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PERMIT TO CONSTRUCT AND DESIGN REPORT FOR LANDFILL NO. 6 AREA D NORTH CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING CANTON, NORTH CAROLINA

VOLUME I ~~and VOLUME II~~

August 2013

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NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE JR.
8/15/13

PERMIT TO CONSTRUCT
FOR
LANDFILL NO. 6
AREA D NORTH
CANTON, NORTH CAROLINA

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EVERGREEN PACKAGING
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VOLUME I

August 2013

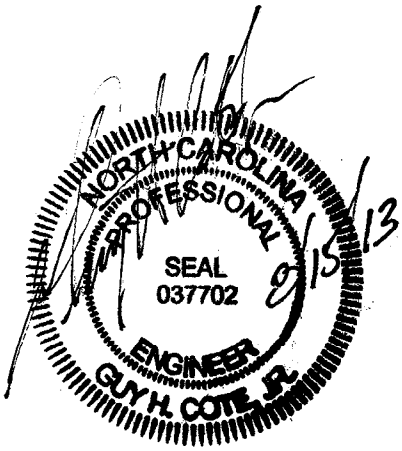

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TABLE OF CONTENTS

Section No.	Title	Page No.
EXECUTIVE SUMMARY		ES-1
1.0	INTRODUCTION	1-1
1.1	Application Structure	1-3
2.0	SOLID WASTE MANAGEMENT RULES	2-1
2.1	Statement of Compliance	2-1
2.2	Solid Waste Management Rules	2-1
2.2.1	Section .0100 - General Provisions	2-1
2.2.2	Section .0200 - Permits for Solid Waste Management Facilities	2-1
2.2.3	Section .0500 - Disposal Sites	2-3

LIST OF ATTACHMENTS

ATTACHMENT 1	HAYWOOD COUNTY PLANNING DEPARTMENT LETTER
ATTACHMENT 2	ANALYSIS OF LANDFILL LINER SYSTEM
ATTACHMENT 3	DESIGN HYDROGEOLOGIC REPORT ADDENDUM
ATTACHMENT 4	EROSION AND SEDIMENT CONTROL PLAN
ATTACHMENT 5	LANDFILL NO. 6 SOLID WASTE PERMIT AND PROPERTY DESCRIPTION

LIST OF FIGURES

Figure No. Title Page No.

1-1 SITE LOCATION PLAN 1-2

EXECUTIVE SUMMARY

Evergreen Packaging - Canton Mill (Evergreen) proposes to construct an expansion to the permitted Landfill No. 6. The expansion is identified as Area D North. Area D North is located north of the previously permitted active landfill Area D South. Area D South will reach capacity in early 2015. This document is prepared pursuant to North Carolina Department of Environment, Health and Natural Resources' Solid Waste Management Rules - 15A NCAC 13B.

The proposed design of Landfill No. 6 Area D North includes the following: a geosynthetic liner system for the containment of waste and leachate; a leachate collection system which minimizes leachate head levels on the liner system; access roadways which manage traffic into and out of the landfill area; and a clean storm water management system which diverts surface water away from the landfill, reducing the total leachate volume.

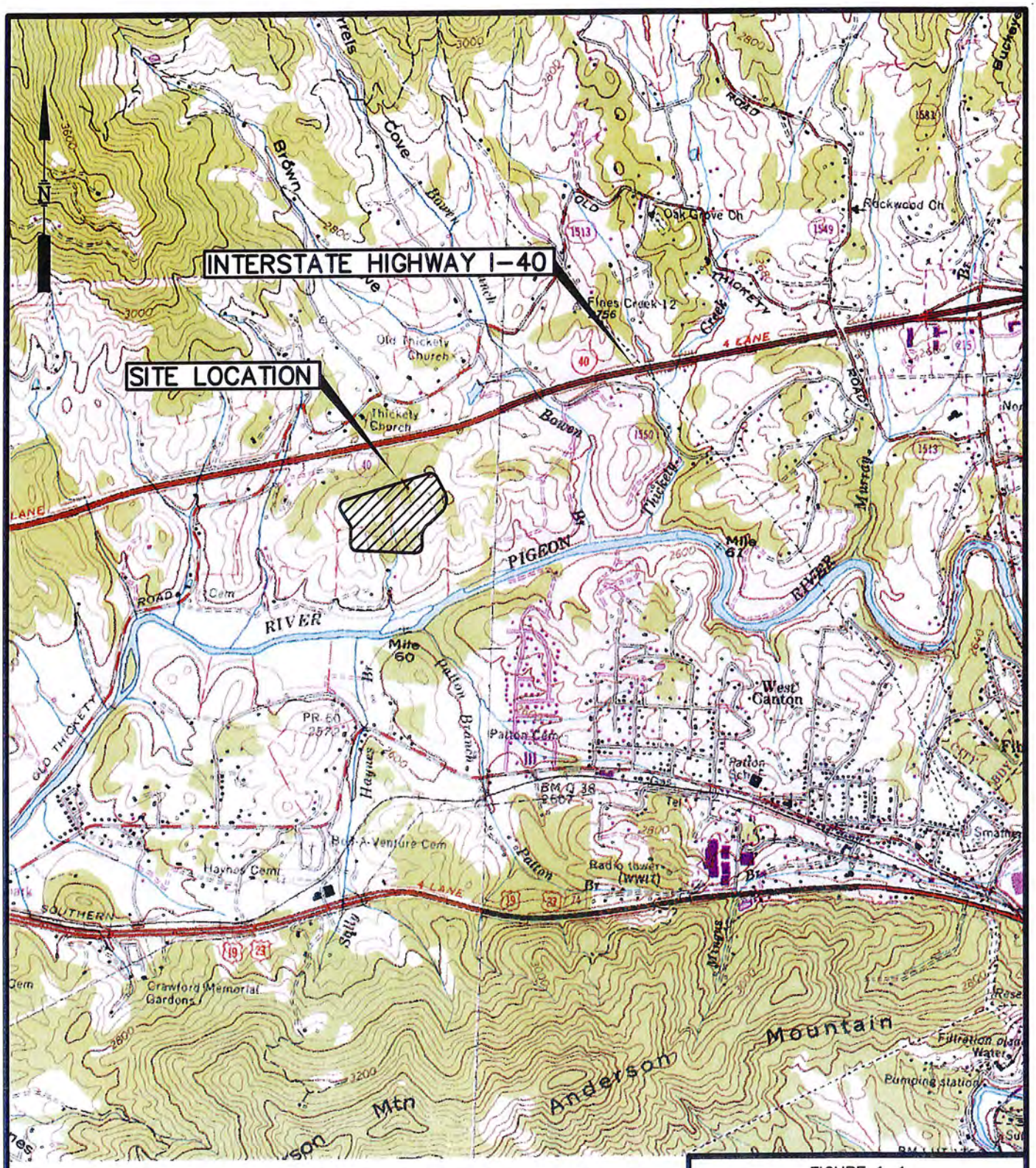
The detailed design of Area D North is provided within Volume II of this permit application, and includes a narrative of historical use of the landfill, design considerations, construction considerations, and a construction schedule. The design report also includes engineering drawings, exploration logs, engineering calculations, engineering specifications, groundwater information, and site specific soil permeability testing, all of which are related to the construction of Area D North.

1.0 INTRODUCTION

Evergreen operates a pulp and paper mill in Canton, North Carolina. Currently, approximately 250,000 cubic yards of production residuals, in-place volume, are generated each year that require landfilling. The production residuals consist of boiler fly ash, cinders, dewatered wastewater treatment sludge, lime mud, wood waste debris, biosolids, and asbestos containing material (ACM). At the present time, these wastes are landfilled at a company-owned landfill in Canton, North Carolina, referred to as Landfill No. 6 (see Figure 1-1). Landfill No. 6 was initially permitted for construction and operation in February 1984 Permit (#44-06).

Landfill No. 6 is divided into nine landfilling areas designated as Areas A through H, and ACM. Areas A through E are designated for disposal of wastewater treatment sludge (sludge), ash, lime mud, wood waste, cinders, and biosolids. Areas F through H are designated for disposal of lime mud. Areas A, B, C, F, G, and H have been constructed according to the original design specifications, landfilled to capacity, and capped. Area D is subdivided into two units, Area D South and Area D North. The current operating area, Area D South, will reach capacity at the beginning of 2015. Upon reaching capacity in Area D South, the next stage of development is planned for Area D North, then Area E.

This document has been prepared to serve as Evergreen's solid waste Permit to Construct application for the development of Area D North of Landfill No. 6. This application has been prepared pursuant to the North Carolina Solid Waste Management Rules, 15A NCAC 13B, Chapters .0100, .0200, and .0500.



BASE MAP ADAPTED FROM THE 7.5-MINUTE USGS CANTON, NC (1990) AND CLYDE (1978) TOPOGRAPHIC QUADRANGLE MAPS.

1000 0 2000 FEET

FIGURE 1-1
SITE LOCATION MAP
ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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DWG: SITELOC LMN: NONE CTB: SME-STD REV: 7/15/2013

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1.1 Application Structure

This application consists of two volumes. Volume I addresses the North Carolina Solid Waste Management Rules. Volume II is the design report for the proposed Area D North landfill, which includes design and development considerations, leachate management, landfill construction, stormwater and erosion control, and an assessment of environmental impact from the facility.

2.0 SOLID WASTE MANAGEMENT RULES

2.1 Statement of Compliance

The application for Area D North has been prepared pursuant to and in compliance with the applicable sections of the Solid Waste Management Rules 15A NCAC 13B Chapters .0100, .0200, and .0500.

2.2 Solid Waste Management Rules

This section will address all pertinent issues of the Rules and respond to the Rule and/or refer the reader to the location of the detailed information provided in Volume II - Design Report. Where applicable the Rule will be reiterated in normal font, all responses or referrals will be in bold type.

2.2.1 Section .0100 - General Provisions. **This application refers to the expansion of Landfill No. 6, a permitted landfill owned and operated by Evergreen. Evergreen seeks to obtain a construction permit from the North Carolina Department of Environment and Natural Resources, Division of Solid Waste Management (NCDENR-SWM) for the construction of the lined expansion, Area D North of Evergreen Landfill No. 6.**

The general provision requirements of this section of the Rules were approved in the original permitting of Landfill No. 6 and are not re-addressed herein.

2.2.2 Section .0200 - Permits for Solid Waste Management Facilities

> .0201 PERMIT REQUIRED. **A permit is required, and this submittal shall be viewed as an application request, to construct the proposed landfill unit referred to as Landfill No. 6 Area D North.**
>
> .0202 PERMIT APPLICATION. **This permit application is contained within two documents:**

- **Volume I - Permit to Construct**
- **Volume II - Design Report.**

Site and construction plans are included in Appendix A of the Design Report.

A letter from the Haywood County Planning Department, stating the facility meets the requirements of the County zoning ordinance is included in Attachment 1.

The detailed plans and specifications provided within the Design Report bear the imprint of the registration seal of a State of North Carolina professional engineer. Also, the geologic study, prepared within the permit to construct Area D, bears the imprint of the registration of a State of North Carolina professional geologist.

All other pertinent information of the proposed facility is found within the Volume I - Permit to Construct and Volume II - Design Report of this application.

Specific information regarding the proposed construction of Landfill No. 6 Area D North detailed within the Design Report is addressed in the following sections.

.0203 PERMIT APPROVAL OR DENIAL. **Not applicable.**

.0204 RECORDATION OF LAND DISPOSAL PERMITS. **When granted, Evergreen will file the approved, certified copy of the permit in the Haywood County register of deeds. The register of deeds will be notified to record the certified copy and index it in the grantor index under Evergreen.**

When the property is sold, leased, conveyed or transferred in any manner, the deed or other instrument of transfer shall contain in the description section in no smaller type than that used in the body of the deed or instrument a statement that

the property has been used as a sanitary landfill and a reference by book and page to the recordation of the permit.

.0205 VARIANCES. **Not applicable.**

2.2.3 Section .0500 - Disposal Sites.

.0501 APPROVED DISPOSAL METHODS. **The sanitary landfill disposal method is referred to within this permit application.**

.0502 OPEN DUMPS. Not Applicable.

.0503 SITING AND DESIGN REQUIREMENTS FOR DISPOSAL SITES. **Siting requirements for Landfill No. 6 Area D were approved as part of Permit No. 44-06. The siting of Landfill No. 6 Area D has not been modified within this application.**

The design of Landfill No. 6 Area D North is provided within Volume II - Design Report of this application. The permit requirements regarding the design of the site are briefly discussed below with reference to the specific section within the Design Report.

(2) A site shall meet the following design requirements:

(a) The concentration of explosive gases generated by the site shall not exceed:

(i) twenty-five percent of the limit for the gases in site structures (excluding gas control or recovery system components); and

(ii) the lower explosive limit for the gases at the property boundary;
The proposed development of Landfill No. 6 Area D North will not concentrate explosive gases which exceed twenty-five percent of the limit for the gases in site structures and the lower explosive limit for the gases at the property boundary. The proposed geosynthetic clay liner and 60-mil HDPE liner will retard lateral movement of

gases during the operational and post-closure life time of the landfill area. The leachate transport pipeline is sealed from the landfill to the leachate pond and from the leachate pond to the wastewater treatment facility.

(b) A site shall not allow uncontrolled public access so as to expose the public to potential health and safety hazards at the disposal site;

The site is accessed via one entrance; the entrance is gated and locked at all times the facility is not in operation. A sign at the entrance states the site is a landfill owned and operated by Evergreen for disposal of Evergreen waste products, and that no unauthorized entrance is allowed.

(c) A site shall meet the following surface water requirements:

(i) A site shall not cause a discharge of pollutants into waters of the state that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES), under Section 402 of the Clean Water Act, as amended, or that is in violation of standards promulgated under G.S. 143-214.1 and G.S. 143-215;

The site shall not cause a discharge of pollutants into waters of the state that are in violation of the NPDES or of standards promulgated under G.S. 143-214.1 and G.S. 143-215. The proposed geosynthetic clay liner and 60-mil HDPE liner, will contain virtually one-hundred percent of all leachate generated within Area D North. In addition, the leachate collection system is designed to minimize leachate head levels that otherwise could contribute to leakage rates of liner systems (refer to Sections 2.0 and 3.0 of the Design Report).

(ii) A site shall not cause a discharge of dredged material or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended, or that is in violation of any state requirements regulating the discharge of dredged or fill material into waters of the state, including wetlands; and

The site will not discharge dredged material or fill material into waters of the state that is in violation of the requirements under Section 404 of the Clean Water Act, as amended, or that is in violation of any state requirements regulating the discharge of dredged or fill material into water of the state, including wetlands. Landfill No. 6 Area D North does not abut any water body of the state, including wetlands, and the base grades are designed to provide at least four feet of separation between the seasonal high water table and any waste placement. The proposed construction will abide by the Erosion and Sedimentation Control Plan prepared in Attachment 4 of this report. Refer to Section 3.3 of the Design Report for additional Erosion Control measures to be implemented during construction.

(iii) A site shall not cause non-point source pollution of waters of the state that violates assigned water quality standards.

The site will not cause non-point source pollution of waters of the state that violates assigned water quality standards, as determined by groundwater modeling of the site. (Refer to Attachment 2).

(d) A site shall meet the following groundwater requirements:

(i) A site, except for landfill clearing and inert debris landfills subject to Rule .0564(8)(e) of this Section, shall be designed so that the bottom elevation of solid waste will be a minimum of four feet above the seasonal high water table;

The site is designed for the bottom elevation of solid waste to be a minimum of four feet above the seasonal high water table. Regional and site-specific groundwater elevations are provided on Figure 5-1 in Attachment 3.

(ii) Operators of new industrial solid waste landfills, lateral expansions of existing industrial solid waste landfills, and industrial solid waste landfills

receiving solid waste on or after January 1, 1998 shall submit to the Division a design which satisfies one of the following criteria:

(A) a design that will ensure that the groundwater standards established under 15A NCAC 2L will not be exceeded in the uppermost aquifer at the compliance boundary established by the Division in accordance with 15A NCAC 2L. The design shall be based upon modeling methods acceptable to the Division, which shall include, at a minimum, the following factors:

(I) the hydrogeologic characteristics of the facility and surrounding lands;

(II) the climatic factors of the area; and

(III) the volume and physical and chemical characteristics of the leachate; or

Landfill No. 6 Area D North includes a base liner system consisting of three components: the upper component is a 60-mil textured HDPE geomembrane, the middle component is a Geosynthetic Clay Liner and the lower component is one foot of compacted site soils. The GCL will be installed in direct and uniform contact with the compacted soil component.

A groundwater model analysis was performed with regard to site climatological data, waste chemical analysis, proposed liner design, and site hydrogeologic information which demonstrates that the proposed design will not cause groundwater standards to be exceeded in the uppermost aquifer at the compliance boundary established by the Division in accordance with 15A NCAC 2L. The groundwater model is presented in Attachment 3.

(B) design with a leachate collection system, a closure cap system, and a composite liner system consisting of two

components; the upper component shall consist of a minimum 30-mil flexible membrane (FML), and the lower components shall consist of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1 x 10^{-7} cm/sec. FML components consisting of high density polyethylene (HDPE) shall be at least 60-mil thick. The FML component shall be installed in direct and uniform contact with the compacted soil component.
Not applicable.

(iii) The Division reserves the right to require an applicant to submit a liner design if the groundwater protection demonstration in sub-item (ii) of this paragraph is not satisfactory.
No response.

(iv) Industrial solid waste landfills shall comply with groundwater standards established under 15A NCAC 2L at the compliance boundary.
Groundwater and surface water quality are monitored routinely by Evergreen around Landfill No. 6 for compliance to groundwater standards.

(e) A site shall not engage in open burning of solid waste;
The landfill site does not engage in open burning of solid waste.

(f) A site, except a land clearing and inert debris landfill, shall meet the following buffer requirements:

(i) A 50-foot minimum buffer between all property lines and disposal areas;

(ii) A 500-foot minimum buffer between private dwellings and wells and disposal areas; and

(iii) A 50-foot minimum buffer between streams and rivers and disposal areas; and

The site meets the above buffer requirements. Refer to Permit No. 44-06.

(g) Requirements of the Sedimentation Pollution Control Law (15A NCAC 4) shall be met.

Requirements of the Sedimentation Pollution Control Law (15A NCAC 4) will be met. A copy of the Erosion and Sediment Control Plan is provided as Attachment 4.

.0504 APPLICATION REQUIREMENTS FOR SANITARY LANDFILLS

1. The following information shall be required for reviewing a site application for a proposed sanitary landfill.

   The information requested within this sub-section has been provided during initial construction permitting of the site. Refer to Permit No. 44-06.

2. The following information shall be required for reviewing a construction plan application for a proposed sanitary landfill:
   a) A map showing existing features to include:
      i) existing topography of the site on a scale of at least 1 inch equals 200 feet with five foot contours;

      Drawing C-101 is included in Appendix A of the Design Report. The horizontal scale of C-101 is 1 inch equals 200 feet and includes 5 foot contours.

ii) benchmarks;

Drawing C-101 is included in Appendix A of the Design Report, and includes the location of existing benchmarks.

iii) springs;

No known springs are located within the limits of Landfill No. 6 Area D North.

iv) streams;

As shown on Drawing C-102 (included in Appendix A of the Design Report) no streams are located within the limits of Landfill No. 6 Area D North.

v) potential groundwater monitoring sites;

The location of current monitoring points is shown on Figure 3-1 in the Hydrogeologic Report included in Attachment 3.

vi) pertinent geological features;

As part of the field investigation for Areas D and E performed by Sevee & Maher Engineers, Inc., 52 piezometers and 28 borings were installed in 2007 (P-07 series). To supplement the hydrogeological study, 19 additional piezometers and 14 borings (P-13 series) were drilled in January 2013 and can be seen on Figure 3-1 in the Hydrogeologic Report included in Attachment 3. Geologic features of the site are shown in Figures 1 thru 3 of Hydrogeologic Report. Boring logs and rock core logs are located in Appendices A and B of the Hydrogeologic Report.

vii) soil boring locations;

Locations of the soil/rock borings are presented in Figure 3-1 of the Hydrogeologic Report included in Attachment 3.

b) A grading plan that provides:

i) proposed excavated contours;

Proposed base grading contours are depicted on Drawings C-103 and 104 in Appendix A of the Design Report. The plan is shown at a horizontal scale of 1 inch equals 50 feet and a contour interval of 2 feet.

ii) soil boring locations;

Locations of the soil/rock borings are presented in Figure 3-1 of the Hydrogeologic Report included in Attachment 3.

iii) locations and elevations of dikes or trenches;

A containment dike borders the north, east, and west sides of Landfill 6 Area D North and Area E. Locations and elevations of the containment dike are included on Drawings C-103, C-104, and C-105 in Appendix A of the Design Report.

iv) designated buffer zones;

Designated buffer zones were established during initial permitting of the facility and are not proposed to be affected due to this project.

v) diversion and controlled removal of surface water from the work areas;

Diversion and controlled removal of surface water from the work areas will be managed with two proposed detention basins. A containment dike along the northern boundary of

Area D North will direct runoff to Detention Basin No. 3. A drainage divide located north of the containment dike will direct runoff to Detention Basin No. 4.

The existing Detention Basin No. 2 located in Area D North will need to be filled to the base grade elevations in preparation of landfilling operations. The outlet control structure will be removed from the detention basin; however, a proposed 12-inch storm drain from Detention Basin No. 3 (located beneath the landfill base liner system) will tie into the existing 12-inch outlet pipe from Detention Basin No. 2.

Detention Basin No. 3 is proposed in the northwest corner of Area D North. The basin is designed with an outlet control structure, a 12-inch outlet pipe, and an overflow device which detains peak flows and allows sediments to settle out. The 12-inch storm drain outlet pipe will connect to the existing 12-inch underdrain that conveys flow beneath the Area 6D-South base liner system and into Detention Basin No. 1.

Detention Basin No. 4 is proposed in the northwest corner of Area E. The basin is designed with an outlet control structure, a 12-inch outlet pipe, and an overflow device which detains peak flows and allows sediments to settle out. The 12-inch storm drain outlet pipe will discharge to an existing drainage swale located northwest of the landfill.

The detention basins, outlet control structures, and culvert outlets proposed for use in Landfill No. 6 Area D North is included in Drawings C-103 and C-104 in Appendix A of the Design Report. Stormwater analyses performed for the

proposed detention basins indicate they have capacity to detain peak flows from the 25-year/24-hour storm events. A complete analysis is provided in Attachment 4 of this application.

vi) proposed utilities and structures;

A leachate collection system is proposed for the development of Landfill No. 6 Area D North. Temporary structures will include general contractor and engineer on-site offices mobilized prior to construction activities. The utilities and structures are shown in Drawings C-103, C-104, C-105, and C-300 in Appendix A of the Design Report.

c) A construction plan that provides:

i) engineering design for liners and leachate collection systems;

Engineering design for liners and leachate collection systems is provided on Drawings C-103, C-104, C-105, and C-300 in Appendix A of the Design Report. Drawings C-103 through C-105 include the base grading system prior to geomembrane installation and the location of the proposed leachate collection piping system. Details of the base geomembrane system and the leachate collection system are included on Drawings C-300 and C-301 in Appendix A of the Design Report. Cross sections of the base geomembrane system and the leachate collection piping system are included on Drawing C-200, in Appendix A of the Design Report.

ii) proposed final contours showing removal of surface water runoff;

Proposed final contours are shown on Drawing C-106 in Appendix A of the Design Report.

iii) locations of slope drains or other drop structures.

No slope drains or drop structures are proposed.

d) An erosion control plan that identifies the following:

i) locations of temporary erosion control measures (sediment basins, stone filters, terraces, silt fences, etc.);

Locations of temporary erosion control measures for excavating the landfill area to base grades are included in Attachment 4 of this report. The proposed excavation to base grades for this project will be managed by the Erosion and Sediment Control Plan. Erosion and sediment control measures are included in this application for review by the NCDENR; however, the design has been submitted to the Haywood County Commissioner's office for approval.

ii) locations of permanent erosion control measures (riprap, energy dissipaters, ditch stabilization, pipe drain, etc.);

Construction for the proposed project will include permanent erosion control measures. Seed and mulch will be applied to all disturbed surfaces not scheduled for landfill liner installation. Final capping (closure) of the landfill will require the installation of riprap aprons, stabilized drainage paths, and improvements to existing stormwater management facilities (i.e. ponds, culverts, etc.). The final capping design will be provided in the Operations Manual as part of the Operations Permit Request. The locations of permanent erosion control measures for Area D North are included on Drawings C-103 and C-104 in Appendix A of the Design Report.

iii) seeding specifications and schedules.

Seeding locations, specifications, and schedules are included on Drawings C-103, C-104, and C-303 in Appendix A

and in the specifications included in Appendix D of the Design Report. Seeding specifications and schedules are also included in the Operations Manual, to be submitted to the Division as part of the Operations Permit application request.

e) Detailed diagrams showing typical sections of:

i) dikes,

The design of Landfill No. 6 Area D North includes detailed diagrams showing typical sections and design calculations for the containment dikes.

Detailed diagrams showing typical sections of the landfill, including dikes, are on Drawings C-200, C-201, C-300, C-301, C-302, and C-303 in Appendix A of the Design Report.

ii) trenches,

Detailed diagrams showing typical sections of the landfill, including trenches, are on Drawing C-300 in Appendix A of the Design Report.

iii) diversions,

The proposed containment dike located along the southern edge of Area D North area will divert stormwater during landfilling operations. The containment dike is detailed on Drawing C-301 in Appendix A of the Design Report.

iv) sediment basins

The northwest corner north of the containment berm of Area D North acts as a sediment pond and includes an outlet structure for the controlled removal of collected storm water.

The sediment pond and outlet control structure is detailed on Drawing C-300 in Appendix A of the Design Report.

v) other pertinent details.

The comprehensive design of Landfill No. 6 Area D North includes details other than those described above. Other pertinent details are located on the Engineering Drawings in Appendix A of the Design Report. Some of the details include the following: temporary landfill access roadway detail; landfill perimeter road detail; anchor trench detail; future geomembrane tie-in detail; final closure detail; and, intermediate closure detail.

f) A minimum of two cross sections per operational area showing:

i) original elevations,

Refer to Drawing C-200 in Appendix A of the Design Report.

ii) proposed excavated depths,

Refer to Drawing C-200 in Appendix A of the Design Report.

iii) proposed final elevations,

Refer to Drawing C-200 in Appendix A of the Design Report.

iv) groundwater elevation,

Refer to Drawing C-200 in Appendix A of the Design Report.

v) soil borings.

Refer to Figures 4-1 and 4-2 in the Design Hydrogeologic Report of Attachment 3 to this report.

g) Site development showing phases or progression of operation.

An Operations Manual will be submitted under separate cover as part of the Operations Permit application for Landfill No. 6 Area D North. The Operations Manual will include site development showing phases or progression of operation. Evergreen has proven successful operation of this type of landfill as demonstrated in Landfill No. 6 Area A-East, Area A-West, and Area D South.

h) A written report that contains the following:

i) A copy of the deed or other legal description of the landfill site that would be sufficient as a description in an instrument of conveyance and property owner's name;

A copy of the deed is found in Attachment 5.

ii) Name of individual responsible for operation and maintenance of the site;

Mr. Jim Giauque, Environmental Department, is responsible for operation and maintenance of the site.

iii) Projected use of land after completion of the sanitary landfill;

There are no planned uses for the site after closure. Evergreen will provide post-closure maintenance such as mowing and contour maintenance.

iv) Anticipated lifetime of the project;

The construction of Area D North is anticipated to take nine to twelve months, refer to Section 4.0 of the Design Report. According to current landfilling disposal rates obtained from Evergreen, the lifespan of the landfill is estimated at approximately four to five years.

v) Description of systematic usage of area, operation, orderly development and completion of the sanitary landfill;
An Operations Manual will be submitted under separate cover prior to the operation of Landfill No. 6 Area D North. The Operations Manual will include the systematic usage of the area, operation, orderly development, and completion of the landfill. The Operations Manual will be similar to the Operations Manual approved by NCDENR for Landfill No. 6 Area A-East, Area A-West, and Area D South.

vi) Earthwork calculations;
Earthwork calculations are included in Section 2.3 of the Design Report.

vii) Seeding specifications and schedules;
Seeding specifications and schedules are addressed in Section 3.3 of the Design Report and in Specification Section 329219 located in Appendix D of the Design Report.

viii) Calculations for temporary and permanent erosion control measures;
Calculations for temporary and permanent erosion control measures are contained in the Erosion and Sediment Control Plan which is located in Attachment 4 of this report.

ix) Any narrative necessary to describe compliance with the Sedimentation Pollution Control Act of 1973 (15A NCAC 4);
Section 3.3 of the Design Report includes a narrative which describes compliance with the Sedimentation Pollution Control Act of 1973.

x) A discussion of compliance with design requirements in Rule .0503(2) of this Section,
Section 2.0 of the Design Report includes a narrative which describes compliance with design requirements in Rule .0503 (2).

xi) Any other information pertinent to the proposed construction plan.
The comprehensive design of Landfill No. 6 Area D North includes additional details in the Design Report. The additional information includes the following: site history, site location, basis for design, and, additional engineering calculations not described or mentioned above.

ATTACHMENT 1

HAYWOOD COUNTY PLANNING DEPARTMENT LETTER

Haywood County Planning
157 Paragon Parkway, Suite 200
Clyde, NC 28721
828.452.6632
828.452.6798(fax)

RECEIVED
AUG 09 2013
EVERGREEN PACKAGING
EHS DEPT

August 9, 2013

Ms. Jim Giaugue
Evergreen Paper
175 Main Street
Canton, NC 28716

SUB: FEMA Flood Determination
PIN: 8647-76-6665
Evergreen Landfill Expansion

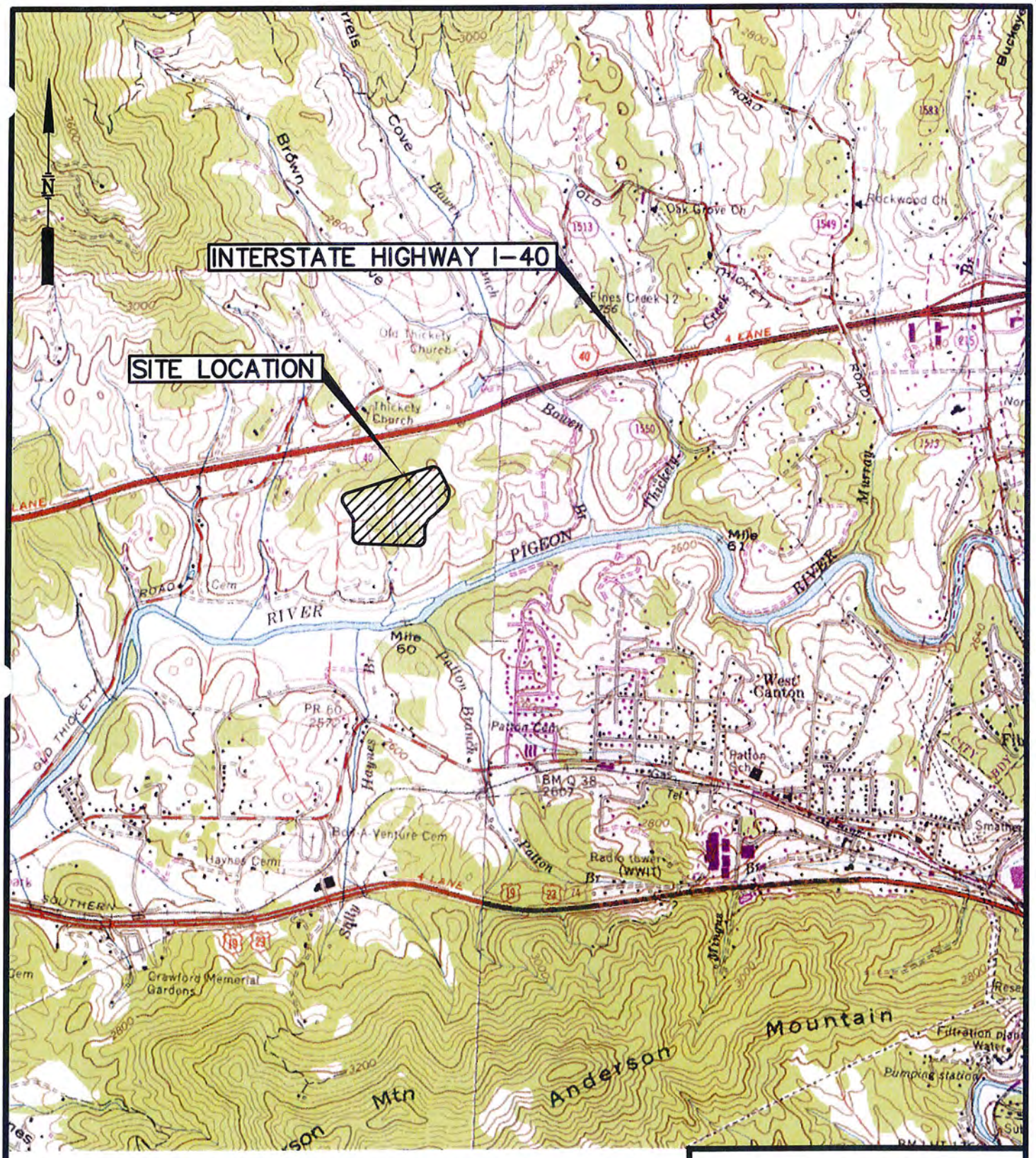
Mr. Giaugue,

This letter is to inform you that I have made an interpretation of the Federal Emergency Management Agency (FEMA) flood map for your property. The map shows that PIN 8647-76-6665 (Evergreen Landfill) has a very small portion of land located in Zone A, while the remaining balance is located in Zone X per FEMA FIRM Map 3700864700J dated April 3, 2012. Based on the plans you provided, the landfill expansion areas D and E are located in Zone X. There are no flood permitting requirements or restrictions for development in Zone X.

If you have any further questions, please contact me at 828.452.6632.

Sincerely,

Kris R. Boyd, CFM
Haywood County Planning Director



BASE MAP ADAPTED FROM THE 7.5-MINUTE USGS CANTON, NC (1990) AND CLYDE (1978) TOPOGRAPHIC QUADRANGLE MAPS.

1000 0 2000 FEET

FIGURE 1-1
SITE LOCATION MAP
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

SME
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ATTACHMENT 2

ANALYSIS OF LANDFILL LINER SYSTEM

ANALYSIS OF LANDFILL LINER SYSTEM
FOR
LANDFILL NO. 6
AREA D NORTH
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

August 2013

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TABLE OF CONTENTS

Section No.	Title	Page No.
EXECUTIVE SUMMARY		ES-1
1.0	INTRODUCTION	1-1
2.0	GUIDELINES FOR ANALYSIS	2-1
3.0	LEACHATE QUALITY	3-1
4.0	LEAKAGE TO SUBSURFACE	4-1
4.1	Method	4-1
4.2	Model Input	4-1
4.3	Results of HELP Model	4-3
5.0	SUBSURFACE TRANSPORT	5-1
5.1	Site Hydrogeologic Characteristics	5-1
5.2	Numerical Analysis of Downgradient Groundwater Quality	5-4
6.0	CONCLUSIONS	6-1

LIST OF APPENDICES

APPENDIX A	LEACHATE LABORATORY RESULTS
APPENDIX B	HELP MODEL
B-1	LEAKAGE THROUGH OPERATING BASE LINER
B-2	LEAKAGE THROUGH OPERATING SIDESLOPE LINER
B-3	LEAKAGE THROUGH CLOSED BASE LINER
B-4	LEAKAGE THROUGH CLOSED SIDESLOPE LINER
B-5	GROUNDWATER RECHARGE

LIST OF FIGURES

Figure No.	Title	Page No.
1-1	SITE LOCATION MAP	1-2
5-1	DELINEATION OF GROUNDWATER RECHARGE ANALYSIS OF LANDFILL LINER SYSTEM	5-3

LIST OF TABLES

Table No.	Title	Page No.
2-1	LEACHATE LABORATORY RESULTS	3-2
5-1	SUMMARY OF IN SITU HYDRAULIC CONDUCTIVITY TESTS FROM AREAS D & E	5-4

ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 - AREA D NORTH
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DBA EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

EXECUTIVE SUMMARY

Evergreen Packaging (Evergreen) owns and operates Landfill No. 6 (Industrial Solid Waste Landfill Facility Permit #44-06) located approximately two miles northwest of the City of Canton in Haywood County, North Carolina. Evergreen proposes to begin construction of Area D North located within the permitted Landfill No. 6. Under adopted industrial waste rules, 15A NCAC 13B Section .0503(2)(d)(ii)(A), the State of North Carolina Department of Environment and Natural Resources, Division of Solid Waste requires an assessment of the proposed liner system for Area D North. The assessment is required to estimate potential groundwater quality impact at the downgradient point of compliance.

The potential impact of the proposed landfill on the groundwater was evaluated by modeling the landfill design and site characteristics. The modeling study included the use of the HELP computer model, version 3.07, and a mass balance dilution analysis. The HELP model is a U.S.EPA sponsored model used for evaluating the performance of landfill designs. The HELP model input included: waste characteristics; leachate collection design; landfill liner components; landfill cover components, construction quality control; and site climatological data. The HELP model results indicated that the leakage rate from Area D North in an operating condition would be on the order of 0.016 cubic feet/acre/year (cf/ac/yr) for the base liner and 2.276 cf/ac/yr for the sideslopes; and for a closed Area D South in a closed condition would be on the order of 0.013 cf/ac/yr for the base and 0.009 cf/sc/yr for the sideslopes. The hydrogeologic assessment indicates the groundwater beneath Area D North flows towards the south and into the Pigeon River.

Leachate water samples were obtained from the most recently closed landfill cell, Area A West, and analyzed by a State certified laboratory. The laboratory data for the leachate showed nine constituents with concentrations above laboratory reporting limits and above North Carolina's GA groundwater standards (NCAC 15A Subchapter 2L, April 1, 2013) (arsenic, coliform organisms, color, dissolved solids (total), fluoride, iron, manganese, selenium, and sulfate).

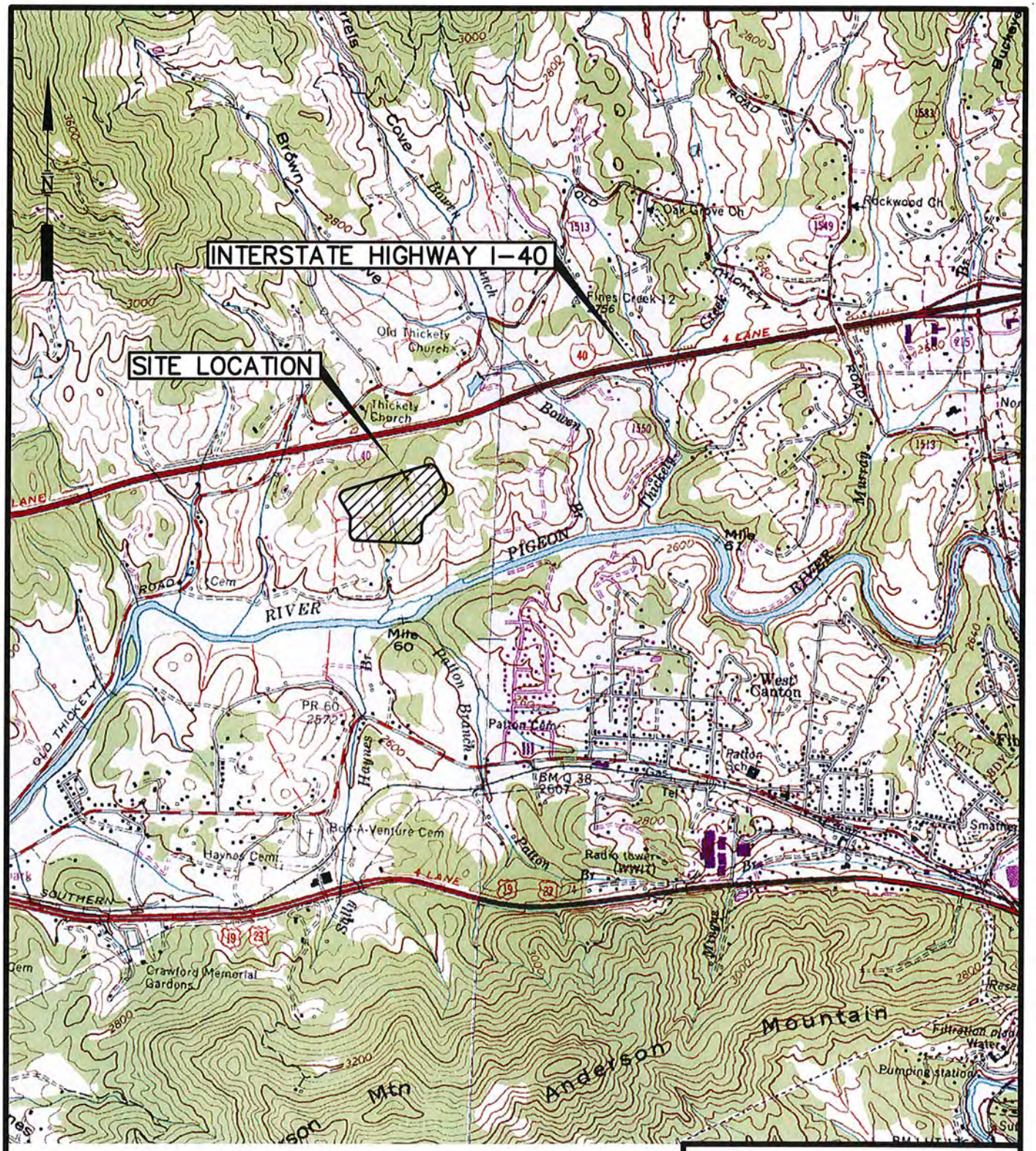
The leakage rate from the HELP model was used along with the leachate water quality data in a mass balance dilution analysis. Given the use of conservative assumptions throughout the evaluation, the results of the mass balance dilution analysis estimated the concentration of constituents to be up to several orders of magnitude below their respective groundwater standards at the model boundary, Pigeon River. Based on the assessment, the landfill liner and leachate collection system proposed for Area D North, will not cause any 2L listed compounds to exceed groundwater standards beyond the landfill property.

1.0 INTRODUCTION

Evergreen currently owns and operates Landfill No. 6, which is located approximately two (2) miles northwest of the City of Canton in Haywood County, North Carolina (refer to Figure 1-1). The landfill has been in operation since 1984. The original design for the landfill incorporates eight (8) major landfilling areas designated as Areas A through H. Area D is subdivided into two smaller units identified as Area D North and Area D South. Area D South is currently being filled with waste at the time of this writing and areas A East, A West, B, C, F, G, and H have all been constructed, filled with waste, and are considered closed. Areas D North and E have not been constructed as of this writing.

The landfill is situated on a rolling to rather steeply sloping parcel of land. Bowen Branch flows through a ravine on the eastern side of the property in a generally north-south direction. The Pigeon River bounds the parcel to the south. Area D is approximately 1,100 feet north of the Pigeon River and approximately 2,500 feet west of Bowen Branch. Bowen Branch drains into the Pigeon River along the southeastern boundary of the parcel.

Evergreen is in the process of permitting Area D North for construction. In accordance with 15A NCAC 13B Section .0503(2)(d)(ii)(A) an assessment of the proposed liner system is necessary to estimate potential groundwater quality impact at the downgradient point of compliance, specifically, the Pigeon River. The Pigeon River is supplied in part by discharge from groundwater (i.e. base flow). Therefore, the river is the nearest receptor of groundwater from the area of the landfill and is the nearest point of compliance for the purpose of this analysis.



BASE MAP ADAPTED FROM THE 7.5-MINUTE USGS CANTON, NC (1990) AND CLYDE (1978) TOPOGRAPHIC QUADRANGLE MAPS.

1000 0 2000 FEET

FIGURE 1-1
SITE LOCATION MAP
ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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2.0 GUIDELINES FOR ANALYSIS

The landfill liner design was analyzed using State of North Carolina guidelines for industrial solid waste landfills (15A NCAC 13B Section .0503(2)(d)(ii)(A)), to demonstrate the adequacy of the landfill design relative to groundwater quality. Specifically, an analysis of downgradient groundwater quality must show that the design will not allow certain compounds that may be present in landfill leachate to exceed U.S.EPA established groundwater Maximum Contaminant Levels (MCLs) at the relevant point(s) of compliance. The analysis considers the following items:

- The hydrogeologic characteristics of the facility and surrounding lands;
- Climatic factors of the area;
- The leachate quality and quantity;
- Leachate leakage to the subsurface (i.e. groundwater); and
- Subsurface transport to the point(s) of compliance.

3.0 LEACHATE QUALITY

Evergreen's Landfill No. 6 is permitted for the disposal of boiler fly ash, cinders, dewatered wastewater treatment sludge, lime mud, woodwaste debris, biosolids, and asbestos containing material (ACM). The primary source of waste accepted is wastewater treatment sludge that accounts for approximately 60 percent of the waste disposed of at Landfill No. 6.

Results of water quality analyses of the Landfill No. 6 leachate, provided by Pace Analytical, Inc., and Evergreen's laboratories in West Nyack, New York and Canton, North Carolina, were reviewed to estimate initial leachate concentrations of each compound listed in the Standards from 15A NCAC 2L Section .0202(g). Specifically, analytical results from May 2005, November 2005, May 2006, November 2006, May 2007, November 2007, and May 2008 were referenced. The average laboratory results from the 2005 through 2008 period are listed on Table 2-1 and assume that where laboratory results did not exceed laboratory reporting limits the concentration assumed in this analysis was one-half of the reporting limit. A summary of parameters detected above laboratory reporting limits is included in Appendix A. From the list of 88 compounds on Table 2-1, 81 were analyzed and reported by the laboratory. The six compounds not tested include carbofuran, diundecyl phthalate, foaming agents, P-dioxane, oxamyl, gross alpha, and radium. The parameters not tested are not suspected to be present in the leachate based on Evergreen's knowledge of the process waste streams. Gross alpha particle activity and radium compounds are typically hydrophobic and not partitioned to the landfill leachate and are not suspected to be present in Evergreen's process waste stream. It should also be noted that several of the laboratory reporting limits were higher than the respective groundwater standard, which is not uncommon for these types of samples and analytes. This was due to the characteristics of the sample, e.g. excessive foaming, which required dilution prior to analyzing the sample.

TABLE 2-1

LEACHATE LABORATORY RESULTS

Parameter	Standard[1] (mg/l)	Laboratory Result (mg/l)
Acetone	6.0	*ND (1.0)*
Acrylamide (propenamide)	0.000008	*ND (1.0)*
Arsenic	0.01	**1.015**
Barium	0.7	0.072
Benzene	0.001	*ND (0.05)*
Boron	0.7	ND (0.2)
Bromoform (tribromomethane)	0.004	*ND (0.05)*
Butylbenzyl phthalate	1.0	ND (0.010)
Cadmium	0.002	**0.019**
Carbofuran	0.04	Not Tested
Carbon tetrachloride	0.0003	*ND (0.05)*
Chlordane	0.0001	*ND (0.004)*
Chloride	250.0	242.9
Chlorobenzene	0.05	ND (0.05)
Chloroform (trichloromethane)	0.07	*ND (0.05)*
2-Chlorophenol	0.0004	*ND (0.010)*
Chromium	0.01	0.0655
Cis-1,2-dichloroethene	0.07	ND (0.05)
Coliform organisms (total)	1 per 100 milliliters	**6,225**
Color	15 color units	**1,607 color units**
Copper	1.0	0.056
Cyanide (free cyanide)	0.07	0.004
2,4-D (2,4-dichlorophenoxy acetic acid)	0.07	ND (0.012)
1,2-Dibromo-3-chloropropane	0.00004	*ND (0.05)*
Dichlorodifluoromethane (Freon-12; Halon)	1.0	ND (0.05)
1,1-Dichloroethane	0.006	ND (0.05)
1,2-Dichloroethane (ethylene dichloride)	0.0004	*ND (0.05)*
1,1-Dichloroethylene (vinylidene chloride)	0.35	*ND (0.05)*
1,2-Dichloropropane	0.0006	*ND (0.05)*
Di-n-butyl (or dibutyl) phthalate (DBP)	0.7	ND (0.01)
Diethylphthalate (DEP)	6.0	ND (0.01)
Di(2-ethylhexyl) phthalate (DEHP)	0.003	*ND (0.01)*
Di-n-octyl phthalate	0.10	ND (0.01)
P-dioxane (1,4-diethylene dioxide)	0.003	Not tested
Dioxin	2.0×10^{-10}	ND (1.0×10^{-9})
Dissolved solids (total)	500	**17,553**
Diundecyl phthalate (Santicizer 711)	0.10	Not tested
Endrin, total	0.002	ND (0.0012)
Epichlorohydrin (1-chloro-2,3-epoxypropane)	0.004	*ND (0.025)*
Ethylbenzene	0.6	*ND (0.05)*
Ethylene dibromide (EDB; 1,2-dibromoethane)	0.00002	*ND (0.00001)*
Ethylene glycol	10.0	*ND (10)*
Fluorene	0.3	ND (0.01)
Fluoride	2.0	**3.36**
Foaming agents	0.5	Not Tested
Gross alpha (adjusted) particle activity (excluding radium-226 and uranium)	15 pCi/l	Not Tested
Heptachlor	0.000008	*ND (0.001)*
Heptachlor epoxide	0.000004	*ND (0.016)*
Heptane	0.4	ND (0.025)

TABLE 2-1 (cont'd)

Parameter	Standard[1] (mg/l)	Laboratory Result (mg/l)
Hexachlorobenzene (perchlorobenzene)	0.00002	*ND (0.01)*
N-hexane	0.4	ND (0.025)
Iron	0.3	**0.51**
Lead	0.015	ND (0.065)
Lindane	0.00003	*ND (0.001)*
Manganese	0.05	**0.20**
Mercury	0.001	0.00034
Metadichlorobenzene (1,3-dichlorobenzene)	0.2	ND (0.01)
Methoxychlor	0.04	ND (0.01)
Methylene chloride (dichloromethane)	0.005	*ND (0.10)*
Methyl ethyl ketone (MEK; 2-butanone)	4.0	*ND (1.0)*
Methyl tert-butyl ether (MTBE)	0.02	ND (0.025)
Naphthalene	0.006	ND (0.010)
Nickel	0.1	**0.066**
Nitrate	10.0	0.245
Nitrite	1.0	0.0172
Orthodichlorobenzene (1,2-dichlorobenzene)	0.02	*ND (0.05)*
Oxamyl	0.2	Not tested
Paradichlorobenzene (1,4-dichlorobenzene)	0.006	*ND (0.05)*
Pentachlorophenol	0.0003	*ND (0.05)*
pH	6.5 - 8.5 Standard Units	8.0
Phenanthrene	0.2	ND (0.01)
Phenol	0.03	0.0125
Radium-226 and radium-228 (combined)	5 pCi/l	Not Tested
Selenium	0.02	**0.135**
Silver	0.02	ND (0.33)
Styrene (ethenylbenzene)	0.07	ND (0.05)
Sulfate	250.0	**1165**
Tetrachloroethylene (perchloroethylene; PCE)	0.0007	*ND (0.05)*
Toluene (methylbenzene)	0.6	0.054
Toxaphene	0.00003	*ND (0.0024)*
2,4,5-TP (Silvex)	0.05	ND (0.002)
Trans-1,2-dichloroethene	0.1	ND (0.05)
1,1,1-Trichloroethane (methyl chloroform)	0.2	ND (0.05)
Trichloroethylene (TCE)	0.003	*ND (0.05)*
Trichlorofluoromethane	2.0	ND (0.05)
Vinyl chloride (chloroethylene)	0.00003	*ND (0.100)*
Xylenes (o-, m-, and p-)	0.5	ND (0.05)
Zinc	1.0	0.077

Notes
1. Class GA Standards from 15A NCAC 02L Section .0202(g), dated April 1, 2013. The parameter concentrations reported in this table are dissolved, colloidal or in a particulate form which are mobile in groundwater.

ND Not detected above reporting limit shown in parenthesis.
660 results in bold exceed standard.
ND (0.001) results in italic are reported below detection; however the detection limit exceeds the standard.

From the data reviewed, the compound values that exceeded laboratory detection levels in the leachate were arsenic, barium, cadmium, chloride, coliform organisms, color, dissolved solids (total), cyanide, fluoride, iron, lead, manganese, nickel, nitrite, phenol, selenium, silver, sulfate, toluene, and zinc. Of these, arsenic, cadmium, coliform organisms, color, dissolved solids (total), fluoride, iron, lead, manganese, nickel, selenium, silver, and sulfate were the only compounds detected above their groundwater standards listed on Table 2-1 (laboratory results in **Bold**). The compounds used in the HELP model liner analysis included compounds detected above the groundwater standards. In addition, the analysis included compounds where the laboratory results were reported below detection limits, and where the laboratory reporting limits were above the groundwater standards. The compounds meeting the previous condition are shown in *italic* on Table 2-1.

4.0 LEAKAGE TO SUBSURFACE

4.1 Method

To determine the potential quantity or rate of leakage from the landfill under the current design, the U.S.EPA sponsored Hydrologic Evaluation of Landfill Performance (HELP) Model, Version 3.07, was used. The HELP model is a quasi-two-dimensional, deterministic computer-based water budget model developed by the U.S. Army Corps of Engineers' Waterways Experiment Station. The model uses climatologic, soil characteristic and landfill design input data to compute a water balance which includes: runoff; evapotranspiration; infiltration; lateral drainage; and leakage through the liner system.

4.2 Model Input

The HELP model evaluation utilized available rainfall data collected at Canton, North Carolina as obtained from NOAA, and default temperature, solar radiation and evapotranspiration data from Asheville, North Carolina. Climatologic Input data are summarized on the computer output sheets found in Appendix B.

The HELP model was utilized to calculate leakage for four conditions: leakage through the base liner in an operating landfill (Area D North), leakage through the sideslope liner in an operating landfill (Area D North), leakage through the base liner in a closed landfill (Area D South) and leakage through the sideslope liner in a closed landfill (Area D North). The landfill cross-section input into the HELP model to determine the potential leakage rate from the landfill consisted of up to ten layers (i.e., the closed landfill with a base liner, which includes a GCL). The model layers are described below beginning from the uppermost layer proceeding to the landfill base.

The HELP model, for the operating landfill was modeled with the first layer consisting of solid waste which was entered with a hydraulic conductivity of 1.4×10^{-6} cm/sec which is the default data for solid wastes consisting of predominantly papermill wastewater treatment sludge, bottom ash, and lime mud. A washed stone layer is located directly beneath the waste and serves as the leachate collection system along with a series of piping laterals and headers. The hydraulic conductivity of the washed stone was entered as 3.0×10^{-1} cm/sec, which is the default data for a

stone or gravel material. An average base slope of 8 percent with a pipe spacing of 200 feet was utilized for the leachate collection layer.

The liner beneath the leachate collection layer in Area D is proposed to consist of a 60-mil high density polyethylene (HDPE) geomembrane. The liner was represented using a hydraulic conductivity of $2x10^{-13}$ cm/sec, which is the default value for an HDPE geomembrane in the HELP model. A pinhole density and installation defect (i.e. holes in liner) rate of 1 per acre, for each, was selected based on the liner installation specification which includes independent quality assurance testing and liner installation monitoring. A copy of the liner installation specification is included in Appendix D of the Design Report.

The secondary liner on the base of Area D beneath the geomembrane layer is proposed to consist of a 240-mil Geosynthetic Clay Liner (GCL) geocomposite. The liner was represented using a hydraulic conductivity of $5x10^{-9}$ cm/sec, which is the accepted value for a GCL geocomposite.

A compacted soil layer is located directly beneath the geocomposite and serves as a separation layer between bedrock and/or groundwater and the geocomposite. The hydraulic conductivity of the soil layer was entered as $5x10^{-5}$ cm/sec. The hydraulic conductivity value for the soil is based on laboratory testing of remolded on-site soils.

Area D South was modeled the same as Area D North, except a cover system was added. The cover system modeled consisted of a topsoil layer and barrier soil layer (28-inches thick), each with a hydraulic conductivity of $5x10^{-5}$ cm/sec, a drainage geocomposite with a hydraulic conductivity of 5 cm/sec above a geomembrane. The liner beneath the geocomposite in Area D is likely to consist of a 60-mil high density polyethylene (HDPE) geomembrane. The liner was represented using a hydraulic conductivity of $2x10^{-13}$ cm/sec, which is the default value for an HDPE geomembrane in the HELP model. A pinhole density and installation defect (i.e. holes in liner) rate of 1 per acre, for each, was selected based on the liner installation specification which includes independent quality assurance testing and liner installation monitoring. Below the geomembrane will be a drainage layer with a hydraulic conductivity value of 0.3 cm/sec, underlain by landfilled materials (i.e., the same configuration as the operating condition).

4.3 Results of HELP Model

As shown in Appendix B-5, the average annual precipitation at the landfill is equal to 39.7 in/acre/yr. Based on the HELP model, the precipitation is distributed to the environment accordingly:

- 54 percent (21.5 inches) evapotranspires to the atmosphere;
- 23 percent (9.1 inches) runs off the waste into the chimney drain or infiltrates the waste to become leachate and is collected and treated; and,
- The remaining water is absorbed into the waste and is classified in the HELP model as “change in water storage”.

5.0 SUBSURFACE TRANSPORT

5.1 Site Hydrogeologic Characteristics

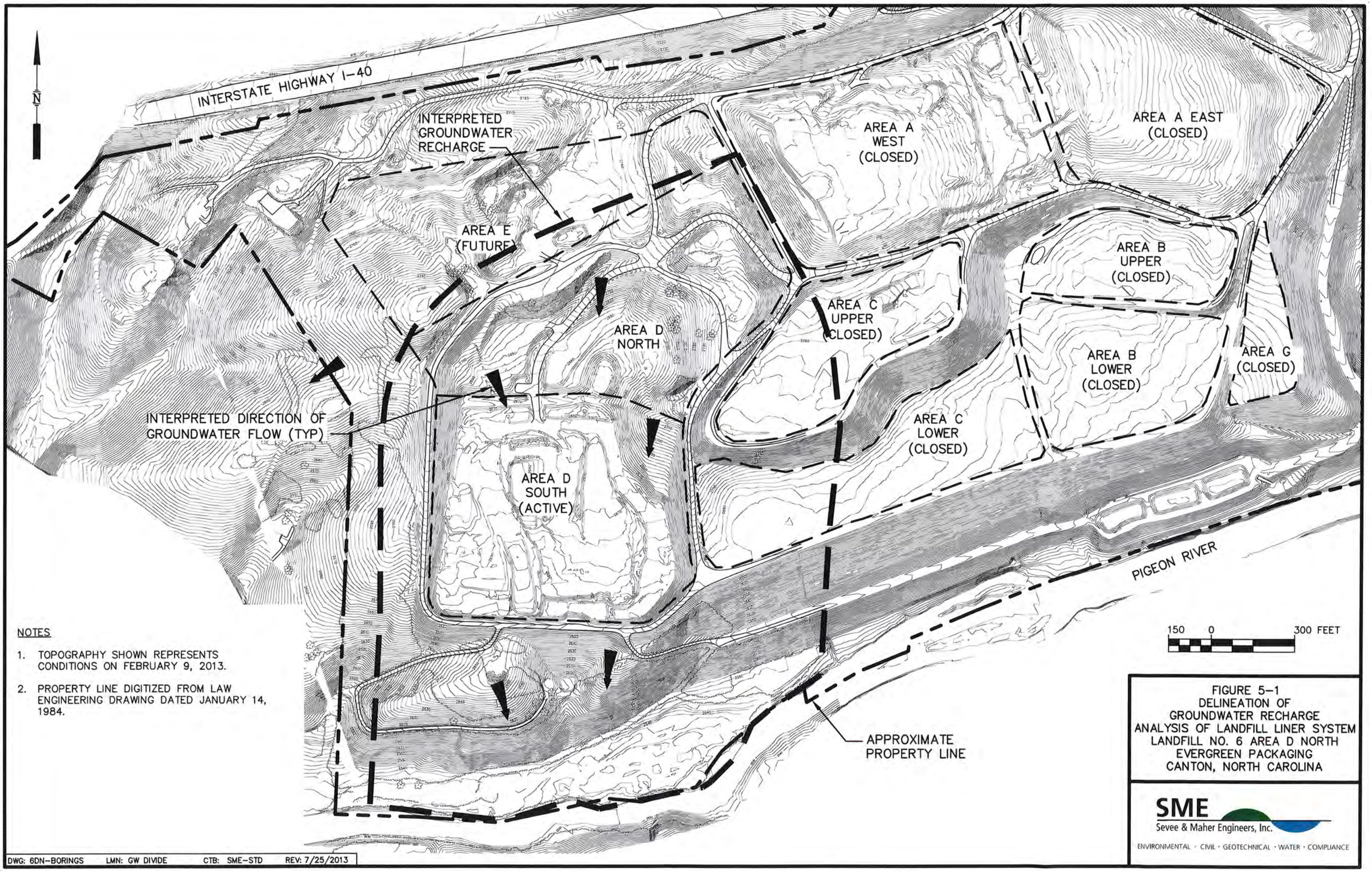
Landfill No. 6 has been the subject of past assessments and site investigations as part of earlier landfill expansion phases. Law Engineering and Testing Company (Law) prepared *Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations* for the entire Landfill No. 6 site in 1982, which included a detailed description of the interpreted hydrogeologic setting (Law, 1982). Also, Sirrine Environmental Consultants (Sirrine, 1989), Sevee & Maher Engineers, Inc. (SME, 1997), and Roy F. Weston, Inc. (Weston, 1995) have prepared related designs, construction documentation, and hydrogeologic reports which provided hydrogeologic information related to previous expansions at Landfill No. 6. More recently, SME conducted a site investigation in 2007 and 2013 to characterize the hydrogeology of the proposed Areas D & E landfill expansion area and gather information required by Rule 15A NCAC 13B.0588 of the North Carolina Department of Environment and Natural Resources (DENR) Solid Waste Management Regulations. The hydrogeologic data collected from 66 new piezometers provides the necessary information to be used in modeling the anticipated subsurface transport of leachate, such as soil hydraulic conductivities, soil types, thicknesses, and waste properties. The installation details for the piezometers are shown on boring logs in Attachment A of the Design Hydrogeologic Report, which is contained in Attachment 3 of Volume I.

Located in the Blue Ridge Physiographic Province of North Carolina, the subsurface lithology reflects the weathering of the igneous and metamorphic parent bedrock. The unconsolidated formation ranged between 4 to over 65 feet within the proposed footprint of Area D North, and consisted predominantly of saprolite. Beneath the friable saprolite, a dense (i.e. residual material with blow counts in excess of 50 to over 100 blows per foot), partially weathered rock (PWR) is often encountered overlying bedrock. The bedrock surface is quite irregular and erratic, even over short horizontal distances, and can be variably weathered and fractured. Alluvial deposits are present locally across the landfill, a function of erosion from sideslopes by surface water and fluvial processes along the Pigeon River. Mass transport of surficial soils accumulates colluvium downslope in the draws and ravines. The grain size distribution is variable, ranging from silty fine to coarse sands to clayey sandy silts. Mica is commonly

encountered, frequently in abundance. Gravel and rock fragments are also present, and are typical in the transitional zone between the saprolite and the bedrock.

The regional groundwater seepage direction is interpreted to be generally to the south as shown in Figure 5-1, towards the Pigeon River, with precipitation recharge being transported primarily in the saprolite. Local groundwater flow directions are controlled more by the geomorphic features of the area, with topographic ridges creating local groundwater divides and groundwater traveling in the direction of downsloping topography. Landfill No. 6 is bounded on the east and west sides by several ridges that appear to run from north to south. Local groundwater flow in Area D is confined by the ridges and moves towards a ravine between the ridges and southerly toward the Pigeon River. A groundwater divide near the boundary between Area D North and Area E results in a predominantly southerly groundwater flow direction beneath Area D North. Water levels measured in nested piezometers indicated groundwater flow in the Areas D and E is primarily horizontal but with slight downward gradients beneath the ridges and slight upward gradients beneath the draws. An upward component to groundwater flow in the northern portion of Area D was also evident (P13-113).

SME conducted in situ slug tests in eight piezometers installed in 2013, and previously conducted 15 tests in previously installed piezometers within and surrounding Area D North to calculate the hydraulic conductivity of the unconsolidated unit and the underlying bedrock. The results of this testing are summarized in Table 5-1.



NOTES

1. TOPOGRAPHY SHOWN REPRESENTS CONDITIONS ON FEBRUARY 9, 2013.
2. PROPERTY LINE DIGITIZED FROM LAW ENGINEERING DRAWING DATED JANUARY 14, 1984.

FIGURE 5-1
DELINEATION OF GROUNDWATER RECHARGE ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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TABLE 5-1
SUMMARY OF IN SITU HYDRAULIC CONDUCTIVITY TESTS
FROM AREAS D & E

Groundwater Zone Screened	Number of Piezometers Tested	In Situ Hydraulic Conductivity			
		Range		Geometric Mean	
		(cm/sec)		(cm/sec)	(ft/day)
Colluvium	2	2.0×10^{-4}	3.1×10^{-2}	2.5×10^{-3}	7.1
Saprolite	3	7.5×10^{-6}	2.2×10^{-3}	1.0×10^{-4}	0.29
PWR	6	4.4×10^{-5}	6.0×10^{-3}	4.8×10^{-4}	1.4
Fractured Bedrock	6	3.4×10^{-5}	4.2×10^{-3}	4.0×10^{-3}	1.1
Competent Bedrock	7	4.3×10^{-6}	1.4×10^{-4}	1.7×10^{-5}	0.049

The saprolite and PWR have similar hydraulic conductivities. Under the prevailing horizontal seepage gradient (approximately 0.08) and effective porosity of 0.3, groundwater movement through the saprolite and PWR would be in the order of 140 feet per year through the shallow groundwater flow system beneath Area D and E. The calculated travel time for groundwater to reach the Pigeon River from the boundary of Area D North is in the order of 10 years.

5.2 Numerical Analysis of Downgradient Groundwater Quality

The downgradient point of compliance is the same as for Area D South and was determined by reviewing hydrogeologic reports prepared for the site and preparing a groundwater potentiometric map with water levels obtained from the wells around the perimeter of the site and the P-07-200-series piezometers in Area D South. Based on the data it was concluded that groundwater within Area D North flows southerly toward Pigeon River, which is confirmed by the seasonal high water table map presented in the Hydrogeologic Report.

To determine potential groundwater concentrations in the downgradient vicinity of Pigeon River (i.e. discharging water), a mass balance dilution analysis was performed. A groundwater-shed was delineated based on measured groundwater levels and topographical information to include the landfill and upgradient areas that drain toward the landfill and eventually into Pigeon River.

The recharge rate to groundwater beyond the landfill limits was estimated using the HELP model. Based on the Canton, North Carolina precipitation data obtained from NOAA, precipitation recharge rates were calculated to be approximately 11 inches per year by the HELP model, see Appendix B. Therefore, a precipitation recharge rate of 11 inches per year

was assumed through the entire watershed, excluding the Area D North and South Landfills. The estimated leakage rate for Area D North during operations is on the order of 0.016 cubic feet/acre/year (cf/ac/yr) for the base liner and 2.276 cf/ac/yr for the sideslopes based on HELP modeling results.

The initial leachate concentrations were determined by the laboratory results discussed in Section 2.0. The parameters that were not detected above the laboratory detection limit were set at one-half the detection limit. Results of the mass balance dilution analysis indicate that the compounds in the leachate will have no effect in the groundwater above 2L standards at the point of discharge to Pigeon River.

The mass balance analysis shows that leachate constituent concentrations are reduced by several orders-of-magnitude from their original values (and therefore significantly less than their respective groundwater standards) prior to reaching Pigeon River. Because the above analysis results in such low concentrations in the groundwater, and the leachate is free of most of the compounds listed in Table 2-1, a more detailed groundwater transport analysis is not necessary. Consideration of complex geochemical processes (soil adsorption, precipitation, decay, and dispersion), and the influence of solute velocity and concentration stability, would tend to further decrease the predicted concentrations of leachate constituents in groundwater in the Pigeon River. Furthermore, the 2L standards refer to dissolved parameter concentrations, leachate samples were not filtered and results used in the analysis are total metals; therefore, the estimated concentrations are conservatively high.

6.0 CONCLUSIONS

Evergreen is proposing to construct Landfill No. 6 Area D North with a liner system consisting of a 4-foot thick soil layer meeting a hydraulic conductivity of less than or equal to $5x10^{-5}$ cm/sec, overlain by a 240-mil GCL and 60-mil HDPE geomembrane, and leachate collection system. The hydrogeologic assessment for Landfill No. 6 Area D North indicates the groundwater beneath Area D North will flow towards the south and into Pigeon River.

The model inputs which included hydrogeologic characteristics of the site, climatic factors, and characteristics of the leachate, show the proposed landfill liner system for Landfill No. 6 Area D North will meet the criteria of 15A NCAC 13B Section .0503(2)(d)(ii)(A). Specifically, the landfill liner system for Area D North will not cause groundwater concentrations of leachate compounds to exceed groundwater standards beyond the landfill property.

APPENDIX A

LEACHATE LABORATORY RESULTS

Estimation of Groundwater Concentrations & Comparison to NCAC 02L Groundwater Standards (April, 2013)
Area 6 D North Design Submission
Evergreen Packaging, Canton, NC, Landfill 6

Areas and Leakage Rates Considered	Total	6 D South	6 D North	Comments
Watershed Area (Acres)	65.5			Total watershed, which encumpasses Area 6 D North and South
Landfill Side-slope Area (Acres)		1.2	4.5	
Landfill Base Liner Area (Acres)		14.3	13.0	
Precipitation Recharge (in/yr)	10.7			HELP Model (Groundwater Recharge)
Landfill Leakage Rate-operational (cf/ac/yr)			2.276	HELP Model (Leakage through Side-slope Liner) (6 D North)
Landfill Leakage Rate-operational (cf/ac/yr)			0.016	HELP Model (Leakage through Base Liner) (6 D North)
Landfill Leakage Rate-closed (cf/ac/yr)		0.013		HELP Model (Leakage through Side-slope Liner) (6 D South)
Landfill Leakage Rate-closed (cf/ac/yr)		0.009		HELP Model (Leakage through Base Liner) (6 D South)

Calculated Values:	(A)	(B)	(C)	Comments
Groundwater Recharge throughout watershed less landfill area (cf/yr)	1262333			This is the quantity of precipitation estimated to enter the watershed.
Leakage from Landfill Areas (cf/yr)		0.14	10.45	This is the quantity of leachate estimated to enter the watershed, based on HELP model.

Estimate Concentration at Pigeon River, due to hypothetical leaking landfill cells:
Estimated Concentration at Pigeon River = ((Concentration(Lab)*Leakage Rate)/(GW Recharge + Leakage Rate))
If, Laboratory Result = ND; then, use 1/2 concentration as an estimated value.

Standard Met?:
If Estimated Concentration < GA Standard = "ok"
If Laboratory Results were all ND = "ok"
If Laboratory Result are not available (i.e., Not Tested (NT)) = "ok"
If Estimated Concentration at Pigeon River > GA Standard = "Exceeds"

Parameter	(D) GA Standard (mg/l)	Available Data Set (Date Range)	Laboratory Result (mg/l)		(E)	(F)=(E*(B+C))/(A+B+C) Estimated Concentration at Pigeon River (mg/l)	Standard Met?
Acetone	6	2005-2008	ND	1		Below Standard	ok
Acrylamide (propenamide)	0.000008	2005-2008	ND	1		4.2E-06	ok
Arsenic	0.01	2005-2013		1.07		9.0E-06	ok
Barium	0.7	2005-2013		0.06		Below Standard	ok
Benzene	0.001	2005-2008	ND	0.05		2.1E-07	ok
Boron	0.7	2005-2008	ND	0.2		Below Standard	ok
Bromoform (tribromomethane)	0.004	2005-2008	ND	0.05		2.1E-07	ok
Butylbenzyl phthalate	1	2005-2008	ND	0.01		Below Standard	ok
Cadmium	0.002	2005-2013		0.017		1.4E-07	ok
Carbofuran	0.04	2005-2008	NT			Not Tested	ok
Carbon tetrachloride	0.0003	2005-2008	ND	0.05		2.1E-07	ok
Chlordane	0.0001	2005-2008	ND	0.004		1.7E-08	ok
Chloride	250	2005-2013		191.3		Below Standard	ok
Chlorobenzene	0.05	2005-2008	ND	0.05		2.1E-07	ok
Chloroform (trichloromethane)	0.07	2005-2008	ND	0.05		Below Standard	ok
2-Chlorophenol	0.0004	2005-2008	ND	0.01		4.2E-08	ok
Chromium	0.01	2005-2013		0.06		4.8E-07	ok
Cis-1,2-dichloroethene	0.07	2005-2008	ND	0.05		Below Standard	ok
Coliform organisms (total)	1	2005-2008		6225		5.2E-02	ok
Color (Color Units)	15	2005-2008		1607		1.3E-02	ok
Copper	1	2005-2013		0.06		Below Standard	ok
Cyanide	0.07	2005-2008		0.004		Below Standard	ok
2,4-D (2,4-dichlorophenoxy acetic acid)	0.07	2005-2008	ND	0.012		Below Standard	ok
1,2-Dibromo-3-chloropropane	0.00004	2005-2008	ND	0.05		2.1E-07	ok
Dichlorodifluoromethane (Freon-12; Halon)	1	2005-2008	ND	0.05		Below Standard	ok
1,1-Dichloroethane	0.006	2005-2008	ND	0.05		2.1E-07	ok
1,2-Dichloroethane (ethylene dichloride)	0.0004	2005-2008	ND	0.05		2.1E-07	ok
1,1-Dichloroethylene (vinylidene chloride)	0.35	2005-2008	ND	0.05		Below Standard	ok
1,2-Dichloropropane	0.0006	2005-2008	ND	0.05		2.1E-07	ok
Di-n-butyl (or dibutyl) phthalate (DBP)	0.7	2005-2008	ND	0.01		Below Standard	ok
Diethylphthalate (DEP)	6	2005-2008	ND	0.01		Below Standard	ok
Di(2-ethylhexyl) phthalate (DEHP)	0.003	2005-2008	ND	0.01		4.2E-08	ok
Di-n-octyl phthalate	0.1	2005-2008	ND	0.01		Below Standard	ok
P-dioxane (1,4-diethylene dioxide)	0.003	2005-2008	NT			Not Tested	ok
Dioxin	2E-10	2005-2008	ND	1.00E-09		4.2E-15	ok
Dissolved solids (total)	500	2005-2008		17,553		1.5E-01	ok
Diundecyl phthalate (Santicizer 711)	0.1	2005-2008	NT			Not Tested	ok
Endrin	0.002	2005-2008	ND	0.0012		Below Standard	ok
Epichlorohydrin (1-chloro-2,3-epoxypropane)	0.004	2005-2008	ND	0.025		1.0E-07	ok
Ethylbenzene	0.6	2005-2008	ND	0.05		Below Standard	ok
Ethylene dibromide (EDB; 1,2-dibromoethane)	0.00002	2005-2008	ND	0.00001		Below Standard	ok

Estimation of Groundwater Concentrations & Comparison to NCAC 02L Groundwater Standards (April, 2013)
Area 6 D North Design Submission
Evergreen Packaging, Canton, NC, Landfill 6

Parameter	(D) GA Standard (mg/l)			(E) Laboratory Result (mg/l)	(F)=(E*(B+C))/(A+B+C) Estimated Concentration at Pigeon River (mg/l)	Standard Met?
Ethylene glycol	10	2005-2008	ND	10	4.2E-05	ok
Fluorene	0.3	2005-2008	ND	0.01	Below Standard	ok
Fluoride	2	2005-2013		4.4	3.7E-05	ok
Foaming agents	0.5	2005-2008	NT		Not Tested	ok
Gross alpha (adjusted) particle activity (excluding radium-226 and uranium)	15 pCi/l	2005-2008	NT		Not Tested	ok
Heptachlor	8.00E-06	2005-2008	ND	0.001	4.2E-09	ok
Heptachlor epoxide	4.00E-06	2005-2008	ND	0.016	6.7E-08	ok
Heptane	0.4	2005-2008	ND	0.025	Below Standard	ok
Hexachlorobenzene (perchlorobenzene)	2.00E-05	2005-2008	ND	0.01	4.2E-08	ok
N-hexane	0.4	2005-2008	ND	0.025	Below Standard	ok
Iron	0.3	2005-2013		0.64	5.4E-06	ok
Lead	0.015	2005-2013		0.04	3.5E-07	ok
Lindane	0.00003	2005-2008	ND	0.001	4.2E-09	ok
Manganese	0.05	2005-2013		0.44	3.7E-06	ok
Mercury	0.001	2005-2013		0.0005	Below Standard	ok
Metadichlorobenzene (1,3-dichlorobenzene)	0.2	2005-2008	ND	0.01	Below Standard	ok
Methoxychlor	0.04	2005-2008	ND	0.01	Below Standard	ok
Methylene chloride (dichloromethane)	0.005	2005-2008	ND	0.1	4.2E-07	ok
Methyl ethyl ketone (MEK; 2-butanone)	4	2005-2008	ND	1	Below Standard	ok
Methyl tert-butyl ether (MTBE)	0.02	2005-2008	ND	0.025	1.0E-07	ok
Naphthalene	0.006	2005-2008	ND	0.01	4.2E-08	ok
Nickel	0.1	2005-2013		0.08	Below Standard	ok
Nitrate	10	2005-2013		0.14	Below Standard	ok
Nitrite	1	2005-2013		0.037	Below Standard	ok
Orthodichlorobenzene (1,2-dichlorobenzene)	0.02	2005-2008	ND	0.05	2.1E-07	ok
Oxamyl	0.2	2005-2008	NT		Not Tested	ok
Paradichlorobenzene	0.006	2005-2008	ND	0.05	2.1E-07	ok
Pentachlorophenol	0.0003	2005-2008	ND	0.05	2.1E-07	ok
pH	6.5 - 8.5	2005-2008		8	Below Standard	ok
Phenanthrene	0.2	2005-2008	ND	0.01	Below Standard	ok
Phenol	0.03	2005-2013		0.009	Below Standard	ok
Radium-226 and radium-228 (combined)	5 pCi/l	2005-2008	NT		Not Tested	ok
Selenium	0.02	2005-2013		0.12	9.8E-07	ok
Silver	0.02	2005-2013		0.03	2.2E-07	ok
Styrene (ethenylbenzene)	0.07	2005-2008	ND	0.05	Below Standard	ok
Sulfate	250	2005-2013		1336	1.1E-02	ok
Tetrachloroethylene (perchloroethylene; PCE)	0.0007	2005-2008	ND	0.05	2.1E-07	ok
Toluene (methylbenzene)	0.6	2005-2008		0.054	Below Standard	ok
Toxaphene	3.00E-05	2005-2008	ND	0.0024	1.0E-08	ok
2,4,5-TP (Silvex)	0.05	2005-2008	ND	0.002	Below Standard	ok
Trans-1,2-dichloroethene	0.1	2005-2008	ND	0.05	Below Standard	ok
1,1,1-Trichloroethane (methyl chloroform)	0.2	2005-2008	ND	0.05	Below Standard	ok
Trichloroethylene (TCE)	0.003	2005-2008	ND	0.05	2.1E-07	ok
Trichlorofluoromethane	2	2005-2008	ND	0.05	Below Standard	ok
Vinyl chloride (chloroethylene)	3.00E-05	2005-2008	ND	0.1	4.2E-07	ok
Xylenes (o-, m-, and p-)	0.5	2005-2008	ND	0.05	Below Standard	ok
Zinc	1	2005-2013		0.07	Below Standard	ok
0 0 0 0	85					

NOTES:
1. ND - Not Detected above indicated reporting limit, in any of the samples tested.
2. Concentration for "Not Detected" compounds set at one-half of the reporting limit.
3. Laboratory Results are the average of 2005-2008 leachate concentrations; and assumes 1/2 detection limit for individual ND results

LANDFILL LEACHATE ANALYSIS RESULTS, EVERGREEN PACKAGING, CANTON, NC

Collection Date	Field Parameters					Analytical Parameters (mg/L)							
	Depth to Water	pH (Field)	Spec. Cond. at 25C (Field)	Temp. (Field)	Turbidity (Field)	Arsenic	Barium	BOD, 5 Day	Cadmium	Calcium	Chloride	Chromium	COD
May-05	na	7.8	21660	25.3	28	2.1	0.04	272	< 0.01	43	184	< 0.02	659
Nov-05	na	7.9	23910	24.5	32	0.026	0.05	164	< 0.01	29	334	< 0.05	487
May-06	na	8.2	1124	21.2	12	1.5	0.04	106	< 0.01	45	179	< 0.10	274
Nov-06	na	8.0	26200	11.1	na	0.50	< 0.10	104	< 0.04	33	447	< 0.10	401
May-07	na	8.1	24390	25.3	12	0.679	< 0.50	116	< 0.05	28	157	< 0.10	545
Nov-07	na	8.1	25140	23.5	20	1.2	0.05	57	< 0.05	31	167	< 0.05	328
May-08	na	7.9	22340	25.3	36	1.1	< 0.10	120	< 0.10	48	232	< 0.50	427
Nov-08	na	7.9	24180	21.7	29	0.95	0.06	63	< 0.10	24	271	< 0.20	311
May-09	na	8.3	7520	18.5	116	0.38	< 0.05	< 60	< 0.02	26	90	< 0.10	96
Nov-09	na	8.0	18950	22.4	56	0.448	0.05	82	< 0.05	49	< 250	< 0.10	286
May-10	na	8.0	20370	22.6	15	0.40	< 0.10	192	< 0.05	71	106	< 0.10	441
Nov-10	na	8.7	5774	15.3	339	0.235	< 0.10	44	< 0.01	35	81	< 0.04	175
May-11	na	8.3	22740	31.2	250	0.904	< 0.10	231	< 0.01	27	308	< 0.20	784
Nov-11	na	7.9	21800	20.9	32.7	0.990	0.05	60	< 0.01	30	118	< 0.10	305
May-12	na	8.1	20700	25	131	1.6	0.07	198	< 0.01 X	51	158	< 0.05	515
Nov-12	na	8.2	20000	22.4	60.4	5.0	0.09	69	0.016	41	155	< 0.05 X	340
May-13	na	8.0	15600	22.2	67.0	0.17	0.04	42	< 0.001	59	140	0.02	156
Average(1)		8.1	18965	22.3	77.2	1.07	0.06	114.7	0.017	39.4	191.3	0.06	384.1

NOTES:

1. Average value represents the average of all values detected over the detection limit and 1/2 the detection limit when the parameter was not detected over the detection limit (i.e., the value above is preceeded by a < symbol).

