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44-06

LANDFILL STABILITY EVALUATION FOR VERTICAL EXPANSION AREA 6A-WEST

BLUE RIDGE PAPER PRODUCTS, INC. CANTON, NORTH CAROLINA

MAY 2006

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

BLUE RIDGE
PAPER PRODUCTS INC.

14 June 2006

Mr. Jim Coffey
Environmental Engineer
Division of Waste Management
North Carolina Department of Environment
and Natural Resources
Asheville Regional Office
2090 US Hwy 70
Asheville, North Carolina 28778

Subject: **Vertical Extension and Center Dike Fill**
Cell VI – Area A - West
Permit ID INDUS 44-06
Landfill No. 6
Blue Ridge Paper Products Inc.
Canton, North Carolina

Dear Mr. Coffey

Blue Ridge Paper Products Inc. requests approval from the Division of Waste Management (DWM) for vertical extension of Landfill Area 6A West (Cell VI) similar to the vertical extension of Landfill Area 6A East (Cell V) that was completed during 2003. We also request approval for liner construction and vertical fill above the center dike between Landfill Areas 6A East and West. This center dike fill will connect and level the finished grade elevations of these adjacent landfill areas. Operation of the Cell VI vertical extension will follow current waste practice and includes phased closure to minimize leachate generation. The Cell VI vertical extension will extend the projected life of Landfill Area 6A West from approximately December 2007 into 2010. The vertical extension will allow time for design and construction of future capacity in Areas D and E of the permitted landfill site.

Enclosed for DWM review are three copies of:

- Cell VI vertical extension geotechnical stability analysis
- construction plans and specifications for the center dike liner
- erosion and sediment control plan for same
- revised operations manual for Landfill Area 6A West to include Cell VI above currently active Cells I and II

The vertical extension design and operations plan were prepared by our consultant – Sevee & Maher Engineers, Inc. Construction of the center dike liner involves removing the access roadway between Area 6A West and Area 6A East, stripping the sideslope cover soils on the west side of Area A East, installing geosynthetic liner materials over the center dike, and installation of surface water and erosion control measures. The proposed liner system over the center dike (60-mil HDPE above a geosynethetic clay liner) is the same as approved and constructed in Cells I and II of Area 6A West.

To ensure continuity of landfill operation, we plan to bid and construct the liner above the center dike in the winter and spring of 2007. We request approval of the Area 6A West Cell VI vertical extension and center dike fill by the end of 2006.

Please contact us if you have any questions or need additional information.

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Enclosures: 3 copies of plans, specs and engineering reports

cc: Guy H. Cote, PE
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J. Clary
B. Shanahan
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Landfill Crew

C. File - Waste

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AREA 6A-WEST
BLUE RIDGE PAPER PRODUCTS, INC.
CANTON, NORTH CAROLINA

1.0 INTRODUCTION

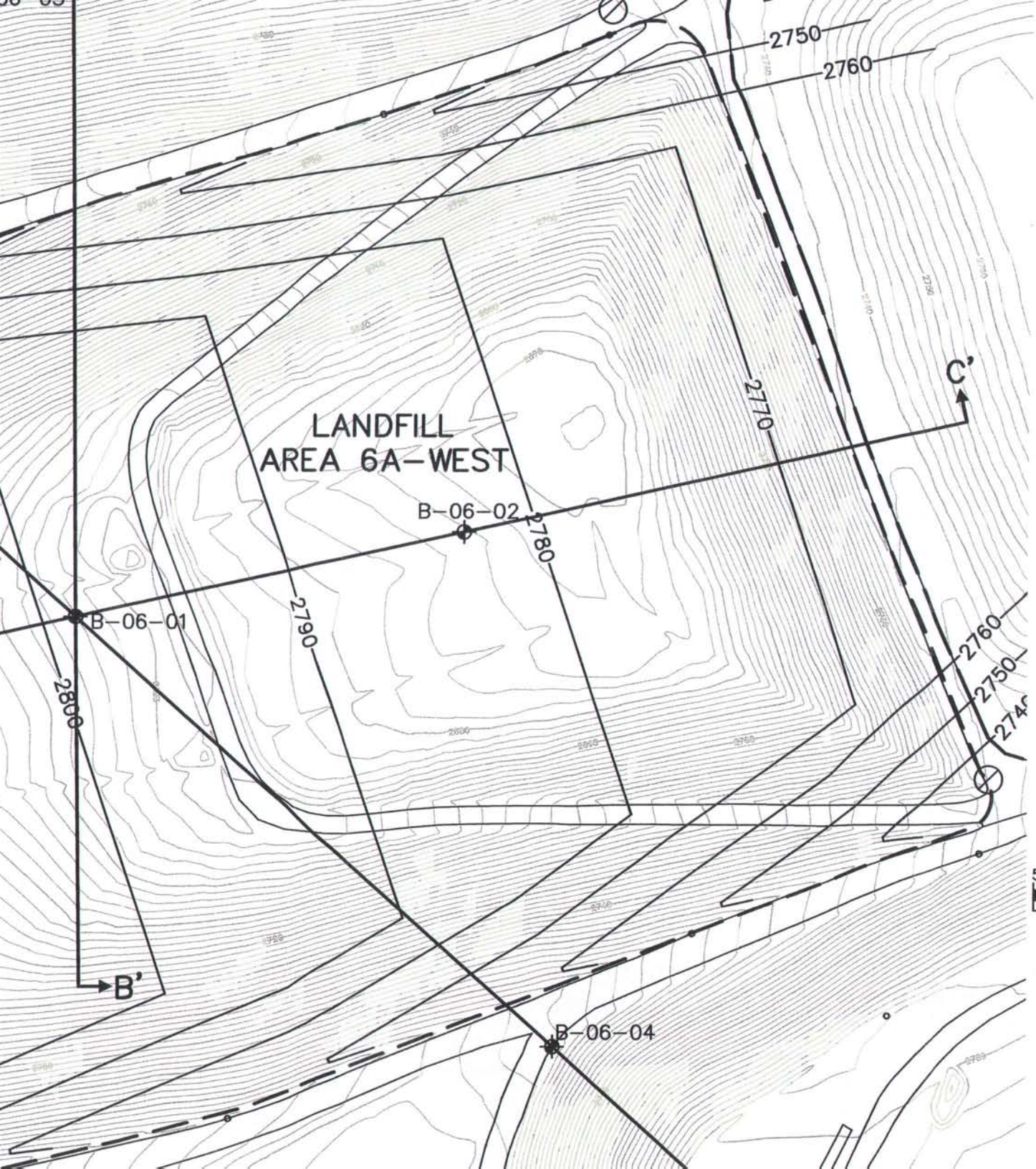
Blue Ridge Paper Products, Inc. (BRPP) owns and operates a 240-acre landfill referred to as Landfill #6 in Canton, North Carolina. The landfill is used for the disposal of sludge, lime mud, fly ash, and wood wastes into discrete cells designated A, B, C, F, G, and H. In Areas B, C, F, G and H, the operating method was to dump the waste from the top perimeter of each cell. This resulted in a waste mass which was generally not well drained, with relatively low shear strength. The relatively low shear strength was due to the lack of drainage within the waste and the inability to compact the waste during placement. Because of these conditions, Areas B, C, F, G, and H at the Landfill #6 facility were designed to be filled with waste to no higher than the landfill perimeter dikes.

BRPP obtained a permit for Area 6A-East allowing final waste grades to extend to a level 30 feet above the perimeter dikes. This permit was based on an evaluation presented in a report titled *Landfill Stability Evaluation for Vertical Expansions, Area 6A-East* (SME, 1999). Area 6A-West, although currently permitted for final waste grades rising to the level of the perimeter dikes, 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 that effectively drains the operating area, allowing controlled placement of waste directly within the cells. The operation of trucks, crawler tractors, and other equipment on top of the waste material compacts the waste. This waste, like that in Area 6A-East, exhibits higher shear strengths than had been typically found in previously operated areas at the Landfill #6 facility. BRPP retained Sevee & Maher Engineers, Inc. (SME) to evaluate the stability of a redesigned Area 6A-West, with Cell VI extending vertically above the existing perimeter dikes, with exterior waste sideslopes rising at 3 horizontal to 1 vertical, to a maximum final grade elevation of 2810 feet National Geodetic Vertical Datum (NGVD). The proposed final grading plan of Area 6A-West with Cell VI is

presented as Figure 1. Like the evaluation for Area 6A-East, components of this stability evaluation included a field exploration program, laboratory testing of waste and soil, review of previous site geotechnical evaluations, interpretation of subsurface conditions, and a stability analysis.

In addition to SME's present geotechnical evaluation of the Area 6A-West Landfill, several other geotechnical investigations have previously been conducted at the BRPP facility. Testing has been performed by SME and others on the site wastes, foundation and dike soils. Data from previous SME investigations and those previously conducted by others were used to augment SME's most recent investigation and testing, namely:

- Landfill Stability Evaluation for Vertical Expansions, Area 6A-East (SME, 1999)
- Operations Manual, Champion International Corporation Landfill No. 6 East, Canton, North Carolina, (SME, 1995a)
- Landfill No. 6 Closure Report, Field and Laboratory Investigation Report (SME, 1995b)
- Geotechnical Report for Landfill No. 6 Expansion Area A (Sirrine, 1989)
- Revised Report of Geotechnical Exploration and Evaluation and Conceptual Site Development Recommendations, Landfill No. 6 (Law, 1982)



LEGEND

PROFILE LOCATION

BORING LOCATION

PROPOSED FINAL GRADES

EXISTING BASE GRADES

50 0 100 200 FEET

FIGURE 1
PROFILE LOCATION PLAN
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A-WEST
CANTON, NORTH CAROLINA

SME

2.0 FIELD INVESTIGATION

Between January 16, 2006 and January 19, 2006, SME conducted field investigations which included drilling five borings at four locations within and around Area 6A-West. These boring locations were designated B-06-01 through B-06-04. Borings B-06-03 and B-06-04 were drilled into the perimeter dike on the north and south sides, respectively, of Area 6A-West. Borings B-06-01, B-06-02 and B-06-02A were drilled in the Area 6A-West waste and terminated above the existing liner system. These borings provided (1) landfill waste and dike material samples for laboratory physical analysis and visual examinations; (2) in-place shear strength data for the waste; (4) standard penetration test (SPT) data for the waste and dike materials; and (4) characterization of the piezometric conditions within the waste and perimeter dikes.

The drilling was performed by A.E. Drilling Services, LLC of Greenville, South Carolina and the work was overseen by SME. The borings were advanced using hollow-stem auger and drive-and-wash boring techniques. Logs of the boring and piezometers installed in select borings are presented in Appendix A. The locations of these borings are shown on Figure 1. Samples of the landfill perimeter dikes were collected using split-spoon sampling methods. Representative soil samples were selected for moisture content and direct shear testing. The landfill waste samples were collected from the borings using both split-spoon sampling techniques, and thin-walled (Shelby) tubes. Typically, as each boring advanced through the waste, sampling would alternate between thin-walled tube sampling, split-spoon sampling, and field vane shear testing. The results of these tests are summarized on the boring logs in Appendix A. Representative waste samples were selected for moisture content, density determination, and consolidated-undrained (CU) triaxial strength testing. All field testing was performed in general accordance with ASTM methods.

Piezometers installed in the borings consisted of one-inch diameter PVC, with slotted screen sections placed at the bottom of the solid piezometer standpipe. The borehole annuluses adjacent to each screened zone were backfilled with uniformly graded filter sand. Above each screen sandpack, a bentonite chip seal was used to isolate the screen in the borehole and prevent surface water from hydraulically short-circuiting the well. Seven piezometers (P-06-01A, P-06-01B,

P-06-02A, P-06-02B P-06-02C, P-06-04A and P-06-04B) were installed in the borings to measure water levels in the waste and perimeter dikes. At the waste boring locations (B-06-01 and B-06-02) multiple piezometers were installed to evaluate piezometric conditions at various depths within the waste (Piezometers P-06-01A and P-06-01B were installed at boring B-06-01, piezometers P-06-02A, P-06-02B were installed at boring B-06-02 and piezometer P-06-02C was installed at boring B-06-02A). The letter suffixes for piezometers indicate the relative depth of the screen: "A" being the deepest instrument and "B" being shallower than "A", etc. Piezometers P-06-04A and P-06-04B were installed in the perimeter dike along the southern side of the Area 6A-West landfill. Boring B-06-03 was placed along the exterior toe of the northern perimeter dike of the Area 6A-West landfill. It became evident during drilling that a water table did not exist within the dike at B-06-03, and therefore a piezometer was not installed.

Water levels were measured in the piezometers by SME and BRPP personnel from January 16, 2006 to February 2, 2006. After stabilizing, three of the seven piezometers were dry including the two piezometers installed in the perimeter dike. Piezometers B-06-01A, P-06-02A, P-06-02B P-06-02C each had a measurable water surface located near the screened interval. The water level data collected from the piezometers is presented in Appendix B.

3.0 LABORATORY INVESTIGATION

The borings indicated that the predominant waste materials in Area 6A-East include papermill sludge mixed with fly ash and lime mud along with occasional wood chips. The lime mud was both mixed with the sludge and ash, as well as placed in distinct layers. Stone drainage layers were also present, and generally occurred at about 10-foot intervals within the waste. Furthermore, the borings located on the perimeter dikes encountered a fill material consisting of a uniform, medium dense, micaceous silty sand with occasional gravel-sized particles. This fill was underlain by a residual soil consisting of a very dense gravelly, micaceous silty sand. Testing was performed on selected waste and dike samples in SME's geotechnical laboratory in Cumberland, Maine.

Total unit weights of the waste were measured on thin-walled (Shelby tubes) samples. The wastes were variable but were consistent with the reported landfill waste stream. The wastes in the tube samples consisted of various combinations of sludge mixed with ash, sludge mixed with lime mud, layers of mixed sludge and lime mud, with occasional gravel and wood chips. The total unit weight of the wastes ranged from approximately 81 to 94 pounds per cubic foot (pcf), with an arithmetic average of approximately 86 pcf. This corresponds well with the 86 pcf average total unit weight determined from previous SME investigations in Area 6

The water content of the waste samples collected ranged from about 21 to 97 percent. The higher water contents were associated with the sludge, whereas the lower water contents were generally associated with the ash and lime mud or partially saturated samples. Total unit weight was back-calculated using the measured water contents of the waste (on samples assumed to be saturated) and specific gravity data previously collected on the waste in SME's geotechnical laboratory (SME, 1995b). The average total unit weight of the waste calculated using this method was about 93 pcf. This is slightly greater than the average value measured from the Shelby tube samples (86 pcf). An average value of 90 pcf was used in the stability analysis. The results of the unit weight determination and water content testing, along with data from specific gravity testing performed in 1995, are presented in Appendix C.

Shear strength of the mixed ash, sludge, and lime mud was measured using isotropically consolidated, undrained, triaxial tests with pore pressure measurement (CIUC). The results of the tests are included in Appendix C. CIUC testing of three sludge/ash samples resulted in an effective friction angle of about 37 degrees, and no cohesion. These values are generally consistent with previous waste shear strength testing which has shown effective friction angles ranging from about 36 to 45 degrees (Law, 1982; SME, 1995b; and SME, 1999).

Shear strength of the dike soil was measured using direct simple shear testing on two composite samples from boring B-06-04. The soils in B-06-04 were representative of the dike materials found in both borings located in the dike. This testing was performed in a dry condition. The dry condition was intended to simulate the existing field conditions. This testing resulted in effective friction angles of about 32 degrees and an effective cohesion of 115 psf. The results of this testing is presented in Appendix C. These results are generally consistent with previous dike soil strength testing which indicate a range of effective friction angles of about 30 to 40 degrees (SME, 1999; Sirrine, 1989; Law, 1982).

4.0 STABILITY EVALUATION

4.1 Selection of Input Parameters

4.1.1 Landfill Wastes. The relevant stability geotechnical properties for the waste were selected based on the laboratory testing reported herein, as well as historical data as discussed in Section 1.0 herein. The total unit weight and effective strength data are tabularized on Table D-1 in Appendix D. The selected effective shear strength of the waste is graphically presented relative to the rest of the available test data in Figure D-1 in Appendix D. The properties selected for the waste were: an average total unit weight of 90 pcf and an average effective friction angle of 36 degrees with no cohesion. Both of these values are conservative estimates based on SME's laboratory testing and on the historical values presented by others.

4.1.2 Perimeter Dikes. The geotechnical data collected on the dike soils from this and previous investigations is tabularized on Table D-2 in Appendix D. The direct shear data is plotted in Figure D-2 of Appendix D, along with available data from previous investigations of borrow source material for the perimeter dike. The geotechnical properties selected for the perimeter dikes were a total unit weight of 120 pcf and an effective friction angle of 32 degrees with an effective cohesion of 115 psf.

4.1.3 Foundation Materials. The foundation soils were assumed to have a slightly lower friction angle than the dike soils since they were not manually compacted. The total unit weight and effective friction angles were selected based on undisturbed tube samples of foundation soils tested by Sirrine, 1989. A total unit weight of 115 pcf and an effective friction angle of 31.5 degrees with no cohesion was selected for use in the stability analysis. The data is graphically presented in Figure D-3, and is tabularized on Table D-3, both in Appendix D.

4.1.4 Soil Cover. The soil cover was estimated to have an effective friction angle of 30 degrees with no cohesion and was assumed to have a unit weight of 125 pcf. The shear strength is based on the dike soil testing, since a similar soil is expected for the cover.

4.1.5 Liner. The Area 6A-West liner system consists of 15-inches of #78 stone, underlain by a 16-ounce geotextile, underlain by a 60 mil HDPE textured geomembrane and, on the southern half of Area 6A West, the 60-mil HDPE textured geomembrane is underlain by a geosynthetic clay liner. The liner system was assigned an effective friction angle 35 degrees with no cohesion and a unit weight of 125 pcf, based on SME's experience with similar materials.

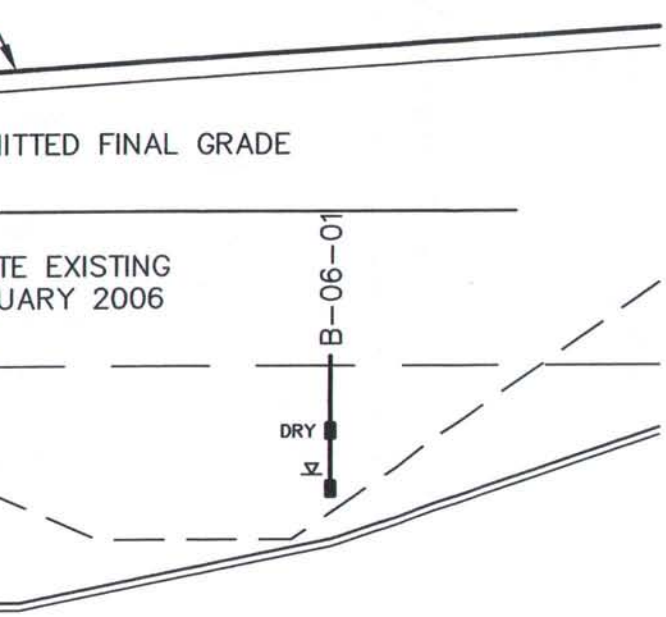
4.1.6 Piezometric Conditions. A regional phreatic surface, based on water level data presented by Sirrine, 1989 and Law, 1982, was used to develop a groundwater phreatic surface (i.e., water table) in the foundation soils. The dikes were observed to be dry, which is consistent with Area 6A-West being lined and, also, with the Sirrine and Law data. For the stability analysis it was assumed that the phreatic surface in the foundation soils was below the base of Area 6A-West at approximate Elevation 2680 feet NGVD for Cross-sections A-A' and B-B', see Figure 2. This was corroborated by measurement of the water level in MW-15 which is located along the exterior toe of the northern perimeter dike of the Area 6A-West Landfill.

The piezometric surfaces in the Area 6A-West waste were based on the recently placed piezometers (P-06-01A, P-06-01B, P-06-02A, P-06-02B and P-06-02C). As shown in profile C-C' on Figure 3, one of the five piezometers in the waste was dry and four of the piezometers had a liquid surface that was approximately at the level of the piezometer screen. In order to model this drainage condition in the stability analysis, a relationship between excess pore pressure and waste depth was established, based on the measured liquid levels in the piezometers. As a result, for every foot of waste in the landfill, 0.18 feet of pore pressure was applied to the waste. A plot of this relationship and a conceptual depiction of the waste pore pressures is presented in Appendix B.

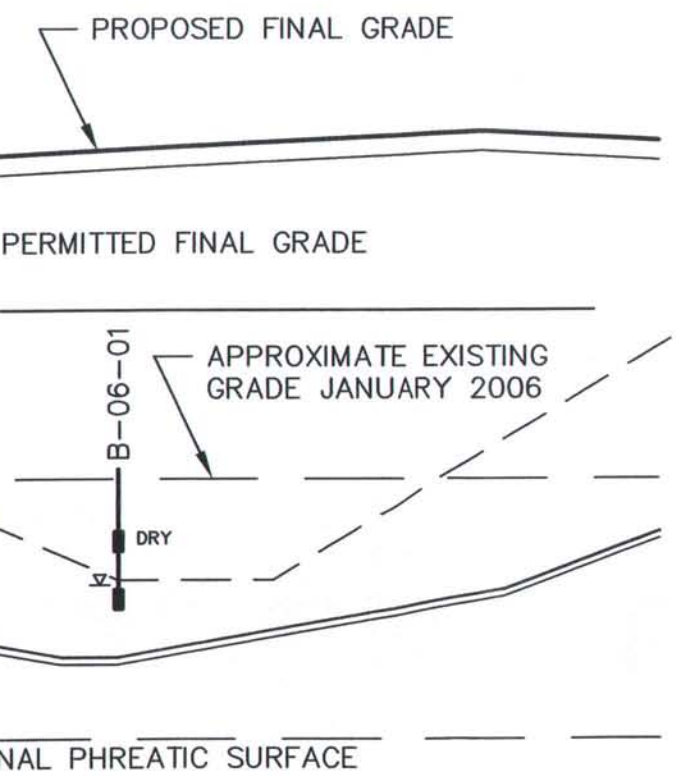
It should be noted that although the above stated piezometric conditions were observed and are expected in the Area 6A-West wastes, the SME evaluation also analyzed the worst-case condition of a fully-saturated waste mass with a phreatic surface near the top of the waste. This conservative condition assumes that the wastes are undrained and the leachate collection system is inoperable.

GEOTECHNICAL PROFILES REPRESENT AN INTERPRETATION OF AVAILABLE BORING DATA, WATER LEVEL MEASUREMENTS AND FIELD OBSERVATIONS. CONDITIONS BETWEEN DATA POINTS MAY VARY FROM THAT SHOWN. THESE GEOTECHNICAL PROFILES SHOULD NOT BE USED FOR DESIGN OR QUANTITY TAKE-OFFS.

SEE FIGURE 1 FOR LOCATION OF GEOTECHNICAL PROFILES.



A-A'



B-B'

LEGEND

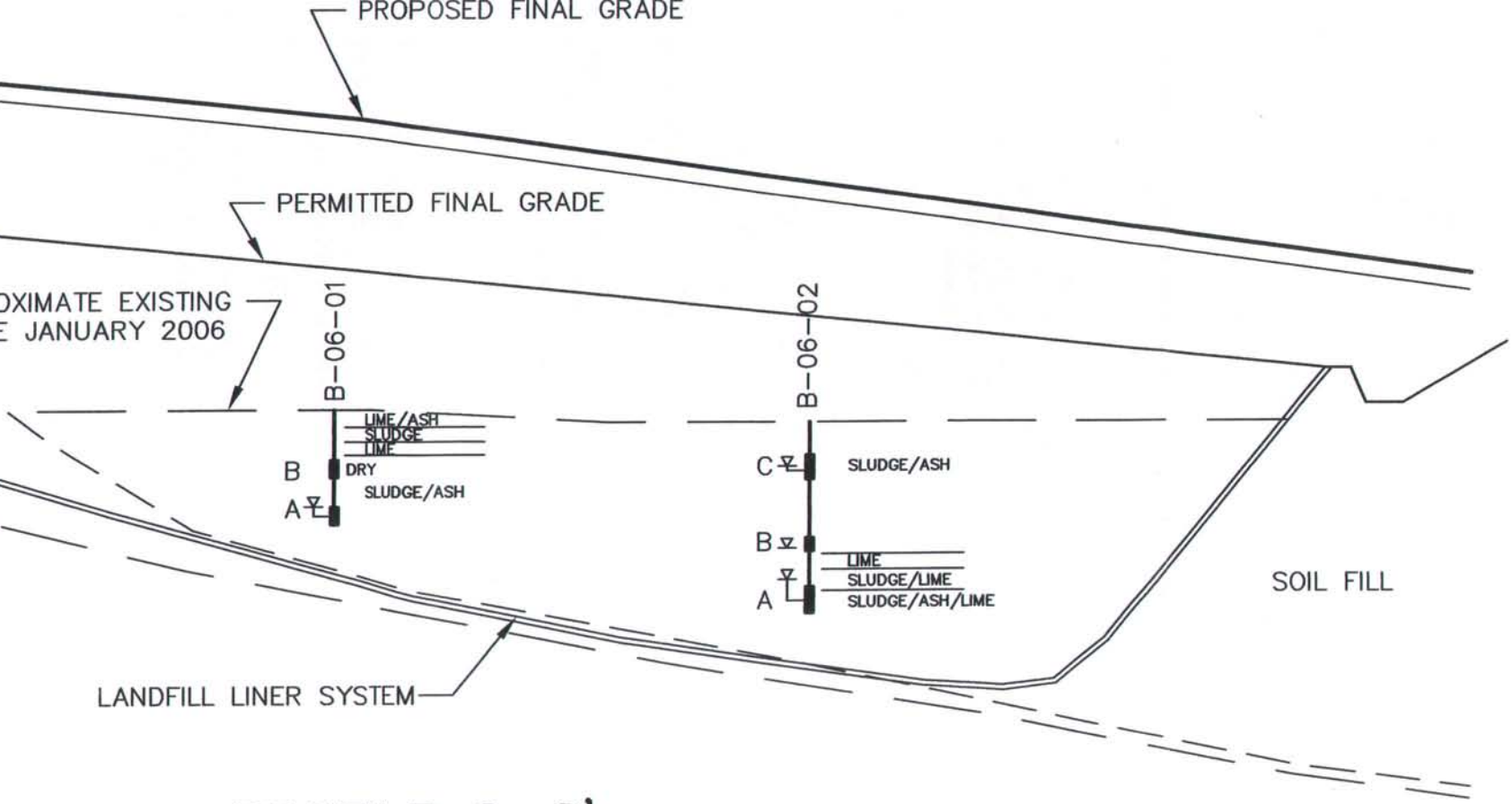
BORING IDENTIFICATION NUMBER

MEASURED WATER LEVEL IN JAN 2006

WATER LEVEL MONITORING INTERVAL

BOTTOM OF EXPLORATION

FIGURE 2
INTERPRETIVE GEOTECHNICAL
PROFILE A-A' & B-B'
LANDFILL 6A-WEST
BLUE RIDGE PAPER PRODUCTS, INC.
CANTON, NORTH CAROLINA



PROFILE C–C'

EXAGGERATION OF GEOTECHNICAL PROFILE IS 5 TO 2.

CAL PROFILE REPRESENTS AN INTERPRETATION OF
BORING DATA, WATER LEVEL MEASUREMENTS AND
ERVATIONS. CONDITIONS BETWEEN DATA POINTS MAY
M THAT SHOWN. THIS GEOTECHNICAL PROFILE SHOULD
SED FOR DESIGN OR QUANTITY TAKE–OFFS.

E 1 FOR LOCATION OF GEOTECHNICAL PROFILE.

FIGURE 3
INTERPRETIVE GEOTECHNICAL
PROFILE C–C'
LANDFILL 6A–WEST
BLUE RIDGE PAPER PRODUCTS, INC.
CANTON, NORTH CAROLINA

4.2 Selection of Critical Stability Cross-Section

Two cross-sections (Cross-Section A-A' and B-B') were selected as representative of the worst-case geometry for Area 6A-West, relative to slope stability. These cross-sections are presented in Figure 2, and their locations in Figure 1. Cross-Sections A-A' and B-B' were selected as critical for the following reasons: (1) they pass through the area with the greatest proposed waste thickness and steepest sloping base grades; and (2) they provide the greatest vertical relief between the maximum designed waste grades, at about Elevation 2810 feet NGVD, and the toe, at Elevations 2700 and 2690 feet NGVD for Cross-sections A-A' and B-B', respectively.

4.3 Stability Analyses

Effective stress conditions were used in the stability analysis. This approach is appropriate for free-draining materials such as the wastes landfilled in Area 6A-West. As described above, shear strengths were selected from the testing of the waste and dike materials. The piezometers installed in the waste and perimeter dike allowed application of piezometric conditions necessary for the effective stress analysis. SME performed both static (i.e., non-earthquake) and seismic (i.e., earthquake) stability analysis for the proposed final grading after closure of Area 6A-West. The seismic analysis consisted of a pseudo-static analysis, in which a horizontal force is applied to the static model to simulate an earthquake acceleration. The seismic stability analyses followed the approach outlined in U.S.EPA Subtitle D – Design Guidance. Based on the work of Hynes and Franklin, 1984, for a factor of safety greater than or equal to 1.0, a maximum value of the seismic coefficient used in the pseudo-static analysis was one-half the maximum acceleration estimated at the base of the landfill in order to keep permanent cover and embankment deformations less than 12 inches after an earthquake. Six to 12 inches of seismically induced downslope displacement is generally considered tolerable in the current design of landfill liners (Seed and Bonaparte, 1992). The maximum horizontal seismic acceleration at the Area 6A-West site was obtained from Algermissen, et al, 1990. This map provides a maximum acceleration at the bedrock surface of 0.26g (acceleration, as a percent of gravity) in the western North Carolina region, with a 90 percent probability of not being exceeded in 250 years. Based on Hynes and

Franklin, 1984, the seismic coefficient to be used in the pseudo-static stability analysis is one-half of 0.26g or 0.13g.

The results of these analyses are included in Appendix E and indicate adequate factors of safety for the proposed final grading configuration under drained conditions. Factors of safety were calculated for three types of failure surfaces: (1) a failure surface passing through the waste alone; (2) a failure surface passing through the waste, perimeter dike and foundation soil; and (3) a deeper failure surface passing through the waste and foundation soil. Minimum factors of safety for the three failure types described above were 2.2, 1.9 and 2.5, respectively. For the seismic case, minimum factors of safety were 1.5, 1.3 and 1.7 for the three failure scenarios, respectively. Generally, factors of safety greater than 1.5 for static cases and 1.0 for seismic cases are considered acceptable by the professional engineering community. Since the seismic factors of safety exceed 1.0, permanent seismic deformations are expected to be satisfactory and will not result in damage to the leachate collection system, liner or landfill slopes (Seed and Bonaparte, 1992).

Moreover, analysis of waste stability for a worst-case condition of a fully-saturated waste mass with a phreatic surface at the top of the waste yielded factors of safety of 1.5 or better.

It should be noted that stability analysis of the existing southern dike yielded a factor of safety of 1.4 for a failure surface passing 20 feet into the exterior dike sideslope. Although this factor of safety is slightly lower than 1.5, which is an accepted standard, the dikes at Landfill No. 6 facility have been standing for many years without any indication of slope instability. Therefore, the 6A-West dikes are considered adequate to maintain slope stability.

The infinite-slope case (Lambe and Whitman, 1969) was used to check the stability of the face of the closed landfill and cover. At this point, it is expected that a compacted soil cover will be used for Area 6A-West. No specific final cover system stability analysis was performed for this report other than this infinite slope analysis. Based on the selected shear strengths, and assuming no seepage parallel to the landfill slope faces, a minimum factor of safety of 1.7 was calculated, which is considered acceptable. This calculation is provided in Appendix E.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the observations made at the landfill, interpretation of the available field and laboratory test data, and the results of the slope stability evaluation completed for this report, the following conclusions have been reached.

- The results of the static and seismic stability analyses conducted for the proposed final grading plan for the Area 6A-West Landfill exceed generally accepted safety factor requirements for the worst-case stability cross-sections analyzed. Accordingly, it is concluded that stable slope, foundation, and waste conditions will be maintained with the proposed final grades and waste streams as presented in this report.

- Future wastes delivered to the landfill are assumed to consist mainly of the same sludge, ash, and lime mud as has historically been placed in Area 6A-East and Area 6A-West. It is recommended that if the future waste stream changes in strength or character, or if the percentage of low-strength material increases significantly from that described within this report, that a reevaluation of the landfill stability be conducted.

- It is recommended that layering of the ash and sludge continue during landfilling operations to maintain stability and otherwise follow the recommendations set forth in the Operations Manual, including the placement of any lower strength waste within the interior portion of the landfill, not less than 100 feet from the exterior slope faces. A revised Operations Manual including Cell VI is attached as Appendix F.

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APPENDIX A

BORING LOGS

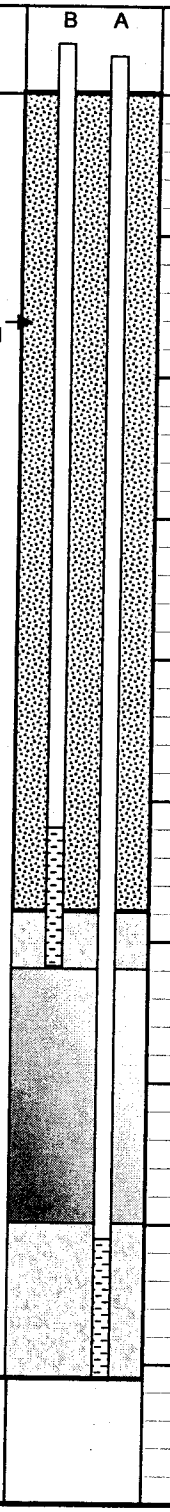
PROJECT: Blue Ridge Paper		JOB NO.: 05127.00	BORING NO.: B-06-01
DATE STARTED: 1-16-06	DATE FINISHED: 1-17-06	DRILLING METHOD: Washed Boring	
GROUND SURFACE ELEVATION (FT): ~2733	DRILLING CONTRACTOR: AE Drilling	LOGGED BY: MSR	
BOREHOLE DIA. (IN): 4	ROCK CORE DIA. (IN): NA	SHEET 1 OF 1	

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N-VALUE (bpf)	SHEAR STRENGTH Su (psf)	WATER CONTENT (%)
	1D	Lime mud and fly ash	14		41
					38
5					
	2D	Sludge with some lime mud	2		
	1S				50
	1V	Lime mud		1772	
10	2V	Sludge		1709	60
15					
	3D	Sludge	WOH,1		97
	2S				94
	3V	Sludge with some gravel		2953	
20	4V			746	38
25	4D		1, WOH		
		Bottom of boring at 25.5 feet bgs			
30					
35					
40					
45					
50					

DEPTH (FT)
5
10
15
20
25
30
35
40
45
50

PROJECT: Blue Ridge Paper		JOB NO.: 05127.00	BORING NO.: B-06-02
DATE STARTED: 1-18-06	DATE FINISHED: 1-18-06	DRILLING METHOD: Hollow Stem Auger	
GROUND SURFACE ELEVATION (FT): ~2730	DRILLING CONTRACTOR: AE Drilling	LOGGED BY: MSR	
BOREHOLE DIA. (IN): 6	ROCK CORE DIA. (IN): NA	SHEET 1 OF 1	

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N-VALUE (bpf)	SHEAR STRENGTH Su (psf)	WATER CONTENT (%)
	1D	Ash and cinders	22		33
5	2D	Wet sludge with ash	WOH, 1		63
10	3D		WOH		
		Dry light brown sludge, some ash and gravel			21
15	1V	Moist gray fibrous sludge with wood, some ash		1368	86
	2V			1554	
20	4D		2		96
	1S				
	3V			2331+	
25	4V			2331+	
30	5D	Same as above with some lime mud	3		75
35	6D	Stiff gray sludge with layers of blue tinted lime mud, some wood	11		37
					50
	2S				52
	5V	Soft wet gray/black sludge with some lime mud, trace gravel		2082	72
40	6V			2486+	
45	7D	Moist to dry stiff fibrous sludge, ash and lime mud	6		47
					62
50		Bottom of boring at 45.5 feet bgs			



DEPTH (FT)
5
10
15
20
25
30
35
40
45
50

G:\Brpp\NC\6a-west\Vertical expansion\drill log.xls

PROJECT: Blue Ridge Paper		JOB NO.: 05127.00	BORING NO.: B-06-02A
DATE STARTED: 1-18-06	DATE FINISHED: 1-18-06	DRILLING METHOD: Hollow Stem Auger	
GROUND SURFACE ELEVATION (FT): ~2730	DRILLING CONTRACTOR: AE Drilling	LOGGED BY: MSR	
BOREHOLE DIA. (IN): 6	ROCK CORE DIA. (IN): NA		SHEET 1 OF 1

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	SHEAR STRENGTH Su (psf)	DEPTH (FT)
5		For material description see B-06-02		5
	1S			
10	1V		777	10
	2V		1399	
15				15
		Bottom of boring at 15 feet bgs		
20				20
25				25
30				30
35				35
40				40
45				45
50				50

PROJECT: Blue Ridge Paper		JOB NO.: 05127.00	BORING NO.: B-06-03
DATE STARTED: 1-19-06	DATE FINISHED: 1-19-06	DRILLING METHOD: Hollow Stem Auger	
GROUND SURFACE ELEVATION (FT): ~2704	DRILLING CONTRACTOR: AE Drilling	LOGGED BY: MSR	
BOREHOLE DIA. (IN): 6	ROCK CORE DIA. (IN): NA	SHEET 1 OF 1	

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N-VALUE (bpf)	GRAIN SIZE (% passing #200)	WATER CONTENT (%)			DEPTH (FT)
	1D	FILL Dry reddish brown silty fine to coarse sand, some gravel, trace roots and drainage stone	4		18			
	2D		6		19			
5	3D		9			26		5
		RESIDUAL SOIL			17			
	4D	Dry light to medium brown micaceous fine to coarse silty sand to sandy silt with relic foliation.	17			10		
	5D		13		24			
10					22			10
15	6D		12	50	23			15
20	7D	.....becoming moist	9		28			20
		Bottom of boring at 21 feet bgs						
25								25
30								30
35								35
40								40
45								45
50								50

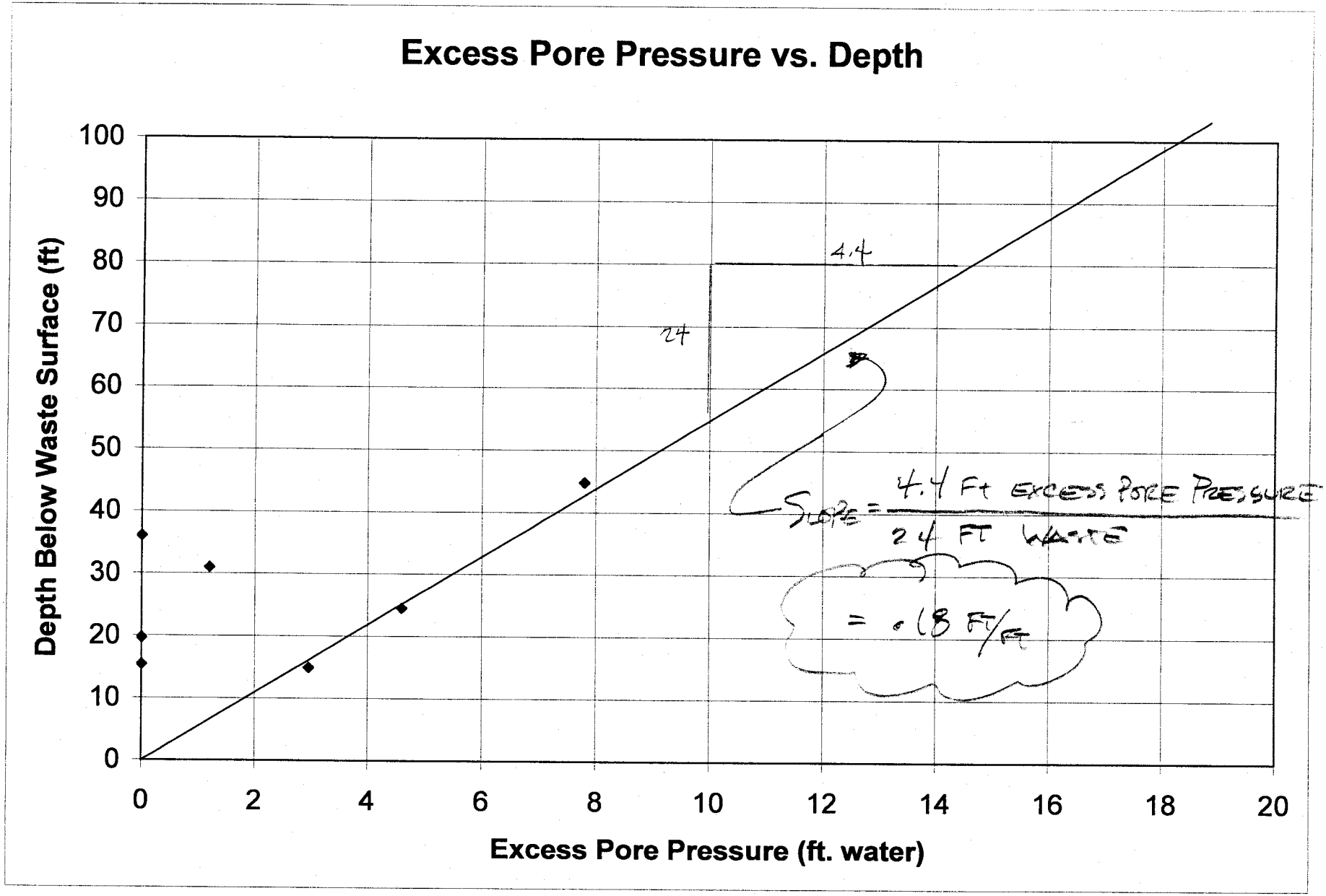
PROJECT: Blue Ridge Paper		JOB NO.: 05127.00	BORING NO.: B-06-04
DATE STARTED: 1-16-06	DATE FINISHED: 1-16-06	DRILLING METHOD: Washed Boring	
GROUND SURFACE ELEVATION (FT): ~2764	DRILLING CONTRACTOR: AE Drilling	LOGGED BY: MSR	
BOREHOLE DIA. (IN): 4	ROCK CORE DIA. (IN): NA	SHEET 1 OF 1	

DEPTH (FT)	SAMPLE NO.	MATERIAL DESCRIPTION	N-VALUE (bpf)	GRAIN SIZE (% passing #200)	WATER CONTENT (%)	B A	DEPTH (FT)
	1D	Fill Reddish brown micaceous silty fine to coarse sand, some gravel, trace roots. Dry	13		15		
5	2D	Reddish brown micaceous silty fine to coarse sand, some zones of clean sand and gravel, trace clay. Dry	10	32	18		5
10	MS		13				10
15	3D	Residual Soil Reddish brown gravelly micaceous silty fine to coarse sand, some cobble. Wet with relic structure.	23		21		15
20	4D		50+		14		20
25	5D	Mottled reddish brown gravelly micaceous silty fine to coarse sand, trace of yellow and white clay, some cobble with relic structure	50+	31	18		25
30	6D		50+		31		30
35	7D		50+		20		35
40		Bottom of boring at 36 feet bgs					40
45							45
50							50

APPENDIX B

WATER LEVEL DATA

Piezometer	Elevation (approx)	Depth (tpvc)	Casing stick-up	Water Level (tpvc)							
				1/16/2006	1/17/2006	1/18/2006	1/18/2006	1/19/2006	1/19/2006	1/27/2006	2/2/2006
P-06-04A	2764	39.3	3.2	33.27	38.17	39.00	dry		dry	dry	dry
P-06-04B	2764	23.0	3.3	20.50	19.80	20.52	21.05		21.98	dry	dry
P-06-01A	2733	27.7	3.2			23.00	23.20	23.30	23.20	23.3	23.10
P-06-01B	2733	17.3	1.9			dry	dry	dry	dry	dry	dry
P-06-02A	2730	49.0	4.2			39.90	40.25	41.00	41.00	41.2	41.20
P-06-02B	2730	35.1	4.1			27.30	28.20	32.80	33.30	33.6	33.90
P-06-02C	2730	18.1	3.2				dry	16.30	16.25	15.5	15.15


Excess Pore Pressure vs. Depth
Depth Below Waste Surface (ft)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
Excess Pore Pressure (ft. water)
4.4
24
SLOPE = 4.4 Ft EXCESS PORE PRESSURE / 24 FT WASTE
= .18 Ft/Ft

Title: Blue [redacted]aper
Comments [redacted]aste sideslope
Name: G:\B[redacted]C\6a-west\Vertical expansion\SlopeW\piezo-concept.gsz

[redacted]gion 1 = Material Number: 1
[redacted]egion 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Piezometric condition in waste modeled as a grid of pressure heads.
Based on the relationship of 0.18 feet of pore pressure per foot of waste.

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

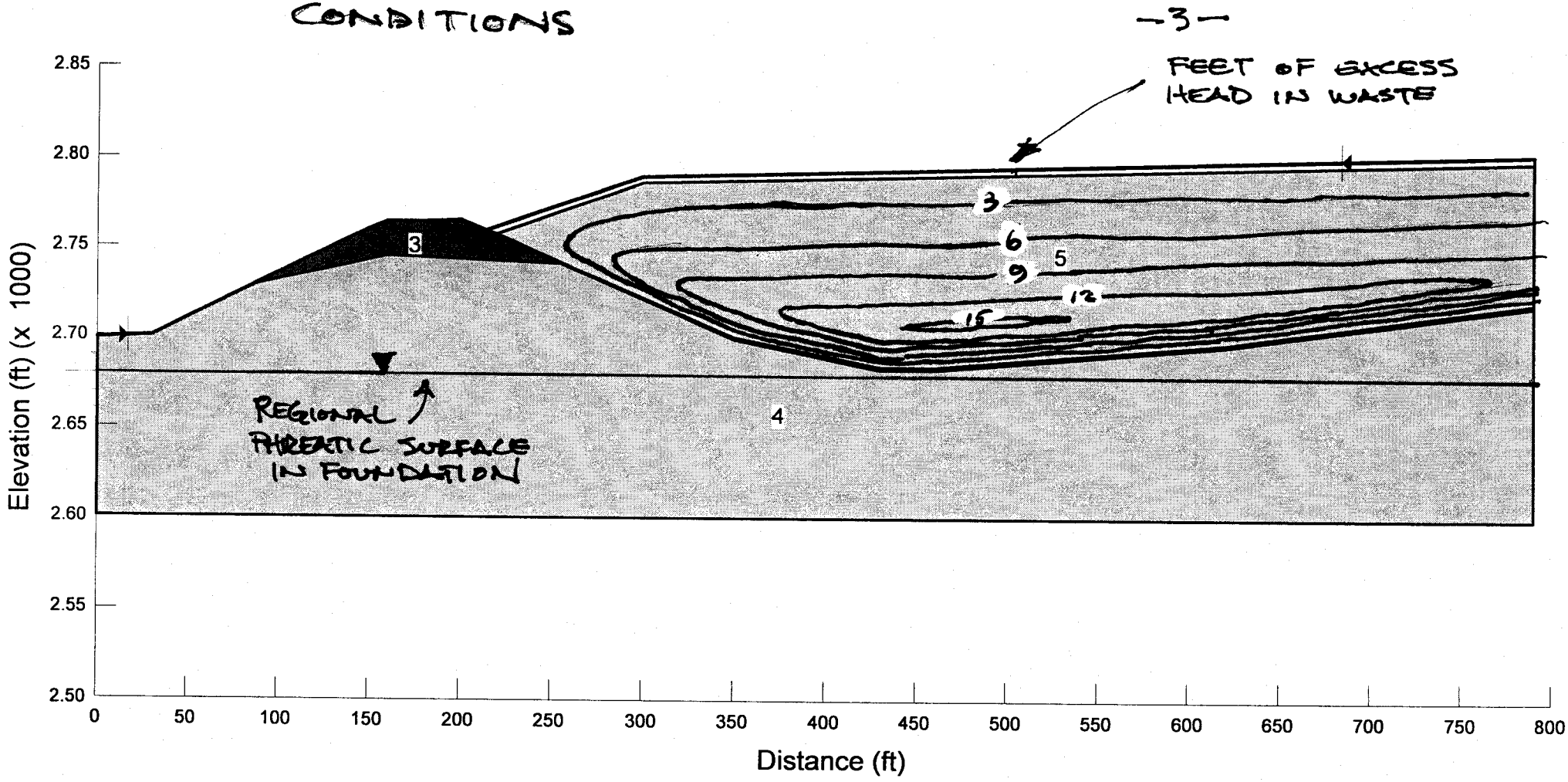
Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

CONCEPTUAL PIEZOMETRIC CONDITIONS



APPENDIX C

LABORATORY TEST RESULTS

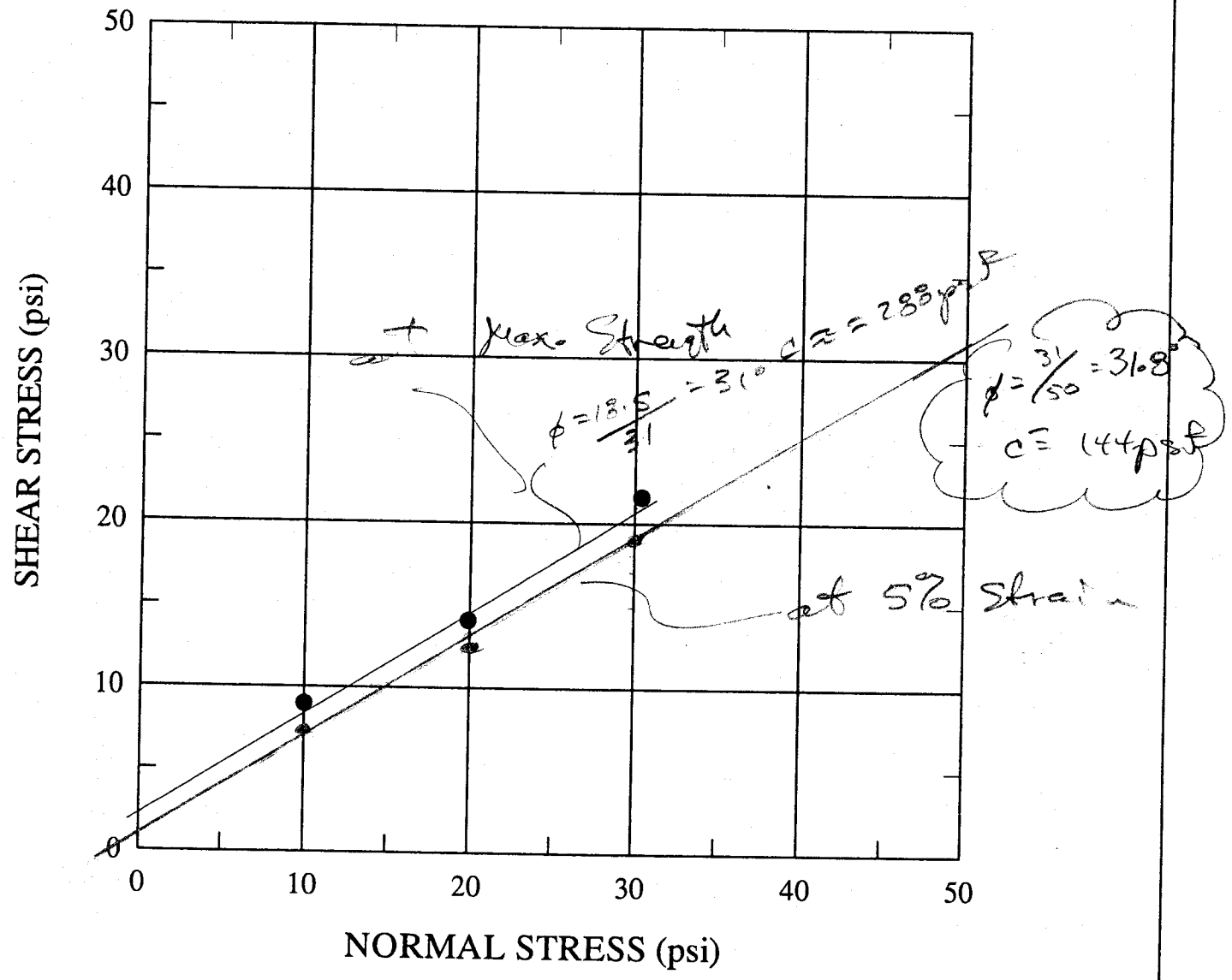
DIRECT SHEAR TEST

PROJECT: BLUE RIDGE PAPER
CANTON, N. CAROLINA

JOB No: 05127
DATE: FEB 06
TEST No: DS 1-3

BORING No: B06-4
SAMPLE No: Composite
DEPTH (ft.): 4-14

DESCRIPTION: Red/ brown sandy SILT (DIKE FILL)



DIAMETER= 2.5 in..
AREA= 4.909 sq. in.
NORMAL STRESS= See Graph psi

LOADING RATE= 0.008 in/min
INIT. W.C.= 17.8 %
PRE-SHEAR DENSITY= 119-124 pcf

Sevee & Maher Engineers

DIRECT SHEAR TEST

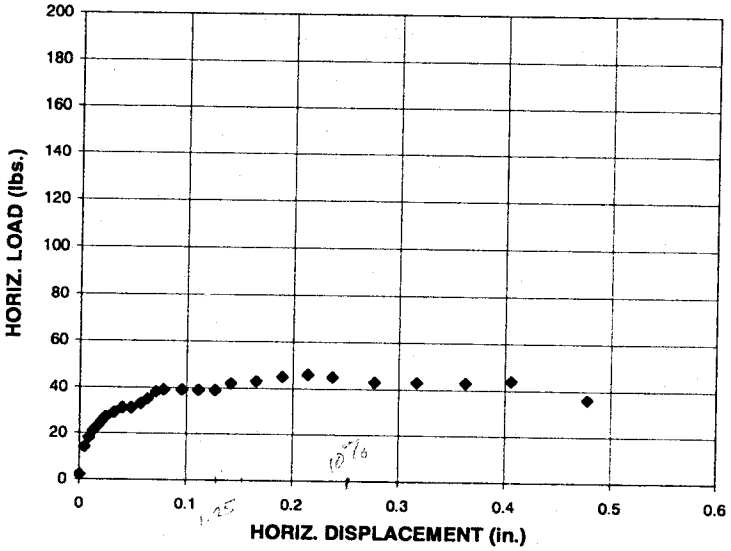
CLIENT: Blue Ridge Paper
PROJECT: Canton, N. Carolina

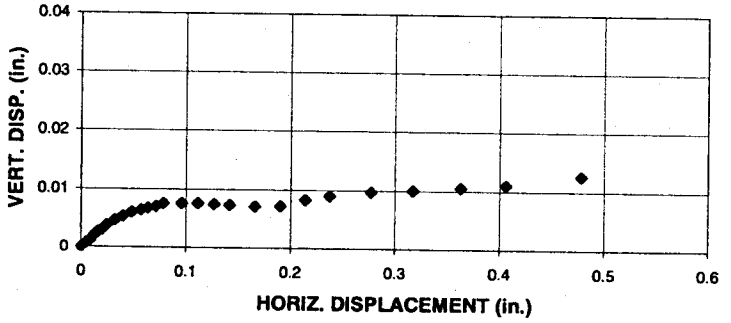
SAMPLE DESCRIPTION: Rd-br sandy SILT to silty SAND

BORING:	B06-4		TEST No.:	DS-1	
SAMPLE:	Composite		WEIGHT:	221.3	(gms)
DEPTH:	4-16	(ft.)	AVE. INITIAL W.C.:	17.8	(%)
INIT. HEIGHT:	1.47	(in.)	FINAL W.C.:	17.8	(%)
DELTA H.:	0.0296	(in.)	INITIAL DENSITY:	116.8	(pcf)
AREA:	4.909	(sq.in.)	BEFORE SHEAR DENSITY;	119.2	(pcf)
STRAIN RATE:	0.008	(in./min.)	NORMAL STRESS:	10	(psi)

