See DC019 Part 2 for calculations.

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: **DC019**

DATE VERIFIED: **September 27, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

Date: March 23, 2012

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

From: Leah Hardenbergh

PO: 110426

Re: Files Approved for Scanning

General File ID or BMP ID:	**DC019**
PIN:	**1240100007**
Owner Name (if known):	**TOANO INVESTMENTS LLC**
Legal Property Description:	**LOT ADJ JENSON**
Site Address:	**8231 RICHMOND ROAD**

(For internal use only):

Box # 1

Agreements (in file as of scan date): Y Book or Doc #: 060010141/090029086

Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

1. As-built plan
2. Completed construction certification
3. Construction Plan
4. Design Calculations
5. Watershed Map – after pg 286 in calc.
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions
10. Geotechnical Reports

JCC Attorney's Office
101-C Mount's Bay Road
Williamsburg, VA 23185
(757) 253-6612

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS
INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

Please type or print legibly in black ink. Covenantor(s) should submit this form to the JCC Environmental Division, 101-E Mounts Bay Road, Williamsburg, VA 23185.

THIS DECLARATION OF COVENANTS, made this 7th day of October, 2009, between Toano Nec Investments, LLC, and all successors in interest, ("COVENANTOR(S)"), owner(s) of the following property:

Parcel Identification Number: 1240100007
Legal Description: LOT ADJ JENSON
Project or Subdivision Name: Nick's LAWN EQUIPMENT
Document/Instrument No. 060010141 or Deed Book _____, Page No. _____, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

I (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 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.

Instrument # 090029086
Recorded on Oct. 29, 2009

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) has executed this DECLARATION OF COVENANTS as of the date first above written.

COVENANTOR(S)

A. N. Cianelli

Signature

Anthony N. Cianelli owner

Print Name and Title

ACKNOWLEDGMENT

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City, to wit:

I hereby certify that on this 23 day of October, 2009, before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared Anthony N. Cianelli and did acknowledge the foregoing instrument to be his/her Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 23 day of October, 2009.

MELANIE J. DAVIS NOTARY PUBLIC COMMONWEALTH OF VIRGINIA

[SEAL]

Melanie J. Davis

Notary Public

Notary Registration Number: 7014335
My Commission expires: 12/31/10

Approved as to form:

Adam Kinsman

County Attorney

This Declaration of Covenants prepared by:

Signature: A. N. Cianelli Print Name and Title: Anthony N. Cianelli, Owner

Address: 15402 Rolfe Ct Lanexa VA 23089

Phone Number: 757-897-9027

Drainage1_pre_doc
(Revised 9-5-08)

James City County Environmental Division
Stormwater Management/BMP Record Drawing & Construction Certification Review
Tracking Form

Project Name: NICK'S LAWN EQUIPMENT REPAIR
County Plan No.: SP-074-09 (SUP-06-09)
Stormwater Management Facility: INFILTRATION BASIN
BMP Phase #: ☐ I ☐ II ☑ III
☑ Information Package Received. Date/By: 1/25/11 - J. BUCHITE; M. MAJOESKI
☑ Completeness Check:
- ☑ Record Drawing — Date/By: 1/24/11 - S. BONEO ✓
- ☑ Construction Certification — Date/By: 1/17/11 - C. KATTAN ✓
- ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☑ Insp/Maint Agreement # / Date: 0900029086 10/29/09
- ☑ BMP Maintenance Plan Location: AS-BUILT DRAWINGS, Sheet C-6 approved plan
- ☐ Other:

☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
- ☑ Yes ☐ No — Location: Note #21 Sheet C-6

☑ Assign **County BMP ID Code #**: Code: DC-019
☑ 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: 1/27/11
☑ Record Drawing (RD) Review — Date: [redacted] 1/25/11 SST
☑ Construction Certification (CC) Review — Date: 1/25/11 SST
☑ Actions:
- ☑ No comments. Meetings Dec 22 through January 21, 2011. see correspondence. Bill Crain + Scott Thomas dealt with David Nice on this. Very controversial matter. Initial AB data showed BMP undersized by 30%. Additional survey data obtained which proved a more reasonable difference. 8%.
- ☐ Comments. Letter Forwarded. Date:
- ☑ Record Drawing (RD)
- ☑ Construction Certification (CC)
- ☑ Construction-Related (CR) NONE
- ☐ Site Issues (SI)
- ☐ Other :

☐ Second Submission:
☐ Reinspection (if necessary):
☑ 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.
☑ Complete "As-built Tracking Log".
☑ Last check of BMP Access Database (County BMP Inventory).
☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
☐ Add BMP to Municipal BMP list (if a County-owned facility)
☐ Add BMP to PRIDE BMP ratings database.

NA 2/2/11

Final Sign-Off

Inspector: Mia P. Majoeski Date: 1/28/2011
Chief Engineer: Scott Thomas Date: 02/01/11

*** See separate checklist, if needed.

James City County, Virginia
Environmental Division

Environmental Division
JAN 26 2011

RECEIVED

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.)

APPROVED
James City County
Environmental Division
By: _____
Date: 02-01-11

Section 1 - Site Information:

Project Name: NICK'S LAWN EQUIPMENT
Structure/BMP Name: INFILTRATION BASIN
Project Location: 8231 RICHMOND ROAD
BMP Location: REAR PART OF SITE
County Plan No.: SP - 0074 - 2009

Project Type:
- ☐ Residential ☐ Business
- ☑ Commercial ☐ Office
- ☐ Institutional ☐ Industrial
- ☐ Public ☐ Roadway
- ☐ Other _____

Tax Map/Parcel No.: 1240100007
BMP ID Code (if known): DC019
Zoning District:: A1
Land Use: LAWN EQUIPMENT SALES & REPAIR
Site Area (sf or acres): 2.11 AC

Brief Description of Stormwater Management/BMP Facility: Type C-4 Infiltration Basin

Nearest Visible Landmark to SWM/BMP Facility: New Nick's Lawn Equipment Building @ 8231 Richmond Road

Nearest Vertical Ground Control (if known):
- ☑ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other

Station Number or Name: JCC 303
Datum or Reference Elevation: NGVD 29 ; Elevation = 113.13
Control Description: JCC Geodetic Control Monument
Control Location from Subject Facility: Facility is ± 450' west of Monument

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: David A. Nice Builders Inc.
Name of Professional Firm Who Routinely Monitored Construction: GET Solutions
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

(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: Nick Cianelli
Mailing Address: 15402 Rolfe Ct.
Laneka, Va 23089
Business Phone: 757-897-9027 Fax: _____
Contact Person: _____ 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: Land Mark Design Group now Vanasse Hangen Brustlin, Inc.
Mailing Address: 351 McLaws Circle, Ste 3
Williamsburg, Va 23185
Business Phone: 757-220-0500
Fax: 757-220-8544
Responsible Plan Preparer: Formerly James Brawley Now Stephen Romeo
Title: Principal # Va LS #1448B
Plan Name: Nick's Lawn Equipment 8231 Richmond Road
Firm's Project No. 2007190 and 33277
Plan Date: 10/20/09
Sheet No.'s Applicable to SWM/BMP Facility: C4 / C5 / C7 / ____ / ____

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

Name: David A. Nice Builders Inc
Mailing Address: 4571 Ware Creek Road
Williamsburg, Va 23188
Business Phone: 757-566-3032
Fax: 757-566-4686
Contact Person: David A. Nice
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: Vanasse Hangen Brustlin, Inc
Mailing Address: 351 McLaws Circle, Ste 3
Williamsburg, VA 23185
Business Phone: 757-220-0500
Fax: 757-220-8544

Name: Stephen Romeo
Title: Principal & VA LS # 1448B

Signature: Stephen Romeo
Date: 1-24-11

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
STEPHEN A. ROMEO
Lic. No. 1448-B
1-24-11
LAND SURVEYOR

_____ (Seal)

LICENSED
Virginia ~~Registered Professional Engineer~~ ~~or Certified~~ Land Surveyor

Construction Certification

Firm Name: GET Solutions
Mailing Address: 1592-E Pendleton Road
Williamsburg, VA 23185
Business Phone: 757-564-6452
Fax: _____

Name: Camille Kattan
Title: Principal Engineer # VA PE # 18045

Signature: Camille A. Kattan
Date: 01/17/11

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.

COMMONWEALTH OF VIRGINIA
CAMILLE A. KATTAN
Lic. No. 018045
01/17/11
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).

XX 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.

____ 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.

____ 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.

XX 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.

N/A 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.

N/A 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 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.

N/A 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.**

N/A 14. Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.

N/A 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.

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

XX 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.

____ 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.)*

N/A A1. All requirements of Section II, Minimum Standards, apply to Group A facilities.

N/A A2. Principal spillway consists of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

N/A A3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

N/A 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.

N/A A5. Adequate fixed vertical sediment depth markers installed in the forebay(s) for future sediment monitoring purposes.

N/A 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.

N/A 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).

N/A A8. No trees are present within a zone 15 feet around the embankment toe and 25 feet from the principal spillway structure.

N/A A9. Wet permanent pool, typically 3 to 6 feet deep, is provided and maintains level within facility.

N/A A10. Low flow orifice has a non-clogging mechanism.

N/A A11. A pond drain pipe with valve was provided.

N/A A12. Pond side slopes are not steeper than 3H:1V, unless approved plan allowed for steeper slope.

N/A 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)*

N/A B1. Same requirements as Group A Wet Ponds.

N/A B2. Minimum 2:1 length to width flow path provided across the facility.

N/A B3. Micropool provided at or around outlet from BMP (generally 3 to 6 ft. deep).

N/A 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.

N/A B5. Adequate wetland buffer provided (Typically 25 ft. outward from maximum design water surface elevation and 15 ft. setback to structures).

N/A B6. No more than one-half (½) of the wetland surface area is planted.

N/A B7. Topsoil or wetland mulch provided to support vigorous growth of wetland plants.

N/A 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)*

XX	C1.	All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.
XX	C2.	Facility is not located on fill slopes or on natural ground in excess of six (6) percent.
XX	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.
XX	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.
N/A	C5.	Sides of infiltration practice lined with filter fabric.
XX	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.
XX	C7.	Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.
XX	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.
XX	C9.	Minimum twenty-five (25) foot separation down gradient from any structure.
XX	C10.	Stormwater outfalls provided for overflow associated with larger design storms.
____	C11.	No visual signs of erosion or channel degradation immediately downstream of facility.
XX	C12.	Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.
XX	C13.	Observation well provided.
XX	C14.	Adequate, direct access provided to the facility for future maintenance, operation and inspection.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(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)*

N/A D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

N/A D2. Sediment pretreatment devices provided.

N/A 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.

N/A 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.

N/A 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.

N/A D6. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed .

N/A D7. Filtering system is off-line from storm drainage conveyance system.

N/A D8. Overflow outlet has adequate erosion protection.

N/A D9. Deflector, diversion, flow splitter or regulator structure provided to divert the water quality volume to the filtering structure.

N/A D10. Minimum four (4) inch perforated underdrain provided in a clean aggregate envelope layer beneath the facility.

N/A 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.

N/A D12. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A D13. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 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)*

N/A E1. All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.

N/A E2. Open channel system has constructed longitudinal slope of less than four (4) percent.

N/A E3. No visual signs of erosion in the open channel system's soil and/or vegetative cover.

N/A E4. Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.

N/A 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).

N/A E6. For E-2 BMPs (Dry Swales), an underdrain system was provided.

N/A E7. Treated timber or rock check dams provided as pretreatment devices for the open channel system.

N/A E8. Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.

N/A 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.

N/A E10. Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.

N/A 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.

N/A 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.

N/A E13. For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.

N/A E14. For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.

N/A E15. For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.

N/A 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)*

N/A	F1.	All requirements of Section II, Minimum Standards, apply to Group F facilities.
N/A	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.)
N/A	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.
N/A	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.
N/A	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.
N/A	F11.	Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
N/A	F12.	Stilling basin or standard outlet protection provided at principal spillway outlet.
N/A	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.
N/A	F15.	No visual signs of erosion or channel degradation immediately downstream of facility.
N/A	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)*

N/A G1. All requirements of Section II, Minimum Standards, apply to Group G facilities as applicable.

N/A 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.

N/A G3. Dedicated open space areas are in undisturbed common areas, conservation easements or are protected by other enforceable instruments that ensures perpetual protection.

N/A G4. Provisions included to clearly specify how the natural vegetated areas utilized as dedicated open space will be managed and field identified (marked).

N/A G5. Adequate protection measures were implemented during construction to protect the defined dedicated open space areas.

N/A G6. Dedicated open space areas were not disturbed during construction (ie. cleared, grubbed or graded).

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

(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.)

XX 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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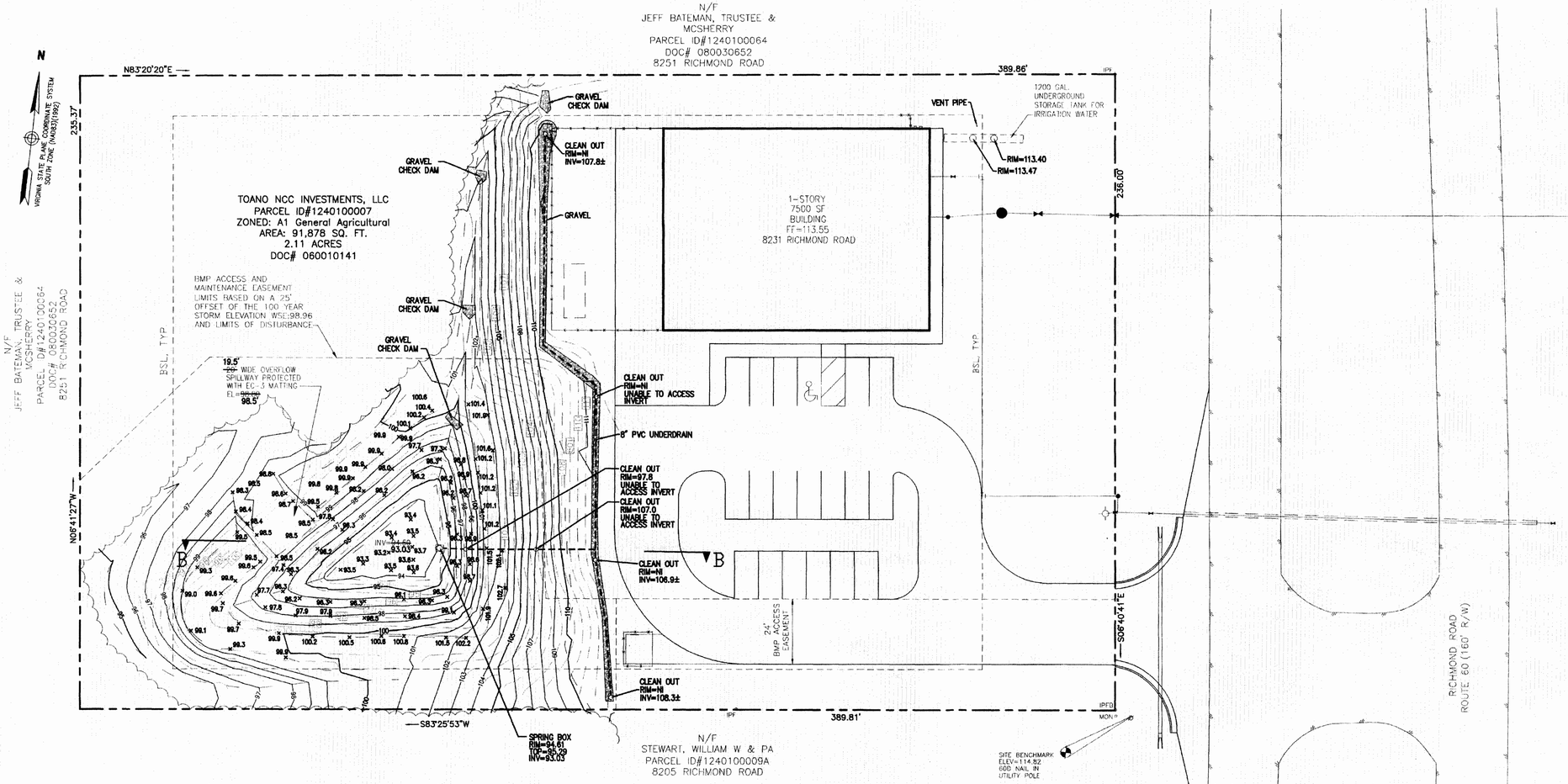

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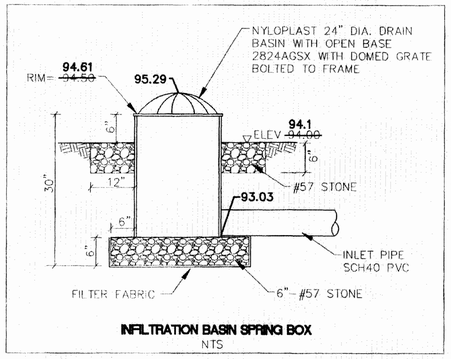

INFILTRATION BASIN SPRING BOX
NTS

COUNTY MONUMENT
JCC_303
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E=11575645.441
ELEV=113.13

REFERENCE SHEETS C-4 AND C-5 OF SP-0074-2009

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SCALE IN FEET

General Notes

1. MERIDIAN SOURCE: VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE (NAD83).
2. ELEVATIONS HEREON ARE IN FEET AND ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).
3. THIS SURVEY DOES NOT IMPLY IN ANY WAY THAT:
   (1) INSPECTIONS WERE MADE DURING THE CONSTRUCTION
   (2) TO THE QUALITY OF THE WORK, OR
   (3) TO ANY ELEMENT OR STRUCTURE NOT VISIBLE OR DEPICTED ON THE SURVEY.
4. RECORD INFORMATION SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BY VHB IN OCTOBER 2010 AND UPDATED JANUARY 2011.
5. HORIZONTAL AND VERTICAL DATUM BASED ON JAMES CITY COUNTY GEODETIC CONTROL NETWORK (#303) AS SHOWN ON PLAN.

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.

Stephen Romeo 1/25/11
STEPHEN A. ROMEO, LS DATE

APPROVED
James City County Environmental Division
By:
Date: 2-2-11
DC019
SP-74-09

VHB
Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services
351 McLaws Circle, Suite 3
Williamsburg, Virginia 23185
757.220.0500 • FAX 757.220.8544
Project Manager: Stephen A. Romeo, LS

LEGEND
NI=NOT INSTALLED AT TIME OF SURVEY

No.	Revision	Date	Appvd.

Designed by VHB | Drawn by CRO | Checked by SAR
CAD checked by | Approved by SAR
Scale 1"=20' | Date 1/5/2011

Project Title
NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Issued for
Review and Approval

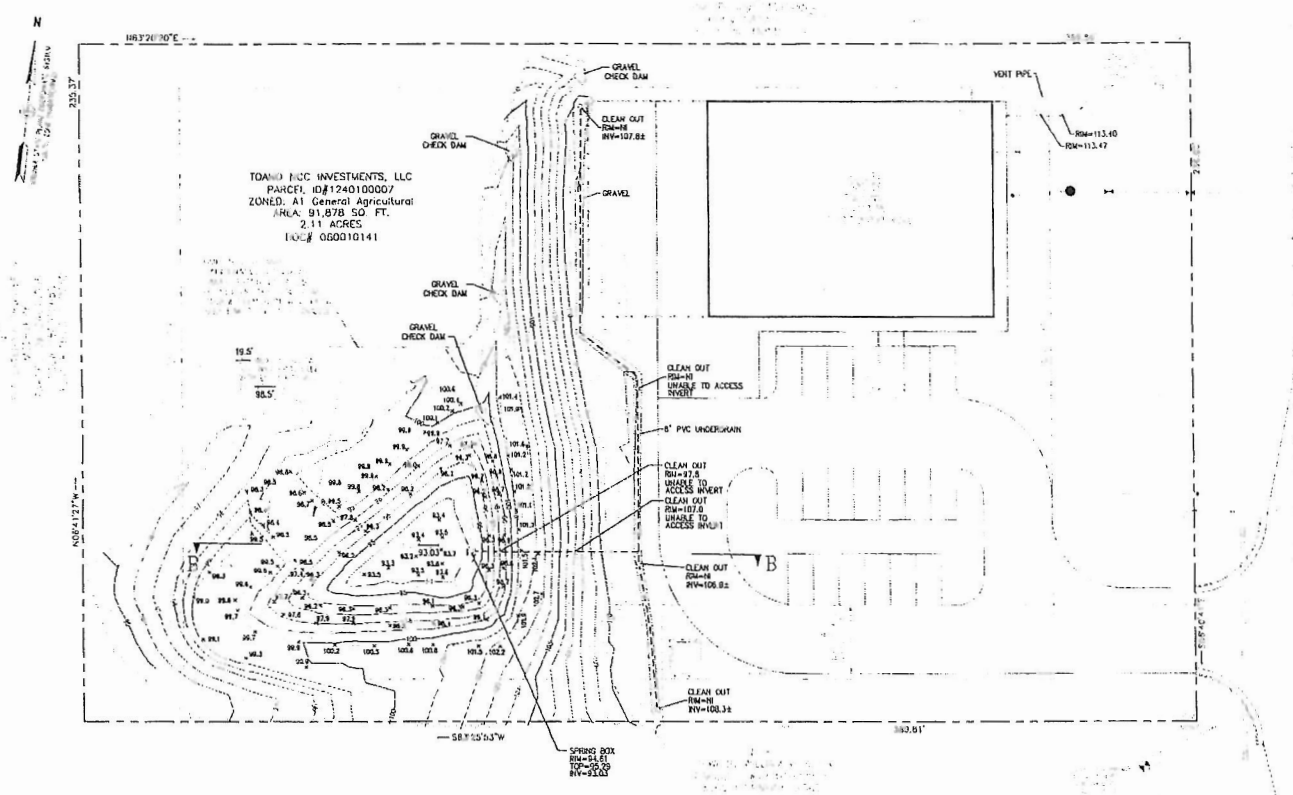
Drawing Title
Record Drawing
SP-0074-2009

Environmental Division
JAN 26 2011
RECEIVED

COMMONWEALTH OF VIRGINIA
1/25/11
STEPHEN A. ROMEO
LIC. NO. 1448-B
Stephen Romeo
LAND SURVEYOR
FOR RECORD DRAWING INFORMATION ONLY

Drawing Number
R-1
Sheet of
1 2
Project Number
33277.00

3327709-REC-BMP-REV.DWG



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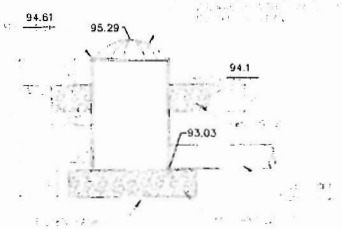


INFILTRATION BASIN SPRING BOX

Environmental Division
JAN 07 2011
RECEIVED

Vanasse Hangen Brustlin, Inc

NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Review and Approval

Record Drawing
SP-0074-2009

R-1

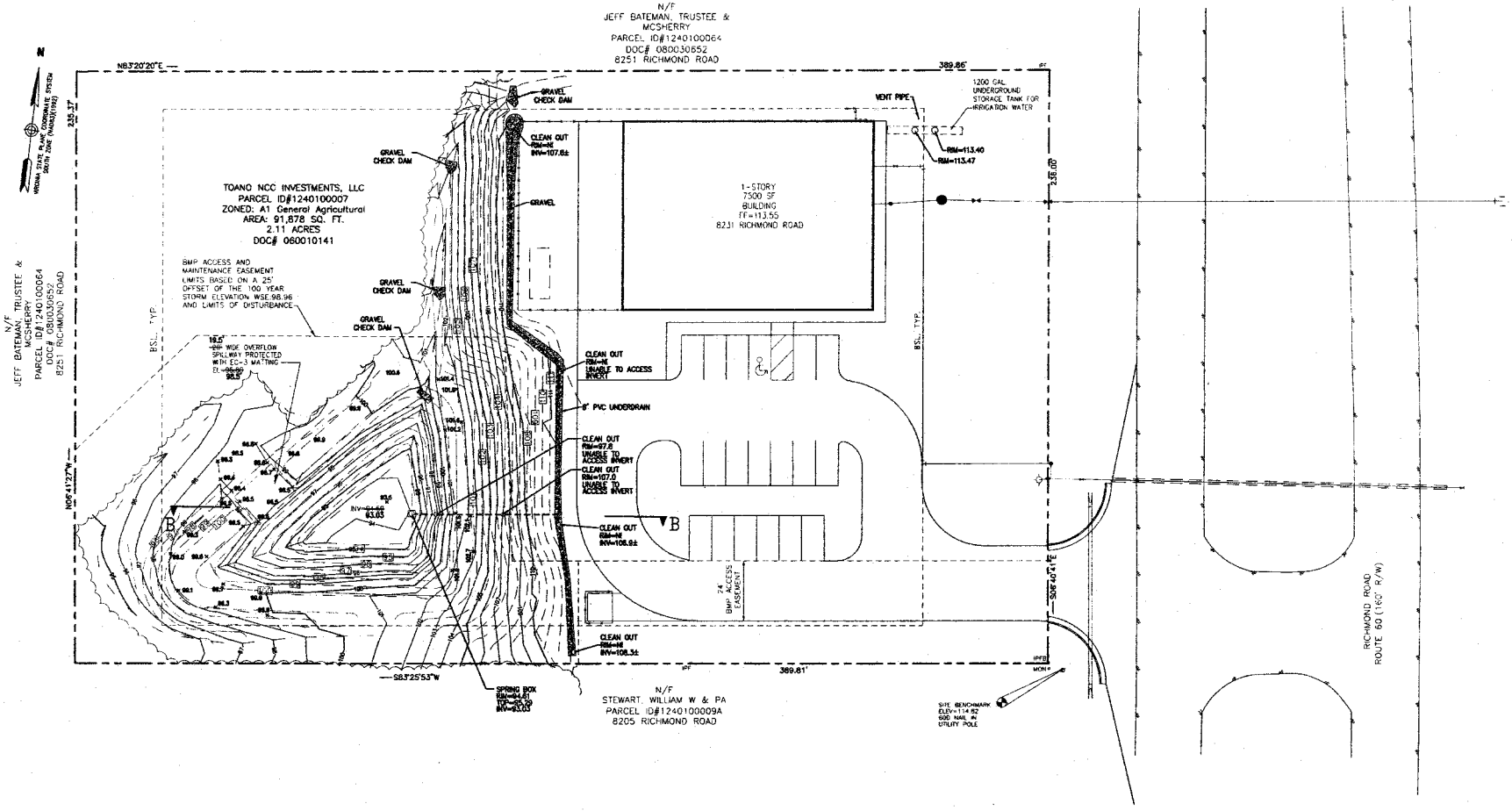
General Notes

1. MERIDIAN SOURCE: VIRGINIA STATE PLANE COORDINATE SYSTEM SOUTH ZONE (NAD83).
2. ELEVATIONS HEREON ARE IN FEET AND ARE BASED ON REGIONAL VERTICAL DATUM OF 1929 (NGVD29).
3. THIS SURVEY DOES NOT IMPLY IN ANY WAY THAT (1) ALL STRUCTURES SEEN SHALL DEFINE THE COMPLETE LIMITS OF THE BOUNDARY OF THE AREA, OR (2) ANY ELEMENT OR STRUCTURE NOT WHOLLY OR PARTLY ON THE SURVEY.
4. [illegible] INFORMATION SHOWN ON THIS PLAT ARE BASED FROM AN ACTUAL ON-THE-GROUND SURVEY PERFORMED BY VHB IN OCTOBER 2010 AND JANUARY 2011.
5. [illegible] AND VERTICAL DATUM BASED ON JAMES CITY COUNTY GEODETIC CONTROL NETWORK (GPS) AS SHOWN ON PLAN.

