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: **WC054**

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: WC054

PIN: 1340100009

Subdivision, Tract, Business or Owner Name (if known): Faith Baptist Church of Williamsburg

Property Description: Church Site

Site Address: 4107 Rochambeau Road

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

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

010010661

Comments

COPY

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 11 day of June, ~~19~~ 2001, between Faith Baptist Church, and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: 4107 Rochambeau Drive - Williamsburg, VA, Deed Book _____, Page No. _____ or Instrument No. 99 000 8273, and James City County, Virginia, hereinafter referred to as the "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.

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.

Instrument # 010010661

Recorded June 15, 2001

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 003

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 11 day of June, ~~19~~ 2001

COVENANTOR(S)

Print Name/Title Daniel J. Tozier (Pastor)

ATTEST:

COVENANTOR(S)

Print Name/Title

ATTEST:

COMMONWEALTH ~~OF~~ VIRGINIA
~~CITY~~/COUNTY OF James City

I hereby certify that on this 11th day of June, ~~19~~ 2001, before the subscribed, a Notary Public of the State of Virginia, and for the ~~City~~/County of James City, aforesaid personally appeared Daniel J. Tozier and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 11th day of June, ~~19~~ 2001

Notary Public

My Commission expires: 9/25/04

Approved as to form:

Deputy County Attorney

This Declaration of Covenants prepared by:

Daniel J. Tozier
(Print Name)

Pastor
(Title)

4107 Rochambeau Drive
(Address)

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

drainage.pre
Revised 2/97

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 004

JAMES CITY COUNTY

TO: Leo

FROM: Darryl

DATE: 8/18

___ For Your Comments ___ Call Me
✓ For Your Approval ___ See Me
___ Note & Return ___ FYI
___ Note & File ___ Signature
___ Reply & Send Me Copy
___ Take Appropriate Action
___

RECEIVED AUG 18 1998 County Attorney James City County, VA

COMMENTS:
This agreement is to allow Faith Baptist to redesign + relocate their BMP to a better location now that they have purchased addl property. It is modeled after an agreement we did in a similar situation for Carolina Furniture a few years back.

Return to Darryl

Joan - 2-17-99
more problems w/ this form — see Leo's note. Thanks - mfc

t and Declaration of
o Construct, Maintain
ss to a Stormwater Facility.

de this 24th day of July 1998, by and between
n interest, (COVENANTORS) and the County of
ical subdivision of the Commonwealth of Virginia.

re the owners of the real property, with
cel (2) in James City on plat entitled "Plat of
me of Hickory Neck Corporation being a portion
lagesterial District James City County, ref:

ationof the mutual covenants herein contained it
e COVENANTORS to develop Parcel 2 by
ordance with the Site Plan approved by the
struct and maintain a stormwater facility, in
within this AGREEMENT, on Parcel 4.

ETH:

full authority to execute deeds,mortgages,other
s in the property described above, do hereby

ll provide surety, acceptable to the County
MENT in the amount of $28,000 letter of credit.

ll construct the stormwater water quality
(FACILITY) as shown on a County approved BMP plan facility to be designed by Langley & McDonald, and that the construction will conform with the "Virginia Erosion and Sedimentation Control Handbook" third edition.

3: The COVENANTORS agree that the construction of said FACILITY will be completed,accepted and approved by the COUNTY no later than February 1, 1999.

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 005

record this agreement
each signature
must be notarized.
Could be 1 notary if
signatures are attested
to. Leo

Joan - 2-17-99
more problems
w/ this form —
see Leo's note.
Thanks - mfe

Agreement and Declaration of
Covenants to Construct, Maintain
and Provide Access to a Stormwater Facility.

This AGREEMENT, made this 24th day of July 1998, by and between Faith Baptist Church and all successors in interest, (COVENANTORS) and the County of James City, Virginia (COUNTY), a political subdivision of the Commonwealth of Virginia.

The COVENANTORS are the owners of the real property, with improvements thereon, designated as Parcel (2) in James City on plat entitled "Plat of subdivision of property standing in the name of Hickory Neck Corporation being a portion of 28.007 acres situated in Stonehouse Magesterial District James City County, ref: DB183,P249 & PB34,P97

NOW,THEREFORE, in considerationof the mutual covenants herein contained it is agreed that the COUNTY will allow the COVENANTORS to develop Parcel 2 by constructing a Church on parcel 2, in accordance with the Site Plan approved by the COUNTY, if the COVENANTORS construct and maintain a stormwater facility, in accordance with the conditions contained within this AGREEMENT, on Parcel 4.

WITNESSETH:

We, the COVENANTORS, 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 COVENANTORS shall provide surety, acceptable to the County Attorney, for performance of this AGREEMENT in the amount of $28,000 letter of credit.

2. The COVENANTORS shall construct the stormwater water quality (FACILITY) as shown on a County approved BMP plan facility to be designed by Langley & McDonald, and that the construction will conform with the "Virginia Erosion and Sedimentation Control Handbook" third edition.

3: The COVENANTORS agree that the construction of said FACILITY will be completed,accepted and approved by the COUNTY no later than February 1, 1999.

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 006

4. If the COVENANTORS fail to construct the facility in accordance with the stipulations contained in this AGREEMENT, the COUNTY may use the surety to construct or complete the FACILITY. On satisfactory completion of the FACILITY, the COUNTY shall release the surety provided in paragraph 1.

5. The COVENANTORS shall provide maintenance for the FACILITY located on and serving the above described property to ensure that the FACILITY is and remains in proper working condition in accordance with that approved design standards, and with the law and applicable executive regulations.

6. The COVENANTORS shall provide and maintain perpetual access from public right-of-ways to the FACILITY and the COUNTY, its agent and its contractor.

7. The COVENANTORS shall grant the COUNTY,it's agent and it's contractor a right of entry to the FACILITY for the purpose of inspecting, operating, installing,constructing, reconstructing, maintaining or repairing the FACILITY.

8. If after ten (10) days written notice by the COUNTY, the COVENANTORS SHALL FAIL TO MAINTAIN THE facility in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may assess the COVENANTORS and/or all property served by the FACILITY for the cost of the work and any applicable penalties.

9. The COVENANTORS 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 FACILITY. Except as to such claims that may arise out of maintenance or construction activities undertaken by the COUNTY or it's agents.

10. The COVENANTORS shall promptly notify the COUNTY when the COVENANTORS legally transfer any of the COVENANTORS ownership in or responsibilities for the FACILITY. The COVENANTORS shall supply the COUNTY with a copy of the document of transfer, executed by both parties.

11. The COVENANTS contained herein shall run with the land and shall bind the COVENANTORS and the COVENANTOR'S heirs, executors, administrators, successors and assignees, and shall bind all present and subsequent owners of the property served by the FACILITY.

12. This AGREEMENT shall be recorded in the circuit court clerk's office for the County of James City, Virginia.

In witness whereof, the parties have executed this AGREEMENT on the date first above written.

Michael Privett
Pastor. & Trustee

Daniel Tozier
Ass't. Pastor &Trustee

Charles Poindexter
Trustee

This Agreement and Declaration Prepared by:

Michael Privett

Pastor, & Trustee

P O Box 650

Lightfoot VA 23090

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 008

Michael Privett
Faith Baptist Church
4107 Richmond Rd.
Williamsburg VA 23185

(James McReynolds)
P.O. Box 650
Lightfoot, VA 23090

Daniel/Tozier

James City County, Virginia
Environmental Division

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

County Plan No.: SP-24-00; SP-124-97
Project Name: FAITH BAPTIST CHURCH
Stormwater Management Facility: OFFSITE DR-1 POND
Phase: ☐ I ☐ II ☑ III

- ☑ Information Received. Date: June 26 '97 HIS LAND SURV.
- ☐ Administrative Check.
  - ☑ Record Drawing Date: 6/26/02 HIS LAND SURV
  - ☐ Construction Certification Date:
  - ☐ RD/CC Standard Forms (Required after Feb 1st 2001Only)
  - ☑ Insp/Maint Agreement Info: I/M #010010661 6/15/01 + SEPARATE AGREEMENT DUE TO BMP SHIFT
  - ☑ BMP Maintenance Plan Location: ~~[illegible]~~ Yes, FILE
  - ☑ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  - ☑ Yes ☐ No Location: Note #19 Sheet C-1 *
- ☑ Assign County BMP ID Code Code: WC 054
- ☑ Log into Division's "As-Built" Tracking Log
- ☑ Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (label, copy hydraulics, BMP information, etc.).
- ☐ Inspector Check of RD/CC.
- ☑ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to field inspection).
- ☑ Final Inspection (FI) Performed Date: 7/3/02
- ☑ Record Drawing (RD) Review Date: 7/2/02
- ☐ Construction Certification (CC) Review Date:
- ☐ Actions:
  - ☐ No comments.
  - ☐ Comments. Letter Forwarded. Date: 7/05/02
    - ☑ Record Drawing (RD)
    - ☑ Construction Certification (CC)
    - ☑ Construction-Related (CR)
    - ☐ Site Issues (SI)
    - ☐ Other :
- ☐ Second Submission: Mitchell-Wilson 9/20/02 RD OK; CC OK; Reinspect WORK 10-9-02 OK;
- ☐ Third Submission:
- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☑ Notify Darryl/Joan/Pat of acceptability using email (preferred), form or verbal. Surety Request
- ☑ 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.
- ☐ Digital Photographs obtained.
- ☒ Add to JCC Hydrology & Hydraulic database (optional).

BMP Certification Information Acceptable

Plan Reviewer: [signature] Date: 10/11/02

* Also, CC per note in box sheet C-3 + Apr JCC ENV Comment #3 dated ~~MAY 19 2000~~ MARCH 27 2000 (SP-24-00). LANDMARK Responded #3 dated MAY 3 2000

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 Baptist Church
Structure/BMP Name: " " " WC-054
Project Location: 4107 Rochambeau Drive
BMP Location: TM (13-4)(1-9)
County Plan No.: SP - 24 - 00

Project Type: ☐ Residential ☐ Business ☐ Commercial ☐ Office ☐ Institutional ☐ Industrial ☐ Public ☐ Roadway ☒ Other Church

Tax Map/Parcel No.: 1340100009
BMP ID Code (if known): WC-054
Zoning District:: A1
Land Use: Church
Site Area (sf or acres): UNKNOWN

Brief Description of Stormwater Management/BMP Facility: Dry Extended Detention Facility

Nearest Visible Landmark to SWM/BMP Facility: Faith Baptist Church Building

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☒ Other
Station Number or Name:
Datum or Reference Elevation: INVERT AS SHOWN ON SHEET C-2 BASIS D1-3, 91.44
Control Description: LANDMARK DESIGN PLANS
Control Location from Subject Facility:

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☒ Unknown
Approx. Construction Start Date for SWM/BMP Facility: _____
Facility Monitored by County Representative during Construction: ☒ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: James McReynolds
Name of Professional Firm Who Routinely Monitored Construction: NONE
Date of Completion for SWM/BMP Facility: Prior to July 3, 2002
Date of Record Drawing/Construction Certification Submittal: Sept 20, 2002

(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 Baptist Church c/o Mr. Michael Privett
Mailing Address: 4107 Rochambeau Drive
Williamsburg, VA 23185
Business Phone: 757-566-2295 Fax: Same
Contact Person: James F. McReynolds Title: _____

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
Mailing Address: 4029 Ironbound Road
Williamsburg, VA 23188
Business Phone: 757-253-2975
Fax: _____
Responsible Plan Preparer: Richard S. Phillips, PE
Title: _____
Plan Name: Faith Baptist Church
Firm's Project No. 1970053-000.04
Plan Date: 7-12-00
Sheet No.'s Applicable to SWM/BMP Facility: C-1 / C-2 / C-3 / ____ / ____

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

Name: James F McReynolds
Mailing Address: 5541 Farmer's Drive
Barhamsville, VA 23011
Business Phone: 757-566-2295
Fax: Same
Contact Person: James McReynolds
Site Foreman/Supervisor: " "
Specialty Subcontractors & Purpose (for BMP Construction Only): NONE

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: Mitchell-Wilson Assoc. P.C.
Mailing Address: P.O. Box 1269
West Point, VA 23181
Business Phone: 804-843-9744
Fax: 804/843-9884

Name: Jonathan Blair Wilson
Title: President

Signature:
Date: 9-20-02

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 (ON THE RECORD DRAWINGS).

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
NO. 019961
9-20-02
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: Mitchell-Wilson Assoc. P.C.
Mailing Address: P.O. Box 1269
West Point, VA 23181
Business Phone: 804-843-9744
Fax: 804-843-9884

Name: Jonathan Blair Wilson
Title: President

Signature:
Date: 9-20-02

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

SEE ATTACHMENT NO. 1

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
NO. 019961
9-20-02
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

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

☐ PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

☒ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

☒ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

☐ Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

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

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

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

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

☐ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

☒ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

☒ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

XX 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

XX 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

N/A 4. All plan sheet revision blocks modified to indicate date and record drawing status.

XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

XX 1. All requirements of Section I (Methods and Presentation) apply to this section.

XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

XX 4. Top widths, berm widths and embankment side slopes.

XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

____ 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

XX 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

XX 8. Elevation of the principal spillway crest or outlet crest of the structure.

XX 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

XX 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

XX 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

NOT AVAILABLE 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

SEE NOTE 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.** SEE GEOTECHNICAL REPORT

XX 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

XX 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

XX 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

N/A 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

N/A 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

XX 20. BMP vicinity properly cleaned of stockpiles and construction debris.

XX 21. No visual signs of erosion or channel degradation immediately downstream of facility.

XX 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VIII. Group F - Extended Dry Detention

(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)

XX F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

XX F2. Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.

N/A F3. Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)

NOT PROVIDED F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.

N/A F5. A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.

SEE NOTE F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction. PIPE IS RCP; JOINT CONSTRUCTION UNKNOWN

N/A F7. Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.

SEE NOTE F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack. NO BAR GRATING PROVIDED ON EW-11 @ 6" Ø ORIFICE TUBE

N/A F9. Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.

N/A F10. Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.

XX F11. Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.

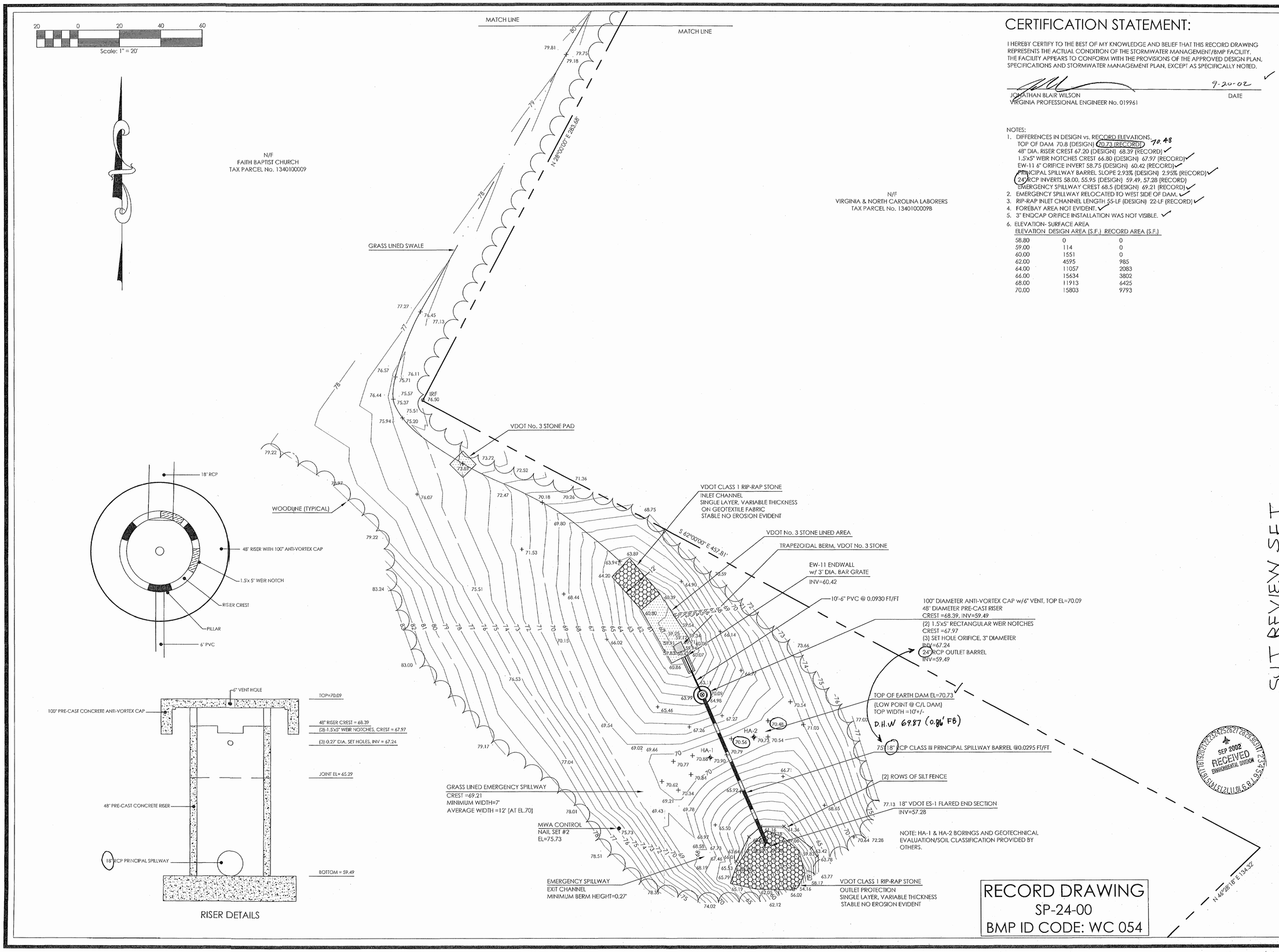
XX F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

XX F13. Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.

N/A F14. No visual signs of undercutting of timber walls or clogging of the low orifice were present.

XX F15. No visual signs of erosion or channel degradation immediately downstream of facility.

XX F16. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.



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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.

9-20-02

JONATHAN BLAIR WILSON — DATE
VIRGINIA PROFESSIONAL ENGINEER No. 019961

NOTES:

1. DIFFERENCES IN DESIGN vs. RECORD ELEVATIONS.
   TOP OF DAM 70.8 (DESIGN) 70.73 (RECORD) 70.48
   48" DIA. RISER CREST 67.20 (DESIGN) 68.39 (RECORD)
   1.5'x5" WEIR NOTCHES CREST 66.80 (DESIGN) 67.97 (RECORD)
   EW-11 6" ORIFICE INVERT 58.75 (DESIGN) 60.42 (RECORD)
   PRINCIPAL SPILLWAY BARREL SLOPE 2.93% (DESIGN) 2.95% (RECORD)
   24" RCP INVERTS 58.00, 55.95 (DESIGN) 59.49, 57.28 (RECORD)
   EMERGENCY SPILLWAY CREST 68.5 (DESIGN) 69.21 (RECORD)
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3. RIP-RAP INLET CHANNEL LENGTH 55-LF (DESIGN) 22-LF (RECORD)
4. FOREBAY AREA NOT EVIDENT.
5. 3" ENDCAP ORIFICE INSTALLATION WAS NOT VISIBLE.
6. ELEVATION- SURFACE AREA

ELEVATION	DESIGN AREA (S.F.)	RECORD AREA (S.F.)
58.80	0	0
59.00	114	0
60.00	1551	0
62.00	4595	985
64.00	11057	2083
66.00	15634	3802
68.00	11913	6425
70.00	15803	9793

NOTE: HA-1 & HA-2 BORINGS AND GEOTECHNICAL EVALUATION/SOIL CLASSIFICATION PROVIDED BY OTHERS.

RECORD DRAWING
SP-24-00
BMP ID CODE: WC 054

SWM REVIEW SET

MITCHELL–WILSON ASSOCIATES, P.C.
CIVIL ENGINEERS & LAND SURVEYORS
720 MAIN STREET, SUITE 112, 2nd FLOOR
P.O. BOX 1269
WEST POINT, VIRGINIA 23181
(804) 843–9744

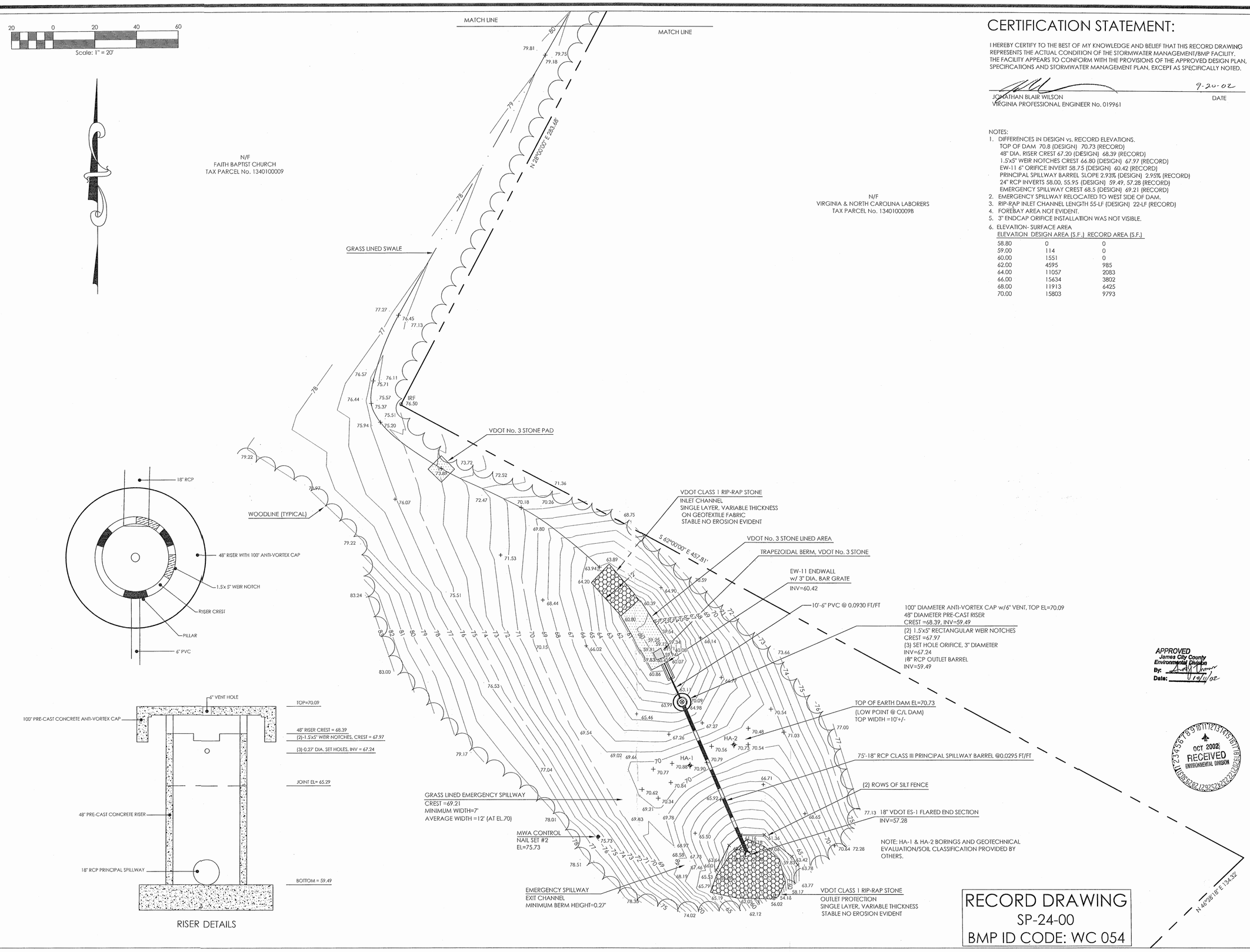
RECORD DRAWING
FAITH BAPTIST CHURCH
STORMWATER MANAGEMENT/BMP FACILITY
TAX PARCEL No. 1340100009
COUNTY BMP ID CODE: WC 054
SP-124-97; AMENDED SP-24-00
JAMES CITY COUNTY, VIRGINIA

DESIGN: | DRAWN: JBW | REVISIONS: | DATE: 9-18-02 | SCALE: 1"=20'

SHEET 1 OF 2

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
No. 019961
PROFESSIONAL ENGINEER

WC054; SP-24-00



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JONATHAN BLAIR WILSON — DATE: 9-20-02
VIRGINIA PROFESSIONAL ENGINEER No. 019961

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RECORD DRAWING
SP-24-00
BMP ID CODE: WC 054

MITCHELL–WILSON ASSOCIATES, P.C.
CIVIL ENGINEERS & LAND SURVEYORS
720 MAIN STREET, SUITE 112, 2nd FLOOR
P.O. BOX 1269
WEST POINT, VIRGINIA 23181
(804) 843-9744

RECORD DRAWING
FAITH BAPTIST CHURCH
STORMWATER MANAGEMENT/BMP FACILITY
TAX PARCEL No. 1340100009
COUNTY BMP ID CODE: WC 054
SP-124-97; AMENDED SP-24-00
JAMES CITY COUNTY, VIRGINIA

DESIGN: | DRAWN: JBW | REVISIONS: | DATE: 9-18-02 | SCALE: 1"=20'

SHEET 1 OF 2

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
No. 019961
PROFESSIONAL ENGINEER
9-20-02

CERTIFICATION STATEMENT:

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7-30-02

JONATHAN BLAIR WILSON — DATE
VIRGINIA PROFESSIONAL ENGINEER No. 019961

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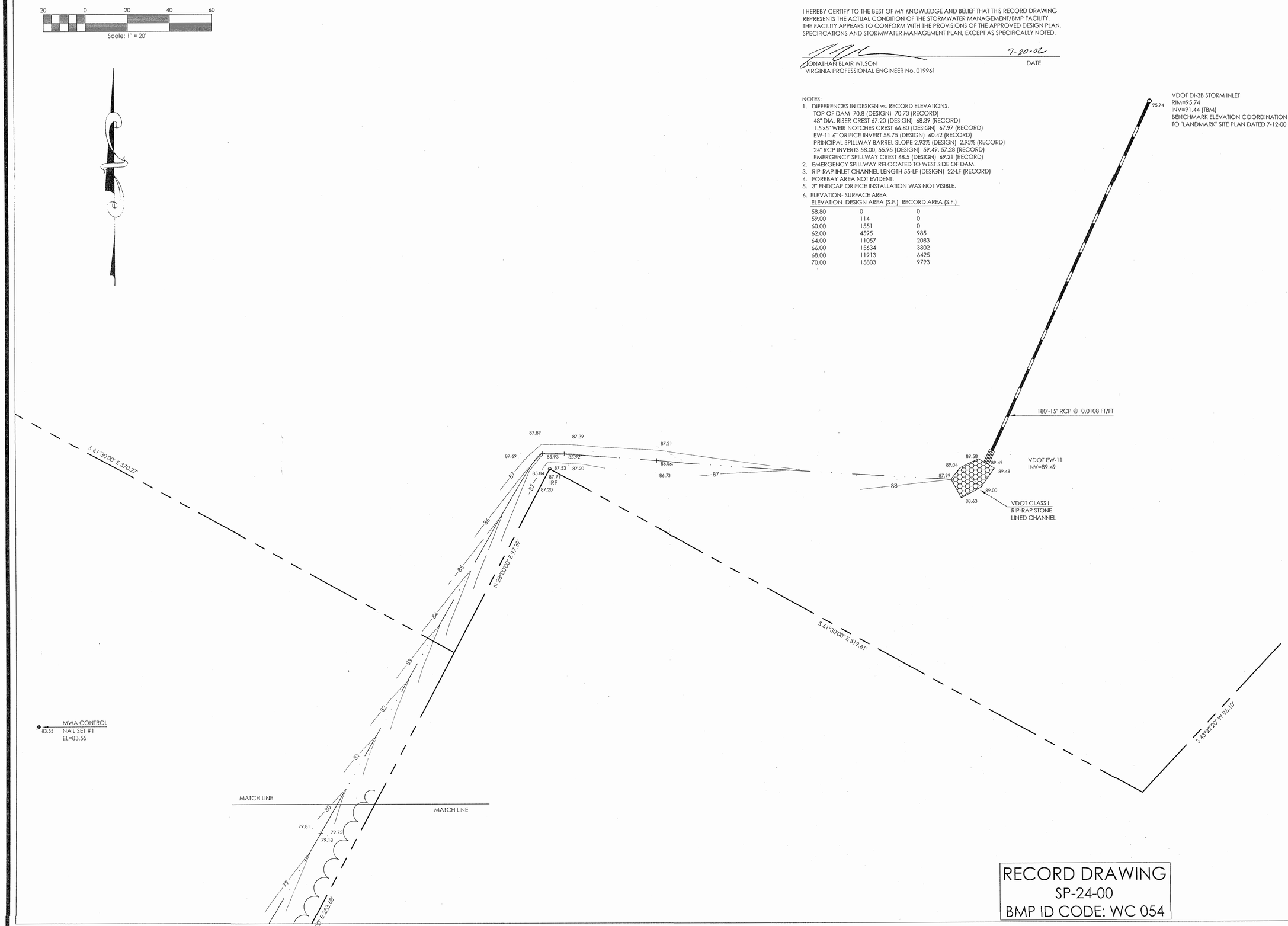

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SP-24-00
BMP ID CODE: WC 054

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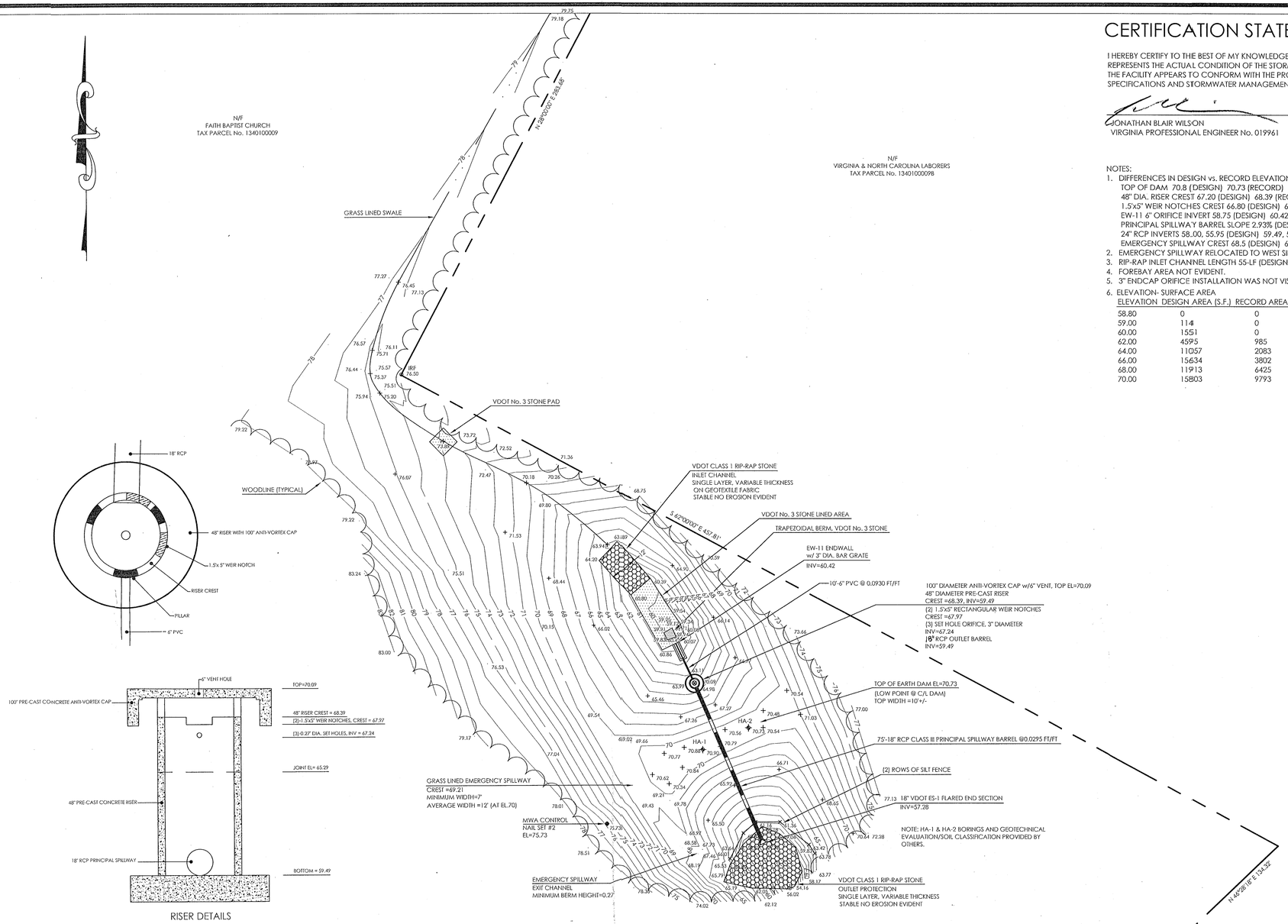
JAMES CITY COUNTY, VIRGINIA

DESIGN: | DRAWN: JBW
REVISIONS:
DATE: 9-18-02 | SCALE: 1"=20'
SHEET 2 OF 2

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
No. 019961
7-30-02
PROFESSIONAL ENGINEER



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9-20-02

JONATHAN BLAIR WILSON — DATE
VIRGINIA PROFESSIONAL ENGINEER No. 019961

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RECORD DRAWING
FAITH BAPTIST CHURCH
STORMWATER MANAGEMENT/BMP FACILITY
TAX PARCEL No. 1340100009
COUNTY BMP ID CODE: WC 054
SP-124-97; AMENDED SP-24-00
JAMES CITY COUNTY, VIRGINIA

DESIGN: | DRAWN: JBW
REVISIONS:
DATE: 9-18-02 | SCALE: 1"=25'

SHEET 2A OF 2

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
No. 019961
9-20-02
PROFESSIONAL ENGINEER

AS-BUILT SURVEY OF
SWM/BMP
ON PROPERTY STANDING IN THE NAME OF
FAITH BAPTIST CHURCH
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE:1"=30' DATE:06/26/02
J.N. 110.8

EXISTING 15" RCP
EXISTING ES-1
RIP RAP
S 42°15'53"W
96.13'
PARCEL ID#1340100040
FAITH BAPTIST CHURCH
N 62°32'26"W
319.64'
S 26°54'32"W
97.45'
NORTH
GRASS LINED DITCH
Shallow depressed curb
SCC
PARCEL ID#1340100009B
VIRGINIA & NORTH CAROLINA LABORERS
INSTR.# 990018392
#PARCEL ID#1340100009
FAITH BAPTIST
CHURCH
INSTR.#990008273
GRAVEL CHECK DAM
RIP RAP
GRAVEL
DRAINAGE STRUCTURE
INV= 60.25
RISER
TOP= 69.94
18"x5"
18" RCP
FLAIRED END SECTION
INV.= 57.14'
RIP RAP
CENTERLINE OF SPILLWAY
P.A.

Inspection 7-3
o Weep holes Hard into Riser Cap per applicant anti-vortex detail on Sheet — of Approved plan.
o ES Issue / T.O.D.
o Stone in Micropool.

70.8
69.8
1.3
68.5

RD Comments
o Forms? Riser — crest + weir notches.
o ES crest Elev
o Top Dam supposed to be EL 70.8. RD does not show of was achieved. Weep to construct to DES EC at show AB Date to confirm.
o LF ORIF SIZE & LOCATION
o CLASS OF RIPRAP.
o SEC A-A from plan on AB plan?
o "INLET DETAIL" on plan?
o MAINT PLAN?

Design
T.O.D = 70.8
ES = 68.5
RC = 67.20
DHW = 69.7
Barrel 18"ϕ @ 2.93%
100-YR 69.7

SITE 7.0 AC. MAIN PARCEL
15.74 NEW PARCEL
DA = 15.53 AC
(12.85 ONSITE + 2.69 OFFSITE
SCPV = 41422 CF (25.6 HRS) 3" ONIF
4 PT DRY POND BMP F-2

	PRE	POST	WSEL
DA	11.56 AC	15.53	
CN	73	80	
Tc	0.41 hrs.	0.29 hrs.	
1 yr	7.29 CFS	19.26 CFS	0.59 CFS EL. 65.2
2 yr	11.49 CFS	26.99 CFS	0.66 CFS EL 66.70
10	25.80	52.47 CFS	21.43 CFS EL. 67.7
100	51.10	94.34 CFS	66.10 CFS EL. 69.7

RIPRAP CHANNEL PER PLAN?
SIZE, TYPE was supposed to have 2-18" perf + 5" wide weirs
LF ORIF LABEL? 6" LFORIF.
EL?
(D-INV 58.0 2" perf TOP?)
(D-55.95)
CLASS?
DATE?

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
No. 1633-A
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

JUN 2002
RECEIVED
ENVIRONMENTAL DIVISION

SJT REVIEW SET.

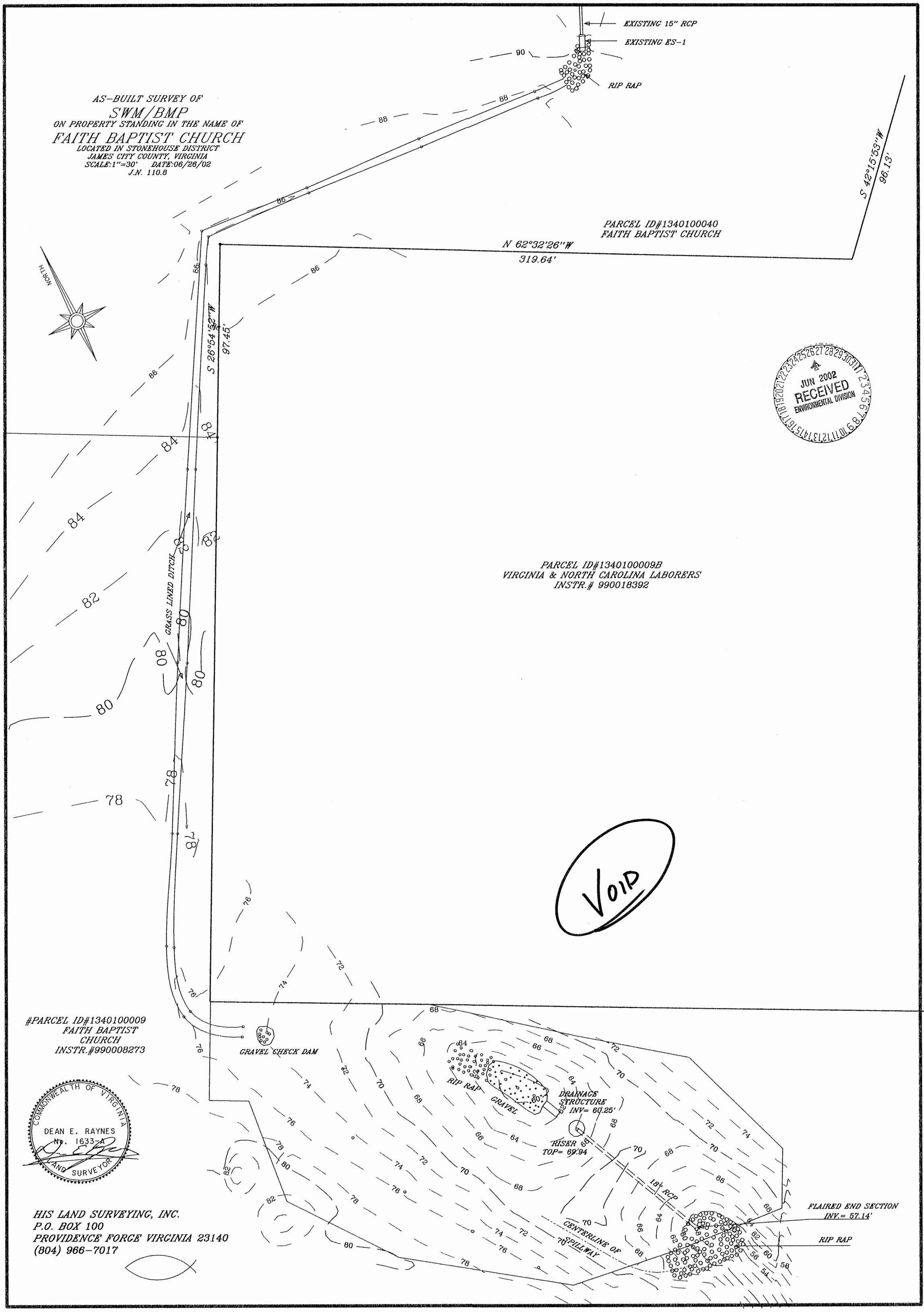
SP-24-00; WC054

69.7
68.5
1.2' IN ES.

SP-24-00
WC054

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 022

AS-BUILT SURVEY OF
SWM/BMP
ON PROPERTY STANDING IN THE NAME OF
FAITH BAPTIST CHURCH
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE:1"=30' DATE:06/26/02
J.N. 110.8



JUN 2002
RECEIVED
ENVIRONMENTAL DIVISION

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
No. 1633-A
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

SP-24-00

RECEIVED
JUL 2000
PLANNING DEPARTMENT

CH

VIRGINIA 23185

COUNTY OF JAMES CITY
FINAL SITE PLAN

APPROVALS	DATE
Fire Dept JD/JS	3.17.00
Health Dept	
VDOT PKD/JS	3.22.00
Planning m	7/28/00
Environ DEC/JS	7.21.00
Zoning Adm. m	7/28/00
JCSA BKL/JS	3.14.00
County Eng. WNB/JS	3.16.00
REA	
Other	

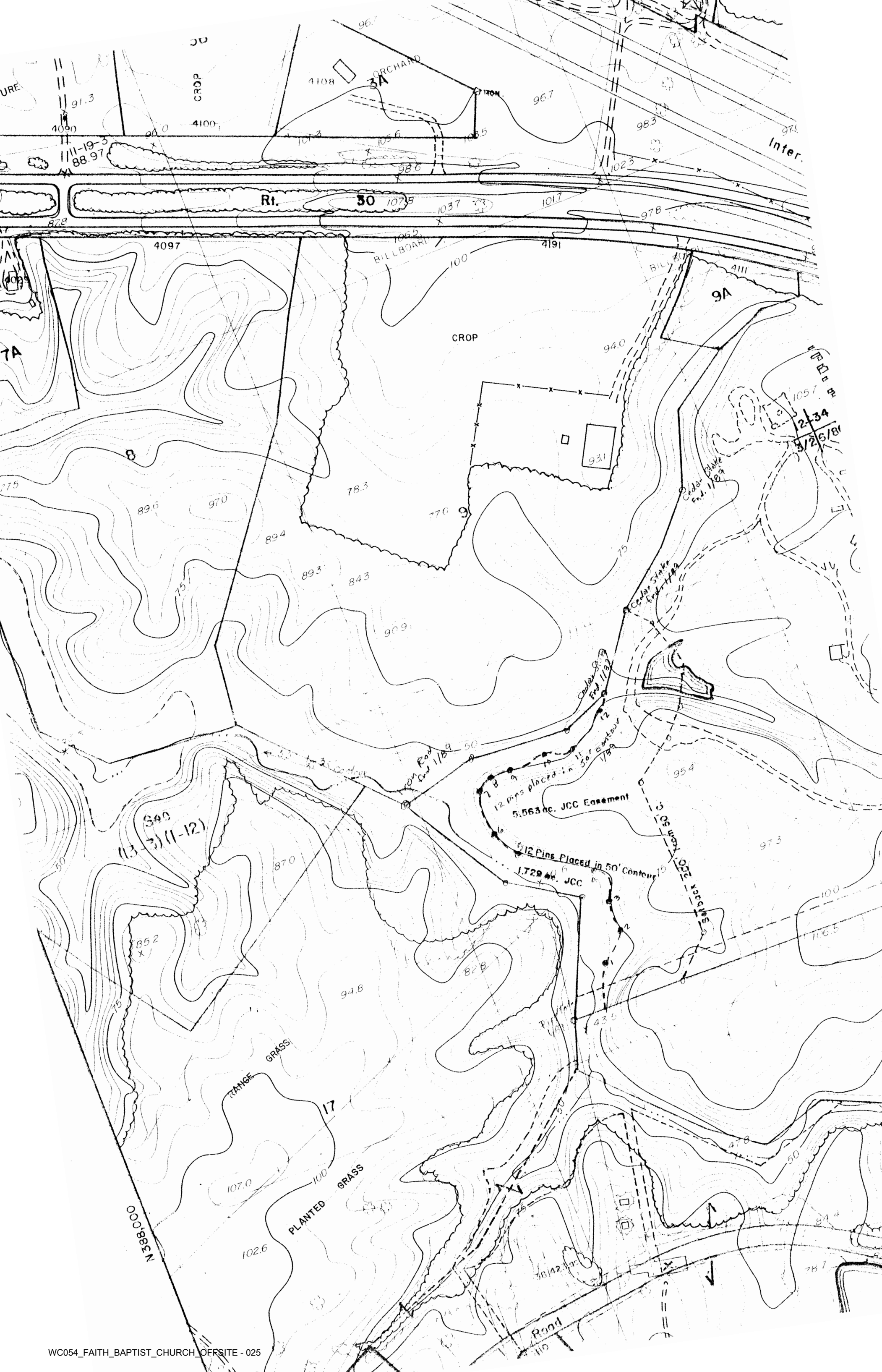
SHEET INDEX

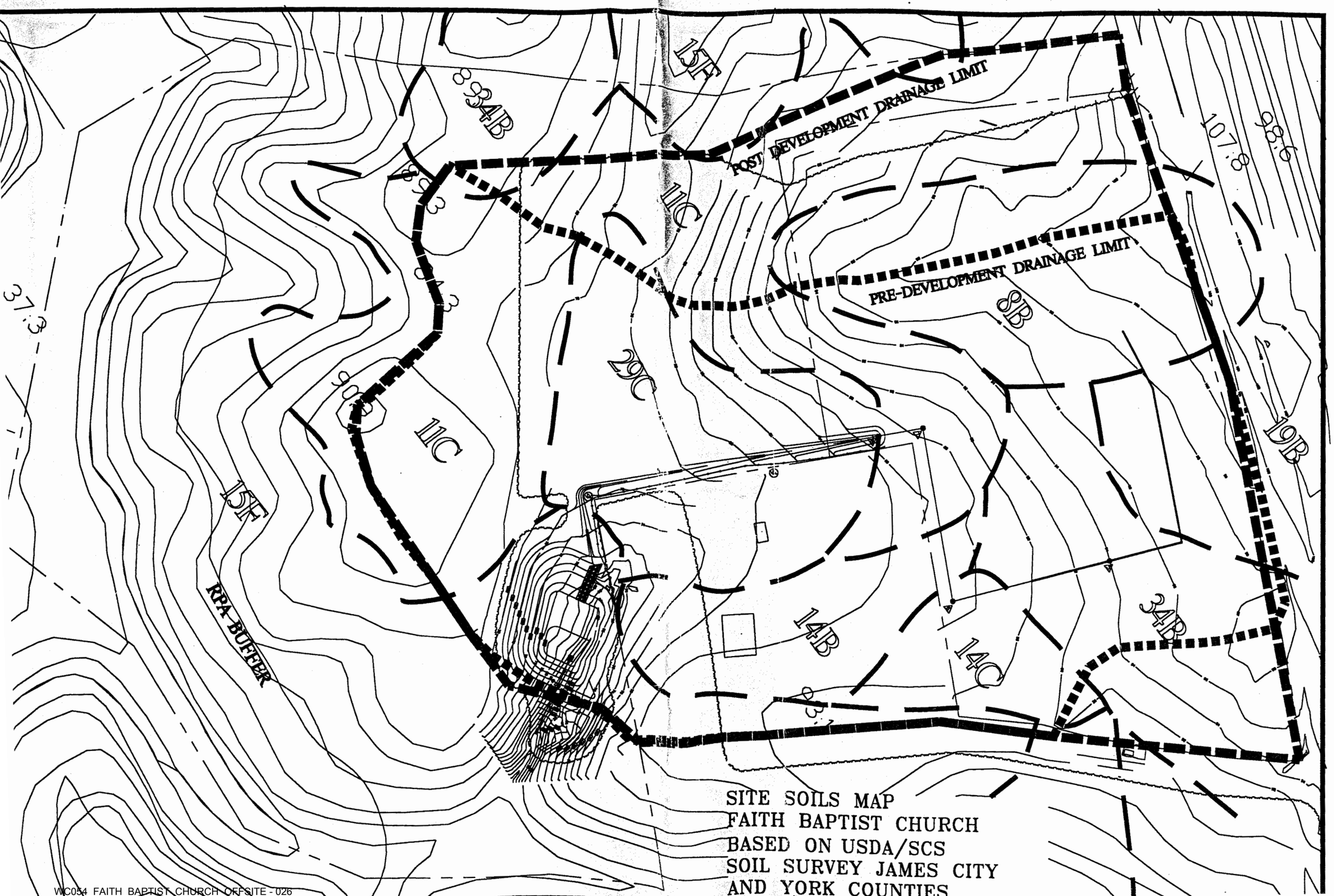
SHT. NO.	DESCRIPTION
C-1	COVER SHEET
C-2	SITE PLAN AMENDMENT
C-3	STORMWATER MANAGEMENT DETAILS

A-1 DISTRICT BULK REGULATIONS:	STORMWATER MANAGEMENT DETAILS
MINIMUM FRONT SETBACK:	75 FEET
MINIMUM SIDE YARD:	15 FEET; 5 FEET FOR ACCESSORY STRUCTURES
MINIMUM REAR YARD:	35 FEET; 5 FEET FOR ACCESSORY STRUCTURES
MAXIMUM BUILDING HEIGHT:	35 FEET; 60 FEET FOR SPIRES
MINIMUM LOT SIZE REQUIRED:	ONE (1) ACRE
MINIMUM LOT SIZE PROPOSED:	SEVEN (7) ACRES
MINIMUM LOT WIDTH REQUIRED:	250 FEET
MINIMUM LOT WIDTH PROPOSED:	800 FEET

PURPOSE:

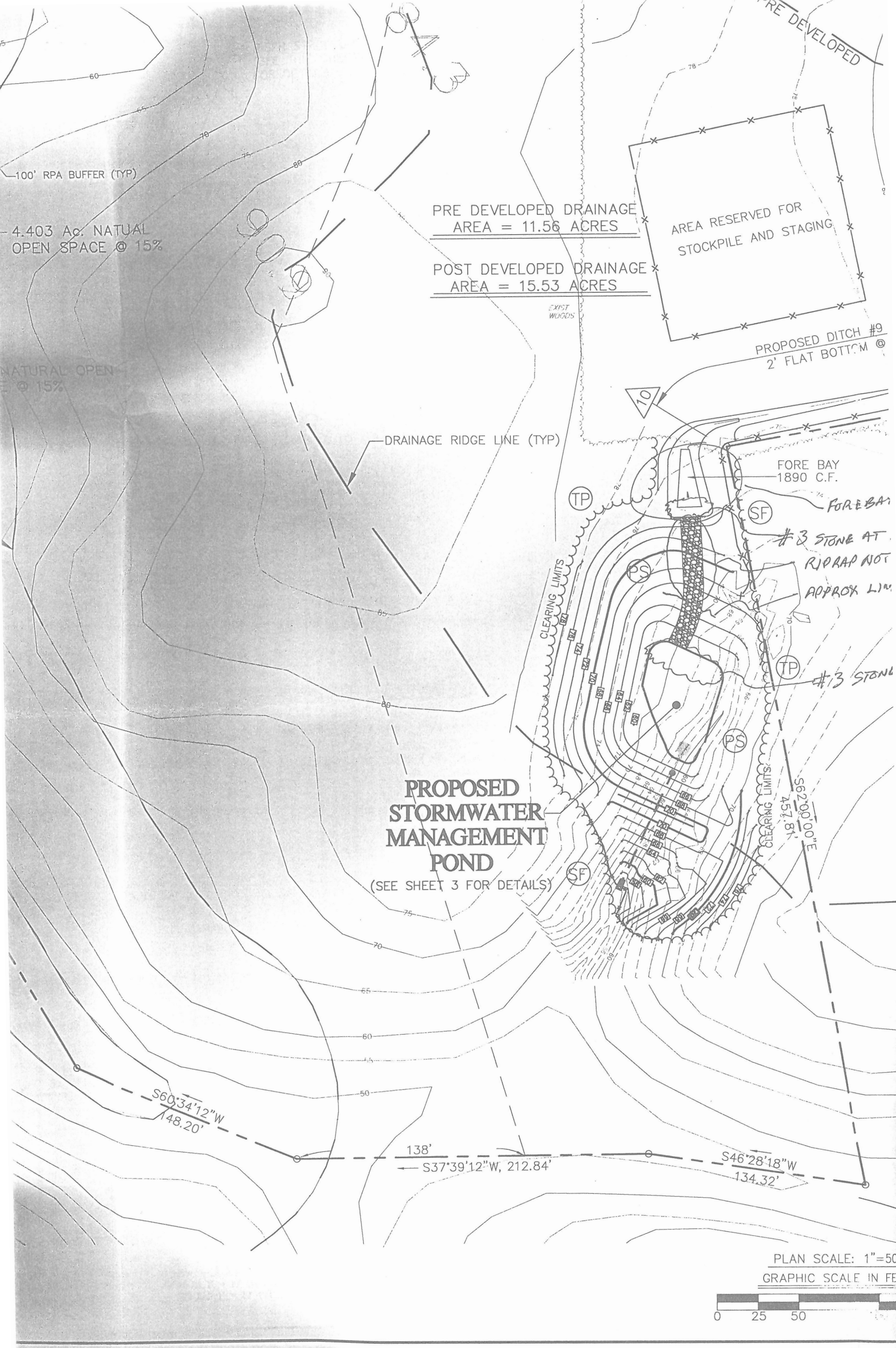
PURPOSE OF THIS AMENDMENT IS TO CONSTRUCT A STORM WATER BEST MANAGEMENT FACILITY TO ACCOMODATE THE CURRENT CONSTRUCTION AND PROVIDE VOLUME SUFFICIENT FOR FUTURE SITE DEVELOPMENT ON LAND ACQUIRED AFTER THE ORIGINAL APPROVAL.


Rt. 30
CROP
ORCHARD
3A
4108
4097
4191
BILLBOARD
9A
CROP
931
954
973
5.563 ac. JCC Easement
12 Pins Placed in 50' Contour
1.729 ac. JCC
Cedar Stake Fnd 1/19
Cedar Stake Fnd 1/18
Cedar Stake Fnd 1/19
12 pins placed in 50' contour 1/89
Iron Rod Fnd 1/18
Iron Rod Set
Inter.
GRASS
RANGE
PLANTED GRASS
17
N 38,000
Road
2-34
3/26/8



SITE SOILS MAP
FAITH BAPTIST CHURCH
BASED ON USDA/SCS
SOIL SURVEY JAMES CITY
AND YORK COUNTIES

PT
JAR
/E W
MAP
AN A
NO


PRE DEVELOPED
100' RPA BUFFER (TYP)
4.403 Ac. NATUAL
OPEN SPACE @ 15%
PRE DEVELOPED DRAINAGE
AREA = 11.56 ACRES
POST DEVELOPED DRAINAGE
AREA = 15.53 ACRES
AREA RESERVED FOR
STOCKPILE AND STAGING
EXIST WOODS
PROPOSED DITCH #9
2' FLAT BOTTOM @
10
DRAINAGE RIDGE LINE (TYP)
FORE BAY
1890 C.F.
FOREBAY
#3 STONE AT
RIPRAP NOT
APPROX LIM
#3 STONE
TP
SF
PS
CLEARING LIMITS
PROPOSED
STORMWATER
MANAGEMENT
POND
(SEE SHEET 3 FOR DETAILS)
S62°00'00"E
457.81'
S60°34'12"W
148.20'
138'
S37°39'12"W, 212.84'
S46°28'18"W
134.32'
PLAN SCALE: 1"=50
GRAPHIC SCALE IN FE
0
25
50

EL. 70.00?
FORE BAY
1890 C.F.

INLET CHANNEL
55± L.F. – CLASS A1
DRY RIP–RAP
W = 10'
d_{50} = 6"
T = 2'

10 ft.

EW–11
INV.=58.75

RISER STRUCTURE
(SEE THIS SHEET
FOR DETAIL)

10'–6" PVC
@2.50%

LIMITS OF CLEARING
(TYPICAL)

ES–1
INV. = 55.95

TEMPORARY CHECK DAM
TO BE REMOVED WHEN
OUTLET PROTECTION
INSTALLED

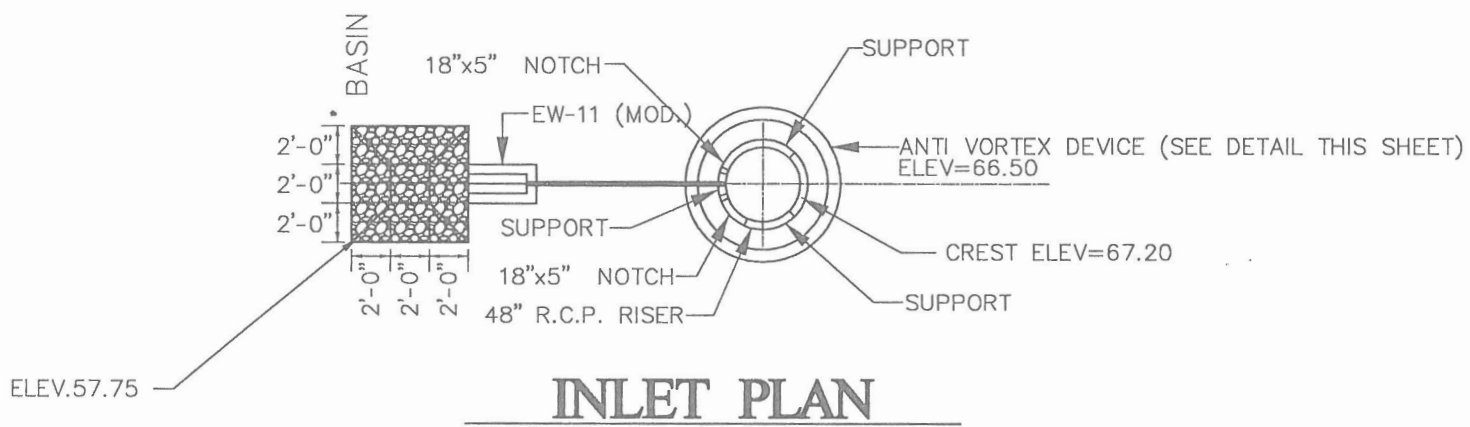
VDOT #1 STONE

ORMWATER MANAGEMENT POND

PLAN SCALE: 1"=25'

GRAPHIC SCALE IN FEET

0 10 25 50 75



INLET PLAN

N.T.S.

