

DIN 25852

PERMIT MODIFICATION

Prepared For:

**GREENWAY WASTE SOLUTIONS OF HARRISBURG, LLC.
19109 WEST CATAWBA AVENUE
SUITE 200
CORNELIUS, NC 28031**

Prepared By:

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CHARLOTTE, NC**

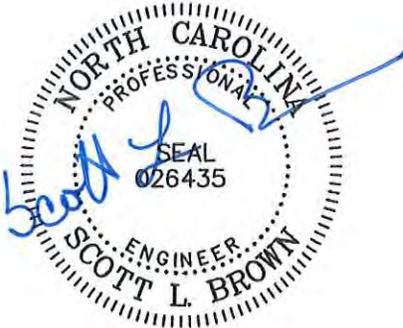
CEC Project 111-370.002

North Carolina Board of Examiners

For

Engineers and Surveyors

License No. C-3035



January 29, 2016



Civil & Environmental Consultants, Inc.

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January 29, 2016

ELECTRONIC SUBMITTAL

john.murray@ncdenr.gov

Mr. John Murray
Solid Waste Section
Division of Waste Management
North Carolina Department of Environmental Quality
400 Commerce Ave
Morehead City, NC 28557



Dear John:

Subject: Greenway Waste Solutions of Harrisburg, LLC Permit
Renewal/Modification Application
Greenway Waste Solutions of Harrisburg, LLC
Permit No. 13-06 CDLF
CEC Project 111-370

On behalf of Greenway Waste Solutions of Harrisburg, LLC, and pursuant to 15A NCAC 13B .1603 (5), please consider this application a request for a permit renewal for the abovementioned facility, which accepts less than 120,000 tons per year. In accordance with 15A NCAC 13B .1603 (5), the facility must submit an application for permit renewal and update applicable sections of the Permit to Construct. Included in this Permit Application is an updated Operations Plan.

At this time, the facility is not proposing to modify:

- The facility plan;
- The engineering plan;
- The construction quality assurance plan;
- The monitoring plans; and
- The closure and post-closure plan.

In addition, Greenway Waste Solutions of Harrisburg, LLC, requests an extension to the Permit to Construct for the Phase 1 Expansion, dated July 1, 2011 (DIN 11248).

As part of this submittal, a Permit Modification is also requested. Included in this application is a summary of the permit modifications, revised operations plan, calculations and permit modification drawings.

Specifically, the permit modification is related to the final closure grades and stormwater features. The flat benches, as depicted in the permitted drawings, have been removed from the landfill face and replaced with "tack-on" drainage swales constructed on the landfill side slopes

Mr. John Murray – NCDEQ
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to intercept sheet flow run-off and convey the storm water to perimeter swales and sediment basins. The proposed revisions associated with this permit modification will increase the capacity for Phase areas 1, 2, and 3 to 5,996,908 cubic yards. The resulting additional capacity is 526,908 cubic yards, a 9.6% increase in capacity from the permitted Phase 1-3 and Landfill Expansion Area combined capacity.

It is understood that changes to the items above may result in additional application fees.

Please let me know if you have any questions or comments. I can be reached at (704) 773-6465 or by e-mail at sbrown@cecinc.com.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

A handwritten signature in blue ink that reads "Scott L. Brown". The signature is stylized and includes a long horizontal line extending to the right.

Scott L. Brown, PE
Vice President

cc: John Brown, Greenway Waste Solutions of Harrisburg, LLC

1.0 SITE DESCRIPTION

This Application for the Modification of Solid Waste Permit for Construction and Demolition Debris Landfill at the Highway 49 C&D Landfill is being submitted by Civil & Environmental Consultants, Inc. on behalf of Greenway Waste Solutions at Harrisburg, LLC. This application package includes information regarding the site design, construction and operation.

Project Title: Highway 49 Landfill Closure Permit Modification for the Construction and Demolition Debris Landfill Facility Solid Waste Permit Number 13-06

Property Owner: C&D Management Company, LLC.
19109 West Catawba Avenue, Suite 200
Cornelius, NC 28031-5614
(704) 895-0329

Property Owner Representative: Mr. Andy Burris, Landfill Manager

Consulting Engineer: Civil & Environmental Consultants, Inc.
1900 Center Park Drive
Suite A
Charlotte, NC 28217

Consulting Engineer's Representative: Scott L. Brown, P.E.

Proposed Site Operator: Greenway Waste Solutions at Harrisburg, LLC.
19109 West Catawba Avenue, Suite 200
Cornelius, NC 28031-5614
(704) 895-0329

Operator's Representative: Mr. Andy Burris, Landfill Manager

The Greenway Waste Solutions of Harrisburg, LLC. Construction and Demolition Debris Landfill is located in Cabarrus County, NC. The operating landfill is located just north of Harrisburg and accessed by Speedrail Court off of Highway 49. The Facility is bordered by Coddle Creek to the north and east which empties to Rocky River to the south. The original permit for the facility to construct Phase 1 was issued in 2000. The Permit to Operate for Phase 1 was issued in 2000, Permit to Construct Phase 2 to was issued in 2004. The Permit to Construct Phase 3 was issued in 2007, Permit to Operate Phases 1-3 and the Permit to Construct Phase 1 Expansion was issued in 2011. Filling operations in Phases 1-3 of the landfill are still occurring. The Permitted Capacity and Acreages for the current permitted landfill are shown in the chart below:

Table 1 – Permitted Capacity and Acreages

C&D Unit	Gross Capacity (cy)	Acreage
Current Landfill		
Phase 1	1,509,000	14.8
Phase 2 & 3	861,000	10.2
Sub-Total	2,370,000	25.8
Landfill Expansion		
Phase I	1,000,000	16.2
Phase II	1,000,000	8.6
Phase III	1,100,000	12.0
Sub-Total	3,100,000	36.8
Total for Facility	5,470,000	62.6

2.0 SUMMARY OF MODIFICATIONS

The requested modification for the Greenway Waste Solutions at Harrisburg, LLC. landfill includes revised landfill final elevations, stormwater conveyance swales and edge of waste limits for the Landfill Closure. The modifications will result in less than ten percent additional landfill capacity and are described in detail below. Additionally, a revised Operations Plan is included in Appendix A of this Permit Modification.

The existing permitted final elevation contours for Landfill Phases 1-3 depict 3:1 side slopes from the edge of waste to the top of the completed landfill. In addition, benches 5 feet in width were to be constructed every thirty (30) vertical feet along the face of the completed landfill slope. Stormwater swales were proposed to intercept stormwater run-off from the landfill slope face. The swales were to discharge to rip-rap downchutes which feed into perimeter swales at the base of the landfill, then directed run-off towards permanent sediment control basins.

The revised final elevation contours for the Phase 1-3 are shown in the Highway 49 C&D Landfill Closure Modification construction drawings dated January 2016 (included with this submittal). The final elevation contours depict a 3:1 slope from the revised edge of waste line to the final top elevation of the landfill. All required buffers are maintained. The flat benches, as depicted in the permitted drawings, have been removed from the landfill face and replaced with “tack-on” drainage swales constructed on the landfill side slopes to intercept sheet flow run-off and convey the stormwater to perimeter swales and sediment basins. There are no modifications proposed for the permanent sediment basins. The highest proposed elevation of the modified landfill Phases 1, 2, and 3 will be elevation 676 feet (NAVD 1988), which is less than the permitted top elevation for Final Closure of 710 feet.

The edge of waste limits for Phases 1-3 were adjusted slightly to maximize the proposed waste footprint, but still maintain compliance with all NC Solid Waste regulations and buffers. The revised limits are shown in the construction drawings (sheets C200 and C300). The proposed modifications to Phases 1-3 and Landfill Expansion areas will result in additional capacity for the phases. The combined permitted capacity for Phases 1-3 and Landfill Expansion is 5,470,000

cubic yards (cy). The proposed revisions associated with this permit modification will increase the capacity for Phases 1-3 and Landfill Expansion to 5,996,908 cy. The resulting additional capacity is 526,908 cy, a 9.6% increase in capacity. This information is summarized in the table below:

Table 2 – Proposed Capacity Modification

Area	Permitted Capacity (cy)	Proposed Additional Capacity (cy)	Proposed Capacity (cy)	Proposed Increase in Capacity
Phases 1-3 and Landfill Expansion	5,470,000	526,908	5,996,908	9.6%

3.0 SUMMARY OF STORMWATER CALCULATIONS

Calculations were performed to ensure that the proposed “tack-on” drainage swales could convey stormwater run-off from the landfill face to slope drains which will discharge to perimeter swales and the existing sediment basins. Sheet C200 of the permit drawings (Appendix B) detail the location of the proposed drainage swales, downchutes and perimeter swales. Sheet C300 of the permit drawings (Appendix B) is the drainage basin map for the proposed tack-on and perimeter swales.

Tack-on and perimeter swales were sized to intercept and convey slope drainage from the 25 year, 5 minute storm event. Stormwater run-off flows were calculated using the rational method. Based on the drainage basin map, the basin area for each tack-on swale will not exceed 3 acres and the basin area for each perimeter swale will not exceed 10.53 acres. The swales were designed to convey these respective flows, see stormwater calculations in the Appendix C.

Both types of swales will require either matting with temporary erosion control blankets until vegetated, or riprap. The flow velocity and erosion control matting calculations have been included in the stormwater calculations in Appendix C. Details for the construction of the swales are shown on sheet C400 of the permit drawings (Appendix B).

APPENDIX A
OPERATIONS PLAN

**HIGHWAY 49 CONSTRUCTION & DEMOLITION LANDFILL PERMIT
MODIFICATION OPERATIONS PLAN**

Prepared For:

**Greenway Waste Solutions of Harrisburg, Inc.
19109 West Catawba Avenue, Suite 200
Cornelius, North Carolina 28031**

Prepared By:

**CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CHARLOTTE, NORTH CAROLINA**

CEC Project 111-370.002

JANUARY 2016



Civil & Environmental Consultants, Inc.

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Appendix A – Composting Facility Permit Application

1.0 INTRODUCTION

1.1 GENERAL

This document is the Operations Plan for the Highway 49 Construction & Demolition Landfill Expansion - Phase 1 (Facility), located in Harrisburg, Cabarrus County, North Carolina. The Plan serves as a guide to the landfill operator with respect to routine landfill operations, environmental monitoring, and record keeping. The Facility is permitted to operate as a construction and demolition (C&D) landfill in accordance with North Carolina Department of Environmental Quality (NCDEQ), Division of Waste Management Permit Number 13-06. The Facility is expected to have a maximum operational waste acceptance rate of 120,000 tons per year. Equipment and staffing recommendations in this manual are based on these disposal rates and are subject to change in the event of future modification to waste acceptance rates at the Facility.

1.2 PURPOSE

The Operations Plan is intended to serve as a site reference. Every employee should be acquainted with its contents and location at the site. Each section of this plan is self-contained, easily updated, and may be used in the field, for training sessions, or self-instruction.

The operations manual addressed the following topics:

- Personnel requirements
- Entrance procedures and recordkeeping
- Incoming vehicle inspection
- Traffic control Landfilling operations Equipment requirements
- Operation and maintenance of environmental controls
- Contingency and emergency procedures
- Safety practices and plan implementation

This Operations Plan has been prepared in accordance with North Carolina Administrative Code (NCAC) Title 15A Section 13B .0542. Furthermore, the plan is based on engineering judgment and reflects generally accepted solid waste landfilling techniques.

1.3 REFERENCE DOCUMENTS

This operations plan constitutes a portion of the Highway 49 Construction & Demolition Landfill Permit Modification prepared by Civil & Environmental Consultants, Inc. (CEC). The entire Permit Modification should be kept on file with this plan at the site to supplement this plan in terms of long-term facility development plans, monitoring requirements, engineering design, site hydrogeology, construction activities, and site closure and post-closure care. Other documents pertinent to facility operations and site development include:

- North Carolina Solid Waste Management Rules, 15A NCAC 13B with current amendments
- North Carolina Erosion and Sediment Control Planning and Design Manual, NCDEQ, May 2013.
- North Carolina Erosion and Sediment Control Field Manual, NCDEQ, July 2001
- Documents 1-12 of the Permit to Construct (Phase 2). Issued to Highway 49 C&D Landfill Inc., September 30, 2004.
- Documents 1-13 of the previous Permit to Operate (Phase 2A). Issued to Highway 49 C&D Landfill Inc., February 4, 2005.
- Modification to Current Operation Plan/Permit to Operate – Revised, Highway 49 C&D Landfill Inc., Cabarrus County, North Carolina. Prepared by: BP Barber Engineering. Prepared for: Highway 49 C&D Landfill Inc. February 15, 2007.
- East Section of Phase 2 As-Built Subgrade Verification, Highway 49 C&D Landfill Inc., Cabarrus County, North Carolina. Prepared by: Chas. H. Sells, Inc. Prepared for: Highway 49 C&D Landfill Inc. August 9, 2007.
- Operations Plan, Highway 49 C&D Landfill Inc., Cabarrus County, North Carolina. Prepared by: BP Barber Engineering. Prepared for: Highway 49 C&D Landfill Inc. August 29, 2007.
- Construction Plan Application and Composting Facility Permit Application for the Highway 49 Landfill. Prepared by BP Barber. Prepared for: Highway 49 C&D Landfill Inc. August, 2010.

- Operations Plan, Highway 49 C&D Landfill Inc., Cabarrus County, North Carolina. Prepared by: Brown and Caldwell. Prepared for: Highway 49 C&D Landfill Inc. June 3, 2011.

1.4 REGULATIONS

Solid Waste Management Rules 15A NCAC 13B .500 and all conditions of the operating permit granted by the NCDEQ Division of Waste Management, shall take precedence and be complied with by landfill operators if there is an actual or perceived contradiction with the text of this plan, unless written consent for variance(s) is granted by the NCDEQ Division of Waste Management. The Facility supervisory staff should be familiar with the State Solid Waste Management Rules and the Facility permit(s).

1.5 LOCATION

The Facility is located on Speedrail Court, in Harrisburg, North Carolina. Currently, landfilling operations are on-going at previously approved Phases 1-3.

2.0 OPERATIONAL DRAWINGS

Figure 1 included in this report illustrates long-term operations of the facility on a topographical map consistent with Subparagraph (d)(2) of Rule .0537 15A NCAC 13B.

The Permit to Construct drawings from the 2010 Permit to Construct Permit Application (BP Barber) include all other regulatory drawings.

3.0 WASTE ACCEPTANCE AND DISPOSAL REQUIREMENTS

The Facility will accept only those solid wastes it is permitted to receive. The landfill owner or operator must notify the Division within 24 hours of attempted disposal of any waste the C&DLF is not permitted to receive, including waste from outside the area the landfill is permitted to serve.

3.1 ASBESTOS WASTE

Friable asbestos waste must be managed in accordance with 40 CFR 61, which is hereby incorporated by reference including any subsequent amendments and additions. Copies of 40 CFR 61 are available for inspection at the Department of Environment Quality, Division of Waste Management. The regulated asbestos waste must be covered immediately with soil in a manner that will not cause airborne conditions and must be disposed of separate and apart from other solid wastes, as shown on Operation drawings:

- (A) In a defined isolated area within the footprint of the landfill, or
- (B) In an area not contiguous with other disposal areas. Separate areas must be designated so that asbestos is not exposed by future land-disturbing activities.

Non-friable asbestos may be accepted consistent with normal operating procedures as set forth in a following section.

3.2 WASTE EXCLUSIONS

The Facility will accept all types of wastes generated within approved service area except those prohibited by 15A NCAC 13B .0542 (e). Specifically, the following types of wastes will not be accepted:

- (1) Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous or municipal solid waste is contained therein,
- (2) Garbage as defined in G.S. 130A-290(a)(7),

- (3) Hazardous waste as defined in G.S. 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators,
- (4) Industrial solid waste unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A),
- (5) Liquid wastes,
- (6) Medical waste as defined in G.S. 130A-290(a)(18),
- (7) Municipal solid waste as defined in G.S. 130A-290(a)(18a),
- (8) Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761,
- (9) Radioactive waste as defined in G.S. 104E-5(14),
- (10) Septage as defined in G.S. 130A-290(a)(32), (11) Sludge as defined in G.S. 130A-290(a)(34),
- (12) Special wastes as defined in G.S. 130A-290(a)(40),
- (13) White goods as defined in G.S. 130A-290(a)(44), and
- (14) Yard trash as defined in G.S. 130A- 290(a)(45),
- (15) The following wastes cannot be received if separate from C&DLF waste: lamps or bulbs including but not limited to halogen, incandescent, neon or fluorescent; lighting ballast or fixtures; thermostats and light switches; batteries including but not limited to those from exit and emergency lights and smoke detectors; lead pipes; lead roof flashing; transformers; capacitors; and copper chrome arsenate (CCA) and creosote treated woods.
- (16) Waste accepted for disposal in a C&DLF unit must be readily identifiable as C&D waste and must not have been shredded, pulverized, or processed to such an extent that the composition of the original waste cannot be readily ascertained except as specified in Subparagraph (17) of this Paragraph.
- (17) C&D waste that has been shredded, pulverized or otherwise processed may be accepted for disposal from a facility that has received a permit from an authorized regulatory authority which specifies such activities are inspected by the authority, and whose primary purpose is recycling and reuse of the C&D material. A waste screening plan and waste acceptance plan must be made available to the Division upon request.

- (18) The owner or operator of a C&DLF must not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance:
- (A) Prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste.
 - (B) Requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

3.3 RECYCLING FACILITY

A Recycling Facility will be operated on site. The facility consists of approximately two (2) acres and is located within the Landfill Facility boundary. The approximately 17,000 square foot Facility is an enclosed structure and receives mixed C&D loads of material. The waste acceptance will be consistent with Section 3.2 of this document. The facility includes an open paved area for parking, the structure itself, and a pole barn for storage.

3.3.1 Overview

This Operations Manual was prepared for Recycling Facility located within the Facility boundary of the Highway 49 C&D Landfill and Recycling Center (Highway 49). The Recycling Facility is strictly for the processing of C&D material in order to recycle materials. Highway 49 plans to recycle as many varieties of materials as possible as end users are available. Initially, scrap metal recycling, wood waste, sheetrock, corrugated cardboard roofing shingles and inert materials will be recycled. 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 Highway 49 upon completion of the recycling process.

The information contained herein was prepared to provide landfill personnel with a clear understanding of how the facility would be operated. While deviations from the operations

outlined here may be acceptable, they should be reviewed and approved by the Design Engineer and the Highway 49 Solid Waste Manager.

3.3.2 Contact Information

All correspondence and questions concerning the operation of the Recycling Facility should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

North Carolina Department of Environmental Quality

North Carolina Department of Environmental Quality
610 E Center Ave
Mooresville, NC 28115
Phone: (704) 663-1699
Fax (704)663-6040

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

Western Area Supervisor: Deborah Aja
Permitting Engineer: John Murray, PE
Waste Management Specialist: Teresa Bradford

Division of Land Resources-Land Quality Section:

Regional Engineer: Zahid Kahn, PE

3.3.3 Recycling Facility Process

Selected in-coming loads will be weighed at the existing scalehouse and directed to the Facility. All in-coming loads to the Facility will be unloaded under the cover of the structure and all processing will be indoors. The recycled material will be loaded into transport trailers within

the structure. There will be no uncovered storage of unprocessed material outside of the structure. Out-going loads will be weighed at the existing scalehouse. Liquids, if any, will not be released from the covered structure. Any non-recyclable material will be disposed of appropriately by Highway 49.

3.3.4 Holding Time for Recyclable

Once a recyclable material is removed from the C&D loads, it may be stockpiled within the Facility for up to 30 days. No materials shall be kept in this area for more than 30 days, nor shall they be stockpiled in other areas waiting recycling. Temporary storage of inert material may be stored uncovered outside of the structure and other materials such as concrete, wood waste, shingles, metals may be relocated to the temporary stockpile areas adjacent to the landfill working face as indicated on the attached site plan. Additional recovered material will be stored in a pole barn on site.

3.3.5 Record Keeping Program

Highway 49 shall maintain the following records related to the Recycling Facility in an operating record at the landfill:

- A. Weight of C&D loads processed;
- B. Weight of C&D loads unrecoverable; and
- C. Date and disposal information for all recycled materials tons include location and vendor of recipient of recycled materials.

The operating record will be kept up to date and reconciled on a monthly basis by the Landfill Manager or his designee. It will be presented upon request to DWM for inspection. A copy of this Operations Manual will be kept at the landfill and will be available for use at all times.

3.4 OTHER RECYCLING

In addition to the Recycling Facility, incoming C&D waste will be recycled as much as practical. Stockpile areas will be located near, but clearly segregated from the working face. These stockpile areas will be kept in a clean orderly fashion. Incoming waste with easily identified recyclables will be unloaded in a recycling area close to the working face. Metals pulled from the load will be placed in the on-site metal recycling container. Clean cardboard will be removed and transported to an on-site bailer.

3.4.1 White Goods

White goods will be handled in accordance with all State and Federal regulations. Material from the Recycling Facility may also be stored in this stockpile. Any white goods containing CFC's will have them managed properly prior to removal of the white goods.

3.4.2 Tires

Stockpiled tires will be covered and handled in accordance with all State and Federal regulations. There will be a designated container on site at all times for tires removed from the working face for final disposal at a properly permitted facility. Material from the Recycling Facility may also be stored in this stockpile. Tires will not be stockpiled for a time period exceeding 30 days. The stockpile will be in an enclosed trailer or covered area.

