RICHARDSON SMITH GARDNER
& ASSOCIATES
ENGINEERING & GEOLOGICAL
SERVICES

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AUG 10 2009
SOLID WASTE SECTION
ASHEVILLE REGIONAL OFFICE

August 7, 2009

Mr. Allen Gaither
Environmental Engineer
Solid Waste Section – NCDENR
2090 US Highway 70
Swannanoa, NC 28778

Fac/Perm/Co ID #	Date	Doc ID#
06-03	8/10/09	8220

Re: Response to Engineering Technical Review – Permit to Construct
Construction and Demolition Landfill Phase III
Avery County C&D Landfill – Permit No. 06-03

Dear Mr. Gaither,

On behalf of Avery County, Richardson Smith Gardner (RSG) has prepared this response to the comments provided in correspondence dated May 27, 2009 (**copy attached**). The following responses address each comment and reference any revisions to the application previously submitted on February 17, 2009. Please find each comment in *italics* and the associated response below.

Facility & Engineering Plan

Comment No. 1

Section 3.1 states "the exterior slopes will be at a maximum of 3:H to 1:V slope". Rule .0543(c)(2)(A) requires post-settlement surface slopes to be a minimum of 5 (20:H to 1:V) percent and a maximum of 25 percent (4:H to 1:V).

Response

We have proposed an alternative closure for the facility to include 3H:1V slopes. The stability of this cover was evaluated in **Appendix B** of the Facility & Engineering Plan which revealed that it is both a stable and safe configuration.

Section 7.0 of the plan has been revised as follows:

> "The results of the slope stability analysis indicates that the proposed C&D landfill configuration is stable and safe."

A revised section is included in **Attachment A** of this response.

Comment No. 2

Section 6.2 does not specify the maximum permeability of the cap system. Rule .0543 (c)(1)(A) requires the cap system to be designed and constructed to have a permeability less than or equal to soils underlying the landfill, or the permeability specified for the final cover in the effective permit, or a permeability no greater than 1.0 x 10-5 cm/sec, whichever is less.

Response:

Section 6.2 has been revised to read as follows:

> "As a minimum, the components of the final cover system (bottom up) will consist of a 12 inch foundation layer (intermediate cover), 18 inch low permeability layer (no greater than 1.0×10^{-5} cm/sec), and a 18 inch thick vegetative soil layer meeting the requirements of 15A NCAC 13B.0543. Other alternative cover demonstrations may be approved by the NC DENR Division of Solid Waste Management. This additional information will be available prior to construction of the final cover system."

Comment No. 3

Section 8 and Appendix C provide a description and analysis of the underdrain system and indicates the system is designed properly to convey rain event infiltration. However, this design cannot be approved as there is no indication it protects surface or groundwater from leachate contamination. A new underdrain design should be discussed with the Section prior to submittal.

Response:

Following discussions with both the Asheville Regional Office and the Central Office of the Division of Waste Management, **Appendix C** of the Facility and Engineering Plan has been updated to included additional analysis of the underdrain, geotextile, and diversion berms to manage stormwater that may impact the valley area between Phases I and II. Additionally, a supplement, **Appendix C**, was added to the **Operations Manual** to provided additional detail in the management of stormwater during operations through the installation of diversion berms within the subgrade of Phase III at approximate 20 feet vertical intervals. Reference was also added to **Sections 2.7** and **3.2.4** of the **Operations Manual** for the supplement. Additional information is provided in the updated **Operations Manual** provided in **Attachment B** of this report.

Section 8.0 of the Facility and Engineering Plan has also been updated to expand the narrative of the underdrain system to read as follows:

> "The development of Phase III includes impact to a non-functioning stream under the approval of nationwide permit No. 39 issued by the US Army Corps of Engineers and the NCDENR Division of Water Quality. A copy of these approvals are included in **Attachment J**. The underdrain system has been proposed to assist in drainage of any base seepage remaining from the impacted stream and to maintain vertical separation of groundwater from the waste. The proposed underdrain section includes a geotextile wrapped washed stone column placed in the abandoned streambed covered by a one (1) foot thick compacted soil layer, a very low permeability ($\leq 5 \times 10^{-9}$) GCL (geosynthetic clay liner) and overlying two (2) foot prepared soil layer to serve as subgrade for the landfill. Refer to **Appendix C** for underdrain analysis.
>
> The development within this area ("the valley") between Phases I and II will include management of potential stormwater that could be conveyed through this area. In order to manage this potential, a series of diversion berms have been included in the base grading to divert stormwater incrementally away from the valley to permanent stormwater management structures as shown in **Drawing No. S2**."

The drawings have also been updated to reflect the installation of the diversion berms and includes updated details for the underdrain which are included as **Attachment C** of this response.

Comment No. 4

None of the Permit Drawings in Attachment H delineate borrow and stockpile areas as required by Rule .0537 (d)(1)(C).

Response:

The Phase III operation will require an additional 48,000 cubic yards of material for construction, operations and cover soil which will be obtained from within the future expansion areas north of Phase III. The proposed borrow areas have been delineated on **Drawings S2** and **S4** and are included in **Attachment C** of this response.

During review of this information, we also identified some discrepancies in **Table 2** of the Facility and Engineering Plan which have been updated and included in the revised plan provided in **Attachment A** of this response.

Comments No. 5

None of the Permit Drawings in Attachment H meet the engineering drawing vertical separation requirements of Rule .0539 (c)(6).

Response:

The potentiometric surface has been added to selected drawings in order simplify the focus of each plan. It is noted that numerous layers are present on both the base grading and final grading plans. Therefore, **Drawings S1** and **P1** have been updated to include the potentiometric surface from the Spring 2009 Groundwater Monitoring Report by Richardson Smith Gardner and Associates. On **Drawing P1** the surface was only added to the initial (pre-waste placement) cell for information and demonstration that the proposed design satisfies the vertical separation requirement. It is also noted that the potentiometric surface is also shown in the section drawings submitted previously. Updated drawings are included in **Attachment C** of this response.

<u>Operations Plan</u>

Comment No. 6

Section 1.2.2 incorrectly indicates Bill Wagner is in the RCO, Raleigh Central Office. Bill is based in the ARO, Asheville Regional Office.

Response:

The correction has been performed and is included in the updated Operations Manual included in **Attachment B** of this response.

Comment No. 7

Section 1.4 states this "sign(s) will provide information on operating hours, operating procedures, and acceptable wastes". Please remember Rule .0505(9)(a) also requires the permit number be on all signage.

Response:

Section 1.4 has been revised to read as follows:

> "This sign(s) will provide information on operating hours, operating procedures, acceptable wastes, and will include the permit number".

An updated Operations Manual is included in **Attachment B** of this response.

Comment No. 8

Section 2.2 refers to 15A NCAC 13B.0101(54) for the definition of Land Clearing and Inert Debris landfill. The proper rule reference is 15A NCAC 13B.0101(22).

Response:

The correction has been performed and is included in the updated Operations Manual included in **Attachment B** of this response.

Comment No. 9

Section 2.2 refers to 15A NCAC 13B.0101(53) for the definition of Land Clearing Waste. The proper rule reference is 15A NCAC 13B.0101(23).

Response:

The correction has been performed and is included in the updated Operations Manual included in **Attachment B** of this response.

Comment No. 10

Section 2.2 references C&D-Like wastes which actually meet the definition of Industrial Solid Waste as defined in Rule .532(11). Per Rule .0542(e)(4) industrial solid wastes are excluded from C&D landfill facilities unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A).

Response:

The reference has been removed and included in the updated Operations Manual included in **Attachment B** of this response.

Comment No. 11

Section 2.5.4 states "at the completion of waste placement each week, or sooner if the area of exposed waste exceeds on acre in size, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste". Rule .0542(f)(2) requires six inches of earthen material when the waste disposal area exceeds one-half acre and at least once weekly. Cover must be placed at more frequent intervals if necessary to control disease vectors, fires, odors, blowing litter, and scavenging. A notation of the date and time of the cover placement must be recorded in the operating record as specified in Paragraph (n) of the Rule.

Response:

Section 2.5.4 has been revised to read as follows:

> "At the completion of waste placement each week, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste. Cover will be placed sooner if the area of exposed waste exceeds one-half acre in size, or as necessary to control vectors, fire, odors, and blowing debris. The date and time of cover placement will be recorded by landfill employees."

A revised section is included in **Attachment B** of this response.

Additional Items

Non-Potable Well

The non-potable well previously located near the scalehouse has been abandoned in accordance with the Waste Relocation and Mitigation Plan[1]. A new well has been installed west of the transfer station. Therefore, all drawings have been updated to reflect his effort.

---

[1] Waste Relocation and Mitigation Plan – Avery County C&D Landfill, by Richardson Smith Gardner and Associates, October 2008.

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Dexter R. Matthews	Beverly Eaves Perdue	Dee Freeman
Director	Governor	Secretary

SOLID WASTE SECTION

May 27, 2009

Mr. Buddy Norris
Avery County Solid Waste - Director
PO Box 640
Newland, North Carolina 28657

Subject: Engineering Technical Review – Permit to Construct
Construction & Demolition Landfill Phase III
Avery County, Permit #06-03, Document ID No. 7376

Dear Mr. Norris:

The Division of Waste Management, Solid Waste Section (Section) has completed review of the document titled *Permit to Construct Application, Phase III, Avery County C&D Landfill, Ingalls, North Carolina*, February 2009 (DIN 6894). It has been determined the Section requires clarification or additional information in order to complete the permitting activity requested. Please provide a response for each of the following items:

Facility & Engineering Plan

1. Section 3.1 states *the exterior slopes will be at a maximum of 3:H to 1:V slope*. Rule .0543(c)(2)(A) requires post-settlement surface slopes to be a minimum of 5 (20:H to 1:V) percent and a maximum of 25 percent (4:H to 1:V).
2. Section 6.2 does not specify the maximum permeability of the cap system. Rule .0543(c)(1)(A) requires the cap system to be designed and constructed to have a permeability less than or equal to soils underlying the landfill, or the permeability specified for the final cover in the effective permit, or a permeability no greater than 1.0 x 10-5 cm/sec, whichever is less.
3. Section 8 and Appendix C provide a description and analysis of the underdrain system and indicates the system is designed properly to convey rain event infiltration. However, this design cannot be approved as there is no indication it protects surface or groundwater from leachate contamination. A new underdrain design should be discussed with the Section prior to submittal.
4. None of the Permit Drawings in Attachment H delineate borrow and stockpile areas as required by Rule .0537(d)(1)(C).
5. None of the Permit Drawings in Attachment H meet the engineering drawing vertical separation requirements of Rule .0539(e)(6).

Operations Plan

6. Section 1.2.2 incorrectly indicates Bill Wagner is in the RCO, Raleigh Central Office. Bill is base in the ARO, Asheville Regional Office.

7. Section 1.4 states *this sign(s) will provide information on operating hours, operating procedures, and acceptable wastes*. Please remember Rule .0505(9)(a) also requires the permit number be on all signage.
8. Section 2.2 refers to 15A NCAC 13B.0101(54) for the definition of Land Clearing and Inert Debris landfill. The proper rule reference is 15A NCAC 13B.0101(22).
9. Section 2.2 refers to 15A NCAC 13B.0101(53) for the definition of Land Clearing Waste. The proper rule reference is 15A NCAC 13B.0101(23).
10. Section 2.2 references C&D-Like wastes which actually meet the definition of Industrial Solid Waste as defined in Rule .532(11). Per Rule .0542(e)(4) industrial solid wastes are excluded from C&D landfill facilities unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A).
11. Section 2.5.4 states *at the completion of waste placement each week, or sooner if the area of exposed waste exceeds one acre in size, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste*. Rule .0542(f)(2) requires six inches of earthen material when the waste disposal area exceeds one-half acre and at least once weekly. Cover must be placed at more frequent intervals if necessary to control disease vectors, fires, odors, blowing litter, and scavenging. A notation of the date and time of the cover placement must be recorded in the operating record as specified in Paragraph (n) of this Rule.

Mr. Zinith Barbee will provide a technical review of the Water Quality Monitoring Plan under separate cover.

If you should have any questions regarding this matter please contact me at (828) 296-4703.

Sincerely,

Allen Gaither
Environmental Engineer

Cc: Stacey Smith – RSG Engineers
Zinith Barbee – SWS/RCO
Bill Wagner – SWS/ARO

ATTACHMENT A

Facility & Engineering Plan

Avery County C&D Landfill
Ingalls, North Carolina
NC Solid Waste Permit No. 06-03

Prepared for:

Avery County
Newland, North Carolina

PERMIT ISSUE DOCUMENTS

February 2009
Revised July 2009

RICHARDSON SMITH GARDNER
& ASSOCIATES
ENGINEERING & GEOLOGICAL
SERVICES

PRINTED ON 100% RECYCLED PAPER

AVERY COUNTY
C&D LANDFILL EXPANSION

FACILITY PLAN

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AVERY COUNTY
C&D LANDFILL FACILITY EXPANSION

FACILITY AND ENGINEERING PLAN

1.0 OVERVIEW

This section presents a plan for the expansion of the Avery County construction and demolition (C&D) debris landfill (Solid Waste Permit No. 06-03) and as presented in the Facility Plan Drawings provided as **Attachment H** to this report.

2.0 FACILITY SERVICES AND WASTE STREAM

2.1 Facility Services

Currently, the following activities or services are provided at the Avery County C&D Landfill facility:

- Scales and scale house facilities
- Construction and Demolition Debris (C&D) Landfill (Permit No. 06-03)
- Mobile Home Deconstruction Area
- White Goods Management Area
- Municipal Solid Waste (MSW) Transfer Station (Permit No. 06-02T)

2.2 Types of Waste

The Avery County Landfill and Transfer facility accepts MSW, C&D, LCID waste, inert debris, asphalt, and white goods. The MSW wastes are routed to the on-site Transfer Station for disposal at the Bristol, Virginia Integrated Waste Management Facility. C&D wastes are routed to the on-site landfill and White Goods are managed on a designated concrete lined management area adjacent to the Transfer Station.

2.3 Disposal Rate

The Avery County Landfill facility currently receives about about 3,000 tons per year of C&D waste, which has been historically disposed of within the existing Phases 1 & 2 disposal areas. However, the landfill expansion anticipates a maximum disposal rate of 10,000 tons per year. This amounts to an average of about 40 tons per day based upon 260 days of operation per year. Actual daily amounts of C&D are expected to vary considerably.

2.4 Service Area

The landfill serves Avery County and its surrounding counties in NC and TN as shown in **Figure 1**.

2.5 Procedures for Waste Segregation

Wastes are segregated at the scales and routed to the appropriate area. Operators at the scalehouse are trained to classify and segregate the waste stream.

Employees at the landfill are trained in the safety procedures for the handling and detection of illegal waste. The screening of unacceptable waste is done through the random checking of incoming loads by a landfill employee at the scalehouse and at the tipping area. When unacceptable waste is detected at the scalehouse, the load is rejected and not permitted into the landfill. If hazardous waste is found at the tipping area, identification of the truck or persons is made (if possible) and documented, then the hazardous waste is identified and placed in a hazardous waste container and taken to a designated hazardous waste staging area for proper disposal. When this occurs, the event is reported to the appropriate authorities.

2.6 Equipment Requirements

Avery County will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

3.0 LANDFILL CAPACITY

3.1 Total Operating Capacity and Life Expectancy

Drawing No. S4 (Final Grading Plan), identifies the final configuration for the phase III facility expansion of the C&D landfill. The top elevation of the final grades is at approximately 3020 feet. The exterior side slopes will be at a maximum of 3:H to 1:V slope.

The stability for the alternate 3:H to 1:V slopes has been evaluated in **Appendix B** this Facility and Engineering Plan. The evaluation concluded that the configuration was stable and safe.

The estimated total gross operating capacity, net capacity (accounts for periodic and final cover), disposal area, and life expectancy for the facility expansion is shown in **Table 1**.

3.2 In-Place Ratio of Waste to Soil and Compaction Factor

The capacities obtained above were based on a 10 percent periodic cover ratio and a compaction factor of 1,000 pounds per cubic yard (0.50 tons/cy). The assumed periodic cover ratio and compaction factor is typical for similar C&D landfills.

4.0 AVAILABLE SOIL RESOURCES AND REQUIRED SOIL QUANTITIES

The soils required to construct the proposed landfill will be removed from within the facility footprint and on-site borrow sources. The soils removed during excavation of the facility may be used for structural fill and general fill.

4.1 Earthwork Quantities

The anticipated quantity of soil to be excavated to achieve base grades and the anticipated quantity to be required as structural fill for foundation soils and berms is shown in **Table 2** as shown in **Drawing No. S2** (Base Grading Plan).

4.2 Periodic Cover

Assuming the previously mentioned periodic cover ratio of 10 percent, the estimated quantity of soil that will be required for use as periodic cover during C&D landfill operations is shown in **Table 2**.

4.3 Low Permeability and Vegetative Soil Layer

On the basis of the three (3) foot thick soil layer (18" low permeability layer and 18" vegetative soil layer) of the C&D landfill final cover, the estimated in-place volume required is shown in **Table 2**.

4.4 Soil Summary

The above soil quantities are summarized in **Table 2**. Note that, based on the proposed base grades and final cover grades shown on **Drawings No. S2 & S4** respectively, long-term the site is a soil surplus which will satisfy all sources of soil required for the project.

5.0 FACILITY DESIGN CRITERIA

The Avery County C&D Landfill is designed and operates in accordance with Sections .0540 and .0542 of the North Carolina Administrative Code, Title 15A, Chapter 13, Subchapter 13B including the following requirements.

5.1 Horizontal Separation Requirements

The horizontal separation requirement between the disposal boundary (edge of waste) and the property lines is a minimum of 200 feet, the minimum buffer between private residences and wells and the disposal boundary is 500 feet, and the minimum buffer between any surface water (stream, wetland, river, creek, etc.) and the disposal boundary is 50 feet.

5.2 Vertical Separation Requirements

The phase III subgrade has been designed to meet the minimum requirement of four (4) feet (post-settlement) above the seasonal high groundwater table and bedrock. The upper two feet of the proposed subgrade generally consist of SM and ML soils. The phase III development includes impact to a portion of non-functioning stream between the existing phase I & II which includes an underdrain system described in **Section 8.0**.

5.3 Survey Control

The facility has established survey control benchmarks by a Registered Land Surveyor in the North Carolina State Plane (NCSP) coordinate system.

6.0 CONTAINMENT AND ENVIRONMENTAL CONTROL SYSTEMS

Technical specifications and a project construction quality assurance (CQA) manual for the following materials can be found in **Attachments C & D** respectively.

6.1 Landfill Subgrade and Perimeter Berms

The subgrade elevations will be achieved by excavation or placement of compacted structural fill (embankment). During excavation, a determination of unsuitable soils (i.e. soils which are too soft, wet, or organic) will be made. Where unsuitable soils are found, the soils will be undercut and backfilled with structural fill.

In addition to providing the landfill foundation in fill areas, structural fill will be used for berm and roadway construction. Structural fill will consist of on-site soils removed during excavation except that no CH, OL, or OH soils will be allowed.

6.2 Final Cover System

As a minimum, the components of the final cover system (bottom up) will consist of a 12 inch foundation layer (intermediate cover), 18 inch low permeability layer (no greater than 1.0×10^{-5} cm/sec), and a 18 inch thick vegetative soil layer meeting the requirements of 15A NCAC 13B.0543. Other alternative cover demonstrations may be approved by the NC DENR Division of Solid Waste Management. This additional information will be available prior to construction of the final cover system.

6.3 Erosion and Sedimentation Control

The Erosion and Sedimentation Control structures provided will be designed and maintained to manage the run-off generated by the 24-hour, 25-year storm event, and conform to the requirements of the Sedimentation Pollution Control Law (15A, NCAC, 4).

A detailed discussion of the site erosion and sedimentation control for the facility can be found in site Erosion and Sedimentation Control Plan (**Attachment G**).

6.4 Landfill Gas Control

The landfill gas (LFG) control system will consist of collection wells, vents, or below surface trenches placed within the waste to capture the gas and either passively vent or flare the gas via utility flares. Monitoring of landfill or other explosive gases will be conducted on a quarterly basis in accordance with 15A NCAC 13B .0544 (d).

6.5 Access and Roadways

Site operations will provide for all-weather access to active areas.

7.0 SLOPE STABILITY

The slope stability of the waste mass in addressed in **Appendix B**. The results of the slope stability analysis indicates that the proposed C&D landfill configuration is stable and safe.

8.0 UNDERDRAIN SYSTEM

The development of Phase III includes impact to a non-functioning stream under the approval of nationwide permit No. 39 issued by the US Army Corps of Engineers and the NCDENR Division of Water Quality. A copy of these approvals are included in **Attachment J**. The underdrain system has been proposed to assist in drainage of any base seepage remaining from the impacted stream and to maintain vertical separation of groundwater from the waste. The proposed underdrain section includes a geotextile wrapped washed stone column placed in the abandoned streambed covered by a one (1) foot thick compacted soil layer, a very low permeability ($\leq 5x10^{-9}$) GCL (geosynthetic clay liner) and overlying two (2) foot prepared soil layer to serve as subgrade for the landfill. Refer to **Appendix C** for underdrain analysis.

The development within this area ("the valley") between Phases I and II will include management of potential stormwater that could be conveyed through this area. In order to manage this potential, a series of diversion berms have been included in the base grading to divert stormwater incrementally away from the valley to permanent stormwater management structures as shown in **Drawing No. S2**.

9.0 STREAM RESTORATION PLAN

The stream impacts approved under nationwide permit No. 39 includes requirements for stream buffer enhancements down stream of the proposed landfill expansion as shown on **Drawing No. S4.**

TABLE 1
SUMMARY OF LANDFILL CAPACITY AND LIFE EXPECTANCY

Phase	Area (Ac.)	Operating Capacity (CY)		Life Expectancy[3]
		Gross[1]	Net[2]	
Phase 1*	2.95	10,800	10,800	0 Years
Phase 2*	2.06	11,500	11,500	0 Years
Phase 3 - Cell 1	0.84	49,000	43,600	1.9 Years
Phase 3 - Cell 2	0.36	47,000	44,700	1.9 Years
Phase 3 - Cell 3	0.90	33,000	27,200	1.2 Years
Total:	7.11	151,300	137,800	5 Years

* Phases 1 & 2 volumes are based on vertical expansion grades proposed in correspondence dated 10-23-08 and will be consumed in accordance with the waste relocation and mitigation plan dated October 2008 by RSG.

Notes:

1. Gross capacity for the expansion is based on final cover grades provided on **Drawing No. S4** and assumes subgrades as shown on **Drawing No. S2**. It is also noted that the capacity does not include volume included in the current permitted area (Phase 1 and 2), but reflects gains in "layover".
2. The net capacity is determined by deductions for final and intermediate cover soils from the gross capacity.
3. The existing life expectancy assumes two hundred sixty (260) operating days a year accepting forty (40) tons a day with a unit weight of 0.5 tons per cubic yard.
4. Refer to **Appendix A** for volume calculations.

TABLE 2
SOIL SUMMARY

Material	Quantity (CY)			
	Phase 1	**Phase 2**	**Phase 3**	**Total**
Excavation[3]	0	0	(21,500)	(21,500)
Structural Fill[3]	0	0	12,000	12,000
Periodic Cover[2]	0	0	11,500	11,500
Intermediate Cover[4]	4,800	3,300	3,400	11,500
Final Cover[1,4]	14,300	10,000	10,200	34,500
Total:	19,100	13,300	15,600	48,000[6]

Notes:

1. The soil summary quantities include remaining final cover earthwork volumes required in the existing Phase 1 area and in the Phase 2 area.
2. Ten (10) percent of the net volume shown in **Table 1** is assumed for periodic cover estimate.
3. Earthwork volumes are estimated based on proposed subgrades as shown in **Drawing No. S2** and existing site topography on the site.
4. Assumed Cap Area is increased by 5.4% to correct for slope.
5. Refer to **Appendix A** for volume calculations.
6. Additional soil required will be excavated from future expansion areas north of Phase III as shown in **Drawings No. S2 and S3**.

Appendix C

Underdrain System Analysis

AVERY COUNTY C&D LANDFILL
PHASE III

UNDERDRAIN SYSTEM ANALYSIS

1.0 OVERVIEW

The development of Phase III occurs with a non-functioning portion of streambed between the existing Phases I and II. The potential for residual stormwater influenced seepage along the old streambed was considered in design. In order to maintain stability of the fill area, provisions for this seepage must be incorporated into the design.

2.0 BASE SEEPAGE

Currently, the streambed impact area includes an intermittent channel which lacks significant aquatic function and an extremely small wetland just upstream of the existing road crossing that does not provide a great deal of function either[1]. Considering the potential for seepage, a washed stone and fabric wrapped underdrain is proposed. This stream channel appears to have little measureable flow, but maintains a saturated condition dependant on rainfall, the potential base seepage was proposed to handle infiltration over the underdrain area from a 5.04 in/hour rain event (2 year - 5 minute storm). Existing saprolitic soils surrounding this area in hydrologic unit 1A include average conductivity of 7.24×10^{-4} cm/sec materials[2]. Therefore, the washed stone underdrain (1 cm/sec, minimum) has much greater flow capacity to remove any increase in seepage. The underdrain shall be bedded approximately one (1) foot into the existing streambed to insure capture, but not positioned such that an aggressive removal of groundwater could occur and thus the potential for becoming a depression point for altering groundwater flow beneath the landfill. The stone trench analysis and geotextile design is provided in the **attached** calculations. As it is expected that this area would gaining from top to bottom, the final section of the stone trench shall be a minimum of five (5) feet by 25 feet wide.

3.0 LOW PERMEABILITY LINER

The placement of waste over the underdrain would rely on a “waste to waste connection” to manage potential residual stormwater trapped within the waste mass to move through its normal attenuation. In order to facility and avoid the potential for any communication between residual storwater and the underdrain, a low permeability GCL (geosynthetic clay liner) is proposed immediately below the regulatory two (2) foot prepared subgrade and above the stone underdrain. The GCL will be placed over a one (1) foot thick compacted soil layer and will extend a minimum of ten (10) feet beyond the stone drain and anchored with a two (2) foot turn down to isolate it from the operational area above.

---

[1] Nationwide Permit No. 39 Pre-construction Notification dated September 19, 2008 prepared by Carolina Ecosystems, Inc.

[2] David Garrett & Associates, Hydrogeologic Investigation Report Site Suitability Evaluation Update Avery County C&D Landfill, April 2008

4.0 DIVERSION BERMS

The site has been designed for fill operations from the bottom along the access road to the north (or upgradient). As a preventative stormwater measure, a series of diversion berms are proposed at approximate 20 feet vertical locations such that each diversion berm manages an approximate one (1) acre (maximum and incremental) drainage area. A minimum two (2) foot high diversion berm will be installed across the subgrade areas and will serve to route stormwater to catch basins or other more permanent stormwater control measures.

The diversion berms are generally located at 20 feet vertical locations (ie. ~El. 2930, ~El. 2950, ~El. 2970, and ~El. 3000) as shown on the Base Grading Plan. In all cases, there is sufficient slope to convey stormwater to other permanent measures outside the waste boundaries. However, in the initial stage of operations (Day 1), a rain event would collect below El. 2920 and would require pumping. The largest incremental drainage area is approximately one (1) acre. The diversion berms have been designed to easily control the 2 year - 5 minute storm (5.04 in/hr) event and will pass the 25 year - 5 minute storm (8.4 in/hr) with more than 0.5 foot of freeboard. Calculations are **attached** providing additional analysis of the diversion berms and their placement within the Phase III area. These diversion berms are intended to remain during operations and filled over.

