other volatile organic components of landfill gas may also create respiratory hazards.

2.2.2 Explosive Atmosphere

Landfill gas tends to migrate and may accumulate in confined spaces. The occurrence and accumulation of methane is sometimes transient. The presence of slight amounts of methane, less than the LEL, is an indication that more may accumulate under other conditions if corrective action is not taken. If methane is detected at concentrations greater than 15 percent (100 percent of the UEL) by volume, then there is always the potential for an explosive methane-air “front” that could be formed nearby by dilution.

Personnel should take the following precautions.

- Avoid any possible source of ignition when working on the landfill gas management system. Sources of ignition may include cell phones (on or off), battery-powered watches, flashlights, non-intrinsically safe equipment, etc. **Smoking is prohibited when working on or near the landfill gas system components**.

- Avoid wearing synthetic clothing, such as polyester, as these materials are extremely flammable. **Wearing synthetic clothing can be fatal in a methane gas flash fire.**

2.2.3 Potential for Landfill Fire

If large quantities of air are introduced into the landfill in a localized area, through either natural occurrence or overly aggressive operation of the landfill gas extraction system, then poorly supported combustion of the buried waste may occur and carbon monoxide may be detected. Subsurface fires produce temperatures of several hundred degrees Fahrenheit within the landfill and typically results from short-circuiting air intrusion into:

- The landfill/cover soil interface;
- Cracks, breaks or buried imperfections in the cover/cap;
- Breaks in buried collection piping and extraction wells; or
- Backfill surrounding collection system components (e.g., from the filter or gravel pack of an extraction well or the gravel backfill around a sump).

Preventing the introduction of air into the landfill by proper operation of the landfill gas extraction system and maintenance of the landfill cover is the best course of action.

2.2.4 Landfill Gas Condensate

Landfill gas condensate may contain trace chemicals and may be biologically active. Appropriate protective gloves and splash protection equipment should be used when working with landfill gas condensate. Operating personnel should avoid direct skin contact.

Condensate is odorous, and may release VOCs. Careful control during condensate handling and disposal is necessary to limit release of odors.

The vapors emanating from condensate storage tanks may be flammable.

3.0 SYSTEM COMPONENTS AND MONITORING PROGRAM

3.1 Introduction

The primary objectives of the landfill gas management system are to: (i) control odors emanating from the landfill; and (ii) comply with the federal, state, and local requirements regarding landfill gas emissions. Further, the landfill gas management system should be operated to maintain anaerobic conditions within the landfill, thereby limiting the intrusion of air into the waste. To meet these objectives, the system components should be monitored on a routine basis.

The landfill gas management systems at JRL are installed in phases as each landfill cell is developed and filled. Due to the waste stream mix at JRL (comprising of pulp/paper sludge, wastewater sludge, CDD residuals, FEPR, and other special wastes) Hydrogen Sulfide (H_2S) tends to be generated rather quickly (within three-months of initial waste placement within a cell). Due to the odor issues associated with rapid LFG generation, LFG is managed using horizontal collection trenches constructed in the waste as the cell is developed. Landfill gas extracted from the landfill is conveyed to a blower/flare station for landfill gas treatment. As the outer slopes of the cells are filled to final grades, vertical extraction wells are installed in accordance with the final landfill gas plan approved by the Maine Department of Environmental Protection (MDEP). The active landfill gas extraction system will continue to operate at the landfill, extracting landfill gas from the horizontal trenches and vertical extraction wells installed in areas where final grades are achieved.

Included with this manual are figures that illustrate the landfill gas infrastructure associated with the constructed cells at the facility.

A description of the various components of the landfill gas management system is provided below. Where applicable, the monitoring requirements for the various components are also discussed below and summarized in Table 2.

3.2 Gas Collection Trenches

Gas collection trenches are installed at discrete locations in the waste mass, and have been designed to manage landfill gas during landfill operations. The first series of trenches in an area of new waste fill will be excavated into the waste mass after approximately 20 feet of waste has been placed in the cell. Additional trenches are constructed at about 40-foot vertical increments thereafter. The trenches are spaced horizontally about 100 feet apart with typically 3-4 trenches per 40-foot lift (dependent upon overall cell width). The constructed trench will consist of a stone or tire chip-filled excavation with a perforated 6-inch diameter SDR-17 HDPE conveyance pipe. The trench will be installed at a minimum 2 percent slope and will drain away from the gas collection wellhead and back into the landfill via the perforations in the pipe.

3.3 Condensate Trap

Landfill gas condensate will be managed using traps constructed at low points along the conveyance pipe. The traps are designed to allow the condensate to drain into the waste mass or to discharge to the primary leachate collection system. Each trap consists of a U-shaped tube filled with liquid to provide a seal against the vacuum in the system. To maintain a seal, the liquid column in the trap must be at least as high as the maximum vacuum obtainable in that portion of the system.

3.4 Wellhead Assemblies

The wellhead assemblies are generally installed at each horizontal collection trench and on the vertical extraction wells. The wellheads provide a means to control landfill gas flow and a means to collect monitoring data. The wellhead assemblies include a gate valve, flexible hose, fittings, and taps that are designed to allow for:

- Differential settlement between the landfill gas transmission pipe and the wellhead assembly;
- Sampling of the gas in the wellhead;
- Measurement of the gas flow rate;
- Measurement of the gas temperature;
- Control of the gas flow rate; and
- Access to the well from the top for equipment or measurements.

Wellheads are monitored on a weekly basis (as part of the LFG monitoring program) to observe their general condition, with particular attention to the condition of the flexible hose between the wellhead and the transmission pipe. Additional data to be gathered includes:

- Valve position (percent open);
- Gas flow rate;
- Static pressure;
- Percent methane;
- Percent carbon dioxide;
- Percent oxygen; and
- Gas temperature.

3.5 Blower/Flare Station

Currently, there is one 3,500 cubic feet per minute (cfm) flare station with dual blowers that extracts landfill gas from the entire landfill.

The blower/flare station is checked at least weekly to evaluate: (i) the condition of pipe and connections; (ii) the consistency of the flare operation; and (iii) the condition of the automatic sparking ignition system.

3.6 Ancillary Observations

In the course of monitoring system components, the condition of the landfill cover systems should also be observed for indications of settlement, tears and rips in the exposed synthetic cover, stressed vegetation, improper drainage, and condition of cover soils. Further, the presence of odors should also be noted.

3.7 Monitoring and Reporting

NEWSME monitors the LFG system components on a weekly basis. A trained NEWSME employee (or intern) performs the landfill gas monitoring described above and listed in Table 2. Results of the weekly monitoring events are reported to MDEP within one week of the monitoring date.

NEWSME reserves the right to request a reduction in the monitoring frequency, if the landfill gas readings remain relatively consistent overall. Justification to reduce the monitoring frequency will be submitted to MDEP for approval.

4.0 OPERATION AND ADJUSTMENT

4.1 Well System Tuning

The adjustment or “tuning” of the landfill gas management system involves monitoring various parameters and making adjustments to optimize the extraction of landfill gas from each extraction point in the system. The objective of the tuning is to provide negative pressure at each extraction point without causing intrusion of air into the landfill. Tuning is an iterative process, as adjustments to any portion of the system have the potential to affect the entire system. A discussion of the monitoring and tuning procedures is provided below. A summary of the steps to be taken and data to be gathered is presented in Table 3.

4.2 Equipment

Equipment required for monitoring the landfill gas management system includes a device or devices to measure landfill gas flow rates and landfill gas composition, and a volt-ohm meter and amp meter probe to evaluate components of the electrical and control systems. The instrumentation used to monitor landfill gas flow rates, pressures, and composition is a GEM-2000 Portable Gas Analyzer manufactured by CES Landtec of Colton, California.

Like most analytical instrumentation, it is important to field calibrate the GEM-2000 prior to using it to collect landfill gas data. The instrument requires calibration with methane, carbon dioxide, and oxygen span gases. The GEM-2000 should be field-checked with calibration gas, and if necessary, calibrated in accordance with the manufacturer's recommendations at least once each day that it is used. A log of the calibration should be kept with the instrument. Vibration, shock, and large temperature changes can affect the calibration of the instrument.

CES Landtec certifies that this instrument is intrinsically safe. However, it is generally good practice to avoid operating this instrument in an explosive atmosphere. On an annual basis, the GEM-2000 should be sent to the manufacturer for a factory calibration.

4.3 Indicator Parameters

Typical ranges in concentrations of the various constituents found in landfill gas are presented in Table 1. Normal values for the landfill are established using data collected during operation. System tuning should be performed based on the methane, carbon dioxide, and oxygen concentrations in the landfill gas. Typically, as the methane and carbon dioxide concentrations decrease, the concentrations of oxygen and nitrogen will increase. Such a trend indicates air intrusion into the system and adjustments should be made to reduce the landfill gas extraction (vacuum) rate. Alternatively, the landfill gas extraction rate could be increased if the methane and carbon dioxide concentrations are consistently in the middle to upper end of the typical ranges and/or indicate the development of an upward trend.

The composition of the landfill gas with respect to methane, carbon dioxide, and oxygen content is read using the "Read Gas Levels" option on the GEM-2000 instrument. The gas sample is obtained through the static pressure port on the instrument. The instrument provides a readout in percent of each of the three gases, methane, carbon dioxide, and oxygen, and percent of the remaining gas, which is designated the "balance gas."

4.4 Flow Rates

The landfill gas extraction flow rates will be different at each monitoring point and will vary with barometric pressure changes as well as landfill cover condition (i.e., whether geomembrane has been constructed over the extraction location or the condition of the intermediate cover). Likewise, the cumulative landfill gas flow rate at the flare will vary with time. The flow rates can be adjusted, if needed, based on the concentrations of the various constituents as described above. As the operating record of the system becomes established over time, "normal" flow ranges for the individual extraction points as well as the system may be established.

The landfill gas flow rate is calculated from differential pressure readings obtained at the wellheads. The GEM-2000 can be programmed to directly correlate differential pressure to flow rate.

4.5 Pressures

Landfill gas pressure will vary throughout the system at any given time, and will vary with varying extraction rates. The pressures at the extraction points should be negative (vacuum) to provide active extraction from that point. If the pressure is positive, then adjustments should be made to increase the flow rate, providing that gas constituent concentrations are within the normal ranges as discussed above.

The static pressure at the landfill gas extraction points and along the conveyance pipe is obtained using the "Read Gas Levels" option on the GEM-2000 instrument. The striped tube with the external filter/water trap assembly is used to connect between the static pressure port on the GEM-2000 and the static pressure ports at the monitoring locations.

4.6 Temperature

Landfill gas temperature at the extraction points is obtained directly from thermometers installed on the wellhead assemblies or from the GEM-2000 using a thermocouple inserted in the wellhead thermometer port.

5.0 MAINTENANCE AND TROUBLESHOOTING

5.1 Collection System Maintenance

LFG system maintenance involves the following:

- Repairs to the conveyance pipes due to damage caused by accident, settlement, environmental factors, and aging;
- Repair or replacement of system components (e.g., wellheads, access ports, flex hoses, valves, condensate traps, etc.);
- Excavation for repair of damaged pipe and components; and
- Repairing and re-adjusting pipe supports and anchors.

In many instances, repairing the system may require shutting down the flare or certain sections of the LFG collection system. The duration of the shutdown should be kept to a minimum; where possible, the work should be scheduled to coincide with scheduled flare shutdowns.

5.2 Landfill Surface

The landfill cover is an integral part of the landfill gas management system. Proper landfill cover maintenance practices are important for effective operation and performance of the landfill gas management system. Experience has shown that in most cases, proper cover maintenance in conjunction with timely installation of active landfill gas management system components will address most landfill odor problems. A visual inspection is helpful in identifying rips, tears, pinholes, cracks, fissures, or bare spots in the synthetic and soil cover systems. Damaged areas should be evaluated and repaired as soon as practical.

5.3 Conveyance Pipe

Over time, the conveyance pipe may develop air leaks. Air leakage should be limited to the degree practicable and it is recommended that oxygen not exceed 3.5 percent by volume in landfill gas in the conveyance pipe. (Under normal operations, the landfill gas should contain no more than one percent oxygen.)

Leaks can occur in above-grade pipe systems due to pipe separations caused by thermal contraction resulting from cooling at night and during a system shutdown. Separations or damage can occur to below-grade pipe due to differential settlement. Buried pipe is also subject to expansion and contraction, but to a lesser degree because of a more uniform temperature and the anchoring effect of the soil support within the trench.

The conveyance pipe is generally installed at a minimum slope of 5 percent within the landfill to limit the potential for liquid ponding in the pipe because of differential settlement. However, condensate blockages along the conveyance pipe may occur. These blockages can be evaluated by installing access ports for monitoring. With buried systems, it may be necessary to "pot hole" (i.e., perform exploratory excavation) with a backhoe to install access ports for monitoring. If the main conveyance pipe becomes blocked or restricted with condensate, then either re-establishing the slope of the pipe or installing an additional condensate trap and drain should rectify the condition.

5.4 Blower(s)/Flare Station Maintenance

A brief discussion of general maintenance requirements for specific equipment follows. For more detailed information refer to the applicable manufacturer's information. Table 4 describes the monitoring checklist for the blower(s)/flare station.

5.4.1 Pipe and Fittings

Process plant pipe and fittings commonly consist of both steel and thermoplastic. Both are durable long-lived materials. However, thermoplastic pipe can be subject to damage from shock, strain, or heat. Thermoplastic pipe should not be used near sources of extreme heat such as the flare. Carbon steel piping can erode and corrode. Stainless steel, cast iron, and aluminum piping have all been successfully used in landfill gas applications.

Landfill gas and condensate exhibit corrosive properties. The presence of oxygen, carbon dioxide, and organic acids common to landfill gas can be present in landfill gas condensate. The combination of these constituents can promote corrosion of steel pipe that carries landfill gas condensate. The most common point of wear due to erosion or corrosion in steel pipe in landfill applications is typically at pipe elbows and other fittings that are subject to erosion and where liquid condensate accumulates. The pipe should be inspected for evidence of corrosion (leakage, particularly at fittings). Where questions of pipe integrity exist, ultrasonic thickness testing may be performed, if necessary.

5.4.2 Valves

Valve seats and stem seals may wear and eventually require replacement. Butterfly valves with elastometer seals, such as Buna-N or EPDM, may be affected by landfill gas. In such cases, it may be necessary to try other elastometer types to find a material more suitable to the service. Viton or TeflonTM valve seats in butterfly and ball valves, respectively, have demonstrated reasonably good performance.