I HEREBY CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THE RECORD DRAWING REPRESENTS THE AS-BUILT CONDITION OF THE STORMWATER MANAGEMENT / BMP FACILITY. THE FACILITY APPEARS TO FUNCTION IN ACCORDANCE WITH THE PROVISIONS OF THE APPROVED DESIGN PLANS, DESIGN REVIEW AND STORMWATER MANAGEMENT PLAN, EXCEPT AS OTHERWISE NOTED.

STEPHEN A. ROSE _____ DATE

DC019_NICKS_LAWN_EQUIP_REPAIR - 024



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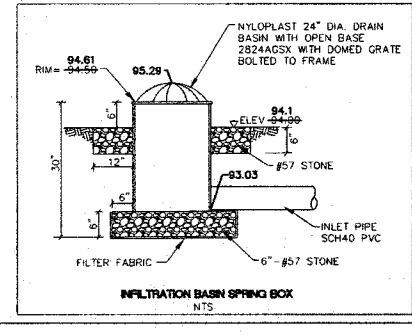

INFILTRATION BASIN SPRING BOX
NTS

COUNTY MONUMENT
JGC 303
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E=11875643.441
ELEV=115.13

REFERENCE SHEETS C-4 AND C-5 OF SP-0074-2009

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SCALE IN FEET

LEGEND
NI=NOT INSTALLED AT TIME OF SURVEY

General Notes

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   (1) INSPECTIONS WERE MADE DURING THE CONSTRUCTION
   (2) TO THE QUALITY OF THE WORK, OR
   (3) TO ANY ELEMENT OR STRUCTURE NOT VISIBLE OR DEPICTED ON THESURVEY.
4. RECORD INFORMATION SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BY VHB IN OCTOBER 2010.
5. HORIZONTAL AND VERTICAL DATUM BASED ON JAMES CITY COUNTY GEODETIC CONTROL NETWORK (#303) AS SHOWN ON PLAN.

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Stephen A. Romeo 11/3/10
STEPHEN A. ROMEO, LS DATE

VHB
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351 McLaws Circle, Suite 3
Williamsburg, Virginia 23185
757.220.0500 • FAX 757.220.8544
Project Manager: Stephen A. Romeo, LS

No.	Revision	Date	Appd.
Designed by VHB	Drawn by CRO	Checked by SAR	
CAD checked by	Approved by SAR		
Scale 1"=20'	Date 10/25/2010		

Project Title
NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Issued for
Review and Approval

Drawing Title
Record Drawing
SP-0074-2009

COMMONWEALTH OF VIRGINIA
N/3/10
STEPHEN A. ROMEO
LIC. NO. 1440-B
LAND SURVEYOR
FOR RECORD DRAWING INFORMATION ONLY

Drawing Number
R-1
Sheet 1 of 2
Project Number
53277.00

3327700-REC-BMP.DWG

MAINTENANCE PLAN FOR INFILTRATION FACILITY
INSPECTIONS FOR SEDIMENT BUILDUP SHALL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS SEDIMENT REMOVAL MAY BE REQUIRED ANUALLY.

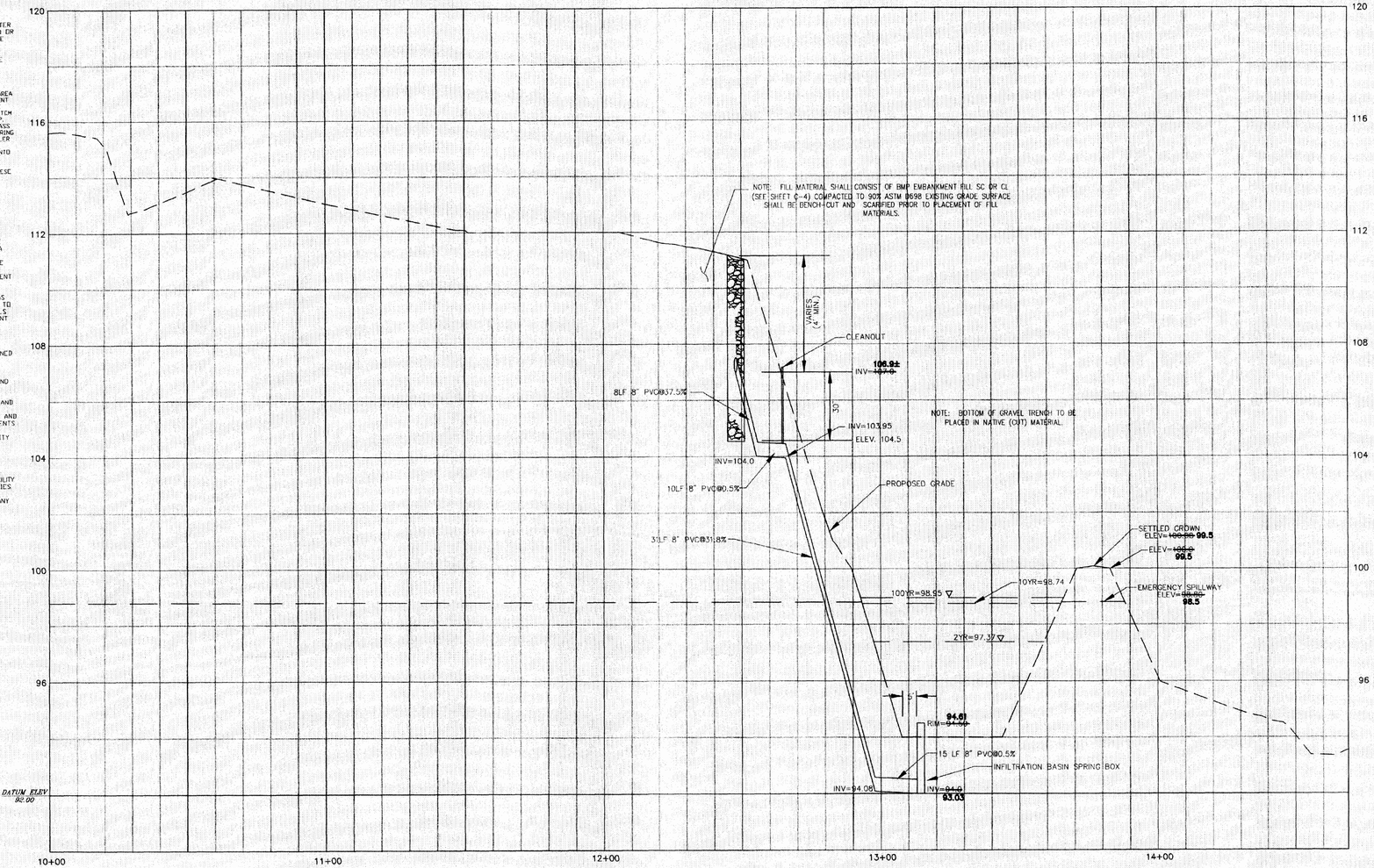
THE OWNER OR ITS DESIGNATED REPRESENTATIVE WILL INSPECT THE STRUCTURE AFTER EACH SIGNIFICANT RAINFALL EVENT OR THE FOLLOWING WORKING DAY IF A WEEKEND OR HOLIDAY OCCURS. A SIGNIFICANT RAINFALL FOR THIS STRUCTURE IS DEFINED AS ONE (1) INCH OR MORE OF GAUGED RAINFALL WITHIN A 24 HOUR PERIOD. ONCE PER YEAR (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.

INFILTRATION BASIN BMP NARRATIVE

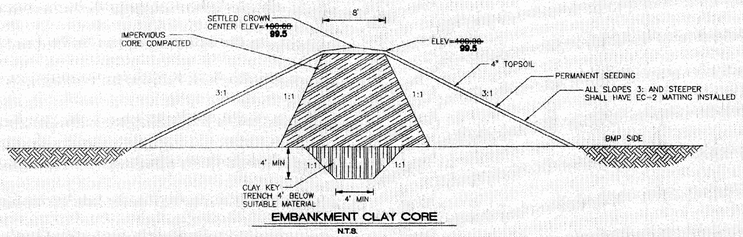
THE BMP (STORMWATER MANAGEMENT FACILITY) FOR THIS SITE SERVES A TOTAL DRAINAGE AREA OF 2.19 ACRES (1.46 ACRES ON-SITE AND 0.73 ACRES OFF-SITE). THE FACILITY IS A 50 POINT JAMES CITY COUNTY, TYPE C-4 BMP AND INCLUDES AN INFILTRATION BASIN WITH A SURFACE AREA OF 1,088 SQUARE FEET AND A STORAGE VOLUME OF 17,984 CUBIC FEET. THE BMP SYSTEM CONSISTS OF THE INFILTRATION BASIN, A GRAVEL FILTER STRIP AND A GRASS FILTER STRIP. STORMWATER FROM THE UPSLOPE PORTIONS OF THE SITE DRAINS OVERLAND ACROSS THE GRASS FILTER STRIP WHICH SERVES TO REMOVE THE LARGER SEDIMENT PARTICLES PRIOR TO ENTERING THE GRAVEL FILTER STRIP. THE GRAVEL FILTER STRIP THEN FUNCTIONS TO REMOVE SMALLER SEDIMENT PARTICLES AND PROVIDE THE REQUIRED WATER QUALITY VOLUME. STORMWATER EXITING THE GRAVEL FILTER STRIP FLOWS THROUGH A PERFORATED PVC DISCHARGE PIPE INTO THE INFILTRATION BASIN. THE INFILTRATION BASIN IS DESIGNED TO INFILTRATE THE FULL VOLUME OF THE 1, 2, AND 10 YEAR STORM EVENTS. OBSERVATION WELLS ARE PROVIDED WITHIN THE GRAVEL TRENCH AND INFILTRATION BASIN TO CHECK THE FUNCTIONALITY OF THESE PARTS OF THE SYSTEM.

INSPECTION AND MAINTENANCE MEASURES:

1. CHECK INFILTRATION BASIN FOR SEDIMENT AND LITTER ACCUMULATION REGULARY (WEEKLY).
2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, INVESTIGATE POSSIBILITIES FOR SEDIMENT OR TRASH BLOCKAGE OR OUTFALL PIPE CLOGGING. IF THE FACILITY RETAINS MORE THAN 1 FOOT OF WATER FOR LONGER THAN 5 DAYS AFTER A SIGNIFICANT RAINFALL, A DETAILED INVESTIGATION BY A PROPERLY LICENSED PROFESSIONAL MAY BE REQUIRED IN ORDER TO ENSURE PROPER FUNCTIONALITY OF THE FACILITY.
3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER AND TO MAINTAIN THE INTEGRITY OF THE FACILITY AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES SHALL INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AREAS AND STABILIZED CONTRIBUTING AREAS. MAINTENANCE SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE EXTENT POSSIBLE. TYPE OF DEBRIS REMOVED SHOULD BE NOTED AND POSSIBLE SOURCES IDENTIFIED AND REDUCED. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY PROPERLY.
4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.
5. BASIN, INCLUDING SIDE SLOPES SHALL BE PLANTED AS PER SEEDING CHART ON SHEET L-2 AND SHOULD BE MOWED AS NEEDED. ALL CLIPPINGS SHALL BE COLLECTED AND DISPOSED OF OFF-SITE. TREES AND SHRUBS ARE NOT PERMITTED TO GROW ON THE EMBANKMENT.
6. 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 OR REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).
7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/RODENT BURROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING.
8. PERFORM AN INSPECTION OF THE GRAVEL TRENCH PERIODICALLY AND REMOVE DEBRIS AS NECESSARY.
9. RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED FOR THE FACILITY. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.
10. 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.



SECTION B-B
HORIZONTAL SCALE: 1" = 20'
VERTICAL SCALE: 1" = 2'



EMBANKMENT CLAY CORE
N.T.S.

REFERENCE SHEETS C-6 AND C-7 OF SP-0074-2009

20 0 20 40
SCALE IN FEET

VHB
Vanasse Hangen Brustlin, Inc.
Transportation
Land Development
Environmental Services
351 McLaws Circle, Suite 3
Williamsburg, Virginia 23185
757.220.0500 • FAX 757.220.8544
Project Manager: Stephen A. Romeo, LS

No.	Revision	Date	Appvd.

Designed by VHB | Drawn by CRO | Checked by SAR
CAD checked by | Approved by SAR
Scale 1"=20' | Date 1/5/2011

Project Title
NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Issued for
Review and Approval

Drawing Title
Record Drawing
SP-0074-2009

COMMONWEALTH OF VIRGINIA
1/25/11
STEPHEN A. ROMEO
LIC. NO. 1448-B
LAND SURVEYOR
FOR RECORD DRAWING INFORMATION ONLY

Drawing Number
R-2
Sheet 2 of 2
Project Number
33277.00

3327700-REC-BMP-REV.DWG

No.	Revision	Date	Appvd.

Designed by VHB	Drawn by CRO	Checked by SAR
CAD checked by	Approved by SAR	
Scale 1"=20'	Date 1/5/2011	

Project Title

NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Issued for

Review and Approval

ONUMENT

1,228
45,441
13

Environmental Division

JAN 07 2011

RECEIVED

Drawing Title

Record Drawing
SP-0074-2009

COMMONWEALTH OF VIRGINIA
STEPHEN A. ROMEO
LIC. NO. 1448-B
LAND SURVEYOR

FOR RECORD DRAWING
INFORMATION ONLY

Drawing Number

R-1

Sheet of
1 2

Project Number
33277.00

S C-4 AND C-5 OF SP-0074-2009

0 20 40

SCALE IN FEET

3327700-REC-BMP-REV.DWG

Vanasse Hangen Brustlin, Inc. Environmental Division TRANSMITTAL

Transportation
Land Development
Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316
757 220 0500
FAX 757 220 8544

JAN 26 2011

RECEIVED

Date: 1/25/11	VHB Project No.: 33277
Re: Nick's Lawn Equipment	
SP - 0074 - 2009	
BMP ID # DC019	

To: JCC Environmental Division
Attn: Scott Thomas

We are sending you: ☑ Attached ☐ Under Separate cover via Regular Mail the following items:

☐ Shop drawings ☑ Prints ☐ Plans ☐ Diskettes ☐ Specifications ☐ Copy of Letter ☐ Change Order
☑ Other BMP Construction Certification Forms

Copies	Date	No.	Description
1 EACH	1/25/11	R-1 & R-2	BMP Record Drawings
1	—	—	BMP Construction Certification Form
			DC019; SP-74-09

These are transmitted as checked below:

☑	For approval	☐	Approved as submitted	☐	Resubmit	____	Copies for approval
☐	For your use	☐	Approved as noted	☐	Submit	____	Copies for distribution
☐	As requested	☐	Return for corrections	☐	Return	____	Corrected prints
☐	For review and comment	☐	For bids due				
☐	Returned prints on loan to VHB						

REMARKS:

APPROVED
James City County
Environmental Division
By: [signature]
Date: 02-01-11

If VHB provides materials to the Client that are stored electronically, the Client recognizes that data, plans, specifications, reports, documents, or other information recorded on or transmitted as electronic media ("CADD Documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, the CADD Documents are provided to the Client for informational purposes only and not as an end product. VHB makes no warranties, either express or implied, regarding the fitness or suitability of the CADD Documents.

The CADD Documents are instruments of professional service, and shall not be used, in whole or in part, for any project other than that for which they were created, without the express written consent of VHB and without suitable compensation to VHB. Accordingly, the Client agrees to waive any and all claims against VHB resulting in any way from the unauthorized alternation, misuse or reuse of the CADD documents and to defend, indemnify, and hold VHB harmless for any claims, losses, damages, or costs, including attorneys fees, arising out of the alteration, misuse or reuse of any CADD Documents.

Copy to: Nick Cianelli
David Nice

By: Stephen Romeo

Vanasse Hangen Brustlin, Inc. TRANSMITTAL

Transportation
Land Development
Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185-6316
757 220 0500
FAX 757 220 8544

Date: 1/28/11	VHB Project No.: 33277
Re: Nick's Lawn Equipment	
BMP Record Drawings (Mylar)	
Environmental Division	
JAN 28 2011	

To: JCC Environmental Division
ATTN: Mike Majeski

We are sending you: ☑ Attached ☐ Under Separate cover via Regular Mail the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Diskettes ☐ Specifications ☐ Copy of letter ☐ Change Order
☑ Other Mylars

RECEIVED

Copies	Date	No.	Description
1 each	1/25/11	R-1 & R-2	BMP Record Drawings
			MYLAR

These are transmitted as checked below:

☐	For approval	☐	Approved as submitted	☐	Resubmit ____		Copies for approval
☑	For your use	☐	Approved as noted	☐	Submit ____		Copies for distribution
☐	As requested	☐	Return for corrections	☐	Return ____		Corrected prints
☐	For review and comment	☐	For bids due				
☐	Returned prints on loan to VHB						

REMARKS:

If VHB provides materials to the Client that are stored electronically, the Client recognizes that data, plans, specifications, reports, documents, or other information recorded on or transmitted as electronic media ("CADD Documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, the CADD Documents are provided to the Client for informational purposes only and not as an end product. VHB makes no warranties, either express or implied, regarding the fitness or suitability of the CADD Documents.

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Copy to: Nick Cranell
David Nice

By: Stephen G Romeo

DA-1 PRE
1.10 Ac
C=0.31
Tc=12.4 min

DA-2 PRE
1.44 Ac
C=0.33
Tc=14.0 min

DA-3 PRE
1.72 Ac
C=0.40
Tc=16.2 min

N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL 19812401000B4
DOC# 080030652
8251 RICHMOND ROAD

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060001741
8281 RICHMOND ROAD

N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL ID#1240100084
DOC# 080030652
8251 RICHMOND ROAD

N/F
STEWART, WILLIAM W & PA
PARCEL ID#1140100009A
8255 RICHMOND ROAD

RICHMOND ROAD
ROUTE 60 (160' R/W)

POI 1
POI 2

GRAPHIC SCALE
0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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

5544 Cleveland Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 497-1300
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 253-2646
Email: lmdg@landmarkdg.com

REVISIONS:

No.	Date	Comment	By

DRAWING STATUS
- Interoffice Review
- Client for Review
- Pre Approval Bidding

COUNTY APPROVAL
- 1st Submittal
- 2nd Submittal
- 3rd Submittal
- Approved

PRE-DEVELOPMENT DRAINAGE AREA MAP

PLAN OF DEVELOPMENT
NICKS LAWN EQUIPMENT
8231 RICHMOND ROAD
STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Designed: PS	Date: 8/24/09
Checked: SAR	Scale: 1"=30'
File Mgr./Drawn: PS	CADD File name: DA-1.dwg
Project Number: 2007190-000.00	Dwg. File No.:

Drawing Number
DA-1

DA-2A POST
1.29 Ac
C=0.42
Tc=5.0 min

DA-3 POST
0.93 Ac
C=0.46
Tc=5.0 min

DA-1 POST
1.13 Ac
C=0.32
Tc=12.4 min

DA-2B POST
0.91 Ac
C=0.61
Tc=5.0 min

N/F
JEFF BATEMAN, TRUSTEE & MCSHERRY
PARCEL ID#1240100064
DOC# 080010652
8251 RICHMOND ROAD

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: M1 General Agricultural
AREA: 91,878 SQ. FT.,
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD

N/F
STEWART, WILLIAM W & PA
PARCEL ID#1240100039
8205 RICHMOND ROAD

RICHMOND ROAD
ROUTE 60 (VAR. R/W)

POI 1

POI 2

GRAPHIC SCALE
0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

3544 Chesapeake Road
Suite 200
Virginia Beach, VA 23462
Tel (757) 233-2975
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel (757) 253-2975
Fax (757) 253-0408
Email: lmdg@landmarkdg.com

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

REVISIONS:

No.	Date	Comment	By

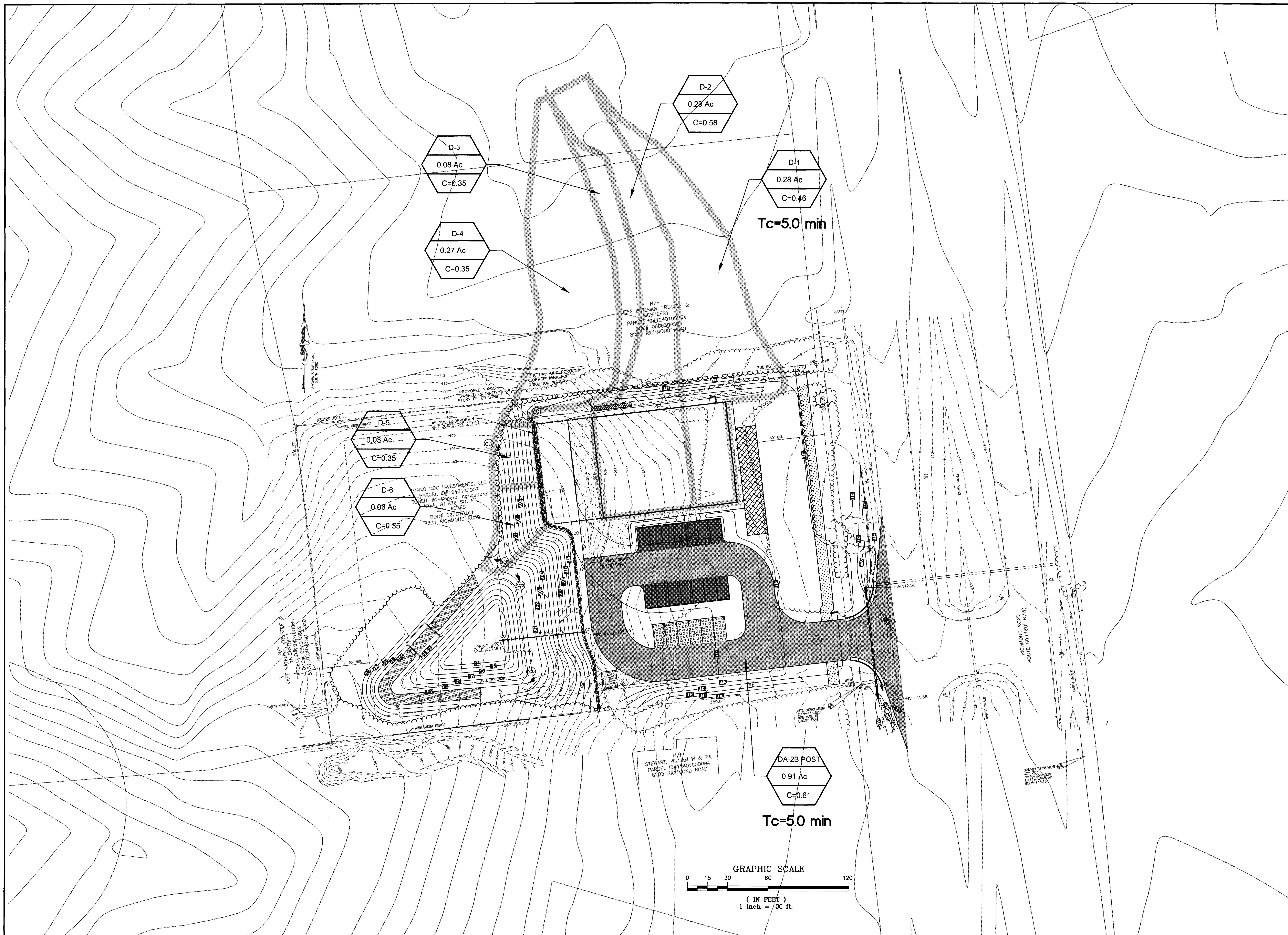
DRAWING STATUS
- Interoffice Review
- Client for Review
- Pre Approval Bidding

COUNTY APPROVAL
- 1st Submittal
- 2nd Submittal
- 3rd Submittal
- Approved

POST-DEVELOPMENT DRAINAGE AREA MAP

PLAN OF DEVELOPMENT
NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD
STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