ELASPED TIME (min.)	VERICAL DIAL READING (in.)	VERTICAL DISP. (in.)	HORIZ. DIAL READING (in.)	HORIZ. DISP. (in.)	LOAD CELL READING (lbs.)	SHEAR STRESS (psi)
0	0.361	0	0.878	0	2	0.00
0.5	0.3603	0.0007	0.8735	0.0045	14	2.44
1	0.3598	0.0012	0.8695	0.0085	18	3.26
1.5	0.359	0.002	0.8657	0.0123	21	3.87
2	0.3584	0.0026	0.862	0.016	23	4.28
2.5	0.358	0.003	0.858	0.02	25	4.69
3	0.3573	0.0037	0.854	0.024	27	5.09
4	0.3564	0.0046	0.846	0.032	29	5.50
5	0.3557	0.0053	0.8383	0.0397	31	5.91
6	0.355	0.006	0.83	0.048	31	5.91
7	0.3546	0.0064	0.821	0.057	33	6.31
8	0.3543	0.0067	0.8145	0.0635	35	6.72
9	0.354	0.007	0.807	0.071	38	7.33
10	0.3535	0.0075	0.7997	0.0783	39	7.54
12	0.3535	0.0075	0.7823	0.0957	39	7.54
14	0.3534	0.0076	0.767	0.111	39	7.54
16	0.3536	0.0074	0.7515	0.1265	39	7.54
18	0.3537	0.0073	0.7365	0.1415	42	8.15
21	0.3539	0.0071	0.7125	0.1655	43	8.35
24	0.3538	0.0072	0.6882	0.1898	45	8.76
27	0.3527	0.0083	0.664	0.214	46	8.96
30	0.352	0.009	0.641	0.237	45	8.76
35	0.3513	0.0097	0.601	0.277	43	8.35
40	0.351	0.01	0.5608	0.3172	43	8.35
45	0.3505	0.0105	0.515	0.363	43	8.35
51	0.35	0.011	0.4723	0.4057	44	8.56
60	0.3484	0.0126	0.4	0.478	36	6.93

Note: Shear Box Not Flooded





DIRECT SHEAR TEST

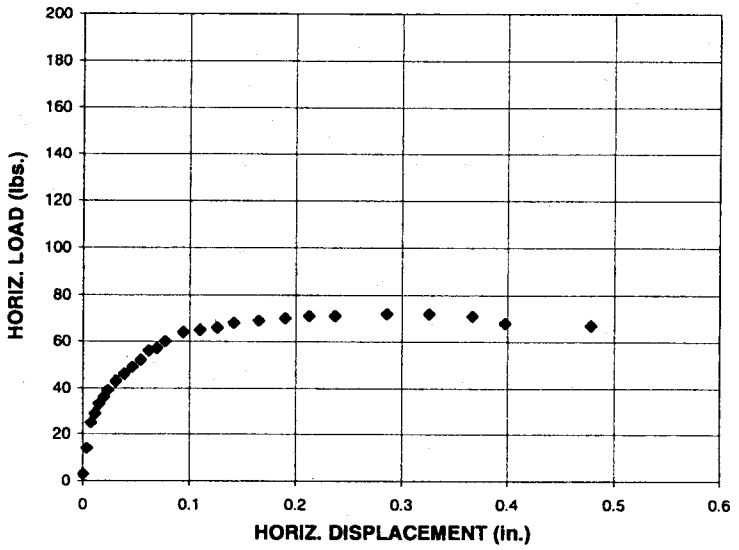
CLIENT: Blue Ridge Paper
PROJECT: Canton, N. Carolina

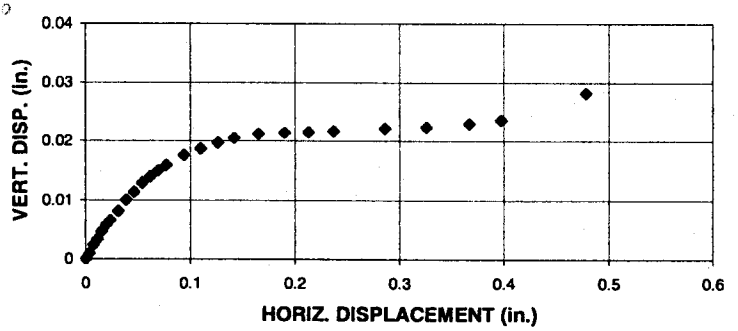
SAMPLE DESCRIPTION: Rd-br sandy SILT to silty SAND

BORING:	B06-4		TEST No.:	DS-2	
SAMPLE:	Composite		WEIGHT:	221.7	(gms)
DEPTH:	4-16	(ft.)	AVE. INITIAL W.C.:	17.8	(%)
INIT. HEIGHT:	1.47	(in.)	FINAL W.C.:	17.8	(%)
DELTA H.:	0.0362	(in.)	INITIAL DENSITY:	117.0	(pcf)
AREA:	4.909	(sq.in.)	BEFORE SHEAR DENSITY;	120.0	(pcf)
STRAIN RATE:	0.008	(in./min.)	NORMAL STRESS:	19.9	(psi)

ELASPED TIME (min.)	VERICAL DIAL READING (in.)	VERTICAL DISP. (in.)	HORIZ. DIAL READING (in.)	HORIZ. DISP. (in.)	LOAD CELL READING (lbs.)	SHEAR STRESS (psi)
0	0.3482	0	0.867	0	3	0.00
0.5	0.3473	0.0009	0.8635	0.0035	14	2.24
1	0.3458	0.0024	0.8595	0.0075	25	4.48
1.5	0.3448	0.0034	0.8558	0.0112	29	5.30
2	0.3435	0.0047	0.852	0.015	33	6.11
2.5	0.3424	0.0058	0.8475	0.0195	36	6.72
3	0.3416	0.0066	0.844	0.023	39	7.33
4	0.34	0.0082	0.8362	0.0308	43	8.15
5	0.3382	0.01	0.8285	0.0385	46	8.76
6	0.3368	0.0114	0.821	0.046	49	9.37
7	0.3353	0.0129	0.813	0.054	52	9.98
8	0.3342	0.014	0.8053	0.0617	56	10.80
9	0.3332	0.015	0.7978	0.0692	57	11.00
10	0.3323	0.0159	0.79	0.077	60	11.61
12	0.3306	0.0176	0.773	0.094	64	12.43
14	0.3295	0.0187	0.757	0.11	65	12.63
16	0.3285	0.0197	0.741	0.126	66	12.83
18	0.3277	0.0205	0.7255	0.1415	68	13.24
21	0.327	0.0212	0.702	0.165	69	13.44
24	0.3268	0.0214	0.677	0.19	70	13.65
27	0.3267	0.0215	0.6542	0.2128	71	13.85
30	0.3265	0.0217	0.63	0.237	71	13.85
36	0.326	0.0222	0.581	0.286	72	14.06
41	0.3258	0.0224	0.541	0.326	72	14.06
46	0.3252	0.023	0.5	0.367	71	13.85
50	0.3246	0.0236	0.4695	0.3975	68	13.24
60	0.32	0.0282	0.389	0.478	67	13.04

Note: Shear Box Not Flooded





DIRECT SHEAR TEST

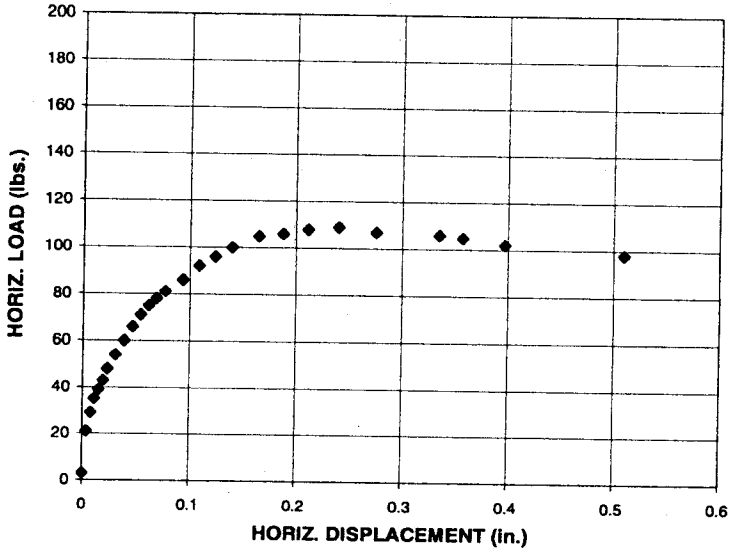
CLIENT: Blue Ridge Paper
PROJECT: Canton, N. Carolina

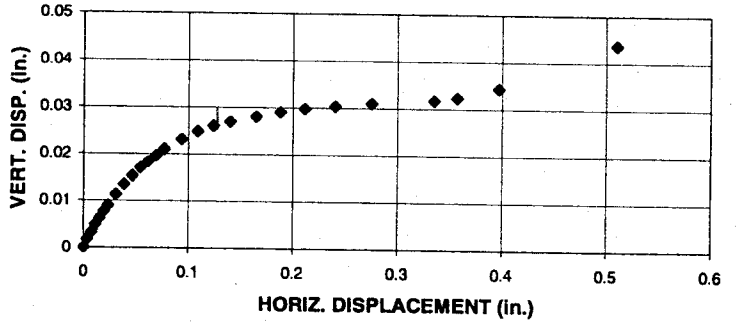
SAMPLE DESCRIPTION: Rd-br sandy SILT to silty SAND

BORING:	B06-4		TEST No.:	DS-3	
SAMPLE:	Composite		WEIGHT:	221.4	(gms)
DEPTH:	4-16	(ft.)	AVE. INITIAL W.C.:	17.8	(%)
INIT. HEIGHT:	1.47	(in.)	FINAL W.C.:	17.8	(%)
DELTA H.:	0.0852	(in.)	INITIAL DENSITY:	116.9	(pcf)
AREA:	4.909	(sq.in.)	BEFORE SHEAR DENSITY;	124.1	(pcf)
STRAIN RATE:	0.008	(in./min.)	NORMAL STRESS:	30.4	(psi)

ELASPED TIME (min.)	VERICAL DIAL READING (in.)	VERTICAL DISP. (in.)	HORIZ. DIAL READING (in.)	HORIZ. DISP. (in.)	LOAD CELL READING (lbs.)	SHEAR STRESS (psi)
0	0.3003	0	0.87	0	3	0.00
0.5	0.2985	0.0018	0.8665	0.0035	21	3.67
1	0.297	0.0033	0.8625	0.0075	29	5.30
1.5	0.2954	0.0049	0.859	0.011	35	6.52
2	0.294	0.0063	0.855	0.015	39	7.33
2.5	0.2926	0.0077	0.851	0.019	43	8.15
3	0.2913	0.009	0.847	0.023	48	9.17
4	0.289	0.0113	0.8395	0.0305	54	10.39
5	0.2868	0.0135	0.8315	0.0385	60	11.61
6	0.285	0.0153	0.8235	0.0465	66	12.83
7	0.2833	0.017	0.816	0.054	71	13.85
8	0.282	0.0183	0.8085	0.0615	75	14.67
9	0.2807	0.0196	0.801	0.069	78	15.28
10	0.2793	0.021	0.793	0.077	81	15.89
12	0.2772	0.0231	0.7765	0.0935	86	16.91
14	0.2755	0.0248	0.761	0.109	92	18.13
16	0.2743	0.026	0.746	0.124	96	18.94
18	0.2734	0.0269	0.73	0.14	100	19.76
21	0.2723	0.028	0.705	0.165	105	20.78
24	0.2713	0.029	0.682	0.188	106	20.98
27	0.2705	0.0298	0.6585	0.2115	108	21.39
30	0.27	0.0303	0.6295	0.2405	109	21.59
35	0.2693	0.031	0.5945	0.2755	107	21.19
40	0.2686	0.0317	0.535	0.335	106	20.98
45	0.268	0.0323	0.513	0.357	105	20.78
50	0.266	0.0343	0.473	0.397	102	20.17
64	0.2565	0.0438	0.36	0.51	98	19.35

Note: Shear Box Not Flooded





5%

.2/2 / 1.5

E = 5-5%

.25 = 10%

.125 = 5%

2/14/2006

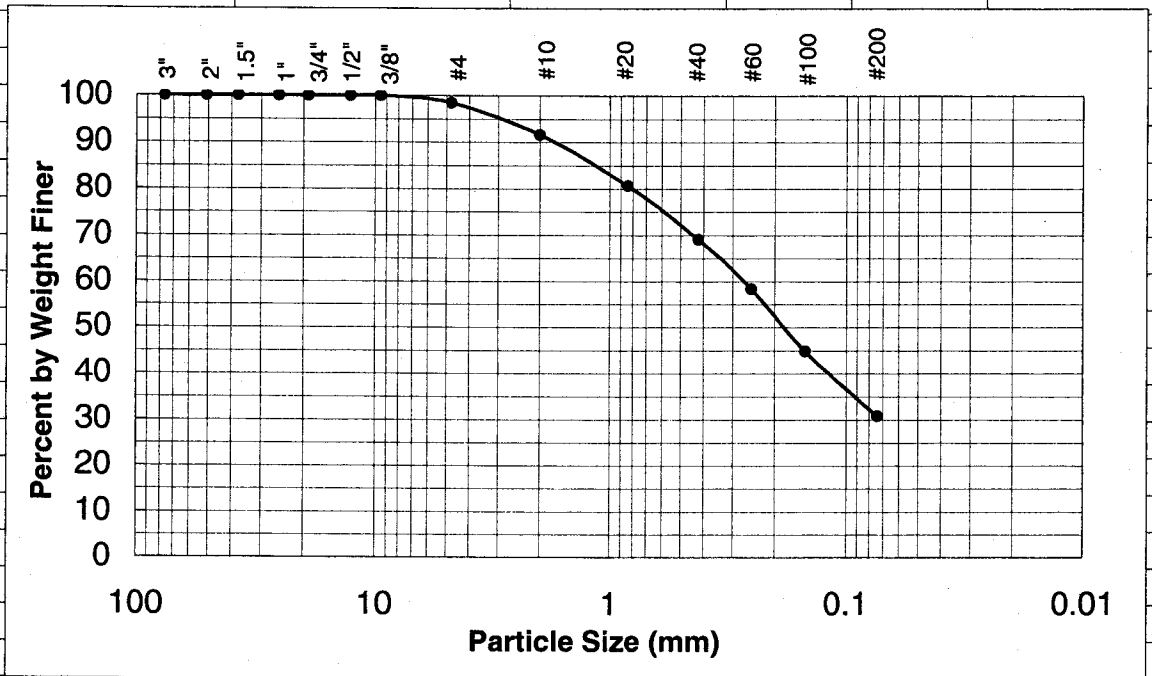
SEVEE MAHER ENGINEERS

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:	05127
	Canton, N. Carolina		DATE:	8-Feb-06
SAMPLE SOURCE:	2006 Borings		BORING No:	B06-4
SAMPLE DESCRIP:	Red silty SAND		SAMPLE No:	5D
	(NATIVE SOIL)		DEPTH (ft):	24-25.5
		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	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**98.4**			
#10	2.0	**91.7**			
#20	0.84	**80.7**			
#40	0.42	**69.1**			
#60	0.25	**58.4**			
#100	0.149	**44.9**			
#200	0.074	**30.8**			



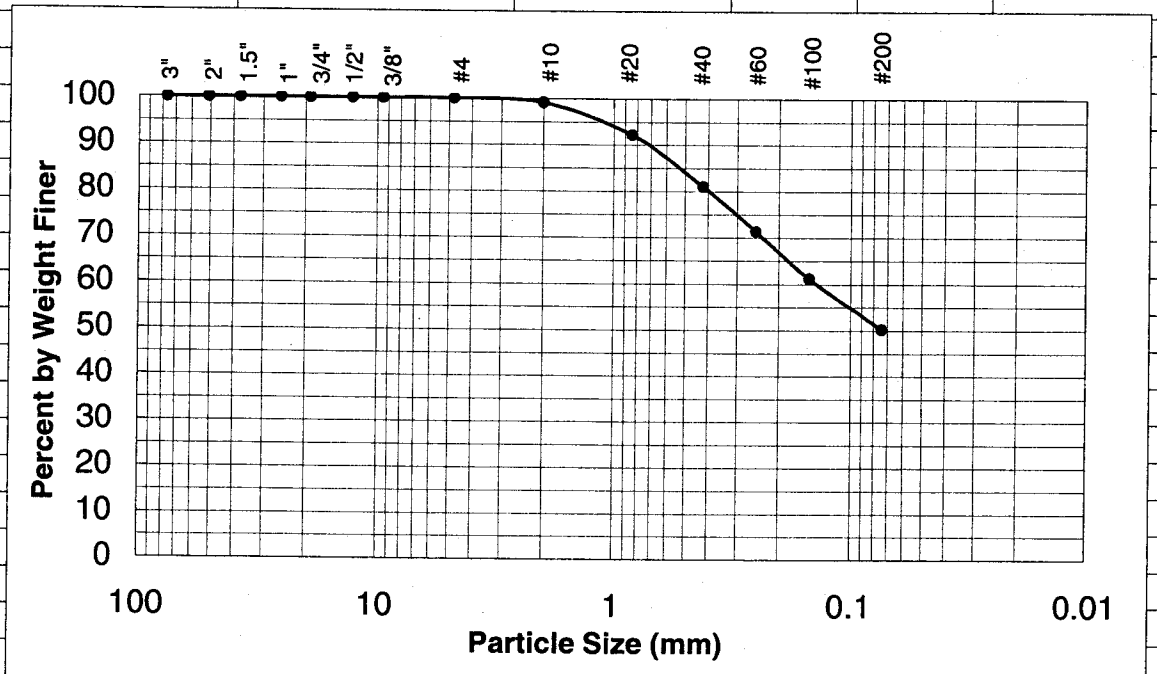
Water Content (%) =	18.3

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:	05127
	Canton, N. Carolina		DATE:	8-Feb-06
SAMPLE SOURCE:	2006 Borings		BORING No:	B06-3
SAMPLE DESCRIP:	Brownish-green sandy SILT		SAMPLE No:	6D
	(NATIVE SOIL)		DEPTH (ft):	14-16
		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	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**100.0**			
#10	2.0	**99.2**			
#20	0.84	**92.2**			
#40	0.42	**81.0**			
#60	0.25	**71.3**			
#100	0.149	**61.1**			
#200	0.074	**50.2**			



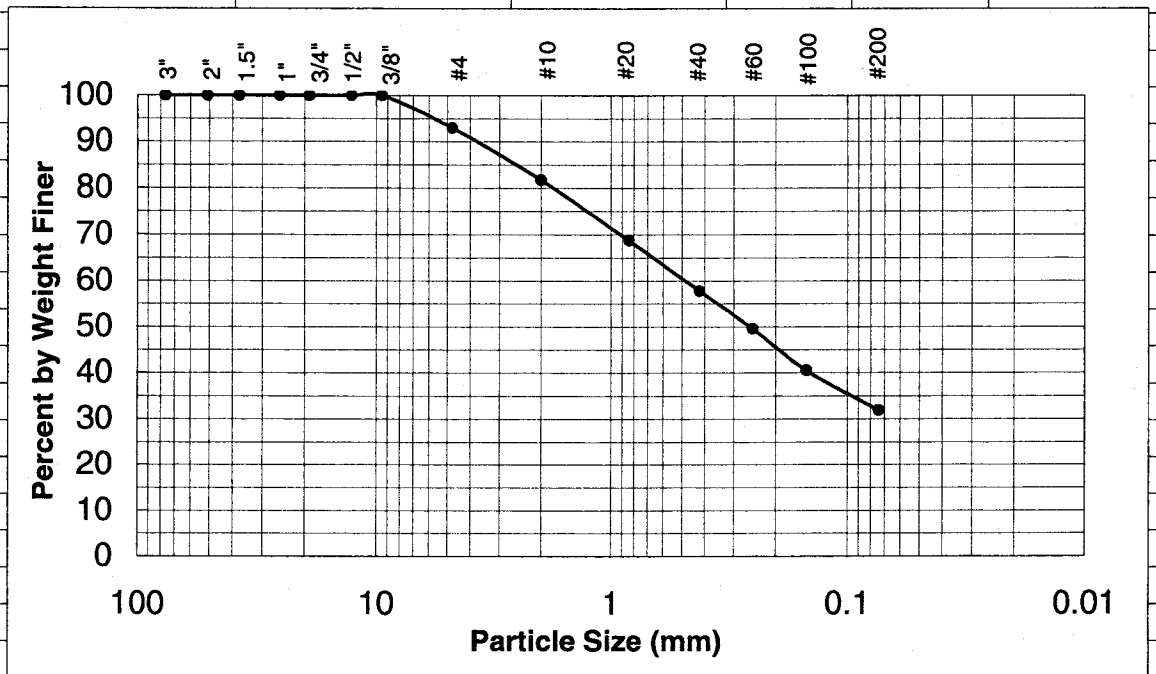
Water Content (%) =	22.5

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:	05127
	Canton, N. Carolina		DATE:	8-Feb-06
SAMPLE SOURCE:	2006 Borings		BORING No:	B06-4
SAMPLE DESCRIP:	Red silty SAND, trace gravel		SAMPLE No:	composite
	(DIKE FILL)		DEPTH (ft):	4-16
		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	**100.0**			
3/4	19.1	**100.0**			
1/2	12.7	**100.0**			
3/8	9.5	**100.0**			
#4	4.76	**93.0**			
#10	2.0	**81.8**			
#20	0.84	**68.8**			
#40	0.42	**57.8**			
#60	0.25	**49.6**			
#100	0.149	**40.5**			
#200	0.074	**31.8**			



Water Content (%) =	17.8		

BLUE RIDGE PAPER
CANTON, N.CAROLINA
WATER CONTENT FROM BORINGS

BORING SAMPLE	DEPTH (ft.)	CAN No.	WT. WET SOIL & CAN (g)	WT. DRY SOIL & CAN (g)	WT. H20 (g)	WT. CAN (g)	DRY SOIL (g)	WATER CONTENT (%)	BAG / JAR
B06-1	0-2	1	160.64	127.82	32.82	48.51	79.31	41.4	J
	2-4	2	174.35	139.97	34.38	49.39	90.58	38.0	J
	8.5-10.5	3	184.59	133.7	50.89	49.04	84.66	60.1	B
	14-16	4	209.72	130.69	79.03	48.84	81.85	96.6	B
	18-20	5	225.73	176.86	48.87	48.59	128.27	38.1	B
B06-2	0-2	6	187.42	152.89	34.53	49.53	103.36	33.4	J
	3.5-5.5	7	198.22	140.34	57.88	49.1	91.24	63.4	J
	10.5-12.5	8	219.4	190.01	29.39	49.38	140.63	20.9	B
	13.5-15.5	9	224.56	143.08	81.48	48.45	94.63	86.1	B
	18.5-20.5	10	162.39	107.56	54.83	50.33	57.23	95.8	J
	28.5-30.5	11	184.67	126.52	58.15	49.4	77.12	75.4	J
	33.5-34.5	12	165.31	133.7	31.61	49.22	84.48	37.4	J
	34.5-35.5	13	229.12	170.64	58.48	52.56	118.08	49.5	J
	38-40	14	237.88	160.56	77.32	52.5	108.06	71.6	B
	43.5-44.5	15	140.58	112.41	28.17	52.58	59.83	47.1	J
	44.5-45.5	16	154.97	115.48	39.49	52.23	63.25	62.4	J
B06-3	0-2	17	187.32	166.35	20.97	51.91	114.44	18.3	J
	2-4	18	145.19	130.39	14.8	52.14	78.25	18.9	J
	4-6	19	188.15	159.22	28.93	49.59	109.63	26.4	J
	6-8	20	111.32	105.76	5.56	51.84	53.92	10.3	J
	5-8	21	127.87	116.4	11.47	50.63	65.77	17.4	B
	8-9	22	162.67	141.53	21.14	51.88	89.65	23.6	J
	9-10	23	113	101.73	11.27	51	50.73	22.2	J
	14-16	from sieve analysis						22.5	J
	19-21	24	155.01	132.59	22.42	51.2	81.39	27.5	J
B06-4	0-2	25	119.14	110.36	8.78	51.26	59.1	14.9	J
	4-16	composite from sieve analysis						17.8	J
	14-16	26	118.13	106.76	11.37	51.74	55.02	20.7	J
	19-20.3	27	135.12	125.14	9.98	51.94	73.2	13.6	J
	24-25.5	from sieve analysis						18.3	J
	29-29.9	28	126.39	116.57	9.82	85.15	31.42	31.3	J
	34-36	29	115.09	104.76	10.33	51.96	52.8	19.6	J

NOTE:
ADDITIONAL WATER CONTENT DATA PRESENTED ON TUBE OPENING DATA SHEETS

RECORD OF TUBE SAMPLE

Project: BLUE RIDGE PAPER, CANTON N.C.
Project No.: 05127
Boring No.: B06-2
Sample No.: 25
Depth (ft.): 35.5 to 37.5
Date: 13 FEB 06
Tested by: EJL

SAMPLE DEPTH IN FEET	LABORATORY LOG	in)	SAMPLE DESCRIPTION	Torvane (tsf)	Shear Vane (kPa)	Pocket Pen. (tsf)	W.C. (%)	Can No.	Alter. Limits	Consol	Shear	Other
		24										
	SLUDGE, ASH, LIME MIXTURE	23					58.4	12				
		22										
		21									CIUC 3	
	LIME MUD	20										
		19										
		18										
		17										
		16										
		15					52.2	13				
		14										
		13					51.4	9				
	VOIDS	12	GREEN LIME MUD w/ BLACK ASH/SLUDGE POCKETS AND FREQUENT VOIDS									
		11					50.6	10				
		10										
		9										
		8										
		7					54.3	11				
		6										
		5										
		4										
		3										
		2										
		1										
		0										

	Total Sample
Length of Soil (in)	
Inside Dia. Of Tube (in)	
Wt. Tube and Soil (gms)	
Wt. Tube (gms)	
Wt. Wet Soil (gms)	
Total Unit Wt. (pcf)	

Sample Sections	Top	Middle	Bottom
	10.125		9.75
	2173.8		2414.9
	726.4		697.2
	1447.4		1717.7
	83.9		103.4

Notes:

Sevee & Maher Engineers

RECORD OF TUBE SAMPLE

Project: Blue Ridge, Canton N.C.
Project No. 05127
Boring No. B06-1 Sample No. 1S
Depth (ft.) 6.5 to 8.5
Date 6 FEB 06
Tested by EJL

LABORATORY LOG	in)	SAMPLE DESCRIPTION	Torvane (tsf)	Shear Vane (kPa)	Pocket Pen. (tsf)	W.C. (%)	Can No.	Alter. Limits	Consol	Shear	Other
	24										
	23										
	22										
	21										
	20										
	19										
	18										
	17										
	16										
	15										
	14										
	13										
	12										
	11										
	10										
	9					49.2	24				
	8	Green									
	7	LIME								CIUC	
	6	MUD									
	5	trace SLUDGE									
	4	POCKETS								1	
	3										
	2										
	1					50.6	25				
	0										

SAMPLE DEPTH IN FEET

	Total Sample
Length of Soil (in)	
Inside Dia. Of Tube (in)	
Wt. Tube and Soil (gms)	
Wt. Tube (gms)	
Wt. Wet Soil (gms)	
Total Unit Wt. (pcf)	

Sample Sections

Top	Middle	Bottom
		8.5 ?
		2043.0
		724.6
		1318.4
		81.4

Notes:

Sevee & Maher Engineers

RECORD OF TUBE SAMPLE

Project: BLUE RIDGE PAPER
CANTON N.C.

Project No. 05127
Date 8 FEB 06
Tested by EJL

Boring No. B06-1 Sample No. 2S
Depth (ft.) 16 to 18

SAMPLE DEPTH IN FEET

LABORATORY LOG	in)	SAMPLE DESCRIPTION	Torvane (tsf)	Shear Vane (kPa)	Pocket Pen. (tsf)	W.C. (%)	Can No.	Alter. Limits	Consol	Shear	Other
16	24										
	23										
	22										
	21										
	20										
	19										
WET SLUDGE	18					103.9	26				
	17					90.2	27				
0	16	DK brown									
0 c-gravel	15	SLUDGE								CIUC	
0	14	ASH									
0 0	13	LIME								2	
	12	w/ gravel									
0	11										
	10					88.9	32				
	9										
	8										
	7										
	6										
	5										
	4	SLUDGE/ASH/GRAVEL									
	3										
	2										
18	1										
	0										

	Total Sample
Length of Soil (in)	
Inside Dia. Of Tube (in)	
Wt. Tube and Soil (gms)	20680
Wt. Tube (gms)	6954
Wt. Wet Soil (gms)	1372.6
Total Unit Wt. (pcf)	83.7

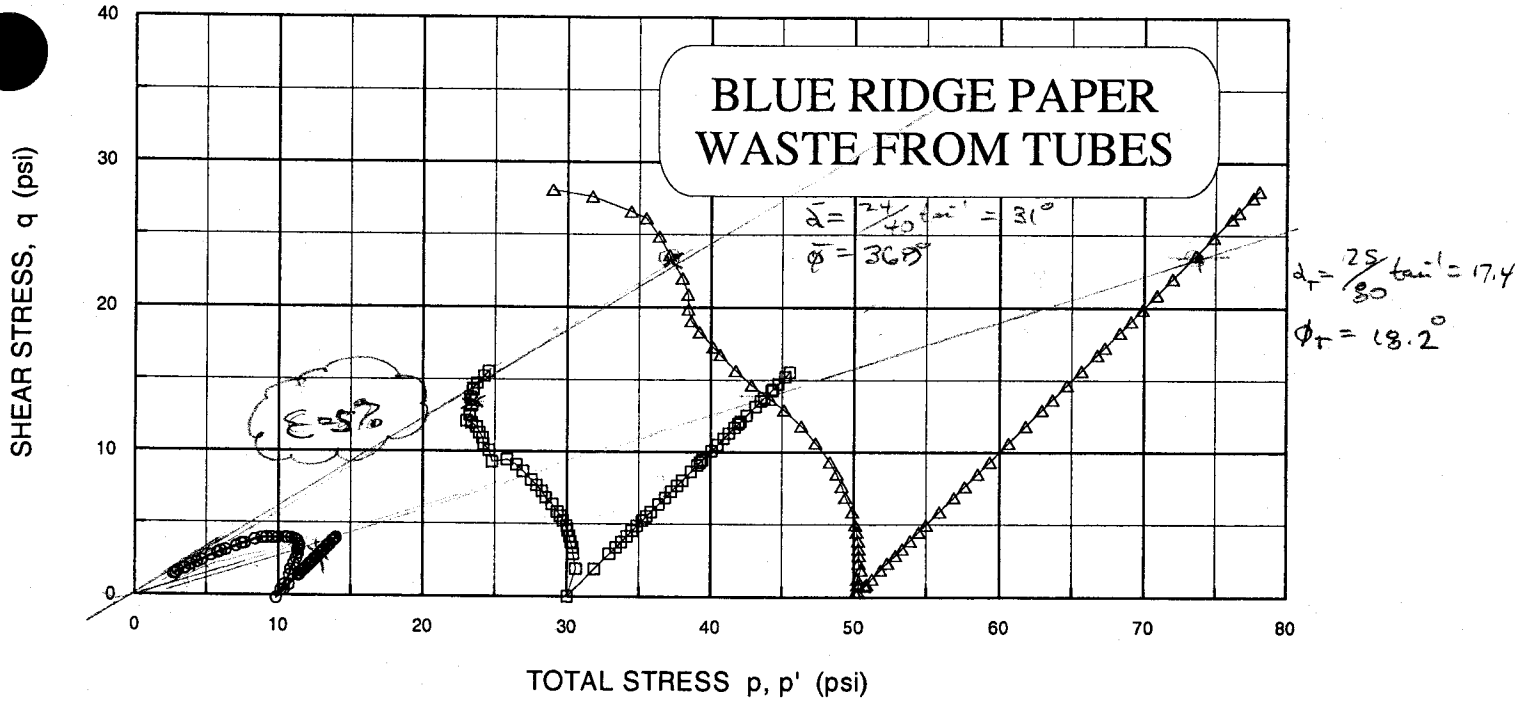
Sample Sections

Top	Middle	Bottom
9.625		

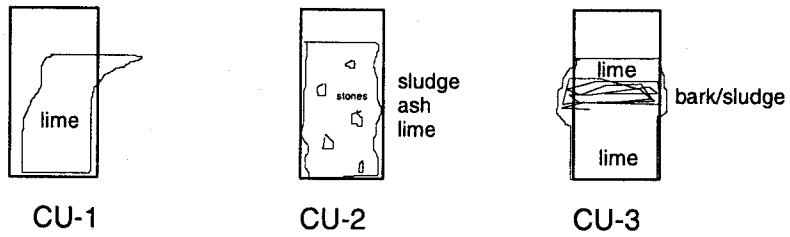
Notes:

Sevee & Maher Engineers

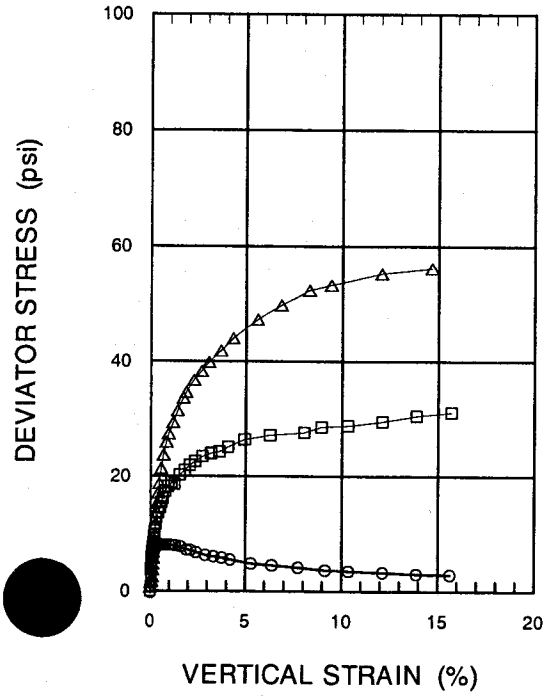
Consolidated Undrained Triaxial Test ASTM D4767



Failure Sketch



CU-1 CU-2 CU-3



TEST CONDITIONS

	SYMBOL:	O	□	△
	TEST No.:	CU-1	CU-2	CU-3
INITIAL	WATER CONTENT (%):	50	89.6	59
	AREA (in^2):	6.350	6.417	6.474
	HEIGHT (in.):	6.000	6.000	6.000
	DRY DENSITY (pcf):	53.9	46.1	55.3
	SATURATION (%):	64.9	92.7	82.5
	VOID RATIO:	1.988	2.495	1.730
	B-VALUE:	1	1	1
PRE-SHEAR	WATER CONTENT (%):	63.7	64.3	57.4
	DRY DENSITY (pcf):	58.7	54.1	66.1
	SATURATION (%):	94.2	84	103
	VOID RATIO:	1.744	1.975	1.437
MINOR PRIN. STRESS (psi):		10	30	50
MAX DEVIATOR STRESS (psi):		8	31.1	56.1
RATE OF STRAIN (in./min.):		0.005	0.005	0.005
FINAL WATER CONTENT (%):		63.7	64.3	57.4

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

PROJECT:	Blue Ridge Paper	TEST CONDITIONS				INITIAL	PRE-SHEAR	FINAL			
DESCRIPTION:	Lime Mud with sludge	INITIAL DIAL READING (in.):	0.43		HEIGHT (in.):	6.000	5.663		15.2400	14.384	(cm)
BORING:	B06-2	SPECIFIC GRAVITY:	2.58	est.	AREA (in^2):	6.474	6.124		41.7664	39.5077	(cm^2)
SAMPLE:	2S	INITIAL WET WT. (gms):	934.2		TOTAL DENSITY (pcf):	91.6	104.0				
DEPTH (ft.):	35.9	INITIAL DRY WT. (gms):	601.5		DRY DENSITY (pcf):	59.0	66.1				
FILE No.:	05127	CELL PRESSURE (psi):	105		WATER CONTENT (%):	55.3		57.4			
TEST No.:	CIUC-3	BACK PRESSURE (psi):	55		VOLUME TOTAL (cc):	636.52	568.28				
DATE:	2/15/2005	EFFECTIVE CONFINING PRESSURE (psi):	50		VOLUME SOLIDS (cc):	233.16					
TESTED BY:	EJL	PORE PRESSURE @ PRESHEAR (psi):	55.1		VOLUME VOIDS (cc):	403.36	335.12				
PRC (lb/div):	0.463	AXIAL STRAIN RATE (in./min.):	0.005		VOID RATIO:	1.7300	1.4373				
		MEMBRANE THICKNESS (in.):	0.012		SATURATION (%):	82.5	103.0				

TIME (min)	DIAL (in.)	LOAD (lb)	PWP (psi)	DELTA L (in.)	AREA CF	CORR. AREA (sq. in.)	IND LOAD (lbs.)	IND PWP (psi)	DEV STRESS (psi)	SIGMA 3 (psi)	SIGMA 1 (psi)	SIGMA 3' (psi)	SIGMA 1' (psi)	P (psi)	P' (psi)	Q (psi)	STRAIN (%)	A
0	0.43	53	55.3	0.0000	1.0000	6.12	3.9	0	0.6	50.0	50.6	49.8	50.4	50.3	50.1	0.3	0.00	0.32
0.5	0.4335	65	55.5	0.0035	0.9994	6.13	9.4	0.4	1.5	50.0	51.5	49.6	51.1	50.8	50.4	0.8	0.06	0.26
1	0.436	68	55.7	0.0060	0.9989	6.13	10.8	0.6	1.8	50.0	51.8	49.4	51.2	50.9	50.3	0.9	0.11	0.34
1.5	0.4375	78	56.1	0.0075	0.9987	6.13	15.4	1.0	2.5	50.0	52.5	49.0	51.5	51.3	50.3	1.3	0.13	0.40
2	0.4383	94	56.5	0.0083	0.9985	6.13	22.8	1.4	3.7	50.0	53.7	48.6	52.3	51.9	50.5	1.9	0.15	0.38
2.5	0.4392	107	57.1	0.0092	0.9984	6.13	28.9	2.0	4.7	50.0	54.7	48.0	52.7	52.4	50.4	2.4	0.16	0.43
3	0.44	120.5	57.6	0.0100	0.9982	6.13	35.1	2.5	5.7	50.0	55.7	47.5	53.2	52.9	50.4	2.9	0.18	0.44
3.5	0.441	133.5	58.1	0.0110	0.9981	6.14	41.1	3.0	6.7	50.0	56.7	47.0	53.7	53.4	50.4	3.4	0.19	0.45
4	0.442	148	58.7	0.0120	0.9979	6.14	47.8	3.6	7.8	50.0	57.8	46.4	54.2	53.9	50.3	3.9	0.21	0.46
4.5	0.4433	164	59.4	0.0133	0.9977	6.14	55.2	4.3	9.0	50.0	59.0	45.7	54.7	54.5	50.2	4.5	0.23	0.48
5	0.4444	177	60	0.0144	0.9975	6.14	61.3	4.9	10.0	50.0	60.0	45.1	55.1	55.0	50.1	5.0	0.25	0.49
6	0.4465	201	61.1	0.0165	0.9971	6.14	72.4	6.0	11.8	50.0	61.8	44.0	55.8	55.9	49.9	5.9	0.29	0.51
7	0.4493	228	62.6	0.0193	0.9966	6.14	84.9	7.5	13.8	50.0	63.8	42.5	56.3	56.9	49.4	6.9	0.34	0.54
8	0.4513	248	63.6	0.0213	0.9962	6.15	94.1	8.5	15.3	50.0	65.3	41.5	56.8	57.7	49.2	7.7	0.38	0.56
9	0.454	271	64.8	0.0240	0.9958	6.15	104.8	9.7	17.0	50.0	67.0	40.3	57.3	58.5	48.8	8.5	0.42	0.57
10	0.457	293	66.1	0.0270	0.9952	6.15	115.0	11.0	18.7	50.0	68.7	39.0	57.7	59.3	48.3	9.3	0.48	0.59
12	0.463	328	68.4	0.0330	0.9942	6.16	131.2	13.3	21.3	50.0	71.3	36.7	58.0	60.6	47.3	10.6	0.58	0.62
14	0.47	360	70.6	0.0400	0.9929	6.17	146.0	15.5	23.7	50.0	73.7	34.5	58.2	61.8	46.3	11.8	0.71	0.65
16	0.478	390	72.9	0.0480	0.9915	6.18	159.9	17.8	25.9	50.0	75.9	32.2	58.1	62.9	45.1	12.9	0.85	0.69
18	0.485	409.7	74.6	0.0550	0.9903	6.18	169.0	19.5	27.3	50.0	77.3	30.5	57.8	63.7	44.2	13.7	0.97	0.71
21	0.498	437.5	76.9	0.0680	0.9880	6.20	181.9	21.8	29.3	50.0	79.3	28.2	57.5	64.7	42.9	14.7	1.20	0.74
24	0.5115	465.5	79	0.0815	0.9856	6.21	194.8	23.9	31.4	50.0	81.4	26.1	57.5	65.7	41.8	15.7	1.44	0.76
28	0.5285	496	81.2	0.0985	0.9826	6.23	209.0	26.1	33.5	50.0	83.5	23.9	57.4	66.8	40.7	16.8	1.74	0.78
30	0.5365	510	82.2	0.1065	0.9812	6.24	215.4	27.1	34.5	50.0	84.5	22.9	57.4	67.3	40.2	17.3	1.88	0.79
35	0.559	540.5	84.2	0.1290	0.9772	6.27	229.6	29.1	36.6	50.0	86.6	20.9	57.5	68.3	39.2	18.3	2.28	0.79
40	0.5815	564	85.6	0.1515	0.9732	6.29	240.4	30.5	38.2	50.0	88.2	19.5	57.7	69.1	38.6	19.1	2.68	0.80
45	0.604	588	86.6	0.1740	0.9693	6.32	251.6	31.5	39.8	50.0	89.8	18.5	58.3	69.9	38.4	19.9	3.07	0.79
52	0.6385	618.5	87.6	0.2085	0.9632	6.36	265.7	32.5	41.8	50.0	91.8	17.5	59.3	70.9	38.4	20.9	3.68	0.78
60	0.675	653	89.1	0.2450	0.9567	6.40	281.7	34.0	44.0	50.0	94.0	16.0	60.0	72.0	38.0	22.0	4.33	0.77
75	0.747	706	91.6	0.3170	0.9440	6.49	306.2	36.5	47.2	50.0	97.2	13.5	60.7	73.6	37.1	23.6	5.60	0.77
90	0.8175	751	93.6	0.3875	0.9316	6.57	327.0	38.5	49.7	50.0	99.7	11.5	61.2	74.9	36.4	24.9	6.84	0.77
107	0.9	799	95.8	0.4700	0.9170	6.68	349.3	40.7	52.3	50.0	102.3	9.3	61.6	76.1	35.4	26.1	8.30	0.78
120	0.964	822	97.3	0.5340	0.9057	6.76	359.9	42.2	53.2	50.0	103.2	7.8	61.0	76.6	34.4	26.6	9.43	0.79
150	1.1125	875.5	101	0.6825	0.8795	6.96	384.7	45.9	55.2	50.0	105.2	4.1	59.3	77.6	31.7	27.6	12.05	0.83
180	1.261	915	104.2	0.8310	0.8533	7.18	403.0	49.1	56.1	50.0	106.1	0.9	57.0	78.1	29.0	28.1	14.67	0.87

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

PROJECT: Blue Ridge Paper
DESCRIPTION: Green LIME MUD, trace ash pockets
BORING: B06-1
SAMPLE: 1S
DEPTH (ft.): -
FILE No.: 05127
TEST No.: CIUC-1
DATE: 2/6/2006
TESTED BY: EJL
PRC (lb/div): 0.463

TEST CONDITIONS

INITIAL DIAL READING (in.):	0.3343	
SPECIFIC GRAVITY:	2.58	est.
INITIAL WET WT. (gms):	808.7	
INITIAL DRY WT. (gms):	539.1	
CELL PRESSURE (psi):	100	
BACK PRESSURE (psi):	90	
EFFECTIVE CONFINING PRESSURE (psi):	10	
PORE PRESSURE @ PRESHEAR (psi):	90.8	
AXIAL STRAIN RATE (in./min.):	0.005	
MEMBRANE THICKNESS (in.):	0.012	

	INITIAL	PRE-SHEAR	FINAL			
HEIGHT (in.):	6.000	5.861		15.2400	14.887	(cm)
AREA (in^2):	6.350	5.971		40.9651	38.5219	(cm^2)
TOTAL DENSITY (pcf):	80.9	96.1				
DRY DENSITY (pcf):	53.9	58.7				
WATER CONTENT (%):	50		63.7			
VOLUME TOTAL (cc):	624.31	573.47				
VOLUME SOLIDS (cc):	208.97					
VOLUME VOIDS (cc):	415.34	364.51				
VOID RATIO:	1.9876	1.7443				
SATURATION (%):	64.9	94.2				

TIME (min)	DIAL (in.)	LOAD (lb)	PWP (psi)	DELTA L (in.)	AREA CF	CORR. AREA (sq. in.)	IND LOAD (lbs.)	IND PWP (psi)	DEV STRESS (psi)	SIGMA 3 (psi)	SIGMA 1 (psi)	SIGMA 3' (psi)	SIGMA 1' (psi)	P (psi)	P' (psi)	Q (psi)	STRAIN (%)	A
0	0.3343	38.5	90.8	0.0000	1.0000	5.97	-1.9	0	-0.3	10.0	9.7	10.0	9.7	9.8	9.8	-0.2	0.00	0.00
0.5	0.335	52	91.0	0.0007	0.9999	5.97	4.4	0.2	0.7	10.0	10.7	9.8	10.5	10.4	10.2	0.4	0.01	0.27
1	0.3358	61	91.1	0.0015	0.9997	5.97	8.5	0.3	1.4	10.0	11.4	9.7	11.1	10.7	10.4	0.7	0.03	0.21
1.5	0.337	77.5	91.4	0.0027	0.9995	5.97	16.2	0.6	2.7	10.0	12.7	9.4	12.1	11.4	10.8	1.4	0.05	0.22
2	0.3382	87.5	91.7	0.0039	0.9993	5.97	20.8	0.9	3.5	10.0	13.5	9.1	12.6	11.7	10.8	1.7	0.07	0.26
2.5	0.3395	98.5	91.9	0.0052	0.9991	5.98	25.9	1.1	4.3	10.0	14.3	8.9	13.2	12.2	11.1	2.2	0.09	0.25
3	0.341	108	92.1	0.0067	0.9989	5.98	30.3	1.3	5.1	10.0	15.1	8.7	13.8	12.5	11.2	2.5	0.11	0.26
3.5	0.3425	116.5	92.3	0.0082	0.9986	5.98	34.2	1.5	5.7	10.0	15.7	8.5	14.2	12.9	11.4	2.9	0.14	0.26
4	0.3443	124	92.6	0.0100	0.9983	5.98	37.7	1.8	6.3	10.0	16.3	8.2	14.5	13.2	11.4	3.2	0.17	0.29
4.5	0.3465	129	92.7	0.0122	0.9979	5.98	40.0	1.9	6.7	10.0	16.7	8.1	14.8	13.3	11.4	3.3	0.21	0.28
5	0.3487	133.5	92.9	0.0144	0.9975	5.99	42.1	2.1	7.0	10.0	17.0	7.9	14.9	13.5	11.4	3.5	0.25	0.30
6	0.353	139	93.2	0.0187	0.9968	5.99	44.7	2.4	7.5	10.0	17.5	7.6	15.1	13.7	11.3	3.7	0.32	0.32
7	0.3577	142.5	93.5	0.0234	0.9960	5.99	46.3	2.7	7.7	10.0	17.7	7.3	15.0	13.9	11.2	3.9	0.40	0.35
8	0.3625	144.5	93.8	0.0282	0.9952	6.00	47.2	3.0	7.9	10.0	17.9	7.0	14.9	13.9	10.9	3.9	0.48	0.38
9	0.368	145.5	94.1	0.0337	0.9943	6.01	47.7	3.3	7.9	10.0	17.9	6.7	14.6	14.0	10.7	4.0	0.57	0.42
10	0.3733	146	94.3	0.0390	0.9933	6.01	47.9	3.5	8.0	10.0	18.0	6.5	14.5	14.0	10.5	4.0	0.67	0.44
12	0.3838	146	94.8	0.0495	0.9916	6.02	47.9	4.0	8.0	10.0	18.0	6.0	14.0	14.0	10.0	4.0	0.84	0.50
14	0.3935	146.2	95.2	0.0592	0.9899	6.03	48.0	4.4	8.0	10.0	18.0	5.6	13.6	14.0	9.6	4.0	1.01	0.55
16	0.404	146.2	95.6	0.0697	0.9881	6.04	48.0	4.8	7.9	10.0	17.9	5.2	13.1	14.0	9.2	4.0	1.19	0.60
18	0.413	145.5	95.9	0.0787	0.9866	6.05	47.7	5.1	7.9	10.0	17.9	4.9	12.8	13.9	8.8	3.9	1.34	0.65
21	0.4283	143.3	96.3	0.0940	0.9840	6.07	46.6	5.5	7.7	10.0	17.7	4.5	12.2	13.8	8.3	3.8	1.60	0.72
24	0.447	136.5	96.7	0.1127	0.9808	6.09	43.5	5.9	7.1	10.0	17.1	4.1	11.2	13.6	7.7	3.6	1.92	0.83
27	0.46	136	96.9	0.1257	0.9786	6.10	43.3	6.1	7.1	10.0	17.1	3.9	11.0	13.5	7.4	3.5	2.14	0.86
30	0.4762	131.7	97.1	0.1419	0.9758	6.12	41.3	6.3	6.7	10.0	16.7	3.7	10.4	13.4	7.1	3.4	2.42	0.93
35	0.5045	124.8	97.6	0.1702	0.9710	6.15	38.1	6.8	6.2	10.0	16.2	3.2	9.4	13.1	6.3	3.1	2.90	1.10
40	0.5295	122.5	97.8	0.1952	0.9667	6.18	37.0	7.0	6.0	10.0	16.0	3.0	9.0	13.0	6.0	3.0	3.33	1.17
45	0.554	120	97.9	0.2197	0.9625	6.20	35.9	7.1	5.8	10.0	15.8	2.9	8.7	12.9	5.8	2.9	3.75	1.23
50	0.581	115.8	98.2	0.2467	0.9579	6.23	33.9	7.4	5.4	10.0	15.4	2.6	8.0	12.7	5.3	2.7	4.21	1.36
62	0.644	107.5	98.5	0.3097	0.9472	6.30	30.1	7.7	4.8	10.0	14.8	2.3	7.1	12.4	4.7	2.4	5.28	1.61
75	0.709	104	98.7	0.3747	0.9361	6.38	28.5	7.9	4.5	10.0	14.5	2.1	6.6	12.2	4.3	2.2	6.39	1.77
90	0.788	99.8	99	0.4537	0.9226	6.47	26.5	8.2	4.1	10.0	14.1	1.8	5.9	12.0	3.8	2.0	7.74	2.00
106	0.8705	94.7	99.1	0.5362	0.9085	6.57	24.1	8.3	3.7	10.0	13.7	1.7	5.4	11.8	3.5	1.8	9.15	2.26
120	0.941	93	99.1	0.6067	0.8965	6.66	23.4	8.3	3.5	10.0	13.5	1.7	5.2	11.8	3.5	1.8	10.35	2.37
140	1.046	90.3	99.4	0.7117	0.8786	6.80	22.1	8.6	3.3	10.0	13.3	1.4	4.7	11.6	3.0	1.6	12.14	2.64
160	1.1485	87	99.4	0.8142	0.8611	6.93	20.6	8.6	3.0	10.0	13.0	1.4	4.4	11.5	2.9	1.5	13.89	2.90
194	1.251	86.5	99.5	0.9167	0.8436	7.08	20.3	8.7	2.9	10.0	12.9	1.3	4.2	11.4	2.7	1.4	15.64	3.03

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST

PROJECT:	Blue Ridge Paper
DESCRIPTION:	SLUDGE,ASH,LIME,GRAVEL
BORING:	B06-1
SAMPLE:	2S
DEPTH (ft.):	16.9
FILE No.:	05127
TEST No.:	CIUC-2
DATE:	2/9/2006
TESTED BY:	EJL
PRC (lb/div):	0.463

TEST CONDITIONS

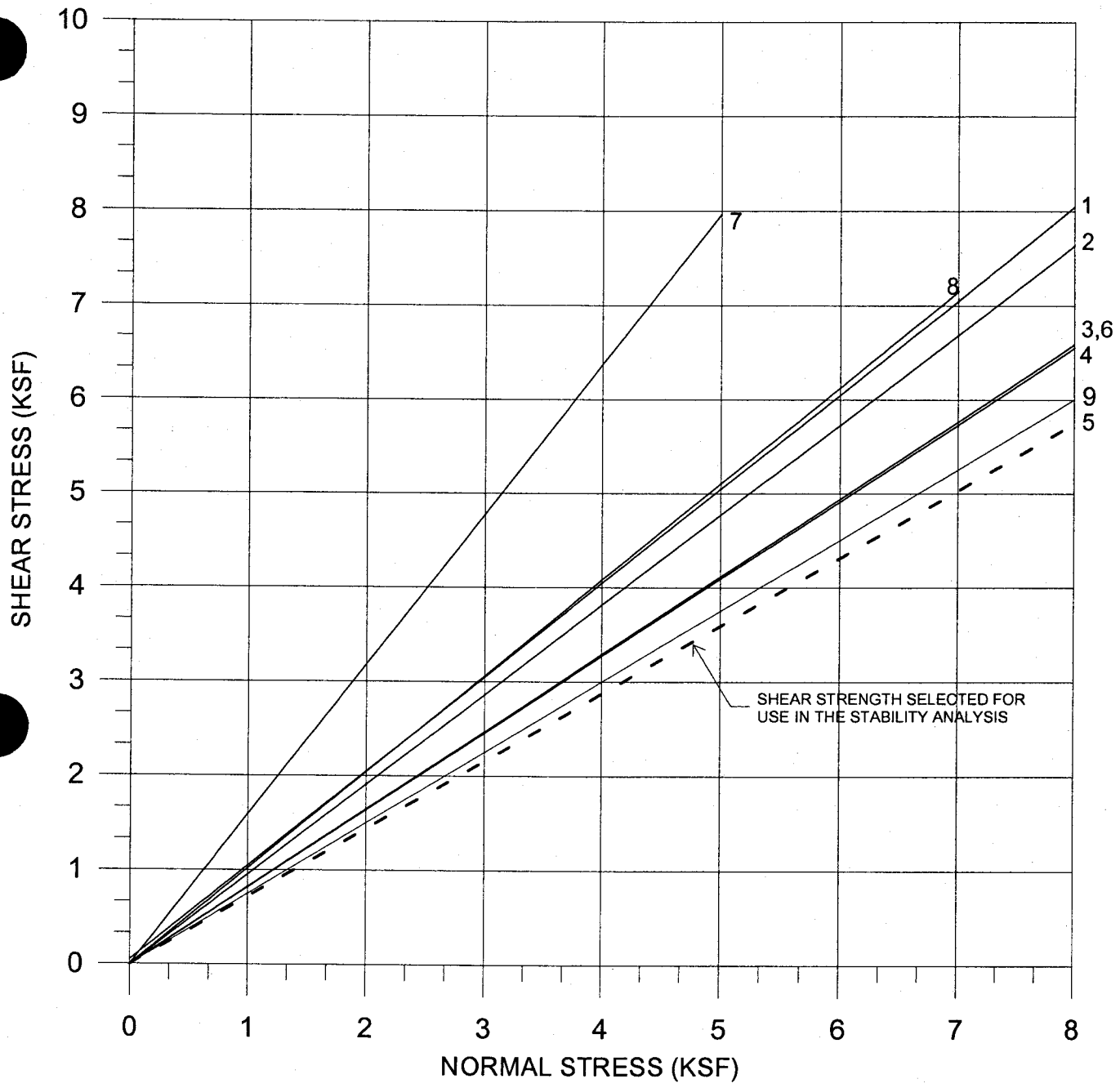
INITIAL DIAL READING (in.):	0.59	
SPECIFIC GRAVITY:	2.58	est.
INITIAL WET WT. (gms):	883.1	
INITIAL DRY WT. (gms):	465.8	
CELL PRESSURE (psi):	105	
BACK PRESSURE (psi):	75	
EFFECTIVE CONFINING PRESSURE (psi):	30	
PORE PRESSURE @ PRESHEAR (psi):	75.4	
AXIAL STRAIN RATE (in./min.):	0.005	
MEMBRANE THICKNESS (in.):	0.012	