5.4.3 Blower Maintenance

Routine maintenance for blowers and motors consists of listening for signs of abnormal operating conditions, monitoring for excessive vibration or temperature, and draining condensate from the blower housing periodically and before startup (if not automatically drained). The blower drive belt tension and wear should be checked on a monthly basis. If belts are glazed or cracked, then they should be replaced. At least one spare set of matched belts should always be on hand. On direct drive machines, flexible coupling alignment should be checked on initial setup and periodically as recommended by the manufacturer (typically quarterly to annually). Bearings should be greased or repacked according to the manufacturers' recommendations, (typically quarterly to annually). The electric drive motor, if not equipped with sealed bearings, should also be greased. Blower seals and packing should be checked periodically for leakage. If blower seals continually leak or will not last, then consult the manufacturer or try another type of seal or seal material. Consult the manufacturer's literature for detailed information on the maintenance of the blower.

5.4.4 Gas Inlet Automatic Block Valve

An automatic block valve shuts off the flow of landfill gas to the blower(s)/flare station when the flare is not operating or when a fault or shutdown is initiated. This is a butterfly type valve and should be serviced only when a need is indicated. The automatic block valve seat should maintain a gas tight seal whenever the valve is in the closed position. Refer to the manufacturer's literature for information on service.

5.4.5 Flame Arrester

A flame arrester is designed to prevent the migration of burning landfill gas from the flare backwards into the process pipe and the flare station. This condition can cause what is known as "detonation" (an explosion) or "flashback" within the pipe network. A flame arrester will only work properly if the velocity and pressure of the flashback in the pipe is within the allowable range and the flame arrester is properly assembled.

The differential pressure across the flame arrester should be checked during monthly monitoring. The normal differential pressure is typically less than 0.5 inches water column (w.c.). The differential pressure across the flame arrester should not exceed 1.0-inch w.c. If excessive differential pressure is observed, then the flame arrester should be serviced. To service the flame arrester, shut down the blower/flare station and block in the flame arrester upstream using the manual and automatic block valves (**verify the valves do not leak**). Closely follow the directions in the manufacturer's literature for maintenance and re-assembly of the flame arrester element. It is important to note that a flame arrester's effectiveness is based upon a design spacing or gap in the flame arrester element. During maintenance and re-assembly, this spacing must be maintained according to the manufacturer's original specifications if the flame arrester is to function as designed. Ensure that all parts are returned and in the proper orientation when re-assembling the flame arrester.

5.4.6 Flare

Operation and maintenance of the flare is straightforward and consists of maintaining proper fuel pressure, maintaining the igniter system, and keeping the flare drained of condensate. Proper fuel velocity, quality, mixing, and flame condition are key to performance. Also, to operate consistently, the flare burner assembly must be adequately shielded from excessive wind. Problems with flame stability in an open flare are usually caused by poor landfill gas quality.

The primary wear on flares is due to thermal stress. If the flare is operated in an imbalanced condition or at excessively high temperature, then it will exhibit signs of accelerated thermal stress. This may be indicated by wear and deformation of the burner.

The flare may require burner adjustment or modification to achieve and maintain proper combustion performance. Adjustment of the flare may involve changing an orifice or burner ring, or moving or changing a plate. Consult the manufacturer or seek qualified assistance.

Landfill gas velocity to the flare is adjusted at the blower/flare station inlet. This is accomplished by balancing the distribution of the blower's total pressure, so that there is sufficient fuel pressure at the flare. In severe cases where adjustment will not work, the flare burner or the blowers may need to be modified or replaced. **Never modify the flame arrester to increase gas velocity.**

The flame safeguard sensor system consists of an electronic controller mounted in the control panel and a thermocouple mounted near the tip of the flare. At least one spare thermocouple should be kept on the site.

A thermocouple can be checked independently with a voltmeter and thermocouple tables or with a digital thermocouple test meter or digital thermometer. Proper polarity must be observed when installing and monitoring a thermocouple. If the thermocouple is subjected to flame impingement, then its life may be shortened considerably. Thermocouples can be mounted in protective sheathing; however, this will cause some delay in response to temperature changes.

See the flare manufacturer's literature for specific component operation, maintenance, and troubleshooting information.

5.4.7 Electrical Equipment Controls and Instrumentation

Dust may accumulate in electrical cabinets and absorb moisture from the air. Over sufficient time, a conductive path can be created that can cause a failure. Connections may also become loose due to thermal expansion and contraction. Electrical service and control cabinets should be cleaned on an annual basis. Wire connections should be checked and tightened throughout the cabinets annually. Calibration and verification of instrumentation gages and thermocouples should be performed annually. Shutdown alarms and devices should be tested and the results recorded in a log. Thermocouples for sensing flare stack temperature should be maintained, and replaced when they no longer perform properly. This is normally evident by failure of the temperature controller to properly read or control the flare stack temperature (usually due to an open junction) or by loose or corroded connection terminals at the temperature transmitter, connector block, or temperature controller.

Test and recalibrate instruments, fault protection, and shutdown devices. Large breakers or fused disconnects should be disconnected under load. Ensure high voltage breakers or disconnects are “locked out” in accordance with 29 CFR 1910.147 and 1910.333 Subpart S before working on equipment associated with them. Fuses should be physically pulled to isolate equipment. When the blower/flare station will be down for major maintenance or stand down, large breakers should be locked out (i.e., physically separated and disconnected) and the fuses should be pulled.

5.4.8 Lubrication - General

Follow the manufacturer’s recommendations for specific types and brands of lubricants. It is important to use the recommended type of grease and not to mix types or brands of grease. Do not over lubricate. Personnel who perform lubrication services should be knowledgeable in lubrication practices and should follow the manufacturer’s instructions for lubrication requirements.

Establish an initial lubrication frequency based upon the equipment manufacturer’s recommendation. It may be necessary to adjust the lubrication frequency interval based upon experience with the equipment.

5.4.9 Other Equipment Maintenance and Operating Tips

The system operator should be proactive, remain alert, and develop a habit of observing equipment.

Equipment noises (such as bearings) may be monitored using an equipment stethoscope or using a wrench or similar tool by placing it on the equipment and placing the opposite end of the tool against the bone in front of the ear to listen. It is important to develop a sense of what baseline conditions are for comparison. The smell of leaking landfill gas or burned lubricant can indicate a seal, component, or lubricant failure.

When checking motors or other electrical devices for temperature by feel, the back of the hand should be used. Approach the equipment slowly and feel for radiant heat, which would indicate a very high temperature. If the equipment is too hot to maintain hand contact, then it is at or above a threshold of about 60 to 63°C (140 to 145°F) and may be considered excessive in many cases depending upon the equipment and service. The reason for using the back of the hand is that it is more heat sensitive and in the case of electrical fault to the casing, the natural reaction will be for the muscles of the arm to contract away from the device. This can prevent electrocution.

Operating personnel should wear all cotton clothing that provides some degree of protection in gas flash fires. Some synthetics such as polyester blends will melt readily, which can be fatal. Ties or loose items (e.g., identification badges hanging around the neck, etc.) should never be worn around rotating or belt-driven equipment. All watches, rings, identification bracelets, etc., should be removed when performing electrical testing or troubleshooting.

It is important that maintenance supplies, lubricants, and spare parts be inventoried on a frequent basis to ensure that adequate stocks are maintained for when they will be needed. Supplies should be reordered and restocked as used.

5.4.10 Condensate Handling Systems

Condensate is managed using traps constructed inside the limit of waste, and condensate knockout structures constructed outside the limit of waste. The condensate knockout structures collect condensate in perimeter landfill gas conveyance pipes located outside the limit of waste and discharge the condensate into primary leachate collection system cleanouts. The condensate traps inside the limit of waste drain by gravity into primary leachate collection system cleanouts or in some cases drain back into the waste mass. The blower/flare station is fitted with various traps, drains, valves, and pumps for handling condensate. Condensate can be corrosive and the equipment should be checked carefully and frequently for the effects of corrosion. Seals, o-rings, and valves are usually high maintenance items. Refer to the manufacturer's information for maintenance of individual equipment or components.

6.0 COLD WEATHER OPERATIONAL CONSIDERATIONS

Condensate in exposed pipes and equipment or in below-grade pipes without adequate soil cover may freeze during winter operations. Care must be taken to limit the amount of condensate allowed to collect in the landfill gas system at any time. The landfill gas is a source of heat for the system. If the system shuts down for a short period during winter months, then condensate in the exposed portions of the system may freeze.

If freezing of condensate under normal operating conditions becomes a regular problem, then heat trace and insulate the affected areas.

7.0 DATA COLLECTION

Data will be collected routinely using the data logger feature of the GEM-2000 for the flare, the well field, structures, etc. These "readings" are transferred to a computer and then uploaded to a secure database website. The database can be accessed by approved landfill personnel.

7.1 Data Assessment

During the initial start-up and operation of the landfill gas management system, baseline data should be acquired. The data should be representative of normal (not unusual, imbalanced, or irregular) conditions. These baseline data may be used in the future for comparison with current data. Parameters to be monitored include pressure, differential pressure, temperature, and flow, at various locations within the landfill gas management system.

Pressure will change with changes in landfill gas flow. Similarly, the landfill gas temperature will change as more waste is disposed and as the in-place waste ages.

With the above caveat in mind, equipment performance may be compared with past or baseline performance under similar operating conditions. Persons assessing the data should be aware of the normal operating range for each parameter and note any changes and assess the reasons for that change. Equipment deterioration that can be either sudden or very gradual may be indicated by an abnormal monitoring result. Such indications should be promptly investigated. Data should fall within established parameters for normal operating ranges for that equipment based upon service conditions. Manufacturer's information and equipment operating experience along with judgment are required to assess the data and determine these ranges.

Over the years, a number of data assessment techniques for landfill gas management systems have been developed. Relevant techniques are listed below.

1. Comparing current performance data with baseline data.

2. Comparing data with tables of acceptable ranges and conditions cross-referenced with recommended adjustments.

3. Directly comparing monitoring data with target criteria (e.g., methane, oxygen, nitrogen residual, wellhead vacuum, flow, etc.).

4. Assessing individual extraction point data parameters with subjective judgment (no specific analytical or mathematical method used).

5. Performing a summation of total landfill gas flow from all the extraction points and comparing with predicted or prior demonstrated acceptable well field flow. This may be used to develop a compensation factor to calculate individual extraction point targets and readjust portions of the landfill gas system infrastructure as needed.

6. Differentiating between air intrusion through the landfill cover and waste mass, and collection pipe leakage, and compensating accordingly (see No. 8 below).

7. Evaluating nitrogen residual by measuring nitrogen with a gas chromatograph or calculate nitrogen as a balance gas.

8. Comparing a summation of individual extraction point data with total composite flow, while accounting for pipe leakage and flow measurement error.

These techniques should be used in conjunction with target criteria and established acceptable performance ranges for each extraction location.

7.2 Landfill Daily Log Book

Whenever the system is monitored for any reason, staff should make appropriate entries in the Daily Log Book stored in the landfill office.

- Name of person making the entry;
- Date and time;
- Reason for the monitoring (e.g., routine, shutdown, specific monitoring or maintenance activity, etc.);
- Reason for any shutdown;

- Actions taken or adjustments made;
- Equipment status upon leaving; and
- Unusual observations made.

The daily log is used as a record of events regarding the landfill and to communicate between operating personnel. The log entry also becomes part of the daily landfill readings.

7.3 Data Collection Routine

Data are collected manually at the individual data points (i.e., at wells on the landfill, at migration monitoring probes surrounding the landfills, etc.).

Equipment used for data collection includes:

- GEM-2000 Portable Gas Analyzer;
- Calibration gases (use before going into the field);
- Data reading sheets;
- Clipboard and writing implement;
- Pocket calculator;
- Site map of the data points;
- Carrying tray, toolbox, or backpack, etc.;
- Tools needed to access the system components; and
- Spare parts for maintenance such as access ports, plugs, etc.

8.0 APPROVAL PROCEDURES FOR LANDFILL MANAGEMENT SYSTEM INSTALLATION

Prior to the installation of new landfill gas management system infrastructure within the landfill, various procedures must be followed to assure that the proposed system modification is properly designed and approved. This section defines the procedures to be followed prior to the modifying the landfill gas management system.

8.1 System Design

The landfill gas management system structures, conveyance pipes, and condensate management structures at JRL are designed by Sanborn, Head & Associates, Inc. (SHA) using sound engineering principles that follow industry standard procedures. The blower/flare station is sized according to projected landfill gas flow rates.

NEWSME routinely retains SHA to prepare detailed design packages for the expansion of the landfill gas management system associated with each new operational cell to comply with Condition 15.B of Solid Waste Order #S-020700-WD-N-A. The detailed design package typically includes the following:

- A description of the basis for the design;
- Drawings;
- Specifications; and
- Quality assurance and quality control information.

The landfill gas system expansion design for each cell is based on the projected development plans as prepared by Sevee & Maher Engineers, Inc. and a yearly review of landfill gas generation rates performed by SHA. The landfill gas expansion design is then submitted to the MDEP for review and approval.

Required changes to the existing LFG infrastructure are occasionally identified and proposed by NEWSME as the landfill gas generation rate and the disposal capacity needs are reviewed. In addition, NEWSME may propose changes to the approved landfill gas management system design to address observed conditions that may require modifications or additions to the system.

8.2 Approval Procedures

Procedures to modify approved landfill gas management system designs fall into two categories referred to as Major and Minor Revisions. A discussion of these revisions are discussed in Sections 8.3 and 8.4 below and depicted in the flow chart provided as Figure 3.

8.3 Approval of Major Revisions to Approved Design

Major revisions are defined as a modification that affects the design or operation of the gas management system and can include such projects as:

- The addition of vertical extraction wells;
- The installation or rerouting of conveyance pipes;
- Changes to the condensate management design; and
- The addition of gas collection trenches.

Major revisions to approved design projects will be handled as a Change Order pursuant to 06-096 CMR 401-3.D of the Maine Solid Waste Regulations. Prior to submitting a formal change order request, NEWSME will contact the MDEP and describe the issue (orally) and the proposed remedy (i.e., construct additional wells). Appropriate sketches will be provided as necessary. NEWSME will identify the anticipated time frame for construction and the name of the qualifying person who will oversee the construction. Following this step, the proposed (MDEP agreed upon) changes will be provided to SHA, who will revise the drawings to include the location of additional wells and associated conveyance pipe, to include well depth information, etc. NEWSME will submit a written change order request to the MDEP for review and approval at least five business days prior to the planned construction, unless an alternate deadline has been agreed upon with the MDEP. The MDEP will issue a response to the change order request within five business days or approval of the Change Order is automatically granted.

8.4 Approval of Minor Revisions to Approved Design

Minor revisions to the design are defined as modifications that do not significantly affect the design or operation of the landfill gas management system and can include projects such as:

- Minor shifting of a previously approved trench;

- The addition of a pipe intended to bypass a "water-out" or non-functioning section of an existing trench; and
- The addition of a short stub to an existing gas collection trench.