Shaded values exceed the NCDENR 2L Standards, April 1, 2013.

na - not analyzed

* This value is the NC DENR 2L Standard for Nitrate. The value in this column is the total N, as both Nitrite and Nitrate. To calculate the nitrate concentration, subtract the Nitrite concentration from the Nitrate/Nitrite as N concentration.

S1 - The matrix spike and / or the matrix spike duplicate sample recovery was not within control limits due to matrix interference. The Laboratory Control Sample (LCS) was within control limits.

S7 - Sample breakthrough to 2nd section is > 10%. Results may be biased low.

X - Result subject to sample matrix interference. Reported detection limit has been adjusted where applicable.

LANDFILL LEACHATE ANALYSIS RESULTS, EVERGREEN PACKAGING, CANTON, NC

Collection Date	Analytical Parameters (mg/L)									
	Copper	Fluoride	Iron	Lead	Magnesium	Manganese	Mercury	Nickel	Nitrate-Nitrite as N	Nitrite as N
May-05	< 0.02	< 10	0.12	< 0.01	150	0.17	< 0.0004	0.04	na	0.020
Nov-05	< 0.02	< 10	0.06	< 0.05	150	0.13	< 0.0004	< 0.04	na	0.020
May-06	< 0.02	1.0	< 0.5	< 0.05	120	0.18	< 0.0004	0.03	na	< 0.020
Nov-06	< 0.08	< 5.0	< 0.50	< 0.08	160	0.34	< 0.0010	< 0.10	na	< 0.020
May-07	< 0.10	< 5.0	< 5.0	< 0.10	150	0.13	< 0.0010	< 0.10	na	0.040
Nov-07	< 0.05	< 5.0	< 0.25	< 0.05	170	0.16	< 0.0008	< 0.05	0.20	< 0.020
May-08	< 0.50	< 10	< 0.50	< 0.50	170	0.29	< 0.0008	< 0.50	0.29	< 0.020
Nov-08	< 0.10	< 5.0	< 0.25	< 0.10	190	< 0.20	< 0.0008	< 0.20	< 0.50	< 0.020
May-09	< 0.10	< 5.0	0.30	< 0.04	61	0.21	< 0.0008	< 0.10	< 0.20	0.140
Nov-09	< 0.10	< 5.0	0.27	< 0.10	160	0.36	< 0.0008	< 0.25	< 0.20	< 0.010
May-10	< 0.10	< 5.0	< 0.50	< 0.10	210	0.68	< 0.0010	< 0.25	< 0.20	0.013
Nov-10	< 0.10	< 2.0	4.4	< 0.05	46	3.2	< 0.001	0.128	< 0.10	0.16
May-11	< 0.50	< 5.0	0.73	< 0.05	190	< 0.5	< 0.002	< 0.50	0.10	< 0.01
Nov-11	< 0.05	< 5.0	< 0.25	< 0.05	200	0.18	< 0.002	< 0.10	< 0.10	< 0.10
May-12	< 0.025	18.8 X	0.58	< 0.05 X	220	0.37	< 0.001 X	< 0.05	0.18	< 0.1 X
Nov-12	< 0.025 X	< 5.0 X	0.40	< 0.05 X	320	0.11	< 0.001 X	0.056	< 0.2 S1, X	< 0.1 X
May-13	< 0.05 X	13.6	0.15	< 0.01	98	0.67	< 0.0002	< 0.05 X	< 0.2 X	< 0.05 X
Average[1]	0.06	4.4	0.64	0.04	163	0.44	0.0005	0.08	0.14	0.037

NOTES:

1. Average value represents the average of all values detected over the detection limit and 1/2 the detection limit when the parameter was not detected over the detection limit (i.e., the value above is preceeded by a < symbol).

Shaded values exceed the NCDENR 2L Standards, April 1, 2013.

na - not analyzed

* This value is the NC DENR 2L Standard for Nitrate. The value in this column is the total N, as both Nitrite and Nitrate. To calculate the nitrate concentration, subtract the Nitrite concentration from the Nitrate/Nitrite as N concentration.

S1 - The matrix spike and / or the matrix spike duplicate sample recovery was not within control limits due to matrix interference. The Laboratory Control Sample (LCS) was within control limits.

S7 - Sample breakthrough to 2nd section is > 10%. Results may be biased low.

X - Result subject to sample matrix interference. Reported detection limit has been adjusted where applicable.

LANDFILL LEACHATE ANALYSIS RESULTS, EVERGREEN PACKAGING, CANTON, NC

Collection Date	Analytical Parameters (mg/L)										
	Total Phosphorus	Potassium	Selenium	Silver	Sodium	Sulfate	Total Dissolved Solids	Total Organic Carbon	Total Organic Halides	Total Rec. Phenols	Zinc
May-05	na	400	< 0.050	< 0.01	5560	503	16500	90	0.640	0.046	< 0.05
Nov-05	na	440	< 0.050	< 0.01	6700	910	17100	118	0.493	< 0.010	< 0.05
May-06	na	250	< 0.050	< 0.01	3200	813	7170	50	0.209	0.014	< 0.02
Nov-06	na	440	< 0.080	< 0.08	6700	1430	21700	94	0.191	< 0.010	< 0.25
May-07	na	490	< 0.10	< 0.10	7500	1720	21000	75	0.518	< 0.015	< 0.50
Nov-07	190	490	0.53	< 0.05	8600	1590	20700	85	0.191	< 0.010	< 0.10
May-08	170	490	< 0.50	< 0.20	5800	1190	18700	126	0.647	< 0.010	< 0.10
Nov-08	177	580	< 0.25	< 0.10	6420	2030	19500	90	0.443	< 0.010	0.14
May-09	13	160	< 0.10	< 0.04	2000	619	4820	30	0.221	0.012	< 0.10
Nov-09	36	380	< 0.25	< 0.10	4700	1550	14200	63	0.449	< 0.010	< 0.05
May-10	34	462	< 0.25	< 0.10	4500	1500	15400	130	0.294	0.019	< 0.10
Nov-10	6.0	130	< 0.10	< 0.02	1400	609	3720	39	0.456	< 0.010	< 0.40
May-11	40	460	< 0.50	< 0.02	6200	1830	18200	138	0.325	< 0.010	< 0.20
Nov-11	42	520	< 0.25	< 0.02	7100	1310	17100	80	1.67	< 0.010	< 0.10
May-12	27	440	< 0.25	< 0.02 X	65000	1340	15600	131	1.95 S7	< 0.010	< 0.10
Nov-12	21	440	< 0.1 X	< 0.02 X	5200	2210	15800	91	0.217	< 0.010 X	< 0.10 X
May-13	16	210	< 0.05 X	< 0.002	2800	1560	10900	39.9	0.129	< 0.005	< 0.02
Average[1]	64	399	0.12	0.03	8787	1336	15183	86	0.532	0.009	0.07

NOTES:

1. Average value represents the average of all values detected over the detection limit and 1/2 the detection limit when the parameter was not detected over the detection limit (i.e., the value above is preceeded by a < symbol).

Shaded values exceed the NCDENR 2L Standards, April 1, 2013.

na - not analyzed

* This value is the NC DENR 2L Standard for Nitrate. The value in this column is the total N, as both Nitrite and Nitrate. To calculate the nitrate concentration, subtract the Nitrite concentration from the Nitrate/Nitrite as N concentration.

S1 - The matrix spike and / or the matrix spike duplicate sample recovery was not within control limits due to matrix interference. The Laboratory Control Sample (LCS) was within control limits.

S7 - Sample breakthrough to 2nd section is > 10%. Results may be biased low.

X - Result subject to sample matrix interference. Reported detection limit has been adjusted where applicable.

APPENDIX B

HELP MODEL

B-1 LEAKAGE THROUGH OPERATING BASE LINER
B-2 LEAKAGE THROUGH OPERATING SIDESLOPE LINER
B-3 LEAKAGE THROUGH CLOSED BASE LINER
B-4 LEAKAGE THROUGH CLOSED SIDESLOPE LINER
B-5 GROUNDWATER RECHARGE

APPENDIX B-1

LEAKAGE THROUGH OPERATING BASE LINER

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP\BRPP\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP\BRPP\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\BRPP\SOLARRAD.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\BRPP\EVAPO18.D11
SOIL AND DESIGN DATA FILE:   C:\HELP\BRPP\NC60BASE.D10
OUTPUT DATA FILE:            C:\HELP\BRPP\NC60BASE.OUT


TIME:   8:20     DATE:   7/24/2013


******************************************************************************

     TITLE:  EVERGREEN - LANDFILL 6D NORTH - NO CAP 60-FT WASTE ON BASE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =    720.00   INCHES
          POROSITY                     =      0.4000 VOL/VOL
          FIELD CAPACITY               =      0.3600 VOL/VOL
          WILTING POINT                =      0.2800 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3670 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.139999997000E-05 CM/SEC


                                  LAYER  2
                                  --------

                       TYPE 2 - LATERAL DRAINAGE LAYER
```

```
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     15.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =      8.00   PERCENT
DRAINAGE LENGTH              =    200.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7470 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC


                        LAYER  5
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     48.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC
```

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	90.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	7.149	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	7.200	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	5.040	INCHES
INITIAL SNOW WATER	=	4.684	INCHES
INITIAL WATER IN LAYER MATERIALS	=	287.503	INCHES
TOTAL INITIAL WATER	=	292.188	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.48	3.60	5.13	3.84	4.19	4.20
4.43	4.79	3.96	3.29	3.29	3.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	3.51	4.57	3.60	4.81	4.49
	4.01	4.46	3.28	2.79	3.50	3.61
STD. DEVIATIONS	1.41	1.89	2.79	1.91	1.62	1.87
	1.50	2.02	1.89	1.57	2.44	2.00
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.769	1.005	1.649	2.203	2.923	3.280
	3.173	2.719	2.033	1.291	1.211	0.548
STD. DEVIATIONS	0.405	0.548	1.300	2.129	2.854	3.185
	3.104	2.664	1.972	1.225	0.782	0.331
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.8296	0.7160	0.7296	0.7541	0.8250	0.7983
	0.8145	0.8581	0.9299	1.0131	1.0072	0.9201
STD. DEVIATIONS	0.5210	0.4920	0.5522	0.5128	0.5466	0.4956
	0.4845	0.4404	0.4169	0.3269	0.3357	0.5010
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0396	0.0376	0.0348	0.0372	0.0394	0.0394
	0.0389	0.0409	0.0459	0.0483	0.0497	0.0439
STD. DEVIATIONS	0.0249	0.0260	0.0264	0.0253	0.0261	0.0244
	0.0231	0.0210	0.0206	0.0156	0.0166	0.0239

DAILY AVERAGE HEAD ON TOP OF LAYER 5

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

****

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	45.89	(5.294)	166597.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	22.805	(18.9744)	82781.48	49.689
LATERAL DRAINAGE COLLECTED FROM LAYER 2	10.19553	(4.89541)	37009.766	22.21506
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.00000	(0.00000)	0.016	0.00001
AVERAGE HEAD ON TOP OF LAYER 3	0.041	(0.020)		
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000	(0.00000)	0.016	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.000	(0.000)		
CHANGE IN WATER STORAGE	12.582	(19.2996)	45672.26	27.415

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	3.66	13285.801
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.04762	172.86519
PERCOLATION/LEAKAGE THROUGH LAYER 3	0.000000	0.00006
AVERAGE HEAD ON TOP OF LAYER 3	0.070	
MAXIMUM HEAD ON TOP OF LAYER 3	0.139	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	2.1 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00006
AVERAGE HEAD ON TOP OF LAYER 5	0.000	
SNOW WATER	176.91	642192.8120

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3971
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2800

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	280.1273	0.3891
2	0.4893	0.0326
3	0.0000	0.0000
4	0.1793	0.7470
5	22.6080	0.4710
SNOW WATER	177.512	

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APPENDIX B-2

LEAKAGE THROUGH OPERATING SIDESLOPE LINER

NC60SIDE.OUT Operating, Side-Slope Liner

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP\BRPP\PRECIP.D4
TEMPERATURE DATA FILE:        C:\HELP\BRPP\TEMP.D7
SOLAR RADIATION DATA FILE:    C:\HELP\BRPP\SOLARRAD.D13
EVAPOTRANSPIRATION DATA:      C:\HELP\BRPP\EVAPO18.D11
SOIL AND DESIGN DATA FILE:    C:\HELP\BRPP\NC60SIDE.D10
OUTPUT DATA FILE:             C:\HELP\BRPP\NC60SIDE.OUT


TIME:   8:18     DATE:   7/24/2013


******************************************************************************

     TITLE:  CHAMPION - LANDFILL 6D SOUTH - NO CAP 60-FT WASTE ON SIDE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                            MATERIAL TEXTURE NUMBER   0
          THICKNESS                    =    720.00   INCHES
          POROSITY                     =      0.4000 VOL/VOL
          FIELD CAPACITY               =      0.3600 VOL/VOL
          WILTING POINT                =      0.2800 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.3670 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.139999997000E-05 CM/SEC


                                   LAYER  2
                                   --------

                        TYPE 2 - LATERAL DRAINAGE LAYER
```

```
                MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =     50.00   PERCENT
DRAINAGE LENGTH              =    300.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
                MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  4
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     48.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER              =     90.00
FRACTION OF AREA ALLOWING RUNOFF     =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
EVAPORATIVE ZONE DEPTH               =     18.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      7.149  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =      7.200  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      5.040  INCHES
INITIAL SNOW WATER                   =      4.684  INCHES
INITIAL WATER IN LAYER MATERIALS     =    287.228  INCHES
TOTAL INITIAL WATER                  =    291.912  INCHES
TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.48	3.60	5.13	3.84	4.19	4.20
4.43	4.79	3.96	3.29	3.29	3.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION

TOTALS	3.27	3.51	4.57	3.60	4.81	4.49
	4.01	4.46	3.28	2.79	3.50	3.61
STD. DEVIATIONS	1.41	1.89	2.79	1.91	1.62	1.87
	1.50	2.02	1.89	1.57	2.44	2.00

RUNOFF

TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION

TOTALS	0.769	1.005	1.649	2.203	2.923	3.280
	3.173	2.719	2.033	1.291	1.211	0.548
STD. DEVIATIONS	0.405	0.548	1.300	2.129	2.854	3.185
	3.104	2.664	1.972	1.225	0.782	0.331

LATERAL DRAINAGE COLLECTED FROM LAYER 2

TOTALS	0.8289	0.7153	0.7294	0.7550	0.8240	0.7990
	0.8134	0.8601	0.9309	1.0129	1.0071	0.9192
STD. DEVIATIONS	0.5217	0.4930	0.5509	0.5127	0.5457	0.4955
	0.4828	0.4403	0.4165	0.3267	0.3362	0.5014

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0001	0.0000	0.0000	0.0000	0.0001	0.0000
	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 3

AVERAGES	0.0118	0.0112	0.0104	0.0111	0.0117	0.0117
	0.0116	0.0122	0.0137	0.0144	0.0148	0.0131
STD. DEVIATIONS	0.0074	0.0078	0.0078	0.0075	0.0078	0.0073
	0.0069	0.0063	0.0061	0.0046	0.0049	0.0071

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT

PRECIPITATION	45.89	(5.294)	166597.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	22.805	(18.9744)	82781.48	49.689
LATERAL DRAINAGE COLLECTED FROM LAYER 2	10.19530	(4.89318)	37008.949	22.21457
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00063	(0.00029)	2.276	0.00137
AVERAGE HEAD ON TOP OF LAYER 3	0.012	(0.006)		
CHANGE IN WATER STORAGE	12.581	(19.3046)	45670.82	27.414

****

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	3.66	13285.801
RUNOFF	0.000	0.0000
DRAINAGE COLLECTED FROM LAYER 2	0.04823	175.06445
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000003	0.01042
AVERAGE HEAD ON TOP OF LAYER 3	0.021	
MAXIMUM HEAD ON TOP OF LAYER 3	0.100	
LOCATION OF MAXIMUM HEAD IN LAYER 2 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	176.91	642192.8120

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3971
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2800

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	280.1273	0.3891
2	0.3873	0.0323
3	0.0000	0.0000
4	22.6080	0.4710
SNOW WATER	177.512	

****
****

APPENDIX B-3

LEAKAGE THROUGH CLOSED BASE LINER

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**              FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP\BRPP\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP\BRPP\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\BRPP\SOLARRAD.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\BRPP\EVAPO18.D11
SOIL AND DESIGN DATA FILE:   C:\HELP\BRPP\CAP60BAS.D10
OUTPUT DATA FILE:            C:\HELP\BRPP\CAP60BAS.OUT


TIME:   9:43     DATE:   7/25/2013


******************************************************************************

     TITLE:  EVERGREEN - LANDFILL 6D NORTH - NO CAP 60-FT WASTE ON BASE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER  12
          THICKNESS                  =      4.00   INCHES
          POROSITY                   =      0.4710 VOL/VOL
          FIELD CAPACITY             =      0.3420 VOL/VOL
          WILTING POINT              =      0.2100 VOL/VOL
          INITIAL SOIL WATER CONTENT =      0.4495 VOL/VOL
          EFFECTIVE SAT. HYD. COND.  =  0.419999997000E-04 CM/SEC


                                  LAYER  2
                                  --------

                       TYPE 3 - BARRIER SOIL LINER
```

```
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499989983000E-04 CM/SEC


                        LAYER  3
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   5.00000000000     CM/SEC


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  5
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0675 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =      5.00   PERCENT
DRAINAGE LENGTH              =    250.0    FEET


                        LAYER  6
                        --------
```

```
          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =    720.00   INCHES
POROSITY                     =      0.4000 VOL/VOL
FIELD CAPACITY               =      0.3600 VOL/VOL
WILTING POINT                =      0.2800 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3682 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.139999997000E-05 CM/SEC


                        LAYER  7
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     15.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =      8.00   PERCENT
DRAINAGE LENGTH              =    200.0    FEET


                        LAYER  8
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  9
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7470 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC
```

```
                    TYPE 3 - BARRIER SOIL LINER
                    MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     48.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

```
SCS RUNOFF CURVE NUMBER              =     90.00
FRACTION OF AREA ALLOWING RUNOFF     =      0.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE   =      1.000  ACRES
EVAPORATIVE ZONE DEPTH               =      4.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE    =      1.798  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE   =      1.884  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE   =      0.840  INCHES
INITIAL SNOW WATER                   =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS     =    302.455  INCHES
TOTAL INITIAL WATER                  =    302.455  INCHES
TOTAL SUBSURFACE INFLOW              =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

```
STATION LATITUDE                          =  35.26 DEGREES
MAXIMUM LEAF AREA INDEX                   =   0.00
START OF GROWING SEASON (JULIAN DATE)     =     96
END OF GROWING SEASON (JULIAN DATE)       =    298
EVAPORATIVE ZONE DEPTH                    =   4.0  INCHES
AVERAGE ANNUAL WIND SPEED                 =   7.60 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY     =  71.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY     =  75.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY     =  84.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY     =  77.00 %
```

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.48	3.60	5.13	3.84	4.19	4.20

4.43	4.79	3.96	3.29	3.29	3.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	3.51	4.57	3.60	4.81	4.49
	4.01	4.46	3.28	2.79	3.50	3.61
STD. DEVIATIONS	1.41	1.89	2.79	1.91	1.62	1.87
	1.50	2.02	1.89	1.57	2.44	2.00
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	1.248	1.450	2.113	2.066	2.659	2.803
	2.412	2.385	1.515	1.303	1.191	0.929
STD. DEVIATIONS	0.300	0.330	0.705	0.943	0.657	1.019
	0.952	0.776	0.741	0.562	0.489	0.235
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	2.3093	2.2273	2.4534	1.6978	2.1201	1.6458
	1.5563	2.1966	1.5311	1.6069	2.3115	2.1909
STD. DEVIATIONS	1.3825	1.7046	2.2640	1.2513	1.2613	1.0466
	0.9141	1.5297	1.1704	1.3663	2.1547	1.2990

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.5736	0.5218	0.5736	0.5551	0.5736	0.5551
	0.5736	0.5736	0.5551	0.5736	0.5551	0.5736
STD. DEVIATIONS	0.0001	0.0077	0.0001	0.0000	0.0001	0.0000
	0.0001	0.0001	0.0000	0.0001	0.0000	0.0001

LATERAL DRAINAGE COLLECTED FROM LAYER 7

TOTALS	0.4746	0.4344	0.4792	0.4667	0.4856	0.4714
	0.4910	0.4959	0.4841	0.5039	0.4908	0.5101
STD. DEVIATIONS	0.2040	0.1848	0.2018	0.1920	0.1939	0.1875
	0.1878	0.1795	0.1671	0.1675	0.1580	0.1598

PERCOLATION/LEAKAGE THROUGH LAYER 8

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	0.1109	0.1300	0.1173	0.0797	0.1013	0.0808
	0.0716	0.1096	0.0819	0.0788	0.1267	0.1027
STD. DEVIATIONS	0.0584	0.1183	0.0997	0.0671	0.0812	0.0591
	0.0564	0.0806	0.0645	0.0750	0.1163	0.0638

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400
	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400
STD. DEVIATIONS	0.0002	0.0000	0.0002	0.0000	0.0002	0.0000
	0.0002	0.0002	0.0000	0.0002	0.0000	0.0002

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0227	0.0228	0.0229	0.0230	0.0232	0.0232
	0.0234	0.0237	0.0239	0.0240	0.0242	0.0243
STD. DEVIATIONS	0.0097	0.0097	0.0096	0.0095	0.0093	0.0092
	0.0090	0.0086	0.0082	0.0080	0.0078	0.0076

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	45.89	(5.294)	166597.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	22.074	(2.6618)	80127.52	48.096
PERCOLATION/LEAKAGE THROUGH LAYER 2	23.84696	(4.36395)	86564.469	51.96020
AVERAGE HEAD ON TOP OF LAYER 2	0.099	(0.020)		
PERCOLATION/LEAKAGE THROUGH LAYER 4	6.75706	(0.00835)	24528.119	14.72297
AVERAGE HEAD ON TOP OF LAYER 4	0.240	(0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	5.78775	(2.16407)	21009.523	12.61094
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.00000	(0.00000)	0.013	0.00001
AVERAGE HEAD ON TOP OF LAYER 8	0.023	(0.009)		
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000	(0.00000)	0.013	0.00001
AVERAGE HEAD ON TOP OF LAYER 10	0.000	(0.000)		
CHANGE IN WATER STORAGE	18.032	(5.5611)	65456.39	39.290

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)

PRECIPITATION	3.66	13285.801
RUNOFF	0.000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 2	1.984183	7202.58350
AVERAGE HEAD ON TOP OF LAYER 2	4.000	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.018502	67.16373
AVERAGE HEAD ON TOP OF LAYER 4	0.240	
DRAINAGE COLLECTED FROM LAYER 7	0.01850	67.16370
PERCOLATION/LEAKAGE THROUGH LAYER 8	0.000000	0.00004
AVERAGE HEAD ON TOP OF LAYER 8	0.027	
MAXIMUM HEAD ON TOP OF LAYER 8	0.058	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00004
AVERAGE HEAD ON TOP OF LAYER 10	0.000	
SNOW WATER	6.35	23043.0586

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4710
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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♀
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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	1.4082	0.3521
2	11.3040	0.4710
3	256.5110	1068.7958
4	0.0000	0.0000

5	0.8097	0.0675
6	279.6256	0.3884
7	0.4900	0.0327
8	0.0000	0.0000
9	0.1793	0.7470
10	22.6080	0.4710
SNOW WATER	0.000	

****
****

APPENDIX B-4

LEAKAGE THROUGH CLOSED SIDESLOPE LINER

CAP60SID.OUT Closed, Side-Slope Liner

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♀
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP\BRPP\PRECIP.D4
TEMPERATURE DATA FILE:       C:\HELP\BRPP\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\BRPP\SOLARRAD.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\BRPP\EVAPO18.D11
SOIL AND DESIGN DATA FILE:   C:\HELP\BRPP\CAP60SID.D10
OUTPUT DATA FILE:            C:\HELP\BRPP\CAP60SID.OUT


TIME:   9:33     DATE:   7/25/2013


******************************************************************************

     TITLE:  CHAMPION - LANDFILL 6D SOUTH - NO CAP 60-FT WASTE ON SIDE

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                            MATERIAL TEXTURE NUMBER  12
          THICKNESS                    =      4.00   INCHES
          POROSITY                     =      0.4710 VOL/VOL
          FIELD CAPACITY               =      0.3420 VOL/VOL
          WILTING POINT                =      0.2100 VOL/VOL
          INITIAL SOIL WATER CONTENT   =      0.4495 VOL/VOL
          EFFECTIVE SAT. HYD. COND.    =  0.419999997000E-04 CM/SEC


                                   LAYER  2
                                   --------

                        TYPE 3 - BARRIER SOIL LINER
```

```
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC


                        LAYER  3
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.24   INCHES
POROSITY                     =      0.7500 VOL/VOL
FIELD CAPACITY               =      0.7470 VOL/VOL
WILTING POINT                =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.7500 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999997000E-08 CM/SEC


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.04   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD


                        LAYER  5
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =      5.00   PERCENT
DRAINAGE LENGTH              =    250.0    FEET


                        LAYER  6
                        --------
```

```
          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =    720.00   INCHES
POROSITY                     =      0.4000 VOL/VOL
FIELD CAPACITY               =      0.3600 VOL/VOL
WILTING POINT                =      0.2800 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3600 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.139999997000E-05 CM/SEC
```

```
                        LAYER  7
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  21
THICKNESS                    =     12.00   INCHES
POROSITY                     =      0.3970 VOL/VOL
FIELD CAPACITY               =      0.0320 VOL/VOL
WILTING POINT                =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.300000012000     CM/SEC
SLOPE                        =     50.00   PERCENT
DRAINAGE LENGTH              =    300.0    FEET
```

```
                        LAYER  8
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      1.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  3 - GOOD
```

```
                        LAYER  9
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =     48.00   INCHES
POROSITY                     =      0.4710 VOL/VOL
FIELD CAPACITY               =      0.3420 VOL/VOL
WILTING POINT                =      0.2100 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.4710 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.499999987000E-04 CM/SEC
```

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	90.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	4.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	1.798	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	1.884	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.840	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	295.858	INCHES
TOTAL INITIAL WATER	=	295.858	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	4.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.48	3.60	5.13	3.84	4.19	4.20
4.43	4.79	3.96	3.29	3.29	3.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.27	3.51	4.57	3.60	4.81	4.49
	4.01	4.46	3.28	2.79	3.50	3.61
STD. DEVIATIONS	1.41	1.89	2.79	1.91	1.62	1.87
	1.50	2.02	1.89	1.57	2.44	2.00
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	1.252	1.451	2.117	2.056	2.652	2.799
	2.413	2.385	1.516	1.305	1.201	0.929
STD. DEVIATIONS	0.301	0.331	0.704	0.933	0.664	1.020
	0.958	0.779	0.741	0.563	0.502	0.235
PERCOLATION/LEAKAGE THROUGH LAYER 2						
TOTALS	2.3098	2.2190	2.4637	1.6942	2.1284	1.6462
	1.5562	2.1947	1.5364	1.6009	2.3017	2.1925
STD. DEVIATIONS	1.3877	1.7049	2.3040	1.2503	1.2559	1.0539
	0.9122	1.5094	1.1730	1.3671	2.1520	1.3034
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LATERAL DRAINAGE COLLECTED FROM LAYER 7						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 9

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	0.1106	0.1298	0.1119	0.0815	0.1032	0.0794
	0.0711	0.1113	0.0834	0.0754	0.1252	0.1034
STD. DEVIATIONS	0.0584	0.1142	0.0891	0.0667	0.0816	0.0603
	0.0549	0.0783	0.0657	0.0732	0.1119	0.0646

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400
	0.2400	0.2400	0.2400	0.2400	0.2400	0.2400
STD. DEVIATIONS	0.0002	0.0000	0.0002	0.0000	0.0002	0.0000
	0.0002	0.0002	0.0000	0.0002	0.0000	0.0002

DAILY AVERAGE HEAD ON TOP OF LAYER 8

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

****

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	45.89	(5.294)	166597.6	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	22.077	(2.6950)	80139.45	48.104
PERCOLATION/LEAKAGE THROUGH LAYER 2	23.84367	(4.39910)	86552.516	51.95302
AVERAGE HEAD ON TOP OF LAYER 2	0.099	(0.019)		
PERCOLATION/LEAKAGE THROUGH	0.00004	(0.00000)	0.136	0.00008

LAYER 4				
AVERAGE HEAD ON TOP OF LAYER 4	0.240 (	0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 7	0.00004 (	0.00000)	0.127	0.00008
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.00000 (	0.00000)	0.009	0.00001
AVERAGE HEAD ON TOP OF LAYER 8	0.000 (	0.000)		
CHANGE IN WATER STORAGE	23.818 (	4.4630)	86458.15	51.896

****

♀
****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	3.66	13285.801
RUNOFF	0.000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 2	1.984222	7202.72705
AVERAGE HEAD ON TOP OF LAYER 2	4.000	
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00037
AVERAGE HEAD ON TOP OF LAYER 4	0.240	
DRAINAGE COLLECTED FROM LAYER 7	0.00000	0.00035
PERCOLATION/LEAKAGE THROUGH LAYER 9	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 8	0.000	
MAXIMUM HEAD ON TOP OF LAYER 8	0.012	
LOCATION OF MAXIMUM HEAD IN LAYER 7 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	6.35	23043.0586

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4710
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	1.4082	0.3521
2	11.3040	0.4710
3	357.8349	1490.9786
4	0.0000	0.0000
5	0.3840	0.0320
6	259.2000	0.3600
7	0.3840	0.0320
8	0.0000	0.0000
9	22.6080	0.4710
SNOW WATER	0.000	

****
****

APPENDIX B-5

GROUNDWATER RECHARGE

From the 6D-S permit to construct
~~appendix A~~

6D - Recharge
x 35 Acres

RECHARGE.OUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                  HELP MODEL VERSION 3.05a  (5 JUNE 1996)                 **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\HELP3\BRPP\RECHARGE.D4
TEMPERATURE DATA FILE:        C:\help3\BRPP\RECHARGE.D7
SOLAR RADIATION DATA FILE:    C:\help3\BRPP\RECHARGE.D13
EVAPOTRANSPIRATION DATA:      C:\help3\BRPP\RECHARGE.D11
SOIL AND DESIGN DATA FILE:    C:\Help3\BRPP\RECHARGE.D10
OUTPUT DATA FILE:             C:\Help3\BRPP\RECHARGE.OUT


TIME:  13:20      DATE:   7/15/2008


******************************************************************************

     TITLE:  BRPP - LANDFILL 6D SOUTH - RECHARGE TO GROUNDWATER

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                 TYPE 1 - VERTICAL PERCOLATION LAYER
                      MATERIAL TEXTURE NUMBER  12
       THICKNESS                    =    240.00   INCHES
       POROSITY                     =     0.4710 VOL/VOL
       FIELD CAPACITY               =     0.3420 VOL/VOL
       WILTING POINT                =     0.2100 VOL/VOL
       INITIAL SOIL WATER CONTENT   =     0.3667 VOL/VOL
       EFFECTIVE SAT. HYD. COND.    =  0.419999997000E-04 CM/SEC
     NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  4.20
              FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                 GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                                 Page 1
```

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	76.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	6.873	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	8.478	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	3.780	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	87.997	INCHES
TOTAL INITIAL WATER	=	87.997	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
ASHEVILLE NORTH CAROLINA

STATION LATITUDE	=	35.26	DEGREES
MAXIMUM LEAF AREA INDEX	=	3.00	
START OF GROWING SEASON (JULIAN DATE)	=	96	
END OF GROWING SEASON (JULIAN DATE)	=	298	
EVAPORATIVE ZONE DEPTH	=	18.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	7.60	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	71.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	75.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	84.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	77.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.28	3.52	4.27	3.34	3.52	3.28
4.48	4.23	3.00	2.65	2.69	3.05

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
36.80	39.10	46.40	55.70	63.30	69.80
73.20	72.60	66.90	56.00	46.40	39.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING

RECHARGE.OUT

COEFFICIENTS FOR ASHEVILLE NORTH CAROLINA
AND STATION LATITUDE = 35.26 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.08	3.43	3.81	3.13	4.04	3.51
	4.03	3.94	2.52	2.24	2.86	3.14
STD. DEVIATIONS	1.33	1.85	2.32	1.66	1.36	1.47
	1.52	1.79	1.45	1.26	2.00	1.73
RUNOFF						
TOTALS	0.120	0.237	0.021	0.002	0.007	0.003
	0.000	0.020	0.006	0.001	0.047	0.015
STD. DEVIATIONS	0.256	0.749	0.035	0.006	0.017	0.013
	0.002	0.072	0.018	0.003	0.099	0.036
EVAPOTRANSPIRATION						
TOTALS	1.087	1.468	2.539	3.058	4.240	3.753
	3.735	2.987	2.581	1.628	0.957	0.725
STD. DEVIATIONS	0.254	0.352	0.293	0.807	0.960	1.052
	1.303	0.791	0.865	0.760	0.262	0.167
PERCOLATION/LEAKAGE THROUGH LAYER 1						
TOTALS	0.3576	0.6212	1.1902	1.5507	1.5604	1.3816
	1.0708	0.8494	0.6233	0.6314	0.5573	0.3598
STD. DEVIATIONS	0.1747	0.6016	0.6666	0.9943	0.7052	0.5194
	0.2989	0.2304	0.2220	0.2837	0.2608	0.2202

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	39.73	(4.479)	144205.4	100.00
RUNOFF	0.481	(0.8836)	1744.89	1.210
EVAPOTRANSPIRATION	28.758	(3.0128)	104391.06	72.391

PERCOLATION/LEAKAGE THROUGH LAYER 1	10.75359	(3.50507)	39035.547	27.06941
CHANGE IN WATER STORAGE	-0.266	(3.1046)	-966.14	-0.670

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	2.99	10853.700
RUNOFF	0.928	3368.7964
PERCOLATION/LEAKAGE THROUGH LAYER 1	0.223098	809.84460
SNOW WATER	5.37	19489.3320

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4306
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.2100

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	84.0051	0.3500
SNOW WATER	0.000	

****
****

ATTACHMENT 3

DESIGN HYDROGEOLOGIC REPORT

DESIGN HYDROGEOLOGIC REPORT ADDENDUM
FOR
LANDFILL NO. 6
AREA D NORTH
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

August 2013

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE, JR.

8/15/13

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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

TABLE OF CONTENTS

Section No.	Title	Page No.
1.0	INTRODUCTION	1-1
1.1	Purpose and Scope	1-1
1.2	Report Organization	1-2
2.0	BACKGROUND SITE INFORMATION	2-1
2.1	Site Location	2-1
2.2	Site Drainage	2-3
2.3	Regional Geology	2-3
3.0	SUPPLEMENTAL 2013 SITE INVESTIGATION	3-1
3.1	Soil Borings and Rock Coring	3-1
3.2	Piezometer Installations	3-4
3.3	Elevation and Position Survey	3-5
3.4	Water Level Monitoring	3-5
3.5	In Situ Hydraulic Conductivity Testing	3-8
4.0	SITE GEOLOGIC CHARACTERISTICS	4-1
4.1	Surficial Geology	4-1
4.2	Bedrock	4-2
5.0	SITE HYDROGEOLOGIC CHARACTERISTICS	5-1
5.1	Hydrogeologic Setting	5-1
5.2	Groundwater Levels	5-4
5.3	Horizontal Groundwater Flow Directions	5-5
5.4	Groundwater Seepage Rates	5-6
6.0	CONCLUSIONS AND RECOMMENDATIONS	6-1
	REFERENCES	

LIST OF ATTACHMENTS

ATTACHMENT A	BORING LOGS AND PIEZOMETER INSTALLATION DETAILS
ATTACHMENT B	ROCK CORE LOGS
ATTACHMENT C	WATER LEVEL MEASUREMENTS
ATTACHMENT D	IN SITU SLUG TEST RESULTS

LIST OF FIGURES

Figure No.	Title	Page No.
2-1	SITE LOCATION MAP	2-2
3-1	EXPLORATION LOCATIONS	3-6
3-2	RANGE OF HISTORIC WATER LEVELS	3-7
4-1	INTERPRETIVE BEDROCK SURFACE MAP	4-4
5-1	INTERPRETIVE GEOLOGIC PROFILES	5-2
5-2	INTERPRETIVE SEASONAL-HIGH GROUNDWATER MAP	5-3

LIST OF TABLES

Table No.	Title	Page No.
3-1	EXPLORATION DETAILS - 2013 SITE INVESTIGATION	3-2
3-2	GROUNDWATER LEVELS	3-3
3-3	IN SITU HYDRAULIC CONDUCTIVITY TESTING	3-9

DESIGN HYDROGEOLOGIC REPORT ADDENDUM
FOR LANDFILL NO. 6 – AREA D NORTH
BLUE RIDGE PAPER PRODUCTS INC. – CANTON MILL
DBA EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

1.0 INTRODUCTION

1.1 Purpose and Scope

Blue Ridge Paper Products Inc. (Blue Ridge) retained Sevee & Maher Engineers, Inc. (SME) to prepare a design and North Carolina Department of Environment and Natural Resources (NCDENR) application to expand Landfill No. 6 at their Canton Mill with a new cell designated as Area D North. Landfill No. 6, is a "Sanitary Landfill", which receives "Industrial Solid Waste" from the pulp and paper manufacturing process as defined by NCDENR Solid Waste Management Regulations, specifically Rule 15A NCAC 13B.[1] Area D North is part of the previously investigated portion of Landfill No. 6 described in a report titled "Hydrogeologic Report for Landfill No. 6 Areas D and E" (SME, 2008). This Report documents the findings of additional investigative activities completed in 2013 that were completed in accordance with the Site Investigation Work Plan for Area D North (SME, 2012) (Work Plan), which was submitted to and approved by NCDENR. The 2013 Site Investigation supplements earlier investigations (SME, 2008) and is an addendum to the 2007 Landfill No. 6 design application to NCDENR.

The purpose of the site investigation was to gather additional hydrogeologic information to supplement the "Design Hydrogeologic Report – Landfill Areas D and E" (SME, 2008), specifically for design of Area D North. This investigation, along with the previously completed investigations, provided a minimum coverage of one piezometer per acre in the Area D North solid waste footprint. Furthermore, the site investigation also provided adequate information to demonstrate compliance required by Rule 15A NCAC 13B.0503 of the NCDENR for a minimum groundwater separation from the base of the Landfill.

---

[1] 15A NCAC 13B .0503, SITING AND DESIGN REQUIREMENTS FOR DISPOSAL SITES, § 2.d.i, states: "A site, except for land clearing and inert debris landfills subject to Rule .0564(8)(e) of this Section, shall be designed so that the bottom elevation of solid waste will be a minimum of four feet above the seasonal high water table ."

The 2013 Site Investigation objectives were accomplished by performing the following activities:

- Complete additional borings and coring of bedrock;
- Install additional piezometers to supplement existing piezometers and monitoring wells to measure groundwater elevations in and adjacent to Area D North;
- Perform additional in-situ slug testing in select piezometers installed in Area D North to measure hydraulic conductivities beneath Area D North;
- Monitor groundwater levels over time to estimate the seasonal-high groundwater table specifically within Area D North; and,
- Prepare a seasonal-high groundwater table map and update the bedrock surface map using the new information.

1.2 Report Organization

This addendum Report is divided into six sections specific to Area D North: Section 2.0 provides a summary of background information. The regional hydrogeologic interpretation was previously described in SME, 2008, which was corroborated by the findings of the 2013 Site Investigation. The technical approach taken to complete the various tasks in the 2013 Site Investigation and the results of those efforts are presented in Section 3.0. A summary of the geologic and hydrogeologic characteristics specific to Area D North are discussed in Sections 4.0 and 5.0, and include an updated competent bedrock surface map and seasonal-high groundwater surface map. A summary of the major conclusions of the hydrogeologic addendum for Area D North are presented in Section 6.0.

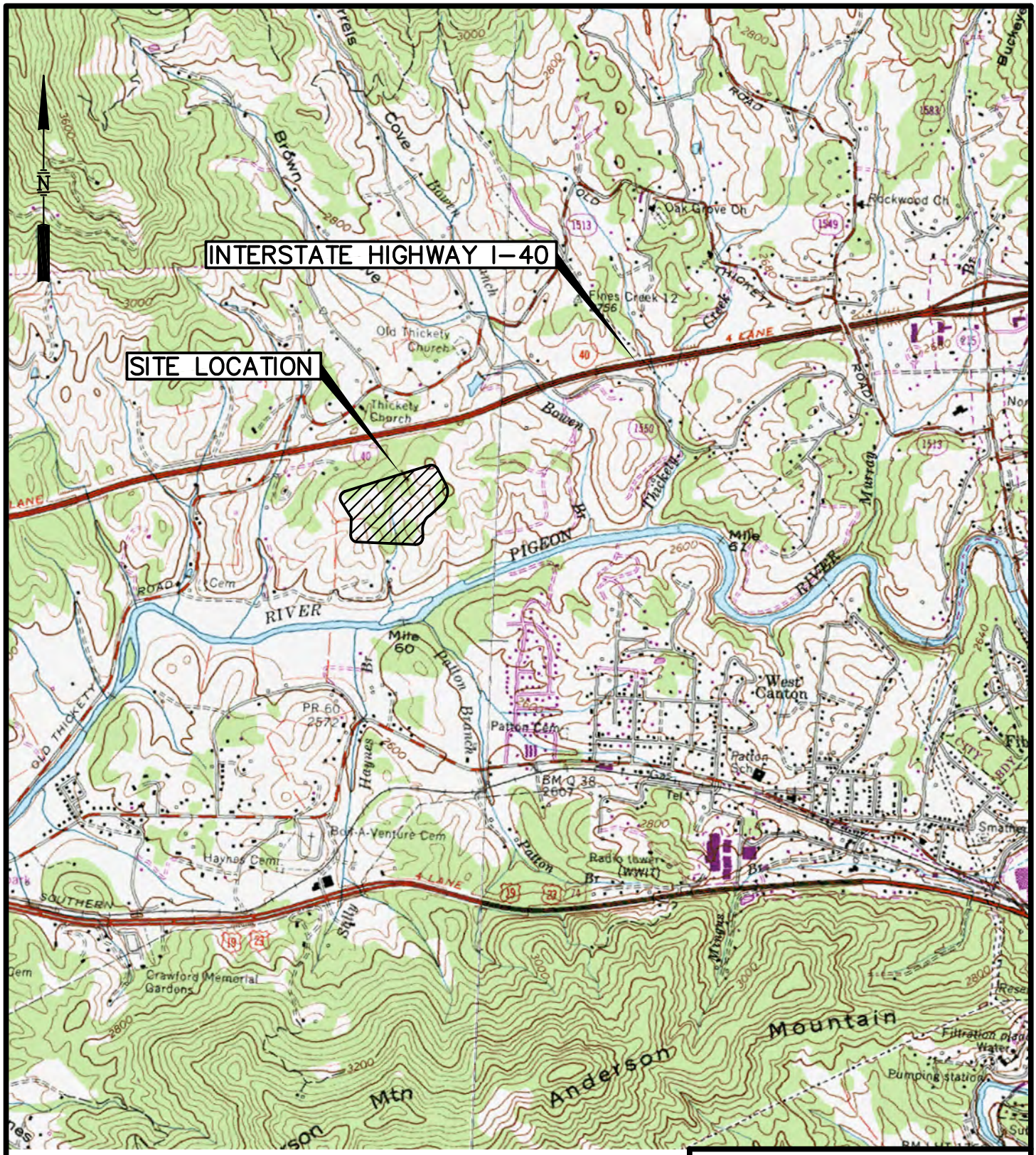
2.0 BACKGROUND SITE INFORMATION

Landfill No. 6 has been in operation since 1984 and currently consists of Areas A through D South. Areas A through C are currently inactive, have received final cover, and are considered to be closed as of 2013. Area D will include two phases known as Area D South and Area D North. Area D South was permitted as an Industrial Solid Waste Landfill Facility by NCDENR on July 17, 2009 (Facility Permit No. 44-06; Doc ID: 7823) and a modified permit issued October 27, 2009 (Facility Permit No. 44-06; Doc ID: 8791); it was constructed in 2009; and waste placement began in 2010 and continues in 2013. Area D North is the focus of this Report and has a solid waste footprint of approximately 15 acres. Area E is expected to be permitted and constructed in the future and would be located north of Area D North.

Area D North was included in past assessments and site investigations as part of earlier landfill permits. Law Engineering and Testing Company (Law) prepared an *Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations* for the entire Landfill No. 6 site in 1982, which included a detailed description of the interpreted hydrogeologic setting (Law, 1982). Also, Sirrine Environmental Consultants (Sirrine, 1989), Roy F. Weston, Inc. (Weston, 1995) and Sevee & Maher Engineers, Inc. (SME, 1995 and 2008) have prepared designs, construction documentation, and hydrogeologic reports which provide additional hydrogeologic information related to Landfill No. 6. Previous site investigations included Area D North.

2.1 Site Location

Area D North is located about two miles northwest of the City of Canton in Haywood County, North Carolina as shown in Figure 2-1. The original Landfill No. 6 incorporated eight landfill cells designated as Areas A through H, and an Asbestos-Containing Material cell. The proposed Area D North cell is located north of the currently active Area D South; and west of two closed landfill cells known as Area A West and Area C Upper (refer to Figure 3-1 for cell locations), as shown on Figure 2-2. Interstate Highway I-40 and the Pigeon River border the Site to the north and south, respectively (Figure 2-1). Ground surface elevations at Area D



BASE MAP ADAPTED FROM THE 7.5-MINUTE USGS CANTON, NC (1990) AND CLYDE (1978) TOPOGRAPHIC QUADRANGLE MAPS.

1000 0 2000 FEET

FIGURE 2-1
SITE LOCATION MAP
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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DWG: SITELOC LMN: NONE CTB: SME-STD REV: 7/19/2013

\\Nserver\cfs\Brpp\NC\6d-n\Acad\Figures\SITELOC.dwg, 7/19/2013 2:10:44 PM, paf

North generally slope downward from a high of approximately 2,780 feet NGVD[2] in its northeast corner toward the south which is approximately 2,660 feet NGVD where it abuts Area D South.

2.2 Site Drainage

Because of the site topography, drainage of surface water is from north to south through various swales. A pond collects surface water at the lower end of Area D North. The lower end of Area D North abuts the north edge of Area D South. Surface water is currently diverted beneath Area D South through a culvert.

2.3 Regional Geology

Landfill No. 6 is located in the Blue Ridge Mountains. Soils have formed in-place from weathering of the underlying bedrock. The degree of weathering decreases with depth. The most shallow soils consist of saprolite which is a weathered-in-place soil (residuum) that is typically silty or clayey and contains relic fracture structure. This soil transitions to partially weathered rock (PWR), which may be soil-like between blocks of rock. The partial weathered rock becomes very fractured bedrock with little or no soil, eventually becoming competent bedrock with depth. There are local deposits of alluvial soils (alluvium) along the Pigeon River. Some localized spots of colluvium (mass transported soil and/or rock) exist atop the saprolite. Groundwater depth varies and is deeper beneath ridges and more shallow in valleys. Regionally, groundwater migrates from the higher topographic features towards the Pigeon River.

[2] Elevations in this report are referenced to the 1929 National Geodetic Vertical Datum (NGVD).

3.0 SUPPLEMENTAL 2013 SITE INVESTIGATION

The methods and procedures utilized to complete the supplemental 2013 Site Investigation are summarized in this section.

3.1 Soil Borings and Rock Coring

Soil borings and rock coring (Drilling) was completed by A.E. Drilling Services, LLC of Greenville, SC (A.E.) under the direction of SME. A.E. is certified and licensed for installing piezometers and drilling wells in North Carolina. Drilling was performed using a CME 550X high-torque ATV auger and core drill rig. The unconsolidated formation (i.e., soils) was drilled with 4.25-inch inside-diameter hollow-stem augers, typically to the depth of auger refusal at each location, as indicated on Table 3-1. Samples of the unconsolidated formation were generally collected at 5-foot intervals using Standard Penetration Sampling (SPT) techniques in general accordance with American Society for Testing and Materials (ASTM) D 1586. Rock core samples were collected from the borings with a dual-tube NX (2.16-inch inside-diameter) diamond bit core barrel in general accordance with the procedures described in ASTM D 2113. Soils were classified according to the Unified Soil Classification System (USCS) in SME, 2008; and those classifications were corroborated by the 2013 Site Investigation. Descriptive boring and bedrock core logs were prepared under the direction of a North Carolina-registered geologist based on visual observations and testing of the retrieved soil and rock core samples. Boring and rock core logs are presented in Attachment A and B, respectively.

TABLE 3-1

EXPLORATION DETAILS - 2013 SITE INVESTIGATION
LANDFILL No. 6, AREA D NORTH

Boring Designation	Auger Refusal	Bottom of Exploration	Surveyed Locations			Piezometer Designation	Geologic Unit Screened[6]	Top of Riser Elevation	Well Screen Interval[4]			Filter Pack					
			Northing	Easting	Ground				Top	Bottom	Length	Top		Bottom		Length	Diameter
	ft-bgs	ft-bgs	NC State Plane NAD		ft NGVD			ft NGVD	ft-bgs	ft-bgs	ft	ft-bgs	ft NGVD	ft-bgs	ft NGVD	ft	inches
B-13-101	NE	60.0	676766.7	845865.6	2732.8	P13-101	PWR	2736.18	47.5	57.5	10.0	45.5	2687.3	58.4	2674.4	12.9	8.5
B-13-102	34.0	34.2	677037.9	846259.8	2733.5	P13-102	Saprolite and PWR	2736.60	24.0	34.0	10.0	22.0	2711.5	34.0	2699.5	12.0	8.5
B-13-103	65.0	65.0	677142.2	846486.6	2761.0	P13-103	Saprolite and PWR	2764.48	55.0	65.0	10.0	53.0	2708.0	65.0	2696.0	12.0	8.5
B-13-104	23.0	30.9	--	--	2716.1	NI		NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
B-13-104R[1]	19.0	60.5	676460.8	845575.4	2716.1	P13-104	Frac Bedrock	2718.98	50.0	60.0	10.0	48.0	2668.1	60.1	2656.0	12.1	3.0
B-13-105	29.3	29.3	676638.3	846033.6	2690.6	P13-105	PWR	2693.79	19.3	29.3	10.0	17.3	2673.3	29.3	2661.3	12.0	8.5
B-13-106	20.5	40.5	676939.5	846443.2	2735.1	P13-106	Comp Bedrock	2738.12	30.5	40.5	10.0	25.0	2710.1	40.5	2694.6	15.5	3.0
B-13-107	12.0	76.0	676957.2	846670.9	2756.6	P13-107A	Comp Bedrock	2759.42	65.9	75.9	10.0	63.9	2692.7	76.0	2680.6	12.1	3.0
						P13-107B	Frac Bedrock	2759.41	30.0	40.0	10.0	28.0	2728.6	41.0	2715.6	13.0	3.0
B-13-107R[2]	4.0	50.3	676962.0	846663.5	2756.5	P13-107C	Frac and Comp Bedrock	2759.57	30.0	50.0	20.0	28.3	2728.2	50.3	2706.2	22.0	3.0
B-13-108	34.0	42.6	676780.8	846468.8	2727.8	P13-108	Frac Bedrock	2730.93	32.6	42.6	10.0	30.6	2697.2	42.6	2685.2	12.0	See Note 5
B-13-109	NE	80.1	676527.9	846625.6	2739.7	P13-109	PWR	2742.74	70.0	80.0	10.0	68.0	2671.7	80.1	2659.6	12.1	8.5
B-13-110	30.5	85.0	676357.3	846528.6	2728.8	P13-110A	Comp Bedrock	2731.75	75.0	85.0	10.0	70.0	2658.8	85.0	2643.8	15.0	3.0
						P13-110B	Comp Bedrock	2731.59	57.0	67.0	10.0	55.0	2673.8	67.5	2661.3	12.5	3.0
B-13-111	NE	26.0	676462.7	846306.3	2670.8	P13-111	Saprolite	2673.69	14.0	24.0	10.0	12.0	2658.8	26.0	2644.8	14.0	8.5
B-13-112	39	39.0	676441.9	846034.9	2681.6	P13-112	PWR	2684.48	28.3	38.3	10.0	26.3	2655.3	39.0	2642.6	12.7	8.5
B-13-113[3]	NE	17.5	676592.6	846308.4	2674.7	P13-113	Saprolite and PWR	2678.04	12.4	17.4	5.0	10.0	2664.7	17.5	2657.2	7.5	8.5
B-13-114	28.6	80.3	677185.9	846608.4	2779.4	P13-114A	Frac and Comp Bedrock	2782.35	70.3	80.3	10.0	65.6	2713.8	80.3	2699.1	14.7	3.0
						P13-114B	Comp Bedrock	2782.61	47.0	57.0	10.0	40.0	2739.4	58.0	2721.4	18.0	3.0

Notes:

1. Boring B-13-104 was abandoned due to core barrel malfunction, B-13-104R was drilled as a replacement and received a piezometer.
2. B-13-107R was drilled adjacent to B-13-107
3. B-13-113 was advanced adjacent to P-07-212, as a replacement piezometer for P-07-212A&B.
4. Piezometer Screens are all 0.75 inch inside-diameter, 0.01-inch machine slotted screens, with rubber "o"-rings and screw-on bottom caps.
5. Filter Pack Diameter: 8.5 inches from 30.6 to 34.0 ft-bgs; and 3 inches from 34.0 to 42.6 ft-bgs.
6. Bedrock lithologic zones definition:
   - PWR - Partially Weathered Rock (Augured, SPT N>50)
   - Comp Bedrock - Competent Bedrock (Cored, RQD > 75%)
   - Frac Bedrock - Fractured Bedrock (Cored, RQD <75%)

Abbreviations:

- NE - Not Encountered
- NI - Not Installed
- ft - feet
- bgs - below ground surface
- NAD - North American Datum (1983)
- NGVD - National Geodetic Vertical Datum (1929)
- RQD - Rock Quality Designation (ASTM D 6032-08)

TABLE 3-2

GROUNDWATER LEVELS
LANDFILL No. 6, AREA D NORTH

Piezometer Designation	Groundwater Zone Screened	Screened Interval			Filter Pack Interval			Range of Groundwater Elevations				Estimated Seasonal High Groundwater[2]
								10/2007 through 07/2008 (See Note 1)		01/2013 through 08/5/2013		
		Top	Bottom	Length	Top	Bottom	Length	High	Low	High	Low	
		ft bgs	ft bgs	ft	ft bgs	ft bgs	ft	ft NGVD	ft NGVD	ft NGVD	ft NGVD	ft NGVD
P-07-201A	PWR	95	100	5	93	100	7	2673.40	2671.09	2678.84	2673.67	
P-07-201B	PWR	62	67	5	59.5	67.5	8	2673.33	2671.29	2677.07	2673.19	
P-07-201C	Saprolite	23	38	15	18	38.5	20.5	2674.17	2672.24	2679.86	2674.85	2682
P-07-202A	PWR	60	70	10	58	71	13	2651.71	2650.27	2652.00	2650.20	
P-07-202B	Saprolite	5	15	10	3	16	13	2653.94	2651.99	2653.80	2651.58	2656
P-07-203A	Comp Bedrock	74.5	84.5	10	72	84.5	12.5	2679.98	2678.31	2683.94	2681.48	
P-07-203B	Frac Bedrock	39.5	44.5	5	38.5	45	6.5	2676.05	2674.10	2680.52	2678.90	
P-07-203C	Saprolite	5	15	10	3	16.5	13.5	2677.34	2675.38	2681.49	2680.25	2683
P-07-204A	Frac Bedrock	110	120	10	108	120.5	12.5	2691.45	2689.48	2694.89	2690.29	
P-07-204B	PWR	67	72	5	65.9	72.5	6.6	2691.68	2689.72	2695.10	2690.41	
P-07-204C	Saprolite	35	45	10	30	45	15	2692.15	2690.09	2695.53	2690.37	2697
P-07-205	PWR	48	68	20	44	69	25	2659.07	2657.31	2666.91	2659.13	2668
P-07-207	Frac Bedrock	69	89	20	66	89.3	23.3	2681.95	2680.06	2683.71	2679.79	2684
P-07-213	Frac Bedrock	55	75	20	51	75	24	2689.85	2685.66	2699.86	2694.86	2700
P-07-226A	Comp Bedrock	85	95	10	83	95.1	12.1	2632.38	2629.82	2633.58	2631.98	
P-07-226B	Frac Bedrock	50	53	3	49	53.5	4.5	2632.24	2629.53	2632.97	2631.52	
P-07-226C	Saprolite	10	20	10	4.3	20.5	16.2	2633.05	2630.44	2634.03	2632.75	2636
MW-1A	Bedrock	102.9	122.9	20	57.8	70.8	13	2704.03	2699.97	2703.45	2697.32	2704
MW-9	Bedrock	44.8	64.8	20	41	64.8	23.8	2647.51	2645.74	2653.15	2649.90	2655
MW-10	Bedrock	54	74	20	52.4	74	21.6	2642.30	2640.91	2647.10	2643.02	2649
MW-11	Bedrock	10.4	20.4	10	10	20.4	10.4	2630.76	2627.77	2632.47	2631.13	2634
P13-101	PWR	47.5	57.5	10	45.5	58.4	12.9	NI	NI	2693.45	2686.38	2693
P13-102	Saprolite/PWR	24	34	10	22	34	12	NI	NI	2705.58	2699.00	2706
P13-103	Saprolite/PWR	55	65	10	53	65	12	NI	NI	2719.21	2712.43	2721
P13-104R	Frac Bedrock	50	60	10	48	60.1	12.1	NI	NI	2680.94	2676.67	2682
P13-105	PWR	19.3	29.3	10	17.3	29.3	12	NI	NI	2683.61	2679.86	2684
P13-106	Comp Bedrock	30.5	40.5	10	25	40.5	15.5	NI	NI	2711.42	2706.19	2713
P13-107A	Comp Bedrock	65.9	75.9	10	63.9	76	12.1	NI	NI	2690.94	2688.12	2693
P13-107B	Frac Bedrock	30	40	10	28	41	13	NI	NI	2724.28	2718.14	
P13-107C	Frac/Comp Bedrock	30	50	20	28.3	50.3	22	NI	NI	2720.23	2718.15	
P13-108	Highly Frac Bedrock	32.6	42.6	10	30.6	42.6	12	NI	NI	2688.07	2685.20	2690
P13-109	PWR	70	80	10	68	80.1	12.1	NI	NI	2682.50	2678.02	2684
P13-110A	Comp Bedrock	75	85	10	70	85	15	NI	NI	2682.03	2659.08	
P13-110B	Comp Bedrock	57	67	10	55	67.5	12.5	NI	NI	2677.37	2674.19	2679
P13-111	Saprolite	14	24	10	12	26	14	NI	NI	2659.10	2655.11	2661
P13-112	PWR	28.3	38.3	10	26.3	39	12.7	NI	NI	2659.87	2657.04	2662
P13-113	Saprolite/PWR	12.4	17.4	5	10	17.5	7.5	NI	NI	2675.52	2671.73	2677
P13-114A	Frac/Comp Bedrock	70.3	80.3	10	65.6	80.3	14.7	NI	NI	2705.10	2704.55	2707
P13-114B	Comp Bedrock	47	57	10	40	58	18	NI	NI	2732.21	2728.55	

NOTES:
1. Seasonal High Groundwater values were used to create the seasonal high groundwater contours shown on Figure 5-1. Based on "rounding-up" measurements as appropriate
2. See Table 3-1 for lithologic descriptions.

3.2 Piezometer Installations

A total of 19 piezometers, designated as the P13-XXX series, were installed at 14 locations drilled between January 2 and January 24, 2013. The 19 piezometers include extra piezometers beyond the number specified in the Work Plan to provide additional characterization of groundwater and to replace a previously installed piezometer that had been damaged (P13-113 replaces P-07-212B). The locations of the P13-XXX series piezometers are shown in Figure 3-1, which also indentifies the locations of: piezometers previously installed as part of the Areas D and E Hydrogeologic Report (SME, 2008); four older monitoring wells positioned north and west of Area D North (MW-1A, -9, -10 and -11); and auger probes and borings (prefixed with an AP- and B-, respectively) drilled during previous investigations at and near Area D North.

Depths for the P13-XXX series piezometers ranged from about 17.5 feet to 85 feet below ground surface (ft-bgs). Multilevel clusters containing two piezometers per boring were installed at three locations (P13-107, -110, and -114). To differentiate between multiple instruments within a boring location, an “A” suffix designated the deepest piezometer, and the shallower piezometer is designated with a “B”, as indicated in Attachment A. For example, P13-114A signifies the deepest piezometer, P13-114B the shallow piezometer at the boring B-13-114 location. Each piezometer was constructed with ¾-inch or 1-inch inside-diameter flush-joint Schedule 40 polyvinylchloride (PVC) riser and was typically provided with a 10-foot-long 0.01-inch machine slotted PVC well screen per ASTM D 5092. A washed sand filter pack typically extended between about one and two feet above the top of the screen and the overlying annular space of the borehole was sealed with either bentonite chips and/or a cement-bentonite grout. A steel protective surface casing was installed around the portion of the riser pipe extending above the ground surface, and a well tag identifying the piezometer was affixed to the protective casing by the Driller. Details of the boring and piezometer installations are summarized in Table 3-1. Piezometer installation diagrams are included on the descriptive boring logs in Attachment A.

3.3 Elevation and Position Survey

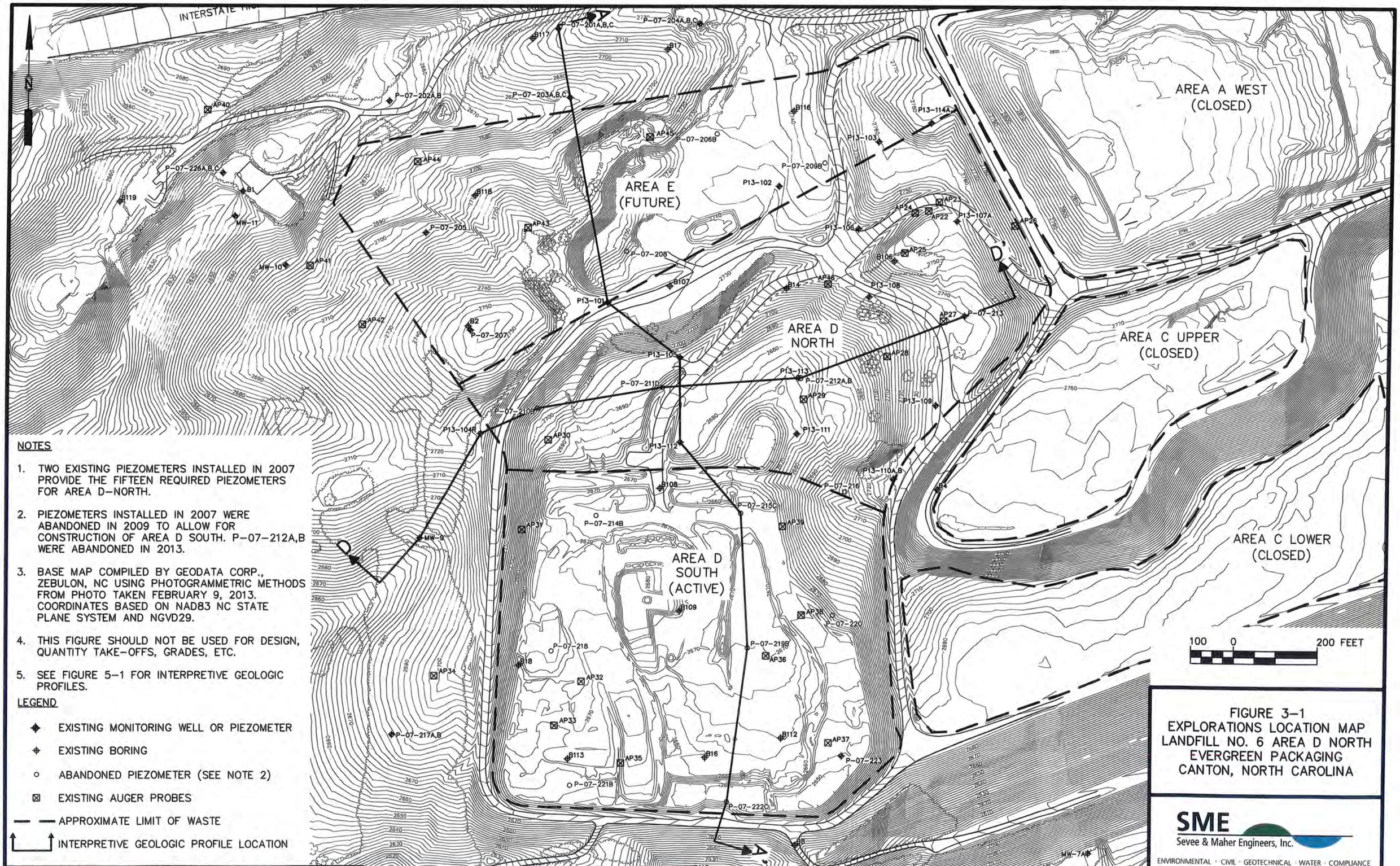
The ground surface elevation and horizontal coordinates of each boring and piezometer completed as part of the 2013 Site Investigation was surveyed by Lattimore and Peeler Surveying, a Registered Land Surveying firm located in Lawndale, NC. The top of each piezometer and monitoring well used in assessing water levels were also surveyed in 2013. The elevation of the top of each piezometer and monitoring well riser pipe was surveyed to the nearest 0.01 foot. Elevations presented herein are referenced to the 1929 National Geodetic Vertical Datum (NGVD). Horizontal locations were reported relative to the North Carolina State Plane Coordinate System NAD 1983. Table 3-1 provides the surveyed locations and elevations, for the borings and piezometers completed in 2013. Table 3-2 summarizes the construction details for each of the 57 piezometers and monitoring wells that have been installed in and near Area D North and the water levels measured at each location.

3.4 Water Level Monitoring

The approved Work Plan (SME, 2012) required that water level monitoring occur on a monthly basis for approximately six months (i.e., from the time the piezometers were installed through the end of June 2013), to capture measurements during the expected seasonal-high groundwater conditions. Due to unusually heavy and persistent rain in the summer of 2013, water level measurements were extended out to July 16, 2013 in order to capture seasonal-high groundwater conditions within Area D North, as shown on Figure 3-2.

To estimate seasonal-high groundwater elevations for Area D North, groundwater levels (i.e., water table)[3] were measured at 39 piezometers and wells between January 18, 2013 and July 16, 2013. The 39 monitored piezometers and wells included 21 of the piezometers and wells measured in 2007-2008 that remain at the Landfill and the 19 piezometers installed as part of the 2013 Site Investigation. Attachment C provides water elevations measured between 2007 and 2013 for each of the 39 locations measured in 2013 for Area D North. The range in

[3] Refer to Section 5.1 for a discussion related to a localized perched water condition that was encountered in Area D North.



NOTES

1. TWO EXISTING PIEZOMETERS INSTALLED IN 2007 PROVIDE THE FIFTEEN REQUIRED PIEZOMETERS FOR AREA D–NORTH.
2. PIEZOMETERS INSTALLED IN 2007 WERE ABANDONED IN 2009 TO ALLOW FOR CONSTRUCTION OF AREA D SOUTH. P–07–212A,B WERE ABANDONED IN 2013.
3. BASE MAP COMPILED BY GEODATA CORP., ZEBULON, NC USING PHOTOGRAMMETRIC METHODS FROM PHOTO TAKEN FEBRUARY 9, 2013. COORDINATES BASED ON NAD83 NC STATE PLANE SYSTEM AND NGVD29.
4. THIS FIGURE SHOULD NOT BE USED FOR DESIGN, QUANTITY TAKE–OFFS, GRADES, ETC.
5. SEE FIGURE 5–1 FOR INTERPRETIVE GEOLOGIC PROFILES.

LEGEND

- EXISTING MONITORING WELL OR PIEZOMETER
- EXISTING BORING
- ABANDONED PIEZOMETER (SEE NOTE 2)
- EXISTING AUGER PROBES
- APPROXIMATE LIMIT OF WASTE
- INTERPRETIVE GEOLOGIC PROFILE LOCATION

FIGURE 3–1
EXPLORATIONS LOCATION MAP
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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DWG: 6DN–BORINGS LMN: EXPLORATION–LOC CTB: SME–STD REV: 7/25/2013

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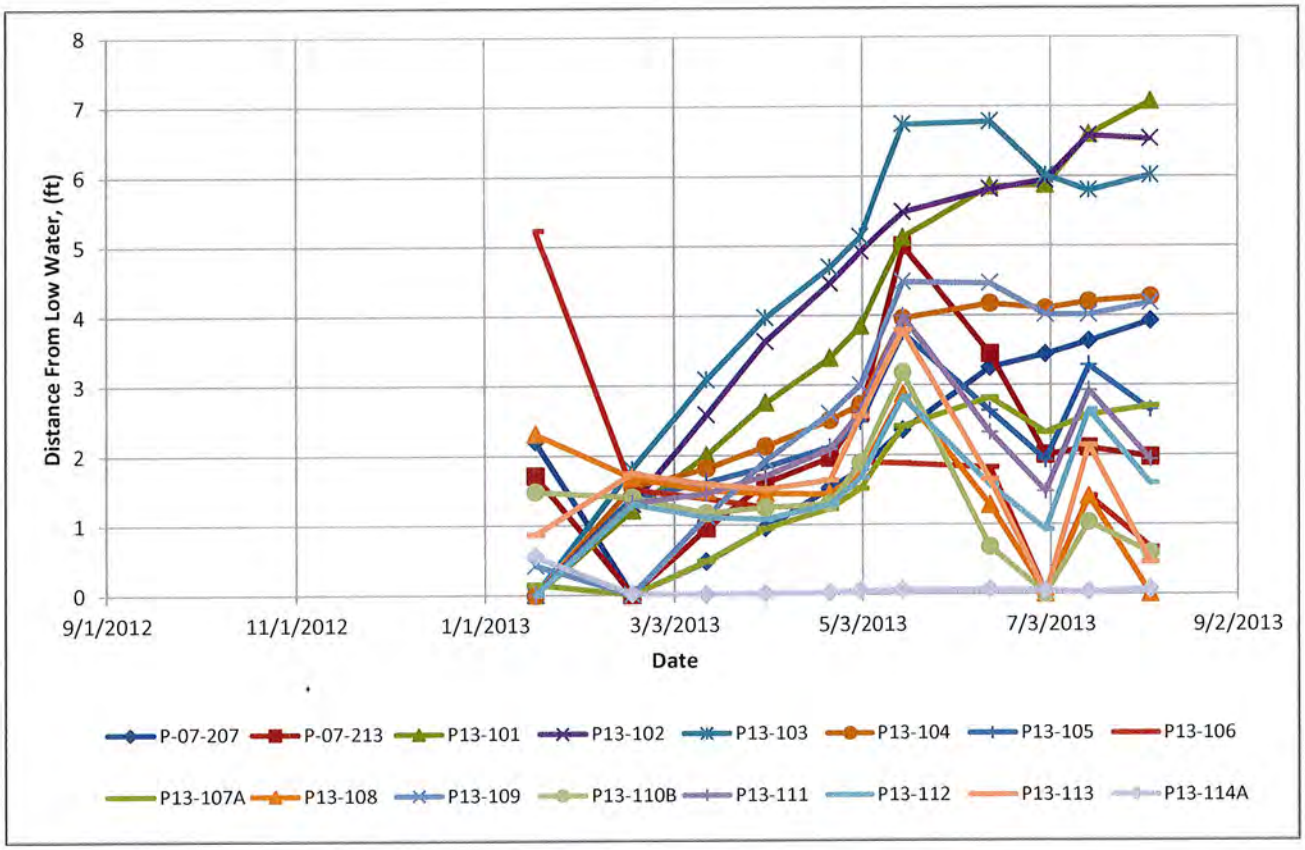

FIGURE 3–2
RANGE OF HISTORIC WATER LEVELS
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

SME
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DWG: HistoricWaterLevels LMN: NONE CTB: SME–STD REV: 8/13/2013

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measured water elevations in the 2007 to 2008 period and in 2013 are shown on Table 3-2, along with the seasonal-high groundwater elevation used to establish liner grades in Area D North.

3.5 In Situ Hydraulic Conductivity Testing

Rising- or failing-head slug tests were used to estimate hydraulic conductivity of soils and rock. Testing was conducted in eight (8) of the P13-XXX series piezometers as part of the 2013 Site Investigation. Fifteen of the P-07-XXX series piezometers installed in 2007 in and near Area D North were previously tested to measure the in situ hydraulic conductivity of the soils and bedrock at Area D North (SME, 2008). The static water level in the piezometers was displaced at the start of the test using one of the following procedures: (1) removing a solid metal rod placed below the level of static water (rising-head), (2) pumping a volume of water out of the piezometer (rising-head), or (3) adding a volume of water to the piezometer (falling-head). Water level displacement during the recovery period was measured with an automated pressure transducer. Slug test data was reduced and analyzed with the AQTESOLV™ computer software package, and the hydraulic conductivity calculated following the methods of Cooper et al., 1967 or Bouwer and Rice, 1973. Plots of the displacement over time for each test performed in 2013 are presented in Attachment D. AQTESOLV™ plots of previously tested wells are in SME, 2008. Calculated hydraulic conductivities for the encountered geologic units in Area D North are summarized in Table 3-3 and produced results consistent with those presented in SME, 2008.

TABLE 3-3

IN SITU HYDRAULIC CONDUCTIVITY TESTING
LANDFILL NO. 6, AREA D NORTH

Geologic Unit Screened[4]	Piezometer Designation	Well Screen Interval Depth			Year Test Performed (see Notes 2 and 3)	In Situ Hydraulic Conductivity		
		Top	Bottom	Length		Well	Geometric Mean	
		ft-bgs	ft-bgs	ft-bgs		cm/sec	cm/sec	ft/day
Colluvium	P-07-215B	23	24.3	1.3	2008	3.1E-02	$2.5x10^{-3}$	7.1
	P-07-215C	4	13	9	2008	2.0E-04		
Saprolite	P-07-211D	19	29	10	2008	2.2E-03	$1.3x10^{-4}$	0.36
	P-07-214B	25	40	15	2008	7.5E-06		
Saprolite and PWR	P13-103	55	65	10	2013	6.8E-05		
PWR	P-07-208	40	60	20	2007	4.4E-05	$7.1x10^{-4}$	2.0
	P-07-209B	25	35	10	2008	6.0E-03		
	P13-101	47.5	57.5	10	2013	4.9E-03		
	P13-105	19.3	29.3	10	2013	4.0E-04		
	P13-112	28.3	38.3	10	2013	3.5E-04		
Frac Bedrock	P-07-207	69	89	20	2008	1.3E-03	$4.0x10^{-4}$	1.1
	P-07-209A	50.3	60.3	10	2008	4.5E-05		
	P-07-210A	60	65	5	2008	3.4E-05		
	P-07-212A	28	30	2	2008	3.3E-03		
	P-07-213	55	75	20	2008	4.2E-03		
	P13-104R	50	60	10	2013	1.5E-04		
Comp Bedrock	P-07-211A	180	190	10	2008	4.5E-05	$1.7x10^{-5}$	0.049
	P-07-211B	80.8	85.8	5	2008	3.9E-05		
	P-07-214A	55.5	60.5	5	2008	2.6E-05		
	P-07-215A	55	65	10	2008	1.1E-04		
	P13-107A	65.9	75.9	10	2013	2.4E-06		
	P13-106	30.5	40.5	10	2013	8.6E-06		
	P13-110B	57	67	10	2013	4.3E-06		

Notes:
1. Piezometers are within 100 feet of Area 6 D North.
2. Tests performed in 2007 and 2008 were presented in the 2008 Hydrogeologic Report for Landfill No. 6 Areas D and E.
3. Tests performed in 2013 are presented in Attachment D.
4. See Table 3-1 for lithologic descriptions.

Abbreviations:
cm/sec - centimeters per second
ft/day - feet per day
ft-bgs - feet below ground surface

4.0 SITE GEOLOGIC CHARACTERISTICS

The geology within Areas D and E was previously described in SME, 2008, and has been confirmed by the supplemental 2013 Site Investigation. Soil borings from the earlier Investigation (SME, 2008) that were completed within or near Area D North include: P-07-207 through P-07-216. Since the geologic interpretation has not changed for that presented for Areas D and E, the geologic conditions described in this section of the Report present only minor refinements to the 2008 interpretation that are needed to better describe specific characteristics of Area D North compared to the whole of Areas D and E. The reader is referred to SME, 2008 for more detail on the site-specific geology, if needed.

4.1 Surficial Geology

The surficial geology encountered in borings drilled as part of the supplemental 2013 Site Investigation identified geologic conditions that were consistent with previous findings. The total thickness of the unconsolidated deposits (i.e., soils) encountered in borings (i.e., alluvium, colluvium, and saprolite) in Area D North ranged from about 4 feet to over 65 feet.

Surficial soils in portions of Area D North have been modified as a result of site activities (e.g., grading, road building, and construction of multiple phases of landfill development). Reworked soils and fill consist of redistributed saprolite, and were found to range in thickness from 10 to over 15 feet where encountered (localized thicknesses vary). The borings encountering the most reworked and fill soil are located along the eastern side of Area D North (B-07-213, B-07-216, B13-109, B13-110, and B13-114). Fill encountered at B13-109, B13-110, and B13-114 included vegetation, woody debris, and stumps. The relative density of the reworked soil and fill, as estimated using SPT N-values, ranged from soft to stiff at B13-109, -110, and -114; to medium dense to very dense at B-07-213 and -216 where rocky fill was encountered. These materials are believed to be a result of site grading activities after the dikes which support Area A West and Area C were completed, and are believed to have been placed primarily for landfill access roads. It is assumed that the dikes do not include layers of these soft materials; instead, these soft materials are believed to be isolated along the western flanks of the dikes supporting the adjacent. Care during the removal of these materials should be exercised to

prevent softening of underlying and adjacent materials. Use of reworked and fill soils as subgrade for the liner system should be evaluated by a qualified engineer during preparation of base grades for the liner system. Over-excavation of localized areas of reworked soils and fills and replacement with approximately two feet of a suitable engineered fill (i.e., silty sand or sandy silt free of roots, stumps, and deleterious matter) below the deepest landfill liner is recommended to provide protection to the liner system.

4.2 Bedrock

Bedrock cores recovered for the supplemental 2013 Site Investigation were similar to those previously recovered at the Landfill. Cores identified bedrock as gray to dark gray, coarse-grained mica schist interlayered with fine to medium-grained, white to light gray biotite gneiss and occasional metagraywacke typical of the Ash Metamorphic Suite, which have been mapped to underlie the landfill site (Wiener and Merschat, 1988). Accessory minerals associated with the bedrock included biotite, muscovite, garnet, quartz, and plagioclase feldspar. These findings are consistent with the previous site investigations.

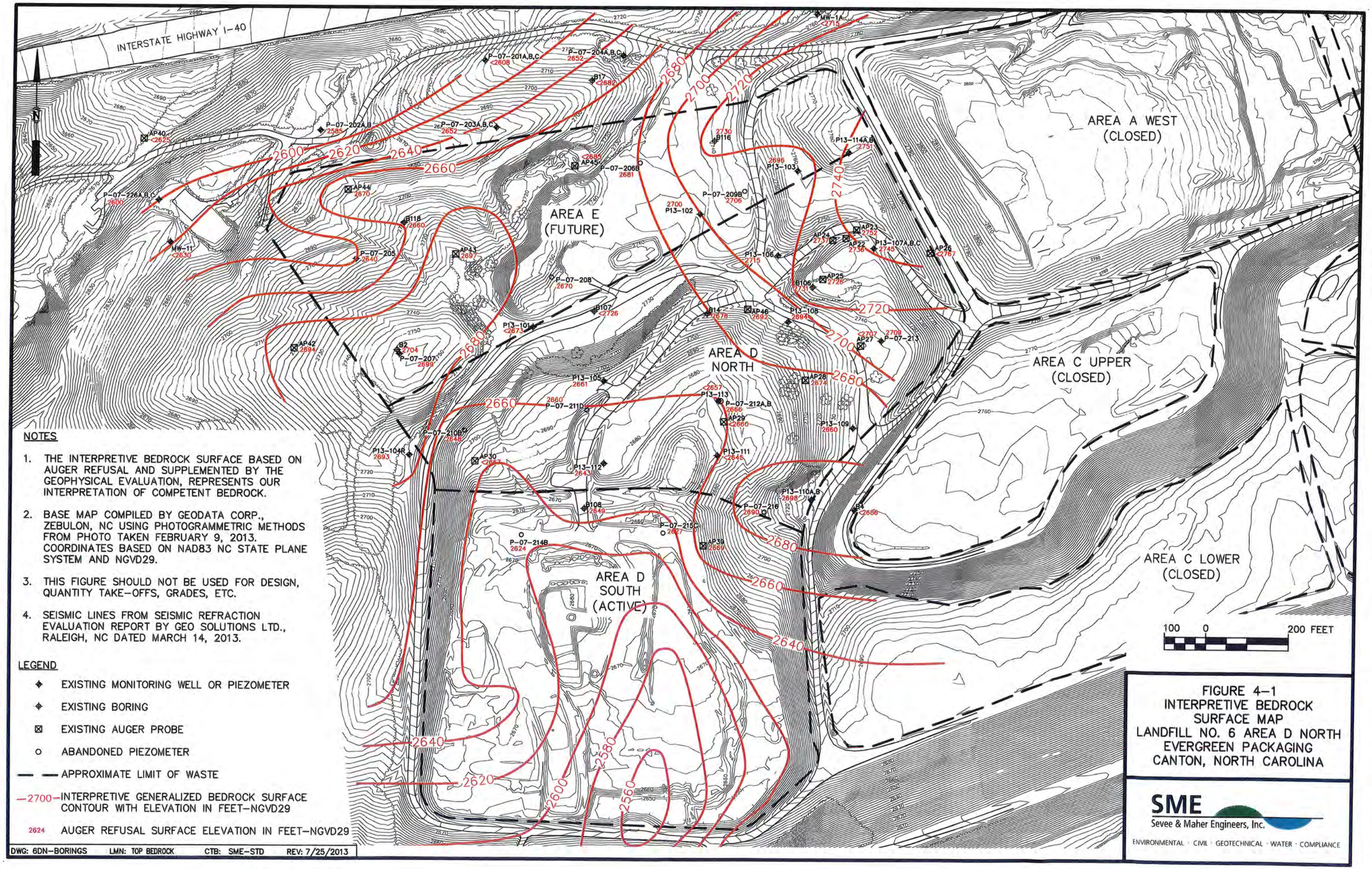
Approximately 295 lineal-feet of bedrock core was collected as part of the supplemental 2013 Site Investigation, which had Rock Quality Designations (RQDs) ranging from 0 to 100 percent. RQD is a measure of the relative degree of fracturing and weathering of the bedrock. Bedrock was identified as either fractured on the logs in Attachment A and B if the RQD of the retrieved core was less than 75 percent or competent bedrock if the RQD was more than 75 percent. Collectively, the rock core recovered in the supplemental 2013 Site Investigation had an average RQD of 77 percent. The upper bedrock was typically more fractured than the deeper bedrock.

