Fac/Perm/Co ID #	Date	Doc ID#
44-06	4/27/11	13672

Blue Ridge Paper Products Inc. - Canton Mill / Waynesville Plant

April 20, 2011

Hand Delivered

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APR 20 2011

SOLID WASTE SECTION
ASHEVILLE REGIONAL OFFICE

Mr. Allen Gaither
North Carolina DENR
Division of Waste Management
2090 US Highway 70
Swannanoa, NC 28778

RE: Blue Ridge Paper Products Inc., Landfill Number 6, Permit Number 44-06, Area 6A-West Closure Design

Dear Mr. Gaither:

Blue Ridge Paper Products dba Evergreen Packaging is submitting the enclosed plan and specification packages for the closure of Landfill 6, Area 6A-West. Two options are included:

1. The design utilizing on-site soils within the closure cap system.
2. An amended design utilizing off-site as well as on-site soils within the closure cap system.

At present, negotiations continue with the EPA's on-site representative, Environmental Restoration LLC, to determine a soil delivery plan utilizing off-site soils (Option 2, above) that is acceptable to all parties. We hope to reach an agreement to take the off-site soils. If an agreement cannot be reached, then the design plan (Option 1, above) described by the approved Area 6A-West Operating Permit will be utilized.

With the submittal of these documents, Evergreen Packaging requests that the Division of Waste Management approve the closure plan and specification packages so we can proceed with closure of Area 6A-West during the 2011 summer and fall construction season.

Thank you for your time and consideration. Should you have questions or comments at this time please let us know.

Sincerely,

James A. Giauque
Waste Compliance & Landfill Supervisor
Evergreen Packaging - Canton Mill
Jim.giauque@everpack.com
828-646-2028 Fax 828-646-6892

Paul Dickens
Manager, Environmental, Health & Safety
Evergreen Packaging – Canton Mill
paul.dickens@everpack.com
828-646-6141 Fax 828-646-6892

Enclosures
File:gaither041911

Copy: Guy Cote (SME)(letter only)
Andy Apostolopoulos
Bill vonVitzthume
Luke Williams
Bruce Wyer

DESIGN REPORT
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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

SME
Sevee & Maher Engineers, Inc.

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ATTACHMENT B	ENGINEERING DRAWINGS
ATTACHMENT C	STORMWATER MANAGEMENT PLAN
ATTACHMENT D	STABILITY ANALYSIS
ATTACHMENT E	WORK PLAN

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1.0 INTRODUCTION

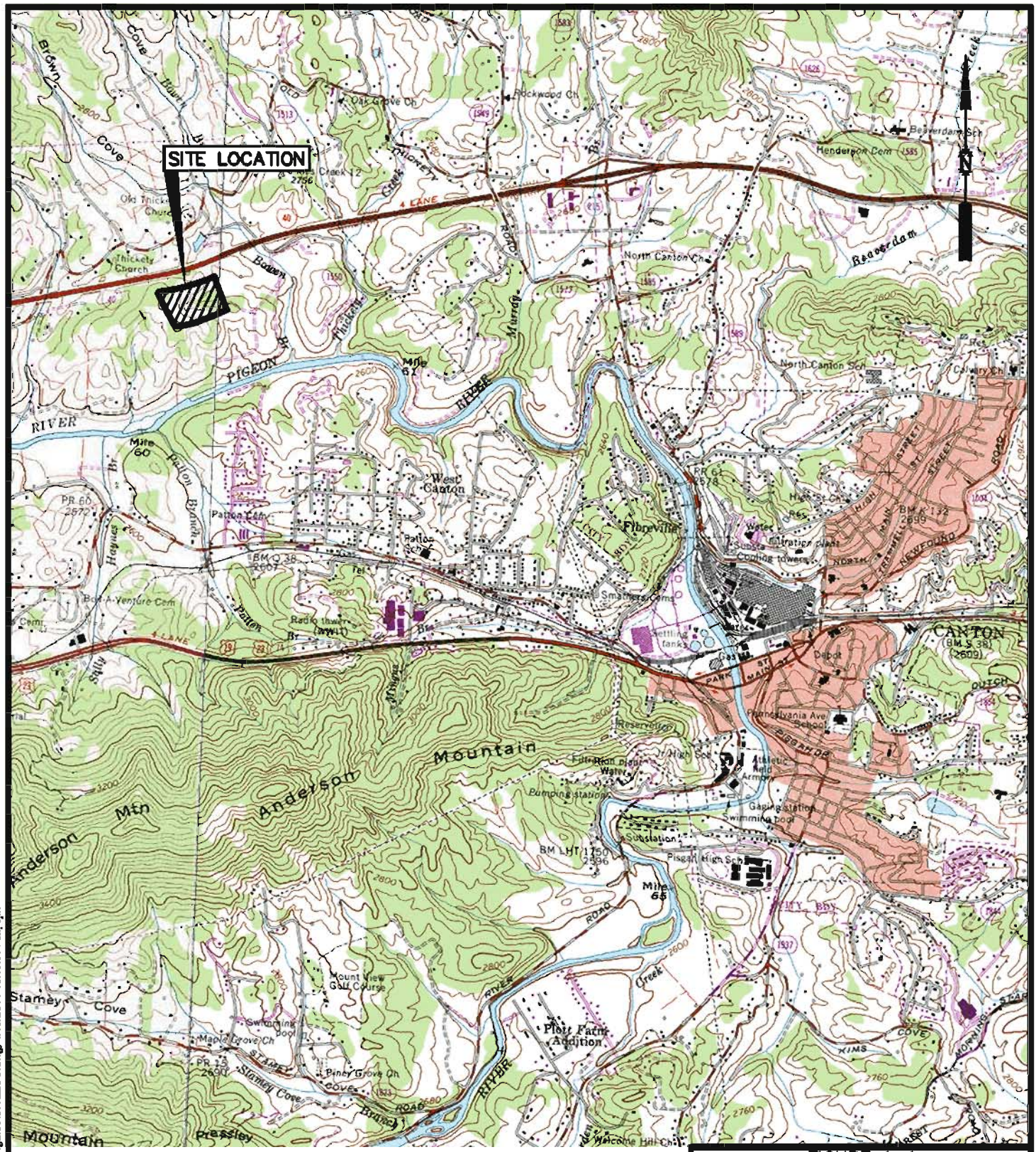
1.1 Facility Information

Facility Name:	Landfill No. 6 Area A-West
Location:	Incinerator Road Canton, North Carolina
Property Owner:	Evergreen Packaging 175 Main Street P.O. Box 4000 Canton, NC 28716 Contact: Mr. Jim Giauque Telephone: (828) 646-2028

1.2 Background

Area 6A-West is used primarily for the disposal of sludge, ash, lime mud, and wood waste disposal, which are all papermaking waste products. Figure 1-1 illustrates the location of the Landfill and other cells in the Landfill No. 6 area, shown on a portion of a USGS 7.5-minute topographic quadrangle map (USGS, 1978 and 1990).

Area 6A-West encompasses an area of approximately 18 acres, and is located west of Area 6A-East. Area 6A-West was constructed by Blue Ridge Paper in 2000. The site was permitted to receive waste in compliance with NCDENR Permit # 44-06.



BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLES
CANTON, NC (1990)
CLYDE, NC (1978)

1250 0 2500 FEET

FIGURE 1–1
SITE LOCATION MAP
LANDFILL NO. 6
WEST AREA CLOSURE
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

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DWG: SITELOC LMN: NONE CTB: SME-STD REV: 2/3/2011

\\Nserver\cfs\Bmp\NC\6a-west\Closure\Acad\Figures\SITELOC.dwg, 4/15/2011 10:16:07 AM, sjm

1.3 Contact Information

The following person will be the Evergreen contact for the closure and post closure activities at the Landfill.

Jim Giauque
Waste Compliance and Landfill Supervisor

Evergreen Packaging
175 Main Street
P.O. Box 4000
Canton, NC 28716

Phone (828)646-2028
Fax (828)646-6892
E-mail jim.giauque@everpack.com

2.0 CLOSURE DESIGN

2.1 Development Concept

The closure plan for the Landfill was developed to minimize leachate generation through placement of a cover system engineered from locally available materials. The closure design was developed considering site-specific conditions, availability of materials in the Canton area, understanding of the past operating procedures of the site, and the type of waste in the landfill. Closure of the site will include the following activities.

- Regrading of the waste, where necessary, in accordance with Subsection 2.2 of this document to obtain closure design grades;
- Placement of a soil cap in accordance with Subsection 2.3 of this document and as shown on the attached Drawings; and
- The seeding and fertilizing of the site in accordance with the seeding specifications described in Subsection 2.5 of this document.

The principal goals for the closure plan are as follows:

- To minimize infiltration; and
- To provide a cover system suitable for development of a grass crop that will prevent erosion and minimize infiltration.

2.2 Site Preparation and Regrade

Grading of the landfill site will be performed prior to cap placement. Areas needing fill will use on site material. Prior to placement of the next layer, drainage stone, a surveyor will check the elevations to assure that the proper grade exists for closure. Following grading of the waste, a 12-inch layer of drainage stone will be spread over the entire landfill area.

2.3 Cap Placement

The final cover system for this amendment will consist of a soil cover that will range in thickness from 3 feet to 27 feet. This differs from the standard cover which is a uniform 3 feet of soil over Area 6A-West. Unlike the grading plan for the standard cover, the use of additional soil over the crown area will create a ridgeline and greater crown slope, approximately 12 percent. A benefit of the increased slope is that it will shed water more quickly making the cover system more efficient.

The soil for the proposed final cover system will come from two sources: (1) off-site borrow from Barber Orchards in Waynesville, North Carolina; and (2) an on-site borrow stockpile resulting from construction of Cell 6D-South in 2010. The off-site borrow is less permeable than the on-site materials based on laboratory testing. The soils are further characterized in the geotechnical report in Attachment E. The difference in permeability will require a drainage stone layer along the sideslopes between the interface of the two soil types. The drainage layer will be connected to the leachate collection layer at the toe of the landfill. The details of the cover system buildup are provided on the engineering drawings in Attachment B. In addition to the permeability differential, SME evaluated the landfill for stability due to the additional thickness (weight) of the soil cover. The stability analysis determined the landfill will be stable with the additional soil placement on the cover. The geotechnical stability analysis is provided in Attachment D.

Placement of cover soil will be in accordance with the Engineering Specifications and Work Plan provided in Attachments A and E, respectively. Cross-sections through the final cover system are provided with the Engineering Drawings located in Attachment B.

2.4 Site Seeding

All areas disturbed during placement of the final cover system will be seeded. Seeding will normally occur between March 1 and October 15. All site grading and surface water runoff control structures such as diversion berms, drainage ditches, stone check dams and culverts will be constructed prior to seeding. Raking, discing, or other acceptable means will be used to loosen the top layer of soil before seeding. Lime and fertilizer will be applied to areas prior to

seeding. Application rates for lime and fertilizer will follow the engineering specifications (Attachment A), or, as needed based on testing. If the site is hydroseeded, lime, fertilizer and seed can be applied simultaneously. The seed mixture to be used will follow the engineering specifications. The seed will be applied uniformly with a cyclone seeder, drilled, cultipack seeder, or hydroseeder. Seeds shall not be planted if there is a danger of frost shortly after seed germination. Maximum seeding depth is ¼ inch when using methods other than hydroseeding. Wood fiber, cellulose mulch, or hay mulch will be spread uniformly upon completion of the seedbed preparation, liming, fertilization, and seeding. The mulch may be anchored in-place by uniformly applying an acceptable mulch binder such as Curasol or Terr-Tac. If germination is unsuccessful (less than 75 percent catch) within 30 days of seeding, or there is unsatisfactory catch in the next year, the appropriate areas site will be reseeded in accordance with the seeding specifications contained herein.

2.5 Quality Assurance/Quality Control Program

The closure plan amendment will be instituted upon regulatory approval. Closure is estimated to take about four months, depending on weather conditions. The owner will utilize qualified personnel or retain the services of a Professional Engineer certified in the State of North Carolina and familiar with the various aspects of landfill design and closure, will be utilized as the on-site representative during closure of the site. The on-site representative will provide observation of the proposed closure activities and will be responsible for quality control enforcement and construction documentation at the site. Services of a contractor familiar and experienced with the various aspects of landfill construction will be procured for the installation of the final closure system.

To control the quality of the soil materials used in the landfill closures, a quality assurance/quality control (QA/QC) program will be implemented. The program will include source testing to demonstrate compliance with the materials specifications and construction testing to demonstrate that materials have been properly installed. Section 01400 of the Engineering Specifications outlines the QA/QC Program.

2.5.1 Soil QA/QC.

2.5.1.1 Source Testing

In addition to testing for physical properties, the soil materials used for the landfill closure amendment will be tested at the source prior to being delivered on-site, to demonstrate compliance with the chemical characterization. Samples will be collected by the owners representative at the borrow source in accordance with the protocols and frequency of testing presented in the Work Plan in Attachment E.

2.5.2 Weekly Inspection Reports. A weekly inspection report will be prepared by the owner's representative during the closure of the landfill. The reports will include material test results, summary of contractor submittals, summary of weekly progress and progress made to date, and anticipated work items for the following week. Copies of the reports will be provided in the construction certification report.

2.5.3 Photographic Documentation. To provide documentation of the landfill closure, photographs will be taken periodically of the closure construction. Copies of the photographs will be provided in the construction certification report.

2.5.4 Record Drawings. Upon completion of the landfill closure, a set of as built drawings will be prepared. The drawings will be sealed by a licensed State of North Carolina Professional Engineer and will be submitted to the NCDENR within 60 days of closure completion.

2.5.5 Final Construction Certification and Report. A final construction report will be submitted to the NCDENR within 60 days following the completion of closure construction at the landfill. The report will include written certification signed by the site representative, that the site has been closed in accordance with the requirements listed in 15A NCAC 13B Rule .0510.

2.6 Leachate and Gas Management

Leachate is primarily generated at each landfill site through precipitation falling onto and infiltrating into the landfill. Leachate will be managed through the placement of a cover system.

Leachate generated at the Landfill is collected through a series of pipes and manholes at the base of the landfill. The leachate is then discharged to the mill for treatment. During the placement of final cover, all leachate generated will continue to be directed to the collection system.

The generation of gas and associated odors once the landfill cover is placed has not been a problem historically; therefore, no gas management/venting system will be incorporated into the final cover system.

2.7 Stormwater Management/Erosion Control

To design the necessary surface water control structures, stormwater runoff calculations for the site were performed utilizing the methodology outlined by the USDA Soil Conservation Service's (SCS) Technical Release No. 55 (TR-55, Urban Hydrology for Small Watersheds, June 1986 Revision) and a computer program named Hydrocad that uses TR-20. A 25-year/24-hour Type II storm with average Antecedent Runoff Conditions was used to calculate the runoff characteristics of the appropriate drainage areas. A Stormwater Management Plan including calculations used to determine design flow rates using TR-55 and TR-20 are included as Attachment C of this document.

Erosion control measures, including the use of erosion control matting, stone check dams, siltation fence, sediment traps, and riprap aprons will be implemented. In addition, the following erosion control procedures will be followed during closure construction operations and after site closure has been completed.

- All soil erosion and sediment control measures will be performed in strict accordance with the "North Carolina Erosion and Sediment Control Planning and Design Manual," including the latest data from the SCS.
- The disturbance of existing soil cover will be kept to a minimum during site closure.
- Acceptable existing topsoil will be stripped and stockpiled for reuse as final cover. Topsoil suitable for reuse will be stockpiled on-site in a manner that natural drainage is not obstructed and no off-site sediment damage will result.

- During grading operations, the site will be brought to approximate finish grades and stabilized without extended delays.
- Erosion and sediment control measures such as stone check dams, erosion control matting and siltation fencing will be installed as shown and/or adjusted to suit construction immediately after a cut or fill slope has been created.
- Silt fencing will be inspected after prolonged rainfall events and repairs made as necessary. Sediment deposits will be periodically removed from the upstream side of the silt areas. This sediment will be spread and stabilized in areas of the site not subject to erosion. Silt fencing will be replaced as necessary to provide proper filtration action.
- Immediately following the final grading of the landfill cap all graded or disturbed areas will be seeded to provide a permanent vegetative cover.

2.8 Design Plans and Technical Specifications

Design plans showing the Landfill's existing site topography, proposed grading plans (elevations and sideslopes), design details, and cross-sections are contained in Attachment B. Technical specifications for the proposed closure activities are contained in Attachment A.

3.0 LONG-TERM (POST-CLOSURE) MAINTENANCE

The subsections that follow describe the various activities that must be done to insure the long-term integrity of the landfill subsequent to final closure.

3.1 Edge-of-Waste Marker

Following the installation of the cover system, edge-of-waste (EOW) markers will be installed delineating the waste boundary. The EOW markers will be permanent signs and inspected at the frequency indicated in the Landfill Operations Manual.

3.2 Mowing

To prevent deep-rooted tree growth, the closed portions of the landfill and drainage ditches will be mowed twice annually at a minimum. Mowing will not begin on 6A-West until grass growth is established. Temporary stone check dams will be removed prior to mowing.

3.3 Site Inspections

Closed areas will be inspected twice per year for a period of at least three years to ensure the cover system integrity is maintained against erosion and other problems. The inspection will include an examination of the following items:

- surface drainageways
- surface grading
- grass growth

Each inspection will include notation of any problems and recommended remedial actions; please refer to the current landfill Operations Manual for maintenance inspection checklist. Following the three years, an inspection frequency of once per year will be instituted unless major problems develop, whereupon more frequent inspections will be made.

ATTACHMENT A

ENGINEERING SPECIFICATIONS

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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

SME
Sevee & Maher Engineers, Inc.

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CONTRACT DOCUMENTS AND
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FOR
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AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA
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INFORMATION FOR BIDDERS

CONTRACT DOCUMENTS AND
CONSTRUCTION SPECIFICATIONS
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA
EVERGREEN PACKAGING

INFORMATION FOR BIDDERS

I. Receipt and Opening of Bids

Evergreen Packaging - Canton Mill (Evergreen) (herein called the "Owner"), invites bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the office of Lynn Sellers until **4:00 P.M.** prevailing time, _____, 2011 and then at said office privately opened and read. The envelopes containing the bids must be sealed, addressed to:

Evergreen Packaging – Canton Mill
Attn: Ms. Lynn Sellers
Canton Mill
P.O. Box 4000
Canton NC 28716

Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within 90 days after the actual date of the opening thereof.

II. Preparation of Bid

Each bid must be submitted on the prescribed form appended to these documents. All blank spaces for bid prices must be filled in, in ink or typewritten.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his address, and the name of the project for which the bid is submitted. If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

III. Subcontractors

The bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner. A complete list of proposed subcontractors shall be included in the Contractor's proposal.

IV. Qualification of Bidder

The Owner may make such investigations as he deems necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Contractor shall submit with the bid the name and resume of the Superintendent who shall be on site during the project. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the contract and to complete the work contemplated therein. Conditional bids will not be accepted.

V. Time of Completion and Liquidated Damages

Bidder must agree to complete all work by _____, 2011. Bidder must submit a detailed schedule for all phases of the project showing starting and completion dates of key activities with their bid.

VI. Condition of Work

Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligations to furnish all material and labor necessary to carry out the provisions of his Contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruptions of or interference with the work of any other contractor.

VII. Addenda and Interpretations

No interpretation of the meaning of the plans, specifications, or other pre-bid documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to Sevee & Maher Engineers, Inc., 4 Blanchard Rd., P.O. Box 85A, Cumberland Center, Maine 04021 and to be given consideration must be received at least five working days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued become part of the Contract documents.

VIII. Security for Faithful Performance

If requested by the Owner, simultaneously with his delivery of the executed Contract, the Contractor shall furnish a Surety Bond or Bonds for 100 percent of the Contract amount as security for faithful performance of this Contract and for the payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract. The surety on such bond or bonds shall be a duly authorized surety company satisfactorily to the Owner. The cost of these bonds, if required, will be reimbursed to the Contractor by the Owner.

IX. Power of Attorney

Attorneys-in-fact who sign Contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

X. Notice of Special Conditions

Attention is particularly called to those parts of the Contract documents and specifications, especially Safety and Conduct Requirements.

XI. Laws and Regulations

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

XII. Method of Award - Lowest Qualified Bidder

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

XIII. Obligation of Bidder

At this time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and Contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his bid.

A pre-bid conference and/or inspection trip for prospective bidders is scheduled for _____, 2011 _____ **P.M.,** at the Purchasing Office.

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

CONTRACT

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

GENERAL AND SPECIAL CONDITIONS

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

SAFETY AND CONDUCT REQUIREMENTS

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

BID SCHEDULE

CONTRACT DOCUMENTS AND
CONSTRUCTION SPECIFICATIONS
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA
EVERGREEN PACKAGING

GENERAL CONTRACTOR

BID SCHEDULE

Item No.	Item and Unit Price Bid	Unit	Engineer's Quantity Estimate	Contractor's Quantity Estimate	Lump Sum Bid	Add/Deduct Per Unit Bid
4.4.1	Mobilization / Demobilization	Lump Sum	1		$	$
4.4.2	Compacted Off-Site Borrow, furnished by Owner and delivered to the site	Cubic Yard	150,000		$	$
4.4.3	Compacted Cover Soil, furnished by Owner, on-site	Cubic Yard	28,500		$	$
4.4.4	Topsoil (4-inch layer)	Cubic Yard	9,500		$	$
4.4.5	Manhole Connections	Each	6		$	$
4.4.6	24-Inch SD Pipe	Linear Foot	60		$	$
4.4.7	Seeding and Mulching	Acres	18		$	$
4.4.8	Erosion Control Mat	Square Yard	2,000		$	$
4.4.9	Optional Finish Waste Grading	Acres	18		$	$
4.4.10	Drainage Stone Placement, furnished by Owner and delivered to site	Cubic Yard	28,500		$	$
4.4.11	Stone Check Dams, furnished by Owner and delivered to site	Each	49		$	$
				LUMP SUM TOTAL:	$	$

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

DRAWING LIST

CONTRACT DOCUMENTS AND
CONSTRUCTION SPECIFICATIONS
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA
EVERGREEN PACKAGING

DRAWING LIST

Drawing No.	Title
	Cover Sheet
C-100	Symbols, Abbreviations, and Specifications
C-101	Site Location Plan
C-102	Existing Conditions Plan
C-103	Area A-West Final Waste Grading Plan
C-104	Area A-West Final Grading Plan
C-300	Sections and Details

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

TECHNICAL SPECIFICATIONS

CONTRACT DOCUMENTS AND CONSTRUCTION SPECIFICATIONS FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA EVERGREEN PACKAGING

TECHNICAL SPECIFICATIONS

DIVISION 1

Section	Title
01010	SUMMARY OF WORK
01300	SUBMITTALS
01561	CLEANING
01562	DUST CONTROL

DIVISION 2

Section	Title
02200	EARTHWORK
02270	EROSION CONTROL
02451	CORRUGATED HDPE PIPE
02480	SEEDING
02570	MANHOLES AND CATCH BASINS

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL INFORMATION

1.01 PROJECT DESCRIPTION

The intent of this project is to place final cover over Area 6A-West of Landfill No. 6. The project encompasses approximately 18 acres of final cover and will take place in the summer of 2011. Work shall include furnishing all materials, labor, and supervision and performing all operations required to complete the work shown on the contract drawings and as described in the Specifications contained herein, and as evidently necessary to complete the work. Work shall include, but not be limited to, the following items:

- Construction and maintenance of necessary erosion control items shown on the engineering drawings. Installation of erosion control shall be in accordance with State of North Carolina "Erosion and Sediment Control Planning and Design Manual". The erosion control measures will include, but not be limited to, siltation fencing, hay bales, temporary seeding, erosion control matting, riprap, and the use of hay mulch.

- Finish grading of waste, optional – Evergreen Packaging (Evergreen) will be responsible for grading the waste. However, Evergreen is requesting an alternative bid item for the Contractor to finish grade the crown portion of the landfill. The contractor shall be responsible for finish grading of the waste to ensure grade and alignment of the cover system are according to the project drawings. Evergreen shall be responsible for providing additional waste if it is required. If excess waste is encountered, the contractor shall move the waste to an active area of Area 6A-West.

- Installation of No. 67 stone on the crown and sideslopes of Area 6A-West. Evergreen will have the stone delivered to the site and dumped at locations selected by the contractor.

- Borrow pit development. The on-site borrow pit will be cleared and stumped by Evergreen. The area shall be grubbed to a depth of approximately one foot. The grubbing material shall be stockpiled and used for topsoil in the final cover system.

- Installation of a minimum thickness of 18 inches of compacted off-site borrow soil, including grading and compaction. Evergreen will be responsible for providing off-site borrow soil material. The Contractor shall be responsible for installation and compaction in accordance with the Contract Drawings.

- Installation of 12 inches of compacted cover soil, including grading and compaction. Evergreen will be responsible for providing an on-site till borrow pit.

The contractor shall be responsible for excavating, screening, and hauling of the cover soil. The cover soil will be excavated and hauled from an on-site source designated by Evergreen.

- Installation of 4 inches of topsoil over the compacted cover soil.
- Installation of a stormwater management system, as shown on the construction drawings, including a diversion berm, manholes, catch basins, and piping.

1.02 PROJECT/WORK IDENTIFICATION:

Project Title:	Landfill No. 6 Area A-West Closure Amendment
Owner:	Evergreen Packaging Canton, North Carolina
Design Engineer:	Sevee & Maher Engineers, Inc. Cumberland Center, Maine

1.03 DEFINITIONS:

A. Contract: The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract includes the proposal, contract form and contract bonds, Specifications, supplemental Specifications, special provisions, general and detailed plans and notice to proceed, also any change orders and agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

A contract may include any part of a project or one or more projects.

B. Contract Documents: The contract includes the technical Specification documents contained herein, the contract form, the Safety and Conduct Requirements, the General and Special Conditions, bid schedule, the drawings, and the addenda issued in the execution of the described work.

C. Information Precedence: In the event that any technical information presented herein conflicts with other such information, the information on the drawings will take precedence. Once such an item is found, it is the contractor's responsibility to report said conflict to the Owner's Representative.

D. Bidder: An individual, firm, or corporation submitting a bid for the advertised work.

E. Contractor: The individual, firm, or corporation contracting with the Owner for performance of prescribed work.

F. Indicated: The term "Indicated" is a cross-reference to graphic representation, notes, or schedules on drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purposes of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

G. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable to each instance.

H. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

I. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

1.04 PROJECT CONDITIONS:

A. Permits: All the necessary permits for this project have been filed for from the appropriate agency. If the issuance of any permit affects the scope or Specification of work, all parties will be notified as soon as possible to determine the effect of cost, schedule, or previous contractual agreement.

B. Temporary Utilities: The Contractor shall be responsible for all utilities necessary to execute his contract. There may be some low voltage power and some telephone service available adjacent to the maintenance building. Any labor costs associated with the extension of these utilities will be borne by the Contractor. Any assumptions made by a bidder contrary to the intent of this paragraph must be explicitly detailed in his bid.

C. Temporary Facilities: Contractor shall provide all temporary facilities including, but not limited to, structures, secured areas for materials storage, potable water, sanitary and medical facilities, etc.

1.04 SUBMITTALS REQUIRED WITH PROPOSAL:

A. Construction Schedule: Contractor shall submit a preliminary bar-chart type schedule with the Bid Documents. On the schedule, indicate a time bar for each major category or unit of work to be performed at the site, properly sequenced, and coordinated with other elements of work. Include estimated man-hours for each activity.

B. Schedule of Rates: Contractor shall submit with the Bid Documents a Standard Schedule of Rates for Labor, Equipment, and Materials. Schedule of Rates will be used as a basis of time and materials payment for extra work.

C. Proposed Management Personnel: The diligent, proactive management of this project, and this construction contract in particular, is extremely important to the successful execution of the project's stated objectives. Towards this end, each bidder will submit with the proposal, the proposed supervisory structure. At a minimum, it will include one

full time superintendent on site, the number, and type of foremen required to supervise the various activities and any anticipated clerical assistance. The proposed should be identified by name, with a resume of his associated experience as a superintendent. This portion of the proposal will be reviewed very carefully and will be a major consideration in the contractor selection process.

PART 2 - PROJECT SCHEDULE:

2.01 GENERAL:

The Contractor in conjunction with the Owner/Owner's Representative is responsible for the coordination of all activities on site and will work with each contractor to ensure a timely project completion.

2.02 CONTRACTOR'S SUBMITTAL:

Each contractor shall submit to the Owner/Owner's Representative a time scaled, pert-type schedule for his/her procurement, construction, and quality assurance activities. Once accepted, these schedules become the baseline construction schedules.

2.03 WEEKLY REVIEW, UPDATING AND PROJECTIONS:

This schedule will be updated on a weekly basis to reflect the actual progress and the current completion projection. The updated schedule will be submitted one day prior to the weekly construction meeting. The Owner/Owner's Representative will review the schedules from both contractors for coordination and project compliance purposes.

PART 3 - CONSTRUCTION SITE MANAGEMENT:

3.01 SAFETY:

Completion of this construction project without incurring an OSHA recordable incident is the first priority of all involved.

3.02 WEEKLY MEETING:

The Owner/Owner's Representative will conduct a weekly meeting on the job site at a mutually agreed upon time. The meeting will take place at the prescribed time each week. The agenda for this meeting will consist of, at a minimum, progress to date, updated projections for each line item completion, safety performance. At this meeting the Owner's Representative will collect from each contractor their updated schedule, weekly safety talk minutes, and any accident investigation reports.

3.03 ACCIDENT REPORTS:

In the event of an accident, the Contractor will inform the Owner/Owner's Representative of said accident weekly for minor cut and bruises, that day for potential lost time accidents, and just as soon as practical on emergency care accidents.

3.04 JOB SITE COMMUNICATIONS:

Each Contractor on the job site will designate a project superintendent and one substitute. All discussions involving variances in schedule, cost, or quality will be directed to the designated representative.

3.05 NOTIFICATION OF POTENTIAL EXTRAS:

Just as soon as a potential contractual extra is revealed, the Contractor shall notify the Owner's Representative in writing (i.e. hand written speedy memo) of said potential which will be signed by the Owner's Representative and the appropriate superintendent(s).

3.06 RECORD DRAWINGS:

The Contractor shall submit as-built drawings to the Engineer for not more than 30 days following contract completion. The release of the final payment is contingent on the receipt of said drawings.

PART 4 - MEASUREMENT, EXECUTION, AND PAYMENT

4.01 DEFINITION OF PAYMENT ITEMS:

Unit price extras and deductions under this contract shall be paid as described herein under the appropriate items. Payment of work shall be full compensation for costs incurred by the Contractor in providing the work as described in the Contract Documents.

The Contractor shall provide a detailed breakdown of the lump sum costs, acceptable to the Owner/Owner's Representative, which will be used for estimating progress payment requests unless otherwise specified herein.

4.02 UNDEFINED AND CONTRACTUAL COSTS:

Costs for work not specifically mentioned, and which are incidental to the overall conduct of the work, shall be included in the Contractor's Bid, distributed into the actual Bid item as deemed appropriate. Examples of these types of costs are, but not necessarily limited to, the following:

Insurance's
Construction Permits and Licenses
Surveying
Temporary Erosion Control

4.03 MEASUREMENTS:

A. All work acceptably completed under the contract will be measured according to United States customary units. The Engineer shall approve all measurements taken for payment on unit price items. The Contractor shall assist the Engineer in conducting measurements for payment.

B. For all items, other than those to be paid for by lump sum, after the work is completed and before final payment is made, the Owner's Representative shall determine the quantities of various items of work accepted as the basis for final payment. In case of unit price items, the Contractor will be paid the amount for the quantity of work accepted and for the materials placed. The quantities of work performed shall be computed in accordance with the following methods of measurements.

1. Area measurement, such as square yard, square feet, units will be made along the ground surface. A unit is equal to one thousand (1,000) square feet.

2. Volume measurement, such as cubic yard or unit, will be an in-place measurement calculated by multiplying the area satisfactorily completed by the measured depth.

3. Linear measurement will be along the surface of the object being measured.

4. Actual count (per each) will be the number of individual units installed.

4.04 EXECUTION AND PAYMENT:

Quantities listed for each item are not guaranteed. The estimated quantities are provided as a Bidder's guide only; the Bidder should verify quantities.

A. Mobilization/Demobilization (4.4.1):

1. General: This item shall consist of preparatory work and operations including, but not limited to those necessary to the movement of personnel, equipment, supplies and incidentals to the project site; and for all other work and operations which must be performed or costs incurred prior to beginning work and upon completion of work on the various items on the project site.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope.

B. Compacted Off-Site Borrow Soil (4.4.2):

1. General: This item consists of all labor and equipment required for the placement to grade of the compacted off-site borrow soil. The borrow soil thickness ranges from a minimum of 18 inches to 27 feet and placed over the No. 67 drainage stone. The borrow soil will be provided by Evergreen from an off-site source. This work shall be installed in accordance with the Contract Drawings and specifications.

   The estimated quantity of off-site borrow soil is 150,000 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

C. Compacted Cover Soil (4.4.3):

1. General: This item shall consist of all equipment, labor, and materials required, and the placement to grade of the compacted cover soil. There is 12 inches of compacted cover soil of 6-inch minus material placed over the prepared subgrade. The cover soil borrow source shall be provided by the Owner on-site. This work shall be installed in accordance with the Contract Drawings and Specification.

   The estimated quantity of soil on this project is 28,500 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

D. Topsoil (4.4.4):

1. General: This item consists of all labor, equipment, and material required, and the placement to grade of the topsoil in accordance with the Contract Drawings and Specifications.

   The estimated quantity of topsoil is 9,500 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

E. Storm Drain Manhole Connections (4.4.5):

1. General: This item shall consist of all equipment, labor, and materials required, and the excavation, coring, placement to grade, and backfill of the manhole pipe boot connection. The manhole connections shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantity of storm drain manhole connections is 6.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

F. Storm Drain Piping (4.4.6):

1. General: This item shall consist of all equipment, labor, and materials required, and the excavation, bedding, placement to grade, and backfill of the storm piping system. The pipe materials shall be furnished by the Owner and delivered to the project site. The piping shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantities are 24-inch diameter HDPE (solid) 60 lf.

G. Seeding and Mulching (4.4.7):

1. General: This item shall consist of all equipment, labor, and materials required for seeding and mulching of Area 6A-West and filled in accordance with the Contract Drawings and Specifications. Seeding includes soil preparation, seed, fertilizer, lime, and mulch.

   The estimated quantity of seed and mulch is 784 units.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

H. Erosion Control Mat (4.4.8):

1. General: This item shall consist of all equipment, labor, and materials required for the installation of erosion control mat on Area 6A-West. Erosion control mat in accordance with the Contract Drawings and Specifications.

   The estimated quantity of erosion control mat is 2,000 sy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

I. Finish Grading (Optional) (4.4.9):

1. General: This item consists of all labor, and equipment to grade the waste on the crown of the landfill to meet the elevations shown on the Contract Drawings.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

J. Drainage Stone (4.4.10):

1. General: This item shall consist of all equipment and labor required, and the placement to grade of the #67 stone. The #67 stone shall be provided by the Owner, delivered to the project site. This work shall be installed in accordance with the Contract Drawings and Specifications.

   The estimated quantity of #67 stone on this project is 28,500 cy.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

K. Stone Check Dams (4.4.11):

1. General: This item shall consist of all equipment and labor required to install stone check dams in accordance with the Contract Drawings and Specifications.

   The estimated quantity of stone check dams is 49 each.

2. Payment: This is a fixed cost item. Any changes to the contract price must be based upon a change in the described scope. Unit pricing is requested on the proposal form in the event that a quantity adjustment is required.

4.05 WORK BY OTHERS:

A. Liner Repairs:

1. General: This item includes repair to the existing 60-mil textured HDPE geomembrane, and geotextile.

2. Payment: Repairs will only be necessary due to contractor error. Therefore, Evergreen will not be responsible for the costs incurred for repairs to the geomembrane.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- Submittal procedures.
- Construction progress schedule.
- Proposed products list.
- Shop drawings.
- Product data.
- Samples.
- Manufacturer's instructions.
- Manufacturer's certificates.

1.02 RELATED SECTIONS AND DOCUMENTS

- Summary of Work: Section 01010

1.03 SUBMITTAL PROCEDURES:

A. Transmit each submittal with Engineer accepted form.

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

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

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

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

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

G. Provide space for Contractor and Engineer review stamps.

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

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

1.04 PROPOSED PRODUCTS LIST:

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

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

1.05 SHOP DRAWINGS:

A. Submit in the form of one reproducible transparency.

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

1.06 PRODUCT DATA:

A. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.

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

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

1.07 SAMPLES:

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

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

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

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

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

1.08 MANUFACTURER'S INSTRUCTIONS:

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

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

1.09 MANUFACTURER'S CERTIFICATES:

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

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

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

END OF SECTION

SECTION 01561

CLEANING

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Related Requirements Specified Elsewhere:

- Summary of Work: Section 01010
- Cleaning for Specific Products or Work: Specification Section for that work

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

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

Stumps and grubbings can be disposed of on-site within the limits of the landfill. The Contractor must make arrangements to properly dispose of other wastes not acceptable for disposal on-site.

1.02 SAFETY REQUIREMENTS:

A. Conduct cleaning and disposal operations to comply with local, state, and federal ordinances and laws, particularly anti-pollution laws.

- Do not burn rubbish and waste materials on project site.
- Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION:

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

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

C. Remove waste materials, debris, and rubbish from site and legally dispose of at approved public or private dumping areas off Owner's property.

3.02 FINAL CLEANING:

A. Perform cleaning operations described herein until project is completed.

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, general provisions of contract, and Supplementary General Conditions apply to the work specified under this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

- Summary of work: Section 01010
- Earthwork: Section 02200

1.03 DESCRIPTION: This work shall consist of furnishing all labor, materials, and equipment for applying water for dust control in conformity with the contract drawings and as specified herein, or as required by the Owner's Representative.

PART 2 - PRODUCTS

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

PART 3 - EXECUTION

3.01 SPRINKLING: Water shall be applied by approved methods as requested by the Owner or the Owner's Representative. Acceptable equipment may include a tank with gauge equipped pressure pump and a nozzle-equipped spray bar. Water shall be dispersed through the nozzle under a minimum pressure of 20 pounds per square inch, gauge pressure.

3.02 CALCIUM CHLORIDE: DO NOT USE.

3.03 SWEEPING: Roads shall be kept free of soil and ash. Clay, ash and other materials tracked, spilled, and/or deposited on the roadways shall be scraped or swept clean on a daily basis.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

Extent of earthwork is indicated on drawings.

Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal or replacement (backfill) of materials removed.

1.03 QUALITY CONTROL:

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

B. Testing and Inspection Service: The Owner shall employ a testing laboratory to perform soil testing of materials at point of source. The Owner shall perform the following analysis on borrow materials used at the site.

- #67 Stone/Stone bedding:

  - Grain Size (D422) - 1/5,000 cy

- Off-site Borrow Soil:

  - Grain Size (D422) - 1/10,000 cy
  - Maximum Dry Density (D 698) – 1/10,000 cy

- Cover Soil:

  - Grain Size (D422) - 1/10,000 cy
  - Maximum Dry Density (D 698) – 1/10,000 cy

1.04 FIELD QUALITY ASSURANCE

A. Quality Assurance Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

Testing shall be as follows:

- #67 Stone/Stone bedding:

  - Grain Size (D422) - 1/5,000 cy

- Off-site Borrow Soil:

  - Grain Size (D422) - 1/5,000 cy or at the discretion of the Engineer
  - In-Place Moisture/Density (D 6938 or D 2937) – 1/5,000 cy/mid-lift or at the discretion of the Engineer

- Cover Soil:

  - Grain Size (D422) - 1/5,000 cy
  - In-Place Moisture/Density (D 6938 or D 2937) - 5/acre/lift

If in opinion of Owner's Representative, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, provide additional compaction, wetting, drying or removal of material as necessary, and testing at no additional expense.

1.05 JOB CONDITIONS:

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

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

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

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

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

Provide minimum of 48-hour notice to Owner's Representative, and receive written notice to proceed before interrupting any utility.

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

C. Use of Explosives: (None anticipated)

1. General: This work shall consist of furnishing, placing and detonating dynamite in places directed for the excavation of related work items in accordance with these specifications and in reasonably close conformity to the lines and grades shown on the plans or as established.

   All blasting plans shall be approved prior to placing the explosive charges.

   Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction.

   The Contractor is solely responsible for the handling, storage, and use of explosive materials.

   The explosives shall be detonated by the propagation or electric method and shall be detonated the same day it is placed.

   No explosives shall be stored on the site overnight.

D. Materials: Dynamite and caps shall be from fresh stock and shall have a maximum strength as specified in the approved blasting plan.

E. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights.

   Operate warning lights as recommended by authorities having jurisdiction.

   Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS:

A. General: Excavations made at the site for the construction of project facilities will generate unspecified quantities of soil materials. These soils will either be suitable or unsuitable for use as fill in the construction of earth-related portions of the project.

1. Suitable Materials: Those materials generated from outside excavations that satisfy the specifications for the material for which it is to be used (i.e., compacted silt/sand, common borrow, etc.). Specifications for suitable project materials follow.

2. Unsuitable Materials: Those materials generated from on-site excavations that do not satisfy the specifications for the project materials identified below. Generally these materials will consist of objectionable quantities of vegetation, organic matter, large stones, debris, and frozen material.

B. #67 Stone/Stone Bedding: Durable, clean angular rock fragments obtained by breaking and crushing rock material, furnished, and placed to the lines and grades as shown on the Drawings. Sieve analysis by weight:

Sieve Designation	% Passing by Weight
1"	100
3/4"	90-100
3/8"	25-55
#4	0- 0
#8	0- 5

C. Off-site Borrow Soil: Off-site borrow soil shall be placed to the lines and dimensions on the Contract Drawings.

D. Cover Soil: Cover soil material shall be placed to the lines and dimensions as shown on the Drawings. The soil shall not contain particles of rock which will not pass the 6-inch square mesh sieve. The soil shall have greater than 20 percent passing the U.S. Standard No. 200 Sieve.

E. Riprap: Stones used for riprap shall consist of sound durable rock which will not become disintegrated by exposure to the action of water or weather. Either field stone or rough unhewn quarry stone may be used. Stones shall weigh from 10 lbs to 200 lbs except that when available suitable stones weighing more than 200 lbs may be used. Approximately 50 percent of the stones by volume, shall exceed a unit weight of 90 lbs.

F. Common Borrow: Shall be earth suitable for embankment construction for use in any filling other than the soil cover. It shall be free of frozen material, perishable rubbish, peat, organic matter, large rock fragments over 12 inches, or other unsuitable material. AASHTO M145 Classifications A-1 through A-5 may be used. Use of other materials as common borrow is at the discretion of the Owner's Representative and only in approved areas.

G. Topsoil: Shall be the soil material stripped from the till borrow pit.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. Unclassified Excavation includes excavation of materials and obstructions encountered to subgrade elevations indicated, regardless of character.

B. Excavation Classifications: The following classifications of excavation will be made when rock excavation is encountered in work:

C. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

D. Rock Excavation:

Rock excavation in trenches and pits includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42" wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated at not less than 90HP flywheel power and 30,000 lb. drawbar pull. Trenches in excess of 10'- 0" in width and pits in excess of 30'-0" in either length or width are classified as open excavation.

Rock excavation in open excavations includes removal and disposal of materials and obstructions encountered which cannot be dislodged and excavated with modern track-mounted heavy-duty excavating equipment without drilling, blasting, or ripping. Rock excavation equipment is defined as Caterpillar Model No. 973 or No. 977K, or equivalent track-mounted loader, rated at not less than 170HP flywheel power and developing 40,000 lb. break-out force (measured in accordance with SAE J732C).

Typical of materials classified as rock are boulders 3 cu. yd. or more in volume, solid rock, rock in ledges, and rock hard cementitious aggregate deposits.

Intermittent drilling, blasting or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.

Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified and worksheets submitted to the Owner's Representative.

Rock payment lines are limited to the following:

In pipe trenches, 6 inches below invert elevation of pipe and
18 inches wider than inside diameter of pipe, but not less than 3 ft.

In open areas, 24 inches below base grade elevation.

E. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner's Representative. Unauthorized excavation, as well as remedial work directed by Owner's Representative, shall be at Contractor's expense.

Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner's Representative.

F. Additional Excavation: When excavation has reached required subgrade elevations, notify Owner's Representative who will make an inspection of conditions. Do not backfill excavations without notifying Owner's Representative.

If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Owner's Representative.

Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

G. Stability of Excavations: Slope sides of excavations to comply with federal and local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

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

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

Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.

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

Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.

I. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.

Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

Use appropriate erosion control in temporary ditches, as described in Section 02270, Erosion Control.

J. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Cover or seed stockpiles when long-term storage indicates the potential for wind or water erosion from the stockpile. Place silt fence around downstream edge of stockpile to prevent transportation of soil.

Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.

Dispose of excess soil material and waste materials as herein specified by Owner's Representative.

K. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

L. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide a minimum 6" to 9" clearance on both sides of pipe or conduit as indicated on Drawings.

Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations.

Where rock or unsuitable material is encountered, carry excavation 6" below required elevation and backfill with a 6" layer of crushed stone or gravel, as approved by Owner's Representative, prior to installation of pipe.

For pipes or conduit 6" or larger in nominal size, tanks and other work indicated to receive subbase, excavate to subbase depth or, if not otherwise indicated, to 6" below bottom of work to be supported.

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

Do not backfill trenches until tests and inspections have been made and backfilling authorized by Owner's Representative. Use care in backfilling to avoid damage or displacement of pipe systems. Owner's Representative must be notified of any intention to backfill trench or otherwise permanently cover pipe.

M. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35° F. (1°C).

N. Final Grading: The Owner will perform grading in accordance with Contract Drawings, in order to obtain subgrade elevations prior to the placement of the drainage stone and cover soil. During the regrading, the Owner shall fill voids encountered below the subgrade elevations with on-site materials or waste materials.

3.02 COMPACTION:

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

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 698.

Pipeline: Compact top 6" of subgrade and each 12" layer of backfill or fill material at 90% maximum density.

Dikes: Compact each 12-inch layer of fill material at 90% maximum density.

Off-site Borrow Soil: Compact each lift (maximum four feet) at 90 percent maximum density measured from middle of lift.

Cover Soil: Compact each 12" lift of cover soil at 90 percent maximum density.

Maintain these conditions until topsoil is placed.

C. Moisture Control: Moisture content of the cover soil and/or embankments shall be at, but not greater than 4 percent higher than optimum as determined by ASTM D 698 (standard proctor). Where subgrade or layer of soil material must be moisture conditioned to meet the allowable range of water content to achieve compaction, uniformly apply water to surface of subgrade, or layer of soil material. Apply water in manner to prevent free water appearing on surface during or subsequent to compaction operations.

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

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

3.03 BACKFILL AND FILL:

A. General: Place acceptable soil material in layers to required subgrade elevations, for each area classification listed below.

In excavations, use satisfactory excavated or borrow material free of frozen material, large stones, brush, roots, sod, or other unsuitable material.

Under grassed areas, use satisfactory excavated or borrow material.

Under piping and conduit, use subbase material where subbase is indicated under piping or conduit; shape to fit bottom 90° of cylinder.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.

Inspection by Owner's Representative, testing, approval, and recording locations of underground utilities.

Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if required.

Removal of trash and debris.

Permanent or temporary horizontal bracing is in place on horizontally supported walls.

C. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition

to optimum moisture content, and compact to required depth and percentage of maximum density.

D. Placement and Compaction: Place backfill and fill materials in layers not more than 15" in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers.

Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content within the optimum range as determined by the soil testing at point of source. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

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

To provide for clod break-up of the cover material, a minimum number of 2 passes will be made with deep-footed pad roller. To eliminate desiccation cracks the surface will be moistened (as necessary) and reworked with 2 passes of a smooth drum roller. Desiccation is defined as moisture content below optimum, or cracks deeper than 1 inch.

The cover soil shall be compacted and smooth drum rolled at the end of each work day to provide for moisture/density testing and prevent ponding of surface water overnight.

The following equipment will be used for compaction of the cover material:

Caterpillar 815F Pad Foot Roller or equivalent equipment approved by the Engineer. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	45,900 lbs
Maximum Pad Tip Area	18 square inches
Minimum Pad Height	7.5 inches
Minimum Wheel Diameter	40.5 inches

The passage of compaction equipment in either direction (forward or backward) is considered a "pass".

The following equipment will be used to obtain a smooth roll surface:

Caterpillar CS563 Vibratory Drum Roller or equivalent equipment approved by the Engineer. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	24,500 lbs
Vibration Frequency	1,400 to 1,800 vpm
Centrifugal Force	
High Amplitude	50,000 lbs
Low Amplitude	35,000 lbs
Maximum Drum Width	7.0 feet

Sealing the lifts will encourage runoff from storms, thus limiting development of excessively moist or wet lenses of soil within the barrier layer. The lift surface shall be scarified or otherwise roughened by tracking with a bulldozer prior to placing the next lift of cover soil to promote good bonding between lifts.

3.04 MAINTENANCE:

A. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

B. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn, gravel road, or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.05 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Removal to Designated Areas on Owner's Property: Transport acceptable excess excavated material to designated soil storage areas on Owner's property. Stockpile soil and seed or spread and seed as directed by Owner's Representative.

Transport waste material, including unacceptable excavated material, trash, and debris to designated spoil areas on Owner's property and dispose of as directed.

END OF SECTION

SECTION 02270

EROSION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

Work covered by this Section includes the control of erosion, siltation, and sedimentation.

1.2 PROJECT REQUIREMENTS

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

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

C. Temporary Protection: Should it become necessary to suspend construction for any length of time, shape all excavated and graded areas in such a manner that runoff will be intercepted and diverted to points where minimal erosion will occur. Provide and maintain temporary erosion and sediment control measures, such as berms, dikes, slope drains, silt stops, and sedimentation basins, until permanent drainage facilities or erosion control features have been completed and are operative.

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

E. Silt Stops: Provide silt stops wherever erosion control measures may not be totally capable of controlling erosion, such as in drainage channels and where steep slopes may exist.

F. Special Precautions: Take special precautions in the use of construction equipment to minimize erosion. Do not leave wheel tracks where erosion might begin.

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

H. Mulching: Mulching shall follow the seeding operation by not more than 24 hours.

I. Remedial Action: Should any protective measures employed indicate any deficiencies or erosion taking place, immediately provide additional materials, or employ different techniques to correct the situation and to prevent subsequent erosion.

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

K. Permits: Comply with all Federal, state and local laws, ordinances, rules, and regulations.

1.03 QUALITY CONTROL:

Provide at least one person who shall be present at all times during erosion control operations and who shall be thoroughly familiar with the types of materials being installed and the best methods for their installation and who shall direct all work performed under this Section.

Material manufacturers and vendors shall be reputable, qualified firms regularly engaged in producing the required types of materials.

Protect and maintain all areas disturbed by the Work, such that erosion is adequately controlled and silt and sediments are not allowed to flow into any watercourse, onto adjacent properties, or into storm drains.

PART 2 - PRODUCTS

2.01 STRAW MULCH:

A. General: Straw mulches shall be reasonably free from swamp grass, weeds, twigs, debris and other deleterious material, and free from rot, mold, primary noxious weed seeds, and rough or woody materials. Mulches containing mature seed of species which would volunteer and be detrimental to the permanent seeding, or would result in overseeding, or would produce growth which is aesthetically unpleasing, is not permitted.

B. Straw Mulch: Properly aired native straw, Sudan grass straw, broomsedge straw, legume straw, or similar straw or grass mowings. When air-dried in the loose state, the contents of the representative bale shall lose not more than fifteen (15) percent of the resulting air-dry weight of the bale. Apply at the rate of 2 tons/ac.

C. Mulch Stabilizers: "Curasol" applied at the rate of 40 gal/ac. or Dow "Mulch Binder" applied at the rate of 45 gal/ac.

D. Permanent Type Mulch Nets: "Curlex" blanket as manufactured by American Excelsior, or equal.

2.02 SEED AND SOD FOR EROSION CONTROL:

A. For Temporary Control Use annual or perennial ryegrass.

B. For Permanent Control See Section "Seeding".

2.03 HAY BALES FOR EROSION CONTROL:

Rectangular shaped bales of straw or straw, weighing at least 40 lbs per bale, free from primary noxious weed seeds and rough or woody materials.

2.04 SILT FENCES:

"Envirofence" by Mirafi, Inc. or an approved equal.

2.05 EROSION CONTROL MATTING:

A. Shall be placed on newly loamed and seeded areas susceptible to erosion or in areas with surface water velocities above 4 feet per second (i.e., drainage swales or channels), as necessary or as indicated on the Contract Drawings, or as directed by the engineer. The matting shall be North American Green S75, SC250, or an approved equivalent.

B. A mulch netting shall be placed over areas that cannot be seeded within the normal growing season, that are not susceptible to severe erosion or high surface water velocities (i.e., sideslopes of dikes). The mulch netting shall be installed over the hay mulch and anchored per the manufacturer's recommendations. The mulch netting shall be Radix manufactured by Tenax or an approved equal.

2.06 STONE CHECK DAMS:

A. Stone check dams shall be constructed of a core of two- to three-inch crushed stone.

B. The stone check dams shall be constructed and placed in ditches as indicated on the Contact Drawings.

PART 3 - EXECUTION

3.01 STRAW MULCHING:

A. Install straw mulch immediately after each area has been properly prepared. When permanent seed or seed for temporary erosion control is shown prior to placing the mulch, place mulch on seeded areas within 24 hours after seeding. Engineer may authorize the blowing of chopped mulch provided that 95% of the mulch fibers will be 6" or more in length and that it can be applied in such a manner that there will be a minimum amount of matting that would retard the growth of plants. Straw mulch should cover the ground enough to shade it, but the mulch should not be so thick that a person standing cannot see the ground through the mulch. Remove matted mulch or branches.

B. Apply a system of pegs and strings, a chemical stabilizer, or temporary type netting to the mulch, where mild winds may blow the mulch, or when ground slopes exceed 15%, or when otherwise required to maintain the mulch firmly in place. Unless otherwise directed, remove the strings and netting prior to the acceptance of the Work.

C. Apply temporary type netting over the mulch and take whatever measures are necessary to maintain the mulch firmly in place, where high winds exist, or heavy rainstorms are likely, or where ground surfaces are steep, or where other conditions require.

D. The use of permanent type netting is not permitted without the prior approval of Engineer, unless otherwise specified.

3.02 HAY BALES AND SILT FENCES:

A. Provide straw bales or silt fences, as required, for the temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, or entering catch basins, or damaging the Work.

B. Stake the straw bales as shown in the details to hold them firmly in place. Use a sufficient number of bales to accommodate runoff without causing any flooding and to adequately store any silt, sediment, and debris reaching them (minimum of 1 every 50 feet).

C. Erect silt fences and bury bottom edge in accordance with the manufacturer's recommended installation instructions. Provide a sufficient length of fence to accommodate runoff without causing any flooding and to adequately store any silt, sediment, and debris reaching it.

D. Leave straw bales and silt fences in place until permanent erosion control measures have stopped all erosion and siltation, then remove and dispose of properly.

3.03 MAINTENANCE

If any temporary erosion and sediment control measures are disturbed, repair them immediately. Check erosion control devices weekly and after any heavy rain storms.

If seed is washed out before germination, repair any damage, refertilize, and reseed.

Maintain mulched and matted areas, silt stops, and other temporary control measures until the permanent control measures are established and no further erosion is likely.

END OF SECTION

SECTION 02451

CORRUGATED HDPE PIPE

PART 1 - GENERAL

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

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 02200

B. Erosion Control: Section 02270

1.03 DESCRIPTION OF WORK:

A. Work Included: Provide and install corrugated HDPE pipe of the type(s), size(s) and in the location(s) shown on the Drawings and as specified herein.

B. Work Not Included: Temporary drainage devices used by the Contractor for construction purposes.

1.04 SUBMITTALS:

A. The Contractor shall furnish the name of the manufacturer to the Owner's Representative prior to commencing work. Pipe of the same manufacturer shall be used throughout the project.

B. The Owner's Representative may request the Contractor to submit manufacturer's certification that the product meets the requirements of this Specification.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Exercise care when handling corrugated pipe to prevent damage to pipe and finish.

B. Immediately remove damaged materials and replace at no additional cost to the Owner.

C. Store materials above ground on platforms, skids, or other adequate supports.

PART 2 - PRODUCTS

2.01 MATERIALS:

1. Stormwater transport pipe shall be annular smooth interior, high density polyethylene pipe.

   a) AASHTO M 294 - Standard specifications for corrugated polyethylene pipe (24" diameter).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Pipe:

1. Accurately lay to the line and grades to the satisfaction of the Owner's Representative.

2. The line and grade may be adjusted by the Owner's Representative from that shown on the Drawings to meet field conditions and no extra compensation shall be claimed therefore.

3. Stone Bedding: As specified in Section 02200.

4. Provide proper facilities for lowering the sections of pipe where pipe is to be placed.

5. Securely attach each section to the adjoining section by the approved method for the type of joint used.

6. Sections of Corrugated Pipe: Join by enclosing joints with coupling bands of the same material as the pipe.

7. Pipe Grade Defined: The pipe grade shown on the Drawings, and referred to in the Specifications is as follows: When a gravel or concrete foundation is used, it is the underside of the gravel or concrete indicated on the plans.

3.02 INSPECTION:

A. Pipe installation shall be subject to inspection by the Owner's Representative for quality, adherence to line grade, jointing, and proper backfill.

B. Any joint not satisfactory to the Owner's Representative shall be removed and remade to his satisfaction at the Contractor's expense.

C. No pipe shall be backfilled until it has been approved by the Owner's Representative.

END OF SECTION

SECTION 02480

SEEDING

PART 1 - GENERAL

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

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

B. Erosion Control: Section 02270

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to perform seeding work in conformity with the contract drawings and as specified herein. Excavation, filling, and grading required to establish elevations shown on the Drawings are not specified in this Section. Refer to Section 02200, Earthwork.

1.04 QUALITY ASSURANCE: Subcontract the seeding work to a single firm specializing in landscape work.

A. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection as required by governmental authorities. Comply with governing regulations applicable to landscape materials.

2. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable or as further specified.

3. Grass Seed: All seed shall be certified as to mixture, germination, and purity, as being in conformity with the following requirements:

a. Each variety of seed shall have a percentage of germination of not less than 80, a percentage of purity of not less than 85, and shall have not more than one percent of weed content.

b. All seed shall be from the same or previous year's crop unless recent tests by an approved testing agency demonstrates that older seed meets the above requirements.

4. Inspection: The Owner's Representative reserves the right to inspect any plant materials either at the place of growth or at the site before planting, for compliance with requirements for name, variety, size, and quality.

1.05 SUBMITTALS

A. Certification: For information only, submit 2 copies of certificates of inspection as required by governmental authorities, and manufacturer's or vendors analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed seed for each grass seed species.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING:

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

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

It shall be the Contractor's responsibility to restore to the line, grade, and surface of all eroded areas with approved material and to keep topsoiled areas in acceptable condition until turf is established and accepted by the Owner's Representative.

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

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

Permanent Seeding:	March 1 – October 15
Temporary Seeding:	October 16 – February 28

PART 2 - PRODUCTS

A. Vegetative Soil (Topsoil): Vegetative soil shall be loam, sandy loam, silt loam, sandy clay loam, silty clay loam, clay loam, or loamy sand. Vegetative layer shall be fertile, friable soil free of roots stumps, stones larger than 3 inches in diameter, live plants, noxious weeds, and foreign matter. It shall contain more than of 1.5% organic matter by weight and should have a pH of above 3.6 before liming, and should have less than 500 parts per million of soluble salts.

An agronomic study should be performed on all vegetative soil sources planned use on the site. Agronomic testing should be performed by the North Carolina Department of Agriculture soil testing laboratory or by commercial laboratories qualified to perform agronomic testing.

B. Soil Amendments:

1. Lime: Natural limestone containing not less than 90% of total carbonates, ground so that not less than 100% passes a 10-mesh sieve, not less than 90% passes a 20 mesh sieve, and not less than 50% passes a 100 mesh sieve.

2. Fertilizer: Fertilizer shall be a commercial type with 50 percent of the elements derived from organic sources and shall conform to the recommendations of the agronomic testing.

2.02 GRASS MATERIAL:

A. Grass Seed: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions, and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

The seed mixtures shall consist of seeds proportioned by weight as follows:

Permanent Seeding		Temporary Seeding	
Kentucky 31	105 lbs/acre	Annual Rye	40 lbs/acre
Creeping Red Fescue	24 lbs/acre		
Kentucky Blue Grass	24 lbs/acre		
Sericea Lespadeza	24 lbs/acre		
Korean Lespadeza	21 lbs/acre		
Annual Rye	21 lbs/acre		
White Dutch Clover	6 lbs/acre		

2.03 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Mulch for Seeded Areas:

1. Hay or straw mulch shall consist of long fibered hay or straw, reasonably free from noxious weeds and other undesirable material. No material shall be used which is too wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings, or other short fibered material shall be used unless directed.

2. Cellulose fiber mulch shall consist of natural wood, recycled paper, or humus cellulose fiber containing no materials which will inhibit seed germination or plant growth. Sufficient non-toxic water soluble green dye shall be added to provide a definite color contrast to the ground surface to aid in even distribution. Cellulose fiber mulch shall be supplied in moisture resistant, sealed bags marked with the manufacturer's name, the air dry weight, and composition of the contents.

B. Mulch Binder: Material for mulch tackifier shall be a non-asphaltic base product, such as Hydro Glass Corporation Hydrotack or an Owner's Representative approved equivalent.

PART 3 - EXECUTION

3.01 SEEDING:

A. Locations: All areas disturbed as a result of construction shall require seeding and mulching.

B. Do not use wet seed or seed which is moldy or otherwise damaged in transit or storage.

C. Rates of Application: Rates of application for limestone, fertilizer, and grass seed shall be in accordance with the Construction Drawings.

D. The hydraulic spray method shall be used for seeding all areas unless alternative methods are approved by the Owner's Representative.

E. Application Procedure:

1. Hydraulic Spray Method: The hydraulic spray method of sowing seed shall be done with an approved machine operated by a competent crew. Seed and fertilizing materials shall be mixed with water in the tank of the machine and kept thoroughly agitated so the materials are uniformly mixed and suspended in the water at all times during operation. The spraying equipment must be designed and operated to distribute seed and fertilizing materials evenly and uniformly on the designated areas at the required rates. If the Owner's Representative finds the application uneven or otherwise unsatisfactory, he may require the hydraulic spray method to be abandoned and the balance of the work done as specified under another method.

F. Mulching:

1. Cellulose fiber mulch shall be applied as a waterborne slurry. The cellulose fiber and water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at a rate that completely covers the ground.

   Cellulose fiber mulch may be mixed with the proper quantities of seed, fertilizer, and agricultural limestone as required, or may be applied separately the next day after seeding.

2. Areas which cannot be seeded within the growing season shall be temporary seeded and mulched to provide protection to the soil surface. An organic mulch other than wood fiber alone shall be used along with a mulch netting. The areas will be reseeded with permanent seed as soon as seeding dates and weather conditions permit.

G. Erosion Control Blanket:

1. Erosion Control Blanket shall be placed at locations indicated on Contract Drawings. The anchoring of the blanket shall be as indicated on the Contract Drawings and as recommended by the manufacturer. All blankets shall be placed after seeding.

3.02 MAINTENANCE AND ACCEPTANCE:

A. Seeded Areas:

1. Maintain seeded areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, acceptable grass growth, free of eroded or bare areas.

2. Seeding, March 1 to October 15, Inclusive: The Contractor shall maintain each seeded area until acceptance of the individual area. Maintenance shall consist of providing protection by erecting necessary signs and barriers and by repairing damaged areas as directed. Damaged areas and areas which do not produce a satisfactory stand of grass shall be repaired to re-establish the condition and grade of the area prior to the original seeding and then refertilized, reseeded and remulched as specified to produce satisfactory results.

   Areas fertilized and seeded by the hydraulic method will be accepted only upon attainment of a reasonable thick uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots, i.e., 5-foot-diameter or more.

3. Seeding, October 16 to February 28, Inclusive: The Contractor shall maintain each seeded area until acceptance of the individual area. Maintenance shall consist of providing protection by erecting necessary signs or barriers and by repairing damaged areas as directed. Damaged areas shall be repaired by re-establishing the grade of the area prior to damage and by reapplying mulch. Refertilizing and reseeding will not be required during this period. Necessary maintenance or repairs will not be paid for but shall be considered incidental to the Contract. Areas fertilized, seeded, and mulched between October 16 and February 28 will be accepted only upon attainment of a reasonably thick uniform stand of not less than 90 percent coverage of permanent grasses, free from sizable thin or bare spots.

4. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorously growing condition for two cuttings.

5. Immediately reseed areas which show bare spots.

3.03 RESTORATION

A. Restore improvements damaged by or removed by this work to original condition, as acceptable to Owners or other parties or authorities having jurisdiction including but not limited to fences, curbs, signs, trees, shrubs, vegetation, poles, and posts.

END OF SECTION

SECTION 02570

MANHOLES AND CATCH BASINS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, general provisions of contract, and supplementary general conditions apply to the work specified under this section.

1.02 RELATED WORK SPECIFIED ELSEWHERE:

A. Earthwork: Section 02200

1.03 DESCRIPTION OF WORK: Work specified in this section shall consist of furnishing all labor, materials, and equipment to construct manholes or catch basins, and alter manholes or catch basins, in conformity with the contract drawings and as specified herein.

1.04 SUBMITTALS: The Contractor shall submit to the Owner's Representative shop drawings of all precast units. Manufacturer's information shall be submitted for precast structures, joint sealants and waterproofing.

PART 2 - MATERIALS

2.01 MORTAR: Cement mortar shall be prepared in the following manner:

A. The cement shall be Type II. The mix shall be one (1) part cement to three (3) parts clean, well graded, hard, durable sand. Hydrated lime may be added to the mixture in an amount not to exceed 15% by weight of the cement. The amount of water shall be only the amount necessary to make a workable mix.

2.02 BRICK: Brick for manholes shall meet the latest AASHTO Specification Designation M-91.

2.03 PRECAST MANHOLES AND CATCH BASINS: Precast sections shall be manufactured in accordance with the latest ASTM Specification Designation C-478. Fabrication of the precast structures shall be as follows:

A. The tongue and groove of manhole and catch basin sections shall be formed of concrete so as to receive "O"-Ring rubber gaskets or a premolded bituminous seal. Sections shall be set so as to be vertical and in true alignment. Approved lubricant shall be applied over the inside tongue and over the rubber gasket immediately prior to setting one section on top of another if "O"-Ring joints are used.

B. Each section of the precast manhole and catch basin shall have two (2) holes for the purpose of handling and installing. These holes shall be tapered and shall be plugged with mortar after installation.

C. Holes for pipes shall be cast in the base section so that there is a clear distance of 4-1/2" minimum between the inside bottom of the base section and the pipe invert.

D. The joint for the pipe at the base section shall consist of (a) a cast iron compression flange, together with cast iron inserts (embedded in the wall of the base section) and an "O"-Ring gasket to provide a watertight seal and to allow a flexible joint capable of deflecting a maximum 9" from centerline of pipe; (b) rubber gasket anchoring rings cast into the concrete base and hard rubber wedge driven in to compress the gasket around the pipe: or (c) flexible rubber sleeve cast into the base section; or other joint as approved by the Owner's Representative.

2.04 WATERPROOFING: Waterproofing for manholes shall be:

A. Asphalt conforming to ASTM Designation D-41, or

B. Cement base coating suitable for brush coat application.

2.05 FRAMES AND COVERS:

A. All castings shall be made of clean, even grain, grey cast iron. The castings shall be smooth, true to pattern and free from projections, sand holes, warp, and other defects which would interfere with the use of, or impair the serviceability of the castings.

B. The horizontal surface of the cover seat and under surface of the cover which rests upon the cover seat shall be machined on all frames and cover intended for vehicular traffic. After machining it shall be impossible to rock any cover after it has been seated on its associated frame.

C. The iron used for castings shall conform to ASTM Designation A-48 for Class 30 grey iron.

D. Unless otherwise shown on the Drawings, all castings shall be coated with coal tar pitch varnish, to which sufficient oil has been added to make a smooth coating, tough and tenacious when cold, not tacky and not brittle.

E. Manufacturer's name and catalog figure number must be cast on each frame and cover. The work SEWER or STORM must be stamped on the manhole covers as appropriate.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. General:

1. The excavation shall be properly dewatered while placing bedding material and setting the base or placing concrete. Waterstops shall be used at the horizontal joint of cast-in-place manholes. Bases shall be placed on a 6" layer of compacted stone bedding.

2. Inlet and outlet stubs shall be connected and sealed as shown on the Drawings.

3. Barrel sections and cones of the appropriate combination of heights shall then be placed, using manufacturer's recommended procedure for sealing the horizontal joints, and as shown on the Drawings or the remaining barrel of the manhole shall be cast above the base.

4. If required, a leakage test shall then be made as described in "Leakage Tests."

5. Following satisfactory completion of the leakage test, the frame, and cover shall be placed on the top or some other means of preventing accidental entry by unauthorized persons, children, animals, etc., until the Contractor is ready to make final adjustment to grade.

B. Waterproofing: The waterproofing of the exterior surfaces of manholes shall be one of the following methods:

1. Bituminous Coating: After the concrete or cement plaster has set, two coats of an approved bituminous waterproofing material shall be applied to all outside surfaces of manholes. Waterproofing material shall be applied by brush or spray at approximate rate of 70 sq. ft./gal., in accordance with the manufacturer's instructions. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first.

2. Cement Base Coating: Cement base coatings delivered in sealed containers shall be mixed in accordance with the manufacturer's recommendations and applied with a stiff brush in 2 coats. Each coat shall be applied at the rate of 2 lb. per sq. yd.

D. Frames and Covers: Frames shall be set on mortared brick courses true to grade and concentric with the opening. All voids beneath the bottom flange and in the brick courses shall be completely filled to make a watertight fit. A ring of mortar at least 1 inch thick shall be placed around the outside of the bottom flange, extending to the edge of the manhole all around its circumference. The bricks and mortar shall not extend beyond the top of precast concrete cone section.

E. Pipe Connections: Pipes entering or leaving manholes shall not exceed two (2) feet in length measured from the inside face of the manhole wall. Pipe connection into precast bases shall be made by manufactured flexible rubber sleeves. Manhole bases using manufactured manhole connections shall be installed in accordance with the manufacturer's requirements.

3.02 ALTER EXISTING MANHOLES OR CATCH BASINS: When altering existing catch basins or manholes, the structure shall be dismantled sufficiently to allow reconstruction in accordance with the applicable requirements as shown on the Drawings for complete catch basins and manholes. Each altered manhole or catch basin shall be cleaned of all accumulated silt, debris, or foreign matter prior to final acceptance of work.