These modifications do not typically require the installation of an additional wellhead and are often a means of addressing a concern in a section of the operational landfill area.

Prior to construction of these changes to the landfill gas management system, NEWSME will notify the MDEP and describe the need for the change, the location, and how the structure will be connected to the existing infrastructure. A hand sketch will be provided as necessary.

9.0 INFRASTRUCTURE CONSTRUCTION AND DOCUMENTATION

Construction of landfill gas infrastructure will be peformed by qualified NEWSME staff and specialty contractors when needed. This section describes the components of the landfill gas management system that can be installed by NEWSME staff and the system components that require specialty contractors.

9.1 Construction Projects by NEWSME Staff

Qualified NEWSME staff is authorized to install the below listed infrastructure:

- Gas collection trenches;
- Conveyance pipe within the solid waste boundary;
- Condensate structures located within the solid waste boundary; and
- Wellheads on new wells and trenches and replacement wellhead fixtures.

NEWSME staff will follow an approved set of technical specifications for each project and qualified personnel will document the construction using field survey techniques. Following construction, field survey data will be provided to SHA so that the as-built drawings may be updated. Updated as-built drawings will be provided to the MDEP as part of the annual report. As-built drawings pertaining to new wellhead installations will be provided to the MDEP within 45 days of completion of work.

9.2 Construction Projects by Specialty Contractors

Specialty contractors will be retained to perform the following installations:

- Vertical extraction wells;
- Conveyance pipes outside of the solid waste boundaries; and
- Condensate pipe and structures outside of the solid waste boundary.

Following the construction of the above infrastructure, updated information will be provided to SHA and as-built plans provide to the MDEP within 45 days of completion of work.

9.3 Construction Quality Assurance and Quality Control

Construction activities by NEWSME staff as listed in Section 9.1 above (with the exception of LFG conveyance pipe installations) will be overseen and documented by qualified NEWSME staff.

Construction of vertical extraction wells, conveyance pipes of 12-inches diameter or greater, and condensate pipe and structures outside of the solid waste boundary will be overseen by qualified construction quality assurance personnel separate from NEWSME and the installation contractor following an approved CQA plan. The construction will be documented and the information will be submitted to the MDEP within 45 days of completion of work.

9.4 Licensing of LFG Infrastructure Installations

Proposals for new gas related projects will be submitted to the MDEP in the form of a minor revision application pursuant to 06-096 CMR 400.3.B(2)(b) of the Maine Solid Waste Management Regulations, except that if a major redesign of the gas extraction system is being proposed, the MDEP may require an amendment application be submitted. For projects related to new cell construction, including the layout for proposed gas collection trenches, the landfill gas management system design will be included with the application for the new cell construction. The MDEP may include comments on the proposed landfill gas management system design as part of its review of the new cell design. MDEP's review will be completed prior to the construction of the new cell.

9.5 Emergency Situations

In an after-hours emergency, such as vandalism or a catastrophic failure, that causes damage and/or shuts down the landfill gas management system, NEWSME will immediately notify the MDEP staff by all means (office, home, DEP spill response line) to notify them of any proposed activities associated with abating the condition. However, it is understood by MDEP staff that any work required to get the landfill gas management system operating again will proceed as needed.

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TABLE 1

TYPICAL LANDFILL GAS CONSTITUENTS

Operations and Maintenance Manual
Juniper Ridge Landfill
Old Town, Maine

COMPONENT	PERCENT VOLUME (All are stated on a dry basis except moisture.)
Methane (CH_4)	45 to 58%.
Carbon Dioxide (CO_2)	32 to 45%.
Oxygen (O_2)	Less than 1%.
Nitrogen (N_2)	0 to 3%.
Hydrogen (H_2)	Trace to 5% plus; generally less than 1%.
Carbon Monoxide (CO)	Trace; CO is an indicator of the possible presence of a subsurface fire.
Hydrogen Sulfide (H_2S) & Other Sulfur Components	Varies by landfill (nominally 10-200 ppm).
Moisture	Up to 14% (increases with gas temperature).
Volatile Organic Compounds (VOCs)	Less than 2%; typically ¼ to ½%.

Note: This table represents typical characteristics of landfill gas. A difference between characteristics in the gas from the facility and the values tabulated above does not necessarily indicate a problem. However, a large disparity should be reviewed to evaluate the cause.

TABLE 2

RECOMMENDED MONITORING SCHEDULE

Operations and Maintenance Manual
Juniper Ridge Landfill
Old Town, Maine

ITEM	FREQUENCY	PARAMETER
Wellheads	Weekly	• Condition of flex hose; • Valve position; • Gas flow rate; • Static Pressure; • Percent methane; • Percent carbon dioxide; • Percent oxygen; and • Temperature of gas.
Blower/Flare Station	Weekly	• Condition of pipe and connections; • Consistency of flame; and • Functioning of ignition sparker.
Conveyance Pipe	Bi-Annual	• General condition of exposed pipe.

Notes:

1. The monitoring frequency may be reduced with approval from the Maine Department of Environmental Protection.

2. In addition to the monitoring schedule outlined above mechanical components of the blower/flare station should also be monitored and serviced in accordance with the manufacturer's instructions.

TABLE 3

GAS EXTRACTION SYSTEM MONITORING CHECKLIST

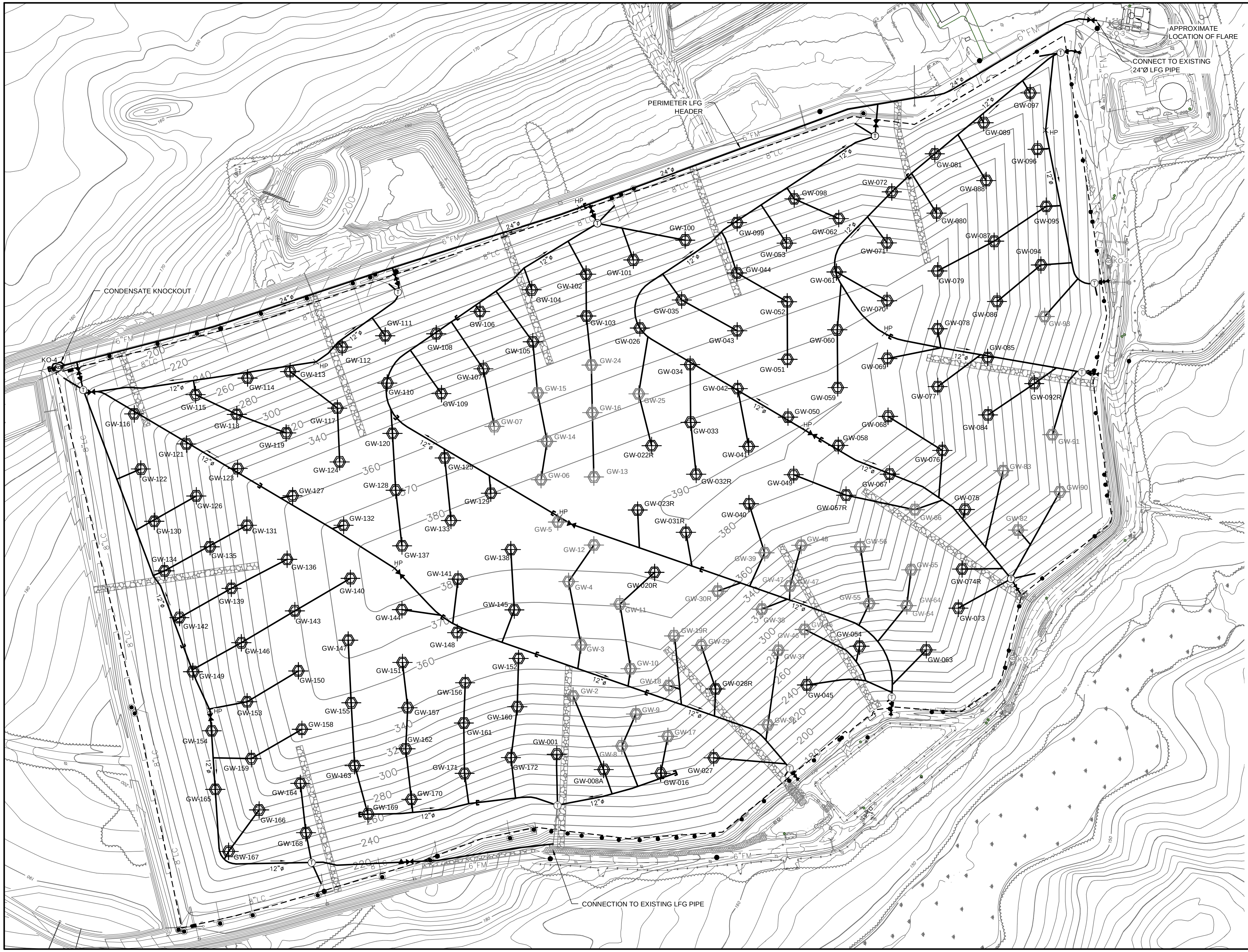
Operations and Maintenance Manual
Juniper Ridge Landfill
Old Town, Maine

A. Prior to going out onto the landfill.

1. Calibrate the GEM-2000 Portable Gas Analyzer (meter) using methane, carbon dioxide, and oxygen.
2. Calibrate the pressure transducers by performing the "Zero Pressure" function.
3. Record the ambient weather conditions including:
   - Temperature;
   - Barometric pressure;
   - Wind speed and direction;
   - Precipitation amounts; and
   - Current observations (i.e., drizzling, raining, snowing).

B. At each wellhead assembly.

1. Connect the striped tubing with the external filter/water trap assembly from the static pressure/sampling port on the meter to the static pressure port on the wellhead assembly.
2. Connect the clear tubing between the impact pressure port on the meter and the impact pressure port on the wellhead assembly.
3. Perform the "Read Gas Levels" function on the meter. Follow instructions on the meter.
4. Record the following data on the data sheets or in the meter memory:
   - Station identification;
   - Percent methane;
   - Percent carbon dioxide;
   - Percent oxygen;
   - Percent balance;
   - Percent LEL;
   - Temperature of the gas stream;
   - Static pressure;
   - Differential pressure;
   - Gas flow rate; and
   - Control valve percent open.
5. Make adjustments to the flow rate by adjusting the wellhead control valve, if required.



NOTES:

1. THE BASE MAP SHOWN WAS PREPARED BY AERIAL SURVEY & PHOTO INC., OF NORRIDGEWOCK, MAINE. PHOTO DATE JULY 31, 2014. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.

2. PROPOSED EXPANSION GRADES SHOWN WERE PROVIDED TO SANBORN HEAD BY SEVEE & MAHER, (SME) INC. OF CUMBERLAND, MAINE.

3. ACTUAL GRADES MAY DIFFER FROM GRADES SHOWN ON DRAWINGS AT THE TIME OF CONSTRUCTION.

4. THE EXISTING LANDFILL GAS EXTRACTION SYSTEM INFRASTRUCTURE FEATURES SHOWN ARE BASED ON A COMBINATION OF DESIGN AND AS-BUILT DOCUMENTATION AVAILABLE TO SANBORN, HEAD & ASSOCIATES, INC. (SANBORN HEAD). ACTUAL LOCATIONS OF INDIVIDUAL FEATURES MAY BE DIFFERENT THAN SHOWN.

5. THE LOCATIONS OF MANY OF THE LANDFILL DESIGN COMPONENTS SHOWN ON THIS PLAN, SUCH AS LEACHATE CLEANOUTS, STORMWATER MANAGEMENT FEATURES, AND UTILITIES, ARE BASED ON PROPOSED LOCATIONS PROVIDED TO SANBORN HEAD BY SEVEE & MAHER ENGINEERS, INC. OF CUMBERLAND, MAINE.

6. THIS PLAN IS INTENDED TO ILLUSTRATE THE PROPOSED LAYOUT OF THE LANDFILL GAS (LFG) EXTRACTION SYSTEM. ACTUAL LOCATION OF WELLS, PIPE, AND VALVES MAY CHANGE DEPENDING ON SITE CONDITIONS AND CONSTRAINTS DURING CONSTRUCTION.

7. SOLID LANDFILL GAS CONVEYANCE PIPE AND COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 6 PERCENT. PERFORATED LANDFILL GAS COLLECTION TRENCHES SHALL BE INSTALLED AT A MINIMUM SLOPE OF 2 PERCENT.

8. HDPE PIPE AND FITTINGS SHALL BE SDR-17.

9. HDPE FITTINGS SHALL BE MOLDED; FABRICATED FITTINGS SHALL NOT BE USED.

LEGEND:

EXISTING		PROPOSED
180	10 FOOT CONTOUR	370
	2 FOOT CONTOUR	
GW-11	VERTICAL LFG WELL	GW-35
12"ø →	LFG CONVEYANCE PIPE (SIZE AND SLOPE DIRECTION)	12"ø →
Ⓣ	CONDENSATE TRAP	Ⓣ
⋈	CONTROL VALVE	⋈
KO KO-1	CONDENSATE KNOCKOUT	KO KO-4
●	LEACHATE COLLECTION CLEANOUT	◉
▲	VERTICAL RISER	▲
	LIMIT OF WASTE CONTAINMENT	— — — — —
	CELL LIMIT	—— - ——
— — — —	EDGE OF ROAD	
× HP	HIGH POINT	× HP
	RIPRAP-LINED DOWNCHUTE	▨
⊓	TEMPORARY PIPE TERMINATION	⊓

SANBORN HEAD

GRAPHICAL SCALE

150' 75' 0' 150' 300'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: E. STEINHAUSER
PIC: E. STEINHAUSER
DATE: June 2015

LFG SYSTEM EXPANSION MASTER PLAN

JUNIPER RIDGE LANDFILL

OLD TOWN, MAINE

JRL LFG INFRASTRUCTURE PLAN (FULL BUILD-OUT)

PROJECT NUMBER: 2536.27

FIGURE NUMBER: 1

MAINE STATE PLANE

CURRENT ACTIVE LFG COLLECTION SOURCES:

VERTICAL WELLS
GW-02
GW-03
GW-04
GW-05
GW-06
GW-09
GW-10
GW-11
GW-12
GW-13
GW-14
GW-15
GW-16
GW-18
GW-19R
GW-20R
GW-21
GW-22R
GW-23R
GW-24
GW-25
GW-28
GW-29
GW-30R
GW-31R
GW-32
GW-36
GW-37
GW-38
GW-39
GW-46
GW-47
GW-48
GW-54
GW-55
GW-56
GW-57
GW-64
GW-65
GW-66
GW--7
GW-74
GW-75
GW-82
GW-83
GW-90
GW-91
GW--A
GW--D
GW--E
GW--F
GW-G2
GW-H2
GW--I
GW--J
GW--K
GW--L
GW--M
GW--N
GW--O
GW--P
GW--S
GW--T