Figure 4-1 presents an interpretive bedrock surface map, based on auger refusal.[4] This map was taken from the 2008 Hydrogeologic Report (SME, 2008) and updated by the new boring auger refusal data. It is essentially the same surface as provided in 2008. Figure 4-1 shows the bedrock surface is highest in the northern and eastern parts of Area D North, where its elevation

[4] 15A NCAC 13B .0538 (2) (C) states, in-part: "*Bedrock for the purpose of this rule is defined as material below auger refusal*."

reaches approximately 2,760 feet in elevation. The interpreted bedrock surface generally slopes downward beneath Area D North, toward the Pigeon River to the southwest, decreasing about 120 feet in elevation.

An important thing to recognize for Figure 4-1 is that localized variability of the bedrock surface cannot be illustrated. Locally, there are small-scale troughs, pinnacles, and ridges that exist at the bedrock surface. If present, these features may appear to conflict with the generalized map contours because they cannot be identified with the boring spacing used to map the bedrock surface. These troughs, pinnacles, and ridges are the result of localized in situ weathering of the bedrock surface. Therefore, Figure 4-1 should be viewed as depicting the “generalized” topography of the bedrock surface with varying conditions between explorations.



NOTES

1. THE INTERPRETIVE BEDROCK SURFACE BASED ON AUGER REFUSAL AND SUPPLEMENTED BY THE GEOPHYSICAL EVALUATION, REPRESENTS OUR INTERPRETATION OF COMPETENT BEDROCK.
2. BASE MAP COMPILED BY GEODATA CORP., ZEBULON, NC USING PHOTOGRAMMETRIC METHODS FROM PHOTO TAKEN FEBRUARY 9, 2013. COORDINATES BASED ON NAD83 NC STATE PLANE SYSTEM AND NGVD29.
3. THIS FIGURE SHOULD NOT BE USED FOR DESIGN, QUANTITY TAKE-OFFS, GRADES, ETC.
4. SEISMIC LINES FROM SEISMIC REFRACTION EVALUATION REPORT BY GEO SOLUTIONS LTD., RALEIGH, NC DATED MARCH 14, 2013.

LEGEND

- EXISTING MONITORING WELL OR PIEZOMETER
- EXISTING BORING
- EXISTING AUGER PROBE
- ABANDONED PIEZOMETER
- APPROXIMATE LIMIT OF WASTE
- 2700 INTERPRETIVE GENERALIZED BEDROCK SURFACE CONTOUR WITH ELEVATION IN FEET-NGVD29
- 2624 AUGER REFUSAL SURFACE ELEVATION IN FEET-NGVD29

DWG: 6DN-BORINGS LMN: TOP BEDROCK CTB: SME-STD REV: 7/25/2013

FIGURE 4-1
INTERPRETIVE BEDROCK SURFACE MAP
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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5.0 SITE HYDROGEOLOGIC CHARACTERISTICS

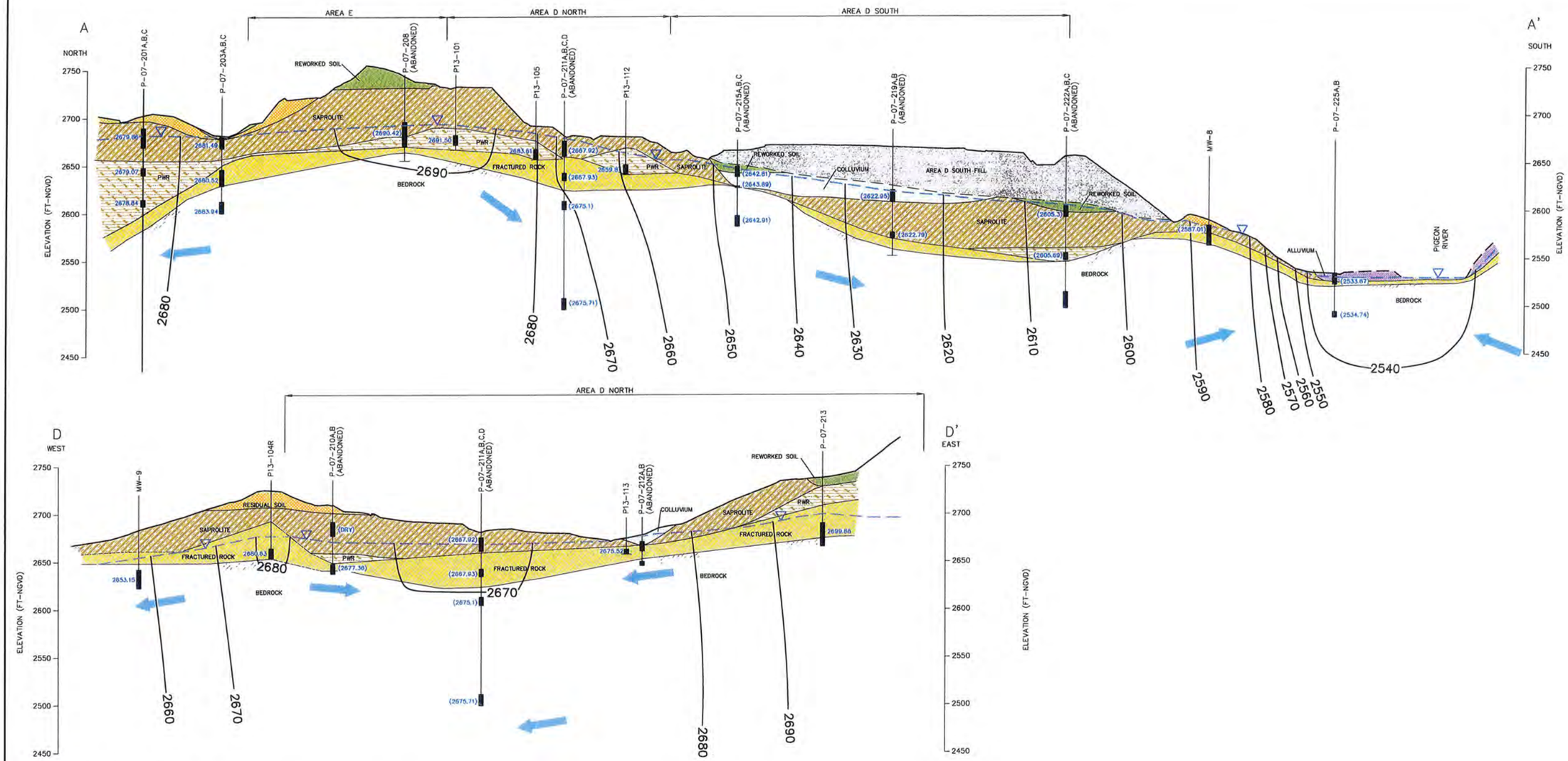
This section of the Report describes the hydrogeologic setting of Area D North. The regional geology and hydrogeology of Landfill No. 6 are described in detail in SME, 2008, and are not repeated herein. The supplemental 2013 Site Investigation findings were consistent with the hydrogeologic characteristics previously described in SME, 2008.

5.1 Hydrogeologic Setting

Seven (7) interpretive geologic profiles were presented through Landfill Areas D and E in the previous hydrogeologic study (SME, 2008). Two of those profiles went through Area D North, as indicated on Figure 3-1 (A-A' and D-D'). Figure 5-1 presents these same two profiles (A-A' and D D'), which have been updated with supplemental information from the 2013 Site Investigation. The profiles on Figure 5-1 have also been updated to reflect topographic conditions from 2013 and show the limits of Area D South. There are no significant subsurface changes to these two profiles from the 2008 work. They continue to show a variable residuum thickness over weathered and competent bedrock.

Groundwater equipotential contours are also shown on the profiles in Figure 5-1 along with generalized groundwater flow arrows illustrating the interpreted groundwater flow directions along each profile. Note that groundwater flow in the bedrock is essentially horizontal. Groundwater recharge occurs at the higher site elevations and discharges to the ground surface at the lower site elevations.

The NCDENR Solid Waste Rules 13A NCAC 13B 0.101 Definitions, item 52, defines the water table as: "*the upper limit of the portion of the ground wholly saturated with water*." Considering this definition; a perched groundwater condition, which is above the elevation where the ground is wholly saturated with water, was not included when determining the water table (i.e., seasonal-high groundwater) for determining separation of landfill liner from groundwater. Two soil borings (B13-107 and B13-114) identified the existence of a localized perched groundwater condition (shown on Figure 5-2 as dashed green contour lines) during piezometer installation, which had not been previously identified.



GEOLOGIC DESCRIPTION

- REWORKED SOIL – RESIDUAL SOIL AND SAPROLITE REDISTRIBUTED ON-SITE DURING GRADING OR CONSTRUCTION ACTIVITIES.
- ALLUVIUM – LOOSE, UNIFORM SILTY FINE SAND (BECOMING GRAVELLY WITH DEPTH) ASSOCIATED WITH THE FLOODPLAIN OF THE PIGEON RIVER.
- COLLUVIUM – LOOSE TO MEDIUM DENSE SILTY SAND ASSOCIATED WITH MASS TRANSPORT OF RESIDUAL SOIL/SAPROLITE DOWNSLOPE.
- RESIDUAL SOIL – FIRM TO STIFF SANDY SILT RESULTING FROM THE CONTINUED WEATHERING OF SAPROLITE. LACKS THE RELICT STRUCTURE OF THE SAPROLITE.
- SAPROLITE – LOOSE TO DENSE, FRIABLE, SILTY SAND EXHIBITING RELICT FEATURES OF THE BEDROCK PARENT MATERIAL. RELATIVE DENSITY INCREASING WITH DEPTH.
- PARTIALLY WEATHERED ROCK (PWR) – TRANSITIONAL ZONE BETWEEN FRIABLE SAPROLITE AND FRACTURED ROCK/BEDROCK. VERY DENSE (N-VALUES TYPICALLY GREATER THAN 50). RELICT STRUCTURE OF PARENT BEDROCK.
- FRACTURED ROCK – MODERATELY TO SEVERELY FRACTURED BEDROCK HAVING AN RQD TYPICALLY LESS THAN 75%.
- COMPETENT BEDROCK – COARSE-GRAINED MICA SCHIST INTERLAYERED WITH FINE TO MEDIUM-GRAINED, BIOTITE GNEISS AND OCCASIONAL METAGRAYWACKE. COMPETENT RQD TYPICALLY EXCEEDING 75%.
- AREA D SOUTH FILL

NOTES:

1. VALUE REPRESENTS DATA FROM APRIL 17, 2013.
2. USED WATER LEVEL DATA FROM 2007 TO 2008 FOR COMPLETENESS SINCE PIEZOMETER ABANDONED DURING LANDFILL AREA D SOUTH CONSTRUCTION.
3. SEE FIGURE 3-1 FOR LOCATIONS OF INTERPRETIVE GEOLOGIC PROFILES.
4. GROUND SURFACE UPDATED WITH 2013 TOPOGRAPHY.

LEGEND

- 2660 — INTERPRETED SEASONAL-HIGH WATER ELEVATION
- SEE NOTE 1 2700 / SEE NOTE 2 (2600) — PIEZOMETER/WELL SCREEN INTERVAL
- BOTTOM OF EXPLORATION
- 2660 — INTERPRETIVE VERTICAL GROUNDWATER EQUIPOTENTIAL CONTOUR IN FEET – NGVD29
- GENERALIZED GROUNDWATER FLOW DIRECTION

HORIZONTAL SCALE
50 0 100 200 FEET

FIGURE 5-1
INTERPRETIVE GEOLOGIC PROFILES
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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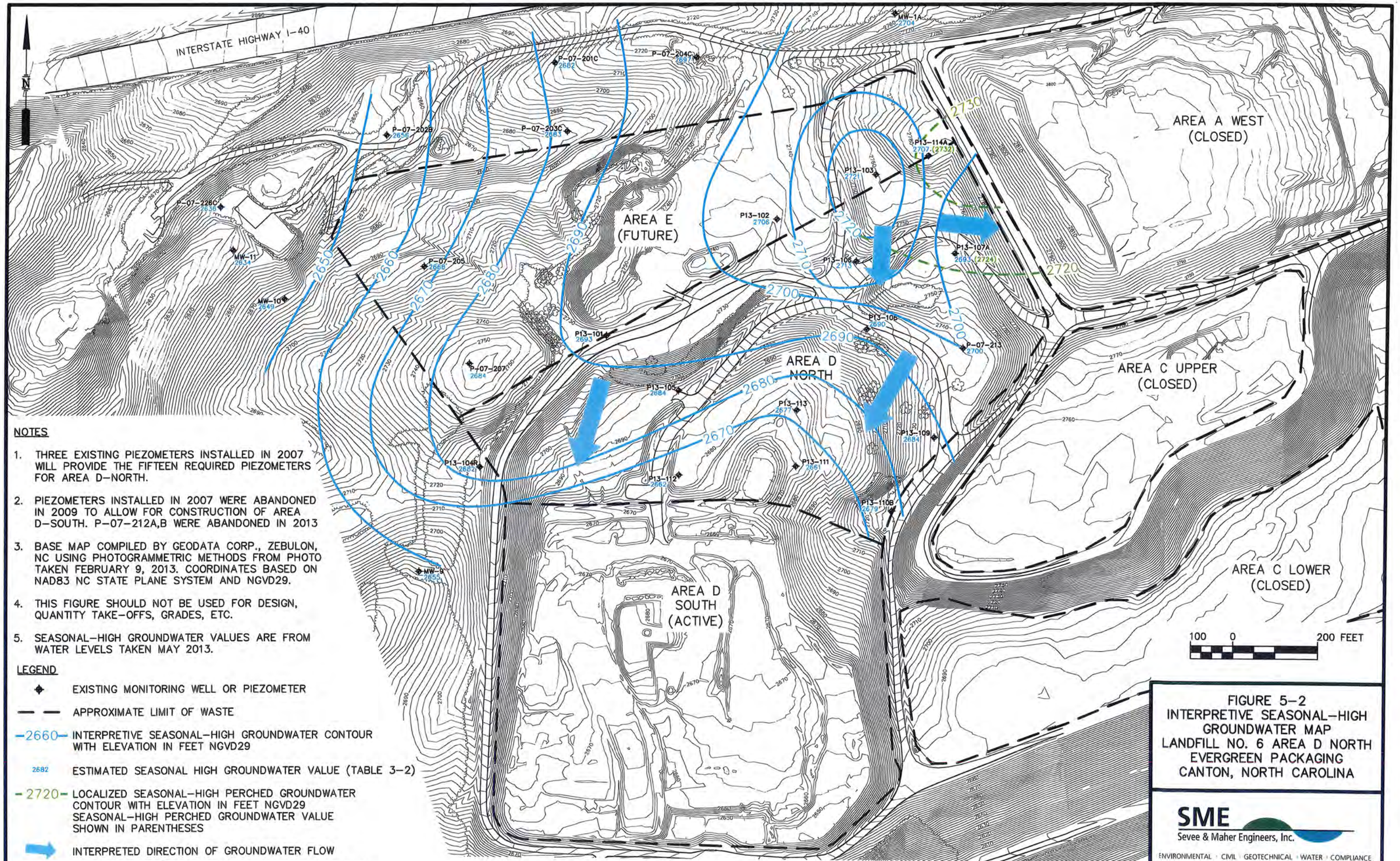
Phone 207.829.5016 · Fax 207.829.5692 · www.smemaine.com

DWG: GEOPROF LMN: 6DN-GEOPROF CTB: PROF REV: 7/26/2013



NOTES

1. THREE EXISTING PIEZOMETERS INSTALLED IN 2007 WILL PROVIDE THE FIFTEEN REQUIRED PIEZOMETERS FOR AREA D-NORTH.
2. PIEZOMETERS INSTALLED IN 2007 WERE ABANDONED IN 2009 TO ALLOW FOR CONSTRUCTION OF AREA D-SOUTH. P-07-212A,B WERE ABANDONED IN 2013
3. BASE MAP COMPILED BY GEODATA CORP., ZEBULON, NC USING PHOTOGRAMMETRIC METHODS FROM PHOTO TAKEN FEBRUARY 9, 2013. COORDINATES BASED ON NAD83 NC STATE PLANE SYSTEM AND NGVD29.
4. THIS FIGURE SHOULD NOT BE USED FOR DESIGN, QUANTITY TAKE-OFFS, GRADES, ETC.
5. SEASONAL-HIGH GROUNDWATER VALUES ARE FROM WATER LEVELS TAKEN MAY 2013.

LEGEND

- ◆ EXISTING MONITORING WELL OR PIEZOMETER
- — — APPROXIMATE LIMIT OF WASTE
- -2660- INTERPRETIVE SEASONAL-HIGH GROUNDWATER CONTOUR WITH ELEVATION IN FEET NGVD29
- 2682 ESTIMATED SEASONAL HIGH GROUNDWATER VALUE (TABLE 3-2)
- -2720- LOCALIZED SEASONAL-HIGH PERCHED GROUNDWATER CONTOUR WITH ELEVATION IN FEET NGVD29 SEASONAL-HIGH PERCHED GROUNDWATER VALUE SHOWN IN PARENTHESES
- ➡ INTERPRETED DIRECTION OF GROUNDWATER FLOW

DWG: 6DN-BORINGS LMN: GW-MAY2013 CTB: SME-STD REV: 7/25/2013

FIGURE 5-2
INTERPRETIVE SEASONAL-HIGH GROUNDWATER MAP
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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At B13-107, water was heard cascading down the borehole when the hole was drilled to its final depth of 76 ft-bgs and before piezometer installation. Highly weathered and fractured bedrock zones were encountered in B13-107 at approximately 31 ft-bgs and was believed to be the source of the cascading water. At P13-107A, the measured water level was at a depth of approximately 67 ft-bgs, which is within the screened interval of approximately 66 to 77 ft-bgs. The water level in the shallow piezometer, which was set at about 40 ft-bgs, was measured at about 35 ft-bgs. The unsaturated portion of the screen of P13-107A (i.e., deeper piezometer) indicates that the shallow groundwater in P13-107B is perched.

At B13-114, iron stained fractures and weathered rock was encountered at 44 to 45 ft and at 52 ft-bgs which appeared to convey water. At P13-114A, the measured water level in 2013 was at a depth of approximately 74 ft-bgs, and within the screened interval, similar to P13-107A. P13-114A was set at about 80.3 ft-bgs. The upper portion of the screen of P13-114A was unsaturated similar to P13-107A. Thus, at both B13-107 and B13-114, a perched water condition was confirmed to be underlain by an intermediate unsaturated zone, which was in turn underlain by the permanent water table. The deep piezometers at these locations (P13-107A and P13-114A) were used to determine seasonal-high groundwater table conditions at Area D North (see Figure 5-2).

To further determine the likely cause for the perched water condition at B13-107, a third piezometer was installed (P13-107C), as summarized in Table 3-2. At P13-107B and C water depths in 2013 were both approximately 35 ft-bgs while the screened interval depths were approximately 30 to 40 and 30 to 50 ft-bgs, respectively. Furthermore, B13-107C terminated in competent bedrock, suggesting that a zone or layer of unweathered rock was locally creating the observed perched water table. The observed perched water table is a function of recent precipitation recharge. Once this area is covered by the lined landfill, recharge will no longer occur and the perched condition will disappear.

5.2 Groundwater Levels

Groundwater level measurements as described in Section 3.4 reveal that the water table predominantly resides within the saprolite within the footprint of Area D North (see Figure 5-2).

Artesian (i.e., above-ground) groundwater conditions were periodically observed at P13-113 in 2013, where the groundwater piezometric levels in the fractured bedrock were above the overlying ground surface. Piezometer P13-113 is located along a north-south trending surface water drainage that nearly bisects Area D North and empties into a stormwater control pond located just outside at the northern edge of Area D South. Data at P13-113 shows that groundwater is locally discharging to the nearby swale.

A seasonal-high groundwater table map, based on observations is provided as Figure 5-2. The depth of the water table, under seasonal-high conditions, varied from the ground surface to more than 70 feet below the existing ground surface. Groundwater was shallower in the piezometers installed along the ravines in the southern portion of Area D North (e.g., P13-111, -112, and -113). Variations in groundwater levels over the period of observation are illustrated in Figure 3-2. The groundwater table fluctuations were less than eight feet between low and high water conditions, with the largest change measured at P-07-212A in 2007-2008 and at P13-103 in 2013.

5.3 Horizontal Groundwater Flow Directions

Groundwater flow beneath Area D North is predominantly horizontal. Groundwater levels in the P-07-XXX series piezometers, P13-XXX series piezometers and older existing monitoring wells at Landfill No. 6 were measured as described in Section 3.4. The seasonal-high groundwater table elevation contours, are shown on Figure 5-2. The direction of groundwater flow in the subsurface is interpreted to flow from the higher potentiometric contours to lower potentiometric contours. Groundwater at Area D North currently flows from the northeastern corner toward the south, with a small component of flow on the eastern edge of Area D North moving toward the adjacent landfills, see Figure 5-2. Some groundwater beneath Area D North also migrates westerly before turning south towards the River. Underdrains below the adjacent landfill and reduced infiltration due to impermeable covers are the likely cause of this easterly groundwater flow.

5.4 Groundwater Seepage Rates

The rate of groundwater movement is a function of hydraulic conductivity, effective porosity, and the hydraulic seepage gradient in the direction of flow. Measurements of the hydraulic conductivity derived from in-situ slug testing of the lithologic units are summarized in Table 3-3. The supplemental hydraulic conductivities were generally consistent with previous testing. Thus, the previously estimated average groundwater velocities are still applicable to Area D North (SME, 2008). After the landfill is constructed, hydraulic gradients are expected to decrease due to loss of recharge, resulting in lower estimated average groundwater velocities.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the supplemental hydrogeologic investigation of Area D North, we conclude the following:

1. The supplement 2013 Site Investigation corroborated and refined previously interpreted understanding of the Area D North Landfill's geologic and hydrogeologic conditions.

2. The seasonal-high groundwater table and depth to bedrock have been updated for Landfill Area D North design and permitting.

3. As before with previous cells at Landfill No. 6, the borings confirmed that portions of the deeper saprolite and partially weathered rock (PWR) can be very dense and may be difficult to excavate or require blasting.

4. Bedrock depth is variable and subject to localized, small-scale ridges, troughs, and pinnacles. The ridges and pinnacles cannot be predicted and can only be discovered by excavation. There should be some expectation on the part of the contractor that they may encounter such localized competent bedrock features.

5. Reworked soils and fill remaining after excavation to establish landfill subgrades should be inspected by a qualified geotechnical engineer to determine if they constitute a potential stability concern and what mitigation measured are most appropriate (i.e., over-excavation and replacement with engineered materials).

6. Prior to or during landfill construction, any piezometer or well (including the drilled well) should be carefully removed and fully grouted to prevent a direct hydraulic route from the ground surface into the bedrock.

REFERENCES

American Society for Testing and Materials (ASTM), 2004. *Standard Practice for Design and Installation of Ground Water Monitoring Wells, Designation D 5092-04e1*; in: 2004 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

American Society for Testing and Materials (ASTM), 2005. *Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, Designation D 2216-05*; in: 2005 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

American Society for Testing and Materials (ASTM), 2006a. *Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation, Designation D 2113-06*; in: 2006 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

American Society for Testing and Materials (ASTM), 2006b. *Test Methods for Specific Gravity of Soil Solids by Water Pycnometer, Designation D 854*; in: 2008 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

American Society for Testing and Materials (ASTM), 2007. *Standard Test Method for Particle-Size Analysis of Soils, Designation D 422-63*; in: 2007 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

American Society for Testing and Materials (ASTM), 2008. *Standard Practice for Penetration Test (SPT) and Split-Barrel Sampling of Soils, Designation D 5186-08*; in: 2008 Annual Book of ASTM Standards, Vol. 4.08; ASTM, Philadelphia, PA.

Bouwer, H. and R.C. Rice, 1976. *A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells*. Water Resources Research, Vol. 12, pp. 423-428.

Cooper, H.H., Jr., J.D. Bredehoeft, and I.S. Papadopulos, 1967. *Response of a Finite-Diameter Well to an Instantaneous Charge of Water*, Water Resources Research, Vol. 3, No. 3, pp.263-269.

Fetter, C.W., 1988. *Applied Hydrology*, Merrill Publishing Co.; Columbus, OH.

Lambe, T.W and R.V. Whitman, 1969. *Soil Mechanics*; John Wiley & Sons; New York, NY.

Law Engineering and Testing Company (LAW), 1982. *Revised Report of Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations, Landfill No. 6,* dated February 1982.

Roy F. Weston, Inc. (Weston), 1995. *Groundwater and Surface Water Assessment for Landfill No. 6*, dated March 1995.

Sirrine Environmental Consultants (Sirrine), 1989. *Geotechnical Report of Landfill No. 6 Expansion Area A*, dated October 1989.

Sevee & Maher Engineers, Inc. (SME), 1995. *Construction Documentation for Landfill 6A East Enhancement Project*, dated March 1995.

Sevee & Maher Engineers, Inc. (SME), 2008. *Hydrogeologic Report for Landfill No. 6 Areas D and E*, dated November 2008.

Sevee & Maher Engineers, Inc. (SME), 2012. *Work Plan – Landfill No. 6 Site Investigation Area D North*, dated November 2012.

Snow, David T., 1968. *Rock Fracture Spacings, Openings, and Porosities," ASCE Journal of the Soil Mechanics and Foundations Division*, Vol. 94, No. SM1.

Wiener, L.S. and C.E. Merschat, 1988. *Geology of the Sandymush and Canton Quadrangles, North Carolina*, Bulletin 90, NCGS, Raleigh, NC.

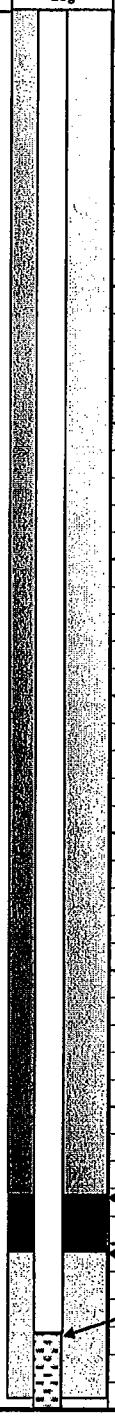
ATTACHMENT A

BORING LOGS AND PIEZOMETER INSTALLATION DETAILS

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-101
DATE STARTED: 01/08/2013	DATE FINISHED: 01/08/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2732.8	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	~~Recovery~~ Penetration	RQD
5	S-1	4 - 6	Saprolite	Rust colored, white and black; Saprolite, dry.	5/6/6/7	12	2.0/2.0	
				Auger cuttings: Red and dry.				
10	S-2	9 - 11		Similar to above, dry to damp.	12/14/17/22	31	1.6/2.0	
				Auger cuttings: Red to brown.				
15	S-3	14 - 15.9		Brown, rust colored, white and black, saprolite to weathered rock, dry to damp.	14/21/38/ 50/0.4'	59 Ref at 15.9'	1.4/1.9	
20	S-4	19 - 21		Similar to above, thick white (quartz zones - not fully weathered out)	7/16/25/51	41	2.0/2.0	
25	S-5	24 - 26		Brown, tan, rust colored, black and white, mica rich, saprolite, dry-damp.	22/26/21/26	47	1.3/2.0	
30	S-6	29 - 31		Similar to above, more rust colored.	7/7/10/11	17	2.0/2.0	
35	S-7	34 - 36		Similar to above.	13/20/19/32	39	2.0/2.0	
40	S-8	39 - 39.4	Partially Weathered Rock	White (quartz) with rust staining, dry.	50/0.4'	Ref at 39.4'	0.4/0.4	
				Augering easy to 43, hard 43-44 (likely quartz zone)				
45	S-9	44 - 46		Rust, tan, black and white, mica rich, Weathered Rock; dry to damp.	20/18/21/31	39	2.0/2.0	
				Auger cuttings: damp to wet				
50	S-10	49 - 51		Black, tan and white; Weathered Rock; saturated.	33/46/43/31	89	2.0/2.0	

P13-101 Piezometer Log



DEPTH (FT): 43.5, 45.5, 47.5

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-101
DATE STARTED: 01/08/2013	DATE FINISHED: 01/08/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2732.8		DRILLING CONTRACTOR: A & E Drilling	LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD	P-13-101 Piezometer Log	DEPTH (FT)
			Partially Weathered Rock	Water at 47.5 ft bgs in open hole to 49 ft bgs.						
55	S-11	54 - 54.9		Highly weathered rock, saturated.	22/50/0.4'	Ref at 54.9'	0.9/0.9			
				Auger cuttings: soupy soil/water mix.						57.5
										58.4
60	S-12	59 - 60		Rust colored with black and brown; weathered rock, saturated	41/50/0.5'	Ref at 60'	1.0/1.0		CAVE	

Bottom of Exploration at 60.0 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.4 ft Top of PVC Elevation = 2736.18

Piezometers: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen;

Filter Sand 58.4 to 45.5 feet; Screen 57.5 to 47.5 feet; Bentonite Seal 45.5 to 43.5 feet; Cement Bentonite Grout 43.5 to 0.0 feet.

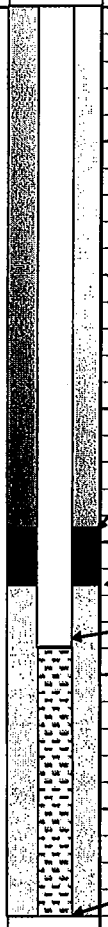
Piezometer development was completed on 1/10/2013

Slug Testing Completed on both piezometers (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-102
DATE STARTED: 01/02/2013	DATE FINISHED: 01/02/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2733.5	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 34 ft bgs	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
5	S-1	4 - 6	Saprolite	Brown, Rust, Black and White; layered Saprolite; dry.	12/23/27/32	50	1.5/2.0	
10	S-2	9 - 11		Similar to above; with white (quartz) from 10.5 to 11.0 ft.	10/14/17/14	31	2.0/2.0	
15	S-3	14 - 16.5		Similar to above, near vertical bedding, hard piece in tip of spoon.	13/24/35	59	1.2/1.5	
20	S-4	19 - 21		19-19.5: similar to above. 19.5 - 21: Light Brown with black streaks, looks like sand stone, weathered, dry.	12/17/25/33	42	2.0/2.0	
25	S-5	24 - 26		Brown, rust colored, black and white, layered, dry.	7/8/8/13	16	2.0/2.0	
30	S-6	29 - 31		Similar to above, piece of weathered quartz.	12/15/34/52	49	2.0/2.0	
				Hard Augering started at 33 ft bgs.				
			Partially Weathered Rock	Auger Refusal at 34 ft bgs.				
35	S-7	34 - 34.2		Gray, Weathered Rock.	50/0.2'	Ref @ 34.2'	0.2/0.2	

P13-102 Piezometer Log



DEPTH (FT)

Bottom of Exploration at 34.2 feet Below Ground Surface

Hole sounded to 34 ft bgs, dry during piezometer installation.

NOTES: Piezometer Stick-up = 3.1 feet Top of PVC Elevation = 2736.60

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 34 to 22 feet; Screen 34 to 24 feet; Bentonite Seal 22 to 19.7 feet; Cement Bentonite Grout 19.7 to 0.0 feet.

Piezometer development was not completed (Piezo was dry from installation through at least 1/25/2013)

No Slug Tests performed, due to dry piezometer

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-103
DATE STARTED: 01/03/2013	DATE FINISHED: 01/03/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2761.0	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 65 ft bgs	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery	RQD	P13-103 Piezometer Log	DEPTH (FT)
5	S-1	4 - 5	Saprolite	Red/Brown; Silt/Sand on layered rock (likely a cobble/boulder), dry.	34/52	Ref at 5.0'	1.0/1.0			
				Augering hard to 9 ft bgs.						
10	S-2	9 - 11		Red, brown, black and white; Saprolite; dry.	16/30/46/49	76	2.0/2.0			
				Auger cuttings: Red/Brown.						
15	S-3	14 - 16		Similar to above, quartz seam 15.5 to 15.7 ft; mica rich, dry.	9/13/16/24	29	2.0/2.0			
20	S-4	19 - 21		Similar to above; quartz seam 19 to 19.2 ft; dry-damp.	9/19/27/43	46	2.0/2.0			
25	S-5	24 - 26		Similar to above, no quartz seam.	9/13/18/20	31	2.0/2.0			
30	S-6	29 - 31		Black, white, brown and red; mica rich; Saprolite; dry-damp; bedding 45-60 degrees from horizontal.	11/18/22/29	40	2.0/2.0			
35	S-7	34 - 36		Similar to above; slightly more red color, less white; dry-damp.	10/17/26/31	43	2.0/2.0			
40	S-8	39 - 41		Similar to S-6.	8/11/15/16	26	2.0/2.0			
45	S-9	44 - 46		Similar to above, approximately 30% quartz, crumbly, dry.	7/8/9/28	17	2.0/2.0			
50	S-10	49 - 51		Gray; Weathered Rock, medium grains of un-weathered quartz; dry to damp.	17/13/20/21	33	2.0/2.0			

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-103
DATE STARTED: 01/03/2013	DATE FINISHED: 01/03/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2761.0	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 65 ft bgs	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD	P13-103 Piezometer Log	DEPTH (FT)
			Saprolite							51
										53
55	S-11	54 - 56		Similar to above.	14/18/27/27	45	2.0/2.0			55
				Auger cuttings: wet, balling up and sticky.						
60	S-12	59 - 61	Partially Weathered Rock	Gray; Weathered Rock; heavy rust staining; saturated.	7/14/40/49	54	2.0/2.0			
				Augured to refusal at 65 feet bgs, after S-13.						
65	S-13	64 - 64.3		Dark Gray; Weathered Rock; saturated.	50/0.3'	Ref at 64.3'	0.3/0.3			65

Bottom of Exploration at 65.0 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.5 feet Top of PVC Elevation = 2764.48

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 65 to 53 feet; Screen 65 to 55 feet; Bentonite Seal 53 to 51 feet; Cement Bentonite Grout 51 to 0.0 feet.

Piezometer development was completed on 1/4/2013

Slug Testing Completed (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-104
DATE STARTED: 01/09/2013	DATE FINISHED: 01/10/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2716.1	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 23.0	Rock Core Interval: 23 to 30.9 feet	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N VALUE (bpf)	~~Recovery~~ Penetration	RQD	Grouted	DEPTH (FT)
5	S-1	4 - 6	Saprolite	Red, brown, black and white; Saprolite; damp.	3/5/8/12	13	2.0/2.0			
10	S-2	9 - 11		Quartz in top of sample; Brown, black and white; Saprolite; dry to damp.	6/8/11/15	19	1.3/2.0			
			Partially Weathered Rock	Auger cuttings: Dark Brown, Weathered Rock (below 13 feet)						
15	S-3	14 - 14.3		White and brown; Weathered Rock (pulverized), high quartz content.	50/0.3'	Ref at 14.3'	0.3/0.3			
				Auger cuttings: Brown and red, Weathered Rock.						
20	S-4	19 - 19.9		White, black and brown; Weathered Rock, dry.	30/50/0.4'	Ref at 19.9'	0.7/0.9			
				Augering: light Brown to Tan; very hard, refusal at 23 feet.						
25	R-1	23 - 25.5	Competent Bedrock	See rock core log			2.42/2.5	75%		
30	R-2	25.5 - 30.5		See rock core log			4.9/5.0	98%		
	R-3	30.5 - 30.9		Bit on Core wore-out, re-drilled hole, see B-13-104R			0/0.4	0%		

Bottom of Exploration at 30.9 feet Below Ground Surface

NOTES: Core bit wore-out at 30.9, hole grouted to surface and hole moved south and re-drilled as B-13-104R.
Boring abandoned, filled with cement-bentonite grout to ground surface.

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-104R
DATE STARTED: 01/10/2013	DATE FINISHED: 01/11/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2716.1	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 19 ft bgs	Rock Core Interval: 19 to 60.5 ft bgs	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery Penetration	RQD
			Saprolite	Auger to refusal at 19 feet below ground surface, see log for B-13-104 for materials encountered 0 to 19 feet at B-13-104				
20	R-1	19.0 - 25.5	Fractured Bedrock	See Bedrock Core Log			4.42/6.5	36%
25	R-2	25.5 - 30.7	Competent Bedrock	See Bedrock Core Log			4.83/5.2	87%
30	R-3	30.7 - 35.7	Fractured Bedrock	See Bedrock Core Log			2.69/5.0	29%
35	R-4	35.7 - 40.7	Competent Bedrock	See Bedrock Core Log			4.67/5.0	93%
40	R-5	40.7 - 45.7		See Bedrock Core Log			5.0/5.0	100%
45	R-6	45.7 - 50.7		See Bedrock Core Log			4.47/5.0	73%
50	R-7	50.7 - 55.7	Fractured Bedrock	See Bedrock Core Log			4.96/5.0	66%
55	R-8	55.7- 60.5		See Bedrock Core Log			3.65/4.8	65%
60								

Bottom of Exploration at 60.5 feet Below Ground Surface

NOTES: Piezometer Stick-up = 2.9 feet Top of PVC Elevation = 2718.98

Piezometers: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen;

Filter Sand 60.1 to 48 feet; Screen 60 to 50 feet; Bentonite Seal 48 to 45 feet; Cement Bentonite Grout 45 to 0.0 feet.

Piezometer development was completed on 1/14/2013

Slug Testing Completed on piezometer (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-105
DATE STARTED: 01/17/2013	DATE FINISHED: 01/18/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2690.6	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 29.3 ft bgs	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
			Fill	Cuttings: red to brown silty sand.				
5	S-1	4 - 6	Saprolite	Brown with white (quartz) bands; dry, crumbly.	34/30/18/21	48	1.8/2.0	
10	S-2	9 - 11	Saprolite	Similar to above.	8/9/13/16	22	1.8/2.0	
15	S-3	14 - 16	Saprolite	Similar to above, mica rich, layered	3/8/11/17	19	2.0/2.0	
20	S-4	19 - 20.9	Partially Weathered Rock	Similar to above, when disturbed it appears sandy, wet to saturated.	7/20/40/ 50/0.4'	60 Ref at 20.9'	1.9/1.9	
25	S-5	24 - 25.4	Partially Weathered Rock	Similar to above, more mica.	32/31/ 50/0.4'	Ref at 25.4'	1.4/1.4	
				Auger Refusal at 29.3 ft bgs				
30	S-6	29.3 - 29.3	Partially Weathered Rock	No Recovery	Bouncing	Ref at 29.3'	0.0/0.0	

Bottom of Exploration at 29.3 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.2 feet Top of PVC Elevation = 2693.79

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 29.3 to 17.3 feet; Screen 29.3 to 19.3 feet; Bentonite Seal 17.3 to15.3 feet; Cement Bentonite Grout 15.3 to 0.0 feet.

Piezometer development was completed 1/21/2013.

Slug Testing Completed (see report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-106
DATE STARTED: 01/07/2013	DATE FINISHED: 01/08/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2735.1	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 20.5 ft bgs	Rock Core Interval: 20.5 to 40.5 ft bgs	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
			FILL (Road)					
5	S-1	4 - 6	Partially Weathered Rock	Red, brown, white, with black flecks, Saprolite; dry.	17/30/41/44	71	2.0/2.0	
10	S-2	9 - 10.35		Tan, brown, with black flecks; Weathered Rock; dry.	17/35/ 54/0.35'	Ref at 10.35'	1.3/1.35	
				Auger cuttings: pieces of hard rock.				
15	S-3	14 - 16		Brown, Tan and rust colored; Saprolite and Weathe	5/7/13/14	20	1.7/2.0	
20	S-4	19 - 19.3		Gray to brown; Weathered Rock.	50/0.3'	Ref at 19.3'	0.3/0.3	
				Auger refusal at 20.5 ft bgs.				
25	R-1	20.5 - 30.5	Fractured Bedrock	See Bedrock Core Log			5.6/10.0	50%
30								
35	R-2	30.5 - 40.5	Competent Bedrock	See Bedrock Core Log			9.82/10.0	98%
40								

P13-106 Piezometer Log

Bottom of Exploration at 40.5 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.0 feet Top of PVC Elevation = 2738.12

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 40.5 to 25 feet; Screen 40.5 to 30.5 feet; Bentonite Seal 25 to 20.5 feet; Cement Bentonite Grout 20.5 to 0.0 feet.

Piezometer development was completed on 1/11/2013

Slug Testing Completed (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-107
DATE STARTED: 01/03/2013	DATE FINISHED: 01/07/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2756.6	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 12 ft bgs	Rock Core Interval: 12 to 76 ft bgs	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-Inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
			Partially Weathered Rock	Augering started in exposed rock outcrop.				
5	S-1	4 - 4.9		Rust colored, brown, black and white; Weathered	34/ 50/0.4'	Ref at 4.9'	0.7/0.9	
10	S-2	9 - 10.9		Rust colored, brown, black, little white; Weathered Rock; dry.	4/32/36/ 50/0.4'	68 Ref at 10.9'	1.9/1.9	
				Auger Refusal at 12 ft bgs.				
15	R-1	12.0 - 14.8	Competent Bedrock	See Bedrock Core Log			2.8/2.8	91%
20	R-2	14.8 - 21.1		See Bedrock Core Log			5.93/6.3	79%
25, 30	R-3	21.1 - 31.1		See Bedrock Core Log			8.65/10.0	74%
35, 40	R-4	31.1 - 41.0	Fractured Bedrock	See Bedrock Core Log			8.3/9.9	81%
45, 50	R-5	41.0 - 50.0	Competent Bedrock	See Bedrock Core Log			9.0/9.0	100%

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Inv.		JOB NO.: 12121.00	BORING NO.: B13-107
DATE STARTED: 01/03/2013	DATE FINISHED: 01/07/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2756.6	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 12 ft bgs	Rock Core Interval: 12 to 76 ft bgs	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery Penetration	RQD	P13-107 A Piezometer Log	DEPTH (FT)
	R-6	50.0 - 51.5	Competent Bedrock	See Bedrock Core Log			1.36/1.5	91%		
55	R-7	51.5 - 60.0		See Bedrock Core Log			8.5/8.5	97%		
60	R-8	60.0 - 61.5		See Bedrock Core Log			1.5/1.5	100%		
65	R-9	61.5 - 71.0		See Bedrock Core Log			9.5/9.5	100%		63.9 / 65.9
70			Tight Fractures							
75	R-10	71.0 - 76.0	Competent Bedrock	See Bedrock Core Log			4.65/5.0	93%		75.9

Bottom of Exploration at 76.0 feet Below Ground Surface

NOTES: Piezometer Stick-up = A&B = 2.8 feet Top of PVC Elevation: A = 2759.42 & B = 2759.41

Piezometers: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen;

"B": Filter Sand 41 to 28 feet; Screen 40 to 30 feet; Bentonite Seal 28 to 24 feet; Cement Bentonite Grout 24 to 0.0 feet.

"A": Filter Sand 76 to 63.9 feet; Screen 75.9 to 65.9 feet; Bentonite Seal 63.9 to 41 feet.

Piezometer development was completed on 1/9/2013

Slug Testing Completed on both piezometers (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation	JOB NO.: 12121.00	BORING NO.: B13-107R
DATE STARTED: 01/21/2013	DATE FINISHED: 01/21/2013	DRILLING METHOD: 4.25 ID HSA and NX Core
GROUND SURFACE ELEVATION (FT): 2756.5	DRILLING CONTRACTOR: A & E Drilling	LOGGED BY: BBJ
Auger Refusal Depth: 4 ft bgs.	Rock Core Interval: 4 to 50.3 feet	SPT with Automatic Hammer / SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
	See B-13-107 for conditions encountered above Auger Refusal.							
				Auger Refusal at 4 ft bgs.				
5	R-1	4.0 - 10.0	Fractured Bedrock	See Bedrock Core Log			1.75/6.0	8%
10	R-2	10.0 - 15.0	Competent Bedrock	See Bedrock Core Log			4.95/5.0	99%
15	R-3	15.0 - 20.0		See Bedrock Core Log			4.73/5.0	83%
20	R-4	20.0 - 25.0		See Bedrock Core Log			5.0/5.0	86%
25	R-5	25.0 - 30.0		See Bedrock Core Log			4.8/5.0	96%
30	R-6	30.0 - 35.0		See Bedrock Core Log			4.15/5.0	77%
35	R-7	35.0 - 40.0	Fractured Bedrock	See Bedrock Core Log			4.95/5.0	84%
40	R-8	40.0 - 45.0	Competent Bedrock	See Bedrock Core Log			5.0/5.0	100%
45	R-9	45.0 - 50.3		See Bedrock Core Log			4.54/5.3	86%
50								

P13-107C Piezometer Log

Bottom of Exploration at 50.3 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.1 feet Top of PVC Elevation = 2759.57

Piezometers: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen

"C": Filter Sand 50.3 to 28.3 feet; Screen 50 to 30 feet; Bentonite Seal 28.3 to 25 feet; Cement Bentonite Grout 25 to 0.0 feet.

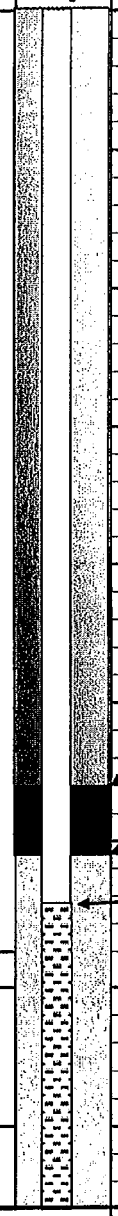
Piezometer development was completed on 1/23/2013

No Slug Testing was performed at this location

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-108
DATE STARTED: 01/23/2013	DATE FINISHED: 01/23/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2727.8	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 34	Rock Core Interval: 34 to 42.6 ft bgs	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	~~Recovery~~ Penetration	RQD
5	S-1	4 - 6	Saprolite	Red, Tan, Black and White; Saprolite, horizontally banded, dry.	6/3/4/6	7	1.3/2.0	
10	S-2	9 - 11	Saprolite	Brown, Rust color, black and white; Saprolite; dry.	8/8/8/10	16	1.5/2.0	
15	S-3	14 - 16	Saprolite	Similar to above, more weathered rock like.	7/9/12/22	21	1.7/2.0	
20	S-4	19 - 20.3	Saprolite	Similar to above, water on rods. Water meter placed in boring was dry.	11/34/50/0.3'	Ref at 20.3'	1.0/1.3	
25	S-5	24 - 26	Saprolite	Brown, Black, rust colored, mica rich, near vertical bedding.	7/12/13/14	25	2.0/2.0	
30	S-6	29 - 31	Saprolite	Brown, rust color and black, Saprolite/Weathered Rock.	8/11/13/16	24	2.0/2.0	
			Partially Weathered Rock	Augering very hard 33 to 34 feet bgs. Auger Refusal at 34.0 feet bgs				
	S-7	34.0 - 34.1	Partially Weathered Rock	No recovery	50/0.1'	Ref at 34.1'	0.0/0.1'	
35	R-1	34 - 35	Competent Bedrock	See Bedrock Core Log			1.0/1.0	80%
	R-2	35 - 40	Highly Fractured Rock / Mud & Soil	See Bedrock Core Log			Rock: 2.95/5.0 Total: 3.4/5.0	26%
40	R-3	40 - 42.6	Highly Fractured Rock	See Bedrock Core Log			1.65/2.6	0%

P13-108 Piezometer Log



DEPTH (FT)

Bottom of Exploration at 42.6 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.1 feet Top of PVC Elevation = 2730.93

Piezometers: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen;

Filter Sand 42.6 to 30.6 feet; Screen 42.6 to 32.6 feet; Bentonite Seal 30.6 to 28 feet; Cement Bentonite Grout 28 to 0.0 feet.

Piezometer development was completed on 1/25/2013

No Slug Testing was performed at this location

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-109
DATE STARTED: 01/14/2013	DATE FINISHED: 1/15/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2739.7	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD	P13-109 Piezometer Log	DEPTH (FT)
5	S-1	4 - 6	FILL	Red/brown; Clay; mixed with wood (0.5 ft thick); soft; wet	WOH/WOH/7/10	7	1.3/2.0			
				Auger cuttings: stumps and wood to 8 ft bgs.						
10	S-2	9 - 11		Brown and gray; mica-rich Clay; wet. Topsoil at 10 ft bgs with rootlets.	2/4/4/4	8	1.2/2.0			
				Auger cuttings: Rust colored to 12 ft bgs, then brown.						
15	S-3	14 - 16		Red with white seams and bands, with black flecks; Saprolite; dry.	7/8/7/11	15	1.3/2.0			
				Auger cuttings: red.						
20	S-4	19 - 21		White quartz (pulverized), and pink; Saprolite; dry.	7/8/8/9	14	1.0/2.0			
25	S-5	24 - 26		Red with white and black; Saprolite; dry.	5/5/7/14	12	1.6/2.0			
				Auger cuttings: brick-red color.						
30	S-6	29 - 31	Saprolite	Similar to above; black varves in bottom of spoon; saprolite to weathered rock.	5/10/13/12	23	1.7/2.0			
				Auger cuttings: similar to above						
35	S-7	34 - 36		Tan/brown, with rust colored, black flecks and varves and white; saprolite to weathered rock.	4/8/11/15	19	1.8/2.0			
				Auger cuttings: Weathered Rock (rock fragments), brick colored.						
40	S-8	39 - 41		Brown, black, and white; weathered rock; dry.	5/14/22/31	36	1.8/2.0			
45	S-9	44 - 46		Brown, black, and white; mica-rich; weathered rock; dry to moist.	4/7/12/22	19	2.0/2.0			
				Auger cuttings: brown						
50	S-10	49 - 51		Gray, darker with depth; weathered rock.	19/19/17/42	36	2.0/2.0			

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-109
DATE STARTED: 01/14/2013	DATE FINISHED: 1/15/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2739.7	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N VALUE (bpf)	Recovery / Penetration	RQD
			Saprolite	Augering: hard then softer again.				
55	S-11	54 - 55.8	Partially Weathered Rock	Gray, darker with depth; Weathered Rock.	17/28/44/ 50/0.3'	72 Ref at 55.8'	1.8/1.8	
				Augering: hard then softer again.				
60	S-12	59 - 61		Similar to above; more in-tact quartz grains.	6/8/11/18	19	1.5/2.0	
65	S-13	64 - 64.7		Similar to above; dry to damp.	14/ 50/0.2'	Ref at 64.7'	0.7/0.7	
70	S-14	69 - 69.4		Dark Brown; Weathered Rock; moist to wet.	50/0.4'	Ref at 69.4'	0.4/0.4	
				Augering very hard at 73.5, attempted spoon.				
	S-15	73.5 - 73.6		No recovery	50/0.1'	Ref at 73.6'	0.0/0.1	
75				Augering: easy drilling, cuttings were saturated brown. Water at 71 ft bgs in augers, hole open to 80 feet (after S-16 was collected)				
				Auger to refusal at 80.1 ft bgs, after collection of S-16				
80	S-16	79 - 79.1		No recovery, interpreted as Bedrock	50/0.1'	Ref at 79.1'	0.0/0.1	

P13-109 Piezometer Log

Bottom of Exploration at 80.1 feet Below Ground Surface

NOTES: Piezometer Stick-up = 3.0 feet Top of PVC Elevation = 2742.74

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 80.1 to 68 feet; Screen 80 to 70 feet; Bentonite Seal 68 to 66 feet; Cement

Piezometer development was completed on 1/21/2013

No Slug Testing was performed at this location

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-110
DATE STARTED: 01/15/2013	DATE FINISHED: 01/17/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2728.8	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 30.5 ft bgs	Rock Core Interval: 30.5 to 85.0 ft bgs	SPT with Automatic Hammer	SHEET 1 OF 2

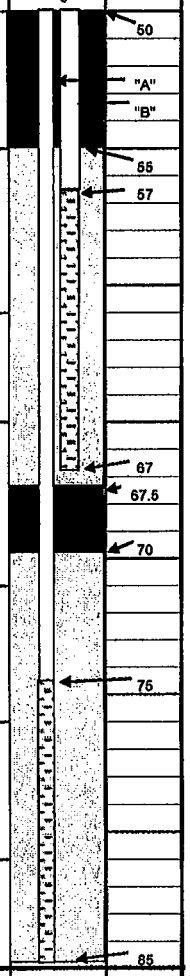
DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Penetration / Recovery	RQD	P13-110 A&B Piezometer Log	DEPTH (FT)
									"A" "B"	
5	S-1	4 - 6	FILL	Brown, Silty CLAY.	12/3/3/4	6	1.5/2.0			
10	S-2	9 - 11		Brown and Rust Color; Silty CLAY, sticky, wet.	2/3/2/3	5	1.5/2.0			
15	S-3	14 - 16		Similar to above, wood at 15 feet, underlain by Saprolite	7/6/7/16	13	1.0/2.0			
20	S-4	19 - 21	Saprolite	Black, Brown and Rust color; Weathered Rock; dry to damp.	5/7/6/8	13	2.0/2.0			
25	S-5	24 - 25.9		Rust stained with Brown and Black; Quartz rick Weathered Rock;	12/19/28/ 50/0.4'	47	1.6/1.9			
			Partially Weathered Rock	Auger Refusal at 30.5 ft bgs, after collection of S-6.						
30	S-6	29 - 30.4		Brown, Black and Rust colored; Sand; little streaking; tip of sample was hard rock.	4/12/50/0.4	Ref at 30.4'	1.0/1.4			
35	R-1	30.5 - 35.6	Highly Fractured Bedrock	See Bedrock Core Log			1.95/5.1	0.0%		
40	R-2	35.6 - 40.5	Fractured Bedrock	See Bedrock Core Log			3.55/4.9	65%		
45	R-3	40.5 - 45.2	Competent Bedrock	See Bedrock Core Log			2.7/4.7	55%		
50	R-4	45.2 - 50.5		See Bedrock Core Log			5.1/5.3	91%		

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-110
DATE STARTED: 01/15/2013	DATE FINISHED: 01/17/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2728.8	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 30.5 ft bgs	Rock Core Interval: 30.5 to 85.0 ft bgs	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-Inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
55	R-5	50.5 - 55.5	Competent Bedrock	See Bedrock Core Log			4.95/5.0	95%
60	R-6	55.5 - 60.5		See Bedrock Core Log			4.88/5.0	98%
65	R-7	60.5 - 65.2		See Bedrock Core Log			4.7/4.7	100%
70	R-8	65.2 - 70.5		See Bedrock Core Log			5.3/5.3	90%
75	R-9	70.5 - 75.5		See Bedrock Core Log			4.9/5.0	98%
80	R-10	75.5 - 80.5		See Bedrock Core Log			5.0/5.0	100%
85	R-11	80.5 - 85.0		See Bedrock Core Log			4.45/4.5	99%

Bottom of Exploration at 85.0 feet Below Ground Surface



NOTES: Piezometer Stick-up: A = 2.9 & B = 2.8 feet Top of PVC Elevation: A = 2731.75 & B = 2731.59

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen.

"B": Filter Sand 57.5 to 55 feet; Screen 67 to 57 feet; Bentonite Seal 55 to 50 feet; Cement Bentonite Grout 50 to 0.0 feet.

"A": Filter Sand 85 to 70 feet; Screen 85 to 75 feet; Bentonite Seal 70 to 67.5.

Piezometer development was completed on 1/21/2013

Slug Testing Completed (see Report)

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-111
DATE STARTED: 01/22/2013	DATE FINISHED: 12/22/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2670.8	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD	P13-111 Piezometer Log	DEPTH (FT)
5	S-1	4 - 6	Saprolite	Tan, Black, Red, layered, Saprolite.	3/5/8/12	13	1.6/2.0			
10	S-2	9 - 11		Red, Brown, Black and White; layered; Weathered Rock.	4/5/7/8	12	1.7/2.0			9
										12
										14
15	S-3	14 - 18		Brown and Rust colored; SAND, little structure (looks like weathered rock at 15.5 to 16 feet bgs	6/7/7/10	14	2.0/2.0			
				Cuttings wet to saturated						
20	S-4	19 - 21		White with Black specks and streaked with Brown and Rust bands, (looks like weathered rock)	8/7/8/8	13	2.0/2.0			
										24
25	S-5	24 - 26		Gray, Rust colored, and black; weathered rock	8/11/13/16	24	1.8/2.0			26

Bottom of Exploration at 26 feet Below Ground Surface.

NOTES: Piezometer Stick-up = 2.9 feet Top of PVC Elevation = 2673.69

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen.

Filter Sand 26 to 12 feet; Screen 24 to 14 feet; Bentonite Seal 12 to 9 feet; Cement Bentonite Grout 9 to 0.0 feet.

Piezometer development was completed on 1/25/2013

No Slug Testing Completed.

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-112
DATE STARTED: 01/11/2013	DATE FINISHED: 01/11/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2681.6	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: 39 ft bgs.	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
5	S-1	4 - 6	Saprolite	Red, brown, black and white; Saprolite; layered; dry to damp. White in tip of spoon.	13/13/15/11	28	1.8/2.0	
				Auger cuttings: red / brown				
10	S-2	9.0 -9.9	Partially Weathered Rock	Black, tan and white; Weathered Rock; layered; damp.	18/ 50/0.4'	Ref at 9.9'	0.9/0.9	
				Auger cuttings: light brown.				
15	S-3	14 - 16		Rust colored, brown, black and white; layered; damp.	15/27/34/45	61	2.0/2.0	
20	S-4	19 - 20.4		Similar to above.	24/31/ 50/0.4'	Ref at 20.4'	1.2/1.4	
				Auger cuttings: Brown and Rust; moist to wet.				
25	S-5	24 - 26		Quartz and mica (0.3 ft thick); over, Brown, black, rust colored, and white; Weathered Rock; damp.	13/17/17/20	34	1.8/2.0	
				Auger cuttings: moist to wet.				
30	S-6	29 - 31		Similar to above; mica rich; wet to saturated.	6/12/24/28	36	2.0/2.0	
35	S-7	34 - 35.6		Similar to above; gray at 38 ft bgs; very hard.	4/7/36/ 50/0.1'	43 Ref at 35.6'	1.6/1.6	
				Augured to refusal at 39 ft bgs, after collection of S-7.				

P13-112 Piezometer Log

Bottom of Exploration at 39.0 feet Below Ground Surface

NOTES: Piezometer Stick-up = 2.9 feet Top of PVC Elevation = 2684.48

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 39 to 26.3 feet; Screen 38.3 to 28.3 feet; Bentonite Seal 26.3 to 23.8 feet; Cement Bentonite Grout 23.8 to 0.0 feet.

Piezometer development was completed 1/11/2013.

No Slug Tests performed, due to dry piezometer

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation		JOB NO.: 12121.00	BORING NO.: B13-113
DATE STARTED: 01/22/2013	DATE FINISHED: 01/22/2013	DRILLING METHOD: 4.25 ID HSA	
GROUND SURFACE ELEVATION (FT): 2674.7	DRILLING CONTRACTOR: A & E Drilling		LOGGED BY: BBJ
Auger Refusal Depth: Not Encountered	Rock Core Interval: None	SPT with Automatic Hammer	SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD	P13-113 Piezometer Log	DEPTH (FT)
	No Sampling See P-07-212		Saprolite	Auger Cuttings: Brown, silty SAND.						
5										
				Auger Cuttings: Red-Brown; silty clay with mica.						7
10										10
										12.4
15			Partially Weathered Rock	Auger Cuttings; Brown-red, silty clay with gravel and sand, (interpreted as Weathered Rock)						17.4
				Bottom of Exploration at 17.5 feet Below Ground Surface						17.5

NOTES: Installed as a replacement for P-07-212A&B, which were damaged during landfill operations.

Piezometer Stick-up = 3.3 feet Top of PVC Elevation = 2678.04

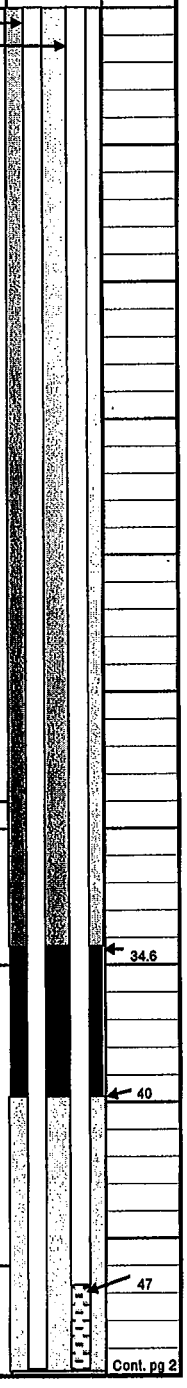
Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen; Filter Sand 17.5 to 10 feet; Screen 17.4 to 12.4 feet; Bentonite Seal 10 to 7 feet; Cement Bentonite Grout 7 to 0.0 feet.

Piezometer development was completed1/25/2013

No Slug Tests performed

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Investigation	JOB NO.: 12121.00	BORING NO.: B13-114
DATE STARTED: 01/23/2013	DATE FINISHED: 01/24/2013	DRILLING METHOD: 4.25 ID HSA and NX Core
GROUND SURFACE ELEVATION (FT): 2779.4	DRILLING CONTRACTOR: A & E Drilling	LOGGED BY: BBJ
Auger Refusal Depth: 28.6 ft bgs	Rock Core Interval: 28.6 to 80.3 ft bgs	SPT with Automatic Hammer / SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery / Penetration	RQD
5	S-1	4 - 8	FILL	Brown, SILT, trace organics and fine sand, wet. Pocket Penetrometer: 0.6 to 1.25 TSF.	1/1/2/2	3	2.0/2.0	
10	S-2	9 - 11	FILL	Brown; SILT; trace organics with rootlets, appears to be fill; moist. Pocket Penetrometer: 2.0 to 2.5 TSF.	3/3/4/4	7	2.0/2.0	
15	S-3	14 - 16	FILL	Similar to above, with more vegetation. Pocket Penetrometer: 3.0 to 3.5 TSF. At 15.8 feet: Red-Brown Clayey.	2/3/4/4	7	2.0/2.0	
20	S-4	19 - 20.4	Saprolite	White, red, black and brown; Saprolite.	5/6/13/17	19	2.0/2.0	
25	S-5	24 - 26	Saprolite	Red, white and black to all white with rust staining; Saprolite to weathered rock.	16/14/7/9	21	2.0/2.0	
			Partially Weathered Rock	Augured to refusal at 28.6 ft bgs, after collection of S-6.				
	S-6	28.5 - 28.6	Partially Weathered Rock	Red and Brown; Weathered Rock.	50/0.2'	Ref at 28.6'	0.2/0.2	
30	R-1	26.6 - 30.3	Fractured Bedrock	See Bedrock Core Log			1.7/1.7	100%
	R-2	30.3 - 35.3	Fractured Bedrock	See Bedrock Core Log			3.75/5.0	49%
35								
40	R-3	35.3 - 45.5	Fractured Bedrock / Competent Bedrock	See Bedrock Core Log			9.4/10.2	77%
45								
	R-4	45.5 - 55.5	Competent Bedrock	See Bedrock Core Log			9.9/10.0	97%
50								



DEPTH (FT)

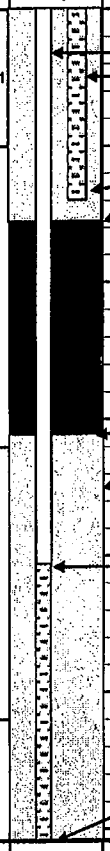
Cont. pg 2

NOTES: See Page 2 of 2

PROJECT: Evergreen Packaging Phase 6D-North Hydrogeologic Inv.		JOB NO.: 12121.00	BORING NO.: B13-114
DATE STARTED: 01/23/2013	DATE FINISHED: 01/24/2013	DRILLING METHOD: 4.25 ID HSA and NX Core	
GROUND SURFACE ELEVATION (FT): 2779.4		DRILLING CONTRACTOR: A & E Drilling	LOGGED BY: BBJ
Auger Refusal Depth: 28.6 ft bgs	Rock Core Interval: 28.6 to 80.3 ft bgs	SPT with Automatic Hammer	SHEET 2 OF 2

DEPTH (FT)	SAMPLE NO.	Sample Interval	Geologic Unit	MATERIAL DESCRIPTION	SPT Blows per 6-inch Interval	SPT N-VALUE (bpf)	Recovery Penetration	RQD
55	R-4 (cont)	45.5 - 55.5	Competent Bedrock	See Page 1			See page 1	See page 1
60	R-5	55.5 - 65.5		See Bedrock Core Log			9.73/10.0	97%
65								
70	R-6	65.5 - 75.5		See Bedrock Core Log			9.75/10.0	88%
75								
80	R-7	75.5 - 80.3		See Bedrock Core Log			4.75/4.8	99%

Bottom of Exploration at 80.3 feet Below Ground Surface



DEPTH (FT): 55, 60, 65, 70, 75, 80

NOTES: Piezometer Stick-up: A = 2.9 & B = 3.2 feet Top of PVC Elevation: A = 2782.35 & B = 2782.61

Piezometer: 3/4 inch ID PVC; 10 feet of 0.010 inch slotted screen.

"B": Filter Sand 58 to 40 feet; Screen 57 to 47 feet; Bentonite Seal 40 to 34.6 feet; Cement Bentonite Grout 34.6 to 0.0 feet.

"A": Filter Sand 80.3 to 65.6 feet; Screen 80.3 to 70.3 feet; Bentonite Seal 65.6 to 56 feet.

Piezometer development was completed on 1/25/2013

No Slug Tests performed

ATTACHMENT B

ROCK CORE LOGS

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-Worta BORING NO. B-13-104 PAGE 1 OF 1

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2693.1-2685.2 DEPTH (FT) INTERVAL 23-30.9

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING SL - SLIGHT MOD - MODERATE SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
23	R-1, 23-25.5	45°	2.42/2.5 97%	1.87/2.5 75%	Fe Staining into Rock next to Fracture	Gray, Gneiss with quartz bedded at ~45° Vuggy and Iron (Fe) Staining adjacent to Fratures with Rust
24	Rust, D, Fe, Fe next to Fracture, Fe					
25						
26	R-2, 25.5-30.5	45°	4.9/5.0 98%	4.82/5.0 96%	next to Fracture	Staining at Natural Contacts, and some black/green film on Contacts.
27	D					
28						
29	Fe next to Fracture					
30						
31	R-3 30.5-30.9		0/0.4 0%			Bottom of Exploration at 30.9. Bit on core barrel wore-out, re-drilled approx 10Ft south of of this location, Name: B-13-104R

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-104R PAGE 1 OF 3

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2697.1-2683.1 DEPTH (FT) INTERVAL 19-33.5

AZIMUTH _____ INCLINATION _____ LOGGED BY B. Johnson (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
19	R-1, 19-25.5 ~Rubble, sev. wx		4.42/6.5	2.45/6.5	Highly Weathered	Severely Weathered, rust stained Gneiss
20			68%	38%		
21						Gray, Gneiss,
22	Fe adjacent to Fracture					Slightly Vuggy with Iron (Fe) staining adjacent to some Fractures, some fractures have black/green film on contacts.
23					Iron stained	
24	No Recovery, likely lost upper part of core					
25						
26	R-2, 25.5-30.7	45°	4.83/5.2	4.53/5.2		
27	D		93%	87%		
28	Fe adjacent to Fract. ← Dark Red in Fract	45°				
29	D					
30	D D Fe adjacent to Fracture	45°				
31	R-3, 30.7-35.7		2.69/5	4.45/5		
32	Fe adjacent to Fract		54%	29%	Iron Staining ↓	Highly Fractured, weathered 31.7-34 feet, No recovery
33						

BEDROCK CORE LOG

PROJECT Evergreen Phase 6 D-North BORING NO. B-13-104R PAGE 2 OF 3

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2683.1 2664.1 DEPTH (FT) INTERVAL 33-48

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
33		See pg 1				Iron Staining	
34		No Recovery, likely lost ~ 31.7-34					
35.7							
36	D	R-4, 35.7-40.7		4.67/5	4.67/5		Gray, Gneiss, with Quartz & Mica, medium grained
	D	No iron Staining, All breaks are mechanical by Driller.		93%	93%		
38	D						
40		Natural					
		R5, 40.7-45.7 Fe on surface		5/5	5/5		
42		0.1' Quartz Seam	50°	100%	100%		
44		Fe at Fract Heavy Fe in Rock				Iron Stained	
	D						
46	D	R-6, 45.7-50.7		4.47/5	3.67/5		
	D			89%	73%		
48	D						

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-104R PAGE 3 OF 3

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) 1½X ELEVATION (FT) 2655.6 (2668.1) INTERVAL DEPTH (FT) 48-60.5 INTERVAL

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
48	See pg 2 — D @ 48.1 — Fe on Fracture		See pg 2	See pg 2		
50	Fe Staining — No Recovery				Iron in Rock More with depth	Fracture Zone
	R-7, 50.7-55.7		4.98/5	3.3/5		Simmilar to above
52			100%	66%		
54	Iron Staining in Rock, Soft	50°				
	Rec all but 0.02 Driller Break					
56	R-8, 55.7-60.5		3.65/4.8	3.1/4.8		High Quartz Zone
			76%	65%		
58	D — Mud in Seam Fe stained Rock	50°			MUD	Thin Mud seam at Fracture
60	No Recovery, possibly lost at mud seam					
61	Bottom of Exploration at 60.5 ft bgs					

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-106 PAGE 1 OF 2

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2715.6-2703.1 DEPTH (FT) INTERVAL 20.5-33

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
19						
20						
	R-1, 20.5-30.5 D		5.6/10.0	4.95/10.0	Weathered Rock	High Quartz content Rock at 20.5 to 21.5 Then Highly to Moderate weathering with repeated core barrel plugging. Voids interpreted as highly weathered/ Saprolite to 26 ft. b.g.s.
22	Vugg and rust stained rock		56%	50%		
	Partial Run, (1A) no recovery core barrel plugged					
24						
26	highly Fractured Rust stained *				Highly Fractured	* Partial Run, 25.5-26' core barrel plugged.
	D					
28	Partial Run, (1B) no recovery core barrel plugged					
30	last partial Run (1C) D				Competent Bedrock	
	R-2, 30.5-40.5		9.82/10	9.82/10		
32			98%	98%		
33						

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-106 PAGE 2 OF 2

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2703.1-2695.6 DEPTH (FT) INTERVAL 33-40.5

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE / CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
33	See pg 2.				Competent Bedrock	
34	Rust staining & Black film.					High Quartz content
36						
	D					
38		75°				Dip on Quartz seam
40						
41						Bottom of Exploration at 40.5 ft b.g.s. See Boring Log for Piezometer details

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-107 PAGE 1 OF 5

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) ELEVATION (FT) INTERVAL 2744.6-2730.6 DEPTH (FT) INTERVAL 12-26

AZIMUTH INCLINATION LOGGED BY BBJ (NAME) (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC. From Horizontal

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
12		R-1, 12-14.8'		2.8/2.8 100%	2.54/2.8 91%	Comp, Tight Fract. Competent Bedrock	Gray, Gneiss, medium grained.
		Black, green film Fract not on bedding plane	20°				
14		+ little Rust on Fract.					
		R-2, 14.8-21.1 on bedding	45	5.93/6.3 94%	4.98/6.3 79%		
16							
18							
		D (To fit Box)					
20		D on Quartz seam					
		D					
		R-3, 21.1-31.1'		8.65/10 87%	7.35/10 74%		
22		Rust at seam					
24							
		Thick Rust accum. on seam	70°				
26							Nearly all quartz

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107 PAGE 2 OF 5

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) ~~2714.6~~ 2730.6 INTERVAL DEPTH (FT) 26-42 INTERVAL

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
26	R-3 (cont.)					Gray, Gneiss
28	D Rust at seam					
30					Fracture Zone	
32	R-4, 31.0-41.0 Fracture Zone, Highly Weathered (likely location of lost core recovery)		7.3/9.9 74%	6.75/9.9 68%	and Poor Recovery	
34			including 1' from R-5		Little to no Natural fractures	
36	D Quartz seam		8.3/9.9			
38	38.15-38.4 D		84%	81%		
40	1.6' Not Recovered — Recovered 1' from R-5					
42	R-5, 41.0-50.0 ~ 2.35' piece, Top 1' was from R-4		9/9 100%	9/9 100%		

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107 PAGE 3 OF 5

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) 2714.6 2700.6 INTERVAL DEPTH (FT) 42-56 INTERVAL

AZIMUTH _____ INCLINATION _____ LOGGED BY RBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING SL - SLIGHT MOD - MODERATE SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
42	D	R-5 (cont.)				Little to No Natural Fractures	
44	D						
46	D						
48		Little to no Iron, weathering					
	D D						
50	D						
		R-6, 50.0-51.5		1.36/1.5 91%	1.36/1.5 91%		*Values reflect 0.31' recovered in R-7
		N Fe on Seam					
	D	Recovered 0.31' in R-7					
		R-7, 51.5-60.0		8.5/8.5	8.25/8.5		
52	D						
		Black, green film on thin Fract.		100%	97%		
54	D						
	D						
56	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107 PAGE 4 OF 5

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2700.6 / 2696.6 DEPTH (FT) INTERVAL 56-70

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
56	R-7 (cont.)				Little to No Natural Fractures	Gray, Gneiss
	-Thin Fracture Black Stain					
58	D					
	-Thin Fracture, Black Stain.					
60	R-8, 60.0-61.5		1.5/1.5 100%	1.5/1.5 100%		
	D					
62	R-9, 61.5-71.0		9.5/9.5 100%	9.5/9.5 100%	Competent Bedrock	
64	D					
66	D					
68	D	45°				
70						

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107 PAGE 5 OF 5

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) 2686.0 2680.0 INTERVAL DEPTH (FT) 70-76 INTERVAL

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
70		R-9 (Cont.) IN				Comp Rock Fractured Bedrock	Gray Gneiss - Tight
		R-10, 71.0-76.0		4.65 / 5.0 = 93%	4.65 / 5.0 = 93%		
72							
74	D						
76							Bottom of Exploration at 76 ft bgs

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107R PAGE 1 OF 4

JOB NO. 12127.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2752.6-2738.6 DEPTH (FT) INTERVAL 4-18

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
4	R-1, 4.0-10.0 Highly Fractured		1.75/6.0 29%	0.45/6.0 8%	Weathered Rock	Quartz, Rust Stained Quartz and Gneiss ← 0.45' Gray Gneiss
6	No Recovery (Weathered Bedrock)					
8						
10	R-2, 10.0-15.0 D		4.95/5.0 99%	4.95/5.0 99%	9.5' Competent Bedrock	
12						
14	D					
16	R-3, 15.0-20.0 D		4.73/5.0 95%	4.15/5.0 83%		
18	D					

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-10TR PAGE 2 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2738.6 2724.6 DEPTH (FT) INTERVAL 18-32

AZIMUTH _____ INCLINATION _____ LOGGED BY RJT (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
18		R-3, (See pg 1)				Comp. Bedrock	Gray Gneiss with mica and quartz
20		R-4, 20.0-25.0		5.0/5.0 100%	4.38/5.0 88%		
22	D D						
24	D						
26		R-5, 25.0-30.0		4.80/5.00 96%	4.80/5.0 96%		
28	D D						
30		R-6, (see pg 3					
32	D						

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107R PAGE 3 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2724.6-2710.6 DEPTH (FT) INTERVAL 32-46

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
32		R-6, 30.0-35.0		4.15 / 5.0 = 83%	3.85 / 5.0 = 77%		Gray, Gneiss
	D						
34						Fractured Bedrock	
		R-7, 35.0-40.0		4.95 / 5.0 = 99%	4.2 / 5.0 = 84%		
36	D					Competent Bedrock	
		Multiple Driller breaks, due to possible damaged over reamer induced chattering of Rods that damaged core					
38							
40		R-8, 40.0-45.0		5.0 / 5.0 = 100%	5.0 / 5.0 = 100%		
D							
	D						
42							
	D D						
	D	Rust on seam					
44							
		R-9 (see pg 4)					
46	D						

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-107R PAGE 4 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2710.6-2706.3 DEPTH (FT) INTERVAL 46-50.3

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
46	D	R-9, 45-50.3		4.54/5.3 86%	4.54/5.3 86%		Gray, Gneiss.
	D						
	D						
48	D	Rust & Black					
	D						
	D						
50							
51							Bottom of Exploration at 50.3 ft b.g.s.

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-108 PAGE 1 OF 1

JOB NO. 12127.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2693.8-2685.2 DEPTH (FT) INTERVAL 34-42.6

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS ON PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
34	R-1, 34.0-35.0 D		1.0/1.0 100%	0.8/1 80%		Gray, Gneiss
	R-2, 35-40		Rock 2.95/5	1.3/5		
36	Vuggy, Rust Stained		58% Total 3.4/5	26%	Highly Weathered Rock	Rust Stained, Vuggy Gneiss
38	Mud/Soil		68%		Mud & Soil	Mud and Soil
	No Recovery					
40	R-3, 40-42.6 Vuggy, Rust Stained		1.85/2.6 71%	0/2.6 0%	Highly Weathered Rock	Rust Stained Vuggy Gneiss
42						
43	Bottom of Exploration at 42.6 ft bgs					

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-110 PAGE 1 OF 4

JOB NO. 12227.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2698.8-2684.8 DEPTH (FT) INTERVAL 30-44

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC. From Horizontal

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
30	Soil. (see boring Log)					
30.5	R-1, 30.5-35.6 Vuggy, Iron stained on Fractures		1.95 / 5.1	0 / 5.1	Weathered Rock Interbedded with Soil	Layered Highly Weathered Rock, Interbedded with Soil (Saprolite)
32	Soil, mostly clay & Mica		38% Total	0%		
	Rust Stained Rock		Rock: 0.95 / 5.1			
34	No Recovery (likely Soil)		19%			
36	R-2, 35.6-40.5 Rust stained Rock	60°	3.55 / 4.9	3.2 / 4.9	37	Gray, Gneiss, Highly Fractured and moderately weathered
			72%	65%	Fractured	
38	Fracture Zone Rust on seams and in Rock					Mostly quartz pieces with heavy rust staining.
40	No Recovery					Possibly Ripable to 42'
	R-3, 40.5-45.2 Rust stained Rock		2.7 / 4.7	2.6 / 4.7		
42			57%	55%		
44	No Recovery					

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D North BORING NO. B-13-110 PAGE 2 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2684.8-2670.8 DEPTH (FT) INTERVAL 44-58

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
44	R-3, (see pg. 1) 2 No Recovery					
	R-4, 45.2-50.5		5.1 / 5.3 = 96%	4.8 / 5.3 = 91%	Little Fractures	Gray, Gneiss, medium Grained
46						
48	D					
50	D					
	R-5, 50.5-55.5		4.95 / 5.0 = 99%	4.75 / 5.0 = 95%		
52	D					
54	D					High quartz, large grain
	R-6, 55.5-60.5		4.88 / 5.0 = 98%	4.88 / 5.00 = 98%		
56	← No Fract, see pg 3					
58						

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-110 PAGE 3 OF 4

JOB NO. 12127.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2670.8-2656.8 DEPTH (FT) INTERVAL 58-72

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

MEASURED BREAKS OR PARTINGS ACROSS CORE
CHIPS, CAVITY, LOST CORE
MEASURED HIGH-ANGLE JOINT (JT = JOINT)
D CORE BROKEN BY DRILLER
M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING
SL - SLIGHT
MOD - MODERATE
SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
58		R-6, (See pg 2)					Gray, Gneiss
	D		45°			Tight Fract.	
60	D	} Recovered in R-7				No Fract.	
		R-7, 60.5-65.2		4.7/4.7 100%	4.7/4.7 100%		
62		No Fractures					
	D						
64							
		R-8, 65.2-70.5		5.3/5.3 100%	4.77/5.3 90%	Fractured	
66		Fracture Zone Iron Stained					
68						Little Fract	
70	D					No Natural Fractures	
	D	R-9, (See pg 4)					
72							

5/90

SEVEE & MAHER ENGINEERS

BEDROCK CORE LOG

PROJECT Evergreen Phase 6 D-North BORING NO. B-13-110 PAGE 4 OF 4

JOB NO. 12127.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2656.8-2643.8 DEPTH (FT) INTERVAL 72-85

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
72	R-9, 70.5-75.5		4.9/5.0 98%	4.9/5.0 98%	No Natural Fractures	Gray, Gneiss with high quartz content.
74	D, D, D					
76	R-10, 75.5-80.5		5.0/5.0 100%	5.0/5.0 100%		
78	D, D, D, D, D, D					
80	D, D				Fracture No Natural Fractures	
82	R-11, 80.5-85.0		4.45/4.5 99%	4.45/4.5 99%		
84	D					
85						Bottom of Exploration at 85.0 ft b.g.s.

BEDROCK CORE LOG

PROJECT Evergreen, Phase 6D-North BORING NO. B-13-14 PAGE 1 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2751.4 2737.4 DEPTH (FT) INTERVAL 28.0-42

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
28	See Boring Log 0-28.6					
	R-1, 28.6-30.3 No Breaks		1.7/1.7 100%	1.7/1.7 100%		Gray, Gneiss
30	D					
	R-2, 30.3-35.3		3.75/5 75%	2.45/5 49%		
32	D					
	Slight soil in seam, possible location of not recovered core					High quartz content
34						
	R-3, 35.3-45.5		9.4/10.2 92%	7.88/10.2 77%		
36						
	Break post recovery					
38						
40	Rust Stained Rock				Fracture Zone likely 0.8 more	Fracture Zone 39'-42'
42						

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-114 PAGE 2 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2737.9 2723.4 DEPTH (FT) INTERVAL 42-56

AZIMUTH _____ INCLINATION _____ LOGGED BY BBJ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	BREAKS IN CORE	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
42		R-3, see pg 1					
44	D D	Rust stained Rock. No Recovery, likely ~40'					
46		R-4, 45.5-55.5		9.9/10.0 99%	9.7/10 97%	Fracture Free Rock	
48							
50	D D						
52		Iron Stained Seam " " "				Small Frac Fracture Free Rock	
54	D	0.1 Not Rec.					
56		R-5, see pg 3					

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-114 PAGE 3 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling Services

CORE DIAMETER (IN.) NX ELEVATION (FT) INTERVAL 2723.4-2709.4 DEPTH (FT) INTERVAL 56-70

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
56	R-5, 55.5-65.5		9.73/10	9.73/10	Fracture Free Rock	Gray Gneiss
	D		97%	97%		
58	D					
60	D					
62	D					
64	D					
	M D					
66	R-6, 65.5-75.5		9.75/10	8.8/10		
	D		98%	88%		
68	D					
	D					
70	D					

BEDROCK CORE LOG

PROJECT Evergreen Phase 6D-North BORING NO. B-13-1/4 PAGE 4 OF 4

JOB NO. 12121.01 DRILLER A&E Drilling

CORE DIAMETER (IN.) Nx ELEVATION (FT) INTERVAL 2709.4-2699.1 DEPTH (FT) INTERVAL 70-80.3

AZIMUTH _____ INCLINATION _____ LOGGED BY _____ (NAME) _____ (DATE)

BREAKS IN CORE: MEASURED BREAKS OR PARTINGS ACROSS CORE; CHIPS, CAVITY, LOST CORE; MEASURED HIGH-ANGLE JOINT (JT = JOINT); D CORE BROKEN BY DRILLER; M CORE PARTED ALONG MICA CONCENTRATION

WX: WEATHERED - WEATHERING; SL - SLIGHT; MOD - MODERATE; SEV - SEVERE

DIP: DIP OF LAYERING, TEXTURE, FOLIATION, BEDDING, ETC.

