



CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: PC180

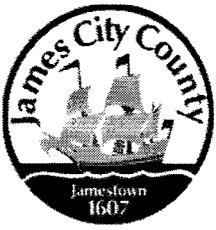
DATE VERIFIED: May 29, 2012

QUALITY ASSURANCE TECHNICIAN:

Leah Hardenbergh

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA



Stormwater Division

MEMORANDUM

DATE: February 24, 2010
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jo Anna Ripley, Stormwater
PO: 270712
RE: Files Approved for Scanning

BMP ID or General File ID PC180

PIN: 460-01-00-002

Subdivision, Tract, Business or Owner

Name (if known):

Williamsburg James City County Courthouse

Property Description:

Property was annexed to the City of Williamsburg

Site Address:

5201 Monticello Avenue

(For internal use only)

Box: JC001

Drawer: 1

Agreements: (in file as of scan date)

N Book or Doc#:

Page:

Comments:

Maintenance Agreement

STORMWATER DETENTION FACILITIES AGREEMENT

THIS STORMWATER DETENTION FACILITIES AGREEMENT, made and entered into this 25th day of September, 2003, by and between JAMES CITY COUNTY and the CITY OF WILLIAMSBURG (hereinafter called the "COVENANTORS"), and the CITY OF WILLIAMSBURG, VIRGINIA, a municipal corporation (hereinafter called the "CITY").

. RECITALS

A. COVENANTORS own certain real property (hereinafter called the "Property"), located within the City of Williamsburg and more particularly described in Exhibit "A", a copy of which is attached hereto and incorporated herein by reference.

B. COVENANTORS, have agreed that James City County will construct certain improvements on the Property which will alter existing storm and surface water conditions on both the Property and adjacent lands. In order to accommodate and regulate these anticipated changes in existing storm and surface water flow conditions, James City County, using certain grant monies received for such purpose and supplemented by courthouse maintenance funds received by COVENANTORS from the Commonwealth of Virginia, will build a storm and surface water management facilities including related landscaping on the Property (the "FACILITIES"), as more particularly described and shown on plan entitled "SPR #03-09: Williamsburg/James City County Courthouse Bioretention Demonstration Project", made by Watershed Consulting PLLC, and dated May 9th, 2003.

C. The parties hereto agree that COVENANTORS, their respective successors and assigns will be responsible at all times to maintain the FACILITIES in accordance with applicable laws, ordinances, regulations and guidelines.

D. The parties have reached an agreement on the construction and maintenance responsibilities of the parties for the FACILITIES and desire that their agreement be reduced to writing.

NOW, THEREFORE, in consideration of the foregoing premises and the mutual covenants contained herein, the parties agree to the following terms and conditions:

1. COVENANTORS hereby agree that James City County will construct or cause to be constructed on the COVENANTORS' Property, the FACILITIES shown on the Plan, which construction shall be in accordance with all applicable City, State and Federal laws, ordinances, regulations and guidelines.

2. COVENANTORS agree to at all times maintain the FACILITIES in good working order and to make such modifications and changes as may be required by CITY from time to time to preserve the design functions and of the FACILITIES and to keep the FACILITIES including landscaping in a good and properly maintained condition and free of trash and debris, which maintenance and modifications shall be in accordance with all applicable City, State and Federal laws, ordinances, regulations and guidelines.

4. COVENANTORS will request the Court Facilities Superintendent appointed under Article IV of a certain agreement between the City of Williamsburg and County of James City dated December 12, 1996 pertaining to acquisition, construction and operation of the Williamsburg James City County Courthouse (the "Courthouse Agreement") to have the FACILITIES inspected at least

every six (6) months, in order to determine if any repairs, maintenance or cleaning is required to maintain the FACILITIES in good working order, or if for any reason the Courthouse Superintendent fails to carry out any required inspection, James City County agrees that it shall be responsible for such inspection. The Court Facilities Superintendent or James City County, as the case may be, shall maintain inspection and maintenance records showing the date and results of each inspection/repair and to make such records available to City upon request.

5. For so long as COVENANTORS jointly own the Property, COVENANTORS agree that the cost of maintaining the FACILITIES shall be budgeted and paid by COVENANTORS as part of the Courthouse operation funding in accordance with Article IV of the Courthouse Agreement..

COVENANTORS:

CITY OF WILLIAMSBURG

BY: 
City Manager

JAMES CITY COUNTY

BY: 
County Administrator

CITY:

CITY OF WILLIAMSBURG

BY: 
City Manager

COMMONWEALTH OF VIRGINIA

City/County of Williamsburg, to wit:

The foregoing instrument was acknowledged before me this 29th day of September, 2003, by Jackson C. Tuttle, II, City Manager of the City of Williamsburg, Virginia.

[Signature]
Notary Public

My Commission expires: February 28, 2006

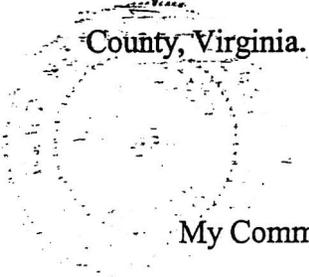
COMMONWEALTH OF VIRGINIA

City/County of James City, to wit:

The foregoing instrument was acknowledged before me this 26th day of September, 2003, by Sanford B. Wanner, County Administrator of James City County, Virginia.

Mary Frances Rieger
Notary Public

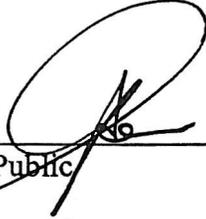
My Commission expires: October 31, 2005.



COMMONWEALTH OF VIRGINIA

City/County of Williamsburg, to wit:

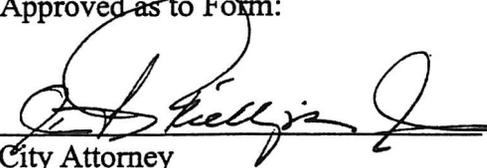
The foregoing instrument was acknowledged before me this 29th day of September, 2002, by Jackson C. Tuttle, II, City Manager of the City of Williamsburg.



Notary Public

My Commission expires: February 28, 2006

Approved as to Form:



City Attorney

Prepared by:
Frank M. Morton, III
County Attorney
James City County
101-C Mounts Bay Road
Williamsburg, VA 23185
(757) 253-6613



James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

(Note: In accordance with the requirements of the Chesapeake Bay Preservation Ordinance, Chapter 23, Section 23-10(4), BMP's shall be designed and constructed in accordance with the manual entitled James City County Guidelines for Design and Construction of Stormwater Management BMP's. Erosion and sediment control policy and approved plans generally require that at the completion of the project and prior to release of surety, an "as-built" plan prepared by a registered Professional Engineer or Certified Land Surveyor must be provided for the drainage system for the project, including any Best Management Practice (BMP) facilities. In addition, for BMP facilities involving the construction of an impounding structure or dam embankment, certification is required by a Professional Engineer who has inspected the structure during its construction. Currently there are over 20 water quality type BMP's accepted by the County.)

Section 1 - Site Information:

Project Name: Williamsburg/James City County Courthouse
 Structure/BMP Name: Bioretention Demonstration Project
 Project Location: 5201 Monticello Ave
 BMP Location: Front (north) yard area along Monticello Ave (NE Corner)
 County Plan No.: City 03 - 09 - _____
 County: SP-77-03 Tax Map/Parcel No.: 460-01-00-002
 Project Type: Residential Business Office Industrial Roadway Public Other
 Commercial Institutional
 BMP ID Code (if known): County BMP PC 180
 Zoning District: _____
 Land Use: Municipal Courthouse
 Site Area (sf or acres): 19.8 acres

Brief Description of Stormwater Management/BMP Facility: Demo project to plan, design and construct a 3,500 sq. ft. full depth bioretention basin w/ native landscaping, mulch, special planting soil mixture and stone/corrugated perforated polyethylene pipe underdrain for water quality control purposes. Total construction footprint including landscape only and slope areas was 5,983 square feet.

Nearest Visible Landmark to SWM/BMP Facility: Courthouse Bldg (south) and sidewalk (north)

Nearest Vertical Ground Control (if known):

JCC Geodetic Ground Control USGS Temporary Arbitrary Other
 Station Number or Name: Sanitary MH cover (southwest of basin)
 Datum or Reference Elevation: El. 96.0 above MSL
 Control Description: Manhole rim/lid
 Control Location from Subject Facility: 82.5 ft. southwest of basin overflow inlet

Section 2 - Stormwater Management / BMP Facility Construction Information:

10/21/03

PreConstruction Meeting Held for Construction of SWM/BMP Facility: Yes No Unknown
Approx. Construction Start Date for SWM/BMP Facility: October 30, 2003
Facility Monitored by County Representative during Construction: Yes No Unknown
Name of Site Work Contractor Who Constructed Facility: Excavator Services LLC
Name of Professional Firm Who Routinely Monitored Construction: GET Solutions Inc.
Date of Completion for SWM/BMP Facility: November 17, 2003
Date of Record Drawing/Construction Certification Submittal: January 10, 2004

(Note: Record Drawing and Construction Certifications are required within thirty (30) days of the completion of Stormwater Management and/or BMP facility construction. Record Drawings and Construction Certifications must be reviewed and approved by the James City County Environmental Division prior to final inspection, acceptance and bond or surety release.)

Section 3 - Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*
Name: James City County, Va. (Contract 04-004)
Mailing Address: 101-F Mounts Bay Road
Williamsburg, Va. 23187
Business Phone: 757-253-6639 Fax: 757-259-4032
Contact Person: Scott J. Thomas, P.E. Title: Senior Engineer

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*
Firm Name: Watershed Consulting PLLC
Mailing Address: P.O. Box 7216
Richmond, Va. 23221
Business Phone: 804-304-4659
Fax: 804-353-8702
Responsible Plan Preparer: Mr. Erik Allen, P.E.
Title: President
Plan Name: JCC Bioretention Demo Project
Firm's Project No. n/a
Plan Date: 10/27/03 Revision 1
Sheet No.'s Applicable to SWM/BMP Facility: 3 / 5 / 7 / 9 / 10

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*
Name: Excavator Services LLC
Mailing Address: 3617 Sherwood Place
Suffolk, Va. 23435
Business Phone: 757-358-2533
Fax: 757-538-2533
Contact Person: Mr. Larry C. Falldorf
Site Foreman/Supervisor: same
Specialty Subcontractors & Purpose (for BMP Construction Only):
Winn Nursery, Norfolk, Va. (plantings)

Section 4 - Professional Certifications:

Certifying Professionals: (Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional Engineer is responsible for the inspection, monitoring and certification of Stormwater Management / BMP facilities during its construction.)

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: Watershed Consulting PLLC
Mailing Address: P. O. Box 7216
Richmond, Va. 23221
Business Phone: 757-304-4659
Fax: 757-353-8702

Name: Erik Allen P.E.
Title: President

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

See Record Drawing Sheet 1 of 1 dated January 10 2004 for record drawing certification.

_____ (Seal)

Virginia Registered Professional Engineer
or Certified Land Surveyor

Construction Certification

Firm Name: James City County, Va.
Mailing Address: 101-E Mounts Bay Road
Williamsburg, Va. 23187
Business Phone: 757-253-6639
Fax: 757-259-4032

Name: Scott J. Thomas, P.E.
Title: Senior Engineer

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this Stormwater Management/BMP facility was monitored and constructed in accordance with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

See Record Drawing Sheet 1 of 1 dated January 10 2004 for construction certification.

- Geotechnical support services for certification purposes provided by GET Solutions, Inc., Proposal # PVG02-353G.
- Basis of certification was field inspection and Construction Materials & Field Engineering Services, Report No. 1 by GET Solutions Inc. dated December 12 2004.

_____ (Seal)

Virginia Registered
Professional Engineer

Section 5 - Record Drawing and Construction Certification Requirements and Instructions:

- PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project. PRECON HELD 10/30/03.
- A fully completed **STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM** and **RECORD DRAWING CHECKLIST**. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.
- The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices. (provided by Watershed Consulting PLLC, 1/10/04)
- Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.
- Record Drawing and Construction Certifications are required within **thirty (30) days** of the completion of Stormwater Management / BMP facility construction. Submittals must be reviewed and accepted by James City County Environmental Division prior to final inspection, acceptance and bond/surety release.

Dual Purpose Facilities - Completion of construction also includes an interim stage for Stormwater Management / BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction, once development and stabilization are substantially complete. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Final record drawing and construction certification of additional permanent components is required once permanent facility construction is complete.

Interim Construction Certification is required for those dual purpose embankment-type facilities that are generally ten (10) feet or greater in dam height (*) and may not be converted, modified or begin function as a permanent SWM / BMP structure for a period generally ranging from six (6) to eighteen (18) months or more from issuance of a Land Disturbance permit for construction.

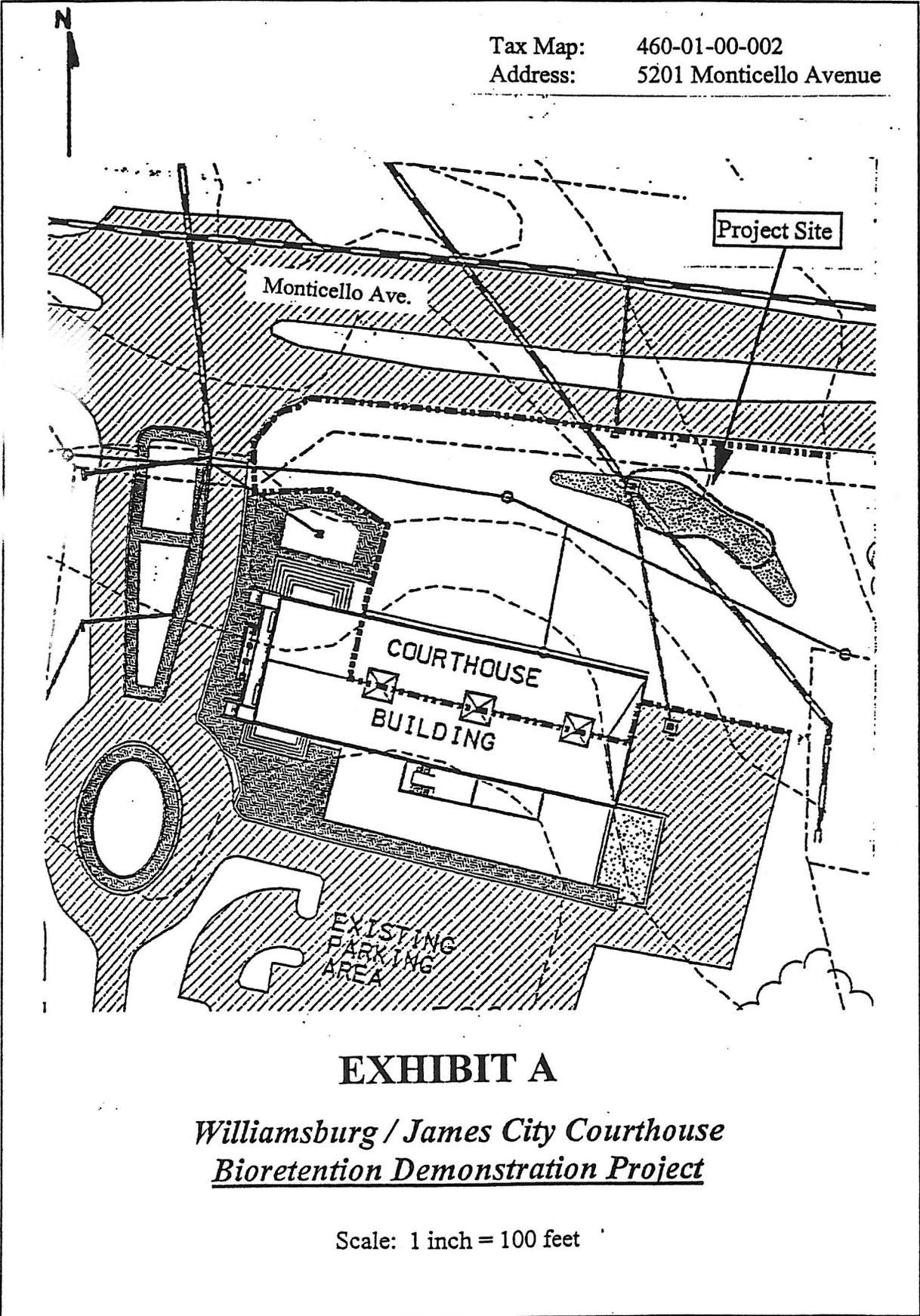


EXHIBIT A

Williamsburg / James City Courthouse Bioretention Demonstration Project

Scale: 1 inch = 100 feet



DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
 (757) 253-6671 Fax: (757) 253-6850 E-MAIL: devtman@james-city.va.us

CODE COMPLIANCE
 (757) 253-6626
 codecomp@james-city.va.us

ENVIRONMENTAL DIVISION
 (757) 253-6670
 environ@james-city.va.us

PLANNING
 (757) 253-6685
 planning@james-city.va.us

COUNTY ENGINEER
 (757) 253-6678
 INTEGRATED PEST MANAGEMENT
 (757) 253-2620

February 27, 2004

Mr. Stephen R. Martin, P.E.
 City Engineer
 City of Williamsburg
 401 Lafayette Street
 Williamsburg, Va. 23185-3617

DISPLAY COPY ONLY

Re: Record Drawings and Construction Certification
 Courthouse Bioretention Demonstration Project
 SPR # 03-09

Dear Steve:

Attached is record drawing and construction certification information as required for the above referenced project. The packet includes one (1) original signed copy of the record drawing (asbuilt) for the project as well as additional information which will be useful for your record files.

If you have any questions or comments, please call me at 757-253-6639. It was a pleasure working with you and the City on this important watershed management project.

Sincerely,

Scott J. Thomas, P.E.
 Senior Engineer
 Environmental Division

SJT/sjt
 attachments

cc: Ward Ratcliffe, Courthouse
 Erik Allen, Watershed Consulting PLLC



Williamsburg / James City County Courthouse
Bioretention Demonstration Project

Record Drawing & Construction Certification Materials

Table of Contents

- Information Packet
 - Certification Forms
 - Maintenance Agreement
 - Geotechnical
 - Final Design Report
 - Final Hydraulic Model
 - Asbuilt Exhibit (11 x 17 size)

- Record (Asbuilt) Drawing (24 x 36 size)

WILLIAMSBURG/JAMES CITY COUNTY COURTHOUSE

BIORETENTION DEMONSTRATION PROJECT

SITUATED AT: 5201 MONTICELLO AVENUE
WILLIAMSBURG, VIRGINIA 23188
(CITY OF WILLIAMSBURG)

PROJECT DATA:

Owner
CITY OF WILLIAMSBURG
Ward Ratcliffe
Courthouse Superintendent
757 564-2230

PROJECT CONTACT

James City County
Environmental Division
101 Mounts Bay Road
Williamsburg, Virginia 23187-8784
Attn: Scott Thomas P.E.
(757) 253-6639
FAX (757) 259-4032

Agent

Watershed Consulting, PLLC
P.O. Box 7216
Richmond, VA 23221
(804) 304-4659

JCC Tax Parcel # 38-4-147

CITY GPIN 460-01-00-002

Zoning LB4

P.B. 70, PG 11&12

Area of Site = 19.8 acres +/-

Area of Land Disturbance= 32,670 SF

Area of Additional Impervious Cover= 0- acres

WATERSHED

SUBWATERSHED 208
CATCHMENT 208-103-1 OF
THE POWHATAN CREEK WATERSHED

EXISTING SIZE OF LANDSCAPED AREA: 2,850 SF

PROPOSED SIZE OF BIORETENTION BASIN: 3,640 SF (MINIMUM)

PREPARED FOR: JAMES CITY COUNTY
DEVELOPMENT MANAGEMENT
ENVIRONMENTAL DIVISION

PROJECT NARRATIVE:

This project consists of converting an existing landscaped and low-lying area into a stormwater Best Management Practice (BMP) bioretention basin. The project area is located in the north (front) lawn of the Williamsburg/James City County Courthouse between the existing courthouse building and the sidewalk along Monticello Avenue.

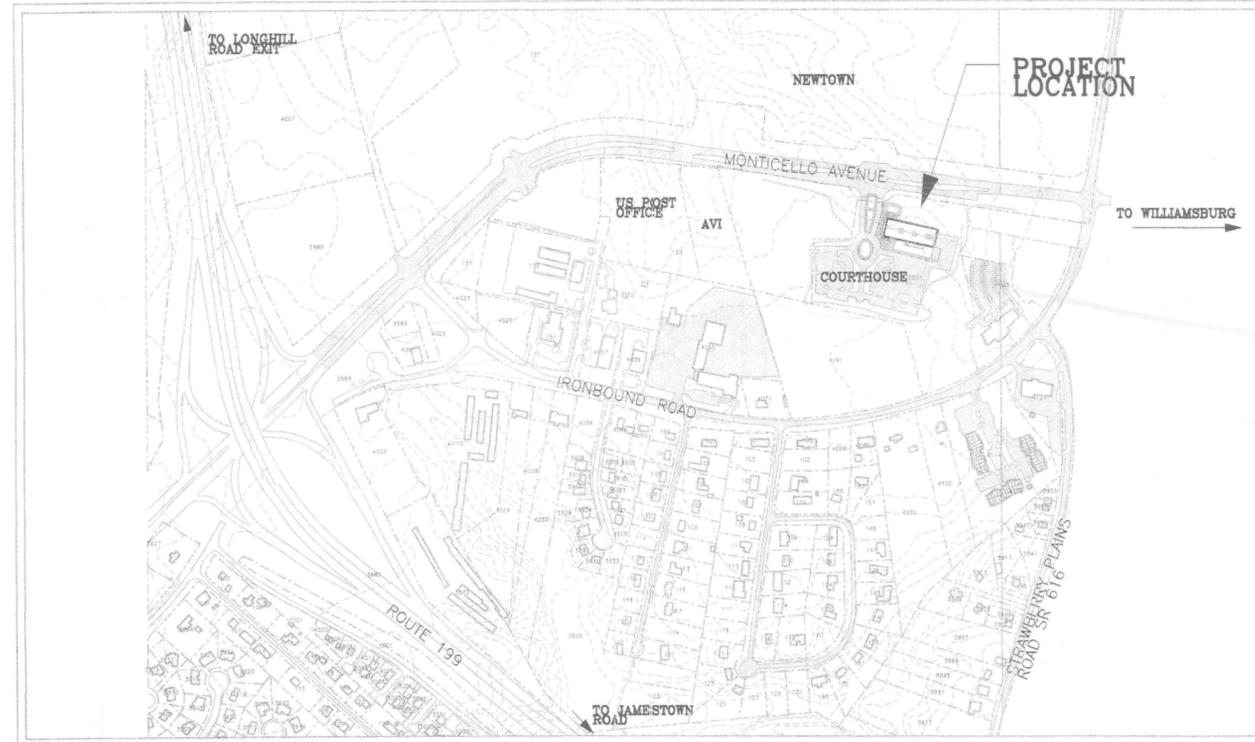
The BMP is proposed to provide additional water quality treatment to reduce non-point source pollution in runoff from a portion of the existing Courthouse site and future development area that may occur to the east of the site. The purpose of the project is to demonstrate planning, design and construction of a bioretention basin, consistent with the County's Chesapeake Bay Preservation Ordinance and Powhatan Creek Watershed Management Plan and low impact development principles generally encouraged by the Chesapeake Bay Local Assistance Department and the Virginia Department of Conservation and Recreation. Due to the project's highly visible position in front of the Courthouse, the project will demonstrate that stormwater management facilities can be effectively retrofitted and incorporated into the functional landscape of a site to provide both pollutant removal capability and serve as an attractive feature.

The project area is situated within identified Subwatershed 208 and Catchment 208-103-1 of the Powhatan Creek Watershed Management Plan. Specific stormwater strategies for this subwatershed and catchment include use of Special Stormwater Criteria for Stream Protection Areas, providing stormwater water quality treatment onsite, providing recharge with BMPs that allows for infiltration and filtering and use of more hydrologically sensitive stormwater management in the New Town area.

Conversion of the existing landscaped area into a bioretention basin will result in no new increase of impervious cover or runoff. It will provide an additional water quality benefit and will not result in a substantial increase in the existing water surface elevation at the existing inlet. No impacts are anticipated to existing utilities, the existing Courthouse building or to Monticello Avenue or its associated stormwater conveyance system. The bioretention basin will ultimately provide water quality treatment for approximately 2 acres of impervious cover within its 5.3 acre drainage area.

GENERAL NOTES:

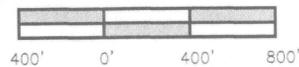
- No work is proposed within VDOT Right-of-Way. It is the Contractor's responsibility to secure VDOT approval for temporary construction access off of Monticello Avenue.
- The Contractor shall call MISS UTILITY prior to commencing land-disturbing activities for the project.
- A preconstruction meeting is required for the project. The Contractor shall contact the Environmental Division of James City County at 757-253-2870 or 757-253-6639 to schedule a preconstruction meeting at least 48 hours in advance.
- Construction of the bioretention basin shall be in accordance with Minimum Standards and Specifications 3.05 and 3.11 of the Virginia Stormwater Management Handbook (latest edition) and the James City County Guidelines for Design and Construction of Stormwater Management BMPs. The contractor is responsible to become familiar with the requirements of these standards.
- The bioretention basin is required to be certified following construction in accordance with the James City County Environmental Division Record Drawing and Construction Certification, Standard Forms & Instructions. Monitoring and testing is to be performed by a geotechnical engineer under contract with James City County. The Contractor is required to coordinate all work with the geotechnical engineer or it's assigned representative.
- The James City County Environmental Division or it's assigned representative must approve installation of the underdrain and geotextile fabric prior to installation of the planting soil layer in the basin.
- Alternate planting soil mixture which deviate from the approved plans and specification must be approved by the James City County Environmental Division or it's assigned representative prior to installation.
- The planting soil mixture shall be certified prior by the geotechnical engineer prior to substantial completion of the planting soil layer or mulching and landscaping of the basin.



LOCATION MAP: 1" = 2000'



APPROXIMATE SCALE: 1" = 400'



NOTES:

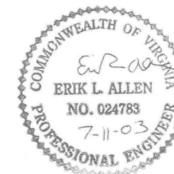
- BASEMAP DERIVED FROM JAMES CITY COUNTY GIS.