HORIZONTAL COLLECTION TRENCHES
GCT-01
GCT-17
GCT-18
GCT-201
GCT-2A1
GCT-2A2
GCT-3A1
GCT-3A2
GCT-3A3
GCT-3A4
GCT-3A5
GCT-3B1
GCT-3B2
GCT-3B3
GCT-3B4
GCT-401
GCT-401A
GCT-402
GCT-402A
GCT-403
GCT-404
GCT-404A
GCT-405A
GCT-406
GCT-406A
GCT-501
GCT-502
GCT-503
GCT-504
GCT-505
GCT-506
GCT-507
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GCT-804
GCT-805
GCT-806
GCT-807
GCT-808
GCT-809
GCT-810
GCT-811
GCT-812
GCT-813
GCT-814
GCT-815
GCT-816
GCT-817
GCT-818
GCT-819

OTHER
3W-01
3W-02
7SOUTH
L7WEST
LC--5
LC--6
LGV401
LGV402
LGV403
LGV404
LPC-1
LPC-3
LPC-4
LPC4A
LPC-2

NOTES:

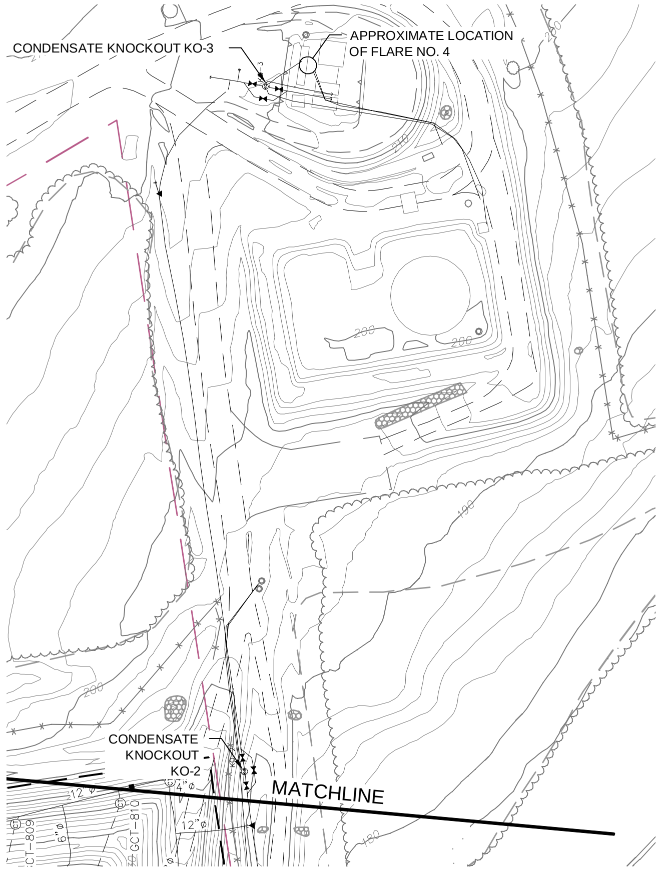
1. THE EXISTING LANDFILL GAS EXTRACTION SYSTEM INFRASTRUCTURE FEATURES SHOWN ARE BASED ON A COMBINATION OF DESIGN AND AS-BUILT DOCUMENTATION AVAILABLE TO SANBORN, HEAD & ASSOCIATES, INC. (SANBORN HEAD). ACTUAL LOCATIONS OF INDIVIDUAL FEATURES MAY BE DIFFERENT THAN SHOWN.

2. BASE MAP WAS PREPARED BY AERIAL SURVEY & PHOTO INC., OF NORRIDGEWOCK, MAINE. PHOTO DATE JULY 31, 2014. VERTICAL DATUM: BRASS PLUG AT PUMP STATION. HORIZONTAL DATUM: MAINE STATE COORDINATES EAST ZONE NAD 83. GROUND CONTROL BY PLISGA & DAY LAND SURVEYORS, BANGOR, MAINE.

LEGEND:

EXISTING

190	10-FOOT CONTOUR
	2-FOOT CONTOUR
— — — —	LIMIT OF WASTE CONTAINMENT
—— – ——	CELL LIMIT
— — — —	EDGE OF ROAD
————	LANDFILL GAS CONVEYANCE PIPE
_ — — — — — — _	LANDFILL GAS COLLECTION TRENCH (PERFORATED PIPE)
—— · · · —— · · · ——	LIMIT OF MARSH
—x—x—x—	FENCE LINE
⊕ GW-9	LANDFILL GAS EXTRACTION WELL
Ⓒ GCT-21	COLLECTION TRENCH WELLHEAD
ⓔ	COLLECTION TRENCH TERMINATION
⊓	PIPE END CAP
⦸	LEACHATE COLLECTION PIPE CLEANOUT
☐	LEACHATE COLLECTION INLET
●	LANDFILL GAS EXTRACTION WELLHEAD
▨	RIPRAP AREAS



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LAYOUT: SHEET 1
CTB FILE: SHA Standard.ctb
PLOT DATE: 4-15-15

SANBORN | HEAD

GRAPHICAL SCALE
100' 50' 0 100' 200'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: R. CLAY
DESIGNED BY: R. CLAY
REVIEWED BY: E. STEINHAUSER
PROJECT MGR: E. STEINHAUSER
PIC: E. STEINHAUSER
DATE: June 2015

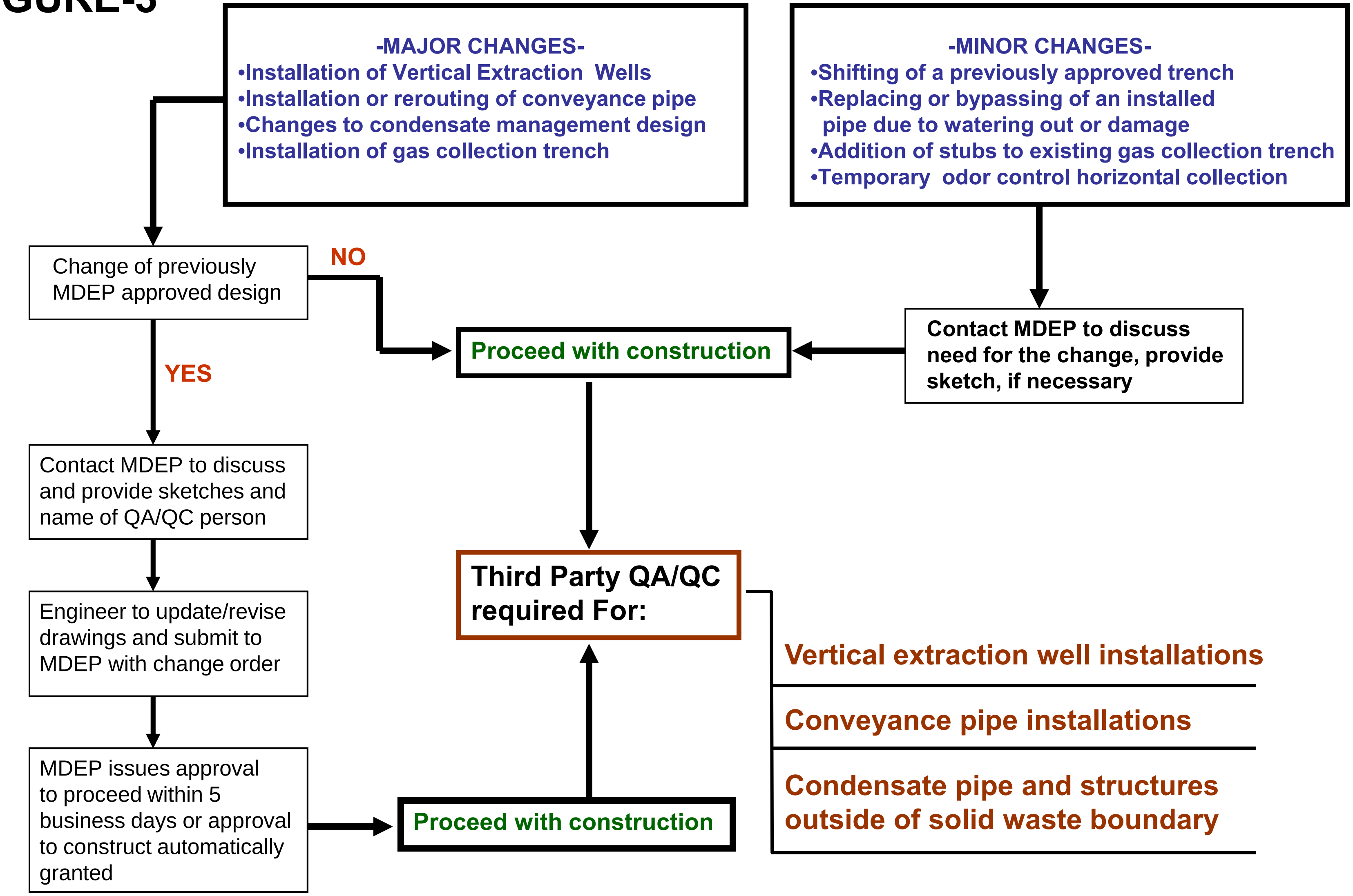
LFG SYSTEM EXPANSION MASTER PLAN
JUNIPER RIDGE LANDFILL
OLD TOWN, MAINE

JRL LFG INFRASTRUCTURE PLAN
(AS-BUILT - CELLS 1-8)

PROJECT NUMBER:
2536.27

FIGURE NUMBER:
2

FIGURE-3



-MAJOR CHANGES-
- Installation of Vertical Extraction Wells
- Installation or rerouting of conveyance pipe
- Changes to condensate management design
- Installation of gas collection trench

-MINOR CHANGES-
- Shifting of a previously approved trench
- Replacing or bypassing of an installed pipe due to watering out or damage
- Addition of stubs to existing gas collection trench
- Temporary odor control horizontal collection

Change of previously MDEP approved design

NO

Proceed with construction

Contact MDEP to discuss need for the change, provide sketch, if necessary

YES

Contact MDEP to discuss and provide sketches and name of QA/QC person

Engineer to update/revise drawings and submit to MDEP with change order

MDEP issues approval to proceed within 5 business days or approval to construct automatically granted

Proceed with construction

Third Party QA/QC required For:

Vertical extraction well installations

Conveyance pipe installations

Condensate pipe and structures outside of solid waste boundary

-PROTOCOL FOR LFG SYSTEMS INSTALLATION-

APPENDIX K

ODOR COMPLAINT MANAGEMENT AND RESPONSE PLAN

JUNIPER RIDGE LANDFILL

Operated by NEWSME Landfill Operations, LLC

JUNIPER RIDGE LANDFILL
Odor Complaint Management and Response Plan

Revision
February 19, 2013

1.0 Introduction

NEWSME Landfill Operations, LLC (NEWSME), which operates the Juniper Ridge Landfill (JRL), receives periodic complaints of odors from residents living within the vicinity of the landfill. NEWSME is committed to mitigating the odor problem and has implemented an aggressive program of identifying potential sources of odors and corrective measures to reduce the intensity and frequency of odors transported offsite to residential locations. A copy of JRL's Odor Control Plan may be found in Attachment C.

As part of the program, NEWSME has instituted a plan to respond to odor complaints received from the community. NEWSME encourages local residents potentially affected by odors from the JRL to report any odors that they may be experiencing as soon as they occur. This will allow the landfill staff to more immediately investigate and identify the source of the odor, and to implement corrective measures to reduce the transport of odors offsite.

This document details the procedures NEWSME staff will follow to respond to complaints received on odor, document the response, and institute a plan of action to address the complaint.

2.0 Odor Complaint Response Procedure

2.1 Basic Procedure for Responding to Odor Complaints

The basic procedure for responding to odor complaints is as follows:

1. When odor complaints are received during landfill operational hours, complaint line personnel will ask several specific questions of the caller including requesting identification and the nature of the complaint (first determine if the complaint is odor related).
2. The information will be documented by the person receiving the call at the scale house, then relayed immediately to a member of the complaint response group, who will respond to the complaint, if deemed necessary.
3. During the following times, all complaint line calls will be automatically forwarded to a member of the response group via cell phone:

   Weekdays: 9:00 PM – 5:30 AM Weekends: 5:00 PM – 5:00 AM
4. The designated response group staff member will be responsible for following up with each caller, more thoroughly documenting the complaint, and also for notifying other staff, if any corrective action(s) may be required.

2.2 NEWSME Phone Number for Receipt of Complaints

NEWSME Operations has a dedicated incoming phone line for complaints from the public relating to any aspect of the JRL operations. **The complaint number is 207-394-4376**. The complaint line is answered 24 hours per day 7 days per week by trained landfill personnel.

2.3 Scale House Operator Procedures for Responding to Odor Complaints

The following information will be gathered from any users (callers) of the complaint number:

- Name, address, and telephone number.
- Determine if the complaint is odor related.
- Ask what time of day they first experienced the odor.
- Ask whether or not the odor is being experienced at their residence.

Attachment A lists the dialogue the scale house operator will employ in responding to a caller, and the specific questions the scale house operator will ask of the caller. After this information is received, the scale house operator taking the call will immediately relay the information to the appropriate complaint response personnel.

In addition, the scale house operator will formally document the complaint using the blank COMPLAINT RECORD FORM provided in Attachment B. The completed COMPLAINT RECORD FORMS will be kept on file at the Environmental Compliance Manager's office.

2.4 Response Group Member Procedure for Further Response to Odor Complaint

During operational hours, an available member of the complaint response group will respond to the complaint if necessary. If a return call has been requested, the on-call response group member will first telephone the person initiating the complaint. If a site visit has been requested, the group member will go to the residence to evaluate site-specific information.

During non-operational hours, the on duty response group member is responsible for completion of all procedures relating to the complaint call.

Whether or not the response group member meets directly with the individual initiating the complaint, the following information will be gathered at the earliest opportunity and entered onto the Complaint Record Form:

- Time of arrival at the location of the odor complaint (if applicable).
- Recorded wind direction and speed at the landfill.
- H_2S level measured at the complaint location.
- Observation of the cover integrity at the landfill.
- Observed waste materials being accepted at time of complaint.
- If necessary, initiate remedial measures with the landfill supervisor to mitigate the source of the odor.

The complaint response group member will be responsible for documenting the additional information required by the COMPLAINT RECORD FORM, including the following:

- Actions taken to remedy cause of the complaint.
- Resolution of the complaint.
- Time and comments made in reporting back to caller.
- Comments made by caller during final exchange.
- Recommendations as to how to resolve any observed problem.

If applicable, it is important that the person calling with the complaint be made fully aware of the actions taken and resolution of the complaint, such as placement of additional cover or other remedial measures. It’s also important to notify the caller if it’s determined that the source of the odor is not the JRL.