3.03 VACUUM LEAKAGE TESTS (as required):

A. General:

1. To be observed by the Engineer on each sewer manhole except for the air release valve manhole.

2. A vacuum test made as described below. Manhole to pipe connection must be a flexible connector to perform this testing.

B. Preparation for Test:

1. After the manhole has been assembled in place, fill lifting holes and point with an approved non-shrinking mortar.

2. Perform test prior to placing the shelf and invert and before filling and pointing the horizontal joints, and before backfilling.

3. If the groundwater table has been allowed to rise above the bottom of the manhole, lower for the duration of the test.

4. Plug pipes and other openings into the manhole and the plugs braced to prevent blow out.

C. Test Procedure:

1. Test immediately after manhole assembly.

2. Use manhole vacuum test equipment equal to NPC Systems, Inc., Milford, New Hampshire.

3. Set tester in place.

4. Inflate compression band to seal base to structure.

5. Draw a vacuum of 10-in. Hg.

6. Close the valve.

7. Acceptable test:

   a. Less than 1 in. Hg drop in one minute for a manhole less than 10 ft. in depth.

   b. Less than 1 in. Hg drop in two minutes for a manhole 10 ft. to 20 ft. in depth.

8. If leakage occurs fill those points with non-shrink grout, allow to set and retest.

9. Rejected Manholes: Disassemble, reconstruct, or replace as directed by the Engineer.

D. Backfilling: The test may be conducted either before or after backfilling around the manhole. However, if the Contractor elects to backfill prior to testing, for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

3.04 EXFILTRATION/INFILTRATION TESTS (AS REQUIRED):

A. General: Upon approval of the Owner's Representative, exfiltration/infiltration leakage tests, observed by the Owner's Representative, can be substituted for a vacuum leakage test on a case-by-case basis. The test shall be an exfiltration or infiltration test made as described below, and as selected by the Owner's Representative.

B. Exfiltration Test: After the manhole has been assembled in place, all lifting holes shall be filled and pointed with an approved non-shrinking mortar. The test shall be made before backfilling and pointing the horizontal joints. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.

Test Procedure: The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily watertight. If the test as described above is unsatisfactory as determined by the Owner's Representative or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and a measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the test fails this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Owner's Representative to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day, shall be cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Owner's Representative. The manhole shall then be retested and, if satisfactory, all interior joints and those exterior joints within 6 feet of the surface shall be filled and pointed.

Backfilling: The test shall be conducted before backfilling around the manhole. However, if the Contractor requests to backfill prior to testing, and is granted permission by the Owner's Representative for any reason, it shall be at his own risk and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc., i.e. it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Owner's Representative that the water table is below the bottom of the manhole throughout the test.

C. Infiltration Test: If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Owner's Representative, such a test can be used to evaluate the watertightness of the manhole. However, if the Owner's Representative is not satisfied, the Contractor shall lower the water table and carry out the exfiltration test as described herein.

END OF SECTION

QUALITY ASSURANCE/ QUALITY CONTROL PLAN FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING

April 2011

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1.0 SCOPE

This Quality Assurance/Quality Control Plan (Plan) addresses construction quality assurance and quality control for earthwork at Area 6A-West at Evergreen Packaging Canton Mill (Evergreen) No. 6 Landfill. Area 6A-West encompasses approximately 18 acres, and will be closed with a soil cover over the entire cell. The development will consist of 12 inches of drainage stone over waste, covered by a minimum of 18 inches of compacted off-site borrow soil, covered by 12 inches of compacted soil cover, overlain by a 4-inch vegetative soil layer.

This plan outlines the characterization of the borrow source's physical properties to determine its ability to achieve the project's performance criteria; defines procedures for stone and soil placement; defines tests and frequency of testing to assure the construction meets or exceeds design criteria; and provides a method for documenting the borrow soil and cover soil placement.

1.1 Parties

The parties discussed in this section are associated with the ownership, design, installation, and quality assurance of the cover system. The definitions, qualifications, and responsibilities of these parties are outlined in the following subsections.

Project Manager. The project manager is the official representative of Evergreen. In this manual the term Project Manager shall apply equally to Construction Coordinator. The Project Manager is responsible for coordinating construction and quality assurance activities for the project. The Project Manager shall serve as communications coordinator for the project, and is responsible for initiating the pre-bid, pre-construction, and construction meetings. As construction coordinator, the Project Manager shall serve as a liaison between all parties involved in the project to assure that communications are maintained. The Project Manager shall also be responsible for proper resolution of all quality assurance issues that arise during construction. For the construction of Area 6A-West, the Project Manager is Bill von Vitzhume (828-646-2635).

Qualifications. The selection of the Project Manager is the direct responsibility of Evergreen. Qualifications for this position include familiarity with the following:

1. Applicable QAMs.
2. All applicable regulatory requirements.
3. Policies and procedures for project management.
4. Placement techniques of low hydraulic conductivity material.

Designer (Engineer). The designer (Engineer) is the individual and/or firm responsible for the preparation of the development design including, project specific engineering drawings, technical specifications and the Quality Assurance Manual. The Engineer is responsible for approving all design and specification changes, manufacturer's material certifications and contractor submittals, and for making any design clarifications during the contract bidding process and construction of the cover system. The Engineer may attend the pre-bid, pre-construction, and construction meetings upon the request of the Project Manager. The Engineer may also act as the Owner's Representative and Construction Quality Assurance Agent (CQA Agent) during construction of the project. The Design Firm for the development of the Landfill is Sevee & Maher Engineers, Inc. (SME) of Cumberland, Maine. The Project Engineer is Guy Cote, P.E. of SME.

Construction Quality Assurance Agent. The CQA Agent is responsible for review of the borrow source and in-place material testing results and for the observation of the Contractor's work to assure that the liner system meets the design specifications. Qualifications for this position include familiarity with the following:

1. Applicable QAMs.
2. All applicable regulatory requirements.
3. Placement techniques of low hydraulic conductivity material.
4. Experience with soil inspection of landfill projects.

The CQA Agent is also responsible for the following:

- Approval/disapproval of borrow source material test results for the cover soil;

- The in-place testing and approval of the materials placed by the Contractor; and

- Ensure that the placement techniques utilized conform to industry standard and this QAM, and as described in Technical Specification Section 02200 Part 3.2, including the following:

  - measuring borrow soil lift thickness;

  - cover soil lift thickness;

  - monitoring and measuring as necessary the maximum clod size of the soil;

  - assuring the proper lift benching techniques are followed; and

  - assuring that proper lift bonding of the soil is achieved.

The CQA Agent will provide continuous monitoring during placement of the borrow soil and cover soil. It is anticipated that only one CQA Agent will be necessary during construction of the soil cover. However, should the Contractor begin placing the borrow soil and cover soil over separate areas of the landfill simultaneously, additional CQA Agents will be added for oversight. The CQA Agent will be under the direction of a State of North Carolina registered Professional Engineer.

General Contractor. The general contractor (Contractor) is responsible for construction of the soil cover system including supplying labor, material, equipment, and supervision for placement of the soil cover system. The primary responsibility of the general contractor is to ensure the soil cover system is constructed in accordance with the design and specifications developed by the Engineer and approved by the permitting agency. The Superintendent is the Contractor's designee who is responsible for the Contractor's field crew. The Superintendent shall represent the Contractor at all site meetings and shall be responsible for acting as the Contractor's spokesman for the project. The Contractor shall be responsible for all aspects of cover placement, including but not limited to, placement of all erosion control measures, subgrade preparation, placement of granular drainage material, placement of borrow soil, placement of

low hydraulic conductivity soil, topsoil, seeding, fertilizing, and mulching. The Contractor is also responsible for informing the Owner, the Engineer, and the CQA Agent of the scheduling and occurrence of all construction activities and of any discrepancies, errors, or omissions in the Contract Documents.

The Contractor shall be pre-qualified and approved by Evergreen. The Superintendent must be qualified based on previously demonstrated construction experience and management ability. Services of the Contractor will be procured through a competitive bid process. Bid packages for the solicitation of construction services will require the Contractor to identify and demonstrate familiarity and experience with the various aspects of landfill construction.

Subcontractors. Subcontractors are responsible for that portion of the work that they are designated to perform by the General Contractor. Subcontractors' work as agents of the General Contractor and as such the General Contractor is responsible for the work and actions of the Subcontractor.

1.2 Communication

To guarantee a high degree of quality during installation and assure a final product that meets all project specifications, clear, open channels of communication are essential. This section discusses appropriate lines of communication and describes all necessary meetings.

Pre-Construction Meeting. A pre-construction meeting shall be held at the site prior to beginning of the project. Typically, the meeting shall be attended by the Project Manager, Designer, CQA Agent, Contractor, Supervisor, and an Evergreen representative.

Specific topics considered for this meeting include review of the project QAP for any problems or additions. In addition, the responsibilities of each party should be reviewed and understood clearly. The meeting shall be documented by a person designated at the beginning of the meeting, and minutes shall be transmitted to all parties.

Progress Meetings. A weekly progress meeting shall be held between the Evergreen representative, Superintendent, CQA Agent, and any other concerned parties. This meeting shall discuss current progress, planned activities for the next week, issues requiring resolution,

and any new business or revisions to the work. The CQA Agent shall log any problems, decisions, or questions arising at this meeting in his weekly report. If any matter remains unresolved at the end of this meeting, the Project Manager shall be responsible for the resolution of the matter and the communication of the decision to the appropriate parties.

2.0 SOIL QUALITY CONTROL

Approximately 28,500 cubic yards of cover soil borrow will be required to cover Area 6A-West. Approximately 150,000 cubic yards of off-site borrow soil will be placed prior to the installation of cover soil. The following quality control procedures will be incorporated into the project specifications to assure that the cover soil borrow source and the off-site borrow soil source, delivered to the site meets the project specifications, and provides the data to define quality control acceptance criteria. Individual moisture density curves from the borrow source testing program will be used to guide soil placement.

Evergreen will retain the services of a technician familiar with various aspects of landfill construction, to serve as the on-site representative during construction. Services of a general contractor will be procured through a competitive bid process. Bid packages for the solicitation of construction services will require the contractor to identify and demonstrate familiarity and experience with the various aspects of landfill construction. To control the quality of the soil materials used in the landfill development, this Quality Assurance/Quality Control (QA/QC) program will be implemented. The program will include borrow source testing to demonstrate compliance with material specifications, and construction testing to demonstrate that materials have been properly installed.

2.1 Borrow Source Testing

The Owner will be required to perform an initial borrow source testing program to determine the variability of the source properties, and its compliance with the project specifications. The Owner shall employ a testing laboratory and contractor to perform the soil testing of the borrow source. Evergreen's representative will accompany the contractor during the collection of the soil samples to develop an understanding of the variability of the cover soil borrow source. The contractor will also be required to prepare soil logs and a plan of the borrow source showing the locations where the samples were collected.

The laboratory shall perform the analysis as shown on Table 2-1 and Table 2-2.

TABLE 2-1

AREA 6A WEST
BORROW SOURCE TESTING PROGRAM
COVER SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422-63	1/10,000 yd^3	Minimum 20% soil particles passing #200 sieve; maximum particle size 6 inch
Moisture/Density	ASTM D 698	1/10,000 yd^3	(2)

Notes:
1. Test frequency per source.
2. Moisture density tests used to define maximum dry density and associated optional moisture content.

TABLE 2-2

AREA 6A WEST
BORROW SOURCE TESTING PROGRAM
NO. 67 DRAINAGE STONE

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 yd^3	(2)

Notes:
1. Test frequency per source.
2. Grain size distribution listed in specifications packet.

TABLE 2-3

AREA 6A WEST
BORROW SOURCE TESTING PROGRAM
OFF-SITE BORROW SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422-63	1/10,000 yd^3	NA
Moisture/Density	ASTM D 698	1/10,000 yd^3	(2)

Notes:
1. Test frequency per source.
2. Moisture density tests used to define maximum dry density and associated optional moisture content.

3.0 SOIL QUALITY ASSURANCE

The following quality assurance procedures and testing will be utilized by Evergreen to guide and document construction of the soil cover.

3.1 Subgrade Preparation

3.1.1 Crown and Sideslopes. The areas of the crown and sideslopes receiving cover will be prepared by Evergreen prior to placing the stone. Preparation of the subgrade will include grading of waste. The Contractor shall be responsible for placement of a 12-inch layer of drainage stone on the crown and sideslopes of Area 6A-West.

3.2 Off-site Borrow Soil Placement

The following QA/QC procedures will be used during placement of the off-site borrow soil:

3.2.1 Placement and Compaction.

- The borrow soil should be placed in horizontal lifts not exceeding 4 feet in thickness. The lifts should be advanced from the outer portions of the Landfill top slope toward the center in effort to minimize pore water pressure increases in the Landfill sideslopes due to equipment activity and/or unbalanced loading.

- The borrow soil should be placed such that when measured for compaction it exhibits an in-place dry density of at least 90 percent of the Standard Proctor density as determined by ASTM D 698. In-place dry density shall be measured from the middle of the lift.

- The stone drainage layer separating the existing mill waste from the lower limit of the borrow soil is a critical component to avoiding development of excess pore water pressure in the borrow soil and providing drainage for the existing Area 6A-West waste. The stone drainage layer must remain functional throughout placement of the borrow soil to allow excess pore water pressures in the mill

waste to dissipate. Care should be taken when placing the borrow soil over the drainage stone to avoid plugging or clogging of the stone drainage way. Similarly, care should be taken to avoid placing wet soil over the stone or over-compacting the soil at the stone/soil interface.

- During the placement of borrow soil, any soft areas that develop on the drainage stone or on the waste surface should be allowed to drain or be stabilized with additional stone before continuing material placement.

- In the event any low strength (i.e., wet) borrow soil is brought to the Landfill, the procedures and recommendations set forth in Evergreen's Operations Manual for handling low strength waste should be followed for placement of the low-strength borrow soil.

- During placement of the borrow soil, the existing Landfill sideslopes should be inspected regularly for signs of cracks, sloughs, leachate boils, or any other displacements or seeps that might be indicative of potential impending slope instability.

3.3 Cover Soil Placement

The following QA/QC procedures will be used during placement of the soil cover material.

3.3.1 Moisture Control. Moisture content of the cover shall range from 0 to 4 percent higher than optimum, as determined by ASTM D 698 (standard proctor) or as determined necessary to meet the project specifications. Where subgrade or a layer of soil material must be moisture conditioned before compaction, water will be uniformly applied to surface of subgrade, or layer of soil material, in proper quantities to prevent free water appearing on surface during or subsequent to compaction operations.

Soil material that is too wet to permit compaction to the specified density will be removed and replaced, or scarified and air dried.

Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. The soils may be disced, harrowed, or pulverized until moisture content is reduced to a satisfactory level.

3.3.2 Placement and Compaction. Placement of cover soil will be in layers not more than 15" in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers. Lift thickness will be measured by the Contractor and the CQA Agent during placement at the frequency of 5 tests per acre per lift. The Contractor may use driven wooden grade stakes to aid in the placement of each lift provided that all the grade stakes are collected and accounted for at the completion of the work and that all holes left behind by the grade stakes are filled with granular bentonite. Other methods of determining lift thickness such as laser survey or free-standing flexible grade stakes can also be used. The CQA Agent may also determine lift thickness by digging small test pits through the loose soil lift into the underlying layer.

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

Place backfill and cover soil evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around structure to approximately same elevation in each lift. To connect soil lifts to a completed layer section (as a result of repairs or sequential liner section at construction), offset the lifts by one-half the compaction equipment width to create a horizontal bench without continuous vertical joints through all lifts of the barrier layer.

To provide for clod break-up of the cover soil material, a minimum number of 2 passes will be made with deep footed pad roller. The CQA Agent will perform visual inspections and measurements as necessary to assure the maximum clod size of the cover soil does not exceed 2 to 3 inches. The Contractor shall make the necessary adjustments including increasing the number of passes with the sheepsfoot roller, decreasing the lift thickness or adjusting the moisture content of the clay to control the clod size of the cover soil.

To eliminate desiccation cracks the surface will be moistened (as necessary) and reworked with 2 passes of a smooth drum roller. Desiccation is defined as moisture content below optimum, or cracks deeper than 1 inch.

Sealing the lifts will encourage runoff from storms, thus limiting development of excessively moist or wet lenses of soil within the barrier layer.

To promote good bonding between lifts, the lift surface shall be scarified or otherwise roughened by tracking with a bulldozer prior to placing the next lift of cover soil. The Contractor shall scarify the in-place lift surface to an approximate depth of 1 inch. The CQA Agent shall visually assure that the soil has been properly scarified prior to placement of subsequent lifts. The scarified zone will be considered part of the loose lift thickness of the subsequent lift.

The following types of equipment will be specified for compaction:

Caterpillar 815 Pad Foot Roller or equivalent equipment approved by the CQA Agent. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	45,900 lbs
Maximum Drum Width	38 inches
Maximum Pad Tip Area	18 square inches
Minimum Pad Height	7.5 inches
Minimum Wheel Diameter	40.5 inches

The passage of compaction equipment in either direction (forward or backward) is considered a "pass".

The following equipment will be used to obtain a smooth roll surface.

Caterpillar CS563 Vibratory Drum Roller or equivalent equipment approved by the CQA Agent. Equivalent equipment shall meet the following specifications:

Minimum Operating Weight	24,500 lbs
Vibration Frequency	1,400 to 1,800 vpm
Centrifugal Force	
High amplitude	50,000 lbs
Low amplitude	35,000 lbs
Maximum Drum Width	7.0 feet

3.4 In-Place Testing

As the soil material is used in the landfill cover, in-place testing will be performed by the owner's representative to monitor material placement and conformance with the criteria specified in the construction specifications. In-place material testing will be performed by a qualified materials testing laboratory and will be observed by the CQA Agent. Testing will be performed on each lift prior to placement of the subsequent lift. The contractor will be required to remove or rework material not conforming with material properties specified.

The owner's testing service shall perform the tests specified in Table 3-1, Table 3-2, and Table 3-3 to document the liner soil in-place properties.

TABLE 3-1

AREA 6A WEST
IN-PLACE TESTING PROGRAM COVER SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 cy	Minimum 20% soil particles passing #200 sieve; maximum soil particle size 6 inch
Field Moisture Content	ASTM D 6938 or ASTM D 2937	5/acre/lift	0 to 4% above optimum
Field Density	ASTM D 6938 or ASTM D 2937	5/acre/lift	90% of maximum
Cover Thickness	Hand Auger	5/acre/lift	12 inch per lift

Note
1. Backfill all in-place test holes with bentonite.

TABLE 3-2

AREA 6A WEST
IN-PLACE TESTING PROGRAM
NO. 67 DRAINAGE STONE

Test	Method	Test Frequency	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 cy	(1)

Note
1. Grain size distribution listed in specifications packet.

TABLE 3-3

AREA 6A WEST
IN-PLACE TESTING PROGRAM OFF-SITE BORROW SOIL

Test	Method	Test Frequency[1]	Required Properties
Grain Size Analysis	ASTM D 422	1/5,000 cy[2]	NA
Field Density	ASTM D 6938 or ASTM D 2937	1/5,000 cy[2]	90% of maximum measured at middle of lift

Note
1. Test frequency per source.
2. At the Engineer's discretion, testing frequency may be reduced if soil properties exhibit little change and compaction is satisfactory.

4.0 CONSTRUCTION DOCUMENTATION

During construction, Evergreen's representative will document that the compaction procedures are being followed, the soil materials are as specified, and the required compaction of the cover soil is achieved. A full-time project representative will be assigned to the construction of the cover system, including the stormwater drainage system.

4.1 Inspection Reports

Inspection reports will be prepared daily and summarized weekly by Evergreen's representative during the development of the Landfill. The reports will include, but is not limited to:

- Contractor submittals and actions taken,
- Soil material test results,
- A summary of work progress,
- Summary of significant problems encountered and their resolutions,
- Change order status,
- Photographs,
- Record drawings,
- Upcoming work items for the next two weeks, and
- Punchlist items as applicable.

The weekly summaries will be forwarded to the Evergreen Project Manager within one week of the completion of each construction week.

4.2 Final Construction Certification and Report

A final construction report will be submitted to Evergreen within 45 days following the completion of Area 6A-West construction at the Landfill. The report will include, but is not limited to:

- Written certification signed and stamped by Engineer supervising project inspection (Statement of Compliance),
- Submittals,
- Field changes and construction modifications,
- QA/QC testing reports,
- Daily reports, and
- Photographs.

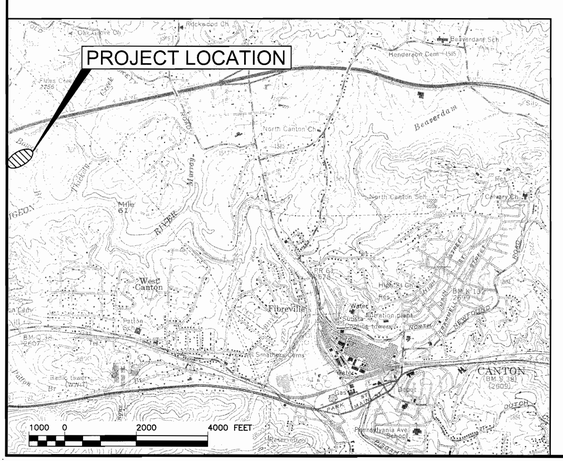
ATTACHMENT B

ENGINEERING DRAWINGS

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

TITLE	DRAWING NUMBER
COVER SHEET	
SYMBOLS, ABBREVIATIONS AND SPECIFICATIONS	C-100
SITE LOCATION PLAN	C-101
EXISTING CONDITIONS PLAN	C-102
AREA A WEST FINAL WASTE GRADING PLAN	C-103
AREA A WEST FINAL GRADING PLAN	C-104
SECTIONS & DETAILS	C-300

LOCATION MAP



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

APRIL 2011
JOB NO. 10164.00

SYMBOLS

EXISTING	PROPOSED		EXISTING	PROPOSED		EXISTING	PROPOSED	
		NORTH ARROW (MAGNETIC)			STONE WALL			MANHOLE
N		NORTH ARROW (PLAN NORTH)			DRAINAGE COURSE (WITH DIRECTION)			CATCH BASIN
25	25	CONTOUR LINES	SHORE SIDE		EDGE OF WATER			WATER VALVE
25 x 63	25.56 x	SPOT ELEVATION (GRADE)			WATER ELEVATION (GROUND OR SURFACE)			HYDRANT
		EXISTING GROUND			FENCE LINE (WOOD)			UTILITY POLE
S B		SURVEY BASELINE WITH TRIANGULATION OR INTERSECTION PT.			FENCE LINE (WIRE)			CLEAN OUT STRUCTURE
		PROPERTY LINE OR R.O.W.			RETAINING WALL	G	G	UNDERGROUND GAS MAIN
N35°-10'-10"W 251.17'	N35°-10'-10"W 251.17'	PROPERTY LINE W/ BEARING AND DISTANCE		T T T	GUARD RAIL	T	T	UNDERGROUND TELEPHONE LINE
	0+00 1+00	CONSTRUCTION BASELINE			BUILDING AND STRUCTURES	E	E	UNDERGROUND ELECTRICAL LINE
		BOUNDARY LINE (State, County, Municipality)		1 2 OR 2:1	SLOPE RATIO (HORIZONTAL TO VERTICAL)	OE	OE	OVERHEAD ELECTRICAL LINE
		SURVEY MONUMENT		TOP OF SLOPE 2:1	SLOPES (WITH SLOPE RATIO)		12" ACP	SANITARY SEWER, SIZE & TYPE
IF	IF	SURVEY IRON			EDGE OF TRAVELED WAY	FM	8" PVC	FORCE MAIN, SIZE & TYPE
		DRILL HOLE, PK, OR STAKE		C F	CUT OR FILL LINE	W	8" D.I.	WATER MAIN, SIZE & TYPE
		WOODS OR BRUSH LINE		CLL	CLEARING LIMIT LINE		12" RCP	STORM DRAIN, SIZE & TYPE
		INDIVIDUAL TREE (Deciduous)			BITUMINOUS PAVEMENT	UD	8" UD	UNDERDRAIN , SIZE & TYPE
		INDIVIDUAL TREE (Coniferous)			CONCRETE			CULVERT
		TREE, TO BE REMOVED	B-12 NW-12 P-12	B-12 NW-12 P-12	TEST BORING, MONITORING WELL, OR PIEZOMETER AND NUMBER			RAILROAD
		MARSH AREA	TP-12	TP-12	TEST PIT AND NUMBER		S	SILTATION FENCE
							D	DIVERSION BERM
								STONE CHECK DAM

A.C.C.M.P	ASPHALT COATED C.M.P.
A.C.P.	ASBESTOS CEMENT PIPE
AC	ACRE
AGG	AGGREGATE
ALUM	ALUMINUM
APPD	APPROVED
APPROX	APPROXIMATE
ASB	ASBESTOS
ASPH	ASPHALT
AUTO	AUTOMATIC
AUX	AUXILIARY
AVE	AVENUE
AZ	AZIMUTH
B.C.C.M.P.	BITUMINOUS COATED C.M.P.
B.M.	BENCH MARK
BIT	BITUMINOUS
BLDG	BUILDING
BOT	BOTTOM
BRG	BEARING
C.B.	CATCH BASIN
CEN	CENTER
CEM. LIN.	CEMENT LINED
C.M.P.	CORRUGATED METAL PIPE
C.O.	CLEAN OUT
CF	CUBIC FEET
CFS	CUBIC FEET PER SECOND
CI	CAST IRON
CL	CLASS
CONC	CONCRETE
CONST	CONSTRUCTION
CONTR	CONTRACTOR
CTR	CENTER
CY	CUBIC YARD

D	DEGREE OF CURVE (ARC DEF.)
DBL	DOUBLE
DEG OR °	DEGREE
DEPT	DEPARTMENT
DI	DUCTILE IRON
DIA OR ø	DIAMETER
DIM	DIMENSION
DIST	DISTANCE
DN	DOWN
DR	DRAIN
DWG	DRAWING
EA	EACH
EG	EXISTING GROUND OR GRADE
ELEC	ELECTRIC
EL	ELEVATION
ELB	ELBOW
EQUIP	EQUIPMENT
EST	ESTIMATED
EXC	EXCAVATE
EXIST	EXISTING
F.G.	FINISH GRADE
FBRGL	FIBERGLASS
FDN	FOUNDATION
FLEX	FLEXIBLE
FLG	FLANGE
FLR	FLOOR
FPS	FEET PER SECOND
FT OR '	FEET
FTG	FOOTING
GA	GAUGE
GAL	GALLON
GALV	GALVANIZED
GPD	GALLONS PER DAY
GPM	GALLONS PER MINUTE

HDPE	HIGH DENSITY POLYETHYLENE
HP	HORSEPOWER
HYD	HYDRANT
I.D.	INSIDE DIAMETER
IN OR "	INCHES
INV	INVERT
INV. EL	INVERT ELEVATION
LB	POUND
LC	LEACHATE COLLECTION
LD	LEAK DETECTION
LIN FT.	LINEAR FEET
LOC	LOCATION
LT	LEFT
M.H.	MANHOLE
M.J.	MECHANICAL JOINT
MATL	MATERIAL
MAX	MAXIMUM
MFR	MANUFACTURE
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
N.I.T.C.	NOT IN THIS CONTRACT
N.T.S.	NOT TO SCALE
N/F	NOW OR FORMERLY
NO. OR #	NUMBER
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER

P.C.	POINT ON CURVE
P.I.	POINT OF INTERSECTION
P.T.	POINT OF TANGENT
PERF	PERFORATED
PSI	POUNDS PER SQUARE INCH
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
QTY	QUANTITY
R.O.W.	RIGHT OF WAY
RAD	RADIUS
REQD	REQUIRED
RT	RIGHT
RTE	ROUTE
S	SLOPE
SCH	SCHEDULE
SF	SQUARE FEET
SD	STORM DRAIN
SDR	STANDARD DIMENSION RATIO
SHT	SHEET
STA	STATION
SY	SQUARE YARD
TAN	TANGENT
TDH	TOTAL DYNAMIC HEAD
TEMP	TEMPORARY
TYP	TYPICAL
V	VOLTS
W/	WITH
W/O	WITHOUT
YD	YARD

VIEW MARKERS & IDENTIFICATION

DETAIL TITLE

MANHOLE

SECTION TITLE & NO.

ACCESS ROAD 3

C-100

DRAWING WHERE SECTION APPEARS

GENERAL NOTES:

THE CONTRACTOR MUST COMPLY WITH ALL APPLICABLE SAFETY PROCEDURES WITH RESPECT TO THE EMPLOYEES OF THE CONTRACTOR AND HIS SUBCONTRACTOR UNDER THE OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA) AND REGULATIONS ISSUED THEREUNDER AND STATE LABOR (SAFETY) DEPARTMENT AND MILL RULES, PROCEDURES, AND REGULATIONS REGARDING SAFETY.

CONTOURS SHOWN ON PLANS MAY NOT REPRESENT EXISTING CONDITIONS OF THE SITE.

MATERIAL SPECIFICATIONS:

OFF-SITE BORROW – SECTION 02200 SPECIFICATION
COVER SOIL – SECTION 02200 SPECIFICATION
VEGETATIVE SOIL – SECTION 02200 SPECIFICATION
#67 STONE – NCDOT #67 AGGREGATE

COMPACTION – ALL FILL SOIL SHALL BE COMPACTED TO A DENSITY OF 90 PERCENT OF ITS MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D698 (STANDARD PROCTOR)

24" HDPE PIPE – SOLID, CORRUGATED, ANNULAR SMOOTH INTERIOR POLYETHYLENE PIPE

SEED AND FERTILIZER:

AREAS DISTURBED BY CONSTRUCTION SHALL BE FERTILIZED AND SEEDED.

MATERIAL:

AGRICULTURAL GROUND LIMESTONE: 100 LBS PER 1,000 SF OR AS NEEDED BASED ON TESTING

FERTILIZER: GRANULAR FERTILIZER 10,10,10 (N,P,K) 25 LB/1000 SF OR AS NEEDED BASED ON TESTING

SEED:

KENTUCKY 31	105 lbs/acre
CREEPING RED FESCUE	24 lbs/acre
KENTUCKY BLUE GRASS	24 lbs/acre
SERICEA LESPEDEZA	24 lbs/acre
KOREAN LESPEDEZA	21 lbs/acre
ANNUAL RYE	21 lbs/acre
WHITE DUTCH CLOVER	6 lbs/acre
	225 lbs/acre

SEEDING WILL BE OCCUR BETWEEN MARCH 1 AND OCT 15; IF NOT, ADD 40 LB/ACRE RYE GRAIN

MULCH – THE MULCH APPLICATION RATE SHALL BE 2 TONS PER ACRE

EROSION AND SEDIMENTATION CONTROL

PROJECT DESCRIPTION

THIS PROJECT CONSIST OF PLACEMENT OF COVER SOIL MATERIAL FOR THE PURPOSE OF CLOSING EXISTING LANDFILL CELLS. THIS PLAN REVISES PREVIOUSLY FILED EROSION CONTROL PLANS. THE PLAN INVOLVES THE CONSTRUCTION OF 6A WEST COVER SYSTEM.

THE PRIMARY MEANS OF EROSION AND SEDIMENT CONTROL WILL BE:

- STONE CHECK DAMS.
- TEMPORARY AND PERMANENT SEEDING OF SLOPES.
- INSTALLING EROSION CONTROL MATTING FOR CHANNEL LINING.
- TEMPORARY MULCHING OF DISTURBED AREAS.

SITE DESCRIPTION

AREA A WEST – THIS SITE IS APPROXIMATELY 18 ACRES IN SIZE AND MODERATELY SLOPING.

ADJACENT PROPERTY

AREAS ARE LOCATED ENTIRELY WITHIN PROPERTY OWNED BY EVERGREEN PACKAGING.

RESPONSIBLE PARTIES

THE CONTRACTOR WILL BE RESPONSIBLE FOR INSTALLATION AND MAINTENANCE OF EROSION AND SEDIMENTATION CONTROL MEASURES UNTIL THE SITE IS STABILIZED (90% GRASS COVER). EVERGREEN PACKAGING WILL BE RESPONSIBLE FOR MAINTENANCE OF THESE MEASURES AFTER GRASS IS ESTABLISHED.

MAINTENANCE PLAN

1. ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED FOR STABILITY AND OPERATION FOLLOWING EVERY RUNOFF-PRODUCING RAINFALL; IN NO CASE LESS THAN ONCE EVERY WEEK. ANY NEEDED REPAIRS WILL BE MADE IMMEDIATELY TO MAINTAIN ALL MEASURES AS DESIGNED.
2. ALL SEDIMENT AND EROSION CONTROL FACILITIES SHALL BE INSPECTED AND RECORDS OF INSPECTIONS KEPT AS REQUIRED BY THE NCDENR GENERAL PERMIT TO DISCHARGE STORMWATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
3. ALL SEEDED AREAS WILL BE FERTILIZED, RESEEDED AS NECESSARY, AND MULCHED ACCORDING TO THE SPECIFICATIONS TO REPAIR AND MAINTAIN A VIGOROUS, DENSE VEGETATIVE COVER.

SPECIFICATIONS

EROSION AND SEDIMENTATION CONTROL
EVERGREEN PACKAGING
LANDFILL 6 AREA A WEST CLOSURE AMENDMENT
HAYWOOD COUNTY, N. C.

THE CONTRACTOR IS ADVISED THAT PARTICULAR ATTENTION TO EROSION AND SEDIMENTATION CONTROL, ACCORDING TO GS 113A-54, IS AN INTEGRAL PART OF THIS WORK.

THE BASIC OBJECTIVE IN EROSION AND SEDIMENTATION CONTROL SHALL BE TO:

- IDENTIFY CRITICAL AREAS;
- LIMIT THE SIZE OF DISTURBED OR EXPOSED AREAS;
- LIMIT THE TIME OF EXPOSURE OR DURATION OF DISTURBANCE TO AN AREA;
- CONTROL SURFACE WATER RUNOFF OVER EXPOSED AREAS SO AS TO REDUCE EROSION AND SEDIMENT LOSS; AND
- TO PLAN AND CONDUCT THE WORK SO AS TO MINIMIZE EXPOSURE TO POSSIBLE EROSION AND OFF-SITE SEDIMENTATION DAMAGE.

THE CONTRACTOR RESPONSIBLE FOR THE CONSTRUCTION SHALL BE FAMILIAR WITH THE NORTH CAROLINA REGULATIONS FOR EROSION AND SEDIMENTATION CONTROL. THE MINIMUM STANDARDS SHALL BE THE GUIDE FOR SEDIMENT CONTROL ON CONSTRUCTION SITES IN NORTH CAROLINA. THESE DOCUMENTS MAY BE OBTAINED FROM THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES.

THE FINISHED GRADE IN ALL AREAS SHALL BE SEEDED AS SOON AS POSSIBLE AND IN NO CASE SHALL ANY DISTURBED AREAS REMAIN UNPROTECTED FOR MORE THAN 30 DAYS. PROTECTION SHALL BE MULCH, SEED AND MULCH.

CONSTRUCTION SEQUENCE

1. DITCHES, BERMS AND SWALES SHALL BE PROTECTED IMMEDIATELY USING EROSION CONTROL MATTING OR HAY BALES WHERE REQUIRED OR SEEDED WITH A QUICK COVER CROP SUCH AS RYE.
2. PROCEED WITH EARTHMOVING OPERATIONS, SLOPING THE AREAS TO MEET THE PROPOSED FINAL GRADES.
3. ALL GRADED OR DISTURBED AREAS SHALL BE SEEDED AND MULCHED AS SOON AS IS PRACTICAL. ALL EXPOSED AREAS MUST BE STABILIZED WITHIN 30 DAYS OF FIRST BEING DISTURBED. TEMPORARY MEASURES SHALL REMAIN AND BE MAINTAINED UNTIL FINISH GRADING, SEEDING AND MULCHING REQUIRES THEIR REMOVAL. THEY SHALL BE INSPECTED, REPAIRED OR OTHERWISE REINSTALLED AS NECESSARY AFTER EACH SIGNIFICANT RAIN.

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

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

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

SYMBOLS, ABBREVIATIONS AND SPECIFICATIONS

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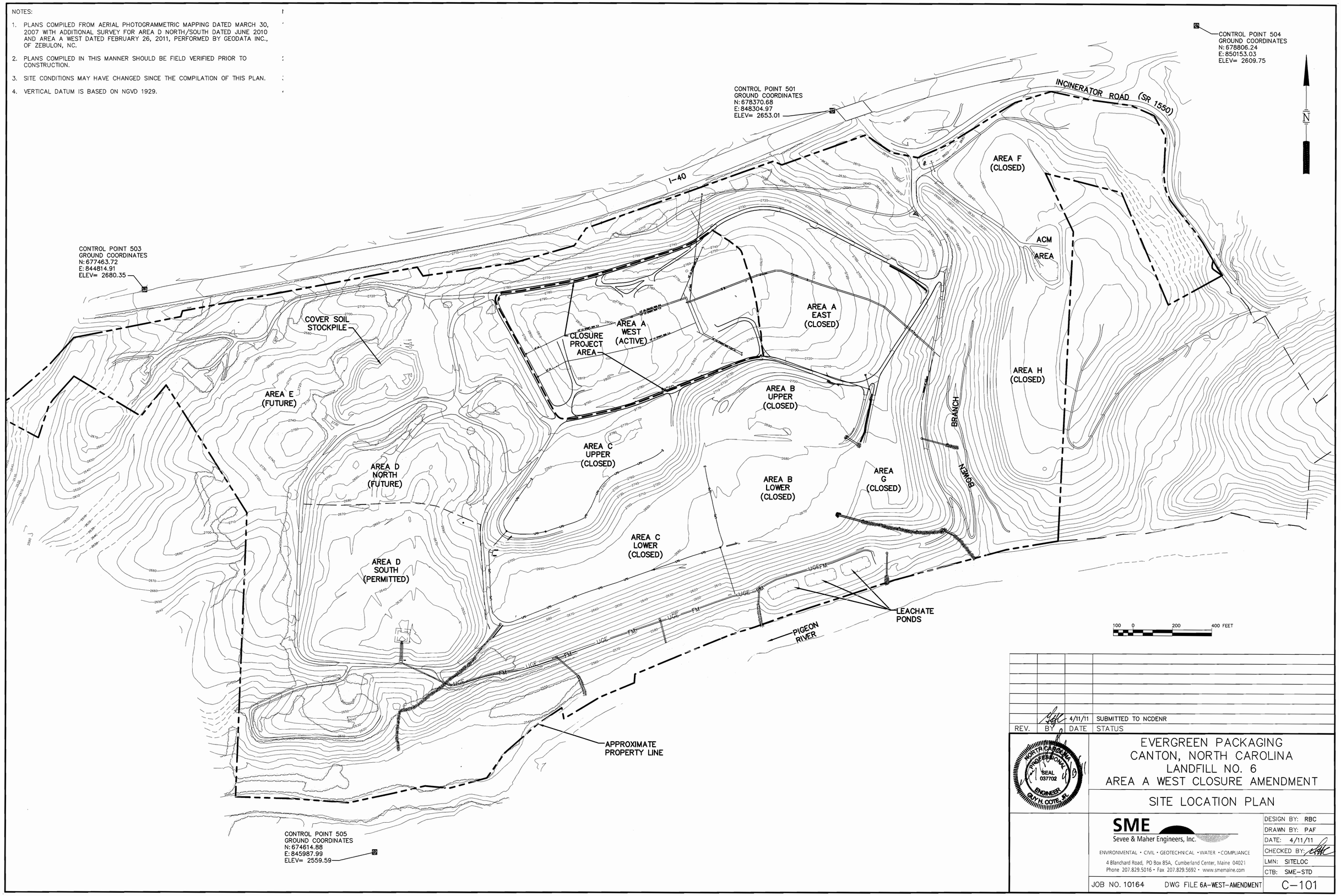
DESIGN BY: RBC
DRAWN BY: SJM
DATE: 4/11/2011
CHECKED BY:
LMN:
CTB: SME-STD

JOB NO. 10164.00 DWG FILE 6A-WEST-AMENDMENT-SYMSHT

C-100

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.



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		4/11/11	SUBMITTED TO NCDENR

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

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

SITE LOCATION PLAN

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DATE:	4/11/11
CHECKED BY:	
LMN:	SITELOC
CTB:	SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-AMENDMENT C-101

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
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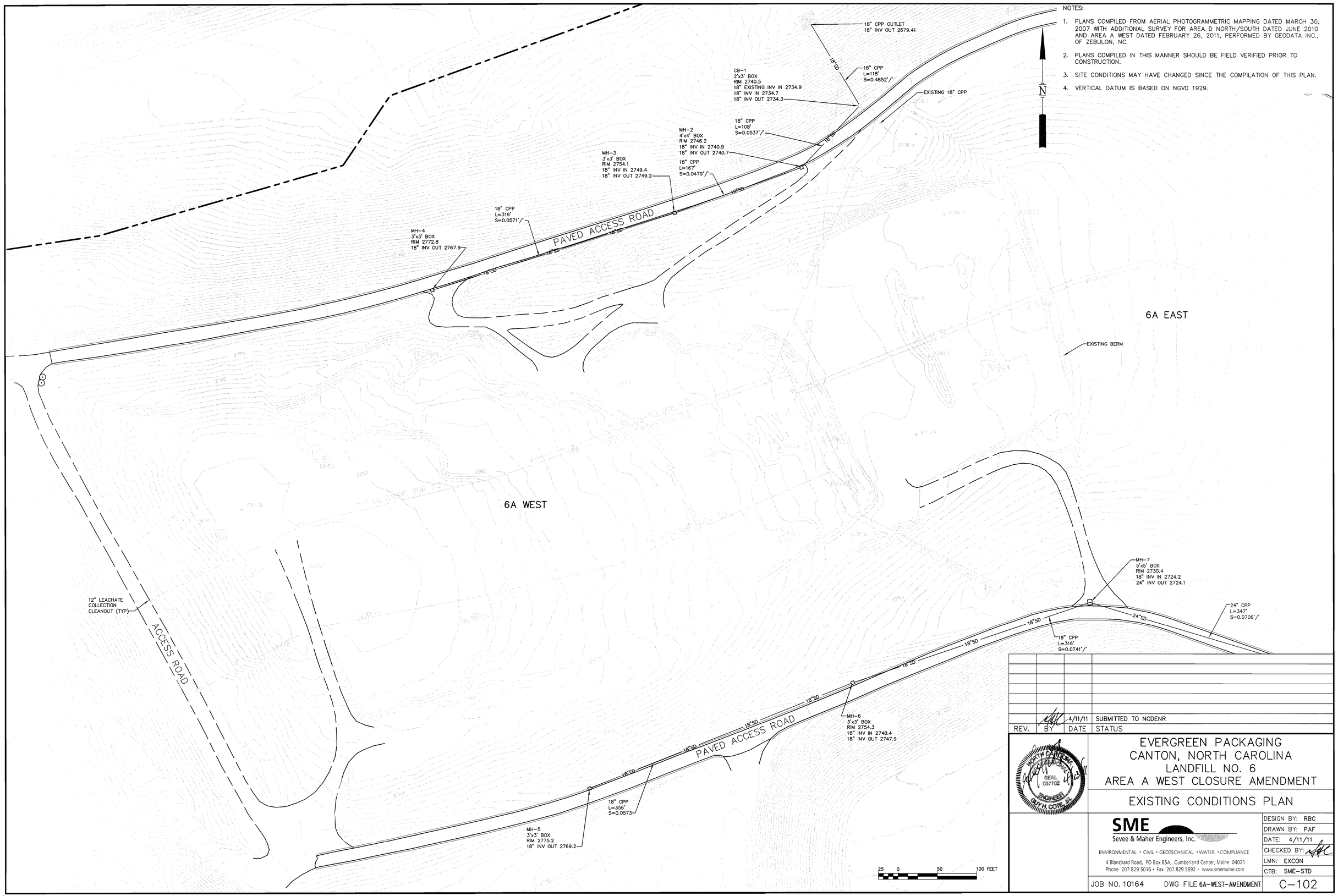
4. VERTICAL DATUM IS BASED ON NGVD 1929.



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		4/11/11	SUBMITTED TO NCDENR

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EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

EXISTING CONDITIONS PLAN

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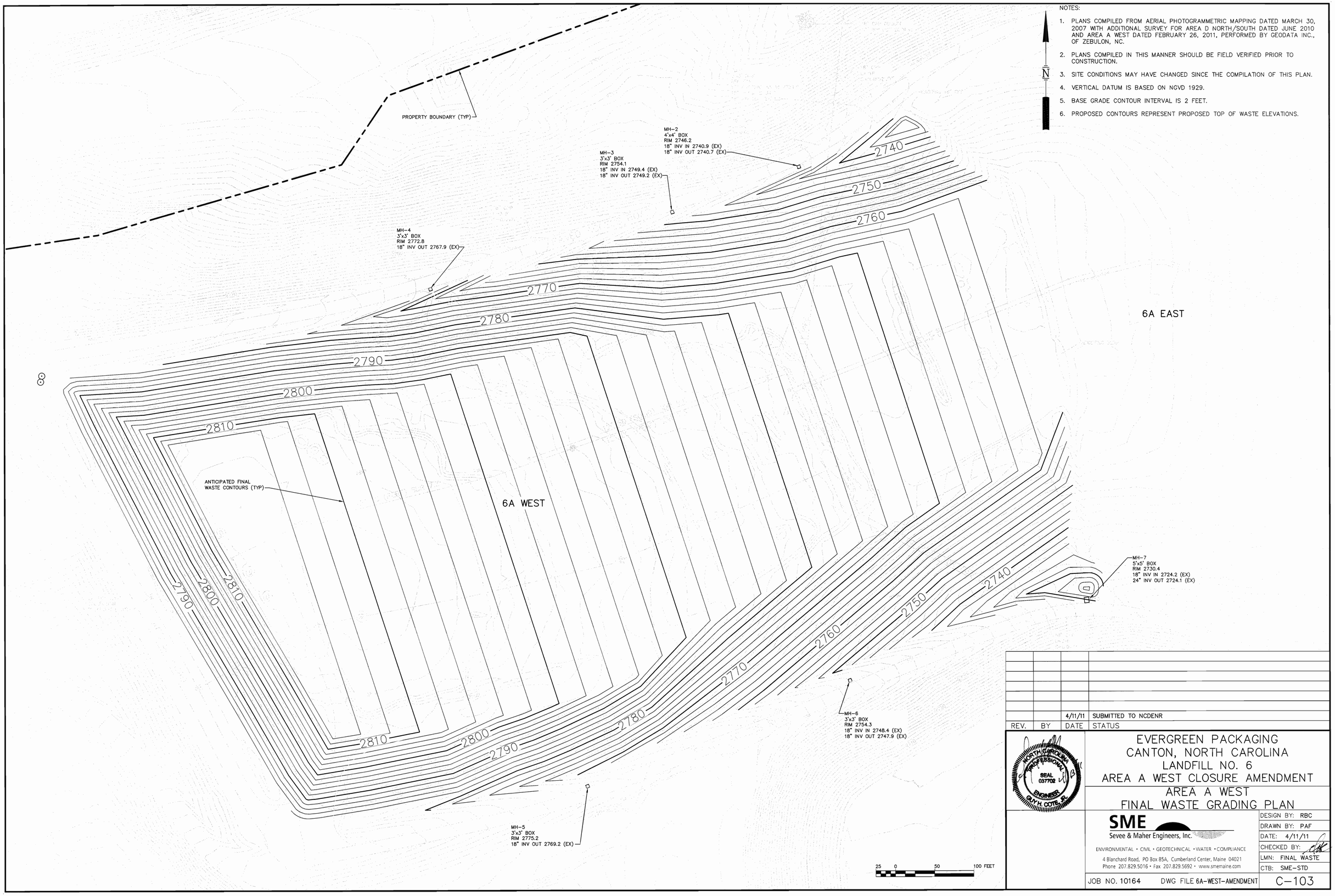
DRAWN BY: PAF
DATE: 4/11/11
CHECKED BY:
LMN: EXCON
CTB: SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-AMENDMENT C-102

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. VERTICAL DATUM IS BASED ON NGVD 1929.
5. BASE GRADE CONTOUR INTERVAL IS 2 FEET.
6. PROPOSED CONTOURS REPRESENT PROPOSED TOP OF WASTE ELEVATIONS.



REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

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EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

AREA A WEST
FINAL WASTE GRADING PLAN

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DATE: 4/11/11
CHECKED BY:
LMN: FINAL WASTE
CTB: SME-STD

JOB NO. 10164 DWG FILE 6A-WEST-AMENDMENT C-103

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 26, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
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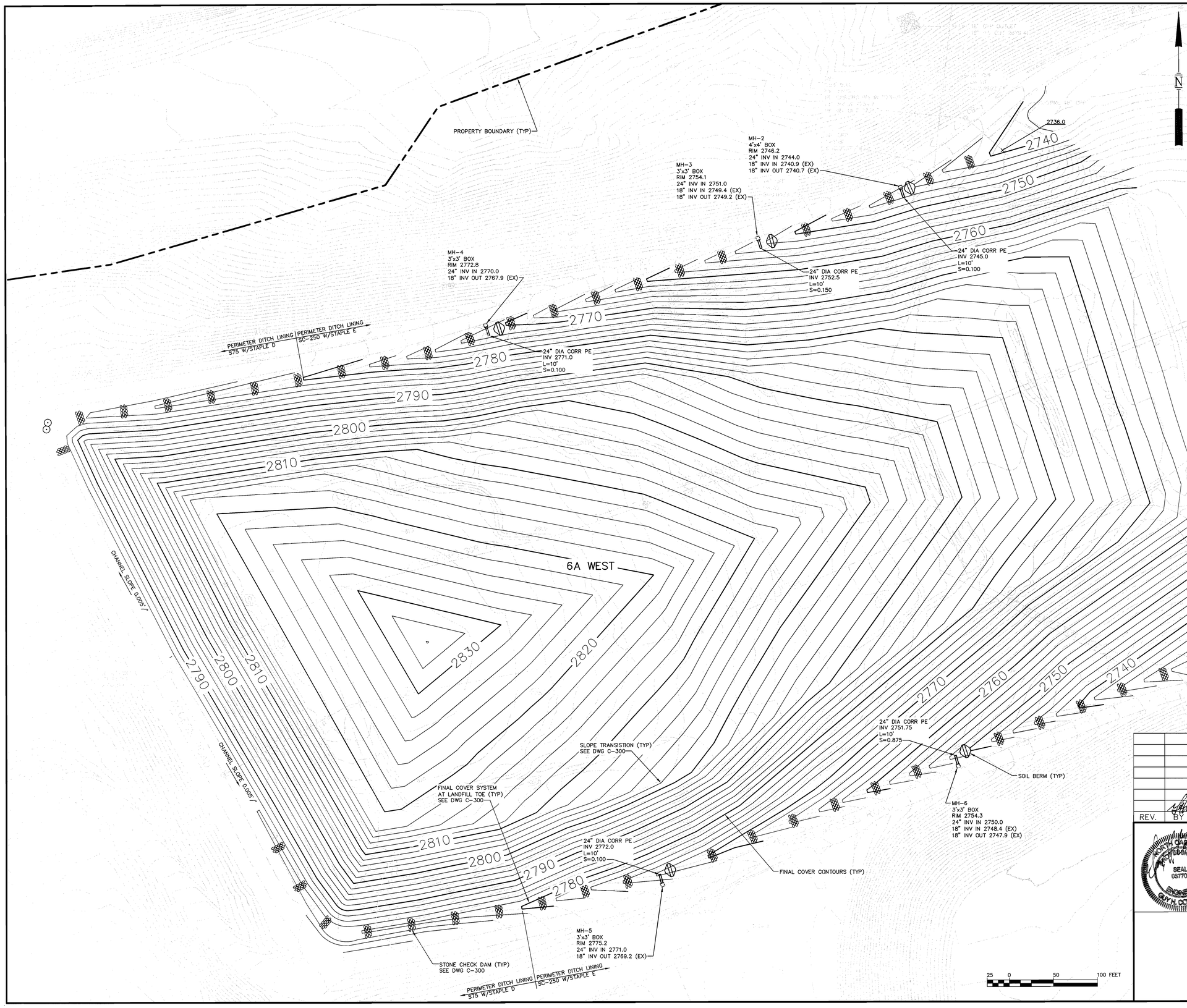
4. VERTICAL DATUM IS BASED ON NGVD 1929.
5. BASE GRADE CONTOUR INTERVAL IS 2 FEET.
6. PROPOSED CONTOURS REPRESENT PROPOSED TOP OF FINAL COVER.



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EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

AREA A WEST FINAL GRADING PLAN

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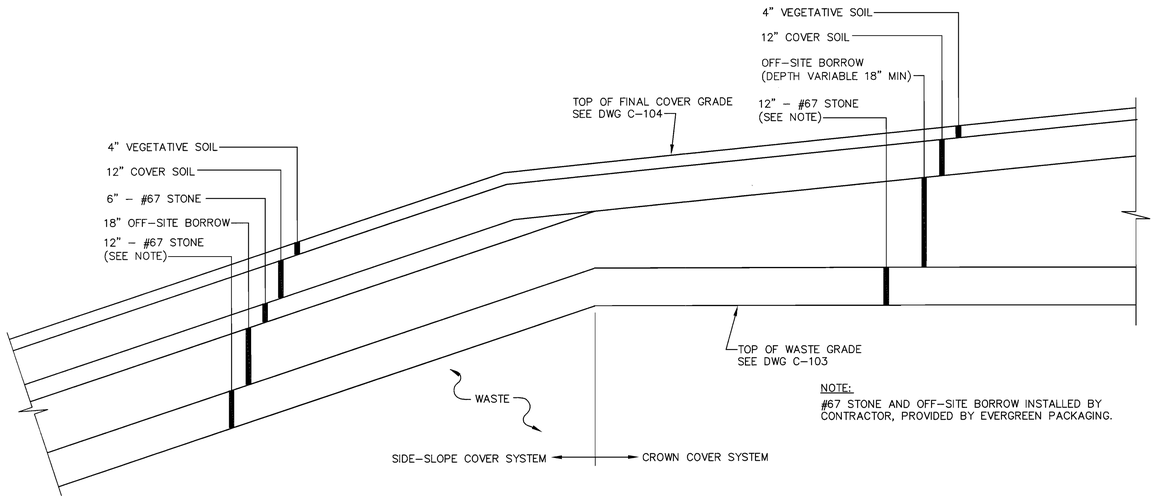
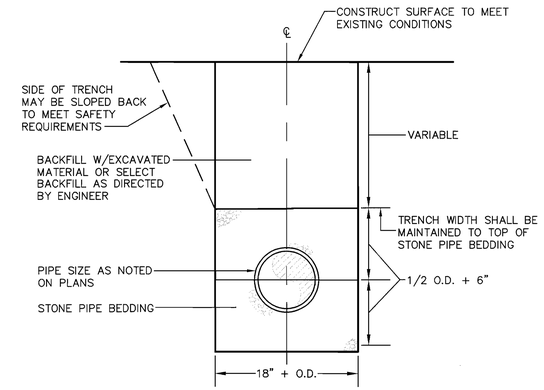
JOB NO. 10164 DWG FILE 6A-WEST-AMENDMENT C-104

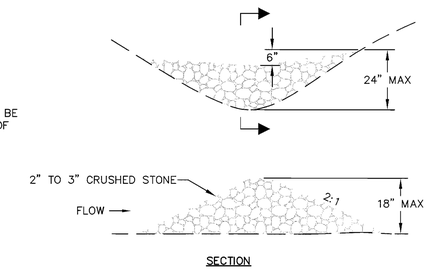


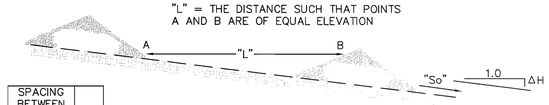
NOTE:
#67 STONE AND OFF-SITE BORROW INSTALLED BY CONTRACTOR, PROVIDED BY EVERGREEN PACKAGING.

SLOPE TRANSITION
NTS



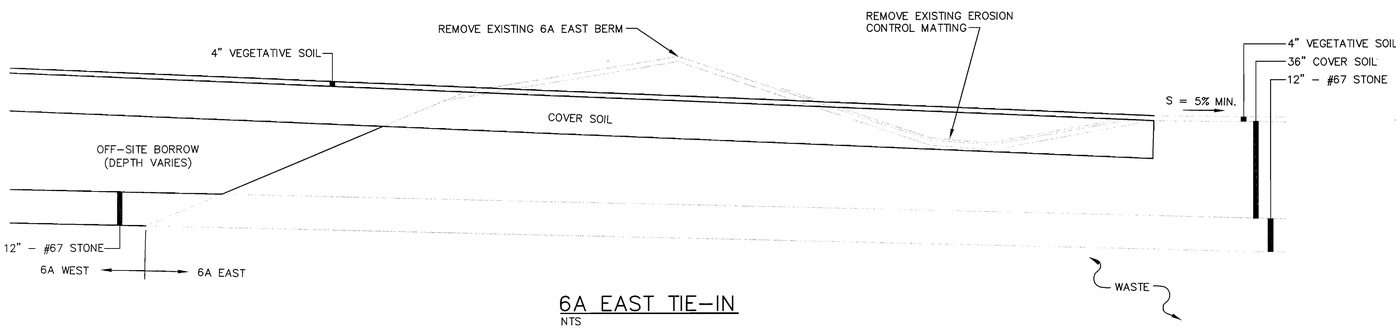
STORM DRAIN
NTS



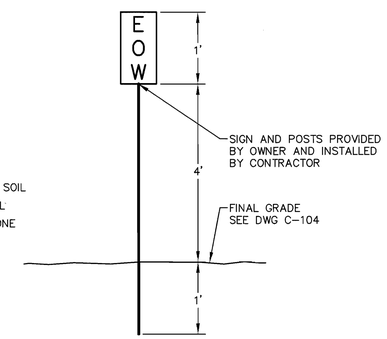


SPACING BETWEEN CHECK DAMS	
"So" FT/FT	"L" FT
0.020	75
0.030	50
0.040	40
0.050	30
0.080	20
0.100	10

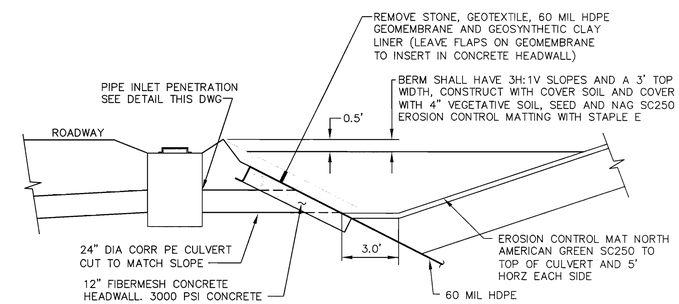
STONE CHECK DAM
NTS



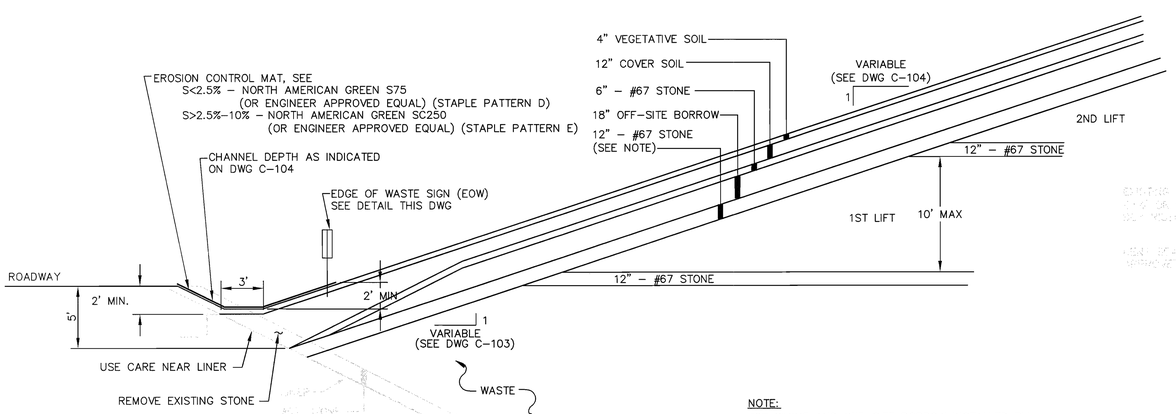
6A EAST TIE-IN
NTS



EDGE OF WASTE SIGN
NTS

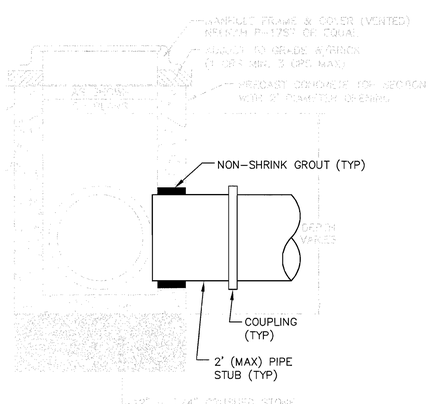


PIPE INLET/PENETRATION
NTS



NOTE:
#67 STONE AND OFF-SITE BORROW INSTALLED BY CONTRACTOR, PROVIDED BY EVERGREEN PACKAGING.

FINAL COVER SYSTEM AT LANDFILL TOE
NTS



PIPE INLET PENETRATION
NTS

REV.	BY	DATE	STATUS
		4/11/11	SUBMITTED TO NCDENR

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

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

SECTIONS AND DETAILS

SME
Sevee & Maher Engineers, Inc.
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DATE: 4/11/11
CHECKED BY:
LMN:
CTB: SME–STD

JOB NO. 10164 DWG FILE 6A–WEST AMENDMENT–DETAILS

C–300

ATTACHMENT C

STORMWATER MANAGEMENT PLAN

STORMWATER MANAGEMENT PLAN
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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

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LIST OF ATTACHMENTS

ATTACHMENT C-1 STORMWATER FLOW CALCULATIONS
ATTACHMENT C-2 EROSION CONTROL CALCULATIONS

STORMWATER MANAGEMENT PLAN
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
EVERGREEN PACKAGING

1.0 INTRODUCTION

Evergreen Packaging (Evergreen) proposes to place final cover over Landfill No. 6, Area 6-West (Area 6A-West)s and at their Canton Landfill. Approximately 18 acres will be covered during the summer of 2011. The final cover system will consist of 12 inches of drainage stone over waste, then at least 36 inches of soil, overlain by a 4-inch vegetative soil layer. The following is an overview of stormwater management and erosion control design considerations and calculations.

2.0 STORMWATER RUNOFF

Surface water runoff from the active portions of Area 6A-West are currently collected and treated as leachate. Stormwater runoff calculations have been performed with Area 6A-West, the valley fill, and a portion of previously closed Area 6A-East. Stormwater runoff calculations for the site were performed utilizing the methodology outlined by the USDA Soil Conservation Service's Technical Release Number 20 (TR20), February 1992 Revision, and a computer stormwater modeling system entitled "Hydrocad" by Applied Microcomputer Systems of Chocorua, New Hampshire. A 24-hour Type II storm with antecedent moisture condition II was used to model the runoff characteristics of the site. Models were created using 2-year and 25-year frequency storm events.

2.1 Final Cover

Upon completion of waste placement in Area 6A-West, final cover will be installed similar to cover placed over 6A-East. A soil cover will be placed over Area 6A-West and the valley fill between Area 6A-West and Area 6A-East. Surface water runoff will be directed away from 6A-West to the east and southeast by perimeter ditches. The perimeter ditches will direct clean water runoff to a system of existing manholes, catch basins and culverts installed during the closure of Area 6A-East and the 2010 Roadway Improvement Construction.

Surface water runoff from Area 6A-West closure will be discharged to the southeast through a series of manholes, to a reinforced ditch. Surface water runoff from Area 6A-West closure will be discharged to the northeast through a series of manholes, to an overflow structure north of Area 6A-East. All stormwater from the project area eventually discharges to Pidgeon Stream.

When the landfill (6A-West and 6A-East) is closed, runoff from approximately 11.2 acres will flow to the southeast side, and runoff from approximately 12.6 acres will flow to the northeast side see figure in Attachment C-1. The calculated peak flow generated during a 25-year/24-hour rain event is 85 cfs, see calculations in Attachment C-1.

3.0 EROSION CONTROL CALCULATIONS

3.1 Turf Reinforcement Matting

Design of the erosion control matting was analyzed using North American Green's Erosion Control Material Software Version 4.3. 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. Channels with a slope less than 2.5 percent will require temporary matting S75 with Staple Pattern D as manufactured by North American Green or equal. Channels with slopes between 2.5 and 10.0 percent will require permanent matting SC-250 with Staple Pattern E as manufactured by North American Green or equal. See Attachment C-2 for erosion control calculations.

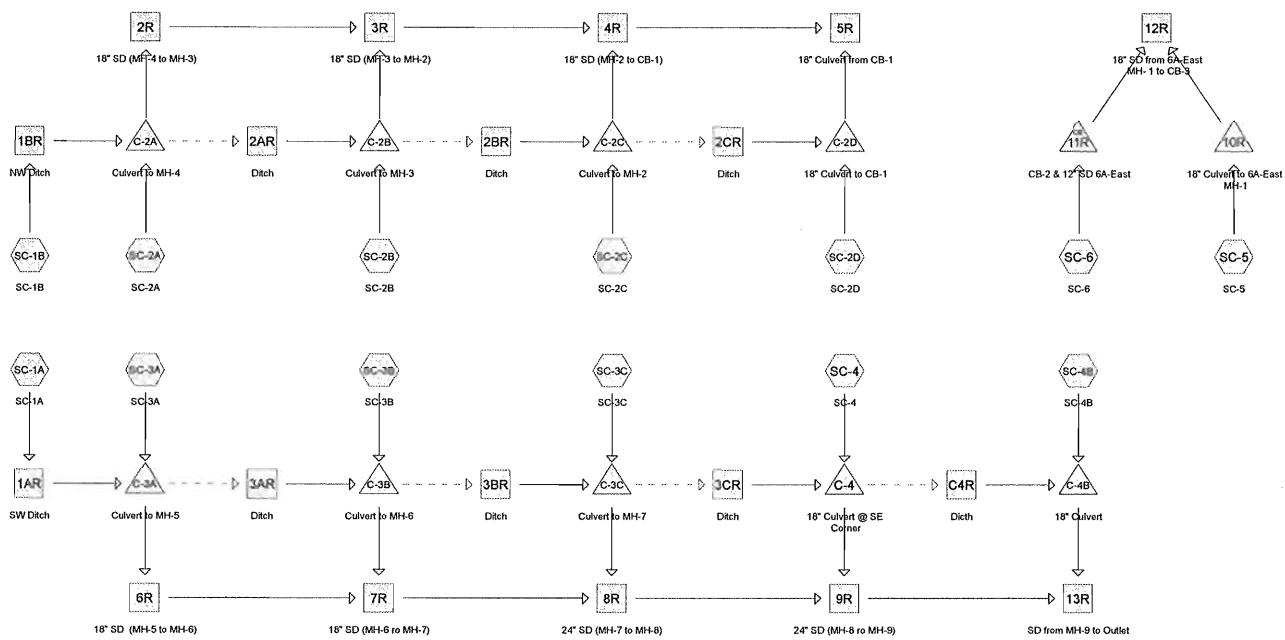
3.2 Stone Check Dams

Stone check dams will be installed on the perimeter ditches as a temporary (construction) erosion control measure. The locations and stone size are shown on the engineering drawings included in Attachment B of the Design Report.

