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: **WC070**

DATE VERIFIED: **July 19, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 12, 2010

TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services

FROM: Tina Cantwell, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: WC070

PIN: 1220100022A

Subdivision, Tract, Business or Owner Name (if known): Faith Fellowship Assembly of God

Property Description: Church Site

Site Address: 112 School House Lane

(For internal use only) **Box** 15 **Drawer:** 8

Agreements: (in file as of scan date) **Y** **Book or Doc#:** 990008273 **Page:** 010010661

Comments

COUNTY OF JAMES CITY, VIRGINIA

COPY

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 7th day of February, 20 03, between Faith Fellowship Assembly of God, and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property: 112 School House Lane, Williamsburg, VA 23188, project name, Faith Fellowship Assembly of God, Document No. 020017155, Deed Book n/a, Page No. n/a; Instrument No. _____, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

We, the COVENANTOR(S), with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interests in the property described above, do hereby covenant with the COUNTY as follows:

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

Instrument # 030008873
Recorded on March 26, 2003

6. The COVENANTOR(S) shall indemnify and save the COUNTY harmless from any and all claims for damages to persons or property arising from the installation, construction, maintenance, repair, operation or use of the SYSTEM.

7. The COVENANTOR(s) shall promptly notify the COUNTY when the COVENANTOR(S) legally transfers any of the COVENANTOR(S)' responsibilities for the SYSTEM. The COVENANTOR(S)' shall supply the COUNTY with a copy of any document of transfer, executed by both parties.

8. The covenants contained herein shall run with the land and shall bind the COVENANTOR(S) and the COVENANTOR(S)' heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of property served by the SYSTEM.

9. This COVENANT shall be recorded in the County Land Records.

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR(S)

By: James J. Jutras

Print Name/Title James J. Jutras, Trustee

By: Kenneth L. Jutras

Print Name/Title Kenneth L. Jutras, Trustee

By: Mattie Kate Prince

Print Name/Title Mattie Kate Prince, Trustee

Approved as to form:

Asst. County Attorney

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I hereby certify that on this 18th day of March, 2003, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared James J. Jutras, Trustee, and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 18th day of March, 2003.

Notary Public

My Commission expires: My Commission Expires May 31, 2007

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I hereby certify that on this 18th day of March, 2003, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Kenneth L. Jutras, Trustee, and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 18th day of March, 2003.

Notary Public

My Commission expires: My Commission Expires May 31, 2007

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 005

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I hereby certify that on this 18th day of March, 2003, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Mattie Kate Prince, Trustee, and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 18th day of March, 2003.

Irving F. Martin
Notary Public

My Commission expires: My Commission Expires May 31, 2006

This Declaration of Covenants prepared by:

James J Jutras
(Print Name)

Pastor
(Title)

102 Plains View Rd
(Address)

Williamsburg VA 23188
(City) (State) (Zip)

drainage.pre

SP-64-03 AMEND FOR PICNIC CANOPY #2
SP-59-03 AMEND FOR PICNIC CANOPY #1
SP-95-02

James City County, Virginia
Environmental Division

Stormwater Management/BMP
Record Drawing and Construction Certification Review
Tracking Form

County Plan No.: SP-95-02
Project Name: FAITH FELLOWSHIP ASSEMBLY OF GOD
Stormwater Management Facility: INFIL BASIN
Phase: ☐ I ☐ II ☒ III

- ☑ Information Received. Date/By: 4/7/04 LANDMARK
- ☐ Administrative Check.
  - ☑ Record Drawing Date/By: 4/6/04 LANDMARK (CERT 10-5-03)
  - ☑ Construction Certification Date/By: 4/7/04 LANDMARK
  - ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001 Only)
  - ☑ Insp/Maint Agreement #/Date: #030008873 3/26/03
  - ☑ BMP Maintenance Plan Location: Sheet C-5
  - ☐ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  ☑ Yes ☐ No Location: Note 20 Sheet C-7; Comm #3 Aug 27 2002
- ☑ Assign **County BMP ID Code**: Code: WC 070
- ☑ Preliminary Input into Division's "As-Built Tracking Log"
- ☑ Add Location to GIS Database Map. Obtain site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into Access BMP Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (Label, copy hydraulics, BMP plan and detail information, etc.).
- ☐ Inspector Check of RD/CC (forward to inspector using transmittal for cursory review).
- ☑ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to Field Inspection).
- ☑ Final Inspection (FI) Performed Date: 4/30/03
- ☑ Record Drawing (RD) Review (***) Date: 4/30/03
- ☑ Construction Certification (CC) Review Date: 4/30/03
- ☑ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: 4/30/03
    - ☐ Record Drawing (RD)
    - ☐ Construction Certification (CC)
    - ☑ Construction-Related (CR)
    - ☐ Site Issues (SI)
    - ☐ Other :

2ND CR INSPECTION w/ JERRY WARREN
FIELD ITEMS OK
THOUGHT I SIGNED OFF ON THIS.

- ☐ Second Submission:
- ☐ Reinspection (if necessary):
- ☐ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☐ Notify Inspector and Inspector Supervisor using "Surety Request Form".
- ☐ Check/Clean active file of any remaining material and finish "As-Built" file.
- ☑ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
- ☑ Copy Final Inspection Report into County BMP Inspection Program file.
- ☑ Obtain Digital Photographs of BMP and log into computer.
- ☐ Complete "As-built Tracking Log".
- ☑ Last check of BMP Access Database. Add to PRIDE database.
- ☑ Add to JCC Hydrology & Hydraulic database (optional).
- ☑ Add to PRIDE BMP ratings database.

Plan Reviewer: [signature] Date: 1-24-05

*** See separate checklist.

Record Drawing / Construction Certification Submittal for a BMP

Date: 4/27/04

Inspector:
- ☑ Pat Menichino
- ☐ Joe Buchite
- ☐ Beth Davis
- ☐ Gerry Lewis
- ☑ Jim Rudnicky
- ☐ Other: _____

Project: FAITH FELLOWSHIP ASSEMBLY OF GOD
BMP Facility: INFILTRATION BASIN
Plan No.: SP-95-02
Assigned County BMP ID Code: WC 070

I have received a transmittal for a ☑ Record Drawing and ☑ Construction Certification for the above referenced facility on April 7, 2004. Prior to performing a field inspection of the BMP and performing a full review of these certification items, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw observed in the field. Please review the drawing and return to me promptly so I can proceed with the review of certification material.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and may make comment on the following areas: Inspection/Maintenance agreement, Record Drawings (RD), Construction Certification (CC) and Construction-Related (CR) field items as it pertains to the BMP. If you have any other related non-BMP site issues such as site erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, you must proceed with closing out these items on your own accord; or alternatively, if needed, I can easily add these items to any comment letter that I may generate to the owner.

Let me know if I need to add any site-related items to my punch list.

Scott

AsBuilts\Admin\z-inspector

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: FAITH FELLOWSHIP ASSEMBLY OF GOD CHURCH
Structure/BMP Name: BMP #1 INFILTRATION BASIN
Project Location: ON SCHOOL HOUSE LANE NEAR ITS INTERSECTION WITH ROCAMBEAU DR.
BMP Location NEAR WESTERLY END OF PARCEL
County Plan No.: SP - 95 - 02

Project Type:				
	ρ Residential	ρ Business	Tax Map/Parcel No.:	1220100022
	ρ Commercial	ρ OfficeBMP ID	Code (if known):	WC 070
	X Institutional	ρ Industrial	Zoning District:	B-1 GENERAL BUSINESS
	ρ Public	ρ Roadway	Land Use:	CHURCH
	ρ Other _____		Site Area (sf or acres):	8.0+/- ACRES

Brief Description of Stormwater Management/BMP Facility: BMP # 1 serves a drainage area of 7.165 acres associated with the development of Faith Fellowship Assembly of God. The facility is a 10-point county type c-4 BMP. The Stormwater infiltration system provides for groundwater recharge anf water quality volume in one location. (See Sheet R-1 for further description)

Nearest Visible Landmark to SWM/BMP Facility: Faith Fellowship Church, Stonehouse Elementary School
Nearest Vertical Ground Control (if known):

X JCC Geodetic Ground Control ρ USGA ρ Temporary ρ Arbitrary ρ Other
Station Number or Name: 349
Datum or Reference Elevation: NGVD 1929 Sta. El.=98.45
Control Description: James City County Geodetic Control Monument
Control Location from Subject Facility: WESTERLY ALONG ROCHAMBEAU DR. FROM SITE

Section 2 – Stormwater Management / BMP Facility Construction Information:

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: LandMark Design Group, Inc.
Mailing Address: 4029 Ironbound Road Suite 100, Williamsburg, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049

Name: Peter Farrell, L.S.
Title: Senior Associate
Signature: Peter Farrell
Date: 10-5-03

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.

Note: Elevation of berm along northerly property line is approximately 0.4' (84.6') below design elvation (84.5').

COMMONWEALTH OF VIRGINIA
10-5-03
PETER FARRELL
002036
Peter Farrell
LAND SURVEYOR

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: LandMark Design Group, Inc.
Mailing Address: 4029 Ironbound Road, Suite 100 Williamsburg, VA 23188
Business Phone: 757-253-2975
Fax: 757-229-0049

Name: Richard S. Phillips, P.E.
Title: Senior Associate
Signature: [signature]
Date: 4/7/04

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.

Note: Sediments have been removed and slope erosion has been corrected.

COMMONWEALTH OF VIRGINIA
4/7/04
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

Pre Construction Meeting Held for Construction of SWM/BMP Facility: X Yes ρ No ρ Unknown
Approx. Construction Start Date for SWM/BMP Facility: July, 2003
Facility Monitored by County Representative during Construction: ρ Yes ρ No x Unknown
Name of Site Work Contractor who Constructed Facility:
Name of Professional Firm Who Routinely Monitored Construction:
Date of Completion for SWM/BMP Facility :AUG. 2003
Date of Record Drawing/Construction Certification Submittal:11/05/03

(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: FAITH FELLOWSHIP ASSEMBLY OF GOD
Mailing Address:2797 LAKE POWELL ROAD
WILLIAMSBURG, VA 23185
Business Phone:757-566-9673 Fax:
Contact Person: REV. JERRY IUTRAS Title:PASTOR

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: LANDMARK DESIGN GROUP, INC
Mailing Address:4029 IRONBOUND RD SUITE 100
WILLIAMSBURG, VA 23188
Business Phone: 253-2975 Fax:229-0049
Responsible Plan Preparer: SAME
Title:
Plan Name: FAITH FELLOWSHIP ASSEMBLY OF GOD
Firm's Project No. 1990220-000.05
Plan Date: JAN. 17, 2003
Sheet No.'s Applicable to SWM/BMP Facility: C-3 / C-4 / C-5 / . /

BMP Contractor: *(Note: Site Work Contractor directly responsible for construction of the Stormwater Management / BMP facility.)*

Name: D & M Contractors
Mailing Address: P.O. Box 262
Barhamsville, VA 23011
Business Phone: 757-566-0339 Fax:
Contact Person: Aubrey M. Hubbard
Site Foreman/Supervisor: same
Specialty Subcontractors & Purpose (for BMP Construction Only): N/A

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY BY LANDMARK DESIGN GROUP, OCTOBER, 2003. AND APRIL 1, 2004.

BMP MAINTENANCE PLAN (INFILTRATION BASIN)

A MAINTENANCE PROGRAM IS REQUIRED TO ENSURE THE STORMWATER MANAGEMENT / BEST MANAGEMENT PRACTICE (BMP) INFILTRATION FACILITY 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, THE BMP INFILTRATION AREA AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION AND ESTABLISHMENT OF VEGETATION IN DISTURBED SITE AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTELY. 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 APPROPRAITE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

BMP DESCRIPTION: INFILTRATION BASIN (BMP NO. 1) SERVES A DRAINAGE AREA OF 7.165 ACRES ASSOCIATED WITH THE DEVELOPMENT OF FAITH FELLOWSHIP ASSEMBLY OF GOD. THE FACILITY IS A 10-POINT COUNTY TYPE C-4 BMP. THE STORMWATER INFILTRATION SYSTEM PROVIDES FOR GROUNDWATER RECHARGE AND WATER QUALITY VOLUME IN ONE LOCATION. THE FACILITY WILL STORE RUNOFF FOR A PERIOD OF 48 HOURS AFTER HEAVY RAINFALL. THE STRUCTURE HAS TWO PURPOSES. IT IS DESIGNED TO ENSURE PEAK RUNOFF FROM THE 2-, 10- AND 100-YEAR DESIGN FREQUENCY STORM EVENTS WERE NOT INCREASED DUE TO THE DEVELOPMENT OF THE SITE AND TO ENSURE WATER QUALITY CRITERIA IS MET. THE STRUCTURE IS BASICALLY A BASIN WITH A BOTTOM SAND LAYER. STORMWATER IS STORED IN THE BASIN UNTIL IT EVENTUALLY SEEPS INTO THE SOIL BENEATH THE BASIN FOR ADDITIONAL NATURAL TYPE EXFILTRATION. WHEN LARGER STORMS OCCUR, OVERFLOW WILL BE CARRIED VIA EXISTING DRAINAGE FACILITIES TO THE EXISTING OFF-SITE LAKE. OBSERVATION WELLS ARE PRESENT TO CHECK THE INFILTRATION FUNCTION OF THE FACILITY.

INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. CHECK OBSERVATION WELLS IMMEDIATELY AFTER A SIGNIFICANT RAINFALL EVENT HAS CEASED OR ITS INTENSITY HAS SLOWED. IF THE BASIN IS FULL OF STORMWATER RUNOFF, WATER SHOULD BE WITHIN THE SOIL ZONES. IF NO WATER IS WITHIN THE SOIL ZONES, IT IS LIKELY THAT THE SURFACE LAYERS OF THE NATURAL SOILS ARE CLOGGED. IF THIS CONDITION IS PRESENT, THE TOP LAYERS OF THE NATURAL SOILS SHOULD BE REPLACED WITH CLEAN MATERIAL.

2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, COMPLETE REPLACEMENT OF THE NATURAL SOILS IS NECESSARY. ALTHOUGH THE SEASONAL WATER TABLE SHOULD HAVE BEEN IDENTIFIED AS BELOW THE FACILITY DURING DESIGN, CARE SHOULD BE TAKEN TO ENSURE WATER PRESENT AT THE BOTTOM OF THE WELLS IS NOT DUE TO A HIGH GROUNDWATER TABLE RATHER THAN NON-OPERATION OF THE INFILTRATION SYSTEM. FOR EXAMPLE, IF THERE IS WATER IN THE OBSERVATION WELLS 48 HOURS FOLLOWING A RAINFALL EVENT IN THE SPRING (APRIL OR MAY), BUT NOT IN THE SUMMER (JULY OR AUGUST), THE SEASONAL HIGH WATER TABLE MAY BE HIGHER THAN ORIGINALLY ANTICIPATED.

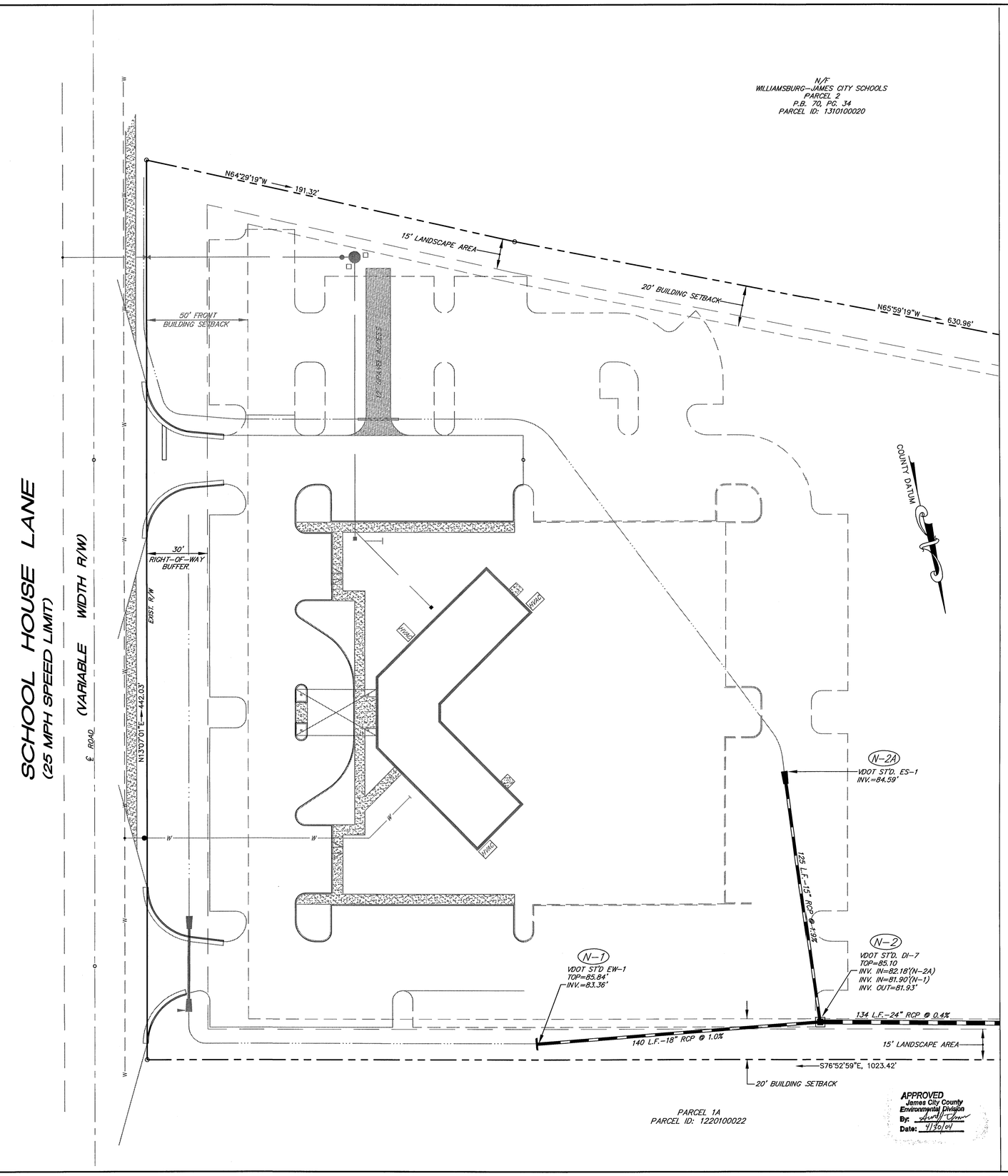
3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER AND TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AND STABILIZED CONTRIBUTING AREAS SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE GREATEST EXTENT POSSIBLE. TRASH AND LITTER COLLECTION IS ENCOURAGED DAILY AROUND THE BMP. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH A BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.

5. ROUTINELY INSPECT VEGETATED FILTERING STRIPS ADJACENT TO THE FACILITY. A HEALTHY STAND OF GRASS SHOULD BE MAINTAINED AT ALL TIMES. MOW THE FILTER STRIP WITH LAWNMOWERS AT HIGH SETTINGS TO ACHIEVE A CUT STAND OF GRASS 4 INCHES OR HIGHER. GRASS CLIPPINGS SHOULD BE BAGGED AS MOWING PROGRESSES SO CUTTINGS WILL NOT PLUG THE INFILTRATION BASIN.

6. 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.

7. THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.



MATCHLINE SEE SHEET R2

COMMONWEALTH OF VIRGINIA
4-6-04
PETER FARRELL
NO. 002036
LAND SURVEYOR

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax. (757) 220-8049
Email: info@landmarkdg.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax. (757) 473-2033
Email: info@landmarkdg.com

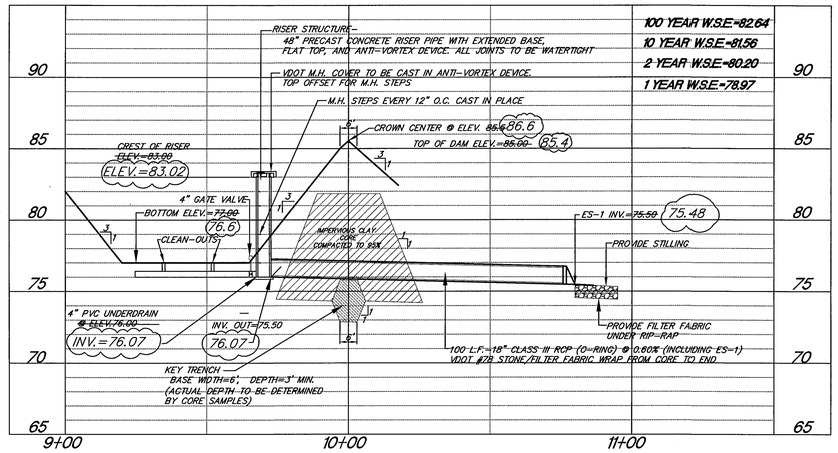
LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

BMP RECORD DRAWINGS
FAITH FELLOWSHIP ASSEMBLY OF GOD
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 04/02/04
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: BMP-REC
Project Number: 1990220-000.17	Dwg. File No.: 14810W
Drawing Number	R-1

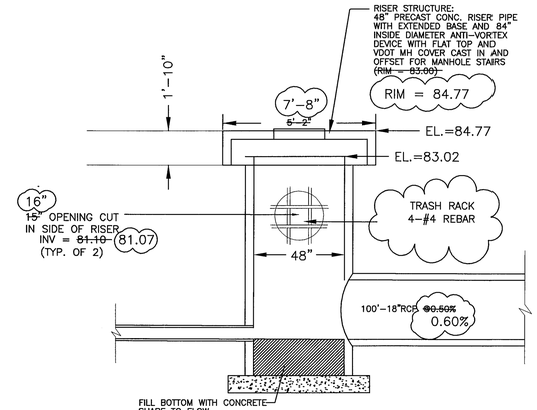
1 OF 2

WC070; SP-95-02



SECTION THROUGH INFILTRATION BASIN

SCALE: 1"=25' (HORIZONTAL)
1"=5' (VERTICAL)

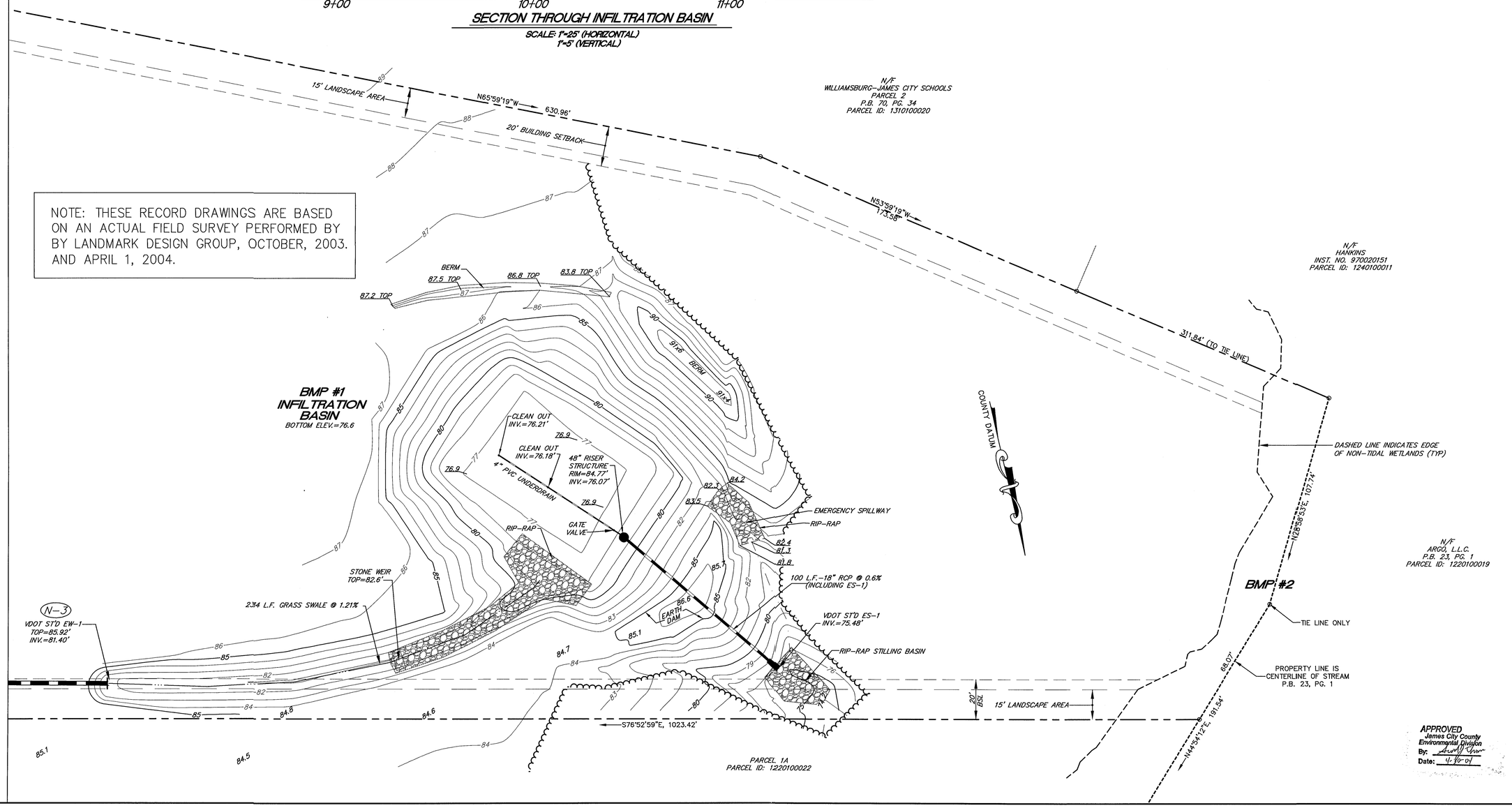


OUTFALL STRUCTURE DETAIL

N.T.S.

MATCHLINE SEE SHEET R1

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY BY LANDMARK DESIGN GROUP, OCTOBER, 2003. AND APRIL 1, 2004.



APPROVED
James City County
Environmental Division
By: [signature]
Date: 4-30-04

COMMONWEALTH OF VIRGINIA
4-6-04
PETER FARRELL
NO. 002036
Peter Farrell
LAND SURVEYOR

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Ph: (757) 220-2310
Fax: (757) 229-0049
Email: info@landmarkdg.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Ph: (757) 497-7929
Fax: (757) 497-7933
Email: info@landmarkdg.com

LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

BMP RECORD DRAWINGS
FAITH FELLOWSHIP ASSEMBLY OF GOD

STONEHOUSE DISTRICT — JAMES CITY COUNTY — VIRGINIA

Designed: LMDG	Date: 04/02/04
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: BMP-REC
Project Number: 1990220-000.17	Dwg. File No.: 14809W
Drawing Number	R-2

2 OF 2

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY BY LANDMARK DESIGN GROUP, OCTOBER, 2003. AND APRIL 1, 2004.

BMP MAINTENANCE PLAN (INFILTRATION BASIN)

A MAINTENANCE PROGRAM IS REQUIRED TO ENSURE THE STORMWATER MANAGEMENT / BEST MANAGEMENT PRACTICE (BMP) INFILTRATION FACILITY 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, THE BMP INFILTRATION AREA AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION AND ESTABLISHMENT OF VEGETATION IN DISTURBED SITE AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTELY. 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 APPROPRAITE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

BMP DESCRIPTION: INFILTRATION BASIN (BMP NO. 1) SERVES A DRAINAGE AREA OF 7.165 ACRES ASSOCIATED WITH THE DEVELOPMENT OF FAITH FELLOWSHIP ASSEMBLY OF GOD. THE FACILITY IS A 10-POINT COUNTY TYPE C-4 BMP. THE STORMWATER INFILTRATION SYSTEM PROVIDES FOR GROUNDWATER RECHARGE AND WATER QUALITY VOLUME IN ONE LOCATION. THE FACILITY WILL STORE RUNOFF FOR A PERIOD OF 48 HOURS AFTER HEAVY RAINFALL. THE STRUCTURE HAS TWO PURPOSES. IT IS DESIGNED TO ENSURE PEAK RUNOFF FROM THE 2-, 10- AND 100-YEAR DESIGN FREQUENCY STORM EVENTS WERE NOT INCREASED DUE TO THE DEVELOPMENT OF THE SITE AND TO ENSURE WATER QUALITY CRITERIA IS MET. THE STRUCTURE IS BASICALLY A BASIN WITH A BOTTOM SAND LAYER. STORMWATER IS STORED IN THE BASIN UNTIL IT EVENTUALLY SEEPS INTO THE SOIL BENEATH THE BASIN FOR ADDITIONAL NATURAL TYPE EXFILTRATION. WHEN LARGER STORMS OCCUR, OVERFLOW WILL BE CARRIED VIA EXISTING DRAINAGE FACILITIES TO THE EXISTING OFF-SITE LAKE. OBSERVATION WELLS ARE PRESENT TO CHECK THE INFILTRATION FUNCTION OF THE FACILITY.

INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. CHECK OBSERVATION WELLS IMMEDIATELY AFTER A SIGNIFICANT RAINFALL EVENT HAS CEASED OR ITS INTENSITY HAS SLOWED. IF THE BASIN IS FULL OF STORMWATER RUNOFF, WATER SHOULD BE WITHIN THE SOIL ZONES. IF NO WATER IS WITHIN THE SOIL ZONES, IT IS LIKELY THAT THE SURFACE LAYERS OF THE NATURAL SOILS ARE CLOGGED. IF THIS CONDITION IS PRESENT, THE TOP LAYERS OF THE NATURAL SOILS SHOULD BE REPLACED WITH CLEAN MATERIAL.

2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, COMPLETE REPLACEMENT OF THE NATURAL SOILS IS NECESSARY. ALTHOUGH THE SEASONAL WATER TABLE SHOULD HAVE BEEN IDENTIFIED AS BELOW THE FACILITY DURING DESIGN, CARE SHOULD BE TAKEN TO ENSURE WATER PRESENT AT THE BOTTOM OF THE WELLS IS NOT DUE TO A HIGH GROUNDWATER TABLE RATHER THAN NON-OPERATION OF THE INFILTRATION SYSTEM. FOR EXAMPLE, IF THERE IS WATER IN THE OBSERVATION WELLS 48 HOURS FOLLOWING A RAINFALL EVENT IN THE SPRING (APRIL OR MAY), BUT NOT IN THE SUMMER (JULY OR AUGUST), THE SEASONAL HIGH WATER TABLE MAY BE HIGHER THAN ORIGINALLY ANTICIPATED.

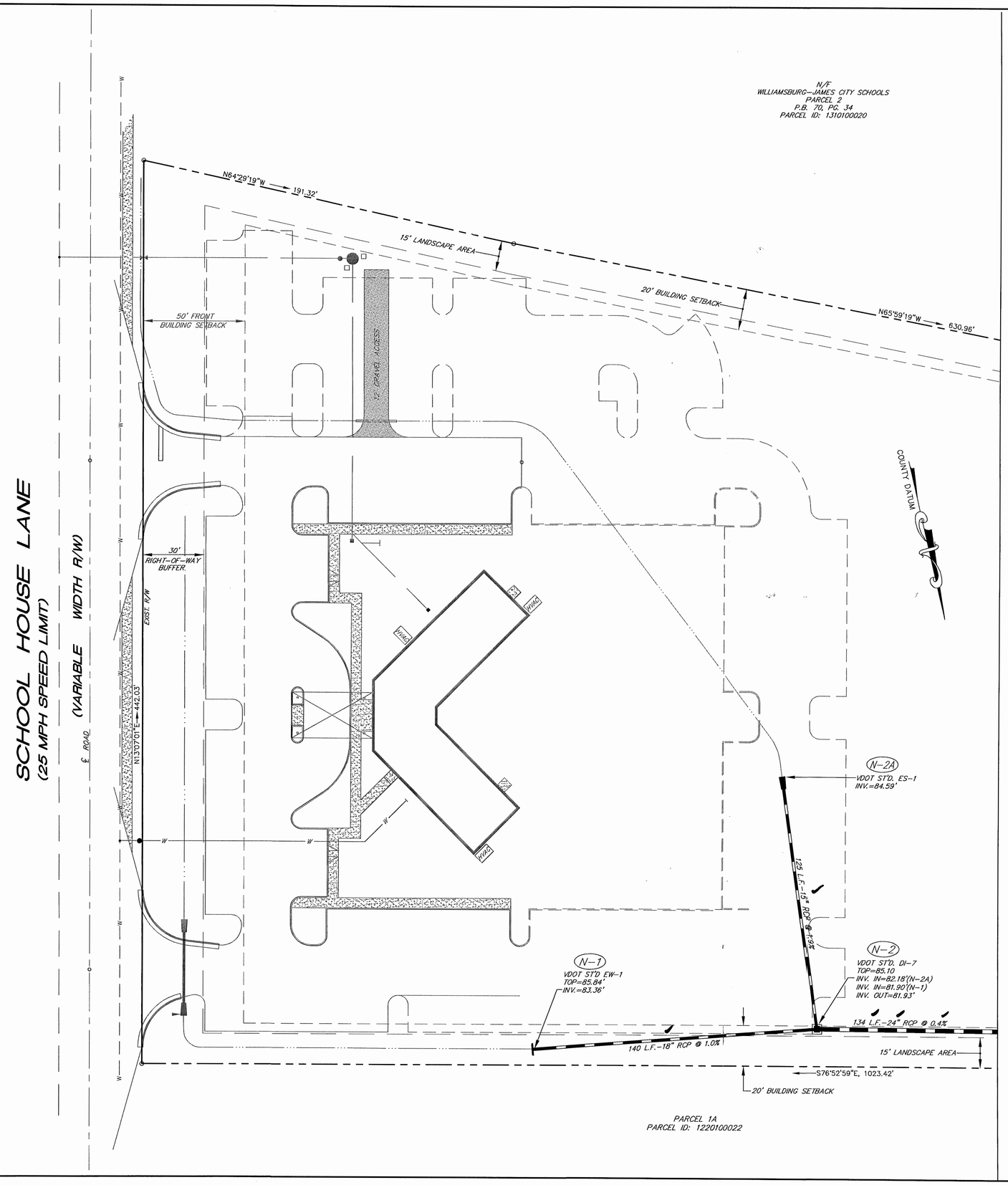
3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER AND TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AND STABILIZED CONTRIBUTING AREAS SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE GREATEST EXTENT POSSIBLE. TRASH AND LITTER COLLECTION IS ENCOURAGED DAILY AROUND THE BMP. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH A BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.

5. ROUTINELY INSPECT VEGETATED FILTERING STRIPS ADJACENT TO THE FACILITY. A HEALTHY STAND OF GRASS SHOULD BE MAINTAINED AT ALL TIMES. MOW THE FILTER STRIP WITH LAWNMOWERS AT HIGH SETTINGS TO ACHIEVE A CUT STAND OF GRASS 4 INCHES OR HIGHER. GRASS CLIPPINGS SHOULD BE BAGGED AS MOWING PROGRESSES SO CUTTINGS WILL NOT PLUG THE INFILTRATION BASIN.

6. 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.

7. THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.



COMMONWEALTH OF VIRGINIA
4-6-04
PETER FARRELL
NO. 002036
Peter Farrell
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LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
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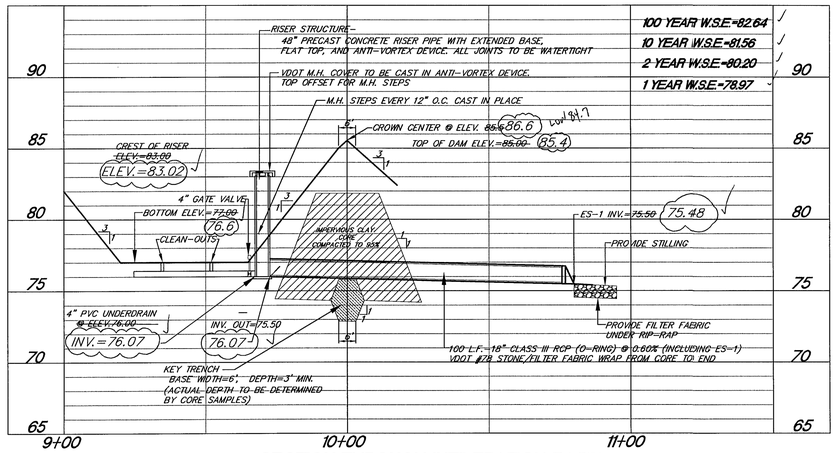
BMP RECORD DRAWINGS
FAITH FELLOWSHIP ASSEMBLY OF GOD
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 04/02/04
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: BMP-REC
Project Number: 1990220-000.17	Dwg. File No.: 14810W
Drawing Number R-1	

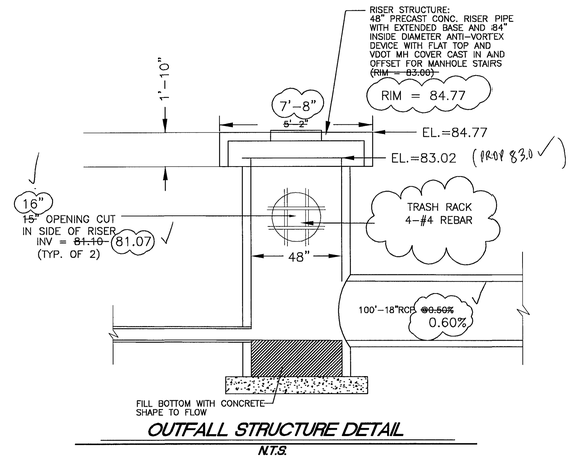
1 OF 2

SJT REVIEW SET SP-95-02; WC070



SECTION THROUGH INFILTRATION BASIN

SCALE: 1"=25' (HORIZONTAL)
1"=5' (VERTICAL)

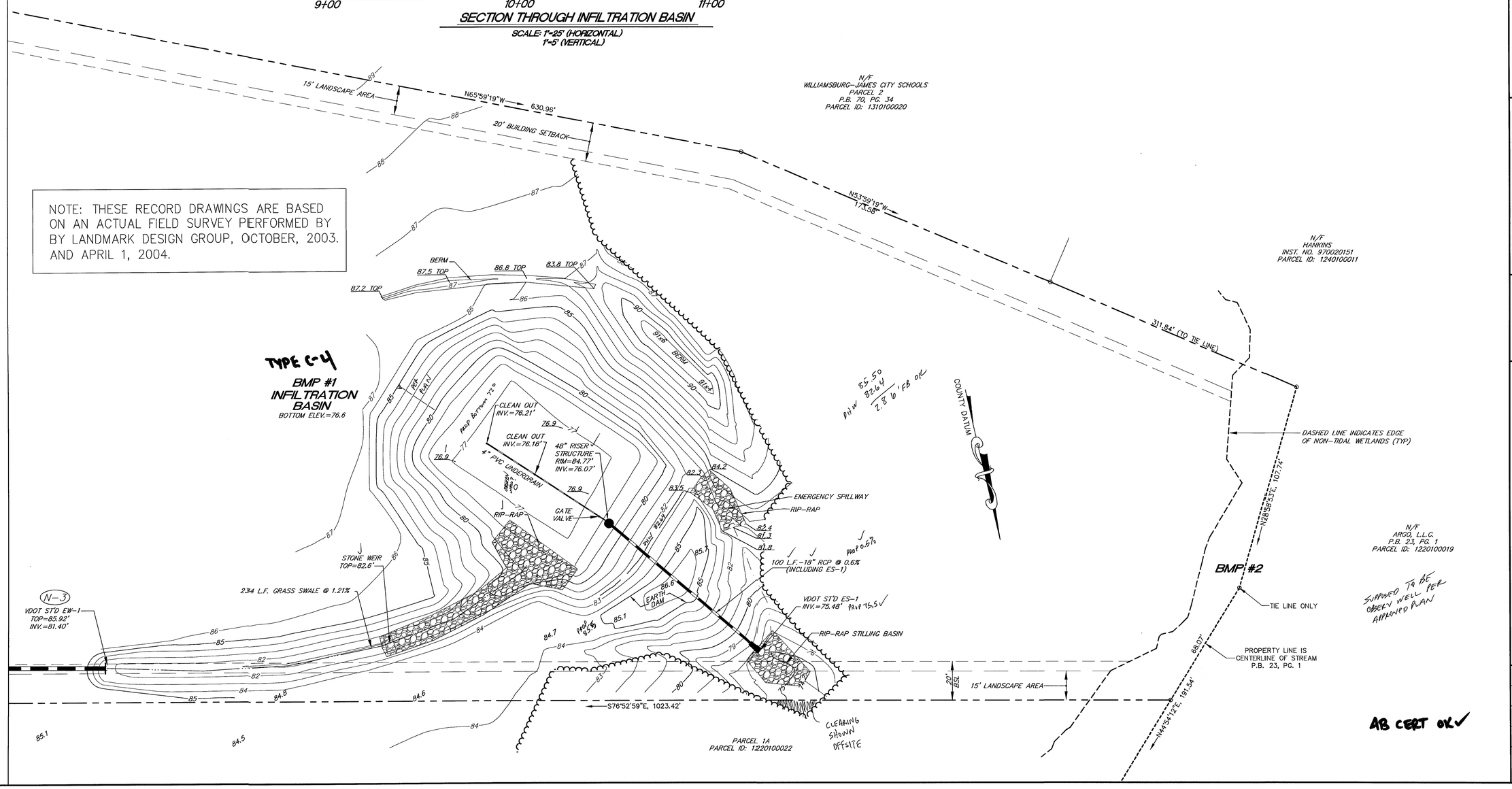


OUTFALL STRUCTURE DETAIL

N.T.S.

MATCHLINE SEE SHEET R1

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY BY LANDMARK DESIGN GROUP, OCTOBER, 2003. AND APRIL 1, 2004.



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4-6-04
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BMP RECORD DRAWINGS
FAITH FELLOWSHIP ASSEMBLY OF GOD

STONEHOUSE DISTRICT — JAMES CITY COUNTY — VIRGINIA

Designed: LMDG	Date: 04/02/04
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Project Number: 1990220-000.17	Dwg. File No.: 14809W
Drawing Number: R-2	

2 OF 2

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 015

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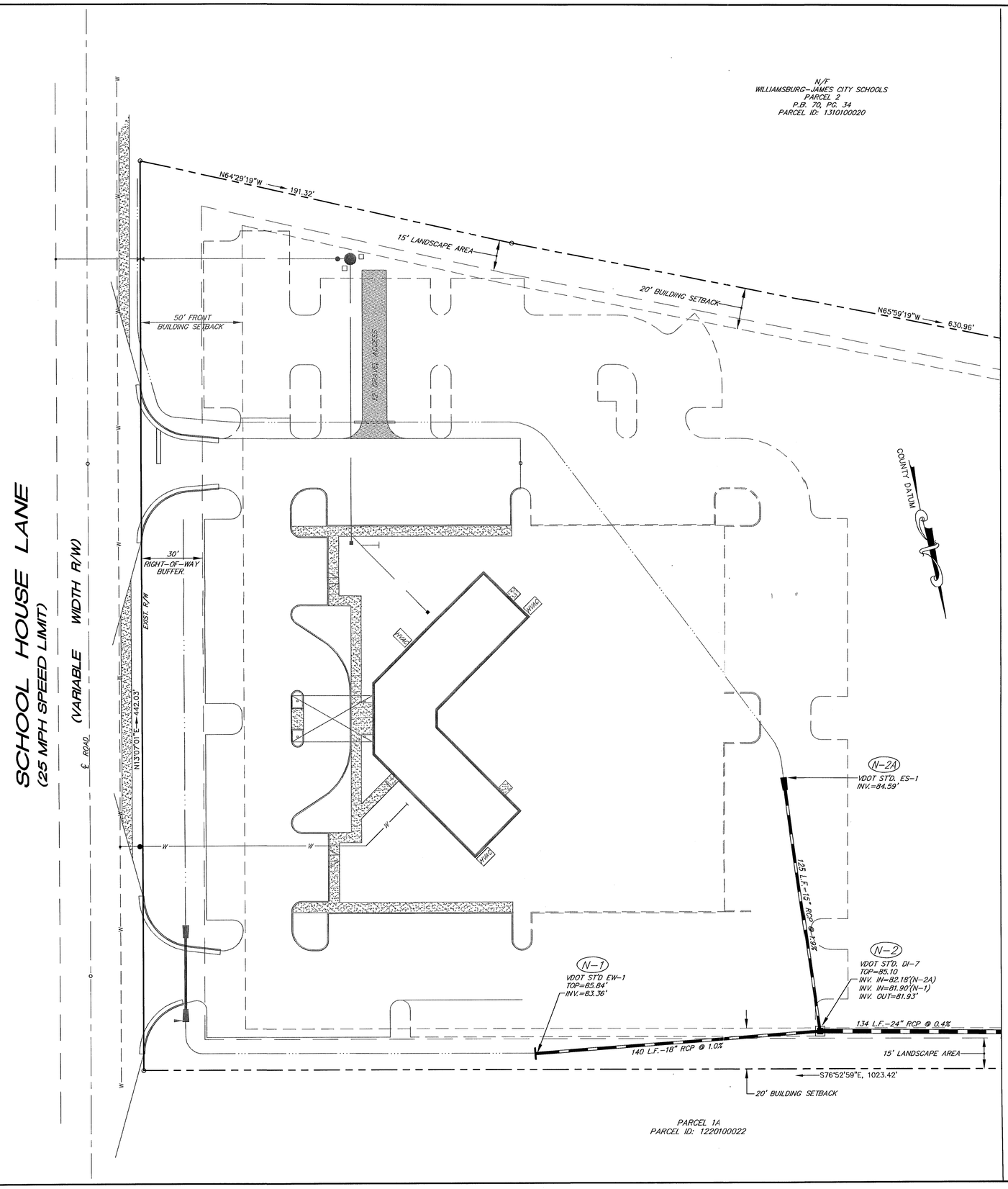

MATCHLINE SEE SHEET R2

COMMONWEALTH OF VIRGINIA
4-6-04
PETER FARRELL
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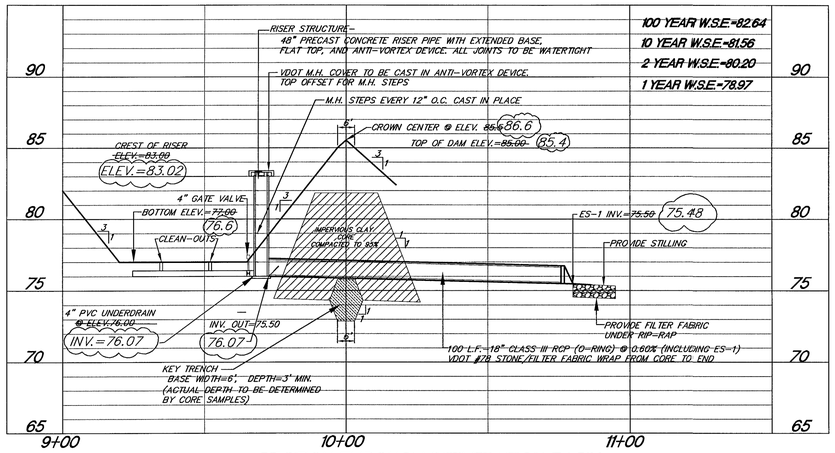
BMP RECORD DRAWINGS

FAITH FELLOWSHIP ASSEMBLY OF GOD

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

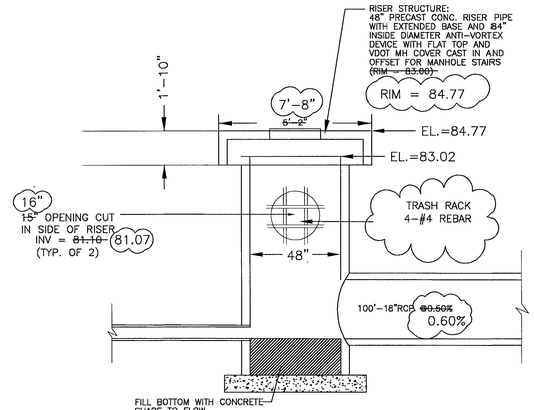
Designed: LMDG	Date: 04/02/04
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: BMP-REC
Project Number: 1990220-000.17	Dwg. File No.: 14810W
Drawing Number R-1	1 OF 2

WC 070; SP-85-02



SECTION THROUGH INFILTRATION BASIN

SCALE: 1"=25' (HORIZONTAL)
1"=5' (VERTICAL)



OUTFALL STRUCTURE DETAIL

N.T.S.

MATCHLINE SEE SHEET R1

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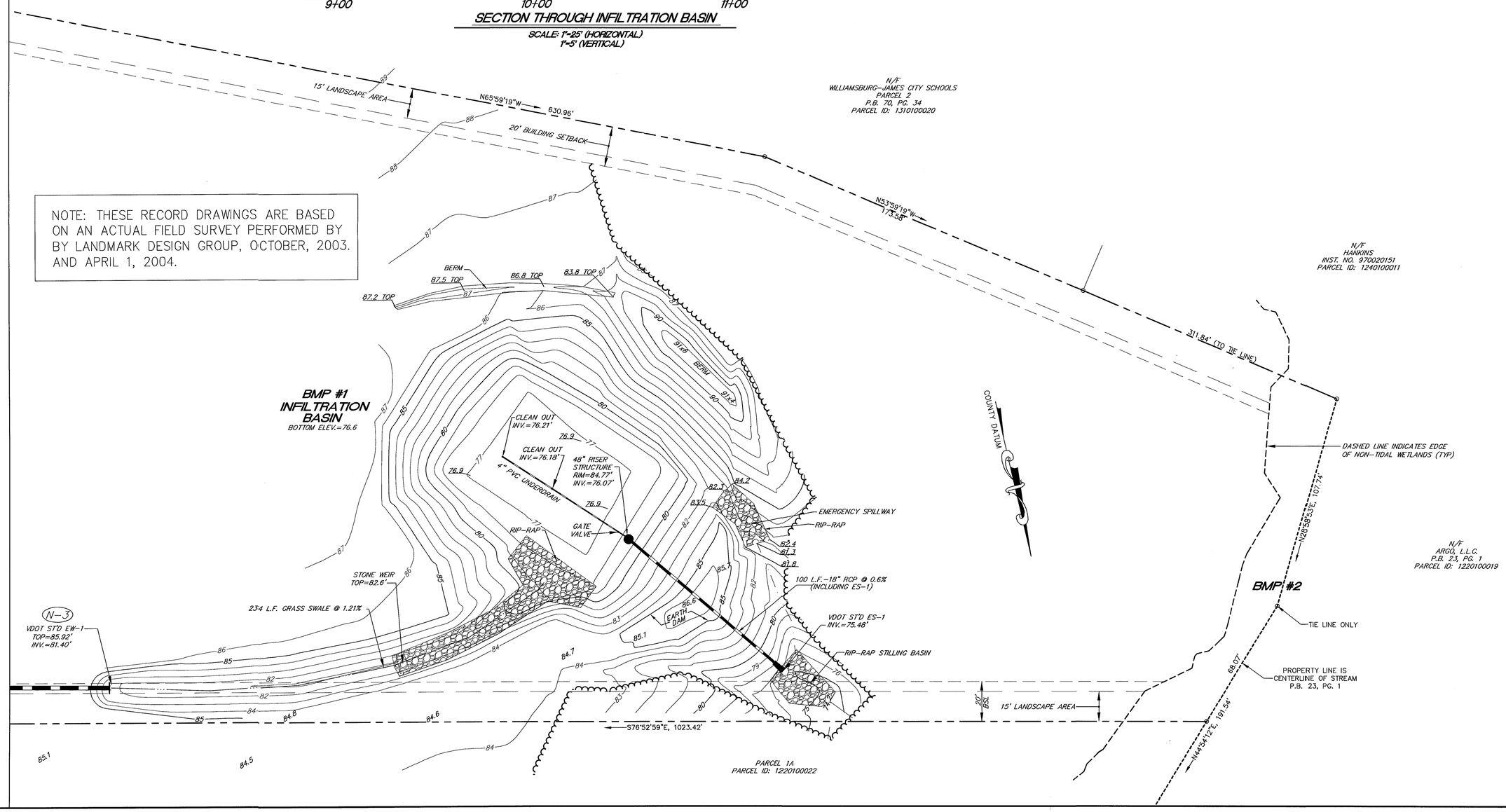

COMMONWEALTH OF VIRGINIA
4-6-04
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BMP RECORD DRAWINGS

FAITH FELLOWSHIP ASSEMBLY OF GOD

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 04/02/04
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: BMP-REC
Project Number: 1990220-000.17	Dwg. File No.: 14809W

Drawing Number

2 OF 2

R-2

LANDMARK DESIGN GROUP
TRANSMITTAL

April 2004

To: SCOTT THOMAS

Company: JAMES CITY COUNTY, ENVIRONMENTAL

From: PETER FARRELL

Date: 04/07/04

Subject: FAITH FELLOWSHIP BMP RECORD DRAWINGS

WC070
SP-95-02

LMDG Job No.: 1990220-000.17

Attached please find:
- [x] Prints
- [ ] Plans
- [ ] Specifications
- [ ] Drawings
- [ ] Report
- [ ] Letter
- [ ]

Transmitted as checked below:
- [ ] For your use
- [ ] As requested
- [x] For review and comment
- [ ] For approval
- [ ] Approved
- [ ]

Copies	Date	Drawing No.	Description
3	04/02/04	14810W	Record drawings for BMP #1 at Faith Fellowship Assembly of God Church
1	04/02/04		Record Drawing Certification

Notes:
SUBMITTED FOR FINALREVIEW

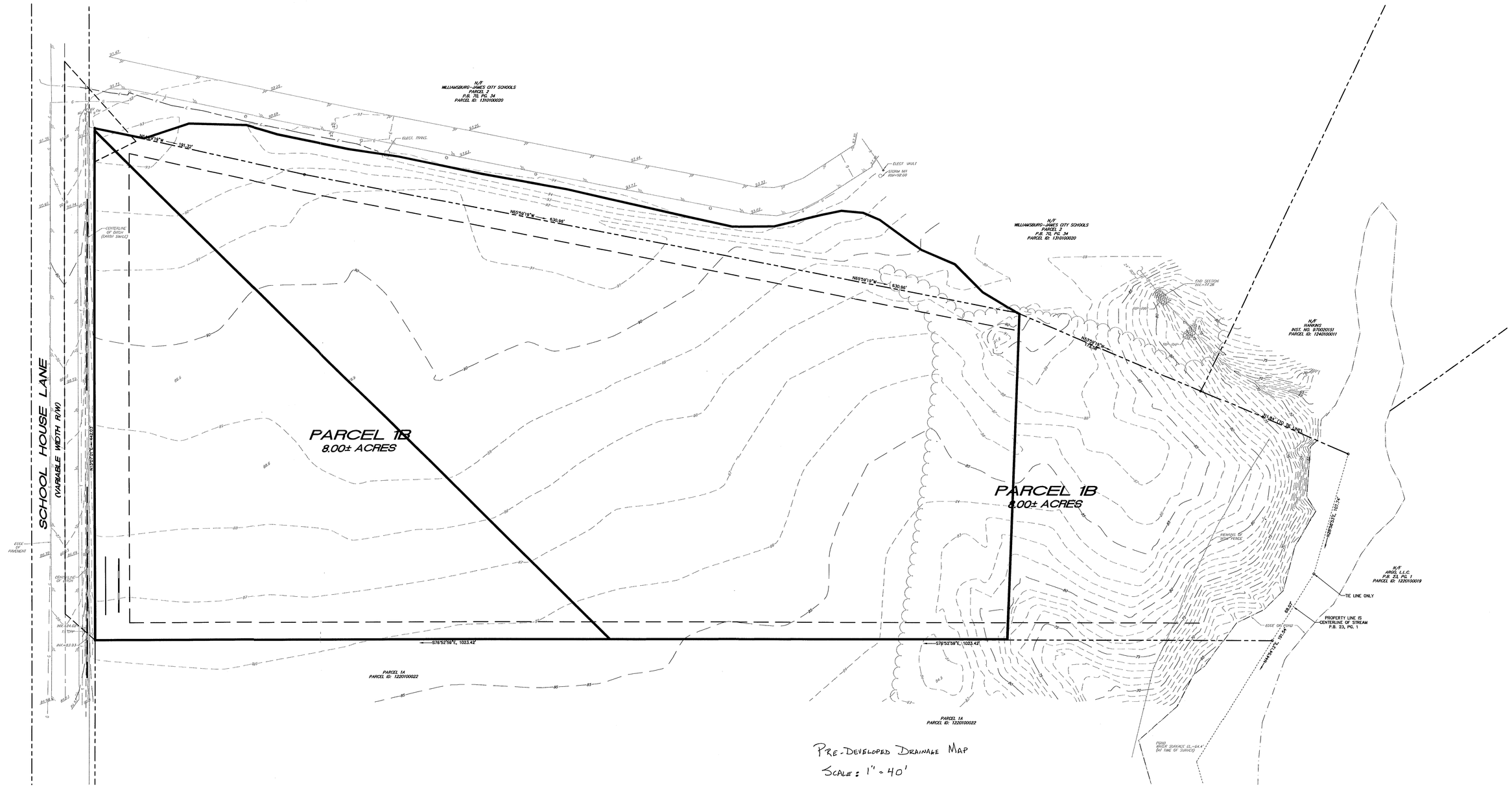
Copies	Enclosures
1. File: 1990220-000.17	[x]
2.	[ ]
3.	[ ]
4.	[ ]
5.	[ ]

LandMark Design Group, Inc.