DEPTH	CONDITION OF CORE, WX, ETC.	DIP	RECOVERY (%)	RQD (%)	GRAPHIC LOG	ROCK TYPE, GRAIN SIZE, COLOR, TEXTURE, ETC.
70	D, N, Rust in seam; Rust and Rock in healed seam; Black on seam				Rust Stained and Black on Seams	Gray, Gneiss
72	D, Green on seam; Iron					
74	Iron; D; D; D				Fracture Free Rock	
76	R-7, 75.5-80.3; D		4.75/4.8 99%	4.75/4.8 99%		
78						
80	D; D					
81	Bottom of Exploration at 80.3 ft bgs.					

5/90

SEVEE & MAHER ENGINEERS

ATTACHMENT C

WATER LEVEL MEASUREMENTS

WATER ELEVATIONS LANDFILL No. 6 AREA D NORTH

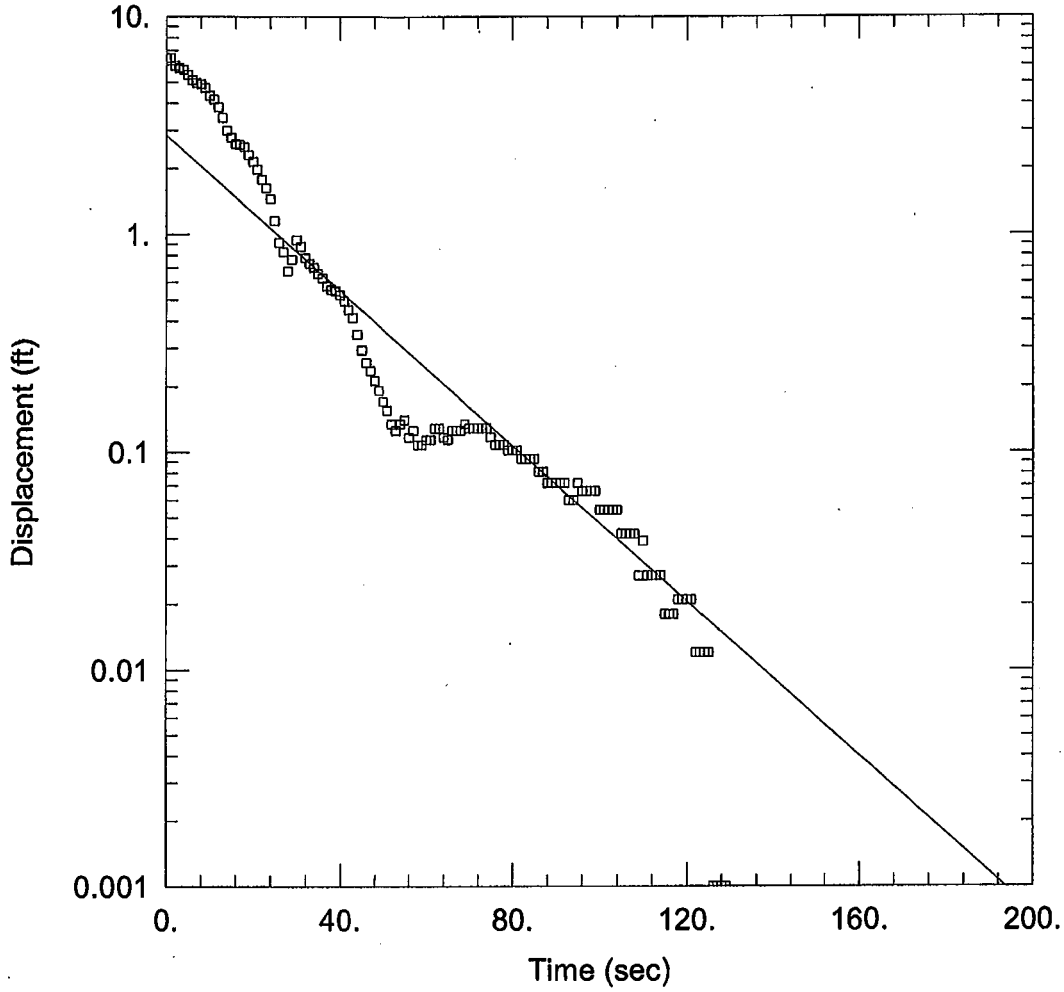
Date:	1/18/2013	2/18/2013	3/14/2013	4/2/2013	4/23/2013	5/3/2013	5/17/2013	6/14/2013	7/2/2013	7/16/2013	8/5/2013	ESTIMATED SEASONAL-HIGH WATER TABLE[2]
P-07-201A	2673.67	2674.84	2675.61	2676.20	2676.89	2677.41	2678.84	2677.62	2676.67	2677.42	2676.61	-
P-07-201B	2673.89	2673.19	2674.22	2674.83	2675.29	2675.59	2677.07	2677.03	2676.93	2676.90	2676.88	-
P-07-201C	2674.85	2675.48	2676.69	2677.46	2678.15	2678.56	2679.86	2679.45	2678.44	2678.62	2678.30	2682
P-07-202A	2652.00	2650.20	2650.42	2650.52	2650.85	2651.26	2651.30	2651.06	2650.61	2651.30	2650.54	-
P-07-202B	2653.80	2651.58	2651.82	2651.88	2652.08	2652.87	2652.56	2652.54	2652.21	2652.78	2651.99	2656
P-07-203A	-	-	2681.48	2682.02	2682.73	2683.05	2683.94	2683.72	2683.35	2683.84	2683.29	-
P-07-203B	-	-	2678.90	2679.31	2679.73	2680.02	2680.52	2679.99	2679.44	2679.97	2679.22	-
P-07-203C	-	-	2680.25	2680.48	2680.85	2681.09	2681.49	2681.07	2680.57	2681.06	2680.34	2683
P-07-204A	2692.21	2690.29	2691.06	2691.75	2692.62	2693.25	2694.24	2694.51	2694.09	2694.89	2694.42	-
P-07-204B	2692.43	2690.41	2691.19	2691.87	2692.76	2693.37	2694.43	2694.67	2694.33	2695.10	2694.67	-
P-07-204C	2692.35	2690.37	2691.34	2692.09	2692.90	2693.48	2694.54	2695.03	2694.80	2695.53	2695.16	2697
P-07-205	2660.83	2659.13	2660.83	2662.08	2663.31	2664.06	2665.79	2666.91	2666.13	2665.80	2665.20	2668
P-07-207	2681.99	2679.79	2680.26	2680.74	2681.31	2681.58	2682.14	2683.04	2683.23	2683.42	2683.71	2684
P-07-213	2696.57	2694.86	2695.81	2696.46	2696.82	2697.46	2699.86	2698.31	2696.86	2696.96	2696.83	2700
P-07-226A	2633.06	2631.98	2632.25	2632.44	2632.82	2633.16	2633.58	2633.20	2632.71	2633.31	2632.59	-
P-07-226B	2632.33	2631.52	2631.77	2631.87	2632.31	2632.64	2632.97	2632.42	2631.90	2632.48	2631.73	-
P-07-226C	2633.81	2632.75	2632.99	2633.09	2633.43	2633.70	2634.03	2633.47	2633.00	2633.66	2632.89	2636
MW-1A	-	2697.32	2697.77	2698.47	2699.20	2699.52	2700.07	2701.23	2701.97	2702.62	2703.45	2704
MW-9	-	2649.90	2650.29	2650.34	2650.52	2650.80	2653.15	2653.11	2652.77	2652.57	2652.42	2655
MW-10	-	2643.02	2643.68	2644.31	2644.93	2645.45	2646.68	2647.10	2646.56	2646.35	2645.76	2649
MW-11	-	-	2631.40	2631.50	2631.91	2632.26	2632.47	2631.71	2631.25	2631.98	2631.13	2634
P13-101	2686.38	2687.59	2688.38	2689.13	2689.77	2690.23	2691.50	2692.23	2692.25	2692.98	2693.45	2693
P13-102	2699	2700.30	2701.58	2702.63	2703.46	2703.92	2704.48	2704.81	2704.94	2705.58	2705.53	2706
P13-103	2712.43	2714.23	2715.51	2716.40	2717.12	2717.56	2719.17	2719.21	2718.44	2718.22	2718.44	2721
P13-104R	2676.67	2678.22	2678.48	2678.80	2679.17	2679.40	2680.63	2680.84	2680.77	2680.87	2680.94	2682
P13-105	2679.86	2681.25	2681.47	2681.69	2681.97	2682.33	2683.61	2682.49	2681.78	2683.14	2682.50	2684
P13-106	2711.42	2707.70	2707.57	2707.44	2707.48	2708.09	2708.07	2708.01	2706.19	2707.60	2706.86	2713
P13-107A	2688.27	2688.12	2688.60	2689.07	2689.35	2689.64	2690.53	2690.94	2690.44	2690.69	2690.82	2693
P13-107B	2724.28	2719.68	2719.56	2719.39	2719.69	2720.11	2719.51	2720.02	2718.14	2720.31	2718.43	-
P13-107C	2719.95	2719.67	2719.55	2719.42	2719.63	2720.06	2719.50	2719.99	2718.15	2720.23	2718.43	-
P13-108	2687.51	2686.88	2686.69	2686.65	2686.64	2686.95	2688.07	2686.48	<2685.20	2686.60	2685.20	2690
P13-109	2678.44	2678.02	2679.14	2679.94	2680.61	2681.02	2682.50	2682.48	2682.03	2682.03	2682.20	2684
P13-110A	2682.03	2659.08	2663.69	2667.04	2670.17	2672.05	2675.34	2678.20	2679.79	2681.90	2679.88	-
P13-110B	2675.67	2675.59	2675.36	2675.44	2675.49	2676.08	2677.37	2674.87	2674.19	2675.22	2674.78	2679
P13-111	2655.11	2656.43	2656.56	2656.81	2657.19	2657.73	2659.10	2657.43	2656.58	2658.03	2657.04	2661
P13-112	2657.04	2658.34	2658.15	2658.12	2658.33	2658.71	2659.87	2658.61	2657.96	2659.68	2658.63	2662
P13-113	2672.6	2673.47	2673.32	2673.24	2673.37	2674.29	2675.52	2673.38	2671.73	2673.87	2672.19	2677
P13-114A	2705.1	2704.56	2704.55	2704.56	2704.57	2704.60	2704.61	2704.61	2704.60	2704.58	2704.62	2707
P13-114B	2732.21	2731.56	2731.25	2731.03	2730.81	2731.09	2732.13	2729.87	2728.55	2729.50	2729.22	-

NOTES:

1. Water level at P-13-108 on 7/2/2013 represents the base of the screen. This well was dry and the water level is actually lower that the value reported.
2. Estimated seasonal-high water table used for landfill groundwater separation. Based on "rounding-up" measurements.

ATTACHMENT D

IN SITU SLUG TEST RESULTS



P-13-101 TEST 3 (PWR)

Data Set: C:\...\B-13-101-T3.aqt
Date: 03/05/13 Time: 09:05:06

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-101
Test Date: 1/12/2013

AQUIFER DATA

Saturated Thickness: 11. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-101)

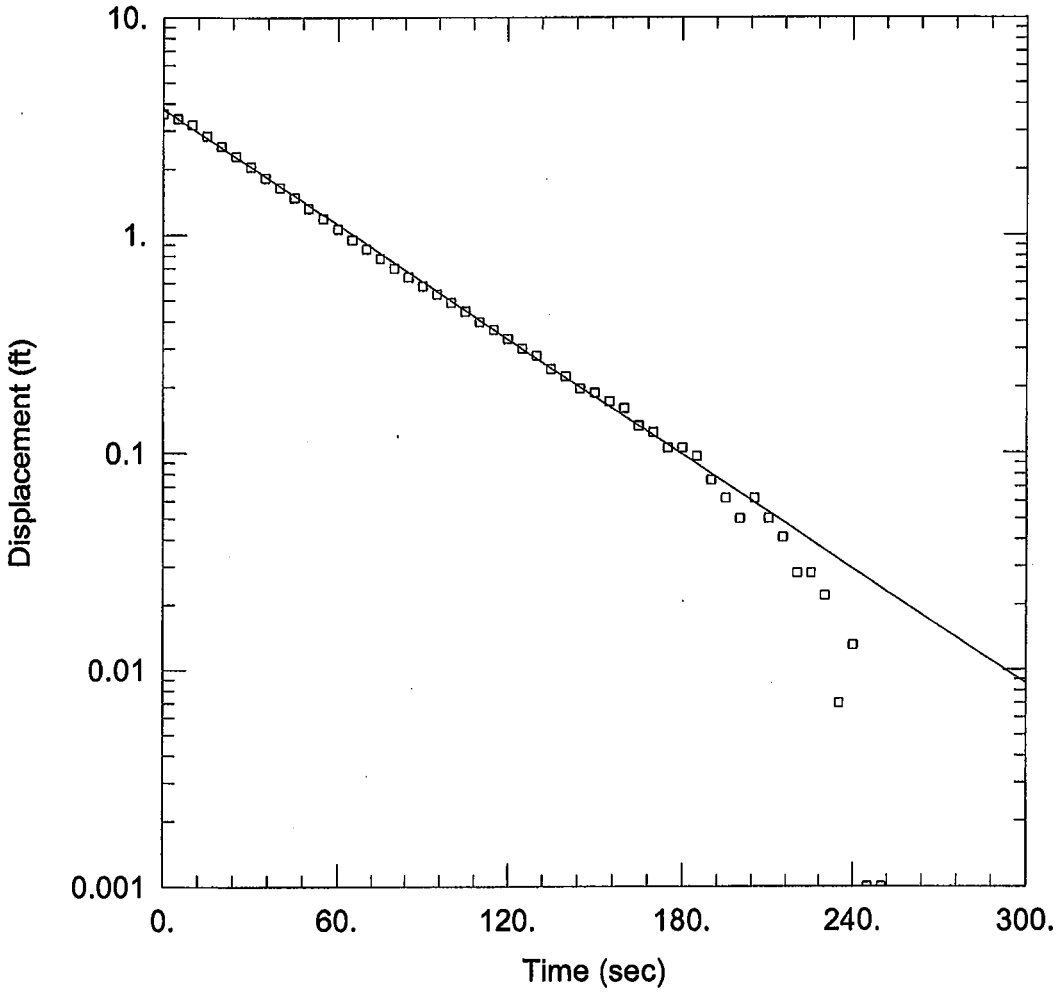
Initial Displacement: 6.463 ft
Total Well Penetration Depth: 11. ft
Casing Radius: 0.03125 ft
Static Water Column Height: 11. ft
Screen Length: 12.9 ft
Wellbore Radius: 0.3542 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.004893 cm/sec y0 = 2.856 ft

The correction for a partially saturated screen was applied.



P-13-103 TEST 1 (Saprolite / PWR)

Data Set: C:\...\B-13-103-T1.aqt
Date: 03/05/13 Time: 09:03:18

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: B-13-103
Test Date: 1/7/2013

AQUIFER DATA

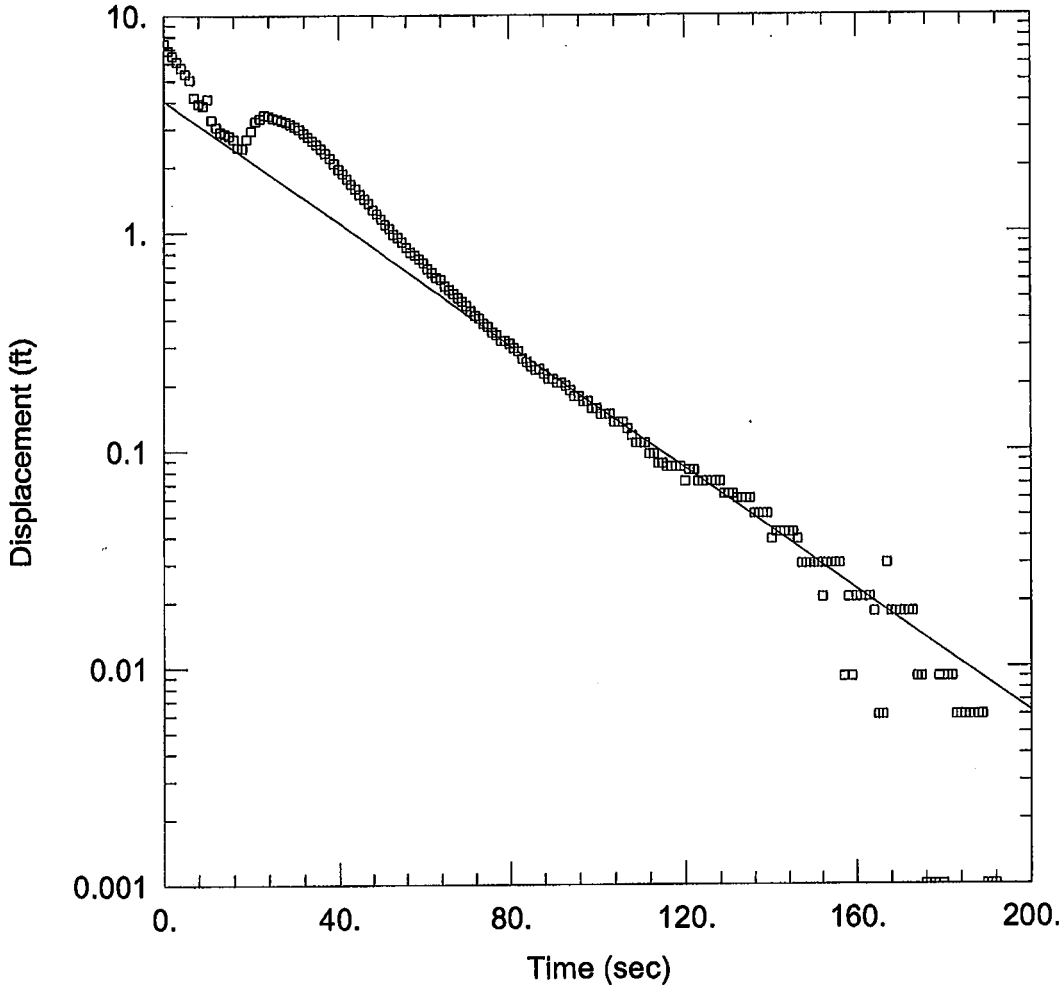
Saturated Thickness: 13.05 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-103)

Initial Displacement: 3.591 ft
Total Well Penetration Depth: 13.05 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 13.05 ft
Screen Length: 12. ft
Wellbore Radius: 0.3542 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 6.844E-5 cm/sec
y0 = 3.757 ft



P-13-104 TEST 2 Fractured Bedrock

Data Set: C:\...\B-13-104-T2.aqt
Date: 03/05/13 Time: 09:09:11

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-104
Test Date: 1/16/2013

AQUIFER DATA

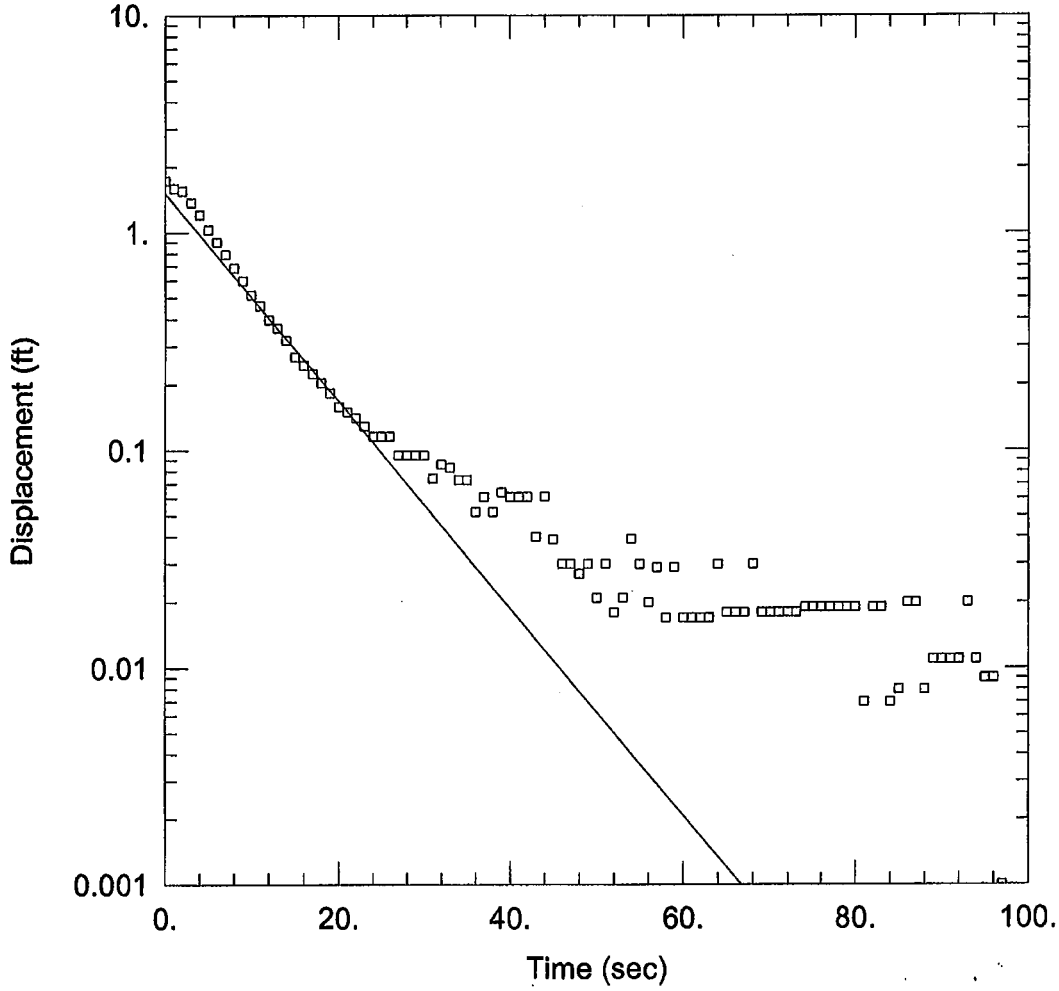
Saturated Thickness: 20.1 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-104)

Initial Displacement: 7.431 ft
Total Well Penetration Depth: 20.1 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 20.1 ft
Screen Length: 12.1 ft
Wellbore Radius: 0.125 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 0.000153 cm/sec
y0 = 4.059 ft



P-13-105 TEST 2

Data Set: C:\...\B-13-105-T2.aqt
Date: 03/05/13 Time: 09:08:38

PROJECT INFORMATION

PWR

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-105
Test Date: 1/22/2013

AQUIFER DATA

Saturated Thickness: 18.3 ft Anisotropy Ratio (Kz/Kr): 1.

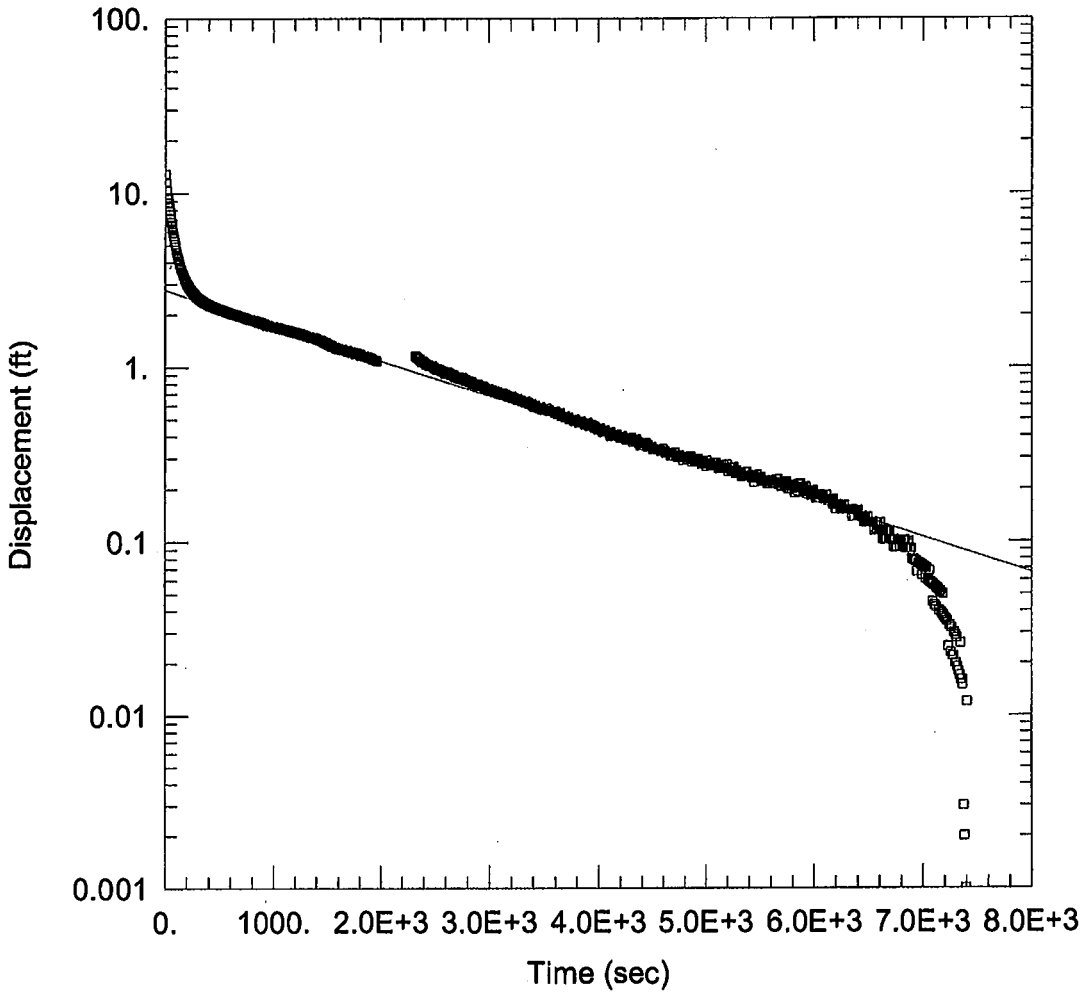
WELL DATA (P-13-105)

Initial Displacement: 1.736 ft
Total Well Penetration Depth: 18.3 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 18.3 ft
Screen Length: 12. ft
Wellbore Radius: 0.3542 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0003999 cm/sec y0 = 1.518 ft



P-13-106 TEST 1 Comp. Bedrock

Data Set: C:\...\B-13-106-T1.aqt
Date: 03/05/13 Time: 09:06:44

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-106
Test Date: 1/12/2013

AQUIFER DATA

Saturated Thickness: 11.2 ft
Anisotropy Ratio (Kz/Kr): 1.

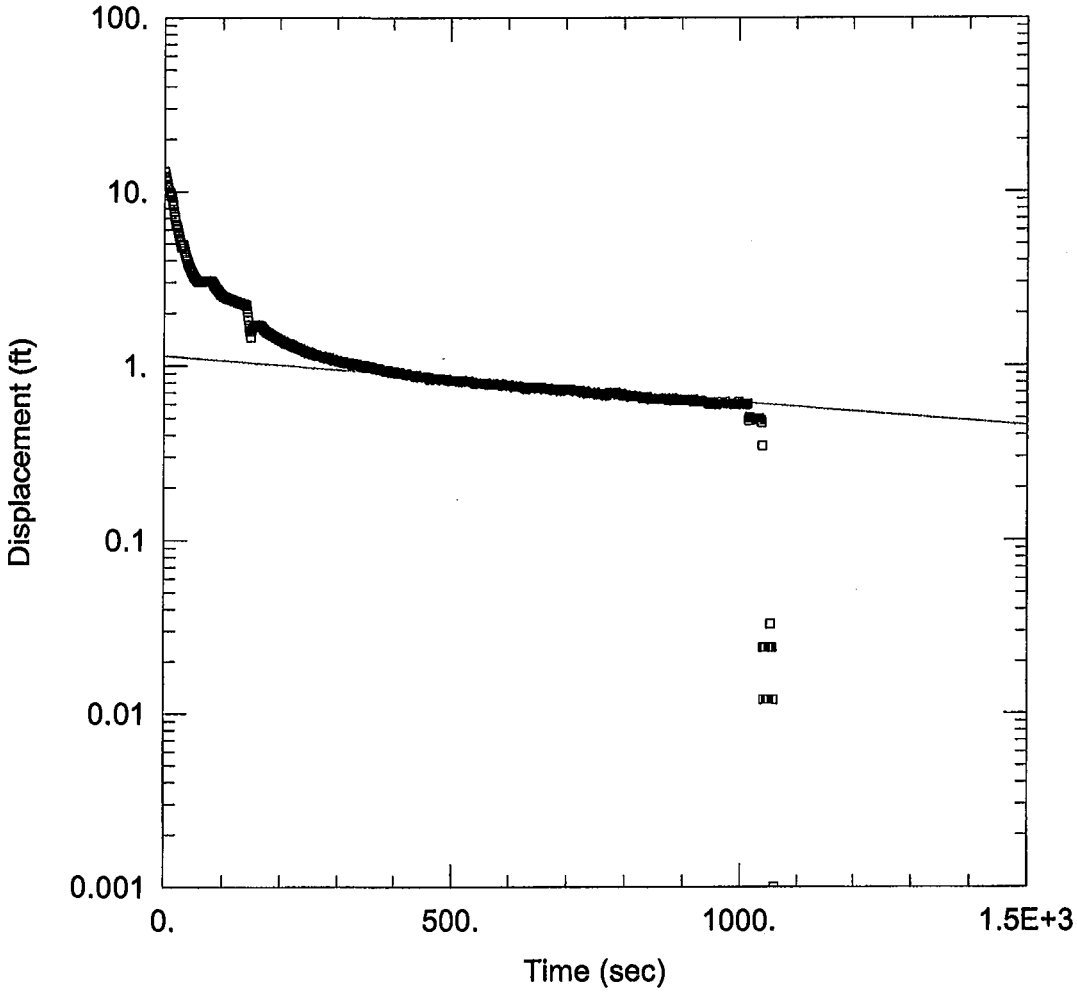
WELL DATA (P-13-106)

Initial Displacement: 12.85 ft
Total Well Penetration Depth: 11.2 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 11.2 ft
Screen Length: 15.5 ft
Wellbore Radius: 0.125 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 8.621E-6 cm/sec
y0 = 2.761 ft

The correction for a partially saturated screen was applied.



P-13-107A TEST 3 Comp. Bedrock

Data Set: C:\...\B-13-107a-T3.aqt
Date: 03/05/13 Time: 09:06:23

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-107A
Test Date: 1/12/2013

AQUIFER DATA

Saturated Thickness: 7.3 ft
Anisotropy Ratio (Kz/Kr): 1.

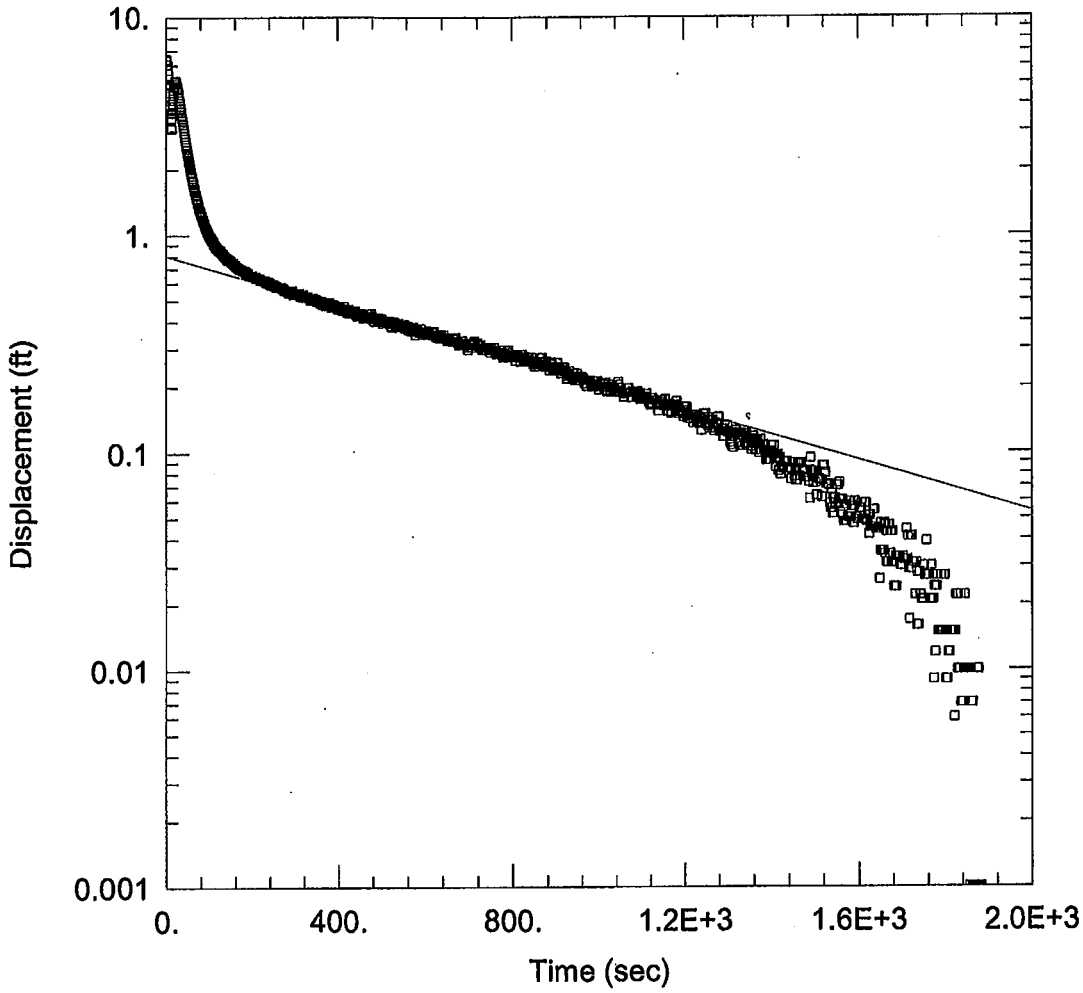
WELL DATA (P-13-107A)

Initial Displacement: 13.05 ft
Total Well Penetration Depth: 7.3 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 7.3 ft
Screen Length: 12.1 ft
Wellbore Radius: 0.125 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 2.394E-6 cm/sec
y0 = 1.134 ft

The correction for a partially saturated screen was applied.



P-13-110B TEST 2 Comp. Bedrock

Data Set: C:\...\B-13-110B-T2.aqt
Date: 03/05/13 Time: 09:06:02

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-110B
Test Date: 1/22/2013

AQUIFER DATA

Saturated Thickness: 11.9 ft
Anisotropy Ratio (Kz/Kr): 1.

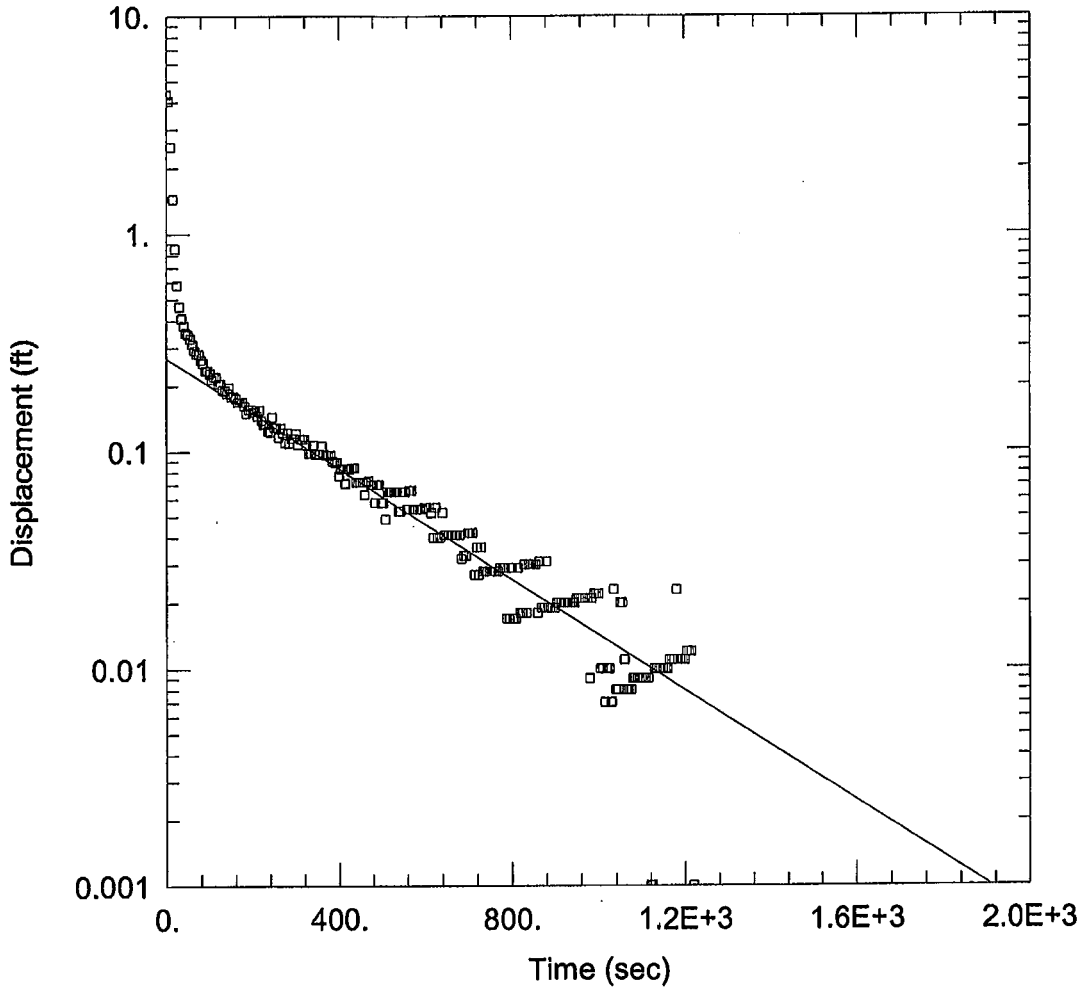
WELL DATA (P-13-110B)

Initial Displacement: 6.42 ft
Total Well Penetration Depth: 11.9 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 11.9 ft
Screen Length: 12.5 ft
Wellbore Radius: 0.3542 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice
K = 4.316E-6 cm/sec
y0 = 0.8038 ft

The correction for a partially saturated screen was applied.



P-13-112 TEST 1 PWR

Data Set: C:\...\B-13-112-T1.aqt
Date: 03/05/13 Time: 09:05:35

PROJECT INFORMATION

Company: Sevee & Maher Engineers, Inc.
Client: Evergreen Packaging
Project: 12121.00
Location: Canton, NC
Test Well: P-13-112
Test Date: 1/12/2013

AQUIFER DATA

Saturated Thickness: 9.9 ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (P-13-112)

Initial Displacement: 4.363 ft
Total Well Penetration Depth: 9.9 ft
Casing Radius: 0.03125 ft
Static Water Column Height: 9.9 ft
Screen Length: 12.7 ft
Wellbore Radius: 0.3542 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 0.0003451 cm/sec
y0 = 0.2687 ft

The correction for a partially saturated screen was applied.

ATTACHMENT 4

EROSION AND SEDIMENTATION CONTROL PLAN

EROSION AND SEDIMENT CONTROL PLAN

FOR LANDFILL NO. 6
AREA D NORTH
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

August 2013

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

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

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE, JR.

8/15/13

TABLE OF CONTENTS

Section No.	Title	Page No.
1.0	INTRODUCTION	1-1
1.1	Facility Information	1-2
1.2	Project Description	1-3
1.3	Site Description	1-3
1.4	Adjacent Properties	1-3
2.0	WATERSHED STORMWATER FLOWS	2-1
2.1	Pre-Development Conditions	2-1
2.2	Post-Development Conditions	2-3
2.3	Comparison of Peak Flows	2-6
3.0	PERFORMANCE STANDARDS	3-1
3.1	Culvert Inlet/Outlet Protection	3-1
3.2	Drainage Channels	3-1
3.3	Detention Basins	3-2
3.4	Rock Filters	3-3
4.0	PLANNED SEDIMENT AND EROSION CONTROL PRACTICES	4-1
5.0	CONSTRUCTION SCHEDULE	5-1
6.0	CONSTRUCTION MAINTENANCE PLAN	6-1

LIST OF APPENDICES

A SOILS MAP
B-1 PRE-DEVELOPMENT STORMWATER ANALYSIS
B-2 POST-DEVELOPMENT STORMWATER ANALYSIS
C EROSION AND SEDIMENT CONTROL DESIGN CALCULATIONS
D EROSION AND SEDIMENT CONTROL PLAN CHECKLIST
E FINANCIAL RESPONSIBILITY/OWNERSHIP FORM
F AFFIDAVIT FOR LAND-DISTURBING ACTIVITIES IN HAYWOOD COUNTY, NC

LIST OF FIGURES

Figure No.	Title	Page No.
1-1	SITE LOCATION MAP	1-4

LIST OF TABLES

Table No.	Title	Page No.
2-1	COMPARISON OF PRE- AND POST-DEVELOPMENT PEAK FLOWS 10-YR/24-HOUR STORM EVENT	2-6
3-1	COMPARISON OF PRE- AND POST-DEVELOPMENT RUNOFF VELOCITIES 10-YR/24-HOUR STORM EVENT	3-2

1.0 INTRODUCTION

This Erosion and Sediment Control Plan is designed for the expansion activities at Landfill No. 6, Area D North, located in Canton, North Carolina (see Figure 1-1). This plan was designed to comply with the Haywood County Erosion and Sediment Control Ordinance.

The ordinance requires installation and maintenance of sufficient erosion control practices to retain sediment within the boundaries of the site. The primary requirements include:

1. Retaining or establishing a sufficient buffer zone along any natural watercourses or lakes to contain sediment to the first 25 percent of the buffer strip nearest the disturbance area.
2. Maintaining an undisturbed buffer of 25 feet along trout waters.
3. Minimizing slope cuts and fills to that sufficient for proper stabilization.
4. Vegetating slopes within 15 working days or 90 calendar days following final grading to prevent off-site sedimentation.
5. Minimizing 10-year discharge velocities at discharge points for post construction.

As designed, uncontaminated runoff for post-development conditions at the site will be managed with two proposed detention basins.

Leachate within waste filling areas will be directed into the leachate collection system through a series of perforated underdrain pipes embedded in the stone base of the landfill liner system. Runoff collected in the leachate collection system is discharged to an existing leachate pond located within Landfill No. 6 property limits.

All drainage structures for the proposed development were designed to accommodate runoff from the 25-year/24-hour storm event and all detention basins were designed for the 25-year/24-hour storm event. Stormwater analyses performed for the proposed detention basins indicate the ponds have capacity to decrease peak flows from the 25-year storm events.

Erosion control measures for the expansion are addressed in this plan and in construction documents for the site. The erosion control measures are intended to stabilize surface water drainage ways during construction and to provide temporary and permanent erosion control systems to minimize sediment transport during construction and operations.

The post-development surface water peak velocities were evaluated in applicable areas which are affected by the landfill expansion. Stormwater flows were calculated using a computer modeling system called HydroCAD (Version 10.0) by Applied Microcomputer Systems of Chocorua, New Hampshire. The methods utilized in HydroCAD are based on the Soil Conservations Services (SCS) Technical Release No. 20 (TR20) Methodology for determining runoff peak flow values and flood hydrographs. A 24-hour, Type II storm with antecedent moisture condition (AMC) 2 was used to model the runoff characteristics of the site. Models were created for post-development site conditions using 2-, 10-, and 25-year frequency storm events. The post-development condition consists of the excavation for the landfill base and liner system and fill placement associated with the Area 6D containment dike. A comparison is made between the pre-development and post-development conditions and is located in Section 2.3 of this plan.

1.1 Facility Information

Facility Name:	Landfill No. 6 – Area 6D North
Location:	1155 Incinerator Road, Canton, North Carolina
Property ID#:	8647-76-6665
Latitude:	35°33'5" N
Longitude:	82°52'17" W
Property Owner:	Evergreen Packaging (Evergreen) 175 Main Street P.O. Box 4000 Canton, NC 28716 Contact: Mr. Jim Giauque Telephone: (828) 646-2028

1.2 Project Description

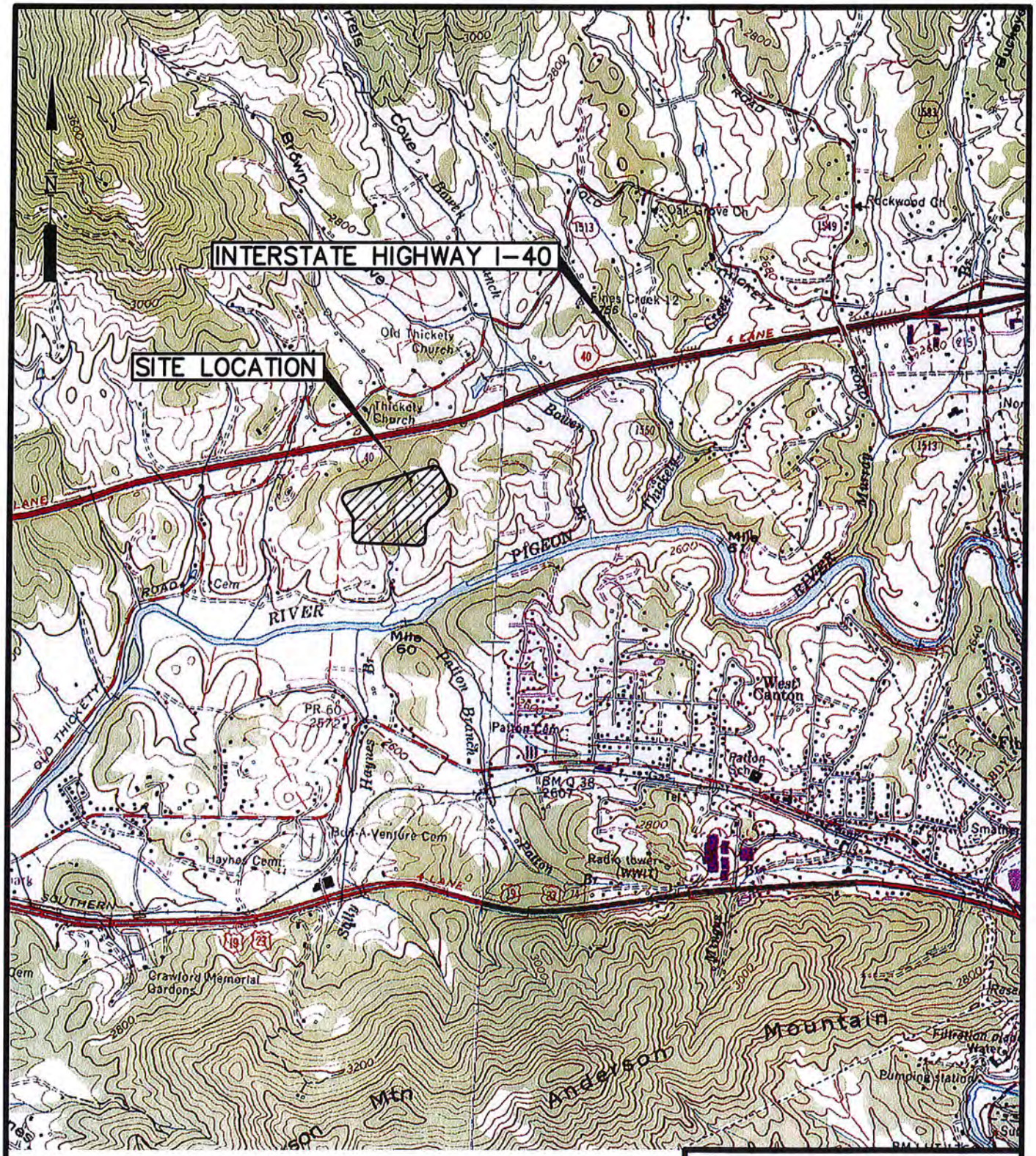
The purpose of this project is to construct an approximately 18 acre landfill expansion located at Evergreen Packaging's Landfill No. 6. The site is located in Haywood County, Canton, North Carolina, and is situated north of and within the watershed of the Pigeon River which is classified as a Class C water body (See Figure 1-1). The project will consist of the excavation of site soils, construction of access roadways, construction of detention basins, placement of landfill liner materials, and installation of a leachate collection system.

1.3 Site Description

The existing topography of the landfill expansion area generally slopes to the north and south at slopes of approximately 2 to 50 percent. Ground cover ranges from wooded areas to the northwest to brush covered meadow and soil covered areas on the remainder of the site. A 12-inch diameter storm drain pipe located beneath the landfill liner is proposed to convey runoff from the north side of Area 6D North to an existing detention basin located to the south of Area 6D South. Surface water drainage flows overland through a series of rock and vegetated drainage ditches, detention basins, culverts, and natural drainage swales before entering into the Pigeon River approximately 700 feet south of Area 6D North.

1.4 Adjacent Properties

Land use near Landfill No. 6 is primarily farmland, residential and undeveloped properties.



BASE MAP ADAPTED FROM THE 7.5-MINUTE USGS CANTON, NC (1990) AND CLYDE (1978) TOPOGRAPHIC QUADRANGLE MAPS.

1000 0 2000 FEET

FIGURE 1-1
SITE LOCATION MAP
ANALYSIS OF LANDFILL LINER SYSTEM
LANDFILL NO. 6 AREA D NORTH
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

SME
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DWG: SITELOC LMN: NONE CTB: SME-STD REV: 7/15/2013

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2.0 WATERSHED STORMWATER FLOWS

2.1 Pre-Development Conditions

For modeling purposes, predevelopment conditions are site conditions as of March 5, 2008 (prior to construction of landfill Area 6D South). The study area for the landfill expansion watershed consists of approximately 85.5 acres in pre-development conditions. Ground cover consists of wooded areas on the northwest portion of the watershed with the remaining areas being a mix of brush/meadow and sand/gravel. Site stormwater flows overland to the south and west to the property line. Stormwater flows eventually contribute to the Pigeon River approximately 700 feet south of Area 6D South. Land use within the study area consists of approximately 28.6 acres of woods cover (HSG B), 4.3 acres of gravel access roads (HSG B), 38.4 acres of brush/grass mix (HSG B), and 0.80 acres of other impervious area (paved parking, roofs, etc). Based on NRCS soils mapping site soils are Evard-Cowee and Hayesville and are classified as hydraulic soil group (HSG) B for the purposes of this analysis. The soils map is included in Appendix A.

The watershed is subdivided into six subcatchments for modeling purposes. Maximum pre-development discharge velocities for the 10-year/24-hour storm event were generated for each subcatchment and analyzed at five analysis points along or within the landfill property boundary and are shown on Drawing D-100, Pre-development Stormwater Management Plan which is included in Appendix B-1.

Subcatchment 1 (SC-1) consists of approximately 37.0 acres in existing conditions and is located west of previously constructed landfill Areas 6A, 6B, 6C, 6F, 6G, and 6H. Vegetated drainage swales within the subcatchment discharge to the south. A spring located within SC-1 is intercepted by a small, previously constructed detention basin (Pond P-1) with 24-inch culvert outlet device. Stormwater is discharged from the basin southerly into a riprap drainage channel (Reach R1) where it eventually crosses the property boundary and enters the Pigeon River.

Subcatchment 2 (SC-2) consists of approximately 24.3 acres and is located to the north of SC-1. This subcatchment is bounded by the westerly property line and contains a portion of

Interstate 40 to the north. Stormwater within SC-2 flows westerly in wooded overland and channelized flow before it crosses the property line. Runoff leaving the property flows through natural drainage ways (Reach R-2) which are tributary to the Pigeon River.

Subcatchment 3 (SC-3) consists of approximately 3.5 acres and is located west of SC-1 and is bounded by the westerly property line. Stormwater within SC-3 flows westerly in wooded overland and channelized flow before it crosses the property line. Runoff leaving the property flows through natural drainage ways (Reach R3) which are tributary to the Pigeon River.

Subcatchment 4 (SC-4) consists of approximately 7.3 acres and is located southwest of SC-1 and is bounded by the westerly property line. Stormwater within SC-4 flows westerly in wooded overland and channelized flow before it crosses the property line. Runoff leaving the property flows through natural drainage ways (Reach R4) which are tributary to the Pigeon River.

Subcatchment 5 (SC-5) consists of approximately 5.3 acres of wooded land and is located northwest of SC-2 and is bounded by the westerly property line. Stormwater within SC-5 flows westerly in wooded overland and channelized flow before it crosses the property line. Runoff leaving the property flows through natural drainage ways (Reach R5) which are tributary to the Pigeon River.

Runoff from an offsite subcatchment (OS1) located north of SC-2 flows through the northwest corner of the landfill property. The offsite subcatchment is approximately 8.1 acres consisting of mostly woods and residential house lots. Runoff from the subcatchment flows under Interstate I-40 within a 36-inch diameter culvert where it combines with flow from Subcatchment 2.

A combined flow of 119.4 cfs was calculated from the 25-year/24-hour duration storm as measured at the Pigeon River Analysis Point. Predevelopment stormwater peak flows for each analysis point are shown in Table 2-1 or Section 2.3. In addition to determining peak flows from each subcatchment, a combined pre-development peak flow was calculated to model the project's contribution to the Pigeon River.

2.2 Post-Development Conditions

In the post-development conditions, SC-1 is divided into four separate areas (1A, 1B, 1C, and 1D) and, as in pre-development conditions, will convey stormwater in a southerly direction. Stormwater within Area D South (16.3 acres) and Area D North (18.2 acres) is collected as leachate and does not contribute to post-development stormwater flows. These landfill areas are identified as SC-1A and SC-1B and have been removed from the post-development stormwater model.

Since a portion of the stormwater runoff is removed as leachate, the study area for the post-development conditions is less than the pre-development conditions (approximately 51.23 acres). The configuration of the individual subcatchments within the area changes due to site development and is divided into ten subcatchments: 1C, 1D, 2A, 2B, 2C, 2D, 3, 4, 5, and OS-1 (an offsite subcatchment located across Interstate 40). The post-development subcatchment areas are shown on Drawing D-101, Post-Development Stormwater Plan. Post-development stormwater analysis print outs are located in Appendix B-2.

Subcatchment SC-1C consists of approximately 2.7 acres and contains a portion of the landfill perimeter road and undisturbed meadow. Stormwater runoff from SC-1C drains southerly into existing Detention Basin 1 (Pond P-1) which also receives upgradient stormwater from existing Detention Basin 2 (Pond P-2). Detention Basin 1 conveys runoff via an existing 24-inch culvert. As in pre-development conditions, stormwater from Detention Basin 1 discharges to the south into a riprap drainage channel (Reach R-1) where it eventually crosses the property boundary and enters the Pigeon River.

Subcatchment SC-1D is located directly north of proposed landfill 6D North and consists of approximately 5.5 acres of gravel roads, meadow, and woods. The subcatchment includes proposed Detention Basin 3 (Pond P-3). The detention basin includes an outlet control structure with a 12-in outlet pipe. The outlet pipe flows underneath the 6D North base liner system and ties into the existing outlet pipe associated with Detention Basin 2. Detention Pond 2 and the associated outlet control structure will continue to function during construction

operations but will be removed prior to landfilling operations begin. Runoff will continue to flow under the 6D South base liner system and discharge into Detention Basin 1.

Detention Basin 3 will attenuate peak flows from upgradient areas during and after landfill construction activities. Detention Basin 3 is located upgradient of the containment berm separating the 6D North landfill and has been adequately sized to accommodate the peak flow without overtopping the earthen containment berm during the 25-year/24-hour storm event.

In the Post-development conditions, subcatchments 2A, 2B, 2C, and 2D contribute to Analysis Point 2.

SC-2A consists of approximately 5.0 acres in post-development conditions. Stormwater within SC-2A flows westerly in wooded overland flow and is routed through Detention Basin 4 (Pond P-4). Detention Basin 4 is designed to detain runoff and allow settling of sediments through an outlet control structure, orifice holes, and a 12-in outlet pipe. The outlet pipe from the detention basin discharges to the west into a series of natural drainage ways (Reach-R2a) which discharge into the Pigeon River.

SC-2B consists of approximately 9.8 acres in post-development conditions. Stormwater within SC-2B flows to a designed drainage channel before it crosses the property line. After leaving the property, stormwater runoff flows through a series of natural drainage ways (Reach R2) which discharge into the Pigeon River.

SC-2C consists of approximately 1.7 acres of undisturbed land in the post-development conditions. As in pre-development conditions, stormwater within SC-2C flows westerly in wooded overland flow before it crosses the property line. After leaving the property, stormwater runoff flows through a series of natural drainage ways (Reach R2C) which discharge into the Pigeon River.

SC-2D consists of approximately 3.7 acres of undisturbed land in the post-development conditions. As in pre-development conditions, stormwater run-on from an offsite subcatchment combines with SC-2D flows and westerly in wooded overland flow before it crosses the property

line. After leaving the property stormwater runoff flows through a series of natural drainage ways (Reach R2D) which discharge into the Pigeon River.

SC-3 consists of approximately 3.6 acres in post-development conditions and includes a portion of the fill slopes resulting from construction of the landfill perimeter road. As in pre-development conditions, Stormwater within SC-3 flows westerly in wooded overland flow before it crosses the property line. After leaving the property stormwater runoff flows through a series of natural drainage ways (Reach R-3) which discharge into the Pigeon River.

Subcatchment SC-4 consists of approximately 5.9 acres in post-development conditions and includes a portion of the landfill perimeter road and associated fill slopes. As in pre-development conditions, stormwater within SC-4 flows westerly in wooded overland flow before it crosses the property line. Once runoff leaves the property it flows through a series of natural drainage ways (Reach R-4) which discharge into the Pigeon River.

Subcatchment 5 (SC-5) consists of approximately 5.3 acres and is undisturbed in the post-development conditions. As in pre-development conditions, stormwater within SC-5 flows westerly in wooded overland flow before it crosses the property line. After leaving the property stormwater runoff flows through a series of natural drainage ways (Reach R-5) which discharge into the Pigeon River.

In addition to determining peak flows from each subcatchment, a combined post-development peak flow was calculated to model the contribution to the Pigeon River.

Post-development stormwater peak flows for each analysis point are shown in Table 2-1 of Section 2.3.

2.3 Comparison of Peak Flows

TABLE 2-1

COMPARISON OF PRE- AND POST-DEVELOPMENT PEAK FLOW
10-YR/24-HOUR STORM EVENT

Analysis Point	Pre-Development Flow (cfs)	Post-Development Flow (cfs)	Difference (cfs)
1 (SC-1)	32.49	7.86	(-) 24.63
2 (SC-2)	66.39	49.35	(-) 17.04
3 (SC-3)	5.50	5.50	0.00
4 (SC-4)	13.32	8.99	(-) 4.33
5 (SC-5)	11.22	11.22	0.00
Pigeon River	83.85	38.03	(-) 45.82

As indicated in Table 2-1, peak runoff rates for post-development conditions at Landfill No. 6 will be less than or equal to those of predevelopment conditions. Therefore, peak velocities in off-site drainage facilities will not increase existing flow rates. This decrease is due to the removal of runoff from open areas of the landfill.

3.0 PERFORMANCE STANDARDS

Permanent erosion and sediment control measures are designed to provide protection from a rainfall event equivalent in magnitude to the 25-year/24-hour storm event (5.2 inches). Temporary erosion and sediment control measures are designed to provide protection from a rainfall event equivalent in magnitude to the 2-year/24-hour storm event (3.5 inches) in an unvegetated state. Performance standards and design calculations for erosion and sediment control are included in Appendix C.

3.1 Culvert Inlet/Outlet Protection

Design of the culvert inlet and outlet protection is based on stormwater flows from the 25-year/24-hour storm event. Outlet protection in the form of riprap aprons is required at several locations within the proposed development. These locations are shown on Drawing D-101, Post-Development Stormwater Management Plan in Appendix B-2. Associated design calculations for inlet/outlet protection are included in Appendix C.

3.2 Drainage Channels

Channel linings were analyzed using North American Green's (NAG) Erosion Control Material Design Software Version 5.0. Flow from a 2-year/24-hour storm event was used to design temporary channel linings and flow from a 25-year/24-hour storm event was used to design permanent channel linings.

Several small drainage ditches located along the proposed landfill perimeter/access roads are located in cut sections. A trapezoidal cross-section with maximum 2 horizontal to 1 vertical (2H:1V) sideslope, minimum 2-foot wide bottom width, and minimum 1.5-foot depth was specified for all ditches. The ditch capacity in each case is greater than the peak flow generated from stormwater runoff while maintaining a minimum of 1-foot freeboard within the ditch. Temporary matting during the unvegetated condition will require NAG's temporary lining S75 (or equal) or permanent lining SC-250 (or equal) prior to a permanent channel lining of vegetation.

The existing 24-inch culvert discharges from Pond P-1 into an existing riprap lined channel which flows to the south towards the Pigeon River. The riprap lined channel is approximately 200 feet long and is sufficiently lined to convey runoff from the 25-year/24-hour storm event and therefore requires no modifications.

Discharge velocities at each respective analysis point were analyzed to ensure channel velocities in proposed conditions are less than or equal to existing conditions channel velocities. The following table shows 10-year/24-hour runoff velocities as modeled for pre- and post-development conditions as measured at Analysis Points 1 through 5 at the landfill property line.

TABLE 3-1

COMPARISON OF PRE- AND POST-DEVELOPMENT RUNOFF VELOCITIES
10-YR/24-HOUR STORM EVENT

Analysis Point	Pre-Development Flow (fps)	Post-Development Flow (fps)	Difference
1 (Pond 1 Discharge)	4.55	2.94	(-) 1.61
2 (SC-2)	3.04	2.57	(-) 0.47
3 (SC-3)	1.70	1.71	(+) 0.01
4 (SC-4)	2.95	2.62	(-) 0.33
5 (SC-5)	1.41	1.41	0.00

With the exception of discharge velocities from SC-3, peak runoff velocities for post-development conditions at Landfill No. 6 will be less than peak velocities in existing conditions. A 0.01 fps increase in velocity was noted at SC-3; however, SME considers this small increase to be de minimis given that the resulting post-development peak velocity is still less than 2 fps.

3.3 Detention Basins

An existing detention basin (Pond P-2) is located in the southeast corner of Area 6D North and will need to be filled to the base grade elevations in preparation of landfilling operations. The outlet control structure will be removed from the detention basin; however, a proposed 12-inch storm drain and a 12-inch underdrain will tie into the existing 12-inch underdrain that currently conveys stormwater underneath the base liner system of Area 6D South. The intent of the underdrain piping is to convey clean surface water from a proposed detention basin (Pond P-3) located in Area E into existing Detention Pond 1 (Pond P-1) located south of Area 6D South.

Stormwater analyses performed for runoff from Area E indicates the Detention Pond 1 has sufficient capacity to detain peak flows from the 25-year storm.

A detention basin (Pond P-3) is proposed in the southwest corner of Area E. The pond is designed with an outlet control structure, orifice holes, a beehive grate spillway, and a 12-inch storm drain outlet pipe. The outlet control structure is designed to detain flows while sediments settle out prior to the discharge of stormwater. The 12-inch underdrain outlet pipe will connect to the existing 12-inch underdrain associated with pond P-2 that conveys flow beneath the Area 6D South liner system.

A detention basin is proposed in the northwest corner of Area E. The pond is designed with an outlet control structure, orifice holes, a beehive grate spillway, and a 12-inch storm drain outlet pipe. The outlet control structure is designed to detain flows while sediments settle out prior to the discharge of stormwater. The 12-inch outlet pipe will discharge to a drainage swale that will be stabilized with a riprap apron located northwest of the landfill.

The detention basins, outlet control structures, and culvert outlets associated with the landfill development for Area 6D North are shown on Drawing D-101, Post-development Stormwater Management Plan. Design drawings, details, and sections for the structures are provided in the engineering drawings. Design calculations are provided in Appendix C of this plan.

3.4 Rock Filters

Rock filters are specified around the culvert inlets and within the ditches tributary to Detention Basin 3 (Pond P-3) to retard velocities reduce the potential for sediment from entering the culvert. The rock filters shall be removed after the site is stabilized as approved by the owner or its representative. The locations and stone size are shown on the engineering drawings.

4.0 PLANNED SEDIMENT AND EROSION CONTROL PRACTICES

Proposed erosion and sedimentation control practices include the following:

1. Construction Sequence Schedule (Practice 6.01) – A construction sequence schedule is included in this plan as Section 5.0.

2. Surface Roughening (Practice 6.03) – To aid in the establishment of vegetative cover, all slopes receiving a vegetative growth media will be tracked with appropriate equipment to create grooves perpendicular to the slope. See Specification Section 329113.00 in Appendix D of the Design Report.

3. Topsoiling (Practice 6.04) – – A vegetative growth media will be added to a depth of four inches in all specified areas. Specifications for topsoil materials are located in Specification Section 310513.00 in Appendix D of the Design Report.

4. Permanent Seeding (Practice 6.11.1) – Permanent seeding will be applied to all areas disturbed by construction. Specifications for Seeding are located in Specification Section 329219.00 in Appendix D of the Design Report.

5. Mulching (Practice 6.14.1) – Mulch will be applied to all seeded areas to limit erosion. See Specification Section 329219.00 in Appendix D of the Design Report.

6. Grass-Lined Channels (Practice 6.30.1). All grass-lined channels will be lined with erosion control blankets until vegetation is stabilized in the channel**.** See Specification Sections 312500.00 in Appendix D of the Design Report for erosion control blanket technical specifications. See Appendix C for drainage channel design calculations.

7. Siltation Fence (Practice 6.62.1). Siltation fence will be installed along the clearing limit lines where siltation is likely to occur. Siltation fence will be

installed in areas noted on the design drawings. See Specification Section 312500.00 in Appendix D of the Design Report for technical specifications.

8. Dust Control (Practice 6.84.1). Should excessive dust become a problem with construction it will be controlled by application of water in a fine spray with a water truck. See Specification Section 312500.00 in Appendix D of the Design Report.

5.0 CONSTRUCTION SCHEDULE

The following construction schedule shall be maintained throughout the project:

1. Obtain plan approval and other applicable permits.

2. Clearly mark limits of work and limits of clearing.

3. Hold pre-construction conference at least one week prior to commencement of construction.

4. Install silt fence as indicated for the perimeter/access roads and landfill expansion areas.

5. Perform clearing and grubbing required for the perimeter/access roads and landfill expansion areas.

6. Perform construction activities for the perimeter/access roads and landfill expansion areas.

7. Install turf reinforcement mat and riprap in ditches, where specified.

8. Remove temporary silt fence upon completion of project and remove other erosion control measures when all areas are stabilized. Estimated time before final stabilization – 9 months from final seeding.

6.0 CONSTRUCTION MAINTENANCE PLAN

The following maintenance will occur at the site in order to minimize the chances for erosion and sediment control issues at the site:

1. All erosion and sediment control practices will be checked for stability and operation following every runoff-producing rainfall but in no case less than once per week. Any required repairs shall be made immediately to maintain all structures as designed.

2. An adequate inventory of sediment and erosion control items (i.e., siltation fence, hay bales, check dam stone, etc.) shall be maintained on-site to perform maintenance sediment and erosion control practices without delay.

3. Sediment will be removed from siltation fence when it becomes one-half foot deep at the fence. Sedimentation fence shall be repaired as necessary to maintain an effective sediment barrier.

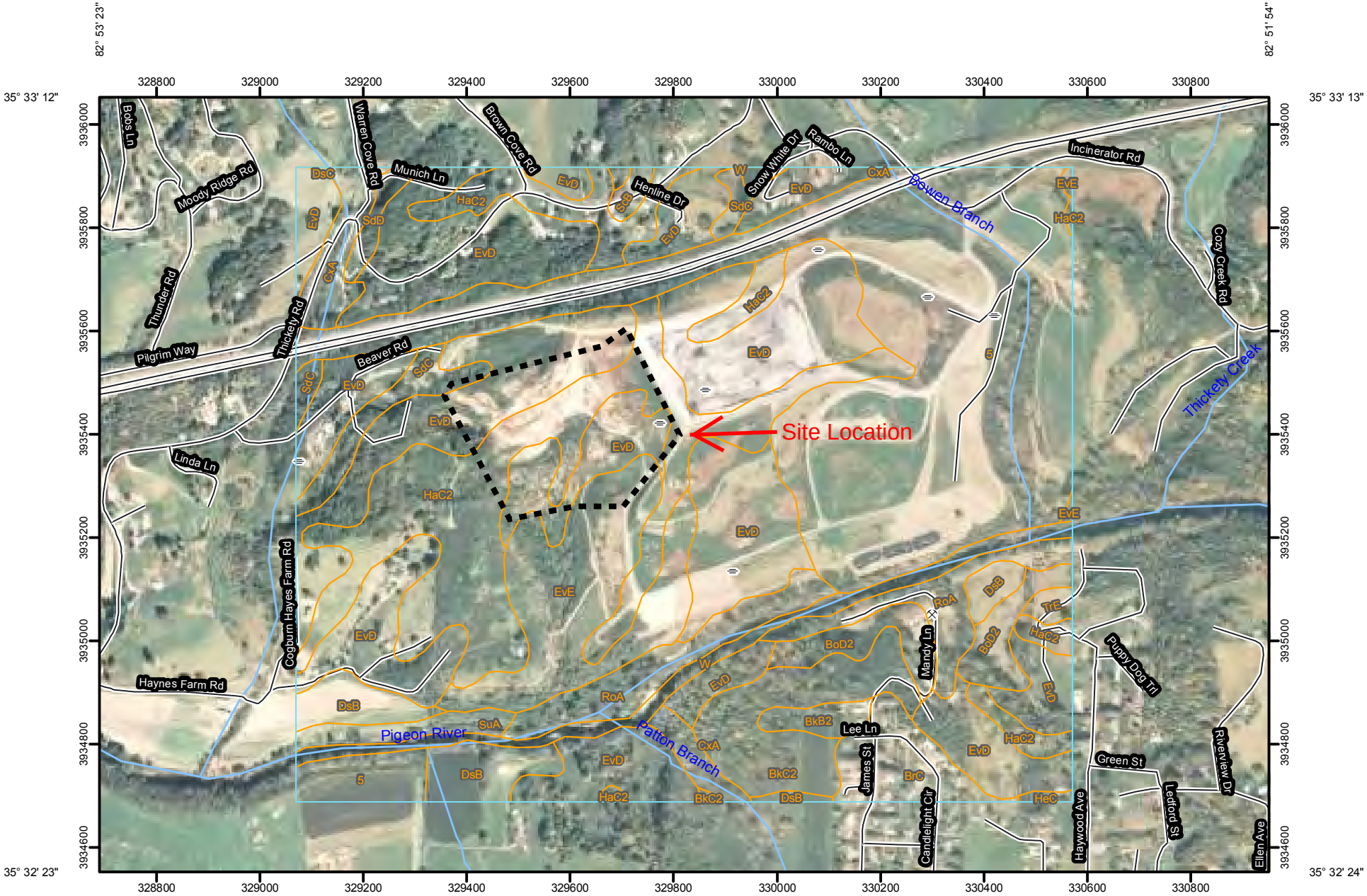
4. Sediments removed from siltation fences and temporary sediment traps will be placed in areas not prone to erosion.

5. All seeded areas will be fertilized, reseeded, and remulched as necessary according to specifications to maintain a vigorous, dense, vegetative growth.

APPENDIX A

SOILS MAP

Soil Map—Haywood County Area, North Carolina
(Landfill No. 6, Canton, North Carolina)



Map Scale: 1:10,700 if printed on A size (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 500 1,000 2,000 3,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Gully

Short Steep Slope

Other

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:10,700 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Haywood County Area, North Carolina
Survey Area Data: Version 11, Jul 16, 2012

Date(s) aerial images were photographed: 9/15/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

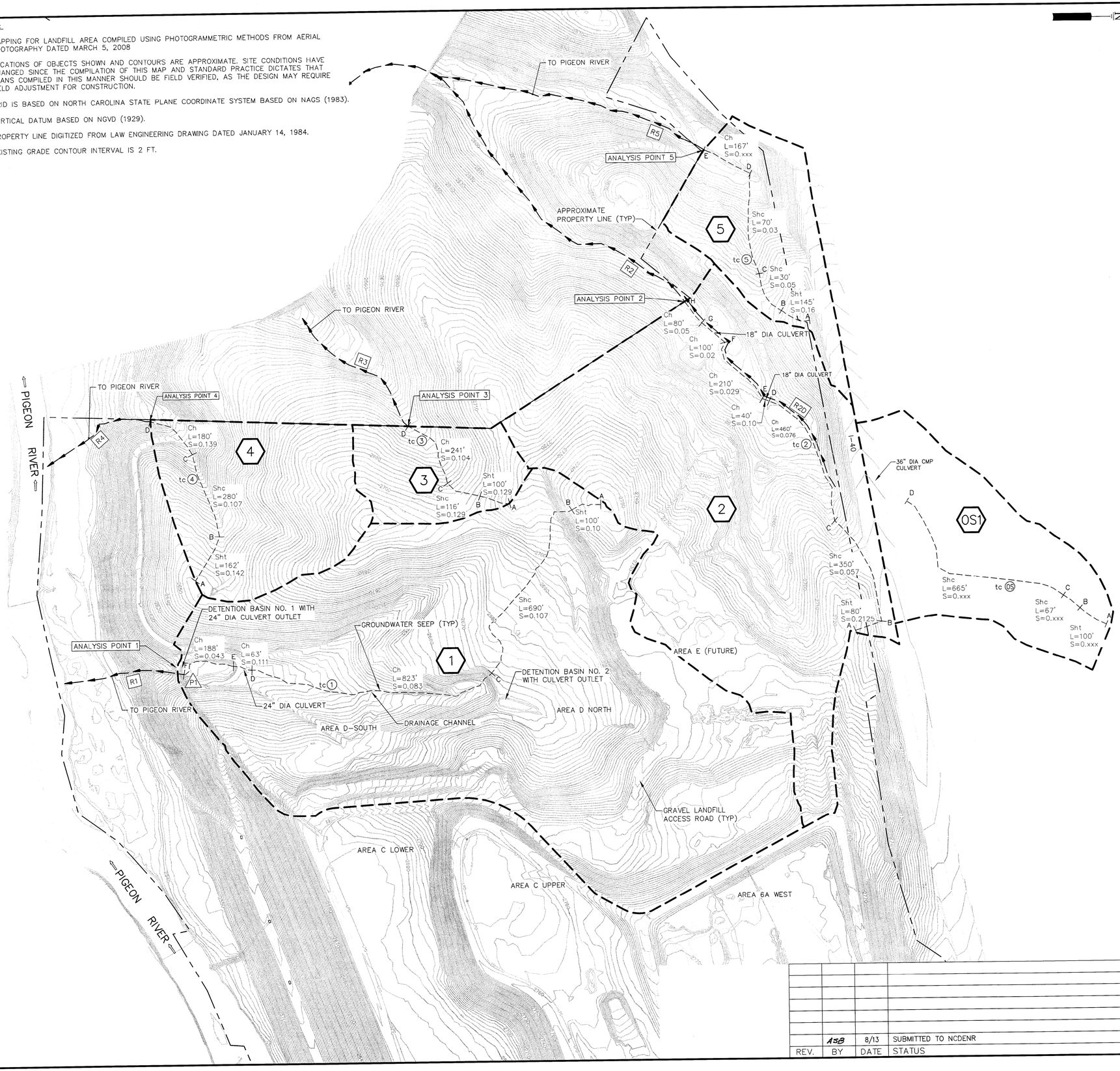
Haywood County Area, North Carolina (NC606)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
5	Udorthents-Urban land complex, 2 to 50 percent slopes	111.7	24.5%
BkB2	Braddock clay loam, 2 to 8 percent slopes, eroded	2.8	0.6%
BkC2	Braddock clay loam, 8 to 15 percent slopes, eroded	16.4	3.6%
BoD2	Braddock clay loam, 15 to 30 percent slopes, eroded, stony	10.5	2.3%
BrC	Braddock-Urban land complex, 2 to 15 percent slopes	9.3	2.0%
CxA	Cullowhee-Nikwasi complex, 0 to 2 percent slopes, frequently flooded	8.7	1.9%
DsB	Dillsboro loam, 2 to 8 percent slopes	13.3	2.9%
DsC	Dillsboro loam, 8 to 15 percent slopes	0.1	0.0%
EvD	Evard-Cowee complex, 15 to 30 percent slopes	144.5	31.7%
EvE	Evard-Cowee complex, 30 to 50 percent slopes	28.5	6.2%
HaC2	Hayesville clay loam, 8 to 15 percent slopes, eroded	63.9	14.0%
HeC	Hayesville-Urban land complex, 2 to 15 percent slopes	0.5	0.1%
RoA	Rosman fine sandy loam, 0 to 2 percent slopes, occasionally flooded	19.0	4.2%
ScB	Saunook loam, 2 to 8 percent slopes	1.3	0.3%
SdC	Saunook loam, 8 to 15 percent slopes, stony	8.3	1.8%
SdD	Saunook loam, 15 to 30 percent slopes, stony	2.2	0.5%
SuA	Statler loam, 0 to 3 percent slopes, rarely flooded	4.1	0.9%
TrE	Trimont gravelly loam, 30 to 50 percent slopes, stony	1.3	0.3%
W	Water	9.6	2.1%
Totals for Area of Interest		**456.1**	**100.0%**

APPENDIX B-1

STORMWATER ANALYSIS – PRE-DEVELOPMENT

NOTES:

1. MAPPING FOR LANDFILL AREA COMPILED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED MARCH 5, 2008
2. LOCATIONS OF OBJECTS SHOWN AND CONTOURS ARE APPROXIMATE. SITE CONDITIONS HAVE CHANGED SINCE THE COMPILATION OF THIS MAP AND STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED, AS THE DESIGN MAY REQUIRE FIELD ADJUSTMENT FOR CONSTRUCTION.
3. GRID IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM BASED ON NAGS (1983).
4. VERTICAL DATUM BASED ON NGVD (1929).
5. PROPERTY LINE DIGITIZED FROM LAW ENGINEERING DRAWING DATED JANUARY 14, 1984.
6. EXISTING GRADE CONTOUR INTERVAL IS 2 FT.



STANDARD STORMWATER MANAGEMENT SYMBOLS

1	SUBCATCHMENT DESIGNATION
	SUBCATCHMENT BOUNDARY
A B C	TIME OF CONCENTRATION SEGMENT DESIGNATION TIME OF CONCENTRATION PATH
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE. (75% TEXT HT)
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Cf	CHANNEL FLOW
	DRAINAGE REACH
R4	REACH DESIGNATION
P9	POND/STRUCTURE DESIGNATION
tc 1	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION

75 0 150 300 FEET

REV.	BY	DATE	STATUS
	ASB	8/13	SUBMITTED TO NCDENR

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER G.M.H. COTE, JR.