Environmental Inventory
Required Per Section 23-10(2) of the
Chesapeake Bay Preservation Ordinance

Tidal Wetlands	None
Tidal Shores	None
Nontidal Wetlands in RPA	None
RPA Buffer	None
Nontidal Wetlands in RPA	None, previously impacted.
See USACOE Authorization	03-R0422
Hydric Soils	None, previously disturbed area
Slopes 25 percent or greater	None

SHEET INDEX:

- COVER SHEET
- DRANAGE MAP
- EXISTING CONDITIONS MAP
- EROSION AND SEDIMENT CONTROL PLAN
- BIORETENTION PLAN AND PROFILE
- BIORETENTION SPECIFICATIONS
- DETAILS
- E&SC NOTES & DETAILS
- GEOTECHNICAL REPORT
- LANDSCAPE PLAN (BY OTHERS)



JCC IFB 04-004

PROJECT MANAGER: EA

DESIGNED: EA

DRAWN: EA

JOB NUMBER:

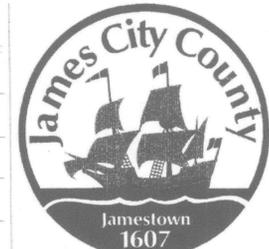
DESIGN FILE: JCCCOVER

DATE: 1-25-03

REVISIONS:

3-10-03 90% REVIEW BY ENVIRONMENTAL DIVISION

5-07-03/7-11-03 90% REVIEW BY ENVIRONMENTAL DIVISION

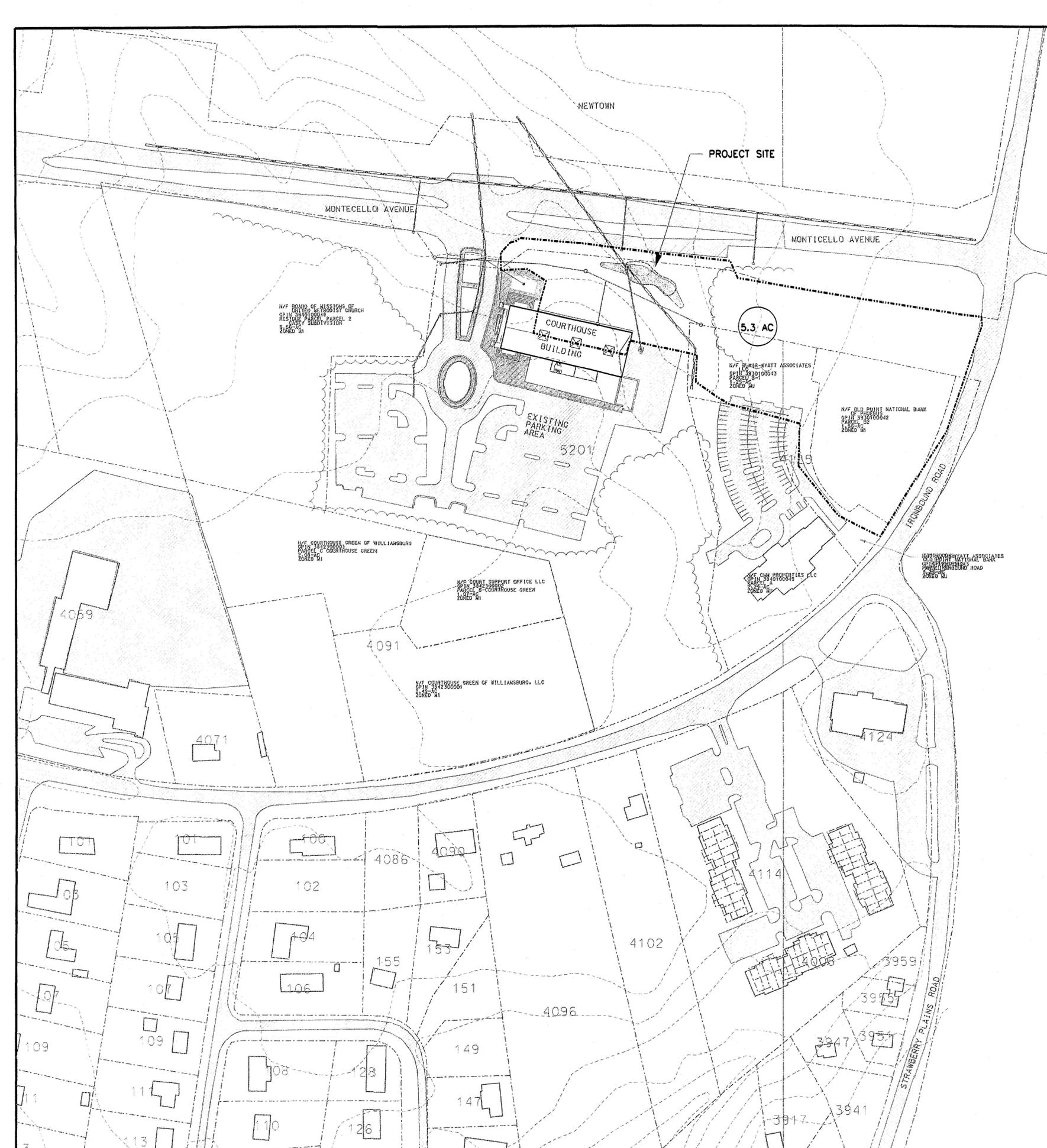


PROTECTED WITH
PRIDE
IN JAMES CITY COUNTY

WATERSHED
CONSULTING
PLLC



PO Box 7216
Richmond, VA 23221
(804) 304-4659



BMP SUMMARY

BMP Landuse Summary

Drainage Area	5.3	acre
Onsite Land Use	Public Courthouse Facility	
Offsite Land Use	Commercial/Business	
Impervious Area		
Courthouse	6,802	sf
Old Point Bank	82,303	sf
Medical Facility	4,000	sf
Total	72,905	sf
	1.67	acre

Minimum Requirements
 COUNTY TYPE D-1 BMP, FILTERING SYSTEM
 TREATMENT VOLUME = 1.0 INCH/IMPERVIOUS ACRE
 50% POLLUTANT REMOVAL EFFICIENCY
 8 POINT BMP

BMP AREA: 5% OF IMPERVIOUS AREA= 3,637 SF
BORINGS: ONE BORING PER 5000 SF OF BASIN AREA
SEPARATION: 100-FT UPSLOPE AND 25-FT DOWNSLOPE OF ANY BUILDING
DESIGN TYPE: ONLINE STORMWATER CONVEYENCE CHANNEL
10-YEAR, 25-YEAR CHECK STORM

Runoff Summary

Drainage Area=	5.3	acre
Impervious %=	38%	
HSG=	C	
CN=	84	
Tc=	25	min
QWQ=	1.3	cfs
Q1=	6	cfs
Q2=	11	cfs
Q10=	19	cfs
Q10=	31	cfs

Inlet Hydraulics (Depth at DI-7 Grate)

WQ elevation=	92.9	ft msl
1-yr elevation=	93.3	ft msl
2-yr elevation=	93.4	ft (msl)
10-yr elevation=	93.6	ft (msl)
100-yr elevation=	94.0	ft (msl)

Minimum Planting Requirements

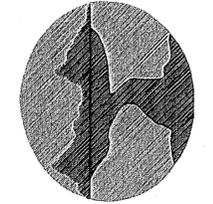
Minimum: 3 species of trees and 3 species of shrubs
 Herbaceous ground cover
 10 trees and shrubs per 1,000 sf basin area
 2 to 3 shrubs for each tree
 Trees: 1-inch minimum caliper
 Shrubs: 3 to 4-ft in height
 Planting Season: March 15-June 30 or September 15 through Nov 15
 Refer to Landscape Plan Sheet 1 and Minimum Standards 3.05 and 3.11 of the VSMH and Bioretention planting specs, Sheet 6

REVISED 5-7-03 PER JCC 90% REVIEW
 REVISED 3-10-03 PER JCC 60% REVIEW

CONTOUR INTERVAL = 5.0'
 GRAPHIC SCALE: 1" = 100'

NORTH 100' 0' 100' 200'
 BASE MAP DERIVED FROM JAMES CITY COUNTY GIS.

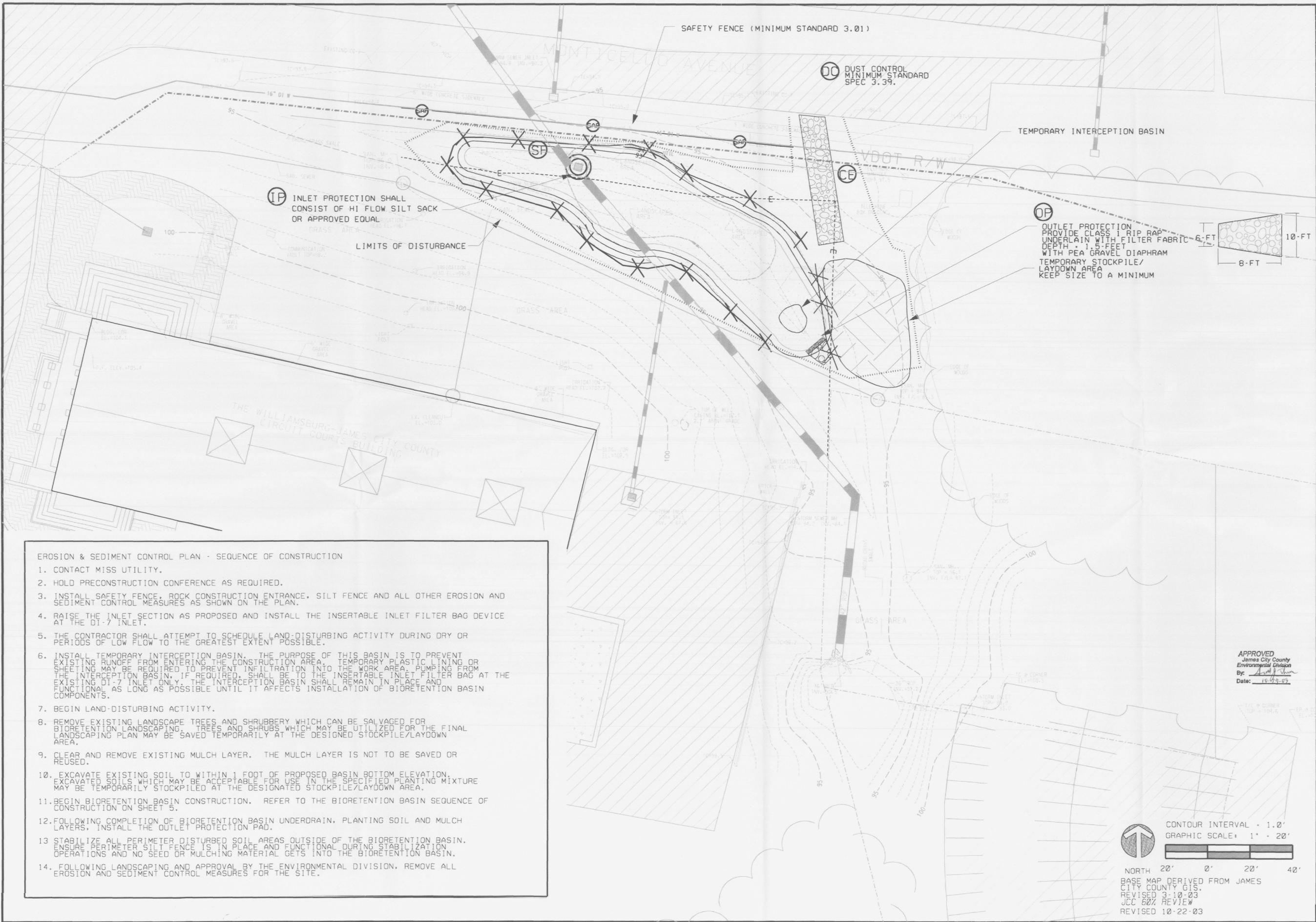
JAMES CITY COUNTY
 BIORETENTION DEMONSTRATION PROJECT
DRAINAGE MAP
 WILLIAMSBURG,
 VIRGINIA



WATERSHED CONSULTING, PLLC
 P.O. Box 7216
 Richmond, VA 23221
 (804) 304-4659



PROJECT MANAGER:	EA
DESIGNED:	EA
DRAWN:	EA
JOB NUMBER:	
DESIGN FILE:	JCCSHEET2M.DGN
DATE:	1/25/03



- EROSION & SEDIMENT CONTROL PLAN - SEQUENCE OF CONSTRUCTION**
1. CONTACT MISS UTILITY.
 2. HOLD PRECONSTRUCTION CONFERENCE AS REQUIRED.
 3. INSTALL SAFETY FENCE, ROCK CONSTRUCTION ENTRANCE, SILT FENCE AND ALL OTHER EROSION AND SEDIMENT CONTROL MEASURES AS SHOWN ON THE PLAN.
 4. RAISE THE INLET SECTION AS PROPOSED AND INSTALL THE INSERTABLE INLET FILTER BAG DEVICE AT THE DI-7 INLET.
 5. THE CONTRACTOR SHALL ATTEMPT TO SCHEDULE LAND-DISTURBING ACTIVITY DURING DRY OR PERIODS OF LOW FLOW TO THE GREATEST EXTENT POSSIBLE.
 6. INSTALL TEMPORARY INTERCEPTION BASIN. THE PURPOSE OF THIS BASIN IS TO PREVENT EXISTING RUNOFF FROM ENTERING THE CONSTRUCTION AREA. TEMPORARY PLASTIC LINING OR SHEETING MAY BE REQUIRED TO PREVENT INFILTRATION INTO THE WORK AREA. PUMPING FROM THE INTERCEPTION BASIN, IF REQUIRED, SHALL BE TO THE INSERTABLE INLET FILTER BAG AT THE EXISTING DI-7 INLET ONLY. THE INTERCEPTION BASIN SHALL REMAIN IN PLACE AND FUNCTIONAL AS LONG AS POSSIBLE UNTIL IT AFFECTS INSTALLATION OF BIORETENTION BASIN COMPONENTS.
 7. BEGIN LAND-DISTURBING ACTIVITY.
 8. REMOVE EXISTING LANDSCAPE TREES AND SHRUBBERY WHICH CAN BE SALVAGED FOR BIORETENTION LANDSCAPING. TREES AND SHRUBS WHICH MAY BE UTILIZED FOR THE FINAL LANDSCAPING PLAN MAY BE SAVED TEMPORARILY AT THE DESIGNATED STOCKPILE/LAYDOWN AREA.
 9. CLEAR AND REMOVE EXISTING MULCH LAYER. THE MULCH LAYER IS NOT TO BE SAVED OR REUSED.
 10. EXCAVATE EXISTING SOIL TO WITHIN 1 FOOT OF PROPOSED BASIN BOTTOM ELEVATION. EXCAVATED SOILS WHICH MAY BE ACCEPTABLE FOR USE IN THE SPECIFIED PLANTING MIXTURE MAY BE TEMPORARILY STOCKPILED AT THE DESIGNATED STOCKPILE/LAYDOWN AREA.
 11. BEGIN BIORETENTION BASIN CONSTRUCTION. REFER TO THE BIORETENTION BASIN SEQUENCE OF CONSTRUCTION ON SHEET 5.
 12. FOLLOWING COMPLETION OF BIORETENTION BASIN UNDERDRAIN, PLANTING SOIL AND MULCH LAYERS, INSTALL THE OUTLET PROTECTION PAD.
 13. STABILIZE ALL PERIMETER DISTURBED SOIL AREAS OUTSIDE OF THE BIORETENTION BASIN. ENSURE PERIMETER SILT FENCE IS IN PLACE AND FUNCTIONAL DURING STABILIZATION OPERATIONS AND NO SEED OR MULCHING MATERIAL GETS INTO THE BIORETENTION BASIN.
 14. FOLLOWING LANDSCAPING AND APPROVAL BY THE ENVIRONMENTAL DIVISION, REMOVE ALL EROSION AND SEDIMENT CONTROL MEASURES FOR THE SITE.

APPROVED
James City County
Environmental Division
By: *[Signature]*
Date: 10/29/03

CONTOUR INTERVAL = 1.0'
GRAPHIC SCALE: 1" = 20'
NORTH
BASE MAP DERIVED FROM JAMES CITY COUNTY GIS.
REVISED 3-10-03
JCC 60% REVIEW
REVISED 10-22-03

JAMES CITY COUNTY
BIORETENTION DEMONSTRATION PROJECT
E&S PLAN
WILLIAMSBURG,
VIRGINIA

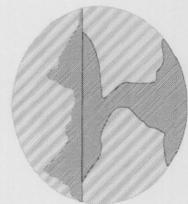


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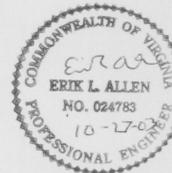
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DRAWN:	EA
JOB NUMBER:	----
DESIGN FILE:	JCCSHEET4M.DGN
DATE:	1/25/03

JAMES CITY COUNTY
BIORETENTION DEMONSTRATION PROJECT
BIORETENTION
PLAN AND PROFILE

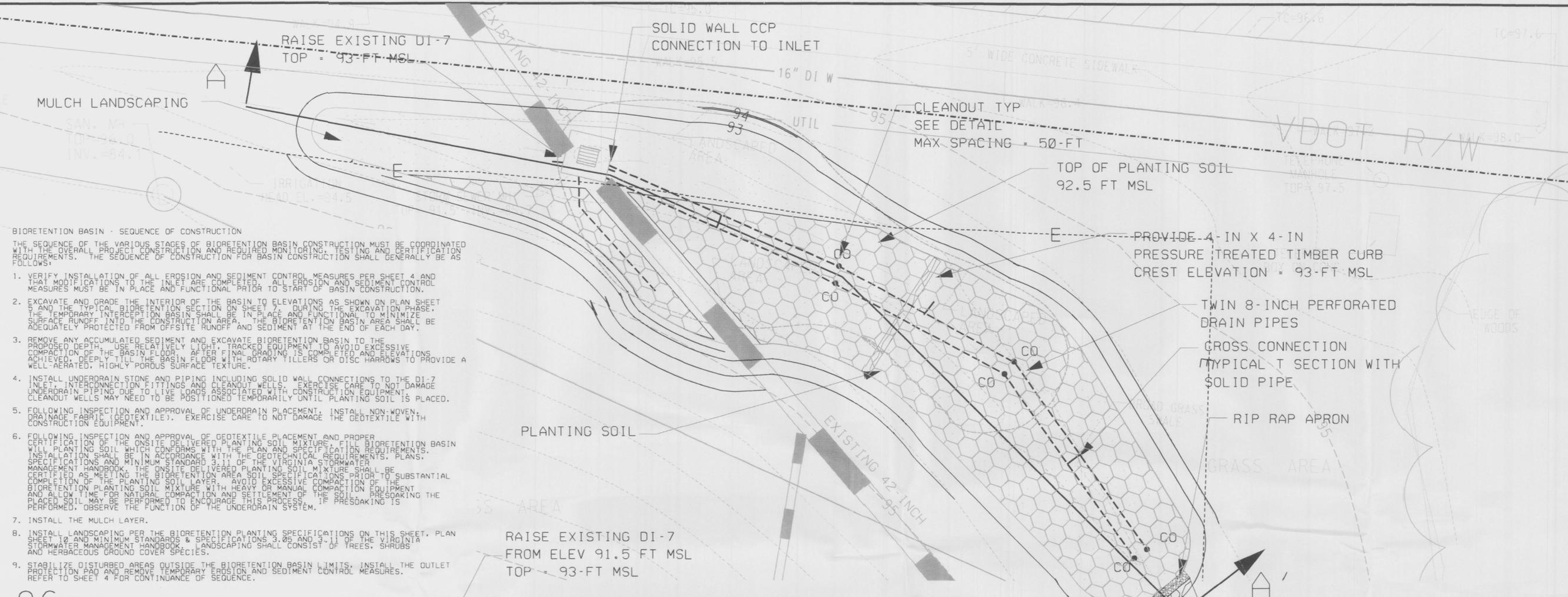


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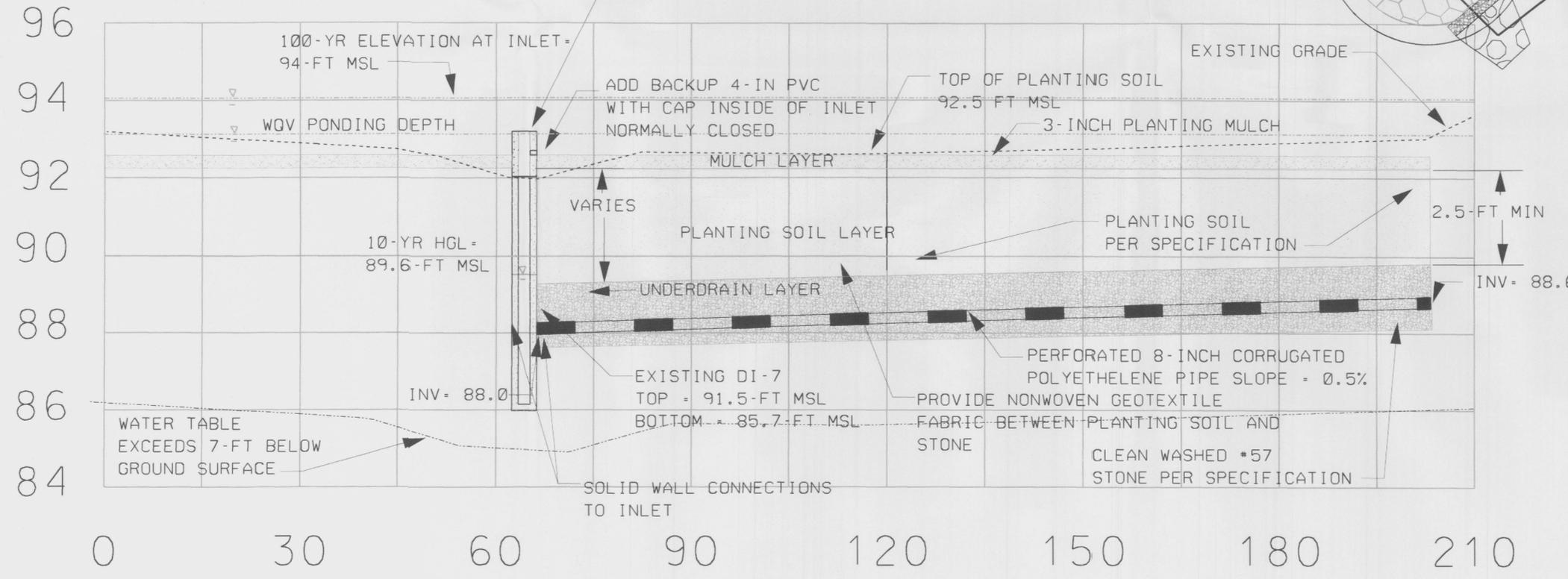
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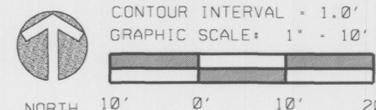
- BIORETENTION BASIN - SEQUENCE OF CONSTRUCTION
- THE SEQUENCE OF THE VARIOUS STAGES OF BIORETENTION BASIN CONSTRUCTION MUST BE COORDINATED WITH THE OVERALL PROJECT CONSTRUCTION AND REQUIRED MONITORING, TESTING AND CERTIFICATION REQUIREMENTS. THE SEQUENCE OF CONSTRUCTION FOR BASIN CONSTRUCTION SHALL GENERALLY BE AS FOLLOWS:
1. VERIFY INSTALLATION OF ALL EROSION AND SEDIMENT CONTROL MEASURES PER SHEET 4 AND THAT MODIFICATIONS TO THE INLET ARE COMPLETE. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE IN PLACE AND FUNCTIONAL PRIOR TO START OF BASIN CONSTRUCTION.
 2. EXCAVATE AND GRADE THE INTERIOR OF THE BASIN TO ELEVATIONS AS SHOWN ON PLAN SHEET 5 AND THE TYPICAL BIORETENTION SECTION ON SHEET 7. DURING THE EXCAVATION PHASE, THE TEMPORARY INTERCEPTION BASIN SHALL BE IN PLACE AND FUNCTIONAL TO MINIMIZE SURFACE RUNOFF INTO THE CONSTRUCTION AREA. THE BIORETENTION BASIN AREA SHALL BE ADEQUATELY PROTECTED FROM OFFSITE RUNOFF AND SEDIMENT AT THE END OF EACH DAY.
 3. REMOVE ANY ACCUMULATED SEDIMENT AND EXCAVATE BIORETENTION BASIN TO THE PROPOSED DEPTH. USE RELATIVELY LIGHT, TRACKED EQUIPMENT TO AVOID EXCESSIVE COMPACTION OF THE BASIN FLOOR. AFTER FINAL GRADING IS COMPLETED AND ELEVATIONS ACHIEVED, DEEPLY TILL THE BASIN FLOOR WITH ROTARY TILLERS OR DISC HARROWS TO PROVIDE A WELL-AERATED, HIGHLY POROUS SURFACE TEXTURE.
 4. INSTALL UNDERDRAIN STONE AND PIPING INCLUDING SOLID WALL CONNECTIONS TO THE DI-7 INLET. INTERCONNECTION FITTINGS AND CLEANOUT WELLS. EXERCISE CARE TO NOT DAMAGE UNDERDRAIN PIPING DUE TO LIVE LOADS ASSOCIATED WITH CONSTRUCTION EQUIPMENT. CLEANOUT WELLS MAY NEED TO BE POSITIONED TEMPORARILY UNTIL PLANTING SOIL IS PLACED.
 5. FOLLOWING INSPECTION AND APPROVAL OF UNDERDRAIN PLACEMENT, INSTALL NON-WOVEN DRAINAGE FABRIC (GEOTEXTILE). EXERCISE CARE TO NOT DAMAGE THE GEOTEXTILE WITH CONSTRUCTION EQUIPMENT.
 6. FOLLOWING INSPECTION AND APPROVAL OF GEOTEXTILE PLACEMENT AND PROPER CERTIFICATION OF THE ONSITE DELIVERED PLANTING SOIL MIXTURE, FILL BIORETENTION BASIN WITH PLANTING SOIL WHICH CONFORMS WITH THE PLAN AND SPECIFICATION REQUIREMENTS. SPECIFICATIONS AND MINIMUM STANDARD 3.11 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK. THE ONSITE DELIVERED PLANTING SOIL MIXTURE SHALL BE CERTIFIED AS MEETING THE BIORETENTION AREA SOIL SPECIFICATIONS PRIOR TO SUBSTANTIAL COMPLETION OF THE PLANTING SOIL LAYER. AVOID EXCESSIVE COMPACTION OF THE BIORETENTION PLANTING SOIL MIXTURE WITH HEAVY OR MANUAL COMPACTION EQUIPMENT AND ALLOW TIME FOR NATURAL COMPACTION AND SETTLEMENT OF THE SOIL. PRESOAKING THE PLACED SOIL MAY BE PERFORMED TO ENCOURAGE THIS PROCESS. IF PRESOAKING IS PERFORMED, OBSERVE THE FUNCTION OF THE UNDERDRAIN SYSTEM.
 7. INSTALL THE MULCH LAYER.
 8. INSTALL LANDSCAPING PER THE BIORETENTION PLANTING SPECIFICATIONS ON THIS SHEET, PLAN SHEET 10 AND MINIMUM STANDARDS & SPECIFICATIONS 3.05 AND 3.11 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK. LANDSCAPING SHALL CONSIST OF TREES, SHRUBS AND HERBACEOUS GROUND COVER SPECIES.
 9. STABILIZE DISTURBED AREAS OUTSIDE THE BIORETENTION BASIN LIMITS. INSTALL THE OUTLET PROTECTION PAD AND REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES. REFER TO SHEET 4 FOR CONTINUANCE OF SEQUENCE.



1. SEE SHEET 6 FOR MULCH, PLANTING, SOIL AND UNDERDRAIN SPECIFICATIONS.
2. SEE SHEET 7 FOR TYPICAL BIORETENTION SECTION
3. SEE SHEET 4 FOR EROSION AND SEDIMENT CONTROL PLAN
4. SEE SHEET 9 FOR GEOTECHNICAL REPORT
5. SEE SHEET 8 FOR CONSTRUCTION NOTES.

REVISED 10-22-03
REVISED 5-7-03
JCC 90% REVIEW

3-10-03/7-11-03
JCC 60% REVIEW



APPROVED
James City County
Environmental Division
By: [Signature]
Date: 1/21/03

BASE MAP DERIVED FROM JAMES CITY COUNTY GIS AND TOPOGRAPHIC SURVEY BY GOODFELLOW, JALBERT, BEARD, AND ASSOCIATES.

SECTION A-A'
1-IN = 2-FT V
1-IN = 10-FT H

Bioretention Area Soil Specifications

1. Planting soil
The bioretention areas shall contain a planting soil mixture of 50% sand, 30% leaf compost (fully composted, NOT partially rotted leaves), and 20% topsoil. Topsoil shall be sandy loam or loamy sand of uniform composition, containing no more than 5% clay, free of stones, stumps, roots, or similar objects greater than one inch, brush, or any other material or substance which may be harmful to plant growth, or a hindrance to plant growth or maintenance. Any alternate mixtures requires County approval prior to installation.

The topsoil shall be free of plants or plant parts of Bermuda grass, Quack grass, Johnson grass, Mugwort, Nutedge, Poison Ivy, Canadian Thistle or others as specified. It shall not contain toxic substances harmful to plant growth.

The top soil shall be tested and meet the following criteria:

pH range:	5.0 - 7.0
Organic matter:	Greater than 1.5
Magnesium (Mg):	100+ Units
Phosphorus (P2O5):	150+ Units
Potassium (K2O):	120+ Units
Soluble salts:	not to exceed 900 ppm/ .9 MMHOS/cm (soil) not to exceed 3,000 ppm/2.5 MMHOS/cm (organic mix)

The following testing frequencies shall apply to the above soil constituents:

pH, Organic Matter: 1 test per 90 cubic yards, but no more than 1 test per Bioretention Area

Magnesium, Phosphorus, Potassium, Soluble Salts:

1 test per 500 cubic yards, but no less than 1 test per borrow source

One grain size analysis shall be performed per 90 cubic yards of planting soil, but no less than 1 test per Bioretention Area. Soil tests must be verified by a qualified professional. Soil infiltration rate shall exceed 2-in/hr.

Other Specifications

1. Mulch

A mulch layer shall be provided on top of the planting soil. An acceptable mulch layer shall include shredded hardwood or shredded wood chips or other similar product. Maximum depth of mulch shall be 2-3-inches. Of the approved mulch products all must be fresh, uniform in color, and free of foreign material including plant material. Do not pile mulch around base of trees and do not use grass clippings.

2. Sand

The sand for bioretention basins when utilized, shall be ASTM C-33 Concrete Sand and free of deleterious material.

3. Compaction

Soil shall be placed in lifts less than 18 inches and lightly compacted (minimal compactive effort) by tamping or rolled with a hand-operated landscape roller. This material should be compacted to a density of no more than 85% of the standard Proctor maximum dry density (ASTM D698).

4. Underdrain pipe

Underdrain pipe shall be constructed of corrugated polyethylene pipe ASTM d2321 with 1/2" perforations 8-inches on center. Perforations shall be placed in 2-3 longitudinal rows. Pipe shall be placed in accordance with manufacturers recommendations ensuring proper cover during backfill operations.

5. Geotextile

A geotextile fabric shall be placed at the interface of the planting soil layer and the underdrain layer. Geotextile fabric shall be nonwoven Mirafil 140N or approved equal.

6. Underdrain Stone

Underdrain stone shall clean washed aggregate VDOT #57 or VDOT #1 open graded course aggregate.