By: PF

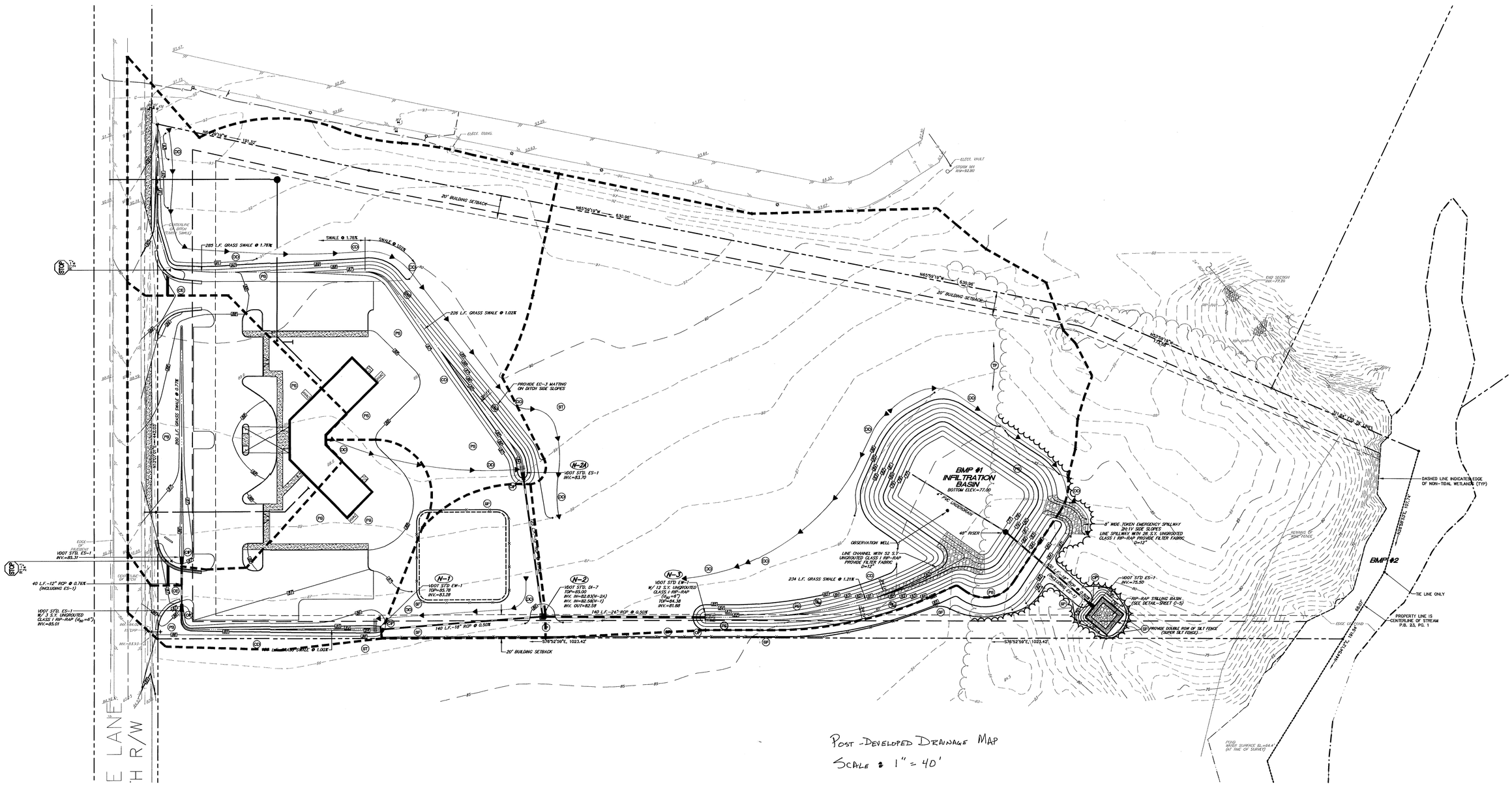
**Acknowledgment by Recipient: _____ _____
Name Date

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants
4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgwb.com



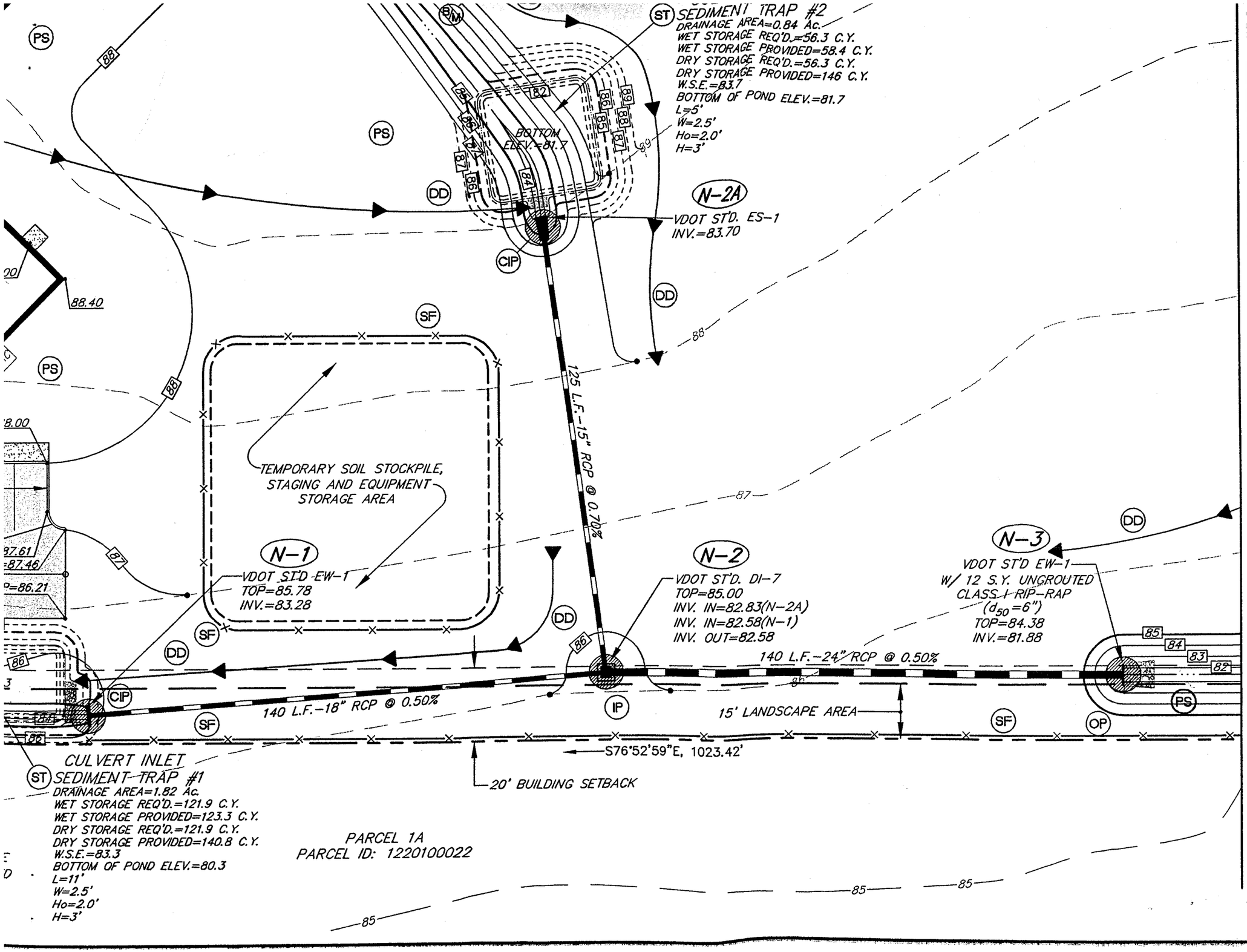
PRE-DEVELOPED DRAINAGE MAP
SCALE: 1" = 40'

FAITH FELLOWSHIP
ASSEMBLY OF GOD
SP-95-02



Post-Developed Drainage Map

Scale: 1" = 40'



DRAWING STAT	
07/26/02	Interoffice Revi
07/26/02	Client for Revie
	Pre Approval Bl

COUNTY APPRO	
7/29/02	1st Submittal
10/8/02	2nd Submittal
12/18/02	3rd Submittal
	Approved

SITE DEVELOPMENT PLAN
FAITH FELLOWSHIP ASSEMBLY OF GOD

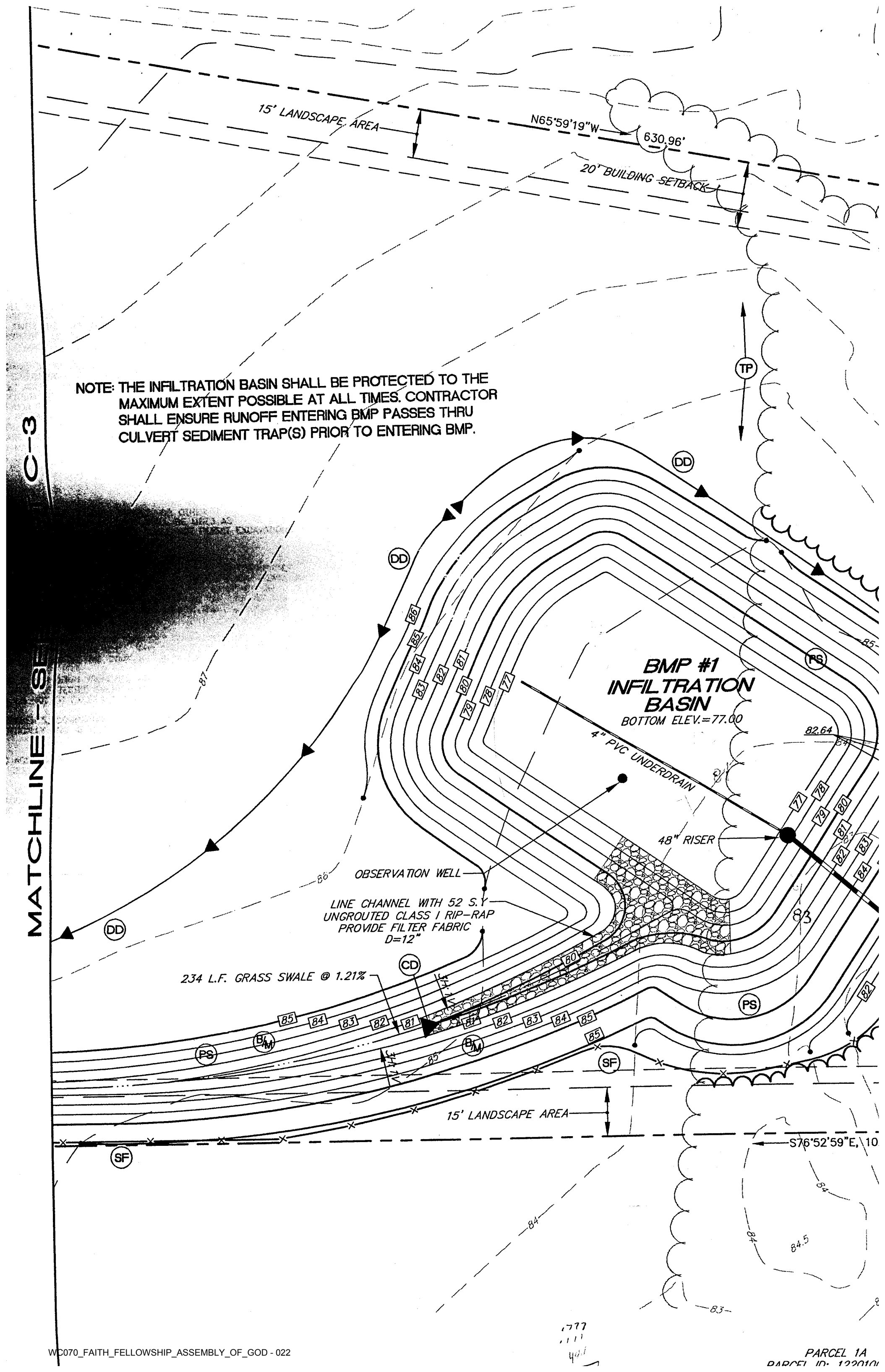
STONEHOUSE DISTRICT

JAMES CITY COUNTY VIRGINIA

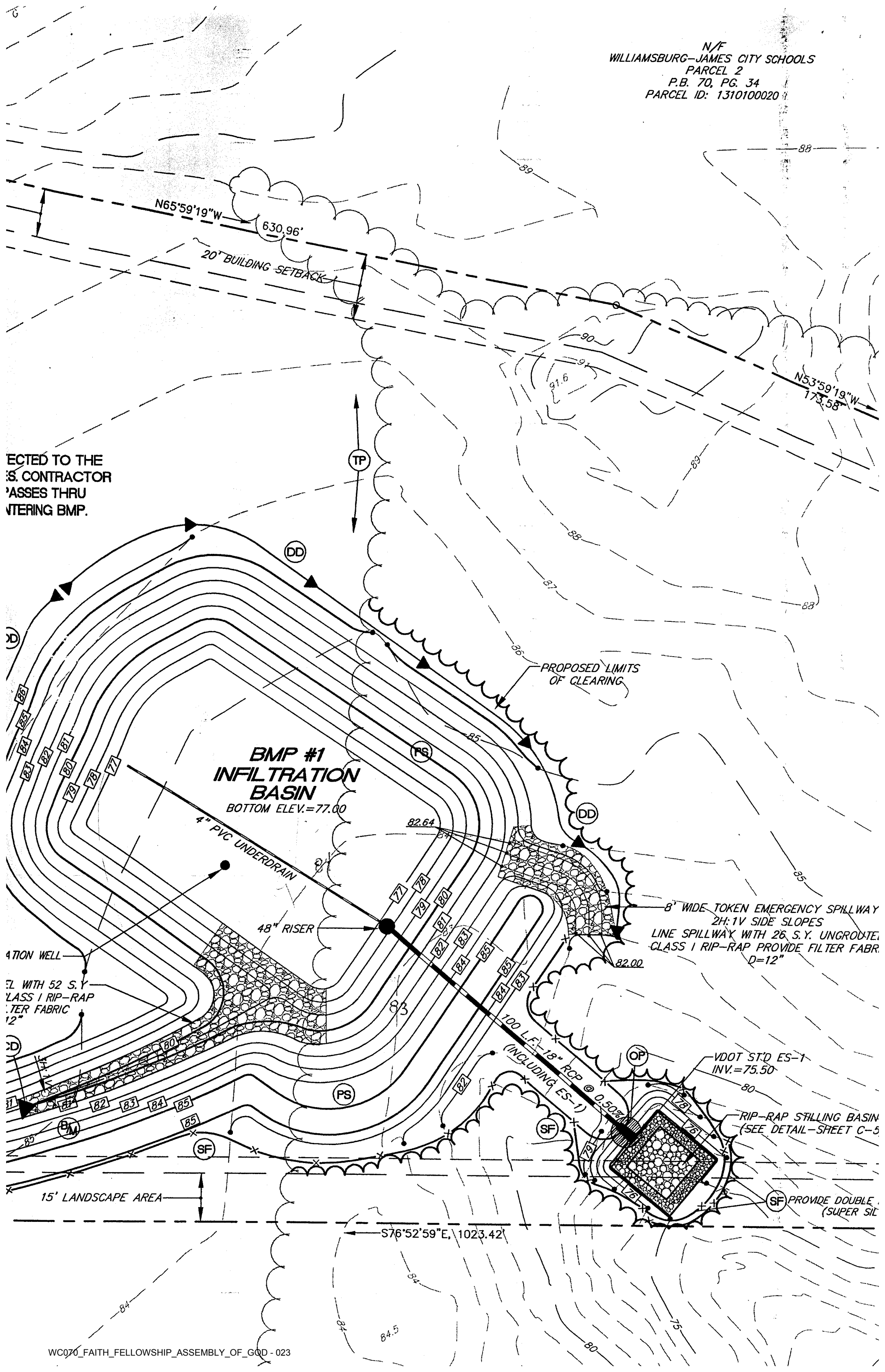
Designed: CJB/GSW	Date: 07/29/02
Checked: CJB	Scale: 1"=25'
File Mgr./Drawn: GSW	CADD File name: Sheet3.dwg
Project Number: 1990220-000.05	Dwg. File No.: 13456W

Drawing Number C-3

3 OF 12


15' LANDSCAPE AREA
N65°59'19"W
630.96'
20' BUILDING SETBACK
NOTE: THE INFILTRATION BASIN SHALL BE PROTECTED TO THE MAXIMUM EXTENT POSSIBLE AT ALL TIMES. CONTRACTOR SHALL ENSURE RUNOFF ENTERING BMP PASSES THRU CULVERT SEDIMENT TRAP(S) PRIOR TO ENTERING BMP.
TP
DD
BMP #1
INFILTRATION
BASIN
BOTTOM ELEV.=77.00
4" PVC UNDERDRAIN
82.64
48" RISER
OBSERVATION WELL
LINE CHANNEL WITH 52 S.Y.
UNGROUTED CLASS I RIP-RAP
PROVIDE FILTER FABRIC
D=12"
234 L.F. GRASS SWALE @ 1.21%
CD
PS
SF
B/M
15' LANDSCAPE AREA
S76°52'59"E, 10
MATCHLINE - SE
C-3

PARCEL 1A


N/F
WILLIAMSBURG–JAMES CITY SCHOOLS
PARCEL 2
P.B. 70, PG. 34
PARCEL ID: 1310100020
N65°59'19"W
630.96'
20' BUILDING SETBACK
N53°59'19"W
173.58'
ECTED TO THE
S. CONTRACTOR
ASSES THRU
NTERING BMP.
TP
DD
PROPOSED LIMITS
OF CLEARING
BMP #1
INFILTRATION
BASIN
BOTTOM ELEV.=77.00
4" PVC UNDERDRAIN
48" RISER
82.64
8' WIDE TOKEN EMERGENCY SPILLWAY
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OP
VDOT ST'D ES-1
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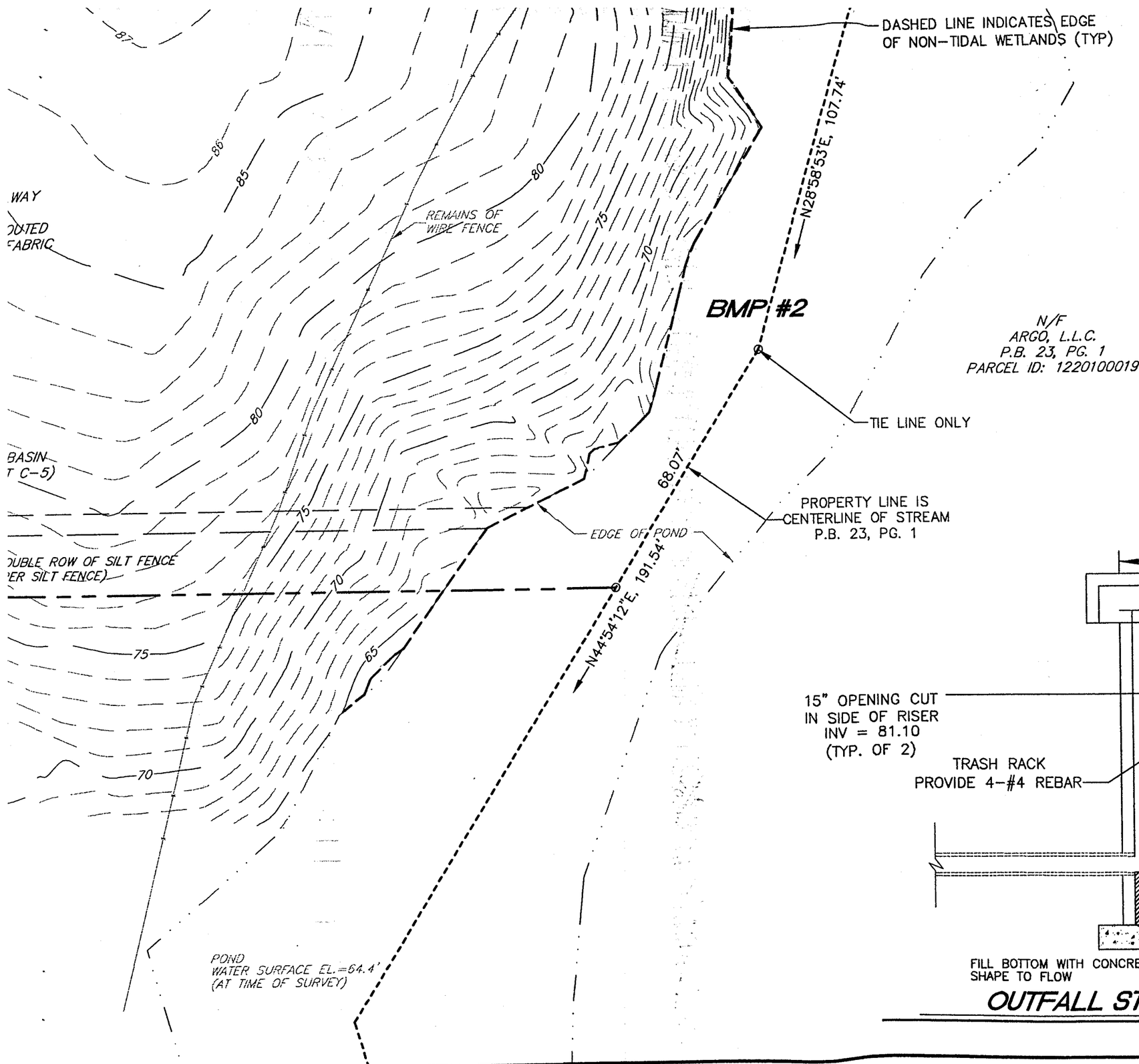
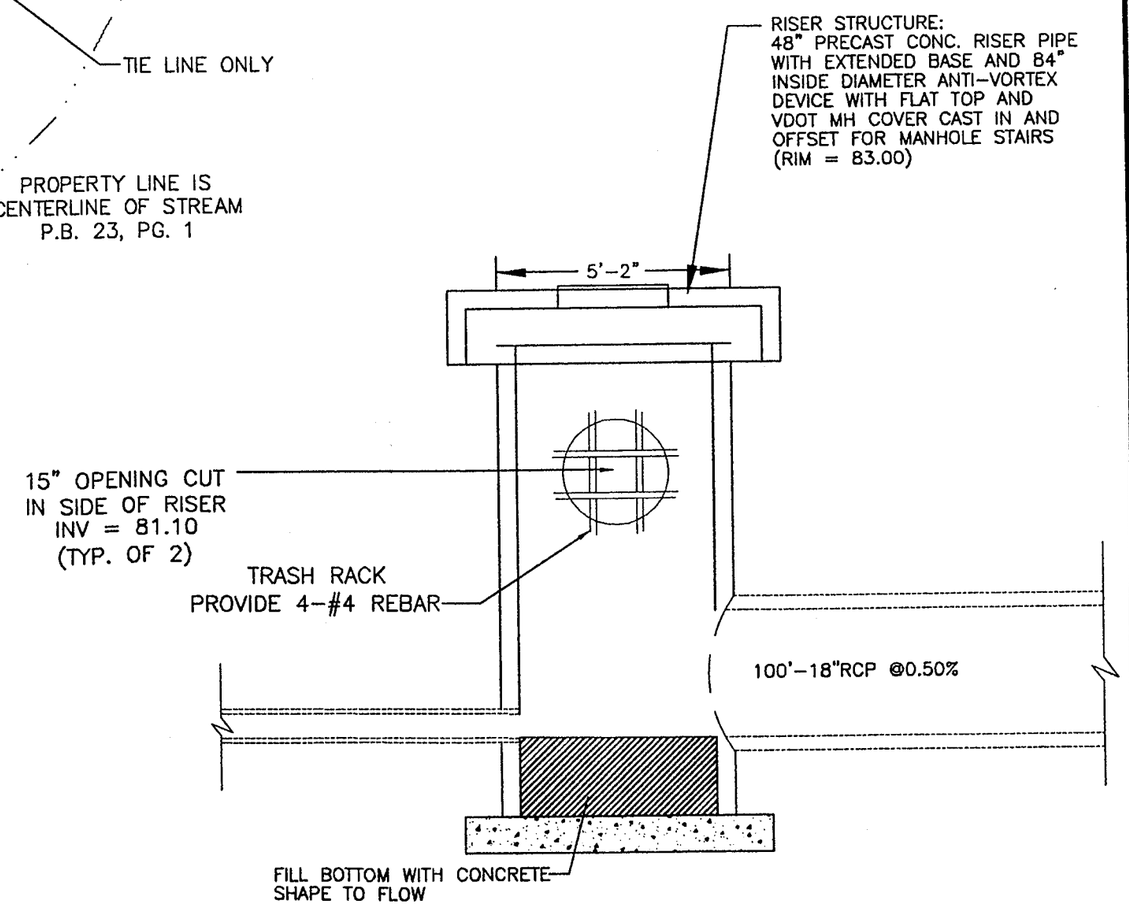
RIP-RAP STILLING BASIN
(SEE DETAIL-SHEET C-5
PS
SF
15' LANDSCAPE AREA
PROVIDE DOUBLE
(SUPER SIL
S76°52'59"E, 1023.42'





OUTFALL STRUCTURE DETAIL

N.T.S.

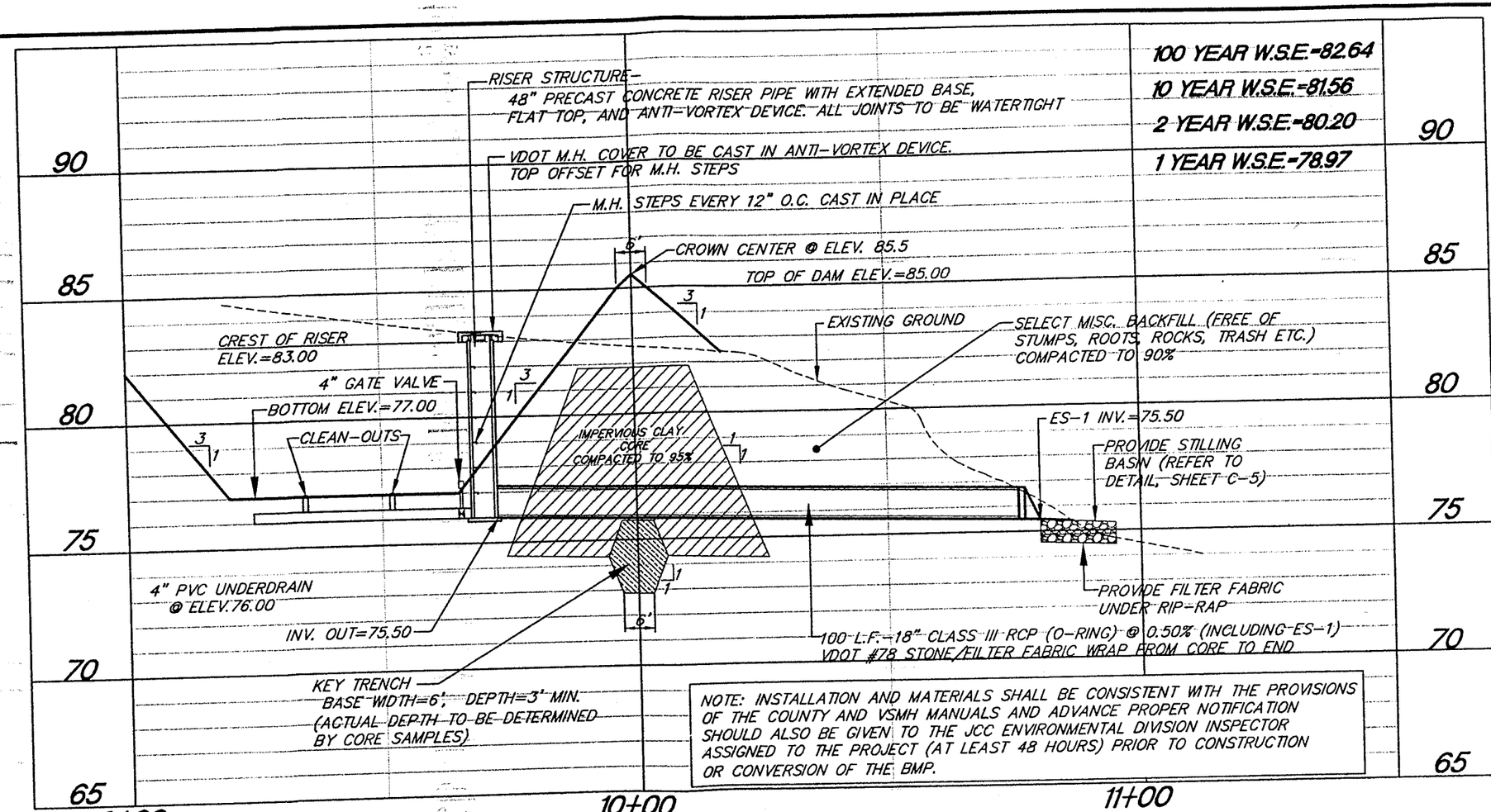
DRAWING STATUS	
07/26/02	Interoffice Review
07/26/02	Client for Review
	Pre Approval Bid
COUNTY APPROV	
7/29/02	1st Submittal
10/8/02	2nd Submittal
12/18/02	3rd Submittal

SITE DEVELOPMENT PLAN

FAITH FELLOWSHIP ASSEMBLY OF GOD

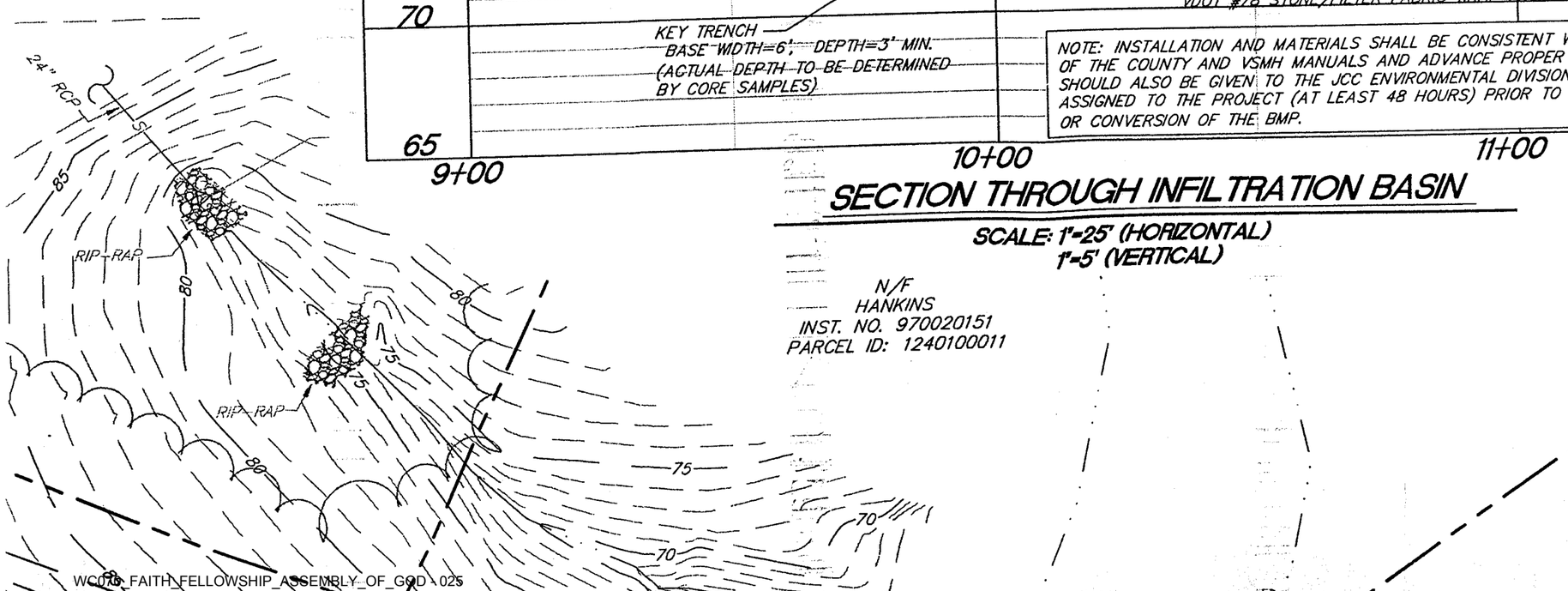
Designed: CJB/GSW	Date: 07/29/0
Checked: CJB	Scale: 1"=25'
File Mgr./Drawn: GSW	CADD File r Sheet4.c
Project Number: 1990220-000.05	Dwg. File N 13454\
Drawing Number C-4	

4 OF 12



SECTION THROUGH INFILTRATION BASIN

SCALE: 1"=25' (HORIZONTAL)
1"=5' (VERTICAL)



COMMONWEALTH OF VIRGINIA
CHARLES J. BODNAR
No. 028501
12/13/2002
PROFESSIONAL ENGINEER

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Williamsburg, VA 23188
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LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

	By
	GSW
	GSW

STANDARDS AND SPECIFICATIONS
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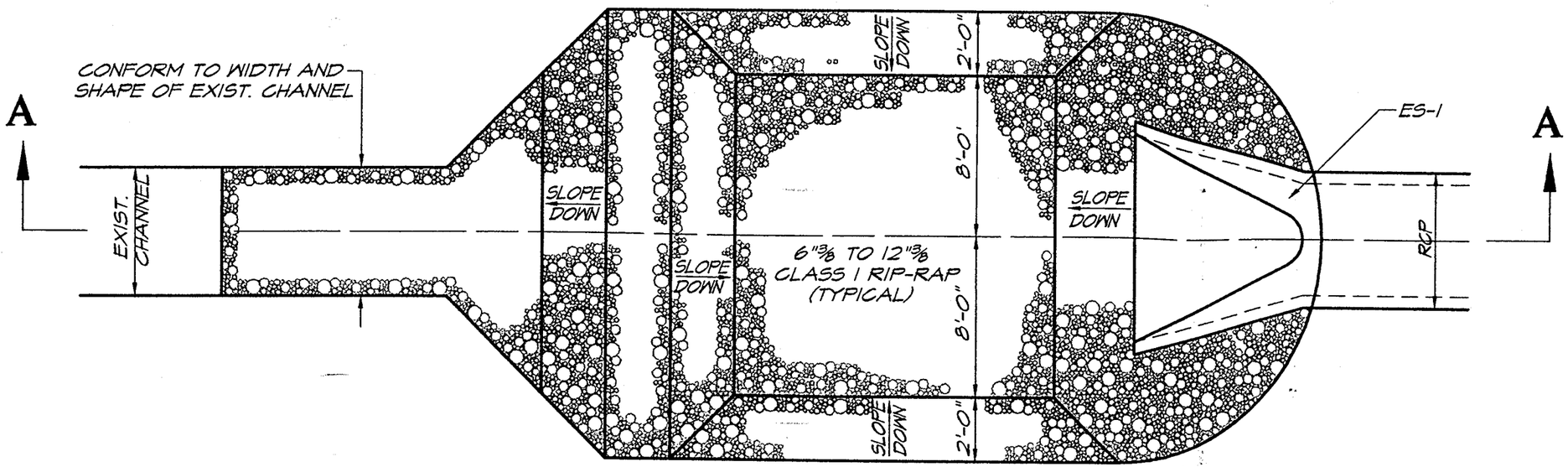
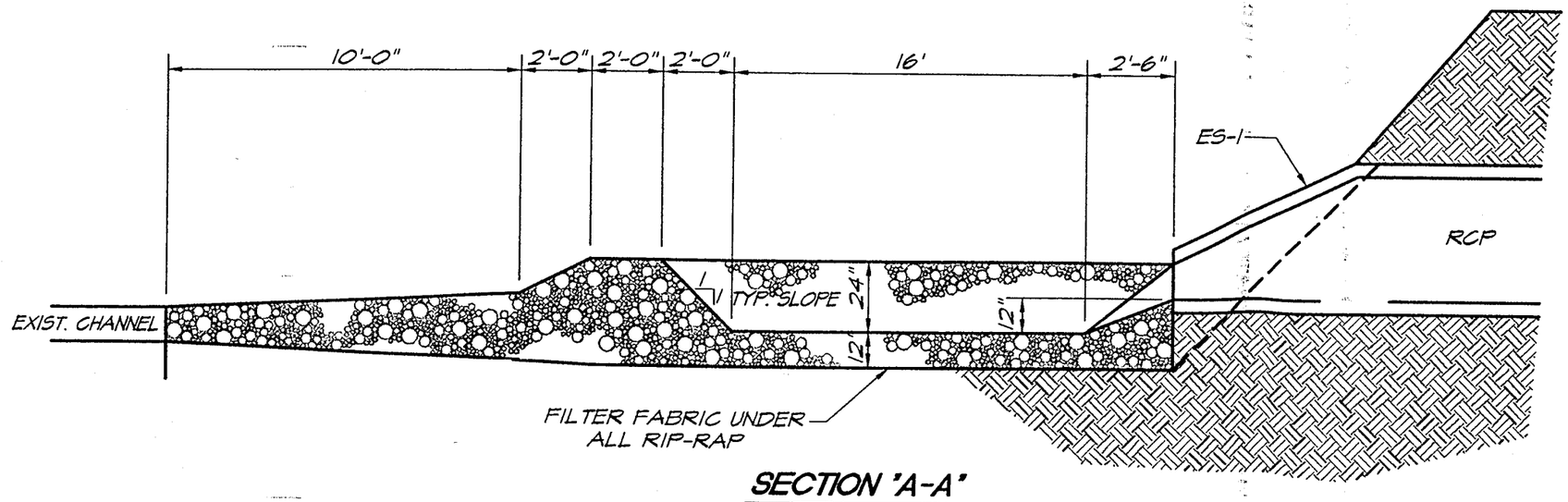


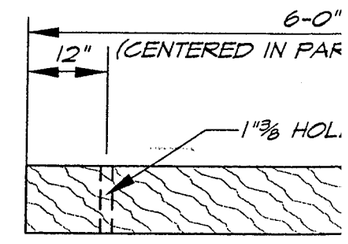
PLAN



SECTION 'A-A'

STILLING BASIN DETAIL

NOT TO SCALE



TIMBER WHEEL STOP

TIMBER WH

SCALE: NONE

FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 026

3. 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.

4. 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 VDOT 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).

5. 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. 3.05) 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 OWNER'S REPRESENTATIVE 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.

6. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING 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.

7. 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.

8. 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.

9. 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.

10. 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 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.

11. 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).

12. 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.

13. 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.

14. ALL SLOPES STEEPER THAN 3H:1V SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS AND MATTINGS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH STD. & SPEC. 3.35, MULCHING, STD. & SPEC. 3.36, SOIL STABILIZATION BLANKETS AND MATTING AND MANUFACTURERS INSTRUCTIONS. NO SLOPES SHALL BE CREATED STEEPER THAN 2H:1V.

15. INLET PROTECTION (STD. & SPEC., 3.07 AND 3.08) SHALL BE PROVIDED FOR ALL STORM DRAIN AND CULVERT INLETS FOLLOWING CONSTRUCTION OF THE SAME.

16. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

17. PAVED DITCHES SHALL BE REQUIRED WHEREVER ACCELERATED EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

18. 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.

19. 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) 60 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.

20. RECORD DRAWINGS (AS-BUILTS) 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 DRAWINGS AND CONSTRUCTION CERTIFICATION, STANDARD FORMS & INSTRUCTIONS.

21. 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.

BMP MAINTENANCE PLAN (INFILTRATION BASIN)

A MAINTENANCE PROGRAM IS REQUIRED TO ENSURE THE STORMWATER MANAGEMENT / BEST MANAGEMENT PRACTICE (BMP) INFILTRATION FACILITY 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, THE BMP INFILTRATION AREA AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION AND ESTABLISHMENT OF VEGETATION IN DISTURBED SITE AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTELY. 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 APPROPRAITE MAINTENANCE. KEYS TO LOCKED ACCESS POINTS OR STRUCTURES SHALL BE MADE AVAILABLE TO THE COUNTY UPON REQUEST.

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INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. CHECK OBSERVATION WELLS IMMEDIATELY AFTER A SIGNIFICANT RAINFALL EVENT HAS CEASED OR ITS INTENSITY HAS SLOWED. IF THE BASIN IS FULL OF STORMWATER RUNOFF, WATER SHOULD BE WITHIN THE SOIL ZONES. IF NO WATER IS WITHIN THE SOIL ZONES, IT IS LIKELY THAT THE SURFACE LAYERS OF THE NATURAL SOILS ARE CLOGGED. IF THIS CONDITION IS PRESENT, THE TOP LAYERS OF THE NATURAL SOILS SHOULD BE REPLACED WITH CLEAN MATERIAL.

2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, COMPLETE REPLACEMENT OF THE NATURAL SOILS IS NECESSARY. ALTHOUGH THE SEASONAL WATER TABLE SHOULD HAVE BEEN IDENTIFIED AS BELOW THE FACILITY DURING DESIGN, CARE SHOULD BE TAKEN TO ENSURE WATER PRESENT AT THE BOTTOM OF THE WELLS IS NOT DUE TO A HIGH GROUNDWATER TABLE RATHER THAN NON-OPERATION OF THE INFILTRATION SYSTEM. FOR EXAMPLE, IF THERE IS WATER IN THE OBSERVATION WELLS 48 HOURS FOLLOWING A RAINFALL EVENT IN THE SPRING (APRIL OR MAY), BUT NOT IN THE SUMMER (JULY OR AUGUST), THE SEASONAL HIGH WATER TABLE MAY BE HIGHER THAN ORIGINALLY ANTICIPATED.

3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER AND TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AND STABILIZED CONTRIBUTING AREAS SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE GREATEST EXTENT POSSIBLE. TRASH AND LITTER COLLECTION IS ENCOURAGED DAILY AROUND THE BMP. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH A BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.

5. ROUTINELY INSPECT VEGETATED FILTERING STRIPS ADJACENT TO THE FACILITY. A HEALTHY STAND OF GRASS SHOULD BE MAINTAINED AT ALL TIMES. MOW THE FILTER STRIP WITH LAWNMOWERS AT HIGH SETTINGS TO ACHIEVE A CUT STAND OF GRASS 4 INCHES OR HIGHER. GRASS CLIPPINGS SHOULD BE BAGGED AS MOWING PROGRESSES SO CUTTINGS WILL NOT PLUG THE INFILTRATION BASIN.

6. 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

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 028

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AND/OR DELETIONS SHALL
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GINEER CBR TESTS ON SUBGRADE
ERVALS NOT TO EXCEED 500 FEET.
(MINIMUM 2 (TWO) TESTS)

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1. CHECK OBSERVATION WELLS IMMEDIATELY AFTER A SIGNIFICANT RAINFALL EVENT HAS CEASED OR ITS INTENSITY HAS SLOWED. IF THE BASIN IS FULL OF STORMWATER RUNOFF, WATER SHOULD BE WITHIN THE SOIL ZONES. IF NO WATER IS WITHIN THE SOIL ZONES, IT IS LIKELY THAT THE SURFACE LAYERS OF THE NATURAL SOILS ARE CLOGGED. IF THIS CONDITION IS PRESENT, THE TOP LAYERS OF THE NATURAL SOILS SHOULD BE REPLACED WITH CLEAN MATERIAL.

2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, COMPLETE REPLACEMENT OF THE NATURAL SOILS IS NECESSARY. ALTHOUGH THE SEASONAL WATER TABLE SHOULD HAVE BEEN IDENTIFIED AS BELOW THE FACILITY DURING DESIGN, CARE SHOULD BE TAKEN TO ENSURE WATER PRESENT AT THE BOTTOM OF THE WELLS IS NOT DUE TO A HIGH GROUNDWATER TABLE RATHER THAN NON-OPERATION OF THE INFILTRATION SYSTEM. FOR EXAMPLE, IF THERE IS WATER IN THE OBSERVATION WELLS 48 HOURS FOLLOWING A RAINFALL EVENT IN THE SPRING (APRIL OR MAY), BUT NOT IN THE SUMMER (JULY OR AUGUST), THE SEASONAL HIGH WATER TABLE MAY BE HIGHER THAN ORIGINALLY ANTICIPATED.

3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER AND TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AND STABILIZED CONTRIBUTING AREAS SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE GREATEST EXTENT POSSIBLE. TRASH AND LITTER COLLECTION IS ENCOURAGED DAILY AROUND THE BMP. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.

4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH A BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.

5. ROUTINELY INSPECT VEGETATED FILTERING STRIPS ADJACENT TO THE FACILITY. A HEALTHY STAND OF GRASS SHOULD BE MAINTAINED AT ALL TIMES. MOW THE FILTER STRIP WITH LAWNMOWERS AT HIGH SETTINGS TO ACHIEVE A CUT STAND OF GRASS 4 INCHES OR HIGHER. GRASS CLIPPINGS SHOULD BE BAGGED AS MOWING PROGRESSES SO CUTTINGS WILL NOT PLUG THE INFILTRATION BASIN.

6. 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.

7. THE FACILITY SHALL NOT ACCEPT ADDITIONAL DRAINAGE OR BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT OR APPROVAL BY THE ENVIRONMENTAL DIVISION OF JAMES CITY COUNTY.

C-3	SITE DEVELOPMENT PLAN
C-4	SITE DEVELOPMENT PLAN
C-5	GENERAL NOTES AND DETAILS
C-6	VDOT NOTES AND DETAILS
C-7	EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
C-8	PUMP STATION DETAILS
C-9	PUMP STATION NOTES AND DETAILS
L-1	LANDSCAPE PLAN
L-2	PLANT SCHEDULE, NOTES AND DETAILS
F-1	LIGHTING PLAN

SP-95-02
WC 070

STATISTICAL DATA

PARCEL I.D. NUMBER:	1220100022
ZONING:	B-1, GENERAL BUSINESS
PROPOSED USE:	HOUSE OF WORSHIP
GROSS SITE ACREAGE:	8.00± AC.
SITE COVERAGE BY BUILDINGS:	4,998 SQ. FT.
PROJECT AREA:	3.25 AC. (41% OF PROPERTY)
TOTAL SITE IMPERVIOUS AREA:	0.83 AC. (10% OF PROPERTY)
AREA DISTURBED:	3.56 AC. (44% OF PROPERTY)
F.E.M.A. PANEL NUMBER	510201 0010 B - DATED: FEB. 6, 1991
F.E.M.A. F.I.R.M. ZONE	ZONE X
BUILDING DATA:	
TOTAL FLOOR AREA OF CHURCH:	4,998 SQ. FT. (PHASE 1)
PROPOSED HEIGHT OF CHURCH:	21'
PROPOSED FLOORS IN CHURCH:	ONE FLOOR
PROPOSED CHURCH BUILDING TYPE:	TYPE 5B
NUMBER OF SEATS	174 (PHASE 1)
PARKING REQUIREMENTS:	
USE CATEGORY:	CATEGORY C
PARKING REQUIRED:	36 SPACES (PHASE 1)
PARKING PROPOSED:	52 SPACES
HANDICAPPED SPACES REQUIRED:	4 H.C. SPACES (1 VAN ACCESSIBLE)
HANDICAPPED SPACES PROPOSED:	4 H.C. SPACES (4 VAN ACCESSIBLE)
TOTAL PROPOSED SITE PARKING:	56 SPACES

OWNER / DEVELOPER:
FAITH FELLOWSHIP ASSEMBLY OF GOD
2797 LAKE POWELL ROAD
WILLIAMSBURG, VA 23185
TELEPHONE: (757) 566-9673

SITE ENGINEER:
LANDMARK DESIGN GROUP
4029 IRONBOUND ROAD, SUITE 100
WILLIAMSBURG, VA 23188
TELEPHONE: (757)-253-2975
FAX: (757)-229-0049

RESPONSIBLE LAND DISTURBER:
THE RESPONSIBLE LAND DISTURBER FOR THIS PROJECT WILL BE CHARLES J. BODNAR, P.E. NO. 028501, OF LANDMARK DESIGN GROUP, UP TO THE TIME OF THE PRECONSTRUCTION MEETING FOR LAND DISTURBING PERMIT. AT THAT TIME THE OWNER WILL REDESIGNATE THAT RESPONSIBILITY.

NOTES:

ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.

ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE AUTHORITY STANDARDS AND SPECIFICATIONS FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL STANDARDS, AND THE COMMONWEALTH OF VIRGINIA WATERWORKS AND SANITARY SEWERAGE REGULATIONS. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA STANDARDS AND REGIONAL STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING FULL TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO THE JCSA.