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA 6D NORTH DEVELOPMENT
PRE-DEVELOPMENT STORMWATER MANAGEMENT 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: ASB
DRAWN BY: SJM
DATE: 7/17/2013
CHECKED BY:
LMN: SMP-E
CTB: SME-STD

JOB NO. 12121.03 DWG FILE 6DN-E-SMP

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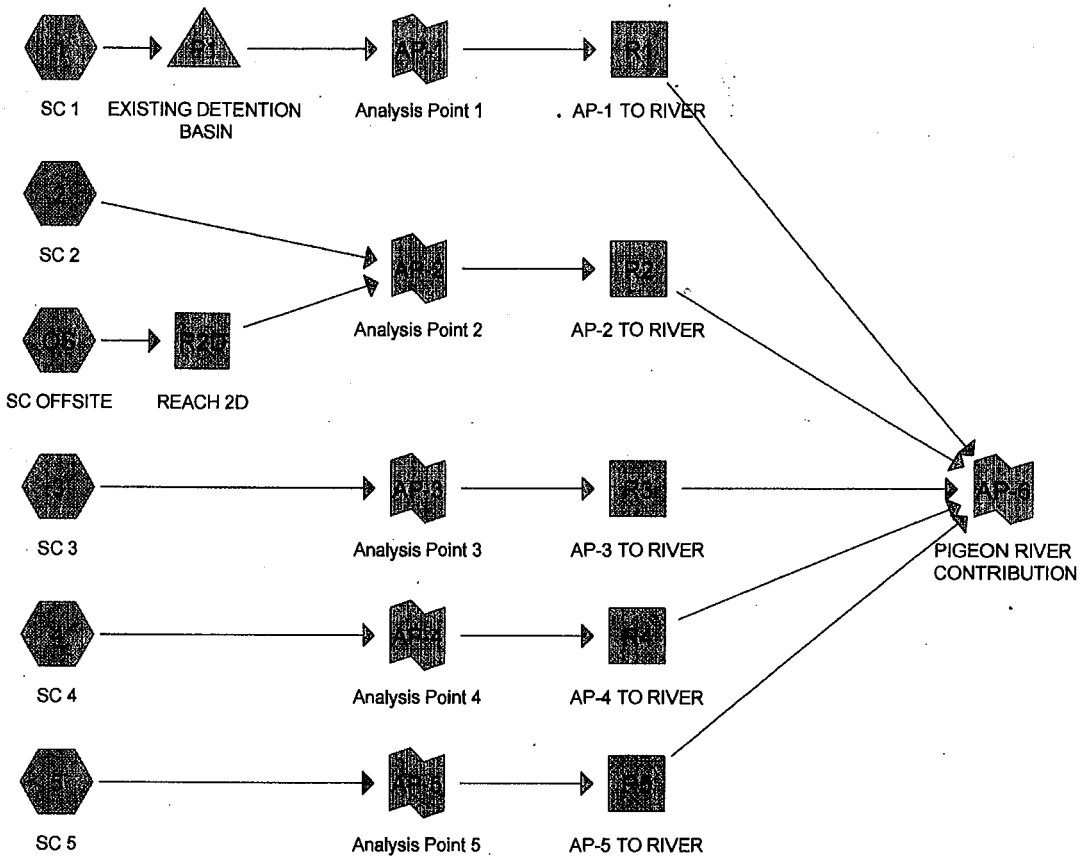


Routing Diagram for PRE-6D North
Prepared by Sevee & Maher Engineers, Inc., Printed 7/25/2013
HydroCAD® 10.00 s/n 01260 © 2012 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.930	70	1/2 acre lots, 25% imp, HSG B (OS)
38.370	67	EX-Brush/Grass mix, Poor, HSG B (1, 2, 3, 4)
4.320	85	EX-Gravel roads, HSG B (1, 2, 4)
0.800	98	EX-Paved parking & roofs (2, 4)
0.070	85	Gravel roads, HSG B (5)
0.060	58	Meadow, non-grazed, HSG B (5)
1.780	98	Paved parking, HSG B (5, OS)
0.020	98	Roofs, HSG B (5)
38.100	55	Woods, Good, HSG B (1, 2, 3, 4, 5, OS)
85.450	**64**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
84.650	HSG B	1, 2, 3, 4, 5, OS
0.000	HSG C	
0.000	HSG D	
0.800	Other	2, 4
85.450		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.930	0.000	0.000	0.000	1.930	1/2 acre lots, 25% imp	OS
0.000	38.370	0.000	0.000	0.000	38.370	EX-Brush/Grass mix, Poor	1, 2, 3, 4
0.000	4.320	0.000	0.000	0.000	4.320	EX-Gravel roads	1, 2, 4
0.000	0.000	0.000	0.000	0.800	0.800	EX-Paved parking & roofs	2, 4
0.000	0.070	0.000	0.000	0.000	0.070	Gravel roads	5
0.000	0.060	0.000	0.000	0.000	0.060	Meadow, non-grazed	5
0.000	1.780	0.000	0.000	0.000	1.780	Paved parking	5, OS
0.000	0.020	0.000	0.000	0.000	0.020	Roofs	5
0.000	38.100	0.000	0.000	0.000	38.100	Woods, Good	1, 2, 3, 4, 5, OS
0.000	**84.650**	**0.000**	**0.000**	**0.800**	**85.450**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1	0.00	0.00	63.0	0.1110	0.025	24.0	0.0	0.0
2	2	0.00	0.00	40.0	0.1000	0.025	18.0	0.0	0.0
3	2	0.00	0.00	100.0	0.0200	0.025	18.0	0.0	0.0
4	OS	0.00	0.00	384.0	0.0730	0.025	36.0	0.0	0.0
5	P1	2,587.00	2,586.00	30.0	0.0333	0.025	24.0	0.0	0.0

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

Subcatchment1: SC 1 Runoff Area=36.990 ac 0.00% Impervious Runoff Depth>0.70"
Flow Length=1,864' Tc=19.4 min CN=64 Runoff=23.98 cfs 2.158 af

Subcatchment2: SC 2 Runoff Area=24.310 ac 3.17% Impervious Runoff Depth>0.70"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=17.56 cfs 1.420 af

Subcatchment3: SC 3 Runoff Area=3.470 ac 0.00% Impervious Runoff Depth>0.41"
Flow Length=457' Tc=11.5 min CN=57 Runoff=1.34 cfs 0.120 af

Subcatchment4: SC 4 Runoff Area=7.290 ac 0.41% Impervious Runoff Depth>0.61"
Flow Length=622' Tc=16.2 min CN=62 Runoff=4.35 cfs 0.372 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth>0.61"
Flow Length=745' Tc=12.0 min CN=62 Runoff=3.76 cfs 0.270 af

SubcatchmentOS: SC OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth>0.70"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=6.87 cfs 0.474 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=0.82' Max Vel=3.87 fps Inflow=19.09 cfs 2.157 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=18.96 cfs 2.151 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=0.92' Max Vel=2.06 fps Inflow=23.26 cfs 1.891 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=12.07 cfs 1.827 af

Reach R2D: REACH 2D Avg. Flow Depth=0.36' Max Vel=3.61 fps Inflow=6.87 cfs 0.474 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=6.19 cfs 0.471 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.17' Max Vel=0.98 fps Inflow=1.34 cfs 0.120 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=0.47 cfs 0.114 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.45' Max Vel=2.08 fps Inflow=4.35 cfs 0.372 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=4.14 cfs 0.370 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.30' Max Vel=0.90 fps Inflow=3.76 cfs 0.270 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=0.98 cfs 0.250 af

Pond P1: EXISTING DETENTION BASIN Peak Elev=2,590.55' Storage=5,355 cf Inflow=23.98 cfs 2.158 af
Primary=19.09 cfs 2.157 af Secondary=0.00 cfs 0.000 af Outflow=19.09 cfs 2.157 af

Link AP-1: Analysis Point 1 Inflow=19.09 cfs 2.157 af
Primary=19.09 cfs 2.157 af

Link AP-2: Analysis Point 2 Inflow=23.26 cfs 1.891 af
Primary=23.26 cfs 1.891 af

Link AP-3: Analysis Point 3 Inflow=1.34 cfs 0.120 af
Primary=1.34 cfs 0.120 af

Link AP-4: Analysis Point 4 Inflow=4.35 cfs 0.372 af
Primary=4.35 cfs 0.372 af

Link AP-5: Analysis Point 5 Inflow=3.76 cfs 0.270 af
Primary=3.76 cfs 0.270 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=24.39 cfs 4.712 af
Primary=24.39 cfs 4.712 af

Total Runoff Area = 85.450 ac Runoff Volume = 4.814 af Average Runoff Depth = 0.68"
96.39% Pervious = 82.368 ac 3.61% Impervious = 3.082 ac

Summary for Subcatchment 1: SC 1

Runoff = 23.98 cfs @ 12.13 hrs, Volume= 2.158 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (ac)	CN	Description
	12.660	55	Woods, Good, HSG B
*	2.560	85	EX-Gravel roads, HSG B
*	21.770	67	EX-Brush/Grass mix, Poor, HSG B
	36.990	64	Weighted Average
	36.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1000	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
7.0	690	0.1070	1.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.2	823	0.0830	11.62	2,324.15	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=10.00' Z= 2.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
0.1	63	0.1110	12.48	39.19	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
0.3	188	0.0430	10.19	4,238.01	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=40.00' D=8.00' Z= 2.0 & 1.0 '/' Top.W=64.00' n= 0.100 Earth, dense brush, high stage
19.4	1,864	Total			

Summary for Subcatchment 2: SC 2

Runoff = 17.56 cfs @ 12.09 hrs, Volume= 1.420 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (ac)	CN	Description
	9.820	55	Woods, Good, HSG B
*	1.620	85	EX-Gravel roads, HSG B
*	12.100	67	EX-Brush/Grass mix, Poor, HSG B
*	0.770	98	EX-Paved parking & roofs
	24.310	64	Weighted Average
	23.540		96.83% Pervious Area
	0.770		3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	80	0.2125	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
4.9	350	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	460	0.0760	4.92	196.97	**Parabolic Channel, C-D** W=30.00' D=2.00' Area=40.0 sf Perim=30.4' n= 0.100 Earth, dense brush, high stage
0.1	40	0.1000	9.77	17.27	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
2.1	210	0.0290	1.68	20.21	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
0.4	100	0.0200	4.37	7.72	**Pipe Channel, F-G** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
0.6	80	0.0500	2.21	26.54	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
16.4	1,320	Total			

Summary for Subcatchment 3: SC 3

Runoff = 1.34 cfs @ 12.05 hrs, Volume= 0.120 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (ac)	CN	Description
	2.840	55	Woods, Good, HSG B
*	0.000	85	EX-Gravel roads, HSG B
*	0.630	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	3.470	57	Weighted Average
	3.470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1290	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	116	0.1290	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.7	241	0.1040	5.79	463.51	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
11.5	457	Total			

Summary for Subcatchment 4: SC 4

Runoff = 4.35 cfs @ 12.09 hrs, Volume= 0.372 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

	Area (ac)	CN	Description
	3.250	55	Woods, Good, HSG B
*	0.140	85	EX-Gravel roads, HSG B
*	3.870	67	EX-Brush/Grass mix, Poor, HSG B
*	0.030	98	EX-Paved parking & roofs
	7.290	62	Weighted Average
	7.260		99.59% Pervious Area
	0.030		0.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 3.76 cfs @ 12.04 hrs, Volume= 0.270 af, Depth> 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: SC OFFSITE

Runoff = 6.87 cfs @ 12.04 hrs, Volume= 0.474 af, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 0.70" for 2-Yr Storm event
Inflow = 19.09 cfs @ 12.23 hrs, Volume= 2.157 af
Outflow = 18.96 cfs @ 12.28 hrs, Volume= 2.151 af, Atten= 1%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.87 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.79 fps, Avg. Travel Time= 3.4 min

Peak Storage= 1,821 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.82'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

Summary for Reach R2: AP-2 TO RIVER

Inflow Area =	32.410 ac,	6.86% Impervious,	Inflow Depth >	0.70"	for 2-Yr Storm event
Inflow =	23.26 cfs @	12.11 hrs,	Volume=	1.891 af	
Outflow =	12.07 cfs @	12.64 hrs,	Volume=	1.827 af,	Atten= 48%, Lag= 31.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.06 fps, Min. Travel Time= 20.6 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 40.2 min

Peak Storage= 14,988 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 279.24 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,550.0' Slope= 0.0380 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,535.00'

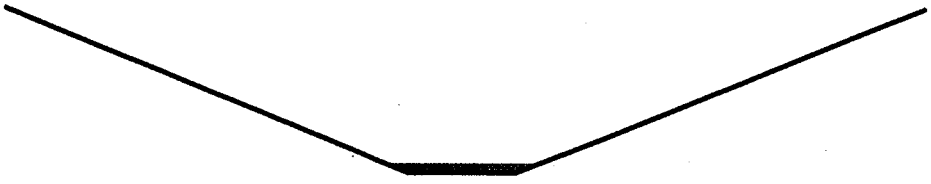
Summary for Reach R2D: REACH 2D

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth >	0.70"	for 2-Yr Storm event
Inflow =	6.87 cfs @	12.04 hrs,	Volume=	0.474 af	
Outflow =	6.19 cfs @	12.14 hrs,	Volume=	0.471 af,	Atten= 10%, Lag= 6.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.61 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 9.2 min

Peak Storage= 1,338 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'



Summary for Reach R3: AP-3 TO RIVER

Inflow Area =	3.470 ac,	0.00% Impervious,	Inflow Depth >	0.41"	for 2-Yr Storm event
Inflow =	1.34 cfs @	12.05 hrs, Volume=	0.120 af		
Outflow =	0.47 cfs @	12.79 hrs, Volume=	0.114 af,	Atten= 65%,	Lag= 44.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.98 fps, Min. Travel Time= 28.9 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 46.0 min

Peak Storage= 818 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area =	7.290 ac,	0.41% Impervious,	Inflow Depth >	0.61"	for 2-Yr Storm event
Inflow =	4.35 cfs @	12.09 hrs, Volume=	0.372 af		
Outflow =	4.14 cfs @	12.18 hrs, Volume=	0.370 af,	Atten= 5%,	Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.08 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 6.4 min

Peak Storage= 699 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth >	0.61" for 2-Yr Storm event
Inflow =	3.76 cfs @	12.04 hrs, Volume=	0.270 af	
Outflow =	0.98 cfs @	13.17 hrs, Volume=	0.250 af,	Atten= 74%, Lag= 67.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 48.3 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 77.1 min

Peak Storage= 2,827 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: EXISTING DETENTION BASIN

Inflow Area =	36.990 ac,	0.00% Impervious,	Inflow Depth >	0.70" for 2-Yr Storm event
Inflow =	23.98 cfs @	12.13 hrs, Volume=	2.158 af	
Outflow =	19.09 cfs @	12.23 hrs, Volume=	2.157 af,	Atten= 20%, Lag= 6.4 min
Primary =	19.09 cfs @	12.23 hrs, Volume=	2.157 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,590.55' @ 12.23 hrs Surf.Area= 3,510 sf Storage= 5,355 cf

Plug-Flow detention time= 2.2 min calculated for 2.152 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (897.2 - 895.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	67,560 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	2,513	3,291	3,685
2,592.00	6,109	8,622	12,307
2,594.00	7,994	14,103	26,410
2,596.00	10,345	18,339	44,749
2,598.00	12,466	22,811	67,560

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=19.02 cfs @ 12.23 hrs HW=2,590.54' (Free Discharge)
└**1=Culvert** (Inlet Controls 19.02 cfs @ 6.05 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link AP-1: Analysis Point 1

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 0.70" for 2-Yr Storm event
Inflow = 19.09 cfs @ 12.23 hrs, Volume= 2.157 af
Primary = 19.09 cfs @ 12.23 hrs, Volume= 2.157 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area = 32.410 ac, 6.86% Impervious, Inflow Depth > 0.70" for 2-Yr Storm event
Inflow = 23.26 cfs @ 12.11 hrs, Volume= 1.891 af
Primary = 23.26 cfs @ 12.11 hrs, Volume= 1.891 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area = 3.470 ac, 0.00% Impervious, Inflow Depth > 0.41" for 2-Yr Storm event
Inflow = 1.34 cfs @ 12.05 hrs, Volume= 0.120 af
Primary = 1.34 cfs @ 12.05 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area = 7.290 ac, 0.41% Impervious, Inflow Depth > 0.61" for 2-Yr Storm event
Inflow = 4.35 cfs @ 12.09 hrs, Volume= 0.372 af
Primary = 4.35 cfs @ 12.09 hrs, Volume= 0.372 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth > 0.61" for 2-Yr Storm event
Inflow = 3.76 cfs @ 12.04 hrs, Volume= 0.270 af
Primary = 3.76 cfs @ 12.04 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area = 85.450 ac, 3.61% Impervious, Inflow Depth > 0.66" for 2-Yr Storm event
Inflow = 24.39 cfs @ 12.50 hrs, Volume= 4.712 af
Primary = 24.39 cfs @ 12.50 hrs, Volume= 4.712 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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

Subcatchment1: SC 1 Runoff Area=36.990 ac 0.00% Impervious Runoff Depth>1.70"
Flow Length=1,864' Tc=19.4 min CN=64 Runoff=67.96 cfs 5.248 af

Subcatchment2: SC 2 Runoff Area=24.310 ac 3.17% Impervious Runoff Depth>1.70"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=49.13 cfs 3.452 af

Subcatchment3: SC 3 Runoff Area=3.470 ac 0.00% Impervious Runoff Depth>1.21"
Flow Length=457' Tc=11.5 min CN=57 Runoff=5.50 cfs 0.350 af

Subcatchment4: SC 4 Runoff Area=7.290 ac 0.41% Impervious Runoff Depth>1.56"
Flow Length=622' Tc=16.2 min CN=62 Runoff=13.32 cfs 0.945 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth>1.56"
Flow Length=745' Tc=12.0 min CN=62 Runoff=11.22 cfs 0.687 af

SubcatchmentOS: SC OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth>1.71"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=18.77 cfs 1.152 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=1.05' Max Vel=4.55 fps Inflow=32.49 cfs 5.245 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=32.46 cfs 5.235 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=1.68' Max Vel=3.04 fps Inflow=66.39 cfs 4.599 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=43.73 cfs 4.502 af

Reach R2D: REACH 2D Avg. Flow Depth=0.64' Max Vel=5.03 fps Inflow=18.77 cfs 1.152 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=17.84 cfs 1.146 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.40' Max Vel=1.70 fps Inflow=5.50 cfs 0.350 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=2.88 cfs 0.340 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.76' Max Vel=2.95 fps Inflow=13.32 cfs 0.945 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=12.81 cfs 0.942 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.60' Max Vel=1.41 fps Inflow=11.22 cfs 0.687 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=4.34 cfs 0.657 af

Pond P1: EXISTING DETENTION BASIN Peak Elev=2,595.40' Storage=38,767 cf Inflow=67.96 cfs 5.248 af
Primary=32.49 cfs 5.245 af Secondary=0.00 cfs 0.000 af Outflow=32.49 cfs 5.245 af

Link AP-1: Analysis Point 1 Inflow=32.49 cfs 5.245 af
Primary=32.49 cfs 5.245 af

Link AP-2: Analysis Point 2 Inflow=66.39 cfs 4.599 af
Primary=66.39 cfs 4.599 af

Link AP-3: Analysis Point 3 Inflow=5.50 cfs 0.350 af
Primary=5.50 cfs 0.350 af

Link AP-4: Analysis Point 4 Inflow=13.32 cfs 0.945 af
Primary=13.32 cfs 0.945 af

Link AP-5: Analysis Point 5 Inflow=11.22 cfs 0.687 af
Primary=11.22 cfs 0.687 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=83.85 cfs 11.676 af
Primary=83.85 cfs 11.676 af

Total Runoff Area = 85.450 ac Runoff Volume = 11.834 af Average Runoff Depth = 1.66"
96.39% Pervious = 82.368 ac 3.61% Impervious = 3.082 ac

Summary for Subcatchment 1: SC 1

Runoff = 67.96 cfs @ 12.11 hrs, Volume= 5.248 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

	Area (ac)	CN	Description
	12.660	55	Woods, Good, HSG B
*	2.560	85	EX-Gravel roads, HSG B
*	21.770	67	EX-Brush/Grass mix, Poor, HSG B
	36.990	64	Weighted Average
	36.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1000	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
7.0	690	0.1070	1.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.2	823	0.0830	11.62	2,324.15	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=10.00' Z= 2.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
0.1	63	0.1110	12.48	39.19	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
0.3	188	0.0430	10.19	4,238.01	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=40.00' D=8.00' Z= 2.0 & 1.0 '/' Top.W=64.00' n= 0.100 Earth, dense brush, high stage
19.4	1,864	Total			

Summary for Subcatchment 2: SC 2

Runoff = 49.13 cfs @ 12.07 hrs, Volume= 3.452 af, Depth> 1.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

	Area (ac)	CN	Description
	9.820	55	Woods, Good, HSG B
*	1.620	85	EX-Gravel roads, HSG B
*	12.100	67	EX-Brush/Grass mix, Poor, HSG B
*	0.770	98	EX-Paved parking & roofs
	24.310	64	Weighted Average
	23.540		96.83% Pervious Area
	0.770		3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	80	0.2125	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
4.9	350	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	460	0.0760	4.92	196.97	**Parabolic Channel, C-D** W=30.00' D=2.00' Area=40.0 sf Perim=30.4' n= 0.100 Earth, dense brush, high stage
0.1	40	0.1000	9.77	17.27	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
2.1	210	0.0290	1.68	20.21	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
0.4	100	0.0200	4.37	7.72	**Pipe Channel, F-G** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
0.6	80	0.0500	2.21	26.54	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
16.4	1,320	Total			

Summary for Subcatchment 3: SC 3

Runoff = 5.50 cfs @ 12.02 hrs, Volume= 0.350 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

	Area (ac)	CN	Description
	2.840	55	Woods, Good, HSG B
*	0.000	85	EX-Gravel roads, HSG B
*	0.630	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	3.470	57	Weighted Average
	3.470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1290	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	116	0.1290	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.7	241	0.1040	5.79	463.51	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
11.5	457	Total			

Summary for Subcatchment 4: SC 4

Runoff = 13.32 cfs @ 12.07 hrs, Volume= 0.945 af, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

	Area (ac)	CN	Description
	3.250	55	Woods, Good, HSG B
*	0.140	85	EX-Gravel roads, HSG B
*	3.870	67	EX-Brush/Grass mix, Poor, HSG B
*	0.030	98	EX-Paved parking & roofs
	7.290	62	Weighted Average
	7.260		99.59% Pervious Area
	0.030		0.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 11.22 cfs @ 12.02 hrs, Volume= 0.687 af, Depth> 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: SC OFFSITE

Runoff = 18.77 cfs @ 12.03 hrs, Volume= 1.152 af, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 1.70" for 10-yr Storm event
Inflow = 32.49 cfs @ 12.33 hrs, Volume= 5.245 af
Outflow = 32.46 cfs @ 12.37 hrs, Volume= 5.235 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.55 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 2.21 fps, Avg. Travel Time= 2.8 min

Peak Storage= 2,643 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.05'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

Summary for Reach R2: AP-2 TO RIVER

Inflow Area =	32.410 ac,	6.86% Impervious,	Inflow Depth >	1.70"	for 10-yr Storm event
Inflow =	66.39 cfs @	12.08 hrs,	Volume=	4.599 af	
Outflow =	43.73 cfs @	12.45 hrs,	Volume=	4.502 af,	Atten= 34%, Lag= 21.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 14.0 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 33.0 min

Peak Storage= 37,057 cf @ 12.21 hrs
Average Depth at Peak Storage= 1.68'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 279.24 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,550.0' Slope= 0.0380 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,535.00'

Summary for Reach R2D: REACH 2D

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth >	1.71"	for 10-yr Storm event
Inflow =	18.77 cfs @	12.03 hrs,	Volume=	1.152 af	
Outflow =	17.84 cfs @	12.10 hrs,	Volume=	1.146 af,	Atten= 5%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.03 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 7.6 min

Peak Storage= 2,766 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'

Summary for Reach R3: AP-3 TO RIVER

Inflow Area =	3.470 ac,	0.00% Impervious,	Inflow Depth >	1.21"	for 10-yr Storm event
Inflow =	5.50 cfs @	12.02 hrs, Volume=		0.350 af	
Outflow =	2.88 cfs @	12.44 hrs, Volume=		0.340 af, Atten= 48%, Lag= 24.9 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.70 fps, Min. Travel Time= 16.6 min
Avg. Velocity = 0.80 fps, Avg. Travel Time= 35.4 min

Peak Storage= 2,912 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area =	7.290 ac,	0.41% Impervious,	Inflow Depth >	1.56"	for 10-yr Storm event
Inflow =	13.32 cfs @	12.07 hrs, Volume=		0.945 af	
Outflow =	12.81 cfs @	12.13 hrs, Volume=		0.942 af, Atten= 4%, Lag= 3.7 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.95 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.13 fps, Avg. Travel Time= 5.1 min

Peak Storage= 1,550 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.76'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth >	1.56" for 10-yr Storm event
Inflow =	11.22 cfs @	12.02 hrs, Volume=	0.687 af	
Outflow =	4.34 cfs @	12.72 hrs, Volume=	0.657 af,	Atten= 61%, Lag= 41.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.41 fps, Min. Travel Time= 30.7 min
Avg. Velocity = 0.70 fps, Avg. Travel Time= 61.8 min

Peak Storage= 8,002 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: EXISTING DETENTION BASIN

Inflow Area =	36.990 ac,	0.00% Impervious,	Inflow Depth >	1.70" for 10-yr Storm event
Inflow =	67.96 cfs @	12.11 hrs, Volume=	5.248 af	
Outflow =	32.49 cfs @	12.33 hrs, Volume=	5.245 af,	Atten= 52%, Lag= 13.5 min
Primary =	32.49 cfs @	12.33 hrs, Volume=	5.245 af	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,595.40' @ 12.33 hrs Surf.Area= 9,641 sf Storage= 38,767 cf

Plug-Flow detention time= 7.8 min calculated for 5.245 af (100% of inflow)
Center-of-Mass det. time= 7.5 min (872.9 - 865.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	67,560 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	2,513	3,291	3,685
2,592.00	6,109	8,622	12,307
2,594.00	7,994	14,103	26,410
2,596.00	10,345	18,339	44,749
2,598.00	12,466	22,811	67,560

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=32.46 cfs @ 12.33 hrs HW=2,595.39' (Free Discharge)
└**1=Culvert** (Inlet Controls 32.46 cfs @ 10.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link AP-1: Analysis Point 1

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 1.70" for 10-yr Storm event
Inflow = 32.49 cfs @ 12.33 hrs, Volume= 5.245 af
Primary = 32.49 cfs @ 12.33 hrs, Volume= 5.245 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area = 32.410 ac, 6.86% Impervious, Inflow Depth > 1.70" for 10-yr Storm event
Inflow = 66.39 cfs @ 12.08 hrs, Volume= 4.599 af
Primary = 66.39 cfs @ 12.08 hrs, Volume= 4.599 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area =	3.470 ac,	0.00% Impervious,	Inflow Depth >	1.21"	for 10-yr Storm event
Inflow =	5.50 cfs @	12.02 hrs, Volume=	0.350 af		
Primary =	5.50 cfs @	12.02 hrs, Volume=	0.350 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area =	7.290 ac,	0.41% Impervious,	Inflow Depth >	1.56"	for 10-yr Storm event
Inflow =	13.32 cfs @	12.07 hrs, Volume=	0.945 af		
Primary =	13.32 cfs @	12.07 hrs, Volume=	0.945 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth >	1.56"	for 10-yr Storm event
Inflow =	11.22 cfs @	12.02 hrs, Volume=	0.687 af		
Primary =	11.22 cfs @	12.02 hrs, Volume=	0.687 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area =	85.450 ac,	3.61% Impervious,	Inflow Depth >	1.64"	for 10-yr Storm event
Inflow =	83.85 cfs @	12.44 hrs, Volume=	11.676 af		
Primary =	83.85 cfs @	12.44 hrs, Volume=	11.676 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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

Subcatchment1: SC 1 Runoff Area=36.990 ac 0.00% Impervious Runoff Depth>2.25"
Flow Length=1,864' Tc=19.4 min CN=64 Runoff=91.84 cfs 6.940 af

Subcatchment2: SC 2 Runoff Area=24.310 ac 3.17% Impervious Runoff Depth>2.25"
Flow Length=1,320' Tc=16.4 min CN=64 Runoff=66.27 cfs 4.566 af

Subcatchment3: SC 3 Runoff Area=3.470 ac 0.00% Impervious Runoff Depth>1.67"
Flow Length=457' Tc=11.5 min CN=57 Runoff=7.94 cfs 0.483 af

Subcatchment4: SC 4 Runoff Area=7.290 ac 0.41% Impervious Runoff Depth>2.08"
Flow Length=622' Tc=16.2 min CN=62 Runoff=18.28 cfs 1.264 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth>2.08"
Flow Length=745' Tc=12.0 min CN=62 Runoff=15.33 cfs 0.919 af

SubcatchmentOS: SC OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth>2.26"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=25.24 cfs 1.523 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=1.53' Max Vel=5.80 fps Inflow=73.72 cfs 6.937 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=68.44 cfs 6.926 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=1.99' Max Vel=3.38 fps Inflow=89.61 cfs 6.083 af
n=0.100 L=2,550.0' S=0.0380 '/' Capacity=279.24 cfs Outflow=62.74 cfs 5.972 af

Reach R2D: REACH 2D Avg. Flow Depth=0.75' Max Vel=5.50 fps Inflow=25.24 cfs 1.523 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=23.98 cfs 1.517 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.50' Max Vel=1.97 fps Inflow=7.94 cfs 0.483 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=4.64 cfs 0.472 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.88' Max Vel=3.25 fps Inflow=18.28 cfs 1.264 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=17.65 cfs 1.261 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.73' Max Vel=1.61 fps Inflow=15.33 cfs 0.919 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=6.65 cfs 0.884 af

Pond P1: EXISTING DETENTION BASIN Peak Elev=2,596.51' Storage=50,117 cf Inflow=91.84 cfs 6.940 af
Primary=34.83 cfs 6.499 af Secondary=38.89 cfs 0.438 af Outflow=73.72 cfs 6.937 af

Link AP-1: Analysis Point 1 Inflow=73.72 cfs 6.937 af
Primary=73.72 cfs 6.937 af

Link AP-2: Analysis Point 2 Inflow=89.61 cfs 6.083 af
Primary=89.61 cfs 6.083 af

Link AP-3: Analysis Point 3 Inflow=7.94 cfs 0.483 af
Primary=7.94 cfs 0.483 af

Link AP-4: Analysis Point 4 Inflow=18.28 cfs 1.264 af
Primary=18.28 cfs 1.264 af

Link AP-5: Analysis Point 5 Inflow=15.33 cfs 0.919 af
Primary=15.33 cfs 0.919 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=128.20 cfs 15.515 af
Primary=128.20 cfs 15.515 af

Total Runoff Area = 85.450 ac Runoff Volume = 15.696 af Average Runoff Depth = 2.20"
96.39% Pervious = 82.368 ac 3.61% Impervious = 3.082 ac

Summary for Subcatchment 1: SC 1

Runoff = 91.84 cfs @ 12.11 hrs, Volume= 6.940 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	12.660	55	Woods, Good, HSG B
*	2.560	85	EX-Gravel roads, HSG B
*	21.770	67	EX-Brush/Grass mix, Poor, HSG B
	36.990	64	Weighted Average
	36.990		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1000	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
7.0	690	0.1070	1.64		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.2	823	0.0830	11.62	2,324.15	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=0.00' D=10.00' Z= 2.0 '/' Top.W=40.00' n= 0.100 Earth, dense brush, high stage
0.1	63	0.1110	12.48	39.19	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.025 Corrugated metal
0.3	188	0.0430	10.19	4,238.01	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=40.00' D=8.00' Z= 2.0 & 1.0 '/' Top.W=64.00' n= 0.100 Earth, dense brush, high stage
19.4	1,864	Total			

Summary for Subcatchment 2: SC 2

Runoff = 66.27 cfs @ 12.07 hrs, Volume= 4.566 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	9.820	55	Woods, Good, HSG B
*	1.620	85	EX-Gravel roads, HSG B
*	12.100	67	EX-Brush/Grass mix, Poor, HSG B
*	0.770	98	EX-Paved parking & roofs
	24.310	64	Weighted Average
	23.540		96.83% Pervious Area
	0.770		3.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	80	0.2125	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
4.9	350	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	460	0.0760	4.92	196.97	**Parabolic Channel, C-D** W=30.00' D=2.00' Area=40.0 sf Perim=30.4' n= 0.100 Earth, dense brush, high stage
0.1	40	0.1000	9.77	17.27	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
2.1	210	0.0290	1.68	20.21	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
0.4	100	0.0200	4.37	7.72	**Pipe Channel, F-G** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
0.6	80	0.0500	2.21	26.54	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Earth, dense brush, high stage
16.4	1,320	Total			

Summary for Subcatchment 3: SC 3

Runoff = 7.94 cfs @ 12.02 hrs, Volume= 0.483 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	2.840	55	Woods, Good, HSG B
*	0.000	85	EX-Gravel roads, HSG B
*	0.630	67	EX-Brush/Grass mix, Poor, HSG B
*	0.000	98	EX-Paved parking & roofs
	3.470	57	Weighted Average
	3.470		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1290	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	116	0.1290	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.7	241	0.1040	5.79	463.51	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
11.5	457	Total			

Summary for Subcatchment 4: SC 4

Runoff = 18.28 cfs @ 12.07 hrs, Volume= 1.264 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

	Area (ac)	CN	Description
	3.250	55	Woods, Good, HSG B
*	0.140	85	EX-Gravel roads, HSG B
*	3.870	67	EX-Brush/Grass mix, Poor, HSG B
*	0.030	98	EX-Paved parking & roofs
	7.290	62	Weighted Average
	7.260		99.59% Pervious Area
	0.030		0.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 15.33 cfs @ 12.02 hrs, Volume= 0.919 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: SC OFFSITE

Runoff = 25.24 cfs @ 12.02 hrs, Volume= 1.523 af, Depth> 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 2.25" for 25-Yr Storm event
Inflow = 73.72 cfs @ 12.22 hrs, Volume= 6.937 af
Outflow = 68.44 cfs @ 12.27 hrs, Volume= 6.926 af, Atten= 7%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.80 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.36 fps, Avg. Travel Time= 2.6 min

Peak Storage= 4,651 cf @ 12.25 hrs
Average Depth at Peak Storage= 1.53'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

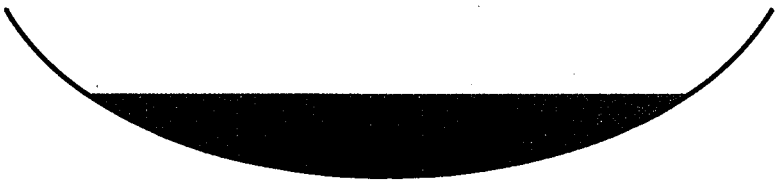
Summary for Reach R2: AP-2 TO RIVER

Inflow Area =	32.410 ac,	6.86% Impervious,	Inflow Depth >	2.25"	for 25-Yr Storm event
Inflow =	89.61 cfs @	12.08 hrs, Volume=	6.083 af		
Outflow =	62.74 cfs @	12.40 hrs, Volume=	5.972 af,	Atten= 30%,	Lag= 19.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.38 fps, Min. Travel Time= 12.6 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 31.2 min

Peak Storage= 47,596 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.99'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 279.24 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,550.0' Slope= 0.0380 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,535.00'



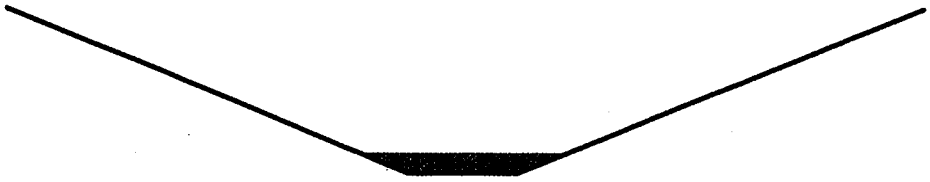
Summary for Reach R2D: REACH 2D

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth >	2.26"	for 25-Yr Storm event
Inflow =	25.24 cfs @	12.02 hrs, Volume=	1.523 af		
Outflow =	23.98 cfs @	12.09 hrs, Volume=	1.517 af,	Atten= 5%,	Lag= 4.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.50 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 7.0 min

Peak Storage= 3,422 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'



Summary for Reach R3: AP-3 TO RIVER

Inflow Area =	3.470 ac,	0.00% Impervious,	Inflow Depth >	1.67"	for 25-Yr Storm event
Inflow =	7.94 cfs @	12.02 hrs, Volume=	0.483 af		
Outflow =	4.64 cfs @	12.38 hrs, Volume=	0.472 af,	Atten= 42%,	Lag= 21.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.97 fps, Min. Travel Time= 14.4 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 32.9 min

Peak Storage= 4,043 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area =	7.290 ac,	0.41% Impervious,	Inflow Depth >	2.08"	for 25-Yr Storm event
Inflow =	18.28 cfs @	12.07 hrs, Volume=	1.264 af		
Outflow =	17.65 cfs @	12.12 hrs, Volume=	1.261 af,	Atten= 3%,	Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.25 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 4.8 min

Peak Storage= 1,937 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.88'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth >	2.08"	for 25-Yr Storm event
Inflow =	15.33 cfs @	12.02 hrs,	Volume=	0.919 af	
Outflow =	6.65 cfs @	12.63 hrs,	Volume=	0.884 af,	Atten= 57%, Lag= 36.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 26.9 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 58.5 min

Peak Storage= 10,754 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: EXISTING DETENTION BASIN

Inflow Area =	36.990 ac,	0.00% Impervious,	Inflow Depth >	2.25"	for 25-Yr Storm event
Inflow =	91.84 cfs @	12.11 hrs,	Volume=	6.940 af	
Outflow =	73.72 cfs @	12.22 hrs,	Volume=	6.937 af,	Atten= 20%, Lag= 7.0 min
Primary =	34.83 cfs @	12.22 hrs,	Volume=	6.499 af	
Secondary =	38.89 cfs @	12.22 hrs,	Volume=	0.438 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,596.51' @ 12.22 hrs Surf.Area= 10,881 sf Storage= 50,117 cf

Plug-Flow detention time= 8.7 min calculated for 6.922 af (100% of inflow)
Center-of-Mass det. time= 8.4 min (865.5 - 857.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	67,560 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	2,513	3,291	3,685
2,592.00	6,109	8,622	12,307
2,594.00	7,994	14,103	26,410
2,596.00	10,345	18,339	44,749
2,598.00	12,466	22,811	67,560

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=34.70 cfs @ 12.22 hrs HW=2,596.44' (Free Discharge)
└**1=Culvert** (Inlet Controls 34.70 cfs @ 11.04 fps)

Secondary OutFlow Max=34.16 cfs @ 12.22 hrs HW=2,596.44' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 34.16 cfs @ 1.72 fps)

Summary for Link AP-1: Analysis Point 1

Inflow Area = 36.990 ac, 0.00% Impervious, Inflow Depth > 2.25" for 25-Yr Storm event
Inflow = 73.72 cfs @ 12.22 hrs, Volume= 6.937 af
Primary = 73.72 cfs @ 12.22 hrs, Volume= 6.937 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area = 32.410 ac, 6.86% Impervious, Inflow Depth > 2.25" for 25-Yr Storm event
Inflow = 89.61 cfs @ 12.08 hrs, Volume= 6.083 af
Primary = 89.61 cfs @ 12.08 hrs, Volume= 6.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area = 3.470 ac, 0.00% Impervious, Inflow Depth > 1.67" for 25-Yr Storm event
Inflow = 7.94 cfs @ 12.02 hrs, Volume= 0.483 af
Primary = 7.94 cfs @ 12.02 hrs, Volume= 0.483 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area = 7.290 ac, 0.41% Impervious, Inflow Depth > 2.08" for 25-Yr Storm event
Inflow = 18.28 cfs @ 12.07 hrs, Volume= 1.264 af
Primary = 18.28 cfs @ 12.07 hrs, Volume= 1.264 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth > 2.08" for 25-Yr Storm event
Inflow = 15.33 cfs @ 12.02 hrs, Volume= 0.919 af
Primary = 15.33 cfs @ 12.02 hrs, Volume= 0.919 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area = 85.450 ac, 3.61% Impervious, Inflow Depth > 2.18" for 25-Yr Storm event
Inflow = 128.20 cfs @ 12.31 hrs, Volume= 15.515 af
Primary = 128.20 cfs @ 12.31 hrs, Volume= 15.515 af, Atten= 0%, Lag= 0.0 min

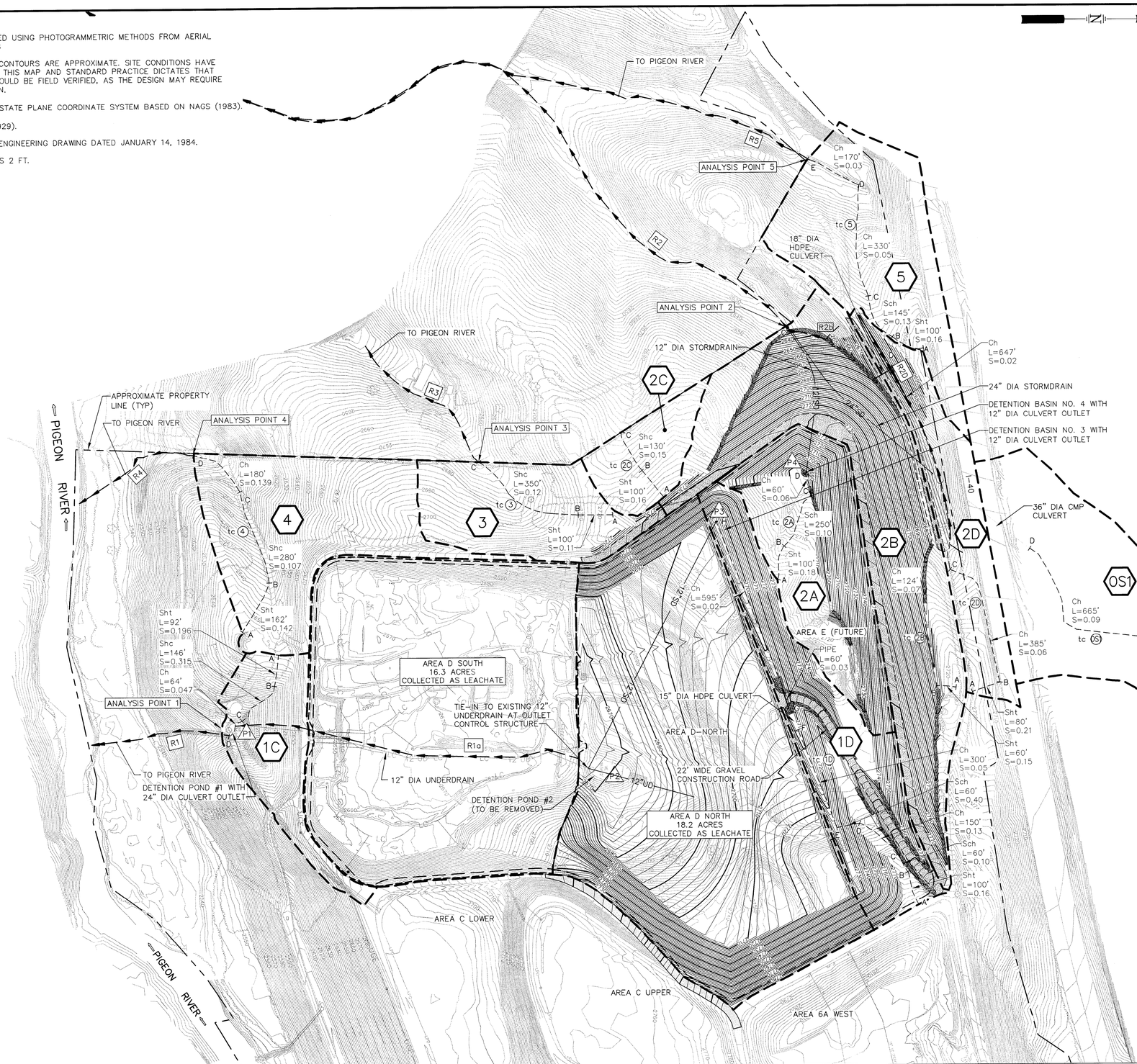
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

APPENDIX B-2

STORMWATER ANALYSIS – POST-DEVELOPMENT

NOTES:

1. MAPPING FOR LANDFILL AREA COMPILED USING PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY DATED MARCH 5, 2008
2. LOCATIONS OF OBJECTS SHOWN AND CONTOURS ARE APPROXIMATE. SITE CONDITIONS HAVE CHANGED SINCE THE COMPILATION OF THIS MAP AND STANDARD PRACTICE DICTATES THAT PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED, AS THE DESIGN MAY REQUIRE FIELD ADJUSTMENT FOR CONSTRUCTION.
3. GRID IS BASED ON NORTH CAROLINA STATE PLANE COORDINATE SYSTEM BASED ON NAGS (1983).
4. VERTICAL DATUM BASED ON NGVD (1929).
5. PROPERTY LINE DIGITIZED FROM LAW ENGINEERING DRAWING DATED JANUARY 14, 1984.
6. EXISTING GRADE CONTOUR INTERVAL IS 2 FT.



STANDARD STORMWATER MANAGEMENT SYMBOLS

1	SUBCATCHMENT DESIGNATION
	SUBCATCHMENT BOUNDARY
A — B — C	TIME OF CONCENTRATION SEGMENT DESIGNATION TIME OF CONCENTRATION PATH
Sht L=50' S=0.005	TIME OF CONCENTRATION TYPE, LENGTH AND SLOPE. (75% TEXT HT)
Sht	SHEET FLOW
Shc	SHALLOW CONCENTRATED FLOW
Cf	CHANNEL FLOW
	DRAINAGE REACH
R4	REACH DESIGNATION
P3	POND/STRUCTURE DESIGNATION
tc 1	TIME OF CONCENTRATION WITH SUBCATCHMENT DESIGNATION

75 0 150 300 FEET

REV.	BY	DATE	STATUS
	ASB	8/13	SUBMITTED TO NCDENR

NORTH CAROLINA PROFESSIONAL SEAL 037702 ENGINEER GUY H. COTE, JR.

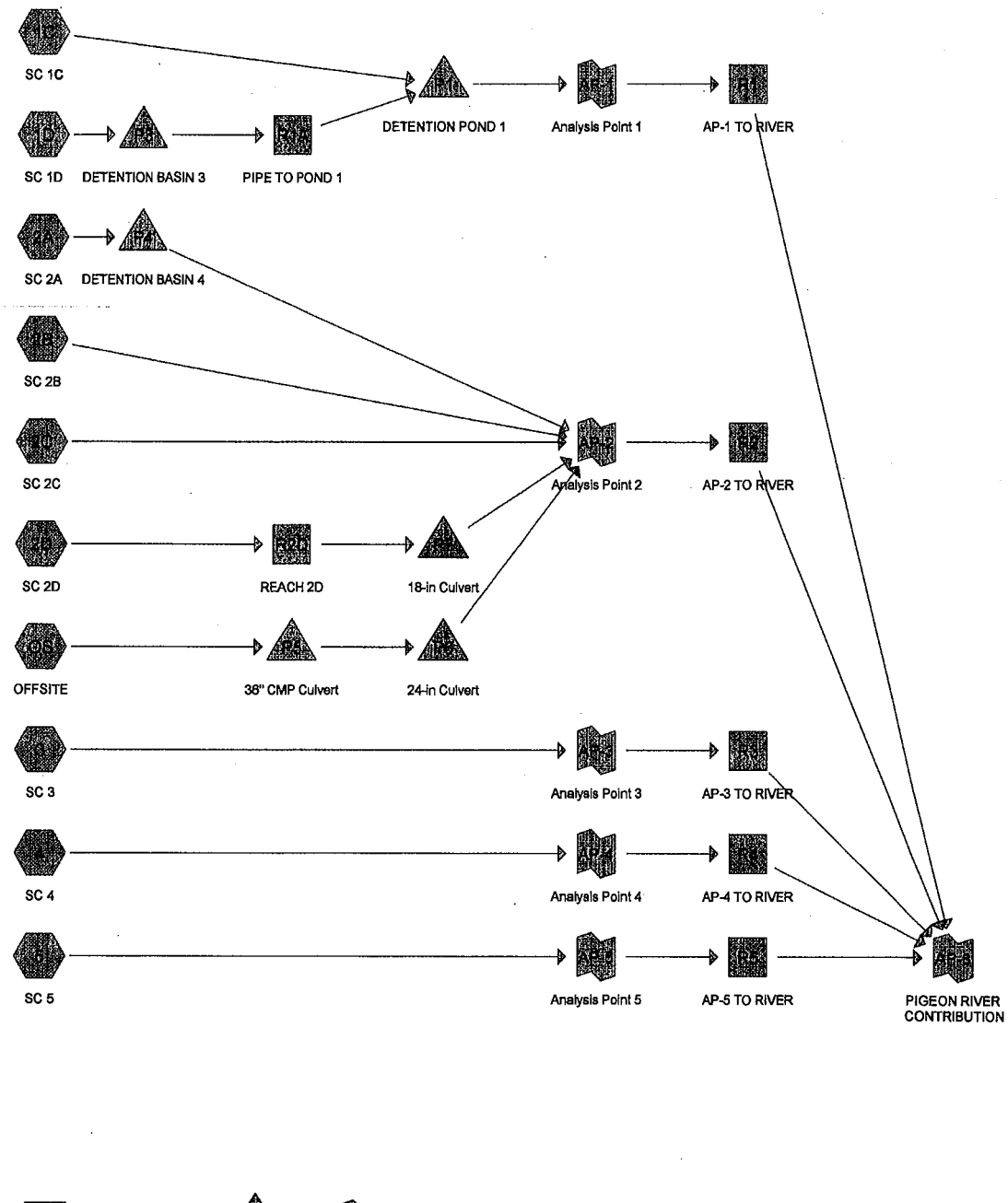
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA 6D NORTH DEVELOPMENT
POST DEVELOPMENT STORMWATER MANAGEMENT PLAN

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: ASB
DRAWN BY: SJM
DATE: 7/17/2013
CHECKED BY:
LMN: SMP-P
CTB: SME-STD

JOB NO. 12121.03 DWG FILE 6DN-BASE

D-101



Routing Diagram for POST-6D North
Prepared by Sevee & Maher Engineers, Inc., Printed 7/26/2013
HydroCAD® 10.00 s/n 01260 © 2012 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.930	70	1/2 acre lots, 25% imp, HSG B (OS)
3.310	85	Gravel roads, HSG B (1C, 1D, 2B, 2D, 3, 4, 5)
21.730	58	Meadow, non-grazed, HSG B (1C, 1D, 2A, 2B, 2C, 2D, 3, 4, 5)
2.540	98	Paved parking, HSG B (2D, 5, OS)
0.020	98	Roofs, HSG B (5)
21.700	55	Woods, Good, HSG B (1D, 2A, 2B, 2C, 2D, 3, 4, 5, OS)
51.230	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
51.230	HSG B	1C, 1D, 2A, 2B, 2C, 2D, 3, 4, 5, OS
0.000	HSG C	
0.000	HSG D	
0.000	Other	
51.230		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.930	0.000	0.000	0.000	1.930	1/2 acre lots, 25% imp	OS
0.000	3.310	0.000	0.000	0.000	3.310	Gravel roads	1C, 1D, 2B, 2D, 3, 4, 5
0.000	21.730	0.000	0.000	0.000	21.730	Meadow, non-grazed	1C, 1D, 2A, 2B, 2C, 2D, 3, 4, 5
0.000	2.540	0.000	0.000	0.000	2.540	Paved parking	2D, 5, OS
0.000	0.020	0.000	0.000	0.000	0.020	Roofs	5
0.000	21.700	0.000	0.000	0.000	21.700	Woods, Good	1D, 2A, 2B, 2C, 2D, 3, 4, 5, OS
0.000	**51.230**	**0.000**	**0.000**	**0.000**	**51.230**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1D	0.00	0.00	60.0	0.0330	0.012	15.0	0.0	0.0
2	OS	0.00	0.00	384.0	0.0730	0.025	36.0	0.0	0.0
3	R1A	2,655.00	2,587.00	1,010.0	0.0673	0.013	12.0	0.0	0.0
4	P1	2,587.00	2,586.00	30.0	0.0333	0.025	24.0	0.0	0.0
5	P3	2,689.00	2,655.00	806.0	0.0422	0.012	12.0	0.0	0.0
6	P4	2,682.30	2,634.00	425.0	0.1136	0.012	12.0	0.0	0.0
7	P5	2,680.00	2,655.83	356.0	0.0679	0.025	36.0	0.0	0.0
8	P6	2,656.60	2,633.50	586.0	0.0394	0.012	20.8	0.0	0.0
9	P7	2,669.00	2,668.50	60.0	0.0083	0.012	18.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1C: SC 1C Runoff Area=2.650 ac 0.00% Impervious Runoff Depth=0.62"
Flow Length=302' Tc=8.4 min CN=62 Runoff=2.23 cfs 0.136 af

Subcatchment1D: SC 1D Runoff Area=5.540 ac 0.00% Impervious Runoff Depth=0.53"
Flow Length=1,325' Tc=9.1 min CN=60 Runoff=3.65 cfs 0.245 af

Subcatchment2A: SC 2A Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=0.42"
Flow Length=410' Tc=11.2 min CN=57 Runoff=1.98 cfs 0.175 af

Subcatchment2B: SC 2B Runoff Area=9.800 ac 0.00% Impervious Runoff Depth=0.62"
Flow Length=1,300' Tc=8.7 min CN=62 Runoff=8.15 cfs 0.503 af

Subcatchment2C: SC 2C Runoff Area=1.650 ac 0.00% Impervious Runoff Depth=0.35"
Flow Length=230' Tc=10.0 min CN=55 Runoff=0.48 cfs 0.048 af

Subcatchment2D: SC 2D Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=0.85"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=4.27 cfs 0.259 af

Subcatchment3: SC 3 Runoff Area=3.560 ac 0.00% Impervious Runoff Depth=0.42"
Flow Length=370' Tc=12.1 min CN=57 Runoff=1.34 cfs 0.123 af

Subcatchment4: SC 4 Runoff Area=5.930 ac 0.00% Impervious Runoff Depth=0.49"
Flow Length=622' Tc=16.2 min CN=59 Runoff=2.48 cfs 0.243 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth=0.62"
Flow Length=745' Tc=12.0 min CN=62 Runoff=3.76 cfs 0.271 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=0.71"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=6.87 cfs 0.476 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=0.33' Max Vel=2.13 fps Inflow=2.79 cfs 0.381 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=2.65 cfs 0.381 af

Reach R1A: PIPE TO POND 1 Avg. Flow Depth=0.27' Max Vel=8.63 fps Inflow=1.49 cfs 0.246 af
12.0" Round Pipe n=0.013 L=1,010.0' S=0.0673 '/' Capacity=9.24 cfs Outflow=1.48 cfs 0.246 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=0.72' Max Vel=1.69 fps Inflow=15.89 cfs 1.449 af
n=0.100 L=2,900.0' S=0.0352 '/' Capacity=268.52 cfs Outflow=6.83 cfs 1.449 af

Reach R2D: REACH 2D Avg. Flow Depth=0.27' Max Vel=3.07 fps Inflow=4.27 cfs 0.259 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=3.67 cfs 0.259 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.18' Max Vel=0.99 fps Inflow=1.34 cfs 0.123 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=0.48 cfs 0.123 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.34' Max Vel=1.75 fps Inflow=2.48 cfs 0.243 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=2.31 cfs 0.243 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.30' Max Vel=0.90 fps Inflow=3.76 cfs 0.271 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=0.98 cfs 0.271 af

Pond P1: DETENTION POND 1 Peak Elev=2,587.79' Storage=251 cf Inflow=2.90 cfs 0.381 af
Primary=2.79 cfs 0.381 af Secondary=0.00 cfs 0.000 af Outflow=2.79 cfs 0.381 af

Pond P3: DETENTION BASIN 3 Peak Elev=2,692.24' Storage=1,485 cf Inflow=3.65 cfs 0.245 af
Primary=1.49 cfs 0.246 af Secondary=0.00 cfs 0.000 af Outflow=1.49 cfs 0.246 af

Pond P4: DETENTION BASIN 4 Peak Elev=2,687.03' Storage=1,389 cf Inflow=1.98 cfs 0.175 af
Outflow=0.55 cfs 0.164 af

Pond P5: 36" CMP Culvert Peak Elev=2,681.06' Storage=1,273 cf Inflow=6.87 cfs 0.476 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=6.23 cfs 0.476 af

Pond P6: 24-in Culvert Peak Elev=2,657.96' Inflow=6.23 cfs 0.476 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=6.23 cfs 0.476 af

Pond P7: 18-in Culvert Peak Elev=2,670.06' Inflow=3.67 cfs 0.259 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=3.67 cfs 0.259 af

Link AP-1: Analysis Point 1 Inflow=2.79 cfs 0.381 af
Primary=2.79 cfs 0.381 af

Link AP-2: Analysis Point 2 Inflow=15.89 cfs 1.449 af
Primary=15.89 cfs 1.449 af

Link AP-3: Analysis Point 3 Inflow=1.34 cfs 0.123 af
Primary=1.34 cfs 0.123 af

Link AP-4: Analysis Point 4 Inflow=2.48 cfs 0.243 af
Primary=2.48 cfs 0.243 af

Link AP-5: Analysis Point 5 Inflow=3.76 cfs 0.271 af
Primary=3.76 cfs 0.271 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=9.29 cfs 2.468 af
Primary=9.29 cfs 2.468 af

Total Runoff Area = 51.230 ac Runoff Volume = 2.479 af Average Runoff Depth = 0.58"
94.06% Pervious = 48.187 ac 5.94% Impervious = 3.042 ac

Summary for Subcatchment 1C: SC 1C

Runoff = 2.23 cfs @ 12.00 hrs, Volume= 0.136 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.370	85	Gravel roads, HSG B
2.280	58	Meadow, non-grazed, HSG B
2.650	62	Weighted Average
2.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	92	0.1960	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	146	0.3150	3.93		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	64	0.0470	10.53	4,718.88	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=40.00' D=8.00' Z= 2.0 '/' Top.W=72.00' n= 0.100 Earth, dense brush, high stage
8.4	302	Total			

Summary for Subcatchment 1D: SC 1D

Runoff = 3.65 cfs @ 12.01 hrs, Volume= 0.245 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.390	85	Gravel roads, HSG B
4.990	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
5.540	60	Weighted Average
5.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
0.1	60	0.0330	10.36	12.71	**Pipe Channel, F-G** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PE, smooth interior
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.1	1,325	Total			

Summary for Subcatchment 2A: SC 2A

Runoff = 1.98 cfs @ 12.05 hrs, Volume= 0.175 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
3.240	58	Meadow, non-grazed, HSG B
5.060	57	Weighted Average
5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B: SC 2B

Runoff = 8.15 cfs @ 12.00 hrs, Volume= 0.503 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
2.100	55	Woods, Good, HSG B
6.160	58	Meadow, non-grazed, HSG B
1.540	85	Gravel roads, HSG B
9.800	62	Weighted Average
9.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	60	0.1500	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	1,240	0.0700	7.86	19.64	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 2.5 '/' Top.W=5.00' n= 0.030 Earth, grassed & winding
8.7	1,300	Total			

Summary for Subcatchment 2C: SC 2C

Runoff = 0.48 cfs @ 12.04 hrs, Volume= 0.048 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.490	55	Woods, Good, HSG B
0.160	58	Meadow, non-grazed, HSG B
1.650	55	Weighted Average
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	130	0.1500	1.94		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.0	230	Total			

Summary for Subcatchment 2D: SC 2D

Runoff = 4.27 cfs @ 12.01 hrs, Volume= 0.259 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3: SC 3

Runoff = 1.34 cfs @ 12.06 hrs, Volume= 0.123 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
2.230	55	Woods, Good, HSG B
0.180	85	Gravel roads, HSG B
1.150	58	Meadow, non-grazed, HSG B
3.560	57	Weighted Average
3.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.4	270	0.1400	1.87		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
12.1	370	Total			

Summary for Subcatchment 4: SC 4

Runoff = 2.48 cfs @ 12.10 hrs, Volume= 0.243 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
2.780	55	Woods, Good, HSG B
0.500	85	Gravel roads, HSG B
2.650	58	Meadow, non-grazed, HSG B
5.930	59	Weighted Average
5.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 3.76 cfs @ 12.04 hrs, Volume= 0.271 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 6.87 cfs @ 12.04 hrs, Volume= 0.476 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 8.190 ac, 0.00% Impervious, Inflow Depth = 0.56" for 2-Yr Storm event
Inflow = 2.79 cfs @ 12.05 hrs, Volume= 0.381 af
Outflow = 2.65 cfs @ 12.15 hrs, Volume= 0.381 af, Atten= 5%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.13 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.02 fps, Avg. Travel Time= 6.1 min

Peak Storage= 463 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

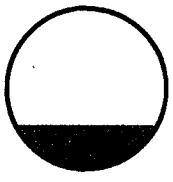
Summary for Reach R1A: PIPE TO POND 1

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 0.53" for 2-Yr Storm event
Inflow = 1.49 cfs @ 12.16 hrs, Volume= 0.246 af
Outflow = 1.48 cfs @ 12.22 hrs, Volume= 0.246 af, Atten= 0%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.63 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 4.38 fps, Avg. Travel Time= 3.8 min

Peak Storage= 173 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.24 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 1,010.0' Slope= 0.0673 '/'
Inlet Invert= 2,655.00', Outlet Invert= 2,587.00'



Summary for Reach R2: AP-2 TO RIVER

Inflow Area = 28.260 ac, 7.83% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 15.89 cfs @ 12.05 hrs, Volume= 1.449 af
Outflow = 6.83 cfs @ 12.78 hrs, Volume= 1.449 af, Atten= 57%, Lag= 43.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.69 fps, Min. Travel Time= 28.7 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 93.3 min

Peak Storage= 11,796 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.72'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 268.52 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,900.0' Slope= 0.0352 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,530.00'

Summary for Reach R2D: REACH 2D

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 0.85" for 2-Yr Storm event
Inflow = 4.27 cfs @ 12.01 hrs, Volume= 0.259 af
Outflow = 3.67 cfs @ 12.13 hrs, Volume= 0.259 af, Atten= 14%, Lag= 7.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.07 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 10.0 min

Peak Storage= 956 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'

Summary for Reach R3: AP-3 TO RIVER

Inflow Area = 3.560 ac, 0.00% Impervious, Inflow Depth = 0.42" for 2-Yr Storm event
Inflow = 1.34 cfs @ 12.06 hrs, Volume= 0.123 af
Outflow = 0.48 cfs @ 12.80 hrs, Volume= 0.123 af, Atten= 64%, Lag= 44.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.99 fps, Min. Travel Time= 28.7 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 54.9 min

Peak Storage= 834 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area = 5.930 ac, 0.00% Impervious, Inflow Depth = 0.49" for 2-Yr Storm event
Inflow = 2.48 cfs @ 12.10 hrs, Volume= 0.243 af
Outflow = 2.31 cfs @ 12.21 hrs, Volume= 0.243 af, Atten= 7%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.76 fps, Avg. Travel Time= 7.7 min

Peak Storage= 467 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 3.76 cfs @ 12.04 hrs, Volume= 0.271 af
Outflow = 0.98 cfs @ 13.17 hrs, Volume= 0.271 af, Atten= 74%, Lag= 67.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.90 fps, Min. Travel Time= 48.3 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 120.2 min

Peak Storage= 2,827 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: DETENTION POND 1

Inflow Area =	8.190 ac,	0.00% Impervious,	Inflow Depth =	0.56"	for 2-Yr Storm event
Inflow =	2.90 cfs @	12.02 hrs,	Volume=	0.381 af	
Outflow =	2.79 cfs @	12.05 hrs,	Volume=	0.381 af,	Atten= 4%, Lag= 2.1 min
Primary =	2.79 cfs @	12.05 hrs,	Volume=	0.381 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,587.79' @ 12.05 hrs Surf.Area= 621 sf Storage= 251 cf

Plug-Flow detention time= 1.5 min calculated for 0.381 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (914.1 - 912.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	21,176 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	1,822	2,600	2,994
2,592.00	2,492	4,314	7,308
2,594.00	3,333	5,825	13,133
2,596.00	4,710	8,043	21,176

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.77 cfs @ 12.05 hrs HW=2,587.79' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.77 cfs @ 2.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P3: DETENTION BASIN 3

Inflow Area =	5.540 ac,	0.00% Impervious,	Inflow Depth =	0.53"	for 2-Yr Storm event
Inflow =	3.65 cfs @	12.01 hrs,	Volume=	0.245 af	
Outflow =	1.49 cfs @	12.16 hrs,	Volume=	0.246 af,	Atten= 59%, Lag= 8.9 min
Primary =	1.49 cfs @	12.16 hrs,	Volume=	0.246 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,692.24' @ 12.16 hrs Surf.Area= 1,442 sf Storage= 1,485 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 7.3 min (915.8 - 908.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,690.00'	22,965 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,690.00	0	0	0
2,692.00	1,170	1,170	1,170
2,694.00	3,420	4,590	5,760
2,696.00	6,210	9,630	15,390
2,697.00	7,400	6,805	22,195
2,697.10	8,000	770	22,965

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,694.00'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,697.00'	**20.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.48 cfs @ 12.16 hrs HW=2,692.24' (Free Discharge)
└─**1=Culvert** (Passes 1.48 cfs of 6.26 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 1.48 cfs @ 5.67 fps)
  └─**3=Top Overflow** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,690.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: DETENTION BASIN 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	0.42"	for 2-Yr Storm event
Inflow =	1.98 cfs @	12.05 hrs, Volume=	0.175 af		
Outflow =	0.55 cfs @	12.41 hrs, Volume=	0.164 af,	Atten= 72%,	Lag= 22.1 min
Primary =	0.55 cfs @	12.41 hrs, Volume=	0.164 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,687.03' @ 12.41 hrs Surf.Area= 1,223 sf Storage= 1,389 cf

Plug-Flow detention time= 67.2 min calculated for 0.164 af (93% of inflow)
Center-of-Mass det. time= 34.7 min (962.4 - 927.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,684.00'	21,000 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,684.00	0	0	0
2,686.00	500	500	500
2,688.00	1,900	2,400	2,900
2,690.00	4,700	6,600	9,500
2,692.00	6,800	11,500	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,682.30'	**12.0" Round Culvert** L= 425.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,682.30' / 2,634.00' S= 0.1136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,686.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,690.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 12.41 hrs HW=2,687.03' (Free Discharge)
└─**1=Culvert** (Passes 0.55 cfs of 6.14 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.55 cfs @ 3.56 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth =	0.71"	for 2-Yr Storm event
Inflow =	6.87 cfs @	12.04 hrs, Volume=	0.476 af		
Outflow =	6.23 cfs @	12.09 hrs, Volume=	0.476 af,	Atten= 9%,	Lag= 2.7 min
Primary =	6.23 cfs @	12.09 hrs, Volume=	0.476 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,681.06' @ 12.09 hrs Surf.Area= 1,787 sf Storage= 1,273 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 6.9 min calculated for 0.476 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (899.5 - 892.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=6.12 cfs @ 12.09 hrs HW=2,681.05' (Free Discharge)
└**1=Culvert** (Inlet Controls 6.12 cfs @ 2.76 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth =	0.71"	for 2-Yr Storm event
Inflow =	6.23 cfs @	12.09 hrs, Volume=	0.476 af		
Outflow =	6.23 cfs @	12.09 hrs, Volume=	0.476 af,	Atten= 0%,	Lag= 0.0 min
Primary =	6.23 cfs @	12.09 hrs, Volume=	0.476 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,657.96' @ 12.09 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=6.13 cfs @ 12.09 hrs HW=2,657.95' (Free Discharge)
└**1=Culvert** (Inlet Controls 6.13 cfs @ 3.12 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area =	3.650 ac,	20.82% Impervious,	Inflow Depth =	0.85"	for 2-Yr Storm event
Inflow =	3.67 cfs @	12.13 hrs, Volume=	0.259 af		
Outflow =	3.67 cfs @	12.13 hrs, Volume=	0.259 af,	Atten= 0%,	Lag= 0.0 min
Primary =	3.67 cfs @	12.13 hrs, Volume=	0.259 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,670.06' @ 12.13 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.60 cfs @ 12.13 hrs HW=2,670.04' (Free Discharge)
└─**1=Culvert** (Inlet Controls 3.60 cfs @ 2.74 fps)

Summary for Link AP-1: Analysis Point 1

Inflow Area = 8.190 ac, 0.00% Impervious, Inflow Depth = 0.56" for 2-Yr Storm event
Inflow = 2.79 cfs @ 12.05 hrs, Volume= 0.381 af
Primary = 2.79 cfs @ 12.05 hrs, Volume= 0.381 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area = 28.260 ac, 7.83% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 15.89 cfs @ 12.05 hrs, Volume= 1.449 af
Primary = 15.89 cfs @ 12.05 hrs, Volume= 1.449 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area = 3.560 ac, 0.00% Impervious, Inflow Depth = 0.42" for 2-Yr Storm event
Inflow = 1.34 cfs @ 12.06 hrs, Volume= 0.123 af
Primary = 1.34 cfs @ 12.06 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area = 5.930 ac, 0.00% Impervious, Inflow Depth = 0.49" for 2-Yr Storm event
Inflow = 2.48 cfs @ 12.10 hrs, Volume= 0.243 af
Primary = 2.48 cfs @ 12.10 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 3.76 cfs @ 12.04 hrs, Volume= 0.271 af
Primary = 3.76 cfs @ 12.04 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area =	51.230 ac,	5.94% Impervious,	Inflow Depth =	0.58"	for 2-Yr Storm event
Inflow =	9.29 cfs @	12.79 hrs, Volume=	2.468 af		
Primary =	9.29 cfs @	12.79 hrs, Volume=	2.468 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1C: SC 1C Runoff Area=2.650 ac 0.00% Impervious Runoff Depth=1.56"
Flow Length=302' Tc=8.4 min CN=62 Runoff=6.47 cfs 0.345 af

Subcatchment1D: SC 1D Runoff Area=5.540 ac 0.00% Impervious Runoff Depth=1.42"
Flow Length=1,325' Tc=9.1 min CN=60 Runoff=11.81 cfs 0.655 af

Subcatchment2A: SC 2A Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=410' Tc=11.2 min CN=57 Runoff=8.13 cfs 0.511 af

Subcatchment2B: SC 2B Runoff Area=9.800 ac 0.00% Impervious Runoff Depth=1.56"
Flow Length=1,300' Tc=8.7 min CN=62 Runoff=23.69 cfs 1.277 af

Subcatchment2C: SC 2C Runoff Area=1.650 ac 0.00% Impervious Runoff Depth=1.08"
Flow Length=230' Tc=10.0 min CN=55 Runoff=2.41 cfs 0.149 af

Subcatchment2D: SC 2D Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=1.94"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=10.47 cfs 0.591 af

Subcatchment3: SC 3 Runoff Area=3.560 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=370' Tc=12.1 min CN=57 Runoff=5.50 cfs 0.360 af

Subcatchment4: SC 4 Runoff Area=5.930 ac 0.00% Impervious Runoff Depth=1.35"
Flow Length=622' Tc=16.2 min CN=59 Runoff=8.99 cfs 0.667 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth=1.56"
Flow Length=745' Tc=12.0 min CN=62 Runoff=11.22 cfs 0.689 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=1.71"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=18.77 cfs 1.156 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=0.54' Max Vel=2.94 fps Inflow=7.86 cfs 1.000 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=7.53 cfs 1.000 af

Reach R1A: PIPE TO POND 1 Avg. Flow Depth=0.54' Max Vel=12.12 fps Inflow=5.35 cfs 0.655 af
12.0" Round Pipe n=0.013 L=1,010.0' S=0.0673 '/' Capacity=9.24 cfs Outflow=4.89 cfs 0.655 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=1.37' Max Vel=2.57 fps Inflow=49.35 cfs 3.672 af
n=0.100 L=2,900.0' S=0.0352 '/' Capacity=268.52 cfs Outflow=27.37 cfs 3.672 af

Reach R2D: REACH 2D Avg. Flow Depth=0.46' Max Vel=4.17 fps Inflow=10.47 cfs 0.591 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=9.77 cfs 0.591 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.41' Max Vel=1.71 fps Inflow=5.50 cfs 0.360 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=2.94 cfs 0.360 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.63' Max Vel=2.62 fps Inflow=8.99 cfs 0.667 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=8.68 cfs 0.667 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.60' Max Vel=1.41 fps Inflow=11.22 cfs 0.689 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=4.34 cfs 0.689 af

Pond P1: DETENTION POND 1 Peak Elev=2,588.45' Storage=793 cf Inflow=8.26 cfs 1.000 af
Primary=7.86 cfs 1.000 af Secondary=0.00 cfs 0.000 af Outflow=7.86 cfs 1.000 af

Pond P3: DETENTION BASIN 3 Peak Elev=2,694.28' Storage=6,782 cf Inflow=11.81 cfs 0.655 af
Primary=5.35 cfs 0.655 af Secondary=0.00 cfs 0.000 af Outflow=5.35 cfs 0.655 af

Pond P4: DETENTION BASIN 4 Peak Elev=2,689.13' Storage=5,950 cf Inflow=8.13 cfs 0.511 af
Outflow=1.91 cfs 0.500 af

Pond P5: 36" CMP Culvert Peak Elev=2,681.89' Storage=3,122 cf Inflow=18.77 cfs 1.156 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=17.31 cfs 1.156 af

Pond P6: 24-in Culvert Peak Elev=2,661.18' Inflow=17.31 cfs 1.156 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=17.31 cfs 1.156 af

Pond P7: 18-in Culvert Peak Elev=2,671.86' Inflow=9.77 cfs 0.591 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=9.77 cfs 0.591 af

Link AP-1: Analysis Point 1 Inflow=7.86 cfs 1.000 af
Primary=7.86 cfs 1.000 af

Link AP-2: Analysis Point 2 Inflow=49.35 cfs 3.672 af
Primary=49.35 cfs 3.672 af

Link AP-3: Analysis Point 3 Inflow=5.50 cfs 0.360 af
Primary=5.50 cfs 0.360 af

Link AP-4: Analysis Point 4 Inflow=8.99 cfs 0.667 af
Primary=8.99 cfs 0.667 af

Link AP-5: Analysis Point 5 Inflow=11.22 cfs 0.689 af
Primary=11.22 cfs 0.689 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=38.03 cfs 6.388 af
Primary=38.03 cfs 6.388 af

Total Runoff Area = 51.230 ac Runoff Volume = 6.400 af Average Runoff Depth = 1.50"
94.06% Pervious = 48.187 ac 5.94% Impervious = 3.042 ac

Summary for Subcatchment 1C: SC 1C

Runoff = 6.47 cfs @ 11.98 hrs, Volume= 0.345 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.370	85	Gravel roads, HSG B
2.280	58	Meadow, non-grazed, HSG B
2.650	62	Weighted Average
2.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	92	0.1960	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	146	0.3150	3.93		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	64	0.0470	10.53	4,718.88	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=40.00' D=8.00' Z= 2.0 '/' Top.W=72.00' n= 0.100 Earth, dense brush, high stage
8.4	302	Total			

Summary for Subcatchment 1D: SC 1D

Runoff = 11.81 cfs @ 11.99 hrs, Volume= 0.655 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.390	85	Gravel roads, HSG B
4.990	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
5.540	60	Weighted Average
5.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
0.1	60	0.0330	10.36	12.71	**Pipe Channel, F-G** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PE, smooth interior
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.1	1,325	Total			

Summary for Subcatchment 2A: SC 2A

Runoff = 8.13 cfs @ 12.02 hrs, Volume= 0.511 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
3.240	58	Meadow, non-grazed, HSG B
5.060	57	Weighted Average
5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B: SC 2B

Runoff = 23.69 cfs @ 11.99 hrs, Volume= 1.277 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
2.100	55	Woods, Good, HSG B
6.160	58	Meadow, non-grazed, HSG B
1.540	85	Gravel roads, HSG B
9.800	62	Weighted Average
9.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	60	0.1500	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	1,240	0.0700	7.86	19.64	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 2.5 '/' Top.W=5.00' n= 0.030 Earth, grassed & winding
8.7	1,300	Total			

Summary for Subcatchment 2C: SC 2C

Runoff = 2.41 cfs @ 12.01 hrs, Volume= 0.149 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.490	55	Woods, Good, HSG B
0.160	58	Meadow, non-grazed, HSG B
1.650	55	Weighted Average
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	130	0.1500	1.94		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.0	230	Total			

Summary for Subcatchment 2D: SC 2D

Runoff = 10.47 cfs @ 12.00 hrs, Volume= 0.591 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3: SC 3

Runoff = 5.50 cfs @ 12.03 hrs, Volume= 0.360 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
2.230	55	Woods, Good, HSG B
0.180	85	Gravel roads, HSG B
1.150	58	Meadow, non-grazed, HSG B
3.560	57	Weighted Average
3.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.4	270	0.1400	1.87		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
12.1	370	Total			

Summary for Subcatchment 4: SC 4

Runoff = 8.99 cfs @ 12.08 hrs, Volume= 0.667 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
2.780	55	Woods, Good, HSG B
0.500	85	Gravel roads, HSG B
2.650	58	Meadow, non-grazed, HSG B
5.930	59	Weighted Average
5.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 11.22 cfs @ 12.02 hrs, Volume= 0.689 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 18.77 cfs @ 12.03 hrs, Volume= 1.156 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 8.190 ac, 0.00% Impervious, Inflow Depth = 1.47" for 10-yr Storm event
Inflow = 7.86 cfs @ 12.02 hrs, Volume= 1.000 af
Outflow = 7.53 cfs @ 12.10 hrs, Volume= 1.000 af, Atten= 4%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 4.8 min

Peak Storage= 967 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

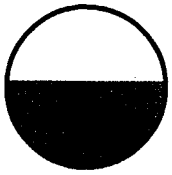
Summary for Reach R1A: PIPE TO POND 1

Inflow Area =	5.540 ac,	0.00% Impervious,	Inflow Depth =	1.42"	for 10-yr Storm event
Inflow =	5.35 cfs @	12.12 hrs, Volume=	0.655 af		
Outflow =	4.89 cfs @	12.18 hrs, Volume=	0.655 af,	Atten= 9%,	Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.12 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 5.61 fps, Avg. Travel Time= 3.0 min

Peak Storage= 435 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.24 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 1,010.0' Slope= 0.0673 '/'
Inlet Invert= 2,655.00', Outlet Invert= 2,587.00'



Summary for Reach R2: AP-2 TO RIVER

Inflow Area =	28.260 ac,	7.83% Impervious,	Inflow Depth =	1.56"	for 10-yr Storm event
Inflow =	49.35 cfs @	12.02 hrs, Volume=	3.672 af		
Outflow =	27.37 cfs @	12.50 hrs, Volume=	3.672 af,	Atten= 45%,	Lag= 28.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.57 fps, Min. Travel Time= 18.8 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 79.0 min

Peak Storage= 31,085 cf @ 12.19 hrs
Average Depth at Peak Storage= 1.37'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 268.52 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,900.0' Slope= 0.0352 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,530.00'

Summary for Reach R2D: REACH 2D

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 1.94" for 10-yr Storm event
Inflow = 10.47 cfs @ 12.00 hrs, Volume= 0.591 af
Outflow = 9.77 cfs @ 12.09 hrs, Volume= 0.591 af, Atten= 7%, Lag= 5.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.17 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 9.2 min

Peak Storage= 1,807 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'

Summary for Reach R3: AP-3 TO RIVER

Inflow Area = 3.560 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-yr Storm event
Inflow = 5.50 cfs @ 12.03 hrs, Volume= 0.360 af
Outflow = 2.94 cfs @ 12.45 hrs, Volume= 0.360 af, Atten= 47%, Lag= 24.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.71 fps, Min. Travel Time= 16.6 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 45.2 min

Peak Storage= 2,954 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area =	5.930 ac,	0.00% Impervious,	Inflow Depth =	1.35"	for 10-yr Storm event
Inflow =	8.99 cfs @	12.08 hrs, Volume=	0.667 af		
Outflow =	8.68 cfs @	12.15 hrs, Volume=	0.667 af,	Atten= 4%,	Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.62 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 6.0 min

Peak Storage= 1,179 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth =	1.56"	for 10-yr Storm event
Inflow =	11.22 cfs @	12.02 hrs, Volume=	0.689 af		
Outflow =	4.34 cfs @	12.72 hrs, Volume=	0.689 af,	Atten= 61%,	Lag= 41.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.41 fps, Min. Travel Time= 30.7 min
Avg. Velocity = 0.42 fps, Avg. Travel Time= 104.1 min

Peak Storage= 8,002 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: DETENTION POND 1

Inflow Area =	8.190 ac,	0.00% Impervious,	Inflow Depth =	1.47"	for 10-yr Storm event
Inflow =	8.26 cfs @	11.99 hrs, Volume=	1.000 af		
Outflow =	7.86 cfs @	12.02 hrs, Volume=	1.000 af,	Atten= 5%,	Lag= 1.8 min
Primary =	7.86 cfs @	12.02 hrs, Volume=	1.000 af		
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,588.45' @ 12.02 hrs Surf.Area= 1,011 sf Storage= 793 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.5 min (885.2 - 883.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	21,176 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	1,822	2,600	2,994
2,592.00	2,492	4,314	7,308
2,594.00	3,333	5,825	13,133
2,596.00	4,710	8,043	21,176

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.67 cfs @ 12.02 hrs HW=2,588.42' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.67 cfs @ 3.21 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P3: DETENTION BASIN 3

Inflow Area =	5.540 ac,	0.00% Impervious,	Inflow Depth =	1.42"	for 10-yr Storm event
Inflow =	11.81 cfs @	11.99 hrs,	Volume=	0.655 af	
Outflow =	5.35 cfs @	12.12 hrs,	Volume=	0.655 af,	Atten= 55%, Lag= 7.8 min
Primary =	5.35 cfs @	12.12 hrs,	Volume=	0.655 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,694.28' @ 12.12 hrs Surf.Area= 3,814 sf Storage= 6,782 cf

Plug-Flow detention time= 19.9 min calculated for 0.654 af (100% of inflow)
Center-of-Mass det. time= 19.6 min (890.3 - 870.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,690.00'	22,965 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,690.00	0	0	0
2,692.00	1,170	1,170	1,170
2,694.00	3,420	4,590	5,760
2,696.00	6,210	9,630	15,390
2,697.00	7,400	6,805	22,195
2,697.10	8,000	770	22,965

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,694.00'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,697.00'	**20.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.05 cfs @ 12.12 hrs HW=2,694.26' (Free Discharge)
└─**1=Culvert** (Passes 5.05 cfs of 8.12 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 2.34 cfs @ 8.94 fps)
  └─**3=Top Overflow** (Weir Controls 2.71 cfs @ 1.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,690.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: DETENTION BASIN 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	1.21"	for 10-yr Storm event
Inflow =	8.13 cfs @	12.02 hrs,	Volume=	0.511 af	
Outflow =	1.91 cfs @	12.32 hrs,	Volume=	0.500 af,	Atten= 76%, Lag= 17.9 min
Primary =	1.91 cfs @	12.32 hrs,	Volume=	0.500 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,689.13' @ 12.32 hrs Surf.Area= 3,486 sf Storage= 5,950 cf

Plug-Flow detention time= 47.7 min calculated for 0.500 af (98% of inflow)
Center-of-Mass det. time= 35.2 min (917.6 - 882.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,684.00'	21,000 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,684.00	0	0	0
2,686.00	500	500	500
2,688.00	1,900	2,400	2,900
2,690.00	4,700	6,600	9,500
2,692.00	6,800	11,500	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,682.30'	**12.0" Round Culvert** L= 425.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,682.30' / 2,634.00' S= 0.1136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,686.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,690.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.91 cfs @ 12.32 hrs HW=2,689.13' (Free Discharge)
└─**1=Culvert** (Passes 1.91 cfs of 7.51 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.91 cfs @ 7.31 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth =	1.71"	for 10-yr Storm event
Inflow =	18.77 cfs @	12.03 hrs,	Volume=	1.156 af	
Outflow =	17.31 cfs @	12.07 hrs,	Volume=	1.156 af,	Atten= 8%, Lag= 2.5 min
Primary =	17.31 cfs @	12.07 hrs,	Volume=	1.156 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,681.89' @ 12.07 hrs Surf.Area= 2,701 sf Storage= 3,122 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 5.0 min calculated for 1.154 af (100% of inflow)
Center-of-Mass det. time= 5.0 min (867.2 - 862.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=16.96 cfs @ 12.07 hrs HW=2,681.87' (Free Discharge)
└─**1=Culvert** (Inlet Controls 16.96 cfs @ 3.67 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area = 8.100 ac, 17.93% Impervious, Inflow Depth = 1.71" for 10-yr Storm event
Inflow = 17.31 cfs @ 12.07 hrs, Volume= 1.156 af
Outflow = 17.31 cfs @ 12.07 hrs, Volume= 1.156 af, Atten= 0%, Lag= 0.0 min
Primary = 17.31 cfs @ 12.07 hrs, Volume= 1.156 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,661.18' @ 12.07 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=16.96 cfs @ 12.07 hrs HW=2,661.04' (Free Discharge)
└─**1=Culvert** (Inlet Controls 16.96 cfs @ 7.19 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 1.94" for 10-yr Storm event
Inflow = 9.77 cfs @ 12.09 hrs, Volume= 0.591 af
Outflow = 9.77 cfs @ 12.09 hrs, Volume= 0.591 af, Atten= 0%, Lag= 0.0 min
Primary = 9.77 cfs @ 12.09 hrs, Volume= 0.591 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,671.86' @ 12.09 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=9.63 cfs @ 12.09 hrs HW=2,671.80' (Free Discharge)
└**1=Culvert** (Inlet Controls 9.63 cfs @ 5.45 fps)