Scale House Operator Odor Response Procedures

-JUNIPER RIDGE LANDFILL-

-LANDFILL COMPLAINT RESPONSE PROCEDURES-

WHEN RECEIVING A COMPLAINT CALL PERTAINING TO JUNIPER RIDGE LANDFILL, FOLLOW THE BELOW LISTED LANGUAGE:

1. **HELLO, THIS IS THE LANDFILL COMPLAINT LINE, WHO IS CALLING PLEASE?**
2. **ARE YOU CALLING WITH A COMPLAINT PERTAINING TO JUNIPER RIDGE LANDFILL?**
3. **WHAT IS YOUR NAME, RESIDENCE ADDRESS, AND TELEPHONE NUMBER?**
4. **WHAT IS THE NATURE OF YOUR COMPLAINT?**
5. **AT WHAT TIME OF DAY DID YOU FIRST NOTICE THE SOURCE OF YOUR COMPLAINT?**
6. **DO YOU WANT SOMEONE TO CALL YOU BACK OR VISIT YOUR RESIDENCE?**
7. **I WILL REPORT THE SPECIFICS OF THIS COMPLAINT TO LANDFILL MANAGEMENT, SO THAT THEY CAN FOLLOW-UP AT THE EARLIEST OPPORTUNITY.**
8. **THANK YOU FOR CALLING TO REPORT THIS SITUATION.**

COMPLETELY FILL OUT THE SCALEHOUSE SECTION OF THE COMPLAINT RECORD FORM, AND THEN CALL THE APPROPRIATE INDIVIDUAL LISTED BELOW TO REPORT THE COMPLAINT. PLEASE CALL IN THE ORDER LISTED.

DURING OPERATIONAL HOURS			***EVENINGS (After 9:00 PM) AND WEEKENDS(After 5:00 PM)***		
NAME	**WORK**	**CELL**	**NAME**	**HOME**	**CELL**
ERIC NUTE		852-0340	TRACY FLAGG		852-3267
JEREMY LABBE	862-4200 x233	217-7988	JEREMY LABBE		217-7988
WAYNE BOYD	862-4200 x224	694-5510	WAYNE BOYD	989-9021	694-5510
DON MEAGHER	862-4200 x230	461-0879	DON MEAGHER	947-1963	461-0879

Attachment B

Blank Complaint Record Form

COMPLAINT RECORD FORM

JUNIPER RIDGE LANDFILL

-THIS SECTION COMPLETED BY SCALEHOUSE-

Complaint received by the following method: ☐ Phone ☐ Email ☐ Fax ☐ In Person

Complaint received at: ☐ 394-4376 (JRL 24-hour line) ☐ 394-4370 (fax)
☐ 941-4580 (MDEP) ☐ michael.t.parker@maine.gov (MDEP)

Date of complaint: ______________ Time of call/fax/visit: _____________ ☐ AM ☐ PM

Name of person filing complaint: ______________________________

Address: ____

Telephone number: ___________________________________

Nature of complaint: ☐ Odor ☐ Noise ☐ Lights ☐ Dust ☐ Traffic ☐ Other
☐ Traffic- Name of Company_______________ License#__________ Route__________
Direction traveling_________ Truck type ☐ tractor trailer ☐ straight/dump trailer
☐ No Specific Information
For odor complaints; time odor was detected:____________ ☐ AM ☐ PM

Is the odor being detected at the caller's residence? ☐ Yes ☐ No

Telephone call requested? ☐ Yes ☐ No

Site visit requested? ☐ Yes ☐ No

Wind direction & speed at time of complaint: From the ___________ @ _____mph

Manager contacted regarding this complaint: _____________________Time:_________________

Comments and/or Odor Type: ☐ Sludge ☐ Trash ☐ Rotten Eggs (H_2S) ☐ Other (Specify)

____

____

Scalehouse Attendant Taking Call: ________________Time Faxed to Jeremy Labbe:________________

Complaint Log Number: _________

-THIS SECTION COMPLETED BY RESPONSE PERSONNEL-

Wind direction & speed at time of visit: From the ___________ @ _________mph

Telephone called returned by: __________________________ Date: ____________ Time:____________

Site visited by: ___________________________ Date: _______________ Time:_______________

If odor present: Butanol level: _______ Potential Source: ☐ H_2S ☐ Sludge ☐ FEPR ☐ MSW ☐ Other

Specific comments pertaining to complaint:

____

Completed Complaint Record Form entered into the Environmental Audit Database: (Date) _____________________

Attachment C

JRL Odor Control Plan

NEWSME LANDFILL OPERATIONS, LLC
JUNIPER RIDGE LANDFILL
ODOR CONTROL PLAN

Introduction

The Juniper Ridge Landfill (JRL), formerly known as the West Old Town Landfill, accepts a variety of special wastes that have the potential to generate odors. The waste types with the highest potential for odor generation are front end process residue (FEPR), by-pass municipal solid waste (MSW), and wastewater sludges. The leachate generated from the landfill is also a likely source of odors during its storage and transport to the wastewater treatment plant. As the waste mix in the landfill begins to degrade, it has the potential to generate landfill gases, such as methane and hydrogen sulfide (H_2S).

All of the above sources of landfill-related odors must be managed appropriately to prevent offsite migration of odor sources, such as H_2S, and the resulting odor complaints from individuals who live near the JRL. This Odor Control Plan describes the current odor control measures implemented at JRL, as well as policies and procedures to control the offsite migration of landfill-related odors.

Control of Odors Associated With Incoming Wastes:

A variety of methods are utilized to control offsite migration of gases and odors associated with daytime operations. They include the following:

1. The active placement of incoming wastes is confined to the smallest cell area possible. The wastes are spread over the active face, compacted, then another lift initiated. If a load of waste arrives that is noticeably odorous, ash, construction and demolition debris (CDD), till, or other effective neutralizing material, will be spread over the waste to limit

odor migration. This activity is particularly important on windy days to minimize gas and odor migration.

2. Additionally, daily cover is applied over the active portion of the landfill at the end of each workday. Cover materials include wood chips, CDD processing fines, bark, ash, soil-type materials, and/or other approved wastes that provide appropriate cover.
3. When necessary, a dozer mounted odor neutralizer spray system is utilized to control odors from arriving wastes as they are offloaded and spread out.
4. Upon arrival at the landfill during warm weather months, the tops of the trailer loads of FEPR, sludge, and bypass MSW pass under a trailer spray system that applies an odor control agent onto the waste to assist in controlling odors during the offloading process. These empty trailers pass through the same spray system to control empty trailer transit odors.
5. A perimeter odor (misting) neutralization system is employed during the warm weather months to provide additional odor control coverage. The system is sited in strategic locations around the active area of the landfill and is moved to appropriate locations when new cells are opened. A portable system is also utilized at the active face of the landfill.

Control of Odors Associated With Leachate Storage & Transport

1. JRL has a leachate storage tank designed to store all leachate being generated from the landfill prior to being transported offsite for appropriate disposal. The leachate storage pond is utilized as a back-up system in the event that leachate generation rates (during a heavy rain event) dramatically increase in a short period of time.
2. Tankers hauling the leachate to the Old Town Fuel & Fiber or City of Brewer waste water treatment plants generally operate during the daytime hours. If required, chemicals will be added or metered into the tankers as they are being loaded so that odors are

minimized during transport. All tanker filling ports are required to be tightly sealed during transport to and from the disposal facility.

Control of Landfill-Related Gases

1. Non-active portions of the landfill will receive intermediate or final cover as soon as the cell reaches its final grade.
2. A comprehensive landfill gas management system, including gas blowers/flare systems, horizontal collection trenches, and vertical extraction wells, have been designed and installed at the facility. Horizontal gas collection trenches and vertical extraction wells have been installed throughout the existing landfill with horizontal systems being installed every 40-feet of waste depth to help control landfill gas generation as a cell is being filled. Gas extraction wells are generally installed after a cell has reached its final capacity and provide more efficient LFG removal.
3. The landfill gas blowers/flare system consists of a 3,500 CFM flare with dual blowers to provide the extraction and destruction of landfill gas.

Monitoring for Offsite Migration of Landfill Related Gases and Odors

1. Daily odor surveys are typically performed around the active landfill areas, while periodic surveys will be performed at surrounding residential areas when conditions warrant. The surveys will include monitoring for gas migration and landfill-related odors. Odor intensity will be rated according to the Butanol Odor Intensity Scale. The surveys will also include measurements of airborne concentrations of H_2S using a Jerome® 631-X™ Hydrogen Sulfide Analyzer. The results of the surveys will be immediately reported to the landfill supervisor in order to assure that any potential odor causing conditions are corrected accordingly.

2. As a proactive measure, JRL has installed six Zellweger Analytic Single Point Monitors onsite and offsite, so that facility personnel can review real-time H_2S concentration data from the monitors and identify conditions that may require abatement. Locations of the monitors are as follows:

    1. Adjacent to the perimeter fence line just south of cell #5.
    2. Located at 2824 Bennoch Road, off Route 16 northeast of the landfill (Route 16 Monitor).
    3. Located approximately 1-mile north of the landfill on the access road (Access Road Monitor).
    4. Located at 4 West Coiley Road , off Route 43 southeast of the landfill (West Coiley Monitor).
    5. Located at the Fort James House off Route 43 southwest of the landfill (Fort James Monitor).
    6. Located off the Old Stagecoach Road northwest of the landfill (Stagecoach Monitor).

All six of the H_2S monitors have direct communication with the landfill's monitoring system through telemetry. Real-time information can be obtained at the scale house, as well as, on the office computer. If any of the H_2S monitors detects a concentration of 15 ppb, the scale house is alerted by telephone with an automated message reporting the condition. The scale house operators and security personnel are instructed to immediately report any such condition to the supervisory staff, so that they can follow-up by investigating onsite conditions as necessary.

If an odor complaint is received at the facility, the scale house staff can report the real-time H_2S data (along with the wind direction from the onsite weather station) to response personnel to assist them with their follow-up investigation.

Odor Complaint Records

1. Odor complaints related to the JRL are accepted by the following four methods:
    - Maine DEP telephone number (941-4580)
    - JRL complaint line (394-4376)
    - JRL fax (394-4373),
    - Email to michael.t.parker@maine.gov
2. As detailed in the JRL *Odor Complaint Management and Response Plan,* specific procedures are followed for responding to complaints. All complaints will be recorded on the facility complaint record form and assigned a complaint record number.

All completed complaint record forms will be kept on file in the Environmental Manager's Office and monthly reports on complaint activity provided to the MDEP.

APPENDIX L

WASTE INSPECTION PLAN

WASTE INSPECTION PLAN
FOR
JUNIPER RIDGE LANDFILL

Waste inspection and education on proper management and handling is the best defense against the receipt of unacceptable waste. Waste inspection is critical to personal safety, environmental protection and compliance. Everyone; customer service, drivers, scale attendants, operators, and managers share in this responsibility.

Unacceptable wastes are wastes that we **CANNOT** or **SHOULD NOT** accept or transport. Wastes can be deemed unacceptable for many reasons, primarily because they are considered dangerous or harmful to human health or the environment. Below is a list of unacceptable wastes at the Juniper Ridge Landfill:

- Any Material Regulated as a "Hazardous" Waste
- Out of State Waste
- Paints
- Chemicals
- Any Liquid Wastes
- Waste Oil
- Untreated Medical-Related Wastes
- Pathological Wastes
- Dead Animals
- Abandoned or Junk Vehicles
- Friable Asbestos Materials
- Other Non-Approved Wastes

Universal Wastes such as:

- Fluorescent Lamps
- Mercury Vapor Tubes
- Light Ballasts Containing PCB's
- Batteries
- Computer Monitors (CRT's)
- Television Sets
- Mercury Thermostats/Switches
- Mercury Thermometers

Appliances such as:

- Washer Machines
- Dryers
- Stoves/Ranges
- Dishwashers
- Microwaves

Items containing CFC's or HCFC's (chlorofluorocarbons and hydrochlorofluorocarbons) such as:

- Refrigerators
- Air Conditioners
- Freezers
- Dehumidifiers
- Water Coolers
- Other Refrigerated Items

Special Wastes:

- Any Waste Material Not Receiving Prior Approval from Environmental Manager

If unacceptable wastes are detected in a load, it is the responsibility of the generator to properly and safely remove the material from the site, handle, transport, and dispose of the material in compliance with all applicable safety and environmental requirements and standards. All costs associated with receipt, removal, testing, and remediation of unacceptable wastes at JRL are the responsibility of the generator. JRL does not accept or store unacceptable waste.

Unacceptable wastes are generally listed in local, state, or federal regulations, disposal or transportation permits, or are unacceptable as a matter of company policy.

In order to uphold employee safety and comply with all acceptable & unacceptable waste regulations, the following guidelines have been established:

1. **Pre-approval of Special Wastes:**
   Special wastes require approval by the environmental manager at the facility prior to disposal. Special wastes are required to go through the **Waste Characterization Program** prior to being approved for acceptance.

2. **At the scalehouse:**
   Scalehouse operators need to question drivers on the type and source of waste, then visually inspect loads and transportation documents when appropriate.

   When inspecting waste loads, some warning signs to watch out for are:
   - Red Bags
   - Drums/Barrels/Containers
   - Vehicle Placards
   - Unfamiliar Labels or Warning Labels
   - Industrial Process Waste
   - Unusual, unfamiliar or irritant odors
   - Liquids oozing or free flowing

   Any suspicious loads should be immediately reported to the Environmental Manager (EM) and moved to a safe location for further inspection.

   The EM will need to determine what the material is and where it originated. This information will allow the EM to track down the problem areas.

   If further inspection determines that an unacceptable material is in the load, and it can be safely removed, then do so and place the material back onto the trailer or rolloff prior to it departing the facility.

   If an unacceptable item or material is identified that could create an unsafe situation when handling, then the load must be rejected. Depending upon the situation, the EM may have to report any unsafe conditions to the appropriate company contacts and regulatory agencies. Proper safety precautions must be taken for all unacceptable materials found.

3. In the landfill:

Landfill operators should be closely monitoring arriving loads for unacceptable materials that could potentially cause a dangerous situation, or cause the facility to be in non-compliance with regulations.

Any arriving load identified as potentially containing an unacceptable material needs to be immediately reported to the site supervisor and EM.

The scalehouse should be contacted if truck traffic needs to be held to address the unacceptable load. If this occurs, incoming traffic will have to stage until the material has been identified and put under safe control.

The area of unacceptable waste should be properly cordoned off. All equipment on the pad will be placed in a safe location in reference to the material. The site supervisor or EM will release the operators as soon as the material has been determined to be safe or the material has been properly removed. It will be the responsibility of the site supervisor and EM to reopen the pad and let the scalehouse know to allow incoming trucks again.