PROJECT AVERY COUNTY C&D LANDFILL

SUBJECT UNDERDRAIN ANALYSIS

SHEET 1 OF

JOB NO. AVERY-08-4

DATE 2-16-09

COMPUTED BY SAS

CHECKED BY

OBJECTIVE

DESIGN UNDERDRAIN BELOW PHASE III EXPANSION TO PULL RESIDUAL STREAM FLOW AND MAINTAIN GROUNDWATER SEPERATION.

GIVEN

→ GROUNDWATER FLOW OCCURS WITH UNIT IB IN THE SAPROLITE LAYER AVERAGE K ≈ 7.24×10^{-4} cm/sec

→ OLD STREAMBED IS ≈ 600' @ ≈ 20' WIDTH @ ~0.25 AC

CALCULATIONS

- BASED ON WATER BALANCE ~ 30% OF PRECIPITATION IS AVAILABLE AS INFILTRATION

∴ ASSUME 2 YR - 5 MIN STORM AS DESIGN BASIS $i = 5.04$ "/HR

& EQUIVALENT C (FOR INFILTRATION) ≈ 0.30

& AREA = 0.25 AC

$Q_{REQ'D} = (0.30)(5.04)(0.25) \approx 0.38$ CFS

- BASED ON CONSERVATIVE ASSUMPTION THAT ALL INFILTRATION REACHES TRENCH $q_{TRENCH} \approx Q_{INFILTRATION}$

$q_{TRENCH} = K i A$ ⇒ K_{STONE} (NO. 57) = 1.90 FT/MIN = 3.16×10^{-2} FT/SEC

$i \approx 10\%$ (@ LEAST SLOPE) = 0.10 FT/FT

∴ DETERMINE q @ 4' DEEP @ 25' WIDTH

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PROJECT AVERY COUNTY C&D LANDFILL

SUBJECT UNDERDRAIN ANALYSIS

SHEET 2 OF 2
JOB NO. AVERY-08-4
DATE 2-16-09
COMPUTED BY SAD
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$$q_{TRENCH} = \frac{3.16\,(10^{-2})\ FT}{SEC} \left| \frac{0.10\ FT}{FT} \right| \frac{(4')(25')}{} = 0.32\ CFS$$

$$Q_i \approx q_{TRENCH} @ 5' = 0.40\ CFS$$

∴ USE 5' DEEP TRENCH @ 25' WIDTH.

NOTE: $K_{STONE} >> K_{UNIT}$, ∴ TRENCH WILL SUFFICIENTLY PULL BASE SEEPAGE QUICKLY AWAY WITH GOOD FACTOR OF SAFETY.

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SHEET: /
JOB #: Avery 07-1
DATE: 7/17/08
BY: KBS
CHKD BY:

Avery County C&D Landfill
Analysis of Design Storms

LOCATION: **Avery County, NC**

SOURCE: **NOAA , North Carolina**
http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html

DEPTH-DURATION-FREQUENCY TABLE

	RETURN PERIOD					
DURATION	2-YR (in)	5-YR (in)	10-YR (in)	25-YR (in)	50-YR (in)	100-YR (in)
5 min	0.42	0.53	0.61	0.70	0.77	0.84
10 min	0.67	0.85	0.97	1.11	1.22	1.33
15 min	0.85	1.08	1.23	1.41	1.55	1.68
30 min	1.17	1.53	1.78	2.09	2.33	2.57
60 min	1.47	1.97	2.31	2.78	3.16	3.54
2 hr	1.68	2.30	2.77	3.43	3.98	4.58
3 hr	1.81	2.47	2.97	3.70	4.32	5.00
6 hr	2.29	3.07	3.67	4.55	5.30	6.14
12 hr	2.95	3.92	4.63	5.63	6.44	7.32
24 hr	3.66	4.96	5.91	7.23	8.30	9.45

INTENSITY-DURATION-FREQUENCY TABLE

	RETURN PERIOD					
DURATION	2-YR (in/hr)	5-YR (in/hr)	10-YR (in/hr)	25-YR (in/hr)	50-YR (in/hr)	100-YR (in/hr)
5 min	5.04	6.36	7.32	8.40	9.24	10.08
10 min	4.02	5.10	5.82	6.66	7.32	7.98
15 min	3.40	4.32	4.92	5.64	6.20	6.72
30 min	2.34	3.06	3.56	4.18	4.66	5.14
60 min	1.47	1.97	2.31	2.78	3.16	3.54
2 hr	0.84	1.15	1.39	1.72	1.99	2.29
3 hr	0.60	0.82	0.99	1.23	1.44	1.67
6 hr	0.38	0.51	0.61	0.76	0.88	1.02
12 hr	0.25	0.33	0.39	0.47	0.54	0.61
24 hr	0.15	0.21	0.25	0.30	0.35	0.39

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DATE: 16-Feb-09

BY: SAS

Water Balance
Western North Carolina

Month	PET(1) (in/month)	Runoff(2) (in/month)	Precipitation (3) 1951-1980 (in/month)	Infiltration(4) (in/month)	Recharge Area (acres)
January	0.9	0.41	3.89	2.58	0.25
February	1.7	0.41	3.92	1.81	0.25
March	2.1	0.51	5.06	2.45	0.25
April	3.3	0.45	4.36	0.61	0.25
May	3.7	0.45	4.35	0.20	0.25
June	4.3	0.46	4.38	0.00	0.25
July	4.1	0.49	4.81	0.22	0.25
August	3.8	0.47	4.56	0.29	0.25
September	3	0.44	4.2	0.76	0.25
October	2	0.38	3.55	1.17	0.25
November	1.1	0.39	3.63	2.14	0.25
December	0.7	0.38	3.55	2.47	0.25
Yearly Totals	**30.7**	**5.24**	**50.26**	**14.70**	**0.25**

→ ~ 30%

Source:

1. NCSU Agricultural Extension Service, Publication AG-375, "Weather and Climate in North Carolina" - Asheville, NC.
2. Runoff is calculated according to the Victor Mocus Equation based on a composite SCS Curve Number of 79 (HSG = B) for conditions prior to landfill construction. This assumption is considered conservative as the landfill and liner system will result in very little infiltration and almost 100% runoff.
3. NCSU Agricultural Extension Service, Publication AG-375, "Weather and Climate in North Carolina"
   - Represents monthly averages from years 1951 to 1980 for Banner Elk, NC.
4. Infiltration determined as the difference between precipitation and losses due to runoff and potential evapotranspiration (PET)

defined on the basis of material density (see **Section 1.6**). The field hydraulic conductivity values relative to each **hydrogeologic unit** vary as follows:

Hydro. Unit	Unit Description	Conductivity (cm/sec) Max.	Min.	Avg.	Conductivity (ft/day) Max.	Min.	Avg.
1A	Saprolite <100 bpf	7.67E-4 PZ-13i	3.42E-4 PZ-12	4.92E-4	2.17 PZ-13i	0.968 PZ-12	1.40
1B	Saprolite >100 bpf	1.60E-3 PZ-9	8.19E-6 MW-3d	7.24E-4	4.53 PZ-9	0.002 MW-3d	2.05
2	Bedrock	2.66E-3 MW-1d	5.64E-4 B-6	1.61E-3	7.53 MW-1d	1.60 B-6	4.65

These data show a slight increasing trend with depth, most likely due to higher clay content in the upper soils, more sand-like conditions and fracturing at depth, indicated by the low RQD values. Due to the layering, distinct horizons of consistent conductivity values are not apparent – note the variability within Unit 1B. The boundaries between units are transitional, that is, the units are interconnected and could be considered as one contiguous porous aquifer. It should be noted that slug tests measure hydraulic properties within a relatively narrow zone of influence around the piezometer, and there is the possibility of sample bias.

1.4.5 Dispersivity Characteristics – Predicting the movement of contaminants in ground water is of interest in developing an effective monitoring program. Contaminant transport modeling, which is dependent on the properties of the both the aquifer and the contaminant of interest, is typically described in the literature by the advection-dispersion equation, where **advection** is chemical movement via groundwater flow due to the groundwater hydraulic (i.e. head) gradient, and **dispersion** is defined as, "The spreading and mixing of chemical constituents in groundwater caused by diffusion and mixing (due to microscopic variations in velocities within and between pores)." [10]

As water moves through a porous medium, soil grains present obstacles that result in friction between the fluid and solids, resulting in localized variations in ground water velocity. Solutes and non-soluble fluids that might be released from a waste unit, i.e., contaminants of concern, may be introduced as steady state flow over a long period or as a relatively short-term pulse. Without dispersion, all of the contaminant would travel in a straight line at the ambient groundwater velocity. With dispersion, some chemical fluids travels faster and some slower than the mean velocity – this is due in part to inherent aquifer properties and in part to chemical properties of the solute.

[10] http://www.fosterwelldrilling.com/glossary.htm

Table 3
Hydrogeologic Properties of Lithologic Units

Piezometer Number	Hydrological Unit	Hydrogeological Description (1)	Average RQD for Screen Interval	Effective Porosity (2,3)	Total Porosity (2,3)	Hydraulic Conductivity (k)		
						ft/min	ft/day	cm/sec
MW-1d	2	Fractured mica gneiss	62.5%	10%	20%	5.23E-03	7.53E+00	2.66E-03
MW-2d	2	Fractured mica gneiss	17.0%	10%	20%	1.11E-03	1.60E+00	5.64E-04
MW-3d	1B	Silty Sand (micaceous)	NA	19%	40%	1.61E-05	2.32E-02	8.19E-06
MW-4d	1B	Sandy Silt (micaceous)	NA	15%	35%	4.53E-04	6.53E-01	2.30E-04
PZ-9	1B	Silty Sand (micaceous)	NA	19%	40%	3.14E-03	4.53E+00	1.60E-03
PZ-10	1B	Sandy Silt (micaceous)	NA	16%	35%	2.93E-03	4.22E+00	1.49E-03
PZ-11d	1B	Sandy Silt (micaceous)	NA	18%	40%	3.09E-05	4.45E-02	1.57E-05
MW-13d	1B	Sandy Silt (micaceous)	NA	15%	35%	1.97E-03	2.84E+00	1.00E-03
PZ-11s	1A/1B	Sandy Silt (micaceous)	NA	20%	45%	8.43E-04	1.21E+00	4.28E-04
PZ-12	1A/1B	Sandy Silt (micaceous)	NA	18%	40%	6.72E-04	9.68E-01	3.42E-04
MW-4s	1A	Sandy Silt (micaceous)	NA	22%	45%	8.72E-04	1.26E+00	4.43E-04
PZ-13i	1A	Sandy Silt (micaceous)	NA	20%	40%	1.51E-03	2.17E+00	7.67E-04
PZ-13s	1A	Silt (micaceous)	NA	20%	40%	9.47E-04	1.36E+00	4.81E-04

Notes Slug test data acquisition and data reduction performed by David Garrett & Associates

Top of Unit 1 is water table

(1) Unit 1A - silty/sandy near-surface soil, low to moderate plasticity (SPT <50 bpf).
Unit 1B - Dense saprolite-silty sand (generally with SPT values in excess of 100 bpf)
Unit 2 - Consolidated, fractured rock (variably weathered)

(2) Total and Effective porosity values for soils assigned based on laboratory testing (see Table 2)
(soils in contact with well screen interval taken into consideration)

(3) Total and Effective porosity values for bedrock assigned based on published literature, adjusted for avg. rock core RQD values, ref. Sinhal and Gupta, 1999 (furnished courtesy of NC DENR SWS)
(NOTE: Total Porosity for Clayey SAND sample at G-2A, 13.3' - 13.8' used to represent silty and clayey sand, but values were adjusted up to exceed the slightly higher calculated effective porosity values)

PROJECT Avery County C&D Landfill - Phase III

SUBJECT Filter Geotextile Analysis

JOB NO. Avery-09-1
DATE 8-4-09
COMPUTED BY SAS
CHECKED BY

Objective To determine the maximum geotextile apparent opening size (AOS) to provide proper retention to protect drainage media from piping and clogging from adjacent soil. Additionally, to determine the minimum required geotextile permittivity to provide proper drainage from the adjacent soil. Geotextile filtration properties must be selected based on the up-gradient soil gradation and plasticity and site specific hydraulic conditions.

References

Bhatia, S.K. and Huang, Q. (1995), "Geotextile Filters for Internally Stable/Unstable Soils", *Geosynthetics International*, Vol. 2, No. 3, pp. 537-565.

Koerner, Robert M. (1999), Designing with Geosynthetics, 4th Ed., Prentice-Hall Inc., Englewood Cliffs, NJ, pp. 84-91.

Mirafi - Geotextile Filter Design, Application, and Product Selection Guide, Ten Cate Nicolon Corp. (www.mirafi.com).

Richardson, G.N., Giroud, J-P., and Zhao, A. (2000), Design of Lateral Drainage Systems for Landfills, Tenax Corp., Baltimore.

Assumption The design criteria given assume that the soil is "set" in intimate contact with the geotextile.

Background From Richardson et. al.:

For the purposes of filtration design, soils can be characterized as stable or unstable. Stable soils perform an internal filtration process that limits migration of fines within the soil. Typically, these soil types include well-graded soils. Unstable soils are those which cannot perform self-filtration (i.e. they have the potential to pipe internally). They may include gap-graded, broad-graded, and other highly erodible soils. In gap-graded soils, there exists a coarse and fine fraction, but very little medium fraction. If there is an insufficient quantity of soil particles in the medium fraction, fine soil particles pipe through the coarse fraction. In broad-graded soils, the gradation is distributed over a very wide range of particle sizes such that fine soil tends to pipe through coarser particles.

Analysis

1. **Define Application and Function of Geotextile:**

Define the application and function of the geotextile (i.e. where the geotextile is to be used and whether retention or permeability is the key function of the material) and also the confining stress (i.e. high - leachate collection system; low - final cover system) and flow conditions (i.e. steady-state - landfill drains; dynamic - shoreline protection).

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2. Evaluate Soils Information:

For representative soils, evaluate grain size and plasticity information. From the grain size curves determine the coefficients of uniformity and curvature as follows:

$$C_u = \frac{d_{60}}{d_{10}}$$

$$C_c = \frac{d_{30}^{\ 2}}{\left(d_{10} \times d_{60}\right)}$$

where:
C_u = coefficient of uniformity (quantifies the distribution of particle sizes)
C_c = coefficient of curvature (identifies internal soil stability)
d_x = the diameter at which x percent of the soil is finer

For $C_u \leq 4$, the soil is uniformly-graded; for $4 < C_u \leq 20$, the soil is well-graded; and for $C_u > 20$, the soil is broad-graded. Uniformly-graded and broad-graded soils require careful analysis. Gap-graded soils which have a coarse and fine fraction, but limited medium fraction are of particular concern and should be avoided. Gap-graded soils are readily identified by the appearance of the grain size curve. For $1 \leq C_c \leq 3$, the soil should be internally stable (Bhatia and Huang state that soils having $C_c \leq 7$ are internally stable.).

Additionally, in general, particles do not move within soils having a plasticity index (PI) greater than 15% so there is no clogging potential (Richardson et. al.).

3. Selection of Soil Retention Requirements (Maximum AOS):

To determine the maximum AOS, use the method given in Koerner/Mirafi (after Luettich) and the method given in Bhatia and Huang. For the AOS determined by either method, the following shows the relationship between opening size and the corresponding U.S. sieve number (with typical non-woven geotextile information as shown).

Opening Size (mm)	U.S. Sieve
0.150	100 (most 8 to 16 oz/sy non-wovens)
0.180	80
0.212	70 (most 4 to 6 oz/sy non-wovens)
0.250	60
0.300	50
0.425	40
0.600	30

- **Luettich Method:**

For steady-state conditions, use the chart below.

- **Bhatia and Huang Method:**

Bhatia and Huang developed the following retention criteria:

For $n \geq 60\%$: $O_{95} < d_{85}(2.71 - 0.36C_c)$ $\quad C_c \leq 7$

$O_{95} < d_{85}(0.65 - 0.05C_c)$ $\quad C_c > 7$

For $n < 60\%$: $O_{95} < d_{85}$

where:
O_{95} = apparent opening size
n = geotextile porosity (%) (for non-woven geotextiles this value is typically 70 to 90%)

4. **Determine Geotextile Permittivity Requirements:**

Determine the geotextile permittivity requirements:

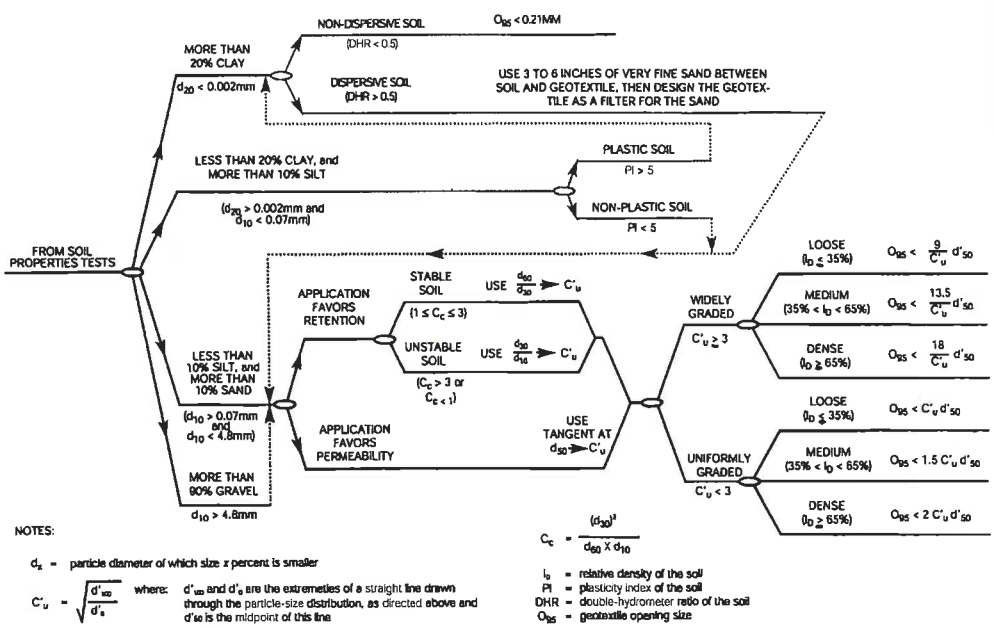
$$\Psi = \frac{k_g}{t_g} \qquad (\text{sec}^{-1})$$

where:
Ψ = minimum required geotextile permittivity (sec^{-1})
k_g = minimum allowable geotextile permeability (cm/sec)
$k_g \geq i_S k_S$
t_g = geotextile thickness under design load (cm)
i_S = hydraulic gradient (use 1.5 for landfills)
k_S = permeability of retained soil (cm/sec).

5. **Other Considerations:**

Other things to consider in the design of a filter geotextile include anti-clogging requirements and survivability/durability requirements. For anti-clogging, it is generally best to use the largest AOS that satisfies the retention criteria. For non-woven geotextiles used in landfill applications, an AOS of 0.21 mm (No. 70 sieve) is typically the largest AOS that is available. For survivability/durability concerns, generally an adequately UV stabilized geotextile made from polypropylene or polyester with an AASHTO M288 Strength Class of 2 is suitable for use in subsurface drainage applications.

Chart 1. Soil Retention Criteria of Steady-State Flow Conditions



Ref: Mirafi (After Luettich)

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SHEET: 5 of 5
JOB #: Avery-09-1
DATE: 8/4/09
BY: SAS
CHKD BY:

Avery County C&D Landfill - Phase III
Filter Geotextile Analysis (Underdrain System)

Application: Underdrain System
Primary Function: Retention
Relative Confining Stress: Medium
Flow Conditions: Steady-State

	Soil Evaluated			
	PZ-12 (3.5 to 5.5 feet)	MW-4D (3.5 to 5.5 feet)	B-1 (14 feet)	B-7 (4 feet)
Soil Description:	Silty Sand	Poorly Graded Gravel with Silt and Sand	Silty Sand	Sandy Silt
Soil Type:	SM	GP-GM	SM	ML
Particle Size (mm) d_{85}:	0.850	15.000	1.000	0.550
d_{60}:	0.190	7.000	0.180	0.055
d_{50}:	0.120	5.000	0.110	0.019
d_{30}:	0.018	0.600	0.035	0.002
d_{20}:	0.007	0.250	0.014	0.001
d_{10}:	0.002	0.090	0.000	0.001
PI:	12	NP	NP	NP
C_u:	126.67	77.78	450.00	55.00
	Use Caution - Soil is Broad Graded!	Use Caution - Soil is Broad Graded!	Use Caution - Soil is Broad Graded!	Use Caution - Soil is Broad Graded!
C_c	1.14	0.57	17.01	0.04
Luettich Method:*	—	—	—	—
Soil Dispersion (When Applicable):	Is Soil Dispersive? (Y/N)	NA	Is Soil Dispersive? (Y/N)	Is Soil Dispersive? (Y/N)
	N	N	N	N
Recommended Maximum AOS (mm) (When Applicable):	**0.210**	**0.210**	**0.210**	**0.210**
	No. 70 Sieve	**No. 70 Sieve**	**No. 70 Sieve**	**No. 70 Sieve**
Internal Soil Stability (When Applicable):	NA	NA	NA	NA
Particle Size (mm) for Determining C'_u d'_{100}:				
d'_{50}:				
d'_0:				
C'_u (When Applicable):				
Soil Relative Density (I_D) (Loose (L), Medium (M), Dense (D) (When Applicable):				
Recommended Maximum AOS (mm) (When Applicable):				
Bhatia & Huang Method:	—	—	—	—
Internal Soil Stability:	Soil is Stable.	Soil is Stable.	Soil is Unstable.	Soil is Stable.
Geotextile Porosity (%):	80	80	80	80
Recommended Max. AOS (mm):	**1.956**	**37.564**	**-0.201**	**1.482**
	No. 30 Sieve	**No. 30 Sieve**	**Check Available Geotextiles.**	**No. 30 Sieve**
Required Geotextile Properties:	—	—	—	—
Hydraulic Gradient (i_a):	1.5	1.5	1.5	1.5
Estimated Soil Permeability (k_e) (cm/sec):	7.0E-04	7.2E-04	7.2E-04	7.2E-04
Min. Allowable Geotextile Permeability (k_g) (cm/sec):	1.1E-03	1.1E-03	1.1E-03	1.1E-03
Geotextile Thickness (t_g) (cm):	0.25	0.25	0.25	0.25
Min. Required Geotextile Permittivity (Ψ) (sec^{-1}):	**0.0042144**	**0.004344**	**0.004344**	**0.004344**

STANDARD TYPE GT-S GEOTEXTILE OK.

***Note: Spreadsheet assumes retention application in using the Luettich Method.**

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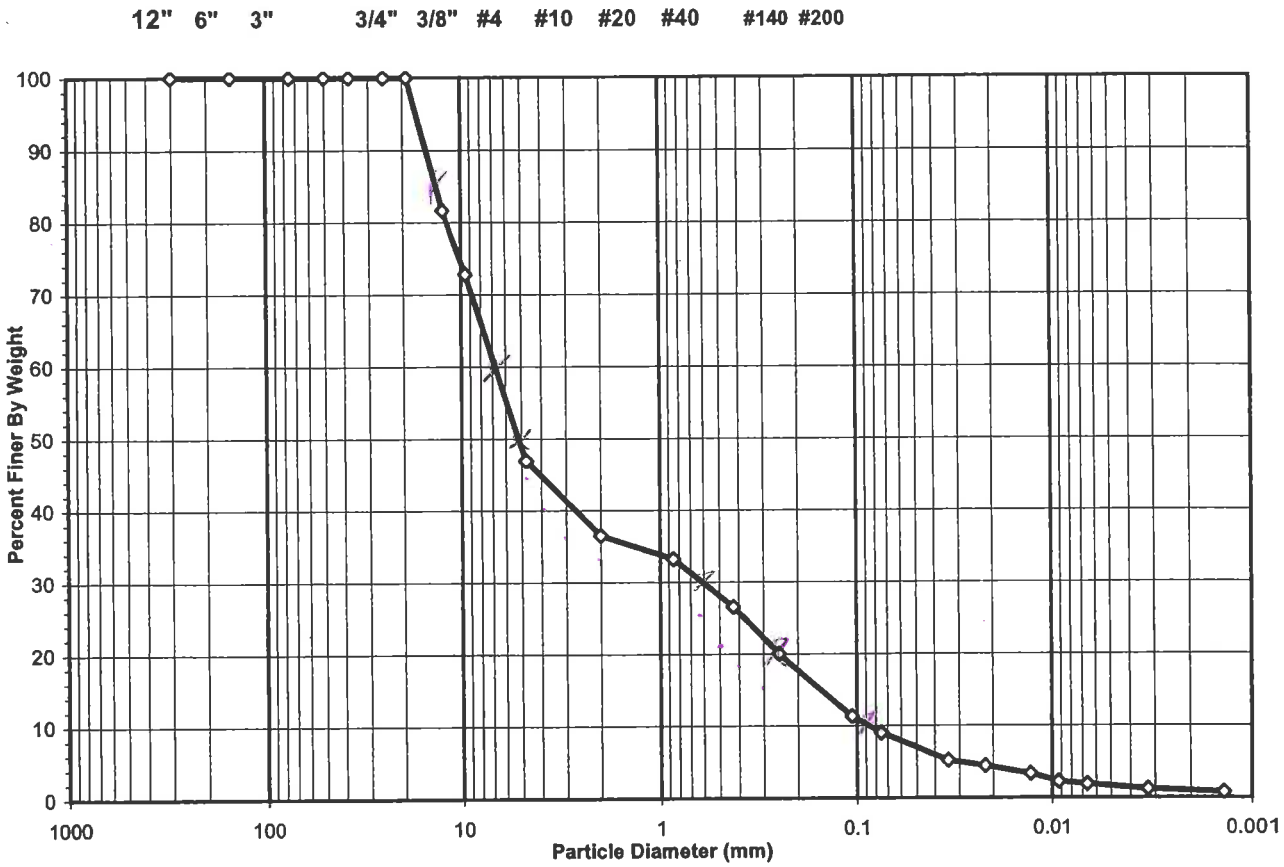
SIEVE AND HYDROMETER ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	DAVID GARRETT	Boring No.	~~B-1~~ MW-40
Client Reference	AVERY COUNTY LF	Depth (ft)	3.5-5
Project No.	2008-518-01	Sample No.	NA
Lab ID	2008-518-01-02	Soil Color	**DARK BROWN**

	SIEVE ANALYSIS					HYDROMETER
USCS	cobbles	gravel	sand			silt and clay fraction
USDA	cobbles	gravel	sand		silt	clay



Sieve Sizes (mm)	USCS Summary	Percentage
Greater Than #4	*Gravel*	53.10
#4 To #200	*Sand*	37.90
Finer Than #200	*Silt & Clay*	9.01

		D60 =	6.744			
USCS Symbol	***GP-GM, TESTED (NON PLASTIC FINES)***	D30 =	0.610	CC =	0.63
USCS Classification	***POORLY GRADED GRAVEL WITH SILT AND SAND***	D10 =	0.087	CU =	77.53

DCN: CT-S3P DATE:02/15/05 REVISION: 1 *\c\2008 PROJECTS\2008-518 D GARRETT\[2008-518-01-02 #10 Split Hydro rev 8.xls]Sheet1*