3.4.3 Concrete/Inert Material

Inert debris such as brick, concrete, concrete block, rock, etc. will be removed and transported to the reprocessing/material storage area for crushing. Material from the Recycling Facility may also be stored in this stockpile. The material will be stockpiled in a pile not to exceed 500 tons for periodic crushing.

3.4.4 Shingles

Shingles will be stockpiled on site for recycling. The stockpile area will be close to the working face, but clearly segregated from it. Material from the Recycling Facility may also be stored in this stockpile. The grinding of shingles will be done by properly permitted third party resources. The stockpile of shingles will not exceed 500 tons. The ground shingles will be transported off-site to a properly permitted third party end- user.

3.4.5 Wood Waste

Wood waste consisting of pallets, dimension lumber, and similar non-treated material will be stockpiled on site for recycling. The stockpile area will be close to the working face, but clearly segregated from it. Material from the Recycling Facility may also be stored in this stockpile. The stockpile of wood waste will not exceed 500 tons.

3.4.6 Gypsum Wallboard/Sheetrock Recycling

A gypsum wallboard/sheetrock recycling area will be operated on site. The area will be an enclosed pole building and receive only “clean” source separated material including off-specification material from manufacturers. In-coming loads will be weighed at the existing scalehouse and directed to the area.

Segregated loads of some products such as gypsum may originate on the project construction site and transported to the facility at which time they are directed to our gypsum reprocessing area by-passing the indoor Recycling Center. The material is deposited on the ground and stockpiled outdoors but is covered with weighted tarps to keep the material dry awaiting processing. When grinding is necessary to develop outgoing product, the Peterson Horizontal Grinder is used to grind the gypsum product to a 2 inch minus material. This product is further refined with a Sandvik Tir-Screener to further enhance the marketability gypsum product to meet the end users specifications. The fine material has a direct feed conveyor that discharges the material into a Pole Structure that is

tarped on all sides. This is performed for two reasons; 1) the product must remain dry at all times because the low moisture content is required by our client and 2) the fine material has the highest dust emissions potential. By discharging this material in the building it eliminates the dust generated by coming off the end of the conveyor and stockpiling on the ground. The larger more coarse product (much less dust potential), is screened leaving some of the original wall board paper backing intact is discharged from the other conveyor line is covered by tarps for transportation to another end user. The fine material is stored in the Pole building awaiting transportation to the final end user.

At no time will stockpiled unprocessed sheetrock exceed 600 tons. The processed material will be stored in bunkers consisting of fine screenings, medium screenings, and coarse/paper screenings. Out-going loads will be weighed at the existing scalehouse. At no time will stockpiled material exceed 600 tons.

The facility recycles all of the in-coming material from Griffin Brothers Reclamation Centers and other sources. One hundred percent of the by-product is sold to customers throughout the region for a variety of uses.

3.5 MOBILE HOME DECONSTRUCTION

3.5.1 Overview

This Operations Manual was prepared for Mobile Home Deconstruction Area located adjacent to the Highway 49 C&D Landfill and Recycling Center (Highway 49). The Mobile Home Deconstruction Area is strictly for the deconstruction of mobile homes in order to recycle materials from the mobile homes. Highway 49 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 Highway 49 upon completion of the deconstruction process.

The information contained herein was prepared to provide landfill personnel with a clear understanding of how the facility would be operated. While deviations from the operations outlined here may be acceptable, they should be reviewed and approved by the Design Engineer and the Highway 49 Solid Waste Manager.

3.5.2 Contact Information

All correspondence and questions concerning the operation of the Highway 49 Mobile Home Deconstruction Area should be directed to the appropriate County and State personnel listed below. For fire or police emergencies dial 911.

North Carolina Department of Environmental Quality

North Carolina Department of Environmental Quality
610 E Center Ave
Mooresville, NC 28115
Phone: (704) 663-1699
Fax (704)663-6040

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

Western Area Supervisor: Deborah Aja
Permitting Engineer: John Murray, PE Waste
Management Specialist: Teresa Bradford

Division of Land Resources-Land Quality Section:

Regional Engineer: Zahid Kahn, PE

3.5.3 Mobile Home Deconstruction Process

Mobile homes will be deconstructed using the processes outlined below.

3.5.3.1 Access

Mobile home owners seeking disposal will contact the Landfill 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, the scale operator at the landfill will contact the next owner on the waiting list. The owner will have a 48 hour window in which to contact the Landfill 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 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.

3.5.3.2 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.

3.5.3.3 White Goods

White goods will be accepted with the mobile home. White goods will be removed using a track-hoe 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.

3.5.3.4 *Asbestos*

Since asbestos may be located in the building materials of mobile homes constructed prior to 1983, all mobile homes built before January 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 daily cover.

3.5.3.5 *Deconstruction of Mobile Homes*

Once accepted, the mobile home will be placed in the mobile home deconstruction area. Mobile home deconstruction will be dependent 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.

3.5.3.6 *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.

3.5.3.7 Record Keeping Program

Highway 49 shall maintain the following records related to the Mobile Home Deconstruction in an operating record at the landfill:

- 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 tons include location and vendor of recipient of recycled materials; and
- E. Date and certification of CFC's removed.

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

3.6 COMPOSTING FACILITY

The composting facility Permit Application included in Appendix A provides detailed site design, construction, and operation information.

3.7 WASTE SCREENING

The landfill operator shall be responsible for screening wastes to ensure that hazardous or unacceptable wastes are not disposed in the landfill. Screening of wastes (load inspections) shall be accomplished as follows:

Informal load checking will be the responsibility of all employees, particularly those that work at the entrance area and those that work at or near the active fill area. Each employee will observe vehicles entering the Facility and landfill for any potentially unauthorized waste and will alert management personnel if any unauthorized wastes are suspected. Through the waste collection programs, there will be several checkpoints:

Facility Entrance – Only authorized vehicles and material will be allowed beyond the scales. The scale attendant will refuse entry to any unauthorized vehicles or vehicles observed carrying unauthorized waste.

Active face checkpoints – All incoming loads of waste will be observed by the equipment operators as it is discharged at the active face

Checkpoints during compaction at active face – Material will be inspected by the landfill compactor operator as it is compacted at the active face.

3.8 RANDOM LOAD INSPECTIONS

In addition to the visual inspections performed by the equipment operator/attendants, a random inspection program shall be implemented to detect and prevent disposal of any of the unauthorized wastes listed in previously. Inspections conducted as part of this program shall be performed by personnel trained in the following areas: methods for identification and determination of unauthorized wastes, handling procedures for unauthorized wastes, record keeping requirements of the program, and occupational health and safety. Inspection personnel shall also have a thorough understanding of the North Carolina Hazardous Waste Management Regulations (15A NCAC 13A) and the North Carolina Regulated Medical Waste Management Regulations (15 NCAC 13B .1203).

The frequency of the random inspections shall be determined by the quantity and type of waste received, the familiarity with the generators and/or transporters, and the occurrences of identified unauthorized waste. Inspections should be performed at the minimum of the following frequency: Once a week. The inspections also need to be random. The time of day and day of week shall vary between inspections. The transporter/hauler selected for inspection shall also vary between inspections.

The procedure for the inspection shall be as follows:

- Stop the selected vehicle prior to the working face of the landfill.
- Notify the driver of the inspection.
- Direct the vehicle to the inspection area. The inspection area may be either a permanently designated location or a temporary location adjacent to the working face.
- If possible, perform a visual observation of the waste prior to unloading. If unauthorized waste is observed, or suspected, the vehicle shall be prohibited from unloading, and shall be directed out of the facility.
- If no unauthorized waste is observed or suspected from the visual observation, or if a visual observation is not possible, the vehicle shall discharge the load at the inspection area. The driver shall remain at the inspection area while the inspection is performed, unless a safety concern requires evacuation of the area. Equipment shall be used to spread and turn the waste to facilitate a visual observation of the load contents. If no unauthorized waste is identified, the waste shall be transferred to the working face for disposal.
- If unauthorized waste is identified in the load, and the unauthorized waste is not a regulated hazardous waste, a regulated medical waste, a regulated toxic waste, a regulated liquid waste, or a waste which requires special handling, the waste shall be loaded back into the vehicle and removed from the facility.
- If acceptability of the waste cannot be determined by visual observation, the waste can either be rejected and loaded back into the vehicle and removed from the facility, or samples of the waste can be taken to determine acceptability. Testing shall be selected based on the reason for the suspicion of unacceptability.
- If the waste is suspected of being a liquid waste, a regulated hazardous waste, a regulated medical waste, or a regulated toxic waste, site personnel will safely identify the nature of the unauthorized waste. Wastes within these categories are not to be handled by landfill staff. Upon assessment of the waste, qualified contractors will be contacted to provide direction for temporary handling, isolation, and security. Within 24 hours of discovery, the Facility will orally inform NCDEQ Division of Waste Management (Division) of the incident and make every effort to contact a

waste contractor for the proper packaging, removal, and disposal of the unauthorized waste. The Division will be informed in writing of the incident and steps taken to properly dispose of the unauthorized waste.

Management of this Facility reserves the right to establish acceptance criteria and procedures for certain non-municipal solid wastes. These may be more restrictive than required by law based on quantities and characteristics of the waste stream, current operating status of the landfill, and characteristics of waste streams previously received. Acceptability will be based on judgment of the landfill operator's technical personnel with respect to regulatory requirements, physical and chemical qualities and other technical considerations.

3.9 COVER, SPREADING, AND COMPACTING

The working face will be restricted to the smallest area feasible and compacted as densely as feasible. Any area that exceeds one-half (1/2) acre or more on a weekly basis will be covered with six (6) inches of earthen material. Cover may be placed at more frequent intervals to control disease, vectors, fires, odors, blowing litter, and scavenging. Areas where additional waste will not receive waste for three (3) months, but will receive additional waste in the future will be covered and stabilized with vegetative cover or other stabilizing material.

Appropriate methods including fencing and diking will be used to confine wind-blown solid waste. At the end of each day, wind-blown waste will be collected and disposed of in the landfill.

3.10 AIR CRITERIA AND FIRE CONTROL

No open burning of waste will be permitted on site. The Division will be notified verbally within 24 hours and in writing with 15 days of any fire and/or explosion at the facility.

If a fire occurs at the landfill, the Harrisburg Fire Department will be notified. Hot loads that are brought to the facility will be immediately dumped away from the landfill and the fire

department notified. The hot load will be sprayed down with water until extinguished. The load is then to be reloaded for disposal in the landfill.

3.11 ACCESS AND SAFETY

The site has controlled access with the use of entrance gates. The entrance gates allow entry to the currently operating landfill located to the west of the expansion area. The same entrance will be used for access to the expansion area, and will remain gated. Access to the expansion area is restricted to the entrance gate only. Coddle Creek prevents access to the site from the north and the east, while the currently operating landfill (with fencing and wooded buffer) prevents access from the west. Access to the site from the south is also restricted by a wooded buffer. Access roads are all-weather construction and will be maintained in good condition.

A scalehouse is located at the entrance with an attendant present during operational hours. The attendant is responsible for evaluating loads to assure compliance with operation requirements and to direct the loads to the appropriate location on site—landfill, recycling/processing area, or composting facility. In addition, signs are posted to direct loads to the appropriate area.

Dust is controlled on access roads through the use of a water truck. Signs are posted indicating that liquid, hazardous, and municipal wastes are prohibited.

3.12 EROSION AND SEDIMENTATION CONTROL

The Erosion and Sedimentation Control Plan was developed by BP Barber to meet all requirements set forth by the Sedimentation Pollution Control Law (15A NCAC 4), and other requirements set forth by the North Carolina Department of Environmental Quality (NCDEQ). All erosion and sedimentation control measures were designed based on a 25 year, 24 hour storm event occurring in Cabarrus County, North Carolina per the NCDEQ Division of Waste Management-Solid Waste Program. Temporary measures to be used on the site are sediment

basins and silt (sediment) fencing. These, along with permanent ditches and seeding make up all erosion control measures to be utilized on the site.

The sediment basin shall be inspected at minimum weekly, and after each significant rain event (1/2 inch or greater). Sediment shall be removed and the basin restored to original dimensions after sediment has accumulated to one-half (1/2) of design volume indicated by cleanout stripe on riser structure. Removed sediment shall be placed in an area that has sediment controls in place. Sediment basin spillways, baffles, embankments and outlet control structure shall be inspected at the same time for erosion damage and piping (embankment only). All necessary repairs shall be made immediately to prevent basin failure.

Silt fencing shall be inspected at least once per week and after every rainfall event. Any tears, cracks or overall failure should be repaired and/or replaced immediately. Sediment deposits shall be removed as necessary to ensure proper functioning of fencing. Silt fencing shall remain until final site stabilization has occurred.

Permanent ditches should be seeded and matted immediately after their construction; they should be inspected after all rain events for any failure of the ditch or erosion control matting. All outlet protection measures used to protect downstream channel vegetation shall be inspected for wash out. All necessary repairs/replacements should be made immediately, and rip rap should be added where necessary.

Embankment and landfill cover slopes shall be periodically inspected for erosion. The slopes shall be mowed no more than twice per year. The embankment slopes shall be re-fertilized in the second year unless vegetation growth is fully adequate. The damaged areas shall be re-seeded (permanent seeding for embankment slopes and temporary seeding for landfill cover slopes), fertilized and mulched immediately. Seeding, fertilizing and mulching shall be in accordance with the Erosion and Sedimentation control plan. Appendix A (BP Barber) presents all erosion and sedimentation control measures on existing and proposed topography. Appendix D (BP Barber) includes all relevant calculations and references for erosion and sedimentation control measures design.

3.13 STORMWATER CONVEYANCE AND MITIGATION

The Town of Harrisburg approved the request for a stormwater exemption in accordance with the Town of Harrisburg's Stormwater Ordinance, see letter in Appendix E (BP Barber). Therefore the facility will not be required to implement structural Stormwater BMPs or prepare a stormwater impact statement. Stormwater will be transported by vegetative conveyances to the maximum extent possible.

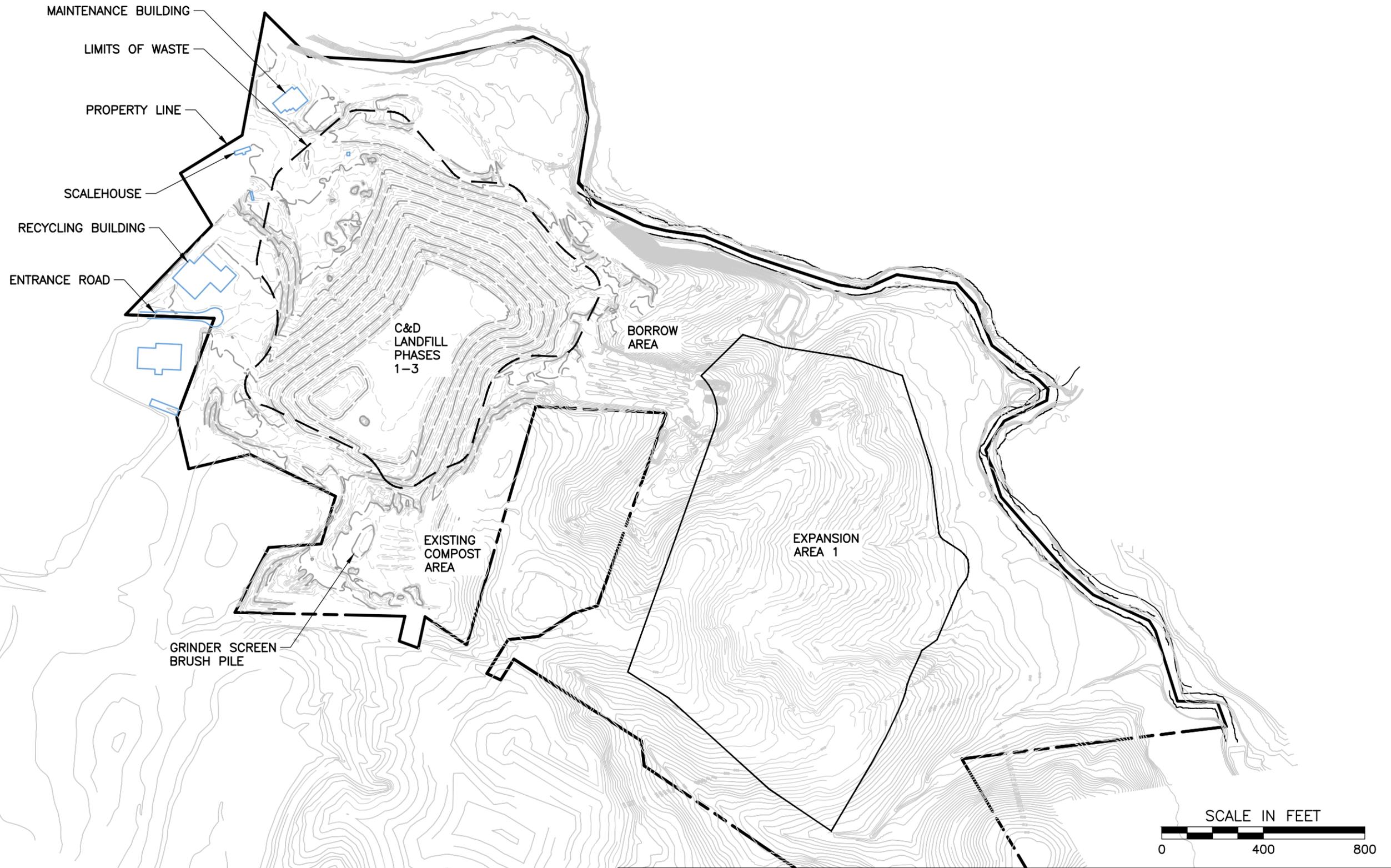
3.14 OPERATING RECORD AND RECORDKEEPING REQUIREMENTS

The owner and operator will record and retain at the facility or an alternative location the following information:

- Records for random waste inspections, monitoring results, certifications of training, and training procedures.
- Amount of recycled material recovered from in-coming waste. (Weighed as exported from the site). Amount of waste received at the facility and county of generation.
- Cost estimates for closure and post-closure.
- Notation of date and time of placement of cover material.
- All audit records, compliance records, and inspection reports.

All information contained in the operating record will be furnished to the Division upon request or made available for inspection by the division. The operating record will also include a copy of all approved permits and Monitoring Plans.

DRAWINGS



REFERENCE

1. TOPOGRAPHIC INFORMATION BASED UPON SURVEY BY PATTERSON LAND SURVEYING, PA. DATED JUNE 17, 2014, AND OCTOBER 28, 2008



Civil & Environmental Consultants, Inc.

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GREENWAY WASTE SOLUTIONS
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FACILITY MAP

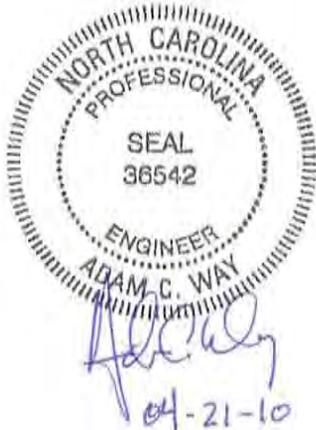
DRAWN BY:	CTH	CHECKED BY:	TMG	APPROVED BY:	TMG	FIGURE NO.:	1
DATE:	JANUARY 2016	DWG SCALE:	1"=400'	PROJECT NO.:	111370.002		

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APPENDIX A

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT

**THE HIGHWAY 49
C&D LANDFILL COMPOSTING
FACILITY PERMIT APPLICATION**



PREPARED FOR:

**HIGHWAY 49 C&D LANDFILL, LLC
19109 WEST CATAWBA AVENUE SUITE 200
CORNELIUS, NORTH CAROLINA 28031**

PREPARED BY:

**BP BARBER
5900 NORTHWOODS BUSINESS PKWY, SUITE O
CHARLOTTE, NORTH CAROLINA 28269-7511
PROJECT NO. 05185-H49**

REVISED APRIL 2010

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1.0 GENERAL PROVISIONS

1.1 Project Description

This Application to renew the Type 1 Composting Facility permit for the Highway 49 C&D Landfill is being submitted by BP Barber on behalf of Highway 49 C&D Landfill, LLC. This application meets the composting facility design parameters, construction requirements, and design drawing requirements found in Section .1400 of 15A NCAC 13B of the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Management Rules. This application package includes information regarding the site design, construction and operation.

Project Title: Highway 49 C&D Landfill Composting Facility

Owner: Highway 49 C&D Landfill, LLC
19109 West Catawba Avenue Suite 200
Cornelius, North Carolina 28031
(704) 895-0329

Owner's Representative: Mike Griffin

Consulting Engineer: BP Barber
5900 Northwoods Business Parkway
Suite O
Charlotte, NC 28269-7511

Consulting Engineer's Representative: Adam C. Way, P.E.

Proposed Site Operator: Highway 49 C&D Landfill, LLC
19109 West Catawba Avenue Suite 118
Cornelius, North Carolina 28031
(704) 895-0329

Operator's Representative: Ronald Gilkerson

The Highway 49 C&D Landfill Composting Facility is located at 2105 Speedrail Court, in Harrisburg, NC. Renewal for the composting permit is being sought. The composting facility will be relocated as shown on the Site Plan in Appendix A, and consists of land totaling 5 acres. Access to the site is provided via Speedrail Court. The property is owned by C&D Management, LLC, and the facility will be operated by Highway 49 C&D Landfill, LLC. Mr. Ronald Gilkerson (Telephone (704) 895-0329) will be responsible for daily operations.