If an unacceptable item is found, and the operators know that it is not a serious hazard, and it can be removed with no employee contact, USING THE EQUIPMENT TO RELOAD IT BACK IN TO THE TRANSPORTER'S TRUCK, then the site supervisor and EM will still need to be contacted but the pad does not need to be shut down if the material can be removed in a safe and timely manner.

If an unacceptable material has been identified after the hauler has departed the site, and it can be safely removed:

- Take the appropriate precautions to remove the item
- Wear appropriate PPE for the task.
- Then transfer the item to a safe storage area until it can be properly disposed of or recycled.

AT NO TIME WILL A LANDFILL EMPLOYEE LEAVE THE EQUIPMENT TO CHECK A MATERIAL ON THE GROUND WITHOUT FOLLOWING THE ABOVE PROCEDURES!!

APPENDIX M

FACILITY NOTIFICATION PROCEDURES

JUNIPER RIDGE LANDFILL

Operated by NEWSME Landfill Operations, LLC

2828 Bennoch Road
Old Town, ME 04468

FACILITY NOTIFICATION PROCEDURES

April 2014

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Attachment A - Contact Information

DISTRIBUTION LIST

Copies of this Facility Notification Plan are located at the following locations:

1. General Manager, Pine Tree Landfill, Hampden, ME
2. Environmental Compliance Manager, JRL Facility, Old Town, ME
3. Landfill Supervisor, JRL Facility, Old Town, ME
4. Regional Engineer, Regional Office
5. Site Safety Manager, Pine Tree Landfill, Hampden, ME
6. Regional Vice President, Regional Office

Copies of this Facility Notification Plan have also been forwarded to the following entities:

1. Maine Bureau of General Services, Bangor, ME
2. MEDEP, Augusta, ME
3. City of Old Town, Old Town, ME
4. Sevee & Maher Engineers, Cumberland Center, ME
5. Pierce Atwood LLP, Portland, ME

1.0 INTRODUCTION

1.1 Plan Purpose

This Facility Notification Plan (FNP) specifically addresses the notification process in the event of a regulatory compliance issue or public safety incident and the need for coverage at the facility during routine operations and in the event of an emergency (internal and external).

Efforts to prevent emergency situations from occurring are just as important as prior planning to respond in the event of an emergency. The JRL facility is committed to the prevention of all incidents and to the safe and effective response to any emergency that may occur.

This FNP plan is in addition to other pre-existing JRL contingency plans including the facility Spill Prevention, Control and Countermeasures (SPCC) Plan, Stormwater Pollution Prevention Plan (SWPPP), Environmental Monitoring Plan, and several health and safety plans already on file at the JRL facility.

1.2 Notification to Proper Officials

JRL will notify the proper officials in a timely manner in the event of a regulatory compliance issue, public safety incident or other emergency situation. The specific notification procedures are discussed in Section 4.0 of this FNP. The list of proper officials to be notified for emergency responders, municipal contacts, regulatory contacts and corporate contacts along with their contact numbers are attached in Appendix A.

2.0 FACILITY INFORMATION

The JRL facility and its associated ancillary buildings and equipment is located at 2828 Bennoch Road, Old Town, Maine and is owned by the Maine Bureau of General Services and operated by NEWSME Landfill Operations, LLC (NEWSME), a subsidiary of Casella Waste Systems, Inc. of Rutland, Vermont. NEWSME operates the Juniper Ridge Landfill and a wood storage facility at the same address.

Facility Name:	Juniper Ridge Landfill
Facility Address/Owner:	2828 Bennoch Road Old Town, ME 04468
County:	Penobscot County

3.0 FACILITY COVERAGE

3.1 Routine Facility Coverage

The following table illustrates facility personnel available at the JRL on a daily basis:

Name/Title	**Contact Info:**
Wayne Boyd, General Manager	(207) 694-5510 cell
Jeremy Labbe, Environmental Compliance Manager	(207) 217-7988 cell
Eric Nute, Landfill Supervisor	(207) 852-0340 cell

In the event that the General Manager is off-site, the Environmental Compliance Manager shall assume responsibility for the site. In the event that the General Manager and the Environmental Compliance Manager are both off-site, the Landfill Supervisor shall assume responsibility for the site. In the event of a regulatory compliance, public safety or emergency situation the General Manager, Environmental Compliance Manager, and Landfill Supervisor are required to:

- Perform notifications to regulatory agencies and local officials,
- Activate any necessary emergency response organizations,
- Coordinate and catalog any emergency response effort,
- Appropriate, either directly or through prearranged contracts, any funds required to carry out all necessary activities, and
- Maintain communications with corporate management.

3.2 Emergency Facility Coverage

In the event that the General Manager, Environmental Compliance Manager, and Landfill Supervisor are off-site or require additional assistance due to emergency or unforeseen circumstance, the following personnel are available:

Name/Title **Emergency Managers**	**Contact Info:**
Jeff Pelletier, Environmental Compliance Tech Anita Verrill, Environmental Compliance Tech	(207) 249-8025 cell (207) 852-8607 cell
Jim Worster, Site Safety Manager	(207) 745-8345 cell
Toni King, Regional Engineer	(207) 653-4421 cell
Brian Oliver, Regional Vice President	(207) 653-4431 cell

In the event of a regulatory compliance, public safety or emergency situation, the Regional Engineer and the Site Safety Manager for the facility shall serve as the designated alternate emergency contacts for the facility. The Regional Engineer and the Site Safety Manager are required to arrive at the site within a reasonable time after notification and are required to do the following:

- Perform notifications to regulatory agencies and local officials,
- Activate any necessary emergency response organizations,
- Coordinate and catalog any emergency response effort,
- Appropriate, either directly or through prearranged contracts, any funds required to carry out all necessary activities, and
- Maintain communications with corporate management.

4.0 NOTIFICATION PROCEDURES

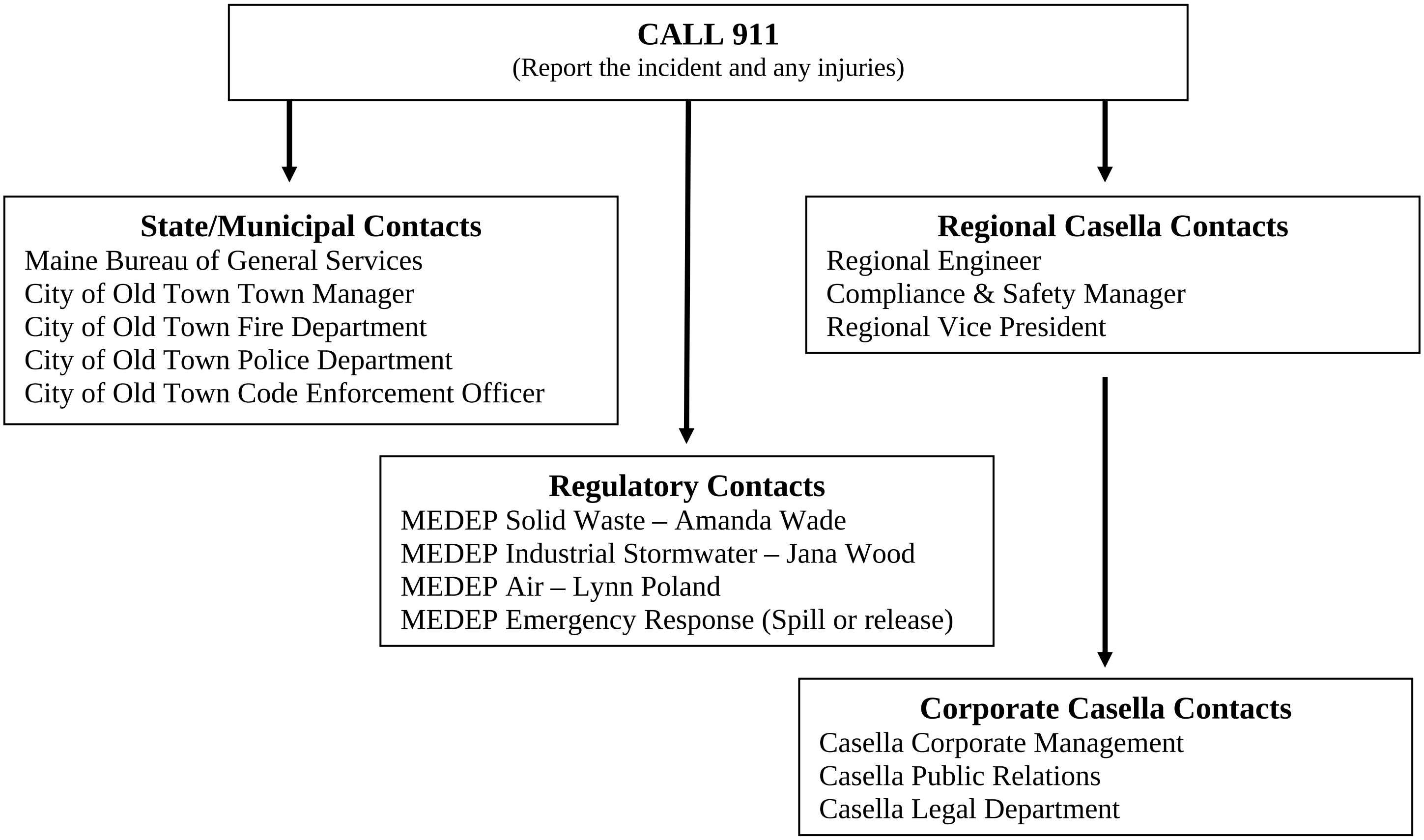
4.1 Safety

In the event of any emergency situation the primary focus of any individual authorized in this FNP is to immediately secure the safety of facility personnel, onsite third-party contractors, facility visitors, and the public. The secondary focus is to take any reasonable action to prevent impacts to public health and the environment. Once this has been accomplished, the procedures below should be executed immediately to notify the proper officials.

4.2 Notification Procedures – Public Safety Emergency

In the event of a public safety emergency and after securing the safety of those at the facility, the facility management team shall execute the following notification procedures:

General Manager	Environmental Compliance Manager	Landfill Supervisor
If not available, responsibility falls to Environmental Compliance Manager	If not available, responsibility falls to Landfill Supervisor	If not available, responsibility falls to Emergency Managers



CALL 911
(Report the incident and any injuries)

State/Municipal Contacts
Maine Bureau of General Services
City of Old Town Town Manager
City of Old Town Fire Department
City of Old Town Police Department
City of Old Town Code Enforcement Officer

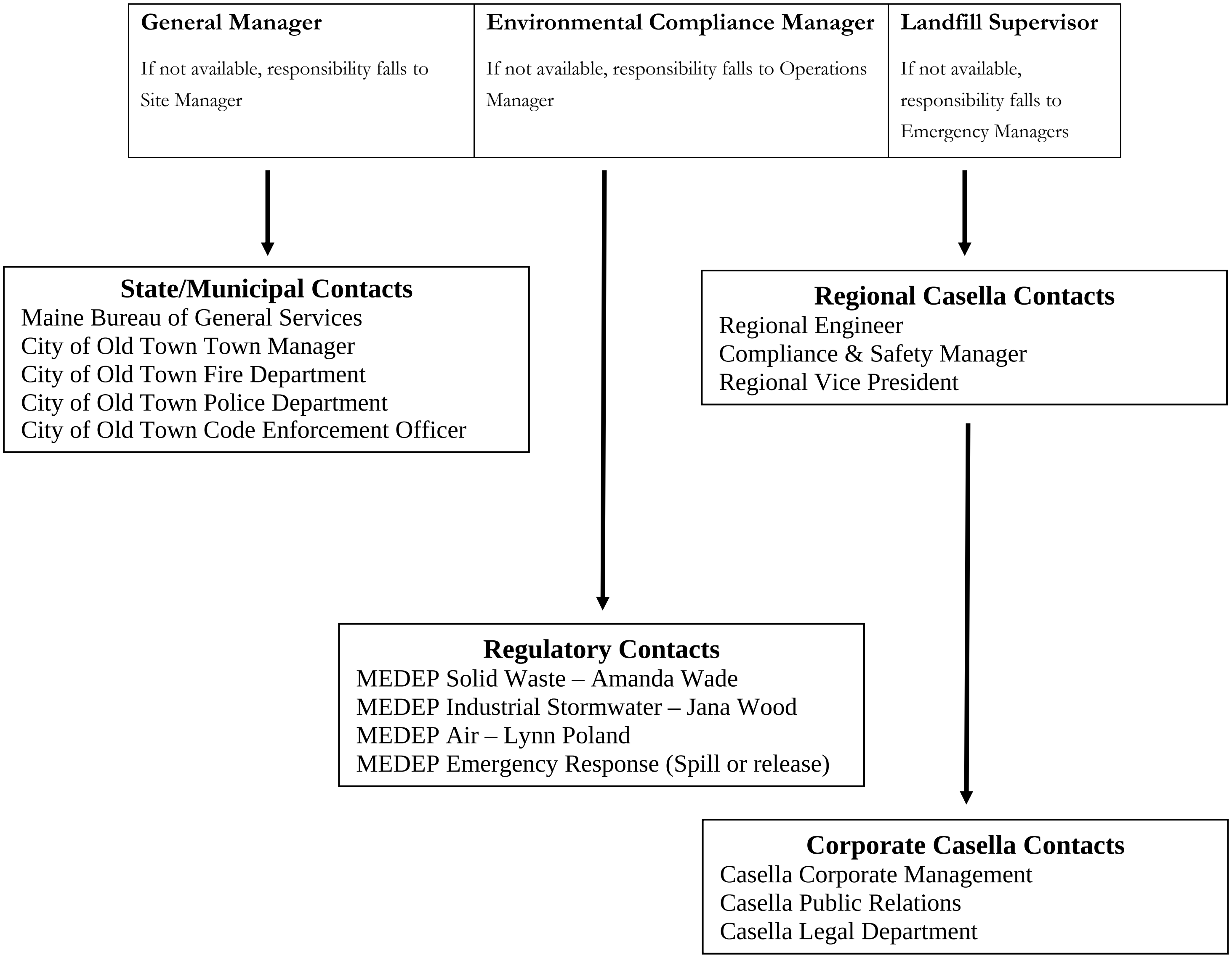
Regional Casella Contacts
Regional Engineer
Compliance & Safety Manager
Regional Vice President

Regulatory Contacts
MEDEP Solid Waste – Amanda Wade
MEDEP Industrial Stormwater – Jana Wood
MEDEP Air – Lynn Poland
MEDEP Emergency Response (Spill or release)

Corporate Casella Contacts
Casella Corporate Management
Casella Public Relations
Casella Legal Department

4.3 Notification Procedures – Regulatory Compliance

In the event of a regulatory compliance issue and after securing the safety of those at the facility, the facility management team shall execute the following notification procedures:



General Manager

If not available, responsibility falls to Site Manager

Environmental Compliance Manager

If not available, responsibility falls to Operations Manager

Landfill Supervisor

If not available, responsibility falls to Emergency Managers

State/Municipal Contacts

Maine Bureau of General Services
City of Old Town Town Manager
City of Old Town Fire Department
City of Old Town Police Department
City of Old Town Code Enforcement Officer

Regional Casella Contacts

Regional Engineer
Compliance & Safety Manager
Regional Vice President

Regulatory Contacts

MEDEP Solid Waste – Amanda Wade
MEDEP Industrial Stormwater – Jana Wood
MEDEP Air – Lynn Poland
MEDEP Emergency Response (Spill or release)

Corporate Casella Contacts

Casella Corporate Management
Casella Public Relations
Casella Legal Department

5.0 TRAINING

5.1 Training

The facility management authorized by this FNP will receive training on the notification procedures.