7. Pea Gravel Diaphragm

A pea gravel diaphragm shall be constructed in accordance with specifications contained in the Virginia Stormwater Management Handbook.

Bioretention Area Planting Specifications

1. Root stock of the plant material shall be kept moist during transport from the source to the job site and until planted.
2. Walls of planting pit shall be dug so that they are vertical.
3. The diameter of the planting pit must be a minimum of six inches (6") larger than the diameter of the ball of the tree.
4. The planting pit shall be deep enough to allow 1/8 of the overall dimension of the root ball to be above grade. Loose soil at the bottom of the pit shall be tamped by hand.
5. The appropriate amount of fertilizer is to be placed at the bottom of the pit (see below for fertilization rates).
6. The plant shall be removed from the container and placed in the planting pit by lifting and carrying the plant by its' ball (never lift by branches or trunk).
7. Set the plant straight and in the center of the pit so that approximately 1/3 of the diameter of the root ball is above the final grade.
8. Backfill planting pit with existing soil.
9. Make sure plant remains straight during backfilling procedure.
10. Never cover the top of the ball with soil. Mound soil around the exposed ball.
11. Trees shall be braced by using 2" by 2" white oak stakes. Stakes shall be placed parallel to walkways and buildings. Stakes are to be equally spaced on the outside of the tree ball. Utilizing hose and wire the tree is braced to the stakes.
12. Because of the high levels of nutrients in stormwater runoff to be treated, bioretention basin plants should not require chemical fertilization.
13. Also refer to landscape plan sheet 10.

Maintenance Plan (Bioretention Type BMPs)

A maintenance program is required to ensure the Stormwater Management / Best Management Practice (BMP) bioretention cell functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment into pretreatment areas, BMP filtering or infiltration area and downstream drainage systems or waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once per year. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

The Owner or its designated representative will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action, performed at the cost of the owner will be taken to ensure appropriate maintenance.

BMP Description: The Bioretention cell serves a drainage area of 5.3 acres associated with the future Old Point National Bank site, a portion of an existing medical facility, and a portion of the Williamsburg/James City County Courthouse. The facility is an 8-point County Type D-1 BMP. The bioretention cell was designed serve as an off-line system to imitate a natural forest type ecosystem with a combination of soil filtration and plant uptake. The cell, which includes an underdrain, planting soil layer, mulch and plantings is designed to appear as a landscaped or natural area. Stormwater runoff, mainly from water quality events, enters the bioretention area in a non-erosive manner and is temporarily stored in a shallow pond on top of the mulch layer. The ponded water is absorbed by plantings, then slowly filters downward through the mulch and planting soil layers into the underdrain envelope, which discharges into the existing storm sewer system underneath Monticello Avenue. Runoff in excess of the water quality event overflows into the drop inlet located in the center of the cell. Due to their nature, bioretention systems are sensitive to fine sediments; therefore, adequate protection is necessary upslope if upslope disturbance is to occur. Sediments that may escape upslope construction areas can quickly clog the facility, severely reducing or eliminating its design filtering capacity. If upstream disturbance is to occur, proper erosion and sediment control measures should be installed to protect the cell to the greatest extent possible.

Inspection and maintenance of the facility will consist of the following additional measures:

1. Mowing/Landscaping Activities. Mowing or landscaping activities should be conducted in a way to prevent lawn and plant clippings and incidental sediment (dust) from entering the cell by the use of mulching or bag mowers and remove clippings, especially in areas tributary to the cell.
2. Trash Removal. Accumulated paper, trash and debris should be removed from contributing drainage areas and from the bioretention cell. The cell should remain clear of trash and debris to preserve the draw-down rate and treatment function of the cell. Type of debris removed should be noted and possible sources identified and reduced. Trash and debris should be removed to a proper disposal area.
3. Filtration Performance. Observe the filtration performance of the cell every six (6) months minimum. If the draw-down time of the facility is reduced in excess of the design time (usually no more than 48 hours), then corrective action is necessary. Corrective action may include cleanout and flushing of the underdrain system, removal and replacement of the mulch, scarifying or removal and replacement of the top layer of the planting soil media or removal and replacement of the entire mulch, planting soil and underdrain systems.
4. Pretreatment Areas. Inspect all areas that serve as pretreatment for the cell including grass filter strips, gravel diaphragms, rock energy dissipators, etc. Immediately clean and remove all sediment build-ups, trash and debris that accumulates and stabilize any disturbed areas directly adjacent to these facilities.
5. Plantings. Replace plantings that are dead, diseased, dying or otherwise have failed to establish. If planting replacement is frequently performed without success, planting soil media may need to be tested to ensure conformance with the design or currently accepted industry standard specifications. If pruning and weeding is desired, ensure all loose vegetation is cleaned and removed from the cell.
6. Mulch Layers. Reapply or spread mulch in areas where erosion has displaced the surface material and replace the mulch layer every year once decay processes have begun. Thickness should be meet original design specifications (normally 3 inch depth).
7. Planting Soil Layer. In order to keep plantings healthy, test planting soil at least once per year to determine if pH is within acceptable ranges. If low, lime should be applied; if high then iron sulfate or other similar treatments can be used if applied by a qualified applicator. After a few years of service, the quantity of heavy metals and other pollutants collected by the cell may reach high toxicity levels which impair plant growth and cell effectiveness. If toxicity levels are high, the soil may need replacement.
8. Flow Control Structures. Check periodically to ensure debris is not clogging any part of the flow control structure. When water levels are above the filter/mulch bed layers, check the outlet flow control devices to ensure that the cell is functionally draining. If there is no discharge from the outlet, the system is non-functional and corrective maintenance is needed immediately to restore draw-down.
9. Many factors may affect operation of the system. Routine inspections and maintenance should be performed by the same assigned individual in order to establish baseline knowledge of how the system functions under different site and weather conditions.
10. Record Keeping. The owner or designated representative shall keep reasonable, accurate written records of inspections performed for the structure. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.
11. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Local Jurisdiction.



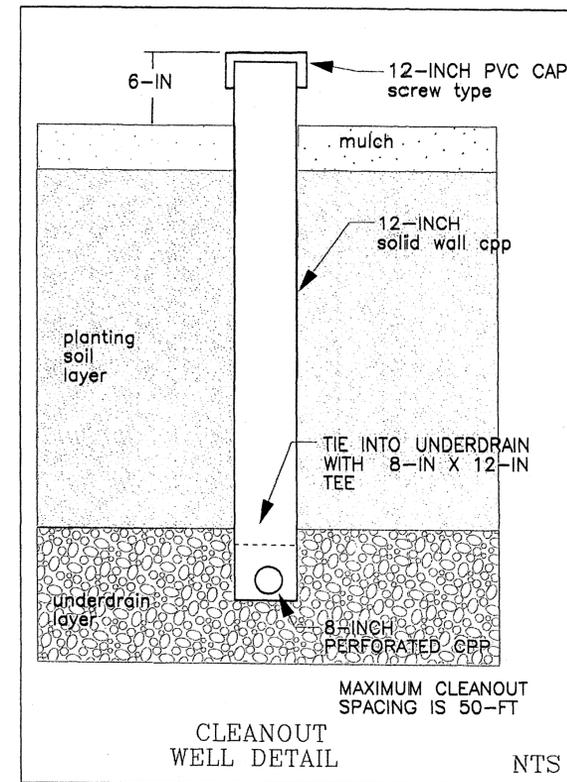
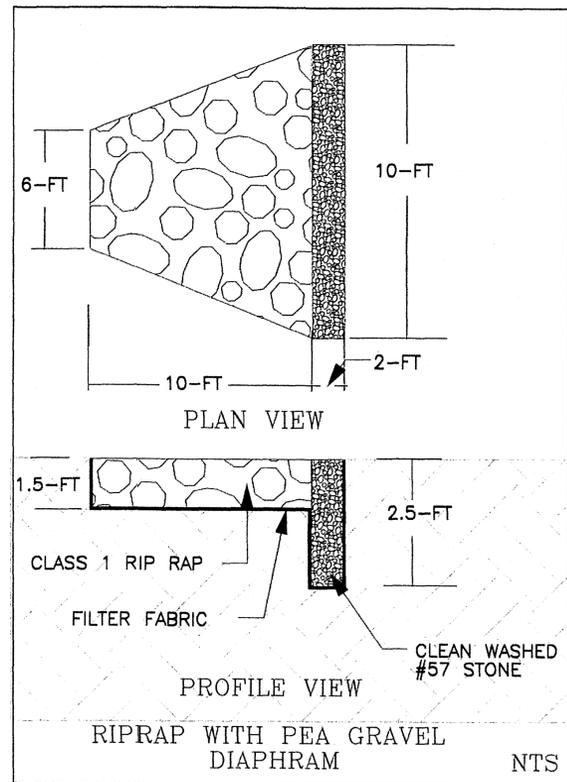
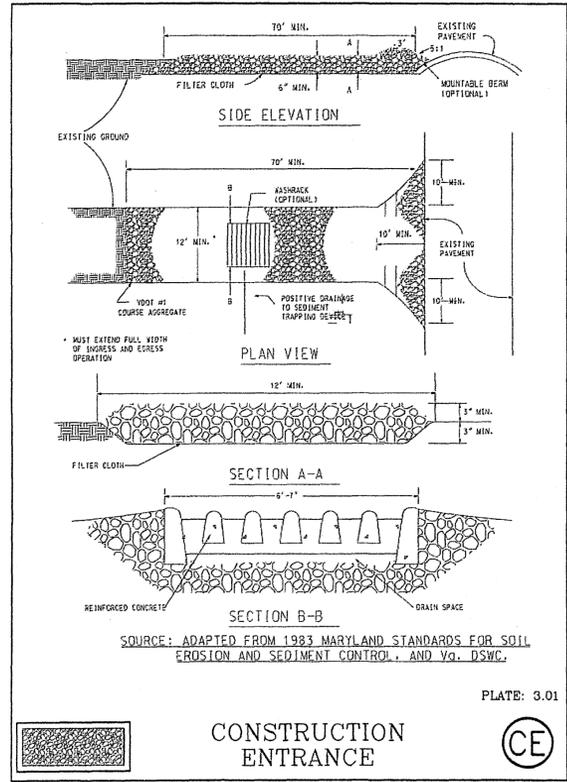
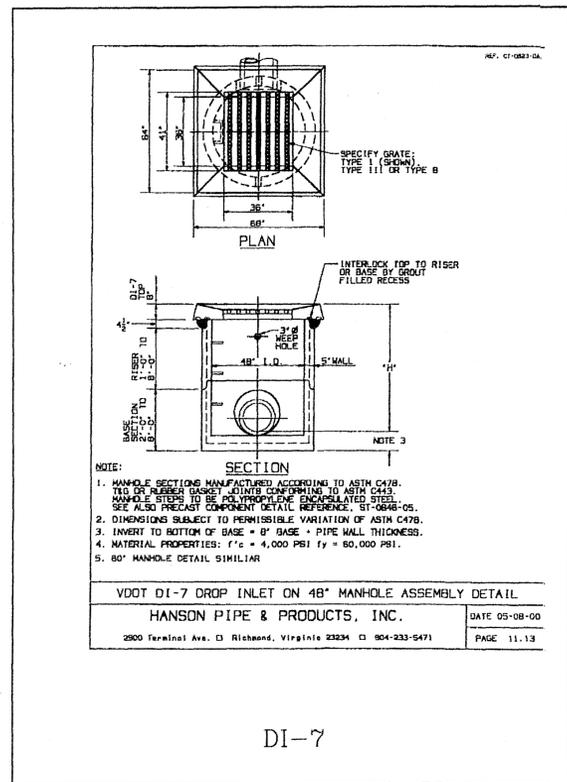
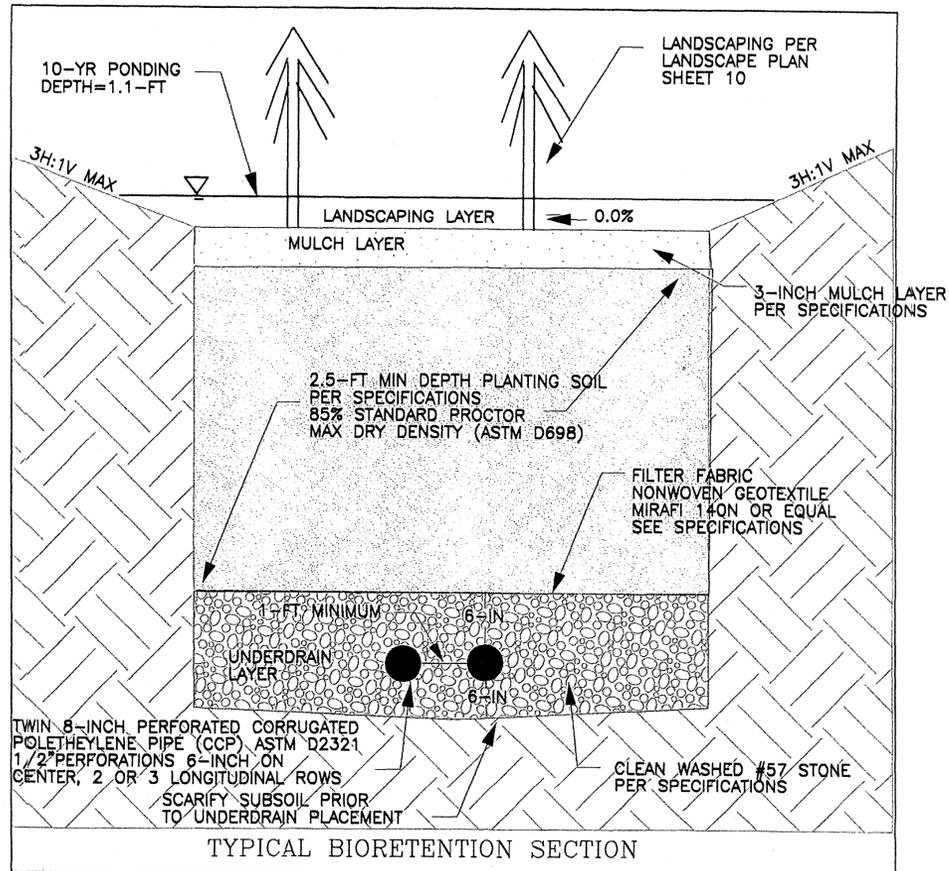
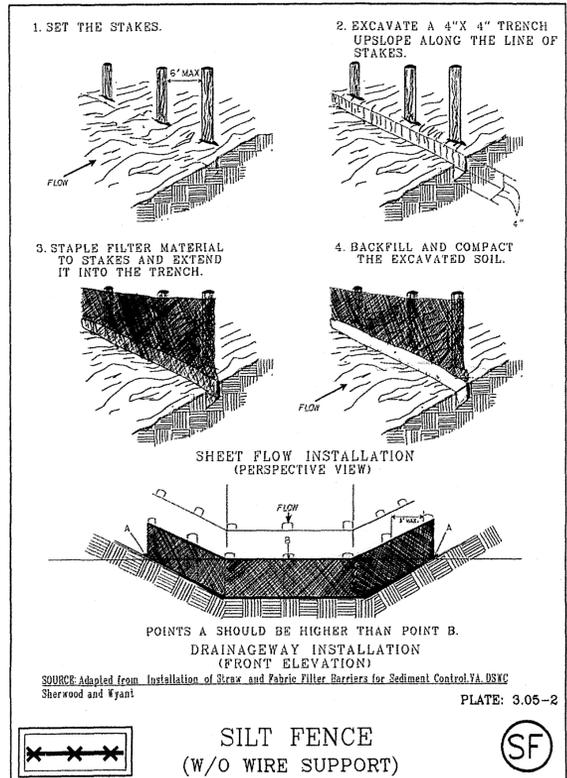
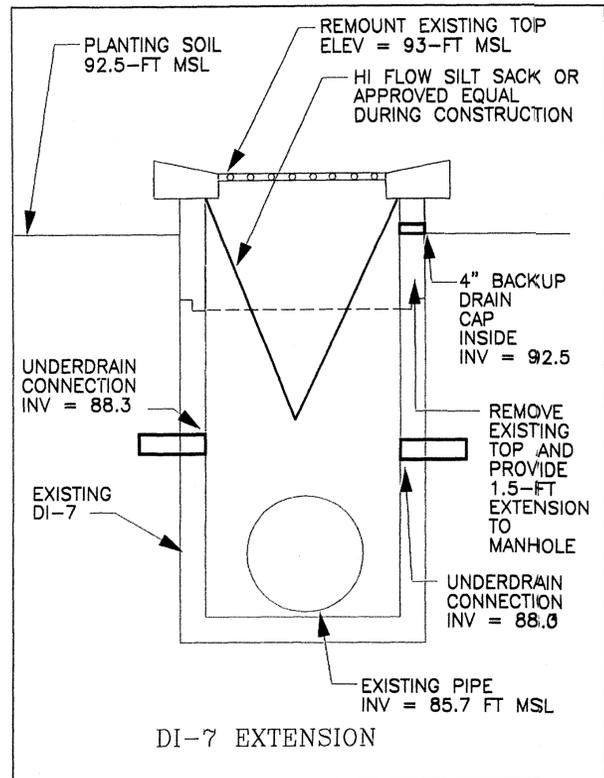
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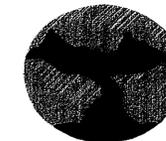


PROJECT MANAGER:	EA
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REVISED 05/7/03
JCC 90% REVIEW
REVISED 03/10/03
JCC 60% REVIEW



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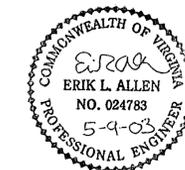
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JAMES CITY COUNTY BIORETENTION DEMONSTRATION PROJECT

DETAILS

VIRGINIA

WILLIAMSBURG,



PROJECT MANAGER:	EA
DESIGNED:	EA
DRAWN:	EA
JOB NUMBER:	
DESIGN FILE:	JCCSHEET7M.DGN
DATE:	1-25-03
REVISIONS:	
5-7-03 JCC 90% REVIEW	
3-10-03 JCC 60% REVIEW	

Erosion and Sediment Control Notes

The purpose of the erosion control measures shown on these plans shall be to preclude the transport of all waterborne sediments resulting from construction activities from entering onto adjacent properties or State waters. If field inspection reveals the inadequacy of the plan to confine sediment to the project site, all appropriate modifications will be made to correct any plan deficiencies. In addition to these notes, all provisions of the Virginia Erosion and Sediment Control Regulations shall apply to this project.

- All erosion and sediment control measures shall be installed and maintained in accordance with the Virginia Erosion and Sediment Control Handbook, 3rd Edition, 1992. The contractor shall be thoroughly familiar with all applicable measures contained therein that may be pertinent to this project, including Minimum Standards 1 through 19. If the approved Erosion and Sediment Control plan is found to be inadequate in the field, the Minimum Standards will apply in addition to the provisions of the approved plan.
- As a prerequisite to approval of an erosion and sediment control plan for land-disturbing activities, the name of a Responsible Land-Disturber shall be provided. The Responsible Land-Disturber shall be an individual who holds a valid certificate of competence issued by the Virginia Department of Conservation and is defined as the person in charge of and responsible for carrying out the land-disturbing activity. Permits or plans without this information are deemed incomplete and will not be approved until proper notification is received. Also, if the person designated as Responsible Land-Disturber changes between the time of plan approval and the scheduled preconstruction meeting, the Environmental Division shall be informed of the change, in writing, 24-hours in advance of the preconstruction meeting.
- A preconstruction meeting shall be held on site between the County, the Developer, the Project Engineer, the Responsible Land-Disturber and the Contractor prior to issuance of the Land Disturbing Permit. The Contractor shall submit a Sequence of Construction to the County for approval prior to the preconstruction meeting. The designated Responsible Land-Disturber is required to attend the preconstruction meeting for the project.
- All points of construction ingress and egress shall be protected by a temporary construction entrance to prevent tracking of mud onto public right-of-ways. An entrance permit from the Virginia Department of Transportation is required prior to any construction activities within State right-of-ways. Where sediment is transported onto a public road surface, the road shall be thoroughly cleaned at the end of each day (Std & Spec 3.02).
- Sediment basins and traps (Std & Spec 3.13 and 3.14), perimeter dikes (Std & Spec 3.09 and 3.12), sediment filter barriers (Std. & Spec 3.06) and other measures intended to trap sediment on-site must be constructed as a first step in grading and must be made functional prior to any upslope land disturbance taking place. Earthen structures such as dams, dikes and diversions must be seeded and mulched immediately after installation. Periodic inspections of the erosion control measures by the owner or owners representatives shall be made to assess their condition. Any necessary maintenance of the measures shall be accomplished immediately and shall include the repair of measures damaged by any subcontractor including those of the public utility companies.
- Surface flows over cut and fill slopes shall be controlled by either redirecting flows from transverse the slopes or by installing mechanical devices to safely lower water downslope without causing erosion. A temporary fill diversion (Std. & Spec. 3.10) and slope drain (Std. & Spec. 3.15) shall be installed prior to the end of each working day.
- Sediment control measures may require minor field adjustments at time of construction to insure their intended purpose is accomplished. Environmental Division approval will be required for other deviations from the approved plan.
- The Contractor shall place soil stockpiles at the locations shown on the plan. Soil stockpiles shall be stabilized or protected with sediment trapping measures. Off-site waste or borrow areas shall be approved by the Environmental Division prior to the import of any borrow or export of any waste to or from the project site.
- The Contractor shall complete drainage facilities within 30 days following completion of rough grading at any point within the project. The installation of drainage facilities shall take precedence over all underground utilities. Outfall ditches from drainage structures shall be stabilized immediately after construction of the same (Std & Spec 3.18). This includes installation of erosion control stone or paved ditches where required. Any drainage outfalls required for a street must be completed before street grading or utility installation begins.
- Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 30 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.
- No more than 300 feet of sanitary sewer, storm drain, water or underground utility lines are to be open at one time. Following installation of any portion of these items, all disturbed areas are to be immediately stabilized (i.e., the same day).
- If disturbed area stabilization is to be accomplished during the months of December, January or February, stabilization shall consist of mulching (Std & Spec 3.35). Seeding will then take place as soon as the season permits.
- The term Seeding, Final Vegetative Cover or Stabilization on this plan shall mean the successful germination and establishment of a stable grass cover from a properly prepared seedbed containing the specified amounts of seed, lime and fertilizer (Std & Spec 3.32). Irrigation shall be required as necessary to ensure establishment of grass cover.
- All slopes steeper than 3H:1V shall require the use of erosion control blankets and matings to aid in the establishment of a vegetative cover. Installation shall be in accordance with Std. & Spec. 3.35, Mulching, Std. & Spec. 3.35, Soil Stabilization Blankets and Matting and Manufacturers instructions. No slopes shall be created steeper than 2H:1V.
- Inlet protection (Std & Spec 3.07 and 3.08) shall be provided for all storm drain and culvert inlets following construction of the same.
- Temporary liners, such as polyethylene sheets, shall be provided for all paved ditches until the permanent concrete liner is installed.
- Paved ditches shall be required wherever accelerated erosion is evident. Particular attention shall be paid to those areas where grades exceed 3 percent.
- Temporary erosion control measures such as silt fence are not to be removed until all disturbed areas are stabilized. Trapped sediment shall be spread, seeded and mulched. After the project and stabilization is complete, all erosion and sediment control measures shall be removed within 30 days.
- No sediment trap or sediment basin shall be removed until a) at least 75 percent of the lots within the drainage area to the trap or basin have been sold to a third party (unrelated to the developer) for the construction of homes and/or b) 80 percent of the single family lots within the drainage area to the trap or basin have been completed and the soil stabilized. A bulk sale of the lots to another builder does not satisfy this provision. Sediment traps and sediment basins shall not be removed without the express authorization of the James City County Environmental Division.
- Record Drawings (As-Built) and Construction Certifications are both required for newly constructed or modified stormwater management/BMP facilities. Certification activities shall be adequately coordinated and performed before, during and following construction in accordance with the current version of the James City County Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.
- Design and construction of private-type site drainage systems outside VDOT rights-of-way shall be performed in accordance with the current version of the James City County Environmental Division, Stormwater Drainage Conveyance Systems (Non-BMP related), General Design and Construction Guidelines.

Erosion and Sediment Control Narrative

PROJECT DESCRIPTION:
The project consists of converting an existing landscaped island into a Bioretention Best Management Practice. The project results in approximately 0.75 acres of land disturbance.

STORMWATER CONSIDERATIONS:
The project results in no change in landuse and no increase in runoff rate. Therefore, no stormwater impacts should be associated with the improvements. This project is a BMP and provides stormwater benefits to a portion of the Courthouse site and adjacent development.

Soil-
The project is located in an area, which has been disturbed by the recent construction of the Williamsburg James City County Courthouse. The project is located on soils identified as Emporia Complex in the Soil Survey for James City and York Counties. This soil is described as deep moderately well drained Emporia Soils. Permeability is moderate in the upper soil and moderately slow in the lower part of the subsoil. Erosion hazard is severe.

EXISTING SITE CONDITIONS:
The site is a maintained landscaped area located in the front lawn of the Williamsburg/James City County Courthouse.

ADJACENT AREAS:
The site is located in a developing area of James City County and Williamsburg directly south of the New Town Development. Adjacent property is being developed for office use.

CRITICAL EROSION AREAS:
No critical erosion areas exist.

OFFSITE AREAS:
Excess material will be hauled to an offsite stockpile location with appropriate E&S measures.

EROSION AND SEDIMENT CONTROL MEASURES
Unless otherwise indicated, all vegetative and structural erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, Third Edition (1992). No Erosion and Sediment Control structure shall be removed without the approval of the County inspector.

STRUCTURAL PRACTICES

Safety fence- STD & SPEC 3.01
Safety fence will be provided between the sidewalk adjacent to Monticello Avenue and the proposed work area.

Temporary Stone Construction Entrance- STD. & SPEC. 3.02
A temporary stone construction entrance will be provided as shown on these plans.

Silt Fence- Std. & Spec. 3.05
Silt fence will be installed at locations shown on these plans in order to intercept and detain sediment from the disturbed areas during construction operations in order to prevent sediment from leaving the site.

Inlet Protection- SILTSACK
The existing DI-7 will be protected during construction operations using a silt sack to prevent sediment from entering the pipe prior to permanent stabilization of disturbed areas.

Dust Control- STD & SPEC 3.39
Dust Control will be of key importance during construction in order to minimize airborne sediment. Stabilizing the site immediately upon construction will be key.

SEEDING
All Disturbed areas will be seeded in accordance with the attached specifications.

MAINTENANCE SCHEDULE
In general, the contractor shall check all erosion and sediment control measures daily and after each significant rainfall. The following items will be checked in particular:

- Silt fence shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately. Sediment deposits shall be removed after each storm event and when deposits reach approximately one-half the height of the barrier. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform to the existing grade, repaired, and seeded.
- The construction entrance shall be inspected daily and any mud or debris located on the stone shall be removed.
- The Silt Sack shall be inspected daily and cleaned when any sediment has accumulated within the structure.
- The need for dust control shall be inspected daily and implemented if necessary.

SEEDING (FOR DISTURBED AREAS OUTSIDE LIMITS OF BIORETENTION)

PERMANENT SEEDING MIXTURE
ACCESS ROAD/STOCKPILE/DIVERSION DIKES

Kentucky 31 Fescue	108 lbs/acre
Red Top Grass	2 lbs/acre
*Seasonal Nurse Crop	20 lbs/acre
Crown Vetch	20 lbs/acre

* Use seasonal nurse crop in accordance with seeding dates listed below

February 18 through April	Annual Rye
May 1st through August 15th	Forstall Millet
August 16th through October	Annual Rye
November through February	Winter Rye

SOIL AMENDMENTS

Lime- 2 tons/acre pulverized agricultural grade limestone
Fertilizer- 1000 lbs 5-20-10

DRAINAGE NOTES

Taken from James City County Environmental Division, Stormwater Drainage Conveyance Systems (Non-BMP related), General Design and Construction Guidelines with modifications as available. All notes apply to this project.

8.0 Construction and Installation

8.1. The Contractor shall keep the County Environmental Division notified of progress at all milestone stages of construction and/or if any unusual site or soil conditions are encountered during construction of the stormwater management system.

8.2. The Contractor is required to contact Miss Utility at 1-800-552-7001 and have existing utilities located prior to undertaking any excavations. This action does not relieve the Contractor of independent verification of existing utilities by hand excavation, test holes or other methods by their own forces.

8.3. The Contractor shall complete drainage facilities within thirty (30) days following the completion of rough grading at any point during the project. The installation of drainage facilities shall take precedence over all other underground utilities.

8.4. The Contractor shall not open or expose more than three hundred (300) linear feet of underground storm drain trench at any one time. Excavated material associated with these operations shall be placed on the uphill side of trenches. Following installation, all disturbed areas are to be stabilized immediately.

8.5. The Contractor shall attempt to schedule installation of storm drainage conveyance system during dry or periods of low flow to the greatest extent possible. Natural stream or base flow may require temporary diversion or pumping to adequate sediment control facilities.