	INITIAL	PRE-SHEAR	FINAL			
HEIGHT (in.):	6.000	5.600		15.2400	14.224	(cm)
AREA (in²):	6.417	5.852		41.3986	37.7548	(cm²)
TOTAL DENSITY (pcf):	87.4	89.0				
DRY DENSITY (pcf):	46.1	54.1				
WATER CONTENT (%):	89.6		64.3			
VOLUME TOTAL (cc):	630.92	537.02				
VOLUME SOLIDS (cc):	180.53					
VOLUME VOIDS (cc):	450.38	356.49				
VOID RATIO:	2.4948	1.9747				
SATURATION (%):	92.7	84.0				

TIME (min)	DIAL (in.)	LOAD (lb)	PWP (psi)	DELTA L (in.)	AREA CF	CORR. AREA (sq. in.)	IND LOAD (lbs.)	IND PWP (psi)	DEV STRESS (psi)	SIGMA 3 (psi)	SIGMA 1 (psi)	SIGMA 3' (psi)	SIGMA 1' (psi)	P (psi)	P' (psi)	Q (psi)	STRAIN (%)	A
0	0.59	45	75.4	0.0000	1.0000	5.85	0.1	0	0.0	30.0	30.0	30.0	30.0	30.0	30.0	0.0	0.00	0.00
0.5	0.5915	93	76.7	0.0015	0.9997	5.85	22.4	1.3	3.8	30.0	33.8	28.7	32.5	31.9	30.6	1.9	0.03	0.34
1	0.594	119	77.9	0.0040	0.9993	5.86	34.4	2.5	5.9	30.0	35.9	27.5	33.4	32.9	30.4	2.9	0.07	0.43
1.5	0.5955	130.3	78.4	0.0055	0.9990	5.86	39.6	3.0	6.8	30.0	36.8	27.0	33.8	33.4	30.4	3.4	0.10	0.44
2	0.597	140	78.9	0.0070	0.9988	5.86	44.1	3.5	7.5	30.0	37.5	26.5	34.0	33.8	30.3	3.8	0.13	0.46
2.5	0.5985	150	79.4	0.0085	0.9985	5.86	48.8	4.0	8.3	30.0	38.3	26.0	34.3	34.2	30.2	4.2	0.15	0.48
3	0.6	159.5	79.9	0.0100	0.9982	5.86	53.2	4.5	9.1	30.0	39.1	25.5	34.6	34.5	30.0	4.5	0.18	0.50
3.5	0.6018	168	80.3	0.0118	0.9979	5.86	57.1	4.9	9.7	30.0	39.7	25.1	34.8	34.9	30.0	4.9	0.21	0.50
4	0.6034	177	80.9	0.0134	0.9976	5.87	61.3	5.5	10.4	30.0	40.4	24.5	34.9	35.2	29.7	5.2	0.24	0.53
4.5	0.605	185	81.4	0.0150	0.9973	5.87	65.0	6.0	11.1	30.0	41.1	24.0	35.1	35.5	29.5	5.5	0.27	0.54
5	0.6068	192.5	81.9	0.0168	0.9970	5.87	68.4	6.5	11.7	30.0	41.7	23.5	35.2	35.8	29.3	5.8	0.30	0.56
6	0.61	206	82.8	0.0200	0.9964	5.87	74.7	7.4	12.7	30.0	42.7	22.6	35.3	36.4	29.0	6.4	0.36	0.58
7	0.616	218	83.7	0.0260	0.9954	5.88	80.2	8.3	13.6	30.0	43.6	21.7	35.3	36.8	28.5	6.8	0.46	0.61
8	0.62	229.5	84.4	0.0300	0.9946	5.88	85.6	9.0	14.5	30.0	44.5	21.0	35.5	37.3	28.3	7.3	0.54	0.62
9	0.6235	240	85.2	0.0335	0.9940	5.89	90.4	9.8	15.4	30.0	45.4	20.2	35.6	37.7	27.9	7.7	0.60	0.64
10	0.6275	249	85.9	0.0375	0.9933	5.89	94.6	10.5	16.1	30.0	46.1	19.5	35.6	38.0	27.5	8.0	0.67	0.65
12	0.6355	265	87.1	0.0455	0.9919	5.90	102.0	11.7	17.3	30.0	47.3	18.3	35.6	38.6	26.9	8.6	0.81	0.68
14	0.644	276.5	88	0.0540	0.9904	5.91	107.3	12.6	18.2	30.0	48.2	17.4	35.6	39.1	26.5	9.1	0.96	0.69
16	0.6535	286	89	0.0635	0.9887	5.92	111.7	13.6	18.9	30.0	48.9	16.4	35.3	39.4	25.8	9.4	1.13	0.72
18	0.6625	282.5	89.9	0.0725	0.9871	5.93	110.1	14.5	18.6	30.0	48.6	15.5	34.1	39.3	24.8	9.3	1.29	0.78
21	0.6773	303.5	90.9	0.0873	0.9844	5.94	119.8	15.5	20.2	30.0	50.2	14.5	34.7	40.1	24.6	10.1	1.56	0.77
24	0.692	315	91.7	0.1020	0.9818	5.96	125.2	16.3	21.0	30.0	51.0	13.7	34.7	40.5	24.2	10.5	1.82	0.78
27	0.707	327	92.2	0.1170	0.9791	5.98	130.7	16.8	21.9	30.0	51.9	13.2	35.1	40.9	24.1	10.9	2.09	0.77
30	0.723	337	92.8	0.1330	0.9763	5.99	135.3	17.4	22.6	30.0	52.6	12.6	35.2	41.3	23.9	11.3	2.38	0.77
35	0.744	349	93.4	0.1540	0.9725	6.02	140.9	18.0	23.4	30.0	53.4	12.0	35.4	41.7	23.7	11.7	2.75	0.77
40	0.769	357	94	0.1790	0.9680	6.05	144.6	18.6	23.9	30.0	53.9	11.4	35.3	42.0	23.4	12.0	3.20	0.78
45	0.7935	362.5	94.5	0.2035	0.9637	6.07	147.2	19.1	24.2	30.0	54.2	10.9	35.1	42.1	23.0	12.1	3.63	0.79
50	0.819	375	94.7	0.2290	0.9591	6.10	152.9	19.3	25.1	30.0	55.1	10.7	35.8	42.5	23.2	12.5	4.09	0.77
60	0.867	394.5	95.2	0.2770	0.9505	6.16	162.0	19.8	26.3	30.0	56.3	10.2	36.5	43.2	23.4	13.2	4.95	0.75
75	0.9423	410	95.6	0.3523	0.9371	6.24	169.1	20.2	27.1	30.0	57.1	9.8	36.9	43.5	23.3	13.5	6.29	0.75
90	1.0416	423.5	95.9	0.4516	0.9194	6.37	175.4	20.5	27.6	30.0	57.6	9.5	37.1	43.8	23.3	13.8	8.06	0.74
105	1.092	441	96.2	0.5020	0.9104	6.43	183.5	20.8	28.5	30.0	58.5	9.2	37.7	44.3	23.5	14.3	8.96	0.73
120	1.168	450	96.3	0.5780	0.8968	6.53	187.7	20.9	28.8	30.0	58.8	9.1	37.9	44.4	23.5	14.4	10.32	0.73
140	1.2685	469	96.4	0.6785	0.8788	6.66	196.5	21.0	29.5	30.0	59.5	9.0	38.5	44.8	23.8	14.8	12.12	0.71
160	1.368	492	96.4	0.7780	0.8611	6.80	207.1	21.0	30.5	30.0	60.5	9.0	39.5	45.2	24.2	15.2	13.89	0.69
180	1.469	511	96.4	0.8790	0.8430	6.94	215.9	21.0	31.1	30.0	61.1	9.0	40.1	45.6	24.6	15.6	15.70	0.68

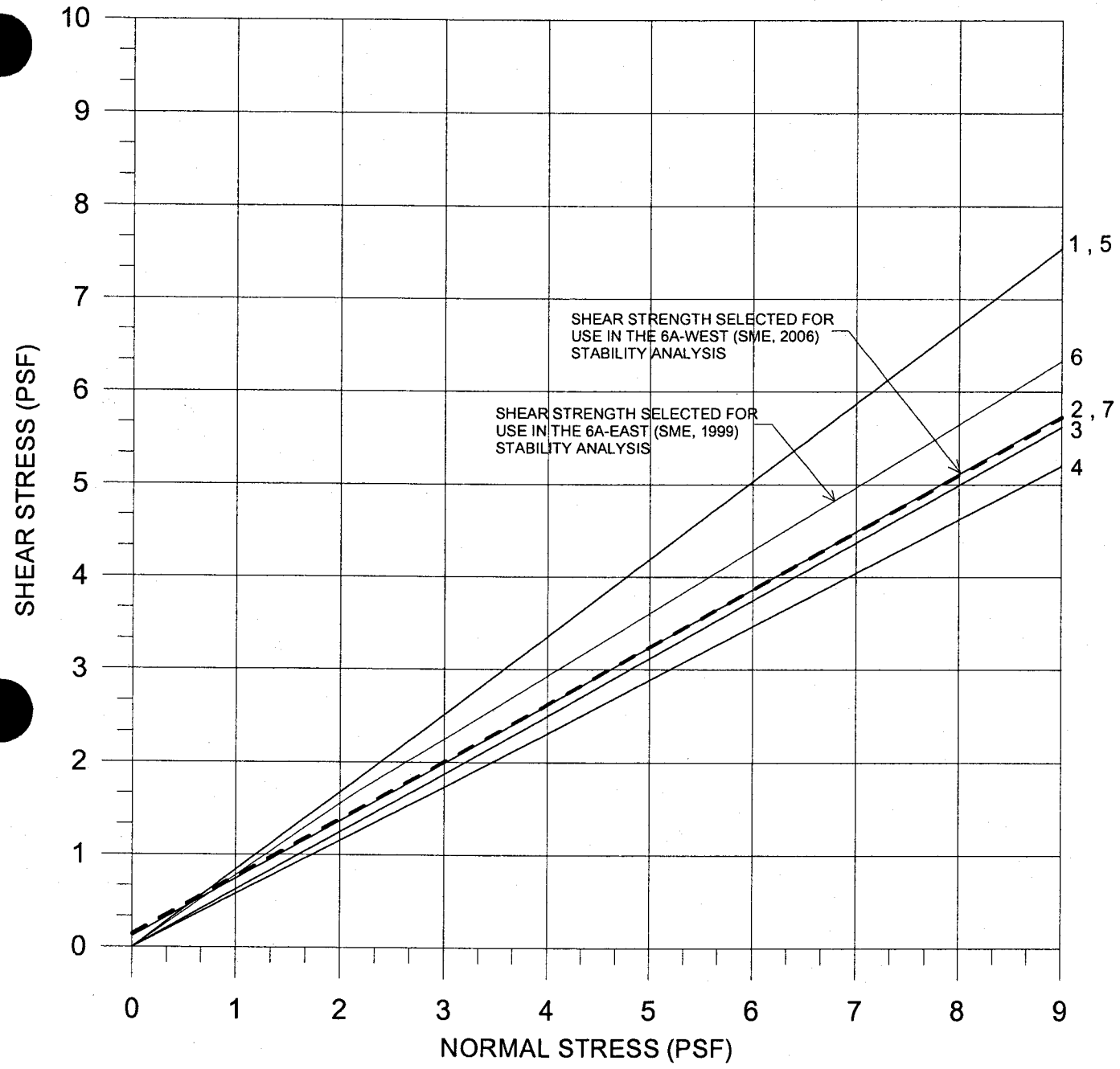
APPENDIX D

SHEAR STRENGTH SELECTED FOR USE IN THE STABILITY ANALYSIS



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-1
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR WASTES
LANDFILL NO. 6A-WEST
BLUE RIDGE PAPER PRODUCTS INC.



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

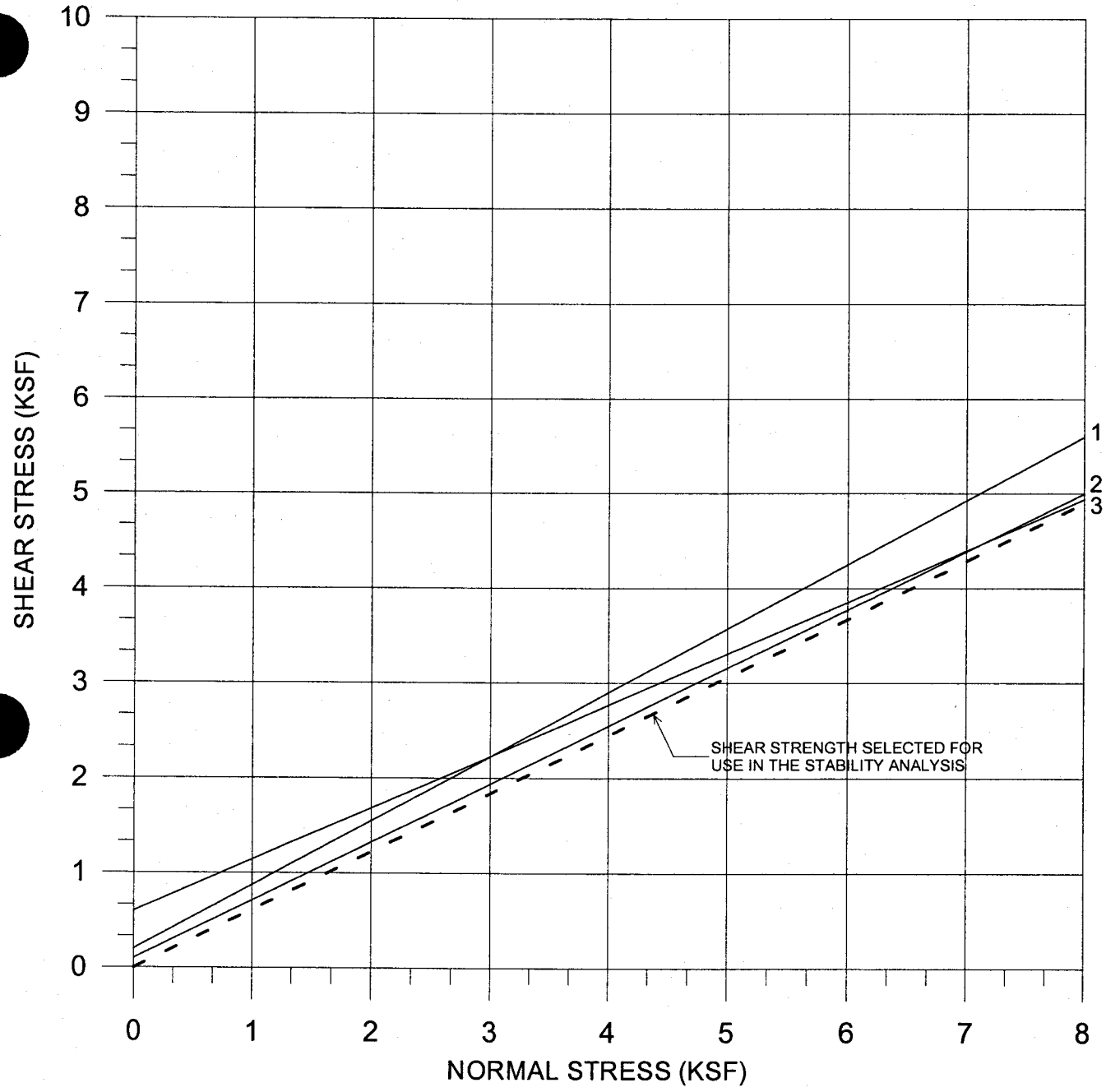
4) 30°, 0 KSF; LAW 1982, CIUC TEST

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
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR PERIMETER DIKE SOILS
LANDFILL NO. 6A-WEST
BLUE RIDGE PAPER PRODUCTS INC.



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-3
PLOT OF AVAILABLE EFFECTIVE SHEAR STRENGTHS FOR FOUNDATION SOILS
LANDFILL NO. 6A-WEST
BLUE RIDGE PAPER PRODUCTS INC.

Table D-1
Summary of Waste Geotechnical Properties Used in the Stability Analysis
Landfill 6A-East and West
Blue Ridge Paper Products Inc.

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		#N\A				40	200	Sludge, Compaction Test
(1)		Sample #2		#N\A						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	#N\A	79	35.7	0			Ash
(3)	B102	1S	12.5	#N\A	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
Summary of Perimeter Dike Geotechnical Properties Used in the Stability Analysis
Landfill 6A-East and West
Blue Ridge Paper Products Inc.

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-3
Summary of Foundation Soil Geotechnical Properties Used in the Stability Analysis
Landfill 6A-East and West
Blue Ridge Paper Products Inc.

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

APPENDIX E

STABILITY ANALYSIS

Title: Blue Ri[redacted]ner
Comments: A[redacted]ste sideslope
Name: G:\Brpp[redacted]6a-west\Vertical expansion\SlopeW\aa003.gsz

A-A WASTE FAILURE

[redacted]n 1 = Material Number: 1
[redacted]gion 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

BISHOP
Method: Ordinary
Factor of Safety: 2.184
Horz Seismic Load: 0

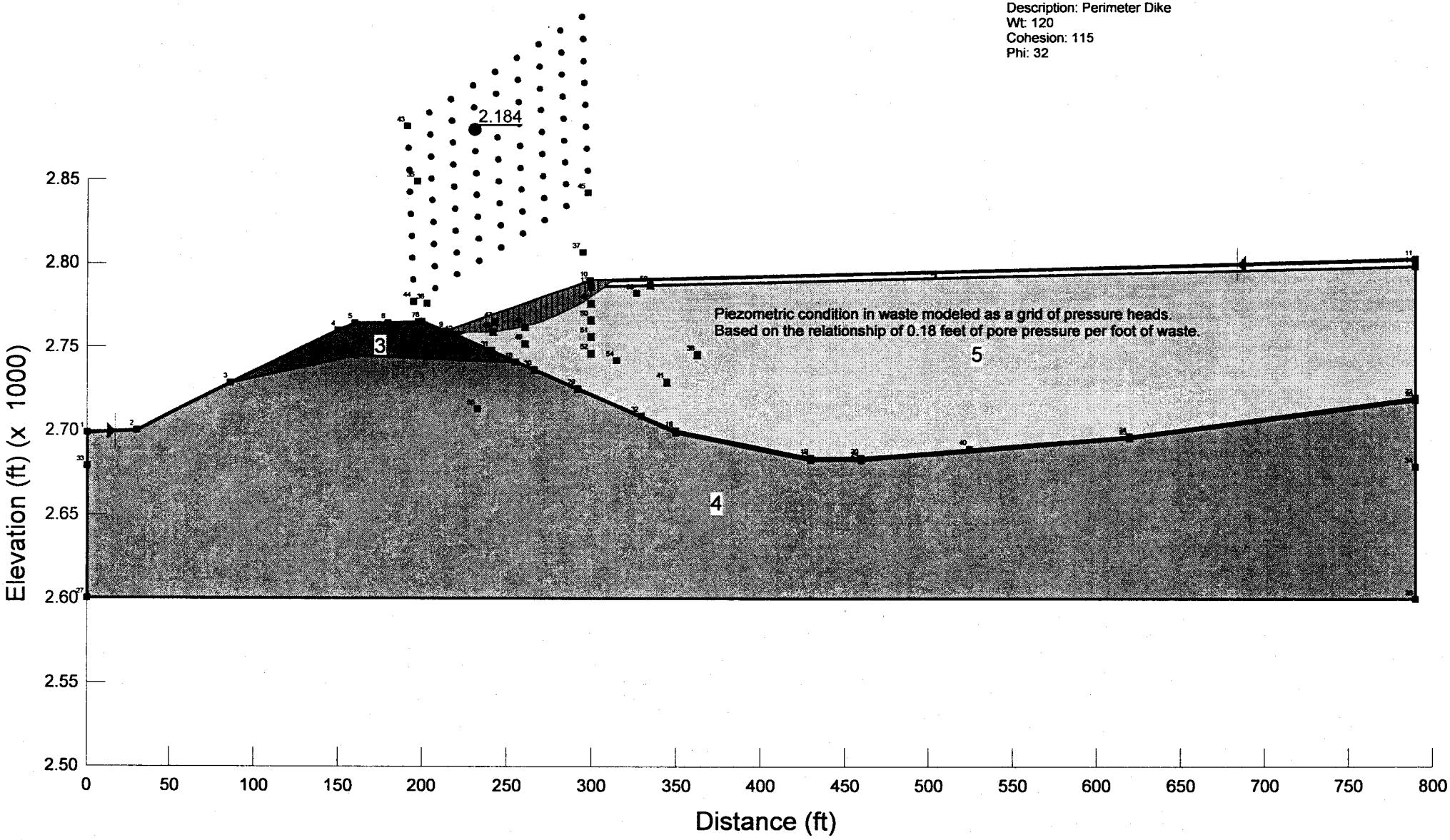
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ri[redacted]per
Comments: A-A' waste sideslope
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa003q.gsz

A-A WASTE FAILURE SEISMIC CASE

[redacted]ion 1 = Material Number: 1
Region 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

BISHOP
Method: Ordinary
Factor of Safety: 1.509
Horz Seismic Load: 0.13

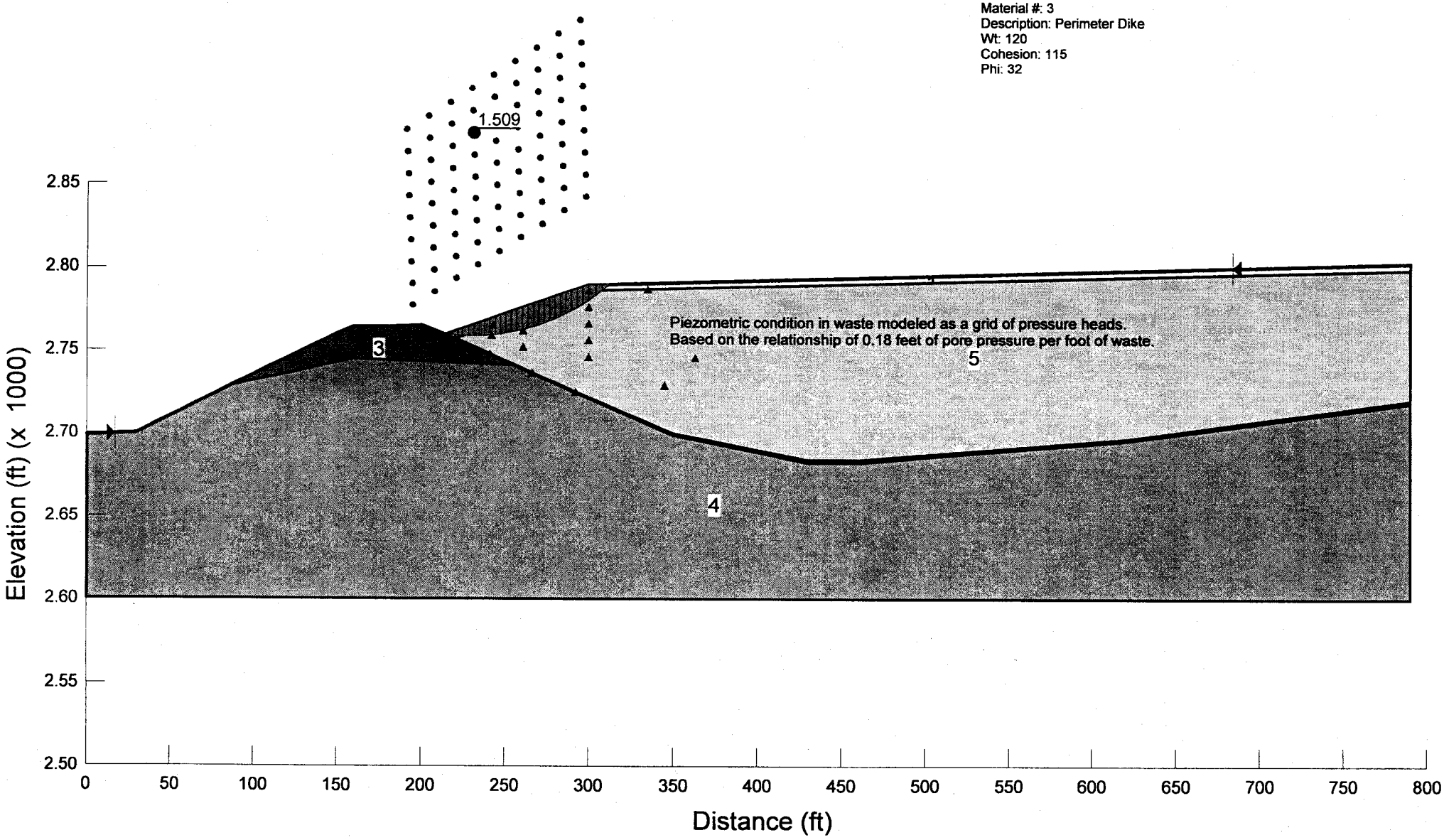
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ri[redacted]er
Comments: A[redacted]rimeter Dike Sideslope
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa004.gsz

A-A'

Perimeter Dike / WASTE

FAILURE SURFACE

[redacted]n 1 = Material Number: 1
[redacted]ion 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Method: Ordinary
Factor of Safety: 2.084
Horz Seismic Load: 0

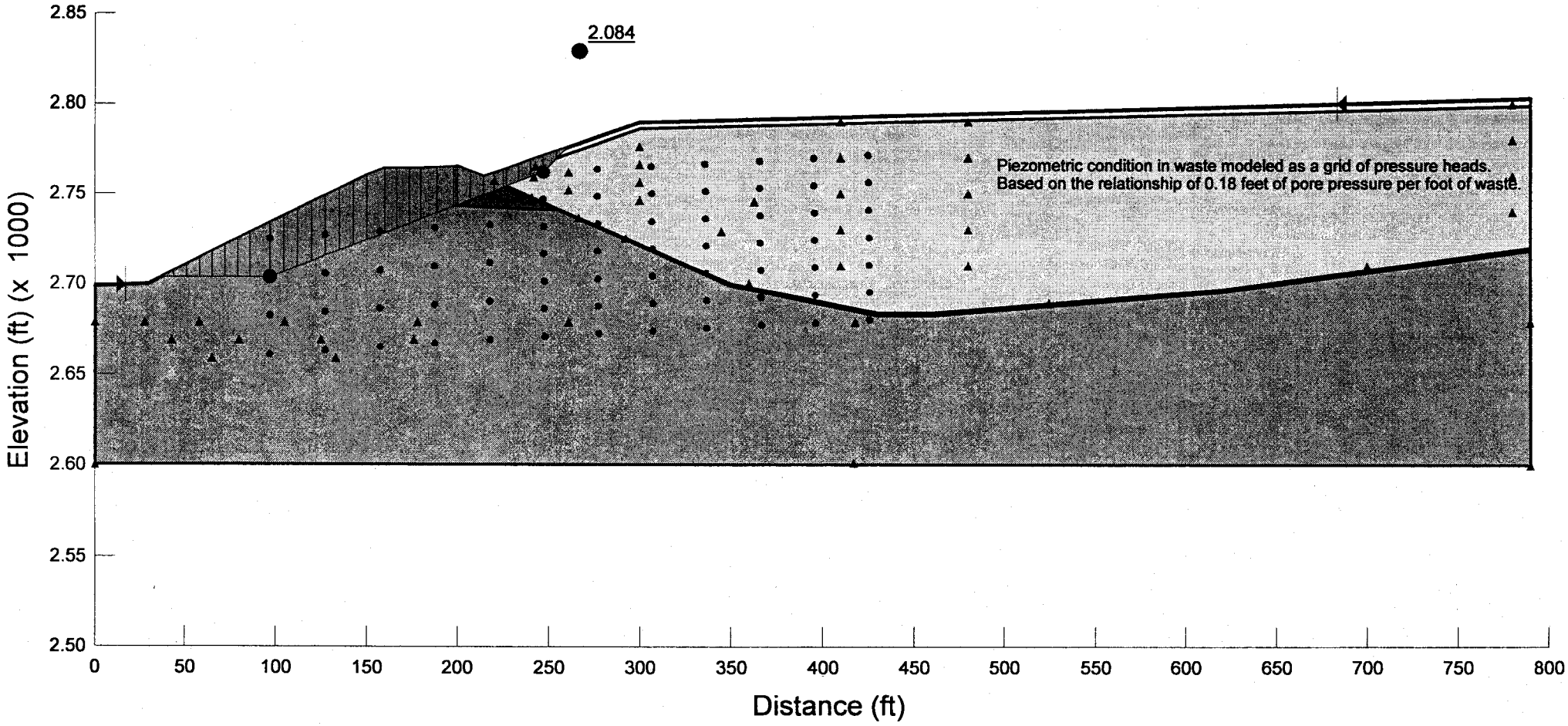
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ri[redacted]er
Comments: A[redacted]rimeter Dike Sideslope
Name: G:\Brpp\[redacted]\6a-west\Vertical expansion\SlopeW\aa004q.gsz

[redacted]on 1 = Material Number: 1
[redacted]gion 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

A-A'

Perimeter Dike/Waste
Failure Surface
Seismic Case

JANUARY

Method: Ordinary
Factor of Safety: 1.362
Horz Seismic Load: 0.13

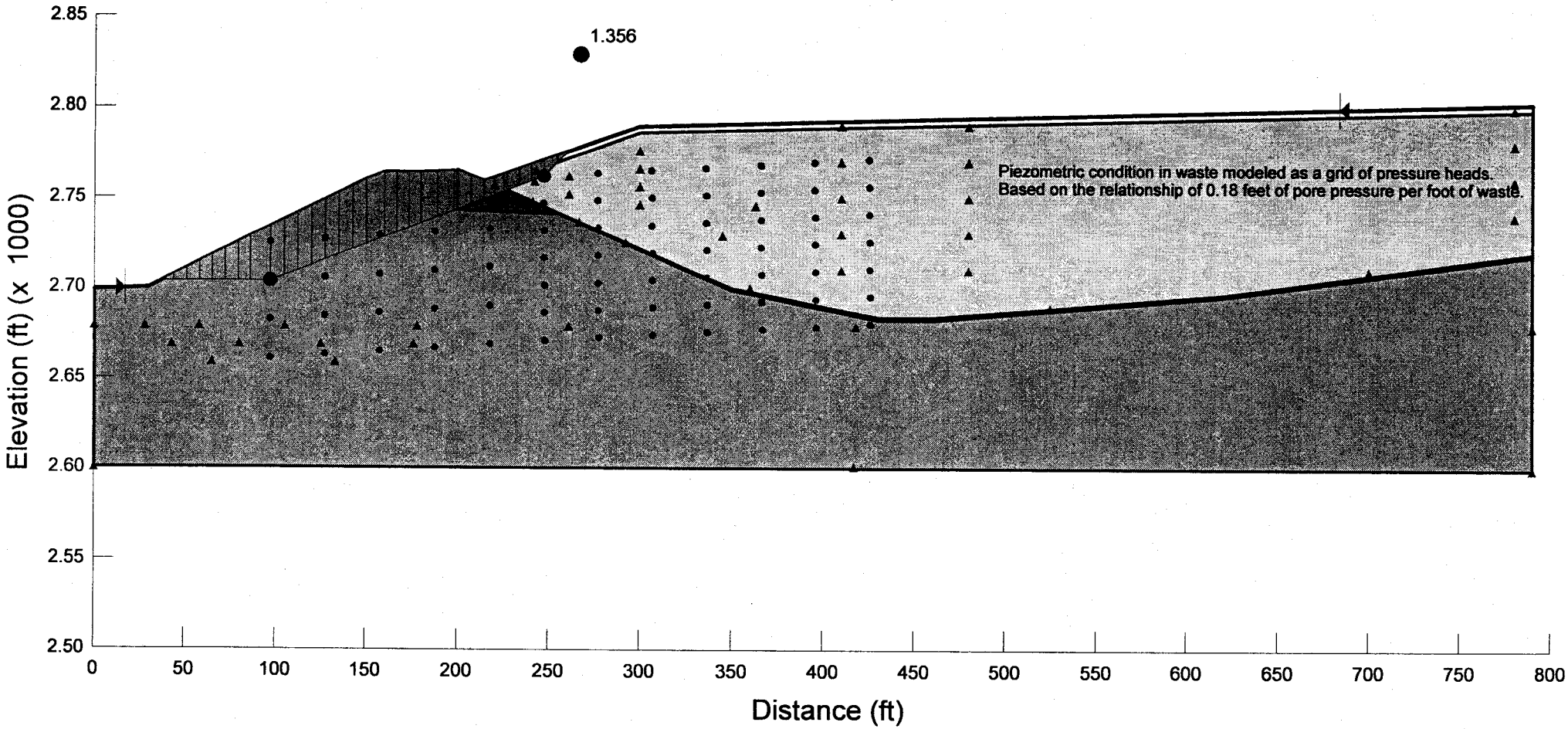
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ridge [redacted]per
Comments: A-A' foundation/waste
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa005.gsz

A-A'

Foundation/waste

Failure Surface

Region 1 = Material Number: 1
Region 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Method: Ordinary
Factor of Safety: 2.531
Horz Seismic Load: 0

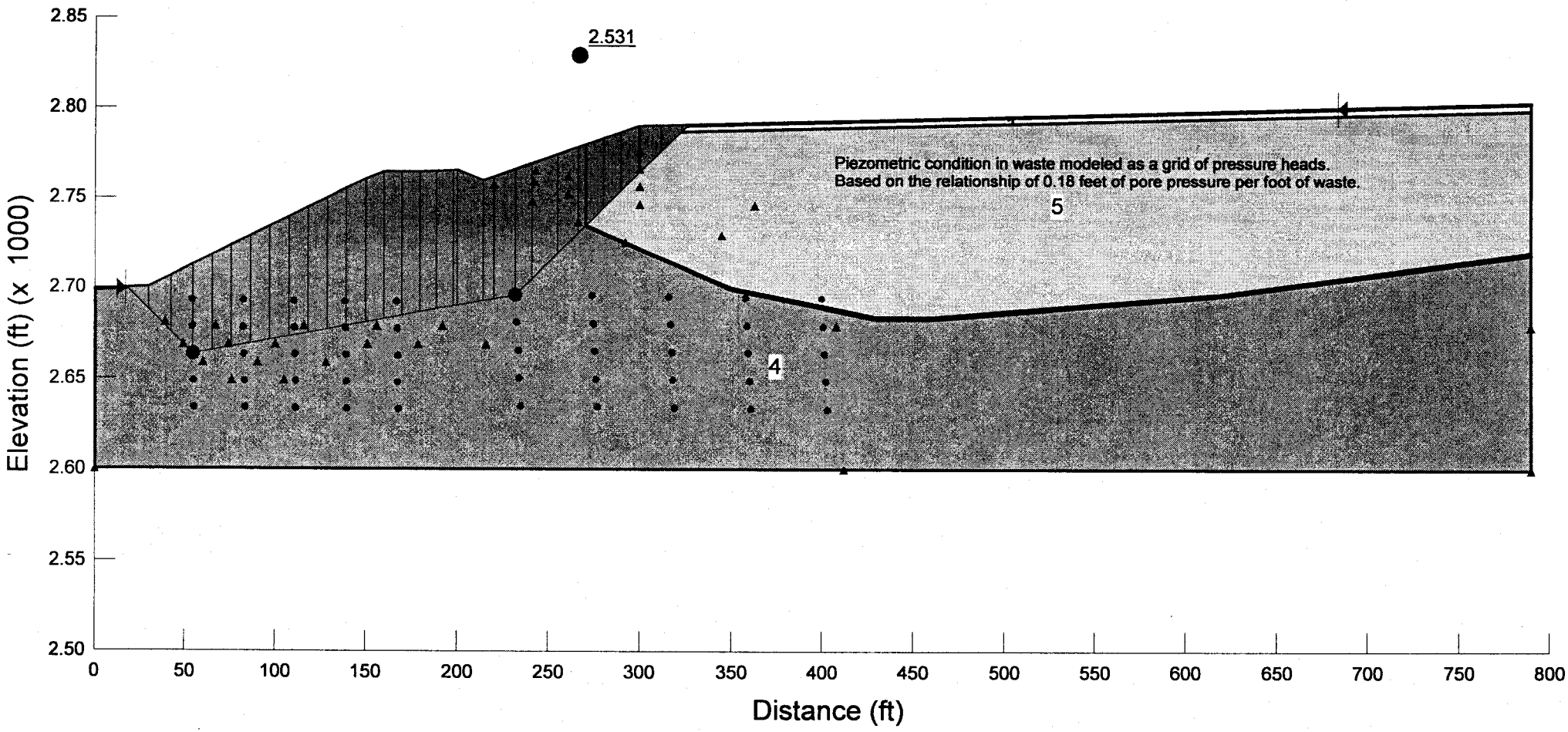
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ridg[redacted]per
Comments: A-A' foundation/waste
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa005q.gsz

A - A'

FOUNDATION/WASTE
FAILURE SURFACE
SEISMIC CASE

Region 1 = Material Number: 1
Region 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Method: Ordinary
Factor of Safety: 1.702
Horz Seismic Load: 0.13

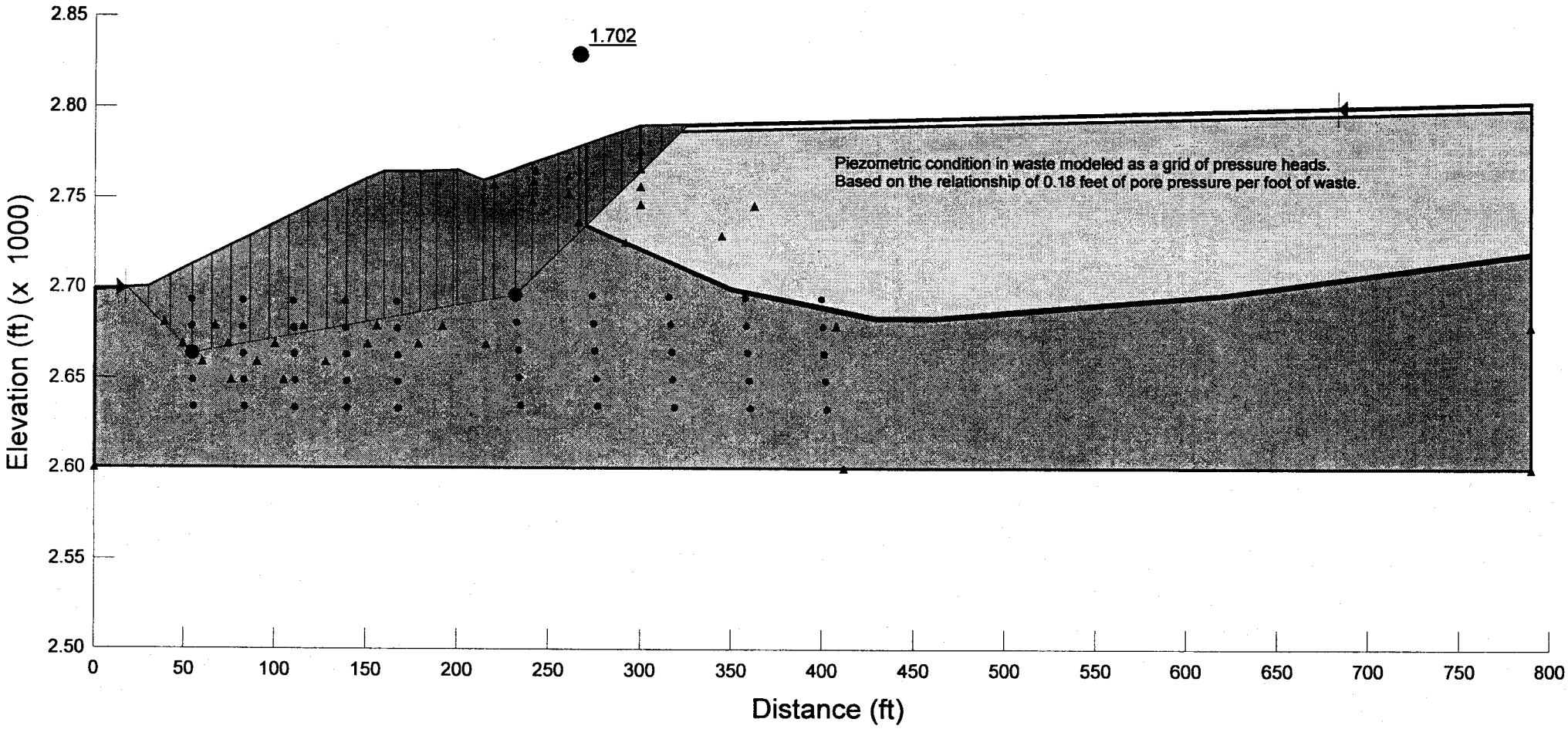
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35



Title: Blue Ridge [redacted]
Comments: B-B' waste
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb001.gsz
Date: 3/14/2006

B-B' WASTE FAILURE

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

BISHOP
Method: Ordinary
Factor of Safety: 2.478
Horz Seismic Load: 0

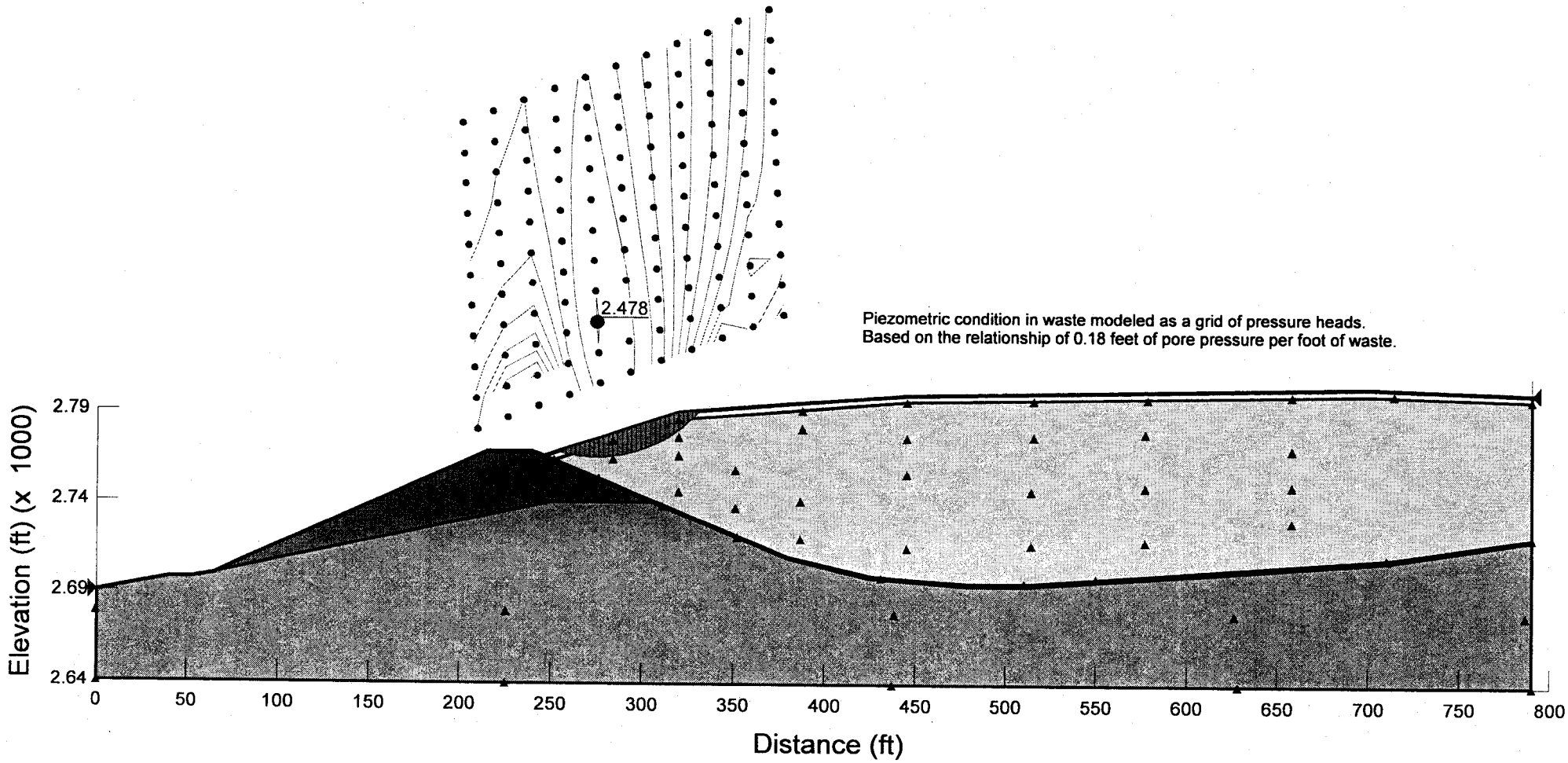
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5



Title: Blue Ridge Paper
Comments: B-B' waste
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb001q.gsz
Date: 3/14/2006

B-B'

WASTE FAILURE

SEISMIC CASE

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

BISHOP

Method: Ordinary
Factor of Safety: 1.686
Horz Seismic Load: 0.13

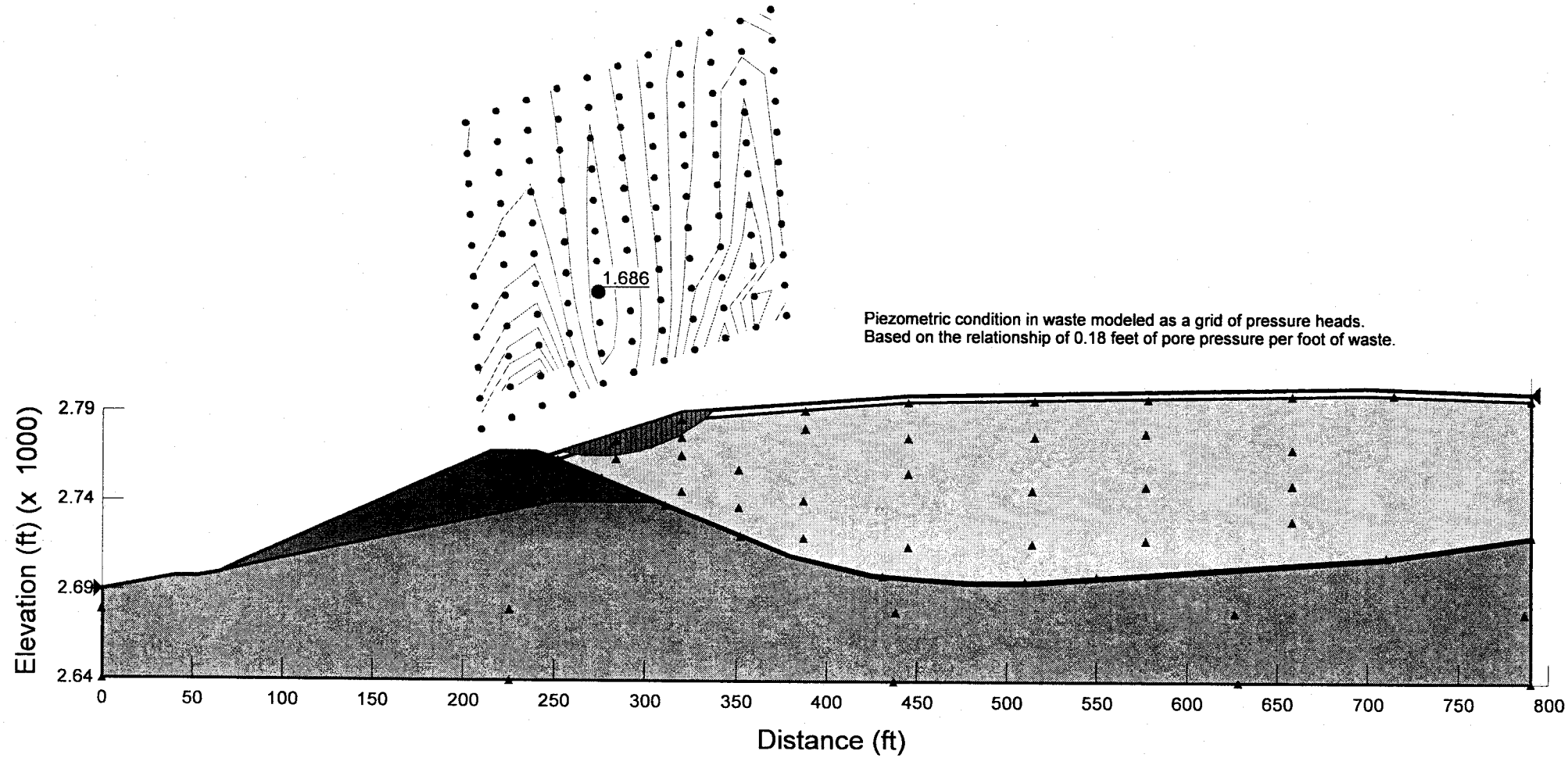
Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5



Title: Blue Ridge Paper
Comments: B-B' dike/foundation
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb002.gsz
Date: 3/14/2006

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

Method: Ordinary
Factor of Safety: 1.583
Horz Seismic Load: 0

BISHOP

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

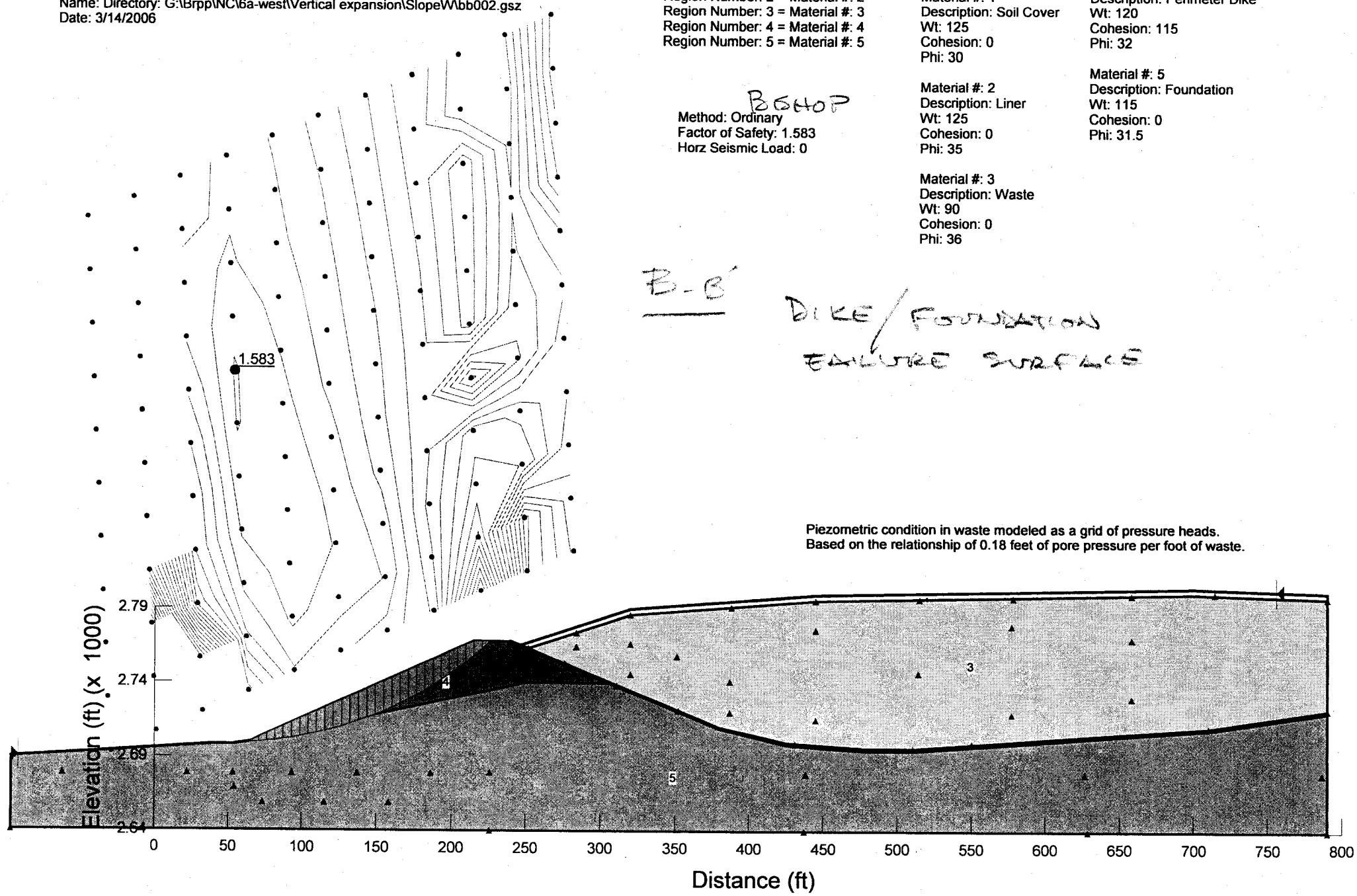
Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5

B-B'

DIKE/FOUNDATION FAILURE SURFACES

Piezometric condition in waste modeled as a grid of pressure heads.
Based on the relationship of 0.18 feet of pore pressure per foot of waste.