ATTACHMENT A

CONTACT INFORMATION

JRL Facility Management	
Wayne Boyd, General Manager	(207) 694-5510 cell
Jeremy Labbe, Environmental Compliance Manager	(207) 217-7988 cell
Eric Nute, Landfill Supervisor	(207) 852-0340 cell
Toni King, Regional Engineer	(207) 653-4421 cell
Jim Worster, Site Safety Manager	(207) 745-8345 cell
Brian Oliver, Regional Vice President	(207) 653-4431 cell

State/Municipal Contacts	
Maine Bureau of General Services	(207) 624-7734
City of Old Town Town Manager	(207) 827-3960
City of Old Town Fire Department	911 (207) 827-3400
City of Old Town Police Department	911 (207) 827-6358
City of Old Town Code Enforcement Officer	911 (207) 827-3965, ext. 205
Maine State Police	(800) 452-4664
Maine Poison Center	(800) 442-6305
Eastern Maine Medical Center	(207) 973-7000

MEDEP Contacts	
MEDEP Solid Waste – Amanda Wade	(207) 485-8056
MEDEP Industrial Stormwater – Jana Wood	(207) 215-7869
MEDEP Air – Lynn Poland	(207) 287-2229
MEDEP Emergency Response	(800) 482-0777

Casella Corporate Contacts	
John Casella – Chairman & CEO	(802) 236-4513 cell
Ed Johnson – President & COO	(802) 236-7936 cell
Joseph Fusco – Vice President	(802) 779-1768 cell
David Schmitt – General Counsel	(802) 282-2509 cell
Shelley Field – Associate General Counsel	(802) 345-2597 cell

APPENDIX N

GEOTECHNICAL MONITORING PLAN

JUNIPER RIDGE LANDFILL EXPANSION APPLICATION
GEOTECHNICAL MONITORING PLAN

Submitted by:

STATE OF MAINE BUREAU OF GENERAL SERVICES,
as Owner
and
NEWSME LANDFILL OPERATIONS, LLC,
as Operator

July 2015

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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JUNIPER RIDGE LANDFILL EXPANSION
GEOTECHNICAL MONITORING PLAN

1.0 INTRODUCTION

This document describes the Geotechnical Monitoring Plan (GMP) for the landfill expansion (Expansion) at the Juniper Ridge Landfill (JRL) in Old Town, Maine. The Expansion will consist of six additional landfill cells, (i.e., Cells 11 through 16), generally constructed to the north of the existing facility. The plan replaces the existing GMP at the time when Cell 11 is constructed. The Expansion cells will receive similar types of wastes as those received in the current landfill cells. The Plan describes the methodology to be used by NEWSME Landfill Operations, LLC (NEWSME) to monitor the geotechnical conditions of the Expansion for consistency with the parameters and assumptions used in the facility's design. The specific activities related to the GMP include periodic landfill observations, review of topographic surveys of the landfill surface, and an annual independent geotechnical landfill inspection and review of landfill operations. The findings of the GMP will be reported annually and will supplement routine landfill observations performed by operational personnel.

2.0 OVERVIEW OF GEOTECHNICAL MONITORING

The GMP consists of three components:

- Visual observation of landfill slope stability and settlement and general landfill conditions;
- Review of semi-annual topographic surveys; and,
- Review of waste types and properties, construction material properties, and filling sequences.

Visual observations and reviews relating to landfill slope stability and settlement will be made on the active and inactive portions of JRL. The review and comparison of topographic surveys will be used to quantify both inplace densities and changes in secondary (time-dependent) strain rates that are used in the assessment of cover performance, in inactive areas. The review of waste types and properties, construction material properties, and filling sequences will be used to both evaluate initial design assumptions used in the geotechnical evaluation of each landfill cell construction, completed as part of the detailed cell design.

2.1 Routine Landfill Inspections, Annual Inspections, and Surveys

Landfill inspections will be routinely completed as described in Section 8.0 of the JRL Operations Manual. These inspections are to document landfill operations and check that facility components are operating properly. As part of these inspections, weekly inspections will observe and document slope stability. During these inspections, the landfill surface will be observed for overall condition, evidence of cracking, localized depressions, erosion, leachate breakout on sideslopes, areas of ponded water, and toe heaving. An inspection report, using the form presented in the Operations Manual, Appendix O, will be filled out for each inspection. These inspections are completed by NEWSME operational personnel.

An annual inspection and review will be completed by the site geotechnical engineer using the form presented in Appendix A. This review will include a site inspection, a review of site operating records, a review of pore pressure measurements obtained from site transducers installed below the landfill liner, and in the leachate collection system and a review of site aerial topographic surveys. As part of this evaluation the engineer will observe waste slope and liner conditions, the types, quantities and waste filling techniques, and overall landfill settlement. The intent of the inspection and evaluation is to confirm that the landfill is maintained in a stable condition and that the geotechnical response of the facility is consistent with that anticipated during design. If necessary, this evaluation may include some additional site survey if deemed appropriate by the engineer. Barring no identified unfavorable conditions requiring immediate action at the landfill, the results of this evaluation will be compiled into a report which will be included in the JRL Annual Report. If any of the inspections or evaluations indicates actions requiring immediate action, the engineer will notify NEWSME and develop a plan that addresses the items identified. These plans will be reviewed with the MEDEP prior to implementing the plan.

2.2 Reporting

An annual Geotechnical Report will be prepared and included in the facilities Annual Report submitted to the Maine Department of Environmental Protection (MEDEP). The report will include a summary of annual site activities, findings from the site inspections and recommendations regarding changes in geotechnical inspections and evaluations.

APPENDIX A

ANNUAL GEOTECHNICAL INSPECTION FORM

ANNUAL GEOTECHNICAL INSPECTION FORM
WEST OLD TOWN, MAINE

Observation Date: _______________ Monitor Name: ______________________
Weather: ____

Observation (Enter a √ as appropriate)			Description (location, direction, appearance, etc.)	Proposed Action
Area	Sat	Unsat.		
Active Area				
location description				
slope stability				
waste lift thickness				
active slope angle				
erosion				
leachate breakout				
ponded water				
toe heaving				
overall condition				
Inactive Area (synthetic)				
location description				
slope stability				
cracking				
erosion				
leachate breakout				
ponded water				
toe heaving				
overall condition				
Interim Soil Cover				
location description				
overall surface condition				
cracking				
erosion of cover material				
erosion of ditch lining				
leachate breakout				
ponded water				
toe heaving				
grass kills				
gas venting				
overall condition				

Utilize additional pages for notes, as necessary.

APPENDIX O

OPERATIONAL AND INSPECTION FORMS

WEEKLY INSPECTION FORM
JUNIPER RIDGE LANDFILL

Areas Inspected	On a Weekly Basis, Inspect the ...	Findings		Corrective Actions Taken (use notes section as needed)
		In Compliance	Needs Attention	
Access Roads	Access roads (including the main entrance road) for debris, staining, erosion, damage, excessive dust and damaged vegetation.			
Landfill	Landfill areas for unacceptable materials, fluid leakage, staining, areas of settlement, erosion, leachate release, and vectors.			
Stockpiles	Tipping, material storage areas, vegetative stockpile areas, and active areas of borrow pit for material migration, staining, erosion, and damage.			
Truck Scale	Truck scale for staining.			
Machinery & Equipment	Machinery & equipment for fluid leakage, staining and waste (if outside of the active cell).			
Maintenance Garage	Garage area (inside and out) for incompatible materials, odors, staining, uncovered materials (i.e., batteries), universal wastes, and good housekeeping practices.			
	500-gallon motor oil tank			
	500-gallon hydraulic oil tank			
	55-gallon drums and 5-gallon pails on spill pallet			
Rubb Building	Rubb Building (inside and out) for incompatible materials, odors, staining, universal wastes, and good housekeeping practices. Inspect waste oil storage area, and all chemical storage inside and contained.			
	1,500-gallon diesel tank			
	1,500-gallon gas tank			
	250-gallon tank of odor control liquid			
	55-gallon drums on spill pallets			
Tanks on top of landfill	2,500-gallon diesel fuel truck for rusting, leaks and staining.			
	500-gallon diesel fuel tank for rusting, leaks and staining			
	300-gallon hydraulic oil tank for rusting, leaks and staining			
Spill Kits	Spill kit for the maintenance garage, scale house, and loading rack to ensure an adequate supply of adsorbents.			
Gas Flare	Gas flare area for incompatible materials, odors, staining, universal wastes, and good housekeeping practices.			

WEEKLY INSPECTION FORM
JUNIPER RIDGE LANDFILL

Areas Inspected	On a Weekly Basis, Inspect the ...	Findings		Corrective Actions Taken (use notes section as needed)
		In Compliance	Needs Attention	
Leachate Storage Tank and Transfer Station	Storage tank for adequate freeboard, tank secondary containment area and transfer area for odors, staining, leaks, and damaged equipment. Verify that catch basin is draining to leachate pump station and that leachate pump station is functioning properly.			
Geomembrane-Lined Pond, Pump Station and Transfer Station	Pond for adequate freeboard, visible portions of the pond liner for damage, pump station for leakage and transfer area for odors, staining, leaks, and damaged equipment. Verify pump station is operating properly.			
Inactive Cells	Verify only clean stormwater discharged to sedimentation/ detention ponds. Leachate impacted stormwater will be properly transferred to the leachate collection system.			
Drainage Channels & Check Dams	Channels and check dams for particulate manner, litter, sheens, siltation, and damage.			
Stormwater and Pond Outfalls	Outfalls for siltation, erosion, sheens, odors, staining or signs of stormwater impacts from pollutants.			
Detention Ponds	Ponds for particulate matter, sheen, odors, or staining.			
Litter Fencing	Mesh and posts for integrity and any damage from wind, debris or equipment.			
Landfill Cover	Soil and vegetation for indication of erosion or stressed vegetation.			
Administrative Building	Area around the fill pipe for the 275-gallon heating oil tank for signs of overfills. Outside area free of vehicle leaks/spills.			

Inspection Completed By: ____

Date: ________________________________

WEEKLY INSPECTION FORM
JUNIPER RIDGE LANDFILL

NOTES:____

JUNIPER RIDGE LANDFILL
FACILITY INSPECTION REPORT

INSPECTION MONTH\YEAR:__________________ **INSPECTION DATE:**__________________

NAME OF INSPECTOR:_________________________________

INSPECTION ITEM DESCRIPTION	INSPECTED NO ACTION TAKEN	NEEDS ACTION (See Comments)
OPERATIONS	(place a check mark in the appropriate column)	
Access roads clear and free of debris		
Active disposal area size minimized		
Daily cover materials being utilized		
Litter being controlled & collected as needed		
Dust being minimized		
Tracking of wastes outside of cell being controlled		
Waste setback from berms		
Leachate controlled & contained in cells		
Odor control measures in-place		
Vector control measures in-place (birds, rats, etc.)		
Fire prevention & control measures in-place		
Adequate working equipment onsite		
LEACHATE MANAGEMENT		
Build-up of sediment in wetwells		
Pumps & valves functioning properly		
Flow conditions		
Pump station vented properly		
Electrical panel inspection		
Flow meter inspection		
Manholes intact and serviceable		
LEACHATE STORAGE & DISPOSAL		
Inspection of leachate storage pond & level		
Any signs of leachate seeps		
Underdrain system monitoring being performed		
Inspection of loading rack system & drain		
Leachate forcemain system		
STORMWATER COLLECTION & CONTROL COMPLIANCE		
Check outlet structures for condition		
Drainage ditches clear and flowing		
Signs of erosion		
Check dams		
Detention ponds		
Silt fences installed properly		
Check roadway ditches for erosion		
SPILL PREVENTION COMPLIANCE		
Condition of oil/fuel storage tanks & drums		
Any signs of leaks or spills		
Secondary containment being utilized as needed		
Spill kits available and restocked as needed		
All containers labeled appropriately		
ACTIVE GAS COLLECTION SYSTEM		
Condensate knockout system		
Condition of wellheads ok		
Presence of leakage on assembly		
Thiopaq® system operation/compliance		
Cleanleness of Thiopaq® system		
Maintenance of Thiopaq® up to date		
Noise/vibration in the motor or blower		
Maintenance up-to-date		
Condition of igniter system		
Plumbness of stack		

JUNIPER RIDGE LANDFILL
FACILITY INSPECTION REPORT

COMMENTS ON NON-COMPLIANT CONDITIONS:

REVIEW BY ENVIRONMENTAL COMPLIANCE MANAGER:

Signature Date

Distribution: General Manager
PCE Manager

APPENDIX P

LINER ACTION PLAN

JUNIPER RIDGE LANDFILL EXPANSION APPLICATION
LINER ACTION PLAN

Submitted by:

STATE OF MAINE BUREAU OF GENERAL SERVICES,
as Owner
and
NEWSME LANDFILL OPERATIONS, LLC,
as Operator

July 2015

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JUNIPER RIDGE LANDFILL EXPANSION
LINER ACTION PLAN

1.0 INTRODUCTION

This document describes the Liner Action Plan (Plan) for Cells 11 through 16 of the proposed landfill expansion (Expansion) at the Juniper Ridge Landfill (JRL) in Old Town, Maine. The Plan describes the method to be used by NEWSME Landfill Operations, LLC (NEWSME) to monitor the performance of the Expansion's primary liner, and if appropriate, trigger response activities in the event monitoring suggests additional actions are warranted. The monitoring and evaluation techniques described in this Plan have been successfully employed at other landfill facilities in the State of Maine to monitor the performance of primary liner systems.

The expansion cells (i.e., Cells 11 through 16) have a primary and secondary liner system with a dedicated leak detection system (LDS) between them. The primary liner is a composite liner consisting of an 80-mil HDPE geomembrane, a geosynthetic clay liner (GCL) and one foot of compacted clay. The secondary liner is a 60-mil HDPE geomembrane.[1] Under the entire landfill base a one foot compacted clay layer exists. The leak detection system for the cells is located between the primary and secondary liners and consists of a geocomposite, one foot of sand, and piping which drains to an internal sump located within the cells. The sumps are equipped with a dedicated pumping system in each cell which allows both the flow and water quality of LDS fluids to be monitored by means of data collected from the totalizing flow meter and dedicated sample ports on each cell's LDS pump discharge.