1.2 Site Requirements

The composting facility will not be located over a closed-out disposal facility. This can be confirmed by viewing the Site Plan in Appendix A. The surrounding area consists of woods and vegetation. Existing ground surface elevations of the proposed composting area range from 608 to 640 feet, mean sea level (MSL). The property surrounding the composting area is owned by the Highway 49 C&D Landfill and others. The applicable buffer requirements are met (see Site Development section 2.1 below) where the composting facility is surrounded by others.

2.0 FACILITY DESIGN

2.1 Site Development

The site is not currently located within an existing flood plain, nor shall the proposed design result in washout of solid waste such as to pose a hazard to human life, wildlife, land or water resources. The composting facility will be located, as required, fifty (50) feet from any property boundary delineating parcels of land not owned by Highway 49 C&D Landfill. A two hundred (200) foot minimum buffer between compost areas and residences or dwellings not owned or occupied by the permittee will be maintained at all times. A fifty (50) foot buffer zone will be maintained between the composting area and perennial

streams/rivers. A twenty-five (25) foot minimum buffer will be maintained between compost areas and swales or berms to allow for adequate access of fire fighting equipment.

The composting facility shall be located in accordance with 15A NCAC 2B .0200, Classification and Water Quality Standards Applicable to Surface Waters in North Carolina. The site will not cause a discharge of materials or fill materials into waters of the State that would be in violation of Section(s) 404, and 402 of the Clean water Act, or in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES). The site will not cause non-point source pollution of waters of the state that violates assigned water quality standards.

The site shall not contravene groundwater standards as established under 15A NCAC 2L. The portion of the site designated for active composting will have a soil texture finer than loamy sand, and a depth to the seasonal high water table shall be maintained of at least twelve (12) inches, (Type 1 facility).

3.0 DESIGN REPORT

3.1 Design Capacity

The design capacity of the facility is approximately 20,000 cubic yards per year.

3.2 Material Processing

This section provides general material processing information. Detailed operations are illustrated on the flow diagram on Page 12 of this report.

Compost (grass clippings and loose leaves)

Grass clippings generated by the Town of Harrisburg will be received free of charge, unless other agreements are made. All material shall be transported through the scales for weighing verification. The material will then be transported to the drop-off area for unloading. The grass clippings and leaves will be segregated in compost windrows. Product mixing will include some soil and mulch fines to enhance nitrification. The compost produced will be available to the Town of Harrisburg or Cabarrus County residents free of charge.

Land-clearing debris (tree limbs, tree stumps, etc.)

Land-clearing debris will be transported in bulk loads and weighed at the scale house. The material will then be transported to the drop-off areas. The debris will be routed to temporary stockpiles in the reprocessing areas. This debris material will also be stored in windrows for proper management. The material will be scheduled for grinding every quarter or when windrow storage capacity reaches 3,000 cubic yards. A tub grinder will be transported to the site to produce mulch from the material. The mulch products will then be placed in the windrows for storage. All windrow mulch products will be power screened for fines separation and topsoil generation. The mulch produced will be used on-site to supplement erosion control measures. As with the compost produced, the mulch material will be offered to the Town of Harrisburg and local residents of Cabarrus County free of charge.

Soil from land-clearing debris

Topsoil from root balls of stumps will be removed prior to grinding and stockpiled separately. The fines from mulch screening will be mixed with the topsoil removed from the root balls, and power screened to refine the product type. The material will then be windrowed for storage. This material will be used to improve cover soils for hydro-seeding. Also, some of the topsoil products will be offered to the Town of Harrisburg and local residents for use in landscaping.

Aggregate (Crushed inert debris such as brick, block, concrete, etc.)

Segregated loads of clean inert debris will be weighed at the scalehouse and transported to the temporary storage areas. This material is not to be placed in the windrows. This material will be scheduled for processing every quarter, or when storage capacity reaches 2,000 cubic yards. A Bohringer Eagle rock crusher, which is rated at less than 100 tons per hour, will be used for processing inert materials. This product will be used on-site for construction of the haul roads.

3.3 Temperature Monitoring

The compost is monitored on a monthly basis for temperature. For compost windrows that have been in storage for thirty (30) days or longer, the temperature is to be monitored on a weekly basis. The temperature probes will be placed in the compost to

document and measure temperature generations. The recorded temperature will be used to ensure that the minimum temperature of 131° F for three (3) days is maintained for the compost. Should the recorded temperature fall below the 131° F temperature specified, pathogen testing will be performed to ensure pathogen levels are in the required range.

The procedure utilized for temperature recording is random testing of all stored compost in windrows at the frequencies mentioned above. Each composting windrow will be monitored with a compost thermometer, which has a 48-inch probe to ensure that all areas inside the windrow can be measured. Each probe measurement will be obtained at fifty (50) foot intervals utilizing the full length of the probe. Each probe will be monitored for a period of approximately five minutes, or until the temperature reading has stabilized. Each monitoring event will be recorded on a monitoring chart. The probe will be verified twice daily at the same location for temperature recordation. If necessary, additional windrow turning will be performed for the compost to bring the temperature up to the required 131° F for three days.

3.4 Temperature Control

Windrow turning is performed on the compost once to twice monthly. The compost is turned using a front-end loader. If temperatures for the compost windrows fall below the 131° F required for three days, additional windrow turning will be performed.

In addition to windrow turning, adding a mixture of grass clippings with the wood chips and leaves will increase biodegradation. If additional turning does not bring temperatures to the desired range, ammonium nitrate may be added to improve biodegradation.

3.5 Service Area

The Highway 49 C&D Landfill composting will continue to service Cabarrus, Mecklenburg, Union, Stanly, and Rowan Counties.

3.6 Equipment Requirements

The facility will be operated with equipment used by the facility owner to maintain and operate the existing C&D landfill.

4.0 CONTAINMENT AND ENVIRONMENTAL CONTROL SYSTEM

4.1 Groundwater Considerations

A minimum of twelve (12) inches will be maintained to the seasonal high water table.

4.2 Controlling Nuisances and Vectors

Potential nuisances affecting the area surrounding the landfill's composting facility include odor, dust, fires, blowing litter, sedimentation, and vectors. Potential vectors include rodents, birds, and other scavengers.

A water truck will be used to control dust emissions on borrow areas, haul roads and at the working face. This equipment will be used on an as-needed basis.

Open burning is not permitted at the landfill. In the event of a fire in the debris, the burning materials will be covered with a soil cover if the fire is deemed manageable. If the fire is determined to be unmanageable for landfill personnel, the local fire department will be notified. Fences will be used to control blowing litter. Routine inspection and policing of the facility will be conducted to ensure that litter will not pose a nuisance or hazard.

Odors and vectors are not expected to be problematic.

5.0 C&D LANDFILL DEVELOPMENT, GENERAL OPERATION AND MAINTENANCE

5.1 Plan and Permit Requirements

All construction documents and plans of the permit shall be followed. A copy of the plans, permits, and operational reports shall be maintained at the office at all times.

5.2 Hours of Operation

The Highway 49 C&D Landfill and its composting facility will maintain operating hours between 7:30 AM and 5:30 PM Monday through Saturday. Saturday hours may be reduced depending on waste stream. The facility will be closed on the following holidays:

New Year's Day	Labor Day
Memorial Day	Thanksgiving Day
Independence Day	Christmas Day

A sign or signs identifying the owner, operator, telephone number, NCDENR permit number, types of waste accepted and the landfill operating hours will be posted at the entrance to the landfill.

5.3 Drop-Off Area

The drop-off area will be located within the composting areal limits, which are shown on the Site Plan in Appendix A. Material is to be separated at the drop-off area by type. Signs designating the types of material such as "Grass Clippings and Leaves," "Land Clearing Debris," "Topsoil" and "Aggregate" shall be posted at the drop-off area.

An inspector shall be located at the drop-off area to inspect each incoming load. Waste that does not meet the criteria for the acceptable materials shall be disposed of in an on-site waste container for future disposal at a permitted municipal solid waste landfill.

5.4 Windrow Processing

The majority of material that is stored in the windrows does not require turning. The compost itself takes an extended period to process. The windrows containing compost are to be turned once to twice monthly. The composting matter is to remain in the windrows for approximately three to six months for aging prior to use.

5.5 Adverse Weather Conditions

Processing, loading, and storage of mulch, aggregate, and compost are done regardless of the weather conditions. The topsoil products may require covered storage.

The drop-off area and entrance have all-weather roadways. The roadways shall be kept clear during periods of snowfall. Tub grinding and screening may be stopped during periods of high winds, should dust become an issue. Dust shall be controlled on the roadways as described in Section 6.6.

5.6 Flow Diagram

Please refer to the attached Flow Diagram on Page 12 of this report.

5.7 Contingency Plan

Should an instance of on-site equipment failure or temporary shut down of the facility occur, all incoming loads of material shall be stockpiled at the drop-off area. Overflow stockpiling is available in the previously approved composting area.

On-site, no open burning of material is permitted. Should accidental fires occur, equipment and stockpiled soil shall be provided to control them. Any occurrence of fire at the facility shall be reported to the NCDENR Division of Waste Management within 24 hours, and written notification shall be submitted by the Operations Manager within 15 days.

Should a fire occur at the facility, the local fire department (Harrisburg Fire Department) shall be notified. Loads that are hot shall be removed immediately and placed away from the facility and the fire department shall be notified. Said loads shall be sprayed down with water until the fire and/or combustion is extinguished. The load shall then be reloaded for disposal in the landfill. The Harrisburg Fire Department is aware of this proposed facility. Should a fire occur they have agreed to respond to the site.

6.0 Facility Operation

6.1 Training of Facility Personnel

The proposed management team and site operation staff are properly trained to

execute important tasks such as the following:

1. Monitoring of incoming wastes
2. Identification of unauthorized wastes
3. Accurate recording of accepted wastes
4. Safe equipment operation

The management team includes Mr. Larry Griffin, Sr. of Griffin Brothers, owner, and Mr. Ronald C. Gilkerson, Site Geologist.

6.2 Entrance

The existing entrance and haul roads for the Highway 49 C&D Landfill will be used to access the Highway 49 C&D Landfill Composting Facility.

6.3 Access and Security

The site has controlled access with the use of entrance gates. The entrance gates allow entry to the currently operating landfill located to the west of the composting facility. The same entrance will be used for access to the composting facility, and will remain gated. Access to the composting facility is restricted to the entrance gate only. Coddle Creek prevents access to the site from the north and the east, while the currently operating landfill (with fencing and wooded buffer) prevents access from the west. Access to the site from the south is also restricted by a wooded buffer. Access roads are all-weather construction and will be maintained in good condition.

A scalehouse is located at the entrance with an attendant present during operational hours. The attendant is responsible for evaluating loads to assure compliance with operation requirements and to direct the loads to the appropriate location on site—landfill, recycling/processing area, or composting facility. In addition, signs are posted to direct loads to the appropriate area.

Dust is controlled on access roads through the use of a water truck. Signs are posted indicating that liquid, hazardous, and municipal wastes are prohibited.

6.4 Signs

Existing signs are provided at the existing site entrance and show the contact name, telephone number, permit number, and the landfill operating hours. Information on disposal procedures and wastes that cannot be accepted is also provided. Traffic signs will be provided as needed to direct customers and to promote orderly traffic flow to and from the disposal areas.

6.5 Waste Acceptance

The Highway 49 C&D Landfill Compost Facility will accept yard trash as defined in 30A-290(a)(45) (solid waste consisting solely of vegetative matter resulting from landscaping maintenance). All yard trash will be composted. The following waste will be accepted:

1. Grass clippings, loose leaves, etc.
2. Tree limbs, stumps, etc.
3. Soil from land clearing debris
4. Aggregate (crushed inert debris such as brick, block, or concrete)

The Highway 49 C&D Landfill Compost Facility cannot accept the following wastes. Further, the following wastes can not be processed into the compost:

1. Hazardous waste nor asbestos containing waste
2. Household hazardous waste
3. Any compost made from solid waste

The Operations Manager will notify the NCDENR Division of Waste Management within twenty-four (24) hours of an attempt to dispose of any of the forbidden waste products.

6.6 Dust, Litter, Odors, and Vectors

Dust, litter, odors, and vectors are discussed in Section 4.2. Dust generated by composting operation will be controlled or reduced by:

1. Application of water via the irrigation system provided along the existing access road or by using a water truck.
2. Regular removal of mud and dirt from the paved roads.
3. Vegetating of final cover and borrow areas as soon as practical.

Blowing litter will be reduced or controlled by:

1. Limiting the size of the active working area.
2. Utilization of litter fences.
3. Policing of the area.

Odors and vectors are not expected to be problematic.

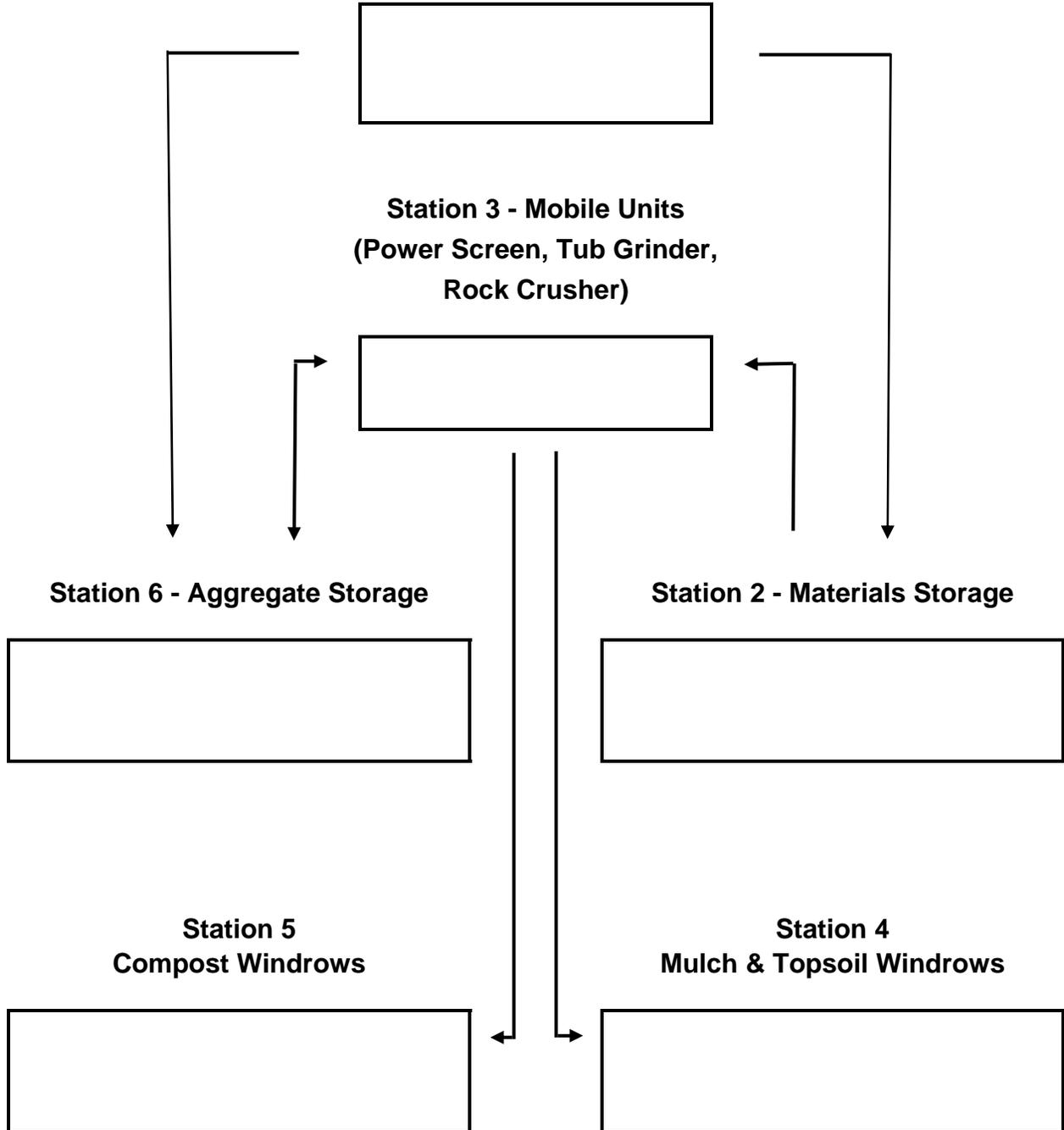
If environmental problems associated with the landfill are detected and confirmed by NCDENR, Highway 49 C&D Landfill, LLC will submit to NCDENR for review and approval a corrective action plan and a schedule of compliance for implementing the plan.

6.7 Landscaping Maintenance

Landscaping maintenance will include the existing entrance. An irrigation system is used to water the grassed and planted areas. Grass is mowed as needed and any distressed areas will be fertilized or replanted. Planted shrubbery and trees will be fertilized and mulched at least two (2) times per year.

Flow Diagram

Station 1 - Recycling & Reprocessing Drop-off Area



**APPENDIX B
DRAWINGS**



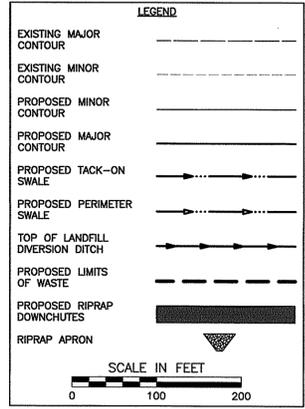
GENERAL EROSION CONTROL NOTES

- ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUESTED DEPENDING UPON FIELD CONDITIONS.
- ON-SITE BURIAL PITS REQUIRE AN ON-SITE DEMOLITION LANDFILL PERMIT.
- ANY ADDITIONAL CLEARING OR GRADING REQUIRED FOR STOCKPILES OR BURIAL PITS WILL BE COORDINATED IN THE FIELD WITH THE EROSION CONTROL OFFICER WHO WILL DETERMINE APPROPRIATE EROSION CONTROL MEASURES FOR SAME.
- ALL EXISTING CONTOURS SHOWN ON PLAN ARE AT 2' INTERVALS AND ALL PROPOSED CONTOURS SHOWN ON PLAN ARE AT 2' CONTOUR INTERVALS.
- STABILIZATION IS THE BEST FORM OF EROSION CONTROL. TEMPORARY SEEDING IS NECESSARY TO ACHIEVE EROSION CONTROL ON LARGE DENUDED AREAS. ALL GRADED SLOPES SHOULD HAVE GROUND COVER PROVIDED ON EXPOSED GRADED SLOPES STEEPER THAN 3:1 AND HIGH QUALITY WATER ZONES (HOW) WITHIN 7 CALENDAR DAYS; SLOPES THAT ARE 3:1 OR FLATTER MUST ESTABLISH GROUND COVER WITHIN 14 CALENDAR DAYS.
- GRADING MORE THAN ONE ACRE WITHOUT AN APPROVED EROSION CONTROL PLAN IS A VIOLATION OF THE NCEQ RULES AND IS SUBJECT TO A FINE.
- CONTRACTOR TO INSTALL SILT FENCE FOR SITE GRADING WHERE NO ADEQUATE EROSION CONTROL MEASURES HAVE BEEN PROVIDED OR IN LOCATIONS WHERE CONDITIONS ARE NOT AS THEY APPEAR ON THESE PLANS.
- INSTALL MATTING AND SEED ALL PROPOSED CHANNELS AS SOON AS THE CHANNELS HAVE BEEN CUT.
- ANY GRADING BEYOND THE DENUDED LIMITS, SHOWN ON THE PLAN IS A VIOLATION OF NCEQ RULES AND IS SUBJECT TO A FINE.
- ADDITIONAL MEASURES TO CONTROL EROSION AND SEDIMENT MAY BE REQUIRED BY A REPRESENTATIVE OF NCEQ.
- SLOPES SHALL BE GRADED NO STEEPER THAN 2:1.
- SEEDING PREPARATION - APPLY GROUND AGRICULTURAL LIMESTONE AT A RATE OF 1 TO 1 1/2 TONS/ACRE ON COARSE-TEXTURED SOILS AND 2-3 TONS/ACRE ON FINE-TEXTURED SOILS. APPLY LIMESTONE UNIFORMLY AND INCORPORATE INTO THE TOP 4-6 INCHES OF SOIL. APPLY A 10-10-10 GRADE FERTILIZER AT 700-1,000 LB/ACRE. FERTILIZER SHOULD BE INCORPORATED INTO THE TOP 4-6 INCHES OF SOIL. IF A HYDRAULIC SEEDER IS USED, DO NOT MIX SEED AND FERTILIZER MORE THAN 30 MINUTES BEFORE APPLICATION.