Title: Blue Ridge Paper
Comments: B-B' dike/foundation
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb002q.gsz
Date: 3/14/2006

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

BISHOP
Method: Ordinary
Factor of Safety: 1.164
Horz Seismic Load: 0.13

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

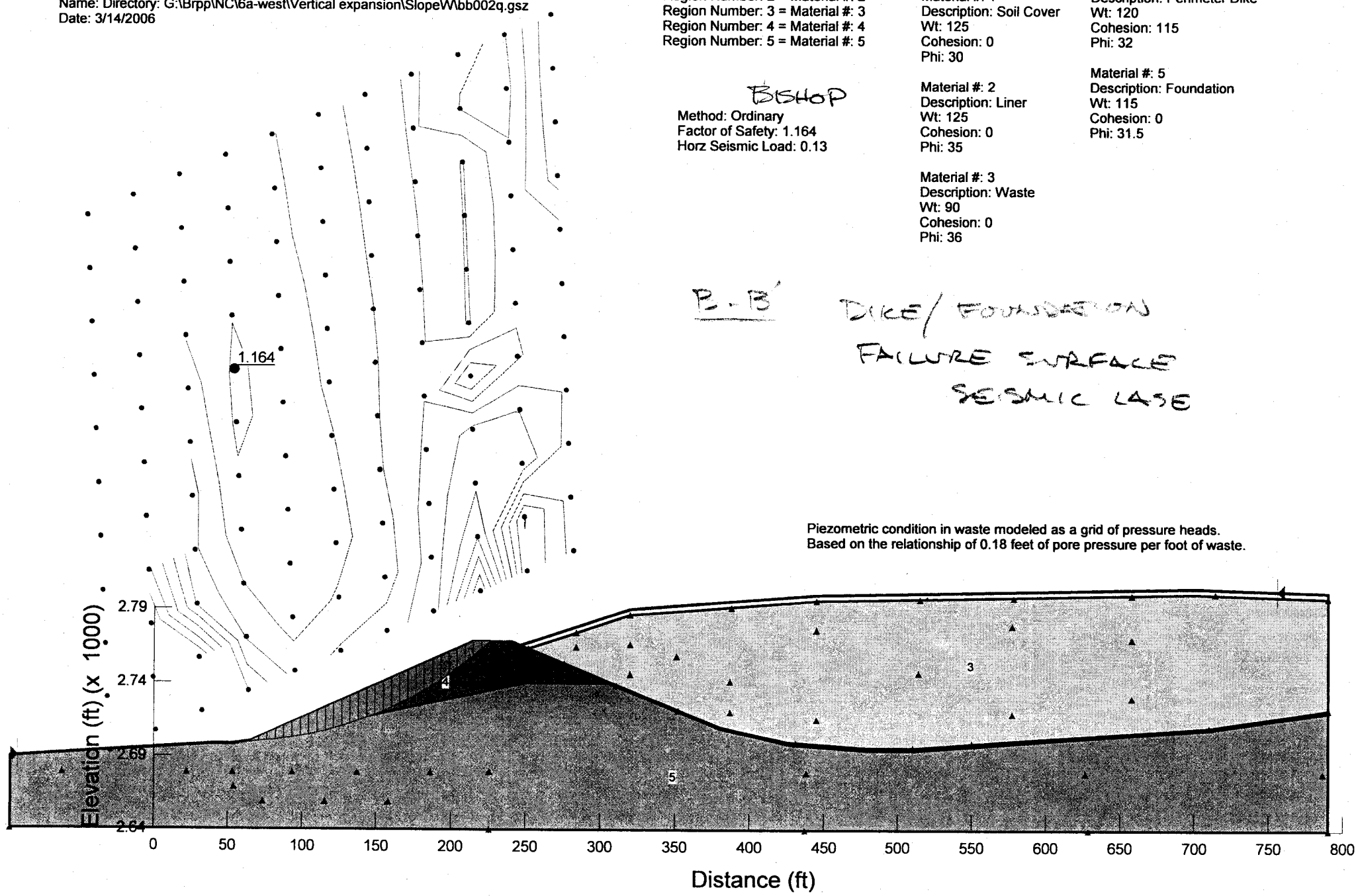
Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5

P.-B' DIKE/FOUNDATION
FAILURE SURFACE
SEISMIC CASE

Piezometric condition in waste modeled as a grid of pressure heads.
Based on the relationship of 0.18 feet of pore pressure per foot of waste.



Title: Blue Ridge Paper
Comments: B-B' waste/foundation/dike
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb003.gsz
Date: 3/14/2006

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

Method: Ordinary
Factor of Safety: 2.053
Horz Seismic Load: 0

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

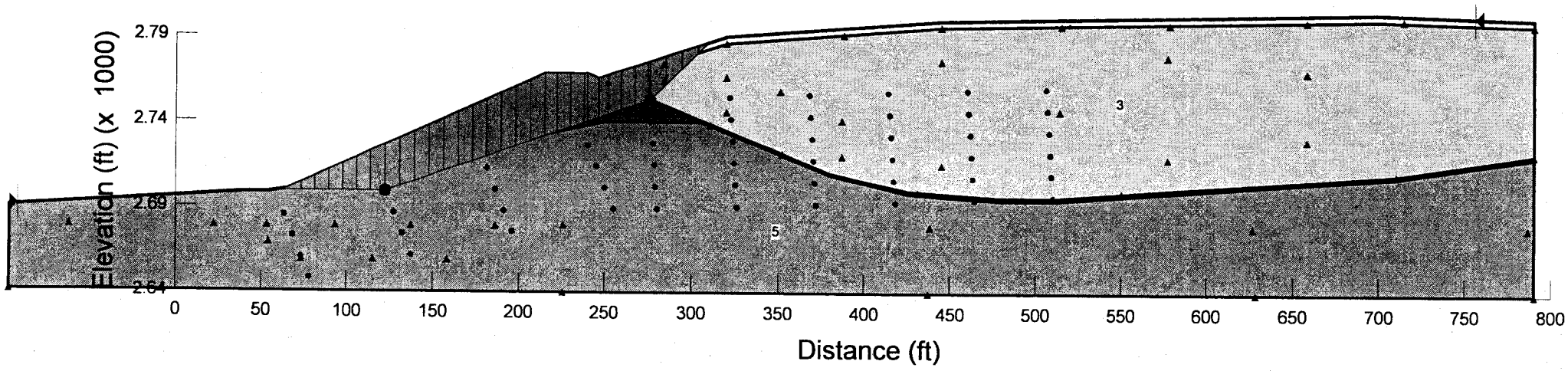
Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5

B-B'

WASTE / FOUNDATION / DIKE FAILURE SURFACE

2.053

Piezometric condition in waste modeled as a grid of pressure heads.
Based on the relationship of 0.18 feet of pore pressure per foot of waste.



Title: Blue Ridge Paper
Comments: B-B' waste/foundation/dike
Name: Directory: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\bb003q.gsz
Date: 3/14/2006

Region Number: 1 = Material #: 1
Region Number: 2 = Material #: 2
Region Number: 3 = Material #: 3
Region Number: 4 = Material #: 4
Region Number: 5 = Material #: 5

Method: Ordinary
Factor of Safety: 1.455
Horz Seismic Load: 0.13

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

Material #: 3
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

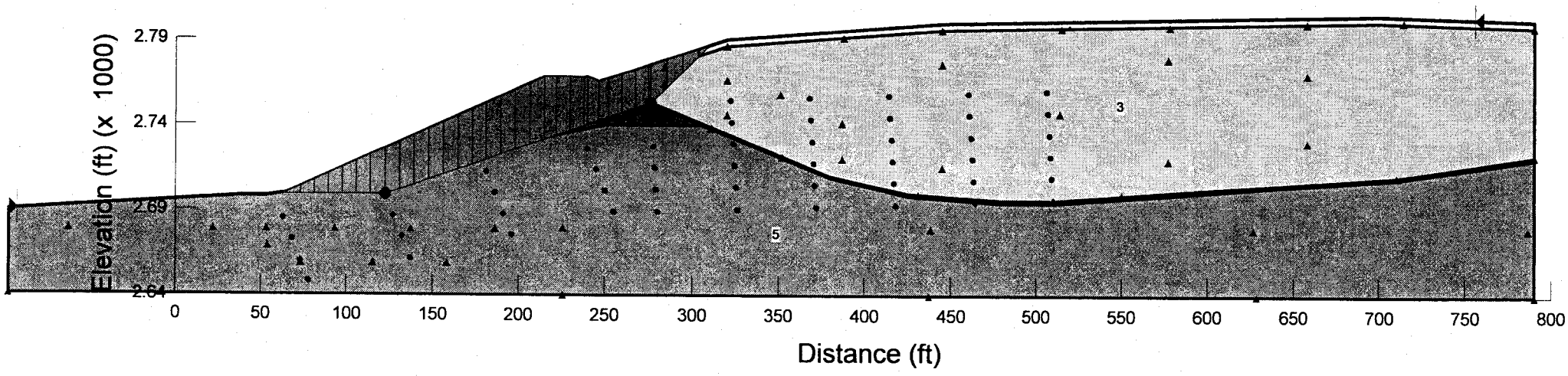
Material #: 4
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 5
Description: Foundation
Wt: 115
Cohesion: 0
Phi: 31.5

B-B' WASTE/FOUNDATION/DIKE
FAILURE SURFACE
SEISMIC CASE

1.455

Piezometric condition in waste modeled as a grid of pressure heads.
Based on the relationship of 0.18 feet of pore pressure per foot of waste.



Title: Blue Ri[redacted]er
Comments: A-[redacted]rimeter Dike Sideslope
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa007.gsz

[redacted]n 1 = Material Number: 1
[redacted]gion 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Method: View: Ordinary
Factor of Safety: 1.405
Horz Seismic Load: 0

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

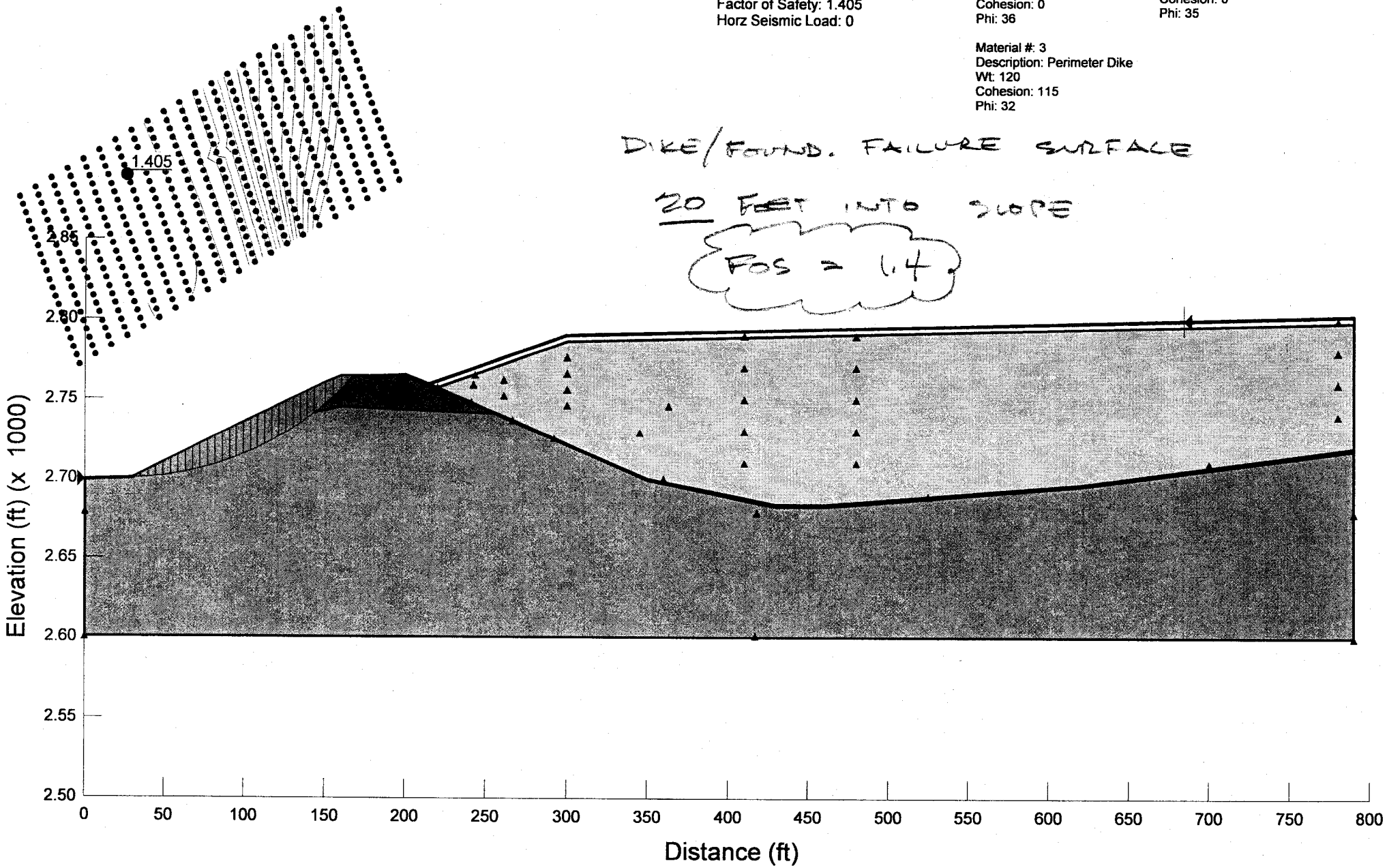
Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

DIKE/FOUND. FAILURE SURFACE

20 FEET INTO SLOPE

FOS = 1.4



Title: Blue Ridge Paper
Comments: A-A' Perimeter Dike Sideslope
Name: G:\Brpp\NC\6a-west\Vertical expansion\SlopeW\aa006.gsz

Region 1 = Material Number: 1
Region 2 = Material Number: 5
Region 3 = Material Number: 3
Region 4 = Material Number: 4
Region 5 = Material Number: 2

Method: Ordinary
Factor of Safety: 1.355
Horz Seismic Load: 0

Material #: 1
Description: Soil Cover
Wt: 125
Cohesion: 0
Phi: 30

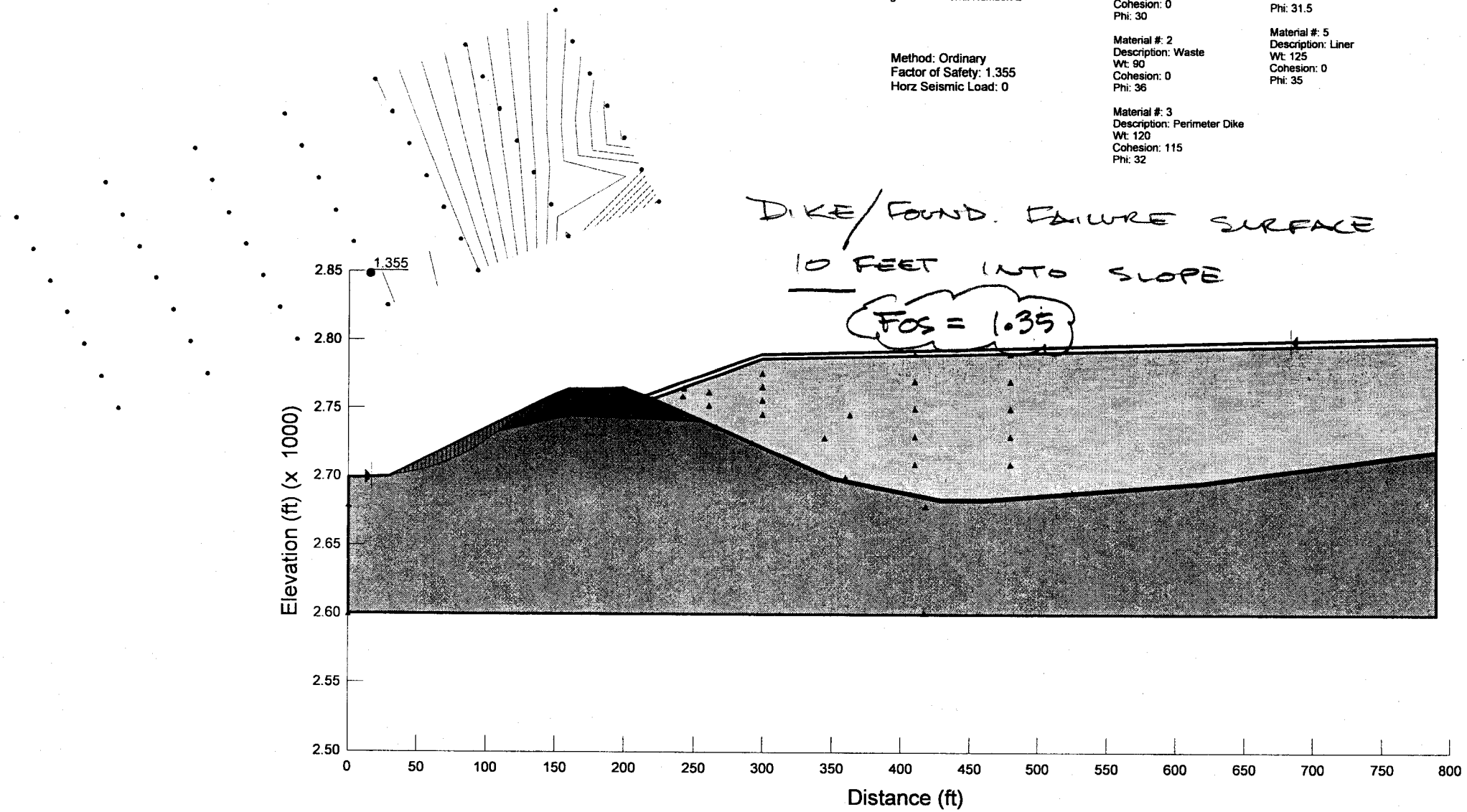
Material #: 2
Description: Waste
Wt: 90
Cohesion: 0
Phi: 36

Material #: 3
Description: Perimeter Dike
Wt: 120
Cohesion: 115
Phi: 32

Material #: 4
Description: Foundation Soil
Wt: 115
Cohesion: 0
Phi: 31.5

Material #: 5
Description: Liner
Wt: 125
Cohesion: 0
Phi: 35

DIKE/FOUND. FAILURE SURFACE
10 FEET INTO SLOPE
FOS = 1.35



INFINITE SLOPE CALCULATION

PROJECT	COMP. BY	JOB NO.
INFINITE SLOPE CALCULATION	MKR	99063
	CHK. BY	DATE 7/20/99

CALCULATE STABILITY OF SOIL COVER AND WASTE OPERATING FACE USING INFINITE SLOPE CALCULATION (LAMB & WHITMAN)

COVER SOIL — ASSUME $\phi = 30^\circ$

FINAL GRADE = 3:1 = $18.4^\circ = i$

$$FOS = \frac{\tan \phi}{\tan i} = \frac{\tan 30}{\tan 18.4} = 1.7$$

WASTE — ASSUME $\phi = 36^\circ$

OPERATING FACE GRADE = 3:1 = $18.4^\circ = i$

$$FOS = \frac{\tan \phi}{\tan i} = \frac{\tan 36}{\tan 18.4} = 2.2$$

THIS ASSUMES NO SEEPAGE ON COVER OR WASTE SIDESLOPES FOS > 1.5 OK

APPENDIX F

OPERATIONS MANUAL

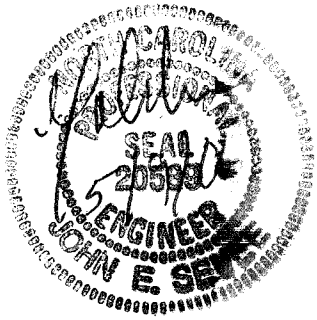
BLUE RIDGE PAPER PRODUCTS, INC.
CANTON, NORTH CAROLINA

OPERATIONS MANUAL
FOR
LANDFILL NO. 6
AREA A WEST

MAY 2006

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine



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1.0 GENERAL

1.1 Purpose

The purpose of this manual is to provide information to the personnel involved in the operation, maintenance and closure of the Landfill. Guidelines for development and operation are provided herein for Landfill Area 6A West and connection with waste filling to Landfill Area 6A East. This document will be revised to describe the development of future phases, as necessary.

It is important to recognize that some of the procedures in this manual may require modification over time as improved methods are developed for carrying out the day to day landfill activities. Changes in procedures must be verified with the Canton mill area management, Environmental, Health and Safety Department (EHS) and Mill Engineering prior to implementation.

It is equally important for the personnel involved in landfill operations to understand the critical requirements for successful landfill operation and maintenance. Operation of a landfill is primarily a task of managing water. Approximately one million gallons per acre of precipitation falls to the ground in the Canton, North Carolina area on a yearly basis. Management of this and other waters which may be associated with or absorbed by the incoming waste is the principal task of the landfill operations personnel.

The landfill has been designed to collect the precipitation and other water which becomes leachate. It is the operations personnel's goal to insure that maximum leachate collection efficiency is maintained while simultaneously minimizing leachate generation to the extent practical. Minimizing leachate generation is accomplished by separating clean surface runoff from the wastes, encouraging evaporation of leachate and other procedures which are discussed herein.

This manual was prepared with regard to the Solid Waste Rules and Regulations of the North Carolina Department of Environment and Natural Resources (NCDENR). It includes descriptions of development procedures, landfill operations, site maintenance, safety procedures,

monitoring requirements, leachate management and numerous other important procedures which must be adhered to. Everyone associated with the management and operation of the landfill should be familiar with this manual to insure a safe and environmentally secure facility.

1.2 Design Concept

It is not the purpose of this document to provide a detailed account of the design of the landfill, however, a general discussion of the design concept is presented herein. The landfill operations personnel are encouraged to review the Design Reports and Engineering Drawings which provide detailed descriptions of the landfill facilities.

The Landfill incorporates a synthetic liner system beneath the waste to minimize the potential for leakage to the underlying groundwater. The bottom liner consists of 60-mil high density polyethylene (HDPE). A drainage layer with embedded perforated pipe is placed above the HDPE to collect and transport leachate. The perforated pipe network connects through a series of manholes to a gravity sewer line which discharges into a wet well. A pump station pumps the leachate to the mill's wastewater treatment plant. During high leachate flows, leachate will be temporarily stored in leachate storage ponds.

1.3 Development Concept

Landfill Area 6A has previously been developed in two major phases, Area 6A East and 6A West. Area 6A East was constructed in 1993. Area 6A East encompasses approximately 15 acres with an estimated capacity of approximately 1.5 million cubic yards. Area 6a East was developed from 1993 through 2002 in three cells: two base cells located on the western and eastern half, known as Cell III and Cell IV, respectively, and one upper cell placed on top of the lower base cells, known as Cell V. Development and operation of Area 6A East in this manner allowed for separation of clean surface water runoff from the waste, thus minimizing leachate generation. Area 6A East underwent Final Closure in two phases completed in the Spring of 2003 and the Fall of 2003.

Area 6A West was constructed in 2000 and is the current active waste-filling area of the landfill. Area 6A West encompasses approximately 15 acres with an estimated capacity of approximately 1.7 million cubic yards. Area 6A West is being developed in three cells: two base cells located on the western and eastern half, known as Cells I and II, respectively, and one upper cell placed on top of the lower base cells, known as Cell VI. Development and operation of Area 6A West in this manner will allow for separation of clean surface water from the waste, thus minimizing leachate generation.

2.0 OPERATIONAL PROCEDURES

2.1 Commencement of Operations

(a) At least 5 business days prior to commencing operation of the new landfill, Blue Ridge Paper Products, Inc. shall notify the NCDENR of the intent to commence operations.

(b) The notice shall include the following:

(1) Facility identification, including permit number;
(2) Date of intended commencement of operations; and
(3) The name and telephone number of the facility manager or other primary contact person.

2.2 Site Access

All vehicles and visitors will enter the site via the gated road which accesses the Landfill. The entrance to the landfill will have a facility sign which includes the following:

- The facility name and permit number;
- The name, address, and telephone number of Blue Ridge Paper Products, Inc.;
- The days and hours that the facility is open to accept waste;
- The type of wastes accepted and not accepted (i.e. "No hazardous or liquid waste accepted"); and
- The penalty for unlawful dumping.

All visitors will check in at the main gate which is located on Main Street. Only approved employees will have unrestricted access to the landfill facility. All others will proceed only after receiving clearance from security at the main gate and landfill management. No visitors will be allowed on-site unaccompanied and the number of visitors will be minimized.

During non-operational hours the gate at the entrance to the site will be locked.

2.3 Operating Hours

The Landfill will normally accept mill wastes seven days per week, and up to a 12-hour per day schedule, depending on daylight hours.

The normal start of the work day for operators will be 6:00 A.M. The operators will perform daily maintenance and move the equipment to the operating area within 1/2 hour of commencement of dumping. An operator shall be present at the operating area at the commencement of dumping.

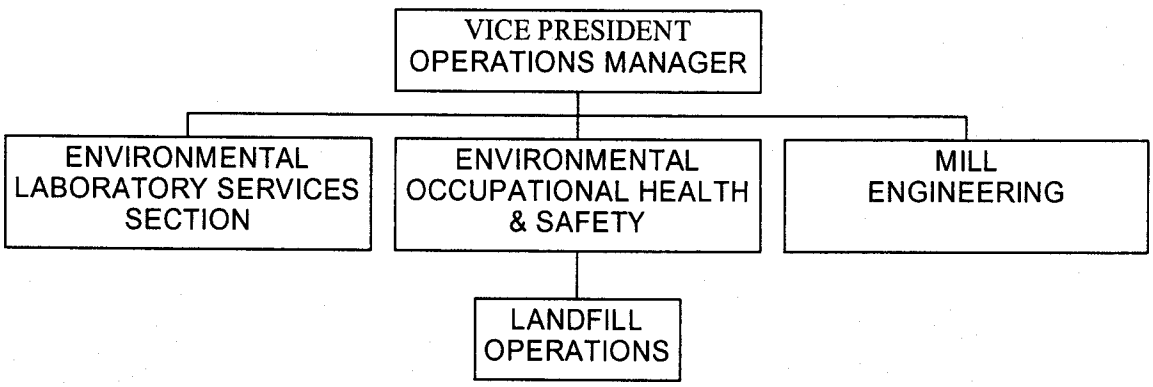
2.4 Personnel Responsibilities

The personnel and departments involved in the operation of the landfill include: 1) EHS department; 2) Mill Engineering; 3) RURU-Environmental Laboratory Services (ELS); and 4) landfill operations. The organization, responsibilities and tasks conducted by these people are described below.

2.4.1 Organization. An organization chart, Figure 2-1, is presented to outline the chain of command and support groups which include the EHS Department and Mill Engineering.

FIGURE 2-1

ORGANIZATION CHART



2.4.2 Personnel.

2.4.2.1 Environmental, Health and Safety Department (EHS)

This group is responsible for securing and assuring compliance with licenses and permits required for operating the landfill. This responsibility includes quantity estimates of all plant waste brought to the site and environmental monitoring of the landfill in accordance with the conditions of the landfill permit. In addition, the department's responsibility includes assuring that the landfill operation is in compliance with all regulations of the NCDENR. This responsibility includes periodic site audits and inspections as well as submission of appropriate data to the NCDENR.

EHS personnel are also charged with directing and overseeing the daily operation of the landfill to assure that the operating plans are being implemented properly. Responsibilities of the EHS personnel in this area include:

a. initiating site development to maintain continuity of operation;
b. directing the overall planning and scheduling of waste placement;
c. maintaining site records and tracking landfill volume consumption;
d. supervising and training personnel; and

e. supervising the site safety program.

In addition, this department is responsible for the maintenance of leachate collection systems, storm water runoff facilities, and roads.

2.4.2.2 Mill Engineering

This group is responsible for overseeing major construction projects at the landfill and providing support services for site maintenance. Major construction projects, such as landfill construction, would be implemented by Mill Engineering.

2.4.2.3 Landfill Operator

The landfill site operators will be responsible for the daily details of landfill operation at the area receiving the wastes. The Operator will:

a. direct placement of the waste by haul vehicle operators;
b. spread and compact wastes;
c. apply cover materials as required;
d. inspect equipment and facilities;
e. abide by established safety rules;
f. maintain site security in conjunction with Canton Mill security;
g. immediately note and report unusual events or circumstances;
h. maintain such records as may be required;
i. immediately report any observed and/or imminent environmental impacts to EHS department management; and
j. strive to maintain neat and efficient operations.

The mill site operators and drivers of the haul vehicles will be responsible for the proper loading and handling of their loads. While on the landfill site they will comply with the provisions of this manual and directions provided by the Landfill Site Operator.

Problems encountered at the landfill should be reported to the Landfill Team and to EHS management.

2.5 Health, Safety and Fire Considerations

The following health and safety procedures will be adhered to at the landfill facility:

1. Only essential personnel will be involved in activities associated with operation of the landfill.

2. Prior to personnel entering into manholes or other similar enclosed facilities, the inside air will be tested in accordance with confined space entry procedures.

3. Dumping areas will be maintained firm and level. After directing trucks to the dumping area, the operating personnel will stand clear of the truck.

4. The leachate storage pond gate will be locked at all times, except when access is required.

5. Exit ramps will be provided in the leachate storage pond for exit in the event that someone falls in.

6. In the event of an accident involving property damage, the mill security will be notified immediately to generate necessary reports.

7. In the event of an accident involving personal injury, assess the severity of the injury and call emergency personnel by dialing 911 outside the mill, or 2911 in the mill. If injuries are only minor, the injured person must report to the mill medical section.

8. In the event of an environmental emergency, the operator will follow the spill and release reporting procedure or call mill extension 6711.

9. Keep gate locked when area not in use.

In the event of a fire, the following procedures will be implemented:

1. If it is an equipment fire, the fire extinguisher provided with all equipment will be utilized, if feasible, to extinguish the fire.

2. If the fire does not appear to be controllable with a fire extinguisher, or if the fire is associated with the landfilled wastes, the emergency dispatcher at mill extension 2911 will be contacted immediately. The emergency dispatcher will be provided with information concerning the location and extent of the fire.

3. The emergency dispatcher will mobilize the appropriate fire fighting equipment and personnel. All fire personnel should be notified in advance to alert them of the nature of hazards at the landfill so they may be appropriately prepared and equipped.

4. All efforts to keep applied water and fire fighting chemicals within the landfill limits will be made.

5. EHS department personnel will be notified as soon as possible so that an inspection can be made.

6. Hot ashes on the sludge pile will not be considered a fire hazard unless they are blown by strong winds.

2.6 Equipment Requirements

The following equipment will be available to conduct the daily landfilling activities, place intermediate and final cover, minimize erosion, maintain roads and operate the leachate system:

1. Bulldozer for fine grading;
2. Bulldozer for waste placement and grading;
3. Front-end loader to move cover material and construct temporary berms;
4. Two-way radio communication system.

2.7 Waste Delivery and Acceptance

To assure that all information regarding a waste delivery is accurately recorded, it is necessary to adhere to a "flow control" system. The details of the "flow control" system are described in this Subsection 2.7 and the following Subsection 2.8, as well as Section 7.0 which describes in detail the record keeping and reporting requirements which will be followed by this facility.

Each day, drivers will provide the following information:

1. The types and sources of the waste being delivered;
2. The number of truck loads of each type of waste delivered; and
3. Weights of the trucks according to the established plan.

Landfill personnel will determine if the landfill is permitted for the type and source of waste being delivered, see the following Subsection 2.8. When the truck arrives at the disposal area, the Landfill Operator will direct the unloading of the waste. Each day the weight tickets will be obtained from the Scale Operator by Landfill personnel for recording onto the daily accounting forms.

2.8 Waste Inspection Plan

The truck driver will inspect the waste load and determine if the waste is accepted at the landfill. If there is any question as to the waste being accepted at the landfill, the truck driver will notify the EHS management for a decision on whether it is an acceptable waste.

The landfill operator will also inspect each load. If an unpermitted waste is disposed, the landfill operator shall notify EHS management.

In the event a special waste is generated, the owner will secure NCDENR approval prior to disposal.

2.9 Waste Placement and Grading

2.9.1 Waste Placement Plan. The following is the waste placement plan. This plan was designed around the nature of the waste disposed at the facility.

The sludge, woodwaste, and lime mud will be dumped by the haul truck operator and spread by an equipment operator. The landfill operator will place the waste in lifts 10 to 15 feet thick. As waste is dumped from the top of the lift the landfill operator will push and spread the waste over the working face, see Figure 2-2. The waste will be spread in layers no greater than 2-feet thick. By spreading the waste in thin layers, the waste is allowed to drain, greater compaction is achieved, and stability of the working face is maintained.

Each lift must be constructed with the ultimate goal of achieving the grades shown on the individual cell grading plans. The grading of each lift must also achieve positive drainage as described in the next section. The next section, Section 3.0, of this manual also describes the staged development of Cells I, II, and VI of Area 6A West in detail.

2.9.2 Special Handling of Waste. Landfilling procedures for the sludge, wood waste, and lime mud, as discussed above, are straight forward. Certain wastes require special handling to dispose

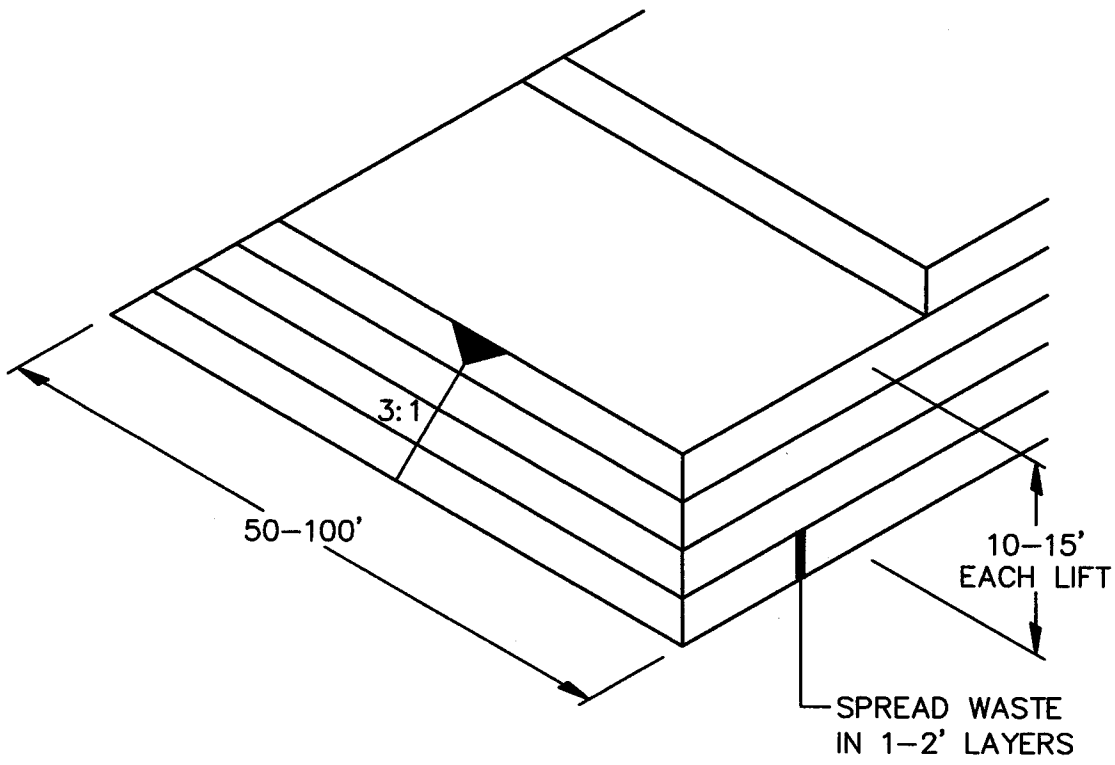


FIGURE 2–2
WASTE PLACEMENT
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

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Services of Mining Engineers, Inc.

of them. The waste which requires special handling is boiler ash. The safe disposal of ash is discussed below.

Boiler Ash. Boiler ash will amount to approximately 1,400 cy per week. Two types of ash are brought out to the landfill: cinders; and fly ash. The cinders consist of soil, bark, and charred wood. This material can be landfilled by spreading it over the working face or used as a gravel substitute for roadways on the landfill. The fly ash is a much finer material and can dry out and become dusty. Landfilling the fly ash can be accomplished by spreading the fly ash and immediately placing a layer of sludge over it, depending on the moisture content of the sludge. This will prevent blowing of the ash, and, water from the sludge will eliminate any fly ash from drying and blowing.

2.9.3 Wet Weather. During very wet weather, access to the working face may become difficult. Grit or gravel can be used to provide a stable traffic mat to improve movement of vehicles on the landfill as needed, but the amount of these materials should be held to a minimum.

3.0 LANDFILL DEVELOPMENT

This section describes the development and operation of Landfill Area 6A. Area 6A is divided into two major phases, Landfill Area 6A East and Area 6A West. Final closure of Area 6A East has been completed and therefore is not described herein. Area 6A West is the active filling area of Landfill 6A and is currently filled to approximately 50 percent of its capacity.

Area 6A West will be subdivided into three cells: two base cells which are currently being filled, known as Cells I and II, and one upper cell, Cell VI, placed on top of the lower base cells. The Landfill permit does not currently permit placement at Cell VI. Application for Cell VI will be made as a request for Vertical Increase of Area 6A West, pending successful operation in Cells I and II. Cells I and II encompass approximately 7.5 acres each, and will have a combined total capacity of approximately 1.1 million cubic yards. The locations of Cell I and Cell II are shown on Figure 3-1. Cell VI will be approximately 15 acres, with a capacity of approximately 600,000 cubic yards. Waste filling within Cell VI will also complete the connection of Area 6A West with Area 6A East. The location of the upper cell is shown on Figure 3-2. The primary purpose of this cellular design is to minimize the active operating area of the landfill at any one time and, thereby, minimize potential odor and the quantity of leachate generated.

The development for the base cells was completed as part of the Area 6A West (facility) construction in 2000. Components of the facility construction included installation of a 60-mil HDPE liner, leachate collection system and underdrain system, and containment dikes. In addition to the HDPE liner, the southern half of Area 6A West was underlain by a geosynthetic clay liner. Cell I and Cell II are the current active filling areas of Landfill 6A and are discussed in Section 3.1 below.

The development of Cell VI will require the installation and tie-in of a geosynthetic clay liner, 60-mil HDPE liner, and leachate collection system above the divider berm bisecting Area 6A West and Area 6A East. Lining the divider berm will allow the "valley" between Area 6A West and Area 6A East to accept waste. The development of Cell VI will also require the stripping of

FIGURE 3-1
CELL I & CELL II
FINAL GRADING PLAN
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LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

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FIGURE 3–2
CELL VI SITE DEVELOPMENT PLAN
BLUE RIDGE PAPER PRODUCTS, INC
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

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the west sideslope cover soils on Area 6A East, construction of containment dikes, the installation of the necessary leachate collection and transport systems to connect the upper cell to the existing leachate transport system, and installation of stormwater structures as the facility is capped.

3.1 Cell I and Cell II

Cell I and Cell II (base cells) are the current active filling areas of Landfill 6A, ranging in depth from 60 to 80 feet, and sloping from west to east. The base of the landfill is sloped in a saw-tooth pattern from north to south with two drains running west to east. The cells contain a leachate collection system consisting of 15 inches of granular material, and a piping network consisting of 12-inch diameter collection/transport pipes. The transport pipes carry the leachate by means of gravity flow through the base of Area 6A West to the wet well located at the southeast corner of the site. From the wet well, the leachate is pumped to the mill's wastewater treatment plant.

Access to the base cells is provided by an access road approximately 24 feet wide to accommodate two-way traffic. Waste will be dumped by the haul truck operator as directed by the landfill operator. The landfill operator will construct waste lifts up to 15 feet thick and maintain an adequate width on the working face. As waste is dumped from the top of the lift, the landfill operator will push and spread the waste over the working face. The waste will be spread in layers no greater than 2 feet thick. The Boiler ash will require special handling and is discussed in Subsection 2.9.2 as well as later in this section. By spreading the waste in thin layers, the waste is allowed to drain, and greater compaction is achieved, see Figure 3-3.

Each lift must be constructed with the ultimate goal of achieving the final grades shown on the Site Development Plan for Cells I and II, provided in Figure 3-1. The grading of each lift must also achieve positive drainage toward the chimney drain strips which are located in the northern and southern halves of Cell II.

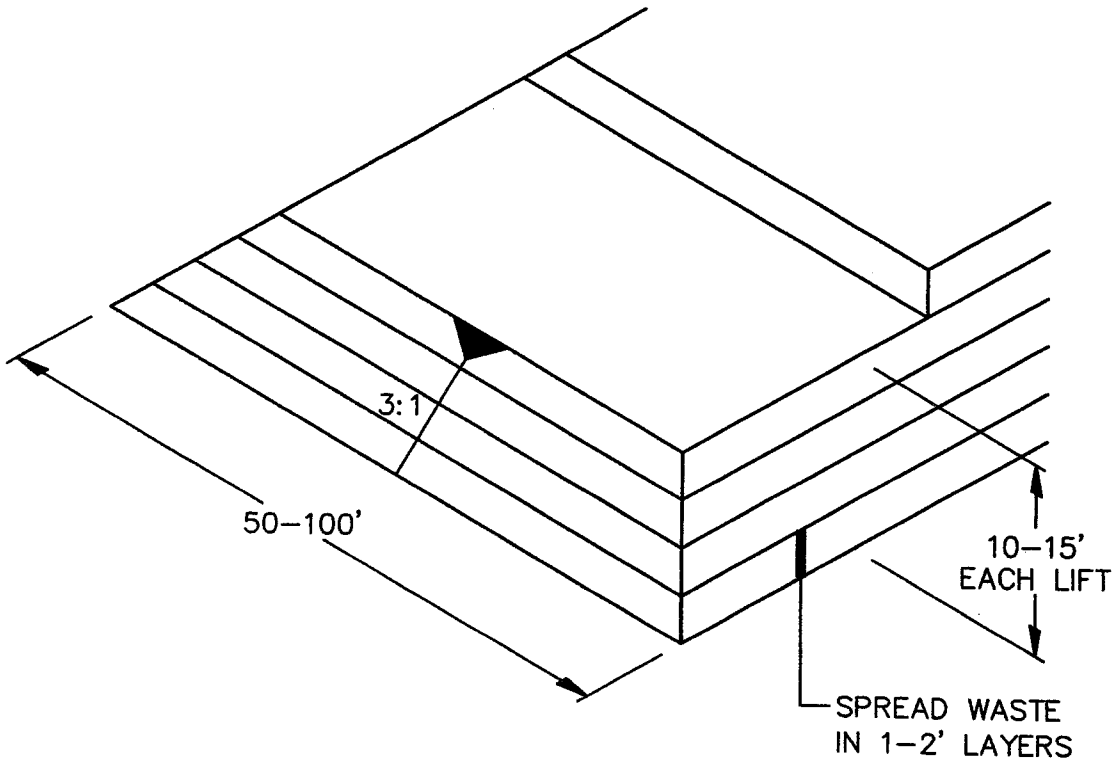

FIGURE 3–3
WASTE PLACEMENT
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

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Sevee & Maher Engineers, Inc.

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A property of papermill sludge is that it contains clay from the papermaking process. As the sludge is landfilled deeper, the consolidation of the sludge also makes the sludge less permeable; water does not drain as easily. In order to maintain good drainage within the landfill, the top surface of each lift will be covered with a 12-inch thick layer of granular material, i.e. stone, gravel, etc. The drainage layer will aid in draining the next lift of waste, making for a more stable landfill operation. In addition to the drainage layers, the chimney drain strips will be expanded upward to the top of the base cells. With each new lift of waste, each chimney drain strip will consist of a 5-foot high dike of drainage stone directly above the previous chimney drain strip. In a horizontal (west-east) direction, the chimney drain strips will be 50 feet in length and spaced 50 feet apart. The waste will be landfilled up to the top of the stone. The process repeats again with a 5-foot high dike of drainage stone. As with the chimney drain strips, the sand drainage layer along the lined sideslopes will also be extended with each new lift of waste.

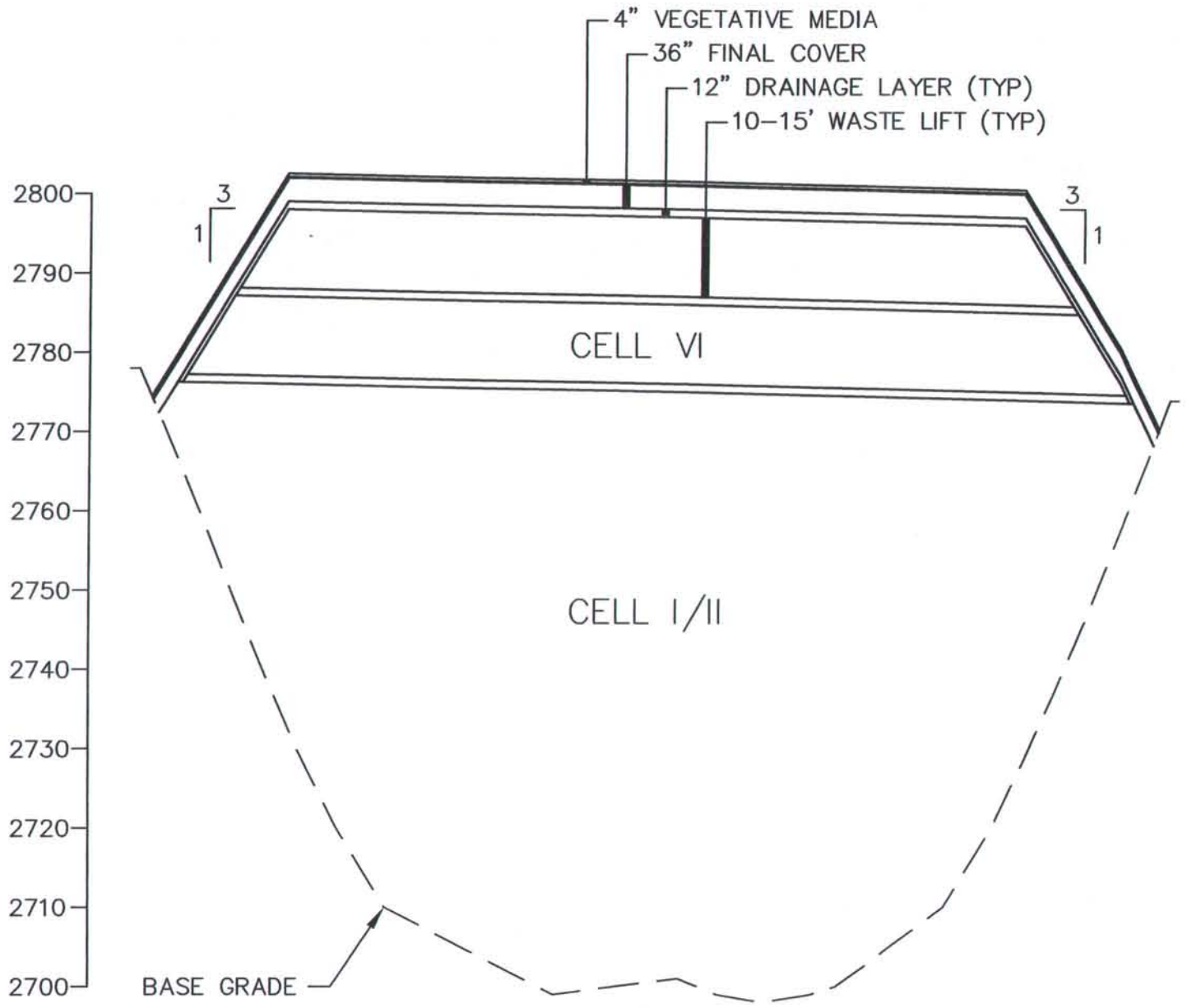
Special operating procedures will need to be implemented during winter operations. During winter operations, provisions must be made for snow removal to maintain the necessary landfill operations. Waste placement, grading and site cleanliness become more important during the winter since waste such as ungraded frozen sludge can become a barrier to traffic movement. The access road must be plowed and sanded to provide safe travel conditions. Salt should not be used because it may seep into the groundwater and will affect groundwater quality data. Sanding will be the preferred method of road treatment in the winter months. Drainage structures such as culverts should be kept free of ice and snow to assure unrestricted runoff during thaw conditions. ***Any damage to the liner system of the landfill that occurs as a result of construction or operational activities will be reported immediately to EHS management for appropriate action.***

3.2 Cell VI

The final cell to be filled within Area 6A West will be Cell VI, located above the previously filled base cells (Cells I and II). Cell VI is designed to provide an additional 30 feet of waste thickness to Area 6A West and also complete the landfill connection of Area 6A West to Area 6A East.

Prior to taking in waste, the development of Cell VI will require the installation and tie-in of a geosynthetic clay liner, 60-mil HDPE liner, and leachate collection system above the divider berm bisecting Area 6A West and Area 6A East. Lining the divider berm will allow the "valley" between Area 6A West and Area 6A East to accept waste. The development of Cell VI will also require the stripping of the west sideslope cover soils on Area 6A East, construction of containment dikes, the installation of the necessary leachate collection and transport systems to connect the upper cell to the existing leachate transport system, and installation of stormwater structures as the facility is capped. Cell VI will handle leachate collection through the use of the stone drainage layers which tie into the stone drainage layer located along the perimeter of the landfill, as shown on Figure 3-4. The stone drainage layer is contiguous along the sideslope to the bottom of the landfill. The leachate will drain to the piping system at the bottom which connects to the leachate transport pipeline east of Area 6A West. The extension of the chimney drain is not proposed within this cell. Leachate collected at the east end will pass down through the chimney drain to the piping system at the bottom of the landfill.

Filling operations for Cell VI will begin at the West end of Area 6A West working eastward to Area 6A East to bring the landfill to final grade. Cell VI will be accessed from an access road created during waste placement on the north sideslope of the cell. The access road will be 24 feet wide to accommodate two-way traffic flow in and out of the cell. Waste will be dumped by the haul truck operator as directed by the landfill operator. The landfill operator will construct waste lifts up to 15 feet thick and maintain an adequate width on the working face. As waste is dumped from the top of the lift, the landfill operator will push and spread the waste over the working face. The waste will be spread in layers no greater than 2 feet thick. By spreading the waste in thin layers, the waste is allowed to drain, and greater compaction is achieved, see Figure 3-3. Occasionally, wetter than normal waste material will be delivered to the landfill for disposal. This type of waste material will not be placed closer than 100 feet from the perimeter of Cell VI.



SCALE: H: 1" = 100'
V: 1" = 20'

FIGURE 3–4
CELL VI CROSS SECTION
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

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Sevee & Maher Engineers, Inc.

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Upon completion of the waste filling to final grade, final cover will be installed over the waste. The final cover layer will consist of 12-inches of drainage stone over waste, covered by 36-inches of compacted low hydraulic conductivity soil, overlain by 4-inches of vegetative soil layer. The 12-inch drainage stone layer will tie into the stone leachate collection and drainage layer along the perimeter of the landfill as shown on Figure 3-4.

A system of manholes, storm drain piping, and culverts will need to be installed during the final cover placement on Area 6A West. Surface water runoff management on the north side of the landfill will consist of 3 culverts along the perimeter ditch that tie into 3 storm drain manholes (Manholes MH-2, MH-3, and MH-4) connected by corrugated HDPE storm drain pipes. The northern storm drain system follows the northern access road to the east and will be routed into existing catch basin CB-1, outletting through an 18-inch culvert that replaces the existing 12-inch culvert at the northeast corner of Area 6A West. Two diversion berms constructed in the final cover will direct surface water runoff from the top of the northern side of the landfill through the culverts into the storm drain system. Surface water runoff management on the south side of the landfill will consist of 3 culverts along the perimeter ditch that tie into 3 storm drain manholes (Manholes MH-5, MH-6, and MH-7) connected by corrugated HDPE storm drain pipes. The southern storm drain system follows the southern access road to the east and will be routed to outlet through an 18-inch culvert at the south side of Area 6A West. Two diversion berms constructed in the cover will direct surface water runoff from the top of the southern side of the landfill through the culverts into the storm drain system. Surface water management on the east side of the landfill will consist of an 18-inch culvert that ties into a storm drain manhole outletting through a 12-inch culvert to the west. An Erosion and Sediment Control Plan for the final cover condition of Landfill No. 6 - Area A West is provided in Appendix F-3. The Erosion and Sediment Control Plan further details the system of manholes, storm drain piping, culverts, and erosion control measures described above, necessary to manage surface water runoff. Figures 3-5 and 3-6 present the closure plan for Area 6A West which includes stormwater details.