Project Number:	Dwg. File No.:
1990220-000.05	13457W
Drawing Number	C-1

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FAITH FELLOWSHIP ASSEMBLY OF GOD

SCHOOL HOUSE PATH

JULY 26, 2002
REVISED: OCTOBER 7, 2002

LMDG FILE NO. 1990220-000.05

SUPPORTING ENGINEERING DOCUMENTS

- EROSION AND SEDIMENT CONTROL NARRATIVE
- JAMES CITY COUNTY EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT CHECKLIST
- DRAINAGE CALCULATIONS
  - NARRATIVE
  - PRE-DEVELOPED TIME OF CONCENTRATION
  - ENTRANCE CULVERT RUNOFF CALCULATION
  - CULVERT N-1 RUNOFF CALCULATION
  - CULVERT N-2A RUNOFF CALCULATION
  - STRUCTURE N-2 RUNOFF CALCULATION
  - BMP POINTS CALCULATION
  - WATER QUALITY VOLUME CALCULATION
  - CHANNEL PROTECTION VOLUME CALCULATION
  - HYDRAULIC GRADELINE AND CULVERT CALCULATIONS
  - CRITICAL STORM DURATION AND MAXIMUM STORAGE VOLUME CALCULATION
  - DOWNSTREAM REACH ANALYSIS
  - DRAINAGE DIAGRAM FOR BMP
  - SUMMARY OF ROUTING ANALYSES
  - 1-YEAR STORM BASIN ROUTING ANALYSIS
  - 2-YEAR STORM BASIN ROUTING ANALYSIS
  - 10-YEAR STORM BASIN ROUTING ANALYSIS
  - 100-YEAR STORM BASIN ROUTING ANALYSIS
  - GEOTECHNICAL REPORT AND ADDENDUM

COMMONWEALTH OF VIRGINIA
CHARLES J. BODNAR
No. 028501
October 7, 2002
PROFESSIONAL ENGINEER

SP-95-02
2nd SUBMISSION

LANDMARK
DESIGN GROUP

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants
4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgwb.com

FAITH FELLOWSHIP ASSEMBLY OF GOD

SCHOOL HOUSE PATH

JULY 26, 2002
REVISED: OCTOBER 7, 2002

LMDG FILE NO. 1990220-000.05

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EROSION AND SEDIMENT CONTROL NARRATIVE

FAITH FELLOWSHIP ASSEMBLY OF GOD
JAMES CITY COUNTY, VIRGINIA

EROSION AND SEDIMENT CONTROL PLAN NARRATIVE
JULY 29, 2002

PROJECT DESCRIPTION

Faith Fellowship Assembly of God is a proposed 174-seat house of worship. The site is located approximately 700 linear feet south on School House Lane from its intersection with Rochambeau. The total site area is 8.00 acres. The site development plan depicts all elements of proposed roadways, site grading, utility installation and drainage facilities. The site is zoned B-1.

EXISTING SITE CONDITIONS

The project limits consist of a cultivated field with the area of the BMP being wooded with light understory. The landform in the general area is a rolling terrain with slopes varying from relatively flat to slopes of approximately 25 % to 50 % along the existing lake to the rear of the site. Elevations within the overall project site generally range from elevation 64 at the existing lake to elevation 92. Drainage from the project is directed to a proposed infiltration basin at the rear of the property. This infiltration basin will drain to the existing lake and ultimately under Rochambeau.

SOILS

The predominant soil types which will be disturbed during construction of Faith Fellowship Assembly of God are Craven-Uchee complex, Emporia complex, Kempsville-Emporia fine sandy loam, and Suffolk fine sandy loam, as depicted on soil mapping contained in the USDA - Soil Conservation Service, Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.

Craven-Uchee complex consists of moderately well drained Craven soils and well-drained Uchee soils. Areas of this complex are on side slopes and narrow ridge tops. Typically, the surface layer of the Craven soils is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale olive fine sandy loam 5 inches thick. The subsoil extends to a depth of 42 inches. It is yellowish brown clay in the upper part and yellowish brown sandy clay loam mottled with gray in the middle and lower parts. The substratum is brownish yellow fine sandy loam mottled with gray in the upper part and gray loamy fine sand with yellow mottles in the lower part, and extends to a depth of at least 72 inches. Typically, the surface layer of the Uchee soils is dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is

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light yellowish brown and very pale brown loamy fine sand 19 inches thick. The subsoil extends to a depth of 56 inches. It is strong brown sandy clay loam and clay mottled with gray and red from 36 to 56 inches. The substratum from 56 to at least 65 inches is variegated red, brown, and gray stratified sandy loam and sandy clay loam. In the Craven soils, permeability is slow: and in the Uchee soils, it is moderate in the upper part of the subsoil and moderately slow in the lower part. The available water capacity is moderate for the Craven soils and low or moderate for the Uchee soils. Surface runoff is rapid. The erosion hazard is severe. The subsoil of both soils has moderate shrink-swell potential. During winter and early spring a seasonal high water table is at a depth of 2 to 3 feet in the Craven soil and 3 ½ feet to 5 feet in the Uchee soil. This soil is in capability subclass IVe. These soils are in hydrologic soil group C and A.

Emporia complex appears on side slopes along drainageways. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of 45-50 inches and is yellowish brown loam with mostly strong brown mottles in the upper parts; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated gray, brown, and red, firm sandy clay loam to a depth of at least 75 inches. In this Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential. A perched high water table is at a depth of 3 to 4 ½ feet in winter and spring. This soil is in capability subclass VIIe. The hydrologic soil group for this soil is C.

Kempsville-Emporia fine sandy loam consists of deep, gently sloping, well drained soils that are so intermingled that it is not practical to separate them at the scale used in mapping. Areas of this complex are on medium to broad upland ridges and side slopes. Typically, the surface layer of this Kempsville soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is light yellowish brown fine sandy loam 10 inches thick. The subsoil extends to a depth of 55 inches. It is yellowish brown and strong brown fine sandy loam and sandy clay loam to a depth of 32 inches. Below this, the subsoil is mottled fine sandy loam that is somewhat firm and compact over yellowish brown sandy clay loam. The substratum is yellowish brown fine sandy loam to a depth of at least 68 inches. Typically, the Emporia soil is as described above. The permeability of the Kempsville soil is moderate. In the Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and is easily tilled throughout a wide range of moisture conditions. The subsoil of the Kempsville soil has low shrink-swell potential, and the Emporia soil has a moderate shrink-swell potential. Both soils are low in organic matter content and natural fertility. Both soils are very strongly acid or strongly acid, both reaction in the surface layer varies because of local liming practices. The Emporia soil has a perched high water table at a depth of 3 to 4-1/2 feet in winter and spring. The soils in this complex are in capability subclass IIe. The hydrology soil group for this soil is B and C.

Suffolk fine sandy loam is deep, gently sloping and well drained. It is long, narrow areas on broad uplands and on side slopes next to drainageways. Typically, the surface layer of this soil is very dark, grayish brown fine sandy loam about 4 inches thick. The subsurface layer is yellowish brown fine sandy loam 10 inches thick. The subsoil is strong brown fine sandy loam and sandy clay loam 26 inches thick. The substratum is brown loamy fine sand to a depth of at least 64 inches. The permeability of this Suffolk soil is moderate, and available water capacity is moderate. The erosion hazard is moderate. The surface layer is friable and easily tilled throughout a wide range of moisture conditions. The subsoil has a low shrink-swell potential. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid in the surface layer and upper part of the subsoil, but reaction in the surface layer varies because of local liming practices. The lower part of the subsoil and the substratum range from extremely acid to medium acid. The soil is in capability subclass IIe. The hydrology soil group for this soil is B.

CRITICAL EROSION AREAS

The soils identified on the site suggest a slight to moderate erosion hazard. The areas with greater than 25% slopes are the side slopes of the existing lake and the side slopes of the new infiltration basin. As no work will be done adjacent to the existing lake, and the new infiltration basin will be regraded as part of this plan, no critical erosion areas are pertinent to this site.

EROSION AND SEDIMENT CONTROL MEASURES

All vegetative and structural erosion and sediment control practices will be constructed and maintained according to minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, 1992, and in accordance with James City County Standards. Detailed plans of erosion control for each phase will be prepared which will include all elements of location of all control practices.

STRUCTURAL PRACTICE:

The following control practices are anticipated for this project.

1. TEMPORARY CONSTRUCTION ENTRANCE (3.02)

   Temporary construction entrance shall be installed where shown on the plans.

2. CONSTRUCTION ROAD STABILIZATION (3.03)

   Proposed roadway areas shall receive the base course of gravel as soon as practical following grading and subbase preparation.

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3. SILT FENCE (3.05)

Silt fence shall be installed where shown on the plans.

4. STORM DRAIN INLET PROTECTION (3.07)

Storm drain inlet protection will be installed for all drainage inlet structures.

5. TEMPORARY DIVERSION DIKE (3.09)

Diversion dikes shall be installed where shown on the plans.

6. TEMPORARY FILL DIVERSION (3.10)

Temporary fill diversions shall be constructed at the top of all fill areas at the end of each workday as needed.

7. OUTLET PROTECTION (3.18)

Outlet protection shall be placed at all drainage outfalls.

8. TREE PROTECTION (3.38)

Tree protection fencing or other suitable devices shall be placed along the "limits of clearing" to protect desirable trees from mechanical and other injury during land disturbing and construction activity.

VEGETATIVE PRACTICES:

1. TOPSOIL STOCKPILE

Topsoil shall be stripped from areas to be graded and stockpiled for later use. Stockpile locations shall be determined at pre-construction meeting.

2. TEMPORARY SEEDING (3.31)

All distributed areas on-site will be seeded with fast-germinating, temporary vegetation immediately following grading or where exposed soil surfaces will not be brought to final grade for a period of time exceeding 30 days. Selection of the appropriate seed mixture as recommended by the Virginia Erosion and Sediment Control Handbook, 1992 will depend on the time of year it is to be applied.

CONSTRUCTION SEQUENCE

1. Establish tree protection and clearing limits flagging.

2. Clear sufficient area for placement of construction entrances. The construction entrances shall be in place immediately (no longer than 24 hours) following clearing activities.

3. Clear sufficient areas to allow the grading of the stormwater facility.

4. Place perimeter silt fence and construction of perimeter diversion dikes.

5. Proceed with site clearing and grubbing operation and commence rough grading.

6. Installation of the storm drainage system shall commence as soon as practical during or following grading activities for a particular area. Preparation of the roadway subgrade and installation of sewer and water utilities may commence at this time. Storm drain inlet protection shall be required as soon as inlet structures are in place.

7. Commence installation of curbing and roadway base courses.

8. Temporary or permanent soil stabilization shall be required for all denuded lot areas.

9. During all phases of construction, the contractor shall perform daily inspection of all receiving drainage outfalls and basin outfalls for sediment transport from Grace Covenant Presbyterian Church construction. Accumulated sediment build up is to be removed and disposed of on-site after each storm event. The contractor shall be responsible for any additional sediment controls and removal of sediment caused by Grace Covenant Presbyterian Church construction. The off-site bmp facility is not to be used for sediment control and additional controls/ clearing may be needed.

PERMANENT STABILIZATION

All areas disturbed by grading will be stabilized with permanent seeding immediately following finish grading. Seeding will be done according to Std. and Spec. 3.32 of the Virginia erosion and Sediment Control Handbook, 1992. Permanently seeded areas shall be protected during establishment with straw mulch.

MAINTENANCE

Maintenance of temporary erosion and sediment control devices is the responsibility of the developer. In general, all erosion and sediment control measures shall be checked weekly and

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after each significant rainfall. Silt fencing shall be inspected immediately after each rainfall and at least daily during prolonged rainfall for undermining or repair. All seeded areas shall be checked to insure a good stand of grass is maintained. Seeded areas deficient shall be reseeded as necessary.

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JAMES CITY COUNTY EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN CHECKLIST

James City County, Virginia
Environmental Division

Erosion and Sediment Control and Stormwater Management Design Plan Checklists

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GENERAL INFORMATION

Project Name: Faith Fellowship Assembly of God
Owner / Applicant: Same
Plan Preparer: LandMark Design Group Email: cbodnar@landmarkdg.com
Project Location: School House Lane
Tax Map / Parcel: 1220100022
County Plan No. (if known):
County BMP Type: Infiltration Basin (C - 4)

Other information submitted in addition to this checklist (Check all that apply):

- ☒ Design or Construction Drawings (Plans, Profiles, Details, etc.).
- ☒ Erosion & Sediment Control Plan (Plans, Details, etc.).
- ☐ Erosion & Sediment Control Plan Design Report.
- ☒ Stormwater Management Design Plan (Plans, Profiles, Details, etc.).
- ☐ Stormwater Management Design Report.
- ☐ Other, List:

Issue Date
March 1, 2001

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

I. *GENERAL:*

Yes	No	N/A	
☒	☐	☐	*FAMILIARITY* with current versions of Chapter 8, Erosion and Sedimentation Control and Chapter 23, Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia and the Virginia Erosion and Sediment Control Handbook (VESCH).
☒	☐	☐	*LAND DISTURBING PERMIT AND SILTATION AGREEMENT* with surety are required for the project.
☐	☒	☐	*VARIANCE* if necessary, requested in writing, for the plan approving authority to waive or modify any of the minimum standards and specifications of the VESCH deemed inappropriate based on site conditions specific to this review case only. Variances which are approved shall be properly documented in the plan and become part of the approved erosion and sediment control plan for the site.

II. *SITE PLAN:*

Yes	No	N/A	
☒	☐	☐	*VICINITY MAP* locating the site in relation to the surrounding area. Include any major landmarks which might assist in physically locating the site.
☒	☐	☐	*INDICATE NORTH* direction in relation to the site.
☒	☐	☐	*LIMITS OF CLEARING AND GRADING* for the site including that required for implementation of erosion and sediment controls, stockpile areas and utilities.
☒	☐	☐	*DISTURBED AREA ESTIMATES* in acres or square feet for the project.
☒	☐	☐	*EXISTING TOPOGRAPHY* or contours for the site at no more than 5 foot contour interval.
☒	☐	☐	*FINAL TOPOGRAPHY*, contours or proposed site grading in accordance with the design plan which indicates changes to existing topography and drainage patterns at no more than 2 foot contour interval (or 1 foot contours where required).
☒	☐	☐	*EXISTING AND PROPOSED SPOT ELEVATIONS* to supplement existing and proposed contours, topography or site grading information. Spot elevations may replace final contours in some instances, especially if terrain is in a low lying area or relatively flat.
☒	☐	☐	*EXISTING VEGETATION* including existing tree lines, grassed or unique vegetation areas.

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Yes	No	N/A	
☒	☐	☐	*EXISTING SITE FEATURES* including roads, buildings, homes, utilities, streams, fences, structures and other important surface features of the site.
☒	☐	☐	*SOILS MAP* with soil symbols, boundaries and legend in accordance with the current Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.
☒	☐	☐	*ENVIRONMENTAL INVENTORY* in accordance with Section 23-10(2) of the Chesapeake Bay Preservation Ordinance of James City County. Inventory generally includes: tidal shores and wetlands, non-tidal wetlands, resource protection area, hydric soils and slopes steeper than 25 percent. For wetlands, provide a copy of issued permits or satisfactory evidence that appropriate permits are being pursued for the entire project.
☒	☐	☐	*100-YEAR FLOODPLAIN LIMITS* or any special flood hazard areas or flood zones based on appropriate Federal Management Agency Flood Insurance Rate Maps (FIRMs) or Flood Hazard Boundary Maps (FHBMs) of James City County, Virginia.
☒	☐	☐	*DRAINAGE AREAS* for offsite and onsite areas, existing or proposed as applicable. Include drainage divides and directional labels for all subareas at points of interest and size (in acres), weighted runoff coefficient or curve number and times of concentration for each subarea.
☒	☐	☐	*CRITICAL EROSION AREAS* which require special consideration or unique erosion and sediment control measures. Refer to the VESCH, Chapter 6 for criteria.
☒	☐	☐	*DEVELOPMENT PLAN* for the site showing all improvements such as buildings, structures, parking areas, access roadways, above and below ground utilities, stormwater management and drainage facilities, trails or sidewalks, proposed vegetation and landscaping, amenities, etc.
☒	☐	☐	*LOCATION OF PRACTICES* proposed for erosion and sediment control, tree protection and temporary stormwater management due to land disturbance activities at the site. Use standard abbreviations, labels and symbols consistent for plan views based on minimum standards and specifications in Chapter 3 of the VESCH.
☒	☐	☐	*TEMPORARY STOCKPILE AREAS* or staging and equipment storage areas as required for onsite or offsite construction activities or indicate that none are anticipated for this project.
☐	☐	☒	*OFFSITE LAND DISTURBING AREAS* including borrow sites, waste areas, utility extensions, etc. and required erosion and sediment controls. If none are anticipated for the project, then indicate on the plans by general or erosion and sediment control notes.
☒	☐	☐	*DETAILS* or alternately, appropriate reference to current minimum standards and specifications of the VESCH for each measure proposed for the project. Non-modified, standard duplicated details (silt fence, diversion dikes, etc.) may be referenced to the current version of the VESCH. Specific dimensional or modified standards (basins, traps, outlet protections, check dams, etc.) require presentation on detail sheets. Schedules or tables may be used for multiple site measures such as sediment traps, basins, channels, slope drains, etc. Any modification to standard details should be clearly defined, explained and illustrated.

Yes No N/A

☒ ☐ ☐ *MAINTENANCE PLAN* or alternately, appropriate reference to current minimum standards and specifications of the VESCH, outlining the inspection frequency and maintenance requirements for all erosion and sediment control measures proposed for the project.

☐ ☐ ☒ *TRENCH DEWATERING* methods and erosion and sediment controls, if anticipated for the project.

☒ ☐ ☐ *CONSTRUCTION SEQUENCE* outlining the anticipated sequence for installation of erosion and sediment controls and site, grading and utility work to be performed for the project by the site contractor.

☐ ☐ ☒ *PHASING PLAN* if required for larger project sites that are to be developed in stages or phases.

☒ ☐ ☐ *STANDARD COUNTY NOTES* are required to be placed on the erosion and sediment control plan. Refer to the standard James City County Erosion and Sediment Control Notes dated May 5, 1999.

☒ ☐ ☐ *PROFESSIONAL SEAL AND SIGNATURE* required on final and complete approved plans, drawings, technical reports and specifications.

III. *NARRATIVE:*

Yes No N/A

☒ ☐ ☐ *PROJECT DESCRIPTION* briefly describing the nature and purpose of the land disturbing activity and the acreage to be disturbed.

☒ ☐ ☐ *EXISTING SITE CONDITIONS* description of existing topography, land use, cover and drainage patterns at the site.

☒ ☐ ☐ *ADJACENT AREA* descriptions of neighboring onsite or offsite areas such as streams, lakes, property, roads, etc. and potential impacts due to concentrated flow or runoff from the land disturbing activity.

☒ ☐ ☐ *OFFSITE DISTURBED AREA* descriptions of proposed borrow sites, waste or surplus areas, utility extensions and erosion and sediment controls to be implemented.

☒ ☐ ☐ *SOILS DESCRIPTION* briefly summarizing site, disturbed area and drainage basin soils including name, unit, hydrologic soil group (HSG) classification, surface runoff potential, erodibility, permeability, depth, texture, structure, erosion hazards, shrink-swell potential, limitations for use and anticipated depths to bedrock and the seasonal water table, as applicable.

☒ ☐ ☐ *CRITICAL AREAS* on the site which many have potentially serious erosion and sediment control problems and special considerations required (ie. steep slopes, hydric soils, channels, springs, sinkholes, water supply reservoirs, groundwater recharge areas, etc.)

Yes No N/A

☒ ☐ ☐ *PROPOSED EROSION & SEDIMENT CONTROL MEASURES* inclusive to the specific erosion and sediment control plan as proposed for the land disturbing activity. Measures should be consistent with those proposed on the site drawings. Address general use, installation, limitations, sequencing and maintenance requirements for each control measure.

☒ ☐ ☐ *STABILIZATION MEASURES* required for the site, either temporary or permanent, and during and following construction including temporary and permanent seeding and mulching, paving, stone, soil stabilization blankets and matting, sodding, landscaping or special stabilization techniques to be utilized at the site.

☒ ☐ ☐ *STORMWATER MANAGEMENT CONSIDERATIONS* for the site, either of temporary or permanent nature, and strategies, sequences and measures required for control. May reference the stormwater management plan for the site, if prepared, for permanent stormwater management facilities and control of drainage once the site is stabilized.

IV. *CALCULATIONS:*

Yes No N/A

☒ ☐ ☐ *CALCULATIONS AND COMPUTATIONS* associated with hydrology, hydraulics and design of proposed temporary and permanent erosion and sediment control measures including: sediment traps and basins, diversions, stormwater conveyance channels, culverts, slope drains, outlet protections, etc. Computations are not required on the construction plan and may be attached in a supplemental erosion and sediment control plan design report, if presented in a clear and organized format.

☐ ☐ ☒ *TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET* submitted for each basin along with schematic or sketch cross-section showing applicable design and construction data, storage volumes (wet-dry), dimensions and elevations. Peak design runoff to be based on the 2- or 25-year design storm event based on maximum disturbed site conditions (existing, interim or proposed conditions) in accordance with Minimum Standard 3.14 of the VESCH.

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

I. *GENERAL:*

Yes	No	N/A	
☒	☐	☐	*FAMILIARITY* with current versions of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual; Chapter 8, Erosion and Sediment Control and Chapter 23, Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia; the Virginia Erosion and Sediment Control Handbook (VESCH); and the Virginia Stormwater Management Handbook (VSMH).
☐	☒	☐	*WAIVER OR EXCEPTION* if necessary, requested in writing, for the plan approving authority to waive or except the requirements of Chapter 23, Chesapeake Bay Preservation ordinance in accordance with procedure established in Sections 23-14 through 23-17 of the ordinance. Applies to this review case only.
☐	☒	☐	*VARIANCE REQUEST* if necessary, requested in writing for the plan approving authority to waive or modify any of the minimum standards and specifications of the VESCH deemed inappropriate based on site conditions specific to this review case only. Variances which are approved shall be properly documented in the plan and become part of the approved erosion and sediment control plan for the site.
☒	☐	☐	*PROFESSIONAL SEAL AND SIGNATURE* required on final and complete approved stormwater management plans, drawings, technical reports and specifications.
☒	☐	☐	*WORKSHEET FOR BMP POINT SYSTEM* to ensure the stormwater management plan for the project attains at least 10 BMP points (New Development) or traditional pollutant load reduction computations per the Chesapeake Bay Local Assistance Manual (Redevelopment Only).
☐	☐	☒	*PROPOSED CONSERVATION EASEMENT AREAS* for any natural open space points claimed in the BMP worksheet.
☒	☐	☐	*INSPECTION/MAINTENANCE AGREEMENT* is required to be prepared and executed with the County for the project.
☒	☐	☐	*FEMA FIRM PANEL* reference with designated special flood hazard areas or zone designations associated with the site, as applicable.
☒	☐	☐	*DRAINAGE AREA MAP* at a maximum scale of 1"=200' scale showing drainage area boundaries for pre- and postdevelopment conditions and associated time of concentration flow paths. Labels to include drainage area size, runoff coefficient or curve number and time of concentration for each subarea shown on the map.

Yes	No	N/A	
☒	☐	☐	*SOILS MAP* with soil symbols, boundaries and legend in accordance with the current Soil Survey of James City and York Counties and the City of Williamsburg, Virginia with approximate locations of the project site, BMPs and applicable drainage basins.
☒	☐	☐	*STORMWATER MANAGEMENT NARRATIVE* in a brief and simple format which describes the project; location; site and drainage basin soil characteristics; receiving water or drainage facility; existing site and drainage basin conditions (topography, land use, cover, slopes, etc.); proposed site development; proposed stormwater management and drainage plan including County BMP type selected; summary of hydrology and hydraulics; maintenance program; and any special assumptions utilized for development of the stormwater management and drainage design plan or computations.
☐	☐	☒	*TEMPORARY STORMWATER MANAGEMENT* (if applicable) for control of stormwater runoff encountered during construction activities in addition to measures provided in the erosion and sediment control plan or stormwater management/drainage plan for the site. Adequate protection measures or sequencing provided.
☐	☐	☒	*MODIFICATION PLAN* clearly defined for temporary sediment control structures which will be converted to permanent SWM/BMP structures. Includes appropriate hydrologic and hydraulic computations, conversions, sequencing and cleanout information or details. Normally related to primary control structures associated with dry detention or wet retention ponds. Normally not permitted for Group C or D categories such as bioretention, infiltration and filtering system facilities.
☒	☐	☐	*STORMWATER MANAGEMENT and DRAINAGE DESIGN REPORT* in a bound 8-1/2 x 11 inch size format. Report shall generally include a title sheet, date, project identification, owner and preparer information, table of contents, narrative, summaries and computations as required. Computations may include: backwater, closed conduit, headwater, hydraulic, hydraulic grade line, hydrology, inlet, open channel, storm sewer, water quality, extended detention or stream channel protection and muti-stage storm routing calculations, as applicable, for the project. Computation data may include hand or computer generated computations, maps or schematics. All information should be presented in a clear, easy to follow format and should closely match construction plan information.
☒	☐	☐	*PLAN VIEW* at 1 inch = 50 ft. scale or less (1" = 40', 1" = 30', etc.)
☒	☐	☐	North arrow and plan legend.
☒	☐	☐	Property lines.
☒	☐	☐	Adjacent property information.
☒	☐	☐	Existing site features and existing impervious cover areas.
☒	☐	☐	Impervious cover tabulations.
☒	☐	☐	Existing drainage facilities (natural or manmade).
☒	☐	☐	Existing environmentally sensitive areas (RPA, wetlands, floodplain, steep slopes, critical soils, buffers, etc.).
☒	☐	☐	Existing and proposed contours (1' or 2' contour interval) and spot elevations as necessary to define high and low topography.
☒	☐	☐	Existing and proposed easement locations.

Yes	No	N/A	
☒	☐	☐	Proposed site improvements and proposed impervious cover areas.
☒	☐	☐	Proposed stormwater conveyance, drainage and management facilities with appropriate labeled construction data and information.
☒	☐	☐	Proposed landscaping and seeding plans (disturbed areas, pond interior, etc.).
☒	☐	☐	Proposed slope stabilization areas (riprap, blankets, mattings, walls, etc.).
☒	☐	☐	Delineation of permanent pools and the 1-, 2-, 10- and 100-year Design Water Surface Elevations.
☒	☐	☐	Delineation of ponding, headwater, surcharge or backwater areas which may affect adjacent existing or proposed buildings, structures or upstream adjacent properties.
☒	☐	☐	Test boring locations with reference surface elevations (if known).
☒	☐	☐	Risers, barrels, underdrains, overflows and outlet protections.
☒	☐	☐	Emergency spillway level section and outlet channel.
☒	☐	☐	Existing and proposed site utilities and protection measures.
☒	☐	☐	Erosion and sediment control measures (for site or BMP).
☒	☐	☐	Maintenance or access corridors to permanent stormwater management, BMP or drainage facilities.

II. *STORMWATER CONVEYANCE SYSTEMS:*

Yes	No	N/A	
☒	☐	☐	*PLAN VIEWS*
	☒	☐	☐ Storm drain lengths, sizes, types, classes and slopes for all segments. Label directly on plan or use structure/pipe schedule.
	☒	☐	☐ Access structure (inlets, manholes, junctions, etc.) rim elevations, inverts, type and required grate or top unit and lengths labeled.
	☒	☐	☐ All structure numbers labeled.
	☒	☐	☐ Adequate horizontal clearance from other site utilities or structures.
☐	☒	☐	*PROFILES* generally are not required but are encouraged to expedite review. If not provided, ensure all pipe segments have adequate minimum cover, do not exceed maximum depths of cover for the type/class of pipe specified and do not conflict with other site utilities or excavation areas.
☒	☐	☐	*DETAILS*
	☐	☒	☐ Typical storm drain bedding details or reference note.
	☒	☐	☐ Standard details or reference note for all proposed access structure types (inlets, manholes, junctions, etc.).
	☒	☐	☐ Inlet shaping detail or applicable reference note.
	☒	☐	☐ Step detail or applicable reference note (if depth 4 ft. or more).
	☒	☐	☐ Typical open channel details with designation, location, shape, type, bottom width, top width, lining, slope, length, side slope, and installation depth required for construction. Channel design data as necessary may also be included.
	☒	☐	☐ Outlet protections at all pipe outfalls.

Yes No N/A

☒ ☐ ☐ *STORMWATER CONVEYANCE SYSTEM COMPUTATIONS*

- ☒ ☐ ☐ Storm Sewer Design computations based on 10-year design event.
- ☒ ☐ ☐ Hydraulic Grade Line computations based on 10-year design event.
- ☐ ☒ ☐ Inlet computations based on current VDOT procedure for spread, ponding depth and grate size required.
- ☒ ☐ ☐ Culvert Headwater computations. Design based on 10-year design storm event and check only for 100-year storm event.
- ☒ ☐ ☐ Open Channel computations based on 2-year design event for velocity and 10-year design event for capacity.
- ☒ ☐ ☐ Standard outlet protection or special energy dissipators.
- ☐ ☒ ☐ Pipe thickness design computations, as required, for selected pipe type (live load, minimum cover, maximum height of cover, etc.).
- ☒ ☐ ☐ Adequate channel computations for receiving channels (based on field measured channel section data).

III. *STORMWATER MANAGEMENT / BMP FACILITIES*:

Yes No N/A

☒ ☐ ☐ *HYDROLOGY* - An SCS based methodology is required for the design of stormwater management/BMP facilities with watersheds exceeding 20 acres. Under 20 acres, other generally accepted methodologies such as the modified rational, critical storm are allowable. Refer to Chapter 5 of the VESCH or Chapter 5 of the VSMH.

- ☒ ☐ ☐ Runoff Curve Number or Coefficient determinations: predeveloped and ultimate development land use scenarios.
- ☒ ☐ ☐ Time of concentration: predeveloped and ultimate development indicating overland, shallow concentrated, and channel flow components (200 ft. maximum length for overland flow).
- ☒ ☐ ☐ Hydrograph generation (tabular or graphical): pre- and postdevelopment conditions for the 1-, 2-, 10-, and 100-year design storm events.

☒ ☐ ☐ *FACILITY CONFIGURATION and MINIMUM SEPARATIONS*

- ☒ ☐ ☐ Screening and layout consistent with Section 24-98(d) of the Chapter 24 Zoning ordinance (landscaping, screening, visibility, etc.).
- ☒ ☐ ☐ Basic considerations for safety and unauthorized entry.
- ☒ ☐ ☐ Proper length to width ratio (Typically 2H:1V).
- ☐ ☒ ☐ Facilities with deep pools (4 feet or more in depth) provided with two benches. Fifteen (15) ft. safety bench outward from normal pool at maximum 6 percent slope and aquatic bench inward from normal shoreline below normal pool. Narrower widths may be considered on a case-by-case basis.
- ☒ ☐ ☐ Pond buffer minimum 25 feet outward from maximum design WSEL. Additional setbacks may be required to permanent structures.
- ☒ ☐ ☐ No trees, shrubs or woody plants within 15 feet of embankment toe or 25 feet from principal spillway structure.

Yes No N/A

☒ ☐ ☐ Infiltration and filtering system facilities generally located at least 100 feet horizontally from any water supply well; 100 feet from any downslope building; and 25 feet from any upslope buildings, unless site specific investigation allows for reduced separation.

Yes No N/A

☒ ☐ ☐ *HYDRAULIC COMPUTATIONS*

- ☒ ☐ ☐ Elevation- or Stage- Storage curve and/or tabular data.
- ☒ ☐ ☐ Weir / Orifice Control - Extended Detention.
- ☒ ☐ ☐ Weir / Orifice Control - riser 1-year control for channel protection.
- ☒ ☐ ☐ Weir / Orifice Control - riser 2-year control for quantity (if required).
- ☒ ☐ ☐ Weir / Orifice Control - riser 10-year control for quantity (if required).
- ☒ ☐ ☐ Inlet / Outlet (barrel) control - (All Storms).
- ☒ ☐ ☐ Check for barrel control prior to riser orifice flow to prevent slug flow-water hammer conditions.
- ☒ ☐ ☐ Emergency spillway capacity and depth of flow.
- ☒ ☐ ☐ Elevation - Discharge (Outlet Rating) curve and/or table. Provide all supporting calculations and/or design assumptions.
- ☒ ☐ ☐ Adequate channel computations for receiving channel. May be waived if facility is designed based on current Stream Channel Protection criteria.

☒ ☐ ☐ *POND or RESERVOIR ROUTING*

- ☒ ☐ ☐ Storage-Indication Routing of postdeveloped inflow hydrographs for the 1-, 2-, 10-, and 100-year design storms. Preference is for structure to discharge up to the 10-year storm through the principal spillway and pass the 100-year storm with a minimum 1 foot of freeboard through a combination principal and emergency spillways. If no emergency spillway is provided, riser must be large enough to pass the design high water flow and trash without overtopping the facility, have 3 square feet or more of cross-sectional area, contain a hood type inlet and have a minimum freeboard of 2 feet. Token spillways with minimum 8 ft. width are also recommended at or above the design 100-year storm elevation.
- ☐ ☒ ☐ Downstream hydrographs at established study points, if conditions warrant (ie. facility discharge combined with uncontrolled bypass).

☒ ☐ ☐ *MISCELLANEOUS COMPUTATIONS*

- ☒ ☐ ☐ Water quality volume for permanent pool based on selected BMP treatment volume (WQv).
- ☒ ☐ ☐ Water quality volume for extended detention based on selected BMP treatment volume (WQv) with drawdown computations.
- ☒ ☐ ☐ Drawdown computations for the 1-year, 24 hour detention for stream channel protection criteria.
- ☒ ☐ ☐ Pond drain computations (within 24 hours).
- ☐ ☐ ☒ Anti-seep collar design (concrete preferred) or match material type.
- ☐ ☐ ☒ Filter diaphragm design (or alternative method of controlling seepage).

Yes No N/A

☐ ☐ ☒ Riser / base structure flotation analyses. FS = 1.25 minimum.

☐ ☐ ☒ Downstream danger reach study and/or emergency action plan (if conditions warrant).

☐ ☐ ☒ Upstream backwater analyses onto offsite adjacent property (if conditions warrant).

☐ ☐ ☒ 100 year floodplain impacts (if conditions warrant).

Yes No N/A

☒ ☐ ☐ *GEOTECHNICAL REQUIREMENTS*

☒ ☐ ☐ Geotechnical Report with recommendations specific to BMP facility type selected. Report prepared by a registered professional engineer. Requires submission, review and approval prior to issuance of Land Disturbance Permit.

☒ ☐ ☐ Initial Feasibility Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).

☒ ☐ ☐ Concept Design Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).

☒ ☐ ☐ Minimum Boring locations: borrow area, pool area, principal control structure, top of facility near one abutment and emergency spillway if provided.

☒ ☐ ☐ Boring logs with Unified Soil Classification (ASTM D2487), soils descriptions and depths to bedrock and the seasonal water table indicated.

☐ ☒ ☐ Standard County Record Drawing/Construction Certification note provided on plan. *Note: It is understood that preparation of record drawings and construction certifications as required for project facilities may not necessarily be performed by the plan preparer. These components may be performed by others.*

☒ ☐ ☐ *PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS*

☒ ☐ ☐ *EXISTING GROUND AND PROPOSED GRADE*

☒ ☐ ☐ Embankment or excavation side slopes labeled (3H:1V maximum).

☒ ☐ ☐ Minimum top width labeled (per VESCH or VSMH requirements).

☒ ☐ ☐ Removal of unsuitable material under proposed facility (per Geotechnical Report requirements).

Yes No N/A

☒ ☐ ☐ *CORE TRENCH*

- ☒ ☐ ☐ Material (per plan or Geotechnical Report).
- ☒ ☐ ☐ Bottom width (4' minimum or greater as dictated by Geotechnical Report recommendations).
- ☒ ☐ ☐ Side slopes (1:1 maximum steepness)
- ☒ ☐ ☐ Depth (4' minimum or greater as dictated by Geotechnical Report).

☒ ☐ ☐ *PRINCIPAL CONTROL STRUCTURE. RISER OR SIMILAR STRUCTURE (DETAILS REQUIRED FOR ALL ITEMS)*

- ☒ ☐ ☐ Durable, watertight, resistant material (concrete preferred).
- ☒ ☐ ☐ Riser diameter is at least 1.25 times larger than barrel diameter.
- ☒ ☐ ☐ All pertinent dimensions and elevations shown.
- ☒ ☐ ☐ Control orifice or weir dimensions and elevations shown.
- ☐ ☐ ☒ Trash rack - removable - for each release.
- ☐ ☒ ☐ Anti-vortex device, baffle or plate.
- ☒ ☐ ☐ Riser base structure with dimensions and embedment specifications (concrete preferred).
- ☒ ☐ ☐ Interior access (steps, ladders, etc.) for maintenance for structures over 4 feet in height. Excessively high risers may need some form of exterior access on top portion.
- ☐ ☐ ☒ Low flow orifice with trash rack device.

☒ ☐ ☐ *PRINCIPAL CONTROL STRUCTURE OUTLET BARREL*

- ☒ ☐ ☐ Material (ASTM C-361 reinforced concrete pipe) with watertight joints. Prior approval required for all other pipe material (other RCP types, CMP, CPP, PVC, etc.).
- ☒ ☐ ☐ Support and bedding requirements for barrel - concrete cradles, etc. or as recommended by the Geotechnical Report.
- ☒ ☐ ☐ Pipe inverts, length, size, class and slope shown.
- ☒ ☐ ☐ Flared end section or endwall provided on barrel outlet.

☐ ☒ ☐ *SEEPAGE CONTROL*

- ☐ ☐ ☐ Phreatic line shown (4:1 slope measured from the intersection of the embankment and the principal spillway design high water).

- ☐ ☐ ☐ *ANTI-SEEP COLLARS*
  - ☐ ☐ ☐ Anti-seep collar, concrete preferred.
  - ☐ ☐ ☐ Size - 15 percent increase in length of saturation using outside pipe diameter.
  - ☐ ☐ ☐ Spacing and location on barrel (located at least 2 feet from a pipe joint).

☐ ☐ ☐ *FILTER DIAPHRAGMS*

☐ ☐ ☐ Design based on latest NRCS design methods and certified by a professional engineer.

Yes No N/A

☒ ☐ ☐ *ELEVATION AND DIMENSIONAL DESIGN DATA*

- ☒ ☐ ☐ Top of facility - construction height and settled height (10 percent settlement).
- ☒ ☐ ☐ Crest of principal control structure spillway at least one (1) foot below crest of emergency spillway, if provided.
- ☒ ☐ ☐ Minimum freeboard of one (1) foot above the 100-year design high water elevation for facilities <u>with</u> an emergency spillway.
- ☐ ☐ ☒ Minimum freeboard of two (2) feet above the 100-year design high water elevation for facilities <u>without</u> an emergency spillway or in accordance with the SCS National Engineering Handbook (prior approval required).
- ☒ ☐ ☐ Basin Sediment Clean-Out elevation (permanent mode). Typically 10 to 25 percent of water quality volume.

☒ ☐ ☐ *CROSS SECTION THROUGH FACILITY*

- ☒ ☐ ☐ Existing Ground.
- ☒ ☐ ☐ Proposed grade.
- ☒ ☐ ☐ Top of facility - constructed and settled.
- ☒ ☐ ☐ Location of emergency spillway with side slopes labeled (emergency spillway in cut).
- ☒ ☐ ☐ Bottom of core trench (4' minimum).
- ☒ ☐ ☐ Location of each soil boring.
- ☒ ☐ ☐ Barrel location.
- ☒ ☐ ☐ Existing and proposed utility location/protection.

☒ ☒ ☐ *EMERGENCY SPILLWAY PROFILE*

- ☐ ☐ ☐ Existing ground.
- ☐ ☐ ☐ Inlet, level (control) and outlet sections per SCS.
- ☐ ☐ ☐ Spillway and crest elevations.

☒ ☐ ☐ *PRETREATMENT DEVICES* of adequate depth and properly designed using required pretreatment volumes for the selected County BMP facility type. Including, but not limited to: sediment forebays, sediment basins, sumps, grass channels, gravel diaphragms, plunge pools, chamber separators, manufactured systems or other acceptable methods.

Yes	No	N/A	
☒	☐	☐	*CONSTRUCTION SPECIFICATIONS and NOTES*
☒	☐	☐	Anticipated sequence of construction for BMP (consistent with erosion and sediment control plan).
☒	☐	☐	Provisions to control base stream or storm flow conditions encountered during construction.
☒	☐	☐	Site and subgrade preparation requirements.
☒	☐	☐	Embankment, fill and backfill material soil and placement (lift) thickness requirements.
☒	☐	☐	Compaction and soil moisture content requirements.
☒	☐	☐	Geosynthetics for drainage, filtration, moisture barrier, separation, and reinforcement purposes.
☐	☐	☒	Clay or synthetic (PVC or HDPE) pond liners.
☒	☐	☐	Storm drain, underdrain and pipe conduit requirements.
☐	☐	☒	Minimum depth of pipe cover for temporary (construction) and final cover conditions.
☒	☐	☐	Permanent shutoff valve and pond drain.
☒	☐	☐	Concrete requirements for structural components.
☒	☐	☐	Riprap and slope protection.
☒	☐	☐	Access or maintenance road surface, base, subbase.
☒	☐	☐	Temporary and permanent stabilization measures.
☐	☐	☒	Temporary or permanent safety fencing.
☐	☐	☒	BMP Landscaping (deep, shallow, fringe, perimeter,etc.)
☒	☐	☐	Dust and traffic control (if warranted).
☒	☐	☐	Construction monitoring and certification by professional.
☐	☐	☐	Other: _____
☐	☐	☐	Other: _____.
☒	☐	☐	*MAINTENANCE PROVISIONS*
☒	☐	☐	Entity responsible for maintenance identified..
☒	☐	☐	Maintenance Plan which outlines the long-term schedule for inspection/maintenance of the facility and forebays
☒	☐	☐	Maintenance access from public right-of-way or publicly traveled road.
☒	☐	☐	Maintenance easement provided encompassing high water pool and buffer, principal and emergency spillways, outlet structures, forebays, embankment area and possible sediment-removal stockpile areas.
☒	☐	☒	Minimum 6 foot wide public safety shelf (landing) or alternative fencing.

IV. *OUTLET PROTECTIONS:*

Yes	No	N/A	
☒	☐	☐	Sized for maximum design release (generally 10-year storm).
☒	☐	☐	Flared end section or endwall.
☒	☐	☐	Dimensions.
☒	☐	☐	Rock or riprap size, quantity and placement thickness.
☒	☐	☐	Slope at 0 percent (Level Grade).
☐	☐	☒	Geotextiles (nonwoven).
☐	☐	☒	Special energy dissipators are required for design discharge velocities that exceed eighteen (18) feet per second; or if use of standard outlet protection would result in velocities exceeding permissible channel velocities; or if space restricts or limits their use.

V. *ADDITIONAL COMMENTS OR INFORMATION SPECIFIC TO THE PLAN:*

Plan Preparer: [signature]

Date: 29 July 2002

SWMProg/BMP/Checklist/ChkList

DRAINAGE CALCULATIONS

NARRATIVE

DRAINAGE NARRATIVE
FOR
FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

All drainage calculations have been performed in accordance with the requirements of the Virginia Department of Transportation *Drainage Manual.*

Pipe sizing calculations have been performed for all new storm drainage piping within the development. All pipes have been sized to have the following minimum standards:

- Minimum velocity of 2.50 feet per second per second per the *VDOT Drainage Manual.*
- Minimum cover of 2.0 feet.

The Stormwater management facilities consist of a new infiltration basin to be constructed at the rear of the site. The design calculations for this basin are included in this calculation package. A copy of the geotechnical report is included in the calculations package. The basin has been designed to meet the water quality and channel protection volumes for the site.

PRE-DEVELOPED TIME OF CONCENTRATION

LAKE
ANALYSES

PRE-DEVELOPED TIME OF CONCENTRATION CALCULATION FOR EXISTING LAKE, FAITH FELLOWSHIP CHURCH

LMDG File No. 1990220-000.05

- Drainage area to existing lake is 4.887 acres.

- Calculate the weighted runoff coefficient, c, for the existing drainage area.

Total Area = 4.887 acres
Total Pavement = 0.000 acres
Total Grass = 4.887 acres

$$c = \frac{\text{Pavement Area} * 0.9 + \text{Grass Area} * 0.3}{\text{Total Area}}$$

$$c = \frac{0.000 * 0.9 + 4.887 * 0.3}{4.887}$$

$$c = 0.30$$

- Calculate the time of concentration using the Kinematic Wave Formula:

$$t_c = 0.93 * \frac{L^{0.6} * n^{0.6}}{I^{0.4} * S^{0.3}}$$

where t_c is the time of concentration
L is the longest travel length of the runoff
n is the Manning's coefficient for the runoff surface
I is the rainfall intensity, and
S is the slope of the travel length.

- The longest travel length is 628 feet. The upper grade elevation is 91 and the lower grade elevation is 85.5 at the property line. This gives us a slope of 0.88%. As the existing property is a corn field, we will use a Manning's coefficient of 0.035 (rough grass channel).

- Since the rainfall intensity, I, is a factor of the time of concentration, we will assume that the time of concentration is 15 minutes. Using the Steel Formula for a 10-year storm event ($I = 143.72/(t_c + 19.2)$), this gives us an intensity of 4.20 inches per hour. We can now solve for the t_c.

$$t_c = 0.93 * \frac{628^{0.6} * 0.035^{0.6}}{4.20^{0.4} * 0.0088^{0.3}} = 13.84 \text{ minutes}$$

- As the calculated t_c does not equal the assumed value, recalculate the t_c.

  t_c equal 13.84 minutes, I equals 4.35 inches per hour.

  Recalculating t_c using Kinematic Wave results in t_c 13.64 minutes.

- As the calculated t_c does not equal the assumed value, recalculate the t_c.

  t_c equal 13.64 minutes, I equals 4.38 inches per hour.

  Recalculating t_c using Kinematic Wave results in t_c 13.60 minutes.

- As the calculated t_c does not equal the assumed value, recalculate the t_c.

  t_c equal 13.60 minutes, I equals 4.38 inches per hour.

- From this calculation, the time of concentration is 13.60 minutes for the overland flow.

ENTRANCE CULVERT RUNOFF CALCULATION

RUNOFF CALCULATION
FOR
ENTRANCE CULVERT, FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

- Drainage area to entrance culvert is 0.803 acres.

- Calculate the weighted runoff coefficient, c, for the drainage area.

Total Area	=	0.803 acres
Total Pavement	=	0.495 acres
Total Grass	=	0.308 acres

$$c = \frac{\text{Pavement Area} * 0.9 + \text{Grass Area} * 0.3}{\text{Total Area}}$$

$$c = \frac{0.495 * 0.9 + 0.308 * 0.3}{0.803}$$

$$c = 0.67$$

- Calculate the time of concentration using the Kinematic Wave Formula:

$$t_c = 0.93 * \frac{L^{0.6} * n^{0.6}}{I^{0.4} * S^{0.3}}$$

where t_c is the time of concentration
L is the longest travel length of the runoff
n is the Manning's coefficient for the runoff surface.
I is the rainfall intensity, and
S is the slope of the travel length.

- For our drainage area, the longest travel length is 61 feet. The upper grade elevation is 89.5 and the lower grade elevation is 86.8 at the beginning of the swale. This gives us a slope of 4.426%. As the overland distance includes both asphalt pavement and lawn area, a n value of 0.0215 will be used for the drainage area.

- Since the rainfall intensity, I, is a factor of the time of concentration, we will assume that the time of concentration is 10 minutes. Using the Steel Formula for a 10-year storm event ($I = 185.06/(t_c + 20.81)$), this gives us an intensity of 6.01 inches per hour. We can now solve for the t_c.

$$t_c = 0.93 * \frac{61^{0.6} * 0.0215^{0.6}}{6.01^{0.4} * 0.04426^{0.3}} = 1.36 \text{ minutes}$$

- As the calculated t_c is dramatically less than the standard starting time of concentration for a basin, the time of concentration is 10.00 minutes for the overland flow.

- The swale to the entrance culvert is 196-feet long with a slope of 0.77%. The swale will have 3:1 side slopes and a v-bottom. Assuming a depth of flow of 1-foot (Q=7.93 cfs) and using Manning's equation, we can calculate that the swale will have a velocity of 2.64 feet per second. The travel time within the swale is 74.2 seconds, or 1.24 minutes.

- The total time of concentration for the entrance culvert is 11.24 minutes. The 10-year storm intensity will be 5.77 inches per hour.

- Calculate the runoff.

  Q = c * I * A = 0.67 * 5.77 * 0.803

  Q = 3.10 cfs.

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 3.10 cfs is 0.70 feet with a velocity of 2.09 feet per second.

- Recalculate the total runoff using the revised velocity.

Travel time in swale	=	93.8 seconds, or 1.56 minutes.
Total time of concentration	=	11.56 minutes.
10-year Intensity	=	5.72 inches per hour.
Total runoff, Q	=	3.08 cfs

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 3.08 cfs is 0.70 feet with a velocity of 2.09 feet per second.

- Using Manning's equation, we can calculate that a 12-inch diameter pipe at 0.76% has a capacity of 3.11 cfs with a velocity of 3.95 feet per second. The travel time within the pipe is 10.1 seconds, or 0.17 minutes.

CULVERT N-1 RUNOFF CALCULATION

RUNOFF CALCULATION
FOR
CULVERT N-1, FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

- Drainage area to culvert N-1 is 0.593 acres.

- Calculate the weighted runoff coefficient, c, for the drainage area.

  Total Area = 0.593 acres
  Total Pavement = 0.385 acres
  Total Grass = 0.208 acres

  $$c = \frac{\text{Pavement Area} * 0.9 + \text{Grass Area} * 0.3}{\text{Total Area}}$$

  $$c = \frac{0.385 * 0.9 + 0.208 * 0.3}{0.593}$$

  $$c = 0.69$$

- The runoff from the entrance culvert will also flow to culvert N-1. The CA for the entrance culvert is 0.538 (Area of 0.803 times weighted "c" of 0.67). The CA for this drainage basin is 0.409. The accumulative CA for culvert N-1 is 0.947.

- The time of concentration to the end of the entrance culvert is 11.73 minutes. From the end of the entrance culvert to culvert N-1 is a 183-foot long ditch. This ditch will have side slopes of 3:1 and a longitudinal slope of 1%. Assuming a flow depth of 1-foot, using Manning's Equation, we can calculate that the velocity in the ditch is 3.01 feet per second. Thus, the travel time within the ditch is 60.8 seconds, or 1.01 minutes.

- The total time of concentration for the culvert N-1 is 12.74 minutes. The 10-year storm intensity will be 5.52 inches per hour.

- Calculate the runoff.

  $$Q = \text{Accumulated CA} * I = 0.947 * 5.52$$

  $$Q = 5.23 \text{ cfs.}$$

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 5.23 cfs is 0.81 feet with a velocity of 2.63 feet per second.

- Recalculate the total runoff using the revised velocity.

Travel time in ditch	=	69.6 seconds, or 1.16 minutes.
Total time of concentration	=	12.89 minutes.
10-year Intensity	=	5.49 inches per hour.
Total runoff, Q	=	5.20 cfs

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 5.20 cfs is 0.81 feet with a velocity of 2.62 feet per second.

- Recalculate the total runoff using the revised velocity.

Travel time in ditch	=	69.8 seconds, or 1.16 minutes.
Total time of concentration	=	12.89 minutes.
10-year Intensity	=	5.49 inches per hour.
Total runoff, Q	=	5.20 cfs

- Using Manning's equation, we can calculate that an 18-inch diameter pipe at 0.50% has a capacity of 7.43 cfs with a velocity of 4.20 feet per second. The travel time within the pipe is 33.3 seconds, or 0.55 minutes.

- The total travel time to Structure N-2 is 13.44 minutes.

CULVERT N-2A RUNOFF CALCULATION

RUNOFF CALCULATION
FOR
CULVERT N-2A, FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

- Drainage area to culvert N-2A is 1.822 acres.

- Calculate the weighted runoff coefficient, c, for the drainage area.

Total Area	=	1.822 acres
Total Pavement	=	0.627 acres
Total Grass	=	1.195 acres

$$c = \frac{\text{Pavement Area} * 0.9 + \text{Grass Area} * 0.3}{\text{Total Area}}$$

$$c = \frac{0.627 * 0.9 + 1.195 * 0.3}{1.822}$$

$$c = 0.51$$

- Calculate the time of concentration using the Kinematic Wave Formula:

$$t_c = 0.93 * \frac{L^{0.6} * n^{0.6}}{I^{0.4} * S^{0.3}}$$

where t_c is the time of concentration
L is the longest travel length of the runoff
n is the Manning's coefficient for the runoff surface
I is the rainfall intensity, and
S is the slope of the travel length.

- For our drainage area, the longest overland travel length is 249 feet. The upper grade elevation is 91.7 and the lower grade elevation is 86.8 at the flow line of the ditch. This gives us a slope of 1.968%. As the overland distance includes both asphalt pavement and lawn areas, an n value of 0.0215 will be used for the drainage area.

- Since the rainfall intensity, I, is a factor of the time of concentration, we will assume that the time of concentration is 10 minutes. Using the Steel Formula for a 10-year storm event ($I = 185.06/(t_c + 20.81)$), this gives us an intensity of 6.01 inches per hour. We can now solve for the t_c.

$$t_c = 0.93 * \frac{249^{0.6} * 0.0215^{0.6}}{6.01^{0.4} * 0.01968^{0.3}} = 4.04 \text{ minutes}$$

- As the calculated t_c is dramatically less than the standard starting time of concentration for a basin, the time of concentration is 10.00 minutes for the overland flow.

- The ditch to culvert N-2A is 511-feet long with an average slope of 1.53%. The ditch will have 3:1 side slopes and a v-bottom. Assuming a depth of flow of 1.5-feet (Q=32.96 cfs) and using Manning's equation, we can calculate that the swale will have a velocity of 4.88 feet per second. The travel time within the swale is 104.7 seconds, or 1.75 minutes.

- The total time of concentration for the culvert is 11.75 minutes. The 10-year storm intensity will be 5.68 inches per hour.

- Calculate the runoff.

  Q = c * I * A = 0.51 * 5.68 * 1.822

  Q = 5.28 cfs.

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 5.28 cfs is 0.75 feet with a velocity of 3.09 feet per second.

- Recalculate the total runoff using the revised velocity.

Travel time in swale	=	165.4 seconds, or 2.76 minutes.
Total time of concentration	=	12.76 minutes.
10-year Intensity	=	5.51 inches per hour.
Total runoff, Q	=	5.12 cfs

- Using Manning's Equation, we can determine that the depth of runoff for a flow of 5.12 cfs is 0.75 feet with a velocity of 3.07 feet per second.

- Recalculate the total runoff using the revised velocity.