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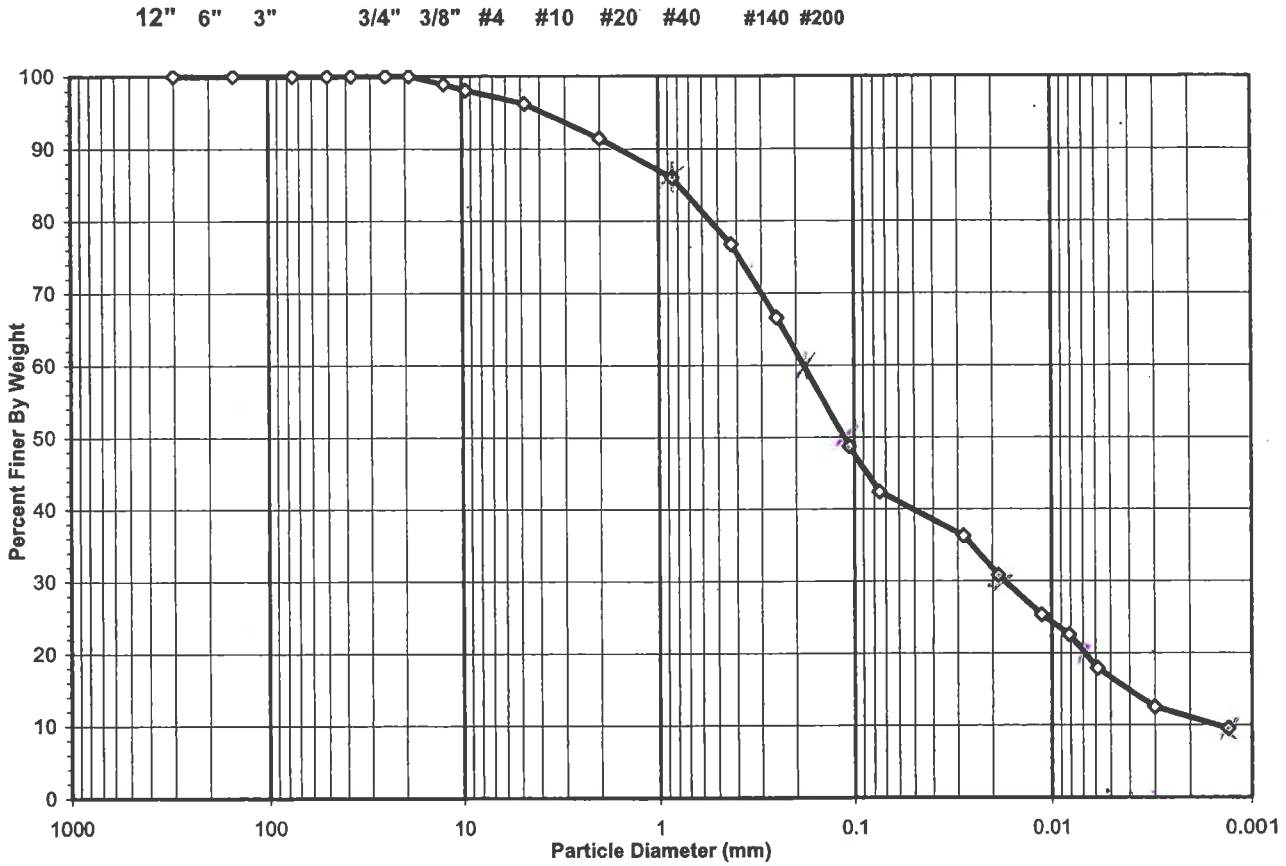
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	DAVID GARRETT	Boring No.	~~B-12~~ PZ-12
Client Reference	AVERY COUNTY LF	Depth (ft)	3.5-5
Project No.	2008-518-01	Sample No.	NA
Lab ID	2008-518-01-12	Soil Color	**LIGHT BROWN**

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	3.76
#4 To #200	*Sand*	53.88
Finer Than #200	*Silt & Clay*	42.36

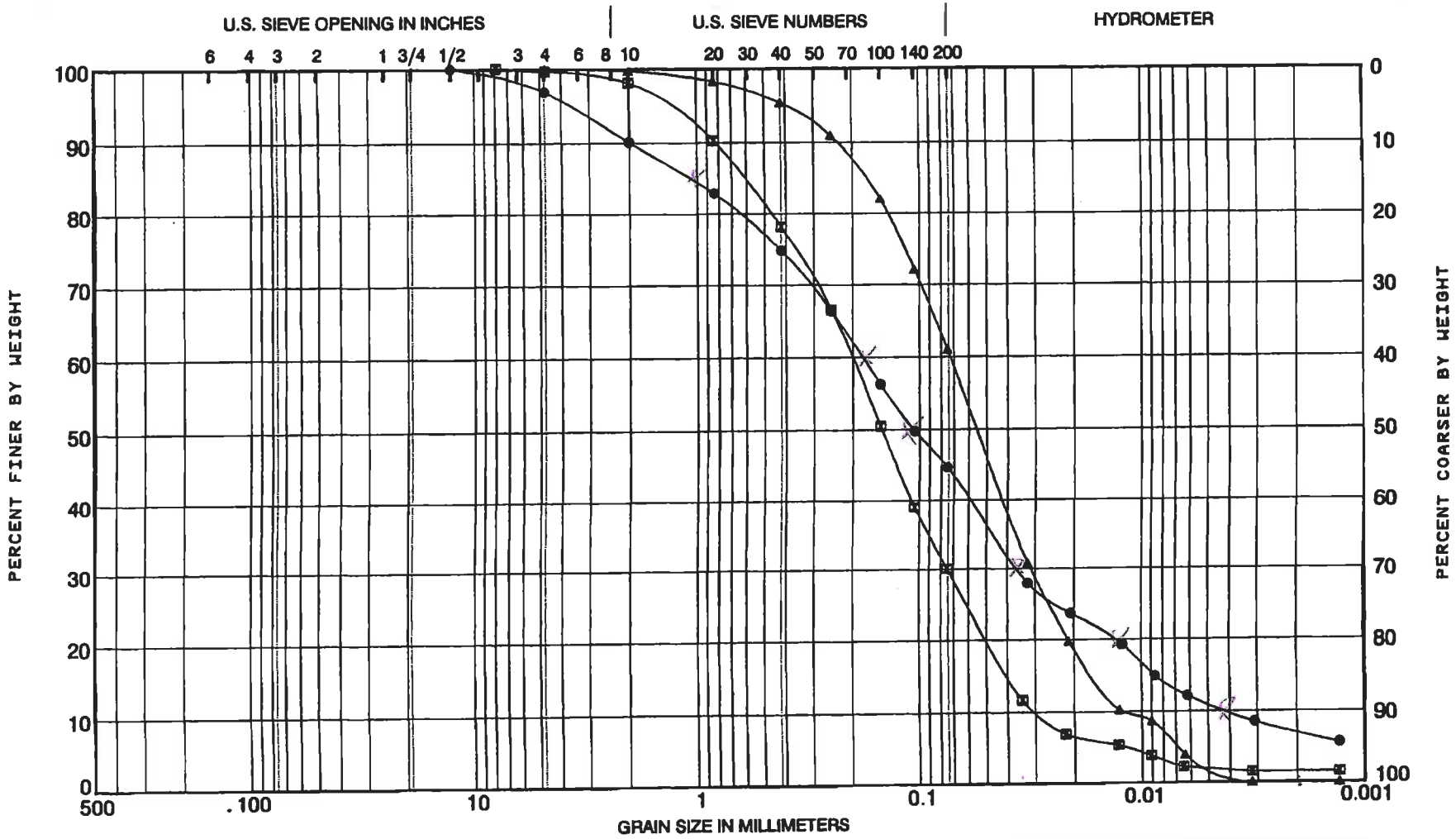
USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***

DCN: CT-S3P DATE:02/15/05 REVISION:8 \\Lab1\c\2008 PROJECTS\2008-518 D GARRETT\[2008-518-01-12 LIMIT.xls]Sheet1

2200 Westinghouse Boulevard • Suite 105 • Raleigh, NC 27604 • Phone (919) 876-0405 • Fax (919) 876-0460

Modified July 19, 1996



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample		D60	D30	D10	% SAND	% SILT	% CLAY
●	1	14.0 ft	0.181	0.036	0.004	52.2	37.6	7.1
⊠	1	19.0 ft	0.203	0.075	0.029	69.6	28.5	1.6
▲	3	24.0 ft	0.073	0.031	0.012	39.0	61.0	0.0

PROJECT NO: 95144.02

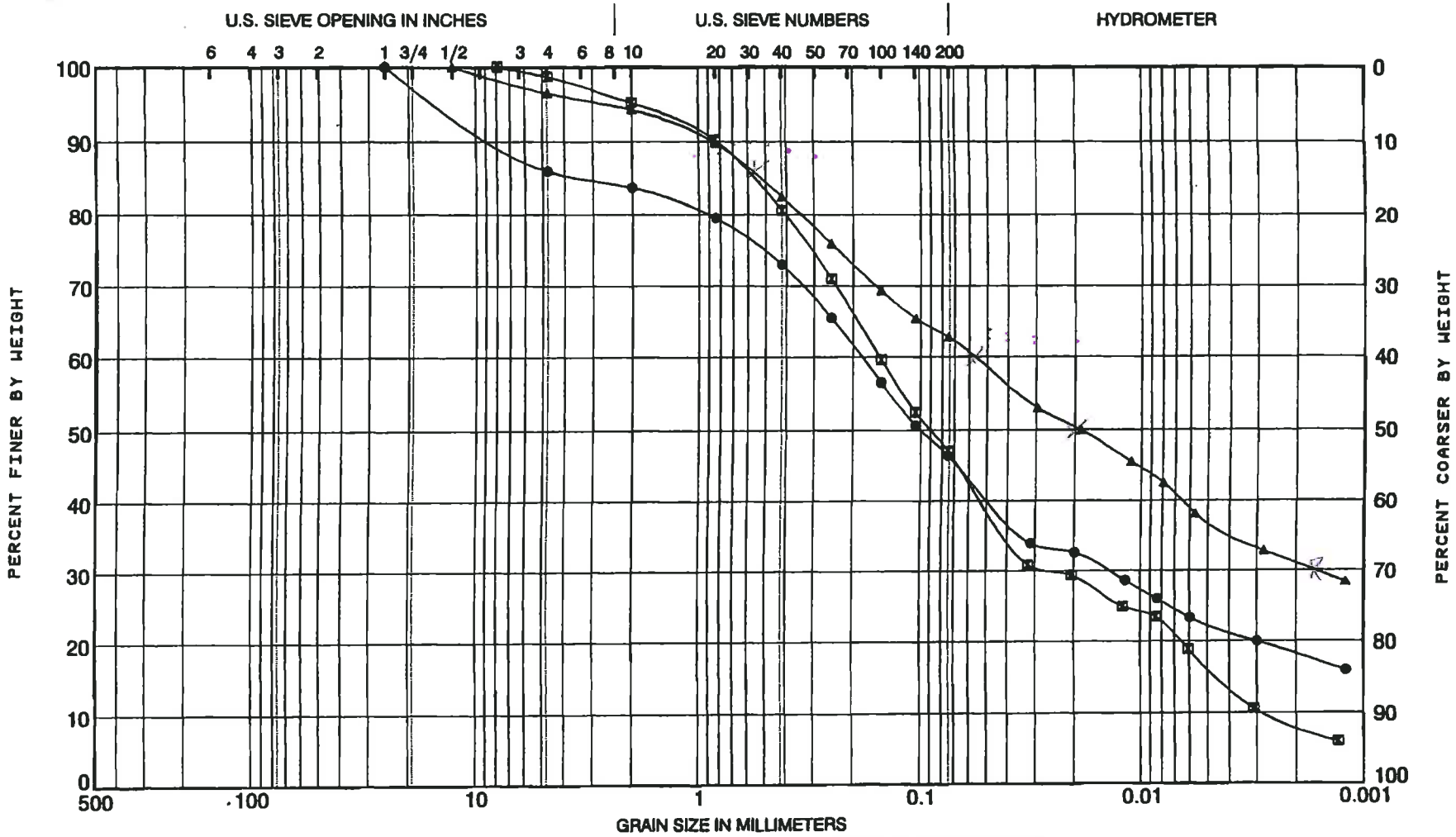
PROJECT: Avery County C&D Landfill

LOCATION: Ingalls, North Carolina

GRADATION CURVES

GAI CONSULTANTS

Modified July 19, 1996



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample		D60	D30	D10	% SAND	% SILT	% CLAY
●	5	1.0 ft	0.183	0.014	<0.001	39.6	28.2	18.2
⊠	5	4.0 ft	0.153	0.025	0.003	51.7	38.7	8.3
▲	7	4.0 ft	0.057	0.002	<0.001	33.7	31.7	31.1

PROJECT NO: 95144.02

PROJECT: Avery County C&D Landfill

LOCATION: Ingalls, North Carolina

GRADATION CURVES

GAI CONSULTANTS

Richardson Smith Gardner & Associates, Inc.
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET: 1 of 1
JOB #: AVERY-09-1
DATE: 8/3/09
BY: SAS
CHKD BY:

Avery County Landfill - Phase III
Drainage Channel Analysis (Phase III Valley Operations)

Channel No. Diversion Berm

Design Parameters:

PEAK DISCHARGE, Q2' = 1.8 ft^3/s Source: 2-Yr 5-min

Bottom Width, B = 0.0 ft
Left Side Slope, z_1 = 2.0 horizontal :1 vertical
Right Side Slope, z_2 = 4.0 horizontal :1 vertical
Minimum Freeboard = 0.5 ft

Maximum Channel Slope, S_{max} = 0.020 ft/ft
Minimum Channel Slope, S_{min} = 0.010 ft/ft

Erosion Control Blanket (ECB) Lining:
Grass Retardance = E
K = 34.6
ECB Product Name = Excelsior Matting
τ_{allow} = 1.55 lb/ft^2

Rip Rap Lining:
D_{50} = NA ft *(NA = Not Applicable)*
τ_{allow} = #VALUE! lb/ft^2

Normal Depth

Depth of Flow (Norm. Depth) Y_n ft	Manning's Roughness Coefficient n	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius $R=A/P$ ft	Top Width T ft	Hydraulic Depth $D=A/T$ ft	Average Velocity V_n ft/s	Flow Rate Q ft^3/s	Froude Number F_r (Normal) #	Maximum Shear Stress τ_d lb/ft^2	Allowable Shear Stress τ_{allow} lb/ft^2	Factor of Safety τ_{allow}/τ_d	Comment
Maximum Slope:													
0.75	0.099	1.69	4.77	0.35	4.50	0.38	1.06	1.8	0.31	**0.9**	1.6	1.7	**O.K.**
Minimum Slope:													
0.89	0.108	2.38	5.66	0.42	5.34	0.45	0.77	1.8	0.20	**0.6**	1.6	2.8	**O.K.**

Critical Depth

Depth of Flow (Crit. Depth) Y_c ft	Manning's Roughness Coefficient n	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius $R=A/P$ ft	Top Width T ft	Hydraulic Depth $D=A/T$ ft	Section Factor $Z=AD^{1/2}$ $ft^{2.5}$	Flow Rate Q ft^3/s	Average Velocity V_c ft/s	Froude Number F_r (Critical) #	Uniform-Flow Critical Slope S_c ft/ft
0.47	0.298	0.66	2.99	0.22	2.82	0.24	0.32	1.8	2.75	1.00	2.250

Determination of Minimum Channel Depth & Top Width

Maximum Slope		Minimum Slope	
Minimum Channel Depth ft	Minimum Top Width T ft	Minimum Channel Depth ft	Minimum Top Width T ft
1.25	7.50	**1.39**	**8.34**

Richardson Smith Gardner & Associates, Inc.
Engineering and Geological Services
14 N. Boylan Avenue Tel: 919-828-0577
Raleigh, NC 27603 Fax: 919-828-3899

SHEET: 1 of 1
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Minimum Channel Slope, S_{min} = 0.010 ft/ft

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K = 34.6
ECB Product Name = Excelsior Matting
τ_{allow} = 1.55 lb/ft^2

Rip Rap Lining:
D_{50} = NA ft ***(NA = Not Applicable)***
τ_{allow} = #VALUE! lb/ft^2

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Depth of Flow (Norm. Depth) Y_n ft	Manning's Roughness Coefficient n	Area of Flow A ft^2	Wetted Perimeter P ft	Hydraulic Radius $R=A/P$ ft	Top Width T ft	Hydraulic Depth $D=A/T$ ft	Average Velocity V_n ft/s	Flow Rate Q ft^3/s	Froude Number F_r (Normal) #	Maximum Shear Stress τ_d lb/ft^2	Allowable Shear Stress τ_{allow} lb/ft^2	Factor of Safety τ_{allow}/τ_d	Comment
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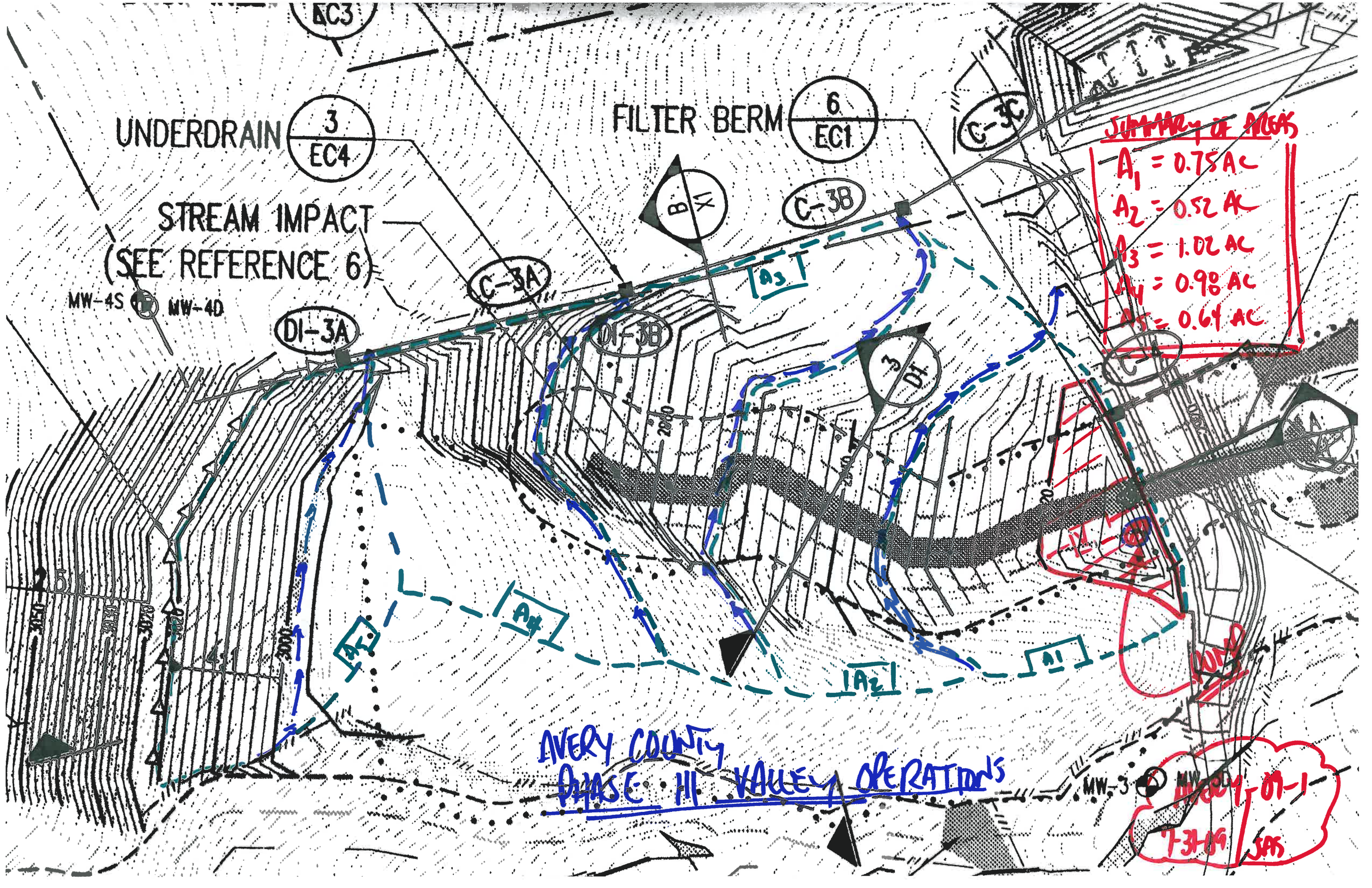
Determination of Minimum Channel Depth & Top Width

Maximum Slope		Minimum Slope	
Minimum Channel Depth ft	Minimum Top Width T ft	Minimum Channel Depth ft	Minimum Top Width T ft
1.25	7.50	**1.39**	**8.34**


EC3
UNDERDRAIN
3
EC4
FILTER BERM
6
EC1
C-3C
STREAM IMPACT
(SEE REFERENCE 6)
MW-4S
MW-4D
B
X1
C-3B
C-3A
DI-3A
DI-3B
3
DI
A3
A4
A2
A1
A5
SUMMARY OF AREAS
A1 = 0.75 AC
A2 = 0.52 AC
A3 = 1.02 AC
A4 = 0.98 AC
A5 = 0.64 AC
POND
MW-3
AVERY COUNTY
PHASE III VALLEY OPERATIONS
7-31-19
09-1
SAS

ATTACHMENT B

Operations Manual

Avery County C&D Landfill
Ingalls, North Carolina
NC Solid Waste Permit No. 06-03

Prepared for:

Avery County
Newland, North Carolina

PERMIT ISSUE DOCUMENTS

February 2009
Revised July 2009

RICHARDSON SMITH GARDNER
& ASSOCIATES
ENGINEERING & GEOLOGICAL
SERVICES

PRINTED ON 100% RECYCLED PAPER

AVERY COUNTY C&D LANDFILL

OPERATIONS MANUAL

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SECTION 1.0
GENERAL FACILITY OPERATIONS

1.1 OVERVIEW

This Operations Manual was prepared for operations of the Avery County C&D Landfill facility permit No. 06-03 located in Ingalls, North Carolina as shown in **Figure 1**. This document discusses the operation of the following solid waste management activities:

- C&D landfill; and
- Mobile home deconstruction area.

Refer to **Figure 2** (Facility Plan) of the Permit Drawings for the location of existing landfill units and other solid waste management activities.

1.2 CONTACT INFORMATION

All correspondence and questions concerning the operation of the Avery County C&D Landfill should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

1.2.1 Avery County

Avery County Landfill (Site and Scale house)
2175 Brushy Creek Road
Newland, NC 28657

Avery County Solid Waste Department (Office)
175 Linville Street
Ingalls, NC 28657
Phone: 828-737-5420
Contact: Henry "Buddy" Norris

1.2.2 North Carolina Department of Environment and Natural Resources

North Carolina DENR - Raleigh Central Office (RCO)
401 Oberlin Road, Suite 150
Raleigh, NC 27605
Phone: (919) 508-8400
Fax: (919) 715-3605

North Carolina DENR - Asheville Regional Office (ARO)
2090 U.S. Highway 70
Swannanoa, NC 28778
Phone: (828) 296-4500
Fax: (828) 299-7043

Division of Waste Management (DWM) - Solid Waste Section:

Field Operations Branch Head:	Mark Poindexter (RCO)
Western Regional Supervisor:	Deb Aja
Waste Management Specialist:	Bill Wagner (ARO)

Division of Land Resources - Land Quality Section:

Regional Engineer:	Starr Silvis, PE

1.3 ACCESS CONTROL

Limiting access to the landfill facility is important for the following reasons:

- Unauthorized and illegal dumping of waste materials is prevented.
- Trespassing, and injury resulting therefrom, is discouraged.
- The risk of vandalism is greatly reduced.

Access to active areas of the landfill will be controlled by a combination of fences and natural barriers, and strictly enforced operating hours. A landfill attendant will be on duty at all times when the facility is open for public use to enforce access restrictions.

1.3.1 Physical Restraints

The site will be primarily accessed by the existing entrance on Brushy Creek Road. Scales and a scale house and office are provided at this entrance. All waste will have been weighed prior to being placed in the landfill. Each entrance will have a gate which will be securely locked during non-operating hours.

1.3.2 Security

Frequent inspections of gates and fences will be performed by landfill personnel. The County will arrange for a random security patrol of the main gate to further discourage trespassing. Evidence of trespassing, vandalism, or illegal operation will be reported to the County Solid Waste Director.

1.4 SIGNAGE

A prominent sign(s) containing the information required by the DWM will be placed at the main landfill entrance. This sign(s) will provide information on operating hours, operating procedures, acceptable wastes, and will include the permit number. Additional signage will be provided as necessary within the landfill complex to distinctly distinguish the roadway to the active landfill unit. Service and maintenance roads for use by operations personnel will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be provided as required.

1.5 COMMUNICATIONS

Two way radio communication will be maintained between the active landfill unit and the landfill scale house and office. The scale house and office have telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house and office.

1.6 FACILITY OPERATING HOURS

Normal hours of operation will be 8:00 A.M. to 4:30 P.M. Monday to Friday and 7:00 A.M. to 12:00 noon on Saturday. Facility will be closed on Sunday.

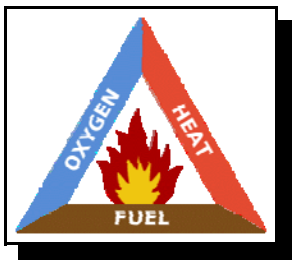
In the event of disaster or other emergency situations the supervisor will request approval from the commission's regional office to allow additional temporary operating hours.

1.7 FIRE AND SAFETY

The possibility of fire at the C&D landfill must be anticipated in the daily operation of the facility. Potential fire hazards include both surface conditions and subsurface conditions. Surface conditions include equipment operations. Subsurface conditions include underground fires caused by decomposition of the C&D materials previously landfilled.

1.7.1 Fire Triangle

The "triangle" illustrates the rule that in order to ignite and burn, a fire requires three (3) elements: heat, fuel, and oxygen. A fire is prevented or extinguished by "removing" any one of them. A fire naturally occurs when the elements are combined in the right mixture (e.g., more heat needed for igniting some fuels, unless there is concentrated oxygen). These principles are integral in the prevention and management of potential fire situations.



1.7.2 Equipment Safety

A combination of factory installed fire suppression systems and/or portable fire extinguishers will be operational on all pieces of heavy equipment at all times. Potential fire hazards at the C&D landfill are created from the build-up of fine, dry dust particles on and around operational motors and control panels. The presence of these build-ups can cause overheating and potential fire if periodic equipment cleaning and maintenance are not practiced. Portable fire extinguishers should be maintained in a state of readiness at the screen location and on each piece of moving equipment and equipment should be cleaned periodically.

1.7.3 Fire Management Strategies

Each fire situation is site specific, however, general strategies for active fire management include the following (in no particular order):

- Accelerated high temperature combustion (displacing fuel);
- Covering of the landfill burn area with soil (reduce oxygen);
- Covering of the burn area with foams (reduce oxygen);
- Flooding the burn area with water (reduce heat);
- Injecting an inert gas such as CO_2 (reduce oxygen); and
- Excavating the burning material (displacing fuel) and then extinguishing it in small controlled areas.

1.7.4 Coordination

A copy of the site Operations Manual will be filed with the local fire department including all contact information for the facility.

1.8 LITTER CONTROL

The vegetative trees/bushes act as a barrier to keep litter contained within the site. Landfill Operators pick up litter within the site daily and respond to weather and heavy wind conditions that may spread litter.

The litter control crew picks up litter outside the site and on access roads each weekday. Any load that is not secured in a manner that would prevent material from leaving the vehicle while it is in motion is subject to an additional fee. Also, trailers are covered by heavy tarp lids to minimize litter and potential for birds to enter the trailer and spread litter.