Designed: PS	Date: 08/24/09
Checked: SAR	Scale: 1"=30'
File Mgr./Drawn: PS	CADD File name: DA-2.dwg
Project Number: 2007190-000.00	Dwg. File No.:
Drawing Number	DA-2



GRASS SWALE DRAINAGE AREA MAP

PLAN OF DEVELOPMENT
NICK'S LAWN EQUIPMENT
8231 RICHMOND ROAD

STONEHOUSE MAGISTERIAL DISTRICT
JAMES CITY COUNTY, VIRGINIA

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

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

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 229-0049
Email: lmdg@landmarkdg.com

REVISIONS:

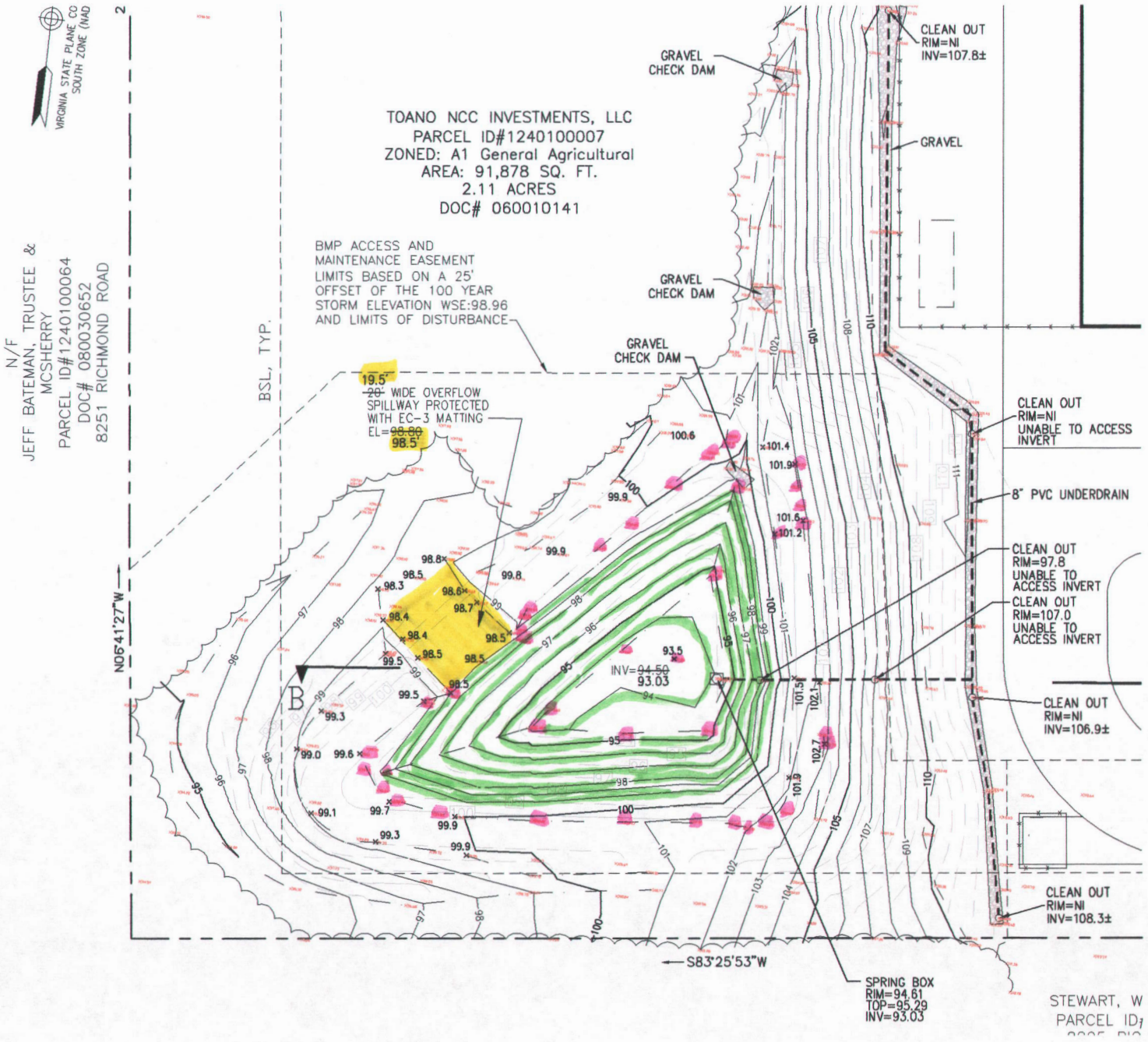
No.	Date	Comment	By

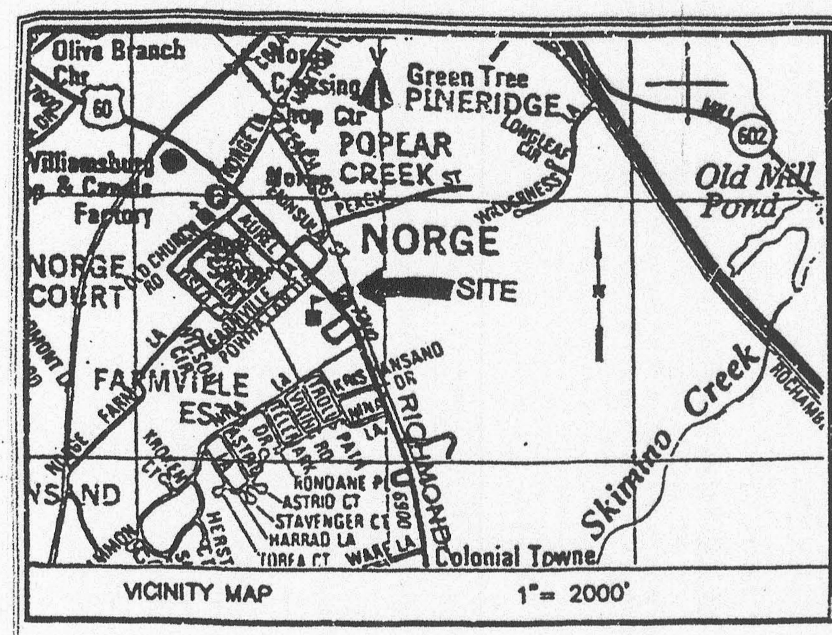
DRAWING STATUS
- Interoffice Review
- Client for Review
- Pre Approval Bidding

COUNTY APPROVAL
- 1st Submittal
- 2nd Submittal
- 3rd Submittal
- Approved

Designed: PS	Date: 08/24/09
Checked: SAR	Scale: 1"=30'
File Mgr./Drawn: PS	CADD File name: DA-3.dwg
Project Number: 2007190-000.00	Dwg. File No.:

Drawing Number
DA-3


VIRGINIA STATE PLANE CO SOUTH ZONE (NAD
N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL ID#1240100064
DOC# 080030652
8251 RICHMOND ROAD
TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
BMP ACCESS AND
MAINTENANCE EASEMENT
LIMITS BASED ON A 25'
OFFSET OF THE 100 YEAR
STORM ELEVATION WSE:98.96
AND LIMITS OF DISTURBANCE
BSL, TYP.
19.5'
~~20'~~ WIDE OVERFLOW
SPILLWAY PROTECTED
WITH EC-3 MATTING
EL=~~98.80~~
98.5'
GRAVEL
CHECK DAM
GRAVEL
GRAVEL
CHECK DAM
GRAVEL
CHECK DAM
CLEAN OUT
RIM=NI
INV=107.8±
CLEAN OUT
RIM=NI
UNABLE TO ACCESS
INVERT
8" PVC UNDERDRAIN
CLEAN OUT
RIM=97.8
UNABLE TO
ACCESS INVERT
CLEAN OUT
RIM=107.0
UNABLE TO
ACCESS INVERT
CLEAN OUT
RIM=NI
INV=106.9±
CLEAN OUT
RIM=NI
INV=108.3±
INV=~~94.50~~
93.03
N05°41'27"W
S83°25'53"W
SPRING BOX
RIM=94.61
TOP=95.29
INV=93.03
STEWART, W
PARCEL ID#



VICINITY MAP 1" = 2000'

BUILDING CODE ANALYSIS

BUILDING CODE OF JURISDICTION = VIRGINIA USBC & BOCA CODE, 1996 EDITION

BUILDING CODE TYPE OF CONSTRUCTION = 5B

BOCA SECTION 3403.0 (ADDITIONS) ALLOWS ADDITIONS WHICH COMPLY WITH CODE WITHOUT EXISTING BUILDING BEING BROUGHT INTO COMPLIANCE; BUT, NEW AND EXISTING AREA MUST COMPLY WITH BOCA 503.0.

FOR CONSTRUCTION TYPE 5B, BOCA SECTION 503.0 ALLOWS 4,800 S.F. FOR MERCANTILE (M) OCCUPANCY AND 7,200 S.F. FOR WAREHOUSE (S-2) OCCUPANCY.

BOCA SECTION 313.1.1 (MIXED USE GROUPS) STIPULATES THAT THE MOST RESTRICTIVE USE GROUP SHALL APPLY TO THE ENTIRE BUILDING OR ELSE PROVIDE 2 HOURS OF FIRE SEPARATION. THE MERCANTILE USE GROUP IS THE MOST RESTRICTIVE, ALLOWING 4,800 S.F. OF FLOOR AREA.

BOCA SECTION 506.2 (AREA MODIFICATIONS) ALLOWS AN AREA INCREASE WHERE MORE THAN 25% OF THE BUILDING FRONTS ON UNOCCUPIED SPACE OF NOT LESS THAN 30 FEET. SINCE THE EXISTING BUILDING ALONG WITH THE PROPOSED ADDITION MEETS THIS MINIMUM, THIS PROJECT IS ENTITLED TO A 150% INCREASE IN THE FLOOR AREA STIPULATED BY BOCA SECTION 503.0.

THEREFORE, TAKING THE MOST RESTRICTIVE OCCUPANCY (MERCANTILE) AREA OF 4,800 S.F. X 150% = 7,200 S.F. ALLOWABLE FLOOR AREA FOR THIS MIXED USE GROUP BUILDING WITHOUT ANY FIRE SEPARATION BETWEEN USE GROUPS.

BUILDING CODE USE GROUP = M FOR EXISTING RETAIL AREA (3,775 S.F.)
S-2 FOR EXISTING WAREHOUSE AREA (1,541 S.F.)
S-2 FOR NEW WAREHOUSE AREA (1,867 S.F.)

TOTAL NEW BUILDING AREA PROVIDED = 7,184 S.F. WHICH IS LESS THAN 7,200 S.F. PERMITTED.

① SITE PLAN NOTES

PROPERTY ZONED "B-1"

PARKING: THERE SHALL BE NO INCREASE IN THE NUMBER OF EMPLOYEES AND THEREFORE NO ADDITIONAL PARKING SPACES ARE PROVIDED OR REQUIRED BY THE ZONING ORDINANCE.

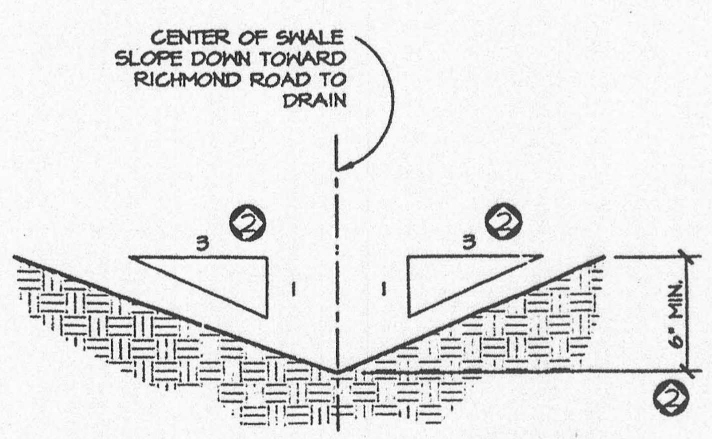
TOTAL SITE AREA = 57,741.56 SQUARE FEET (1.24 ACRE)

AMOUNT OF OPEN SPACE = 31,068.66 S.F. (53.81 PERCENT OF TOTAL SITE)

AMOUNT OF IMPERVIOUS AREA (BUILDING AND PARKING) = 26,673 S.F. (46.19 PERCENT OF TOTAL SITE)

WATER METER, WATER LINE SANITARY SEWER LINE AND CLEAN OUT (CO) IS FROM DRAWINGS BY G. ALAN MORLEDGE, AIA, DATED JAN. 7, 1982 FOR THE ORIGINAL BUILDING AND SITE PLAN

Additional Impervious
Sp-0040-2009 Shed Site Plan Amendment 294
Sp-0001-2011 Greenhouse Site plan amendment 820'
Total Impervious Cover
Retail 3775 Sheds 394 parking 9120
Warehouse 3408 Greenhouse 820'
Total 17517
27887 ft



① SWALE CROSS SECTION
SCALE: NO SCALE

BUILDING GENERAL NOTES

1. ALL CONSTRUCTION MEANS AND METHODS OF CONSTRUCTION SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE ARCHITECT ASSUMES ABSOLUTELY NO RESPONSIBILITY OR LIABILITY FOR ANY LACK OF THE CONTRACTOR'S KNOWLEDGE AND/OR SKILL IN CONSTRUCTION MEANS AND/OR METHODS.

2. ALL JOB SITE SAFETY SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

3. THE CONTRACTOR SHALL PROVIDE ALL INSURANCE REQUIRED BY LAW AND ALL NECESSARY INSURANCE TO PROTECT THE INTERESTS OF THE CONTRACTOR AND THE OWNER.

4. ALL WORK SHALL COMPLY WITH ALL APPLICABLE BUILDING CODES, ORDINANCES AND/OR REGULATIONS AS WELL AS APPLICABLE INDUSTRY STANDARDS. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRICAL CODE (NFPA 70A-1993).

5. ALL HEATING/VENTILATION/AIR CONDITIONING (HVAC), PLUMBING AND ELECTRICAL WORK SHALL BE DESIGNED AND INSTALLED BY LICENSED TRADESMEN WHO ARE LICENSED BY THE COMMONWEALTH OF VIRGINIA FOR THE APPLICABLE TRADE. ALL DESIGN OF HVAC, PLUMBING, FIRE SUPPRESSION SYSTEMS AND ELECTRICAL SYSTEMS SHALL COMPLY WITH APPLICABLE CODES, ORDINANCES AND/OR REGULATIONS AS WELL AS APPLICABLE INDUSTRY STANDARDS.

6. ALL SUB-CONTRACTORS OF THE CONTRACTOR SHALL BE LICENSED CONTRACTORS WHO ARE LICENSED BY THE COMMONWEALTH OF VIRGINIA AND SHALL BE SKILLED FOR THE REQUIRED WORK OF THEIR SUB-CONTRACTS.

7. IN THE EVENT OF A CONFLICT BETWEEN THESE DRAWINGS AND THE APPLICABLE CODES, THE MORE STRINGENT REQUIREMENTS SHALL APPLY TO THE WORK.

8. ALL CONCRETE SHALL BE 3500 P.S.I. (@ 28 DAYS) COMPRESSIVE STRENGTH CONCRETE. ALL CONCRETE WORK SHALL CONFORM WITH AMERICAN CONCRETE INSTITUTE (ACI)SPECIFICATIONS (ACI 318, LATEST EDITION). ALL REINFORCING STEEL BARS ("REBAR")SHALL COMPLY WITH ASTM A-615, GRADE 60. WIRE MESH REINFORCING ("W.W.M.") SHALL COMPLY WITH ASTM A-185. PROVIDE WIRE REBAR CHAIRS TO SUPPORT REBAR DURING CONCRETE PLACEMENT TO THE LOCATIONS INDICATED IN THESE DRAWINGS. DO NOT USE BRICKS AS REBAR SUPPORTS. ALL REBAR IN CONCRETE FOOTINGS AND MASONRY WALLS SHALL BE LAPPED AS NECESSARY IN ACCORDANCE WITH ACI SPECIFICATIONS AND DETAILS IN THESE DRAWINGS. PEA GRAVEL CONCRETE FOR MASONRY CELL/BOND BEAM FILL SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 P.S.I. AND SHALL CONFORM WITH ASTM C476. ALL CONCRETE SHALL BE MADE WITH TYPE 2 CEMENT CONFORMING WITH ASTM C150. PROVIDE 6 SACKS (@ 94 POUNDS PER SACK) MINIMUM FOR EACH CUBIC YARD OF CONCRETE AND WITH AN ABSOLUTE WATER CEMENT RATIO OF 0.51 (5.8 U.S. GALLONS PER 94 POUND SACK OF CEMENT. THE CONCRETE OF THE FOOTINGS, BASEMENT SLABS AND MASONRY FILL SHALL NOT BE AIR ENTRAINED. CONCRETE SHALL BE MIXED AND DELIVERED IN ACCORDANCE WITH ASTM C94 OR ASTM C685.

9. ALL CONCRETE MASONRY UNITS ("C.M.U.") SHALL CONFORM WITH ASTM C-90. MORTAR SHALL CONFORM WITH ASTM C-270, TYPE S. ALL MORTAR JOINTS SHALL BE 3/8" AND SHALL BE TOOLED CONCAVE. ALL MASONRY JOINT REINFORCING SHALL BE "DUR-O-WAL" TRUSS TYPE JOINT REINFORCING WITH # 9 DEFORMED SIDE BARS AND # 9 CROSS BARS. MASONRY JOINT REINFORCING SHALL BE INSTALLED AT 16" O.C. VERTICALLY ABOVE GRADE AND 8" O.C. BELOW GRADE.

10. ALL STEEL LINTELS SHALL COMPLY WITH ASTM A-36. ALL ANCHOR BOLTS SHALL COMPLY WITH ASTM A-307. ALL LINTELS SHALL BE PROVIDED WITH (2) COATS OF ZINC RICH PRIMER PAINT AND SHALL BE TOUCHED-UP IN THE FIELD AFTER INSTALLATION IS OTHERWISE COMPLETE.

11. ALL WOOD INDICATED AS "SALT TREATED" AS WELL AS ALL WOOD IN CONTACT WITH MASONRY AND CONCRETE SHALL BE TREATED WITH 0.25 POUNDS PER CUBIC FOOT OF CCA PRESERVATIVE IN ACCORDANCE WITH AWPA STANDARDS. ALL LUMBER TO LUMBER CONNECTIONS SHALL BE DIRECT NAILED WITH A MINIMUM OF TWO (2) 16d NAILS AT EACH CONNECTION.

12. ALL GALVANIZED FRAMING "HURRICANE STRAPS" AND OTHER FRAMING ANCHORING DEVICES SHALL BE MANUFACTURED BY SIMPSON (NATIONAL TOLL FREE PHONE NUMBER: 1-800-999-5099) OR EQUAL AS APPROVED BY THE ARCHITECT.

13. ALL PLYWOOD SHALL BE MANUFACTURED AND GRADED IN ACCORDANCE WITH "U.S. PRODUCT STANDARD PSi-74" FOR PLYWOOD CONSTRUCTION. EACH SHEET OF PLYWOOD SHALL BEAR THE "APA" GRADE MARK. ALL PLYWOOD ROOF, FLOOR AND WALL SHEATHING SHALL BE 5/8" THICK APA GRADE "C-D" AND SHALL BE MANUFACTURED WITH EXTERIOR GRADE GLUE ("CD EXT.").

14. ALL RIDGE VENTS SHALL BE # V 400 "COR-A-VENT" WITH 18 SQ. INCHES NET FREE AIR AREA PER LINEAR FOOT OF VENT. APPLY SHINGLES ALONG TOP OF VENT. INSTALL IN ACCORDANCE WITH MANUFACTURER'S DIRECTIONS/SPECIFICATIONS. NATIONAL TOLL FREE PHONE # 1-800-837-8368.

15. ALL ROOF PLYWOOD SHEATHING SHALL BE COVERED WITH 15 POUND FELT PAPER.

16. ALL WOOD TRUSSES SHALL BE MANUFACTURED BY A MEMBER OF THE TRUSS PLATE INSTITUTE (T.P.I.) AND ALL TRUSS CONNECTIONS SHALL BE MADE WITH CONNECTOR PLATES MEETING THE REQUIREMENTS OF T.P.I. AND SHALL BE CONNECTED IN ACCORDANCE WITH T.P.I. SPECIFICATIONS/RECOMMENDATIONS AND/OR INSTRUCTIONS. TRUSS ERECTION AT THE JOB SITE SHALL BE IN ACCORDANCE WITH T.P.I.'S SPECIFICATIONS/RECOMMENDATIONS AND/OR INSTRUCTIONS. ATTACH ALL TRUSSES TO WALL PLATES AND/OR TRUSS GIRDER WITH SIMPSON "STRONG-TIE" CONNECTORS INDICATED (SEE NOTE # 13 ABOVE). TRUSS DESIGN CALCULATIONS SHALL BE PERFORMED BY A VIRGINIA LICENSED PROFESSIONAL ENGINEER IN ACCORDANCE WITH THE FOLLOWING LOADING:

ROOF LIVE LOAD	20 PSF
ROOF DEAD LOAD	ACTUAL OR 7 PSF (MINIMUM)
WIND LIVE LOAD	80 MILES PER HOUR
BOTTOM CHORD DEAD LOAD	ACTUAL OR 20 PSF
DURATION FACTOR	15%
TOP CHORD MINIMUM SIZE	2" X 4"
BOTTOM CHORD MINIMUM SIZE	2" X 4"

THE TRUSS MANUFACTURER SHALL SUBMIT 6 COPIES OF SEALED DESIGN CALCULATIONS AND 6 COPIES OF SEALED SHOP DRAWINGS FOR REVIEW BY THE ARCHITECT. ALL CALCULATIONS AND SHOP DRAWINGS SHALL BE SEALED BY A VIRGINIA LICENSED PROFESSIONAL ENGINEER AND SHALL BE SUBMITTED AND FULLY REVIEWED PRIOR TO ERECTION OF ANY TRUSSES.

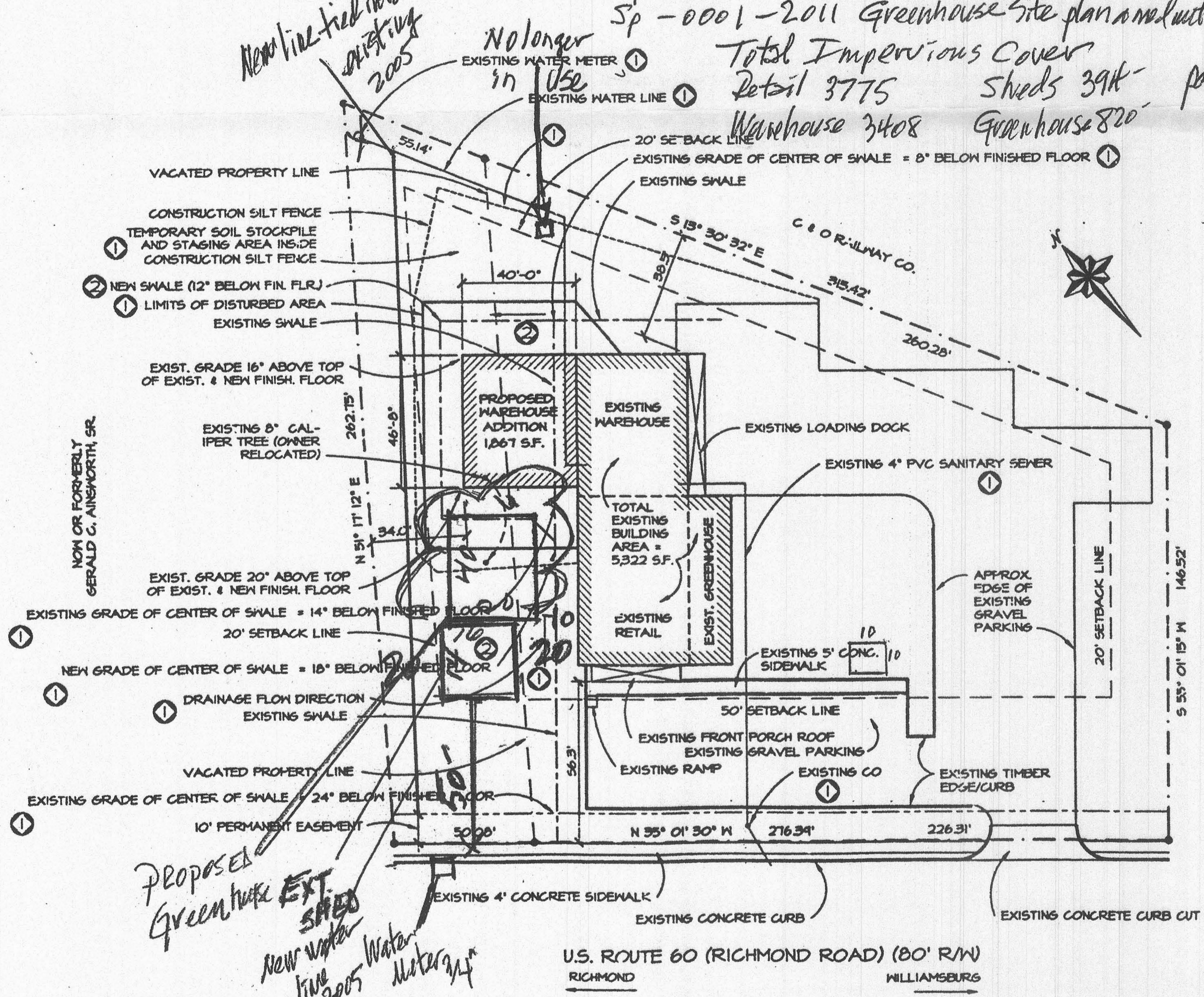
17. THE CONTRACTOR SHALL RE-GRADE THE WORK AREA TO PROVIDE ADEQUATE DRAINAGE AND DIRECT RUN-OFF INTO EXISTING DRAINAGE SWALES. STOCKPILE EXISTING TOP SOIL AND SPREAD UPON COMPLETION OF ROUGH GRADING. THE CONTRACTOR SHALL PROVIDE GRASS SEED STRAW OVER ALL DISTURBED AREAS. THE OWNER SHALL PROVIDE AND INSTALL ALL NEW SHRUBS IN THE AREA INDICATED ON THE LANDSCAPING PLAN.