Travel time in swale	=	166.4 seconds, or 2.77 minutes.
Total time of concentration	=	12.77 minutes.
10-year Intensity	=	5.51 inches per hour.
Total runoff, Q	=	5.12 cfs

- Using Manning's equation, we can calculate that a 15-inch diameter pipe at 0.70% has a capacity of 5.40 cfs with a velocity of 4.40 feet per second. The travel time within the pipe is 28.4 seconds, or 0.47 minutes.

- The total travel time to the Structure N-2 is 13.24 minutes.

STRUCTURE N-2 RUNOFF CALCULATION

RUNOFF CALCULATION
FOR
STRUCTURE N-2, FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

- Drainage area to structure N-2 is 0.325 acres.

- Calculate the weighted runoff coefficient, c, for the drainage area.

  Total Area = 0.325 acres
  Total Pavement = 0.200 acres
  Total Grass = 0.125 acres

  $$c = \frac{\text{Pavement Area} * 0.9 + \text{Grass Area} * 0.3}{\text{Total Area}}$$

  $$c = \frac{0.200 * 0.9 + 0.125 * 0.3}{0.325}$$

  $$c = 0.67$$

- The runoff from the culvert N-1 will also flow to structure N-2. The CA for culvert N-1 is 0.947. The CA for this drainage basin is 0.456. In addition, the runoff from culvert N-2A will also flow to structure N-2. The CA for culvert N-2A is 0.929. The accumulative CA for structure N-2 is 2.094.

- The total time of concentration for the structure N-2 is 13.44 minutes. The 10-year storm intensity will be 5.40 inches per hour.

- Calculate the runoff.

  $$Q = \text{Accumulated CA} * I = 2.094 * 5.40$$

  $$Q = 11.31 \text{ cfs.}$$

- Using Manning's equation, we can calculate that an 24-inch diameter pipe at 0.55% has a capacity of 16.00 cfs with a velocity of 5.09 feet per second. The travel time within the pipe is 27.5 seconds, or 0.46 minutes. Thus, the total time of concentration for the stormwater management facility is 13.90 minutes.

BMP POINTS CALCULATION

BmP

IMPORTANT MESSAGE

FOR Darryl

DATE 5/11 TIME _____ A.M. P.M.

M Stan Treeleaven

OF Faith Baptist Church

PHONE 566-3750
AREA CODE NUMBER EXTENSION

☐ FAX

☐ MOBILE
AREA CODE NUMBER TIME TO CALL

TELEPHONED	✓	PLEASE CALL	✓
CAME TO SEE YOU	✓	WILL CALL AGAIN	
WANTS TO SEE YOU		RUSH	
RETURNED YOUR CALL		WILL FAX TO YOU	

MESSAGE Wants to relocate retention pond. Will this hold up the CO inspection?

SIGNED Jim

TOPS FORM 4005 LITHO IN U.S.A.

BMP POINT CALCULATIONS
FOR
FAITH FELLOWSHIP ASSEMBLY OF GOD

LMDG File No. 1990220-000.05

- Per boundary of site, the site area is 8.00 acres.

- BMP Basin 1 is a ten-point infiltration basin to be constructed along the western boundary of the site. The total area served by this basin is 7.165 acres.

  BMP Points = $\frac{7.165}{8.00}$ x 10 = **8.96 BMP points**

- The portion of the site to the west of BMP Basin 1 drains to an existing lake. Per telephone conversations with Mr. Scott Thomas of the James City County Environmental Division, the existing lake may be considered an off-site BMP facility provided no additional flows are transferred to the lake by this development. Since the routing calculations prove that no additional flows are generated by the site, the existing lake, for the purpose of this calculation, will be considered a small wet pond (County BMP A-1) with a point value of 6. The total area of the site served by the existing lake is 1.629 acres.

  BMP Points = $\frac{1.629}{8.00}$ x 6 = **1.22 BMP points**

- Total BMP Points for Site = 8.96 + 1.22 = **10.18 BMP points**

GEO TECH

WATER QUALITY VOLUME CALCULATION

WATER QUALITY VOLUME CALCULATION
FOR
FAITH FELLOWSHIP CHURCH

LMDG File No. 1990220-000.05

- Per the *James City County Guidelines for Design and Construction of Stormwater Management* BMP's, an infiltration basin (County Type C-4 BMP) is required to have a water quality volume equal to 1-inch (0.08 feet) times the impervious area draining to the basin.

- The site is zoned B-1. Per County Ordinance, the ultimate impervious area for the site is 60% of the site area. The water quality design for this project will account for 50% of the entire site being impervious. Any impervious area above 50% will require modification to the water quality portion of this project. The site totals 8.00 acres. Thus, the design to impervious area is 4.00 acres, or 174,240 square feet.

- The water quality volume required, for the ultimate development, is 13,939 cubic feet (0.08 * 174240).

WQ sizing for ultimate 50% of 8 AC. SITE OR 4.0 AC

ACTUAL IMPERV 0.83 AC

$\frac{0.83}{4.00} = 20.8\%$

CHANNEL PROTECTION VOLUME CALCULATION

CHANNEL PROTECTION VOLUME CALCULATION

Project Name : Faith Fellowship Church
Proposed Stormwater Management

Project # : 1990220-000.05

One Year Precipitation : P= 2.8 Inches

TABLE F1 / TR-55 Coefficients for Rainfall Type II			
I_a/P	C_0	C_1	C_2
0.10	2.55323	-0.61512	-0.16403
0.30	2.46532	-0.62257	-0.11657
0.35	2.41896	-0.61594	-0.08820
0.40	2.36409	-0.59857	-0.05621
0.45	2.29238	-0.57005	-0.02281
0.50	2.20282	-0.51599	-0.01259

PRE-DEVELOPMENT CONDITIONS :

Drainage Area : DA_{PRE} = 4.87 Acres ✓
SCS Curve Number : CN_{PRE} = 66 Unitless
Time of Concentration : Tc_{PRE} = 0.227 Hours

Initial abstraction ; I_a=0.2x(1000/CN - 10) = 1.030 Inches
I_a/P = 0.37

Accumulated direct runoff : $Q_U = (P-I_a)^2 / (P+4xI_a)$ = 0.45 Inches

Unit Peak Discharge : q_u = 601 cfs/sq.mile/in.
$\log(q_u)=C_0+C_1\log(T_c)+C_2[\log(T_c)]^2$
C_0,C_1,C_2: Coefficients from TABLE F1 above

Pre-development peak discharge :
$q_p = q_u \times DA \times Q_U / 640$ = 2.07 c.f.s.

POST DEVELOPMENT CONDITIONS :

Drainage Area : DA_{POST} = 7.165 Acres ✓
SCS Curve Number : CN_{POST} = 85 Unitless
Time of Concentration Tc_{POST} = 0.23 Hours

Initial abstraction ; I_a = 0.353 Inches
I_a/P = 0.13
Accumulated direct runoff : Q_U = 1.42 Inches
Unit Peak Discharge : q_u = 757 cfs/sq.mile/in.
Post development peak discharge rate : $q_i = q_p$ = 12.05 c.f.s.

Ration of outflow to inflow : * $q_o/q_i = 11.98 \times q_u$^0.937 = 0.0240
* Direct calculation using equation for T=24hr. developed by Stewart Comstock,P.E., MDE

Peak outflow discharge : q_o = 0.2895 c.f.s.

Ratio of storage volume to runoff volume : V_s/V_r = 0.65
$V_s/V_r = 0.683-1.43(q_o/q_i)+1.64(q_o/q_i)^2-8.04(q_o/q_i)^3$ =

Required Storage Volume :
$V_s = V_s/V_r \times Q_u \times A/12 \times 43560$ = **24020** cubic feet

ESTIMATED POND FULL DRAWDOWN

H_{TRIAL} = 3.9 Feet
A_o = 0.0304803 sq. ft.
d_o = 2.3639899 inches

BMP BASIN 2 $D_{ORIFICE}$ = 4 inches

	W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f	H_{AVG} ft.	Q_{AVG} cfs	dT hours	
	85.00	22025	19719	87995	7.50	1.1379	4.8	
	84.00	17412	64629	68277	3.50	0.7672	23.4	
	83.00	14402	12946	45155	5.50	0.9704	3.7	
	82.00	11489	10131	32210	4.50	0.8747	3.2	
WQVSE	81.10	9044.6	20422	**24070**	**2.05**	**0.5766**	**9.8**	**CPVSE**
	81.00	8773	7770	22079	3.50	0.7672	2.8	
	80.00	6767	5990	14309	2.50	0.6418	2.6	
	79.00	5212	4672	8319	1.50	0.4852	2.7	
	78.00	4131	3648	3648	0.50	0.2426	4.2	
	77.00	3164	0	0	0.00			

DRAW DOWN TIME = 28.2

HYDRAULIC GRADELINE AND CULVERT CALCULATIONS

Project: Faith Fellowship Assembly of God
Location: School House Path
Design: C.J. Bodnar
Date: 7-Oct-02
Revision:

HYDRAULIC GRADELINE CALCULATIONS

Yr. Storm: 10

1. Enter Tailwater Elevation (ft.) ? 83.48

2. Enter "N" value for pipe?
RCP 0.013

FROM PT.	TO PT.	Q OUT (cfs)	PIPE MATERIAL	PIPE DIA.	L OUT (ft.)	FRICTION SLOPE	DNSTREAM INVERT	V OUT (FPS)	M.H.	INLET SHAPE	Q IN (cfs)	PIPE DIA.	F.L.E.	H.G.E.
N-2A	N-2	5.12	RCP	15	125	0.0063	82.83	4.17	N	Y	0.00	0	84.10	84.75
N-1	N-2	5.20	RCP	18	140	0.0025	82.58	2.94	N	Y	0.00	0	85.78	84.30
N-2	N-3	11.31	RCP	24	140	0.0025	81.88	3.60	N	Y	10.32	18	85.00	83.89

LD-269
Rev. 3-83

Project Faith Fellowship

Plan Sheet No. ____ Designer CJB
Rev. Date ____ Date 10/7/2002

Sheet 1 of ____

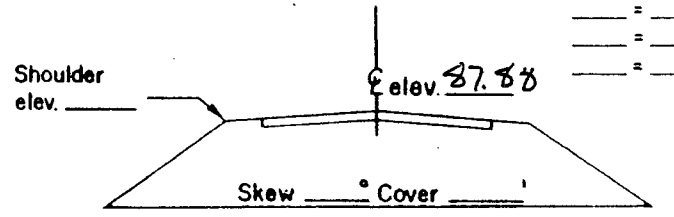
HYDROLOGICAL DATA:
D.A. = 0.803 AC.

ENTRANCE CULVERT

AHW Controls
100 yr. Flood plain ____ elev. ____
Design AHW depth ____ elev. ____
Structures ____ elev. ____

STATION ____

freq.	TW elev.
10	85.81



Inv. El. 85.31 — So = 0.76 % — Inv. El. 85.01
Orig. Gr. Elev. ____ — L = 40 — Orig. Gr. Elev. ____

DISCHARGES USED
Q 10 = 3.08 CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS

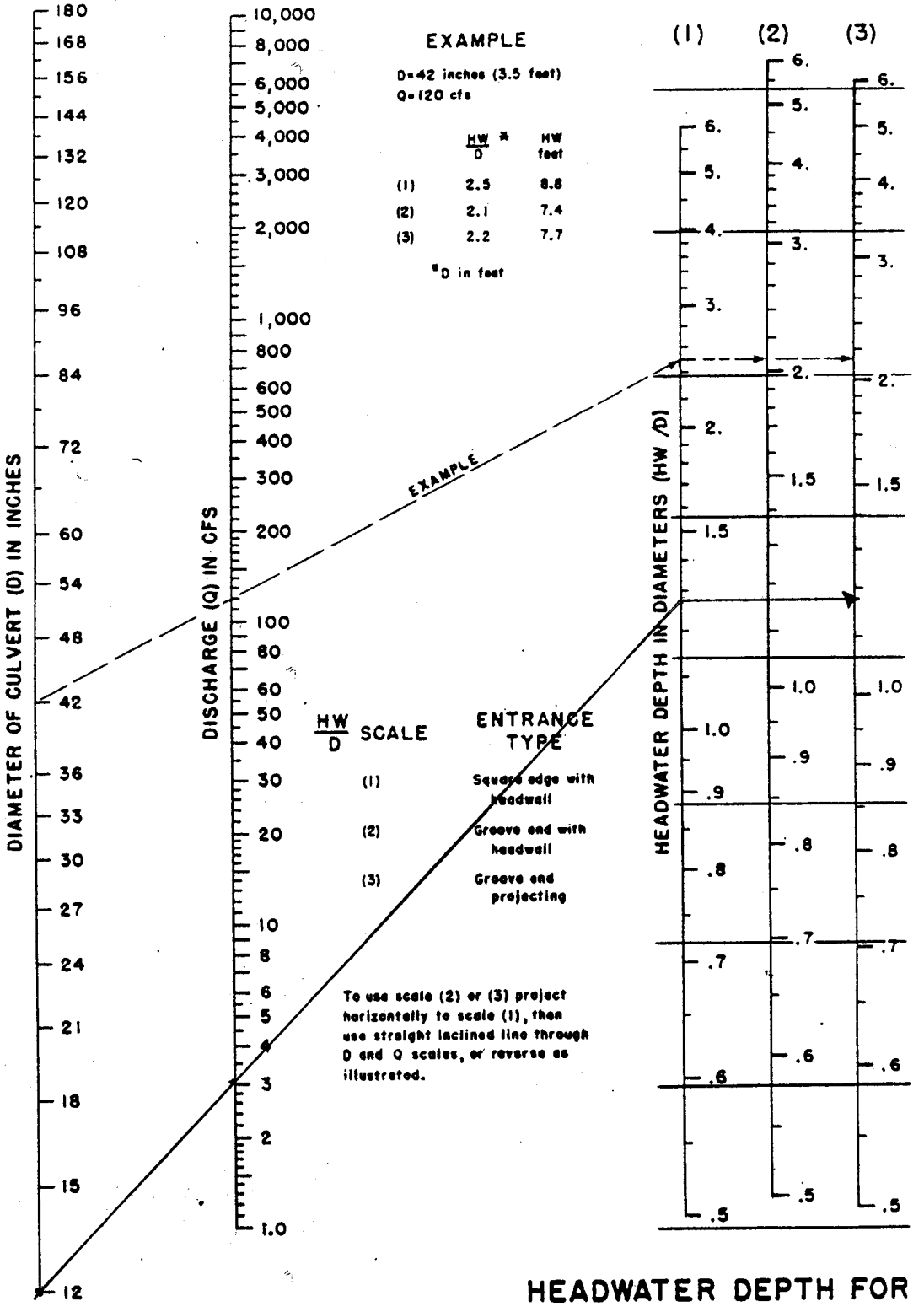
RISK ASSESSMENT
ADT ____
Detours Available ____, Length ____
Overtopping Stage 87.00
Flood Plain Management ____
Criteria and Significant Impact ____

240 A

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	OUTLET VELOCITY Smooth	End Treat.	COMMENTS
12" RCP	3.08	3.08	1.17 ✓	1.17	0.2	0.6	0.8	0.8	1.07	0.30	1.57	1.57 ✓		3.90 fps		HW @ upstream = 86.88 okay

Design Flood Exceed. Prob. ____ Elev. ____
Overtop Flood Exceed. Prob. ____ Elev. ____

CHART 1



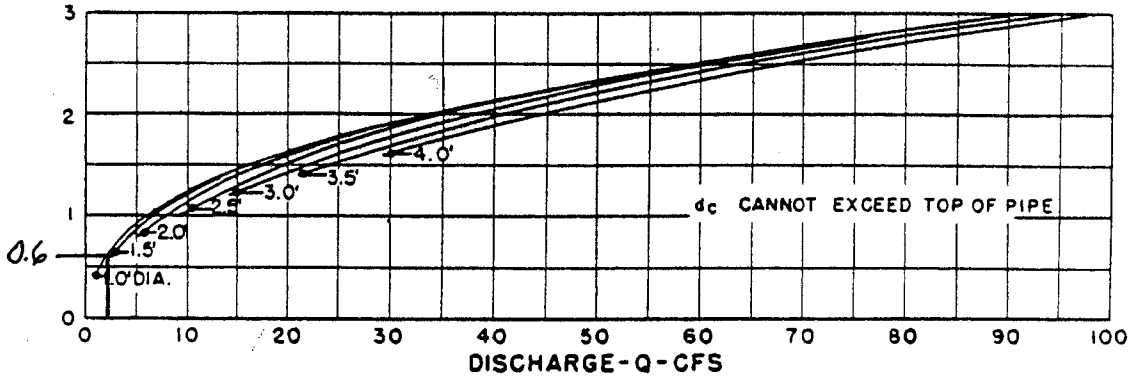
HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

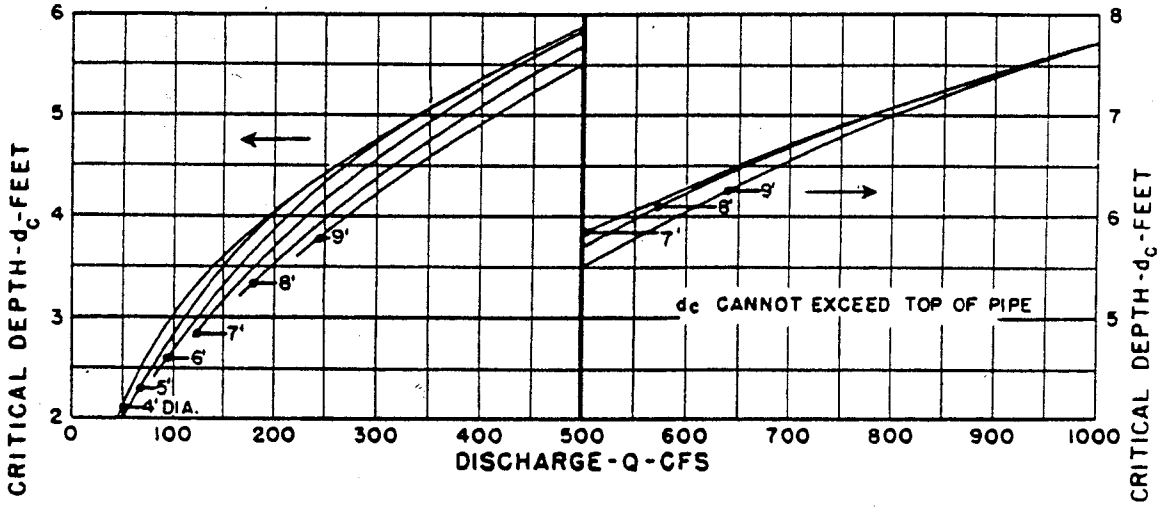
HEADWATER SCALES 2&3
REVISED MAY 1964

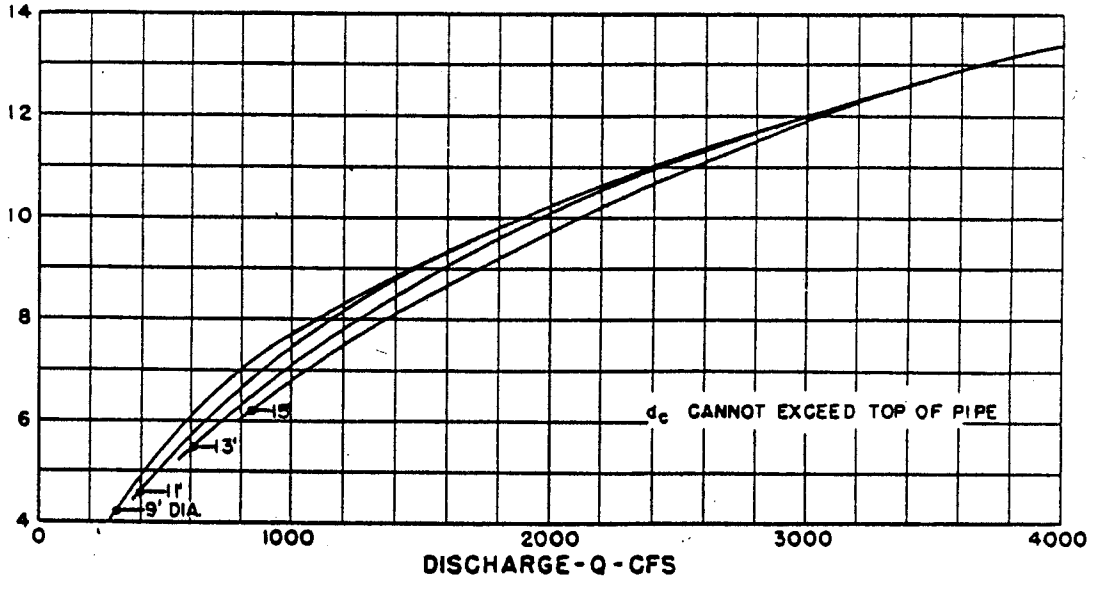
BUREAU OF PUBLIC ROADS JAN. 1963

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 083

CHART 4







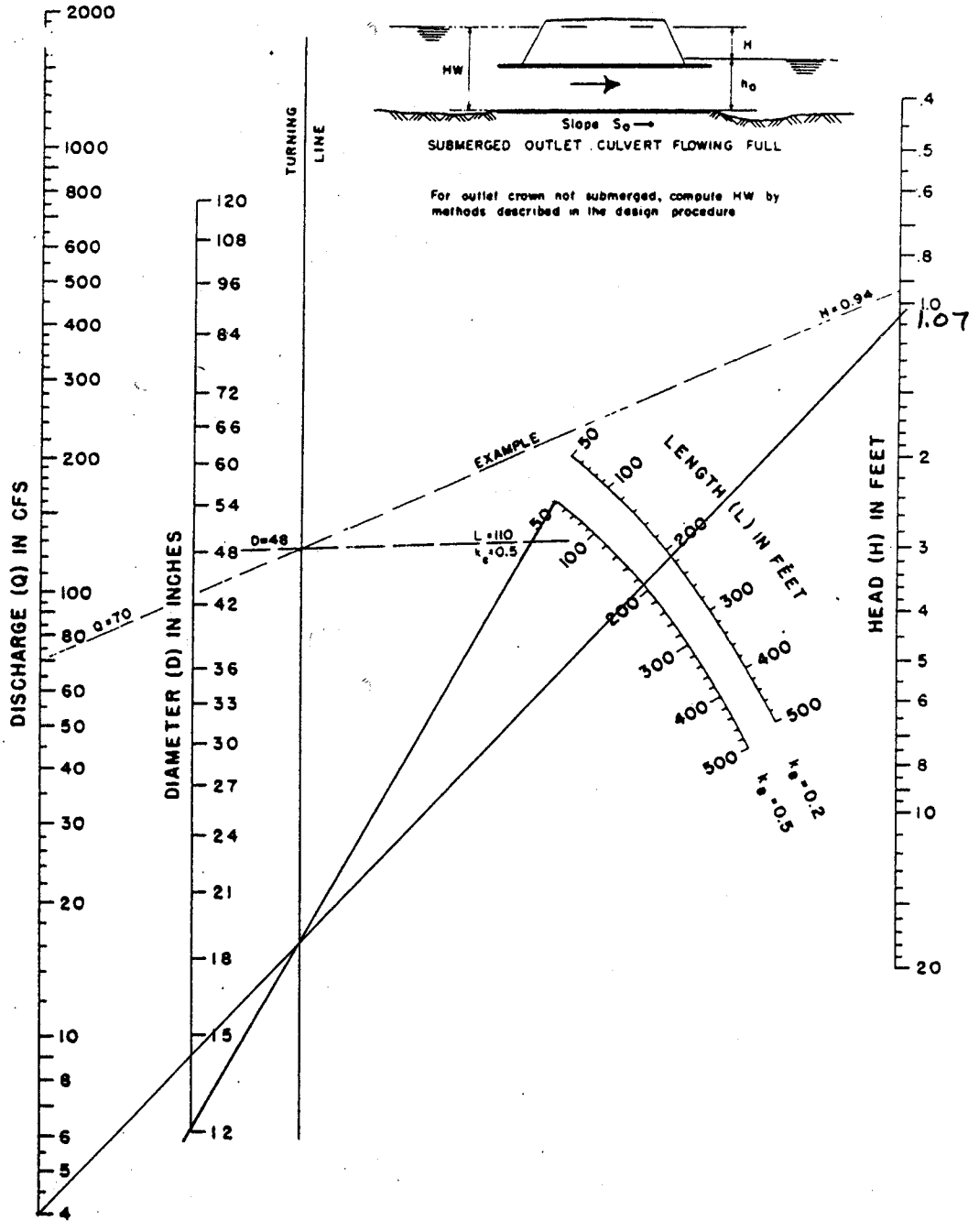
BUREAU OF PUBLIC ROADS

JAN. 1964

CRITICAL DEPTH
CIRCULAR PIPE

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 084

CHART 5



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 085

CRITICAL STORM DURATION AND MAXIMUM STORAGE VOLUME CALCULATION

MODIFIED RATIONAL METHOD-DIRECT SOLUTION 7/25/02
CRITICAL STORM DURATION & MAXIMUM STORAGE VOLUME
PROJECT: Faith Fellowship Church

Table VA	a_2	b_2	a_{10}	b_{10}	a_{100}	b_{100}
Location : James City County	121.86	16.58	185.06	20.81	279.14	24.73

0.007*(n*L)^0.8/((P)^0.5*S^0.4)

Pre Development: $t_{c\ pre}$ = 13.8 minutes $I_n = a_n/(b_n+t_c)$ inches per hour

	Rational "C"	Area	I_2	Q_2	I_{10}	Q_{10}
Grass :	0.3	4.87				
Impervious:	0	0				
Composite Values :	0.30	4.87	4.01	5.86	5.35	7.81

Post Development: $t_{c\ post}$ = 13.6 minutes $I_n = a_n/(b_n+T_{dn})$ inches per hour

	Rational "C"	Area
Grass & Landscape:	0.4	3.165
Impervious:	0.9	4
Composite Values :	0.30	7.165

How?

T_{d2}	I_2	Q_{i2}
17.74	3.55	7.63

T_{d10}	I_{10}	Q_{i10}
21.30	4.39	9.45

2-year Storage Required : V_2 = 2975 cubic feet

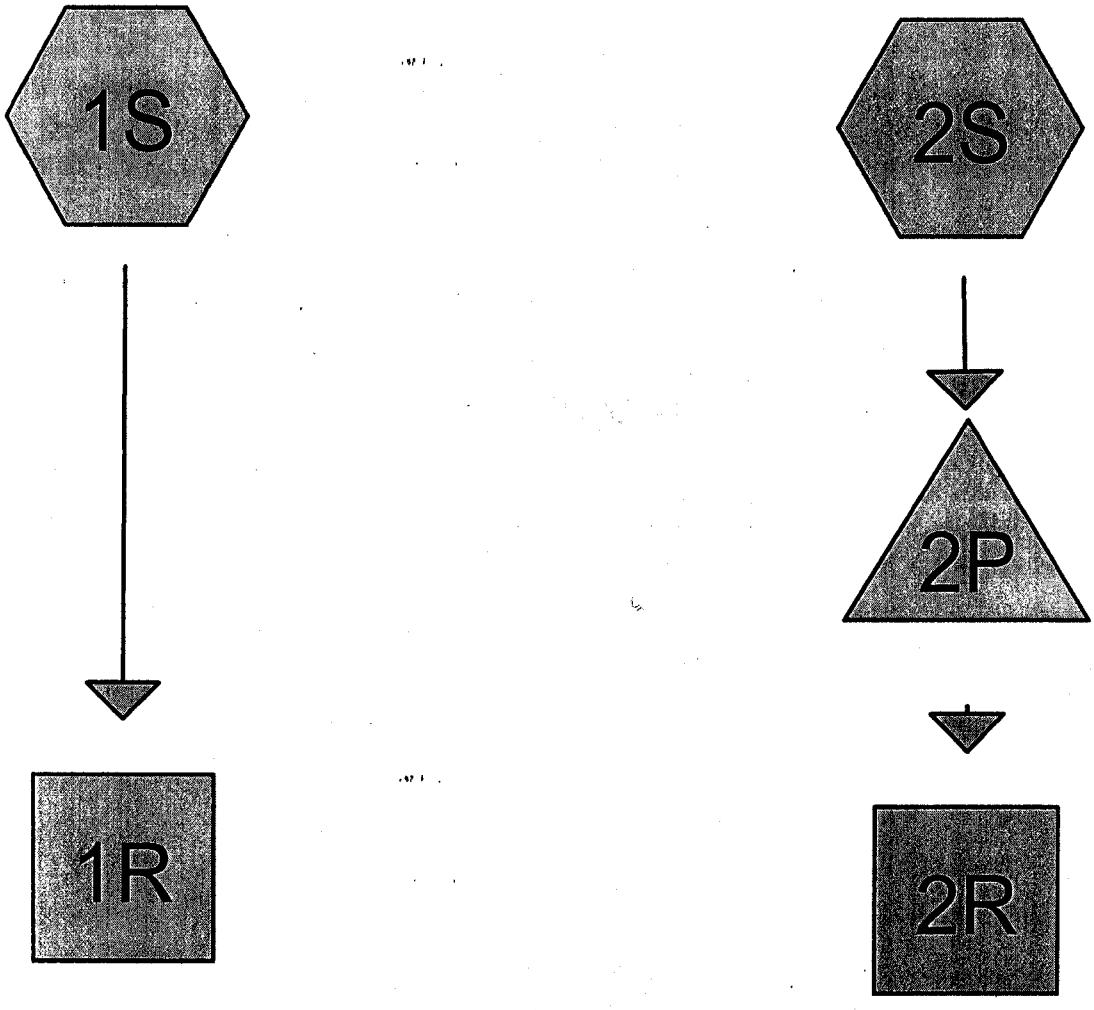
10-year Storage Required : V_{10} = 4227 cubic feet

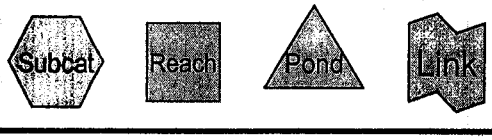
DOWNSTREAM REACH ANALYSIS

Natural Channel below dam **BMP**

Station	Reach #	Elevation	O/S Left	O/S Right	d	W_{base}	A_{inc}	A_{accum}	P_W	R_h
50.00	1R / 2R	74	0	0	0	0	0		0.00	
		75	20	14	1	34	17	17	34.06	0.50
Slope =	-0.07	76	28	23	2	51	43	60	51.12	1.16
		77	35	30	3	65	58	118	65.14	1.80
95.00	na	71	0	0	0	0	0		0.00	
		72	15	11	1	26	13	13	26.08	0.50
Slope =	-0.05	73	20	14	2	34	30	43	34.26	1.26
		74	31	20	3	51	43	73	51.13	1.42

DRAINAGE DIAGRAM FOR BMP





Drainage Diagram for Faith Fellowship BMP
Prepared by LandMark Design Group, Inc. 07/25/2002
HydroCAD® 6.00 s/n 001766 © 1986-2001 Applied Microcomputer Systems

SUMMARY OF ROUTING ANALYSES

SUMMARY OF ROUTING ANALYSES

STORM EVENT		Pre-Developed Runoff		Post-Developed Runoff		Runoff Infiltration Rate		Routed Runoff Rate
1		2.04		5.51		0.13		0.00
2		4.20		9.71		0.21		0.00
10		13.37		26.21		0.27		5.67
100		23.66		43.81		0.29		16.86

1-YEAR STORM BASIN ROUTING ANALYSIS

Subcatchment 1S: Undeveloped site

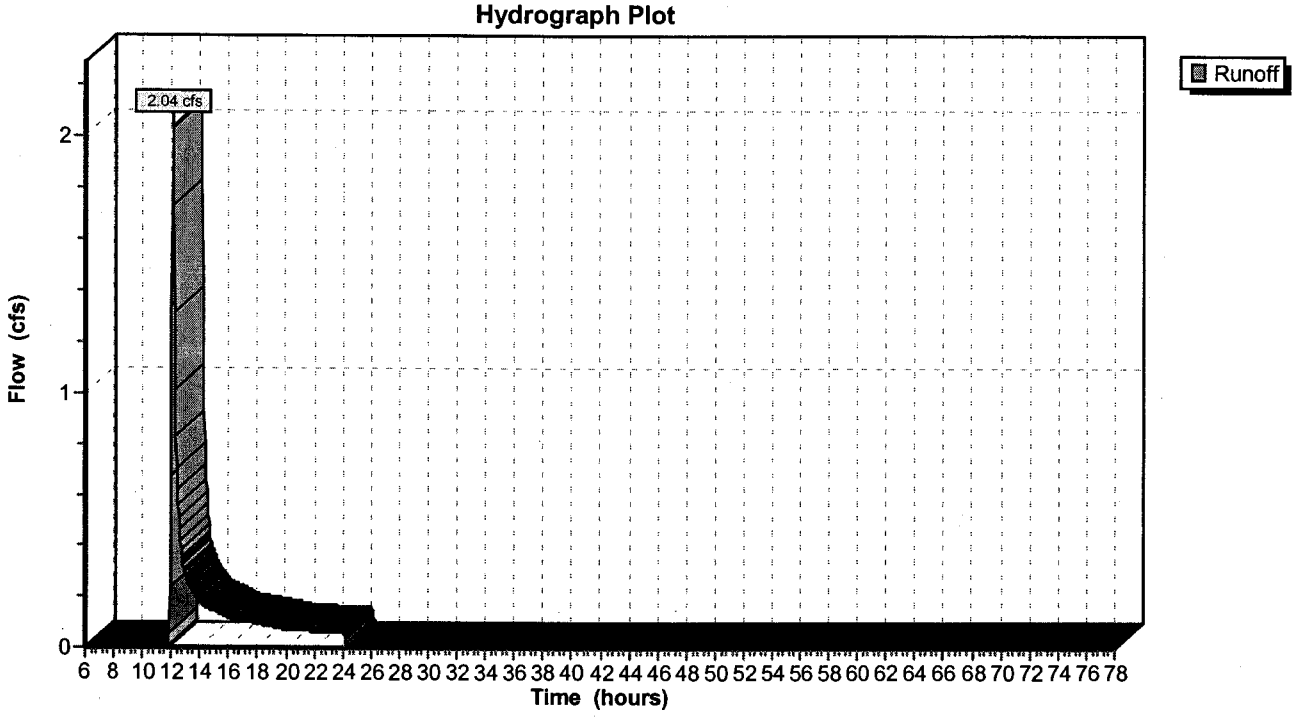
Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.80"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site



Subcatchment 2S: Developed Site

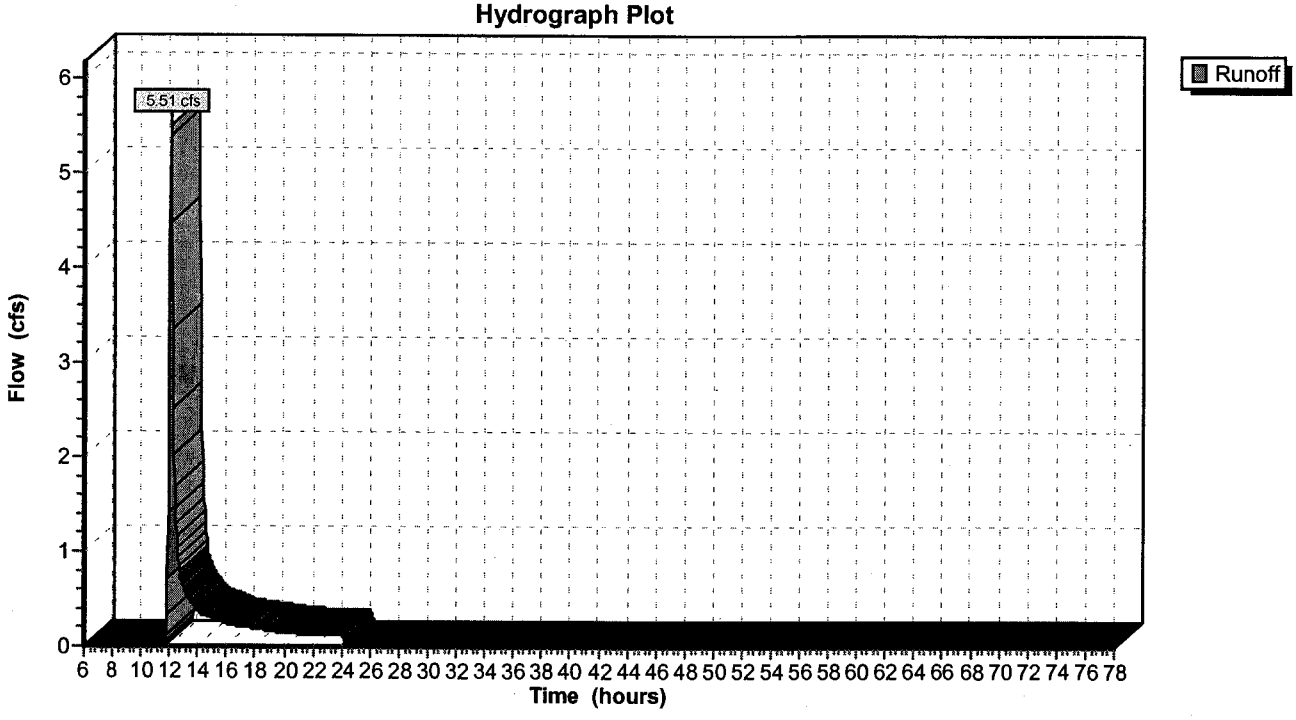
Runoff = 5.51 cfs @ 12.08 hrs, Volume= 0.387 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.80"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site



Reach 1R: Natural Channel Below BMP

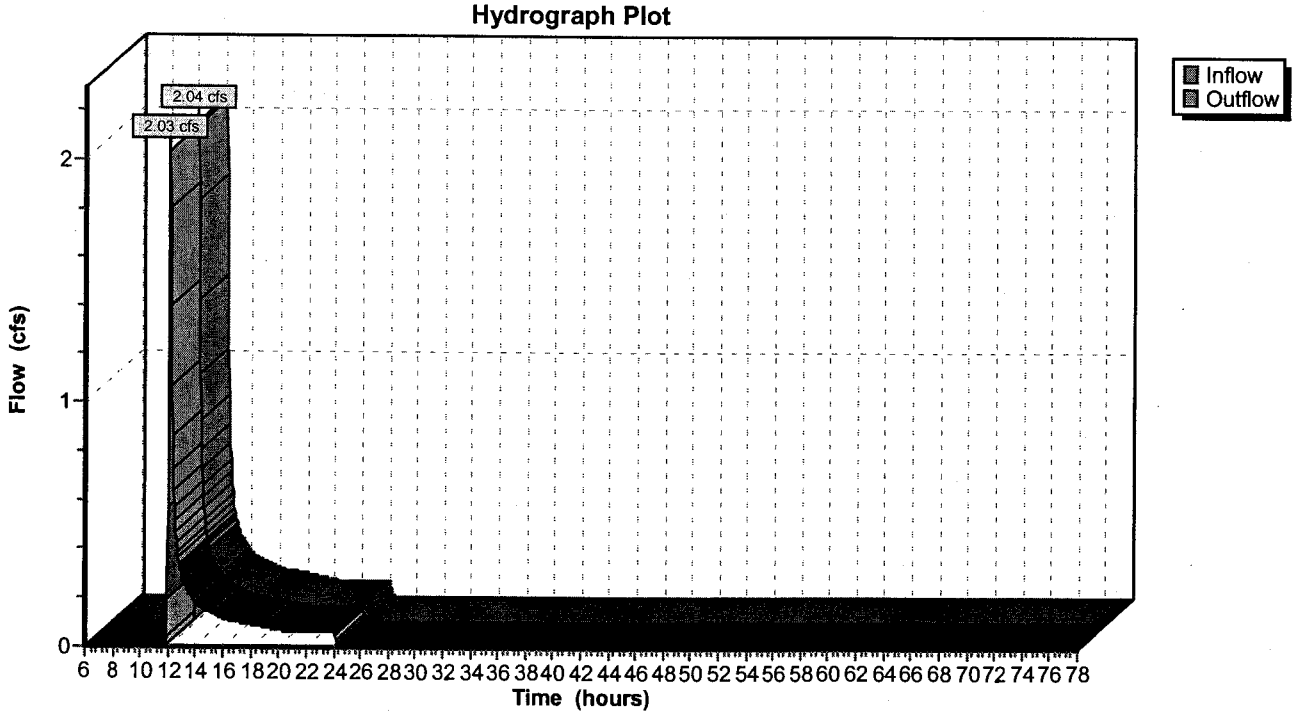
Inflow = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af
Outflow = 2.03 cfs @ 12.10 hrs, Volume= 0.165 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.05'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

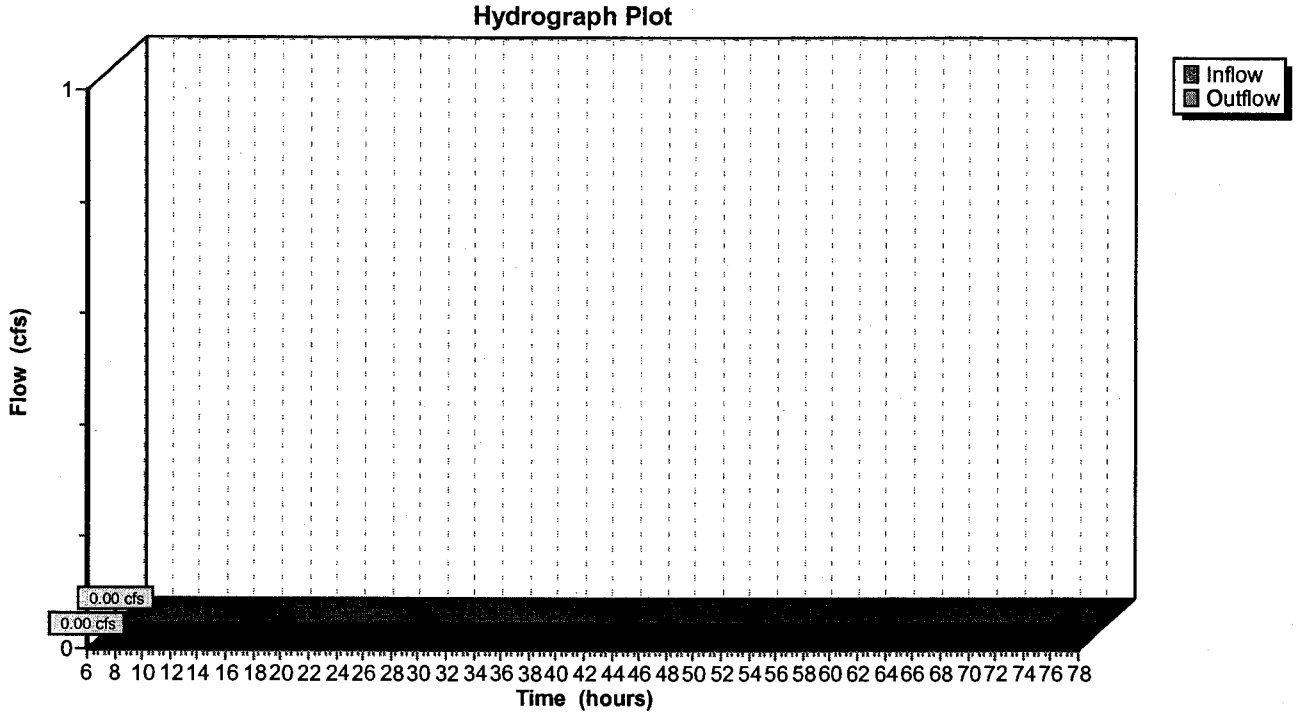
Inflow = 0.00 cfs @ 6.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 6.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	5.51 cfs @	12.08 hrs,	Volume=	0.387 af	
Outflow	=	0.13 cfs @	22.91 hrs,	Volume=	0.362 af,	Atten= 98%, Lag= 649.7 min
Discarded	=	0.13 cfs @	22.91 hrs,	Volume=	0.362 af	
Primary	=	0.00 cfs @	6.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 79.51' Storage= 11,800 cf
Plug-Flow detention time= 1,272.4 min calculated for 0.362 af (94% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	3,164	229.0	0	0	3,164
78.00	4,131	309.0	3,637	3,637	6,600
80.00	6,767	593.0	10,790	14,427	27,005
81.00	8,773	743.0	7,748	22,175	42,966
82.00	11,489	772.0	10,101	32,276	46,543
83.00	14,402	790.0	12,918	45,194	48,913
84.00	17,412	820.0	15,883	61,077	52,840
85.00	2,025	870.0	8,458	69,535	59,617

Discarded OutFlow (Free Discharge)
└─1=Exfiltration

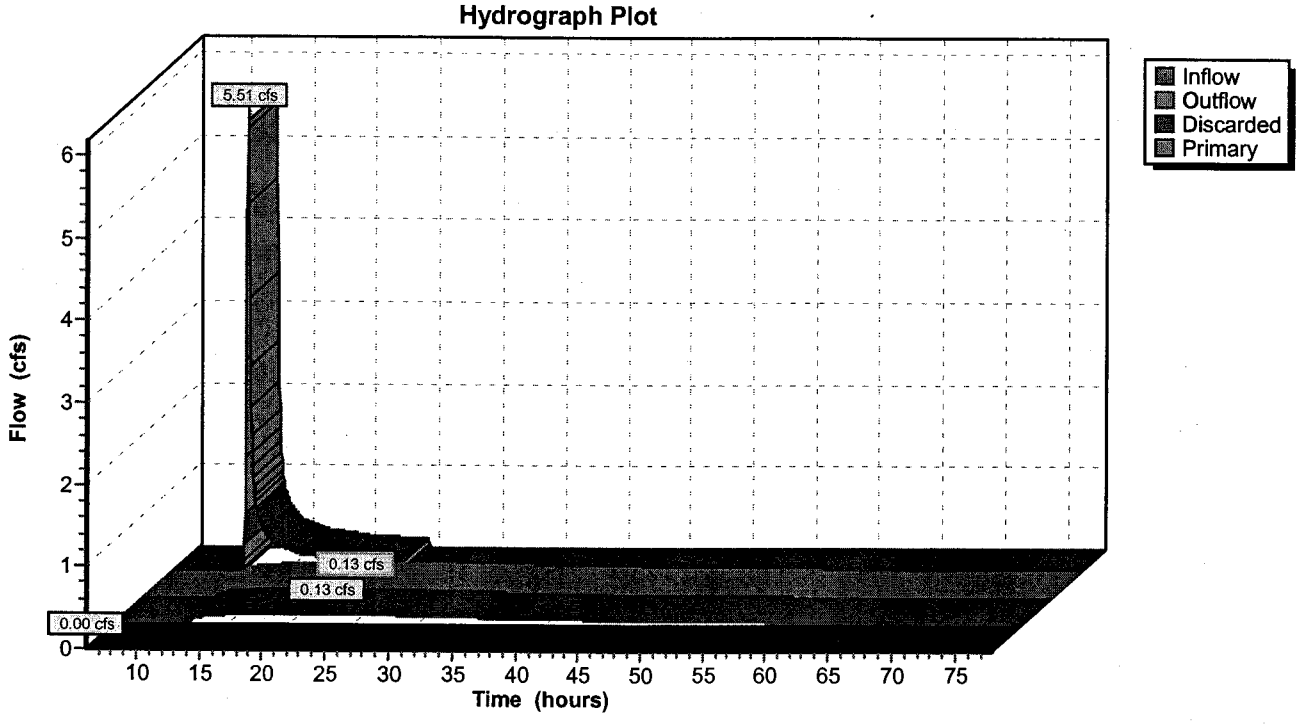
Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

$0.000347 \frac{ft}{min} \times \frac{12 in.}{1 ft} \times \frac{60 min}{1 hr.}$

$f_d = 0.24$ in/hr. Design
$f = 0.5$ in/hr. testing } OK

Pond 2P: Infiltration BMP



2-YEAR STORM BASIN ROUTING ANALYSIS

Subcatchment 1S: Undeveloped site

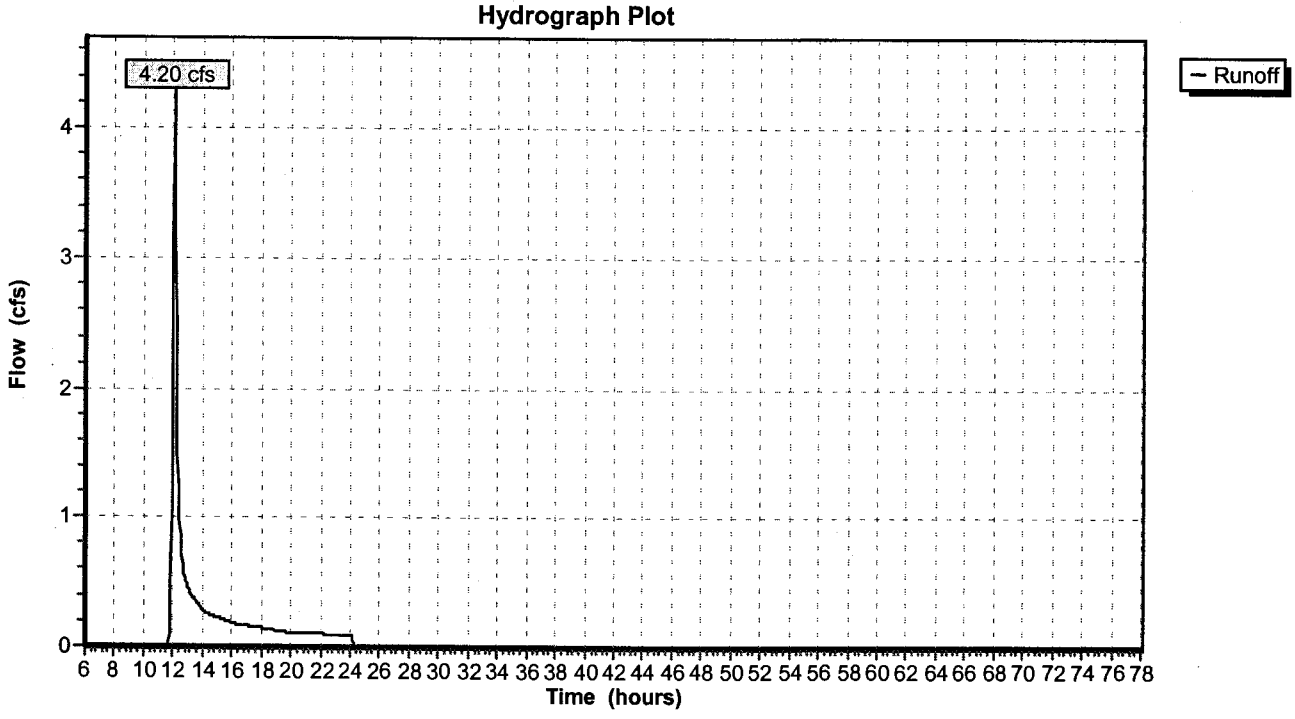
Runoff = 4.20 cfs @ 12.07 hrs, Volume= 0.292 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.50"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site



Subcatchment 2S: Developed Site

Runoff = 9.71 cfs @ 12.07 hrs, Volume= 0.635 af

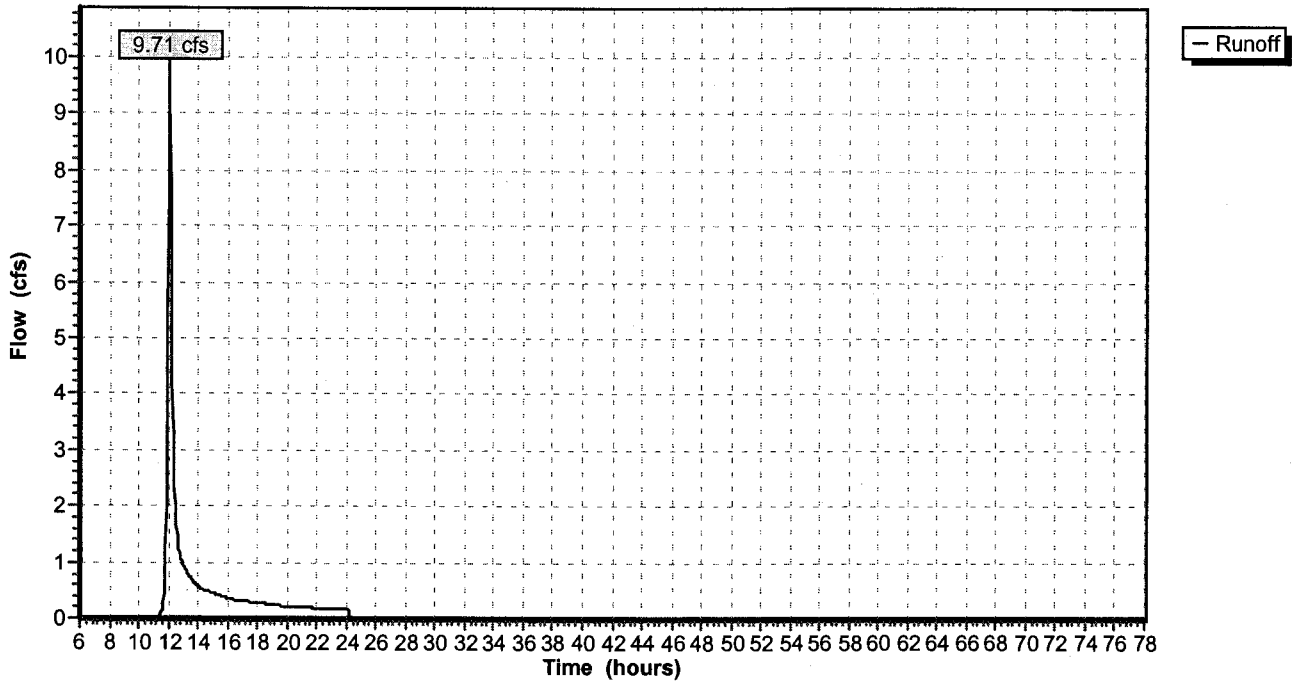
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.50"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