NOTE: THE VIRGINIA DEP
NOT ASSUME RES
THE STORMWATER
STRUCTURES, AN
ANY DAMAGE.

THE CONSTRUCTIO
BY A PROFESSION
THE STUCTURE D

NOTE: ONE ANTI–VORTEX DEVICE SUPPOR
FACE THE RETENTION BASIN WITH
2–18"x5" WEIR NOTCHES TO BE P
3" TO EACH SIDE OF SUPPORT.

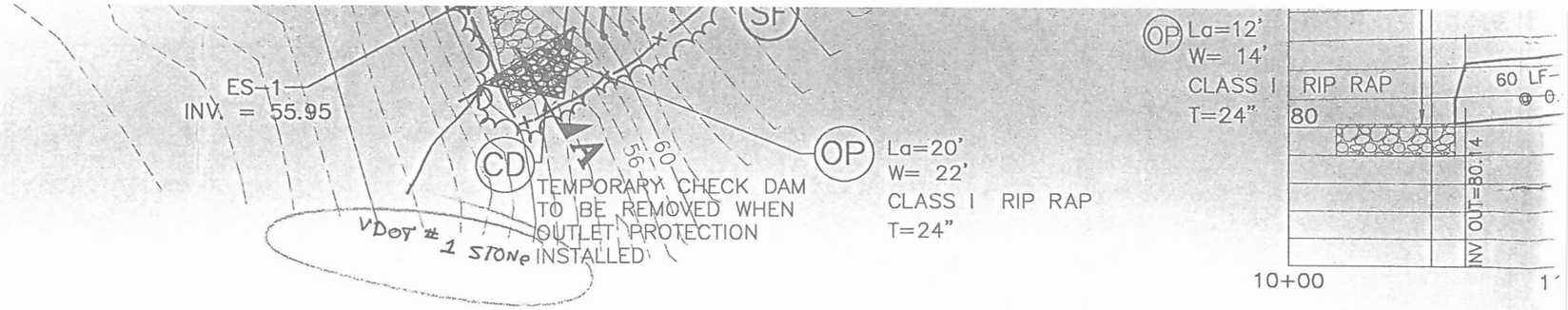
7.68" RAINFALL (100 YEAR EVENT) PEAK ELEV. = 69.7
6.24" RAINFALL (25 YEAR EVENT) PEAK ELEV. = 68.8
5.04" RAINFALL (10 YEAR EVENT) PEAK ELEV. = 67.7
3.36" RAINFALL (2 YEAR EVENT) PEAK ELEV. = 66.7
WQVSE ELEV. = 66.75

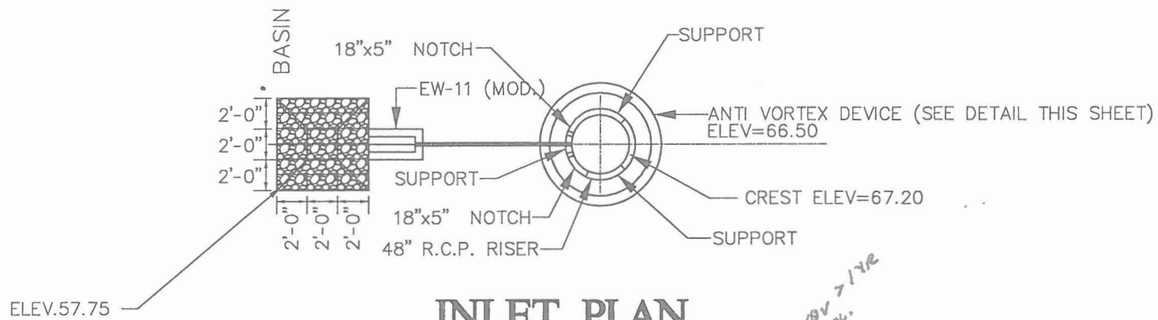
STORMWATER MANAGEMENT POND

PLAN SCALE: 1"=25'

GRAPHIC SCALE IN FEET

0 10 25 50 75





INLET PLAN

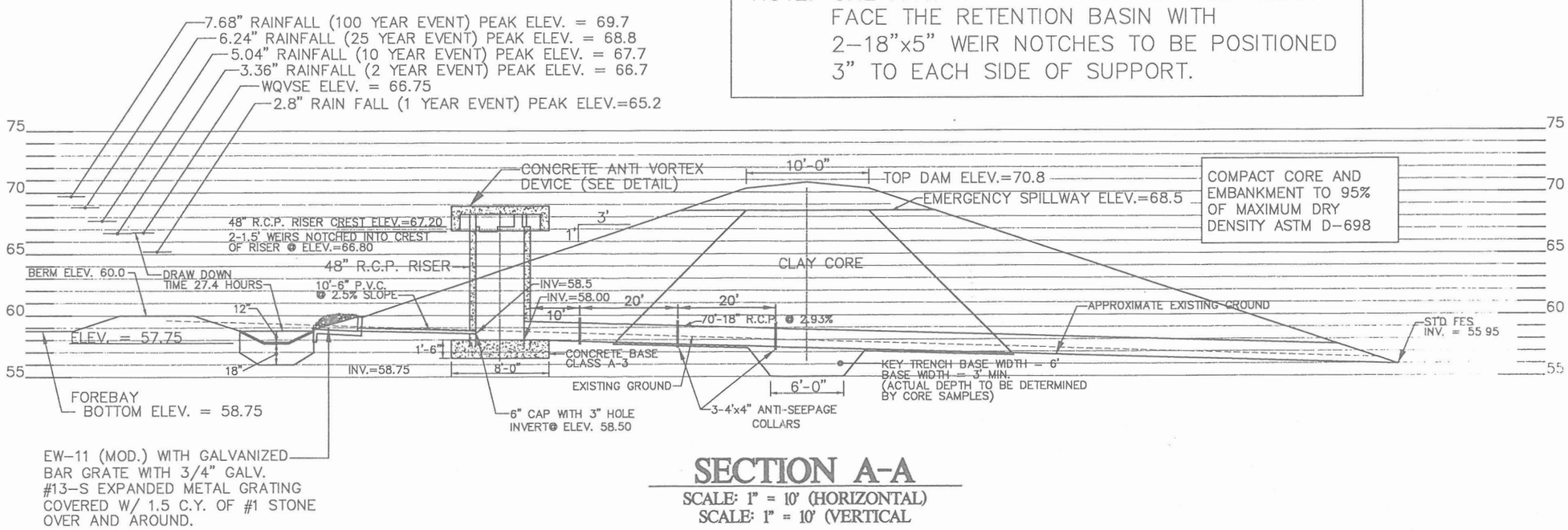
N.T.S.

How is WQV > 1 YR STORM USED.

NOTE: THE VIRGINIA DEPARTMENT OF TRANSPORTATION DOES NOT ASSUME RESPONSIBILITY FOR MAINTENANCE OF THE STORMWATER MANAGEMENT POND OR IT'S STRUCTURES, AND SHALL BE SAVED HARMLESS FROM ANY DAMAGE.

THE CONSTRUCTION OF THE DAM SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER WHO HAS INSPECTED THE STUCTURE DURING CONSTRUCTION.

NOTE: ONE ANTI-VORTEX DEVICE SUPPORT MUST FACE THE RETENTION BASIN WITH 2-18"x5" WEIR NOTCHES TO BE POSITIONED 3" TO EACH SIDE OF SUPPORT.



SECTION A-A

SCALE: 1" = 10' (HORIZONTAL)
SCALE: 1" = 10' (VERTICAL

SEQUENCE OF CONSTRUCTION

1. CONTRACTOR/OWNER MUST ORGANIZE A PRE-CONSTRUCTION MEETING ON SITE WITH THE OWNER, THE ENGINEER AND JAMES CITY COUNTY INSPECTORS, PRIOR TO STARTING ANY CONSTRUCTION, CLEARING, GRUBBING, AND/OR EARTHWORK. THE LAND DISTURBANCE PERMIT SHOULD BE AVAILABLE AT THIS TIME.

2. OWNER MUST OBTAIN THE SERVICES OF A CERTIFIED LAND SURVEYOR, LICENSED IN THE STATE OF VIRGINIA, TO ESTABLISH ALL CLEARING LIMITS AND FLAG SAME.

3. INSTALL CONSTRUCTION ENTRANCE AND SILT FENCING AS INDICATED ON THE SITE PLANS.

4. CLEAR AND GRUB AREAS WITHIN THE FLAGGED LIMITS OF CLEARING.

5. ALL DENUDED AREAS THAT WILL REMAIN DENUDED LONGER THAN 7 DAYS SHALL RECEIVE TEMPORARY SEEDING.

6. INSTALL OUTLET PROTECTION AT OUTFALL FROM STORMWATER MANAGEMENT POND AND INSTALL CHECK DAM.

7.EXCAVATE AREA OF STORMWATER MANAGEMENT POND, OUTFALL CHANNEL FROM STORMWATER MANAGEMENT POND, AND OUTFALL CHANGE FROM STRUCTURE #8. CONSTRUCT DAM AT STORMWATER MANAGEMENT POND.

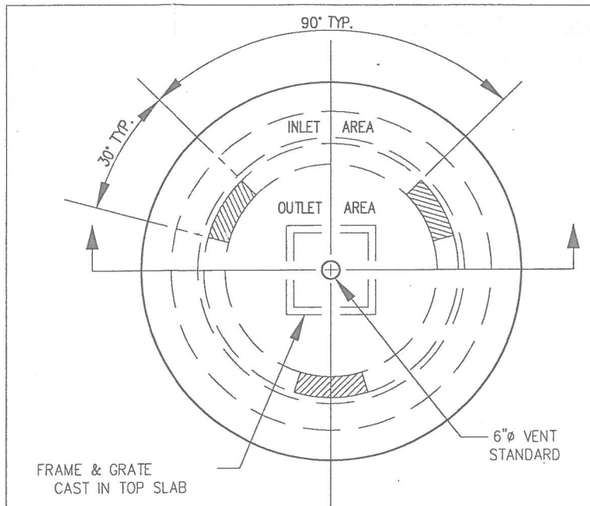
8. INSTALL VDOT STANDARD EC-2 LINING IN OUTFALL CHANNEL, FERTILIZE AND SEED.

9. INSTALL CHECK DAMS IN OUTFALL CHANNELS.

10. INSTALL STORM DRAINAGE PIPING AND STRUCTURES FROM STRUCTURE #8 TO STRUCTURE #5.

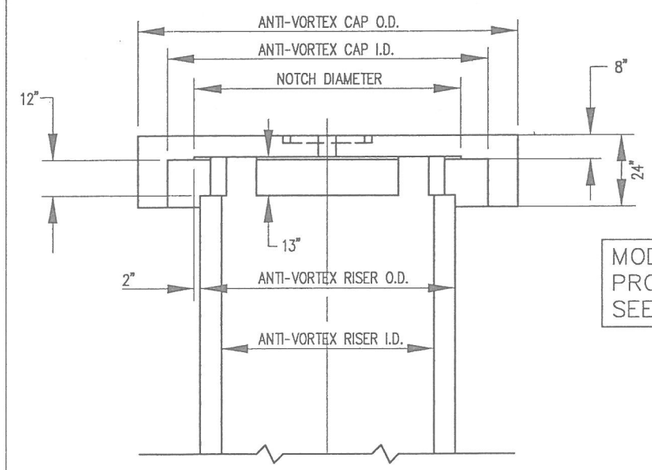
11. ALL DISTURBED AREAS MUST RECEIVE PERMANENT SEEDING AS SOON AS FINISHED GRADES ARE ACHIEVED.

12. AFTER AN ACCEPTANCE AND STABLE GROUND COVER HAS BEEN ESTABLISHED, REMOVE SILT FENCE AND OTHER TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES.



PLAN

NOTE:
1. ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
2. DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478.
3. INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER O.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.).
4. SLAB REIFORCEMENT TO BE ASTM A615 #4 BARS @ 8" E.W. CIRCUMFERENCIAL REINFORCEMENT TO BE Asc = 1 @ 0.150 2 x 6 W2.5 x W2.5 WWF MINIMUM. MATERIAL PROPERTIES: fy = 60 kei. fc = 4 ksi. CONCRETE COVER OVER REINFORCEMENT (CCOR) = 1", UNLESS NOTED.
5. DI-1 FRAME & GRATE IS UNAVAILABLE FOR 48" I.D. RISERS AND LARGER.



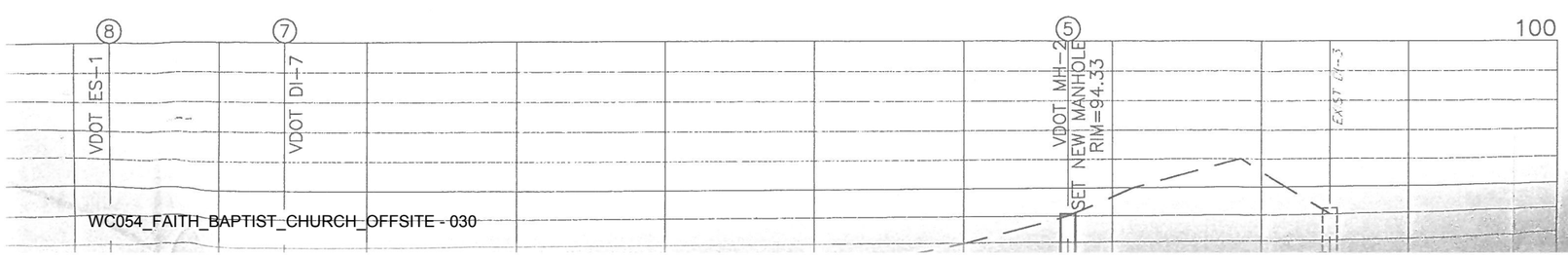
SECTION

RISER		ANTI-VORTEX CAP		NOTCH DIAMETER	APPROX. CAP WEIGHT
I.D.	O.D.	I.D.	O.D.		
48"	58"	84"	100"	62"	4.27 T

MODIFY STANDARD RISER CASTING
PROVIDE 18" WIDE WEIR NOTCHES
SEE NOTE & DETAIL THIS SHEET

PRECAST ANTI-VORTEX DEVICE DETAIL (CAP AND RISER)

ORIGINAL DATE	02-01-95	RCH
LAST REVISION		
SCALE	1" = 3'	



WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 030

TABLE 3.32-D

PARKING	
PHASE I	135 SP.
EXPANSION	65 SP.
TOTAL	200 SP.

ROCHAMBEAU DRIVE

STATE RTE. 168

I-64

MEDIAN BREAK

75' BLDG SETBACK FRONT R/W

30' BUFFER

PARKING - 135 SP.

DROP OFF

15' BLDG SETBACK (SIDE)

CHURCH

EXP.

RIGHT OUT ONLY

CLASSROOMS

BUSES

DUMPSTERS

LOADING

BUS LOADING

COURT YARD

ACTIVITY CENTER

PLAY YARD

PARKING EXPANSION - 65 SP.

EXISTING SIGN EASEMENT

CLASSROOMS

BREEZEWAY

EXP.

SOFTBALL

38' BLDG SETBACK (REAR)

DETENTION POND

15' BLDG SETBACK (SIDE)

SOCCER

PAVILION

EXISTING ASPHALT

DETENTION POND

EXISTING STEEL BUILDING

100' RPA BUFFER

Scale 1" = 50'

0 50' 100' 150' 200'

REFERENCE

FAITH BAPTIST CHURCH

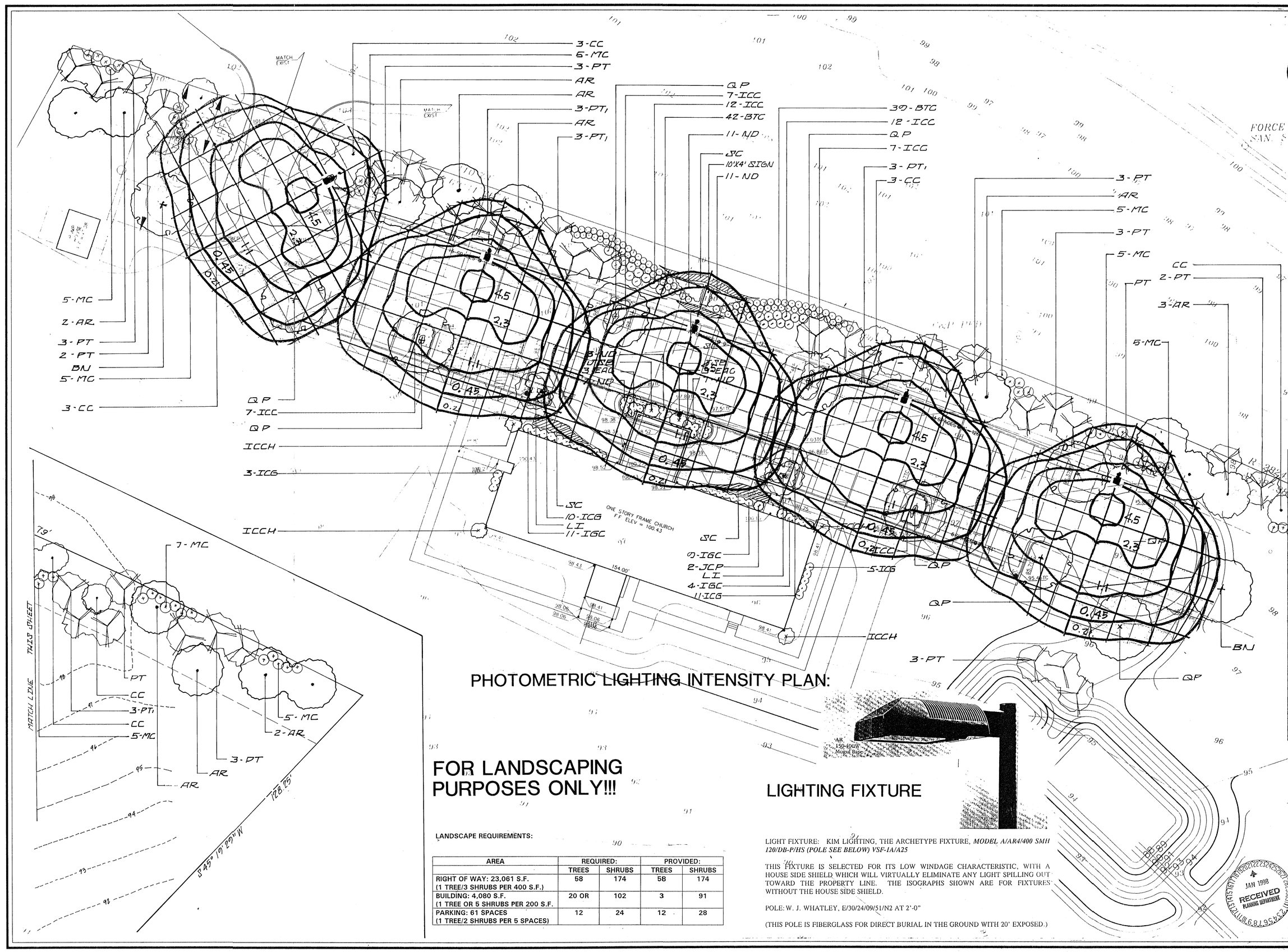
JAMES CITY COUNTY, VA.

CONCEPT C

prepared by
Langley & McDonald, P.C.

97053-1 JUNE 27, 1997 DWB*

WC054_FAITH_BAPTIST_CHURCH_OFFSITE - 031



PHOTOMETRIC LIGHTING INTENSITY PLAN:

FOR LANDSCAPING PURPOSES ONLY!!!

LANDSCAPE REQUIREMENTS:

AREA	REQUIRED:		PROVIDED:	
	TREES	SHRUBS	TREES	SHRUBS
RIGHT OF WAY: 23,061 S.F. (1 TREE/3 SHRUBS PER 400 S.F.)	58	174	58	174
BUILDING: 4,080 S.F. (1 TREE OR 5 SHRUBS PER 200 S.F.	20 OR	102	3	91
PARKING: 61 SPACES (1 TREE/2 SHRUBS PER 5 SPACES)	12	24	12	28

LIGHTING FIXTURE

LIGHT FIXTURE: KIM LIGHTING, THE ARCHETYPE FIXTURE, *MODEL A/AR4/400 SMH 120/DB-P/HS (POLE SEE BELOW) VSF-IA/A25*

THIS FIXTURE IS SELECTED FOR ITS LOW WINDAGE CHARACTERISTIC, WITH A HOUSE SIDE SHIELD WHICH WILL VIRTUALLY ELIMINATE ANY LIGHT SPILLING OUT TOWARD THE PROPERTY LINE. THE ISOGRAPHS SHOWN ARE FOR FIXTURES WITHOUT THE HOUSE SIDE SHIELD.

POLE: W. J. WHATLEY, E/30/24/09/51/N2 AT 2'-0"

(THIS POLE IS FIBERGLASS FOR DIRECT BURIAL IN THE GROUND WITH 20' EXPOSED.)

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
PROFESSIONAL ENGINEER

Langley and McDonald, P.C.
Engineers • Surveyors • Planners
Landscape Architects • Environmental Consultants
WILLIAMSBURG VIRGINIA BEACH

DES.	WEG
DWN.	WEG
CHK.	RSP
DATE	

FAITH BAPTIST CHURCH
LIGHTING PLAN & DETAILS
JAMES CITY COUNTY, VIRGINIA

PROJ. NO.	97053
SCALE:	1" = 20'
SHEET	1 OF 1
DWG.	6727W

JAN 1998
RECEIVED
PLANNING DEPARTMENT

FAITH BAPTIST CHURCH

RECORD DRAWINGS
CERTIFICATIONS
WITH
REVISED STORMWATER MANAGEMENT
DETENTION BASIN HYDROLOGIC &
HYDRAULIC ANALYSIS

SEPTEMBER 20, 2002

SEP 2002
RECEIVED
ENVIRONMENTAL DIVISION

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
NO. 019961
9-20-02
PROFESSIONAL ENGINEER

WC 054
SP-24-00

• OK IF;
• ES WORK IS PERFORMED PER MEMO.
• ANNUAL INSPECTIONS FOR NEED FOR TOE DRAIN PER MEMO.
• SF REMOVED (#6).

PREPARED BY:
Mitchell-Wilson Associates, P.C.
Civil Engineers & Land Surveyors
West Point, Virginia
(804) 843-9744

James McReynolds
757-566-2295
869-6841

MITCHELL-WILSON ASSOCIATES, P.C.

Memo

To: Scott J. Thomas, P.E.

From: Jonathan Blair Wilson, P.E.

CC: James F. McReynolds

Date: 09/20/2002

Re: Faith Baptist Church

ATTACHMENT No. 1

Relative to construction certification requirements for the extended dry detention basin constructed for the Faith Baptist Church project and the County's initial review (letter dated 7-5-02) of the as-built plan prepared by HIS Land Surveying, Inc. for the stormwater facility:

The construction of the stormwater management facility was performed without the benefit of monitoring and observations by a Virginia Professional Engineer. The certification provided is based on my visual observations of the facility, supplemented with a field survey of the facility and a hydrologic and hydraulic analysis of the facility based on the current level of development of the drainage basin.

The project plans and design of the stormwater management detention basin developed by LandMark Design Group was based on a future hydrologic condition that reflected a future ultimate development condition. This future ultimate condition was based on the assumption that the post-development imperviousness would include an additional 3.95 acres of building and pavement, and that the drainage area to the facility would increase from11.56 acres of contributing area to 15.53 acres of contributing area. Based on the ultimate buildout hydrologic condition, the constructed detention facility does not have sufficient storage capacity to detain and attenuate peak design storm discharges to pre-development rates.

We have advised our client that the ultimate buildout condition will require modification of the as-built facility.

Since the ultimate buildout condition is a distant future condition, we have re-evaluated the existing stormwater facility based on current hydrologic conditions and hydraulically modeled the as-built facility. The facility is capable of detaining and attenuating all storm events up to the 100-year design storm event such that post-development peak rates of discharge from the facility do not exceed pre-development peak rates of discharge. The post-development hydrologic condition includes the current level of site impervious and a near future Activities/Recreation free standing 60' x 120' building. Hydrologic and hydraulic computations and models are included herewith for your consideration.

It should be noted that the LandMark pre-development hydrologic analysis was based on a SCS weighted runoff curve number of 73, whereas our re-evaluation of the watershed hydrology was based on a pre-development condition weighted runoff curve number of 66. Our re-evaluation results in a

conservative analysis of the capabilities of the detention facility to reduce peak discharge rates to pre-development peak discharge rates at the point of outfall into the downstream receiving channel.

Based on the two (2) hand auger borings and soils classification provided by Geotechnical Environmental Testing Solutions, Inc. it appears that the earth embankment was constructed with a clay core. The compaction of the embankment cannot be certified; however, considering the description of the embankment soils provided by the geotechnical field evaluation of "stiff and medium stiff", some level of controlled compaction was achieved. No evidence of subsidence, settlement or other detrimental deflection was observed during my site review. Seepage through the embankment should be minimal given the duration of saturation on the upstream face of the dam during detention periods, and the geotechnical engineer's estimated saturated hydraulic conductivity for the soils encountered.

No certification can be provided for the seepage control along the principal spillway barrel. The project design plans specified concrete anti-seep collars. Although anti-seep collars can be effective in increasing the flow path of seepage along the principal spillway barrel, other methods of seepage control can be employed to prevent failure of the embankment due to piping along the principal spillway barrel. I recommend that the condition of the downstream embankment toe, especially near the principal spillway outlet, be monitored for evidence of seepage and saturation during the annual dam inspections. If evidence of seepage and saturation appears, a toe drain or blanket can be installed to control the seepage and prevent failure of the dam.

A small berm was constructed along the eastern side of the emergency spillway exit channel. During 25-year and greater intensity storm events the emergency spillway will function. Flow through the emergency spillway exit channel could overtop the small berm. It is recommended that the berm height be increased to provide a minimum depth of 1.4-feet (0.4-feet flow depth plus 1.0-feet freeboard to overtopping). The top width of the berm should be increased to a minimum width of four (4) feet. Alternatively, the exit channel could be excavated to provide the 1.4-feet of minimum depth, thus eliminating the need for the berm altogether.

0.6' 1.6' MIN.

No formal forebay area was constructed immediately upstream from the detention facility. The LandMark plans specified the forebay bottom to be constructed at Elevation 58.75 (same as the basin bottom, see Section A-A detail on C-3). The plan view of the forebay area indicates a volume of 1890 cubic feet with a top elevation of 76.00. It is unclear based on the Section A-A detail whether LandMark intended the forebay to be constructed as part of the detention basin (in the bottom of the basin), or intended the forebay to be constructed immediately upstream from the basin as shown in the plan view. Regardless of the designer's intent for the forebay, the 600-foot long grass lined swale will be an effective sediment removal mechanism. Based on the County design criteria for forebays, the project would require 414 cubic foot of forebay storage. A series of shallow check dams could be placed along the grass swale to provide the forebay storage if considered essential by County staff to the operation of the dry detention facility.

NOT ESSENTIAL

Based on my observation of the facilities as constructed, the stability of the open lawn areas, grass lined channels and detention basin side slopes, modification or grading changes to provide a formal forebay would not provide substantial increases in water quality, over the existing sediment removal capability of the 600-foot long grass lined inlet swale.

The VDOT No. 3 Stone aggregate that lines the bottom of the detention basin is not detrimental to the function of the detention basin. The stone provides a stable lining for the basin bottom. Removal of the stone is not necessary, nor does it detract from the operation of the basin.

The facility as constructed appears to be stable and functional for the level of current development on the Faith Baptist Church property.

Supplemental Information and Documentation:

Mitchell-Wilson Associates, P.C. Drainage Analysis

Geotechnical Environmental Testing Solutions, Inc. "Faith Baptist Church –Existing BMP Dam Evaluation"

LandMark Design Group drainage analysis provided to Mitchell-Wilson Associates, P.C. by Owner

Correspondence from County regarding Record Drawings and Certifications

FAITH BAPTIST CHURCH

PRODEVELOPMENT CONDITIONS

DA = 11.56 Ac = 0.0180625 Sq. mi

RCN = 66

SOIL GROUP	LAND USE	AREA	RCN	PRODUCT
A	OPEN SPACE	2.32	39	90.48
C	OPEN SPACE	5.31	74	392.94
C	WOODS	3.66	70	256.20
C	IMPERVIOUS	0.27	98	26.46
		11.56		766.08

RCN = 766.08/11.56 = 66.27 USE: 66 ✓

Tc = 0.31 hrs

OVERLAND FLOW: L = 100' S = 2% n = 0.24 T_o = 0.23

SHALLOW CONCENTRATED: L = 800' H = 39.5' T = 4.5 min T_{sc} = 0.08

Tc = 0.31 hr ✓

YEAR	1	2	10	25	100
Rf. (IN)	2.80	3.36	5.04	6.24	7.68
Qpeak (cfs)	4.30	7.81	21.04	31.99	46.06

2- AND 10- ALLOWABLES

REVISED LANDMARK FIGURES

CN 73 ⇒ 66

TC 0.41 hrs ⇒ 0.31 hrs.

FAITH BAPTIST CHURCH

POST DEVELOPMENT CONDITIONS

DA = 11.56 AC = 0.0180625 sq. mi

RCN = 72

SOIL GROUP	LANDUSE	AREA	RCN	PRODUCT
A	IMPERVIOUS *	1.14	98	111.72
A	OPEN SPACE	1.18	39	46.02
C	OPEN SPACE	5.31	74	392.94
C	WOODS	3.66	70	256.20
C	IMPERVIOUS	0.27	98	26.46
		11.56		833.34

RCN = 833.34/11.56 = 72.09 USE: 72

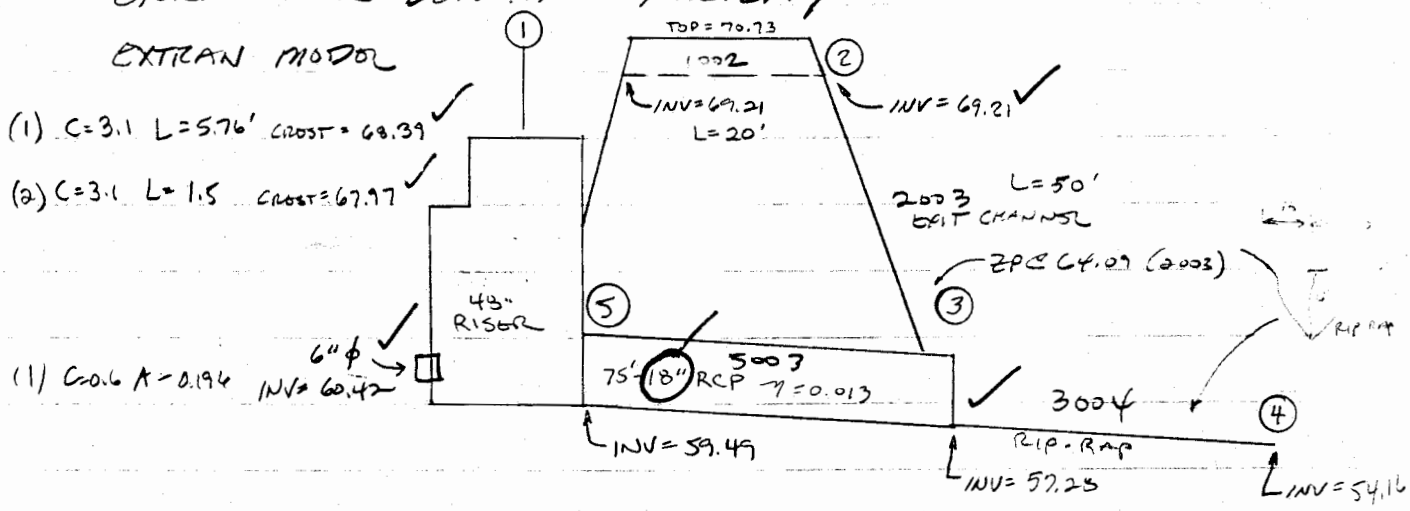
T_c = 0.31 hrs → Hydrologically most remote route is not altered

YEAR	1	2	10	25	100
R_f (in)	2.80	3.36	5.04	6.24	7.68
Q peak (cfs)	7.76	12.12	27.30	39.24	54.18
	PREDEV	(7.81)	(21.04)		(46.06)

* INCLUDES "FUTURE" 60×120 ACTIVITY BUILDING

STORMWATER DETENTION FACILITY

EXTRAN MODEL



1002 EMERG. SPILLWAY CREST, Level @ 69.21

2003 " " EXIT CHANNEL;

5003 18" PRINCIPAL SPILLWAY, 75'-RCP n=0.013

3004 RIP RAP CHANNEL OUTLET,

ROUTED STORM DISCHARGES & HW ELEVATIONS:

YEAR	1	2 (PRE 7.81)	10 (PRE 21.04)	25	100 (PRE 46.06)
Q ROUTED (cfs)	1.98	2.31	19.48	27.72	43.86
HW ELEV. (ft)	65.30	66.91	68.89	69.69	69.87 D.H.W.
T DURATION	11:36 to 25:29 13 hr 53 min w/ 6" ORIFICE				

69.87
1
70.87

TOP OF DAM @ ℄ LOW PT
= 70.73

∴ Freeboard = 0.86'

FLOW E.S. 69.87 − 69.21 = 0.66' (7.92")
SAY 8"

WATER QUALITY VOLUME

1-YEAR DESIGN STORM

DA = 11.56 AC

Rf = 2.8 inches

RCN = 72

R_o = 0.69 inches

WQV = DA · R_o = 28954 CF.

	ELEV.	AREA	AVG AREA	Δ ELEV.	Δ STOR	Σ STOR
	60.42	342	454	0.58	263	0
	61.0	566	776	1	776	263
	62.0	985	1236	1	1236	1039
	63.0	1487	1785	1	1785	2275
	64.0	2083	2462	1	2462	4060
	65.0	2842	3322	1	3322	6522
	66.0	3802	4407	1	4407	9844
	67.0	5012	5718	1	5718	14251
RISER WEIR 67.97	68.0	6425	7195	1	7195	19969
	69.0	7965	8879	1	8879	27164
	70.0	9793	10636	0.73	7764	36043
	70.73	11480				43807

EXISTING RISER CREST = 67.97 VOL. STOR = 19370 CF.

USING THE KORPLUNK METHOD:

WHERE WQV = 28954 CF (1-YR STORM RUNOFF VOLUME)

AND ASSUMES THAT THE RISER IS ADJUSTED TO PROVIDE THE REQ'D STORAGE VOLUME OF 28954 CF @ CREST = 69.20

1/2 ϕ 3" ORIFICE

THEN $H = (69.20 - [60.42 + 0.12]) = 8.66'$

$h = H/2 = 4.33$ (AVERAGE HEAD)

$Q = Ca\sqrt{2gh}$; USING 3" ϕ ORIFICE AND AVERAGE HEAD CONDITION;

$$Q = (0.60)\left(\pi \frac{0.25^2}{4}\right)\sqrt{2(32.2)(4.33)} = 0.49 \text{ cfs}$$

$$T_{DRAWDOWN} = V/Q = 28954 \text{ CF} / 0.49 \text{ cfs}$$

$= 59090$ sec

$= 16$ hrs based on plug flow

which means that a 24-hour detention time can not be attained with a minimum diameter orifice of 3-inches.

1

```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR-20                    FULLPRINT
TITLE 001
TITLE     FAITH BAPTIST CHURCH PRE-DEV CONDITION
 3 STRUCT      01
 9 ENDTBL
 6 RUNOFF 1    01     1  0.018062500        66.0        0.311 1   1   1
   ENDATA
 7 INCREM 6              0.1
 7 COMPUT 7    01    01          0.0         2.8         1.02 2  01   1
   ENDCMP 1
 7 COMPUT 7    01    01          0.0        3.36         1.02 2  02   1
   ENDCMP
 7 COMPUT 7    01    01          0.0        5.04         1.02 2  03   1
   ENDCMP
 7 COMPUT 7    01    01          0.0        6.24         1.02 2  04   1
   ENDCMP
 7 COMPUT 7    01    01          0.0        7.68         1.02 2  05   1
   ENDCMP
   ENDJOB 2
0******************************END OF 80-80 LIST*******************************
1
```

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1	STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	2.80	24.00	.45	---	12.13	4.30	237.9
ALTERNATE 2	STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	3.36	24.00	.73	---	12.12	7.81	432.2
ALTERNATE 3	STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	5.04	24.00	1.75	---	12.10	21.04	1165.0
ALTERNATE 4	STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	6.24	24.00	2.62	---	12.10	31.99	1771.1
ALTERNATE 5	STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	7.68	24.00	3.75	---	12.09	46.06	2550.2

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
0 STRUCTURE 1	.02	
+ ALTERNATE 1		4.30
ALTERNATE 2		7.81
ALTERNATE 3		21.04
ALTERNATE 4		31.99
ALTERNATE 5		46.06

1END OF 1 JOBS IN THIS RUN

1

```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB TR-20                    FULLPRINT
TITLE 001
TITLE     FAITH BAPTIST CHURCH POST-DEV CONDITION
 3 STRUCT      01
 9 ENDTBL
 6 RUNOFF 1    01      1  0.018062500        72.0        0.311 1   1   1
   ENDATA
 7 INCREM 6               0.1
 7 COMPUT 7    01     01          0.0         2.8         1.02 2  01   1
   ENDCMP 1
 7 COMPUT 7    01     01          0.0        3.36         1.02 2  02   1
   ENDCMP
 7 COMPUT 7    01     01          0.0        5.04         1.02 2  03   1
   ENDCMP
 7 COMPUT 7    01     01          0.0        6.24         1.02 2  04   1
   ENDCMP
 7 COMPUT 7    01     01          0.0        7.68         1.02 2  05   1
   ENDCMP
   ENDJOB 2
0******************************END OF 80-80 LIST*******************************
```

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	2.80	24.00	.69	---	12.11	7.76	429.5
ALTERNATE 2 STORM 1													
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	3.36	24.00	1.03	---	12.11	12.12	671.0
ALTERNATE 3 STORM 1													
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	5.04	24.00	2.23	---	12.10	27.30	1511.6
ALTERNATE 4 STORM 1													
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	6.24	24.00	3.19	---	12.09	39.24	2172.7
ALTERNATE 5 STORM 1													
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	7.68	24.00	4.41	---	12.09	54.18	2999.3

1

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
0 STRUCTURE 1	.02	
+ ALTERNATE 1		7.76
ALTERNATE 2		12.12
ALTERNATE 3		27.30
ALTERNATE 4		39.24
ALTERNATE 5		54.18

1END OF 1 JOBS IN THIS RUN

```
SW     1  10 0
MM     1  2  3  0
@      10 '1718D1.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 09-20-02'
A1  '24-HOUR TYPE II RAINFALL, 1 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.00  360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1    100.0 60.42 0.0   0.00
D1     2    100.0 69.21 0.0   0.00
D1     3    100.0 57.28 0.0   0.00
D1     4    100.0 54.16 0.0   0.00
D1     5    100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1    80.00 -0.10  13
E2     0.0078 0.00 0.0130 0.58 0.0226 1.58 0.0341 2.58 0.0478 3.58
       0.0652 4.58 0.0873 5.58 0.1150 6.58 0.1475 7.58 0.1828 8.58
       0.2248 9.58 0.2635 10.31 3.20 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF CORIF ZP
F1     1      5      1    0.196  0.60 0.00
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1     4  1
J1     1
$ENDPROGRAM
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	4.88	12	36	0.00	34.70	0.0	0.0	2.260E-07
2	100.00	79.91	0.00	0	0	0.00	30.79	0.0	0.0	1.358E-07
3	100.00	79.98	0.61	12	36	0.00	42.11	0.0	0.0	1.111E-07
4	100.00	76.86	0.13	12	36	0.00	45.71	0.0	0.0	7.155E-09
5	100.00	60.99	0.40	12	36	0.00	40.11	0.0	0.0	1.824E-08

1----------

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	0.00	0.00	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-3.91	0.0	0.00000
2003	17930.55	42.86	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-6.20	0.0	0.10240
5003	12.40	7.02	18.00	1.98	12	36	3.75	12	36	0.16	0.40	0.61	1393.4	0.02947
3004	75379.04	56.26	272.40	1.98	12	36	4.58	12	36	0.00	0.61	0.13	0.0	0.11540
90005	0.09	0.48	5.99	1.98	12	36	10.09	12	36	20.95	4.88	-0.52	0.0	0.00005
90006	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90007	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90008	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90009	********	********	5.99	1.98	12	36	********	0	0	********	********	********	**********	**********

1----------

===> SWMM 4.0 SIMULATION ENDED NORMALLY.

===> YOUR INPUT FILE WAS NAMED : 1718D1.DAT
===> YOUR OUTPUT FILE WAS NAMED: 1718D1.OUT

```
SW     1  10 0
MM     1  2  3  0
@      10 '1718D2.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 09-20-02'
A1  '24-HOUR TYPE II RAINFALL, 2 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.002 360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1    100.0 60.42 0.0   0.00
D1     2    100.0 69.21 0.0   0.00
D1     3    100.0 57.28 0.0   0.00
D1     4    100.0 54.16 0.0   0.00
D1     5    100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1    80.00 -0.10  13
E2     0.0078 0.00 0.0130 0.58 0.0226 1.58 0.0341 2.58 0.0478 3.58
       0.0652 4.58 0.0873 5.58 0.1150 6.58 0.1475 7.58 0.1828 8.58
       0.2248 9.58 0.2635 10.31 3.20 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF CORIF ZP
F1     1      5      1    0.196  0.60 0.00
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1     4  1
J1     1
$ENDPROGRAM
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	6.49	12	42	0.00	33.09	0.0	0.0	2.260E-07
2	100.00	79.91	0.00	0	0	0.00	30.79	0.0	0.0	1.358E-07
3	100.00	79.98	0.63	12	42	0.00	42.09	0.0	0.0	1.111E-07
4	100.00	76.86	0.15	12	42	0.00	45.69	0.0	0.0	7.156E-09
5	100.00	60.99	0.44	12	42	0.00	40.07	0.0	0.0	1.824E-08

1----------

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	0.00	0.00	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-2.30	0.0	0.00000
2003	17930.55	42.86	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-6.18	0.0	0.10240
5003	12.40	7.02	18.00	2.31	12	42	4.06	12	42	0.19	0.44	0.63	1409.4	0.02947
3004	75379.04	56.26	272.40	2.31	12	42	4.82	12	42	0.00	0.63	0.15	0.0	0.11540
90005	0.09	0.48	5.99	2.31	12	42	11.79	12	42	24.50	6.49	-0.48	0.0	0.00005
90006	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90007	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90008	********	********	5.99	0.00	0	0	********	0	0	********	********	********	**********	**********
90009	********	********	5.99	2.31	12	42	********	0	0	********	********	********	**********	**********

1----------

===> SWMM 4.0 SIMULATION ENDED NORMALLY.

===> YOUR INPUT FILE WAS NAMED : 1718D2.DAT
===> YOUR OUTPUT FILE WAS NAMED: 1718D2.OUT

```
SW     1  10 0
MM     1  2  3  0
@      10 '1718D10.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 09-20-02'
A1  '24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.00  360 360 36   0
B2     0  1  12.566  30  0.05
B3     5 4 5 4 0
B4     1 2 3 4 5
B5     1002 2003 5003 3004
B6     1 2 3 4 5
B7     1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1     100.0 60.42 0.0   0.00
D1     2     100.0 69.21 0.0   0.00
D1     3     100.0 57.28 0.0   0.00
D1     4     100.0 54.16 0.0   0.00
D1     5     100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1     80.00 -0.10  13
E2     0.0078 0.00 0.0130 0.58 0.0226 1.58 0.0341 2.58 0.0478 3.58
       0.0652 4.58 0.0873 5.58 0.1150 6.58 0.1475 7.58 0.1828 8.58
       0.2248 9.58 0.2635 10.31 3.20 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF CORIF ZP
F1     1      5      1     0.196  0.60 0.00
*1     1      5      1     0.057  0.60 6.82
*1     1      5      1     0.057  0.60 6.82
*1     1      5      1     0.057  0.60 6.82
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1     7.55  10.3 1.50 3.1
G1     1      5      1     7.55  10.3 1.50 3.1
G1     1      5      1     7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1     4  1
J1     1
$ENDPROGRAM
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	8.47	12	18	0.00	31.11	0.0	0.0	2.266E-07
2	100.00	79.91	0.00	0	0	0.00	30.79	0.0	0.0	1.358E-07
3	100.00	79.98	0.98	12	18	0.00	41.74	0.0	0.0	1.112E-07
4	100.00	76.86	0.97	12	24	0.00	44.87	0.0	0.0	7.215E-09
5	100.00	60.99	2.69	12	16	1.19	37.82	4.8	0.0	1.824E-08

1----------

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	0.00	0.00	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-0.32	0.0	0.00000
2003	17930.55	42.86	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-5.83	0.0	0.10240
5003	12.40	7.02	18.00	16.89	12	18	11.03	12	16	1.36	2.69	0.98	1353.2	0.02947
3004	75379.04	56.26	272.40	19.48	12	24	8.44	12	28	0.00	0.98	0.97	1.4	0.11540
90005	0.09	0.48	5.99	2.66	12	13	13.56	12	13	28.16	8.47	1.77	0.0	0.00005
90006	********	********	5.99	4.07	12	18	********	0	0	********	********	********	**********	**********
90007	********	********	5.99	4.07	12	18	********	0	0	********	********	********	**********	**********
90008	********	********	5.99	6.22	12	18	********	0	0	********	********	********	**********	**********
90009	********	********	5.99	19.48	12	24	********	0	0	********	********	********	**********	**********

1----------

===> YOUR INPUT FILE WAS NAMED : 1718D10.DAT

===> YOUR OUTPUT FILE WAS NAMED: 1718D10.OUT

```
SW     1  10 0
MM     1  2  3  0
@      10 '1718D25.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 09-20-02'
A1  '24-HOUR TYPE II RAINFALL, 25 YEAR STORM EVENT DEVELOPED CONDITION'
B1   172800 0.5   0.00  360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1    100.0 60.42 0.0   0.00
D1     2    100.0 69.20 0.0   0.00
D1     3    100.0 57.28 0.0   0.00
D1     4    100.0 54.16 0.0   0.00
D1     5    100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1    80.00 -0.10  13
E2     0.0078 0.00 0.0130 0.58 0.0226 1.58 0.0341 2.58 0.0478 3.58
       0.0652 4.58 0.0873 5.58 0.1150 6.58 0.1475 7.58 0.1828 8.58
       0.2248 9.58 0.2635 10.31 3.20 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF CORIF ZP
F1     1      5      1     0.196  0.60 0.00
*1     1      5      1     0.057  0.60 6.82
*1     1      5      1     0.057  0.60 6.82
*1     1      5      1     0.057  0.60 6.82
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1     7.55  10.3 1.50 3.1
G1     1      5      1     7.55  10.3 1.50 3.1
G1     1      5      1     7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1     4  1
J1     1
$ENDPROGRAM
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	9.27	12	13	0.00	30.31	0.0	0.0	2.270E-07
2	100.00	79.90	0.29	12	13	0.00	30.51	0.0	0.0	1.358E-07
3	100.00	79.98	1.19	12	7	0.00	41.53	0.0	0.0	1.112E-07
4	100.00	76.86	1.07	12	7	0.00	44.77	0.0	0.0	7.208E-09
5	100.00	60.99	40.51	12	8	39.01	0.00	91.9	86.6	1.824E-08

1----------

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	1373.18	3.00	128.40	8.39	12	13	2.60	12	13	0.01	0.48	0.29	0.3	0.00050
2003	17913.03	42.82	128.40	8.27	12	13	4.93	12	13	0.00	0.29	-5.62	0.0	0.10220
5003	12.40	7.02	18.00	27.78	12	7	16.33	12	7	2.24	40.51	1.19	1200.0	0.02947
3004	75379.04	56.26	272.40	27.72	12	7	9.38	12	17	0.00	1.19	1.07	1.1	0.12480
90005	0.09	0.48	5.99	4.06	12	12	20.72	12	12	43.04	9.27	39.59	0.0	0.00005
90006	********	********	5.99	10.53	12	13	********	0	0	********	********	********	**********	**********
90007	********	********	5.99	10.53	12	13	********	0	0	********	********	********	**********	**********
90008	********	********	5.99	26.60	12	13	********	0	0	********	********	********	**********	**********
90009	********	********	5.99	27.72	12	7	********	0	0	********	********	********	**********	**********