ATTACHMENT C-1

STORMWATER FLOW CALCULATIONS

2-YEAR/24-HOUR STORM



Subcat Reach Pond Link

Drainage Diagram for 6A WEST FINAL CLOSURE - Amendment
Prepared by Sevee & Maher Engineers, Inc., Printed 4/8/2011
HydroCAD® 8.50 s/n 001260 © 2007 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
18.060	71	Cover Soil (SC-2B,SC-2C,SC-2D,SC-3A,SC-3B,SC-3C,SC-4,SC-4B,SC-5,SC-6)
4.385	71	Landfill Cover Soil (SC-1A,SC-1B,SC-2A)
0.046	98	(SC-1B)
0.331	98	Paved parking & roofs (SC-3A,SC-5,SC-6)
0.774	98	Paved parking, HSG C (SC-2B,SC-2C,SC-2D,SC-3B,SC-3C,SC-4,SC-4B)
0.176	98	Paved. Gravel (SC-2A)
23.772		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.774	HSG C	SC-2B, SC-2C, SC-2D, SC-3B, SC-3C, SC-4, SC-4B
0.000	HSG D	
22.998	Other	SC-1A, SC-1B, SC-2A, SC-2B, SC-2C, SC-2D, SC-3A, SC-3B, SC-3C, SC-4, SC-4B, SC-5, SC
23.772		**TOTAL AREA**

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

Subcatchment SC-1A: SC-1A Runoff Area=68,508 sf 0.00% Impervious Runoff Depth>1.06"
Flow Length=540' Tc=8.5 min CN=71 Runoff=2.61 cfs 0.139 af

Subcatchment SC-1B: SC-1B Runoff Area=33,600 sf 5.95% Impervious Runoff Depth>1.18"
Flow Length=465' Tc=8.2 min CN=73 Runoff=1.45 cfs 0.076 af

Subcatchment SC-2A: SC-2A Runoff Area=98,570 sf 7.78% Impervious Runoff Depth>1.18"
Flow Length=350' Tc=8.4 min CN=73 Runoff=4.22 cfs 0.222 af

Subcatchment SC-2B: SC-2B Runoff Area=114,120 sf 4.09% Impervious Runoff Depth>1.12"
Flow Length=665' Tc=8.8 min CN=72 Runoff=4.56 cfs 0.244 af

Subcatchment SC-2C: SC-2C Runoff Area=67,450 sf 4.03% Impervious Runoff Depth>1.12"
Flow Length=515' Tc=8.7 min CN=72 Runoff=2.70 cfs 0.144 af

Subcatchment SC-2D: SC-2D Runoff Area=34,577 sf 7.32% Impervious Runoff Depth>1.18"
Flow Length=295' Tc=6.2 min CN=73 Runoff=1.62 cfs 0.078 af

Subcatchment SC-3A: SC-3A Runoff Area=86,695 sf 7.35% Impervious Runoff Depth>1.18"
Flow Length=400' Tc=8.4 min CN=73 Runoff=3.71 cfs 0.195 af

Subcatchment SC-3B: SC-3B Runoff Area=113,001 sf 6.33% Impervious Runoff Depth>1.18"
Flow Length=685' Tc=8.8 min CN=73 Runoff=4.78 cfs 0.255 af

Subcatchment SC-3C: SC-3C Runoff Area=110,620 sf 5.08% Impervious Runoff Depth>1.12"
Flow Length=650' Tc=8.8 min CN=72 Runoff=4.42 cfs 0.237 af

Subcatchment SC-4: SC-4 Runoff Area=81,750 sf 8.94% Impervious Runoff Depth>1.18"
Flow Length=648' Tc=8.9 min CN=73 Runoff=3.44 cfs 0.184 af

Subcatchment SC-4B: SC-4B Runoff Area=25,930 sf 14.27% Impervious Runoff Depth>1.30"
Flow Length=320' Tc=6.3 min CN=75 Runoff=1.34 cfs 0.065 af

Subcatchment SC-5: SC-5 Runoff Area=99,800 sf 0.85% Impervious Runoff Depth>1.06"
Flow Length=780' Tc=11.4 min CN=71 Runoff=3.39 cfs 0.203 af

Subcatchment SC-6: SC-6 Runoff Area=100,880 sf 7.14% Impervious Runoff Depth>1.18"
Flow Length=585' Tc=11.2 min CN=73 Runoff=3.89 cfs 0.227 af

Reach 1AR: SW Ditch Avg. Depth=0.24' Max Vel=2.92 fps Inflow=2.61 cfs 0.139 af
n=0.030 L=370.0' S=0.0297 '/' Capacity=150.84 cfs Outflow=2.43 cfs 0.139 af

Reach 1BR: NW Ditch Avg. Depth=0.17' Max Vel=2.18 fps Inflow=1.45 cfs 0.076 af
n=0.030 L=495.0' S=0.0242 '/' Capacity=136.21 cfs Outflow=1.27 cfs 0.075 af

Reach 2AR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=319.0' S=0.0580 '/' Capacity=210.67 cfs Outflow=0.00 cfs 0.000 af

Reach 2BR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=167.0' S=0.0509 '/' Capacity=197.36 cfs Outflow=0.00 cfs 0.000 af

Reach 2CR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=108.0' S=0.0741 '/' Capacity=238.09 cfs Outflow=0.00 cfs 0.000 af

Reach 2R: 18" SD (MH-4 to MH-3) Avg. Depth=0.45' Max Vel=11.03 fps Inflow=4.86 cfs 0.296 af
D=18.0" n=0.013 L=319.0' S=0.0580 '/' Capacity=25.30 cfs Outflow=4.80 cfs 0.296 af

Reach 3AR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=356.0' S=0.0590 '/' Capacity=212.47 cfs Outflow=0.00 cfs 0.000 af

Reach 3BR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=316.0' S=0.0728 '/' Capacity=236.01 cfs Outflow=0.00 cfs 0.000 af

Reach 3CR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=347.0' S=0.0749 '/' Capacity=239.46 cfs Outflow=0.00 cfs 0.000 af

Reach 3R: 18" SD (MH-3 to MH-2) Avg. Depth=0.65' Max Vel=12.44 fps Inflow=9.24 cfs 0.540 af
D=18.0" n=0.013 L=167.0' S=0.0497 '/' Capacity=23.42 cfs Outflow=9.15 cfs 0.540 af

Reach 4R: 18" SD (MH-2 to CB-1) Avg. Depth=0.71' Max Vel=14.13 fps Inflow=11.77 cfs 0.684 af
D=18.0" n=0.013 L=108.0' S=0.0593 '/' Capacity=25.57 cfs Outflow=11.70 cfs 0.684 af

Reach 5R: 18" Culvert from CB-1 Avg. Depth=0.44' Max Vel=30.62 fps Inflow=13.09 cfs 0.762 af
D=18.0" n=0.013 L=120.0' S=0.4575 '/' Capacity=71.05 cfs Outflow=13.05 cfs 0.762 af

Reach 6R: 18" SD (MH-5 to MH-6) Avg. Depth=0.48' Max Vel=11.53 fps Inflow=5.74 cfs 0.334 af
D=18.0" n=0.013 L=356.0' S=0.0584 '/' Capacity=25.39 cfs Outflow=5.60 cfs 0.333 af

Reach 7R: 18" SD (MH-6 ro MH-7) Avg. Depth=0.61' Max Vel=14.92 fps Inflow=10.19 cfs 0.588 af
D=18.0" n=0.013 L=316.0' S=0.0766 '/' Capacity=29.07 cfs Outflow=10.01 cfs 0.587 af

Reach 8R: 24" SD (MH-7 to MH-8) Avg. Depth=0.66' Max Vel=15.52 fps Inflow=14.26 cfs 0.824 af
D=24.0" n=0.013 L=347.0' S=0.0697 '/' Capacity=59.74 cfs Outflow=14.00 cfs 0.824 af

Reach 9R: 24" SD (MH-8 ro MH-9) Avg. Depth=0.74' Max Vel=16.20 fps Inflow=17.26 cfs 1.005 af
D=24.0" n=0.013 L=221.0' S=0.0683 '/' Capacity=59.13 cfs Outflow=17.09 cfs 1.004 af

Reach 12R: 18" SD from 6A-East MH- 1 to Avg. Depth=0.43' Max Vel=17.00 fps Inflow=7.19 cfs 0.429 af
D=18.0" n=0.011 L=150.0' S=0.1033 '/' Capacity=39.91 cfs Outflow=7.14 cfs 0.429 af

Reach 13R: SD from MH-9 to Outlet Avg. Depth=0.80' Max Vel=14.47 fps Inflow=17.09 cfs 1.020 af
D=24.0" n=0.013 L=30.0' S=0.0500 '/' Capacity=50.59 cfs Outflow=17.08 cfs 1.020 af

Reach C4R: Dicth Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=221.0' S=0.0498 '/' Capacity=195.17 cfs Outflow=0.00 cfs 0.000 af

Pond 10R: 18" Culvert to 6A-East MH-1 Peak Elev=2,726.93' Storage=166 cf Inflow=3.39 cfs 0.203 af
18.0" x 20.0' Culvert Outflow=3.35 cfs 0.202 af

Pond 11R: CB-2 & 12" SD 6A-East Peak Elev=2,722.86' Inflow=3.89 cfs 0.227 af
12.0" x 105.0' Culvert Outflow=3.89 cfs 0.227 af

Pond C-2A: Culvert to MH-4 Peak Elev=2,772.02' Storage=340 cf Inflow=5.06 cfs 0.297 af
Primary=4.86 cfs 0.296 af Secondary=0.00 cfs 0.000 af Outflow=4.86 cfs 0.296 af

Pond C-2B: Culvert to MH-3 Peak Elev=2,753.47' Storage=222 cf Inflow=4.56 cfs 0.244 af
Primary=4.50 cfs 0.244 af Secondary=0.00 cfs 0.000 af Outflow=4.50 cfs 0.244 af

Pond C-2C: Culvert to MH-2 Peak Elev=2,745.73' Storage=170 cf Inflow=2.70 cfs 0.144 af
Primary=2.64 cfs 0.144 af Secondary=0.00 cfs 0.000 af Outflow=2.64 cfs 0.144 af

Pond C-2D: 18" Culvert to CB-1 Peak Elev=2,736.64' Storage=89 cf Inflow=1.62 cfs 0.078 af
18.0" x 30.0' Culvert Outflow=1.56 cfs 0.078 af

Pond C-3A: Culvert to MH-5 Peak Elev=2,773.12' Storage=228 cf Inflow=5.80 cfs 0.334 af
Primary=5.74 cfs 0.334 af Secondary=0.00 cfs 0.000 af Outflow=5.74 cfs 0.334 af

Pond C-3B: Culvert to MH-6 Peak Elev=2,752.75' Storage=244 cf Inflow=4.78 cfs 0.255 af
Primary=4.69 cfs 0.254 af Secondary=0.00 cfs 0.000 af Outflow=4.69 cfs 0.254 af

Pond C-3C: Culvert to MH-7 Peak Elev=2,728.96' Storage=99 cf Inflow=4.42 cfs 0.237 af
Primary=4.41 cfs 0.237 af Secondary=0.00 cfs 0.000 af Outflow=4.41 cfs 0.237 af

Pond C-4: 18" Culvert @ SE Corner Peak Elev=2,702.69' Storage=476 cf Inflow=3.44 cfs 0.184 af
Primary=3.29 cfs 0.181 af Secondary=0.00 cfs 0.000 af Outflow=3.29 cfs 0.181 af

Pond C-4B: 18" Culvert Peak Elev=2,691.18' Storage=2,160 cf Inflow=1.34 cfs 0.065 af
18.0" x 69.0' Culvert Outflow=0.03 cfs 0.016 af

Total Runoff Area = 23.772 ac Runoff Volume = 2.268 af Average Runoff Depth = 1.14"
94.42% Pervious = 22.445 ac 5.58% Impervious = 1.327 ac

Summary for Subcatchment SC-1A: SC-1A

Runoff = 2.61 cfs @ 11.99 hrs, Volume= 0.139 af, Depth> 1.06"

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 (sf)	CN	Description
*	68,508	71	Landfill Cover Soil
	68,508		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	90	0.1000	0.23		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.5	350	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.5	540	Total			

Summary for Subcatchment SC-1B: SC-1B

Runoff = 1.45 cfs @ 11.98 hrs, Volume= 0.076 af, Depth> 1.18"

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 (sf)	CN	Description
*	31,600	71	Landfill Cover Soil
*	2,000	98	
	33,600	73	Weighted Average
	31,600		Pervious Area
	2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	90	0.1000	0.23		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	275	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=13.00' n= 0.030
8.2	465	Total			

Summary for Subcatchment SC-2A: SC-2A

Runoff = 4.22 cfs @ 11.98 hrs, Volume= 0.222 af, Depth> 1.18"

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 (sf)	CN	Description
*	90,900	71	Landfill Cover Soil
*	7,670	98	Paved. Gravel
	98,570	73	Weighted Average
	90,900		Pervious Area
	7,670		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	140	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	110	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
8.4	350	Total			

Summary for Subcatchment SC-2B: SC-2B

Runoff = 4.56 cfs @ 11.99 hrs, Volume= 0.244 af, Depth> 1.12"

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 (sf)	CN	Description
*	109,450	71	Cover Soil
	4,670	98	Paved parking, HSG C
	114,120	72	Weighted Average
	109,450		Pervious Area
	4,670		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
1.0	145	0.1100	2.32		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.5	110	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.4	310	0.0600	12.83	205.24	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=2.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=14.00' n= 0.030
8.8	665	Total			

Summary for Subcatchment SC-2C: SC-2C

Runoff = 2.70 cfs @ 11.99 hrs, Volume= 0.144 af, Depth> 1.12"

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 (sf)	CN	Description
*	64,730	71	Cover Soil
	2,720	98	Paved parking, HSG C
	67,450	72	Weighted Average
	64,730		Pervious Area
	2,720		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
0.9	120	0.1100	2.32		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.2500	3.50		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.2	155	0.0600	12.83	205.24	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=2.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=14.00' n= 0.030
8.7	515	Total			

Summary for Subcatchment SC-2D: SC-2D

Runoff = 1.62 cfs @ 11.95 hrs, Volume= 0.078 af, Depth> 1.18"

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 (sf)	CN	Description
*	32,047	71	Cover Soil
	2,530	98	Paved parking, HSG C
	34,577	73	Weighted Average
	32,047		Pervious Area
	2,530		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	75	0.1100	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
0.6	125	0.2500	3.50		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.1	95	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=3.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=15.00' n= 0.030
6.2	295	Total			

Summary for Subcatchment SC-3A: SC-3A

Runoff = 3.71 cfs @ 11.98 hrs, Volume= 0.195 af, Depth> 1.18"

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 (sf)	CN	Description
*	80,325	71	Cover Soil
	6,370	98	Paved parking & roofs
	86,695	73	Weighted Average
	80,325		Pervious Area
	6,370		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	135	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.1	65	0.0600	12.82	230.78	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=16.00' n= 0.030
8.4	400	Total			

Summary for Subcatchment SC-3B: SC-3B

Runoff = 4.78 cfs @ 11.99 hrs, Volume= 0.255 af, Depth> 1.18"

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 (sf)	CN	Description
*	105,851	71	Cover Soil
	7,150	98	Paved parking, HSG C
	113,001	73	Weighted Average
	105,851		Pervious Area
	7,150		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	145	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	100	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.5	340	0.0600	12.51	400.40	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
8.8	685	Total			

Summary for Subcatchment SC-3C: SC-3C

Runoff = 4.42 cfs @ 11.99 hrs, Volume= 0.237 af, Depth> 1.12"

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 (sf)	CN	Description
*	105,000	71	Cover Soil
	5,620	98	Paved parking, HSG C
	110,620	72	Weighted Average
	105,000		Pervious Area
	5,620		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.8	105	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.2500	3.50		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.4	305	0.0600	13.28	239.05	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=3.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=15.00' n= 0.030
8.8	650	Total			

Summary for Subcatchment SC-4: SC-4

Runoff = 3.44 cfs @ 11.99 hrs, Volume= 0.184 af, Depth> 1.18"

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 (sf)	CN	Description
*	74,440	71	Cover Soil
	7,310	98	Paved parking, HSG C
	81,750	73	Weighted Average
	74,440		Pervious Area
	7,310		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	95	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
1.7	263	0.1400	2.62		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.3	290	0.0740	14.87	237.97	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.9	648	Total			

Summary for Subcatchment SC-4B: SC-4B

Runoff = 1.34 cfs @ 11.95 hrs, Volume= 0.065 af, Depth> 1.30"

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 (sf)	CN	Description
*	22,230	71	Cover Soil
	3,700	98	Paved parking, HSG C
	25,930	75	Weighted Average
	22,230		Pervious Area
	3,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.2	40	0.2000	3.13		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	180	0.0600	13.32	239.75	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
6.3	320	Total			

Summary for Subcatchment SC-5: SC-5

Runoff = 3.39 cfs @ 12.02 hrs, Volume= 0.203 af, Depth> 1.06"

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 (sf)	CN	Description
*	98,950	71	Cover Soil
	850	98	Paved parking & roofs
	99,800	71	Weighted Average
	98,950		Pervious Area
	850		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
3.0	400	0.1000	2.21		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.1	90	0.0670	14.08	253.35	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
11.4	780	Total			

Summary for Subcatchment SC-6: SC-6

Runoff = 3.89 cfs @ 12.01 hrs, Volume= 0.227 af, Depth> 1.18"

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 (sf)	CN	Description
*	93,680	71	Cover Soil
	7,200	98	Paved parking & roofs
	100,880	73	Weighted Average
	93,680		Pervious Area
	7,200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
2.9	295	0.0600	1.71		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
11.2	585	Total			

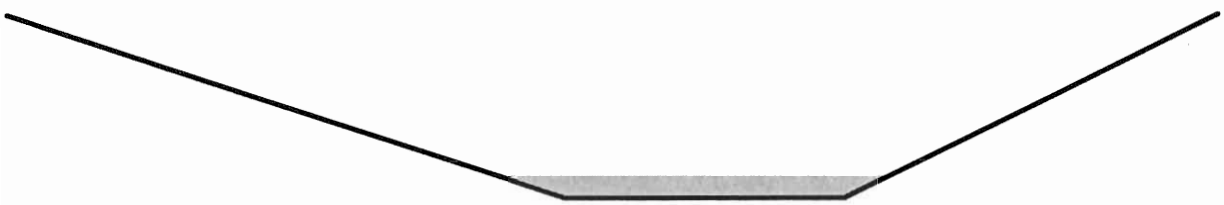
Summary for Reach 1AR: SW Ditch

Inflow Area = 1.573 ac, 0.00% Impervious, Inflow Depth > 1.06" for 2-Yr Storm event
Inflow = 2.61 cfs @ 11.99 hrs, Volume= 0.139 af
Outflow = 2.43 cfs @ 12.05 hrs, Volume= 0.139 af, Atten= 7%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.92 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 7.1 min

Peak Storage= 317 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.84 cfs

3.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 370.0' Slope= 0.0297 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,772.00'



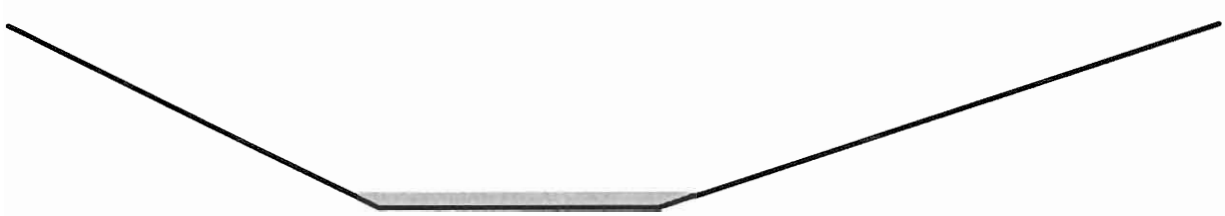
Summary for Reach 1BR: NW Ditch

Inflow Area =	0.771 ac,	5.95% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	1.45 cfs @	11.98 hrs,	Volume=	0.076 af	
Outflow =	1.27 cfs @	12.08 hrs,	Volume=	0.075 af,	Atten= 12%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.18 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 12.2 min

Peak Storage= 296 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 136.21 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 495.0' Slope= 0.0242 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,771.00'



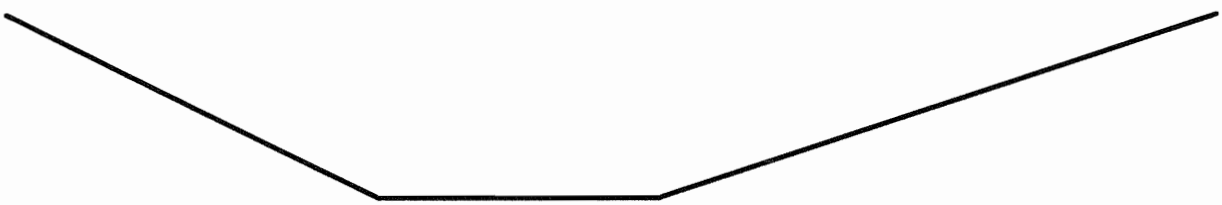
Summary for Reach 2AR: Ditch

Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 210.67 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,770.00', Outlet Invert= 2,751.50'



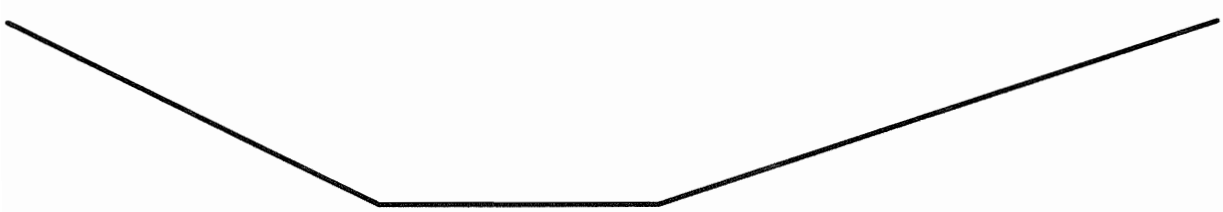
Summary for Reach 2BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 197.36 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 167.0' Slope= 0.0509 '/'
Inlet Invert= 2,751.50', Outlet Invert= 2,743.00'



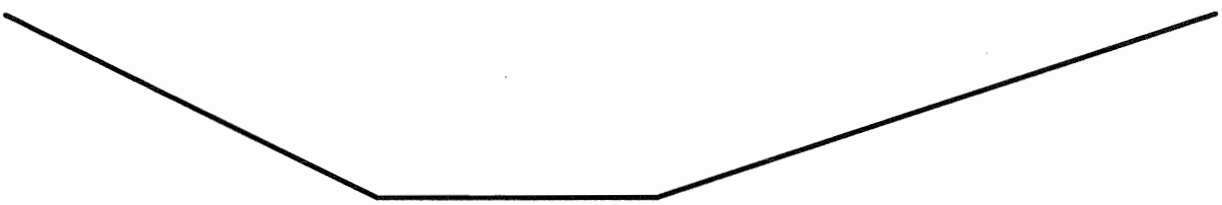
Summary for Reach 2CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 238.09 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 108.0' Slope= 0.0741 '/'
Inlet Invert= 2,743.00', Outlet Invert= 2,735.00'



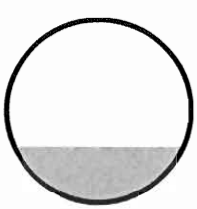
Summary for Reach 2R: 18" SD (MH-4 to MH-3)

Inflow Area =	3.034 ac,	7.32% Impervious,	Inflow Depth >	1.17"	for 2-Yr Storm event
Inflow =	4.86 cfs @	12.01 hrs,	Volume=	0.296 af	
Outflow =	4.80 cfs @	12.02 hrs,	Volume=	0.296 af,	Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.03 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.06 fps, Avg. Travel Time= 1.3 min

Peak Storage= 141 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.30 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,767.90', Outlet Invert= 2,749.40'



Summary for Reach 3AR: Ditch

Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 212.47 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 356.0' Slope= 0.0590 '/'
Inlet Invert= 2,772.00', Outlet Invert= 2,751.00'

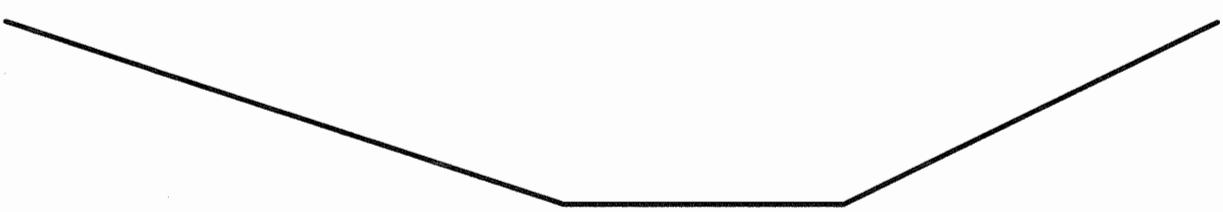
Summary for Reach 3BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 236.01 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 316.0' Slope= 0.0728 '/'
Inlet Invert= 2,751.00', Outlet Invert= 2,728.00'



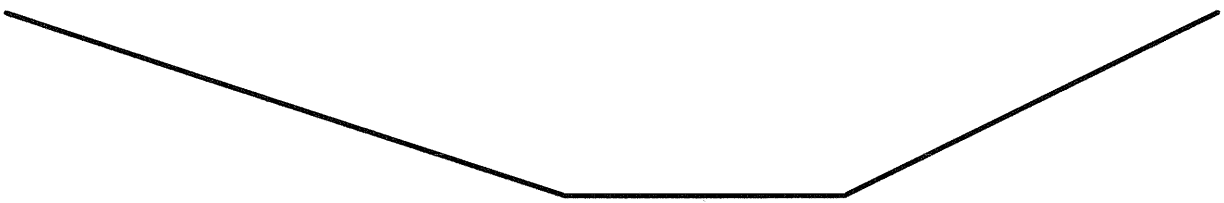
Summary for Reach 3CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 239.46 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 347.0' Slope= 0.0749 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,702.00'



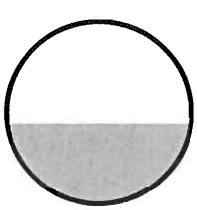
Summary for Reach 3R: 18" SD (MH-3 to MH-2)

Inflow Area =	5.654 ac,	5.82% Impervious,	Inflow Depth >	1.15"	for 2-Yr Storm event
Inflow =	9.24 cfs @	12.01 hrs, Volume=	0.540 af		
Outflow =	9.15 cfs @	12.02 hrs, Volume=	0.540 af,	Atten= 1%,	Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.44 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.60 fps, Avg. Travel Time= 0.6 min

Peak Storage= 124 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 23.42 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 167.0' Slope= 0.0497 '/'
Inlet Invert= 2,749.20', Outlet Invert= 2,740.90'



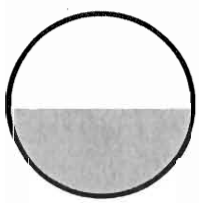
Summary for Reach 4R: 18" SD (MH-2 to CB-1)

Inflow Area =	7.202 ac,	5.44% Impervious,	Inflow Depth >	1.14"	for 2-Yr Storm event
Inflow =	11.77 cfs @	12.01 hrs, Volume=	0.684 af		
Outflow =	11.70 cfs @	12.02 hrs, Volume=	0.684 af,	Atten= 1%,	Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.13 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.27 fps, Avg. Travel Time= 0.3 min

Peak Storage= 90 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.71'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.57 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 108.0' Slope= 0.0593 '/'
Inlet Invert= 2,740.70', Outlet Invert= 2,734.30'



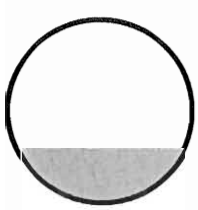
Summary for Reach 5R: 18" Culvert from CB-1

Inflow Area =	7.996 ac,	5.62% Impervious,	Inflow Depth >	1.14"	for 2-Yr Storm event
Inflow =	13.09 cfs @	12.01 hrs, Volume=	0.762 af		
Outflow =	13.05 cfs @	12.01 hrs, Volume=	0.762 af, Atten= 0%, Lag= 0.1 min		

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 30.62 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 11.08 fps, Avg. Travel Time= 0.2 min

Peak Storage= 51 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 71.05 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 120.0' Slope= 0.4575 '/'
Inlet Invert= 2,734.30', Outlet Invert= 2,679.40'



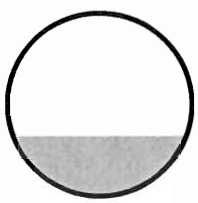
Summary for Reach 6R: 18" SD (MH-5 to MH-6)

Inflow Area =	3.563 ac,	4.10% Impervious,	Inflow Depth >	1.12"	for 2-Yr Storm event
Inflow =	5.74 cfs @	12.01 hrs, Volume=	0.334 af		
Outflow =	5.60 cfs @	12.03 hrs, Volume=	0.333 af, Atten= 2%, Lag= 1.0 min		

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.53 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 4.21 fps, Avg. Travel Time= 1.4 min

Peak Storage= 175 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.39 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 356.0' Slope= 0.0584 '/'
Inlet Invert= 2,769.20', Outlet Invert= 2,748.40'



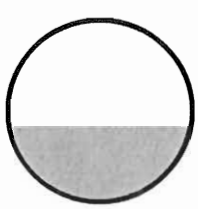
Summary for Reach 7R: 18" SD (MH-6 ro MH-7)

Inflow Area =	6.157 ac,	5.04% Impervious,	Inflow Depth >	1.15"	for 2-Yr Storm event
Inflow =	10.19 cfs @	12.01 hrs,	Volume=	0.588 af	
Outflow =	10.01 cfs @	12.03 hrs,	Volume=	0.587 af,	Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.92 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.48 fps, Avg. Travel Time= 1.0 min

Peak Storage= 214 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 29.07 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 316.0' Slope= 0.0766 '/'
Inlet Invert= 2,748.40', Outlet Invert= 2,724.20'



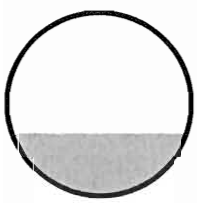
Summary for Reach 8R: 24" SD (MH-7 to MH-8)

Inflow Area =	8.697 ac,	5.05% Impervious,	Inflow Depth >	1.14"	for 2-Yr Storm event
Inflow =	14.26 cfs @	12.01 hrs,	Volume=	0.824 af	
Outflow =	14.00 cfs @	12.02 hrs,	Volume=	0.824 af,	Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.52 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.66 fps, Avg. Travel Time= 1.0 min

Peak Storage= 317 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.74 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 347.0' Slope= 0.0697 '/'
Inlet Invert= 2,724.10', Outlet Invert= 2,699.90'



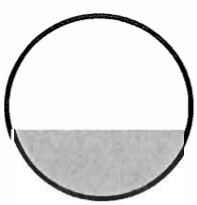
Summary for Reach 9R: 24" SD (MH-8 ro MH-9)

Inflow Area = 10.573 ac, 5.74% Impervious, Inflow Depth > 1.14" for 2-Yr Storm event
Inflow = 17.26 cfs @ 12.02 hrs, Volume= 1.005 af
Outflow = 17.09 cfs @ 12.03 hrs, Volume= 1.004 af, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.20 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.94 fps, Avg. Travel Time= 0.6 min

Peak Storage= 233 cf @ 12.03 hrs, Average Depth at Peak Storage= 0.74'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.13 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 221.0' Slope= 0.0683 '/'
Inlet Invert= 2,699.40', Outlet Invert= 2,684.30'



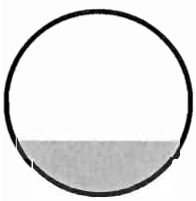
Summary for Reach 12R: 18" SD from 6A-East MH- 1 to CB-3

Inflow Area = 4.607 ac, 4.01% Impervious, Inflow Depth > 1.12" for 2-Yr Storm event
Inflow = 7.19 cfs @ 12.02 hrs, Volume= 0.429 af
Outflow = 7.14 cfs @ 12.03 hrs, Volume= 0.429 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 17.00 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.23 fps, Avg. Travel Time= 0.4 min

Peak Storage= 63 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 39.91 cfs

18.0" Diameter Pipe, n= 0.011
Length= 150.0' Slope= 0.1033 '/'
Inlet Invert= 2,715.50', Outlet Invert= 2,700.00'



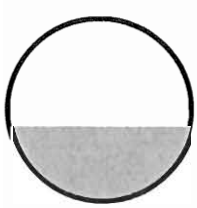
Summary for Reach 13R: SD from MH-9 to Outlet

Inflow Area =	11.169 ac,	6.20% Impervious,	Inflow Depth >	1.10"	for 2-Yr Storm event
Inflow =	17.09 cfs @	12.03 hrs, Volume=	1.020 af		
Outflow =	17.08 cfs @	12.03 hrs, Volume=	1.020 af,	Atten= 0%,	Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 14.47 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.38 fps, Avg. Travel Time= 0.1 min

Peak Storage= 35 cf @ 12.03 hrs, Average Depth at Peak Storage= 0.80'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 50.59 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 30.0' Slope= 0.0500 '/'
Inlet Invert= 2,683.90', Outlet Invert= 2,682.40'



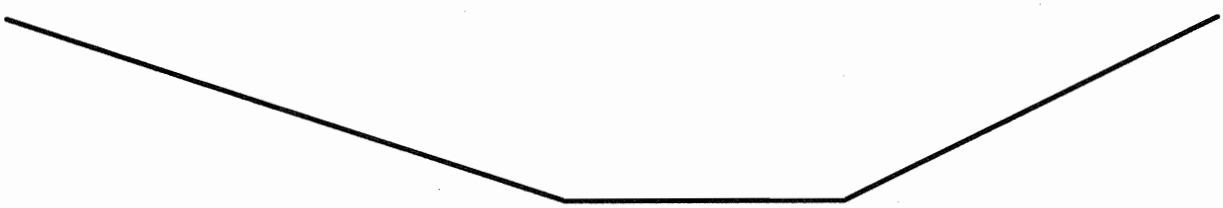
Summary for Reach C4R: Dicth

Inflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af		
Outflow =	0.00 cfs @	0.00 hrs, Volume=	0.000 af,	Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 195.17 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 221.0' Slope= 0.0498 '/'
Inlet Invert= 2,702.00', Outlet Invert= 2,691.00'



Summary for Pond 10R: 18" Culvert to 6A-East MH-1

Inflow Area =	2.291 ac,	0.85% Impervious,	Inflow Depth >	1.06"	for 2-Yr Storm event
Inflow =	3.39 cfs @	12.02 hrs,	Volume=	0.203 af	
Outflow =	3.35 cfs @	12.03 hrs,	Volume=	0.202 af,	Atten= 1%, Lag= 1.0 min
Primary =	3.35 cfs @	12.03 hrs,	Volume=	0.202 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,726.93' @ 12.03 hrs Surf.Area= 306 sf Storage= 166 cf

Plug-Flow detention time= 1.3 min calculated for 0.202 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (865.3 - 864.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,726.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,726.00	50	0	0
2,728.00	600	650	650
2,729.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,726.00'	**18.0" x 20.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,725.00' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.27 cfs @ 12.03 hrs HW=2,726.92' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.27 cfs @ 2.88 fps)

Summary for Pond 11R: CB-2 & 12" SD 6A-East

Inflow Area =	2.316 ac,	7.14% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	3.89 cfs @	12.01 hrs,	Volume=	0.227 af	
Outflow =	3.89 cfs @	12.01 hrs,	Volume=	0.227 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.89 cfs @	12.01 hrs,	Volume=	0.227 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,722.86' @ 12.01 hrs
Flood Elev= 2,728.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,721.00'	**12.0" x 105.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,715.50' S= 0.0524 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.81 cfs @ 12.01 hrs HW=2,722.80' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.81 cfs @ 4.85 fps)

Summary for Pond C-2A: Culvert to MH-4

Inflow Area =	3.034 ac,	7.32% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	5.06 cfs @	12.00 hrs,	Volume=	0.297 af	
Outflow =	4.86 cfs @	12.01 hrs,	Volume=	0.296 af,	Atten= 4%, Lag= 0.8 min
Primary =	4.86 cfs @	12.01 hrs,	Volume=	0.296 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 / 2
Peak Elev= 2,772.02' @ 12.01 hrs Surf.Area= 0 sf Storage= 340 cf
Flood Elev= 2,773.00' Surf.Area= 0 sf Storage= 1,200 cf

Plug-Flow detention time= 3.6 min calculated for 0.296 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (860.1 - 858.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.00'	1,200 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,771.00	0
2,772.00	325
2,773.00	1,200

Device	Routing	Invert	Outlet Devices
#1	Primary	2,771.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,770.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,772.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.79 cfs @ 12.01 hrs HW=2,772.01' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.79 cfs @ 3.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,771.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2B: Culvert to MH-3

Inflow Area =	2.620 ac,	4.09% Impervious,	Inflow Depth >	1.12"	for 2-Yr Storm event
Inflow =	4.56 cfs @	11.99 hrs,	Volume=	0.244 af	
Outflow =	4.50 cfs @	12.00 hrs,	Volume=	0.244 af,	Atten= 1%, Lag= 0.8 min
Primary =	4.50 cfs @	12.00 hrs,	Volume=	0.244 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= 2,753.47' @ 12.00 hrs Surf.Area= 407 sf Storage= 222 cf
Flood Elev= 2,755.50' Surf.Area= 1,150 sf Storage= 1,363 cf

Plug-Flow detention time= 1.2 min calculated for 0.244 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (860.2 - 859.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,752.50'	1,363 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,752.50	50	0	0
2,754.00	600	488	488
2,755.00	1,150	875	1,363

Device	Routing	Invert	Outlet Devices
#1	Primary	2,752.50'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,751.00' S= 0.1500 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,754.00'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.49 cfs @ 12.00 hrs HW=2,753.47' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.49 cfs @ 2.96 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,752.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2C: Culvert to MH-2

Inflow Area =	1.548 ac,	4.03% Impervious,	Inflow Depth >	1.12"	for 2-Yr Storm event
Inflow =	2.70 cfs @	11.99 hrs,	Volume=	0.144 af	
Outflow =	2.64 cfs @	12.00 hrs,	Volume=	0.144 af,	Atten= 2%, Lag= 1.0 min
Primary =	2.64 cfs @	12.00 hrs,	Volume=	0.144 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= 2,745.73' @ 12.00 hrs Surf.Area= 437 sf Storage= 170 cf
Flood Elev= 2,745.00' Surf.Area= 30 sf Storage= 0 cf

Plug-Flow detention time= 1.4 min calculated for 0.144 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (860.3 - 859.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,745.00'	1,180 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,745.00	30	0	0
2,747.00	1,150	1,180	1,180

Device	Routing	Invert	Outlet Devices
#1	Primary	2,745.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,744.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,746.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.62 cfs @ 12.00 hrs HW=2,745.72' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.62 cfs @ 2.55 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,745.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2D: 18" Culvert to CB-1

Inflow Area =	0.794 ac,	7.32% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	1.62 cfs @	11.95 hrs,	Volume=	0.078 af	
Outflow =	1.56 cfs @	11.97 hrs,	Volume=	0.078 af,	Atten= 4%, Lag= 0.9 min
Primary =	1.56 cfs @	11.97 hrs,	Volume=	0.078 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,736.64' @ 11.97 hrs Surf.Area= 227 sf Storage= 89 cf

Plug-Flow detention time= 1.8 min calculated for 0.078 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (855.5 - 854.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,736.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,736.00	50	0	0
2,738.00	600	650	650
2,739.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,736.00'	**18.0" x 30.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,734.30' S= 0.0567 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=1.51 cfs @ 11.97 hrs HW=2,736.63' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.51 cfs @ 2.14 fps)

Summary for Pond C-3A: Culvert to MH-5

Inflow Area =	3.563 ac,	4.10% Impervious,	Inflow Depth > 1.12"	for 2-Yr Storm event
Inflow =	5.80 cfs @	12.00 hrs, Volume=	0.334 af	
Outflow =	5.74 cfs @	12.01 hrs, Volume=	0.334 af, Atten= 1%, Lag= 0.7 min	
Primary =	5.74 cfs @	12.01 hrs, Volume=	0.334 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= 2,773.12' @ 12.01 hrs Surf.Area= 358 sf Storage= 228 cf
Flood Elev= 2,775.00' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 1.0 min calculated for 0.334 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (861.2 - 860.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,772.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,772.00	50	0	0
2,774.00	600	650	650
2,775.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,772.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,771.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,774.50'	**15.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=5.60 cfs @ 12.01 hrs HW=2,773.10' (Free Discharge)
└**1=Culvert** (Inlet Controls 5.60 cfs @ 3.15 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,772.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3B: Culvert to MH-6

Inflow Area =	2.594 ac,	6.33% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	4.78 cfs @	11.99 hrs, Volume=	0.255 af		
Outflow =	4.69 cfs @	12.00 hrs, Volume=	0.254 af,	Atten= 2%,	Lag= 0.9 min
Primary =	4.69 cfs @	12.00 hrs, Volume=	0.254 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= 2,752.75' @ 12.00 hrs Surf.Area= 480 sf Storage= 244 cf
Flood Elev= 2,754.00' Surf.Area= 1,150 sf Storage= 1,256 cf

Plug-Flow detention time= 0.9 min calculated for 0.254 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (857.0 - 856.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,751.75'	1,256 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,751.75	9	0	0
2,753.00	600	381	381
2,754.00	1,150	875	1,256

Device	Routing	Invert	Outlet Devices
#1	Primary	2,751.75'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,750.00' S= 0.1750 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,753.60'	**14.2' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.67 cfs @ 12.00 hrs HW=2,752.74' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.67 cfs @ 2.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,751.75' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3C: Culvert to MH-7

Inflow Area =	2.539 ac,	5.08% Impervious,	Inflow Depth >	1.12"	for 2-Yr Storm event
Inflow =	4.42 cfs @	11.99 hrs,	Volume=	0.237 af	
Outflow =	4.41 cfs @	11.99 hrs,	Volume=	0.237 af,	Atten= 0%, Lag= 0.4 min
Primary =	4.41 cfs @	11.99 hrs,	Volume=	0.237 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= 2,728.96' @ 11.99 hrs Surf.Area= 176 sf Storage= 99 cf
Flood Elev= 2,731.00' Surf.Area= 975 sf Storage= 1,017 cf

Plug-Flow detention time= 0.6 min calculated for 0.236 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (859.8 - 859.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,728.00'	1,017 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,728.00	30	0	0
2,730.00	333	363	363
2,731.00	975	654	1,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,728.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,726.00' S= 0.2000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,730.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.34 cfs @ 11.99 hrs HW=2,728.95' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.34 cfs @ 2.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,728.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4: 18" Culvert @ SE Corner

Inflow Area =	1.877 ac,	8.94% Impervious,	Inflow Depth >	1.18"	for 2-Yr Storm event
Inflow =	3.44 cfs @	11.99 hrs,	Volume=	0.184 af	
Outflow =	3.29 cfs @	12.01 hrs,	Volume=	0.181 af,	Atten= 4%, Lag= 1.4 min
Primary =	3.29 cfs @	12.01 hrs,	Volume=	0.181 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= 2,702.69' @ 12.01 hrs Surf.Area= 514 sf Storage= 476 cf
Flood Elev= 2,705.00' Surf.Area= 1,150 sf Storage= 2,400 cf

Plug-Flow detention time= 14.0 min calculated for 0.181 af (98% of inflow)
Center-of-Mass det. time= 4.8 min (861.1 - 856.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,701.00'	2,400 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,701.00	50	0	0
2,703.00	600	650	650
2,705.00	1,150	1,750	2,400

Device	Routing	Invert	Outlet Devices
#1	Primary	2,701.70'	**18.0" x 13.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,700.10' S= 0.1231 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,704.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.22 cfs @ 12.01 hrs HW=2,702.67' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.22 cfs @ 2.65 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,701.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4B: 18" Culvert

Inflow Area =	0.595 ac, 14.27% Impervious, Inflow Depth > 1.30" for 2-Yr Storm event			
Inflow =	1.34 cfs @	11.95 hrs, Volume=	0.065 af	
Outflow =	0.03 cfs @	17.22 hrs, Volume=	0.016 af, Atten= 98%, Lag= 315.8 min	
Primary =	0.03 cfs @	17.22 hrs, Volume=	0.016 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,691.18' @ 17.22 hrs Surf.Area= 1,603 sf Storage= 2,160 cf
Flood Elev= 2,693.00' Surf.Area= 2,000 sf Storage= 3,641 cf

Plug-Flow detention time= 455.6 min calculated for 0.016 af (24% of inflow)
Center-of-Mass det. time= 315.1 min (1,163.4 - 848.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,688.50'	3,641 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,688.50	20	0	0
2,689.00	111	33	33
2,690.00	1,035	573	606
2,692.00	2,000	3,035	3,641

Device	Routing	Invert	Outlet Devices
#1	Primary	2,691.10'	**18.0" x 69.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,684.20' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=0.03 cfs @ 17.22 hrs HW=2,691.18' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.03 cfs @ 0.75 fps)

25-YEAR/24-HOUR STORM

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

Subcatchment SC-1A: SC-1A Runoff Area=68,508 sf 0.00% Impervious Runoff Depth>2.89"
Flow Length=540' Tc=8.5 min CN=71 Runoff=7.29 cfs 0.379 af

Subcatchment SC-1B: SC-1B Runoff Area=33,600 sf 5.95% Impervious Runoff Depth>3.08"
Flow Length=465' Tc=8.2 min CN=73 Runoff=3.82 cfs 0.198 af

Subcatchment SC-2A: SC-2A Runoff Area=98,570 sf 7.78% Impervious Runoff Depth>3.08"
Flow Length=350' Tc=8.4 min CN=73 Runoff=11.18 cfs 0.582 af

Subcatchment SC-2B: SC-2B Runoff Area=114,120 sf 4.09% Impervious Runoff Depth>2.99"
Flow Length=665' Tc=8.8 min CN=72 Runoff=12.41 cfs 0.652 af

Subcatchment SC-2C: SC-2C Runoff Area=67,450 sf 4.03% Impervious Runoff Depth>2.99"
Flow Length=515' Tc=8.7 min CN=72 Runoff=7.36 cfs 0.386 af

Subcatchment SC-2D: SC-2D Runoff Area=34,577 sf 7.32% Impervious Runoff Depth>3.09"
Flow Length=295' Tc=6.2 min CN=73 Runoff=4.27 cfs 0.204 af

Subcatchment SC-3A: SC-3A Runoff Area=86,695 sf 7.35% Impervious Runoff Depth>3.08"
Flow Length=400' Tc=8.4 min CN=73 Runoff=9.84 cfs 0.512 af

Subcatchment SC-3B: SC-3B Runoff Area=113,001 sf 6.33% Impervious Runoff Depth>3.08"
Flow Length=685' Tc=8.8 min CN=73 Runoff=12.67 cfs 0.667 af

Subcatchment SC-3C: SC-3C Runoff Area=110,620 sf 5.08% Impervious Runoff Depth>2.99"
Flow Length=650' Tc=8.8 min CN=72 Runoff=12.03 cfs 0.632 af

Subcatchment SC-4: SC-4 Runoff Area=81,750 sf 8.94% Impervious Runoff Depth>3.08"
Flow Length=648' Tc=8.9 min CN=73 Runoff=9.14 cfs 0.482 af

Subcatchment SC-4B: SC-4B Runoff Area=25,930 sf 14.27% Impervious Runoff Depth>3.28"
Flow Length=320' Tc=6.3 min CN=75 Runoff=3.37 cfs 0.163 af

Subcatchment SC-5: SC-5 Runoff Area=99,800 sf 0.85% Impervious Runoff Depth>2.89"
Flow Length=780' Tc=11.4 min CN=71 Runoff=9.63 cfs 0.552 af

Subcatchment SC-6: SC-6 Runoff Area=100,880 sf 7.14% Impervious Runoff Depth>3.08"
Flow Length=585' Tc=11.2 min CN=73 Runoff=10.44 cfs 0.595 af

Reach 1AR: SW Ditch Avg. Depth=0.43' Max Vel=4.08 fps Inflow=7.29 cfs 0.379 af
n=0.030 L=370.0' S=0.0297 '/' Capacity=150.84 cfs Outflow=6.85 cfs 0.378 af

Reach 1BR: NW Ditch Avg. Depth=0.31' Max Vel=3.08 fps Inflow=3.82 cfs 0.198 af
n=0.030 L=495.0' S=0.0242 '/' Capacity=136.21 cfs Outflow=3.60 cfs 0.197 af

Reach 2AR: Ditch Avg. Depth=0.19' Max Vel=3.54 fps Inflow=2.57 cfs 0.023 af
n=0.030 L=319.0' S=0.0580 '/' Capacity=210.67 cfs Outflow=2.08 cfs 0.023 af

Reach 2BR: Ditch Avg. Depth=0.19' Max Vel=3.33 fps Inflow=2.44 cfs 0.019 af
n=0.030 L=167.0' S=0.0509 '/' Capacity=197.36 cfs Outflow=1.93 cfs 0.019 af

Reach 2CR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=108.0' S=0.0741 '/' Capacity=238.09 cfs Outflow=0.00 cfs 0.000 af

Reach 2R: 18" SD (MH-4 to MH-3) Avg. Depth=0.70' Max Vel=13.92 fps Inflow=11.28 cfs 0.756 af
D=18.0" n=0.013 L=319.0' S=0.0580 '/' Capacity=25.30 cfs Outflow=11.25 cfs 0.755 af

Reach 3AR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=356.0' S=0.0590 '/' Capacity=212.47 cfs Outflow=0.00 cfs 0.000 af

Reach 3BR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=316.0' S=0.0728 '/' Capacity=236.01 cfs Outflow=0.00 cfs 0.000 af

Reach 3CR: Ditch Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=347.0' S=0.0749 '/' Capacity=239.46 cfs Outflow=0.00 cfs 0.000 af

Reach 3R: 18" SD (MH-3 to MH-2) Avg. Depth=1.18' Max Vel=15.09 fps Inflow=22.47 cfs 1.411 af
D=18.0" n=0.013 L=167.0' S=0.0497 '/' Capacity=23.42 cfs Outflow=22.40 cfs 1.411 af

Reach 4R: 18" SD (MH-2 to CB-1) Avg. Depth=1.50' Max Vel=16.46 fps Inflow=30.75 cfs 1.815 af
D=18.0" n=0.013 L=108.0' S=0.0593 '/' Capacity=25.57 cfs Outflow=26.11 cfs 1.815 af

Reach 5R: 18" Culvert from CB-1 Avg. Depth=0.69' Max Vel=38.53 fps Inflow=30.87 cfs 2.019 af
D=18.0" n=0.013 L=120.0' S=0.4575 '/' Capacity=71.05 cfs Outflow=30.75 cfs 2.019 af

Reach 6R: 18" SD (MH-5 to MH-6) Avg. Depth=0.85' Max Vel=15.02 fps Inflow=15.48 cfs 0.890 af
D=18.0" n=0.013 L=356.0' S=0.0584 '/' Capacity=25.39 cfs Outflow=15.41 cfs 0.889 af

Reach 7R: 18" SD (MH-6 ro MH-7) Avg. Depth=1.15' Max Vel=18.68 fps Inflow=27.28 cfs 1.556 af
D=18.0" n=0.013 L=316.0' S=0.0766 '/' Capacity=29.07 cfs Outflow=27.00 cfs 1.555 af

Reach 8R: 24" SD (MH-7 to MH-8) Avg. Depth=1.17' Max Vel=20.17 fps Inflow=38.53 cfs 2.187 af
D=24.0" n=0.013 L=347.0' S=0.0697 '/' Capacity=59.74 cfs Outflow=38.10 cfs 2.186 af

Reach 9R: 24" SD (MH-8 ro MH-9) Avg. Depth=1.33' Max Vel=20.75 fps Inflow=46.08 cfs 2.665 af
D=24.0" n=0.013 L=221.0' S=0.0683 '/' Capacity=59.13 cfs Outflow=45.78 cfs 2.665 af

Reach 12R: 18" SD from 6A-East MH- 1 to Avg. Depth=0.73' Max Vel=22.24 fps Inflow=19.06 cfs 1.147 af
D=18.0" n=0.011 L=150.0' S=0.1033 '/' Capacity=39.91 cfs Outflow=18.98 cfs 1.146 af

Reach 13R: SD from MH-9 to Outlet Avg. Depth=1.52' Max Vel=18.25 fps Inflow=47.05 cfs 2.778 af
D=24.0" n=0.013 L=30.0' S=0.0500 '/' Capacity=50.59 cfs Outflow=47.02 cfs 2.777 af

Reach C4R: Dicth Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.030 L=221.0' S=0.0498 '/' Capacity=195.17 cfs Outflow=0.00 cfs 0.000 af

Pond 10R: 18" Culvert to 6A-East MH-1 Peak Elev=2,728.16' Storage=755 cf Inflow=9.63 cfs 0.552 af
18.0" x 20.0' Culvert Outflow=8.92 cfs 0.552 af

Pond 11R: CB-2 & 12" SD 6A-East Peak Elev=2,731.29' Inflow=10.44 cfs 0.595 af
12.0" x 105.0' Culvert Outflow=10.44 cfs 0.595 af

Pond C-2A: Culvert to MH-4 Peak Elev=2,772.72' Storage=951 cf Inflow=14.12 cfs 0.779 af
Primary=11.28 cfs 0.756 af Secondary=2.57 cfs 0.023 af Outflow=13.86 cfs 0.779 af

Pond C-2B: Culvert to MH-3 Peak Elev=2,754.21' Storage=625 cf Inflow=13.64 cfs 0.675 af
Primary=11.22 cfs 0.656 af Secondary=2.44 cfs 0.019 af Outflow=13.67 cfs 0.675 af

Pond C-2C: Culvert to MH-2 Peak Elev=2,746.40' Storage=593 cf Inflow=8.89 cfs 0.405 af
Primary=8.37 cfs 0.405 af Secondary=0.00 cfs 0.000 af Outflow=8.37 cfs 0.405 af

Pond C-2D: 18" Culvert to CB-1 Peak Elev=2,737.13' Storage=233 cf Inflow=4.27 cfs 0.204 af
18.0" x 30.0' Culvert Outflow=4.09 cfs 0.204 af

Pond C-3A: Culvert to MH-5 Peak Elev=2,774.34' Storage=888 cf Inflow=16.32 cfs 0.890 af
Primary=15.48 cfs 0.890 af Secondary=0.00 cfs 0.000 af Outflow=15.48 cfs 0.890 af

Pond C-3B: Culvert to MH-6 Peak Elev=2,753.57' Storage=809 cf Inflow=12.67 cfs 0.667 af
Primary=12.14 cfs 0.666 af Secondary=0.00 cfs 0.000 af Outflow=12.14 cfs 0.666 af

Pond C-3C: Culvert to MH-7 Peak Elev=2,729.79' Storage=298 cf Inflow=12.03 cfs 0.632 af
Primary=11.97 cfs 0.632 af Secondary=0.00 cfs 0.000 af Outflow=11.97 cfs 0.632 af

Pond C-4: 18" Culvert @ SE Corner Peak Elev=2,703.87' Storage=1,277 cf Inflow=9.14 cfs 0.482 af
Primary=8.02 cfs 0.479 af Secondary=0.00 cfs 0.000 af Outflow=8.02 cfs 0.479 af

Pond C-4B: 18" Culvert Peak Elev=2,691.69' Storage=3,049 cf Inflow=3.37 cfs 0.163 af
18.0" x 69.0' Culvert Outflow=1.34 cfs 0.113 af

Total Runoff Area = 23.772 ac Runoff Volume = 6.004 af Average Runoff Depth = 3.03"
94.42% Pervious = 22.445 ac 5.58% Impervious = 1.327 ac

Summary for Subcatchment SC-1A: SC-1A

Runoff = 7.29 cfs @ 11.98 hrs, Volume= 0.379 af, Depth> 2.89"

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 (sf)	CN	Description
*	68,508	71	Landfill Cover Soil
	68,508		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	90	0.1000	0.23		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.5	350	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.5	540	Total			

Summary for Subcatchment SC-1B: SC-1B

Runoff = 3.82 cfs @ 11.97 hrs, Volume= 0.198 af, Depth> 3.08"

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 (sf)	CN	Description
*	31,600	71	Landfill Cover Soil
*	2,000	98	
	33,600	73	Weighted Average
	31,600		Pervious Area
	2,000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	90	0.1000	0.23		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.2	275	0.0050	3.87	61.86	**Trap/Vee/Rect Channel Flow, C-D** Bot.W=3.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=13.00' n= 0.030
8.2	465	Total			

Summary for Subcatchment SC-2A: SC-2A

Runoff = 11.18 cfs @ 11.98 hrs, Volume= 0.582 af, Depth> 3.08"

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 (sf)	CN	Description
*	90,900	71	Landfill Cover Soil
*	7,670	98	Paved. Gravel
	98,570	73	Weighted Average
	90,900		Pervious Area
	7,670		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	140	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.5	110	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
8.4	350	Total			

Summary for Subcatchment SC-2B: SC-2B

Runoff = 12.41 cfs @ 11.98 hrs, Volume= 0.652 af, Depth> 2.99"

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 (sf)	CN	Description
*	109,450	71	Cover Soil
	4,670	98	Paved parking, HSG C
	114,120	72	Weighted Average
	109,450		Pervious Area
	4,670		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
1.0	145	0.1100	2.32		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.5	110	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.4	310	0.0600	12.83	205.24	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=2.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=14.00' n= 0.030
8.8	665	Total			

Summary for Subcatchment SC-2C: SC-2C

Runoff = 7.36 cfs @ 11.98 hrs, Volume= 0.386 af, Depth> 2.99"

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 (sf)	CN	Description
*	64,730	71	Cover Soil
	2,720	98	Paved parking, HSG C
	67,450	72	Weighted Average
	64,730		Pervious Area
	2,720		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
0.9	120	0.1100	2.32		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.2500	3.50		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.2	155	0.0600	12.83	205.24	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=2.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=14.00' n= 0.030
8.7	515	Total			

Summary for Subcatchment SC-2D: SC-2D

Runoff = 4.27 cfs @ 11.95 hrs, Volume= 0.204 af, Depth> 3.09"

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 (sf)	CN	Description
*	32,047	71	Cover Soil
	2,530	98	Paved parking, HSG C
	34,577	73	Weighted Average
	32,047		Pervious Area
	2,530		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	75	0.1100	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
0.6	125	0.2500	3.50		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.1	95	0.0500	12.12	218.22	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=3.00' D=2.00' Z= 2.0 & 4.0 '/' Top.W=15.00' n= 0.030
6.2	295	Total			

Summary for Subcatchment SC-3A: SC-3A

Runoff = 9.84 cfs @ 11.98 hrs, Volume= 0.512 af, Depth> 3.08"

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 (sf)	CN	Description
*	80,325	71	Cover Soil
	6,370	98	Paved parking & roofs
	86,695	73	Weighted Average
	80,325		Pervious Area
	6,370		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	135	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	100	0.3300	4.02		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.1	65	0.0600	12.82	230.78	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 3.0 & 4.0 '/' Top.W=16.00' n= 0.030
8.4	400	Total			

Summary for Subcatchment SC-3B: SC-3B

Runoff = 12.67 cfs @ 11.98 hrs, Volume= 0.667 af, Depth> 3.08"

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 (sf)	CN	Description
*	105,851	71	Cover Soil
	7,150	98	Paved parking, HSG C
	113,001	73	Weighted Average
	105,851		Pervious Area
	7,150		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	145	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.4	100	0.3000	3.83		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.5	340	0.0600	12.51	400.40	**Trap/Vee/Rect Channel Flow, D-E** Bot.W=2.00' D=2.00' Z= 12.0 & 2.0 '/' Top.W=30.00' n= 0.030
8.8	685	Total			

Summary for Subcatchment SC-3C: SC-3C

Runoff = 12.03 cfs @ 11.98 hrs, Volume= 0.632 af, Depth> 2.99"

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 (sf)	CN	Description
*	105,000	71	Cover Soil
	5,620	98	Paved parking, HSG C
	110,620	72	Weighted Average
	105,000		Pervious Area
	5,620		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	100	0.1100	0.24		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.8	105	0.1100	2.32		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
0.7	140	0.2500	3.50		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.4	305	0.0600	13.28	239.05	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=3.00' D=2.00' Z= 4.0 & 2.0 '/' Top.W=15.00' n= 0.030
8.8	650	Total			

Summary for Subcatchment SC-4: SC-4

Runoff = 9.14 cfs @ 11.98 hrs, Volume= 0.482 af, Depth> 3.08"

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 (sf)	CN	Description
*	74,440	71	Cover Soil
	7,310	98	Paved parking, HSG C
	81,750	73	Weighted Average
	74,440		Pervious Area
	7,310		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	95	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
1.7	263	0.1400	2.62		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
0.3	290	0.0740	14.87	237.97	**Trap/Vee/Rect Channel Flow, C - D** Bot.W=3.00' D=2.00' Z= 3.0 & 2.0 '/' Top.W=13.00' n= 0.030
8.9	648	Total			

Summary for Subcatchment SC-4B: SC-4B

Runoff = 3.37 cfs @ 11.95 hrs, Volume= 0.163 af, Depth> 3.28"

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 (sf)	CN	Description
*	22,230	71	Cover Soil
	3,700	98	Paved parking, HSG C
	25,930	75	Weighted Average
	22,230		Pervious Area
	3,700		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	100	0.1600	0.28		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.2	40	0.2000	3.13		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.2	180	0.0600	13.32	239.75	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
6.3	320	Total			

Summary for Subcatchment SC-5: SC-5

Runoff = 9.63 cfs @ 12.01 hrs, Volume= 0.552 af, Depth> 2.89"

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 (sf)	CN	Description
*	98,950	71	Cover Soil
	850	98	Paved parking & roofs
	99,800	71	Weighted Average
	98,950		Pervious Area
	850		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
3.0	400	0.1000	2.21		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
0.1	90	0.0670	14.08	253.35	**Trap/Vee/Rect Channel Flow, D - E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
11.4	780	Total			

Summary for Subcatchment SC-6: SC-6

Runoff = 10.44 cfs @ 12.01 hrs, Volume= 0.595 af, Depth> 3.08"

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 (sf)	CN	Description
*	93,680	71	Cover Soil
	7,200	98	Paved parking & roofs
	100,880	73	Weighted Average
	93,680		Pervious Area
	7,200		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.1000	0.23		**Sheet Flow, A - B** Grass: Dense n= 0.240 P2= 3.50"
2.9	295	0.0600	1.71		**Shallow Concentrated Flow, B - C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.89		**Shallow Concentrated Flow, C - D** Short Grass Pasture Kv= 7.0 fps
11.2	585	Total			

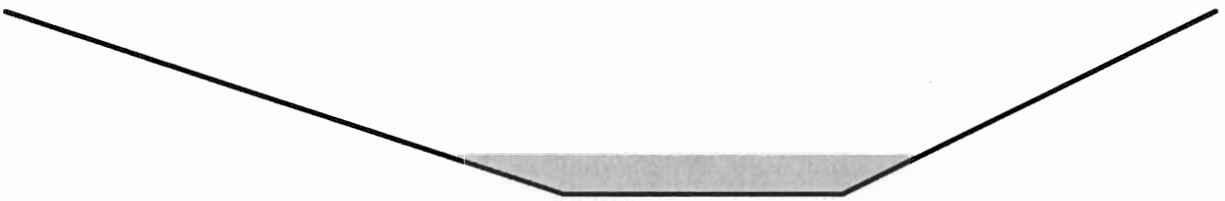
Summary for Reach 1AR: SW Ditch

Inflow Area = 1.573 ac, 0.00% Impervious, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 7.29 cfs @ 11.98 hrs, Volume= 0.379 af
Outflow = 6.85 cfs @ 12.02 hrs, Volume= 0.378 af, Atten= 6%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.08 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 5.4 min

Peak Storage= 650 cf @ 12.00 hrs, Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 150.84 cfs

3.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 370.0' Slope= 0.0297 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,772.00'



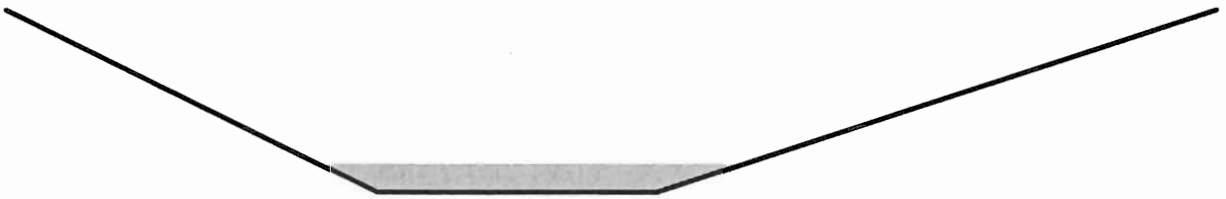
Summary for Reach 1BR: NW Ditch

Inflow Area =	0.771 ac,	5.95% Impervious,	Inflow Depth >	3.08"	for 25-Yr Storm event
Inflow =	3.82 cfs @	11.97 hrs,	Volume=	0.198 af	
Outflow =	3.60 cfs @	12.05 hrs,	Volume=	0.197 af,	Atten= 6%, Lag= 4.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.08 fps, Min. Travel Time= 2.7 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 9.8 min

Peak Storage= 586 cf @ 12.00 hrs, Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 136.21 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 495.0' Slope= 0.0242 '/'
Inlet Invert= 2,783.00', Outlet Invert= 2,771.00'



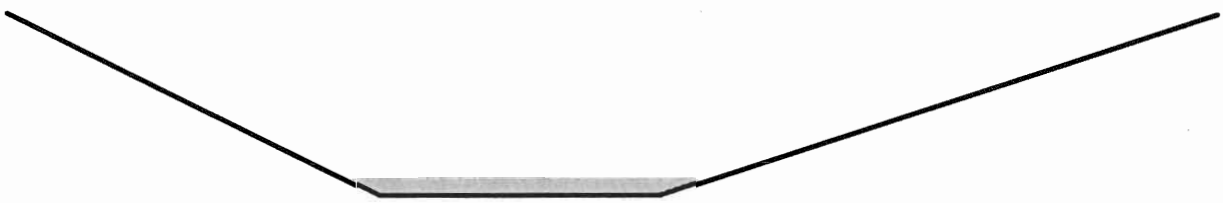
Summary for Reach 2AR: Ditch

Inflow =	2.57 cfs @	12.00 hrs,	Volume=	0.023 af	
Outflow =	2.08 cfs @	12.05 hrs,	Volume=	0.023 af,	Atten= 19%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.54 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 4.1 min

Peak Storage= 213 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 210.67 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,770.00', Outlet Invert= 2,751.50'



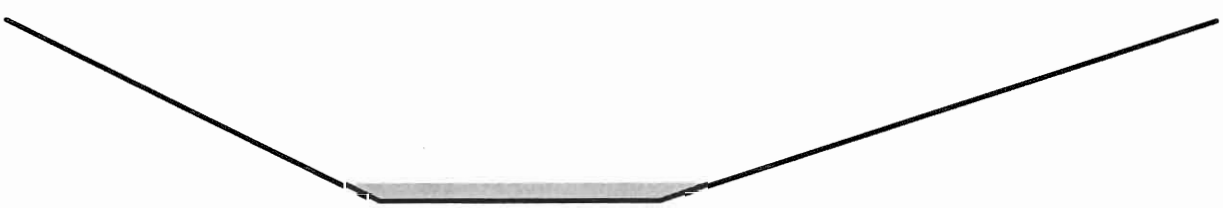
Summary for Reach 2BR: Ditch

Inflow	=	2.44 cfs @	12.00 hrs, Volume=	0.019 af	
Outflow	=	1.93 cfs @	12.03 hrs, Volume=	0.019 af, Atten= 21%, Lag= 1.6 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.33 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.48 fps, Avg. Travel Time= 1.9 min

Peak Storage= 113 cf @ 12.01 hrs, Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 197.36 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 167.0' Slope= 0.0509 '/'
Inlet Invert= 2,751.50', Outlet Invert= 2,743.00'



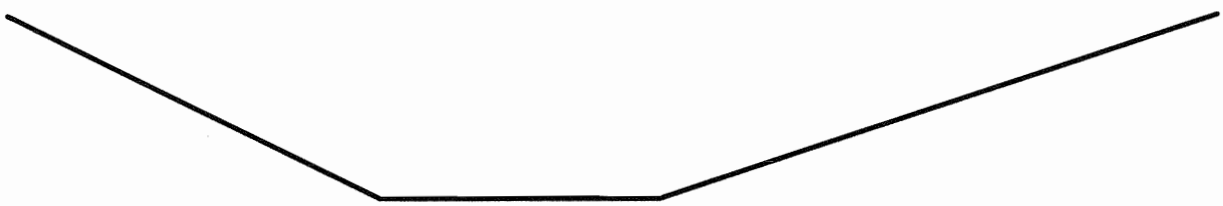
Summary for Reach 2CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 238.09 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 2.0 3.0 '/' Top Width= 13.00'
Length= 108.0' Slope= 0.0741 '/'
Inlet Invert= 2,743.00', Outlet Invert= 2,735.00'



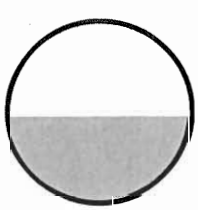
Summary for Reach 2R: 18" SD (MH-4 to MH-3)

Inflow Area =	3.034 ac,	7.32% Impervious,	Inflow Depth >	2.99"	for 25-Yr Storm event
Inflow =	11.28 cfs @	12.00 hrs,	Volume=	0.756 af	
Outflow =	11.25 cfs @	12.01 hrs,	Volume=	0.755 af,	Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 13.92 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.94 fps, Avg. Travel Time= 1.1 min

Peak Storage= 259 cf @ 12.00 hrs, Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.30 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 319.0' Slope= 0.0580 '/'
Inlet Invert= 2,767.90', Outlet Invert= 2,749.40'



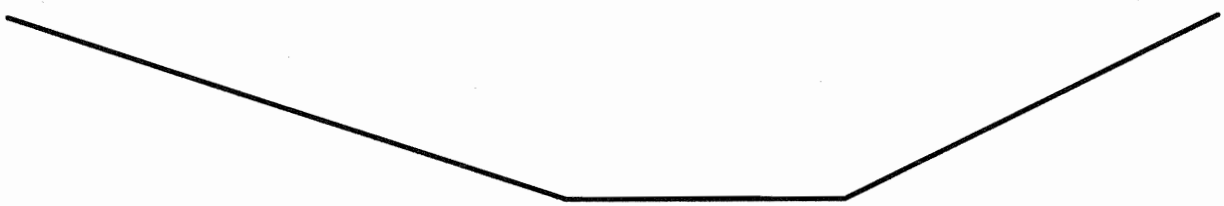
Summary for Reach 3AR: Ditch

Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 212.47 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 356.0' Slope= 0.0590 '/'
Inlet Invert= 2,772.00', Outlet Invert= 2,751.00'



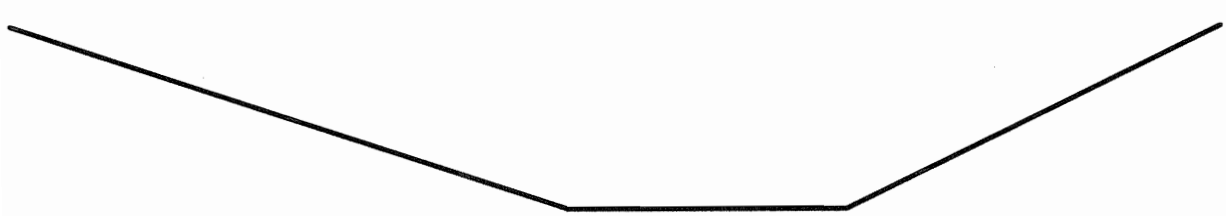
Summary for Reach 3BR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 236.01 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 316.0' Slope= 0.0728 '/'
Inlet Invert= 2,751.00', Outlet Invert= 2,728.00'



Summary for Reach 3CR: Ditch

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 239.46 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 347.0' Slope= 0.0749 '/'
Inlet Invert= 2,728.00', Outlet Invert= 2,702.00'

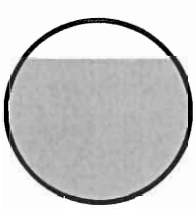
Summary for Reach 3R: 18" SD (MH-3 to MH-2)

Inflow Area =	5.654 ac,	5.82% Impervious,	Inflow Depth >	3.00"	for 25-Yr Storm event
Inflow =	22.47 cfs @	12.01 hrs,	Volume=	1.411 af	
Outflow =	22.40 cfs @	12.01 hrs,	Volume=	1.411 af,	Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.09 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.60 fps, Avg. Travel Time= 0.5 min

Peak Storage= 249 cf @ 12.01 hrs, Average Depth at Peak Storage= 1.18'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 23.42 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 167.0' Slope= 0.0497 '/'
Inlet Invert= 2,749.20', Outlet Invert= 2,740.90'



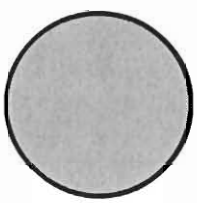
Summary for Reach 4R: 18" SD (MH-2 to CB-1)

Inflow Area =	7.202 ac,	5.44% Impervious,	Inflow Depth >	3.02"	for 25-Yr Storm event
Inflow =	30.75 cfs @	12.01 hrs,	Volume=	1.815 af	
Outflow =	26.11 cfs @	11.95 hrs,	Volume=	1.815 af,	Atten= 15%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.46 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 6.39 fps, Avg. Travel Time= 0.3 min

Peak Storage= 191 cf @ 12.00 hrs, Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.57 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 108.0' Slope= 0.0593 '/'
Inlet Invert= 2,740.70', Outlet Invert= 2,734.30'



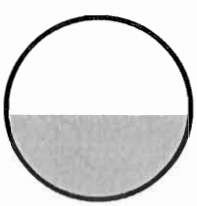
Summary for Reach 5R: 18" Culvert from CB-1

Inflow Area =	7.996 ac,	5.62% Impervious,	Inflow Depth >	3.03"	for 25-Yr Storm event
Inflow =	30.87 cfs @	11.97 hrs, Volume=	2.019 af		
Outflow =	30.75 cfs @	11.97 hrs, Volume=	2.019 af,	Atten= 0%,	Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 38.53 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 13.55 fps, Avg. Travel Time= 0.1 min