The Plan describes a procedure to monitor the performance of the primary liner system using water quantity and quality data from the cell's LDS to a calculated Action Leakage Rates (ALRs). ALRs are calculated flow rates collected by the leak detection layer that trigger further

---

[1] In some areas of the landfill the secondary geomembrane is augmented with a GCL and one foot of clay.

investigations or actions that will be undertaken to evaluate primary liner's performance. For the Expansion two ALRs have been identified and are discussed in Section 3.0

The procedure for monitoring the primary liner performance uses a comparison of the specific conductance measurements in the LDS with the specific conductance identified as LDS Action Levels (LDSALs). The LDSALs are calculated using the ALR flow rates, the background flow rates in the leak detection system, and the specific conductance measurements of the LDS discharge prior to active use of the cell, and the specific conductance of the landfill leachate. This approach allows for a more representative evaluation of primary liner performance than a straight comparison of flow from the LDS system to the ALR's since flow in the LDS system can be from a number of sources which are not leachate related. These can include fluid present in the system as a result of construction or non-leachate leakage into the system from the perimeter of the cells. By incorporating specific conductance measurements into the evaluation of the primary liner performance the source of water collected in the LDS system can be better quantified. As the landfill cells are operated, actual flow and specific conductance measurements, obtained from the LDSs will be incorporated into the monitoring program. The procedures for both calculating the LDSALs and incorporating data into the monitoring program are discussed in Section 3.0.

NEWSME will be responsible for collecting the monitoring data (i.e., flows and conductivity measurements), compiling and evaluating the data, and reporting the data to the Maine Department of Environmental Protection (MEDEP). In the event the data suggests a leak has occurred, they may also involve a professional technical consultant to evaluate the data and assist in determining whether a leak has occurred and appropriate response actions. NEWSME will collect flow data and water quality samples from the leachate and individual cell's leak detection systems on a monthly basis for use in implementing this Plan.

The remainder of this Plan discusses the approach and methodology for monitoring the performance of the landfill cells' primary liner. Section 2.0 provides an overview of the Expansion containment systems design, and possible sources of fluids that would be collected by the leak detection layer. Section 3.0 discusses the two specific ALRs selected for the Expansion, and the corresponding Response Activities (RAs). This section also describes the methodology for converting ALRs to LDSALs. Section 4.0 describes the location and frequency of monitoring associated with the Plan, as well as the methodology for collecting samples from the Expansion cells' leachate sumps.

2.0 OVERVIEW OF CONTAINMENT SYSTEM DESIGN AND PROJECTED FLOW RATES

2.1 Containment System Design

The cells' containment system is designed to contain and collect leachate generated in the cells and monitor the performance of the primary liner system with a dedicated leak detection system. The containment system design includes the following components:

Leachate collection layer:

- a 12-inch layer of drainage sand (K $\geq$ 1x10^{-2} cm/sec),
- a network of 6 and 8-inch diameter perforated HDPE pipe,
- a geocomposite drainage net and piping system, and
- an internal leachate sump and pump system.

Primary liner system:

- a 80-mil high-density polyethylene (HDPE) textured geomembrane,
- a geosynthetic clay liner (GCL), and
- a 12-inch clay layer (hydraulic conductivity (K) less than or equal to 1x10^{-7} cm/sec).

Leak detection system:

- a 12-inch layer of drainage sand (K $\geq$ 1x10^{-2} cm/sec),
- a network of 6-inch diameter perforated HDPE pipe with sampling,
- a geocomposite drainage net and piping system, and
- an internal leak detection sump and pump system within each cell.

Secondary liner system:

- a 60-mil HDPE textured geomembrane.

The entire double liner system is underlain by and a 12 inch clay layer, having a hydraulic conductivity (K) less than or equal to 1x10^{-7} cm/sec.

2.2 Leak Detection Flow Rates

Fluid within the leak detection layer will flow to the individual LDS pump stations. There are several potential sources of fluid that could be present in the leak detection layer. These include construction water and liquids that enter the LDS before waste filling begins; liquids that enter the LDS system from areas not in contact with wastes, such as along the perimeter of the landfill cells in the vicinity of the anchor trench, and any fluid which may flow through the liner system due to defects in the primary liner system. The amount of these fluids can vary depending on the site conditions.

3.0 ACTION LEAKAGE RATES \ACTION LEVELS\ AND RESPONSE ACTIONS

3.1 Background

40 CFR § 265.302 defines Action Leakage Rate as the “maximum design flow rate that the leak detection system can remove without the fluid head on the bottom liner exceeding one foot.” The action leakage rate must include an adequate safety margin to allow for uncertainties in the design (e.g., slope, hydraulic conductivity, thickness of drainage material), construction operation, and location of LDS, waste and leachate characteristics, likelihood and amounts of other sources of liquids in the LDS and proposed response actions (e.g. the action leakage rate must consider decreases in flow capacity of the system over time resulting from siltation, and clogging, rib layover and creep of synthetic components of the system overburden pressure, etc.) U.S.EPA initially proposed a range for ALRs of between 5 and 20 gallon per acre per day (gpad) for waste management units with a composite liner system (Federal Register, 1987). In a supplemental document supporting final rulemaking, U.S.EPA acknowledged that these values may not be achievable in waste facilities meeting the minimum U.S.EPA design standards for double lined facilities (U.S.EPA, 1992). U.S.EPA recommended an ALR of 100 gpad for landfill facilities. This recommendation was based on measurements of actual flow rates in leakage detection systems of operating facilities, which meet the U.S.EPA minimum design requirements, and a theoretical analysis using a sophisticated three-dimensional seepage model. In recommending the 100 gpad, U.S.EPA states "leakage rates above this value often indicate that major localized or general failure of the top liner system. Flow rates of 1,000 gpad or greater represent significant flow rates and potentially significant hole sizes that may be readily identified and repaired."

The information contained in the supplemental U.S.EPA document (U.S.EPA, 1992) suggests that facilities constructed with proper QA/QC, as proposed for the Expansion cells, typically have flow rates in their LDS of less than 100 gpad; whereas, only 70 percent of the well-designed facilities with good QA/QC can meet the original proposed upper bounds of 20 gpad, included in U.S.EPA's original proposal. The Expansion cells will be constructed with an extensive amount of QA/QC testing and oversight as is currently done for the existing landfill cells. Therefore, site-specific ALRs were being proposed to the Expansion as described in Section 3.2

3.2 Landfill Cells Action Leakage Rates

For Cells 11 through 16, two ALRs will be used to monitor and evaluate the primary liner's performance. These ALR's have been established based on the EPA guidance and the site specific design assumptions, characteristics, and QA/QC Plans. Each ALR has an appropriate Response Activity (RA) associated with it. The purpose of defining two ALRs is to provide an initial response level set at a low level that triggers an initial review and increased monitoring of the data collected from the LDS, and a second level that warrants a more immediate investigation of potential sources of primary liner leaks. The exceedance of the first ALR would trigger a more frequent sampling regime. Then a more detailed analysis of LDS water quality to determine the cause for the ALR exceedance. The first ALR (ALR-I) will require obtaining additional measurements during the work week to confirm the initial results; notification of the MEDEP after obtaining four weekly sets of readings; continue monitoring the LDS during the work week for four consecutive months to confirm the ALR-I is consistently being exceeded. If four consecutive monthly readings indicate a leak, then monitor the individual LDS sumps for detection monitoring water quality parameters. The second ALR (ALR-II) will indicate a potential compromise of the primary liner system requiring a more immediate action, including additional investigations and the notification of MEDEP.

The Action Leakage Rates established for the cells consist of two liner leakage rates that were utilized to evaluate the potential impact of landfill leakage on the surrounding environment.[1]

- The first ALR (ALR-I) is set at 4.6 gallons gpad. This value was used to evaluate the effect on site groundwater if three 1 cm^2 holes develop in the secondary liner

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[1] In a total liner failure, the amount of leachate that would enter the environment will be controlled by the hydraulic conductivity of the soil present under the liner including the imported clay layer. Volume III of the MEDEP Application contained a contaminant transport analysis (Section 4.0) as required by the MEDEP Solid Waste Management Rules (Section 401.2.D.).

system. This ALR is below the 20 gpad that has historically been used in the State of Maine.

- The second ALR (ALR-II) is set 92 gpad. This value was used in the contaminant transport analysis to evaluate potential effect of on-site groundwater assuming no liner is present.[2]

The total leachate leakage rates for the individual cells based on these ALRs are summarized in Table 1.

TABLE 1

ACTION LEAKAGE RATES – EXPANSION CELLS

Cell ID	**Cell Area (Acres)**	**LDS-ALR-I (gallons per day)**	**LDS-ALR-II (gallons per day)**
11	9.5	44	874
12	12.6	58	1159
13	11.8	54	1085
14	6.7	31	616
15	6	28	552
16	7.1	33	653

3.3 Leak Detection System Action Levels

To determine if an ALR has been exceeded in a landfill cell, the monthly measured specific conductance value of the LDS discharge will be compared to a calculated Leak Detection System Action Level (LDSAL). The LDSAL will be calculated using ALR values in Table 1; the base LDS flow rate and the baseline LDS specific conductance measurement collected before active cell operations, and the specific conductance measurements of the leachate. The LDSAL will be calculated for each cell using the equation: LDSAL = *{[(base flow rates) * (the baseline specific conductance)] + [action leakage rates) * (leachate specific conductance)] /((base flow rate to the underdrain) + action leachate rates))*.

Tables 2 shows the general specific conductance values associated LDSAL-I and LDSAL-2 for Cell 11 with for the solution to this equation for each of the ALRs, and assumed values for both

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[2] The contaminant transport analysis demonstrated that a leak of this level would not result in contamination at sensitive receptors.

baseline flow in the LDS and Specific conductance of the leachate. As the facility is operated, operational data will be incorporated into the calculation of the LDSALs for each of the individual cells. The collection of this data, and its incorporation into determining the LDSAL, is discussed in Section 4.1.

TABLE 2

LEAK DETECTION SYSTEM ACTION LEVELS

Cell	Cell Size acres	Total Leachate Seepage Flows (gpd)		Baseline Values			Leak Detection System Action Levels	
		ALR I 4.6 gpad	ALR II 92 gpad	Flow gpd	LDS Cond. μmhos/cm	Leach. Cond. μmhos/cm	LDSAL I μmhos/cm	LDSAL II μmhos/cm
11	9.5	44	874	2,025	400	20,000	817	6,309

3.4 Response Actions

NEWSME will notify the MEDEP within 15 working days of obtaining four consecutive monthly readings from the leak detection discharge, suggesting exceedance of ALR-I (as determined by comparing the specific conductance measurement to the corresponding LDSAL). After notifying the MEDEP, NEWSME will monitoring the leak detection discharges at weekly intervals for four consecutive months, and notify the MEDEP of the results. If the results from the four months of weekly monitoring program suggests that liner seepage in excess of the ALR-I rate has occurred, a sample of the water from the offending LDS will be analyzed for the detection monitoring parameters contained in the facility's Environmental Monitoring Plan, at the end of the four months to assist in evaluating the source of the fluid in the LDS system. The MEDEP will be kept informed either verbally or written of the results of the sampling. NEWSME will prepare a report summarizing the results of the sampling and submit it to the MEDEP for its review within 60 days of receiving the detection monitoring test results. The report will contain recommendations for addressing the ALR-1 exceedance.

If the results of LDS monitoring exceed the LDSAL value associated ALR-II rate, NEWSME will notify MEDEP within 10 working days, and after consultation with MEDEP will submit a plan to the MEDEP which identifies the approach it will implement to evaluate the cause of the exceedance of ALR-II and identify appropriate corrective actions. Upon receipt of approval of this plan, NEWSME will undertake the plan and provide MEDEP with monthly progress reports. NEWSME will continue to collect measurements of flow and specific conductance from the LDS on a weekly basis until NEWSME and MEDEP agree to a modified plan.

4.0 MONITORING PROCEDURES

4.1 Monitoring Frequency

To implement the Plan, water quality and quantity samples will be collected from the LDS for each landfill cell. The total flows will be obtained from the totalizing flow meters installed on the discharge lines for the LDSs. The water quality samples will be collected from the sampling port on the LDS pump station discharge from each cell.

During the initial baseline period of operations, after a cell has been constructed and waste placed in the cell, LDS water quality and quantity samples will be collected at a frequency defined in Table 3. The baseline period is anticipated to last up to a year after the construction of a cell is completed and waste is placed in the cell.[4] Data collected during this baseline period will be used to calculate the LDSALs used to monitor the performance of the primary liner, and provide baseline conductivity measurements at each sampling port. After this baseline period, the frequency of data collection will be modified during the operating and closure life of the facility. The frequency of sample collections during the operational and closure period is summarized in Table 3. At the end of each calendar year, the data from that preceding year will be incorporated into the calculation of the UALs values used to monitor the primary liner performance. This will be done by calculating the monthly-means of the leachate specific conductance measurement, and recalculating the LDSAL values using this data for each cell. NEWSME will make appropriate recommendations for changes to the methodology for calculating the LDSALs based on the data collected as part of the annual report prepared for the Landfill. NEWSME will make no changes to the methodology until it receives MEDEP's approval.

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[4] The baseline period will be extended after initial waste in placed in the landfill cell provided the data collected suggests that the liner system is functioning as designed.

TABLE 3

LINER ACTION PLAN SAMPLING FREQUENCY

Item	Baseline Period[2]	After Baseline Period Provided LDSAL-I is not Exceeded	After Baseline Period If LDSAL-I is Exceeded for Four Consecutive Months	After Baseline Period If LDSAL-II is Exceeded
LDS Flow Rate(gpd)	Bi-Weekly	Monthly	Weekly	Daily
LDS Specific Conductance (μmhos/cm)	Bi-Weekly	Monthly	Weekly	Weekly
Leachate Specific Conductance(μmhos/cm)	Bi-weekly	Monthly	Weekly	Weekly
Leak Detection Water Quality Characterization	1	1	2	As Required[3]

Notes:

1. Leak detection water quality will be characterized as outlines in the Facility's EMP.
2. The sample period during the baseline period may be decreased as the data collected is consistent. The data will be collected no less than monthly during the baseline period.
3. A sample will be obtained after four consecutive months of LDSAL-1 exceedance.

4.2 Reporting Procedures

During the baseline period of operation for each cell, NEWSME will submit a report to the MEDEP with the results of the sampling program three times per year. The report will include cumulative flow data from the LDS with specific conductance measurements. After the baseline period for each cell, NEWSME will submit a yearly report presenting all of the data collected during the preceding year, and any recommended changes to the monitoring program, such as adjustments of the LDSAL values for each cell.