8.6. The Contractor shall use laser technology to establish and set grade for stormwater drainage conveyance facilities on excessively flat slopes (generally less than 0.5 percent).

8.7. All soil stabilization blankets and matting shall be inspected periodically by the Contractor to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall material after repairing damage to the slope or channel and reseed. Installation of blankets and matting shall follow the requirements of the VESCH and applicable manufacturer recommendations.

8.8. For EC-3 or TRM stormwater conveyance channel linings, the Contractor shall apply and work lime into the soil prior to placement of soil stabilization fabric. Following fabric installation, lining voids shall be filled with topsoil and seeded and fertilized by permanent seed methods specified.

8.9. The Contractor shall immediately replace channel stabilization blankets and erosion control matings if sitework or associated utility operations such as cable, electric, gas, phone, sewer, water, etc. damage their functional intent.

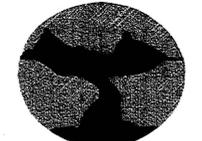
8.10. The Contractor shall be responsible for replacing with matching material any existing or proposed drains, pipes, culverts and drainage structures damaged due to handling, installation or lack of adequate temporary protection or cover during construction.

8.11. The Contractor shall be responsible for replacing with matching materials of any existing pavement, driveways, walkways, curbs, utilities, irrigation systems, landscaping etc. that must be cut or are in any way damaged during construction.

8.12. The Contractor shall clean storm drains and inlets of accumulated trash, debris and sediment at the last stage of construction.

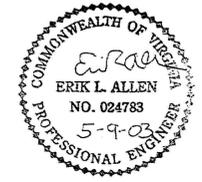
8.13. The Contractor shall be responsible for implementing traffic and job site safety measures during construction activities; furnishing materials and workmanship that will result in drainage structures with suitable character and function; and recording details of construction necessary for inclusion into record drawing (as-built) or construction certifications as required by the Owner for the project.

WATERSHED CONSULTING PLLC



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Richmond, VA 23221
(804) 304-4659

JAMES CITY COUNTY BIORETENTION DEMONSTRATION PROJECT
E&S NOTES AND DETAILS
VIRGINIA
JAMES CITY COUNTY,



PROJECT MANAGER:	EA
DESIGNED:	EA
DRAWN:	EA
JOB NUMBER:	
DESIGN FILE:	JCCSHEET8m.DGN
DATE:	1-25-03
REVISIONS:	5-7-03 JCC 90% REVIEW 3-10-03 JCC 60% REVIEW

Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

TO: James City County
 Environmental Division
 101 Mounts Bay Road
 P. O. Box 8784
 Williamsburg, Virginia 23187-8784

Attn: Mr. Scott J. Thomas, P. E.

RE: Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

Dear Mr. Thomas:

In compliance with your instructions, we have completed our Subsurface Exploration and Geotechnical Engineering Services for the above referenced project. The results of this study, together with our recommendations, are presented in this report.

Project Description:

The project site is an existing landscape island situated at the northeast corner of the Williamsburg/JCC Courthouse site in James City County, Virginia. This area is approximately 110 feet by 25 feet in plan dimensions, and is located adjacent to Monticello Avenue.

The development at this site is planned to consist of installing a bioretention facility. This facility will generally consist of a low lying landscape area, receiving storm runoff which is allowed to pond in shallow depths and for a few hours. The components of the facility will include landscape plants, a mulch layer, underlying special soil media, and a stone underdrain system.

Purpose and Scope of Services:

The purpose of this study was to obtain preliminary information on the general subsurface conditions at the proposed project sites in order to provide conclusions and recommendations for soil characteristics and reuse, permeability estimates of underlying soils, construction specifications, groundwater conditions, and other

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 info@get-solutions.com

Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

The Geotechnical Engineer warrants that the findings, recommendations, specifications or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

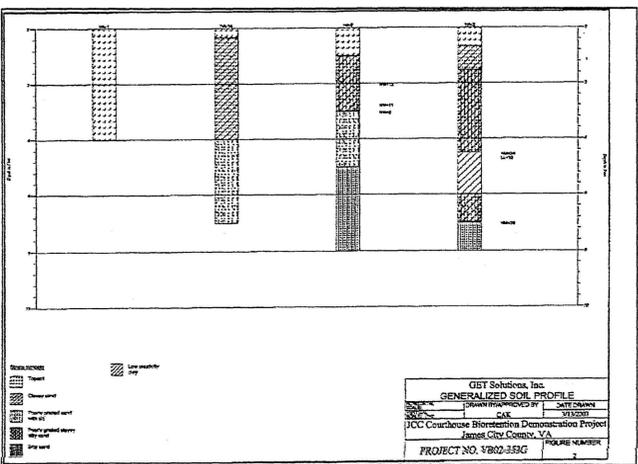
We trust that the information contained herein meets your immediate needs, and we would ask that you call this office with any questions that you may have.

Respectfully Submitted,
 G E T Solutions, Inc.
 Camille A. Katten, P.E.
 Principal Engineer
 VA Reg. # 018045

Copies: (2) Client
 (1) Watershed Consulting, PLLC

Attachments: Boring Location Plan- Figure 1
 Log of Borings
 Generalized Soil Profile- Figure 2

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 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

geotechnical aspects. Construction monitoring will be conducted during the earthwork activities. In this regard, engineering assessments for the following items were formulated:

- Advance four (4) 4 to 8-foot deep auger borings within the proposed retention area. Initially, three borings were planned, but a fourth was drilled (HA-1A), due to encountering refusal at a shallow depth at the location of HA-1.
- Perform laboratory tests on selected soil samples collected from the soil test borings in order to determine in-situ moisture content, moisture-plasticity relationships (Attberg Limits), and full sieve analysis.

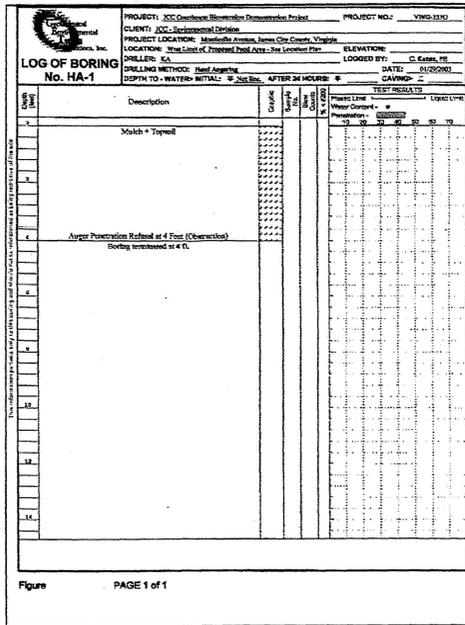
The boring and laboratory test data will be utilized in effectively qualifying the soils at this site for reuse.

- Conduct a geotechnical engineering evaluation of the available data with respect to bioretention area design.
- Prepare an engineering report presenting data, soil boring logs, observations, evaluations and design/construction recommendations. Preliminary earthwork related construction parameters will also be addressed in our report.
- Assist design engineer in preparation of construction specifications to be completed at a later date.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic material in the soil, bedrock, surface water, groundwater or air, on or below or around this site.

Field Exploration:

In order to explore the general subsurface soil types and to aid in developing associated foundation design parameters, four (4) 4 to 8-foot deep auger borings were drilled by G E T Solutions, Inc. within the anticipated bioretention pond footprint. The borings were performed with the use of a 3-inch diameter hand auger. The soil samples were obtained continuously.



Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

The boring locations were established, located, and staked in the field by G E T Solutions, Inc. in corroboration with the client. The approximate boring locations are indicated on the "Log of Boring" sheets, included with this report, and are shown on the attached "Boring Location Plan", Figure 1.

Laboratory Testing:

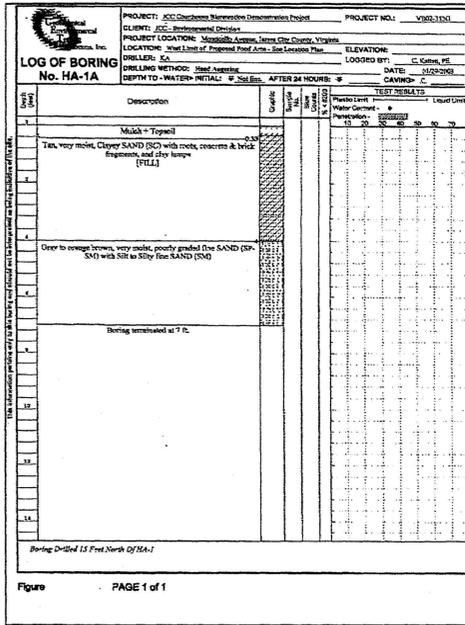
Representative portions of all soil samples collected during drilling were sealed in glass jars, and transferred to our laboratory for classification and analysis. The soil classification was done by a Geotechnical Engineer in accordance with ASTM D2488.

Five (5) representative soil samples were selected and subjected to laboratory testing, which included natural moisture and #200 sieve wash testing in order to corroborate the visual classification. These test results are presented in TABLE 1 below:

Boring No.	Depth (ft)	Natural Moisture (%)	#200 Sieve (%)	Atterberg Limits (LL/PL/PI) (%)	USCS Classification
HA-2	2	13	43	Non Plastic	SM-SC
HA-2	2.5	11	38	Non Plastic	SM-SC
HA-2	3	9	9	Non Plastic	SP-SM
HA-3	4.5	24	89	32/21/11	CL
HA-3	7	28	19	Non Plastic	SM-SC

Subsurface Soil and Groundwater Conditions:

The results of our field exploration program generally indicated the presence of about 4 to 48 inches of mulch/topsoil material at the boring locations, with the 4-foot layer found at the drop inlet (HA-1) otherwise this material averaged about 8 inches in thickness. Underlying the organic materials, a FILL layer containing Clayey fine SAND (SC) was generally found to a depth of 2 to 4.5 feet below the surface (excluding the location of HA-1). This layer contained brick and concrete fragments, gravel, and mulch. Beneath the FILL soils, granular materials were generally found to the boring termination depths, with the exception of a 1.5-foot thick layer of SANDY CLAY (CL) found at a depth of 4 feet at the location of HA-3.



Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

The groundwater table was not found in the borings to the depths explored; however, the soils were very wet at depths greater than about 7 feet (an indication of closeness of groundwater).

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration are included with this report in the form of "Log of Boring" and "Generalized Soil Profile" (Figure 2) sheets, which should be reviewed for specific information as to the individual borings. The stratifications shown on the records of the subsurface exploration represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual.

Soil Characteristics:

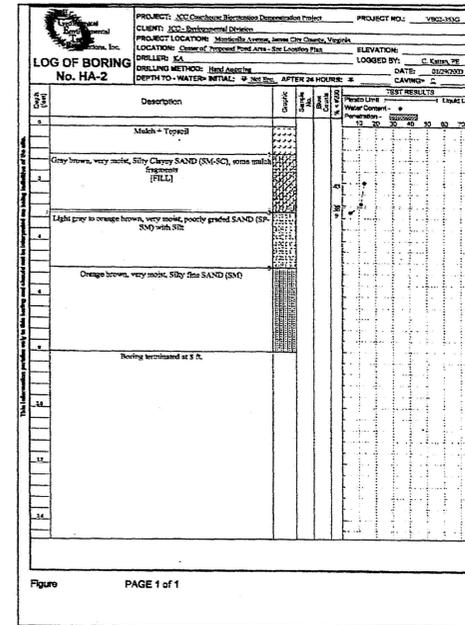
The majority of the soils found at this site are sandy, with fines content (silt and clay) ranging between 9 and 43 percent (again, with the exception of the clay layer found in HA-3). Accordingly, these soils may be considered suitable for mixing with other porous organic material (mulch, compost, and planting soil) to create the special soil media below the mulch layer and above the stone underdrain system. The final mixture, however, may be required to have a maximum of 10 to 15 percent fines by weight in order to maintain adequate porosity. As such, portions of these soils may be required to be hauled off site, and disposed of.

Underdrains & Liner:

It is our opinion that a filter fabric liner should be placed over the stone (drainage) blanket, to prevent soil infiltration and clogging of the blanket. Filter fabric, however, may not be necessary along the side walls of the bioretention pond.

Subgrade Preparation:

Following the excavation of the bioretention area, the exposed subgrade soils should be evaluated by G E T Solutions, Inc. for stability. Upon approval, the stone drainage blanket should be placed to a depth of at least 12 inches beneath the drainage pipe invert elevation, followed by filter fabric placement. The purpose of the filter fabric is to prevent migration of fines into the stone medium, thus reducing water conductivity characteristics of that medium. The filter fabric should consist of permeable non-woven material, such as Mirafil 140N or equivalent.



Report of Geotechnical Engineering & Field Testing Services
 Bioretention Demonstration Project
 Williamsburg/JCC Courthouse
 Williamsburg, Virginia
 G E T Project No.: PV02-353G

March 7, 2003

Structural Fill and Placement:

Following the material to be used for "planting soil" should be mixed and placed in the excavation.

This material should be compacted to a dry density of no more than 85 percent of the standard Proctor maximum dry density (ASTM D998). A representative of G E T Solutions, Inc. should perform field density tests on each lift as necessary to assure that adequate compaction is achieved. Minimal compaction efforts are expected to be required for this purpose.

BMP Design:

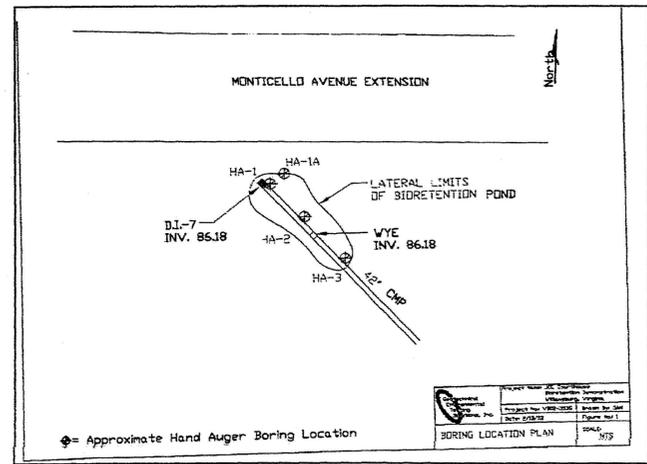
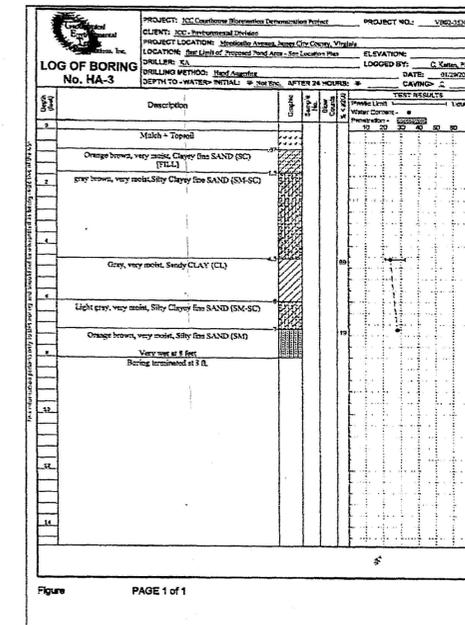
Based on the results of our field and laboratory testing program, sandy soils were encountered below a depth of 4 to 8 feet at this site. These soils may be considered suitable for infiltration, and would have a coefficient of permeability on the order of 1X10E-3 to 5X10E-4 cm/sec. Groundwater observation wells may be required to be placed at this site in order to determine the static groundwater level at this location.

Drainage and Groundwater Concerns:

It is expected that dewatering may be required for excavations that extend deeper than about 8 feet (expected current groundwater level) below existing grades. Dewatering above the groundwater level could probably be accomplished by pumping from sumps. Dewatering at depths below the groundwater level may require well-pointing.

Limitations:

The observations and evaluations submitted are based on the available soil information obtained by G E T Solutions, Inc. and the information supplied by the client for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, G E T Solutions, Inc. should be notified immediately to determine if changes in the foundation recommendations are required. If G E T Solutions, Inc. is not retained to perform these functions, G E T Solutions, Inc. can not be responsible for the impact of those conditions on the geotechnical recommendations for the project.



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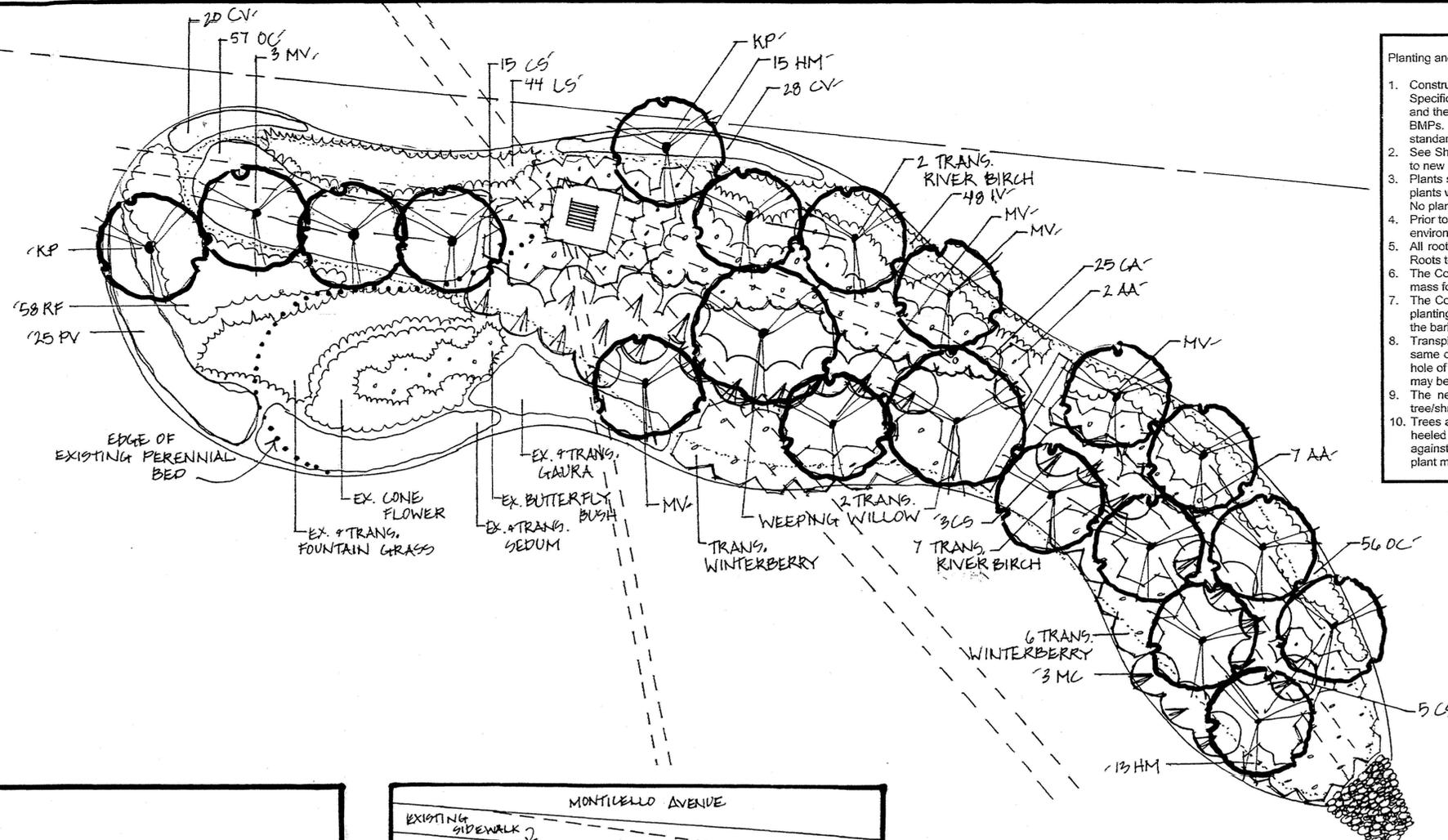
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 Richmond, VA 23221
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JAMES CITY COUNTY
 BIORETENTION DEMONSTRATION PROJECT

GEOTECHNICAL REPORT

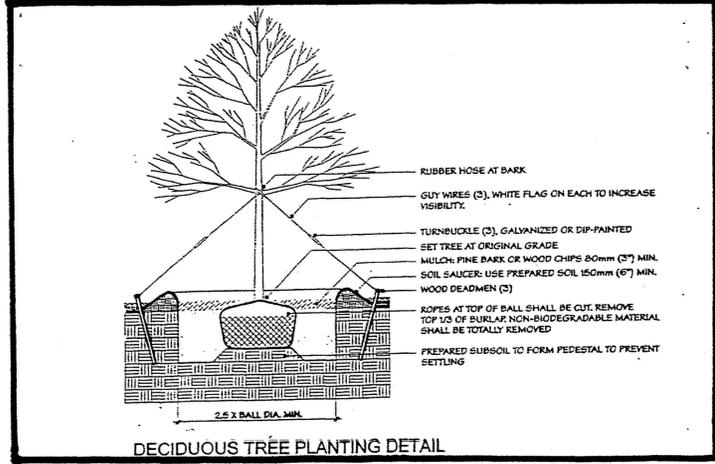
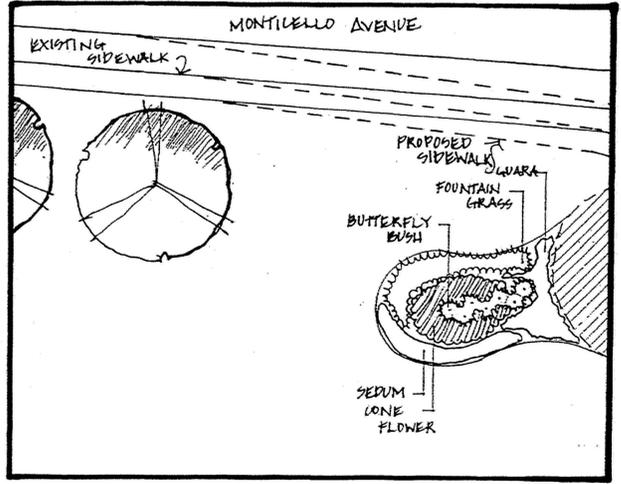
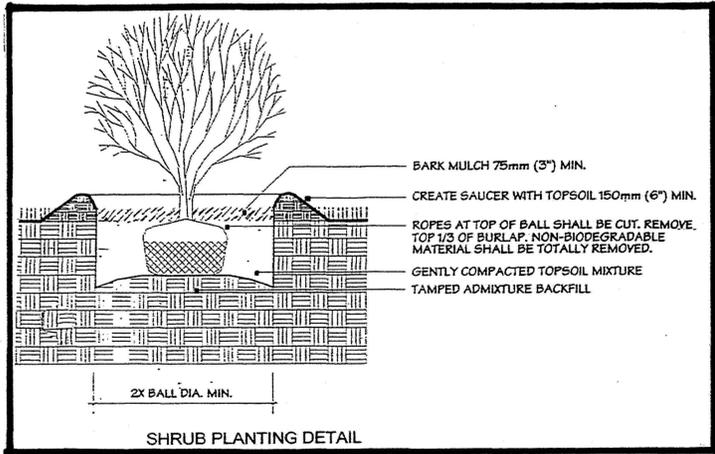
WILLIAMSBURG, VIRGINIA

PROJECT MANAGER:	EA
DESIGNED:	EA
DRAWN:	EA
JOB NUMBER:	
DESIGN FILE:	JCCSHEET9M.DGN
DATE:	1-25-03
REVISIONS:	
	5-7-03 JCC 90%
	REVIEW
	3-10-03 JCC 60%
	REVIEW



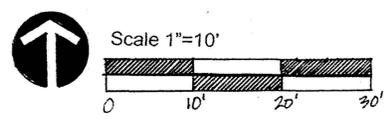
Planting and Transplanting Specifications and Notes:

1. Construction of the bioretention basin shall be in accordance with Minimum Standards and Specifications 3.05 and 3.11 of the Virginia Stormwater Management Handbook (latest edition) and the James City County Guidelines for Design and Construction of Stormwater Management BMPs. The contractor is responsible to become familiar with the requirements of these standards.
2. See Sheet 4 for the designated location of storage of existing plant material to be transplanted to new locations with this project.
3. Plants shall not be dragged, lifted or pulled by trunk, branches or foliage in a damaging way. All plants will be lifted and placed gently on the ground so no root, trunk, or branch damage occurs. No plant may be dropped or thrown any distance off a truck, loader or platform to the ground.
4. Prior to installation, all plants must be protected from root and foliar drying sources such as high environmental temperatures, wind and sun.
5. All roots over 1/2" to be removed will be cut with a sharp, clean hand pruner or pruning saw. Roots torn by construction equipment should not be left without a clean cut.
6. The Contractor shall use suitable equipment to harvest the shrubs/trees with an adequate root-mass for the plants survival.
7. The Contractor shall avoid excessive damage to the shrub/tree tops during the harvesting and planting process. Large shrubs shall be bundled and tied prior to digging to reduce damage to the bark. Tree limbs may be trimmed as is reasonable to avoid damage from the equipment.
8. Transplanted shrubs/trees shall be replanted such that the plants are set into the ground at the same depth they were growing at the harvest location. The shrubs/trees shall be placed in a hole of an adequate size and shall be backfilled and tamped to remove voids in the soil. Water may be used to wash fill material around the root-mass.
9. The new position or storage facility should be prepared before the tree is moved so the tree/shrub can be repositioned within two hours of lifting.
10. Trees and shrubs to be temporarily located in the location shown on Sheet 4. These are to be heeled in with double shredded hardwood mulch to preserve moisture and provide protection against extreme climactic conditions. The Contractor is responsible for providing water to the plant material if necessary.



Plant List

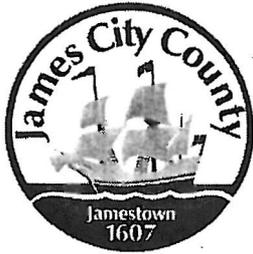
Quantity	Symbol	Botanical Name	Common Name	Size	Notes
48	CV	<i>Coreopsis verticillata</i> 'Moonbeam'	Moonbeam Coreopsis	1 quart	container
28	HM	<i>Hibiscus moscheutos</i>	Rose Mallow	3 gallon	container
48	IV	<i>Iris versicolor</i>	Blue Flag	1 gallon	container
44	LS	<i>Lobelia siphilitica</i>	Blue Cardinal Flower	1 quart	container
113	OC	<i>Osmunda cinnamomea</i>	Cinnamon Fern	1 gallon	container
25	PV	<i>Panicum virgatum</i> 'Heavy Metal'	Switch Grass	1 gallon	container
58	RF	<i>Rudbeckia fulgida</i> 'Goldsturm'	Black Eyed Susan	1 quart	container
9	AA	<i>Aronia arbutifolia</i>	Red Chokeberry	24-30"	B&B or container
25	CA	<i>Clethra alnifolia</i>	Sweet Pepper Bush	3 gallon	container
23	CS	<i>Cornus sericea</i>	Redosier Dogwood	24-30"	B&B or container
3	MC	<i>Myrica cerifca</i>	Wax Myrtle	36-42"	B&B or container
2	KP	<i>Koelreuteria paniculata</i>	Goldenraintree	1-1.5" cal.	B&B or container
7	MV	<i>Magnolia virginiana</i>	Sweetbay Magnolia	1-1.5" cal.	B&B or container



JAMES CITY COUNTY
 BIORETENTION DEMONSTRATION PROJECT
LANDSCAPE PLAN
 WILLIAMSBURG, VIRGINIA



Design Report



*Williamsburg / James City County
Courthouse Bioretention Demonstration Project*

Final Design/Construction Summary

Purpose of Project:

An existing low-lying landscaped area in front of the Courthouse was converted into a bioretention basin consistent with the County and City Chesapeake Bay Preservation programs and the County's Powhatan Creek Watershed Management Plan..

Design References:

Minimum Standards 3.05 and 3.11 of the Virginia Stormwater Management Handbook, Group D County BMP Manual Requirements; and design information from Prince George's County, Maryland, the Center for Watershed Protection and the Low Impact Development Center were adhered to to the greatest extent possible.