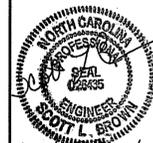
- ALL DISTURBED AREAS THAT WILL NOT BE LANDSCAPED, AS INDICATED ON THE PLANS, SHALL BE SEEDED WITH REBEL II FESCUE MIXTURE AT THE FOLLOWING RATE:
FESCUE AT 5-6 LBS/1000 S.F.
10-10-10 FERTILIZER AT 20 LBS/1000 S.F.
LIME AT 100 LBS/1000 S.F.
STRAW MULCH AT 1 1/2 BALES/1000 S.F.
- 113A-57. MANDATORY STANDARDS FOR LAND-DISTURBING ACTIVITY.
- NO LAND-DISTURBING ACTIVITY DURING PERIODS OF CONSTRUCTION OR IMPROVEMENT TO LAND SHALL BE PERMITTED IN PROXIMITY TO A LAKE OR NATURAL WATERCOURSE UNLESS A BUFFER ZONE IS PROVIDED ALONG THE MARGIN OF THE WATERCOURSE OF SUFFICIENT WIDTH TO CONFINE VISIBLE SILTATION WITHIN THE TWENTY-FIVE PERCENT (25%) OF THE BUFFER ZONE NEAREST THE LAND-DISTURBING ACTIVITY. WATERS THAT HAVE BEEN CLASSIFIED AS TROUT WATERS BY THE ENVIRONMENTAL MANAGEMENT COMMISSION SHALL HAVE AN UNDISTURBED BUFFER ZONE 25 FEET WIDE OR OF SUFFICIENT WIDTH TO CONFINE VISIBLE SILTATION WITHIN THE TWENTY-FIVE PERCENT (25%) OF THE BUFFER ZONE NEAREST THE LAND-DISTURBING ACTIVITY, WHICHEVER IS GREATER. PROVIDED, HOWEVER, THAT THE SEDIMENTATION CONTROL COMMISSION MAY APPROVE PLANS WHICH INCLUDE LAND-DISTURBING ACTIVITY ALONG TROUT WATERS WHEN THE DURATION OF SAID DISTURBANCE WOULD BE TEMPORARY AND THE EXTENT OF SAID DISTURBANCE WOULD BE MINIMAL. THIS SUBDIVISION SHALL NOT APPLY TO A LAND-DISTURBING ACTIVITY IN CONNECTION WITH THE CONSTRUCTION OF FACILITIES TO BE LOCATED ON, OVER, OR UNDER A LAKE OR NATURAL WATERCOURSE.
- THE ANGLE FOR GRADED SLOPES AND FILLS SHALL BE NO GREATER THAN THE ANGLE WHICH CAN BE RETAINED BY VEGETATIVE COVER OR OTHER ADEQUATE EROSION CONTROL DEVICES OR STRUCTURES. IN ANY EVENT, SLOPES STEEPER THAN 3:1 AND HIGH QUALITY WATER ZONES (HOW) MUST ESTABLISH GROUND COVER WITHIN 7 CALENDAR DAYS; SLOPES THAT ARE 3:1 OR FLATTER MUST ESTABLISH GROUND COVER WITHIN 14 CALENDAR DAYS, OR BE PLANTED OR OTHERWISE PROVIDED WITH GROUND COVER, DEVICES, OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION.
- WHENEVER LAND-DISTURBING ACTIVITY IS UNDERTAKEN ON A TRACT COMPRISING MORE THAN ONE ACRE, IF MORE THAN ONE ACRE IS UNCOVERED, THE PERSON CONDUCTING THE LAND-DISTURBING ACTIVITY SHALL INSTALL SEDIMENTATION AND EROSION CONTROL DEVICES AND PRACTICES AS ARE SUFFICIENT TO RETAIN THE SEDIMENT GENERATED BY THE LAND-DISTURBING ACTIVITY WITHIN THE BOUNDARIES OF THE TRACT DURING CONSTRUCTION UPON AND DEVELOPMENT OF SAID TRACT, AND SHALL PLANT OR OTHERWISE PROVIDE A PERMANENT GROUND COVER SUFFICIENT TO RESTRAIN EROSION AFTER COMPLETION OF CONSTRUCTION OR DEVELOPMENT, GRADED SLOPES STEEPER THAN 3:1 AND HIGH QUALITY WATER ZONES (HOW) MUST ESTABLISH GROUND COVER WITHIN 7 CALENDAR DAYS; SLOPES THAT ARE 3:1 OR FLATTER MUST ESTABLISH GROUND COVER WITHIN 14 CALENDAR DAYS.
- NO PERSON SHALL INITIATE ANY LAND-DISTURBING ACTIVITY ON A TRACT IF MORE THAN ONE ACRE IS TO BE UNCOVERED UNLESS, 30 OR MORE DAYS PRIOR TO INITIATING THE ACTIVITY, AN EROSION AND SEDIMENTATION CONTROL PLAN FOR SUCH ACTIVITY IS FILED WITH THE AGENCY HAVING JURISDICTION. THE AGENCY HAVING JURISDICTION SHALL FORWARD TO THE DIRECTOR OF THE DIVISION OF WATER QUALITY A COPY OF EACH EROSION AND SEDIMENTATION CONTROL PLAN FOR A LAND-DISTURBING ACTIVITY THAT INVOLVES THE UTILIZATION OF DITCHES FOR DE-WATERING OR LOWERING THE WATER TABLE OF THE TRACT.

GENERAL NOTES

- THE CONTRACTOR SHALL OBTAIN ALL PERMITS AND APPROVALS PRIOR TO COMMENCING WORK.
- ANY CONFLICTS BETWEEN THESE PLANS AND THE PERMIT DRAWINGS SHOULD BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER.
- CONTRACTOR SHALL FIELD VERIFY ALL EXISTING SITE CONDITIONS PRIOR TO COMMENCING WORK.
- CONDITIONS AT THE SITE, FOR PURPOSE OF THIS WORK, MAY VARY FROM THOSE SHOWN AND ARE THE RESPONSIBILITY OF THE CONTRACTOR TO INCORPORATE THE ACTUAL EXISTING CONDITIONS IN THE EXECUTION OF THE WORK.
- THE CONTRACTOR SHALL NOT BLOCK WASTE HAULING OR OTHER LANDFILL OPERATIONS.
- THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE SITE SAFETY ASSOCIATED WITH THE WORK UNDER THIS CONTRACT AND FOR COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL HEALTH AND SAFETY LAWS, CODES, REGULATIONS AND ORDINANCES INCLUDING BUT NOT LIMITED TO THOSE MANDATED BY OSHA.
- THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING THE LOCATION OF ALL UTILITIES PRIOR TO BEGINNING WORK.
- THE CONTRACTOR SHALL RESTORE TO THE OWNERS SATISFACTION ALL AREAS DISTURBED BY CONSTRUCTION; INCLUDING ROADWAY SURFACES, ROADWAY SHOULDERS AND DITCHES, DRAINAGE STRUCTURES, UTILITIES AND OTHER EXISTING FEATURES.
- THE CONTRACTOR IS RESPONSIBLE FOR DEWATERING (IF REQUIRED) ALL EXCAVATION, FILL AREAS, ETC. TO WORK IN DRY CONDITIONS. EXCESS EXCAVATED MATERIALS FROM THE WORK SHALL BE STOCKPILED IN THE AREA DESIGNATED AND STABILIZED.
- THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING AND AVOIDING DAMAGE TO ALL MONITORING WELLS. IN THE EVENT OF DAMAGE, THE CONTRACTOR WILL PAY FOR WELL REPLACEMENT.



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NORTH CAROLINA
BOARD OF EXAMINERS
FOR ENGINEERS AND
SURVEYORS LICENSE
NO. C-3035

**PROPOSED DRAINAGE BASIN PLAN
GRADING PLAN**

DRAWING NO.: **C300**

SHEET 4 OF 5

DATE: JANUARY 2016
DRAWN BY: [Name]
CHECKED BY: [Name]
PROJECT NO.: 111-370-002
APPROVED BY: [Signature]

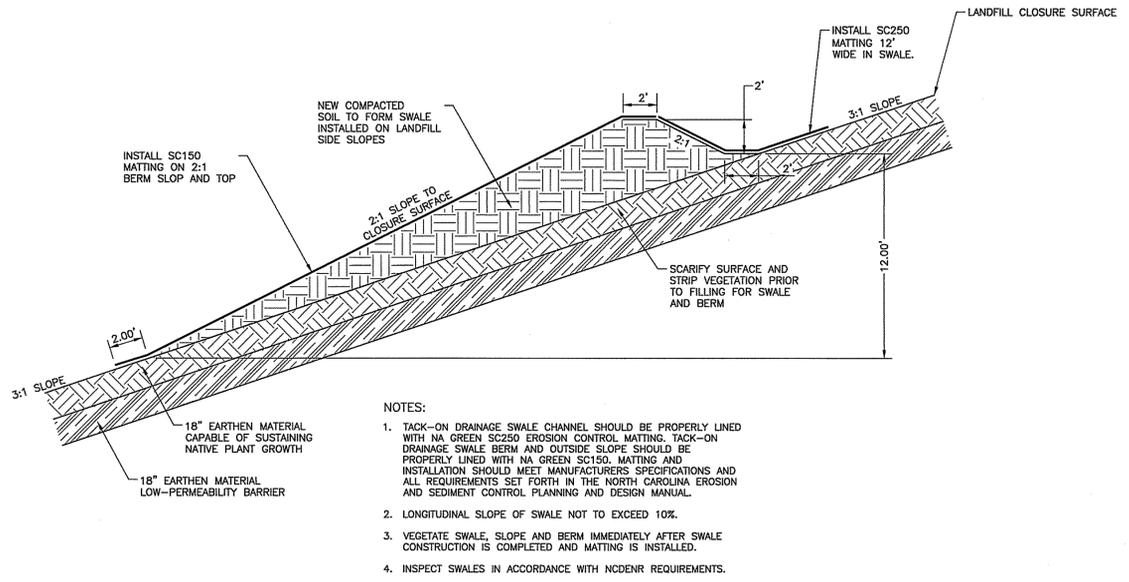
**GREENWAY WASTE SOLUTIONS
OF HARRISBURG LLC
PERMIT MODIFICATION
HARRISBURG, NC**

CEC

Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 - Fax: 980.237.0372
www.cecinc.com

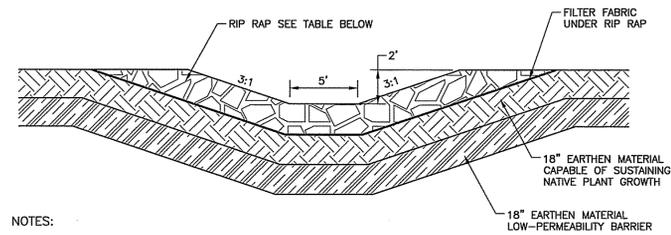
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- NOTES:
- TACK-ON DRAINAGE SWALE CHANNEL SHOULD BE PROPERLY LINED WITH NA GREEN SC250 EROSION CONTROL MATTING. TACK-ON DRAINAGE SWALE BERM AND OUTSIDE SLOPE SHOULD BE PROPERLY LINED WITH NA GREEN SC150 MATTING AND INSTALLATION SHOULD MEET MANUFACTURERS SPECIFICATIONS AND ALL REQUIREMENTS SET FORTH IN THE NORTH CAROLINA EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.
 - LONGITUDINAL SLOPE OF SWALE NOT TO EXCEED 10%.
 - VEGETATE SWALE, SLOPE AND BERM IMMEDIATELY AFTER SWALE CONSTRUCTION IS COMPLETED AND MATTING IS INSTALLED.
 - INSPECT SWALES IN ACCORDANCE WITH NCDENR REQUIREMENTS.

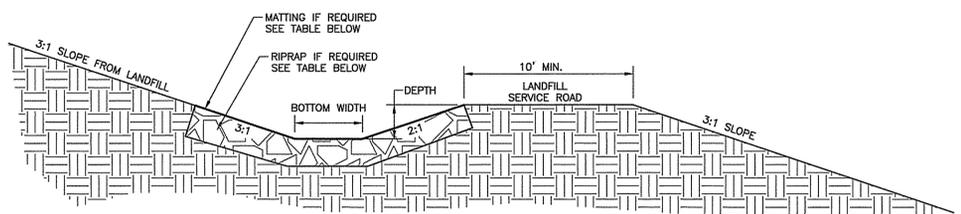
1 TACK-ON DRAINAGE SWALE
C400/ NOT TO SCALE



- NOTES:
- RIP RAP DOWNCHUTE CHANNEL SHOULD BE PROPERLY LINED WITH FILTER FABRIC. FABRIC INSTALLATION SHOULD MEET MANUFACTURERS SPECIFICATIONS.
 - LONGITUDINAL SLOPE OF DOWNCHUTE NOT TO EXCEED 3:1.

CHUTE	RIPRAP
1	D50=18"
2	D50=27"
3	D50=24"
4	D50=12"

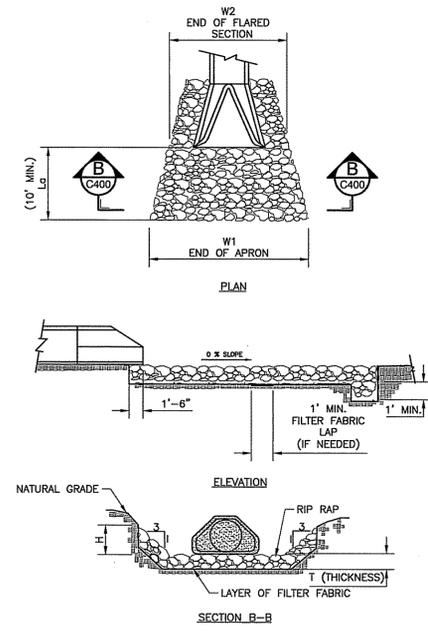
2 RIP RAP DOWNCHUTE
C400/ NOT TO SCALE



DITCH	DEPTH	BOTTOM WIDTH	SLOPE	MATTING	RIPRAP
1	2.0 FT	5 FT	3:1	SC250	N/A
2	1.5 FT	0 FT	3:1	N/A	D50=15"
3	2.0 FT	0 FT	3:1, 2:1	N/A	N/A
4	2.5 FT	0 FT	3:1, 2:1	SC 250	N/A
5	2.5 FT	0 FT	3:1, 2:1	SC 250	N/A
6	2.0 FT	0 FT	3:1, 2:1	N/A	N/A

- NOTES:
- PERIMETER DRAINAGE SWALE CHANNEL SHOULD BE PROPERLY LINED WITH NA GREEN SC250 EROSION CONTROL MATTING, RIPRAP (D50=15"), OR APPROVED GRASS LINING AS SHOWN. MATTING AND INSTALLATION SHOULD MEET MANUFACTURERS SPECIFICATIONS AND ALL REQUIREMENTS SET FORTH IN THE NORTH CAROLINA EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.
 - LONGITUDINAL SLOPE OF SWALE NOT TO EXCEED 10%.
 - VEGETATE SWALE IMMEDIATELY AFTER SWALE CONSTRUCTION IS COMPLETED AND MATTING IS INSTALLED.
 - INSPECT SWALES IN ACCORDANCE WITH NCDENR REQUIREMENTS.

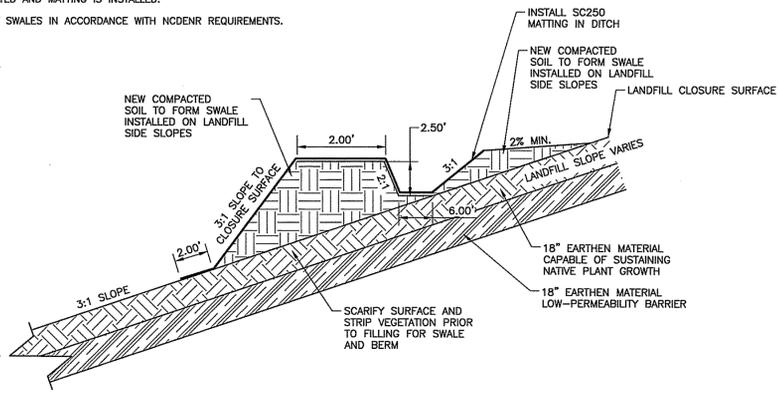
3 PERIMETER DRAINAGE DITCH
C400/ NOT TO SCALE



- NOTES:
- CLASS OR MEDIAN SIZE OF RIPRAP AND LENGTH, WIDTH AND DEPTH OF APRON TO BE DESIGNED BY THE ENGINEER AND ARE SUMMARIZED BELOW.
 - RIPRAP SHOULD EXTEND UP BOTH SIDES OF THE APRON AND AROUND THE END OF THE PIPE OR CULVERT AT THE DISCHARGE OUTLET AT A MAXIMUM SLOPE OF 2:1 AND A HEIGHT NOT LESS THAN TWO THIRDS THE PIPE DIAMETER OR CULVERT HEIGHT.
 - THERE SHALL BE NO OVERFLOW FROM THE END OF THE APRON TO THE SURFACE OF THE RECEIVING CHANNEL. THE AREA TO BE PAVED OR RIPRAPPED SHALL BE UNDERCUT SO THAT THE INVERT OF THE APRON SHALL BE AT THE SAME GRADE (FLUSH) WITH THE SURFACE OF THE RECEIVING CHANNEL. THE APRON SHALL HAVE A CUTOFF OR TOE WALL AT THE DOWNSTREAM END.
 - THE WIDTH OF THE END OF THE APRON SHALL BE EQUAL TO THE BOTTOM WIDTH OF THE RECEIVING CHANNEL. MAXIMUM TAPER TO RECEIVING CHANNEL 5:1.
 - ALL SUBGRADE FOR STRUCTURE TO BE COMPACTED TO 95% OR GREATER.
 - THE PLACING OF FILL, EITHER LOOSE OR COMPACTED IN THE RECEIVING CHANNEL SHALL NOT BE ALLOWED.
 - NO BENDS OR CURVES IN THE HORIZONTAL ALIGNMENT OF THE APRON WILL BE PERMITTED.
 - FILTER FABRIC SHALL BE INSTALLED ON COMPACTED SUBGRADE PRIOR TO PLACEMENT OF RIP RAP.
 - ANY DISTURBED AREA FROM END OF APRON TO RECEIVING CHANNEL MUST BE STABILIZED.

OUTLET	La	W1	W2	T	H	d50	dmax
PIPE OUTLET	25	10.5	28.5	1.70 FT	6 IN.	9 IN.	13.5 IN.

4 OUTLET PROTECTION
C400/ NOT TO SCALE



- NOTES:
- DIVERSION DITCH SHOULD BE PROPERLY LINED WITH NA GREEN SC250 EROSION CONTROL MATTING. DITCH BERM AND OUTSIDE SLOPE SHOULD BE PROPERLY LINED WITH NA GREEN SC250 MATTING AND INSTALLATION SHOULD MEET MANUFACTURERS SPECIFICATIONS AND ALL REQUIREMENTS SET FORTH IN THE NORTH CAROLINA EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL.
 - LONGITUDINAL SLOPE OF DITCH NOT TO EXCEED 6%.
 - VEGETATE DITCH, SLOPE AND BERM IMMEDIATELY AFTER DITCH CONSTRUCTION IS COMPLETED AND MATTING IS INSTALLED.
 - INSPECT DITCHES IN ACCORDANCE WITH NCDENR REQUIREMENTS.