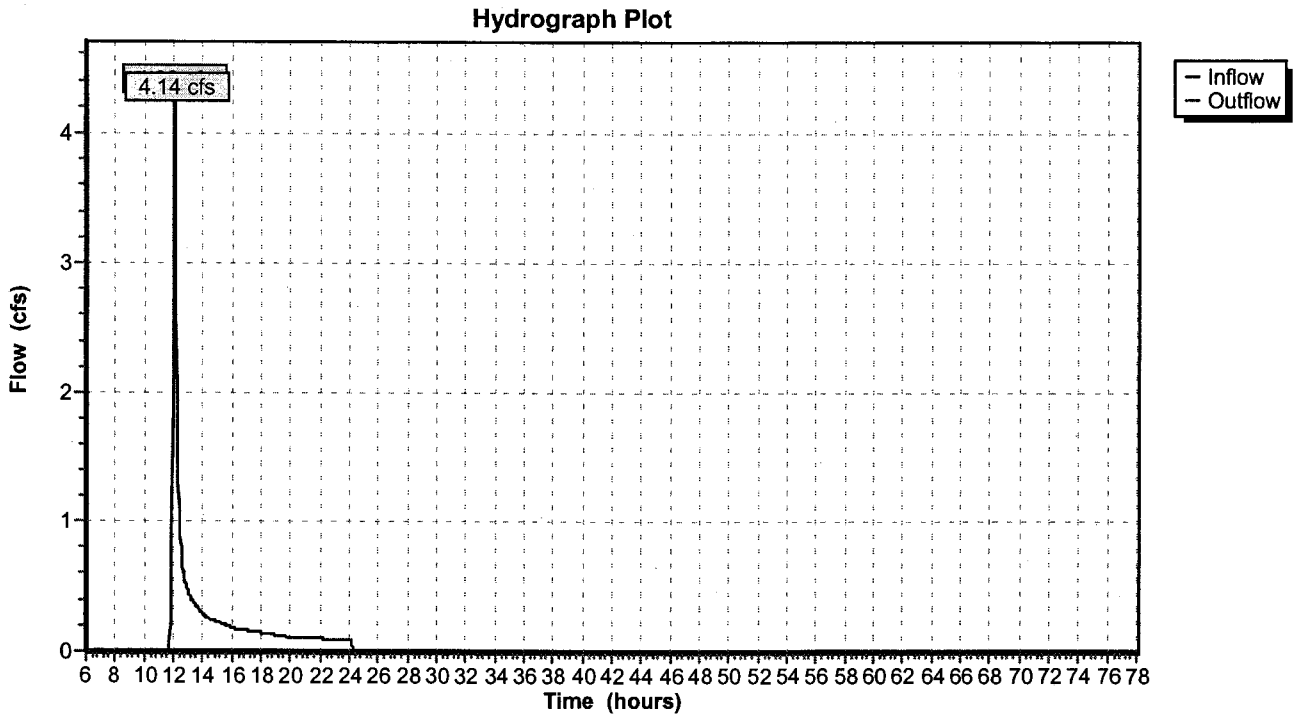
Inflow = 4.20 cfs @ 12.07 hrs, Volume= 0.292 af
Outflow = 4.14 cfs @ 12.09 hrs, Volume= 0.292 af, Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.10'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

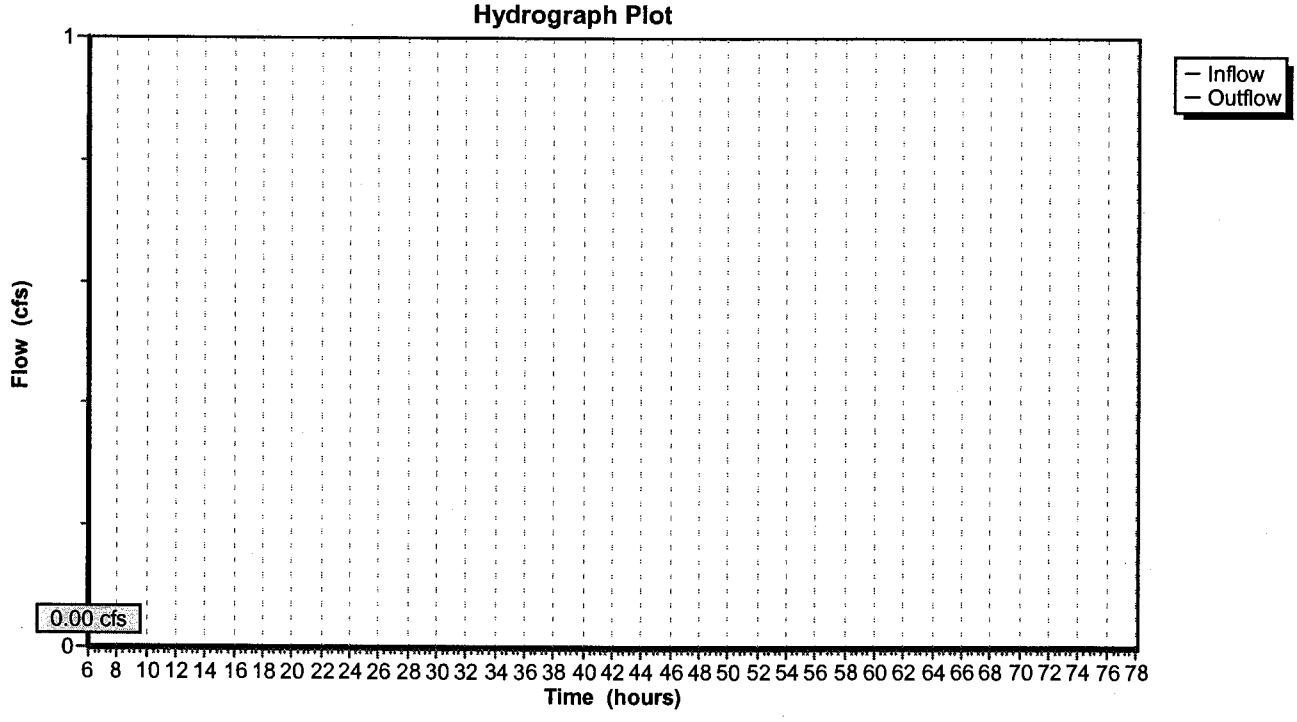
Inflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	9.71 cfs @	12.07 hrs,	Volume=	0.635 af
Outflow	=	0.21 cfs @	19.91 hrs,	Volume=	0.583 af, Atten= 98%, Lag= 470.5 min
Discarded	=	0.21 cfs @	19.91 hrs,	Volume=	0.583 af
Primary	=	0.00 cfs @	6.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 80.63' Storage= 19,284 cf
Plug-Flow detention time= 1,225.1 min calculated for 0.583 af (92% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	3,164	229.0	0	0	3,164
78.00	4,131	309.0	3,637	3,637	6,600
80.00	6,767	593.0	10,790	14,427	27,005
81.00	8,773	743.0	7,748	22,175	42,966
82.00	11,489	772.0	10,101	32,276	46,543
83.00	14,402	790.0	12,918	45,194	48,913
84.00	17,412	820.0	15,883	61,077	52,840
85.00	2,025	870.0	8,458	69,535	59,617

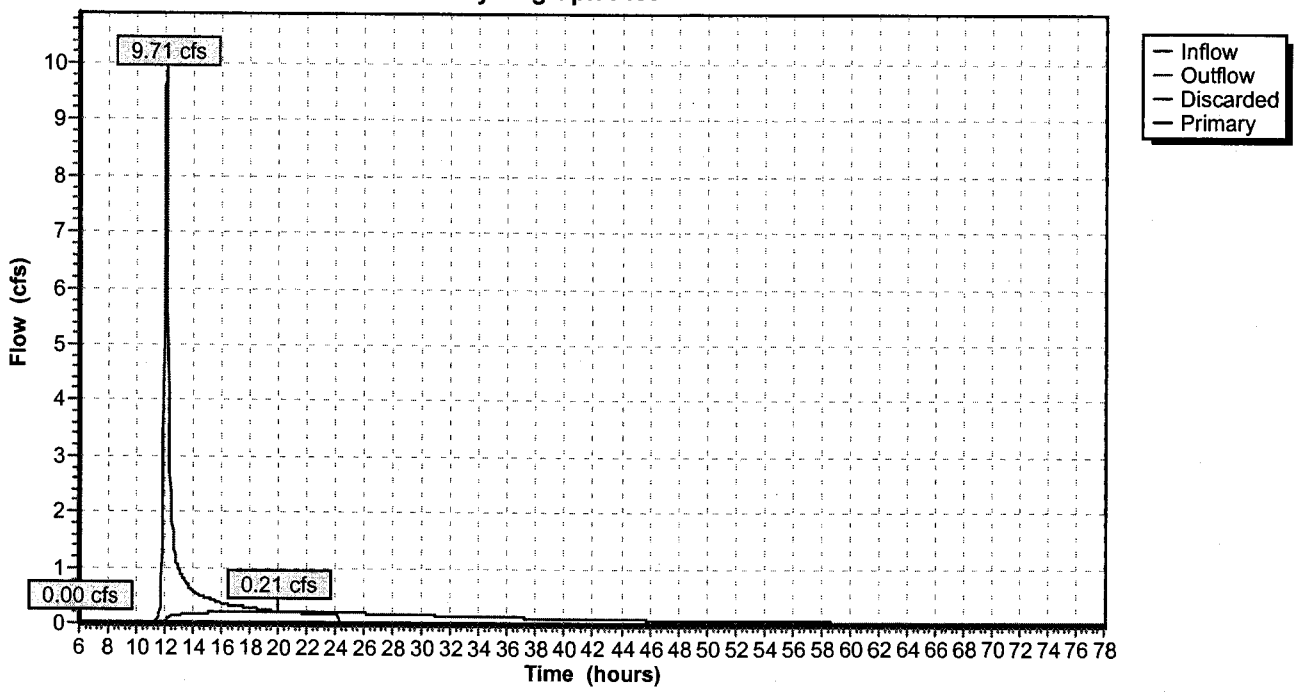
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500 ✓
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600 ✓
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** ✓ C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



10-YEAR STORM BASIN ROUTING ANALYSIS

Subcatchment 1S: Undeveloped site

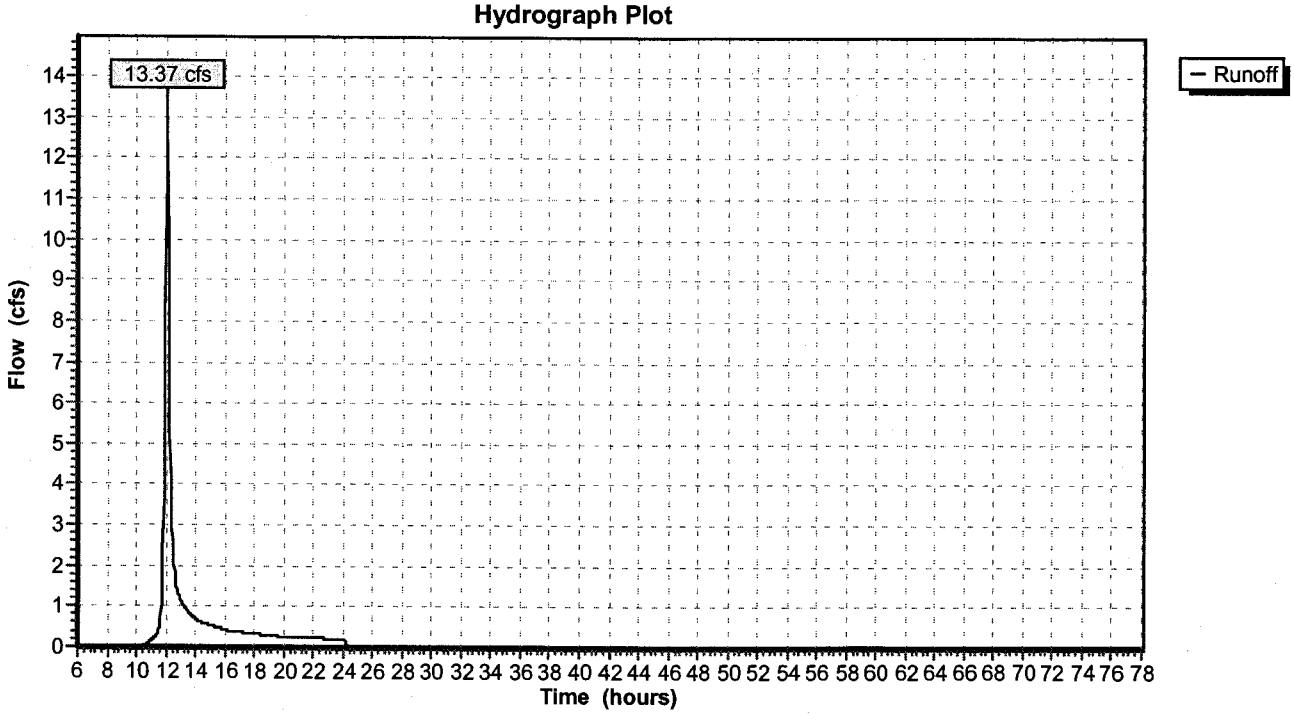
Runoff = 13.37 cfs @ 12.06 hrs, Volume= 0.838 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=5.80"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site



Subcatchment 2S: Developed Site

Runoff = 26.21 cfs @ 12.06 hrs, Volume= 1.635 af

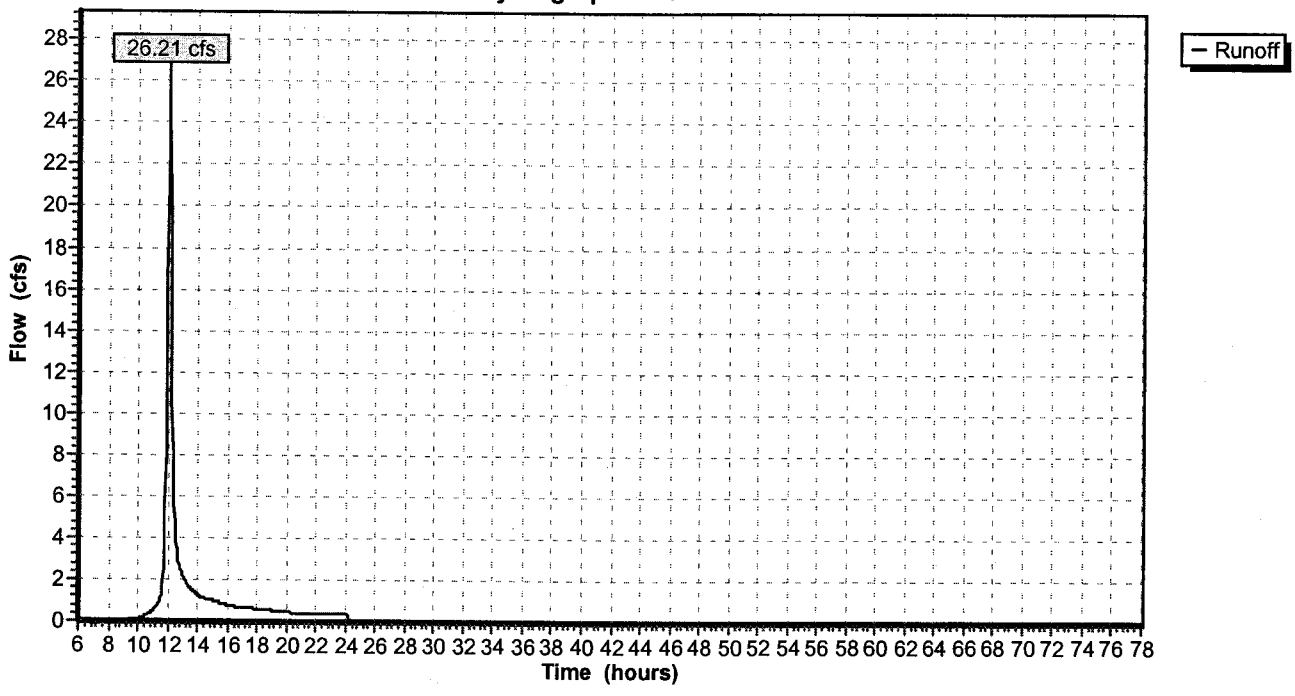
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=5.80"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

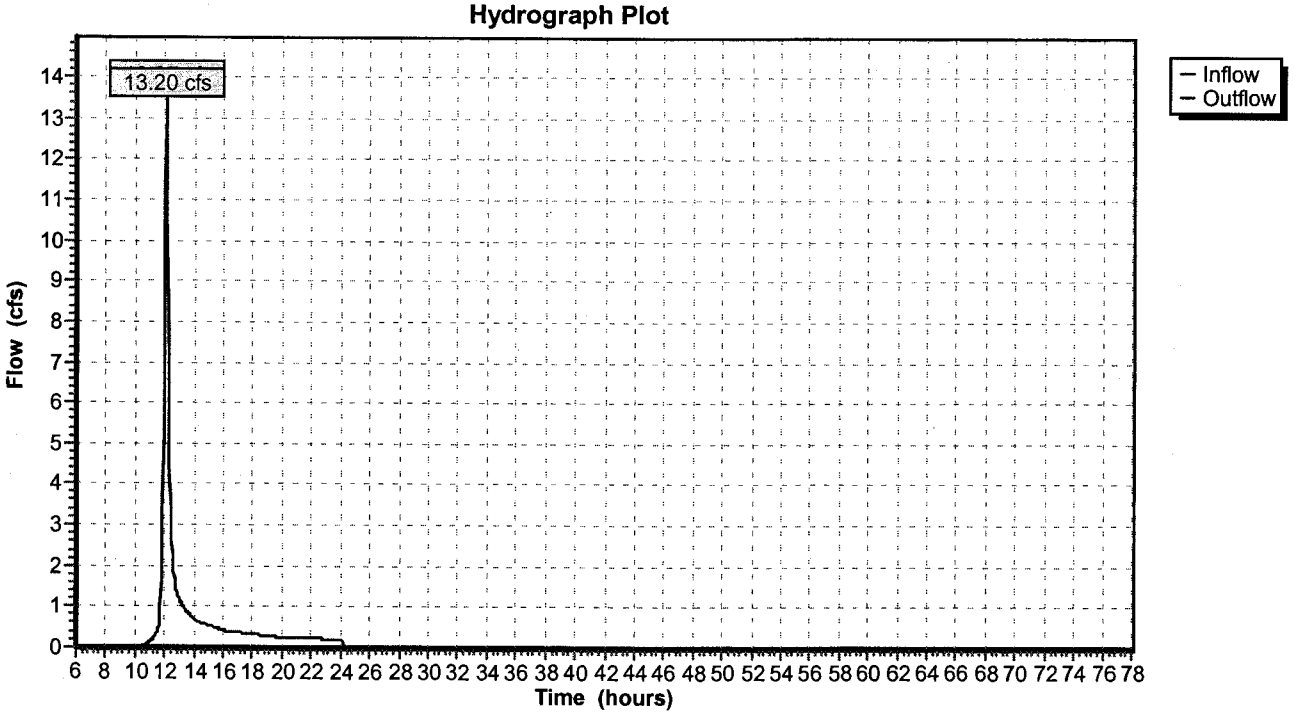
Inflow = 13.37 cfs @ 12.06 hrs, Volume= 0.838 af
Outflow = 13.20 cfs @ 12.07 hrs, Volume= 0.838 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.33'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

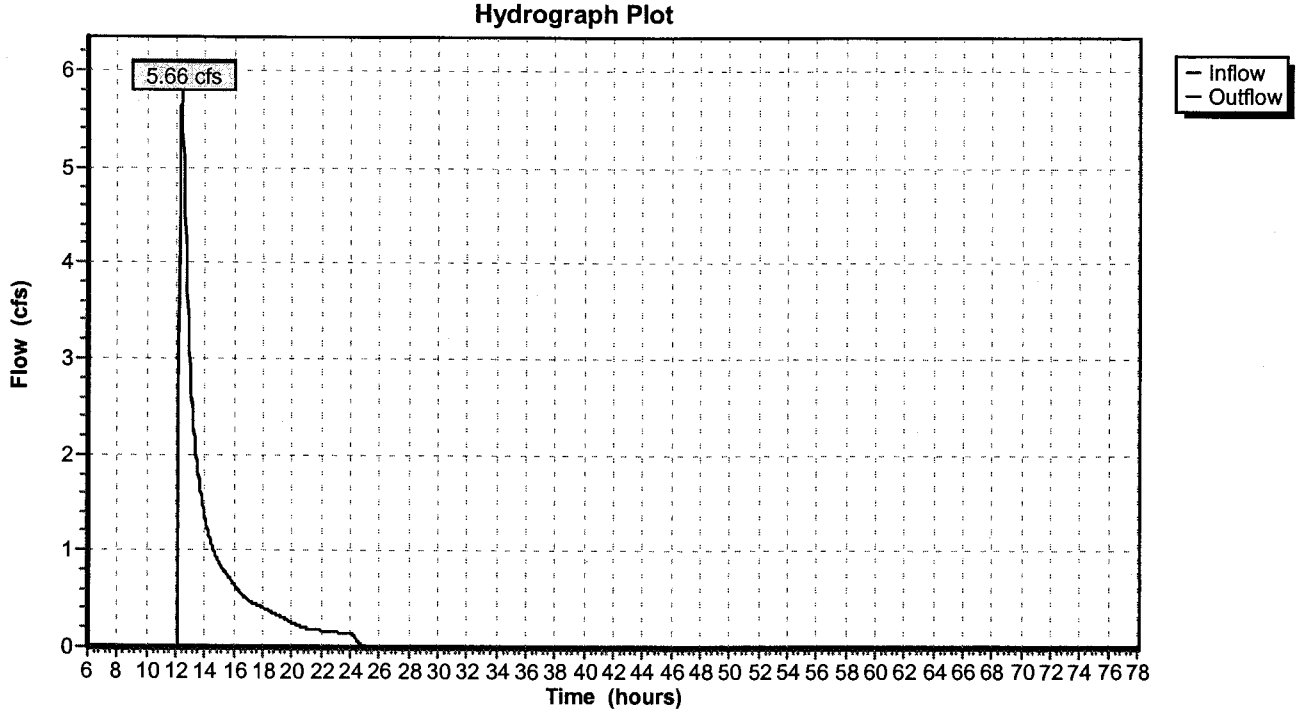
Inflow = 5.67 cfs @ 12.39 hrs, Volume= 0.817 af
Outflow = 5.66 cfs @ 12.40 hrs, Volume= 0.817 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.14'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	26.21 cfs @	12.06 hrs,	Volume=	1.635 af
Outflow	=	5.93 cfs @	12.39 hrs,	Volume=	1.567 af, Atten= 77%, Lag= 19.5 min
Discarded	=	0.27 cfs @	12.39 hrs,	Volume=	0.749 af
Primary	=	5.67 cfs @	12.39 hrs,	Volume=	0.817 af

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 81.96' Storage= 31,854 cf
Plug-Flow detention time= 611.7 min calculated for 1.567 af (96% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	3,164	229.0	0	0	3,164
78.00	4,131	309.0	3,637	3,637	6,600
80.00	6,767	593.0	10,790	14,427	27,005
81.00	8,773	743.0	7,748	22,175	42,966
82.00	11,489	772.0	10,101	32,276	46,543
83.00	14,402	790.0	12,918	45,194	48,913
84.00	17,412	820.0	15,883	61,077	52,840
85.00	2,025	870.0	8,458	69,535	59,617

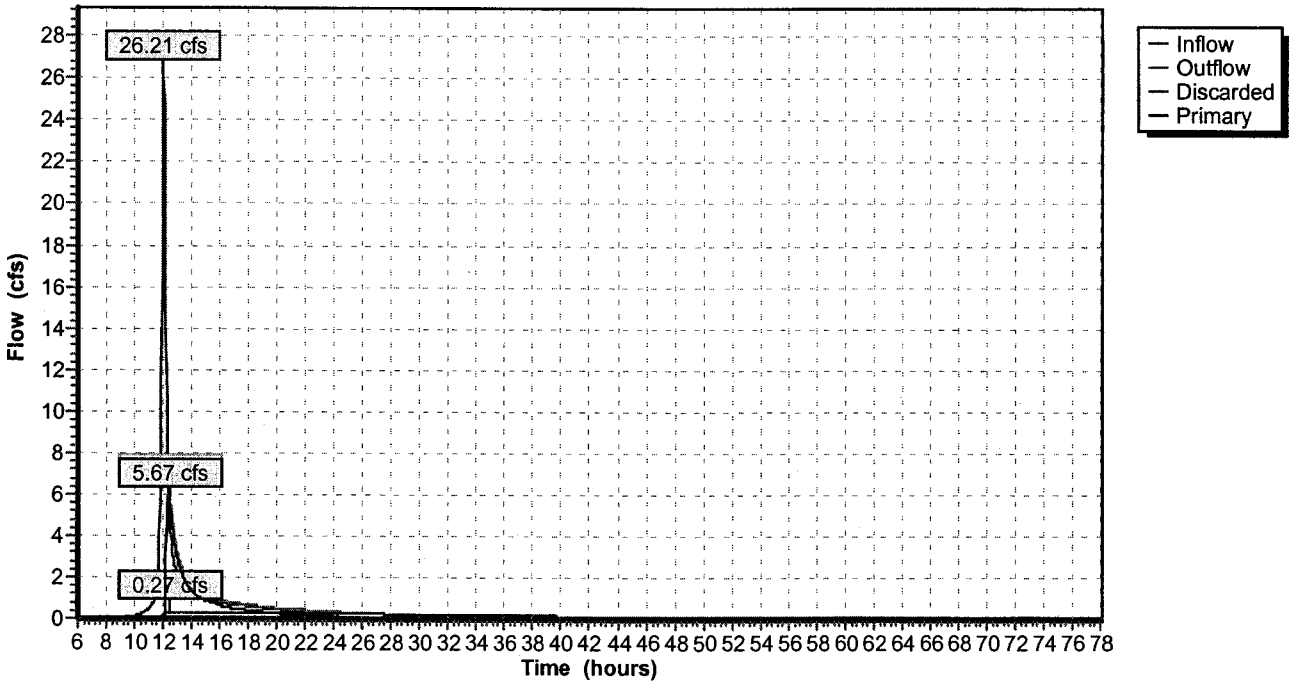
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



100-YEAR STORM BASIN ROUTING ANALYSIS

Subcatchment 1S: Undeveloped site

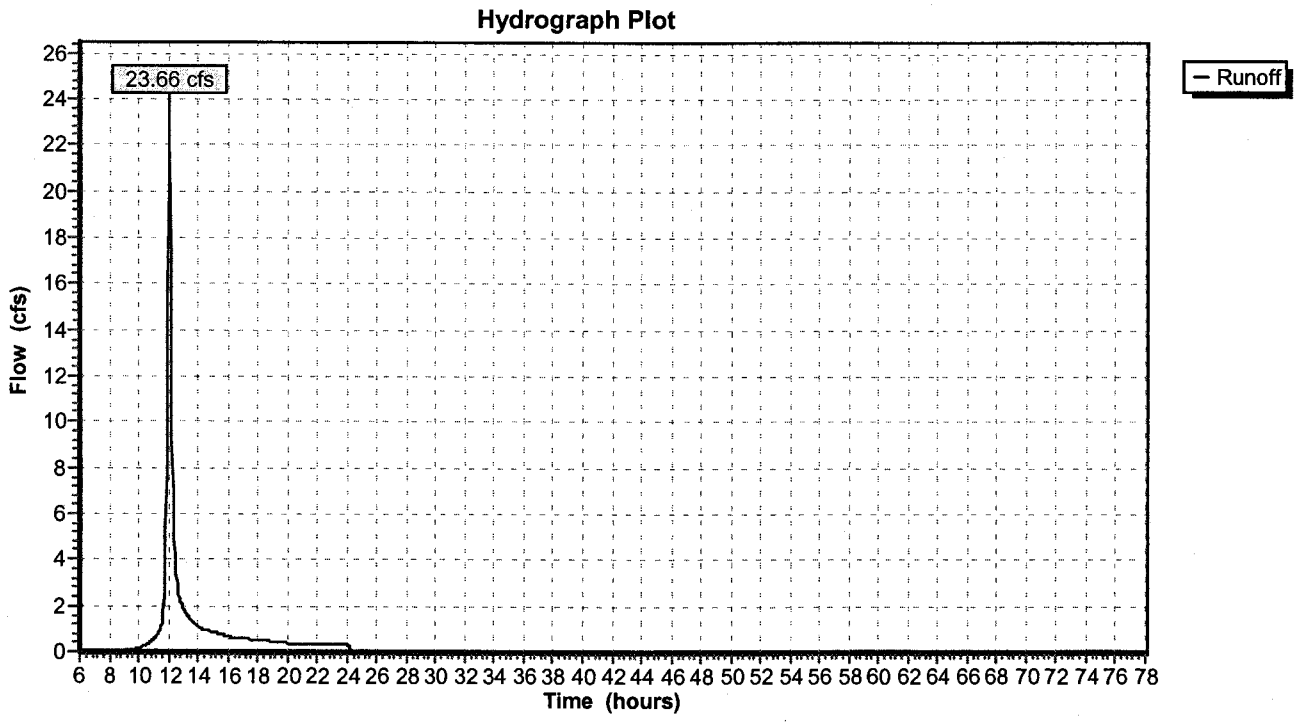
Runoff = 23.66 cfs @ 12.06 hrs, Volume= 1.464 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=8.00"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site



Subcatchment 2S: Developed Site

Runoff = 43.81 cfs @ 12.06 hrs, Volume= 2.734 af

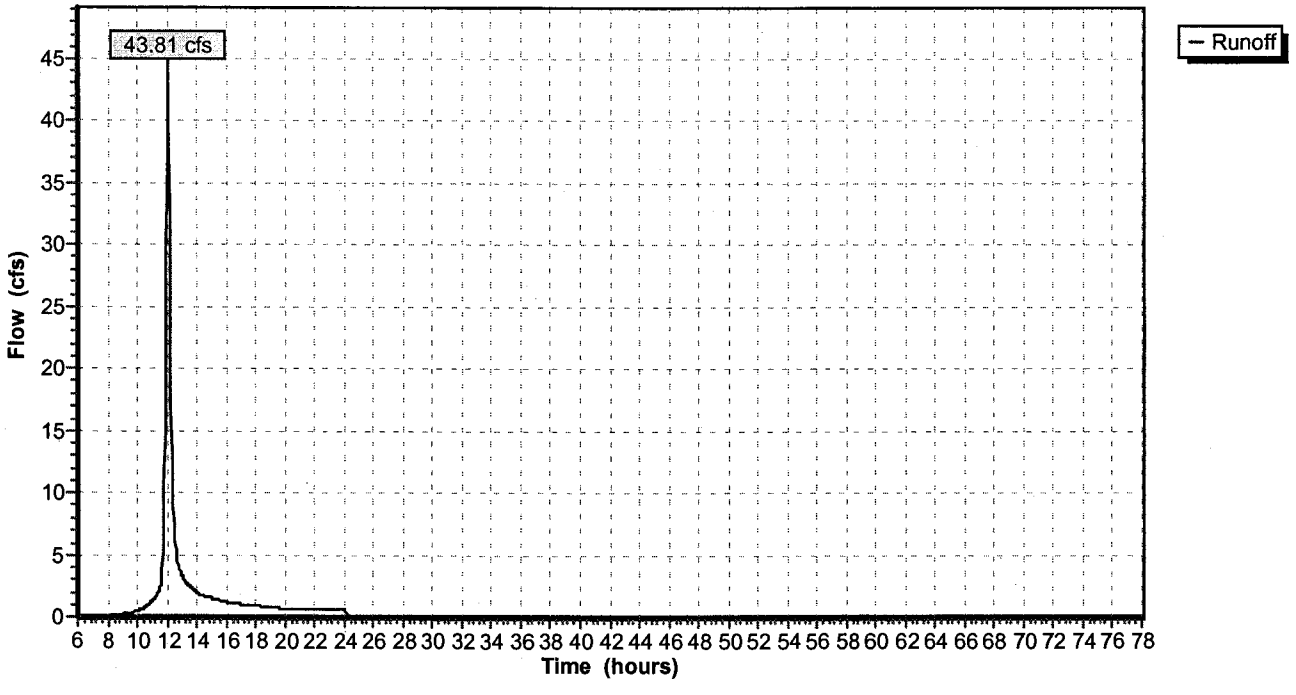
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=8.00"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

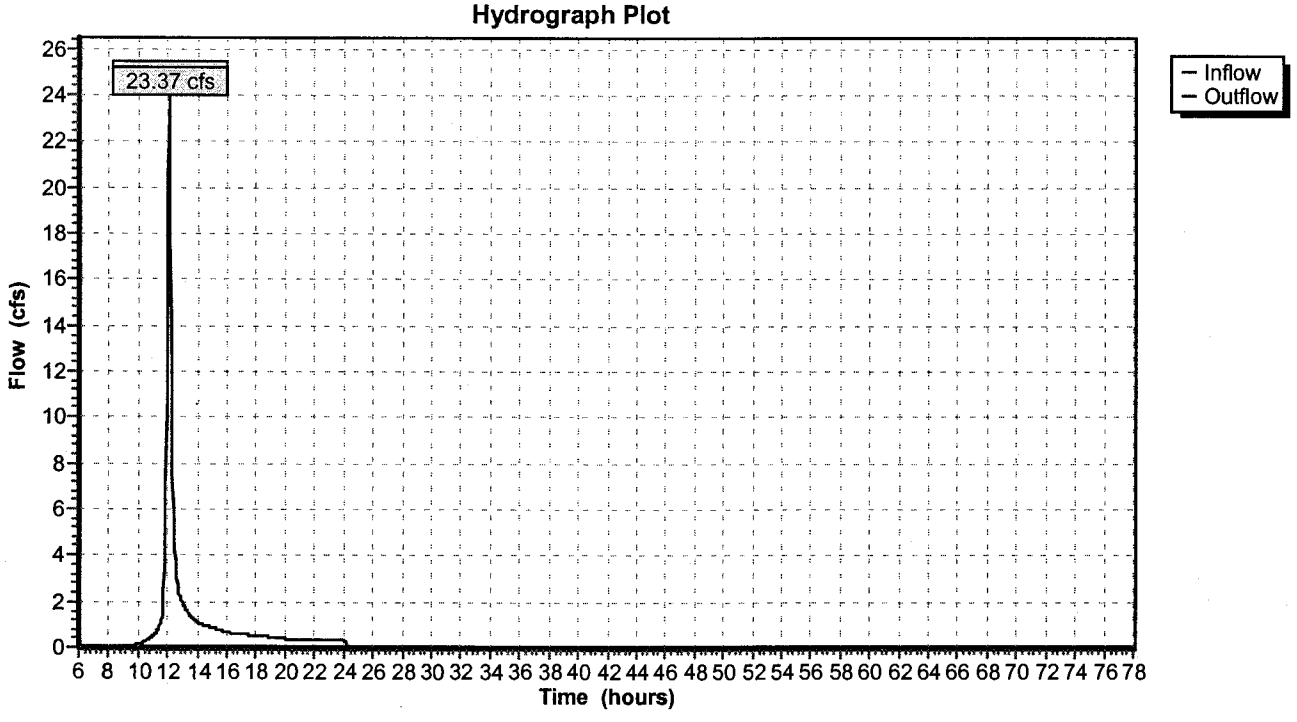
Inflow = 23.66 cfs @ 12.06 hrs, Volume= 1.464 af
Outflow = 23.37 cfs @ 12.07 hrs, Volume= 1.464 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.58'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

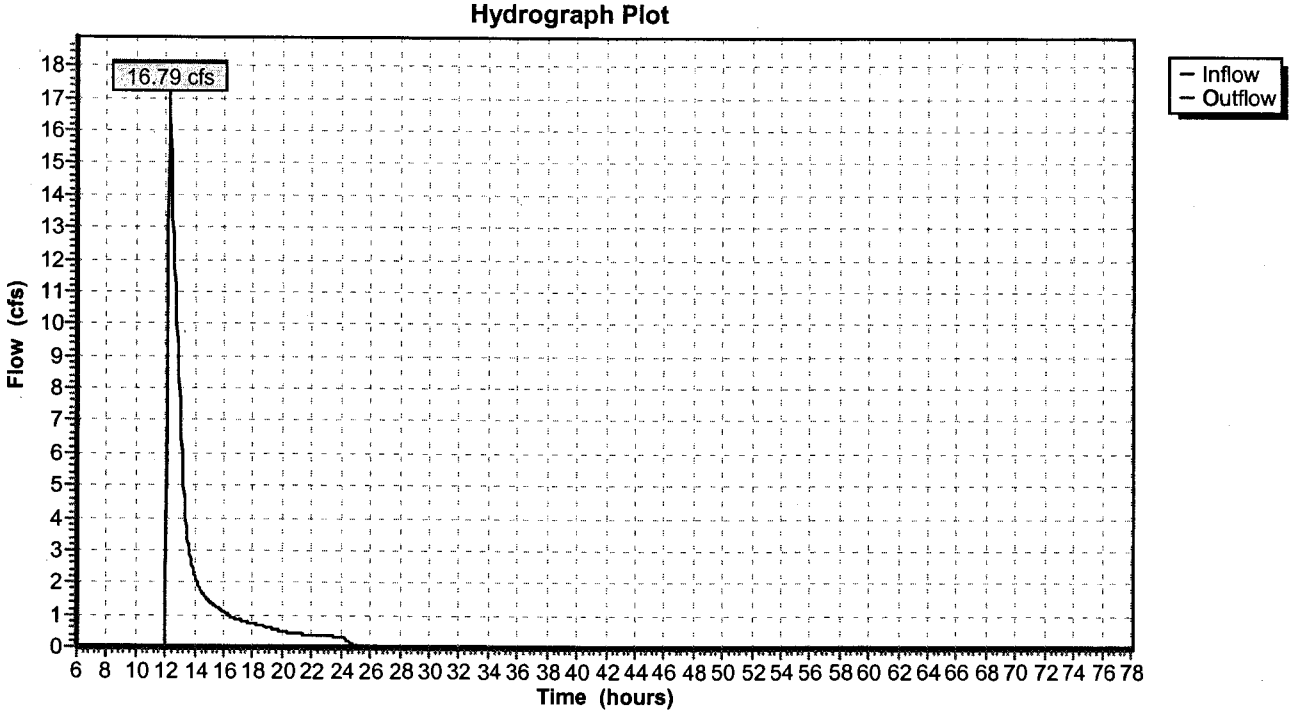
Inflow	=	16.86 cfs @	12.26 hrs,	Volume=	1.896 af
Outflow	=	16.79 cfs @	12.27 hrs,	Volume=	1.896 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.41'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	43.81 cfs @	12.06 hrs, Volume=	2.734 af	
Outflow	=	17.14 cfs @	12.26 hrs, Volume=	2.665 af,	Atten= 61%, Lag= 12.0 min
Discarded	=	0.29 cfs @	12.26 hrs, Volume=	0.769 af	
Primary	=	16.86 cfs @	12.26 hrs, Volume=	1.896 af	

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 83.16' Storage= 47,771 cf
Plug-Flow detention time= 379.1 min calculated for 2.665 af (97% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	3,164	229.0	0	0	3,164
78.00	4,131	309.0	3,637	3,637	6,600
80.00	6,767	593.0	10,790	14,427	27,005
81.00	8,773	743.0	7,748	22,175	42,966
82.00	11,489	772.0	10,101	32,276	46,543
83.00	14,402	790.0	12,918	45,194	48,913
84.00	17,412	820.0	15,883	61,077	52,840
85.00	2,025	870.0	8,458	69,535	59,617

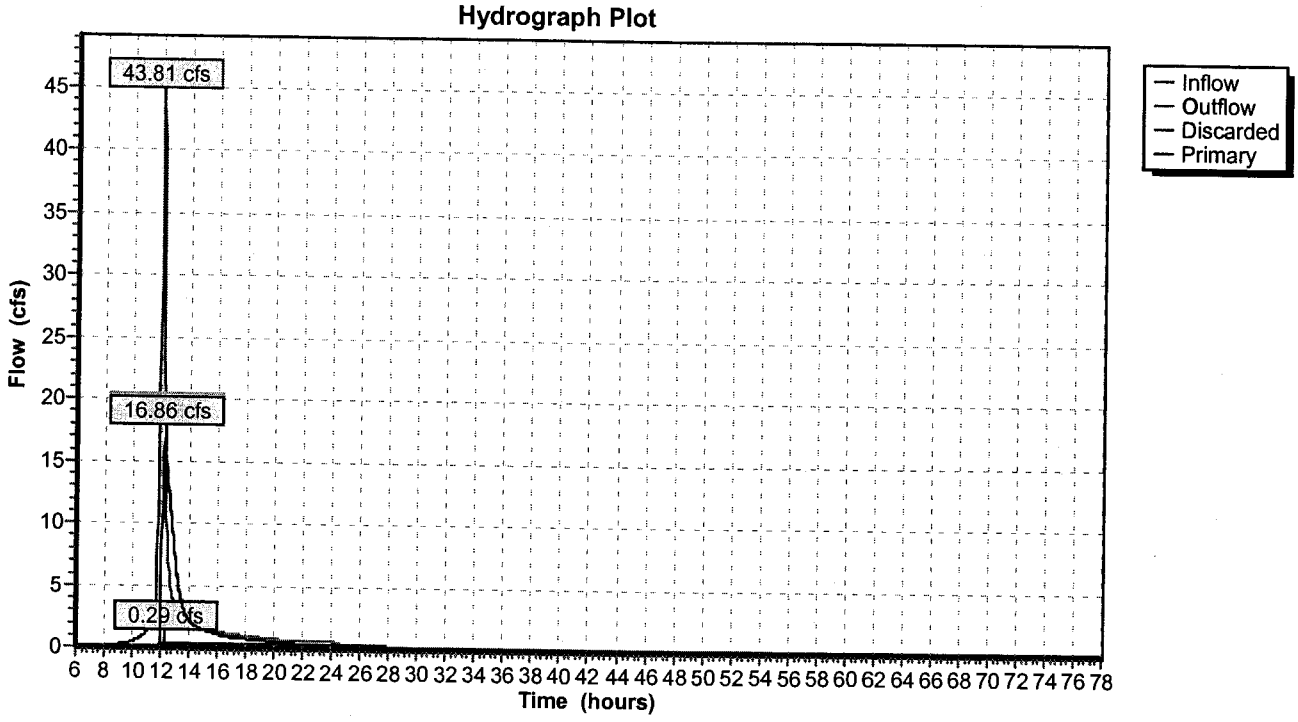
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

PLAN 82 64 ?

Pond 2P: Infiltration BMP



Worksheet
Worksheet for Triangular Channel

Project Description	
Worksheet	Structure N-3 to BMP 1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.035	
Slope	0.014500	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Discharge	11.31	cfs

1.21% per plan

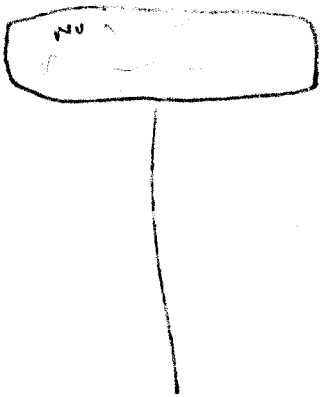
NW CHANNEL TO BMP

Results		
Depth	1.07	ft
Flow Area	3.5	ft²
Wetted Perimeter	6.80	ft
Top Width	6.45	ft
Critical Depth	0.98	ft
Critical Slope	0.024327	ft/ft
Velocity	3.26	ft/s
Velocity Head	0.17	ft
Specific Energy	1.24	ft
Froude Number	0.78	
Flow Type	Subcritical	

12"

✓ MATTEN

FAITH Fellowship
Assembly of God
SP-95-02



PRET

DA 4.383
CN 66
TU 13.6

Post

DA 7.165
CN 71
TU 13.8

Tim McKinney
Howard Price

Colonial Heritage Route 60

	Pre	Post	Post/Pre	
1	2.04	5.51	79.51 ~~80.60~~	~~0.73~~ 0.00
2	4.20	9.71	80.63	~~0.07~~ 0.00
10	12.37	26.21	81.96	~~0.27~~ 5.67
100	23.66	43.81	83.16	~~0.29~~ 16.86

Alternates
100-YEAR

.24

Grouchfire

WQ for 50% site 13,939 cf

Note: BMP #1 INFIL BASIN

- No increase in runoff from BMP for all storm events. (i.e. 100-YR control)

- WQ included
- SCPv included

- Outfall Channel
  - No discharge from BMP for 1-, 2-YR.
  - 100-YR discharge is less.
  - 2.4 fps max is ok for nat stream
    ∴ Adequate
- No impacts to downstream lake. (Postdev.)

- Concern with construction phase no attenuation as BMP const is delayed.

Subcatchment 1S: Undeveloped site

Runoff = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af

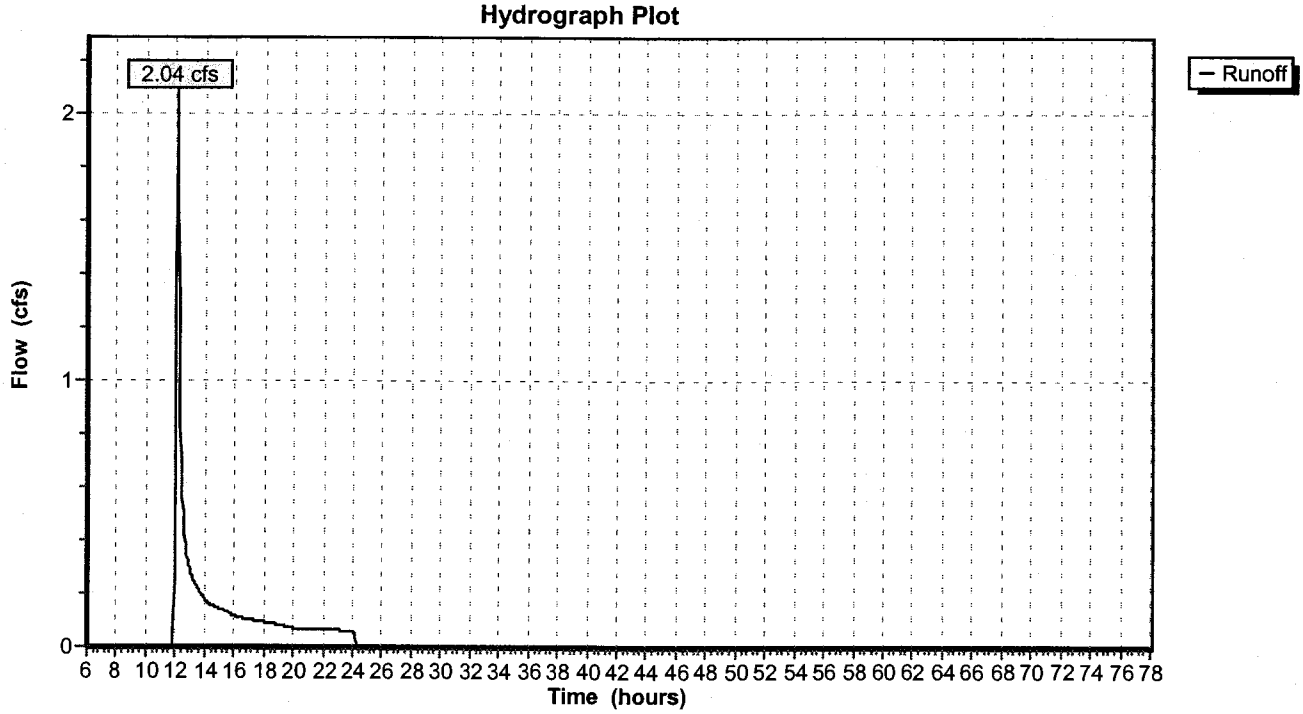
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.80"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site

Hydrograph Plot



PREDEV 4.383AC CN 66 TC = 13.6 min
POSTDEV 7.165AC CN 71 TC = 13.8 min

BASIN	PREDEV	POST IN	POST OUT
1-YR	2.04 cfs	5.51 cfs	0.05 cfs @ EL 78.97
2-YR	4.20 cfs	9.71 cfs	0.07 cfs @ EL 80.2
10-YR	13.37 cfs	26.21 cfs	2.07 cfs @ EL 81.56
100-YR	23.66 cfs	43.81 cfs	11.56 cfs @ EL. 82.64

FINAL BMP COMPS.