Peak Storage= 95 cf @ 11.97 hrs, Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 71.05 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 120.0' Slope= 0.4575 '/'
Inlet Invert= 2,734.30', Outlet Invert= 2,679.40'



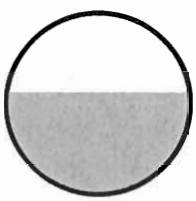
Summary for Reach 6R: 18" SD (MH-5 to MH-6)

Inflow Area =	3.563 ac,	4.10% Impervious,	Inflow Depth >	3.00"	for 25-Yr Storm event
Inflow =	15.48 cfs @	12.02 hrs, Volume=	0.890 af		
Outflow =	15.41 cfs @	12.03 hrs, Volume=	0.889 af,	Atten= 0%,	Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 15.02 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.14 fps, Avg. Travel Time= 1.2 min

Peak Storage= 365 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.85'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 25.39 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 356.0' Slope= 0.0584 '/'
Inlet Invert= 2,769.20', Outlet Invert= 2,748.40'



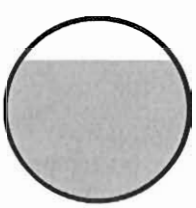
Summary for Reach 7R: 18" SD (MH-6 ro MH-7)

Inflow Area = 6.157 ac, 5.04% Impervious, Inflow Depth > 3.03" for 25-Yr Storm event
Inflow = 27.28 cfs @ 12.01 hrs, Volume= 1.556 af
Outflow = 27.00 cfs @ 12.02 hrs, Volume= 1.555 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 18.68 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 6.68 fps, Avg. Travel Time= 0.8 min

Peak Storage= 460 cf @ 12.02 hrs, Average Depth at Peak Storage= 1.15'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 29.07 cfs

18.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 316.0' Slope= 0.0766 '/'
Inlet Invert= 2,748.40', Outlet Invert= 2,724.20'



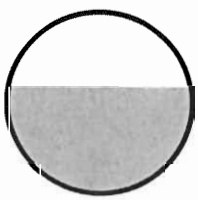
Summary for Reach 8R: 24" SD (MH-7 to MH-8)

Inflow Area = 8.697 ac, 5.05% Impervious, Inflow Depth > 3.02" for 25-Yr Storm event
Inflow = 38.53 cfs @ 12.01 hrs, Volume= 2.187 af
Outflow = 38.10 cfs @ 12.02 hrs, Volume= 2.186 af, Atten= 1%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 20.17 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 6.90 fps, Avg. Travel Time= 0.8 min

Peak Storage= 661 cf @ 12.01 hrs, Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.74 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 347.0' Slope= 0.0697 '/'
Inlet Invert= 2,724.10', Outlet Invert= 2,699.90'



Summary for Reach 9R: 24" SD (MH-8 ro MH-9)

Inflow Area = 10.573 ac, 5.74% Impervious, Inflow Depth > 3.03" for 25-Yr Storm event
Inflow = 46.08 cfs @ 12.02 hrs, Volume= 2.665 af
Outflow = 45.78 cfs @ 12.02 hrs, Volume= 2.665 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 20.75 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 7.26 fps, Avg. Travel Time= 0.5 min

Peak Storage= 489 cf @ 12.02 hrs, Average Depth at Peak Storage= 1.33'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 59.13 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 221.0' Slope= 0.0683 '/'
Inlet Invert= 2,699.40', Outlet Invert= 2,684.30'

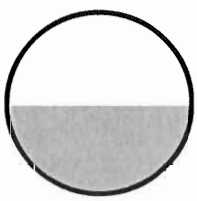
Summary for Reach 12R: 18" SD from 6A-East MH- 1 to CB-3

Inflow Area = 4.607 ac, 4.01% Impervious, Inflow Depth > 2.99" for 25-Yr Storm event
Inflow = 19.06 cfs @ 12.02 hrs, Volume= 1.147 af
Outflow = 18.98 cfs @ 12.02 hrs, Volume= 1.146 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 22.24 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 7.63 fps, Avg. Travel Time= 0.3 min

Peak Storage= 128 cf @ 12.02 hrs, Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 39.91 cfs

18.0" Diameter Pipe, n= 0.011
Length= 150.0' Slope= 0.1033 '/'
Inlet Invert= 2,715.50', Outlet Invert= 2,700.00'



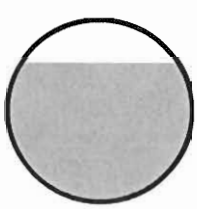
Summary for Reach 13R: SD from MH-9 to Outlet

Inflow Area =	11.169 ac,	6.20% Impervious,	Inflow Depth >	2.98"	for 25-Yr Storm event
Inflow =	47.05 cfs @	12.03 hrs,	Volume=	2.778 af	
Outflow =	47.02 cfs @	12.03 hrs,	Volume=	2.777 af,	Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 18.25 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 6.59 fps, Avg. Travel Time= 0.1 min

Peak Storage= 77 cf @ 12.03 hrs, Average Depth at Peak Storage= 1.52'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 50.59 cfs

24.0" Diameter Pipe, n= 0.013 Corrugated PE, smooth interior
Length= 30.0' Slope= 0.0500 '/'
Inlet Invert= 2,683.90', Outlet Invert= 2,682.40'



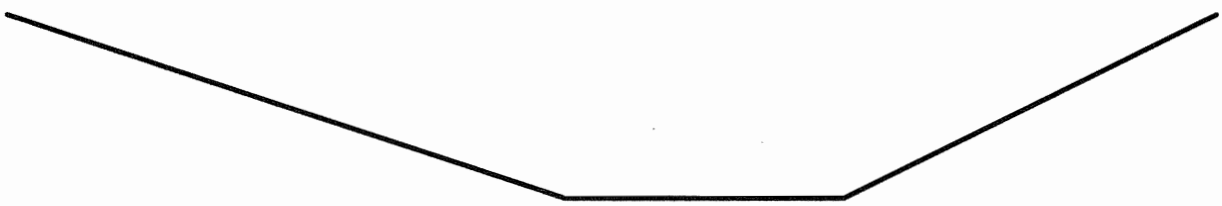
Summary for Reach C4R: Dicth

Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 195.17 cfs

3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 2.0 '/' Top Width= 13.00'
Length= 221.0' Slope= 0.0498 '/'
Inlet Invert= 2,702.00', Outlet Invert= 2,691.00'



Summary for Pond 10R: 18" Culvert to 6A-East MH-1

Inflow Area =	2.291 ac,	0.85% Impervious,	Inflow Depth >	2.89"	for 25-Yr Storm event
Inflow =	9.63 cfs @	12.01 hrs,	Volume=	0.552 af	
Outflow =	8.92 cfs @	12.05 hrs,	Volume=	0.552 af,	Atten= 7%, Lag= 2.2 min
Primary =	8.92 cfs @	12.05 hrs,	Volume=	0.552 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,728.16' @ 12.05 hrs Surf.Area= 689 sf Storage= 755 cf

Plug-Flow detention time= 1.1 min calculated for 0.551 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (835.6 - 834.8)

Volume	Invert	Avail.Storage	Storage Description
#1	2,726.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,726.00	50	0	0
2,728.00	600	650	650
2,729.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,726.00'	**18.0" x 20.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,725.00' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=8.87 cfs @ 12.05 hrs HW=2,728.15' (Free Discharge)
└**1=Culvert** (Inlet Controls 8.87 cfs @ 5.02 fps)

Summary for Pond 11R: CB-2 & 12" SD 6A-East

Inflow Area =	2.316 ac,	7.14% Impervious,	Inflow Depth >	3.08"	for 25-Yr Storm event
Inflow =	10.44 cfs @	12.01 hrs,	Volume=	0.595 af	
Outflow =	10.44 cfs @	12.01 hrs,	Volume=	0.595 af,	Atten= 0%, Lag= 0.0 min
Primary =	10.44 cfs @	12.01 hrs,	Volume=	0.595 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,731.29' @ 12.00 hrs
Flood Elev= 2,728.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	2,721.00'	**12.0" x 105.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,715.50' S= 0.0524 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=10.34 cfs @ 12.01 hrs HW=2,731.10' (Free Discharge)
└**1=Culvert** (Inlet Controls 10.34 cfs @ 13.16 fps)

Summary for Pond C-2A: Culvert to MH-4

Inflow Area =	3.034 ac,	7.32% Impervious,	Inflow Depth >	3.08"	for 25-Yr Storm event
Inflow =	14.12 cfs @	11.99 hrs,	Volume=	0.779 af	
Outflow =	13.86 cfs @	12.00 hrs,	Volume=	0.779 af,	Atten= 2%, Lag= 0.5 min
Primary =	11.28 cfs @	12.00 hrs,	Volume=	0.756 af	
Secondary =	2.57 cfs @	12.00 hrs,	Volume=	0.023 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,772.72' @ 12.00 hrs Surf.Area= 0 sf Storage= 951 cf
Flood Elev= 2,773.00' Surf.Area= 0 sf Storage= 1,200 cf

Plug-Flow detention time= 1.7 min calculated for 0.779 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (830.8 - 829.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,771.00'	1,200 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
2,771.00	0
2,772.00	325
2,773.00	1,200

Device	Routing	Invert	Outlet Devices
#1	Primary	2,771.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,770.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,772.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50

Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=11.24 cfs @ 12.00 hrs HW=2,772.71' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.24 cfs @ 3.93 fps)

Secondary OutFlow Max=2.49 cfs @ 12.00 hrs HW=2,772.71' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.49 cfs @ 1.12 fps)

Summary for Pond C-2B: Culvert to MH-3

Inflow Area =	2.620 ac,	4.09% Impervious,	Inflow Depth > 3.09"	for 25-Yr Storm event
Inflow =	13.64 cfs @	11.99 hrs, Volume=	0.675 af	
Outflow =	13.67 cfs @	12.00 hrs, Volume=	0.675 af,	Atten= 0%, Lag= 0.5 min
Primary =	11.22 cfs @	12.00 hrs, Volume=	0.656 af	
Secondary =	2.44 cfs @	12.00 hrs, Volume=	0.019 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,754.21' @ 12.00 hrs Surf.Area= 715 sf Storage= 625 cf
Flood Elev= 2,755.50' Surf.Area= 1,150 sf Storage= 1,363 cf

Plug-Flow detention time= 1.0 min calculated for 0.675 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (827.6 - 826.9)

Volume	Invert	Avail.Storage	Storage Description
#1	2,752.50'	1,363 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,752.50	50	0	0
2,754.00	600	488	488
2,755.00	1,150	875	1,363

Device	Routing	Invert	Outlet Devices
#1	Primary	2,752.50'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,751.00' S= 0.1500 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,754.00'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=11.18 cfs @ 12.00 hrs HW=2,754.20' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.18 cfs @ 3.92 fps)

Secondary OutFlow Max=2.37 cfs @ 12.00 hrs HW=2,754.20' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.37 cfs @ 1.10 fps)

Summary for Pond C-2C: Culvert to MH-2

Inflow Area =	1.548 ac,	4.03% Impervious,	Inflow Depth >	3.14"	for 25-Yr Storm event
Inflow =	8.89 cfs @	12.00 hrs,	Volume=	0.405 af	
Outflow =	8.37 cfs @	12.02 hrs,	Volume=	0.405 af,	Atten= 6%, Lag= 1.3 min
Primary =	8.37 cfs @	12.02 hrs,	Volume=	0.405 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= 2,746.40' @ 12.02 hrs Surf.Area= 815 sf Storage= 593 cf
Flood Elev= 2,745.00' Surf.Area= 30 sf Storage= 0 cf

Plug-Flow detention time= 1.2 min calculated for 0.404 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (826.2 - 825.3)

Volume	Invert	Avail.Storage	Storage Description
#1	2,745.00'	1,180 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,745.00	30	0	0
2,747.00	1,150	1,180	1,180

Device	Routing	Invert	Outlet Devices
#1	Primary	2,745.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,744.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,746.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=8.14 cfs @ 12.02 hrs HW=2,746.38' (Free Discharge)
└**1=Culvert** (Inlet Controls 8.14 cfs @ 3.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,745.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-2D: 18" Culvert to CB-1

Inflow Area =	0.794 ac,	7.32% Impervious,	Inflow Depth >	3.09"	for 25-Yr Storm event
Inflow =	4.27 cfs @	11.95 hrs,	Volume=	0.204 af	
Outflow =	4.09 cfs @	11.96 hrs,	Volume=	0.204 af,	Atten= 4%, Lag= 1.0 min
Primary =	4.09 cfs @	11.96 hrs,	Volume=	0.204 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,737.13' @ 11.96 hrs Surf.Area= 361 sf Storage= 233 cf

Plug-Flow detention time= 1.4 min calculated for 0.204 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (827.1 - 826.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,736.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,736.00	50	0	0
2,738.00	600	650	650
2,739.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,736.00'	**18.0" x 30.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,734.30' S= 0.0567 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.98 cfs @ 11.96 hrs HW=2,737.11' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.98 cfs @ 2.83 fps)

Summary for Pond C-3A: Culvert to MH-5

Inflow Area =	3.563 ac,	4.10% Impervious,	Inflow Depth > 3.00"	for 25-Yr Storm event
Inflow =	16.32 cfs @	11.99 hrs, Volume=	0.890 af	
Outflow =	15.48 cfs @	12.02 hrs, Volume=	0.890 af, Atten= 5%, Lag= 1.5 min	
Primary =	15.48 cfs @	12.02 hrs, Volume=	0.890 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= 2,774.34' @ 12.02 hrs Surf.Area= 789 sf Storage= 888 cf
Flood Elev= 2,775.00' Surf.Area= 1,150 sf Storage= 1,525 cf

Plug-Flow detention time= 0.9 min calculated for 0.888 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (832.0 - 831.4)

Volume	Invert	Avail.Storage	Storage Description
#1	2,772.00'	1,525 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,772.00	50	0	0
2,774.00	600	650	650
2,775.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,772.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,771.00' S= 0.1000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,774.50'	**15.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=15.22 cfs @ 12.02 hrs HW=2,774.30' (Free Discharge)
└─**1=Culvert** (Inlet Controls 15.22 cfs @ 4.84 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,772.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3B: Culvert to MH-6

Inflow Area =	2.594 ac,	6.33% Impervious,	Inflow Depth >	3.08"	for 25-Yr Storm event
Inflow =	12.67 cfs @	11.98 hrs,	Volume=	0.667 af	
Outflow =	12.14 cfs @	12.00 hrs,	Volume=	0.666 af,	Atten= 4%, Lag= 1.3 min
Primary =	12.14 cfs @	12.00 hrs,	Volume=	0.666 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= 2,753.57' @ 12.00 hrs Surf.Area= 912 sf Storage= 809 cf
Flood Elev= 2,754.00' Surf.Area= 1,150 sf Storage= 1,256 cf

Plug-Flow detention time= 0.9 min calculated for 0.665 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (828.9 - 828.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,751.75'	1,256 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,751.75	9	0	0
2,753.00	600	381	381
2,754.00	1,150	875	1,256

Device	Routing	Invert	Outlet Devices
#1	Primary	2,751.75'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,750.00' S= 0.1750 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,753.60'	**14.2' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=12.10 cfs @ 12.00 hrs HW=2,753.56' (Free Discharge)
└─**1=Culvert** (Inlet Controls 12.10 cfs @ 4.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,751.75' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-3C: Culvert to MH-7

Inflow Area =	2.539 ac,	5.08% Impervious,	Inflow Depth >	2.99"	for 25-Yr Storm event
Inflow =	12.03 cfs @	11.98 hrs,	Volume=	0.632 af	
Outflow =	11.97 cfs @	11.99 hrs,	Volume=	0.632 af,	Atten= 1%, Lag= 0.5 min
Primary =	11.97 cfs @	11.99 hrs,	Volume=	0.632 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= 2,729.79' @ 11.99 hrs Surf.Area= 302 sf Storage= 298 cf
Flood Elev= 2,731.00' Surf.Area= 975 sf Storage= 1,017 cf

Plug-Flow detention time= 0.5 min calculated for 0.631 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (830.8 - 830.5)

Volume	Invert	Avail.Storage	Storage Description
#1	2,728.00'	1,017 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,728.00	30	0	0
2,730.00	333	363	363
2,731.00	975	654	1,017

Device	Routing	Invert	Outlet Devices
#1	Primary	2,728.00'	**24.0" x 10.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 2,726.00' S= 0.2000 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,730.50'	**10.5' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=11.70 cfs @ 11.99 hrs HW=2,729.76' (Free Discharge)
└**1=Culvert** (Inlet Controls 11.70 cfs @ 3.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,728.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4: 18" Culvert @ SE Corner

Inflow Area =	1.877 ac,	8.94% Impervious,	Inflow Depth >	3.08"	for 25-Yr Storm event
Inflow =	9.14 cfs @	11.98 hrs,	Volume=	0.482 af	
Outflow =	8.02 cfs @	12.03 hrs,	Volume=	0.479 af,	Atten= 12%, Lag= 2.6 min
Primary =	8.02 cfs @	12.03 hrs,	Volume=	0.479 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= 2,703.87' @ 12.03 hrs Surf.Area= 840 sf Storage= 1,277 cf
Flood Elev= 2,705.00' Surf.Area= 1,150 sf Storage= 2,400 cf

Plug-Flow detention time= 7.6 min calculated for 0.479 af (99% of inflow)
Center-of-Mass det. time= 3.5 min (831.8 - 828.2)

Volume	Invert	Avail.Storage	Storage Description
#1	2,701.00'	2,400 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,701.00	50	0	0
2,703.00	600	650	650
2,705.00	1,150	1,750	2,400

Device	Routing	Invert	Outlet Devices
#1	Primary	2,701.70'	**18.0" x 13.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,700.10' S= 0.1231 '/' Cc= 0.900 n= 0.012
#2	Secondary	2,704.50'	**3.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=7.86 cfs @ 12.03 hrs HW=2,703.82' (Free Discharge)
└**1=Culvert** (Inlet Controls 7.86 cfs @ 4.45 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2,701.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond C-4B: 18" Culvert

Inflow Area =	0.595 ac, 14.27% Impervious, Inflow Depth > 3.28" for 25-Yr Storm event			
Inflow =	3.37 cfs @	11.95 hrs, Volume=	0.163 af	
Outflow =	1.34 cfs @	12.07 hrs, Volume=	0.113 af, Atten= 60%, Lag= 7.3 min	
Primary =	1.34 cfs @	12.07 hrs, Volume=	0.113 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,691.69' @ 12.07 hrs Surf.Area= 1,852 sf Storage= 3,049 cf
Flood Elev= 2,693.00' Surf.Area= 2,000 sf Storage= 3,641 cf

Plug-Flow detention time= 173.2 min calculated for 0.113 af (69% of inflow)
Center-of-Mass det. time= 70.3 min (891.8 - 821.6)

Volume	Invert	Avail.Storage	Storage Description
#1	2,688.50'	3,641 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,688.50	20	0	0
2,689.00	111	33	33
2,690.00	1,035	573	606
2,692.00	2,000	3,035	3,641

Device	Routing	Invert	Outlet Devices
#1	Primary	2,691.10'	**18.0" x 69.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,684.20' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=1.29 cfs @ 12.07 hrs HW=2,691.68' (Free Discharge)
└─**1=Culvert** (Inlet Controls 1.29 cfs @ 2.05 fps)

ATTACHMENT C-2

EROSION CONTROL CALCULATIONS

PROJECT	COMP. BY	JOB NO.
EVERGREEN PACKAGING AREA 6A WEST CLOSURE AMENDMENT CHANNEL LINING DESIGN	BDP	
	CHK. BY	DATE 4/7/2011

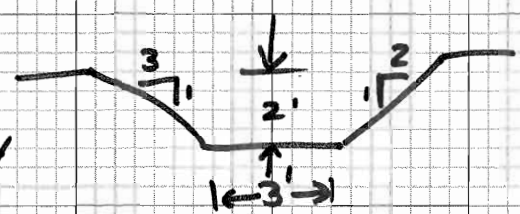
TEMPORARY LINING DESIGN

ASSUMPTIONS:

$Q_{MAX} = 5.8$ cfs

$S_{MAX} = 10\%$

CHANNEL GEOMETRY



RESULTS:

1. FOR CHANNELS WITH SLOPE LESS THAN 2.5% USE NORTH AMERICAN GREEN (NAG) S75 EROSION CONTROL MATTING W/ STAPLE PATTERN D.
2. FOR CHANNEL SLOPES GREATER THAN 2.5% AND NO GREATER THAN 10% USE NAG SC250 EROSION CONTROL MATTING W/STAPLE PATTERN E.

(SEE ATTACHED)

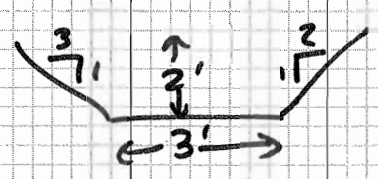
PERMANENT LINING DESIGN

ASSUMPTIONS:

$Q_{MAX} = 16.3$ cfs

$S_{MAX} = 10\%$

Channel Geometry



RESULT

1. GRASS (UNREINFORCED) IS ACCEPTABLE FOR SLOPES L.T. 2.5%
2. SC250 W/STAPLE E IS ACCEPTABLE FOR SLOPES 2.5-10%.

TEMP LINING

CHANNELS SLOPE L.T. 2.5%

North American Green - ECMDS Version 4.3 | 4/7/2011 | 01:49 PM

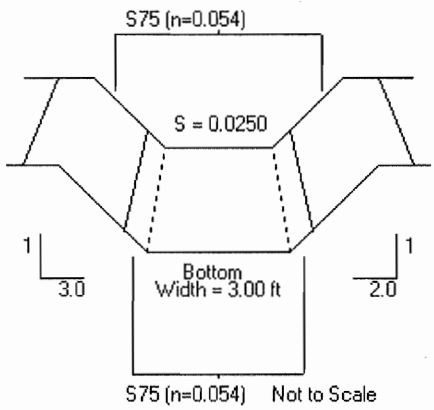
HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.8	2.0	2.39	2.43	0.41	0.55

COMPOSITE RESULTS

Low-Flow Channel Depth (ft)	Low Flow Perimeter (ft)	Channel Perimeter (ft)	Effective Manning's 'n'	Shear Ratio
2.00	5.99	5.99	0.054	0.00

MAX Q FOR 2-YR STORM CHANNEL



LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Low Flow	S75	Unvegetated					1.55	0.86	1.80	STABLE ✓
	Staple D									
Side Slope	S75	Unvegetated					1.55	0.00	N/A	STABLE ✓
	Staple D									

∴ TEMP CHANNEL LINING FOR CHANNELS W/SLOPES >2.5%

S75 W/STAPLE D

PERM LINING

CHANNEL SLOPE > 2.5%

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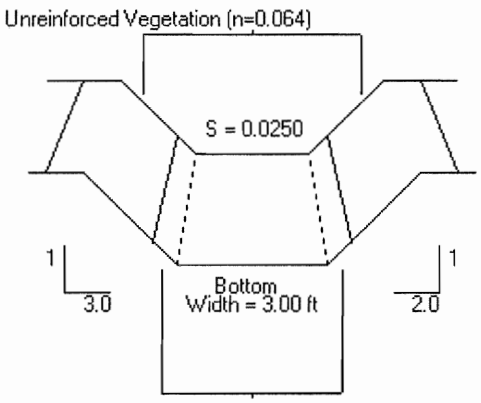
HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
16.3	2.0	2.81	5.80	0.67	1.04

COMPOSITE RESULTS

Low-Flow Channel Depth (ft)	Low Flow Perimeter (ft)	Channel Perimeter (ft)	Effective Manning's 'n'	Shear Ratio
2.00	8.60	8.60	0.064	0.00

CHANNEL MAX Q FOR 25-YR STORM



LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Low Flow	Unreinforced	Vegetation		C	Mix	75-95%	4.20	1.62	2.60	STABLE
		Soil	Silt Loam				0.035	0.024	1.47	STABLE
Side Slope	Unreinforced	Vegetation		C	Mix	75-95%	4.20	0.00	N/A	STABLE
		Soil	Silt Loam				0.035	0.000	N/A	STABLE

∴ TEMP. CHANNEL LINING

NAG S75 W/STAPLE D

TEMP LINING

CHANNEL SLOPE >2.5% <10%

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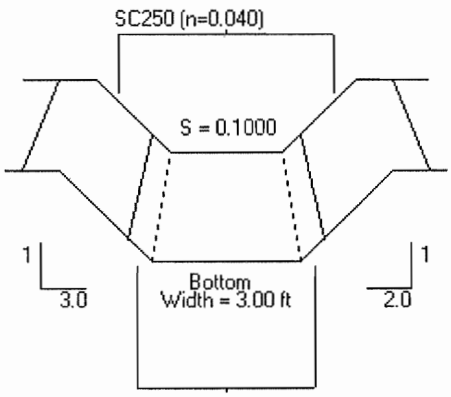
HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
5.8	2.0	4.76	1.22	0.26	0.32

COMPOSITE RESULTS

Low-Flow Channel Depth (ft)	Low Flow Perimeter (ft)	Channel Perimeter (ft)	Effective Manning's 'n'	Shear Ratio
2.00	4.73	4.73	0.040	0.00

CHANNEL MAX Q FOR 2-YR STORM.



Not to Scale

LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Low Flow	SC250	Unvegetated	1				3.00	2.00	1.50	STABLE ✓
	Staple E									
Side Slope	SC250	Unvegetated	1				3.00	0.00	N/A	STABLE ✓
	Staple E									

∴ USE NAG SC250 W/STAPLE PATTERN E ON ALL CHANNELS OF ~~>2.5% & >~~ <2.5% & >10%

PERM. LINING

CHANNEL SLOPE

2.5% – 10%

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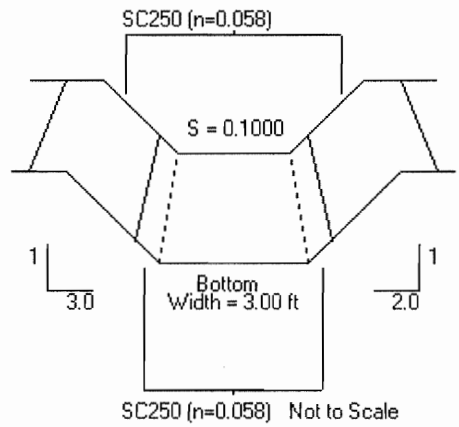
HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
16.3	2.0	5.03	3.24	0.48	0.69

COMPOSITE RESULTS

Low-Flow Channel Depth (ft)	Low Flow Perimeter (ft)	Channel Perimeter (ft)	Effective Manning's 'n'	Shear Ratio
2.00	6.71	6.71	0.058	0.00

CHANNEL MAX Q FOR 25-YR STORM



LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics: Phase	Class	Type	Density	Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
Low Flow	SC250	Vegetation	3	C	Mix	75-95%	10.00	4.29	2.33	STABLE
	Staple E	Soil	Silt Loam				0.800	0.428	1.87	STABLE
Side Slope	SC250	Vegetation	3	C	Mix	75-95%	10.00	0.00	N/A	STABLE
	Staple E	Soil	Silt Loam				0.800	0.000	N/A	STABLE

ATTACHMENT D

STABILITY ANALYSIS

GEOTECHNICAL EVALUATION
FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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

SME
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GEOTECHNICAL EVALUATION
LANDFILL NO. 6 AREA A-WEST – AMENDMENT
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

1.0 INTRODUCTION

Evergreen Packaging's Canton Mill (Evergreen) (formerly Blue Ridge Paper Products, Inc.) is proposing an alternate cover system from the approved closure outlined in the Operations Manual for Landfill No. 6 Area A-West (Area 6A-West). The approved standard cover consists of a uniform 3 feet of soil over Area 6A-West. This Amendment will consist of a soil cover that will range in thickness from 3 to 27 feet. The additional soil over the crown will increase the crown slope to approximately 12 percent. The added soil thickness will increase the pressure on the existing waste surface, which will impart additional stresses within the waste mass. SME has evaluated slope stability with respect to additional loading from the cover soil placement. Figure 1-1 shows the approved final grading plan for the Project and Figure 1-2 shows the amended final grading plan. Figure 1-3 shows an isopach map of proposed fill thickness to accomplish the Closure Plan amendment. An interpretive Landfill cross-section showing the existing Landfill wastes and drainage layers, the proposed additional cover soil, and the cover buildup is presented as Figure 1-4. Evergreen is also proposing to use off-site borrow soil as the lower 18 inches of an approximately forty-inch thick final cover system for the Area 6A-West Landfill.

The primary geotechnical concern for placing the additional cover soil over the existing Area 6A-West waste is the potential for development of temporary excess pore-water pressures in the underlying waste due to the applied borrow soil load. Should such excess pore-water pressure conditions occur in the waste a corresponding temporary reduction in waste shear strength could result, which could cause a temporary reduction in slope stability for the Landfill. Since shear strength of the existing waste in 6A-West is critical to maintaining slope stability of the overall waste mass, as well as the newly placed borrow soil, only limited amounts of temporary waste strength loss can be tolerated without reducing slope stability safety factors to potentially unacceptable values. To understand and avoid development of this condition, SME has evaluated the geotechnical components of the Project with respect to maintaining the physical integrity and function of the solid waste disposal facility and its systems as described in the original permit for Area 6A-West (i.e., NCDENR Permit #44-06). The evaluation included analysis of the waste mass and final cover slope stability, understanding the fill placement and

LEGEND

PERMITTED FINAL WASTE GRADES

EXISTING TOPOGRAPHY

100 0 200 FEET

FIGURE 1-1
PERMITTED FINAL WASTE GRADES
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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DWG: 6A-WEST-AMENDMENT LMN: PFWG-FIGURE CTB: SME-STD REV: 4/7/11

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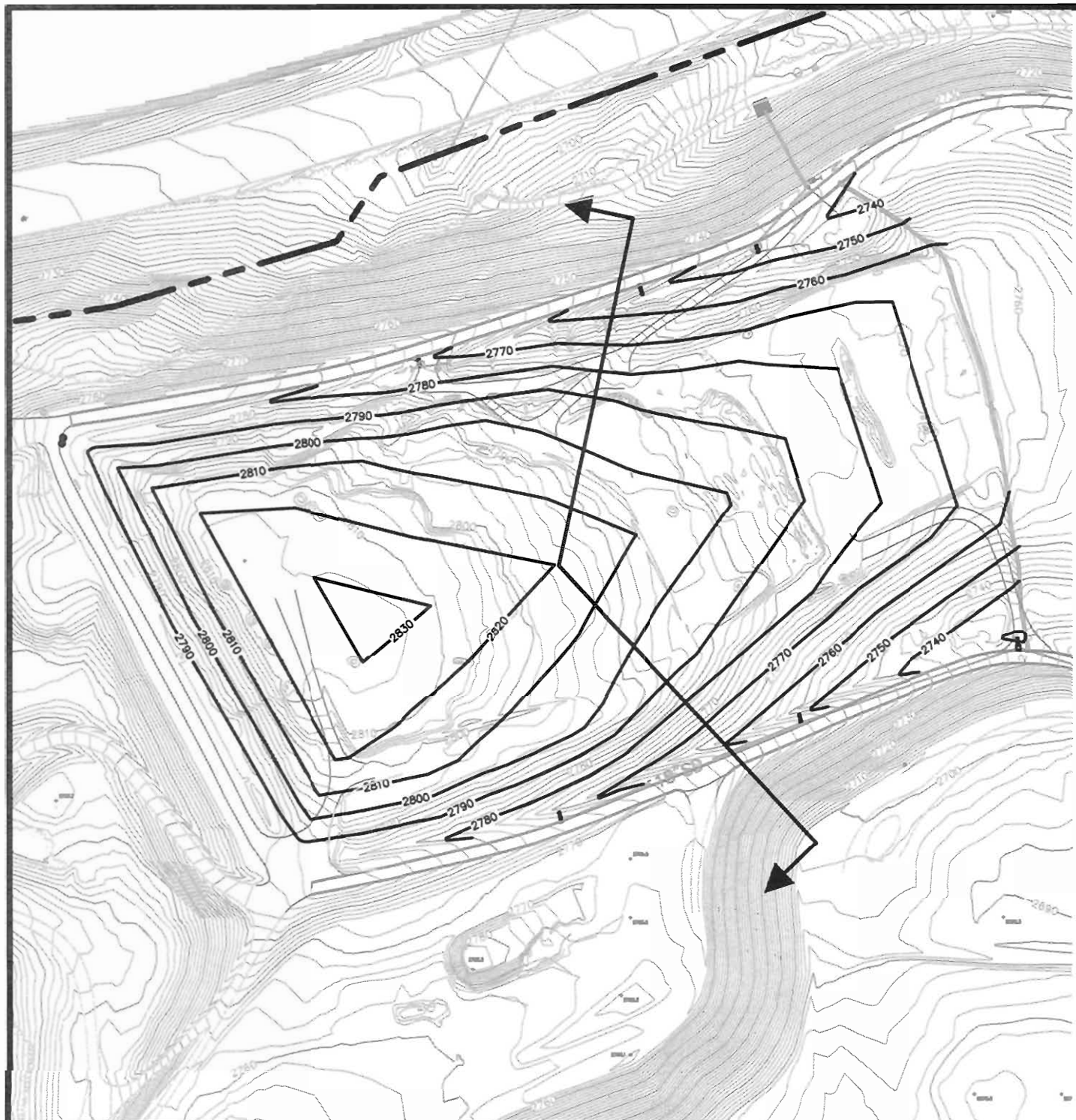

NOTE

INTERPRETIVE STABILITY CROSS-SECTION SHOWN ON FIGURE 2-1.

LEGEND

AMENDMENT FINAL COVER GRADES

EXISTING TOPOGRAPHY

INTERPRETIVE STABILITY CROSS-SECTION LOCATION

100 0 200 FEET

FIGURE 1-2
PROPOSED FINAL GRADING PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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N

NOTE

FILL THICKNESS REPRESENTS THE PROPOSED ADDITIONAL BORROW AND COVER SOIL TO BE PLACED ABOVE THE APPROVED FINAL GRADES.

LEGEND

15 — FILL THICKNESS ISOPACH CONTOURS (FEET)

EXISTING TOPOGRAPHY

100 0 200 FEET

FIGURE 1-3
FILL THICKNESS ISOPACH MAP
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CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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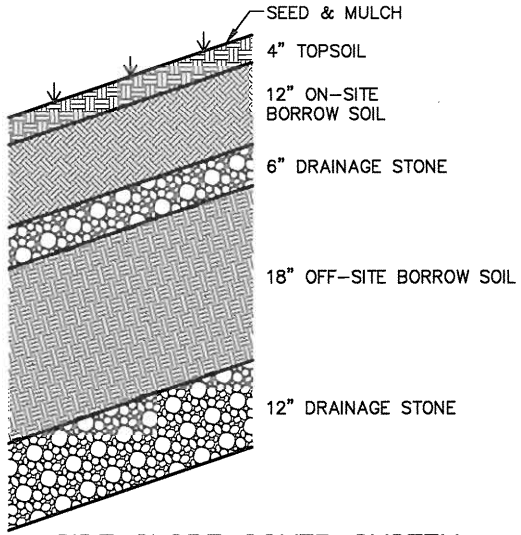
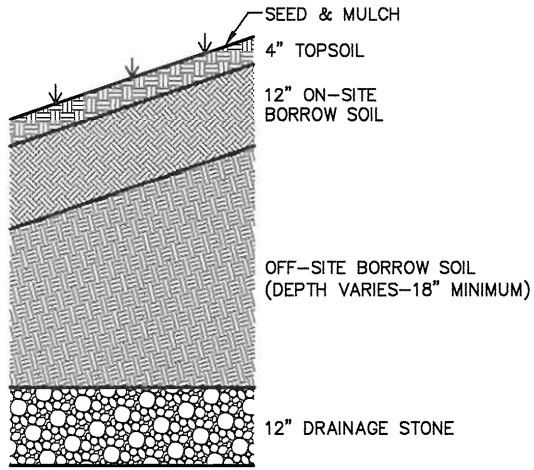


SIDE SLOPE COVER SYSTEM



TOP SLOPE COVER SYSTEM

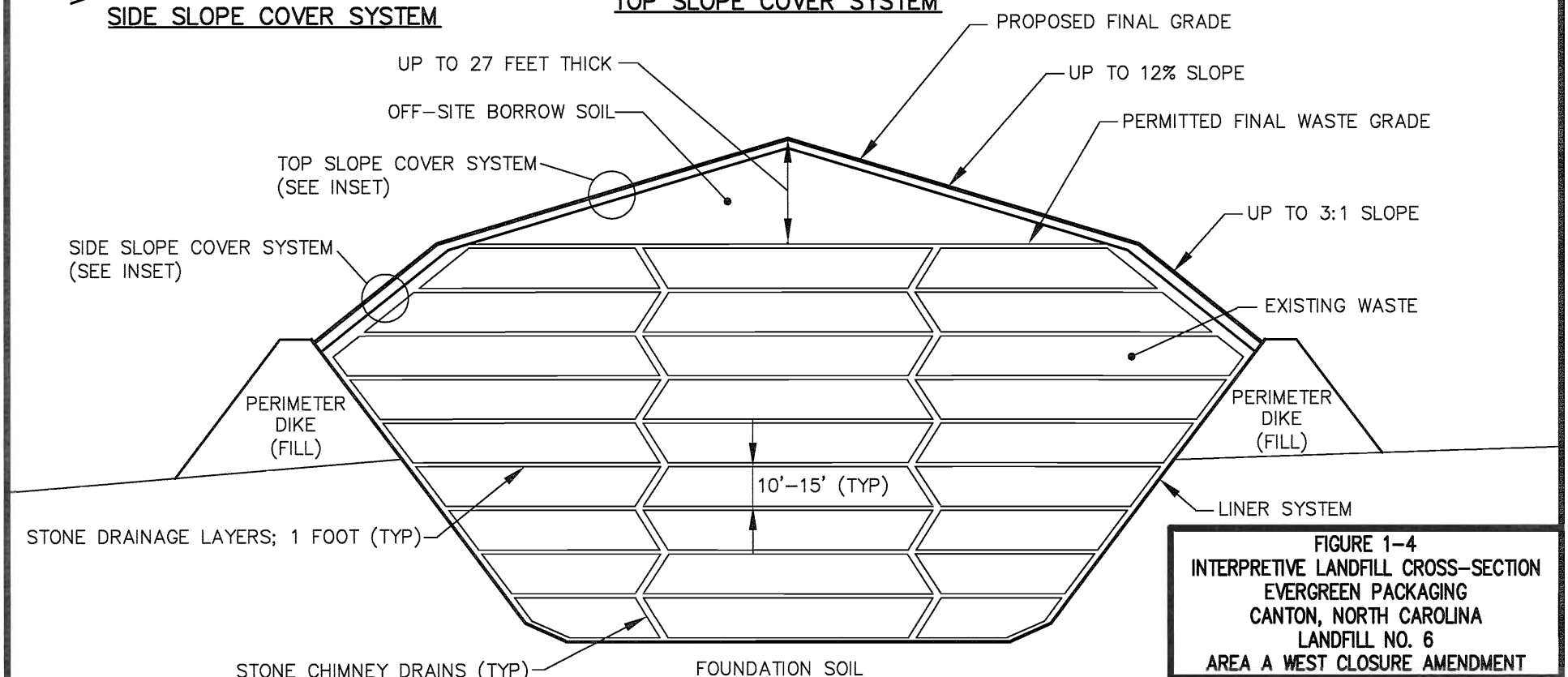


FIGURE 1-4
INTERPRETIVE LANDFILL CROSS-SECTION
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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DWG: CROSS SECTION LMN: LMN CTB: SME-STD REV: 4/12/11

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sequence and characterizing of the Project soils relative to their geotechnical behavior with respect to density and shear strength. The evaluation and resulting conclusions and recommendations demonstrate that the additional cover soil can be placed in 6A-West while expecting a stable landfill configuration to be maintained during and after cover soil placement.

2.0 GEOTECHNICAL EVALUATION

Slope stability analysis was completed relative to increasing the top slope angle of Area 6A-West in a general north-south direction from zero (0) to twelve (12) percent for a maximum added soil thickness of about 27 feet (see Figure 1-3). The analysis showed that the Landfill top slope angle can be increased to 12 percent while maintaining slope stability safety factors adequate for maintaining slope stability during operation and after closure. The operational slope stability analysis considered increased pore-water pressures resulting from the additional cover soil. Post-closure slope stability analysis was completed considering that the increased operational pore pressures had fully dissipated. Analysis of slope stability for the Landfill sideslope cover system indicated that the proposed cover can be expected to maintain a stable configuration provided adequate drainage is included within the cover system.

To provide necessary cover system drainage, stone drainage layers will be placed within the sideslope portion of the cover. The stone will drain precipitation which infiltrates the cover by connecting to the existing stone drainage layers within the waste mass (see Figure 1-4). An evaluation of the cover system stone drainage layers was completed with respect to their capacity to convey precipitation infiltration and leachate expressed from the waste due to loads imparted by the off-site borrow soil. The proposed stone drainage layers were found to be capable of adequately draining the precipitation infiltration and leachate from the Area 6A-West Landfill during the operational and post-closure periods.

2.1 Geotechnical Setting

The existing waste in the Project area consists mainly of pulp and paper mill wastewater treatment sludge, fly ash, lime mud, and wood wastes. The current permit allows for final waste grades to extend to a level 30 feet above the existing perimeter dikes that surround the Landfill. The Landfill was constructed by excavating native soil and placing it in fills up to 70 feet in height around the perimeter. In effect, the Area 6A-West Landfill consists of a deep basin into which wastes have been placed. The Area 6A-West Landfill has been operated from the outset using practices intended to keep the waste mass well drained and compacted. Area 6A-West contains a leachate collection system over the entire bottom area of the waste cell consisting of drainage stone and perforated piping. Additionally, a one-foot thick layer of drainage stone separates each 10- to 15-foot lift of

waste within the Landfill. The stone drainage layers are connected vertically through the entire thickness of the waste mass by way of stone chimney drains that run in a general east-west direction along the length of Area 6A-West. The Project area is underlain by foundation soils consisting of medium to very dense residual saprolitic soils.

2.1.1 Understanding of Planned Cover System Construction. Based on geotechnical testing of Project soils, discussions with Evergreen relative to the Project Schedule, and review of the Project design documents, the following understandings were used in conjunction with the slope stability analyses performed to evaluate the affects of placing the cover soil over the top of the existing Area 6A-West waste mass.

- Approximately 150,000 cubic yards of off-site borrow soil will be delivered to Area 6A-West and placed over the existing waste in that area as cover soil.

- The off-site borrow soil is composed primarily of a mixture of various soils consisting of fine to medium grained sand, silt and clay, and silty sand derived from weathered saprolite.

- Prior to placement of the cover soil, Area 6A-West will have been constructed to its approximate permitted final waste grades.

- The final grading of the cover soil will change in that the top slope of Area 6A-West will be increased such that the thickness of the cover soil will be upwards of 27 feet along the east - west centerline of Area 6A-West. The cover soil thickness will taper from maximum thickness (near the centerline) to a minimum thickness of 3 feet at the point where the top slope of the Landfill transitions to the sideslope.

- The sideslope grading for Area 6A-West will generally remain unchanged from that which currently exists.

- The cover soil will be separated from the existing mill waste by a one-foot thick layer of drainage stone. The drainage stone will connect with the existing drainage stone that comprises the leachate collection system for Area 6A-West.

- Placement of the borrow soil will be completed over a period of months.

2.2 Geotechnical Parameters Used for Slope Stability Analysis

Geotechnical characteristics of the wastes and existing site soils used in this stability evaluation were primarily gathered from previous geotechnical evaluations completed for the Area 6A-West facility by SME and others (see reference list). Those evaluations included field and laboratory testing of the Landfill waste, foundation soil, and soil fill used to construct the perimeter dike around the No. 6 Landfill. Data from those evaluations were reviewed and used to select geotechnical property values for use in the stability analysis.

As part of this evaluation, SME performed geotechnical testing on samples of off-site borrow and on-site borrow soils planned to be used for the Project. In particular, density and hydraulic conductivity testing were performed to characterize the two borrow sources relative to their placement within Area 6A-West. A detailed description and results of the geotechnical testing for the borrow soils is provided as Appendix D-1.

The geotechnical parameters used for the slope stability analysis are presented in Table 2-1. A compilation of the test data used to select the values in Table 2-1 is presented in Appendix D-2.

TABLE 2-1

GEOTECHNICAL PARAMETERS USED FOR SLOPE STABILITY ANALYSES

Material	Wet Density	Construction/Operational Period Stability Analysis Parameters[4]		Post-Closure Stability Analysis Parameters	
	γ_t (pcf)	c (psf)	ϕ (degrees)	c (psf)	ϕ (degrees)
Off-site Borrow Soil[1]	113	-	30	-	30
On-site Borrow Soil[1]	128	-	30	-	30
Area 6A-West Waste[2]	90	-	36	-	36
Area 6A-West Liner and Leachate Collection Layer[3]	125	-	35	-	35
Perimeter Dike[2]	115	115	32	115	32
Foundation Soil[2]	115	-	31.5	-	31.5

Notes:
1. Density based on borrow soil testing performed by SME 2011 (Appendix D-1). Shear strength estimated from previous site investigations and testing of similar materials.
2. Based on site specific testing performed on Area 6A-West materials and reported in SME, 2006 and summarized in Appendix D-2.
3. Density and Shear strength estimated based on Civil Engineering Reference Manual, M. Lindenberg, 1999.
4. Strength values indicated are as follow: ϕ = angle of internal friction, degrees; c = cohesion.

2.3 Piezometric Conditions

Only limited data relative to the current piezometric conditions in the Area 6A-West waste mass exists. Nested piezometers placed within the Area 6A-West waste as part of SME's 2006 geotechnical evaluation showed the waste to be in a drained condition at that time, with strong downward hydraulic gradients present. Observation of present day flows from the Landfill leachate collection indicate immediate response to precipitation events, thereby indicating the system continues to be free-draining. To that end, the piezometric conditions modeled for the slope stability analysis were reflective of a functioning leachate collection system and drained waste condition prior to placement of the borrow soil.

The Area 6A-West waste mass is composed of 10- to 15-foot thick waste layers separated by one-foot thick stone drainage layers. Piezometric conditions within the waste mass were modeled with the assumption that the waste will become pressurized immediately after cover soil placement, and that the initial increase in pore-water pressure will be at a one to one correspondence with the

contact stress from the added cover soil. It was also assumed that the stone drainage layers within the waste mass will continue to function effectively and that no excess pore-water pressure will develop there. The resulting piezometric model for short-term construction and operating conditions is therefore comprised of multiple discreet waste layers that have roughly equivalent excess pore pressure distributions. In other words, pore-water pressure will increase within each waste layer, but will remain hydrostatic (or less) in the horizontal stone drainage layers. A plot showing the modeled pore-water pressure distribution as result of the additional cover soil loading of Area 6A-West, along with pore pressure calculations are presented in Appendix D-3.

It was also assumed in the slope stability analysis that there would be no development of excess pore-water pressure within the placed cover soil itself. The cover soil will be placed in Area 6A-West such that it is separated from the existing waste by a one-foot thick layer of drainage stone. The drainage stone will serve to intercept any upward draining of leachate from the existing waste, thereby avoiding any transfer of possible excess pore-water pressure into the cover soil layer.

2.4 Selection of Cross -Section Used for Slope Stability Analysis

An interpretive worst-case Landfill cross-section was developed to evaluate the slope stability of Area 6A–West as result of applying the additional cover soil load. The selected cross-section runs from north to south through Area 6A-West and is shown on Figure 2-1. The cross-section includes a combination of the longest and steepest sideslope configurations for Area 6A-West and where the greatest thickness of cover soil is expected to be placed.

2.5 Earthquake Loads Used for Slope Stability Analyses

The RCRA Subtitle D *Seismic Design Guidance for Municipal Solid Waste Landfill Facilities* (U.S.EPA, 1995) and *United States National Seismic Hazard Maps* (USGS, 2008) were used to select seismic coefficients for use in the analysis of slope stability when earthquake loads are applied to the Landfill. For the operational and end-of-construction cases, the guidance recommends that a seismic coefficient representative of a peak earthquake acceleration having a 10 percent probability of exceedance in 50 years be used to complete a pseudo-static stability analysis. For Evergreen's Area 6A-West Landfill, the operational/end-of-construction coefficient is equal to 0.07(g). The guidance also recommends the coefficient be factored to account for foundation and Landfill waste stiffness. For the soils and wastes in the Area 6A-West area, the coefficient was adjusted to 0.075g.

For the post-closure case, an adjusted seismic coefficient of 0.14g was determined, which is representative of a peak earthquake acceleration having a 10 percent probability of exceedance in 250 years. The Project seismic considerations are also presented in Appendix D-4.

INSERT FIGURE 2-1 INTERPRETIVE STABILITY CROSS-SECTION

3.0 SLOPE STABILITY ANALYSIS

3.1 Waste Mass Slope Stability

Multiple circular-shaped potential slip surfaces oriented through the planned cover soil and existing Landfill waste were analyzed for slope stability safety factors using the interpretive slope stability cross-section discussed in Section 2.4 and the soil and waste geotechnical property values presented in Table 2-1. The analyses included factor of safety calculations for both operational and post-closure conditions and examined slip surfaces penetrating the existing wastes as well as the Landfill liner and perimeter dike. The Bishop Limit Equilibrium Method of slope stability analysis was used to calculate the lowest safety factor for each potential slip surface examined. The slope stability analyses were conducted using the SLOPE/W stability program which is a computer based algorithm compiled by GEO-SLOPE International, Ltd. of Calgary, Alberta, Canada.

The lowest slope stability safety factors for operational and construction conditions were calculated to be 1.8 and 1.4 for the static and seismic cases, respectively. Slope stability factors of safety greater than 1.3 for static conditions and 1.1 for the seismic case are considered acceptable by the professional engineering community for embankments such as landfills. Based on the RCRA Subtitle D guidance document (U.S.EPA, 1995), since the seismic factors of safety were calculated to be greater than 1.0, permanent Landfill deformations, due to seismic loading, are expected to be less than 6 inches. Deformations of that scale are not expected to result in damage to the leachate collection system, liner, or Landfill slopes (Seed and Bonaparte, 1992). The results of the waste mass stability analysis for operational and construction conditions are summarized on Table 3-1. The plots generated in the SLOPE/W output file show the worst-case cross-section and the location of the potential slip surface exhibiting the lowest calculated safety factor for the operational condition. These plots are included in Appendix D-5.

TABLE 3-1

SUMMARY OF LOWEST CALCULATED SAFETY FACTORS
FOR WASTE MASS SLOPE STABILITY

Landfill Development Stage	Static Analysis		Seismic Analysis	
	Min. Calc. Safety Factor	Safety Factor Considered Satisfactory	Min. Calc. Safety Factor	Safety Factor Considered Satisfactory
Operations and Construction	1.8	1.3	1.4	1.1
Post - Closure	1.8	1.5	1.2	1.0

The lowest slope stability safety factors for post-closure conditions were calculated to be 1.8 and 1.2 for the static and seismic cases respectively. Post-closure factors of safety greater than 1.5 and 1.0 for static and seismic cases are considered acceptable by the professional engineering community for maintaining long-term slope stability of the waste mass. The SLOPE/W output file for the lowest calculated safety factor using post-closure conditions is included in Appendix D-5.

The slope stability analyses which were performed to evaluate the affect of placing additional cover soil on Area 6A-West did not focus or specifically search for potential slip surfaces located within the Landfill liner/leachate collection system, Landfill perimeter dike, or Landfill foundation. Rather, slope stability analyses, including those components of the Landfill, were previously performed as part of a comprehensive slope stability evaluation for Area 6A-West, which was previously submitted to the NCDNR (SME, 2006). Review of that evaluation indicated the previously calculated safety factors were sufficiently high such that recalculation of safety factors relative to the leachate collection system, perimeter dike, and Landfill foundation for this Project was not necessary.

3.2 Cover System Slope Stability

Final sideslope and top slope cover slope stability was evaluated for the Project. The final sideslope cover will consist of the following layers in descending order relative to the finished surface grades of the Landfill.

Vegetative Soil (4 inches)
On-site Borrow Soil (12 inches)
Drainage Stone (6 inches)
Off-site Borrow Soil (18 inches)
Drainage Stone (12 inches)

The final top slope cover will consist of the following layers in descending order relative to the finished surface grades.

Vegetative Soil (4 inches)
On-site Borrow Soil (12 inches)
Off-site Borrow Soil (18 inches minimum)

Table 3-2 presents the shear strength values and various material weights used for the final cover stability analyses.

TABLE 3-2

GEOTECHNICAL PROPERTIES USED FOR FINAL COVER SYSTEM SLOPE STABILITY ANALYSES

Material	Total Density (pcf)	Saturated Density (pcf)	Construction/Operational and Post Closure Strength[1]	Thickness (inches)	Hydraulic Conductivity[2] (cm/sec)
Vegetative Soil	90	130	$\phi = 30$ and $c = 0$	4	-
On-site Borrow Soil	128	135	$\phi = 30$ and $c = 0$	12	4×10^{-6}
Drainage Stone	135	140	$\phi = 45$ and $c = 0$	6	4
Off-site Borrow Soil	113	120	$\phi = 30$ and $c = 0$	18	3×10^{-7}
Drainage Stone	135	140	$\phi = 45$ and $c = 0$	12	4

Notes:
1. Strength values indicated are as follow: ϕ = angle of internal friction, degrees; c = cohesion. Estimates of shear strength based on NAVFAC DM 7.1.
2. Borrow soils based on testing performed by SME in 2011. Drainage stone based on Bear, 1972. .

To evaluate static and seismic slope stability of the top slope and sideslope final cover, interpretive, typical cross-sections were developed for both the sideslope and topslope configurations. The static stability analyses for the cover resulted in calculated post-closure safety factors of 1.8 and 6.1 for the 3H:1V sideslope and topslope (i.e., 10 to 12 percent, respectively. The seismic stability analyses for the cover resulted in calculated post-closure

safety factors of 1.2 and 2.5 for the sideslope and topslope, respectively. The cover slope stability calculations are presented in Appendix D-6.

Sideslope cover stability was also evaluated with respect to drainage and buildup of seepage forces within the drainage stone layer of the sideslope cover (Koerner and Soong, 2003). The stability calculations indicate that, for the cover soil hydraulic conductivities and for the drainage stone transmissivity used in the cover design, drainage piping is not required in the sideslope or top slope cover systems. Calculations were also performed to estimate the flow of leachate expressed from the existing waste to the horizontal stone drainage layers as result of placing the additional cover soil on the Area 6A-West surface. The flow calculations indicated the stone drainage layers in the sideslope cover system have adequate capacity to handle the precipitation infiltration as well as any leachate expressed during Area 6A-West loading without undergoing a pressurized condition.

Top slope cover stability was evaluated and found that satisfactory slope stability factors of safety can be expected, even if saturated cover soil conditions are assumed. Because of this, it is anticipated that the top slope cover will be constructed without a drainage stone layer. Future users of the Landfill surface should be aware that the topslope cover soils may become temporarily saturated after a long precipitation event; as such, traffic on the top slope cover (i.e. mowers and maintenance equipment) should be avoided for several days following long precipitation events.

3.3 Sensitivity Analysis

To provide a check of the theoretical worst case slope stability condition that could exist relative to the additional cover soil placement in the Landfill, a slope stability analysis was performed assuming that the Area 6A-West leachate collection system was not functioning. The slope stability analysis assumed that the existing waste mass would be saturated at the time of the borrow soil load application and as such excess pore-water pressures would occur in the existing waste mass immediately after load placement. The increase in pore-water pressure was assumed to be at a one to one correspondence with the contact stress from the added borrow soil. The application of the additional cover soil load on the Landfill top slope was also assumed to cause some lateral increase of pore-water pressure in the waste comprising Area 6A-West sideslope. Under these conditions, the lowest slope stability safety factor was calculated to have a value of 1.0. Therefore, even if only

very limited Landfill drainage were available, slope stability factors of safety greater than 1.0 could be expected.

3.4 Findings

- The proposed placement of additional cover soil in the Area 6A-West Landfill results in short-term operational slope stability safety factors calculated to be equal to or greater than 1.8. Short-term safety factors as low as 1.3 are generally considered adequate to maintain operational slope stability.

- Post-closure slope stability safety factors relative to the planned cover soil placement were calculated to be 1.8 or greater. The calculated post-closure safety factors are considered adequate relative to long-term slope stability.

- Results of the seismic stability analyses demonstrate that the Area 6A-West Landfill has been designed to satisfactorily resist the maximum earthquake acceleration for the Project area and that any earthquake induced deformations will be within acceptable levels.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are offered relative to maintained Landfill slope stability during and after placement of the borrow soil in the Area 6A-West Landfill.

- The off-site borrow soil should be placed in horizontal lifts not exceeding 4 feet in thickness. The lifts should be advanced from the outer portions of the Landfill top slope toward the Landfill center in effort to minimize pore-water pressure increases in the existing waste comprising the Landfill sideslopes due to potential concentrated equipment activity in those areas and/or unbalanced loading.

- The off-site borrow soil should be placed such that when measured for compaction it exhibits an in-place dry density of at least 90 percent of the Standard Proctor density as determined by ASTM D 698.

- The stone drainage layer separating the existing mill waste from the lower limit of the cover soil is a necessary component to avoiding development of excess pore-water pressure in the existing wastes by providing drainage for the upper portions of the Area 6A-West waste. The stone drainage layer must remain functional throughout placement of the borrow soil to allow excess pore-water pressures in the underlying waste to dissipate. Care should be taken when placing the borrow soil over the drainage stone to avoid plugging or clogging of the stone drainage way. Similarly, care should be taken to avoid placing wet soil over the stone or over-compacting the soil at the stone/soil interface.

- During placement of the stone drainage layer on the surface of the Area 6A-West waste, care should be taken to protect the stone from direct contact with surface water runoff.

- During placement of the drainage stone or borrow soil, any soft areas that develop on the drainage stone or on the waste surfaces should be allowed to drain or be stabilized with additional stone before continuing cover soil placement.

- In the event any low strength (i.e., wet) borrow soil is brought to the Landfill, the procedures and recommendations set forth in the Operations Manual for handling low strength waste should be followed for placement of that material.

- During placement of the cover soil, the existing Landfill sideslopes should be inspected regularly for signs of cracks, sloughs, leachate boils, or any other displacements or seeps that might be indicative of potential impending slope instability.

- Evergreen should avoid traffic, including mowers and maintenance equipment on the top slope cover for several days if the cover soil becomes saturated after precipitation events.

5.0 CLOSURE

The slope stability analysis findings, conclusions, and recommendations presented in this report are limited to the conditions and assumptions described. In the event there are zones of existing low strength waste or areas where excess pore-water pressures exist in the 6A-West Landfill prior to placement of the cover soil, then operational safety factors could be lower than described herein, and some localized displacement of the existing waste or borrow soil could occur. Should such conditions be encountered, SME requests the opportunity to review the conditions and provide recommendations for mitigating measures as appropriate.

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APPENDIX D-1

RESULTS OF 2011 GEOTECHNICAL TESTING

SME
Sevee & Maher Engineers, Inc.

ENVIRONMENTAL • CIVIL • GEOTECHNICAL • WATER • COMPLIANCE

11044
2011 0317pd.doc

MEMO TO: Paul Dickens, Evergreen Packaging

FROM: Mark Robinson

DATE: March 17, 2011

SUBJECT: **SUMMARY OF SOIL TESTING RESULTS FOR EVERGREEN PACKAGING**

As requested by Evergreen Packaging (Evergreen), Sevee & Maher Engineers, Inc. (SME) has completed geotechnical testing to characterize off-site borrow soils from Barber Orchards in Waynesville, NC (Orchard soils) and on-site cover (cover) soils stockpiled at the Evergreen Landfill Facility in Canton, NC. The testing was performed relative to the possible placement of the Orchard and cover soils within Evergreen's Area 6A-West Landfill. SME received samples of Orchard Soil from six locations and six samples of cover soil on February 10, 2011. The samples of Orchard soil were designated as BO-1 through BO-6 and the cover soil samples were designated BRP-1 through BRP-6.

INDEX TESTING

Index tests (grain size analysis and Atterberg limits) were performed to evaluate the variability of physical characteristics of soils. Based on the index tests the group of six Orchard soils samples was found to have similar physical properties. In the same way, the group of six cover soil samples was found to have similar characteristics. There was, however, greater variability between the two groups of soil. Grain size analyses were performed on all twelve samples, while Atterberg limit testing was performed on three samples from each group. The Atterberg limit tests were performed on three samples that were selected as representative of the group. Namely, Orchard soil samples BO-1, BO-4, and BO-6 and cover soil samples BRP-1, BRP-4, and BRP-6 were tested for Atterberg Limits. The results are presented in the attached summary table along with individual laboratory test data sheets.

For the Orchard soils, the material finer than the #200 sieve ranged from 50 to 62 percent and the plasticity index ranged from approximately 8 to 12 indicating a Unified Soil Classification System (USCS) classification of ML. For the Cover soils, the material finer than the #200 sieve

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ranged from 24 to 33 percent and the Atterberg limits testing indicated that the soil was non-plastic. The USCS classification for the cover soil is SM.

MOISTURE-DENSITY TESTING

SME performed a total of six Moisture-Density (M-D) tests (three each on the Orchard and cover soils). The same soil samples used for Atterberg Limit tests were used for M-D testing. The maximum dry density (γ_{dmax}) calculated for the Orchard soils was 97, 89, and 77 pounds per cubic foot (pcf) at optimum water contents ($\mathbf{w_{opt}}$) of 25, 28, and 37 percent, respectively. The γ_{dmax} calculated for the cover soils was 109, 116, and 109 pcf at $\mathbf{w_{opt}}$ of 19, 16, and 18 percent, respectively. Although no ash content was performed, observation of the Orchard soils showed considerable organic matter (roots and leaves), thereby accounting for the lower measured density of the Orchard soils in comparison to the cover soils.

HYDRAULIC CONDUCTIVITY TESTING

Six hydraulic conductivity tests (three each on the Orchard and cover soils) were performed by compacting soil samples at water contents similar to those received by the laboratory. The same soil samples used for Atterberg Limits and M-D testing were used for the hydraulic conductivity testing. The average hydraulic conductivity for the Orchard and cover soils was 3.5×10^{-7} and 4.2×10^{-6} centimeters per second (cm/s), respectively.

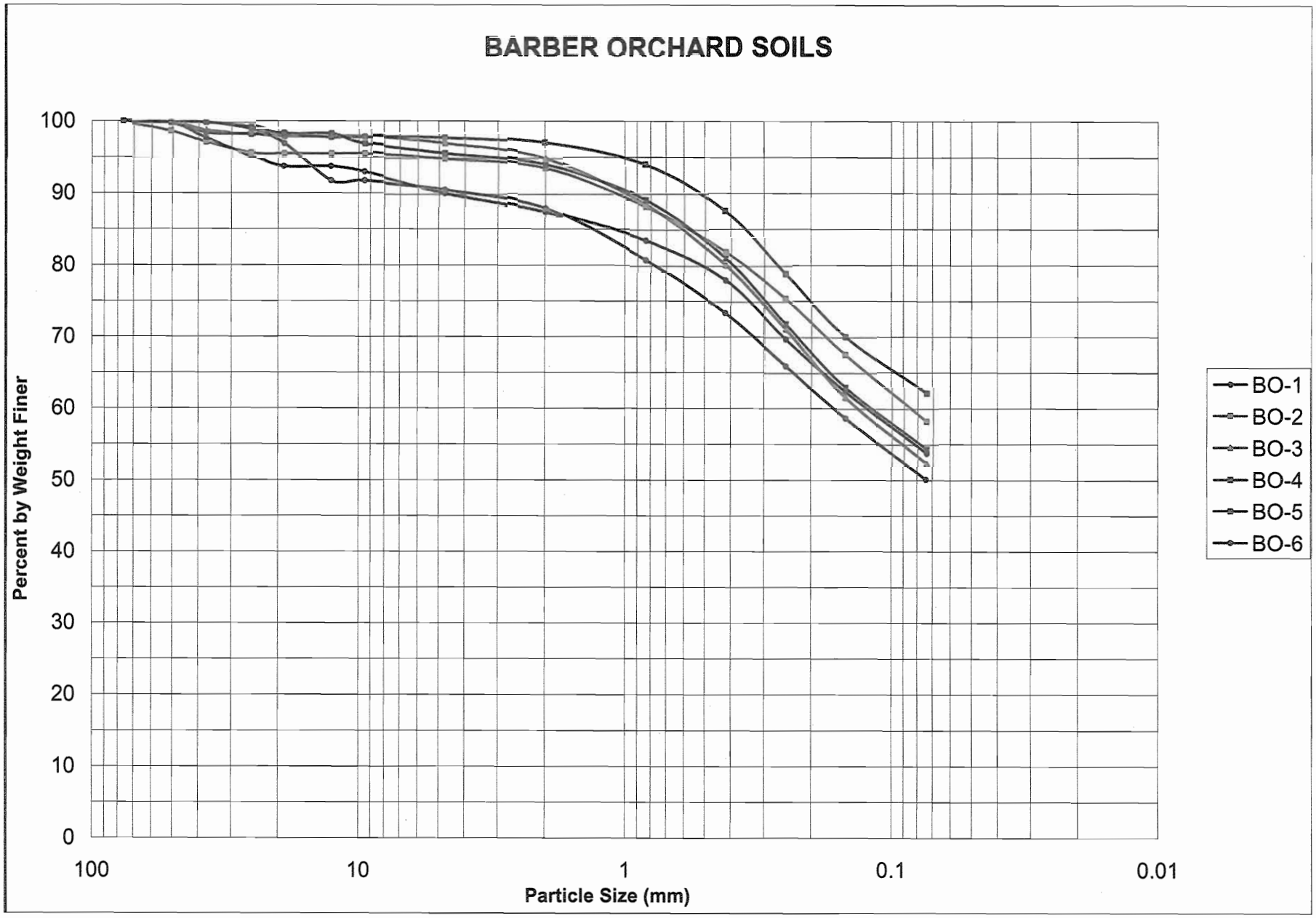
Four additional hydraulic conductivity tests were performed (two each on the Orchard and cover soils) for soil conditions that were drier than those received by the laboratory. Sample water content was reduced by five percent to simulate possible placement conditions in the summer season, when natural drying may occur. For each soil group, the hydraulic conductivity was higher (more permeable) at the lower moisture content, with the hydraulic conductivity of the Orchard soils remaining less permeable than the cover soils.

The results of the hydraulic conductivity testing are attached.