Summary for Link AP-1: Analysis Point 1

Inflow Area = 8.190 ac, 0.00% Impervious, Inflow Depth = 1.47" for 10-yr Storm event
Inflow = 7.86 cfs @ 12.02 hrs, Volume= 1.000 af
Primary = 7.86 cfs @ 12.02 hrs, Volume= 1.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area = 28.260 ac, 7.83% Impervious, Inflow Depth = 1.56" for 10-yr Storm event
Inflow = 49.35 cfs @ 12.02 hrs, Volume= 3.672 af
Primary = 49.35 cfs @ 12.02 hrs, Volume= 3.672 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area = 3.560 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-yr Storm event
Inflow = 5.50 cfs @ 12.03 hrs, Volume= 0.360 af
Primary = 5.50 cfs @ 12.03 hrs, Volume= 0.360 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area = 5.930 ac, 0.00% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 8.99 cfs @ 12.08 hrs, Volume= 0.667 af
Primary = 8.99 cfs @ 12.08 hrs, Volume= 0.667 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth = 1.56" for 10-yr Storm event
Inflow = 11.22 cfs @ 12.02 hrs, Volume= 0.689 af
Primary = 11.22 cfs @ 12.02 hrs, Volume= 0.689 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area =	51.230 ac,	5.94% Impervious,	Inflow Depth =	1.50"	for 10-yr Storm event
Inflow =	38.03 cfs @	12.51 hrs, Volume=	6.388 af		
Primary =	38.03 cfs @	12.51 hrs, Volume=	6.388 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1C: SC 1C Runoff Area=2.650 ac 0.00% Impervious Runoff Depth=2.09"
Flow Length=302' Tc=8.4 min CN=62 Runoff=8.79 cfs 0.462 af

Subcatchment1D: SC 1D Runoff Area=5.540 ac 0.00% Impervious Runoff Depth=1.92"
Flow Length=1,325' Tc=9.1 min CN=60 Runoff=16.36 cfs 0.887 af

Subcatchment2A: SC 2A Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=410' Tc=11.2 min CN=57 Runoff=11.73 cfs 0.707 af

Subcatchment2B: SC 2B Runoff Area=9.800 ac 0.00% Impervious Runoff Depth=2.09"
Flow Length=1,300' Tc=8.7 min CN=62 Runoff=32.18 cfs 1.707 af

Subcatchment2C: SC 2C Runoff Area=1.650 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=230' Tc=10.0 min CN=55 Runoff=3.57 cfs 0.209 af

Subcatchment2D: SC 2D Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=2.53"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=13.74 cfs 0.770 af

Subcatchment3: SC 3 Runoff Area=3.560 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=370' Tc=12.1 min CN=57 Runoff=7.94 cfs 0.497 af

Subcatchment4: SC 4 Runoff Area=5.930 ac 0.00% Impervious Runoff Depth=1.84"
Flow Length=622' Tc=16.2 min CN=59 Runoff=12.79 cfs 0.909 af

Subcatchment5: SC 5 Runoff Area=5.290 ac 15.69% Impervious Runoff Depth=2.09"
Flow Length=745' Tc=12.0 min CN=62 Runoff=15.33 cfs 0.922 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=2.26"
Flow Length=1,219' Tc=12.4 min CN=64 Runoff=25.24 cfs 1.528 af

Reach R1: AP-1 TO RIVER Avg. Flow Depth=0.66' Max Vel=3.35 fps Inflow=11.99 cfs 1.350 af
n=0.100 L=370.0' S=0.1568 '/' Capacity=566.87 cfs Outflow=11.84 cfs 1.350 af

Reach R1A: PIPE TO POND 1 Avg. Flow Depth=0.74' Max Vel=13.31 fps Inflow=8.17 cfs 0.888 af
12.0" Round Pipe n=0.013 L=1,010.0' S=0.0673 '/' Capacity=9.24 cfs Outflow=8.21 cfs 0.888 af

Reach R2: AP-2 TO RIVER Avg. Flow Depth=1.64' Max Vel=2.88 fps Inflow=67.06 cfs 4.909 af
n=0.100 L=2,900.0' S=0.0352 '/' Capacity=268.52 cfs Outflow=40.01 cfs 4.908 af

Reach R2D: REACH 2D Avg. Flow Depth=0.53' Max Vel=4.54 fps Inflow=13.74 cfs 0.770 af
n=0.030 L=770.0' S=0.0273 '/' Capacity=1,999.45 cfs Outflow=12.86 cfs 0.770 af

Reach R3: AP-3 TO RIVER Avg. Flow Depth=0.51' Max Vel=1.98 fps Inflow=7.94 cfs 0.497 af
n=0.100 L=1,700.0' S=0.0765 '/' Capacity=395.93 cfs Outflow=4.73 cfs 0.497 af

Reach R4: AP-4 TO RIVER Avg. Flow Depth=0.75' Max Vel=2.92 fps Inflow=12.79 cfs 0.909 af
n=0.100 L=350.0' S=0.1000 '/' Capacity=452.76 cfs Outflow=12.30 cfs 0.909 af

Reach R5: AP-5 TO RIVER Avg. Flow Depth=0.73' Max Vel=1.61 fps Inflow=15.33 cfs 0.922 af
n=0.100 L=2,600.0' S=0.0315 '/' Capacity=254.27 cfs Outflow=6.65 cfs 0.922 af

Pond P1: DETENTION POND 1 Peak Elev=2,589.00' Storage=1,436 cf Inflow=12.60 cfs 1.350 af
Primary=11.99 cfs 1.350 af Secondary=0.00 cfs 0.000 af Outflow=11.99 cfs 1.350 af

Pond P3: DETENTION BASIN 3 Peak Elev=2,694.73' Storage=8,638 cf Inflow=16.36 cfs 0.887 af
Primary=8.17 cfs 0.888 af Secondary=0.00 cfs 0.000 af Outflow=8.17 cfs 0.888 af

Pond P4: DETENTION BASIN 4 Peak Elev=2,690.00' Storage=9,513 cf Inflow=11.73 cfs 0.707 af
Outflow=2.26 cfs 0.695 af

Pond P5: 36" CMP Culvert Peak Elev=2,682.26' Storage=4,203 cf Inflow=25.24 cfs 1.528 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=23.09 cfs 1.528 af

Pond P6: 24-in Culvert Peak Elev=2,664.08' Inflow=23.09 cfs 1.528 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=23.09 cfs 1.528 af

Pond P7: 18-in Culvert Peak Elev=2,673.40' Inflow=12.86 cfs 0.770 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=12.86 cfs 0.770 af

Link AP-1: Analysis Point 1 Inflow=11.99 cfs 1.350 af
Primary=11.99 cfs 1.350 af

Link AP-2: Analysis Point 2 Inflow=67.06 cfs 4.909 af
Primary=67.06 cfs 4.909 af

Link AP-3: Analysis Point 3 Inflow=7.94 cfs 0.497 af
Primary=7.94 cfs 0.497 af

Link AP-4: Analysis Point 4 Inflow=12.79 cfs 0.909 af
Primary=12.79 cfs 0.909 af

Link AP-5: Analysis Point 5 Inflow=15.33 cfs 0.922 af
Primary=15.33 cfs 0.922 af

Link AP-6: PIGEON RIVER CONTRIBUTION Inflow=57.70 cfs 8.586 af
Primary=57.70 cfs 8.586 af

Total Runoff Area = 51.230 ac Runoff Volume = 8.596 af Average Runoff Depth = 2.01"
94.06% Pervious = 48.187 ac 5.94% Impervious = 3.042 ac

Summary for Subcatchment 1C: SC 1C

Runoff = 8.79 cfs @ 11.98 hrs, Volume= 0.462 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.370	85	Gravel roads, HSG B
2.280	58	Meadow, non-grazed, HSG B
2.650	62	Weighted Average
2.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	92	0.1960	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	146	0.3150	3.93		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.1	64	0.0470	10.53	4,718.88	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=40.00' D=8.00' Z= 2.0 '/' Top.W=72.00' n= 0.100 Earth, dense brush, high stage
8.4	302	Total			

Summary for Subcatchment 1D: SC 1D

Runoff = 16.36 cfs @ 11.99 hrs, Volume= 0.887 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.390	85	Gravel roads, HSG B
4.990	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
5.540	60	Weighted Average
5.540		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
0.1	60	0.0330	10.36	12.71	**Pipe Channel, F-G** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PE, smooth interior
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.1	1,325	Total			

Summary for Subcatchment 2A: SC 2A

Runoff = 11.73 cfs @ 12.02 hrs, Volume= 0.707 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
3.240	58	Meadow, non-grazed, HSG B
5.060	57	Weighted Average
5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B: SC 2B

Runoff = 32.18 cfs @ 11.99 hrs, Volume= 1.707 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
2.100	55	Woods, Good, HSG B
6.160	58	Meadow, non-grazed, HSG B
1.540	85	Gravel roads, HSG B
9.800	62	Weighted Average
9.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	60	0.1500	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	1,240	0.0700	7.86	19.64	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 2.5 '/' Top.W=5.00' n= 0.030 Earth, grassed & winding
8.7	1,300	Total			

Summary for Subcatchment 2C: SC 2C

Runoff = 3.57 cfs @ 12.00 hrs, Volume= 0.209 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.490	55	Woods, Good, HSG B
0.160	58	Meadow, non-grazed, HSG B
1.650	55	Weighted Average
1.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	130	0.1500	1.94		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.0	230	Total			

Summary for Subcatchment 2D: SC 2D

Runoff = 13.74 cfs @ 12.00 hrs, Volume= 0.770 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3: SC 3

Runoff = 7.94 cfs @ 12.03 hrs, Volume= 0.497 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
2.230	55	Woods, Good, HSG B
0.180	85	Gravel roads, HSG B
1.150	58	Meadow, non-grazed, HSG B
3.560	57	Weighted Average
3.560		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.4	270	0.1400	1.87		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
12.1	370	Total			

Summary for Subcatchment 4: SC 4

Runoff = 12.79 cfs @ 12.07 hrs, Volume= 0.909 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
2.780	55	Woods, Good, HSG B
0.500	85	Gravel roads, HSG B
2.650	58	Meadow, non-grazed, HSG B
5.930	59	Weighted Average
5.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	162	0.1420	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.0	280	0.1070	2.29		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.1390	6.70	535.86	**Parabolic Channel, C-D** W=60.00' D=2.00' Area=80.0 sf Perim=60.2' n= 0.100 Earth, dense brush, high stage
16.2	622	Total			

Summary for Subcatchment 5: SC 5

Runoff = 15.33 cfs @ 12.02 hrs, Volume= 0.922 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
4.330	55	Woods, Good, HSG B
0.070	85	Gravel roads, HSG B
0.810	98	Paved parking, HSG B
0.060	58	Meadow, non-grazed, HSG B
0.020	98	Roofs, HSG B
5.290	62	Weighted Average
4.460		84.31% Pervious Area
0.830		15.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	100	0.1600	0.19		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.3	145	0.1300	1.80		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.4	330	0.1500	3.83	45.97	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 10.0 '/' Top.W=22.00' n= 0.100 Very weedy reaches w/pools
0.4	170	0.0300	6.46	51.67	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=4.00' D=1.00' Z= 4.0 '/' Top.W=12.00' n= 0.030 Earth, grassed & winding
12.0	745	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 25.24 cfs @ 12.02 hrs, Volume= 1.528 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.5	384	0.0730	13.26	93.71	**Pipe Channel, D-E** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
12.4	1,219	Total			

Summary for Reach R1: AP-1 TO RIVER

Inflow Area = 8.190 ac, 0.00% Impervious, Inflow Depth = 1.98" for 25-Yr Storm event
Inflow = 11.99 cfs @ 12.10 hrs, Volume= 1.350 af
Outflow = 11.84 cfs @ 12.15 hrs, Volume= 1.350 af, Atten= 1%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.35 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 4.5 min

Peak Storage= 1,315 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 566.87 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 370.0' Slope= 0.1568 '/'
Inlet Invert= 2,590.00', Outlet Invert= 2,532.00'

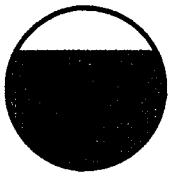
Summary for Reach R1A: PIPE TO POND 1

Inflow Area = 5.540 ac, 0.00% Impervious, Inflow Depth = 1.92" for 25-Yr Storm event
Inflow = 8.17 cfs @ 12.10 hrs, Volume= 0.888 af
Outflow = 8.21 cfs @ 12.17 hrs, Volume= 0.888 af, Atten= 0%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.31 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 5.97 fps, Avg. Travel Time= 2.8 min

Peak Storage= 626 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 9.24 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 1,010.0' Slope= 0.0673 '/'
Inlet Invert= 2,655.00', Outlet Invert= 2,587.00'



Summary for Reach R2: AP-2 TO RIVER

Inflow Area = 28.260 ac, 7.83% Impervious, Inflow Depth = 2.08" for 25-Yr Storm event
Inflow = 67.06 cfs @ 12.02 hrs, Volume= 4.909 af
Outflow = 40.01 cfs @ 12.45 hrs, Volume= 4.908 af, Atten= 40%, Lag= 25.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 16.8 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 74.6 min

Peak Storage= 40,670 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.64'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 268.52 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,900.0' Slope= 0.0352 '/'
Inlet Invert= 2,632.00', Outlet Invert= 2,530.00'

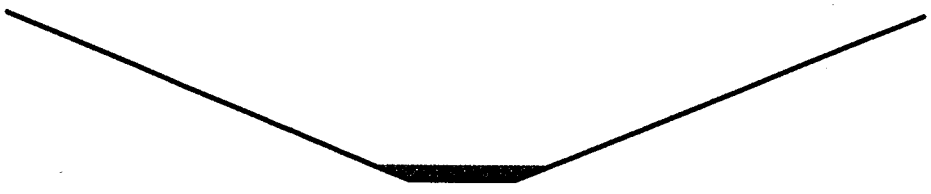
Summary for Reach R2D: REACH 2D

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 2.53" for 25-Yr Storm event
Inflow = 13.74 cfs @ 12.00 hrs, Volume= 0.770 af
Outflow = 12.86 cfs @ 12.08 hrs, Volume= 0.770 af, Atten= 6%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 8.9 min

Peak Storage= 2,192 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 6.00' Flow Area= 114.0 sf, Capacity= 1,999.45 cfs

4.00' x 6.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 34.00'
Length= 770.0' Slope= 0.0273 '/'
Inlet Invert= 2,688.00', Outlet Invert= 2,667.00'



Summary for Reach R3: AP-3 TO RIVER

Inflow Area = 3.560 ac, 0.00% Impervious, Inflow Depth = 1.68" for 25-Yr Storm event
Inflow = 7.94 cfs @ 12.03 hrs, Volume= 0.497 af
Outflow = 4.73 cfs @ 12.39 hrs, Volume= 0.497 af, Atten= 40%, Lag= 21.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.98 fps, Min. Travel Time= 14.3 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 42.7 min

Peak Storage= 4,097 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 395.93 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 1,700.0' Slope= 0.0765 '/'
Inlet Invert= 2,664.00', Outlet Invert= 2,534.00'

Summary for Reach R4: AP-4 TO RIVER

Inflow Area = 5.930 ac, 0.00% Impervious, Inflow Depth = 1.84" for 25-Yr Storm event
Inflow = 12.79 cfs @ 12.07 hrs, Volume= 0.909 af
Outflow = 12.30 cfs @ 12.13 hrs, Volume= 0.909 af, Atten= 4%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.92 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 5.7 min

Peak Storage= 1,507 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.75'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 452.76 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 350.0' Slope= 0.1000 '/'
Inlet Invert= 2,568.00', Outlet Invert= 2,533.00'

Summary for Reach R5: AP-5 TO RIVER

Inflow Area = 5.290 ac, 15.69% Impervious, Inflow Depth = 2.09" for 25-Yr Storm event
Inflow = 15.33 cfs @ 12.02 hrs, Volume= 0.922 af
Outflow = 6.65 cfs @ 12.63 hrs, Volume= 0.922 af, Atten= 57%, Lag= 36.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 26.9 min
Avg. Velocity = 0.44 fps, Avg. Travel Time= 99.4 min

Peak Storage= 10,754 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 254.27 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.100 Earth, dense brush, high stage
Length= 2,600.0' Slope= 0.0315 '/'
Inlet Invert= 2,612.00', Outlet Invert= 2,530.00'

Summary for Pond P1: DETENTION POND 1

Inflow Area =	8.190 ac,	0.00% Impervious,	Inflow Depth =	1.98"	for 25-Yr Storm event
Inflow =	12.60 cfs @	12.05 hrs,	Volume=	1.350 af	
Outflow =	11.99 cfs @	12.10 hrs,	Volume=	1.350 af,	Atten= 5%, Lag= 3.0 min
Primary =	11.99 cfs @	12.10 hrs,	Volume=	1.350 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,589.00' @ 12.10 hrs Surf.Area= 1,301 sf Storage= 1,436 cf

Plug-Flow detention time= 1.6 min calculated for 1.349 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (874.8 - 873.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,587.00'	21,176 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,587.00	10	0	0
2,588.00	778	394	394
2,590.00	1,822	2,600	2,994
2,592.00	2,492	4,314	7,308
2,594.00	3,333	5,825	13,133
2,596.00	4,710	8,043	21,176

Device	Routing	Invert	Outlet Devices
#1	Primary	2,587.00'	**24.0" Round Culvert** L= 30.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,587.00' / 2,586.00' S= 0.0333 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	2,596.00'	**45.0' long x 10.0' 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) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=11.94 cfs @ 12.10 hrs HW=2,589.00' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.94 cfs @ 3.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,587.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond P3: DETENTION BASIN 3

Inflow Area =	5.540 ac,	0.00% Impervious,	Inflow Depth =	1.92"	for 25-Yr Storm event
Inflow =	16.36 cfs @	11.99 hrs,	Volume=	0.887 af	
Outflow =	8.17 cfs @	12.10 hrs,	Volume=	0.888 af,	Atten= 50%, Lag= 6.5 min
Primary =	8.17 cfs @	12.10 hrs,	Volume=	0.888 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,694.73' @ 12.11 hrs Surf.Area= 4,441 sf Storage= 8,638 cf

Plug-Flow detention time= 17.8 min calculated for 0.886 af (100% of inflow)
Center-of-Mass det. time= 18.5 min (879.4 - 860.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,690.00'	22,965 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,690.00	0	0	0
2,692.00	1,170	1,170	1,170
2,694.00	3,420	4,590	5,760
2,696.00	6,210	9,630	15,390
2,697.00	7,400	6,805	22,195
2,697.10	8,000	770	22,965

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,694.00'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,697.00'	**20.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.17 cfs @ 12.10 hrs HW=2,694.73' (Free Discharge)
└─**1=Culvert** (Barrel Controls 8.17 cfs @ 10.40 fps)
  ├─**2=Pool Drain Holes** (Passes < 2.50 cfs potential flow)
  └─**3=Top Overflow** (Passes < 12.82 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,690.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: DETENTION BASIN 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	1.68"	for 25-Yr Storm event
Inflow =	11.73 cfs @	12.02 hrs,	Volume=	0.707 af	
Outflow =	2.26 cfs @	12.37 hrs,	Volume=	0.695 af,	Atten= 81%, Lag= 21.4 min
Primary =	2.26 cfs @	12.37 hrs,	Volume=	0.695 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,690.00' @ 12.37 hrs Surf.Area= 4,703 sf Storage= 9,513 cf

Plug-Flow detention time= 52.3 min calculated for 0.695 af (98% of inflow)
Center-of-Mass det. time= 42.9 min (914.2 - 871.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,684.00'	21,000 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,684.00	0	0	0
2,686.00	500	500	500
2,688.00	1,900	2,400	2,900
2,690.00	4,700	6,600	9,500
2,692.00	6,800	11,500	21,000

Device	Routing	Invert	Outlet Devices
#1	Primary	2,682.30'	**12.0" Round Culvert** L= 425.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,682.30' / 2,634.00' S= 0.1136 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,686.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 4 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,690.00'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.25 cfs @ 12.37 hrs HW=2,690.00' (Free Discharge)
└─**1=Culvert** (Passes 2.25 cfs of 8.01 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.25 cfs @ 8.59 fps)
  └─**3=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.12 fps)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac,	17.93% Impervious,	Inflow Depth =	2.26"	for 25-Yr Storm event
Inflow =	25.24 cfs @	12.02 hrs,	Volume=	1.528 af	
Outflow =	23.09 cfs @	12.07 hrs,	Volume=	1.528 af,	Atten= 9%, Lag= 2.7 min
Primary =	23.09 cfs @	12.07 hrs,	Volume=	1.528 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,682.26' @ 12.07 hrs Surf.Area= 3,114 sf Storage= 4,203 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 4.6 min calculated for 1.526 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (858.4 - 853.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=22.66 cfs @ 12.07 hrs HW=2,682.23' (Free Discharge)
└**1=Culvert** (Inlet Controls 22.66 cfs @ 4.02 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area = 8.100 ac, 17.93% Impervious, Inflow Depth = 2.26" for 25-Yr Storm event
Inflow = 23.09 cfs @ 12.07 hrs, Volume= 1.528 af
Outflow = 23.09 cfs @ 12.07 hrs, Volume= 1.528 af, Atten= 0%, Lag= 0.0 min
Primary = 23.09 cfs @ 12.07 hrs, Volume= 1.528 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,664.08' @ 12.07 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=22.66 cfs @ 12.07 hrs HW=2,663.85' (Free Discharge)
└**1=Culvert** (Inlet Controls 22.66 cfs @ 9.61 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 2.53" for 25-Yr Storm event
Inflow = 12.86 cfs @ 12.08 hrs, Volume= 0.770 af
Outflow = 12.86 cfs @ 12.08 hrs, Volume= 0.770 af, Atten= 0%, Lag= 0.0 min
Primary = 12.86 cfs @ 12.08 hrs, Volume= 0.770 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,673.40' @ 12.08 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=12.57 cfs @ 12.08 hrs HW=2,673.25' (Free Discharge)
└**1=Culvert** (Inlet Controls 12.57 cfs @ 7.11 fps)

Summary for Link AP-1: Analysis Point 1

Inflow Area =	8.190 ac,	0.00% Impervious,	Inflow Depth =	1.98"	for 25-Yr Storm event
Inflow =	11.99 cfs @	12.10 hrs, Volume=	1.350 af		
Primary =	11.99 cfs @	12.10 hrs, Volume=	1.350 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-2: Analysis Point 2

Inflow Area =	28.260 ac,	7.83% Impervious,	Inflow Depth =	2.08"	for 25-Yr Storm event
Inflow =	67.06 cfs @	12.02 hrs, Volume=	4.909 af		
Primary =	67.06 cfs @	12.02 hrs, Volume=	4.909 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-3: Analysis Point 3

Inflow Area =	3.560 ac,	0.00% Impervious,	Inflow Depth =	1.68"	for 25-Yr Storm event
Inflow =	7.94 cfs @	12.03 hrs, Volume=	0.497 af		
Primary =	7.94 cfs @	12.03 hrs, Volume=	0.497 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-4: Analysis Point 4

Inflow Area =	5.930 ac,	0.00% Impervious,	Inflow Depth =	1.84"	for 25-Yr Storm event
Inflow =	12.79 cfs @	12.07 hrs, Volume=	0.909 af		
Primary =	12.79 cfs @	12.07 hrs, Volume=	0.909 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-5: Analysis Point 5

Inflow Area =	5.290 ac,	15.69% Impervious,	Inflow Depth =	2.09"	for 25-Yr Storm event
Inflow =	15.33 cfs @	12.02 hrs, Volume=	0.922 af		
Primary =	15.33 cfs @	12.02 hrs, Volume=	0.922 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link AP-6: PIGEON RIVER CONTRIBUTION

Inflow Area =	51.230 ac,	5.94% Impervious,	Inflow Depth =	2.01"	for 25-Yr Storm event
Inflow =	57.70 cfs @	12.43 hrs,	Volume=	8.586 af	
Primary =	57.70 cfs @	12.43 hrs,	Volume=	8.586 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

APPENDIX C

EROSION AND SEDIMENT CONTROL DESIGN CALCULATIONS

PROJECT NAME EVERGREEN PACKAGING - AREA 6D NORTH
LOCATION: CANTON, NORTH CAROLINA
PREPARED BY: DATE: 8/14/2013
CHECKED BY: DATE:

Grass Ditch Stability Calculations

CHANNEL ID	B (FT)	D (FT)	Z1	Z2	LINING	STAPLE PATTERN
1D-4	8	5	2.5	2.5	S75	D
1D-5	8	5	2.5	2.5	S75	D
2A-1	2	2	2.5	2.5	C125	D
2B-1	2	2	2.5	2.5	C125	D
2B-2	4	2	2.5	2.5	C125	D
2D-1	4	2	2.5	2.5	C125	D
3D-1	2	2	2.5	2.5	C125	D

Riprap Ditch Stability Calculations

CHANNEL ID	B (FT)	D (FT)	Z1	Z2	d_{50} (in)	thickness (in)
1D-1	0	2	2	2	8	18
1D-2	0	2	2	2	6	14
1D-3	0	2	2	2	6	14
2A-2	20	2	2.5	2.5	6	14
2A-3	2	2	2.5	2.5	6	14
2B-1	2	2	2.5	2.5	12	27
2B-3	2	2	2.5	2.5	8	18
2B-4	4	2	2.5	2.5	12	27

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          ******  HYCHL  ****** (Version 6.1) ******           Date 08-15-2013
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 Commands Read From File: C:\HYCHL\1D-1.CHL

       JOB 1D-1
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.10   4.6
       TRP 2      2.0    2.0
 ** LEFT SIDE SLOPE    2.0 AND RIGHT SIDE SLOPE    2.0
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)    2.00
       LRR 0.67   2 0 2.65   0.047
 ** D50 (ft)    .67
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .047
       END
***************END OF COMMAND FILE************