5 TOP OF LANDFILL DIVERSION DITCH
C400/ NOT TO SCALE

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 - Fax: 980.237.0372
www.cesinc.com

GREENWAY WASTE SOLUTIONS OF HARRISBURG LLC PERMIT MODIFICATION HARRISBURG, NC

DATE: JANUARY 2016
DRAWN BY: VARIES
DWG SCALE: VARIES
PROJECT NO: 111-370-002
APPROVED BY: THUG



NORTH CAROLINA BOARD OF EXAMINERS FOR ENGINEERS AND SURVEYORS LICENSE NO. C-3035



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DRAWING NO: C400 SHEET 5 OF 5

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**APPENDIX C
CALCULATIONS**

TACK ON SWALES

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: 8% SLOPE TACK ON SWALE

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Basin	*Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
8% SLOPE TACK ON SWALE	1.76	0.40	5.0	8.05	5.67

* LARGEST DRAINAGE AREA TO SWALE

Channel Report

8% TACK ON SWALE

Trapezoidal

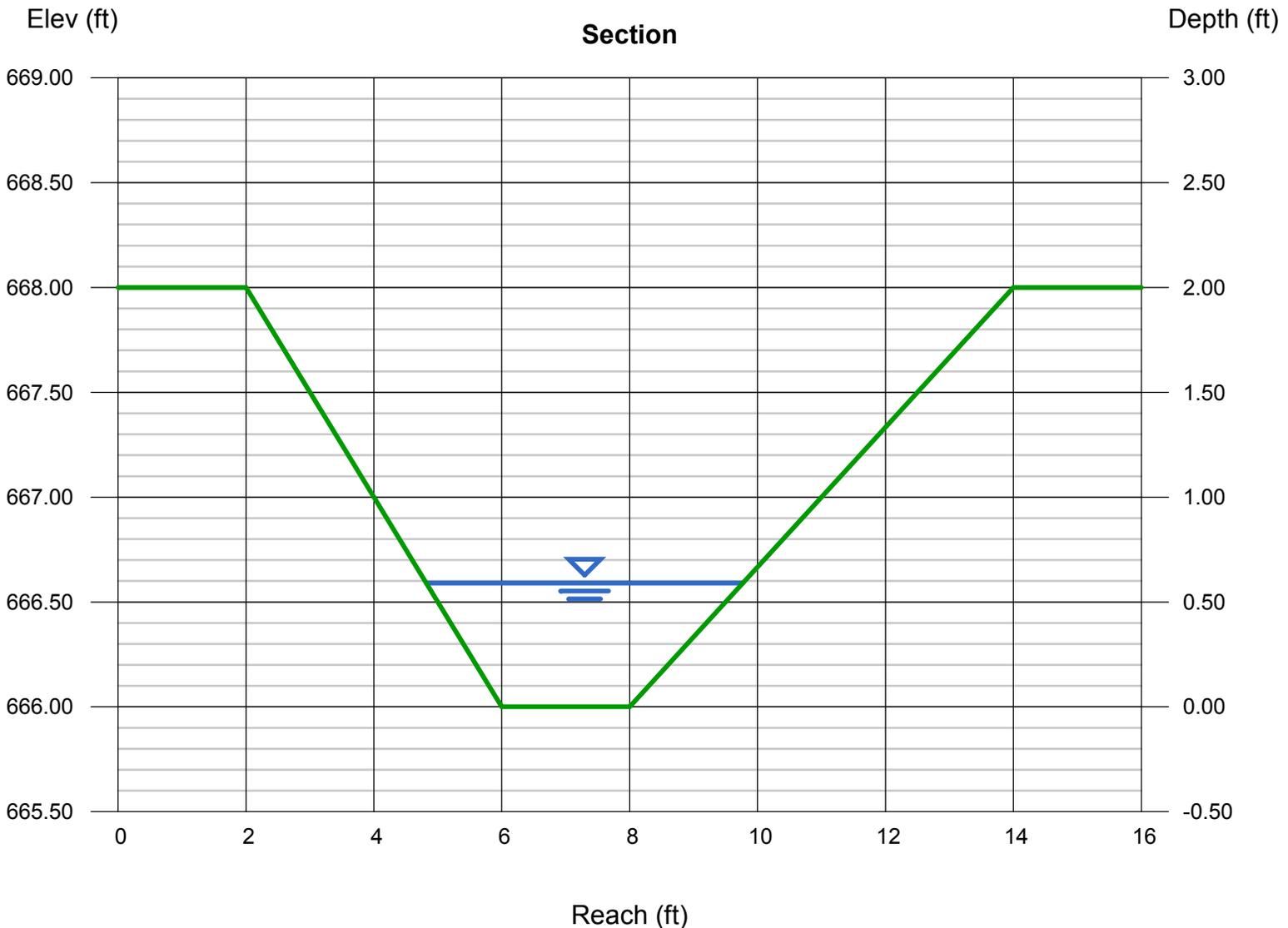
Bottom Width (ft) = 2.00
Side Slopes (z:1) = 2.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 666.00
Slope (%) = 8.00
N-Value = 0.081

Highlighted

Depth (ft) = 0.59
Q (cfs) = 5.670
Area (sqft) = 2.05
Velocity (ft/s) = 2.77
Wetted Perim (ft) = 5.19
Crit Depth, Yc (ft) = 0.51
Top Width (ft) = 4.95
EGL (ft) = 0.71

Calculations

Compute by: Known Q
Known Q (cfs) = 5.67






Tensar International Corporation
 5401 St. Wendel-Cynthiana Road
 Poseyville, Indiana 47633
 Tel. 800.772.2040
 Fax 812.867.0247
 www.nagreen.com

**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: 8% TACK ON SWALE**

Discharge	5.67
Peak Flow Period	0.08
Channel Slope	0.08
Channel Bottom Width	2
Left Side Slope	2
Right Side Slope	3
Low Flow Liner	
Retardance Class	C
Vegetation Type	Bunch Type
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

SC250 - Class C - Bunch Type - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	5.67 cfs	4.63 ft/s	0.41 ft	0.04	3 lbs/ft ²	2.03 lbs/ft ²	1.48	STABLE	E
SC250 Reinforced Vegetation	Straight	5.67 cfs	2.8 ft/s	0.59 ft	0.081	10 lbs/ft ²	2.92 lbs/ft ²	3.42	STABLE	E
Underlying Substrate	Straight	5.67 cfs	2.8 ft/s	0.59 ft	--	0.8 lbs/ft ²	0.398 lbs/ft ²	2.01	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: TOP OF LANDFILL DIVERSION DITCH

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
TOP OF LANDFILL DIVERSION DITCH	3.81	0.40	5.0	8.05	12.27

*LARGEST DRAINAGE AREA

Channel Report

TOP OF LANDFILL DIVERSION DITCH

Trapezoidal

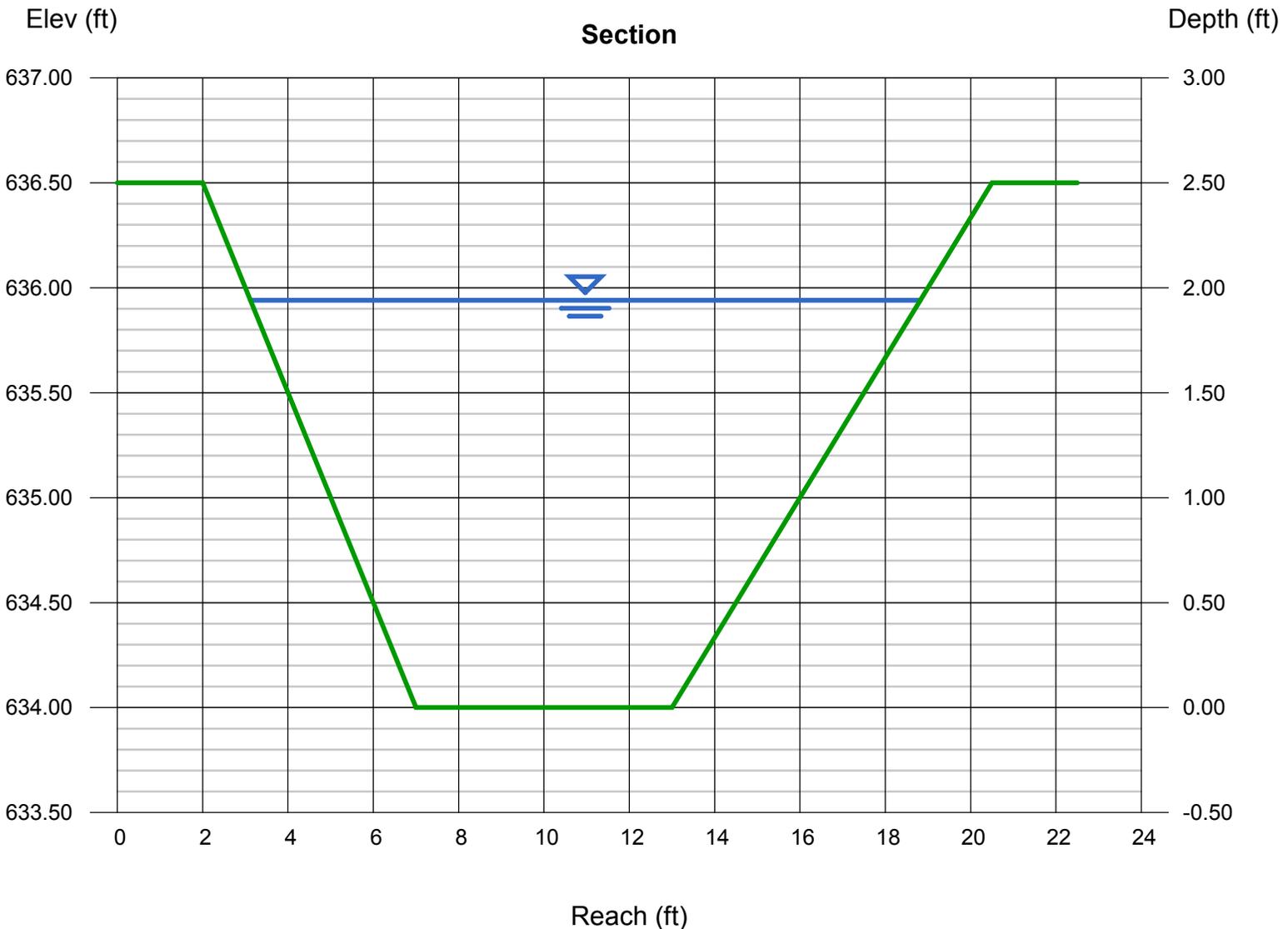
Bottom Width (ft) = 6.00
Side Slopes (z:1) = 2.00, 3.00
Total Depth (ft) = 2.50
Invert Elev (ft) = 634.00
Slope (%) = 0.06
N-Value = 0.073

Highlighted

Depth (ft) = 1.94
Q (cfs) = 12.27
Area (sqft) = 21.05
Velocity (ft/s) = 0.58
Wetted Perim (ft) = 16.47
Crit Depth, Yc (ft) = 0.48
Top Width (ft) = 15.70
EGL (ft) = 1.95

Calculations

Compute by: Known Q
Known Q (cfs) = 12.27





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 Fax 812.867.0247
 www.nagreen.com

**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: TOP OF LANDFILL DIVERSION DITCH**

Discharge	12.27
Peak Flow Period	0.08
Channel Slope	.06
Channel Bottom Width	6
Left Side Slope	2
Right Side Slope	3
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

SC250 - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	12.27 cfs	4.43 ft/s	0.4 ft	0.04	3 lbs/ft ²	1.48 lbs/ft ²	2.02	STABLE	E
SC250 Reinforced Vegetation	Straight	12.27 cfs	2.96 ft/s	0.56 ft	0.073	10 lbs/ft ²	2.1 lbs/ft ²	4.76	STABLE	E
Underlying Substrate	Straight	12.27 cfs	2.96 ft/s	0.56 ft	--	0.8 lbs/ft ²	0.235 lbs/ft ²	3.4	STABLE	--



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**Erosion Control Materials Design Software
 Version 5.0**

Project Name: PERMIT MOD
Project Number: 77786
Project Location: HARRISBURG, NORTH CAROLINA
Slope Name: TACK ON SWALE OUTSIDE SLOPE

Country	United States
State/Region	North Carolina
City	Charlotte
Annual R Factor	175
Adjusted R Factor	21
Total Slope Length	30
Protection Type	Permanent
Protection Period	3
Beginning Month	January
Slope Gradient (H:1)	3
Soil Type	Clay Loam
K Factor	0.210

Reach 1

Start: 0ft End: 30ft

Vegetation Type: Mix (Both Sod/Bunch)(50-75%)

Material	ASL bare	ASL mat	MSL bare	MSL mat	Soil Loss Tolerance	SF	Remarks	Staple / App Rate
Estb. Veg.	0.658 in	0.028 in	0 in	0 in	0.03 in	1.085	STABLE	--
SC150	0.06 in	0.002 in	0.103 in	0.004 in	0.25 in	71.295	STABLE	B

DOWNCHUTES

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: DOWNCHUTE 1 FLOW

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Downchute	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
DOWNCHUTE 1	3.28	0.40	5.0	8.05	10.56

Channel Report

DOWNCHUTE 1

Trapezoidal

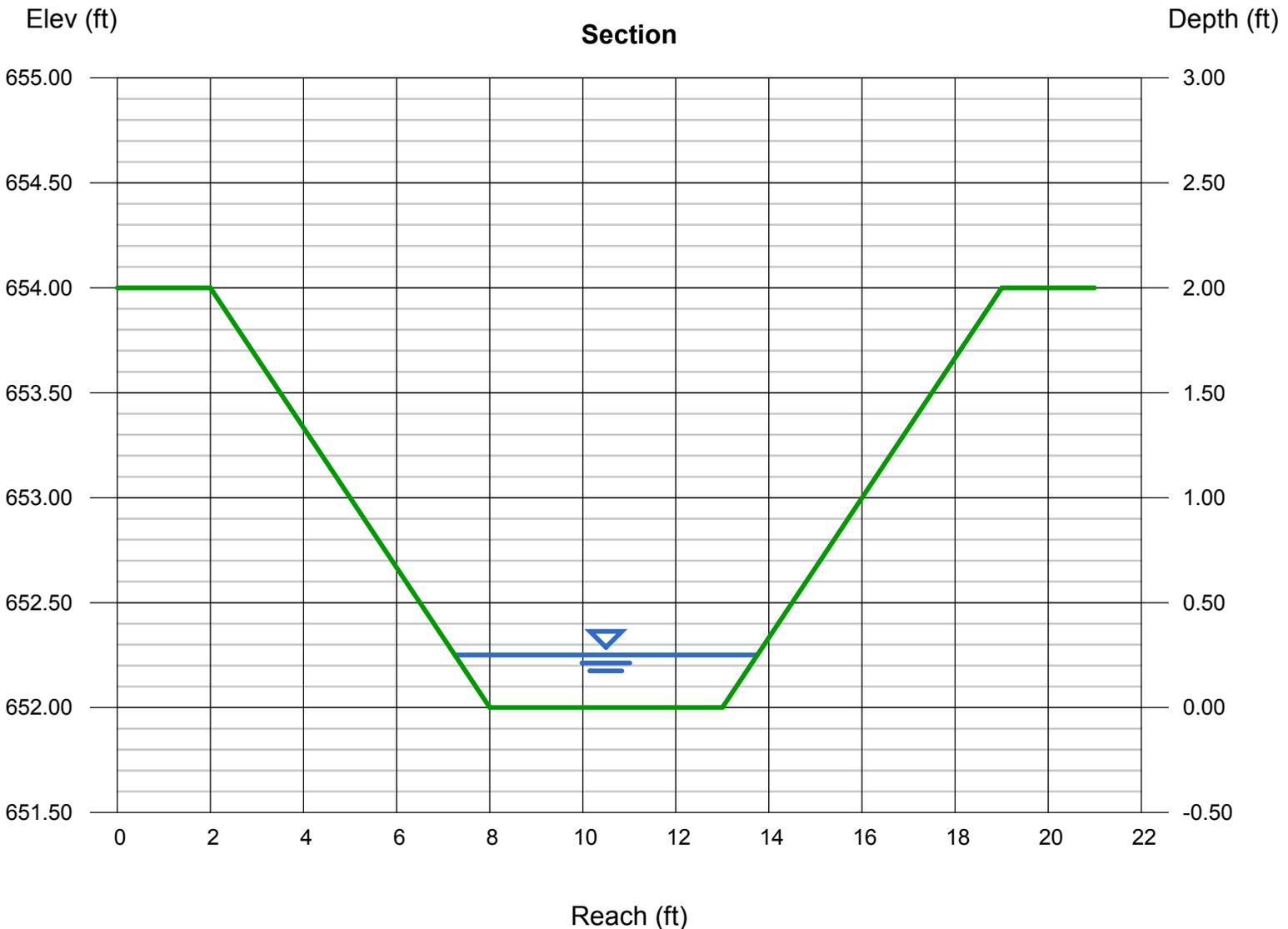
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 652.00
Slope (%) = 33.00
N-Value = 0.040

Highlighted

Depth (ft) = 0.25
Q (cfs) = 10.56
Area (sqft) = 1.44
Velocity (ft/s) = 7.35
Wetted Perim (ft) = 6.58
Crit Depth, Yc (ft) = 0.47
Top Width (ft) = 6.50
EGL (ft) = 1.09

Calculations

Compute by: Known Q
Known Q (cfs) = 10.56






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**Erosion Control Materials Design Software
 Version 5.0**

**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: DOWNCHUTE 1**

Discharge	10.56
Peak Flow Period	0.08
Channel Slope	0.33
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	
Vegetation Type	
Vegetation Density	
Soil Type	Clay Loam

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	10.56 cfs	7.6 ft/s	0.24 ft	0.04	6 lbs/ft ²	5 lbs/ft ²	1.2	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: DOWNCHUTE 2 FLOW

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Downchute	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
DOWNCHUTE 2	7.84	0.40	5.0	8.05	25.24

Channel Report

DOWNCHUTE 2

Trapezoidal

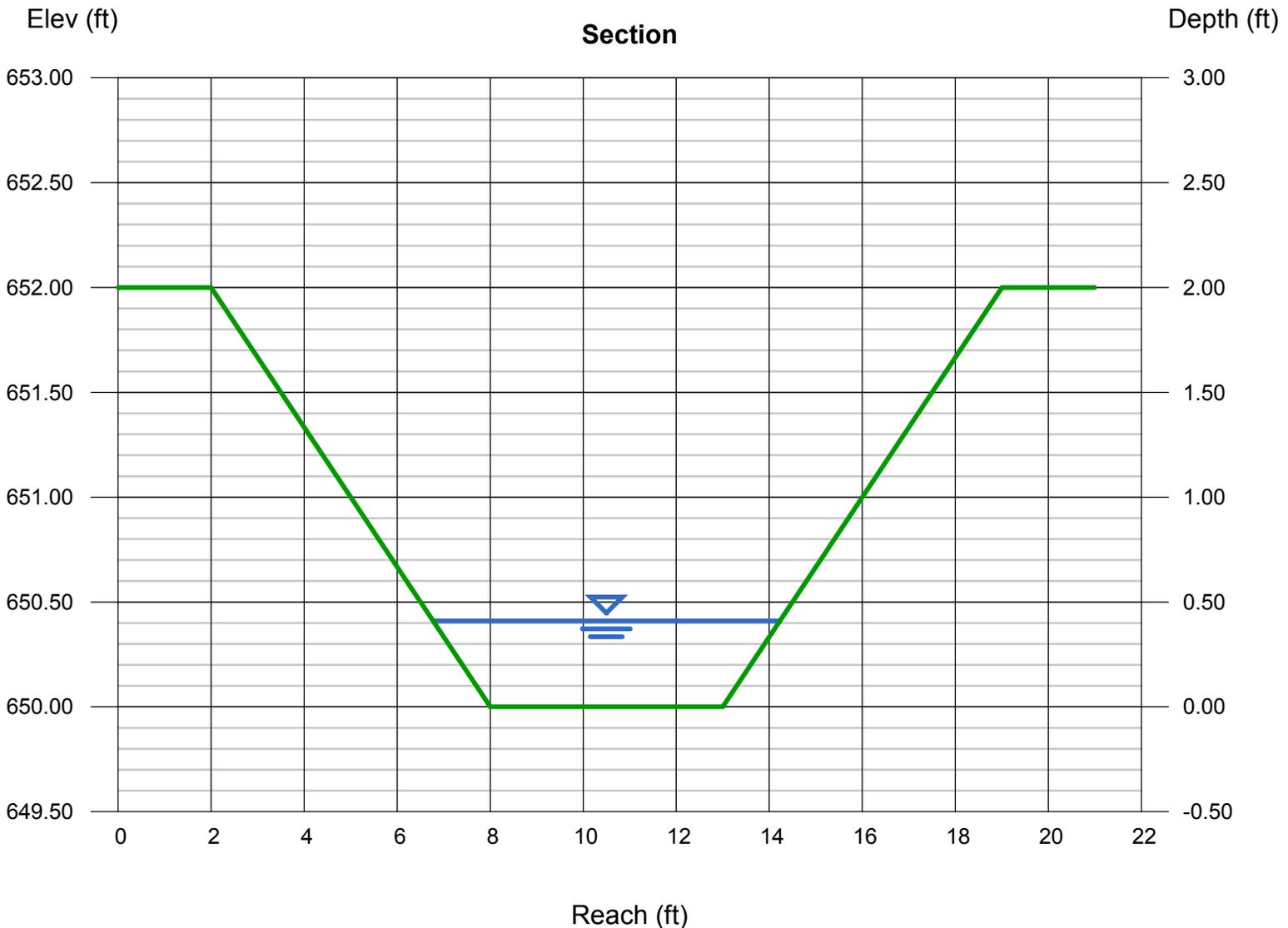
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 650.00
Slope (%) = 33.00
N-Value = 0.040

Highlighted

Depth (ft) = 0.41
Q (cfs) = 25.24
Area (sqft) = 2.55
Velocity (ft/s) = 9.88
Wetted Perim (ft) = 7.59
Crit Depth, Yc (ft) = 0.79
Top Width (ft) = 7.46
EGL (ft) = 1.93

Calculations

Compute by: Known Q
Known Q (cfs) = 25.24






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**Erosion Control Materials Design Software
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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: DOWNCHUTE 2**

Discharge	25.24
Peak Flow Period	0.08
Channel Slope	0.33
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	
Vegetation Type	
Vegetation Density	
Soil Type	Clay Loam

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	25.24 cfs	10.18 ft/s	0.4 ft	0.04	9 lbs/ft ²	8.24 lbs/ft ²	1.09	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: DOWNCHUTE 3 FLOW

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Downchute	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
DOWNCHUTE 3	6.52	0.40	5.0	8.05	20.99