1.9 SEVERE WEATHER CONDITIONS

Unusual weather conditions can directly affect the operation of the landfill facility. Some of these weather conditions and recommended operational responses are as follows.

1.9.1 Ice Storms

An ice storm can make access to the landfill dangerous, prevent movement or placement of cover soil, and, thus, may require closure of the landfill until the ice is removed or has melted.

1.9.2 Heavy Rains

Exposed soil surfaces can create a muddy situation in some portions of the landfill during rainy periods. The control of drainage and use of crushed stone on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. In areas where the aggregate surface is washed away or otherwise damaged, new aggregate

should be used for repair.

Intense rains can affect newly constructed drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, inspection by landfill personnel will be initiated and corrective measures taken to repair any damage found before the next rainfall.

1.9.3 Electrical Storms

The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfilling activities will be temporarily suspended during such an event. To guarantee the safety of all field personnel, refuge will be taken in the on-site buildings or in rubber-tired vehicles.

1.9.4 Windy Conditions

Landfill operations during a particularly windy period may require that the working face be temporarily shifted to a more sheltered area. When this is done, the previously exposed face will be immediately covered with daily cover.

1.9.5 Violent Storms

In the event of hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations may be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured.

1.10 EQUIPMENT REQUIREMENTS

The County will maintain on-site equipment required to perform the necessary landfill activities (see **Section 2.4.4**). Periodic maintenance of all landfilling equipment, and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

1.11 PERSONNEL REQUIREMENTS

At least one member of the landfill supervisory staff will be certified as a Manager of Landfill Operations (MOLO) by the Solid Waste Association of North America (SWANA). Each landfill employee will go through an annual training course (led by supervisory staff) and is certified by SWANA as Landfill Operations personnel. As part of this training, personnel learn to recognize loads which may contain prohibited wastes. The personnel requirements for operation and maintenance of the site are listed in **Section 2.4.3**.

1.12 HEALTH AND SAFETY

All aspects of the transfer and C&D landfill operations were developed with the health and safety of the operating staff, customers, and neighbors in mind. Prior to commencement of operations of the facility, a member of the operating staff will be designated site safety officer. This individual, together with the facility's management will modify the site safety and

emergency
response program to remain consistent with National Solid Waste Management Association and Occupational Safety and Health Administration (OSHA) guidance.

Safety equipment provided includes equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Facility personnel will be encouraged to complete the American Red Cross Basic First Aid Course. Other safety requirements as designated by the Owner will also be implemented.

Each facility employee will go through annual training course in health and safety (led by supervisory staff). All training shall be documented and attested to by signatures of the trainer and trainee. The following are some general recommendations for the health and safety of workers at the Avery County facility.

1.12.1 Personal Hygiene

The following items are recommended as a minimum of practice:

- Wash hands before eating, drinking, or smoking.
- Wear personal protective equipment as described in **Section 1.12.2.**
- Wash, disinfect, and bandage ANY cut, no matter how small it is. Any break in the skin can become a source of infection.
- Keep fingernails closely trimmed and clean (dirty nails can harbor pathogens).

1.12.2 Personal Protective Equipment

Personal Protective Equipment (PPE) must be evaluated as to the level of protection necessary for particular operating conditions and then made available to facility employees. The list below includes the PPE typically used and/or required in a solid waste management facility workplace.

- Safety shoes with steel toes.
- Noise reduction protection should be used in areas where extended exposure to continuous high decibel levels are expected.
- Disposable rubber latex or chemical resistant gloves for handling and/or sampling of waste materials.
- Dust filter masks

Following use, PPE's should be disposed of or adequately cleaned, dried, or readied for reuse.

1.12.3 Mechanical Equipment Hazard Prevention

The loaders and other equipment should be operated with care and caution. All safety equipment such as horns, backup alarms, and lights should be functional. A Lockout-Tagout program shall be used to identify equipment in need or under repair and insure that operation is "off-limits" prior to maintenance or repair. All operators shall be

trained in the proper operation of equipment.

1.12.4 Employee Health and Safety

Some general safety rules are:

- Consider safety first when planning and conducting activities.
- Review the equipment Manual prior to attempting repairs/changes.
- Remember the buddy system in case of repair of mechanical equipment
- Post emergency contact phone numbers.
- Provide easy and visible access to the Right to Know materials.
- Provide easy and visible access to the first aid kit and fire extinguishers.

1.12.5 Physical Exposure

Facility personnel may come in contact with the fluids, solids, and airborne constituents found at the C&D landfill. Routine training should be conducted regarding the individual and collective materials and their associated hazards. Training concerning safe work practices around these potential exposures should use equipment and proper disposal procedures.

1.12.6 Material Safety Data Sheets

Material Safety Data Sheets (MSDS) shall be collected on every waste (if available) that enters the facility. Information shall also be made available for all chemicals stored on site for use by the facility. MSDS sheets shall be stored in a location with all other Right to Know information for the site

1.13 UTILITIES

Electrical power, water, and telephone will be provided at the landfill scale house and office and restroom will be provided at the transfer station.

1.14 RECORD KEEPING PROGRAM

The County will maintain the following records in an operating record at the landfill:

A. Waste inspection records (see **Section 2.3.1**);
B. Daily tonnage records - including source of generation;
C. Waste determination records;
D. Quantity, location of disposal, generator, and special handling procedures for all special wastes disposed of at the site;
E. List of generators and haulers that have attempted to dispose of restricted wastes;
F. Employee training procedures and records of training completed;
G. Documentation of cell activation;
H. Documentation of mobile home deconstruction (see **Appendix B**)
I. Gas monitoring results and remediation measures as required (see **Section 3.4**);
J. All ground water monitoring and surface water quality information (See the

current **Water Quality Monitoring Plan**) including:

1. Monitoring well construction records;
2. Sampling dates and results;
3. Statistical analyses; and
4. Results of inspections, repairs, etc.

K. Annual landfill reports;

L. All closure and post-closure information, where applicable, including:

1. Testing;
2. Certification; and
3. Recording.

M. Cost estimates or financial assurance documentation.

The operating record will be kept up to date by the Solid Waste Director or his designee. It will be presented upon request to the DWM for inspection. A copy of this Operations Manual will be kept at the landfill and will be available for use at all times.

SECTION 2.0
WASTE HANDLING OPERATIONS

2.1 OVERVIEW

This section describes the required waste handling operations for the Avery County Landfill facility.

2.2 ACCEPTABLE WASTES

Only the following wastes generated within the approved service area may be disposed of in the C&D landfill unit (Note list is in accordance with existing permit):

- Land Clearing and Inert Debris: as defined in 15A NCAC 13B.0101(22) means a facility for the disposal of land-clearing waste, concrete, brick, concrete block, uncontaminated soil, gravel and rock, untreated and unpainted wood, and yard trash.
- Land Clearing Waste: as defined in 15A NCAC 13B.0101(23) means solid waste which is generated solely from land-clearing activities, limited to stumps, trees, limbs, brush, grass, and other naturally occurring vegetative material.
- Asphalt: in accordance with NCGS 130A-294(m).
- Construction and Demolition Debris: as defined in NCGS 130A-290(a)(4) means solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but does not include inert debris, land-clearing debris, or yard debris.
- Other Wastes as Approved by the Solid Waste Section of the Division of Waste Management.

In addition, waste from the deconstruction of mobile homes described in **Section 2.6** and the special wastes (asbestos only) described in **Section 2.5.3** and may also be disposed of in the C&D landfill unit.

2.3 WASTE SCREENING PROGRAMS

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placarding or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes are an ongoing part of the landfill operation.

2.3.1 Waste Receiving and Inspection

All vehicles must stop at the scale house located at the main entrance of the facility and visitors are required to sign-in. All waste transportation vehicles are weighed and the content of the load assessed. The scale attendant(s) requests from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill. The attendant(s) then visually checks the vehicle as it crosses the scale. Signs informing users of the acceptable and unacceptable types of waste are posted at the scale house. Once passing the scales, the vehicles are routed to the C&D landfill, MSW transfer station, or other area (mobile home deconstruction, etc.) as appropriate.

Vehicles are randomly selected for screening on a regular basis, depending on personnel available. At least one vehicle per week, but not less than 1% by weight of the waste stream entering the landfill (based on the previous week's total), will be randomly selected by inspection personnel. A random truck number and time will be selected (e.g., the tenth load after 10:00 a.m.) on the day of inspections. However, if something looks suspicious is spotted in any waste load, that load is inspected further.

Vehicles selected for inspection are directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded. Waste is carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill inspects the waste discharged at the screening site. If unacceptable waste is found, including wastes generated from outside of the service area, the load will be isolated and secured by berming off the area. For unacceptable wastes that are non-hazardous, the Solid Waste Director will then notify officials of the DWM (see **Section 1.2.2**) within 24 hours of attempted disposal of any waste the landfill is not permitted to receive in order to determine the proper course of action. For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 2.3.2** will be followed. The hauler is responsible for removing unacceptable waste from the landfill property.

If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell. All random waste inspections will be documented by landfill staff using the waste screening form provided in **Appendix A**.

In addition to random waste screening described above, waste unloaded on the active face will be inspected by the equipment operators, trained to spot unacceptable wastes, before and during spreading and compaction. Any suspicious looking waste is reported immediately to the designated primary inspector for further evaluation.

2.3.2 Hazardous Waste Contingency Plan

In the event that identifiable hazardous waste or waste of questionable character is detected at the landfill, appropriate equipment, protective gear, personnel, and materials as necessary will be employed to isolate the wastes. The DWM will be notified

immediately (see **Section 1.2.2**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, all attempts will be made to prevent that vehicle from leaving the site or, if the vehicle has left the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The County will assist the DWM as necessary and appropriate in the removal and disposition of the hazardous waste and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with either on-site soils or other tarping material until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill.

Should an incident where hazardous waste is found at the landfill occur, the event will be documented by landfill staff using the waste screening form provided in **Appendix A**.

Records of information gathered as part of the waste screening programs will be maintained at the landfill site during its active life and as long as required by the County and the DWM.

2.4 FACILITY OPERATIONS

2.4.1 Operating Capacity

The Operating Capacity for the solid waste facility is estimated to be approximately 10,000 tons per year of C&D waste.

2.4.2 Service Area

The anticipated service area for the facility (subject to change) is generally anticipated to be concentrated as shown in **Figure 3**.

2.4.3 Personnel Requirements

The anticipated personnel requirements for operation and maintenance of the site are listed in the following table.

Description	Primary Function (Allocation)
1) Site Manager (1)	Overall management of the facility
2) Scale house Attendant (1)	Receiving and weight for incoming loads
3) Operators (1)	Management of active proposed area.
4) Labor (1)	General labor and operational staff around the site

2.4.4 Equipment Requirements

The anticipated equipment requirements for operation and maintenance of the site are listed in the following table.

Description	Primary Function (Allocation)
1) Excavator (1)	Soil cover loading, and site maintenance
2) Front End Loader (1)	Loading, and site cleanup
3) Dump Truck	Hauling material around site

2.5 WASTE DISPOSAL

2.5.1 Access

Traffic will be clearly directed to the appropriate active access road. The location of access roads during waste placement will be determined by operations personnel in order to reflect waste placement strategy.

2.5.2 General Procedures

Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, a certain number of vehicles will be allowed on the working face at a time. The actual number will be determined by the truck spotter. This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity. Operations at the working face will be conducted in a manner which will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of waste.

The approach to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face area. Personnel will direct traffic necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of cover

required each day. Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either periodic, intermediate, or final cover, as appropriate.

The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e. 5H:1V max.) using a dozer and a minimum number of three full passes.

Wind screens adjacent to the working face may be used as required to control windblown waste.

The use of portable signs with directional arrows and portable traffic barricades will facilitate the unloading of wastes to the designated disposal locations. These signs and barricades will be placed along the access route to the working face of the landfill or other designated areas which may be established.

2.5.3 Special Waste Management

2.5.3.1 Asbestos Management

The County may dispose of asbestos within the C&D landfill. Asbestos will only be accepted if it has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Asbestos will arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator.

Once the hauler brings the asbestos to the landfill, the hauler will be directed to the designated asbestos disposal area by operations personnel. The designated disposal area will be prepared by operations personnel by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal area. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill dozer will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place.

The landfill staff will record the approximate location and elevation of the asbestos waste once cover is in-place. The Solid Waste Director will then review pertinent disposal and location information to assure compliance with regulatory requirements and enter the information into the Operating Record.

Once disposal and recording for asbestos waste is completed, the disposal area may be covered with waste. No excavation into designated asbestos disposal areas will be permitted.

2.5.4 Periodic Cover

At the completion of waste placement each week, a 6-inch layer of earthen material or other material as approved by the DWM will be placed over the exposed waste. Cover will be placed sooner if the area of exposed waste exceeds one-half acre in size, or as necessary to control vectors, fire, odors, and blowing debris. The date and time of cover placement will be recorded by landfill employees.

2.5.5 Intermediate Cover

A 12 inch layer of soil cover should be placed on all waste surfaces that have not received waste in 30 days but are below final elevation. This intermediate cover should be seeded immediately and graded such that all precipitation run-off is channeled to the surface water systems.

2.5.7 Height Monitoring

Approximately every month, the landfill staff will monitor landfill top and side slope elevations with a level. When such elevations approach design grades, the final top-of-waste grades will be staked to limit over-placement of waste.

2.6 DECONSTRUCTION OF MOBILE HOMES

The deconstruction of mobile homes is handled in an area adjacent to the C&D landfill unit. A description of the process is provided in **Appendix B**.

2.7 WASTE OPERATIONS IN PHASE III

The waste fill operations within the valley between existing Phases I and II will require additional procedures to manage stormwater and potential residual stormwater within the waste mass. A description of the operations is provided in **Appendix C**.

SECTION 3.0
ENVIRONMENTAL MANAGEMENT

3.1 OVERVIEW

This section reviews the overall environmental management tasks required for the successful operation of the landfill facility.

3.2 SURFACE WATER CONTROL

As used herein, the definition of "surface water" is water which results from precipitation or site run-on that has not contacted the waste.

Proper control of surface water at the landfill will accomplish the following goals:

- Prevent the run-on of surface water into the landfill unit or the active face(s);
- Limit the erosion caused by surface waters; and
- Limit sediments carried off-site by surface waters.

Separate erosion and sedimentation control plan(s) have been provided for the facility. These plans describe both short and long term engineered features and practices for preventing erosion and controlling sedimentation at this site. The following is a brief discussion of some of these features and practices, focusing more on the landfill units.

3.2.1 Surface Water Run-On Control

The perimeter channels around the landfill unit are designed to prevent the run-on of surface water from adjacent land into the landfill. Additional structures such as diversion berms, channels, down pipes, etc. carry surface water away from the landfill.

3.2.2 Erosion Control

The serviceability of the landfill relies heavily on soil berms, barrier layers, and agricultural layers that are readily eroded by flowing water. Erosion control provisions incorporated in the landfill include the following:

- The slope of the working face must be no steeper than 5H:1V where practical to limit erosion of the periodic cover.
- Intermediate cover that has been exposed for more than 30 days must be seeded immediately and repaired when erosion features are identified.
- Drainage breaks (diversion berms, etc.) are provided on the final cover to

limit the flow length of run-off.

- Water collected by each drainage break is routed to stormwater drainage channels or down pipes so that the run-off volume does not accumulate going down the slope.

- The vegetative soil layer placed over the final cover must be seeded immediately.

Additional erosion control measures have been taken within the drainage channels and at points of stormwater discharge. All final cover should be inspected regularly for erosion damage and promptly repaired.

3.2.3 Sedimentation Control

Stormwater run-off from the landfill unit is conveyed to the on site sediment basin. This basin should be inspected regularly for sediment build-up or erosion damage. The basin should be cleaned out when sediment fills the lower half of the basin.

3.2.4 Waste Operations in Phase III

The waste fill operations within the valley between existing Phases I and II will require additional procedures to manage stormwater and potential residual stormwater within the waste mass. A description of the operations is provided in **Appendix C**.

3.3 WATER QUALITY MONITORING

The monitoring program and procedures outlined in the current Water Quality Monitoring Plan will be followed for the monitoring of site groundwater monitoring wells and surface water monitoring locations. The results of the water quality monitoring program will be placed in the facility operating record as described in **Section 1.14**.

3.4 LANDFILL GAS MANAGEMENT

Monitoring shall be performed to identify (if any) subsurface migration of landfill gas at explosive levels are present in on-site structures and/or at the property boundary in gas monitoring probes. Methane or other explosive gas concentrations shall not exceed 25 percent of the lower explosive limit (LEL) (1.25% of CH_4) in on-site structures, such as scale houses, or 100% of the LEL (5% of CH_4) at the facility property boundary. Subsurface methane monitoring wells are installed between the landfill perimeter and the property line, and are spaced approximately 500 feet apart. Additional wells will be installed as necessary and consistent with landfill expansion.

If landfill gas levels exceed these limits, the following must be performed:

- Immediately take all steps necessary for the protection of personnel, staff, or neighboring properties and notify the DWM;
- Within seven (7) days, place in the operating record a description of events taken following the detection event; and
- Within 60 days, implement a remediation plan for the explosive gas releases, place a copy in the operating record, and notify the DWM that the plan has been implemented

3.5 VECTOR CONTROL

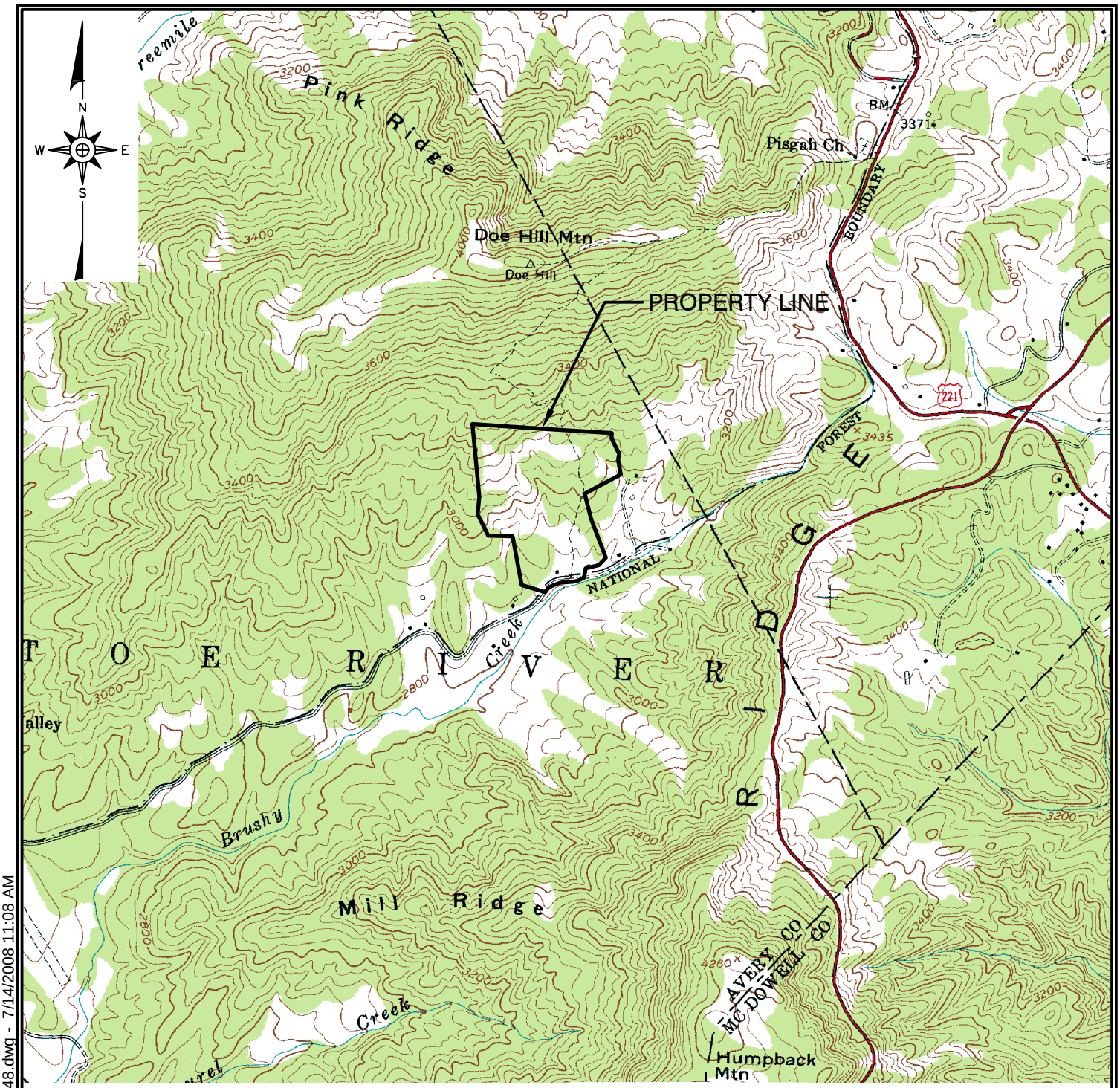
Due to the nature of the waste disposed in the C&D landfill unit, vector control is not anticipated to be of concern. Note that the use of periodic cover will discourage animals from nesting in the waste.

3.6 ODOR CONTROL

Due to the nature of the waste disposed in the C&D landfill unit, odor control is not anticipated to be of concern. However, if odors do occur, additional cover will be placed or other mitigation alternatives will be provided.

3.7 DUST CONTROL

Dust related to waste hauler traffic on the access roads will be minimized by using a water truck to limit dust on the gravel portion of the road. Dust generated by excavation of cover soil will be limited by watering the cut soil areas if accessible to the water truck.



REFERENCES

1. U.S.G.S. QUADRANGLE "LINVILLE FALLS, NC" 1956, PHOTO INSPECTED 1984
2. SITE PROPERTY LINE FROM FIELD SURVEY DATED 1/14/08, BY SURVEYING SOLUTIONS, P.C.

0 2000' 4000' 6000'

AVERY COUNTY C&D LANDFILL
SITE VICINITY MAP

RICHARDSON SMITH GARDNER & ASSOCIATES
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Raleigh, N.C. 27603
www.rsgengineers.com
ph: 919-828-0577
fax: 919-828-3899

SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.	FILE NAME
AS SHOWN	J.A.L.	J.A.S.	Jul. 2008	AVERY 07-1	1	AVERY-A0048

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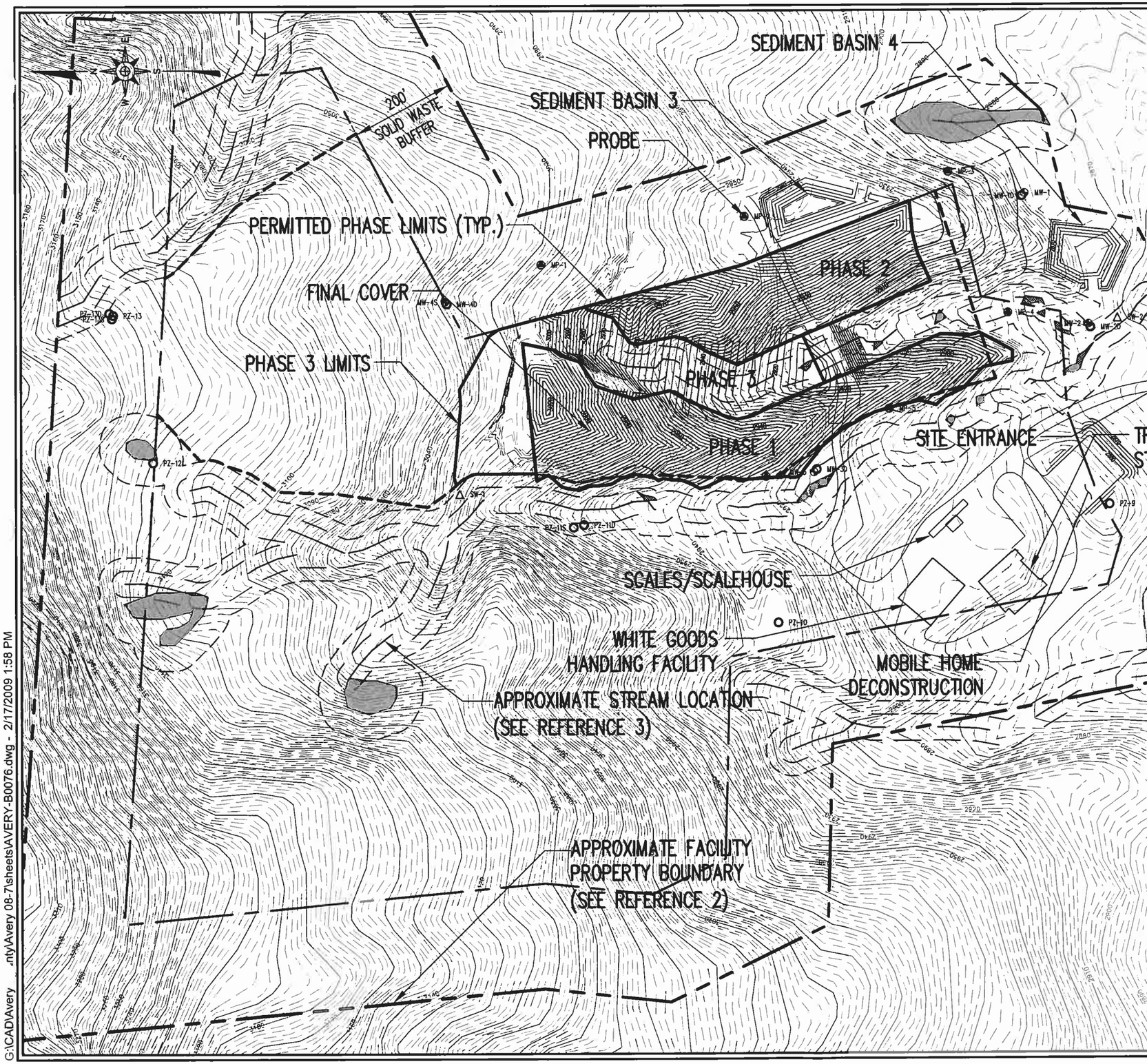

LEGEND

- EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- APPROX. STREAM LOCATION (SEE REFERENCES 3, 4)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER
- WETLANDS (SEE REFERENCES 3, 4)
- MONITORING WELL
- PIEZOMETER
- METHANE GAS MONITORING PROBE

PRELIMINARY
NOT FOR CONSTRUCTION

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
2. SITE PROPERTY LINE AND MONITORING WELLS FROM FIELD SURVEYS DATED 9/07 AND 1/14/08, BY SURVEYING SOLUTIONS, P.C.
3. STREAM AND WETLAND LOCATIONS IN NORTHERN SECTOR OF SITE OBTAINED FROM GPS FIELD SURVEY DATED 4/07, BY CAROLINA ECOSYSTEMS, INC.
4. STREAMS AND WETLANDS NEAR PHASE 1 AND 2 FROM FIELD SURVEY DATED 2/18/08 BY SURVEYING SOLUTIONS, P.C.