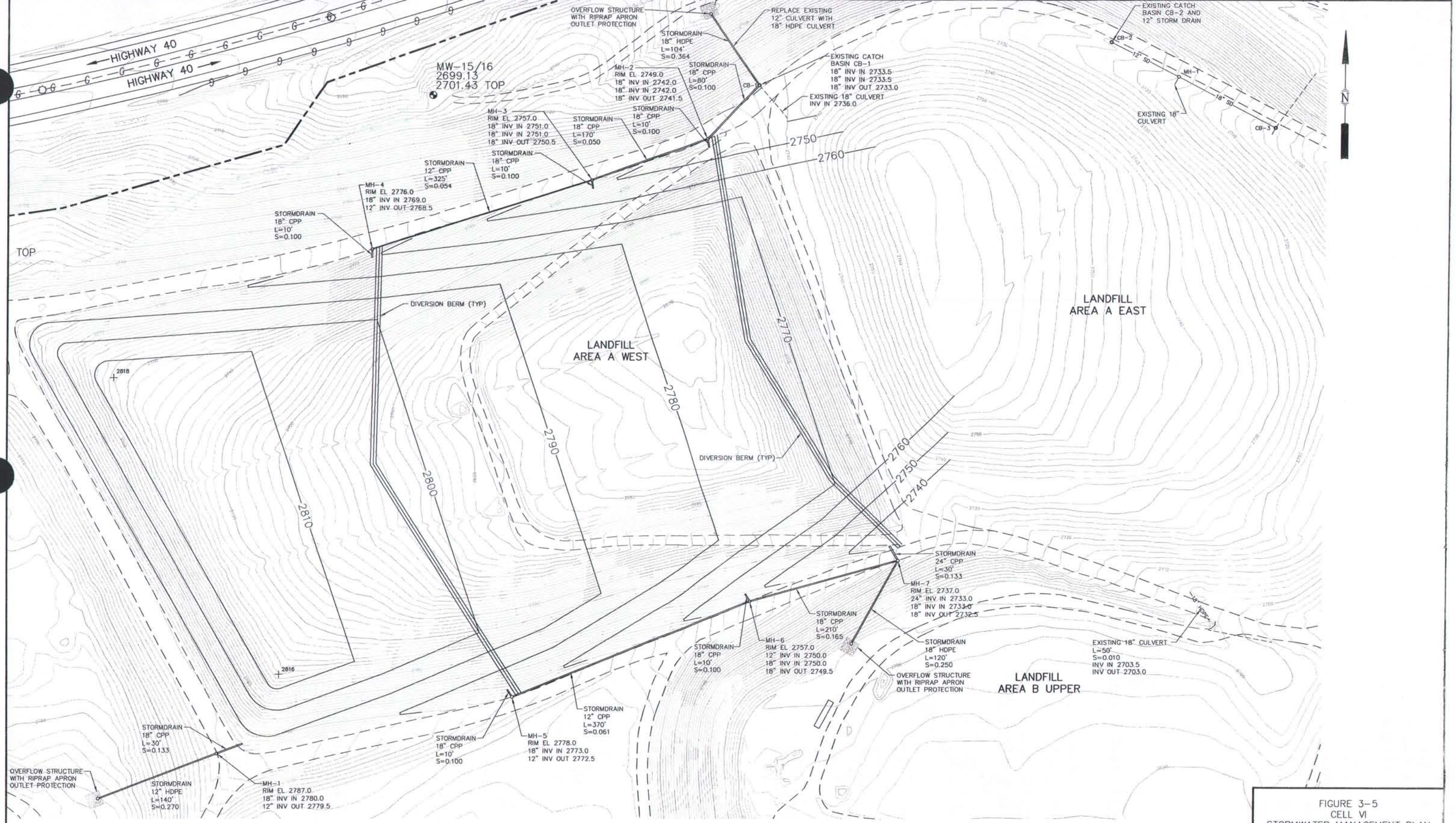

FIGURE 3-5
CELL VI
STORMWATER MANAGEMENT PLAN
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

SME
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Consulting Engineers
Cumberland Center, Maine

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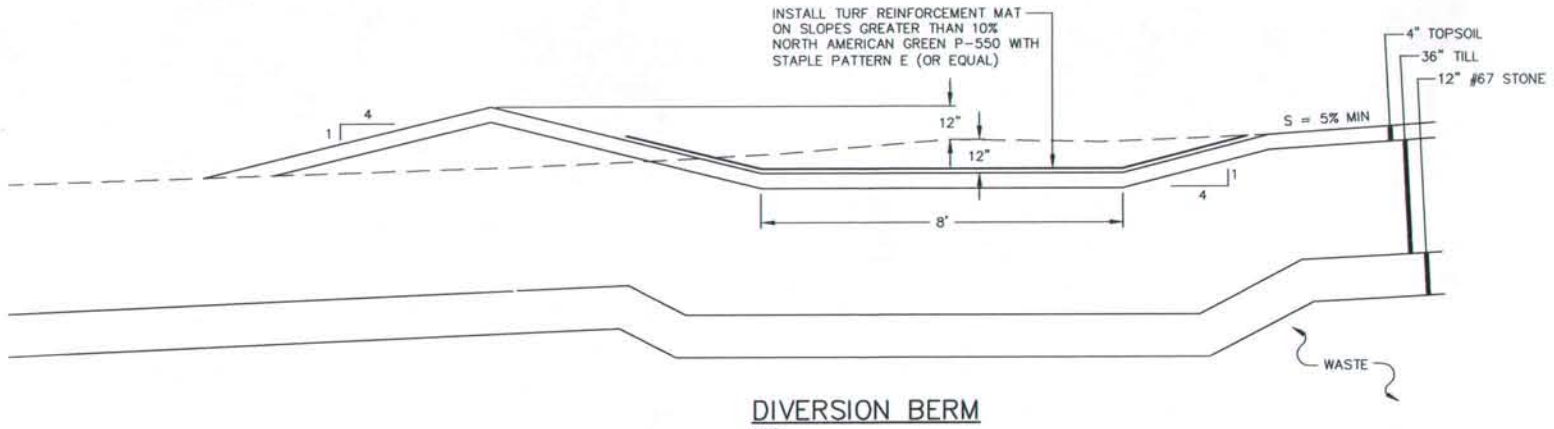
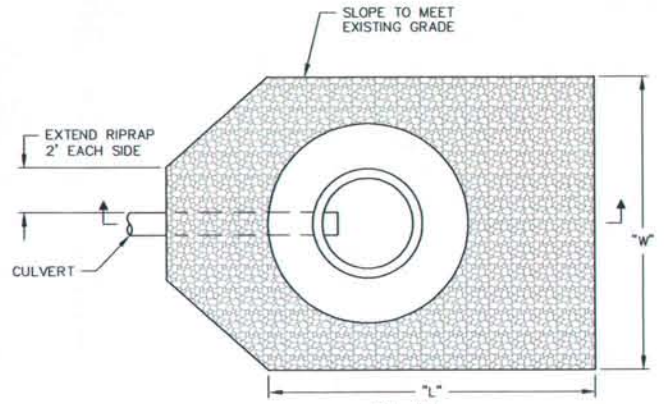
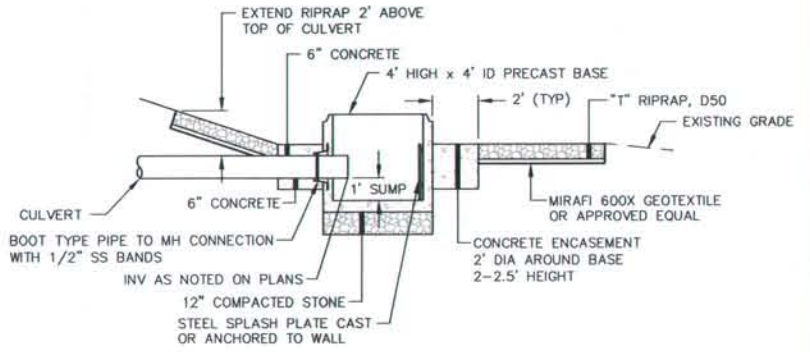


DIVERSION BERM
NTS



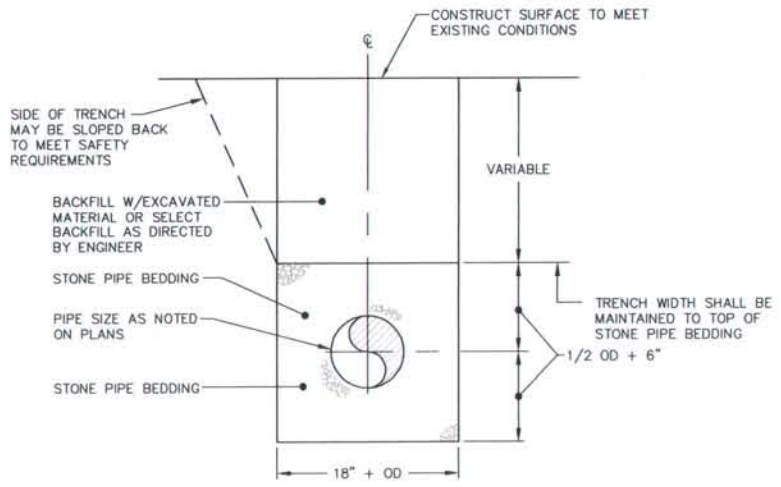
PLAN



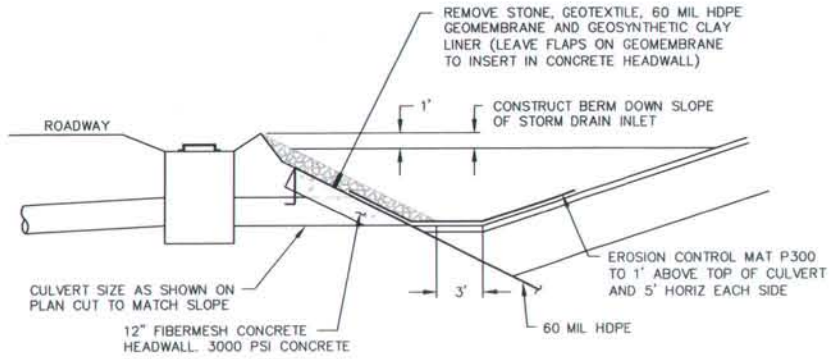
SECTION

CULVERT NO	DIA	"L"	"W"	RIPRAP D50	"T"
1R	12"	12'	13'	4"	8"
5R	18"	20'	22'	10"	20"
8R	18"	20'	22'	10"	20"

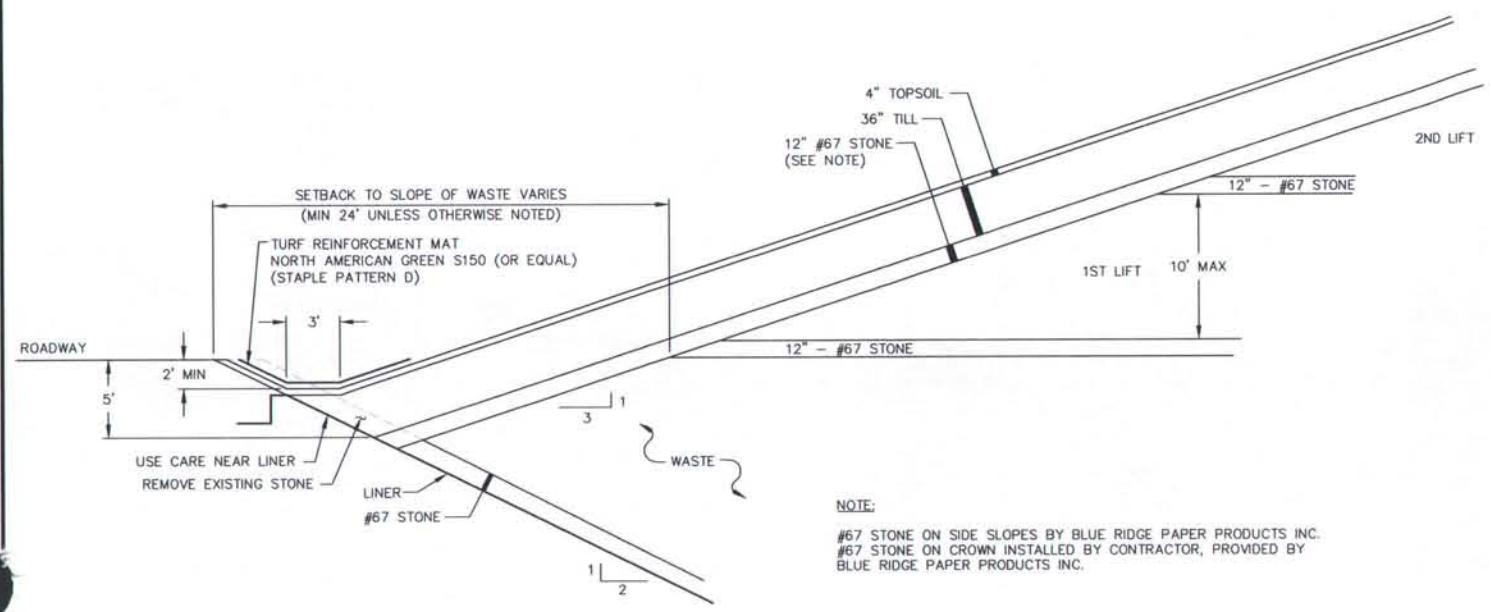
RIPRAP OUTLET PROTECTION
NTS



STORM DRAIN
NTS



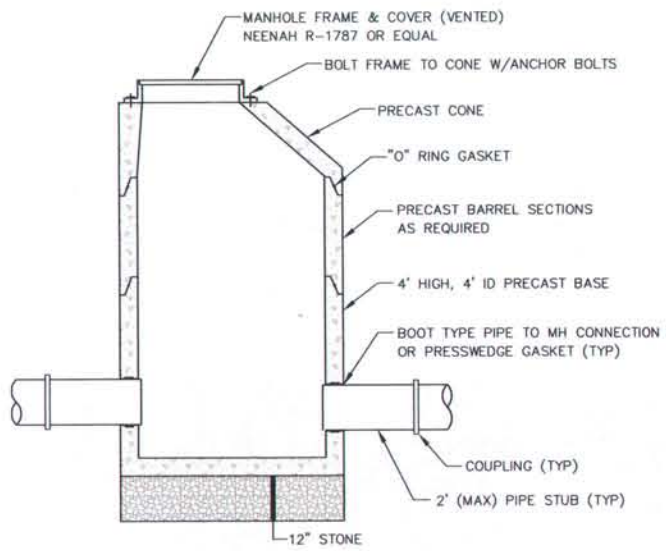
STORMDRAIN INLET/PENETRATION
NTS



FINAL COVER SYSTEM
NTS

NOTE:

#67 STONE ON SIDE SLOPES BY BLUE RIDGE PAPER PRODUCTS INC.
#67 STONE ON CROWN INSTALLED BY CONTRACTOR, PROVIDED BY BLUE RIDGE PAPER PRODUCTS INC.



TYPICAL MANHOLE
NTS

MANHOLE NOTES:

1. ALL CONCRETE SHALL HAVE A MINIMUM 4000 PSI COMPRESSIVE STRENGTH AFTER 28 DAYS.
2. DESIGN FOR H-20 WHEEL LOADING.
3. CONFORM TO ASTM-C478 SPECIFICATIONS.
4. FIELD VERIFY EXISTING PIPE INVERTS PRIOR TO CONSTRUCTION.
5. PENETRATIONS INTO EXISTING MANHOLES FOR NEW PIPES SHALL USE EITHER A PRESS BOOT CONNECTION OR COMPRESSION TYPE GASKET.

FIGURE 3-6
SECTIONS & DETAILS
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

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4.0 LEACHATE MANAGEMENT

4.1 Leachate Generation

Leachate will be generated in the landfill through two mechanisms. The major source of leachate will be generated through precipitation falling onto the active landfill areas. Precipitation generated leachate will be minimized through the placement of a soil cover over areas which have reached intermediate grade.

Leachate will also be generated through waste consolidation and subsequent drainage of entrained water. Further discussion concerning the volumes of leachate may be found in the Design Report.

Leachate will be collected through a gridwork of perforated pipes which underlie the waste and drainage layers which are placed between waste lifts. Leachate will flow by gravity to the leachate pump station and storage ponds and pumped via a force main to the Canton Mill wastewater treatment plant.

4.2 Leachate Storage

The leachate storage ponds utilize a synthetic liner to contain leachate, and have been designed to store leachate for extended periods prior to transportation to the WWTP. The capacity of the ponds is approximately 1.7 million gallons.

4.3 Leachate Flow Control

The leachate transport piping system from the landfill is designed with gate valves to control the flow if necessary. The following scenarios are described with the proper actions to be taken.

The leachate transport system from the leachate ponds to the wastewater treatment plant includes a pump station capable of handling up to 200 gpm of flow. Should this flow be exceeded, the

leachate flow above the 200 gpm will be directed to the leachate storage ponds. There are no actions required by the landfill operator for this scenario. Once the flow falls below 200 gpm, the ponds will begin to empty.

In the event the leachate transport pipe from the pump station to the treatment plant develops a leak, pipe break, blockage, or the pump station needs maintenance, the transport pipeline can be shut off. A gate valve located on the outlet of the pond can be opened, thereby allowing the ponds to fill. Leachate flow will remain to the leachate storage ponds for temporary storage.

4.4 Leachate Disposal

The leachate generated during the operation of the secure landfill will be treated by Blue Ridge Paper Products, Inc.'s wastewater treatment facility.

5.0 LANDFILL INSPECTION AND MAINTENANCE

5.1 General

Landfill inspection and maintenance will be an ongoing activity. All personnel will be expected to observe the condition of landfill facilities throughout their workday and notify the EHS management of areas and equipment which may need repair and maintenance. Formal landfill inspections will be conducted in the spring and fall of each year. Additional inspections may be warranted following unusual climatic or operational events including, but not limited to, major rain storms, flood, fire, hurricane or earthquake. These inspections will follow the inspection forms attached in Appendix F-2. A description of the inspection items are discussed in the remainder of this section. EHS management is ultimately responsible to insure that the inspection and maintenance of all landfill facilities and equipment occurs.

5.2 Access Roads

The access roads to the landfill will be maintained by Blue Ridge Paper Products, Inc.. Frequent inspections by the operators, especially during the spring and winter months will be made to insure that these roads are in safe condition.

Internal landfill access roads, including those within the landfill cells, will be maintained as all weather roads. Prompt attention to road repairs is the most cost-effective approach since deterioration becomes increasingly more rapid once it has begun.

5.3 Equipment

Maintenance of equipment and landfill operations vehicles is critical in controlling and maintaining landfill operations. All equipment will be subject to a comprehensive, preventive maintenance program, as specified in the manufacturers specifications. Critical parts or replacement equipment will be identified and obtainable within a short period of time to maintain

continuity of operations. Replacement parts with long lead times will be purchased and kept on-site.

5.4 Erosion Control Facilities

Open Areas - Areas outside of the landfill, which have been disturbed will be seeded to prevent erosion. The seeding will be performed in accordance with the seeding schedule contained in the closing plan. Prior to any land disturbing activity greater than 1/2 acre, a soil and erosion plan must be secured by the appropriate mill group (EHS or Mill Engineering).

Ditches - Areas, which are rip-rapped or otherwise protected, will be repaired as necessary. All ditches, which are not rip-rapped or otherwise protected, will be seeded. All debris and other blockages will be removed from the ditch to allow for unobstructed drainage. Reseeding of the drainage ditches will be necessary from time to time as erosion occurs.

Cover System - Areas, which have received final or intermediate cover, will be reconditioned and reseeded as necessary. In areas which have eroded, the soil will be replaced and seeded.

5.5 Leachate Collection Piping

A cleanout is located at the end of the leachate collection main. This device provides a means to remove blockages within the piping system, should they occur.

5.6 Leachate Storage Pond

To insure the integrity of the leachate storage pond, periodic inspections will be made. Annually, when the pond has been emptied, visual inspection of the liner will be made. Any tears or punctures will be noted and repaired.

5.7 Liner Repair

If tears or punctures occur in the liner within the pond or along the sideslopes of the landfill, they will be repaired as soon as possible. Punctures and tears less than 6 inches in length will be repaired by Blue Ridge Paper Products, Inc. personnel if trained personnel are available. Repairs will involve placement of an overlapping patch (6-inch minimum overlap) which will be tack-welded to the underlying liner. Extra liner will be stored on-site for field repairs. If the liner tear is greater than 6 inches in length, a liner installer will be contacted to make the necessary repairs.

5.8 Landfill Underdrain System

The landfill underdrain system will be inspected on a monthly basis. An inspection form, See Appendix F-2, will be filled out to document each inspection. The inspection will consist of the following list.

1. Pipe outlets shall be checked for blockages and that the discharge is not eroding the outlet ditch. Any blockages should be removed to provide free flow from the pipe outlet. If erosion should occur, the ditch outlet should be stabilized, i.e. riprapped. The end of the pipe also has a rodent guard to prevent animals from entering the pipe. This should be checked and repaired, if necessary.

2. Inspect the manholes for blockages or silt build-up. For either case the EHS management should have the manhole cleaned and reinspected.

In addition to a monthly inspection, the underdrains shall be inspected after any major rain storms, floods, fire, hurricane, and earthquake or facility failure.

6.0 WATER QUALITY MONITORING

6.1 General

To aid in evaluating the performance of the landfill, a groundwater and surface water monitoring program will be conducted as described herein. The collection, preparation, preservation and delivery of the samples to the laboratory shall be the responsibility of the EHS. A description of the sampling program is given below.

6.2 Groundwater Monitoring

Twenty-one wells will be used for groundwater quality monitoring. The approximate locations for monitoring wells are shown on Figure 6-1. The schedule for monitoring is shown in Table 6-1. Semi-annual samples will be collected in March and November.

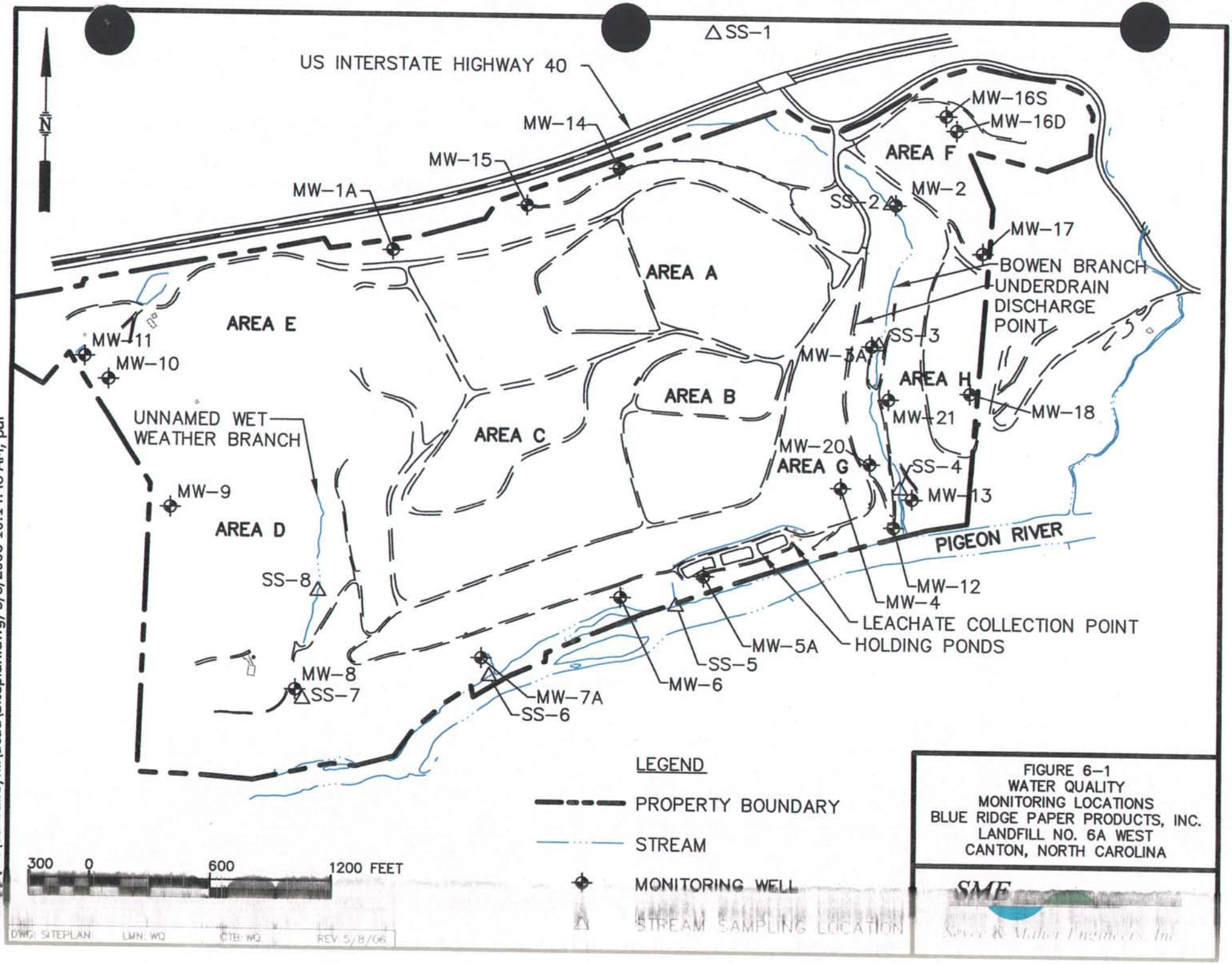

FIGURE 6-1
WATER QUALITY
MONITORING LOCATIONS
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

SME

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TABLE 6-1

LANDFILL NO. 6 WATER QUALITY ANALYSES

Parameter	Semi-annually
pH	X
specific conductance	X
temperature	X
water level	X
TOC	X
TOH	X
Inorganics	
Arsenic	X
Barium	X
Calcium	X
Cadmium	X
Chromium	X
Iron	X
Lead	X
Magnesium	X
Manganese	X
Mercury	X
Nickel	X
Potassium	X
Selenium	X
Silver	X
Sodium	X
Zinc	X
Chloride	X
Fluoride	X
Nitrite (as N)	X
Nitrate (as N)	X
Phenol, Total	X
Sulfate	X
Dissolved solids	X

6.3 Surface Water Sampling

Surface water sampling will be collected at upgradient and downgradient locations. The approximate locations of the four surface water sampling stations are shown on Figure 6-1.

Samples will be collected on a semi-annual basis when a sample can be obtained. Samples will be analyzed according to the schedule in Table 6-1.

6.4 Underdrain Monitoring

An underdrain sample will be collected from the underdrain outlet as shown on Figure 6-1. Samples will be collected semi-annually and analyzed according to the schedule in Table 6-1.

7.0 RECORD KEEPING & REPORTING

7.1 General

One of the most important elements of a well run landfill is an efficient record keeping system. For a facility of this nature it requires the timely collection, interpretation and management of large volumes of data. Data collected will be presented in an annual report to the NCDENR. The annual report will include the source, type and volume of waste accepted over the course of the calendar year.

A copy of the permit and operating plan will be maintained at the facility.

7.2 Operating Records and Annual Reports

(a) Blue Ridge Paper Products, Inc. will maintain documentation of all facility operations, including:

(1) Identification of the facility, owner, and operator;
(2) Quantity, type and source(s) of wastes received;
(3) Complete record of inspections, maintenance, repairs, and emergency event response;
(4) Data on all environmental monitoring required at or for Landfill Area 6A;

(b) Blue Ridge Paper Products, Inc. will file an annual report of operation with the NCDENR by July 31 of each year, for the previous 12 months of operation.

7.3 Waste Description

The Landfill is licensed to dispose of wastes which fall into five general categories. Regardless of the type of waste, similar accounting procedures will be used. Accounting will include logging the number of truckloads with regard to waste type and volume.

The five general categories are:

1. Fly ash from multi-fuel boilers;
2. Lime waste;
3. Wastewater treatment plant sludge;
4. Wood waste; and
5. Cinders.

The daily amount of each category of acceptable waste will be recorded on a truckload log sheets. A daily truck weight sample of each waste category will be logged as needed. A copy of the log sheets are included in Appendix F-1.

8.0 FINAL AND INTERMEDIATE CLOSURE

8.1 General

Closure of the site is a continuing process which includes the following activities:

1. Final grading and shaping;
2. Closure of discontinued channels, pipes, or drains;
3. Placement of cover materials;
4. Seeding and fertilizing.

The principle goals of the closing plan for the Landfill are: 1) to minimize future generation of leachate; and 2) to provide a cover system suitable for developing a grass crop which will prevent erosion. The final cover system designed for this site will minimize future generation of leachate, and provide a suitable stormwater management plan which will minimize the potential of erosion.

Inspection and monitoring of closed areas are necessary to detect erosion and to initiate repair for prevention of significant damage to the landfill cover. Uneven settlement may result in ponding or breaks in the cover system, these areas will be rebuilt and/or regraded to restore proposed contours. In addition, maintenance and post-closure care will include periodic mowing to discourage large, deep rooted vegetation which can damage the cover integrity.

8.2 Closure Procedures

The subsections which follow describe the various closure procedures and activities which must be performed.

8.2.1 Grading. The waste will be placed and graded to the elevations shown on the figures provided in Section 3.0 of this report. Prior to seeding, a surveyor will check elevations to insure

that the proper grades exist and there are no low areas or depressions within the site. The surveyor will also check the perimeter slopes to be sure they are at the proper grades. Spot elevations will be taken in the surface runoff ditches to insure that proper slopes exist.

8.2.2 Closure of Channels, Pipes, or Drains. The closure of channels, pipes, or drains will be accomplished in a manner which ensures the integrity of the system for the system's design life.

The design life of all components within the landfill is 50 years, typical products which have this life is stainless steel and high density polyethylene (HDPE). Design of the closure should also take into consideration the forces acting on the area of interest.

The site development of Cell VI includes several piping systems associated with the proper management of leachate. The closure of inlet structures for Cell VI will require the use of properly designed caps with the above mentioned materials and strength requirements.

8.2.3 Final Cover System. The final cover system over the Landfill will consist of three layers. The three layers from top to bottom are:

1. Four inches of cover soil;
2. 36 inches of suitable on-site soils, i.e. residual soils; and
3. 12 inches of granular drainage material.

8.2.4 Seeding. All areas which have been covered will be seeded. Seeding will normally occur between April 30 and September 30. All surface water runoff control facilities such as drainage ditches, berms and culverts are to be constructed prior to seeding. All grading will also be performed prior to seeding. The top layer of soil should be loosened by raking, discing or other acceptable means before seeding. Lime (2 tons/acre or as needed based on testing) and fertilizer (1,000 lbs/acre of 10/10/10 or as needed based on testing) will be harrowed or disced into the soil at a minimum of 3 inches. If the site is hydroseeded, lime, fertilizer and seed can be applied simultaneously. The seed mixture to be used is as shown below.

SEEDING MIXTURE (OR EQUAL)

Tall Fescue (KY 31)	80 lb/acre
Sericea lespedeza	20 lb/acre
Kobe lespedeza	10 lb/acre
	110 lb/acre

The seed will be applied uniformly with a cyclone seeder, drill, cultipack seeder or hydroseeder. Seed should not be planted if there is a danger of frost shortly after seed germination. Maximum seeding depth is 1/4 inch when using methods other than hydroseeding.

8.3 Erosion Control

The following procedures will be used for erosion control on the seeded areas:

- Slopes less than 4:1 - Apply unrotted, long-fibered hay, straw or cellulose fiber at a rate of 2 tons per acre. Mulch material should be relatively free of all kinds of weeds, and should be anchored with a tractor drawn implement designed to punch and anchor it into the top 2 inches of soil. Anchoring of the mulch will be performed immediately after placement to minimize loss by wind or water. This method of anchoring should be done on the contour wherever possible.

- Slopes steeper than 4:1 - On 4:1 slopes or steeper, the seed will be applied by hydroseeding with a binder or excelsior matting to control erosion. Siltation fences will be installed at the bottom of all seeded slopes. Berms will divert runoff from the top of the slopes to established slopes.

- Drainage ditches - The grass-bottomed drainage ditches will be seeded in the same manner as the remainder of the site. The same mulch specified above will

be placed in these areas. Staples, lightweight biodegradable paper, plastic or cotton nettings will be placed within the ditches to anchor the mulch.

8.4 Long-Term (Post Closure) Maintenance

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

8.4.1 Mowing. To prevent deep rooted tree growth, the closed portions of the landfill and drainage ditches will be mowed at least twice per year.

8.4.2 Site Inspection. Once the landfill is closed, the area will be inspected by the EHS in the spring and fall of each year for a period of at least three years to insure the cover system integrity is maintained against differential settlement, 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. Following the three years, an inspection frequency of once per year will be sufficient unless major problems develop, whereupon more frequent inspections will be made.

8.5 Leachate Collection

Leachate collection will continue past the closure of the landfill. The primary source of leachate will be consolidation of waste. The amount of leachate which must be collected, transported and treated will be greatly reduced from that generated during operation of the landfill.

8.6 Water Quality Monitoring

The semi-annual monitoring program described elsewhere in this manual will continue after site closure. After closure, if the concentrations of parameters analyzed stabilize, the NCDENR can be approached to reduce the frequency of sampling and the number of parameters analyzed.

APPENDIX F-1

WASTE RECEIPT FORMS

LANDFILL
MONTHLY LOAD WEIGHTS

MONTH/YEAR_____

DATE	LIME 25 LOADS P/M	SLUDGE 25 LOADS P/M	FLYASH 20 LOADS P/M	CINDERS 5 LOADS P/M	WOODWASTE 2 LOADS P/M
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
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28					
29					
30					
31					

APPENDIX F-2

INSPECTION FORMS

UNDERDRAIN INSPECTION RECORD

INSPECTION BY: _____ DAY | S | M | T | W | T | F | S |

DATE _____

UNDERDRAIN LOCATION: _____ WEATHER _____

_____ TEMP. _____

PIPE OUTLET

	PASS	CORRECTIVE ACTION REQUIRED
BLOCKAGES		
RODENT GUARD	_____	_____
DITCH OUTLET	_____	_____
	_____	_____

CORRECTIVE ACTION: _____

_____

MANHOLE

BLOCKAGES		
SILT BUILD-UP	_____	_____
M.H. COVER IN PLACE	_____	_____
	_____	_____

CORRECTIVE ACTION: _____

_____

FOLLOW-UP INSPECTIONS OF PREVIOUSLY REPORTED DEFICIENCIES _____

_____

_____

_____

DISTRIBUTION: 1. ELS MANAGEMENT
2. EOHS

SEVEE & MAHER ENGINEERS

LANDFILL INSPECTION RECORD

INSPECTION BY: _____ DAY | S | M | T | W | T | F | S |

[redacted]ATION: _____ DATE: _____

REASON FOR INSPECTION: _____ TEMP.: _____

	PASS	CORRECTIVE ACTION REQUIRED
ACCESS ROADS		
ROAD SURFACE	____	____
CULVERTS	____	____

CORRECTIVE ACTION: _____

LEACHATE STORAGE POND / PIPELINE		
CONDITION OF VISIBLE LINER	____	____
FENCE	____	____
FLOW RECORDERS	____	____
MANHOLE COVERS	____	____
EROSION	____	____

CORRECTIVE ACTION: _____

[redacted]NDFILL OPERATIONS		
SLOPE STABILITY	____	____
WASTE COVERED	____	____
SETBACK ALONG DIKES	____	____
INLET STRUCTURES	____	____

CORRECTIVE ACTION: _____

CLOSURE AREAS		
SLOPE STABILITY	____	____
VEGETATION	____	____
EROSION	____	____
DITCHES	____	____

CORRECTIVE ACTION: _____

FOLLOWUP INSPECTIONS OF PERVIOUSLY REPORTED DEFICIENCIES _____

[redacted]TRIBUTION: 1. ELS MANAGEMENT
2. EOHS

APPENDIX F-3

EROSION AND SEDIMENT CONTROL PLAN FOR LANDFILL NO. 6 AREA A WEST FINAL COVER

BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

EROSION AND SEDIMENT CONTROL PLAN FOR LANDFILL NO. 6 AREA A WEST FINAL COVER

MARCH 2006

SME

Sevee & Maher Engineers, Inc.
Waste Management and Hydrogeologic Consultants
Cumberland Center, Maine

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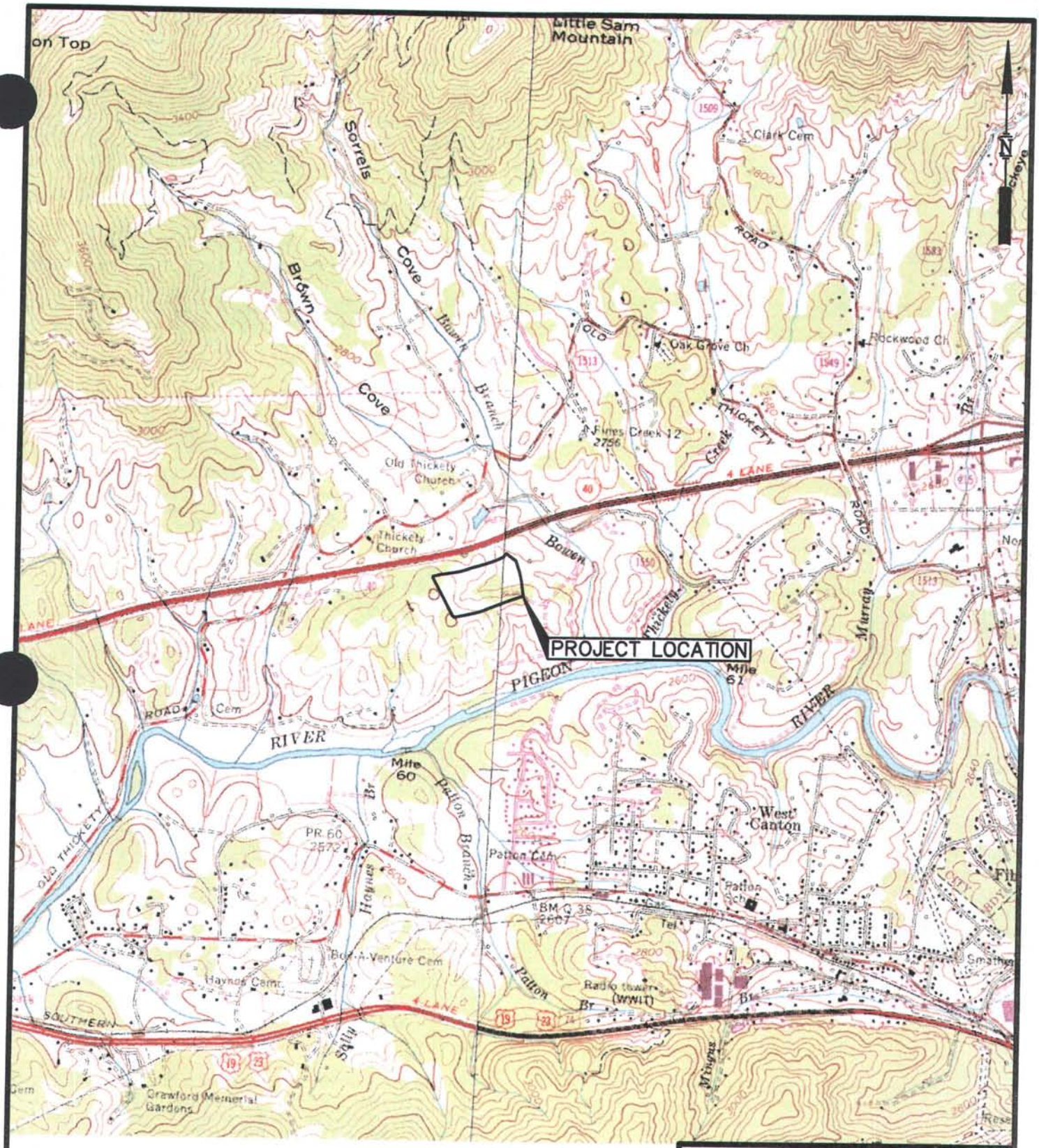
1.0 INTRODUCTION

This Erosion and Sediment Control Plan is designed for the closure activities at the Area 6A West Landfill located in Canton, North Carolina (see Figure 1-1). This plan has been prepared and submitted by Sevee & Maher Engineers, Inc. and was designed to comply with North Carolina Department of Environment and Natural Resources (NCDENR) Rules for stormwater quality as outlined in the North Carolina Sedimentation Pollution Control Act of 1973.

This law requires installation and maintenance of sufficient erosion control practices to retain sediment within the boundaries of the site. The primary requirements of which are:

1. Retaining or establishing a sufficient buffer zone along any natural watercourses or lakes to contain sediment to the first 25 percent of the buffer strip nearest the disturbance area.
2. Maintaining an undisturbed buffer of 25 feet along trout waters.
3. Minimizing slope cuts and fills to that sufficient for proper stabilization.
4. Vegetating slopes within 30 working days of 120 calendar days of final grading to prevent off-site sedimentation.

As designed, runoff for post-development conditions at the site will be directed to a system of manholes and storm drains constructed during the placement of final cap on Cell VI of the Area 6A West Landfill. All drainage structures in the proposed development were designed to accommodate runoff from the 25-year/24-hour storm event. Erosion control measures for the closure are addressed in this plan and in construction documents for the site. The erosion control measures are intended to stabilize surface water drainageways during construction and to provide temporary and permanent erosion control systems to minimize sediment transport during construction and operations.



BASE MAP ADAPTED FROM 7.5 MIN
USGS TOPOGRAPHIC QUADRANGLES:
CLYDE, NC–1978 & CANTON, NC–1990

2000 0 2000 4000 FEET

DWG: SITE LMN: CTB: HPSTD REV: 3/21/06

FIGURE 1–1
SITE LOCATION MAP
BLUE RIDGE PAPER PRODUCTS
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

SME
Sevee & Maher Engineers, Inc.

G:\Brpp\NC\6a-west\acad\SITE.dwg, 3/21/2006 2:31:29 PM, drd

The post-development surface water peak velocities were evaluated for the watersheds in which the Area 6A-West Landfill is included. Stormwater runoff flows were calculated using a computer modeling system called HydroCAD (Version 7.10) by Applied Microcomputer Systems of Chocorua, New Hampshire. The methods utilized in HydroCAD are based on the Soil Conservation Services (SCS) Technical Release No. 55 Methodology (TR55) for determining runoff peak flow values and flood hydrographs. A 24-hour Type 2 storm with antecedent moisture condition II was used to model the runoff characteristics of the site. Models were created for post-development site conditions using a 25-year frequency storm event. The post-development condition consists of the finish grading and landfill cap construction for the site.

1.1 Project Description

The purpose of this project is the construction of a landfill cap totaling approximately 17 acres for the Area 6A-West site. The site is located in Canton, North Carolina at Blue Ridge Paper Product's Landfill No. 6 (See Figure 1-1). By order from the North Carolina Division of Waste Management, Blue Ridge Paper Products is responsible for all closure and post-closure requirements.

1.2 Site Description

The topography of the closure area slopes to the east between 5 and 20 percent. Surface water drainage outside the closure area flows through a series of grass-lined drainage ditches, culverts, and natural drainage swales from west to east around the landfill eventually flowing to Pigeon River to the south.

1.3 Adjacent Properties

Land use surrounding the Landfill No. 6 property is primarily undeveloped, with Interstate Highway I-40 located to the north, and the Pigeon River to the south.

2.0 WATERSHED STORMWATER FLOWS

The study area for the watershed consists of approximately 17 acres in post-development conditions. Surface water runoff during the active construction of Cell VI will be collected and treated as leachate. The placement of final cover on Cell VI will direct clean water runoff to a system of ditches, culverts, manholes, and storm drains as discussed below.

Due to past land usage as a waste disposal site, surficial soils are not as mapped on surficial soil maps for the area. For the purposes of analysis and based on the findings of field reconnaissance existing soils within the area of analysis are classified as hydraulic soil group (HSG) C.

The analyzed watershed is comprised of six subcatchment (SC) areas based on site topography. The construction area totals approximately 17 acres of cover in Subcatchments SC-1, SC-2A, SC-2B, SC-2C, SC-2D, SC-3A, SC-3B, and SC-3C with additional runoff to Subcatchments SC-4, SC-5, and SC-6 downslope of the closure area (Area 6A-East).

Subcatchment area SC-1 is approximately 1.8 acres on the west side of Area 6A-West. Area SC-1 consists of meadow (proposed landfill cap) with Hydrologic Soil Group (HSG) C and a curve number (CN) of 71. Storm water flows from SC-1 drain southward along a perimeter ditch adjacent to the western access road to an 18-inch Corrugated Polyethylene Pipe (CPP) culvert. The 18-inch culvert routes runoff into a storm drain manhole (MH-1) with a 12-inch HDPE pipe outlet routing runoff to the west. SC-1 generated a peak flow of 8.61 CFS from a 25-year/24-hour duration storm.

Subcatchment area SC-2 totals approximately 6.1 acres on the north side of Area 6A-West. Land use for SC-2 consists of meadow (existing and proposed landfill cap) with HSG C and a CN of 71. Area SC-2 has been modeled in smaller subcatchments areas SC-2A, SC-2B, SC-2C, and SC-2D.

Subcatchment area SC-2A is approximately 2.3 acres on the northwest side of Area 6A-West. Storm water flows from SC-2A drain eastward along a perimeter ditch adjacent to the northern

access road to an 18-inch CPP culvert. A diversion berm constructed along the top of the cover system on the east side of SC-2A will direct stormwater from the top of the landfill to the 18-inch culvert. The 18-inch culvert routes runoff to the north into a storm drain manhole (MH-4) with a 12-inch CPP storm drain pipe outlet. Manhole MH-4's 12-inch storm drain outlet is routed to the east to manhole MH-3, described below. SC-2A generated a peak flow of 10.10 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-2B is approximately 1.0 acre on the north side of Area 6A-West. Storm water flows from SC-2B drain eastward along a perimeter ditch adjacent to the northern access road to an 18-inch CPP culvert. The 18-inch culvert routes runoff to the north into a storm drain manhole (MH-3) with a 12-inch storm drain pipe inlet from SC-2A and an 18-inch CPP storm drain pipe outlet. Manhole MH-3's 18-inch storm drain outlet is routed to the east to manhole MH-2, described below. SC-2B generated a peak flow of 3.97 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-2C is approximately 2.5 acres on the northeast side of Area 6A-West. Storm water flows from SC-2C drain eastward along a perimeter ditch adjacent to the northern access road to an 18-inch CPP culvert. A diversion berm constructed along the top of the cover system on the east side of SC-2C will direct stormwater from the top of the landfill to the 18-inch culvert. The 18-inch culvert routes runoff to the north into a storm drain manhole (MH-2) with an 18-inch storm drain pipe inlet from SC-2B and an 18-inch CPP storm drain pipe outlet. Manhole MH-2's 18-inch storm drain outlet is routed to the east to existing catch basin CB-1 located at the northwest corner of Area 6A-East, described below. SC-2C generated a peak flow of 9.40 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-2D is approximately 0.35 acres on the northeast side where Area 6A-East meets Area 6A-West. Storm water flows from SC-2D drain eastward along a perimeter ditch adjacent to the northern access road to an existing 18-inch CPP culvert. The 18-inch culvert routes runoff to the north into existing catch basin CB-1, where it meets with the 18-inch storm drain pipe from SC-2C. Catch Basin CB-1 directs runoff via an 18-inch HDPE culvert pipe

which replaces the existing 12-inch Corrugated Metal culvert, and outlets to the north. SC-2D generated a peak flow of 1.56 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-3 totals approximately 6.8 acres on the south side of Area 6A-West. Land use for SC-3 consists of meadow (existing and proposed landfill cap) with HSG C and a CN of 71. Area SC-3 has been modeled in smaller subcatchments areas SC-3A, SC-3B, and SC-3C.

Subcatchment area SC-3A is approximately 2.3 acres on the southwest side of Area 6A-West. Storm water flows from SC-3A drain eastward along a perimeter ditch adjacent to the southern access road to an 18-inch CPP culvert. A diversion berm constructed along the top of the cover system on the east side of SC-3A will direct stormwater from the top of the landfill to the 18-inch culvert. The 18-inch culvert routes runoff to the south into a storm drain manhole (MH-5) with a 12-inch CPP storm drain pipe outlet. Manhole MH-5's 12-inch storm drain outlet is routed to the east to manhole MH-6, described below. SC-3A generated a peak flow of 9.67 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-3B is approximately 1.0 acre on the north side of Area 6A-West. Storm water flows from SC-3B drain eastward along a perimeter ditch adjacent to the southern access road to an 18-inch CPP culvert. The 18-inch culvert routes runoff to the south into a storm drain manhole (MH-6) with a 12-inch storm drain pipe inlet from SC-3A and an 18-inch CPP storm drain pipe outlet. Manhole MH-6's 18-inch storm drain outlet is routed to the east to manhole MH-7, described below. SC-3B generated a peak flow of 4.16 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-3C is approximately 3.5 acres on the southeast side of Area 6A-West. Storm water flows from SC-3C drain eastward along a perimeter ditch adjacent to the northern access road to a 24-inch CPP culvert. A diversion berm constructed along the top of the cover system on the east side of SC-3C will direct stormwater from the top of the landfill to the 24-inch culvert. The 24-inch culvert routes runoff to the south into storm drain manhole (MH-7) where it meets with the 18-inch storm drain pipe from SC-2B. Manhole MH-7 directs runoff via an 18-

inch HDPE culvert pipe which outlets to the south. SC-3C generated a peak flow of 13.34 cfs from a 25-year/24-hour duration storm.

Subcatchment area SC-4 is approximately 2.0 acres on the south side of Area 6A-East and the southeast side of Area 6A-West. Area SC-4 consists of meadow (existing and proposed landfill cap) with HSG C and a CN of 71. Area SC-4 was analyzed to check the capacity of the existing drainage structures from the final closure condition of Area 6A-West and Area 6A-East. Storm water flows from SC-4 drain southward along an existing perimeter ditch adjacent to the southern access road to an existing 18-inch CPP culvert. SC-4 generated a peak flow of 8.55 CFS from a 25-year/24-hour duration storm. The existing perimeter ditch and 18-inch culvert outlet for Area SC-4 are adequately sized to accept runoff from the south during the final closure conditions.

Subcatchment area SC-5 is approximately 2.7 acres along the top and northwest sides of Area 6A-East and the west side of Area 6A-West. Area SC-5 consists of meadow (existing and proposed landfill cap) with HSG C and a CN of 71. Area SC-5 was analyzed to check the capacity of the existing drainage structures from the final closure condition of Area 6A-West and Area 6A-East. Stormwater flows from SC-5 drain eastward along the top of the landfill, to an existing perimeter ditch adjacent to the eastern access road. An existing 18-inch culvert directs runoff from the ditch to the east into an existing storm drain manhole (MH-1). Manhole MH-1 contains an 18-inch storm drain pipe inlet from SC-6 and an 18-inch storm drain pipe outlet to existing storm drain catch basin (CB-3). An existing diversion berm constructed along the top of the cover system on the east side of SC-5 also diverts stormwater from the top of the landfill to the 18-inch culvert. SC-5 generated a peak flow of 10.32 CFS from a 25-year/24-hour duration storm. The existing perimeter ditch and 18-inch culvert outlet for Area SC-5 are adequately sized to accept runoff from the west during the final closure conditions.

Subcatchment area SC-6 is approximately 2.3 acres along the top and north sides of Area 6A-East and the northwest side of Area 6A-West. Area SC-6 consists of meadow (existing and proposed landfill cap) with HSG C and a CN of 71. Area SC-6 was analyzed to check the capacity of the existing drainage structures from the final closure condition of Area 6A-West and

Area 6A-East. Stormwater flows from SC-6 drain eastward along the top of the landfill, to an existing perimeter ditch adjacent to the northern access road, to an existing catch basin with a 12-inch storm drain outlet. The 12-inch storm drain directs runoff to the south into an existing storm drain manhole MH-1 which directs runoff for SC-3B, as described above. SC-6 generated a peak flow of 8.80 CFS from a 25-year/24-hour duration storm. The existing catch basin and 12-inch storm drain are adequately sized to accept runoff from SC-6 during the final closure conditions.

To determine the peak surface water runoff rates, a CN and Tc were calculated for each subcatchment in post-development conditions based on area, hydrologic soil group, cover type, and drainage patterns. These calculations are located in Appendix F-3-1. The subcatchment boundaries and Tc routing for post-development conditions are also included as Figure 2-1 in Appendix F-3-1.

3.0 PERFORMANCE STANDARDS & DESIGN CALCULATIONS

Permanent erosion and sedimentation control measures for this project are designed to provide protection from a rainfall event equivalent in magnitude to the 25-year storm event. Temporary erosion and sedimentation control measures for this project are designed to provide protection from a rainfall event equivalent in magnitude to the 2-year storm event in an unvegetated state. Performance standards and design calculations for erosion and sediment control are included in Appendix F-3-2

3.1 Culvert Inlet/Outlet Protection

The inlet protection for all culverts has been analyzed using the culvert inlet with the highest inflow for conservative design. For the closure area, Culvert inlet SC-3C was sized to handle the flow from a 25-year/24-hour duration storm of 13.34 cfs. The inlet protection for culverts will need to be 11 feet long by the width of the ditch and 10 inches deep using an average stone diameter (D_{50}) of 5 inches.

The 12-inch culvert on the southwest corner outletting from manhole MH-1 (Culvert 1R) will require an energy dissipation structure and riprap outlet protection. Due to the steep pitch of the pipe and high water velocity expected at the outlet (V~8.5 ft/sec), an energy dissipation structure consisting of a 4 ft. diameter open top concrete manhole barrel with a steel splash plate is to be placed at the culvert outlet. Stormwater flow from the dissipation structure will overflow the top of the concrete barrel into a riprap apron outlet. This outlet apron will be 12 feet long by 13 feet wide and 8 inches deep using an average stone diameter (D_{50}) of 4 inches.

The existing 12-inch culvert on the northeast corner outletting from existing catch basin CB-1 will require removal and replacement with an 18-inch HDPE culvert (Culvert 5R) with installation of an energy dissipation structure and riprap apron outlet protection. Due to the steep pitch of the pipe and high water velocity expected at the outlet (V~13 ft/sec), an energy dissipation structure consisting of a 4 ft. diameter open top concrete manhole barrel with a steel

is to be placed at the culvert outlet. Stormwater flow from the dissipation structure will overflow the top of the concrete barrel into a riprap outlet apron. This outlet apron will be 20 feet long by 21 feet wide and 20 inches deep using an average stone diameter (D_{50}) of 10 inches.

The 18-inch culvert on the southeast corner outletting from manhole MH-7 (Culvert 8R) will require and energy dissipation structure and riprap outlet protection. Due to the steep pitch of the pipe and high water velocity (V~12 ft/sec) expected at the outlet, an energy dissipation structure consisting of a 4 ft. diameter open top concrete manhole barrel with a steel splash plate is to be placed at the culvert outlet. Stormwater flow from the dissipation structure will overflow the top of the concrete barrel into a riprap outlet apron. This outlet apron will be 20 feet long by 22 feet wide and 20 inches deep using an average stone diameter (D_{50}) of 10 inches.

3.2 Drainage Channels

Design of drainage channel geometries are conservatively sized based on the subcatchment(s) with the maximum drainage area, quickest time of concentration, and capacity to handle the peak flow from a 25-year/24-hour storm. Design of the erosion control matting was analyzed using North American Green's (NAG) Erosion Control Material Design Software Version 4.3. Flow from a 25-year/24-hour storm event was used to design channel linings where temporary turf reinforcement mat is adequate. Flow from a 25-year/24-hour storm event was used to design areas where permanent channel lining is required.

All perimeter ditches included within this design incorporate a trapezoidal cross-section with maximum 3 horizontal to 1 vertical (3H:1V) sideslopes, 3-foot-wide bottom, and 2-foot depth. The capacity of this ditch design is greater than the peak flow generated from stormwater runoff while maintaining a minimum of 1 foot freeboard within the ditch. Temporary matting during the unvegetated condition will require NAG's temporary lining SC150 or equal, prior to a permanent channel lining of vegetation.

The diversion berms / ditches included in this design incorporate a trapezoidal cross-section with maximum 4 horizontal to 1 vertical (4H:1V) sideslopes, 8 foot-wide bottom, and 2-foot depth.

The capacity of this ditch design is greater than the peak flow generated from stormwater runoff while maintaining a minimum of 1-foot freeboard within the ditch. The diversion ditch will require NAG's permanent lining P550 or equal at slopes greater than 10%.

4.0 PLANNED SEDIMENT AND EROSION CONTROL PRACTICES

Proposed erosion and sedimentation control practices include the following:

1. Construction Sequence Schedule (Practice 6.01) – A construction sequence schedule is included in this plan as Section 5.0.

2. Surface Roughening (Practice 6.03) – To aid in the establishment of vegetative cover, all slopes receiving topsoil will be tracked with appropriate equipment to create grooves perpendicular to the slope.

3. Topsoiling (Practice 6.04) – Topsoil will be added to a depth of six inches in all areas within the limits of the landfill capping.

4. Permanent Seeding (Practice 6.11.1) – Permanent seeding will be applied to all areas disturbed by construction.

5. Mulching (Practice 6.14.1) – Mulch will be applied to all seeded areas to limit erosion.

6. Grass-Lined Channels (Practice 6.30.1) –All grass-lined channels will be lined with Erosion Control Blankets until vegetation is stabilized in the channel. See Appendix B for drainage channel design calculations.

7. Siltation Fence (Practice 6.62.1) - Siltation fence will be installed along the clearing limit lines where siltation is likely to occur.

8. Dust Control (Practice 6.84.1) – Should excessive dust become a problem with construction it will be controlled by application of water in a fine spray with a water truck.

9. Hay Bales – Hay bales will be placed in drainage channels where necessary for the temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, entering catch basins, or damaging the work.

5.0 CONSTRUCTION SCHEDULE

The following construction schedule shall be maintained throughout the project:

1. Obtain plan approval and other applicable permits.

2. Clearly mark limits of work and limits of clearing (if applicable).

3. Hold pre-construction conference at least one week prior to commencement of construction.

4. Install silt fence as indicated for Area 6A-West.

5. Perform clearing (if applicable) or final grading required for Area 6A-West.

6. Perform construction activities for Area 6A-West.

7. Install turf reinforcement mat in ditches.

8. Sequence construction activities so that not more than four acres of area are open at one time. An open area is one that has not reached final grade and/or has not been permanently seeded and mulched.

9. Remove temporary silt fence upon completion of project and remove other erosion control measures when all areas are stabilized. Estimated time before final stabilization – 9 months from final seeding.

6.0 CONSTRUCTION MAINTENANCE PLAN

The following maintenance will occur at the site in order to minimize the chances for erosion and sediment control issues at the site:

1. All erosion and sediment control practices will be checked for stability and operation following every runoff-producing rainfall but in no case less than once per week. Any required repairs shall be made immediately to maintain all structures as designed.

2. An adequate inventory of sediment and erosion control items (i.e., siltation fence, hay bales, check dam stone, etc.) shall be maintained on-site to perform maintenance sediment and erosion control practices without delay.

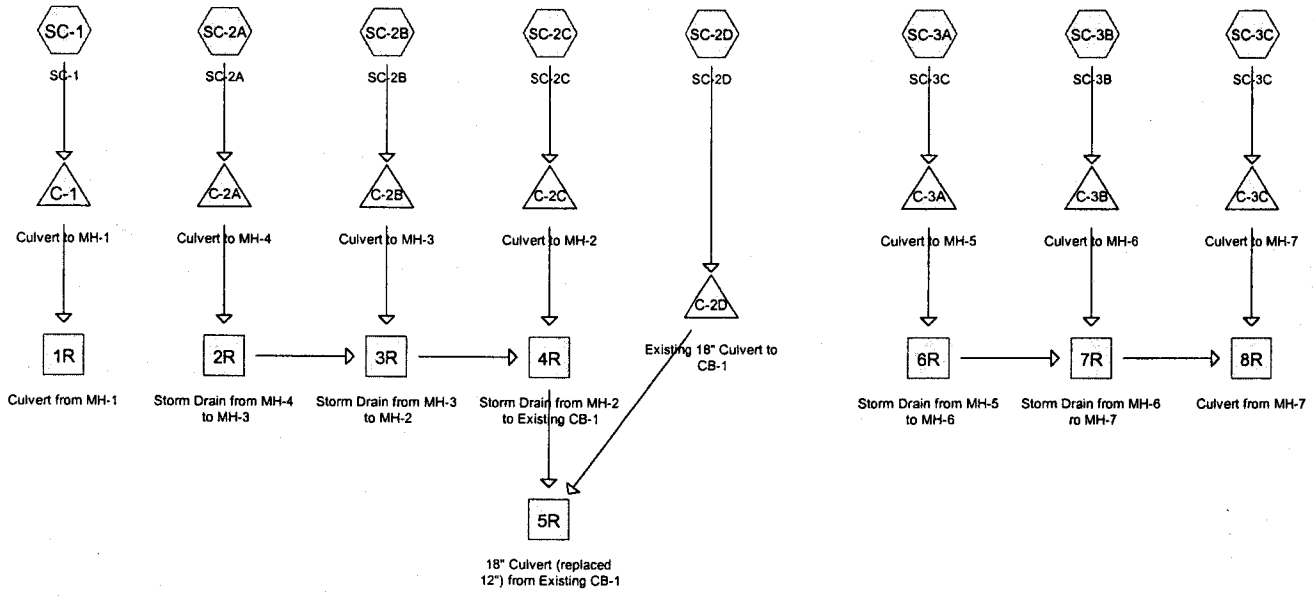
3. Sediment will be removed from siltation fence when it becomes one-half foot deep at the fence. Sedimentation fence shall be repaired as necessary to maintain an effective sediment barrier.