1----------

===> YOUR INPUT FILE WAS NAMED : 1718D25.DAT
===> YOUR OUTPUT FILE WAS NAMED: 1718D25.OUT

```
SW     1  10 0
MM     1  2  3  0
@      10 '1718D100.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 09-20-02'
A1  '24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.00  360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1     100.0 60.42 0.0   0.00
D1     2     100.0 69.20 0.0   0.00
D1     3     100.0 57.28 0.0   0.00
D1     4     100.0 54.16 0.0   0.00
D1     5     100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1     80.00 -0.10  13
E2     0.0078 0.00 0.0130 0.58 0.0226 1.58 0.0341 2.58 0.0478 3.58
       0.0652 4.58 0.0873 5.58 0.1150 6.58 0.1475 7.58 0.1828 8.58
       0.2248 9.58 0.2635 10.31 3.20 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF CORIF ZP
F1     1      5      1    0.196  0.60 0.00
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*1     1      5      1    0.057  0.60 6.82
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1     4  1
J1     1
$ENDPROGRAM
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	9.45	12	11	0.00	30.13	0.0	0.0	2.274E-07
2	100.00	79.90	0.40	12	11	0.00	30.40	0.0	0.0	1.358E-07
3	100.00	79.98	1.36	12	2	0.00	41.36	0.0	0.0	1.114E-07
4	100.00	76.86	1.26	12	2	0.00	44.58	0.0	0.0	7.308E-09
5	100.00	60.99	40.51	12	2	39.01	0.00	58.2	51.3	1.824E-08

1----------

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	1373.18	3.00	128.40	19.74	12	11	4.25	12	11	0.01	0.66	0.40	0.0	0.00050
2003	17913.03	42.82	128.40	19.69	12	11	6.55	12	12	0.00	0.40	-5.45	0.0	0.10220
5003	12.40	7.02	18.00	45.03	12	2	26.19	12	2	3.63	40.51	1.36	1271.0	0.02947
3004	75379.04	56.26	272.40	43.86	12	2	10.30	12	2	0.00	1.36	1.26	2.3	0.11540
90005	0.09	0.48	5.99	2.66	11	58	13.56	11	58	28.17	9.45	39.59	0.2	0.00005
90006	********	********	5.99	12.14	12	11	********	0	0	********	********	********	**********	**********
90007	********	********	5.99	12.14	12	11	********	0	0	********	********	********	**********	**********
90008	********	********	5.99	32.02	12	11	********	0	0	********	********	********	**********	**********
90009	********	********	5.99	43.86	12	2	********	0	0	********	********	********	**********	**********

1----------

===> SWMM 4.0 SIMULATION ENDED NORMALLY.

===> YOUR INPUT FILE WAS NAMED : 1718D100.DAT
===> YOUR OUTPUT FILE WAS NAMED: 1718D100.OUT

Subcatchment 1S: PRE DEVELOPMENT DRAINAGE AREA

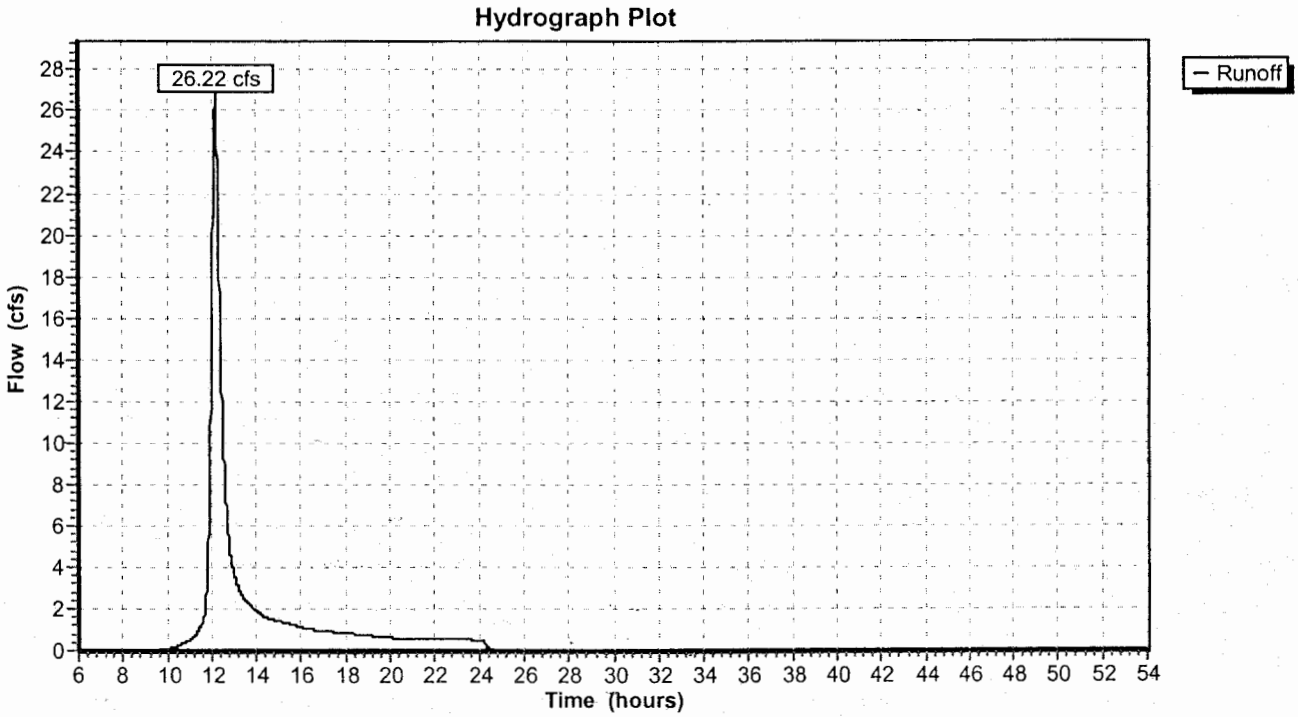
Runoff = 26.22 cfs @ 12.17 hrs, Volume= 2.227 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.04"

Area (ac)	CN	Description
1.620	77	LIGHT BRUSH
0.270	98	OFFSITE BUILDING & PAVEMENT
7.150	72	WOODS
2.520	72	OFFSITE WOODS
11.560	73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	150	0.0200	0.2		**Sheet Flow, OPEN FIELD** Grass: Short n= 0.150 P2= 3.40"
3.4	550	0.0275	2.7		**Shallow Concentrated Flow, SURFACE SWALE** Unpaved Kv= 16.1 fps
7.9	420	0.0547	0.9	4.42	**Channel Flow, WOODED RAVINE** Area= 5.0 sf Perim= 7.5' r= 0.67' n= 0.300
24.4	1,120	Total			

Subcatchment 1S: PRE DEVELOPMENT DRAINAGE AREA



Subcatchment 2S: POST DEVELOPMENT DRAINAGE AREA

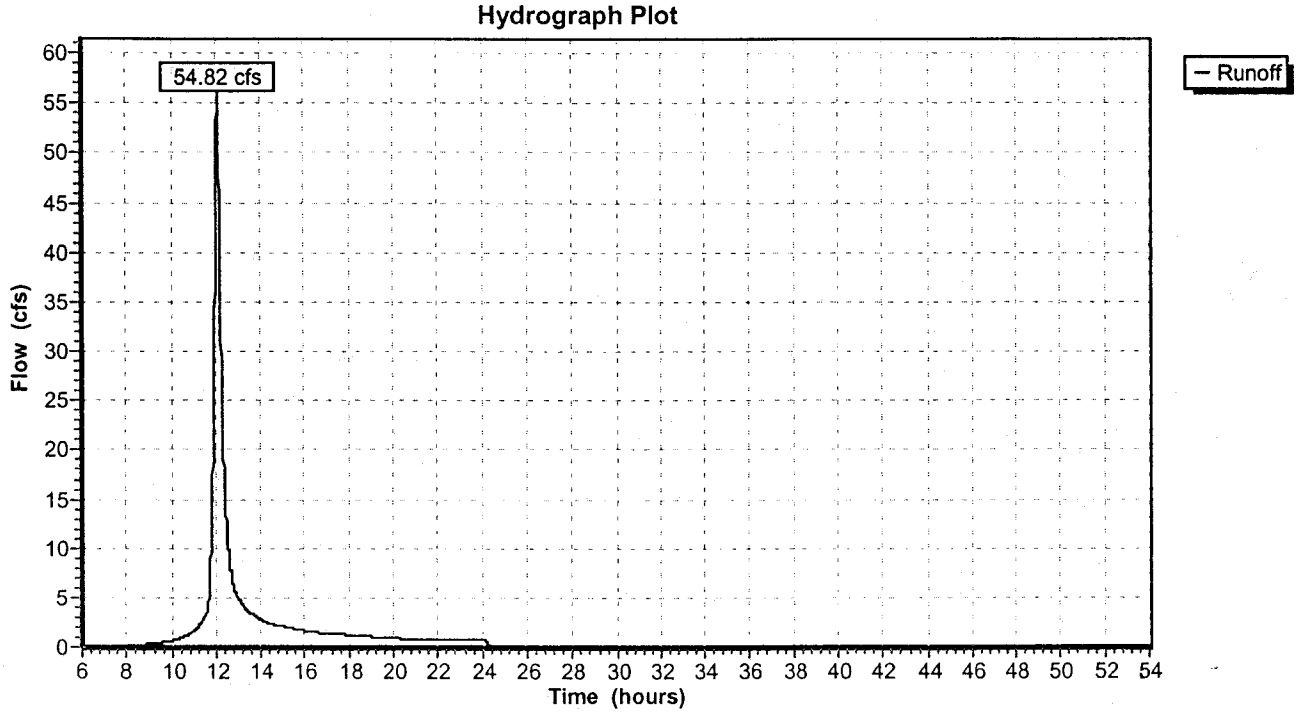
Runoff = 54.82 cfs @ 12.09 hrs, Volume= 3.789 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.04"

Area (ac)	CN	Description
0.700	39	PLAYING FIELD
0.980	98	BUILDING & PAVING
0.640	61	LAWN
3.950	98	FUTURE BUILDING & PAVING
0.270	98	OFFSITE BUILDING& PAVING
6.470	74	WOODS & GREENSPACE
2.520	72	OFFSITE GREENSPACE
15.530	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	35	0.0200	0.1		**Sheet Flow, LAWN** Grass: Short n= 0.150 P2= 3.40"
2.3	165	0.0100	1.2		**Sheet Flow, PAVING** Smooth surfaces n= 0.011 P2= 3.40"
0.5	100	0.0275	3.4		**Shallow Concentrated Flow, Segment ID:** Paved Kv= 20.3 fps
2.5	500	0.0275	3.4		**Shallow Concentrated Flow, DRAINAGE SYSTEM** Paved Kv= 20.3 fps
7.9	420	0.0547	0.9	4.42	**Channel Flow, WOODED RAVINE** Area= 5.0 sf Perim= 7.5' r= 0.67' n= 0.300
17.3	1,220	Total			

Subcatchment 2S: POST DEVELOPMENT DRAINAGE AREA



Reach 11R: Natural Channel Pre-Development

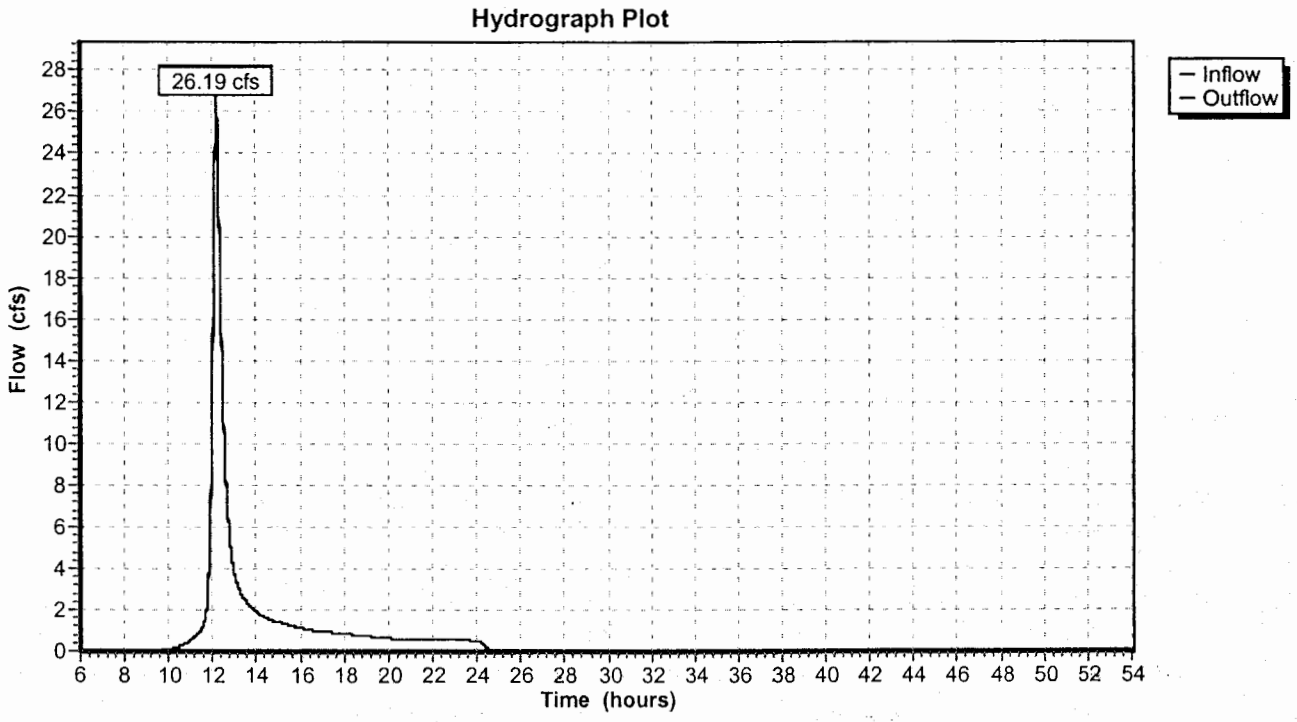
Inflow = 26.22 cfs @ 12.17 hrs, Volume= 2.227 af
Outflow = 26.19 cfs @ 12.18 hrs, Volume= 2.227 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.0 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 0.3 min

Peak Depth= 2.17'
Capacity at bank full= 354.88 cfs
Inlet Invert= 54.00', Outlet Invert= 50.00'
Custom cross-section table, n= 0.150 Length= 50.0' Slope= 0.0800 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	7.0	8.1	350	17.82
4.00	28.0	15.1	1,400	118.52
6.00	64.0	23.0	3,200	354.88

Reach 11R: Natural Channel Pre-Development



Reach 21R: Natural Channel Post Dev.

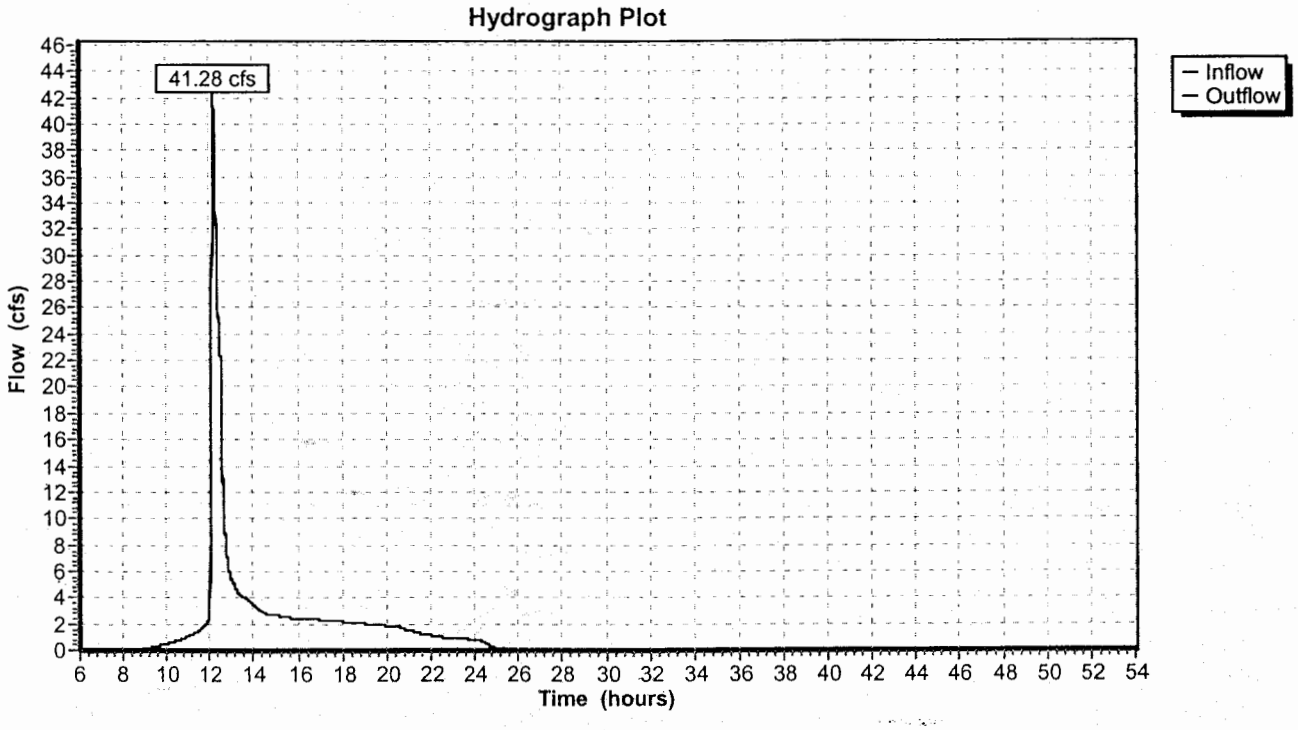
Inflow = 41.32 cfs @ 12.20 hrs, Volume= 3.781 af
Outflow = 41.28 cfs @ 12.21 hrs, Volume= 3.781 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 0.3 min

Peak Depth= 2.47'
Capacity at bank full= 354.88 cfs
Inlet Invert= 54.00', Outlet Invert= 50.00'
Custom cross-section table, n= 0.150 Length= 50.0' Slope= 0.0800 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	7.0	8.1	350	17.82
4.00	28.0	15.1	1,400	118.52
6.00	64.0	23.0	3,200	354.88

Reach 21R: Natural Channel Post Dev.



Reach 25R: Emergency Spillway

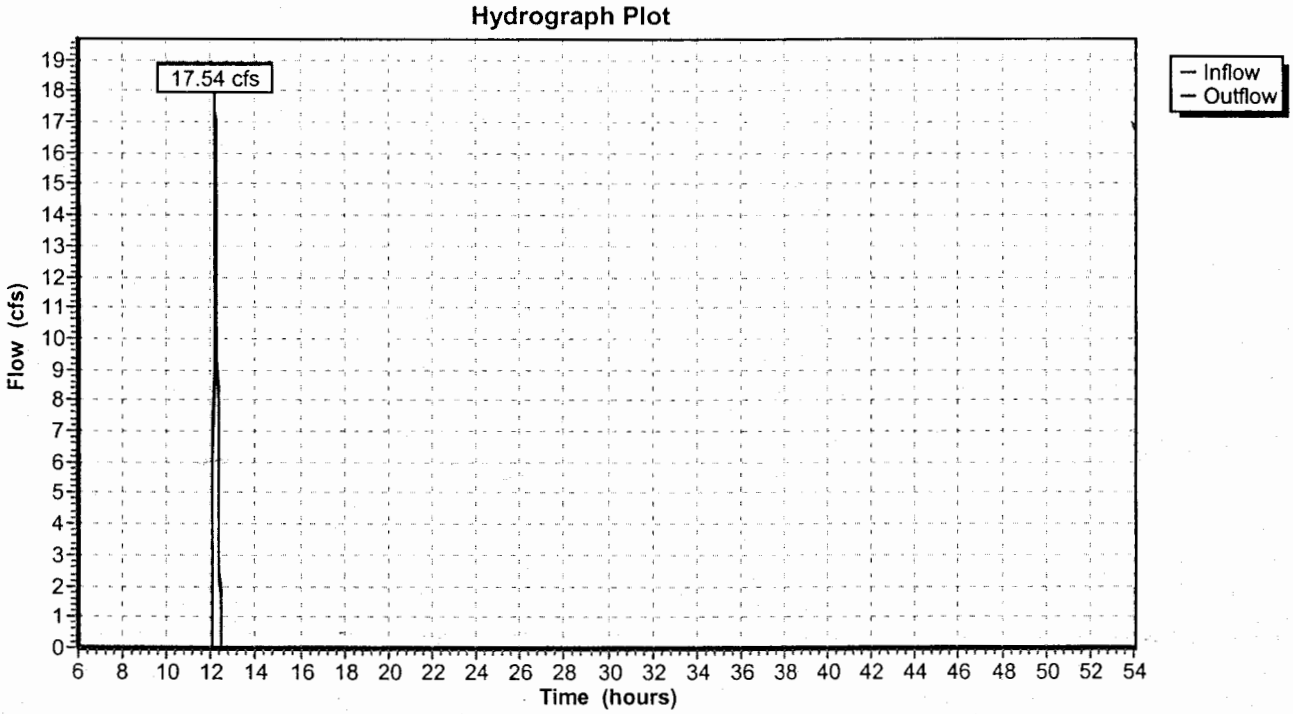
[80] Warning: Exceeded Pond 2P by 0.80' @ 13.25 hrs (0.00 cfs)

Inflow	=	17.57 cfs @	12.20 hrs, Volume=	0.287 af
Outflow	=	17.54 cfs @	12.20 hrs, Volume=	0.287 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.9 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.9 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.34'
Capacity at bank full= 110.38 cfs
Inlet Invert= 69.00', Outlet Invert= 65.00'
8.00' x 1.00' deep channel, n= 0.030 Length= 60.0' Slope= 0.0667 '/'
Side Slope Z-value= 2.0 '/'

Reach 25R: Emergency Spillway



Pond 2P: BMP STORM

Inflow	=	54.82 cfs @	12.09 hrs,	Volume=	3.789 af
Outflow	=	41.35 cfs @	12.20 hrs,	Volume=	3.781 af, Atten= 25%, Lag= 6.3 min
Primary	=	23.78 cfs @	12.20 hrs,	Volume=	3.494 af
Secondary	=	17.57 cfs @	12.20 hrs,	Volume=	0.287 af

Routing by Stor-Ind method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs

Peak Elev= 69.89' Storage= 40,649 cf
Plug-Flow detention time= 66.5 min calculated for 3.780 af (100% of inflow)
Storage and wetted areas determined by Prismatic sections

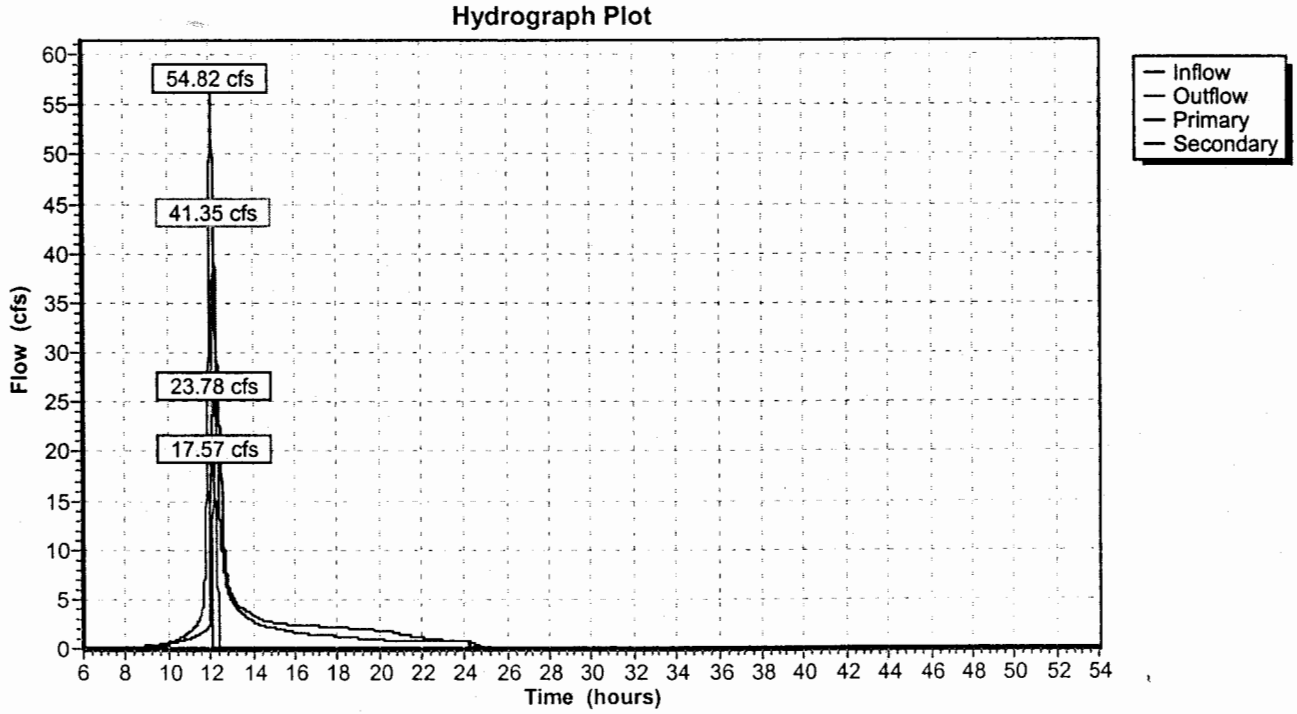
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
60.00	360	0	0
64.00	2,520	5,760	5,760
68.00	6,732	18,504	24,264
70.00	10,602	17,334	41,598
72.00	14,994	25,596	67,194

Primary OutFlow (Free Discharge)
- 1=Primary Outlet
  - 2=Pool Drain
  - 3=Notched Weir
  - 5=Riser Crest
  - 6=Orifice in riser

Secondary OutFlow (Free Discharge)
- 4=Emergnecy Spillway

#	Routing	Invert	Outlet Devices
1	Primary	60.25'	**18.0" x 70.0' long Primary Outlet** Ke= 0.600 Outlet Invert= 57.14' S= 0.0444 '/' n= 0.013 Cc= 0.900
2	Device 1	60.25'	**6.0" x 10.0' long Pool Drain** CMP, square edge headwall, Ke= 0.500 Outlet Invert= 60.25' S= 0.0000 '/' n= 0.013 Cc= 0.900
3	Device 1	67.77'	**1.5' long x 0.7' high Notched Weir** 2 End Contraction(s)
4	Secondary	69.00'	**8.0' long Emergnecy Spillway** Head (feet) 0.50 1.00 1.50 Coef. (English) 2.53 2.63 2.72
5	Device 1	68.19'	**48.0" Horiz. Riser Crest** Limited to weir flow C= 0.600
6	Device 1	67.27'	**3.5" Vert. Orifice in riser** C= 0.600

Pond 2P: BMP STORM



Subcatchment 1S: PRE DEVELOPMENT DRAINAGE AREA

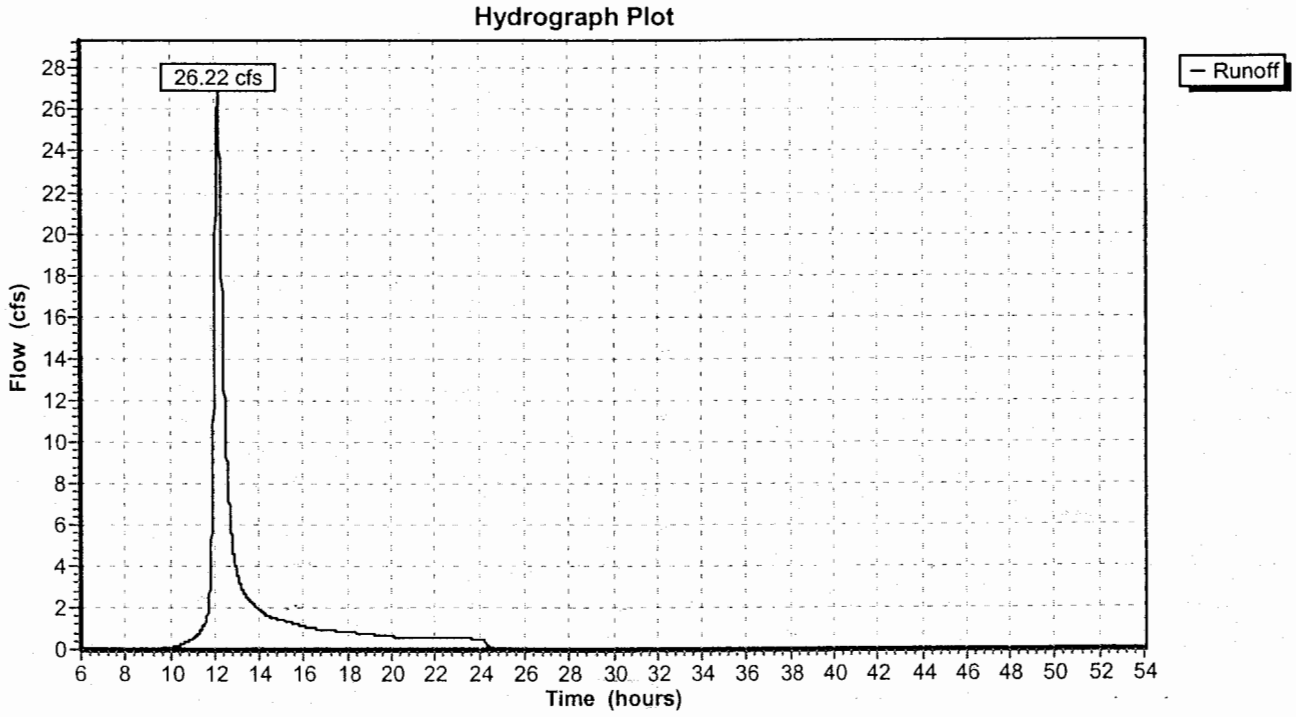
Runoff = 26.22 cfs @ 12.17 hrs, Volume= 2.227 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.04"

Area (ac)	CN	Description
1.620	77	LIGHT BRUSH
0.270	98	OFFSITE BUILDING & PAVEMENT
7.150	72	WOODS
2.520	72	OFFSITE WOODS
11.560	73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	150	0.0200	0.2		**Sheet Flow, OPEN FIELD** Grass: Short n= 0.150 P2= 3.40"
3.4	550	0.0275	2.7		**Shallow Concentrated Flow, SURFACE SWALE** Unpaved Kv= 16.1 fps
7.9	420	0.0547	0.9	4.42	**Channel Flow, WOODED RAVINE** Area= 5.0 sf Perim= 7.5' r= 0.67' n= 0.300
24.4	1,120	Total			

Subcatchment 1S: PRE DEVELOPMENT DRAINAGE AREA



Subcatchment 2S: POST DEVELOPMENT DRAINAGE AREA

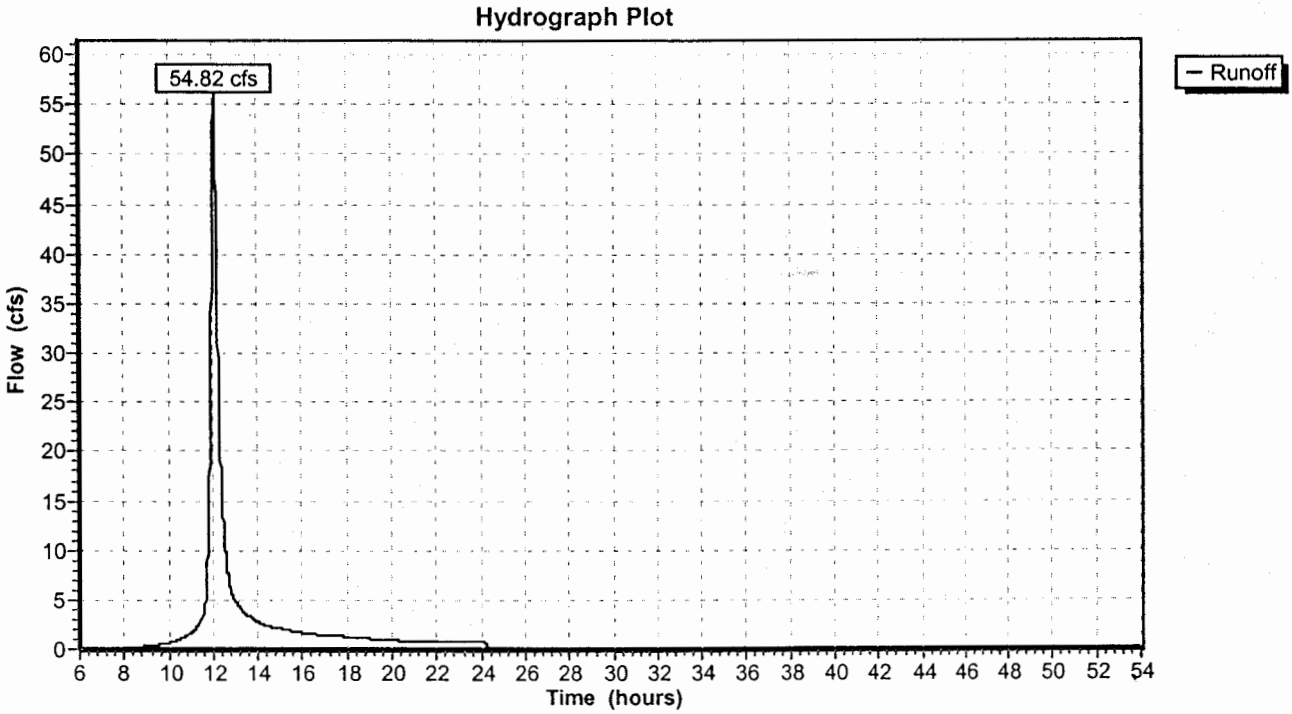
Runoff = 54.82 cfs @ 12.09 hrs, Volume= 3.789 af

Runoff by SCS TR-20 method, UH=SCS, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Type II 24-hr Rainfall=5.04"

Area (ac)	CN	Description
0.700	39	PLAYING FIELD
0.980	98	BUILDING & PAVING
0.640	61	LAWN
3.950	98	FUTURE BUILDING & PAVING
0.270	98	OFFSITE BUILDING& PAVING
6.470	74	WOODS & GREENSPACE
2.520	72	OFFSITE GREENSPACE
15.530	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	35	0.0200	0.1		**Sheet Flow, LAWN** Grass: Short n= 0.150 P2= 3.40"
2.3	165	0.0100	1.2		**Sheet Flow, PAVING** Smooth surfaces n= 0.011 P2= 3.40"
0.5	100	0.0275	3.4		**Shallow Concentrated Flow, Segment ID:** Paved Kv= 20.3 fps
2.5	500	0.0275	3.4		**Shallow Concentrated Flow, DRAINAGE SYSTEM** Paved Kv= 20.3 fps
7.9	420	0.0547	0.9	4.42	**Channel Flow, WOODED RAVINE** Area= 5.0 sf Perim= 7.5' r= 0.67' n= 0.300
17.3	1,220	Total			

Subcatchment 2S: POST DEVELOPMENT DRAINAGE AREA



Reach 11R: Natural Channel Pre-Development

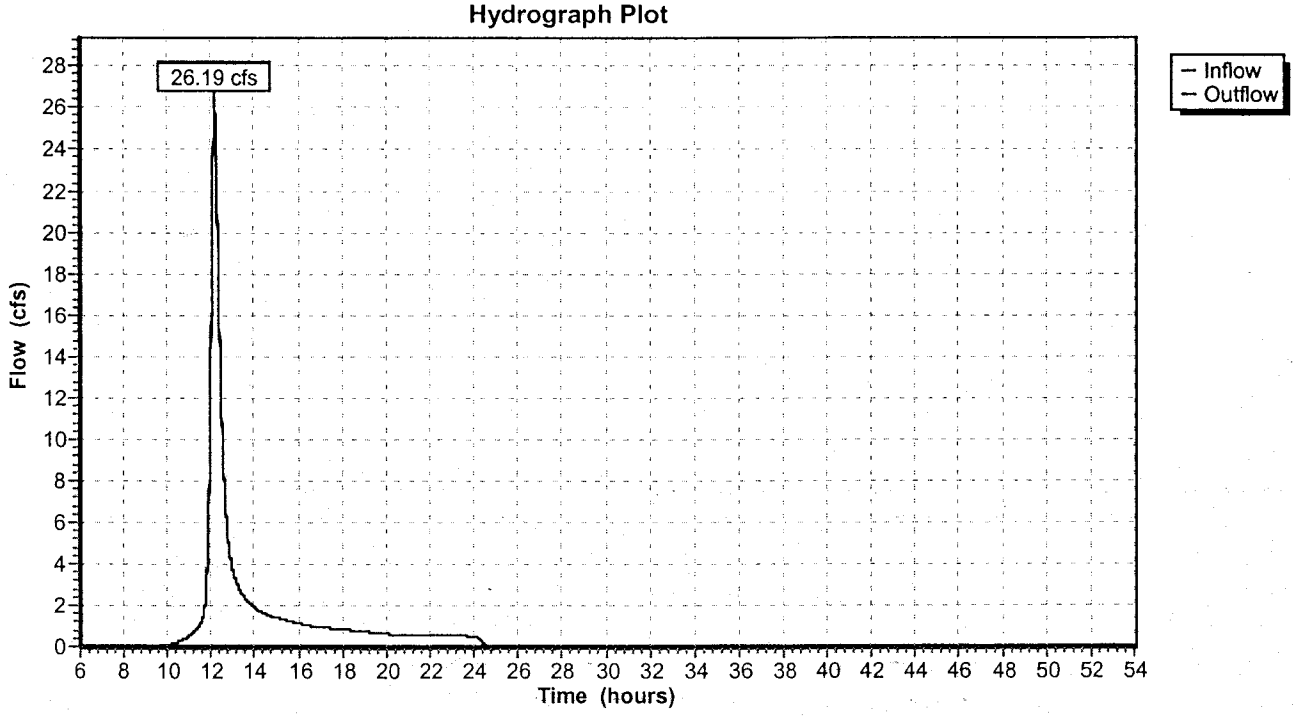
Inflow = 26.22 cfs @ 12.17 hrs, Volume= 2.227 af
Outflow = 26.19 cfs @ 12.18 hrs, Volume= 2.227 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.0 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 0.3 min

Peak Depth= 2.17'
Capacity at bank full= 354.88 cfs
Inlet Invert= 54.00', Outlet Invert= 50.00'
Custom cross-section table, n= 0.150 Length= 50.0' Slope= 0.0800 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	7.0	8.1	350	17.82
4.00	28.0	15.1	1,400	118.52
6.00	64.0	23.0	3,200	354.88

Reach 11R: Natural Channel Pre-Development



Reach 21R: Natural Channel Post Dev.

[79] Warning: Submerged Pond 2P Primary device # 1 OUTLET by 5.56'
[61] Hint: Submerged 1% of Reach 25R bottom

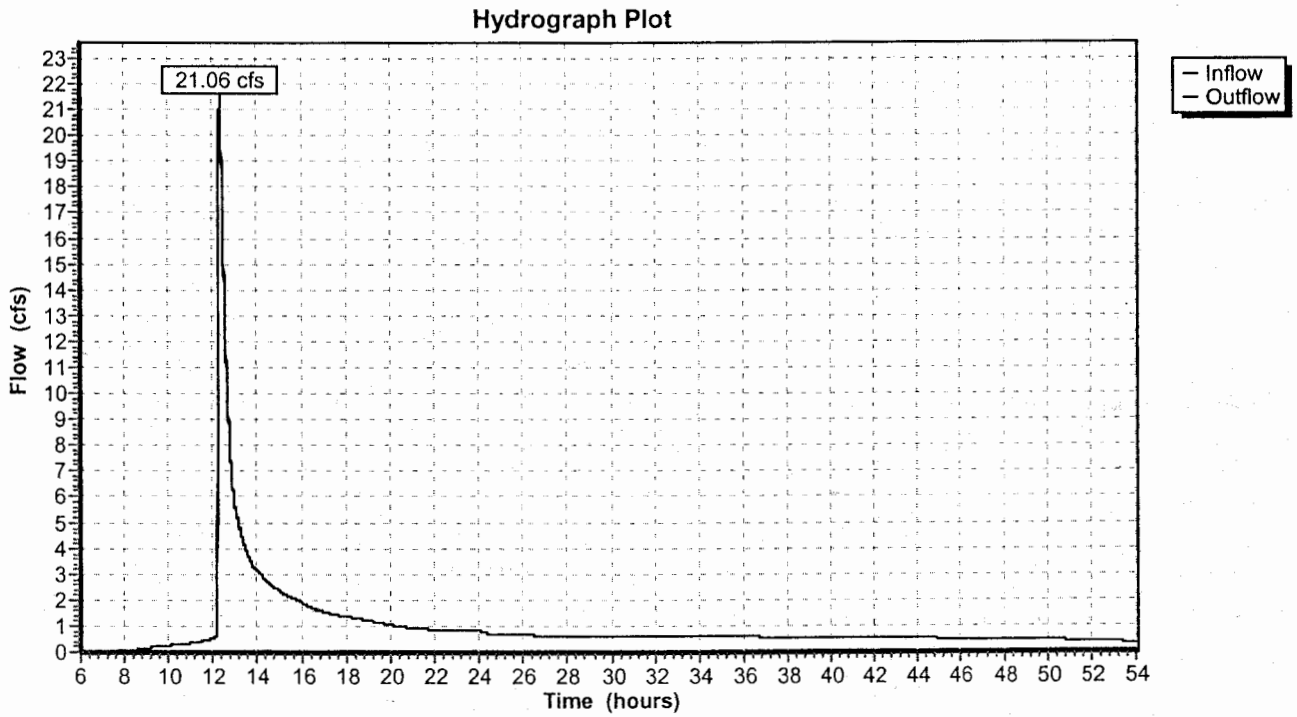
Inflow = 21.08 cfs @ 12.33 hrs, Volume= 3.713 af
Outflow = 21.06 cfs @ 12.34 hrs, Volume= 3.713 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.7 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 0.3 min

Peak Depth= 2.06'
Capacity at bank full= 354.88 cfs
Inlet Invert= 54.00', Outlet Invert= 50.00'
Custom cross-section table, n= 0.150 Length= 50.0' Slope= 0.0800 '/'

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
2.00	7.0	8.1	350	17.82
4.00	28.0	15.1	1,400	118.52
6.00	64.0	23.0	3,200	354.88

Reach 21R: Natural Channel Post Dev.



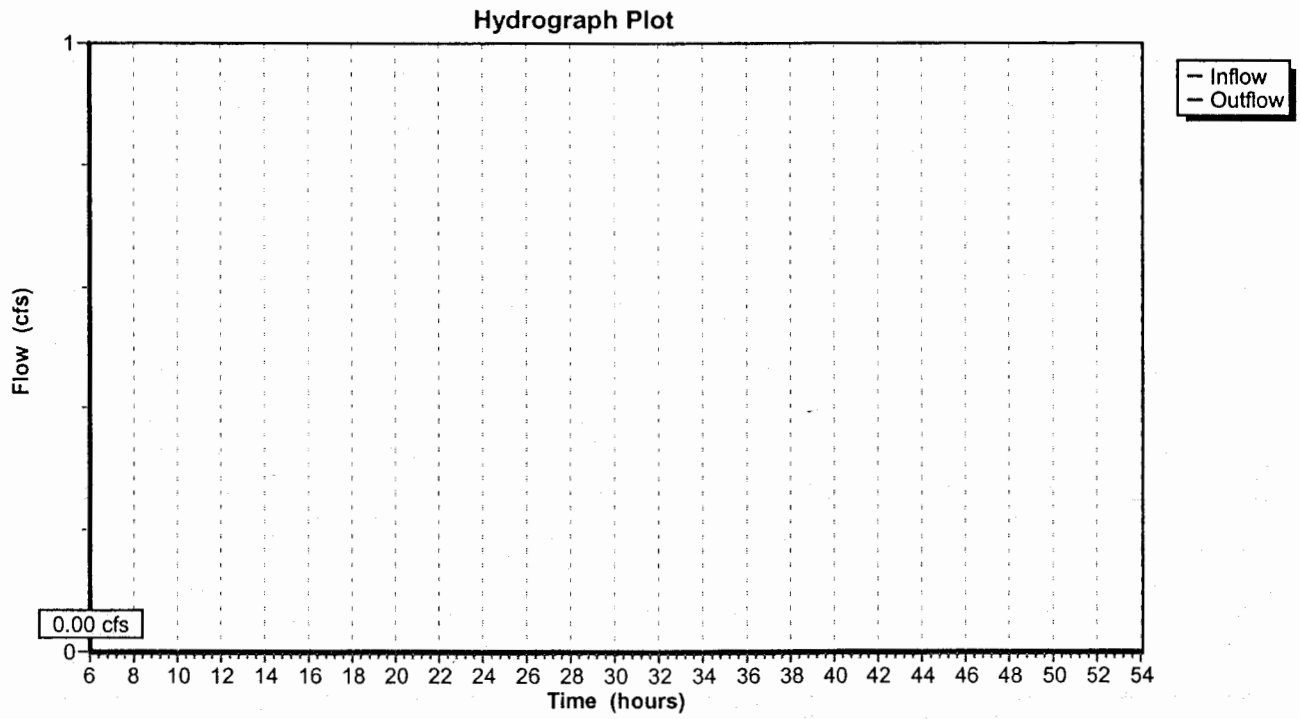
Reach 25R: Emergnecy Spillway

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= 6.00-54.00 hrs, dt= 0.01 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= 806.34 cfs
Inlet Invert= 68.50', Outlet Invert= 56.00'
12.00' x 2.00' deep channel, n= 0.030 Length= 85.0' Slope= 0.1471 '/'
Side Slope Z-value= 2.0 '/'

Reach 25R: Emergnecy Spillway



Pond 2P: BMP STORM

Inflow	=	54.82 cfs @	12.09 hrs,	Volume=	3.789 af
Outflow	=	21.08 cfs @	12.33 hrs,	Volume=	3.713 af, Atten= 62%, Lag= 14.3 min
Primary	=	21.08 cfs @	12.33 hrs,	Volume=	3.713 af
Secondary	=	0.00 cfs @	6.00 hrs,	Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 6.00-54.00 hrs, dt= 0.01 hrs

Peak Elev= 67.66' Storage= 72,158 cf
Plug-Flow detention time= 580.4 min calculated for 3.713 af (98% of inflow)
Storage and wetted areas determined by Prismatic sections

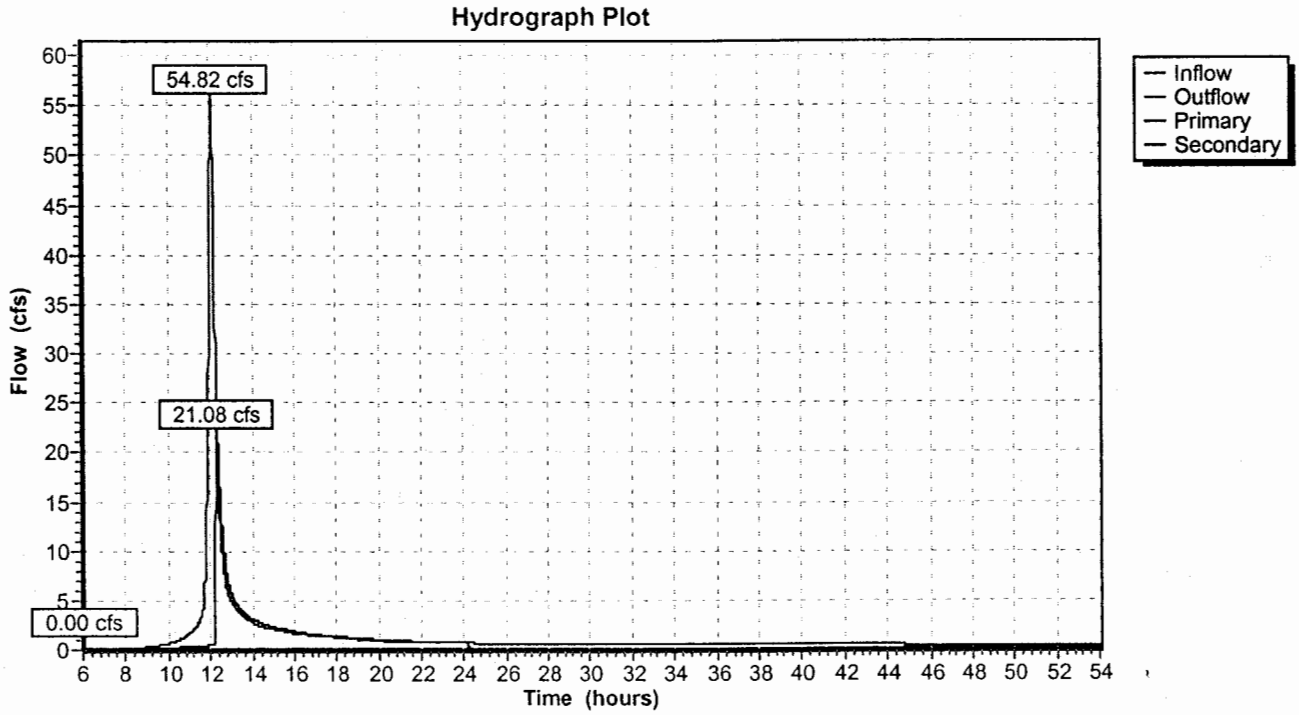
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
58.80	0	0	0
59.00	114	11	11
60.00	1,551	833	844
62.00	4,595	6,146	6,990
64.00	11,057	15,652	22,642
66.00	15,634	26,691	49,333
68.00	11,913	27,547	76,880
70.00	15,803	27,716	104,596

Primary OutFlow (Free Discharge)
- 1=Culvert
  - 2=Orifice/Grate
  - 3=Sharp-Crested Rectangular Weir
  - 5=Orifice/Grate

Secondary OutFlow (Free Discharge)
- 4=Broad-Crested Rectangular Weir

#	Routing	Invert	Outlet Devices
1	Primary	58.00'	**18.0" x 150.0' long Culvert** Ke= 0.600 Outlet Invert= 50.50' S= 0.0500 '/' n= 0.013 Cc= 0.900
2	Device 1	58.80'	**3.0" Vert. Orifice/Grate** C= 0.600
3	Device 1	66.80'	**1.5' long x 0.7' high Sharp-Crested Rectangular Weir X 2.00** 2 End Contraction(s)
4	Secondary	68.50'	**12.0' long Broad-Crested Rectangular Weir** Head (feet) 0.50 1.00 1.50 Coef. (English) 2.53 2.63 2.72
5	Device 1	67.20'	**48.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

Pond 2P: BMP STORM



FAITH BAPTIST CHURCH
4107 ROCHAMBEAU DRIVE
WILLIAMSBURG, VIRGINIA 23185

"STORMWATER MANAGEMENT POND"

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

1/21/2000

ORIGINAL DESIGN
ADJUSTMENTS PER AB CONDITION
Mitchell/Wilson

SP-24-00
WC054

JANUARY 5, 2000

Langley and McDonald, P.C.

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NARRATIVE

FAITH BAPTIST CHURCH
4107 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23185

"STORMWATER MANAGEMENT POND"
JANUARY 5, 2000

This Site Plan Amendment will provide stormwater management, both water quality as well as a water quantity, for this existing church site. The site is located at 4107 Rochambeau Drive, within Stonehouse Magisterial District, James City County, Virginia.

Construction of the original Stormwater Management Facility was deferred in anticipation of the church obtaining additional adjoining property. The Church was able to purchase the adjoining 15.743 acres, which expands the site from 7.0 acres originally to 22.743 total acres today.

The Stormwater Management Facility has been located to capture the drainage from 12.85 acres plus 2.69 acres off-site. The remaining acreage will not drain into this facility, however, it will be declared as Natural Open Space. The 4.40 acres Natural Open Space will drain into the existing RPA area which contains 3.52 acres. This totals 7.92 acres and is eligible for the 15% open space credit. A 50' strip along the west property line is also counted as Natural Open Space. This 0.89 acres qualifies for this 10% open space credit.

The pond itself is designed and sized to treat the 15.53 acres (12.85 on-site and 2.69 off-site) for with future expansion. Although no development is planned at this time, the Church hopes to add additional structures and parking in the future. The pond is sized for this expansion.

For channel protection, we have provided 41,422 cu. ft. of storage that discharges through a 3" orifice. For BMP, we have a 25.6 hour draw down time. SCP

The pre-developed Q for the 10 year storm event is 25.80 cfs. The post-developed Q for the 10 year storm event is 21.43 cfs.

10 POINT BMP CALCULATIONS

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
Dry Pond	4	x	12.848 + 2.689 offsite / 12.848 = 1.21	=	4.84
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: _____

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
0.89/22.74 =	x	0.04 (0.1 per 1%)	=	0.04
7.92/22.74 =	x	0.35 (0.15 per 1%)	=	5.25

TOTAL NATURAL OPEN SPACE CREDIT: 5.29

C. TOTAL WEIGHTED POINTS

OK

4.84	+	5.29	=	10.13
Structural BMP Points		Natural Open Space Points		Total

STORMWATER MANAGEMENT POND CALCULATIONS

CHANNEL PROTECTION VOLUME CALCULATION
Faith Baptist Church

One Year Precipitation : P= 2.8 Inches

PRE-DEVELOPMENT CONDITIONS :

Drainage Area :	DA_{PRE} =	11.56	Acres
SCS Curve Number :	CN_{PRE} =	73	Unitless
Time of Concentration :	Tc_{PRE} =	0.41	Hours
	I_a =	0.740	
	I_a/P =	0.26	
	Q_U =	0.74	
	q_u =	585	
	q_p =	7.78	

POST DEVELOPMENT CONDITIONS :

Drainage Area :	DA_{POST} =	15.53	Acres
SCS Curve Number :	CN_{POST} =	80	Unitless — what is this based on?
Time of Concentration :	Tc_{POST} =	0.29	Hours
	I_a =	0.500	
	I_a/P =	0.18	
	Q_U =	1.10	
	q_u =	686	cfs/sm
	$q_i = q_p$ =	18.35	c.f.s.
	q_o/q_i =	0.026342	
	q_o =	0.483463	
	V_s/V_r =	0.65	
CHANNEL PROTECTION VOLUME :	**V_s =**	**40163**	**cubic feet**
5.3	A_o =	0.04366	
	d_o =	2.829282	

ESTIMATED POND FULL DRAWDOWN

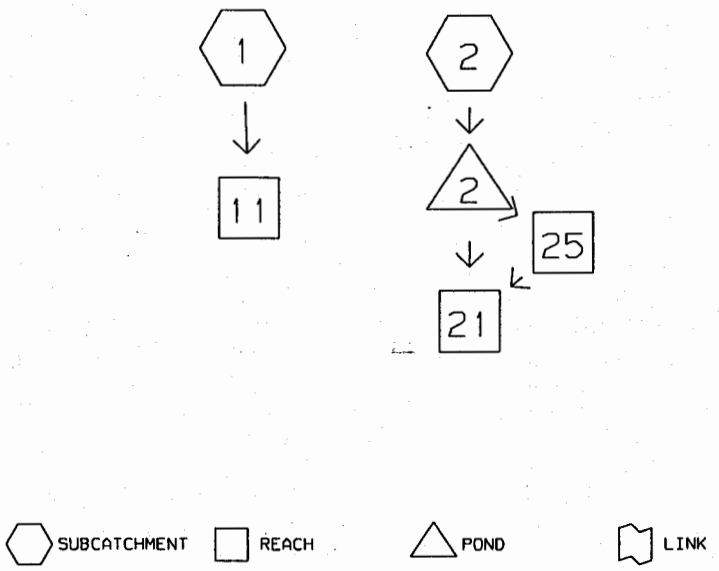
BMP POND 5.2 $D_{ORIFICE}$ = **3** inches

W.S.E. (feet)	AREA s.f.	INC. VOL c.f.	STORAGE c.f	H_{AVG} ft.	Q_{AVG} cfs	dT hours	
70.00	15803	27716	82959	10.25			
68.00	11913	21085	55243	8.25			
66.75	10199.88	7264	**41422**	**6.63**	**0.6026**	**3.3**	**WQVSE**
66.00	9172	15634	34158	6.25	0.5849	7.4	
64.00	6462	11057	18524	4.25	0.4800	6.4	
62.00	4595	7467	7467	1.63	0.2895	7.2	
60.00	1551	833	847	0.75	0.1869	1.2	
59.00	114	14	14	0.13	0.0000		
58.75	0	0					

DRAW DOWN TIME = 25.6

CPV2FBC.WK4

WATERSHED ROUTING ==========



SUBCATCHMENT 1	= PRE DEVELOPMENT DRAINAGE AREA	->	REACH 11
SUBCATCHMENT 2	= POST DEVELOPMENT DRAINAGE AREA	->	POND 2
REACH 11	= Natural Channel Pre-Development	->	
REACH 21	= Natural Channel Post Dev.	->	
REACH 25	= Emergnecy Spillway	->	REACH 21
POND 2	= BMP STORM	->	REACH 21
POND 2 secondary	= BMP STORM	->	REACH 25

SUBCATCHMENT 1 **PRE DEVELOPMENT DRAINAGE AREA**

PEAK= 7.29 CFS @ 12.16 HRS, VOLUME= .71 AF

ACRES	CN		
1.62	77	LIGHT BRUSH	SCS TR-20 METHOD
.27	98	OFFSITE BUILDING & PAVEMENT	TYPE II 24-HOUR
7.15	72	WOODS	RAINFALL= 2.80 IN
2.52	72	OFFSITE WOODS	SPAN= 10-60 HRS, dt=.1 HRS
11.56	73		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**OPEN FIELD**	13.1
Grass: Short n=.15 L=150' P2=3.4 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**SURFACE SWALE**	3.4
Unpaved Kv=16.1345 L=550' s=.0275 '/' V=2.68 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		
	Total Length= 1120 ft Total Tc=	24.4

SUBCATCHMENT 2 **POST DEVELOPMENT DRAINAGE AREA**

PEAK= 19.26 CFS @ 12.06 HRS, VOLUME= 1.43 AF

ACRES	CN		
.70	39	PLAYING FIELD	SCS TR-20 METHOD
.98	98	BUILDING & PAVING	TYPE II 24-HOUR
.64	61	LAWN	RAINFALL= 2.80 IN
3.95	98	FUTURE BUILDING & PAVING	SPAN= 10-60 HRS, dt=.1 HRS
.27	98	OFFSITE BUILDING& PAVING	
6.47	74	WOODS & GREENSPACE	
2.52	72	OFFSITE GREENSPACE	
15.53	80		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**LAWN**	4.1
Grass: Short n=.15 L=35' P2=3.4 in s=.02 '/'		
TR-55 SHEET FLOW	**PAVING**	2.3
Smooth surfaces n=.011 L=165' P2=3.4 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=100' s=.0275 '/' V=3.37 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**DRAINAGE SYSTEM**	2.5
Paved Kv=20.3282 L=500' s=.0275 '/' V=3.37 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		
	Total Length= 1220 ft Total Tc=	17.3

REACH 11 **Natural Channel Pre-Development**

Qin = 7.29 CFS @ 12.16 HRS, VOLUME= .71 AF
Qout= 7.26 CFS @ 12.17 HRS, VOLUME= .71 AF, ATTEN= 0%, LAG= .9 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 54.81 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 21 **Natural Channel Post Dev.**

Qin = .59 CFS @ 17.66 HRS, VOLUME= 1.43 AF
Qout= .59 CFS @ 17.67 HRS, VOLUME= 1.43 AF, ATTEN= 0%, LAG= .7 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 54.07 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 25 **Emergnecy Spillway**

Qin = 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF
Qout= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.20	2.48	20.47
.40	5.12	65.51
.60	7.92	129.98
.86	11.80	240.07
1.20	17.28	426.54
1.60	24.32	706.23
2.00	32.00	1051.33

12' x 2' CHANNEL
SIDE SLOPE= .5 '/'
n= .03
LENGTH= 85 FT
SLOPE= .25 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-60 HRS, dt=.1 HRS

POND 2 **BMP STORM**

Qin = 19.26 CFS @ 12.06 HRS, VOLUME= 1.43 AF
Qout= .59 CFS @ 17.66 HRS, VOLUME= 1.43 AF, ATTEN= 97%, LAG= 335.8 MIN
Qpri= .59 CFS @ 17.66 HRS, VOLUME= 1.43 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
58.8	0	0	0
59.0	114	11	11
60.0	1551	833	844
62.0	4595	6146	6990
64.0	11057	15652	22642
66.0	15634	26691	49333
68.0	11913	27547	76880
70.0	15803	27716	104596

STOR-IND METHOD
PEAK STORAGE = 39225 CF
PEAK ELEVATION= 65.2 FT
FLOOD ELEVATION= 70.0 FT
START ELEVATION= 58.8 FT
SPAN= 10-60 HRS, dt=.1 HRS
Tdet= 760.3 MIN (1.42 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	58.0'	**18" CULVERT**
			n=.013 L=150' S=.05'/' Ke=.6 Cc=.9 Cd=.56
2	1	58.8'	**3" ORIFICE/GRATE**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
3	1	66.8'	**1.5' SHARP-CRESTED RECTANGULAR WEIR X 2**
			Q=C L H^1.5 C=3.27+.4 H/.7 L=Length-2(.1 H)
4	S	68.5'	**12' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.53, 2.63, 2.72, 0, 0, 0, 0, 0
5	1	67.2'	**48" HORIZONTAL ORIFICE/GRATE**
			Q=.6 Area SQR(2gH) (Limited to weir flow @ low head)

Primary Discharge
└─1=Culvert
  ├─2=Orifice/Grate
  ├─3=Sharp-Crested Rectangular Weir
  └─5=Orifice/Grate

Secondary Discharge
└─4=Broad-Crested Rectangular Weir

1-YR.

SUBCATCHMENT 1 **PRE DEVELOPMENT DRAINAGE AREA**

PEAK= 11.49 CFS @ 12.15 HRS, VOLUME= 1.05 AF

ACRES	CN		
1.62	77	LIGHT BRUSH	SCS TR-20 METHOD
.27	98	OFFSITE BUILDING & PAVEMENT	TYPE II 24-HOUR
7.15	72	WOODS	RAINFALL= 3.36 IN
2.52	72	OFFSITE WOODS	SPAN= 10-60 HRS, dt=.1 HRS
11.56	73		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**OPEN FIELD**	13.1
Grass: Short n=.15 L=150' P2=3.4 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**SURFACE SWALE**	3.4
Unpaved Kv=16.1345 L=550' s=.0275 '/' V=2.68 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1120 ft Total Tc=	24.4

SUBCATCHMENT 2 **POST DEVELOPMENT DRAINAGE AREA**

PEAK= 26.99 CFS @ 12.05 HRS, VOLUME= 1.97 AF

ACRES	CN		
.70	39	PLAYING FIELD	SCS TR-20 METHOD
.98	98	BUILDING & PAVING	TYPE II 24-HOUR
.64	61	LAWN	RAINFALL= 3.36 IN
3.95	98	FUTURE BUILDING & PAVING	SPAN= 10-60 HRS, dt=.1 HRS
.27	98	OFFSITE BUILDING& PAVING	
6.47	74	WOODS & GREENSPACE	
2.52	72	OFFSITE GREENSPACE	
15.53	80		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**LAWN**	4.1
Grass: Short n=.15 L=35' P2=3.4 in s=.02 '/'		
TR-55 SHEET FLOW	**PAVING**	2.3
Smooth surfaces n=.011 L=165' P2=3.4 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=100' s=.0275 '/' V=3.37 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**DRAINAGE SYSTEM**	2.5
Paved Kv=20.3282 L=500' s=.0275 '/' V=3.37 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1220 ft Total Tc=	17.3

REACH 11 **Natural Channel Pre-Development**

Qin = 11.49 CFS @ 12.15 HRS, VOLUME= 1.05 AF
Qout= 11.28 CFS @ 12.16 HRS, VOLUME= 1.05 AF, ATTEN= 2%, LAG= .9 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 55.25 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 21 **Natural Channel Post Dev.**

Qin = .66 CFS @ 18.86 HRS, VOLUME= 1.97 AF
Qout= .66 CFS @ 18.87 HRS, VOLUME= 1.97 AF, ATTEN= 0%, LAG= .7 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 54.07 FT
PEAK VELOCITY= 2.5 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 25 **Emergnecy Spillway**

Qin = 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF
Qout= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.20	2.48	20.47
.40	5.12	65.51
.60	7.92	129.98
.86	11.80	240.07
1.20	17.28	426.54
1.60	24.32	706.23
2.00	32.00	1051.33

12' x 2' CHANNEL
SIDE SLOPE= .5 '/'
n= .03
LENGTH= 85 FT
SLOPE= .25 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-60 HRS, dt=.1 HRS

POND 2 **BMP STORM**

Qin = 26.99 CFS @ 12.05 HRS, VOLUME= 1.97 AF
Qout= .66 CFS @ 18.86 HRS, VOLUME= 1.97 AF, ATTEN= 98%, LAG= 408.5 MIN
Qpri= .66 CFS @ 18.86 HRS, VOLUME= 1.97 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
58.8	0	0	0
59.0	114	11	11
60.0	1551	833	844
62.0	4595	6146	6990
64.0	11057	15652	22642
66.0	15634	26691	49333
68.0	11913	27547	76880
70.0	15803	27716	104596

STOR-IND METHOD
PEAK STORAGE = 58563 CF
PEAK ELEVATION= 66.7 FT
FLOOD ELEVATION= 70.0 FT
START ELEVATION= 58.8 FT
SPAN= 10-60 HRS, dt=.1 HRS
Tdet= 1001.5 MIN (1.97 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	58.0'	**18" CULVERT** n=.013 L=150' S=.05'/' Ke=.6 Cc=.9 Cd=.56
2	1	58.8'	**3" ORIFICE/GRATE** Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
3	1	66.8'	**1.5' SHARP-CRESTED RECTANGULAR WEIR X 2** Q=C L H^1.5 C=3.27+.4 H/.7 L=Length-2(.1 H)
4	S	68.5'	**12' BROAD-CRESTED RECTANGULAR WEIR** Q=C L H^1.5 C=2.53, 2.63, 2.72, 0, 0, 0, 0, 0
5	1	67.2'	**48" HORIZONTAL ORIFICE/GRATE** Q=.6 Area SQR(2gH) (Limited to weir flow @ low head)

Primary Discharge
└─1=Culvert
  ├─2=Orifice/Grate
  ├─3=Sharp-Crested Rectangular Weir
  └─5=Orifice/Grate

Secondary Discharge
└─4=Broad-Crested Rectangular Weir

SUBCATCHMENT 1 **PRE DEVELOPMENT DRAINAGE AREA**

PEAK= 25.80 CFS @ 12.14 HRS, VOLUME= 2.22 AF

ACRES	CN		
1.62	77	LIGHT BRUSH	SCS TR-20 METHOD
.27	98	OFFSITE BUILDING & PAVEMENT	TYPE II 24-HOUR
7.15	72	WOODS	RAINFALL= 5.04 IN
2.52	72	OFFSITE WOODS	SPAN= 10-60 HRS, dt=.1 HRS
11.56	73		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**OPEN FIELD**	13.1
Grass: Short n=.15 L=150' P2=3.4 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**SURFACE SWALE**	3.4
Unpaved Kv=16.1345 L=550' s=.0275 '/' V=2.68 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		
	Total Length= 1120 ft Total Tc=	24.4

SUBCATCHMENT 2 **POST DEVELOPMENT DRAINAGE AREA**

PEAK= 52.47 CFS @ 12.05 HRS, VOLUME= 3.73 AF

ACRES	CN		
.70	39	PLAYING FIELD	SCS TR-20 METHOD
.98	98	BUILDING & PAVING	TYPE II 24-HOUR
.64	61	LAWN	RAINFALL= 5.04 IN
3.95	98	FUTURE BUILDING & PAVING	SPAN= 10-60 HRS, dt=.1 HRS
.27	98	OFFSITE BUILDING& PAVING	
6.47	74	WOODS & GREENSPACE	
2.52	72	OFFSITE GREENSPACE	
15.53	80		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**LAWN**	4.1
Grass: Short n=.15 L=35' P2=3.4 in s=.02 '/'		
TR-55 SHEET FLOW	**PAVING**	2.3
Smooth surfaces n=.011 L=165' P2=3.4 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=100' s=.0275 '/' V=3.37 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**DRAINAGE SYSTEM**	2.5
Paved Kv=20.3282 L=500' s=.0275 '/' V=3.37 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		
	Total Length= 1220 ft Total Tc=	17.3

REACH 11 **Natural Channel Pre-Development**

Qin = 25.80 CFS @ 12.14 HRS, VOLUME= 2.22 AF
Qout= 25.72 CFS @ 12.14 HRS, VOLUME= 2.22 AF, ATTEN= 0%, LAG= .2 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.15 FT
PEAK VELOCITY= 3.0 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 21 **Natural Channel Post Dev.**

Qin = 21.43 CFS @ 12.34 HRS, VOLUME= 3.73 AF
Qout= 20.80 CFS @ 12.35 HRS, VOLUME= 3.73 AF, ATTEN= 3%, LAG= .7 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.04 FT
PEAK VELOCITY= 2.7 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 25 **Emergnecy Spillway**

Qin = 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF
Qout= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF, ATTEN= 0%, LAG= 0.0 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.20	2.48	20.47
.40	5.12	65.51
.60	7.92	129.98
.86	11.80	240.07
1.20	17.28	426.54
1.60	24.32	706.23
2.00	32.00	1051.33

12' x 2' CHANNEL
SIDE SLOPE= .5 '/'
n= .03
LENGTH= 85 FT
SLOPE= .25 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= 0.00 FT
PEAK VELOCITY= 0.0 FPS
TRAVEL TIME = 0.0 MIN
SPAN= 10-60 HRS, dt=.1 HRS

POND 2 **BMP STORM**

Qin = 52.47 CFS @ 12.05 HRS, VOLUME= 3.73 AF
Qout= 21.43 CFS @ 12.34 HRS, VOLUME= 3.73 AF, ATTEN= 59%, LAG= 17.4 MIN
Qpri= 21.43 CFS @ 12.34 HRS, VOLUME= 3.73 AF
Qsec= 0.00 CFS @ 0.00 HRS, VOLUME= 0.00 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
58.8	0	0	0
59.0	114	11	11
60.0	1551	833	844
62.0	4595	6146	6990
64.0	11057	15652	22642
66.0	15634	26691	49333
68.0	11913	27547	76880
70.0	15803	27716	104596

STOR-IND METHOD
PEAK STORAGE = 72464 CF
PEAK ELEVATION= 67.7 FT
FLOOD ELEVATION= 70.0 FT
START ELEVATION= 58.8 FT
SPAN= 10-60 HRS, dt=.1 HRS
Tdet= 609.5 MIN (3.72 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	58.0'	**18" CULVERT**
			n=.013 L=150' S=.05'/' Ke=.6 Cc=.9 Cd=.56
2	1	58.8'	**3" ORIFICE/GRATE**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
3	1	66.8'	**1.5' SHARP-CRESTED RECTANGULAR WEIR X 2**
			Q=C L H^1.5 C=3.27+.4 H/.7 L=Length-2(.1 H)
4	S	68.5'	**12' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.53, 2.63, 2.72, 0, 0, 0, 0, 0
5	1	67.2'	**48" HORIZONTAL ORIFICE/GRATE**
			Q=.6 Area SQR(2gH) (Limited to weir flow @ low head)

Primary Discharge
└─1=Culvert
  ├─2=Orifice/Grate
  ├─3=Sharp-Crested Rectangular Weir
  └─5=Orifice/Grate

Secondary Discharge
└─4=Broad-Crested Rectangular Weir

10-YR

SUBCATCHMENT 1 **PRE DEVELOPMENT DRAINAGE AREA**

PEAK= 37.05 CFS @ 12.13 HRS, VOLUME= 3.15 AF

ACRES	CN	
1.62	77	LIGHT BRUSH
.27	98	OFFSITE BUILDING & PAVEMENT
7.15	72	WOODS
2.52	72	OFFSITE WOODS
11.56	73	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 6.24 IN
SPAN= 10-60 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**OPEN FIELD**	13.1
Grass: Short n=.15 L=150' P2=3.4 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**SURFACE SWALE**	3.4
Unpaved Kv=16.1345 L=550' s=.0275 '/' V=2.68 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1120 ft Total Tc=	24.4

SUBCATCHMENT 2 **POST DEVELOPMENT DRAINAGE AREA**

PEAK= 71.36 CFS @ 12.04 HRS, VOLUME= 5.04 AF

ACRES	CN	
.70	39	PLAYING FIELD
.98	98	BUILDING & PAVING
.64	61	LAWN
3.95	98	FUTURE BUILDING & PAVING
.27	98	OFFSITE BUILDING& PAVING
6.47	74	WOODS & GREENSPACE
2.52	72	OFFSITE GREENSPACE
15.53	80	

SCS TR-20 METHOD
TYPE II 24-HOUR
RAINFALL= 6.24 IN
SPAN= 10-60 HRS, dt=.1 HRS

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**LAWN**	4.1
Grass: Short n=.15 L=35' P2=3.4 in s=.02 '/'		
TR-55 SHEET FLOW	**PAVING**	2.3
Smooth surfaces n=.011 L=165' P2=3.4 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=100' s=.0275 '/' V=3.37 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**DRAINAGE SYSTEM**	2.5
Paved Kv=20.3282 L=500' s=.0275 '/' V=3.37 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1220 ft Total Tc=	17.3

REACH 11 **Natural Channel Pre-Development**

Qin = 37.05 CFS @ 12.13 HRS, VOLUME= 3.15 AF
Qout= 36.72 CFS @ 12.14 HRS, VOLUME= 3.15 AF, ATTEN= 1%, LAG= .5 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.37 FT
PEAK VELOCITY= 3.3 FPS
TRAVEL TIME = .2 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 21 **Natural Channel Post Dev.**

Qin = 30.03 CFS @ 12.30 HRS, VOLUME= 5.04 AF
Qout= 29.24 CFS @ 12.36 HRS, VOLUME= 5.04 AF, ATTEN= 3%, LAG= 3.2 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.22 FT
PEAK VELOCITY= 3.1 FPS
TRAVEL TIME = .3 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 25 **Emergnecy Spillway**

Qin = 5.06 CFS @ 12.30 HRS, VOLUME= .07 AF
Qout= 4.87 CFS @ 12.30 HRS, VOLUME= .07 AF, ATTEN= 4%, LAG= .2 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.20	2.48	20.47
.40	5.12	65.51
.60	7.92	129.98
.86	11.80	240.07
1.20	17.28	426.54
1.60	24.32	706.23
2.00	32.00	1051.33

12' x 2' CHANNEL
SIDE SLOPE= .5 '/'
n= .03
LENGTH= 85 FT
SLOPE= .25 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .05 FT
PEAK VELOCITY= 8.3 FPS
TRAVEL TIME = .2 MIN
SPAN= 10-60 HRS, dt=.1 HRS

POND 2 **BMP STORM**

Qin = 71.36 CFS @ 12.04 HRS, VOLUME= 5.04 AF
Qout= 30.22 CFS @ 12.30 HRS, VOLUME= 5.04 AF, ATTEN= 58%, LAG= 15.4 MIN
Qpri= 25.17 CFS @ 12.30 HRS, VOLUME= 4.97 AF
Qsec= 5.06 CFS @ 12.30 HRS, VOLUME= .07 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
58.8	0	0	0
59.0	114	11	11
60.0	1551	833	844
62.0	4595	6146	6990
64.0	11057	15652	22642
66.0	15634	26691	49333
68.0	11913	27547	76880
70.0	15803	27716	104596

STOR-IND METHOD
PEAK STORAGE = 87999 CF
PEAK ELEVATION= 68.8 FT
FLOOD ELEVATION= 70.0 FT
START ELEVATION= 58.8 FT
SPAN= 10-60 HRS, dt=.1 HRS
Tdet= 461.1 MIN (5.03 AF)

#	ROUTE	INVERT	OUTLET DEVICES
1	P	58.0'	**18" CULVERT**
			n=.013 L=150' S=.05'/' Ke=.6 Cc=.9 Cd=.56
2	1	58.8'	**3" ORIFICE/GRATE**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
3	1	66.8'	**1.5' SHARP-CRESTED RECTANGULAR WEIR X 2**
			Q=C L H^1.5 C=3.27+.4 H/.7 L=Length-2(.1 H)
4	S	68.5'	**12' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.53, 2.63, 2.72, 0, 0, 0, 0, 0
5	1	67.2'	**48" HORIZONTAL ORIFICE/GRATE**
			Q=.6 Area SQR(2gH) (Limited to weir flow @ low head)

Primary Discharge
└─1=Culvert
  ├─2=Orifice/Grate
  ├─3=Sharp-Crested Rectangular Weir
  └─5=Orifice/Grate

Secondary Discharge
└─4=Broad-Crested Rectangular Weir

25-12

SUBCATCHMENT 1 **PRE DEVELOPMENT DRAINAGE AREA**

PEAK= 51.10 CFS @ 12.13 HRS, VOLUME= 4.29 AF

ACRES	CN		
1.62	77	LIGHT BRUSH	SCS TR-20 METHOD
.27	98	OFFSITE BUILDING & PAVEMENT	TYPE II 24-HOUR
7.15	72	WOODS	RAINFALL= 7.68 IN
2.52	72	OFFSITE WOODS	SPAN= 10-60 HRS, dt=.1 HRS
11.56	73		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**OPEN FIELD**	13.1
Grass: Short n=.15 L=150' P2=3.4 in s=.02 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**SURFACE SWALE**	3.4
Unpaved Kv=16.1345 L=550' s=.0275 '/' V=2.68 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1120 ft Total Tc=	24.4

SUBCATCHMENT 2 **POST DEVELOPMENT DRAINAGE AREA**

PEAK= 94.34 CFS @ 12.04 HRS, VOLUME= 6.63 AF

ACRES	CN		
.70	39	PLAYING FIELD	SCS TR-20 METHOD
.98	98	BUILDING & PAVING	TYPE II 24-HOUR
.64	61	LAWN	RAINFALL= 7.68 IN
3.95	98	FUTURE BUILDING & PAVING	SPAN= 10-60 HRS, dt=.1 HRS
.27	98	OFFSITE BUILDING& PAVING	
6.47	74	WOODS & GREENSPACE	
2.52	72	OFFSITE GREENSPACE	
15.53	80		

Method	Comment	Tc (min)
TR-55 SHEET FLOW	**LAWN**	4.1
Grass: Short n=.15 L=35' P2=3.4 in s=.02 '/'		
TR-55 SHEET FLOW	**PAVING**	2.3
Smooth surfaces n=.011 L=165' P2=3.4 in s=.01 '/'		
SHALLOW CONCENTRATED/UPLAND FLOW	**Segment ID:**	.5
Paved Kv=20.3282 L=100' s=.0275 '/' V=3.37 fps		
SHALLOW CONCENTRATED/UPLAND FLOW	**DRAINAGE SYSTEM**	2.5
Paved Kv=20.3282 L=500' s=.0275 '/' V=3.37 fps		
CHANNEL FLOW	**WOODED RAVINE**	7.9
a=5 sq-ft Pw=7.5' r=.667'		
s=.0547 '/' n=.3 V=.88 fps L=420' Capacity=4.4 cfs		

	Total Length= 1220 ft Total Tc=	17.3

REACH 11 **Natural Channel Pre-Development**

Qin = 51.10 CFS @ 12.13 HRS, VOLUME= 4.29 AF
Qout= 50.64 CFS @ 12.14 HRS, VOLUME= 4.29 AF, ATTEN= 1%, LAG= .5 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.64 FT
PEAK VELOCITY= 3.7 FPS
TRAVEL TIME = .2 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 21 **Natural Channel Post Dev.**

Qin = 65.97 CFS @ 12.21 HRS, VOLUME= 6.63 AF
Qout= 63.65 CFS @ 12.22 HRS, VOLUME= 6.63 AF, ATTEN= 4%, LAG= .5 MIN

ELEV (FT)	END AREA (SQ-FT)	PERIM (FT)
54.00	0.00	0.00
56.00	7.00	8.08
58.00	28.00	15.08
60.00	64.00	22.99

SPECIAL 50' CHANNEL
n= .15
LENGTH= 50 FT
SLOPE= .08 FT/FT
CAPACITY= 354.9 CFS

STOR-IND+TRANS METHOD
PEAK ELEV.= 56.92 FT
PEAK VELOCITY= 3.8 FPS
TRAVEL TIME = .2 MIN
SPAN= 10-60 HRS, dt=.1 HRS

REACH 25 **Emergnecy Spillway**

Qin = 39.88 CFS @ 12.21 HRS, VOLUME= .78 AF
Qout= 39.75 CFS @ 12.21 HRS, VOLUME= .78 AF, ATTEN= 0%, LAG= .1 MIN

DEPTH (FT)	END AREA (SQ-FT)	DISCH (CFS)
0.00	0.00	0.00
.20	2.48	20.47
.40	5.12	65.51
.60	7.92	129.98
.86	11.80	240.07
1.20	17.28	426.54
1.60	24.32	706.23
2.00	32.00	1051.33

12' x 2' CHANNEL
SIDE SLOPE= .5 '/'
n= .03
LENGTH= 85 FT
SLOPE= .25 FT/FT

STOR-IND+TRANS METHOD
PEAK DEPTH= .29 FT
PEAK VELOCITY= 11.0 FPS
TRAVEL TIME = .1 MIN
SPAN= 10-60 HRS, dt=.1 HRS

POND 2 **BMP STORM**

Qin = 94.34 CFS @ 12.04 HRS, VOLUME= 6.63 AF
Qout= 66.10 CFS @ 12.21 HRS, VOLUME= 6.63 AF, ATTEN= 30%, LAG= 10.0 MIN
Qpri= 26.22 CFS @ 12.21 HRS, VOLUME= 5.85 AF
Qsec= 39.88 CFS @ 12.21 HRS, VOLUME= .78 AF

ELEVATION (FT)	AREA (SF)	INC.STOR (CF)	CUM.STOR (CF)
58.8	0	0	0
59.0	114	11	11
60.0	1551	833	844
62.0	4595	6146	6990
64.0	11057	15652	22642
66.0	15634	26691	49333
68.0	11913	27547	76880
70.0	15803	27716	104596

STOR-IND METHOD
PEAK STORAGE = 99833 CF
PEAK ELEVATION= 69.7 FT DHW
FLOOD ELEVATION= 70.0 FT
START ELEVATION= 58.8 FT
SPAN= 10-60 HRS, dt=.1 HRS
Tdet= 357.2 MIN (6.62 AF)

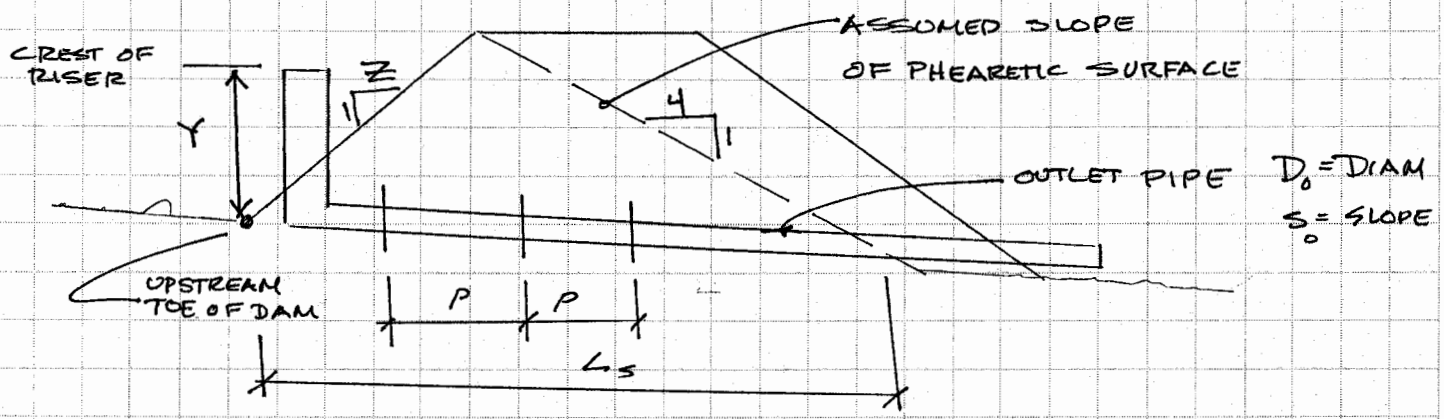
#	ROUTE	INVERT	OUTLET DEVICES
1	P	58.0'	**18" CULVERT**
			n=.013 L=150' S=.05'/' Ke=.6 Cc=.9 Cd=.56
2	1	58.8'	**3" ORIFICE/GRATE**
			Q=.6 PI r^2 SQR(2g) SQR(H-r) (Use H/2 if H<d)
3	1	66.8'	**1.5' SHARP-CRESTED RECTANGULAR WEIR X 2**
			Q=C L H^1.5 C=3.27+.4 H/.7 L=Length-2(.1 H)
4	S	68.5'	**12' BROAD-CRESTED RECTANGULAR WEIR**
			Q=C L H^1.5 C=2.53, 2.63, 2.72, 0, 0, 0, 0, 0
5	1	67.2'	**48" HORIZONTAL ORIFICE/GRATE**
			Q=.6 Area SQR(2gH) (Limited to weir flow @ low head)

Primary Discharge
└─1=Culvert
  ├─2=Orifice/Grate
  ├─3=Sharp-Crested Rectangular Weir
  └─5=Orifice/Grate

100-YR

Secondary Discharge
└─4=Broad-Crested Rectangular Weir

SEEPAGE COLLAR



$$Y = (67.2 - 57.75) = 9.45$$

$$L_s = Y(Z+4)\left(1 + \frac{S_o}{.25 - S_o}\right) = 9.45 \times 7 \times \left(1 + \frac{.0293}{.25 - .0293}\right) \cong 75'$$

INCREASE BY 10% $\Delta L_s = 7.5'$

USE 4x4 COLLAR

$$S = 4 \quad D_o = 1.5$$

$$V = \frac{4 - 1.5}{2} = 1.25$$

NUMBER OF COLLARS FOR $\Delta L_s = 7.5$

$$N = \frac{7.5}{2 \times 1.25} = 3 \quad \text{USE 3 COLLARS}$$

DRAINAGE CALCULATIONS

STORM - SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. Faith Baptist Church
COUNTY _____ DISTRICT _____
DESCRIPTION _____

SHEET _____ OF _____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
3	5	EXISTING			15"			4.54	91.44	90.56	88'	0.01	15"	6.46	5.70	15.4	
5	7	1.67	0.80	1.33	2.10	13.07	5.6	11.76	89.75	80.62	265'	0.0345	15"	12.00	11.14	23.8	
7	8	1.25	0.80	1.00	3.10	13.84	5.6	17.36	80.50	80.14	60'	0.0060	24"	17.52	6.36	9.43	

L-79

EXISTING 15" FROM EXISTING #3 TO #5
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\faithbap.fm2
Worksheet	EXISTING 15" FROM #3
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010000	ft/ft
Diameter	15.00	in
Discharge	4.54	cfs

Results		
Depth	0.77	ft
Flow Area	0.80	ft^2
Wetted Perimeter	2.26	ft
Top Width	1.21	ft
Critical Depth	0.86	ft
Percent Full	61.82	
Critical Slope	0.007293	ft/ft
Velocity	5.70	ft/s
Velocity Head	0.50	ft
Specific Energy	1.28	ft
Froude Number	1.24	
Maximum Discharge	6.95	cfs
Full Flow Capacity	6.46	cfs
Full Flow Slope	0.004940	ft/ft
Flow is supercritical.		

Notes:

EXISTING 15" RCP @ 1.00% SLOPE

FROM #5 TO #7
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\faithbap.fm2
Worksheet	FROM #5 TO #7
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.034500	ft/ft
Diameter	15.00	in
Discharge	11.76	cfs

Results		
Depth	1.00	ft
Flow Area	1.06	ft^2
Wetted Perimeter	2.77	ft
Top Width	1.00	ft
Critical Depth	1.21	ft
Percent Full	80.23	
Critical Slope	0.029223	ft/ft
Velocity	11.14	ft/s
Velocity Head	1.93	ft
Specific Energy	2.93	ft
Froude Number	1.91	
Maximum Discharge	12.91	cfs
Full Flow Capacity	12.00	cfs
Full Flow Slope	0.033145	ft/ft
Flow is supercritical.		

Notes:

265' OF 15" RCP @ 3.45% SLOPE

FROM #7 TO #8
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\faithbap.fm2
Worksheet	From 7 to 8
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.006000	ft/ft
Diameter	24.00	in
Discharge	17.00	cfs

Results		
Depth	19.1	in
Flow Area	2.68	ft^2
Wetted Perimeter	4.40	ft
Top Width	1.62	ft
Critical Depth	1.49	ft
Percent Full	79.40	
Critical Slope	0.006938	ft/ft
Velocity	6.36	ft/s
Velocity Head	0.63	ft
Specific Energy	2.22	ft
Froude Number	0.87	
Maximum Discharge	18.85	cfs
Full Flow Capacity	17.52	cfs
Full Flow Slope	0.005648	ft/ft
Flow is subcritical.		

Notes:

60' - 24" RCP @ 0.60% SLOPE

DITCH FLOW FROM #8 T0 #9
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\faithbap.fm2
Worksheet	Ditch flow From 8 to 9
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.018900	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	21.23	cfs

Results		
Depth	1.32	ft
Flow Area	6.15	ft^2
Wetted Perimeter	7.92	ft
Top Width	7.29	ft
Critical Depth	1.07	ft
Critical Slope	0.045336	ft/ft
Velocity	3.45	ft/s
Velocity Head	0.19	ft
Specific Energy	1.51	ft
Froude Number	0.66	
Flow is subcritical.		

DITCH FLOW FROM #9 TO #10
Worksheet for Trapezoidal Channel

Project Description	
Project File	c:\haestad\fmw\faithbap.fm2
Worksheet	Ditch flow from 9 to 10
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.020000	ft/ft
Left Side Slope	2.000000	H : V
Right Side Slope	2.000000	H : V
Bottom Width	2.00	ft
Discharge	22.15	cfs

Results		
Depth	1.33	ft
Flow Area	6.21	ft^2
Wetted Perimeter	7.96	ft
Top Width	7.33	ft
Critical Depth	1.10	ft
Critical Slope	0.045093	ft/ft
Velocity	3.56	ft/s
Velocity Head	0.20	ft
Specific Energy	1.53	ft
Froude Number	0.68	
Flow is subcritical.		

STORMWATER MANAGEMENT

AND BMP CALCULATIONS

FOR

FAITH BAPTIST CHURCH

SP-124-97
VOID
ORIGINAL BASIN NEAR EXIST. CHURCH SITE - CHANGED LOCATION DUE TO PROPERTY ACQUISITIONS,

OCTOBER 15, 1997

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

5544 Greenwich Road, Virginia Beach, VA 23462
(804) 473-2000 FAX: (804) 497-7933

201 Packets Court, Williamsburg, VA 23185
(804) 253-2975 FAX: (804) 229-0049

PRE/POST-DEVELOPED CALCULATIONS

FAITH BAPTIST CHURCH

STORMWATER MANAGEMENT

PRE-DEVELOPED DRAINAGE CALCULATIONS:

Tc = overland flow -

Drainage Area	=	1.00 Acres.
Coefficient of Runoff	=	0.25
CA	=	0.25
Time of Concentration	=	15.0 minute

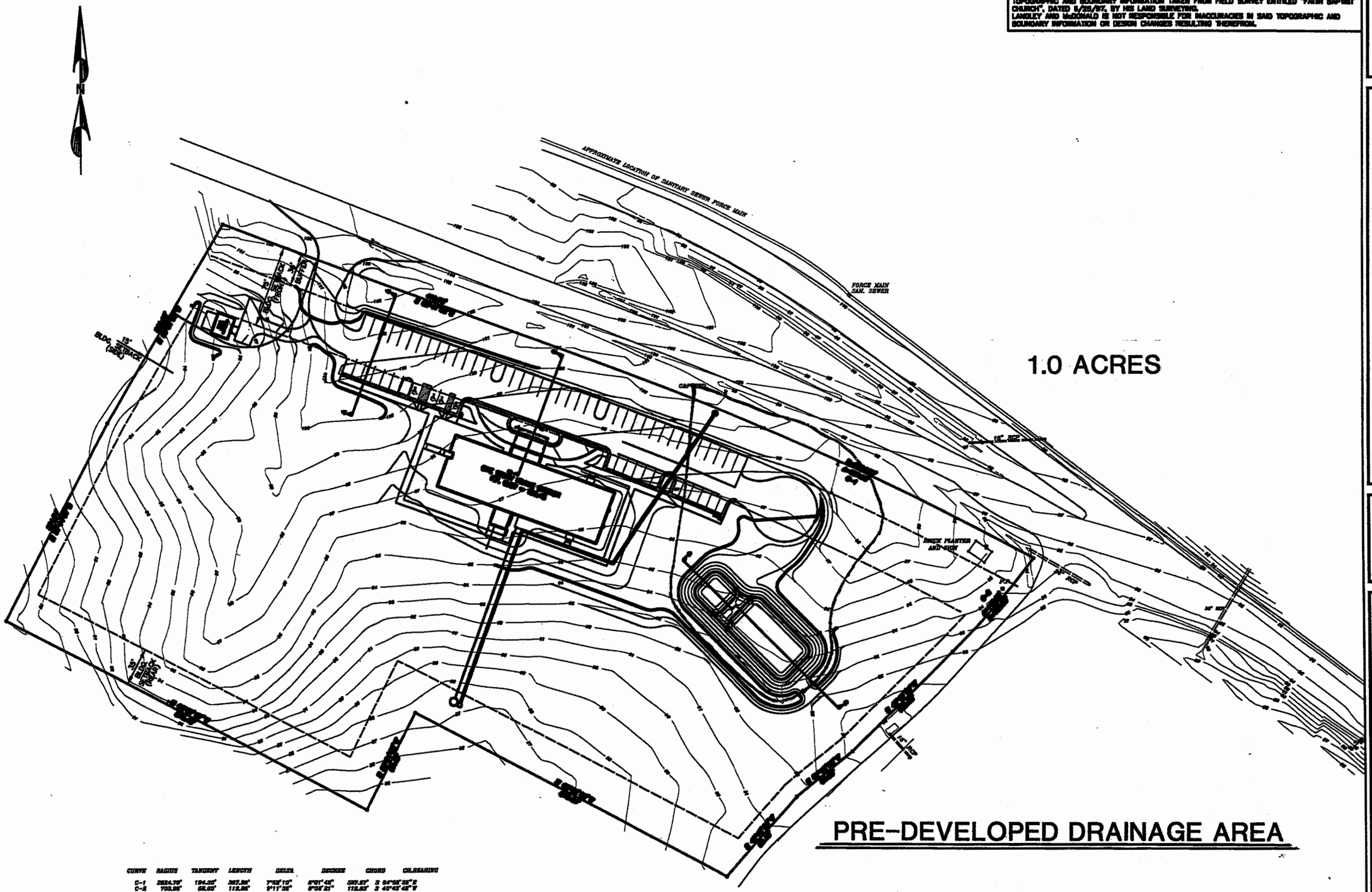
RAINFALL INTENSITIES:

2 Year Frequency	=	3.9
10 Year Frequency	=	5.3
25 Year Frequency	=	6.0
100 Year Frequency	=	7.2

PRE-DEVELOPED DISCHARGE (CUBIC FEET PER SECOND):

2 Year Storm	=	0.98 cfs
10 Year Storm	=	1.33 cfs
25 Year Storm	=	1.50 cfs
100 Year Storm	=	1.80 cfs

TOPOGRAPHIC AND BOUNDARY INFORMATION TAKEN FROM FIELD SURVEY ENTITLED "FAITH BAPTIST CHURCH", DATED 8/23/97, BY MS LAND SURVEYING.
LANGLEY AND McDONALD IS NOT RESPONSIBLE FOR INACCURACIES IN SAID TOPOGRAPHIC AND BOUNDARY INFORMATION OR DESIGN CHANGES RESULTING THEREFROM.



PRE-DEVELOPED DRAINAGE AREA

CURVE	RADIUS	TANGENT	LENGTH	DELTA	DEGREE	CHORD	CH.BEARING
C-1	2824.78'	194.35'	387.56'	7°52'10"	2°01'42"	387.27'	S 64°58'35" E
C-2	703.96'	58.69'	112.86'	9°11'35"	8°08'21"	112.63'	S 40°43'48" W

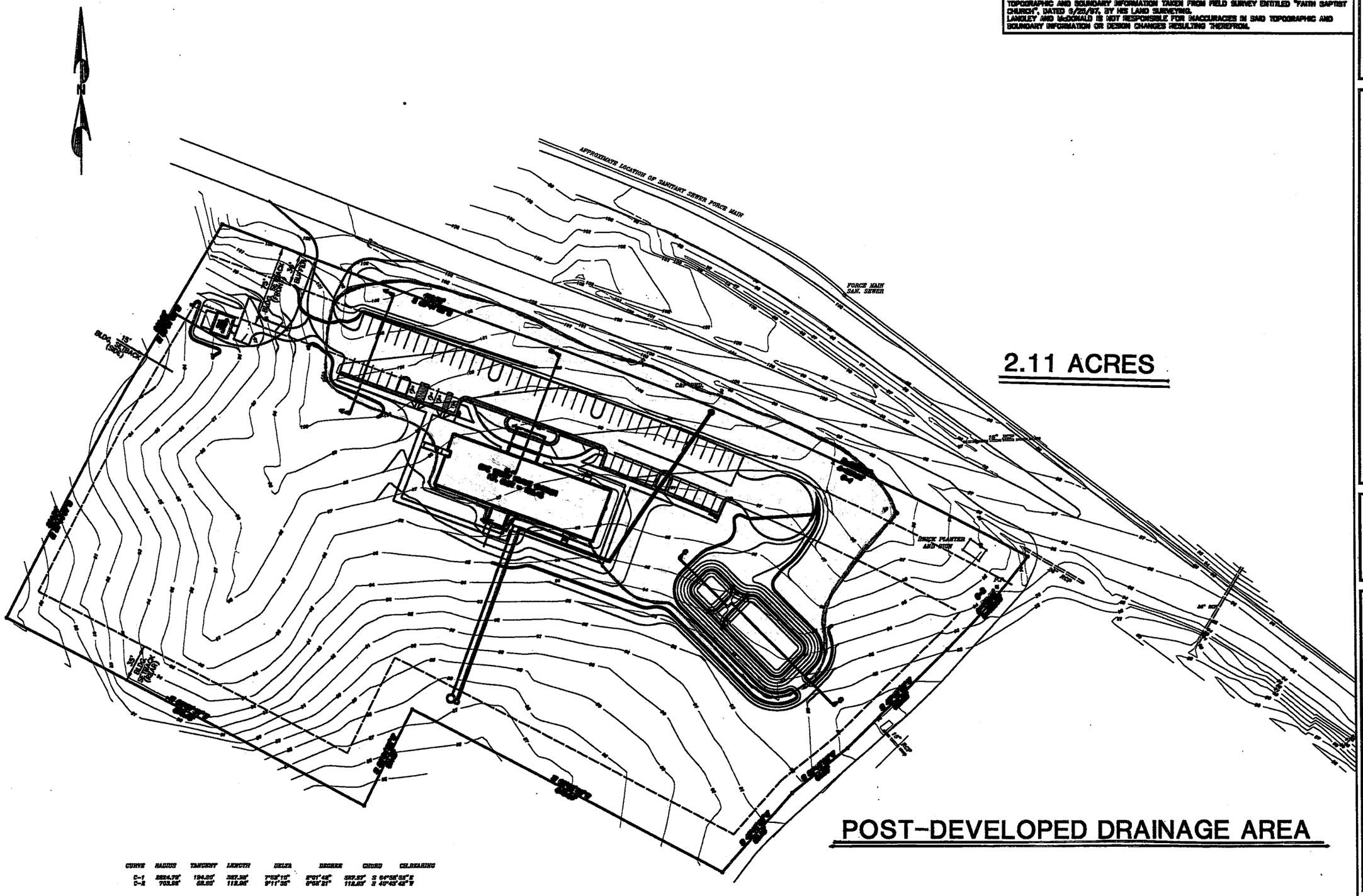
PLAN SCALE: 1"=40'
GRAPHIC SCALE IN FEET
0 20 40 80 120

Langley and McDonald, P.C.
Engineers • Surveyors • Planners
Landscape Architects • Environmental Consultants
VIRGINIA BEACH WILLIAMSBURG

DES. DWN. CHK. DATE

PROJ. NO.
SCALE:
SHEET OF
DWG.

TOPOGRAPHIC AND BOUNDARY INFORMATION TAKEN FROM FIELD SURVEY ENTITLED "FAITH BAPTIST CHURCH", DATED 3/25/97, BY HIS LAND SURVEYING.
LANGLEY AND McDONALD IS NOT RESPONSIBLE FOR INACCURACIES IN SAID TOPOGRAPHIC AND BOUNDARY INFORMATION OR DESIGN CHANGES RESULTING THEREFROM.



CURVE	RADIUS	TANGENT	LENGTH	DELTA	DEGREE	CHORD	CH.BEARING
C-1	8824.78'	194.00'	387.90'	7°52'10"	0°01'45"	387.87'	S 64°58'55" E
C-2	703.06'	58.00'	112.06'	9°11'36"	0°08'21"	111.83'	S 40°43'42" W

PLAN SCALE: 1"=40'
GRAPHIC SCALE IN FEET
0 20 40 80 120

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VIRGINIA BEACH WILLIAMSBURG

REV.	DWN.	CHK.	DATE

PROJ. NO.
SCALE:
SHEET OF
DWG.

B.M.P. CALCULATIONS

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
C-3 (70% INFILT)	11	x	.88	=	9.68
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: _____

B. NATURAL OPEN SPACE CREDIT

Fraction of Site	Natural Open Space Credit		Points for Natural Open Space
2.4 ÷ 0.08 = 0.032 / 3.2%	.32 (0.1 per 1%)	=	0.32

.32

C. TOTAL WEIGHTED POINTS

9.68	+	0.32	=	10.0
Structural BMP Points		Natural Open Space Points		TOTAL

0.08 Ac = 3,484.8 Sq ft.

site = 2.25 ac / 2.75 = 82% 11 × .82 = 9.02 pt

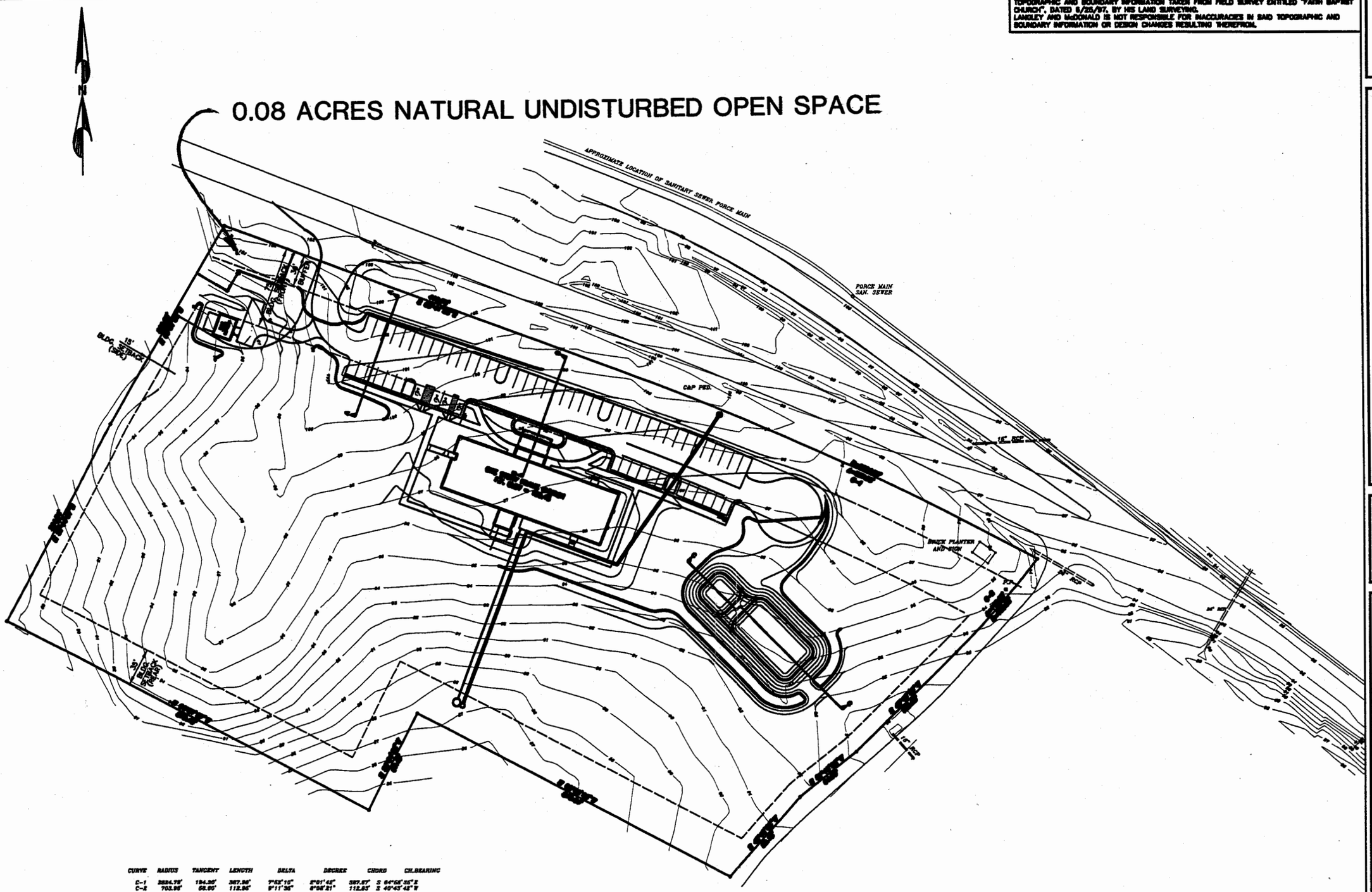
.98 – NOS

x / 2.75 × 10 = 0.98

10x = 2.7

x = 0.27 ac

TOPOGRAPHIC AND BOUNDARY INFORMATION TAKEN FROM FIELD SURVEY ENTITLED "FAITH BAPTIST CHURCH", DATED 8/25/97, BY HIS LAND SURVEYING.
LANGLEY AND McDONALD IS NOT RESPONSIBLE FOR INACCURACIES IN SAID TOPOGRAPHIC AND BOUNDARY INFORMATION OR DESIGN CHANGES RESULTING THEREFROM.



CURVE	RADIUS	TANGENT	LENGTH	DELTA	DEGREE	CHORD	CH.BEARING
C-1	2834.79'	194.30'	387.96'	7°53'10"	2°01'45"	387.57'	S 64°58'35" E
C-2	703.96'	58.90'	112.95'	9°11'36"	8°08'21"	112.83'	S 40°43'48" W

PLAN SCALE: 1"=40'
GRAPHIC SCALE IN FEET
0 20 40 80 120

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INFLOW HYDROGRAPH

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