18. THE EXISTING HEATING AND AIR CONDITIONING SYSTEM SHALL BE EXTENDED INTO THE ADDITION TO SERVE THE OFFICES. REWORK EXISTING SYSTEM AS NECESSARY TO PROVIDE ADEQUATE HEAT AND COOLING. RELOCATE CONDENSATE DRAIN LINES AND OUTDOOR CONDENSING UNIT TO ALLOW CONSTRUCTION OF ADDITION.

19. REWORK EXISTING ELECTRICAL SYSTEM TO PROVIDE LIGHTING AND ELECTRICAL SERVICES AS INDICATED IN THE PLAN.

20. THE CONTRACTOR SHALL NOT DO ANY EXCAVATION PRIOR TO LOCATING ALL ELECTRICAL, FUEL OIL, TELEPHONE, SEWER AND/OR WATER SUPPLY LINES, TANK AND/OR EQUIPMENT IN THE AREA OF THE WORK. NOTIFY THE ARCHITECT OF ANY CONFLICTS OF SUCH LINES AND/OR EQUIPMENT WITH THE PROPOSED ADDITION.

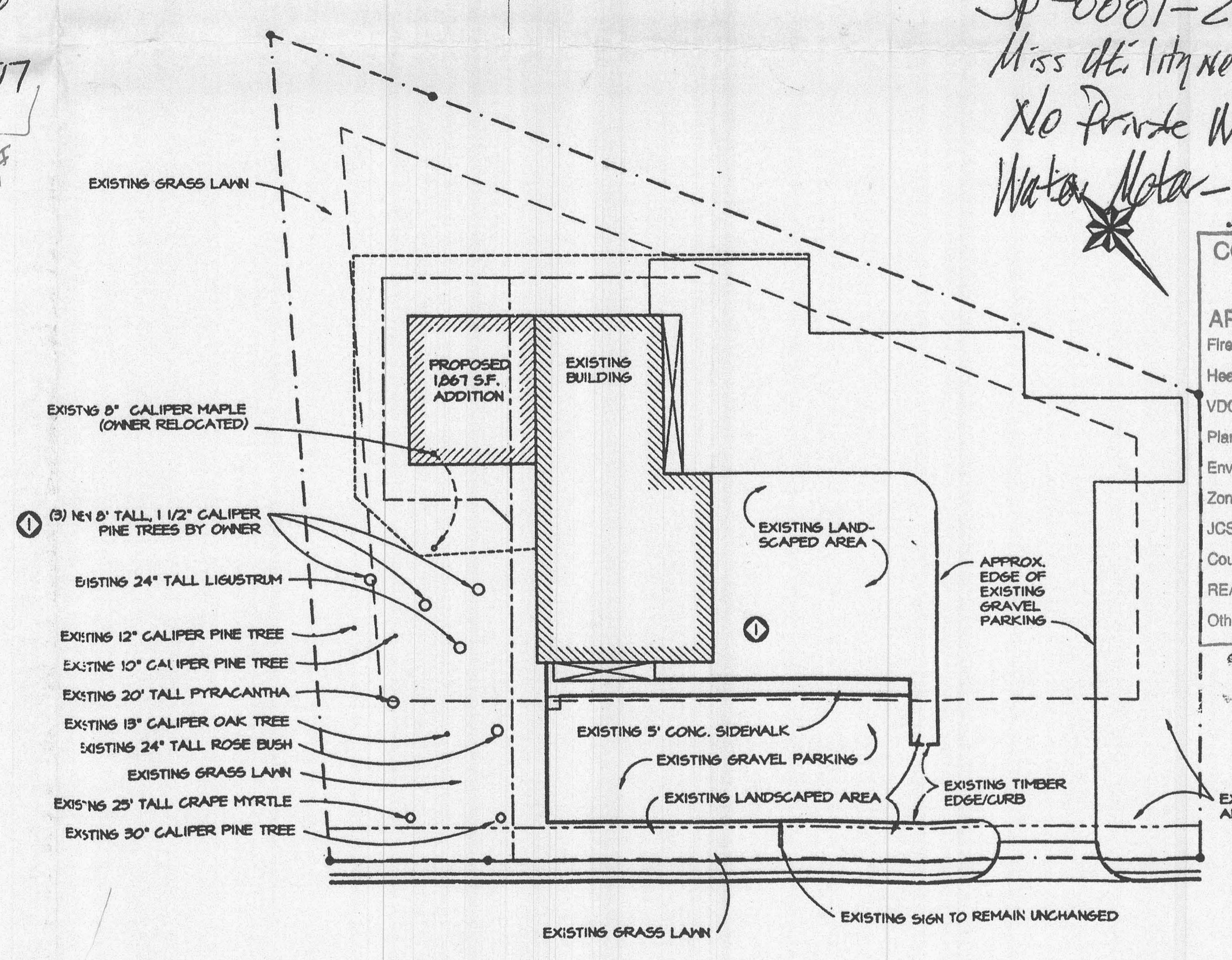
Setback 50 feet.
SP-0001-2011
Miss Utility notified 24hrs prior
No Private Well
Water Meter 3/4"



SITE PLAN
SCALE: 1" = 30'

NOTE: ALL BOUNDARY SURVEY, SETBACK AND EXISTING BUILDING LOCATION INFORMATION FROM DJG (COMMISSION # 6175) "PLAT SHOWING RESUBDIVISION OF PROPERTY OF GERALD G. AINSWORTH, SR.", DATED 11/20/1997 FOR TAX MAP 23-2 PARCEL 01-0-0027 (DB 732, PG 261) (MB 27, PG 65)

GRAPHIC SCALE: 1" = 30'



LANDSCAPING PLAN
SCALE: 1" = 30'

NOTE: ALL EXISTING TREES AND SHRUBS SHALL REMAIN IN PLACE OR BE MOVED AS INDICATED. THE AREA OF THE SITE AROUND THE PROPOSED ADDITION SHALL BE GRADED AND PLANTED WITH GRASS SEED AS SELECTED BY THE OWNERS.

(23-2)(01-0-0027)
SP-5-98
Jamestown Feed & Seed

COUNTY OF JAMES CITY
FINAL SITE PLAN

APPROVALS	DATE
Fire Dept.	
Health Dept.	
VDOT	
Planning	
Environ.	
Zoning Adm.	
JCSA	
County Eng.	
REA	
Other	

SP-0001-11

RECEIVED JAN 2011 Planning Department

RECEIVED FEB 1998 PLANNING DEPARTMENT

Environmental Division JAN 21 2011 RECEIVED

COMMONWEALTH OF VIRGINIA 2/16/98 JAN. 12, 1998 PROJ. # 9721 ZAN L. CARTWRIGHT No. 4772 ARCHITECT

SCALE: 1" = 30'-0" UNLESS NOTED OTHERWISE
DATE: JAN. 12, 1998
REVISED: FEB. 10, 1998 ① FEB. 16, 1998 ②

SITE & LANDSCAPING PLANS AND PROJECT GENERAL NOTES

Addition to Jamestown Feed & Seed
Richmond Road, Norge, James City County, Virginia

ZAN L. CARTWRIGHT, AIA
125 [illegible] WILLIAMSBURG, VIRGINIA 23188 (757) 565-1832

Z.L.C File: [illegible]
Plotted: [illegible]

This drawing is an instrument of the Architect's services. The Architect is the author of the drawing and retains all common law, statutory and other rights including the copyright. The drawing is authorized solely for the project described herein only. Other use or reproduction shall constitute a violation of the copyright.

Mr. & Mrs. Gerald C. Ainsworth, Sr.

is herewith granted permission to reproduce this drawing solely for construction of and other purposes for the project described herein.
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sheet # 1 of 3 sheets
project # 9721

SP-0001-2011

RIGHT-OF-WAY.
11. TOPOGRAPHY FIELD SURVEY PREFORMED BY LMDG.
12. BOUNDARY FROM PLAT PREPARED BY WALTERS LAND SURVEYING.

ID EXISTING CONDITIONS
OL PLAN
OL NOTES & DETAILS

AND DETAILS

OWNER/DEVELOPER

NICK'S LAWN EQUIPMENT
CONTACT PERSON:
NICK CIANELLI
15402 ROLFE COURT
LANEXA, VA 23089
PHONE (757) 897-9027

SITE ENGINEER

LANDMARK DESIGN GROUP
CONTACT PERSON:
JAMES W. BRAWLEY, P.E.
4029 IRONBOUND ROAD
SUITE 100
WILLIAMSBURG VA, 23188
PHONE: (757) 253-2975
FAX: (757) 229-0049

RESPONSIBLE LAND DISTURBER DURING THE REVIEW PROCESS

JAMES W. BRAWLEY, P.E.
LANDMARK DESIGN GROUP
4029 IRONBOUND ROAD, SUITE 100
WILLIAMSBURG VA, 23188
PHONE: (757) 253-2975
FAX: (757) 229-0049

ARK
OUP
urveyors
ental Consultants
ite 100
8
7) 229-0049
.com

COMMONWEALTH OF VIRGINIA
JAMES W. BRAWLEY III
LIC. No. 024305
10-20-09
PROFESSIONAL ENGINEER

STATISTICAL DATA

PARCEL ID	1240100007
PARCEL AREA	2.11 AC.
TAX MAP NO	(1-7)(1-24)
ADDRESS	8231 RICHMOND ROAD
ZONING	A1 GENERAL AGRICULTURAL DISTRICT
WATERSHED	DIASCUND CREEK
PROPOSED USE	LAWN EQUIPMENT SALE/REPAIR
SETBACKS	15' SIDE 35' REAR 50' FRONT
PROJECT AREA	2.11 AC.
DISTURBED AREA (ON-SITE)	1.56 AC.
DISTURBED AREA (OFF-SITE)	0.14 AC.
EXISTING IMPERVIOUS	0.07 AC
PROPOSED IMPERVIOUS	0.54 AC (26%)
PROPOSED PERVIOUS	1.57 AC (74%)

PROPOSED BUILDING:

(2) OFFICES (5.3%)	400 SF
SHOWROOM(26.7%)	2000 SF
STORAGE/SHOP(68.0%)	5100 SF
TOTAL BUILDING AREA	7500 SF

PROPOSED BUILDING HEIGHT (SINGLE STORY) 16'

REQUIRED PARKING:

2000 sf SHOWROOM @ 1:200 sf	10 SPACES
(2) 200 sf OFFICES @ 1:250 sf	1.6 SPACES
5100 sf STORAGE/SHOP @ 1PER EMPLOYEE	3 SPACES
2100 sf OUTDOOR DISPLAY @ 1:500 sf	4 SPACES
TOTAL SPACES REQUIRED	19 SPACES

PROVIDED PARKING:

REGULAR SPACES	18 SPACES
VAN ACCESSIBLE H/C	1 SPACE
TOTAL SPACES PROVIDED	19 SPACES

PROPOSED NUMBER OF EMPLOYEES 3
TENTATIVE HOURS OF OPERATION 6am-6pm

NEAREST COUNTY MONUMENTATION JCC STATION NUMBER 303.
HORIZONTAL: VA STATE PLANE SOUTH ZONE, NAD 83
VERTICAL: NGVD 1988

APPROVED PLAN
SP-74-09
DC 019
C-1

Dwg. File No.: 19,115W

N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL ID#1240100064
DOC# 08003065?
8251 RICHMOND ROAD

BSL, TYP.

INFILTRATION
BASIN
BOTTOM EL=94.00

LIMITS OF CLEARING

LIMITS OF
DISTURBANCE

20' WIDE OVERFLOW
SPILLWAY PROTECTED
WITH EC-3 MATTING
EL=98.80

ACCESS &
MAINTENANCE
EASEMENT
25'

PROTECT SLOPE
WITH EC-3 MATTING

N06°41'27"W

35' BSL

BORING
CET B-2
G=100.50

HA-1/INF-1

BORING
CET B-1
G=99.48

HA-2/INF-2

98.80

100 YR-98.96

25'

PROVIDE EC-3 MATTING
ON ENTIRE SLOPE

CONCRETE

LANDSCAPE AREA

(PERMEA

EARTH SWALE

EMBANKMENT CLAY
CORE

VARIABLE WIDTH
ACCESS & MAINTENANCE
EASEMENT

S83°25'53"W

8 FT HIGH WOODEN
SCREENING FENCE

PROPOSED DUMPSTER

8" CONCRETE SLAB

N/F
STEWART, WILLIAM
PARCEL ID#1240
8205 RICHMON

8 FT HIGH CHAIN LINK FENCE

OUTSIDE STORAGE 8'x8'x24' CONTAINER

18 FT ROLLING GATE

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD

INFILTRATION BASIN BOTTOM EL=94.00

LIMITS OF CLEARING

LIMITS OF DISTURBANCE

20' WIDE OVERFLOW SPILLWAY PROTECTED WITH EC-3 MATTING EL=98.80

PROVIDE EC-3 MATTING ON ENTIRE SLOPE

BORING GET B-2 G=100.50

HA-1/INF-1

BORING GET B-1 G=99.48

HA-2/INF-2

SPRING BOX (SEE DETAIL)

INV=94.50

8" PVC

100 YR-98.96

EQUIPMENT LOADING AREA

LANDSCAPE AREA

5' COVERED CONCRETE

CONCRETE

5' WIDE GRASS FILTER STRIP

INV (UP)=107.00

WIRE MESH FENCE

EMBANKMENT CLAY CORE

S83°25'53"W

VARIABLE WIDTH ACCESS & MAINTENANCE EASEMENT

8 FT HIGH WOODEN SCREENING FENCE

PROPOSED DUMPSTER

STA: 11+55
(1) 2" CORP STOP AND VALVE
(1) 2" 90° BEND

STA: 11+52
(1) 8" GATE VALVE

18" STEEL CASING END AT STA. 11+40

STEWAR
PARCE
8205

CONTRACTOR REQUIRED
FOLLOWING STANDARD
SERVICE AUTHORITY DE
CRITERIA FOR WATER D
SEWER SYSTEMS DATED

W13.0 W14.0
W17.0 GP-3
GP-3.1 JR.1
PC.1 PP.1

HRPDC REGIONAL CONS

N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL ID#1240100064
DOC# 080030652
8251 RICHMOND ROAD

PROTECT SLOPE WITH EC-3 MATTING

N06°41'27"W

35' BSL

BORING GET B-1 G=100.50

HA-1/INF-1

BORING GET B-1 G=99.48

HA-2/INF-2

SPRING BOX (SEE DETAIL)

INV=94.50

8" PVC

CO.

INV (UP)=107.00

25'R

49'R

111.90

111.75 L.P.

111.95

111.25

LANDSCAPE AI

98.80

100 YR=98.96

SCD

EARTH SWALE

EMBANKMENT CLAY CORE

WIRE MESH FENCE

S83°25'53"W

VARIABLE WIDTH ACCESS & MAINTENANCE EASEMENT

8 FT HIGH WOODEN SCREENING FENCE

PROPOSED DUMPSTER

8" CONCRETE S

IPF

STEWART, WI
PARCEL ID#
8205 RICI

STA: 11+66
3/4" DOMESTIC METER AT PROPERTY LINE

STA: 11+71
JCSA APPROVED RPZ BACKFLOW PREVENTER IN ABOVE GROUND ENCLOSURE

STA: 11+55
(1) 2" CORP STOP AND VALVE
(1) 2" 90° BEND

STA: 11+59
(1) 6" GATE VALVE
(1) FH ASSY.

PROP. PEDESTRIAN TRAIL

STA: 11+52
(1) 8" GATE VALVE

STA: 11+56
(1) 8x6 REDUCER

18" STEEL CASING END AT STA. 11+40

10X10 BORING PIT

EXIST R/W

GRAPHIC SCALE

0 10 20 40

(IN FEET)
1 inch = 10 ft

CONTRACTOR REQUIRED TO F
FOLLOWING STANDARD DETAIL
SERVICE AUTHORITY DESIGN A
CRITERIA FOR WATER DISTRIBU
SEWER SYSTEMS DATED MARC

W13.0 W14.0
W17.0 GP-3
GP-3.1 JR.1
PC.1 PP.1

HRPDC REGIONAL CONSTRUCTI
STANDARDS FOURTH EDITION

RC_01 WD_01
WD_07 SS_11
SS_13 WS_01
WS_02 WS_04
WS_06 WS_07

INSET DETAIL

DC019_NICKS_LAWN_EQUIP_REPAIR - 038

PROPOSED
1-STORY
7500 SF
BUILDING
FF=113.55

SEE C-7 FOR SECTION A-A

100'

INV (OUT)=109.52

4" PVC LATERAL @1.0% SLOPE

SANITARY CLEAN OUT
INV (IN)=109.47
INV (OUT)=109.47

STA:13+56
(1) 2" GATE VALVE

STA:13+45
(1) 90° BEND

113.15

10'X10 BORING PIT

STA: 11+7?
(1) 1 1/2" BALL VALVE AT PROPERTY LINE AS PER JCSA STD DTL GP-1

STA:12+10
(1) 90° BEND

20'

1200 SF GRASS OUTDOOR DISPLAY AREA

50' BSL

900 SF CONCRETE OUTDOOR DISPLAY AREA

11+00

SCAPE
REA

113.10

LANDSCAPE AREA

113.35
112.90

112.90

113.30

113.25

ED CONCRETE WALK

L.P.

112.90
L.P.

2" PVC DOMESTIC WATER

BSL, TYP.

90

6'

113.10

6 ~ 9'X18' PARKING SPACES

113.15

5'R

5'R

9'

113.05

GRASS
TRIP

24'

34'R

112.20

WHEEL STOPS, TYP.

7 ~ 9'X18' PARKING SPACES

112.56

2'R

10'R

10'R

5'R

112.40

STA:12+16
(1) 90° BEND

24'

2" PVC DOMESTIC WATERLINE PROPOSED

SEE INSET, THIS SHEET

LANDSCAPE AREA
111.95

111.80
L.P.

112.56

112.10
L.P.

112.40

07.00

12+00
6 ~ 9'X18' PARKING SPACES
(PERMEABLE PAVERS)

25'R

10'R

111.90

111.95

112.56

24'
ACCESS EASEMENT

11.25

112

SIGN

25'R

25'R TYP.

TC 114.67
FL 114.17

30'

S06°40'41"E

70'

TC 114.67
FL 114.17

113

114

115

116

117

15' BSL

389.81'

IPF

GRAVEL

TC 114.80 HP
FL 114.30 HR PFB

MON

PP

8" CONCRETE SLAB

12+75.78

A

SITE BENCHMARK
ELEV=114.82
60D NAIL IN
UTILITY POLE

PROTECT OUTLET WITH EC-3 MATTING

112.50

112.50

EXIST. R/W

N/F
STEWART, WILLIAM W & PA
PARCEL ID#1240100009A
8205 RICHMOND ROAD

OR REQUIRED TO REFERENCE THE
G STANDARD DETAILS: JAMES CITY
AUTHORITY DESIGN AND ACCEPTANCE
FOR WATER DISTRIBUTION AND SANITARY
STEMS DATED MARCH 2008

W14.0
GP-3
JR.1

NOTE:

1. CONTRACTOR TO FIELD ADJUST PARKING AS NEEDED TO CENTER LOADING SPACE FOR DISABLED PERSONS PARKING ON CENTER OF THE DOOR TO THE BUILDING.
2. ONLY JCSA PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ON THE EXISTING JCSA WATERMAIN.
3. LANDMARK DESIGN GROUP AND THE UNDERSIGNED VIRGINIA LICENSED PROFESSIONAL ENGINEER HEREBY CERTIFY THAT THE GRINDER PUMP AND FORCE MAIN DESIGN MEET ALL VIRGINIA DEPARTMENT OF HEALTH (VDH) "SEWAGE COLLECTION AND TREATMENT (SCAT) REGULATIONS.
4. THE OWNER SHALL COORDINATE INSPECTION OF THE BACKFLOW PREVENTION DEVICE WITH MR. THOMAS FAUBER, JCSA UTILITY SPECIAL CORRDINATOR AT (757) 259-4138. THE BACKFLOW PR

INFILTRATION BASIN WATER SURFACE ELEVATION
2 yr = 97.39
10 yr = 98.77
25 yr = 98.90
100 yr = 98.96

GRAVEL FILTER STRIP WATER SURFACE ELEVATION
2 yr = 109.25
10 yr = 110.25
25 yr = 110.90
100 yr = 111.03

VIRGINIA STATE PLANE SOUTH ZONE

JEFF BATE
MC
PARCEL
DOC#
8251 R

4'X4' MEC
WITH 2' H
SCREENIN
SIDE

A
10+00

PROPOSED 2'X6.5' WASHED CRUSHED STONE FILTER STRIP

1200 GAL. UNDERGROUND STORAGE TANK FOR IRRIGATION WATER

PROPOSED GRASS SWALE @0.5% SLOPE

N83°20'20"E

WIRE MESH FENCE

235.37'

8" PVC UNDERDRAIN @ 0.00% SLOPE (TYP.)

8 FT HIGH CHAIN LINK FENCE

OUTSIDE STORAGE 8'x8'x24' CONTAINER

18 FT ROLLING GATE

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD

BSL, TYP.

INFILTRATION BASIN BOTTOM EL=94.00

LIMITS OF CLEARING

LIMITS OF DISTURBANCE

25'

SCD

CD

CO

112.85

18'

EQUIPMENT LOADING AREA

75'

SEE C-7 FOR SECTION A-A

113.30

LANDSCAPE AREA

5' COVERED CONCRETE

112.90

L.P.

6'

5'

CONCRETE

112.12

PROVIDE EC-3 MATTING ON ENTIRE SLOPE

5' WIDE GRASS FILTER STRIP

113 112 111 110 108 107 104 103 106 105 117 118 109 90 80

DC019_NICKS_LAWN_EQUIP_REPAIR - 040

Areas with Craven–Uchee soils shall be monitored due to the high erodiability factor.

Erosion and Sediment Control Measures
All vegetative and structural erosion and sediment control practices will be constructed and maintained in accordance with the minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, Third edition dated 1992.

Structural Practices:

1. Temporary Construction Entrance (3.02): Construction entrance will be installed to prevent tracking onto the existing roadway.
2. Silt Fence (3.05): Silt fence shall be installed along the toe of all slopes and all other areas that may carry silt beyond the right of way. Silt fence shall also be installed on the downhill side of the utility extensions.
3. Diversion Dikes (3.09): Will be utilized to minimize offsite drainage onto exposed areas.
4. Outlet Protection (3.18): Will be utilized at all outfall points using Class I riprap.
5. Permanent Seeding (3.32): Permanent seeding shall be applied to all disturbed area on the site once final grades have been established.
6. Slope Stabilization Blankets & Matting (3.36): All ditches shall be lined with treatment 1 matting (VDOT EC–2). All slopes steeper than 3:1 shall be treated with treatment 1 matting.
7. Tree Protection (3.38): Tree protection shall be installed prior to clearing operations.

Stormwater Management:

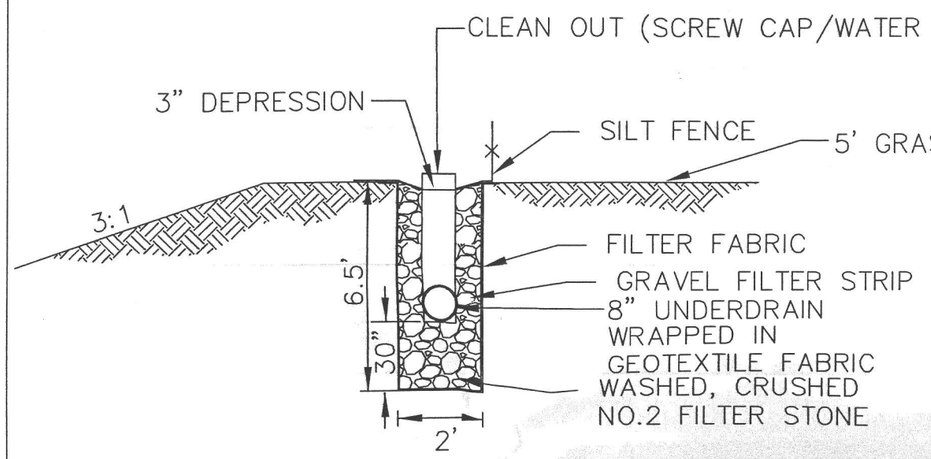
An Infiltration Basin with an approximate floor area of 1,088 square feet is proposed for treating the runoff from this site.

The attached geotechnical report (Sheet C–4) indicates that infiltration rates in the area of the proposed Infiltration Basin vary from the 4.06 to 8.21 inches per hour with a median infiltration rate of 6.14 inches per hour. A safety factor of 2 (3.07 inches per hour) has been used for the design infiltration rate per VSMH standards.
The proposed Infiltration Basin has been designed to completely infiltrate the runoff from the 1, 2 and 10 year storm event within 48 hours and safely convey the runoff from the 25 and 100 year storm events through the stabilized emergency spillway.

Parking lot landscaping areas will be graded as depressions as a measure to increase opportunities for groundwater recharge during smaller, more frequent rain events.

In addition, the entire building roof area of 7500 square feet drains to an underground tank that will store water for irrigation. Any excess roof drainage overflow will be routed directly to the Infiltration Basin.
Grass and gravel filter strips are proposed as pretreatment devices to treat stormwater runoff before it enters the Infiltration Basin. The gravel filter strip has been designed with an under drain system that discharges into on the bottom of the proposed Infiltration Basin.
The total post–development impervious cover treated on–site is approximately 0.54 acre.