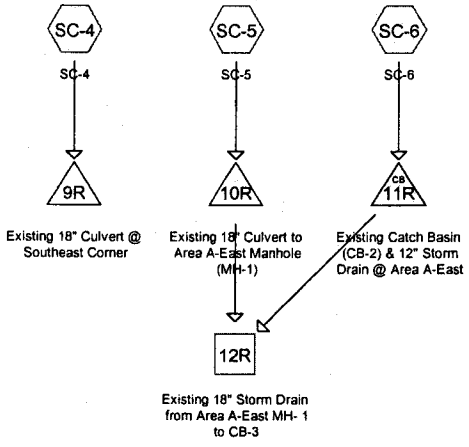
4. Sediments removed from siltation fences and temporary sediment traps will be placed in areas not prone to erosion.

5. All seeded areas will be fertilized, reseeded, and remulched as necessary according to specifications to maintain a vigorous, dense, vegetative growth.

APPENDIX F-3-1

POST-DEVELOPMENT STORMWATER ANALYSIS
AREA 6A WEST FINAL COVER





Subcat Reach Pond Link

Drainage Diagram for 6A WEST FINAL CLOSURE

Prepared by Sevee & Maher Engineers, Inc. 2/17/2006

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-1: SC-1 Runoff Area=76,300 sf Runoff Depth>2.90"
Flow Length=655' Tc=6.9 min CN=71 Runoff=8.61 cfs 0.423 af

Subcatchment SC-2A: SC-2A Runoff Area=99,600 sf Runoff Depth>2.89"
Flow Length=490' Tc=10.0 min CN=71 Runoff=10.10 cfs 0.551 af

Subcatchment SC-2B: SC-2B Runoff Area=41,650 sf Runoff Depth>2.89"
Flow Length=410' Tc=11.7 min CN=71 Runoff=3.97 cfs 0.230 af

Subcatchment SC-2C: SC-2C Runoff Area=107,200 sf Runoff Depth>2.89"
Flow Length=820' Tc=14.2 min CN=71 Runoff=9.40 cfs 0.593 af

Subcatchment SC-2D: SC-2D Runoff Area=15,100 sf Runoff Depth>2.89"
Flow Length=190' Tc=9.5 min CN=71 Runoff=1.56 cfs 0.084 af

Subcatchment SC-3A: SC-3C Runoff Area=97,700 sf Runoff Depth>2.89"
Flow Length=560' Tc=10.7 min CN=71 Runoff=9.67 cfs 0.541 af

Subcatchment SC-3B: SC-3B Runoff Area=44,100 sf Runoff Depth>2.89"
Flow Length=440' Tc=12.0 min CN=71 Runoff=4.16 cfs 0.244 af

Subcatchment SC-3C: SC-3C Runoff Area=152,600 sf Runoff Depth>2.89"
Flow Length=870' Tc=14.3 min CN=71 Runoff=13.34 cfs 0.844 af

Subcatchment SC-4: SC-4 Runoff Area=86,400 sf Runoff Depth>2.89"
Flow Length=680' Tc=10.7 min CN=71 Runoff=8.55 cfs 0.478 af

Subcatchment SC-5: SC-5 Runoff Area=116,600 sf Runoff Depth>2.89"
Flow Length=720' Tc=13.9 min CN=71 Runoff=10.32 cfs 0.645 af

Subcatchment SC-6: SC-6 Runoff Area=99,100 sf Runoff Depth>2.89"
Flow Length=630' Tc=13.8 min CN=71 Runoff=8.80 cfs 0.548 af

Reach 1R: Culvert from MH-1 Peak Depth=0.43' Max Vel=25.7 fps Inflow=8.21 cfs 0.422 af
D=12.0" n=0.011 L=140.0' S=0.2679 '/' Capacity=21.79 cfs Outflow=8.18 cfs 0.422 af

Reach 2R: Storm Drain from MH-4 to MH-3 Peak Depth=0.79' Max Vel=14.2 fps Inflow=9.39 cfs 0.551 af
D=12.0" n=0.011 L=325.0' S=0.0538 '/' Capacity=9.77 cfs Outflow=9.34 cfs 0.551 af

Reach 3R: Storm Drain from MH-3 to MH-2 Peak Depth=0.73' Max Vel=15.5 fps Inflow=13.25 cfs 0.781 af
D=18.0" n=0.011 L=170.0' S=0.0500 '/' Capacity=27.76 cfs Outflow=13.18 cfs 0.781 af

Reach 4R: Storm Drain from MH-2 to Existi Peak Depth=0.81' Max Vel=23.0 fps Inflow=22.50 cfs 1.373 af
D=18.0" n=0.011 L=80.0' S=0.1000 '/' Capacity=39.26 cfs Outflow=22.46 cfs 1.373 af

Reach 5R: 18" Culvert (replaced 12") from Peak Depth=0.58' Max Vel=37.6 fps Inflow=23.86 cfs 1.457 af
D=18.0" n=0.011 L=140.0' S=0.3643 '/' Capacity=74.93 cfs Outflow=23.82 cfs 1.457 af

Reach 6R: Storm Drain from MH-5 to MH-6 Peak Depth=0.73' Max Vel=14.9 fps Inflow=9.17 cfs 0.540 af
D=12.0" n=0.011 L=370.0' S=0.0608 '/' Capacity=10.38 cfs Outflow=9.06 cfs 0.540 af

Reach 7R: Storm Drain from MH-6 ro MH-7 Peak Depth=0.52' Max Vel=24.0 fps Inflow=13.17 cfs 0.784 af
D=18.0" n=0.011 L=100.0' S=0.1650 '/' Capacity=50.43 cfs Outflow=13.14 cfs 0.784 af

Reach 8R: Culvert from MH-7 Peak Depth=0.68' Max Vel=33.9 fps Inflow=26.29 cfs 1.627 af
D=18.0" n=0.011 L=120.0' S=0.2542 '/' Capacity=62.59 cfs Outflow=26.24 cfs 1.627 af

Reach 12R: Existing 18" Storm Drain from Peak Depth=0.72' Max Vel=22.1 fps Inflow=18.44 cfs 1.192 af
D=18.0" n=0.011 L=150.0' S=0.1033 '/' Capacity=39.91 cfs Outflow=18.38 cfs 1.192 af

Pond 9R: Existing 18" Culvert @ Southeast Peak Elev=2,708.11' Storage=722 cf Inflow=8.55 cfs 0.478 af
18.0" x 50.0' Culvert Outflow=7.85 cfs 0.478 af

Pond 10R: Existing 18" Culvert to Area A-E Peak Elev=2,728.07' Storage=696 cf Inflow=10.32 cfs 0.645 af
18.0" x 20.0' Culvert Outflow=9.80 cfs 0.644 af

Pond 11R: Existing Catch Basin (CB-2) & 12" Storm Drain Peak Elev=2,726.91' Inflow=8.80 cfs 0.548 af
12.0" x 105.0' Culvert Outflow=8.80 cfs 0.548 af

Pond C-1: Culvert to MH-1 Peak Elev=2,785.67' Storage=469 cf Inflow=8.61 cfs 0.423 af
18.0" x 30.0' Culvert Outflow=8.21 cfs 0.422 af

Pond C-2A: Culvert to MH-4 Peak Elev=2,771.96' Storage=629 cf Inflow=10.10 cfs 0.551 af
18.0" x 10.0' Culvert Outflow=9.39 cfs 0.551 af

Pond C-2B: Culvert to MH-3 Peak Elev=2,753.10' Storage=221 cf Inflow=3.97 cfs 0.230 af
18.0" x 10.0' Culvert Outflow=3.90 cfs 0.230 af

Pond C-2C: Culvert to MH-2 Peak Elev=2,744.24' Storage=274 cf Inflow=9.40 cfs 0.593 af
18.0" x 10.0' Culvert Outflow=9.36 cfs 0.592 af

Pond C-2D: Existing 18" Culvert to CB-1 Peak Elev=2,736.64' Storage=88 cf Inflow=1.56 cfs 0.084 af
18.0" x 30.0' Culvert Outflow=1.53 cfs 0.083 af

Pond C-3A: Culvert to MH-5 Peak Elev=2,775.91' Storage=596 cf Inflow=9.67 cfs 0.541 af
18.0" x 10.0' Culvert Outflow=9.17 cfs 0.540 af

Pond C-3B: Culvert to MH-6 Peak Elev=2,751.98' Storage=181 cf Inflow=4.16 cfs 0.244 af
18.0" x 10.0' Culvert Outflow=4.12 cfs 0.244 af

Pond C-3C: Culvert to MH-7 Peak Elev=2,738.76' Storage=513 cf Inflow=13.34 cfs 0.844 af
24.0" x 30.0' Culvert Outflow=13.21 cfs 0.843 af

Total Runoff Area = 21.496 ac Runoff Volume = 5.179 af Average Runoff Depth = 2.89"

Subcatchment SC-1: SC-1

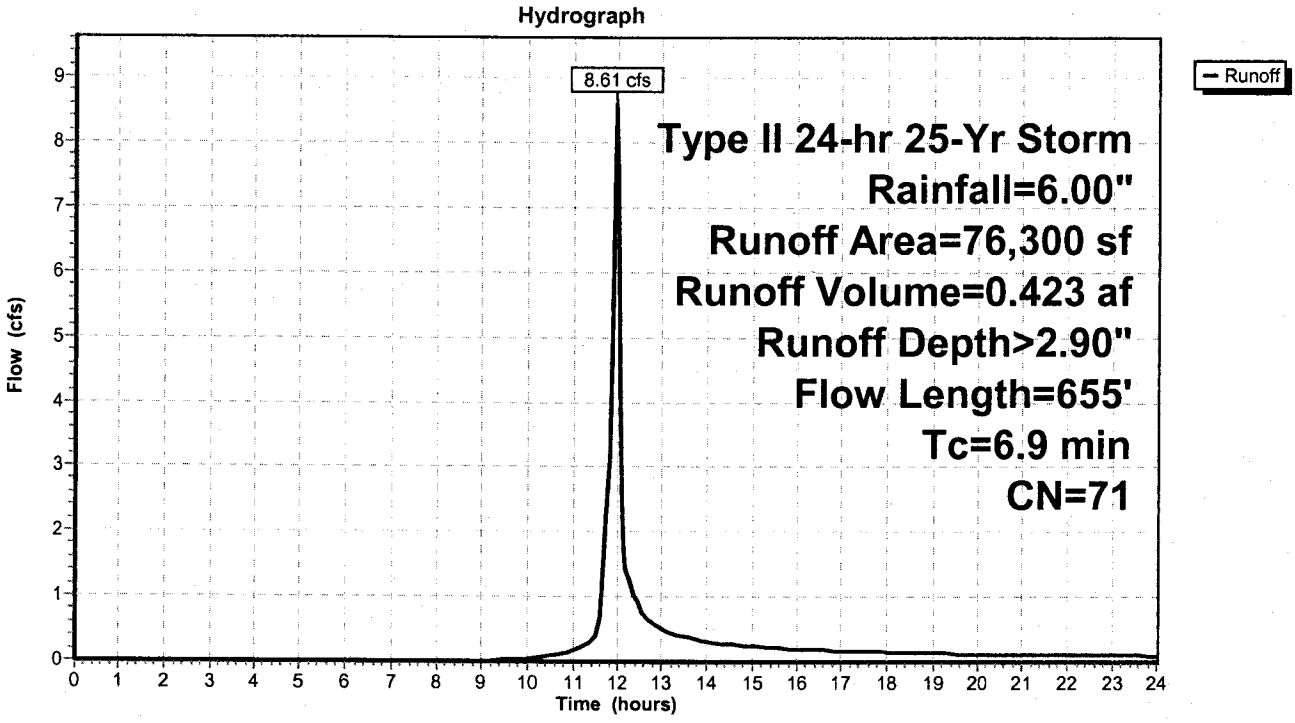
Runoff = 8.61 cfs @ 11.96 hrs, Volume= 0.423 af, Depth> 2.90"

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
76,300	71	Landfill Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	70	0.1100	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.3	65	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.4	520	0.0125	6.1	109.43	**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
6.9	655	Total			

Subcatchment SC-1: SC-1



Subcatchment SC-2A: SC-2A

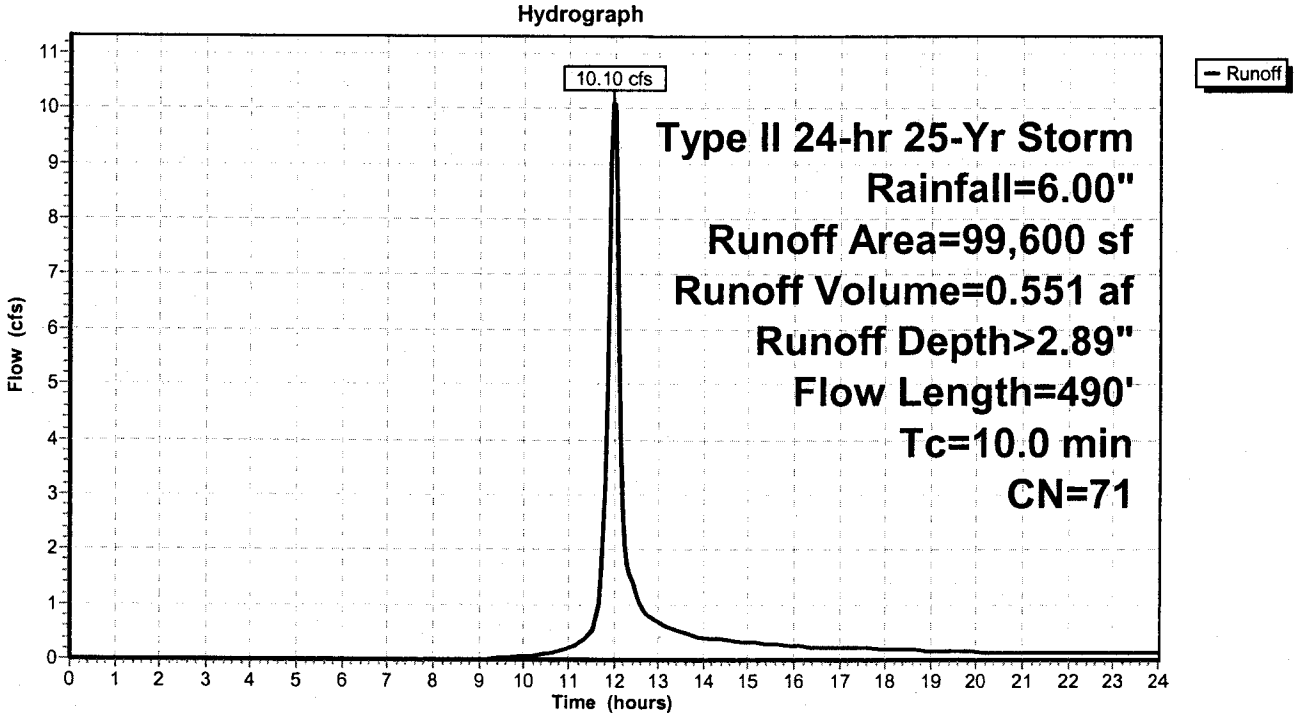
Runoff = 10.10 cfs @ 11.99 hrs, Volume= 0.551 af, Depth> 2.89"

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
99,600	71	Landfill Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	100	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	200	0.0250	8.3	165.04	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	90	0.3300	30.0	599.62	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
10.0	490	Total			

Subcatchment SC-2A: SC-2A



Subcatchment SC-2B: SC-2B

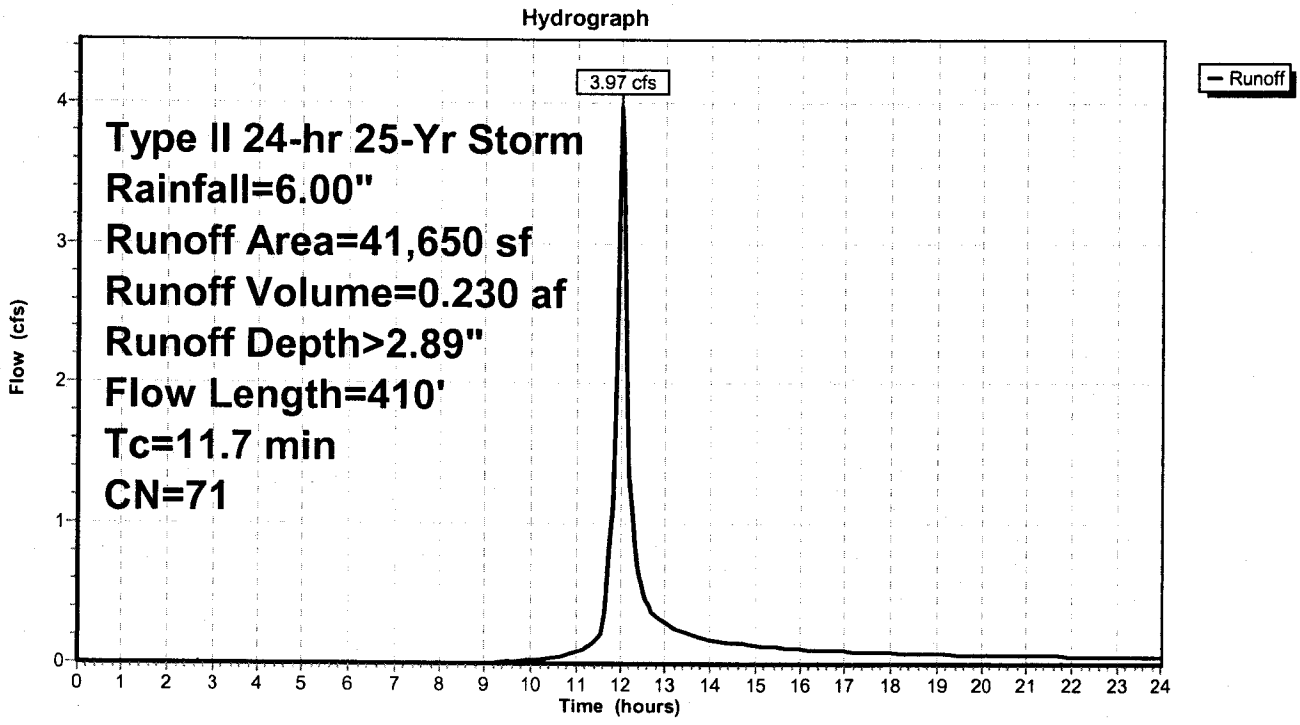
Runoff = 3.97 cfs @ 12.01 hrs, Volume= 0.230 af, Depth> 2.89"

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
41,650	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
2.2	220	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	90	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
11.7	410	Total			

Subcatchment SC-2B: SC-2B



Subcatchment SC-2C: SC-2C

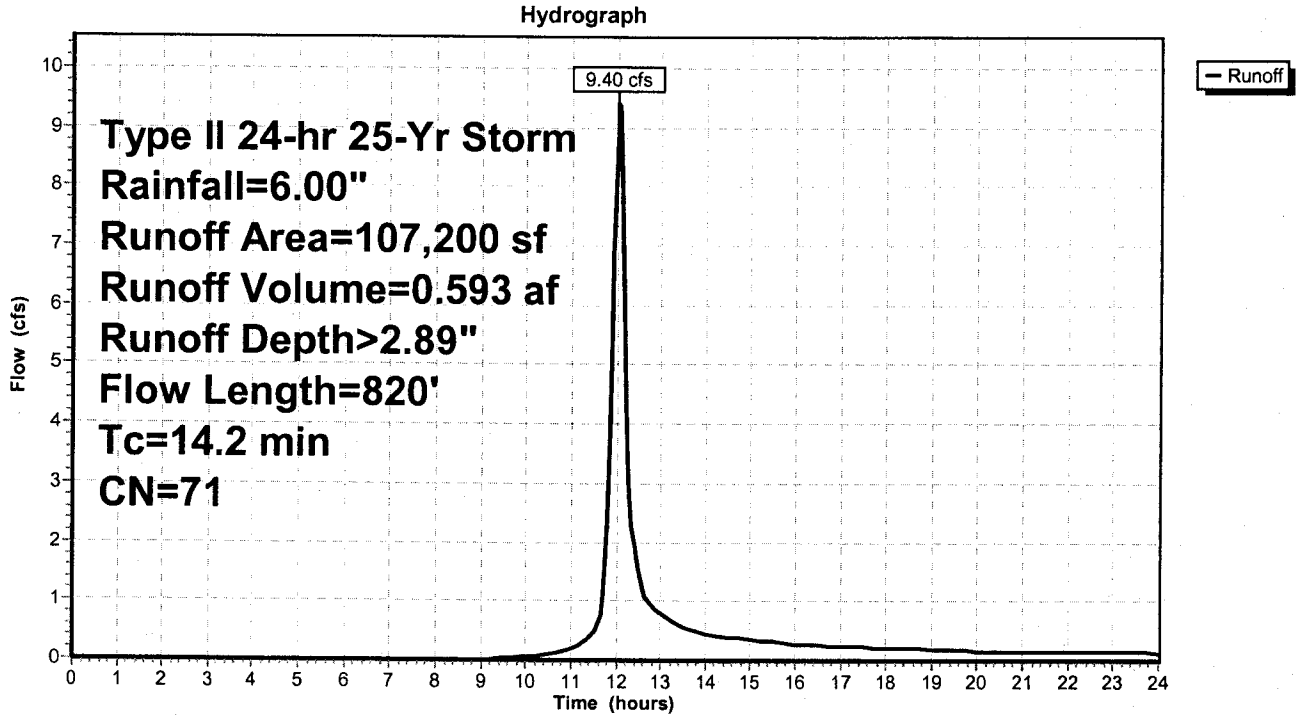
Runoff = 9.40 cfs @ 12.04 hrs, Volume= 0.593 af, Depth> 2.89"

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
107,200	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
4.6	450	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	180	0.0250	8.3	165.04	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	90	0.3300	30.0	599.62	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
14.2	820	Total			

Subcatchment SC-2C: SC-2C



Subcatchment SC-2D: SC-2D

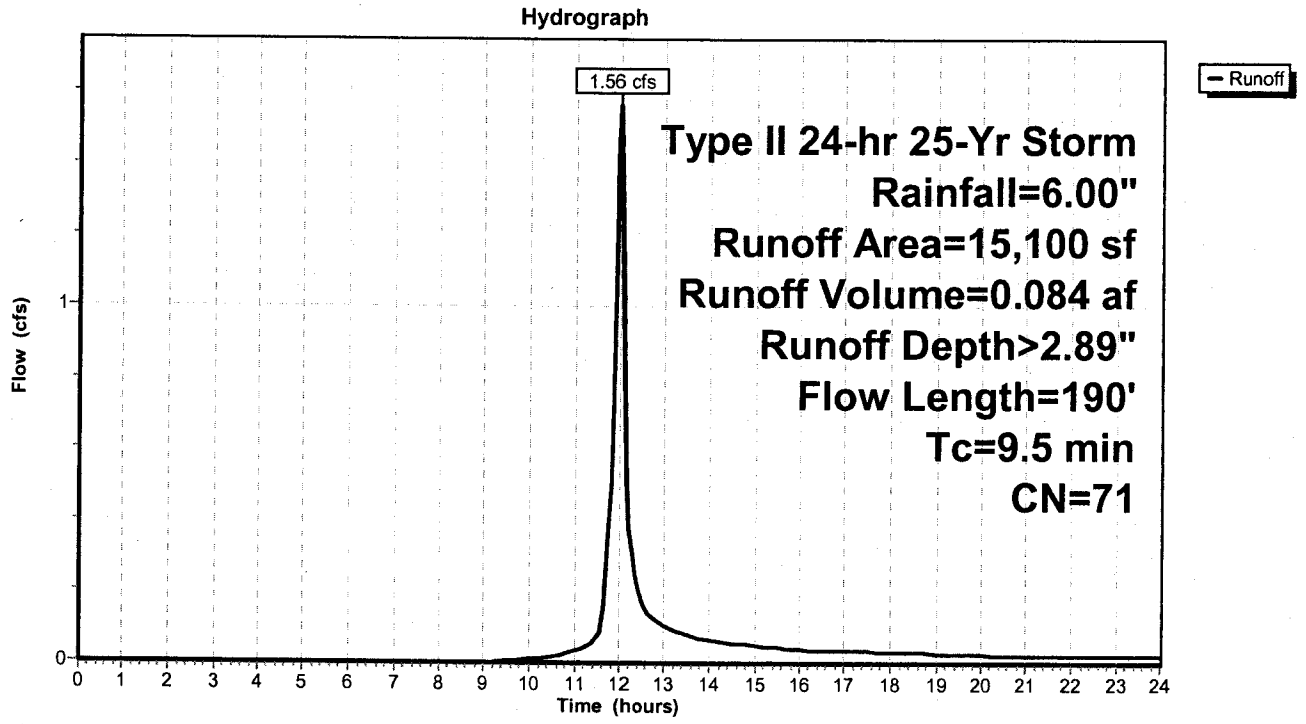
Runoff = 1.56 cfs @ 11.99 hrs, Volume= 0.084 af, Depth> 2.89"

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
15,100	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.4	90	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
9.5	190	Total			

Subcatchment SC-2D: SC-2D



Subcatchment SC-3A: SC-3C

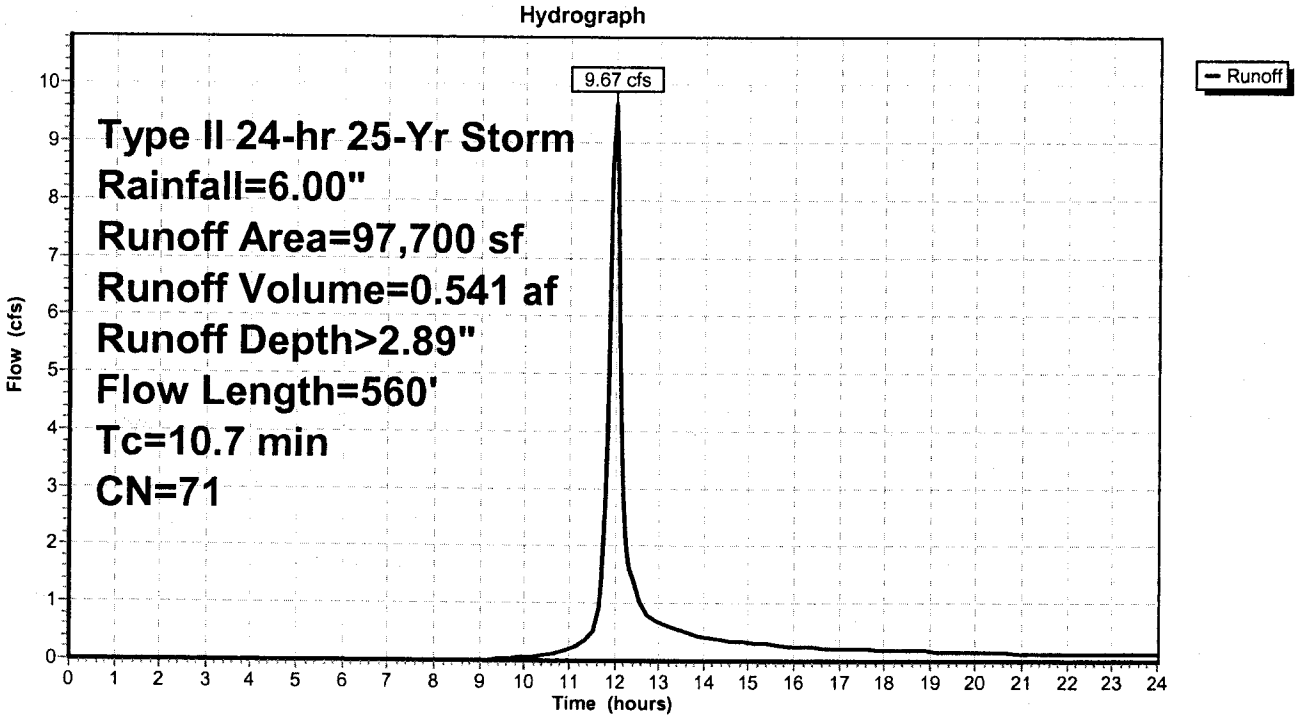
Runoff = 9.67 cfs @ 12.00 hrs, Volume= 0.541 af, Depth> 2.89"

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
97,700	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
1.0	100	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	270	0.0250	8.3	165.04	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	90	0.3300	30.0	599.62	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
10.7	560	Total			

Subcatchment SC-3A: SC-3C



Subcatchment SC-3B: SC-3B

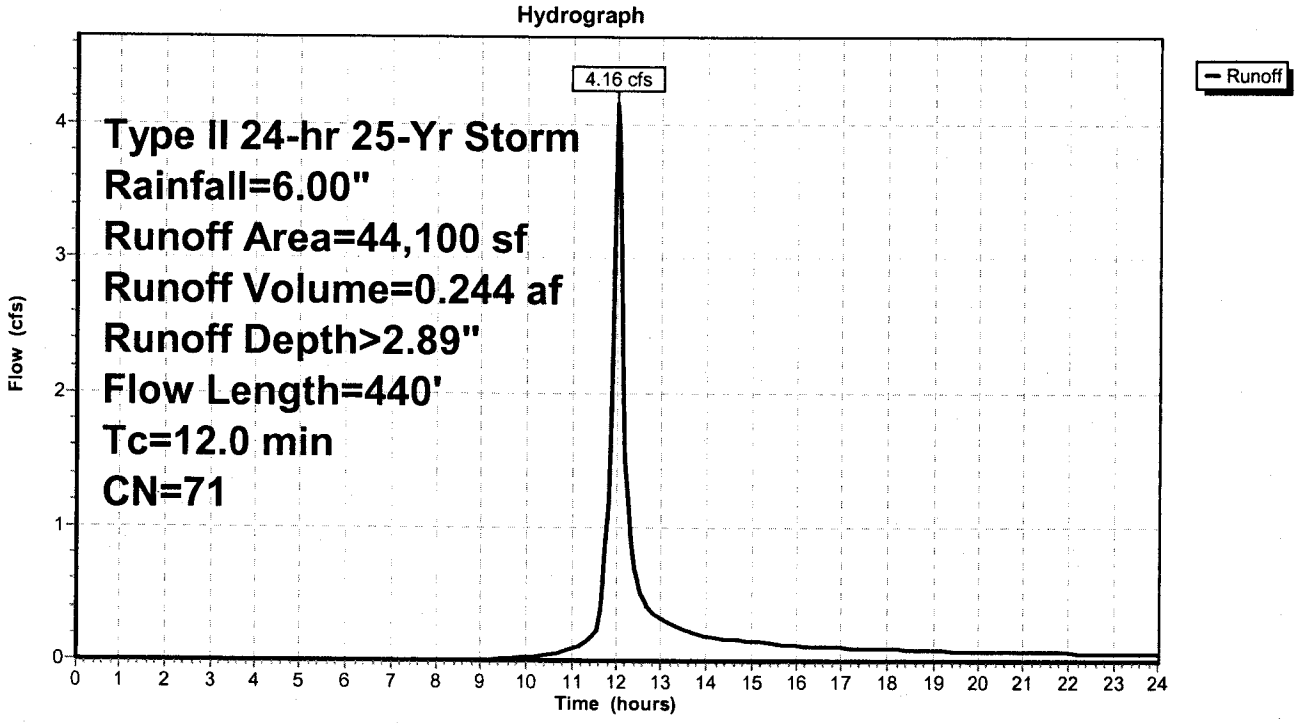
Runoff = 4.16 cfs @ 12.01 hrs, Volume= 0.244 af, Depth> 2.89"

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
44,100	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
2.5	250	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.4	90	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
12.0	440	Total			

Subcatchment SC-3B: SC-3B



Subcatchment SC-3C: SC-3C

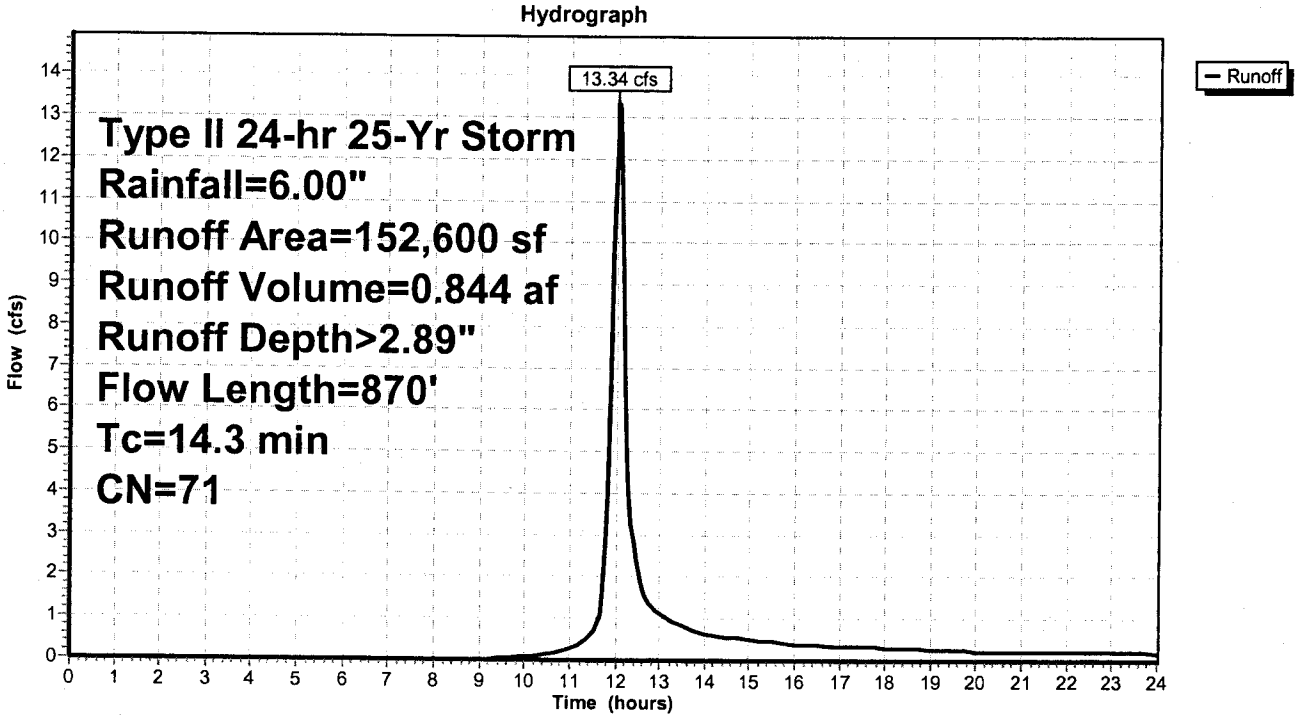
Runoff = 13.34 cfs @ 12.04 hrs, Volume= 0.844 af, Depth> 2.89"

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
152,600	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
4.6	450	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	230	0.0250	8.3	165.04	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
0.1	90	0.3300	30.0	599.62	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
14.3	870	Total			

Subcatchment SC-3C: SC-3C



Subcatchment SC-4: SC-4

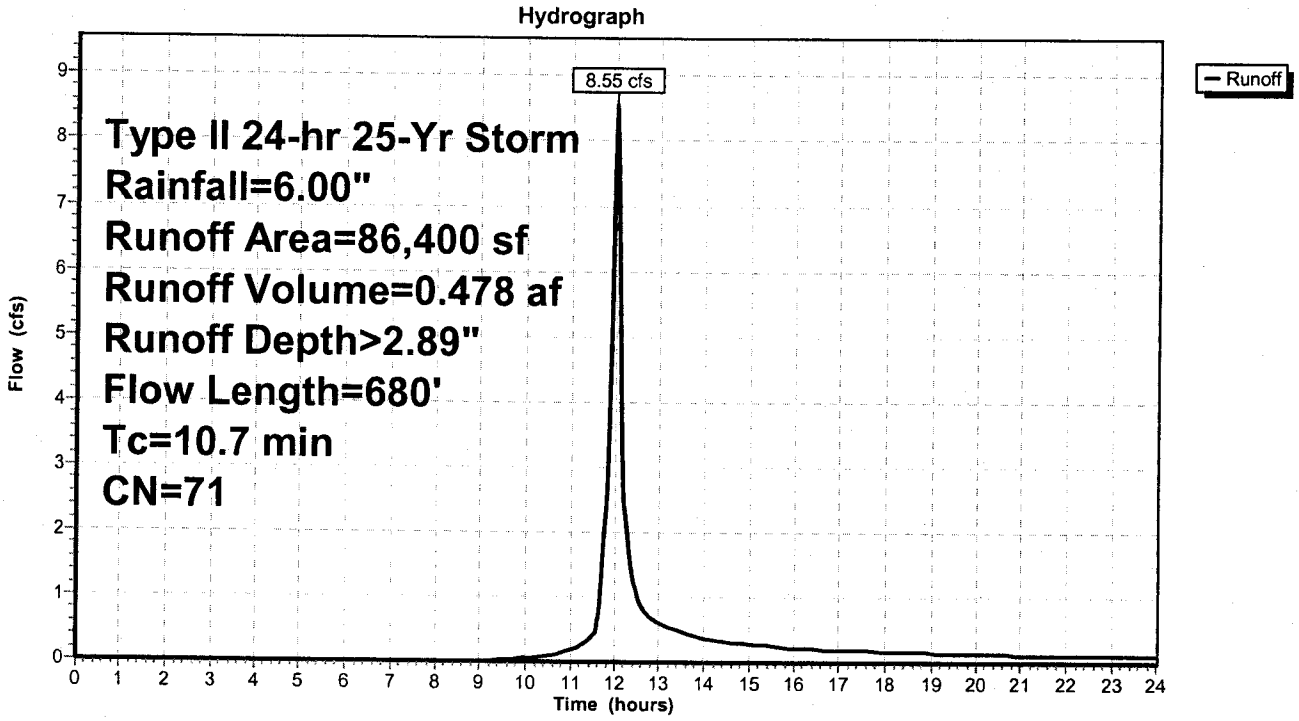
Runoff = 8.55 cfs @ 12.00 hrs, Volume= 0.478 af, Depth> 2.89"

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
86,400	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.7	70	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	130	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.4	380	0.0736	14.8	265.54	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
10.7	680	Total			

Subcatchment SC-4: SC-4



Subcatchment SC-5: SC-5

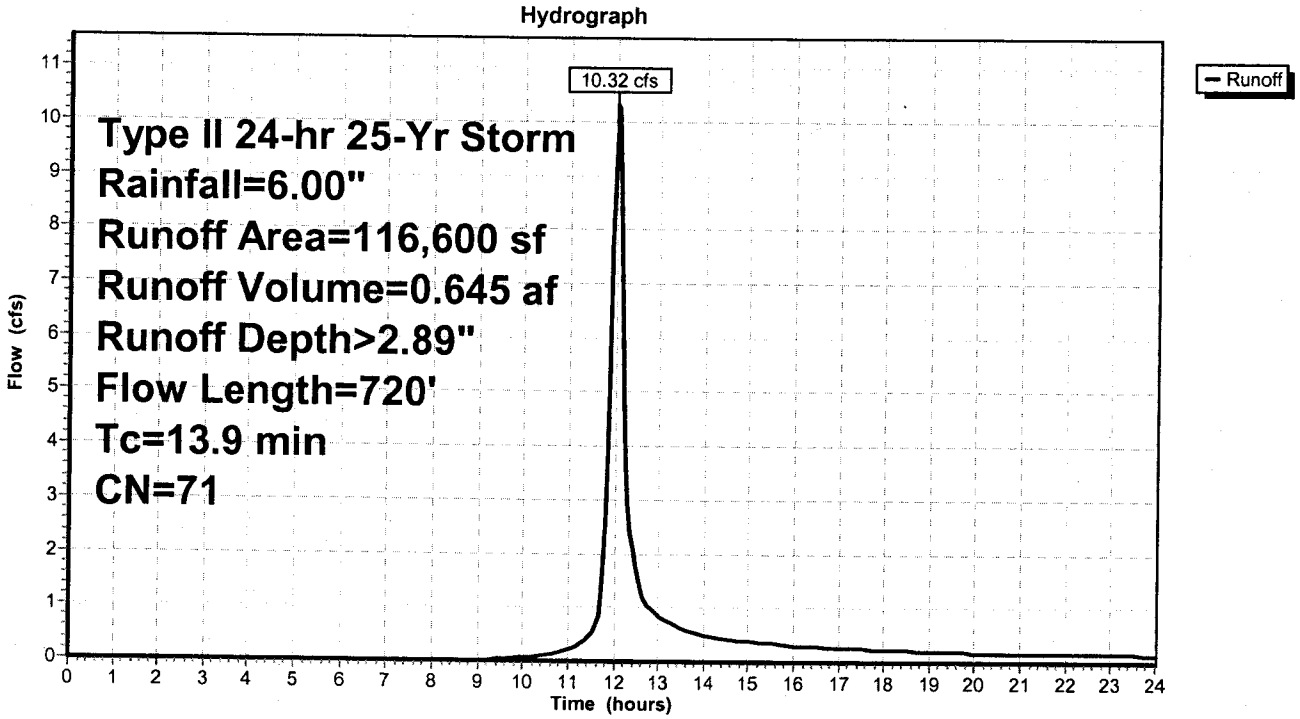
Runoff = 10.32 cfs @ 12.04 hrs, Volume= 0.645 af, Depth> 2.89"

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
116,600	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.9		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
0.1	90	0.0670	14.1	253.35	**Trap/Vee/Rect Channel Flow, Segment ID: D-E** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.030
13.9	720	Total			

Subcatchment SC-5: SC-5



Subcatchment SC-6: SC-6

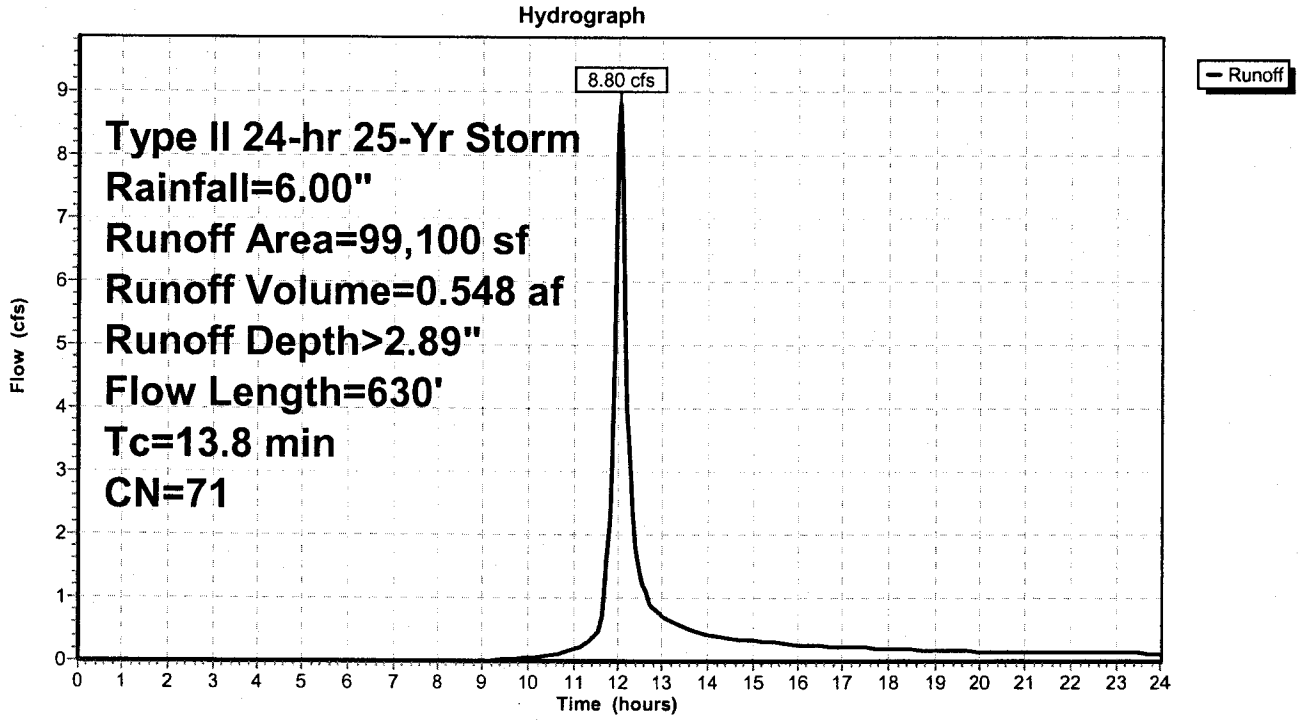
Runoff = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af, Depth> 2.89"

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
99,100	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
3.6	340	0.0500	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
1.1	190	0.1700	2.9		**Shallow Concentrated Flow, Segment ID: C-D** Short Grass Pasture Kv= 7.0 fps
13.8	630	Total			

Subcatchment SC-6: SC-6



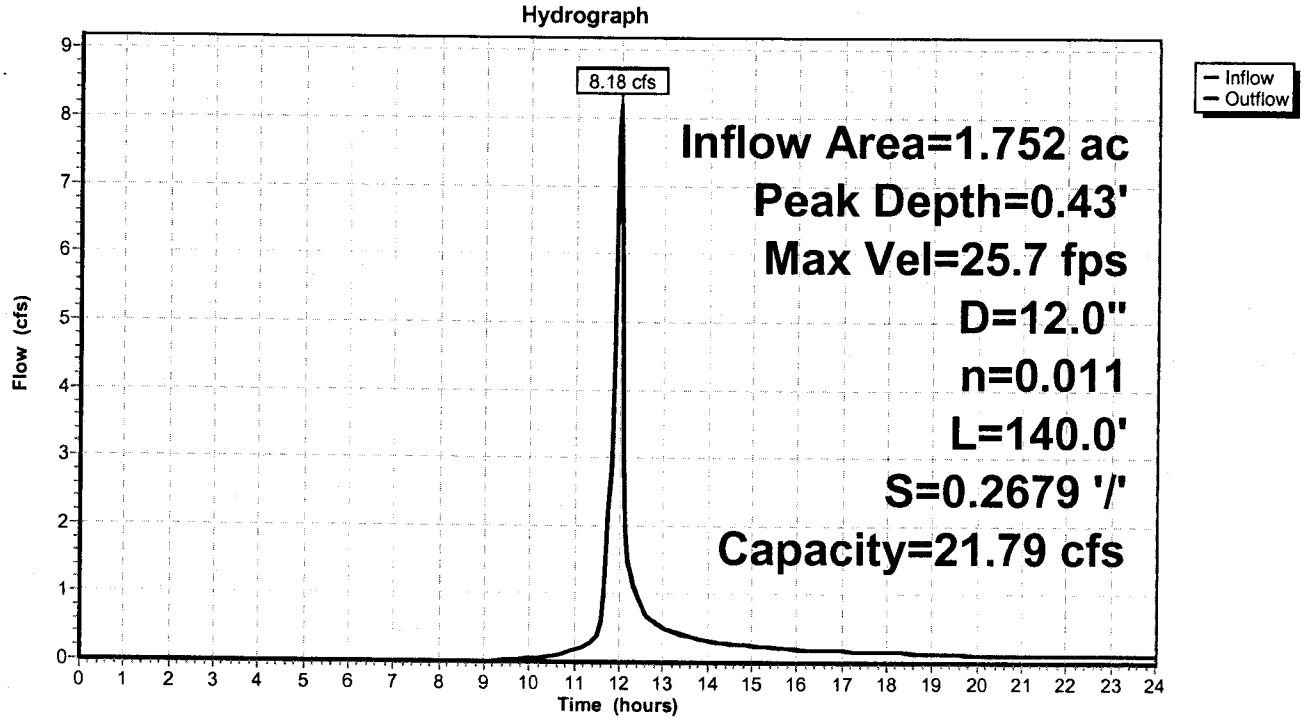
Reach 1R: Culvert from MH-1

Inflow Area = 1.752 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 8.21 cfs @ 11.98 hrs, Volume= 0.422 af
Outflow = 8.18 cfs @ 11.98 hrs, Volume= 0.422 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= 25.7 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.5 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.43' @ 11.98 hrs
Capacity at bank full= 21.79 cfs
Inlet Invert= 2,779.50', Outlet Invert= 2,742.00'
12.0" Diameter Pipe, n= 0.011
Length= 140.0' Slope= 0.2679 '/'

Reach 1R: Culvert from MH-1



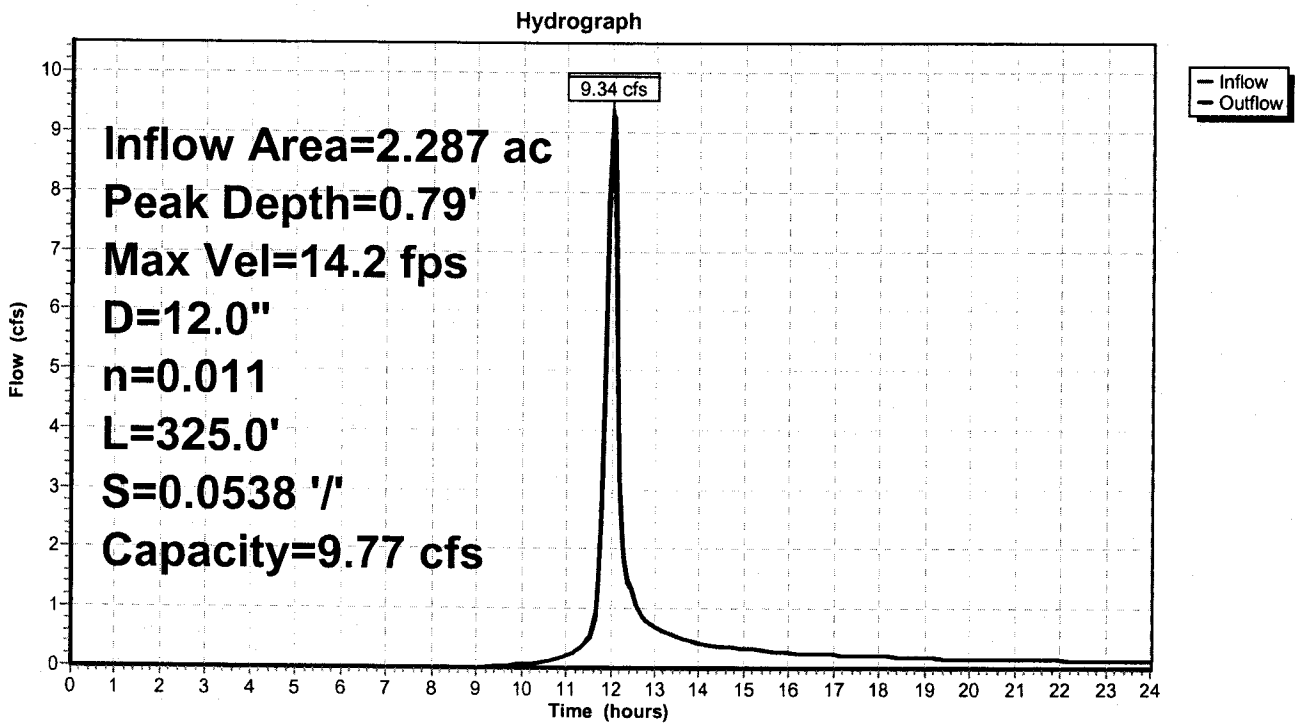
Reach 2R: Storm Drain from MH-4 to MH-3

Inflow Area = 2.287 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 9.39 cfs @ 12.02 hrs, Volume= 0.551 af
Outflow = 9.34 cfs @ 12.03 hrs, Volume= 0.551 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= 14.2 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.2 fps, Avg. Travel Time= 1.0 min

Peak Depth= 0.79' @ 12.03 hrs
Capacity at bank full= 9.77 cfs
Inlet Invert= 2,768.50', Outlet Invert= 2,751.00'
12.0" Diameter Pipe, n= 0.011
Length= 325.0' Slope= 0.0538 '/'

Reach 2R: Storm Drain from MH-4 to MH-3



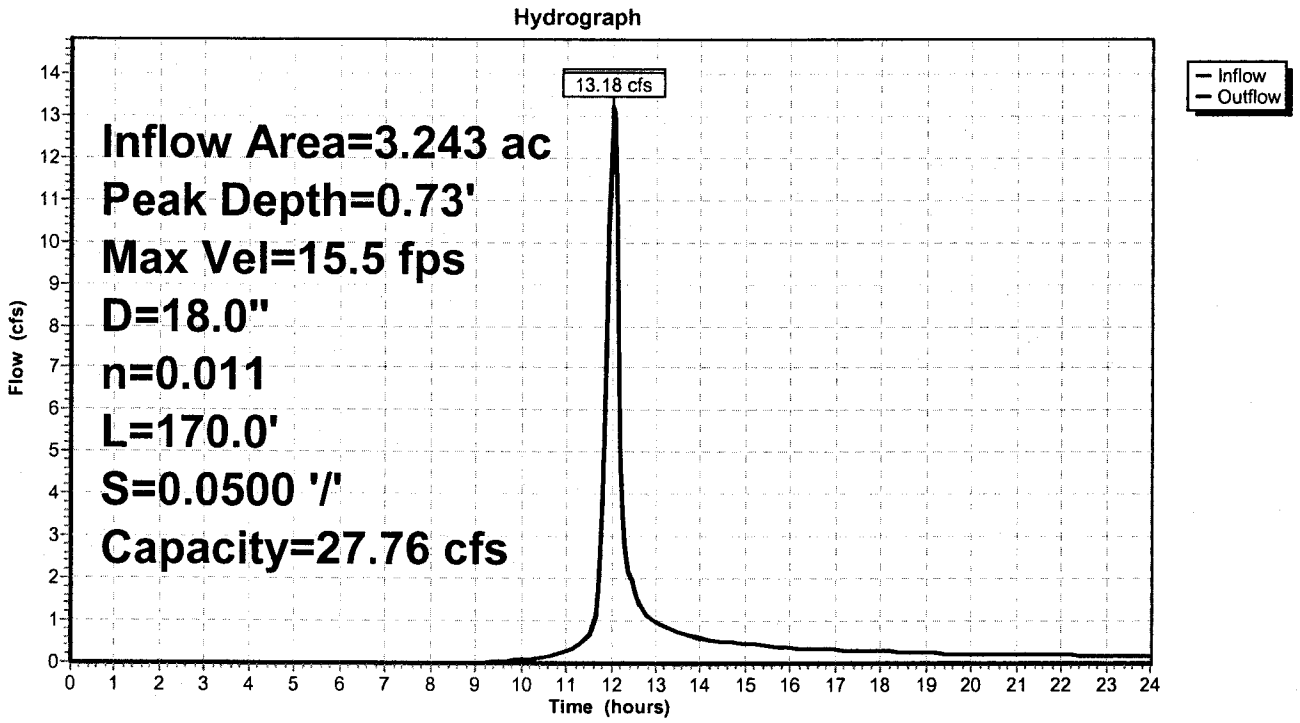
Reach 3R: Storm Drain from MH-3 to MH-2

Inflow Area = 3.243 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 13.25 cfs @ 12.03 hrs, Volume= 0.781 af
Outflow = 13.18 cfs @ 12.04 hrs, Volume= 0.781 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= 15.5 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.4 fps, Avg. Travel Time= 0.5 min

Peak Depth= 0.73' @ 12.03 hrs
Capacity at bank full= 27.76 cfs
Inlet Invert= 2,750.50', Outlet Invert= 2,742.00'
18.0" Diameter Pipe, n= 0.011
Length= 170.0' Slope= 0.0500 '/'