BLUE RIDGE PAPER
BARBER ORCHARD SOIL
TESTING SUMMARY

sample	W.C (%)	% pass #200 (%)	LL (%)	PL (%)	PI (%)	DD_{max} (pcf)	WC_{opt} (%)	Hydraulic Conductivity 1 (as rec'd)			Hydraulic Conductivity 2 (dried)		
								dd	wc	(cm/sec)	dd	wc	(cm/sec)
Orchard soils													
BO-1	31.0	53.8	40.9	29.4	11.5	96.5	24.5	85.7	32	8.1E-08	-	-	-
BO-2	43.5	58.2											
BO-3	56.4	52.3											
BO-4	34.3	62.2	41.8	33.3	8.5	89	28	81	34	7.9E-07	76.4	29.5	5.2E-06
BO-5	54.3	54.3											
BO-6	48.4	50	56.8	49.2	7.6	77	36.6	68.4	46.7	6.5E-07	65.3	38	1.2E-05
On-site soils													
BRP-1	24.3	27.5	-	-	non plastic	109	19	99	25.6	3.1E-06	-	-	-
BRP-2	25.1	26.4											
BRP-3	24.1	25.6											
BRP-4	21.4	24.1	-	-	non plastic	115.5	15.8	106.5	21.8	7.8E-06	106	16.6	1.8E-05
BRP-5	16.6	27.1											
BRP-6	28.1	33.4	-	-	non plastic	109	18.2	97.8	27.5	3.1E-06	99.2	21.2	1.9E-05

GRAIN SIZE ANALYSIS


BARBER ORCHARD SOILS
Percent by Weight Finer
100
90
80
70
60
50
40
30
20
10
0
100
10
1
0.1
0.01
Particle Size (mm)
BO-1
BO-2
BO-3
BO-4
BO-5
BO-6

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
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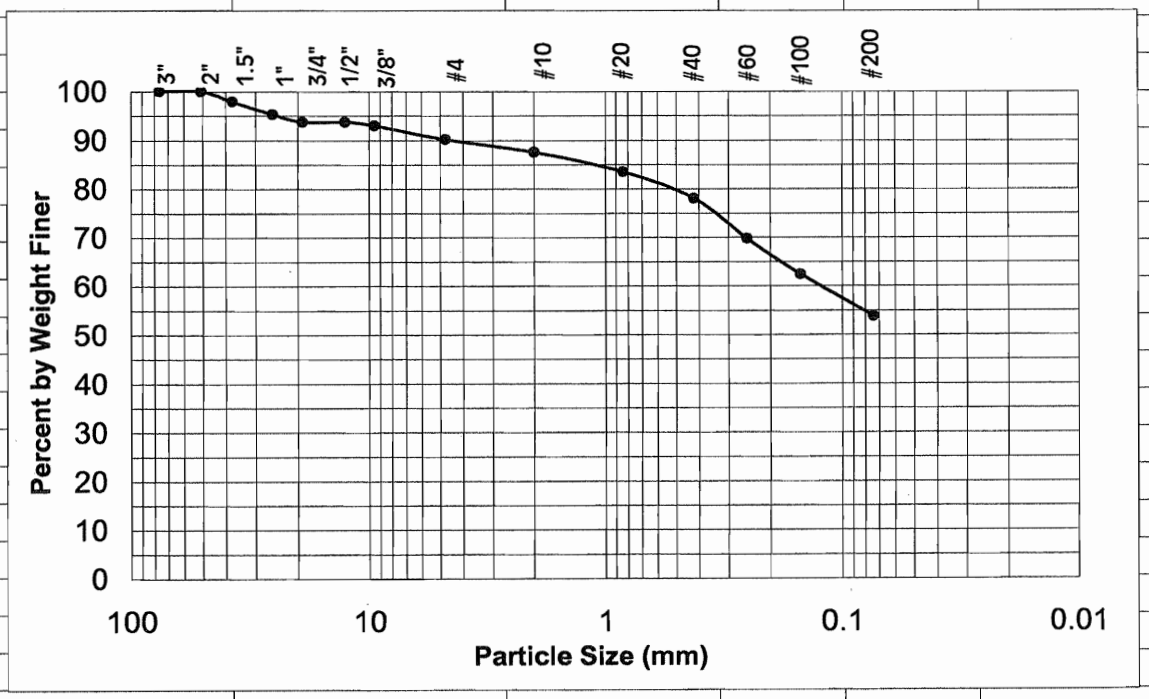
GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:	11014
	Canton, N. Carolina		DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard		SAMPLE No:	BO-1
SAMPLE DESCRIP:	Red brown sandy SILT, trace gravel			

DATA

			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**97.9**			
1	25.4	**95.3**			
3/4	19.1	**93.7**			
1/2	12.7	**93.7**			
3/8	9.5	**93.0**			
#4	4.76	**90.2**			
#10	2.0	**87.5**			
#20	0.84	**83.5**			
#40	0.42	**78.0**			
#60	0.25	**69.7**			
#100	0.149	**62.4**			
#200	0.074	**53.8**			



Water Content (%) = 31.0

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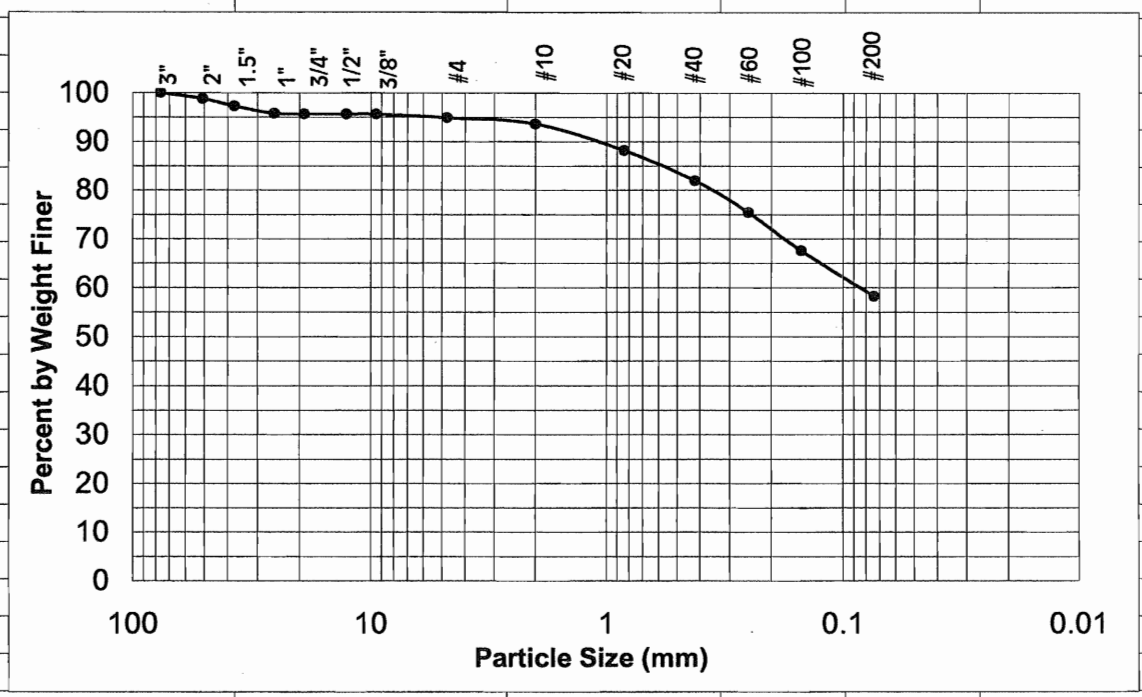
GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		11014
	Canton, N. Carolina		DATE:		11-Feb-10
SAMPLE SOURCE:	Barber Orchard		SAMPLE No:		BO-2
SAMPLE DESCRIP:	Red brown silty SAND, trace gravel				

DATA

			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**98.8**			
1.5	37.5	**97.3**			
1	25.4	**95.7**			
3/4	19.1	**95.6**			
1/2	12.7	**95.6**			
3/8	9.5	**95.6**			
#4	4.76	**94.9**			
#10	2.0	**93.6**			
#20	0.84	**88.2**			
#40	0.42	**81.9**			
#60	0.25	**75.4**			
#100	0.149	**67.5**			
#200	0.074	**58.2**			



Water Content (%) = 43.5

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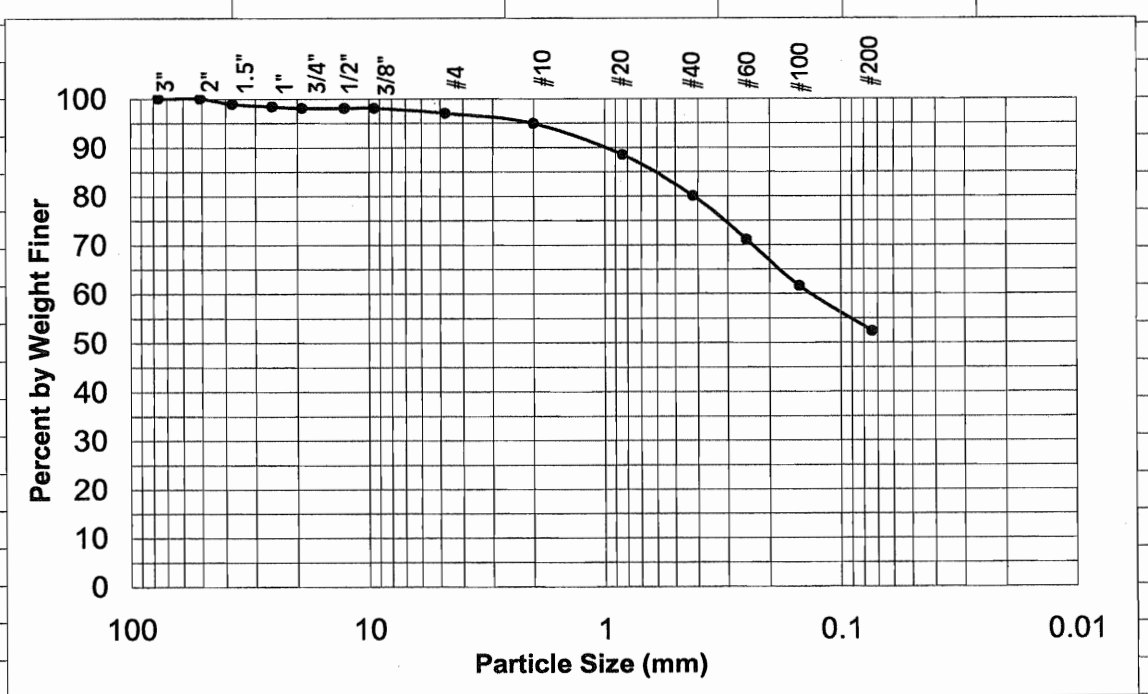
GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		11014
	Canton, N. Carolina		DATE:		11-Feb-10
SAMPLE SOURCE:	Barber Orchard		SAMPLE No:		BO-3
SAMPLE DESCRIP:	Dark brown sandy SILT, with organics				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**98.9**			
1	25.4	**98.4**			
3/4	19.1	**98.1**			
1/2	12.7	**98.1**			
3/8	9.5	**98.1**			
#4	4.76	**97.0**			
#10	2.0	**94.9**			
#20	0.84	**88.5**			
#40	0.42	**80.0**			
#60	0.25	**71.1**			
#100	0.149	**61.5**			
#200	0.074	**52.3**			

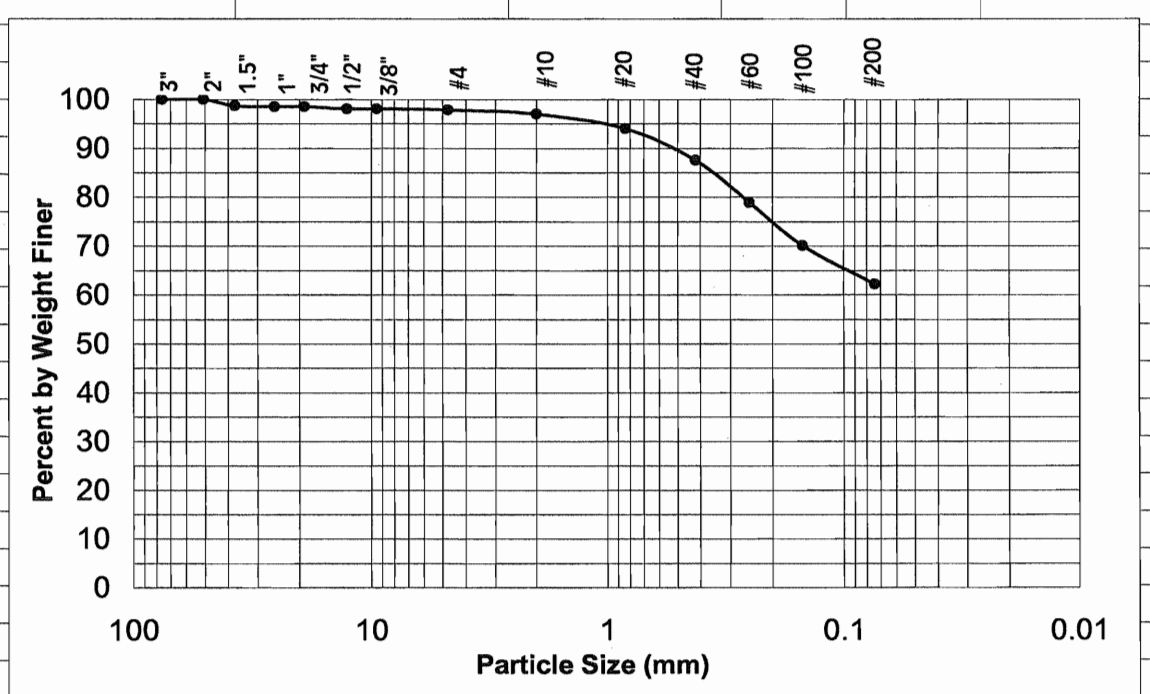


Water Content (%) = 56.4

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard			SAMPLE No:	BO-4
SAMPLE DESCRIP:	Brown sandy SILT				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**98.7**			
1	25.4	**98.5**			
3/4	19.1	**98.5**			
1/2	12.7	**98.0**			
3/8	9.5	**98.0**			
#4	4.76	**97.9**			
#10	2.0	**97.0**			
#20	0.84	**94.0**			
#40	0.42	**87.6**			
#60	0.25	**78.9**			
#100	0.149	**70.1**			
#200	0.074	**62.2**			



Water Content (%) = 34.3

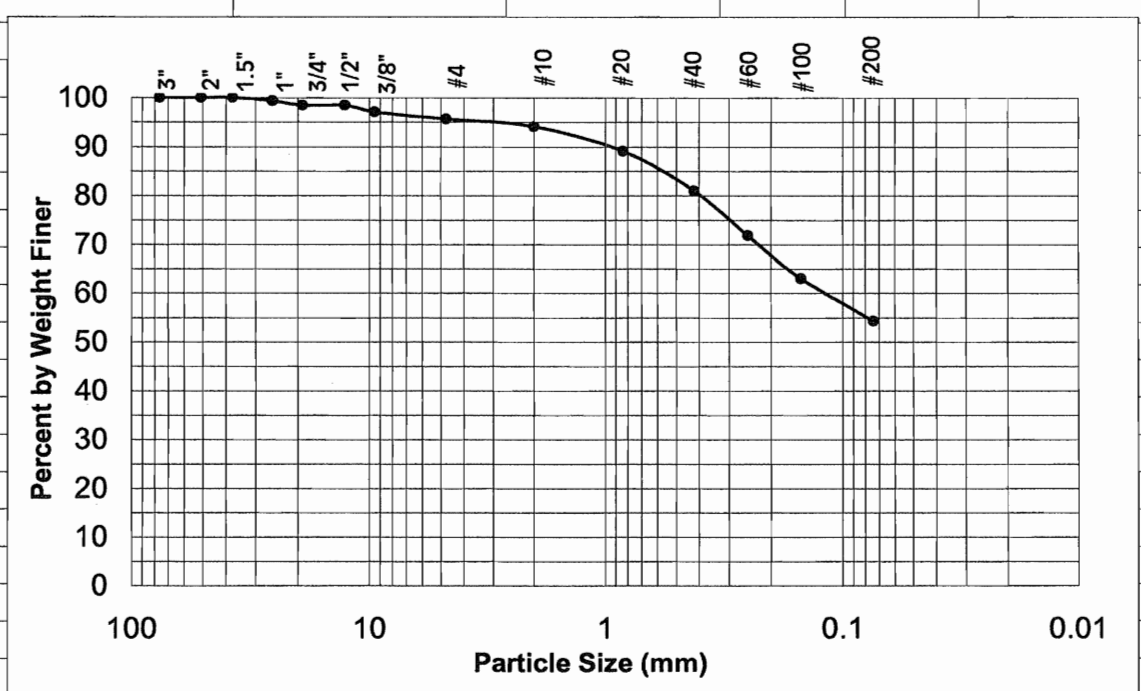
SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard			SAMPLE No:	BO-5
SAMPLE DESCRIP:	Dark brown sandy SILT, with organics				

DATA

			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**99.3**			
3/4	19.1	**98.4**			
1/2	12.7	**98.4**			
3/8	9.5	**97.0**			
#4	4.76	**95.6**			
#10	2.0	**94.1**			
#20	0.84	**89.1**			
#40	0.42	**81.0**			
#60	0.25	**71.8**			
#100	0.149	**63.0**			
#200	0.074	**54.3**			

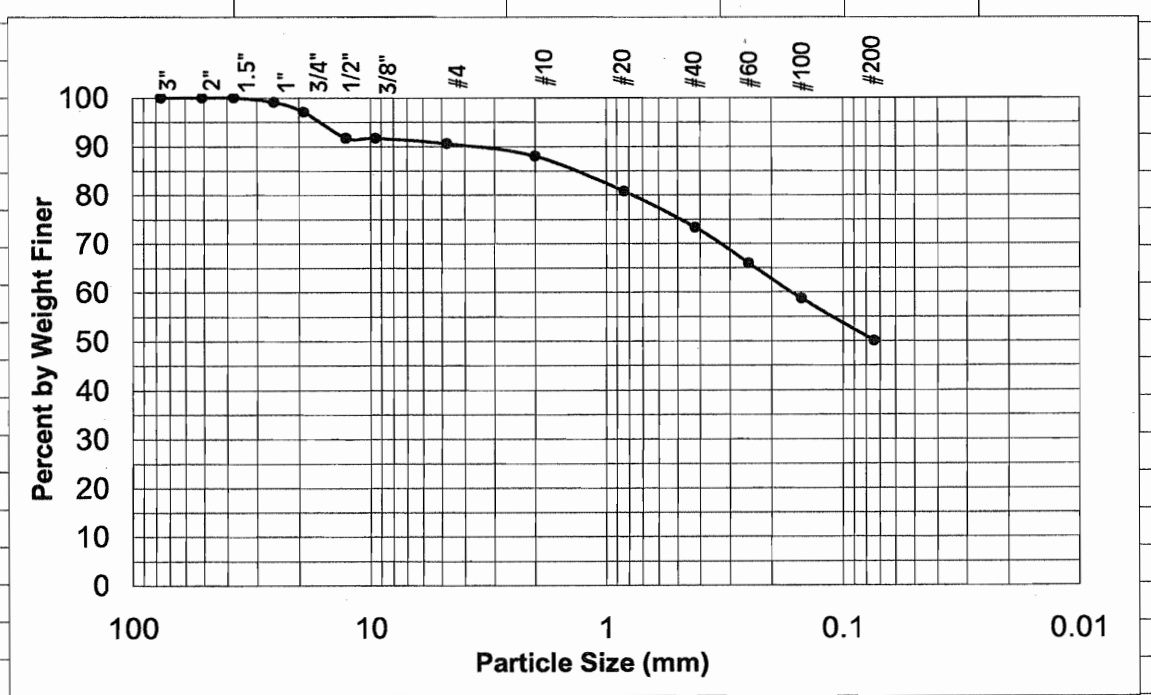


Water Content (%) = 54.3

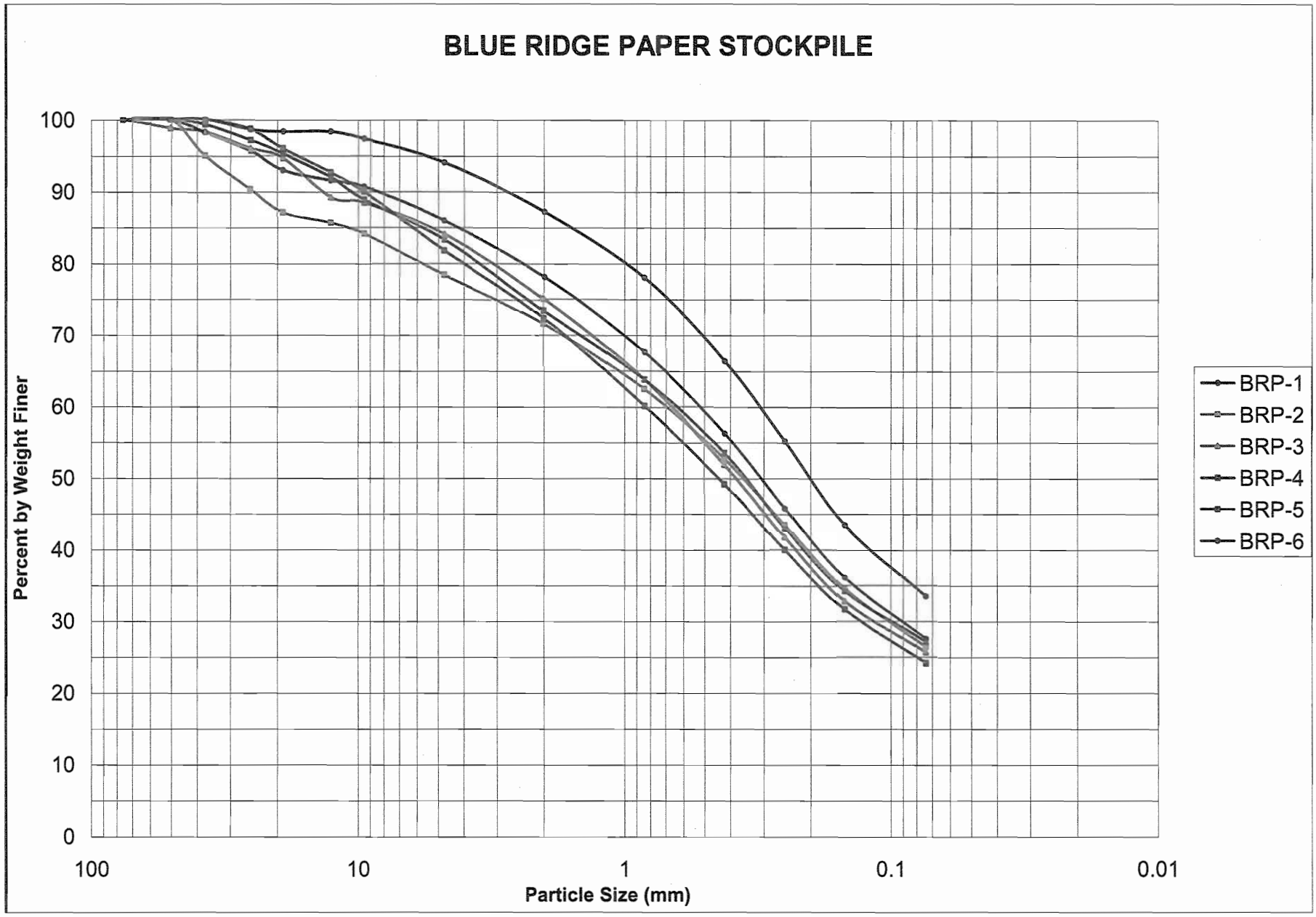
SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard			SAMPLE No:	BO-6
SAMPLE DESCRIP:	Dark brown sandy SILT, trace gravel, with organics				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**99.1**			
3/4	19.1	**97.1**			
1/2	12.7	**91.7**			
3/8	9.5	**91.7**			
#4	4.76	**90.6**			
#10	2.0	**88.0**			
#20	0.84	**80.7**			
#40	0.42	**73.3**			
#60	0.25	**65.9**			
#100	0.149	**58.6**			
#200	0.074	**50.0**			



Water Content (%) = 48.4


BLUE RIDGE PAPER STOCKPILE
Percent by Weight Finer
100
90
80
70
60
50
40
30
20
10
0
100
10
1
0.1
0.01
Particle Size (mm)
BRP-1
BRP-2
BRP-3
BRP-4
BRP-5
BRP-6

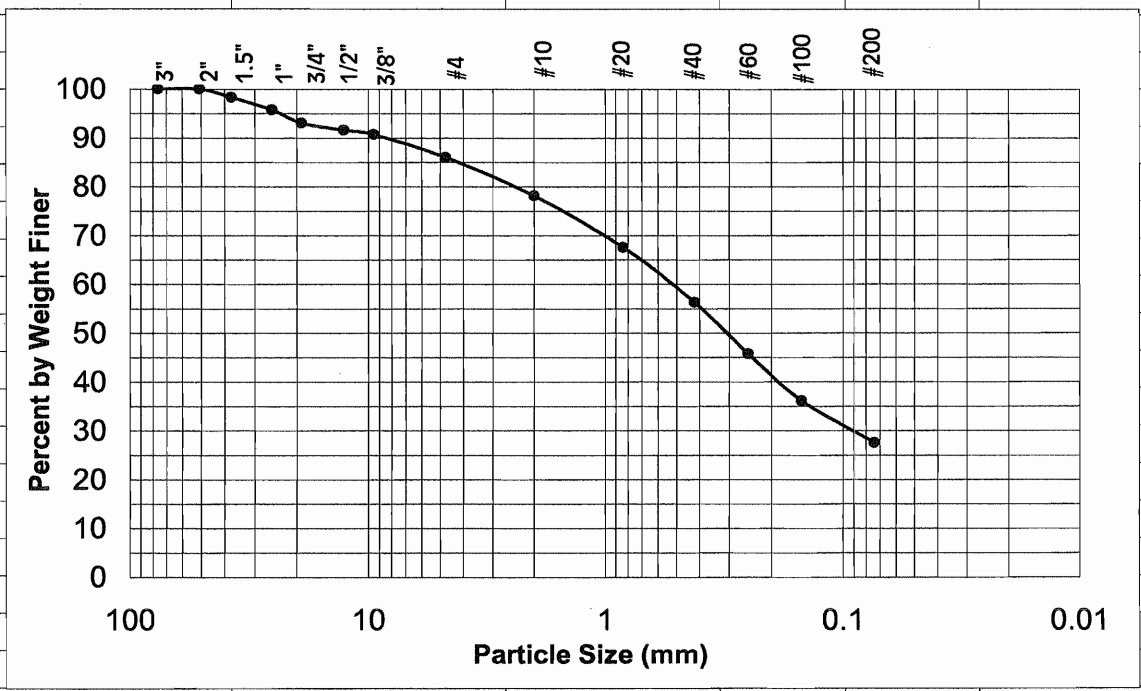
SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile		SAMPLE No:		BRP-1
SAMPLE DESCRIP:	Red silty SAND, little gravel				

DATA

			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**98.3**			
1	25.4	**95.8**			
3/4	19.1	**93.0**			
1/2	12.7	**91.6**			
3/8	9.5	**90.7**			
#4	4.76	**86.0**			
#10	2.0	**78.1**			
#20	0.84	**67.6**			
#40	0.42	**56.3**			
#60	0.25	**45.8**			
#100	0.149	**36.1**			
#200	0.074	**27.5**			

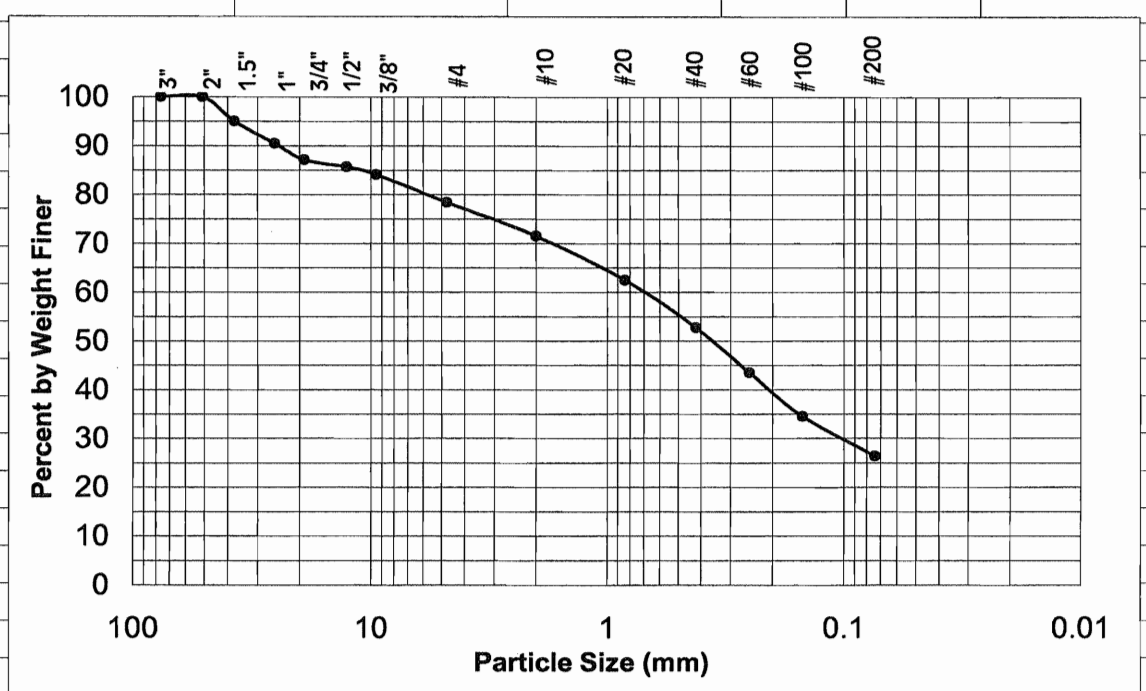


Water Content (%) = 24.3

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile			SAMPLE No:	BRP-2
SAMPLE DESCRIP:	Red silty SAND, some grave;				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**95.0**			
1	25.4	**90.4**			
3/4	19.1	**87.1**			
1/2	12.7	**85.6**			
3/8	9.5	**84.0**			
#4	4.76	**78.3**			
#10	2.0	**71.5**			
#20	0.84	**62.5**			
#40	0.42	**52.7**			
#60	0.25	**43.4**			
#100	0.149	**34.5**			
#200	0.074	**26.4**			

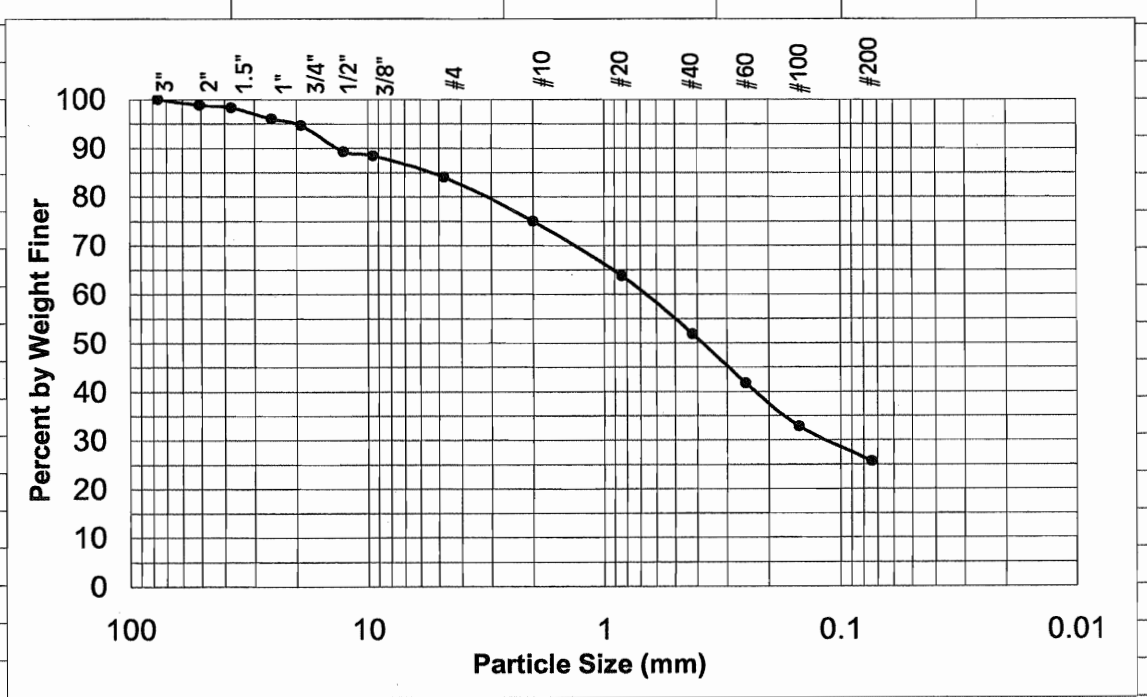


Water Content (%) = 25.1

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper		PROJECT No:		11014
	Canton, N. Carolina		DATE:		11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile		SAMPLE No:		BRP-3
SAMPLE DESCRIP:	Red silty SAND, little gravel				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**98.8**			
1.5	37.5	**98.3**			
1	25.4	**96.0**			
3/4	19.1	**94.6**			
1/2	12.7	**89.2**			
3/8	9.5	**88.4**			
#4	4.76	**84.0**			
#10	2.0	**75.0**			
#20	0.84	**63.8**			
#40	0.42	**51.8**			
#60	0.25	**41.7**			
#100	0.149	**32.8**			
#200	0.074	**25.6**			

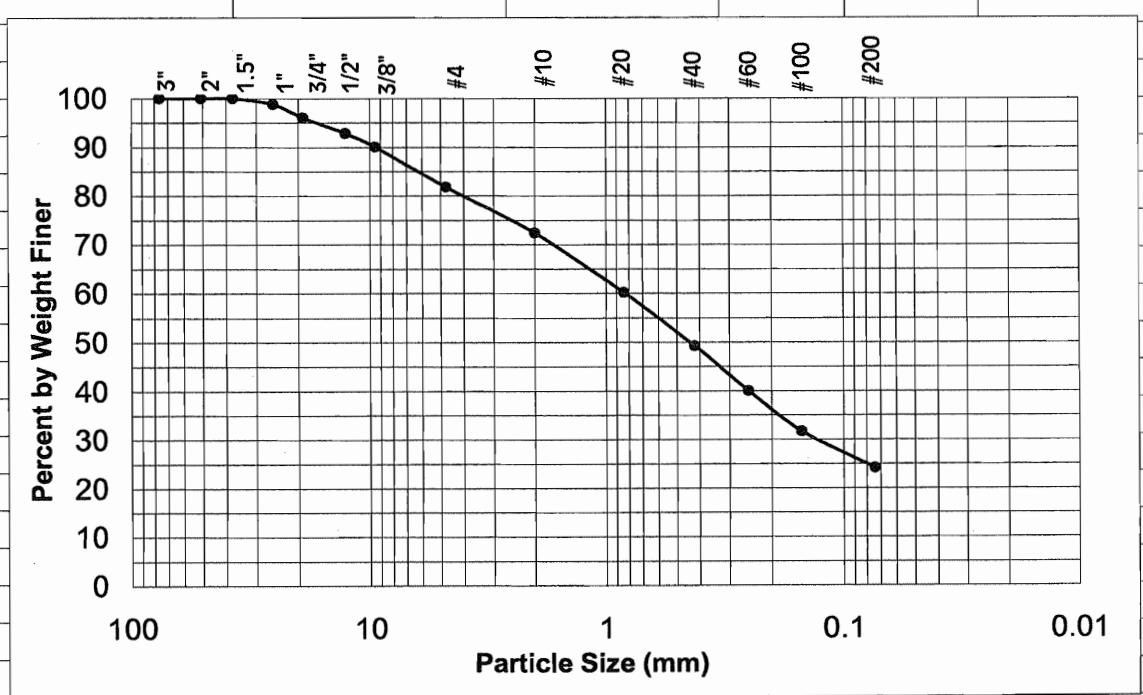


Water Content (%) = 24.1

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile			SAMPLE No:	BRP-4
SAMPLE DESCRIP:	Red silty SAND, little gravel				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**98.8**			
3/4	19.1	**96.0**			
1/2	12.7	**92.8**			
3/8	9.5	**90.0**			
#4	4.76	**81.8**			
#10	2.0	**72.4**			
#20	0.84	**60.2**			
#40	0.42	**49.2**			
#60	0.25	**40.0**			
#100	0.149	**31.6**			
#200	0.074	**24.1**			



Water Content (%) = 21.4

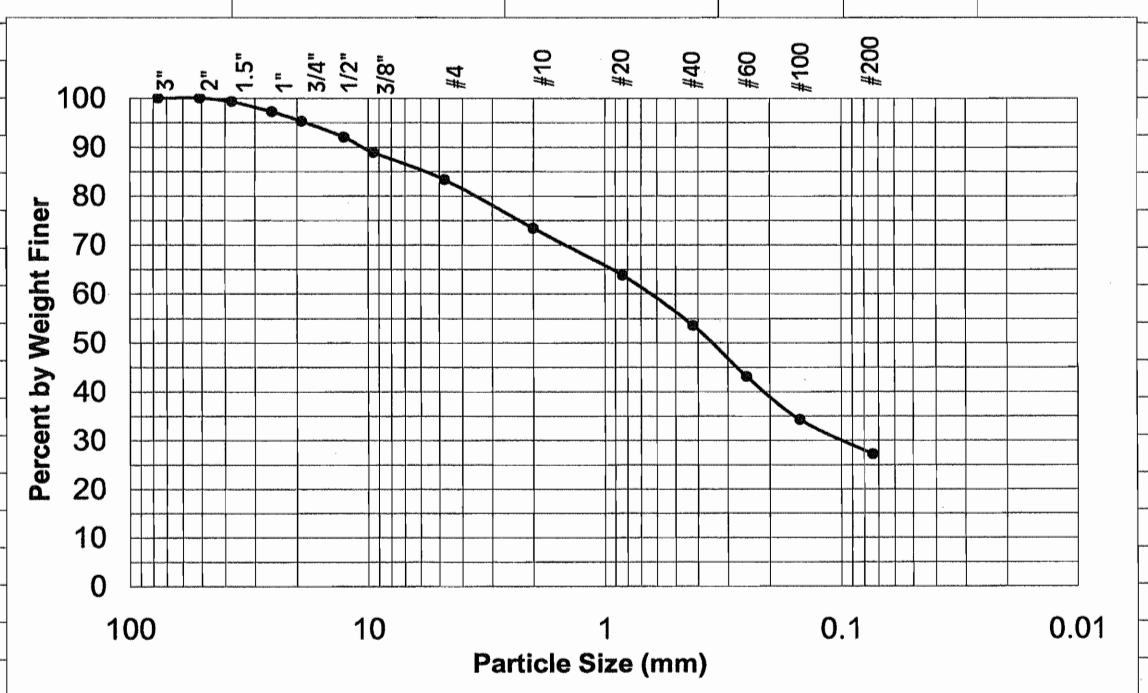
SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile			SAMPLE No:	BRP-5
SAMPLE DESCRIP:	Red silty SAND, little gravel				

DATA

			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	100.0			
2	50.8	100.0			
1.5	37.5	99.3			
1	25.4	97.2			
3/4	19.1	95.2			
1/2	12.7	92.0			
3/8	9.5	88.8			
#4	4.76	83.3			
#10	2.0	73.3			
#20	0.84	63.8			
#40	0.42	53.5			
#60	0.25	43.0			
#100	0.149	34.2			
#200	0.074	27.1			

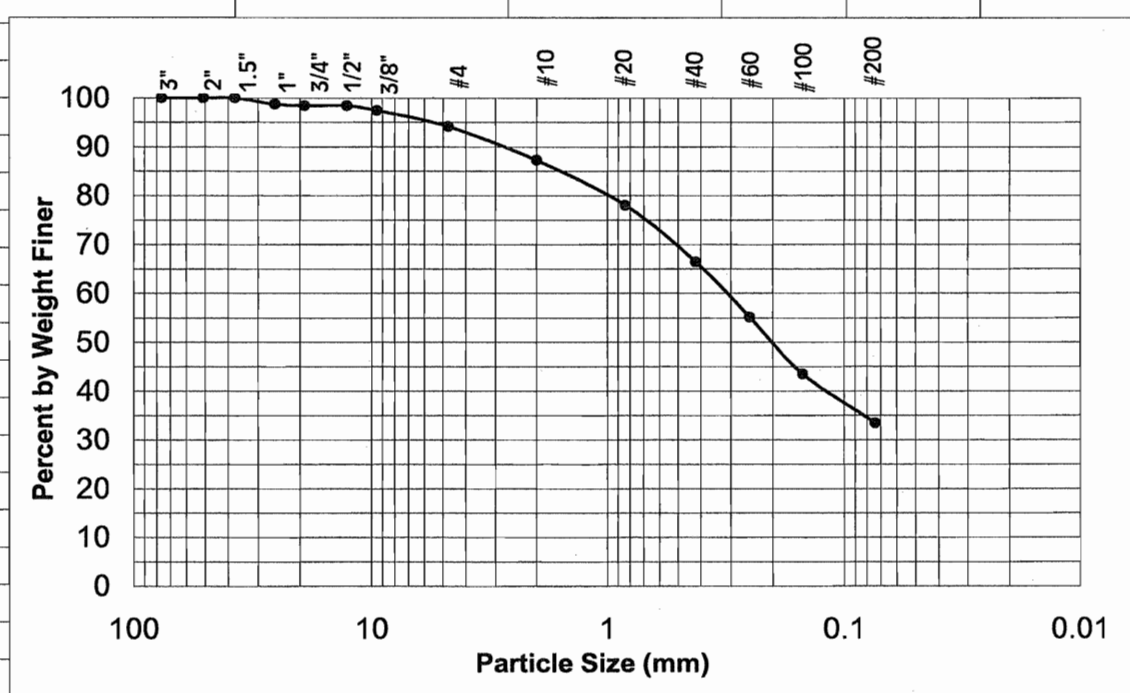


Water Content (%) = 16.6

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

GRAIN SIZE ANALYSIS - ASTM D422

PROJECT NAME:	Blue Ridge Paper			PROJECT No:	11014
	Canton, N. Carolina			DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile			SAMPLE No:	BRP-6
SAMPLE DESCRIP:	Red silty SAND, trace gravel				
		DATA			
			SPECIFICATION		
U.S Std SIEVE (in.)	PARTICLE SIZE (mm)	% by WT. FINER	Min	Max	P / F
3	76.2	**100.0**			
2	50.8	**100.0**			
1.5	37.5	**100.0**			
1	25.4	**98.7**			
3/4	19.1	**98.4**			
1/2	12.7	**98.4**			
3/8	9.5	**97.4**			
#4	4.76	**94.1**			
#10	2.0	**87.2**			
#20	0.84	**78.0**			
#40	0.42	**66.4**			
#60	0.25	**55.1**			
#100	0.149	**43.4**			
#200	0.074	**33.4**			



Water Content (%) = 28.1

ATTERBERG LIMIT TESTS

ATTERBERG LIMIT DATA SHEET

PROJECT: BRPP
BARBER ORCHARD

JOB NO: 11014
DATE: 15 FEB 11
TESTED BY: EJL

BORING NO: _____
SAMPLE NO: Bo-1
DEPTH (ft.): _____

SAMPLE SOURCE: _____
SAMPLE DESCRIPTION: Rd-brown sandy SILT trace gravel

SAMPLE PRETREATMENT: (✓) NONE ( ) AIR DRIED ( ) OVEN DRIED @ 60 C

SPLIT ON: (✓) No. 40 SIEVE ( ) No. 10 SIEVE ( ) NOT SPLIT

OVEN TEMP. FOR WATER CONTENTS: ( ) 60 C (✓) 110 C

PLASTIC LIMIT

CONTAINER NO:	X-5	X-6	
WT. WET SOIL + CONT.	35.24	32.06	
WT. DRY SOIL + CONT.	32.19	29.63	
WT. CONTAINER (g)	21.79	21.40	
WATER CONTENT (%)	29.3	29.5	

NAT. WATER CONTENT

31.0

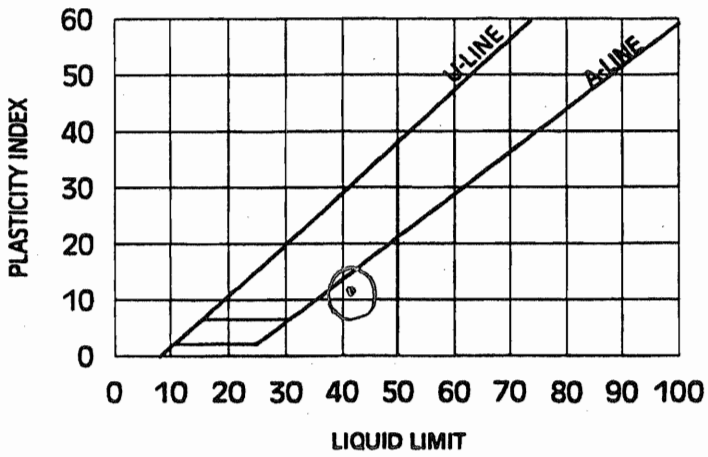
LIQUID LIMIT

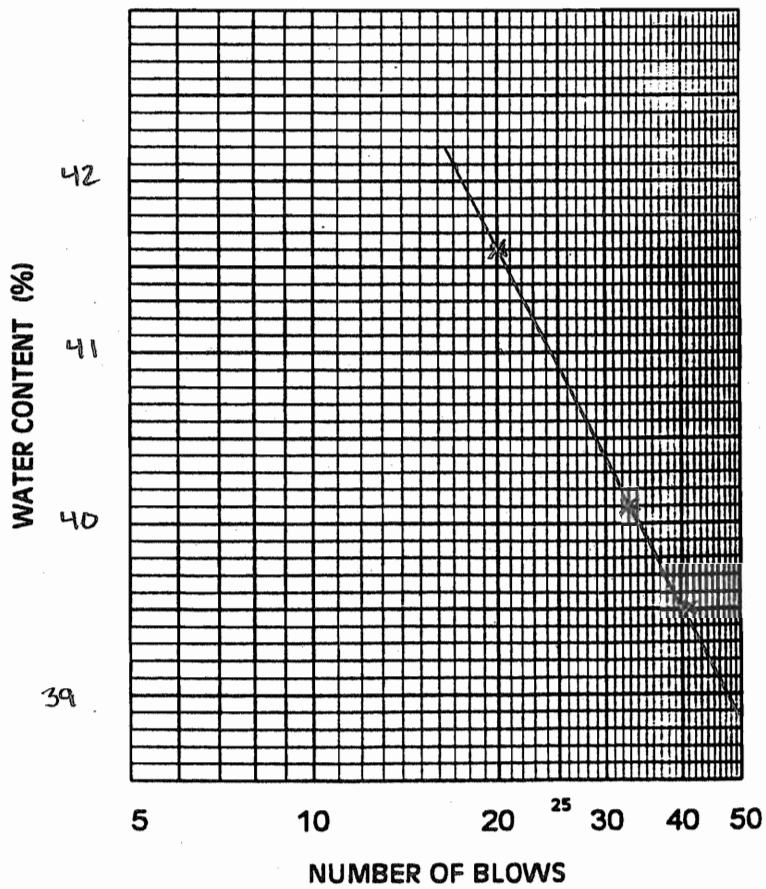
NO. OF BLOWS:	20	33	41		
CONTAINER NO:	X-2	X-3	X-4		
WT. WET SOIL + CONT.	29.84	28.79	29.35		
WT. DRY SOIL + CONT.	27.38	26.77	27.14		
WT. CONTAINER (g)	21.47	21.73	21.55		
WATER CONTENT (%)	41.6	40.1	39.5		

SUMMARY OF RESULTS

NAT. WATER CONTENT:	31.0
LIQUID LIMIT:	40.9
PLASTIC LIMIT:	29.4
PLASTIC INDEX:	11.5

PLASTICITY CHART





SEVEE & MAHER ENGINEERS

ATTERBERG LIMIT DATA SHEET

PROJECT: BRPP
BARBER ORCHARD

JOB NO: 11014
DATE: 15 FEB 11
TESTED BY: EJL

BORING NO: _____
SAMPLE NO: B0-4
DEPTH (ft.): _____

SAMPLE SOURCE: _____
SAMPLE DESCRIPTION: Brown sandy SILT

SAMPLE PRETREATMENT: (✓) NONE ( ) AIR DRIED ( ) OVEN DRIED @ 60 C

SPLIT ON: (✓) No. 40 SIEVE ( ) No. 10 SIEVE ( ) NOT SPLIT

OVEN TEMP. FOR WATER CONTENTS: ( ) 60 C (✓) 110 C

PLASTIC LIMIT

CONTAINER NO:	X-10	X-11	
WT. WET SOIL + CONT.	29.85	29.65	
WT. DRY SOIL + CONT.	27.83	27.60	
WT. CONTAINER (g)	21.82	21.39	
WATER CONTENT (%)	33.6	33.0	

NAT. WATER CONTENT

34.3

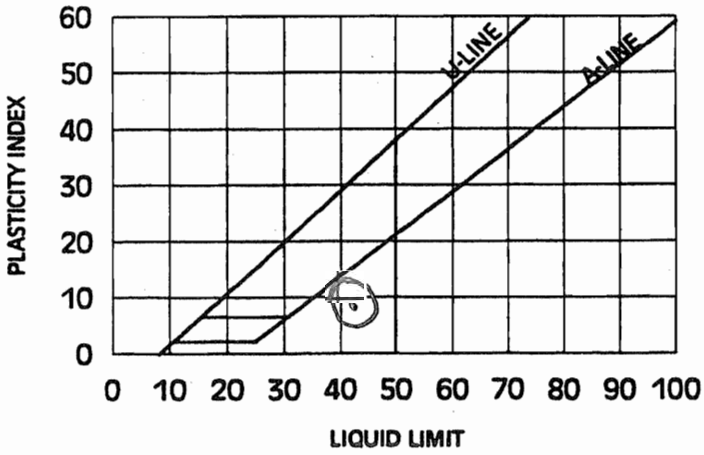
LIQUID LIMIT

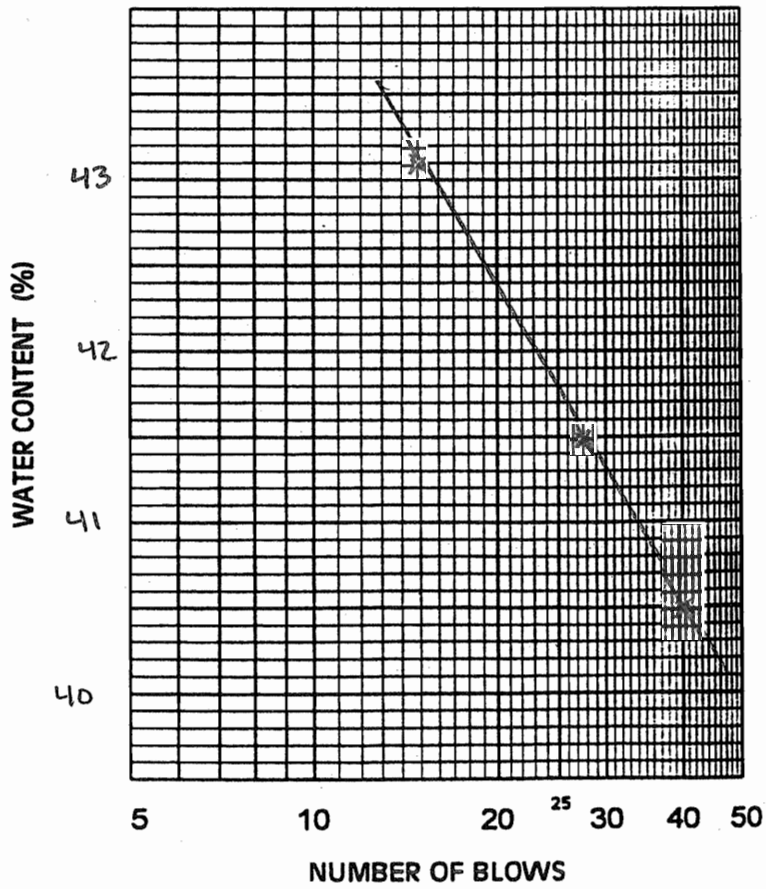
NO. OF BLOWS:	41	28	15		
CONTAINER NO:	X-7	X-8	X-9		
WT. WET SOIL + CONT.	28.71	29.95	29.01		
WT. DRY SOIL + CONT.	26.61	27.40	26.78		
WT. CONTAINER (g)	21.43	21.25	21.60		
WATER CONTENT (%)	40.5	41.5	43.1		

SUMMARY OF RESULTS

NAT. WATER CONTENT:	34.3
LIQUID LIMIT:	41.8
PLASTIC LIMIT:	33.3
PLASTIC INDEX:	8.5

PLASTICITY CHART





SEVEE & MAHER ENGINEERS

ATTERBERG LIMIT DATA SHEET

PROJECT: BRPP
BARBER ORCHARD

JOB NO: 11014
DATE: 15 FEB 11
TESTED BY: EJL

BORING NO: _____
SAMPLE NO: B0-6
DEPTH (ft.): _____

SAMPLE SOURCE: _____
SAMPLE DESCRIPTION: Dk brown sandy SILT w/ gravel and organics

SAMPLE PRETREATMENT: (✓) NONE ( ) AIR DRIED ( ) OVEN DRIED @ 60 C

SPLIT ON: (✓) No. 40 SIEVE ( ) No. 10 SIEVE ( ) NOT SPLIT

OVEN TEMP. FOR WATER CONTENTS: ( ) 60 C (✓) 110 C

PLASTIC LIMIT

CONTAINER NO:	X-15	X-16	
WT. WET SOIL + CONT.	29.53	29.08	
WT. DRY SOIL + CONT.	26.89	26.70	
WT. CONTAINER (g)	21.54	21.84	
WATER CONTENT (%)	49.3	49.0	

NAT. WATER CONTENT

48.4

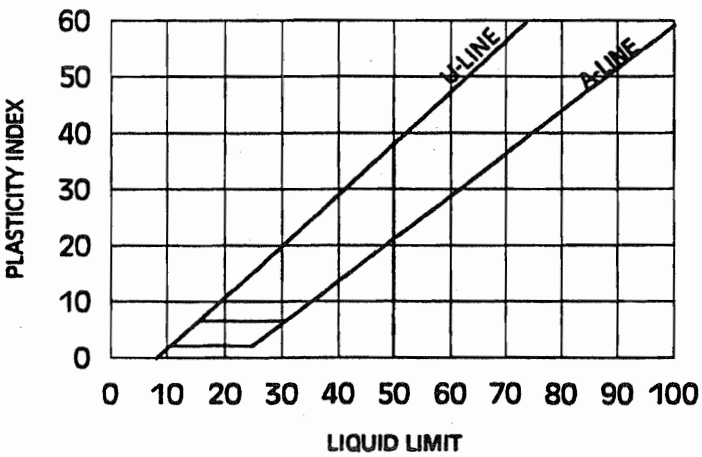
LIQUID LIMIT

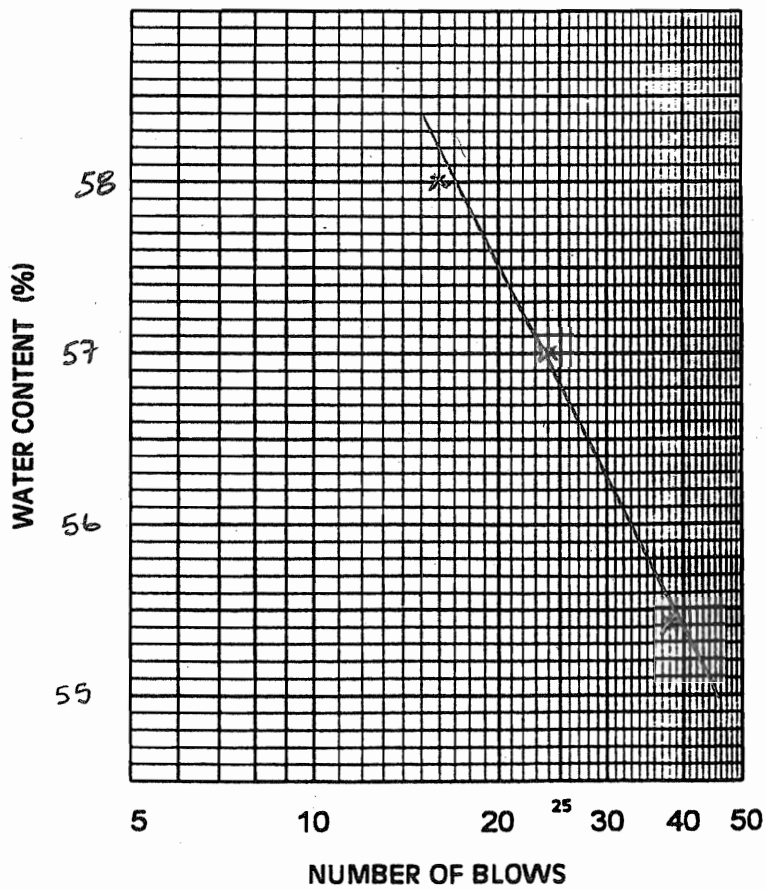
NO. OF BLOWS:	38	24	16		
CONTAINER NO:	X-12	X-13	X-14		
WT. WET SOIL + CONT.	32.67	29.69	27.89		
WT. DRY SOIL + CONT.	28.65	26.69	25.57		
WT. CONTAINER (g)	21.39	21.43	21.57		
WATER CONTENT (%)	55.4	57.0	58.0		

SUMMARY OF RESULTS

NAT. WATER CONTENT:	48.4
LIQUID LIMIT:	56.8
PLASTIC LIMIT:	49.2
PLASTIC INDEX:	7.6

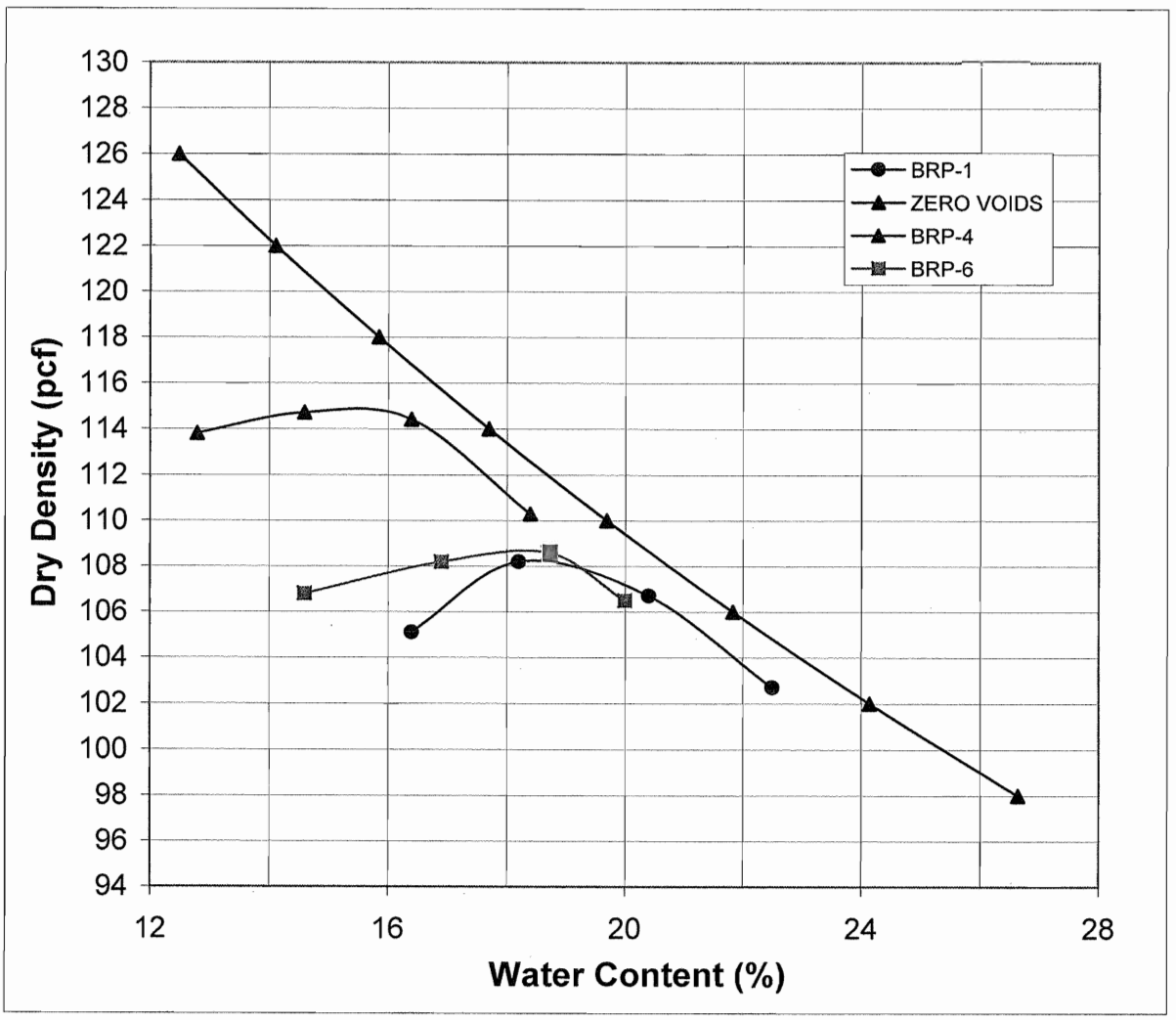
PLASTICITY CHART





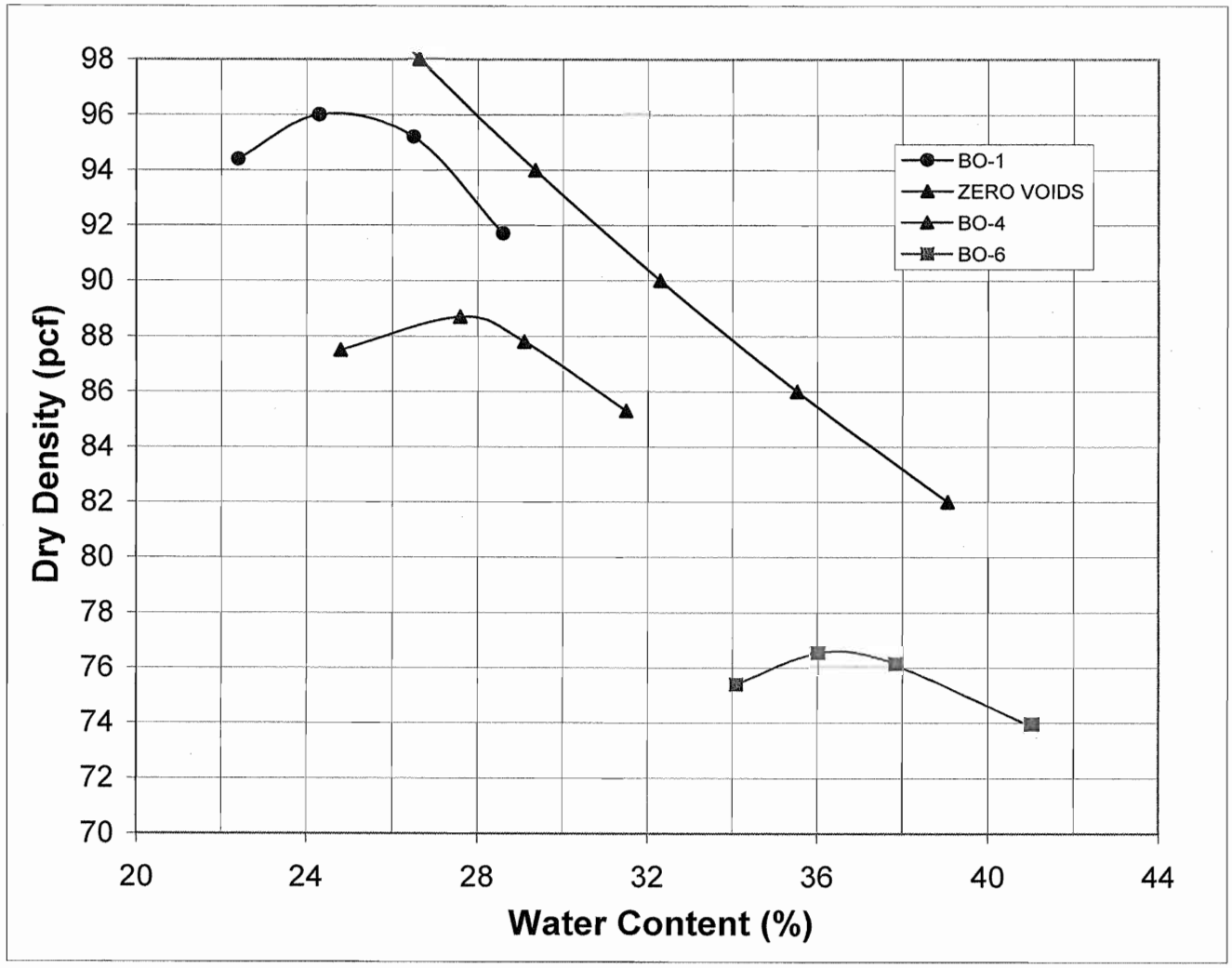
SEVEE & MAHER ENGINEERS

MOISTURE-DENSITY TESTS



BRP-1			BRP-4			BRP-6		
Moisture (%)	Dry Density (pcf)	Total Density (pcf)	Moisture (%)	Dry Density (pcf)	Total Density (pcf)	Moisture (%)	Dry Density (pcf)	Total Density (pcf)
16.4	105.1	122	12.8	113.8	128	14.6	106.8	122
18.2	108.2	128	14.6	114.7	131	16.9	108.2	126
20.4	106.7	128	16.4	114.4	133	18.7	108.6	129
22.5	102.7	126	18.4	110.3	131	20	106.5	128
25.3	98.9	124						
27.5	95.9	122						

Total Density				
	BO-1	BO-4	BO-6	**ALL SAMPLES**
Average	126	131	126	**127**
Geometric Mean	126	131	126	**127**
Median	127	131	127	**128**



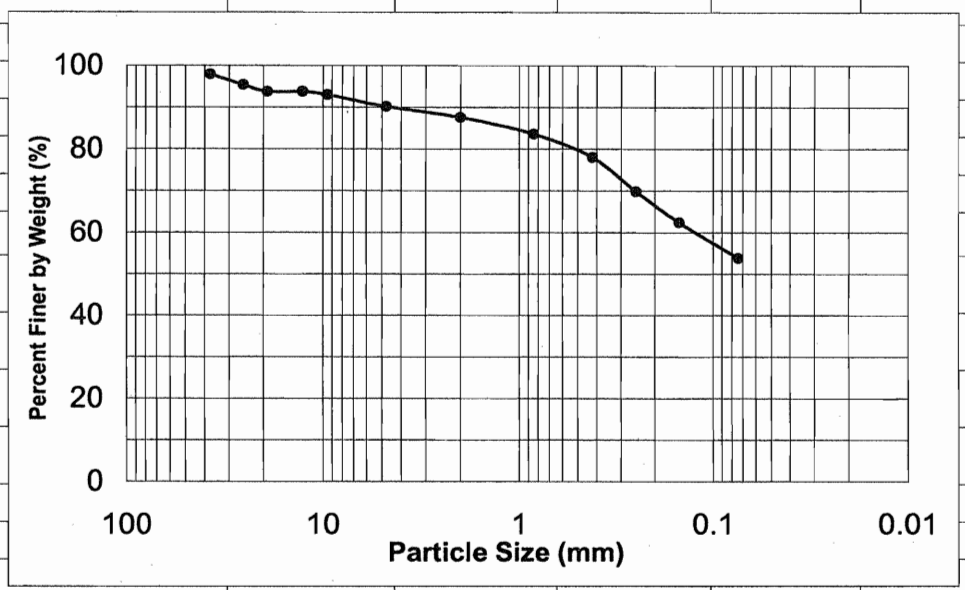
BO-1			BO-4			BO-6		
Moisture (%)	Dry Density (pcf)	Total Density (pcf)	Moisture (%)	Dry Density (pcf)	Total Density (pcf)	Moisture (%)	Dry Density (pcf)	Total Density (pcf)
22.4	94.4	116	24.8	87.5	109	34.1	75.4	101
24.3	96	119	27.6	88.7	113	36	76.5	104
26.5	95.2	120	29.1	87.8	113	37.8	76.1	105
28.6	91.7	118	31.5	85.3	112	41	73.9	104

Total Density				
	BO-1	BO-4	BO-6	**ALL SAMPLES**
Average	118	112	104	**111**
Geometric Mean	118	112	104	**111**
Median	119	113	104	**113**

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

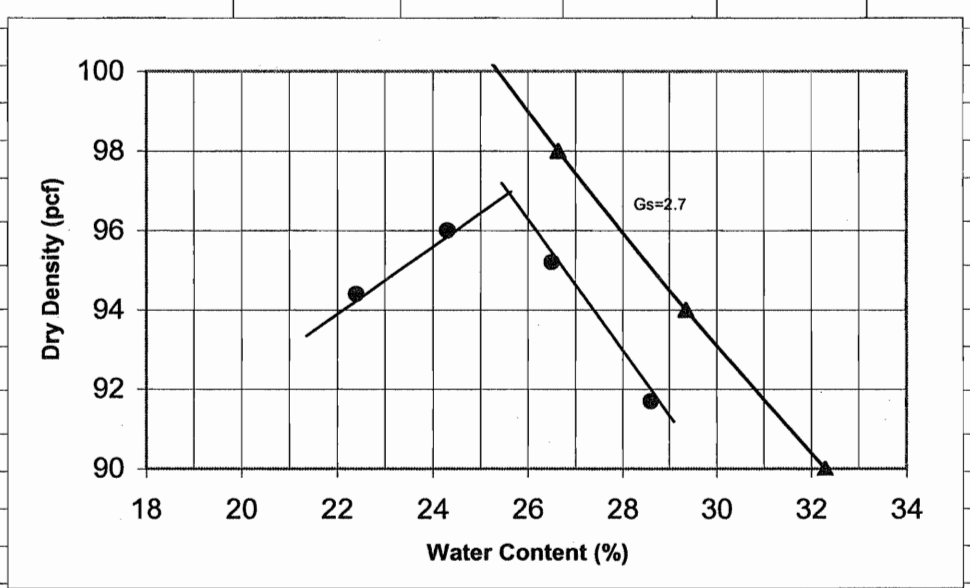
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard	SAMPLE No:	BO-1
SAMPLE DESCRIP:	Red brown sandy SILT, trace gravel		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	40.9
W_P=	29.4
I_P=	11.5
W_N=	33.2

MOISTURE-DENSITY ASTM D 698 A

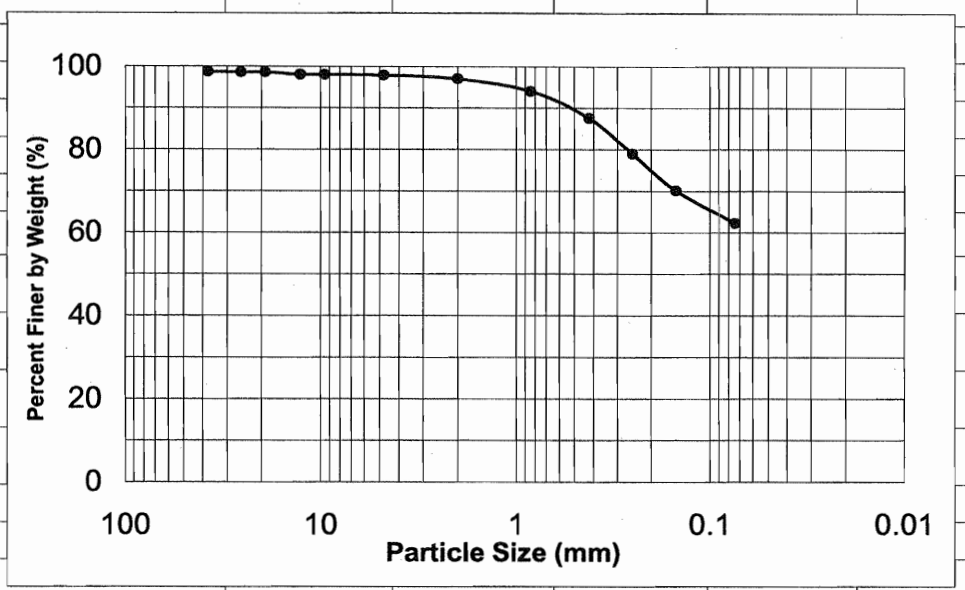


MAXIMUM DRY DENSITY (pcf)	OPTIMUM W.C. (%)
24.5	96.5

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

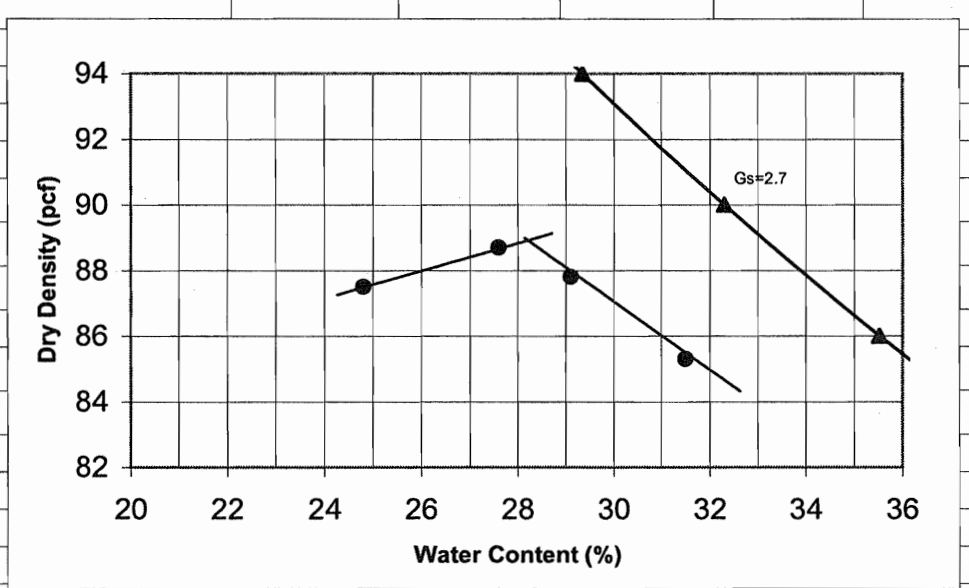
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard	SAMPLE No:	BO-4
SAMPLE DESCRIP:	Brown sandy SILT		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	41.8
W_P=	33.3
I_P=	8.5
W_N=	34.3