GRAVEL FILTER STRIP
(N.T.S.)



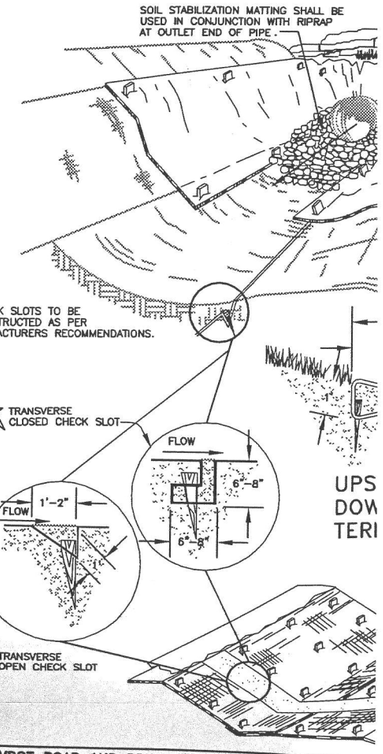
NOTE:
UNDERDRAIN PIPE SHALL BE AASHTO M–278 8" RIGID PVC SCH40 OR SDR35 1/2"DIA. PERFORATIONS @ 12" OC 3 HOLES PER ROW

INFILTRATION BASIN WATER SURFACE ELEVATION
2 yr = 97.39
10 yr = 98.77
25 yr = 98.90
100 yr = 98.96

GRAVEL FILTER STRIP WATER SURFACE ELEVATION
2 yr = 109.25
10 yr = 110.25
25 yr = 110.90
100 yr = 111.03

B/M

TYPICAL TREATMI SOIL STABILIZA MATTING INSTALL



SOURCE: VDOT ROAD AND BRIDGE STANDARDS

TYPICAL TREAT SOIL STABILIZAT SLOPE INSTA

FILL SLOPE SECTION

ANTICIPATED THAT UNDER NORMAL CONDITIONS SEDIMENT REMOVAL MAY BE [illegible]

THE OWNER OR ITS DESIGNATED REPRESENTATIVE WILL INSPECT THE 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.

INFILTRATION BASIN BMP NARRATIVE

THE BMP (STORMWATER MANAGEMENT FACILITY) FOR THIS SITE SERVES A TOTAL DRAINAGE AREA OF 2.19 ACRES (1.46 ACRES ON-SITE AND 0.73 ACRES OFF-SITE). THE FACILITY IS A 10 POINT JAMES CITY COUNTY, TYPE C-4 BMP AND INCLUDES AN INFILTRATION BASIN WITH A SURFACE AREA OF 1,088 SQUARE FEET AND A STORAGE VOLUME OF 17,984 CUBIC FEET. THE BMP SYSTEM CONSISTS OF THE INFILTRATION BASIN, A GRAVEL FILTER STRIP AND A GRASS FILTER STRIP. STORMWATER FROM THE UPSLOPE PORTIONS OF THE SITE DRAINS OVERLAND ACROSS THE GRASS FILTER STRIP WHICH SERVES TO REMOVE THE LARGER SEDIMENT PARTICLES PRIOR TO ENTERING THE GRAVEL FILTER STRIP. THE GRAVEL FILTER STRIP THEN FUNCTIONS TO REMOVE SMALLER SEDIMENT PARTICLES AND PROVIDES THE REQUIRED WATER QUALITY VOLUME. STORMWATER EXITING THE GRAVEL FILTER STRIP FLOWS THROUGH A PERFORATED PVC DISCHARGE PIPE INTO THE INFILTRATION BASIN. THE INFILTRATION BASIN IS DESIGNED TO INFILTRATE THE FULL VOLUME OF THE 1, 2, AND 10 YEAR STORM EVENTS. OBSERVATION WELLS ARE PROVIDED WITHIN THE GRAVEL TRENCH AND INFILTRATION BASIN TO CHECK THE FUNCTIONALITY OF THESE PARTS OF THE SYSTEM.

INSPECTION AND MAINTENANCE MEASURES:

1. CHECK INFILTRATION BASIN FOR SEDIMENT AND LITTER ACCUMULATION REGULARY (WEEKLY).
2. CHECK OBSERVATION WELLS 2 TO 3 DAYS FOLLOWING A SIGNIFICANT RAINFALL EVENT. IF STORMWATER IS PRESENT IN THE BOTTOM OF THE WELLS, INVESTIGATE POSSIBILITIES FOR SEDIMENT OR TRASH BLOCKAGE OR OUTFALL PIPE CLOGGING. IF THE FACILITY RETAINS MORE THAN 1 FOOT OF WATER FOR LONGER THAN 5 DAYS AFTER A SIGNIFICANT RAINFALL, A DETAILED INVESTIGATION BY A PROPERLY LICENSED PROFESSIONAL MAY BE REQUIRED IN ORDER TO ENSURE PROPER FUNCTIONALITY OF THE FACILITY.
3. IMMEDIATELY REMOVE TRASH, DEBRIS OR SEDIMENT THAT PREVENTS THE MOVEMENT OF WATER, AND TO MAINTAIN THE INTEGRITY OF THE FACILITY AND PROVIDE FOR AN ATTRACTIVE APPEARANCE. PROPERTY MAINTENANCE MEASURES SHALL INCLUDE THE REMOVAL OF TRASH, LITTER AND SEDIMENT FROM SURROUNDING GRASS, PARKING AREAS AND STABILIZED CONTRIBUTING AREAS. MAINTENANCE SHOULD BE PERFORMED WEEKLY TO PREVENT MIGRATION INTO THE BMP. DURING WINTER, KEEP SNOW REMOVAL MATERIALS SUCH AS SAND, SALT OR CINDERS AWAY FROM THE INFILTRATION AREA TO THE EXTENT POSSIBLE. TYPE OF DEBRIS REMOVED SHOULD BE NOTED AND POSSIBLE SOURCES IDENTIFIED AND REDUCED. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY PROPERLY.
4. MANY FACTORS WILL AFFECT THE OPERATION OF AN INFILTRATION SYSTEM. ROUTINE INSPECTIONS AND MAINTENANCE SHOULD BE PERFORMED BY THE SAME ASSIGNED INDIVIDUAL IN ORDER TO ESTABLISH BASELINE KNOWLEDGE OF HOW THE SYSTEM FUNCTIONS UNDER DIFFERENT SITE AND WEATHER CONDITIONS.
5. BASIN, INCLUDING SIDE SLOPES SHALL BE PLANTED AS PER SEEDING CHART ON SHEET L-2 AND SHOULD BE MOWED AS NEEDED. ALL CLIPPINGS SHALL BE COLLECTED AND DISPOSED OF OFF-SITE. TREES AND SHRUBS ARE NOT PERMITTED TO GROW ON THE EMBANKMENT.
6. 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 OR REQUIREMENTS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH).
7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/RODENT BURROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING.
8. PERFORM AN INSPECTION OF THE GRAVEL TRENCH PERIODICALLY AND REMOVE DEBRIS AS NECESSARY.
9. RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED FOR THE FACILITY. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.
10. 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.

50-60-380 & 390

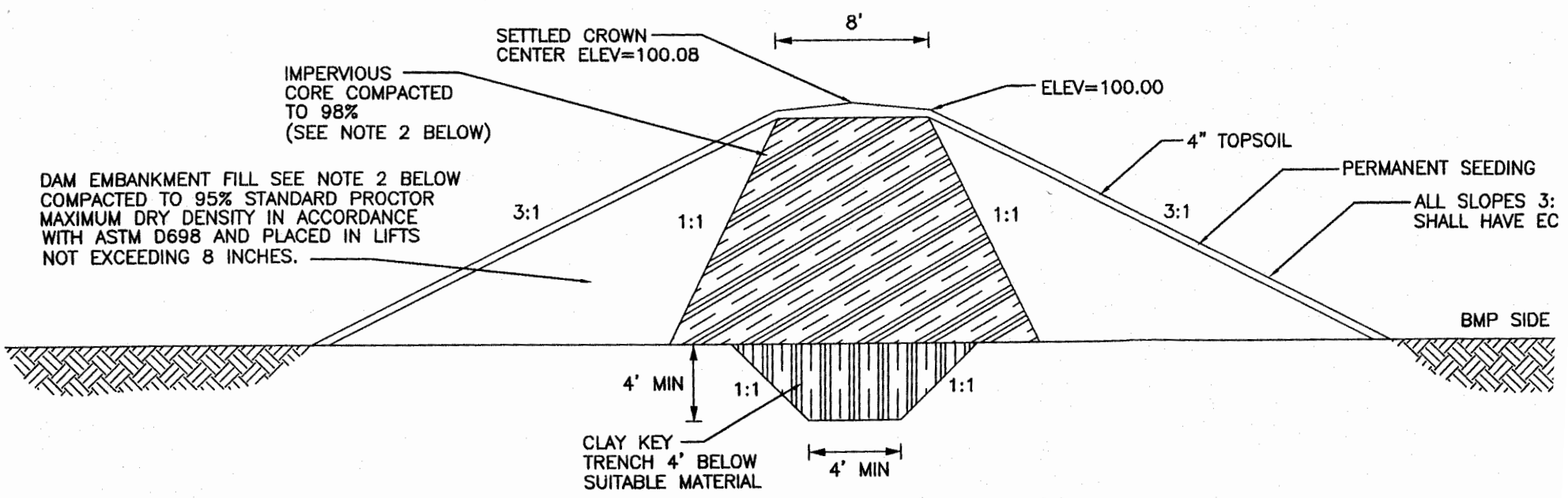
PERMIT FOR STORM WATER DISCHARGES FROM CONSTRUCTION [illegible]
LIMITED TO THE FOLLOWING ITEMS:

IMPLEMENTATION, DOCUMENTATION, AND INSPECTIONS NECESSARY FOR COM
STORM WATER GENERAL PERMIT

1. IMPLEMENTATION OF THE STORM WATER POLLUTION PREVENTION PLA FOR THE SITE AND IN ACCORDANCE WITH THE GENERAL PERMIT REQUIREM TO EROSION AND SEDIMENT CONTROL, POST-CONSTRUCTION STORM WATE OTHER CONTROLS REGARDING SOLID MATERIALS, SEDIMENTS AND DUST, A DEMONSTRATED COMPLIANCE WITH APPLICABLE STATE AND/OR LOCAL WAS SANITARY SEWER OR SEPTIC SYSTEM REGULATIONS.
2. RETENTION OF THE STORM WATER POLLUTION PREVENTION PLAN AT SITE. THE PLAN AND OTHER RELATED DOCUMENTS SHALL BE MADE AVAI REQUEST TO AUTHORIZED LOCAL, STATE, OR FEDERAL REPRESENTATIVES.
3. AMENDMENT OF THE STORM WATER POLLUTION PREVENTION PLAN W A CHANGE IN DESIGN, CONSTRUCTION, OPERATION, OR MAINTENANCE, WHI SIGNIFICANT EFFECT ON THE POTENTIAL FOR THE DISCHARGE OF POLLUTA SURFACE WATERS OF THE STATE, OR IF THE STORM WATER POLLUTION P PROVES TO BE INEFFECTIVE IN ELIMINATING OR SIGNIFICANTLY MINIMIZING THE CONSTRUCTION ACTIVITY.
4. DOCUMENTATION OF THE DATES WHEN MAJOR GRADING ACTIVITIES O CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A P AND WHEN STABILIZATION MEASURES ARE IMPLEMENTED.
5. INSPECTIONS OF DISTURBED AREAS OF THE CONSTRUCTION SITE AN STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION THAT HAVE STABILIZED, STRUCTURAL CONTROL MEASURES, AND LOCATIONS WHERE VE EXIT THE SITE SHALL BE CONDUCTED AT LEAST ONCE EVERY SEVEN CALE WITHIN 24 HOURS OF THE END OF A STORM EVENT THAT PRODUCES SU REQUIRED BY THE GENERAL PERMIT REGULATIONS. REPORTS SUMMARIZIN SHALL BE MADE IN ACCORDANCE TO THE REGULATIONS AND RETAINED AS STORM WATER POLLUTION PREVENTION PLAN.
6. ALL CONTRACTORS AND SUBCONTRACTORS SHALL SIGN A COPY OF STATEMENT AS DESCRIBED IN THE GENERAL PERMIT BEFORE CONDUCTING SERVICES AT THE SITE IDENTIFIED IN THE POLLUTION PREVENTION PLAN. SHALL BE INCLUDED IN THE STORM WATER POLLUTION PREVENTION PLAN.
7. ALL DOCUMENTS, RECORDS, REPORTS, AND OTHER INFORMATION RE GENERAL PERMIT REGULATIONS SHALL BE GIVEN TO THE OWNER FOLLOWI STABILIZATION OF THE SITE.
8. WHERE THE SITE HAS BEEN FINALLY STABILIZED AND ALL STORM W FROM CONSTRUCTION ACTIVITIES THAT ARE AUTHORIZED BY THE GENERAL ELIMINATED, A NOTICE OF TERMINATION SHALL BE PREPARED FOR THE O SUBMIT TO THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, WATE
9. THE STRUCTURAL STABILITY OF THE PERMITTED FACILITIES SHALL BE

PROHIBITION AND REPORTING OF RELEASES OF SUBSTANCES OTHER THAN
10. EXECUTION OF REPORTING REQUIREMENTS IN THE EVENT OF NONC GENERAL PERMIT OR IF ANY UNPERMITTED, UNUSUAL OR EXTRAORDINARY OR COULD BE EXPECTED TO ENTER SURFACE WATERS OF THE STATE.
11. PROHIBITION OF NON-STORMWATER DISCHARGES EXCEPT AS PROVI GENERAL PERMIT. APPROPRIATE POLLUTION PREVENTION MEASURES FOR COMPONENTS OF DISCHARGE SHALL BE IMPLEMENTED.
12. EXECUTION OF REPORTING REQUIREMENTS OF 40 CFR PART 117 (PART 302 (1992). IN ADDITION, THE DISCHARGE OF HAZARDOUS SUBSTA THE STORM WATER DISCHARGE FROM THE CONSTRUCTION SITE SHALL BE MINIMIZED IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTI
13. PROHIBITION OF DISCHARGE OF HAZARDOUS SUBSTANCES, OIL, OR RESULTING FROM ON-SITE SPILLS OR RELEASES.

MANAGEMENT MEASURES AND RESPONSE TO UNINTENTIONAL RELEASES
14. ALL WASTE COLLECTING, CONTROL, TREATMENT, MANAGEMENT OF AND DISPOSAL FACILITIES SHALL BE OPERATED IN A MANNER CONSISTEN PERMIT REGULATIONS.
15. ALL FEASIBLE STEPS TO MINIMIZE ANY ADVERSE IMPACTS TO STA FROM NONCOMPLIANCE WITH CONDITIONS SPECIFIED IN THE GENERAL PE REASONABLE STEPS TO MINIMIZE, CORRECT OR PREVENT ANY DISCHARGE THE GENERAL PERMIT WHICH HAS A REASONABLE LIKELIHOOD OF ADVER HUMAN HEALTH OR THE ENVIRONMENT SHALL BE TAKEN.



EMBANKMENT CLAY CORE

N.T.S.

NOTES:

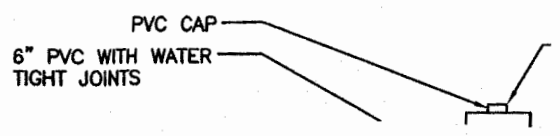
1. EMBANKMENT STABILITY: SUBSURFACE SOILS ON THIS SITE ARE RELATIVELY STABLE AND CAPABLE OF SUPPORTING THE PROPOSED BMP EMBANKMENTS, WHI THAN ABOUT 5 OR 6 FEET IN HEIGHT.

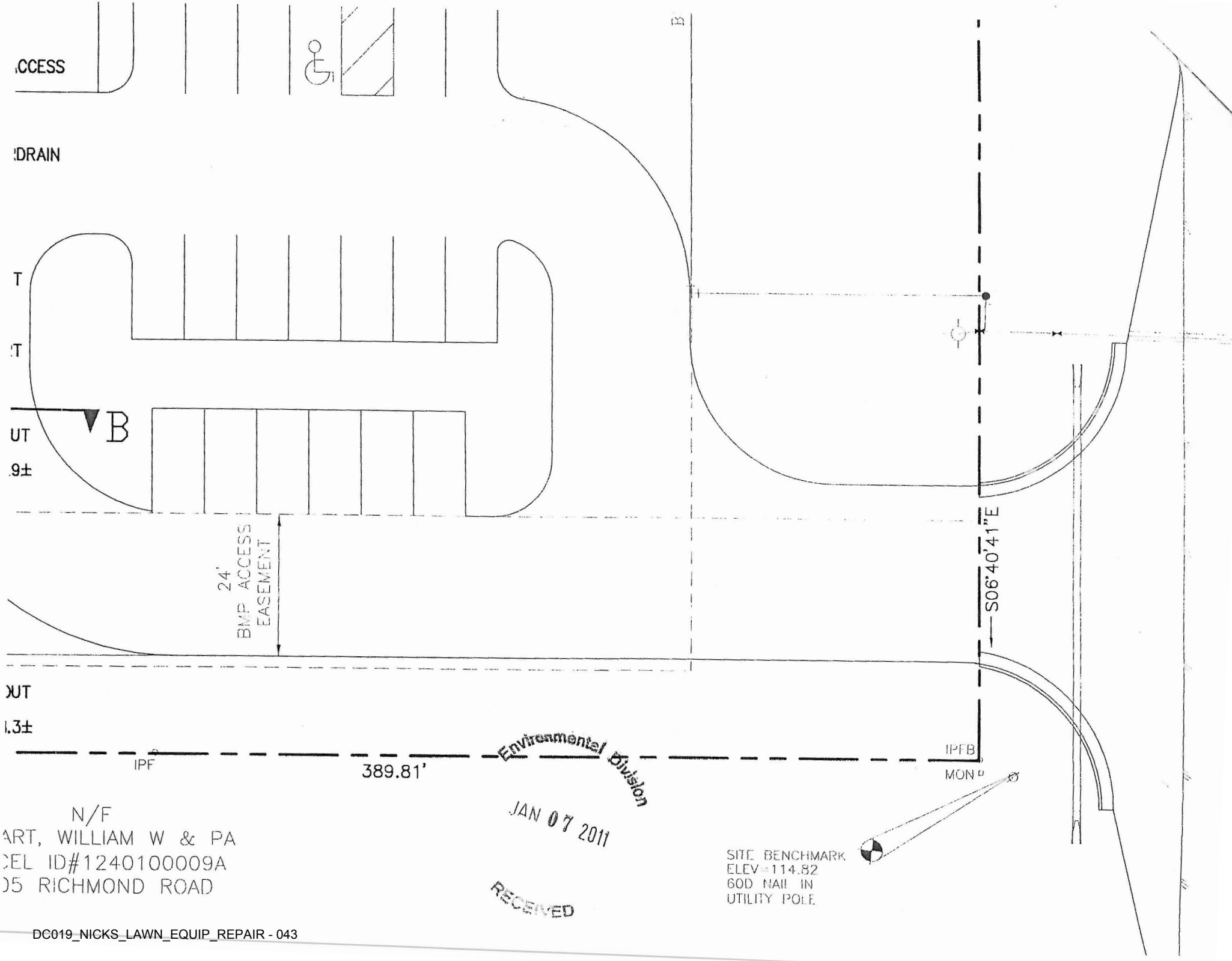
2. BMP FILL MATERIALS: ALL BMP FILL MATERIALS SHOULD BE PLACED IN MAXIMUM 8-INCH LOOSE LIFTS (4 INCHES FOR LIGHT COMPACTION EQUIPMENT) AN CONDITIONED TO WITHIN +/- 3% OF THE SOIL'S OPTIMUM MOISTURE CONTENT PRIOR TO COMPACTION. COMPACTION SHOULD BE ACCOMPLISHED USING SHEE CONJUNCTION WITH VIBRATORY DRUM EQUIPMENT AS REQUIRED, UNTIL A MINIMUM DENSITY OF 95% OF THE SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSI ACHIEVED. GROUND SURFACES WITH SLOPES GREATER THAN 1V:5H SHOULD BE BENCHED TO RECEIVE FILL SO THAT FILL COMPACTION OCCURS ON A HORIZC QUALIFIED SOILS TECHNICIAN UNDER THE DIRECTION OF A GEOTECHNICAL ENGINEER SHOULD BE CALLED ON TO PROVIDE COMPACTION TESTING DURING THE I ASSURE THAT THE MINIMUM COMPACTION REQUIREMENTS ARE BEING MET. AT LEAST 1 TEST PER 2,500 SQUARE FEET PER LIFT SHOULD BE PERFORMED. CO TRENCHES SHOULD BE PERFORMED AT A RATE OF AT LEAST 1 TEST PER 50 LINEAR FEET PER LIFT. THE POND SUBGRADES SHOULD BE THOROUGHLY COMI SEEPAGE LOSS. THIS SHOULD BE ACCOMPLISHED BY SCARIFYING THE SUBGRADE TO A DEPTH OF 8 INCHES, MOISTURE CONDITIONING THE SOILS TO WITHIN MOISTURE CONTENT, AND COMPACTING TO A DRY DENSITY OF AT LEAST 95% OF THE SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). BOTH SMOOTH DRUM COMPACTION EQUIPMENT SHOULD BE USED AS REQUIRED.

THE FOLLOWING BMP FILL TYPES SHOULD BE USED ON THIS PROJECT. THE GEOTECHNICAL ENGINEER SHOULD BE CALLED ON AT THE TIME OF CONSTRUCTI FOR THE CONTRACTOR SUITABLE FILL MATERIALS.

DAM EMBANKMENT FILL: INORGANIC SOIL MATERIAL CLASSIFIED AS SC OR CL, CONTAINING AT LEAST 20% BY DRY WEIGHT CLAY AND HAVING A MAXIMUM LIQ FILL MATERIAL SHOULD BE FREE OF GRAVEL, ORGANICS, AND ANY OTHER DELETERIOUS MATERIALS.

KEY AND CORE FILL: INORGANIC SOIL MATERIAL CLASSIFIED AS CL, ML, MH, OR CH CONTAINING AT LEAST 60% FINES (SILT AND CLAY) AND HAVING A MAXI 60.

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Environmental Division
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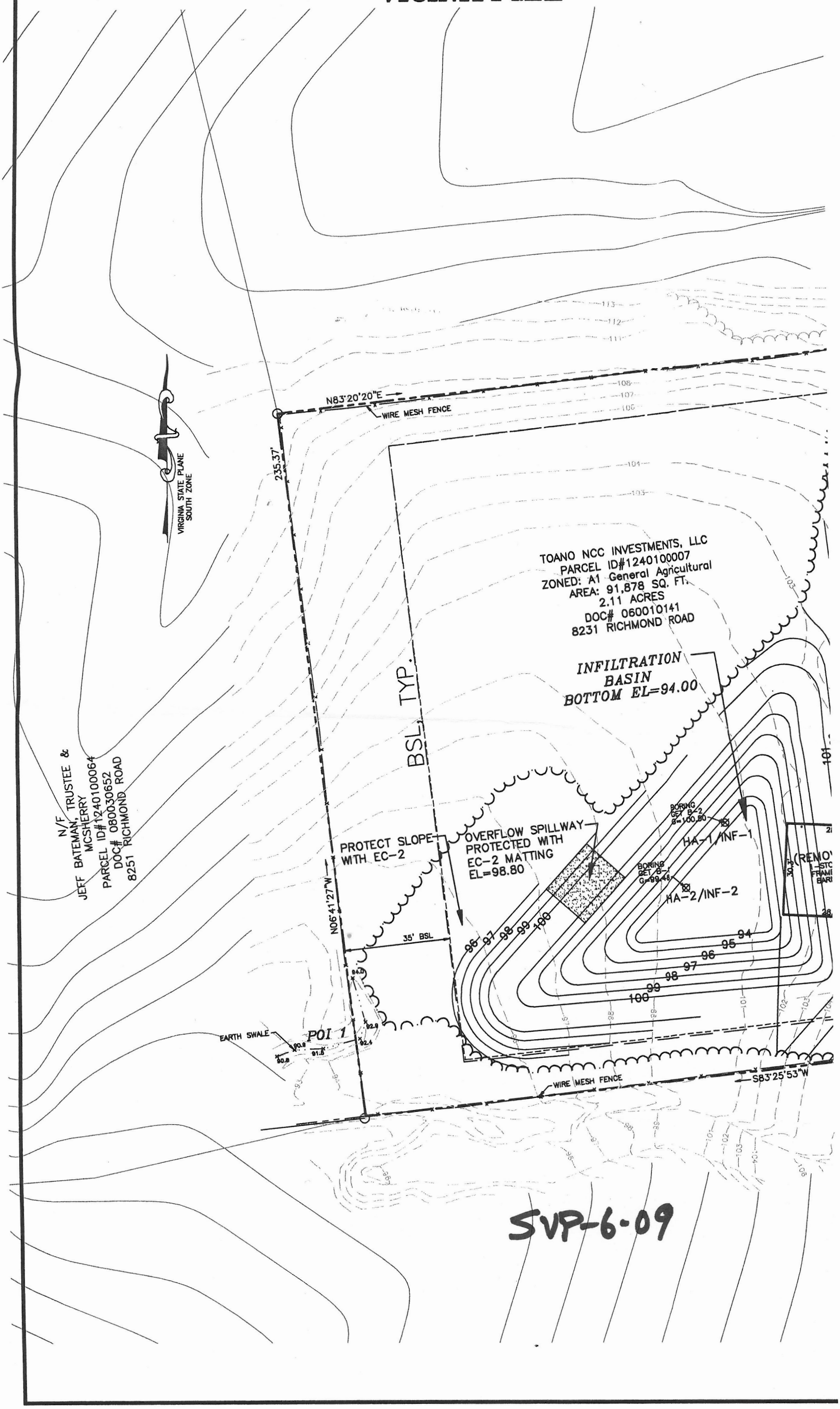
60D NAIL IN
UTILITY POLE

RESERVOIR

VICINITY MAP



SVP-6-09

placement, the cut surface should
al Engineer or his authorized
n roller or a loaded tandem axle
ns may be used at this time to aid
Any soft or unsuitable materials
removed and replaced with an
cted to the criteria outlined in the
ively wet but otherwise suitable
g to +/- 3% of optimum moisture
have been approved by the
ed.

ers of Structural Fill should be

uilding and pavement limits to a

e conditioned to within +/- 3% of
to a dry density at least 95% of
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uld be a maximum of 8 inches in
of fill should be performed at a
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ment areas, but not less than 2

this project:

fied as SC, SM, or better which
num 50% passing the No. 200
top 24 inches consist of XXX
w the building and pavement

l as SM, SC, SP, or better
d free of organics and debris.
3.