0 200' 400' 600'

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FIGURE NO.	2
FILE NAME	AVERY-B0076
SCALE:	AS SHOWN
PROJECT NO.	AVERY 08-7
CHECKED BY:	
DRAWN BY:	J.A.L.
DATE:	Feb. 2009

TITLE: AVERY COUNTY FACILITY PLAN

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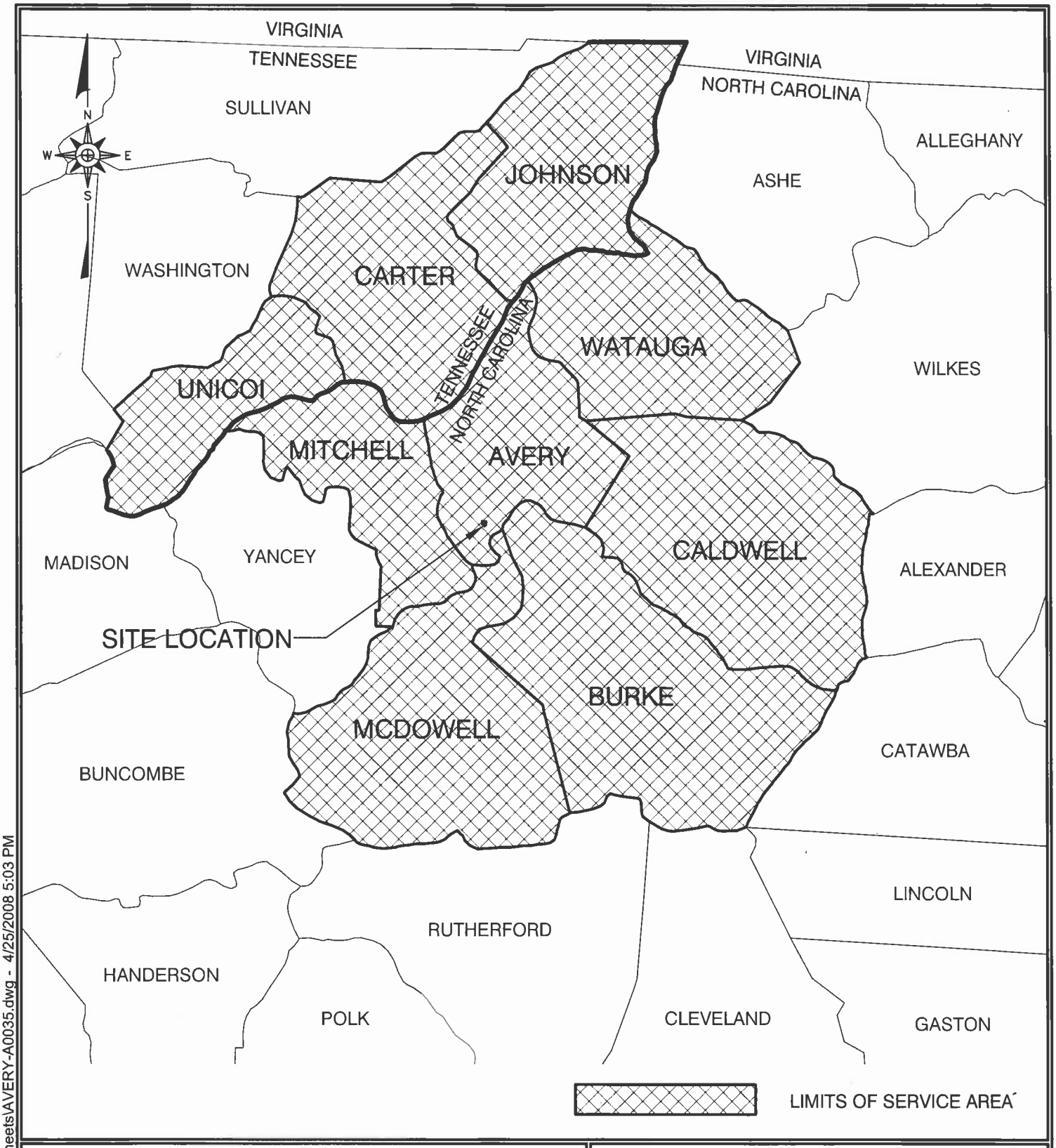

AVERY COUNTY LANDFILL FACILITY SERVICE AREA

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NOT TO SCALE	C.T.J.	S.A.S.	Apr. 2008	AVERY 07-1	3	AVERY-A0035

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Appendix A

Waste Screening Form

Avery County C&D Landfill
Permit No. 06-03
(828) 737-5420

WASTE SCREENING FORM

Day / Date: _____ Time Weighed in: _____
Truck Owner: _____ Driver Name: _____
Truck Type: _____ Vehicle ID / Tag No: _____
Weight _____ Tare: _____
Waste Generator / Source: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
Detained at Scales _____ Staff Initials _____
Detained by Operating Staff _____ Staff Initials _____

Inspection Location: _____

Approved Waste Determination Form Present? Yes _____ No _____ N/A _____

Description of Load: _____
_____
_____

Load Accepted (signature) _____ Date _____
Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete only if load not accepted)

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
Texture _____ _____
Drums Present _____ Smell _____
Est. Cu. Yds. Present in Load _____
Est. Tons Present in Load _____

Avery County Emergency Management Contacted? Yes _____ No _____

Company or Authority Contacted? _____
Hazardous Materials Present: _____
_____

Hauler Notified (if waste not accepted) Phone: Time Contacted:
Other Observations: _____
_____

Final Disposition
Signed _____ Date _____
Waste Screening Inspector or Solid Waste Director

Attach related correspondence to this form.
File completed form in Operating Record.

Appendix B

Mobile Home Deconstruction

AVERY COUNTY C&D LANDFILL

OPERATIONS MANUAL
APPENDIX B: MOBILE HOME DECONSTRUCTION

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- 2.5 Deconstruction of Mobile Homes 2
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AVERY COUNTY C&D LANDFILL

OPERATIONS MANUAL
APPENDIX B: MOBILE HOME DECONSTRUCTION

1.0 OVERVIEW

This portion of the Operations Manual was prepared for the Mobile Home Deconstruction Area located adjacent to the Avery County Construction and Demolition Debris (C&D) Landfill unit. The Mobile Home Deconstruction Area is strictly for the deconstruction of mobile homes in order to recycle materials from the mobile homes. Avery County plans to recycle as many varieties of materials as possible as end users are available. Initially, scrap metal recycling will be conducted. Once an end-user of another material (i.e. glass) is located, these other materials may be recycled. Any non-recyclable material will be disposed of appropriately by the County upon completion of the deconstruction process.

2.0 MOBILE HOME DECONSTRUCTION PROCESS

Mobile homes will be deconstructed using the following processes.

2.1 Access

Mobile home owners seeking disposal will contact the landfill facility and be placed on a waiting list. No more than TWO (2) mobile homes will be allowed on-site for deconstruction at one time. Once space is available for a mobile home, landfill personnel will contact the next owner on the waiting list. The owner will have a 48 hour window in which to contact the landfill facility with information regarding the delivery date and hauler. If owner cannot arrange delivery within this initial 48 hour period, the owner may make alternate arrangements for delivery and must notify the landfill facility a minimum of 48 hours prior to planned delivery. The delivered mobile home will not be weighed on the scales at time of delivery, but the owner will be charged based upon the size and dimensions of the mobile home.

If delivery is not made within 48 hours of the scheduled delivery date, the owners name will be placed on the waiting list and the owner will be notified. If an owner has more than one mobile home, they will be rotated with others on the waiting list.

2.2 Waste Disposal

All mobile homes must be free of garbage, household hazardous waste, and all other non-construction and demolition waste prior to acceptance by the landfill.

2.3 White Goods

White goods will be accepted with the mobile home. White goods will be removed and handled in accordance with all State and Federal regulations. Any white goods containing CFC's will have them managed properly prior to removal of the white goods

and deconstruction of the mobile home.

2.4 Asbestos

Since asbestos may be located in the building materials of mobile homes constructed prior to 1983, all mobile homes built before 1/1/1983 will be thoroughly sprayed with water (both interior and exterior) to minimize dust. Upon demolition of a mobile home constructed prior to 1983, the waste generated will be placed in the C&D landfill and covered with six inches of soil or approved alternate cover.

2.5 Deconstruction of Mobile Homes

Once accepted, the mobile home will be placed in the mobile home deconstruction area. Mobile home deconstruction will be dependant upon weather conditions and manpower availability and will ONLY take place in the deconstruction area. Prior to deconstruction, mobile homes constructed before 1983 will be thoroughly sprayed with water to minimize dust (as noted above). The home will then be deconstructed using a track-hoe. The track-hoe will tear the trailer apart and lay the pieces on the ground to be separated by landfill personnel. The personnel will separate the non-recyclable materials from the recyclable materials. Initially, scrap metal is planned for recycling. As other end-users for other materials are available, other materials may be separated for recycling. All material not planned for recycling will be placed in the C&D landfill before the end of the day in which the deconstruction takes place. Material from mobile homes constructed prior to 1983 will be covered prior to the end of the day. All recyclable materials will be stockpiled in the deconstruction area for future recycling. **NO OPEN FLAMES OR CUTTING WITH TORCHES WILL BE ALLOWED WITHIN 100 FEET OF THE C&D LANDFILL**.

2.6 Holding Time for Mobile Homes

All mobile homes must be deconstructed within 45 days from acceptance into the deconstruction area. Upon receipt at the landfill, the date shall be painted on the side or end of the mobile home, or on the frame, for identification purposes for Solid Waste Section personnel.

2.7 Holding Time for Recyclables

Once a recyclable material is removed from a mobile home, it may be stockpiled in the mobile home deconstruction area for up to 45 days. No materials shall be kept in this area for more than 45 days, nor shall they be stockpiled in other areas awaiting recycling.

3.0 RECORD KEEPING PROGRAM

The County shall maintain the following records related to the Mobile Home Deconstruction in an operating record at the landfill (see also **Section 1.11** of the Operations Manual):

A. Mobile Home Acceptance records including dates and description;
B. Owner and hauler information for each mobile home;
C. Date of deconstruction for each mobile home and materials to be recycled;
D. Date and disposal information for all recycled materials ton include location and vendor of recipient of recycled materials.
E. Date and certification of CFC's removed.

Appendix C

Phase III Stormwater Management

AVERY COUNTY C&D LANDFILL

OPERATIONS MANUAL
APPENDIX C: PHASE III STORMWATER MANAGEMENT

1.0 OVERVIEW

This portion of the Operations Manual was prepared for the environmentally sensitive areas that lie within existing Phases I and II ("the valley") developed as Phase III. In consideration of the steep topography of the area, stormwater management of both run-on and run-off shall be considered in the day to day operations to prevent any impacts to the centrally located stream immediately downstream of the operation. This appendix is considered as a supplement to **Section 3.0** of the Operations Manual specific to operations within the valley.

2.0 STORMWATER CONTROLS

The stormwater controls to be employed include run-on diversions and run-off conveyances which will be directed to on-site sediment basins for treatment. As described in the Operations Manual, proper control of surface water at the landfill will accomplish the following goals:

- Prevent the run-on of surface water into the landfill unit or the active face(s); and
- Limit the erosion caused by surface waters.

2.1 Surface Water Run-On Control

The first step in management of the valley area includes the diversion of run-on surface water from entering Phase III. This area includes diversion channels, silt fence, and catch basins to direct and capture stormwater and route to the on-site sediment basins. Therefore, the remaining stormwater includes what falls within the waste area footprint.

2.2 Surface Water Run-Off Control

The site has been designed for fill operations from the bottom along the access road to the north (or upgradient). As a preventative stormwater measure, a series of diversion berms are proposed at approximate 20 feet vertical locations such that each diversion berm manages an approximate one (1) acre (maximum and incremental) drainage area. A minimum two (2) foot high diversion berm will be installed across the subgrade areas and will serve to route stormwater to catch basins or other more permanent stormwater control measures. As the fill operations advance, each final waste lift surface shall be sloped to the south at approximately one (1%) percent where incremental diversion swales proposed under the final cover program shall be placed to control and convey stormwater to the on-site sediment basins. This program proposes a zoned approach of filling operations to minimize the impact of any single fill area from being overcome with a storm event.

2.3 Diversion Berms

The diversion berms are generally located at 20 feet vertical locations (ie. ~El. 2930, ~El. 2950, ~El. 2970, and ~El. 3000) as shown on the Base Grading Plan. In all cases, there is sufficient slope to convey stormwater to other permanent measures outside the waste boundaries. However, in the initial stage of operations (Day 1), a rain event would collect below El. 2920 and would require pumping discussed in **Section 2.4**. The largest incremental drainage area is approximately one (1) acre. The diversion berms have been designed to easily control the 2 year - 5 minute storm (5.04 in/hr) event and will pass the 25 year - 5 minute storm (8.4 in/hr) with more than 0.5 foot of freeboard.

The diversion berms are also designed to assist in dispersion of any accumulated stormwater within the waste mass. Phase III shall be operated to bind the previous waste fill operations within both Phases I and II. Therefore, once filling operations move above a particular diversion berm, the intermediate cover soil shall be stripped away and the diversion berm shall remain to assist in the diversion and dispersion of this residual stormwater within the existing waste masses. In summary, the waste fill shall be a "waste to waste connection" without any soil barriers.

3.2.3 Pumping Operations

Stormwater run-off from initial operations (Day 1) have the potential to collect below El. 2920 and will require pumping. In this case, the volume below this elevation is approximately 220,000 gallons and can be completely removed in an eight (8) hour period by a 500 gallon per minute pump (ie. 6" to 8"). During this period, the site operations shall have this pump on stand-by for delivery or on site.

In order to provide comparison of storms, the 2 year storm will accumulate approximately 63,000 gallons and the 25 year storm will accumulate approximately 125,000 gallons. Therefore, in either case, the area is more than adequate to temporarily stage stormwater. In no case, consistent with the Operations Manual, shall waste be placed in standing water.

3.0 RECORD KEEPING PROGRAM

The County shall maintain a record of each storm event and in the case of initial operations, a record of each pumping event.

ATTACHMENT C

Should you have any questions or require clarification, please contact us at your earliest convenience at (919) 828-0577 or by email listed below.

Sincerely,
Richardson Smith Gardner & Associates, Inc.

Don Misenheimer
Project Scientist, Ext. 140
don@rsgengineers.com

Stacey A. Smith, P.E
Project Manager, Ext. 127
stacey@rsgengineers.com

Attachments

Cc: Mr. Henry "Buddy" Norris, Avery County
Mr. Bill Wagner – ARO/SWS (Letter Only)
Mr. Zinith Barbee – ARO/SWS
File

H:\Projects\Avery County (NC)\Avery-08-4 (Phase III PTC)\NCDENR Comments\Response to Comments 7-28-09.doc

AVERY COUNTY SOLID WASTE DEPARTMENT
AVERY COUNTY, NORTH CAROLINA

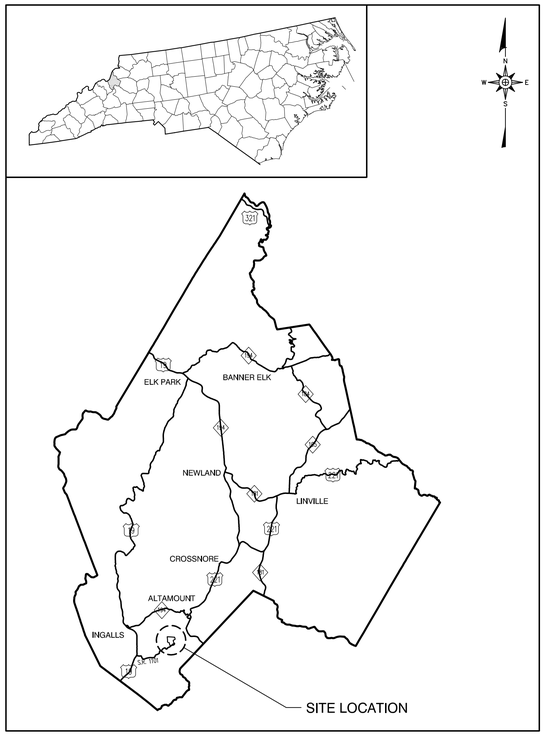
CONSTRUCTION & DEMOLITION LANDFILL
PHASE III PERMIT TO CONSTRUCT

FEBRUARY 2009

REVISED AUGUST 5, 2009

DATE	NO.	REVISION
8/5/09	2	REFER TO REVISED SHEETS
7/30/09	1	REVISIONS TO NCDENR COMMENT LETTER DATED 5-22-09

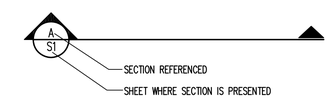
PERMIT ISSUE
NOT FOR CONSTRUCTION



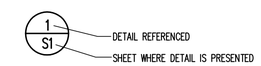
SITE LOCATION MAP
NOT TO SCALE

SHEET NO.	DRAWING NO.	TITLE	REVISION
1		TITLE – COVER SHEET	1 2
2	S1	EXISTING CONDITIONS	1
3	S2	BASE GRADING PLAN	1 2
4	S3	STREAM AND WETLAND MITIGATION PLAN	1 2
5	S4	FINAL GRADING PLAN	1 2
6	P1	PHASING PLAN	1 2
7	X1	SECTIONS	2
8	EC1	STORMWATER MANAGEMENT DETAILS (SHEET 1 OF 3)	
9	EC2	STORMWATER MANAGEMENT DETAILS (SHEET 2 OF 3)	2
10	EC3	STORMWATER MANAGEMENT DETAILS (SHEET 3 OF 3)	2
11	EC4	CASCADE AND RESTORATION DETAILS	
12	D1	UNDERDRAIN DETAILS	2
13	MD1	MISCELLANEOUS DETAILS	

STANDARD SECTION LOCATION (SHEET AND DETAIL)



STANDARD DETAIL CALLOUT



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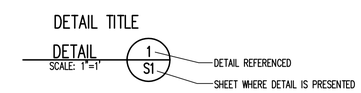
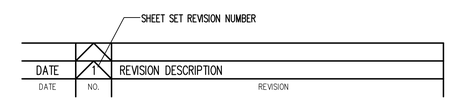


STANDARD REVISION CALLOUT (SHEET AND DETAIL)



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FILE NAME
AVERY-D0064B

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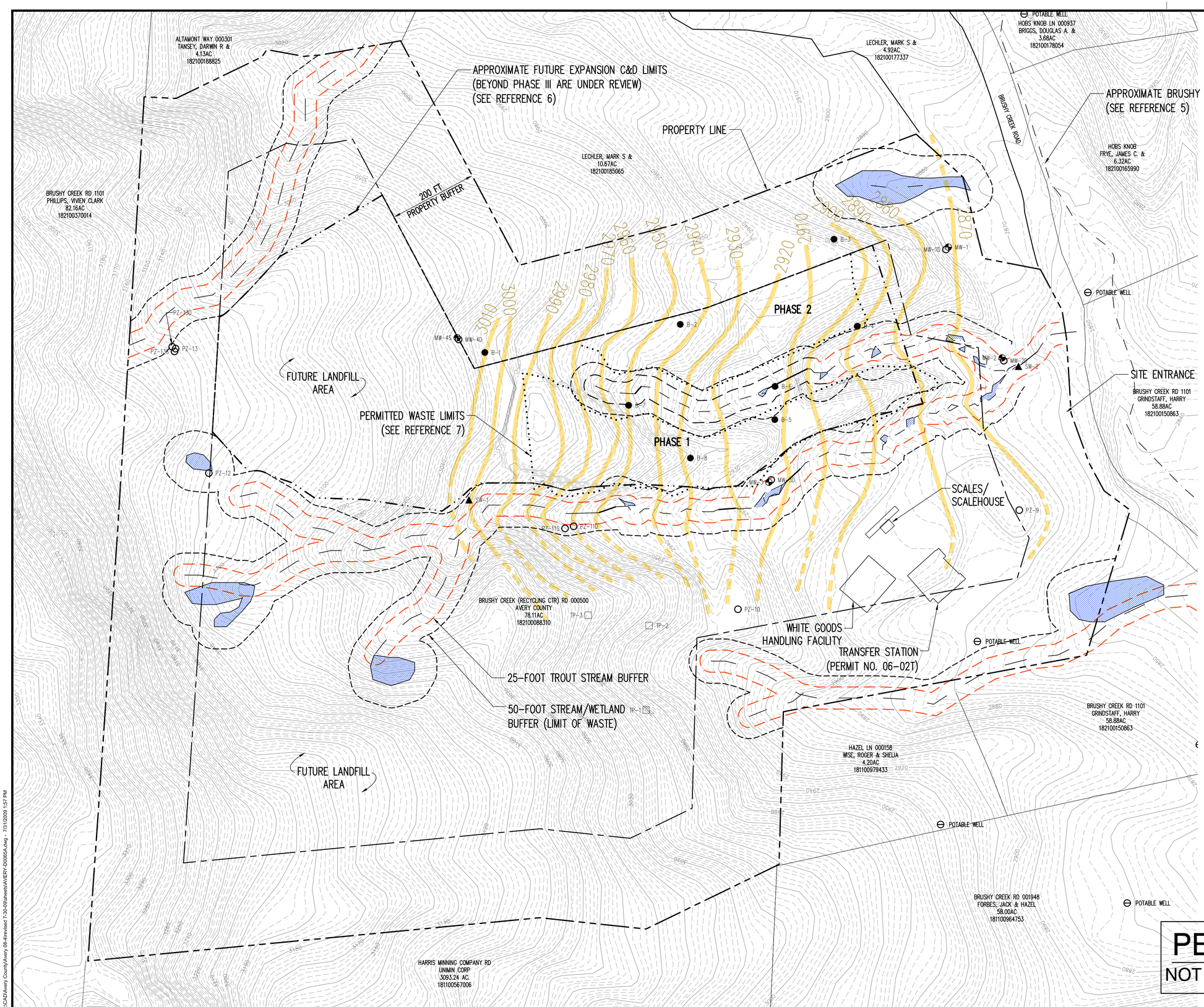

LEGEND

- EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- PERMITTED WASTE LIMITS
- PROPOSED SUBGRADE LIMITS
- PROPOSED SUBGRADE LIMITS
- APPROX. STREAM LOACTION (SEE REFERENCES 3, 4)
- WETLANDS (SEE REFERENCES 3, 4)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER
- POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
- MONITORING WELL
- PIEZOMETER
- SURFACE WATER MONITORING POINT
- BORING
- POTABLE WELL

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
2. SITE PROPERTY LINE AND MONITORING WELL LOCATIONS FROM FIELD SURVEYS DATED 9/07 AND 1/14/08, BY SURVEYING SOLUTIONS, P.C.
3. STREAM AND WETLAND LOCATIONS IN NORTHERN SECTOR OF SITE OBTAINED FROM GPS FIELD SURVEY DATED 4/07, BY CAROLINA ECOSYSTEMS, INC.
4. STREAMS AND WETLANDS NEAR PHASE 1 AND 2 FROM FIELD SURVEY DATED 2/18/08 BY SURVEYING SOLUTIONS, P.C.
5. BRUSHY CREEK LOCATION FROM AVERY COUNTY GIS DEPARTMENT.
6. EXPANSION LIMITS UPDATED TO REFLECT PENDING PERMITTING, SEE DRAWING "BASE GRADING PLAN" BY RSG ENGINEERS.
7. PERMITTED WASTE LIMITS FROM DRAWING ENTITLED "EROSION CONTROL SITE PLAN"BY MUNICIPAL ENGINEERING SERVICES CO., P.A. CONSULTING ENGINEERS, DATED 5-22-96.
8. POTABLE WELL LOCATIONS ARE APPROXIMATE.
7. POTENTIOMETRIC SURFACE SHOWN WAS OBTAINED FROM DRAWING, AVERY COUNTY C&D LANDFILL POTENTIOMETRIC MAP SPRING '09, CREATED BY RICHARDSON SMITH GARDNER AND ASSOCIATES IN JULY 2009.