MOISTURE-DENSITY ASTM D 698 A



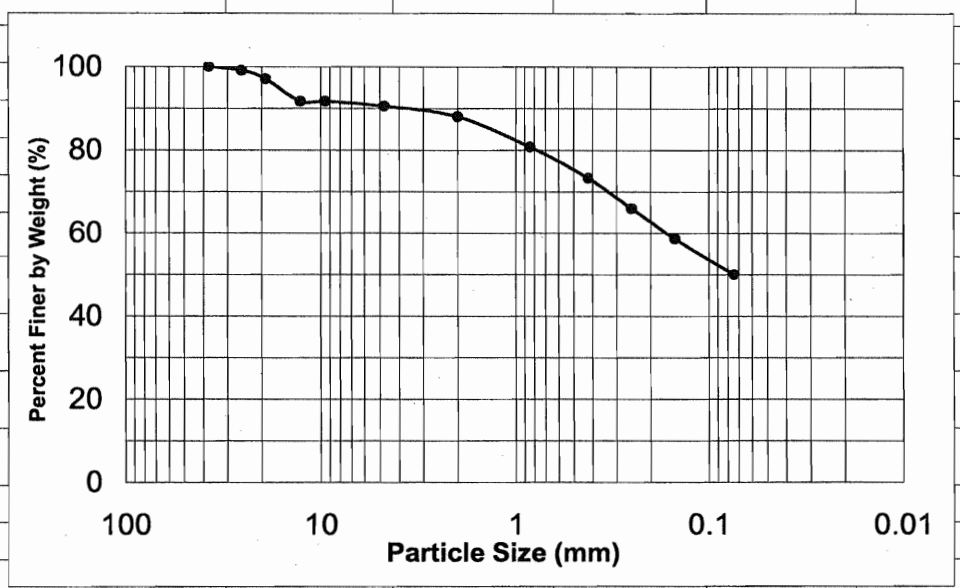
MAXIMUM
DRY DENSITY (pcf)
89

OPTIMUM W.C. (%)
28

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

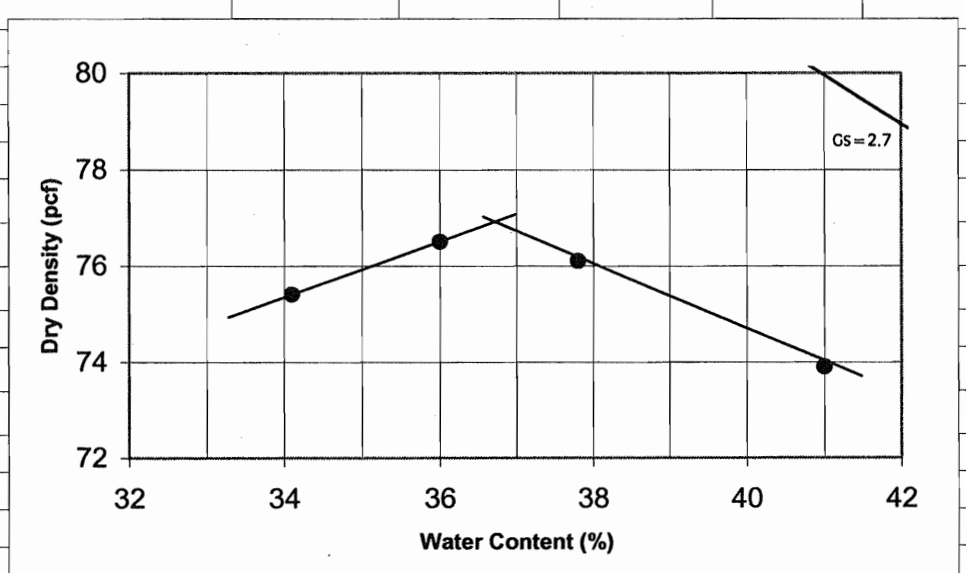
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	Barber Orchard	SAMPLE No:	BO-6
SAMPLE DESCRIP:	Dark brown sandy SILT, trace gravel, with organics		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	56.8
W_P=	49.2
I_P=	7.6
W_N=	48.7

MOISTURE-DENSITY ASTM D 698 A



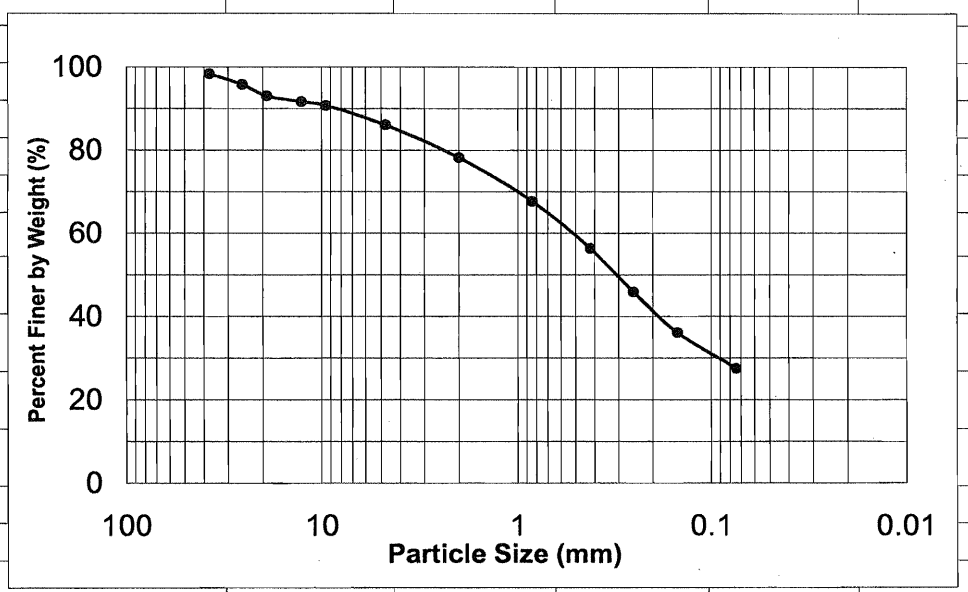
MAXIMUM DRY DENSITY (pcf)
77

OPTIMUM W.C. (%)
36.6

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

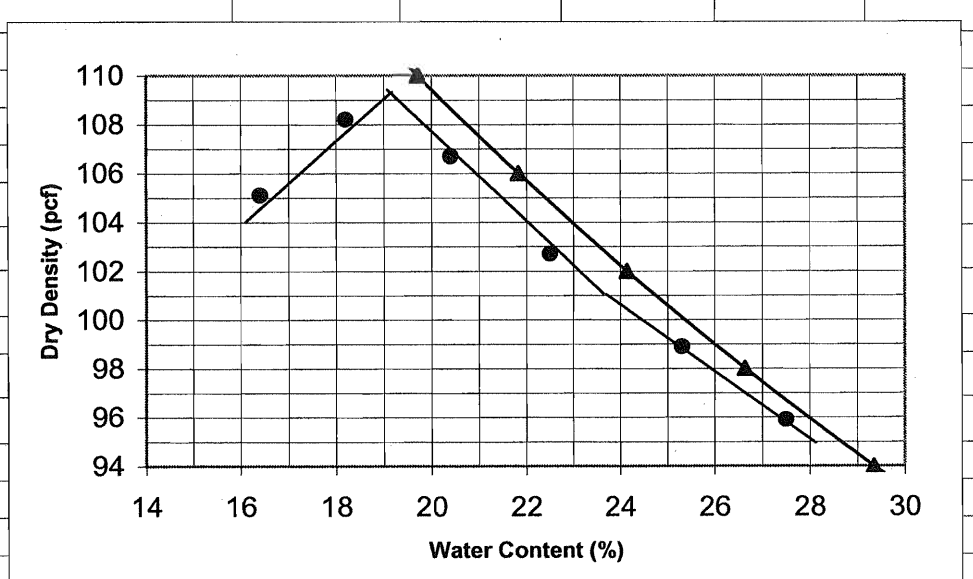
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile	SAMPLE No:	BRP-1
SAMPLE DESCRIP:	Red silty SAND, little gravel		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	
W_P=	
I_P=	NP
W_N=	24.3

MOISTURE-DENSITY ASTM D 698 A



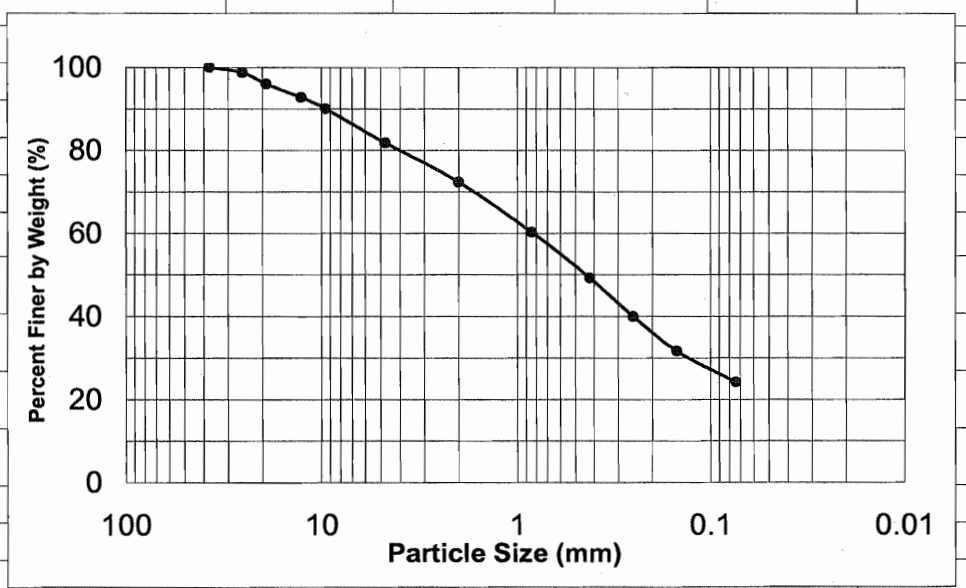
MAXIMUM
DRY DENSITY (pcf)
109

OPTIMUM W.C. (%)
19

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

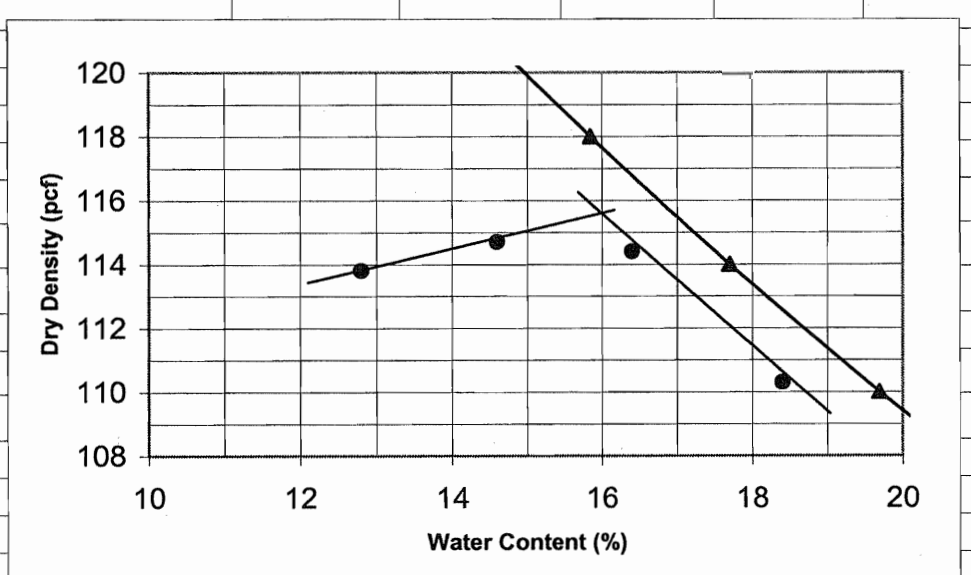
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile	SAMPLE No:	BRP-4
SAMPLE DESCRIP:	Red silty SAND, little gravel		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	
W_P=	
I_P=	NP
W_N=	21.4

MOISTURE-DENSITY ASTM D 698 A



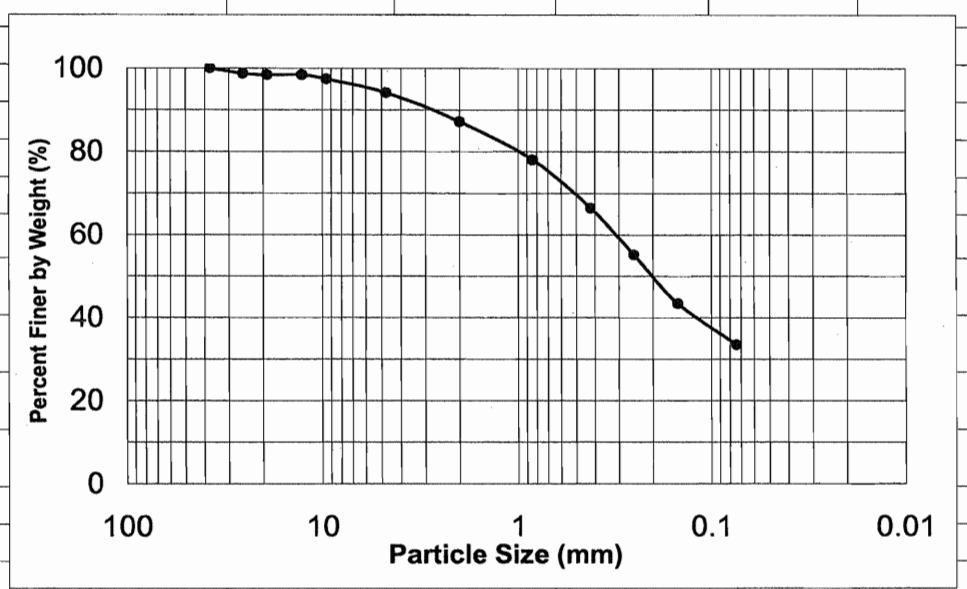
MAXIMUM
DRY DENSITY (pcf)
115.5

OPTIMUM W.C. (%)
15.8

SEVEE & MAHER ENGINEERS
4 BLANCHARD ROAD
CUMBERLAND CTR., MAINE 04021
(207) 829-5016

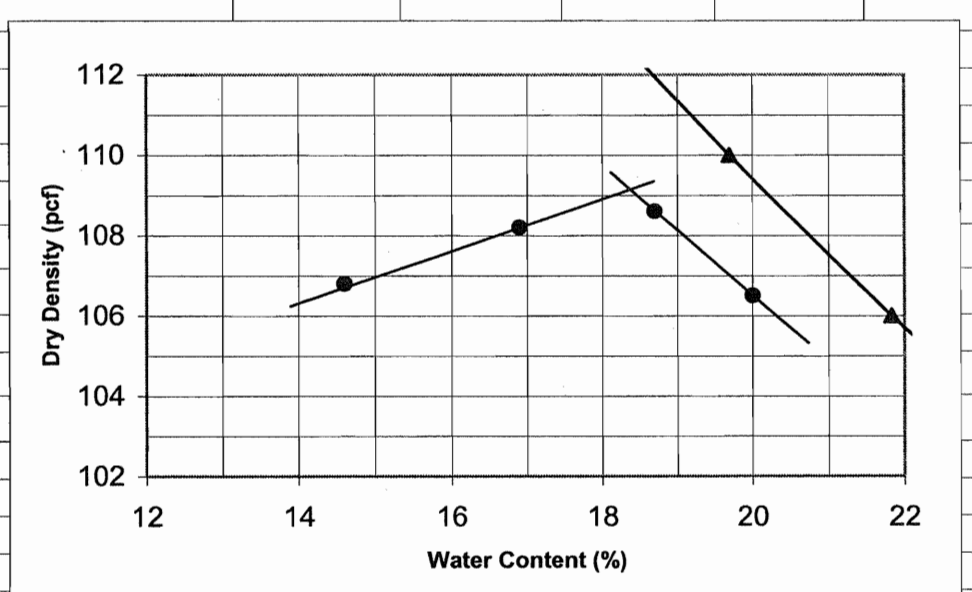
PROJECT NAME:	Blue Ridge Paper	PROJECT No:	11014
	Canton, N. Carolina	DATE:	11-Feb-10
SAMPLE SOURCE:	On-Site Srockpile	SAMPLE No:	BRP-6
SAMPLE DESCRIP:	Red silty SAND, trace gravel		

GRAIN SIZE ANALYSIS ASTM D 422



ATTER. LIMITS (%)	
W_L=	
W_P=	
I_P=	NP
W_N=	28.1

MOISTURE-DENSITY ASTM D 698 A



MAXIMUM
DRY DENSITY (pcf)
109

OPTIMUM W.C. (%)
18.2

HYDRAULIC CONDUCTIVITY TESTS

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

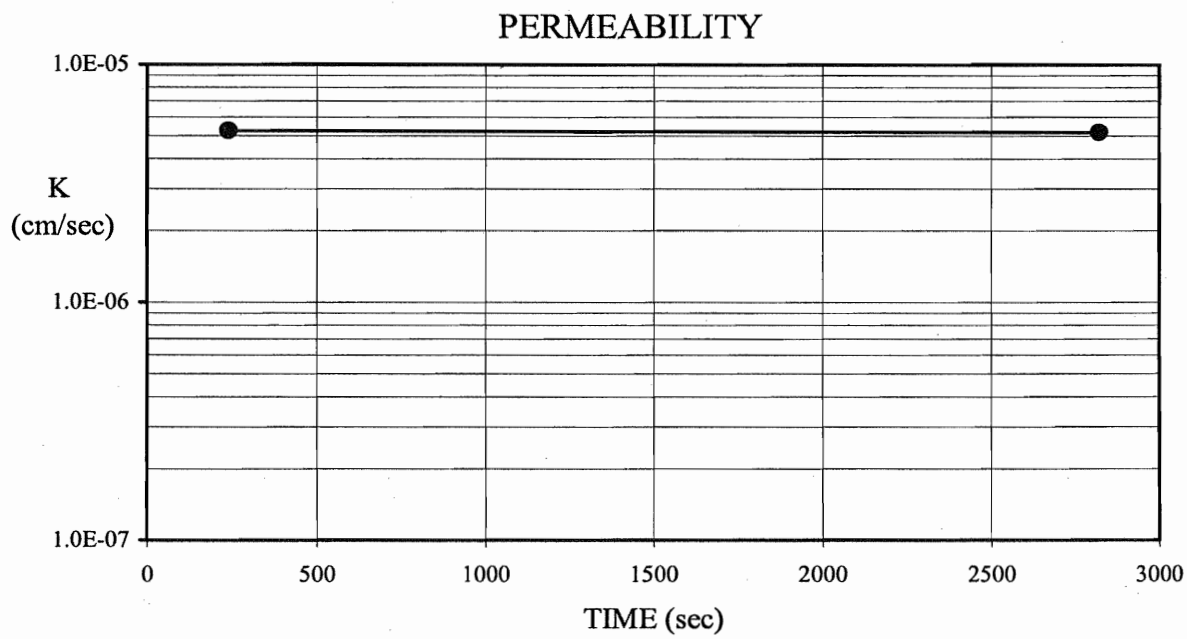
Description: Brown sandy SILT

Exploration:
Sample No.: BO-4
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.177	7.114
Length (cm)=	9.832	9.741
Moist. Cont. (%)=	29.5	35.8
Wet Wt. Soil (gms)=	630.2	662.8
Wet Density (pcf)=	98.9	106.9
Dry Density (pcf)=	76.4	78.7

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.98
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.4



Average Permeability (cm/sec)= 5.2E-06

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

Description: Dark brown sandy SILT, tr gravel w/ organics

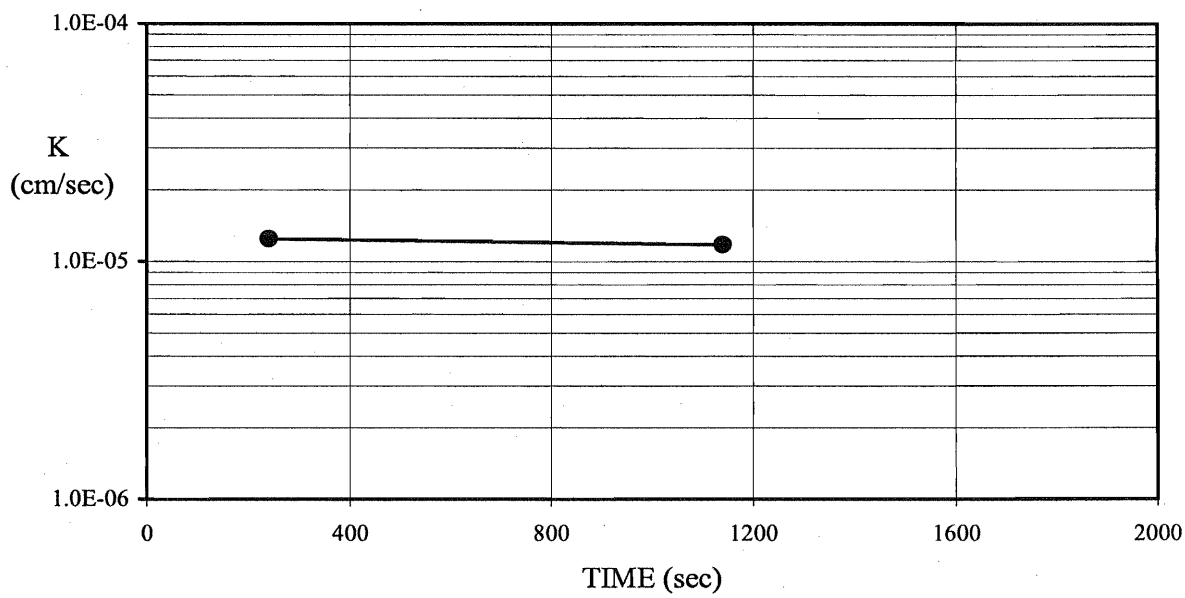
Exploration:
Sample No.: BO-6
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.181	7.123
Length (cm)=	9.992	9.850
Moist. Cont. (%)=	38.0	49.0
Wet Wt. Soil (gms)=	584.3	629.3
Wet Density (pcf)=	90.2	100.1
Dry Density (pcf)=	65.3	67.2

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.94
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.3

PERMEABILITY



Average Permeability (cm/sec)= 1.2E-05

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

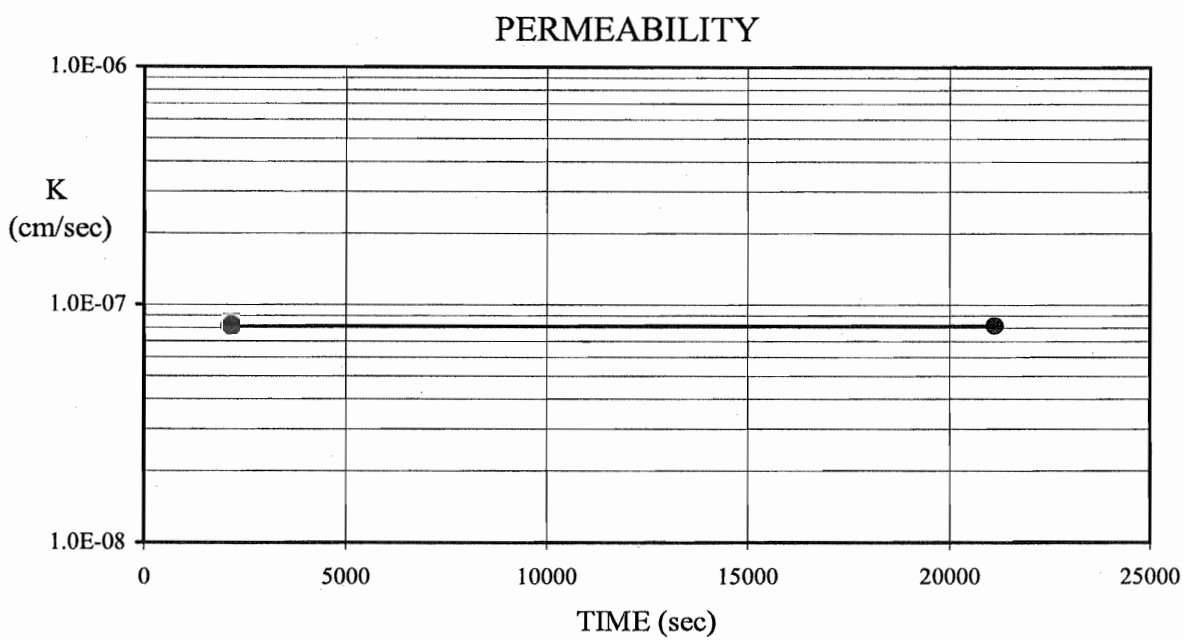
Description: Red-brown sandy SILT, trace gravel

Exploration:
Sample No.: BO-1
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.163	7.159
Length (cm)=	9.868	9.630
Moist. Cont. (%)=	32.0	31.0
Wet Wt. Soil (gms)=	720.5	713.8
Wet Density (pcf)=	113.1	115.0
Dry Density (pcf)=	85.7	87.8

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.98
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.6



Average Permeability (cm/sec)= 8.1E-08

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

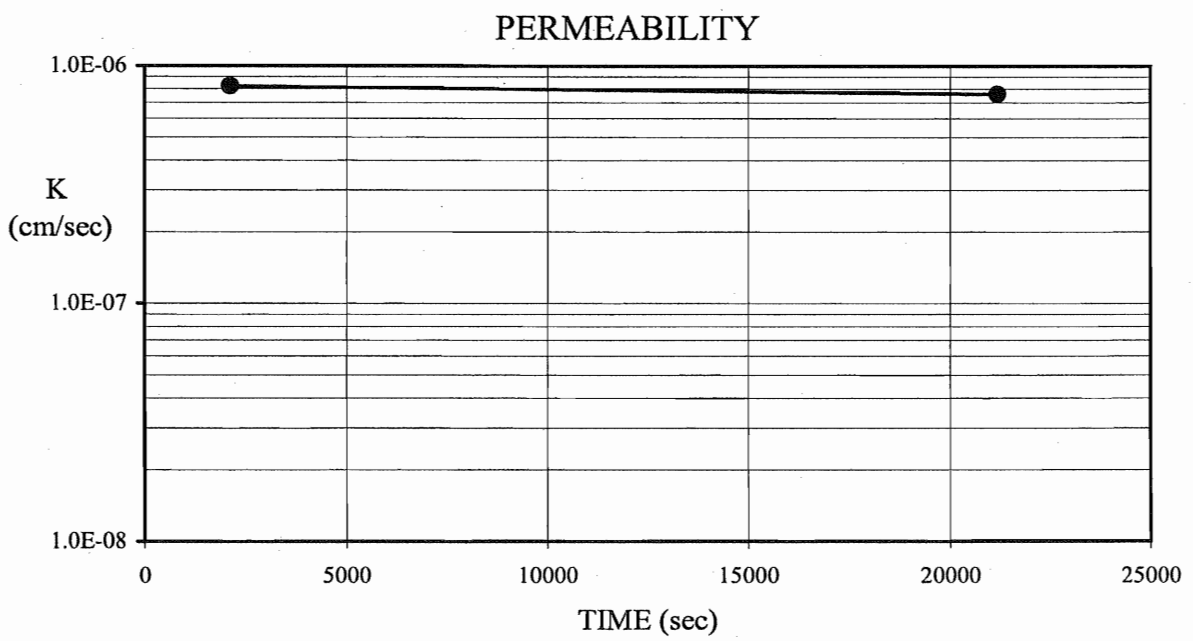
Description: Brown sandy SILT

Exploration:
Sample No.: BO-4
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.173	7.170
Length (cm)=	10.376	10.166
Moist. Cont. (%)=	34.0	35.7
Wet Wt. Soil (gms)=	728.4	734.2
Wet Density (pcf)=	108.4	111.7
Dry Density (pcf)=	81.0	82.3

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.96
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.8



Average Permeability (cm/sec)= 7.9E-07

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

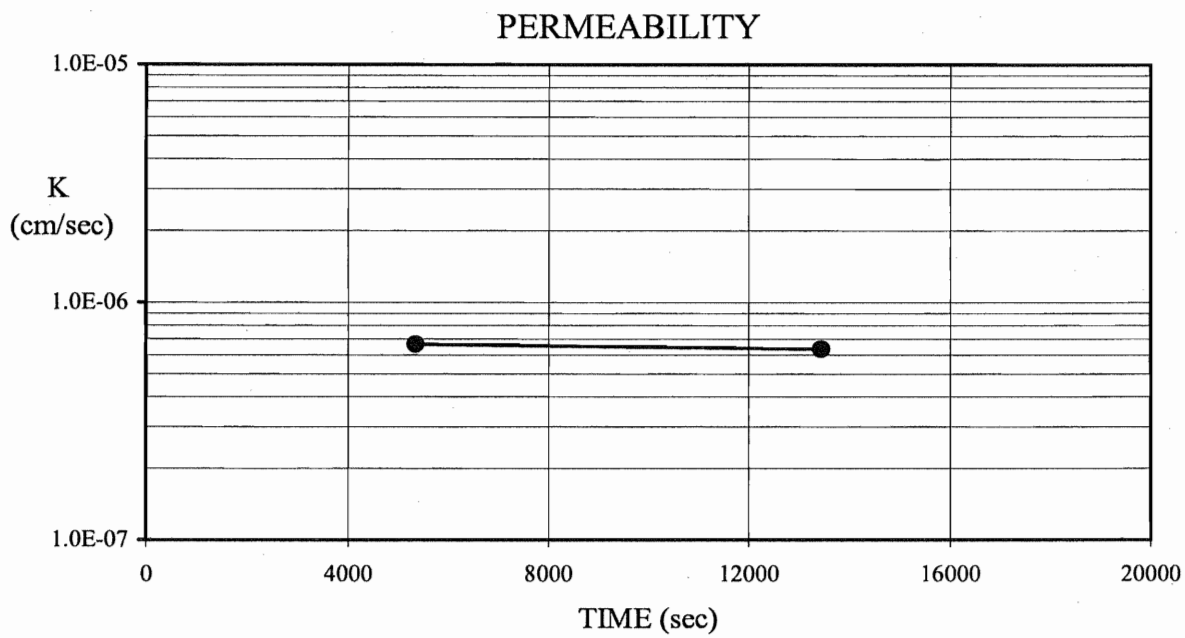
Description: Dark brown sandy SILT, tr gravel w/ organics

Exploration:
Sample No.: BO-6
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.186	7.153
Length (cm)=	10.928	10.702
Moist. Cont. (%)=	46.7	45.8
Wet Wt. Soil (gms)=	712.3	716.2
Wet Density (pcf)=	100.3	104.0
Dry Density (pcf)=	68.4	71.3

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	1
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.1



Average Permeability (cm/sec)= 6.5E-07

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

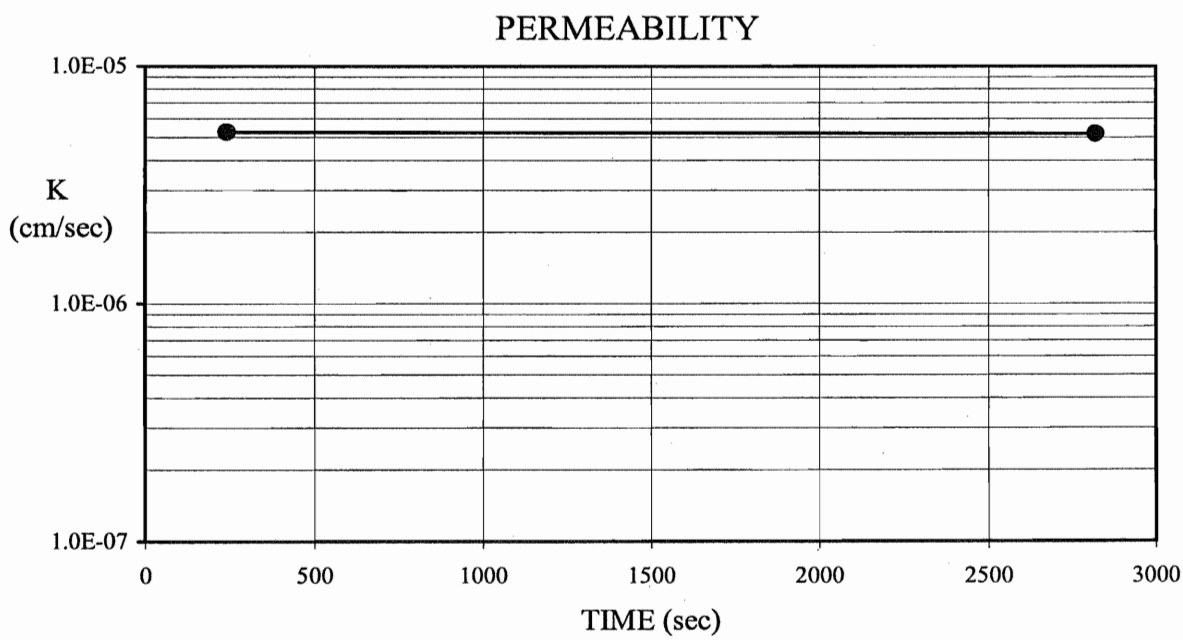
Description: Brown sandy SILT

Exploration:
Sample No.: BO-4
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.177	7.114
Length (cm)=	9.832	9.741
Moist. Cont. (%)=	29.5	-467.5
Wet Wt. Soil (gms)=	630.2	662.8
Wet Density (pcf)=	98.9	106.9
Dry Density (pcf)=	76.4	-29.1

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.98
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.4



Average Permeability (cm/sec)= 5.2E-06

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

Description: Dark brown sandy SILT, tr gravel w/ organics

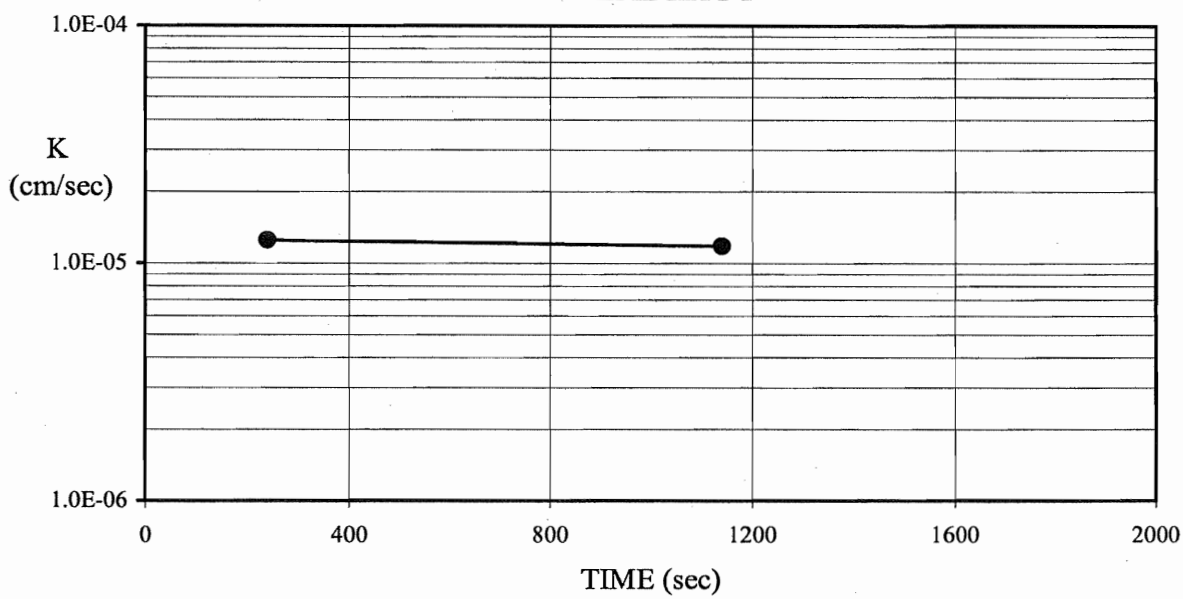
Exploration:
Sample No.: BO-6
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.181	7.123
Length (cm)=	9.992	9.850
Moist. Cont. (%)=	38.0	-421.9
Wet Wt. Soil (gms)=	584.3	629.3
Wet Density (pcf)=	90.2	100.1
Dry Density (pcf)=	65.3	-31.1

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.94
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.3

PERMEABILITY



Average Permeability (cm/sec)= 1.2E-05

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

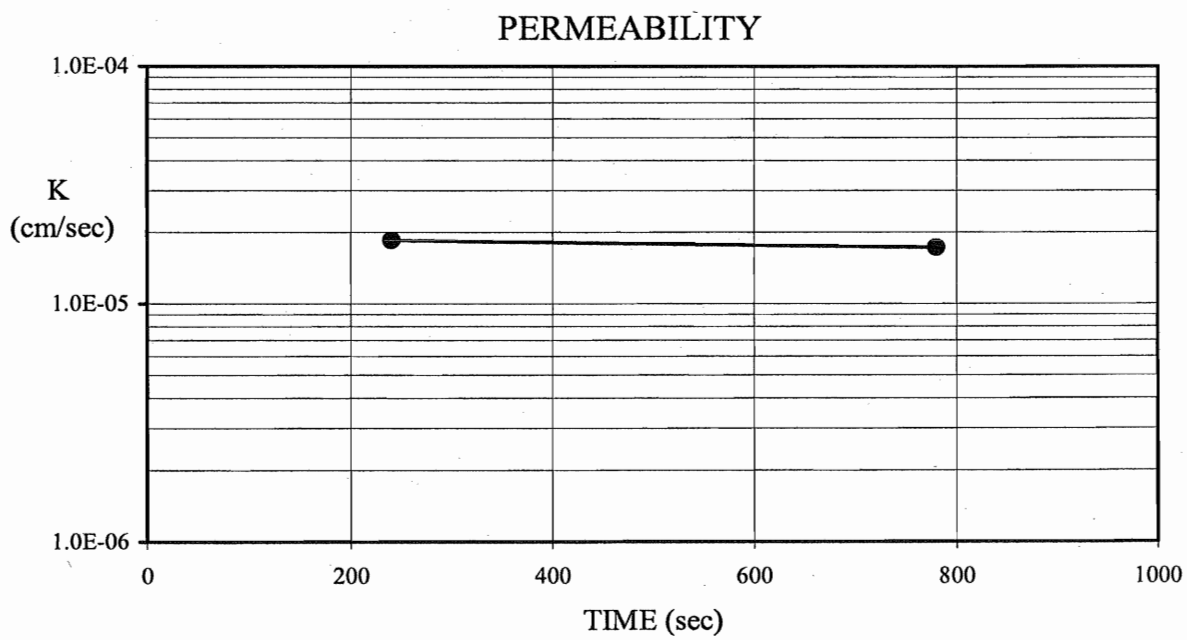
Description: Red silty SAND, little gravel

Exploration:
Sample No.: BRP-4
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.180	7.246
Length (cm)=	10.131	10.080
Moist. Cont. (%)=	16.6	21.4
Wet Wt. Soil (gms)=	811.8	846.1
Wet Density (pcf)=	123.6	127.1
Dry Density (pcf)=	106.0	104.7

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.96
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.0



Average Permeability (cm/sec)= 1.8E-05

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

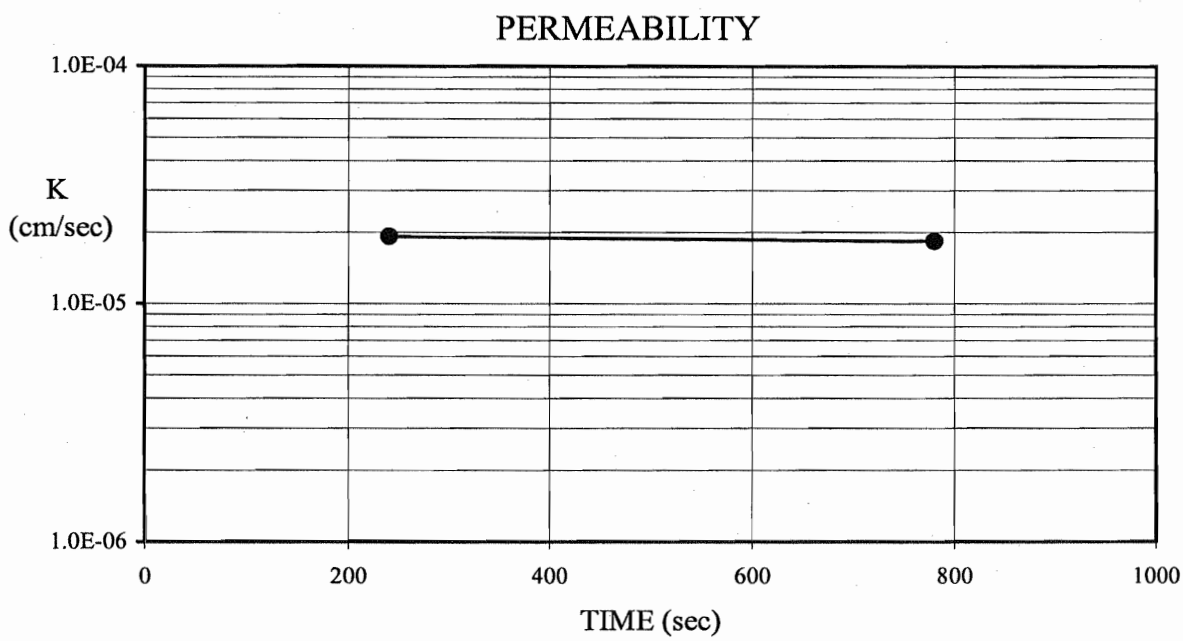
Description: Red silty SAND, trace gravel

Exploration:
Sample No.: BRP-6
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.176	7.232
Length (cm)=	10.662	10.626
Moist. Cont. (%)=	21.2	26.0
Wet Wt. Soil (gms)=	830.2	863.7
Wet Density (pcf)=	120.2	123.5
Dry Density (pcf)=	99.2	98.0

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.94
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.2



Average Permeability (cm/sec)= 1.9E-05

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

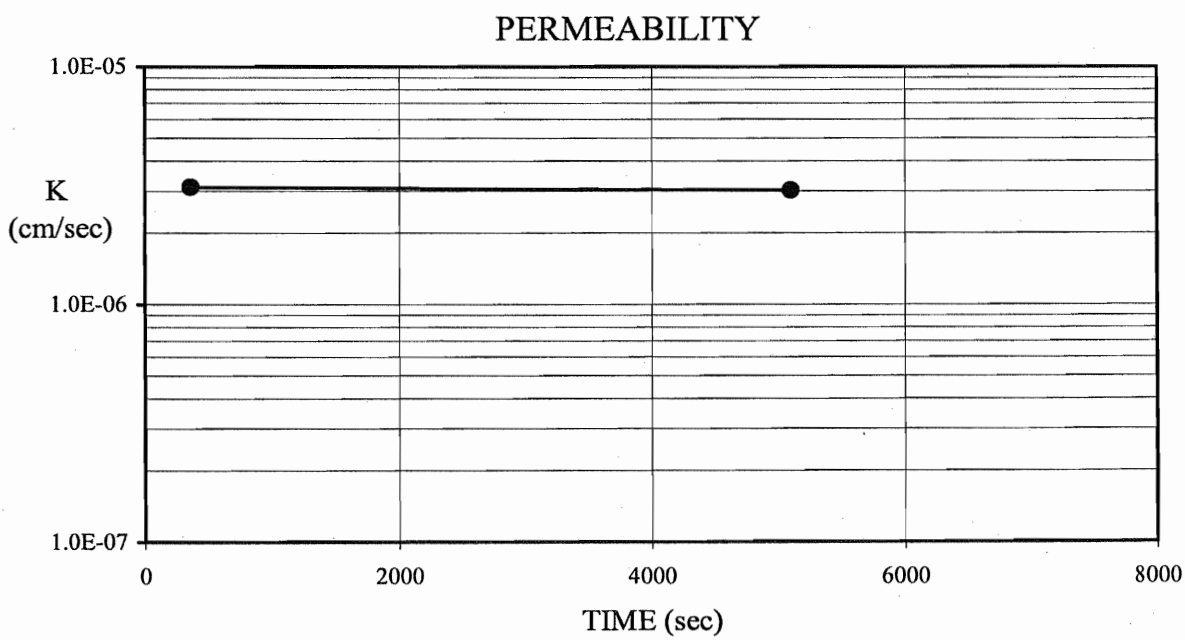
Description: Red silty SAND, little gravel

Exploration:
Sample No.: BRP-1
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.181	7.233
Length (cm)=	10.495	10.142
Moist. Cont. (%)=	25.6	25.2
Wet Wt. Soil (gms)=	847.2	848.4
Wet Density (pcf)=	124.4	127.1
Dry Density (pcf)=	99.0	101.5

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	1
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.9



Average Permeability (cm/sec)= 3.1E-06

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

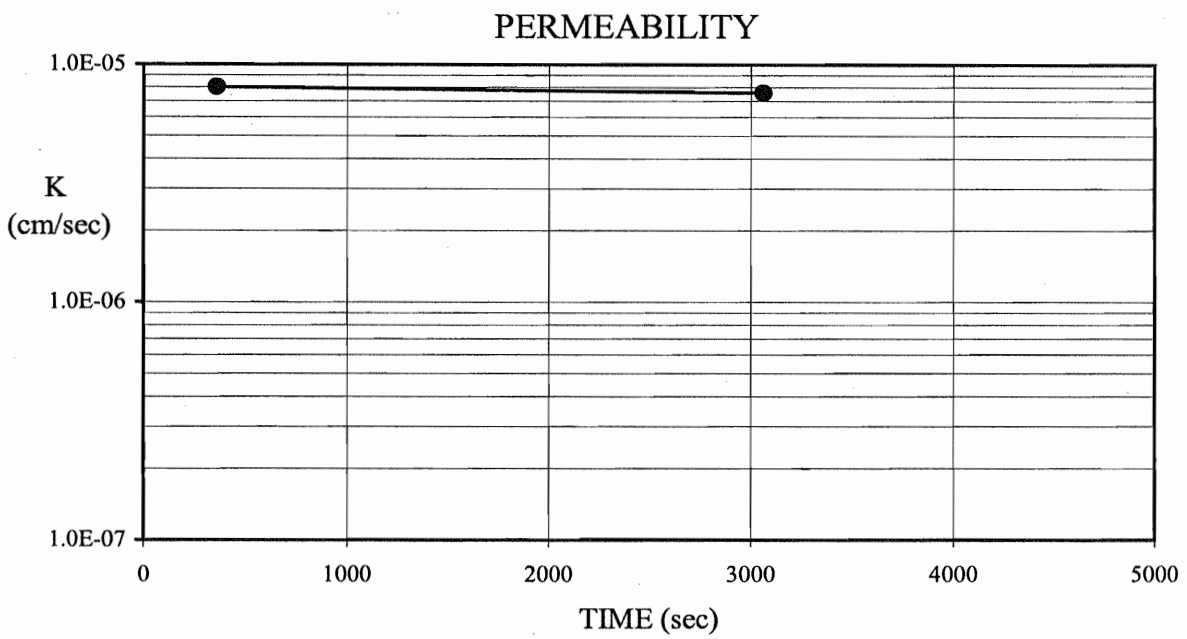
Description: Red silty SAND, little gravel

Exploration:
Sample No.: BRP-4
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.197	7.242
Length (cm)=	10.318	9.978
Moist. Cont. (%)=	21.8	21.0
Wet Wt. Soil (gms)=	872.1	870
Wet Density (pcf)=	129.7	132.1
Dry Density (pcf)=	106.5	109.2

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	1
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.1



Average Permeability (cm/sec)= 7.8E-06

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

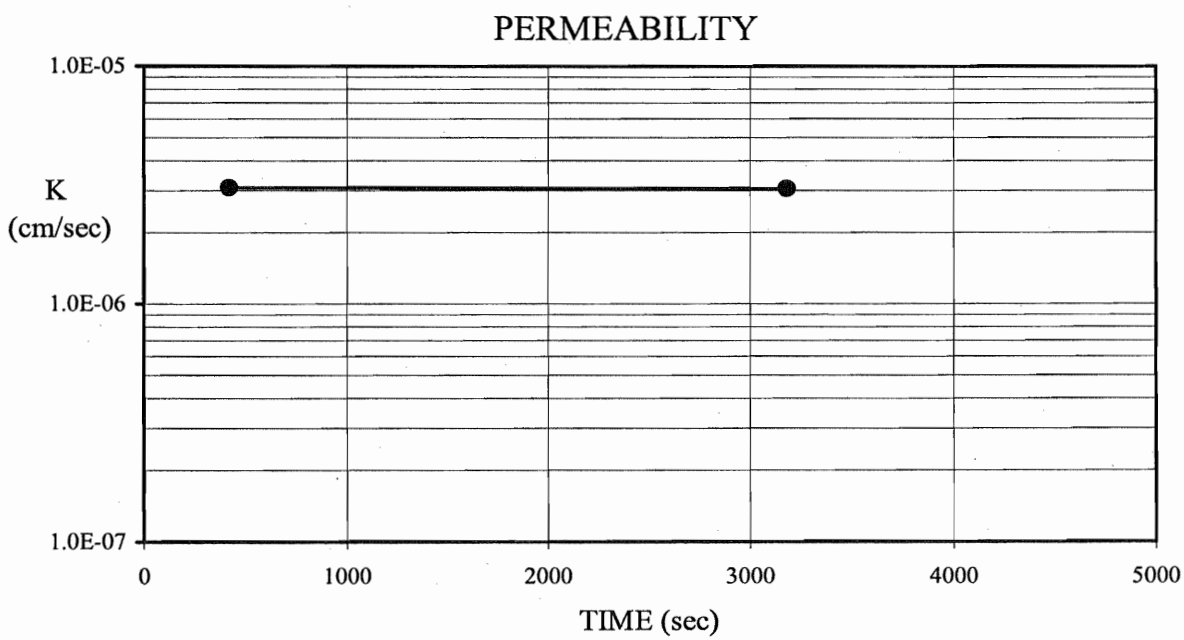
Description: Red silty SAND, trace gravel

Exploration:
Sample No.: BRP-6
Depth (ft.): as rec'd

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.182	7.217
Length (cm)=	10.582	10.257
Moist. Cont. (%)=	27.5	26.5
Wet Wt. Soil (gms)=	856.2	849.2
Wet Density (pcf)=	124.7	126.4
Dry Density (pcf)=	97.8	99.9

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.98
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.7



Average Permeability (cm/sec)= 3.1E-06

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

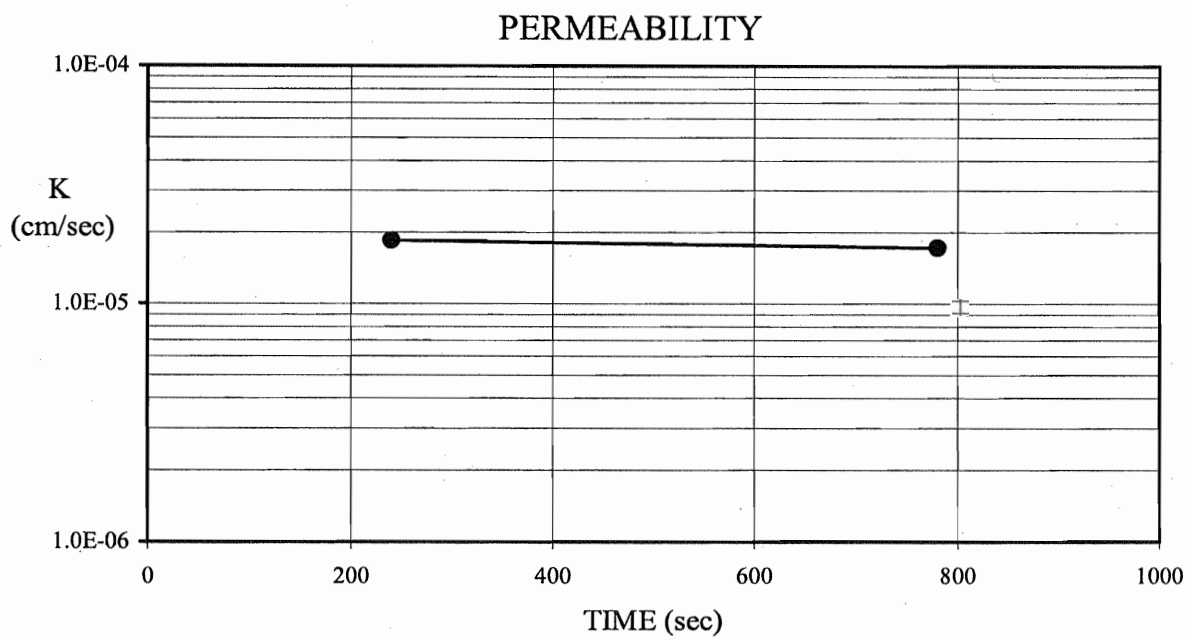
Description: Red silty SAND, little gravel

Exploration:
Sample No.: BRP-4
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.180	7.246
Length (cm)=	10.131	10.080
Moist. Cont. (%)=	16.6	-519.4
Wet Wt. Soil (gms)=	811.8	846.1
Wet Density (pcf)=	123.6	127.1
Dry Density (pcf)=	106.0	-30.3

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.96
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	14.0



Average Permeability (cm/sec)= 1.8E-05

Hydraulic Conductivity- ASTM D 5084

Project: Blue Ridge Paper
Barber Orchards

Job No.: 11014

Description: Red silty SAND, trace gravel

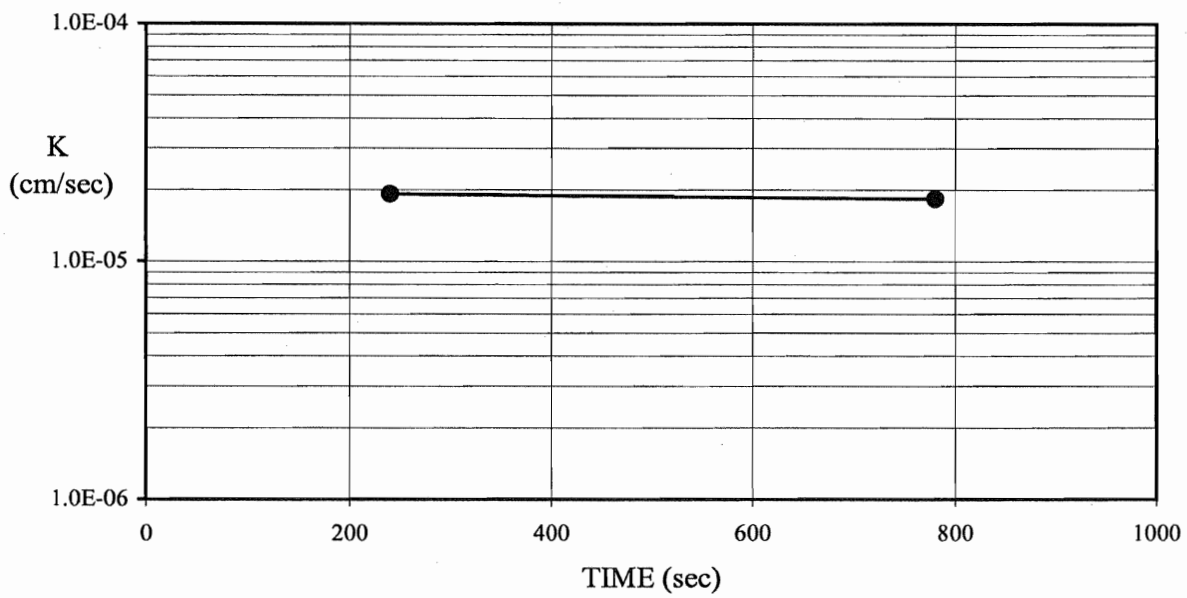
Exploration:
Sample No.: BRP-6
Depth (ft.): dried

( ) Undisturbed
(X) Remolded

SAMPLE	INITIAL	FINAL
Diameter (cm)=	7.176	7.232
Length (cm)=	10.662	10.626
Moist. Cont. (%)=	21.2	-566.7
Wet Wt. Soil (gms)=	830.2	863.7
Wet Density (pcf)=	120.2	123.5
Dry Density (pcf)=	99.2	-26.5

TEST CONDITIONS	
Cell Press. (psi)=	105.0
Influent Press. (psi)=	100.0
Effluent Press. (psi)=	98.0
B-Value=	0.94
Head (cm)=	140.7
Hyd. Gradient (cm/cm)=	13.2

PERMEABILITY



Average Permeability (cm/sec)= 1.9E-05

APPENDIX D-2

SUMMARY OF PREVIOUS GEOTECHNICAL TESTING

Table D-2-1
Summary of Existing Waste Geotechnical Properties Used in the Stability Analysis
Landfill 6A-West
Evergreen Packaging

Data Source	Boring ID	Sample ID	Depth (ft.below ground)	Total Unit Weight (pcf)	Water Content (%)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Total Friction Angle (degrees)	Total Stress Cohesion	Description
(1)		Bulk #1		64	160				570	Sludge UU Test
(1)		Bulk #2		82	160				550	Sludge/Ash, UU Test
(1)		Bulk #3		68	90				1100	Sludge/Ash, UU Test
(1)		Sample #1						40	200	Sludge, Compaction Test
(1)		Sample #2								Sludge/Ash, Compaction Test
(2)				55		45	50			Assumed
(3)				76						Used in Report
(3)	B101	3S	32.5	78	79	39.3	0			Sludge/Ash,CIUC
(3)	B101	4S	40.5	80	75	43.7	0			Sludge/Ash,CIUC
(3)	B101	1S	13.5		79	35.7	0			Ash
(3)	B102	1S	12.5		79	39.5	0			Ash, some Sludge
(3)				96	54					Lime mud Density test
(4)	B99-102	U3	30.6	78	77.6	57.9	0			Sludge/Ash,CIUC
(4)	B99-102	U2	20.5	85	71.1	45.6	0			Sludge/Ash,CIUC
(4)	B99-103	U4	40.5	96		39.5	0			Lime mud, CIUC
(5)	B-06-01	2S	16-18	84	94					Sludge/Ash/Lime, CIUC
(5)	B-06-01	1S	6.5-8.5	81	50	36.9	0			Lime mud, CIUC
(5)	B-06-02	2S	35.5-37.5	94	52					Lime/Sludge/Ash, CIUC

(1) Sirrine, 1989
(2) Law, 1982
(3) SME, 1995
(4) SME, 1999
(5) SME, 2006

Table D-2-2
Summary of Existing Waste Geotechnical Properties Used in the Stability Analysis
Landfill 6A-West
Evergreen Packaging

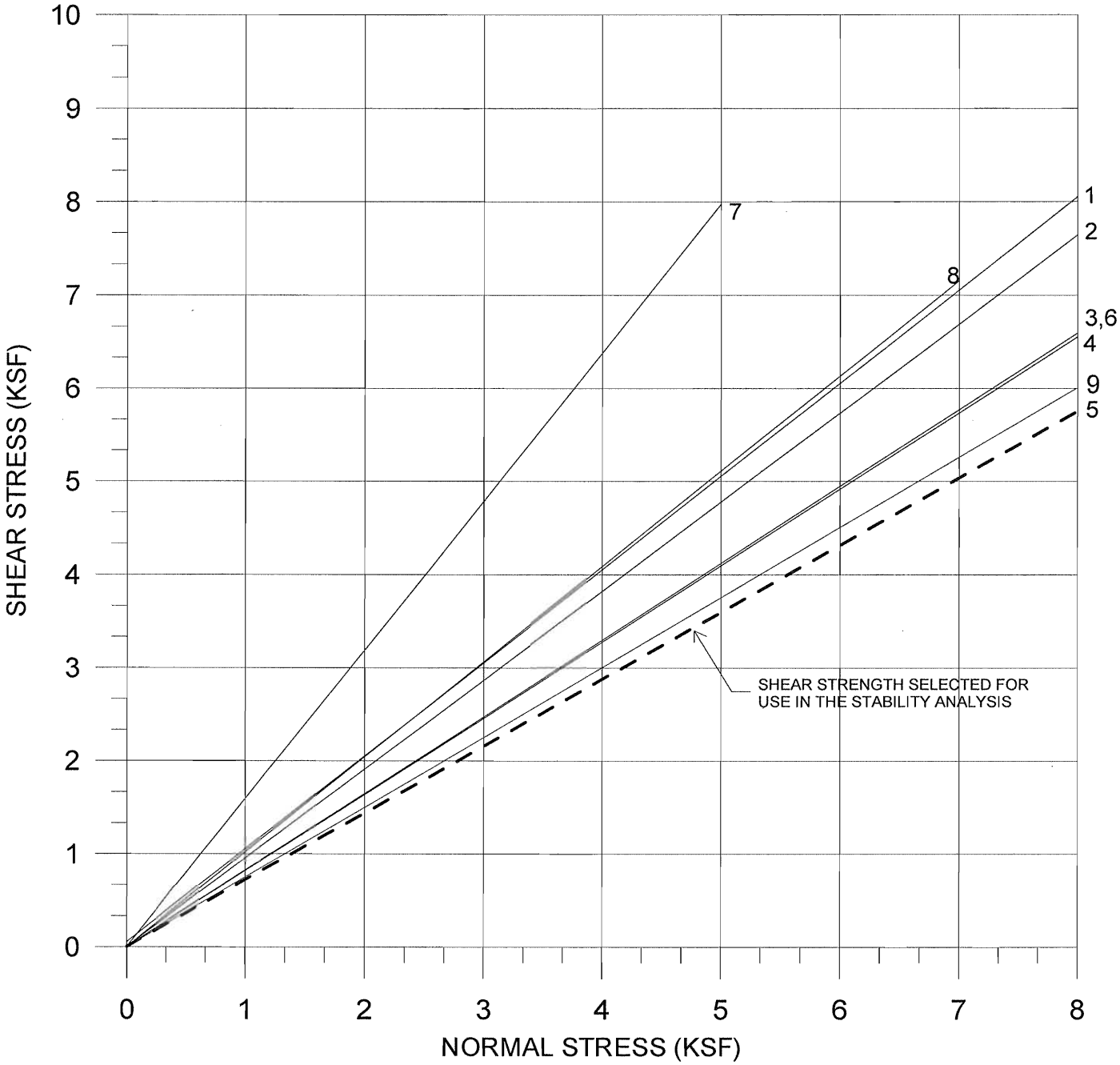
Data Source	Boring ID	Depth (ft.below ground)	Total Unit Weight[5] (pcf)	Maximum Dry Density (pcf)	Optimum Water Content (%)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Total Friction Angle (degrees)	Total Stress Cohesion (psf)	Description
(1)	AP-18	18.5-23.5	126	109	15.9					Compaction Test
(1)	AP-14	28.5-38.5	133	117	14.1					Compaction Test
(1)	AP-5	18.5-23.5	127	112	13.9	40	0	20	216	CIUC/Compaction Test
(1)	AP-3	14-20	128	109	18.6					Compaction Test
(1)	AP-1	20-35	127	110	15.5	32	115	18.5	202	CIUC/Compaction Test
(2)	B-8	3-12	127	107	17.9					Compaction Test
(2)	B-10	1-8	131	113	16.3	32	0	19	600	CIUC/Compaction Test
(2)	B-18	1-8	129	111	16.3	30	0	19	900	CIUC/Compaction Test
(2)	B-18	18-23	127	108	17.3					Compaction Test
(3)	B99-101	10-60	117		14.6[6]	34	260			Direct Shear test, run dry,normal stress>15psi
(3)	B99-101	10-60	117		14.6[6]	38	0			Direct Shear test, run dry,normal stress<15psi
(3)	B99-101	10-60	117		16.4[6]	40	0			Direct Shear test, run wet
(4)	B-06-04	4-14	119-124		17.8[6]	32	144			Direct Shear test, run dry

(1) Sirrine, 1989
(2) Law, 1982
(3) SME, 1999
(4) SME, 2006
(5) With the exception of the direct shear tests, total unit weight is based on max. dry density and optimum water content.
(6) Natural water content.

Table D-2-3
Summary of Existing Waste Geotechnical Properties Used in the Stability Analysis
Landfill 6A-West
Evergreen Packaging

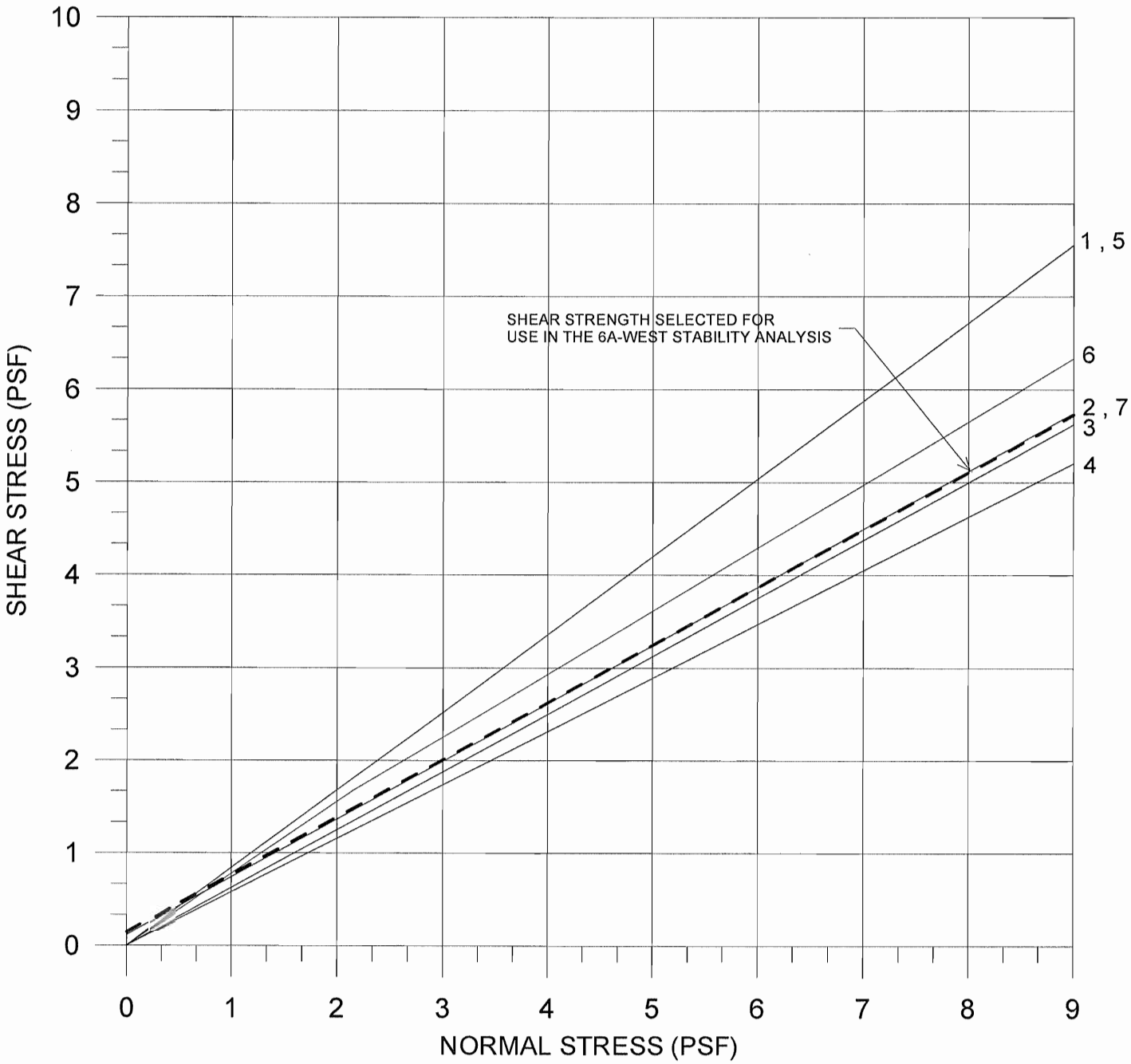
Data Source	Boring ID	Depth (ft.below ground)	Total Unit Weight (pcf)	Saturated Total Unit Weight (pcf)	Water Content (%)	Effective Friction Angle (degrees)	Effective Cohesion (psf)	Total Friction Angle (degrees)	Total Stress Cohesion (psf)	Description
(1)	B-8	9-11	117	130	13.2	34	200	27.5	300	Undisturbed Sample
(1)	B-10	13-15	104	118	19.7	31.5	100	16.5	400	Undisturbed Sample
(1)	B-11	8-11	124	125	28.3	28.5	600	17.5	800	Undisturbed Sample

(1) Law, 1982



1) 45°, 0.05 KSF; LAW 1982, ASSUMED WASTE VALUE
2) 43.7°, 0 KSF; SME 1995, SLUDGE/ASH, CIUC TEST
3) 39.5°, 0 KSF; SME 1995, SLUDGE/ASH, CIUC TEST
4) 39.3°, 0 KSF; SME 1995, SLUDGE/ASH, CIUC TEST
5) 35.7°, 0 KSF; SME 1995, SLUDGE/ASH, CIUC TEST
6) 39.5°, 0 KSF; SME 1999, LIME MUD, CIUC TEST
7) 57.9°, 0 KSF; SME 1999, SLUDGE/ASH, CIUC TEST
8) 45.6°, 0 KSF; SME 1999, SLUDGE/ASH, CIUC TEST
9) 36.9°, 0 KSF; SME 2006, SLUDGE/LIME/ASH, CIUC TEST

FIGURE D-2-1
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR EXISTING WASTES
LANDFILL NO. 6A-WEST
EVERGREEN PACKAGING, CANTON, NORTH CAROLINA



1) 40°, 0 KSF; SIRRINE 1989, CIUC TEST

2) 32°, 0.115 KSF; SIRRINE 1989, CIUC TEST

3) 32°, 0 KSF; LAW 1982, CIUC TEST

4) 30°, 0 KSF; LAW 1982, CIUC TEST

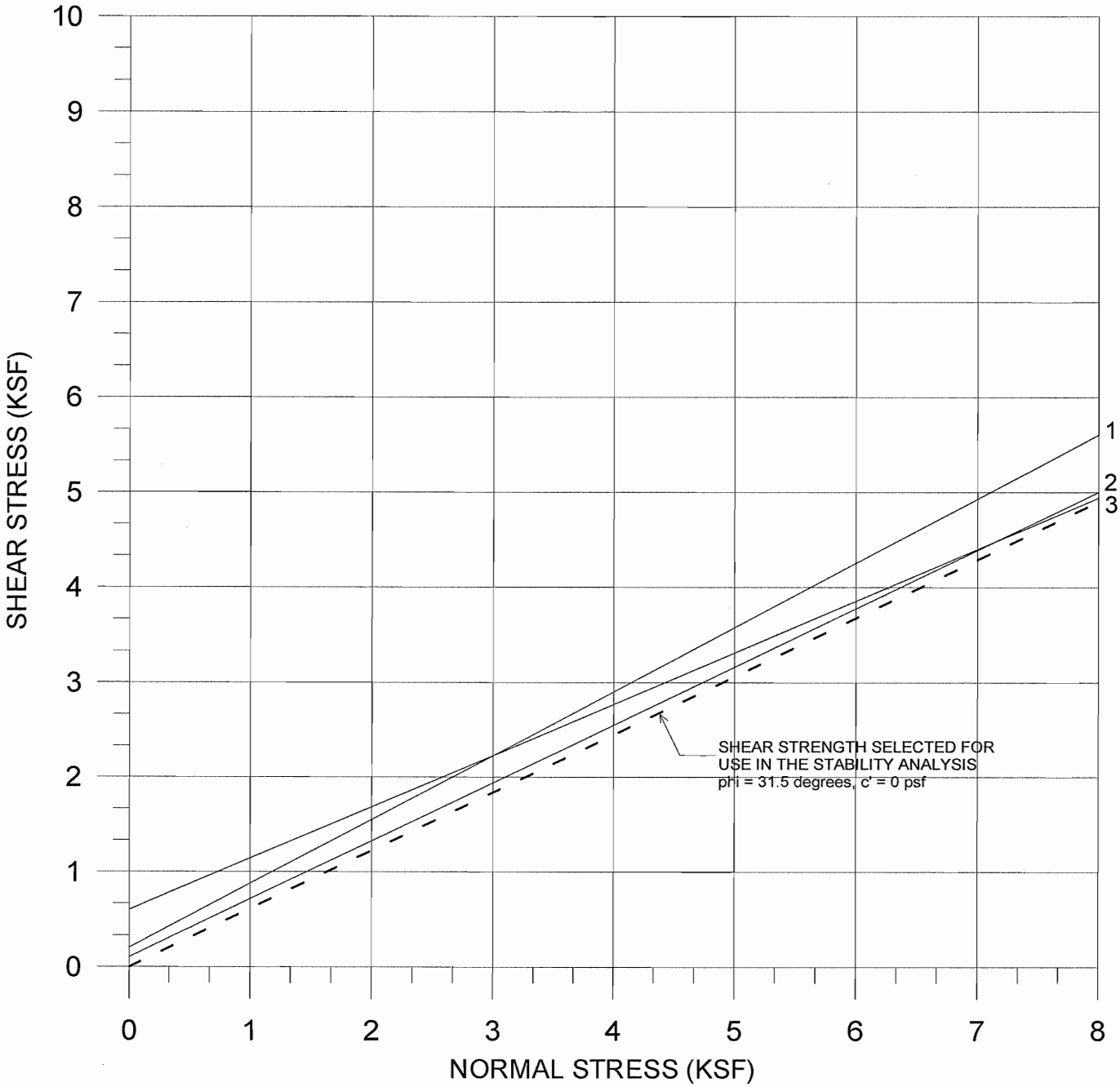
5) 40°, 0 KSF; SME 1999, DIRECT SHEAR TEST (WET)

6) 38°, 0 KSF FOR NORMAL STRESSES LESS THAN 2.2 KSF
34°, 0.26 KSF FOR NORMAL STRESSES GREATER THAN 2.2 KSF;
SME 1999, DIRECT SHEAR TEST (DRY)

7) 32°, 0.144 KSF; SME 2006

FIGURE D-2-2
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR PERIMETER DIKE SOILS
LANDFILL NO. 6A-WEST
EVERGREEN PACKAGING, CANTON, NORTH CAROLINA

SEVEE & MAHER ENGINEERS



1) 34°, 0.2 KSF; LAW 1982, CIUC TEST

2) 31.5°, 0.1 KSF; LAW 1982, CIUC TEST

3) 28.5°, 0.6 KSF; LAW 1982, CIUC TEST

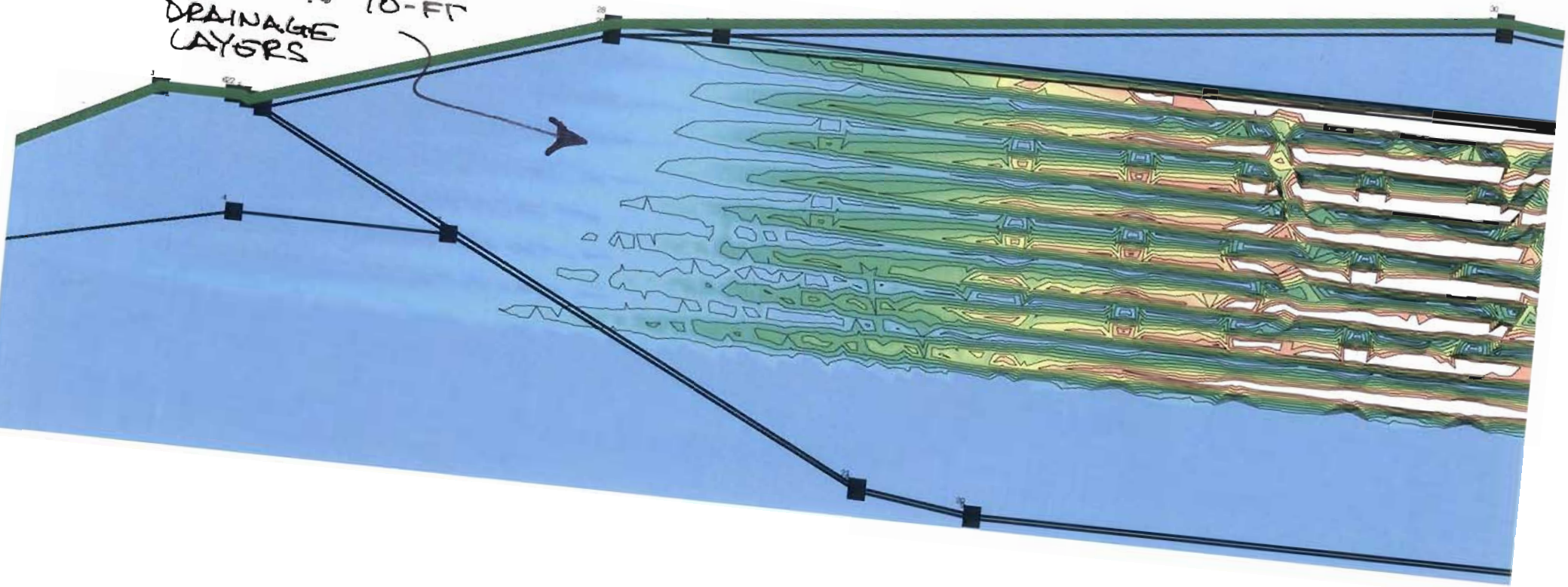
FIGURE D-2-3
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR FOUNDATION SOILS
LANDFILL NO. 6A-WEST
EVERGREEN PACKAGING, CANTON, NORTH CAROLINA

APPENDIX D-3

PORE-WATER PRESSURE CALCULATIONS

PORE WATER PRESSURE DISTRIBUTION USED IN THE STABILITY ANALYSES FOR CONST/OPERATIONAL CONDITIONS

SHOWS BUILDUP OF PORE-PRESSURE BETWEEN 10-FT DRAINAGE LAYERS



Vertical Stress Increase at Points that are located below a triangularly loaded area

Sevee & Maher Engineers, Inc.