```
*****************************************************************************
*****************************************************************************
*                                                                           *
*                                                                           *
*                        MODIFIED RATIONAL METHOD                           *
*            ---- Grand Summary For All Storm Frequencies ----              *
*                                                                           *
*                                                                           *
*****************************************************************************
*****************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

Area = 2.25 acres Tc = 12.80 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
2	0.677	98	1.388	2.12	0.98	12,438	9,180
10	0.677	101	1.869	2.85	1.33	17,258	12,717
25	0.745	158	1.497	2.51	1.50	23,779	16,093
100	0.846	157	1.911	3.64	1.80	34,281	25,112

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MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

```
*****************************************************************
*  RETURN FREQUENCY:   2 yr     |  Allowable Outflow:     0.98 cfs    *
*  'C' Adjustment: 1.000        |  Required Storage:     9,180 cu.ft. *
*---------------------------------------------------------------*
*  Peak Inflow:    2.12 cfs       Inflow .HYD stored: 2FIN    .HYD   *
*****************************************************************
```

```
|                Td =  98 minutes                  |  Return Freq:     2 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.00
|                                                  |
|                                                  |
|                Tc=   12.80  minutes              |
|                I =   4.264  in/hr                |  Area (ac):      2.25
|              . Q =    6.50  cfs                  |  Weighted C:     0.68
|            .|.                                   |  Adjusted C:     0.68
F           .   .                                  |
L          .  |  .            Required Storage     |
O         .       .        .--     9,180 cu.ft.   |  Td=       98 minutes
W        .    |    .       |                      |  I =    1.388 in/hr
        .     x x x x x x x|x x x x x x x x x x x  Q =     2.12 cfs
c      .                   |
f     .    x                                       x
s    .                                               o   Q=    0.98 cfs
    .   x                                 o         |x  (Allow.Outflow)
   .  x                     .     o                |
  .  x                 o    .       NOT TO SCALE    |   x
 . x       o                .       ============    |
 o                          .                       |       x
`-------------------------------------------------|------------
                                                 104.87 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

**** Modified Rational Hydrograph *****

Weighted C = 0.677 Area= 2.250 acres Tc = 12.80 minutes

Adjusted C = 0.677 Td= 98.00 min. I= 1.39 in/hr Qp= 2.12 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 2FIN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.013	0.13	0.30	0.46	0.63	0.79	0.96	1.12
0.130	1.29	1.45	1.62	1.78	1.95	2.12	2.12
0.247	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.363	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.480	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.597	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.713	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.830	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0.947	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.063	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.180	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.297	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.413	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.530	2.12	2.12	2.12	2.12	2.12	2.12	2.12
1.647	1.98	1.82	1.65	1.49	1.32	1.16	0.99
1.763	0.83	0.66	0.50	0.33	0.17	0.00	

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1	0.670	2.18						
ROOF DRAINS								
	0.900	0.07						
			12.80	0.677	0.677	4.264	2.25	6.50

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 0.98 cfs

Hydrograph file duration= 98.00 minutes
Hydrograph file: 2FIN .HYD Tc = 12.80 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.677	0.677	13	4.264	2.25	6.50	4,989	4,237
0.677	0.677	15	4.000	2.25	6.09	5,485	4,668
0.677	0.677	20	3.500	2.25	5.33	6,399	5,435
0.677	0.677	30	2.750	2.25	4.19	7,542	6,283
0.677	0.677	40	2.250	2.25	3.43	8,227	6,675
0.677	0.677	50	2.000	2.25	3.05	9,142	7,295
0.677	0.677	60	1.800	2.25	2.74	9,873	7,733
********** Storage Maximum							
0.677	0.677	98	1.388	2.25	2.12	12,438	9,180
0.677	0.677	120	1.150	2.25	1.75	12,615	8,711
0.677	0.677	180	0.750	2.25	1.14	12,341	6,673
0.677	0.677	240	0.600	2.25	0.91	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

```
*****************************************************************************
*  RETURN FREQUENCY:  10 yr      |  Allowable Outflow:     1.33 cfs     *
*  'C' Adjustment: 1.000         |  Required Storage:    12,717 cu.ft. *
*---------------------------------------------------------------------------*
*  Peak Inflow:    2.85 cfs      |  Inflow .HYD stored: 10FIN    .HYD    *
*****************************************************************************
```

```
 |                Td = 101 minutes                    |  Return Freq:    10 yr
/------- Approx. Duration for Max. Storage ------/     |  C adj.factor: 1.00
 |                                                    |
 |                                                    |
 |                Tc=   12.80  minutes                |
 |                I =   5.470  in/hr                  |  Area (ac):      2.25
 |              . Q =    8.33  cfs                   |  Weighted C:     0.68
 |            .|.                                     |  Adjusted C:     0.68
F|          .   .                                     |
L|         .  |  .              Required Storage      |
O|        .       .         .--    12,717 cu.ft.     |  Td=      101 minutes
W|       .    |    .                                 |  I =    1.869 in/hr
 |      .     x x x x x x x|x x x x x x x x x x x x  |  Q =     2.85 cfs
c|     .                   |                          |
f|    .    x                                          |  x
s|   .                                                |    o   Q=    1.33 cfs
 |  .   x                                 o           |  x  (Allow.Outflow)
 | .  x                     .     o                   |
 |  .  x               o    .        NOT TO SCALE     |   x
 |  . x       o              .        ============    |
 | o                         .                        |       x
 `-----------------------------------------------------|------------
                                                      107.82 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

**** Modified Rational Hydrograph *****

Weighted C = 0.677 Area= 2.250 acres Tc = 12.80 minutes

Adjusted C = 0.677 Td= 101.00 min. I= 1.87 in/hr Qp= 2.85 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 10FIN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 0.017 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.013	0.18	0.40	0.62	0.85	1.07	1.29	1.51
0.130	1.74	1.96	2.18	2.40	2.63	2.85	2.85
0.247	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.363	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.480	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.597	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.713	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.830	2.85	2.85	2.85	2.85	2.85	2.85	2.85
0.947	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.063	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.180	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.297	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.413	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.530	2.85	2.85	2.85	2.85	2.85	2.85	2.85
1.647	2.85	2.85	2.85	2.67	2.45	2.22	2.00
1.763	1.78	1.56	1.33	1.11	0.89	0.67	0.44
1.880	0.22	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1	0.670	2.18						
ROOF DRAINS	0.900	0.07						
			12.80	0.677	0.677	5.470	2.25	8.33

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

RETURN FREQUENCY: 10 yr `C' Adjustment = 1.000 Allowable Q = 1.33 cfs

Hydrograph file duration= 101.00 minutes
Hydrograph file: 10FIN .HYD Tc = 12.80 minutes

Weighted `C'	Adjusted `C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.677	0.677	13	5.470	2.25	8.33	6,401	5,379
0.677	0.677	15	5.250	2.25	8.00	7,199	6,090
0.677	0.677	20	4.700	2.25	7.16	8,593	7,284
0.677	0.677	30	3.750	2.25	5.71	10,284	8,577
0.677	0.677	40	3.150	2.25	4.80	11,518	9,412
0.677	0.677	50	2.750	2.25	4.19	12,570	10,064
0.677	0.677	60	2.450	2.25	3.73	13,438	10,533
********** Storage Maximum							
0.677	0.677	101	1.869	2.25	2.85	17,258	12,717
**********							
0.677	0.677	120	1.600	2.25	2.44	17,552	12,253
0.677	0.677	180	1.150	2.25	1.75	18,923	11,230
0.677	0.677	240	0.870	2.25	1.33	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

```
*****************************************************************
*  RETURN FREQUENCY:  25 yr     |  Allowable Outflow:     1.50 cfs    *
*  'C' Adjustment: 1.100        |  Required Storage:    16,093 cu.ft. *
*---------------------------------------------------------------*
*  Peak Inflow:    2.51 cfs        Inflow .HYD stored: 25FIN   .HYD   *
*****************************************************************
```

```
|                Td = 158 minutes                    |  Return Freq:    25 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.10
|                                                    |
|                                                    |
|                Tc=   12.80  minutes                |
|                I =   6.352  in/hr                  |  Area (ac):     2.25
|              . Q =   10.65  cfs                    |  Weighted C:    0.68
|            .|.                                     |  Adjusted C:    0.74
F            .   .                                   |
L           .  |  .            Required Storage      |
O          .       .        .--    16,093 cu.ft.    |  Td=     158 minutes
W         .    |    .                               |  I =   1.497 in/hr
         .     x x x x x x x|x x x x x x x x x x x  Q =    2.51 cfs
c       .                    |
f      .    x                                        x
s     .                                                o   Q=    1.50 cfs
     .   x                                o           |x  (Allow.Outflow)
    .  x                     .     o                  |
   .  x                o     .       NOT TO SCALE     |   x
  . x       o                .       ============     |
 o                          .                         |       x
-----------------------------------------------------|------------
                                                   163.15 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

**** Modified Rational Hydrograph *****

Weighted C = 0.677 Area= 2.250 acres Tc = 12.80 minutes

Adjusted C = 0.745 Td= 158.00 min. I= 1.50 in/hr Qp= 2.51 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 25FIN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 0.017 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.013	0.16	0.35	0.55	0.74	0.94	1.14	1.33
0.130	1.53	1.72	1.92	2.12	2.31	2.51	2.51
0.247	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.363	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.480	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.597	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.713	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.830	2.51	2.51	2.51	2.51	2.51	2.51	2.51
0.947	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.063	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.180	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.297	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.413	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.530	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.647	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.763	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.880	2.51	2.51	2.51	2.51	2.51	2.51	2.51
1.997	2.51	2.51	2.51	2.51	2.51	2.51	2.51
2.113	2.51	2.51	2.51	2.51	2.51	2.51	2.51
2.230	2.51	2.51	2.51	2.51	2.51	2.51	2.51
2.347	2.51	2.51	2.51	2.51	2.51	2.51	2.51
2.463	2.51	2.51	2.51	2.51	2.51	2.51	2.51
2.580	2.51	2.51	2.51	2.51	2.35	2.16	1.96
2.697	1.76	1.57	1.37	1.18	0.98	0.78	0.59
2.813	0.39	0.20	0.00				

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1	0.670	2.18						
ROOF DRAINS	0.900	0.07						
			12.80	0.677	0.745	6.352	2.25	10.65

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

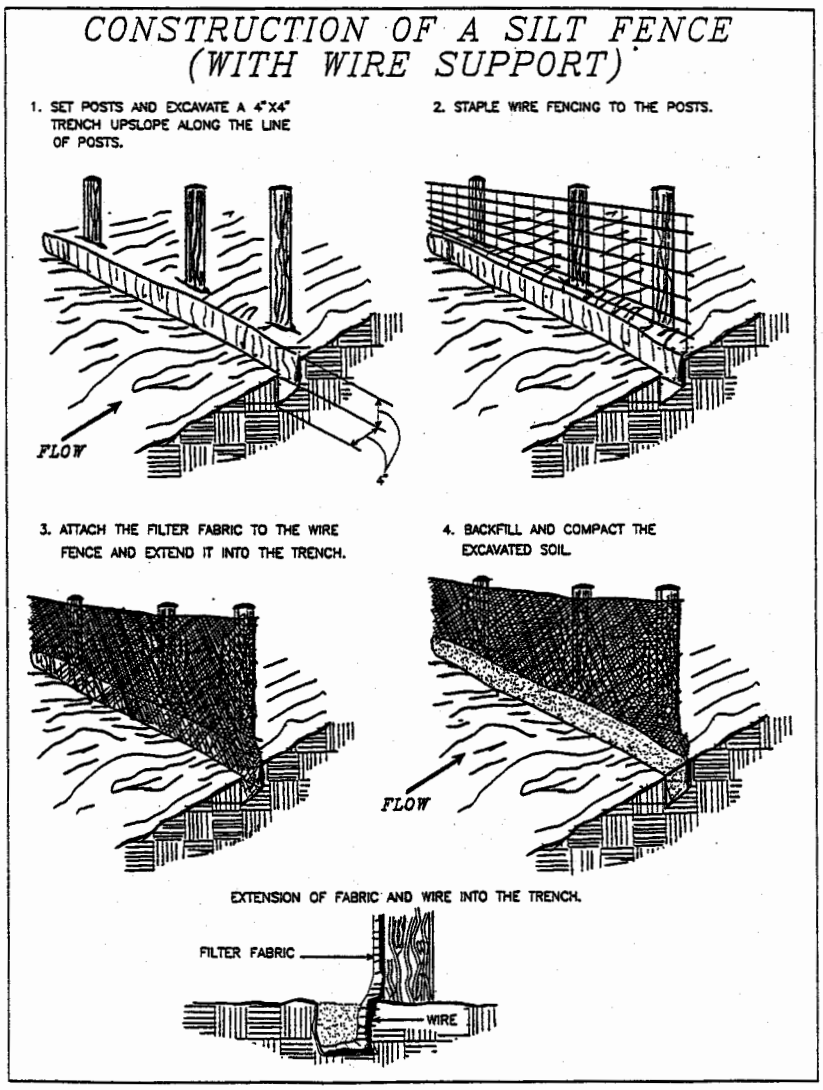
First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 1.50 cfs

Hydrograph file duration= 158.00 minutes
Hydrograph file: 25FIN .HYD Tc = 12.80 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.677	0.745	13	6.352	2.25	10.65	8,176	7,024
0.677	0.745	15	6.000	2.25	10.06	9,050	7,799
0.677	0.745	20	5.400	2.25	9.05	10,860	9,384
0.677	0.745	30	4.400	2.25	7.37	13,274	11,348
0.677	0.745	40	3.600	2.25	6.03	14,480	12,104
0.677	0.745	50	3.250	2.25	5.45	16,341	13,515
0.677	0.745	60	2.800	2.25	4.69	16,894	13,818
0.677	0.745	120	1.750	2.25	2.93	21,117	15,141
**********						Storage	Maximum
0.677	0.745	158	1.497	2.25	2.51	23,779	16,093
**********							
0.677	0.745	180	1.350	2.25	2.26	24,436	15,760
0.677	0.745	240	1.000	2.25	1.68	24,134	12,759
0.677	0.745	300	0.850	2.25	1.42	Qpeak < Qallow	



Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-1

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

```
*****************************************************************************
*  RETURN FREQUENCY: 100 yr      |  Allowable Outflow:      1.80 cfs     *
*  'C' Adjustment: 1.250         |  Required Storage:    25,112 cu.ft. *
*---------------------------------------------------------------------------*
*  Peak Inflow:     3.64 cfs     |  Inflow .HYD stored: 100FIN  .HYD     *
*****************************************************************************
```

```
|                Td = 157 minutes                    |  Return Freq:   100 yr
/------- Approx. Duration for Max. Storage ------/    C adj.factor: 1.25
|                                                    |
|                                                    |
|                Tc=   12.80  minutes                |
|                I =   7.552  in/hr                  |  Area (ac):      2.25
|              . Q =   14.38  cfs                    |  Weighted C:     0.68
|            .|.                                     |  Adjustment C:   0.85
F          .   .                                     |
L         .  |  .            Required Storage        |
O        .       .        .--    25,112 cu.ft.      |  Td=     157 minutes
W       .    |    .       |                         |  I =   1.911 in/hr
       .     x x x x x x x|x x x x x x x x x x x x  |  Q =    3.64 cfs
c     .                   |                         |
f    .    x                                         |  x
s   .                                               |    o   Q=    1.80 cfs
   .   x                                 o          |x  (Allow.Outflow)
  .  x                     .     o                  |
 .  x                 o    .       NOT TO SCALE     |   x
. x       o                .       ============     |
o                          .                        |       x
-----------------------------------------------------|------------
                                                 163.47 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:48 09-25-1997

FAITH BAPTIST CHURCH

**** Modified Rational Hydrograph *****

Weighted C = 0.677 Area= 2.250 acres Tc = 12.80 minutes

Adjusted C = 0.846 Td= 157.00 min. I= 1.91 in/hr Qp= 3.64 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 100FIN .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.017 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.013	0.23	0.51	0.80	1.08	1.36	1.65	1.93
0.130	2.22	2.50	2.79	3.07	3.35	3.64	3.64
0.247	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.363	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.480	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.597	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.713	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.830	3.64	3.64	3.64	3.64	3.64	3.64	3.64
0.947	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.063	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.180	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.297	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.413	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.530	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.647	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.763	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.880	3.64	3.64	3.64	3.64	3.64	3.64	3.64
1.997	3.64	3.64	3.64	3.64	3.64	3.64	3.64
2.113	3.64	3.64	3.64	3.64	3.64	3.64	3.64
2.230	3.64	3.64	3.64	3.64	3.64	3.64	3.64
2.347	3.64	3.64	3.64	3.64	3.64	3.64	3.64
2.463	3.64	3.64	3.64	3.64	3.64	3.64	3.64
2.580	3.64	3.64	3.64	3.41	3.13	2.84	2.56
2.697	2.27	1.99	1.71	1.42	1.14	0.85	0.57
2.813	0.28	0.00					

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

FAITH BAPTIST CHURCH

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
1	0.670	2.18						
ROOF DRAINS	0.900	0.07						
			12.80	0.677	0.846	7.552	2.25	14.38

Quick TR-55 Ver.5.46 S/N:
Executed: 16:04:46 09-25-1997

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

FAITH BAPTIST CHURCH

RETURN FREQUENCY: 100 yr `C' Adjustment = 1.250 Allowable Q = 1.80 cfs

Hydrograph file duration= 157.00 minutes
Hydrograph file: 100FIN .HYD Tc = 12.80 minutes

Weighted `C'	Adjusted `C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.677	0.846	13	7.552	2.25	14.38	11,046	9,664
0.677	0.846	15	7.200	2.25	13.71	12,341	10,840
0.677	0.846	20	6.500	2.25	12.38	14,855	13,084
0.677	0.846	30	5.250	2.25	10.00	17,998	15,686
0.677	0.846	40	4.500	2.25	8.57	20,569	17,717
0.677	0.846	50	3.800	2.25	7.24	21,711	18,320
0.677	0.846	60	3.400	2.25	6.48	23,311	19,380
0.677	0.846	120	2.250	2.25	4.29	30,853	23,682
********** Storage Maximum							
0.677	0.846	157	1.911	2.25	3.64	34,281	25,112
**********							
0.677	0.846	180	1.700	2.25	3.24	34,967	24,555
0.677	0.846	240	1.300	2.25	2.48	35,652	22,001
0.677	0.846	300	1.100	2.25	2.09	37,709	20,820
0.677	0.846	360	0.900	2.25	1.71	Qpeak < Qallow	

VOLUME CALCULATIONS

POND-2 Version: 5.20
S/N:

FAITH BAPTIST CHURCH

CALCULATED 09-18-1997 14:32:53
DISK FILE: C:\970531\SWM\FAITH .VOL

Planimeter scale: 1 inch = 40 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
88.00	1.45	2,320	0	0	0
89.00	1.98	3,168	8,199	2,733	2,733
90.00	2.70	4,320	11,187	3,729	6,462
91.00	3.49	5,584	14,816	4,939	11,401
92.00	4.01	6,416	17,986	5,995	17,396
93.00	4.74	7,584	20,976	6,992	24,388
94.00	6.00	9,600	25,717	8,572	32,960
95.00	8.08	12,928	33,668	11,223	44,183

Elevations With Areas Interpolated From
The Closest Two Planimeter Readings

92.50	-----	6,988	20,100	3,350	20,746

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

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

STRUCTURE CALCULATIONS

RATING TABLE

FOR INFILTRATION FLOW RATE

From Foundation Engineering Services Inc.Geotechnical Engineering Report Quote:

"The collected field data was reduced using a computer model representing the U.S. Department of the Navy, Naval Facilities Engineering Command equation for determining the coefficient of permeability of the subject soil stratum. The infiltration rate was calculated to be thirty-six (36) feet per day (1.3xE-4 meter per second). In sizing the Stormwater management area, the infiltration rate presented in this report should be used conservatively with proper application of a safety factor [minimum of two (2)]. **In this regard, it is recommended that the design infiltration rate of eighteen (18 feet per day (6.3xE-5 meter per second) be utilized."**

18 feet per day, ÷ 24 = 0.75 feet per hour.