Channel Report

DOWNCHUTE 3

Trapezoidal

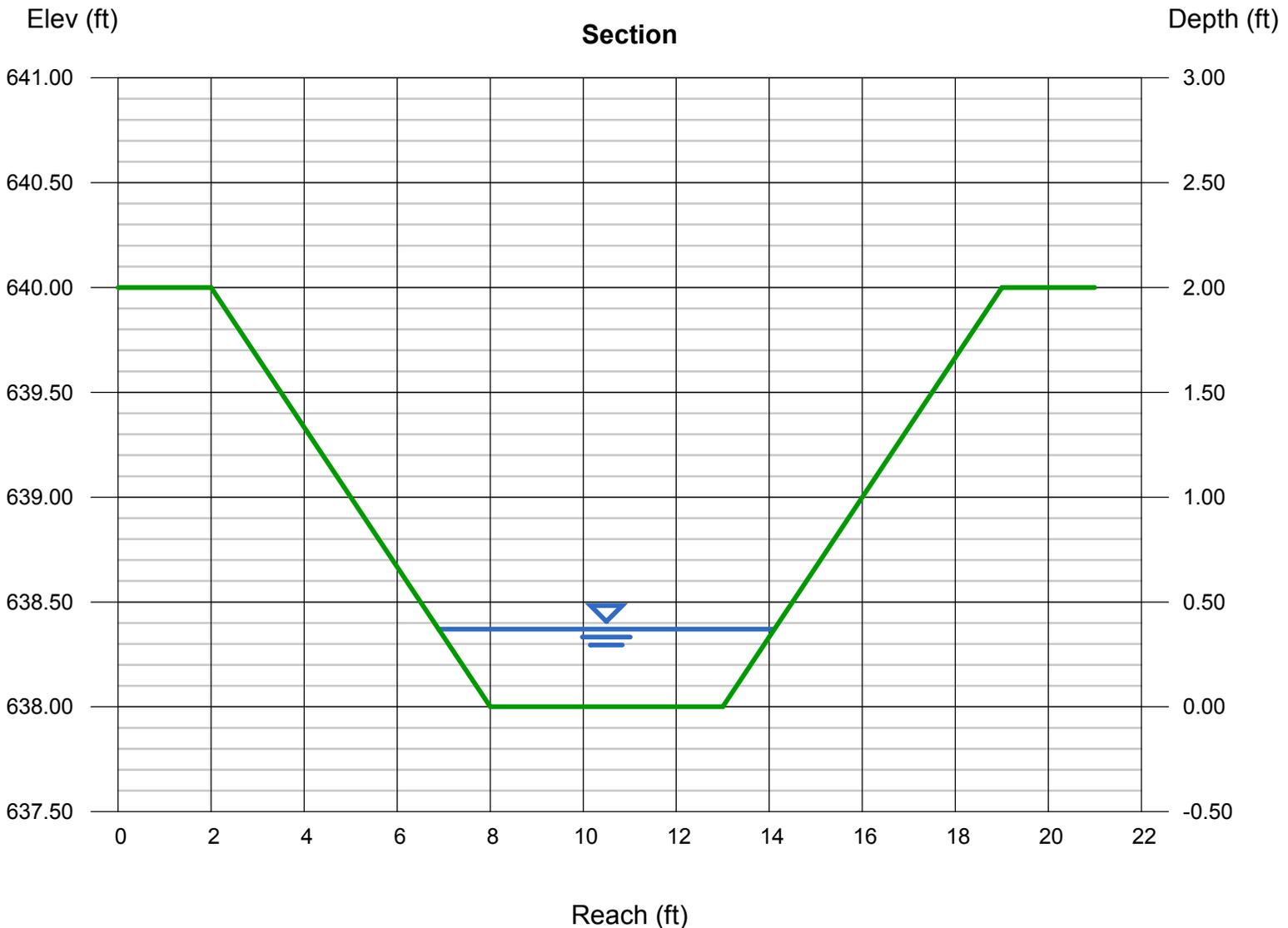
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 638.00
Slope (%) = 33.00
N-Value = 0.040

Highlighted

Depth (ft) = 0.37
Q (cfs) = 20.99
Area (sqft) = 2.26
Velocity (ft/s) = 9.28
Wetted Perim (ft) = 7.34
Crit Depth, Yc (ft) = 0.71
Top Width (ft) = 7.22
EGL (ft) = 1.71

Calculations

Compute by: Known Q
Known Q (cfs) = 20.99






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**Erosion Control Materials Design Software
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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: DOWNCHUTE 3**

Discharge	20.99
Peak Flow Period	0.08
Channel Slope	0.33
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	
Vegetation Type	
Vegetation Density	
Soil Type	Clay Loam

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	20.99 cfs	9.58 ft/s	0.36 ft	0.04	8 lbs/ft ²	7.42 lbs/ft ²	1.08	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: DOWNCHUTE 4 FLOW

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Downchute	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
DOWNCHUTE 4	0.88	0.40	5.0	8.05	2.83

Channel Report

DOWNCHUTE 4

Trapezoidal

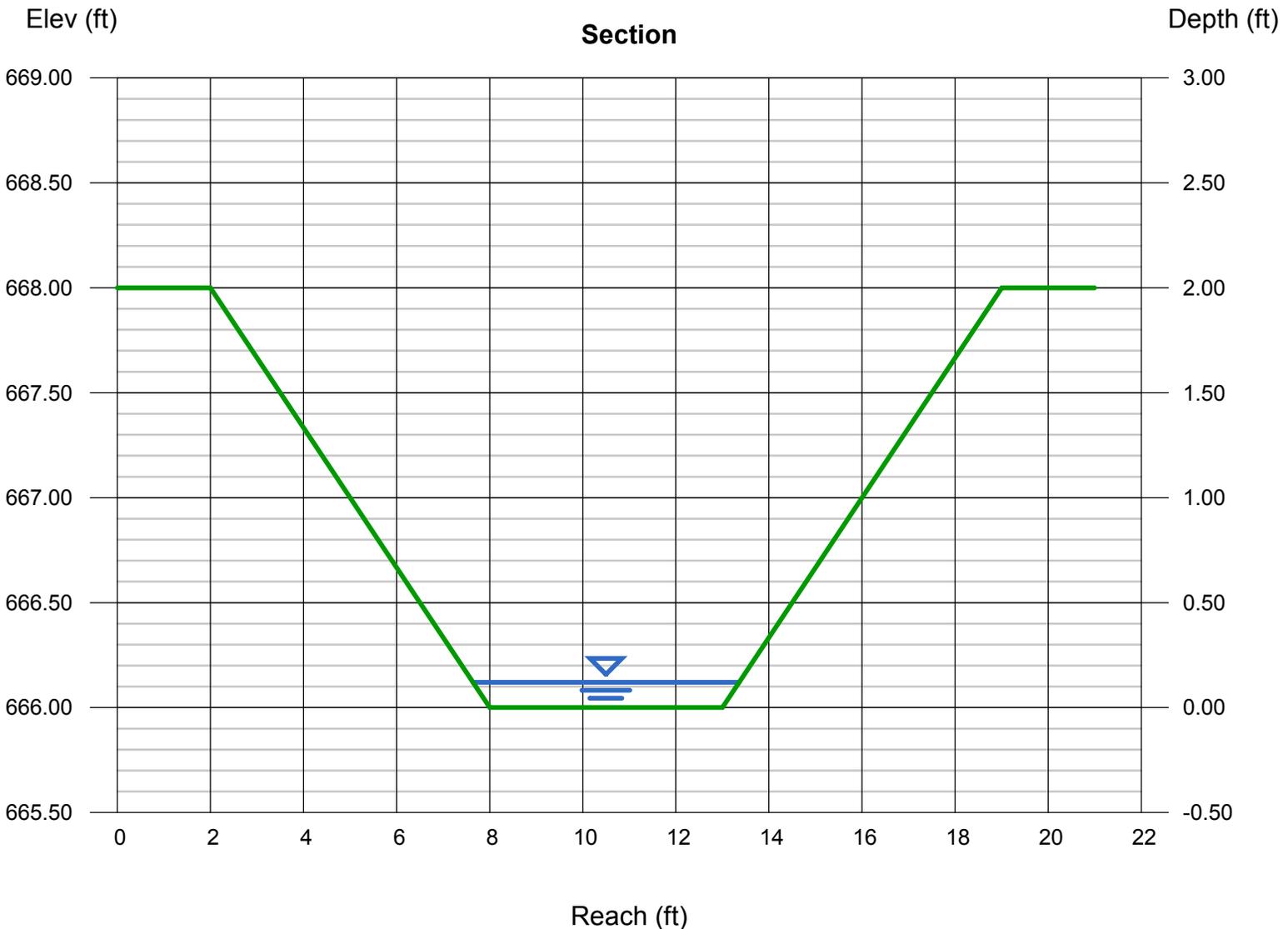
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 666.00
Slope (%) = 33.00
N-Value = 0.040

Highlighted

Depth (ft) = 0.12
Q (cfs) = 2.830
Area (sqft) = 0.64
Velocity (ft/s) = 4.40
Wetted Perim (ft) = 5.76
Crit Depth, Yc (ft) = 0.21
Top Width (ft) = 5.72
EGL (ft) = 0.42

Calculations

Compute by: Known Q
Known Q (cfs) = 2.83






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Project Name: PERMIT MOD
Project Number: 77786
Project Location: HARRISBURG, NORTH CAROLINA
Channel Name: DOWNCHUTE 4

Discharge	2.83
Peak Flow Period	0.08
Channel Slope	0.33
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	
Vegetation Type	
Vegetation Density	
Soil Type	Clay Loam

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	2.83 cfs	4.74 ft/s	0.11 ft	0.04	4 lbs/ft ²	2.31 lbs/ft ²	1.73	STABLE	--

PERIMETER DITCHES

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 1

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 1	5.68	0.40	5.0	8.05	18.29

Channel Report

PERIMETER DITCH 1

Trapezoidal

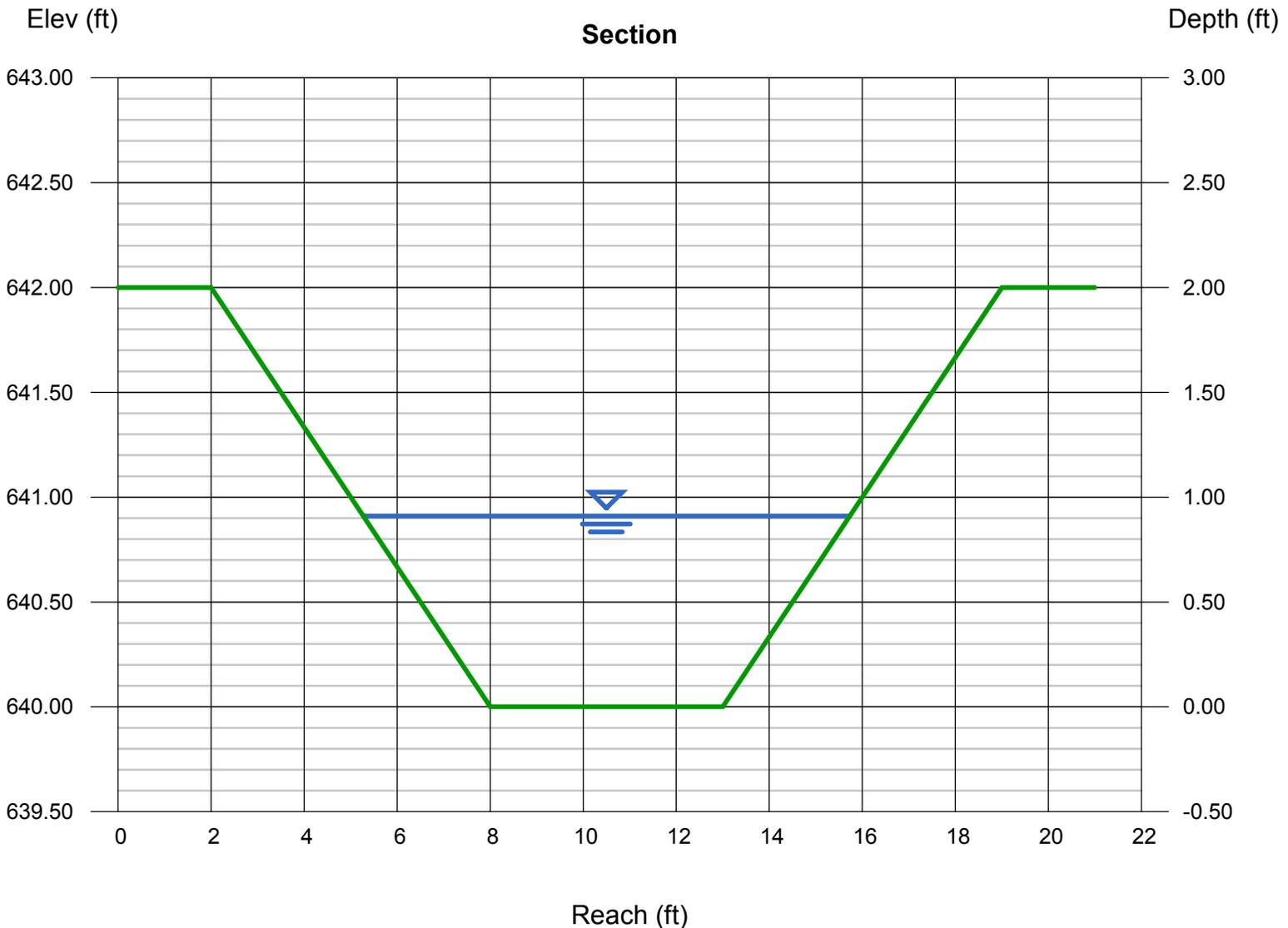
Bottom Width (ft) = 5.00
Side Slopes (z:1) = 3.00, 3.00
Total Depth (ft) = 2.00
Invert Elev (ft) = 640.00
Slope (%) = 2.50
N-Value = 0.067

Highlighted

Depth (ft) = 0.91
Q (cfs) = 18.29
Area (sqft) = 7.03
Velocity (ft/s) = 2.60
Wetted Perim (ft) = 10.76
Crit Depth, Yc (ft) = 0.66
Top Width (ft) = 10.46
EGL (ft) = 1.02

Calculations

Compute by: Known Q
Known Q (cfs) = 18.29





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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: PERIMETER DITCH 1**

Discharge	18.29
Peak Flow Period	0.08
Channel Slope	0.025
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

SC250 - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	18.29 cfs	4 ft/s	0.66 ft	0.037	3 lbs/ft ²	1.02 lbs/ft ²	2.93	STABLE	E
SC250 Reinforced Vegetation	Straight	18.29 cfs	2.63 ft/s	0.9 ft	0.067	10 lbs/ft ²	1.41 lbs/ft ²	7.1	STABLE	E
Underlying Substrate	Straight	18.29 cfs	2.63 ft/s	0.9 ft	--	0.8 lbs/ft ²	0.13 lbs/ft ²	6.17	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 2

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 2	3.58	0.40	5.0	8.05	11.53

Channel Report

PERIMETER DITCH 2

Triangular

Side Slopes (z:1) = 3.00, 2.00
Total Depth (ft) = 1.50

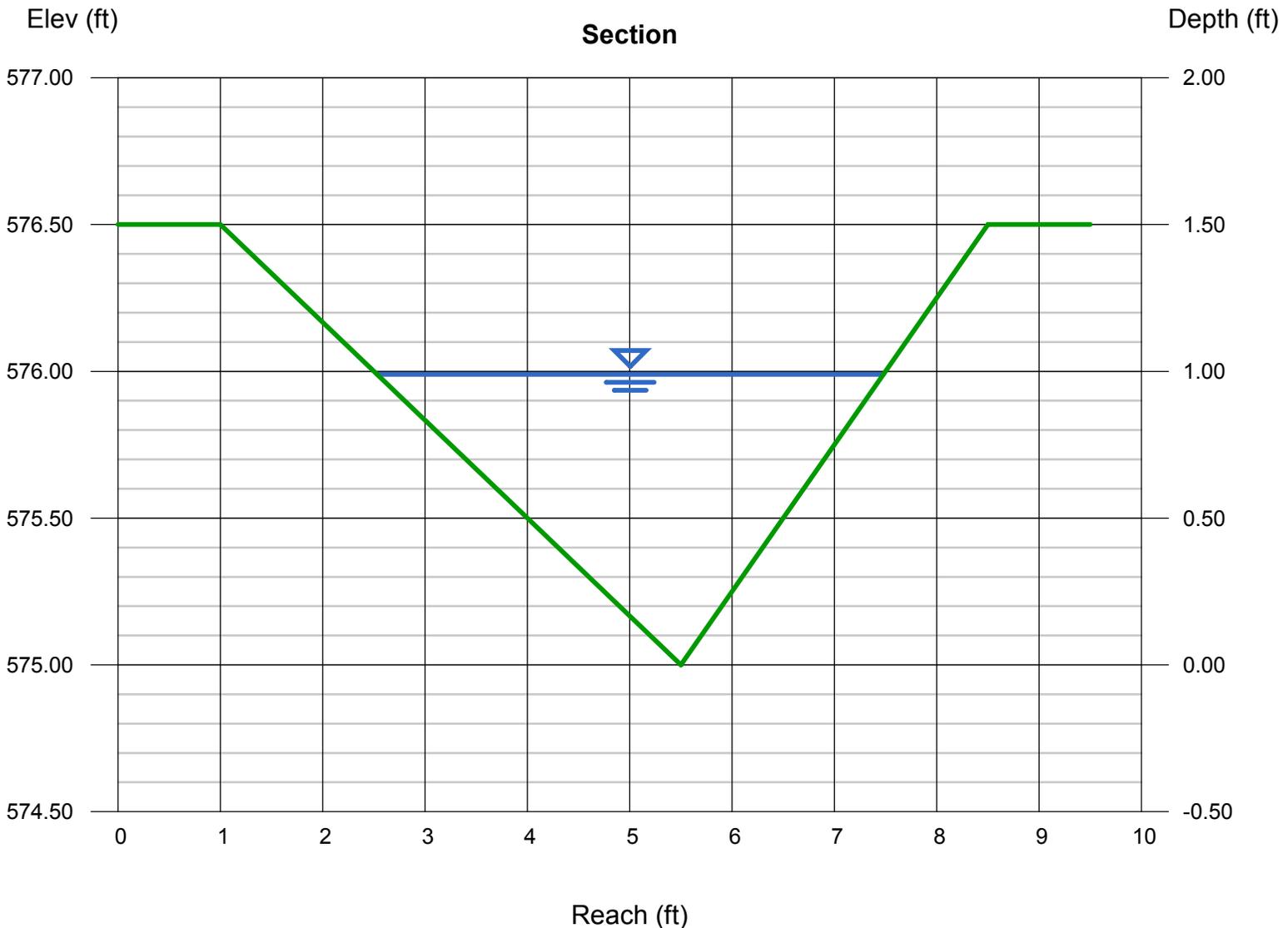
Invert Elev (ft) = 575.00
Slope (%) = 8.60
N-Value = 0.054

Calculations

Compute by: Known Q
Known Q (cfs) = 11.53

Highlighted

Depth (ft) = 0.99
Q (cfs) = 11.53
Area (sqft) = 2.45
Velocity (ft/s) = 4.71
Wetted Perim (ft) = 5.34
Crit Depth, Yc (ft) = 1.06
Top Width (ft) = 4.95
EGL (ft) = 1.33






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Project Name: PERMIT MOD
Project Number: 77786
Project Location: HARRISBURG, NORTH CAROLINA
Channel Name: PERIMETER DITCH 2

Discharge	11.53
Peak Flow Period	0.08
Channel Slope	0.086
Channel Bottom Width	0
Left Side Slope	3
Right Side Slope	2
Low Flow Liner	
Retardance Class	
Vegetation Type	
Vegetation Density	
Soil Type	Clay Loam

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	11.53 cfs	4.79 ft/s	0.98 ft	0.054	6 lbs/ft ²	5.27 lbs/ft ²	1.14	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 3

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Basin	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 3	1.50	0.40	5.0	8.05	4.83

Channel Report

PERIMETER DITCH 3

Triangular

Side Slopes (z:1) = 3.00, 2.00
Total Depth (ft) = 2.00

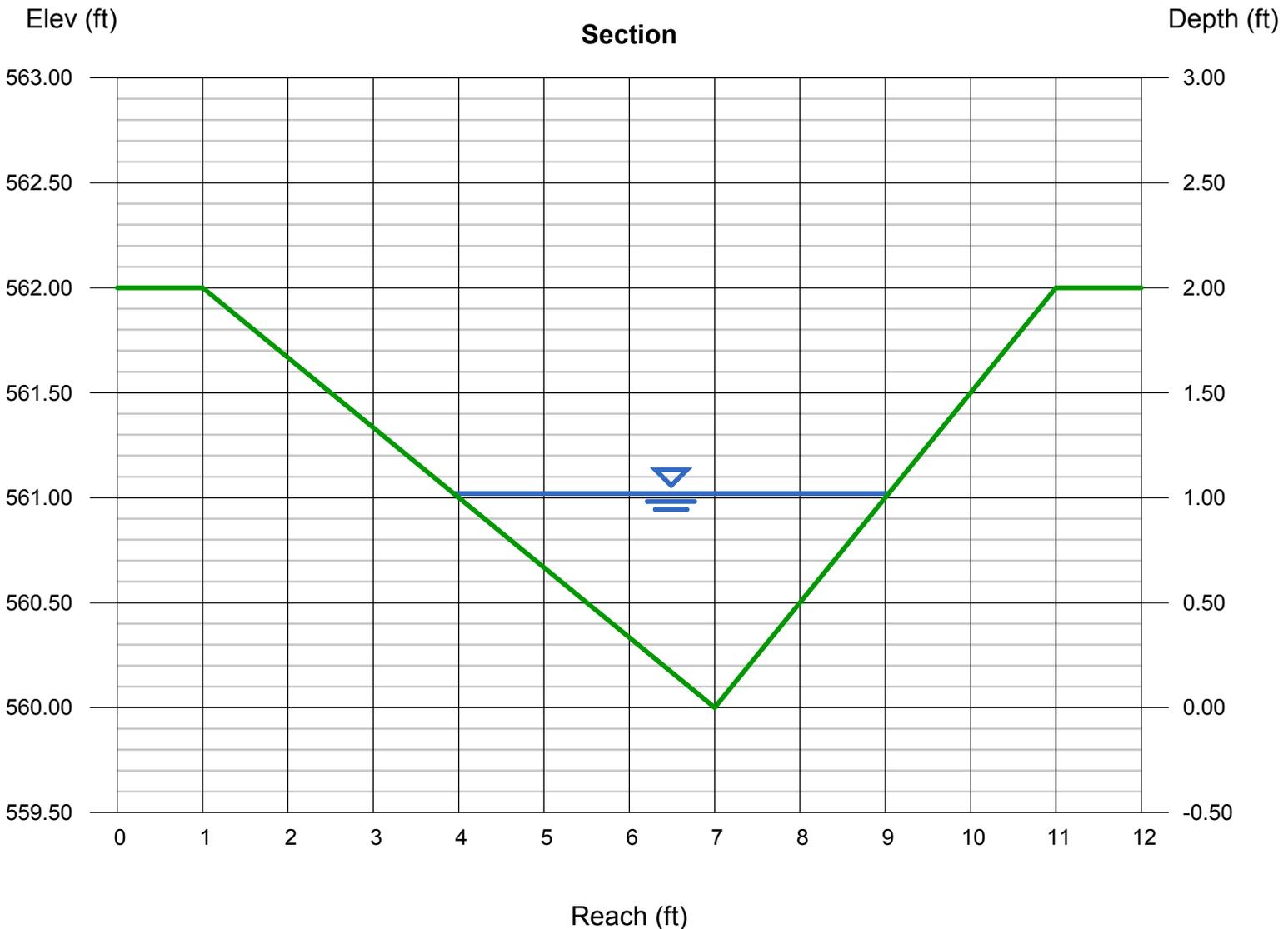
Invert Elev (ft) = 560.00
Slope (%) = 3.50
N-Value = 0.090