Design Information:

Site Information:

Site Area:	19.8 acres
Site Use:	Municipal Courthouse Building
Site Use in Drainage Area:	Existing-Mixed Undeveloped and Commercial; Future-Mixed Business/Commercial
Hydrologic Soil Group:	C (onsite soils previously disturbed, remaining drainage area wooded)

BMP Area Information:

Existing Cell Size: 2,850 square feet (preconstruction)
Minimum Basin Size: 3,637 square feet (5 percent of design assumption for impervious area, 1.67 acres)
Original Proposed Size: 3,640 square feet
Actual Constructed: 3,500 square feet of full depth bioretention
Minimum Required: 3,070 square feet (1.41 acres imperv x 43,560 x 0.05 = 3,070 square ft. minimum size)
Comparison: 3,500 square feet >> 3,070 square feet

Existing Inlet Rim: El. 91.5
Inlet Invert Elevation: El. 85.7 (Existing 5.8 ft. deep; Proposed 7.3 ft. deep)
Hydraulic Grade Line: El. 89.6 (10-year, existing 42-inch storm drain beneath basin)
Proposed Inlet Rim: El. 93.0 (Raise inlet 18 inches)
Actual Inlet Rim: El. 92.96 (Raised 1.46 ft.)
Proposed Basin Bottom Elevation: El. 92.5 (top of mulch layer)
Actual Basin Bottom Elevation: El. 92.19 to 92.6

Current (Pre-Basin Construction) Conditions:

Drainage Area: 2.29 acres
HSG: C (Onsite previously disturbed)
CN: 78 (Composite Woods, Imperv & Yard)
Time of Concentration: 15.82 min. (Overland, Shallow Concentrated)
Available Volume: 0.541 ac-ft. (Inlet rim El. 91.5 to El. 95.0)

Existing Hydrology & Hydraulics: (SCS Methodology, existing inlet at El. 91.5; landscaped area only)

	<u>Inflow</u>	<u>Outflow</u>	<u>WSEL</u>
1-year	2.60 cfs	2.56 cfs	91.75
2-year	4.03 cfs	3.94 cfs	91.82
10-year	9.22 cfs	8.97 cfs	92.06
25-year	10.63 cfs	10.37 cfs	92.12
100-year	14.43 cfs	14.13 cfs	92.26 (Existing maximum WSEL at inlet, prior to bioretention basin)

Future Conditions at Build-Out: (Note: Drainage area expanded due to development and onsite storm drainage piping systems.)

Drainage Area:	5.3 acres	(Ultimate design; considers development of drainage basin)
Impervious Area Per Design:	1.67 acres	
Impervious Area Actual:	1.41 acres	(per site plans for Old Point, Prudential McCardle and existing)
Design CN:	84	
Asbuilt CN:	83	
Design Time of Concentration:	25 minutes	(Overland, shallow concentrated and channel flow)
Asbuilt Time of Concentration:	10 minutes	(Adjusted in model due to upland development plans)

Future Condition - Peak Inflows to Basin: (SCS Methodology; County model; values in brackets based on consultant model)

ORIGINAL DESIGN:

WQ storm:	1.0 inch per impervious acre; 1.67 acre; Volume = 6054 cf; [Qpeak = 1.25 cfs]	
Peak Discharge (1-year storm):	6.71 cfs	[7.0 cfs]
Peak Discharge (2-year storm):	9.65 cfs	[10.07 cfs]
Peak Discharge (10-year storm):	19.72 cfs	[20.7 cfs]
Peak Discharge (100-year storm):	29.59 cfs	[31.0 cfs]

ASBUILT:

WQ storm:	1.0 inch per impervious acre; 1.41 acre; Volume = 6054 cf; [Qpeak = 1.25 cfs]	
Peak Discharge (1-year storm):	9.34 cfs	
Peak Discharge (2-year storm):	13.47 cfs	
Peak Discharge (10-year storm):	27.67 cfs	
Peak Discharge (100-year storm):	41.42 cfs	

Proposed Hydraulics: (Bioretention Basin with planting soil and underdrain; raised inlet to El. 93.0; basin floor –mulch EL. 92.5; infiltration rate at 0.5 inch/hour. SCS Methodology; County model; values in brackets based on consultant model)

ORIGINAL DESIGN:

NO TAILWATER EFFECTS

	<u>Inflow</u>	<u>Outflow</u>	<u>WSEL</u>	
WQ storm:	[1.25 cfs]	[0.22 cfs]	[92.93]	(Below proposed inlet rim, 0.43 ft. depth)
1-year storm:	6.71 cfs [6.98 cfs]	6.35 cfs [6.7 cfs]	93.23 [93.32]	(0.32 ft. above inlet rim)
2-year storm:	9.65 cfs [10.07 cfs]	9.17 cfs [9.7 cfs]	93.33 [93.41]	(0.41 ft. above inlet rim)
10-year storm:	19.72 cfs [20.7 cfs]	19.15 cfs [20 cfs]	93.61 [93.68]	(0.68 ft. above inlet rim)
100-year storm:	29.59 cfs [31.0 cfs]	28.84 cfs [29 cfs]	93.80 [93.98]	(0.98 ft. above inlet rim)

WITH TAILWATER EFFECTS DUE TO DOWNSTREAM MAN-MADE STORM SYSTEM

	<u>Inflow</u>	<u>Outflow</u>	<u>WSEL</u>	
WQ storm:	[1.25 cfs]	[0.22 cfs]	[92.93]	(Below proposed inlet rim, 0.43 ft. depth)
1-year storm:	6.71 cfs [6.98 cfs]	6.35 cfs [6.7 cfs]	93.23 [93.32]	(0.32 ft. above inlet rim)
2-year storm:	9.65 cfs [10.07 cfs]	9.17 cfs [9.7 cfs]	93.33 [93.41]	(0.41 ft. above inlet rim)
10-year storm:	19.72 cfs [20.7 cfs]	19.15 cfs [20 cfs]	93.61 [93.68]	(0.68 ft. above inlet rim)
100-year storm:	29.59 cfs [31.0 cfs]	28.84 cfs [29 cfs]	93.80 [93.98]	(0.98 ft. above inlet rim)

ASBUILT (WITH TAILWATER EFFECTS DUE TO DOWNSTREAM MAN-MADE STORM SYSTEM):

	<u>Inflow</u>	<u>Outflow</u>	<u>WSEL</u>	
WQ storm:	[1.25 cfs]	[0.22 cfs]	[92.93]	(Below proposed inlet rim, 0.43 ft. depth)
1-year storm:	9.34 cfs	8.55 cfs	93.28	(0.32 ft. above inlet rim)
2-year storm:	13.47 cfs	12.58 cfs	93.39	(0.43 ft. above inlet rim)
10-year storm:	27.67 cfs	26.07 cfs	93.71	(0.75 ft. above inlet rim)
100-year storm:	41.42 cfs	39.17 cfs	93.95	(0.99 ft. above inlet rim)

Bioretention Design/Construction Features:

- Design: Convert existing landscaped area into a County type D-1 filtering system bioretention BMP. Treatment volume 1.0 inch per impervious acre; average total P removal efficiency 50 percent or greater; 8 point BMP. For additional water quality, not water quantity benefit.
- Underdrain: Original design: dual 8-inch perforated corrugated polyethylene pipes at minimum slope 0.5 percent. Cross-connection and cleanout features; installation per ASTM D2321. Changed to dual 6-inch.
- Stone: Minimum 20-inch depth; clean washed No. 57 stone; minimum cover 6-inch; installation per ASTM D2321.
- Geotextile: Non-woven drainage fabric for separation between stone under drain and planting soil layers.
- Planting Soil: 2.5 minimum depth; light compaction; 50% sand-30% leaf compost-20% topsoil mixture. Strict installation procedure tied to Minimum Standard & Spec. 3.11 of the VSMH and strict certification requirement.
- Mulch Layer: 3-inch minimum shredded hardwood or shredded wood chips.
- Landscaping: Full landscape plan on Sheet 10. Additional specifications on Sheet 6 and 10. Supplemental references to Minimum Standard & Spec. 3.05 and 3.11 of the VSMH.

Infiltration Considerations:

Although Group D BMP facilities are filtering devices, infiltration can be a consideration in design. The geotechnical report states that permeability of sandy soils at a depth of 4 to 6 ft. from the surface range from 1×10^{-3} to 5×10^{-4} cm/sec (0.001 to 0.0005 cm per sec). As minimum depth for excavation is approximately 53 inches, we are down at least 4 ft. across the basin. Infiltration design basis on average permeability rate at 0.00075 cm/sec. Metric conversion to inches per hour is 1.063 inches per hour. This is the infiltration rate, F VSMH nomenclature. Based on VSMH, $F_d = 0.5 \times F$. Therefore, $F_d = 1.063/2$ or 0.531 inches per hour. Minimum infiltration rate per County BMP manual is 0.5 inches per hour. Therefore, to be conservative use 0.5 inches per hour.

Based on construction, underlying sand layers were encountered as anticipated by borings. Bag samples taken.

Comparisons Current vs. Future Development:

- Tailwater on downstream system has insignificant effects on hydraulic function of basin and the primary inlet.
- Basin surface area is expanded and basin grade and inlet is raised per design.
- Proposed design high water is only 1.72 ft. above current high water level. Contained within basin.
- Asbuilt design high water is only 1.69 ft. above current high water level. Contained within basin.
- Proposed or asbuilt design high water does not appear to affect any existing structures nor encroach onto VDOT right-of-way.
- Additional water quality benefit by infiltration and filtering action through proposed BMP basin.
- Water quality elevation in proposed basin does not overtop into overflow inlet, depth is 0.43 ft.

Other Important Notes:

- Design assumption for upstream impervious area (1.67 acres) exceeded that proposed per adjacent site development plans (1.41 acres). Reference County Plans SP-127-03 Old Point Bank and SP-138-03 Prudential McCardle Realty.
- Final constructed footprint for full depth bioretention was 3,500 square feet. Reduced due to existing utility line conflicts.
- Invert of underdrains is 1.6 ft. below 10-year hydraulic grade line elevation.
- Refer to asbuilts dated January 10th 2004.

FINAL HYDRAULIC MODEL

Job File: C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Rain Dir: C:\HAESTAD\PPKW\RAINFALL\

=====
JOB TITLE
=====

Wmsg/JCC Courthouse
Bioretention Demonstration Project

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MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID JCC.RNQ

JCCSCSdata

Return Event	Total Depth in	Rainfall Type	RNF File	RNF ID	
Dev..1	2.8000	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev..2	3.5000	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev.10	5.8000	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev.25	6.4000	Synthetic Curve	SCSTYPES	TypeII	24hr
Dev100	8.0000	Synthetic Curve	SCSTYPES	TypeII	24hr

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
BIOCELL	IN POND	1	.569		12.0000	9.34		
BIOCELL	IN POND	2	.821		12.0000	13.47		
BIOCELL	IN POND	10	1.725		12.0000	27.67		
BIOCELL	IN POND	25	1.972		12.0000	31.42		
BIOCELL	IN POND	100	2.640		12.0000	41.42		
BIOCELL	OUT POND	1	.431		12.0500	8.55	93.28	.116
BIOCELL	OUT POND	2	.679		12.0500	12.58	93.39	.132
BIOCELL	OUT POND	10	1.571		12.0500	26.07	93.71	.184
BIOCELL	OUT POND	25	1.815		12.0500	29.63	93.78	.196
BIOCELL	OUT POND	100	2.477		12.0000	39.17	93.95	.230
*OUTFALL	JCT	1	.431		12.0500	8.55		
*OUTFALL	JCT	2	.679		12.0500	12.58		
*OUTFALL	JCT	10	1.571		12.0500	26.07		
*OUTFALL	JCT	25	1.815		12.0500	29.63		
*OUTFALL	JCT	100	2.477		12.0000	39.17		
ULT DEV	AREA	1	.569		12.0000	9.34		
ULT DEV	AREA	2	.821		12.0000	13.47		
ULT DEV	AREA	10	1.725		12.0000	27.67		

MASTER NETWORK SUMMARY
 SCS Unit Hydrograph Method

(*Node=Outfall; +Node=Diversion;)
 (Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Storage Node ID	Return Type	Event Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond ac-ft
ULT DEV	AREA	25	1.972		12.0000	31.42		
ULT DEV	AREA	100	2.640		12.0000	41.42		

Type.... Executive Summary (Nodes)
 Name.... Watershed
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev..1

Page 2.01
 Event: 1 yr

NETWORK SUMMARY -- NODES
 (Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev..1
 Description: 1-year event

 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
 Storm Frequency = 1 yr
 Total Rainfall Depth= 2.8000 in
 Duration Multiplier = 1
 Resulting Duration = 24.0000 hrs
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Qpeak Trun. hrs	Qpeak cfs	Max WSEL ft
BIOCELL	IN POND	.569	12.0000	9.34	
BIOCELL	OUT POND	.431	12.0500	8.55	93.28
Outfall	OUTFALL JCT	.431	12.0500	8.55	
ULT DEV	AREA	.569	12.0000	9.34	

Type.... Executive Summary (Nodes)
 Name.... Watershed
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev..2

Page 2.02
 Event: 2 yr

NETWORK SUMMARY -- NODES
 (Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev..2
 Description: 2-year storm event

 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
 Storm Frequency = 2 yr
 Total Rainfall Depth= 3.5000 in
 Duration Multiplier = 1
 Resulting Duration = 24.0000 hrs
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Qpeak Trun. hrs	Qpeak cfs	Max WSEL ft
BIOCELL	IN POND	.821	12.0000	13.47	
BIOCELL	OUT POND	.679	12.0500	12.58	93.39
Outfall	OUTFALL JCT	.679	12.0500	12.58	
ULT DEV	AREA	.821	12.0000	13.47	

Type.... Executive Summary (Nodes)
 Name.... Watershed
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev.10

Page 2.03
 Event: 10 yr

NETWORK SUMMARY -- NODES
 (Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev.10
 Description: 10-year storm event

 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
 Storm Frequency = 10 yr
 Total Rainfall Depth= 5.8000 in
 Duration Multiplier = 1
 Resulting Duration = 24.0000 hrs
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Qpeak Trun. hrs	Qpeak cfs	Max WSEL ft
BIOCELL	IN POND	1.725	12.0000	27.67	
BIOCELL	OUT POND	1.571	12.0500	26.07	93.71
Outfall	OUTFALL JCT	1.571	12.0500	26.07	
ULT DEV	AREA	1.725	12.0000	27.67	

Type.... Executive Summary (Nodes)
 Name.... Watershed
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev.25

Page 2.04
 Event: 25 yr

NETWORK SUMMARY -- NODES
 (Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev.25
 Description: 25-year storm event

 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
 Storm Frequency = 25 yr
 Total Rainfall Depth= 6.4000 in
 Duration Multiplier = 1
 Resulting Duration = 24.0000 hrs
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Qpeak Trun. hrs	Qpeak cfs	Max WSEL ft
BIOCELL	IN POND	1.972	12.0000	31.42	
BIOCELL	OUT POND	1.815	12.0500	29.63	93.78
Outfall	OUTFALL JCT	1.815	12.0500	29.63	
ULT DEV	AREA	1.972	12.0000	31.42	

Type.... Executive Summary (Nodes)
 Name.... Watershed
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev100

NETWORK SUMMARY -- NODES
 (Trun.= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left & Rt)

DEFAULT Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev100
 Description: 100-year storm event

 Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
 Storm Frequency = 100 yr
 Total Rainfall Depth= 8.0000 in
 Duration Multiplier = 1
 Resulting Duration = 24.0000 hrs
 Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Node ID	Type	HYG Vol ac-ft	Qpeak Trun. hrs	Qpeak cfs	Max WSEL ft
BIOCELL	IN POND	2.640	12.0000	41.42	
BIOCELL	OUT POND	2.477	12.0000	39.17	93.95
Outfall	OUTFALL JCT	2.477	12.0000	39.17	
ULT DEV	AREA	2.640	12.0000	41.42	

Type.... Design Storms
Name.... JCCSCSdata

Page 3.01

File.... C:\HAESTAD\PPKW\RAINFALL\JCC.RNQ
Title... Wmbsg/JCC Courthouse
Bioretention Demonstration Project

DESIGN STORMS SUMMARY

Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev..1
Description: 1-year event

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 1 yr
Total Rainfall Depth= 2.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = Dev..2
Description: 2-year storm event

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 2 yr
Total Rainfall Depth= 3.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = Dev.10
Description: 10-year storm event

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.8000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = Dev.25
Description: 25-year storm event

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.4000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Type.... Design Storms
Name.... JCCSCSdata

Page 3.02

File.... C:\HAESTAD\PPKW\RAINFALL\JCC.RNQ
Title... Wmsg/JCC Courthouse
 Bioretention Demonstration Project

DESIGN STORMS SUMMARY

Design Storm File, ID = JCC.RNQ JCCSCSdata

Storm Tag Name = Dev100
Description: 100-year storm event

Data Type, File, ID = Synthetic Storm SCSTYPES.RNF TypeII 24hr
Storm Frequency = 100 yr
Total Rainfall Depth= 8.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Type.... Runoff CN-Area
Name.... ULT DEV

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Title... Upstream Dev (Total Imperv 61684 sf or 1.416 acres)

RUNOFF CURVE NUMBER DATA

.....

Upstream Dev (Total Imperv 61684 sf or 1.416 acres)

Soil/Surface Description	CN	Area acres	Impervious Adjustment		Adjusted CN
			%C	%UC	
Courthouse Imper (6602 sf)	98	.152			98.00
Old Point Imperv SP-127-03	98	.790			98.00
PM Realty Imperv SP-138-03	98	.383			98.00
Tidewater PhyTher (4000 sf)	98	.092			98.00
Courthouse Yard (35500 sf)	86	.815			86.00
Old Point Landscaped	86	.750			86.00
PM Realty Landscaped	86	.210			86.00
Wooded-Undev (City)	70	2.108			70.00

COMPOSITE AREA & WEIGHTED CN ---> 5.300 82.84 (83)

.....

Type.... SCS Unit Hyd. Summary
Name.... ULT DEV Tag: Dev..1
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev..1

Page 5.01
Event: 1 yr

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\
HYG File - ID = COURTHOU.HYG - ULT DEV Dev..1
Tc = .1667 hrs
Drainage Area = 5.300 acres Runoff CN= 83

=====
Computational Time Increment = .02223 hrs
Computed Peak Time = 12.0024 hrs
Computed Peak Flow = 9.34 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 9.34 cfs
=====

DRAINAGE AREA

ID:ULT DEV
CN = 83
Area = 5.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

1.2873 in
.569 ac-ft

HYG Volume... .569 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16670 hrs (ID: None Selected)
Computational Incr, Tm = .02223 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, $K = 2/(1+(Tr/Tp))$)
Receding/Rising, Tr/Tp = 1.6698 (solved from $K = .7491$)

Unit peak, qp = 36.02 cfs
Unit peak time Tp = .11113 hrs
Unit receding limb, Tr = .44453 hrs
Total unit time, Tb = .55567 hrs

Type.... SCS Unit Hyd. Summary
Name.... ULT DEV Tag: Dev..2
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev..2

Page 5.02
Event: 2 yr

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\
HYG File - ID = COURTHOU.HYG - ULT DEV Dev..2
Tc = .1667 hrs
Drainage Area = 5.300 acres Runoff CN= 83

=====
Computational Time Increment = .02223 hrs
Computed Peak Time = 12.0024 hrs
Computed Peak Flow = 13.47 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 13.47 cfs
=====

DRAINAGE AREA

ID:ULT DEV
CN = 83
Area = 5.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

1.8586 in
.821 ac-ft

HYG Volume... .821 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16670 hrs (ID: None Selected)
Computational Incr, Tm = .02223 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.02 cfs
Unit peak time Tp = .11113 hrs
Unit receding limb, Tr = .44453 hrs
Total unit time, Tb = .55567 hrs

Type.... SCS Unit Hyd. Summary
Name.... ULT DEV Tag: Dev.10
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev.10

Page 5.03
Event: 10 yr

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.8000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\
HYG File - ID = COURTHOU.HYG - ULT DEV Dev.10
Tc = .1667 hrs
Drainage Area = 5.300 acres Runoff CN= 83

=====
Computational Time Increment = .02223 hrs
Computed Peak Time = 11.9802 hrs
Computed Peak Flow = 27.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 27.67 cfs
=====

DRAINAGE AREA

ID:ULT DEV
CN = 83
Area = 5.300 acres
S = 2.0482 in
0.25 = .4096 in

Cumulative Runoff

3.9061 in
1.725 ac-ft

HYG Volume... 1.725 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16670 hrs (ID: None Selected)
Computational Incr, Tm = .02223 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.02 cfs
Unit peak time Tp = .11113 hrs
Unit receding limb, Tr = .44453 hrs
Total unit time, Tb = .55567 hrs

Type.... SCS Unit Hyd. Summary
Name.... ULT DEV Tag: Dev.25
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev.25

Page 5.04
Event: 25 yr

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.4000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\
HYG File - ID = COURTHOU.HYG - ULT DEV Dev.25
Tc = .1667 hrs
Drainage Area = 5.300 acres Runoff CN= 83

=====
Computational Time Increment = .02223 hrs
Computed Peak Time = 11.9802 hrs
Computed Peak Flow = 31.71 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 31.42 cfs
=====

DRAINAGE AREA

ID:ULT DEV
CN = 83
Area = 5.300 acres
S = 2.0482 in
0.2S = .4096 in

Cumulative Runoff

4.4640 in
1.972 ac-ft

HYG Volume... 1.972 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16670 hrs (ID: None Selected)
Computational Incr, Tm = .02223 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp)))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.02 cfs
Unit peak time Tp = .11113 hrs
Unit receding limb, Tr = .44453 hrs
Total unit time, Tb = .55567 hrs

Type.... SCS Unit Hyd. Summary
Name.... ULT DEV Tag: Dev100
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev100

Page 5.05
Event: 100 yr

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = C:\HAESTAD\PPKW\
HYG File - ID = COURTHOU.HYG - ULT DEV Dev100
Tc = .1667 hrs
Drainage Area = 5.300 acres Runoff CN= 83

=====
Computational Time Increment = .02223 hrs
Computed Peak Time = 11.9802 hrs
Computed Peak Flow = 41.89 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 41.42 cfs
=====

DRAINAGE AREA

ID:ULT DEV
CN = 83
Area = 5.300 acres
S = 2.0482 in
0.25 = .4096 in

Cumulative Runoff

5.9774 in
2.640 ac-ft

HYG Volume... 2.640 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .16670 hrs (ID: None Selected)
Computational Incr, Tm = .02223 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 36.02 cfs
Unit peak time Tp = .11113 hrs
Unit receding limb, Tr = .44453 hrs
Total unit time, Tb = .55567 hrs

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW

Solution to Mannings Open Channel Flow Equation
 (Computed values are based on normal depth.)

CIRCULAR CROSS SECTION

Slope = .014200 ft/ft
 Mannings n = 0.01300
 Invert Elev. = 85.76 ft
 Top of Channel = 89.26 ft
 Diameter = 3.5000 ft

Elev. (ft)	Depth (ft)	Flow (cfs)	Vel. (ft/sec)	Area (sq.ft)	Top W. (ft)	Wet.P. (ft)	Hd (ft)	Froude No.
85.760	.00	.00	.00	.0000	.00	.00	.00	0.00
85.830	.07	.08	1.75	.0459	.98	.99	.05	1.43
85.900	.14	.36	2.77	.1291	1.37	1.41	.09	1.59
85.970	.21	.85	3.60	.2357	1.66	1.73	.14	1.69
86.040	.28	1.56	4.34	.3606	1.90	2.01	.19	1.75
86.110	.35	2.50	5.00	.5007	2.10	2.25	.24	1.80
86.180	.42	3.67	5.61	.6540	2.27	2.48	.29	1.84
86.250	.49	5.05	6.17	.8187	2.43	2.68	.34	1.87
86.320	.56	6.66	6.70	.9936	2.57	2.88	.39	1.90
86.390	.63	8.47	7.20	1.1776	2.69	3.07	.44	1.92
86.460	.70	10.50	7.66	1.3698	2.80	3.25	.49	1.93
86.530	.77	12.72	8.11	1.5694	2.90	3.42	.54	1.94
86.600	.84	15.14	8.53	1.7756	2.99	3.58	.59	1.95
86.670	.91	17.75	8.93	1.9877	3.07	3.75	.65	1.96
86.740	.98	20.53	9.31	2.2053	3.14	3.90	.70	1.96
86.810	1.05	23.48	9.67	2.4276	3.21	4.06	.76	1.96
86.880	1.12	26.58	10.02	2.6542	3.27	4.21	.81	1.96
86.950	1.19	29.84	10.35	2.8846	3.32	4.36	.87	1.96
87.020	1.26	33.24	10.66	3.1183	3.36	4.50	.93	1.95
87.090	1.33	36.76	10.96	3.3548	3.40	4.65	.99	1.94
87.160	1.40	40.40	11.24	3.5938	3.43	4.79	1.05	1.94
87.230	1.47	44.14	11.51	3.8348	3.45	4.94	1.11	1.93
87.300	1.54	47.98	11.77	4.0773	3.47	5.08	1.17	1.92
87.370	1.61	51.91	12.01	4.3211	3.49	5.22	1.24	1.90
87.440	1.68	55.90	12.24	4.5656	3.50	5.36	1.31	1.89
87.510	1.75	59.94	12.46	4.8106	3.50	5.50	1.37	1.87
87.580	1.82	64.03	12.67	5.0555	3.50	5.64	1.45	1.86
87.650	1.89	68.15	12.86	5.3000	3.49	5.78	1.52	1.84
87.720	1.96	72.29	13.04	5.5438	3.47	5.92	1.60	1.82
87.790	2.03	76.42	13.21	5.7864	3.45	6.06	1.67	1.80
87.860	2.10	80.54	13.36	6.0273	3.43	6.20	1.76	1.78
87.930	2.17	84.63	13.51	6.2663	3.40	6.35	1.84	1.75
88.000	2.24	88.68	13.64	6.5029	3.36	6.49	1.94	1.73
88.070	2.31	92.66	13.76	6.7366	3.32	6.64	2.03	1.70
88.140	2.38	96.57	13.86	6.9670	3.27	6.79	2.13	1.67
88.210	2.45	100.37	13.95	7.1936	3.21	6.94	2.24	1.64
88.280	2.52	104.06	14.03	7.4159	3.14	7.09	2.36	1.61

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW

Solution to Mannings Open Channel Flow Equation
 (Computed values are based on normal depth.)

CIRCULAR CROSS SECTION

Slope = .014200 ft/ft
 Mannings n = 0.01300
 Invert Elev. = 85.76 ft
 Top of Channel = 89.26 ft
 Diameter = 3.5000 ft

Elev. (ft)	Depth (ft)	Flow (cfs)	Vel. (ft/sec)	Area (sq.ft)	Top W. (ft)	Wet.P. (ft)	Hd (ft)	Froude No.
88.350	2.59	107.60	14.10	7.6334	3.07	7.25	2.49	1.58
88.420	2.66	110.99	14.15	7.8456	2.99	7.41	2.62	1.54
88.490	2.73	114.19	14.18	8.0517	2.90	7.58	2.78	1.50
88.560	2.80	117.18	14.20	8.2513	2.80	7.75	2.95	1.46
88.630	2.87	119.93	14.20	8.4435	2.69	7.93	3.14	1.41
88.700	2.94	122.41	14.19	8.6275	2.57	8.11	3.36	1.36
88.770	3.01	124.57	14.15	8.8024	2.43	8.31	3.62	1.31
88.840	3.08	126.38	14.09	8.9672	2.27	8.52	3.94	1.25
88.910	3.15	127.77	14.01	9.1204	2.10	8.74	4.34	1.19
88.980	3.22	128.67	13.89	9.2606	1.90	8.99	4.88	1.11
89.044	3.28	128.96	13.76	9.3749	1.69	9.24	5.56	1.03
89.050	3.29	128.96	13.74	9.3854	1.66	9.26	5.65	1.02
89.120	3.36	128.44	13.53	9.4920	1.37	9.59	6.92	0.91
89.190	3.43	126.68	13.23	9.5752	.98	10.00	9.77	0.75
89.260	3.50	119.88	12.46	9.6211	.00	11.00	****	****

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Title... Cell Graded Condition

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sq(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
91.60	-----	.0000	.0000	.000	.000
92.50	-----	.0972	.0972	.029	.029
93.00	-----	.1112	.3124	.052	.081
93.25	-----	.1350	.3687	.031	.112
93.50	-----	.1589	.4404	.037	.149
93.75	-----	.1832	.5127	.043	.191
94.00	-----	.2067	.5845	.049	.240
94.25	-----	.2780	.7244	.060	.300
94.50	-----	.3483	.9375	.078	.379
94.75	-----	.4185	1.1486	.096	.474
95.00	-----	.4828	1.3508	.113	.587

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

$$\text{Volume} = (1/3) * (\text{EL2}-\text{EL1}) * (\text{Area1} + \text{Area2} + \text{sq.rt.}(\text{Area1}*\text{Area2}))$$

where: EL1, EL2 = Lower and upper elevations of the increment
 Area1,Area2 = Areas computed for EL1, EL2, respectively
 Volume = Incremental volume between EL1 and EL2

Type.... Outlet Input Data
Name.... PONDRROUTE

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Title... DI-7 Inlet Grate (Rim El. 92.96)

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 91.60 ft
Increment = .50 ft
Max. Elev.= 95.00 ft

Spot Elevations, ft
93.00

OUTLET CONNECTIVITY

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.	Outfall	E1, ft	E2, ft
----- Inlet Box TW SETUP, DS Channel	DI	---> TW	92.960	95.000

Type.... Outlet Input Data
Name.... PONDROUTE

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File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Title... DI-7 Inlet Grate (Rim El. 92.96)

OUTLET STRUCTURE INPUT DATA

Structure ID = DI
Structure Type = Inlet Box

of Openings = 1
Invert Elev. = 92.96 ft
Orifice Area = 10.5000 sq.ft
Orifice Coeff. = .600
Weir Length = 13.00 ft
Weir Coeff. = 3.000
K, Submerged = .000
K, Reverse = 1.000
Kb, Barrel = .000000 (per ft of full flow)
Barrel Length = .00 ft
Mannings n = .0000

Structure ID = TW
Structure Type = TW SETUP, DS Channel

USE DOWNSTREAM CHANNEL NORMAL DEPTH FOR TW...
Channel Type: Chn-Circular
Channel ID: PONDROUTE

CONVERGENCE TOLERANCES...
Maximum Iterations= 30
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .10 cfs
Max. Q tolerance = .10 cfs

Type.... Outlet Input Data
Name.... PONDRROUTE

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File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Title... DI-7 Inlet Grate (Rim El. 92.96)

USE DOWNSTREAM CHANNEL NORMAL DEPTH FOR TW...
Channel Type: Chn-Circular
Channel ID: PONDRROUTE

Solution to Mannings Open Channel Flow Equation
(Computed values are based on normal depth.)