0.75 feet per hour, ÷ 60 = 0.0125 feet per minute.

0.0125 feet per minute ÷ 60 = 0.000208 feet per second.

Assuming 40% loss for root matting, silting, thatch or other unforeseen clogging within the Stormwater management / BMP pond. We calculated the infiltration rates as follows:

0.000208 feet per second x 0.40 = 0.00008 feet per second. Infiltration per square foot of surface.

Elevation 88 - 30' x 60' - Radius (4') 25.13 = 1774.87sq.ft. x 0.00008 ft. per sec. = 0.1420cfs.

Elevation 89 - 36' x 36' - Radius (7') 76.97 = 2191.03sq.ft. - 1774.87sq.ft.= 416.66sq.ft. x 0.00008 ft. per sec. = 0.0333cfs. + 0.1420cfs. = 0.1753cfs.

Elevation 90 - 42' x 66' - Radius (10') 157.08 = 2614.92sq.ft. - 2191.03sq.ft. = 423.89sq.ft. x 0.00008ft. per sec. = 0.339cfs. + 0.1753cfs. = 0.2092cfs.

Elevation 91 - 48' x 69' - Radius (13') 0265.47 = 3046.53sq.ft - 2614.92sq.ft. = 431.61sq.ft x 0.00008ft per sec. = 0.345cfs. + 0.2092cfs. = 0.2437cfs.

Elevation 92 - 54' x 72' - Radius (16') 402.12 = 3485.88sq.ft. - 3046.53sq.ft. = 439.35sq.ft. x 0.00008ft. per sec. = 0.351cfs. + 0.2437cfs. = 0.2788cfs.

Elevation 93 - 60' x 75' - Radius (19') 567.05 = 3932.94sq.ft. - 3485.88sq.ft. = 447.06sq.ft. x 0.00008ft. per sec. = 0.3576cfs. + 0.2788cfs. = 0.3146cfs.

Elevation 94 - 66' x 78' - Radius 921') 692.72 = 4455.28sq.ft. - 3932.94sq.ft. = 522.34sq.ft. x 0.00008ft. per sec. = 0.4178cfs. + 0.3146cfs. = 0.3564cfs.

Elevation 95 - 72' x 81' - Radius (24') 904.78 = 4927.22sq.ft. - 4455.28sq.ft. = 471.94sq.ft. x 0.00008ft. per sec. = 0.0378cfs. + 0.3564cfs. = 0.3942cfs.

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
88.00	0.0	1
88.33	0.1	1
88.66	0.2	1
88.99	0.2	1
89.32	0.2	1
89.65	0.2	1
89.98	0.2	1
90.31	0.2	1
90.64	0.2	1
90.97	0.2	1
91.30	0.3	1
91.63	0.3	1
91.96	0.3	1
92.29	0.3	1
92.50	0.3	1
92.62	0.3	1
92.95	0.3	1
93.28	0.3	1
93.61	3.5	1 +2
93.94	11.1	1 +2
94.27	23.1	1 +2
94.60	39.8	1 +2
94.93	61.5	1 +2
95.00	0.0	

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

Outlet Structure File: C:\970531\SWM\FAITH .STR
Planimeter Input File: C:\970531\SWM\FAITH .VOL
Rating Table Output File: C:\970531\SWM\FAITH .PND

Min. Elev.(ft) = 88 Max. Elev.(ft) = 95 Incr.(ft) = .33

Additional elevations (ft) to be included in table:
* *
92.50

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
TABLE	1		->	1
WEIR-XY	2		->	2

Outflow rating table summary was stored in file:
C:\970531\SWM\FAITH .PND

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

TABLE
Input your own rating table.
E1 (ft) =88.00 E2 (ft) =95.00

Constant (ft) added to each elevation was:

Elev. (ft)	Q (cfs)
88	0
88.5	.142
89	.1753
90	.2092
91	.2437
92	.2788
93	.3146
94	.3564
95	.3942

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

WEIR-XY
Weir - Defined by X, Y Coordinates
E1 (ft) =93.3 E2 (ft) =95.00

X dist.(ft)	Y elev.(ft)
0	95
6.6	93.3
11.6	93.3
18.2	95

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

Outflow Rating Table for Structure #1
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
88.00	0.0	
88.33	0.1	Interpolated from input table
88.66	0.2	Interpolated from input table
88.99	0.2	Interpolated from input table
89.32	0.2	Interpolated from input table
89.65	0.2	Interpolated from input table
89.98	0.2	Interpolated from input table
90.31	0.2	Interpolated from input table
90.64	0.2	Interpolated from input table
90.97	0.2	Interpolated from input table
91.30	0.3	Interpolated from input table
91.63	0.3	Interpolated from input table
91.96	0.3	Interpolated from input table
92.29	0.3	Interpolated from input table
92.50	0.3	Interpolated from input table
92.62	0.3	Interpolated from input table
92.95	0.3	Interpolated from input table
93.28	0.3	Interpolated from input table
93.61	0.3	Interpolated from input table
93.94	0.4	Interpolated from input table
94.27	0.4	Interpolated from input table
94.60	0.4	Interpolated from input table
94.93	0.4	Interpolated from input table
95.00	0.0	E = or > E2=95.00

Outlet Structure File: FAITH .STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
FAITH BAPTIST CHURCH

****

Outflow Rating Table for Structure #2
WEIR-XY Weir - Defined by X, Y Coordinates

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages	
88.00	0.0	E < Y min= 93.3	
88.33	0.0	E < E1=93.3	
88.66	0.0	E < E1=93.3	
88.99	0.0	E < E1=93.3	
89.32	0.0	E < E1=93.3	
89.65	0.0	E < E1=93.3	
89.98	0.0	E < E1=93.3	
90.31	0.0	E < E1=93.3	
90.64	0.0	E < E1=93.3	
90.97	0.0	E < E1=93.3	
91.30	0.0	E < E1=93.3	
91.63	0.0	E < E1=93.3	
91.96	0.0	E < E1=93.3	
92.29	0.0	E < E1=93.3	
92.50	0.0	E < E1=93.3	
92.62	0.0	E < E1=93.3	
92.95	0.0	E < E1=93.3	
93.28	0.0	E < E1=93.3	
93.61	3.1	W(ft)=7.407	Max. D(ft)=.31
93.94	10.7	W(ft)=9.969	Max. D(ft)=.64
94.27	22.7	W(ft)=12.532	Max. D(ft)=.97
94.60	39.4	W(ft)=15.094	Max. D(ft)=1.3
94.93	61.1	W(ft)=17.656	Max. D(ft)=1.63
95.00	0.0	E = or > E2=95.00	

ROUTING CALCULATIONS

EXECUTED: 09-25-1997 16:56:17 Return Freq: 2 years

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*  FAITH BAPTIST CHURCH *
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Inflow Hydrograph: C:\970531\SWM\2FIN .HYD
Rating Table file: C:\970531\SWM\FAITH .PND

----INITIAL CONDITIONS----
Elevation = 88.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
88.00	0.0	0
88.33	0.1	809
88.66	0.2	1,708
88.99	0.2	2,702
89.32	0.2	3,802
89.65	0.2	5,025
89.98	0.2	6,376
90.31	0.2	7,859
90.64	0.2	9,476
90.97	0.2	11,234
91.30	0.3	13,112
91.63	0.3	15,080
91.96	0.3	17,140
92.29	0.3	19,304
92.50	0.3	20,746
92.62	0.3	21,593
92.95	0.3	24,010
93.28	0.3	26,586
93.61	3.5	29,376
93.94	11.1	32,388
94.27	23.1	35,666
94.60	39.8	39,292
94.93	61.5	43,286

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
27.0	27.1
56.9	57.1
90.0	90.2
126.7	126.9
167.5	167.7
212.5	212.7
261.9	262.1
315.8	316.0
374.4	374.6
437.0	437.3
502.6	502.9
571.2	571.5
643.3	643.6
691.4	691.7
719.6	719.9
800.2	800.5
886.0	886.3
979.0	982.5
1079.4	1090.5
1188.6	1211.7
1309.5	1349.3
1442.6	1504.1

Time increment (t) = 0.017 hrs.

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 16:56:17

Return Freq: 2 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\2FIN .HYD
Outflow Hydrograph: C:\970531\SWM\2FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.013	0.00	-----	0.0	0.0	0.00	88.00
0.030	0.13	0.1	0.1	0.1	0.00	88.00
0.047	0.30	0.4	0.6	0.6	0.00	88.01
0.063	0.46	0.8	1.3	1.3	0.00	88.02
0.080	0.63	1.1	2.4	2.4	0.01	88.03
0.097	0.79	1.4	3.8	3.8	0.01	88.05
0.113	0.96	1.8	5.5	5.5	0.02	88.07
0.130	1.12	2.1	7.5	7.6	0.03	88.09
0.147	1.29	2.4	9.8	9.9	0.04	88.12
0.163	1.45	2.7	12.5	12.6	0.05	88.15
0.180	1.62	3.1	15.4	15.6	0.06	88.19
0.197	1.78	3.4	18.7	18.8	0.07	88.23
0.213	1.95	3.7	22.3	22.4	0.08	88.27
0.230	2.12	4.1	26.1	26.3	0.10	88.32
0.247	2.12	4.2	30.2	30.4	0.11	88.37
0.263	2.12	4.2	34.2	34.4	0.12	88.41
0.280	2.12	4.2	38.1	38.4	0.14	88.45
0.297	2.12	4.2	42.1	42.4	0.15	88.50
0.313	2.12	4.2	46.0	46.3	0.16	88.54
0.330	2.12	4.2	49.9	50.2	0.18	88.58
0.347	2.12	4.2	53.7	54.1	0.19	88.63
0.363	2.12	4.2	57.6	58.0	0.20	88.67
0.380	2.12	4.2	61.4	61.8	0.20	88.71
0.397	2.12	4.2	65.2	65.6	0.20	88.74
0.413	2.12	4.2	69.1	69.5	0.20	88.78
0.430	2.12	4.2	72.9	73.3	0.20	88.82
0.447	2.12	4.2	76.8	77.2	0.20	88.86
0.463	2.12	4.2	80.6	81.0	0.20	88.90
0.480	2.12	4.2	84.4	84.8	0.20	88.94
0.497	2.12	4.2	88.3	88.7	0.20	88.97
0.513	2.12	4.2	92.1	92.5	0.20	89.01
0.530	2.12	4.2	96.0	96.4	0.20	89.05
0.547	2.12	4.2	99.8	100.2	0.20	89.08
0.563	2.12	4.2	103.6	104.0	0.20	89.11
0.580	2.12	4.2	107.5	107.9	0.20	89.15
0.597	2.12	4.2	111.3	111.7	0.20	89.18
0.613	2.12	4.2	115.2	115.6	0.20	89.22
0.630	2.12	4.2	119.0	119.4	0.20	89.25
0.647	2.12	4.2	122.8	123.2	0.20	89.29
0.663	2.12	4.2	126.7	127.1	0.20	89.32
0.680	2.12	4.2	130.5	130.9	0.20	89.35
0.697	2.12	4.2	134.4	134.8	0.20	89.38
0.713	2.12	4.2	138.2	138.6	0.20	89.41
0.730	2.12	4.2	142.0	142.4	0.20	89.45
0.747	2.12	4.2	145.9	146.3	0.20	89.48

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 16:56:17

Return Freq: 2 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\2FIN .HYD
Outflow Hydrograph: C:\970531\SWM\2FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.763	2.12	4.2	149.7	150.1	0.20	89.51
0.780	2.12	4.2	153.6	154.0	0.20	89.54
0.797	2.12	4.2	157.4	157.8	0.20	89.57
0.813	2.12	4.2	161.2	161.6	0.20	89.60
0.830	2.12	4.2	165.1	165.5	0.20	89.63
0.847	2.12	4.2	168.9	169.3	0.20	89.66
0.863	2.12	4.2	172.8	173.2	0.20	89.69
0.880	2.12	4.2	176.6	177.0	0.20	89.72
0.897	2.12	4.2	180.4	180.8	0.20	89.75
0.914	2.12	4.2	184.3	184.7	0.20	89.77
0.930	2.12	4.2	188.1	188.5	0.20	89.80
0.947	2.12	4.2	192.0	192.4	0.20	89.83
0.964	2.12	4.2	195.8	196.2	0.20	89.86
0.980	2.12	4.2	199.6	200.0	0.20	89.89
0.997	2.12	4.2	203.5	203.9	0.20	89.92
1.014	2.12	4.2	207.3	207.7	0.20	89.94
1.030	2.12	4.2	211.2	211.6	0.20	89.97
1.047	2.12	4.2	215.0	215.4	0.20	90.00
1.064	2.12	4.2	218.8	219.2	0.20	90.02
1.080	2.12	4.2	222.7	223.1	0.20	90.05
1.097	2.12	4.2	226.5	226.9	0.20	90.07
1.114	2.12	4.2	230.4	230.8	0.20	90.10
1.130	2.12	4.2	234.2	234.6	0.20	90.13
1.147	2.12	4.2	238.0	238.4	0.20	90.15
1.164	2.12	4.2	241.9	242.3	0.20	90.18
1.180	2.12	4.2	245.7	246.1	0.20	90.20
1.197	2.12	4.2	249.6	250.0	0.20	90.23
1.214	2.12	4.2	253.4	253.8	0.20	90.25
1.230	2.12	4.2	257.2	257.6	0.20	90.28
1.247	2.12	4.2	261.1	261.5	0.20	90.31
1.264	2.12	4.2	264.9	265.3	0.20	90.33
1.280	2.12	4.2	268.8	269.2	0.20	90.35
1.297	2.12	4.2	272.6	273.0	0.20	90.38
1.314	2.12	4.2	276.4	276.8	0.20	90.40
1.330	2.12	4.2	280.3	280.7	0.20	90.42
1.347	2.12	4.2	284.1	284.5	0.20	90.45
1.364	2.12	4.2	288.0	288.4	0.20	90.47
1.380	2.12	4.2	291.8	292.2	0.20	90.49
1.397	2.12	4.2	295.6	296.0	0.20	90.52
1.414	2.12	4.2	299.5	299.9	0.20	90.54
1.430	2.12	4.2	303.3	303.7	0.20	90.56
1.447	2.12	4.2	307.2	307.6	0.20	90.59
1.464	2.12	4.2	311.0	311.4	0.20	90.61
1.480	2.12	4.2	314.8	315.2	0.20	90.64
1.497	2.12	4.2	318.7	319.1	0.20	90.66
1.514	2.12	4.2	322.5	322.9	0.20	90.68

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 16:56:17

Return Freq: 2 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\2FIN .HYD
Outflow Hydrograph: C:\970531\SWM\2FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.530	2.12	4.2	326.4	326.8	0.20	90.70
1.547	2.12	4.2	330.2	330.6	0.20	90.72
1.564	2.12	4.2	334.0	334.4	0.20	90.74
1.580	2.12	4.2	337.9	338.3	0.20	90.77
1.597	2.12	4.2	341.7	342.1	0.20	90.79
1.614	2.12	4.2	345.6	346.0	0.20	90.81
1.630	2.12	4.2	349.4	349.8	0.20	90.83
1.647	2.12	4.2	353.2	353.6	0.20	90.85
1.664	1.98	4.1	356.9	357.3	0.20	90.87
1.680	1.82	3.8	360.3	360.7	0.20	90.89
1.697	1.65	3.5	363.4	363.8	0.20	90.91
1.714	1.49	3.1	366.1	366.5	0.20	90.92
1.730	1.32	2.8	368.6	369.0	0.20	90.94
1.747	1.16	2.5	370.6	371.0	0.20	90.95
1.764	0.99	2.2	372.4	372.8	0.20	90.96
1.780	0.83	1.8	373.8	374.2	0.20	90.97
1.797	0.66	1.5	374.9	375.3	0.20	90.97
1.814	0.50	1.2	375.6	376.0	0.20	90.98
1.830	0.33	0.8	376.1	376.5	0.20	90.98
1.847	0.17	0.5	376.2	376.6	0.20	90.98
1.864	0.00	0.2	375.9	376.3	0.20	90.98

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\2FIN .HYD
Outflow Hydrograph: C:\970531\SWM\2FOUT .HYD

Starting Pond W.S. Elevation = 88.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 2.12 cfs
Peak Outflow = 0.20 cfs
Peak Elevation = 90.98 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	11,293 cu-ft
Total Storage in Pond	=	11,293 cu-ft

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*  FAITH BAPTIST CHURCH *
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Inflow Hydrograph: C:\970531\SWM\10FIN .HYD
Rating Table file: C:\970531\SWM\FAITH .PND

----INITIAL CONDITIONS----
Elevation = 88.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
88.00	0.0	0	0.0	0.0
88.33	0.1	809	27.0	27.1
88.66	0.2	1,708	56.9	57.1
88.99	0.2	2,702	90.0	90.2
89.32	0.2	3,802	126.7	126.9
89.65	0.2	5,025	167.5	167.7
89.98	0.2	6,376	212.5	212.7
90.31	0.2	7,859	261.9	262.1
90.64	0.2	9,476	315.8	316.0
90.97	0.2	11,234	374.4	374.6
91.30	0.3	13,112	437.0	437.3
91.63	0.3	15,080	502.6	502.9
91.96	0.3	17,140	571.2	571.5
92.29	0.3	19,304	643.3	643.6
92.50	0.3	20,746	691.4	691.7
92.62	0.3	21,593	719.6	719.9
92.95	0.3	24,010	800.2	800.5
93.28	0.3	26,586	886.0	886.3
93.61	3.5	29,376	979.0	982.5
93.94	11.1	32,388	1079.4	1090.5
94.27	23.1	35,666	1188.6	1211.7
94.60	39.8	39,292	1309.5	1349.3
94.93	61.5	43,286	1442.6	1504.1

Time increment (t) = 0.017 hrs.

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 16:58:46

Return Freq: 10 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\10FIN .HYD
Outflow Hydrograph: C:\970531\SWM\10FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.013	0.00	-----	0.0	0.0	0.00	88.00
0.030	0.18	0.2	0.2	0.2	0.00	88.00
0.047	0.40	0.6	0.8	0.8	0.00	88.01
0.063	0.62	1.0	1.8	1.8	0.01	88.02
0.080	0.85	1.5	3.2	3.2	0.01	88.04
0.097	1.07	1.9	5.1	5.1	0.02	88.06
0.113	1.29	2.4	7.4	7.4	0.03	88.09
0.130	1.51	2.8	10.1	10.2	0.04	88.12
0.147	1.74	3.3	13.3	13.4	0.05	88.16
0.163	1.96	3.7	16.8	17.0	0.06	88.21
0.180	2.18	4.1	20.8	21.0	0.08	88.26
0.197	2.40	4.6	25.2	25.4	0.09	88.31
0.213	2.63	5.0	30.0	30.3	0.11	88.37
0.230	2.85	5.5	35.3	35.5	0.13	88.42
0.247	2.85	5.7	40.7	41.0	0.15	88.48
0.263	2.85	5.7	46.0	46.4	0.16	88.54
0.280	2.85	5.7	51.4	51.7	0.18	88.60
0.297	2.85	5.7	56.7	57.1	0.20	88.66
0.313	2.85	5.7	62.0	62.4	0.20	88.71
0.330	2.85	5.7	67.3	67.7	0.20	88.77
0.347	2.85	5.7	72.6	73.0	0.20	88.82
0.363	2.85	5.7	77.9	78.3	0.20	88.87
0.380	2.85	5.7	83.2	83.6	0.20	88.92
0.397	2.85	5.7	88.5	88.9	0.20	88.98
0.413	2.85	5.7	93.8	94.2	0.20	89.03
0.430	2.85	5.7	99.1	99.5	0.20	89.07
0.447	2.85	5.7	104.4	104.8	0.20	89.12
0.463	2.85	5.7	109.7	110.1	0.20	89.17
0.480	2.85	5.7	115.0	115.4	0.20	89.22
0.497	2.85	5.7	120.3	120.7	0.20	89.26
0.513	2.85	5.7	125.6	126.0	0.20	89.31
0.530	2.85	5.7	130.9	131.3	0.20	89.36
0.547	2.85	5.7	136.2	136.6	0.20	89.40
0.563	2.85	5.7	141.5	141.9	0.20	89.44
0.580	2.85	5.7	146.8	147.2	0.20	89.48
0.597	2.85	5.7	152.1	152.5	0.20	89.53
0.613	2.85	5.7	157.4	157.8	0.20	89.57
0.630	2.85	5.7	162.7	163.1	0.20	89.61
0.647	2.85	5.7	168.0	168.4	0.20	89.66
0.663	2.85	5.7	173.3	173.7	0.20	89.69
0.680	2.85	5.7	178.6	179.0	0.20	89.73
0.697	2.85	5.7	183.9	184.3	0.20	89.77
0.713	2.85	5.7	189.2	189.6	0.20	89.81
0.730	2.85	5.7	194.5	194.9	0.20	89.85
0.747	2.85	5.7	199.8	200.2	0.20	89.89

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\10FIN .HYD
Outflow Hydrograph: C:\970531\SWM\10FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.763	2.85	5.7	205.1	205.5	0.20	89.93
0.780	2.85	5.7	210.4	210.8	0.20	89.97
0.797	2.85	5.7	215.7	216.1	0.20	90.00
0.813	2.85	5.7	221.0	221.4	0.20	90.04
0.830	2.85	5.7	226.3	226.7	0.20	90.07
0.847	2.85	5.7	231.6	232.0	0.20	90.11
0.863	2.85	5.7	236.9	237.3	0.20	90.14
0.880	2.85	5.7	242.2	242.6	0.20	90.18
0.897	2.85	5.7	247.5	247.9	0.20	90.21
0.914	2.85	5.7	252.8	253.2	0.20	90.25
0.930	2.85	5.7	258.1	258.5	0.20	90.29
0.947	2.85	5.7	263.4	263.8	0.20	90.32
0.964	2.85	5.7	268.7	269.1	0.20	90.35
0.980	2.85	5.7	274.0	274.4	0.20	90.39
0.997	2.85	5.7	279.3	279.7	0.20	90.42
1.014	2.85	5.7	284.6	285.0	0.20	90.45
1.030	2.85	5.7	289.9	290.3	0.20	90.48
1.047	2.85	5.7	295.2	295.6	0.20	90.51
1.064	2.85	5.7	300.5	300.9	0.20	90.55
1.080	2.85	5.7	305.8	306.2	0.20	90.58
1.097	2.85	5.7	311.1	311.5	0.20	90.61
1.114	2.85	5.7	316.4	316.8	0.20	90.64
1.130	2.85	5.7	321.7	322.1	0.20	90.67
1.147	2.85	5.7	327.0	327.4	0.20	90.70
1.164	2.85	5.7	332.3	332.7	0.20	90.73
1.180	2.85	5.7	337.6	338.0	0.20	90.76
1.197	2.85	5.7	342.9	343.3	0.20	90.79
1.214	2.85	5.7	348.2	348.6	0.20	90.82
1.230	2.85	5.7	353.5	353.9	0.20	90.85
1.247	2.85	5.7	358.8	359.2	0.20	90.88
1.264	2.85	5.7	364.1	364.5	0.20	90.91
1.280	2.85	5.7	369.4	369.8	0.20	90.94
1.297	2.85	5.7	374.7	375.1	0.20	90.97
1.314	2.85	5.7	379.9	380.4	0.21	91.00
1.330	2.85	5.7	385.2	385.6	0.22	91.03
1.347	2.85	5.7	390.5	390.9	0.23	91.06
1.364	2.85	5.7	395.7	396.2	0.23	91.08
1.380	2.85	5.7	400.9	401.4	0.24	91.11
1.397	2.85	5.7	406.1	406.6	0.25	91.14
1.414	2.85	5.7	411.3	411.8	0.26	91.17
1.430	2.85	5.7	416.5	417.0	0.27	91.19
1.447	2.85	5.7	421.6	422.2	0.28	91.22
1.464	2.85	5.7	426.7	427.3	0.28	91.25
1.480	2.85	5.7	431.8	432.4	0.29	91.27
1.497	2.85	5.7	436.9	437.5	0.30	91.30
1.514	2.85	5.7	442.0	442.6	0.30	91.33

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\10FIN .HYD
Outflow Hydrograph: C:\970531\SWM\10FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.530	2.85	5.7	447.1	447.7	0.30	91.35
1.547	2.85	5.7	452.2	452.8	0.30	91.38
1.564	2.85	5.7	457.3	457.9	0.30	91.40
1.580	2.85	5.7	462.4	463.0	0.30	91.43
1.597	2.85	5.7	467.5	468.1	0.30	91.46
1.614	2.85	5.7	472.6	473.2	0.30	91.48
1.630	2.85	5.7	477.7	478.3	0.30	91.51
1.647	2.85	5.7	482.8	483.4	0.30	91.53
1.664	2.85	5.7	487.9	488.5	0.30	91.56
1.680	2.85	5.7	493.0	493.6	0.30	91.58
1.697	2.85	5.7	498.1	498.7	0.30	91.61
1.714	2.67	5.5	503.1	503.7	0.30	91.63
1.730	2.45	5.1	507.6	508.2	0.30	91.66
1.747	2.22	4.7	511.7	512.3	0.30	91.68
1.764	2.00	4.2	515.3	515.9	0.30	91.69
1.780	1.78	3.8	518.5	519.1	0.30	91.71
1.797	1.56	3.3	521.2	521.8	0.30	91.72
1.814	1.33	2.9	523.5	524.1	0.30	91.73
1.830	1.11	2.4	525.3	525.9	0.30	91.74
1.847	0.89	2.0	526.7	527.3	0.30	91.75
1.864	0.67	1.6	527.7	528.3	0.30	91.75
1.880	0.44	1.1	528.2	528.8	0.30	91.75
1.897	0.22	0.7	528.3	528.9	0.30	91.75
1.914	0.00	0.2	527.9	528.5	0.30	91.75

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\10FIN .HYD
Outflow Hydrograph: C:\970531\SWM\10FOUT .HYD

Starting Pond W.S. Elevation = 88.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	2.85 cfs
Peak Outflow	=	0.30 cfs
Peak Elevation	=	91.75 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	15,860 cu-ft
Total Storage in Pond	=	15,860 cu-ft

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*  FAITH BAPTIST CHURCH *
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Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Rating Table file: C:\970531\SWM\FAITH .PND

----INITIAL CONDITIONS----
Elevation = 88.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
88.00	0.0	0	0.0	0.0
88.33	0.1	809	27.0	27.1
88.66	0.2	1,708	56.9	57.1
88.99	0.2	2,702	90.0	90.2
89.32	0.2	3,802	126.7	126.9
89.65	0.2	5,025	167.5	167.7
89.98	0.2	6,376	212.5	212.7
90.31	0.2	7,859	261.9	262.1
90.64	0.2	9,476	315.8	316.0
90.97	0.2	11,234	374.4	374.6
91.30	0.3	13,112	437.0	437.3
91.63	0.3	15,080	502.6	502.9
91.96	0.3	17,140	571.2	571.5
92.29	0.3	19,304	643.3	643.6
92.50	0.3	20,746	691.4	691.7
92.62	0.3	21,593	719.6	719.9
92.95	0.3	24,010	800.2	800.5
93.28	0.3	26,586	886.0	886.3
93.61	3.5	29,376	979.0	982.5
93.94	11.1	32,388	1079.4	1090.5
94.27	23.1	35,666	1188.6	1211.7
94.60	39.8	39,292	1309.5	1349.3
94.93	61.5	43,286	1442.6	1504.1

Time increment (t) = 0.017 hrs.

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Outflow Hydrograph: C:\970531\SWM\25FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.013	0.00	-----	0.0	0.0	0.00	88.00
0.030	0.16	0.2	0.2	0.2	0.00	88.00
0.047	0.35	0.5	0.7	0.7	0.00	88.01
0.063	0.55	0.9	1.6	1.6	0.01	88.02
0.080	0.74	1.3	2.8	2.8	0.01	88.03
0.097	0.94	1.7	4.5	4.5	0.02	88.05
0.113	1.14	2.1	6.5	6.5	0.02	88.08
0.130	1.33	2.5	8.9	9.0	0.03	88.11
0.147	1.53	2.9	11.7	11.8	0.04	88.14
0.163	1.72	3.3	14.8	14.9	0.06	88.18
0.180	1.92	3.6	18.3	18.5	0.07	88.23
0.197	2.12	4.0	22.2	22.4	0.08	88.27
0.213	2.31	4.4	26.4	26.6	0.10	88.32
0.230	2.51	4.8	31.0	31.2	0.11	88.38
0.247	2.51	5.0	35.8	36.0	0.13	88.43
0.263	2.51	5.0	40.5	40.8	0.15	88.48
0.280	2.51	5.0	45.2	45.5	0.16	88.53
0.297	2.51	5.0	49.9	50.2	0.18	88.58
0.313	2.51	5.0	54.5	54.9	0.19	88.64
0.330	2.51	5.0	59.1	59.5	0.20	88.68
0.347	2.51	5.0	63.7	64.1	0.20	88.73
0.363	2.51	5.0	68.4	68.8	0.20	88.78
0.380	2.51	5.0	73.0	73.4	0.20	88.82
0.397	2.51	5.0	77.6	78.0	0.20	88.87
0.413	2.51	5.0	82.2	82.6	0.20	88.91
0.430	2.51	5.0	86.8	87.2	0.20	88.96
0.447	2.51	5.0	91.5	91.9	0.20	89.00
0.463	2.51	5.0	96.1	96.5	0.20	89.05
0.480	2.51	5.0	100.7	101.1	0.20	89.09
0.497	2.51	5.0	105.3	105.7	0.20	89.13
0.513	2.51	5.0	109.9	110.3	0.20	89.17
0.530	2.51	5.0	114.6	115.0	0.20	89.21
0.547	2.51	5.0	119.2	119.6	0.20	89.25
0.563	2.51	5.0	123.8	124.2	0.20	89.30
0.580	2.51	5.0	128.4	128.8	0.20	89.34
0.597	2.51	5.0	133.0	133.4	0.20	89.37
0.613	2.51	5.0	137.7	138.1	0.20	89.41
0.630	2.51	5.0	142.3	142.7	0.20	89.45
0.647	2.51	5.0	146.9	147.3	0.20	89.49
0.663	2.51	5.0	151.5	151.9	0.20	89.52
0.680	2.51	5.0	156.1	156.5	0.20	89.56
0.697	2.51	5.0	160.8	161.2	0.20	89.60
0.713	2.51	5.0	165.4	165.8	0.20	89.63
0.730	2.51	5.0	170.0	170.4	0.20	89.67
0.747	2.51	5.0	174.6	175.0	0.20	89.70

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 17:04:10

Return Freq: 25 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Outflow Hydrograph: C:\970531\SWM\25FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.763	2.51	5.0	179.2	179.6	0.20	89.74
0.780	2.51	5.0	183.9	184.3	0.20	89.77
0.797	2.51	5.0	188.5	188.9	0.20	89.81
0.813	2.51	5.0	193.1	193.5	0.20	89.84
0.830	2.51	5.0	197.7	198.1	0.20	89.87
0.847	2.51	5.0	202.3	202.7	0.20	89.91
0.863	2.51	5.0	207.0	207.4	0.20	89.94
0.880	2.51	5.0	211.6	212.0	0.20	89.97
0.897	2.51	5.0	216.2	216.6	0.20	90.01
0.914	2.51	5.0	220.8	221.2	0.20	90.04
0.930	2.51	5.0	225.4	225.8	0.20	90.07
0.947	2.51	5.0	230.1	230.5	0.20	90.10
0.964	2.51	5.0	234.7	235.1	0.20	90.13
0.980	2.51	5.0	239.3	239.7	0.20	90.16
0.997	2.51	5.0	243.9	244.3	0.20	90.19
1.014	2.51	5.0	248.5	248.9	0.20	90.22
1.030	2.51	5.0	253.2	253.6	0.20	90.25
1.047	2.51	5.0	257.8	258.2	0.20	90.28
1.064	2.51	5.0	262.4	262.8	0.20	90.31
1.080	2.51	5.0	267.0	267.4	0.20	90.34
1.097	2.51	5.0	271.6	272.0	0.20	90.37
1.114	2.51	5.0	276.3	276.7	0.20	90.40
1.130	2.51	5.0	280.9	281.3	0.20	90.43
1.147	2.51	5.0	285.5	285.9	0.20	90.46
1.164	2.51	5.0	290.1	290.5	0.20	90.48
1.180	2.51	5.0	294.7	295.1	0.20	90.51
1.197	2.51	5.0	299.4	299.8	0.20	90.54
1.214	2.51	5.0	304.0	304.4	0.20	90.57
1.230	2.51	5.0	308.6	309.0	0.20	90.60
1.247	2.51	5.0	313.2	313.6	0.20	90.63
1.264	2.51	5.0	317.8	318.2	0.20	90.65
1.280	2.51	5.0	322.5	322.9	0.20	90.68
1.297	2.51	5.0	327.1	327.5	0.20	90.70
1.314	2.51	5.0	331.7	332.1	0.20	90.73
1.330	2.51	5.0	336.3	336.7	0.20	90.76
1.347	2.51	5.0	340.9	341.3	0.20	90.78
1.364	2.51	5.0	345.6	346.0	0.20	90.81
1.380	2.51	5.0	350.2	350.6	0.20	90.83
1.397	2.51	5.0	354.8	355.2	0.20	90.86
1.414	2.51	5.0	359.4	359.8	0.20	90.89
1.430	2.51	5.0	364.0	364.4	0.20	90.91
1.447	2.51	5.0	368.7	369.1	0.20	90.94
1.464	2.51	5.0	373.3	373.7	0.20	90.96
1.480	2.51	5.0	377.9	378.3	0.21	90.99
1.497	2.51	5.0	382.5	382.9	0.21	91.01
1.514	2.51	5.0	387.1	387.5	0.22	91.04

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 17:04:10

Return Freq: 25 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Outflow Hydrograph: C:\970531\SWM\25FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.530	2.51	5.0	391.6	392.1	0.23	91.06
1.547	2.51	5.0	396.2	396.7	0.24	91.09
1.564	2.51	5.0	400.7	401.2	0.24	91.11
1.580	2.51	5.0	405.2	405.7	0.25	91.13
1.597	2.51	5.0	409.7	410.3	0.26	91.16
1.614	2.51	5.0	414.2	414.8	0.26	91.18
1.630	2.51	5.0	418.7	419.3	0.27	91.21
1.647	2.51	5.0	423.2	423.7	0.28	91.23
1.664	2.51	5.0	427.6	428.2	0.29	91.25
1.680	2.51	5.0	432.1	432.6	0.29	91.28
1.697	2.51	5.0	436.5	437.1	0.30	91.30
1.714	2.51	5.0	440.9	441.5	0.30	91.32
1.730	2.51	5.0	445.3	445.9	0.30	91.34
1.747	2.51	5.0	449.7	450.3	0.30	91.37
1.764	2.51	5.0	454.2	454.8	0.30	91.39
1.780	2.51	5.0	458.6	459.2	0.30	91.41
1.797	2.51	5.0	463.0	463.6	0.30	91.43
1.814	2.51	5.0	467.4	468.0	0.30	91.45
1.830	2.51	5.0	471.8	472.4	0.30	91.48
1.847	2.51	5.0	476.3	476.9	0.30	91.50
1.864	2.51	5.0	480.7	481.3	0.30	91.52
1.880	2.51	5.0	485.1	485.7	0.30	91.54
1.897	2.51	5.0	489.5	490.1	0.30	91.57
1.914	2.51	5.0	493.9	494.5	0.30	91.59
1.930	2.51	5.0	498.4	499.0	0.30	91.61
1.947	2.51	5.0	502.8	503.4	0.30	91.63
1.964	2.51	5.0	507.2	507.8	0.30	91.65
1.980	2.51	5.0	511.6	512.2	0.30	91.67
1.997	2.51	5.0	516.0	516.6	0.30	91.70
2.014	2.51	5.0	520.5	521.1	0.30	91.72
2.030	2.51	5.0	524.9	525.5	0.30	91.74
2.047	2.51	5.0	529.3	529.9	0.30	91.76
2.064	2.51	5.0	533.7	534.3	0.30	91.78
2.080	2.51	5.0	538.1	538.7	0.30	91.80
2.097	2.51	5.0	542.6	543.2	0.30	91.82
2.114	2.51	5.0	547.0	547.6	0.30	91.84
2.130	2.51	5.0	551.4	552.0	0.30	91.87
2.147	2.51	5.0	555.8	556.4	0.30	91.89
2.164	2.51	5.0	560.2	560.8	0.30	91.91
2.180	2.51	5.0	564.7	565.3	0.30	91.93
2.197	2.51	5.0	569.1	569.7	0.30	91.95
2.214	2.51	5.0	573.5	574.1	0.30	91.97
2.230	2.51	5.0	577.9	578.5	0.30	91.99
2.247	2.51	5.0	582.3	582.9	0.30	92.01
2.264	2.51	5.0	586.8	587.4	0.30	92.03
2.280	2.51	5.0	591.2	591.8	0.30	92.05

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Outflow Hydrograph: C:\970531\SWM\25FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.297	2.51	5.0	595.6	596.2	0.30	92.07
2.314	2.51	5.0	600.0	600.6	0.30	92.09
2.330	2.51	5.0	604.4	605.0	0.30	92.11
2.347	2.51	5.0	608.9	609.5	0.30	92.13
2.364	2.51	5.0	613.3	613.9	0.30	92.15
2.380	2.51	5.0	617.7	618.3	0.30	92.17
2.397	2.51	5.0	622.1	622.7	0.30	92.19
2.414	2.51	5.0	626.5	627.1	0.30	92.21
2.430	2.51	5.0	631.0	631.6	0.30	92.23
2.447	2.51	5.0	635.4	636.0	0.30	92.25
2.464	2.51	5.0	639.8	640.4	0.30	92.28
2.480	2.51	5.0	644.2	644.8	0.30	92.30
2.497	2.51	5.0	648.6	649.2	0.30	92.31
2.514	2.51	5.0	653.1	653.7	0.30	92.33
2.530	2.51	5.0	657.5	658.1	0.30	92.35
2.547	2.51	5.0	661.9	662.5	0.30	92.37
2.564	2.51	5.0	666.3	666.9	0.30	92.39
2.581	2.51	5.0	670.7	671.3	0.30	92.41
2.597	2.51	5.0	675.2	675.8	0.30	92.43
2.614	2.51	5.0	679.6	680.2	0.30	92.45
2.631	2.51	5.0	684.0	684.6	0.30	92.47
2.647	2.51	5.0	688.4	689.0	0.30	92.49
2.664	2.35	4.9	692.7	693.3	0.30	92.51
2.681	2.16	4.5	696.6	697.2	0.30	92.52
2.697	1.96	4.1	700.1	700.7	0.30	92.54
2.714	1.76	3.7	703.2	703.8	0.30	92.55
2.731	1.57	3.3	706.0	706.6	0.30	92.56
2.747	1.37	2.9	708.3	708.9	0.30	92.57
2.764	1.18	2.6	710.2	710.8	0.30	92.58
2.781	0.98	2.2	711.8	712.4	0.30	92.59
2.797	0.78	1.8	713.0	713.6	0.30	92.59
2.814	0.59	1.4	713.7	714.3	0.30	92.60
2.831	0.39	1.0	714.1	714.7	0.30	92.60
2.847	0.20	0.6	714.1	714.7	0.30	92.60
2.864	0.00	0.2	713.7	714.3	0.30	92.60

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\25FIN .HYD
Outflow Hydrograph: C:\970531\SWM\25FOUT .HYD

Starting Pond W.S. Elevation = 88.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 2.51 cfs
Peak Outflow = 0.30 cfs
Peak Elevation = 92.60 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	21,437 cu-ft
Total Storage in Pond	=	21,437 cu-ft

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*  FAITH BAPTIST CHURCH *
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Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Rating Table file: C:\970531\SWM\FAITH .PND

----INITIAL CONDITIONS----
Elevation = 88.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)
88.00	0.0	0
88.33	0.1	809
88.66	0.2	1,708
88.99	0.2	2,702
89.32	0.2	3,802
89.65	0.2	5,025
89.98	0.2	6,376
90.31	0.2	7,859
90.64	0.2	9,476
90.97	0.2	11,234
91.30	0.3	13,112
91.63	0.3	15,080
91.96	0.3	17,140
92.29	0.3	19,304
92.50	0.3	20,746
92.62	0.3	21,593
92.95	0.3	24,010
93.28	0.3	26,586
93.61	3.5	29,376
93.94	11.1	32,388
94.27	23.1	35,666
94.60	39.8	39,292
94.93	61.5	43,286

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
27.0	27.1
56.9	57.1
90.0	90.2
126.7	126.9
167.5	167.7
212.5	212.7
261.9	262.1
315.8	316.0
374.4	374.6
437.0	437.3
502.6	502.9
571.2	571.5
643.3	643.6
691.4	691.7
719.6	719.9
800.2	800.5
886.0	886.3
979.0	982.5
1079.4	1090.5
1188.6	1211.7
1309.5	1349.3
1442.6	1504.1

Time increment (t) = 0.017 hrs.

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 17:11:29

Return Freq: 100 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Outflow Hydrograph: C:\970531\SWM\100FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.013	0.00	-----	0.0	0.0	0.00	88.00
0.030	0.23	0.2	0.2	0.2	0.00	88.00
0.047	0.51	0.7	1.0	1.0	0.00	88.01
0.063	0.80	1.3	2.3	2.3	0.01	88.03
0.080	1.08	1.9	4.1	4.1	0.02	88.05
0.097	1.36	2.4	6.5	6.5	0.02	88.08
0.113	1.65	3.0	9.4	9.5	0.04	88.12
0.130	1.93	3.6	12.9	13.0	0.05	88.16
0.147	2.22	4.2	16.9	17.1	0.06	88.21
0.163	2.50	4.7	21.5	21.7	0.08	88.26
0.180	2.79	5.3	26.6	26.8	0.10	88.33
0.197	3.07	5.9	32.2	32.5	0.12	88.39
0.213	3.35	6.4	38.4	38.6	0.14	88.46
0.230	3.64	7.0	45.0	45.4	0.16	88.53
0.247	3.64	7.3	51.9	52.3	0.18	88.61
0.263	3.64	7.3	58.8	59.2	0.20	88.68
0.280	3.64	7.3	65.7	66.1	0.20	88.75
0.297	3.64	7.3	72.6	73.0	0.20	88.82
0.313	3.64	7.3	79.5	79.9	0.20	88.89
0.330	3.64	7.3	86.3	86.7	0.20	88.96
0.347	3.64	7.3	93.2	93.6	0.20	89.02
0.363	3.64	7.3	100.1	100.5	0.20	89.08
0.380	3.64	7.3	107.0	107.4	0.20	89.14
0.397	3.64	7.3	113.9	114.3	0.20	89.21
0.413	3.64	7.3	120.7	121.1	0.20	89.27
0.430	3.64	7.3	127.6	128.0	0.20	89.33
0.447	3.64	7.3	134.5	134.9	0.20	89.38
0.463	3.64	7.3	141.4	141.8	0.20	89.44
0.480	3.64	7.3	148.3	148.7	0.20	89.50
0.497	3.64	7.3	155.1	155.5	0.20	89.55
0.513	3.64	7.3	162.0	162.4	0.20	89.61
0.530	3.64	7.3	168.9	169.3	0.20	89.66
0.547	3.64	7.3	175.8	176.2	0.20	89.71
0.563	3.64	7.3	182.7	183.1	0.20	89.76
0.580	3.64	7.3	189.5	189.9	0.20	89.81
0.597	3.64	7.3	196.4	196.8	0.20	89.86
0.613	3.64	7.3	203.3	203.7	0.20	89.91
0.630	3.64	7.3	210.2	210.6	0.20	89.96
0.647	3.64	7.3	217.1	217.5	0.20	90.01
0.663	3.64	7.3	223.9	224.3	0.20	90.06
0.680	3.64	7.3	230.8	231.2	0.20	90.10
0.697	3.64	7.3	237.7	238.1	0.20	90.15
0.713	3.64	7.3	244.6	245.0	0.20	90.20
0.730	3.64	7.3	251.5	251.9	0.20	90.24
0.747	3.64	7.3	258.3	258.7	0.20	90.29

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 17:11:29

Return Freq: 100 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Outflow Hydrograph: C:\970531\SWM\100FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.763	3.64	7.3	265.2	265.6	0.20	90.33
0.780	3.64	7.3	272.1	272.5	0.20	90.37
0.797	3.64	7.3	279.0	279.4	0.20	90.42
0.813	3.64	7.3	285.9	286.3	0.20	90.46
0.830	3.64	7.3	292.7	293.1	0.20	90.50
0.847	3.64	7.3	299.6	300.0	0.20	90.54
0.863	3.64	7.3	306.5	306.9	0.20	90.58
0.880	3.64	7.3	313.4	313.8	0.20	90.63
0.897	3.64	7.3	320.3	320.7	0.20	90.67
0.914	3.64	7.3	327.1	327.5	0.20	90.70
0.930	3.64	7.3	334.0	334.4	0.20	90.74
0.947	3.64	7.3	340.9	341.3	0.20	90.78
0.964	3.64	7.3	347.8	348.2	0.20	90.82
0.980	3.64	7.3	354.7	355.1	0.20	90.86
0.997	3.64	7.3	361.5	361.9	0.20	90.90
1.014	3.64	7.3	368.4	368.8	0.20	90.94
1.030	3.64	7.3	375.3	375.7	0.20	90.98
1.047	3.64	7.3	382.2	382.6	0.21	91.01
1.064	3.64	7.3	389.0	389.4	0.22	91.05
1.080	3.64	7.3	395.8	396.3	0.23	91.08
1.097	3.64	7.3	402.6	403.1	0.25	91.12
1.114	3.64	7.3	409.4	409.9	0.26	91.16
1.130	3.64	7.3	416.1	416.6	0.27	91.19
1.147	3.64	7.3	422.8	423.4	0.28	91.23
1.164	3.64	7.3	429.5	430.1	0.29	91.26
1.180	3.64	7.3	436.2	436.8	0.30	91.30
1.197	3.64	7.3	442.9	443.5	0.30	91.33
1.214	3.64	7.3	449.6	450.2	0.30	91.36
1.230	3.64	7.3	456.2	456.8	0.30	91.40
1.247	3.64	7.3	462.9	463.5	0.30	91.43
1.264	3.64	7.3	469.6	470.2	0.30	91.47
1.280	3.64	7.3	476.3	476.9	0.30	91.50
1.297	3.64	7.3	483.0	483.6	0.30	91.53
1.314	3.64	7.3	489.6	490.2	0.30	91.57
1.330	3.64	7.3	496.3	496.9	0.30	91.60
1.347	3.64	7.3	503.0	503.6	0.30	91.63
1.364	3.64	7.3	509.7	510.3	0.30	91.67
1.380	3.64	7.3	516.4	517.0	0.30	91.70
1.397	3.64	7.3	523.0	523.6	0.30	91.73
1.414	3.64	7.3	529.7	530.3	0.30	91.76
1.430	3.64	7.3	536.4	537.0	0.30	91.79
1.447	3.64	7.3	543.1	543.7	0.30	91.83
1.464	3.64	7.3	549.8	550.4	0.30	91.86
1.480	3.64	7.3	556.4	557.0	0.30	91.89
1.497	3.64	7.3	563.1	563.7	0.30	91.92
1.514	3.64	7.3	569.8	570.4	0.30	91.95

POND-2 Version: 5.20 S/N:
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Return Freq: 100 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Outflow Hydrograph: C:\970531\SWM\100FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1.530	3.64	7.3	576.5	577.1	0.30	91.99
1.547	3.64	7.3	583.2	583.8	0.30	92.02
1.564	3.64	7.3	589.8	590.4	0.30	92.05
1.580	3.64	7.3	596.5	597.1	0.30	92.08
1.597	3.64	7.3	603.2	603.8	0.30	92.11
1.614	3.64	7.3	609.9	610.5	0.30	92.14
1.630	3.64	7.3	616.6	617.2	0.30	92.17
1.647	3.64	7.3	623.2	623.8	0.30	92.20
1.664	3.64	7.3	629.9	630.5	0.30	92.23
1.680	3.64	7.3	636.6	637.2	0.30	92.26
1.697	3.64	7.3	643.3	643.9	0.30	92.29
1.714	3.64	7.3	650.0	650.6	0.30	92.32
1.730	3.64	7.3	656.6	657.2	0.30	92.35
1.747	3.64	7.3	663.3	663.9	0.30	92.38
1.764	3.64	7.3	670.0	670.6	0.30	92.41
1.780	3.64	7.3	676.7	677.3	0.30	92.44
1.797	3.64	7.3	683.4	684.0	0.30	92.47
1.814	3.64	7.3	690.0	690.6	0.30	92.50
1.830	3.64	7.3	696.7	697.3	0.30	92.52
1.847	3.64	7.3	703.4	704.0	0.30	92.55
1.864	3.64	7.3	710.1	710.7	0.30	92.58
1.880	3.64	7.3	716.8	717.4	0.30	92.61
1.897	3.64	7.3	723.4	724.0	0.30	92.64
1.914	3.64	7.3	730.1	730.7	0.30	92.66
1.930	3.64	7.3	736.8	737.4	0.30	92.69
1.947	3.64	7.3	743.5	744.1	0.30	92.72
1.964	3.64	7.3	750.2	750.8	0.30	92.75
1.980	3.64	7.3	756.8	757.4	0.30	92.77
1.997	3.64	7.3	763.5	764.1	0.30	92.80
2.014	3.64	7.3	770.2	770.8	0.30	92.83
2.030	3.64	7.3	776.9	777.5	0.30	92.86
2.047	3.64	7.3	783.6	784.2	0.30	92.88
2.064	3.64	7.3	790.2	790.8	0.30	92.91
2.080	3.64	7.3	796.9	797.5	0.30	92.94
2.097	3.64	7.3	803.6	804.2	0.30	92.96
2.114	3.64	7.3	810.3	810.9	0.30	92.99
2.130	3.64	7.3	817.0	817.6	0.30	93.02
2.147	3.64	7.3	823.6	824.2	0.30	93.04
2.164	3.64	7.3	830.3	830.9	0.30	93.07
2.180	3.64	7.3	837.0	837.6	0.30	93.09
2.197	3.64	7.3	843.7	844.3	0.30	93.12
2.214	3.64	7.3	850.4	851.0	0.30	93.14
2.230	3.64	7.3	857.0	857.6	0.30	93.17
2.247	3.64	7.3	863.7	864.3	0.30	93.20
2.264	3.64	7.3	870.4	871.0	0.30	93.22
2.280	3.64	7.3	877.1	877.7	0.30	93.25

POND-2 Version: 5.20 S/N:
EXECUTED: 09-25-1997 17:11:29

Return Freq: 100 years

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Outflow Hydrograph: C:\970531\SWM\100FOUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
2.297	3.64	7.3	883.8	884.4	0.30	93.27
2.314	3.64	7.3	890.1	891.0	0.46	93.30
2.330	3.64	7.3	896.1	897.4	0.67	93.32
2.347	3.64	7.3	901.6	903.4	0.87	93.34
2.364	3.64	7.3	906.8	908.9	1.05	93.36
2.380	3.64	7.3	911.6	914.1	1.22	93.38
2.397	3.64	7.3	916.1	918.9	1.38	93.39
2.414	3.64	7.3	920.4	923.4	1.53	93.41
2.430	3.64	7.3	924.3	927.6	1.67	93.42
2.447	3.64	7.3	928.0	931.6	1.81	93.44
2.464	3.64	7.3	931.4	935.2	1.93	93.45
2.480	3.64	7.3	934.6	938.7	2.04	93.46
2.497	3.64	7.3	937.6	941.9	2.15	93.47
2.514	3.64	7.3	940.4	944.8	2.25	93.48
2.530	3.64	7.3	943.0	947.6	2.34	93.49
2.547	3.64	7.3	945.4	950.2	2.43	93.50
2.564	3.64	7.3	947.6	952.7	2.51	93.51
2.581	3.64	7.3	949.8	954.9	2.58	93.52
2.597	3.64	7.3	951.7	957.0	2.65	93.52
2.614	3.64	7.3	953.6	959.0	2.72	93.53
2.631	3.64	7.3	955.3	960.9	2.78	93.54
2.647	3.41	7.1	956.7	962.4	2.83	93.54
2.664	3.13	6.5	957.5	963.2	2.86	93.54
2.681	2.84	6.0	957.8	963.5	2.87	93.54
2.697	2.56	5.4	957.4	963.2	2.86	93.54
2.714	2.27	4.8	956.6	962.3	2.83	93.54
2.731	1.99	4.3	955.3	960.9	2.78	93.54
2.747	1.71	3.7	953.6	959.0	2.72	93.53
2.764	1.42	3.1	951.4	956.7	2.64	93.52
2.781	1.14	2.6	948.9	954.0	2.55	93.51
2.797	0.85	2.0	946.0	950.9	2.45	93.50
2.814	0.57	1.4	942.7	947.4	2.33	93.49
2.831	0.28	0.9	939.2	943.6	2.20	93.48
2.847	0.00	0.3	935.3	939.5	2.07	93.46

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: C:\970531\SWM\FAITH .PND
Inflow Hydrograph: C:\970531\SWM\100FIN .HYD
Outflow Hydrograph: C:\970531\SWM\100FOUT .HYD

Starting Pond W.S. Elevation = 88.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow = 3.64 cfs
Peak Outflow = 2.87 cfs
Peak Elevation = 93.54 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	28,824 cu-ft
Total Storage in Pond	=	28,824 cu-ft

Geotechnical
Environmental
Testing
Solutions, Inc.

July 31, 2002

TO: **Landmark Design Group**
4029 Ironbound Road
Suite 100
Williamsburg, Virginia 23188

Attn: Mr. Richard S. Phillips, P. E.