0 100' 200' 300'

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
1	7-30-09	RESPONSE TO NODER COMMENT LETTER DATED 5-22-09

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SEAL

SEAL

PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
EXISTING CONDITIONS

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0065A	
SHEET NO. 2	DRAWING NO. S1

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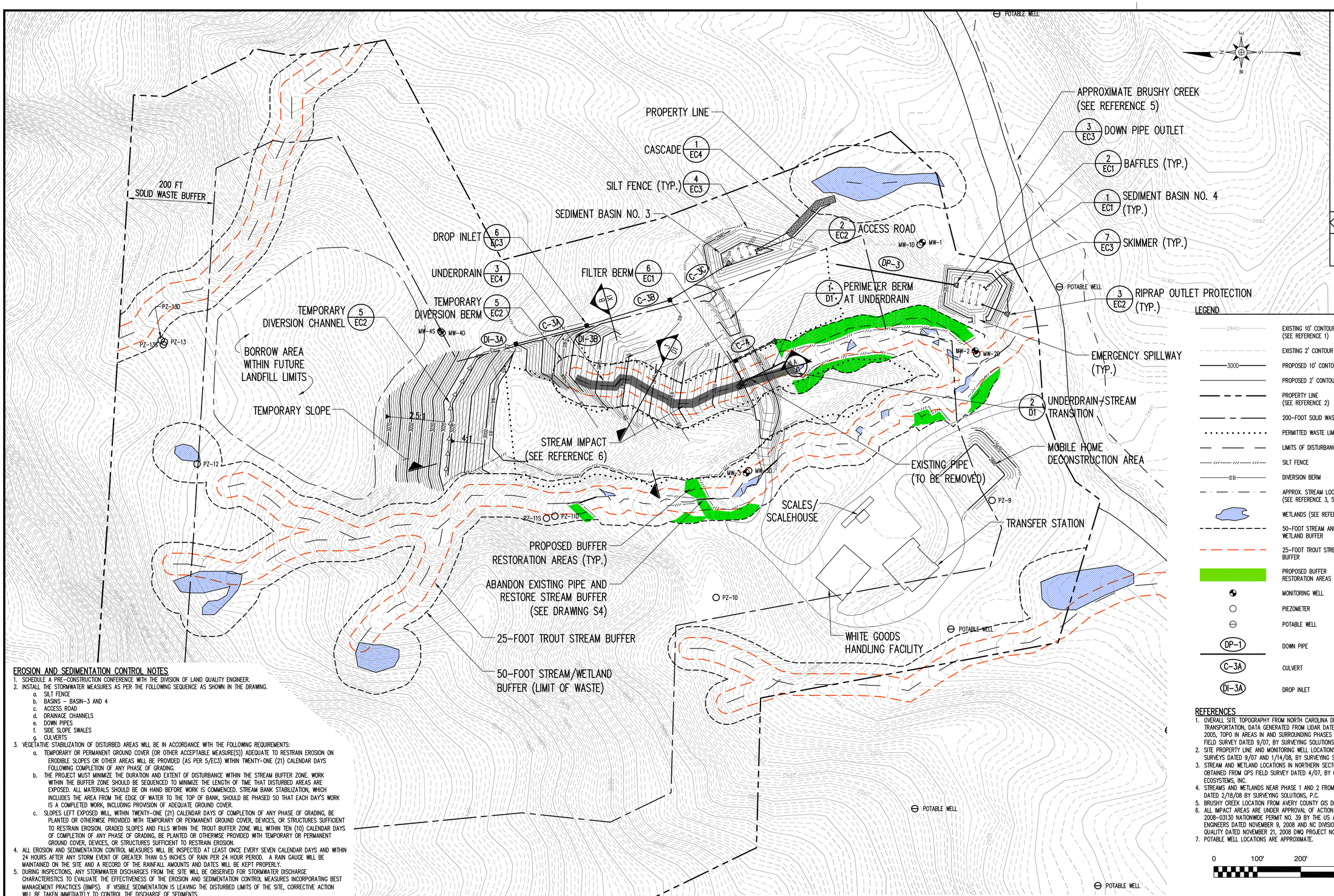

EROSION AND SEDIMENTATION CONTROL NOTES

1. SCHEDULE A PRE-CONSTRUCTION CONFERENCE WITH THE DIVISION OF LAND QUALITY ENGINEER.
2. INSTALL THE STORMWATER MEASURES AS PER THE FOLLOWING SEQUENCE AS SHOWN IN THE DRAWING.
   a. SILT FENCE
   b. BASINS – BASIN-3 AND 4
   c. ACCESS ROAD
   d. DRAINAGE CHANNELS
   e. DOWN PIPES
   f. SIDE SLOPE SWALES
   g. CULVERTS
3. VEGETATIVE STABILIZATION OF DISTURBED AREAS WILL BE IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:
   a. TEMPORARY OR PERMANENT GROUND COVER (OR OTHER ACCEPTABLE MEASURE(S)) ADEQUATE TO RESTRAIN EROSION ON ERODIBLE SLOPES OR OTHER AREAS WILL BE PROVIDED (AS PER 5/EC3) WITHIN TWENTY-ONE (21) CALENDAR DAYS FOLLOWING COMPLETION OF ANY PHASE OF GRADING.
   b. THE PROJECT MUST MINIMIZE THE DURATION AND EXTENT OF DISTURBANCE WITHIN THE STREAM BUFFER ZONE. WORK WITHIN THE BUFFER ZONE SHOULD BE SEQUENCED TO MINIMIZE THE LENGTH OF TIME THAT DISTURBED AREAS ARE EXPOSED. ALL MATERIALS SHOULD BE ON HAND BEFORE WORK IS COMMENCED. STREAM BANK STABILIZATION, WHICH INCLUDES THE AREA FROM THE EDGE OF WATER TO THE TOP OF BANK, SHOULD BE PHASED SO THAT EACH DAY'S WORK IS A COMPLETED WORK, INCLUDING PROVISION OF ADEQUATE GROUND COVER.
   c. SLOPES LEFT EXPOSED WILL, WITHIN TWENTY-ONE (21) CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION. GRADED SLOPES AND FILLS WITHIN THE TROUT BUFFER ZONE WILL WITHIN TEN (10) CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION.
4. ALL EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD. A RAIN GAUGE WILL BE MAINTAINED ON THE SITE AND A RECORD OF THE RAINFALL AMOUNTS AND DATES WILL BE KEPT PROPERLY.
5. DURING INSPECTIONS, ANY STORMWATER DISCHARGES FROM THE SITE WILL BE OBSERVED FOR STORMWATER DISCHARGE CHARACTERISTICS TO EVALUATE THE EFFECTIVENESS OF THE EROSION AND SEDIMENTATION CONTROL MEASURES INCORPORATING BEST MANAGEMENT PRACTICES (BMPS). IF VISIBLE SEDIMENTATION IS LEAVING THE DISTURBED LIMITS OF THE SITE, CORRECTIVE ACTION WILL BE TAKEN IMMEDIATELY TO CONTROL THE DISCHARGE OF SEDIMENTS.
6. REPAIRS TO EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE MADE AS NEEDED AND ACCUMULATED SEDIMENT REMOVED IF NECESSARY. ALL SEDIMENTS WHICH ARE REMOVED FROM EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE DISPOSED OF IN AN APPROVED MANNER AT A LOCATION TO BE DESIGNATED BY THE ENGINEER IN SUCH A MANNER THAT FURTHER EROSION AND SEDIMENTATION WILL NOT OCCUR.
7. THE CONTRACTOR SHALL ESTABLISH A SMOOTH, HEALTHY, UNIFORM, CLOSE STAND OF GRASS FROM THE SPECIFIED SEED. PRIOR TO REVEGETATION, THE CONTRACTOR SHALL ADEQUATELY TEST THE SOILS TO BE REVEGETATED TO ENSURE THE ADEQUACY OF THE SPECIFIED REQUIREMENTS. ANY MODIFICATIONS TO THESE REQUIREMENTS DEEMED NECESSARY AFTER THE REVIEW OF SOIL TEST RESULTS, SHALL BE AT THE CONTRACTOR'S SOLE EXPENSE. THE ENGINEER WILL PERFORM THE OBSERVATIONS TO DETERMINE WHEN SUCCESSFUL REVEGETATION IS ACHIEVED.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL SEEDED AREAS THROUGH THE END OF HIS WARRANTY PERIOD. THE CONTRACTOR SHALL PROVIDE, AT HIS EXPENSE, PROTECTION OF ALL SEEDED AREAS AGAINST DAMAGE AT ALL TIMES UNTIL ACCEPTANCE OF THE WORK.

CULVERT SCHEDULE

NO.	SIZE	LENGTH (FT)	INV. IN (FT)	INV. OUT (FT)	SLOPE (%)	REMARKS
C-3A	18" CPP	200	3013	2973	2	INLET IN DI-3B
C-3B	24" CPP	250	2970	2939	12.4	INLET IN DI-3B
C-3C	24" CPP	170	2934	2930	2.3	INLET IN BASIN-3
C-4	18" RCP	75	2918	2900	24	INLET IN GRASS SWALE TO BASIN-4

LEGEND

- EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- 200-FOOT SOLID WASTE BUFFER
- PERMITTED WASTE LIMITS
- LIMITS OF DISTURBANCE
- SILT FENCE
- DIVERSION BERM
- APPROX. STREAM LOCATION (SEE REFERENCE 3, 5)
- WETLANDS (SEE REFERENCE 3)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER
- PROPOSED BUFFER RESTORATION AREAS
- MONITORING WELL
- PIEZOMETER
- POTABLE WELL
- DP-1 DOWN PIPE
- C-3A CULVERT
- DI-3A DROP INLET

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
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4. STREAMS AND WETLANDS NEAR PHASE 1 AND 2 FROM FIELD SURVEY DATED 2/18/08 BY SURVEYING SOLUTIONS, P.C.
5. BRUSHY CREEK LOCATION FROM AVERY COUNTY GIS DEPARTMENT.
6. ALL IMPACT AREAS ARE UNDER APPROVAL OF ACTION ID 2008-031/50 NATIONWIDE PERMIT NO. 39 BY THE US ARMY CORE OF ENGINEERS DATED NOVEMBER 9, 2008 AND NC DIVISION OF WATER QUALITY DATED NOVEMBER 21, 2008 DWQ PROJECT NO. #08-1464.
7. POTABLE WELL LOCATIONS ARE APPROXIMATE.

0 100' 200' 300'

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
2	8/5/09	ADDED DIVERSION BERM; SPOT ELEVATIONS
1	7/30/09	RESPONSE TO NODER COMMENT LETTER DATED 5-22-09

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SEAL

SEAL

PROJECT TITLE: AVERY COUNTY C&D LANDFILL PHASE 3 PERMIT TO CONSTRUCT

DRAWING TITLE: BASE GRADING PLAN

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0066B	
SHEET NO. 3	DRAWING NO. S2

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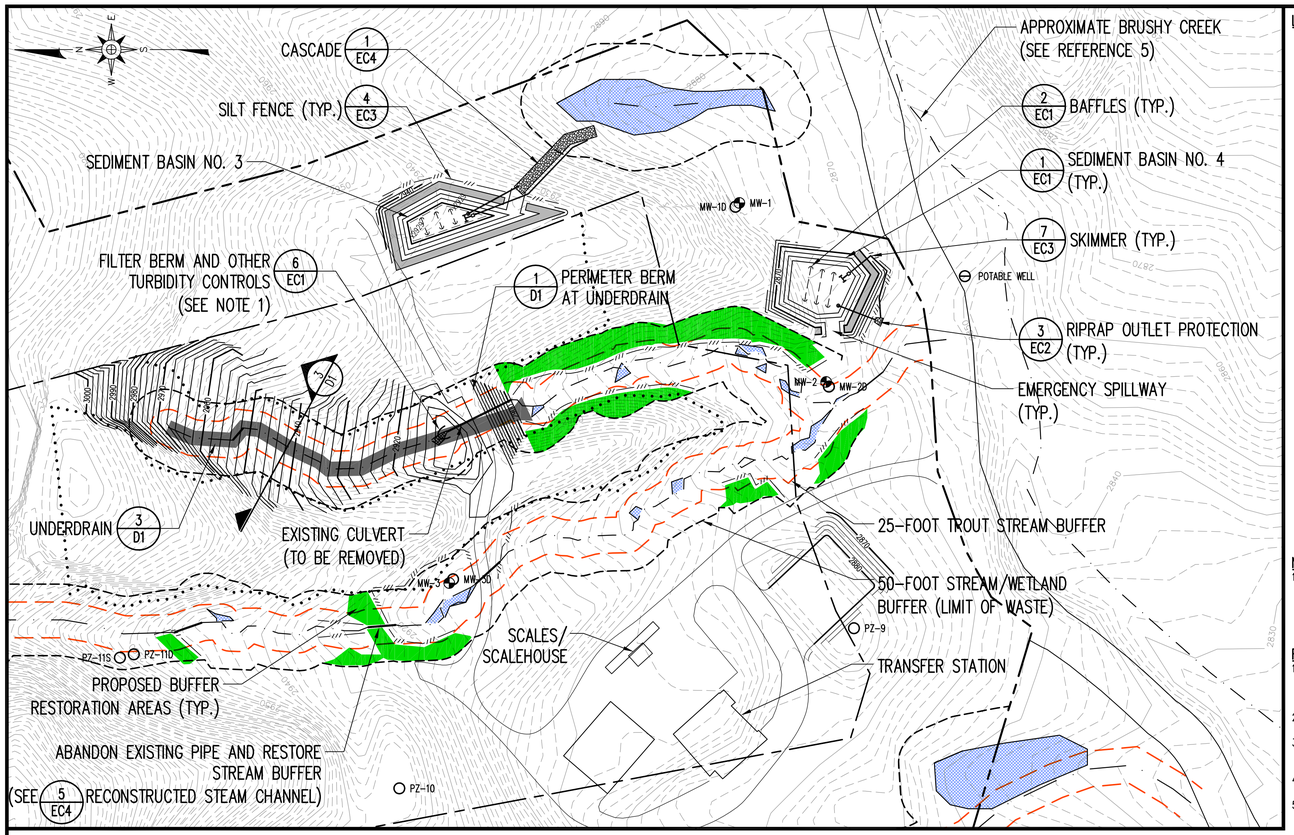

RESTORATION PLAN

LEGEND

- EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- 200-FOOT SOLID WASTE BUFFER
- PERMITTED WASTE LIMITS
- SILT FENCE
- APPROX. STREAM LOCATION (SEE REFERENCE 3, 5)
- WETLANDS (SEE REFERENCE 3)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER
- WETLAND IMPACT AREA
- PROPOSED BUFFER RESTORATION AREAS
- MONITORING WELL
- PIEZOMETER
- SKIMMER, ANCHOR BLOCK AND LOW-FLOW EFFLUENT COOLING PIPE

NOTE

1. TURBIDITY CONTROL: IF THE AMOUNT OF SURFACE FLOW AND GROUNDWATER EXCEEDS THE CAPACITY OF THE FILTER BERM TO CONTROL TURBIDITY (AS DEFINED BY NPDES REQUIREMENTS), THEN RUNOFF MUST BE CONTAINED, MIXED WITH POLYACROYLAMIDE FLOCCULANT, AND PUMPED THROUGH A GEOTEXTILE DEWATERING BAG.

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
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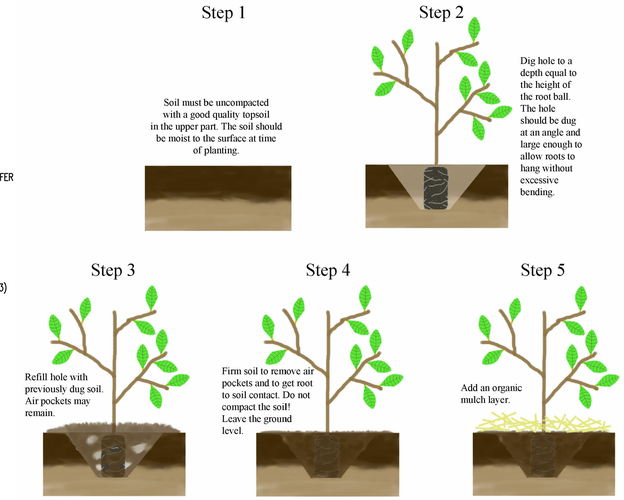
5. BRUSHY CREEK LOCATION FROM AVERY COUNTY GIS DEPARTMENT.

0 100' 200' 300'



RESTORATION PLANTING DETAIL 1 S4
NOT TO SCALE

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
2	8/5/09	ADDED SPOT ELEVATIONS
1	7/30/09	RESPONSE TO NCDER COMMENT LETTER DATED 5-22-09

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SEAL

SEAL

PROJECT TITLE: AVERY COUNTY C&D LANDFILL PHASE 3 PERMIT TO CONSTRUCT

DRAWING TITLE: STREAM AND WETLAND MITIGATION PLAN

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0069B	
SHEET NO. 4	DRAWING NO. S3

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Avery County Landfill
On-Site Mitigation Plan

This on-site mitigation plan has been developed based on the need to have a stable, healthy, and natural plant community established along the on-site streams where disturbance has occurred or waste will be removed. The site and surrounding area was investigated to determine existing conditions and to develop the target plant community to restore to these areas. It was determined that the Chestnut Oak Forest community type as described in *Classification of the Natural Communities of North Carolina – Third Approximation* was the appropriate target community for these stream buffer areas. This plan will provide for a stable stream buffer with plant species that should restore these areas to the natural plant communities that was likely here prior to their disturbance.

In addition, this plan addresses the remediation of previous impacts to the streams on site. This includes removal of sediment from the perennial channel between the landfill cells and removal of an existing 40' pipe in the channel to the west of the landfill. This work is intended to allow the aquatic habitat in the streams to recover, and to improve water quality in the streams and downstream trout habitat.

1.0 Stream Buffer Restoration Plan

1.1 Soil Preparation

The site will undergo large earth moving activities prior to the restoration efforts. These activities will likely result in compacted soil and subsoil. The areas to be restored as stream buffer will need to be properly prepared to ensure adequate growing conditions. If compaction or loss of topsoil has occurred, the following actions must be taken in the stream buffer restoration areas before final seedbed/woody planting preparation begins.

- All disturbed areas within the buffer restoration zones that have been compacted must be rip-tilled in such a manner as to allow plant root growth in the subsoil. All heavy equipment such as large excavators/bulldozers is prohibited from entering the restoration zone after the rip-tilling has been completed.
- In disturbed areas within the buffer restoration zones, final grade elevations shall be attained by the application of 6 to 10 inches of topsoil to all disturbed areas within the restoration zones.
- The topsoil shall be disked to ensure proper connection with the subsoil and prevention of surface compaction. This activity shall be done in dry weather conditions with satisfactory soil moisture.
- All erosion control/permanent seeding soil preparation criteria shall then be implemented. See **Erosion Control Notes** for details.

1.2 Stream Buffer Plant List

(SB): All disturbed areas denoted on plans as SB shall be planted with plants selected from the following list.

Scientific Name	Common Name	Layer	Spacing (ft) On-Center	Plant Size	Distribution
Pinus strobus	White Pine	Tree	8x8	Container	Random
Liriodendron tulipifera	Tulip Poplar	Tree	8x8	Container	Random
Quercus prinus	Chestnut Oak	Tree	8x8	Container	Random
Quercus rubra	Northern Red Oak	Tree	8x8	Container	Random
Quercus coccinea	Scarlet Oak	Tree	8x8	Container	Random
Fagus grandifolia	American Beech	Tree	8x8	Container	Random
Acer rubrum	Red Maple	Tree	8x8	Container	Random
Carpinus caroliniana	Ironwood	Tree	8x8	Container	Random
Kalmia latifolia	Mountain Laurel	Shrub	8x8	Container	Random
Rhododendron maximum	Great Laurel	Shrub	8x8	Container	Random

1.3 Planting Requirements

- **The Stream Buffer Zone shall be planted with at least six (6) of the above species.**
- **No species shall make up more than 30% of the total planted stems in each SB area.**
- **No species shall make up less than 10% of the total planted stems in each SB area.**
- **No plant substitutions beyond the list above are allowed.**

The following are the weather and soil conditions that must be present at the site during all planting of the stream buffer zones.

- **Temperature greater than 35^{0}F and less than 85^{0}F**
- **Relative Humidity greater than 30%**
- **Wind less than 10 miles/hour**
- **Soil is moist to the surface**
- **Soil surface is protected by an organic mulch layer or equivalent protection**
- **Soil has been ripped and disked such that compaction will not inhibit growth**

The stream buffer restoration areas should be adequately marked before planting commences.

The correct spacing of vegetation should be checked by the On-Site Supervisor on a regular basis.

1.3.1 Plant Distribution

Random Distribution – take all six (6) plant species selected for planting from the plant list in the proper percentages to meet the planting requirements. Mix the plants so that they are all planted randomly at the 8' spacing called for in this plan. If done properly, sometimes two or more of the same species will be planted adjacent to each other and other times there may only be one plant of a species completely surrounded by one or more other species.

1.3.2 Planting Method

The following describes the general planting techniques to be followed when installing the plants. However, these techniques may be modified if the contractor believes that other techniques will improve health and survival of the plants.

Containerized Plants (equal to or larger than 16 cubic inches)

i. Containerized plants must be robust healthy growing plants.
ii. The root system must be vigorous and dense enough to hold the shape of the container once removed.
iii. Container vegetation must always be handled by the container and never by the tops of the plants.
iv. Containerized plants must be stored in the shade and kept moist until installation.
v. If soil is compacted, the area of planting shall be loosened to a depth equal to that of the root ball for a radius of one (1) feet around each plant.
vi. Install containerized plants only when soil is moist and/or wet.
vii. Before installation, remove any damaged roots and loosen any circling or compacted roots.
viii. Install containerized plants using an appropriate implement such that a hole is created that will allow the plant to be inserted without any bending, binding, or breaking of roots.
ix. Container stock shall be planted in a vertical position with the root collar approximately 0.5 inches below the soil surface. The planting trench or hole shall be deep and wide enough to permit roots to spread out and down without J-rooting.
x. After planting, the soil shall be tamped firmly to eliminate air pockets.
xi. A 2 foot radius of a 3- to 4-inch layer of organic mulch such as straw must then be placed on the soil surface around the entire plant.
xii. If dry conditions occur following planting, a method to water the plants should be developed and implemented.

Plant spacing is called out on a grid basis such as 8 x 8, etc. This spacing refers to planting the plants 8 feet apart from each other in all directions within a planting zone. This spacing does not relate to planting distance from other zones or the planting distance at the zone boundary.

Planting shall begin 2' in from the planting zone boundary nearest to the stream. Planting will then proceed away from the stream on an 8' spacing. The plants will be planted along all other boundaries to within a distance of 4 feet or less from any boundary edge. This is likely to result in an outer row being planted closer than the designated 8' spacing.

Some existing stream buffer areas are to remain undisturbed. These areas should be protected from encroachment and no additional planting will be done in these areas. If some of these areas are impacted during construction activities, then the stream buffer restoration plan shall be implemented for those areas as well.

In addition to the woody plants to be planted in the stream buffer areas, the soil will be prepared, seeded and protected according to the temporary and permanent seeding requirements for the entirety of the site. However, no fescue, lespedeza, or other aggressive nonnative grasses are allowed to be planted in the stream buffer areas.

1.3.3 Planting Warranty

For all planted material, the contractor shall warrant an 80% survival rate against defects including mortality and poor growth, except for defects resulting from abuse by other parties and abnormal weather conditions.

2.0 Stream Daylighting and Remediation

2.1 Stream Daylighting

The approximate 40' pipe within the stream channel just west of the existing landfill, and within the proposed buffer restoration area, will be removed and the banks returned to natural conditions. This will be accomplished through the following steps:

- Removing the pipe during a dry period with low-flow conditions in the stream channel.
- Reestablishing the banks to match upstream and downstream contours.
- Stabilizing the stream banks with erosion control blanket down to, but not including, the bed of the stream.
- Planting the stream bank as described in Section 1.0 of this plan, along with the associated buffers.
- Appropriate sediment and erosion control measures will be used during this work.

2.2 Sediment Removal

The perennial channel between the two landfill cells, from the road crossing down to its confluence with the larger stream, will be enhanced through the removal of deposited sediment from within the channel. This will be accomplished in the following manner:

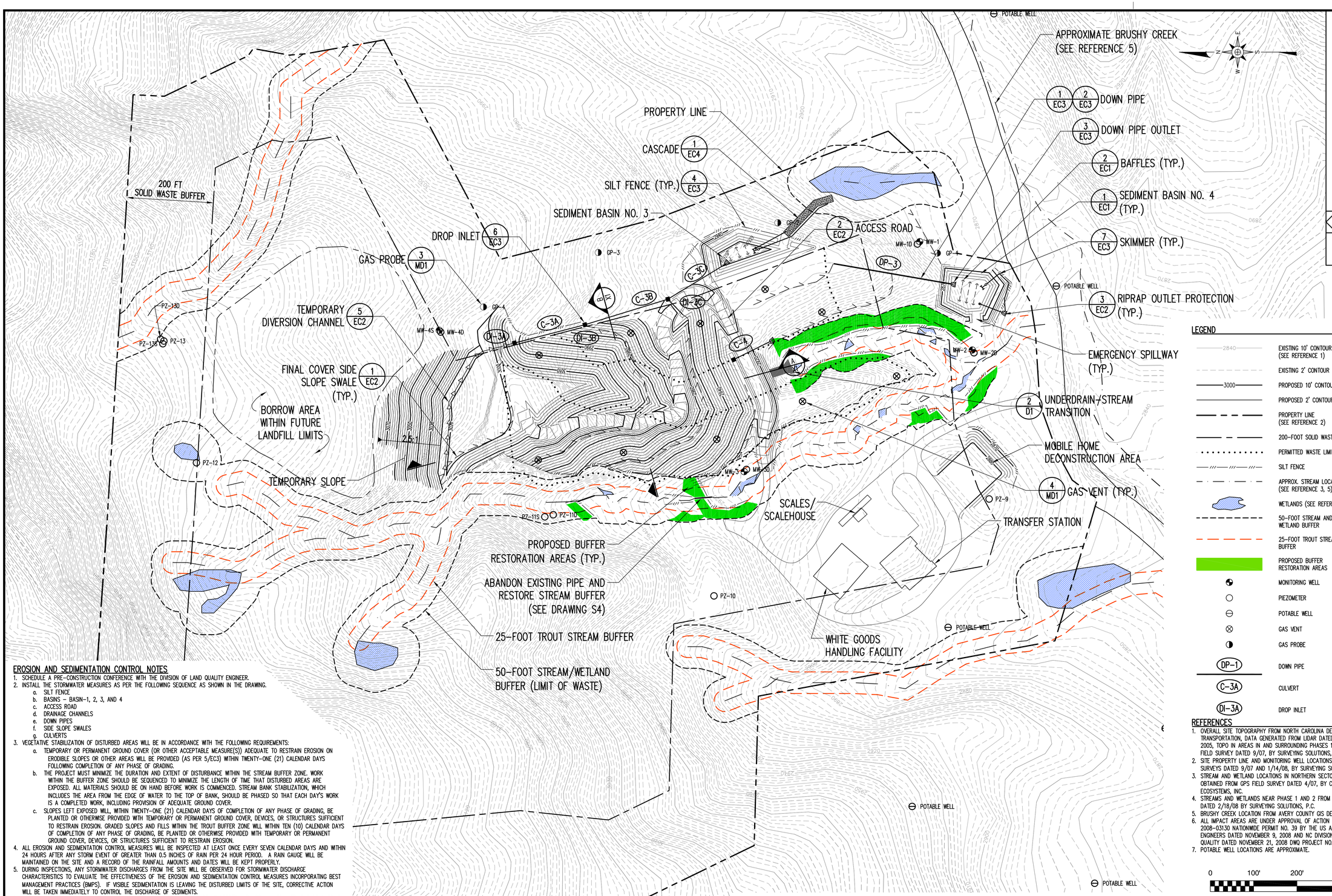
- Carolina Ecosystems, Inc. or other qualified personnel will inspect the stream channel prior to the start of the work, and place staking along the banks to indicate the areas and approximate depth of the sediment removal.
- Removal of the sediment will be performed by hand using shovels or other hand tools. No mechanized equipment will be used within the channel.
- Several staging areas for excavated materials will be established along the channel for deposition of the material. This material will then be moved by on-site equipment to an appropriate location with adequate sediment and erosion controls.
- The staging areas will be located in coordination with the buffer restoration and will be planted as described in Section 1.0 when work is completed. Each staging area will have silt fence placed on the downstream sides to prevent material from re-entering the channel.
- Sediment will be removed down to a depth just above the original bed of the stream in order to not disturb the channel dimensions.
- This work will be performed during a low-flow or dry period and appropriate sediment and erosion control measures will be implemented during this work.

3.0 Conclusions

This plan will be implemented in conjunction with the Avery County Landfill expansion. It will serve to provide compensation for the removal of 408 linear feet of intermittent channel that currently does not provide significant aquatic habitat, and to remediate previous secondary impacts from landfill operations. The result of this work will be a decrease in sedimentation of downstream trout habitat, an increase in the stability of temperature fluctuations within the channel, and a re-colonization of the affected stream channel by typical aquatic macrobenthos over the long term.

EROSION CONTROL BLANKET NOTE

1. FOLLOWING SEEDING, APPLY A 4' STRIP OF EROSION CONTROL BLANKET TO ALL DISTURBED STREAM BANKS. THE BLANKET WILL BEGIN AT THE TOE OF THE STREAM BANK AT THE MOST DOWNSTREAM POINT OF THE PROJECT (THIS IS SO THE OVERLAPS WILL GO WITH THE FLOW OF THE STREAM). THE BOTTOM EDGE SHOULD BE HEELED OR TACKED INTO THE SOIL SO AS TO PREVENT FLOATING. WHEN A NEW PIECE OF BLANKET IS USED, IT MUST BE PLACED ON TOP OF THE PREVIOUSLY INSTALLED BLANKET AND OVERLAPPED BY TWO OR MORE FEET. BRING THE BLANKET UP AND OVER THE TOP OF THE STREAM BANK AND HEEL IN THE TOP EDGE. APPLY DEGRADABLE BLANKET STAKES TO ENSURE GOOD CONTACT WITH THE SOIL. ALL OTHER SEEDED AREAS WILL BE PROPERLY COVERED WITH WHEAT STRAW TO PROTECT THE SOIL SURFACE.