VDOT Size No. 57 Stone. As
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57 Stone.

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nts which will retain water:
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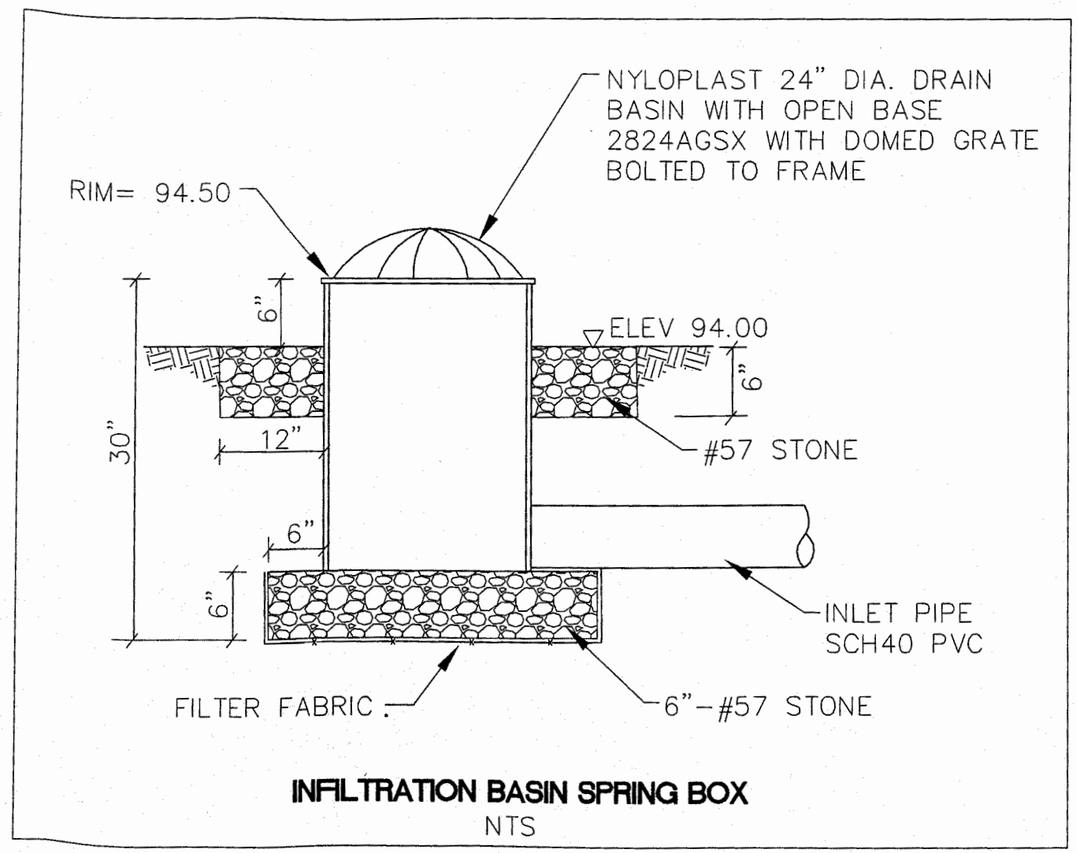
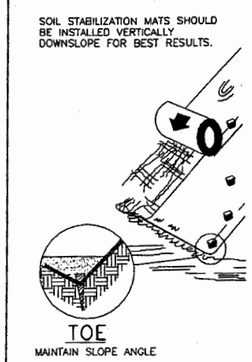
d, the design grades should



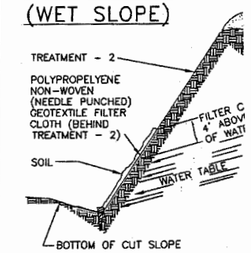
INFILTRATION BASIN SPRING BOX
NTS

SLOPE

FILL SLOPE SECTI



SLOPE LINING
(WET SLOPE)



SOURCE: VDOT ROAD AND BRI

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IAL DRAINAGE OR BE MODIFIED IN ANY WAY
ENVIRONMENTAL DIVISION OF JAMES CITY

SERVICES AT THE SITE IDENTIFIED IN THE POLLUTION PREVENTION PLAN. ALL CERTIFICATIONS SHALL BE INCLUDED IN THE STORM WATER POLLUTION PREVENTION PLAN.

7. ALL DOCUMENTS, RECORDS, REPORTS, AND OTHER INFORMATION RELEVANT TO THE GENERAL PERMIT REGULATIONS SHALL BE GIVEN TO THE OWNER FOLLOWING FINAL STABILIZATION OF THE SITE.

8. WHERE THE SITE HAS BEEN FINALLY STABILIZED AND ALL STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES THAT ARE AUTHORIZED BY THE GENERAL PERMIT ARE ELIMINATED, A NOTICE OF TERMINATION SHALL BE PREPARED FOR THE OWNER TO SIGN AND SUBMIT TO THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY, WATER DIVISION.

9. THE STRUCTURAL STABILITY OF THE PERMITTED FACILITIES SHALL BE ENSURED.

PROHIBITION AND REPORTING OF RELEASES OF SUBSTANCES OTHER THAN STORM WATER

10. EXECUTION OF REPORTING REQUIREMENTS IN THE EVENT OF NONCOMPLIANCE OF THE GENERAL PERMIT OR IF ANY UNPERMITTED, UNUSUAL OR EXTRAORDINARY DISCHARGE ENTERS OR COULD BE EXPECTED TO ENTER SURFACE WATERS OF THE STATE.

11. PROHIBITION OF NON-STORMWATER DISCHARGES EXCEPT AS PROVIDED FOR IN THE GENERAL PERMIT. APPROPRIATE POLLUTION PREVENTION MEASURES FOR NON-STORM WATER COMPONENTS OF DISCHARGE SHALL BE IMPLEMENTED.

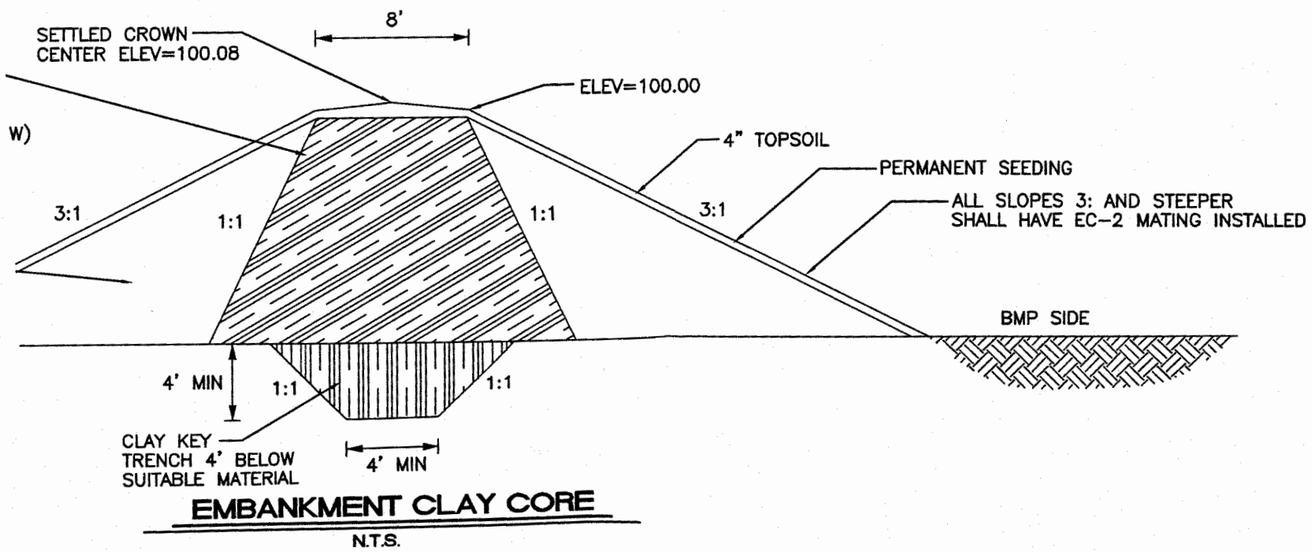
12. EXECUTION OF REPORTING REQUIREMENTS OF 40 CFR PART 117 (1992) AND 40 CFR PART 302 (1992). IN ADDITION, THE DISCHARGE OF HAZARDOUS SUBSTANCES OR OIL IN THE STORM WATER DISCHARGE FROM THE CONSTRUCTION SITE SHALL BE PREVENTED OR MINIMIZED IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN.

13. PROHIBITION OF DISCHARGE OF HAZARDOUS SUBSTANCES, OIL, OR POLLUTANTS RESULTING FROM ON-SITE SPILLS OR RELEASES.

MANAGEMENT MEASURES AND RESPONSE TO UNINTENTIONAL RELEASES

14. ALL WASTE COLLECTING, CONTROL, TREATMENT, MANAGEMENT OF POLLUTANT ACTIVITIES AND DISPOSAL FACILITIES SHALL BE OPERATED IN A MANNER CONSISTENT WITH THE GENERAL PERMIT REGULATIONS.

15. ALL FEASIBLE STEPS TO MINIMIZE ANY ADVERSE IMPACTS TO STATE WATERS RESULTING FROM NONCOMPLIANCE WITH CONDITIONS SPECIFIED IN THE GENERAL PERMIT 16. ALL REASONABLE STEPS TO MINIMIZE, CORRECT OR PREVENT ANY DISCHARGE IN VIOLATION OF THE GENERAL PERMIT WHICH HAS A REASONABLE LIKELIHOOD OF ADVERSELY AFFECTING HUMAN HEALTH OR THE ENVIRONMENT SHALL BE TAKEN.



EMBANKMENT CLAY CORE

N.T.S.

ON THIS SITE ARE RELATIVELY STABLE AND CAPABLE OF SUPPORTING THE PROPOSED BMP EMBANKMENTS, WHICH WILL BE LESS

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OPTIMUM MOISTURE CONTENT PRIOR TO COMPACTION. COMPACTION SHOULD BE ACCOMPLISHED USING SHEEPSFOOT ROLLERS, IN
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EMENTS ARE BEING MET. AT LEAST 1 TEST PER 2,500 SQUARE FEET PER LIFT SHOULD BE PERFORMED. COMPACTION TESTING IN
F AT LEAST 1 TEST PER 50 LINEAR FEET PER LIFT. THE POND SUBGRADES SHOULD BE THOROUGHLY COMPACTED TO MINIMIZE
BY SCARIFYING THE SUBGRADE TO A DEPTH OF 8 INCHES, MOISTURE CONDITIONING THE SOILS TO WITHIN +/-3% OF OPTIMUM
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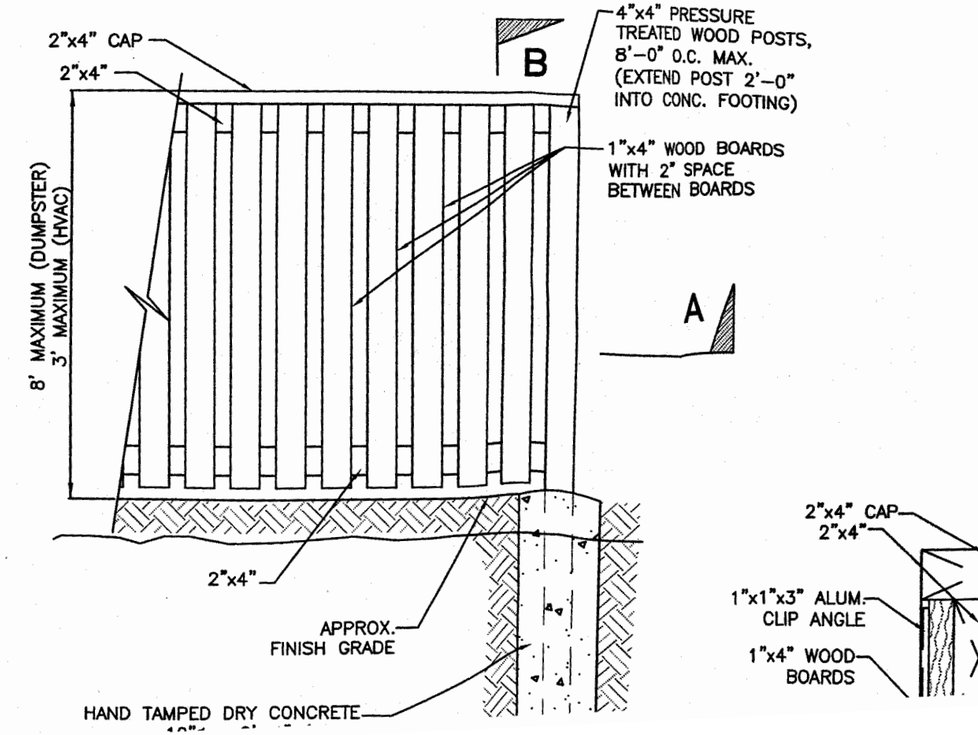
BE USED AS REQUIRED.

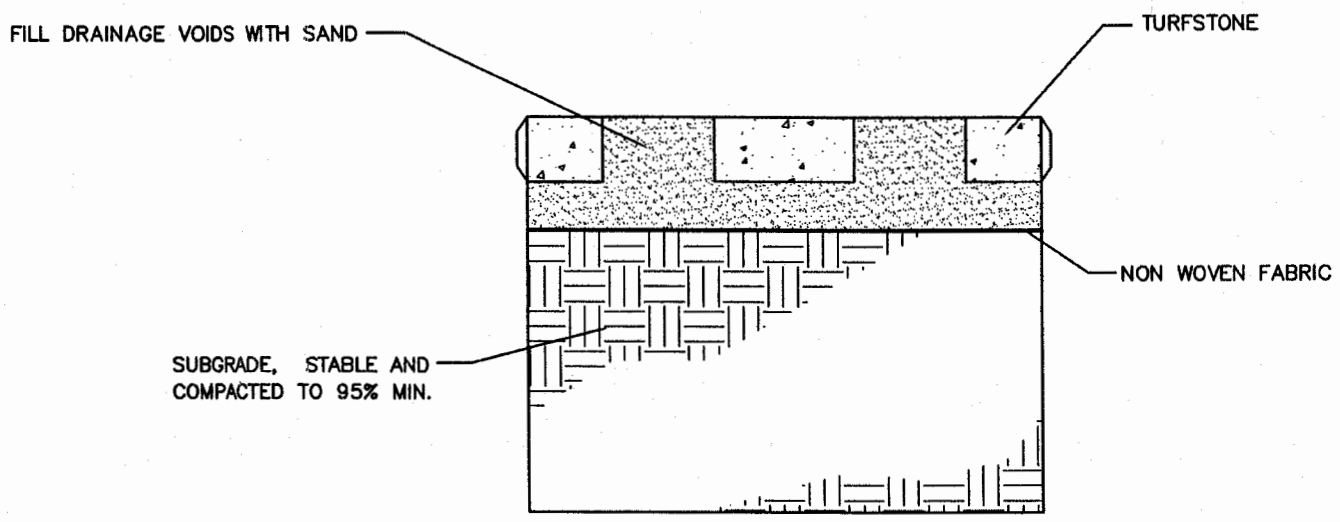
ED ON THIS PROJECT. THE GEOTECHNICAL ENGINEER SHOULD BE CALLED ON AT THE TIME OF CONSTRUCTION TO HELP IDENTIFY

CONTAINING AT LEAST 20% BY DRY WEIGHT CLAY AND HAVING A MAXIMUM LIQUID LIMIT OF 50. THE

ensure their intended purpose is accomplished, to ensure adequate protection of the health, safety and welfare o
public, or if site conditions change, become apparent or alter significantly following the date of plan approval. Co
Environmental Division approval shall be required for any deviation of erosion and sediment control measures from
approved plan.

11. Off-site waste or borrow areas shall be approved by the County Environmental Division prior to the import of any borrow or export of any waste to or from the project site.
12. Culvert and storm drain inlet protections, in accordance with the provisions of Minimum Standards & Specs. 3.07 3.08 of the Virginia Erosion and Sediment Control Handbook (VESCH), may be removed at the discretion of the assigned County Environmental Division inspector should placement of the measure result in excessive road floodinc traffic hazard or result in the redirection of drainage onto or toward existing lots, driveways or structures. Decisior shall be made on a case-by-case basis based on field situations encountered.
13. Drainage facilities shall be installed and functional within 30 days following completion of rough grading at any poin within the project.
14. No more than 300 feet of trench may be open at one time for underground utility lines, including storm water conveyances. All other provisions of Minimum Standard #16 of the Virginia Erosion and Sediment Control regulations apply.
15. If disturbed area stabilization is to be accomplished during the months of December, January or February, stabilizati shall consist of Mulching in accordance with Minimum Standard & Spec. 3.35 of the Virginia Erosion and Sediment Control Handbook (VESCH). Seeding will then take place as soon as the season permits.
16. The term seeding, final vegetative cover or stabilization on the approved plan shall mean the successful germination and establishment of a stable grass cover from a properly prepared seedbed, in accordance with Minimum Standards & Specs. 3.29 through 3.37 of the Virginia Erosion and Sediment Control Handbook (VESCH), as applicable. Irrigation if necessary, shall comply with all applicable outdoor water use restrictions of the James City Service Authority.
17. Temporary erosion and sediment control measures shall not be removed until all disturbed areas are stabilized. Removal shall not occur without authorization by the County Environmental Division. Disturbances associated with the removal of temporary erosion and sediment control measures shall be properly stabilized.
18. No sediment trap or sediment basin shall be removed until a) at least 75 percent of the single-family lots within th drainage area to the trap or basin have been sold to a third party for the construction of homes (unrelated to the developer); and/or, b) 60 percent of the single-family lots within the drainage area to the trap or basin are completed and stabilized. A bulk sale of the lots to another builder does not satisfy this provision. Sediment traps and sediment basins shall not be removed without authorization of the County Environmental Division.
19. Applicable provisions of the County BMP Manual (James City County Guidelines for Design and Construction of Stormwater Management BMPs) and the Virginia Stormwater Management Handbook (VSMH) apply to the project.
20. Design and construction of private-type storm drainage systems, outside VDOT right-of-way, shall be performed in accordance with the current version of the James City County Environmental Division, Stormwater Drainage Conveyance Systems (Non-BMP related), General Design and Construction Guidelines.
21. Record Drawings (Asbuilts) and Construction Certifications are required for all stormwater facilities including stormwater management/BMP facilities and storm drainage conveyance systems. Record drawings and construction certifications must meet established program requirements of both the County Environmental and Stormwater Divisions.
22. All stormwater facilities including BMPs, storm drainage pipes, stormwater conveyances, inlets, manholes, outfalls and roadside and other open channels shall be inspected by the County Stormwater Division and geotechnical engineer in accordance with established County Stormwater Division program requirements.





TURFSTONE PAVER BLOCK SECTION

N.T.S.

(MAX.)

TAIL

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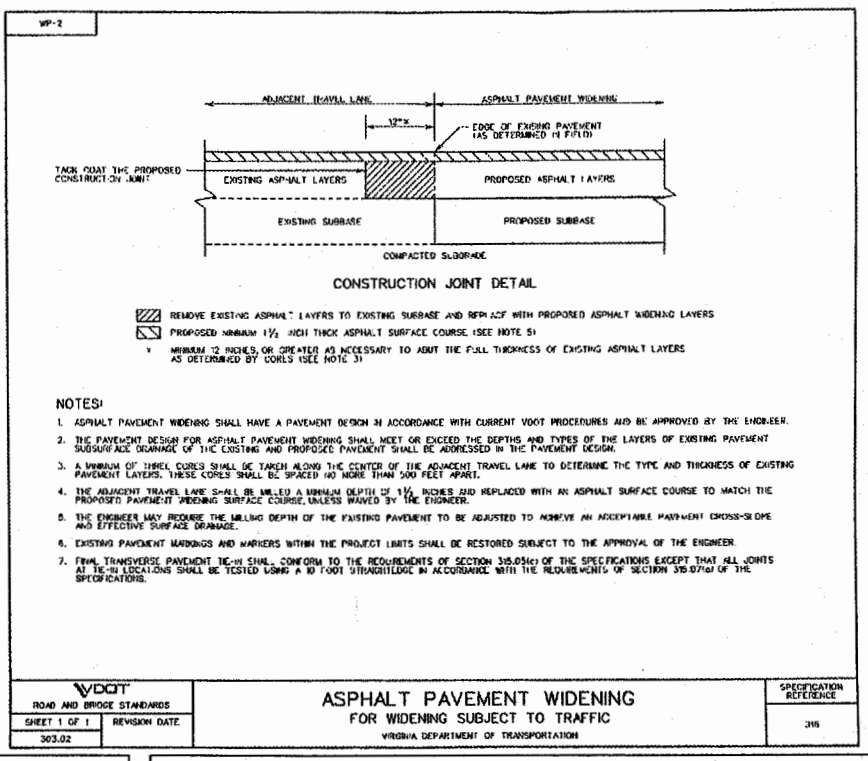
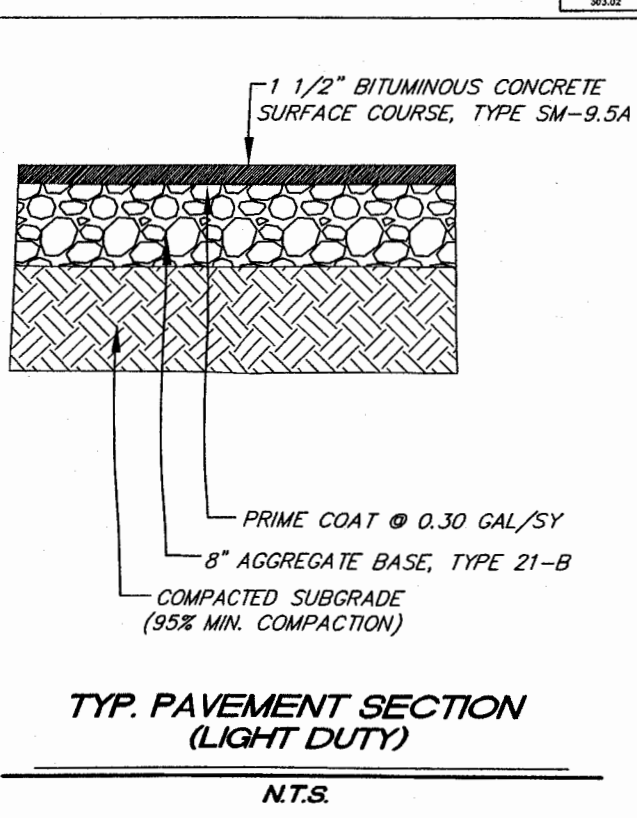
LE 40, ASTM D 3034,

57





TYP. PAVEMENT SECTION
(LIGHT DUTY)

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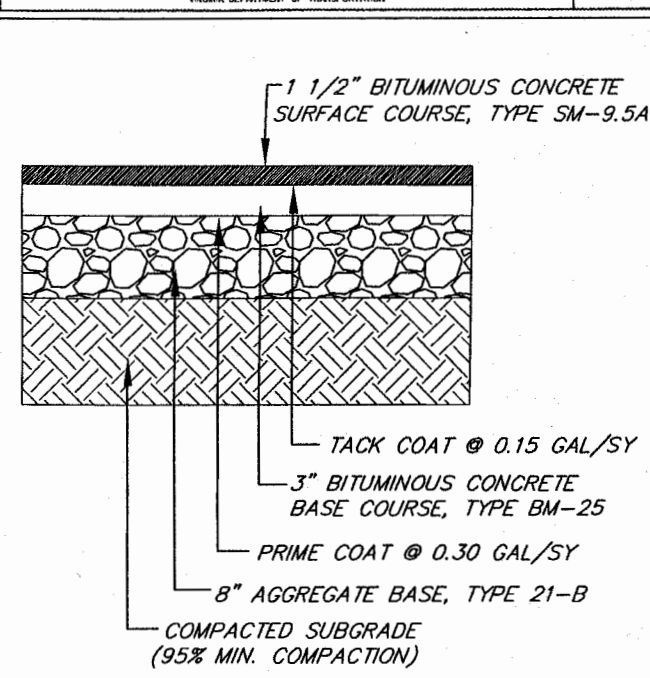
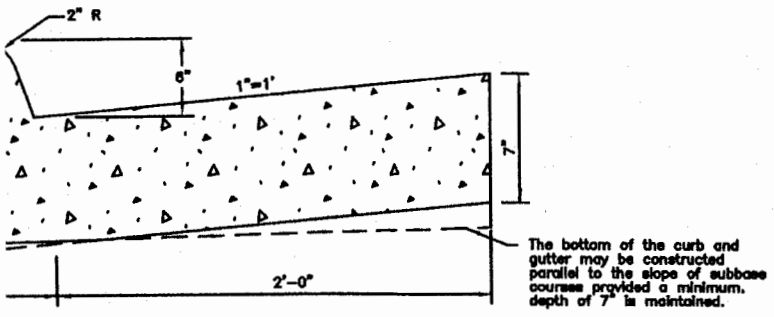
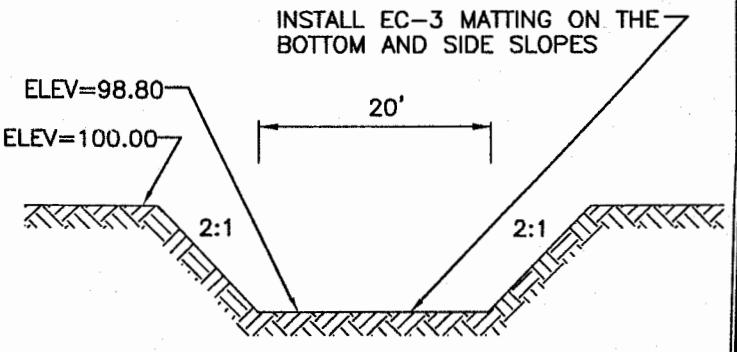


TYP. PAVEMENT SECTION
(HEAVY DUTY)

N.T.S.