RE: Shallow Subsurface Soil Exploration Report
Faith Baptist Church – Existing BMP Dam Evaluation
Rochambeau Road
Williamsburg, Virginia
GET Project No. VB02-239G

Dear Mr. Romeo:

Pursuant to your request, **G E T Solutions Inc.** completed a shallow subsurface exploration at the above referenced project site. This consisted of drilling 2 hand auger soil borings on the crest of the dam at the locations identified by you, and established in the field by our personnel. These borings were 20 feet apart, located east and west of the concrete drainage structure, as indicated on the boring logs.

The hand auger borings (HA-1 and HA-2) were extended to depths of 10 feet below the surface. These borings indicated the presence of about 2 to 4 inches of topsoil material, underlain by Sandy and Silty CLAY (CL/FILL) with inter-bedded Sand (SM/FILL) deposits extending to the boring terminations depths. Based on the resistance to the hand auger during its advancement the cohesive soils (CLAYS) were of medium stiff to stiff consistency and the granular soils (SANDS) where of loose to medium dense relative density.

The groundwater table was not encountered in the hand auger probes. In general, 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.). It is estimated normal seasonal high groundwater level will fluctuate within 2 feet above the current (unidentified) levels.

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

Based on visual classification the CLAY soils, (containing more than 50% by weight passing a #200 sieve) encountered in both hand auger probes are considered to have estimated permeability values (k_s) of $1x10^{-7}$ or less.

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

Respectfully Submitted,
G E T Solutions, Inc.

Camille A. Kattan, P. E.
Principal Engineer
Va. Lic. #018045

Copies: (3) Client

Attachments: Log Of Boring Sheets
Generalized Soil Profile

Geotechnical Environmental Testing Solutions, Inc.

LOG OF BORING No. HA-1

PROJECT: Faith Baptist Church - Existing BMP Dam Evaluation **PROJECT NO.:** VB02-239G
CLIENT: Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: West Side of DAM on Crest **ELEVATION:**
DRILLER: P. Everheart **LOGGED BY:** A. Mushett, E.I.T.
DRILLING METHOD: Hand Auger **DATE:** 7/29/02
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▽ **CAVING>** C

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Lim; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	Topsoil 2 inches	.2				
	Tannish Brown, moist, Fine Sandy CLAY (CL), medium dense	1				
	Brown, moist, Silty Fine SAND (SM), medium dense	2				
2	Tannish Brown and Gray, moist, Fine Sandy CLAY (CL), stiff					
4						
6						
8	Brown, moist, Silty Fine SAND (SM), medium dense	8				
10	Boring terminated at 10 ft.					
12						
14						

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

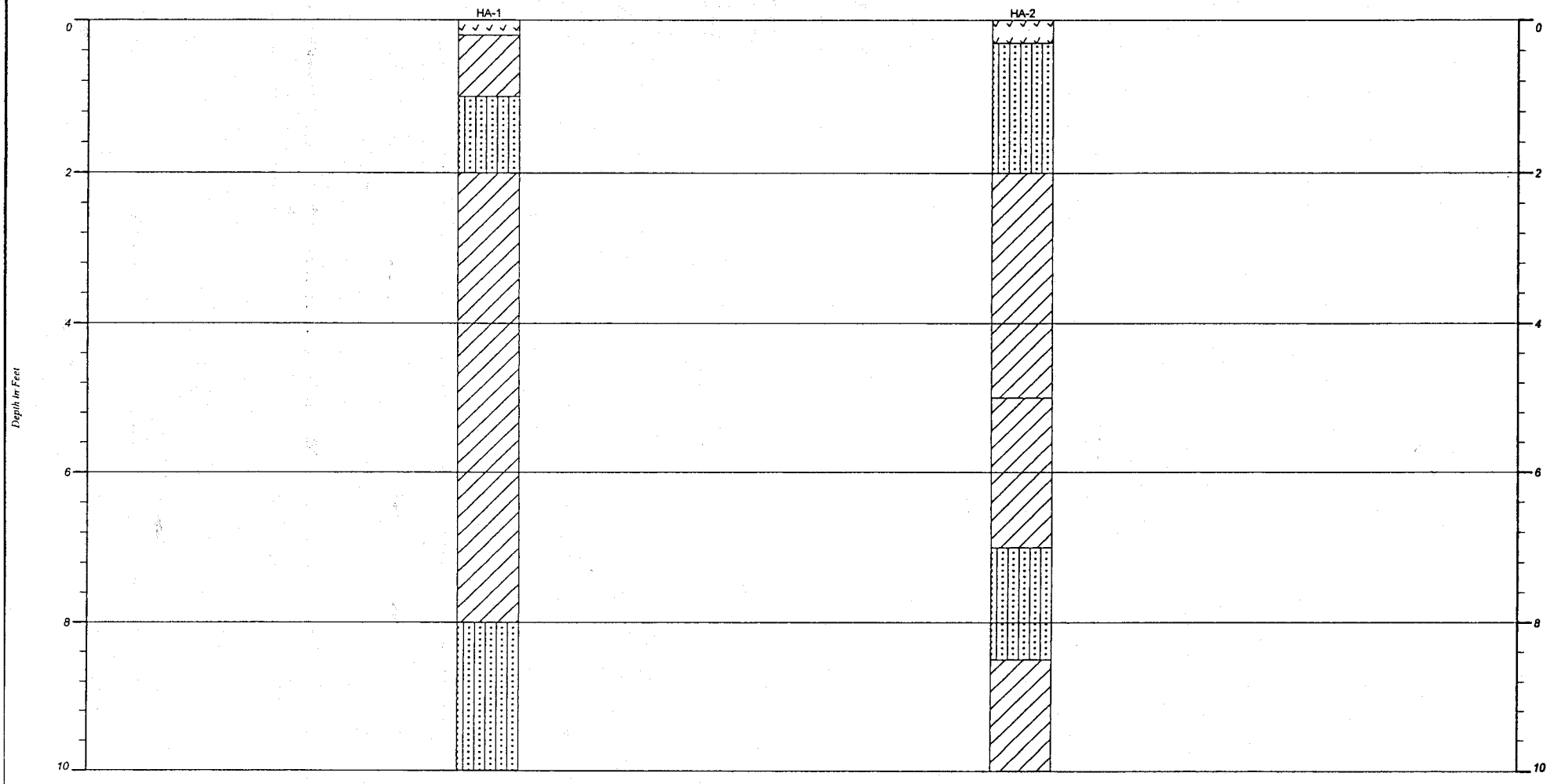
Geotechnical Environmental Testing Solutions, Inc.

LOG OF BORING No. HA-2

PROJECT: Faith Baptist Church - Existing BMP Dam Evaluation **PROJECT NO.:** VB02-239G
CLIENT: Landmark Design Group
PROJECT LOCATION: Williamsburg, Virginia
LOCATION: East Side of Dam on Crest **ELEVATION:**
DRILLER: P. Everheart **LOGGED BY:** A. Mushett, E.I.T.
DRILLING METHOD: Hand Auger **DATE:** 7/29/02
DEPTH TO - WATER> INITIAL: ▽ **AFTER 24 HOURS:** ▼ **CAVING>**

Depth (feet)	Description	Graphic	Sample No.	Blow Counts	% < #200	TEST RESULTS (Plastic Limit ⊢—⊣ Liquid Limit; Water Content - ●; Penetration - ▨; 10 20 30 40 50)
	Topsoil 4 inches (.3)					
	Brown, moist, Silty Fine to Medium SAND (SM), loose to medium dense, trace Clay lumps (2)					
2	Brown, moist, Fine Sandy CLAY (CL), medium stiff, with Sand Lenses (5)					
4						
	Gray and Brown, moist, Silty CLAY (CL), medium stiff (7)					
6						
	Gray, moist, Silty Fine to Medium SAND (SM), medium dense (8.5)					
8						
	Brown, moist, Fine Sandy CLAY (CL), medium stiff					
10	Boring terminated at 10 ft.					
12						
14						

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



Strata symbols

- Topsoil
- Low plasticity clay
- Silty sand

GET Solutions, Inc.

GENERALIZED SOIL PROFILE

HORIZONTAL SCALE: VERTICAL SCALE: 1"=2'	DRAWN BY/APPROVED BY	DATE DRAWN
	A.M.	8/1/2002

Faith Baptist Church - Existing BMP Dam Evaluation

PROJECT NO. VB02-239G	FIGURE NUMBER

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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ENVIRONMENTAL DIVISION
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environ@james-city.va.us

PLANNING
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planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 253-2620

July 5, 2002

Mr. Michael Privett
Faith Baptist Church
4107 Rochambeau Road
Williamsburg, Va. 23185

AFTER
1. ES Depth Modification IS DONE; CERT BY BLAIR WILSON
2. SF IS REMOVED
THEN OK w/ RELEASE OF BOND
9-26-02

Re: Faith Baptist Church
County Plan No. SP-124-97; Amended SP-24-00
Stormwater Management Facility
County BMP ID Code: WC 054

Dear Mr. Privett:

The Environmental Division has reviewed a record drawing as submitted to our office on June 26th 2002 for the above referenced project. The record drawing provides as-built information for a dry pond detention facility situated in the southeast corner of the site approximately 750 ft. south of the main church building.

Based on our review of the project and a concurrent field inspection as performed on July 3rd 2002, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site:

Construction Certification:

1. In accordance with Note # 19 on Sheet C-1 and the "boxed" note on Sheet C-3 of the approved plan set, construction certification for the stormwater management/BMP facility is required. None was provided. This is especially important since the facility has a large engineered and compacted earthen embankment. The note on Sheet C-1 is as follows:

9-20-02 BLAIR WILSON

"As-built drawings must be provided for all detention/BMP facilities. Also upon completion, the construction of all detention/BMP facilities shall be certified by a professional engineer who inspected the structure during construction. The certification shall state that to the best of his/her judgement, knowledge and belief, the structure was constructed in accordance with the approval plans and specifications".

The certification can be in letter format or by use of the certification statements in Section 4 of the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions*. A copy of these requirements are attached.

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2. Along with the record drawing set, submit completed record drawing and construction certification forms, Sections 1 through 5, and applicable record drawing checklists from the *James City County, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions* (packet). The Environmental Division began use of the forms and checklists in this packet effective February 1st 2001.

9-20-02

3. Show the following additional information on the record drawing: size and invert elevation of the low flow orifice at the EW-11 endwall (micropool area); dimensions and elevations of the two weir slots at the riser crest; invert elevation of the 18-inch barrel at the upstream end in the riser; crest elevation of the emergency spillway; and class of riprap at the outfall end of the pond barrel.

4. Based on contour information as shown on the record drawing, the highest constructed elevation for top of dam is at contour El. 70.0. Design top of dam elevation for this facility was at El. 70.8 and design water surface elevation for the 100-year storm was at El. 69.7. A minimum of freeboard of 1 foot is required between the 100-year water surface elevation and the lowest top of dam elevation for this type of facility. As it appears that design top of dam elevations were not achieved, three options exist to satisfy design requirements:

FINAL ES DEPTH RECOMMEND MEMO

4a) Provide additional as-built spot elevation data along top of dam to confirm that top of dam elevation meets or exceeds Elevation 70.8; NO

4b) Provide a "check" hydraulic model (routing) using as-built data to show the facility as constructed can safely pass the design 100-year storm event with minimum 1 ft. of freeboard;

4c) Construct top of dam to proper design elevation (El. 70.8) using additional compacted fill material along top of dam and revise the record drawing as appropriate.

5. If possible add the following County identifiers to the lower right hand corner of the record drawing: County Plan Number SP-24-00 and BMP ID Code: WC 054.

Construction - Related:

6. Remove silt fence present along the downstream toe of the dam embankment.

7. It appears the emergency spillway was relocated from the north side of the BMP (as proposed) to the south side of the BMP (as constructed). Based on our review of the approved plan, the record drawing and our field inspection, it does not appear the middle (level) portion of the emergency spillway crest has adequate depth to safely pass the 100-year design storm event over the dam to the natural channel. Firstly, the as-built elevation of the emergency spillway crest was not provided. Secondly, there appears to be a low spot (of inadequate depth) where high storm flows through the spillway could overtop the spillway channel and short-circuit across the compacted fill embankment (dam face) rather than be safely conveyed to the natural channel. This condition could result in surface erosion of the dam embankment and failure of the dam. *(Note: As design emergency spillway crest was at El. 68.5 and design top of dam was at El. 70.8, less 1 ft. of freeboard minimum, it is presumed that the emergency spillway should be approximately 1.3 feet deep minimum.)*

TO BE BUILT UP OR EXCAV. PER MEMO

8. An access hatch, as required per the "Precast Anti-Vortex Detail" on Sheet C-3 of the approved plan was not provided. As the anti-vortex/trash rack cap is of considerable weight, a hatch or manhole type lid is necessary for future inspection and maintenance purposes. NO CALL ON PLAN. HATCH NOT AVAIL. CAN SEE THRU WEIRS.

9. The entire bottom portion of the BMP (approximately 30 ft. x 20 ft. size) in front of the low flow orifice and EW-11 endwall was found to be completely filled with coarse aggregate. Placement of stone in this area was not in accordance with the provisions of the approved plan and serves no benefit for water quality purposes. The stone should be removed, unless proper justification is present to warrant it's presence, such as a persistent surface erosion condition. MEMO ADDRESSES

Also, during our field inspection a groundhog and lair was observed at the outfall area of the 15-inch storm pipe which conveys drainage from the main site to the stormwater conveyance channel which leads to the BMP. A groundhog is considered a nuisance animal as it relates to structural embankments of BMPs and could seriously threaten the structural integrity of the compacted fill embankment, should it find the fill as a suitable burrow location. Although presently a considerable distance from the BMP, it is highly suggested that efforts be taken to routinely monitor groundhog activity in the area and take action as appropriate to ensure the integrity of the dam embankment is not jeopardized. Obviously, this type of condition may be very difficult to control or solve completely; however, efforts should be made to the greatest extent possible to limit groundhog activity in the direct vicinity of the BMP embankment.

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed.

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

Sincerely,

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

cc: Dean Raynes, HIS Land Surveying - via fax

G:\SWMProg\AsBuilts\SP2400.wc054

FES

FOUNDATION ENGINEERING SCIENCE, INC.
• Geotechnical Engineering
• Environmental Management
• Construction Materials Testing

11843-B Canon Boulevard, Suite 6
Newport News, Virginia 23606
Phone: (757) 873-4113
Fax: (757) 873-4114
Email: Elawar@aol.com

August 4, 1997

Faith Baptist Church
P.O. Box 650
Lightfoot, Virginia 23090

Attn: **Pastor Mike Privett**

Re: Final Report
Geotechnical Engineering Services
Faith Baptist Church, Phase I
James City County, Virginia
FES Project No. 1-701182.001

Dear Mr. Privett:

Foundation Engineering Science, Inc. (FES) has completed a geotechnical engineering study at the subject project site. The geotechnical engineering services were performed in general accordance with FES Proposal No. 1-700065.001, dated July 9, 1997, following your authorization on July 18, 1997. The geotechnical engineering study consisted of performing several soil test borings, auger borings , obtaining one (1) bulk soil sample and performing one (1) permeability test within the site of the proposed structure, pavement and storm-water management areas. The subsurface information obtained were evaluated with respect to the available project characteristics and recommendations for the foundation support systems, pavement structural section and storm-water management area designs were presented. In addition to the foundation system and pavement structural design recommendations, we assessed the general conditions pertaining to the earthwork phases and developed recommendations for site clearing, grading and filling operations.

Briefly, the results of our analyses indicate the proposed new construction can be supported on conventional shallow foundations with an allowable soil bearing pressure of 2500 pounds per square foot (psf) and with the first floor built over crawl sapce following proper subgrade preparation and proper drainage improvements, as recommended in this report.

Briefly, the results of our field exploration and testing program indicated the existing soils located from an approximate depth of five (5) to six (6) feet have an infiltration rate of thirty-six (36) feet per day (1.3x E-4 meter per second). The soils located from an approximate depth of five (5) to ten (10) feet consisted of sand with some silt (SP-SM). In sizing the storm-water management area, the infiltration rate presented in this report should be used conservatively with proper application of a safety factor [minimum of two (2)]. In this regard, it is recommended that the design infiltration rate of eighteen (18) feet per day (6.3xE-5 meter per second) be utilized.

The subgrade soils encountered in the borings performed in the pavement areas indicate a flexible pavement section can be supported. The design pavement structural sections for the entrance road and parking areas are shown in the pavement design recommendation section of this report.

The results of the subsurface exploration program, laboratory testing program, including the recommendations for the foundation system and pavement areas are included in this report. We have great interest in providing construction materials testing and special inspection services during the construction phase of this project and will be pleased to meet with you at your convenience to discuss these engineering services.

FES appreciates the opportunity to be of service to **Faith Baptist Church** on this important project and look forward to its successful completion. If we can be of any further assistance or you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,

FOUNDATION ENGINEERING SCIENCE, INC.

1/12/98

Raja S. Elawar, P.E.
Principal
VA Reg. No. 23683

COMMONWEALTH OF VIRGINIA
RAJA S. ELAWAR
No. 026383
PROFESSIONAL ENGINEER

Attachments: Appendix
Table 1- California Bearing Ratio Test Result
Figures
Boring Profile Sheets
Laboratory Test Result Figures

Copies: (1) Client
(2) Langley & McDonald, P.C. (Mr. Dick Phillips, P.E.)

C:\wpdocs\geotech\1-701182.001

AB FILE

DEVELOPMENT MANAGEMENT

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July 5, 2002

Mr. Michael Privett
Faith Baptist Church
4107 Rochambeau Road
Williamsburg, Va. 23185

Re: Faith Baptist Church
County Plan No. SP-124-97; Amended SP-24-00
Stormwater Management Facility
County BMP ID Code: WC 054

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Sincerely,

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

cc: Dean Raynes, HIS Land Surveying - via fax

G:\SWMProg\AsBuilts\SP2400.wc054

720 Main Street
Suite 112
P.O. Box 1269
West Point, Virginia 23181-1269
(804) 843-9744

Mitchell-Wilson Associates, P.C.

October 10, 2002

OCT 2002
RECEIVED
ENVIRONMENTAL DIVISION

Mr. Scott J. Thomas, P.E.
Environmental Division
James City County
P.O. 8784
Williamsburg, Virginia 23187-8784

Dear Scott:

RE: Faith Baptist Church Stormwater Management Basin SP-24-00, BMP WC 054

In accordance with our discussions relative to the certification and as-built facilities on the referenced project, I observed the reconstruction of the emergency spillway exit channel on October 7, 2002 and the finished construction on October 11, 2002. Based on my observations, the reconstruction appears to be satisfactory and in general conformance with my recommendations as outlined in my memorandum to you dated September 20, 2002.

Attached is one (1) set of blueprints of the Record Drawing and the original mylars of the Record Drawings. Please contact me if you have any questions.

Sincerely,

Jonathan Blair Wilson, P.E.
President

APPROVED
James City County
Environmental Division
By: _____
Date: 10-11-02

cc. file 1718

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
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(757) 253-2620

August 29, 2002

Faith Baptist Church of Williamsburg
Mr. Michael R. Privett
4107 Rochambeau Drive
Williamsburg, VA 23188

Re: Faith Baptist Church

Dear Mr. Privett:

The purpose of this letter is to inform you that the $18,000 Letter of Credit No. 7760017056/0002 for the above referenced project expires on October 1,, 2002. As stated in the Siltation Agreement, prior to release of this surety all construction must be complete. The remaining item to be completed is the submission of as-built drawings for the stormwater detention facility. Once this requirement has been met the letter of credit will no longer need to be extended.

James City County will grant an extension to this Letter of Credit for up to six months. We will require delivery of the revised Letter of Credit to the **James City County, Environmental Division, 101 Mounts Bay Road, Williamsburg VA 23185,** no later than 4:00 p.m., **September 24, 2002** to avoid draw of existing surety.

Sincerely,

Darryl E Cook

Darryl E. Cook
Environmental Director

cc: BB&T

JAMES CITY COUNTY - ENVIRONMENTAL DIVISION

Office Phone: 757-253-6670 Fax Number: 757-259-4032

DATE SENT: 9/09/02

Name: Blair Wilson
Firm or Company: Mitchell-Wilson
Facsimile Number: (804) 843-9334
Number of pages including this transmittal: 4
From: Scott J. Thomas

James City County
P O Box 8784
Williamsburg VA 23187-8784

Comments: BMP Certification Forms.

If you do not receive all pages, call 757-253-6670 as soon as possible

SCOTT J. THOMAS, P.E.
CIVIL ENGINEER

ENVIRONMENTAL DIVISION

101 MOUNTS BAY ROAD, P.O. BOX 8784 (757) 253-6639
WILLIAMSBURG, VIRGINIA 23187-8784 FAX: (757) 259-4032
E-MAIL: scottt@james-city.va.us

DEVELOPMENT MANAGEMENT

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July 5, 2002

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4107 Rochambeau Road
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Sincerely,

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

cc: Dean Raynes, HIS Land Surveying - via fax

G:\SWMProg\AsBuilts\SP2400 wc054

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

SP-24-00
GPIN 1340100009

County BMP ID Code (if known): WC 054

Name of Facility: Faith Baptist Church BMP No.: 1 of 1 Date: 07/03/02

Location: 4107 Rochambeau Road

Name of Owner: Faith Baptist Church of Williamsburg

Name of Inspector: SJ Thomas

Type of Facility: Dry Ext Det Pond

Weather Conditions: Sunny, Hot, 90's Type: ☑ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	Large Earthen Embankment; 12' High; 2H:1V SS			
Grass Height	✓			Good Grass Cover; 1-3' High
Vegetation Condition	✓			OK
Tree Growth	✓			None.
Erosion	✓			None Observed
Trash & Debris	✓	✓		Silt Fence D/S for.
Seepage	✓			None Observed.
Fencing or Benches				
Interior Landscaping/Planted Areas:	☑ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation			
Vegetated Conditions		✓		Interior SS Grassed;
Trash & Debris	✓			Micropool Area is all VDOT #1
Floating Material	✓			Stone (30x20). No WQ
Erosion	✓			benefit
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other				
Notes: Services Church Tax parcel + Offsite Areas				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☐ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☑ None, Dry (Detention Basin)				
Shoreline Erosion	✓			Good interior
Algae	✓			
Trash & Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other	✓			
Inflows (Describe Types/Locations): Shallow SCC @ west end.				
Condition of Structure	✓			SCC is shallow, not well-
Erosion		✓		defined at inflow to BMP.
Trash and Debris	✓			Minor slope erosion of
Sediment	✓			BMP slope to micropool.
Outlet Protection	✓			VDOT #1 stone.
Other	✓			
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): 48"ϕ RCP Riser w/ conc. cap.				
Condition of Structure	✓			6" PVC with Ent-1 LF ORIF.
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other		✓		NO ACCESS LID ON RCP CAP
Principal Outlet Structure - Barrel, Conduit, etc. : 18" RCP Barrel.				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection		✓		Clean veg at Pipe outfall.
Other				
Emergency Spillway (Overflow): Plan East Side; Const on West Side				
Vegetation	✓			
Lining	✓			
Erosion		✓	✓	Does not appear deep enough MEDIAN
Trash & Debris				OF FLAT CREST. See note.
Other				
Notes: BMP is in remote back (south) of offsite tract. Meant for future expansion of panel.				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows		✓	✓	Groundhog hole at 15" storm outfall
Graffiti	✓			500' North of BMP. Could
Other				threaten BMP.
Surrounding Perimeter Conditions:	South Woods; North Adj. Parcel (V# + NC Laborers)			
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			Church to open field to BMP. ≈ 700' south of church parking lot.
Other				

Remarks:
- o Remove silt fence D/S toe.
- o ES thru fill at South side of dam. Does not appear deep enough in middle of crest section (1.2' ft. per plan) May overtop & threaten D/S Fill Emb.
- o Micropool area (30 + 20') filled w/ #1 stone. Not per plan Serves no WQ benefit.
- o SIC to BMP is shallow, not well-defined @ BMP.
- o Early signs of erosion of D/S Nat. Channel @ BMP.
- o Monitor Groundhog activity 500' north of BMP.

Overall Environmental Division Internal Rating: 3

REINSPECT 10-9-02
OK, SAME RATING

Signature: [signature] **Date:** 7/3/02 10:35 pm

Title: Civil Engineer ENV DIV.

SWMProg\BMP\CoInspProg\DetRet.wpd

WATERSHED	WC	MAINTENANCE PLAN	~~No~~ Yes	CTRL STRUC DESC	RCP Riser
BMP ID NO	054	SITE AREA acre	22.74	CTRL STRUC SIZE inches	48
PLAN NO	SP-24-00	LAND USE	House of Worship	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(13-04)((01-09)	old BMP TYP		OTLT BARRL SIZE inch	18
PIN NO	1340100009	JCC BMP CODE	F2 Dry ED with forebay		
CONSTRUCTION DATE	7/1/2002	POINT VALUE	4	EMERG SPILLWAY	~~No~~ YES
PROJECT NAME	Faith Baptist Church			DESIGN HW ELEV	69.7
FACILITY LOCATION	4107 Rochambeau Road			PERM POOL ELE	na
CITY-STATE	Williamsburg, Va. 23185	SVC DRAIN AREA acres	15.53	2-YR OUTFLOW cfs	0.66
CURRENT OWNER	Faith Baptist Church of Williamsburg			10-YR OUTFLOW cfs	21.43
OWNER ADDRESS	4107 Rochambeau Road			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	12.85 ac onsite; 2.69 offsite		
CITY-STATE-ZIP CODE	Williamsburg, Va. 23188	IMPERV AREA acres	5.20	CONSTR CERTI	~~No~~ Yes
OWNER PHONE	566-0456	RECV STREAM	UT of Frances Swamp		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	No	LAST INSP DATE	
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	0	INTERNAL RATING	
		CHAN PROT CTRL	Yes	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0.922	CN=80; 4 ac. future bldg & paving; BMP offsite main 7 ac parcel.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu

PROJECT: FAITH BAPTIST CHURCH
CASE NO. SP-124-97
PREPARED BY: R.S. PHILLIPS, P.E.

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
C-3 (70%)	11	x	2.11 / 2.75	=	8.44
D-1 (10%-20%)	2	x	.26/2.75	=	.19
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 8.63

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit (0.1 per 1%)		Points for Natural Open Space
13.9%	x	.1	=	1.39

C. TOTAL WEIGHTED POINTS

Structural BMP Points	+	Natural Open Space Points	=	TOTAL
8.63	+	1.39	=	10.02

WC054

ENVIRONMENTAL DIVISION REVIEW COMMENTS
FAITH BAPTIST CHURCH
PLAN NO. SP-24-00 MCE/DEC
March 24, 2000

1. A Land Disturbing Permit and Siltation Agreement, with surety, are required for this project.

2. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project.

3. As-built drawings must be provided for the detention basin on completion. Also, a note shall be provided on the plan stating that upon completion, the construction of the dam will be certified by a professional engineer who has inspected the structure during construction.

4. Provide a soils map to delineate the different soil types in accordance with the James City County Soil Survey.

5. Show any temporary soil stockpile areas, staging and equipment storage areas.

6. Identify any off-site land disturbing areas required with proper erosion control measures.

7. Provide the James City County Erosion Control Notes dated 5/5/99.

8. Provide a sequence of construction for the project.

9. Provide conservation easements for all Natural Open Space areas claimed in the BMP worksheet.

10. On sheet C-3, relabel the riprap channel that enters the basin at the northwest end. It is not the emergency spillway. Provide a detail or a more complete description of the channel configuration.

11. Provide details on the riprap outlet protection for the BMP. Specify the amount of stone to be used in accordance with Spec 3.19 of the third edition of the Virginia Erosion Control Handbook (VESCH).

12. Specify the compaction of the material for the clay core and the remainder of the embankment.

13. Provide a stone construction entrance at the entrance to the project.

14. Provide information on the check dams in the swale. Are these to be permanent or temporary?

15. Provide silt fence along the downslope side of the proposed 15 inch silt fence.

ENVIRONMENTAL DIVISION REVIEW COMMENTS
FAITH BAPTIST CHURCH
PLAN NO. SP-24-00
May 24, 2000 MCE/DEC

1. Modify the sequence of construction to show the installation of the check dam referenced in Item #7 to before Item #6 where excavation and construction begins.

2. Low Flow Orifice Protection. The Section A-A references a modified EW-11 structure to be used as low flow release trash protection. I cannot find this detail on the plan. Also the plan section specifies an EW-12 to be used. Please clarify and provide the appropriate detail.

3. BMP Pretreatment. The resubmission shows the forebay located in the bottom of the basin. The intent of the forebay is to provide an easily accessible area where sediment entering the BMP can be captured and readily removed. Please determine the feasibility of locating the forebay in either the channel immediately above the BMP or modifying the shape of the basin to located the forebay within a corner of the proposed BMP at a higher elevation. Also provide a riprap overflow weir in the berm of the forebay to control the flow from the forebay into the basin.

4. Maintenance Plan. The maintenance plan for the stormwater management/BMP facility needs to be developed by the project designer, not the owner, as owners generally don't have the expertise to develop one. See attached example plan that can be used as a guide.

5. Geotechnical Report. Ensure that a copy of the geotechnical report is forwarded to the County when it is prepared. The owner needs to be made aware that the construction of the facility will need to be certified by a qualified professional engineer.

(Note: This is a Sample Maintenance Plan for a Detention or Retention facility. Use or modify as required specific to operation and maintenance requirements for your designed SWM / BMP facility.)

Maintenance Plan (Detention or Retention Pond BMP's)

A maintenance program is required to ensure the Stormwater Management / Best Management Practice (BMP) pond 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, its spillways and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection meaures should be implemented with inspections performed at least once weekly.

The Owner or its designated representative will inspect the SWM/BMP structure after each significant rainfall event or the following working day if a weekend or holiday occurs. A significant rainfall for this structure is defined as one (1) inch or more of gauged rainfall within a 24 hour period. Once per year (more or less) a representative of the County may jointly inspect the structure. Appropriate action, performed at the cost of the owner will be taken to ensure appropriate maintenance. Where structures are to be maintained jointly, allocation of maintenance costs will be in accordance with terms established in maintenance agreements. Keys to locked access points or structures shall be made available to the County upon request.

BMP Description: {Briefly describe the type of structure, the site it serves and function in layman terms. Example: BMP # 1 serves a drainage area of 5.5 acres associated with Section 1 of XYZ Development. The facility is a 4 point County Type F-2 BMP with a 72 inch vertical RCP riser, 36 inch RCP outlet barrel and trapezoidal shaped emergency overflow channel. There are 3 openings in the riser to provide for water quality drawdown and to offer control for the 2- and 10- year design storm events. During the 100-year storm, the maximum water level should rise to about 2 feet above the top of the riser, which is 1.5 feet below the top of dam, and surface area of the water would be about 3/4 of an acre. An emergency spillway is located at the left end (facing downstream) of the facility. The average depth of the shallow marsh portion of the BMP is about 7 feet.}

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

Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage areas. If the depth of sediment reaches the depth of x ' - x " above the bottom of pond (or Cleanout Elevation of xxx.x) , removal is required using a rubber-wheeled backhoe. At the same time, or at least once per year, clean pretreatment devices, the riser bottom and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area.

Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees and shrubs should not be permitted to grow on any part of the graded embankments.

Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed a qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.

In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations.

Perform quarterly inspections of the riser section and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevent the movement of water, trash and litter downstream and to maintain the integrity of the structure and provide an attractive appearance.

FAITH BAPTIST CHURCH
BMP / RETENTION POND MAINTENANCE PROGRAM

1. A Maintenance Program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) Pond Facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris, sediment and non-point source pollution into pretreatment areas, the SWM/BMP facility, and its spillways and down stream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If any other construction or related land-disturbing activities are preformed upslope of the SWM/BMP facility, adequate protection measures should be implemented with inspections preformed at least once weekly.

2. The Owner or its designated representative will inspect the SWM/BMP facility after each significant rainfall event or the following workday if a weekend or holiday occurs. A significant rainfall for this structure is defined as one inch (1") 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 facility and its appurtenances. Appropriate action, preformed at the cost of the Owner, will be taken to ensure the SWM/BMP facility remains in optimum operating condition. Keys to locked access points or structures, should they exist, shall be made available to the County upon request.

3. This SWM/BMP facility services a watershed area or 15.53 acres. During a 25-year storm event the maximum water level should rise to about 1" above the top of the anti-vortex device, which is 1.93 feet below the top of the dam, an emergency spillway is located at the left side of the dam. (Facing downstream.)

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

   A) Inspect for sediment buildup by visual observation and a physical determination of sediment depth within pond storage area. If the depth of sediment reaches the depth of 3.5' above the bottom of the pond (or a cleanout elevation 62.25') removal is required using a rubber-tyred backhoe. At the same time, or at least once per year, clean pretreatment devices, the riser bottom, and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area.

   B) Perform maintenance mowing of pond grasses at least twice each year. Grasses such as tall fescue should be mowed in early summer and in late fall to prevent seeds of annual weeds from maturing. Trees and shrubs should not be permitted to grow on any part of the graded embankments.

C) Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by a qualified independent soil-testing laboratory. Apply additional line and fertilizer in accordance with test recommendations.

D) In stabilized pond areas, if vegetation covers less that 40% of soil surfaces, lime, fertilize, and seed in accordance with recommendations for new seedings. If vegetation covers more than 40% but less than 70% of soil surface, lime fertilize and over seed in accordance with current seeding recommendations.

E) Perform quarterly inspections of the riser sections and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris along with any trash and litter downstream to maintain the integrity of the facility and provide an attractive appearance.

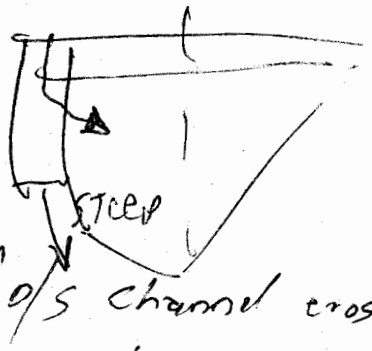
REINSPECTIONS 10-9-02

FAITH BAPTIST CHURCH

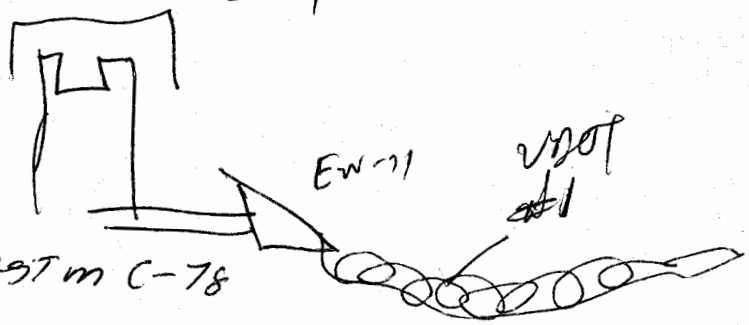
- EMERGENCY SPILLWAY DEEPENED (7.5' W x 30" DEEP; 3H:1V SS)
- EMERG SPILLWAY + PART OF D/S DAM SLOPE MATTED W/ EC-2.
- WIRE SCREEN ADDED TO EW-11 LF ORIF
- CLASS I 22' L x 10' WIDE W/ FABRIC ADDED TO C/L INTERIOR SLOPE OF DAM @ INFLOW.
- INSPECT O/L. SAT

WC 054 F1 July 3 2008
10:20

- Remove SF D/S emb
- EMB Good veg 1-3' High no trees
- ES - Not defined channel thru fill 1.2 ft deep. 25' ft from facility would jump out of spillway and flow across D/S fdp. (could cause failure
  Cross Sect



- Some signs of D/S channel erosion Sed.
- OP Class I 15' wide x 20' L
- Barrel 18" RCP - clear veg from D/S barrel out
- LFORIF
  6" PVC w/
  EW-11 clean



- Riser 48" ASTM C-78
  w/ RCP cap
- micropool 30 x 20' w/ VDOT #1 stone does promote WQ
  Wht stone in MP?
  Not on DCAW

Rating
3 10:35pm

SJ Thomas
JL Rawlings

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 26 day of Nov, 2006, between Faith Baptist Church, and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property:

Parcel Identification Number: 1340100040
Legal Description: Parcel 2 Hickory Neck Corp
Project or Subdivision Name: Faith Baptist Church - Recreation Bldg
Document No.
OR Deed Book 0822, Page No. 0634,
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, monitoring, 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

Instrument # 060029135
Recorded on Dec. 6, 2006

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.

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)

Faith Baptist Church

Print Name/Title Daniel A. Tozier-Trustee

ATTEST:

Joe F. Fraga

COVENANTOR(S)

Faith Baptist Church
Michael R Privett, Trustee

Print Name/Title Michael R. Privett, Trustee

ATTEST:

Joe F. Fraga

COMMONWEALTH OF VIRGINIA

~~CITY/~~COUNTY OF James City

I hereby certify that on this 26 day of November, 2006, before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared Daniel I. Tozier, Michael R Privett and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 26 day of November, 2006.

Carolyn R Sargent
Notary Public

My Commission expires: Feb 28, 2010

Approved as to form:

A Hankinsman
County Attorney

This Declaration of Covenants prepared by:

James F McReynolds
JAMES F McREYNOLDS
(Print Name)

trustee
(Title)

5541 FARMERS DR.
(Address)

BARHAMSVILLE 23011
(City) (State) (Zip)

757-566-2295
(Phone Number)

drainage1.pre

James City County
VIRGINIA
Jamestown 1607

TRANSMITTAL SHEET

ENGINEERING & RESOURCE PROTECTION → STORMWATER

Project: FAITH BAPTIST CHURCH

County Plan No. SP-104-07

Assigned BMP No.: WC054

BMP Type: DRY POND

Information Enclosed:

- ☑ Record Drawings (Asbuilts)
- ☑ Construction Certification
- ☑ Computations
- ☑ Other : MYLARS

RECEIVED ON
JAN 14 '13
Stormwater Division

Name: MICHAEL MAJDESKI

Date: 1/10/2013

Signature: Michael P. Majdeski

James City County Environmental Division
Stormwater Management/BMP Record Drawing & Construction Certification Review
Tracking Form

Project Name: FAITH BAPTIST CHURCH
County Plan No.: SP-104-07
Stormwater Management Facility: DRY POND
BMP Phase #: ☐ I ☐ II ☑ III

- ☑ Information Package Received. Date/By: 2/27/12 - ERP
- ☑ Completeness Check:
  - ☑ Record Drawing Date/By: 3/1/12 D. RAYNES
  - ☑ Construction Certification Date/By: 1/23/12 J.B. WILSON
  - ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - ☑ Insp/Maint Agreement # / Date: 060029135 / 11/26/04
  - ☑ BMP Maintenance Plan Location: COPY PROVIDED IN FILE
  - ☐ Other: N/A
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
  - ☑ Yes ☐ No Location: SITE PLAN - COPY PROVIDED IN FOLDER
- ☑ Assign **County BMP ID Code #**: Code: DC054
- ☑ Preliminary Input/Log into Division's "As-Built Tracking Log"
- ☑ Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
- ☑ Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☑ Active Project File Review (correspondence, H&H, design computations, etc.).
- ☑ Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.).
- ☑ Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
- ☑ Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
- ☑ Final Inspection (FI) Performed Date: 8/6/12 MM
- ☑ Record Drawing (RD) Review Date: 8/29/12 WAC
- ☑ Construction Certification (CC) Review Date: 8/29/12 WAC
- ☐ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: 9/13/12 RD DELAYED
  - ☑ Record Drawing (RD)
  - ☑ Construction Certification (CC)
  - ☑ Construction-Related (CR)
  - ☑ Site Issues (SI)
  - ☐ Other :
- ☑ Second Submission: RD 10/15/12 OKAY PER WAC
- ☑ Reinspection (if necessary): N/A
- ☑ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
- ☑ Complete "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 save into County BMP Inventory.
- ☑ Request mylar/reproducible from As-Built plan preparer. - SUBMITTED 10/15
- ☑ Complete "As-built Tracking Log".
- ☑ Last check of BMP Access Database (County BMP Inventory).
- ☐ Add BMP to JCC Hydrology & Hydraulic database (optional). N/A
- ☐ Add BMP to Municipal BMP list (if a County-owned facility) N/A
- ☐ Add BMP to PRIDE BMP ratings database. N/A

Final Sign-Off

Inspector: [signature] Date: 10/16/12

Chief Engineer: [signature] Date: 1/10/13

*** See separate checklist, if needed.

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

County BMP ID Code (if known): WCOSH

Name of Facility: FAITH BAPTIST CHURCH BMP No.: 1 of 1 Date: 9/6/12

Location: ADJACENT TO ROCHAMBEAU DR.

Name of Owner: JAMES McREYNOLDS

Name of Inspector: M. MAJDESKI

Type of Facility: DRY POND

Weather Conditions: SUNNY 70° Type: ☑ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height	✓			
Vegetation Condition	✓			
Tree Growth	✓			
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	✓			
Interior Landscaping/Planted Areas:	☑ None	☐ Constructed Wetland/Shallow Marsh	☐ Naturally Established Vegetation	
Vegetated Conditions	✓			
Trash & Debris	✓			
Floating Material	✓			
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other				
Notes:				

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		N/A		
Sediment				
Aesthetics				
Other				
Inflows (Describe Types/Locations):				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure	✓			
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			
Other				
Emergency Spillway (Overflow):				
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:				
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			
Other				

Remarks:

-NONE-

Overall Environmental Division Internal Rating: 4/5

Signature: Mia P. Mia **Date:** 9/6/12

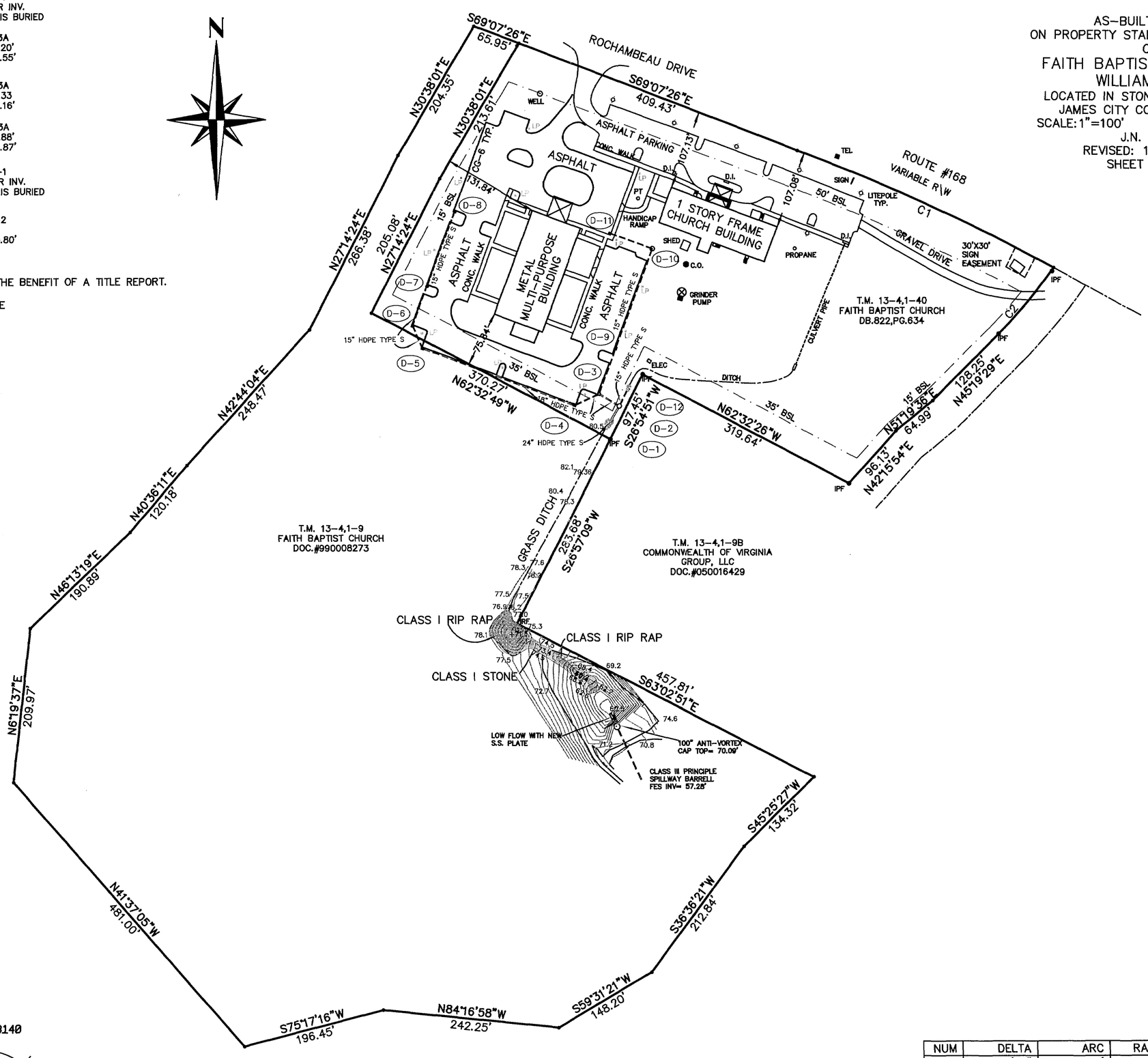
Title: Sr. Environmental Inspector

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

AS-BUILT SURVEY
ON PROPERTY STANDING IN THE NAME
OF
FAITH BAPTIST CHURCH OF WILLIAMSBURG
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=100' DATE: 10/21/2011
J.N. 110.8
REVISED: 10/04/2012
SHEET 1 OF 3

(D-1) VDOT ES-2 24" FES INV. = 81.3'
(D-2) VDOT MH-1 NO RIM OR INV. SHOT MH IS BURIED
(D-3) VDOT DI-3A RIM = 87.97' INV. = 82.97'
(D-4) VDOT DI-3A RIM = 88.20' INV. = 83.55'
(D-5) VDOT DI-3A RIM = 89.65' INV. = 85.50'
(D-6) VDOT DI-3A RIM = 90.33 INV. = 86.16'
(D-7) VDOT DI-3A RIM = 91.17' INV. = 87.01'
(D-8) VDOT DI-3A RIM = 93.88' INV. = 89.87'
(D-9) VDOT DI-3A RIM = 90.72' INV. = 86.70'
(D-10) VDOT MH-1 NO RIM OR INV. SHOT MH IS BURIED
(D-11) VDOT DI-1 RIM = 97.00' INV. = 93.01'
(D-12) VDOT ES-2 15" FES INV. = 85.80'

NOTES:
1. THIS SURVEY WAS DONE WITHOUT THE BENEFIT OF A TITLE REPORT.
2. REFERENCES: PB.65,PG.76
3. ADDRESS: 4107 ROCHAMBEAU DRIVE



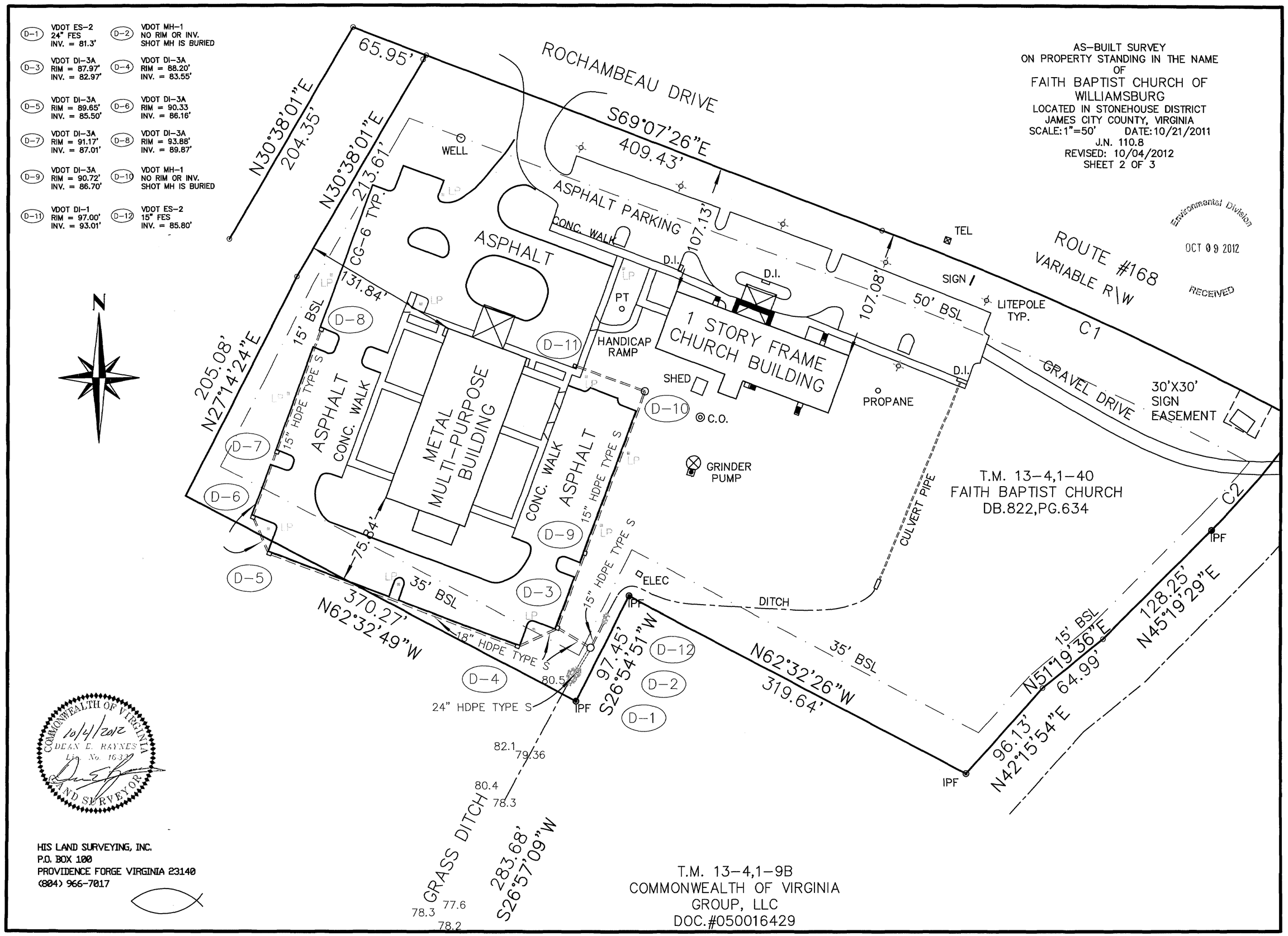
NUM	DELTA	ARC	RADIUS	BEARING	DISTANCE
C1	7°52'10"	387.98'	2824.79'	N65°45'21"W	387.68'
C2	9°36'26"	118.04'	703.96'	N40°01'11"E	117.90'

COMMONWEALTH OF VIRGINIA
10/4/2012
DEAN E. RAYNES
Lic. No. 1633
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

Environmental Division
OCT 09 2012
RECEIVED

AS-BUILT SURVEY
ON PROPERTY STANDING IN THE NAME
OF
FAITH BAPTIST CHURCH OF
WILLIAMSBURG
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=50' DATE: 10/21/2011
J.N. 110.8
REVISED: 10/04/2012
SHEET 2 OF 3



Environmental Division
OCT 09 2012
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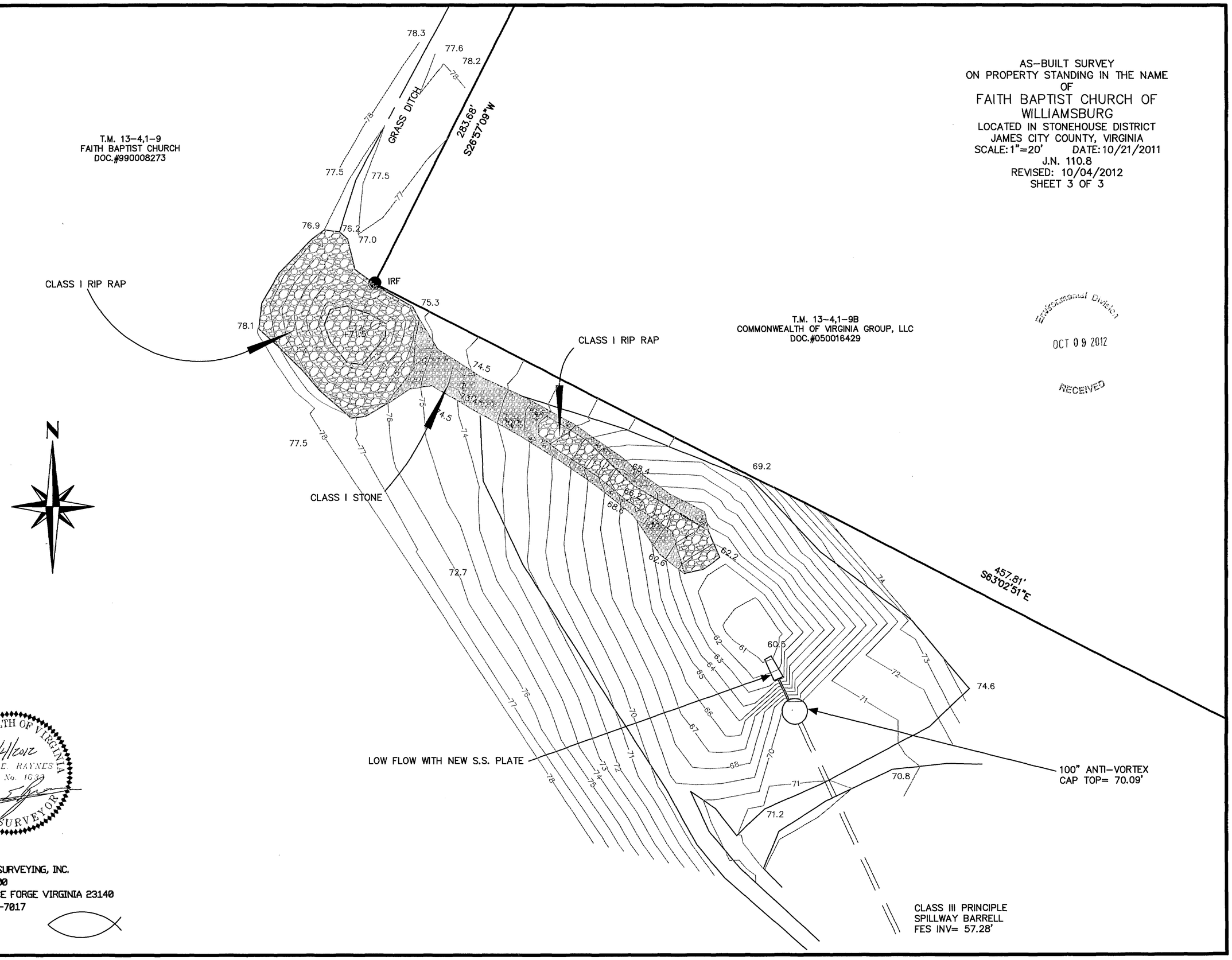
AS-BUILT SURVEY
ON PROPERTY STANDING IN THE NAME
OF
FAITH BAPTIST CHURCH OF
WILLIAMSBURG
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=20' DATE: 10/21/2011
J.N. 110.8
REVISED: 10/04/2012
SHEET 3 OF 3



Environmental Division
OCT 09 2012
RECEIVED

COMMONWEALTH OF VIRGINIA
10/4/2012
DEAN E. RAYNES
Lic. No. 16[illegible]
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

attached below existing above grade disabled parking signs, provided that the bottom edge of the attached sign is no lower than four feet above the parking surface.

Maintenance Plan (Dry Swale BMP)

A maintenance program is required to ensure the Stormwater Management / Best Management Practice (BMP) dry swale 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 filtration area and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once per year. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

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

BMP Description: The dry swale facility serve the Faith Baptist Church Recreation Building and parking area. The dry swale drainage area is approximately 1.8 acres. The facility is a 10point County Type E-2 BMP. The stormwater dry swale system provides for groundwater recharge and water quality volume in one location. The facility will intercept, store and filter runoff resulting from rainfall events. The system is designed to permit overflows to be conveyed though a piped storm drain system to a stable outfall upstream from an existing dry detention stormwater management basin. The structure includes a pre-treatment sedimentation forebay area, a 30-inch deep by 24-inch wide sand filled trench filter with a 4-inch diameter perforated high density polyethylene under drain outlet pipe wrapped in VDOT No. 57 stone aggregate. Stormwater is stored in void spaces within the filtering zones until it eventually seeps into under drain piping beneath the sand filter trench, and is ultimately discharged to the downstream dry detention basin for further treatment and release.

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

1. Sediment shall be removed from the pre-treatment forebay area when the depth of the sediment accumulation is 12-inches or more. Vegetation in the forebay area should be limited to a maximum height of 18-inches. The forebay outlet shall be cleaned and/or repaired when drawdown times exceed 36-hours. Trash and debris should be removed as necessary.

2. Sediment shall be removed from the filter bed when the accumulation of sediment exceeds one inch of depth, and when water ponds on the surface of the filter bed for more than 48-hours following a rainfall event. The top layer of the sand filter should be removed and replaced with clean material. The contaminated layer of sand should be disposed of in an acceptable manner, or taken to a landfill as may be required.

3. Grass cover over the dray swale area should be mowed a minimum of three (3) times per growing season to maintain a grass height of 12-inches or less.

4. 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 including the removal of trash, litter and sediment from surrounding grass, parking and stabilized contributing areas should be performed weekly to prevent migratio into the BMP. During winter, keep snow removal materials such as sand, salt or cinders away from the filtration 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 disposa area.

5. Many factors will affect the operation of a dry swale filtration 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.