CIRCULAR CROSS SECTION

Slope = .014200 ft/ft
Mannings n = 0.01300
Invert Elev. = 85.76 ft
Top of Channel = 89.26 ft
Diameter = 3.5000 ft

Type.... Composite Rating Curve
Name.... PONDRROUTE

File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Title... DI-7 Inlet Grate (Rim El. 92.96)

***** COMPOSITE OUTFLOW SUMMARY *****

CUMULATIVE HGL CONVERGENCE ERROR .000 (+/- ft)

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
91.60	.00	85.76	.000	None contributing
92.10	.00	85.76	.000	None contributing
92.60	.00	85.76	.000	None contributing
92.96	.00	85.76	.000	DI
93.00	.31	85.89	.000	DI
93.10	2.04	86.08	.000	DI
93.60	19.97	86.73	.000	DI
94.10	47.47	87.29	.000	DI
94.60	64.72	87.59	.000	DI
95.00	72.18	87.72	.000	DI

INFILTRATION RATING TABLE CALCULATIONS

Infilt.(cfs) = (.5000 (in/hr) * Area) * Ku
Where: Ku = units conversion factor

W.S.Elev ft	Total Area acres	Infilt. cfs
91.60	.0000	.00
92.10	.0300	.02
92.60	.0999	.05
92.96	.1100	.06
93.00	.1112	.06
93.10	.1204	.06
93.60	.1684	.08
94.10	.2340	.12
94.60	.3756	.19
95.00	.4828	.24

Type.... Pond E-V-Q Table
 Name.... BIOCELL
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW

LEVEL POOL ROUTING DATA

HYG Dir = C:\HAESTAD\PPKW\
 Inflow HYG file = COURTHOU.HYG - BIOCELL IN Dev..1
 Outflow HYG file = COURTHOU.HYG - BIOCELL OUT Dev..1

Pond Node Data = BIOCELL
 Pond Volume Data = BIOCELL
 Pond Outlet Data = PONDRROUTE

Infiltration = .5000 in/hr

INITIAL CONDITIONS

 Starting WS Elev = 91.60 ft
 Starting Volume = .000 ac-ft
 Starting Outflow = .00 cfs
 Starting Infiltr. = .00 cfs
 Starting Total Qout = .00 cfs
 Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + 0 cfs
91.60	.00	.000	.0000	.00	.00	.00
92.10	.00	.005	.0300	.02	.02	2.44
92.60	.00	.039	.0999	.05	.05	18.93
92.96	.00	.077	.1100	.06	.06	37.22
93.00	.31	.081	.1112	.06	.37	39.68
93.10	2.04	.093	.1204	.06	2.10	47.02
93.60	19.97	.165	.1684	.08	20.05	99.92
94.10	47.47	.262	.2340	.12	47.59	174.44
94.60	64.72	.415	.3756	.19	64.91	265.65
95.00	72.18	.587	.4828	.24	72.42	356.46

Type.... Node: Pond Inflow Summary
 Name.... BIOCELL IN
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev100

Page 9.03
 Event: 100 yr

SUMMARY FOR HYDROGRAPH ADDITION
 at Node: BIOCELL IN

HYG Directory: C:\HAESTAD\PPKW\

```

=====
Upstream Link ID  Upstream Node ID  HYG file      HYG ID        HYG tag
-----
ADD                ULT DEV        COURTHOU.HYG  ULT DEV        Dev100
=====
  
```

```

INFLOWS TO:  BIOCELL      IN
-----
HYG file      HYG ID          HYG tag        Volume      Peak Time     Peak Flow
              HYG ID          HYG tag        ac-ft       hrs           cfs
-----
COURTHOU.HYG ULT DEV        Dev100        2.640       12.0000      41.42
  
```

```

TOTAL FLOW INTO:  BIOCELL      IN
-----
HYG file      HYG ID          HYG tag        Volume      Peak Time     Peak Flow
              HYG ID          HYG tag        ac-ft       hrs           cfs
-----
COURTHOU.HYG BIOCELL      IN  Dev100        2.640       12.0000      41.42
  
```

Type.... Node: Pond Inflow Summary
 Name.... BIOCELL IN
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev100

Page 9.04
 Event: 100 yr

TOTAL NODE INFLOW...
 HYG file = C:\HAESTAD\PPKW\COURTHOU.HYG
 HYG ID = BIOCELL IN
 HYG Tag = Dev100

 Peak Discharge = 41.42 cfs
 Time to Peak = 12.0000 hrs
 HYG Volume = 2.640 ac-ft

HYDROGRAPH ORDINATES (cfs)
 Output Time increment = .0500 hrs
 Time on left represents time for first value in each row.

Time hrs					
4.3000	.00	.00	.00	.01	.01
4.5500	.01	.02	.02	.02	.03
4.8000	.03	.04	.04	.04	.05
5.0500	.05	.06	.06	.06	.07
5.3000	.07	.08	.08	.09	.09
5.5500	.09	.10	.10	.11	.11
5.8000	.12	.12	.13	.13	.14
6.0500	.14	.14	.15	.15	.16
6.3000	.16	.17	.17	.18	.18
6.5500	.19	.19	.20	.20	.21
6.8000	.21	.22	.22	.23	.23
7.0500	.24	.24	.25	.26	.26
7.3000	.27	.27	.28	.28	.29
7.5500	.29	.30	.30	.31	.31
7.8000	.32	.32	.33	.34	.34
8.0500	.35	.36	.36	.37	.39
8.3000	.40	.41	.42	.44	.45
8.5500	.47	.48	.49	.51	.52
8.8000	.54	.55	.57	.58	.60
9.0500	.62	.63	.64	.65	.66
9.3000	.66	.67	.68	.68	.69
9.5500	.70	.71	.72	.74	.76
9.8000	.79	.81	.84	.86	.89
10.0500	.91	.94	.98	1.01	1.05
10.3000	1.08	1.12	1.16	1.20	1.24
10.5500	1.29	1.33	1.38	1.44	1.51
10.8000	1.57	1.64	1.71	1.77	1.85
11.0500	1.92	2.02	2.13	2.27	2.41
11.3000	2.57	2.73	2.90	3.07	3.26
11.5500	3.76	4.96	6.87	9.93	13.69
11.8000	18.37	24.44	33.51	40.66	41.42
12.0500	36.89	27.08	17.54	11.90	9.06
12.3000	7.45	6.45	5.72	5.15	4.64

Type.... Node: Pond Inflow Summary
 Name.... BIOCELL IN
 File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
 Storm... TypeII 24hr Tag: Dev100

Page 9.05
 Event: 100 yr

HYDROGRAPH ORDINATES (cfs)						
Time hrs	Output Time increment = .0500 hrs					
	Time on left represents time for first value in each row.					
12.5500	4.21	3.86	3.59	3.39	3.25	
12.8000	3.12	3.01	2.90	2.80	2.70	
13.0500	2.60	2.51	2.43	2.37	2.31	
13.3000	2.25	2.19	2.13	2.08	2.02	
13.5500	1.97	1.92	1.87	1.83	1.79	
13.8000	1.75	1.71	1.67	1.63	1.59	
14.0500	1.55	1.52	1.49	1.47	1.45	
14.3000	1.44	1.42	1.41	1.40	1.38	
14.5500	1.37	1.35	1.34	1.33	1.31	
14.8000	1.30	1.29	1.27	1.26	1.24	
15.0500	1.23	1.22	1.20	1.19	1.17	
15.3000	1.16	1.15	1.13	1.12	1.11	
15.5500	1.09	1.08	1.06	1.05	1.04	
15.8000	1.02	1.01	.99	.98	.97	
16.0500	.95	.94	.93	.92	.92	
16.3000	.91	.91	.90	.90	.89	
16.5500	.89	.88	.88	.87	.87	
16.8000	.86	.86	.85	.85	.84	
17.0500	.84	.83	.83	.82	.82	
17.3000	.81	.81	.80	.80	.79	
17.5500	.79	.78	.78	.77	.77	
17.8000	.76	.76	.75	.75	.74	
18.0500	.74	.73	.73	.72	.72	
18.3000	.71	.71	.70	.70	.69	
18.5500	.69	.68	.68	.67	.67	
18.8000	.66	.66	.65	.65	.64	
19.0500	.64	.63	.63	.62	.62	
19.3000	.61	.61	.60	.60	.59	
19.5500	.59	.58	.58	.57	.57	
19.8000	.56	.56	.55	.55	.54	
20.0500	.54	.53	.53	.53	.53	
20.3000	.53	.52	.52	.52	.52	
20.5500	.52	.52	.52	.52	.52	
20.8000	.52	.51	.51	.51	.51	
21.0500	.51	.51	.51	.51	.51	
21.3000	.51	.50	.50	.50	.50	
21.5500	.50	.50	.50	.50	.50	
21.8000	.50	.49	.49	.49	.49	
22.0500	.49	.49	.49	.49	.49	
22.3000	.49	.48	.48	.48	.48	
22.5500	.48	.48	.48	.48	.48	
22.8000	.48	.47	.47	.47	.47	
23.0500	.47	.47	.47	.47	.47	
23.3000	.47	.46	.46	.46	.46	
23.5500	.46	.46	.46	.46	.46	
23.8000	.46	.45	.45	.45	.45	
24.0500	.41	.28	.15	.07	.03	

Type.... Node: Pond Inflow Summary
Name.... BIOCELL IN
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev100

Page 9.06
Event: 100 yr

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
24.3000	.02	.01	.00	.00	.00

Type.... Pond Routing Summary
Name.... BIOCELL OUT Tag: Dev..1
File.... C:\HAESTAD\PPKW\COURTHOUSE.AB.PPW
Storm... TypeII 24hr Tag: Dev..1

Page 9.07
Event: 1 yr

LEVEL POOL ROUTING SUMMARY

HYG Dir = C:\HAESTAD\PPKW\
Inflow HYG file = COURTHOU.HYG - BIOCELL IN Dev..1
Outflow HYG file = COURTHOU.HYG - BIOCELL OUT Dev..1

Pond Node Data = BIOCELL
Pond Volume Data = BIOCELL
Pond Outlet Data = PONDRROUTE

Infiltration = .5000 in/hr

INITIAL CONDITIONS

Starting WS Elev = 91.60 ft
Starting Volume = .000 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout = .00 cfs
Time Increment = .0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

=====
Peak Inflow = 9.34 cfs at 12.0000 hrs
Peak Outflow = 8.55 cfs at 12.0500 hrs
Peak Infiltration = .07 cfs at 12.0500 hrs

Peak Elevation = 93.28 ft
Peak Storage = .116 ac-ft
=====

MASS BALANCE (ac-ft)

+ Initial Vol = .000
+ HYG Vol IN = .569
- Infiltration = .137
- HYG Vol OUT = .431
- Retained Vol = .000

Unrouted Vol = -.001 ac-ft (.166% of Inflow Volume)

Index of Starting Page Numbers for ID Names

----- B -----
BIOCELL... 7.01, 9.01, 9.02, 9.03
BIOCELL OUT Dev..1... 9.07

----- J -----
JCCSCSdata... 3.01

----- P -----
PONDROUTE... 6.01, 8.01, 8.04

----- U -----
ULT DEV... 4.01, 5.01, 5.02, 5.03,
5.04, 5.05

----- W -----
Watershed... 1.01, 2.01, 2.02, 2.03,
2.04, 2.05

Geotechnical

**Construction Materials Testing and Field
Engineering Services
Report No. 1
Bioretention Demonstration Project
Williamsburg, Virginia
G E T Project No. WM03-443T
December 12, 2003
Prepared For: James City County
Environmental Division**



December 12, 2003

**To: James City County
Environmental Division
101 Mounts Bay Road
P.O. Box 8784
Williamsburg, Virginia 23187-8784**

Attn: Mr. Scott J. Thomas, P.E.

**Re: Construction Materials Testing and Field Engineering Services
Bioretention Demonstration Project
5201 Monticello Avenue
Williamsburg, Virginia
GET Project No. WM03-443T
Report No. 1**

Dear Mr. Thomas:

As requested, representatives of **G E T Solutions Inc.** visited the project site between the dates of October 31 and November 19, 2003. The purposes of these visits were to observe the installation of the bioretention basin, collect bulk soil samples of the planting soil mixture, and perform compaction testing on the planting soil mixture.

During our site visits, the contractor was in the process of installing the underdrain system, geotextile fabric, and backfilling the planting soil mixture. Prior to the placement of the underdrain system, the exposed subgrade soils were evaluated. The soils encountered generally consisted of Clayey SAND (SC). A review of the geotechnical report prepared by **G E T Solutions, Inc.** (GET Job No. VB02-353G, dated February 11, 2003) indicated that the subsurface soils recovered during our field-testing procedures were consistent with those documented in the geotechnical report. Based on our field testing procedures, the observed subgrade soils were considered suitable for placement of the underdrain system.

Upon approval of the subgrade, the contractor continued with the construction of the underdrain system, which included the installation of a perforated drain pipe placed in No. 57 stone. The underdrain system was observed to have been placed in general accordance with the contract drawings.

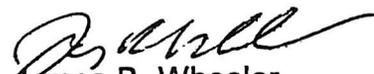
Subsequently, a layer of non-woven geotextile fabric was placed on top of the No. 57 stone. The geotextile fabric appeared to conform to the project specifications and was placed in accordance with the contract drawings.

Following the installation of the fabric, the contractor proceeded with the placement of the planting soil mixture. Periodic compaction testing was performed on various lifts to ensure minimal compaction is performed by the contractor. The compaction test results indicated that the fill materials were compacted to 86% to 88% of the theoretical maximum dry density (ASTM D 698). The completed compaction test reports are attached. Upon completion of the backfill operations, a 3-inch layer of mulch was placed across the entire bioretention basin.

During our site visits, two (2) bulk soil samples were collected and transported to our Williamsburg laboratory for standard Proctor analysis in accordance with ASTM D 698. The bulk samples consisted of Silty SAND (SM) with organics (planting soil mixture). The Moisture Density Test Reports (Proctor Curves) are included as an attachment.

We appreciate the opportunity to offer our services to you, and trust that you will call this office with any questions that you may have.

Respectfully Submitted,
GET Solutions, Inc.


James R. Wheeler
Staff Geologist


D. Mark Scholefield, P.E.
Senior Project Engineer
VA Reg. # 33932

Distribution: (2) Client

Attachments: Compaction Test Reports
Moisture Density Test Reports (Proctor Curves)

COMPACTION TEST REPORTS



G E T Solutions, Inc.
 1592 Penniman Road, Suite E
 Williamsburg, VA 23185
 Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Bio-Retention Demonstration Project
 Project Location: James City County, Virginia
 Client: James City County Environmental Division
 General Contractor: Excavator Services LLC
 Grading Contractor: Excavator Services LLC

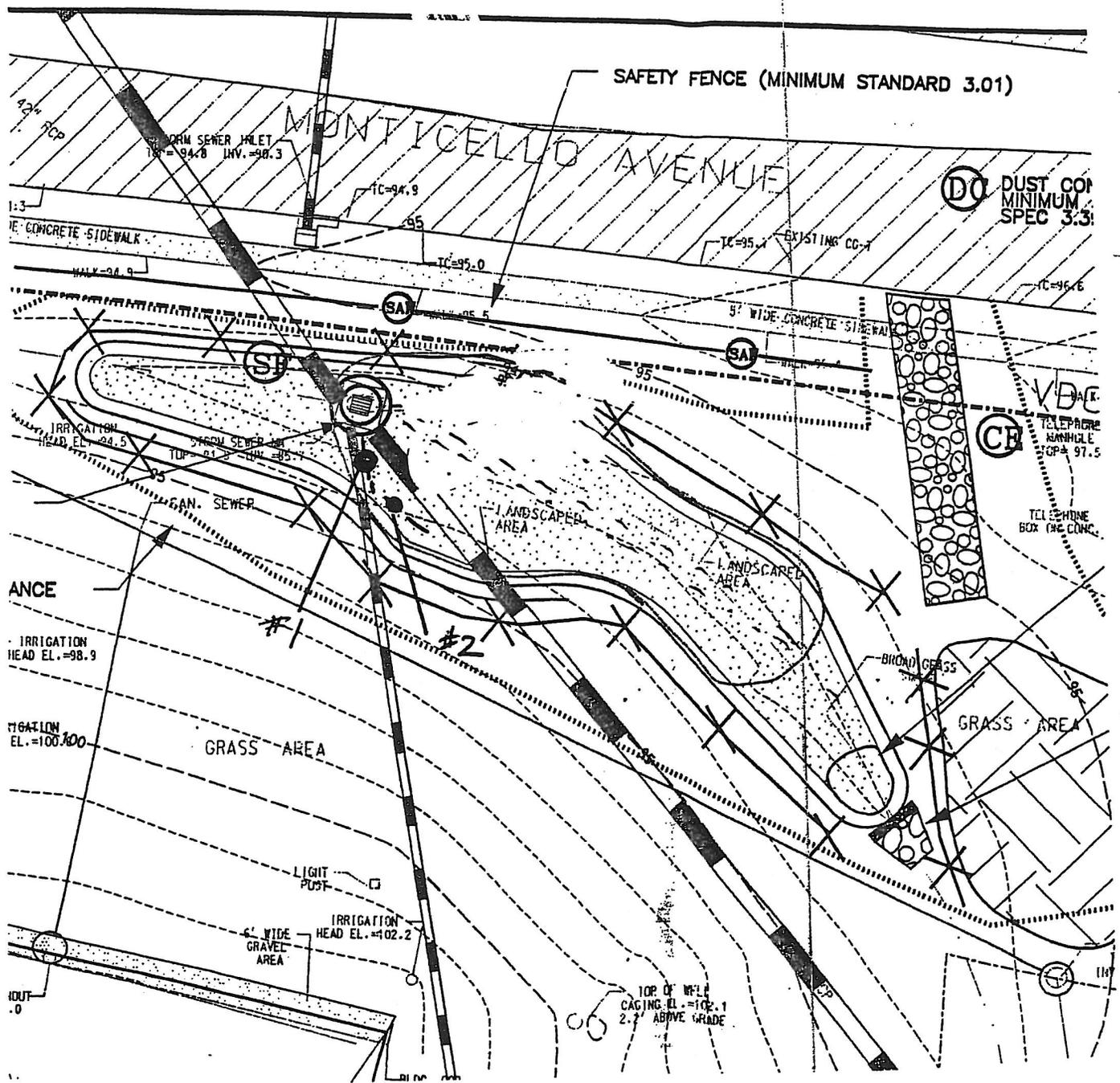
Date: 10-31-03
 Technician: T. Sabbah
 Job #: WM03-443T
 Weather: Clear Temp (°F): 76°
 General Location: BMP Area

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (IN)	Location, Grid, Coordinates, or Roadway Station
				Spec.	Actual				
1	16.5	90.1	1	85	88	X		12" BFG	See Attached Sketch
2	16.8	90.7	1	85	88	X		12" BFG	See Attached Sketch

Compaction Equipment Used: Troxler 3430
 (1) Test Location Established By: Estimate
 (2) Depth of Elev. of Test Established By: Estimate
 (3) Test Conducted On: Planting Soil ("Bio-soil") Backfill
 (4) Proctor Type: ASTM D698

Proctor No.: 1
 Max. Density (PCF): 102.9
 Opt. Moisture (%): 17.7

Remarks: BFG = Below Finish Grade



Locations are approximate

LOCATION PLAN

PROJECT: Bio-Retention Demonstration Project
 James City County, Virginia
 PROJECT NO: WM03-443T
 CLIENT: James City County Environmental Division

SCALE: NTS
 DATE: 10/31/2003
 PLOT BY: TS



GET Solutions, Inc.
 1592 Penniman Road, Suite E
 Williamsburg, VA 23185
 Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Bio-Retention Demonstration Project
 Project Location: James City County, Virginia
 Client: James City County Environmental Division
 General Contractor: Excavator Services LLC
 Grading Contractor: Excavator Services LLC

Date: 11-3-03
 Technician: T. Sabbah
 Job #: WM03-443T
 Weather: Clear Temp (°F): 70°
 General Location: BMP Area

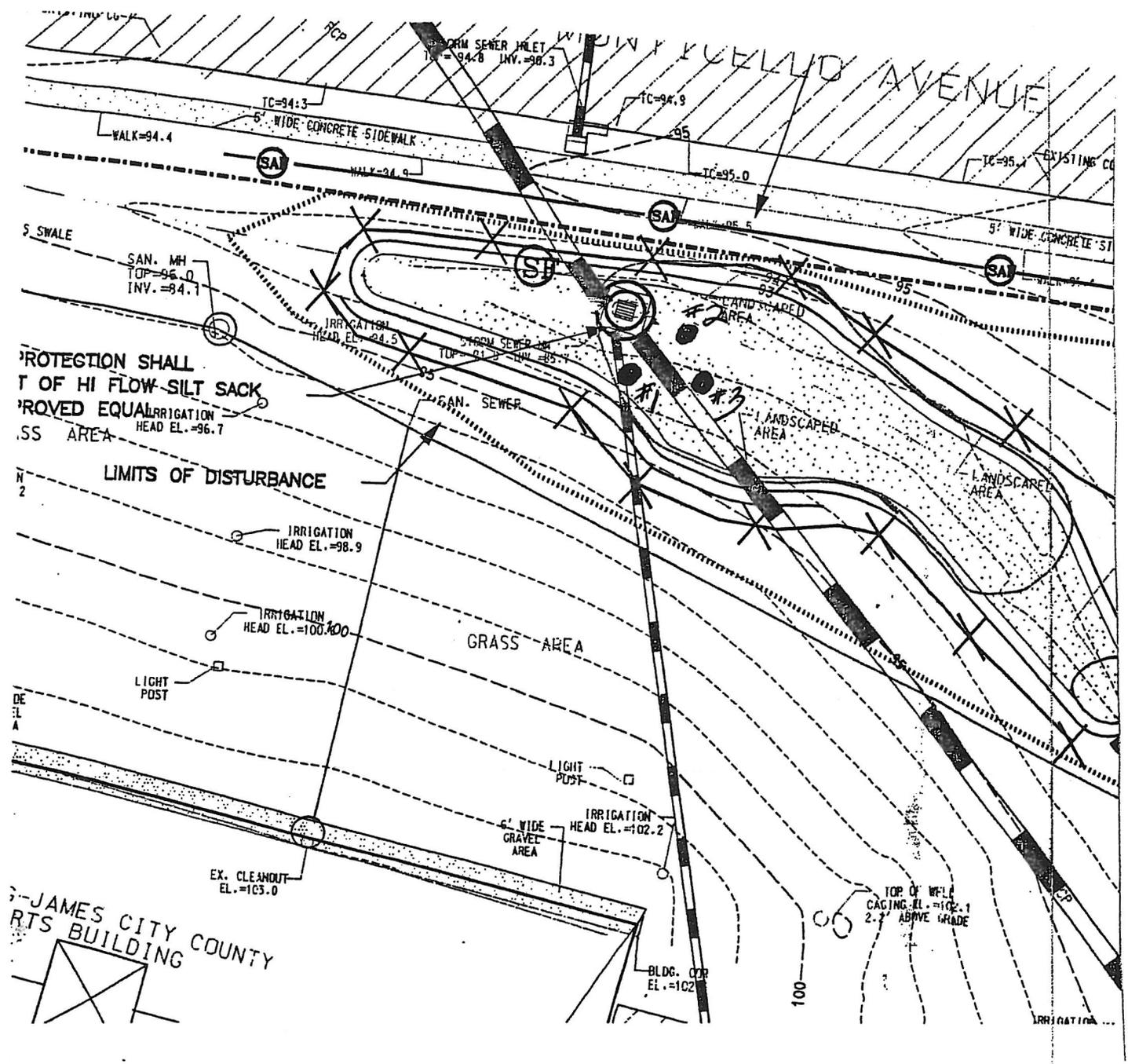
Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (IN)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	17.0	88.3	1	85	86	X		6" BFG	See Attached Sketch
2	18.1	90.4	1	85	88	X		6" BFG	See Attached Sketch
3	17.2	88.7	1	85	86	X		6" BFG	See Attached Sketch

Compaction Equipment Used: Troxler 3430
 (1) Test Location Established By: Estimate
 (2) Depth of Elev. of Test Established By: Estimate
 (3) Test Conducted On: Planting Soil ("Bio-soil") Backfill
 (4) Proctor Type: ASTM D698

Proctor No.: 1
 Max. Density (PCF): 102.9
 Opt. Moisture (%): 17.7

Remarks: BFG = Below Finish Grade

Figure 1



Locations are approximate

LOCATION PLAN

PROJECT: Bio-Retention Demonstration Project
 James City County, Virginia

PROJECT NO: WM03-443T

CLIENT: James City County Environmental Division

SCALE: NTS
DATE: 11/3/2003
PLOT BY: TS



G E T Solutions, Inc.
 1592 Penniman Road, Suite E
 Williamsburg, VA 23185
 Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Bio-Retention Demonstration Project
 Project Location: James City County, Virginia
 Client: James City County Environmental Division
 General Contractor: Excavator Services LLC
 Grading Contractor: Excavator Services LLC

Date: 11-5-03
 Technician: T. Sabbah
 Job #: WM03-443T
 Weather: Clear Temp (°F): 78°
 General Location: BMP Area

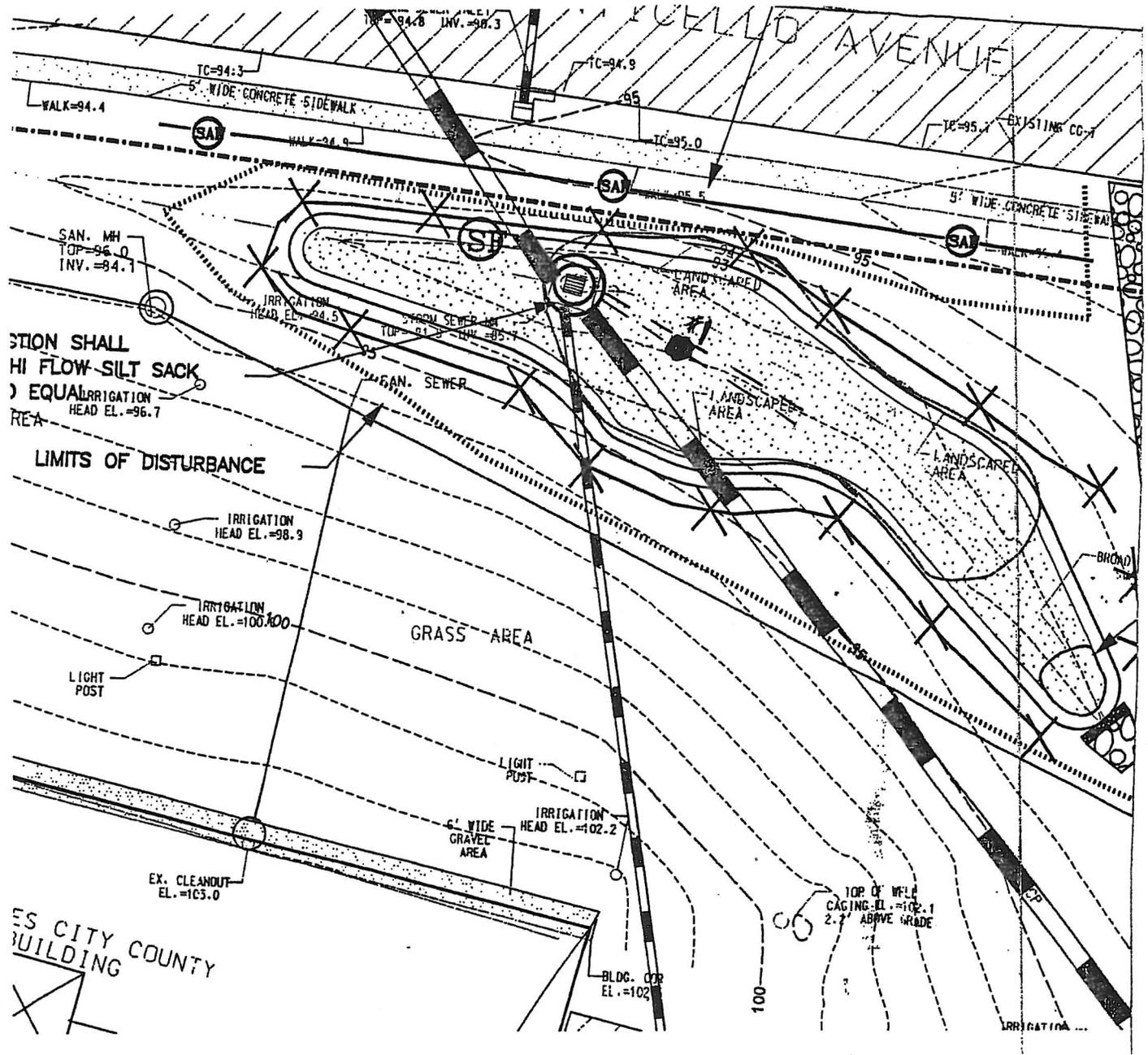
Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid Coordinates, or Roadway Station
				Spec	Actual				
1	25.0	88.7	1	85	86	X		1' BFG	See Attached Sketch