EROSION AND SEDIMENTATION CONTROL NOTES

1. SCHEDULE A PRE-CONSTRUCTION CONFERENCE WITH THE DIVISION OF LAND QUALITY ENGINEER.
2. INSTALL THE STORMWATER MEASURES AS PER THE FOLLOWING SEQUENCE AS SHOWN IN THE DRAWING.
   a. SILT FENCE
   b. BASINS – BASIN-1, 2, 3, AND 4
   c. ACCESS ROAD
   d. DRAINAGE CHANNELS
   e. DOWN PIPES
   f. SIDE SLOPE SWALES
   g. CULVERTS
3. VEGETATIVE STABILIZATION OF DISTURBED AREAS WILL BE IN ACCORDANCE WITH THE FOLLOWING REQUIREMENTS:
   a. TEMPORARY OR PERMANENT GROUND COVER (OR OTHER ACCEPTABLE MEASURE(S)) ADEQUATE TO RESTRAIN EROSION ON ERODIBLE SLOPES OR OTHER AREAS WILL BE PROVIDED (AS PER 5/EC3) WITHIN TWENTY-ONE (21) CALENDAR DAYS FOLLOWING COMPLETION OF ANY PHASE OF GRADING.
   b. THE PROJECT MUST MINIMIZE THE DURATION AND EXTENT OF DISTURBANCE WITHIN THE STREAM BUFFER ZONE. WORK WITHIN THE BUFFER ZONE SHOULD BE SEQUENCED TO MINIMIZE THE LENGTH OF TIME THAT DISTURBED AREAS ARE EXPOSED. ALL MATERIALS SHOULD BE ON HAND BEFORE WORK IS COMMENCED. STREAM BANK STABILIZATION, WHICH INCLUDES THE AREA FROM THE EDGE OF WATER TO THE TOP OF BANK, SHOULD BE PHASED SO THAT EACH DAY'S WORK IS A COMPLETED WORK, INCLUDING PROVISION OF ADEQUATE GROUND COVER.
   c. SLOPES LEFT EXPOSED WILL, WITHIN TWENTY-ONE (21) CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION. GRADED SLOPES AND FILLS WITHIN THE TROUT BUFFER ZONE WILL WITHIN TEN (10) CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY OR PERMANENT GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION.
4. ALL EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT OF GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD. A RAIN GAUGE WILL BE MAINTAINED ON THE SITE AND A RECORD OF THE RAINFALL AMOUNTS AND DATES WILL BE KEPT PROPERLY.
5. DURING INSPECTIONS, ANY STORMWATER DISCHARGES FROM THE SITE WILL BE OBSERVED FOR STORMWATER DISCHARGE CHARACTERISTICS TO EVALUATE THE EFFECTIVENESS OF THE EROSION AND SEDIMENTATION CONTROL MEASURES INCORPORATING BEST MANAGEMENT PRACTICES (BMPS). IF VISIBLE SEDIMENTATION IS LEAVING THE DISTURBED LIMITS OF THE SITE, CORRECTIVE ACTION WILL BE TAKEN IMMEDIATELY TO CONTROL THE DISCHARGE OF SEDIMENTS.
6. REPAIRS TO EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE MADE AS NEEDED AND ACCUMULATED SEDIMENT REMOVED IF NECESSARY. ALL SEDIMENTS WHICH ARE REMOVED FROM EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE DISPOSED OF IN AN APPROVED MANNER AT A LOCATION TO BE DESIGNATED BY THE ENGINEER IN SUCH A MANNER THAT FURTHER EROSION AND SEDIMENTATION WILL NOT OCCUR.
7. THE CONTRACTOR SHALL ESTABLISH A SMOOTH, HEALTHY, UNIFORM, CLOSE STAND OF GRASS FROM THE SPECIFIED SEED. PRIOR TO REVEGETATION, THE CONTRACTOR SHALL ADEQUATELY TEST THE SOILS TO BE REVEGETATED TO ENSURE THE ADEQUACY OF THE SPECIFIED REQUIREMENTS. ANY MODIFICATIONS TO THESE REQUIREMENTS DEEMED NECESSARY AFTER THE REVIEW OF SOIL TEST RESULTS, SHALL BE AT THE CONTRACTOR'S SOLE EXPENSE. THE ENGINEER WILL PERFORM THE OBSERVATIONS TO DETERMINE WHEN SUCCESSFUL REVEGETATION IS ACHIEVED.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL SEEDED AREAS THROUGH THE END OF HIS WARRANTY PERIOD. THE CONTRACTOR SHALL PROVIDE, AT HIS EXPENSE, PROTECTION OF ALL SEEDED AREAS AGAINST DAMAGE AT ALL TIMES UNTIL ACCEPTANCE OF THE WORK.

CULVERT SCHEDULE

NO.	SIZE	LENGTH (FT)	INV. IN (FT)	INV. OUT (FT)	SLOPE (%)	REMARKS
C-3A	18" CPP	200	3013	2973	2	INLET IN DI-3B
C-3B	24" CPP	250	2970	2939	12.4	INLET IN DI-3B
C-3C	24" CPP	170	2934	2930	2.3	INLET IN BASIN-3
C-4	18" RCP	75	2918	2900	24	INLET IN GRASS SWALE TO BASIN-4

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
2. SITE PROPERTY LINE AND MONITORING WELL LOCATIONS FROM FIELD SURVEYS DATED 9/07 AND 1/14/08, BY SURVEYING SOLUTIONS, P.C.
3. STREAM AND WETLAND LOCATIONS IN NORTHERN SECTOR OF SITE OBTAINED FROM GPS FIELD SURVEY DATED 4/07, BY CAROLINA ECOSYSTEMS, INC.
4. STREAMS AND WETLANDS NEAR PHASE 1 AND 2 FROM FIELD SURVEY DATED 2/18/08 BY SURVEYING SOLUTIONS, P.C.
5. BRUSHY CREEK LOCATION FROM AVERY COUNTY GIS DEPARTMENT.
6. ALL IMPACT AREAS ARE UNDER APPROVAL OF ACTION ID 2008-03130 NATIONWIDE PERMIT NO. 39 BY THE US ARMY CORE OF ENGINEERS DATED NOVEMBER 9, 2008 AND NC DIVISION OF WATER QUALITY DATED NOVEMBER 21, 2008 DWQ PROJECT NO. #08-1464.
7. POTABLE WELL LOCATIONS ARE APPROXIMATE.

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
2	8/5/09	ADDED SPOT ELEVATIONS
1	7/30/09	RESPONSE TO NCDER COMMENT LETTER DATED 5-22-09

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SEAL

SEAL

PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
FINAL GRADING PLAN

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0067B	
SHEET NO. 5	DRAWING NO. S4

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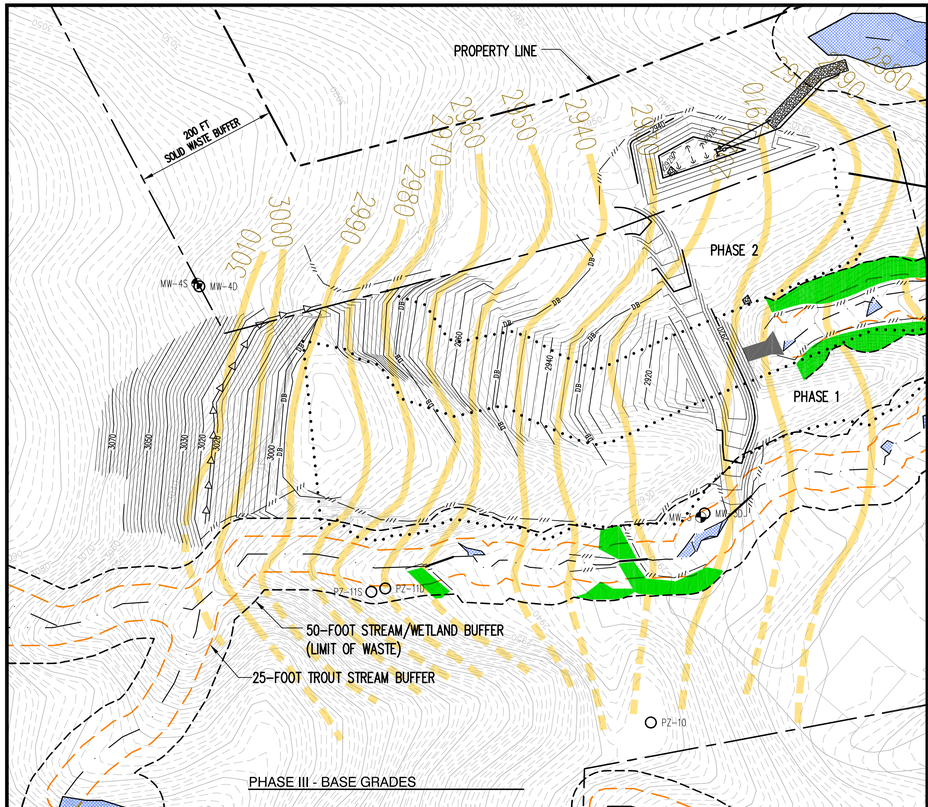
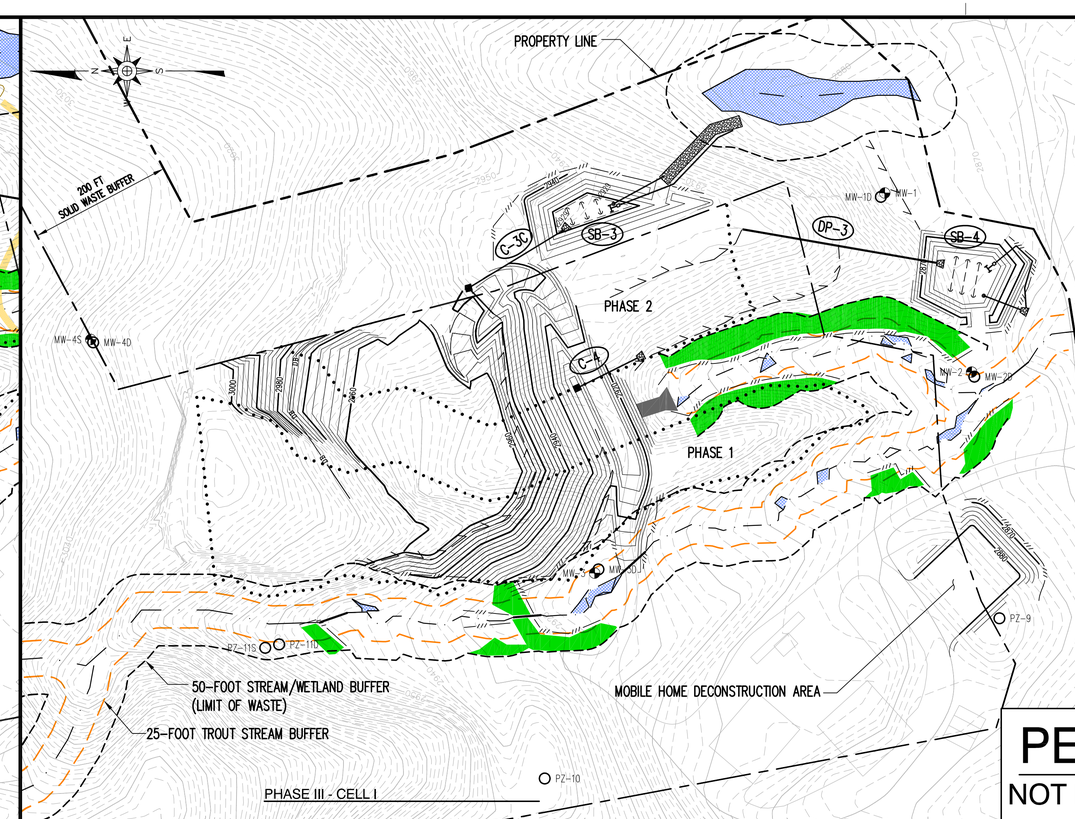


PHASE III - BASE GRADES



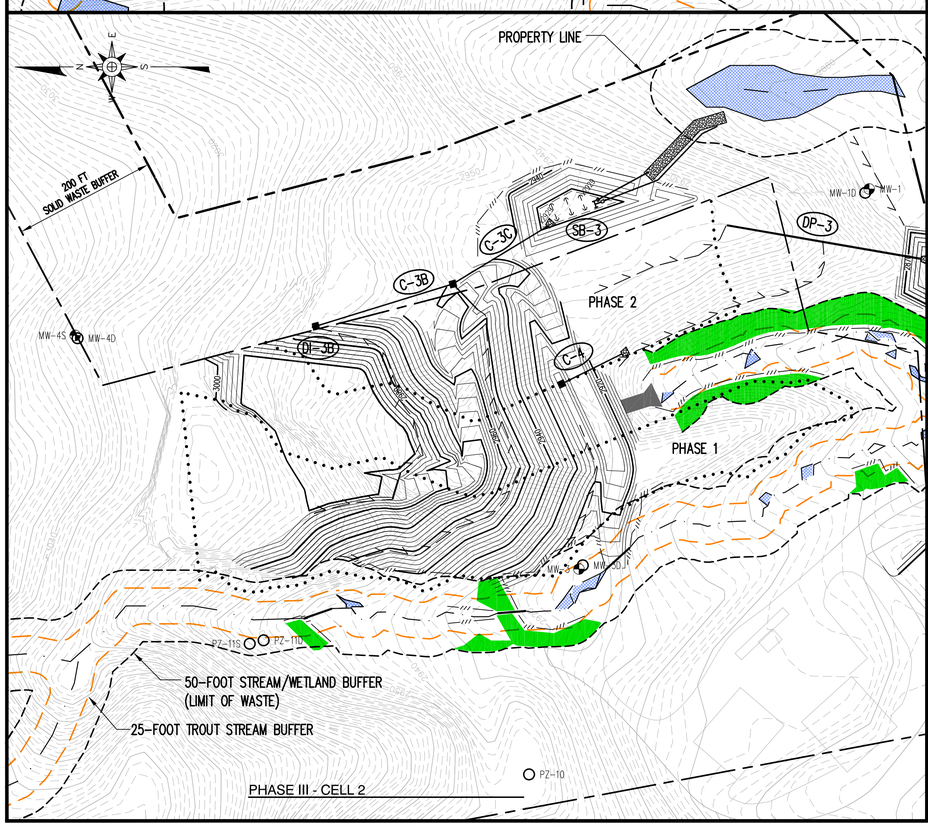
PHASE III - CELL I

LEGEND

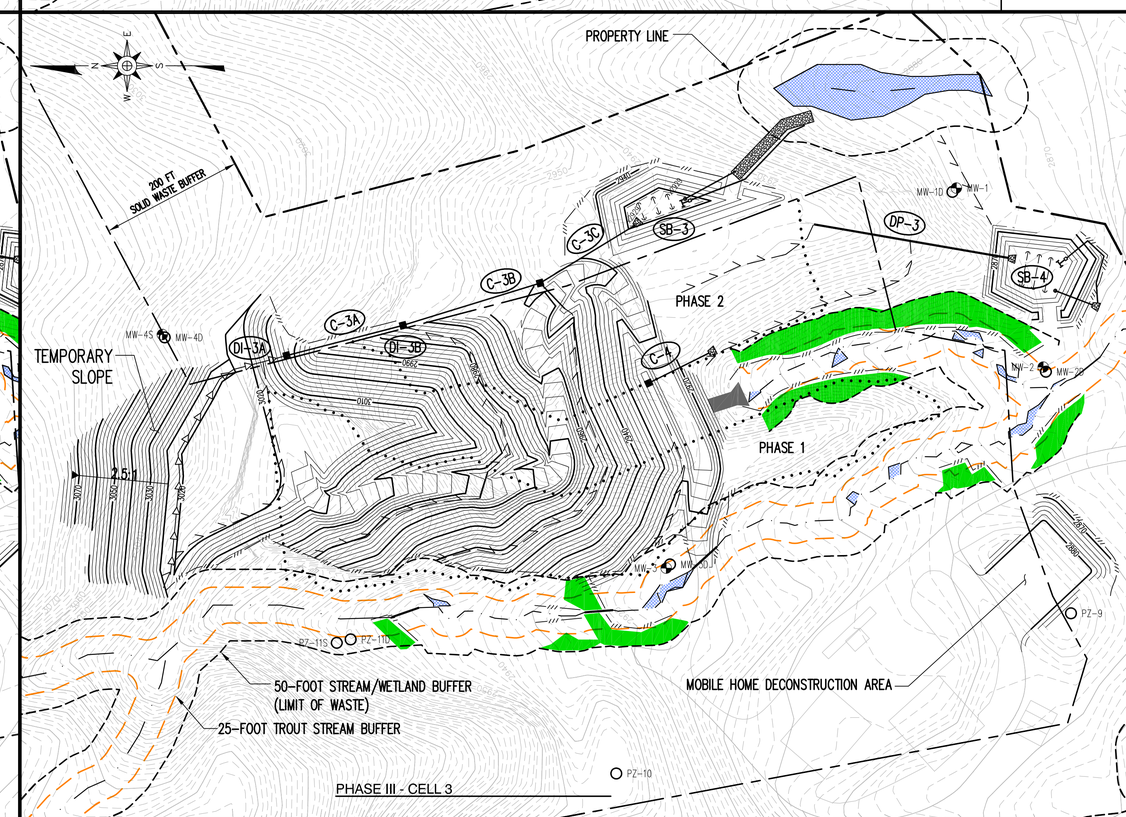
- EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- 200-FOOT SOLID (SEE REFERENCE 2)
- PERMITTED WASTE LIMITS
- SILT FENCE
- APPROX. STREAM LOCATION (SEE REFERENCE 3, 5)
- WETLANDS (SEE REFERENCE 3)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER
- PROPOSED BUFFER RESTORATION AREAS
- POTENTIOMETRIC SURFACE (DASHED WHERE INFERRED)
- MONITORING WELL
- PIEZOMETER
- POTABLE WELL
- DP-1 DOWN PIPE
- C-3A CULVERT
- DI-3A DROP INLET
- SB-3 SEDIMENT BASIN

PERMIT ISSUE

NOT FOR CONSTRUCTION



PHASE III - CELL 2



PHASE III - CELL 3

REFERENCES

1. OVERALL SITE TOPOGRAPHY FROM NORTH CAROLINA DEPARTMENT OF TRANSPORTATION, DATA GENERATED FROM LIDAR DATED MARCH 2005, TOPO IN AREAS IN AND SURROUNDING PHASES 1 AND 2 FROM FIELD SURVEY DATED 9/07, BY SURVEYING SOLUTIONS, P.C.
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7. POTENTIOMETRIC SURFACE SHOWN ON PHASE III BASE GRADES LAYOUT, WAS OBTAINED FROM DRAWING, AVERY COUNTY C&D LANDFILL POTENTIOMETRIC MAP SPRING '09, CREATED BY RICHARDSON SMITH GARDNER AND ASSOCIATES IN JULY 2009.

0 100' 200' 300'

NO.	DATE	REVISION
2	8/5/09	ADDED DIVERSION BERMS, SPOT ELEVATIONS
1	7/30/09	RESPONSE TO NCDENR COMMENT LETTER DATED 5-22-09

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SEAL

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PROJECT TITLE: AVERY COUNTY C&D LANDFILL PHASE 3 PERMIT TO CONSTRUCT

DRAWING TITLE: PHASING PLAN

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0075B	
SHEET NO. 6	DRAWING NO. P1

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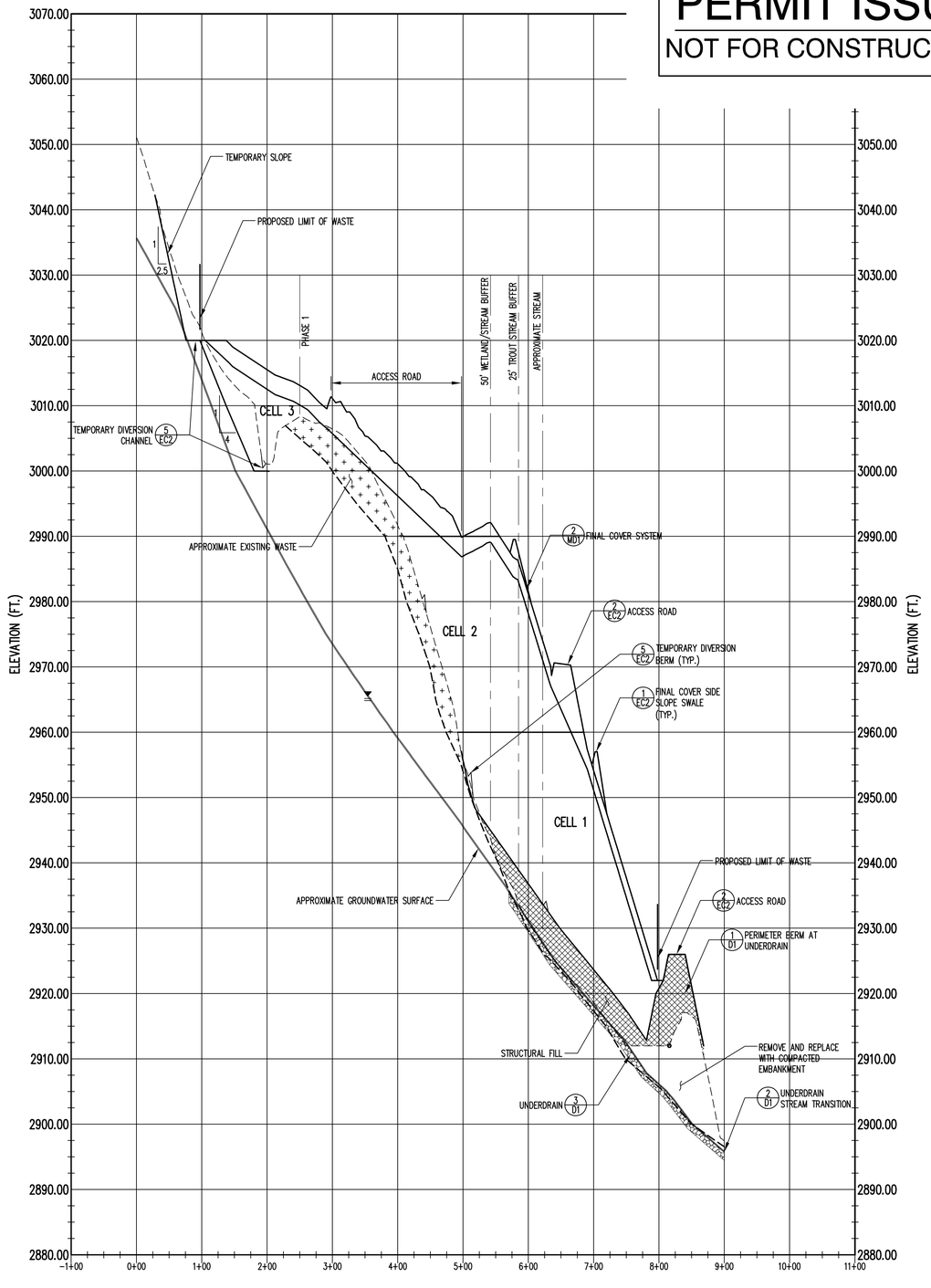
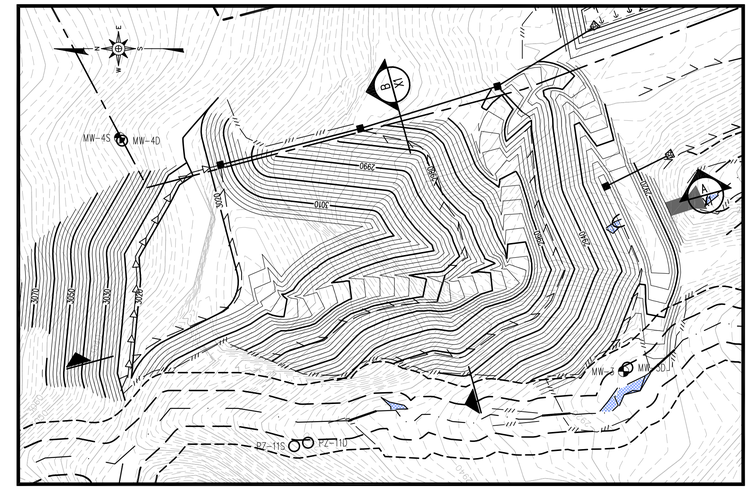
PERMIT ISSUE
NOT FOR CONSTRUCTION



SECTION AA

DETAIL A X1
NOT TO SCALE



SECTION LOCATION MAP
SCALE: 1" = 100'

LEGEND

- 2840 — EXISTING 10' CONTOUR (SEE REFERENCE 1)
- EXISTING 2' CONTOUR
- 3000 — PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPERTY LINE (SEE REFERENCE 2)
- 200-FOOT SOLID WASTE BUFFER
- PERMITTED WASTE LIMITS
- SILT FENCE
- APPROX. STREAM LOCATION (SEE REFERENCE 3, 5)
- WETLANDS (SEE REFERENCE 3)
- 50-FOOT STREAM AND WETLAND BUFFER
- 25-FOOT TROUT STREAM BUFFER

REFERENCES

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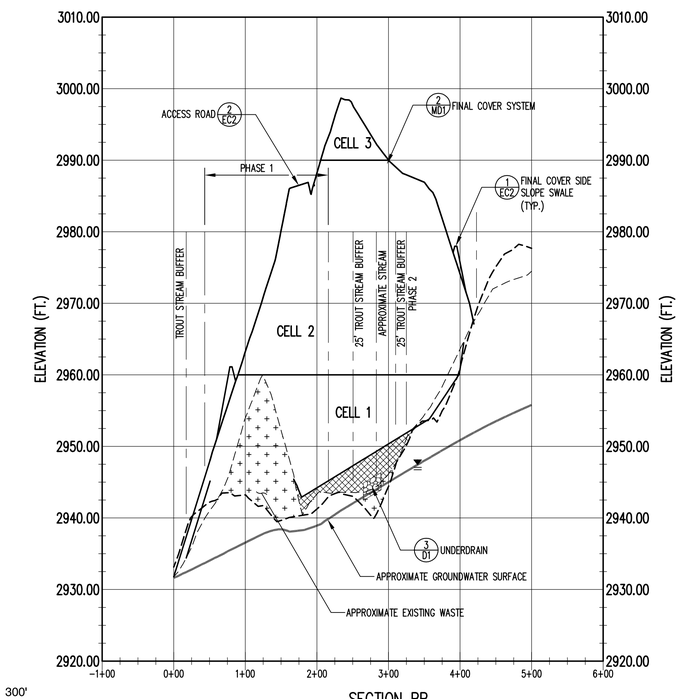
5. BRUSHY CREEK LOCATION FROM AVERY COUNTY GIS DEPARTMENT.
6. DRAWING ENTITLED "CONCEPTUAL DESIGN, SHEET 1 OF 1", DATED 6/22/95, PREPARED BY MUNICIPAL ENGINEERING SERVICES, P.A. EXPANSION LIMITS UPDATED TO REFLECT PENDING PERMITTING, SEE DRAWING "BASE GRADING PLAN" BY RSG ENGINEERS.



SECTION BB

DETAIL B X1
NOT TO SCALE

30' 20' 10' 0

0 100' 200' 300'

NO.	DATE	REVISION
2	8/5/09	ADDED DIVERSION BERMS

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SEAL

SEAL

PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
SECTIONS

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0068A	
SHEET NO. 7	DRAWING NO. X1

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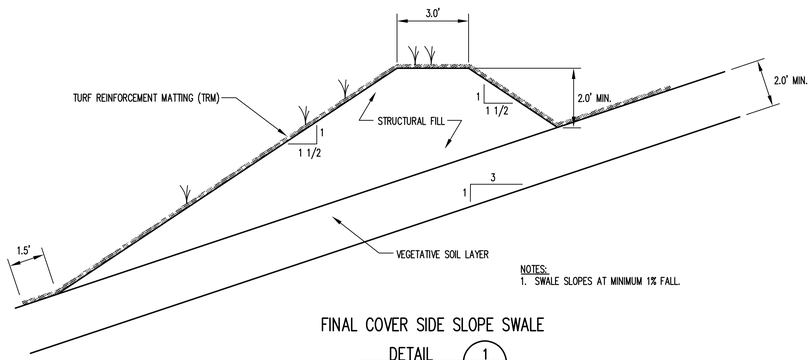
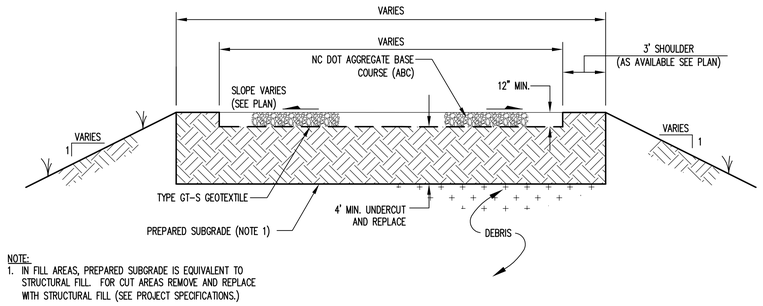


NOTES:
1. SWALE SLOPES AT MINIMUM 1% FALL.