PROJECT: Verso Paper, (City), ME - Vertical Expansion **Calc. By:** BBJ **Ckd. By:**

COMMENTS: Not Used in this analysis **Date:** **Date:**

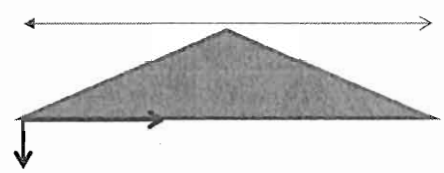
Reference: Das, 1983; "Advanced Soil Mechanics", Section 3.1.9

Vertical Stress Increase due to loaded Area (Values from Table 3.6)

		Where X > 2b			High Edge	Mid-pt.	Low Edge	Where X < 0		
Label =		1	2	3	4	5	6	7	8	9
X/b =		5	4	3	2	1	0	-1	-2	-3
X =		570	456	342	228	114	0	-114	-228	-342
Depth, Z/b	Z									
0	0	0.0000	0.0000	0.0000	0.5000	0.5000	0.0000	0.0000	0.0000	0.0000
0.5	57	0.0005	0.0019	0.0152	0.4220	0.4797	0.0748	0.0041	0.0008	0.0003
1	114	0.0035	0.0119	0.0622	0.3524	0.4092	0.1273	0.0272	0.0053	0.0018
1.5	171	0.0097	0.0285	0.1010	0.2952	0.3341	0.1528	0.0447	0.0140	0.0005
2	228	0.0182	**0.0457**	0.1206	0.2500	**0.2749**	0.1592	0.0643	**0.0249**	0.0107
2.5	285	0.0274	0.0596	0.1268	0.2148	0.2309	0.1553	0.0777	0.0356	0.0170
3	342	0.0358	0.0691	0.1258	0.1872	0.1979	0.1469	0.0854	0.0448	0.0235
4	456	0.0482	0.0775	0.1154	0.1476	0.1735	0.1273	0.0894	0.0567	0.0347
5	570	0.0546	0.0776	0.1026	0.1211	0.1241	0.1098	0.0858	0.0616	0.0422

Using Superposition, combine two symetrical triangularly loaded areas together:

Width of loaded Area is split apart, x/b



Beyond the toe of the load, x/b

			1	2	3	4	5	6	7	8	9
	9	8	7	6	5	4	3	2	1		
			1+7	2+6	3+5	4+4	5+3	6+2	7+1	8	9
	5	4	3	2	1	0	-1	-2	-3	-4	-5
Depth, Z/b											
0	0	0	0	0	0.5	1	0.5	0	0	0	0
0.5	0.0003	0.0008	0.0046	0.0767	0.4949	0.844	0.4949	0.0767	0.0046	0.0008	0.0003
1	0.0018	0.0053	0.03067	0.1392	0.4714	0.7048	0.4714	0.1392	0.03067	0.0053	0.0018
1.5	0.00054	0.014	0.0544	0.1813	0.4351	0.5904	0.4351	0.1813	0.0544	0.014	0.00054
2	0.0107	0.0249	0.0825	0.2049	0.3955	0.5	0.3955	0.2049	0.0825	0.0249	0.0107
2.5	0.017	0.0356	0.1051	0.2149	0.3577	0.4296	0.3577	0.2149	0.1051	0.0356	0.017
3	0.0235	0.0448	0.1212	0.216	0.3237	0.3744	0.3237	0.216	0.1212	0.0448	0.0235
4	0.0347	0.0567	0.1376	0.2048	0.2889	0.2952	0.2889	0.2048	0.1376	0.0567	0.0347
5	0.0422	0.0616	0.1404	0.1874	0.2267	0.2422	0.2267	0.1874	0.1404	0.0616	0.0422

Vertical Stress Increase at Points that are located below a triangularly loaded area

Sevee & Maher Engineers, Inc.

PROJECT: 0
COMMENTS:

Calc. By: msr
Date: Mar-11

Ckd. By:
Date:

Reference: Das, 1983; "Advanced Soil Mechanics", Section 3.1.9

Height of Fill "X" = 17 ft
Unit Weight of Fill = 120 pcf

Po = 2040 psf

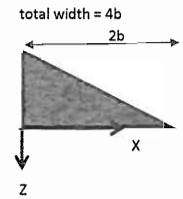
SLOPE/W Points

	x	y
Point A:	342	2792
Point B:	570	2810

b =	114	
2b=	228	
4b =	456	Total Base Width

A = Left toe
B = Crest

See Fig 3.1.10:



Vertical Stress due to the applied load is as follows:

								Mid Point							
Slope/W X =	890	865	840	815	798	740	690	570	450	400	342	325	300	275	250
Slope/W Y															
2792	0.0	0.0	0.0	0.0	0.0	518.9	966.3	2040.0	966.3	518.9	0.0	0.0	0.0	0.0	0.0
2787	0.0	0.0	0.1	0.4	14.2	519.0	966.3	2011.5	966.3	519.0	14.2	0.4	0.1	0.0	0.0
2777	0.3	0.6	1.6	7.6	42.6	519.7	966.2	1954.7	966.2	519.7	42.6	7.6	1.6	0.6	0.3
2767	1.4	2.8	6.6	23.6	70.7	522.0	965.7	1898.2	965.7	522.0	70.7	23.6	6.6	2.8	1.4
2757	3.8	7.0	15.6	44.4	98.3	526.4	964.6	1842.2	964.6	526.4	98.3	44.4	15.6	7.0	3.8
2747	7.6	13.7	28.1	67.2	125.3	532.9	962.7	1786.9	962.7	532.9	125.3	67.2	28.1	13.7	7.6
2737	13.0	22.5	43.2	90.7	151.5	540.9	959.8	1732.6	959.8	540.9	151.5	90.7	43.2	22.5	13.0
2727	19.8	33.3	60.0	114.3	176.8	550.0	956.0	1679.3	956.0	550.0	176.8	114.3	60.0	33.3	19.8
2717	28.1	45.6	77.9	137.5	201.0	559.4	951.0	1627.3	951.0	559.4	201.0	137.5	77.9	45.6	28.1

						Right Low Edge			Mid-Pt.			Left Low Edge				
	Slope/W X =	890	865	840	815	798	740	690	570	450	400	342	325	300	275	250
	X' =	548	523	498	473	456	398	348	228	108	58	0	-17	-42	-67	-92

alpha

					Where X > 2b				High Edge	Where 0 < X < 2b		Low Edge	Where X < 0			
	X'/b =	4.807	4.588	4.368	4.149	4.000	3.491	3.053	2.000	0.947	0.509	0.000	-0.149	-0.368	-0.588	-0.807
	X' =	548	523	498	473	456	398	348	228	108	58	0	-17	-42	-67	-92
Z'/b	Z'	**Slope/W Y**														
0	0	2792	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.5708	3.1416	3.1416	0.0000	0.0000	0.0000	0.0000
0.04385965	5	2787	0.0065	0.0074	0.0085	0.0098	0.0110	0.0168	0.0273	1.5489	3.0537	3.0262	0.0000	0.2656	0.1000	0.0575	0.0387
0.13157895	15	2777	0.0195	0.0221	0.0254	0.0294	0.0328	0.0503	0.0813	1.5051	2.8792	2.8005	0.0000	0.6618	0.2875	0.1694	0.1148
0.21929825	25	2767	0.0324	0.0368	0.0422	0.0489	0.0544	0.0833	0.1337	1.4616	2.7087	2.5886	0.0000	0.8719	0.4446	0.2726	0.1874
0.30701754	35	2757	0.0452	0.0513	0.0587	0.0680	0.0757	0.1153	0.1836	1.4185	2.5444	2.3956	0.0000	0.9767	0.5658	0.3633	0.2546
0.39473684	45	2747	0.0578	0.0655	0.0750	0.0868	0.0965	0.1462	0.2302	1.3759	2.3880	2.2230	0.0000	1.0279	0.6547	0.4401	0.3152
0.48245614	55	2737	0.0702	0.0795	0.0910	0.1051	0.1167	0.1756	0.2730	1.3341	2.2408	2.0698	0.0000	1.0502	0.7177	0.5030	0.3686
0.57017544	65	2727	0.0823	0.0932	0.1065	0.1228	0.1361	0.2033	0.3118	1.2931	2.1034	1.9341	0.0000	1.0557	0.7609	0.5534	0.4147
0.65789474	75	2717	0.0942	0.1065	0.1215	0.1398	0.1548	0.2292	0.3463	1.2530	1.9760	1.8136	0.0000	1.0508	0.7894	0.5927	0.4537

delta

					Where X > 2b				High Edge	Where 0 < X < 2b		Low Edge	Where X < 0			
	X'/b =	4.807	4.588	4.368	4.149	4.000	3.491	3.053	2.000	0.947	0.509	0.000	-0.149	-0.368	-0.588	-0.807
	X' =	548	523	498	473	456	398	348	228	108	58	0	-17	-42	-67	-92
Z/b	Z	**Slope/W Y**														
0	0	2792	1.5708	1.5708	1.5708	1.5708	1.5708	1.5708	1.5708	0.0000	1.5708	1.5708	1.5708	0.0000	0.0000	0.0000	0.0000
0.04385965	5	2787	1.5552	1.5538	1.5523	1.5504	1.5489	1.5414	1.5292	0.0000	1.5292	1.5414	1.5489	1.5504	1.5523	1.5538	1.5552
0.13157895	15	2777	1.5240	1.5200	1.5153	1.5096	1.5051	1.4828	1.4464	0.0000	1.4464	1.4828	1.5051	1.5096	1.5153	1.5200	1.5240
0.21929825	25	2767	1.4928	1.4863	1.4785	1.4691	1.4616	1.4248	1.3654	0.0000	1.3654	1.4248	1.4616	1.4691	1.4785	1.4863	1.4928
0.30701754	35	2757	1.4619	1.4527	1.4419	1.4289	1.4185	1.3678	1.2870	0.0000	1.2870	1.3678	1.4185	1.4289	1.4419	1.4527	1.4619
0.39473684	45	2747	1.4311	1.4194	1.4056	1.3891	1.3759	1.3120	1.2120	0.0000	1.2120	1.3120	1.3759	1.3891	1.4056	1.4194	1.4311
0.48245614	55	2737	1.4006	1.3865	1.3698	1.3500	1.3341	1.2579	1.1410	0.0000	1.1410	1.2579	1.3341	1.3500	1.3698	1.3865	1.4006
0.57017544	65	2727	1.3704	1.3539	1.3346	1.3115	1.2931	1.2056	1.0744	0.0000	1.0744	1.2056	1.2931	1.3115	1.3346	1.3539	1.3704
0.65789474	75	2717	1.3406	1.3218	1.2998	1.2737	1.2530	1.1553	1.0122	0.0000	1.0122	1.1553	1.2530	1.2737	1.2998	1.3218	1.3406

Just the Right Hand Side

Sigma z

					Where X > 2b				High Edge	Where 0 < X < 2b		Low Edge	Where X < 0			
	X'/b =	4.807	4.588	4.368	4.149	4.000	3.491	3.053	2.000	0.947	0.509	0.000	-0.149	-0.368	-0.588	-0.807
	X' =	548	523	498	473	456	398	348	228	108	58	0	-17	-42	-67	-92
Z/b	Z	**Slope/W Y**														
0	0	2792	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1020.0000	966.3158	518.9474	0.0000	0.0000	0.0000	0.0000	0.0000
0.04385965	5	2787	0.0009	0.0012	0.0016	0.0022	0.0029	0.0076	0.0240	1005.7621	966.2865	518.9674	14.2333	0.3849	0.0623	0.0229	0.0112
0.13157895	15	2777	0.0239	0.0317	0.0430	0.0600	0.0766	0.2045	0.6359	977.3409	965.5370	519.4584	42.5364	7.5642	1.5710	0.5995	0.2969
0.21929825	25	2767	0.1099	0.1457	0.1974	0.2749	0.3505	0.9286	2.8376	949.0824	962.8245	521.0738	70.3550	23.3617	6.4344	2.6222	1.3295
0.30701754	35	2757	0.2989	0.3956	0.5352	0.7433	0.9458	2.4762	7.3800	921.0909	957.1738	523.9729	97.3864	43.6186	15.1013	6.6470	3.4771
0.39473684	45	2747	0.6279	0.8292	1.1191	1.5495	1.9663	5.0699	14.6435	893.4647	948.0150	527.8362	123.3564	65.6069	26.9845	12.8290	6.9545
0.48245614	55	2737	1.1296	1.4883	2.0028	2.7623	3.4939	8.8448	24.6349	866.2945	935.1964	532.0864	148.0281	87.9324	41.1594	21.0117	11.8227
0.57017544	65	2727	1.8322	2.4074	3.2283	4.4328	5.5855	13.8461	37.0558	839.6617	918.9207	536.1077	171.2074	109.8371	56.7467	30.8589	18.0161
0.65789474	75	2717	2.7583	3.6128	4.8257	6.5930	8.2721	20.0368	51.4085	813.6372	899.6390	539.3811	192.7463	130.8717	73.0333	41.9658	25.3806

Feet of water above data point (For imput to Slope/W)

Assumed initial phreatic surface elevation	2759	2765	2774.5	2784	2792	2792	2792	2792	2792	2792	2792	2784	2775	2766	2760
							Mid Point								
Slope/W X =	890	865	840	815	798	740	690	570	450	400	342	325	300	275	250
Slope/W Y															
2792					0.0	8.3	15.5	32.7	15.5	8.3	0.0				
2787				-3.0	5.2	13.3	20.5	37.2	20.5	13.3	5.2	-3.0			
2777			-2.5	7.1	15.7	23.3	30.5	46.3	30.5	23.3	15.7	7.1	-2.0		
2767		-2.0	7.6	17.4	26.1	33.4	40.5	55.4	40.5	33.4	26.1	17.4	8.1	-1.0	
2757		8.1	17.8	27.7	36.6	43.4	50.5	64.5	50.5	43.4	36.6	27.7	18.3	9.1	
2747			28.0	38.1	47.0	53.5	60.4	73.6	60.4	53.5	47.0	38.1	28.5		
2737				48.5	57.4	63.7	70.4	82.8	70.4	63.7	57.4	48.5			
2727					67.8	73.8	80.3	91.9	80.3	73.8	67.8				
2717						84.0	90.2	101.1	90.2	84.0					

Feet of water above data point (For imput to Slope/W)

	Assumed initial phreatic surface elevation	2759	2765	2774.5	2784	2792	2792	2792	2792	2792	2792	2792	2784	2775	2766	2760
								Mid Point								
	Slope/W X =	890	865	840	815	798	740	690	570	450	400	342	325	300	275	250
Z	**Slope/W Y**				0.0											
0	**2792**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	**2787**	0.0	0.0	0.0	0.0	0.2	8.3	15.5	32.2	15.5	8.3	0.2	0.0	0.0	0.0	0.0
10	**2782**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	**2777**	0.0	0.0	0.0	0.1	0.7	8.3	15.5	31.3	15.5	8.3	0.7	0.1	0.0	0.0	0.0
20	**2772**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	**2767**	0.0	0.0	0.1	0.4	1.1	8.4	15.5	30.4	15.5	8.4	1.1	0.4	0.1	0.0	0.0
30	**2762**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	**2757**	0.1	0.1	0.3	0.7	1.6	8.4	15.5	29.5	15.5	8.4	1.6	0.7	0.3	0.1	0.1
40	**2752**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45	**2747**	0.1	0.2	0.5	1.1	2.0	8.5	15.4	28.6	15.4	8.5	2.0	1.1	0.5	0.2	0.1
50	**2742**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	**2737**	0.2	0.4	0.7	1.5	2.4	8.7	15.4	27.8	15.4	8.7	2.4	1.5	0.7	0.4	0.2
60	**2732**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
65	**2727**	0.3	0.5	1.0	1.8	2.8	8.8	15.3	26.9	15.3	8.8	2.8	1.8	1.0	0.5	0.3
70	**2722**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75	**2717**	0.5	0.7	1.2	2.2	3.2	9.0	15.2	26.1	15.2	9.0	3.2	2.2	1.2	0.7	0.5
80	2712	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

APPENDIX D-4

SEISMIC CONSIDERATIONS

PROJECT	COMP. BY	JOB NO.
Pseudo-Static Stability Calculations	MSR	
	CHK. BY	DATE 4/4/11

Calculate Pseudo-Static Factor of Safety

FROM USGS Earthquake Hazard Maps, 2008

FOR: 10% Probability of exceedance in 50yr

$a_{max} = 0.07g$

10% probability of exceedance in 250yr

$a_{max} = 0.18g$

USE USEPA 1995 guidance

- amplify a_{max} through wastemass

$a_{max_{50}} \Rightarrow k_s = 0.28g$

$a_{max_{250}} \Rightarrow k_s = 0.15g$

- Reduce acceleration by one-half (Makdisi & Seed)

$k_{s_{50}} = 0.28/2 = 0.14$

$k_{s_{250}} = 0.15/2 = 0.075$

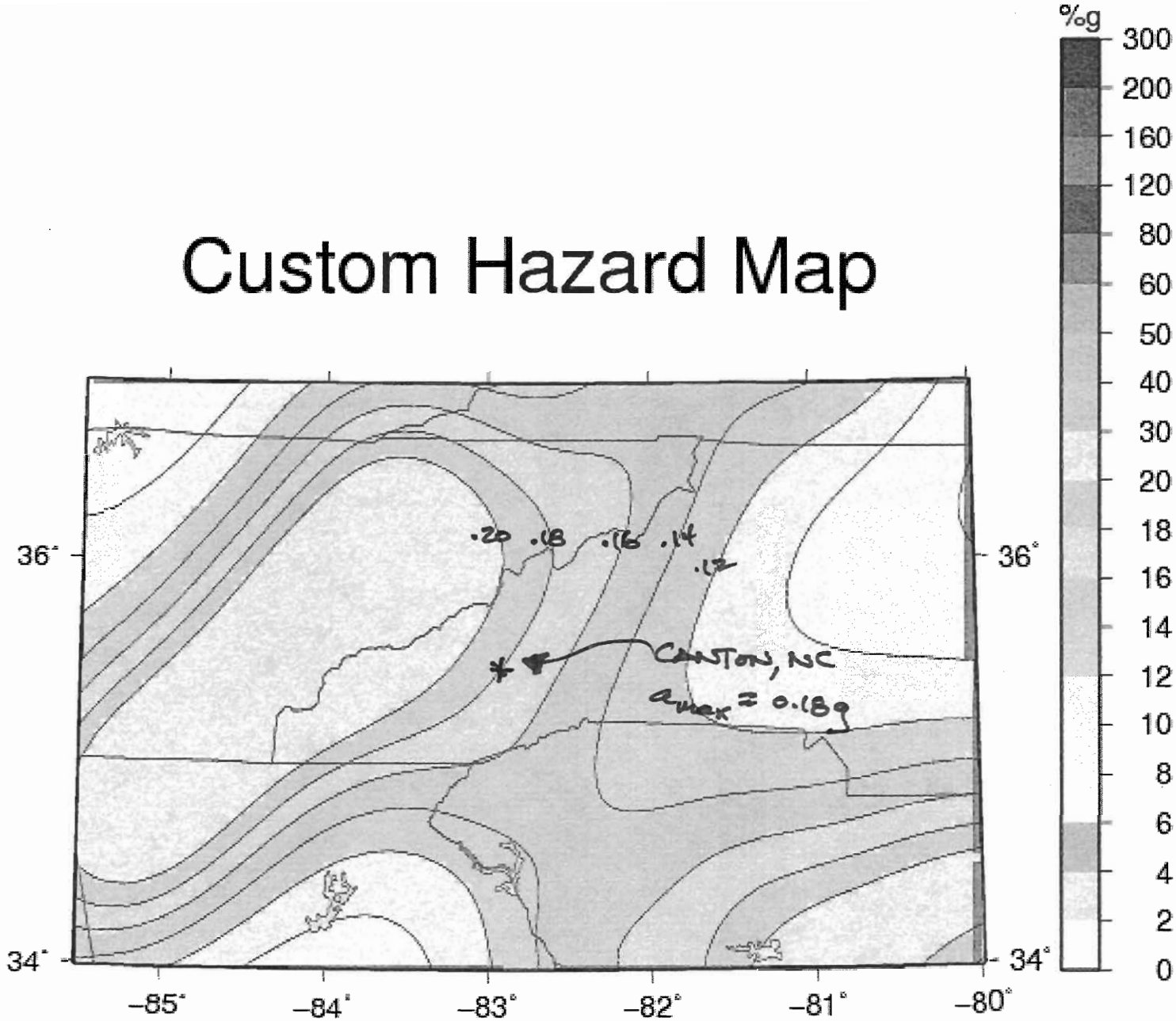
FOR OPERATIONS FOS = 1.4

FOR POST CLOSURE FOS = 1.2

Since Both are above 1.0, deformation is less than 6-12" and deformation analysis is unnecessary (USEPA, 1995)

SEVEE & MAHER ENGINEERS

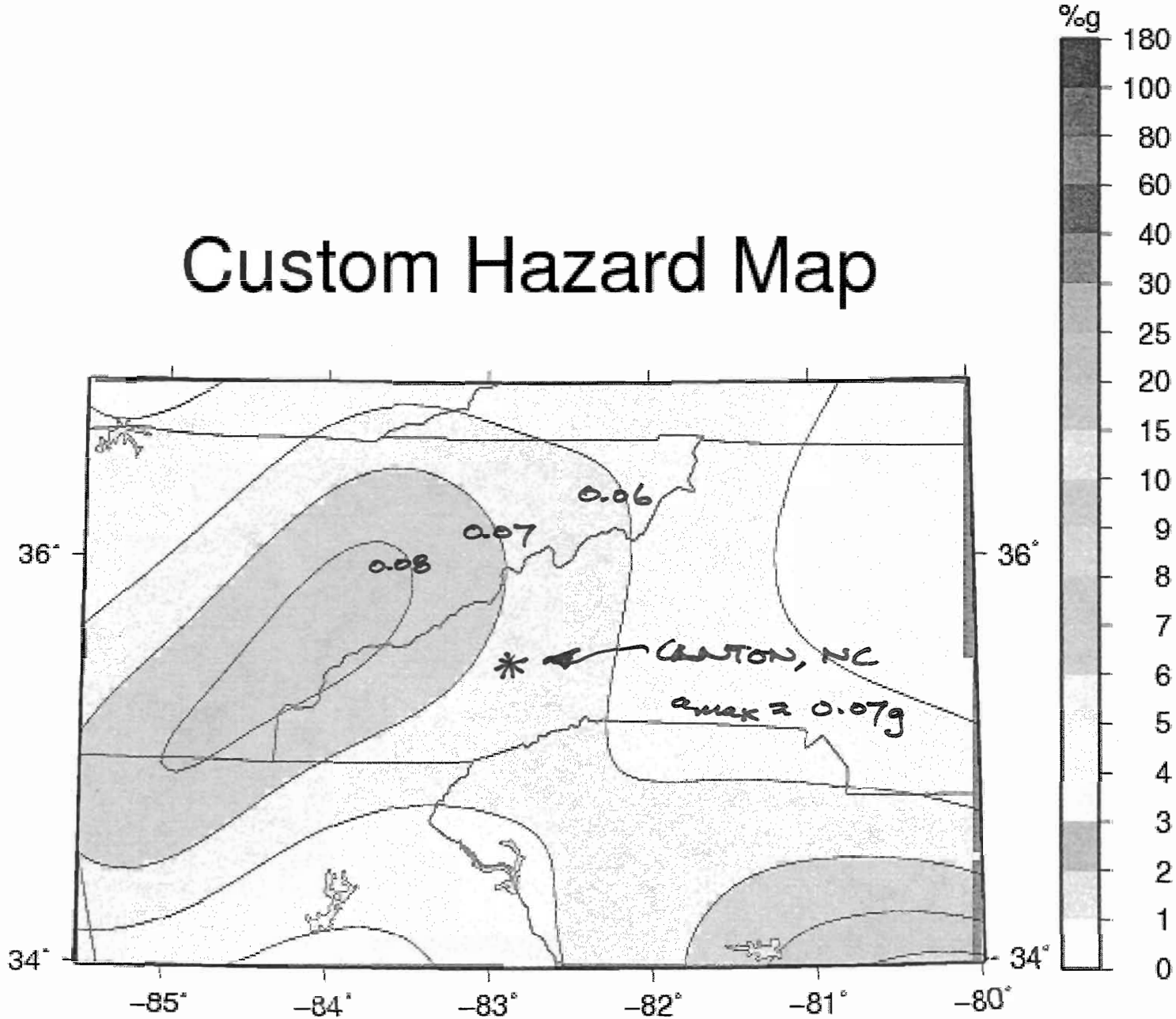
Custom Hazard Map



Peak Ground Acceleration

USGS EarthQuake Hazard Map 2008
10% Probability of exceedence in 250 yrs.

Custom Hazard Map



Peak Ground Acceleration

USGS Earthquake Hazard Map 2008
10% Probability of exceedance in 50 yrs.

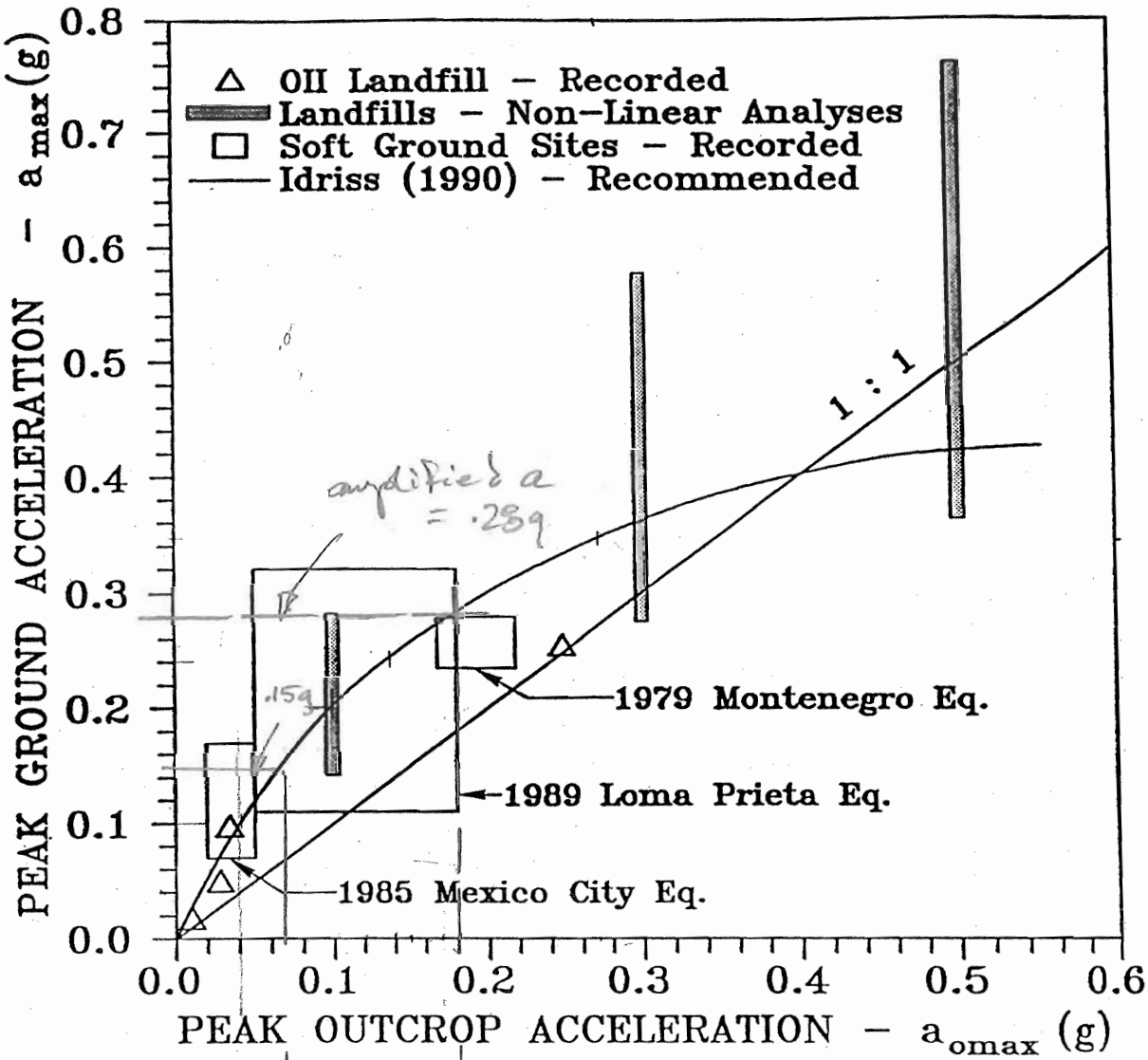


Figure 4.5 Observed Variations of Peak Horizontal Accelerations on Soft Soil and MSW Sites in Comparison to Rock Sites (Kavazanjian and Matasović, 1994).

APPENDIX D-5

SLOPE/W OUTPUT FILES

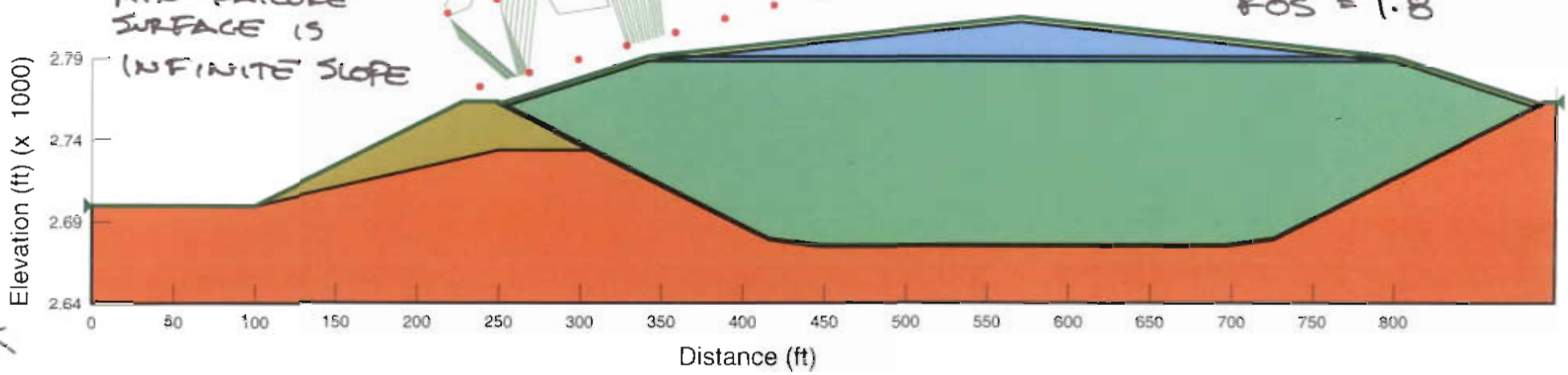
Title: Blue Ridge Paper Date: 4/4/2011 Time: 4:06:15 PM
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\ File Name: generic cross section.gsz
Method: Bishop, Ordinary and Janbu
Analysis Name: Add Fill (phi=36) ops
Horizontal EQ Load: 0

Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Liner Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 35 ° Phi-B: 0 °
Name: Waste 36 Model: Mohr-Coulomb Unit Weight: 90 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 36 ° Phi-B: 0 °
Name: Perimeter Dike Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 115 psf Phi: 32 ° Phi-B: 0 °
Name: Foundation Model: Mohr-Coulomb Unit Weight: 115 pcf Unit Wt. Above Water Table: 115 pcf Cohesion: 0 psf Phi: 31.5 ° Phi-B: 0 °
Name: Soil Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °

PH head Spatial Fn.: Stone Layer Model

STATIC ANALYSIS
OPERATING CONDITIONS
EXCESS PORE PRESSURES
APPLIED TO WASTE MASS
FOS = 1.8

MIN FAILURE
SURFACE IS
INFINITE SLOPE



operations

Report generated using GeoStudio 2007, version 7.15. Copyright © 1991-2009 GEO-SLOPE International Ltd.

File Information

Title: Blue Ridge Paper
Comments: B-B' waste
Revision Number: 57
Date: 4/6/2011
Time: 4:45:28 PM
File Name: generic cross section 12%.gsz
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\
Last Solved Date: 4/6/2011
Last Solved Time: 4:46:16 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

operations

Kind: SLOPE/W
Method: Bishop, Ordinary and Janbu
Settings
- **PWP Conditions Source:** Pressure Head Spatial Function
- **Pressure Head Spatial Fn.:** Stone Layer Model

SlipSurface
- **Direction of movement:** Right to Left
- **Use Passive Mode:** No
- **Slip Surface Option:** Grid and Radius
- **Critical slip surfaces saved:** 1
- **Optimize Critical Slip Surface Location:** Yes
- **Tension Crack**
  - **Tension Crack Option:** (none)

FOS Distribution
- **FOS Calculation Option:** Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Soil Cover

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Liner

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °

Waste 36

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Unit Wt. Above Water Table: 90 pcf
Cohesion: 0 psf
Phi: 36 °
Phi-B: 0 °

Perimeter Dike

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 115 psf
Phi: 32 °
Phi-B: 0 °

Foundation

Model: Mohr-Coulomb
Unit Weight: 115 pcf

Unit Wt. Above Water Table: 115 pcf
Cohesion: 0 psf
Phi: 31.5 °
Phi-B: 0 °

Soil Fill

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Slip Surface Grid

Upper Left: (37, 3224) ft
Lower Left: (238, 2773) ft
Lower Right: (539, 2857) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (254.7098, 2761.2098) ft
Upper Right Coordinate: (342, 2789) ft
Lower Left Coordinate: (187, 2642) ft
Lower Right Coordinate: (572, 2806) ft
Number of Increments: 10
Left Projection: No
Left Projection Angle: 0 °
Right Projection: No
Right Projection Angle: 0 °
UsePoints: 0

Slip Surface Limits

Left Coordinate: (0, 2700.0234) ft
Right Coordinate: (900, 2764) ft

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Spatial Functions

Stone Layer Model

Model: Krigged Surface
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Pressure Head (ft)

Data Point: (890, 2792, 0)
Data Point: (890, 2787, 0)
Data Point: (890, 2782, 0)
Data Point: (890, 2777, 0)
Data Point: (890, 2772, 0)
Data Point: (890, 2767, 0)
Data Point: (890, 2762, 0)
Data Point: (890, 2757, 0.1)
Data Point: (890, 2752, 0)
Data Point: (890, 2747, 0.2)
Data Point: (890, 2742, 0)
Data Point: (890, 2737, 0.3)
Data Point: (890, 2732, 0)
Data Point: (890, 2727, 0.5)
Data Point: (890, 2722, 0)
Data Point: (890, 2717, 0.7)
Data Point: (865, 2792, 0)
Data Point: (865, 2787, 0)
Data Point: (865, 2782, 0)
Data Point: (865, 2777, 0)
Data Point: (865, 2772, 0)
Data Point: (865, 2767, 0.1)
Data Point: (865, 2762, 0)
Data Point: (865, 2757, 0.2)
Data Point: (865, 2752, 0)
Data Point: (865, 2747, 0.3)
Data Point: (865, 2742, 0)
Data Point: (865, 2737, 0.5)
Data Point: (865, 2732, 0)
Data Point: (865, 2727, 0.8)
Data Point: (865, 2722, 0)
Data Point: (865, 2717, 1.1)
Data Point: (840, 2792, 0)
Data Point: (840, 2787, 0)
Data Point: (840, 2782, 0)
Data Point: (840, 2777, 0)
Data Point: (840, 2772, 0)
Data Point: (840, 2767, 0.2)
Data Point: (840, 2762, 0)
Data Point: (840, 2757, 0.4)
Data Point: (840, 2752, 0)

Data Point: (840, 2747, 0.7)
Data Point: (840, 2742, 0)
Data Point: (840, 2737, 1)
Data Point: (840, 2732, 0)
Data Point: (840, 2727, 1.4)
Data Point: (840, 2722, 0)
Data Point: (840, 2717, 1.9)
Data Point: (815, 2792, 0)
Data Point: (815, 2787, 0)
Data Point: (815, 2782, 0)
Data Point: (815, 2777, 0.2)
Data Point: (815, 2772, 0)
Data Point: (815, 2767, 0.6)
Data Point: (815, 2762, 0)
Data Point: (815, 2757, 1.1)
Data Point: (815, 2752, 0)
Data Point: (815, 2747, 1.6)
Data Point: (815, 2742, 0)
Data Point: (815, 2737, 2.2)
Data Point: (815, 2732, 0)
Data Point: (815, 2727, 2.7)
Data Point: (815, 2722, 0)
Data Point: (815, 2717, 3.3)
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Data Point: (798, 2787, 0.3)
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Data Point: (798, 2777, 1)
Data Point: (798, 2772, 0)
Data Point: (798, 2767, 1.7)
Data Point: (798, 2762, 0)
Data Point: (798, 2757, 2.4)
Data Point: (798, 2752, 0)
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Data Point: (798, 2742, 0)
Data Point: (798, 2737, 3.6)
Data Point: (798, 2732, 0)
Data Point: (798, 2727, 4.2)
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Data Point: (798, 2717, 4.8)
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Data Point: (450, 2752, 0)

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Data Point: (450, 2717, 22.8)
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Data Point: (400, 2787, 12.4)
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Data Point: (400, 2777, 12.5)
Data Point: (400, 2772, 0)
Data Point: (400, 2767, 12.5)
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Data Point: (400, 2747, 12.8)
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Data Point: (342, 2717, 4.8)
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Data Point: (325, 2782, 0)
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Data Point: (325, 2752, 0)

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Data Point: (250, 2787, 0)
Data Point: (250, 2782, 0)
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Data Point: (250, 2762, 0)
Data Point: (250, 2757, 0.1)
Data Point: (250, 2752, 0)

Data Point: (250, 2747, 0.2)
Data Point: (250, 2742, 0)
Data Point: (250, 2737, 0.3)
Data Point: (250, 2732, 0)
Data Point: (250, 2727, 0.5)
Data Point: (250, 2722, 0)
Data Point: (250, 2717, 0.7)
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Data Point: (630, 2737, 21.6)
Data Point: (630, 2727, 21.1)
Data Point: (630, 2717, 20.7)
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Data Point: (600, 2777, 19.5)
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Data Point: (600, 2747, 18.7)
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Data Point: (540, 2737, 24.7)
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Data Point: (510, 2777, 23.4)
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Data Point: (480, 2737, 18.5)
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Regions

	Material	Points	Area (ft^2)
Region 1	Waste 36	25,18,19,20,21,24,29,27	54504.837
Region 2	Perimeter Dike	2,3,6,7,4	3746.091
Region 3	Foundation	1,2,4,7,8,9,10,14,15,23,11,12	55454.693
Region 4	Liner	15,17,16,25,18,19,20,21,24,5,22,6,7,8,9,10,14	697.13651
Region 5	Soil Cover	5,28,33,29,24	307.93237
Region 6	Soil Fill	29,33,32,27	1288.5008
Region 7	Soil Cover	28,30,26,32,31,33	1370.1801
Region 8	Soil Cover	32,26,16,25,27	307.56021
Region 9	Soil Fill	33,31,32	4813.2092

Points

	X (ft)	Y (ft)
Point 1	0	2700.0234
Point 2	100.02467	2700
Point 3	227.98191	2763.9966
Point 4	250	2733.9569
Point 5	251.00052	2762.9946
Point 6	247.01831	2763.9984
Point 7	305.501	2733.9842
Point 8	415.97095	2678.9912
Point 9	445.98302	2675.0116
Point 10	695.98042	2675.0029
Point 11	898.98091	2640
Point 12	0	2640
Point 13	-0.5	2679
Point 14	725.98648	2679.0043
Point 15	894	2764
Point 16	890	2763
Point 17	892	2764
Point 18	726	2680
Point 19	696	2676
Point 20	446	2676
Point 21	416	2680
Point 22	249	2764
Point 23	900	2764
Point 24	254.7098	2761.2098
Point 25	886.47442	2761.1506
Point 26	800	2792
Point 27	800	2789
Point 28	342	2792
Point 29	342	2789
Point 30	570	2819.0017
Point 31	570	2816.006
Point 32	770.99689	2792
Point 33	369.99637	2792

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.8	(187.6, 3113.9)	40.16006	(341.976, 2791.99)	(256.805, 2764.84)
2	881	1.8	(187.6, 3113.9)	356.428	(337.777, 2790.65)	(252.183, 2763.37)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)
1	Optimized	256.8423	2764.8515	0	0.59336809	0.34258123
2	Optimized	258.11495	2765.253	0.018063292	1.0786472	0.61232839
3	Optimized	260.586	2766.0425	1.1035895	1.9931457	0.51358554
4	Optimized	263.05705	2766.8315	2.3847046	3.1011299	0.41362833
5	Optimized	266.28695	2767.859	3.6264906	4.5620277	0.54013258
6	Optimized	269.4727	2768.8725	3.767241	4.8836901	0.64458216
7	Optimized	271.8555	2769.634	3.2614831	4.1365658	0.50522926
8	Optimized	274.23835	2770.396	2.4099453	3.0463401	0.36742268
9	Optimized	276.67545	2771.1745	1.3375464	1.7637167	0.24604957
10	Optimized	279.1668	2771.97	0.15246698	0.39584979	0.14051713
11	Optimized	281.5105	2772.717	0	0.28713707	0.16577867
12	Optimized	283.7065	2773.4145	0	0.55387596	0.31978043
13	Optimized	286.1536	2774.193	0	0.72048135	0.4159701
14	Optimized	288.85175	2775.0525	0	0.78729591	0.45454551
15	Optimized	291.5499	2775.912	0	0.85414579	0.4931413
16	Optimized	294.24805	2776.7715	0	0.92099566	0.53173709
17	Optimized	297.0557	2777.667	0.86175005	1.675567	0.46985746
18	Optimized	299.9729	2778.5995	1.9778914	2.4919309	0.29678085
19	Optimized	302.6487	2779.454	2.802859	3.1497675	0.20028769
20	Optimized	305.0831	2780.23	3.059792	3.3711643	0.17977085
21	Optimized	307.51745	2781.0065	2.4054641	2.680674	0.15889249
22	Optimized	310.67245	2782.0085	0	0.70128004	0.40488422
23	Optimized	313.84385	2783.0165	0	0.97180147	0.56106984
24	Optimized	316.3109	2783.806	0	0.63824177	0.36848906

25	Optimized	318.77795	2784.5955	0	0.30472454	0.1759328
26	Optimized	321.1516	2785.3395	0	1.6996424	0.98128897
27	Optimized	323.43185	2786.039	0	4.8220403	2.7840062
28	Optimized	326.3258	2786.9025	0	11.578191	6.6846719
29	Optimized	329.8334	2787.93	17.207778	42.615887	14.669378
30	Optimized	333.6395	2789.201	45.014591	61.411376	9.4666881
31	Optimized	337.2629	2790.4665	52.938874	55.288483	1.3565475
32	Optimized	340.4051	2791.4835	28.028172	28.592866	0.3260259

Slices of Slip Surface: 881

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesiv Strengt (psf)
1	881	253.60985	2763.6405	0	21.919454	12.655203	0
2	881	256.46295	2764.19	0	64.172995	37.050296	0
3	881	259.3161	2764.764	0	103.85546	59.960977	0
4	881	262.16925	2765.3625	0.7027108	141.38529	81.223125	0
5	881	265.02235	2765.9855	2.0692984	175.83426	100.32325	0
6	881	267.8755	2766.6325	3.6699597	206.55518	117.13584	0
7	881	270.72865	2767.304	5.0578604	233.4557	131.86555	0
8	881	273.58175	2768.001	5.6813756	256.73165	144.94394	0
9	881	276.4349	2768.723	5.5775337	276.63644	156.49593	0
10	881	279.28805	2769.4695	4.8772343	293.36564	166.55886	0
11	881	282.14115	2770.2415	3.6885879	308.20576	175.81307	0
12	881	284.9943	2771.0395	2.1551835	320.09311	183.56155	0
13	881	287.84745	2771.863	0.44037454	328.95403	189.66745	0
14	881	290.70055	2772.712	0	334.91794	193.36496	0
15	881	293.5537	2773.587	0	337.92727	195.1024	0
16	881	296.40685	2774.4885	0	338.46736	195.41422	0
17	881	299.25995	2775.4165	0	336.47687	194.26501	0
18	881	302.1131	2776.371	0	331.33601	191.29693	0
19	881	304.96625	2777.3525	0.72864164	322.75412	185.9215	0
20	881	307.81935	2778.361	2.6621943	310.19229	177.55258	0
21	881	310.67245	2779.397	4.1557584	293.34378	166.96278	0
22	881	313.5256	2780.461	4.1658251	275.33464	156.55939	0
23	881	316.37875	2781.5525	1.6891118	254.04001	145.69486	0

24	881	319.23185	2782.672	0	229.80767	132.67952	0
25	881	322.085	2783.8205	0	202.73917	117.05152	0
26	881	324.93815	2784.9975	0	172.64259	99.675246	0
27	881	327.79125	2786.2035	0	146.25274	84.439062	0
28	881	330.6444	2787.439	8.0327422	127.92933	69.222329	0
29	881	333.49755	2788.704	36.896593	108.87341	41.555835	0
30	881	336.35065	2789.999	54.761369	75.951818	12.234311	0

Title: Blue Ridge Paper Date: 4/4/2011 Time: 4:06:15 PM
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\ File Name: generic cross section.gsz
Method: Bishop, Ordinary and Janbu
Analysis Name: Add Fill (phi=36) ops seismic
Horizontal EQ Load: 0.07

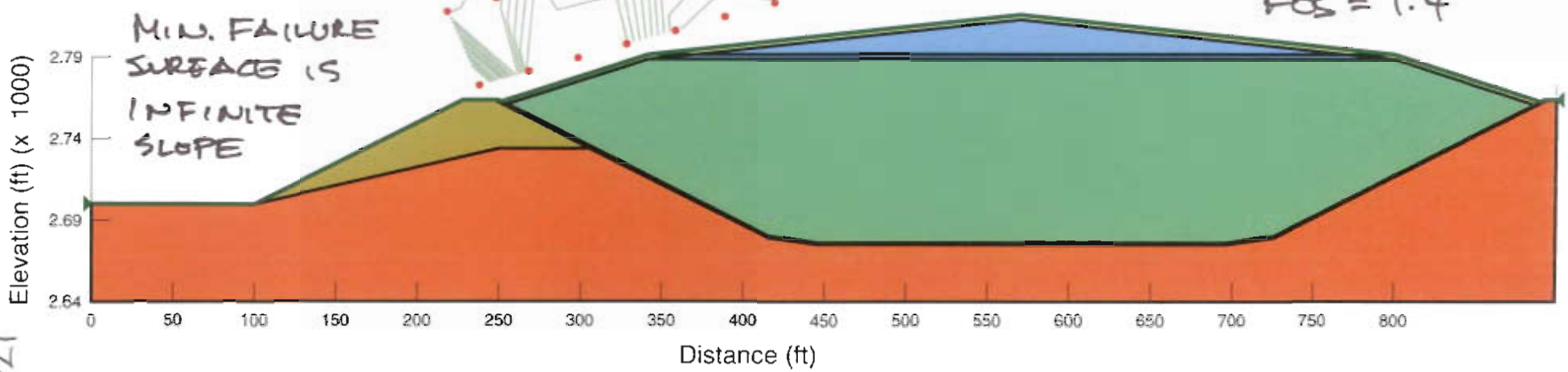
Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Liner Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 35 ° Phi-B: 0 °
Name: Waste 36 Model: Mohr-Coulomb Unit Weight: 90 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 36 ° Phi-B: 0 °
Name: Perimeter Dike Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 115 psf Phi: 32 ° Phi-B: 0 °
Name: Foundation Model: Mohr-Coulomb Unit Weight: 115 pcf Unit Wt. Above Water Table: 115 pcf Cohesion: 0 psf Phi: 31.5 ° Phi-B: 0 °
Name: Soil Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °

PH head Spatial Fn.: Stone Layer Model

SEISMIC ANALYSIS
OPERATING CONDITIONS
EXCESS PORE PRESSURES
APPLIED TO WASTE
MASS

FOS = 1.4

MIN. FAILURE
SURFACE IS
INFINITE
SLOPE



17/28

operations seismic

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File Information

Title: Blue Ridge Paper
Comments: B-B' waste
Revision Number: 57
Date: 4/6/2011
Time: 4:45:28 PM
File Name: generic cross section 12%.gsz
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\
Last Solved Date: 4/6/2011
Last Solved Time: 4:49:14 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

operations seismic

Kind: SLOPE/W
Method: Bishop, Ordinary and Janbu
Settings
- **PWP Conditions Source:** Pressure Head Spatial Function
- **Pressure Head Spatial Fn.:** Stone Layer Model

SlipSurface
- **Direction of movement:** Right to Left
- **Use Passive Mode:** No
- **Slip Surface Option:** Grid and Radius
- **Critical slip surfaces saved:** 1
- **Optimize Critical Slip Surface Location:** Yes
- **Tension Crack**
  - **Tension Crack Option:** (none)

FOS Distribution
- **FOS Calculation Option:** Constant

Advanced

Number of Slices: 30
Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Soil Cover

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Liner

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °

Waste 36

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Unit Wt. Above Water Table: 90 pcf
Cohesion: 0 psf
Phi: 36 °
Phi-B: 0 °

Perimeter Dike

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 115 psf
Phi: 32 °
Phi-B: 0 °

Foundation

Model: Mohr-Coulomb
Unit Weight: 115 pcf

Unit Wt. Above Water Table: 115 pcf
Cohesion: 0 psf
Phi: 31.5 °
Phi-B: 0 °

Soil Fill

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Slip Surface Grid

Upper Left: (37, 3224) ft
Lower Left: (238, 2773) ft
Lower Right: (539, 2857) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (254.7098, 2761.2098) ft
Upper Right Coordinate: (342, 2789) ft
Lower Left Coordinate: (187, 2642) ft
Lower Right Coordinate: (572, 2806) ft
Number of Increments: 10
Left Projection: No
Left Projection Angle: 0 °
Right Projection: No
Right Projection Angle: 0 °
UsePoints: 0

Slip Surface Limits

Left Coordinate: (0, 2700.0234) ft
Right Coordinate: (900, 2764) ft

Seismic Loads

Horz Seismic Load: 0.07
Vert Seismic Load: 0
Ignore seismic load in strength: No

Spatial Functions

Stone Layer Model

Model: Krigged Surface
Limit Range By: Data Values
Data Points: X (ft), Y (ft), Pressure Head (ft)

Data Point: (890, 2792, 0)
Data Point: (890, 2787, 0)
Data Point: (890, 2782, 0)
Data Point: (890, 2777, 0)
Data Point: (890, 2772, 0)
Data Point: (890, 2767, 0)
Data Point: (890, 2762, 0)
Data Point: (890, 2757, 0.1)
Data Point: (890, 2752, 0)
Data Point: (890, 2747, 0.2)
Data Point: (890, 2742, 0)
Data Point: (890, 2737, 0.3)
Data Point: (890, 2732, 0)
Data Point: (890, 2727, 0.5)
Data Point: (890, 2722, 0)
Data Point: (890, 2717, 0.7)
Data Point: (865, 2792, 0)
Data Point: (865, 2787, 0)
Data Point: (865, 2782, 0)
Data Point: (865, 2777, 0)
Data Point: (865, 2772, 0)
Data Point: (865, 2767, 0.1)
Data Point: (865, 2762, 0)
Data Point: (865, 2757, 0.2)
Data Point: (865, 2752, 0)
Data Point: (865, 2747, 0.3)
Data Point: (865, 2742, 0)
Data Point: (865, 2737, 0.5)
Data Point: (865, 2732, 0)
Data Point: (865, 2727, 0.8)
Data Point: (865, 2722, 0)
Data Point: (865, 2717, 1.1)
Data Point: (840, 2792, 0)
Data Point: (840, 2787, 0)
Data Point: (840, 2782, 0)
Data Point: (840, 2777, 0)
Data Point: (840, 2772, 0)
Data Point: (840, 2767, 0.2)
Data Point: (840, 2762, 0)
Data Point: (840, 2757, 0.4)
Data Point: (840, 2752, 0)

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Data Point: (840, 2742, 0)
Data Point: (840, 2737, 1)
Data Point: (840, 2732, 0)
Data Point: (840, 2727, 1.4)
Data Point: (840, 2722, 0)
Data Point: (840, 2717, 1.9)
Data Point: (815, 2792, 0)
Data Point: (815, 2787, 0)
Data Point: (815, 2782, 0)
Data Point: (815, 2777, 0.2)
Data Point: (815, 2772, 0)
Data Point: (815, 2767, 0.6)
Data Point: (815, 2762, 0)
Data Point: (815, 2757, 1.1)
Data Point: (815, 2752, 0)
Data Point: (815, 2747, 1.6)
Data Point: (815, 2742, 0)
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Data Point: (815, 2732, 0)
Data Point: (815, 2727, 2.7)
Data Point: (815, 2722, 0)
Data Point: (815, 2717, 3.3)
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Data Point: (798, 2787, 0.3)
Data Point: (798, 2782, 0)
Data Point: (798, 2777, 1)
Data Point: (798, 2772, 0)
Data Point: (798, 2767, 1.7)
Data Point: (798, 2762, 0)
Data Point: (798, 2757, 2.4)
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Data Point: (798, 2742, 0)
Data Point: (798, 2737, 3.6)
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Data Point: (740, 2732, 0)
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Data Point: (740, 2722, 0)
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Data Point: (450, 2717, 22.8)
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Data Point: (400, 2777, 12.5)
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Data Point: (400, 2762, 0)
Data Point: (400, 2757, 12.6)
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Data Point: (400, 2737, 13)
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Data Point: (300, 2782, 0)
Data Point: (300, 2777, 0)
Data Point: (300, 2772, 0)
Data Point: (300, 2767, 0.2)
Data Point: (300, 2762, 0)
Data Point: (300, 2757, 0.4)
Data Point: (300, 2752, 0)
Data Point: (300, 2747, 0.7)
Data Point: (300, 2742, 0)
Data Point: (300, 2737, 1)
Data Point: (300, 2732, 0)
Data Point: (300, 2727, 1.4)
Data Point: (300, 2722, 0)
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Data Point: (275, 2782, 0)
Data Point: (275, 2777, 0)
Data Point: (275, 2772, 0)
Data Point: (275, 2767, 0.1)
Data Point: (275, 2762, 0)
Data Point: (275, 2757, 0.2)
Data Point: (275, 2752, 0)
Data Point: (275, 2747, 0.3)
Data Point: (275, 2742, 0)
Data Point: (275, 2737, 0.5)
Data Point: (275, 2732, 0)
Data Point: (275, 2727, 0.8)
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Regions

	Material	Points	Area (ft^2)
Region 1	Waste 36	25,18,19,20,21,24,29,27	54504.837
Region 2	Perimeter Dike	2,3,6,7,4	3746.091
Region 3	Foundation	1,2,4,7,8,9,10,14,15,23,11,12	55454.693
Region 4	Liner	15,17,16,25,18,19,20,21,24,5,22,6,7,8,9,10,14	697.13651
Region 5	Soil Cover	5,28,33,29,24	307.93237
Region 6	Soil Fill	29,33,32,27	1288.5008
Region 7	Soil Cover	28,30,26,32,31,33	1370.1801
Region 8	Soil Cover	32,26,16,25,27	307.56021
Region 9	Soil Fill	33,31,32	4813.2092

Points

	X (ft)	Y (ft)
Point 1	0	2700.0234
Point 2	100.02467	2700
Point 3	227.98191	2763.9966
Point 4	250	2733.9569
Point 5	251.00052	2762.9946
Point 6	247.01831	2763.9984
Point 7	305.501	2733.9842
Point 8	415.97095	2678.9912
Point 9	445.98302	2675.0116
Point 10	695.98042	2675.0029
Point 11	898.98091	2640
Point 12	0	2640
Point 13	-0.5	2679
Point 14	725.98648	2679.0043
Point 15	894	2764
Point 16	890	2763
Point 17	892	2764
Point 18	726	2680
Point 19	696	2676
Point 20	446	2676
Point 21	416	2680
Point 22	249	2764
Point 23	900	2764
Point 24	254.7098	2761.2098
Point 25	886.47442	2761.1506
Point 26	800	2792
Point 27	800	2789
Point 28	342	2792
Point 29	342	2789
Point 30	570	2819.0017
Point 31	570	2816.006
Point 32	770.99689	2792
Point 33	369.99637	2792

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.5	(187.6, 3113.9)	356.4283	(337.777, 2790.65)	(252.183, 2763.37)
2	881	1.5	(187.6, 3113.9)	356.428	(337.777, 2790.65)	(252.183, 2763.37)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohe Stre (ps
1	Optimized	253.60985	2763.6405	0	21.620145	12.482397	
2	Optimized	256.46295	2764.19	0	63.261691	36.524154	
3	Optimized	259.3161	2764.764	0	102.3208	59.074942	
4	Optimized	262.16925	2765.3625	0.7027108	139.22263	79.974511	
5	Optimized	265.02235	2765.9855	2.0692984	173.06648	98.72527	
6	Optimized	267.8755	2766.6325	3.6699597	203.21203	115.20567	
7	Optimized	270.72865	2767.304	5.0578604	229.56006	129.6164	
8	Optimized	273.58175	2768.001	5.6813756	252.30981	142.39099	
9	Optimized	276.4349	2768.723	5.5775337	271.7079	153.65044	
10	Optimized	279.28805	2769.4695	4.8772343	287.95327	163.43402	
11	Optimized	282.14115	2770.2415	3.6885879	302.32565	172.41819	
12	Optimized	284.9943	2771.0395	2.1551835	313.77149	179.91176	
13	Optimized	287.84745	2771.863	0.44037454	322.23725	185.78951	
14	Optimized	290.70055	2772.712	0	327.88233	189.30295	
15	Optimized	293.5537	2773.587	0	330.6286	190.88851	
16	Optimized	296.40685	2774.4885	0	330.97108	191.08624	
17	Optimized	299.25995	2775.4165	0	328.83466	189.85278	
18	Optimized	302.1131	2776.371	0	323.6191	186.84157	
19	Optimized	304.96625	2777.3525	0.72864164	315.06958	181.48483	
20	Optimized	307.81935	2778.361	2.6621943	302.67925	173.21493	
21	Optimized	310.67245	2779.397	4.1557584	286.11051	162.78665	
22	Optimized	313.5256	2780.461	4.1658251	268.39652	152.55366	
23	Optimized	316.37875	2781.5525	1.6891118	247.44161	141.88527	
24	Optimized	319.23185	2782.672	0	223.6647	129.13288	

25	Optimized	322.085	2783.8205	0	197.1985	113.85261	
26	Optimized	324.93815	2784.9975	0	167.82351	96.892951	
27	Optimized	327.79125	2786.2035	0	142.08616	82.03348	
28	Optimized	330.6444	2787.439	8.0327422	124.44298	67.209481	
29	Optimized	333.49755	2788.704	36.896593	106.74046	40.324373	
30	Optimized	336.35065	2789.999	54.761369	75.308429	11.86285	

Slices of Slip Surface: 881

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesiv Strengt (psf)
1	881	253.60985	2763.6405	0	21.620145	12.482397	0
2	881	256.46295	2764.19	0	63.261691	36.524154	0
3	881	259.3161	2764.764	0	102.3208	59.074942	0
4	881	262.16925	2765.3625	0.7027108	139.22263	79.974511	0
5	881	265.02235	2765.9855	2.0692984	173.06648	98.72527	0
6	881	267.8755	2766.6325	3.6699597	203.21203	115.20567	0
7	881	270.72865	2767.304	5.0578604	229.56006	129.6164	0
8	881	273.58175	2768.001	5.6813756	252.30981	142.39099	0
9	881	276.4349	2768.723	5.5775337	271.7079	153.65044	0
10	881	279.28805	2769.4695	4.8772343	287.95327	163.43402	0
11	881	282.14115	2770.2415	3.6885879	302.32565	172.41819	0
12	881	284.9943	2771.0395	2.1551835	313.77149	179.91176	0
13	881	287.84745	2771.863	0.44037454	322.23725	185.78951	0
14	881	290.70055	2772.712	0	327.88233	189.30295	0
15	881	293.5537	2773.587	0	330.6286	190.88851	0
16	881	296.40685	2774.4885	0	330.97108	191.08624	0
17	881	299.25995	2775.4165	0	328.83466	189.85278	0
18	881	302.1131	2776.371	0	323.6191	186.84157	0
19	881	304.96625	2777.3525	0.72864164	315.06958	181.48483	0
20	881	307.81935	2778.361	2.6621943	302.67925	173.21493	0
21	881	310.67245	2779.397	4.1557584	286.11051	162.78665	0
22	881	313.5256	2780.461	4.1658251	268.39652	152.55366	0
23	881	316.37875	2781.5525	1.6891118	247.44161	141.88527	0
24	881	319.23185	2782.672	0	223.6647	129.13288	0
25	881	322.085	2783.8205	0	197.1985	113.85261	0

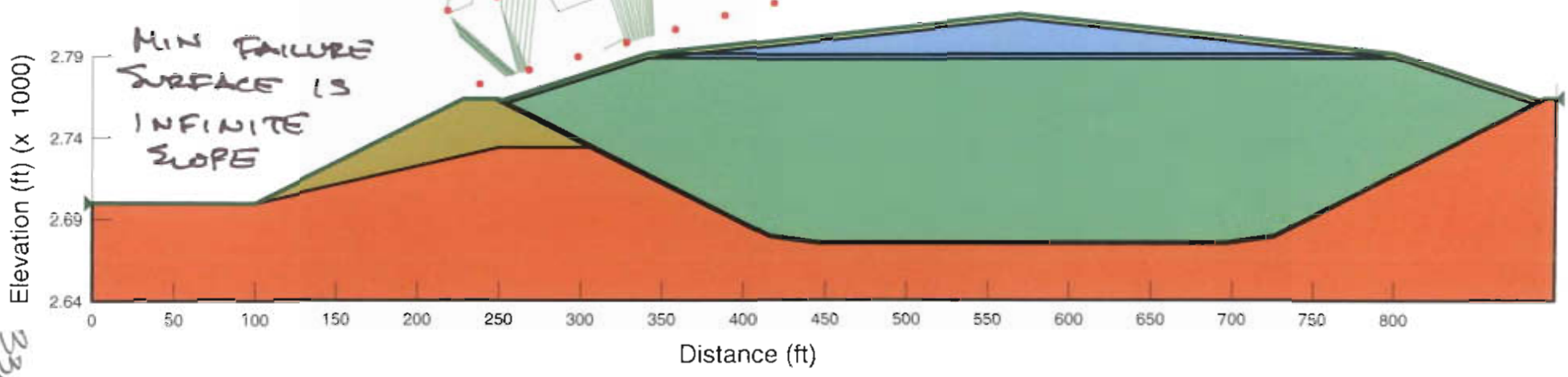
26	881	324.93815	2784.9975	0	167.82351	96.892951	0
27	881	327.79125	2786.2035	0	142.08616	82.03348	0
28	881	330.6444	2787.439	8.0327422	124.44298	67.209481	0
29	881	333.49755	2788.704	36.896593	106.74046	40.324373	0
30	881	336.35065	2789.999	54.761369	75.308429	11.86285	0

Title: Blue Ridge Paper Date: 4/4/2011 Time: 4:06:15 PM
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\ File Name: generic cross section.gsz
Method: Bishop, Ordinary and Janbu
Analysis Name: Add Fill (phi=36) post closure
Horizontal EQ Load: 0

Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Liner Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 35 ° Phi-B: 0 °
Name: Waste 36 Model: Mohr-Coulomb Unit Weight: 90 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 36 ° Phi-B: 0 °
Name: Perimeter Dike Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 115 psf Phi: 32 ° Phi-B: 0 °
Name: Foundation Model: Mohr-Coulomb Unit Weight: 115 pcf Unit Wt. Above Water Table: 115 pcf Cohesion: 0 psf Phi: 31.5 ° Phi-B: 0 °
Name: Soil Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °

STATIC ANALYSIS
POST-CLOSURE CONDITIONS
PORE PRESSURE DISIPATED
FOS = 1.8

MIN FAILURE SURFACE IS INFINITE SLOPE



post closure

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File Information

Title: Blue Ridge Paper
Comments: B-B' waste
Revision Number: 57
Date: 4/6/2011
Time: 4:45:28 PM
File Name: generic cross section 12%.gsz
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\
Last Solved Date: 4/6/2011
Last Solved Time: 4:51:05 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

post closure

Kind: SLOPE/W
Method: Bishop, Ordinary and Janbu
Settings
    PWP Conditions Source: (none)
SlipSurface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Grid and Radius
    Critical slip surfaces saved: 1
    Optimize Critical Slip Surface Location: Yes
    Tension Crack
        Tension Crack Option: (none)
FOS Distribution
    FOS Calculation Option: Constant
Advanced
    Number of Slices: 30

Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Soil Cover

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Liner

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °

Waste 36

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Unit Wt. Above Water Table: 90 pcf
Cohesion: 0 psf
Phi: 36 °
Phi-B: 0 °

Perimeter Dike

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 115 psf
Phi: 32 °
Phi-B: 0 °

Foundation

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Unit Wt. Above Water Table: 115 pcf

Cohesion: 0 psf
Phi: 31.5 °
Phi-B: 0 °

Soil Fill

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Slip Surface Grid

Upper Left: (37, 3224) ft
Lower Left: (238, 2773) ft
Lower Right: (539, 2857) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (254.7098, 2761.2098) ft
Upper Right Coordinate: (342, 2789) ft
Lower Left Coordinate: (187, 2642) ft
Lower Right Coordinate: (572, 2806) ft
Number of Increments: 10
Left Projection: No
Left Projection Angle: 0 °
Right Projection: No
Right Projection Angle: 0 °
UsePoints: 0

Slip Surface Limits

Left Coordinate: (0, 2700.0234) ft
Right Coordinate: (900, 2764) ft

Seismic Loads

Horz Seismic Load: 0
Vert Seismic Load: 0

Regions

	Material	Points	Area (ft²)
Region 1	Waste 36	25,18,19,20,21,24,29,27	54504.837
Region 2	Perimeter Dike	2,3,6,7,4	3746.091
Region 3	Foundation	1,2,4,7,8,9,10,14,15,23,11,12	55454.693
Region 4	Liner	15,17,16,25,18,19,20,21,24,5,22,6,7,8,9,10,14	697.13651
Region 5	Soil Cover	5,28,33,29,24	307.93237
Region 6	Soil Fill	29,33,32,27	1288.5008
Region 7	Soil Cover	28,30,26,32,31,33	1370.1801
Region 8	Soil Cover	32,26,16,25,27	307.56021
Region 9	Soil Fill	33,31,32	4813.2092

Points

	X (ft)	Y (ft)
Point 1	0	2700.0234
Point 2	100.02467	2700
Point 3	227.98191	2763.9966
Point 4	250	2733.9569
Point 5	251.00052	2762.9946
Point 6	247.01831	2763.9984
Point 7	305.501	2733.9842
Point 8	415.97095	2678.9912
Point 9	445.98302	2675.0116
Point 10	695.98042	2675.0029
Point 11	898.98091	2640
Point 12	0	2640
Point 13	-0.5	2679
Point 14	725.98648	2679.0043
Point 15	894	2764
Point 16	890	2763
Point 17	892	2764
Point 18	726	2680
Point 19	696	2676
Point 20	446	2676
Point 21	416	2680

Point 22	249	2764
Point 23	900	2764
Point 24	254.7098	2761.2098
Point 25	886.47442	2761.1506
Point 26	800	2792
Point 27	800	2789
Point 28	342	2792
Point 29	342	2789
Point 30	570	2819.0017
Point 31	570	2816.006
Point 32	770.99689	2792
Point 33	369.99637	2792

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.8	(187.6, 3113.9)	41.96349	(342, 2792)	(253.012, 2763.64)
2	881	1.8	(187.6, 3113.9)	356.428	(337.777, 2790.65)	(252.183, 2763.37)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	254.0393	2763.912	0	5.9015525	3.4072629	0
2	Optimized	256.46905	2764.6415	0	10.907294	6.2973293	0
3	Optimized	259.27315	2765.548	0	9.4841168	5.4756574	0
4	Optimized	262.07725	2766.454	0	8.0612787	4.6541815	0
5	Optimized	264.7803	2767.3185	0	7.763051	4.4819996	0
6	Optimized	267.38225	2768.141	0	8.5589983	4.94154	0
7	Optimized	270.1126	2769.013	0	8.3107316	4.7982031	0
8	Optimized	272.97135	2769.9355	0	7.0516711	4.0712842	0
9	Optimized	275.5719	2770.776	0	5.7506114	3.320117	0
10	Optimized	277.91435	2771.5345	0	4.4111441	2.5467753	0
11	Optimized	280.0999	2772.224	0	5.2484308	3.0301829	0

12	Optimized	282.70385	2773.0535	0	5.2350511	3.0224582	0
13	Optimized	285.8831	2774.0925	0	2.3138268	1.3358885	0
14	Optimized	289.3145	2775.195	0	1.3304366	0.76812791	0
15	Optimized	292.99805	2776.361	0	2.2796502	1.3161567	0
16	Optimized	296.4401	2777.4505	0	3.1706248	1.8305611	0
17	Optimized	299.64075	2778.4635	0	4.002899	2.3110748	0
18	Optimized	303.45845	2779.6865	0	3.2731135	1.8897329	0
19	Optimized	307.12955	2780.8685	0	1.8936772	1.0933151	0
20	Optimized	310.03705	2781.7995	0	1.4055263	0.81148097	0
21	Optimized	312.9446	2782.7305	0	0.91740805	0.52966579	0
22	Optimized	315.85215	2783.6615	0	0.42925709	0.2478317	0
23	Optimized	318.98885	2784.6605	0	0.52466723	0.30291677	0
24	Optimized	322.509	2785.7805	0	0.78611277	0.45386242	0
25	Optimized	326.1834	2786.953	0	0.63143108	0.3645569	0
26	Optimized	329.36565	2787.968	0	0.54507436	0.31469883	0
27	Optimized	332.05575	2788.826	0	0.52701146	0.30427021	0
28	Optimized	334.7458	2789.6835	0	0.50891315	0.29382115	0
29	Optimized	337.5681	2790.584	0	0.37518135	0.21661105	0
30	Optimized	340.5227	2791.528	0	0.12528597	0.07233389	0

Slices of Slip Surface: 881

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	881	253.60985	2763.6405	0	21.925654	12.658782	0
2	881	256.46295	2764.19	0	64.193628	37.062209	0
3	881	259.3161	2764.764	0	103.4057	59.701311	0
4	881	262.16925	2765.3625	0	139.57565	80.584036	0
5	881	265.02235	2765.9855	0	172.71067	99.714554	0
6	881	267.8755	2766.6325	0	202.81249	117.09384	0
7	881	270.72865	2767.304	0	229.89066	132.72743	0
8	881	273.58175	2768.001	0	253.94589	146.61573	0
9	881	276.4349	2768.723	0	274.9868	158.76371	0
10	881	279.28805	2769.4695	0	293.01678	169.17332	0
11	881	282.14115	2770.2415	0	308.0368	177.84513	0
12	881	284.9943	2771.0395	0	320.04928	184.78054	0

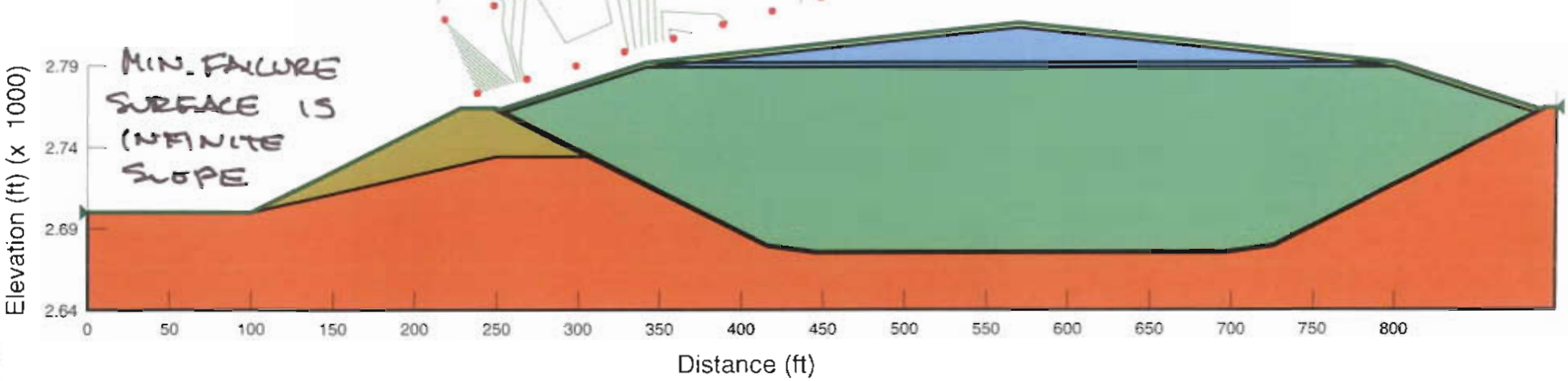
13	881	287.84745	2771.863	0	329.0583	189.9819	0
14	881	290.70055	2772.712	0	335.06892	193.45213	0
15	881	293.5537	2773.587	0	338.06112	195.17968	0
16	881	296.40685	2774.4885	0	338.06685	195.18299	0
17	881	299.25995	2775.4165	0	335.0789	193.4579	0
18	881	302.1131	2776.371	0	329.08566	189.99769	0
19	881	304.96625	2777.3525	0	320.0834	184.80024	0
20	881	307.81935	2778.361	0	308.07729	177.8685	0
21	881	310.67245	2779.397	0	293.0609	169.19879	0
22	881	313.5256	2780.461	0	275.03626	158.79226	0
23	881	316.37875	2781.5525	0	253.99752	146.64554	0
24	881	319.23185	2782.672	0	229.93796	132.75474	0
25	881	322.085	2783.8205	0	202.85603	117.11898	0
26	881	324.93815	2784.9975	0	172.74285	99.733133	0
27	881	327.79125	2786.2035	0	139.59523	80.595341	0
28	881	330.6444	2787.439	0	103.40928	59.703374	0
29	881	333.49755	2788.704	0	64.170908	37.049091	0
30	881	336.35065	2789.999	0	21.878111	12.631334	0

Title: Blue Ridge Paper Date: 4/4/2011 Time: 4:06:15 PM
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\ File Name: generic cross section.gsz
Method: Bishop, Ordinary and Janbu
Analysis Name: Add Fill (phi=36) post closure USEPA seismic
Horizontal EQ Load: 0.14

Name: Soil Cover Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °
Name: Liner Model: Mohr-Coulomb Unit Weight: 125 pcf Cohesion: 0 psf Phi: 35 ° Phi-B: 0 °
Name: Waste 36 Model: Mohr-Coulomb Unit Weight: 90 pcf Unit Wt. Above Water Table: 90 pcf Cohesion: 0 psf Phi: 36 ° Phi-B: 0 °
Name: Perimeter Dike Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 115 psf Phi: 32 ° Phi-B: 0 °
Name: Foundation Model: Mohr-Coulomb Unit Weight: 115 pcf Unit Wt. Above Water Table: 115 pcf Cohesion: 0 psf Phi: 31.5 ° Phi-B: 0 °
Name: Soil Fill Model: Mohr-Coulomb Unit Weight: 120 pcf Unit Wt. Above Water Table: 120 pcf Cohesion: 0 psf Phi: 30 ° Phi-B: 0 °

SEISMIC ANALYSIS
POST-CLOSURE CONDITIONS
PORE PRESSURE DISIPATED
FOS = 1.2

MIN. FAILURE SURFACE IS INFINITE SLOPE



post closure seismic

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File Information

Title: Blue Ridge Paper
Comments: B-B' waste
Revision Number: 57
Date: 4/6/2011
Time: 4:45:28 PM
File Name: generic cross section 12%.gsz
Directory: H:\Brpp\NC\6a-west\2010 vertical expansion\
Last Solved Date: 4/6/2011
Last Solved Time: 4:51:11 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

post closure seismic

Kind: SLOPE/W
Method: Bishop, Ordinary and Janbu
Settings
- **PWP Conditions Source:** (none)

SlipSurface
- **Direction of movement:** Right to Left
- **Use Passive Mode:** No
- **Slip Surface Option:** Grid and Radius
- **Critical slip surfaces saved:** 1
- **Optimize Critical Slip Surface Location:** Yes
- **Tension Crack**
  - **Tension Crack Option:** (none)

FOS Distribution
- **FOS Calculation Option:** Constant

Advanced
- **Number of Slices:** 30

Optimization Tolerance: 0.01
Minimum Slip Surface Depth: 0.1 ft
Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1
Driving Side Maximum Convex Angle: 5 °
Resisting Side Maximum Convex Angle: 1 °

Materials

Soil Cover

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Liner

Model: Mohr-Coulomb
Unit Weight: 125 pcf
Cohesion: 0 psf
Phi: 35 °
Phi-B: 0 °

Waste 36

Model: Mohr-Coulomb
Unit Weight: 90 pcf
Unit Wt. Above Water Table: 90 pcf
Cohesion: 0 psf
Phi: 36 °
Phi-B: 0 °

Perimeter Dike

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 115 psf
Phi: 32 °
Phi-B: 0 °

Foundation

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Unit Wt. Above Water Table: 115 pcf

Cohesion: 0 psf
Phi: 31.5 °
Phi-B: 0 °

Soil Fill

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Unit Wt. Above Water Table: 120 pcf
Cohesion: 0 psf
Phi: 30 °
Phi-B: 0 °

Slip Surface Grid

Upper Left: (37, 3224) ft
Lower Left: (238, 2773) ft
Lower Right: (539, 2857) ft
Grid Horizontal Increment: 10
Grid Vertical Increment: 10
Left Projection Angle: 0 °
Right Projection Angle: 0 °

Slip Surface Radius

Upper Left Coordinate: (254.7098, 2761.2098) ft
Upper Right Coordinate: (342, 2789) ft
Lower Left Coordinate: (187, 2642) ft
Lower Right Coordinate: (572, 2806) ft
Number of Increments: 10
Left Projection: No
Left Projection Angle: 0 °
Right Projection: No
Right Projection Angle: 0 °
UsePoints: 0

Slip Surface Limits

Left Coordinate: (0, 2700.0234) ft
Right Coordinate: (900, 2764) ft

Seismic Loads

Horz Seismic Load: 0.14
Vert Seismic Load: 0
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft²)
Region 1	Waste 36	25,18,19,20,21,24,29,27	54504.837
Region 2	Perimeter Dike	2,3,6,7,4	3746.091
Region 3	Foundation	1,2,4,7,8,9,10,14,15,23,11,12	55454.693
Region 4	Liner	15,17,16,25,18,19,20,21,24,5,22,6,7,8,9,10,14	697.13651
Region 5	Soil Cover	5,28,33,29,24	307.93237
Region 6	Soil Fill	29,33,32,27	1288.5008
Region 7	Soil Cover	28,30,26,32,31,33	1370.1801
Region 8	Soil Cover	32,26,16,25,27	307.56021
Region 9	Soil Fill	33,31,32	4813.2092

Points

	X (ft)	Y (ft)
Point 1	0	2700.0234
Point 2	100.02467	2700
Point 3	227.98191	2763.9966
Point 4	250	2733.9569
Point 5	251.00052	2762.9946
Point 6	247.01831	2763.9984
Point 7	305.501	2733.9842
Point 8	415.97095	2678.9912
Point 9	445.98302	2675.0116
Point 10	695.98042	2675.0029
Point 11	898.98091	2640
Point 12	0	2640
Point 13	-0.5	2679
Point 14	725.98648	2679.0043
Point 15	894	2764
Point 16	890	2763
Point 17	892	2764
Point 18	726	2680
Point 19	696	2676
Point 20	446	2676
Point 21	416	2680

Point 22	249	2764
Point 23	900	2764
Point 24	254.7098	2761.2098
Point 25	886.47442	2761.1506
Point 26	800	2792
Point 27	800	2789
Point 28	342	2792
Point 29	342	2789
Point 30	570	2819.0017
Point 31	570	2816.006
Point 32	770.99689	2792
Point 33	369.99637	2792

Critical Slip Surfaces

	Slip Surface	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.2	(187.6, 3113.9)	42.83804	(341.999, 2792)	(251.172, 2763.05)
2	881	1.2	(187.6, 3113.9)	356.428	(337.777, 2790.65)	(252.183, 2763.37)

Slices of Slip Surface: Optimized

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	252.6897	2763.522	0	1.165588	0.67295253	0
2	Optimized	255.7253	2764.468	0	3.4966695	2.0188031	0
3	Optimized	258.89145	2765.4625	0	5.1201795	2.956137	0
4	Optimized	262.1881	2766.505	0	6.0526462	3.4944969	0
5	Optimized	265.4557	2767.5325	0	7.541623	4.3541581	0
6	Optimized	268.83365	2768.606	0	7.846619	4.5302476	0
7	Optimized	272.35095	2769.74	0	6.4949667	3.7498708	0
8	Optimized	275.25845	2770.6605	0	7.2289457	4.1736338	0
9	Optimized	277.5562	2771.3675	0	9.9780166	5.7608106	0
10	Optimized	280.2125	2772.2155	0	9.7369833	5.6216499	0
11	Optimized	283.22735	2773.2045	0	6.6975443	3.866829	0

12	Optimized	286.2422	2774.1935	0	3.6577902	2.1118261	0
13	Optimized	289.80435	2775.3355	0	2.97826	1.7194992	0
14	Optimized	293.4669	2776.501	0	3.2095227	1.8530188	0
15	Optimized	296.4676	2777.4635	0	2.5450599	1.469391	0
16	Optimized	299.2534	2778.353	0	2.3822193	1.3753749	0
17	Optimized	301.92765	2779.2075	0	2.1864173	1.2623286	0
18	Optimized	304.49035	2780.0265	0	1.9581599	1.1305441	0
19	Optimized	307.5201	2780.9875	0	2.4388036	1.4080439	0
20	Optimized	311.01685	2782.091	0	3.6222339	2.0912977	0
21	Optimized	314.5136	2783.195	0	4.8055551	2.7744886	0
22	Optimized	317.9646	2784.2945	0	4.8208904	2.7833424	0
23	Optimized	321.3698	2785.39	0	3.6954103	2.1335461	0
24	Optimized	324.77495	2786.486	0	2.5698463	1.4837015	0
25	Optimized	327.9487	2787.492	0	3.1877055	1.8404227	0
26	Optimized	330.91345	2788.4205	0	4.9738948	2.8716795	0
27	Optimized	333.90055	2789.361	0	6.2147342	3.5880785	0
28	Optimized	337.04525	2790.3735	0	5.0979864	2.9433238	0
29	Optimized	340.3476	2791.458	0	1.6993192	0.98110241	0

Slices of Slip Surface: 881

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	881	253.60985	2763.6405	0	21.321525	12.309988	0
2	881	256.46295	2764.19	0	62.350387	35.998013	0
3	881	259.3161	2764.764	0	100.32266	57.921312	0
4	881	262.16925	2765.3625	0	135.25718	78.090767	0
5	881	265.02235	2765.9855	0	167.1717	96.516625	0
6	881	267.8755	2766.6325	0	196.08178	113.20787	0
7	881	270.72865	2767.304	0	222.00394	128.17404	0
8	881	273.58175	2768.001	0	244.95256	141.42343	0
9	881	276.4349	2768.723	0	264.93964	152.96297	0
10	881	279.28805	2769.4695	0	281.98543	162.80436	0
11	881	282.14115	2770.2415	0	296.09408	170.95	0
12	881	284.9943	2771.0395	0	307.28804	177.41283	0
13	881	287.84745	2771.863	0	315.57428	182.1969	0

14	881	290.70055	2772.712	0	320.96079	185.3068	0
15	881	293.5537	2773.587	0	323.46714	186.75384	0
16	881	296.40685	2774.4885	0	323.09431	186.53859	0
17	881	299.25995	2775.4165	0	319.86106	184.67187	0
18	881	302.1131	2776.371	0	313.768	181.15404	0
19	881	304.96625	2777.3525	0	304.83014	175.99376	0
20	881	307.81935	2778.361	0	293.05122	169.1932	0
21	881	310.67245	2779.397	0	278.43976	160.75727	0
22	881	313.5256	2780.461	0	261.00591	150.69183	0
23	881	316.37875	2781.5525	0	240.75497	138.99995	0
24	881	319.23185	2782.672	0	217.69436	125.6859	0
25	881	322.085	2783.8205	0	191.82337	110.74928	0
26	881	324.93815	2784.9975	0	163.15645	94.19842	0
27	881	327.79125	2786.2035	0	131.69063	76.03162	0
28	881	330.6444	2787.439	0	97.434961	56.254101	0
29	881	333.49755	2788.704	0	60.391069	34.8668	0
30	881	336.35065	2789.999	0	20.564259	11.87278	0

APPENDIX D-6

COVER SYSTEM STABILITY CALCULATIONS

Project Name:	Evergreen Packaging Area 6A-West		
Project Number:	10164		
Calculations By:	MSR	Date:	4/5/2011
Checked By:		Date:	

This spreadsheet calculates the factor of safety for veneer cover soils systems using the methods outlined in the paper titled "Analysis and Design of Veneer Cover Soils", by Koerner and Soong, Geosynthetics International, Volume 12, No 1, 2005, Pages 28 through 49. See "Notations" sheet for complete description of symbols and formulas used in calculations. As modified for site specific conditions of drainage.

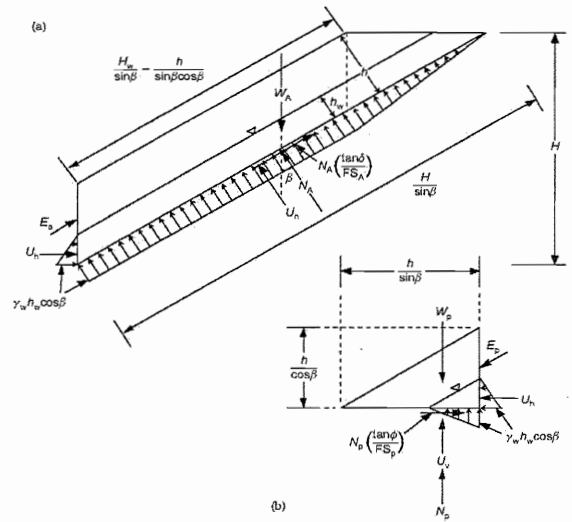


Figure 13. Limit equilibrium forces involved in finite-length slope of uniform cover soil with parallel-to-slope seepage build-up: (a) active wedge; (b) passive wedge

Trig Calculations	
Sin β	0.118404
Tan β	0.119243
Cos β	0.992966
Tan ϕ	0.57735
Tan δ	0.57735
$\sin^2 \beta$	0.014019
$\cos^2\beta$	0.985981
Sin2β	0.235142

Seepage Parallel to Slope Conditions

Calculations

965.12	$W_A = \gamma_d (h-h_w)[2H\cos\beta - (h+h_w)]/\sin 2\beta + \gamma_{sat} h_w(2H\cos\beta - h_w)/\sin 2\beta$
515.58	$N_A = W_A \cos\beta + U_h \sin\beta - U_n$
1.82	$U_h = \gamma_w h_w^2/2$
33.52	$W_P = \gamma_{dry}(h^2 - h_w^2) + g_{sat} h_w^2/\sin 2\beta$
442.96	$U_n = \gamma_w h_w \cos\beta(2H\cos\beta - h_w)/\sin 2\beta$
15.28	$U_V = U_h \cot\beta$
113.50	$a = W_A \sin\beta\cos\beta - U_h\cos^2\beta + U_h$
-313.80	$b = -W_A\sin^2\beta\tan\phi + U_h\sin\beta\cos\beta\tan\phi - N_A\cos\beta\tan\delta - (W_P - U_V)\tan\phi$
20.35	$c = N_A\sin\beta\tan\delta\tan\phi$

2.70	**FS** $= -b+(\sqrt{b^2} - 4ac)/2a$

	Input		Input	
h	0.6	Thickness of Cover Soil (m)	2	ft
γ_d	16.5	Dry Unit weight of cover soil (kN/m^3)	105	pcf
β	6.8	Slope angle at interface (degrees)	12% Slope	
ϕ	30.0	Friction angle of cover soil (degrees)		
δ	30.0	Interface friction angle at interface of interest	**Post-Peak**	<<======
γ_{sat}	21.2	Saturated Unit weight of cover soil (kN/m^3)	135	pcf
H	9.1	Vertical Height of Slope measured from the toe (m)	30	ft
h_w	0.6	Height of free water surface perpendicular to slope (m)	2	ft
γ_w	9.8	Unit weight of water (kN/m^3)	62.4	pcf

12% Top Slope
Saturated Conditions
FOS = 2.7

Project Name:	Evergreen Packaging Area 6A-West		
Project Number:	10164		
Calculations By:	MSR	Date:	4/5/2011
Checked By:		Date:	

This spreadsheet calculates the factor of safety for veneer cover soils systems using the methods outlined in the paper titled "Analysis and Design of Veneer Cover Soils", by Koerner and Soong, Geosynthetics International, Volume 12, No 1, 2005, Pages 28 through 49. See "Notations" sheet for complete description of symbols and formulas used in calculations. As modified for site specific conditions of drainage.

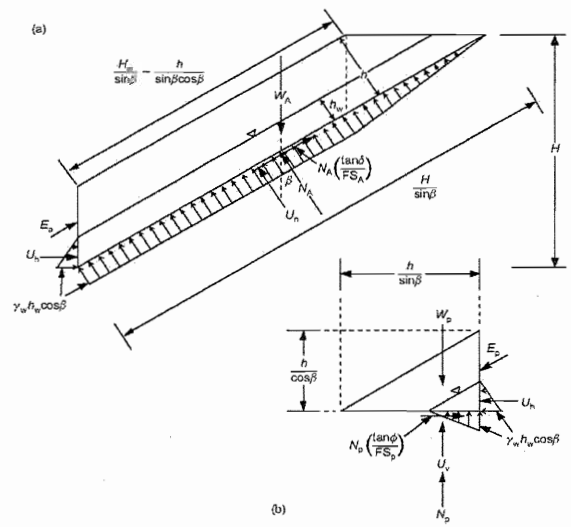


Figure 13. Limit equilibrium forces involved in finite-length slope of uniform cover soil with parallel-to-slope seepage build-up: (a) active wedge; (b) passive wedge

Trig Calculations	
Sin β	0.118404
Tan β	0.119243
Cos β	0.992966
Tan ϕ	0.57735
Tan δ	0.57735
$\sin^2 \beta$	0.014019
$\cos^2\beta$	0.985981
Sin2β	0.235142

Seepage Parallel to Slope Conditions

Calculations

750.65	$W_A = \gamma_d (h-h_w)[2H\cos\beta - (h+h_w)]/\sin 2\beta + \gamma_{sat} h_w(2H\cos\beta - h_w)/\sin 2\beta$
745.37	$N_A = W_A \cos\beta + U_h \sin\beta - U_n$
0.00	$U_h = \gamma_w h_w^2/2$
26.07	$W_P = \gamma_{dry}(h^2 - h_w^2) + g_{sat} h_w^2/\sin 2\beta$
0.00	$U_n = \gamma_w h_w \cos\beta(2H\cos\beta - h_w)/\sin 2\beta$
0.00	$U_V = U_h \cot\beta$
88.25	$a = W_A \sin\beta\cos\beta - U_h\cos^2\beta + U_h$
-448.44	$b = -W_A\sin^2\beta\tan\phi + U_h\sin\beta\cos\beta\tan\phi - N_A\cos\beta\tan\delta - (W_P - U_V)\tan\phi$
29.42	$c = N_A\sin\beta\tan\delta\tan\phi$

5.01	**FS** $= -b+(\sqrt{b^2 - 4ac})/2a$

	Input		Input	
h	0.6	Thickness of Cover Soil (m)	2	ft
γ_d	16.5	Dry Unit weight of cover soil (kN/m³)	105	pcf
β	6.8	Slope angle at interface (degrees)	12% Slope	
ϕ	30.0	Friction angle of cover soil (degrees)		
δ	30.0	Interface friction angle at interface of interest	**Post-Peak**	<<======
γ_{sat}	21.2	Saturated Unit weight of cover soil (kN/m³)	135	pcf
H	9.1	Vertical Height of Slope measured from the toe (m)	30	ft
h_w	0.0	Height of free water surface perpendicular to slope (m)	0	ft
γ_w	9.8	Unit weight of water (kN/m³)	62.4	pcf

12% TOP Slope
Drained Conditions
FOS = 5.0

Project Name:	Evergreen Packaging Area 6A-West		
Project Number:	10164		
Calculations By:	MSR	Date:	4/5/2011
Checked By:		Date:	

This spreadsheet calculates the factor of safety for veneer cover soils systems using the methods outlined in the paper titled "Analysis and Design of Veneer Cover Soils", by Koerner and Soong, Geosynthetics International, Volume 12, No 1, 2005, Pages 28 through 49. See "Notations" sheet for complete description of symbols and formulas used in calculations. As modified for site specific conditions of drainage.

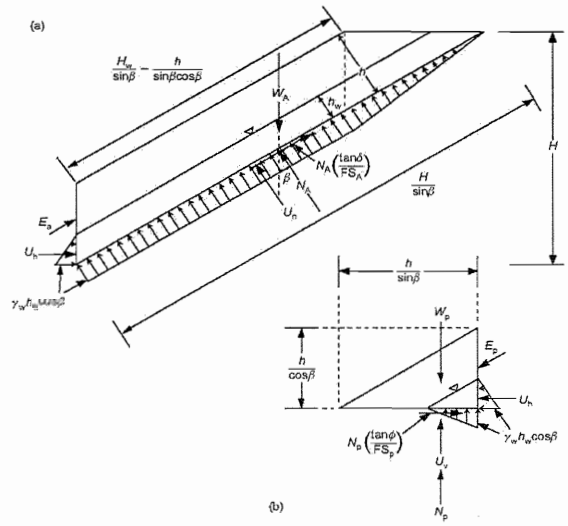


Figure 13. Limit equilibrium forces involved in finite-length slope of uniform cover soil with parallel-to-slope seepage build-up: (a) active wedge; (b) passive wedge

Trig Calculations

Sin β	0.315649
Tan β	0.332656
Cos β	0.948876
Tan ϕ	0.57735
Tan δ	0.57735
$\sin^2 \beta$	0.099634
$\cos^2\beta$	0.900366
Sin2β	0.599024

Seepage Parallel to Slope Conditions

Calculations

281.12	$W_A = \gamma_d (h-h_w)[2H\cos\beta - (h+h_w)]/\sin 2\beta + \gamma_{sat} h_w(2H\cos\beta - h_w)/\sin 2\beta$
266.75	$N_A = W_A \cos\beta + U_h \sin\beta - U_n$
0.00	$U_h = \gamma_w h_w^2/2$
10.24	$W_P = \gamma_{dry}(h^2 - h_w^2) + g_{sat} h_w^2/\sin 2\beta$
0.00	$U_n = \gamma_w h_w \cos\beta(2H\cos\beta - h_w)/\sin 2\beta$
0.00	$U_V = U_h \cot\beta$
84.20	$a = W_A \sin\beta\cos\beta - U_h\cos^2\beta + U_h$
-168.22	$b = -W_A\sin^2\beta\tan\phi + U_h\sin\beta\cos\beta\tan\phi - N_A\cos\beta\tan\delta - (W_P - U_V)\tan\phi$
28.07	$c = N_A\sin\beta\tan\delta\tan\phi$

1.81	**FS** $= -b+(\sqrt{b^2} - 4ac)/2a$

	Input		Input	
h	0.6	Thickness of Cover Soil (m)	2	ft
γ_d	16.5	Dry Unit weight of cover soil (kN/m³)	105	pcf
β	18.4	Slope angle at interface (degrees)	3:1 Slope	
ϕ	30.0	Friction angle of cover soil (degrees)		
δ	30.0	Interface friction angle at interface of interest	**Post-Peak**	<<======
γ_{sat}	21.2	Saturated Unit weight of cover soil (kN/m³)	135	pcf
H	9.1	Vertical Height of Slope measured from the toe (m)	30	ft
h_w	0.0	Height of free water surface perpendicular to slope (m)	0	ft
γ_w	9.8	Unit weight of water (kN/m³)	62.4	pcf

3:1 SIDE SLOPE
DRAINED CONDITIONS
FOS = 1.81

Project Name:	Evergreen Packaging Area 6A-West		
Project Number:	10164		
Calculations By:	MSR	Date:	4/5/2011
Checked By:		Date:	

This spreadsheet calculates the factor of safety for veneer cover soils systems using the methods outlined in the paper titled "Analysis and Design of Veneer Cover Soils", by Koerner and Soong, Geosynthetics International, Volume 12, No 1, 2005, Pages 28 through 49. See "Notations" sheet for complete description of symbols and formulas used in calculations. As modified for site specific conditions of drainage.

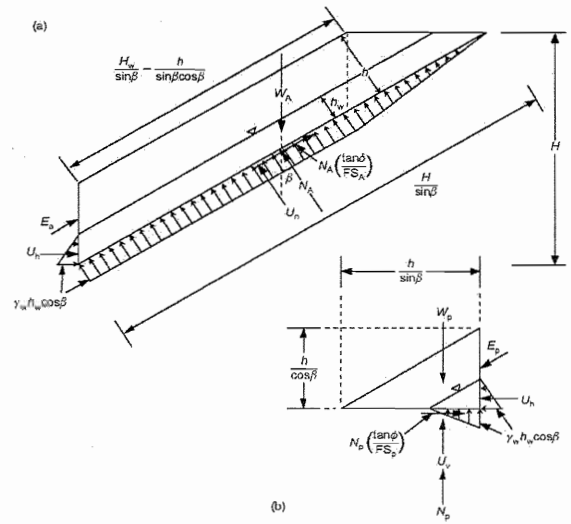


Figure 13. Limit equilibrium forces involved in finite-length slope of uniform cover soil with parallel-to-slope seepage build-up: (a) active wedge; (b) passive wedge

Trig Calculations	
Sin β	0.315649
Tan β	0.332656
Cos β	0.948876
Tan ϕ	0.57735
Tan δ	0.57735
Sin^2 β	0.099634
Cos^2β	0.900366
Sin2β	0.599024

Seepage Parallel to Slope Conditions

Calculations

281.95	$W_A = \gamma_d (h-h_w)[2H\cos\beta - (h+h_w)]/\sin 2\beta + \gamma_{sat} h_w(2H\cos\beta - h_w)/\sin 2\beta$
265.90	$N_A = W_A \cos\beta + U_h \sin\beta - U_n$
0.00	$U_h = \gamma_w h_w^2/2$
10.24	$W_P = \gamma_{dry}(h^2 - h_w^2) + g_{sat} h_w^2/\sin 2\beta$
1.64	$U_n = \gamma_w h_w \cos\beta(2H\cos\beta - h_w)/\sin 2\beta$
0.00	$U_V = U_h \cot\beta$
84.45	$a = W_A \sin\beta\cos\beta - U_h\cos^2\beta + U_h$
-167.80	$b = -W_A\sin^2\beta\tan\phi + U_h\sin\beta\cos\beta\tan\phi - N_A\cos\beta\tan\delta - (W_P - U_V)\tan\phi$
27.98	$c = N_A\sin\beta\tan\delta\tan\phi$

1.80	**FS** $= -b+(\sqrt{b^2} - 4ac)/2a$

	Input		Input	
h	0.6	Thickness of Cover Soil (m)	2	ft
γ_d	16.5	Dry Unit weight of cover soil (kN/m³)	105	pcf
β	18.4	Slope angle at interface (degrees)	3:1 Slope	
ϕ	30.0	Friction angle of cover soil (degrees)		
δ	30.0	Interface friction angle at interface of interest	**Post-Peak**	<<======
γ_{sat}	21.2	Saturated Unit weight of cover soil (kN/m³)	135	pcf
H	9.1	Vertical Height of Slope measured from the toe (m)	30	ft
h_w	0.0	Height of free water surface perpendicular to slope (m)	0.02	ft
γ_w	9.8	Unit weight of water (kN/m³)	62.4	pcf

3:1 SIDE SLOPE
WITH CALCULATE
HEIGHT OF WATER IN
DRAINAGE LAYER
FOS = 1.8

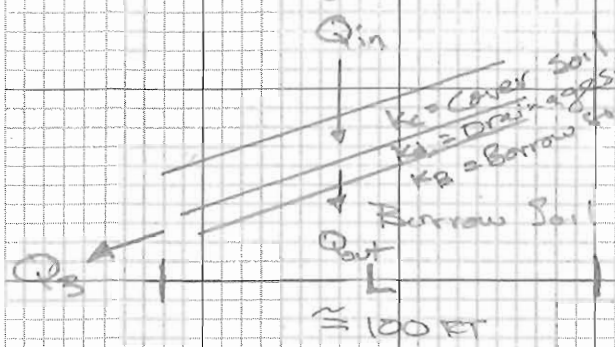
PROJECT	COMP. BY	JOB NO.
COVER SYSTEM DRAINAGE CALCS.	MAR	
	CHK. BY	DATE 4/4/11

SIZE DRAINAGE LAYER

ASSUME DRAINAGE MAT'L IS CRUSHED STONE

ESTIMATE $K_{STONE} = 10000$ FT/day

$Q = KiA$



UNIT GRADIENT

$Q_{in} = K_{cover}(1)(L*1)$

$Q_{out} = 0$ since $K_B < K_c$

where $K_c = 1 \times 10^{-6}$ cm/s

$= 0.003$ FT/day

$K_B = 1 \times 10^{-7}$ cm/s

$= 0.0003$ FT/day

IN Assume $Q_{in} = Q_3 = K_c(1)(L*1)$

OUT $Q_3 = K_d \cdot i_d \cdot (t_d * 1)$

SET Q_3 equal to each other and solve for thickness (t_d)

$K_d(i_d)(t_d*1) = K_c(1)(L*1)$

$t_d = \dfrac{K_c(L)}{K_d(i_d)}$ ⇒ INCORPORATE REDUCTION FACTORS AND SAFETY FACTORS

INCREASE K_c FROM .003 FT/day to .03 FT/day

DECREASE K_d FROM 10000 FT/day to 1000 FT/day

$t_d = \dfrac{0.03 \text{ FT/day}\,(100 \text{ FT})}{1000 \text{ FT/day}\,(.33)}$

$\boxed{t_d = 0.009 \text{ FT SAY } 0.01 \text{ FT}}$

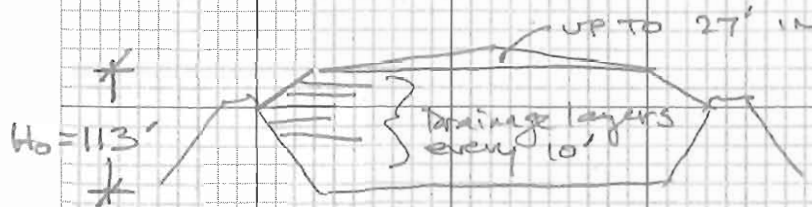
This is the contribution of water in drainage layer from precipitation

PROJECT	COMP. BY	JOB NO.
DRAINAGE CALCS CONT....	ANGR	
	CHK. BY	DATE 4/4/11

CALCULATE WATER EXPRESSE FROM EXISTING WASTE DUE TO APPLICATION OF UP TO 27 FT OF BORROW SOIL

FROM CONSOLIDATION TESTING (SME, 2006) COMPRESSION RATIO (CR) ≅ 0.35 FOR WASTE

SETTEMENT OF WASTE MASS



AVG. WASTE HT = 27/2 = 13.5'

$\gamma_{waste} = 90$ pcf

$\gamma_{borrow} = 113$ pcf

$$S_c = C_R H_o \log \frac{\sigma'_{vo} + \Delta\sigma}{\sigma'_{vo}}$$

ASSUME SATURATED CONDITIONS (CONSERVATIVE)

$H_o = 113'$

$\Delta\sigma = 13.5 \times 113$ pcf $= 1526$ psf

$\sigma'_o = (113/2 \times 90) - (113/2 * 62.4) = 1559$ psf

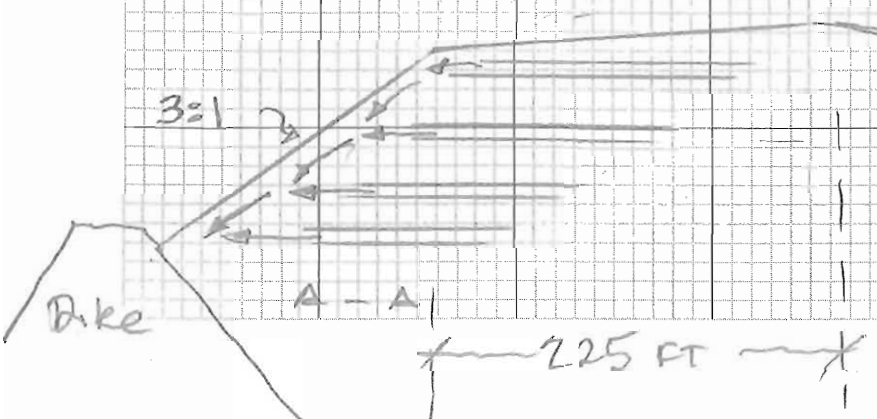
$$S_c = 0.35(113) \log \frac{1559 + 1526}{1559}$$

$= 11.7$ FT.

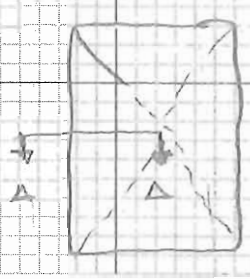
LANDFILL HAS DRAINAGE LAYERS EVERY 10' ∴ APPROXIMATE 12 WASTE LAYERS TOTAL

SO, 11.7' settlement ÷ 12 layers

≅ 1 FT settlement per WASTE LAYER



PLAN VIEW



ASSUME FLOW TO SIDESLOPE = SAME TO EACH SIDE OF LF.

PROJECT	COMP. BY	JOB NO.
Drainage Calcs Cont...	MSR	
	CHK. BY	DATE 4/4/11

ASSUME EACH 1 FT OF SETTLEMENT RESULTS IN 1 FT OF WATER EXPRESSED PER DRAINAGE LAYER

FOR EACH 1 FT UNIT thickness OF LF

VOL = 225' x 1' thickness

= 225 FT^3

1/2 landfill width

⇒ 225 FT * 7.5 gal/FT^3

= 1688 gal per layer

there are 4 Layers in Sideslope

→ 6752 gal Entering Sideslope drainage layer During a one month period (SEE TIME CALCULATION BELOW)

TIME TO DRAIN 10' WASTE LAYER:

$T = c_v \frac{t}{H_{dr}^2}$ $H_{dr} = 5'$ (doubly drained) $= 152.4\,cm$

ASSUME 50% CONSOLIDATION $c_v = 2.1 \times 10^{-3}\ cm^2/s$ FROM SME Testing

∴ T = 0.197 (Das p. 207)

$t = \frac{0.197\,(152.4\,cm^2)}{2.1 \times 10^{-3}\ cm^2/s}$

= 2178797 sec

= 605 hrs

= 25 days → $Q = \frac{6752\,gal}{25\,days} = 270$ gpd

PROJECT	COMP. BY	JOB NO.
Drainage Calcs cont...	MSR	
	CHK. BY	DATE 4/4/11

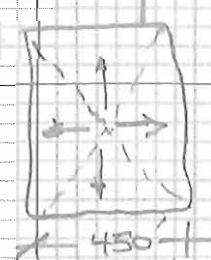
HOW THICK IS DRAINAGE LAYER NECESSARY TO CONVEY WATER/LEACHATE FROM INFILTRATION AND CONSOLIDATION?

$Q = 270$ gpd $= 36\ FT^3/day$

Reduce Flow by 1/2 to simulate

Since already looking at 1/2 of landfill

Radial Flow



$Q = K_{stone}\, i\, A$

where $Q = 36\ FT^3/2 = 18\ FT^3$

$K_{stone} = 10{,}000\ FT/day$

$i = .33$ (3:1 slope)

$A = \dfrac{Q}{Ki}$

thickness (width) $= \dfrac{18\ FT^3}{10000\ FT/day\ (.33)}$

$t\left(\frac{450}{2}\right) = \dfrac{18}{3300}$

$t = 0.00002\ FT$

∴ with precipitation (0.01 FT) and consolidation water (≈ 0) total thickness of water

6" Drainage layer is adequate

SEVEE & MAHER ENGINEERS

ATTACHMENT E

WORK PLAN

OFF-SITE BORROW SOIL WORK PLAN FOR LANDFILL NO. 6 AREA A-WEST CLOSURE AMENDMENT CANTON, NORTH CAROLINA

Prepared for

EVERGREEN PACKAGING
CANTON, NORTH CAROLINA

April 2011

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

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

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OFF-SITE BORROW SOIL
WORK PLAN FOR
LANDFILL NO. 6
AREA A-WEST CLOSURE AMENDMENT
CANTON, NORTH CAROLINA
EVERGREEN PACKAGING

1.0 INTRODUCTION

1.1 Facility Information

Facility Name:	Landfill No. 6 Area A-West
Location:	Incinerator Road Canton, North Carolina
Property Owner:	Evergreen Packaging 175 Main Street P.O. Box 4000 Canton, NC 28716 Contact: Mr. Jim Giauque Telephone: (828) 646-2028

1.2 Purpose

The purpose of this Work Plan is to provide information to the personnel involved in acceptance and placement of off-site borrow soil within Landfill No. 6 Area A-West (Area 6A-West) of Evergreen Packaging's (Evergreen) Landfill facility in Canton, North Carolina. Guidelines for material characterization, sampling, sample analysis, acceptance, transportation, handling, sequencing, and placement procedures are provided herein to be used during this project.

2.0 FACILITY OPERATIONS

2.1 Project Description

This Work Plan is being submitted by Evergreen Packaging (Evergreen) as an Amendment to the closure plan approved in the Operations Manual by the North Carolina Department of Environment and Natural Resources (NCDENR, Permit # 44-06). In part, the Operations Manual requires Evergreen to close areas of Landfill No. 6 (Landfill) upon moving to newly developed areas. The current operating area and soon-to-reach capacity is Area 6A West. An Overview Site Plan and Site Plan are shown in Figures 2-1 and 2-2, respectively. This area is expected to reach capacity prior to the summer of 2011 and will then require closure. The closure of Area 6A West is approved as a three foot soil cover similar to the previous closure of Area 6A East. This Amendment to the closure plan is to allow placement of off-site borrow soil approved by the Environmental Protection Agency and the NCDENR for use in the lower portion of the capping system. The off-site borrow soil would be overlain by a layer of on-site borrow to prevent direct contact of the off-site borrow soil. This closure plan amendment contains construction related information such as roles and responsibilities, off-site soil characterization, off-site soil transportation, and off-site soil placement control.

2.2 Working Hours

The Area 6A-West Closure Project operating hours will be set by the Contractor. There are no limits with regards to the number of days or hours in a day the work may proceed. Transportation of off-site borrow soil to the facility will be performed during daylight hours only.

2.3 Personnel Responsibilities

The personnel involved in the Area 6A-West Closure Project include:

1. The Owner (Evergreen)
2. The Engineer (Sevee & Maher Engineers, Inc.)

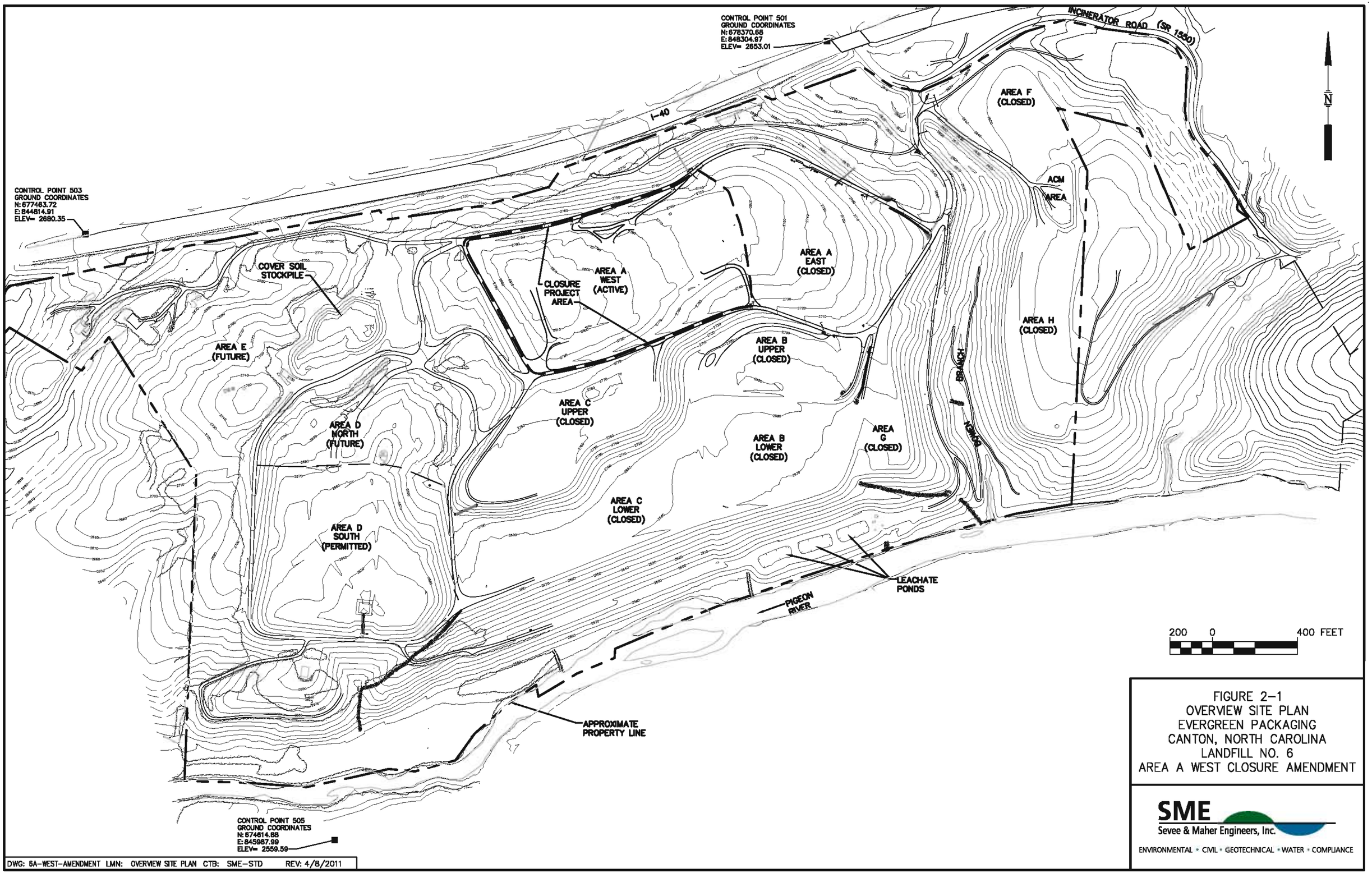

FIGURE 2-1
OVERVIEW SITE PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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DWG: 6A-WEST-AMENDMENT LMN: OVERVIEW SITE PLAN CTB: SME-STD REV: 4/8/2011

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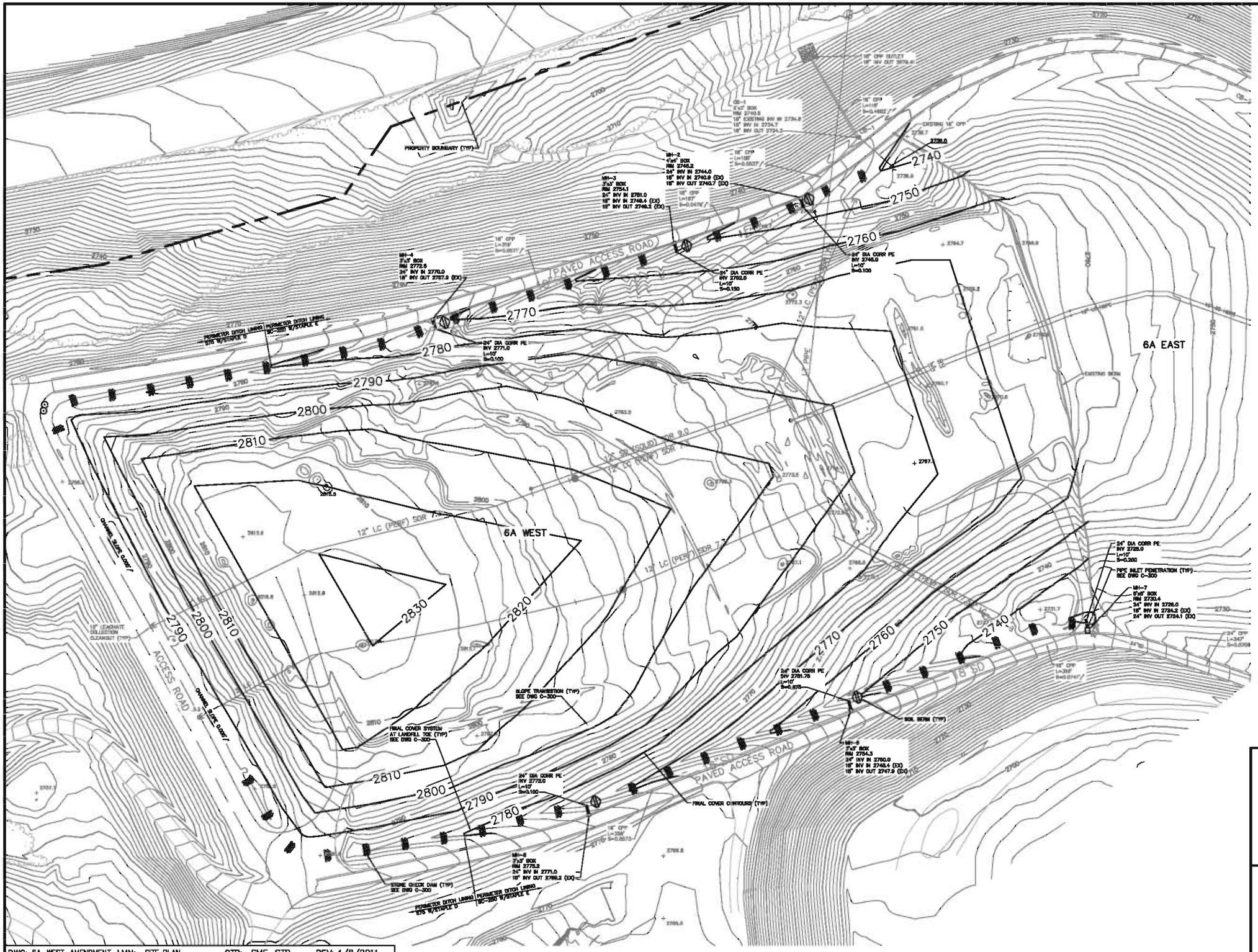

60 0 120 FEET

FIGURE 2-2
SITE PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

SME
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DWG: 6A-WEST-AMENDMENT LMN: SITE PLAN CTB: SME-STD REV: 4/8/2011

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The Contractor

- Supervisor
- Equipment operator
- Haul vehicle drivers

3. The Off-site Borrow Soils Provider ("Provider")

2.3.1 Personnel/Entities.

2.3.1.1 Owner

The Owner is responsible for securing and assuring compliance with licenses and permits required for the construction project. The responsibility includes control of all Contractor activities at the facility, coordination of work with Evergreen's operations, and project management. In addition the Owner is responsible for providing or assembling a team to provide technical expertise and engineering and submission of appropriate data to the NCDENR. The Owner will be responsible for preparing waste grades within Area 6A-West prior to construction. The Owner, or its representative, will be responsible for weekly construction documentation to the NCDENR which shall include photos and weekly progress reports. The Owner shall be responsible for maintenance of all existing access roads (excluding sweeping of the paved access roads used by the Contractor).

2.3.1.2 Engineer

The engineer is responsible with providing the Owner with oversight of all construction activities, including but not limited to, supplying drawings, specifications, and Work Plan for the Project. The engineer will also be responsible for the following items:

1) Stormwater inspections and reporting;
2) Contractor activities monitoring and submittals of daily construction reports and photos;
3) Conducting weekly on-site meetings with the Owner and Contractor and providing the Owner with weekly minutes and photographs;
4) Train and instruct all personnel in proper facility operations;

5) Collecting soil samples and reporting results; and

6) Providing a final construction documentation report.

2.3.1.3 Contractor

The Contractor is responsible for providing all labor, equipment, and resources necessary to complete the project as shown and described in the contract documents which includes the contract drawings and specifications. The Contractor shall meet all objectives and comply with all requirements of the contract documents, and comply with the provisions of all local, state, federal, or other government laws, permits, or regulations, and this Work Plan.

The Contractor shall:

(1) Assure that all employees are properly trained in operating all equipment required for the work;

(2) Direct and manage all work at Area 6A-West and control activities to minimize safety hazards. Coordinate work with the Owner's operators in Landfill No. 6 Area 6D-South, as necessary;

(3) Strictly control the access to Area 6A-West area at all times; and

(4) Perform the work according to the contract documents and this Work Plan; and

(5) The Contractor shall be responsible creating a closure sequencing plan that meets the requirements of Section 3.0 of this Work Plan;

(6) Maintenance of any and all traffic control devices required for the project;

(7) Sweeping and/or dust control on all paved and gravel access roads used by the Contractor during the work;

(8) Provide construction documentation for the work including:

- Contractor shall perform a topographic survey of Area 6A-West after placement of the drainage stone over the waste;
- The Contractor shall provide the Owner with a daily load count of material from off-site and on-site. The load count will contain the estimated volume of each haul vehicle;

- Contractor shall perform a topographic survey of Area 6A-West after placement of the off-site borrow;
- Contractor shall survey inverts of all pipes installed as part of this work; and
- Contractor shall provide an ongoing evaluation of the operation and recommend proposed modifications if required or advisable.

(9) The Contractor's Supervisor is charged with directing and overseeing the project to assure that the cover system construction is being implemented according to the contract documents. Responsibilities of the Supervisor include:

- Interfacing with the Owner and coordination of the work with the Owner;
- Directing the overall scheme and schedule of closure;
- Maintaining site records and tracking construction volumes;
- Supervising and training personnel; and
- Supervising the site safety program.

(10) The Contractor's Equipment Operator under the supervision of the Supervisor will be responsible for the daily material placement operations. The Equipment Operator will:

- Direct placement of soil materials;
- Inspect equipment and facilities;
- Abide by established safety rules;
- Maintain site security;
- Immediately note and report unusual events or circumstances;
- Maintain such records as may be required;
- Immediately report any observed and/or imminent environmental impacts to the Supervisor, Engineer, or Owner; and
- Strive to maintain neat and efficient operations.

(11) The Contractor's haul vehicle drivers will be responsible for the proper handling of their loads. All haulers shall affix Ownership identification and/or facility or company logo to all vehicles used in conjunction with the operation of the facility.

Speed limits on and off Mill property shall be observed. Tailgates shall be secured and checked before proceeding on road. The drivers shall use extreme caution on Incinerator Road because it is residential in nature. Gaskets and secondary mechanical locking devices will be required on tailgates to eliminate the possibility of a material spill during waste transport.

2.3.1.4 Off-site Borrow Soils Provider

The Provider is responsible for providing all labor, equipment, and resources necessary to sample, analyze, review, certify, and transport off-site borrow soil from the point of origin, to the 6A-West Landfill facility. The Provider shall comply with the provisions of all local, state, federal, or other government laws, permits, or regulations, and this Work Plan.

The Provider shall:

(1) Assure that all employees are properly trained in operating all equipment required for transportation of the off-site borrow soil;

(2) Coordinate work relating to sampling, analysis, certification, and transportation of off-site borrow soil with the Owner and Contractor;

(3) Provide the Owner with a load count of the trucks that deliver soil to the 6A-West Landfill facility on a daily basis; and

(4) Perform the work according to this Work Plan.

2.4 Health, Safety Considerations

The following health and safety procedures will be adhered to at the facility:

1. All Contractor employees and associated subcontract personnel will be required to complete all necessary Evergreen training prior to admittance to the site.

2. Only essential personnel will be involved in activities associated with operation of the site.

3. Loading and unloading areas will be maintained firm and level.

4. In the event of an accident, the Supervisor and Owner's representative will be notified immediately. A description of the severity of the injury will be made, and emergency personnel requested, if necessary. The Supervisor will be responsible for notifying emergency personnel.

5. In the event of an environmental emergency, the Operator will notify the Supervisor and Owner's representative. Owner will review the situation and notify all necessary local and state officials.

6. In the event of a spill while transporting off-site borrow soil to the site, the soil shall be cleaned up immediately.

7. The Contractor is responsible for preparing a Health and Safety Plan for this project. The Owner will provide the Contractor with off-site borrow soil analytical data upon request. The Contractor shall maintain a copy of the Health and Safety Plan on-site at all times. A copy of the Health and Safety Plan will be provided to the Owner upon request.

8. Traffic: A site plan indicating the on-site haul routes is included as Figure 3-1.

3.0 OFF-SITE BORROW SOIL CHARACTERIZATION

Off-site borrow soil shall be characterized (sampled, analyzed, and certified) prior to delivery to Area 6A-West.

3.1 Sampling

The Provider will provide the Owner with at least 48 hours notice of any soil sampling so that the Owner or the Owner's Representative can observe the soil sampling. A representative sample shall be taken at a rate of at least one test per one-thousand (1,000) cubic yards of soil. This representative sample shall be a composite of at least 4 locations (within a certain area of the pile). Appropriate clean sampling devices (i.e. disposable metal or plastic spoons, etc.) will be used for soil sampling. Table 3-1 below indicates the parameters, analytical method, and maximum allowable concentration for acceptance of the material.

TABLE 3-1

OFF-SITE BORROW SOIL
MAXIMUM ALLOWABLE CONCENTRATION

Parameter[1]	Maximum Allowable Concentration (mg/L)
Arsenic	5.0
Barium	100.0
Cadmium	1.0
Chromium	5.0
Lead	5.0
Mercury	0.2
Selenium	1.0
Silver	5.0

Notes
1. All analyses shall be by Toxicity Characteristic Leaching Procedure (TCLP) Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" U.S.EPA Publication SW-846.

The Owner reserves the right to require additional soil analysis parameters and/or decrease the maximum allowable concentrations at any time during the project. The laboratory performing soil analytical testing shall be certified in the State of North Carolina.

The Provider will review analytical results of all soil samples to confirm that they meet the analytical requirements of this Work Plan. The Provider will provide a signed certification stating that the soil was tested in accordance with the procedures listed in this Work Plan and that the results of analytical testing indicate that the soil parameter concentrations are less than or equal to the maximum allowable concentrations listed in the Work Plan.

The Provider shall report to the Owner any tests that fail to meet the analytical requirements listed above. Should failing test be recorded, approximately 500 cubic yards of soil in the area of the failing test will be removed and segregated for disposal at another location. The remaining soil near the removal shall then be tested. In no circumstance shall soil from areas of failing tests be reincorporated or remixed into the pile and delivered to Area 6A-West.

The Provider will provide the Owner with a signed certification letter and all associated analytical results at lease 48-hours before delivery of the material to the site. One electronic and one paper copy of the certification and analytical data will be provided to the Owner. The Owner will review the certification and analytical results to determine if the material is acceptable for placement within Landfill 6A-West. No material will be delivered to the site without the Owners written approval. The Owner reserves the right to deny acceptance of any and all soil material for any reason.

Off-site borrow shall be soil suitable for placement as landfill cover soil. It shall be free of frozen material, perishable rubbish, peat, and organic matter, large rock fragments over 12 inches, or unsuitable material. The Owner reserves the right to reject material that does not meet these requirements.

3.2 Transportation

After the Owner has approved soil to be delivered to the site, the Provider will be responsible for transportation of off-site borrow soil from its origin to the area of placement within Area 6A-West. Transportation of the soil shall be in accordance with all applicable local, county, state, and federal regulations. Transportation of the soil shall be in covered vehicles during daylight hours acceptable to the Contractor. Specific care should be taken while transporting soil on Incinerator Road, as it has several residential homes and children and pets are a

common occurrence on this road. The trucks shall follow the established trucking routes shown in Figure 3-1. Upon reaching the Area 6A-West Landfill, the Contractor will guide the trucks to the location of off-loading. Trucks delivering soil will stay on paved and gravel access ways and will make all attempts to limit tracking of off-site borrow soil on and off the site. The Owner reserves the right to stop delivery of the soil material if it is found that the material is being delivered in a manner that is inconsistent with this plan.

3.3 Placement

Placement of borrow soil is critical to the success of the project. The Contractor will be required to submit a Construction Sequencing Plan to the Owner for approval prior to the start of work. The Contractor will not begin work until the Owner has accepted the Construction Sequencing Plan. The Construction Sequencing Plan shall include drawings and text that detail the Contractors anticipated placement sequencing of the cover system.

The Construction Sequencing Plan must address all items included in Section 4.0 of the geotechnical analysis report. These geotechnical requirements include the placement of borrow soil:

- In lifts that do not exceed 4-feet in thickness;
- With an in-place dry density of at least 90 percent of the standard Proctor density;
- In a manner that does not clog the underlying stone layer;
- In lifts that advance from outer portions of the Landfill top slope toward the center; and
- Over soil that are not saturated.

The following is a list of additional requirements that must be incorporated into the Construction Sequencing Plan:

NOTES:

1. PLANS COMPILED FROM AERIAL PHOTOGRAMMETRIC MAPPING DATED MARCH 30, 2007 WITH ADDITIONAL SURVEY FOR AREA D NORTH/SOUTH DATED JUNE 2010 AND AREA A WEST DATED FEBRUARY 28, 2011, PERFORMED BY GEODATA INC., OF ZEBULON, NC.
2. PLANS COMPILED IN THIS MANNER SHOULD BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
3. SITE CONDITIONS MAY HAVE CHANGED SINCE THE COMPILATION OF THIS PLAN.
4. ALL CONTRACTOR AND SUB CONTRACTOR VEHICLES MUST FOLLOW ALL EVERGREEN TRAFFIC PATTER SIGNS.

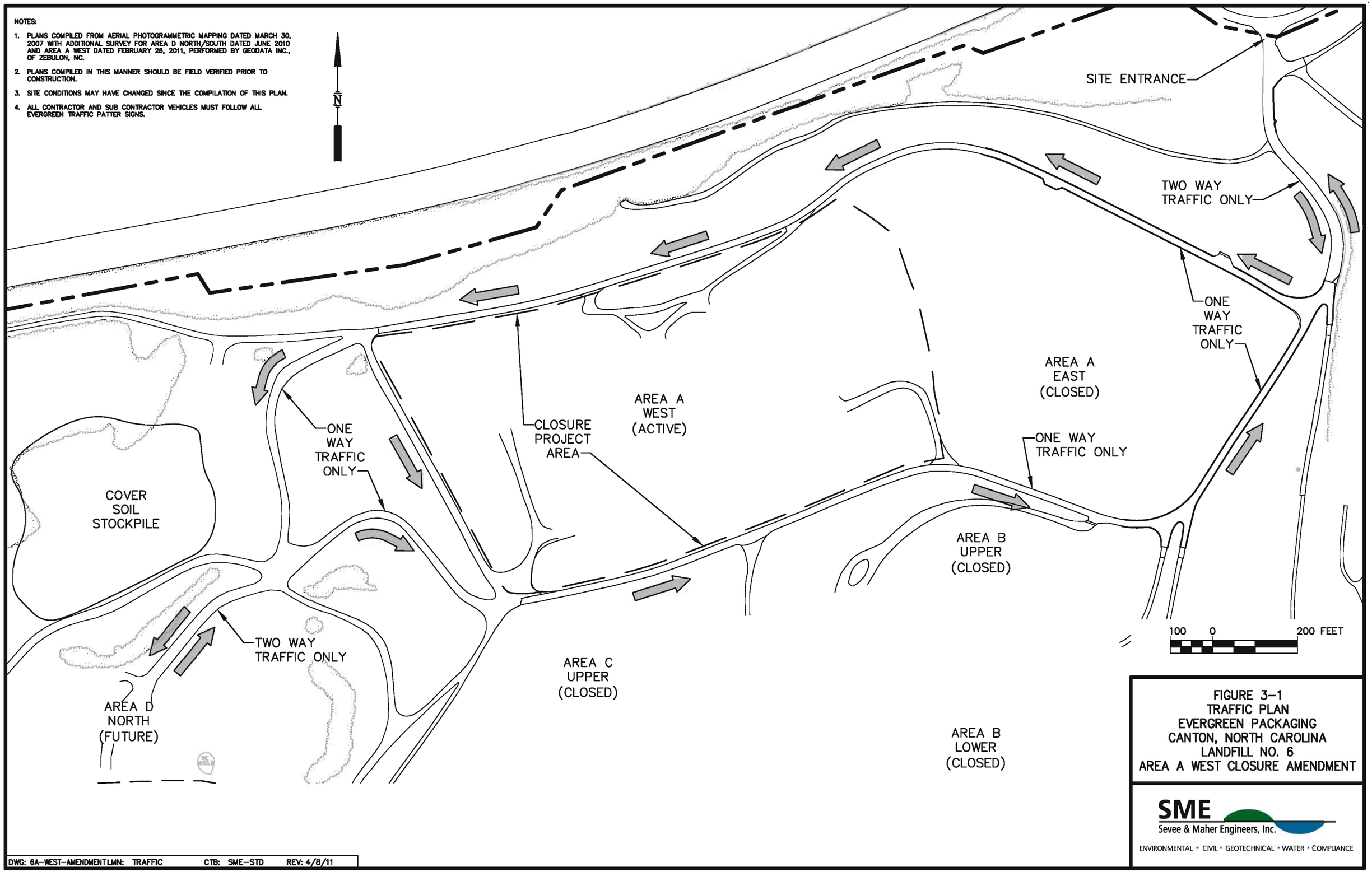

FIGURE 3–1
TRAFFIC PLAN
EVERGREEN PACKAGING
CANTON, NORTH CAROLINA
LANDFILL NO. 6
AREA A WEST CLOSURE AMENDMENT

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

DWG: 6A–WEST–AMENDMENT LMN: TRAFFIC CTB: SME–STD REV: 4/8/11

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- Water coming in contact with the borrow soil shall be conveyed to the 6A-West leachate collection system without leaving the limits of the 6A-West Landfill;

- Water coming in contact with borrow soil will not be allowed to flow over cover soil or vegetative soil;

- Stockpiling of borrow soil on-site shall not be allowed;

- The area of exposed borrow soil may not exceed 4 acres at any given time;

- The placement of cover soil shall be in a manner that does not cause unnecessary erosion or sedimentation;

- The Contractor shall provide means of access for Provider vehicles so that these vehicles can deliver borrow soil to the working area without traveling on borrow soil areas;

- The Contractor shall maintain truck washing facilities appropriate for removal of soil from construction vehicles;

- Any borrow soil tracked or deposited onto cover soil within Area 6A-West or outside Area 6A-West shall be removed and placed within cover soil areas immediately;

- All borrow soil shall be removed from the tires, tracks and undercarriage of construction vehicles before they move from borrow soil to cover soil areas;

- The Contractor shall take all actions necessary to prevent vehicles from rutting the cover soil to a depth that would contact the borrow soil; and

- The Contractor must provide dust control measures (i.e. watering) for construction with particular attention paid to controlling dust generated from uncovered borrow soil areas.

The Contractor is responsible for adjusting the work Construction Sequencing Plan as necessary during construction. Any adjustments to this plan must be approved by the Owner. The Owner reserves the right to stop work if it is found that the Contractors work practices do not meet the requirements of the approved Work Plan.