Subcatchment 2S: Developed Site

Runoff = 5.51 cfs @ 12.08 hrs, Volume= 0.387 af

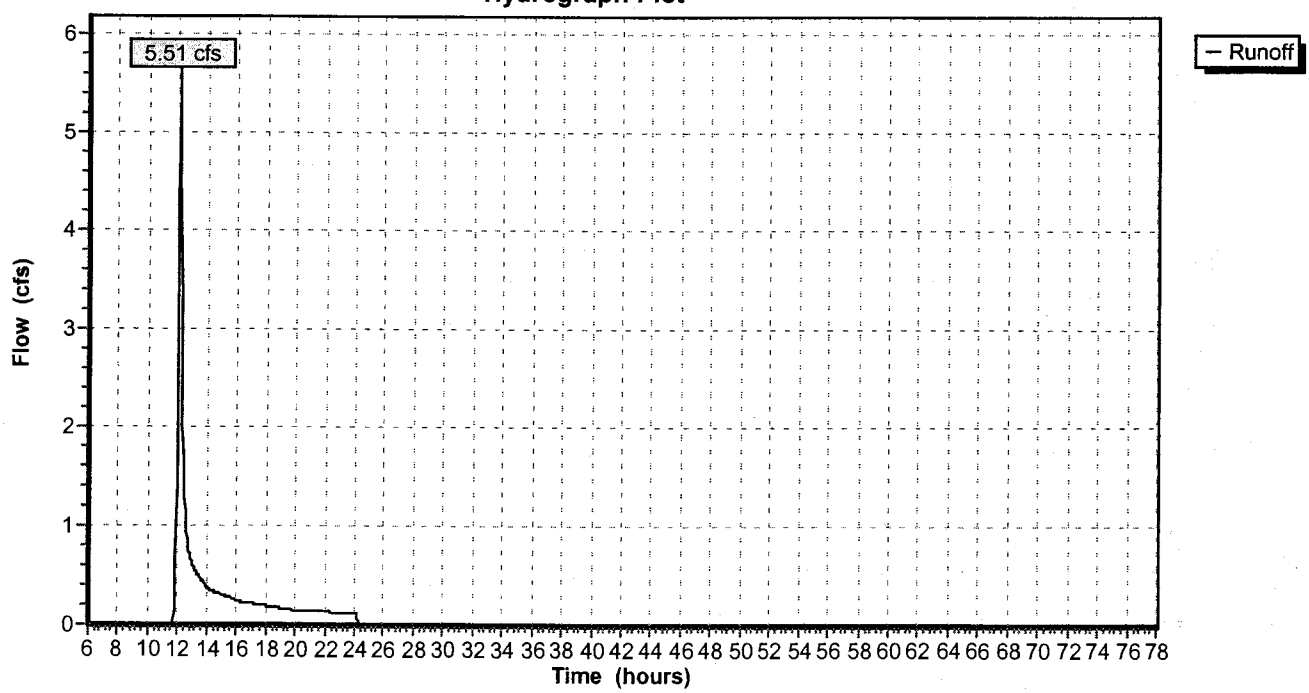
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=2.80"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

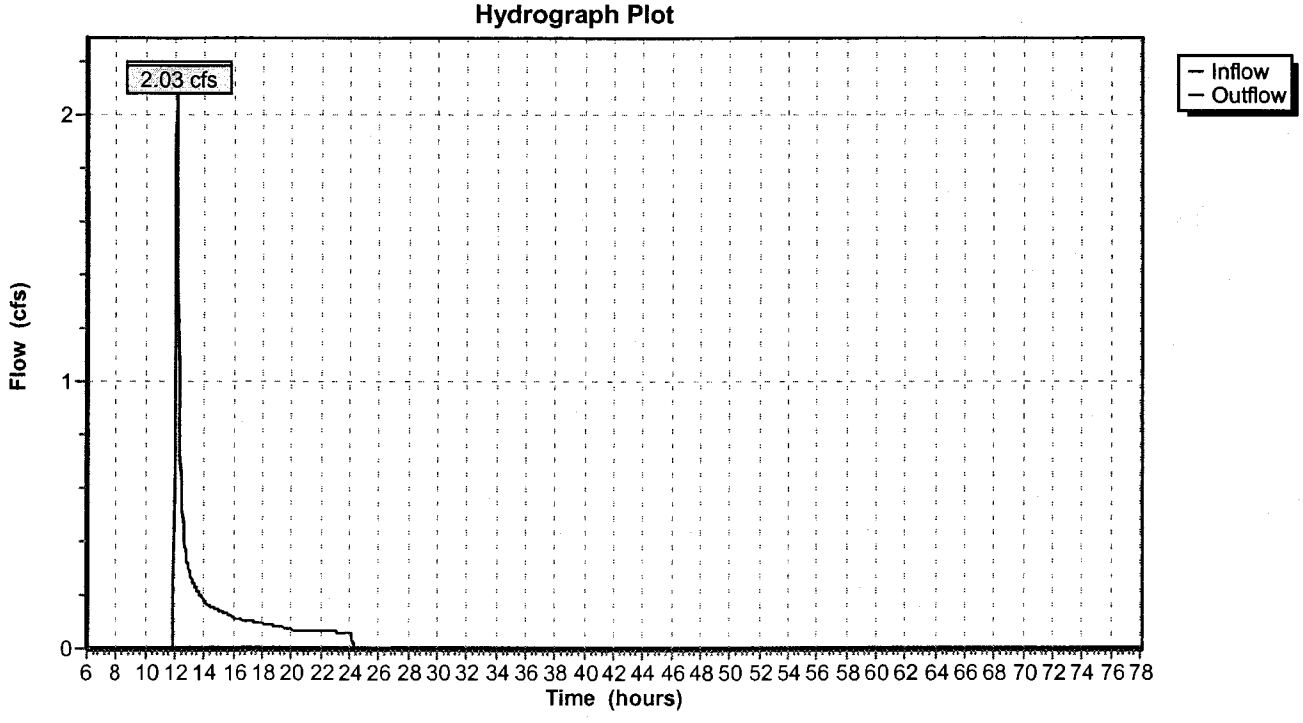
Inflow = 2.04 cfs @ 12.09 hrs, Volume= 0.165 af
Outflow = 2.03 cfs @ 12.10 hrs, Volume= 0.165 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.05'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

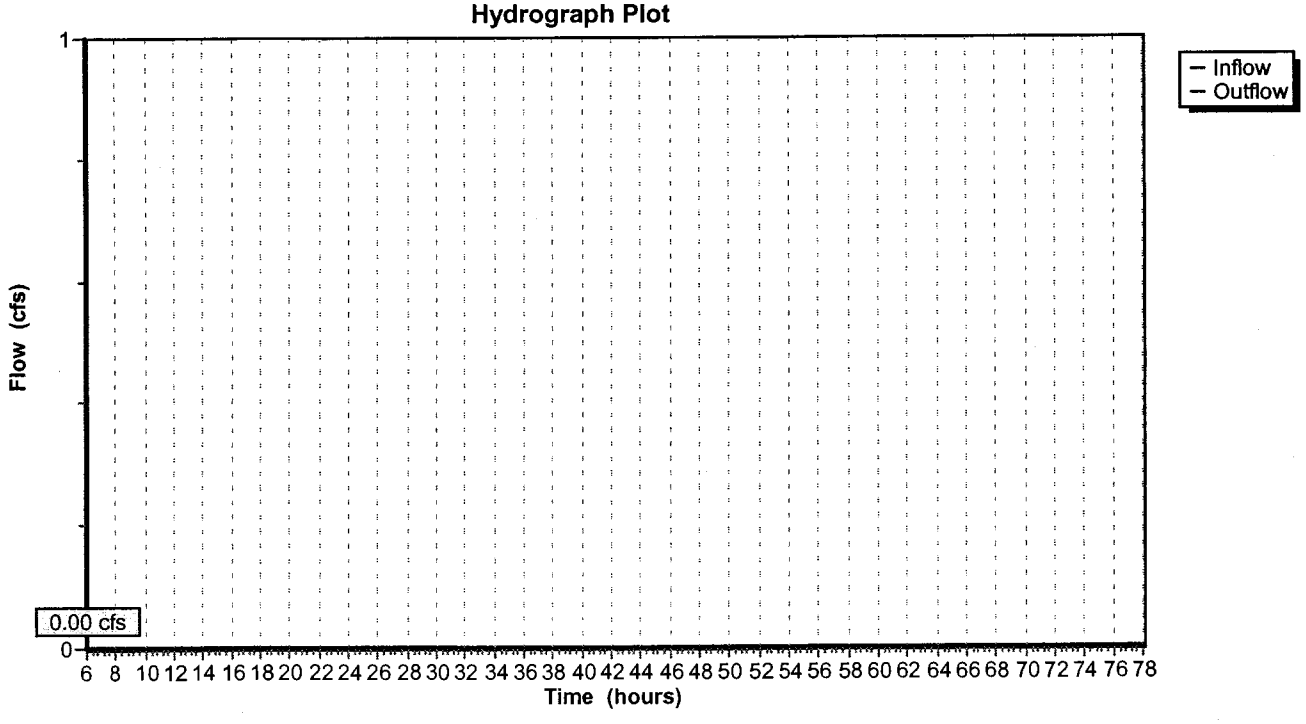
Inflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af	
Outflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	5.51 cfs @	12.08 hrs,	Volume=	0.387 af
Outflow	=	0.05 cfs @	24.22 hrs,	Volume=	0.252 af, Atten= 99%, Lag= 728.7 min
Discarded	=	0.05 cfs @	24.22 hrs,	Volume=	0.252 af
Primary	=	0.00 cfs @	6.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 78.97' Storage= 14,761 cf
Plug-Flow detention time= 1,908.2 min calculated for 0.252 af (65% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	6,217	308.0	0	0	6,217
78.00	7,502	334.0	6,849	6,849	7,584
80.00	8,901	362.0	16,383	23,233	9,283
81.00	10,765	523.0	9,818	33,051	20,631
82.00	12,930	703.0	11,831	44,882	38,202
83.00	16,006	858.0	14,441	59,322	57,472
84.00	22,172	902.0	19,005	78,328	63,697
85.00	25,765	911.0	23,946	102,274	65,281

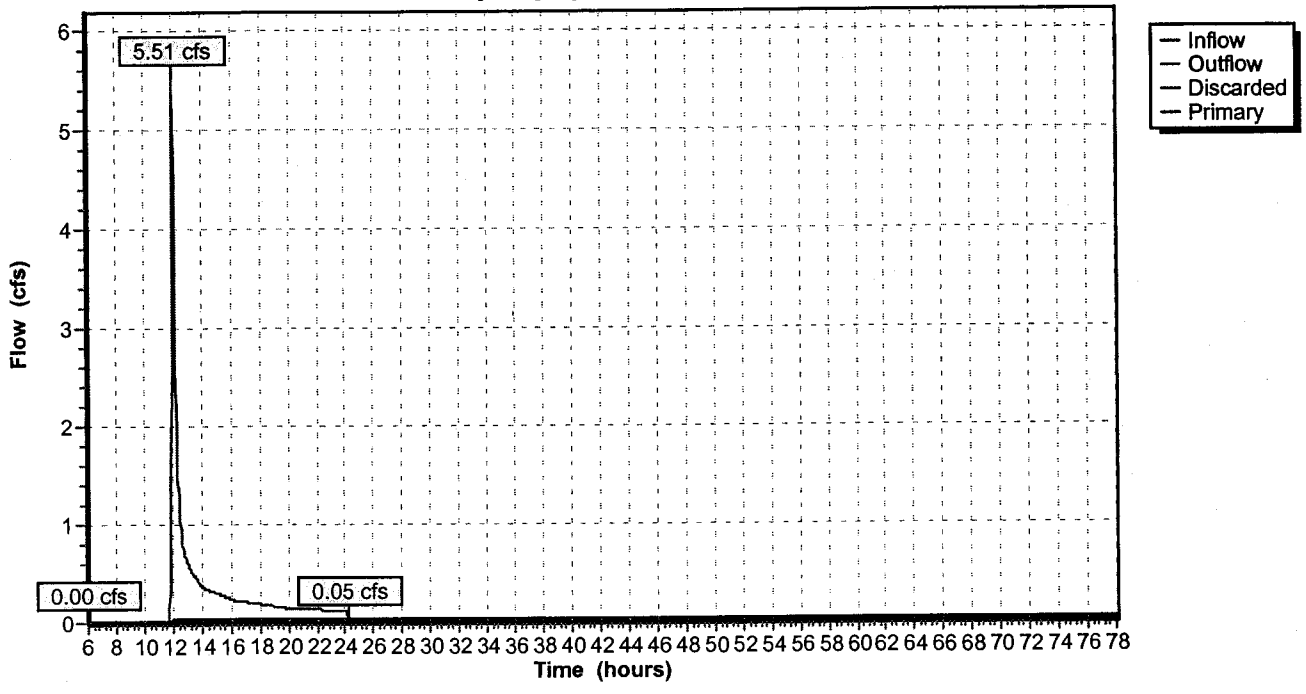
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



Subcatchment 1S: Undeveloped site

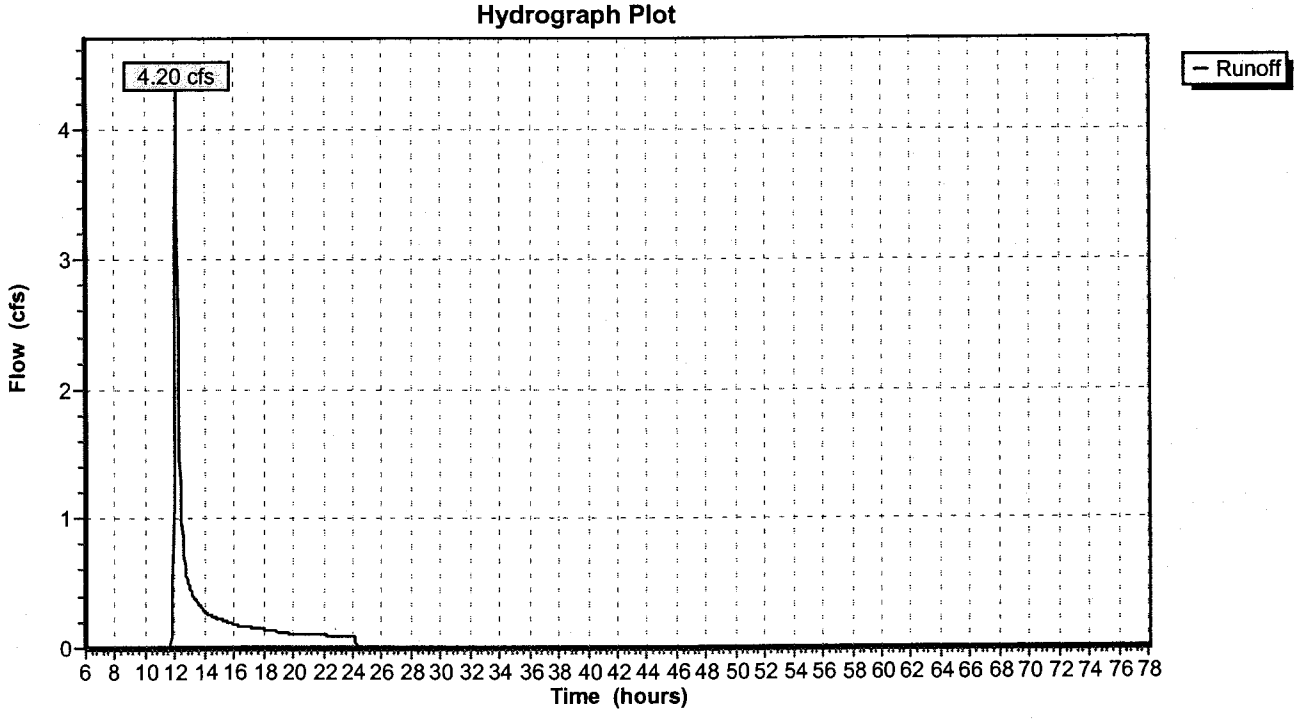
Runoff = 4.20 cfs @ 12.07 hrs, Volume= 0.292 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.50"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site



Subcatchment 2S: Developed Site

Runoff = 9.71 cfs @ 12.07 hrs, Volume= 0.635 af

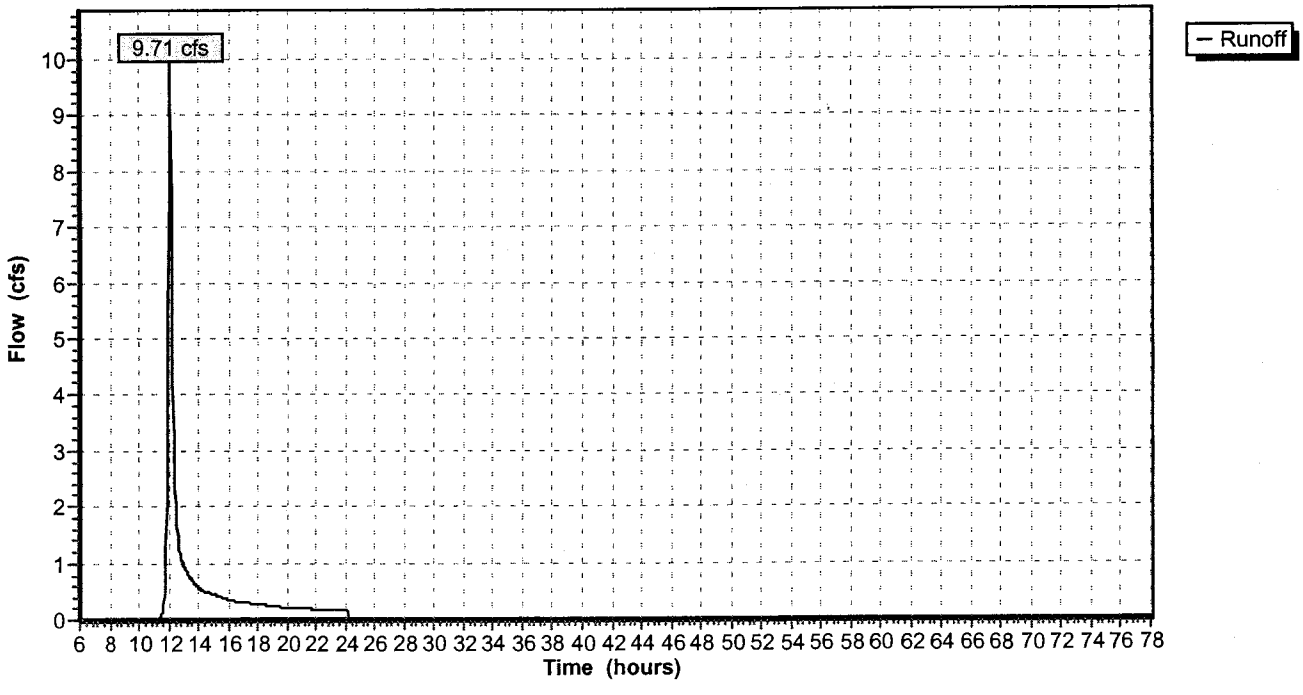
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=3.50"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

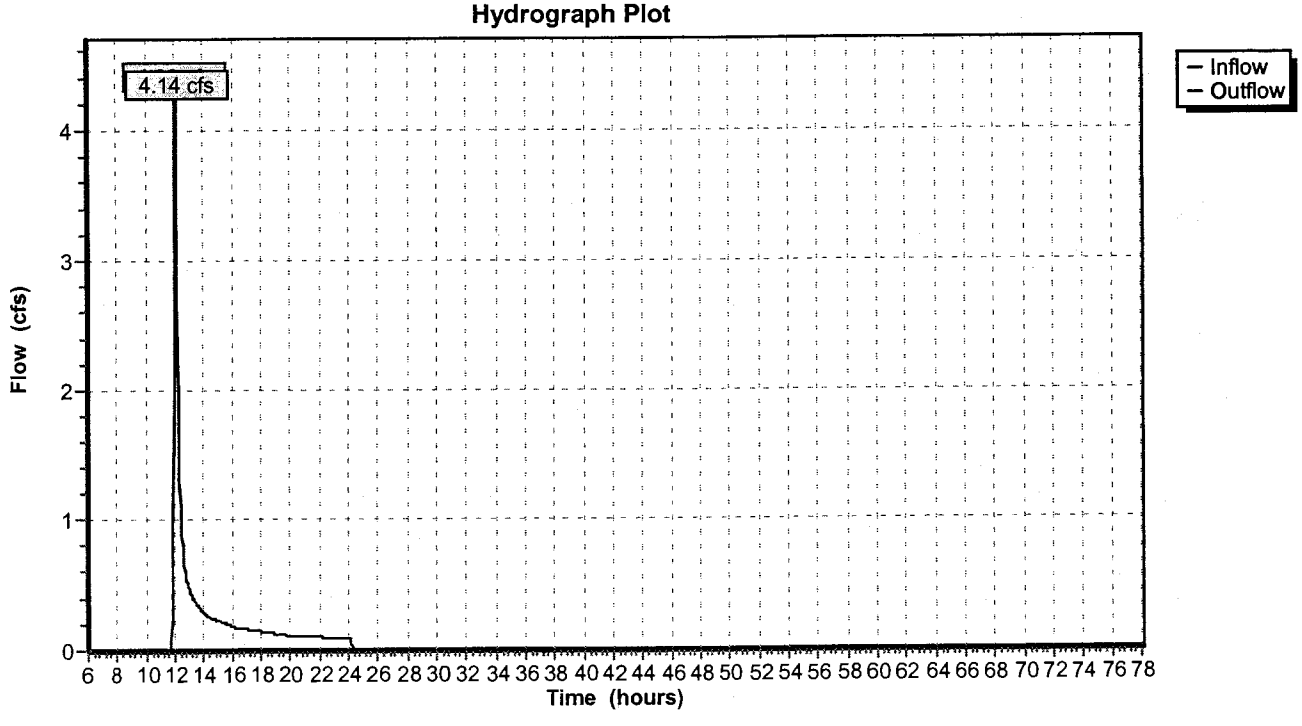
Inflow = 4.20 cfs @ 12.07 hrs, Volume= 0.292 af
Outflow = 4.14 cfs @ 12.09 hrs, Volume= 0.292 af, Atten= 1%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.10'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

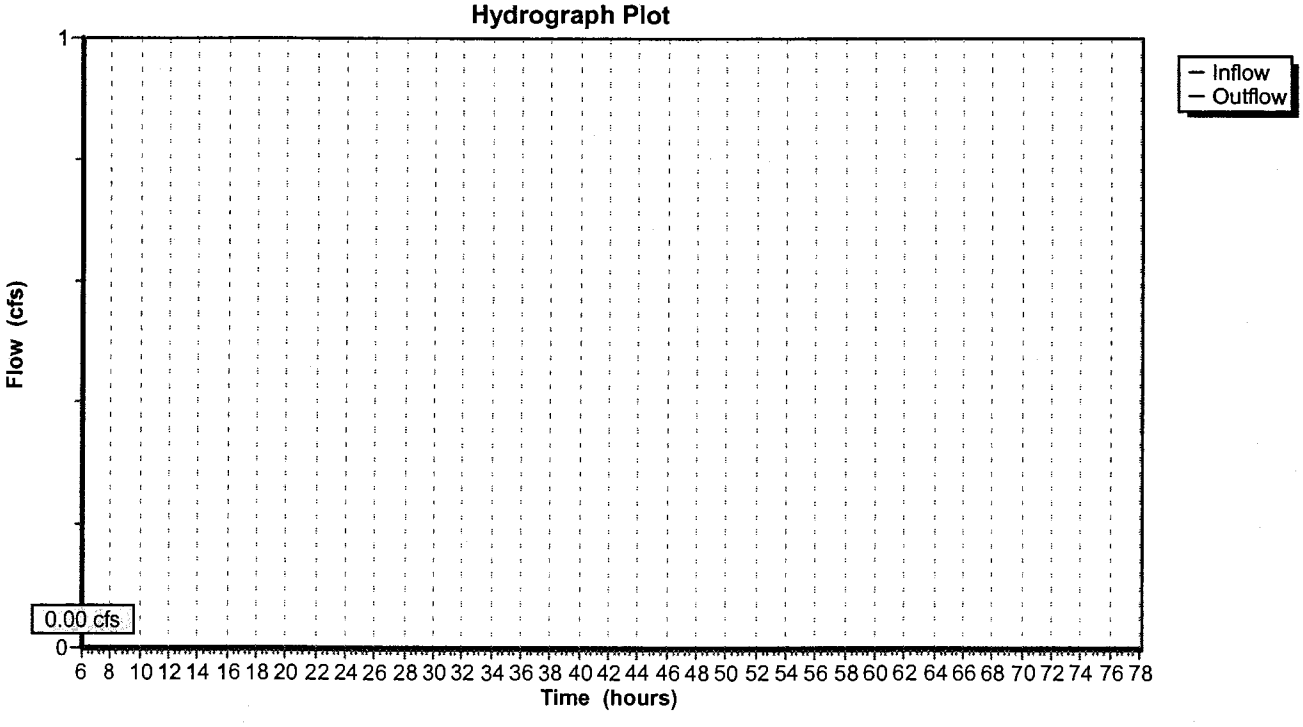
Inflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af
Outflow	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.0 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.00'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	9.71 cfs @	12.07 hrs, Volume=	0.635 af	
Outflow	=	0.07 cfs @	24.23 hrs, Volume=	0.291 af,	Atten= 99%, Lag= 729.5 min
Discarded	=	0.07 cfs @	24.23 hrs, Volume=	0.291 af	
Primary	=	0.00 cfs @	6.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 80.20' Storage= 25,203 cf
Plug-Flow detention time= 1,914.3 min calculated for 0.291 af (46% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	6,217	308.0	0	0	6,217
78.00	7,502	334.0	6,849	6,849	7,584
80.00	8,901	362.0	16,383	23,233	9,283
81.00	10,765	523.0	9,818	33,051	20,631
82.00	12,930	703.0	11,831	44,882	38,202
83.00	16,006	858.0	14,441	59,322	57,472
84.00	22,172	902.0	19,005	78,328	63,697
85.00	25,765	911.0	23,946	102,274	65,281

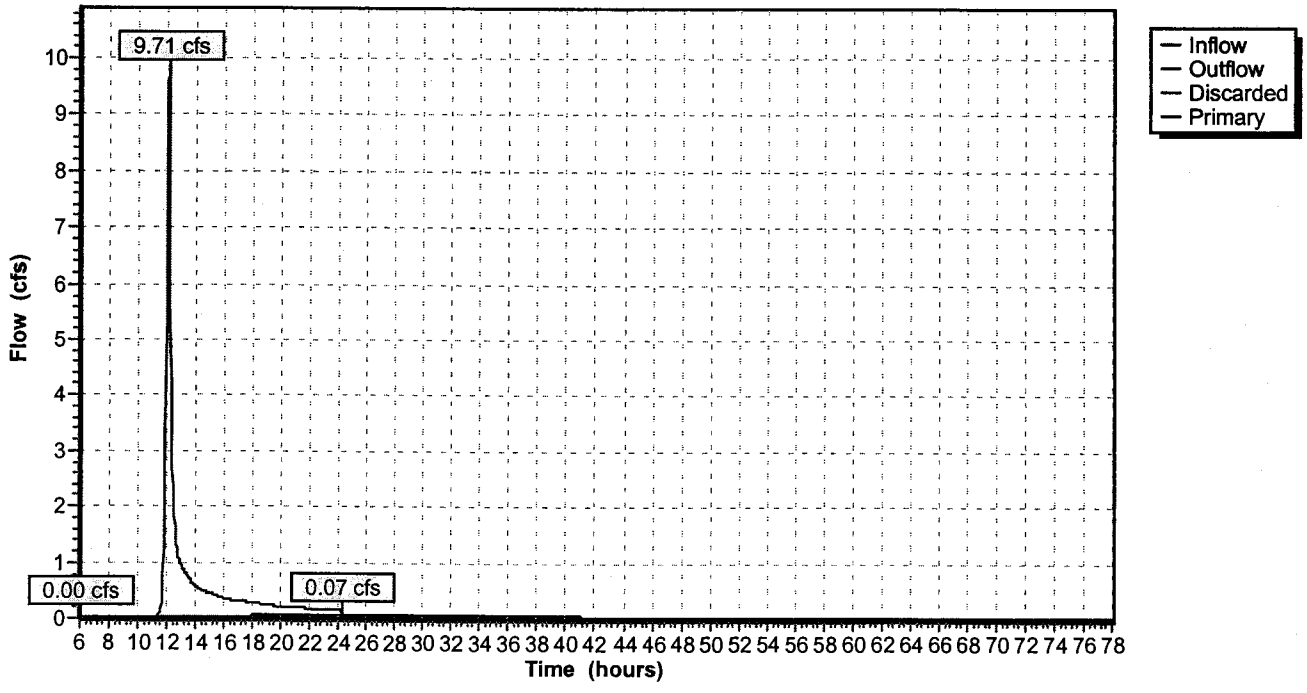
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500 Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



Subcatchment 1S: Undeveloped site

Runoff = 13.37 cfs @ 12.06 hrs, Volume= 0.838 af

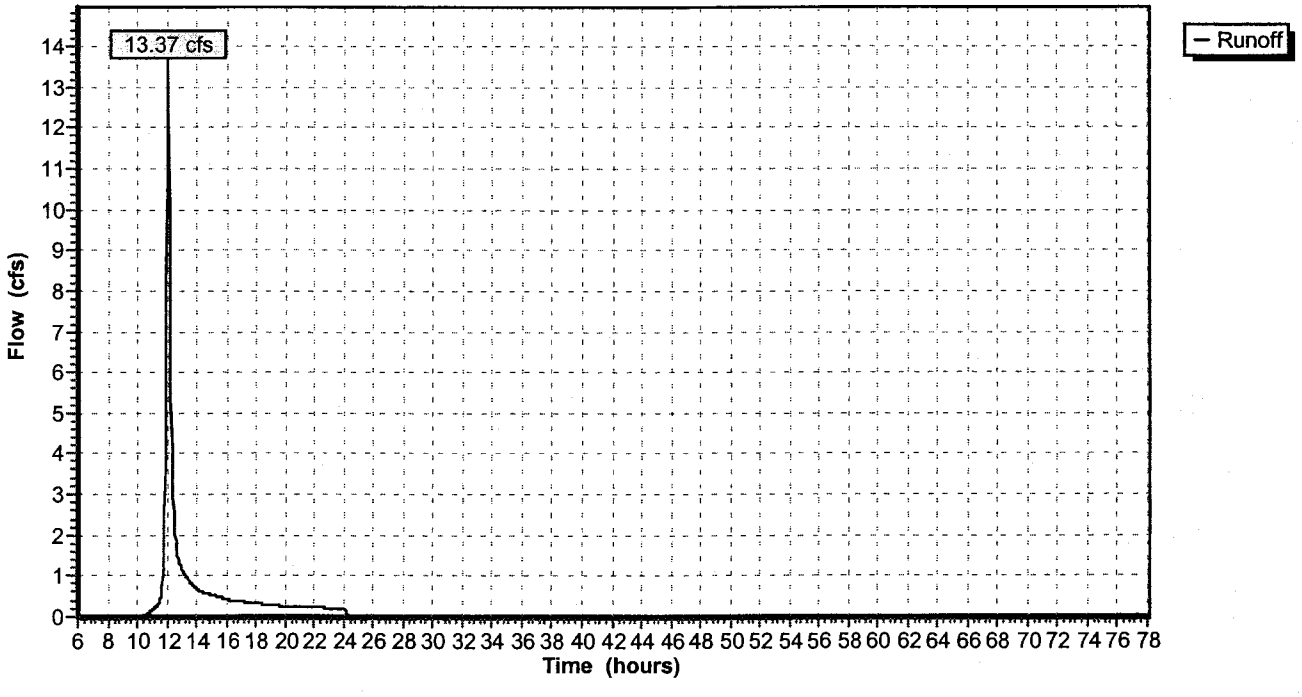
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=5.80"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site

Hydrograph Plot



Subcatchment 2S: Developed Site

Runoff = 26.21 cfs @ 12.06 hrs, Volume= 1.635 af

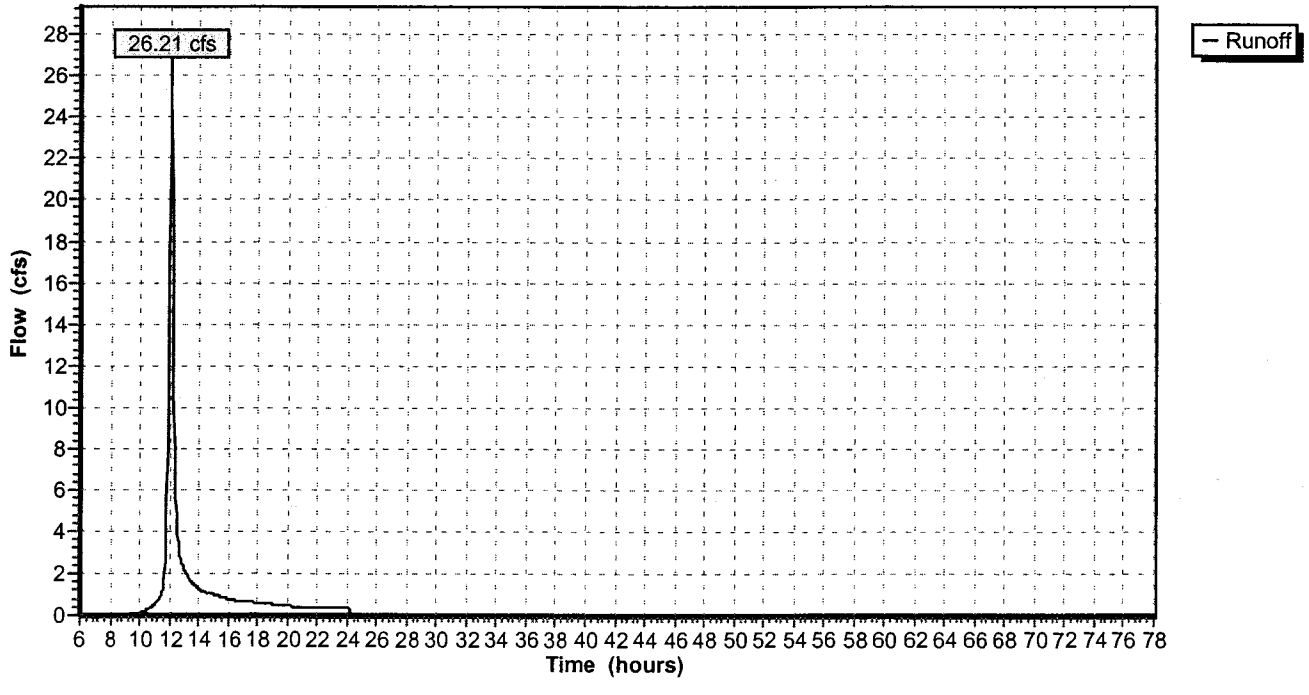
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=5.80"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

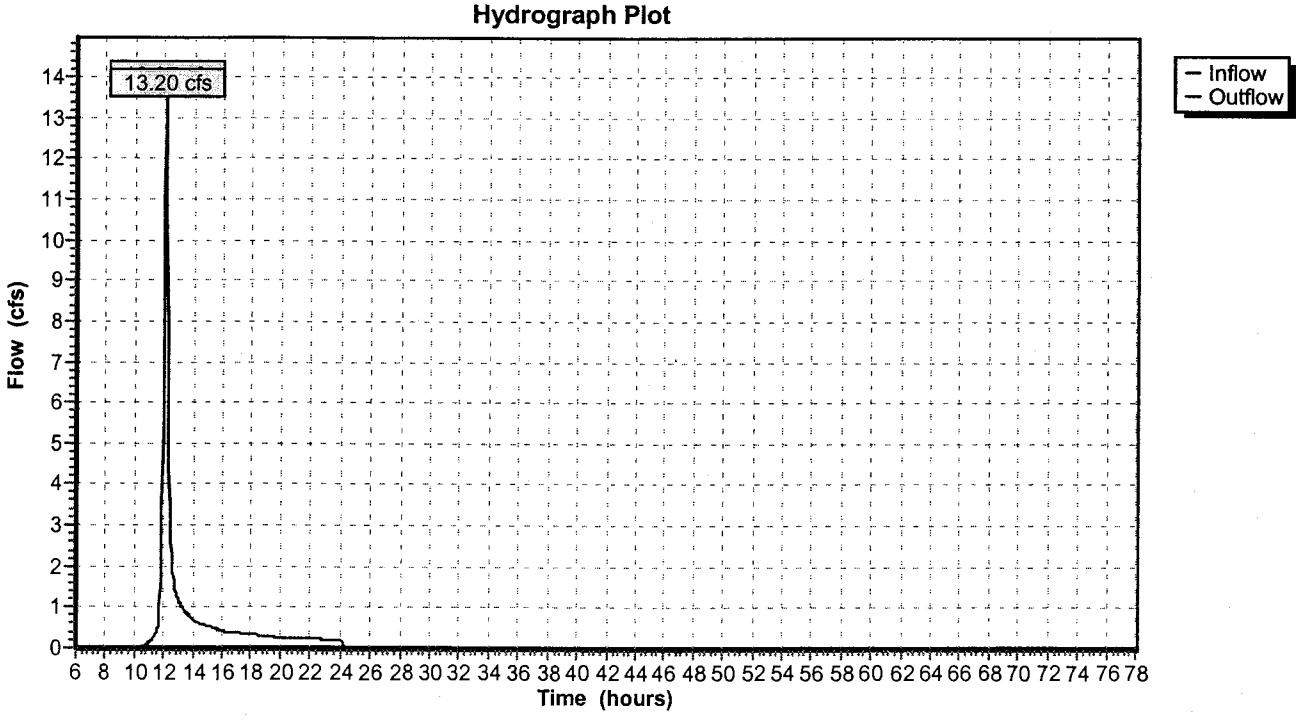
Inflow = 13.37 cfs @ 12.06 hrs, Volume= 0.838 af
Outflow = 13.20 cfs @ 12.07 hrs, Volume= 0.838 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.33'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

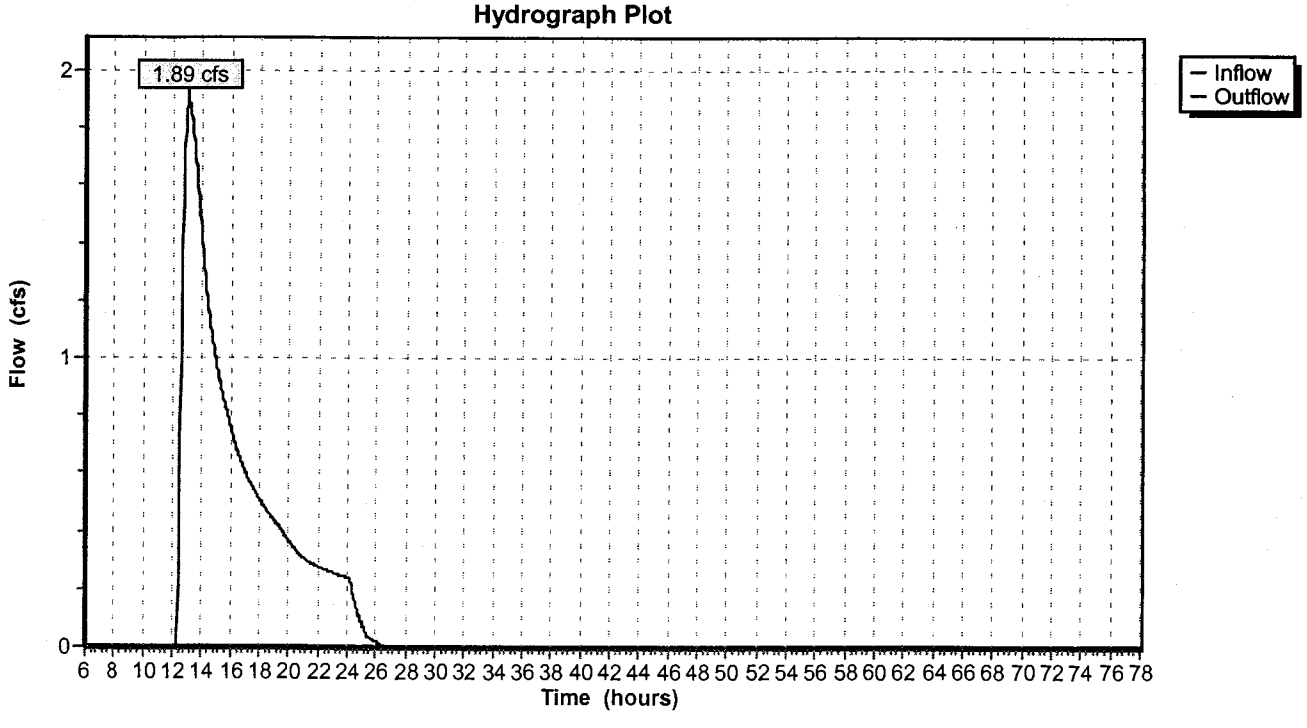
Inflow = 1.89 cfs @ 13.07 hrs, Volume= 0.661 af
Outflow = 1.89 cfs @ 13.08 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.05'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	26.21 cfs @	12.06 hrs, Volume=	1.635 af	
Outflow	=	2.07 cfs @	13.07 hrs, Volume=	1.169 af,	Atten= 92%, Lag= 60.4 min
Discarded	=	0.18 cfs @	13.07 hrs, Volume=	0.509 af	
Primary	=	1.89 cfs @	13.07 hrs, Volume=	0.661 af	

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 81.56' Storage= 39,676 cf
Plug-Flow detention time= 788.8 min calculated for 1.169 af (72% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	6,217	308.0	0	0	6,217
78.00	7,502	334.0	6,849	6,849	7,584
80.00	8,901	362.0	16,383	23,233	9,283
81.00	10,765	523.0	9,818	33,051	20,631
82.00	12,930	703.0	11,831	44,882	38,202
83.00	16,006	858.0	14,441	59,322	57,472
84.00	22,172	902.0	19,005	78,328	63,697
85.00	25,765	911.0	23,946	102,274	65,281

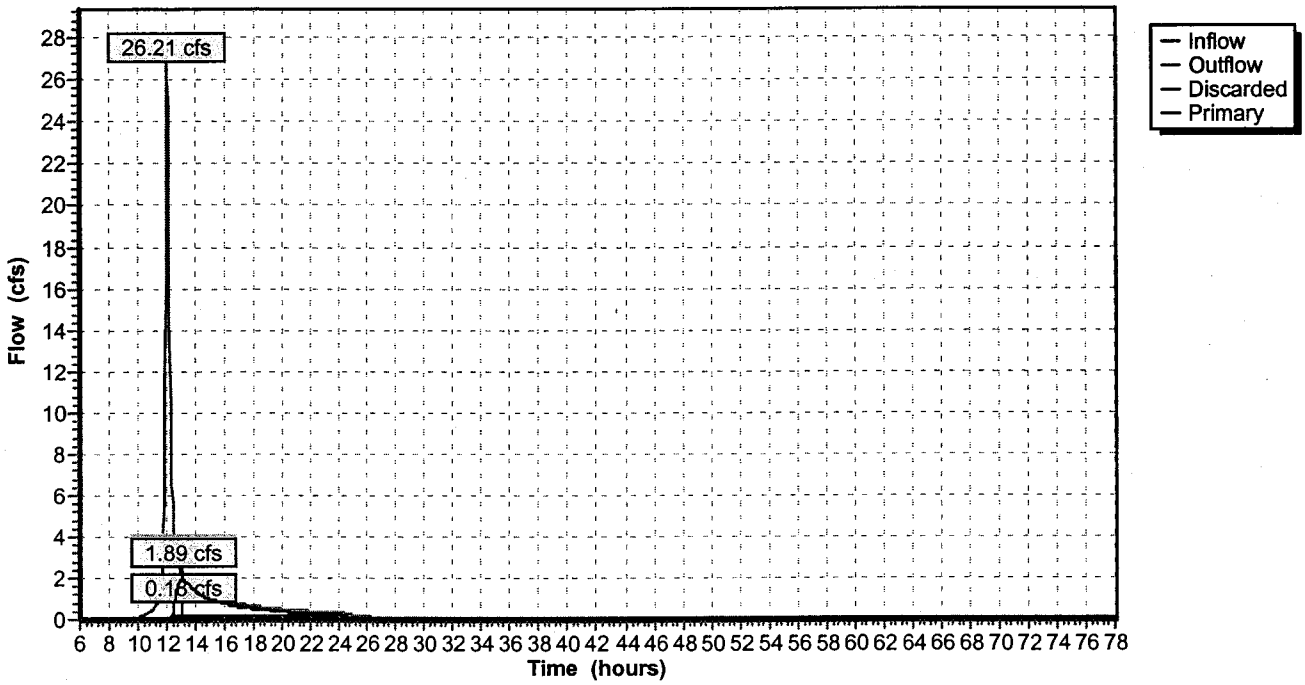
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



Subcatchment 1S: Undeveloped site

Runoff = 23.66 cfs @ 12.06 hrs, Volume= 1.464 af

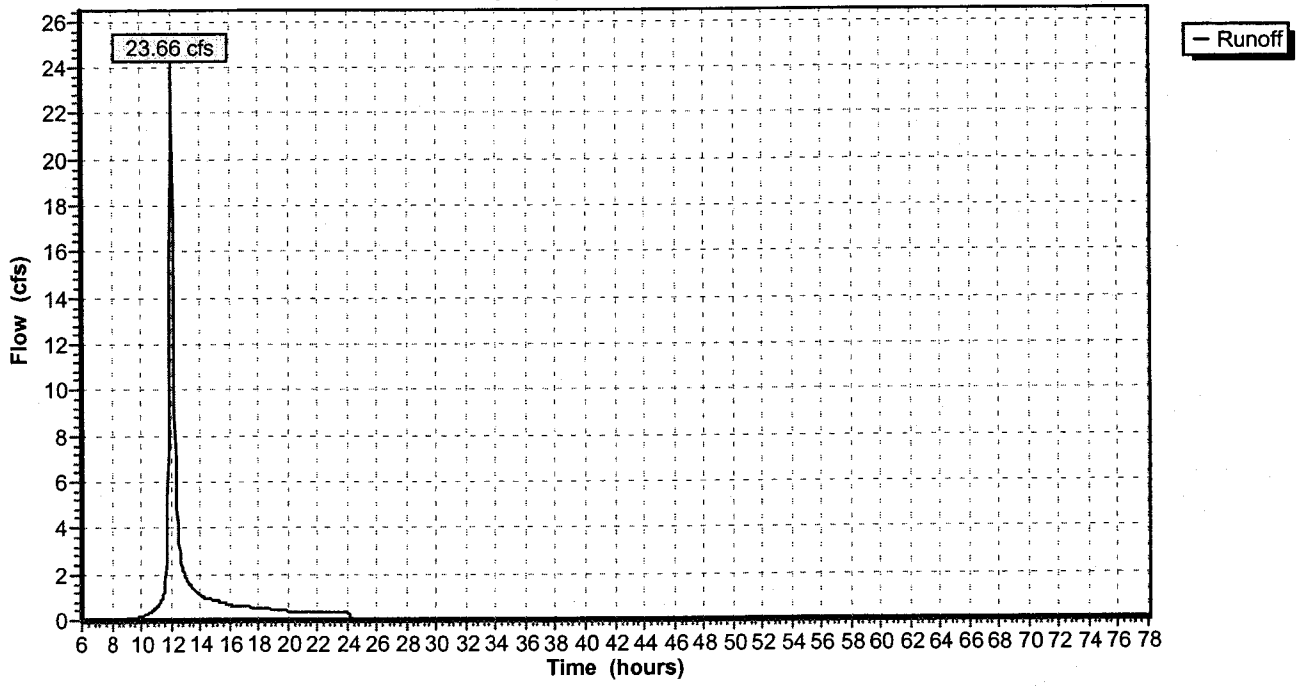
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=8.00"

Area (ac)	CN	Description
4.383	66	Natural Filed

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Undeveloped Site**

Subcatchment 1S: Undeveloped site

Hydrograph Plot



Subcatchment 2S: Developed Site

Runoff = 43.81 cfs @ 12.06 hrs, Volume= 2.734 af

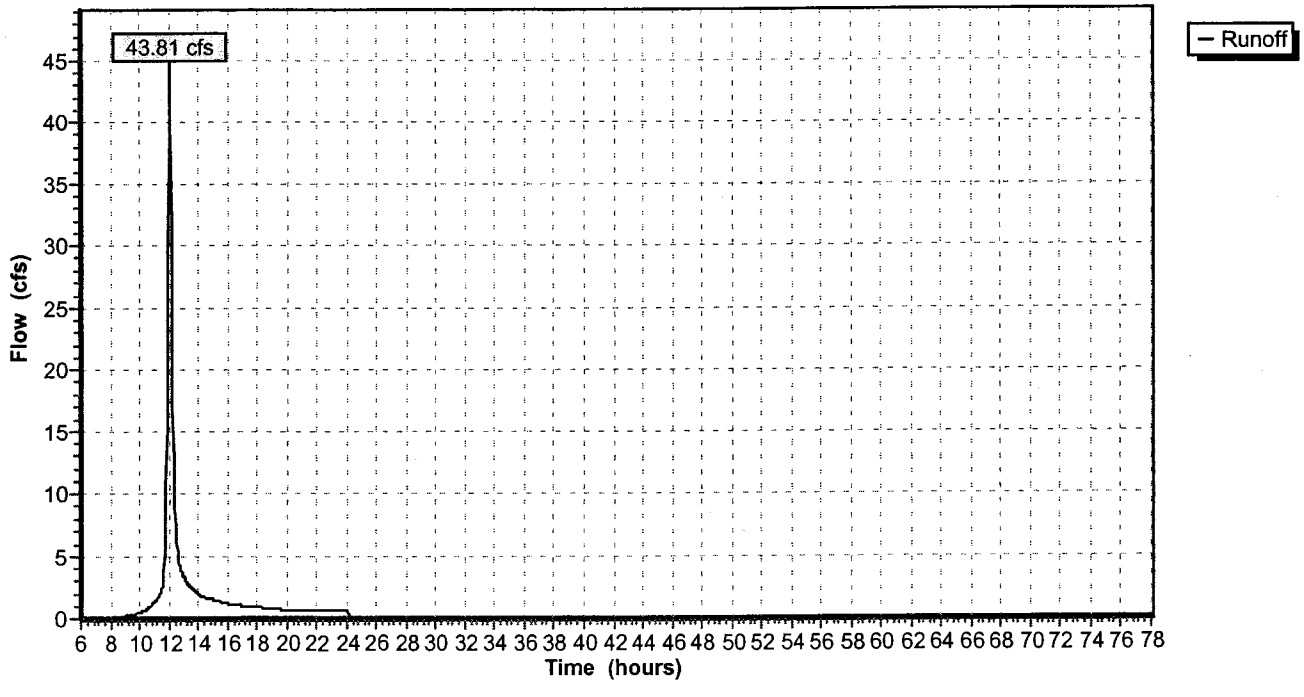
Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Type II 24-hr Rainfall=8.00"

Area (ac)	CN	Description
0.325	78	Onsite area to Structure N-2
1.822	73	On and Off site to culvert N-2a
0.593	79	On site to Culvert N-1
0.803	78	On and Off site to Entrance Culvert
3.622	66	On and Off site to Pond
7.165	71	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8					**Direct Entry, Developed site / Re-routing**

Subcatchment 2S: Developed Site

Hydrograph Plot



Reach 1R: Natural Channel Below BMP

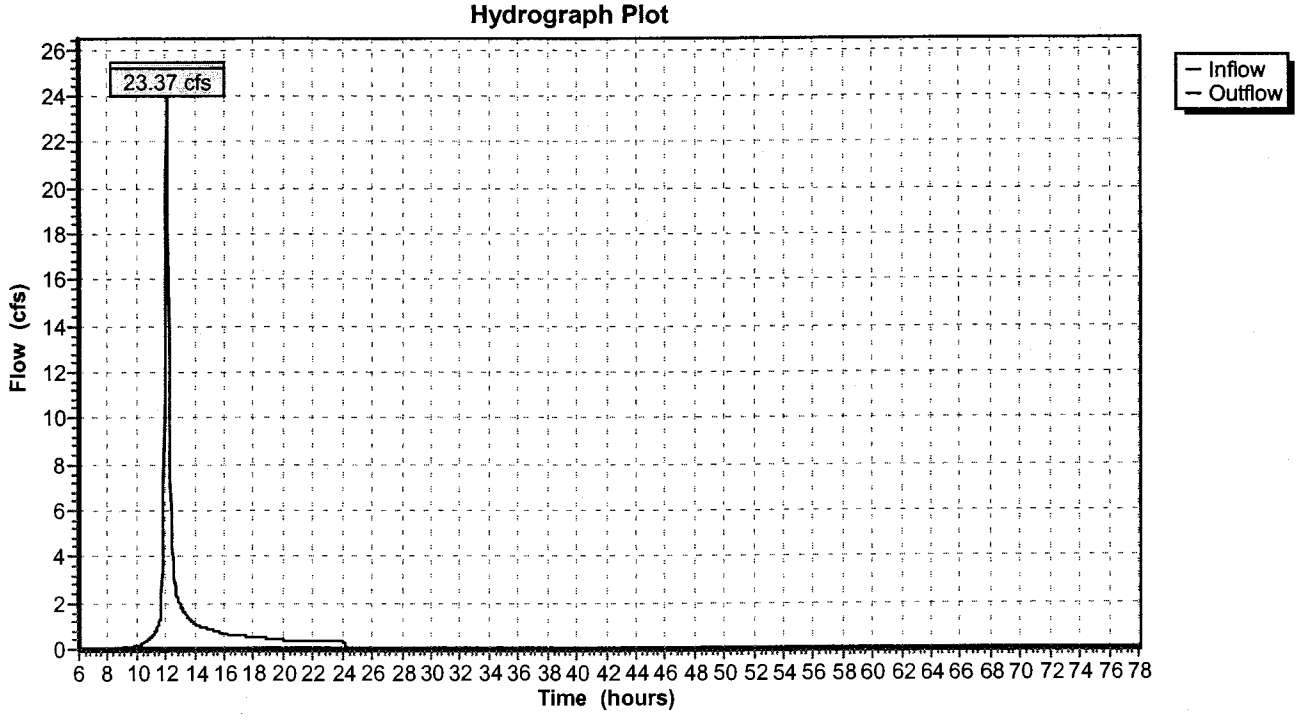
Inflow = 23.66 cfs @ 12.06 hrs, Volume= 1.464 af
Outflow = 23.37 cfs @ 12.07 hrs, Volume= 1.464 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.58'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 1R: Natural Channel Below BMP



Reach 2R: Natural Channel Below BMP

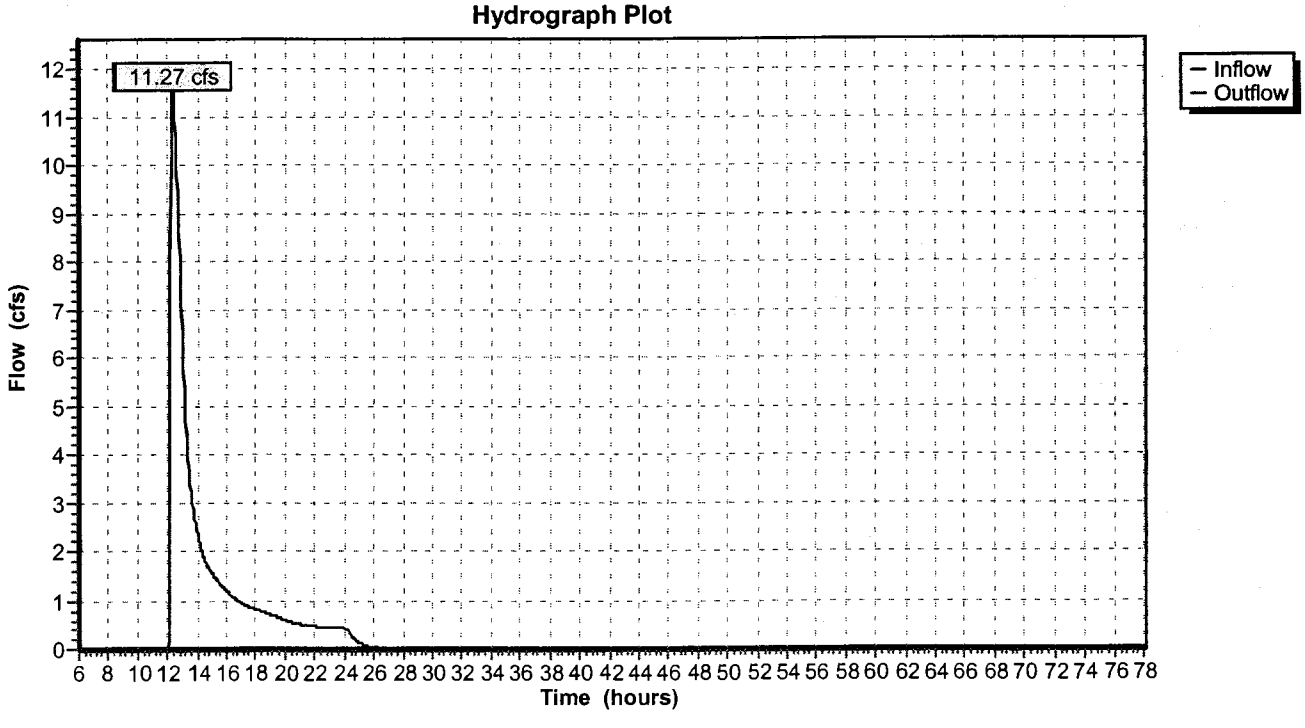
Inflow = 11.27 cfs @ 12.33 hrs, Volume= 1.733 af
Outflow = 11.27 cfs @ 12.35 hrs, Volume= 1.733 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.27'
Capacity at bank full= 673.06 cfs
Inlet Invert= 74.00', Outlet Invert= 71.00'
Custom cross-section table, n= 0.100 Length= 45.0' Slope= 0.0667 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.00	17.0	34.1	765	41.01
2.00	60.0	51.1	2,700	256.22
3.00	118.0	65.1	5,310	673.06

Reach 2R: Natural Channel Below BMP



Pond 2P: Infiltration BMP

Inflow	=	43.81 cfs @	12.06 hrs, Volume=	2.734 af	
Outflow	=	11.56 cfs @	12.33 hrs, Volume=	2.267 af,	Atten= 74%, Lag= 16.5 min
Discarded	=	0.29 cfs @	12.33 hrs, Volume=	0.534 af	
Primary	=	11.27 cfs @	12.33 hrs, Volume=	1.733 af	

Routing by Stor-Ind method, Time Span= 6.00-78.00 hrs, dt= 0.05 hrs

Peak Elev= 82.64' Storage= 54,053 cf
Plug-Flow detention time= 445.4 min calculated for 2.265 af (83% of inflow)
Storage and wetted areas determined by Irregular sections

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
77.00	6,217	308.0	0	0	6,217
78.00	7,502	334.0	6,849	6,849	7,584
80.00	8,901	362.0	16,383	23,233	9,283
81.00	10,765	523.0	9,818	33,051	20,631
82.00	12,930	703.0	11,831	44,882	38,202
83.00	16,006	858.0	14,441	59,322	57,472
84.00	22,172	902.0	19,005	78,328	63,697
85.00	25,765	911.0	23,946	102,274	65,281

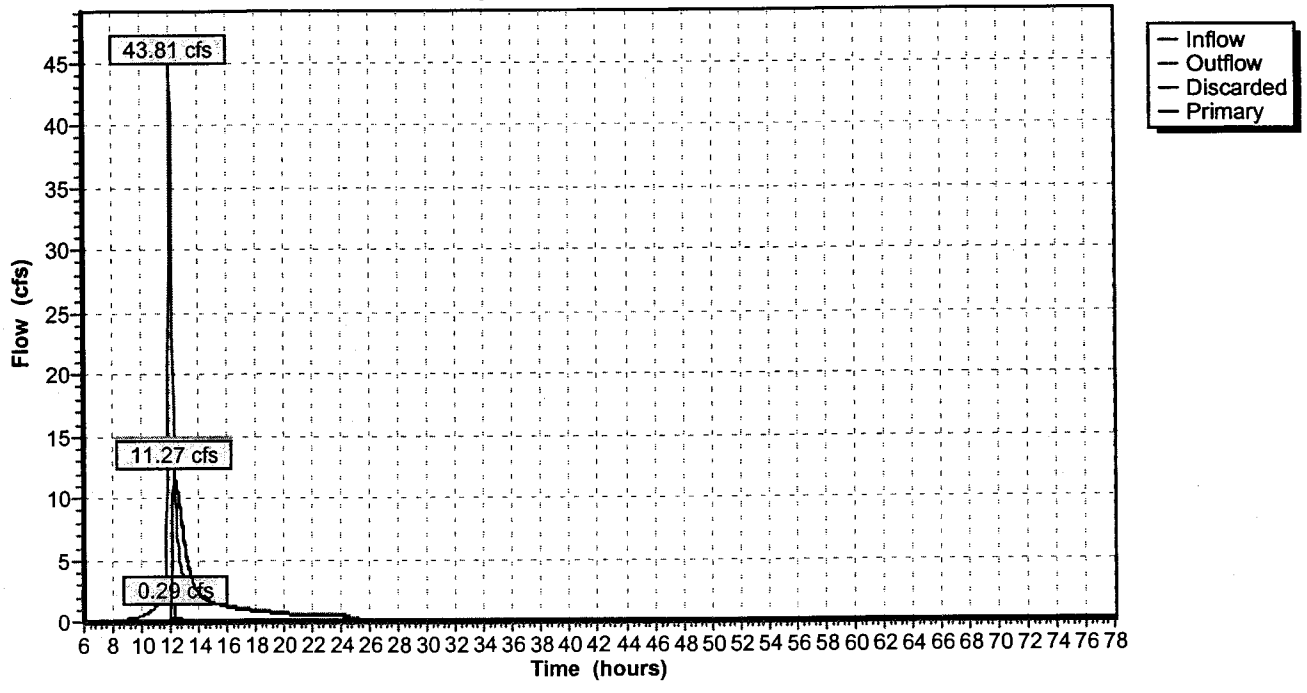
Discarded OutFlow (Free Discharge)
└─1=Exfiltration

Primary OutFlow (Free Discharge)
└─2=Culvert
  ├─3=Orifice/Grate
  └─4=Orifice/Grate

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.000347 fpm Exfiltration over entire Wetted area**
2	Primary	76.00'	**18.0" x 100.0' long Culvert** Ke= 0.500
			Outlet Invert= 75.50' S= 0.0050 '/' n= 0.013 Cc= 0.900
3	Device 2	83.00'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Device 2	81.10'	**15.0" Vert. Orifice/Grate X 2.00** C= 0.600

Pond 2P: Infiltration BMP

Hydrograph Plot



GEOTECHNICAL REPORT AND ADDENDUM

Report of Subsurface Investigation
And Geotechnical Engineering Services
Faith Fellowship Church
Williamsburg, Virginia
GET Project No. VB02-183G
June 24, 2002
Prepared For: Pastor Jerry Jutras
C/O LandMark Design Group

See Addendum #1
For final vote.