Reach 3R: Storm Drain from MH-3 to MH-2



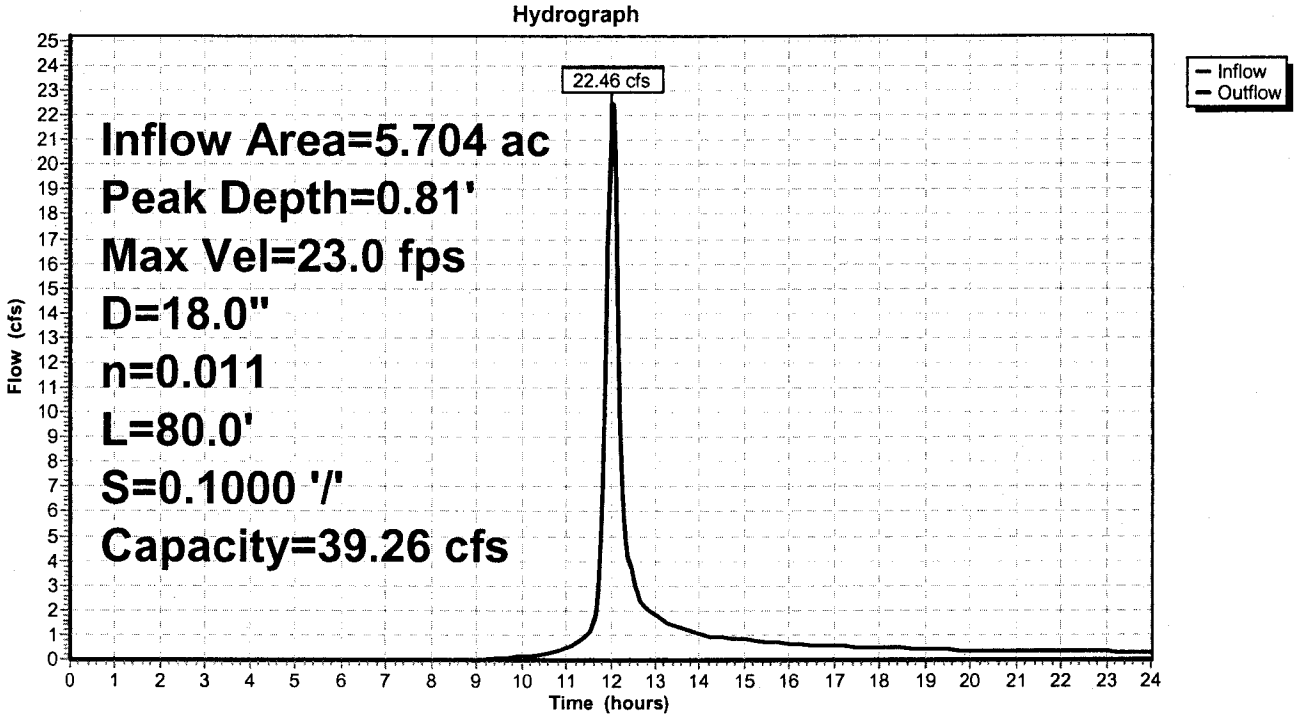
Reach 4R: Storm Drain from MH-2 to Existing CB-1

Inflow Area = 5.704 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 22.50 cfs @ 12.04 hrs, Volume= 1.373 af
Outflow = 22.46 cfs @ 12.04 hrs, Volume= 1.373 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= 23.0 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.1 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.81' @ 12.04 hrs
Capacity at bank full= 39.26 cfs
Inlet Invert= 2,741.50', Outlet Invert= 2,733.50'
18.0" Diameter Pipe, n= 0.011
Length= 80.0' Slope= 0.1000 '/'

Reach 4R: Storm Drain from MH-2 to Existing CB-1



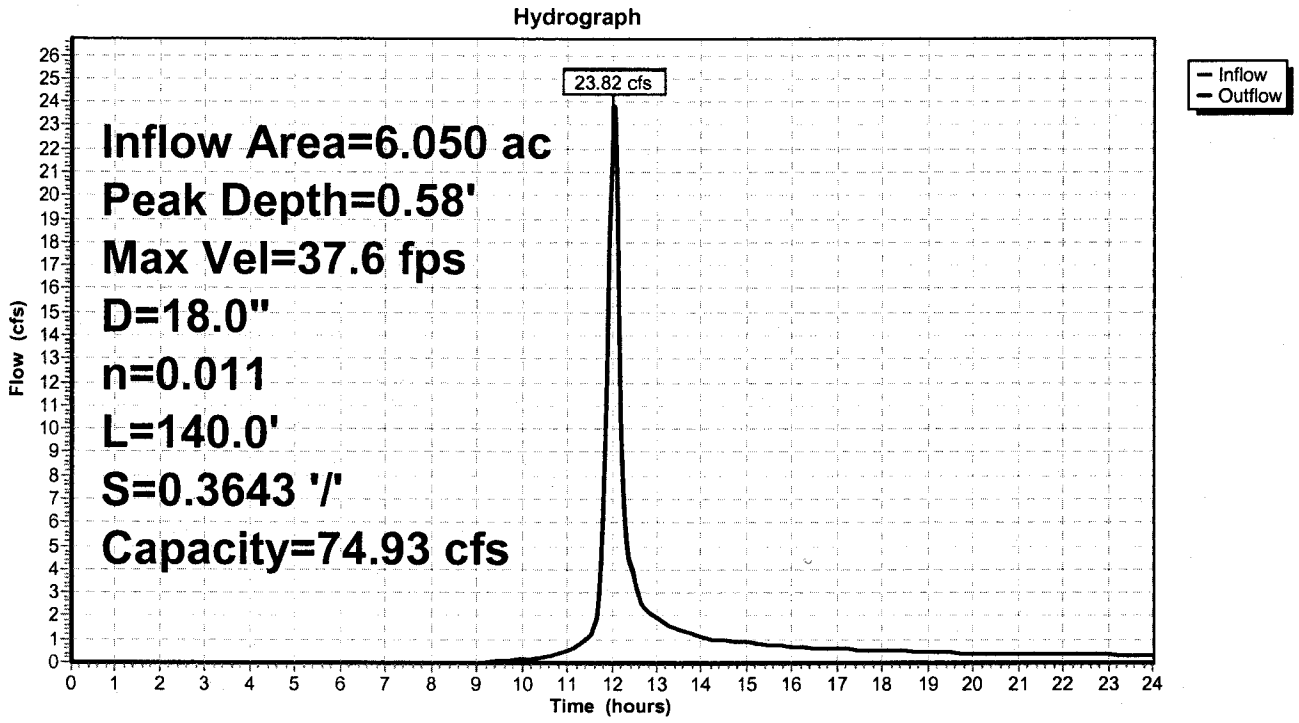
Reach 5R: 18" Culvert (replaced 12") from Existing CB-1

Inflow Area = 6.050 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 23.86 cfs @ 12.04 hrs, Volume= 1.457 af
Outflow = 23.82 cfs @ 12.04 hrs, Volume= 1.457 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= 37.6 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 13.0 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.58' @ 12.04 hrs
Capacity at bank full= 74.93 cfs
Inlet Invert= 2,733.00', Outlet Invert= 2,682.00'
18.0" Diameter Pipe, n= 0.011
Length= 140.0' Slope= 0.3643 '/'

Reach 5R: 18" Culvert (replaced 12") from Existing CB-1



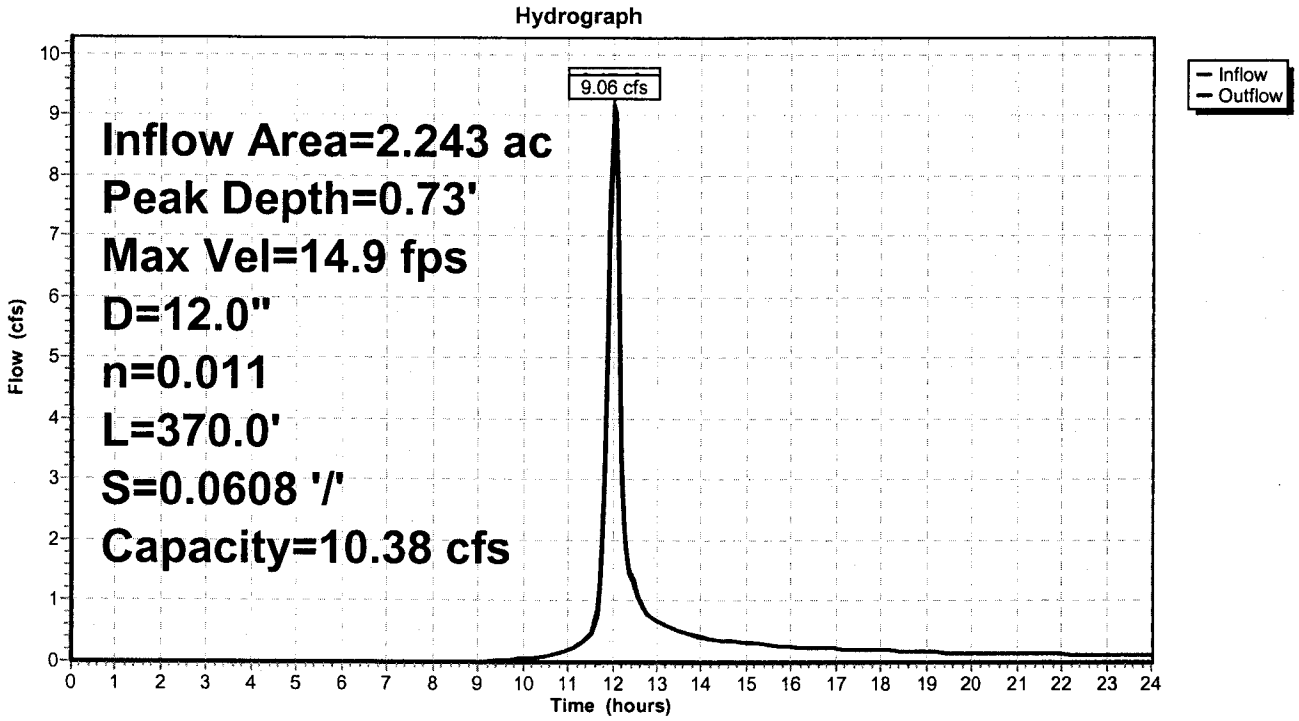
Reach 6R: Storm Drain from MH-5 to MH-6

Inflow Area = 2.243 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 9.17 cfs @ 12.03 hrs, Volume= 0.540 af
Outflow = 9.06 cfs @ 12.04 hrs, Volume= 0.540 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= 14.9 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 5.4 fps, Avg. Travel Time= 1.1 min

Peak Depth= 0.73' @ 12.04 hrs
Capacity at bank full= 10.38 cfs
Inlet Invert= 2,772.50', Outlet Invert= 2,750.00'
12.0" Diameter Pipe, n= 0.011
Length= 370.0' Slope= 0.0608 '/'

Reach 6R: Storm Drain from MH-5 to MH-6



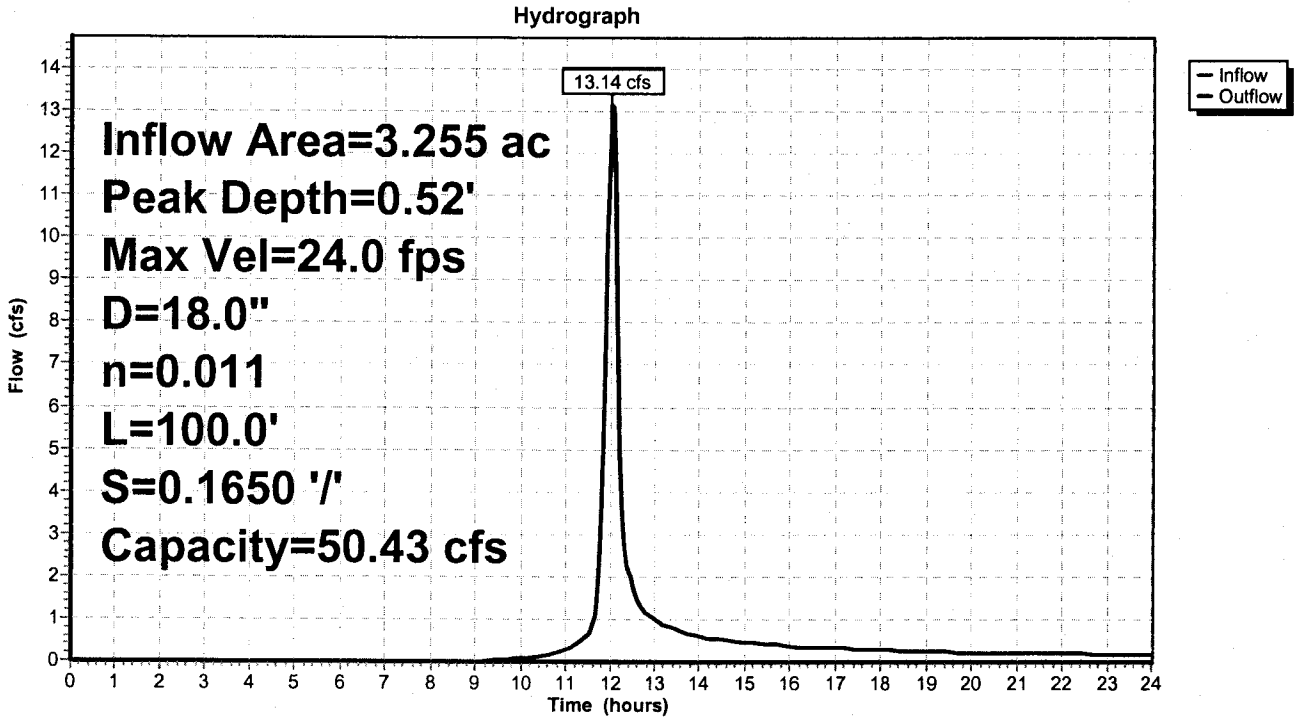
Reach 7R: Storm Drain from MH-6 ro MH-7

Inflow Area = 3.255 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 13.17 cfs @ 12.04 hrs, Volume= 0.784 af
Outflow = 13.14 cfs @ 12.04 hrs, Volume= 0.784 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= 24.0 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.2 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.52' @ 12.04 hrs
Capacity at bank full= 50.43 cfs
Inlet Invert= 2,749.50', Outlet Invert= 2,733.00'
18.0" Diameter Pipe, n= 0.011
Length= 100.0' Slope= 0.1650 '/'

Reach 7R: Storm Drain from MH-6 ro MH-7



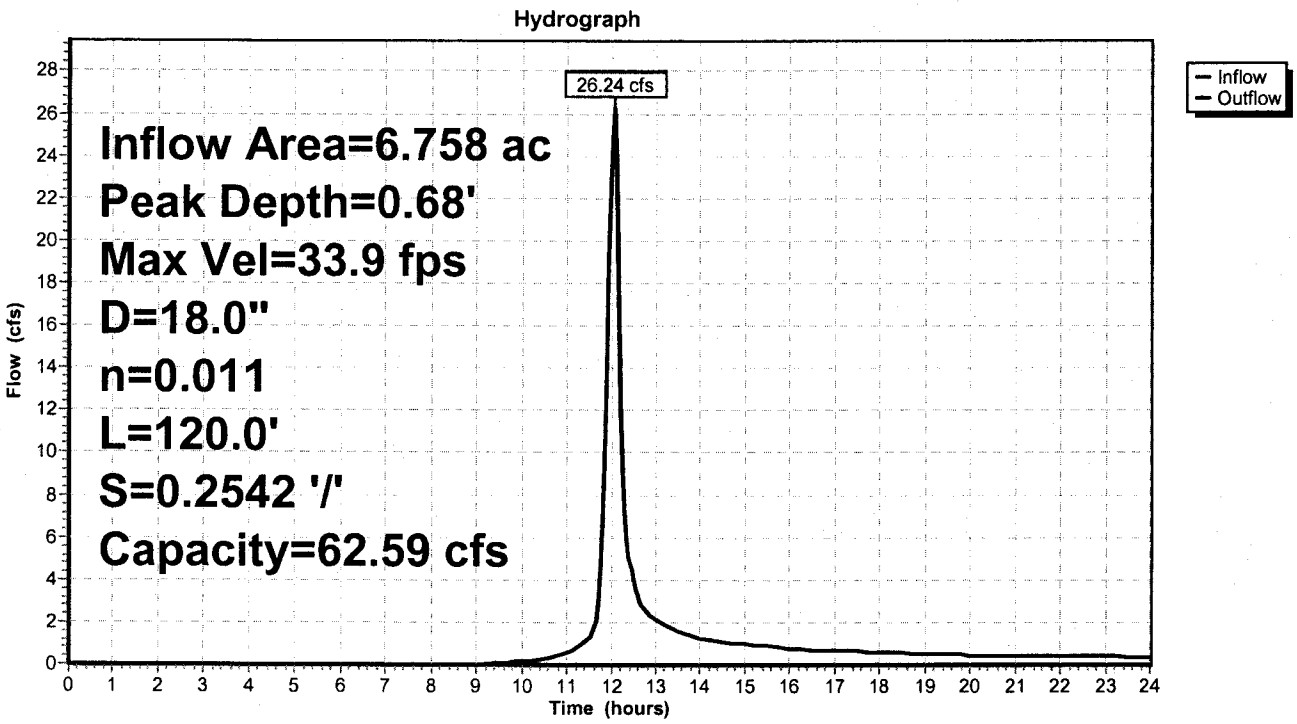
Reach 8R: Culvert from MH-7

Inflow Area = 6.758 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 26.29 cfs @ 12.05 hrs, Volume= 1.627 af
Outflow = 26.24 cfs @ 12.05 hrs, Volume= 1.627 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= 33.9 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 11.8 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.68' @ 12.05 hrs
Capacity at bank full= 62.59 cfs
Inlet Invert= 2,732.50', Outlet Invert= 2,702.00'
18.0" Diameter Pipe, n= 0.011
Length= 120.0' Slope= 0.2542 '/'

Reach 8R: Culvert from MH-7



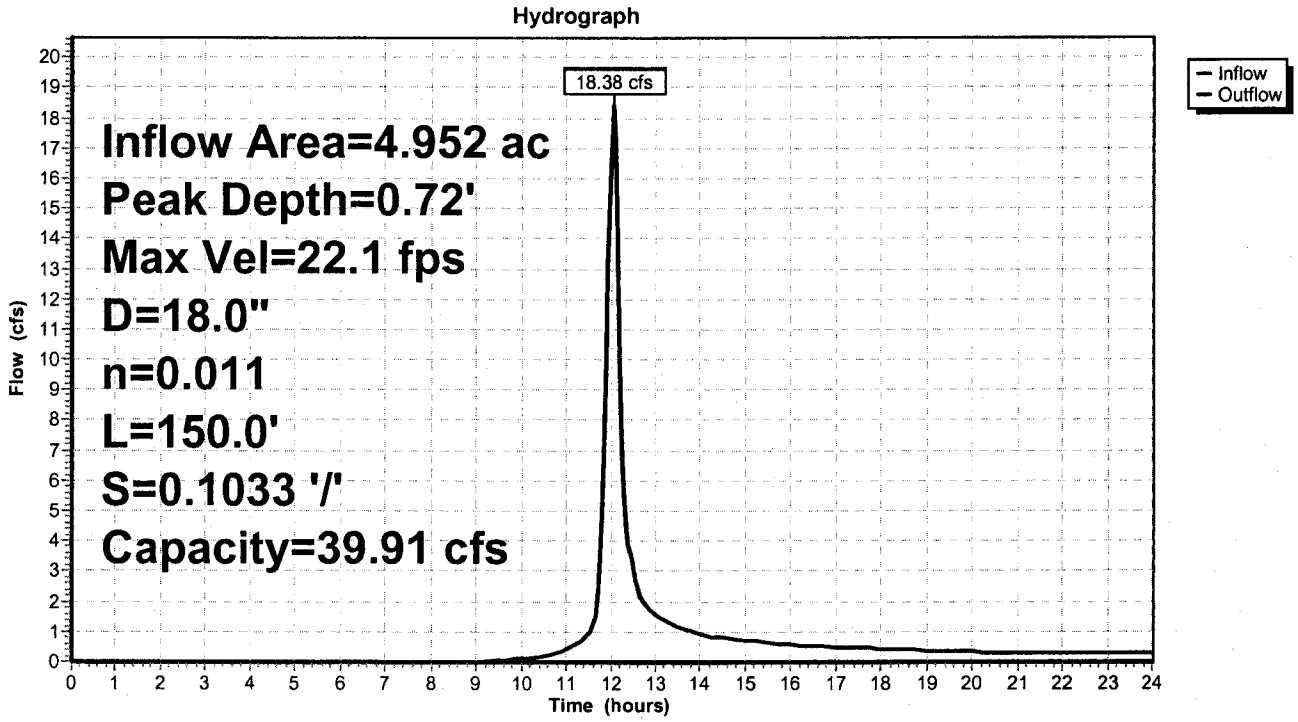
Reach 12R: Existing 18" Storm Drain from Area A-East MH- 1 to CB-3

Inflow Area = 4.952 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 18.44 cfs @ 12.05 hrs, Volume= 1.192 af
Outflow = 18.38 cfs @ 12.05 hrs, Volume= 1.192 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= 22.1 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 7.8 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.72' @ 12.05 hrs
Capacity at bank full= 39.91 cfs
Inlet Invert= 2,715.50', Outlet Invert= 2,700.00'
18.0" Diameter Pipe, n= 0.011
Length= 150.0' Slope= 0.1033 '/'

Reach 12R: Existing 18" Storm Drain from Area A-East MH- 1 to CB-3



Pond 9R: Existing 18" Culvert @ Southeast Corner

Inflow Area = 1.983 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 8.55 cfs @ 12.00 hrs, Volume= 0.478 af
Outflow = 7.85 cfs @ 12.04 hrs, Volume= 0.478 af, Atten= 8%, Lag= 2.3 min
Primary = 7.85 cfs @ 12.04 hrs, Volume= 0.478 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,708.11' @ 12.04 hrs Surf.Area= 663 sf Storage= 722 cf
Plug-Flow detention time= 1.3 min calculated for 0.477 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (835.2 - 834.2)

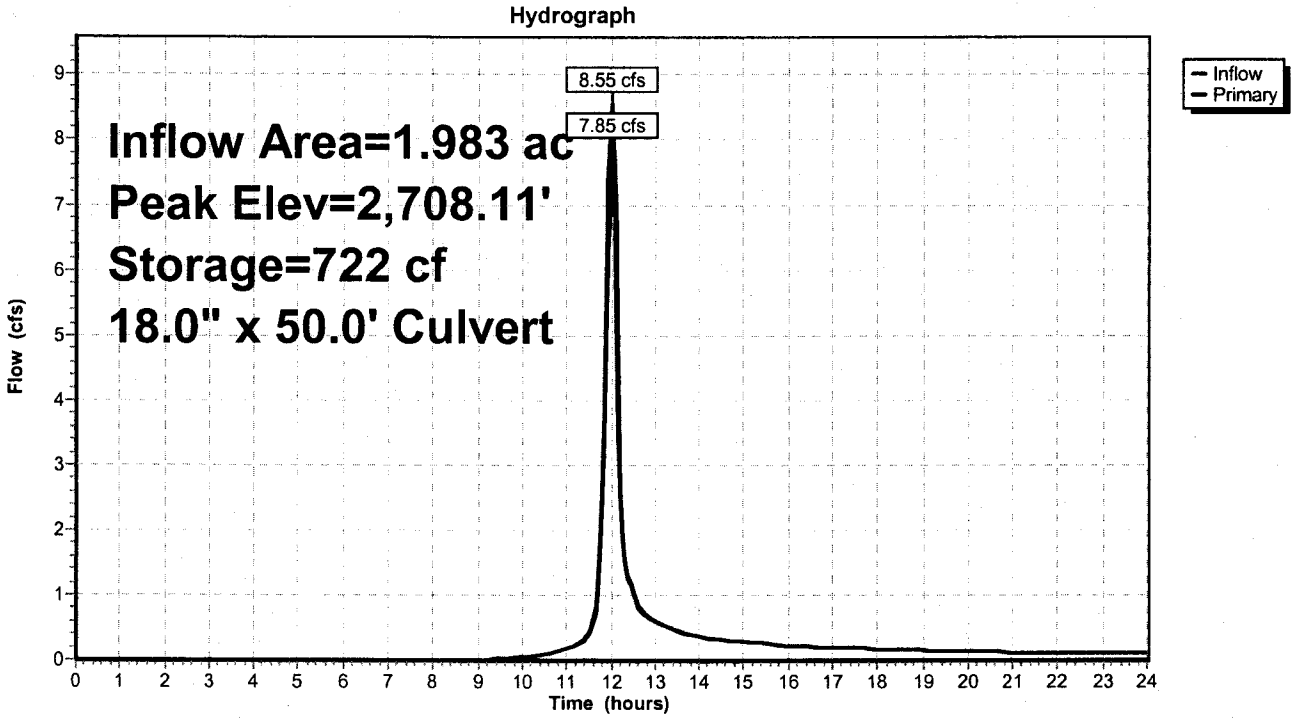
Volume	Invert	Avail.Storage	Storage Description
#1	2,706.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,706.00	50	0	0
2,708.00	600	650	650
2,709.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,706.00'	**18.0" x 50.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,703.50' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=7.74 cfs @ 12.04 hrs HW=2,708.08' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 7.74 cfs @ 4.4 fps)

Pond 9R: Existing 18" Culvert @ Southeast Corner



Pond 10R: Existing 18" Culvert to Area A-East Manhole (MH-1)

Inflow Area = 2.677 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 10.32 cfs @ 12.04 hrs, Volume= 0.645 af
Outflow = 9.80 cfs @ 12.07 hrs, Volume= 0.644 af, Atten= 5%, Lag= 2.0 min
Primary = 9.80 cfs @ 12.07 hrs, Volume= 0.644 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,728.07' @ 12.07 hrs Surf.Area= 641 sf Storage= 696 cf
Plug-Flow detention time= 1.0 min calculated for 0.643 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (837.4 - 836.6)

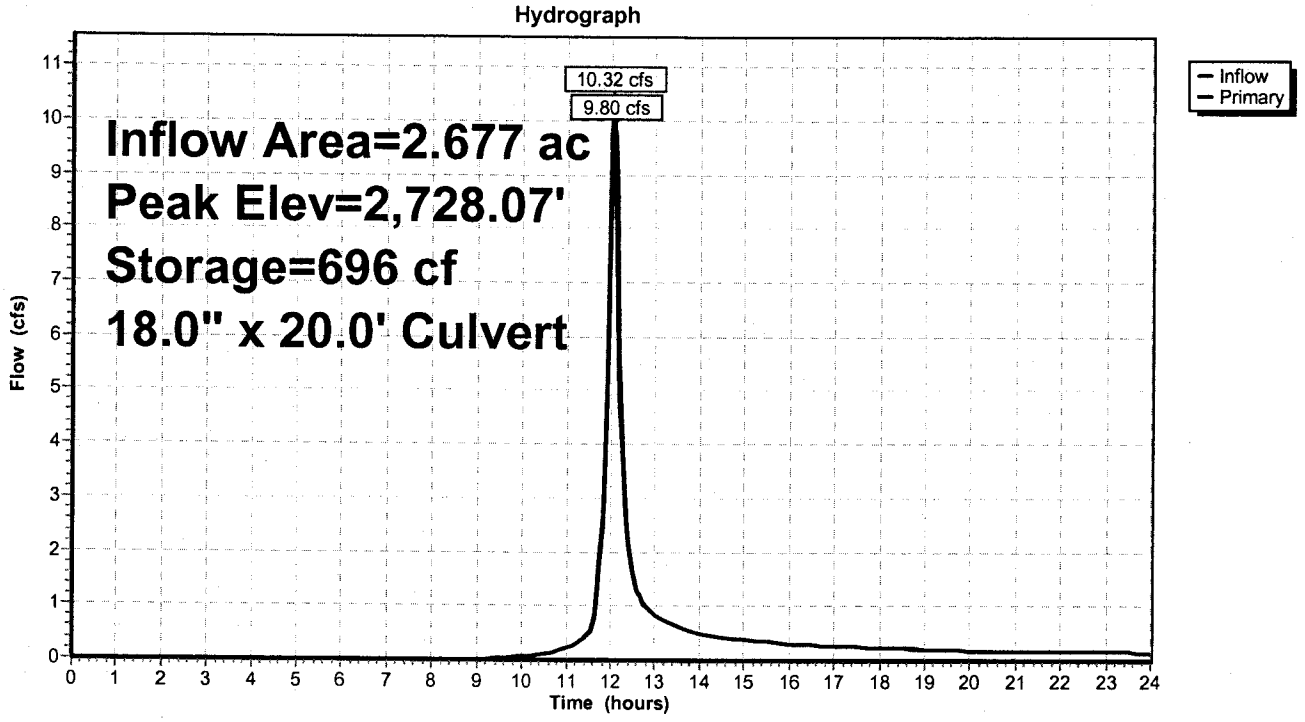
Volume	Invert	Avail.Storage	Storage Description
#1	2,726.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

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** Ke= 0.500 Outlet Invert= 2,725.00' S= 0.0500 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=9.66 cfs @ 12.07 hrs HW=2,728.04' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 9.66 cfs @ 5.5 fps)

Pond 10R: Existing 18" Culvert to Area A-East Manhole (MH-1)



Pond 11R: Existing Catch Basin (CB-2) & 12" Storm Drain @ Area A-East

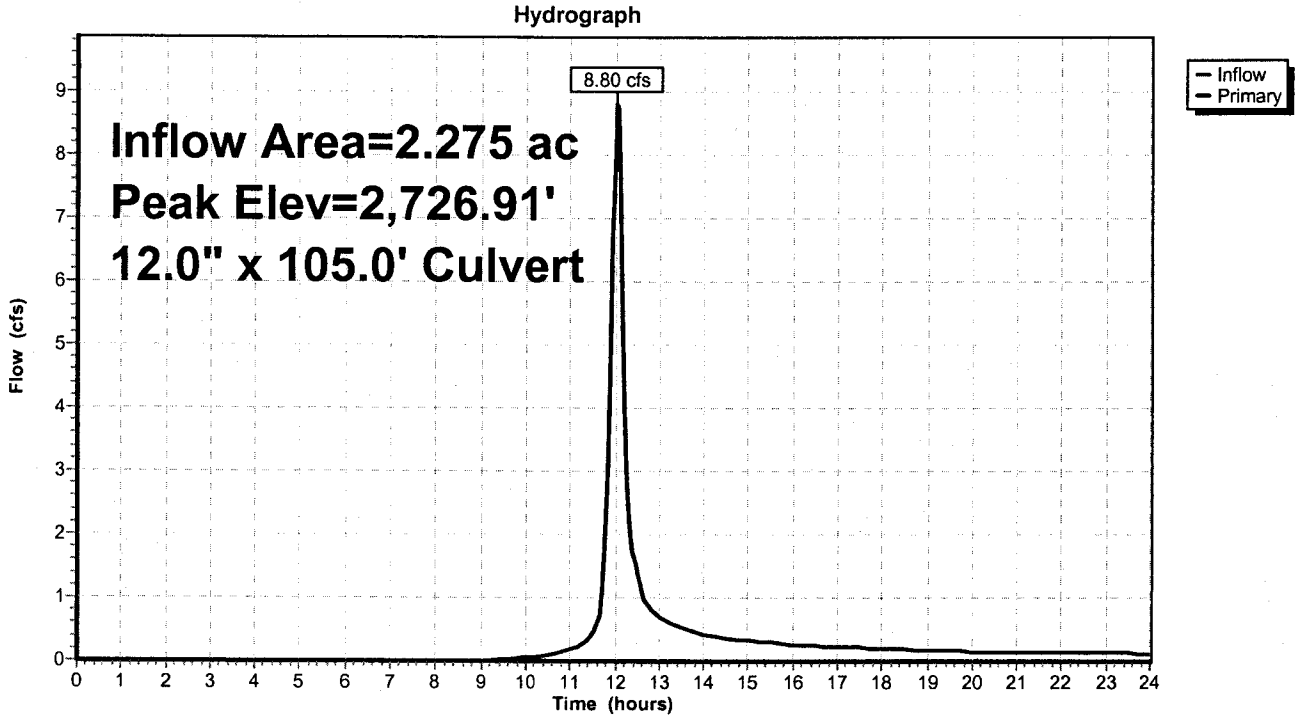
Inflow Area = 2.275 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af
Outflow = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af, Atten= 0%, Lag= 0.0 min
Primary = 8.80 cfs @ 12.04 hrs, Volume= 0.548 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,726.91' @ 12.04 hrs
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (836.6 - 836.6)

Device	Routing	Invert	Outlet Devices
#1	Primary	2,721.00'	**12.0" x 105.0' long Culvert** Ke= 0.500 Outlet Invert= 2,715.50' S= 0.0524 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=8.65 cfs @ 12.04 hrs HW=2,726.73' (Free Discharge)
1=Culvert (Inlet Controls 8.65 cfs @ 11.0 fps)

Pond 11R: Existing Catch Basin (CB-2) & 12" Storm Drain @ Area A-East



Pond C-1: Culvert to MH-1

Inflow Area = 1.752 ac, Inflow Depth > 2.90" for 25-Yr Storm event
Inflow = 8.61 cfs @ 11.96 hrs, Volume= 0.423 af
Outflow = 8.21 cfs @ 11.98 hrs, Volume= 0.422 af, Atten= 5%, Lag= 1.5 min
Primary = 8.21 cfs @ 11.98 hrs, Volume= 0.422 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,785.67' @ 11.98 hrs Surf.Area= 510 sf Storage= 469 cf
Plug-Flow detention time= 1.0 min calculated for 0.422 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (832.1 - 831.4)

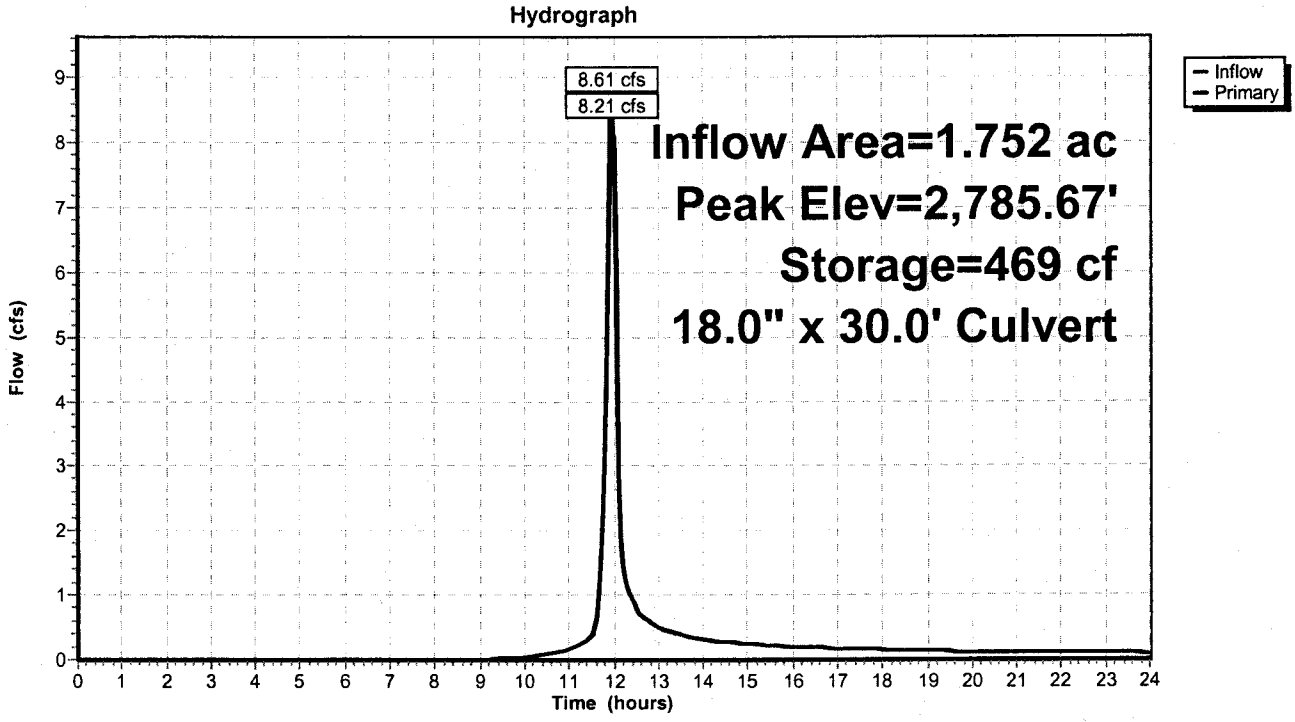
Volume	Invert	Avail.Storage	Storage Description
#1	2,784.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,784.00	50	0	0
2,786.00	600	650	650
2,787.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,784.00'	**18.0" x 30.0' long Culvert** Ke= 0.500 Outlet Invert= 2,780.00' S= 0.1333 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=7.94 cfs @ 11.98 hrs HW=2,785.62' (Free Discharge)
↑**1=Culvert** (Inlet Controls 7.94 cfs @ 4.5 fps)

Pond C-1: Culvert to MH-1



Pond C-2A: Culvert to MH-4

Inflow Area = 2.287 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 10.10 cfs @ 11.99 hrs, Volume= 0.551 af
Outflow = 9.39 cfs @ 12.02 hrs, Volume= 0.551 af, Atten= 7%, Lag= 1.7 min
Primary = 9.39 cfs @ 12.02 hrs, Volume= 0.551 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 2,771.96' @ 12.02 hrs Surf.Area= 590 sf Storage= 629 cf
Plug-Flow detention time= 0.9 min calculated for 0.551 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (834.4 - 833.7)

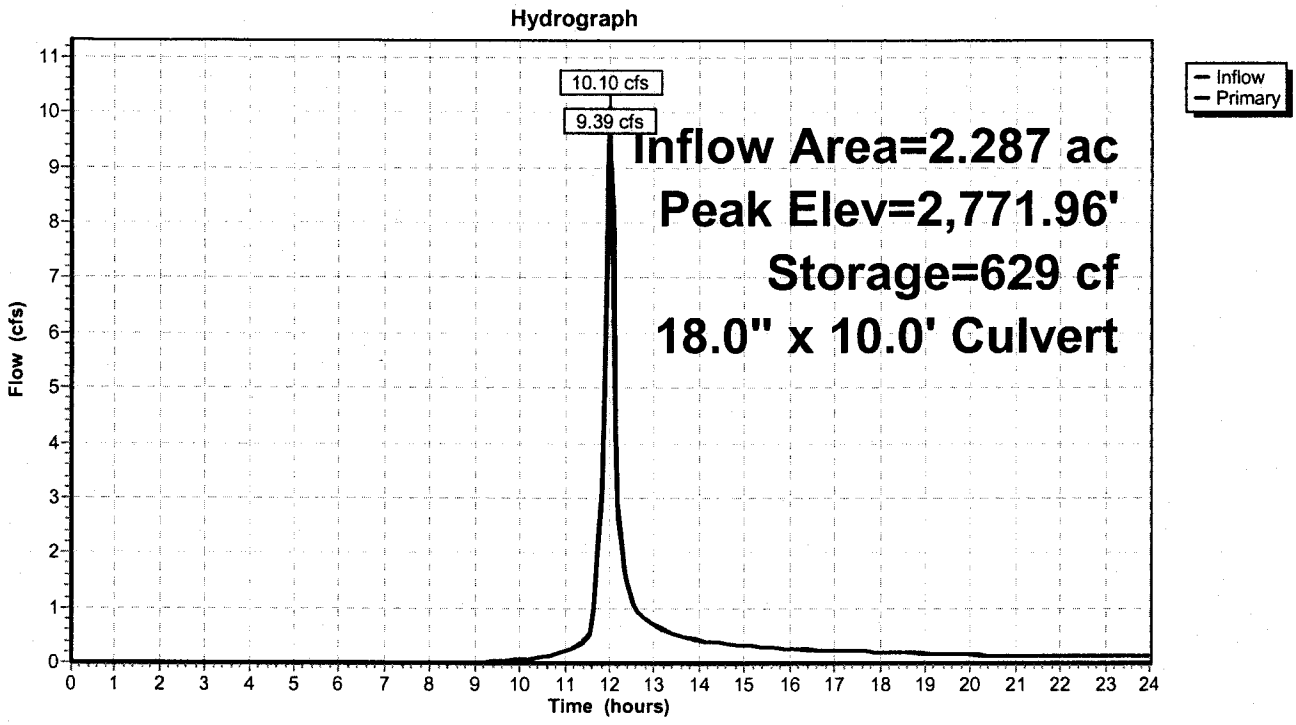
Volume	Invert	Avail.Storage	Storage Description
#1	2,770.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,770.00	50	0	0
2,772.00	600	650	650
2,773.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,770.00'	**18.0" x 10.0' long Culvert** Ke= 0.500 Outlet Invert= 2,769.00' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=9.21 cfs @ 12.02 hrs HW=2,771.92' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 9.21 cfs @ 5.2 fps)

Pond C-2A: Culvert to MH-4



Pond C-2B: Culvert to MH-3

Inflow Area = 0.956 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 3.97 cfs @ 12.01 hrs, Volume= 0.230 af
Outflow = 3.90 cfs @ 12.03 hrs, Volume= 0.230 af, Atten= 2%, Lag= 1.1 min
Primary = 3.90 cfs @ 12.03 hrs, Volume= 0.230 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,753.10' @ 12.03 hrs Surf.Area= 352 sf Storage= 221 cf
Plug-Flow detention time= 1.3 min calculated for 0.230 af (100% of inflow)
Center-of-Mass det. time= 0.9 min (835.9 - 835.0)

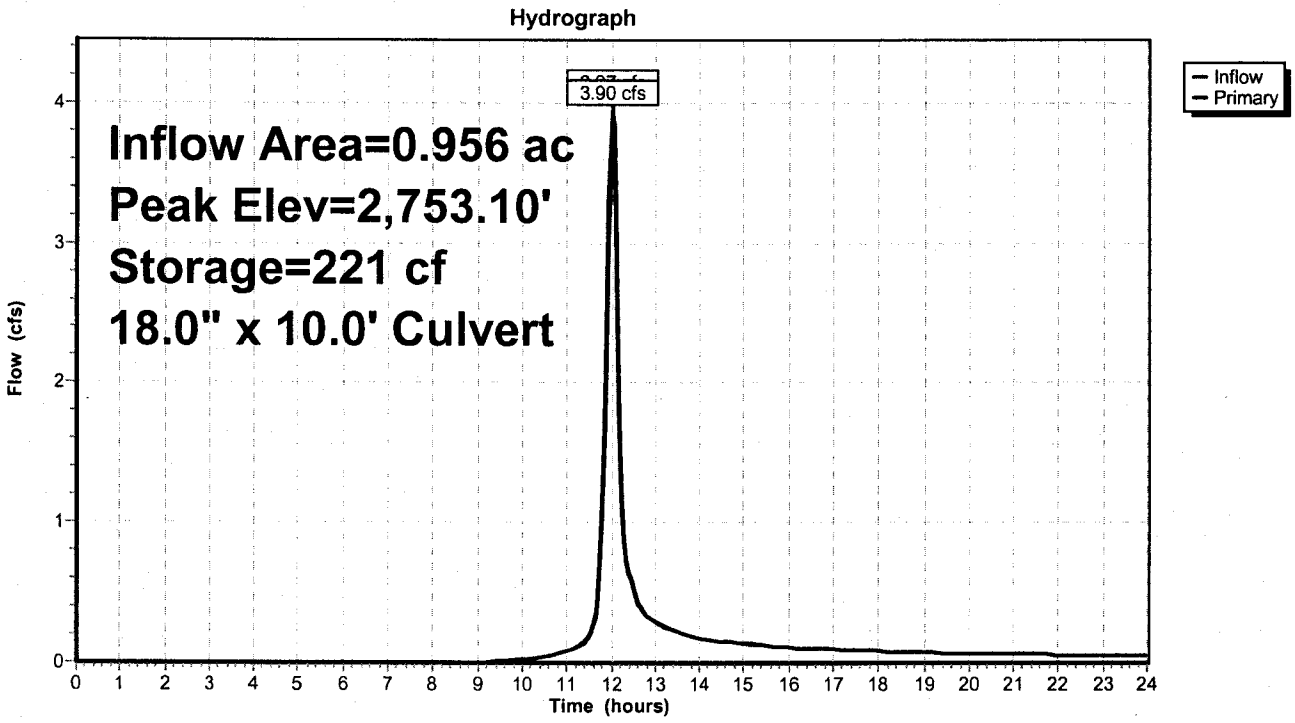
Volume	Invert	Avail.Storage	Storage Description
#1	2,752.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,752.00	50	0	0
2,754.00	600	650	650
2,755.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,752.00'	**18.0" x 10.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,751.00' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=3.81 cfs @ 12.03 hrs HW=2,753.08' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 3.81 cfs @ 2.8 fps)

Pond C-2B: Culvert to MH-3



Pond C-2C: Culvert to MH-2

Inflow Area = 2.461 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 9.40 cfs @ 12.04 hrs, Volume= 0.593 af
Outflow = 9.36 cfs @ 12.05 hrs, Volume= 0.592 af, Atten= 0%, Lag= 0.6 min
Primary = 9.36 cfs @ 12.05 hrs, Volume= 0.592 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,744.24' @ 12.05 hrs Surf.Area= 391 sf Storage= 274 cf
Plug-Flow detention time= 0.6 min calculated for 0.592 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (837.3 - 836.9)

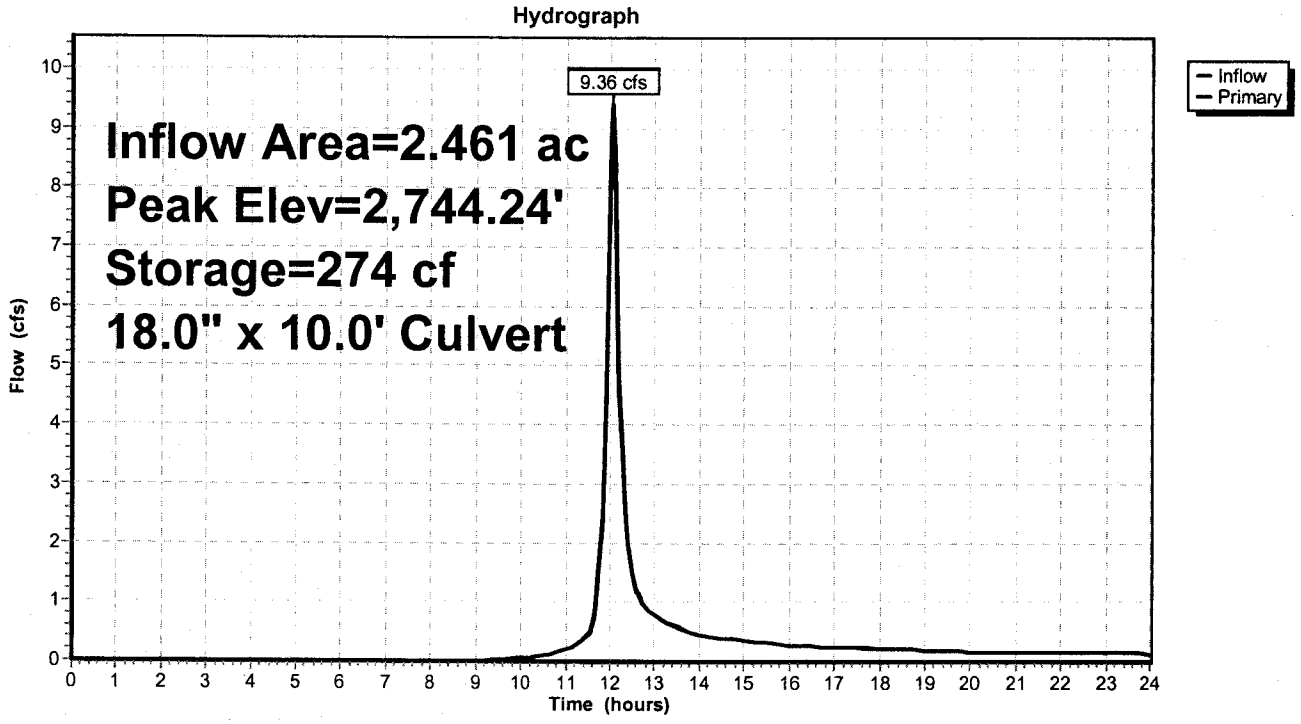
Volume	Invert	Avail.Storage	Storage Description
#1	2,743.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,743.00	50	0	0
2,745.00	600	650	650
2,746.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,743.00'	**18.0" x 10.0' long Culvert X 2.00** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 2,742.00' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=9.35 cfs @ 12.05 hrs HW=2,744.24' (Free Discharge)
↑**1=Culvert** (Inlet Controls 9.35 cfs @ 3.0 fps)

Pond C-2C: Culvert to MH-2



Pond C-2D: Existing 18" Culvert to CB-1

Inflow Area = 0.347 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 1.56 cfs @ 11.99 hrs, Volume= 0.084 af
Outflow = 1.53 cfs @ 12.00 hrs, Volume= 0.083 af, Atten= 1%, Lag= 0.8 min
Primary = 1.53 cfs @ 12.00 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,736.64' @ 12.00 hrs Surf.Area= 225 sf Storage= 88 cf
Plug-Flow detention time= 1.8 min calculated for 0.083 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (834.5 - 833.3)

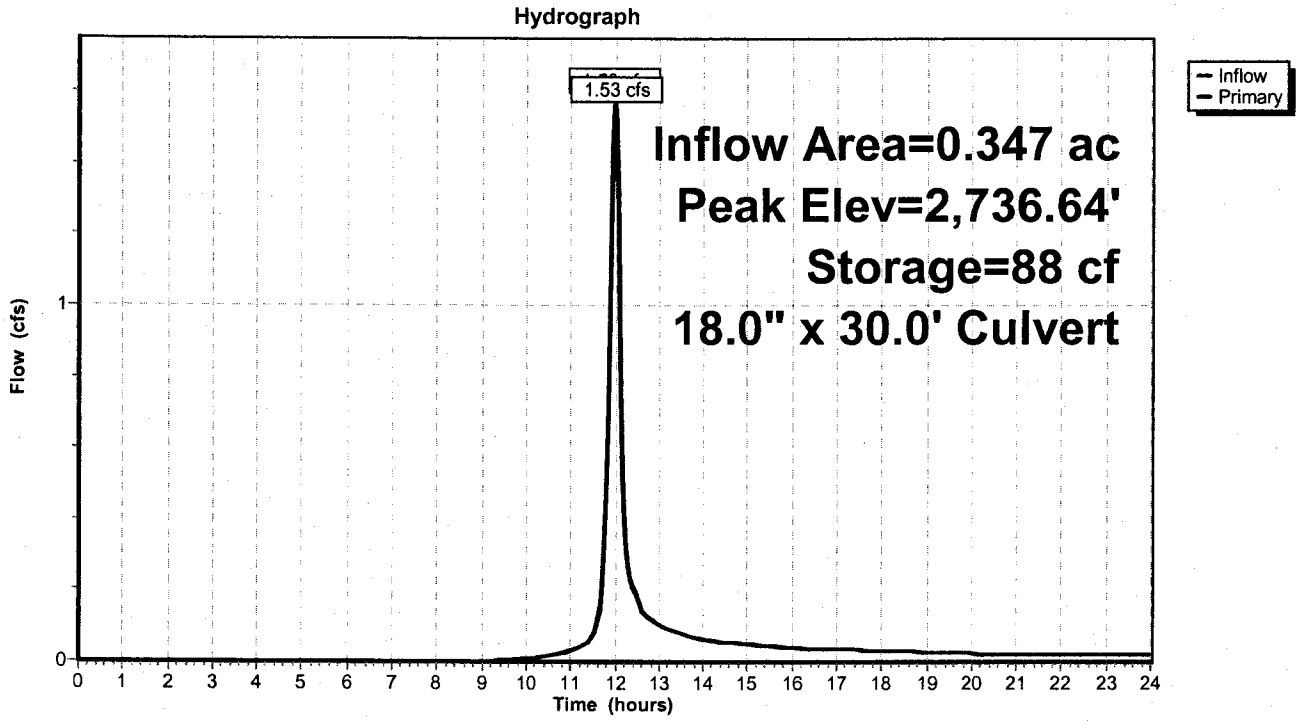
Volume	Invert	Avail.Storage	Storage Description
#1	2,736.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

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= 2,733.50' S= 0.0833 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=1.53 cfs @ 12.00 hrs HW=2,736.64' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 1.53 cfs @ 2.1 fps)

Pond C-2D: Existing 18" Culvert to CB-1



Pond C-3A: Culvert to MH-5

Inflow Area = 2.243 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 9.67 cfs @ 12.00 hrs, Volume= 0.541 af
Outflow = 9.17 cfs @ 12.03 hrs, Volume= 0.540 af, Atten= 5%, Lag= 1.8 min
Primary = 9.17 cfs @ 12.03 hrs, Volume= 0.540 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,775.91' @ 12.03 hrs Surf.Area= 575 sf Storage= 596 cf
Plug-Flow detention time= 1.0 min calculated for 0.539 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (835.0 - 834.2)

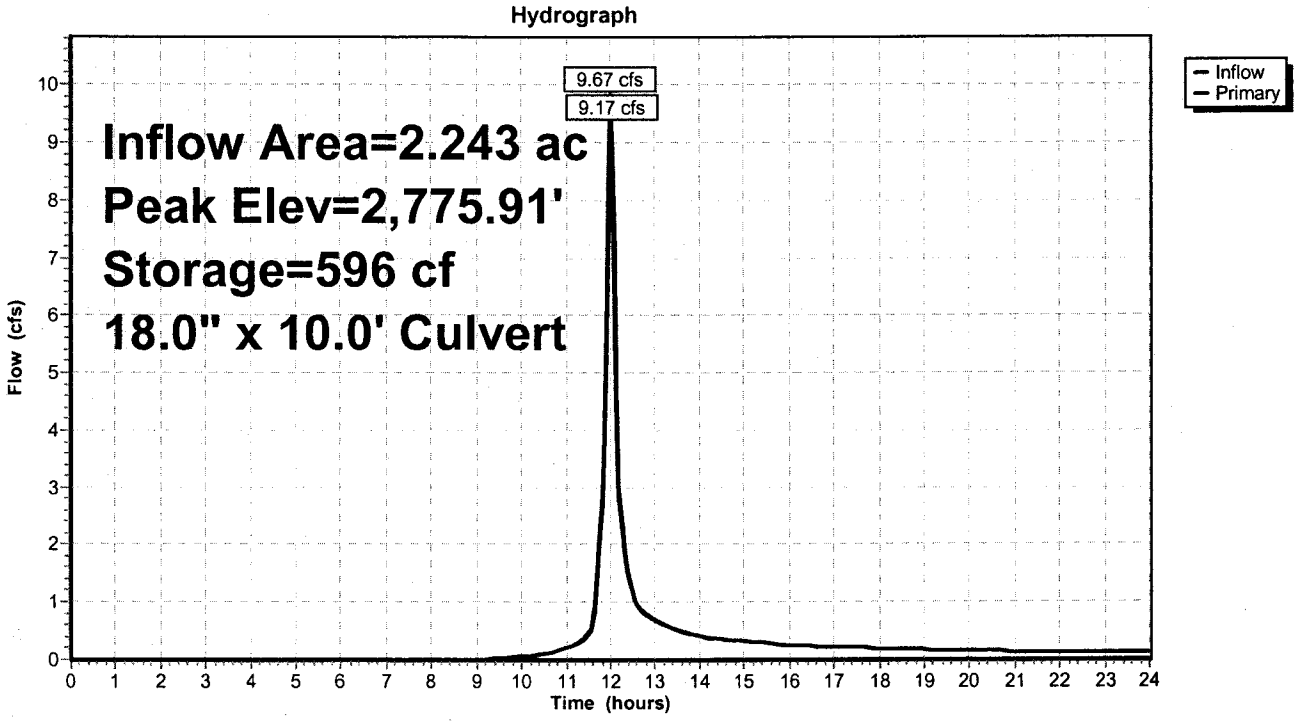
Volume	Invert	Avail.Storage	Storage Description
#1	2,774.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,774.00	50	0	0
2,776.00	600	650	650
2,777.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,774.00'	**18.0" x 10.0' long Culvert** Ke= 0.500 Outlet Invert= 2,773.00' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=8.97 cfs @ 12.03 hrs HW=2,775.86' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 8.97 cfs @ 5.1 fps)