Calculations

Compute by: Known Q
Known Q (cfs) = 4.83

Highlighted

Depth (ft) = 1.02
Q (cfs) = 4.830
Area (sqft) = 2.60
Velocity (ft/s) = 1.86
Wetted Perim (ft) = 5.51
Crit Depth, Yc (ft) = 0.75
Top Width (ft) = 5.10
EGL (ft) = 1.07





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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: PERIMETER DITCH 3**

Discharge	4.83
Peak Flow Period	0.08
Channel Slope	0.035
Channel Bottom Width	0
Left Side Slope	3
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	4.83 cfs	1.87 ft/s	1.02 ft	0.09	4.2 lbs/ft ²	2.22 lbs/ft ²	1.89	STABLE	--
Underlying Substrate	Straight	4.83 cfs	1.87 ft/s	1.02 ft	--	0.05 lbs/ft ²	0.027 lbs/ft ²	1.88	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 4

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 4	8.35	0.40	5.0	8.05	26.89

Channel Report

PERIMETER DITCH 4

Triangular

Side Slopes (z:1) = 3.00, 2.00
Total Depth (ft) = 2.50

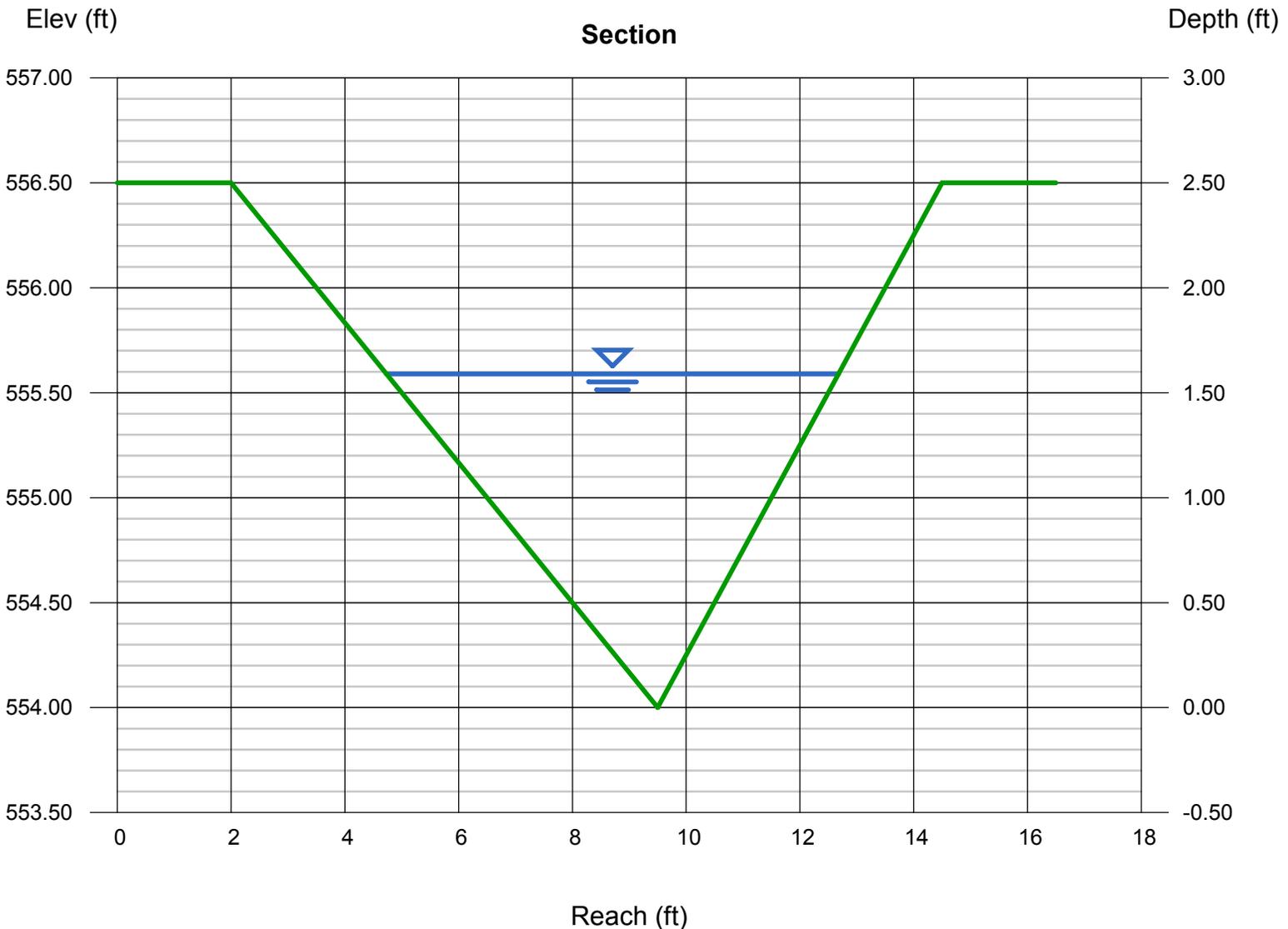
Invert Elev (ft) = 554.00
Slope (%) = 3.50
N-Value = 0.053

Calculations

Compute by: Known Q
Known Q (cfs) = 26.89

Highlighted

Depth (ft) = 1.59
Q (cfs) = 26.89
Area (sqft) = 6.32
Velocity (ft/s) = 4.25
Wetted Perim (ft) = 8.58
Crit Depth, Yc (ft) = 1.49
Top Width (ft) = 7.95
EGL (ft) = 1.87





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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: PERIMETER DITCH 4**

Discharge	26.89
Peak Flow Period	0.08
Channel Slope	0.035
Channel Bottom Width	0
Left Side Slope	3
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

SC250 - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	26.89 cfs	7.26 ft/s	1.22 ft	0.026	3 lbs/ft ²	2.66 lbs/ft ²	1.13	STABLE	E
SC250 Reinforced Vegetation	Straight	26.89 cfs	4.27 ft/s	1.59 ft	0.053	10 lbs/ft ²	3.46 lbs/ft ²	2.89	STABLE	E
Underlying Substrate	Straight	26.89 cfs	4.27 ft/s	1.59 ft	--	0.8 lbs/ft ²	0.178 lbs/ft ²	4.48	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 5

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 5	10.53	0.40	5.0	8.05	33.91

Channel Report

PERIMETER DITCH 5

Triangular

Side Slopes (z:1) = 3.00, 2.00
Total Depth (ft) = 2.50

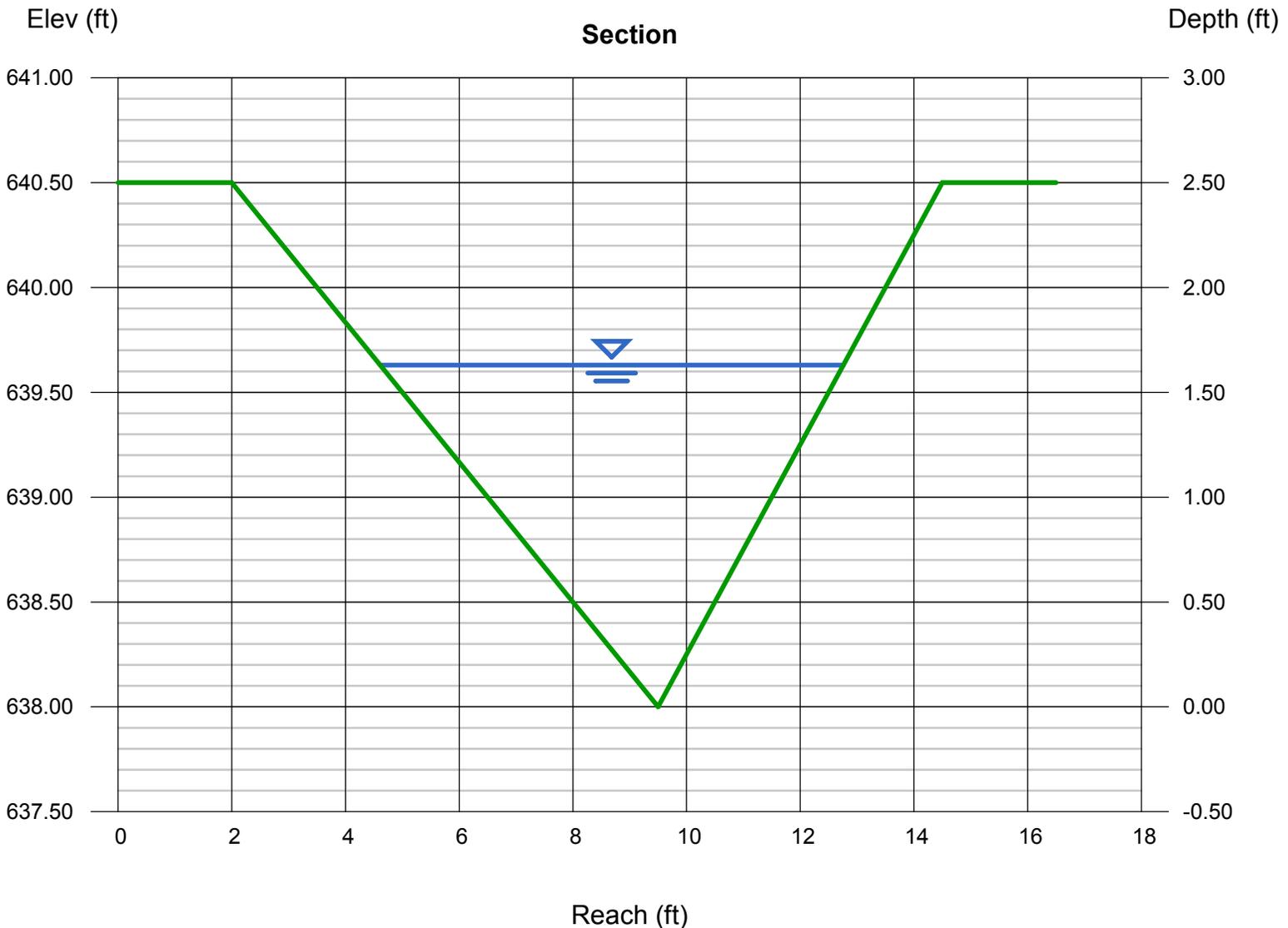
Invert Elev (ft) = 638.00
Slope (%) = 4.76
N-Value = 0.052

Calculations

Compute by: Known Q
Known Q (cfs) = 33.91

Highlighted

Depth (ft) = 1.63
Q (cfs) = 33.91
Area (sqft) = 6.64
Velocity (ft/s) = 5.11
Wetted Perim (ft) = 8.80
Crit Depth, Yc (ft) = 1.63
Top Width (ft) = 8.15
EGL (ft) = 2.04





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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: PERIMETER DITCH 5**

Discharge	33.91
Peak Flow Period	0.08
Channel Slope	0.0476
Channel Bottom Width	5
Left Side Slope	3
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

SC250 - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
SC250 Unvegetated	Straight	33.91 cfs	6.44 ft/s	0.76 ft	0.035	3 lbs/ft ²	2.27 lbs/ft ²	1.32	STABLE	E
SC250 Reinforced Vegetation	Straight	33.91 cfs	4.9 ft/s	0.94 ft	0.052	10 lbs/ft ²	2.8 lbs/ft ²	3.58	STABLE	E
Underlying Substrate	Straight	33.91 cfs	4.9 ft/s	0.94 ft	--	0.8 lbs/ft ²	0.417 lbs/ft ²	1.92	STABLE	--

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PERIMETER DITCH 5

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PERIMETER DITCH 6	0.34	0.40	5.0	8.05	1.09

Channel Report

PERIMETER DITCH 6

Triangular

Side Slopes (z:1) = 3.00, 2.00
Total Depth (ft) = 2.00

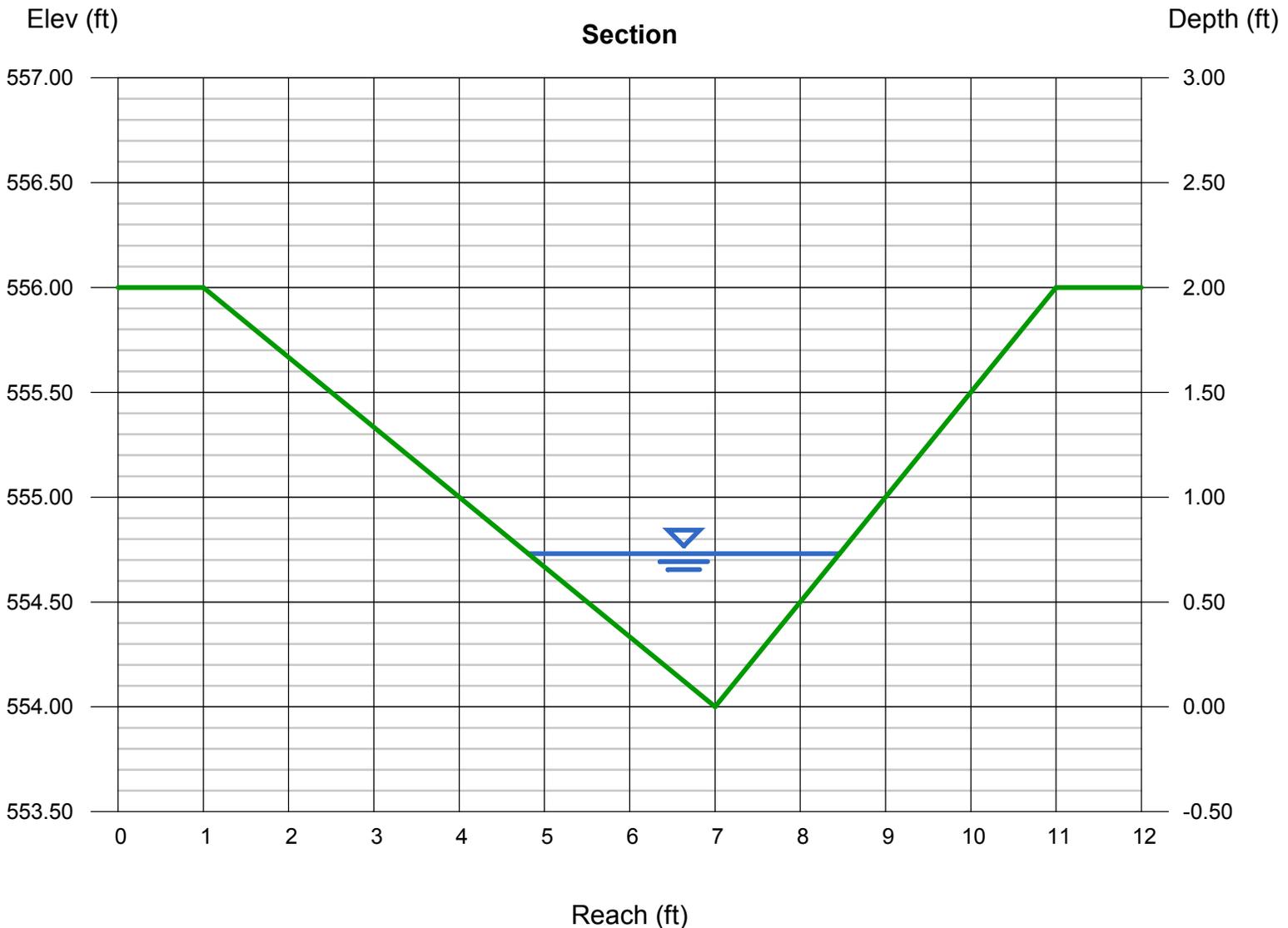
Invert Elev (ft) = 554.00
Slope (%) = 3.50
N-Value = 0.159

Calculations

Compute by: Known Q
Known Q (cfs) = 1.09

Highlighted

Depth (ft) = 0.73
Q (cfs) = 1.090
Area (sqft) = 1.33
Velocity (ft/s) = 0.82
Wetted Perim (ft) = 3.94
Crit Depth, Yc (ft) = 0.42
Top Width (ft) = 3.65
EGL (ft) = 0.74






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**Erosion Control Materials Design Software
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**Project Name: PERMIT MOD
 Project Number: 77786
 Project Location: HARRISBURG, NORTH CAROLINA
 Channel Name: PERIMETER DITCH 6**

Discharge	1.09
Peak Flow Period	0.08
Channel Slope	0.035
Channel Bottom Width	0
Left Side Slope	3
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegetation Type	Mix (Sod & Bunch)
Vegetation Density	Fair 50-75%
Soil Type	Clay Loam

Unreinforced Vegetation - Class C - Mix (Sod & Bunch) - Fair 50-75%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Unreinforced Vegetation	Straight	1.09 cfs	0.84 ft/s	0.72 ft	0.159	4.2 lbs/ft ²	1.57 lbs/ft ²	2.67	STABLE	--
Underlying Substrate	Straight	1.09 cfs	0.84 ft/s	0.72 ft	--	0.05 lbs/ft ²	0.006 lbs/ft ²	8.26	STABLE	--

STORMWATER PIPES

Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PIPE 1

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Pipe	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PIPE 1	5.68	0.40	5.0	8.05	18.29

Culvert Report

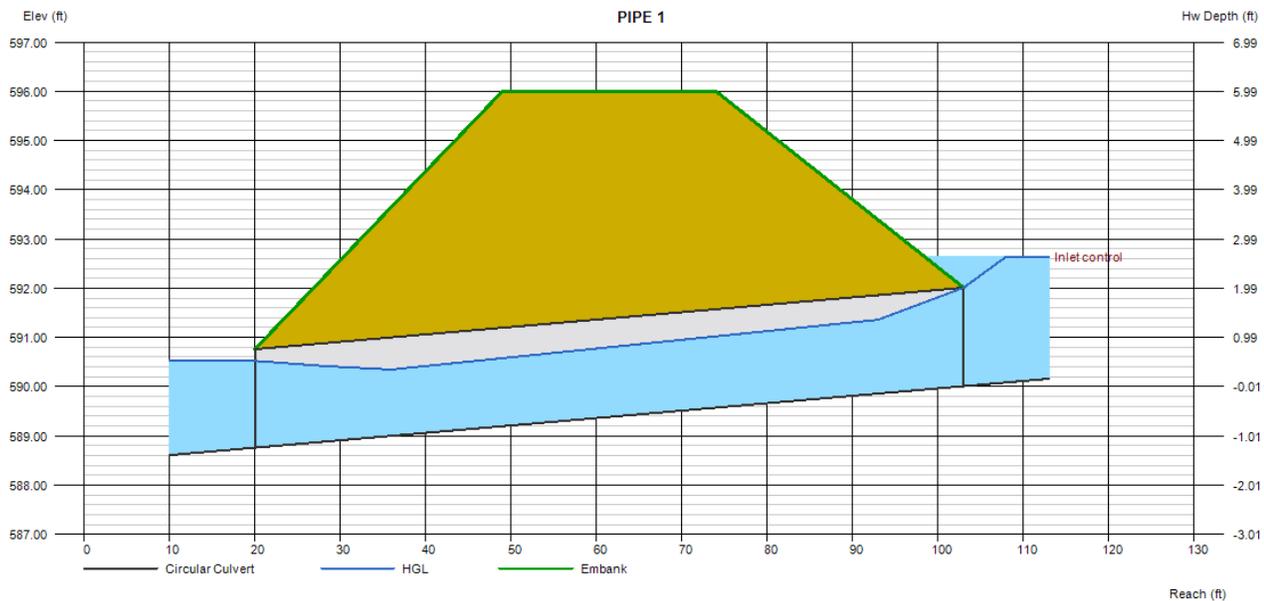
PIPE 1

Invert Elev Dn (ft)	= 588.76
Pipe Length (ft)	= 83.00
Slope (%)	= 1.51
Invert Elev Up (ft)	= 590.01
Rise (in)	= 24.0
Shape	= Circular
Span (in)	= 24.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 596.00
Top Width (ft)	= 25.00
Crest Width (ft)	= 10.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 18.29
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 18.00
Qpipe (cfs)	= 18.00
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 6.14
Veloc Up (ft/s)	= 6.99
HGL Dn (ft)	= 590.52
HGL Up (ft)	= 591.54
Hw Elev (ft)	= 592.64
Hw/D (ft)	= 1.32
Flow Regime	= Inlet Control



Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PIPE 2

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Pipe	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PIPE 2	1.50	0.40	5.0	8.05	4.83

Culvert Report

PIPE 2

Invert Elev Dn (ft)	= 552.00
Pipe Length (ft)	= 42.00
Slope (%)	= 9.52
Invert Elev Up (ft)	= 556.00
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