FINAL COVER SIDE SLOPE SWALE

DETAIL 1/EC2
NOT TO SCALE



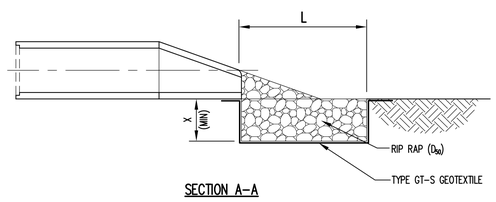
NOTE:
1. IN FILL AREAS, PREPARED SUBGRADE IS EQUIVALENT TO STRUCTURAL FILL. FOR CUT AREAS REMOVE AND REPLACE WITH STRUCTURAL FILL (SEE PROJECT SPECIFICATIONS.)

TYPICAL ROADWAY CROSS SECTION

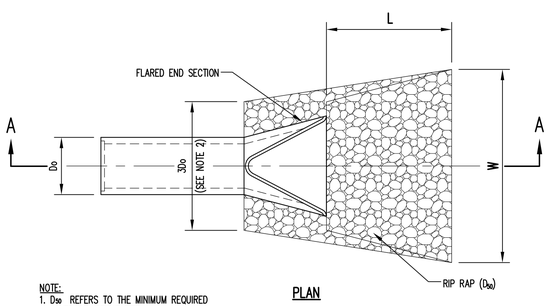
DETAIL 2/EC2
NOT TO SCALE

RIP RAP OUTLET PROTECTION SCHEDULE

PIPE	D_0 (IN)	L (FT)	W (FT)	D_{50} (FT)	X (FT)
BASIN-3	15	10	11.5	0.5	1.0
BASIN-4	15	10	11.5	0.5	1.0
DP-1	18	18	19.5	0.75	1.5
DP-2	18	20	21.5	0.75	1.5
DP-3	18	15	19.5	0.75	1.5
C-3C	24	18	20	0.5	1.0
C-4	18	10	11.5	0.25	0.5



SECTION A-A

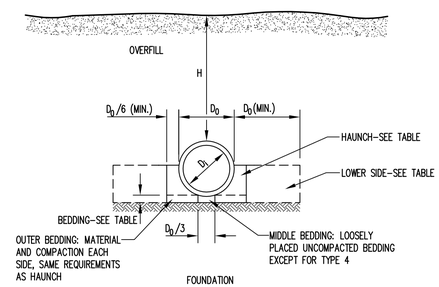


NOTE:
1. D_{50} REFERS TO THE MINIMUM REQUIRED AVERAGE STONE SIZE
2. FOR MORE THAN ONE PIPE, EXTEND RIP RAP 1.0' MIN. BEYOND OUTSIDE EDGES OF PIPES.

PLAN

RIP RAP OUTLET PROTECTION

DETAIL 3/EC2
NOT TO SCALE



CONCRETE PIPE INSTALLATION

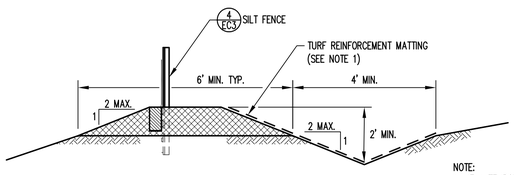
DETAIL 4/EC2
NOT TO SCALE

(BASED ON AMERICAN CONCRETE PIPE ASSOCIATION RECOMMENDATIONS)

STANDARD EMBANKMENT INSTALLATION SOILS AND MINIMUM COMPACTION REQUIREMENTS

INSTALLATION TYPE	BEDDING THICKNESS	HAUNCH AND OUTER BEDDING	LOWER SIDE
TYPE 1	D_0/24"(600mm) MINIMUM, NOT LESS THAN 3"(75mm). IF ROCK FOUNDATION, USE D_0/12"(300mm) MINIMUM, NOT LESS THAN 6"(150mm).	95% SW, SP, GW, GP	90% SW, SP, GW, GP; 95% ML, SM, GM OR GC, SC WITH <20% PASSING NO.200 SIEVE; OR 100% CL, MH, SC, GC, CH.
TYPE 2	D_0/24"(600mm) MINIMUM, NOT LESS THAN 3"(75mm). IF ROCK FOUNDATION, USE D_0/12"(300mm) MINIMUM, NOT LESS THAN 6"(150mm).	90% SW, SP, GW, GP; OR 95% ML, SM, GM OR GC, SC WITH <20% PASSING NO.200 SIEVE	85% SW, SP, GW, GP; 90% ML, SM, GM OR GC, SC WITH <20% PASSING NO.200 SIEVE; OR 95% CL, MH, SC, GC, CH.
TYPE 3	D_0/24"(600mm) MINIMUM, NOT LESS THAN 3"(75mm). IF ROCK FOUNDATION, USE D_0/12"(300mm) MINIMUM, NOT LESS THAN 6"(150mm).	85% SW, SP, GW, GP; 90% ML, SM, GM OR GC, SC WITH <20% PASSING NO.200 SIEVE; OR 95% CL, MH, SC, GC, CH	85% SW, SP, GW, GP; 90% ML, SM, GM OR GC, SC WITH <20% PASSING NO.200 SIEVE; OR 95% CL, MH, SC, GC, CH.
TYPE 4	NO BEDDING REQUIRED, EXCEPT IF ROCK FOUNDATION, USE D_0/12"(300mm) MINIMUM, NOT LESS THAN 6"(150mm).	NO COMPACTION REQUIRED, EXCEPT IF CL, MH, SC, GC, CH USE 85%	NO COMPACTION REQUIRED, EXCEPT IF CL, MH, SC, GC, CH USE 85%

NOTES:
1. COMPACTION AND SOIL SYMBOLS (95% SW) REFER TO SW SOIL MATERIAL (USCS CLASSIFICATION) WITH A MINIMUM STANDARD PROCTOR COMPACTION (ASTM D 698) OF 95%.
2. SOIL IN THE OUTER BEDDING, HAUNCH, AND LOWER SIDE ZONES, EXCEPT WITHIN D_0/3 FROM THE PIPE SPRINGLINE, SHALL BE COMPACTED TO AT LEAST THE SAME COMPACTION AS THE MAJORITY OF THE SOIL IN THE OVERFILL ZONE.
3. SUBTRENCHES:
   3.1. A SUBTRENCH IS DEFINED AS A TRENCH WITH ITS TOP BELOW FINISHED GRADE BY MORE THAN 0.1H OR, FOR ROADWAYS, ITS TOP IS AT AN ELEVATION LOWER THAN 1'(0.3m) BELOW THE BOTTOM OF THE PAVEMENT BASE MATERIAL.
   3.2. THE MINIMUM WIDTH OF A SUBTRENCH SHALL BE 1.33 D_0 OR WIDER IF REQUIRED FOR ADEQUATE SPACE TO ATTAIN THE SPECIFIED COMPACTION IN THE HAUNCH AND BEDDING ZONES.
   3.3. FOR SUBTRENCHES WITH WALLS OF NATURAL SOIL, ANY PORTION OF THE LOWER SIDE ZONE IN THE SUBTRENCH WALL SHALL BE AT LEAST AS FIRM AS AN EQUIVALENT SOIL PLACED TO THE COMPACTION REQUIREMENTS SPECIFIED FOR THE LOWER SIDE ZONE AND AS FIRM AS THE MAJORITY IF THE SOIL IN THE OVERFILL ZONE, OR SHALL BE REMOVED AND REPLACED WITH SOIL COMPACTED TO THE SPECIFIED LEVEL.



NOTE:
1. IF A TEMPORARY DIVERSION BERM IS SPECIFIED ON THE SITE PLAN, NO EXCAVATION SHALL BE ASSUMED AND SHALL BE CONSTRUCTED A MINIMUM OF 2 FEET HIGH.

TEMPORARY DIVERSION CHANNEL – BERM 2

DETAIL 5/EC2
NOT TO SCALE

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
2	8/5/09	REVISED DETAIL 5/EC2

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PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
STORMWATER MANAGEMENT
DETAILS
(SHEET 2 OF 3)

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0071A	
SHEET NO. 9	DRAWING NO. EC2

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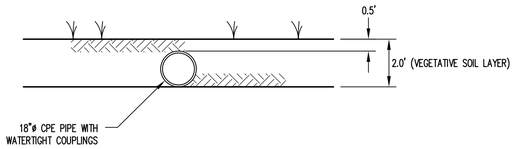
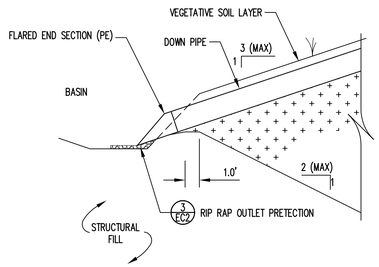


DOWN PIPE ON SLOPE

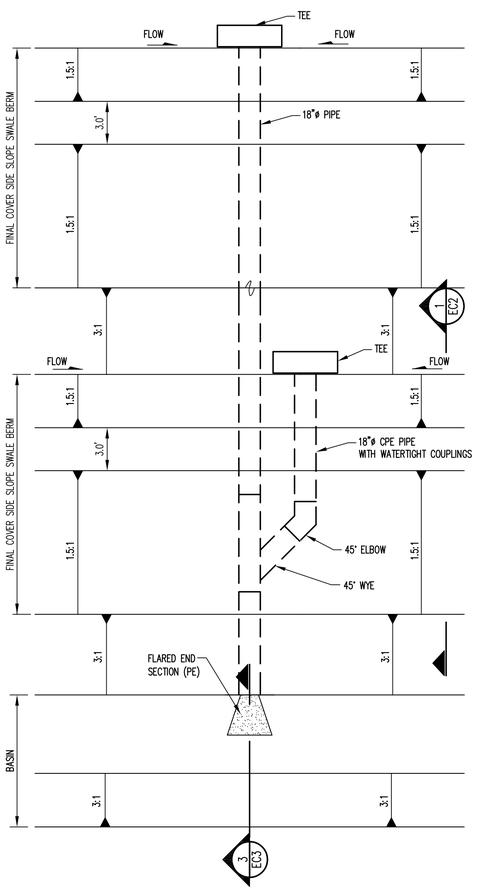
DETAIL 1 / EC3
NOT TO SCALE



DOWN PIPE OUTLET

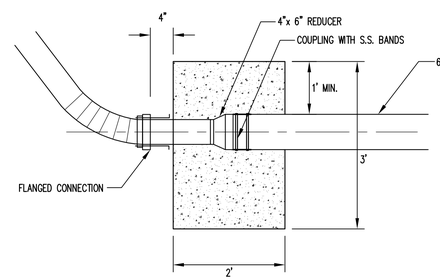
DETAIL 3 / EC3
NOT TO SCALE

PERMIT ISSUE
NOT FOR CONSTRUCTION

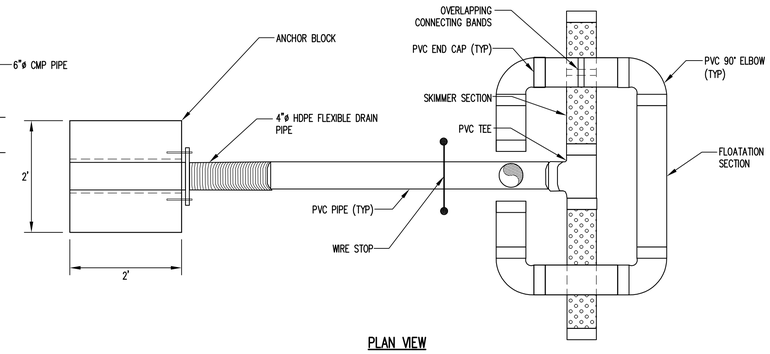


DOWN PIPE INLETS & OUTLETS

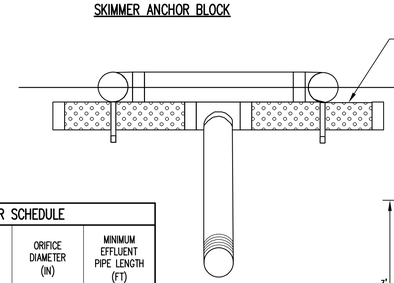
DETAIL 2 / EC3
NOT TO SCALE



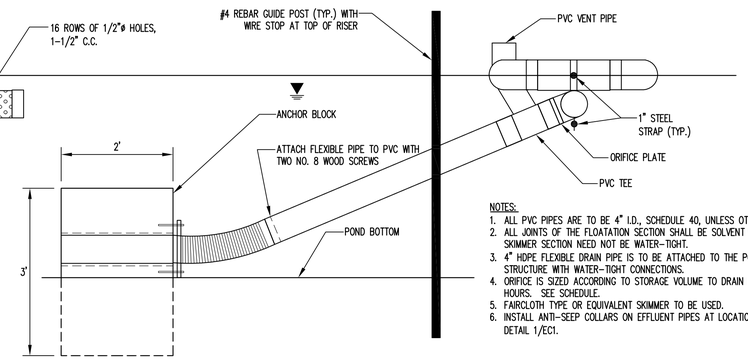
SKIMMER ANCHOR BLOCK



PLAN VIEW



FRONT VIEW



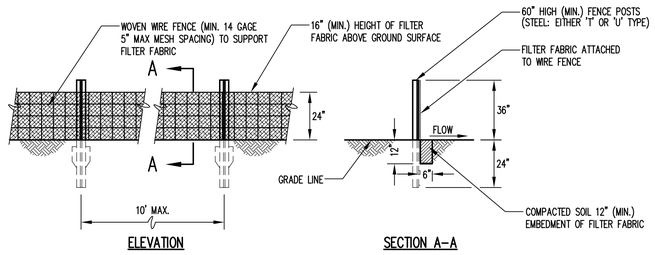
SIDE VIEW

SKIMMER SCHEDULE			
BASIN	ANTI-SEEP COLLARS (FT)	ORIFICE DIAMETER (IN)	MINIMUM EFFLUENT PIPE LENGTH (FT)
3	1 x 1	4	280
4	1 x 1	4	135

NOTES:
1. ALL PVC PIPES ARE TO BE 4" I.D., SCHEDULE 40, UNLESS OTHERWSE NOTED.
2. ALL JOINTS OF THE FLOATATION SECTION SHALL BE SOLVENT WELDED. JOINTS OF SKIMMER SECTION NEED NOT BE WATER-TIGHT.
3. 4" HDPE FLEXIBLE DRAIN PIPE IS TO BE ATTACHED TO THE POND OUTLET STRUCTURE WITH WATER-TIGHT CONNECTIONS.
4. ORIFICE IS SIZED ACCORDING TO STORAGE VOLUME TO DRAIN POND IN 24 TO 72 HOURS. SEE SCHEDULE.
5. FAIRCLOTH TYPE OR EQUIVALENT SKIMMER TO BE USED.
6. INSTALL ANTI-SEEP COLLARS ON EFFLUENT PIPES AT LOCATIONS SHOWN ON DETAIL 1/EC1.

SKIMMER

DETAIL 7 / EC3
NOT TO SCALE



ELEVATION

SECTION A-A

SILT FENCE

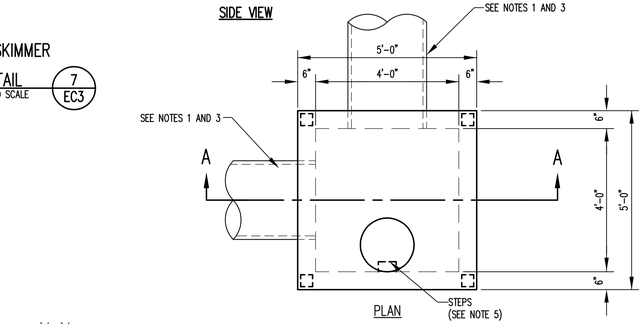
DETAIL 4 / EC3
NOT TO SCALE

SEEDING SCHEDULE NO. 2M		
MATERIAL	SEED TYPE	APPLICATION RATE
LIME	-	4,000 LBS/ACRE
FERTILIZER	10-10-10 ANALYSIS	1,000 LBS/ACRE
SEED	CREEPING RED FESCUE, BLUEGRASS AND TALL FESCUE	40 LBS/ACRE
PERMANENT	CROW VETCH KOREAN LESPEDEZA REDTOP SEASONAL NURSE CROP	10 LBS/ACRE 10 LBS/ACRE 5 LBS/ACRE SEE NOTE 2
TEMPORARY	SEASONAL NURSE CROP	SEE NOTE 2
MULCH	-	4,000-5,000 LBS/ACRE
BINDER	ASPHALT EMULSION	300 GALLONS/ACRE

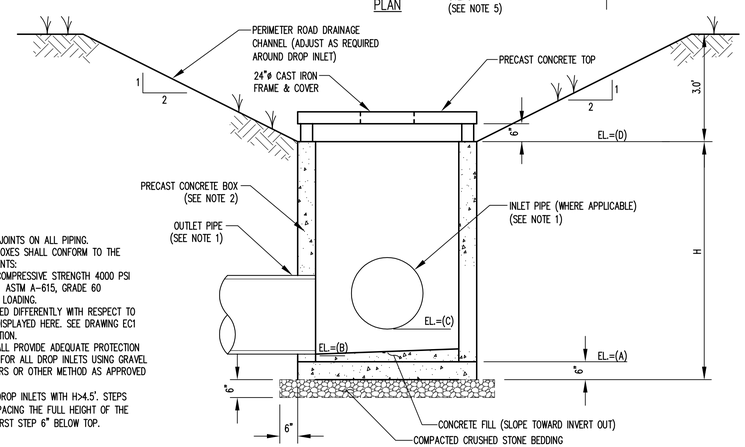
NOTES:
1. APPLICATION RATES AND/OR CHEMICAL ANALYSIS SHALL BE CONFIRMED OR ESTABLISHED BY A SOIL TEST.
2. USE SEASONAL NURSE CROP IN ACCORDANCE WITH SEEDING DATES AS STATED BELOW:
   MAY 1 - AUGUST 15 — 10 LBS/ACRE GERMAN MILLET OR 15 LBS/ACRE SUDANGRASS
   AUGUST 16 - APRIL 30 — 40 LBS/ACRE RYE (GRAIN)
3. IN TROUT BUFFERS, USE 15 LBS/ACRE OF SEED MIX ERNMX-304 (NC MOUNTAINS RIPARIAN MIX) FROM ERNST SEED COMPANY OR EQUIVALENT.

SEEDING SCHEDULE

DETAIL 5 / EC3
NOT TO SCALE



PLAN



NOTES:
1. PROVIDE WATERTIGHT JOINTS ON ALL PIPING.
2. PRECAST CONCRETE BOXES SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
   A. CONCRETE: COMPRESSIVE STRENGTH 4000 PSI
   B. REINFORCING: ASTM A-615, GRADE 60
   C. MEETS H-20 LOADING.
3. PIPES MAY BE ORIENTED DIFFERENTLY WITH RESPECT TO THE CHANNEL THAN DISPLAYED HERE. SEE DRAWING EC1 FOR PROPER ORIENTATION.
4. THE CONTRACTOR SHALL PROVIDE ADEQUATE PROTECTION FROM SEDIMENTATION FOR ALL DROP INLETS USING GRAVEL AND WIRE MESH FILTERS OR OTHER METHOD AS APPROVED BY THE ENGINEER.
5. PROVIDE STEPS FOR DROP INLETS WITH H>4.5'. STEPS SHALL HAVE A 16" SPACING THE FULL HEIGHT OF THE DROP INLET. START FIRST STEP 6" BELOW TOP.

DROP INLET SCHEDULE					
DROP INLET	BASE OF BOX EL=(A) FT	OUTLET PIPE INVERT EL=(B) FT	INLET PIPE INVERT EL=(C) FT	TOP of BOX EL=(D) FT	HEIGHT of BOX (FT) (H)
DI-3A	3,012.5	3,013.0	N/A	3,002.0	4.0
DI-3B	2,969.5	2,970.0	2,973.0	2,976.0	7.0
DI-3C	2,933.5	2,934.0	2,939.0	2,942.0	9.0

2

SECTION A-A

DROP INLET

DETAIL 6 / EC3
NOT TO SCALE

NO.	DATE	REVISION
2	8/5/09	REVISED DROP INLET SCHEDULE 6/EC3

RICHARDSON SMITH GARDNER & ASSOCIATES
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PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
STORMWATER MANAGEMENT
DETAILS
(SHEET 3 OF 3)

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0072A	
SHEET NO. 10	DRAWING NO. EC3

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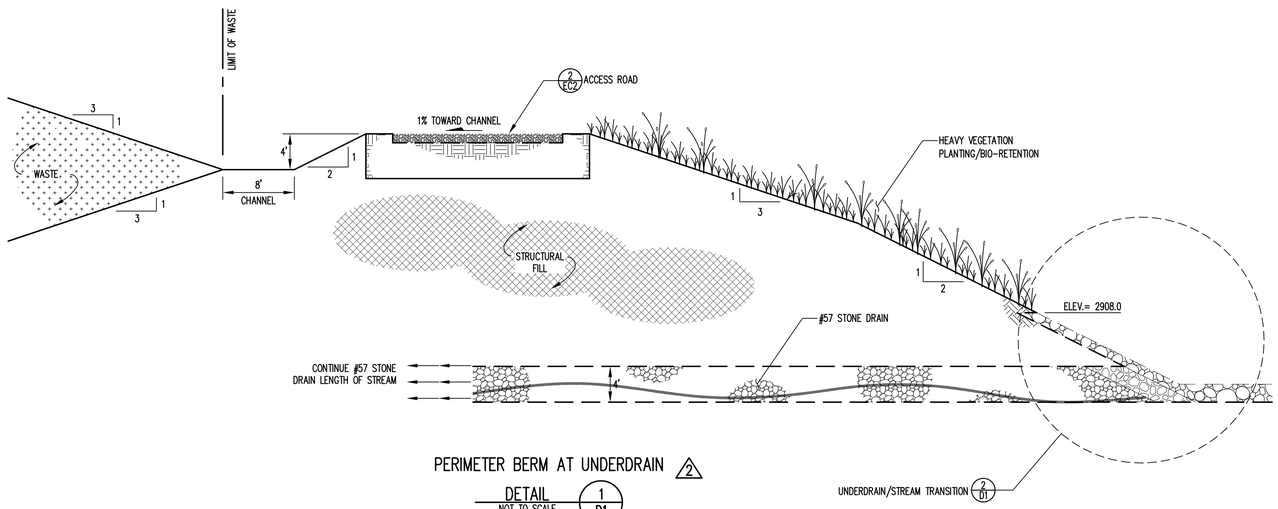
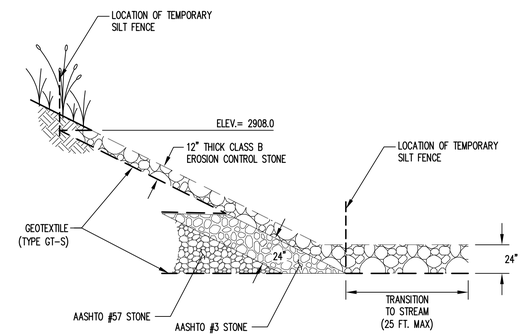


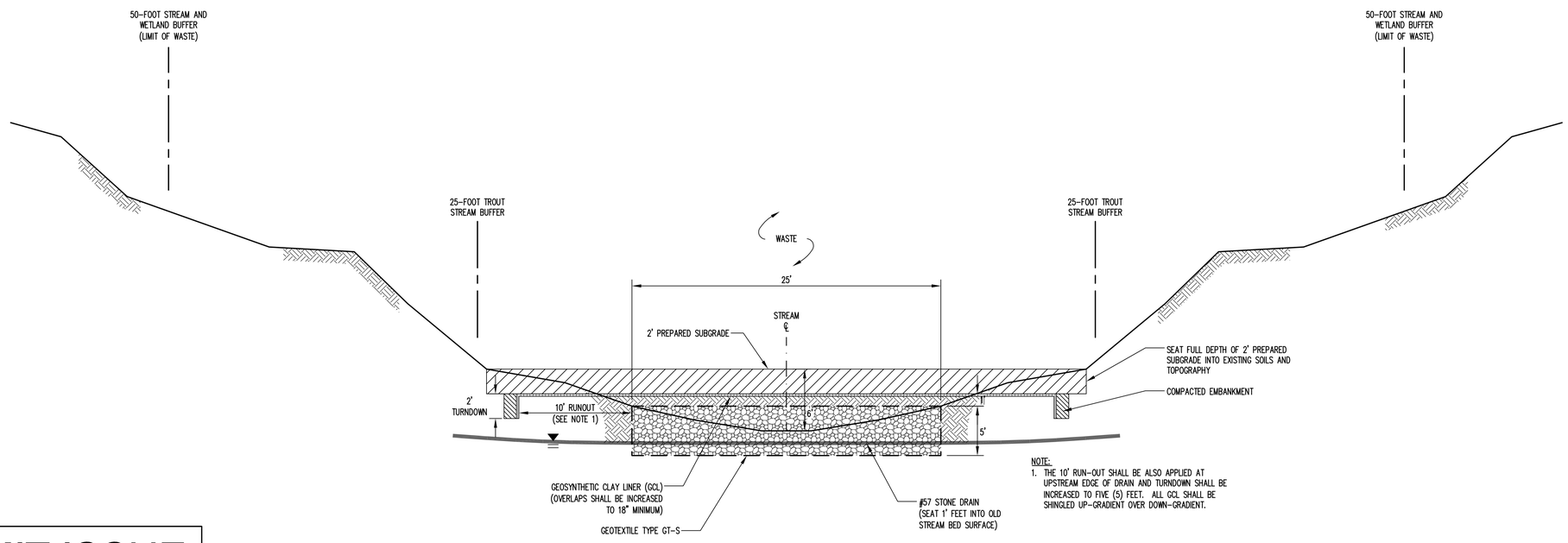
PERIMETER BERM AT UNDERDRAIN 2

DETAIL 1 / D1
NOT TO SCALE



UNDERDRAIN – STREAM TRANSITION

DETAIL 2 / D1
NOT TO SCALE



NOTE:
1. THE 10' RUN-OUT SHALL BE ALSO APPLIED AT UPSTREAM EDGE OF DRAIN AND TURNDOWN SHALL BE INCREASED TO FIVE (5) FEET. ALL GCL SHALL BE SHINGLED UP-GRADIENT OVER DOWN-GRADIENT.

UNDERDRAIN – TYPICAL SECTION 2

DETAIL 3 / D1
NOT TO SCALE

PERMIT ISSUE
NOT FOR CONSTRUCTION

NO.	DATE	REVISION
2	8/5/09	REVISED DETAILS 1/D1 & 3/D1

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PROJECT TITLE:
AVERY COUNTY
C&D LANDFILL
PHASE 3
PERMIT TO CONSTRUCT

DRAWING TITLE:
UNDERDRAIN DETAILS

DESIGNED BY: S.A.S.	DRAWN BY: C.T.J.
CHECKED BY:	PROJECT NO.: AVERY 08-4
SCALE: AS SHOWN	DATE: FEB. 2009
FILE NAME: AVERY-D0076A	
SHEET NO. 12	DRAWING NO. D1

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