Pond C-3A: Culvert to MH-5



Pond C-3B: Culvert to MH-6

Inflow Area = 1.012 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 4.16 cfs @ 12.01 hrs, Volume= 0.244 af
Outflow = 4.12 cfs @ 12.03 hrs, Volume= 0.244 af, Atten= 1%, Lag= 0.9 min
Primary = 4.12 cfs @ 12.03 hrs, Volume= 0.244 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,751.98' @ 12.03 hrs Surf.Area= 319 sf Storage= 181 cf
Plug-Flow detention time= 1.1 min calculated for 0.243 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (836.0 - 835.2)

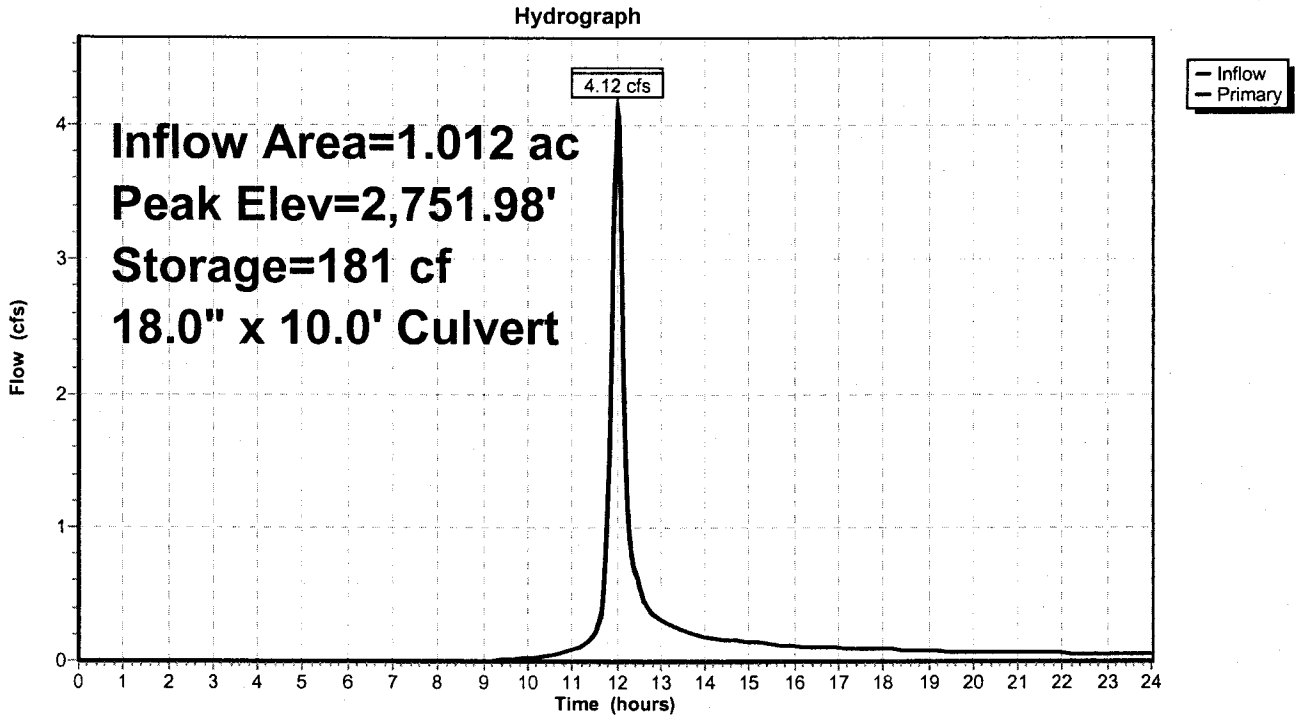
Volume	Invert	Avail.Storage	Storage Description
#1	2,751.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,751.00	50	0	0
2,753.00	600	650	650
2,754.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,751.00'	**18.0" x 10.0' long Culvert** Ke= 0.500 Outlet Invert= 2,750.00' S= 0.1000 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=4.02 cfs @ 12.03 hrs HW=2,751.97' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.02 cfs @ 3.3 fps)

Pond C-3B: Culvert to MH-6



Pond C-3C: Culvert to MH-7

Inflow Area = 3.503 ac, Inflow Depth > 2.89" for 25-Yr Storm event
Inflow = 13.34 cfs @ 12.04 hrs, Volume= 0.844 af
Outflow = 13.21 cfs @ 12.06 hrs, Volume= 0.843 af, Atten= 1%, Lag= 0.8 min
Primary = 13.21 cfs @ 12.06 hrs, Volume= 0.843 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2,738.76' @ 12.06 hrs Surf.Area= 534 sf Storage= 513 cf
Plug-Flow detention time= 0.8 min calculated for 0.843 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (837.5 - 836.9)

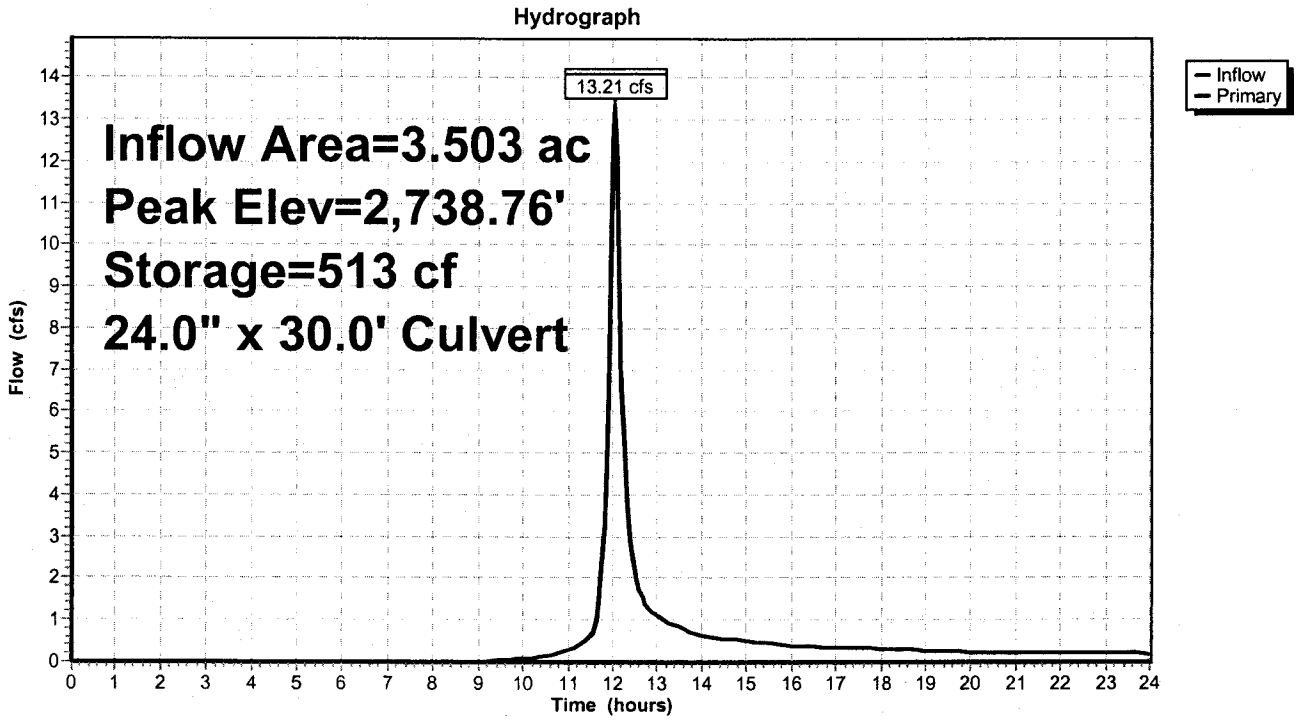
Volume	Invert	Avail.Storage	Storage Description
#1	2,737.00'	1,525 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
2,737.00	50	0	0
2,739.00	600	650	650
2,740.00	1,150	875	1,525

Device	Routing	Invert	Outlet Devices
#1	Primary	2,737.00'	**24.0" x 30.0' long Culvert** Ke= 0.500 Outlet Invert= 2,733.00' S= 0.1333 '/' Cc= 0.900 n= 0.011

Primary OutFlow Max=13.11 cfs @ 12.06 hrs HW=2,738.75' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 13.11 cfs @ 4.5 fps)

Pond C-3C: Culvert to MH-7



HIGHWAY 40
HIGHWAY 40

MW-15/16
2699.13
2701.43 TOP

OVERFLOW STRUCTURE WITH RIPRAP APRON OUTLET PROTECTION

REPLACE EXISTING 12" CULVERT WITH 18" HDPE CULVERT

5R
18" HDPE
L=104'
S=0.364

4R
18" CPP
L=80'
S=0.100

MH-2
18" INV IN 2742.0
18" INV IN 2742.0
18" INV OUT 2741.5

C-2C
18" CPP
L=10'
S=0.100

C-2D
EXISTING 18" CULVERT
INV IN 2736.0

EXISTING CATCH BASIN CB-1
18" INV IN 2733.5
18" INV IN 2733.5
18" INV OUT 2733.0

11R
EXISTING CATCH BASIN CB-2 AND 12" STORM DRAIN

10R
EXISTING 18" CULVERT

MH-3
18" INV IN 2751.0
18" INV IN 2751.0
18" INV OUT 2750.5

3R
18" CPP
L=170'
S=0.050

C-2B
18" CPP
L=10'
S=0.100

2R
12" CPP
L=325'
S=0.054

MH-4
18" INV IN 2769.0
12" INV OUT 2768.5

C-2A
18" CPP
L=10'
S=0.100

TOP

LANDFILL
AREA A WEST

LANDFILL
AREA A EAST

LANDFILL
AREA B UPPER

C-1
18" CPP
L=30'
S=0.133

OVERFLOW STRUCTURE WITH RIPRAP APRON OUTLET PROTECTION

1R
12" HDPE
L=140'
S=0.270

MH-1
18" INV IN 2780.0
12" INV OUT 2779.5

C-3A
18" CPP
L=10'
S=0.100

MH-5
18" INV IN 2773.0
12" INV OUT 2772.5

6R
12" CPP
L=370'
S=0.061

C-3B
18" CPP
L=10'
S=0.100

MH-6
12" INV IN 2750.0
18" INV IN 2750.0
18" INV OUT 2749.5

7R
18" CPP
L=210'
S=0.165

C-3C
24" CPP
L=30'
S=0.133

MH-7
24" INV IN 2733.0
18" INV IN 2733.0
18" INV OUT 2732.5

8R
18" HDPE
L=120'
S=0.250

9R
EXISTING 18" CULVERT

OVERFLOW STRUCTURE WITH RIPRAP APRON OUTLET PROTECTION

LEGEND

1 SUBCATCHMENT DESIGNATION

SUBCATCHMENT BOUNDARY

A B C TIME OF CONCENTRATION SEGMENT DESIGNATION
TIME OF CONCENTRATION PATH

DRAINAGE REACH

FLOW ARROW

30 0 60 120 FEET

DWG: SITEPLAN LMN: SMP-POST CTB: SMP REV: 2/21/06

G:\Brpp\NC6a-Valley\fillacad\Site

1/2006 10:24:25 AM, drd

FIGURE 2-1
POST DEVELOPMENT
STORMWATER ANALYSIS PLAN
BLUE RIDGE PAPER PRODUCTS, INC.
LANDFILL NO. 6A WEST
CANTON, NORTH CAROLINA

SME
Sevee & Maher Engineers, Inc.
Consulting Engineers
Cumberland Center, Maine

APPENDIX F-3-2

EROSION AND SEDIMENT CONTROL DESIGN CALCULATIONS
AREA 6A WEST FINAL COVER

Project Name: Area 6A West Landfill - Final Cover
Project Location: Canton, North Carolina
Project No: 05127.01
Comp By: KLC
Date: 2/15/2006
Chk. By:

PERIMETER DITCH DESIGN

OBJECTIVE: Design channel with adequate freeboard and lining to convey stormwater flows from temporary (2-year 24 hour storm event) and permanent conditions (25-year, 24-hour storm event).

REFERENCES:

1. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.10, Chocorua, New Hampshire, 2005
2. North American Green, Inc., Erosion Control Materials Design Software (ECMDS) Version 4.3, 2003.

DESIGN PROCEDURE:

Channel Geometry Analysis

1. Determine peak stormwater flows for 25-year, 24-hour storm event using TR-20. (See Post Development Hydrocad Printouts). Evaluate ditch geometry using 25-year, 24-hour storm event with minimum channel slope. Depth based on maximum flow depth + 1 foot freeboard rounded up to next whole foot.
2. Use one typical section for ditches based upon conservative design as follows:
   a. Max drainage area;
   b. Quickest time of concentration;
   c. Flattest longitudinal ditch slope expected (~1.25% slope)

Channel Lining Analysis

3. Determine peak stormwater flows for 2-year and 25-year, 24-hour storm event using TR-20. (See Post Development Hydrocad Printouts). Evaluate temporary channel lining using 2-year, 24-hour storm event with maximum channel slope. Evaluate permanent channel lining using 25-year, 24-hour storm event with maximum channel slope.

SUMMARY OF RESULTS:

PERIMETER DITCH SC	Q (cfs) 25-yr	Flow Depth ft.
SC-1	8.61	0.58

Ditch Geometry	
Sideslope	3 H:1V
Sideslope	3 H:1V
Bottom Width	3 ft
Slope (min.)	0.0125 ft/ft
Depth (min.)	2 ft

Perimeter Ditch Subcatchment SC-1 used for conservative design of channel geometry.

See attached printout for analysis summary.

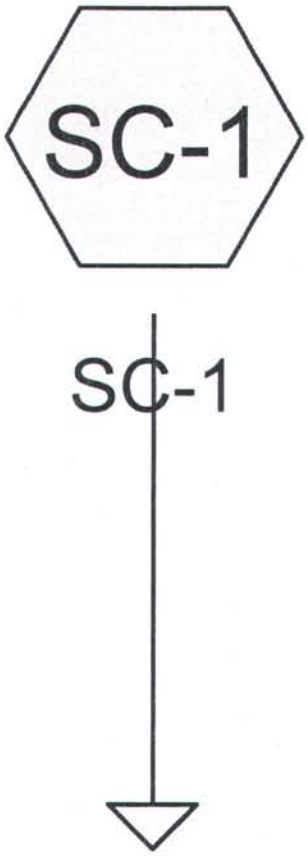
PERIMETER DITCH SC	Q (cfs) 2-yr	Q (cfs) 25-yr
SC-1	3.08	8.61
SC-2A	3.59	10.10
SC-2B	1.40	3.97
SC-2C	3.29	9.40
SC-2D	0.55	1.56
SC-3A	3.42	9.67
SC-3B	1.46	4.16
SC-3C	4.67	13.34
SC-4	3.03	8.55
SC-5	3.62	10.32
SC-6	3.09	8.80
Q_{max}=	4.67	13.34

cfs

Ditch Geometry	
Sideslope	3 H:1V
Sideslope	3 H:1V
Bottom Width	3 ft
Slope (max.)	0.08 ft/ft
Depth (min.)	2 ft
Temporary Lining:	NAG SC150 w/Staple Pattern D
Permanent Lining:	Grass Vegetation

See attached printout for analysis summary.

Perimeter Ditch Subcatchment with highest flows (SC-3C) used for conservative design of channel lining.



Perimeter Ditch

Subcat Reach Pond Link

Drainage Diagram for 6A WEST DITCHES
Prepared by Sevee & Maher Engineers, Inc. 2/16/2006

Subcatchment SC-1: SC-1

Runoff = 8.94 cfs @ 11.97 hrs, Volume= 0.423 af, Depth> 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=6.00"

Area (sf)	CN	Description
76,300	71	Landfill Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	70	0.1100	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
0.3	65	0.3300	4.0		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
5.5	135	Total			

Reach R-1: Perimeter Ditch

Inflow Area = 1.752 ac, Inflow Depth > 2.90"
Inflow = 8.94 cfs @ 11.97 hrs, Volume= 0.423 af
Outflow = 8.26 cfs @ 12.04 hrs, Volume= 0.421 af, Atten= 8%, Lag= 4.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.1 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 9.8 min

Peak Depth= 0.58' @ 12.00 hrs
Capacity at bank full= 109.43 cfs
Inlet Invert= 2,790.00', Outlet Invert= 2,783.50'
3.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 15.00'
Length= 520.0' Slope= 0.0125 '/'

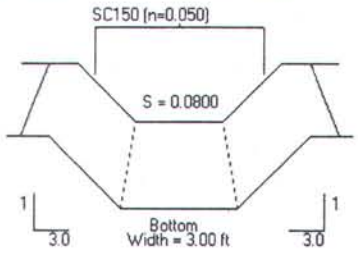
North American Green - ECMDS Version 4.3 | 2/15/2006 | 03:33 PM | COMPUTED BY: KLC

PROJECT NAME: Area 6A West Landfill - Final Cover | PROJECT NO.: 05027.01

FROM STATION/REACH: | TO STATION/REACH: | DRAINAGE AREA: SC-3C | DESIGN FREQUENCY: 2 yr./24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
4.7	1.0	3.46	1.36	0.26	0.34



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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
Straight	SC150	Unvegetated					2.00	1.69	1.18	STABLE
	Staple D									

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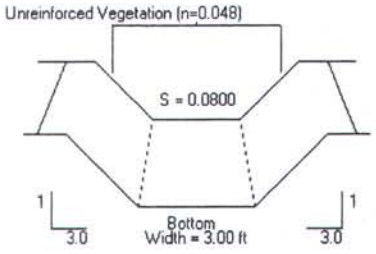
North American Green - ECMDS Version 4.3		2/15/2006	03:36 PM	COMPUTED BY: KLC
PROJECT NAME: Area 6A West Landfill - Final Cover		PROJECT NO.: 05027.01		
FROM STATION/REACH:	TO STATION/REACH:	DRAINAGE AREA: SC-3C		DESIGN FREQUENCY: 25 yr./24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
13.3	1.0	4.87	2.73	0.41	0.58



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LINER RESULTS

Reach	Matting Type / Staple Pattern	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
			Phase	Class	Type	Density				
Straight	Unreinforced	Vegetation		D	Mix	75-95%	3.33	2.88	1.15	STABLE
		Soil	Sandy Loam				0.035	0.077	0.45	UNSTABLE

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NORTH AMERICAN GREEN

MATERIAL SPECIFICATION

SC150

The extended-term erosion control blanket shall be a machine-produced blanket of 70% agricultural straw and 30% coconut fiber matrix with a functional longevity of up to 24 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographic location, and elevation).

The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the blanket. The blanket shall be covered on the top side with heavyweight photodegradable polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.63 x 0.63 inch (1.59 x 1.59 cm) mesh, and on the bottom side with a lightweight photodegradable polypropylene netting with an approximate 0.50 x 0.50 inch (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread.

The SC150 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the U.S. Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications For Construction of Roads and Bridges on Federal Highway Projects, FP-03 2003 Section 713.17* as a *Type 3.B Extended-term Erosion Control Blanket.*

The SC150 is also available upon request with the DOT System™. The DOT System™ consists of installation staple patterns clearly marked on the erosion control blanket with environmentally safe paint. The blanket shall be manufactured with a colored line or thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) to ensure proper material overlapping.

The extended-term straw/coconut fiber erosion control blanket shall be SC150 as manufactured by North American Green, or equivalent. The SC150 erosion control blanket shall have the following properties:

Material Content

Matrix	70% Straw Fiber (0.35 lb/yd^2) (0.19 kg/m^2) 30% Coconut Fiber (0.15 lb/yd^2) (0.08 kg/m^2)
Netting	Top side heavyweight photodegradable with UV additives (3.0 lbs/1,000 ft^2 [1.47 kg/100 m^2] approximate weight) Bottom side lightweight photodegradable Minimum netting weight (1.50 lbs/1,000 ft^2 [0.73 kg/100 m^2] approx. weight)
Thread	Degradable

SC150 is Available with the Following Physical Specifications Per Roll [English Units (Metric Units)]

Width	6.67 ft (2.03 m)	16.0 ft (4.87 m)
Length	108.00 ft (32.92 m)	108.0 ft (32.92 m)
Weight ± 10%	44.00 lbs (19.95 kg)	105.6 lbs (47.90 kg)
Area	80.00 yds^2 (66.89 m^2)	192.0 yd^2 (165.53 m^2)

Roll Widths Also Available Upon Special Request

Width	8.0 ft (2.43 m)	13.3 ft (4.05 m)
Length	108.0 ft (32.92 m)	108.0 ft (32.92 m)
Weight ± 10%	52.8 lbs (23.95 kg)	88.0 lbs (39.92 kg)
Area	96.0 yd^2 (80.26 m^2)	160.0 yd^2 (133.78 m^2)

Stitch Spacing for All Rolls = 1.50 inches (3.81 cm)

NORTH AMERICAN GREEN®

SUPPLEMENTAL SPECIFICATION

SC150

The North American Green SC150 extended-term degradable erosion control blanket is constructed with a 70% agricultural straw and 30% coconut fiber matrix and has a functional longevity of up to 24 months (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographic location, and elevation). The straw and coconut fibers shall be evenly distributed over the entire area of the blanket. The blanket shall be covered on the top with a heavyweight polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.625 x 0.625 inch (1.59 x 1.59 cm) mesh size. The blanket shall be covered on the bottom with a lightweight polypropylene net having a 0.50 inch x 0.50 inch (1.27 cm x 1.27 cm) mesh size. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The following list contains further physical properties of the SC150 erosion control blanket.

Property	Test Method	Typical
Thickness	ASTM D5199/ECTC	0.34 in (8.64 mm)
Resiliency	ECTC Guidelines	75%
Mass per Unit Area	ASTM D6475	11.44 oz/yd^2 (388 g/m^2)
Water Absorption	ASTM D1117/ECTC	200%
Swell	ECTC Guidelines	30%
Stiffness/Flexibility	ASTM D1388/ECTC	1.11 oz-in (12,397 mg-cm)
Light Penetration	ECTC Guidelines	11.70%
Smolder Resistance	ECTC Guidelines	Yes**
MD Tensile Strength	ASTM D5035	205.20 lbs/ft (2.99 kN/m)
MD Elongation	ASTM D5035	28.00%
TD Tensile Strength	ASTM D5035	152.40 lbs/ft (2.22 kN/m)
TD Elongation	ASTM D5035	23.10%

**Material is smolder resistant according to the specified test
MD – Machine direction
TD – Transverse direction

Bench Scale Testing†

Test Method - Description	Parameters	Results
ECTC Method 2 – Determination of unvegetated RECP's ability to protect soil from rain splash and associated runoff	50 mm (2 in)/hr for 30 min	Soil loss ratio* = 5.47
	100 mm (4 in)/hr for 30 min	Soil loss ratio* = 5.67
	150 mm (6 in)/hr for 30 min	Soil loss ratio* = 5.88
ECTC Method 3 – Determination of unvegetated RECP's ability to protect soil from hydraulically-induced shear stress.	Shear: 2.39 lbs/ft² for 30 min	Soil loss: 336g
	Shear: 2.73 lbs/ft² for 30 min	Soil loss: 443g
	Shear: 2.96 lbs/ft² for 30 min	Soil loss: 566g
Failure criteria = 0.50 inch soil loss	**Shear at 0.50 inch soil loss (450g)**	**2.72 lbs/ft²**
ECTC Draft Method 4 – Determination of temporary RECP performance in encouraging seed germination and plant growth	Top soil; Fescue (Kentucky 31); 21 day incubation 27° C ± 2° & approximately 50% RH	Percent improvement = 538% (increased biomass)

* Soil Loss Ratio = Soil Loss with Bare Soil / Soil Loss with RECP (NOTE: Soil loss based on regression analysis)

†Bench Scale Performance Testing

Bench scale tests are index property tests. These tests are not indicative of field performance and therefore should not be used in design to establish performance levels for rolled erosion control products. Bench scale tests are performed according to methods developed by the Erosion Control Technology Council (ECTC).

NORTH AMERICAN GREEN®

PERFORMANCE SPECIFICATION

SC150

The North American Green SC150 extended-term degradable erosion control blanket is constructed with a 70% agricultural straw and 30% coconut fiber matrix and has a functional longevity of approximately 24 months (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographic location, and elevation). The straw and coconut fibers shall be evenly distributed over the entire area of the mat. The blanket shall be covered on the top with a heavyweight polypropylene netting having ultraviolet additives to delay breakdown and an approximate 0.625 x 0.625 inch (1.59 x 1.59 cm) mesh size. The blanket shall be covered on the bottom with a lightweight polypropylene net having a 0.50 inch x 0.50 inch (1.27 cm x 1.27 cm) mesh size. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The following list contains further physical properties of the SC150 erosion control blanket.

Property	Test Method	Typical
Thickness	ASTM D5199/ECTC	0.34 in (8.64 mm)
Resiliency	ECTC Guidelines	75%
Mass per Unit Area	ASTM D6475	11.44 oz/yd² (388 g/m²)
Water Absorption	ASTM D1117/ECTC	200%
Swell	ECTC Guidelines	30%
Stiffness/Flexibility	ASTM D1388/ECTC	1.11 oz-in (12,397 mg-cm)
Light Penetration	ECTC Guidelines	11.70%
Smolder Resistance	ECTC Guidelines	Yes**
MD Tensile Strength	ASTM D5035	205.20 lbs/ft (2.99 kN/m)
MD Elongation	ASTM D5035	28.00%
TD Tensile Strength	ASTM D5035	152.40 lbs/ft (2.22 kN/m)
TD Elongation	ASTM D5035	23.10%

**Material is smolder resistant according to the specified test
MD – Machine direction
TD – Transverse direction

Slope Design Data

Cover Factors (C)			
	Slope Gradient (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.001	0.048	0.100
20 – 50	0.051	0.079	0.145
≥ 50 ft (15.2 m)	0.100	0.110	0.190

Channel Design Data

Channel Roughness Coefficients	
Flow Depth	Manning's 'n'
≤ 0.50 ft (0.15 m)	0.050
0.50-2.00 ft	0.050-0.018
≥ 2.00 ft (0.60 m)	0.018
Max. Permissible Shear Stress 2.00 lbs/ft² (96.0 Pa)	

Bench Scale Testing†

Unvegetated Channel	3.9 lbs/ft²

Approximate Max Flow Velocity
8.00 ft/s (2.44 m/s)

For most accurate design data consult ECMDS™
Manning's 'n' value expressed in English units

†Bench Scale Performance Testing

Bench scale tests are index property tests. These tests are not indicative of field performance and therefore should not be used in design to establish performance levels for rolled erosion control products. Bench scale tests are performed according to methods developed by the Erosion Control Technology Council (ECTC).

STAPLE PATTERN GUIDE
6.67' (2.03 M) WIDE ROLLS

NORTH AMERICAN GREEN
EROSION CONTROL *Products*
Guaranteed SOLUTIONS

14649 HIGHWAY 41 NORTH
EVANSVILLE, IN 47725
800-772-2040
www.nagreen.com

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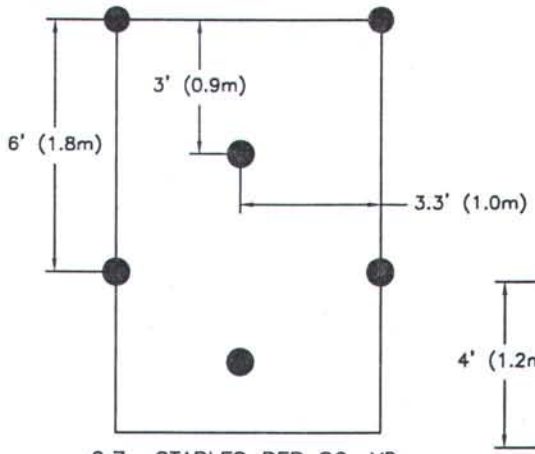

0.7 STAPLES PER SQ. YD.
(0.8 STAPLES PER SQ. M)

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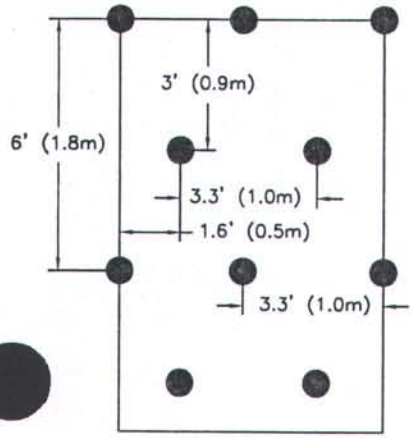

1.15 STAPLES PER SQ. YD.
(1.35 STAPLES PER SQ. M)

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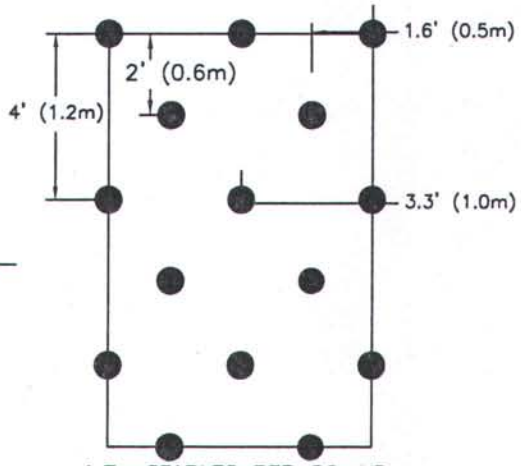
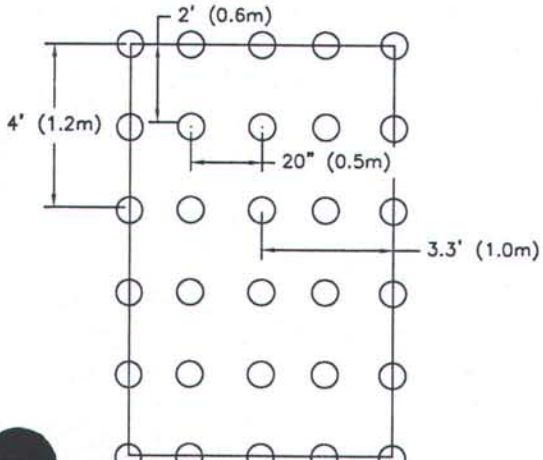


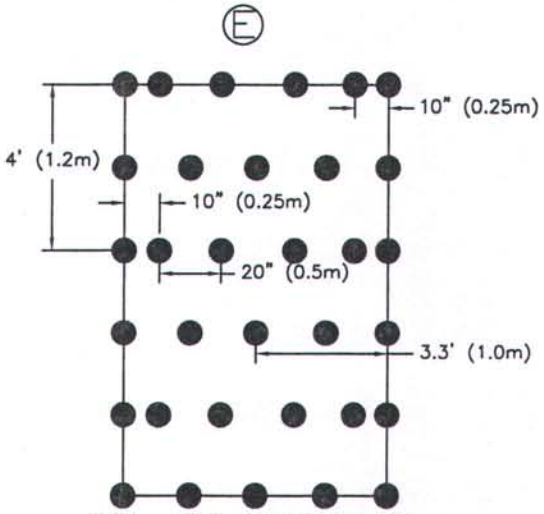
1.7 STAPLES PER SQ. YD.
(2.0 STAPLES PER SQ. M)

Ⓓ



3.4 STAPLES PER SQ. YD.
(4.1 STAPLES PER SQ. M)

Ⓔ



3.75 STAPLES PER SQ. YD.
(4.5 STAPLES PER SQ. M)

REV. 01/05

Project Name: Area 6A West Landfill - Final Cover
Project Location: Canton, North Carolina
Project No: 05127.01
Comp By: KLC
Date: 2/15/2006
Chk. By:

DIVERSION BERM/DITCH DESIGN

OBJECTIVE: Design channel with adequate freeboard to convey stormwater flows from 25-year, 24-hour storm event (P=6 in.).

REFERENCES:

1. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System, Version 7.10, Chocorua, New Hampshire, 2005
2. North American Green, Inc., Erosion Control Materials Design Software (ECMDS) Version 4.3, 2003.

DESIGN PROCEDURE:

1. Determine peak stormwater flows for 25-year, 24-hour storm event using TR-20. (See Post Development Hydrocad Printouts). Evaluate permenent channel lining using 25-year, 24-hour storm event with maximum channel slope.

SUMMARY OF RESULTS:

	Q (cfs)	Flow Depth
DITCH SC	25-yr	ft.
SC-3C	11.10	0.16

Diversion Berm/Ditch Subcatchment SC-3C used for conservative channel sizing design.

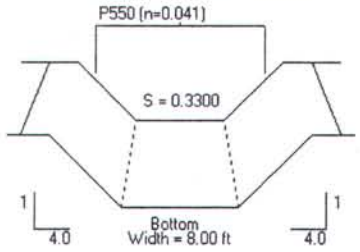
Ditch Geometry	
Sideslope	4 H:1V
Sideslope	4 H:1V
Bottom Width	8 ft
Depth	2 ft
Slope (max)	approx. 0.33 ft/ft
Permanent Ditch Lining:	NAG P550 w/ Staple Pattern E

See attached printout for analysis summary.

North American Green - ECMDS Version 4.3		2/15/2006 04:27 PM	COMPUTED BY: KLC
PROJECT NAME: Area 6A West Landfill - Final Cover		PROJECT NO.: 05027.01	
FROM STATION/REACH:	TO STATION/REACH:	DRAINAGE AREA: SC-3C to Diversion	DESIGN FREQUENCY: 25 yr./24-hr

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq.ft)	Hydraulic Radius(ft)	Normal Depth (ft)
11.1	1.0	6.55	1.69	0.18	0.19



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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
Straight	P550	Unvegetated	1				4.00	3.98	1.01	STABLE
	Staple E									

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Diversion Berm/Ditch

Subcat Reach Pond Link

Drainage Diagram for 6A WEST DITCHES
Prepared by Sevee & Maher Engineers, Inc. 2/15/2006

Subcatchment SC-3C: SC-3C to Diversion Berm

Runoff = 11.09 cfs @ 12.06 hrs, Volume= 0.698 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 Rainfall=6.00"

Area (sf)	CN	Description
126,400	71	Cover Soil

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0550	0.2		**Sheet Flow, Segment ID: A-B** Grass: Dense n= 0.240 P2= 3.50"
4.6	450	0.0550	1.6		**Shallow Concentrated Flow, Segment ID: B-C** Short Grass Pasture Kv= 7.0 fps
0.5	230	0.0250	8.3	165.04	**Trap/Vee/Rect Channel Flow, Segment ID: C-D** Bot.W=2.00' D=2.00' Z= 4.0 '/' Top.W=18.00' n= 0.030
14.2	780	Total			

Reach R-3C: Diversion Berm/Ditch

Inflow Area = 2.902 ac, Inflow Depth > 2.89"
Inflow = 11.09 cfs @ 12.06 hrs, Volume= 0.698 af
Outflow = 11.02 cfs @ 12.07 hrs, Volume= 0.698 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= 8.0 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.6 min

Peak Depth= 0.16' @ 12.07 hrs
Capacity at bank full= 1,093.70 cfs
Inlet Invert= 2,770.00', Outlet Invert= 2,740.00'
8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 4.0 '/' Top Width= 24.00'
Length= 90.0' Slope= 0.3333 '/'

NORTH AMERICAN GREEN®

MATERIAL SPECIFICATION

P550

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent three-dimensional turf reinforcement matting.

The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between the bottom and middle ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings and then covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle, dramatically corrugated (crimped) netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81 cm) centers with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.

The P550 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the U.S. Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications For Construction of Roads and Bridges on Federal Highway Projects, FP-03 2003 Section 713.18* as a *Type 5A, B, and C Permanent Turf Reinforcement Mat.*

Installation staple patterns shall be clearly marked on the turf reinforcement mattings with environmentally safe paint. All mats shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

The composite turf reinforcement mat shall be the North American Green P550, or equivalent. The P550 permanent composite turf reinforcement mat shall have the following physical properties:

Material Content

Matrix	100% UV Stabilized Polypropylene Fibers (0.50 lbs/yd²) (0.27 kg/m²)
Netting	Top and bottom- Ultra Heavy Duty UV Stabilized Polypropylene (24 lb/1,000 ft² [11.7 kg/100 m²] approximate weight)
	Mid – Corrugated Ultra Heavy Duty UV Stabilized Polypropylene (24 lb/1,000 ft² [11.7 kg/100 m²] approximate weight)
Thread	UV Stabilized Polypropylene

P550 is Available with the Following Physical Specifications Per Roll [English Units (Metric Units)]

Width	6.50 ft (2.00 m)
Length	55.50 ft (16.90 m)
Weight ± 10%	52 lbs (23.59 kg)
Area	40.00 yd² (33.40 m²)

Stitch Spacing for All Rolls = 1.50 inches (3.81 cm)

NORTH AMERICAN GREEN®

SUPPLEMENTAL SPECIFICATION

P550

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent three-dimensional turf reinforcement matting.

The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between the bottom and middle ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings and then covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle, dramatically corrugated (crimped) netting shall form prominent closely spaced ridges across the entire width of the mat. The three nets shall be stitched together on 1.50 inch (3.81 cm) centers with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.

Property	Test Method	Typical
Thickness	ASTM D6525	0.76 in (19.30 mm)
Resiliency	ASTM D6524	95 %
Density	ASTM D792	0.528 oz/in³ (0. 913 g/cm³)
Mass per Unit Area	ASTM D6566	21.45 oz/yd² (728 g/m²)
Porosity	ECTC Guidelines	96 %
Open Volume/Unit Area	ECTC Guidelines	122,906 in³/yd² (1,684,589 cm³/m²)
Stiffness	ASTM D1388/ECTC	366.27 oz-in (4,087,934 mg-cm)
Light Penetration	ECTC Guidelines	16 %
UV Stability	ASTM D4355*	100%
MD Tensile Strength	ASTM D6818 [ASTM D5035]	763 lbs/ft (11.15 kN/m) [1381 lbs/ft (20.15 kN/m)]
MD Elongation	ASTM D6818 [ASTM D5035]	10 % [13 %]
TD Tensile Strength	ASTM D6818 [ASTM D5035]	1134 lbs/ft (16.55 kN/m) [1523 lbs/ft (22.23 kN/m)]
TD Elongation	ASTM D6818 [ASTM D5035]	11% [13 %]

*ASTM D1682 (4 inch strip) Tensile Strength and percent Strength Retention of material following 1000 hrs exposure in Xenon-Arc Weatherometer.
MD – Machine direction
TD – Transverse direction

Bench Scale Testing†

Test Method - Description	Parameters	Results
ECTC Method 2 – Determination of unvegetated RECP's ability to protect soil from rain splash and associated runoff	50 mm (2 in)/hr for 30 min	Soil loss ratio* = 10.79
	100 mm (4 in)/hr for 30 min	Soil loss ratio* = 9.98
	150 mm (6 in)/hr for 30 min	Soil loss ratio* = 9.53
ECTC Method 3 – Determination of unvegetated RECP's ability to protect soil from hydraulically-induced shear stress. **Failure criteria = 0.50 inch soil loss**	Shear: 4.48 lbs/ft² for 30 min	Soil loss: 262g
	Shear: 5.14 lbs/ft² for 30 min	Soil loss: 445g
	Shear: 5.64 lbs/ft² for 30 min	Soil loss: 645g
	Shear at 0.50 inch soil loss (450g)	**5.1 lbs/ft²**
ECTC Draft Method 4 – Determination of temporary RECP performance in encouraging seed germination and plant growth	Top soil; Fescue (Kentucky 31); 21 day incubation 27° C ± 2° & approximately 50% RH	Percent improvement = 354% (increased biomass)
* Soil Loss Ratio = Soil Loss with Bare Soil / Soil Loss with RECP (NOTE: Soil loss based on regression analysis)		

†Bench Scale Performance Testing

Bench scale tests are index property tests. These tests are not indicative of field performance and therefore should not be used in design to establish performance levels for rolled erosion control products. Bench scale tests are performed according to methods developed by the Erosion Control Technology Council (ECTC).

Updated 1/2004

NORTH AMERICAN GREEN®

PERFORMANCE SPECIFICATION

P550

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 100% UV stabilized polypropylene fiber matrix incorporated into a permanent three-dimensional turf reinforcement matting.
The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between the bottom and middle ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings and then covered by an ultra heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle, dramatically corrugated (crimped) netting shall form prominent closely spaced ridges across the entire width of the mat. The three nets shall be stitched together on 1.50 inch (3.81 cm) centers with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.

Slope Design Data - Unvegetated Cover Factors

	Slope Gradient (S)		
Slope Length (L)	≤ 3:1	3:1-2:1	≥ 2:1
≤ 20 ft (6 m)	**0.00045**	**0.0145**	**0.0425**
20 – 50 ft	**0.0173**	**0.0305**	**0.0495**
≥ 50 ft (15.2 m)	**0.0345**	**0.0465**	**0.0565**

Channel Design Data

Roughness Coefficients - Unvegetated	
Flow Depth	Manning's 'n'
≤ 0.50 ft (0.15 m)	**0.041**
0.50 – 2.00 ft	**0.040 – 0.014**
≥ 2.00 ft (0.60 m)	**0.013**

Maximum Permissible Shear Stress		
	Short Duration	Long Duration
Phase 1 UNVEGETATED	**4.0 lbs/ft² (191 Pa)**	**3.25 lbs/ft² (156 Pa)**
Phase 2 PARTIALLY VEGETATED	**12.0 lbs/ft² (576 Pa)**	**12.0 lbs/ft² (576 Pa)**
Phase 3 FULLY VEGETATED	**14.0 lbs/ft² (672 Pa)**	**12.0 lbs/ft² (576 Pa)**

Approximate Maximum Flow Velocity
Unvegetated = 12.5 ft/s (3.8 m/s)
Vegetated = 25 ft/s (7.6 m/s)

Values are approximate, precise values can be obtained using ECMDS™

*Performance values obtained through third party testing at the Texas Transportation Institute, Colorado State University, and Utah State University based on soil loss failure criteria not exceeding 0.50 inches (1.27 cm).

STAPLE PATTERN GUIDE
6.67' (2.03 M) WIDE ROLLS

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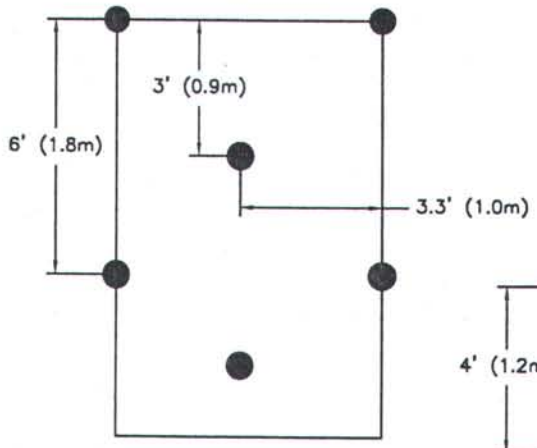
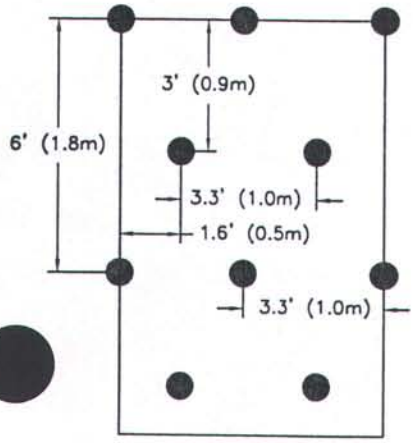
14649 HIGHWAY 41 NORTH
EVANSVILLE, IN 47725
800-772-2040
www.nagreen.com

Ⓐ



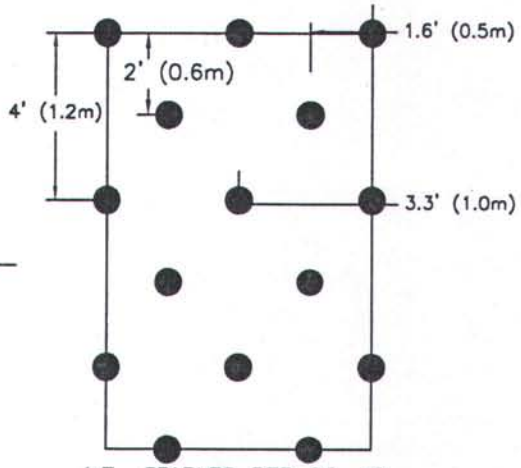
0.7 STAPLES PER SQ. YD.
(0.8 STAPLES PER SQ. M)

Ⓑ



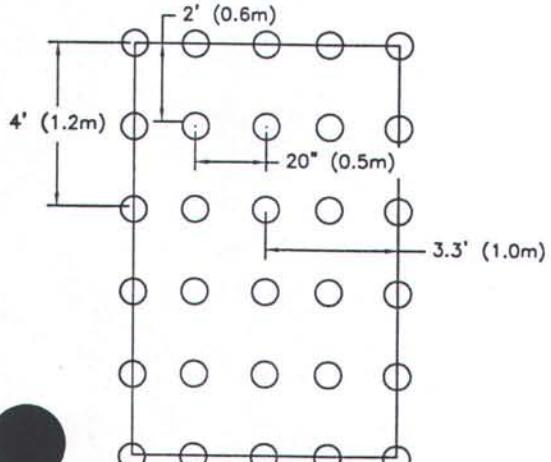
1.15 STAPLES PER SQ. YD.
(1.35 STAPLES PER SQ. M)

Ⓒ



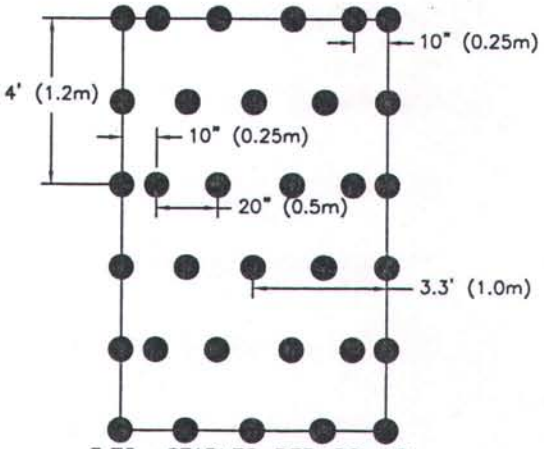
1.7 STAPLES PER SQ. YD.
(2.0 STAPLES PER SQ. M)

Ⓓ



3.4 STAPLES PER SQ. YD.
(4.1 STAPLES PER SQ. M)

Ⓔ



3.75 STAPLES PER SQ. YD.
(4.5 STAPLES PER SQ. M)

REV. 01/05

Project Name: Area 6A West Landfill - Final Cover
Project Location: Canton, North Carolina
Project No: 05127.01
Comp By: KLC
Date: 2/15/2006
Chk. By:

RIPRAP INLET / OUTLET PROTECTION DESIGN

OBJECTIVE: Design culvert outlet protection to protect the outlet of culverts from scour and deterioration.

REFERENCES:

1. North Carolina Erosion and Sediment Control Planning and Design Manual, 1994
2. Applied Microcomputer Systems, HydroCAD Stormwater Modeling System,Version 7.10, Chocorua, New Hampshire, 2005

DESIGN PROCEDURE:

1. Use design flows for 25-year, 24-hour storm event and attached Outlet Protection Figure (8.06a) to determine apron dimensions and riprap size.

SUMMARY OF RESULTS:

Outlet Protection:

Culvert No.	Q_{25} (cfs)	Culv. Dia. (in)
1R	8.18	12
5R	23.82	18
8R	26.24	18

La (ft)	W_1 (ft)	W_2 (ft)	Riprap D_{50} (in)	Thickness (in)
12	13	3	4	8
20	22	5	10	20
20	22	5	10	20

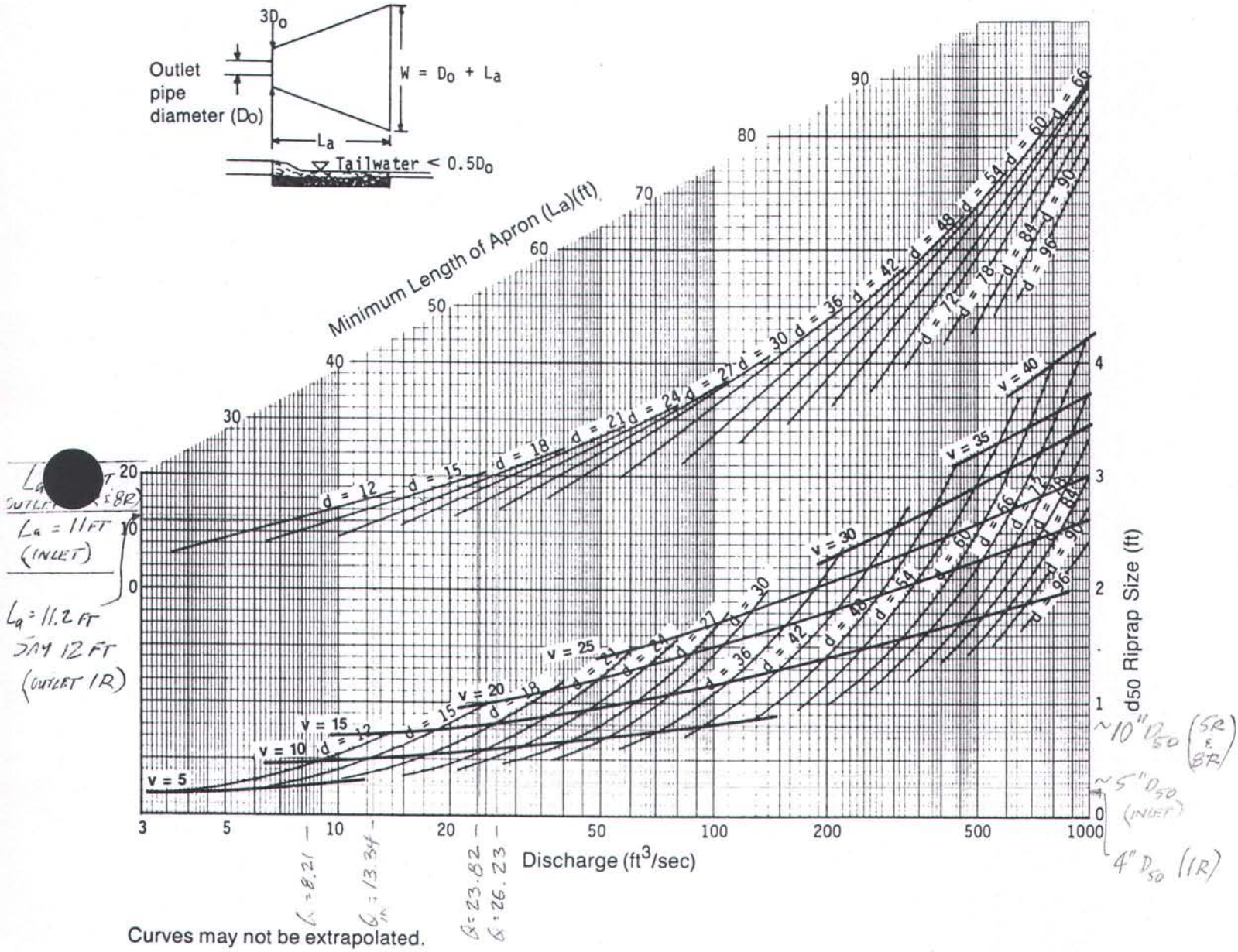
Culvert 1R, 5R, and 8R will discharge directly into a 4-ft dia.open top concrete barrel section w/ steel splash plate for energy dissipation prior to discharging to riprap apron outlet.

Inlet Protection:

Culvert No.	Q_{25} (cfs)	Culv. Dia. (in)
C-3C	13.34	24

La (ft)	W_1 (ft)	W_2 (ft)	Riprap D_{50} (in)	Thickness (in)
11	13	6	5	10

Culvert inlet with highest inflow (SC-3C) used for conservative design of riprap inlet protection.



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

APPENDIX F-3-3

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

STATE OF NORTH CAROLINA
Department of Environment, Health and Natural Resources,
Land Quality Section

EROSION AND SEDIMENTATION CONTROL PLAN CHECKLIST

The following items should be incorporated with respect to specific site conditions, in an erosion and sedimentation control plan:

LOCATION INFORMATION

_____ Project location
_____ Roads, streets
_____ North arrow
_____ Scale
_____ Adjoining lakes, streams or other major drainage ways

GENERAL SITE FEATURES

_____ North Arrow
_____ Scale
_____ Property line
_____ Legend
_____ Existing contours
_____ Proposed contours
_____ Limit and acreage of disturbed area
_____ Planned existing buildings location and elevations
_____ Planned and existing roads location and elevations
_____ Lot and/or building numbers
_____ Land use of surrounding areas
_____ Rock outcrops
_____ Seeps or springs
_____ Wetland limits
_____ Easements
_____ Streams, lakes, ponds, drainage ways, dams
_____ Boundaries of the total tract
_____ Borrow and/or waste areas (Note - when the person financially for the overall project is not the person financially responsible for off-stie borrow ares not regulated by the provisions of the Mining Act of 1971 and off-site waste areas other than land fills regulated by the Department of Human Resources, such areas should be considered separate land disturbing activities subject to the Sedimentation Pollution Control Act of 1973. Off-site borrow areas are subject to the requirements of the Mining Act of 1971).
_____ Stockpiled topsoil or subsoil location
_____ Street profiles

SITE DRAINAGE FEATURES

_____ Existing and planned drainage patterns (include off-site areas that drain through project)
_____ Size of Areas (Acreage)
_____ Size of location of culverts and sewers
_____ Soils information (type, special characteristics)
_____ Design calculations for peak discharges of runoff (including the construction phase and final runoff coefficients of the site)
_____ Design calculations and construction details for culverts and storm sewers
_____ Design calculations, cross sections and method of stabilization of existing and planned channels (include temporary linings)
_____ Design calculations and construction details of energy dissipators below culverts and strom sewer outlets (for rip-rap aprons, include stone sizes (diameters) and apron dimensions)
_____ Soil information below culvert and stone sewer outlets
_____ Design calculations and construction details to control groundwater, i.e. seeps, high water table, ect.
_____ Name of receiving watercourse or name of municipal operator (only where stormwater discharges are to occur)

EROSION CONTROL MEASURES

_____ Legend
_____ Location of temporary and permanent measures
_____ Construction drawings and details for temporary and permanent measures
_____ Design calculations for sediment basins and other measures
_____ Maintenance requirements during construction
_____ Person responsible for maintenance during construction
_____ Maintenance requirements and responsible person(s) of permanent measures

VEGETATIVE STABILIZATION

_____ Areas and acreage to be vegetatively stabilized
_____ Planned vegetation with details of plants, seed, mulch and fertilizer
_____ Specifications for permanent and temporary vegetation
_____ Method of soil preparation

NOTE: Should include provisions for ground cover on exposed slopes within 30 working days following completion of any phase of grading, permanent ground cover for all disturbed areas within 30 working days or 120 calendar days (whichever is shorter) following completion of construction or development.

OTHER REQUIREMENTS

_____ Narrative describing construction sequence (as needed)
_____ Narrative describing the nature and purpose of the construction activity
_____ Completed Financial Responsibility/Ownership Form (to be signed by person financially responsible for project)
_____ Bid specifications regarding erosion control
_____ Construction sequence related to sedimentation and erosion control (include installation of critical measures prior to initiation of the land-disturbing activity and removal of measures after areas they serve have been permanently stablized.