Compaction Equipment Used: Troxler 3430
 (1) Test Location Established By: Estimate
 (2) Depth of Elev. of Test Established By: Estimate
 (3) Test Conducted On: Planting Soil ("Bio-soil") Backfill
 (4) Proctor Type: ASTM D698

Proctor No.: 1
 Max. Density (PCF): 102.9
 Opt. Moisture (%): 17.7

Remarks: BFG = Below Finish Grade

Figure 1



Locations are approximate

LOCATION PLAN

PROJECT: Bio-Retention Demonstration Project
 James City County, Virginia

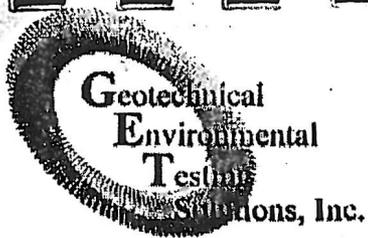
PROJECT NO: WM03-443T

CLIENT: James City County Environmental Division

SCALE: NTS

DATE: 11/5/2003

PLOT BY: TS



G E T Solutions, Inc.
 1592 Penniman Road, Suite E
 Williamsburg, VA 23185
 Phone: 757-564-6452 Fax: 757-564-6453

COMPACTION TEST REPORT

Project: Bio-Retention Demonstration Project
 Project Location: James City County, Virginia
 Client: James City County Environmental Division
 General Contractor: Excavator Services LLC
 Grading Contractor: Excavator Services LLC

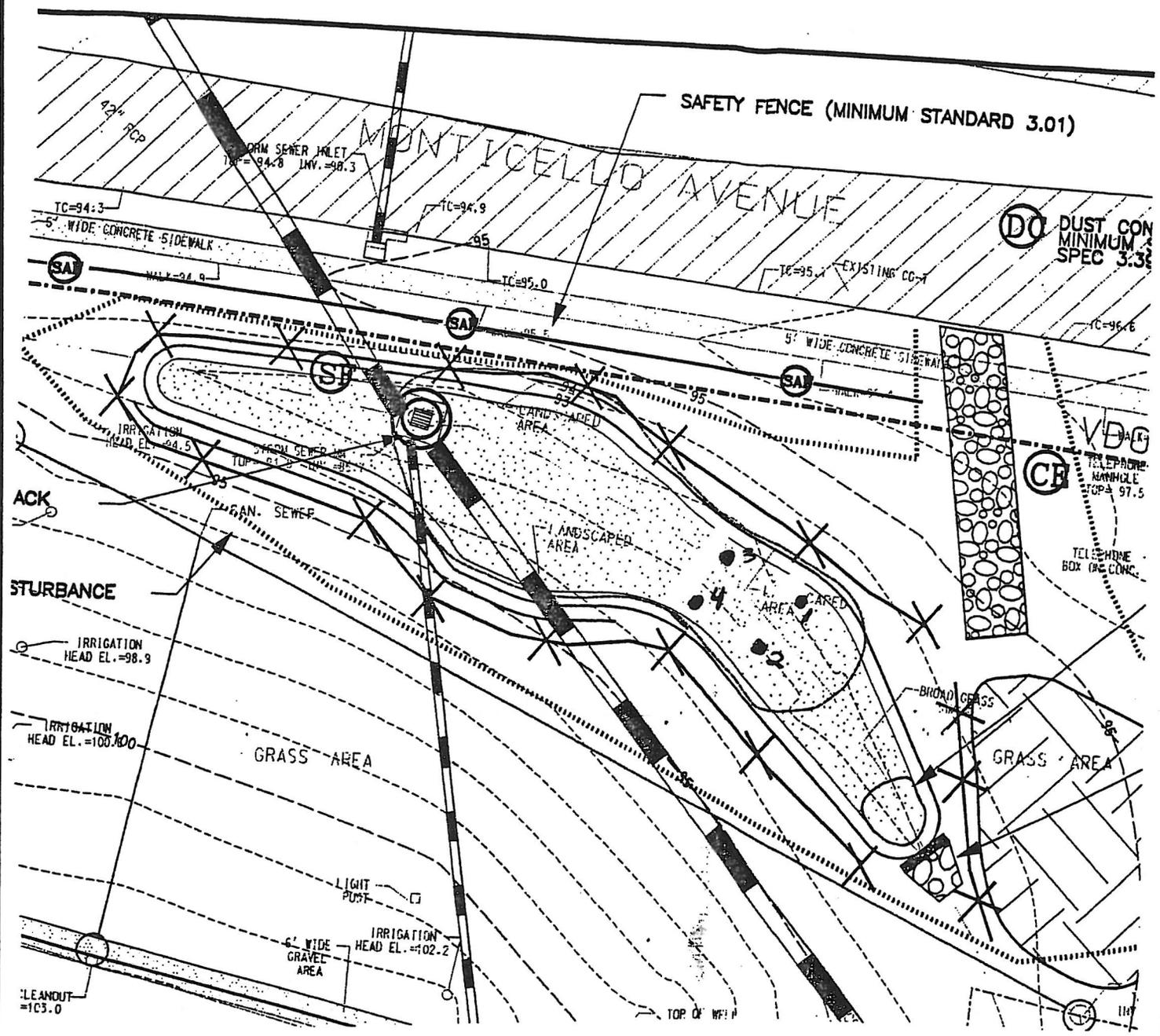
Date: 11-11-03
 Technician: T. Sabbah
 Job #: WM03-443T
 Weather: Clear Temp (°F): 60°
 General Location: BMP Area

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation Below Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	21.0	89.4	1	85	87	X		1' BFG	See Attached Sketch
2	20.6	89.3	1	85	87	X		1' BFG	See Attached Sketch
3	20.7	89.6	1	85	87	X		1' BFG	See Attached Sketch
4	20.0	89.8	1	85	87	X		1' BFG	See Attached Sketch

Compaction Equipment Used: Troxler 3430
 (1) Test Location Established By: Estimate
 (2) Depth of Elev. of Test Established By: Estimate
 (3) Test Conducted On: Planting Soil ("Bio-soil") Backfill
 (4) Proctor Type: ASTM D698

Proctor No.: 1
 Max. Density (PCF): 102.9
 Opt. Moisture (%): 17.7

Remarks: BFG = Below Finish Grade



Locations are approximate

LOCATION PLAN

PROJECT: Bio-Retention Demonstration Project
 James City County, Virginia

PROJECT NO: WM03-443T

CLIENT: James City County Environmental Division

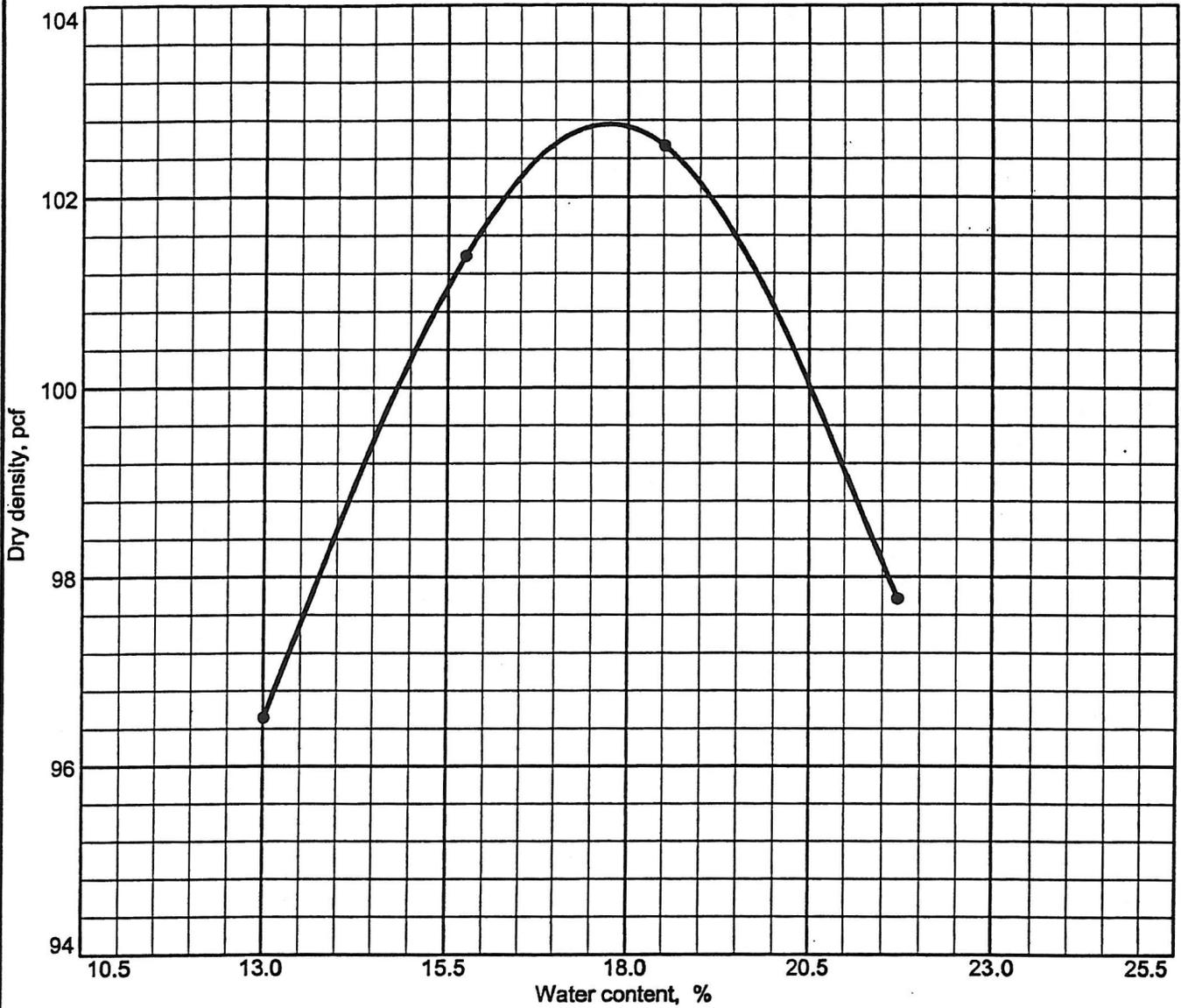
SCALE: NTS

DATE: 11/11/2003

PLOT BY: TS

**MOISTURE DENSITY TEST REPORTS
(PROCTOR CURVES)**

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

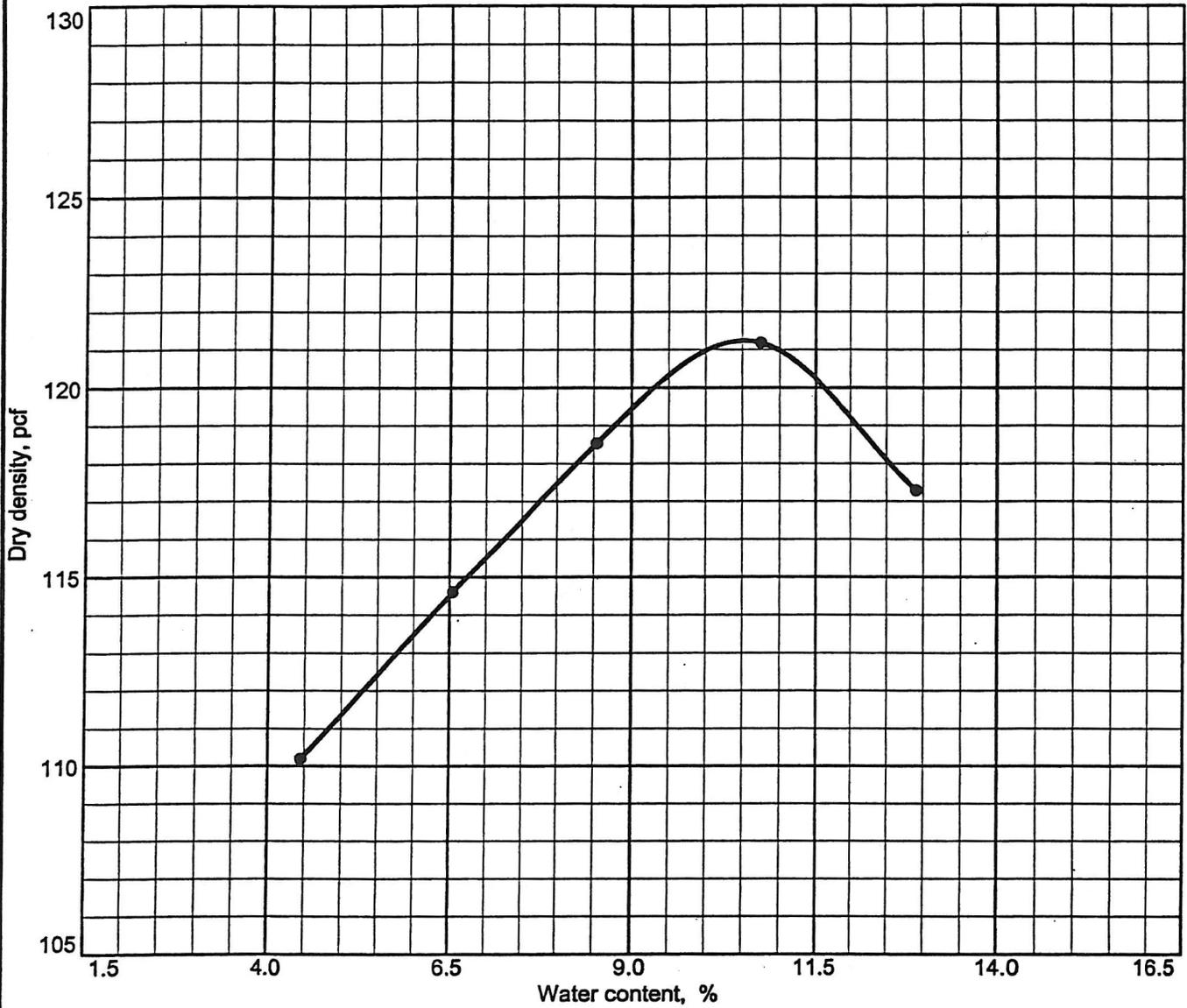


Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
N/A	SM		28.3					27.7

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 102.8 pcf Optimum moisture = 17.7 %	Dark brown, moist, Silty SAND (SM) with organics
Project No. WM03-443T Client: James City County Environmental Division Project: Bioretention Demonstration Project ● Location: Stockpile	Remarks: Proctor ID #1 Planting Soil ("Bio-soil") Organic Content = 8.0%
MOISTURE DENSITY TEST REPORT (PROCTOR CURVE) <h2 style="margin: 0;">GET SOLUTIONS, INC.</h2>	

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)



Test specification: ASTM D 698-91 Procedure A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
N/A	SM		16.7					21.8

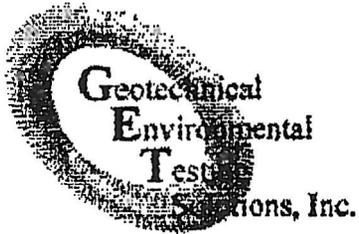
TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 121.2 pcf Optimum moisture = 10.5 %	Dark brown, moist, Silty SAND (SM) with organics

Project No. WM03-443T **Client:** James City County Environmental Division
Project: Bioretention Demonstration Project
 ● **Location:** Stockpile

Remarks:
 Proctor #2
 Planting Soil ("Bio-soil")
 Organic Content = 7.7%

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

GET SOLUTIONS, INC.



G E T Solutions, Inc.
1592 Penniman Road, Suite E
Williamsburg, VA 23185

Ph: (757) 564-6452
Fax: (757) 564-6453
Mobile: (757) 761-6026

Fax

To: Scott Thomas	From: James R. Wheeler
Company: JCC Environmental Dept.	Pages: 9
Fax: 757-259-4032	Date/Time: 11/14/03 4:16 PM
Re: Bioretention Demo. Project	CC:

Urgent For Review Please Comment Please Reply Please Recycle

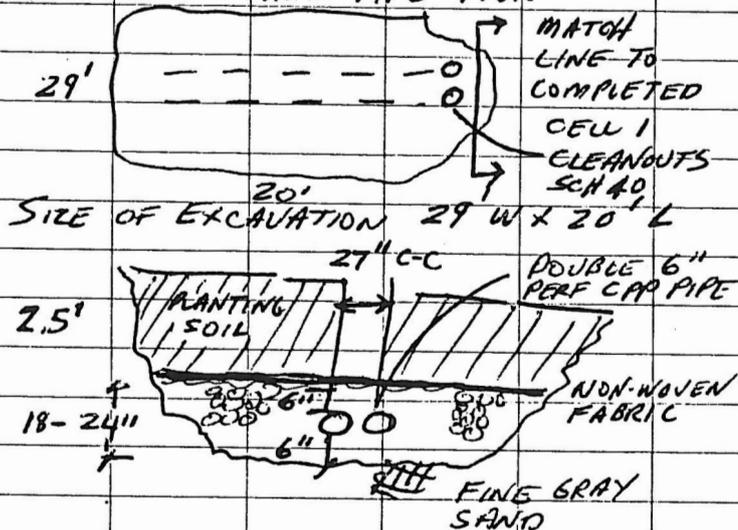
Here are the lab results of the first 2 proctors we ran, plus the compactions we have performed.

James R. Wheeler, Staff Geologist

Courthouse Bioret Demo 04-004 Project (S.J. THOMAS)

CELL 3

Nov 8 2003 2ND LARGE PHASED CELL
EAST OF INLET, EAST OF 1ST DOUBLE
CLEANOUTS ON MAIN PIPE RUN

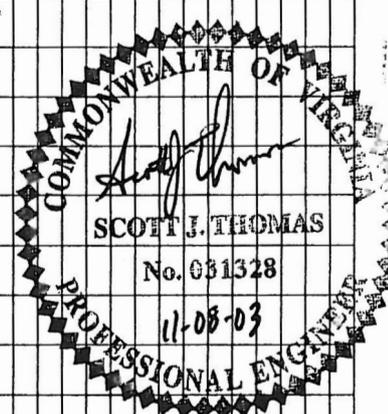
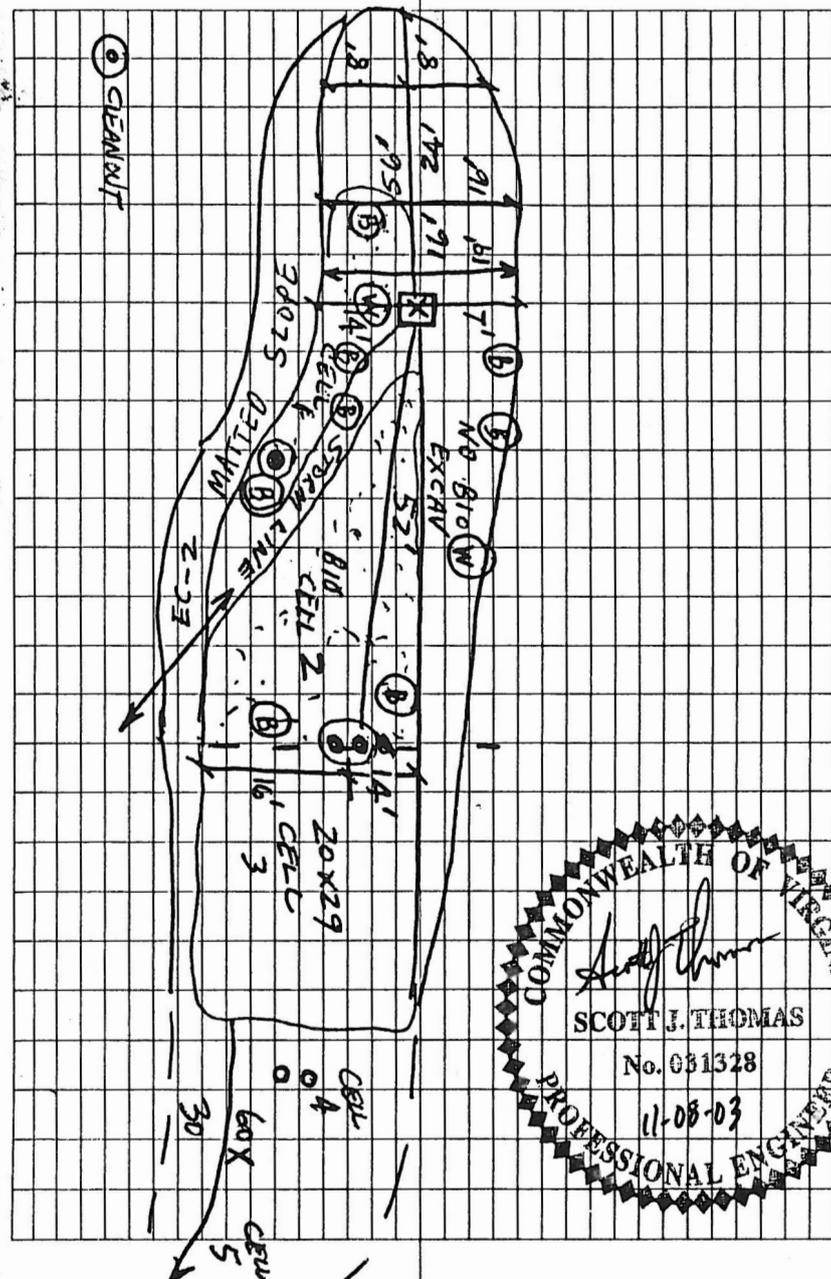


PROBLEMS ALONG THE WAY

ELECTRIC LINE, STORM
DRAIN, PLANTING SOIL
COMPACTION, P.S. MIXTURE
RAINFALL EVENTS (3/4" +)
BASIN LOOK
MIGRATION INTO BIO SOIL
SITE DISTURBANCE (INSENSITIVE AREAS)
ADJACENT RUNOFF
SOIL TEST TIME
IRRIE LINES

CHANGES (+)

PHASING
TRANSPLANTING
DRY WEATHER PERIOD
GOOD CONTRACTOR
ADJACENT NEW TOWN/COAST,
COOP W/ COURTHOUSE OFFICIALS
SAND LAYER
~~ADJACENT~~
FREQUENT INSP + DISCUSSION
(OWNER-CONTRACTOR)
FIELD ADJUSTMENTS



Yorktown Materials

P.O. Box 1741 Yorktown, Virginia 23692

Phone: 757-898-4444 Fax: 757-898-4274

30 October 2003

RE: Yorktown BioSoils

To Whom It May Concern:

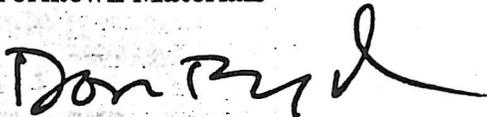
Our material is produced according to the James City County & Virginia Stormwater Handbook Minimum Standards – Bioretention

Chapter 3 Section 3.11-22

Soil Texture and Structure

It is recommended that the planting soils for bioretention have a sandy loam, loamy sand, or loam texture. The Maryland recommendations are 50 percent sand, 20 percent compost and 30 percent topsoil. The Virginia engineers suggest a specification 50 percent sand and 50 percent hemic or fibric peat. Yorktown BioSoils in consultations with James City County Engineers has been prepared following the Maryland recommendations. It is mixed mechanically with a front-end loader.

Yorktown Materials



Don Boyd



March 7, 2003

**TO: James City County
Environmental Division
101 Mounts Bay Road
P. O. Box 8784
Williamsburg, Virginia 23187-8784**

Attn: Mr. Scott J. Thomas, P. E.

**RE: Report of Geotechnical Engineering & Field Testing Services
Bioretention Demonstration Project
Williamsburg/JCC Courthouse
Williamsburg, Virginia
G E T Project No: PVG02-353G**



Dear Mr. Thomas:

In compliance with your instructions, we have completed our Subsurface Exploration and Geotechnical Engineering Services for the above referenced project. The results of this study, together with our recommendations, are presented in this report.

Project Description:

The project site is an existing landscape island situated at the northeast corner of the Williamsburg/JCC Courthouse site in James City County, Virginia. This area is approximately 110 feet by 25 feet in plan dimensions, and is located adjacent to Monticello Avenue.

The development at this site is planned to consist of installing a bioretention facility. This facility will generally consist of a low lying landscape area, receiving storm runoff which is allowed to pond in shallow depths and for a few hours. The components of the facility will include landscape plants, a mulch layer, underlying special soil media, and a stone underdrain system.

Purpose and Scope of Services:

The purpose of this study was to obtain preliminary information on the general subsurface conditions at the proposed project sites in order to provide conclusions and recommendations for soil characteristics and reuse, permeability estimates of underlying soils, construction specifications, groundwater conditions, and other

geotechnical aspects. Construction monitoring will be conducted during the earthwork activities. In this regard, engineering assessments for the following items were formulated:

- Advance four (4) 4 to 8-foot deep auger borings within the proposed retention area. Initially, three borings were planned, but a fourth was drilled (HA-1A), due to encountering refusal at a shallow depth at the location of HA-1.
- Perform laboratory tests on selected soil samples collected from the soil test borings in order to determine in-situ moisture content, moisture-plasticity relationships (Atterberg Limits), and full sieve analysis.

The boring and laboratory test data will be utilized in effectively qualifying the soils at this site for reuse.

- Conduct a geotechnical engineering evaluation of the available data with respect to bioretention area design.
- Prepare an engineering report presenting data, soil boring logs, observations, evaluations and design/construction recommendations. Preliminary earthwork related construction parameters will also be addressed in our report.
- Assist design engineer in preparation of construction specifications (to be completed at a later date).

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic material in the soil, bedrock, surface water, groundwater or air, on or below or around this site.

Field Exploration:

In order to explore the general subsurface soil types and to aid in developing associated foundation design parameters, four (4) 4 to 8-foot deep auger borings were drilled by **G E T Solutions, Inc.** within the anticipated bioretention pond footprint. The borings were performed with the use of a 3-inch diameter hand auger. The soil samples were obtained continuously.

The boring locations were established, located, and staked in the field by G E T solutions, Inc. in corroboration with the client. The approximate boring locations are indicated on the "Log of Boring" sheets, included with this report, and are shown on the attached 'Boring Location Plan", Figure 1.

Laboratory Testing:

Representative portions of all soil samples collected during drilling were sealed in glass jars, and transferred to our laboratory for classification and analysis. The soil classification was done by a Geotechnical Engineer in accordance with ASTM D2488.

Five (5) representative soil samples were selected and subjected to laboratory testing, which included natural moisture and -#200 sieve wash testing in order to corroborate the visual classification. These test results are presented in TABLE I below:

Table I – Laboratory Test Results

Boring No.	Depth (Ft)	Natural Moisture (%)	-#200 Sieve (%)	Atterberg Limits (LL/PL/PI) (%)	USCS Classification
HA-2	2	13	43	Non Plastic	SM-SC
HA-2	2.5	11	38	Non Plastic	SM-SC
HA-2	3	5	9	Non Plastic	SP-SM
HA-3	4.5	24	69	32/21/11	CL
HA-3	7	28	19	Non Plastic	SM-SC

Subsurface Soil and Groundwater Conditions:

The results of our field exploration program generally indicated the presence of about 4 to 48 inches of mulch/topsoil material at the boring locations, with the 4-foot layer found at the drop inlet (HA-1) otherwise this material averaged about 8 inches in thickness. Underlying the organic materials, a FILL layer containing Clayey fine SAND (SC) was generally found to a depth of 2 to 4.5 feet below the surface (excluding the location of HA-1). This layer contained brick and concrete fragments, gravel, and mulch. Beneath the FILL soils, granular materials were generally found to the boring termination depths, with the exception of a 1.5-foot thick layer of Sandy CLAY (CL) found at a depth of 4 feet at the location of HA-3.



The groundwater table was not found in the borings to the depths explored; however, the soils were very wet at depths greater than about 7 feet (an indication of closeness of groundwater).

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration are included with this report in the form of "Log of Boring" and "Generalized Soil Profile" [Figure 2] sheets, which should be reviewed for specific information as to the individual borings. The stratifications shown on the records of the subsurface exploration represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the transition may be gradual.