Geotechnical
Environmental
Testing
Solutions, Inc.

Geotechnical
Environmental
Testing
Solutions, Inc.

June 24, 2002

TO: **Pastor Jerry Jutras**
C/O LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, Virginia 23188

Attn: Mr. C. J. Bodnar, P.E.

RE: Report of Subsurface Investigation and Geotechnical Engineering Services
Faith Fellowship Church
Williamsburg, Virginia
G E T Project No: VB02-183G

Dear Mr. Bodnar:

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

Often, because of design and construction details that occur on a project, questions arise concerning subsurface conditions. **G E T Solutions, Inc.** would be pleased to continue its role as Geotechnical Engineer during the project implementation.

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.

D. Mark Scholefield, P.E.
Staff Engineer
VA Lic. # 033932

COMMONWEALTH OF VIRGINIA
6/24/02
DAVID MARK SCHOLEFIELD
No.033932
PROFESSIONAL ENGINEER

Camille A. Kattan
Principal Engineer
VA Lic. # 018045

Copies: (3) Client

204 Grayson Road, Suite B • Virginia Beach, VA 23462 • Phone: (757)-518-1703 • Fax: (757)-518-1704
info@getsolutionsinc.com

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GET Solutions, Inc.

1.0 PROJECT INFORMATION

1.1 Project Authorization:

G E T Solutions, Inc. has completed our subsurface exploration and geotechnical engineering services for the proposed Faith Fellowship Church project located in Williamsburg, Virginia. The geotechnical engineering services were conducted in general accordance with **G E T** Proposal No. PVB02-212G, dated May 21, 2002. Authorization to proceed with the services was in the form of **G E T** Proposal No. PVB02-212G, signed on June 4, 2002, by Pastor Jerry Jutras.

1.2 Project Description:

The proposed development at this site is planned to consist of constructing a new church, with associated parking and stormwater management facilities. As reported by the project Civil Engineer, the structure will consist of a one-story, wood-framed building with a wood truss roof system. The structure will be about 5000 square feet in plan area. The maximum wall and column loads associated with the building are expected to be about 3 kips per linear foot and up to 40 kips per column, respectively. The slab will be constructed as a slab-on grade member, with the distributed loads not expected to exceed about 150 pounds per square foot (PSF). The finish floor elevation was not known at the time of this reporting, however it is anticipated that the finish floor elevation will coincide with or be slightly above the current grades. Accordingly, less than 2 feet of cut or fill is expected to be required to establish the proper elevations. The stormwater management pond is proposed for construction on the western portion of the property.

If any of the noted information is incorrect or has changed, please inform **G E T Solutions, Inc.** so that we may amend the recommendations presented in this report, if appropriate.

1.3 Purpose and Scope of Services:

The purpose of this study was to obtain information on the general subsurface conditions at the proposed project site. The subsurface conditions encountered were then evaluated with respect to the available project characteristics. In this regard, engineering assessments for the following items were formulated:

1. General assessment of the soils revealed by the borings performed at the proposed development.

2. General location and description of potentially deleterious material encountered in the borings that may interfere with construction progress or structure performance, including existing fills or surficial/subsurface organics.

3. Soil subgrade preparation, including stripping, grading and compaction. Engineering criteria for placement and compaction of approved structural fill material.

4. Construction considerations for fill placement, subgrade preparation, and foundation excavations.

5. Typical pavement sections based on the field exploration activities (one CBR test) and our experience with similar soil conditions.

6. Shallow subsurface soils evaluation with respect to the Stormwater Management Pond construction and suitability of the excavated soils for reuse as structural fill material.

7. Feasibility of utilizing a shallow foundation system for support of the proposed structure and an evaluation of Shrink/Swell potential of the foundation bearing soils. Design parameters required for the foundation system, including foundation sizes, allowable bearing pressures, foundation levels and expected total and differential settlements.

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. Prior to development of this site, an environmental assessment is advisable.

2.0 FIELD AND LABORATORY PROCEDURES

2.1 Field Exploration:

In order to explore the general subsurface soil types and to aid in developing associated foundation design parameters, two 20-foot deep Standard Penetration Test (SPT) borings (designated as B-1 and B-2) were drilled by **G E T Solutions, Inc.** Specifically, Boring B-1 was drilled within the proposed building area and Boring B-2 was drilled within the proposed Stormwater Management Area. The SPT borings were performed with the use of a power drill rig using hollow stem auger drilling procedures. The soil samples were obtained with a Split-Spoon Sampler in general accordance with the Standard Penetration Test (SPT) method ASTM D-1586. These samples were taken continuously from the ground surface to a depth of 10 feet, and at 5-foot intervals thereafter.

In addition to the SPT borings, one bulk soil sample (designated as CBR-1) was collected from the approximate subgrade level within the proposed pavement area, at a depth ranging from about 1 to 2 feet below existing grades. The bulk soil sample was returned to our laboratory and subjected to CBR testing in accordance with VTM standards. Also, a 5-foot deep hand auger boring was drilled at the CBR location.

The boring and CBR locations were established by representatives of LandMark Development Group and were located and staked in the field by a representative of **G E T Solutions, Inc.** The approximate boring and CBR locations are shown on the attached "Boring Location Plan", Figure 1 (Appendix I), adopted from a site plan furnished to us by LandMark Design Group.

2.2 Laboratory Testing:

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

Three representative split spoon soil samples were selected and subjected to laboratory testing, which included natural moisture, -#200 sieve wash testing and analysis, in order to corroborate the visual classification. These test results are noted in Table I and are presented on the "Log of Boring" sheets (Appendix II), included with this report.

Table I – Laboratory Test Results

Boring No.	Sample No.	Depth (Ft)	Natural Moisture (%)	-#200 Sieve (%)	Classification
B-1	S-2	2-4	15	28.2	SM
B-2	S-4	6-8	21	46.5	SM
B-2	S-6	13.5-15	12	19.6	SM

The bulk subgrade soil sample was subjected to natural moisture content, -#200 sieve, Atterberg Limits, Standard Proctor, and CBR testing in accordance with VTM standards. A summary of the CBR test results and the moisture density relationship curve (Proctor) is presented in Appendix IV.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Location and Description:

The proposed project site is accessed by School House Lane in Williamsburg, Virginia. Specifically, the proposed construction area is bordered to the south by Stonehouse Elementary School, to the east by School House Lane, and to the north and west by undeveloped property. During our site reconnaissance, the parcel generally consisted of an agricultural field, with the exception of the westernmost portion of the property, which was wooded. Based on a visual observation, the site appeared level with less than a 1-foot change in elevation in 50 feet. Evidence of underground utilities (storm drain, phone, power) were observed adjacent to the existing roadway, as marked by the utility companies.

3.2 Subsurface Soil Conditions:

The results of our field exploration program indicated the presence of approximately 6 to 8 inches of tilled material at the boring locations. The tilled material thickness could vary at other locations. Underlying the superficial materials and extending to the SPT boring termination depth 20 feet below current grades, the subsurface soils were generally arranged in a 2-layer configuration.

The initial soil layer extended beneath the tilled material to approximately 18 feet below current grades. The soils of this layer were granular in nature and consisted of SAND (SP-SM, SM, SM-SC) with varying amounts of Silt and Clay. The Standard Penetration Test (SPT) results, N-values, recorded within the granular soils ranged from 3 to 14 blows-per-foot (BPF), indicating a very loose to medium dense relative density. Seams of CLAY (CL) were interbedded within the granular stratum at depths ranging from 7 to 18 feet below current grades. The granular soils of this layer have low Shrink/Swell potential and will not have adverse effects upon the foundations in that respect.

The second soil layer extended beneath the initial soil layer to the SPT boring termination depth of 20 feet below current grades. These soils consisted of CLAY (CL) with varying amounts of Sand. The N-values recorded within the soils of this layer averaged 7 BPF, indicating a medium stiff consistency.

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration are included in Appendix II (Log of Boring sheets) and in the Generalized Soil Profile presented in Appendix III, 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.

3.3 Groundwater Information:

The groundwater table depth was measured at each boring location during drilling operations. The depth to the groundwater table was recorded at 18 feet below the existing grades at the locations of Borings B-1 and B-2. The groundwater table was not encountered at the location of HA-1, as it was terminated at a depth of 5 feet below current grades.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as existing swales, drainage ponds, underdrains and areas of covered soil (paved parking lots, side walks, etc.). In the project's area, seasonal groundwater fluctuations of ± 2 feet are common; however, greater fluctuations have been documented. We recommend that the contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on the construction procedures, if necessary.

3.4 Shrink-Swell Soils Characteristics:

The soils recovered during our field exploration were tested and evaluated for their potential to expand or contract with moisture changes (typically termed shrink-swell). Shallow foundations constructed on expansive soils (Clays) at certain depths may be subjected to detrimental uplift forces caused by the swelling of these soils as a result of an increase in the moisture content. As these clays lose moisture they may conversely shrink. This situation can adversely affect the foundation.

The most important fact to remember is that swelling and shrinking will only take place if moisture changes occur, which can be induced by change in weather conditions, leaky pipes, poor drainage and site layout (i.e. reduction of trees, elevation change etc.). The depth of the soil influenced by weather conditions is termed the "active depth", which will vary due to weather changes, locality and the presence or absence of ground water. Soils encountered below the active zone may posses the characteristics for potential shrink/swell, but since the water content of the soil is constant volume changes will not take place. The local active depth associated with the change in weather conditions generally extends to about 4 to 10 feet below existing grades depending on the region, and site topography.

Many researchers have developed relationships between the shrink/swell potential and various soil properties. Liquid Limit (LL) and Plasticity Index (PI) testing are commonly used as indicators of shrink/swell potential, with the higher PI's resulting in higher shrink/swell potential. Several publications recognize soils with PI's in excess of 25 as high potential shrink/swell soils, conversely soils with PI's less than 15 are considered to be of low shrink/swell potential.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 Clearing and Grading:

The proposed construction areas should be cleared by means of removing the tilled organic materials, all trees, topsoil, and root mat. It is estimated that a cut averaging 6 inches in depth will be required to remove the tilled organic materials. This cut is expected to extend deeper in isolated areas to remove deeper deposits of topsoil material, root mat or debris, which may become evident during the clearing. It is recommended that the clearing operations extend laterally at least 5 feet beyond the perimeter of the proposed building and parking areas.

The results of our field exploration program indicated that the soils below the topsoil consisted of very loose SAND (SP-SM, SM). Combinations of excess surface moisture from precipitation ponding on the site and the construction traffic, including heavy compaction equipment, may create pumping and general deterioration of the bearing capabilities of the surface soils. Therefore, undercutting to remove very loose soils in isolated areas may become necessary. In this regard, and in order to reduce undercutting, care should be exercised during the clearing, grading and construction operations at the site. Grading should be performed during a dry season if at all possible. This should minimize these potential problems, although they may not be totally eliminated.

4.2 Subgrade Preparation:

Following the clearing operation, the exposed subgrade soils should be densified with a large static drum roller. After the subgrade soils have been densified, they should be evaluated by **G E T Solutions, Inc.** for stability. Accordingly, the subgrade soils should be proofrolled to check for pockets of loose material hidden beneath a crust of better soil. Several passes should be made by a large rubber-tired roller or loaded dump truck over the construction areas, with the successive passes aligned perpendicularly. The number of passes will be determined in the field by the Geotechnical Engineer depending on the soils conditions. Any pumping and unstable areas observed during proofrolling (beyond the initial cut) should be undercut and/or stabilized at the directions of the Geotechnical Engineer.

Following the field exploration activities and approval by the engineer, it is recommended that, within the construction areas, natural soils below stripped grade should be compacted to a dry density of at least 98 percent of the standard Proctor maximum dry density (ASTM D698), as tested to a depth of 12 inches, when possible.

4.3 Structural Fill and Placement:

Following the approval of the natural subgrade soils by the Geotechnical Engineer, the placement of the fill required to establish the design grades may begin. Any material to be used for structural fill should be evaluated and tested by **G E T Solutions, Inc.** prior to placement to determine if they are suitable for the intended use. Suitable structural fill material should consist of sand or gravel containing less than 25% by weight of fines (SP, SM, SW, GP, GW), having a liquid limit less than 20 and plastic limit less than 6, and should be free of rubble, organics, clay, debris and other unsuitable material.

Based on our field and laboratory testing procedures, the majority of the on-site soils located beneath the tilled material appear suitable for re-use as structural fill within the construction areas. Further classification testing (natural moisture, full sieve, Standard Proctor) should be performed on any on-site materials presented for reuse as structural fill. If pockets of CLAY (CL) or Clayey SAND (SC) are encountered they should be separated from the sandy soils and stockpiled for use as general fill within green areas.

All structural fill should be compacted to a dry density of at least 98 percent of the standard Proctor maximum dry density (ASTM D698). In general, the compaction should be accomplished by placing the fill in maximum 10-inch loose lifts and mechanically compacting each lift to at least the specified minimum dry density. 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.

Backfill material in utility trenches within the construction areas should consist of structural fill (as previously above), and should be compacted to at least 98 percent of ASTM D698. This fill should be placed in 4 to 6 inch loose lifts when hand compaction equipment is used.

Care should be used when operating the compactors near existing structures to avoid transmission of the vibrations that could cause settlement damage or disturb occupants. In this regard, it is recommended that the vibratory roller remain at least 25 feet away from existing structures; these areas should be compacted with small, hand-operated compaction equipment.

4.4 Foundation Design Recommendations:

Provided that the construction procedures are properly performed, the proposed structure can be supported by shallow spread footings bearing over firm soil or well compacted structural fill material. The footings can be designed using a net allowable soil pressure of 1500 pounds per square foot (psf). In using net pressures, the weight of the footings and backfill over the footings, including the weight of the floor slab, need not be considered. Hence, only loads applied at or above the finished floor need to be used for dimensioning the footings.

In order to develop the recommended bearing capacity, the base of the footings should have an embedment of at least 18 inches beneath finished grades and wall footings should have a minimum width of 24 inches. In addition, isolated square column footings are recommended to be a minimum of 3 feet by 3 feet in area for bearing capacity consideration. The recommended 18-inch footing embedment is considered sufficient to provide adequate cover against frost penetration to the bearing soils. The foundation bearing soils are granular in nature and have a low Shrink/Swell potential.

4.5 Settlements:

It is estimated that, with proper site preparation, the maximum resulting total settlement of the proposed foundations should be up to 1 inch. The maximum differential settlement magnitude is expected to be less than 1/2-inch between adjacent footings (wall footings and column footings of widely varying loading conditions). The settlements were estimated on the basis of the results of the field penetration tests. Careful field control will contribute substantially towards minimizing the settlements.

4.6 Foundation Excavations:

In preparation for shallow foundation support, the footing excavations should extend into firm natural soil or well compacted structural fill. All foundation excavations should be observed by **G E T Solutions, Inc.** At that time, the Geotechnical Engineer should also explore the extent of excessively loose, soft, or otherwise unsuitable material within the exposed excavations. Also, at the time of footing observations, the Geotechnical Engineer may find it necessary to make hand auger borings or use a hand penetration device in the bases of the foundation excavations. The necessary depth of penetration will be established during the subgrade observations.

If soft pockets requiring undercut are encountered in the footing excavations, the proposed footing elevation should be re-established by backfilling after the unsuitable material has been removed. This backfilling may be done with very lean concrete or with a well-compacted, suitable fill such as sand or gravel.

Immediately prior to reinforcing steel placement, it is suggested that the bearing surfaces of all footing and floor slab areas be compacted using hand operated mechanical tampers. In this manner, any localized areas, which have been loosened by excavation operations, should be adequately recompacted. The compaction testing in the base of the footings may be waived by the Geotechnical Engineer, where firm bearing soils are observed during the footing inspections.

Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition such as from physical disturbance, rain or frost. Surface run-off water should be drained away from the excavations and not be allowed to pond. If possible, all footing concrete should be placed the same day the excavation is made. If this is not possible, the footing excavations should be adequately protected.

4.7 Slabs-on-Grade:

The floor slabs may be constructed as slab-on-grade members provided the previously recommended earthwork activities and evaluations are carried out properly. It is recommended that all ground floor slabs be directly supported by at least a 4-inch layer of relatively clean, compacted, poorly graded sand (SP) or gravel (GP) with less than 5% passing the No. 200 Sieve (0.074 mm). The purpose of the 4-inch layer is to act as a capillary barrier and equalize moisture conditions beneath the slab.

It is recommended that all ground floor slabs be "floating". That is, generally ground supported and not rigidly connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the floor slabs because of differential movements between the slab and the foundation.

It is also recommended that the floor slab bearing soils be covered by a vapor barrier or retarder in order to minimize the potential for floor dampness, which can affect the performance of glued tile and carpet. Generally, use a vapor retarder for minimal vapor resistance protection below the slab on grade. When floor finishes, site conditions or other considerations require greater vapor resistance protection; consideration should be given to using a vapor barrier. Selection of a vapor retarder or barrier should be made by the Architect based on project requirements.

4.8 Stormwater Management Pond:

Based on the results of our field and laboratory testing program, the subsurface soils encountered beneath the topsoil material to a depth of about 18 feet below existing grades generally consist of SAND (SP-SM, SM, SM-SC) with varying amounts of Silt and Clay. As previously mentioned the majority of these soils appear to be suitable for reuse as structural fill. Based on the limited field and laboratory test results, the hydraulic conductivity of the shallow soils (between the depths of 3 and 18 feet) as identified at the location of B-2 was estimated to be $k = 1 \times 10^{-4}$ cm/sec to $k = 1 \times 10^{-5}$ cm/sec. In order to more accurately determine the soil hydraulic conductivity, a permeability study should be performed within the proposed pond location.

4.9 Pavements:

The California Bearing Ratio (CBR) test results indicated a soaked CBR value of 29.8. In accordance with VDOT standards the average soaked CBR value was multiplied by a factor of two-thirds to determine a pavement design CBR value. The two-thirds factor provides the necessary safety margins to compensate for some non-uniformity of the soil. Therefore, a CBR value of 19.9 should be used in designing the pavement sections. Based on our experience with similar soil conditions, the following minimum pavement sections are typically used in this area:

I. Flexible Pavement:

	Light Duty (Parking Bays)
SUBGRADE:	Stable, compacted to at least 98% of the standard Proctor maximum dry density and approved by the Geotechnical Engineer.
AGGREGATE BASE:	Minimum 8.0 inches of Aggregate Base Material meeting 21-A or 21-B gradation.
ASPHALT SURFACE:	Minimum 2.0 inches of Asphalt Concrete, SM-12.5.

Heavy Duty (Drive Isles)

SUBGRADE:	Stable, compacted to at least 98% of the standard Proctor maximum dry density and approved by the Geotechnical Engineer.
AGGREGATE BASE:	Minimum 8.0 inches of Aggregate Base Material meeting 21-A of 21-B gradation.
ASPHALT BASE:	Minimum 3.0 inches of Asphalt Concrete, BM-25.
ASPHALT SURFACE:	Minimum 2.0 inches of Asphalt Concrete, SM-12.5.

Actual pavement section thickness should be provided by the design civil engineer based on traffic loads, volume, and the owners design life requirements. The above sections correspond to thickness representative of typical local construction practices and as such periodic maintenance should be anticipated. All pavement material and construction procedures should conform to Virginia Department of Transportation (VDOT) requirements.

In preparation for a stable subgrade support for the pavement section, the following construction steps are recommended:

1. Following pavement rough grading operations, the exposed subgrade should be observed under proofrolling. This proofrolling should be accomplished with a fully loaded dump truck or 7 to 10 ton drum roller to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed should be removed and replaced with a well-compacted material. The inspection of these phases should be performed by the Geotechnical Engineer or his representative.

2. If excessively unstable subgrade soils are observed during proofrolling and/or fill placement, it is expected that these weak areas can be stabilized by means of thickening the base course layer to 10 to 12 inches and/or lining the subgrade with geotextile fabric (Mirafi 500x or equivalent). These alternates are to be addressed by the Geotechnical Engineer during construction, if necessary, who will recommend the most economical approach at the time.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 Drainage and Groundwater Concerns:

Dewatering is not expected to be an issue on this project, as excavations in excess of 18 feet (current groundwater level) are not anticipated.

It would be advantageous to construct all fills early in the construction. If this is not accomplished, disturbance of the existing site drainage could result in collection of surface water in some areas, thus rendering these areas wet and very loose. Temporary drainage ditches should be employed by the contractor to accentuate drainage during construction.

5.2 Excavations:

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new (OSHA) guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. **G E T Solutions, Inc.** is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by **G E T Solutions, Inc.** and the information supplied by LandMark Design Group and their consultants 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.

After the plans and specifications are more complete the Geotechnical Engineer should be provided the opportunity to review the final design plans and specifications to assure our engineering recommendations have been properly incorporated into the design documents, in order that the earthwork and foundation recommendations may be properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Pastor Jerry Jutras and his consultants for the specific application to the proposed Faith Fellowship Church located in Williamsburg, Virginia.

APPENDICES

I. BORING LOCATION PLAN

II. LOG OF BORINGS

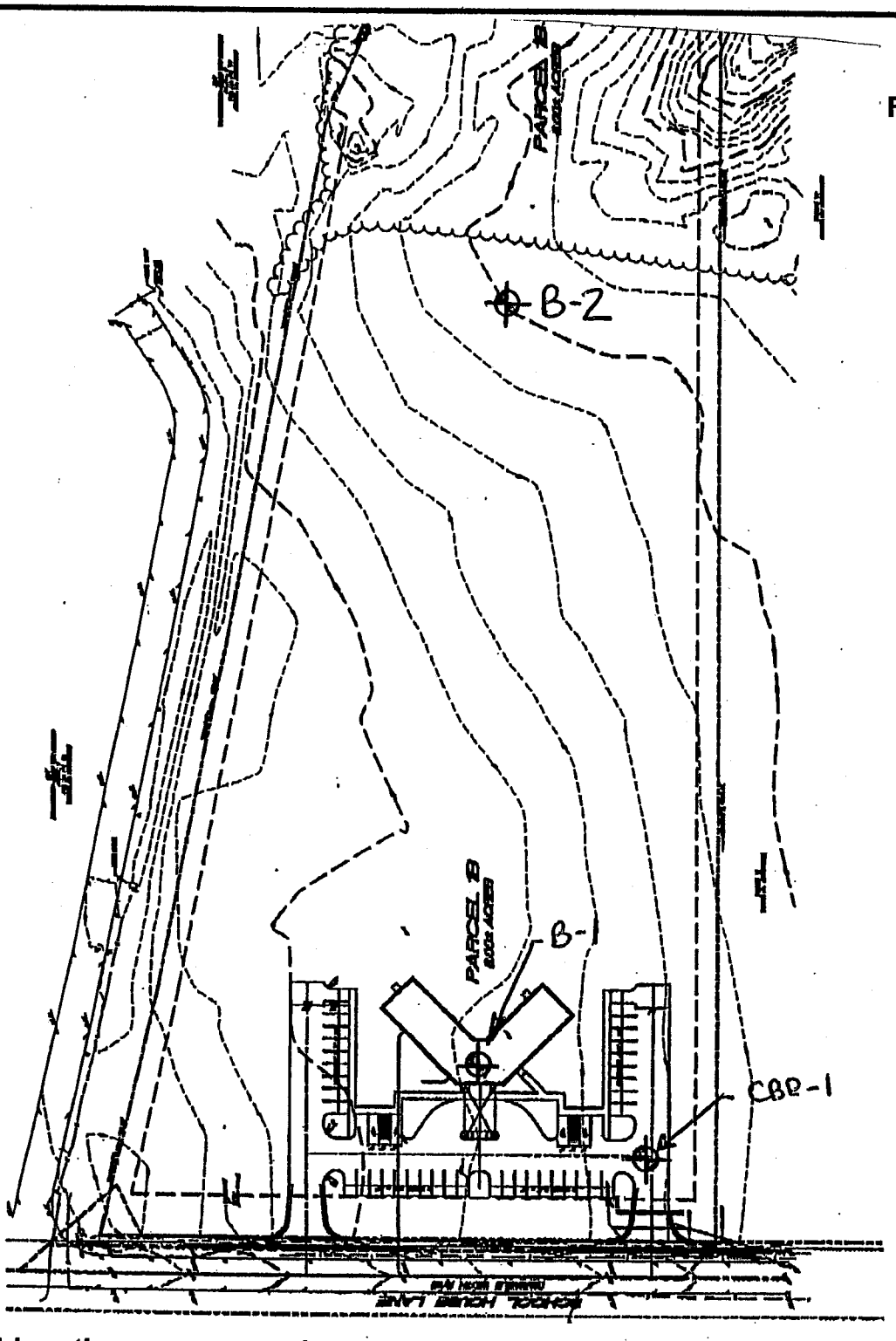
III. GENERALIZED SOIL PROFILE

IV. SUMMARY OF CBR TEST RESULTS

APPENDIX I -

BORING LOCATION PLAN

FIGURE 1



Test locations are approximate

BORING LOCATION PLAN

PROJECT: Faith Fellowship Church
Williamsburg, Virginia

SCALE: N/A
DATE: 06/24/2002
PLOT BY: MS

PROJECT NO: VB02-183G
CLIENT: Pastor Jerry Jutras C/O LandMark Design Group

APPENDIX II -

LOG OF BORINGS

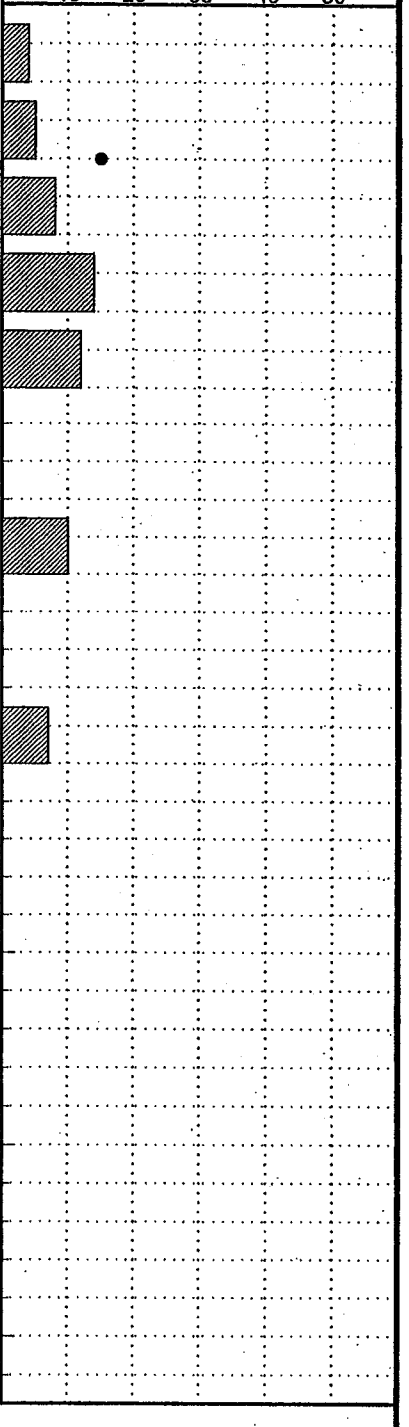
Geotechnical Environmental Testing Solutions, Inc.

LOG OF BORING No. B-1

PROJECT: Faith Fellowship Church **PROJECT NO.:** VB02-183G
CLIENT: Pastor Jerry Jutras C/O Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: See Attached Boring Location Sketch **ELEVATION:**
DRILLER: Atlantic Drilling Services, Inc. **LOGGED BY:** M. Scholefield, P.E.
DRILLING METHOD: Hollow Stem Auger **DATE:** 5/24/02
DEPTH TO - WATER> INITIAL: ▽ 18 **AFTER 24 HOURS:** ▽ **CAVING>** C.

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0	6 inches Tilled Material				
	Tan, moist, poorly graded fine SAND (SP- SM) with silt, very loose	.5	1	2 2 2	
	Tan-brown, moist, Silty fine SAND (SM), trace clay, very loose to medium dense	3	2	2 2 3	28.2
5			3	3 4 4	
	Interbedded seams of CLAY (CL) from 8 ft		4	7 7 7	
10			5	5 6 6	
15			6	4 4 6	
	Reddish brown, wet, CLAY (CL), trace to little sand, medium stiff	18	7	3 3 4	
20	Boring terminated at 20 ft.				
25					
30					
35					

TEST RESULTS
Plastic Limit ⊢——⊣ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50



This information provided on this boring log should only be interpreted as being indicative of the site.

Figure

Geotechnical Environmental Testing Laboratories, Inc.

LOG OF BORING No. B-2

PROJECT: Faith Fellowship Church **PROJECT NO.:** VB02-183G
CLIENT: Pastor Jerry Jutras C/O Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: See Attached Boring Location Sketch **ELEVATION:**
DRILLER: Atlantic Drilling Services, Inc. **LOGGED BY:** M. Scholefield, P.E.
DRILLING METHOD: Hollow Stem Auger **DATE:** 5/24/02
DEPTH TO - WATER> INITIAL: ▽ 18 **AFTER 24 HOURS:** ▽ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200
0					
	6 inches Tilled Material				
	.5 Tan, moist, poorly graded fine SAND (SP- SM) with silt, very loose		1	2 2 2	
	3 Tan, moist, Silty Clayey fine SAND (SM-SC) to Silty fine SAND (SM), very loose to medium dense		2	2 1 2	
5			3	3 5 6	
	Interbedded seams of CLAY (CL) from 7 ft		4	6 8 6	46.5
10			5	4 6 7	
15			6	3 5 6	19.6
	▽ 18 Reddish brown, wet, CLAY (CL), trace to little sand, medium stiff		7	2 2 5	
20	Boring terminated at 20 ft.				
25					
30					
35					

TEST RESULTS
Plastic Limit ├──┤ Liquid Limit
Water Content - ●
Penetration - ▨
10 20 30 40 50

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

Figure

Geotechnical Environmental Testing Solutions, Inc.

LOG OF BORING No. CBR-1

PROJECT: Faith Fellowship Church **PROJECT NO.:** VB02-183G
CLIENT: Pastor Jerry Jutras C/O Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: See Attached Boring Location Sketch **ELEVATION:**
DRILLER: John L. **LOGGED BY:** M. Scholefield, P.E.
DRILLING METHOD: Hand Auger **DATE:** 5/24/02
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▽ **CAVING>** C.

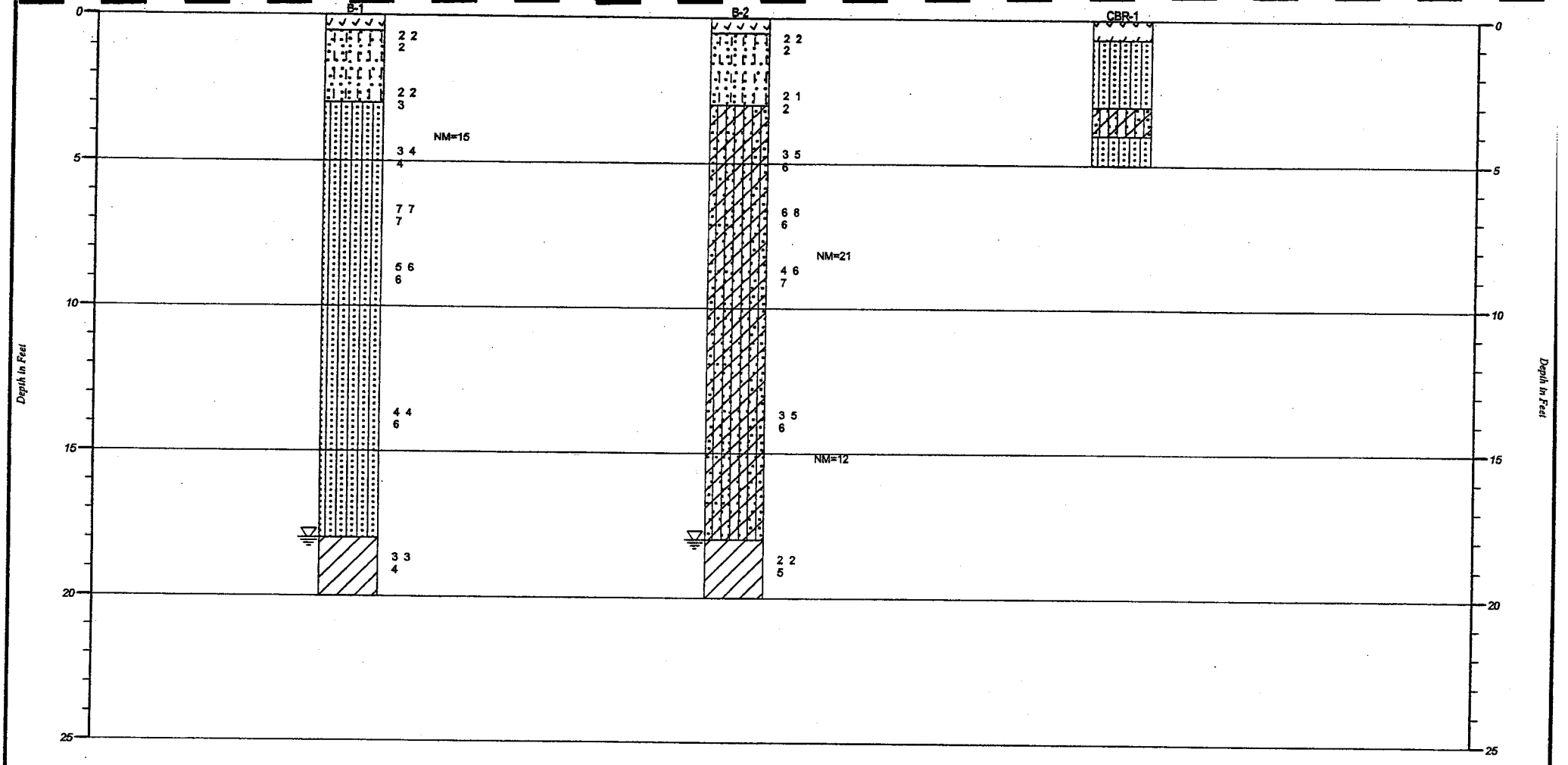
Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
0	8 inches Tilled Material					
	.67 Tan, moist, Silty fine SAND (SM), very loose					
2						
	3 Tan-brown, moist, Silty Clayey fine SAND (SM-SC), loose					
4	4 Tan, moist, Silty fine SAND (SM), medium dense					
	Boring terminated at 5 ft.					
6						
8						
10						
12						
14						

This [redacted]ation [redacted]s on [redacted]s bo[redacted] sho[redacted] be in[redacted]ed as being indicative of the site.

Figure

APPENDIX III -

GENERALIZED SOIL PROFILE



Strata symbols

- Topsoil
- Poorly graded sand with silt
- Silty sand
- Low plasticity clay
- Poorly graded clayey silty sand

GET Solutions, Inc. GENERALIZED SOIL PROFILE		
HORIZONTAL SCALE: VERTICAL SCALE: 1"=5'	DRAWN BY/APPROVED BY MS	DATE DRAWN 6/23/02
Faith Fellowship Church Williamsburg, Virginia		
PROJECT NO. VB02-183G		FIGURE NUMBER 1

APPENDIX IV -

SUMMARY OF CBR TEST RESULTS

SUMMARY OF CBR TEST DATA

Sample Number	CBR-1
Sample Depth (ft.)	1-2
Unified Soil Classification Symbol	SM
Natural Moisture Content (%)	10
Atterberg Limits LL/PL/PI	NP
% Passing #200 Sieve	19.3
Maximum Dry Density, pcf	113.6
Optimum Moisture %	11.0
Soaked CBR Value	29.8
Unsoaked CBR Value	31.7
Resiliency Factor	3.0
Swell %	0.0

NP = Non-Plastic

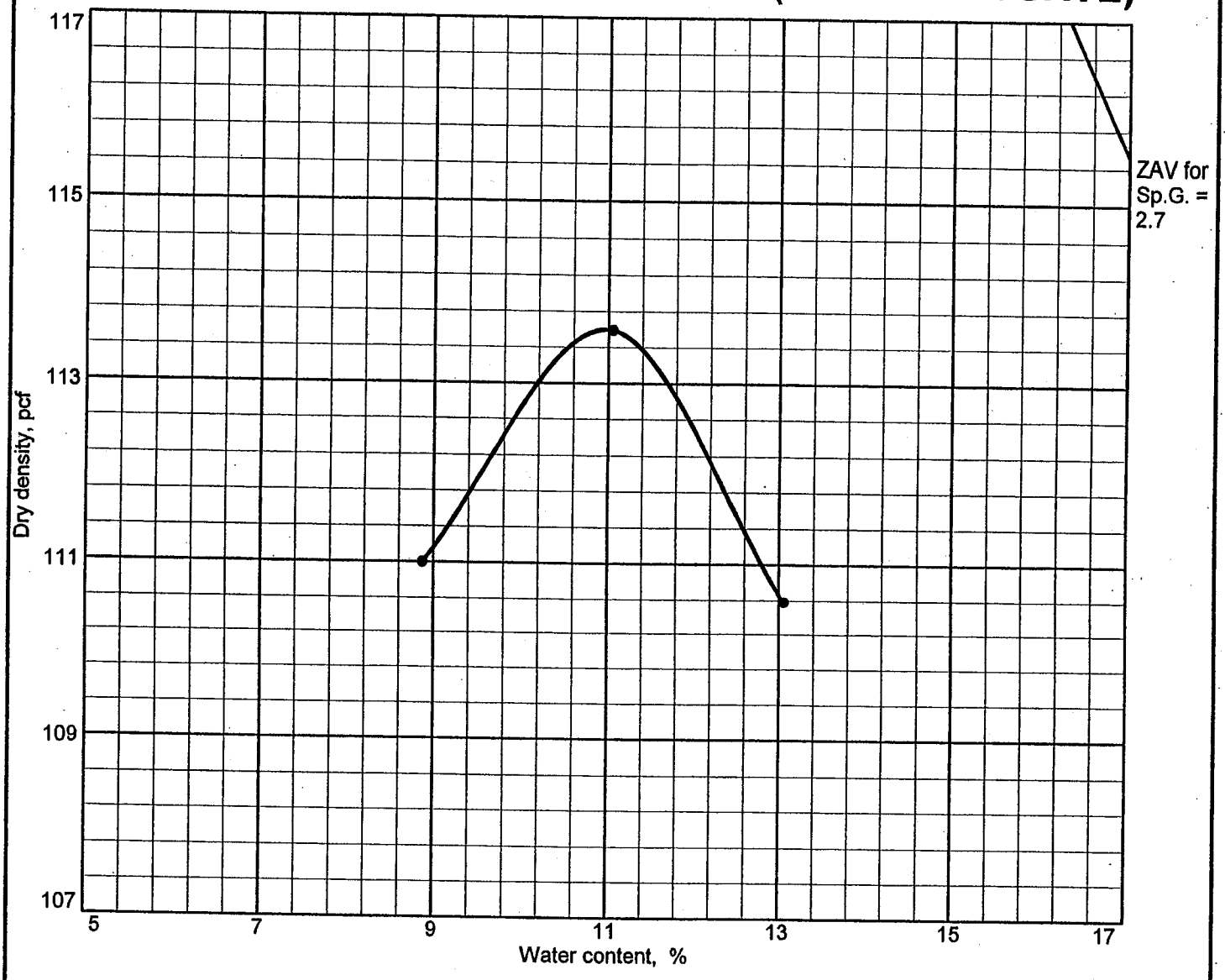
Project: Faith Fellowship Church

Project No: VB02-183G

Client: Pastor Jerry Jutras C/O LandMark Design Group

Date: 6/24/02

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)



Test specification: VTM-1 Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
1-2 ft.	SM	A-2-4(0)	10		NP	NP	0.0	19.3

TEST RESULTS

Maximum dry density = 113.6 pcf

Optimum moisture = 11.0 %

MATERIAL DESCRIPTION

Tannish Brown, Silty SAND

Project No. VB02-183G **Client:** Pastor Jerry Jutras C/O Landmark Design Group

Project: Faith Fellowship Church

• **Location:** CBR-1 (See Boring Plan)

Remarks:

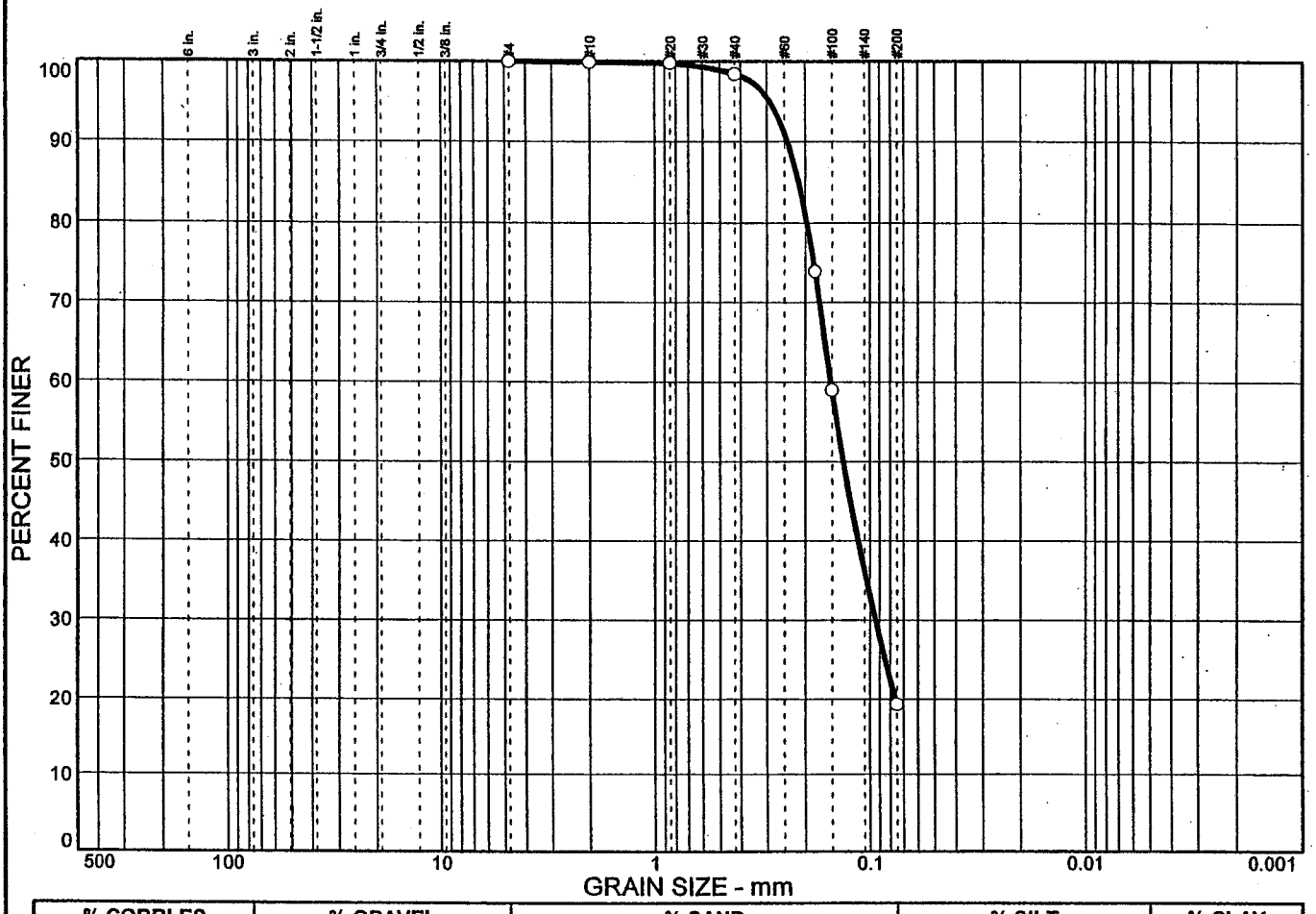
CBR-1
Sample Obtained 5/21/02
Soaked CBR Value = 29.8
Resiliency Factor = 3.0

MOISTURE DENSITY TEST REPORT (PROCTOR CURVE)

GET SOLUTIONS, INC.

Figure 1

Gradation Analysis Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	80.7	19.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.8		
#40	98.4		
#80	73.9		
#100	59.0		
#200	19.3		

* (no specification provided)

Soil Description

Tannish Brown, Silty SAND

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{85}= 0.215 D_{60}= 0.152 D_{50}= 0.133
D_{30}= 0.0942 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

CBR-1
Sample Obtained 5/21/02

Sample No.: CBR-1 **Source of Sample:** **Date:** 5/21/02
Location: CBR-1 (See Boring Plan) **Elev./Depth:** 1-2 ft.

GET SOLUTIONS, INC.

Client: Pastor Jerry Jutras C/O Landmark Design Group
Project: Faith Fellowship Church
Project No: VB02-183G **Figure** 1a

Addendum No. 1
Report of Subsurface Investigation and Geotechnical Services
Faith Fellowship Church – Infiltration Testing
Williamsburg, Virginia
G E T Project #VB02-183G-A
September 26, 2002
Prepared For: Pastor Jerry Jutras

G E T Solutions, Inc.

Geotechnical
Environmental
Testing
Solutions, Inc.

September 26, 2002

TO: **Pastor Jerry Jutras**
C/O LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, Virginia 23188

Attn: Mr. C. J. Bodnar, P.E.

RE: Addendum No. 1
Report of Subsurface Investigation and Geotechnical Engineering Services
Faith Fellowship Church – Infiltration Testing
Williamsburg, Virginia
G E T Project No: VB02-183G

Dear Mr. Bodnar:

The following is an addendum to our original report of subsurface investigation and geotechnical engineering services (VB02-183G) submitted June 24, 2002 for the above referenced project. As requested, we revisited the project site to perform an infiltration test within the proposed stormwater management pond area.

Purpose and Scope of Services:

The proposed development at this site is planned to consist of constructing a new church, with associated parking and stormwater management facilities. The stormwater management pond is proposed to be constructed on the western portion of the property. The purpose of this subsequent study was to obtain additional information on the general subsurface soil conditions with respect to the proposed stormwater management pond. Specifically, infiltration rate testing was conducted at the proposed base of the infiltration basin (approximately 7 feet below existing grades). EL 77±

Site Location and Description:

The proposed project site is accessed by School House Lane in Williamsburg, Virginia. The area of the proposed stormwater management pond generally consisted of an agricultural field, with the exception of the western most portion of the property, which was wooded. Based on a visual observation, the area appeared level with less than a 1-foot change in elevation in 50 linear feet.

204 Grayson Road, Suite B • Virginia Beach, VA 23462 • Phone: (757)-518-1703 • Fax: (757)-518-1704
info@getsolutionsinc.com

Field Exploration:

In order to explore the general subsurface soil types and to aid in developing associated design parameters, one 7-foot deep hand auger boring was drilled by **G E T Solutions, Inc.** within the proposed stormwater management area corresponding to the location of the infiltration test (INF-1).

Laboratory Testing:

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

One representative sample was selected and subjected to laboratory testing, which included natural moisture, -#200 sieve wash testing and analysis, in order to corroborate the visual classification and infiltration results. The test results are noted in Table I and are presented on the "Log of Boring" sheet (Appendix II), included with this report.

Table I – Laboratory Test Results

Boring No.	Sample No.	Depth (Ft)	Natural Moisture (%)	-#200 Sieve (%)	Classification
B-1	S-4	6-7	14.8	30.8	SM

Subsurface Soil Conditions:

The results of our field exploration program indicated the presence of approximately 2 inches of topsoil material at the hand auger boring location. The topsoil material thickness could vary at other locations. Underlying the superficial materials and extending to the boring termination depth of 7 feet below current grades, the subsurface soils were generally arranged in a 3-layer configuration.

EU 77

The initial soil layer extended beneath the topsoil material to approximately 4 feet below current grades. The soils of this layer were granular in nature and consisted of SAND (SM and SC) with varying amounts of Silt and Clay. The second soil layer extended beneath the initial soil layer to a depth of 6 feet below current grades. These soils consisted of a CLAY (CL) with varying amounts of Sand. The third soil layer extended beneath the second soil layer to the auger termination depth of 7 feet below current grades. The soils of this layer were granular in nature and consisted of SAND (SM) with varying amounts of Silt. Groundwater was not encountered at the boring location to the depth explored.

EL. 77
SM
OK FOR
INFIL.
QUESTION
DEPTH

Based upon the resistance of the soils to hand auger penetration in combination with intermittent probing the granular soils (SAND) encountered are considered of medium dense relative density and the cohesive soils (CLAY) were of medium stiff consistency.

The subsurface description is of a generalized nature provided to highlight the major soil strata encountered. The records of the subsurface exploration are included in Appendix II (Log of Boring sheets), which should be reviewed for specific information as to the individual boring. 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.

Infiltration Testing:

A hand auger probe was extended to the test depth of 7 feet below existing site grades within the lateral limits of the proposed stormwater management pond. The borehole was prepared utilizing a planer auger to remove clippings from the bottom of the borehole. Infiltration testing was then conducted within the vadose zone utilizing a Precision Permeameter and the following testing procedures.