6. Routinely inspect vegetated filtering strips adjacent to the facility. A healthy stand of grass should be maintained at all times. Mow the filter strips with lawnmowers at high setting 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 sand filter.

7. 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.

8. 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

Wilson Engineers, LLC

Memo

Environmental Division

FEB 27 2012

RECEIVED

To: William Cain, P.E.

From: Jonathan Blair Wilson, P.E.

CC: file 1718

Date: 2/23/2012

Re: Faith Baptist Church Record Drawing and Certification Statement

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Attached is the review submission of the Engineer's Certification Statement and the Record Drawing for the Faith Baptist Church project. Please note that the Record Drawing was prepared by HIS Land Surveying, and as such my Engineer's Certification is limited to only my visual observations of the project, and not the information contained on the Record Drawing. Faith Baptist Church commissioned my former firm Mitchell-Wilson Associates, P.C. to provide construction staking services for the BMP improvements and storm drainage system; but did not commission us to provide construction inspection or project observations during the facility installations. My Engineer's certification is limited to visual observations of the completed project and does not include certification on any required inspection, monitoring or certification of construction required during the progress of the work.

Please contact me at (804) 843-9744 if you have any questions. Thank you.

STORMWATER
COMPS.

FAITH BAPTIST CHURCH
Parking Area Expansion
SITE PLAN

Final
Drainage and Stormwater Calculations

October 17, 2008

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
Lic. No. 019961
10-17-08
PROFESSIONAL ENGINEER

Prepared By:
Mitchell-Wilson Associates, P.C.
Civil Engineers & Land Surveyors
3560 King William Avenue
P.O. Box 1269
West Point, Virginia 23181-1269
(804) 843-9744

Faith Baptist Church
Summary of Stormwater Analysis Revisions of October 2008

Original Approved Design ("Landmark" plan SP-124-97)

Existing Peak Discharge (10 year)	=	26.19 cfs

Post –Development

Master Plan Total Impervious Area	=	5.20 acres including existing off-site area
Developed Peak Discharge (10 year)	=	54.82 cfs
Routed Peak Discharge (10 year)	=	21.08 cfs

Elevation-Storage (from Landmark BMP design)

Elevation (ft)	Cumulative Storage (cf)
58.80	0
59.0	11
60.0	844
62.0	6990
64.0	22642
66.0	49333
68.0	76880
70.0	104596

Routed Peak Water Surface Elevation = 67.66' (10-year storm) "LandMark"

Current Plan of Development (Mitchell-Wilson Associates, P.C.) SP-104-07

Post –Development

Total Impervious Area	=	3.34 acres including existing off-site area
Developed Peak Discharge (10 year)	=	32.03 cfs
Routed Peak Discharge (10 year)	=	19.53 cfs

Elevation-Storage (with new interior volume excavation @ 3:1 side slopes)

Elevation (ft)	Cumulative Storage (cf)
60.42	0
67.97	34428
70.0	52205
70.73	60027

Routed Peak Water Surface Elevation	=	68.93' (10-year storm)
Emergency Spillway Crest	=	69.21'
Top of Dam (at Low Point – existing)	=	70.73'
Top of Dam (with topsoil addition)	=	71.0'
Routed Peak Discharge (100 year)	=	53.67 cfs
Maximum 100-Year Storm Water Surface Elevation	=	69.94'
Freeboard to Top of Dam(with topsoil addition)	=	1.06'

FOR A LARGER SITE AREA. SITE IS PROPOSED FOR SUBDIVISION TO LESSEN SITE AREA INCREASING IMPERVIOUS AREA %.

BMP WC-054 originally was designed to serve the future full development of Faith Baptist Church properties with an allowable on-site total impervious area of 4.93 acres (5.20 acres combined total watershed impervious areas consisting of on-site impervious area plus existing off-site impervious area). The BMP was designed and approved as meeting James City County design standards for water quantity and quality control. As currently constructed, BMP WC-054 is adequate to serve the level of site development currently existing, currently under construction, the new proposed Phase 1 and Phase 2 future improvements. The total impervious area of the Faith Baptist Church properties at the completion of the Phase 2 work will only be 2.539 acres, or 51% of the BMP WC-054 original master plan design imperviousness.

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
Lic. No. 019961
10-17-08
PROFESSIONAL ENGINEER

4. Stormwater & Drainage Calculations

A. Permanent Facilities

B. Temporary Sediment Basin

#1718 8-21-07 JBW

FAITH BAPTIST IMPERVIOUS AREAS / RUNOFF COEFFICIENT

D-8 = 0.772 Ac

	AREA (S.F.)
NEW ASPHALT	8609
CURRENT ASPHALT	5034
ORIGINAL ASPHALT	1876
ROUTE 60 ASPHALT	4200
NEW SIDEWALK	462
CURRENT SIDEWALK	273
NEW CG-6 & CG-2	444
CURRENT CG-2	137
CURRENT PORTICO	338
CURRENT BUILDING	1514
FUTURE BUILDING ADDITION	1092

TOTAL IMPERVIOUS AREA = 23969 S.F.
= 0.550 Ac

COMPOSITE "C" FACTOR

	%	×	C	=
IMPERVIOUS	0.550/0.772	×	0.90	= 0.64
LAWN	0.222/0.772	×	0.30	= 0.07
			C	= 0.71

1718 8-21-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS/RUNOFF COEF.

D-7 = 0.340 Ac

	AREA (S.F)
NEW ASPHALT	5607
NEW SIDEWALK	657
FUTURE SIDEWALK	37
FUTURE BUILDING ADDITION	2666
CURRENT BUILDING	3790
NEW CG-6 & CG-2	284
TOTAL IMPERVIOUS AREA	= 13041
	= 0.299 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.299/0.340 × 0.90 =	0.79
LAWN	0.041/0.340 × 0.30 =	0.04
	C =	0.83

D-6 = 0.061 Ac

	AREA (S.F.)
FUTURE ASPHALT	1788
FUTURE SIDEWALK	81
FUTURE CG-6 & CG-2	181
TOTAL IMPERVIOUS AREA	= 2050 S.F.
	= 0.047 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.047/0.061 × 0.90 =	0.69
LAWN	0.014/0.061 × 0.30 =	0.07
	C =	0.76

#1718 8-21-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS / RUNOFF COEFFICIENT

D-5 = 0.170 Ac

	AREA (S.F)
FUTURE ASPHALT	5552
FUTURE SIDEWALK	473
FUTURE CG-6 & CG-2	356

TOTAL IMPERVIOUS AREA = 6381 S.F
= 0.146 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.146/0.170	× 0.90 =	0.77
LAWN	0.024/0.170	× 0.30 =	0.04
		C =	0.81

D-4 = 0.171 Ac

	AREA (S.F.)
FUTURE ASPHALT	5545
FUTURE SIDEWALK	473
FUTURE CG-6 & CG-2	356

TOTAL IMPERVIOUS AREA = 6374 S.F.
= 0.146 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.146/0.171	× 0.90 =	0.77
LAWN	0.025/0.171	× 0.30 =	0.04
		C =	0.81

#1718 8-21-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS/RUNOFF COEF.

D-3 = 0.064 Ac

	AREA (S.F.)
FUTURE ASPHALT	1844
FUTURE SIDEWALK	81
FUTURE LG-6 ; LG-2	188

TOTAL IMPERVIOUS AREA = 2113 S.F.
= 0.048 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.048/0.064	× 0.90	= 0.68
LAWN	0.016/0.064	× 0.30	= 0.08
		C	= 0.76

#1718 8-21-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS / RUNOFF COEFFICIENT

D-11 = 0.253 Ac

	AREA (S.F.)
CURRENT ASPHALT	5858
CURRENT SIDEWALK	1067
CURRENT PORTICO	338
CURRENT CG-2	50
TOTAL IMPERVIOUS AREA	= 7313 S.F.
	= 0.168 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.168 / 0.253 × 0.90 =	0.60
LAWN	0.085 / 0.253 × 0.30 =	0.10
	C =	0.70

D-9 = 0.521 Ac

	AREA (S.F.)
CURRENT BUILDING	5250
FUTURE BUILDING	3750
FUTURE ASPHALT	7793
FUTURE SIDEWALK	996
FUTURE CG-6 & CG-2	386
TOTAL IMPERVIOUS AREA	= 18175 S.F.
	= 0.417 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS	0.417 / 0.521 × 0.90 =	0.72
LAWN	0.104 / 0.521 × 0.30 =	0.06
	C =	0.78

#1718 8-21-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS / RUNOFF COEF.

D-12 = 2.617 Ac

	AREA (S.F.)
EXISTING ASPHALT	19966
EXISTING SIDEWALKS, RAMPS, STEPS, STOOPS	2246
EXISTING C&G	865
EXISTING PORTICO	676
EXISTING BUILDING	8002
EXISTING SHED	123
EXISTING GRAVEL DRIVE	292

TOTAL IMPERVIOUS AREA = 32170 S.F.
= 0.738 Ac

COMPOSITE "C" FACTOR

IMPERVIOUS 0.738/2.617 x 0.90 = 0.25
LAWN 1.879/2.617 x 0.30 = 0.22
C = 0.47

T_C = 16 MIN

OVERLAND FLOW L = 100' n = 0.24 S = 2.42% T = 13 MIN

SHALLOW CONCENTRATED FLOW L = 348' H = 10' T = 3 MIN

#1718 9-4-07 JBW

FAITH BAPTIST CHURCH IMPERVIOUS AREAS / RUNOFF COEF

D-1b = 2.571 Ac

IMPERVIOUS AREA = ϕ

Composite "C" FACTOR

WOODED	0.79 Ac / 2.571 Ac × 0.25 =	0.08
LAWN	1.781 Ac / 2.571 Ac × 0.30 =	0.21
	C =	0.29

Tc: 13 min

OVERLAND L=100' S=6% T=11min

SHALLOW CONCENTRATED L=314 H=22 T=2min

D-1A = 5.143 Ac

IMPERVIOUS AREA = 1.103 Ac (VA. Commonwealth Group LLC)

Composite "C" FACTOR

IMPERVIOUS AREA	1.103 / 5.143 × 0.90 =	0.19
WOODED	1.107 / 5.143 × 0.25 =	0.05
LAWN	2.933 / 5.143 × 0.30 =	0.17
	C =	0.41

TC = 18 MIN

OVERLAND FLOW L=100' S=2% T=13 min

SHALLOW CONCENTRATED L = 812' H=36.5 T=5 min

8-21-07 JBW

LD-229
July 2000

STORM SEWER DESIGN
COMPUTATIONS

ROUTE: NA PROJ: FAITH BAPTIST CHURCH
COUNTY: JAMES CITY DISTRICT: SUFFOLK
DESCRIPTION: ON-SITE STORM DRAIN

SHEET ____ OF ____

FROM POINT (1)	TO POINT (2)	AREA DRAIN "A" ACRES (3)	RUN-OFF COEF. C (4)	CA INCREMENT (5)	CA ACCUMULATED (6)	INLET TIME MINUTES (7)	RAIN FALL IN./HR. (8)	RUN-OFF Q C.F.S. (9)	INVERT ELEVATIONS UPPER END (10)	INVERT ELEVATIONS LOWER END (11)	LENGTH FT. (12)	SLOPE FT./FT. (13)	DIA. IN. (14)	CAPACITY C.F.S. (15)	VEL. F.P.S. (16)	FLOW TIME MINUTES INCREMENT / ACCUMULATED (17)	REMARKS (18)
D-8	D-7	0.772	0.71	0.55		5.0	7.17	3.94	89.50	86.83	108	0.0247	15	10.17	3.21	0.6 / 5.6	
D-7	D-6	0.340	0.83	0.28	0.83	5.6	7.01	5.81	86.83	85.83	58	0.0172	15	8.48	4.74	0.2 / 5.8	
D-6	D-5	0.061	0.76	0.05	0.88	5.8	6.95	6.12	85.83	84.83	33	0.0303	15	11.26	4.99	0.1 / 5.9	
D-5	D-4	0.170	0.81	0.14	1.02	5.9	6.93	7.07	84.83	82.83	222	0.0090	18	9.96	4.00	0.9 / 6.8	
D-4	D-3	0.171	0.81	0.14	1.16	6.8	6.70	7.77	82.83	82.50	38	0.0087	18	9.79	4.40	0.1 / 6.9	
D-11	D-10	0.253	0.70	0.18		5.0	7.17	1.29	93.00	92.50	64	0.0078	15	5.71	1.05	1.0 / 6.0	
D-10	D-9	—	—		0.18	6.0	6.90	1.24	92.50	86.00	151	0.0430	15	13.42	1.01	2.5 / 8.5	
D-9	D-3	0.521	0.78	0.41	0.59	8.5	6.31	3.72	86.00	82.50	58	0.0603	15	15.89	3.03	0.3 / 8.8	
D-3	D-2	0.064	0.76	0.05	1.80	8.8	6.25	11.25	82.50	81.50	31	0.0322	18	18.84	6.37	0.1 / 8.9	
D-12	D-2	2.617	0.47	1.23		16.0	5.03	6.19	84.00	81.50	20	0.1250	15	22.87	5.04	— / 16.0	
D-2	D-1				3.03	16.0	5.03	15.24	81.50	81.40	20	0.0050	24	15.98	4.85	— / 16.0	
D-1	OUTFALL	0.128	0.30	0.04	3.07	16.0	5.03	15.44									

$C_{10} = \frac{A}{B + T_c}$ A = 185.06
B = 20.81

Appendix 9B-3 LD-347 Hydraulic Grade Line Computations

LD-347 Rev. 7/00
HYDRAULIC GRADE LINE

ON-SITE SYSTEM (PRIVATE)

PROJECT: FAITH BAPTIST CHURCH
SHEET: 1 of 2

INLET NUMBER (1)	Outlet Water Surface Elev. (2)	D_o (3)	Q_o (4)	L_o (5)	S_{fo} % (6)	H_f (7)	JUNCTION LOSS V_o (8)	H_o (9)	Q_i (10)	V_i (11)	Q_iV_i (12)	$\frac{V_i^2}{2g}$	H_i (13)	Angle (14)	H_Δ (15)	H_t (16)	1.3 H_t (17)	0.5 H_t (18)	Final H (19)	Inlet Water Surface Elev. (20)	Rim Elev. (21)
D-2	83.00	24	15.24	20	0.45	0.09	4.85	0.09	11.25	6.37	71.66	0.63	0.22	90	0.44	0.75	—	0.38	0.47	83.47	86.00
									6.19	5.04	31.20										
D-3	83.47	18	11.25	31	1.15	0.36	6.37	0.16	7.77	4.40	34.19	0.30	0.10	53	0.15	0.41	0.53	0.14	0.50	83.97	87.50
									3.72	3.03	11.27										
D-4	83.97	18	7.77	38	0.55	0.21	4.40	0.08	7.07	4.00	28.28	0.25	0.09	46	0.11	0.28	0.36	0.18	0.39	84.36	87.50
D-5	84.36	18	7.07	222	0.45	1.00	4.00	0.06	6.12	4.99	30.54	0.38	0.13	45	0.16	0.35	0.46	0.23	1.23	85.59	89.00
D-6	85.59	15	6.12	33	0.89	0.29	4.99	0.10	5.81	4.74	27.54	0.35	0.12	45	0.15	0.37	0.48	0.24	0.53	86.12	90.00
D-7	86.12	15	5.81	58	0.81	0.47	4.74	0.09	3.94	3.21	12.65	0.16	0.06	—	—	0.15	0.20	0.10	0.57	87.62*	91.00
D-8	87.62	15	3.94	108	0.37	0.40	3.21	0.04	—	—	—	—	—	—	—	0.04	0.05	0.03	0.43	90.02*	93.50

$d_n = 0.$
$d_c = 0.$

* HGL FALLS BELOW INLET INVERT; SET INLET W.S. = d_n

$$H_i = 0.35\frac{V_i^2}{2g} \quad H_o = 0.25\frac{V_o^2}{2g} \quad H_\Delta = K\frac{V_i^2}{2g}$$

FINAL H = $H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	25° K = 0.22	

See LD-72 D)67

Appendix 9B-3 LD-347 Hydraulic Grade Line Computations

LD-347 Rev. 7/00
HYDRAULIC GRADE LINE

ON-SITE SYSTEM (PRIVATE)

PROJECT: FAITH BAPTIST CHURCH
SHEET: 2 of 2

INLET NUMBER (1)	Outlet Water Surface Elev. (2)	D_o (3)	Q_o (4)	L_o (5)	S_{fo} % (6)	H_f (7)	JUNCTION LOSS V_o (8)	H_o (9)	Q_i (10)	V_i (11)	Q_iV_i (12)	$\frac{V_i^2}{2g}$	H_i (13)	Angle (14)	H_Δ (15)	H_t (16)	1.3 H_t (17)	0.5 H_t (18)	Final H (19)	Inlet Water Surface Elev. (20)	Rim Elev. (21)	
D-9	83.97	15	3.72	58	0.33	0.19	3.03	0.04	1.24	1.01	1.25	0.02	0.01	—	—	0.05	0.06	0.03	0.22	86.40*	90.00	dn=
D-10	86.40	15	1.24	151	0.04	0.06	1.01	0.01	1.29	1.05	1.35	0.02	0.01	90	0.01	0.03	—	0.02	0.08	92.78*	96.50	dn=
D-11	92.78	15	1.29	64	0.04	0.02	1.05	0.01	—	—	—	—	—	—	—	0.01	0.01	0.01	0.03	93.41*	97.00	dn=

* HGL FALLS BELOW INLET INVERT ; SET INLET W.S. = dn

$$H_i = 0.35\frac{V_i^2}{2g} \quad H_o = 0.25\frac{V_o^2}{2g} \quad H_\Delta = K\frac{V_i^2}{2g}$$

FINAL H = $H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	25° K = 0.22	

See LD-72 D)67

Appendix 9B-1 LD-204 Stormwater Inlet Computations

LD-204
Rev. 6-85

RTE NA PROJ FAITH BAPTIST CHURCH DATE 8-23-07 SHEET ____ OF ____

ON-SITE INLETS

INLET NUMBER (1)	TYPE (2)	LENGTH (FT) (3)	STATION (4)	DRAINAGE AREA (AC) (5)	C (6)	CA (7)	sum CA (8)	I (IN//HR) (9)	Q INCR (CFS) (10)	Q_b, CARRYOVER (CFS) (11)	Q_T, GUTTER FLOW (CFS) (12)	S, GUTTER SLOPE (FT/FT) (13)	S_x, CROSS SLOPE (FT/FT) (14)	T, SPREAD (FT) (15)	W (FT) (16)	W/T (17)	S_W (FT/FT) (18)	S_W/S_X (19)	E_o (App. 9C-8) (20)	a = 12W(S_W - S_X) + Local Depression (21)	S'_W = a/(12W) (22)	$S_e = S_X + S'_W (E_o)$, (FT/FT) (23)	COMPUTED LENGTH, L_T, (FT) (App. 9C-17) (24)	L, SPECIFIED LENGTH (FT) (25)	L/L_T (26)	E (App. 9C-18) (27)	Q_i, INTERCEPTED (CFS) (28)	Q_b, CARRYOVER (CFS) (29)	Sag Inlets Only: d (FT) (30)	h (FT) (31)	d/h (32)	T, SPREAD @ SAG (FT) (33)	REMARKS
D-8	3A	2.5		0.772	0.71	0.55		4.0	2.20																				0.29	0.44	0.65		
								6.5	3.57																				0.40	0.44	0.91		
D-7	3A	2.5		0.340	0.83	0.28		4.0	1.12																				0.18	0.44	0.41		
								6.5	1.82																				0.26	0.44	0.59		
D-6	3A	2.5		0.061	0.76	0.05		4.0	0.20																				0.06	0.44	0.14		
								6.5	0.32																				0.08	0.44	0.18		
D-5	3A	2.5		0.170	0.81	0.14		4.0	0.56																				0.12	0.44	0.27		
								6.5	0.91																				0.16	0.44	0.36		
D-4	3A	2.5		0.171	0.81	0.14		4.0	0.56																				0.12	0.44	0.27		
								6.5	0.91																				0.24	0.44	0.54		
D-9	3A	2.5		0.521	0.78	0.41		4.0	1.64																				0.33	0.44	0.75		
								6.5	2.66																				0.06	0.44	0.14		
D-3	3A	2.5		0.064	0.76	0.05		4.0	0.20																				0.08	0.44	0.18		
								6.5	0.32																								

$Q = C_W (L + 1.8W) d^{1.5}$ $C_W = 2.3$

$Q = 14.03\, d^{1.5}$

#1718 5-13-08 JBW

RIP-RAP STONE OUTLET PROTECTION

D-1

$Q_{10} = 15.44$ cfs

$D_o = 24''$

$d_n = 0.65'$ $d_n > 1/2 D$ ∴ MAXIMUM TW COND.

FROM PLATE 3.18-4 $d_{50} = 6''$ MIN.

MINIMUM APRON LENGTH, $L_A = 10'$

INITIAL WIDTH $= 3D_o = 6'$

$W = D_o + 0.4L_A = 2 + 0.4(10) = 6'$

USE: 6'×6' APRON

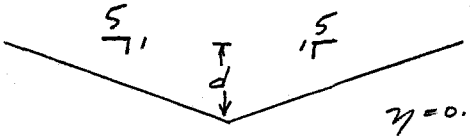
CLASS I RIP-RAP

$T = 26''$

#1718 8-21-07 JBW

OUTFALL CHANNEL ADEQUACY

$Q_{10} = (\sum_{D-1}^{D-11} CA) I_{10} = (3.07) \times 5.03 = 15.44$ cfs.



EXISTING CHANNEL D-1 to BMP

$n = 0.035$ EXISTING GRASS LINED

$S_b = 0.0322$ ft/ft.

$V_{10} = 4.26$ fps

$d_{10} = 0.85$ ft. ← $d_{(MIN)}$ @ Shallow point = 0.6'

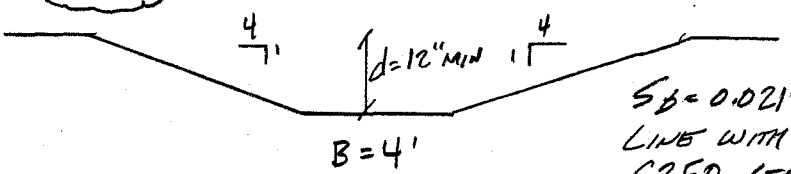
$\tau = 1.71$ lb/SF

$\tau_{max} = 2.16$ lb/SF FINE SANDY LOAM

F.S. = 1.26 STABLE

EXISTING CHANNEL WILL OVERTOP BANKS

TRY:



$S_b = 0.0217$ ft/ft.

LINE WITH NORTH AMERICAN GREEN C350 STAPLE PATTERN E (UNVEGETATED – TRIAL #1)

BEND RADIUS = 32'

$V_{10} = 3.49$ fps
$d_{10} = 0.67$ ft (NORMAL)
$d_{BEND} = 0.78$ ft (SUPERELEVATED)
$\tau = 1.09$ lb/SF (SUPERELEVATED)
$\tau_{max} = 3.20$ lb/SF
} UNVEGETATED

F.S. = 2.93 ADEQUATE & STABLE

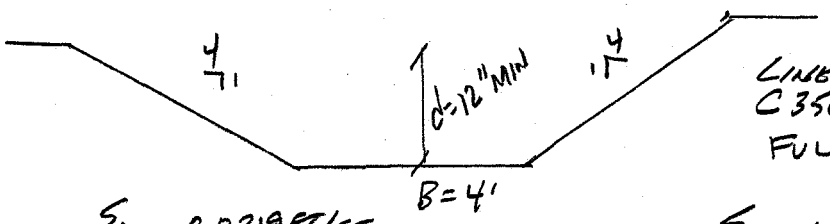
$V_{10} = 3.58$ fps
$d_{10} = 0.65$ ft (NORMAL)
$d_{BEND} = 0.77$ ft (SUPERELEVATED)
$\tau = 1.07$ lb/SF (SUPERELEVATED)
$\tau_{max} = 2.16$ lb/SF
} (VEGETATED – TRIAL #2)

F.S. = 2.01 ADEQUATE & STABLE

#1718 5-12-08 JBW

OUTLET CHANNEL TO FOREBAY AREA

$Q_{10} = (\Sigma CA)_{D1}^{D-11} I_{10} = (3.07) \times 5.03 \text{ in/hr} = 15.44 \text{ cfs}$



LINE WITH NORTH AMERICAN GREEN C350 STAPLE PATTERN & FULLY VEGETATED

$S_b = 0.0219$ FT/FT
$n = 0.035$
$V_{10} = 3.59$ fps
$d_n = 0.65'$
$\tau = 0.89$ lb/SF
$\tau_{max} = 2.16$ lb/SF
$FS = 2.43$

STABLE & ADEQUATE

$S_b = 0.0464$ FT/FT
$n = 0.035$
$V_{10} = 4.82$ fps
$d_n = 0.53'$
$\tau = 1.52$ lb/SF
$\tau_{max} = 2.16$ lb/SF
$FS = 1.42$

STABLE & ADEQUATE

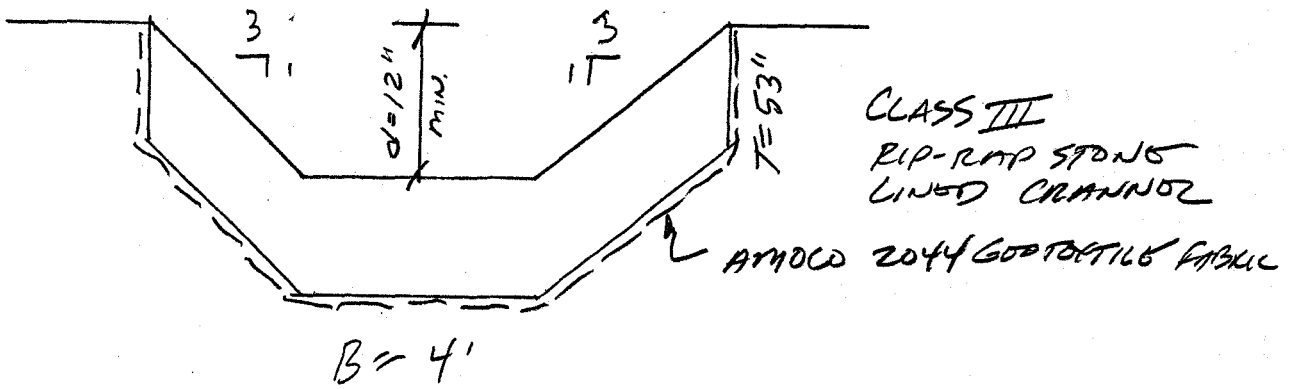
FAITH BAPTIST | 10-13-08

REVISED INLET CHANNEL TO BMP

CHANNEL LINING CALCULATIONS:

$Q_{10} = (\Sigma CA)_{D-16}^{D-12} \; I_{10} = (3.82) \times 5.03 \text{ in/hr} = 19.21 \text{ cfs}$

STA 0+59.59 TO STA 0+97.82



$S_b = 0.2506$ ft/ft

$\eta = 0.10$

$V_{10} = 4.66$ fps

$d_n = 0.68$

$\tau_{max} = \gamma d S_b = (62.4 \text{ lb/ft}^3)(0.68 \text{ ft})(0.2506) = 10.6 \text{ lb/ft}^2$

$\tau_p = F_x(\gamma_s - \gamma) D_{50} = 0.047(165 \text{ lb/ft}^3 - 62.4 \text{ lb/ft}^3)\, 2.2" = 10.6 \text{ lb/ft}^2$

F.S. = 1.0

Appendix 7B-4 **RIPRAP DESIGN WORK SHEET FOR STANDARD VDOT RIPRAP SIZES ONLY**

CHANNEL DATA

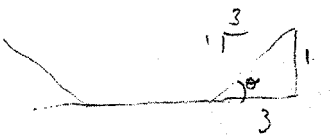
Q = 19.21 (cfs) P = 8.30 (ft.) n = 0.10

S_o = 0.2506 (ft/ft) R = 0.50 (ft.)

d_n = 0.68 (ft.) V_n = 4.66 (fps)

A = 4.11 ($ft.^2$) Side Slope = 3 :1

DETERMINE RIPRAP SIZE



$\phi = 42°$ Side Slope = 3 :1 θ = 18.43°

$\tan\theta = \frac{1}{3}$

$\theta = 18.43$

$K_1 = [1 - (\sin^2\theta / \sin^2\phi)]^{0.5}$

$K_1 = [1 - (\sin^2 18.43° / \sin^2 42°)]^{0.5}$ = 0.88

For Specific Gravity = 2.65 and Stability Factor = 1.2

$D_{50} = 0.001 \cdot V_a^3 / (d_{avg}^{0.5} \cdot K_1^{1.5})$

$D_{50} = 0.001 \cdot 4.66^3 / (0.68^{0.5} \cdot 0.88^{1.5})$

D_{50} Computed = 0.15 ft. (SEE TRACTIVE FORCE CALCS)

Note: All VDOT standard riprap (Class AI through Type II) is assumed to have a ϕ of approximately 42° and a Specific Gravity of 2.65. Therefore, the Computed D_{50} should be adjusted by the Stability Correction Factor (C_{SF}) (if any) to derive a Final D_{50}. The VDOT standard class of riprap with the next higher D_{50} should be specified.

Correction Factor For Stability Factor (SF) other than 1.2 (Default = 1.0)

$C_{SF} = (SF / 1.2)^{1.5} = (1.2 / 1.2)^{1.5} = 1.0$

Final $D_{50} = C_{SF} \cdot$ Computed D_{50} = 1.0 • 0.15 = 0.15

RIPRAP RECOMMENDATION: VDOT (Class) (Type) III

Thickness (T) = 53 " (2 • D_{50} MSD minimum)

PER TRACTIVE FORCE METHOD PREVIOUS SHEET

Source: VDOT

TR-20 HYDROLOGY WORKSHEET

Date: 7-25-03 Revised : 8-21-07

Condition DEVELOPED **Project** FAITH BAPTIST CHURCH

			Acres	Sq. Miles
Drainage Basin #	1	**Total Area**	12.81	0.020015625

Soil Group	Land Use	Area (ac)	RCN	Product
A	OPEN SPACE	2.32	39	90.48
C	OPEN SPACE	3.49	74	258.26
C	WOODS	3.66	70	256.2
C	EXIST. IMPERV	0.88	98	86.24
C	CURRENT IMPERV	0.54	98	52.92
C	New Impervious	0.36	98	35.28
C	Future Impervious	0.77	98	75.46
C	*Offsite Imp. -VCG*	0.79	98	77.42
				0
				0
Totals		12.81		932.26
RCN=	**73**			

C=71

Time of Concentration				
Overland Flow				
T(overland) (hrs)	Length (L)	Roughness (n)	Rainfall (P)	Slope (S)
0.22	100	0.24	3.6	0.02
Shallow Concentrated				
T (concentrated) (hrs)	Height (H)	Length (L)		
0.08	39.5	800		
Total Tc (hrs)	**0.30**			

Total Imper. Area 3.34 **%Impervious** 26.07

Notes:

1. Current impervious area based on as-built survey by Mitchell-Wilson Associates, P.C.
2. New impervious area due to new building, walks and parking area (to be constructed with this plan)
3. Time of concentration route in existing condition remains unaltered in post-development condition.
4. *Future impervious area and planning for full-site buildout.*

```
1


 ******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

 JOB TR-20                    FULLPRINT
 TITLE 001
 TITLE     FAITH BAPTIST CHURCH POST-DEV CONDITION 1-YR STORM
  3 STRUCT      01
  9 ENDTBL
  6 RUNOFF 1    01     1  0.020015625        73.0        0.301 1   1   1
    ENDATA
  7 INCREM 6               0.1
  7 COMPUT 7    01    01          0.0        2.80         1.02 2  03   1
    ENDCMP
    ENDJOB 2
0*******************************END OF 80-80 LIST*********************************
1


 TR20 XEQ 08-29-07  14:55                                                                                                JOB
1   PASS   1
      REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 1-YR STORM
   PAGE   1



 EXECUTIVE CONTROL OPERATION INCREM                                                                                      RECORD
ID
+                                       MAIN TIME INCREMENT =    .10 HOURS


 EXECUTIVE CONTROL OPERATION COMPUT                                                                                      RECORD
ID
+                                       FROM STRUCTURE  1
+                                                          TO STRUCTURE  1
         STARTING TIME =    .00     RAIN DEPTH =  2.80    RAIN DURATION=  1.00    RAIN TABLE NO.= 2    ANT. MOIST. COND= 2
         ALTERNATE NO.= 3          STORM NO.= 1    MAIN TIME INCREMENT =    .10 HOURS


 OPERATION RUNOFF   STRUCTURE  1
            OUTPUT HYDROGRAPH=  1
            AREA=     .02 SQ MI   INPUT RUNOFF CURVE= 73.    TIME OF CONCENTRATION=    .30 HOURS
            INTERNAL HYDROGRAPH TIME INCREMENT=  .0400 HOURS

            PEAK TIME(HRS)              PEAK DISCHARGE(CFS)           PEAK ELEVATION(FEET)
               12.11                            9.52                        (RUNOFF)

 TIME(HRS)         FIRST HYDROGRAPH POINT =    .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =     .02
```

SQ.MI.											
11.00	DISCHG	.00	.00	.00	.00	.00	.02	.11	.48	1.23	3.42
12.00	DISCHG	7.17	9.51	7.65	4.98	3.49	2.61	2.13	1.85	1.67	1.51
13.00	DISCHG	1.37	1.28	1.18	1.11	1.04	.98	.94	.88	.83	.79
14.00	DISCHG	.76	.74	.71	.68	.65	.62	.60	.57	.54	.53
15.00	DISCHG	.53	.53	.53	.53	.51	.49	.47	.46	.46	.46
16.00	DISCHG	.46	.46	.46	.46	.47	.47	.46	.43	.41	.40
17.00	DISCHG	.40	.40	.39	.40	.40	.40	.40	.40	.40	.38
18.00	DISCHG	.35	.33	.33	.32	.32	.32	.32	.32	.32	.32
19.00	DISCHG	.32	.32	.32	.32	.33	.33	.33	.33	.32	.31
20.00	DISCHG	.28	.26	.25	.25	.25	.25	.25	.25	.25	.25
21.00	DISCHG	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25
22.00	DISCHG	.25	.25	.25	.25	.25	.25	.25	.25	.25	.25
23.00	DISCHG	.25	.25	.25	.25	.25	.25	.25	.25	.25	.23
24.00	DISCHG	.20	.16	.10	.05	.02	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = .74 WATERSHED INCHES, 9.52 CFS-HRS, .79 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD
ID

EXECUTIVE CONTROL OPERATION ENDJOB RECORD
ID
1

TR20 XEQ 08-29-07 14:55 JOB
1 SUMMARY
REV PC 09/83(.2) FAITH BAPTIST CHURCH POST-DEV CONDITION 1-YR STORM
PAGE 2

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)
ALTERNATE 3 STORM 1												
+ STRUCTURE 1	RUNOFF	.02	2	2	.10	.0	2.80	24.00	.74	---	12.11	9.52

RATE (CSM)

```
     475.5
1


 TR20 XEQ 08-29-07  14:55                                                                                    JOB
1   SUMMARY
      REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 1-YR STORM
   PAGE   3


 SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

 XSECTION/          DRAINAGE
 STRUCTURE            AREA       STORM NUMBERS..........
   ID               (SQ MI)            1

0 STRUCTURE   1          .02
+_________________________
    ALTERNATE    3                   9.52
1END OF  1 JOBS IN THIS RUN
```

FAITH BAPTIST | 10-9-08

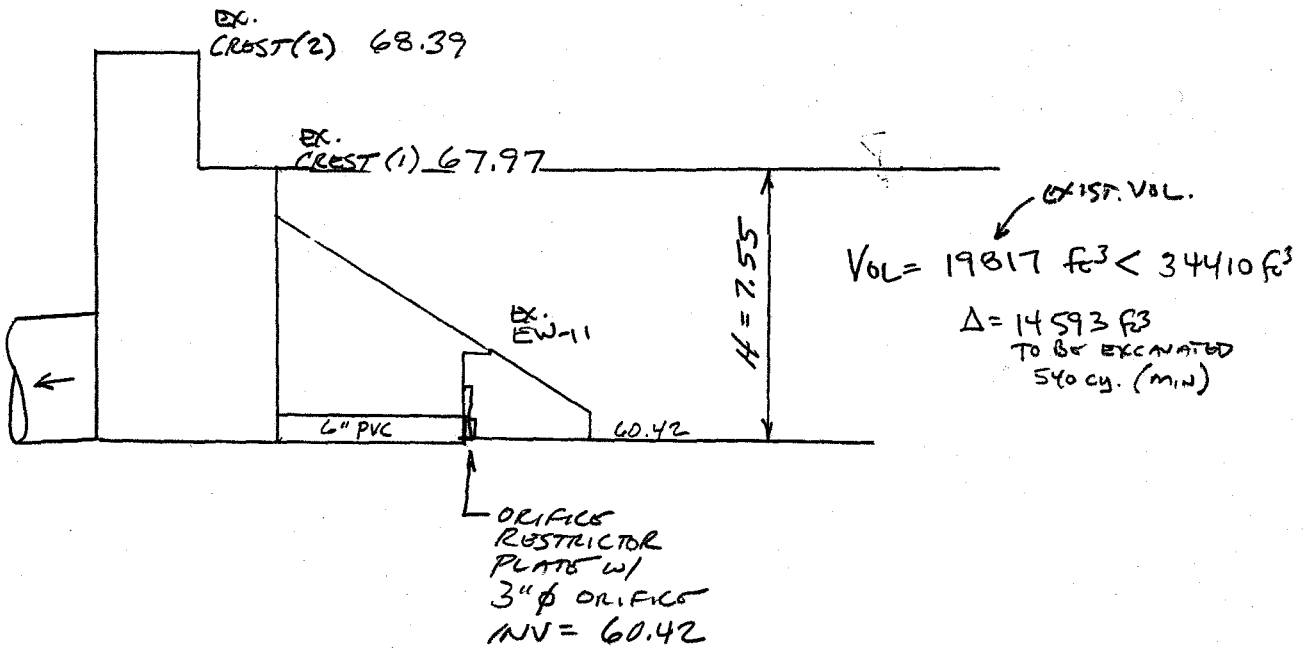
1-YEAR STORM RUNOFF VOLUME

FROM TR-20

R_f = 2.8 INCHES

R_o = 0.74 INCHES

V_R = 34410 ft^3 = 0.79 Ac-ft.



$Q_o = C a \sqrt{2gh}$

$Q_o = (0.6)(0.0491)\sqrt{2 \times 32.2 \times \left(\frac{7.55}{2}\right)} = 0.46$ cfs

T_D = 34410 ft^3 / 0.46 cfs = 74804 sec ≈ 20 hr 47 min

MAXIMUM DETENTION TIME FOR 3"φ ORIFICE

NEW ELEVATION STORAGE TABLE (BELOW 67.97)

ELEV (ft)	AREA (ft^2)	AVG. AREA (ft^2)	ΔELEV (ft)	ΔSTOR (ft^3)	Σ STOR (ft^3)
60.42	1558				0
		4560	7.55	34428	
67.97	7562				34428

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                    FULLPRINT
TITLE 001
TITLE     FAITH BAPTIST CHURCH POST-DEV CONDITION 10-YR STORM
 3 STRUCT      01
 6 RUNOFF 1    01      1  0.020015625        73.0        0.301 1   1   1
   ENDATA
 7 INCREM 6               0.1
 7 COMPUT 7    01    01          0.0        5.04         1.02 2  03   1
   ENDCMP
   ENDJOB 2
0*******************************END OF 80-80 LIST*********************************
R20 XEQ 08-29-07  14:55                                                                                    JOB  1   PASS   1
     REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 10-YR STORM                                  PAGE   1
                                          RECORD ID
+                                         FROM STRUCTURE  1
+                                                          TO STRUCTURE  1
        STARTING TIME =    .00    RAIN DEPTH =  5.04    RAIN DURATION=  1.00    RAIN TABLE NO.= 2    ANT. MOIST. COND= 2
        ALTERNATE NO.= 3          STORM NO.= 1    MAIN TIME INCREMENT =    .10 HOURS
 OPERATION RUNOFF   STRUCTURE  1
           OUTPUT HYDROGRAPH=  1
           AREA=    .02 SQ MI   INPUT RUNOFF CURVE= 73.    TIME OF CONCENTRATION=    .30 HOURS
           INTERNAL HYDROGRAPH TIME INCREMENT=  .0400 HOURS

           PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
              12.09                          32.03                        (RUNOFF)

 TIME(HRS)         FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
    9.00    DISCHG        .00       .00       .01       .02       .03       .05       .07       .09       .11       .13
   10.00    DISCHG        .15       .18       .21       .24       .28       .33       .39       .47       .55       .64
   11.00    DISCHG        .75       .87      1.00      1.15      1.33      1.58      2.45      5.00      8.36     15.96
   12.00    DISCHG      27.14     31.95     24.31     15.27     10.33      7.52      6.01      5.12      4.55      4.10
   13.00    DISCHG       3.69      3.42      3.14      2.94      2.76      2.60      2.46      2.30      2.17      2.07
   14.00    DISCHG       1.98      1.91      1.83      1.76      1.69      1.61      1.54      1.46      1.40      1.37
   15.00    DISCHG       1.36      1.35      1.35      1.35      1.30      1.24      1.19      1.18      1.17      1.17
   16.00    DISCHG       1.17      1.17      1.17      1.17      1.17      1.17      1.15      1.09      1.03      1.00
   17.00    DISCHG        .99       .99       .99       .99       .99       .99       .99       .99       .98       .94
   18.00    DISCHG        .87       .83       .81       .80       .80       .80       .80       .80       .80       .80
   19.00    DISCHG        .80       .80       .80       .80       .80       .80       .80       .80       .80       .75
   20.00    DISCHG        .68       .64       .62       .61       .61       .61       .60       .60       .60       .61
   21.00    DISCHG        .61       .61       .61       .61       .61       .61       .61       .61       .61       .61
   22.00    DISCHG        .61       .61       .61       .61       .61       .61       .61       .61       .61       .61
   23.00    DISCHG        .61       .61       .61       .61       .61       .61       .61       .61       .61       .56
   24.00    DISCHG        .49       .40       .24       .11       .05       .02       .01       .00

   RUNOFF VOLUME ABOVE BASEFLOW =  2.31 WATERSHED INCHES,     29.86 CFS-HRS,     2.47 ACRE-FEET;   BASEFLOW =    .00 CFS

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
                 (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                  A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

 SECTION/    STANDARD              RAIN  ANTEC  MAIN        PRECIPITATION                          PEAK DISCHARGE
 STRUCTURE    CONTROL   DRAINAGE  TABLE  MOIST  TIME   ------------------------  RUNOFF   ------------------------------------
    ID       OPERATION   AREA      #     COND  INCREM  BEGIN    AMOUNT  DURATION  AMOUNT  ELEVATION  TIME      RATE       RATE
                        (SQ MI)                (HR)   (HR)     (IN)    (HR)      (IN)     (FT)     (HR)     (CFS)      (CSM)


    ALTERNATE    3   STORM    1
+  ____________________________
 STRUCTURE  1  RUNOFF      .02     2      2     .10      .0     5.04    24.00     2.31      ---     12.09     32.03     1600.5
1
 TR20 XEQ 08-29-07  14:55                                                                                    JOB  1   SUMMARY
     REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 10-YR STORM                                  PAGE   3


 SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

 XSECTION/          DRAINAGE
 STRUCTURE            AREA       STORM NUMBERS..........
   ID               (SQ MI)            1

0 STRUCTURE   1          .02
+____________________________
    ALTERNATE    3                 32.03
1END OF  1 JOBS IN THIS RUN
```

```
******************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY******************

JOB TR-20                    FULLPRINT
TITLE 001
TITLE     FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM
 3 STRUCT      01
 6 RUNOFF 1    01      1  0.020015625        73.0        0.301 1   1   1
   ENDATA
 7 INCREM 6              0.1
 7 COMPUT 7    01    01          0.0         7.68         1.02 2  03   1
   ENDCMP
   ENDJOB 2
0*****************************END OF 80-80 LIST*******************************
TR20 XEQ 08-29-07  14:56                                                                    JOB  1   PASS   1
     REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM                    PAGE   1
EXECUTIVE CONTROL OPERATION INCREM                                                          RECORD ID
+                                    MAIN TIME INCREMENT =   .10 HOURS
EXECUTIVE CONTROL OPERATION COMPUT                                                          RECORD ID
+                                    FROM STRUCTURE  1
+                                                   TO STRUCTURE  1
        STARTING TIME =    .00    RAIN DEPTH =  7.68    RAIN DURATION=  1.00    RAIN TABLE NO.= 2    ANT. MOIST. COND= 2
        ALTERNATE NO.= 3          STORM NO.= 1    MAIN TIME INCREMENT =   .10 HOURS
OPERATION RUNOFF   STRUCTURE  1
          OUTPUT HYDROGRAPH=  1
          AREA=    .02 SQ MI   INPUT RUNOFF CURVE= 73.    TIME OF CONCENTRATION=   .30 HOURS
          INTERNAL HYDROGRAPH TIME INCREMENT=  .0400 HOURS

          PEAK TIME(HRS)              PEAK DISCHARGE(CFS)          PEAK ELEVATION(FEET)
             12.08                          62.59                       (RUNOFF)
             23.65                           1.05                       (RUNOFF)

TIME(HRS)         FIRST HYDROGRAPH POINT =   .00 HOURS      TIME INCREMENT =  .10 HOURS      DRAINAGE AREA =    .02 SQ.MI.
   7.00    DISCHG        .00       .01       .03       .04       .06       .07       .09       .10       .12       .13
   8.00    DISCHG        .15       .17       .19       .22       .26       .30       .34       .37       .39       .42
   9.00    DISCHG        .44       .48       .53       .58       .62       .65       .69       .76       .82       .86
  10.00    DISCHG        .90       .95      1.03      1.10      1.22      1.35      1.50      1.72      1.92      2.16
  11.00    DISCHG       2.43      2.68      3.00      3.31      3.72      4.26      6.31     12.18     19.29     34.21
  12.00    DISCHG      54.91     62.19     46.37     28.75     19.18     13.82     10.93      9.24      8.18      7.33
  13.00    DISCHG       6.59      6.09      5.59      5.21      4.90      4.60      4.36      4.07      3.83      3.65
  14.00    DISCHG       3.49      3.36      3.21      3.09      2.96      2.82      2.71      2.56      2.44      2.39
  15.00    DISCHG       2.37      2.36      2.36      2.35      2.27      2.15      2.08      2.05      2.04      2.03
  16.00    DISCHG       2.03      2.03      2.03      2.04      2.04      2.04      2.00      1.89      1.79      1.74
  17.00    DISCHG       1.72      1.71      1.71      1.71      1.71      1.71      1.71      1.71      1.70      1.62
  18.00    DISCHG       1.50      1.43      1.40      1.38      1.38      1.37      1.37      1.37      1.37      1.37
  19.00    DISCHG       1.37      1.38      1.38      1.38      1.38      1.38      1.38      1.38      1.37      1.29
  20.00    DISCHG       1.17      1.09      1.06      1.05      1.04      1.04      1.04      1.04      1.04      1.04
  21.00    DISCHG       1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04
  22.00    DISCHG       1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04
  23.00    DISCHG       1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04      1.04       .95
  24.00    DISCHG        .83       .68       .41       .19       .08       .04       .01       .01       .00

  RUNOFF VOLUME ABOVE BASEFLOW =  4.53 WATERSHED INCHES,     58.47 CFS-HRS,     4.83 ACRE-FEET;   BASEFLOW =    .00 CFS
     REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM                    PAGE   2


SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
                  (A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
                   A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/   STANDARD              RAIN  ANTEC  MAIN        PRECIPITATION                          PEAK DISCHARGE
STRUCTURE   CONTROL   DRAINAGE   TABLE  MOIST  TIME   ------------------------  RUNOFF   ------------------------------------
   ID      OPERATION   AREA       #     COND  INCREM  BEGIN    AMOUNT  DURATION  AMOUNT  ELEVATION  TIME     RATE      RATE
                      (SQ MI)                (HR)    (HR)     (IN)     (HR)     (IN)     (FT)    (HR)     (CFS)     (CSM)


   ALTERNATE    3   STORM    1
+ ____________________________
 STRUCTURE  1  RUNOFF      .02     2      2     .10      .0     7.68    24.00     4.53      ---     12.08     62.59    3127.0
1


TR20 XEQ 08-29-07  14:56                                                                    JOB  1   SUMMARY
     REV PC 09/83(.2)          FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM                    PAGE   3


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/          DRAINAGE
STRUCTURE            AREA       STORM NUMBERS.........
  ID               (SQ MI)          1

0 STRUCTURE   1        .02
+____________________________
   ALTERNATE    3                 62.59
1END OF  1 JOBS IN THIS RUN
```

HYDRAULIC ANALYSIS

JAMES CITY COUNTY BMP WC-054

AS-BUILT STORMWATER BASIN
FAITH BAPTIST CHURCH FULLY DEVELOPED CONDITION HYDROLOGY

10-YEAR DESIGN STORM EVENT
&
100-YEAR DESIGN STORM EVENT

FAITH BAPTIST | 10-9-08 | SUMMARY 10-YEAR 100-YEAR

ELEVATION STORAGE TABLE (FOR EXTRAN MODEL)

ELEV (ft)	AREA (ft²)	AREA (AC)	DEPTH (ft)	ΔSTOR (ft³)	ΣSTOR (ft³)
60.42	1558	0.0358	0.00		0
				34428	
67.97	7562	0.1737	7.55		34428
70.00	9952	0.2285	9.58	17777	52205
70.73	11478	0.2635	10.31	7822	60027
80.00	139392	3.200	19.58		

FILES: 1718610.TXT
1718610.OUT

ROUTED DISCHARGE:
$Q_{10} = 19.53$ cfs HW = 8.51' HWEL = 68.93

FILES: 1718b100.TXT
1718b100.OUT

ROUTED DISCHARGE:
$Q_{100} = 46.86$ cfs HW = 9.52' HWEL = 69.94

$Q_{10\ ROUTED} = 19.53$ cfs $< Q_{10e} = 26.19$ cfs ← ORIGINAL "LAND MARK" ANALYSIS 9-10-02 SP-124-97

10-YEAR STORM IS CONTROLLED TO BELOW PRE-DEVELOPMENT RATE.

NEED TO ADD TOPSOIL TO TOP OF DAM TO ATTAIN MINIMUM 12" FREEBOARD @ THE 100-YEAR STORM EVENT (NEW TOP = 71.0)

```
SW    1  10 0
MM    1  2  3  0
@     10 '1718R10.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08'
A1  '24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.00  360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1    100.0 60.42 0.0   0.00
D1     2    100.0 69.21 0.0   0.00
D1     3    100.0 57.28 0.0   0.00
D1     4    100.0 54.16 0.0   0.00
D1     5    100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1    80.00 -0.10  6
E2     0.0358 0.00 0.0924 3.78 0.1737 7.55 0.2285 9.58 0.2635 10.31
       3.2000 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF   CORIF ZP
F1     1     5     1    0.0491  0.60 0.00
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1     5     1    7.55  10.3 1.50 3.1
G1     1     5     1    7.55  10.3 1.50 3.1
G1     1     5     1    7.97  10.3 5.76 3.1
*******************************************
*  OUTFALL @ JUNCTION 4
I1    4  1
J1    1
$ENDPROGRAM
```

```
1          ************************************************
           *          ENVIRONMENTAL PROTECTION AGENCY     *
           *           STORM WATER MANAGEMENT MODEL       *
           *                  VERSION 4.0                 *
           ************************************************

                         DEVELOPED BY

           ************************************************
           *            METCALF & EDDY, INC.              *
           *           UNIVERSITY OF FLORIDA              *
           *       WATER RESOURCES ENGINEERS, INC.        *
           *              SEPTEMBER 1970                  *
           ************************************************

                         UPDATED BY

           ************************************************
           *           UNIVERSITY OF FLORIDA              *
           *          CAMP DRESSER & MCKEE, INC.          *
           *                                              *
           *   MARCH     1975          NOVEMBER  1977     *
           *   NOVEMBER  1981          SEPTEMBER 1988     *
           ************************************************

           ************************************************
           *    THIS IS A NEW RELEASE OF SWMM.  IF ANY    *
           *     PROBLEMS OCCUR IN RUNNING THIS MODEL     *
           *           CONTACT WAYNE HUBER                *
           *           UNIVERSITY OF FLORIDA              *
           *            PHONE 1-904-392-0846              *
           ************************************************

           ************************************************
           *  THIS IS AN IMPLEMENTATION OF EPA SWMM 4.0   *
           *  "NATURE IS FULL OF INFINITE CAUSES WHICH    *
           *   HAVE NEVER OCCURED IN EXPERIENCE" da Vinci *
           ************************************************

           ************************************************
           *       DISK OR TAPE ASSIGNMENTS BY BLOCK      *
           *         JIN  -> INPUT TO A BLOCK             *
           *        JOUT  -> OUTPUT FROM A BLOCK          *
           ************************************************

            BLOCK( 1)      JIN( 1) 10      JOUT( 1)  0

           ************************************************
           *             SCRATCH DISKS OR TAPES           *
           *        THESE CAN BE USED BY ANY BLOCK        *
           ************************************************

      NSCRAT(1) NCSRAT(2) NSCRAT(3) NSCRAT(4) NSCRAT(5) NSCRAT(6) NSCRAT(7)
          2         0         0         0         0         0         0

     *******************************************************
     * ENTRY MADE TO EXTENDED TRANSPORT MODEL (EXTRAN)     *
     * UPDATED BY THE UNIVERSITY OF FLORIDA (UF) AND       *
     * CAMP DRESSER AND MCKEE INC. (CDM), SEPTEMBER, 1988. *
     *                                                     *
     * "Smooth runs the water where the brook is deep."    *
     *                 Shakespeare, Henry VI, II, III, 1 *
     *******************************************************

1-------------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY          ****   EXTENDED TRANSPORT PROGRAM   ****      WATER RESOURCES DIVISION
WASHINGTON, D.C.                         ****                                ****      CAMP DRESSER & MCKEE INC.
                                         ****        ANALYSIS MODULE         ****      ANNANDALE, VIRGINIA

    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION


 CONTROL INFORMATION FOR SIMULATION
 ----------------------------------

 INTEGRATION CYCLES................. 86400

 LENGTH OF INTEGRATION STEP IS......     1. SECONDS

 CREATE EQUIVALENT CONDUITS BASED
 ON THE COURANT CONDITION...........     1

 USE U.S. CUSTOMARY UNITS FOR I/O...     0

 PRINTING STARTS IN CYCLE...........   360

 INTERMEDIATE PRINTOUT INTERVALS OF.   360 CYCLES

 SUMMARY PRINTOUT INTERVALS OF......   431 CYCLES
```

```
HOT START FILE MANIPULATION(REDO)..      0

INITIAL TIME.......................  0.00 HOURS

ITERATION VARIABLES: ITMAX.........    30
                     SURTOL........ 0.050

DEFAULT SURFACE AREA OF JUNCTIONS.. 12.57 CUB FT.

EXPLICIT EXTRAN SOLUTION.(ISOL=0)..


NORMAL FLOW OPTION WHEN THE WATER
SURFACE SLOPE IS LESS THAN THE
GROUND SURFACE SLOPE (KSUPER=0)....