Soil Characteristics:

The majority of the soils found at this site are sandy, with fines content (silt and clay) ranging between 9 and 43 percent (again, with the exception of the clay layer found in HA-3). Accordingly, these soils may be considered suitable for mixing with other porous organic material (mulch, compost, and planting soil) to create the special soil media below the mulch layer and above the stone underdrain system. The final mixture, however, may be required to have a maximum of 10 to 15 percent fines by weight in order to maintain adequate porosity. As such, portions of these soils may be required to be hauled off site, and disposed of.

Underdrains & Liner:

It is our opinion that a filter fabric liner should be placed over the stone (drainage) blanket, to prevent soil infiltration and clogging of the blanket. Filter fabric, however, may not be necessary along the side walls of the bioretention pond.

Subgrade Preparation:

Following the excavation of the bioretention area, the exposed subgrade soils should be evaluated by **G E T Solutions, Inc.** for stability. Upon approval, the stone drainage blanket should be placed to a depth of at least 12 inches beneath the drainage pipe invert elevation, followed by filter fabric placement. The purpose of the filter fabric is to prevent migration of fines into the stone medium, thus reducing water conductivity characteristics of that medium. The filter fabric should consist of permeable non-woven material, such as Mirafi 140N or equivalent.

Structural Fill and Placement:

Following the material to be used for "planting soil" should be mixed and placed in the excavation.

This material should be compacted to a dry density of no more than 85 percent of the standard Proctor maximum dry density (ASTM D698). A representative of **G E T Solutions, Inc.** should perform field density tests on each lift as necessary to assure that adequate compaction is achieved. Minimal compaction efforts are expected to be required for this purpose.

BMP Design:

Based on the results of our field and laboratory testing program, sandy soils were encountered below a depth of 4 to 6 feet at this site. These soils may be considered suitable for infiltration, and would have a coefficient of permeability on the order of 1×10^{-3} to 5×10^{-4} cm/sec. Groundwater observation wells may be required to be placed at this site in order to determine the static groundwater level at this location.

Drainage and Groundwater Concerns:

It is expected that dewatering may be required for excavations that extend deeper than about 8 feet (expected current groundwater level) below existing grades. Dewatering above the groundwater level could probably be accomplished by pumping from sumps. Dewatering at depths below the groundwater level may require well pointing.

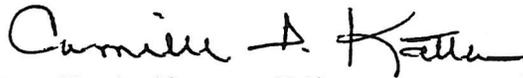
Limitations:

The observations and evaluations submitted are based on the available soil information obtained by **G E T Solutions, Inc.** and the information supplied by the client for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, **G E T Solutions, Inc.** should be notified immediately to determine if changes in the foundation recommendations are required. If **G E T Solutions, Inc.** is not retained to perform these functions, **G E T Solutions, Inc.** can not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

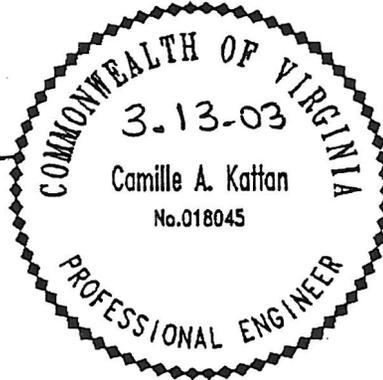
The Geotechnical Engineer warrants that the findings, recommendations, specifications or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

We trust that the information contained herein meets your immediate need, and we would ask that you call this office with any questions that you may have.

Respectfully Submitted,
G E T Solutions, Inc.



Camille A. Kattan, P.E.
Principal Engineer
VA Reg. # 018045

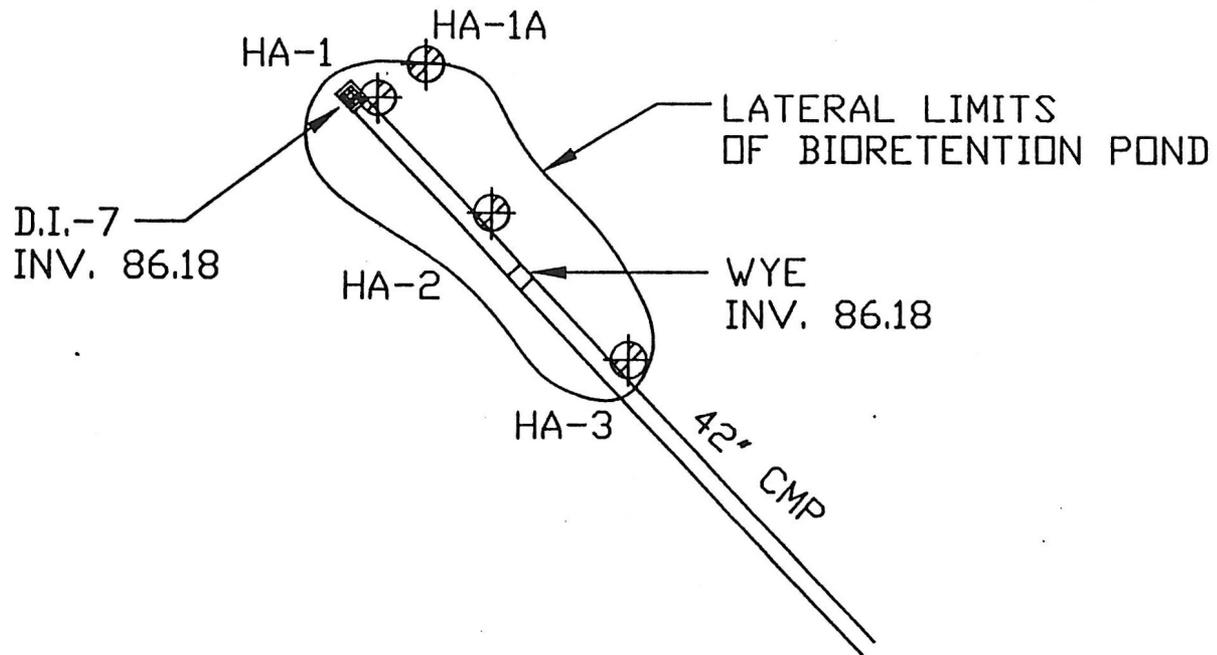


Copies: (2) Client
(1) Watershed Consulting, PLLC

Attachments: Boring Location Plan- Figure 1
Log of Borings
Generalized Soil Profile- Figure

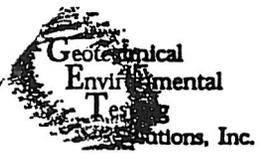
MONTICELLO AVENUE EXTENSION

North



⊕ = Approximate Hand Auger Boring Location

	Project Name: JCC Courthouse Bioretention Demonstration Williamsburg, Virginia	
	Project No: VB02-353G	Drawn By: G
	Date: 2/13/03	Figure No: 1
BORING LOCATION PLAN		SCALE: NTS



PROJECT: JCC Courthouse Bioretention Demonstration Project PROJECT NO.: VB02-353G
 CLIENT: JCC - Environmental Division
 PROJECT LOCATION: Monticello Avenue, James City County, Virginia
 LOCATION: West Limit of Proposed Pond Area - See Location Plan ELEVATION: _____
 DRILLER: KA LOGGED BY: C. Kattan, PE
 DRILLING METHOD: Hand Augering DATE: 01/29/2003
 DEPTH TO - WATER> INITIAL: Not Enc. AFTER 24 HOURS: _____ CAVING> _____

LOG OF BORING

No. HA-1

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS						
						Plastic Limit	Water Content - ●		Liquid Limit		Penetration -	
						10	20	30	40	50	60	70
0	Mulch + Topsoil											
2												
4	Auger Penetration Refusal at 4 Feet (Obstruction) Boring terminated at 4 ft.											
6												
8												
10												
12												
14												

PROJECT: JCC Courthouse Bioretention Demonstration Project PROJECT NO.: VB02-353G
 CLIENT: JCC - Environmental Division
 PROJECT LOCATION: Monticello Avenue, James City County, Virginia
 LOCATION: West Limit of Proposed Pond Area - See Location Plan ELEVATION: _____
 DRILLER: KA LOGGED BY: C. Kattan, PE
 DRILLING METHOD: Hand Augering DATE: 01/29/2003
 DEPTH TO - WATER> INITIAL: Not Enc. AFTER 24 HOURS: _____ CAVING> _____

**LOG OF BORING
No. HA-1A**

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS							
						Plastic Limit	Water Content - ●		Liquid Limit	Penetration - 			
							10	20	30	40	50	60	70
0	Mulch + Topsoil												
0.33	Tan, very moist, Clayey SAND (SC) with roots, concrete & brick fragments, and clay lumps [FILL]												
2													
4	Gray to orange brown, very moist, poorly graded fine SAND (SP-SM) with Silt to Silty fine SAND (SM)												
6													
8	Boring terminated at 7 ft.												
10													
12													
14													

Boring Drilled 15 Feet North Of HA-1

This information pertains only to this boring and should not be interpreted as being indicative of the site.

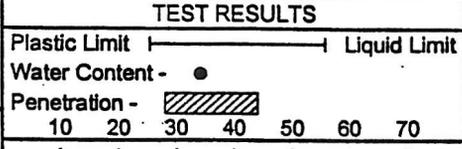


PROJECT: JCC Courthouse Bioretention Demonstration Project PROJECT NO.: VB02-353G
 CLIENT: JCC - Environmental Division
 PROJECT LOCATION: Monticello Avenue, James City County, Virginia
 LOCATION: Center of Proposed Pond Area - See Location Plan ELEVATION: _____
 DRILLER: KA LOGGED BY: C. Kattan, PE
 DRILLING METHOD: Hand Augering DATE: 01/29/2003
 DEPTH TO - WATER> INITIAL: Not Enc. AFTER 24 HOURS: Not Enc. CAVING> Not Enc.

LOG OF BORING

No. HA-2

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	TEST RESULTS	
					Plastic Limit	Liquid Limit
0	Mulch + Topsoil	[Symbol]				
1	Gray brown, very moist, Silty Clayey SAND (SM-SC), some mulch fragments [FILL]	[Symbol]				
2						
3	Light gray to orange brown, very moist, poorly graded SAND (SP-SM) with Silt	[Symbol]				
4						
5	Orange brown, very moist, Silty fine SAND (SM)	[Symbol]				
6						
8	Boring terminated at 8 ft.					
10						
12						
14						



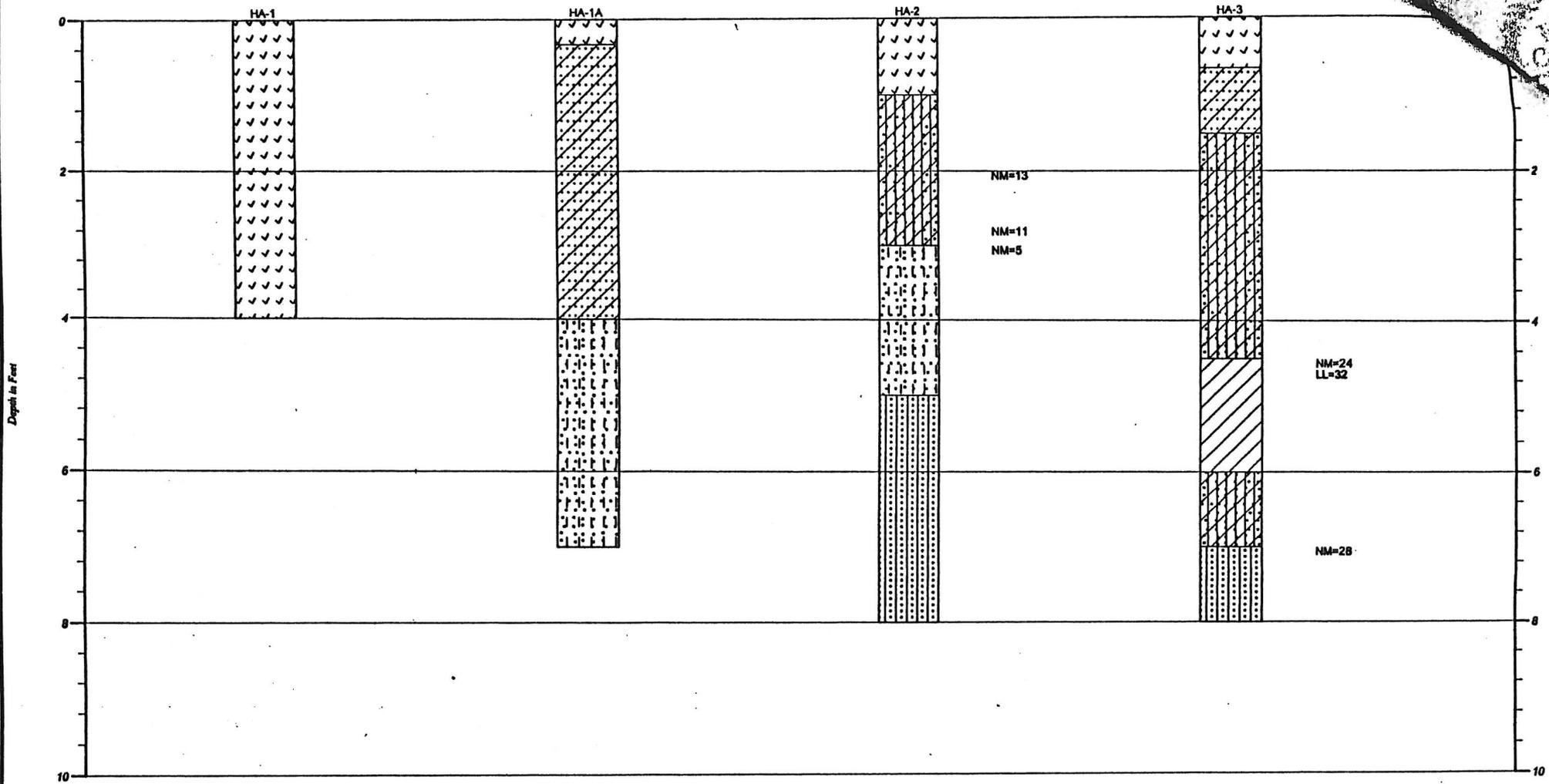
THIS INFORMATION PERTAINS ONLY TO THE BORING AND SHOULD NOT BE INTERPRETED AS BEING REPRESENTATIVE OF THE ENTIRE SITE.

PROJECT: JCC Courthouse Bioretention Demonstration Project PROJECT NO.: VB02-353G
 CLIENT: JCC - Environmental Division
 PROJECT LOCATION: Monticello Avenue, James City County, Virginia
 LOCATION: East Limit of Proposed Pond Area - See Location Plan ELEVATION: _____
 DRILLER: KA LOGGED BY: C. Kattan, PE
 DRILLING METHOD: Hand Augering DATE: 01/29/2003
 DEPTH TO - WATER> INITIAL: Not Enc. AFTER 24 HOURS: _____ CAVING> C

**LOG OF BORING
No. HA-3**

This information pertains only to this boring and should not be interpreted as being indicative of the site.

Depth (feet)	Description	Graphic	Sample No.	Blow Counts % < #200	TEST RESULTS		
					Plastic Limit	Liquid Limit	
						Water Content - ●	
						Penetration - ▨	
						10 20 30 40 50 60 70	
0	Mulch + Topsoil						
0.67	Orange brown, very moist, Clayey fine SAND (SC) [FILL]						
1.5	gray brown, very moist, Silty Clayey fine SAND (SM-SC)						
4.5	Gray, very moist, Sandy CLAY (CL)				69		
6	Light gray, very moist, Silty Clayey fine SAND (SM-SC)						
7	Orange brown, very moist, Silty fine SAND (SM)				19		
8	Very wet at 8 feet Boring terminated at 8 ft.						
10							
12							
14							



Strata symbols

-  Topsoil
-  Clayey sand
-  Poorly graded sand with silt
-  Poorly graded clayey silty sand
-  Silty sand

 Low plasticity clay

GET Solutions, Inc.		
GENERALIZED SOIL PROFILE		
HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE DRAWN
VERTICAL SCALE: 1"=2'	CAK	3/13/2003
JCC Courthouse Bioretention Demonstration Project James City County, VA		
PROJECT NO. VB02-353G		FIGURE NUMBER
		2

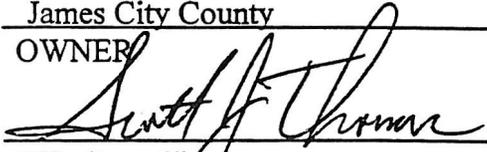
NOTICE TO PROCEED

TO: Camille Kattan
ATTN: Geotechnical Testing Solutions
1592 Penniman Road
Williamsburg, VA 23185

DATE: December 16, 2002
PROJECT: Purchase Order 230244
Williamsburg - JCC
Courthouse

You are hereby notified to commence WORK in accordance with the Agreement dated December 16, 2002, on or before December 19, 2002 and you are to complete the WORK within 90 consecutive days thereafter. The date of completion of all WORK is therefore March 16, 2003.

Liquidated damages in the amount of \$ 100 will be assessed by the Owner for failure to substantially complete the work on or before the date of completion stated above or as may be modified by duly executed change orders.

James City County
OWNER

BY Scott Thomas
Senior Engineer
TITLE

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED
is hereby acknowledged by:

Camille A. Kattan
this the 6th day of January, 2003
~~19~~ _____

GET Solutions, Inc.
CONTRACTOR
CAMILLE A. KATTAN
BY
PRESIDENT
TITLE

NOTE TO CONTRACTOR:

Please prepare and submit progress schedule within 14 days following date of Notice to Proceed and prepare and submit your schedule of values for lump sum contracts at least 10 days prior to the date of your first partial payment estimate.



November 18, 2002

TO: James City County
Environmental Division
101 Mounts Bay Road
P. O. Box 8784
Williamsburg, Virginia 23187-8784



Attn: Mr. Scott J. Thomas, P. E.

RE: Proposal for Geotechnical Engineering & Field Testing Services
Bioretention Demonstration Project
Williamsburg/JCC Courthouse
Williamsburg, Virginia
G E T Proposal No: PVG02-338G

Dear Mr. Thomas:

Pursuant to your request, **G E T Solutions, Inc.** is pleased to submit this proposal for providing Geotechnical Engineering & Field Testing Services at the above referenced project site. This proposal presents our understanding of the project, our project approach and scope of work, our unit rates, the estimated total cost for our services, and our anticipated schedule for the geotechnical engineering services at this site.

SITE AND PROJECT INFORMATION

The project site is an existing landscape island situated at the northeast corner of the Williamsburg/JCC Courthouse site in James City County, Virginia. This area is approximately 110 feet by 25 feet in plan dimensions, and is located adjacent to Monticello Avenue.

The development at this site is planned to consist of installing a bioretention facility. This facility will generally consist of a low lying landscape area, receiving storm runoff which is allowed to pond in shallow depths and for a few hours. The components of the facility will include landscape plants, a mulch layer, underlying special soil media, and a stone underdrain system.

PURPOSE AND SCOPE OF SERVICES

The purpose of the geotechnical engineering services will be to determine pertinent information regarding the subsurface soil and groundwater conditions at the site in order to provide conclusions and recommendations for soil characteristics and reuse, permeability estimates of underlying soils, construction specifications, placement monitoring, groundwater conditions, and other geotechnical aspects. Accordingly, G E T Solutions, Inc. will perform the following tasks:

Design Phase

- Contact the local underground utility service company prior to beginning our field services, in order to identify the location of underground utilities in the work area.
- Advance three (3) 8-foot deep auger borings within the proposed retention area.
- Perform laboratory tests on selected soil samples collected from the soil test borings in order to determine in-situ moisture content, moisture-plasticity relationships (Atterberg Limits), and full sieve analysis.

The boring and laboratory test data will be utilized in effectively qualifying the soils at this site for reuse.

- Conduct a geotechnical engineering evaluation of the available data with respect to bioretention area design.
- Prepare an engineering report presenting data, soil boring logs, observations, evaluations and design/construction recommendations. Preliminary earthwork related construction parameters will also be addressed in our report.
- Assist design engineer in preparation of construction specifications.

Construction Phase

- Perform construction inspection, including placement of geotextile fabric, underdrains and gravel blanket, soil mixing and quality, and compaction (as needed).
- Provide proper certification of BMP components consistent with current county criteria.

All work will be conducted in accordance with ASTM standards, and in support of the design team members. Also, our services will be consistent with the provisions of Minimum Standard and Specification 3.11 of the Virginia Stormwater Management Handbook (1999 edition), the JCC BMP manual, and the performance criteria established by the Center for Watershed Protection.

FEE FOR SERVICES

The fee for our services is based on a unit rate format, whereby our fees would be invoiced by the actual amount of technical time expended for this project and the amount of laboratory testing performed. For this project, we propose to accomplish the work in accordance with the attached Schedule of Services and Fees (Attachment "A") for a total cost of [REDACTED]

If additional services are requested or needed you will be notified prior to proceeding with the additional expenses. Any additional services, upon approval, will be invoiced based on the unit prices presented on the attached Schedule of Services and Fees (Attachment "A").

SCHEDULE

Once we receive a notice to proceed, we will contact and meet with the underground utility locators, and we will mobilize to the site within 1 day thereafter. We believe that the drilling and soil sampling activities will require 1 day. The laboratory testing, engineering evaluation and report preparation will require about 1 to 2 weeks. Therefore, our report should be issued within about 2 weeks of our receiving formal authorization. If project schedules require quicker report turn around times, we can adjust our expected schedules accordingly. During the interim, we will maintain verbal contact with you, in order to inform the design team of preliminary findings.

The field testing services are expected to last for a period of 1 week, and will be coordinated with the engineer and contractor at that time.

We appreciate the opportunity to submit this proposal, and we look forward to working with you towards a successful completion of this project. Please feel free to contact us any time at (757) 518-1703 with any questions that you may have.

Respectfully submitted,
G E T Solutions, Inc.



Camille A. Kattan, P.E.
Principal Engineer
VA Reg. # 18045

AGREED TO THIS _____ DAY OF _____, 2002

BY: _____
(Signature) (Please Print Name)

TITLE: _____

FIRM: _____

Attachments: Schedule of Services and Fees - Attachment "A"



ATTACHMENT "A"
Proposal for Geotechnical Engineering & Field Testing Services
Bioretention Demonstration Project
Williamsburg/JCC Courthouse
Williamsburg, Virginia
G E T Proposal No: PVG02-338G
Prepared For: JCC Environmental Division

	Quantity	Unit	Unit Rate (\$)	Total (\$)
I. Design Phase Services				
Boring Location & Utility Clearance	2	hrs	██████	██████
Sr. Engineering technician to perform 3 Auger Borings	4	hrs	██████	██████
Natural Moisture Content Determination	4	each	██████	██████
Sieve Analysis	3	each	██████	██████
Atterberg Limits Testing	2	each	██████	██████
Sr. Soils Engineer For Analysis & Report Preparation	4	hrs	██████	██████
CADD Operator	3	hrs	██████	██████
Typist	3	hrs	██████	██████
<i>Subtotal: Design Phase Services</i>				██████
II. Construction Phase Services				
Project Engineer, P. E. including on-site Time	5	hrs	██████	██████
Sr. Engineering Technician for Construction Monitoring (Assuming 5 days @ 8hrs/day)	40	hrs	██████	██████
Sr. Soils Engineer for report Preparation	3	hrs	██████	██████
CADD	2	hrs	██████	██████
Clerical	3	hrs	██████	██████
<i>Subtotal: Construction Phase Services</i>				██████
ESTIMATED TOTAL ALL SERVICES				██████



Scott Thomas

From: Scott Thomas
Sent: Monday, December 15, 2003 1:28 PM
To: P. E. Camille A. Kattan (ckattan@getsolutionsinc.com)
Subject: Courthouse Bioretention Demonstration Project

Camille

I just received an invoice from GET Solutions, Inc. in the amount of [REDACTED] for services rendered between October 21st and November 19th 2003 (Invoice [REDACTED] dated Nov 30th 2003). [REDACTED]

According to my records and your proposal (PVG02-338G) dated November 18th 2002, the above amount was for construction phase services which included:

- Construction inspection, including placement of geotextile fabric, underdrains and gravel blanket, soil mixing and quality and compaction (as needed);
- Proper certification of BMP components consistent with current County criteria.
- Also, Attachment A of the proposal shows time for the senior soils engineer for report preparation.

Unless you disagree, I find it proper that I provide the construction certification for the project as I was present to observe and monitor all phases of construction of the project in accordance with the approved project plan and adjustments made along the way, specifically changes that arose as a result of utility conflicts and properties of the planting soil mixture. However, to do this properly, I need to fully review all documentation and testing results as performed by GET.

The only information I have received on the project from GET was a fax from James R. Wheeler dated November 14th 2003. This information included two Proctor tests performed from the planting soil (biosoil) stockpiles as labeled Proctor # 1 and Proctor # 2.

Please forward under signed and sealed cover letter any field inspection logs, compaction test reports, laboratory test results and any other information as performed or desired to be relayed by GET about your monitoring of the project, plus copies of any information as received from the planting soil mix supplier (Yorktown Materials) as appropriate to support the construction certification. For your information, I have attached our current record drawing/construction certification forms and information in .pdf file format.)

(Note: We performed an asbuilt survey of the bioretention basin last Friday Dec 12th 2003. The purpose of the asbuilt survey was to ensure the contractor built the basin to the dimensions and grades as outlined on the approved and revised construction plan and in order to issue a certificate of substantial completion to the contractor and to prepare and submit certifications as required to the City of Williamsburg. I need to fully review all information as collected from GET prior to sign-off on substantial completion per the contract documents and to support the asbuilt certification to the City and construction certification as required by James City County.)

Scott J. Thomas, P.E.
James City County
Environmental Division

Visit:

http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html

and

www.protectedwithpride.org

12/15/2003

James City County Stormwater Division
Stormwater Management / BMP Inspection Report
Bioretention Facilities

Submit by Email

Print Form

County BMP ID Code

Name of Facility BMP No: Date

Location

Owner Name

Inspector Name

Type of Facility

Weather Conditions Type Final Inspection County BMP Inspection Program Owner Inspection

If an inspection item is not applicable, mark NA, otherwise mark the appropriate column.

- O.K - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.
- Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
- Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.

Provide an explanation and details in the comment column, if routine or urgent are marked.

Facility Item	O.K.	Routine	Urgent	Comments
Accessibility:				
Roads	N/A			
Parking Areas	N/A			
Gates	N/A			
Locks	N/A			
Safety Fencing	N/A			
Vegetated Condition		X		
Observation Wells/Areas:				
Trap Doors	N/A			
Manhole Covers	N/A			
Grates	X			
Steps	N/A			
Pretreatment Devices	<input checked="" type="checkbox"/> Inlet	<input type="checkbox"/> Sump	<input type="checkbox"/> Forebay	<input type="radio"/> Radio Button
Sediment	X			
Trash & Debris	X			
Structure	X			

Notes:

Inflow Structure (Describe type/Location)

WJCC Courthouse Bioretention -

Facility Item	O.K.	Routine	Urgent	Comments
Condition	X			
Erosion	X			
Trash & Debris	X			
Sediment	X			
Aesthetics	X			
Others				
Primary Infiltration (Biorentation Cell) Area:				
Specialty Landscaping	X			
Subgrade Soil	X			
Aggregate	X			
Underdrain	X			
Sediment	X			
Aesthetics	X			
Overflow or Bypass Control Structure (Describe Type/Location)				
Condition	X			
Erosion	X			
Trash and Debris	X			
Sediment	X			
Other				
Outlet Structure (Describe Type/Location):				
Condition	X			
Erosion	X			
Trash & Debris	X			
Sediment	X			
Outlet Protection	X			
Other				
Contributing Drainage Area/Perimeter Conditions:				
Land Use	X			
Stabilization	X			
Trash & Debris	X			
Pollutant Hazard	X			
Other				

COVENANTOR(S)

Print Name

Title

ACKNOWLEDGMENT

COMMONWEALTH OF VIRGINIA

TO WIT:

CITY/COUNTY OF _____

I hereby certify that on this _____ day of _____ 20 _____

before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared _____ and did acknowledge the foregoing instrument to be his/her Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this _____ day of _____ 20 _____

[SEAL]

Notary Public

Notary Registration Number: _____

My commission expires: _____

Approved as to form:

County Attorney

This Declaration of covenants prepared by:

Name:

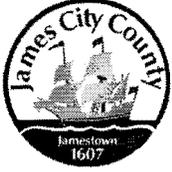
Print Name:

Title

Address

City

Phone Number:



James City County Stormwater Division

BMP ID:	PC180						
PIN:	Williamsburg James City County Courthouse						
Tax Map #:	n/a - within City of Williamsburg						
Site Address/Legal Description (if known):				5201 Monticello Ave			
Approved for scanning:			Jo Anna Ripley		Date:	02/10/2010	
<i>(For internal use only)</i>	Box:	1	Shelf:	1			
Agreements:	N	Book or Doc#:			Page:		