 1D-1
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     41.51
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):            4.60
       CHANNEL SHAPE:                 TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):               .100
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                  4.60
 MAX DEPTH (ft)               .45
 AREA (ft^2)                 1.31
 WETTED PERIMETER (ft)       4.02
 HYDRAULIC RADIUS (ft)        .33
 AVG VELOCITY (ft/s)         3.52
 MANNINGS EQUIVALENT         .065
 Davg / D50                   .51
 FROUDE NUMBER                .92
 REYNOLDS NUMBER (10^5)       .70
 ------------------
 STABILITY ANALYSIS
 ------------------
```

CONDITION	LINING TYPE	PERMIS SHR (LB/FT^2)	CALC. SHR (LB/FT^2)	STAB. FACTOR	REMARKS
BOTTOM; STRAIGHT	RIPRAP	3.24	2.81	1.16	STABLE
SIDE; STRAIGHT	RIPRAP	2.39	2.16	1.11	STABLE

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 *** NORMAL END OF HYCHL ***
```

```
          ******  HYCHL  ****** (Version 6.1) ******           Date 08-15-2013
   
 Commands Read From File: C:\HYCHL\1D-2.CHL

       JOB 1D-2
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.10   2.20
       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 0.5    2 0 2.65   0.047
 ** D50 (ft)    .50
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .047
       END
***************END OF COMMAND FILE************

 1D-2
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     41.31
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):            2.20
       CHANNEL SHAPE:                  TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):              .100
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                  2.20
 MAX DEPTH (ft)               .30
 AREA (ft^2)                  .78
 WETTED PERIMETER (ft)       3.34
 HYDRAULIC RADIUS (ft)        .23
 AVG VELOCITY (ft/s)         2.82
 MANNINGS EQUIVALENT         .065
 Davg / D50                   .49
 FROUDE NUMBER                .91
 REYNOLDS NUMBER (10^5)       .45
 ------------------
 STABILITY ANALYSIS
 ------------------

                      LINING    PERMIS SHR   CALC. SHR  STAB.
     CONDITION        TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
     ---------         ------    ----------   ---------  ------   -------
   BOTTOM; STRAIGHT   RIPRAP          2.42      1.86      1.30   STABLE
   SIDE; STRAIGHT     RIPRAP          1.78      1.44      1.24   STABLE

 *** NORMAL END OF HYCHL ***
```

```
          ******  HYCHL  ****** (Version 6.1) ******          Date 08-14-2013
Commands Read From File: C:\HYCHL\1D-3.CHL

      JOB 1D-3
      UNI 0
** UNITS PARAMETER = 0 (ENGLISH)
      CHL 0.10   1.0
      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 0.50   2 0 2.65   0.047
** D50 (ft)    .50
** SPECIFIC GRAVITY    2.65
** SHIELDS PARAMETER    .047
      END
***************END OF COMMAND FILE************

1D-3
------------
INPUT REVIEW
------------
  DEFAULT ANGLE OF REPOSE (degrees):     41.31
  DESIGN PARAMETERS:
      DESIGN DISCHARGE (ft^3/s):            1.00
      CHANNEL SHAPE:                  TRAPEZOIDAL
      CHANNEL SLOPE (ft/ft):               .100

*** WARNING:  DEPTH DID NOT CONVERGE. PROGRAM WILL CONTINUE
                WITH MOST RECENT VALUE
-------------------------------------
HYDRAULIC CALCULATIONS USING BATHURST
-------------------------------------

FLOW (cfs)                 1.00
MAX DEPTH (ft)              .21
AREA (ft^2)                 .50
WETTED PERIMETER (ft)      2.93
HYDRAULIC RADIUS (ft)       .17
AVG VELOCITY (ft/s)        1.98
MANNINGS EQUIVALENT        .075
Davg / D50                  .36
FROUDE NUMBER               .77
REYNOLDS NUMBER (10^5)      .45
------------------
STABILITY ANALYSIS
------------------

                     LINING    PERMIS SHR   CALC. SHR  STAB.
    CONDITION        TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
    ---------         ------    ----------   ---------  ------   -------
  BOTTOM; STRAIGHT   RIPRAP          2.42      1.30      1.86   STABLE
  SIDE; STRAIGHT     RIPRAP          1.78      1.00      1.78   STABLE

*** NORMAL END OF HYCHL ***
```

```
         ******  HYCHL  ****** (Version 6.1) ******          Date 08-14-2013
 Commands Read From File: C:\HYCHL\2A-2.CHL

       JOB 2A-2
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.17   1.80
       TRP 20     2      2
 ** LEFT SIDE SLOPE    2.0 AND RIGHT SIDE SLOPE    2.0
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)   20.00
       LRR 0.5    2 0 2.65   0.047
 ** D50 (ft)    .50
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .047
       END
***************END OF COMMAND FILE************

 2A-2
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     41.31
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):            1.80
       CHANNEL SHAPE:                  TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):               .170

 *** WARNING:  DEPTH DID NOT CONVERGE. PROGRAM WILL CONTINUE
                WITH MOST RECENT VALUE
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                  1.80
 MAX DEPTH (ft)               .08
 AREA (ft^2)                 2.00
 WETTED PERIMETER (ft)      20.44
 HYDRAULIC RADIUS (ft)        .10
 AVG VELOCITY (ft/s)          .90
 MANNINGS EQUIVALENT         .556
 Davg / D50                   .20
 FROUDE NUMBER                .55
 REYNOLDS NUMBER (10^5)       .45
 ------------------
 STABILITY ANALYSIS
 ------------------

                      LINING    PERMIS SHR   CALC. SHR  STAB.
    CONDITION         TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
    ---------          ------    ----------   ---------  ------   -------
  BOTTOM; STRAIGHT   RIPRAP          2.42        .88      2.74   STABLE
  SIDE; STRAIGHT     RIPRAP          1.78        .69      2.59   STABLE

 *** NORMAL END OF HYCHL ***
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         ******  HYCHL  ****** (Version 6.1) ******           Date 08-15-2013
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 Commands Read From File: C:\HYCHL\2B-1.CHL

       JOB 2B-1
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.10   14.4
       TRP 2      2.5    2.5
 ** LEFT SIDE SLOPE    2.5 AND RIGHT SIDE SLOPE    2.5
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)    2.00
       LRR 1.00   2 0 2.65   0.047
 ** D50 (ft)   1.00
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .047
       END
***************END OF COMMAND FILE************

 2B-1
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     41.74
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):           14.40
       CHANNEL SHAPE:                  TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):               .100
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                 14.40
 MAX DEPTH (ft)               .80
 AREA (ft^2)                 3.22
 WETTED PERIMETER (ft)       6.32
 HYDRAULIC RADIUS (ft)        .51
 AVG VELOCITY (ft/s)         4.48
 MANNINGS EQUIVALENT         .069
 Davg / D50                   .53
 FROUDE NUMBER                .88
 REYNOLDS NUMBER (10^5)      1.28
 *** WARNING:  REYNOLDS NUMBER IS LARGER THAN 10^5

 ------------------
 STABILITY ANALYSIS
 ------------------

                      LINING    PERMIS SHR   CALC. SHR  STAB.
     CONDITION        TYPE      (LB/FT^2)    (LB/FT^2)  FACTOR   REMARKS
     ---------         ------    ----------   ---------  ------   -------
   BOTTOM; STRAIGHT   RIPRAP          4.84      4.99       .97   UNSTABLE
   SIDE; STRAIGHT     RIPRAP          4.02      3.98      1.01   STABLE

 *** NORMAL END OF HYCHL ***
```

```
          ******  HYCHL  ****** (Version 6.1) ******          Date 08-15-2013

 Commands Read From File: C:\HYCHL\2B-4.CHL

       JOB 2B-4
       UNI 0
 ** UNITS PARAMETER = 0 (ENGLISH)
       CHL 0.10   23.3
       TRP 4      2.5    2.5
 ** LEFT SIDE SLOPE    2.5 AND RIGHT SIDE SLOPE    2.5
 ** THE BASE WIDTH OF THE TRAPEZOID (ft)    4.00
       LRR 1.0    2 0 2.65   0.047
 ** D50 (ft)   1.00
 ** SPECIFIC GRAVITY    2.65
 ** SHIELDS PARAMETER    .047
       END
***************END OF COMMAND FILE************

 2B-4
 ------------
 INPUT REVIEW
 ------------
   DEFAULT ANGLE OF REPOSE (degrees):     41.74
   DESIGN PARAMETERS:
       DESIGN DISCHARGE (ft^3/s):           23.30
       CHANNEL SHAPE:                   TRAPEZOIDAL
       CHANNEL SLOPE (ft/ft):               .100
 -------------------------------------
 HYDRAULIC CALCULATIONS USING BATHURST
 -------------------------------------

 FLOW (cfs)                 23.30
 MAX DEPTH (ft)               .79
 AREA (ft^2)                 4.70
 WETTED PERIMETER (ft)       8.24
 HYDRAULIC RADIUS (ft)        .57
 AVG VELOCITY (ft/s)         4.96
 MANNINGS EQUIVALENT         .067
 Davg / D50                   .59
 FROUDE NUMBER                .99
 REYNOLDS NUMBER (10^5)      1.28
 *** WARNING:  REYNOLDS NUMBER IS LARGER THAN 10^5

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 STABILITY ANALYSIS
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CONDITION	LINING TYPE	PERMIS SHR (LB/FT^2)	CALC. SHR (LB/FT^2)	STAB. FACTOR	REMARKS
BOTTOM; STRAIGHT	RIPRAP	4.84	4.90	.99	UNSTABLE
SIDE; STRAIGHT	RIPRAP	4.02	4.01	1.00	STABLE

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 *** NORMAL END OF HYCHL ***
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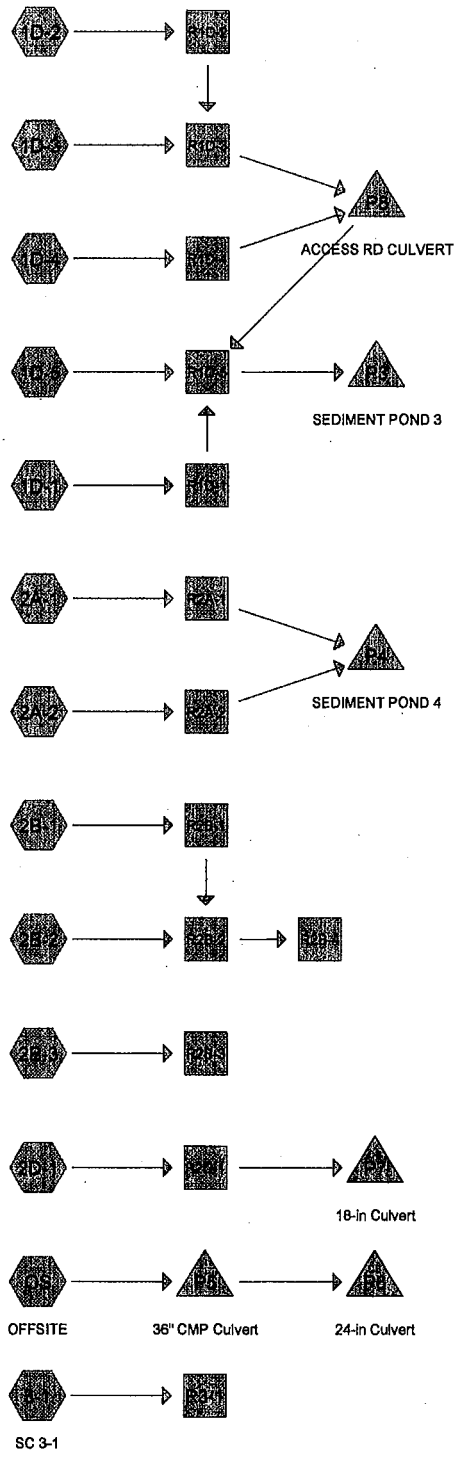

Routing Diagram for 6D North_ESC
Prepared by Sevee & Maher Engineers, Inc., Printed 7/26/2013
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.930	70	1/2 acre lots, 25% imp, HSG B (OS)
2.311	85	Gravel roads, HSG B (1D-1, 1D-2, 1D-3, 1D-4, 2B-1, 2B-2, 2B-3, 2D-1, 3-1)
15.390	58	Meadow, non-grazed, HSG B (1D-1, 1D-2, 1D-3, 1D-4, 1D-5, 2A-1, 2A-2, 2B-1, 2B-2, 2B-3, 2D-1, 3-1)
1.730	98	Paved parking, HSG B (2D-1, OS)
11.040	55	Woods, Good, HSG B (1D-5, 2A-1, 2A-2, 2B-1, 2B-3, 2D-1, 3-1, OS)
32.401	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
32.401	HSG B	1D-1, 1D-2, 1D-3, 1D-4, 1D-5, 2A-1, 2A-2, 2B-1, 2B-2, 2B-3, 2D-1, 3-1, OS
0.000	HSG C	
0.000	HSG D	
0.000	Other	
32.401		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.930	0.000	0.000	0.000	1.930	1/2 acre lots, 25% imp	OS
0.000	2.311	0.000	0.000	0.000	2.311	Gravel roads	1D-1, 1D-2, 1D-3, 1D-4, 2B-1, 2B-2, 2B-3, 2D-1, 3-1
0.000	15.390	0.000	0.000	0.000	15.390	Meadow, non-grazed	1D-1, 1D-2, 1D-3, 1D-4, 1D-5, 2A-1, 2A-2, 2B-1, 2B-2, 2B-3, 2D-1, 3-1
0.000	1.730	0.000	0.000	0.000	1.730	Paved parking	2D-1, OS
0.000	11.040	0.000	0.000	0.000	11.040	Woods, Good	1D-5, 2A-1, 2A-2, 2B-1, 2B-3, 2D-1, 3-1, OS
0.000	**32.401**	**0.000**	**0.000**	**0.000**	**32.401**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	OS	0.00	0.00	170.0	0.0200	0.025	18.0	0.0	0.0
2	P3	2,689.00	2,655.00	806.0	0.0422	0.012	12.0	0.0	0.0
3	P4	2,685.00	2,634.00	410.0	0.1244	0.012	12.0	0.0	0.0
4	P5	2,680.00	2,655.83	356.0	0.0679	0.025	36.0	0.0	0.0
5	P6	2,656.60	2,633.50	586.0	0.0394	0.012	20.8	0.0	0.0
6	P7	2,669.00	2,668.50	60.0	0.0083	0.012	18.0	0.0	0.0
7	P8	2,706.00	2,704.00	60.0	0.0333	0.012	15.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1D-1: Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=0.62"
Flow Length=1,265' Tc=9.0 min CN=62 Runoff=1.17 cfs 0.073 af

Subcatchment1D-2: Runoff Area=0.530 ac 0.00% Impervious Runoff Depth=0.71"
Tc=5.0 min CN=64 Runoff=0.63 cfs 0.031 af

Subcatchment1D-3: Runoff Area=0.150 ac 0.00% Impervious Runoff Depth=1.06"
Tc=5.0 min CN=71 Runoff=0.29 cfs 0.013 af

Subcatchment1D-4: Runoff Area=1.511 ac 0.00% Impervious Runoff Depth=0.45"
Tc=5.0 min CN=58 Runoff=0.96 cfs 0.057 af

Subcatchment1D-5: Runoff Area=1.930 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=1,265' Tc=9.0 min CN=58 Runoff=0.99 cfs 0.073 af

Subcatchment2A-1: Runoff Area=4.300 ac 0.00% Impervious Runoff Depth=0.42"
Flow Length=410' Tc=11.2 min CN=57 Runoff=1.68 cfs 0.149 af

Subcatchment2A-2: Runoff Area=0.760 ac 0.00% Impervious Runoff Depth=0.42"
Flow Length=410' Tc=11.2 min CN=57 Runoff=0.30 cfs 0.026 af

Subcatchment2B-1: Runoff Area=3.800 ac 0.00% Impervious Runoff Depth=0.62"
Tc=5.0 min CN=62 Runoff=3.77 cfs 0.195 af

Subcatchment2B-2: Runoff Area=3.700 ac 0.00% Impervious Runoff Depth=0.62"
Tc=5.0 min CN=62 Runoff=3.67 cfs 0.190 af

Subcatchment2B-3: Runoff Area=2.250 ac 0.00% Impervious Runoff Depth=0.53"
Tc=5.0 min CN=60 Runoff=1.82 cfs 0.100 af

Subcatchment2D-1: Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=0.85"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=4.27 cfs 0.259 af

Subcatchment3-1: SC 3-1 Runoff Area=0.300 ac 0.00% Impervious Runoff Depth=1.06"
Flow Length=275' Tc=10.8 min CN=71 Runoff=0.46 cfs 0.027 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=0.71"
Flow Length=1,005' Tc=12.5 min CN=64 Runoff=6.84 cfs 0.476 af

Reach R1D-1: Avg. Flow Depth=0.13' Max Vel=3.68 fps Inflow=1.17 cfs 0.073 af
n=0.030 L=700.0' S=0.1029 '/' Capacity=202.70 cfs Outflow=1.05 cfs 0.073 af

Reach R1D-2: Avg. Flow Depth=0.28' Max Vel=0.22 fps Inflow=0.63 cfs 0.031 af
n=0.800 L=460.0' S=0.1043 '/' Capacity=7.66 cfs Outflow=0.16 cfs 0.031 af

Reach R1D-3: Avg. Flow Depth=0.06' Max Vel=2.28 fps Inflow=0.29 cfs 0.044 af
n=0.030 L=280.0' S=0.1071 '/' Capacity=206.88 cfs Outflow=0.26 cfs 0.044 af

Reach R1D-4: Avg. Flow Depth=0.05' Max Vel=1.36 fps Inflow=0.96 cfs 0.057 af
n=0.030 L=570.0' S=0.0386 '/' Capacity=1,807.32 cfs Outflow=0.56 cfs 0.057 af

Reach R1D-5: Avg. Flow Depth=0.10' Max Vel=1.75 fps Inflow=1.80 cfs 0.214 af
n=0.030 L=590.0' S=0.0271 '/' Capacity=1,514.94 cfs Outflow=1.47 cfs 0.214 af

Reach R2A-1: Avg. Flow Depth=0.17' Max Vel=3.50 fps Inflow=1.68 cfs 0.149 af
n=0.030 L=790.0' S=0.0658 '/' Capacity=189.16 cfs Outflow=1.45 cfs 0.149 af

Reach R2A-2: Avg. Flow Depth=0.01' Max Vel=1.49 fps Inflow=0.30 cfs 0.026 af
n=0.030 L=240.0' S=0.1667 '/' Capacity=1,397.50 cfs Outflow=0.26 cfs 0.026 af

Reach R2B-1: Avg. Flow Depth=0.24' Max Vel=5.18 fps Inflow=3.77 cfs 0.195 af
n=0.030 L=980.0' S=0.1000 '/' Capacity=233.15 cfs Outflow=3.23 cfs 0.195 af

Reach R2B-2: Avg. Flow Depth=0.40' Max Vel=2.61 fps Inflow=5.61 cfs 0.385 af
n=0.030 L=475.0' S=0.0126 '/' Capacity=114.33 cfs Outflow=5.17 cfs 0.385 af

Reach R2B-3: Avg. Flow Depth=0.14' Max Vel=4.97 fps Inflow=1.82 cfs 0.100 af
n=0.030 L=550.0' S=0.1709 '/' Capacity=304.81 cfs Outflow=1.60 cfs 0.100 af

Reach R2B-4: Avg. Flow Depth=0.21' Max Vel=5.36 fps Inflow=5.17 cfs 0.385 af
n=0.030 L=350.0' S=0.1086 '/' Capacity=335.18 cfs Outflow=5.04 cfs 0.385 af

Reach R2D-1: Avg. Flow Depth=0.33' Max Vel=2.21 fps Inflow=4.27 cfs 0.259 af
n=0.030 L=790.0' S=0.0114 '/' Capacity=108.58 cfs Outflow=3.50 cfs 0.259 af

Reach R3-1: Avg. Flow Depth=0.09' Max Vel=2.25 fps Inflow=0.46 cfs 0.027 af
n=0.030 L=230.0' S=0.0609 '/' Capacity=181.90 cfs Outflow=0.43 cfs 0.027 af

Pond P3: SEDIMENT POND 3 Peak Elev=2,690.73' Storage=1,432 cf Inflow=1.47 cfs 0.214 af
Primary=0.40 cfs 0.203 af Secondary=0.00 cfs 0.000 af Outflow=0.40 cfs 0.203 af

Pond P4: SEDIMENT POND 4 Peak Elev=2,686.57' Storage=648 cf Inflow=1.71 cfs 0.175 af
Outflow=0.98 cfs 0.175 af

Pond P5: 36" CMP Culvert Peak Elev=2,681.06' Storage=1,270 cf Inflow=6.84 cfs 0.476 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=6.21 cfs 0.476 af

Pond P6: 24-in Culvert Peak Elev=2,657.96' Inflow=6.21 cfs 0.476 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=6.21 cfs 0.476 af

Pond P7: 18-in Culvert Peak Elev=2,670.03' Inflow=3.50 cfs 0.259 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=3.50 cfs 0.259 af

Pond P8: ACCESS RD CULVERT Peak Elev=2,706.19' Storage=1,672 cf Inflow=0.64 cfs 0.101 af
15.0" Round Culvert n=0.012 L=60.0' S=0.0333 '/' Outflow=0.17 cfs 0.068 af

Total Runoff Area = 32.401 ac Runoff Volume = 1.668 af Average Runoff Depth = 0.62"
93.17% Pervious = 30.189 ac 6.83% Impervious = 2.212 ac

Summary for Subcatchment 1D-1:

Runoff = 1.17 cfs @ 12.00 hrs, Volume= 0.073 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.200	85	Gravel roads, HSG B
1.220	58	Meadow, non-grazed, HSG B
1.420	62	Weighted Average
1.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 1D-2:

Runoff = 0.63 cfs @ 11.95 hrs, Volume= 0.031 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.120	85	Gravel roads, HSG B
0.410	58	Meadow, non-grazed, HSG B
0.530	64	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-3:

Runoff = 0.29 cfs @ 11.94 hrs, Volume= 0.013 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.070	85	Gravel roads, HSG B
0.080	58	Meadow, non-grazed, HSG B
0.150	71	Weighted Average
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-4:

Runoff = 0.96 cfs @ 11.96 hrs, Volume= 0.057 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.001	85	Gravel roads, HSG B
1.510	58	Meadow, non-grazed, HSG B
1.511	58	Weighted Average
1.511		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-5:

Runoff = 0.99 cfs @ 12.01 hrs, Volume= 0.073 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.000	85	Gravel roads, HSG B
1.770	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
1.930	58	Weighted Average
1.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 2A-1:

Runoff = 1.68 cfs @ 12.05 hrs, Volume= 0.149 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
2.480	58	Meadow, non-grazed, HSG B
4.300	57	Weighted Average
4.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2A-2:

Runoff = 0.30 cfs @ 12.05 hrs, Volume= 0.026 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.160	55	Woods, Good, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.760	57	Weighted Average
0.760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B-1:

Runoff = 3.77 cfs @ 11.95 hrs, Volume= 0.195 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.130	55	Woods, Good, HSG B
2.020	58	Meadow, non-grazed, HSG B
0.650	85	Gravel roads, HSG B
3.800	62	Weighted Average
3.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-2:

Runoff = 3.67 cfs @ 11.95 hrs, Volume= 0.190 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
3.100	58	Meadow, non-grazed, HSG B
0.600	85	Gravel roads, HSG B
3.700	62	Weighted Average
3.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-3:

Runoff = 1.82 cfs @ 11.96 hrs, Volume= 0.100 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.970	55	Woods, Good, HSG B
1.020	58	Meadow, non-grazed, HSG B
0.260	85	Gravel roads, HSG B
2.250	60	Weighted Average
2.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2D-1:

Runoff = 4.27 cfs @ 12.01 hrs, Volume= 0.259 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3-1: SC 3-1

Runoff = 0.46 cfs @ 12.01 hrs, Volume= 0.027 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
0.010	55	Woods, Good, HSG B
0.150	85	Gravel roads, HSG B
0.140	58	Meadow, non-grazed, HSG B
0.300	71	Weighted Average
0.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1400	0.18		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	175	0.1700	2.06		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.8	275	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 6.84 cfs @ 12.04 hrs, Volume= 0.476 af, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Yr Storm Rainfall=3.50"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.6	170	0.0200	4.37	7.72	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
12.5	1,005	Total			

Summary for Reach R1D-1:

Inflow Area = 1.420 ac, 0.00% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 1.17 cfs @ 12.00 hrs, Volume= 0.073 af
Outflow = 1.05 cfs @ 12.10 hrs, Volume= 0.073 af, Atten= 10%, Lag= 5.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 8.9 min

Peak Storage= 200 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 202.70 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 700.0' Slope= 0.1029 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,704.00'

Summary for Reach R1D-2:

Inflow Area = 0.530 ac, 0.00% Impervious, Inflow Depth = 0.71" for 2-Yr Storm event
Inflow = 0.63 cfs @ 11.95 hrs, Volume= 0.031 af
Outflow = 0.16 cfs @ 12.69 hrs, Volume= 0.031 af, Atten= 75%, Lag= 44.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.22 fps, Min. Travel Time= 34.9 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 106.4 min

Peak Storage= 332 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 7.66 cfs

2.00' x 2.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 460.0' Slope= 0.1043 '/'
Inlet Invert= 2,784.00', Outlet Invert= 2,736.00'

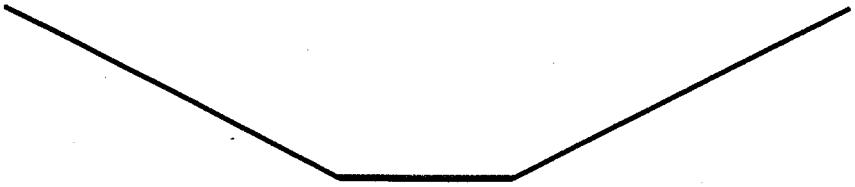
Summary for Reach R1D-3:

Inflow Area = 0.680 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-Yr Storm event
Inflow = 0.29 cfs @ 11.94 hrs, Volume= 0.044 af
Outflow = 0.26 cfs @ 12.00 hrs, Volume= 0.044 af, Atten= 10%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.28 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 3.8 min

Peak Storage= 33 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 206.88 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 280.0' Slope= 0.1071 '/'
Inlet Invert= 2,736.00', Outlet Invert= 2,706.00'



Summary for Reach R1D-4:

Inflow Area = 1.511 ac, 0.00% Impervious, Inflow Depth = 0.45" for 2-Yr Storm event
Inflow = 0.96 cfs @ 11.96 hrs, Volume= 0.057 af
Outflow = 0.56 cfs @ 12.16 hrs, Volume= 0.057 af, Atten= 41%, Lag= 11.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.36 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 7.3 min

Peak Storage= 242 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,807.32 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 570.0' Slope= 0.0386 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,706.00'

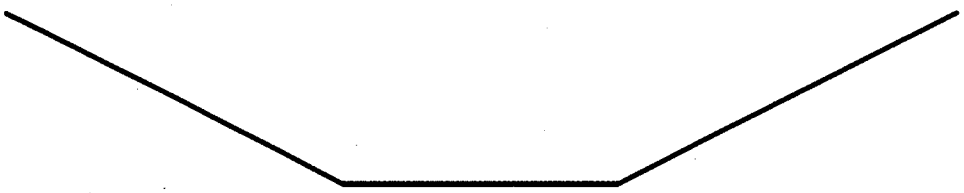
Summary for Reach R1D-5:

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 0.46" for 2-Yr Storm event
Inflow = 1.80 cfs @ 12.06 hrs, Volume= 0.214 af
Outflow = 1.47 cfs @ 12.22 hrs, Volume= 0.214 af, Atten= 18%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.75 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 8.9 min

Peak Storage= 496 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,514.94 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 590.0' Slope= 0.0271 '/'
Inlet Invert= 2,706.00', Outlet Invert= 2,690.00'



Summary for Reach R2A-1:

Inflow Area = 4.300 ac, 0.00% Impervious, Inflow Depth = 0.42" for 2-Yr Storm event
Inflow = 1.68 cfs @ 12.05 hrs, Volume= 0.149 af
Outflow = 1.45 cfs @ 12.16 hrs, Volume= 0.149 af, Atten= 14%, Lag= 6.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 9.5 min

Peak Storage= 335 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 189.16 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 790.0' Slope= 0.0658 '/'
Inlet Invert= 2,738.00', Outlet Invert= 2,686.00'

Summary for Reach R2A-2:

Inflow Area = 0.760 ac, 0.00% Impervious, Inflow Depth = 0.42" for 2-Yr Storm event
Inflow = 0.30 cfs @ 12.05 hrs, Volume= 0.026 af
Outflow = 0.26 cfs @ 12.14 hrs, Volume= 0.026 af, Atten= 12%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.49 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 2.7 min

Peak Storage= 43 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 2.00' Flow Area= 50.0 sf, Capacity= 1,397.50 cfs

20.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 30.00'
Length= 240.0' Slope= 0.1667 '/'
Inlet Invert= 2,726.00', Outlet Invert= 2,686.00'

‡

Summary for Reach R2B-1:

Inflow Area = 3.800 ac, 0.00% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 3.77 cfs @ 11.95 hrs, Volume= 0.195 af
Outflow = 3.23 cfs @ 12.04 hrs, Volume= 0.195 af, Atten= 14%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.18 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 1.69 fps, Avg. Travel Time= 9.6 min

Peak Storage= 616 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 233.15 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 980.0' Slope= 0.1000 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,678.00'

Summary for Reach R2B-2:

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 5.61 cfs @ 11.99 hrs, Volume= 0.385 af
Outflow = 5.17 cfs @ 12.08 hrs, Volume= 0.385 af, Atten= 8%, Lag= 5.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.61 fps, Min. Travel Time= 3.0 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 9.4 min

Peak Storage= 940 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 114.33 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 475.0' Slope= 0.0126 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,672.00'

Summary for Reach R2B-3:

Inflow Area = 2.250 ac, 0.00% Impervious, Inflow Depth = 0.53" for 2-Yr Storm event
Inflow = 1.82 cfs @ 11.96 hrs, Volume= 0.100 af
Outflow = 1.60 cfs @ 12.01 hrs, Volume= 0.100 af, Atten= 12%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.97 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 5.4 min

Peak Storage= 185 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 304.81 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 550.0' Slope= 0.1709 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,634.00'

Summary for Reach R2B-4:

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 0.62" for 2-Yr Storm event
Inflow = 5.17 cfs @ 12.08 hrs, Volume= 0.385 af
Outflow = 5.04 cfs @ 12.12 hrs, Volume= 0.385 af, Atten= 3%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.36 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.74 fps, Avg. Travel Time= 3.4 min

Peak Storage= 339 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 335.18 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 350.0' Slope= 0.1086 '/'
Inlet Invert= 2,672.00', Outlet Invert= 2,634.00'

Summary for Reach R2D-1:

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 0.85" for 2-Yr Storm event
Inflow = 4.27 cfs @ 12.01 hrs, Volume= 0.259 af
Outflow = 3.50 cfs @ 12.17 hrs, Volume= 0.259 af, Atten= 18%, Lag= 9.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.21 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 19.8 min

Peak Storage= 1,245 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 108.58 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 790.0' Slope= 0.0114 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,669.00'

Summary for Reach R3-1:

Inflow Area = 0.300 ac, 0.00% Impervious, Inflow Depth = 1.06" for 2-Yr Storm event
Inflow = 0.46 cfs @ 12.01 hrs, Volume= 0.027 af
Outflow = 0.43 cfs @ 12.06 hrs, Volume= 0.027 af, Atten= 5%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.25 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 4.1 min

Peak Storage= 45 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 181.90 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 230.0' Slope= 0.0609 '/'
Inlet Invert= 2,730.00', Outlet Invert= 2,716.00'

Summary for Pond P3: SEDIMENT POND 3

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 0.46" for 2-Yr Storm event
Inflow = 1.47 cfs @ 12.22 hrs, Volume= 0.214 af
Outflow = 0.40 cfs @ 12.72 hrs, Volume= 0.203 af, Atten= 73%, Lag= 30.1 min
Primary = 0.40 cfs @ 12.72 hrs, Volume= 0.203 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,690.73' @ 12.72 hrs Surf.Area= 1,633 sf Storage= 1,432 cf

Plug-Flow detention time= 79.4 min calculated for 0.203 af (95% of inflow)
Center-of-Mass det. time= 50.5 min (1,028.7 - 978.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,689.00'	28,706 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,689.00	0	0	0
2,690.00	960	480	480
2,692.00	2,795	3,755	4,235
2,694.00	5,480	8,275	12,510
2,696.00	7,850	13,330	25,840
2,696.33	9,520	2,866	28,706

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 7 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,693.30'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,696.00'	**10.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.40 cfs @ 12.72 hrs HW=2,690.73' (Free Discharge)
└─**1=Culvert** (Passes 0.40 cfs of 4.20 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 0.40 cfs @ 3.06 fps)
  └─**3=Top Overflow** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,689.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: SEDIMENT POND 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	0.42"	for 2-Yr Storm event
Inflow =	1.71 cfs @	12.16 hrs,	Volume=	0.175 af	
Outflow =	0.98 cfs @	12.31 hrs,	Volume=	0.175 af,	Atten= 42%, Lag= 9.3 min
Primary =	0.98 cfs @	12.31 hrs,	Volume=	0.175 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,686.57' @ 12.31 hrs Surf.Area= 899 sf Storage= 648 cf

Plug-Flow detention time= 4.7 min calculated for 0.175 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (943.1 - 938.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,685.00'	20,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,685.00	0	0	0
2,686.00	500	250	250
2,688.00	1,900	2,400	2,650
2,690.00	4,700	6,600	9,250
2,692.00	6,800	11,500	20,750

Device	Routing	Invert	Outlet Devices
#1	Primary	2,685.00'	**12.0" Round Culvert** L= 410.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,685.00' / 2,634.00' S= 0.1244 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,685.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 9 rows with 6.0" cc spacing C= 0.600

#3 Device 1 2,689.50' **24.0" Horiz. Orifice/Grate** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=0.98 cfs @ 12.31 hrs HW=2,686.57' (Free Discharge)
└─**1=Culvert** (Passes 0.98 cfs of 3.08 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 0.98 cfs @ 3.92 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 0.71" for 2-Yr Storm event				
Inflow =	6.84 cfs @	12.04 hrs, Volume=	0.476 af		
Outflow =	6.21 cfs @	12.09 hrs, Volume=	0.476 af, Atten= 9%, Lag= 2.7 min		
Primary =	6.21 cfs @	12.09 hrs, Volume=	0.476 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,681.06' @ 12.09 hrs Surf.Area= 1,785 sf Storage= 1,270 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 6.9 min calculated for 0.476 af (100% of inflow)
Center-of-Mass det. time= 6.8 min (899.6 - 892.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=6.11 cfs @ 12.09 hrs HW=2,681.05' (Free Discharge)
└─**1=Culvert** (Inlet Controls 6.11 cfs @ 2.76 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 0.71" for 2-Yr Storm event				
Inflow =	6.21 cfs @	12.09 hrs, Volume=	0.476 af		
Outflow =	6.21 cfs @	12.09 hrs, Volume=	0.476 af, Atten= 0%, Lag= 0.0 min		
Primary =	6.21 cfs @	12.09 hrs, Volume=	0.476 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,657.96' @ 12.09 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=6.12 cfs @ 12.09 hrs HW=2,657.94' (Free Discharge)
└**1=Culvert** (Inlet Controls 6.12 cfs @ 3.12 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area =	3.650 ac,	20.82% Impervious,	Inflow Depth =	0.85"	for 2-Yr Storm event
Inflow =	3.50 cfs @	12.17 hrs,	Volume=	0.259 af	
Outflow =	3.50 cfs @	12.17 hrs,	Volume=	0.259 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.50 cfs @	12.17 hrs,	Volume=	0.259 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,670.03' @ 12.17 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.41 cfs @ 12.17 hrs HW=2,670.01' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.41 cfs @ 2.70 fps)

Summary for Pond P8: ACCESS RD CULVERT

Inflow Area =	2.191 ac,	0.00% Impervious,	Inflow Depth =	0.56"	for 2-Yr Storm event
Inflow =	0.64 cfs @	12.14 hrs,	Volume=	0.101 af	
Outflow =	0.17 cfs @	13.63 hrs,	Volume=	0.068 af,	Atten= 74%, Lag= 89.3 min
Primary =	0.17 cfs @	13.63 hrs,	Volume=	0.068 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,706.19' @ 13.63 hrs Surf.Area= 1,311 sf Storage= 1,672 cf

Plug-Flow detention time= 264.5 min calculated for 0.068 af (67% of inflow)
Center-of-Mass det. time= 131.4 min (1,070.4 - 938.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,704.00'	5,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,704.00	250	0	0
2,706.00	1,190	1,440	1,440
2,708.00	2,500	3,690	5,130

Device	Routing	Invert	Outlet Devices
#1	Primary	2,706.00'	**15.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,706.00' / 2,704.00' S= 0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.17 cfs @ 13.63 hrs HW=2,706.19' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.17 cfs @ 1.47 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1D-1: Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=1.56"
Flow Length=1,265' Tc=9.0 min CN=62 Runoff=3.40 cfs 0.185 af

Subcatchment1D-2: Runoff Area=0.530 ac 0.00% Impervious Runoff Depth=1.71"
Tc=5.0 min CN=64 Runoff=1.64 cfs 0.076 af

Subcatchment1D-3: Runoff Area=0.150 ac 0.00% Impervious Runoff Depth=2.27"
Tc=5.0 min CN=71 Runoff=0.62 cfs 0.028 af

Subcatchment1D-4: Runoff Area=1.511 ac 0.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=58 Runoff=3.38 cfs 0.161 af

Subcatchment1D-5: Runoff Area=1.930 ac 0.00% Impervious Runoff Depth=1.28"
Flow Length=1,265' Tc=9.0 min CN=58 Runoff=3.65 cfs 0.206 af

Subcatchment2A-1: Runoff Area=4.300 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=410' Tc=11.2 min CN=57 Runoff=6.91 cfs 0.435 af

Subcatchment2A-2: Runoff Area=0.760 ac 0.00% Impervious Runoff Depth=1.21"
Flow Length=410' Tc=11.2 min CN=57 Runoff=1.22 cfs 0.077 af

Subcatchment2B-1: Runoff Area=3.800 ac 0.00% Impervious Runoff Depth=1.56"
Tc=5.0 min CN=62 Runoff=10.66 cfs 0.495 af

Subcatchment2B-2: Runoff Area=3.700 ac 0.00% Impervious Runoff Depth=1.56"
Tc=5.0 min CN=62 Runoff=10.38 cfs 0.482 af

Subcatchment2B-3: Runoff Area=2.250 ac 0.00% Impervious Runoff Depth=1.42"
Tc=5.0 min CN=60 Runoff=5.67 cfs 0.266 af

Subcatchment2D-1: Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=1.94"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=10.47 cfs 0.591 af

Subcatchment3-1: SC 3-1 Runoff Area=0.300 ac 0.00% Impervious Runoff Depth=2.27"
Flow Length=275' Tc=10.8 min CN=71 Runoff=1.01 cfs 0.057 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=1.71"
Flow Length=1,005' Tc=12.5 min CN=64 Runoff=18.70 cfs 1.156 af

Reach R1D-1: Avg. Flow Depth=0.24' Max Vel=5.34 fps Inflow=3.40 cfs 0.185 af
n=0.030 L=700.0' S=0.1029 '/' Capacity=202.70 cfs Outflow=3.16 cfs 0.185 af

Reach R1D-2: Avg. Flow Depth=0.61' Max Vel=0.33 fps Inflow=1.64 cfs 0.076 af
n=0.800 L=460.0' S=0.1043 '/' Capacity=7.66 cfs Outflow=0.64 cfs 0.076 af

Reach R1D-3: Avg. Flow Depth=0.10' Max Vel=3.23 fps Inflow=0.70 cfs 0.104 af
n=0.030 L=280.0' S=0.1071 '/' Capacity=206.88 cfs Outflow=0.69 cfs 0.104 af

Reach R1D-4: Avg. Flow Depth=0.14' Max Vel=2.55 fps Inflow=3.38 cfs 0.161 af
n=0.030 L=570.0' S=0.0386 '/' Capacity=1,807.32 cfs Outflow=2.83 cfs 0.161 af

Reach R1D-5: Avg. Flow Depth=0.24' Max Vel=3.01 fps Inflow=6.47 cfs 0.623 af
n=0.030 L=590.0' S=0.0271 '/' Capacity=1,514.94 cfs Outflow=6.13 cfs 0.623 af

Reach R2A-1: Avg. Flow Depth=0.40' Max Vel=5.54 fps Inflow=6.91 cfs 0.435 af
n=0.030 L=790.0' S=0.0658 '/' Capacity=189.16 cfs Outflow=6.47 cfs 0.435 af

Reach R2A-2: Avg. Flow Depth=0.03' Max Vel=2.03 fps Inflow=1.22 cfs 0.077 af
n=0.030 L=240.0' S=0.1667 '/' Capacity=1,397.50 cfs Outflow=1.15 cfs 0.077 af

Reach R2B-1: Avg. Flow Depth=0.44' Max Vel=7.16 fps Inflow=10.66 cfs 0.495 af
n=0.030 L=980.0' S=0.1000 '/' Capacity=233.15 cfs Outflow=9.51 cfs 0.495 af

Reach R2B-2: Avg. Flow Depth=0.77' Max Vel=3.79 fps Inflow=18.19 cfs 0.977 af
n=0.030 L=475.0' S=0.0126 '/' Capacity=114.33 cfs Outflow=16.82 cfs 0.977 af

Reach R2B-3: Avg. Flow Depth=0.28' Max Vel=7.31 fps Inflow=5.67 cfs 0.266 af
n=0.030 L=550.0' S=0.1709 '/' Capacity=304.81 cfs Outflow=5.16 cfs 0.266 af

Reach R2B-4: Avg. Flow Depth=0.42' Max Vel=7.92 fps Inflow=16.82 cfs 0.977 af
n=0.030 L=350.0' S=0.1086 '/' Capacity=335.18 cfs Outflow=16.42 cfs 0.977 af

Reach R2D-1: Avg. Flow Depth=0.57' Max Vel=3.04 fps Inflow=10.47 cfs 0.591 af
n=0.030 L=790.0' S=0.0114 '/' Capacity=108.58 cfs Outflow=9.08 cfs 0.591 af

Reach R3-1: Avg. Flow Depth=0.14' Max Vel=2.96 fps Inflow=1.01 cfs 0.057 af
n=0.030 L=230.0' S=0.0609 '/' Capacity=181.90 cfs Outflow=0.96 cfs 0.057 af

Pond P3: SEDIMENT POND 3 Peak Elev=2,692.57' Storage=6,044 cf Inflow=6.13 cfs 0.623 af
Primary=1.94 cfs 0.612 af Secondary=0.00 cfs 0.000 af Outflow=1.94 cfs 0.612 af

Pond P4: SEDIMENT POND 4 Peak Elev=2,688.65' Storage=4,174 cf Inflow=7.61 cfs 0.511 af
Outflow=3.20 cfs 0.511 af

Pond P5: 36" CMP Culvert Peak Elev=2,681.89' Storage=3,113 cf Inflow=18.70 cfs 1.156 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=17.26 cfs 1.156 af

Pond P6: 24-in Culvert Peak Elev=2,661.16' Inflow=17.26 cfs 1.156 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=17.26 cfs 1.156 af

Pond P7: 18-in Culvert Peak Elev=2,671.57' Inflow=9.08 cfs 0.591 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=9.08 cfs 0.591 af

Pond P8: ACCESS RD CULVERT Peak Elev=2,706.58' Storage=2,236 cf Inflow=3.26 cfs 0.265 af
15.0" Round Culvert n=0.012 L=60.0' S=0.0333 '/' Outflow=1.43 cfs 0.232 af

Total Runoff Area = 32.401 ac Runoff Volume = 4.214 af Average Runoff Depth = 1.56"
93.17% Pervious = 30.189 ac 6.83% Impervious = 2.212 ac

Summary for Subcatchment 1D-1:

Runoff = 3.40 cfs @ 11.99 hrs, Volume= 0.185 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.200	85	Gravel roads, HSG B
1.220	58	Meadow, non-grazed, HSG B
1.420	62	Weighted Average
1.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 1D-2:

Runoff = 1.64 cfs @ 11.94 hrs, Volume= 0.076 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.120	85	Gravel roads, HSG B
0.410	58	Meadow, non-grazed, HSG B
0.530	64	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-3:

Runoff = 0.62 cfs @ 11.94 hrs, Volume= 0.028 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.070	85	Gravel roads, HSG B
0.080	58	Meadow, non-grazed, HSG B
0.150	71	Weighted Average
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-4:

Runoff = 3.38 cfs @ 11.95 hrs, Volume= 0.161 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.001	85	Gravel roads, HSG B
1.510	58	Meadow, non-grazed, HSG B
1.511	58	Weighted Average
1.511		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-5:

Runoff = 3.65 cfs @ 11.99 hrs, Volume= 0.206 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.000	85	Gravel roads, HSG B
1.770	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
1.930	58	Weighted Average
1.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 2A-1:

Runoff = 6.91 cfs @ 12.02 hrs, Volume= 0.435 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
2.480	58	Meadow, non-grazed, HSG B
4.300	57	Weighted Average
4.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2A-2:

Runoff = 1.22 cfs @ 12.02 hrs, Volume= 0.077 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.160	55	Woods, Good, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.760	57	Weighted Average
0.760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B-1:

Runoff = 10.66 cfs @ 11.94 hrs, Volume= 0.495 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.130	55	Woods, Good, HSG B
2.020	58	Meadow, non-grazed, HSG B
0.650	85	Gravel roads, HSG B
3.800	62	Weighted Average
3.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-2:

Runoff = 10.38 cfs @ 11.94 hrs, Volume= 0.482 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
3.100	58	Meadow, non-grazed, HSG B
0.600	85	Gravel roads, HSG B
3.700	62	Weighted Average
3.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-3:

Runoff = 5.67 cfs @ 11.94 hrs, Volume= 0.266 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.970	55	Woods, Good, HSG B
1.020	58	Meadow, non-grazed, HSG B
0.260	85	Gravel roads, HSG B
2.250	60	Weighted Average
2.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2D-1:

Runoff = 10.47 cfs @ 12.00 hrs, Volume= 0.591 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3-1: SC 3-1

Runoff = 1.01 cfs @ 12.00 hrs, Volume= 0.057 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
0.010	55	Woods, Good, HSG B
0.150	85	Gravel roads, HSG B
0.140	58	Meadow, non-grazed, HSG B
0.300	71	Weighted Average
0.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1400	0.18		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	175	0.1700	2.06		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.8	275	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 18.70 cfs @ 12.03 hrs, Volume= 1.156 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Storm Rainfall=5.20"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.6	170	0.0200	4.37	7.72	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
12.5	1,005	Total			

Summary for Reach R1D-1:

Inflow Area = 1.420 ac, 0.00% Impervious, Inflow Depth = 1.56" for 10-yr Storm event
Inflow = 3.40 cfs @ 11.99 hrs, Volume= 0.185 af
Outflow = 3.16 cfs @ 12.05 hrs, Volume= 0.185 af, Atten= 7%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.34 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 7.2 min

Peak Storage= 424 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 202.70 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 700.0' Slope= 0.1029 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,704.00'

Summary for Reach R1D-2:

Inflow Area = 0.530 ac, 0.00% Impervious, Inflow Depth = 1.71" for 10-yr Storm event
Inflow = 1.64 cfs @ 11.94 hrs, Volume= 0.076 af
Outflow = 0.64 cfs @ 12.44 hrs, Volume= 0.076 af, Atten= 61%, Lag= 29.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.33 fps, Min. Travel Time= 23.0 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 90.3 min

Peak Storage= 898 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 7.66 cfs

2.00' x 2.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 460.0' Slope= 0.1043 '/'
Inlet Invert= 2,784.00', Outlet Invert= 2,736.00'

Summary for Reach R1D-3:

Inflow Area = 0.680 ac, 0.00% Impervious, Inflow Depth = 1.83" for 10-yr Storm event
Inflow = 0.70 cfs @ 12.44 hrs, Volume= 0.104 af
Outflow = 0.69 cfs @ 12.48 hrs, Volume= 0.104 af, Atten= 2%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.23 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 3.6 min

Peak Storage= 61 cf @ 12.45 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 206.88 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 280.0' Slope= 0.1071 '/'
Inlet Invert= 2,736.00', Outlet Invert= 2,706.00'

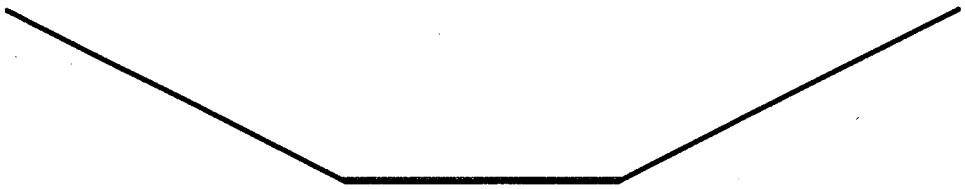
Summary for Reach R1D-4:

Inflow Area = 1.511 ac, 0.00% Impervious, Inflow Depth = 1.28" for 10-yr Storm event
Inflow = 3.38 cfs @ 11.95 hrs, Volume= 0.161 af
Outflow = 2.83 cfs @ 12.05 hrs, Volume= 0.161 af, Atten= 16%, Lag= 6.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.55 fps, Min. Travel Time= 3.7 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 7.1 min

Peak Storage= 650 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,807.32 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 570.0' Slope= 0.0386 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,706.00'



Summary for Reach R1D-5:

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 6.47 cfs @ 12.02 hrs, Volume= 0.623 af
Outflow = 6.13 cfs @ 12.12 hrs, Volume= 0.623 af, Atten= 5%, Lag= 6.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 8.4 min

Peak Storage= 1,204 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,514.94 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 590.0' Slope= 0.0271 '/'
Inlet Invert= 2,706.00', Outlet Invert= 2,690.00'

Summary for Reach R2A-1:

Inflow Area = 4.300 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-yr Storm event
Inflow = 6.91 cfs @ 12.02 hrs, Volume= 0.435 af
Outflow = 6.47 cfs @ 12.09 hrs, Volume= 0.435 af, Atten= 6%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.54 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 7.1 min

Peak Storage= 943 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 189.16 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 790.0' Slope= 0.0658 '/'
Inlet Invert= 2,738.00', Outlet Invert= 2,686.00'

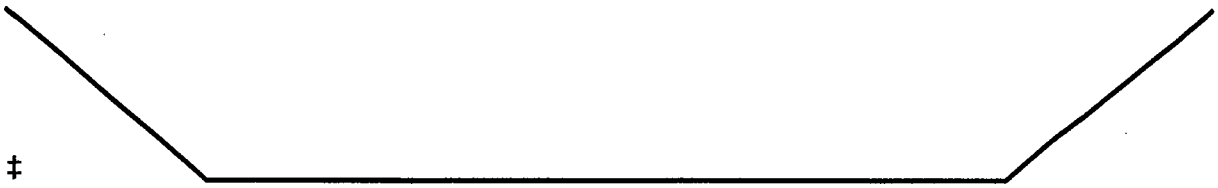
Summary for Reach R2A-2:

Inflow Area = 0.760 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-yr Storm event
Inflow = 1.22 cfs @ 12.02 hrs, Volume= 0.077 af
Outflow = 1.15 cfs @ 12.08 hrs, Volume= 0.077 af, Atten= 6%, Lag= 3.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 2.7 min

Peak Storage= 141 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 2.00' Flow Area= 50.0 sf, Capacity= 1,397.50 cfs

20.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 30.00'
Length= 240.0' Slope= 0.1667 '/'
Inlet Invert= 2,726.00', Outlet Invert= 2,686.00'



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Summary for Reach R2B-1:

Inflow Area = 3.800 ac, 0.00% Impervious, Inflow Depth = 1.56" for 10-yr Storm event
Inflow = 10.66 cfs @ 11.94 hrs, Volume= 0.495 af
Outflow = 9.51 cfs @ 12.01 hrs, Volume= 0.495 af, Atten= 11%, Lag= 3.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.16 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 7.6 min

Peak Storage= 1,334 cf @ 11.97 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 233.15 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 980.0' Slope= 0.1000 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,678.00'

Summary for Reach R2B-2:

Inflow Area =	7.500 ac,	0.00% Impervious,	Inflow Depth =	1.56"	for 10-yr Storm event
Inflow =	18.19 cfs @	11.97 hrs, Volume=	0.977 af		
Outflow =	16.82 cfs @	12.03 hrs, Volume=	0.977 af, Atten= 7%, Lag= 3.9 min		

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.79 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 7.3 min

Peak Storage= 2,184 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.77'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 114.33 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 475.0' Slope= 0.0126 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,672.00'

Summary for Reach R2B-3:

Inflow Area =	2.250 ac,	0.00% Impervious,	Inflow Depth =	1.42"	for 10-yr Storm event
Inflow =	5.67 cfs @	11.94 hrs, Volume=	0.266 af		
Outflow =	5.16 cfs @	11.98 hrs, Volume=	0.266 af, Atten= 9%, Lag= 2.1 min		

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.31 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.19 fps, Avg. Travel Time= 4.2 min

Peak Storage= 411 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 304.81 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 550.0' Slope= 0.1709 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,634.00'

Summary for Reach R2B-4:

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 1.56" for 10-yr Storm event
Inflow = 16.82 cfs @ 12.03 hrs, Volume= 0.977 af
Outflow = 16.42 cfs @ 12.05 hrs, Volume= 0.977 af, Atten= 2%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.92 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.22 fps, Avg. Travel Time= 2.6 min

Peak Storage= 742 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 335.18 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 350.0' Slope= 0.1086 '/'
Inlet Invert= 2,672.00', Outlet Invert= 2,634.00'

Summary for Reach R2D-1:

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 1.94" for 10-yr Storm event
Inflow = 10.47 cfs @ 12.00 hrs, Volume= 0.591 af
Outflow = 9.08 cfs @ 12.12 hrs, Volume= 0.591 af, Atten= 13%, Lag= 7.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 16.1 min

Peak Storage= 2,432 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 108.58 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 790.0' Slope= 0.0114 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,669.00'

Summary for Reach R3-1:

Inflow Area = 0.300 ac, 0.00% Impervious, Inflow Depth = 2.27" for 10-yr Storm event
Inflow = 1.01 cfs @ 12.00 hrs, Volume= 0.057 af
Outflow = 0.96 cfs @ 12.04 hrs, Volume= 0.057 af, Atten= 4%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.96 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 3.9 min

Peak Storage= 76 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 181.90 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 230.0' Slope= 0.0609 '/'
Inlet Invert= 2,730.00', Outlet Invert= 2,716.00'

Summary for Pond P3: SEDIMENT POND 3

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 1.35" for 10-yr Storm event
Inflow = 6.13 cfs @ 12.12 hrs, Volume= 0.623 af
Outflow = 1.94 cfs @ 12.68 hrs, Volume= 0.612 af, Atten= 68%, Lag= 33.3 min
Primary = 1.94 cfs @ 12.68 hrs, Volume= 0.612 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,692.57' @ 12.68 hrs Surf.Area= 3,560 sf Storage= 6,044 cf

Plug-Flow detention time= 59.1 min calculated for 0.612 af (98% of inflow)
Center-of-Mass det. time= 47.7 min (954.8 - 907.1)

Volume	Invert	Avail.Storage	Storage Description
#1	2,689.00'	28,706 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,689.00	0	0	0
2,690.00	960	480	480
2,692.00	2,795	3,755	4,235
2,694.00	5,480	8,275	12,510
2,696.00	7,850	13,330	25,840
2,696.33	9,520	2,866	28,706

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 7 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,693.30'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,696.00'	**10.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.94 cfs @ 12.68 hrs HW=2,692.57' (Free Discharge)
└─**1=Culvert** (Passes 1.94 cfs of 6.62 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 1.94 cfs @ 5.04 fps)
  └─**3=Top Overflow** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,689.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: SEDIMENT POND 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	1.21"	for 10-yr Storm event
Inflow =	7.61 cfs @	12.09 hrs,	Volume=	0.511 af	
Outflow =	3.20 cfs @	12.27 hrs,	Volume=	0.511 af,	Atten= 58%, Lag= 10.9 min
Primary =	3.20 cfs @	12.27 hrs,	Volume=	0.511 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,688.65' @ 12.27 hrs Surf.Area= 2,807 sf Storage= 4,174 cf

Plug-Flow detention time= 11.6 min calculated for 0.511 af (100% of inflow)
Center-of-Mass det. time= 11.6 min (901.0 - 889.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,685.00'	20,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,685.00	0	0	0
2,686.00	500	250	250
2,688.00	1,900	2,400	2,650
2,690.00	4,700	6,600	9,250
2,692.00	6,800	11,500	20,750

Device	Routing	Invert	Outlet Devices
#1	Primary	2,685.00'	**12.0" Round Culvert** L= 410.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,685.00' / 2,634.00' S= 0.1244 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,685.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 9 rows with 6.0" cc spacing C= 0.600

#3 Device 1 2,689.50' **24.0" Horiz. Orifice/Grate** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=3.19 cfs @ 12.27 hrs HW=2,688.64' (Free Discharge)
└─**1=Culvert** (Passes 3.19 cfs of 5.29 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 3.19 cfs @ 6.09 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 1.71" for 10-yr Storm event				
Inflow =	18.70 cfs @	12.03 hrs, Volume=	1.156 af		
Outflow =	17.26 cfs @	12.07 hrs, Volume=	1.156 af, Atten= 8%, Lag= 2.5 min		
Primary =	17.26 cfs @	12.07 hrs, Volume=	1.156 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,681.89' @ 12.07 hrs Surf.Area= 2,697 sf Storage= 3,113 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 5.0 min calculated for 1.154 af (100% of inflow)
Center-of-Mass det. time= 5.0 min (867.3 - 862.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=16.90 cfs @ 12.07 hrs HW=2,681.86' (Free Discharge)
└─**1=Culvert** (Inlet Controls 16.90 cfs @ 3.67 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 1.71" for 10-yr Storm event				
Inflow =	17.26 cfs @	12.07 hrs, Volume=	1.156 af		
Outflow =	17.26 cfs @	12.07 hrs, Volume=	1.156 af, Atten= 0%, Lag= 0.0 min		
Primary =	17.26 cfs @	12.07 hrs, Volume=	1.156 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,661.16' @ 12.07 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=16.91 cfs @ 12.07 hrs HW=2,661.02' (Free Discharge)
└**1=Culvert** (Inlet Controls 16.91 cfs @ 7.17 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area =	3.650 ac,	20.82% Impervious,	Inflow Depth =	1.94"	for 10-yr Storm event
Inflow =	9.08 cfs @	12.12 hrs,	Volume=	0.591 af	
Outflow =	9.08 cfs @	12.12 hrs,	Volume=	0.591 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.08 cfs @	12.12 hrs,	Volume=	0.591 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,671.57' @ 12.12 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=8.88 cfs @ 12.12 hrs HW=2,671.50' (Free Discharge)
└**1=Culvert** (Inlet Controls 8.88 cfs @ 5.02 fps)

Summary for Pond P8: ACCESS RD CULVERT

Inflow Area =	2.191 ac,	0.00% Impervious,	Inflow Depth =	1.45"	for 10-yr Storm event
Inflow =	3.26 cfs @	12.04 hrs,	Volume=	0.265 af	
Outflow =	1.43 cfs @	12.18 hrs,	Volume=	0.232 af,	Atten= 56%, Lag= 8.3 min
Primary =	1.43 cfs @	12.18 hrs,	Volume=	0.232 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,706.58' @ 12.18 hrs Surf.Area= 1,568 sf Storage= 2,236 cf

Plug-Flow detention time= 107.5 min calculated for 0.232 af (87% of inflow)
Center-of-Mass det. time= 44.8 min (935.6 - 890.7)

Volume	Invert	Avail.Storage	Storage Description
#1	2,704.00'	5,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,704.00	250	0	0
2,706.00	1,190	1,440	1,440
2,708.00	2,500	3,690	5,130

Device	Routing	Invert	Outlet Devices
#1	Primary	2,706.00'	**15.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,706.00' / 2,704.00' S= 0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.42 cfs @ 12.18 hrs HW=2,706.57' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.42 cfs @ 2.58 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1D-1: Runoff Area=1.420 ac 0.00% Impervious Runoff Depth=2.09"
Flow Length=1,265' Tc=9.0 min CN=62 Runoff=4.62 cfs 0.247 af

Subcatchment1D-2: Runoff Area=0.530 ac 0.00% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=64 Runoff=2.18 cfs 0.100 af

Subcatchment1D-3: Runoff Area=0.150 ac 0.00% Impervious Runoff Depth=2.90"
Tc=5.0 min CN=71 Runoff=0.79 cfs 0.036 af

Subcatchment1D-4: Runoff Area=1.511 ac 0.00% Impervious Runoff Depth=1.76"
Tc=5.0 min CN=58 Runoff=4.75 cfs 0.221 af

Subcatchment1D-5: Runoff Area=1.930 ac 0.00% Impervious Runoff Depth=1.76"
Flow Length=1,265' Tc=9.0 min CN=58 Runoff=5.17 cfs 0.283 af

Subcatchment2A-1: Runoff Area=4.300 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=410' Tc=11.2 min CN=57 Runoff=9.97 cfs 0.601 af

Subcatchment2A-2: Runoff Area=0.760 ac 0.00% Impervious Runoff Depth=1.68"
Flow Length=410' Tc=11.2 min CN=57 Runoff=1.76 cfs 0.106 af

Subcatchment2B-1: Runoff Area=3.800 ac 0.00% Impervious Runoff Depth=2.09"
Tc=5.0 min CN=62 Runoff=14.41 cfs 0.662 af

Subcatchment2B-2: Runoff Area=3.700 ac 0.00% Impervious Runoff Depth=2.09"
Tc=5.0 min CN=62 Runoff=14.03 cfs 0.645 af

Subcatchment2B-3: Runoff Area=2.250 ac 0.00% Impervious Runoff Depth=1.92"
Tc=5.0 min CN=60 Runoff=7.80 cfs 0.360 af

Subcatchment2D-1: Runoff Area=3.650 ac 20.82% Impervious Runoff Depth=2.53"
Flow Length=1,280' Tc=10.6 min CN=67 Runoff=13.74 cfs 0.770 af

Subcatchment3-1: SC 3-1 Runoff Area=0.300 ac 0.00% Impervious Runoff Depth=2.90"
Flow Length=275' Tc=10.8 min CN=71 Runoff=1.29 cfs 0.072 af

SubcatchmentOS: OFFSITE Runoff Area=8.100 ac 17.93% Impervious Runoff Depth=2.26"
Flow Length=1,005' Tc=12.5 min CN=64 Runoff=25.12 cfs 1.528 af

Reach R1D-1: Avg. Flow Depth=0.29' Max Vel=5.91 fps Inflow=4.62 cfs 0.247 af
n=0.030 L=700.0' S=0.1029 '/' Capacity=202.70 cfs Outflow=4.31 cfs 0.247 af

Reach R1D-2: Avg. Flow Depth=0.74' Max Vel=0.37 fps Inflow=2.18 cfs 0.100 af
n=0.800 L=460.0' S=0.1043 '/' Capacity=7.66 cfs Outflow=0.95 cfs 0.100 af

Reach R1D-3: Avg. Flow Depth=0.12' Max Vel=3.71 fps Inflow=1.03 cfs 0.136 af
n=0.030 L=280.0' S=0.1071 '/' Capacity=206.88 cfs Outflow=1.02 cfs 0.136 af

Reach R1D-4: Avg. Flow Depth=0.17' Max Vel=2.90 fps Inflow=4.75 cfs 0.221 af
n=0.030 L=570.0' S=0.0386 '/' Capacity=1,807.32 cfs Outflow=4.17 cfs 0.221 af

Reach R1D-5: Avg. Flow Depth=0.32' Max Vel=3.61 fps Inflow=10.67 cfs 0.854 af
n=0.030 L=590.0' S=0.0271 '/' Capacity=1,514.94 cfs Outflow=10.15 cfs 0.854 af

Reach R2A-1: Avg. Flow Depth=0.49' Max Vel=6.16 fps Inflow=9.97 cfs 0.601 af
n=0.030 L=790.0' S=0.0658 '/' Capacity=189.16 cfs Outflow=9.34 cfs 0.601 af

Reach R2A-2: Avg. Flow Depth=0.04' Max Vel=2.29 fps Inflow=1.76 cfs 0.106 af
n=0.030 L=240.0' S=0.1667 '/' Capacity=1,397.50 cfs Outflow=1.66 cfs 0.106 af

Reach R2B-1: Avg. Flow Depth=0.52' Max Vel=7.84 fps Inflow=14.41 cfs 0.662 af
n=0.030 L=980.0' S=0.1000 '/' Capacity=233.15 cfs Outflow=12.95 cfs 0.662 af

Reach R2B-2: Avg. Flow Depth=0.92' Max Vel=4.16 fps Inflow=25.11 cfs 1.307 af
n=0.030 L=475.0' S=0.0126 '/' Capacity=114.33 cfs Outflow=23.25 cfs 1.307 af

Reach R2B-3: Avg. Flow Depth=0.33' Max Vel=8.07 fps Inflow=7.80 cfs 0.360 af
n=0.030 L=550.0' S=0.1709 '/' Capacity=304.81 cfs Outflow=7.12 cfs 0.360 af

Reach R2B-4: Avg. Flow Depth=0.50' Max Vel=8.71 fps Inflow=23.25 cfs 1.307 af
n=0.030 L=350.0' S=0.1086 '/' Capacity=335.18 cfs Outflow=22.69 cfs 1.307 af

Reach R2D-1: Avg. Flow Depth=0.66' Max Vel=3.31 fps Inflow=13.74 cfs 0.770 af
n=0.030 L=790.0' S=0.0114 '/' Capacity=108.58 cfs Outflow=12.16 cfs 0.770 af

Reach R3-1: Avg. Flow Depth=0.16' Max Vel=3.23 fps Inflow=1.29 cfs 0.072 af
n=0.030 L=230.0' S=0.0609 '/' Capacity=181.90 cfs Outflow=1.23 cfs 0.072 af

Pond P3: SEDIMENT POND 3 Peak Elev=2,693.36' Storage=9,259 cf Inflow=10.15 cfs 0.854 af
Primary=3.14 cfs 0.843 af Secondary=0.00 cfs 0.000 af Outflow=3.14 cfs 0.843 af

Pond P4: SEDIMENT POND 4 Peak Elev=2,689.41' Storage=6,717 cf Inflow=10.98 cfs 0.707 af
Outflow=4.16 cfs 0.707 af

Pond P5: 36" CMP Culvert Peak Elev=2,682.26' Storage=4,189 cf Inflow=25.12 cfs 1.528 af
36.0" Round Culvert n=0.025 L=356.0' S=0.0679 '/' Outflow=23.02 cfs 1.528 af

Pond P6: 24-in Culvert Peak Elev=2,664.04' Inflow=23.02 cfs 1.528 af
20.8" Round Culvert n=0.012 L=586.0' S=0.0394 '/' Outflow=23.02 cfs 1.528 af

Pond P7: 18-in Culvert Peak Elev=2,673.02' Inflow=12.16 cfs 0.770 af
18.0" Round Culvert n=0.012 L=60.0' S=0.0083 '/' Outflow=12.16 cfs 0.770 af

Pond P8: ACCESS RD CULVERT Peak Elev=2,706.89' Storage=2,758 cf Inflow=4.79 cfs 0.357 af
15.0" Round Culvert n=0.012 L=60.0' S=0.0333 '/' Outflow=3.00 cfs 0.324 af

Total Runoff Area = 32.401 ac Runoff Volume = 5.631 af Average Runoff Depth = 2.09"
93.17% Pervious = 30.189 ac 6.83% Impervious = 2.212 ac

Summary for Subcatchment 1D-1:

Runoff = 4.62 cfs @ 11.99 hrs, Volume= 0.247 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.200	85	Gravel roads, HSG B
1.220	58	Meadow, non-grazed, HSG B
1.420	62	Weighted Average
1.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 1D-2:

Runoff = 2.18 cfs @ 11.94 hrs, Volume= 0.100 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.120	85	Gravel roads, HSG B
0.410	58	Meadow, non-grazed, HSG B
0.530	64	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-3:

Runoff = 0.79 cfs @ 11.94 hrs, Volume= 0.036 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.070	85	Gravel roads, HSG B
0.080	58	Meadow, non-grazed, HSG B
0.150	71	Weighted Average
0.150		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-4:

Runoff = 4.75 cfs @ 11.94 hrs, Volume= 0.221 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.001	85	Gravel roads, HSG B
1.510	58	Meadow, non-grazed, HSG B
1.511	58	Weighted Average
1.511		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, A-B**

Summary for Subcatchment 1D-5:

Runoff = 5.17 cfs @ 11.99 hrs, Volume= 0.283 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.000	85	Gravel roads, HSG B
1.770	58	Meadow, non-grazed, HSG B
0.160	55	Woods, Good, HSG B
1.930	58	Weighted Average
1.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.2	150	0.1300	12.96	51.83	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.2	60	0.4000	4.43		**Shallow Concentrated Flow, D-E** Short Grass Pasture Kv= 7.0 fps
0.5	300	0.0500	9.49	97.25	**Trap/Vee/Rect Channel Flow, E-F** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
1.7	595	0.0200	6.00	61.51	**Trap/Vee/Rect Channel Flow, G-H** Bot.W=8.00' D=1.00' Z= 2.0 & 2.5 '/' Top.W=12.50' n= 0.030
9.0	1,265	Total			

Summary for Subcatchment 2A-1:

Runoff = 9.97 cfs @ 12.02 hrs, Volume= 0.601 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.820	55	Woods, Good, HSG B
2.480	58	Meadow, non-grazed, HSG B
4.300	57	Weighted Average
4.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2A-2:

Runoff = 1.76 cfs @ 12.02 hrs, Volume= 0.106 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.160	55	Woods, Good, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.760	57	Weighted Average
0.760		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	100	0.1800	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
2.6	250	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	60	0.0600	8.72	39.24	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 2.5 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
11.2	410	Total			

Summary for Subcatchment 2B-1:

Runoff = 14.41 cfs @ 11.94 hrs, Volume= 0.662 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.130	55	Woods, Good, HSG B
2.020	58	Meadow, non-grazed, HSG B
0.650	85	Gravel roads, HSG B
3.800	62	Weighted Average
3.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-2:

Runoff = 14.03 cfs @ 11.94 hrs, Volume= 0.645 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
3.100	58	Meadow, non-grazed, HSG B
0.600	85	Gravel roads, HSG B
3.700	62	Weighted Average
3.700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2B-3:

Runoff = 7.80 cfs @ 11.94 hrs, Volume= 0.360 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.970	55	Woods, Good, HSG B
1.020	58	Meadow, non-grazed, HSG B
0.260	85	Gravel roads, HSG B
2.250	60	Weighted Average
2.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Summary for Subcatchment 2D-1:

Runoff = 13.74 cfs @ 12.00 hrs, Volume= 0.770 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
1.590	55	Woods, Good, HSG B
0.760	98	Paved parking, HSG B
0.260	85	Gravel roads, HSG B
1.040	58	Meadow, non-grazed, HSG B
3.650	67	Weighted Average
2.890		79.18% Pervious Area
0.760		20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	85	0.2100	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
0.9	385	0.0600	7.38	22.14	**Trap/Vee/Rect Channel Flow, B-C** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.030 Earth, grassed & winding
2.7	810	0.0200	4.99	24.93	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
10.6	1,280	Total			

Summary for Subcatchment 3-1: SC 3-1

Runoff = 1.29 cfs @ 12.00 hrs, Volume= 0.072 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
0.010	55	Woods, Good, HSG B
0.150	85	Gravel roads, HSG B
0.140	58	Meadow, non-grazed, HSG B
0.300	71	Weighted Average
0.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.1400	0.18		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.50"
1.4	175	0.1700	2.06		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.8	275	Total			

Summary for Subcatchment OS: OFFSITE

Runoff = 25.12 cfs @ 12.03 hrs, Volume= 1.528 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Yr Storm Rainfall=6.00"

Area (ac)	CN	Description
5.200	55	Woods, Good, HSG B
0.970	98	Paved parking, HSG B
1.930	70	1/2 acre lots, 25% imp, HSG B
8.100	64	Weighted Average
6.647		82.07% Pervious Area
1.452		17.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.6	70	0.0900	2.10		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.0	665	0.0900	10.58	52.89	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.030 Earth, grassed & winding
0.6	170	0.0200	4.37	7.72	**Pipe Channel, D-E** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.025 Corrugated metal
12.5	1,005	Total			

Summary for Reach R1D-1:

Inflow Area = 1.420 ac, 0.00% Impervious, Inflow Depth = 2.09" for 25-Yr Storm event
Inflow = 4.62 cfs @ 11.99 hrs, Volume= 0.247 af
Outflow = 4.31 cfs @ 12.05 hrs, Volume= 0.247 af, Atten= 7%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.91 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 6.7 min

Peak Storage= 526 cf @ 12.01 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 202.70 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 700.0' Slope= 0.1029 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,704.00'

Summary for Reach R1D-2:

Inflow Area = 0.530 ac, 0.00% Impervious, Inflow Depth = 2.26" for 25-Yr Storm event
Inflow = 2.18 cfs @ 11.94 hrs, Volume= 0.100 af
Outflow = 0.95 cfs @ 12.39 hrs, Volume= 0.100 af, Atten= 57%, Lag= 27.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.37 fps, Min. Travel Time= 20.7 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 85.7 min

Peak Storage= 1,185 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 7.66 cfs

2.00' x 2.00' deep channel, n= 0.800 Sheet flow: Woods+dense brush
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 460.0' Slope= 0.1043 '/'
Inlet Invert= 2,784.00', Outlet Invert= 2,736.00'

Summary for Reach R1D-3:

Inflow Area = 0.680 ac, 0.00% Impervious, Inflow Depth = 2.40" for 25-Yr Storm event
Inflow = 1.03 cfs @ 12.39 hrs, Volume= 0.136 af
Outflow = 1.02 cfs @ 12.42 hrs, Volume= 0.136 af, Atten= 1%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.71 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 3.4 min

Peak Storage= 78 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 206.88 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 280.0' Slope= 0.1071 '/'
Inlet Invert= 2,736.00', Outlet Invert= 2,706.00'

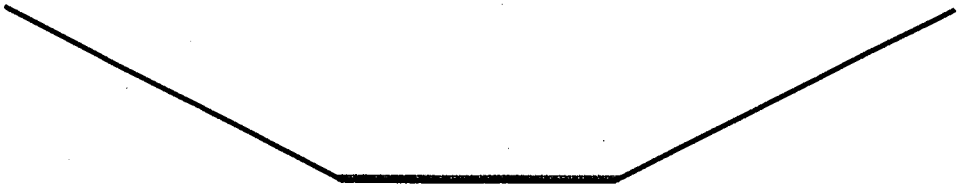
Summary for Reach R1D-4:

Inflow Area = 1.511 ac, 0.00% Impervious, Inflow Depth = 1.76" for 25-Yr Storm event
Inflow = 4.75 cfs @ 11.94 hrs, Volume= 0.221 af
Outflow = 4.17 cfs @ 12.03 hrs, Volume= 0.221 af, Atten= 12%, Lag= 5.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 7.1 min

Peak Storage= 819 cf @ 11.98 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,807.32 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 570.0' Slope= 0.0386 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,706.00'



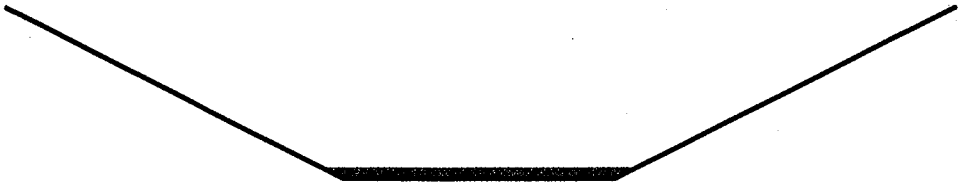
Summary for Reach R1D-5:

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 1.85" for 25-Yr Storm event
Inflow = 10.67 cfs @ 12.04 hrs, Volume= 0.854 af
Outflow = 10.15 cfs @ 12.12 hrs, Volume= 0.854 af, Atten= 5%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.61 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 8.2 min

Peak Storage= 1,657 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 5.00' Flow Area= 90.0 sf, Capacity= 1,514.94 cfs

8.00' x 5.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 28.00'
Length= 590.0' Slope= 0.0271 '/'
Inlet Invert= 2,706.00', Outlet Invert= 2,690.00'



Summary for Reach R2A-1:

Inflow Area = 4.300 ac, 0.00% Impervious, Inflow Depth = 1.68" for 25-Yr Storm event
Inflow = 9.97 cfs @ 12.02 hrs, Volume= 0.601 af
Outflow = 9.34 cfs @ 12.08 hrs, Volume= 0.601 af, Atten= 6%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.16 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 2.03 fps, Avg. Travel Time= 6.5 min

Peak Storage= 1,232 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 189.16 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 790.0' Slope= 0.0658 '/'
Inlet Invert= 2,738.00', Outlet Invert= 2,686.00'

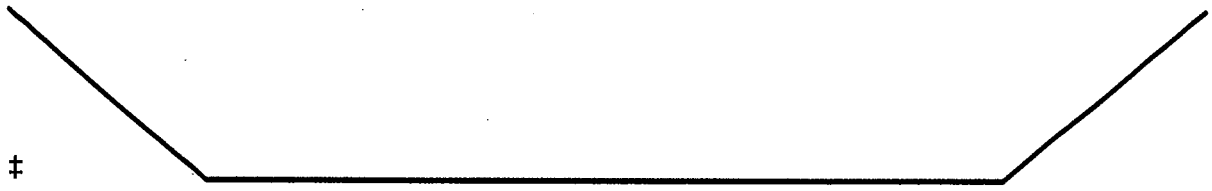
Summary for Reach R2A-2:

Inflow Area = 0.760 ac, 0.00% Impervious, Inflow Depth = 1.68" for 25-Yr Storm event
Inflow = 1.76 cfs @ 12.02 hrs, Volume= 0.106 af
Outflow = 1.66 cfs @ 12.07 hrs, Volume= 0.106 af, Atten= 6%, Lag= 3.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.29 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 2.7 min

Peak Storage= 180 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 2.00' Flow Area= 50.0 sf, Capacity= 1,397.50 cfs

20.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 30.00'
Length= 240.0' Slope= 0.1667 '/'
Inlet Invert= 2,726.00', Outlet Invert= 2,686.00'



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Summary for Reach R2B-1:

Inflow Area = 3.800 ac, 0.00% Impervious, Inflow Depth = 2.09" for 25-Yr Storm event
Inflow = 14.41 cfs @ 11.94 hrs, Volume= 0.662 af
Outflow = 12.95 cfs @ 12.00 hrs, Volume= 0.662 af, Atten= 10%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.84 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 7.0 min

Peak Storage= 1,671 cf @ 11.96 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 233.15 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 980.0' Slope= 0.1000 '/'
Inlet Invert= 2,776.00', Outlet Invert= 2,678.00'

Summary for Reach R2B-2:

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 2.09" for 25-Yr Storm event
Inflow = 25.11 cfs @ 11.96 hrs, Volume= 1.307 af
Outflow = 23.25 cfs @ 12.02 hrs, Volume= 1.307 af, Atten= 7%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.16 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 6.8 min

Peak Storage= 2,754 cf @ 11.99 hrs
Average Depth at Peak Storage= 0.92'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 114.33 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 475.0' Slope= 0.0126 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,672.00'

Summary for Reach R2B-3:

Inflow Area = 2.250 ac, 0.00% Impervious, Inflow Depth = 1.92" for 25-Yr Storm event
Inflow = 7.80 cfs @ 11.94 hrs, Volume= 0.360 af
Outflow = 7.12 cfs @ 11.97 hrs, Volume= 0.360 af, Atten= 9%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.07 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.38 fps, Avg. Travel Time= 3.9 min

Peak Storage= 515 cf @ 11.95 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 304.81 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 550.0' Slope= 0.1709 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,634.00'

Summary for Reach R2B-4:

Inflow Area = 7.500 ac, 0.00% Impervious, Inflow Depth = 2.09" for 25-Yr Storm event
Inflow = 23.25 cfs @ 12.02 hrs, Volume= 1.307 af
Outflow = 22.69 cfs @ 12.04 hrs, Volume= 1.307 af, Atten= 2%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.71 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.40 fps, Avg. Travel Time= 2.4 min

Peak Storage= 924 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 335.18 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 350.0' Slope= 0.1086 '/'
Inlet Invert= 2,672.00', Outlet Invert= 2,634.00'

Summary for Reach R2D-1:

Inflow Area = 3.650 ac, 20.82% Impervious, Inflow Depth = 2.53" for 25-Yr Storm event
Inflow = 13.74 cfs @ 12.00 hrs, Volume= 0.770 af
Outflow = 12.16 cfs @ 12.11 hrs, Volume= 0.770 af, Atten= 12%, Lag= 6.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 4.0 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 15.1 min

Peak Storage= 2,970 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 108.58 cfs

4.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 14.00'
Length= 790.0' Slope= 0.0114 '/'
Inlet Invert= 2,678.00', Outlet Invert= 2,669.00'

Summary for Reach R3-1:

Inflow Area = 0.300 ac, 0.00% Impervious, Inflow Depth = 2.90" for 25-Yr Storm event
Inflow = 1.29 cfs @ 12.00 hrs, Volume= 0.072 af
Outflow = 1.23 cfs @ 12.04 hrs, Volume= 0.072 af, Atten= 4%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.23 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 3.8 min

Peak Storage= 90 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 181.90 cfs

2.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.5 '/' Top Width= 12.00'
Length= 230.0' Slope= 0.0609 '/'
Inlet Invert= 2,730.00', Outlet Invert= 2,716.00'

Summary for Pond P3: SEDIMENT POND 3

Inflow Area = 5.541 ac, 0.00% Impervious, Inflow Depth = 1.85" for 25-Yr Storm event
Inflow = 10.15 cfs @ 12.12 hrs, Volume= 0.854 af
Outflow = 3.14 cfs @ 12.51 hrs, Volume= 0.843 af, Atten= 69%, Lag= 23.2 min
Primary = 3.14 cfs @ 12.51 hrs, Volume= 0.843 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,693.36' @ 12.51 hrs Surf.Area= 4,615 sf Storage= 9,259 cf

Plug-Flow detention time= 56.2 min calculated for 0.842 af (99% of inflow)
Center-of-Mass det. time= 48.1 min (939.3 - 891.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,689.00'	28,706 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,689.00	0	0	0
2,690.00	960	480	480
2,692.00	2,795	3,755	4,235
2,694.00	5,480	8,275	12,510
2,696.00	7,850	13,330	25,840
2,696.33	9,520	2,866	28,706

Device	Routing	Invert	Outlet Devices
#1	Primary	2,689.00'	**12.0" Round Culvert** L= 806.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,689.00' / 2,655.00' S= 0.0422 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	2,690.00'	**1.0" Vert. Pool Drain Holes X 12.00 columns** X 7 rows with 6.0" cc spacing C= 0.600
#3	Device 1	2,693.30'	**24.0" Horiz. Top Overflow** C= 0.600 Limited to weir flow at low heads
#4	Secondary	2,696.00'	**10.0' long x 10.0' breadth Containment Berm** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=3.10 cfs @ 12.51 hrs HW=2,693.36' (Free Discharge)
└─**1=Culvert** (Passes 3.10 cfs of 7.43 cfs potential flow)
  ├─**2=Pool Drain Holes** (Orifice Controls 2.83 cfs @ 6.17 fps)
  └─**3=Top Overflow** (Weir Controls 0.27 cfs @ 0.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,689.00' (Free Discharge)
└─**4=Containment Berm** (Controls 0.00 cfs)

Summary for Pond P4: SEDIMENT POND 4

Inflow Area =	5.060 ac,	0.00% Impervious,	Inflow Depth =	1.68"	for 25-Yr Storm event
Inflow =	10.98 cfs @	12.08 hrs,	Volume=	0.707 af	
Outflow =	4.16 cfs @	12.28 hrs,	Volume=	0.707 af,	Atten= 62%, Lag= 11.7 min
Primary =	4.16 cfs @	12.28 hrs,	Volume=	0.707 af	

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,689.41' @ 12.28 hrs Surf.Area= 3,873 sf Storage= 6,717 cf

Plug-Flow detention time= 14.6 min calculated for 0.706 af (100% of inflow)
Center-of-Mass det. time= 14.6 min (892.1 - 877.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,685.00'	20,750 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,685.00	0	0	0
2,686.00	500	250	250
2,688.00	1,900	2,400	2,650
2,690.00	4,700	6,600	9,250
2,692.00	6,800	11,500	20,750

Device	Routing	Invert	Outlet Devices
#1	Primary	2,685.00'	**12.0" Round Culvert** L= 410.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,685.00' / 2,634.00' S= 0.1244 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	2,685.00'	**1.0" Vert. Orifice/Grate X 12.00 columns** X 9 rows with 6.0" cc spacing C= 0.600

#3 Device 1 2,689.50' **24.0" Horiz. Orifice/Grate** C= 0.600
Limited to weir flow at low heads

Primary OutFlow Max=4.15 cfs @ 12.28 hrs HW=2,689.40' (Free Discharge)
└─**1=Culvert** (Passes 4.15 cfs of 5.90 cfs potential flow)
├─**2=Orifice/Grate** (Orifice Controls 4.15 cfs @ 7.05 fps)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond P5: 36" CMP Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 2.26" for 25-Yr Storm event				
Inflow =	25.12 cfs @	12.03 hrs, Volume=	1.528 af		
Outflow =	23.02 cfs @	12.07 hrs, Volume=	1.528 af, Atten= 8%, Lag= 2.7 min		
Primary =	23.02 cfs @	12.07 hrs, Volume=	1.528 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,682.26' @ 12.07 hrs Surf.Area= 3,109 sf Storage= 4,189 cf
Flood Elev= 2,695.00' Surf.Area= 18,245 sf Storage= 77,900 cf

Plug-Flow detention time= 4.8 min calculated for 1.528 af (100% of inflow)
Center-of-Mass det. time= 4.7 min (858.4 - 853.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,680.00'	77,900 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,680.00	605	0	0
2,685.00	6,155	16,900	16,900
2,690.00	18,245	61,000	77,900

Device	Routing	Invert	Outlet Devices
#1	Primary	2,680.00'	**36.0" Round Culvert** L= 356.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,680.00' / 2,655.83' S= 0.0679 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf

Primary OutFlow Max=22.59 cfs @ 12.07 hrs HW=2,682.23' (Free Discharge)
└─**1=Culvert** (Inlet Controls 22.59 cfs @ 4.01 fps)

Summary for Pond P6: 24-in Culvert

Inflow Area =	8.100 ac, 17.93% Impervious, Inflow Depth = 2.26" for 25-Yr Storm event				
Inflow =	23.02 cfs @	12.07 hrs, Volume=	1.528 af		
Outflow =	23.02 cfs @	12.07 hrs, Volume=	1.528 af, Atten= 0%, Lag= 0.0 min		
Primary =	23.02 cfs @	12.07 hrs, Volume=	1.528 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,664.04' @ 12.07 hrs
Flood Elev= 2,673.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,656.60'	**20.8" Round Culvert** L= 586.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,656.60' / 2,633.50' S= 0.0394 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 2.36 sf

Primary OutFlow Max=22.59 cfs @ 12.07 hrs HW=2,663.81' (Free Discharge)
└**1=Culvert** (Inlet Controls 22.59 cfs @ 9.57 fps)

Summary for Pond P7: 18-in Culvert

Inflow Area =	3.650 ac,	20.82% Impervious,	Inflow Depth =	2.53"	for 25-Yr Storm event
Inflow =	12.16 cfs @	12.11 hrs, Volume=	0.770 af		
Outflow =	12.16 cfs @	12.11 hrs, Volume=	0.770 af,	Atten= 0%,	Lag= 0.0 min
Primary =	12.16 cfs @	12.11 hrs, Volume=	0.770 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 2,673.02' @ 12.11 hrs
Flood Elev= 2,674.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,669.00'	**18.0" Round Culvert** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2,669.00' / 2,668.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=11.96 cfs @ 12.11 hrs HW=2,672.92' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.96 cfs @ 6.77 fps)

Summary for Pond P8: ACCESS RD CULVERT

Inflow Area =	2.191 ac,	0.00% Impervious,	Inflow Depth =	1.96"	for 25-Yr Storm event
Inflow =	4.79 cfs @	12.02 hrs, Volume=	0.357 af		
Outflow =	3.00 cfs @	12.12 hrs, Volume=	0.324 af,	Atten= 37%,	Lag= 5.6 min
Primary =	3.00 cfs @	12.12 hrs, Volume=	0.324 af		

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,706.89' @ 12.12 hrs Surf.Area= 1,773 sf Storage= 2,758 cf

Plug-Flow detention time= 83.4 min calculated for 0.324 af (91% of inflow)
Center-of-Mass det. time= 33.9 min (912.4 - 878.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,704.00'	5,130 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,704.00	250	0	0
2,706.00	1,190	1,440	1,440
2,708.00	2,500	3,690	5,130

Device	Routing	Invert	Outlet Devices
#1	Primary	2,706.00'	**15.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 2,706.00' / 2,704.00' S= 0.0333 '/' Cc= 0.900 n= 0.012 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.91 cfs @ 12.12 hrs HW=2,706.87' (Free Discharge)
└─**1=Culvert** (Inlet Controls 2.91 cfs @ 3.18 fps)

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-1

Discharge	4.6
Peak Flow Period	1
Channel Slope	0.1
Channel Bottom Width	0
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	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	4.6 cfs	5.52 ft/s	0.65 ft	0.037	3 lbs/ft2	4.03 lbs/ft2	0.74	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	4.6 cfs	3.2 ft/s	0.85 ft	0.077	10 lbs/ft2	5.29 lbs/ft2	1.89	STABLE	E
Underlying Substrate	Straight	4.6 cfs	3.2 ft/s	0.85 ft	--	0.8 lbs/ft2	0.248 lbs/ft2	3.22	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	4.6 cfs	8.23 ft/s	0.53 ft	0.022	2.25 lbs/ft2	3.3 lbs/ft2	0.68	UNSTABLE	D

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	4.6 cfs	3.2 ft/s	0.85 ft	0.077	4.2 lbs/ft2	5.29 lbs/ft2	0.79	UNSTABLE	--
Underlying Substrate	Straight	4.6 cfs	3.2 ft/s	0.85 ft	--	0.04 lbs/ft2	0.055 lbs/ft2	0.64	UNSTABLE	--

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Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-1 (TEMP)

Discharge	1.2
Peak Flow Period	1
Channel Slope	0.1
Channel Bottom Width	0
Left Side Slope	2.5
Right Side Slope	2.5
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	1.2 cfs	2.83 ft/s	0.41 ft	0.055	1.55 lbs/ft2	2.57 lbs/ft2	0.6	UNSTABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	1.2 cfs	3.6 ft/s	0.37 ft	0.04	3 lbs/ft2	2.28 lbs/ft2	1.32	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	1.2 cfs	5.64 ft/s	0.29 ft	0.022	2.25 lbs/ft2	1.82 lbs/ft2	1.24	STABLE	D

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Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
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Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-2

Discharge	2.2
Peak Flow Period	1
Channel Slope	0.1
Channel Bottom Width	0
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	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	2.2 cfs	4.35 ft/s	0.5 ft	0.04	3 lbs/ft2	3.14 lbs/ft2	0.96	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	2.2 cfs	2.19 ft/s	0.71 ft	0.1	10 lbs/ft2	4.43 lbs/ft2	2.26	STABLE	E
Underlying Substrate	Straight	2.2 cfs	2.19 ft/s	0.71 ft	--	0.8 lbs/ft2	0.143 lbs/ft2	5.58	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	2.2 cfs	6.81 ft/s	0.4 ft	0.022	2.25 lbs/ft2	2.51 lbs/ft2	0.9	UNSTABLE	D

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	2.2 cfs	2.19 ft/s	0.71 ft	0.1	4.2 lbs/ft2	4.43 lbs/ft2	0.95	UNSTABLE	--
Underlying Substrate	Straight	2.2 cfs	2.19 ft/s	0.71 ft	--	0.04 lbs/ft2	0.027 lbs/ft2	1.3	STABLE	--

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Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-2 (TEMP)

Discharge	1
Peak Flow Period	0.6
Channel Slope	0.1
Channel Bottom Width	0
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	1 cfs	2.81 ft/s	0.42 ft	0.055	1.55 lbs/ft2	2.63 lbs/ft2	0.59	UNSTABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	1 cfs	3.57 ft/s	0.37 ft	0.04	3 lbs/ft2	2.34 lbs/ft2	1.28	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	1 cfs	5.59 ft/s	0.3 ft	0.022	2.25 lbs/ft2	1.87 lbs/ft2	1.21	STABLE	D

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Poseyville, Indiana 47633
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Fax 812.867.0247
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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-3

Discharge	2.7
Peak Flow Period	1
Channel Slope	0.1
Channel Bottom Width	0
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	2.7 cfs	4.41 ft/s	0.5 ft	0.04	3 lbs/ft2	3.09 lbs/ft2	0.97	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	2.7 cfs	2.25 ft/s	0.69 ft	0.098	10 lbs/ft2	4.32 lbs/ft2	2.31	STABLE	E
Underlying Substrate	Straight	2.7 cfs	2.25 ft/s	0.69 ft	--	0.8 lbs/ft2	0.148 lbs/ft2	5.41	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	2.7 cfs	6.9 ft/s	0.4 ft	0.022	2.25 lbs/ft2	2.47 lbs/ft2	0.91	UNSTABLE	D

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	2.7 cfs	2.25 ft/s	0.69 ft	0.098	4.2 lbs/ft2	4.32 lbs/ft2	0.97	UNSTABLE	--
Underlying Substrate	Straight	2.7 cfs	2.25 ft/s	0.69 ft	--	0.04 lbs/ft2	0.027 lbs/ft2	1.28	STABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-3 (TEMP)

Discharge	0.6
Peak Flow Period	1
Channel Slope	0.10
Channel Bottom Width	0
Left Side Slope	2.5
Right Side Slope	2.5
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	0.6 cfs	2.38 ft/s	0.32 ft	0.055	1.55 lbs/ft2	1.98 lbs/ft2	0.78	UNSTABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	0.6 cfs	3.03 ft/s	0.28 ft	0.04	3 lbs/ft2	1.76 lbs/ft2	1.71	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	0.6 cfs	4.74 ft/s	0.23 ft	0.022	2.25 lbs/ft2	1.4 lbs/ft2	1.6	STABLE	D

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Poseyville, Indiana 47633
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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-4

Discharge	4.8
Peak Flow Period	1
Channel Slope	0.034
Channel Bottom Width	8
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	Sandy Loam

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	4.8 cfs	2.02 ft/s	0.28 ft	0.055	1.55 lbs/ft2	0.59 lbs/ft2	2.63	STABLE	D

SC250 - 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
SC250 Unvegetated	Straight	4.8 cfs	2.46 ft/s	0.23 ft	0.04	3 lbs/ft2	0.49 lbs/ft2	6.14	STABLE	E
SC250 Reinforced Vegetation	Straight	4.8 cfs	1.23 ft/s	0.44 ft	0.12	10 lbs/ft2	0.94 lbs/ft2	10.68	STABLE	E
Underlying Substrate	Straight	4.8 cfs	1.23 ft/s	0.44 ft	--	0.8 lbs/ft2	0.026 lbs/ft2	30.77	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	4.8 cfs	3.58 ft/s	0.16 ft	0.022	2.25 lbs/ft2	0.34 lbs/ft2	6.57	STABLE	D

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	4.8 cfs	1.23 ft/s	0.44 ft	0.12	4.2 lbs/ft2	0.94 lbs/ft2	4.48	STABLE	--
Underlying Substrate	Straight	4.8 cfs	1.23 ft/s	0.44 ft	--	0.04 lbs/ft2	0.004 lbs/ft2	8.85	STABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 1D-5

Discharge	14.4
Peak Flow Period	1
Channel Slope	0.02
Channel Bottom Width	8
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 .	Sandy Loam

S75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
S75 Unvegetated	Straight	14.4 cfs	2.58 ft/s	0.61 ft	0.053	1.55 lbs/ft2	0.76 lbs/ft2	2.05	STABLE	D

SC250 - 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
SC250 Unvegetated	Straight	14.4 cfs	3.11 ft/s	0.51 ft	0.04	3 lbs/ft2	0.64 lbs/ft2	4.68	STABLE	E
SC250 Reinforced Vegetation	Straight	14.4 cfs	2.02 ft/s	0.75 ft	0.076	10 lbs/ft2	0.94 lbs/ft2	10.66	STABLE	E
Underlying Substrate	Straight	14.4 cfs	2.02 ft/s	0.75 ft	--	0.8 lbs/ft2	0.049 lbs/ft2	16.17	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	14.4 cfs	4.55 ft/s	0.36 ft	0.022	2.25 lbs/ft2	0.45 lbs/ft2	4.97	STABLE	D

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	14.4 cfs	2.02 ft/s	0.75 ft	0.076	4.2 lbs/ft2	0.94 lbs/ft2	4.48	STABLE	--
Underlying Substrate	Straight	14.4 cfs	2.02 ft/s	0.75 ft	--	0.04 lbs/ft2	0.01 lbs/ft2	3.59	STABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2A-1

Discharge	10
Peak Flow Period	1
Channel Slope	0.07
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	10 cfs	5.29 ft/s	0.56 ft	0.039	3 lbs/ft2	2.43 lbs/ft2	1.23	STABLE	E
SC250 Reinforced Vegetation	Straight	10 cfs	3.56 ft/s	0.73 ft	0.067	10 lbs/ft2	3.2 lbs/ft2	3.13	STABLE	E
Underlying Substrate	Straight	10 cfs	3.56 ft/s	0.73 ft	--	0.8 lbs/ft2	0.226 lbs/ft2	3.55	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	10 cfs	7.96 ft/s	0.41 ft	0.022	2.25 lbs/ft2	1.81 lbs/ft2	1.24	STABLE	D

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	10 cfs	3.56 ft/s	0.73 ft	0.067	4.2 lbs/ft2	3.2 lbs/ft2	1.31	STABLE	--
Underlying Substrate	Straight	10 cfs	3.56 ft/s	0.73 ft	--	0.04 lbs/ft2	0.044 lbs/ft2	0.8	UNSTABLE	--

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Poseyville, Indiana 47633
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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2A-2

Discharge	1.8
Peak Flow Period	1
Channel Slope	0.17
Channel Bottom Width	20
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	1.8 cfs	1.96 ft/s	0.05 ft	0.04	3 lbs/ft2	0.49 lbs/ft2	6.16	STABLE	E
SC250 Reinforced Vegetation	Straight	1.8 cfs	0.64 ft/s	0.14 ft	0.25	10 lbs/ft2	1.46 lbs/ft2	6.86	STABLE	E
Underlying Substrate	Straight	1.8 cfs	0.64 ft/s	0.14 ft	--	0.8 lbs/ft2	0.009 lbs/ft2	85.84	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	1.8 cfs	2.8 ft/s	0.03 ft	0.022	2.25 lbs/ft2	0.34 lbs/ft2	6.61	STABLE	D

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	1.8 cfs	0.64 ft/s	0.14 ft	0.25	4.2 lbs/ft2	1.46 lbs/ft2	2.88	STABLE	--
Underlying Substrate	Straight	1.8 cfs	0.64 ft/s	0.14 ft	--	0.04 lbs/ft2	0.001 lbs/ft2	24.69	STABLE	--

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Poseyville, Indiana 47633
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Fax 812.867.0247
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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-1

Discharge	14.4
Peak Flow Period	1
Channel Slope	0.1
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Excellent >=95%
Soil Type	Sandy Loam

SC250 - Class C - Mix (Sod & Bunch) - Excellent >=95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	14.4 cfs	6.77 ft/s	0.61 ft	0.038	3 lbs/ft2	3.78 lbs/ft2	0.79	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	14.4 cfs	4.97 ft/s	0.75 ft	0.058	10 lbs/ft2	4.67 lbs/ft2	2.14	STABLE	E
Underlying Substrate	Straight	14.4 cfs	4.97 ft/s	0.75 ft	--	0.8 lbs/ft2	0.172 lbs/ft2	4.64	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	14.4 cfs	10.03 ft/s	0.46 ft	0.022	2.25 lbs/ft2	2.85 lbs/ft2	0.79	UNSTABLE	D

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Excellent >=95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	14.4 cfs	4.97 ft/s	0.75 ft	0.058	4.2 lbs/ft2	4.67 lbs/ft2	0.9	UNSTABLE	--
Underlying Substrate	Straight	14.4 cfs	4.97 ft/s	0.75 ft	--	0.04 lbs/ft2	0.034 lbs/ft2	1.03	STABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-1 (TEMP)

Discharge	3.8
Peak Flow Period	1
Channel Slope	0.01
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
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	3.8 cfs	1.63 ft/s	0.65 ft	0.052	1.55 lbs/ft2	0.4 lbs/ft2	3.85	STABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	3.8 cfs	2 ft/s	0.56 ft	0.039	3 lbs/ft2	0.35 lbs/ft2	8.6	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	3.8 cfs	3.01 ft/s	0.42 ft	0.022	2.25 lbs/ft2	0.26 lbs/ft2	8.68	STABLE	D

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-2

Discharge	25.1
Peak Flow Period	1
Channel Slope	0.06
Channel Bottom Width	4
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	25.1 cfs	6.39 ft/s	0.69 ft	0.036	3 lbs/ft2	2.57 lbs/ft2	1.17	STABLE	E
SC250 Reinforced Vegetation	Straight	25.1 cfs	4.83 ft/s	0.85 ft	0.054	10 lbs/ft2	3.18 lbs/ft2	3.15	STABLE	E
Underlying Substrate	Straight	25.1 cfs	4.83 ft/s	0.85 ft	--	0.8 lbs/ft2	0.301 lbs/ft2	2.65	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	25.1 cfs	9.11 ft/s	0.52 ft	0.022	2.25 lbs/ft2	1.95 lbs/ft2	1.16	STABLE	D

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	25.1 cfs	4.83 ft/s	0.85 ft	0.054	4.2 lbs/ft2	3.18 lbs/ft2	1.32	STABLE	--
Underlying Substrate	Straight	25.1 cfs	4.83 ft/s	0.85 ft	--	0.04 lbs/ft2	0.066 lbs/ft2	0.53	UNSTABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-3

Discharge	7.8
Peak Flow Period	1
Channel Slope	0.17
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	7.8 cfs	6.64 ft/s	0.39 ft	0.04	3 lbs/ft2	4.18 lbs/ft2	0.72	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	7.8 cfs	4.58 ft/s	0.52 ft	0.067	10 lbs/ft2	5.49 lbs/ft2	1.82	STABLE	E
Underlying Substrate	Straight	7.8 cfs	4.58 ft/s	0.52 ft	--	0.8 lbs/ft2	0.478 lbs/ft2	1.67	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	7.8 cfs	10.1 ft/s	0.28 ft	0.022	2.25 lbs/ft2	3.02 lbs/ft2	0.75	UNSTABLE	D

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	7.8 cfs	4.58 ft/s	0.52 ft	0.067	4.2 lbs/ft2	5.49 lbs/ft2	0.77	UNSTABLE	--
Underlying Substrate	Straight	7.8 cfs	4.58 ft/s	0.52 ft	--	0.04 lbs/ft2	0.074 lbs/ft2	0.47	UNSTABLE	--

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-3 (TEMP)

Discharge	1.8
Peak Flow Period	1
Channel Slope	0.02
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
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	1.8 cfs	1.62 ft/s	0.38 ft	0.055	1.55 lbs/ft2	0.47 lbs/ft2	3.29	STABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	1.8 cfs	2.03 ft/s	0.32 ft	0.04	3 lbs/ft2	0.4 lbs/ft2	7.56	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	1.8 cfs	3.07 ft/s	0.23 ft	0.022	2.25 lbs/ft2	0.29 lbs/ft2	7.89	STABLE	D

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-4

Discharge	35.5
Peak Flow Period	1
Channel Slope	0.13
Channel Bottom Width	4
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	B
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - Class B - 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
SC250 Unvegetated	Straight	35.5 cfs	9.25 ft/s	0.67 ft	0.037	3 lbs/ft2	5.47 lbs/ft2	0.55	UNSTABLE	E
SC250 Reinforced Vegetation	Straight	35.5 cfs	5.68 ft/s	0.97 ft	0.073	10 lbs/ft2	7.88 lbs/ft2	1.27	STABLE	E
Underlying Substrate	Straight	35.5 cfs	5.68 ft/s	0.97 ft	--	0.8 lbs/ft2	0.356 lbs/ft2	2.25	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	35.5 cfs	13.22 ft/s	0.51 ft	0.022	2.25 lbs/ft2	4.13 lbs/ft2	0.54	UNSTABLE	D

Unreinforced Vegetation - Class B - 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	35.5 cfs	5.68 ft/s	0.97 ft	0.073	5.73 lbs/ft2	7.88 lbs/ft2	0.73	UNSTABLE	--
Underlying Substrate	Straight	35.5 cfs	5.68 ft/s	0.97 ft	--	0.04 lbs/ft2	0.091 lbs/ft2	0.39	UNSTABLE	--

Tensar International Corporation
5401 St. Wendel-Cynthiana Road
Poseyville, Indiana 47633
Tel. 800.772.2040
Fax 812.867.0247
www.nagreen.com

Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2B-4 (TEMP)

Discharge	7.8
Peak Flow Period	1
Channel Slope	0.13
Channel Bottom Width	4
Left Side Slope	2.5
Right Side Slope	2.5
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	7.8 cfs	4.36 ft/s	0.36 ft	0.055	1.55 lbs/ft2	2.95 lbs/ft2	0.52	UNSTABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	7.8 cfs	5.4 ft/s	0.3 ft	0.04	3 lbs/ft2	2.46 lbs/ft2	1.22	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	7.8 cfs	8.02 ft/s	0.21 ft	0.022	2.25 lbs/ft2	1.74 lbs/ft2	1.29	STABLE	D

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Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2D-1

Discharge	25.1
Peak Flow Period	1
Channel Slope	0.01
Channel Bottom Width	4
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	25.1 cfs	3.85 ft/s	1 ft	0.03	3 lbs/ft2	0.63 lbs/ft2	4.79	STABLE	E
SC250 Reinforced Vegetation	Straight	25.1 cfs	2.29 ft/s	1.44 ft	0.062	10 lbs/ft2	0.9 lbs/ft2	11.12	STABLE	E
Underlying Substrate	Straight	25.1 cfs	2.29 ft/s	1.44 ft	--	0.8 lbs/ft2	0.028 lbs/ft2	28.72	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	25.1 cfs	5.12 ft/s	0.81 ft	0.02	2.25 lbs/ft2	0.51 lbs/ft2	4.43	STABLE	D

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	25.1 cfs	2.29 ft/s	1.44 ft	0.062	4.2 lbs/ft2	0.9 lbs/ft2	4.67	STABLE	--
Underlying Substrate	Straight	25.1 cfs	2.29 ft/s	1.44 ft	--	0.04 lbs/ft2	0.014 lbs/ft2	2.45	STABLE	--

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Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 2D-1 (TEMP)

Discharge	6.8
Peak Flow Period	1
Channel Slope	0.01
Channel Bottom Width	4
Left Side Slope	2.5
Right Side Slope	2.5
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	6.8 cfs	1.81 ft/s	0.66 ft	0.051	1.55 lbs/ft2	0.41 lbs/ft2	3.75	STABLE	D

SC250

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	6.8 cfs	2.21 ft/s	0.57 ft	0.039	3 lbs/ft2	0.35 lbs/ft2	8.46	STABLE	E

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	6.8 cfs	3.26 ft/s	0.41 ft	0.022	2.25 lbs/ft2	0.26 lbs/ft2	8.7	STABLE	D

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www.nagreen.com

Erosion Control Materials Design Software
Version 5.0

Project Name: Evergreen Packaging - 6D North
Project Number: 26085
Project Location: Canton, North Carolina
Channel Name: REACH 3-1

Discharge	1.3
Peak Flow Period	1
Channel Slope	0.06
Channel Bottom Width	2
Left Side Slope	2.5
Right Side Slope	2.5
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Sandy Loam

SC250 - 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
SC250 Unvegetated	Straight	1.3 cfs	2.67 ft/s	0.2 ft	0.04	3 lbs/ft2	0.73 lbs/ft2	4.1	STABLE	E
SC250 Reinforced Vegetation	Straight	1.3 cfs	1.07 ft/s	0.4 ft	0.149	10 lbs/ft2	1.51 lbs/ft2	6.62	STABLE	E
Underlying Substrate	Straight	1.3 cfs	1.07 ft/s	0.4 ft	--	0.8 lbs/ft2	0.027 lbs/ft2	29.51	STABLE	--

C125

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
C125 Unvegetated	Straight	1.3 cfs	3.99 ft/s	0.14 ft	0.022	2.25 lbs/ft2	0.52 lbs/ft2	4.33	STABLE	D

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	1.3 cfs	1.07 ft/s	0.4 ft	0.149	4.2 lbs/ft2	1.51 lbs/ft2	2.78	STABLE	--
Underlying Substrate	Straight	1.3 cfs	1.07 ft/s	0.4 ft	--	0.04 lbs/ft2	0.004 lbs/ft2	8.49	STABLE	--

Slope Stability Analysis

Project Name:	Evergreen Packaging
Project Location:	Area 6-D North
Project No:	12121.03
Comp By:	ASB
Date:	7/15/2013
Chk. By:	

OBJECTIVE: Design erosion control blanket for slope stabilization associated with Area 6D North and 6E dike.

REFERENCES:

1. North American Green Erosion Control Materials Design Software, Version 5.0.

DESIGN PROCEDURE:

1. Input nearest weather station (Asheville, NC) - software determines applicable RUSLE variables.
2. Input slope length, slope gradient, protection period, and soil type in software program.

SUMMARY OF RESULTS:

1. North American Green Erosion Control Blanket SC250 and C125 provide sufficient slope stabilization for the 6D North and 6E dike (See attached computations).

RIPRAP APRON DESIGN

Project Name: Evergreen Packaging
Project Location: Area 6-D North
Project No: 12121.03
Comp By: ASB
Date: 7/15/2013
Chk. By:

OBJECTIVE: Design culvert outlet protection to protect the outlet of culverts from scour and deterioration.

REFERENCES:

1. North Carolina Erosion and Sediment Control Planning and Design Manual

2. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System,Version 10.0, Chocorua, New Hampshire, 2012

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:

Culvert No.: P-4
Culvert Location: Sediment Pond 4 Outlet
Culvert Subcatchment: 2A
Design Q: 4.2 cfs (Q_{25})
Culvert Dia. 1 ft.
La: 8 ft.
W 9 ft.
D: 3 ft.
D_{50} Riprap: 4 in.

Culvert No.: P-1D-1
Culvert Location: Temp Landfill Access Road Culvert
Culvert Subcatchment: 1D
Design Q: 4.7 cfs (Q_{25})
Culvert Dia. 1.25 ft.
La: 9 ft.
W 11 ft.
D: 4 ft.
D_{50} Riprap: 4 in.

APPENDIX D

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

HAYWOOD COUNTY EROSION CONTROL PROGRAM
(IN ACCORDANCE w/ NC DENR DLQ)

EROSION and SEDIMENTATION CONTROL PLAN PRELIMINARY REVIEW CHECKLIST

Project Name: Evergreen Packaging, Landfill No. 6, Area D North

Physical Location/Address: 1155 Incinerator Road, Canton, North Carolina

The following items shall be incorporated with respect to specific site conditions in an Erosion & Sedimentation Control Plan:

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

_____ Two copies of Forms and Plan / Additional Information.
_____ Completed, signed & notarized FRO Form.
_____ Accurate application fee payable to Haywood County ($350.00 per acre rounded up to the next acre – Plan Review Fee).
_____ An Additional 10% of the total fee will be charged for any land-disturbing activity in areas of the county that may impact classified trout waters.
_____ Certificate of assumed name, if the owner is a partnership.
_____ Name of Registered Agent (if applicable)
_____ Copy of the most current Deed for the site. Please make sure the deed(s) and ownership information are consistent between the plan sheets, local records and this form.
_____ Provide latitude and longitude (in decimal degrees) at the project entrance.

NOTE: Plan review fees shall be doubled the normal fee amount when land-disturbing activity begins before a Land-Disturbing Permit is obtained from the County.

NOTE: A Pre-Construction Conference is required.

LOCATION INFORMATION

_____ Project location & labeled vicinity map (roads, streets, landmarks).
_____ North arrow and scale.
_____ Identify Water Body/Stream Classification for the project.

GENERAL SITE FEATURES (Plan elements)

_____ Property lines and ownership ID for all adjoining properties.
_____ Existing contours (topographic lines).
_____ Proposed contours.
_____ Limits of all disturbed areas (provide acreage total, delineate limits, and label). Be sure to include all access to measures; lots that will be disturbed, drives, and utilities that may extend offsite.
_____ Planned and existing building locations and elevations.
_____ Planned & existing road locations & elevations, including temporary access roads.
_____ Lot and/or building numbers, septic areas and landscape areas.
_____ Hydrogeologic features: rock outcrops, seeps, springs, wetlands and their limits, streams, lakes, ponds, dams, etc. (include all required local or state buffer zones and any DWQ Riparian Buffer determinations).
_____ Easements and drainageways, particularly required for offsite affected areas. Include copies of any recorded easements and/or agreements with adjoining property owners.
_____ Profiles of streets, utilities, ditch lines, etc.
_____ Stockpiled topsoil or subsoil locations showing control measures.
_____ If the same person conducts the land-disturbing activity & any related borrow or waste activity, the related borrow or waste activity shall constitute part of the land-disturbing activity unless the borrow or waste activity is regulated under the Mining Act of 1971, or is a landfill regulated by the Division of Waste Management. If the land-disturbing activity and any related borrow or waste activity are not conducted by the same person, they shall be considered separate land-disturbing activities and must be permitted either through the Sedimentation Pollution Control Act as a one-use borrow site or through the Mining Act.
_____ Location and details associated with any onsite stone crushing or other processing of material excavated. If the affected area associated with excavation, processing, and transport of such materials will comprise one (1) or more acres, and materials will be leaving the development tract, a mining permit will be required.
_____ Required Army Corps 404 permit and Water Quality 401 certification (e.g. stream disturbances, culverts in streams, etc.).

EROSION & SEDIMENT CONTROL MEASURES (on plan)

_____ Legend (provide appropriate symbols for all measures and reference them to the construction details).
_____ Location of temporary measures.
_____ Location of permanent measures.
_____ Construction drawings and details for temporary and permanent measures. Show measures to scale on plan and include proposed contours where necessary. Ensure design storage requirements are maintained through all phases of construction.
_____ Maintenance requirements for measures.
_____ Contact person responsible for maintenance.
_____ Maintenance regulations and responsible person(s) of permanent measures.

SITE DRAINAGE FEATURES

_____ Existing and planned drainage patterns (include off-site areas that drain through project and address temporary and permanent conveyance of stormwater over/through graded slopes and fills).
_____ Method used to determine acreage of land being disturbed and drainage areas to all proposed measures (e.g. delineation map).
_____ Size, pipe material and location of culverts and sewers.
_____ Soil information: type, special characteristics.
_____ Soil information below culvert storm outlets.
_____ Name and classification of receiving water course or name of municipal operator (only where stormwater discharges are to occur).

STORMWATER CALCULATIONS

_____ Pre-construction runoff calculations for each outlet from the site (at peak discharge points). Be sure to provide all supporting data for the computation methods used (rainfall data for required storm events, time of concentration/storm duration, and runoff coefficients).

_____ Design calculations for peak discharges of runoff (including the construction phase & the final runoff coefficients for the site).

_____ Design calcs for culverts and storm sewers (include HW, TW and outlet velocities).

_____ Discharge and velocity calculations for open channel and ditch flows (easement & rights-of-way).

_____ Design calcs for cross sections and method of stabilization for existing and planned channels (include temporary linings). Include appropriate permissible velocity and/or shear stress data.

_____ Design calcs and construction details for energy dissipaters below culvert and storm sewer outlets (include stone/material specs & apron dimensions). Avoid discharges on fill slopes.

_____ Design calcs and dimension of sediment basins (note current surface area and dewatering standards as well as diversion of runoff to the basins). Be sure that all surface drains, including ditches and berms, will have positive drainage to the basins.

VEGETATIVE STABILIZATION

_____ Area & acreage to be stabilized with vegetation.

_____ Method of soil preparation.

_____ Seed type & rates (temporary & permanent).

_____ Fertilizer type and rates.

_____ Mulch type and rates (include mulch anchoring methods to be used).

NOTE: Plan should include provisions for groundcover on exposed slopes within 21 calendar days following completion of any phase of grading; permanent groundcover for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

NARRATIVE AND CONSTRUCTION SEQUENCE

_____ Narrative describing the nature & purpose of the construction activity.

_____ Construction sequence related to erosion and sediment control (including installation of critical measures prior to the initiation of the land-disturbing activity & removal of measures after areas they serve are permanently stabilized). Address all phases of construction and necessary practices associated with temporary stream bypasses and/or crossings.

_____ Bid specifications related only to erosion control.

TROUT BUFFER ZONES AND HQW AREAS