⊥ HAVE 4" THICK STONE BASE THAT
END A MINIMUM OF 12" BEHIND THE CURB.





EMERGENCY SPILLWAY

N.T.S.

DC019_NICKS_LAWN_EQUIP_REPAIR - 047

COMMONWEALTH OF VIRGINIA
JAMES W. BRAWLEY III
LIC. No. 024305
10-20-09
PROFESSIONAL ENGINEER

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

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Suite 1100
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Fax (757) 497-7933
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LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

REVISIONS:

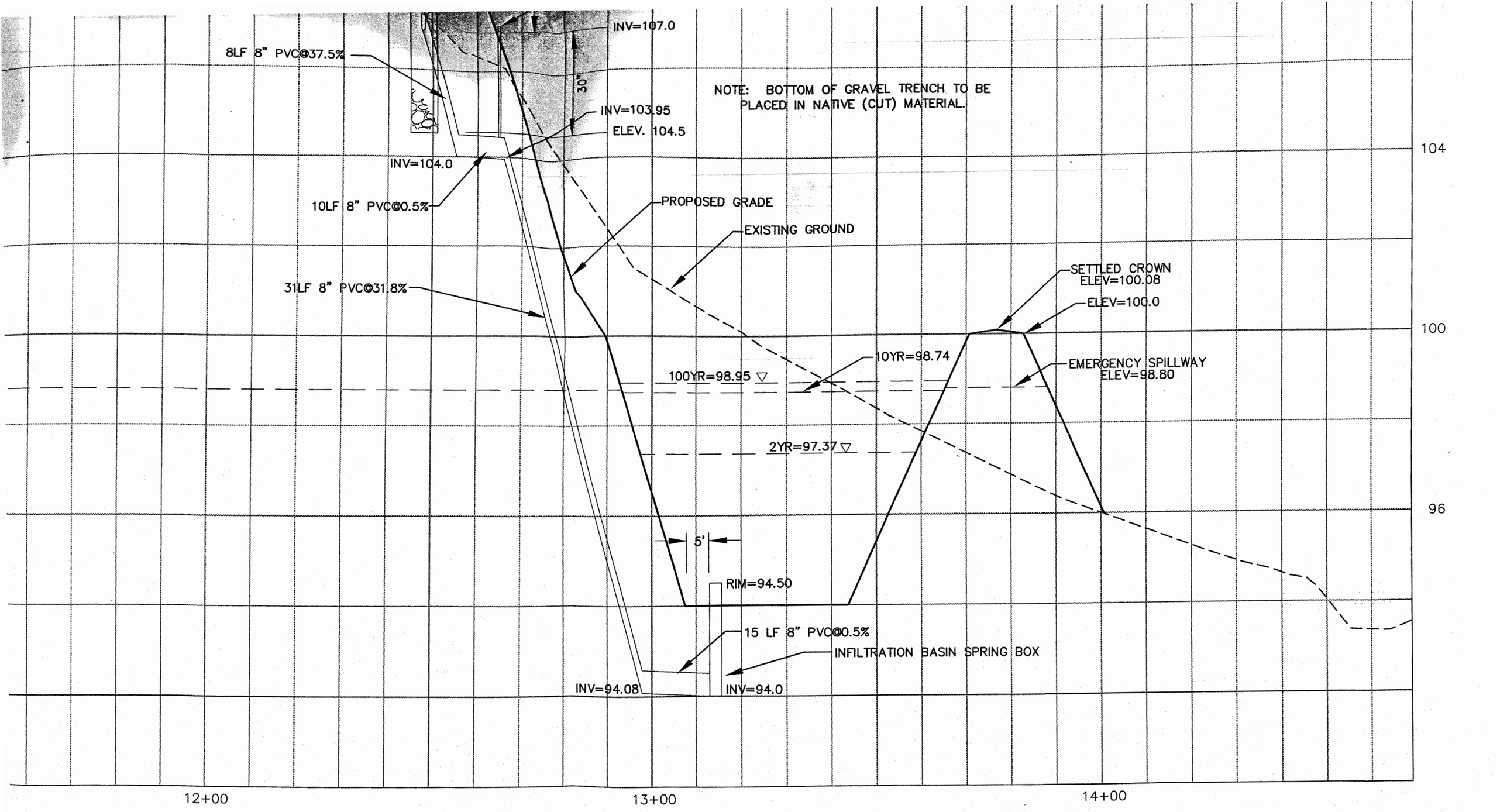
No.	Date	Comment	By
1	9/22/09	REVISED PER JCC COMMENTS	LFV
2	10/20/09	REVISED PER JCC COMMENTS	LFV

DRAWING STATUS
- Interoffice Review
- Client for Review
- Pre Approval Bidding

COUNTY APPROVAL
- 1st Submittal
- 2nd Submittal
- 3rd Submittal
- Approved

TAILS

MENT
MENT
OAD
STRICT
INIA



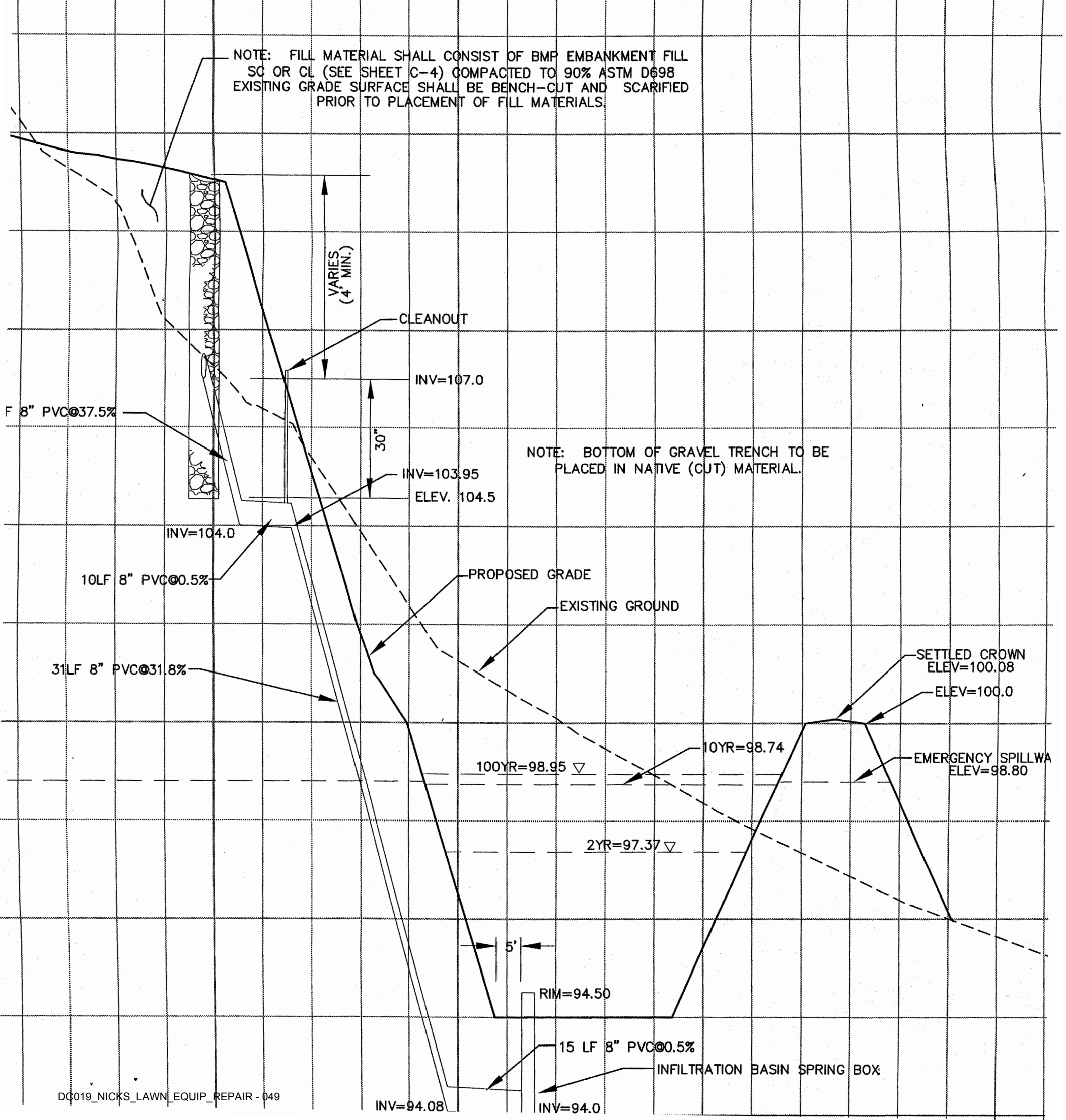
SECTION B–B

HORIZONTAL SCALE: 1"=20'
VERTICAL SCALE: 1"=2'

12+00

SECTION A–A

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



LONDON PLANE TREE

WILLOW OAK

2	0	0	0	0	QP	2
12	22	10	4	3		51
5	0	16	0	0	IG	21
10	14	5	0	0	IB	29
0	37	0	0	5	MC	42
40	10	24	8	0	JP	82
55	61	45	8	5		174

2 LS
9 IB
4 MC
PROPOSED 2'X6' WASHED CRUSHED STONE FILTER STRIP
N83°20'20"E
WIRE MESH FENCE
5 MC
NEW EX TREE LINE
TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD
12 JP
3 LI
20 JP
5 MV
1 MC
1 MC
3 BN
LIMITS OF CLEARING
EX TREE LINE
N06°41'27"W
35' BSL
BORING
GET B-2
G=100.50
BORING
GET B-1
G=99.48
8'
DC019_NICKS_LAWN_EQUIP_REPAIR -050

ON

GRAVEL FILTER STRIP
WATER SURFACE ELEVATION

2 yr = 109.25
10 yr = 110.25
25 yr = 110.90
100 yr = 111.03

N
JEFF BATEMA
MCSI
PARCEL ID#
DOC# 0
8251 RICH
4'X4' MECHAN
WITH 2' HIGH
SCREENING F
SIDES O

PROPOSED 2'X6.5' WASHED CRUSHED STONE FILTER STRIP

1200 GAL. UNDERGROUND STORAGE TANK FOR IRRIGATION WATER

PROPOSED GRASS SWALE @0.5% SLOPE

8" PVC UNDERDRAIN @ 0.00% SLOPE (TYP.)

8 FT HIGH CHAIN LINK FENCE

OUTSIDE STORAGE 8'x8'x24' CONTAINER

18 FT ROLLING GATE

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD

INFILTRATION BASIN
BOTTOM EL=94.00

LIMITS OF CLEARING

LIMITS OF DISTURBANCE

25'

PROVIDE EC-3 MATTING ON ENTIRE SLOPE

OVERFLOW
Y PROTECTED
-3 MATTING
0

BORING
GET B-2
G=100.50

HA-1/INF-1

25'

BORING
GET B-1
G=98.48

HA-2/INF-2

98.80

100

SPRING BOX (SEE DETAIL)

INV=94.50

8" PVC

CO.

94 95 96 97 98 99 100

100 YR-98.96

WIRE MESH FENCE

EMBANKMENT CLAY CORE

S83°25'53"W

VARIABLE WIDTH ACCESS & MAINTENANCE

113.30

112.85

18'

EQUIPMENT LOADING AREA

75'

SEE C-7 FOR SECTION A-A

100'

LANDSCAPE AREA

11+00

113.30

113.35

112.90

5' COVERED CONCRETE WALK

112.90 L.P.

6'

CONCRETE

112.12

5'R

113.10

5' WIDE GRASS FILTER STRIP

24'

112.20

10'R

5'R

24'

111.90

111.75 L.P.

LANDSCAPE ARE

111.95

INV (UP)=107.00

25'R

111.90

111.95

A9'R

111.25

111.25

IPF

8 FT HIGH WOODEN SCREENING FENCE

PROPOSED DUMPSTER

8" CONCRETE SL

A

10+00

B

2+0

6 ~ 9')

(P

PROPO
1-STO
7500
BUILDI
FF=11

DC019_NICKS_LAWN_EQUIP_REPAIR - 051

VICINITY MAP

N83°20'20"E

WIRE MESH FENCE

235.37'

VIRGINIA STATE PLANE SOUTH ZONE

N/F
JEFF BATEMAN, TRUSTEE &
MCSHERRY
PARCEL ID#1240100064
DOC# 080030652
8251 RICHMOND ROAD

TOANO NCC INVESTMENTS, LLC
PARCEL ID#1240100007
ZONED: A1 General Agricultural
AREA: 91,878 SQ. FT.
2.11 ACRES
DOC# 060010141
8231 RICHMOND ROAD

BSL, TYP.

INFILTRATION BASIN
BOTTOM EL=94.00

PROTECT SLOPE WITH EC-2

OVERFLOW SPILLWAY PROTECTED WITH EC-2 MATTING
EL=98.80

N06°41'27"W

35' BSL

BORING
GET B-2
G=100.90

HA-1/INF-1

BORING
GET B-1
G=99.48

HA-2/INF-2

EARTH SWALE

POI 1

WIRE MESH FENCE

S83°25'53"W

SVP-6-09

GEOTECHNICAL REPORT

SUP-6-09

GET Solutions, Inc.
Geotechnical · Environmental · Testing

February 17, 2009

To: **Mr. Nick Cianelli**
15402 Rolfe Ct.
Lanexa, VA, 23089

Re: Soil Investigation Report
Cianelli Richmond Road Metal Building
James City County, Virginia
GET Project No: WM09-115G

Dear Mr. Romeo:

Pursuant to your request, **GET Solutions, Inc.** has completed a soil investigation for the above referenced project. The purpose of this investigation was to explore subsurface soil and groundwater conditions and provide recommendations to guide design on the proposed building foundations and BMP facility.

Site and Project Characteristics:

At the time of our site visit the proposed building area was a sloped and grass/tree covered area containing a fence and some small amounts of debris. An existing one-story house, garage, and barn are present on the project site. We understand the proposed building will be one-story, steel-frame, prefabricated metal building measuring 75 feet by 100 feet. The building will be supported either by spread footings with an independent floor slab-on-grade or by a monolithic slab-on-grade with turned-down edges. Maximum wall loads are expected to be 2 kips/ft and maximum columns loads are expected to be 40 kips. The project will include development of a BMP facility in the rear of the site. It is desired to have an infiltration component to the BMP facility, if practical.

Exploration Procedures:

Two hand auger borings (designated as HA-1 and HA-2) were performed by **GET Solutions, Inc.** within the footprint of the proposed building. One hand auger boring (designated as BMP-1) was performed in the planned location of the BMP facility. The hand auger boring locations are indicated on the attached Boring Location Plan of Enclosure I. The hand auger borings were extended to depths of 10 feet below the existing site elevations.

The soil deposits encountered in the hand auger borings were classified in the field in general accordance with ASTM D2488 (Description and Identification of Soils - Visual/Manual Procedures). Representative samples of soils encountered were

1592 Penniman Road, Suite E • Williamsburg, VA 23185 • Phone (757) 564-6452 • Fax (757) 564-6453
info@getsolutionsinc.com

Foundation Materials" as outlined in the International Building Code. It is considered essential that all footing excavations and subgrade areas be observed by a qualified inspector to assure that the recommendations made herein are consistent with actual conditions.

2. Spread footings can be designed for a net allowable soil pressure of 2,000 psf. Footing excavations should extend to a depth sufficient to penetrate any existing soft, loose, or otherwise unsuitable materials so as to bear directly in stable, natural soils or properly placed and compacted Structural Fill.

3. The bottom of all spread footings should be located at a depth of at least 24 inches below finished exterior grades. Footings should have a minimum width of 24 inches. Wall footings should be continuously reinforced.

4. The Seismic Site Class, based on International Building Code guidelines, was estimated for the site. The Seismic Site Class for the proposed building was determined from the hand auger borings and our experience with the soils and geologic conditions in the project and surrounding areas. Based on Section 1615 of the International Building Code and our local experience, the project site is estimated to have a Seismic Site Class of D.

5. Based on footings designed and constructed as discussed herein, total long-term settlements should not exceed about one (1.0) inch. Removal of all soft or loose, organic, or otherwise unsuitable materials from below the footings is essential in minimizing settlements which do occur.

Slab Design:

1. It is recommended that slabs-on-grade be supported by a minimum 4-inch layer of No. 57 Stone placed over stable natural subgrade or compacted Engineered Fill directly supported over natural subgrades. For slabs subjected to heavy storage or vehicular loading, we recommend the Porous Fill layer thickness be increased to 6 inches. This granular layer (porous fill) will facilitate the fine grading of the subgrade and help prevent the rise of water to the floor slab. The granular material should be compacted in place by at least two passes with suitable vibratory compaction equipment. Care should be taken to compact underslab backfill over the top of footings.

2. Before the placement of concrete, a 6-mil poly vapor barrier should be placed on top of the granular material to provide additional moisture protection.

3. For spread footings with an independent slab-on-grade, the slab should be isolated from the exterior walls by utilizing expansion material or other bond breaking material. Also, the floor slab-on-grade should be reinforced with minimum 6x6-W4/W4 welded wire fabric to minimize the effects or shrinkage. The reinforcement should be positioned in the top half of the slab.

2. At the location of the proposed BMP facility, Silty Sands were encountered to a depth of about 5 feet. Clayey Sands of moderately low permeability were encountered between about 5 and 8 feet. An infiltration test was performed at a depth of about 2.0 feet. This test indicated an infiltration rate of 2.8 inches per hour. The groundwater table was not encountered within the hand auger boring.

3. Fill employed to construct low-profile BMP embankments for temporary water retention should consist of soil material classified as CL or SC with a minimum 20% by weight Clay and a maximum liquid Limit of 50. BMP Embankment Fill should be moisture conditioned to within +/- 3% of optimum moisture content then be compacted to a dry density at least 95% of that soil's Standard Proctor maximum dry density (ASTM D698). BMP cut and fill slopes above the water table should be 2H to 1V or flatter for stability, but should be protected from erosion. BMP surfaces below the water table should be 3H to 1V or flatter.

4. Shallower soils at the location of the BMP are predominately Silty SANDS (SM). Most of these soils may be considered suitable for reuse as Structural Fill below buildings and pavements. These soils would not be suitable for reuse as BMP Embankment Fill where water retention is desired.

Construction Recommendations:

1. The subgrade preparation should consist of removing all topsoil, unstable surface material, and any other soft or unsuitable material from the proposed building and pavement areas. We recommend the clearing and stripping to remove unsuitable site material be extended a minimum of 5 feet beyond the building limits and 2 feet beyond the edge of pavements. We anticipate that a site stripping depth on the order of 12 inches will be required to remove topsoil and organic laden soils from the surface.

2. After cutting to the desired grade, and prior to fill placement, the cut surface should be observed by an experienced Geotechnical Engineer or his authorized representative. Proofrolling using a 10-ton drum roller or a loaded tandem axle dump truck having an axle weight of at least 10 tons may be used at this time to aid in identifying localized soft or unsuitable material. Any soft or unsuitable materials encountered during this proofrolling should be removed and replaced with an approved backfill (Structural Fill material) compacted to the criteria outlined in the following paragraphs. Soils which are excessively wet but otherwise suitable should be scarified and aerated to achieve drying to +/- 3% of optimum moisture and then be recompacted. Once subgrades have been approved by the Geotechnical Engineer, Structural Fill can be placed.

3. Existing subgrades as well as subsequent layers of Structural Fill should be properly compacted as follows:

   a. The existing subgrades within the expanded building and pavement limits to a

to remove soft or wet natural soils may be required. Where footing, turned-down slab, or thickened slab section undercutting is performed, the design grades should be reestablished by backfilling with No. 57 Stone.

Limitations:

It should be noted that this study was limited in scope to hand auger borings and laboratory classification testing. The recommendations contained herein were based on the data obtained from the hand auger borings which indicate subsurface conditions at these specific locations at the time of the exploration. Soil conditions may vary between borings.

Furthermore, it is sometimes difficult to characterize soil content and consistency using hand auger borings alone. Therefore, as a critical part of a complete soil evaluation, all footing excavations should be observed by a qualified inspector to ascertain that soil conditions encountered by our exploration are consistent with conditions encountered during construction. If during the course of construction variations appear evident, the Geotechnical Engineer should be informed so that the conditions can be addressed.

Closing:

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.

Sara B. Phillips

Sara Phillips
Project Geologist

Robert C Moss

Robert C, Moss, III, P.E
Principal Engineer
VA Reg. # 019982

Enclosures: Boring Location Plan
Logs of Borings
Field Infiltration Test data

Copies: (1) Client via mail
(1) Mr. Steve Romeo, LS via email

GET Solutions, Inc.

Geotechnical • Environmental • Testing

June 22, 2009

To: **LandMark Design Group**
4029 Ironbound Road, Suite 100
Williamsburg, Virginia 23188

Attn: Mr. Stephen Romeo, LS

Re: Addendum No. 1
Subsurface Exploration and Geotechnical Engineering Services
8231 Richmond Road – Infiltration Testing
James City County, Virginia
GET Project No: WM09-115G

Dear Mr. Romeo:

The following is Addendum No. 1 to our report of subsurface investigation and geotechnical engineering services (WM09-115G) dated February 17, 2009, for the above referenced project. The purpose of this addendum is to provide the results of our hand auger borings and infiltration testing for the proposed stormwater management facility (BMP).

We understand that this portion of the project consists of the construction of an infiltration type BMP facility to support the development at 8231 Richmond Road in James City County, Virginia. The BMP facility will be a dry detention basin with a bottom elevation of 91 feet. Existing grades are at about 96 to 100 feet. Pond side slopes will be about 3H to 1V.

This investigation was accomplished by performing two hand auger borings to a depth of 11.5 feet below the existing grades at the location of the BMP facility, as indicated on the site plan prepared by the client in Appendix I, "Boring Location Plan" included with this report. In addition, two infiltration tests were performed at the respective hand auger boring locations at a depth of 11 feet below existing grades. Representative samples were returned to our laboratory for moisture content and washed sieve testing to ascertain groundwater levels and soil types. A boring location plan, hand auger boring logs, and infiltration test results are submitted with this letter.

Based on the results of our hand auger borings, the following geotechnical commentary is submitted:

1. Our hand auger borings encountered 6 to 8 inches of topsoil materials at the boring locations. Underlying the topsoil materials, a layer of FILL was encountered to depths ranging from 1 to 1.17 feet below existing site grades. The FILL was comprised of Silty, fine to medium SAND (SM) with trace Clay and Gravel. The shallow FILL materials appear to be associated with past clearing, grading, and construction activities for the adjacent barn structure.

Underlying the topsoil and FILL materials and extending to the boring termination depth of 11.5 feet below existing site elevations, the natural subsurface soils encountered were comprised of SAND (SM, SC, and SP-SM) with varying amounts of Silt and Clay. These soils are of relatively moderate to high permeability (see Appendix IV, "Infiltration Test Data"). In this regard, it appears that infiltration design will be feasible at the locations and depths explored. The results of our laboratory and infiltration testing are illustrated below.

Table I – Laboratory and Infiltration Test Results

Boring No.	Depth (Ft)	Natural Moisture (%)	Silt and Clay (%)	USCS Classification	Ksat Value (cm/sec)
HA-1	11	10.3	11.7	SP-SM	5.79×10^{-3}
HA-2	11	13.0	18.6	SM	2.86×10^{-3}

The laboratory test results are also included in Appendix II, "Boring Logs" and Appendix III, "Generalized Soil Profile."

2. The groundwater table was not encountered at the hand auger borings to the depth explored (11.5 feet below existing surface grades). In this regard, the groundwater table is not expected to affect dry detention.

3. The soils encountered should be stable on the proposed side slope of 3H:1V in their undisturbed condition or in a disturbed and recompacted condition. No unusual conditions which might affect slope stability were observed.

4. It is expected that the Sandy soils encountered at the proposed BMP facility are typical of other soils on the property. In this regard, they could be used as Structural Fill, where permitted by the project specifications.

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

Respectfully Submitted,

G E T Solutions, Inc.