EL. 84 N.G.
7
EL. 77 TEST
BOTTOM BMP EL. 77.

GET Solutions, Inc.

September 26, 2002

A support stand was assembled and placed adjacent to the borehole. This stand holds a calibrated reservoir (2000 ml) and a cable used to raise and lower the water control unit (WCU). The WCU establishes a constant water head within the borehole during testing by use of a precision valve and float assembly. The WCU was attached to the flow reservoir with a 2-meter (6.6 foot) braided PVC hose and then lowered by cable into the borehole to the test depth elevation. As required by the Glover solution, the WCU was suspended above the bottom of the borehole at an elevation of approximately 5 times the borehole diameter. The shut-off valve was then opened allowing water to pass through the WCU to fill the borehole to the constant water level elevation. The absorption rate slowed as the soil voids became filled and an equilibrium developed as a wetting bulb developed around the borehole. Water was continuously added until the flow rate stabilized. The reservoir was then re-filled in order to begin testing. During testing, as the water drained into the borehole and surrounding soils the water level within the calibrated reservoir was recorded as well as the elapsed time during each interval. The test was continued until relatively consistent flow rates were documented. During testing the quick release connections and shutoff valve was monitored to ensure that no leakage occurred. The flow rate (Q), height of the constant water level (H), and borehole diameter (D) were used to calculate K_s utilizing the Glover Solution.

Based on the field testing and corroborated with laboratory testing results (published values compared to classification results), the hydraulic conductivity of the shallow soils at a depth of 7 feet as identified at the location of the infiltration test was k = 3.51×10^{-4} cm/sec to k = 3.94×10^{-4} cm/sec

100cm = 1m
0.0394 m
3.94×10^{-2} m
HIGH PERMEABILITY OVER 10^{-3}
See Test Results
70.5 in/hr

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.

G. Allan Mushett, E.I.T.
Staff Engineer

COMMONWEALTH OF VIRGINIA
9/26/02
DAVID MARK SCHOLEFIELD
No.033932
PROFESSIONAL ENGINEER

D. Mark Scholefield, P.E.
Staff Engineer
VA Lic. # 033932

3.94×10^{-4} cm/sec
$3.94 \times 10^{-4} \times 0.3937 = 0.0002$ in/sec
$= 0.09$ in/hr.

GET Solutions, Inc.

APPENDICES

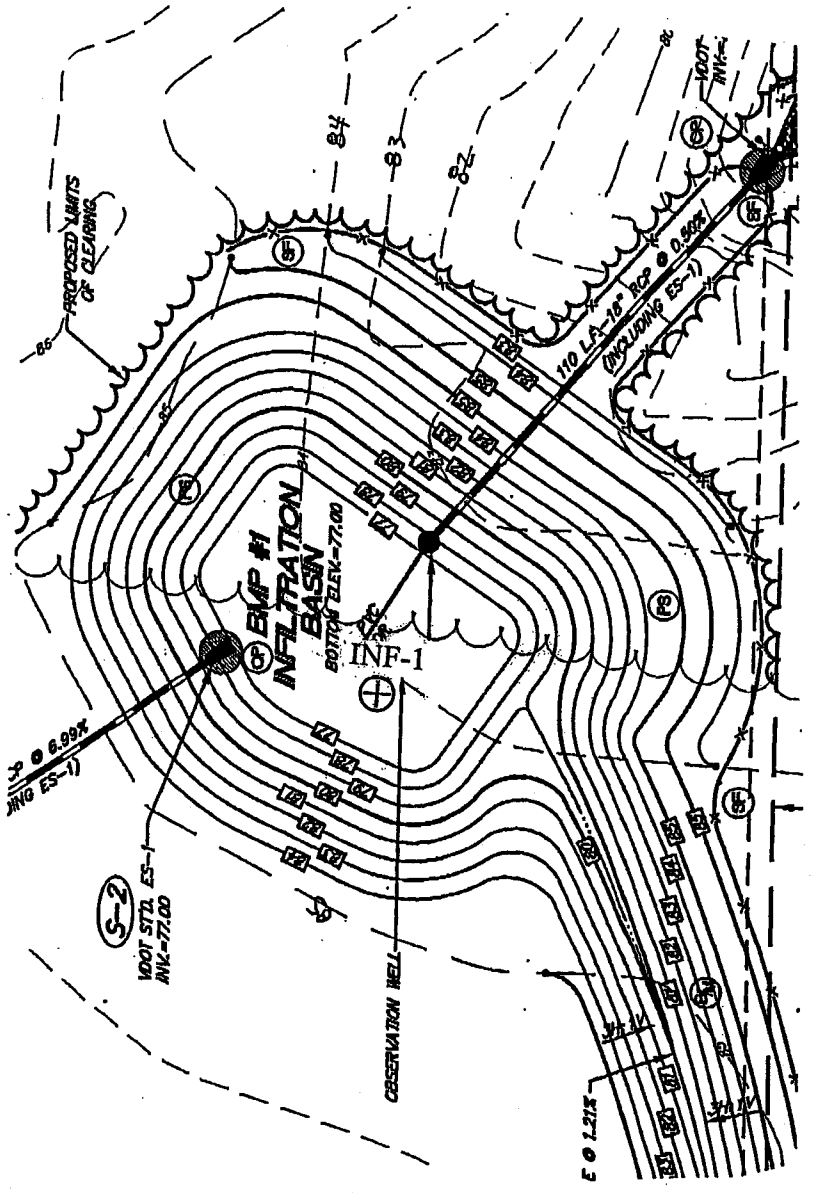
I. INFILTRATION/BORING LOCATION PLAN

II. LOG OF HAND AUGER BORING (INF-1)

III. SUMMARY OF INFILTRATION TEST RESULTS

APPENDIX I -

INFILTRATION/BORING LOCATION PLAN



BORING LOCATION PLAN

PROJECT: Faith Fellowship Church
Williamsburg, Virginia

SCALE: N/A
DATE: 9/26/2002
PLOT BY: GAM

PROJECT NO: VB02-183G-A
CLIENT: Pastor Jerry Jutras c/o Landmark Design Group

APPENDIX II -

LOG OF HAND AUGER BORING (INF-1)

Geotechnical Environmental Testing Solutions, Inc.

LOG OF BORING No. HA-1

PROJECT: Faith Fellowship Church **PROJECT NO.:** VB02-183GA
CLIENT: Pastor Jerry Justra c/o Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: See Attached Location Sketch **ELEVATION:**
DRILLER: G. Allan Mushett, E.I.T. **LOGGED BY:** Allan Mushett, EIT
DRILLING METHOD: Hand Auger **DATE:** 9/24/02
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	2 Inches Topsoil (.166)					
	Brown, moist, Silty Fine SAND (SM), medium dense					
2	Orangish Brown, moist, Clayey SAND (SC), medium dense (2)					
4	Orangish Brown, moist, Fine Sandy CLAY (CL), medium stiff (4)					
6	Brown, moist, Silty Fine to Medium SAND (SM), medium dense (6)				30.8	●
	Boring terminated at 7 ft. El. 77.0±					
8						
10						
12						
14						

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

Figure

APPENDIX III -

SUMMARY OF INFILTRATION TEST RESULTS

GET Solutions, Inc.	SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET	Sheet No.: 1

Project Name.:	FAITH FELLOWSHIP CHURCH	**Parcel.....:**	BMP Area	**Terminology and Solution**	
Boring No.....:	Hand Auger (HA-1)	**Date.....:**	9/24/02	Ksat :	Saturated hydraulic conductivity
Investigators.:	Allan Mushett, E.I.T.	**File Name.....:**	FaithInfil	Q:	Steady-state rate of water flow into the soil
Boring Depth.:	7 Feet	**WCU Base. Ht. h:**	15.0 cm	H:	Constant height of water in borehole
Boring Dia.....:	9.5 cm	**WCU Susp. Ht. S:**	25.0 cm	r:	Radius of cylindrical borehole
Boring Rad. (r):	4.75 cm	**Const. Wtr. Ht. H:**	40.0 cm	Ksat = Q[sinh-1(H/r) -.(r2/H2+1).5 + r/H] / (2pH2)	[Glover Solu

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
1800		10:30:00 AM								
1600	200	10:31:38 AM	0:01:38	1.63	122.45	0.024	3.94E-04	34.0	0.558	1.12
1400	200	10:33:17 AM	0:01:39	1.65	121.21	0.023	3.90E-04	33.7	0.552	1.10
1200	200	10:35:01 AM	0:01:44	1.73	115.38	0.022	3.71E-04	32.0	0.526	1.05
1000	200	10:36:50 AM	0:01:49	1.82	110.09	0.021	3.54E-04	30.6	0.502	1.00
800	200	10:38:40 AM	0:01:50	1.83	109.09	0.021	3.51E-04	30.3	0.497	0.99
600	200	10:40:19 AM	0:01:39	1.65	121.21	0.023	3.90E-04	33.7	0.552	1.10

OK for 0.5"/HR.

$f_c = 0.5/2 = 0.25$

FS = 2

@ EL 77.0

Natural Moisture:	NT	**Init. Satur.Time:**	40 Minutes	**ESTIMATED FIELD KSAT:**	
Texture/Classif:	SAND (SM)	**Consistency:**	Medium Dense	**Depth to an Impermeable Layer:**	N/A
Structure/Fabric:	N/A	**Slope/Landsc:**	Level	**Depth to Bedrock.....:**	N/A

Notes: Ksat Class: Moderately High

SJT FILE

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

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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

April 30, 2004

Reverend Jerry Jutras
Faith Fellowship Assembly of God
P.O. Box 646
Lightfoot, Va. 23090

Re: Faith Fellowship Assembly of God
County Plan No. SP-95-02
County BMP ID Code: WC 070

Dear Mr. Jutras:

The Environmental Divisions has received a record drawing (asbuilt) and construction certification for the stormwater management facility for the above referenced project. The record drawing provides as-built information for an infiltration basin situated in the east corner of the site.

Based on our review of the project and a concurrent field inspection as performed on April 30th 2004, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

Construction Certification:

1. The construction certification dated April 7th 2004 is **satisfactory**.

Record Drawing:

2. The record drawing set dated April 4th 2004 is **satisfactory**. Please forward one reproducible and one blue/black line set of the record drawings to our office.

Construction - Related Items:

3. Stabilize the area in back of the parking lot at the north end of the site.

4. Remove silt fence present along the north border of the site, the back of the parking area at the north end of the site, the downstream toe of dam embankment for the infiltration basin, the infiltration basin floor (bottom) area and all storm drainage inlet protections, once these areas are stabilized with vegetation.

5. Remove 4 to 6 inches of sediment present within storm drainage Inlet # N-2.

6. Remove sediment from the outfall end of the 18-inch pipe at storm structure # N-2A and remove accumulated sediment from the stormwater conveyance channel (open channel) approximately 50 ft. downstream of this pipe outfall. Approximately 6 inches of sediment was present at the end of the pipe and within the bottom of the stormwater conveyance channel.

7. Remove the fallen tree from across the downstream face of the infiltration basin dam embankment.

8. Some concern is raised about the permeability of the bottom area of the infiltration basin (70' x 50' area). There is a thin layer (2 to 3 inches) of accumulated sediment and an insufficient stand of grass cover across the entire top of the infiltration basin floor (bottom) area. At a minimum, these surface sediments shall be removed or the entire basin bottom should be scarified to provide a well-aerated, highly porous surface texture which promotes infiltration of water into the subsoils.

9. The bottom of the basin is bare and very sparse with vegetation (grass). Provide a well-established grass or turf medium on the floor area of the basin. Grass with extensive root growth enhances infiltration through the surface layer, prevents erosion and sedimentation, deters invasive weed growth and serves as filter media to strain out suspended material.

   (Note: This plan was approved with measures and sequencing such that the infiltration basin was to be protected to the greatest extent possible during land-disturbing activities. Refer to the BMP note on Sheet C-4 and plan review comments by the Environmental Division as follows: comment # 27 dated August 27, 2002 and comments # 3 and # 16 dated October 23, 2002.)

10. The 4-inch PVC underdrain within the bottom of the basin is a backup, not a primary, underdrain system to be used in case of failure of the soils within the basin. At the time of our inspection, the valve on this system appeared to be open with the infiltration system relying on the underdrain for proper function. This is indicative of two things: 1) failure of the subsoils to serve their design purpose for infiltration; or 2) inadvertent opening of the valve. The valve should be closed and used as a backup.

Once this work is satisfactorily completed, contact our office appropriately for reinspection. We can then proceed with final release of the surety and/or closing out the project.

Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Mr. Jim Rudnicky, at 757-259-4026 if you have any further comments or questions.

Sincerely,

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

cc: Peter Farrell, LandMark Design Group - via fax
Jim Rudnicky, JCC Environmental Division

G:\AsBuilts\admin\final\SP9502.wc070

Geotechnical
Environmental
Testing
Solutions, Inc.

December 4, 2002

TO: **Pastor Jerry Jutras**
C/O LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, Virginia 23188

GEOTECH REPORT AMENDMENT

Attn: Mr. C. J. Bodnar, P.E.

RE: Stormwater Management Area
Faith Fellowship Church – Infiltration Testing
Williamsburg, Virginia
G E T Project No: VB02-183G

Dear Mr. Bodnar:

As requested, we have revisited the infiltration report dated September 26, 2002. As documented in the Geotechnical Report (Addendum No. 1), the infiltration testing was performed at a depth of 7 feet below existing grades. This test depth was established to correspond with the base of the stormwater management system. The infiltration test is designed to introduce water at the desired depth (7 feet) and to measure the rate of infiltration as the water permeates through the underlying soils. The soils recovered at the 20-foot deep SPT boring locations consisted of SAND (SM, SM-SC) with varying amounts of Silt and Clay and appeared relatively consisted between the depths of 3 and 18 feet below current grades. Accordingly, it is our opinion that the test results are indicative of the soils encountered at depths ranging from 7 feet (test depth) to about 9 feet (infiltration zone) below existing grades.

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.

D. Mark Scholefield, P.E.
Staff Engineer
VA Lic. # 033932

COMMONWEALTH OF VIRGINIA
12/4/02
DAVID MARK SCHOLEFIELD
No.033932
PROFESSIONAL ENGINEER

204 Grayson Road, Suite B • Virginia Beach, VA 23462 • Phone: (757)-518-1703 • Fax: (757)-518-1704
info@getsolutionsinc.com

Scott Thomas

From: Phillips, Richard [RPhillips@VHB.com]

Sent: Friday, April 09, 2004 8:32 AM

To: Scott Thomas

Cc: mrinaldi@landmarkdg.com

Subject: Faith Fellowship A.G. Church

Scott: earlier this week I inspected the BMP at the subject site. The problem with the sediment from the slope erosion had been corrected,so I stopped by LandMark and signed the construction certificate. Contact Mark Rinaldi at LandMark if you have any questions and he will contact me.
Thanks Dick Phillips

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Vanasse Hangen Brustlin, Inc. 101 Walnut St
Watertown, MA 02472
617-924-1770

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

GPIN 1220100022

County BMP ID Code (if known): WC 070

Name of Facility: FAITH FELLOWSHIP ASSEMBLY OF GOD BMP No.: 1 of 1 Date:

Location: 3611 Rochambeau Road (ENTRANCE ROAD TO STONEHOUSE ES)

Name of Owner: FAITH FELLOWSHIP ASSEMBLY OF GOD

Name of Inspector: SJ Thomas, WACAIN

Type of Facility: INFILTRATION BASIN

Weather Conditions: Sunny, Warm 60's Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

☐ BMP

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
Embankments and Side Slopes: EARTH 4H:1V U/S, TOP DAM 15', 8-10' HIGH DAM				
Grass Height	✓			FAIR, SPARSE BUT OK
Vegetation Condition	✓			SPARSE BUT OK
Tree Growth	✓			NONE
Erosion	✓			None
Trash & Debris		✓	✓	REMOVE FALLEN TREE D/S SLOPE
Seepage				
Fencing or Benches				
Interior Landscaping/Planted Areas: ☒ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation				
Vegetated Conditions	✓	✓		INFIL BOTTOM AREA
Trash & Debris	✓			SPARSE VEG, MULCH
Floating Material	✓			INTERIOR SLOPES 3H:1V
Erosion	✓			MATTED EC-2, SPARSE
Sediment		✓		BUT OK VEG.
Dead Plant	✓			
Aesthetics	✓			NO GROWTH, NEED GRASS
Other				
Notes: Serves BUD, PARKING + UNDEV FUTURE LAND + PICNIC SHELTER				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools:	☐ Permanent Pool (Retention Basin)	☐ Shallow Marsh (Detention Basin)	☐ None, Dry (Detention Basin)	
Shoreline Erosion				
Algae				
Trash & Debris				
Sediment				
Aesthetics				
Other				
Inflows (Describe Types/Locations):	18" RCP TO 100' SCC, 3' BW TO RR CHANN TO RR OP 50x20			
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment			✓	SED IN SSC, END RR OP 2-3"
Outlet Protection	✓			
Other			✓	1' DEEP SED IN SCC
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):	48 RCP, 3 WEIRS 4'x1' DEEP, 2-1'ϕ ORIFICES			
Condition of Structure	✓			RISER 5' HIGH
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other				4' BACKUP UNDERDRAIN PVC, 2 C.O.
Principal Outlet Structure - Barrel, Conduit, etc. :	18" RCP, 6" ABOVE RISER BOTTOM, ES-1			
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			
Other	✓			30'x30 CLASS I RIPRAP OP
Emergency Spillway (Overflow):	15' WIDE RR CREST, GRASS LOWER END			
Vegetation	✓			
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other				
Surrounding Perimeter Conditions: NORTH OPEN LOT, WEST WOODS/LAKE, ~~EAST~~ SOUTH SCHOOL,				
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			OPEN SITE
Access /Maintenance Roads or Paths				EASY ACCESS
Other				

Remarks:

- BACK OF BLDG/PARKING AREA UNSTABILIZED
- REMOVE SILT FENCE NORTH BORDER + BACK OF BLDG PARKING AREA
- REMOVE IP @ INLET N-2 + 4-6" SEDIMENT
- REMOVE SEDIMENT FROM OUTFALL PIPE N-2A (18"), 6" DEEP.
- REMOVE 1' deep sediment in SSC ~ 50' LONG SECTION
- REMOVE FALLEN TREE, D/S FACE OF DAM
- SEED & MULCH INFIL BOTTOM AREA (80+55). NEED GRASS COVER (FINE LAYER OF SED 1-2" DEEP ACROSS INFIL BOTTOM AREA
- REMOVE SF INSIDE PERIMETER OF BASIN
- REMOVE SF D/S TOE OF DAM.

JUNCUS - SOFTSTEM BULRUSH OF BOTTOM OF D/S DAM FACE.

Overall Environmental Division Internal Rating: 3 2/3 FINE LAYER OF SEDIMENT IN INFIL BASIN BOTTOM

Signature: Scott Thorne P.E. **Date:** 4/30/04

Title: CIVIL ENGINEER

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

Date Record Created:

Created By:

WS_BMPNO: WC070

Print Form

PRINTED ON:
Friday, March 12, 2010
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WATERSHED	WC
BMP ID NO	070
PLAN NO	SP-95-02
TAX PARCEL	(12-2)(1-22)
PIN NO	1220100022
CONSTRUCTION DATE	8/1/2003
PROJECT NAME	Faith Fellowship Assembly of God
FACILITY LOCATION	3611 Rochambeau Drive
CITY-STATE	Williamsburg, Va. 23188
CURRENT OWNER	Faith Fellowship Assembly of God
OWNER ADDRESS	3611 Rochambeau Drive
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, Va. 23188
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN	Yes
SITE AREA acre	8
LAND USE	House of Worship
old BMP TYP	Infiltration Basin
JCC BMP CODE	C4 Infiltration Basin 1.0
POINT VALUE	10
SVC DRAIN AREA acres	7.165
SERVICE AREA DESCRI	Building, Parking & Undev area
IMPERV AREA acres	4.00
RECV STREAM	UT Ware-Frances Swamp
EXT DET-WQ-CTRL	Yes
WTR QUAL VOL acre-ft	0.32
CHAN PROT CTRL	Yes
CHAN PROT VOL acre-ft	0.551
SW/FLOOD CONTROL	Yes
GEOTECH REPORT	Yes

CTRL STRUC DESC	RCP Riser
CTRL STRUC SIZE inches	48
OTLT BARRL DESC	RCP Barrel
OTLT BARRL SIZE inch	18
EMERG SPILLWAY	Yes
DESIGN HW ELEV	82.64
PERM POOL ELEV	na
2-YR OUTFLOW cfs	0.07
10-YR OUTFLOW cfs	2.07
REC DRAWING	Yes
CONSTR CERTIF	Yes

LAST INSP DATE

Inspected by:

INTERNAL RATING

MISC/COMMENTS

Sized for 4 ac. Imperv for future dev (current 0.83 ac.)

Additional Comments:

GPIN 1220100022
3611 Rochambeau Drive
WMB 23188

22.3 AC
B1

GEL/SJT

ENVIRONMENTAL DIVISION REVIEW COMMENTS
FAITH FELLOWSHIP ASSEMBLY OF GOD
COUNTY PLAN NO. SP - 095 - 02
October 23, 2002

Chesapeake Bay Preservation:

1. Wetlands. Previous comment # 5 was not fully addressed. The location of delineated nontidal wetland areas could not be found on Environmental Inventory Sheet C-2.

Erosion & Sediment Control Plan:

2. E&SC Plan. The erosion and sediment control plan and the sequence of construction must properly provide for adequate perimeter erosion and sediment control during initial site clearing and grading operations. Existing topography for the site is such that any runoff from the main disturbed portion of the site will be conveyed offsite until the north perimeter stormwater conveyance channels and pipes are in place and functional. Based on the current sequence of construction, site clearing and grubbing and grading (Steps 5 and 6) can precede installation of the perimeter storm drainage channel and pipe system (Step 6). Therefore, installation of the north conveyance system must precede site work on the main part of the site to properly intercept construction-related runoff. Secondly, standard County and VSMH Minimum Standard 3.10 procedure for installation of infiltration basins is not to construct or place the measure into service until after the entire contributing area is stabilized. Therefore until the site drainage channels and associated rock check dams and inlet protections are installed, there is no perimeter sediment trapping device for the site. Similarly, once the north conveyance channel/culvert is installed there is no primary sediment trapping measure to control initial site work and channel construction activity and to adequately protect the infiltration BMP area from sedimentation as a result of construction. Options for the site include early sequencing of a temporary diversion dike along the north property border or early installation of the north perimeter stormwater conveyance channel and pipes which convey drainage to a temporary sediment trap situated between proposed drainage structure # N-3 and BMP # 1. If associated drainage to a single trap situated in the north channel exceeds VESCH Minimum Standard & Spec. 3.13 requirements for drainage area, a variance request in writing may be requested or the use of two sediment trap type - culvert inlet protections (CIP) in accordance with VESCH Minimum Standard & Spec. 3.08 may be feasible at proposed storm structures # N-1 and # N-2A. *(Note: Rock check dams and culvert inlet protections as situated within stormwater conveyance channels will not be installed until well after clearing, grubbing and site grading operations have already commenced. These features will not be considered as primary, but secondary sediment trapping measures for this site activity, unless sediment trap type CIPs are used.)*

3. Sequence of Construction. Step 3 of the sequence of construction conflicts with standard County and VSMH procedure for construction sequencing of infiltration basins. It also conflicts with the general note as placed on Sheet C-4 to address previous comment # 27. Grading of the stormwater management facility cannot precede site work activity, unless the measure is specifically designed to serve as a sediment trapping facility during construction and properly protected, cleaned and converted to an infiltration facility following construction. *(Note: Refer to page 3.10A-6 of the VSMH.)*

4. Soil Stockpile. Provide a temporary diversion dike along the north side of the temporary soil stockpile and staging area to direct runoff to proposed inlet # N-2. Increased or concentrated runoff from the stockpile/laydown area shall not be conveyed directly offsite to the adjacent north parcel.

WC070_FAITH_FELLOWSHIP_ASSEMBLY_OF_GOD - 202

5. Basin Construction. Previous comment # 9 was not fully addressed. Although it is acknowledged that a stilling basin was added to the outfall of the 18-inch barrel through the infiltration basin, some sort of initial control must be implemented to handle clearing & grading activities associated with the infiltration basin and now the stilling basin. Even if construction of the stilling basin precedes construction of the main basin, an erosion and sediment control measure must be implemented in the natural channel as there is approximately 1,500 square feet of disturbance associated with the stilling basin itself.

6. Stormwater Channel. Based on the response to previous comment # 10, if the intent is to provide EC-3 matting for all channel side slopes, then the typical swale detail on Sheet C-5 should reflect that intent.

7. Outlet Protection. In response to previous comment # 14, a riprap channel was added to the end of the stormwater conveyance channel to provide for outlet protection into the BMP. Show minimum depth of lining (normal depth) and placement thickness for the riprap by use of plan labels or a typical section. The riprap should also be extended down the interior (north) side slope of the basin to the basin bottom at proposed contour El. 77.

Stormwater Management / Drainage:

8. Drainage Map. Response to previous comment # 20 indicated that drainage area maps were included in the submittal package. None were found.

9. Stormwater Management. Supporting information as provided in the resubmission plans and design report do not substantiate potential effects to the offsite downstream existing receiving channel and Lake (BMP # 2) during the land-disturbing phase of the construction prior to installation of the infiltration basin BMP. Uncontrolled (increased) runoff from land-disturbing activities at the site could have a potentially adverse affect or threaten the structural integrity or stormwater function of the existing downstream receiving channel or pond.

10. Infiltration Basin. It appears the bottom level of infiltration basin BMP # 1 has about one-third of the minimum surface area required for the water quality storm event based on requirements outlined in Minimum Standard & Spec. 3.10 of the VSMH. A greater pond bottom surface area is recommended to promote infiltration and reduce the chance of clogging. *(See page 3.10a - 4 of the VSMH).*

11. BMP # 1. Previous comment # 25 was not fully addressed. Top of dam width should be 8 ft. minimum to ensure proper access around the dam for maintenance purposes.

12. BMP # 1. Due to the opening size of the dual 15-inch orifices on the riser structure (invert El. 81.10) consider use of a large trash rack device to stop trash and debris migration into the riser and to prevent unauthorized entry into the riser. The trash rack can be simple in nature such as two # 4 bars equally spaced each way.

13. Token Emergency Spillway. Provide a token emergency spillway for the BMP. Although the principal spillway mechanism is intended to pass the design 100-year event and 2 feet of freeboard is provided, our division commonly requires token emergency spillways as a secondary release mechanism. The token spillway can be set at or above the design 100-year WSEL as to not impact pond hydraulics and can be simple in nature such as minimum 8 ft. width, 2H:1V side slopes with grass or matted lining.

14. Stormwater Conveyance Channels. Response to previous comment # 32 stated that design calculations for onsite stormwater conveyance channels were provided in the design report. None were found.

15. Geotechnical. The subsurface soil conditions and infiltration testing portions of the geotechnical report (Addendum No. 1 by Geotechnical Environmental Testing Solutions, Inc. dated September 26th 2002) indicates that hand auger probes extended to a depth of 7 feet below existing grade at the stormwater management facility and permeability/infiltration testing was performed at that location. Although it appears that the actual infiltration rate would meet a minimum standard of 0.5 inches per hour and a factor of safety of 2 was applied for design, it is unclear if the infiltration rate assumption is indicative and representative of soils below proposed bottom grade of the infiltration facility. Based on existing topography, it appears that existing ground elevation at the BMP is around El. 84.0 and proposed bottom (top of surface layer) of the BMP is shown at El. 77; therefore, the terminus of the boring exactly coincides with proposed bottom of the BMP and the location of the soil test. Ensure that the assumptions made for the field infiltration rate are representative of soils below the BMP bottom. *(Note: Minimum Standard 3.10 of the VSMH requires verification to a minimum of 3 feet below the bottom of the facility).* Similarly, the geotechnical report also indicates that groundwater was not encountered at the boring to the depth explored. As the boring depth roughly coincides with the bottom of the infiltration facility (top of surface layer), ensure that reasonable assumptions can be made that the water table is sufficiently below the facility. *(Note: Minimum Standard 3.10 of the VSMH requires verification that separation between the bottom of an infiltration facility and the existing water table or bedrock is 2 to 4 feet.)*

16. Drainage Plan. Although the plans and design report clearly show there is adequate postdevelopment control for water quality, stream channel protection and attenuation purposes for the 1-, 2-, 10- and 100-year events to the downstream natural receiving channel and lake (ie. no increase in runoff), these conditions apply to the postdevelopment condition after clearing and grading is complete, site improvements are made, disturbed areas are stabilized, the site is landscaped and the infiltration basin is installed and functional. County and state requirements typically require delaying construction of infiltration basins until after contributing drainage areas are stabilized to prevent clogging and malfunction, unless the basin is specifically designed for use as a control during construction and adequately protected from sedimentation or properly converted to permanent BMP mode by cleaning sediment and overexcavating. Based on the current erosion and sediment control plan for the site, serious concern is warranted about the potential for increased runoff and discharge into the offsite natural channel and lake during the peak of construction activity when 3.25 acres of the total drainage area to the basin may be in a disturbed condition. Currently there are no provisions are on the plan for an adequately sized online sediment basin or trap to provide for interim sediment trapping and attenuation purposes. The drainage plan as presented with stormwater conveyance channels and pipes offers no attenuation during the land-disturbing phase of construction and the potential exists to impact offsite property and receiving natural drainage features during this phase of construction.

PREVIOUS Comments

ENVIRONMENTAL DIVISION REVIEW COMMENTS
FAITH FELLOWSHIP ASSEMBLY OF GOD
COUNTY PLAN NO. SP - 095 - 02
August 27, 2002

General Comments:

1. ✓ A Land-Disturbing Permit and Siltation Agreement, with surety, are required for this project.
Note 2, Sheet C-1

2. ✓ A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facility associated with this project. Note 4, Sheet C-1

3. ✓ Record Drawing and Construction Certification. The stormwater management/BMP facilities as proposed for this project will require submission, review and approval of record drawings (as-builts) and construction certifications prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines.
Note 5 Sheet C-1, Note 20 Sheet C-7

Chesapeake Bay Preservation:

4. ✓ Steep Slope Areas. Section 23-10(2) of the Chesapeake Bay Preservation Ordinance requires delineation of areas with slopes 25 percent or greater. Although the narrative on Sheet C-2 shows that 25 percent slope areas are present within the limits of construction, there is no line-work, hatching or shading on the map to indicate where these areas are situated within the limits of work. If 25 percent steep slope areas are impacted due to construction activity, a request for a waiver or exception is required, in writing, to the Environmental Division.

5. Wetlands. Show the location of delineated nontidal wetland areas consistent with the jurisdictional determination (USACOE 02-R1060) on Environmental Inventory Sheet C-2 and plan Sheet C-4.
Sheet C-4, not on ENV INV C-2.

Erosion & Sediment Control Plan:

6. ✓ Offsite Land Disturbing Areas. Identify any offsite land disturbing areas including borrow, waste, or disposal sites (with required erosion and sediment controls) or indicate on the plans that none are anticipated for this project. Note 6 sheet C-1

7. ✓ Temporary Stockpile. Describe how the temporary soil stockpile and staging area will be accessed once site grading is started and stormwater conveyance channel installation occurs. A temporary road crossing per Minimum Standard 3.24 may be necessary as the channels should not be forded.
RELOCATED STOCKPILE

8. Sequence of Construction. Step 9 of the sequence of construction does not apply to this project.
Several plan/sequence issues.

9. Silt Fence. Sheet C-4 shows two rows of silt fence at the outlet end of the BMP barrel. Silt fences should not be used in areas of concentrated flow. In lieu of silt fence, consider use of a single large rock check dam in the natural channel below the proposed BMP location. A rock check dam will provide for initial control during basin clearing and grading operations. Stone from the check dam can then be utilized for outlet or channel protection purposes once the site is stabilized.
not addressed.

10. ✓ Stormwater Channels. The typical stormwater conveyance channel section on Sheet C-5 is not consistent with grading as shown on Sheets C-3 and C-4. The grading plans show channel side slopes at 3H:1V or flatter but the detail shows 2H:1V. Slopes greater than 3H:1V would require matting in accordance with Standard Erosion and Sediment Control Note # 14. Show intended graded channel side slopes on the plan (ie. 3H:1V, 2H:1V, etc.) and provide keys and symbols in accordance with Minimum Standard 3.36 if matting is necessary.

E+SC PLAN
WHAT IS INITIAL CONTROL?

James City County, Virginia
Environmental Division
Stormwater Management Program

Stormwater Management Design Plan
Staff "Quick" Review

Plan No. SP - 95 - 02 Date/Time: 8/26/02 11:00AM
Project Name: FAITH FELLOWSHIP ASSEMBLY OF GOD.
Rough Location: 364 Richambeau ROAD
ADC Map: Sheet 1 Grid: K - 6 ☑ First Review
Flood Map / Zone: 510201- 00 0010 B Zone: X ☐ ____ Review
Description: Outside 500-YEAR
Drainage Area: ☒ Onsite ☐ Offsite
Submitted:

Y	N		
☐	☒	Demolition Plan (if applicable)	Sheets:
☑	☐	Site, Geometric or Layout Plan	Sheets: C-3, C-4
☑	☐	Grading Plan	Sheets: C-3, C-4
☑	☐	Storm Drainage Plan	Sheets: C-3, C-4
☑	☐	E&SC Plan	Sheets: C-3, C-4
☐	☒	Profiles (Storm)	Sheets:
☑	☐	Environmental Inventory	Sheets: C-2
☑	☐	Note & Detail Sheets	Sheets: C-5, C-6, C-7
☐	☒	Drainage Map(s)	
☑	☐	Soils Map/Narrative	Report / C-2
☑	☐	E&SC/SWM Design Plan Checklist (Required).	
☑	☐	E&SC/Stormwater Management / Drainage Narratives.	
☑	☐	E&SC/Stormwater Management Design Report with Calculations (Attachment).	
☑	☐	Geotechnical Report (Attachment).	
☐	☑	Waivers, Variances, or Exceptions (Attachments in Writing).	
		☐ VESCH ☑ CBP Ord (RPA, Steep Slope Policy) ☐ JCC BMP Manual	
☐	☐	Other (List):	

PARCEL 1A HAZELWOOD

JCC GIS Database: Zoning: B - 1 Tax Parcel/GPIN: (12-2)(01-22) 1220100022
Receiving Water: UT of Swamp Creek Site Acreage: 22.30 acres / s.f.
Other Approvals (SUP, etc.):
Site Plan Information: Owner: RM HAZELWOOD / DEV FAITH FELLOWSHIP ASSEMBLY OF GOD.
Zoning: B - 1 Description: Gen Business
Site Area: ~~3.37~~ 8.00 acres / s.f
Disturbed Area: 3.37 acres / s.f. (42.13 %)
☐ Disturbance > 5 acres, VPDES Notice of Intent required.
Impervious Cover: 0.83 acres / s.f. (10.38 %)
☐ Less than or equal to 60 percent. Meets CBPO requirements.
☐ More than 60 percent. Does Not Meet CBPO requirements.
Open / Green Space: ____ acres / s.f. (. %)

Site Development Plan:
☐ Residential, Lots, etc. ☒ Commercial (B / O / R) Church ☑ Govern./Institutional ☐ Industrial
☑ Roadways or Entrances ☑ Parking or Loading ☑ Water ☑ Sanitary Sewer Fm.
☑ Landscaping ☑ SWM/BMP facilities ☑ Manmade Drainage ☐ Parks, Amenities
☑ Pump/Lift Station ☐ Dams (regulated) ☐ Other, ____
Description: Church; 5,000SF; 52 parking spaces; One Story

MAIN SITE 31B EH MODERATE

Soils Information: Site: AB, HC, 15F, 19B, 31B Hydric: ☐ Yes ☐ No
Soil Survey Sheet DA: Same. HSG: _____
_____ BMP: 19B Hydric: ☐ Yes ☐ No
Description of Soils at BMP: 19B Kempsville-Emporia fsl, 2-6%. MODPERM SEASONAL HWT.

BMP Control: ☐ None ☒ Onsite ☒ Offsite ☐ Previously Approved ☐ Manufactured BMP
BMP Types: 1- Name: ONSITE INFIL (JCC BMP Type C - 4), Points 10
2- Name: OFFSITE WET POND (JCC BMP Type A - 1), Points 6
3- Name: _____ (JCC BMP Type ____ - ____), Points _____

Onsite Drainage: ☑ Reinforced Concrete Pipe ☐ Corrugated Metal Pipe ☐ Aluminum Type Pipe
☐ Corrugated Polyethylene Pipe ☐ PVC Type Pipe ☑ Open Channel Type
☑ Storm Drain ☑ Culverts Type: RCP CLASS III
☐ Inlets ☐ Other (Specify): _____

1. VDOT Standards & Specifications Referenced for work **within** R/W: ☑ Yes ☐ No Sheet C-5
2. VDOT Standards & Specifications Referenced for work **outside** R/W: ☑ Yes ☐ No

Site Limitations: ☐ RPA ☑ RMA ☑ Steep Slopes ☑ Delineated Wetlands
☐ Hydric Soils ☐ Critical Soils ☐ Vegetated ☐ Buffers: _____
☑ Defined Natural Drainage Features onsite ☐ Downstream Storm/Culv.
☐ Downstream Channel Erosion ☐ Floodplain ☐ Problem Drainage Area
☐ Stormwater Hotspot ☐ Other, _____
☐ Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

☐ Yes ☐ No	# BMP #1 ONSITE INFIL BASIN.			
Predev (Present)	DA = 4.383 ac.	C/CN = 66	Tc = 13.6	min / hrs.
2-year	4.20	cfs		
10-year	13.37	cfs		
100-year	23.66	cfs		
PostDev w/o Detention (Inflow)	DA = 7.165 ac.	C/CN = 72	Tc = 10.2	min / hrs.
1-year	6.94 CFS			
2-year	11.76	cfs		
10-year	30.49	cfs		
100-year	50.27	cfs		
PostDev with Detention (Routed)	DA = ac.	C/CN =	Tc =	min / hrs.
2-year	0.70	cfs	at El.	80.47
10-year	11.93	cfs	at El.	81.84
100-year (DHW)	19.08	cfs	at El.	83.30

1-YEAR 2.04 CFS

1-YEAR 0.15 CFS @ EL. 80.31

Downstream Tailwater Assumption for Pond Routing: NO TW. OK
Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables: ☐ Yes ☐ No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ☐ Yes ☐ No

CONTROLS 1-, 2-, 10- + 100-YEAR to predev.

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

❒ Check if None ❒ Provided: BMP # 1 Type: INFIL BASIN C-4

Y N * See Below for Pertinent WQv /Stream CPv Design Information.

❒ ❒ Top of Facility (Dam Crest) El. 85

❒ ❒ Design High Water (100-year) El. 83.30

❒ ❒ Emergency Spillway (ES) Crest El. ? BW:_____ SS: _____

❒ ❒ FreeBoard _____ 1 ft. or > with Emerg. Spillway.

❒ Acceptable ❒ Not Acceptable. _____ 2 ft. or > w/o Emerg. Spillway.

❒ ❒ Principal Spillway (Riser) Crest El. 83.00 Size/Type: _____

❒ ☑ Principal Spillway Crest 1 ft. below Crest of Emergency Spillway. ❒ Yes ☒ No ❒ N/A

☑ ❒ Stage-Storage Curve or Data

☑ ❒ Outlet Rating Curve or Table (Composite Structure)

☑ ☑ Extended Detention for WQ Provided (Min. 24 hours) ❒ Yes ❒ No ❒ N/A

☑ ❒ 1-year, 24 hour detention criteria for Stream Channel Protection. ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year design storm El. 80.20 or Volume 11,686 CF

❒ ❒ Normal/Permanent Pool El. NA ❒ N/A

❒ ❒ Orifice/Weir #1 (Highest El.) El. _____ Type: _____

❒ ❒ Orifice/Weir #2 El. _____ Type: _____

❒ ❒ Orifice/Weir #3 El. _____ Type: _____

❒ ❒ Orifice/Weir #4 El. _____ Type: _____

❒ ❒ Orifice/Weir #5 (Lowest El.) El. _____ Type: _____

❒ ☑ Low Flow Orifice (ExDet, CPv) El. _____ Type: _____

☑ ☑ Pond Drain w/ Valve (24 hr.) El. _____ Type: _____

☑ ❒ Pond Bottom (Positive Drain) El. _____ Riser Height: 7'

☑ ❒ Steps or Access Provided (for over 4 ft. depth) ❒ N/A

☑ ❒ Riser Base Bottom El. _____ Type: _____

☑ ❒ Core Trench ❒ N/A

☑ ☑ Anti-Seep Collars or other Acceptable Seepage Control Method. ❒ N/A

☑ ❒ Principal Spillway Anti-Vortex/Trash Rack Device Type: _____

❒ ❒ Low Flow Orifice Trash Rack. Type: _____

❒ ❒ Outlet Barrel: Type/Class: 3 Size: 18"

Inv. U/S: 76.0 Inv D/S: 75.45

Slope: 0.50% Length: 110 (ft.)

❒ ❒ Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.

❒ ❒ Outlet Protection.

❒ Standard Riprap Outlet Protection (OP) Type: _____

❒ Special Dissipator Structure (SDS) Type: _____

❒ ❒ BMP Cleanout Elevation El. _____ or Depth _____

❒ ❒ Adequate Channel Downstream of BMP: ❒ 1-year, 24-hour; or ❒ MS # 19 criteria.

Sketch or Notes, If Necessary:

* WQv / Stream CPv Design Summary	
Imperv. Area	4.0 ac. (50% SITE)
WQTV (Per JCC Man)	~~13,939 CF~~ 1" P.I.A.
WQ Vol. Required	13,939 CF
WQ Vol. Provided	
1-yr SCPv Required	11686 CF
1-yr SCPv Provided	14038 CF
Ext Det Orifice Size	INFILT.

Sediment Trap & Basins

❒ Temporary Sediment Trap # 1 _____ DA = _____ < 3 acres

❒ Temporary Sediment Trap # 2 _____ DA = _____ < 3 acres

❒ Temporary Sediment Basin # 1 _____ DA = _____ ❒ BMP # ____ convert.

❒ Temporary Sediment Basin # 2 _____ DA = _____ ❒ BMP # ____ convert.

E&SC Plan Comments: _____

MAIN SITE 31B EH moderate

Soils Information: Site: AB, 11E, 15F, 19B, 31B Hydric: ☐ Yes ☐ No
Soil Survey Sheet DA: Same. HSG: _____
_____ BMP: 19B Hydric: ☐ Yes ☐ No
Description of Soils at BMP: 19B Kempsville-Emporia fsl, 2-6%. Mod Perm Seasonal HWT.

BMP Control: ☐ None ☒ Onsite ☒ Offsite ☐ Previously Approved ☐ Manufactured BMP
BMP Types: 1- Name: OWSITE INFIL (JCC BMP Type C - 4), Points 10
2- Name: OFFSITE WET POND (JCC BMP Type A - 1), Points 6
3- Name: _____ (JCC BMP Type ____ - ____), Points _____

Onsite Drainage: ☑ Reinforced Concrete Pipe ☐ Corrugated Metal Pipe ☐ Aluminum Type Pipe
☐ Corrugated Polyethylene Pipe ☐ PVC Type Pipe ☑ Open Channel Type
☑ Storm Drain ☑ Culverts Type: RCP CLASS III
☐ Inlets ☐ Other (Specify): _____

1. VDOT Standards & Specifications Referenced for work **within** R/W: ☑ Yes ☐ No Sheet C-5
2. VDOT Standards & Specifications Referenced for work **outside** R/W: ☑ Yes ☐ No

Site Limitations: ☐ RPA ☑ RMA ☑ Steep Slopes ☑ Delineated Wetlands
☐ Hydric Soils ☐ Critical Soils ☐ Vegetated ☐ Buffers: _____
☑ Defined Natural Drainage Features onsite ☐ Downstream Storm/Culv.
☐ Downstream Channel Erosion ☐ Floodplain ☐ Problem Drainage Area
☐ Stormwater Hotspot ☐ Other, _____
☐ Site Activities may warrant a General VPDES Permit for Discharge of Stormwater Associated with Industrial Activities (ie. process water, batch plants, etc.).

Site Stormwater Management / BMP Control (Add sheets if necessary for Multiple Onsite Facilities):

☐ Yes ☐ No	# BMP #2 EXIST POND			
Predev (Present)	DA =	ac.	C/CN =	Tc = min / hrs.
2-year			cfs	
10-year			cfs	
100-year			cfs	
PostDev w/o Detention (Inflow)	DA =	ac.	C/CN =	Tc = min / hrs.
1-year				
2-year			cfs	
10-year			cfs	
100-year			cfs	
PostDev with Detention (Routed)	DA =	ac.	C/CN =	Tc = min / hrs.
2-year			cfs	at El.
10-year			cfs	at El.
100-year (DHW)			cfs	at El.

Downstream Tailwater Assumption for Pond Routing: _____
Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables: ☐ Yes ☐ No
Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements: ☐ Yes ☐ No

Plan Review Steps & Components:

Y	N	
☑	☐	First "Look-Thru". Quick look through plan for familiarity and completeness.
☑	☐	Existing Utilities - Miss Utility (1-800-552-7001) or other methods.
☑	☐	Responsible Land-Disturber Certification; Disturbed Area Estimate.
☑	☐	Worksheet for BMP Point System. 10 point (New Dev) or Pollutant Load method (Redevelopment).
☑	☐	FEMA Special Flood Hazard Areas. Check location relative to property site and/or development area.
☑	☐	Check JCC Tax Parcel Maps for RPA / RMA locations and Tax Parcel number.
☑	☐	Stormwater hotspot, general layout and/or BMP separation distances (if any) are satisfactory.
☐	☑	Environmental Inventory - Chesapeake Bay Ordinance requirements satisfactory.
☑	☐	Highlight/check impacts to any Environmental Sensitive Areas (wetlands, RPA, floodplain, steep slopes, etc.).
☑	☐	Offsite borrow, waste areas and onsite stockpiles areas addressed.
☑	☐	Review existing topography to determine adequacy of perimeter E&SC plan (Phase I).
☑	☐	Current version of Standard JCC Erosion & Sediment Control Notes on plan.
☑	☐	Virginia E&SC Regulations. Minimum Standards # 1 thru # 19 appear satisfied.
☑	☐	Check for Offsite Work; Grading Plan conflicts such as excessive cut-fill slopes, deep excavations, etc.
☑	☐	Review adequacy of onsite E&SC plan (Phase II).
☑	☐	Review layout to check for conflicts (utilities, buildings, parking, buffers, etc.).
☑	☐	Storm Drainage - culverts, inlets, channels, storm drains. (pipe data, cover, conflicts, specs or reference to VDOT).
☐	☑	Proper Outlet Protection or Energy Dissipator information, details and computations.
☐	☑	Review Sequence of Construction (for E&SC and SWM/BMP installation).
☑	☐	Review E&SC Narrative (preferred to be on plan); SWM Narrative (Report).
☑	☐	Review for any Lot-to-Lot or adjacent property uncontrolled drainage problems.
☑	☐	Review plan based on Chapter 19 Subdivision ordinance as it relates to SWM/BMP control.
☑	☐	Review plan based on Chapter 24 Zoning as it relates to SWM/BMP control.
☑	☐	Review plan based on Chapter 23 Chesapeake Bay ordinance requirements.
☑	☐	Review plan based on JCC E&SC/SWM Design Plan Checklist.
☑	☐	Review plan based on Virginia Erosion and Sediment Control Handbook (VESCH).
☑	☐	Review E&SC Plan Design Report and computations (Attached report).
☑	☐	Review plan based on JCC BMP manual for BMP type selected for project.
☑	☐	Review plan based on Virginia Stormwater Management Handbook (VSMH) for BMP type.
☑	☐	Review SWM Design Report and computations (Attached Report).
☑	☐	Review for potential mosquito-vector issues with BMP type and location.
☑	☐	Review plan based on JCC Stormwater Conveyance System Design/Construction Guidelines.
☑	☐	Review plan based on General Knowledge and Experience for Design/Construction.
☑	☐	Review plan based on other BMP design/construction references. List:
☑	☐	Review BMP for Buffer/Setback Requirements (Min 25 ft. from DHW) and Access.
☑	☑	Review BMP Benching (aquatic, safety) & Pondscape Plan (deep pool, shallow water, shoreline fringes, etc.).
☐	☑	Review Maintenance Plan for SWM / BMP facility. Detailed and specific guidance for long-term maintenance.
☑	☐	Well-defined, adequate channels downstream of uncontrolled or SWM/BMP areas. (MS # 19 or 1-year criteria).
☐	☐	Adequate conversion plan for TSB to use as permanent BMP.
☑	☐	Geotechnical. Information per Appendix E (infiltration) or to substantiate use of other BMPs (soils-wet pond, etc).
☑	☐	Provisions on plan requiring Record Drawing and Construction Certification of SWM facilities.
☑	☐	Drainage, Maintenance and Open Space Easements (if provided) appear satisfactory.
☐	☑	Wetland Permit required prior to issuance of a Land-Disturbance Permit or Final Approval.
☑	☐	Inclusion of H&H and SWM / BMP data into any JCC databases.
☐	☐	Other: _____

Prepared Environmental Division comments for the following categories based on above review areas:

☐ ☐	***General Comments:***	☐ ☐	***Erosion & Sediment Control Plan:***
☐ ☐	***Floodplain:***	☐ ☐	***Chesapeake Bay Preservation:***
☐ ☐	***Stormwater Management / Drainage:***	☐ ☐	***Other:***

Additional Notes & Comments: _____

(Note: THIS FORM FOR COUNTY USE ONLY.)

☐ 1st Rev ☐ 2nd Rev ☐ 3rd Rev

Signature	Date
Signature	Date
Signature	Date

Pond / BMP Design Data (Add Sheet If Necessary for Multiple Onsite Facilities):

❒ Check if None ❒ Provided: BMP # _____ Type: _____

Y N * See Below for Pertinent WQv /Stream CPv Design Information.

❒ ❒ Top of Facility (Dam Crest) El. _____

❒ ❒ Design High Water (100-year) El. _____

❒ ❒ Emergency Spillway (ES) Crest El. _____ BW:_____ SS: _____

❒ ❒ FreeBoard _____ 1 ft. or > with Emerg. Spillway.

❒ Acceptable ❒ Not Acceptable. _____ 2 ft. or > w/o Emerg. Spillway.

❒ ❒ Principal Spillway (Riser) Crest El. _____ Size/Type: _____

❒ ❒ Principal Spillway Crest 1 ft. below Crest of Emergency Spillway. ❒ Yes ❒ No ❒ N/A

❒ ❒ Stage-Storage Curve or Data

❒ ❒ Outlet Rating Curve or Table (Composite Structure)

❒ ❒ Extended Detention for WQ Provided (Min. 24 hours) ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year, 24 hour detention criteria for Stream Channel Protection. ❒ Yes ❒ No ❒ N/A

❒ ❒ 1-year design storm El. _____ or Volume _____

❒ ❒ Normal/Permanent Pool El. _____ ❒ N/A

❒ ❒ Orifice/Weir #1 (Highest El.) El. _____ Type: _____

❒ ❒ Orifice/Weir #2 El. _____ Type: _____

❒ ❒ Orifice/Weir #3 El. _____ Type: _____

❒ ❒ Orifice/Weir #4 El. _____ Type: _____

❒ ❒ Orifice/Weir #5 (Lowest El.) El. _____ Type: _____

❒ ❒ Low Flow Orifice (ExDet, CPv) El. _____ Type: _____

❒ ❒ Pond Drain w/ Valve (24 hr.) El. _____ Type: _____

❒ ❒ Pond Bottom (Positive Drain) El. _____ Riser Height: _____

❒ ❒ Steps or Access Provided (for over 4 ft. depth) ❒ N/A

❒ ❒ Riser Base Bottom El. _____ Type: _____

❒ ❒ Core Trench ❒ N/A

❒ ❒ Anti-Seep Collars or other Acceptable Seepage Control Method. ❒ N/A

❒ ❒ Principal Spillway Anti-Vortex/Trash Rack Device Type: _____

❒ ❒ Low Flow Orifice Trash Rack. Type: _____

❒ ❒ Outlet Barrel: Type/Class: _____ Size: _____

Inv. U/S: _____ Inv D/S: _____

Slope: _____ Length: _____ (ft.)

❒ ❒ Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.

❒ ❒ Outlet Protection.

❒ Standard Riprap Outlet Protection (OP) Type: _____

❒ Special Dissipator Structure (SDS) Type: _____

❒ ❒ BMP Cleanout Elevation El. _____ or Depth _____

❒ ❒ Adequate Channel Downstream of BMP: ❒ 1-year, 24-hour; or ❒ MS # 19 criteria.

Sketch or Notes, If Necessary:

* WQv / Stream CPv Design Summary	
Imperv. Area	_____
WQTV (Per JCC Man)	_____
WQ Vol. Required	_____
WQ Vol. Provided	_____
1-yr SCPv Required	_____
1-yr SCPv Provided	_____
Ext Det Orifice Size	_____

Sediment Trap & Basins

❒ Temporary Sediment Trap # 1 _____ DA = _____ < 3 acres

❒ Temporary Sediment Trap # 2 _____ DA = _____ < 3 acres

❒ Temporary Sediment Basin # 1 _____ DA = _____ ❒ BMP # ____ convert.

❒ Temporary Sediment Basin # 2 _____ DA = _____ ❒ BMP # ____ convert.

E&SC Plan Comments: _____