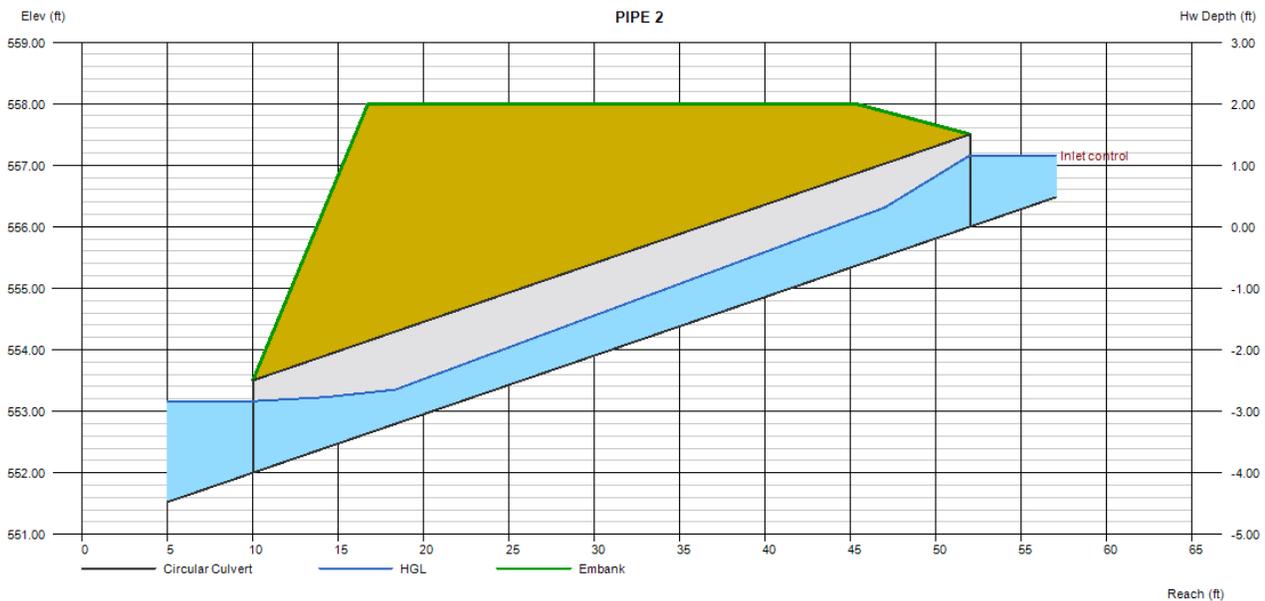
Top Elevation (ft)	= 558.00
Top Width (ft)	= 28.50
Crest Width (ft)	= 10.00

Calculations

Qmin (cfs)	= 0.00
Qmax (cfs)	= 4.83
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 4.65
Qpipe (cfs)	= 4.65
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 3.16
Veloc Up (ft/s)	= 4.65
HGL Dn (ft)	= 553.16
HGL Up (ft)	= 556.83
Hw Elev (ft)	= 557.16
Hw/D (ft)	= 0.77
Flow Regime	= Inlet Control



Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PIPE 3

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
PIPE	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PIPE 3	8.69	0.40	5.0	8.05	27.98

Culvert Report

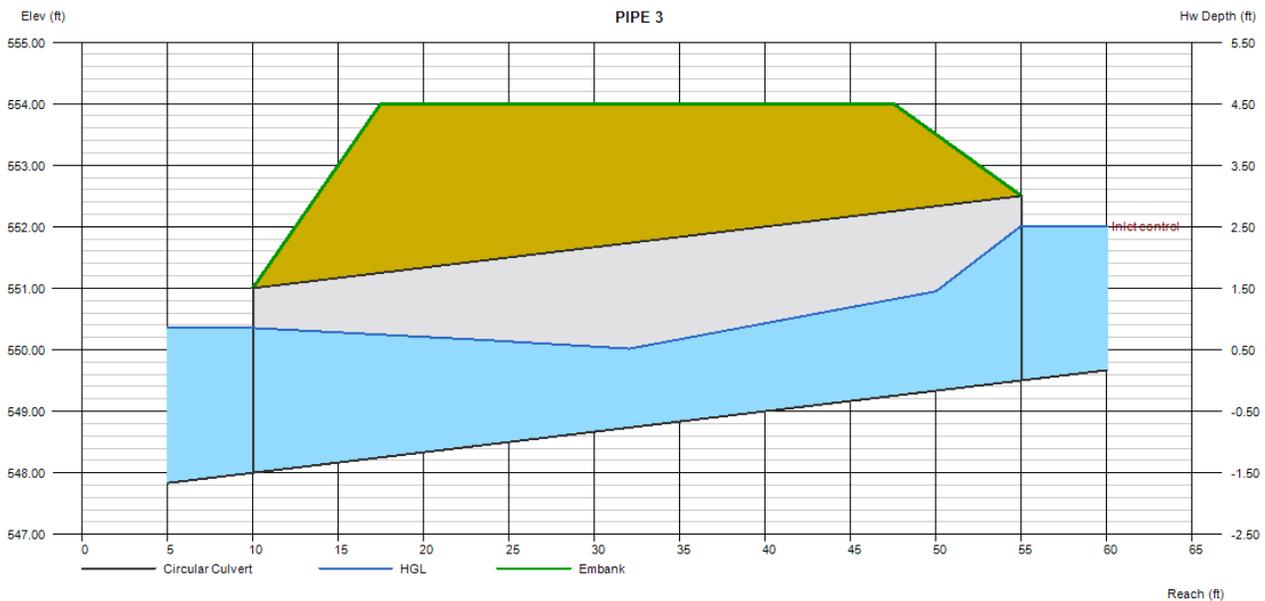
PIPE 3

Invert Elev Dn (ft)	= 548.00
Pipe Length (ft)	= 45.00
Slope (%)	= 3.33
Invert Elev Up (ft)	= 549.50
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 554.00
Top Width (ft)	= 30.00
Crest Width (ft)	= 10.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 27.98
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 27.95
Qpipe (cfs)	= 27.95
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.70
Veloc Up (ft/s)	= 6.72
HGL Dn (ft)	= 550.35
HGL Up (ft)	= 551.21
Hw Elev (ft)	= 552.01
Hw/D (ft)	= 0.84
Flow Regime	= Inlet Control



Civil & Environmental Consultants, Inc.

Project Name: HIGHWAY 49
CEC Project No.: 111-370.002
Description: PIPE 4

By: CTH
Date: 1/12/2016
Checked By: NTB
Date: 1/12/2016

Rational Runoff					
Ditch	Area (acres)	Composite C	Time of Concentration, Tc (min)	Intensity, I (in/hr)	Flow, Q (cfs)
PIPE 4	10.53	0.40	5.0	8.05	33.91

Culvert Report

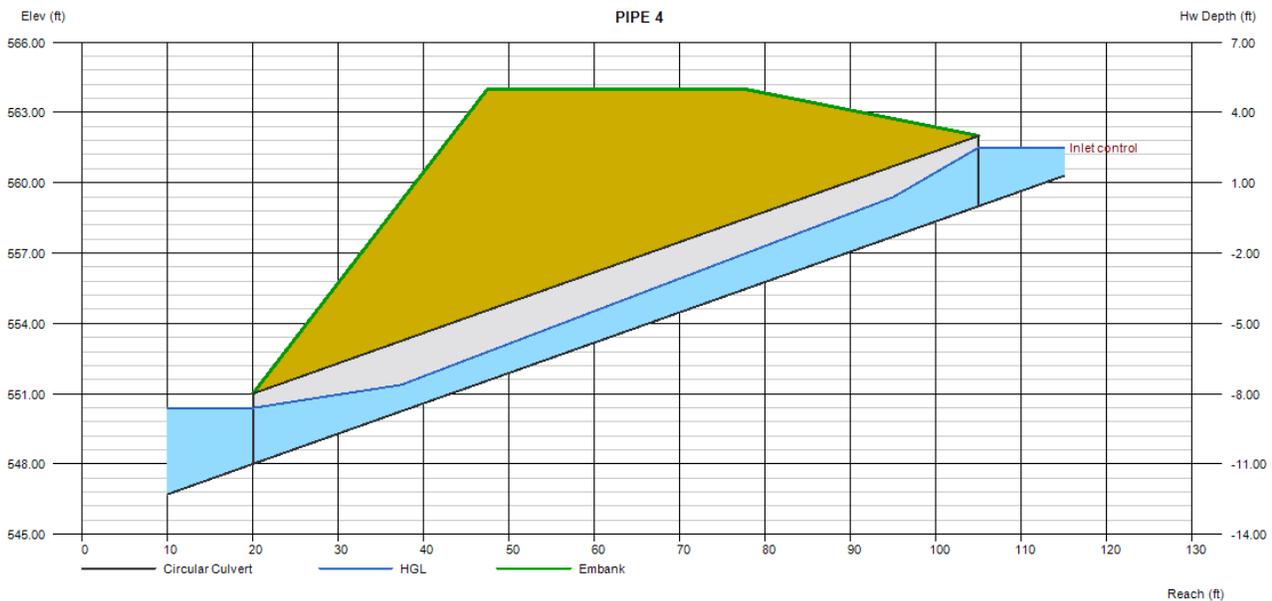
PIPE 4

Invert Elev Dn (ft)	= 548.00
Pipe Length (ft)	= 85.00
Slope (%)	= 12.94
Invert Elev Up (ft)	= 559.00
Rise (in)	= 36.0
Shape	= Circular
Span (in)	= 36.0
No. Barrels	= 1
n-Value	= 0.013
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment	
Top Elevation (ft)	= 564.00
Top Width (ft)	= 30.00
Crest Width (ft)	= 10.00

Calculations	
Qmin (cfs)	= 0.00
Qmax (cfs)	= 33.91
Tailwater Elev (ft)	= (dc+D)/2

Highlighted	
Qtotal (cfs)	= 30.10
Qpipe (cfs)	= 30.10
Qovertop (cfs)	= 0.00
Veloc Dn (ft/s)	= 4.99
Veloc Up (ft/s)	= 6.91
HGL Dn (ft)	= 550.39
HGL Up (ft)	= 560.78
Hw Elev (ft)	= 561.50
Hw/D (ft)	= 0.83
Flow Regime	= Inlet Control





NOAA Atlas 14, Volume 2, Version 3
Location name: Harrisburg, North Carolina, US*
Latitude: 35.3262°, Longitude: -80.6451°
Elevation: 590 ft*
 * source: Google Maps



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

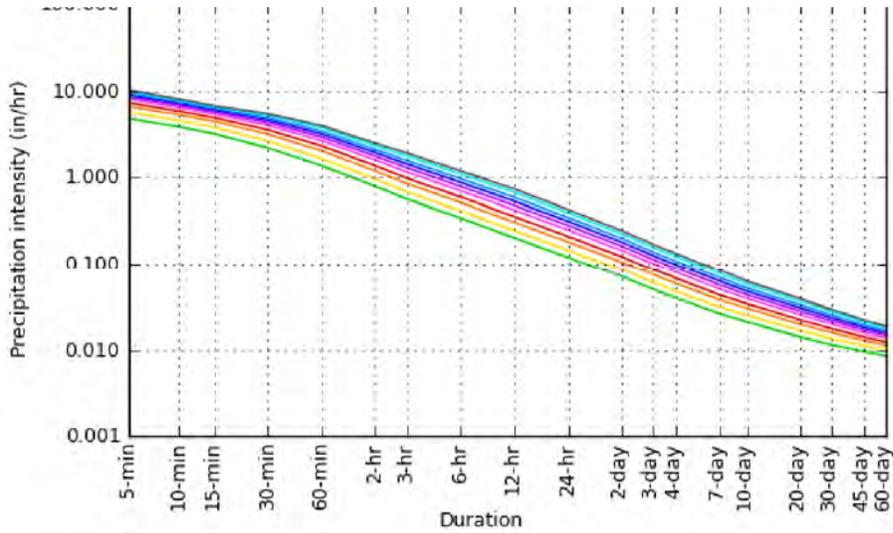
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.81 (4.44-5.22)	5.69 (5.24-6.19)	6.62 (6.10-7.20)	7.30 (6.70-7.91)	8.05 (7.36-8.71)	8.57 (7.79-9.28)	9.04 (8.18-9.78)	9.46 (8.51-10.2)	9.91 (8.83-10.8)	10.2 (9.04-11.1)
10-min	3.85 (3.55-4.17)	4.55 (4.20-4.95)	5.30 (4.88-5.76)	5.83 (5.35-6.32)	6.41 (5.86-6.94)	6.82 (6.20-7.39)	7.18 (6.50-7.77)	7.49 (6.74-8.12)	7.84 (6.98-8.51)	8.06 (7.12-8.77)
15-min	3.20 (2.96-3.48)	3.81 (3.52-4.15)	4.48 (4.12-4.86)	4.92 (4.52-5.33)	5.42 (4.96-5.87)	5.76 (5.24-6.23)	6.05 (5.48-6.55)	6.30 (5.67-6.83)	6.58 (5.86-7.14)	6.74 (5.96-7.34)
30-min	2.20 (2.03-2.38)	2.63 (2.43-2.86)	3.18 (2.93-3.45)	3.56 (3.27-3.86)	4.01 (3.67-4.35)	4.34 (3.94-4.69)	4.63 (4.19-5.02)	4.91 (4.41-5.31)	5.23 (4.66-5.68)	5.46 (4.82-5.94)
60-min	1.37 (1.26-1.49)	1.65 (1.52-1.80)	2.04 (1.88-2.21)	2.32 (2.13-2.51)	2.67 (2.44-2.89)	2.94 (2.67-3.18)	3.19 (2.89-3.45)	3.44 (3.09-3.73)	3.75 (3.34-4.08)	3.98 (3.52-4.34)
2-hr	0.794 (0.729-0.867)	0.962 (0.882-1.05)	1.19 (1.09-1.30)	1.37 (1.25-1.49)	1.59 (1.45-1.74)	1.77 (1.60-1.92)	1.94 (1.74-2.11)	2.10 (1.87-2.29)	2.32 (2.05-2.54)	2.49 (2.17-2.72)
3-hr	0.566 (0.519-0.620)	0.683 (0.627-0.749)	0.853 (0.781-0.935)	0.984 (0.897-1.07)	1.16 (1.05-1.26)	1.30 (1.17-1.41)	1.44 (1.29-1.56)	1.58 (1.40-1.72)	1.77 (1.55-1.93)	1.92 (1.66-2.10)
6-hr	0.343 (0.315-0.375)	0.414 (0.380-0.453)	0.517 (0.474-0.565)	0.597 (0.546-0.652)	0.706 (0.641-0.768)	0.792 (0.715-0.861)	0.880 (0.787-0.957)	0.969 (0.859-1.06)	1.09 (0.956-1.19)	1.19 (1.03-1.30)
12-hr	0.202 (0.186-0.221)	0.244 (0.225-0.267)	0.306 (0.281-0.334)	0.356 (0.325-0.388)	0.423 (0.384-0.460)	0.477 (0.430-0.518)	0.533 (0.476-0.578)	0.592 (0.522-0.641)	0.673 (0.585-0.728)	0.738 (0.632-0.799)
24-hr	0.120 (0.111-0.129)	0.144 (0.135-0.156)	0.181 (0.169-0.196)	0.210 (0.195-0.227)	0.250 (0.231-0.269)	0.281 (0.260-0.303)	0.313 (0.289-0.337)	0.347 (0.318-0.373)	0.392 (0.358-0.423)	0.428 (0.390-0.462)
2-day	0.070 (0.065-0.075)	0.085 (0.079-0.091)	0.105 (0.098-0.113)	0.122 (0.113-0.131)	0.144 (0.133-0.155)	0.162 (0.149-0.174)	0.180 (0.166-0.193)	0.199 (0.182-0.213)	0.224 (0.205-0.241)	0.244 (0.222-0.263)
3-day	0.050 (0.046-0.053)	0.060 (0.056-0.064)	0.074 (0.069-0.079)	0.085 (0.079-0.091)	0.101 (0.093-0.108)	0.113 (0.104-0.121)	0.125 (0.116-0.135)	0.138 (0.127-0.148)	0.156 (0.143-0.168)	0.170 (0.155-0.183)
4-day	0.039 (0.037-0.042)	0.047 (0.044-0.051)	0.058 (0.054-0.062)	0.067 (0.062-0.072)	0.079 (0.073-0.085)	0.089 (0.082-0.095)	0.098 (0.091-0.105)	0.108 (0.100-0.116)	0.122 (0.112-0.131)	0.133 (0.121-0.143)
7-day	0.026 (0.024-0.028)	0.031 (0.029-0.033)	0.038 (0.035-0.040)	0.043 (0.040-0.046)	0.050 (0.047-0.054)	0.056 (0.052-0.060)	0.062 (0.058-0.066)	0.069 (0.063-0.073)	0.077 (0.071-0.082)	0.084 (0.077-0.090)
10-day	0.021 (0.020-0.022)	0.025 (0.023-0.026)	0.030 (0.028-0.032)	0.034 (0.032-0.036)	0.039 (0.036-0.041)	0.043 (0.040-0.046)	0.047 (0.044-0.050)	0.052 (0.048-0.055)	0.057 (0.053-0.061)	0.062 (0.057-0.066)
20-day	0.014 (0.013-0.015)	0.016 (0.016-0.017)	0.019 (0.018-0.020)	0.022 (0.021-0.023)	0.025 (0.024-0.026)	0.027 (0.026-0.029)	0.030 (0.028-0.032)	0.032 (0.030-0.034)	0.036 (0.033-0.038)	0.039 (0.036-0.041)
30-day	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.020 (0.018-0.021)	0.021 (0.020-0.022)	0.023 (0.022-0.024)	0.025 (0.023-0.026)	0.027 (0.025-0.028)	0.029 (0.027-0.030)
45-day	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.016 (0.015-0.016)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)	0.021 (0.020-0.022)	0.022 (0.021-0.023)
60-day	0.009 (0.008-0.009)	0.010 (0.010-0.010)	0.011 (0.011-0.012)	0.012 (0.012-0.013)	0.014 (0.013-0.014)	0.015 (0.014-0.015)	0.016 (0.015-0.016)	0.016 (0.016-0.017)	0.018 (0.017-0.018)	0.019 (0.018-0.019)

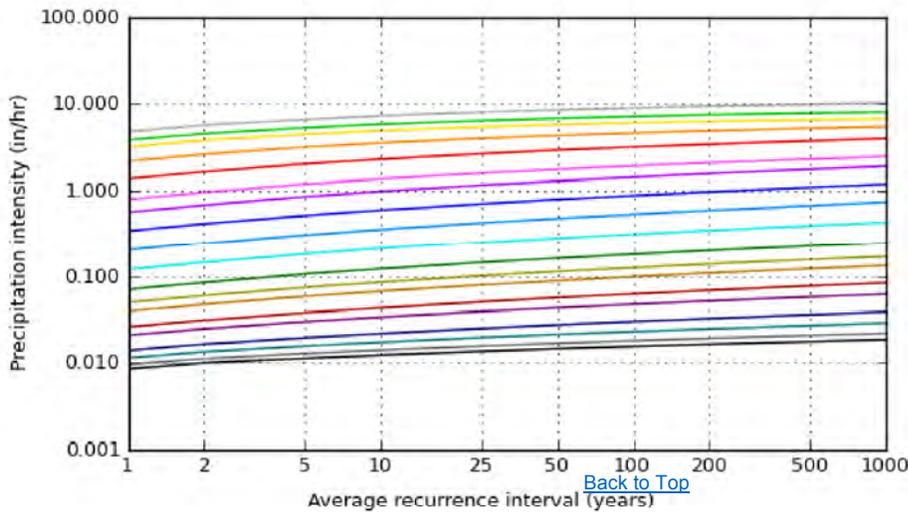
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

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Maps & aerials

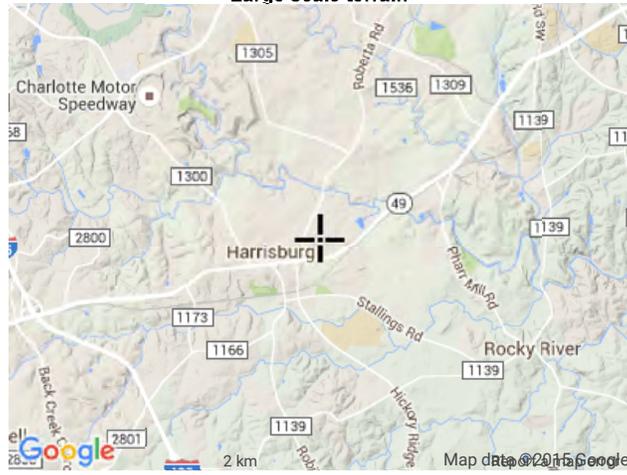
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed Oct 21 18:41:32 2015

Small scale terrain



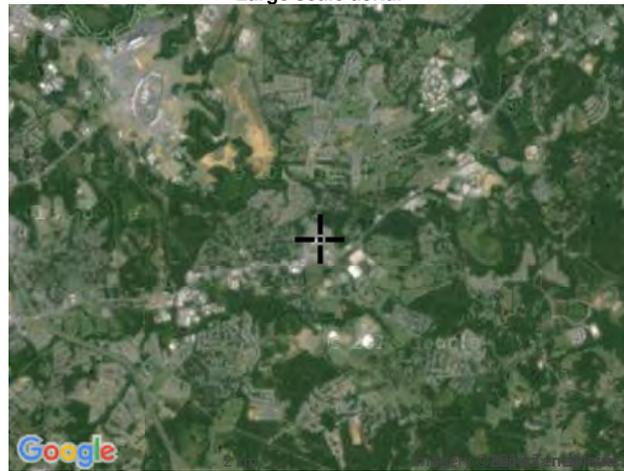
Large scale terrain



Large scale map



Large scale aerial



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