NJSW INPUT HYDROGRAPH JUNCTIONS....      0

PRINTED OUTPUT FOR THE FOLLOWING  5 JUNCTIONS

            1         2         3         4         5

PRINTED OUTPUT FOR THE FOLLOWING  4 CONDUITS

          1002      2003      5003      3004

WATER SURFACE ELEVATIONS WILL BE PLOTTED FOR THE FOLLOWING   5 JUNCTIONS

            1         2         3         4         5

FLOW RATE WILL BE PLOTTED FOR THE FOLLOWING   4 CONDUITS

          1002      2003      5003      3004
1-----------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY              ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
WASHINGTON, D.C.                             ****                                ****        CAMP DRESSER & MCKEE INC.
                                             ****         ANALYSIS MODULE        ****        ANNANDALE, VIRGINIA

    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

1
 ****************************************************
 *                    CONDUIT DATA                  *
 ****************************************************

     CONDUIT   LENGTH   CLASS     AREA    MANNING       MAX WIDTH       DEPTH   JUNCTIONS        INVERT HEIGHT          TRAPEZOID
      NUMBER     (FT)             (SQ FT)   COEF.           (FT)         (FT)    AT ENDS        ABOVE JUNCTIONS         SIDE SLOPE
      -----     ----             -------   -----           ----         ----    -------        ---------------         ----------
  1    1002      20.      6      458.44    0.035           7.00        10.70      1     2         8.79    0.00         3.30 3.40
  2    2003      50.      6      418.37    0.035           7.00        10.70      2     3         0.00    6.81         3.00 3.00
  3    5003      75.      1        1.77    0.019           1.50         1.50      5     3         0.00    0.00
  4    3004      25.      6     1339.75    0.045           0.01        22.70      3     4         0.00    0.00         2.70 2.50

 ===> WARNING !!! (C*DELT/LEN) IN CONDUIT  3004 IS  1.1 AT FULL DEPTH.
 ===> THE NEW EQUIVALENT LENGTH/ROUGHNESS/RATIO FOR CONDUIT  3004 IS       27.0 /  0.0432725 /  1.000

 ===> WARNING !! UPSTREAM AND DOWNSTREAM FOR CONDUIT      1002
 ===>            REVERSED TO CORRESPOND TO POSITIVE
 ===>            FLOW AND DECREASING SLOPE CONVENTION.
1-----------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY              ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
WASHINGTON, D.C.                             ****                                ****        CAMP DRESSER & MCKEE INC.
                                             ****         ANALYSIS MODULE        ****        ANNANDALE, VIRGINIA

    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

1
 ****************************************************
 *                   JUNCTION DATA                  *
 ****************************************************

     JUNCTION     GROUND     CROWN     INVERT     QINST     DEPTH              CONNECTING CONDUITS
      NUMBER      ELEV.      ELEV.     ELEV.      CFS       FEET
      ------      -----      ------    -----      ----      ----
  1       1      100.00     79.91     60.42      0.00      0.00                 1002
  2       2      100.00     79.91     69.21      0.00      0.00                 1002   2003
  3       3      100.00     79.98     57.28      0.00      0.00                 2003   5003   3004
  4       4      100.00     76.86     54.16      0.00      0.00                 3004
  5       5      100.00     60.99     59.49      0.00      0.00                 5003


-----------------------------------------------------------------------------------------------------------------------------


1-----------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY              ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
```

WASHINGTON, D.C. **** **** ANALYSIS MODULE **** **** CAMP DRESSER & MCKEE INC. ANNANDALE, VIRGINIA

FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

****
* STORAGE JUNCTION DATA *
****

STORAGE JUNCTION	SURFACE AREA (FT2)	VOLUME (CF)	CROWN ELEVATION (FT)
1	-0.10	-1.96	80.00

****
* ORIFICE DATA *
****

JUNCTION FROM	JUNCTION TO	TYPE	AREA (FT2)	DISCHARGE COEFF.	HEIGHT ABOVE JUNCTION
1	5	1	0.05	0.6000	0.000

====> EQUIVALENT PIPE INFORMATION FOR ORIFICE # 1
INTERNAL CONDUIT NUMBER..... 90005
PIPE DIAMETER..... 0.25
PIPE LENGTH..... 200.00
MANNINGS ROUGHNESS..... 0.0034
INVERT ELEVATION AT UPSTREAM END..... 60.4200
INVERT ELEVATION AT DOWNSTREAM END... 60.4100

****
* WEIR DATA *
****

JUNCTION FROM	JUNCTION TO	LINK NUMBER	TYPE	CREST HEIGHT(FT)	WEIR TOP(FT)	WEIR LENGTH(FT)	DISCHARGE COEFF.
1	5	90006	1	7.55	10.30	1.50	3.10
1	5	90007	1	7.55	10.30	1.50	3.10
1	5	90008	1	7.97	10.30	5.76	3.10

8.37

CREST = 12.57

****
* FREE OUTFALL DATA *
* DATA GROUP I1 *
* BOUNDARY CONDITION ON DATA GROUP J1 *
****

OUTFALL AT JUNCTION..... 4 HAS BOUNDARY CONDITION NUMBER... 1

1----------

ENVIRONMENTAL PROTECTION AGENCY **** EXTENDED TRANSPORT PROGRAM **** WATER RESOURCES DIVISION
WASHINGTON, D.C. **** **** CAMP DRESSER & MCKEE INC.
**** ANALYSIS MODULE **** ANNANDALE, VIRGINIA

FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

****
* INTERNAL CONNECTIVITY INFORMATION *
****

CONDUIT	JUNCTION	JUNCTION
90005	1	5
90006	1	5
90007	1	5
90008	1	5
90009	4	0

1

****
* BOUNDARY CONDITON INFORMATION *
* DATA GROUPS J1-J4 *
****

BOUNDARY CONDITION NUMBER.. 1 HAS NO CONTROL WATER SURFACE.

****
* HEADER INFORMATION FROM INTERFACE FILE: *

```
*****************************************

TITLE FROM FIRST COMPUTATIONAL BLOCK:
001
   FAITH BAPTIST CHURCH POST-DEV CONDITION 10-YR STORM

TITLE FROM IMMEDIATELY PRECEDING COMPUTATIONAL BLOCK
001
   FAITH BAPTIST CHURCH POST-DEV CONDITION 10-YR STORM

NAME OF PRECEDING BLOCK:................TR20EXT V1.02
INITIAL JULIAN DATE (IDATEZ)......................    7241
INITIAL TIME OF DAY IN SECONDS (TZERO)............ 32400.0
NO. TRANSFERED INPUT LOCATIONS....................       1
NO. TRANSFERED POLLUTANTS........................       0
SIZE OF TOTAL CATCHMENT AREA (ACRES)..............   12.81

***********************************************
* ELEMENT NUMBERS OF INTERFACE INLET LOCATIONS: *
***********************************************
      1

*********************************************************
*               SURCHARGE ITERATION SUMMARY             *
*********************************************************

MAXIMUM NUMBER OF ITERATIONS IN A TIME STEP.....        4
TOTAL NUMBER OF ITERATIONS IN THE SIMULATION....   172815
SURCHARGE ITERATIONS DURING THE SIMULATION......       15
MAXIMUM SURCHARGE FLOW ERROR DURING SIMULATION.. 2.45E-01 CFS
TOTAL NUMBER OF TIME STEPS DURING SIMULATION....    86400

1- - - - - - - - - - - - - CONTINUITY BALANCE AT END OF RUN - - - - - - - - - - - - -

INITIAL SYSTEM VOLUME      =          0.04 CU FT
TOTAL SYSTEM INFLOW VOLUME =     107410.52 CU FT
INFLOW + INITIAL VOLUME    =     107410.55 CU FT

JUNCTION OUTFLOWS/STREET FLOODING

   JUNCTION  OUTFLOW, FT3
   --------  ------------
          4      92746.52

TOTAL SYSTEM OUTFLOW       =       92746.52 CU FT
VOLUME LEFT IN SYSTEM      =       15476.80 CU FT
OUTFLOW + FINAL VOLUME     =      108223.31 CU FT
ERROR IN CONTINUITY, PERCENT =        -0.76

1-----------------------------------------------------------------------------------------

    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION
```

* * * * * * S U M M A R Y S T A T I S T I C S F O R J U N C T I O N S * * * * * *

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	8.51	12	18	0.00	31.07	0.0	0.0	2.577E-06
2	100.00	79.91	0.00	0	0	0.00	30.79	0.0	0.0	1.358E-07
3	100.00	79.98	0.97	12	18	0.00	41.75	0.0	0.0	1.354E-07
4	100.00	76.86	0.97	12	26	0.00	44.87	0.0	0.0	1.596E-08
5	100.00	60.99	2.41	12	18	0.91	38.10	1.9	0.0	2.864E-08

```
1-----------------------------------------------------------------------------------------
 ENVIRONMENTAL PROTECTION AGENCY *** EXTENDED TRANSPORT PROGRAM *** WATER RESOURCES DIVISION
 WASHINGTON, D.C.                ***                            *** CAMP DRESSER & MCKEE INC.
                                 ***      ANALYSIS MODULE       *** ANNANDALE, VIRGINIA
```

FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	0.00	0.00	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-0.28	0.0	0.00000
2003	17930.55	42.86	128.40	0.00	0	0	0.00	0	0	0.00	0.00	-5.84	0.0	0.10240
5003	12.40	7.02	18.00	16.69	12	18	10.73	12	18	1.35	2.41	0.97	1353.4	0.02947
3004	75379.04	56.26	272.40	19.53	12	26	8.52	12	28	0.00	0.97	0.97	1.8	0.11540
90005	0.02	0.48	3.00	0.67	12	14	13.74	12	14	28.53	8.51	1.49	0.0	0.00005
90006	********	********	3.00	4.38	12	18	********	0	0	********	********	********	**********	**********
90007	********	********	3.00	4.38	12	18	********	0	0	********	********	********	**********	**********
90008	********	********	3.00	7.11	12	18	********	0	0	********	********	********	**********	**********
90009	********	********	3.00	19.53	12	26	********	0	0	********	********	********	**********	**********

1----------

ENVIRONMENTAL PROTECTION AGENCY *** EXTENDED TRANSPORT PROGRAM *** WATER RESOURCES DIVISION
WASHINGTON, D.C. *** *** CAMP DRESSER & MCKEE INC.
*** ANALYSIS MODULE *** ANNANDALE, VIRGINIA

FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 10 YEAR STORM EVENT DEVELOPED CONDITION

1

```
**************************************************
* SUBCRITICAL AND CRITICAL FLOW ASSUMPTIONS FROM *
* SUBROUTINE HEAD.  SEE FIGURE 5-4 IN THE EXTRAN *
*       MANUAL FOR FURTHER INFORMATION.          *
**************************************************
```

CONDUIT NUMBER	LENGTH OF DRY FLOW(MIN)	LENGTH OF SUBCRITICAL FLOW(MIN)	LENGTH OF UPSTR. CRITICAL FLOW(MIN)	LENGTH OF DOWNSTR. CRITICAL FLOW(MIN)
1002	1440.00	0.00	0.00	0.00
2003	1440.00	0.00	0.00	0.00
5003	21.52	1418.48	0.00	0.00
3004	31.93	1408.07	0.00	0.00
90005	12.20	11.58	0.00	1416.22

===> EXTENDED TRANSPORT MODEL SIMULATION ENDED NORMALLY.

===> SWMM 4.0 SIMULATION ENDED NORMALLY.

===> YOUR INPUT FILE WAS NAMED : 1718B10.TXT
===> YOUR OUTPUT FILE WAS NAMED: 1718B10.OUT

```
SW    1  10 0
MM    1  2  3  0
@     10 '1718R100.BIN'
$EXTRAN
A1  'FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08'
A1  '24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION'
B1   86400 1.0   0.00  360 360 36   0
B2    0  1  12.566  30  0.05
B3    5 4 5 4 0
B4    1 2 3 4 5
B5    1002 2003 5003 3004
B6    1 2 3 4 5
B7    1002 2003 5003 3004
*    NCOND  N1  N2  Qi  TYP AFULL DEEP WIDE LENGTH ZP1   ZP2   ROUGH SS1 SS2
C1    1002  1   2   0.0  6  0.000 10.7 7.00   20   8.79  0.00  .0350 3.3 3.4
C1    2003  2   3   0.0  6  0.000 10.7 7.00   50   0.00  6.81  .0350 3.0 3.0
C1    5003  5   3   0.0  1  0.000 1.50 1.50   75   0.00  0.00  .0189 0.0 0.0
C1    3004  3   4   0.0  6  0.000 22.7 0.00   25   0.00  0.00  .0450 2.7 2.5
*  JUNCTION GROUND INV.  Qc   Yi
*   NUMBER   ELEV  ELEV  cfs   ft
D1     1    100.0 60.42 0.0   0.00
D1     2    100.0 69.21 0.0   0.00
D1     3    100.0 57.28 0.0   0.00
D1     4    100.0 54.16 0.0   0.00
D1     5    100.0 59.49 0.0   0.00
*  STORAGE NODES
E1     1    80.00 -0.10  6
E2     0.0358 0.00 0.0924 3.78 0.1737 7.55 0.2285 9.58 0.2635 10.31
       3.2000 19.58
*  ORIFICE NODE
*  NJUNC1 NJUNC2 NKLASS AORIF   CORIF ZP
F1     1      5      1    0.0491  0.60 0.00
*  WEIR NODE
*  NJUNC1 NJUNC2 KWEIR YCREST YTOP WLEN COEF
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.55  10.3 1.50 3.1
G1     1      5      1    7.97  10.3 5.76 3.1
*****************************************
*  OUTFALL @ JUNCTION 4
I1    4  1
J1    1
$ENDPROGRAM
```

```
1          ************************************************
           *          ENVIRONMENTAL PROTECTION AGENCY     *
           *           STORM WATER MANAGEMENT MODEL       *
           *                 VERSION 4.0                  *
           ************************************************

                          DEVELOPED BY

           ************************************************
           *            METCALF & EDDY, INC.              *
           *           UNIVERSITY OF FLORIDA              *
           *       WATER RESOURCES ENGINEERS, INC.        *
           *             SEPTEMBER 1970                   *
           ************************************************

                          UPDATED BY

           ************************************************
           *           UNIVERSITY OF FLORIDA              *
           *          CAMP DRESSER & MCKEE, INC.          *
           *                                              *
           *   MARCH     1975          NOVEMBER  1977     *
           *   NOVEMBER  1981          SEPTEMBER 1988     *
           ************************************************

           ************************************************
           *    THIS IS A NEW RELEASE OF SWMM.  IF ANY    *
           *     PROBLEMS OCCUR IN RUNNING THIS MODEL     *
           *           CONTACT WAYNE HUBER                *
           *          UNIVERSITY OF FLORIDA               *
           *           PHONE 1-904-392-0846               *
           ************************************************

           ************************************************
           *  THIS IS AN IMPLEMENTATION OF EPA SWMM 4.0   *
           *  "NATURE IS FULL OF INFINITE CAUSES WHICH    *
           *   HAVE NEVER OCCURED IN EXPERIENCE" da Vinci *
           ************************************************

           ************************************************
           *       DISK OR TAPE ASSIGNMENTS BY BLOCK      *
           *         JIN  -> INPUT TO A BLOCK             *
           *        JOUT  -> OUTPUT FROM A BLOCK          *
           ************************************************

            BLOCK( 1)      JIN( 1) 10      JOUT( 1)  0

           ************************************************
           *            SCRATCH DISKS OR TAPES            *
           *        THESE CAN BE USED BY ANY BLOCK        *
           ************************************************

      NSCRAT(1) NCSRAT(2) NSCRAT(3) NSCRAT(4) NSCRAT(5) NSCRAT(6) NSCRAT(7)
          2         0         0         0         0         0         0

     *******************************************************
     * ENTRY MADE TO EXTENDED TRANSPORT MODEL (EXTRAN)     *
     * UPDATED BY THE UNIVERSITY OF FLORIDA (UF) AND       *
     * CAMP DRESSER AND MCKEE INC. (CDM), SEPTEMBER, 1988. *
     *                                                     *
     * "Smooth runs the water where the brook is deep."    *
     *                 Shakespeare, Henry VI, II, III, 1 *
     *******************************************************

1-------------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY          ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
WASHINGTON, D.C.                         ****                                ****        CAMP DRESSER & MCKEE INC.
                                         ****         ANALYSIS MODULE        ****        ANNANDALE, VIRGINIA

    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION


CONTROL INFORMATION FOR SIMULATION
----------------------------------

INTEGRATION CYCLES................. 86400

LENGTH OF INTEGRATION STEP IS......     1. SECONDS

CREATE EQUIVALENT CONDUITS BASED
ON THE COURANT CONDITION...........     1

USE U.S. CUSTOMARY UNITS FOR I/O...     0

PRINTING STARTS IN CYCLE...........   360

INTERMEDIATE PRINTOUT INTERVALS OF.   360 CYCLES

SUMMARY PRINTOUT INTERVALS OF......   431 CYCLES
```

```
HOT START FILE MANIPULATION(REDO)..      0

INITIAL TIME.......................  0.00 HOURS

ITERATION VARIABLES: ITMAX.........    30
                     SURTOL........ 0.050

DEFAULT SURFACE AREA OF JUNCTIONS.. 12.57 CUB FT.

EXPLICIT EXTRAN SOLUTION.(ISOL=0)..


NORMAL FLOW OPTION WHEN THE WATER
SURFACE SLOPE IS LESS THAN THE
GROUND SURFACE SLOPE (KSUPER=0)....

NJSW INPUT HYDROGRAPH JUNCTIONS....      0

PRINTED OUTPUT FOR THE FOLLOWING  5 JUNCTIONS

             1         2         3         4         5

PRINTED OUTPUT FOR THE FOLLOWING  4 CONDUITS

          1002      2003      5003      3004

WATER SURFACE ELEVATIONS WILL BE PLOTTED FOR THE FOLLOWING   5 JUNCTIONS

             1         2         3         4         5

FLOW RATE WILL BE PLOTTED FOR THE FOLLOWING   4 CONDUITS

          1002      2003      5003      3004
1-----------------------------------------------------------------------------
 ENVIRONMENTAL PROTECTION AGENCY            ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
 WASHINGTON, D.C.                           ****                                ****        CAMP DRESSER & MCKEE INC.
                                            ****         ANALYSIS MODULE        ****        ANNANDALE, VIRGINIA

     FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
     24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

1
 ****************************************************
 *                    CONDUIT DATA                  *
 ****************************************************
```

	CONDUIT NUMBER	LENGTH (FT)	CLASS	AREA (SQ FT)	MANNING COEF.	MAX WIDTH (FT)	DEPTH (FT)	JUNCTIONS AT ENDS		INVERT HEIGHT ABOVE JUNCTIONS		TRAPEZOID SIDE SLOPE	
1	1002	20.	6	458.44	0.035	7.00	10.70	1	2	8.79	0.00	3.30	3.40
2	2003	50.	6	418.37	0.035	7.00	10.70	2	3	0.00	6.81	3.00	3.00
3	5003	75.	1	1.77	0.019	1.50	1.50	5	3	0.00	0.00		
4	3004	25.	6	1339.75	0.045	0.01	22.70	3	4	0.00	0.00	2.70	2.50

```
 ===> WARNING !!! (C*DELT/LEN) IN CONDUIT  3004 IS  1.1 AT FULL DEPTH.
 ===> THE NEW EQUIVALENT LENGTH/ROUGHNESS/RATIO FOR CONDUIT  3004 IS       27.0 /  0.0432725 /  1.000

 ===> WARNING !! UPSTREAM AND DOWNSTREAM FOR CONDUIT      1002
 ===>            REVERSED TO CORRESPOND TO POSITIVE
 ===>            FLOW AND DECREASING SLOPE CONVENTION.
1-----------------------------------------------------------------------------
 ENVIRONMENTAL PROTECTION AGENCY            ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
 WASHINGTON, D.C.                           ****                                ****        CAMP DRESSER & MCKEE INC.
                                            ****         ANALYSIS MODULE        ****        ANNANDALE, VIRGINIA

     FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
     24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

1
 ****************************************************
 *                   JUNCTION DATA                  *
 ****************************************************
```

	JUNCTION NUMBER	GROUND ELEV.	CROWN ELEV.	INVERT ELEV.	QINST CFS	DEPTH FEET	CONNECTING CONDUITS		
1	1	100.00	79.91	60.42	0.00	0.00	1002		
2	2	100.00	79.91	69.21	0.00	0.00	1002	2003	
3	3	100.00	79.98	57.28	0.00	0.00	2003	5003	3004
4	4	100.00	76.86	54.16	0.00	0.00	3004		
5	5	100.00	60.99	59.49	0.00	0.00	5003		

```
---------------------------------------------------------------------------------------------------------------------------

1-----------------------------------------------------------------------------
 ENVIRONMENTAL PROTECTION AGENCY            ****   EXTENDED TRANSPORT PROGRAM   ****        WATER RESOURCES DIVISION
```

WASHINGTON, D.C. **** **** CAMP DRESSER & MCKEE INC.
**** ANALYSIS MODULE **** ANNANDALE, VIRGINIA

FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

****
* STORAGE JUNCTION DATA *
****

STORAGE JUNCTION	SURFACE AREA (FT2)	VOLUME (CF)	CROWN ELEVATION (FT)
1	-0.10	-1.96	80.00

****
* ORIFICE DATA *
****

JUNCTION FROM	JUNCTION TO	TYPE	AREA (FT2)	DISCHARGE COEFF.	HEIGHT ABOVE JUNCTION
1	5	1	0.05	0.6000	0.000

====> EQUIVALENT PIPE INFORMATION FOR ORIFICE # 1
INTERNAL CONDUIT NUMBER..... 90005
PIPE DIAMETER..... 0.25
PIPE LENGTH..... 200.00
MANNINGS ROUGHNESS..... 0.0034
INVERT ELEVATION AT UPSTREAM END..... 60.4200
INVERT ELEVATION AT DOWNSTREAM END... 60.4100

****
* WEIR DATA *
****

JUNCTION FROM	JUNCTION TO	LINK NUMBER	TYPE	CREST HEIGHT(FT)	WEIR TOP(FT)	WEIR LENGTH(FT)	DISCHARGE COEFF.
1	5	90006	1	7.55	10.30	1.50	3.10
1	5	90007	1	7.55	10.30	1.50	3.10
1	5	90008	1	7.97	10.30	5.76	3.10

****
* FREE OUTFALL DATA *
* DATA GROUP I1 *
* BOUNDARY CONDITION ON DATA GROUP J1 *
****

OUTFALL AT JUNCTION.... 4 HAS BOUNDARY CONDITION NUMBER... 1

1----------

ENVIRONMENTAL PROTECTION AGENCY **** EXTENDED TRANSPORT PROGRAM **** WATER RESOURCES DIVISION
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FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

****
* INTERNAL CONNECTIVITY INFORMATION *
****

CONDUIT	JUNCTION	JUNCTION
90005	1	5
90006	1	5
90007	1	5
90008	1	5
90009	4	0

1

****
* BOUNDARY CONDITON INFORMATION *
* DATA GROUPS J1-J4 *
****

BOUNDARY CONDITION NUMBER.. 1 HAS NO CONTROL WATER SURFACE.

****
* HEADER INFORMATION FROM INTERFACE FILE: *

```
*****************************************

TITLE FROM FIRST COMPUTATIONAL BLOCK:
001
   FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM

TITLE FROM IMMEDIATELY PRECEDING COMPUTATIONAL BLOCK
001
   FAITH BAPTIST CHURCH POST-DEV CONDITION 100-YR STORM

NAME OF PRECEDING BLOCK:................TR20EXT V1.02
INITIAL JULIAN DATE (IDATEZ)......................    7241
INITIAL TIME OF DAY IN SECONDS (TZERO)............ 25200.0
NO. TRANSFERED INPUT LOCATIONS....................       1
NO. TRANSFERED POLLUTANTS.........................       0
SIZE OF TOTAL CATCHMENT AREA (ACRES)..............   12.81

***********************************************
* ELEMENT NUMBERS OF INTERFACE INLET LOCATIONS: *
***********************************************
      1

*******************************************************
*              SURCHARGE ITERATION SUMMARY            *
*******************************************************

MAXIMUM NUMBER OF ITERATIONS IN A TIME STEP.....       31
TOTAL NUMBER OF ITERATIONS IN THE SIMULATION....   178858
SURCHARGE ITERATIONS DURING THE SIMULATION......     6058
MAXIMUM SURCHARGE FLOW ERROR DURING SIMULATION.. 4.08E+01 CFS
TOTAL NUMBER OF TIME STEPS DURING SIMULATION....    86400

1- - - - - - - - - - - - -  CONTINUITY BALANCE AT END OF RUN - - - - - - - - - - - - -

INITIAL SYSTEM VOLUME      =          0.04 CU FT
TOTAL SYSTEM INFLOW VOLUME =     210414.75 CU FT
INFLOW + INITIAL VOLUME    =     210414.78 CU FT

JUNCTION OUTFLOWS/STREET FLOODING

   --------  ------------
          4     173555.70
          5      68530.11

TOTAL SYSTEM OUTFLOW       =     242085.81 CU FT
VOLUME LEFT IN SYSTEM      =      20517.28 CU FT
OUTFLOW + FINAL VOLUME     =     262603.09 CU FT
ERROR IN CONTINUITY, PERCENT =      -24.80

1-----------------------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY *** EXTENDED TRANSPORT PROGRAM *** WATER RESOURCES DIVISION
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    FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
    24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION


* * * * * *  S U M M A R Y  S T A T I S T I C S  F O R  J U N C T I O N S  * * * * * *
```

JUNCTION NUMBER	GROUND ELEVATION (FT)	UPPERMOST PIPE CROWN ELEVATION (FT)	MAXIMUM COMPUTED DEPTH (FT)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	FEET OF SURCHARGE AT MAX DEPTH	FEET MAX. DEPTH IS BELOW GROUND ELEVATION	LENGTH OF SURCHARGE (MIN)	LENGTH OF FLOODING (MIN)	MAXIMUM JUNCTION AREA ACRES
1	100.00	80.00	9.52	12	6	0.00	30.06	0.0	0.0	3.007E-06
2	100.00	79.91	0.45	12	6	0.00	30.34	0.0	0.0	1.358E-07
3	100.00	79.98	1.40	12	6	0.00	41.32	0.0	0.0	1.360E-07
4	100.00	76.86	1.30	12	6	0.00	44.54	0.0	0.0	1.635E-08
5	100.00	60.99	40.51	12	1	39.01	0.00	45.0	39.0	2.897E-08

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1-----------------------------------------------------------------------------------------
ENVIRONMENTAL PROTECTION AGENCY *** EXTENDED TRANSPORT PROGRAM *** WATER RESOURCES DIVISION
WASHINGTON, D.C.                ***                            *** CAMP DRESSER & MCKEE INC.
                                ***      ANALYSIS MODULE       *** ANNANDALE, VIRGINIA
```

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24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

* * * * * * * S U M M A R Y S T A T I S T I C S F O R C O N D U I T S * * * * * * *

CONDUIT NUMBER	DESIGN FLOW (CFS)	DESIGN VELOCITY (FPS)	CONDUIT VERTICAL DEPTH (IN)	MAXIMUM COMPUTED FLOW (CFS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	MAXIMUM COMPUTED VELOCITY (FPS)	TIME OF OCCURENCE HR.	TIME OF OCCURENCE MIN.	RATIO OF MAX. TO DESIGN FLOW	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS UPSTREAM (FT)	MAXIMUM DEPTH ABOVE INVERT AT CONDUIT ENDS DOWNSTREAM (FT)	LENGTH OF SUPERCRITICAL FLOW (MIN)	GROUND SLOPE (FT/FT)
1002	0.00	0.00	128.40	-26.24	12	6	-4.97	12	6	0.00	0.45	0.73	0.0	0.00000
2003	17930.55	42.86	128.40	26.11	12	6	7.10	12	6	0.00	0.45	-5.41	0.3	0.10240
5003	12.40	7.02	18.00	40.81	12	1	23.38	12	1	3.29	40.51	1.40	1294.4	0.02947
3004	75379.04	56.26	272.40	46.86	12	6	9.85	12	6	0.00	1.40	1.30	3.0	0.11540
90005	0.02	0.48	3.00	0.92	13	19	18.68	13	19	38.79	9.52	39.59	0.2	0.00005
90006	********	********	3.00	12.72	12	6	********	0	0	********	********	********	**********	**********
90007	********	********	3.00	12.72	12	6	********	0	0	********	********	********	**********	**********
90008	********	********	3.00	34.34	12	6	********	0	0	********	********	********	**********	**********
90009	********	********	3.00	46.86	12	6	********	0	0	********	********	********	**********	**********

1----------

ENVIRONMENTAL PROTECTION AGENCY *** EXTENDED TRANSPORT PROGRAM *** WATER RESOURCES DIVISION
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FAITH BAPTIST CHURCH STORMWATER MANAGEMENT ANALYSIS 10-09-08
24-HOUR TYPE II RAINFALL, 100 YEAR STORM EVENT DEVELOPED CONDITION

1

```
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* SUBCRITICAL AND CRITICAL FLOW ASSUMPTIONS FROM *
* SUBROUTINE HEAD.  SEE FIGURE 5-4 IN THE EXTRAN *
*       MANUAL FOR FURTHER INFORMATION.          *
**************************************************
```

CONDUIT NUMBER	LENGTH OF DRY FLOW(MIN)	LENGTH OF SUBCRITICAL FLOW(MIN)	LENGTH OF UPSTR. CRITICAL FLOW(MIN)	LENGTH OF DOWNSTR. CRITICAL FLOW(MIN)
1002	1216.38	79.65	0.00	143.97
2003	1216.60	0.00	0.00	223.40
5003	14.18	1425.82	0.00	0.00
3004	23.55	1416.45	0.00	0.00
90005	6.15	86.78	0.00	1347.07

===> EXTENDED TRANSPORT MODEL SIMULATION ENDED NORMALLY.

===> SWMM 4.0 SIMULATION ENDED NORMALLY.

===> YOUR INPUT FILE WAS NAMED : 1718B100.TXT
===> YOUR OUTPUT FILE WAS NAMED: 1718B100.OUT

REDUCED EASEMENTS

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
WC-054	4	x	12.81/7.007	=	7.3
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 7.3

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
	x	(0.1 per 1%)	=	
1.26/7.007	x	15 (0.15 per 1%)	=	2.7 OFFSITE CREDIT

TOTAL NATURAL OPEN SPACE CREDIT: _____

C. TOTAL WEIGHTED POINTS

7.3	+	2.7	=	10
Structural BMP Points		Natural Open Space Points		Total

4.715 Ac RPA & 100' RPA BUFFER — ON PARCEL 9 NOT INCLUDED
12.81 Ac WATERSHED - BMP WC-054
7.007 Ac Parcel 40
15.743 Ac Parcel 9 TOTAL = 22.75 Ac

BMP TYPE F2 (4-POINTS)

TOTAL WATERSHED AREA = 12.31 Ac
TOTAL IMPERVIOUS AREA = 3.34 Ac

WQV = 1"/IMPERVIOUS ACRE

WQV = 1/12 × 3.34 × 43560 = 12124 ft³

FROM ELEVATION-STORAGE TABLE:

VOLUME (STORAGE) = 12124 @ ELEV = 63.08'

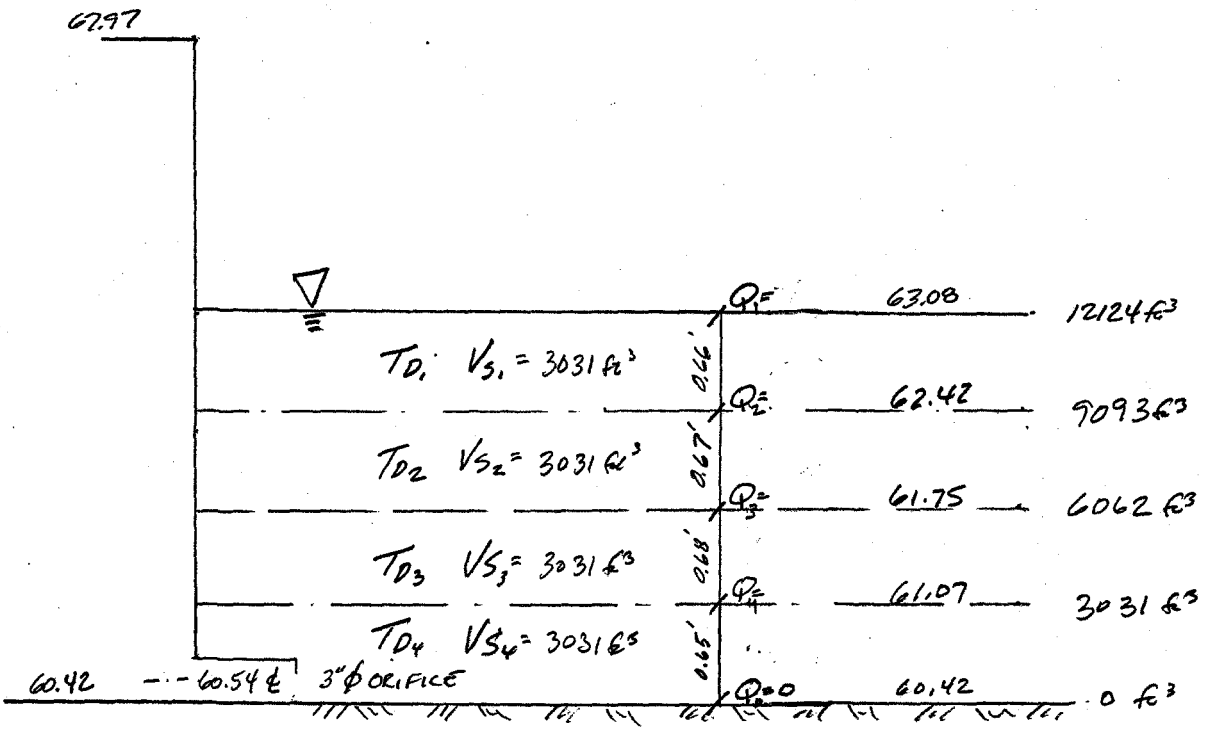
$Q = Ca\sqrt{2gh}$ where $h = 1/2(63.08 - 60.42) = 1.33'$
$g = 32.2\ ft/s^2$
$C = 0.60$
$a = \pi d^2/4 = \pi(3/12)^2/4 = 0.0491$

$Q = 0.27\ cfs$

$T_D = 12124\ ft^3 / 0.27\ cfs = 44903\ sec \Rightarrow 12\ hrs\ 28\ min.$

SIMPLE KELPLUNK METHOD: SEE
STAGE-DISCHARGE APPROACH NEXT SHEET

FAITH BAPTIST | BMP TYPE F2



$Q_1 = Ca\sqrt{2gH_1} = (0.6)(0.0491)\sqrt{2(32.2)[2.54]} = 0.38\ cfs$

$Q_2 = Ca\sqrt{2gH_2} = (0.6)(0.0491)\sqrt{2(32.2)[1.88]} = 0.32\ cfs$

$Q_3 = Ca\sqrt{2gH_3} = (0.6)(0.0491)\sqrt{2(32.2)[1.21]} = 1.26\ cfs$

$Q_4 = Ca\sqrt{2gH_4} = (0.6)(0.0491)\sqrt{2(32.2)[0.53]} = 0.17\ cfs$

$Q_{1-2} = 0.35\ cfs$

$Q_{2-3} = 0.29\ cfs$

$Q_{3-4} = 0.22\ cfs$

$Q_{4-0} = 0.08\ cfs$

$T_{D_1} = 3031\ ft^3 / 0.35\ cfs = 8660\ sec$

$T_{D2} = 3031\ ft^3 / 0.29\ cfs = 10452\ sec$

$T_{D3} = 3031\ ft^3 / 0.22\ cfs = 13777\ sec$

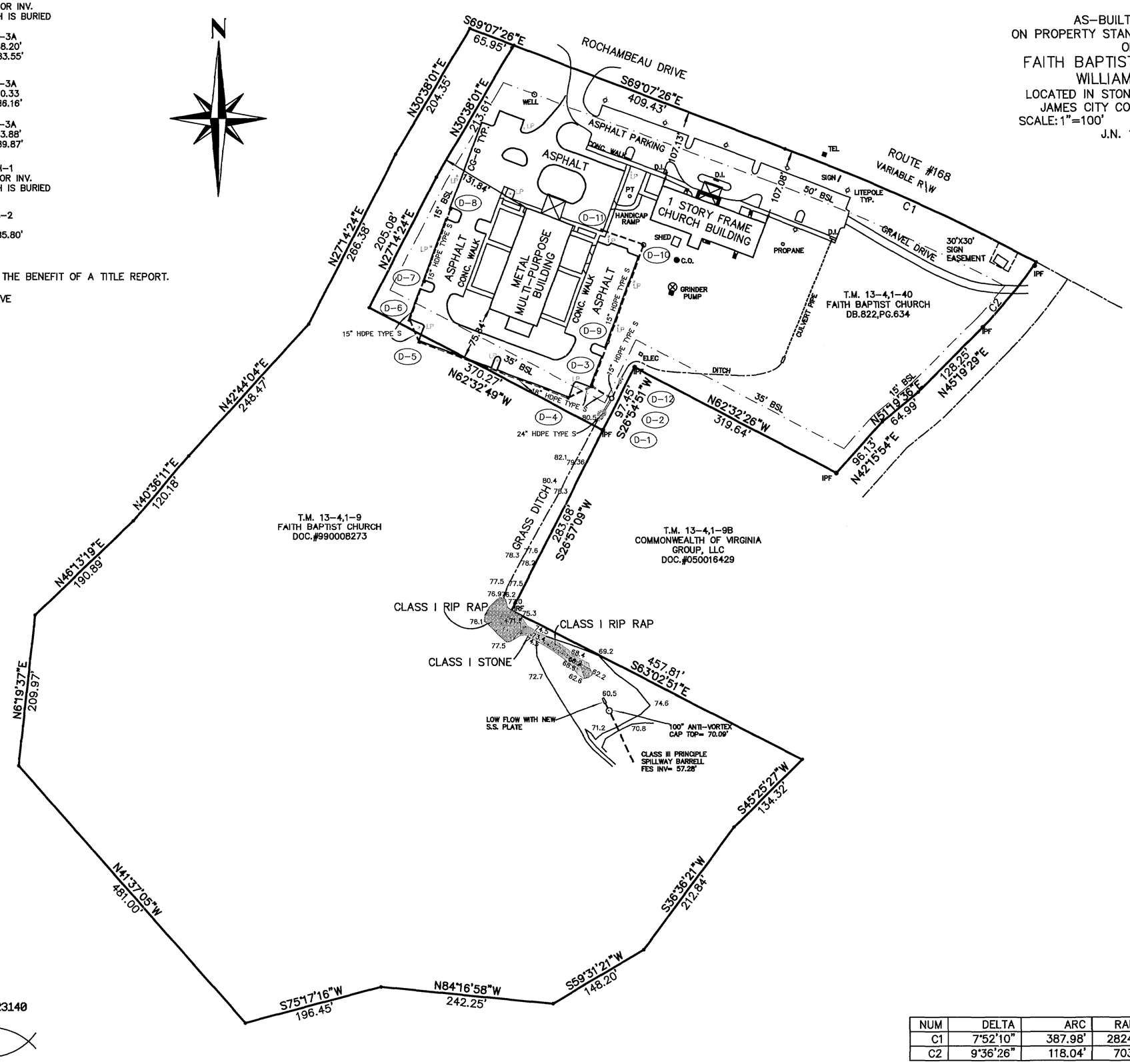
$T_{D4} = 3031\ ft^3 / 0.08\ cfs = 37888\ sec$

$\Sigma T_{1-4} = 70777\ sec = 19\ hrs\ 40\ min$

AS-BUILT SURVEY
ON PROPERTY STANDING IN THE NAME
OF
FAITH BAPTIST CHURCH OF WILLIAMSBURG
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=100' DATE: 10/21/2011
J.N. 110.8

D-1	VDOT ES-2 24" FES INV. = 81.3'	D-2	VDOT MH-1 NO RIM OR INV. SHOT MH IS BURIED
D-3	VDOT DI-3A RIM = 87.97' INV. = 82.97'	D-4	VDOT DI-3A RIM = 88.20' INV. = 83.55'
D-5	VDOT DI-3A RIM = 89.65' INV. = 85.50'	D-6	VDOT DI-3A RIM = 90.33 INV. = 86.16'
D-7	VDOT DI-3A RIM = 91.17' INV. = 87.01'	D-8	VDOT DI-3A RIM = 93.88' INV. = 89.87'
D-9	VDOT DI-3A RIM = 90.72' INV. = 86.70'	D-10	VDOT MH-1 NO RIM OR INV. SHOT MH IS BURIED
D-11	VDOT DI-1 RIM = 97.00' INV. = 93.01'	D-12	VDOT ES-2 15" FES INV. = 85.80'

NOTES:
1. THIS SURVEY WAS DONE WITHOUT THE BENEFIT OF A TITLE REPORT.
2. REFERENCES: PB.65,PG.76
3. ADDRESS: 4107 ROCHAMBEAU DRIVE



NUM	DELTA	ARC	RADIUS	BEARING	DISTANCE
C1	7°52'10"	387.98'	2824.79'	N65°45'21"W	387.68'
C2	9°36'26"	118.04'	703.96'	N40°01'11"E	117.90'

COMMONWEALTH OF VIRGINIA
DEAN E. RAYNES
Lic. No. 1633
LAND SURVEYOR

HIS LAND SURVEYING, INC.
P.O. BOX 100
PROVIDENCE FORGE VIRGINIA 23140
(804) 966-7017

Environmental Division
FEB 27 2012
RECEIVED

AS-BUILT SURVEY
ON PROPERTY STANDING IN THE NAME
OF
FAITH BAPTIST CHURCH OF
WILLIAMSBURG
LOCATED IN STONEHOUSE DISTRICT
JAMES CITY COUNTY, VIRGINIA
SCALE: 1"=100' DATE: 10/21/2011
J.N. 110.8

(D-1) VDOT ES-2
24" FES
INV. = 81.3'

(D-2) VDOT MH-1
NO RIM OR INV.
SHOT MH IS BURIED

(D-3) VDOT DI-3A
RIM = 87.97'
INV. = 82.97'

(D-4) VDOT DI-3A
RIM = 88.20'
INV. = 83.55'

(D-5) VDOT DI-3A
RIM = 89.65'
INV. = 85.50'

(D-6) VDOT DI-3A
RIM = 90.33
INV. = 86.16'

(D-7) VDOT DI-3A
RIM = 91.17'
INV. = 87.01'

(D-8) VDOT DI-3A
RIM = 93.88'
INV. = 89.87'

(D-9) VDOT DI-3A
RIM = 90.72'
INV. = 86.70'

(D-10) VDOT MH-1
NO RIM OR INV.
SHOT MH IS BURIED

(D-11) VDOT DI-1
RIM = 97.00'
INV. = 93.01'

(D-12) VDOT ES-2
15" FES
INV. = 85.80'

NOTES:
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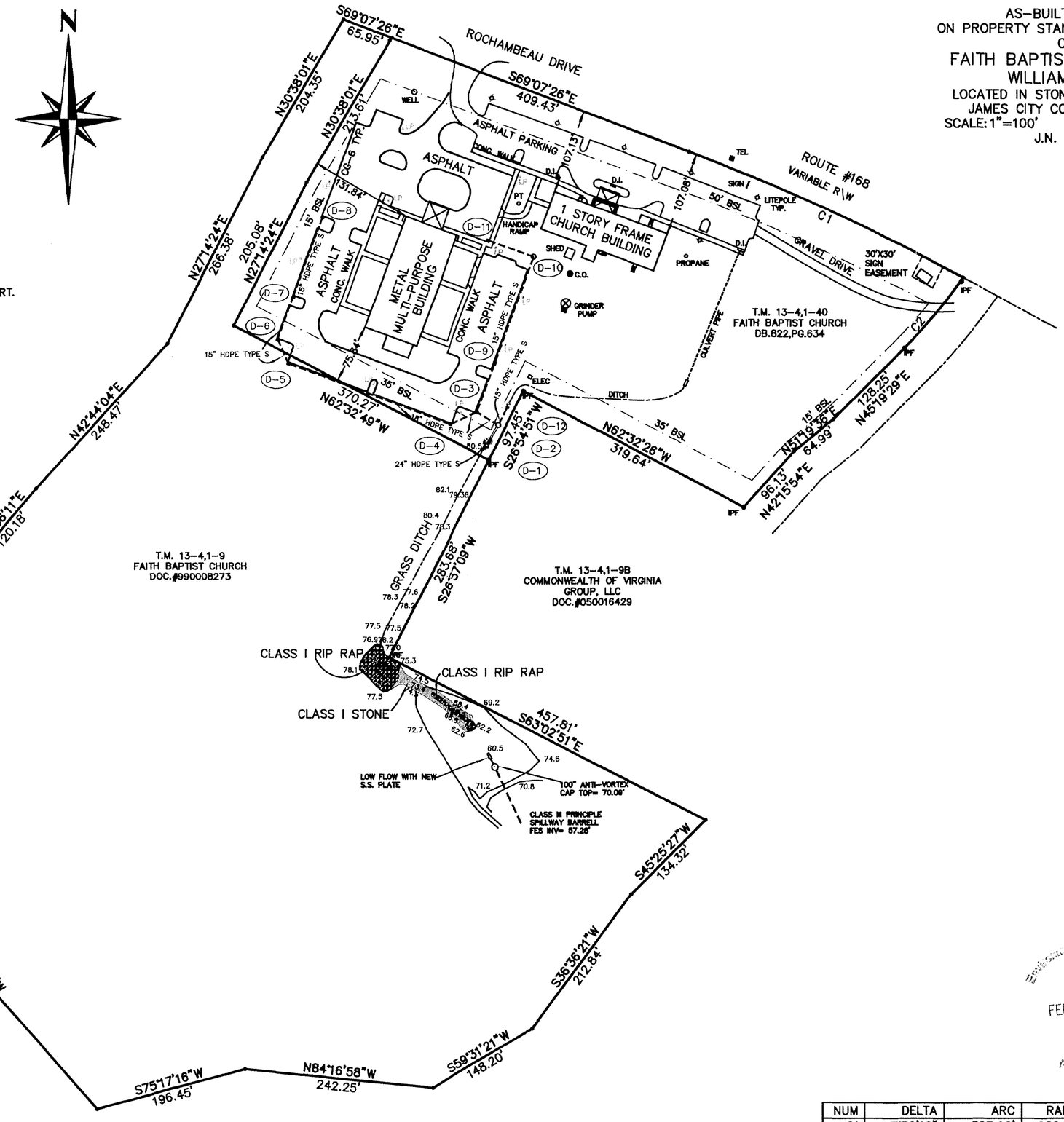

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Environmental Division
FEB 27 2012
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NUM	DELTA	ARC	RADIUS	BEARING	DISTANCE
C1	7°52'10"	387.98'	2824.79'	N65°45'21"W	387.68'
C2	9°36'26"	118.04'	703.96'	N40°01'11"E	117.90'

Environmental Division

FEB 27 2012

RECEIVED

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 Baptist Church
Structure/BMP Name: WC 054
Project Location: 4107 Rochambeau Drive
BMP Location: 4107 Rochambeau Drive
County Plan No.: SP - 0104 - 2007

Project Type:
- ☐ Residential
- ☐ Business
- ☐ Commercial
- ☐ Office
- ☐ Institutional
- ☐ Industrial
- ☐ Public
- ☐ Roadway
- ☑ Other Church

Tax Map/Parcel No.: (13-4)(1-40)
BMP ID Code (if known): WC 054
Zoning District:: Agricultural, A-1
Land Use: Church
Site Area (sf or acres): 7.007 AC

Brief Description of Stormwater Management/BMP Facility:

Dry Detention Basin with Sediment Forebay

Nearest Visible Landmark to SWM/BMP Facility: Faith Baptist Church Recreation Building

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☑ Arbitrary ☐ Other
Station Number or Name: na
Datum or Reference Elevation: Landmark Design Group Vertical Control SP-01-06-2000
Control Description: TBM Nail Found #1
Control Location from Subject Facility:

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☑ Unknown
Approx. Construction Start Date for SWM/BMP Facility: unknown
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☑ Unknown
Name of Site Work Contractor Who Constructed Facility: James McReynolds
Name of Professional Firm Who Routinely Monitored Construction: none
Date of Completion for SWM/BMP Facility: October 2011
Date of Record Drawing/Construction Certification Submittal: October 21, 2011/ January 20,2012

(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 Baptist Church
Mailing Address: 4107 Rochambeau Drive
Williamsburg, VA 23188
Business Phone: (757) 566-0456 Fax:
Contact Person: James McReynolds Title:

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: Mitchell-Wilson Associates, P.C.
Mailing Address: P.O. Box 1269
West Point, VA 23181-1269
Business Phone: (804) 843-9744
Fax:
Responsible Plan Preparer: Jonathan Blair Wilson, P.E.
Title: President
Plan Name: Faith Baptist Church Parking Area Expansion
Firm's Project No. MWA-07-1718
Plan Date: 10-09-08
Sheet No.'s Applicable to SWM/BMP Facility: C2 / C3 / C5 / C9 /

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

Name: James McReynolds
Mailing Address: 5541 FARMERS DRIVE
BARHAMSVILLE, VA 23011
Business Phone: 757-566-2295
Fax:
Contact Person:
Site Foreman/Supervisor:
Specialty Subcontractors & Purpose (for BMP Construction Only):

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: HIS Land Surveying
Mailing Address: P.O. Box 100
Providence Forge, VA 23140
Business Phone: (804) 966-7017
Fax:

Name: Dean Raynes
Title: Land Surveyor
Signature:
Date: 2/1/2012

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.

COMMONWEALTH OF VIRGINIA
2/1/2012
DEAN E. RAYNES
Lic. No. 1633
LAND SURVEYOR

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: Wilson Engineers, LLC
Mailing Address: P.O. Box 1269
West Point, VA 23181
Business Phone: (804) 843-9744
Fax:

Name: Jonathan Blair Wilson
Title: Professional Engineer
Signature:
Date: 1-23-12

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.

1. Sediment forebay surfaced with Rip Rap Stone
2. Inlet channel constructed with VDOT No. 1 Stone and Class I Rip Rap.
3. Engineer was not commissioned to monitor facility during construction.

COMMONWEALTH OF VIRGINIA
JONATHAN BLAIR WILSON
Lic. No. 019961
1-23-12
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

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

☐ PreConstruction Meeting - Provides an opportunity to review SWM / BMP facility construction, maintenance and operation plans and address any questions regarding construction and/or monitoring of the structure. The design engineer, certifying professionals (if different), Owner/Applicant, Contractor and County representative(s) are encouraged to attend the preconstruction meeting. Advanced notice to the Environmental Division is requested. Usually, this requirement can be met simultaneously with Erosion and Sediment Control preconstruction meetings held for the project.

☑ A fully completed ***STORMWATER MANAGEMENT / BMP FACILITIES, RECORD DRAWING and CONSTRUCTION CERTIFICATION FORM*** and ***RECORD DRAWING CHECKLIST***. All applicable sections shall be completed in their entirety and certification statements signed and sealed by the registered professional responsible for individual record drawing and/or construction certification.

☑ The Record Drawing shall be prepared by a Registered Professional Engineer or Certified Land Surveyor for the drainage system of the project including any Best Management Practices.

☐ Construction Certification. Construction of Stormwater Management / BMP facilities which contain impoundments, embankments and related engineered appurtenances including subgrade preparation, compacted soils, structural fills, liners, geosynthetics, filters, seepage controls, cutoffs, toe drains, hydraulic flow control structures, etc. shall be visually observed and monitored by a Registered Professional Engineer or his/her authorized representative. The Engineer must certify that the structure, embankment and associated appurtenances were built in accordance with the approved design plan, specifications and stormwater management plan and standard accepted construction practice and shall submit a written certification and/or drawings to the Environmental Division as required. Soil and compaction test reports, concrete test reports, inspection reports, logs and other required construction material or installation documentation may be required by the Environmental Division to substantiate the certification, if specifically requested. The Engineer shall have the authority and responsibility to make minor changes to the approved plan, in coordination with the assigned County inspector, in order to compensate for unsafe or unusual conditions encountered during construction such as those related to bedrock, soils, groundwater, topography, etc. as long as changes do not adversely affect the integrity of the structure(s). Major changes to the approved design plan or structure must be reviewed and approved by the original design professional and the James City County Environmental Division.

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

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

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

Interim or final record drawing and construction certifications are not required for temporary sediment basins which are designed and constructed in accordance with current minimum standards and specifications for temporary sediment basins per the Virginia Erosion and Sediment Control Handbook (VESCH); have a temporary service life of less than eighteen (18) months; and will be removed completely once associated disturbed areas are stabilized, unless a distinct hazard to the public's health, safety and welfare is determined by the Environmental Division due to the size or presence of the structure or due to evidence of improper construction.

(*Note: Dam Height as referenced above is generally defined as the vertical distance from the natural bed of the stream or waterway at the downstream toe of the embankment to the top of the embankment structure in accordance with 4VAC50-20-30, Virginia Impoundment Structure Regulations and the Virginia Dam Safety Program.)

❒ Record Drawings shall provide, at a minimum, all information as shown within these requirements and the attached **RECORD DRAWING CHECKLIST** specific to the type of SWM/BMP facility being constructed. Other additional record data may be formally requested by the James City County Environmental Division. *(Note: Refer to the current edition of the James City County Guidelines for Design and Construction of Stormwater Management BMP's manual for a complete list of acceptable BMP's. Currently there are over 20 acceptable water quality type BMP's accepted by the County.)*

❒ Record Drawings shall consist of blue/black line prints and a reproducible (mylar, sepia, diazo, etc.) set of the approved stormwater management plan including applicable plan views, profiles, sections, details, maintenance plans, etc. as related to the subject SWM / BMP facility. The set shall indicate **"RECORD DRAWING "** in large text in the lower right hand corner of each sheet with record elevations, dimensions and data drawn in a clearly annotated format and/or boxed beside design values. Approved design plan values, dimensions and data shall not be removed or erased. Drawing sheet revision blocks shall be modified as required to indicate record drawing status. Elevations to the nearest 0.1' are sufficiently accurate except where higher accuracy is needed to show positive drainage. Certification statements as shown in Section 4 of the Record Drawing and Construction Certification Form, ***or similar forms thereof***, and professional signatures and seals, with dates matching that of the record drawing status in the revision or title block, are also required on all associated record drawing plans, prints or reproducibles.

❒ Submission Requirements. Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system, it is requested that the record drawings also be submitted to the Environmental Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Environmental Division staff at the time of final submission.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

I. Methods and Presentation: *(Required for all Stormwater Management / BMP facilities.)*

____ 1. All constructed facilities meet approved design plans, unless otherwise shown. Record information or deviations from approved design plan shown in clearly annotated format and/or boxed beside design values.

XX 2. Elevations to the nearest 0.1' unless higher accuracy is needed to show positive drainage.

____ 3. All plan sheets labeled with "RECORD DRAWING" in large text in lower right hand corner (Approved County Plan Number and BMP ID Code can be included if known).

____ 4. All plan sheet revision blocks modified to indicate date and record drawing status.

____ 5. All plan sheets have certification statements and certifying professional's signature and seal.

II. Minimum Standards: *(Required for all Stormwater Management / BMP facilities, as applicable.)*

____ 1. All requirements of Section I (Methods and Presentation) apply to this section.

XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.

XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.

N/A 4. Top widths, berm widths and embankment side slopes.

____ 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.

N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.

____ 7. Profile or elevations along the entire centerline of the emergency spillway. Emergency spillway may be steeper, but no flatter or narrower than design.

____ 8. Elevation of the principal spillway crest or outlet crest of the structure.

_____ 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

_____ 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

_____ 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

_____ 12. Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

_____ 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

_____ 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

_____ 15. Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.

_____ 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

_____ 17. BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.

_____ 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

____ 19. Fencing location and type, if applicable to facility.

_____ 20. BMP vicinity properly cleaned of stockpiles and construction debris.

_____ 21. No visual signs of erosion or channel degradation immediately downstream of facility.

_____ 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

_____ A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

_____ A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

_____ A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

_____ A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

_____ A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

_____ A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

_____ A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).

_____ A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

_____ A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

_____ A10. Low flow orifice has a non-clogging mechanism.

_____ A11. A pond drain pipe with valve was provided.

_____ A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

_____ A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IV. Group B - Wetlands *(Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland)*

_____ B1. Same requirements as Group A Wet Ponds.

_____ B2. Minimum 2:1 length to width flow path provided across the facility.

_____ B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

_____ B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.

_____ B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

_____ B6. No more than one-half (½) of the wetland surface area is planted.

_____ B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

_____ B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

V. Group C - Infiltration Practices

(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)

_____ C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

_____ C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

_____ C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.

_____ C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.

_____ C5. Sides of infiltration practice lined with filter fabric.

_____ C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

_____ C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

_____ C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.

_____ C9. Minimum twenty-five (25) foot separation down gradient from any structure.

_____ C10. Stormwater outfalls provided for overflow associated with larger design storms.

_____ C11. No visual signs of erosion or channel degradation immediately downstream of facility.

_____ C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

_____ C13. Observation well provided.

_____ C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VI. Group D - Filtering Systems *(Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)*

_____ D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

_____ D2. Sediment pretreatment devices provided.

_____ D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.

_____ D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.

_____ D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

_____ D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed .

_____ D7. Filtering system is off-line from storm drainage conveyance system.

_____ D8. Overflow outlet has adequate erosion protection.

_____ D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

_____ D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

_____ D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.

_____ D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

_____ D13. No visual signs of erosion or channel degradation immediately downstream of facility.

_____ D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT / BMP FACILITIES
AS-BUILT PLAN CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VII. Group E - Open Channel Systems *(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales;and E-3 Biofilters)*

_____ E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

_____ E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

_____ E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

_____ E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

_____ E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

_____ E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.

_____ E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.

_____ E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.

_____ E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

_____ E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

_____ E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

_____ E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

_____ E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.

_____ E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.

_____ E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.

_____ E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

VIII. Group F - Extended Dry Detention *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*

____	F1.	All requirements of Section II, Minimum Standards, apply to Group F facilities.
XX	F2.	Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
N/A	F3.	Timber wall BMP used in intermittent stream only. (ie. Prohibited in perennial streams.)
XX	F4.	Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.
N/A	F5.	A reverse slope pipe, vertical stand pipe or mini-barrel and riser was provided to prevent clogging.
XX	F6.	Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.
N/A	F7.	Mini-barrel and riser, if used, contains a removable trash rack to reduce clogging.
XX	F8.	Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.
N/A	F9.	Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
N/A	F10.	Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
XX	F11.	Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
XX	F12.	Stilling basin or standard outlet protection provided at principal spillway outlet.
XX	F13.	Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.
XX	F14.	No visual signs of undercutting of timber walls or clogging of the low orifice were present.
XX	F15.	No visual signs of erosion or channel degradation immediately downstream of facility.
XX	F16.	No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

IX. Group G - Open Spaces *(Includes All Open Space Types G-1; G-2; and G-3)*

_____ G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

_____ G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.

_____ G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.

_____ G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).

_____ G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

_____ G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

(Key for Checklist is as follows: XX Acceptable N/A Not Applicable Inc Incomplete)

X. Storm Drainage Systems (Associated with BMP's Only)

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

____ SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

XX SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

XX SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

XX SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.

N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception .)

____ O1. All requirements of Section II, Minimum Standards, apply to this section.

____ O2. Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

XIII. References

(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)

- ❒ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- ❒ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).
- ❒ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- ❒ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- ❒ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- ❒ Prince William County, Virginia, Stormwater Management Fact Sheet.
- ❒ Stafford County, Virginia, As-Built Plan Checklist.
- ❒ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- ❒ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- ❒ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- ❒ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- ❒ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

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