_____ Delineate minimum trout buffer zones.

NOTE: State law requires that unnamed tributaries to DEM classified "trout waters" have the same protection as those streams to which they are tributary. High Quality Water zones have differing ground cover rules and a size-of-disturbed-area restriction.

GRADED SLOPES AND FILLS

_____ Identify all Cut Slopes that are steeper than 1:1 and include slope height (vertical).

_____ Identify all Fill Slopes that are steeper than 1.5:1 and include slope height (vertical).

_____ Show all proposed Retaining Walls

_____ Identify required Buffer Zones for all slope construction or repair.

_____ Identify all Borrow and Waste Areas (include off-site locations).

_____ Identify Compaction Methods for Fills.

_____ Identify Slope Protection Methods (including Diversions).

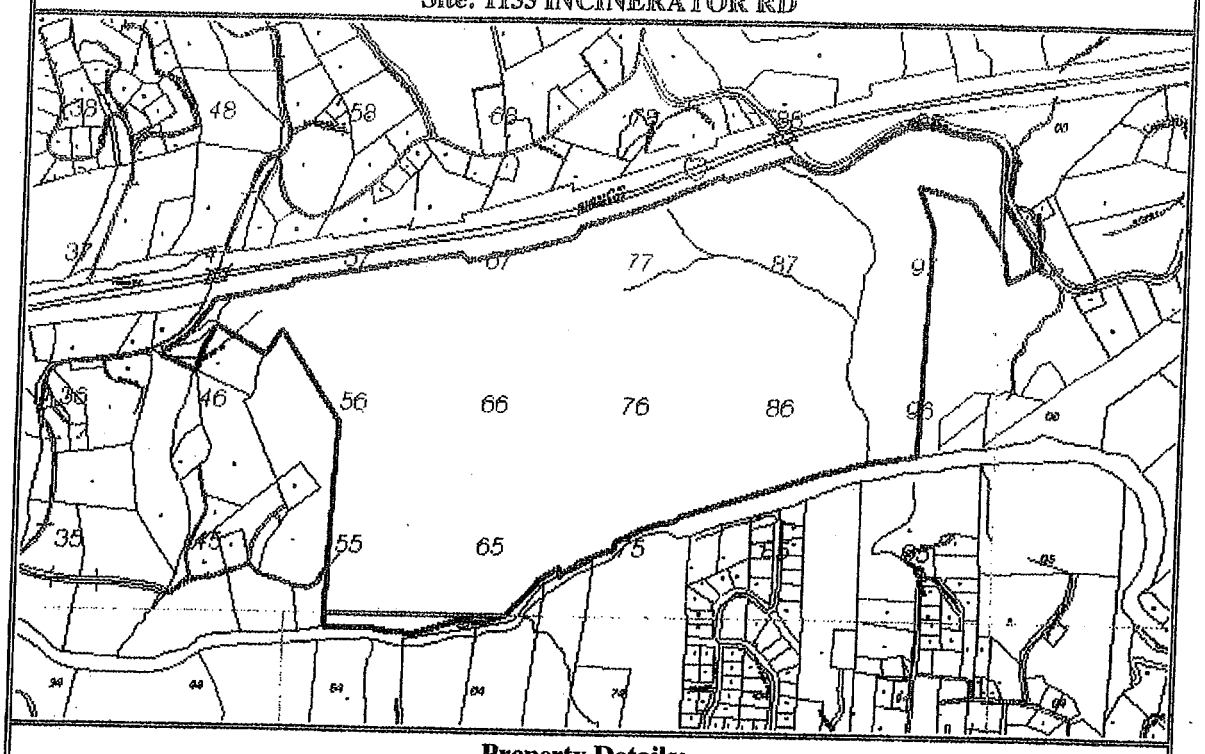
_____ Identify all Utilities in Fills.

Rev: 2/10/09; 5/18/12

APPENDIX E

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM

Site: 1155 INCINERATOR RD



Property Details:

START	1001	UNIQUEID	14891
PIN_DASH	8647-76-6665	PIN	8647766665
NAME1	BLUE RIDGE PAPER PRODUCTS, INC	NAME2	
ADDRESS1	GARY WILLIAMS	ADDRESS2	P O BOX 4000
CTY_ST_ZIP	CANTON, NC 28716	MAPSHEET	8647
LEGAL_REF1	472/1073	LEGAL_REF2	
ADD_REF1		ADD_REF2	
CALC_ACRES	244.255	STREET_ADD	1155 INCINERATOR RD
SALE_DAT1	5/19/1999	SALE_PRIC1	0
PROP_DESC	1155 INCINERATOR RD TR 15 1151 INCINERATOR RD	SUBDIV_COD	
SUBDIV_NAM		TOT_MKT_VA	739160
TOT_BLD_VA	79070	MAIN_AREA	1208
YR_BUILT	1976	LAND_VALUE	660090
DEFER_VAL	0	TO_ASSD_VA	739160
ACCT_NO	126531	TOWNSHIP	BEAVERDAM
SALE_DAT2		SALE_PRIC2	0
TAX_CODES	G01,F02,F10	BUILD_USE	DWELLING
OCCUPANCY	SINGLE FAMILY	LAND_TYPE	OPENLAND,WOODLAND,WATERFRONT,HOMESITE

DISCLAIMER: These maps and information either in digital or hardcopy format are not surveys. This map data is prepared from the inventory of real property found within this jurisdiction and is compiled from recorded deeds, plats, and other public records and data. Users of any maps generated on this site are hereby notified that the aforementioned public primary information sources should be consulted for verification on the information contained herein. Haywood County assumes no legal responsibility for the information contained on these maps.

TRANSFER MADE ON PROPERTY RECORD
Date 5/19/99
By pm

Excise Tax $120,000.00

HAYWOOD COUNTY NC 05/19/1999
$120000.00
STATE OF NORTH CAROLINA Real Estate Excise Tax

Book 472 Page 1073
REGISTERED
HAYWOOD COUNTY NC
05/19/1999 10:30 AM
AMY R. MURRAY
Register Of Deeds

7169
Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the ____ day of _____, 19 ___
by _____

Mail after recording to: S. H. Spencer Compton, Paul, Weiss, Rifkind, Wharton & Garrison, 1285 Avenue of the Americas, New York, NY 10019-6064.
This instrument was prepared by: Robert E. Fogarty, One Champion Plaza, Stamford, CT 06921.
Brief description for the Index: **

NORTH CAROLINA SPECIAL WARRANTY DEED

THIS DEED made this 14th day of May, 1999 to be effective as of and from the 14th day of May, 1999, by and between

GRANTOR	GRANTEE
Champion International Corporation, a New York corporation One Champion Plaza Stamford, Connecticut 06921	Blue Ridge Paper Products Inc. a Delaware Corporation c/o KPS Special Situations Fund, L.P. 200 Park Avenue, 58th Floor New York, NY 10166

1073

The designation Grantor and Grantee as used herein shall include said parties, their successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of

which is hereby acknowledged, has and by these presents does *GRANT, BARGAIN, SELL* and *CONVEY* unto the Grantee in fee simple, subject to the exceptions described below, those certain parcels of land situated in Haywood County, North Carolina which are more particularly described on Exhibit "A" attached hereto and made a part hereof for all purposes together with any improvements thereon (referred to hereinafter as the "Premises"). In the case of tracts numbered one through eight, the legal descriptions were prepared by using calls contained in deeds to Champion International or its predecessor and calls in deeds to adjoining landowners and that the description should follow streets, the Pigeon River and the lines of properties of adjoining landowners referred to, notwithstanding the fact that an actual survey of the tracts may show the calls to vary from those contained in the deeds referred to.

TO HAVE AND TO HOLD the aforesaid lots and parcels of land and all privileges and appurtenances thereto belonging to the Grantee and its successors and assigns in fee simple.

And the Grantor covenants with the Grantee, that Grantor has done nothing to impair such title in and to the Premises as Grantor received, and Grantor will warrant and defend the title to the Premises against the lawful claims of all persons claiming by, under or through Grantor, except for the exceptions hereinafter stated.

1. This conveyance is made and accepted subject to the following: mortgages, deeds of trust, claims, charges, liens, pledges, leases, covenants, restrictions, reservations, tenancies, encroachments, lack of access, security interests, conditional sales agreements, title retention agreements, conservation zones, easements, encumbrances, third party rights and other restrictions on or imperfections of title, of any kind and nature choate or inchoate, including liens for taxes not yet due and payable, of record in the office where official real estate records are maintained in the county where the Premises are situated, as are revealed by the surveys heretofore furnished to the Grantee by the Grantor, and as are apparent from an inspection of the Premises.

2. That certain memorandum of lease between Americarb, Inc., and Grantor dated April 28, 1992, including the easements described therein, which memorandum of lease was registered in Book 427 at page 384 in the Register of Deeds of Haywood County on June 12, 1992.

3. That certain unrecorded lease between the Town of Canton and Grantor dated March 11, 1997, for Blackwell Field located near 100 Park Street, Canton, North Carolina.

1074

4. That certain unrecorded lease between the County of Haywood and Grantor dated November 1, 1997, for a parcel of land on Fiberville road west of School Street in the Town of Canton, North Carolina, including an easement described therein.

5. That certain unrecorded agreement between Thurman R. Robinson, Robert E. Robinson and James Reeves Robinson and Grantor dated June 11, 1982.

This conveyance includes all of Grantor's rights, titles, and interests, if any, in and to all of the oil, gas, and other minerals in, on, under or that may be produced or saved from the aforementioned property, including coal, lignite, sulfur, and uranium, as wells as any other minerals customarily extracted from real property through surface mining operations.

GRANTEE, BY ITS ACCEPTANCE HEREOF AND OF THE BENEFITS TO BE DERIVED HEREFROM, ACKNOWLEDGES THAT THE HEREIN-DESCRIBED PREMISES ARE CONVEYED BY GRANTOR TO GRANTEE "IN THEIR PRESENT CONDITION, AS IS AND WITH ALL FAULTS" AND WITHOUT WARRANTY OF ANY KIND EXCEPT THE WARRANTY OF TITLE TO SAID PREMISES HEREIN CONTAINED.

IN WITNESS WHEREOF, the Grantor and the Grantee have caused this instrument to be signed in their respective corporate name by their duly authorized officers and their seals to be hereunto affixed by authority of their Boards of Directors, the day and year first above written.

[Corporate seal]

Champion International Corporation

By: _____
Stephen B. Brown, Senior Vice President

ATTEST:

_____
Name: Robert E. Fogarty
Title: Asst. Secretary

1075

STATE OF NEW YORK)
) SS.
COUNTY OF NEW YORK)

I, the undersigned, a Notary Public in and for said state and county do hereby certify that Robert E. Fogarty personally appeared before me this day and acknowledged that (s)he is an Asst. Secretary of Champion International Corporation, a corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its Senior Vice President, sealed with its corporate seal, and attested to by himself/herself as its Asst. Secretary.

WITNESS my hand and Notarial Seal this 13th day of May, 1999.

[NOTARY SEAL]

Notary Public

CHRISTINA V. LYNGE
Notary Public, State of New York
No. 4902102
Qualified in New York County
Commission Expires July 27, 1999

My Commission Expires:
July 27, 1999

[corporate seal]

Blue Ridge Paper Products Inc.

By:
Name: Gordon Jones
Title: Chief Executive Officer

ATTEST:

Name: Stephen Presser
Title: Secretary

1076

STATE OF NEW YORK)
) SS.
COUNTY OF NEW YORK)

I, the undersigned, a Notary Public in and for said state and county do hereby certify that Stephen Presser personally appeared before me this day and acknowledged that (s)he is ~~as~~ the Secretary of Blue Ridge Paper Products Inc, a corporation, and that by authority duly given and as the act of the corporation, the foregoing instrument was signed in its name by its Chief Executive Officer ~~President~~, sealed with its corporate seal, and attested to by himself/~~herself~~ as its _____ Secretary.

WITNESS my hand and Notarial Seal this 14th day of May, 1999.

[NOTARY SEAL]

Dorcas Dawe
Notary Public

My Commission Expires:

DORCAS DAWE
Notary Public, State of New York
No. 31-4877093
Qualified in New York County
Commission Filed in Kings & Queens County
Commission Expires February 2, 2001

The foregoing Certificate(s) of Christina V. Zymaj
DORCAS Dawe

is/are certified to be correct. This instrument and this certificate are duly registered at the date and time and in the Book and Page show on the first page hereof.

Amy R Mmary REGISTER OF DEEDS FOR Haywood County

By:_____ Deputy/Assistant-Register of Deeds.

1077

Exhibit A
Canton Property

In the case of tracts numbered one through eight, the legal descriptions were prepared by using calls contained in deeds to Champion International or its predecessor and calls in deeds to adjoining landowners and that the description should follow streets, the Pigeon River and the lines of properties of adjoining landowners referred to, notwithstanding the fact that an actual survey of the tracts may show the calls to vary from those contained in the deeds referred to.

FIRST TRACT

Located in the Town of Canton, Haywood County

BEGINNING on a iron rod set in the northwestern right of way line of NC Highway 215, Woodside Drive, as established by a right of way agreement between Catherine S. Trull and others and the North Carolina Department of Transportation dated June 5, 1991 and recorded in Deed Book 418, at Page 977 in the Haywood County Registry, said point being the easternmost corner on the highway right of way of a tract of land owned by Catherine Smathers Trull, Webb Morrow Smathers, Mary Smathers Cook and Ruby Smathers McKinney by virtue of a deed from Ruby Webb Smathers dated September 1, 1977 and recorded in Deed Book 292 at Page 304 in the Haywood County Registry which is known as tax parcel No. 8657-51-3912 on the Haywood County Tax Maps, said beginning point being also located in the eastern boundary of Block "B" as shown on a plat of Sunset Park, which plat is recorded in Plat Cabinet B at Slide 61 in the Haywood County Registry; runs thence with the northern boundary of the Trull and others tract and with the northern boundary of Blocks "B" and "D" of Sunset Park a course of approximately North 51 deg. 30 min. West to a point which is the northeastern corner of Lot 21 of Block "D" of Sunset Park which point is located South 86 deg. East 40 feet from State Road No. 1554 (Terrace Drive) and in the southern boundary of a tract conveyed to Reeves Payne and wife, by Wiley C. Jones and wife by deed dated November 13, 1968 and recorded in Deed Book 176 at Page 411 in the Haywood County Registry, now shown as tax parcel 8657-43-2262; thence with the Southern boundary of said tract South 86 deg. East to the southeastern corner of said tract; thence with the eastern boundary of said tract and the eastern boundary of a tract described in a deed from Thurman Smith and wife to James Boyd Croft and wife, Angel Croft dated August 4, 1987 and recorded in Deed Book 383, at Page 4 in the Haywood County Registry, which is known as tax parcel No. 8657-43-3259 North 2 deg. 15 min.

East to a point which is the southwestern corner of a tract conveyed to Donna M. Ledbetter and N. Paulette Shelton by deed dated August 21, 1993 and recorded in Deed Book 437 at Page 1344 in the Haywood County Registry; thence with the southern boundary of said tract, North 71 deg. 50 min. East to a point in the southern boundary of said tract which is the northwestern corner of a tract of land conveyed to Jack Douglas Waldrop and wife, Mary Jo S. Waldrop by deed dated May 4, 1967 and recorded in Deed Book 219 at Page 31 in the Haywood County Registry; runs thence with the Southwestern boundary of said tract, South 21 deg. 02 min. East 237.8 feet to a point at the southernmost corner of said tract at the westernmost corner of a tract conveyed by Champion Papers, Inc. to Horace B. Sellars and wife, Doris Sellars by deed dated June 4, 1963 and recorded in Deed Book 199 at Page 69 in the Haywood County Registry; runs thence with the southwestern boundary of the Sellars' tract, South 51 deg. 25 min. East 140.5 feet to the southernmost corner of said tract and the westernmost corner of a tract conveyed by Champion Papers, Inc. to Greek F. Waddell and wife, Daphne R. Waddell by deed dated May 16, 1962 and recorded in Deed Book 195, at Page 35 in the Haywood County Registry; runs thence with the boundaries of said tract, South 51 deg. 25 min. East 125.00 feet to the southernmost corner of said tract and North 38 deg. 35 min. East 157.00 feet to the easternmost corner of said tract in the center of Pasadena Street; runs thence with the center of Pasadena Street in a southeasterly direction (approximately South 54 deg. 12 min. East) to a point which is the southernmost corner in Pasadena Street of a tract of land described in a deed from The Champion Paper and Fibre Company to W. K. Stephens and wife, Elaine F. Stevens, dated February 2, 1960 and recorded in Deed Book 185 at Page 258 in the Haywood County Registry; thence with the southeastern line of said tract North 38 deg. 35 min. East 177.7 feet to the Easternmost corner of said tract; thence South 38 deg. 56 min. 06 sec. East to the northernmost corner of a tract conveyed by U. S. Plywood-Champion Papers, Inc. to Ray W. Foster and wife by deed dated December 13, 1968 and recorded in Deed Book 232 at Page 90; thence with the northwestern line of the Foster tract, South 38 deg. 35 min. West 172 feet to the center of Pasadena Street; thence with Pasadena Street, South 51 deg. 25 min. East 319 feet to the intersection of Pasadena Street with a street (unopened) known as Newberry Street which is the Southernmost corner of a lot conveyed by The Champion Paper and Fibre Company to R. W. Foster and wife by deed dated October 27, 1959 and recorded in Deed Book 186 at Page 7; runs thence with the southeastern line of the R. W. Foster lot, North 38 deg. 35 min. East 167.00 feet to the easternmost corner of said lot; thence with the northern boundary of said lot, North 51 deg. 25 min. West 194.00 to the northernmost corner of said lot and the easternmost corner of the tract conveyed to Foster by Deed Book 232 at Page 90, above referred to; thence with the Eastern boundary of that tract, North 51 deg. 25 min. West 65 feet and North 45 deg. 20 min. West 63 feet to the northernmost corner of said lot; thence continuing North 45 deg. 20 min. West to the southernmost corner of a tract of land described in a deed from Pauline Connelly Self and others to Roland E. Osborne, III dated May 29, 1996 and recorded in Deed Book 453, at Page

297 in the Haywood County Registry; runs thence with the southern boundary of said tract North 70 deg. 27 min. 48 sec. East 150.94 feet to the easternmost corner of said tract; thence with the eastern boundary of said tract which is the western margin of a street known as Skyland Terrace in a northwesterly direction to the northeastern corner of said tract at the southeastern corner of a tract of land conveyed by U.S. Plywood-Champion Papers, Inc. to David S. Jaynes and wife, Stuart Jaynes by deed dated February 19, 1969 and recorded in Deed Book 232 at Page 482 in the Haywood County Registry; runs thence with the eastern boundary of the Jaynes' tract and with the western boundary of Skyland Avenue, North 30 deg. West 60 feet to the northeastern corner of said tract; thence continuing with the western margin of Skyland Avenue, North 31 deg. 41 min. West 113.1 feet to a point; North 18 deg. 01 min. West 305.44 feet, more or less, to the point of intersection of the western margin of Skyland Avenue with the southern margin of Terrace Drive; thence in a southeastern direction with the southern margin of Terrace Drive, 30 feet, more or less, to the point of intersection of the southern margin of Terrace Drive with the eastern margin of Skyland Avenue and at the northwest corner of Lot 4 as shown on a plat entitled, "Survey for Champion International Corporation", recorded in Plat Cabinet C, Slide 1121 in the Haywood County Registry; runs thence with the eastern margin of Skyland Avenue and the western boundary of said Lot 4, South 13 deg. 11 min. 07 sec. East 168.51 feet to a point which is the northwestern corner of Lot FTD-5 shown on a plat of Fiberville and Skyland Terrace which is recorded in Map Book E at Page C-6 in the Office of the Register of Deeds for Haywood County, which lot is described in a deed to Naomi C. Bohnsdahl, Trustee which is recorded in Deed Book 438 at Page 2135 in the Haywood County Registry; runs thence with the eastern margin of Skyland Terrace and the Bohnsdahl tract, five (5) calls as follows: South 18 deg. 04 min. East 17.04 feet to a point, South 10 deg. 30 min. East 26.99 feet to a point, South 18 deg. 06 min. East 33.35 feet to a point, South 25 deg. 23 min. East 60.41 feet to a point and South 31 deg. 37 min. East, passing the southwestern corner of Lot FTD-5 at 51.36 feet a total distance of 101.36 feet to a point which is the southwestern corner of the second tract described in the deed recorded in Deed Book 438 at Page 2135 in the Haywood County Registry; runs thence with the southern and eastern boundaries of the second tract, North 65 deg. 35 min. East to the southeastern corner of said second tract and North 19 deg. 01 min. West 50.00 feet to the southeastern corner of Lot FTD-5 as shown on the recorded plat of Fiberville and Skyland Terrace; runs thence with the southern boundary of Lot FTD-4 as shown on the plat, North 66 deg. 35 min. East 96.00 feet to a point, the common corner of Lots FTD-3, 4 and 6; thence with the western boundary of FTD-6, South 26 deg. 51 min. East 93.69 feet to a point; thence with the western boundary of Lot FTD-1 (as described in Deed Book 317 at Page 872), South 30 deg. 02 min. East 268.00 feet to the southwestern corner of Lot FTD-1; thence with the southern boundary of said lot, North 58 deg. 48 min. East 218.28 feet to a point in the southwestern margin of Terrace Drive, a corner of Lot FTD-1; thence continuing North 58 deg. 48 min. East 30.00 feet, more or less, to a point on the

eastern margin of Terrace Drive as shown on the plat; thence with the eastern margin of Terrace Drive as shown on the plat, in a northwesterly direction to the point of intersection of the eastern margin of Terrace Drive and with the eastern margin of Thompson Avenue; runs thence with the eastern margin of Thompson Avenue, on a curve to the right and in a northeasterly direction to a point on the eastern margin of Thompson Avenue, which is the westernmost corner of Lot FT-2 as shown on the plat of Fiberville and Skyland Terrace which lot is described in a deed from Security Mortgage Investors to Burgin W. Scott and Faye F. Scott recorded in Deed Book 298 at Page 324 in the Haywood County Registry; runs thence with the southern boundary of said lot, North 86 deg. 12 min. East 250.84 feet to the southeastern corner of said lot in the western boundary of lot FC-8 as shown on the plat; runs thence with the western boundary of Lot FC-6 and the western boundary of Lot FD-3, North 18 deg. 09 min. West , passing the northeastern corner of Lot FT-2 at 135 feet, 140 feet, more or less, to the northwestern corner of Lot FD-3 as shown on the plat; thence with the northern boundary of said lot, North 71 deg. 51 min. East 50 feet to the northwestern corner of Lot FD-2 as shown on the plat at the northeastern corner of Lot FD-3 as shown on the plat; runs thence with the eastern boundary of Lot FD-3 and FC-6, South 18 deg. 09 min. East 212.5 feet to the southeastern corner of lot FC-6 on the northern margin of "Avenue C" as shown on said plat, which is now known as Rosewood; thence crossing Rosewood, in a southerly direction, to a point which is the northwestern corner of Lot FC-3 as shown on the recorded plat which is a concrete monument control corner; runs thence with the southern margin of Rosewood Avenue, North 71 deg. 51 min. East along the northern boundary of Lot FC-3 and FC-1 (which were reconveyed to Champion International Corporation by deeds recorded in Deed Book 395 at Page 1063 and Deed recorded in Deed Book 293 at Page 391, 104.5 feet to the northeastern corner of Lot FC-1; runs thence with the eastern boundary of Lot FC-1 and Lot FB-2, crossing an unopened alley, South 18 deg. 09 min. East 187.10 feet, more or less, to the southeastern corner of Lot FB-2 as shown on the recorded plat in the northern margin of "Avenue B", now known as Balsam Drive; runs thence with the northern margin of Balsam Drive, and the southern boundary of Lots FB-2, FB-4 and FB-6, South 71 deg. 51 min. West 150.00 feet to the southwestern corner of Lot FB-6 on the northern margin of Balsam Avenue; thence crossing Balsam Avenue, to the northwestern corner of Lot FB-5 as shown on the recorded plat; runs thence with the western boundary of Lot FB-5 and Lot FA-6 and crossing a eight (8) foot alley, South 15 deg. 00 min. East 196.28 feet to the southwestern corner of Lot FA-6 in the northern margin of a street known as "Avenue A" on the recorded plat, now known as White Pine Avenue; thence running South 15 deg. East approximately 32 feet to the northwestern corner of Lot FA-5 in the southern margin of Avenue A or White Pine Avenue; runs thence North 71 deg. 51 min. East 166.5 feet to a point in the southern margin of Avenue A or White Pine Avenue at the northeastern corner of Lot FA-1 shown on the recorded plat in the western margin of a ten (10) foot alley; runs thence with the eastern boundary of Lot FA-1 and the western boundary of the ten (10) foot alley, South 16

deg. 14 min. East 135.73 feet to a corner of Lot FA-1 in the boundary of Lot FM-3 at the end of the alley; runs thence North 71 deg. 51 min. East along the end of said alley, 10.00 feet to a point in the western boundary of Lot FM-5 in the eastern boundary of the alley; thence with the western boundary of Lot FM-5, North 16 deg. 14 min. West 49.9 feet to the northwestern corner of Lot FM-5; runs thence with the northern boundary of Lot FM-5, North 71 deg. 51 min. East to the point of intersection of the northern boundary of Lot FM-5 and the western boundary of a tract of land conveyed by Champion International Corporation to the North Carolina Department of Transportation by instrument dated May 23, 1991 and record in Deed Book 418 at Page 1170 in the Haywood County Registry; runs thence with the western boundary of the tract so conveyed by Champion to the Department of Transportation which is the western right of way line of NC Highway 215 in a southwesterly direction to the point of BEGINNING.

SECOND TRACT:

Located in the Town of Canton, Haywood County

BEGINNING on a point in the center of Terrace Drive (State Road 1554) which said point is the northwestern corner of a tract of land described in a deed from H. Michael Bull and others to Smith Capehart Nicholls and wife, Marilyn Bull Nicholls dated June 7, 1986 and recorded in Deed Book 391 at Page 429 in the Haywood County Registry, said point also being the northern common corner of lots of FP-1 and FP-O as shown on an unrecorded plat of the property of The Champion & Fibre Company; runs thence with the western margin of Lot FP-0, which is the property described in the deed to Nicholls recorded in Book 391, at Page 429, South 24 deg. 45 min. East 152 feet to the southernmost corner of the Nicholls property in the northern boundary line of a tract of land described in a deed from Hilda S. Hardin, widow to Chris Michael Hardin dated January 23, 1998 and recorded in Deed Book 463 at Page 1415 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 87 deg. 06 min. 22 sec. West 58.67 feet to a point; then South 58 deg. 09 min. 00 sec. West 94.30 feet to a point in the center of Pasadena Street; runs thence with the center of Pasadena Street about North 30 deg. 45 min. West to the point of intersection of the center line of Pasadena Street with the center line of Terrace Drive; runs thence with the center of Terrace Drive in a northeasterly direction to the place of BEGINNING.

The above described tract is the major portion of lot FP-1 as shown on the unrecorded plat of property of The Champion Paper and Fibre Company and includes property adjacent to said lot within the right of way of Pasadena Street and Terrace Drive.

THIRD TRACT:

Located in the Town of Canton, Haywood County

Being Lots 3 and 4 as shown on a plat entitled "Survey for Champion International Corporation" by Hampton, Hintz & Associates which is recorded in Plat Cabinet C at Slide 1121 in the Office of the Register of Deeds for Haywood County, reference to said recorded plat being made for a more particularly description of the lots.

FOURTH TRACT:

Located in the Town of Canton, Haywood County

BEGINNING on a stake which is the southernmost corner of the second tract described in a deed from Michael Pace and wife and others to Kathy W. Garrett dated May 8, 1998 and recorded in Deed Book 465 at Page 1008 in the Office of the Register of Deeds for Haywood County; runs thence with the Eastern boundary of said tract (which is the western boundary of the property of Champion International Corporation, North 2 deg. 35 min. East 320.1 feet to a large white oak corner of the Garrett tract which is also the southernmost corner of the First Tract described in a deed from W. V. Ivester and wife, Pearl Ivester to The Champion Paper and Fibre Company dated May 31, 1955 and recorded in Deed Book 165 at Page 124 in the Office of the Register of Deeds for Haywood County; runs thence with the northern boundary of the Garrett tract and the southern boundary of the First Tract described in the deed to Champion (Deed Book 165 at Page 124) North 53 deg. West passing through a spring 360.7 feet, more or less, to a Spanish oak corner and North 56 deg. 35 min. West 186.9 feet to the westernmost corner of the first tract described in the deed to The Champion Paper and Fibre Company recorded in Deed Book 165 at Page 124 on the southeastern bank of the Pigeon River; thence continuing North 56 deg. 35 min. West to a point in the center of the Pigeon River; runs thence up and with the center of the Pigeon River in a northerly, easterly, southerly and southeasterly direction to a point in the center of the River where Woodside Drive (State Road 215) crosses the Pigeon River; runs thence in a southweeterly direction to a point which represents the eastern right of way line, extended southward, of a street formerly known as Main Street (now known as Fiberville Street) which street is shown as Main Street on a plat entitled Fiberville & Skyland Terrace, which plat is recorded in Plat Book E, at Page C-6 in the office of the Register of Deeds for Haywood County; runs thence with the eastern margin of the street known as Fiberville Street so as to include a strip of land between said street and the Pigeon River in a northwesterly direction (about North 40 deg. West and then North 37 deg. West) to a point on the eastern margin of Fiberville Street at a point which is located North 53 deg. 32 min. East 35.5 feet (across Fiberville Street) from the northernmost corner of lot 48 as shown on the plat of Fiberville and Skyland Terrace referred to above; thence crossing Fiberville Street, South 53 deg. 32 min. West 35.5 feet, more or less, to the northernmost corner of said Lot 48; runs thence with the

Northern boundary of said Lot 48, South 53 deg. 32 min. West 142.18 feet, more or less, to the westernmost corner of said Lot 48; runs thence with the western boundary of Lot 48, 47, 46, 45, 44, 43 and 42, South 40 deg. 03 min. East 402 feet, more or less, to a point which is the southernmost corner of Lot 42 as shown on the recorded plat at the northernmost corner of a tract of land conveyed by Champion International Corporation to George Michael Trostel, II by deed dated November 19, 1991 and recorded in Deed Book 423 at Page 383 in the Haywood County Registry; runs thence with the northwestern boundary of said tract, South 34 deg. 33 min. 10 sec. West 155.32 feet to the westernmost corner of the Trostel tract on the northeastern margin of Thompson Avenue; runs thence with the northeastern or eastern margin of Thompson Avenue in a northwesterly direction to a point where Thompson Avenue makes a curve to the south and becomes Skyland Terrace; runs thence with the northern and western margins of Skyland Terrace to a point on the western margin of Skyland Terrace at the northeastern corner of a tract of land described in a deed from Stephen A. Burrus and wife to John C. Parrish and wife, Audrey Lucille Parrish dated May 29, 1998 and recorded in Deed Book 465, at Page 1651 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 81 deg. 20 min. 00 sec. West 150.33 feet and North 81 deg. 26 min. 00 sec. West 50.00 feet to an iron pin which is the northwestern corner of the Parrish tract; runs thence with the western boundary of the Parrish tract, South 5 deg. 42 min. 11 sec. West 250.60 feet to a concrete monument which is the southwestern corner of the Parrish tract; runs thence with the southern boundary of the Parrish tract, North 78 deg. 59 min. 07 sec. East 88 feet, more or less, to the northwestern corner of the second tract described in a deed from Holly Cochran Messer to Ronald M. Higdon and Kathy L. Jackson dated March 26, 1991 and recorded in Deed Book 416, at Page 442 in the Haywood County Registry; runs thence with the western boundary of the first and second tracts described in the Higdon deed, South 6 deg. 32 min. 00 sec. East 26.07 feet and South 14 deg. 51 min. 00 sec. East 106.75 feet to the southwestern corner of the first tract described in the Higdon deed at the northwestern corner of a tract of land described in a deed from Louise W. Sechrest to James Allen Sechrest and Margaret Ann Abbott dated March 31, 1995 and recorded in Deed Book 446 at Page 1599 in the Haywood County Registry; runs thence with the western boundary of the Sechrest tract, South 1 deg. 21 min. West 137.39 feet to the southwestern corner of the Sechrest tract which is the Northwestern corner of Lot FS-6 as shown on the plat entitled "Fiberville & Skyland Terrace" recorded in Plat Book E at Page C-6 in the Haywood County Registry; runs thence with the western line of lot FS-6, South 19 deg. 54 min. East 99.34 feet, more or less, to a point which is the southwestern corner of FS-6 at the northeastern corner of a tract of land described in a deed from Champion Papers, Inc. to Joseph Samuel Schenck and wife, Elaine C. Schenck recorded in Deed Book 215 at Page 27 in the Haywood County Registry; runs thence with the northern and western boundaries of the Schenck tract, South 73 deg. 59 min. West 171.7 feet and South 19 deg. 45 min. East 126.64 feet to the southwestern corner of the Schenck tract at the northwestern corner of a tract of

land described in a deed from Wilford Phillips and wife to James C. Ward and wife, Betty W. Ward dated December 2, 1966 and recorded in Deed Book 214 at Page 284 in the Haywood County Registry; runs thence with the western boundary of the Ward tract, South 19 deg. 54 min. East 10 feet to a point and South 22 deg. 47 min. East 110 feet to the southwestern corner of the Ward tract at the northwestern corner of the second tract described in a deed from R. D. Coleman, Jr. and wife, Ruth K. Coleman to Frank C. Morrison, Jr. and wife, Joan M. Morrison dated June 1, 1961 and recorded in Deed Book 188 at Page 205 in the Haywood County Registry; runs thence with the western boundary of the Morrison property South 22 deg. 47 min. East 10 feet to a point and South 24 deg. 29 min. East 160.85 feet to the southwestern corner of the Morrison tract in the northern margin of Terrace Drive; thence with the northern margin of Terrace Drive in a southwesterly direction, 155 feet, more or less, to a point on the northern margin of Terrace Drive which is the southeastern corner of a tract described in a deed from Champion Papers, Inc. to W. E. Smith and wife, Cathleen Smith dated December 6, 1963 and recorded in Deed Book 201 at Page 57 in the Haywood County Registry; runs thence with the eastern boundary of said tract, North 02 deg. 45 min. East 293 feet to the northeastern corner of said tract and South 57 deg. 13 min. West 60 feet to the northwestern corner of said tract in the western boundary of the property of Champion International Corporation; runs thence in a northerly direction a straight line to the point of BEGINNING.

FIFTH TRACT:

Located in the Town of Canton, Haywood County

Being a tract of land lying between Thompson Avenue on the east and Skyland Terrace on the west and more particularly described as follows:

BEGINNING on a point on the western margin of Thompson Avenue at the northeastern corner of a tract of land described in a deed from Neal C. Bellamy, Jr. and wife, Mary Jean Bellamy to Sam R. Brown, Jr. and wife, Virginia B. Brown dated May 29, 1959 and recorded in Deed Book 177 at Page 379 in the Haywood County Registry; runs thence with the western margin of Thompson Avenue in a northerly direction to its intersection with Skyland Terrace; thence in a westerly and southerly direction with the southern and eastern margins of Skyland Terrace to a point in the eastern margin of Skyland Terrace which is the northwestern corner of the Sam R. Brown and wife tract above referred to; runs thence with the northern boundary of the Brown tract, North 66 deg. 49 min. East 128.50 feet to the place of BEGINNING.

SIXTH TRACT:

Located in the Town of Canton, Haywood County

Being Lots 36, 37, 39, 44, 46 and 47 as shown on the recorded plat of Fiberville & Skyland Terrace recorded in Plat Book E at Page C-6 in the Office of the Register of Deeds for Haywood County, reference to which plat is hereby made for a more particularly description.

SEVENTH TRACT:

Located in the Town of Canton, Haywood County

Being Lot FB-1, Lots FM-16 and FM-17 and Lot FM-9 as shown on the plat of Fiberville & Skyland Terrace recorded in Plat Book E at Page C-6 in the Haywood County Registry less that portion of said lots which may lie within the boundaries of Balsam Avenue, White Pine Drive or Woodside Drive (State Road No. 215) as the new right of way was conveyed for Woodside Drive by Champion International Corporation to the North Carolina Department of Transportation by instrument dated May 23, 1991 and recorded in Deed Book 418 at page 1170 in the Haywood County Registry.

EIGHTH TRACT:

Located in the Town of Canton, Haywood County

Beginning on a point at the intersection at the northern margin of High Street with the eastern margin of Reservoir Street as they are now located; runs thence with the eastern margin of Reservoir Street and the eastern margin of Mitchell Street in a northerly direction to a point on the eastern margin of Mitchell Street which is the northwestern corner of a tract of land described in a deed from W. W. Mitchell and wife, Sally Mitchell to The Champion Paper and Fibre Company dated July 18, 1958 and recorded in Deed Book 175 at Page 336 in the Haywood County Registry; runs thence with the northern boundary of said tract, North 79 deg. 45 min. East 320 feet, more or less, to the northeastern corner of said tract in the western margin of Cherry Street, as it now exists; thence with the western margin of Cherry Street in a southeasterly direction to a point on the western margin of Cherry Street which is the northernmost corner of a tract of land described in a deed from Champion International Corporation to Donald R. Mitchell and wife, Melinda S. Mitchell dated May 10, 1993 and recorded in Deed Book 436 at Page 5 in the Haywood County Registry; runs thence with the northwestern boundary of said tract, South 35 deg. 29 min. 38 sec. West 145.75 feet to the westernmost corner of said tract and South 45 deg. 45 min. East 28.5 feet to the southernmost corner of said tract in the northernmost corner of a tract described in a deed from James Reeves Robinson to Lois Robinson dated February 26, 1979 and

recorded in Deed Book 305 at Page 40 in the Haywood County Registry; runs thence with the northern boundary of the Lois Robinson tract, South 34 deg. West 72.8 feet to the northwestern corner of said tract in the northeastern corner of a tract described in a deed from Catherine E. Mashburn to Thomas Dewey Parham dated June 24, 1985 and recorded in Deed Book 360 at Page 1013 in the Haywood County Registry; runs thence with the northern boundary of said tract, South 51 deg. West 117 feet to the northwestern corner of said tract; runs thence South 27 deg. 20 min. East 136 feet to a point in the northern margin of High Street at the southwestern corner of the Parham tract; runs thence with the northern margin of High Street in a southwesterly direction, 130 feet, more or less, to a point on the northern margin of High Street which is the southeastern corner of Lot No. 19 of Block D as shown on a plat of the lands of J. N. Mease, Academy Heights, recorded in Map Book A, at Page 99 in the Haywood County Registry, which lot, together with Lot 17 and 18 were conveyed to Mary D. Clemmons by Mary Dudley by deed recorded in Deed Book 260 at Page 22 in the Haywood County Registry; runs thence with the boundaries of Lots 19, 18 and 17, North 22 deg. 45 min. West 100 feet to a point, South 77 deg. 45 min. West 90 feet to a point and South 22 deg. 45 min. East 100 feet to a point on the northern margin of High Street; thence with the northern margin of High Street in a southwesterly direction to the point of BEGINNING.

NINTH TRACT

Located in the Town of Canton, Haywood County

(The Main Mill Site)

BEGINNING at a railroad spike found which is located 3,7760.61 feet South 80 Degrees 32 Minutes 52 Seconds East of the North Carolina Geodetic Survey Monument "Mease" in Haywood County, North Carolina, thence South 8 Degrees, 42 Minutes, 01 Seconds West, 18.55 feet, to a point on a curve, thence 24.98 feet along a curve to the left of radius 547.65 feet, a chord bearing and distance of South 85 Degrees, 17 Minutes, 27 Seconds West, 24.97 feet, to a point thence South 6 Degrees, 42 Minutes, 01 Seconds West, 10.35 feet, to a point, thence 25.00 feet along a curve to the right of radius 537.65 feet, a chord bearing and distance of North 85 Degrees, 02 Minutes, 11 Seconds East, 25.00 feet, to a point, thence South 8 Degrees, 42 Minutes, 01 Seconds West, 79.03 feet, to a point, thence 120.14 feet along a curve to the left of radius 2291.83 feet, a chord bearing and distance of South 74 Degrees, 46 Minutes, 03 Seconds West, 120.12 feet, to a point, thence South 73 Degrees, 18 Minutes, 26 Seconds West, 423.11 feet, to a point, thence South 23 Degrees, 44 Minutes, 10 Seconds East, 60.41 feet, to a point, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 10.00 feet, to a point, thence South 24 Degrees, 24 Minutes, 48 Seconds East, 109.89 feet to a corner of a wall, thence South 24 Degrees, 24 Minutes,

48 Seconds East, 149.15 feet to the south east corner of a concrete monument found, thence South 24 Degrees, 24 Minutes, 48 Seconds East, 14.96 feet, to a point, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 109.79 feet to a point, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 14.30 feet to the corner of a wall, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 149.13 feet to the corner of a wall, thence South 71 Degrees, 50 Minutes, 21 Seconds West, 150.00 feet to an iron rod set, thence North 18 Degrees, 09 Minutes, 39 Seconds West, 48.61 feet to an iron pipe found, thence South 73 Degrees, 09 Minutes, 21 Seconds West, 152.10 feet to a point, thence South 18 Degrees, 09 Minutes, 39 Seconds East, 215.54 feet to a point, thence South 71 Degrees, 58 Minutes, 39 Seconds West, 232.64 feet to an iron rod found, thence South 71 Degrees, 45 Minutes, 24 Seconds West, 140.51 feet to an iron rod found, thence North 12 Degrees, 11 Minutes, 19 Seconds West, 295.47 feet to an iron rod found, thence North 12 Degrees, 11 Minutes, 19 Seconds West, 56.95 feet, to a point, thence South 73 Degrees, 20 Minutes, 21 Seconds West, 257.23 feet, to a point, thence South 73 Degrees, 15 Minutes, 08 Seconds West, 28.27 feet to a point in the bed of the Pigeon River, thence South 15 Degrees, 33 Minutes, 19 Seconds East, 330.00 feet to a point in the bed of the Pigeon River, thence South 14 Degrees, 48 Minutes, 19 Seconds East, 363.00 feet to a point in the bed of the Pigeon River, thence North 29 Degrees, 18 Minutes, 19 Seconds West, 297.00 feet to a point, thence North 14 Degrees, 48 Minutes, 19 Seconds West, 33.70 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 59.21 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 16.81 feet to a point, thence South 66 Degrees, 01 Minutes, 56 Seconds West, 71.19 feet to a point, thence South 71 Degrees, 59 Minutes, 15 Seconds West, 600.00 feet to a point, thence South 38 Degrees, 45 Minutes, 45 Seconds East, 50.89 feet to a point, thence South 71 Degrees, 37 Minutes, 11 Seconds West, 38.99 feet to a point, thence North 77 Degrees, 10 Minutes, 45 Seconds West, 210.38 feet to a point in the center of Main Street, thence North 75 Degrees, 51 Minutes, 43 Seconds West, 216.70 feet to a point in the center of Main Street, thence North 11 Degrees, 15 Minutes, 44 Seconds East, 32.00 feet to an iron pipe found, thence North 11 Degrees, 15 Minutes, 13 Seconds East, 189.89 feet to an iron pipe found, thence North 11 Degrees, 15 Minutes, 17 Seconds East, 65.34 feet to a point, thence 172.51 feet along a curve to the right of radius 744.61 feet, a chord bearing and distance of South 87 Degrees, 11 Minutes, 33 Seconds West, 172.12 feet, to a point, thence North 86 Degrees, 10 Minutes, 17 Seconds West, 105.76 feet to a point, thence South 4 Degrees, 49 Minutes, 38 Seconds West, 38.50 feet to an iron pipe found, thence North 83 Degrees, 27 Minutes, 22 Seconds West, 124.48 feet to an iron pipe found, thence South 2 Degrees, 22 Minutes, 14 Seconds East, 111.43 feet to an iron rod set, thence South 2 Degrees, 22 Minutes, 14 Seconds East, 37.07 feet to a point in the center of Main Street, thence North 57 Degrees, 42 Minutes, 14 Seconds West, 157.20 feet, to a point, thence North 46 Degrees, 56 Minutes, 17 Seconds West, 130.00 feet, to a point, thence North 7 Degrees, 38 Minutes, 35 Seconds West, 4.78 feet, to an iron pipe found, thence North

7 Degrees, 39 Minutes, 16 Seconds West, 63.42 feet, to an iron pipe found, thence North 73 Degrees, 44 Minutes, 22 Seconds West, 42.49 feet, to a point, thence 180.31 feet along a curve to the right of radius 1389.60 feet, a chord bearing and distance of North 70 Degrees, 01 Minutes, 20 Seconds West, 180.18 feet, to a point, thence North 66 Degrees, 18 Minutes, 18 Seconds West, 206.20 feet, to a point, thence North 8 Degrees, 52 Minutes, 05 Seconds East, 12.27 feet, to an iron rail found, thence North 8 Degrees, 39 Minutes, 26 Seconds East, 75.87 feet, to an iron rail found, thence North 9 Degrees, 14 Minutes, 09 Seconds East, 42.75 feet, to a point, thence 39.29 feet along a curve to the right of radius 823.36 feet, a chord bearing and distance of South 59 Degrees, 16 Minutes, 24 Seconds East, 39.29 feet, to an iron pipe found, thence North 4 Degrees, 53 Minutes, 45 Seconds West, 153.29 feet, to a point, thence North 8 Degrees, 51 Minutes, 52 Seconds East, 15.96 feet, to an iron rail found, thence North 56 Degrees, 10 Minutes, 00 Seconds East, 66.00 feet, to a chiseled square in a concrete drive, thence North 23 Degrees, 46 Minutes, 42 Seconds West, 111.58 feet, to an iron rail found, thence North 23 Degrees, 46 Minutes, 39 Seconds West, 8.52 feet, to an iron pipe found, thence North 23 Degrees, 46 Minutes, 39 Seconds West, 4.11 feet, to a point, thence North 21 Degrees, 37 Minutes, 38 Seconds East, 82.98 feet, to a point, thence 165.07 feet along a curve to the right of radius 420.49 feet, a chord bearing and distance of North 32 Degrees, 52 Minutes, 25 Seconds East, 164.01 feet, to a point, thence North 44 Degrees, 07 Minutes, 11 Seconds East, 42.56 feet, to an iron rod set, thence 20.03 feet along a curve to the right of radius 581.21 feet, a chord bearing and distance of North 45 Degrees, 06 Minutes, 25 Seconds East, 20.03 feet, to a point, thence South 42 Degrees, 43 Minutes, 18 Seconds East, 22.23 feet, to an iron rod set, thence North 50 Degrees, 20 Minutes, 27 Seconds East, 117.69 feet, to an iron rod found, thence North 58 Degrees, 29 Minutes, 18 Seconds East, 115.84 feet, to an iron rod found, thence North 52 Degrees, 15 Minutes, 59 Seconds East, 117.82 feet, to an iron rod found, thence North 40 Degrees, 00 Minutes, 10 Seconds East, 215.07 feet, to an iron rod found, thence North 39 Degrees, 13 Minutes, 20 Seconds East, 347.13 feet, to an iron rod found, thence North 63 Degrees, 55 Minutes, 29 Seconds East, 55.04 feet, to an iron rod set, thence North 35 Degrees, 47 Minutes, 19 Seconds East, 50.09 feet, to an iron rod found, thence North 17 Degrees, 25 Minutes, 15 Seconds East, 53.85 feet, to an iron rod set, thence North 39 Degrees, 50 Minutes, 55 Seconds East, 273.98 feet, to an iron rod set, thence North 32 Degrees, 35 Minutes, 30 Seconds East, 87.17 feet, to an iron rod set, thence North 20 Degrees, 22 Minutes, 34 Seconds East, 98.03 feet, to an iron rod set, thence North 10 Degrees, 11 Minutes, 22 Seconds East, 63.49 feet, to an iron rod, set thence North 11 Degrees, 46 Minutes, 37 Seconds East, 172.96 feet, to an iron rod set, thence North 8 Degrees, 43 Minutes, 02 Seconds East, 137.00 feet, to an iron rod set, thence North 3 Degrees, 51 Minutes, 15 Seconds West, 123.85 feet, to an iron rod found, thence North 13 Degrees, 44 Minutes, 44 Seconds West, 111.02 feet, to an iron rod set, thence North 16 Degrees, 07 Minutes, 46 Seconds West, 359.74 feet, to an iron rod found, thence North 10 Degrees, 40 Minutes, 25 Seconds West, 152.90 feet, to an iron rod found, thence North 25 Degrees,

53 Minutes, 47 Seconds East, 77.84 feet, to an iron rod set, thence North 64 Degrees, 17 Minutes, 19 Seconds East, 181.94 feet, to an iron rod set, thence North 64 Degrees, 17 Minutes, 19 Seconds East, 80.23 feet, to an iron rod set, thence North 30 Degrees, 01 Minutes, 48 Seconds West, 102.77 feet, to a point, thence 50.43 feet along a curve to the left of radius 1472.39 feet, a chord bearing and distance of North 31 Degrees, 00 Minutes, 40 Seconds West, 50.43 feet, to an iron rod set, thence North 63 Degrees, 24 Minutes, 36 Seconds East, 45.73 feet, to an iron rail found, thence North 63 Degrees, 24 Minutes, 36 Seconds East, 157.67 feet, to an iron rail found, thence North 62 Degrees, 42 Minutes, 27 Seconds East, 158.44 feet, to an iron rail found, thence South 16 Degrees, 07 Minutes, 26 Seconds West, 156.89 feet, to an iron pipe found, thence South 8 Degrees, 25 Minutes, 05 Seconds West, 18.26 feet, to an iron rod set, thence South 81 Degrees, 34 Minutes, 55 Seconds East, 293.77 feet, to a Champion monument found, thence South 75 Degrees, 25 Minutes, 04 Seconds East, 19.52 feet, to an iron pipe found, thence South 75 Degrees, 25 Minutes, 04 Seconds East, 131.65 feet, to an iron rod set, thence South 56 Degrees, 35 Minutes, 04 Seconds East, 199.18 feet, to an iron pipe found, thence South 56 Degrees, 35 Minutes, 04 Seconds East, 178.52 feet, to an iron pipe found, thence South 3 Degrees, 45 Minutes, 48 Seconds East, 8.35 feet, to a point, thence 36.06 feet along a curve to the left of radius 50.91 feet, a chord bearing and distance of South 24 Degrees, 03 Minutes, 15 Seconds East, 35.31 feet, to a point, thence 55.17 feet along a curve to the left of radius 241.43 feet, a chord bearing and distance of South 50 Degrees, 53 Minutes, 29 Seconds East, 55.05 feet, to a point, thence South 57 Degrees, 26 Minutes, 18 Seconds East, 141.68 feet, to a point, thence 179.41 feet along a curve to the left of radius 835.27 feet, a chord bearing and distance of South 63 Degrees, 35 Minutes, 30 Seconds East, 179.07 feet, to a point, thence 15.72 feet along a curve to the left of radius 28.60 feet, a chord bearing and distance of South 85 Degrees, 29 Minutes, 44 Seconds East, 15.53 feet, to a point, thence North 78 Degrees, 45 Minutes, 14 Seconds East, 74.62 feet, to a point, thence 56.52 feet along a curve to the right of radius 53.84 feet, a chord bearing and distance of South 70 Degrees, 26 Minutes, 21 Seconds East, 53.84 feet, to a point, thence 6.30 feet along a curve to the right of radius 11.73 feet, a chord bearing and distance of South 24 Degrees, 15 Minutes, 00 Seconds East, 11.73 feet, to a point, thence South 8 Degrees, 52 Minutes, 05 Seconds East, 44.19 feet, to a point, thence 88.55 feet along a curve to the left of radius 166.60 feet, a chord bearing and distance of South 24 Degrees, 05 Minutes, 41 Seconds East, 87.51 feet, to a point, thence South 39 Degrees, 19 Minutes, 16 Seconds East, 63.85 feet, to a point, thence 183.43 feet along a curve to the right of radius 586.83 feet, a chord bearing and distance of South 30 Degrees, 22 Minutes, 00 Seconds East, 182.68 feet, to a point, thence South 21 Degrees, 24 Minutes, 43 Seconds East, 200.20 feet, to an iron rod set, thence South 74 Degrees, 31 Minutes, 50 Seconds West, 120.43 feet, to an iron rod set, thence South 74 Degrees, 31 Minutes, 50 Seconds West, 81.30 feet, to an iron rod set, thence South 80 Degrees, 13 Minutes, 15 Seconds West, 122.19 feet, to a point, thence South 7 Degrees, 04 Minutes, 10 Seconds East, 30.03 feet, to a Champion

Monument found, thence South 11 Degrees, 57 Minutes, 01 Seconds West, 85.36 feet, to a Champion Monument found, thence South 76 Degrees, 21 Minutes, 08 Seconds East, 118.21 feet, to an iron rod found, thence South 78 Degrees, 21 Minutes, 08 Seconds East, 27.63 feet, to a point, thence North 8 Degrees, 38 Minutes, 19 Seconds East, 49.61 feet, to an iron rod found, thence South 81 Degrees, 58 Minutes, 10 Seconds East, 88.88 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 15.00 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 106.00 feet, to an iron rod found, thence North 74 Degrees, 31 Minutes, 50 Seconds East, 5.41 feet, to a point, thence North 0 Degrees, 21 Minutes, 00 Seconds East, 128.86 feet, to a point, thence North 43 Degrees, 12 Minutes, 56 Seconds East, 7.65 feet, to an iron pipe found, thence North 69 Degrees, 21 Minutes, 58 Seconds East, 117.52 feet, to an iron pipe found, thence South 20 Degrees, 36 Minutes, 07 Seconds East, 99.89 feet, to an axle found, thence North 73 Degrees, 15 Minutes, 02 Seconds East, 60.40 feet, to an axle found, thence North 71 Degrees, 37 Minutes, 20 Seconds East, 92.15 feet, to an iron pipe found, thence North 20 Degrees, 27 Minutes, 50 Seconds West, 102.21 feet, to an iron rod found, thence North 73 Degrees, 10 Minutes, 54 Seconds East, 117.57 feet, to an iron pipe found, thence South 19 Degrees, 56 Minutes, 16 Seconds East, 99.85 feet, to an iron pipe found, thence North 72 Degrees, 03 Minutes, 15 Seconds East, 112.00 feet, to an iron rod found, thence North 19 Degrees, 56 Minutes, 06 Seconds West, 100.00 feet, to an iron rod found, thence North 69 Degrees, 32 Minutes, 36 Seconds East, 369.33 feet, to an iron pipe found, thence South 59 Degrees, 10 Minutes, 52 Seconds West, 107.00 feet, to an iron rod found, thence South 3 Degrees, 40 Minutes, 52 Seconds West, 53.00 feet, to an iron rod found, thence 64.97 feet along a curve to the left of radius 61.54 feet, a chord bearing and distance of South 32 Degrees, 09 Minutes, 27 Seconds West, 61.99 feet, to a point, thence South 1 Degrees, 54 Minutes, 49 Seconds West, 336.40 feet, to a point, thence 9.01 feet along a curve to the right of radius 6.19 feet, a chord bearing and distance of South 43 Degrees, 37 Minutes, 35 Seconds West, 8.23 feet, to a point, thence South 85 Degrees, 20 Minutes, 21 Seconds West, 24.41 feet, to a point, thence 49.26 feet along a curve to the left of radius 73.09 feet, a chord bearing and distance of South 66 Degrees, 02 Minutes, 02 Seconds West, 48.33 feet, to a point, thence South 46 Degrees, 43 Minutes, 43 Seconds West, 94.29 feet, to a point, thence 61.11 feet along a curve to the left of radius 97.48 feet, a chord bearing and distance of South 28 Degrees, 46 Minutes, 09 Seconds West, 60.11 feet, to a point, thence South 10 Degrees, 48 Minutes, 34 Seconds West, 87.06 feet, to a point, thence 63.78 feet along a curve to the right of radius 46.20 feet, a chord bearing and distance of South 48 Degrees, 42 Minutes, 50 Seconds West, 59.23 feet, to a point, thence South 86 Degrees, 37 Minutes, 05 Seconds West, 35.20 feet, to a point, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 35.06 feet, to an iron pipe found, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 121.57 feet, to an iron pipe found, thence South 14 Degrees, 23 Minutes, 00 Seconds East, 6.46 feet, to a point, thence North 67 Degrees, 47 Minutes, 44 Seconds East, 32.35 feet, to a point; thence North 68

Degrees, 08 Minutes, 17 Seconds East, 35.51 feet, to a 36" Locust tree, thence South 14 Degrees, 36 Minutes, 38 Seconds East, 3.38 feet, to a point, thence North 45 Degrees, 36 Minutes, 27 Seconds East, 32.00 feet, to an iron pipe found, thence North 39 Degrees, 00 Minutes, 55 Seconds East, 17.02 feet, to an iron pipe found, thence North 39 Degrees, 01 Minutes, 02 Seconds East, 36.27 feet, to an iron pipe found, thence North 39 Degrees, 00 Minutes, 59 Seconds East, 74.01 feet, to an iron rod set, thence North 52 Degrees, 39 Minutes, 01 Seconds West, 53.12 feet, to an iron rod set, thence North 79 Degrees, 57 Minutes, 44 Seconds East, 55.24 feet, to an iron pipe found, thence North 79 Degrees, 57 Minutes, 44 Seconds East, 79.34 feet, to an iron pipe found, thence South 2 Degrees, 04 Minutes, 15 Seconds East, 24.89 feet, to an iron pipe found, thence South 0 Degrees, 05 Minutes, 45 Seconds West, 99.56 feet, to an "x" chiseled in a concrete sidewalk, thence South 0 Degrees, 18 Minutes, 39 Seconds East, 75.00 feet, to a point, thence South 77 Degrees, 13 Minutes, 24 Seconds West, 65.00 feet, to a point, thence South 59 Degrees, 40 Minutes, 21 Seconds West, 69.24 feet, to a point, thence North 24 Degrees, 21 Minutes, 30 Seconds West, 15.69 feet, to a point, thence 87.47 feet along a curve to the right of radius 222.11 feet, a chord bearing and distance of South 75 Degrees, 55 Minutes, 21 Seconds West, 86.91 feet, to a point, thence South 87 Degrees, 12 Minutes, 15 Seconds West, 597.72 feet, to a point, thence 214.37 feet along a curve to the right of radius 354.97 feet, a chord bearing and distance of North 75 Degrees, 29 Minutes, 42 Seconds West, 211.13 feet, to a point, thence South 31 Degrees, 48 Minutes, 20 Seconds West, 50.00 feet, to a point, thence 244.57 feet along a curve to the left of radius 404.97 feet, a chord bearing and distance of South 75 Degrees, 29 Minutes, 42 Seconds East, 240.87 feet, to a point, thence North 87 Degrees, 12 Minutes, 15 Seconds East, 597.72 feet, to a point, thence 106.51 feet along a curve to the left of radius 237.12 feet, a chord bearing and distance of North 76 Degrees, 00 Minutes, 51 Seconds East, 105.62 feet, to an iron rod set, thence North 63 Degrees, 08 Minutes, 46 Seconds East, 15.93 feet, to a point, thence 52.24 feet along a curve to the right of radius 126.84 feet, a chord bearing and distance of North 73 Degrees, 16 Minutes, 00 Seconds East, 51.87 feet, to a point, thence 47.09 feet along a curve to the right of radius 29.18 feet, a chord bearing and distance of South 48 Degrees, 42 Minutes, 13 Seconds East, 42.14 feet, to a point, thence 61.59 feet along a curve to the right of radius 1159.76 feet, a chord bearing and distance of South 0 Degrees, 57 Minutes, 16 Seconds East, 61.58 feet, to an iron rod set, thence North 75 Degrees, 46 Minutes, 37 Seconds West, 52.40 feet, to a railroad spike set, thence South 59 Degrees, 33 Minutes, 53 Seconds West, 96.40 feet, to a railroad spike set, thence South 4 Degrees, 33 Minutes, 53 Seconds West, 62.04 feet, to a railroad spike set, thence South 4 Degrees, 33 Minutes, 53 Seconds West, 352.96 feet, to a railroad spike set, thence South 61 Degrees, 03 Minutes, 53 Seconds West, 4.60 feet, to a railroad spike set, thence South 14 Degrees, 31 Minutes, 44 Seconds West, 176.57 feet, to a point, thence South 84 Degrees, 53 Minutes, 58 Seconds East, 31.59 feet, to a point, thence North 14 Degrees, 31 Minutes, 44 Seconds East, 138.47 feet, to a point, thence 17.56

feet along a curve to the right of radius 23.01 feet, a chord bearing and distance of North 36 Degrees, 23 Minutes, 33 Seconds East, 17.13 feet, to a point, thence North 58 Degrees, 15 Minutes, 22 Seconds East, 51.89 feet, to a point, thence 19.70 feet along a curve to the right of radius 39.41 feet, a chord bearing and distance of North 72 Degrees, 34 Minutes, 39 Seconds East, 19.49 feet, to a point, thence 13.35 feet along a curve to the right of radius 10.42 feet, a chord bearing and distance of South 56 Degrees, 23 Minutes, 13 Seconds East, 12.46 feet, to a point, thence South 19 Degrees, 40 Minutes, 23 Seconds East, 2.32 feet, to a point, thence South 8 Degrees, 41 Minutes, 26 Seconds West, 5.84 feet, to a point, thence 90.71 feet along a curve to the left of radius 1090.84 feet, a chord bearing and distance of South 6 Degrees, 18 Minutes, 30 Seconds West, 90.68 feet, to a point, thence South 3 Degrees, 55 Minutes, 34 Seconds West, 85.50 feet, to a point, thence South 84 Degrees, 53 Minutes, 58 Seconds East, 12.88 feet, to a point, thence North 11 Degrees, 24 Minutes, 05 Seconds East, 41.00 feet, to a point, thence South 84 Degrees, 03 Minutes, 59 Seconds East, 18.13 feet, to a point on the East side of Bridge Street, thence North 3 Degrees, 55 Minutes, 34 Seconds East, 45.75 feet, to a point, thence 87.69 feet along a curve to the right of radius 1054.51 feet, a chord bearing and distance of North 6 Degrees, 18 Minutes, 30 Seconds East, 87.66 feet, to a point, thence North 8 Degrees, 41 Minutes, 26 Seconds East, 28.78 feet, to a point, thence 46.56 feet along a curve to the right of radius 42.32 feet, a chord bearing and distance of North 40 Degrees, 12 Minutes, 11 Seconds East, 44.24 feet, to a point, thence North 71 Degrees, 42 Minutes, 57 Seconds East, 56.51 feet, to a point, thence 193.93 feet along a curve to the right of radius 525.70 feet, a chord bearing and distance of North 82 Degrees, 17 Minutes, 02 Seconds East, 192.83 feet, to a point, thence South 87 Degrees, 08 Minutes, 54 Seconds East, 6.88 feet, to a point, thence South 17 Degrees, 43 Minutes, 59 Seconds East, 1.85 feet, to a point, thence South 17 Degrees, 43 Minutes, 59 Seconds East, 125.50 feet, to an iron rod found, thence North 71 Degrees, 11 Minutes, 01 Seconds East, 62.70 feet, to an iron rod found, thence South 22 Degrees, 44 Minutes, 00 Seconds East, 83.00 feet, to an iron rod found, thence South 28 Degrees, 03 Minutes, 59 Seconds East, 126.07 feet, to a concrete monument found, thence North 84 Degrees, 03 Minutes, 59 Seconds West, 117.68 feet, concrete monument found, thence South 44 Degrees, 35 Minutes, 59 Seconds West, 70.54 feet, to a concrete monument found, thence South 82 Degrees, 17 Minutes, 13 Seconds West, 221.94 feet, to a concrete monument found, thence North 88 Degrees, 07 Minutes, 22 Seconds West, 113.38 feet, to a railroad spike found, thence 181.44 feet along a curve to the left of radius 2391.46 feet, a chord bearing and distance of South 79 Degrees, 25 Minutes, 40 Seconds West, 181.40 feet, to a railroad spike found and the Point of Beginning containing 197.019 acres, more or less. Being the same tract of land shown in that certain survey titled Champion Plant, Canton, North Carolina, dated May 11, 1999, by C. O. Hampton Company, Land Surveyors, P.O. Drawer 1319, Fletcher, North Carolina and recorded as a plat in the Haywood County Registry on Slide Number _____, on the _____ day of 1999.

Canton Property May 13, 1999

1093

TENTH TRACT (Oxygen Injection Site at Landfill #3).

BEGINNING on an iron rod set, which iron rod is located South 4 deg. 37 min. 48 sec. West 154.02 feet from a pine on the eastern bank of the Pigeon River, which pine is the beginning corner of a tract of land described in a deed from W. M. Williamson and wife, Oma Jarrett Williamson to The Champion Paper and Fibre Company, dated October 28, 1955 and recorded in Deed Book 165 at Page 600 in the Haywood County Registry and which pine is also the beginning corner of another tract of land conveyed to the Champion Paper and Fibre Company by E. O. Crane and wife, Treacy Crane by deed dated October 28, 1957 and recorded in Deed Book 174 at Page 234 in the Haywood County Registry, the iron rod beginning corner being further located North 50 deg. 20 min. 29 sec. West 4,894.52 feet from NC Geodetic Survey Station MEASE having coordinates of North=672106.184 and East=854833.647, NAD 83; runs thence from the beginning corner thus established and tied down as follows: South 35 deg. 38 min. 01 sec. East 24.95 feet to a point in the center of a 20 foot right of way for an oxygen line hereinafter separately set forth; continuing South 35 deg. 38 min. 01 sec. East 58.05 feet to an iron rod set; South 53 deg. 16 min. 01 sec. East 98.60 feet to an iron rod set; South 36 deg. 18 min. 34 sec. West 25.82 feet to a point in a gravel drive which is the western terminus and beginning point of a thirty (30) foot right of way for ingress and egress hereinafter separately described; continuing South 36 deg. 18 min. 34 sec. West 52.53 feet to an iron rod set northeast of the Pigeon River; thence continuing South 36 deg. 18 min. 34 sec. West 30.06 feet to the northeastern bank of the Pigeon River; runs thence up and with the bank of the Pigeon River, eight calls as follows: North 52 deg. 27 min. 06 sec. West 54.66 feet to a point, North 58 deg. 57 min. 42 sec. West 37.63 feet to a point, North 54 deg. 10 min. 17 sec. West 38.63 feet to a point, North 44 deg. 58 min. 42 sec. West 34.58 feet to the southernmost corner of a concrete deck adjacent to the River, North 36 deg. 31 min. 21 sec. West 10.94 feet to the westernmost corner of the concrete deck, North 31 deg. 16 min. 23 sec. West 54.71 feet to a point, North 4 deg. 34 min. 22 sec. West 43.19 feet to a point and North 33 deg. 39 min. 10 sec. East 31.43 feet to a point on the bank of the river; thence leaving the Pigeon River and running South 83 deg. 06 min. 23 sec. East, 32.19 feet to an iron rod set; thence continuing South 83 deg. 06 min. 23 sec. East 57.56 feet to the place of BEGINNING. Containing 0.62 acres, according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

ELEVENTH TRACT (Road Right of Way at Landfill #3)

There is hereby conveyed a thirty (30) foot right of way for ingress, egress and regress from said Oxygen Injection Site to Wrightsville Road (State Road No. 1551), the center

line of the right of way being described as follows:

BEGINNING on a point in the center of the gravel drive referred to in the above description, which point is the terminus of the fourth call contained in said description; runs thence with the center of the gravel drive, twenty-one (21) calls as follows:

South 71 Deg. 07 Min. 37 Sec. East 114.22 feet, to a point; thence 296.78 feet along a curve to the left of radius 472.80 feet, a chord bearing and distance of South 89 Deg. 06 Min. 35 Sec. East 291.93 feet, to a point; thence 283.51 feet along a curve to the left a radius of 1219.60 feet, a chord bearing and distance of North 66 Deg. 14 Min. 53 Sec. East 282.87 feet, to a point; thence North 59 Deg. 35 Min. 19 Sec. East 112.26 feet, to a point; thence 466.70 feet along a curve to the left of radius 1085.51 feet, a chord bearing and distance of North 47 Deg. 16 Min. 19 Sec. East 463.11 feet, to a point; thence North 34 Deg. 57 Min. 19 Sec. East 202.51 feet to a point; thence 159.79 feet along a curve to the left of radius 1651.68 feet, a chord bearing and distance of North 32 deg. 11 min. 02 sec. East 159.73 feet to a point; thence 143.16 feet along a curve to the right of radius 222.36 feet, a chord bearing and distance of North 47 Deg. 51 Min. 26 Sec. East 140.70 feet, to a point; thence North 66 Deg. 18 Min. 08 Sec. East 51.32 feet, to a point; thence 140.91 feet along a curve to the left of radius 145.95 feet, a chord bearing and distance of North 38 Deg. 38 Min. 34 Sec. East 135.51 feet, to a point; thence North 10 Deg. 59 Min. 00 Sec. East 118.05 feet, to a point; thence 187.49 feet along a curve to the right of radius 399.64 feet, a chord bearing and distance of North 22 Deg. 59 Min. 23 Sec. East 186.27 feet, to a point; thence North 34 Deg. 59 Min. 46 Sec. East 91.32 feet, to a point; thence 26.69 feet along a curve to the left of radius 40.00 feet, a chord bearing and distance of North 15 Deg. 52 Min. 56 Sec. East 26.20 feet, to a point; thence North 3 Deg. 13 Min. 55 Sec. West 22.49 feet, to a point; thence 31.16 feet along a curve to the left of radius 30.00 feet, a chord bearing and distance of North 32 Deg. 59 Min. 15 Sec. West 29.78 feet, to a point; thence North 62 Deg. 44 Min. 35 Sec. West 32.48 feet, to a point; thence 40.95 feet along a curve to the left of radius 81.42 feet, a chord bearing and distance of North 77 Deg. 09 Min. 02 Sec. West 40.52 feet, to a point; thence South 88 Deg. 26 Min. 30 Sec. West 163.77 feet, to a point; thence 185.66 feet along a curve to the right of radius 603.28 feet, a chord bearing and distance of North 82 Deg. 44 Min. 31 Sec. West 184.92 feet, to a point; thence North 73 Deg. 55 Min. 32 Sec. West 91.01 feet, to a point in the center of Wrightsville Road (State Road No. 1551), according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

The right of way shall be 30 feet in width, 15 feet on either side of the center line above described.

Canton Property May 13, 1999

1095

TWELFTH TRACT (Oxygen Storage Site at Landfill #3).

BEGINNING on an iron rod set in the boundary line between the tract conveyed to the Champion Paper and Fibre Company by W. M. Williamson and wife, by Deed Book 165, at Page 600, and the tract conveyed to The Champion Paper and Fibre Company by E. O. Crane and wife, by Deed Book 174 at Page 234, both in the Haywood County Registry, said beginning point being located North 51 deg. 15 min. 05 sec. East 725.55 feet from a pine on the eastern bank of the Pigeon River which pine is the beginning corner described in both of the tracts referred to, the iron rod set at the beginning corner being further located North 40 deg. 31 min. 33 sec. West 4,908.98 feet from NC Geodetic Survey Station MEASE having coordinates of N= 672106.184 and E = 854883.547, NAD 83; runs thence from the beginning corner thus located and tied down as follows: North 61 deg. 22 min. 00 sec. West 174.84 to an iron rod set; North 38 deg. 32 min. 07 sec. East 65.69 feet to a point which is the northeastern terminus of the center line of a twenty (20) foot right of way for an oxygen line hereinafter separately described; thence continuing North 38 deg. 32 min. 07 sec. East 20.70 feet to an iron rod set; thence South 61 deg. 22 min. 00 sec. East 195.44 feet to a point in the dividing line between the two tracts owned by Champion International Corporation by virtue of the two deeds to the Champion Paper and Fibre Company above referred to; runs thence South 51 deg. 15 min. 05 sec. West 13.54 feet to a point in the center of a gravel drive which is the western terminus of a twenty-five (25) foot right of way leading to Wrightsville Road (State Road No. 1551) which is hereinafter separately described; thence continuing South 51 deg. 15 min. 05 sec. West 78.66 feet to the place of BEGINNING. Containing 0.36 acres according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, , 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site".

THIRTEENTH TRACT (Road Right of Way at Landfill #3)

There is also hereby conveyed a twenty-five (25) foot right of way for ingress, egress and regress from the above described 0.36 acre Oxygen Storage Site to the a public road known as Wrightsville Road (State Road #1551), the center line of the 25 foot right of way being described as follows: BEGINNING on a point in the center of the gravel drive which is the terminus of the fifth call contained in the description to the 0.36 acre tract above described; runs thence from said point, South 61 deg. 12 min. 36 sec. East 99.88 feet to a point, thence 106.91 feet along a curve to the left of radius of 114.99 feet a chord bearing and distance of South 87 deg. 50 min. 47 sec. East 103.10 feet; thence North 65 deg. 31 min. 05 sec. East 23.04 feet to a point in the gravel drive where it intersects the State maintained portion of Wrightsville Road (State Road No. 1551). According to a survey by C. O. Hampton Company, Land Surveyors dated May11, 1999 and entitled "Survey for Champion International Landfill 3 Oxygen

Injection Site". The right of way shall extend 12½ feet on either side of the center line.

FOURTEENTH TRACT (Oxygen Line Right of Way at Landfill #3)

There is also hereby conveyed an easement for an existing oxygen line, which easement is twenty (20) feet in width, and which easements leads from the Oxygen Storage Site (above described) in a southwesterly direction to the Oxygen Injection Site above described, the center line of the easement being described as follows: BEGINNING on a point which is the terminus of the second call contained in the description for the 0.36 acre Oxygen Storage Site above described, which point is in the center of the existing oxygen line, runs thence with the center of said oxygen line, eleven calls as follows: North 57 deg. 13 min. 37 sec. West 52.57 feet to a point, South 36 deg. 45 min. 22 sec. West 65.66 feet to a point, South 34 deg. 04 min. 05 sec. West 142.36 feet to a point, South 2 deg. 07 min. 54 sec. West 104.14 feet to a point, South 4 deg. 45 min. 15 sec. West 101.20 feet to a point, South 0 deg. 04 min. 13 sec. East 52.23 feet to a point, South 16 deg. 07 min. 29 sec. West 56.58 feet to a point, South 23 deg. 49 min. 08 sec. West 40.57 feet to a point, South 28 deg. 41 min. 18 sec. West 213.13 feet to a point, South 17 deg. 10 min. 34 sec. West 49.82 feet to a point and South 73 deg. 21 min. 57 sec. West 132.20 feet to a point in the northern line of the 0.62 acre Oxygen Injection Site above described. According to a survey by C. O. Hampton Company, Land Surveyors dated May 11, , 1999 and entitled "Survey for Champion International Landfill 3 Oxygen Injection Site". The twenty (20) foot right of way above described shall lie parallel to and ten (10) feet on either side of the center line.

FIFTEENTH TRACT (Landfill 6)

Beginning at a right-of-way monument at the intersection of the southern right-of-way of Interstate 40 with the western right-of-way of Incinerator Road, Secondary Road 1550, said beginning point stands North 75 degrees, 15 minutes, 57 seconds East, 2,493.54 feet from North Carolina Geodetic Survey Monument "Culvert",
thence, from said beginning point and with the right-of-way of Incinerator Road, as follows: South 45 Degrees, 07 Minutes, 15 Seconds East, 44.40 feet,
to an existing iron pipe
thence 234.90 feet along a curve to the left of radius 285.63 feet,
a chord bearing and distance of
South 68 Degrees, 40 Minutes, 53 Seconds East, 228.34 feet,
to a point
thence 158.72 feet along a curve to the left of radius 285.63 feet,
a chord bearing and distance of
South 71 Degrees, 50 Minutes, 20 Seconds East, 156.69 feet,
to a existing iron pipethence North 55 Degrees, 55 Minutes, 07 Seconds East, 102.63

feet,
to a existing iron pipe
thence North 7 Degrees, 59 Minutes, 55 Seconds West, 22.26 feet,
to a existing iron pipe
thence North 55 Degrees, 55 Minutes, 08 Seconds East, 190.10 feet,
to a existing iron pipe
thence 143.90 feet along a curve to the right of radius 642.13 feet,
a chord bearing and distance of
North 62 Degrees, 20 Minutes, 20 Seconds East, 143.60 feet,
to an existing iron pipe
thence, leaving the right-of-way of Incinerator Road, North 24 Degrees, 02 Minutes, 39 Seconds West, 42.40 feet,
to a point
thence North 82 Degrees, 45 Minutes, 46 Seconds East, 151.17 feet,
to a point
thence South 78 Degrees, 14 Minutes, 14 Seconds East, 260.67 feet,
to a point
thence North 86 Degrees, 45 Minutes, 46 Seconds East, 179.21 feet,
to a point
thence South 56 Degrees, 14 Minutes, 14 Seconds East, 346.62 feet,
to an iron rod set
thence South 56 Degrees, 14 Minutes, 14 Seconds East, 20.00 feet,
to a point in Thickety Creek
thence, with Thickety Creek as follows: South 28 Degrees, 23 Minutes, 48 Seconds West, 62.18 feet,
to a point
thence South 14 Degrees, 28 Minutes, 17 Seconds West, 47.12 feet,
to a point
thence South 9 Degrees, 14 Minutes, 54 Seconds East, 46.42 feet,
to a point
thence South 16 Degrees, 45 Minutes, 17 Seconds West, 38.09 feet,
to a point
thence South 0 Degrees, 04 Minutes, 24 Seconds East, 50.66 feet,
to a point
thence leaving Thickety Creek, North 76 Degrees, 21 Minutes, 01 Seconds West, 46.87 feet,
to a point in the center of Incinerator Road, Secondary Road 1550
thence with the center of said Incinerator Road as follows: 146.71 feet along a curve to the left of radius 251.02 feet,
a chord bearing and distance of
South 25 Degrees, 43 Minutes, 18 Seconds East, 144.63 feet,
to a point

Canton Property May 13, 1999

1098

thence 208.12 feet along a curve to the right of radius 1158.87 feet,
a chord bearing and distance of
South 37 Degrees, 19 Minutes, 14 Seconds East, 207.84 feet,
to a point
thence 70.62 feet along a curve to the right of radius 2407.61 feet,
a chord bearing and distance of
South 31 Degrees, 20 Minutes, 08 Seconds East, 70.61 feet,
to a point in the center of the Incinerator Road bridge over Thickety Creek
thence leaving said Incinerator Road and with Thickety Creek, as follows: South 28 Degrees, 50 Minutes, 37 Seconds West, 12.35 feet,
to a point
thence South 13 Degrees, 50 Minutes, 35 Seconds West, 53.36 feet,
to a point
thence South 3 Degrees, 11 Minutes, 14 Seconds East, 73.83 feet,
to a point
thence South 37 Degrees, 02 Minutes, 53 Seconds East, 30.19 feet,
to a point
thence South 63 Degrees, 54 Minutes, 11 Seconds East, 4.74 feet,
to a point
thence leaving Thickety Creek South 65 Degrees, 29 Minutes, 48 Seconds West, 27.64 feet,
to an iron rod set
thence South 65 Degrees, 29 Minutes, 48 Seconds West, 183.59 feet,
to an iron rod set at a fence corner
thence North 8 Degrees, 18 Minutes, 11 Seconds West, 189.45 feet,
to an iron rod set at a fence corner
thence North 32 Degrees, 51 Minutes, 27 Seconds West, 434.89 feet,
to an axle found at fence corner
thence North 75 Degrees, 48 Minutes, 25 Seconds West, 409.08 feet,
to a iron rod set
thence South 24 Degrees, 02 Minutes, 39 Seconds East, 311.10 feet,
to an existing iron pipe at fence corner
thence South 3 Degrees, 42 Minutes, 21 Seconds West, 297.40 feet,
to an existing iron pipe
thence South 3 Degrees, 42 Minutes, 21 Seconds West, 1289.64 feet,
to an existing iron pipe
thence South 3 Degrees, 42 Minutes, 20 Seconds West, 22.99 feet,
to a point on the north bank of the Pigeon River
thence with the north bank of the Pigeon River, as follows: South 82 Degrees, 05 Minutes, 50 Seconds West, 337.95 feet,
to a point
thence South 76 Degrees, 32 Minutes, 50 Seconds West, 275.46 feet,

to a point
thence South 71 Degrees, 55 Minutes, 45 Seconds West, 1,057.44 feet,
to a point
thence crossing a side channel of Pigeon River South 59 Degrees, 44 Minutes, 28 Seconds West, 77.77 feet,
to a point on the south bank of a small island
thence with the south bank of said small island South 73 Degrees, 53 Minutes, 25 Seconds West, 221.45 feet,
to a point
thence South 63 Degrees, 28 Minutes, 45 Seconds West, 172.95 feet,
to a point
thence South 60 Degrees, 19 Minutes, 22 Seconds West, 46.31 feet,
to a point
thence leaving the south bank of said small island South 8 Degrees, 32 Minutes, 30 Seconds West, 39.99 feet,
to a point in the Pigeon river
thence with the centerline of Pigeon River as follows South 67 Degrees, 01 Minutes, 40 Seconds West, 255.69 feet,
to a point
thence South 55 Degrees, 45 Minutes, 48 Seconds West, 169.96 feet,
to a point
thence with the centerline of Pigeon River as follows: North 1 Degrees, 42 Minutes, 26 Seconds East, 59.99 feet,
to a point on the north bank of Pigeon River
thence leaving the centerline of Pigeon River and with the north bank of Pigeon River as follows: South 57 Degrees, 32 Minutes, 23 Seconds West, 168.46 feet,
to a point
thence South 43 Degrees, 22 Minutes, 03 Seconds West, 354.58 feet,
to a point
thence South 73 Degrees, 35 Minutes, 48 Seconds West, 196.79 feet,
to a point
thence North 78 Degrees, 57 Minutes, 35 Seconds West, 116.59 feet,
to a point
thence South 85 Degrees, 37 Minutes, 22 Seconds West, 50.32 feet,
to a point
thence South 69 Degrees, 23 Minutes, 42 Seconds West, 213.17 feet,
to a point
thence South 78 Degrees, 46 Minutes, 46 Seconds West, 117.33 feet,
to a point
thence North 88 Degrees, 45 Minutes, 31 Seconds West, 83.05 feet,
to a point
thence North 83 Degrees, 14 Minutes, 25 Seconds West, 90.47 feet,

to a point
thence North 81 Degrees, 52 Minutes, 10 Seconds West, 192.86 feet,
to a point
thence South 89 Degrees, 16 Minutes, 02 Seconds West, 142.69 feet,
to a point
thence South 87 Degrees, 44 Minutes, 38 Seconds West, 113.33 feet,
to a point
thence leaving the north bank of Pigeon River, North 2 Degrees, 21 Minutes, 51 Seconds East, 21.73 feet,
to a existing iron pipe
thence North 2 Degrees, 21 Minutes, 51 Seconds East, 1413.68 feet,
to an existing iron rod in a pine stump at a fence corner
thence North 32 Degrees, 39 Minutes, 17 Seconds West, 765.15 feet,
to an existing iron rod north of a small branch
thence South 35 Degrees, 17 Minutes, 20 Seconds West, 211.82 feet,
to an existing iron pipe in the center of said small branch
thence North 60 Degrees, 31 Minutes, 13 Seconds West, 347.98 feet,
to an existing iron pipe in the center of a 60 foot right-of-way
thence North 60 Degrees, 31 Minutes, 13 Seconds West, 59.06 feet,
to a point in the center of said 60 foot right-of-way
thence leaving the 60 foot right-of-way, South 30 Degrees, 08 Minutes, 08 Seconds West, 29.65 feet,
to an existing iron pipe
thence South 30 Degrees, 08 Minutes, 08 Seconds West, 158.64 feet,
to an existing iron pipe
thence South 14 Degrees, 14 Minutes, 53 Seconds West, 168.20 feet,
to an existing iron pipe
thence North 66 Degrees, 04 Minutes, 22 Seconds West, 288.30 feet,
to an existing iron rod in the east right-of-way of New Thickety Road, Secondary Road 1513
thence with the existing right-of-way of said New Thickety Road as follows: 207.79 feet
along a curve to the left of radius 756.89 feet,
a chord bearing and distance of
North 57 Degrees, 21 Minutes, 43 Seconds East, 207.14 feet,
to a point
thence with the existing right-of-way of said New Thickety Road as follows: 257.65 feet
along a curve to the left of radius 756.89 feet,
a chord bearing and distance of
North 39 Degrees, 44 Minutes, 43 Seconds East, 256.41 feet,
to a point
thence North 29 Degrees, 59 Minutes, 35 Seconds East, 83.70 feet,
to a right-of-way monument at the intersection of the east right-of-way of said New

Thickety Road with the southern right-of-way of Interstate 40
thence leaving the right-of-way of New Thickety Road and with the southern right-of-way of Interstate 40 as follows: North 78 Degrees, 56 Minutes, 05 Seconds East, 359.68 feet,
to a right-of-way monument
thence North 79 Degrees, 39 Minutes, 56 Seconds East, 201.61 feet,
to a right-of-way monument
thence North 25 Degrees, 05 Minutes, 54 Seconds East, 36.87 feet,
to a right-of-way monument
thence North 79 Degrees, 32 Minutes, 15 Seconds East, 936.32 feet,
to a right-of-way monument
thence North 79 Degrees, 36 Minutes, 39 Seconds East, 271.15 feet,
to a right-of-way monument
thence South 38 Degrees, 30 Minutes, 16 Seconds East, 56.32 feet,
to a right-of-way monument
thence North 79 Degrees, 30 Minutes, 14 Seconds East, 268.20 feet,
to a right-of-way monument
thence North 78 Degrees, 39 Minutes, 29 Seconds East, 204.38 feet,
to a right-of-way monument
thence North 76 Degrees, 17 Minutes, 53 Seconds East, 309.86 feet,
to a right-of-way monument
thence North 35 Degrees, 21 Minutes, 25 Seconds East, 94.49 feet,
to a right-of-way monument
thence North 72 Degrees, 11 Minutes, 44 Seconds East, 384.90 feet,
to a right-of-way monument
thence North 69 Degrees, 24 Minutes, 00 Seconds East, 255.53 feet,
to a right-of-way monument
thence North 67 Degrees, 53 Minutes, 32 Seconds East, 249.81 feet,
to a right-of-way monument
thence North 67 Degrees, 41 Minutes, 03 Seconds East, 154.44 feet,
to a right-of-way monument
thence South 39 Degrees, 50 Minutes, 28 Seconds East, 31.08 feet,
to a right-of-way monument
thence 461.67 feet along a curve to the right of radius 5578.25 feet,
a chord bearing and distance of
North 69 Degrees, 04 Minutes, 55 Seconds East, 461.53 feet,
to a right-of-way monument
the Point of Beginning Containing 245.0 acres, more or less, according to a survey by C. O. Hampton Company, Land Surveyors dated May 11, 1999 and entitled "Survey for Champion International Landfill 6".

Canton Property May 13 , 1999

1102

TRANSFER MADE ON PROPERTY RECORD
Date 5/19/99
By

Excise Tax $120,000.00

HAYWOOD COUNTY NC 05/19/1999
$120000.00
STATE OF NORTH CAROLINA Real Estate Excise Tax

Book 472 Page 1073
REGISTERED
HAYWOOD COUNTY NC
05/19/1999 10:30 AM
AMY R. MURRAY
Register Of Deeds

7169
Recording Time, Book and Page

Tax Lot No. _____ Parcel Identifier No. _____
Verified by _____ County on the ____ day of _____, 19 ___
by _____

Mail after recording to: S. H. Spencer Compton, Paul, Weiss, Rifkind, Wharton & Garrison, 1285 Avenue of the Americas, New York, NY 10019-6064.
This instrument was prepared by: Robert E. Fogarty, One Champion Plaza, Stamford, CT 06921.
Brief description for the Index: **

NORTH CAROLINA SPECIAL WARRANTY DEED

THIS DEED made this 14th day of May, 1999 to be effective as of and from the 14th day of May, 1999, by and between

GRANTOR	GRANTEE
Champion International Corporation, a New York corporation One Champion Plaza Stamford, Connecticut 06921	Blue Ridge Paper Products Inc. a Delaware Corporation c/o KPS Special Situations Fund, L.P. 200 Park Avenue, 58th Floor New York, NY 10166

1073

The designation Grantor and Grantee as used herein shall include said parties, their successors and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of

APPENDIX F

AFFIDAVIT FOR LAND-DISTURBING ACTIVITIES IN HAYWOOD COUNTY, NC

AFFIDAVIT FOR LAND-DISTURBING ACTIVITIES IN HAYWOOD COUNTY, N. C.
(Statement of Intent and Commitment to Perform by the Person Financially Responsible
and/or by the Land Owner)

PROJECT: Evergreen Packaging, Landfill No. 6, Area D North PIN #_____

LOCATION: 1155 Incinerator Road, Canton, North Carolina

I now state under oath that I will perform all land-disturbing activity on this project, for which I am responsible or upon land I own, in accordance with the provisions of Chapter 154 of the Haywood County Code of Ordinances ***and*** within the obligations set forth in this performance obligation ***and*** in my erosion and sediment control plan as approved by Haywood County. I acknowledge that Haywood County's Erosion and Sediment Control Ordinance is based on rules and regulations promulgated by the State of North Carolina in the *Sedimentation Pollution Control Act of 1973 (as amended)* and in the North Carolina Administrative Code.

►I have received a copy of the Haywood County Erosion and Sediment Control Ordinance.

►I will comply with the provisions for establishing temporary and permanent ground covers as per the Ordinance. Some requirements are as follows: ***The angle for graded slopes and fills shall be no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with a temporary or permanent ground cover, device, or structure sufficient to restrain erosion.***

a) If any graded slopes or fills on this project are to be left idle for a period of twenty one (21) calendar days~~, I~~ agree to seed and mulch these disturbed areas by the seventh (7th) calendar day. I realize that this will give disturbed areas two weeks for the grass to grow. If these disturbed areas are not adequately protected by day twenty one (21) or if any graded slopes or fills on this project are not planned for vegetative cover, I will provide other adequate ground covers on all the applicable disturbed areas by the end of day 21. I realize that these types of ground covers include gravel, adequate mulch, rip rap with filter cloth, sod or other measures that will meet the requirements of the Ordinance to restrain erosion.

b) If my construction is in a season of the year considered outside the window for successfully establishing vegetative ground cover (when frost normally occurs), I will comply by using other acceptable applications of material such as adequate mulch to meet the requirements of the ground cover requirements.

c) I understand that open channels such as ditches may be difficult to stabilize with grass ground cover. I may meet this ground cover obligation by using either check dams to help grass establish, sod in the ditch, or hardened liners such as rock rip rap or fabric liners. I will construct adequately sized ditches, and I will stabilize them as per the requirements of the Ordinance.

►I will install all reasonable measures to protect all public and private properties from any sediment damage as a result of my land disturbing activity. I will keep my sediment on my property by using a combination of the following acceptable erosion and sediment control practices: □ gravel construction entrance, □ trenched, tamped and adequately braced silt fence, □ silt pits, □ sediment traps, □ diversion ditches, □ berms, □ measures to keep sediment out of culverts.

► I or my designate(s) will inspect all erosion and sediment control measures at least once every seven (7) calendar days and after any rain event producing 0.5 inches or more precipitation during any 24-hour period. I am the person responsible for cleanout and maintenance of erosion and sediment control measures on my project. I know that maintenance is my responsibility even though I may hire someone else to perform the work. I will maintain the measures on my property or project and keep them functional and adequate.

► I am now informed that the average yearly rainfall for Haywood County is 50" to 60" of rain (distributed from north to south). I am now informed that the amount of rainfall from the 24-hour, one-year storm is 3" to 3.5" of rain, and the 24-hour, ten-year storm produces from 5" to 6" of rainfall (distributed from north to south).

▶I am aware of the rules and regulations regarding buffer zone requirements as per the Ordinance; and some are as follows (the Ordinance contains the complete listing of requirements):

a) No land-disturbing activity during periods of construction or improvement to land shall be permitted in proximity to a lake or natural watercourse unless a buffer zone is provided along the margin of the watercourse of sufficient width to confine visible siltation within the 25% of the buffer zone nearest the land-disturbing activity.

b) Waters that have been classified as trout waters by the Environmental Management Commission shall have an undisturbed buffer zone 25-feet wide or of sufficient width to confine visible siltation within the 25% of the buffer zone nearest the land-disturbing activity, whichever is greater. Provided, however, that the Director may approve plans which include land-disturbing activity along trout waters when the duration of the disturbance would be temporary and the extent of the disturbance would be minimal. This subdivision shall not apply to a land-disturbing activity in connection with the construction of facilities to be located on, over, or under a lake or natural watercourse.

c) Unless otherwise provided, the width of a buffer zone is measured from the edge of the water to the nearest edge of the disturbed area with the 25% of the strip nearer the land-disturbing activity containing natural or artificial means of confining visible siltation.

d) The 25-foot minimum width for an undisturbed buffer zone adjacent to designated trout waters shall be measured horizontally from the top of the bank.

e) Where a temporary and minimal disturbance is permitted as an exception by G.S. §113A-57(1) land-disturbing activities in the buffer zone adjacent to designated trout waters shall be limited to a maximum of 10% of the total length of the buffer zone within the tract to be distributed such that there is not more than 100 linear feet of disturbance in each 1000 linear feet of buffer zone. Larger areas may be disturbed with the written approval of the Director.

▶As per §154.60(C)(6)(a) of the Erosion Control Ordinance, the specific time frame I am requesting for this land-disturbing activity is (from the commencement of land-disturbing activity to the point of final stabilization):

____/____/____	____/____/____	_____
↑Commencement date↑	↑ Ending Date ↑	↑ Amount of time requested ↑

▶ I agree to comply with the provisions of my erosion and sediment control plan as approved or modified by Haywood County, the above statements and the rules, regulations, and requirements of Chapter 154 of the Haywood County Code of Ordinances: Erosion and Sediment Control. Witness my signature below:

Person Financially Responsible:_____

Land Owner:_____

*I,*_____*, a Notary Public of the County of* _____

*in the State of*_____*, hereby certify that*_____

_____*personally appeared before me this day and acknowledged the due execution of the foregoing instrument.*

Witness my hand and Official Seal this_____***day of***_____***, 20***_____.

Notary:_____

My commission expires:_____

ATTACHMENT 5

LANDFILL NO. 6 SOLID WASTE PERMIT AND PROPERTY DESCRIPTION

Ronald H. Levine, M.D., M.P.H.
STATE HEALTH DIRECTOR

DIVISION OF HEALTH SERVICES
P.O. Box 2091
Raleigh, N.C. 27602-2091

CERTIFIED COPY OF SOLID WASTE PERMIT

I do hereby certify that the attached PERMIT is an exact and true copy of Permit No. 45-06.

O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Environmental Health Section

CERTIFIED TRUE COPY
Jo DAVIS
in accos
NC 27606

North Carolina
Wake County

I, Nell Z. Sellers, a Notary Public for said County and State, do hereby certify that O.W. Strickland personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal, this the 28th day of March, 19 84.

(official seal)

Nell Z. Sellers
Notary Public

My commission expires July 24, 1987.

842

PERMIT NO. 43-06

DATE ISSUED 3/28/84

STATE OF NORTH CAROLINA
DEPARTMENT OF HUMAN RESOURCES
Division of Health Services
P.O. Box 2091 Raleigh 27602

SOLID WASTE PERMIT

CHAMPION PAPERS is hereby issued a permit to operate a SANITARY LANDFILL (No. 6 Areas A-G) located ON S.R. 1550 & I-40 IN HAYWOOD COUNTY, in accordance with Article 13B of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The facility is located on the below described property.

BEGINNING on a concrete right of way monument at the point of intersection of the southern right of way line of Interstate Highway 40, with the Southeastern right of way line of the New Thickety Road, said concrete right of way monument being located South 75 deg. 34 min. 14 sec. West 1683.01 feet from North Carolina Geodetic Survey "Station Culvert" have Y coordinate of 677542.47 and an X coordinate of 845996.22, said beginning point being further the Northwestern corner of the "First Tract" described in a deed to Champion International Corporation from Brantley M. Davis and wife, Gladys S. Davis, dated January 8, 1981, and recorded in Deed Book 321 at Page 158, in the Office of the Register of Deeds for Haywood County; runs thence from the beginning point thus established and with the Southern right of way line of Interstate Highway 40, 14 calls as follows: North 79 deg. 12 min. East 561.62 feet to a concrete right of way monument; North 25 deg. 06 min. East 36.88 feet to a concrete right of way monument; North 79 deg. 34 min. East 1207.83 feet to a concrete right of way monument; South 28 deg. 31 min. East 56.18 feet to a concrete right of way monument; North 79 deg. 30 min. East 268.26 feet to a concrete right of way monument; North 78 deg. 40 min. East 204.43 feet to a concrete right of way monument; North 76 deg. 18 min. East 309.93 feet to a concrete right of way

O. W. Strickland, Head
Solid & Hazardous Waste Management Branch
Environmental Health Section

843

DHS Form 2077 (Rev. 1/82)
Solid & Hazardous Waste Management Branch

PERMIT NO. 45-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Property Description (Continued):

monument; North 35 deg. 22 min. East 94.51 feet to a concrete right of way monument; North 72 deg. 12 min. East 384.99 feet to a concrete right of way monument; North 69 deg. 25 min. East 255.85 feet to a concrete right of way monument; North 67 deg. 57 min. East 249.62 feet to a concrete right of way monument; North 67 deg. 41 min. East 154.48 feet to a concrete right of way monument; South 39 deg. 50 min. East 31.94 feet to a concrete right of way monument; and on a curve to the right with a radius of 5579.58 feet, an arc distance of 461.78 feet to a concrete right of way monument delineating the intersection of the Southern right of way line of Interstate Highway 40 and the Southern right of way line of the New Thickety Road; thence with the Southern right of way line of the New Thickety Road, six calls as follows: South 45 deg. 07 min. East 44.41 feet to an iron pipe; on a curve to the left with a radius of 285.69 feet, an arc distance of 393.72 feet to a point; North 55 deg. 55 min. East 102.55 feet to a point; North 8 deg. 0 min. West 22.27 feet to a point; North 55 deg. 55 min. East 190.14 feet to a point; and on a curve to the right with a radius of 642.29 feet, an arc distance of 95.58 feet to a point on said right of way line; thence leaving the Southern right of way line of the New Thickety Road and running with a hedgerow, the line of the property claimed by Carroll Smith, South 34 deg. 57 min. East 255.48 feet to a point; thence South 24 deg. 03 min. East, with a fence line and the line of the Claude Smith property, 459.74 feet to an iron pipe at a fence corner; runs thence South 3 deg. 42 min. West, generally with a fence and with the line of Thurman R. Robinson, and passing an iron pipe at 1587.42 feet, 1610.42 feet to the Northern margin of the Pigeon River; thence down the Pigeon River, ten calls as follows: South 82 deg. 06 min. West 338.03 feet to a point on the North Bank of the river, at the mouth of Sorrells Cove Branch; South 76 deg. 33 min. West 275.53 feet to an eight inch walnut on the North bank of the river; South 71 deg. 56 min. West 1057.69 feet to an eight inch leaning willow on the North bank of the river, where the channel of said river forks; South 59 deg. 45 min. West 77.79 feet to a point on the South margin of an island in the river; South 74 deg. 54 min. West 221.50 feet to a point on the Southern margin of said island in the river; South 63 deg. 29 min. West 172.99 feet to a point on the Southern margin of said island in the river; South 60 deg. 19 min. West 46.32 feet to a point on the South bank of said island in the river; South 08 deg. 33 min. West 40 feet to a point in the center of the main channel of the river; South 67 deg. 02 min. West 255.75 feet to a point in the main channel of the river; and South 55 deg. 46 min. West 170 feet to a point in the center of the main channel of the river; runs thence North 01 deg. 43 min. East 60 feet to a point on the Northern edge of the Pigeon River; thence with the North bank of the Pigeon River, twelve calls as follows: South 57 deg. 32 min. West 168.50 feet to an eighteen inch sycamore; South 43 deg. 22 min. West 354.67 feet to a point; South 73 deg. 36 min. West 196.84 feet to an eighteen inch sycamore; North 78 deg. 57 min. West 116.62 feet to a forked maple; South 85 deg. 37 min., West 50.33

PERMIT NO. 45-06

DATE ISSUED 3/23/84

SOLID WASTE PERMIT

Property Description (Continued):

feet to a six inch forked bean tree; South 69 deg. 24 min. West 213.22 feet to a twelve inch locust; South 78 deg. 47 min. West 117.36 feet to a twelve inch sycamore; North 88 deg. 43 min. West 83.07 feet to an eight inch sycamore; North 83 deg. 14 min. West 90.49 feet to a ten inch sycamore; North 81 deg. 52 min. West 192.91 feet to a twelve inch locust; South 89 deg. 16 min. West 142.72 feet to a twenty inch walnut; and South 87 deg. 45 min. West 113.37 feet to a point on the bank of said river, in the Eastern boundary line of the property of George H. Cogburn, Jr.; runs thence with the Eastern and Northeastern boundary line of the Cogburn property; three calls as follows: North 02 deg. 24 min. East 1434.14 feet to an iron pipe in a fence stump in a fence corner; North 33 deg. 04 min. West 732.69 feet to a point in a maple stump; and, generally with a branch, South 41 deg. 18 min. West 203.37 feet to an iron pipe in the center of said branch at the Easternmost corner of a tract of land conveyed by James L. Henderson and wife, to Casmer A. Belniak and wife, by deed dated August 12, 1974, and recorded in Deed Book 270 at Page 423, Records of Haywood County; runs thence with the Northern and Northwestern boundary line of the Belniak tract, four calls as follows: North 60 deg. 29 min. West 337.85 feet to an iron pipe in the center of a sixty foot private road right of way; North 60 deg. 03 min. West 37 feet to an iron pipe in the center of said private road right of way; South 29 deg. 47 min. West 201.58 feet to a hub; and South 14 deg. 11 min. West 155.06 feet to a hub in a fence line; thence leaving the Belniak line, and running North 66 deg. 04 min. West 288.55 feet to an iron pipe on the Southeastern right of way line of the New Thickety Road: thence with said right of way, three calls as follows: on a curve to the left with a radius of 755.94 feet, an arc distance of 206.87 feet to an iron pipe; on another curve to the left with a radius of 465.63 feet, an arc distance of 258.76 feet to an iron pipe; and North 30 deg. East 83.72 feet to the place of BEGINNING, according to a survey by Webb A. Morgan, R.L.S., containing 235.051 acres.

PERMIT NO. 63-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Conditions of Permit:

1. This permit may be subject to review at an administrative hearing upon petition of anyone whose legal rights, privileges and duties may have been affected by the issuance thereof.

2. This permit shall not be effective unless the certified copy is filed in the register of deeds' office, in the grantor index under the name of the owner of the land in the county or counties in which the land is located. After recordation, the certified copy shall be returned to the Solid & Hazardous Waste Management Branch and shall have indicated on it the page and book number, date of recordation and registrar's seal.

3. The following requirements shall be met prior to receiving solid waste at the site:

   a. Site preparation shall be in accordance with construction plan.

   b. Site inspection shall be made by a representative of the Division of Health Services.

4. This solid waste disposal site is permitted to receive solid waste as defined in 10 NCAC 10F, .0101(31), except that hazardous waste, liquid waste and any other wastes that may pose a threat to the environment or the public health are prohibited from disposal at this site unless prior authorization is obtained from the Division of Health Services.

5. This permit is for construction according to plans prepared by Law Engineering Testing Co. dated January, 1983. Any modification or deviation from the approved plans shall be approved by the N.C. Solid and Hazardous Waste Management Branch.

6. Ground water monitoring wells are installed per the DHS monitoring well standard.

PERMIT NO. 43-06

DATE ISSUED 3/28/84

SOLID WASTE PERMIT

Conditions of Permit:

7. The northwest corner of area E shall be limited to 50' south of the existing stream unless the stream, after proper approval is obtained, is relocated so that it is outside landfill construction activity.

8. The groundwater and surface water sampling plan is adequate with the exception of the following items:

   1. Sampling frequency should be no less than annually.

   2. Parameters to be evaluated are:

      A. EPA Interim Primary Drinking Water Standards*

         Arsenic
         Barium
         Cadmium
         Chromium
         Fluoride
         Lead
         Mercury
         Nitrite (as N)
         Selenium
         Silver

         *Maximum allowable concentrations can be found in the May 19, 1980 Federal Register, Appendix III, page 33757.

      B. Groundwater Quality Parameters*

         Chloride
         Iron
         Manganese
         Sulfate
         Phenols

         *Allowable concentrations based on 1962 Drinking Water Standards and background water quality data.

DHS Form 2071 (Rev. 1/82) Solid & Hazardous Waste Management Branch

PERMIT NO. 85-06

DATE ISSUED 7/28/86

SOLID WASTE PERMIT

Conditions of Permit:

C. Groundwater Contamination Indicators*

pH
Specific conductance
Elevation of groundwater surface
Total organic carbon
Total organic halogen
Total dissolved solids

*Allowable concentrations determined by background comparison, see Part 265.93(b) Appendix B.

Filed for registration
day of April 19 84
4:20 o'clock P M and registered
in office of the Register of Deeds for
Haywood County, North Carolina.
This 2 day of April 19 84
in Book No. 349 on page 842
Register of Deeds
Haywood County
By Deputy

DHS Form 2871 (Rev. 1/82)
Solid & Hazardous Waste Management Branch