Sara B. Phillips
Project Geologist

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

Appendices: I. Boring Location Plan
II. Boring Logs
III. Subsurface Soil Profile
IV. Infiltration Test Data

Copies: (1) Client via e-mail for distribution: SRomeo@landmarkdg.com

APPENDICES

I. BORING LOCATION PLAN

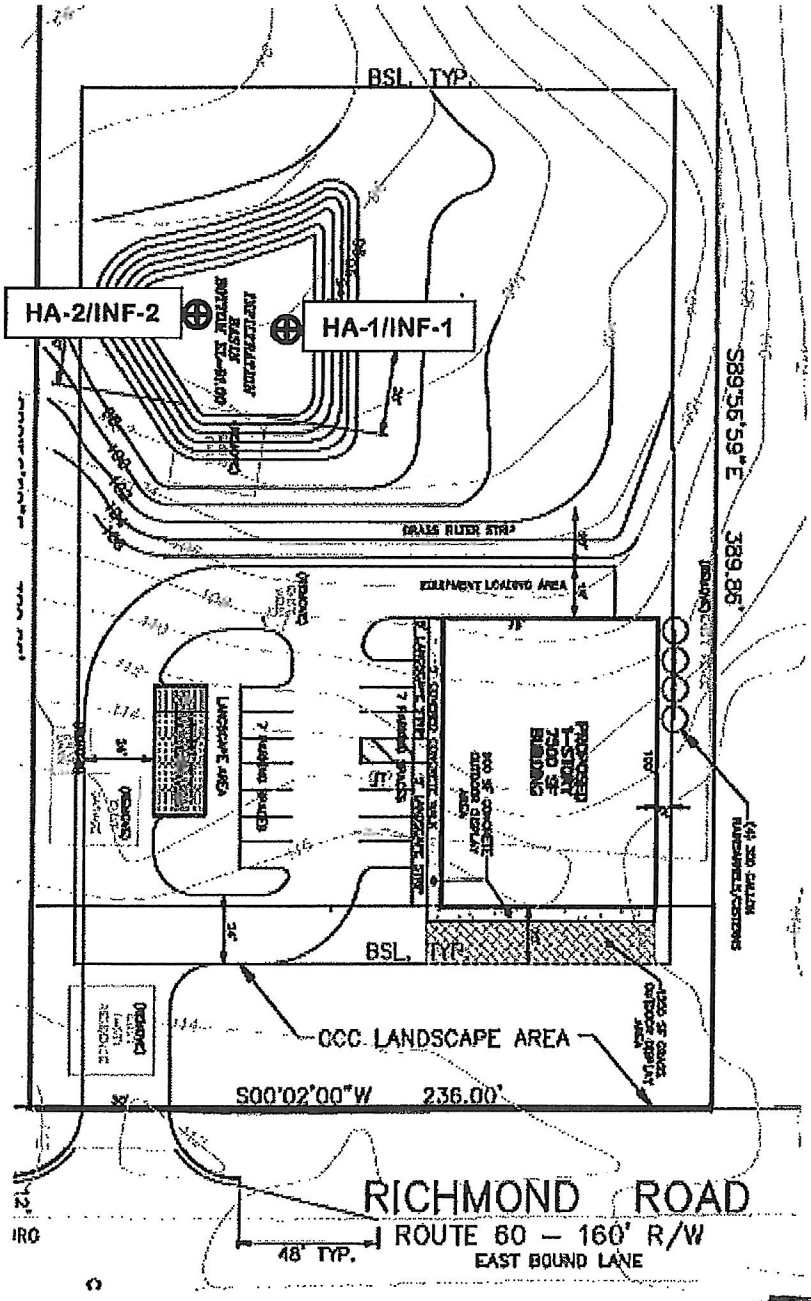
II. BORING LOGS

III. SUBSURFACE SOIL PROFILE

IV. INFILTRATION TEST DATA

APPENDIX I

BORING LOCATION PLAN



Locations are approximate

BORING LOCATION PLAN

PROJECT: 8231 Richmond Road – Infiltration Testing
James City County, Virginia
PROJECT NO: WM09-115G
CLIENT: LandMark Design Group

SCALE: NTS
DATE: 06/12/09
PLOT BY: SP

APPENDIX II

BORING LOGS

GET Solutions, Inc.

Geotechnical • Environmental • Testing

BORING LOG
HA/INF-1

PROJECT: 8231 Richmond Road - Infiltration Testing
CLIENT: LandMark Design Group
PROJECT LOCATION: James City County, Virginia
BORING LOCATION: See Attached Boring Location Plan
DRILLER: GET Solutions, Inc.
DRILLING METHOD: Hand Auger
DEPTH TO WATER - INITIAL*: ▽ NE AFTER 24 HOURS: ▽ NT CAVING> C

PROJECT NO.: WM09-115G
SURFACE ELEVATION: 98
LOGGED BY: SP
DATE: 6/11/2009

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
98	0	0	8 inches of Topsoil							
			0.67							
			Dark brown, moist, Silty, fine SAND (SM) with trace Clay, Gravel, and organics, FILL							
			1.17							
96		2	Grayish brown to tan, moist, Silty, fine SAND (SM) with trace Clay							
	0.8		3							
			Orangish brown, moist, Silty to Clayey SAND (SM-SC)							
94		4	4							
			Orangish brown, moist, Clayey, fine SAND (SC)							
	1.6									
92		6								
			7							
			Tan, moist, Silty, fine SAND (SM) with trace Clay							
90	2.4	8								
			9							
			Orangish brown, moist, poorly graded SAND (SP-SM) with Silt							
88		10								
	3.2									12
			Boring terminated at 11.5 ft.							
86		12								
	4									
84		14								
	4.8									
82		16								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70
279

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

Notes:

*The initial groundwater reading may not be indicative of the static groundwater level.

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

DC019_NICKS_LAWN_EQUIP_REPAIR - 065

GET Solutions, Inc.

Geotechnical • Environmental • Testing

BORING LOG
HA/INF-2

PROJECT: 8231 Richmond Road - Infiltration Testing
CLIENT: LandMark Design Group
PROJECT LOCATION: James City County, Virginia
PROJECT NO.: WM09-115G
BORING LOCATION: See Attached Boring Location Plan
SURFACE ELEVATION: 98
DRILLER: GET Solutions, Inc.
LOGGED BY: SP
DRILLING METHOD: Hand Auger
DATE: 6/11/2009
DEPTH TO WATER - INITIAL*: NE **AFTER 24 HOURS:** NT **CAVING>** C

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

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
98	0	0	6 inches of Topsoil							
			0.5							
			Dark brown, moist, Silty, fine SAND (SM) with trace Clay, Gravel, and organics, FILL							
			1'							
			Grayish brown to brown, moist, Silty, fine SAND (SM) with trace Clay							
96		2								
	0.6									
			3							
			Orangish brown, moist, Clayey, fine SAND (SC)							
94		4								
	1.6									
			5							
			Tan, moist, Silty, fine SAND (SM) with trace Clay							
92		6								
	2.4									
90		8								
88		10								19
	3.2									
			Boring terminated at 11.5 ft.							
86		12								
	4									
84		14								
	4.8									
82		16								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

280

Notes:

*The initial groundwater reading may not be indicative of the static groundwater level.

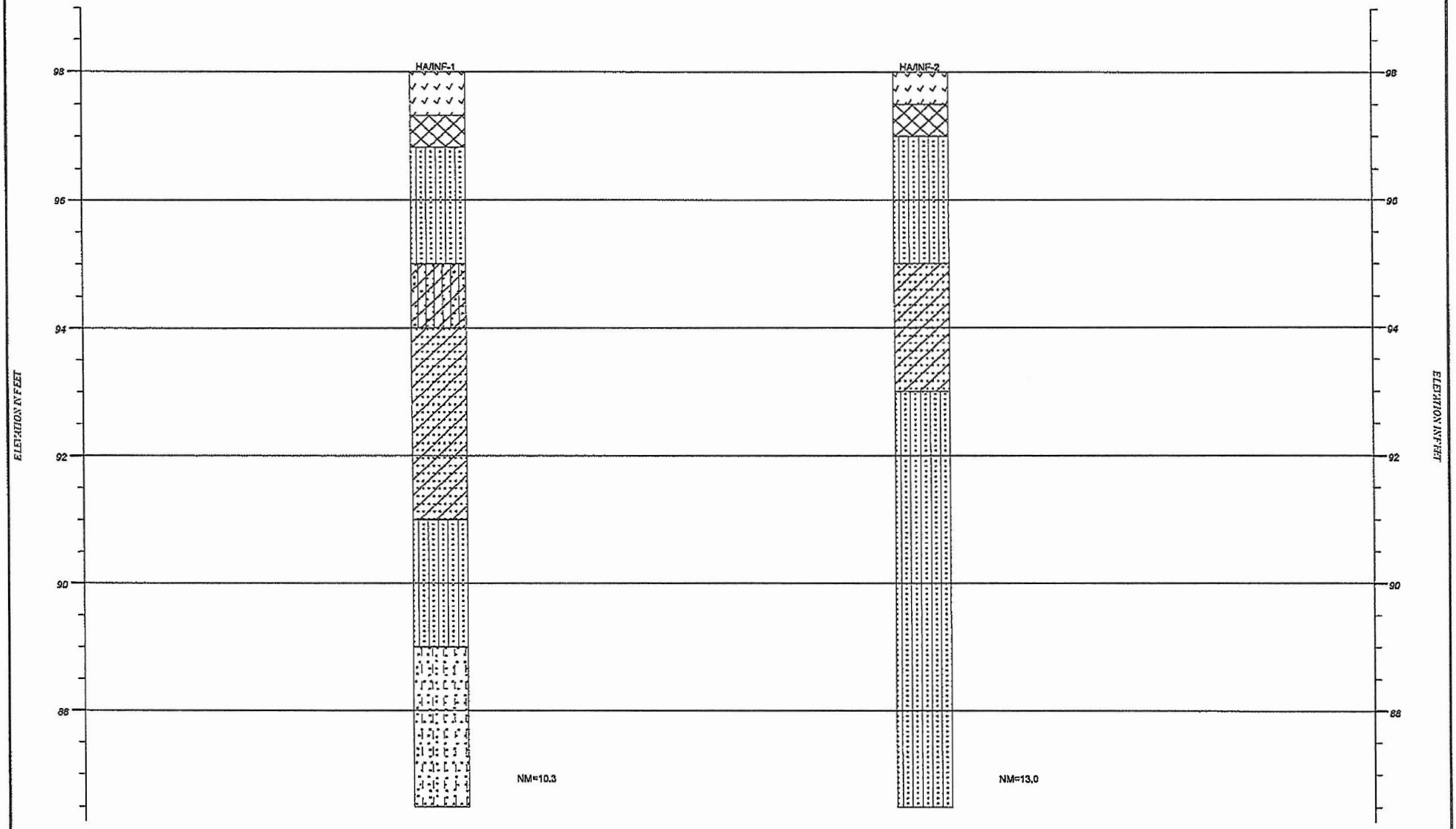
SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

DC019_NICKS_LAWN_EQUIP_REPAIR - 066

APPENDIX III

SUBSURFACE SOIL PROFILE



Strata symbols

- Topsoil
- Fill
- Silty Sand
- Silty Clayey Sand
- Clayey Sand
- Poorly graded Sand with Silt

282

GET Solutions, Inc. GENERALIZED SOIL PROFILE		
HORIZONTAL SCALE: VERTICAL SCALE: 1"=2'	DRAWN BY/APPROVED BY: SP	DATE DRAWN: 6/22/2009
8231 Richmond Road - Infiltration Testing James City County, Virginia		
PROJECT NO. WM09-115G		FIGURE NUMBER: 1

DC019_NICKS_LAWN_EQUIP_REPAIR - 068

APPENDIX IV

INFILTRATION TEST DATA

G E T Solutions, Inc.	SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET	Sheet No.: 1
Project Name.: 8231 Richmond Road - Infiltration Testing	Parcel.....: James City County, Virginia	**Terminology and Solution**
Boring No.....: HA-1/INF-1	Date.....: 6/12/2009	Ksat : Saturated hydraulic conductivity
Investigators.: S. Phillips	File Name.....: WM09-115G	Q: Steady-state rate of water flow into the soil
Boring Depth.: 138 inches	WCU Base. Ht. h: 15.0 cm	H: Constant height of water in borehole
Boring Dia.....: 8.3 cm	WCU Susp. Ht. S: 15.2 cm	r: Radius of cylindrical borehole
Boring Rad. (r): 4.15 cm	Const. Wtr. Ht. H: 30.2 cm	Ksat = Q[sinh-1(H/r) - (r2/H2+1).5 + r/H] / (2pH2) [Glover Solution]

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2000	100	9:30:00 AM								
1900	100	9:30:05 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1800	100	9:30:10 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1700	100	9:30:15 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1600	100	9:30:21 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1500	100	9:30:26 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1400	100	9:30:31 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1300	100	9:30:37 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1200	100	9:30:43 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1000	100	9:30:48 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
900	100	9:30:54 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
800	100	9:31:00 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
700	100	9:31:06 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
Natural Moisture: Moist		**Init. Satur.Time:** 9:00:00 AM		**ESTIMATED FIELD KSAT:**		0.348	5.79E-03	**500.5**	8.210	16.42
Texture/Classif: SAND (SP-SM)		**Consistency:** N/A		**Depth to an Impermeable Layer:**		N/A	**Notes:** High			
Structure/Fabric: N/A		**Slope/Landsc:** Flat		**Depth to Bedrock.....:**		N/A				

ksatReport1.xls — Precision Permeameter™ — Rev. 4/5/2002

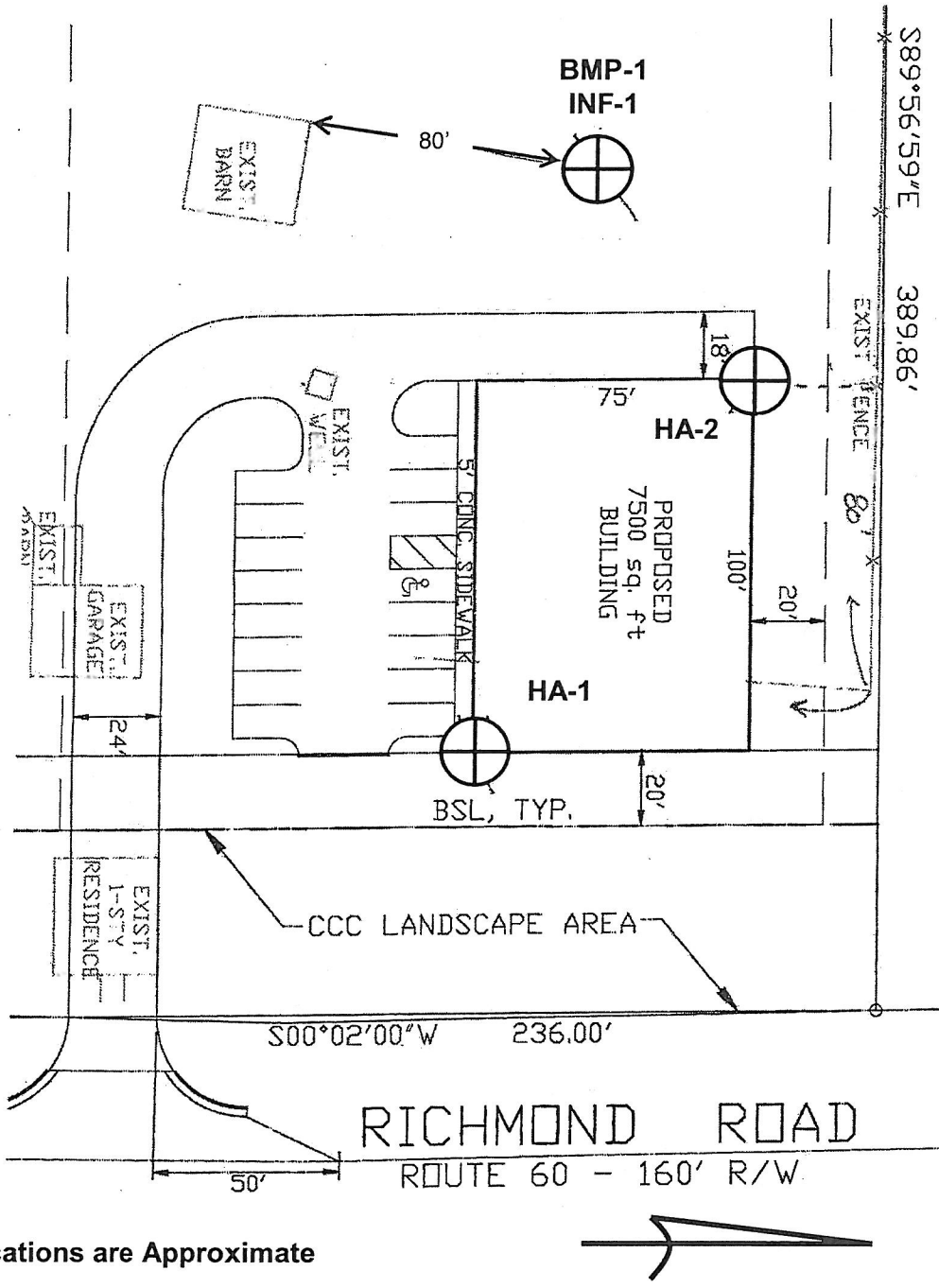
G E T Solutions, Inc.			SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET						Sheet No.: 2	
Project Name.:	8231 Richmond Road - Infiltration Testing		Parcel.....:	James City County, Virginia		Terminology and Solution				
Boring No.....:	HA-2/INF-2		Date.....:	6/12/2009		Ksat :	Saturated hydraulic conductivity			
Investigators.:	DM/JW		File Name.....:	WM09-115G		Q:	Steady-state rate of water flow into the soil			
Boring Depth.:	138 inches		WCU Base. Ht. h:	15.0 cm		H:	Constant height of water in borehole			
Boring Dia.....:	8.3 cm		WCU Susp. Ht. S:	15.2 cm		r:	Radius of cylindrical borehole			
Boring Rad. (r):	4.15 cm		Const. Wtr. Ht. H:	30.2 cm		Ksat = Q[sinh-1(H/r) - (r2/H2+1).5 + r/H] / (2pH2) [Glover Solution]				

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2000	100	10:00:00 AM								
1900	100	10:00:10 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1800	100	10:00:20 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1700	100	10:00:31 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1600	100	10:00:41 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1500	100	10:00:52 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1400	100	10:01:03 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1300	100	10:01:15 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
1200	100	10:01:26 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1000	100	10:01:37 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
900	100	10:01:49 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
800	100	10:02:01 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
700	100	10:02:13 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
Natural Moisture:	Moist	Init. Satur.Time:	9:30:00 AM	ESTIMATED FIELD KSAT:		0.172	2.86E-03	**247.5**	4.060	8.12
Texture/Classif:	SAND (SM)	Consistency:	N/A	Depth to an Impermeable Layer:	N/A	Notes:	High			
Structure/Fabric:	N/A	Slope/Landsc:	Flat	Depth to Bedrock.....:	N/A					

ksatReport1.xls — Precision Permeameter™ — Rev. 4/5/2002

285

APPENDIX I
BORING LOCATION PLAN
CIANELLI RICHMOND ROAD METAL BUILDING
JAMES CITY COUNTY, VIRGINIA
GET PROJECT NO: WM09-115G



Locations are Approximate

GET Solutions, Inc.
Geotechnical • Environmental • Testing

BORING LOG
HA-1

PROJECT: Cianelli Richmond Road Metal Building
CLIENT: Mr. Nick Cianelli
PROJECT LOCATION: James City County, Virginia
PROJECT NO.: WM09-115G
BORING LOCATION: See Attached Boring Location Plan
SURFACE ELEVATION:
DRILLER: GET Solutions, Inc.
LOGGED BY: SP
DRILLING METHOD: Hand Auger
DATE: 2/16/2009
DEPTH TO WATER - INITIAL*: NE AFTER 24 HOURS: NT CAVING> C

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
	0	0	5 inches of Topsoil							
			Tannish brown, moist, Clayey, fine SAND (SC) with organics, Possible FILL							
		1								
			Orangish brown, moist, Silty, fine SAND (SM) with trace Clay							
	0.8	2								
		3								
			Orangish brown, moist, Clayey, fine SAND (SC)							44
		4								
		5								
	1.6		Orangish brown, moist, Silty, fine SAND (SM) with little to trace Clay							
		6								
	2.4	8								
		10								
			Boring terminated at 10 ft.							
	3.2									
		12								
	4									
		14								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

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

Notes:

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

*The initial groundwater reading may not be indicative of the static groundwater level.

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

GET Solutions, Inc.
Geotechnical • Environmental • Testing

BORING LOG
HA-2

PROJECT: Cianelli Richmond Road Metal Building
CLIENT: Mr. Nick Cianelli
PROJECT LOCATION: James City County, Virginia
PROJECT NO.: WM09-115G
BORING LOCATION: See Attached Boring Location Plan
SURFACE ELEVATION:
DRILLER: GET Solutions, Inc.
LOGGED BY: SP
DRILLING METHOD: Hand Auger
DATE: 2/16/2009
DEPTH TO WATER - INITIAL*: NE **AFTER 24 HOURS:** NT **CAVING>** C

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
	0	0	10 inches of Topsoil							
			Tannish brown to tan, moist, Silty, fine SAND (SM) with trace Clay							
	0.8	2	Orangish brown, moist, Clayey, fine SAND (SC)							
	1.6	4	Orangish brown, moist, Silty, fine SAND (SM) with little to trace Clay							
	2.4	8								
	3.2	10	Boring terminated at 10 ft.							
	4	12								
		14								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

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

Notes:

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

*The initial groundwater reading may not be indicative of the static groundwater level.

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

GET Solutions, Inc.
Geotechnical • Environmental • Testing

BORING LOG
BMP-1

PROJECT: Cianelli Richmond Road Metal Building
CLIENT: Mr. Nick Cianelli
PROJECT LOCATION: James City County, Virginia
BORING LOCATION: See Attached Boring Location Plan
DRILLER: GET Solutions, Inc.
DRILLING METHOD: Hand Auger
DEPTH TO WATER - INITIAL*: ▽ NE **AFTER 24 HOURS:** ▽ NT **CAVING>** ⊏

PROJECT NO.: WM09-115G
SURFACE ELEVATION:
LOGGED BY: SP
DATE: 2/16/2009

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
	0	0	5 inches of Topsoil							
			0.42 Tannish brown to tan, moist, Silty, fine SAND (SM) with trace Clay							29
	0.8	2								
			3 Orangish brown, moist, Silty, fine SAND (SM) with little Clay							
		4	4 Orangish brown, moist, Clayey, fine SAND (SC)							
	1.6	6	6 Tannish brown to tan, moist, Silty, fine SAND (SM) with trace Clay							
	2.4	8								
		10	Boring terminated at 10 ft.							
	3.2									
		12								
	4									
		14								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

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

Notes:

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

*The initial groundwater reading may not be indicative of the static groundwater level.

*Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

G E T Solutions, Inc.	SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET	Sheet No.: 1

Project Name.:	Richmond Road Industrial Building	**Parcel.....:**	James City County, Virginia	**Terminology and Solution**	
Boring No.....:	BMP-1/INF-1	**Date.....:**	2/16/2009	Ksat :	Saturated hydraulic conductivity
Investigators.:	S. Phillips	**File Name.....:**	WM09-115G	Q:	Steady-state rate of water flow into the soil
Boring Depth.:	24 inches	**WCU Base. Ht. h:**	15.0 **cm**	H:	Constant height of water in borehole
Boring Dia.....:	8.3 **cm**	**WCU Susp. Ht. S:**	15.2 **cm**	r:	Radius of cylindrical borehole
Boring Rad. (r):	4.15 **cm**	**Const. Wtr. Ht. H:**	30.2 **cm**	Ksat = Q[sinh-1(H/r) - (r2/H2+1).5 + r/H] / (2pH2)	[Glover So

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2000	100	3:30:00 PM								
1900	100	3:30:15 PM	0:00:15	0.25	400.00	0.126	2.11E-03	182.0	2.985	5.97
1800	100	3:30:31 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
1700	100	3:30:47 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
1600	100	3:31:03 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
1500	100	3:31:18 PM	0:00:15	0.25	400.00	0.126	2.11E-03	182.0	2.985	5.97
1400	100	3:31:33 PM	0:00:15	0.25	400.00	0.126	2.11E-03	182.0	2.985	5.97
1300	100	3:31:49 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
1200	100	3:32:06 PM	0:00:17	0.28	352.94	0.112	1.86E-03	160.6	2.634	5.27
1000	100	3:32:22 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
900	100	3:32:38 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
800	100	3:32:54 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
700	100	3:33:10 PM	0:00:16	0.27	375.00	0.118	1.97E-03	170.6	2.799	5.60
Natural Moisture:	Moist	**Init. Satur.Time:**	3:00:00 PM	**ESTIMATED FIELD KSAT:**		0.120	2.00E-03	**172.6**	2.832	5.66
Texture/Classif:	SAND (SM)	**Consistency:**	N/A	**Depth to an Impermeable Layer:**	N/A	**Notes:**				
Structure/Fabric:	N/A	**Slope/Landsc:**	Flat	**Depth to Bedrock.....:**	N/A					

GET Solutions, Inc.
Geotechnical · Environmental · Testing

G E T Solutions, Inc.
1592-E Penniman Road
Williamsburg, Virginia 23185
Tel: (757) 564-6452
Fax:(757) 564-6453

FIELD REPORT No. 2
Page 1 of 2

Project No: **WM09-197T**
Permit No:
Permit Date:

Project Name:
Nicks Lawn Equipment
Location:
James City County, Virginia
Client:
Mr. Nick Cianelli
Contractor:
David Nice Builders, Inc.

Day/Date:
Wed/27 Jan 10
Weather/Temp:
Sunny/40°F
Scope of Services:
Key Way Inspection

Deficiency Needing Correction ☐ No Deficiency Observed ☒

As requested, a **G E T** representative visited the project site in order to inspect a portion of the key way excavation. Refer to the attached sketch for specific locations (Figure 1, Page 2 of 2). The contractor had excavated the observed area to depths ranging from 6 to 8 feet below surrounding grades and a minimum of 4 feet wide. Based on our field observations, the observed key way excavation was suitable for backfill. The contractor was advised to use cohesive soils (CL/SC) encountered at various depths across the site.

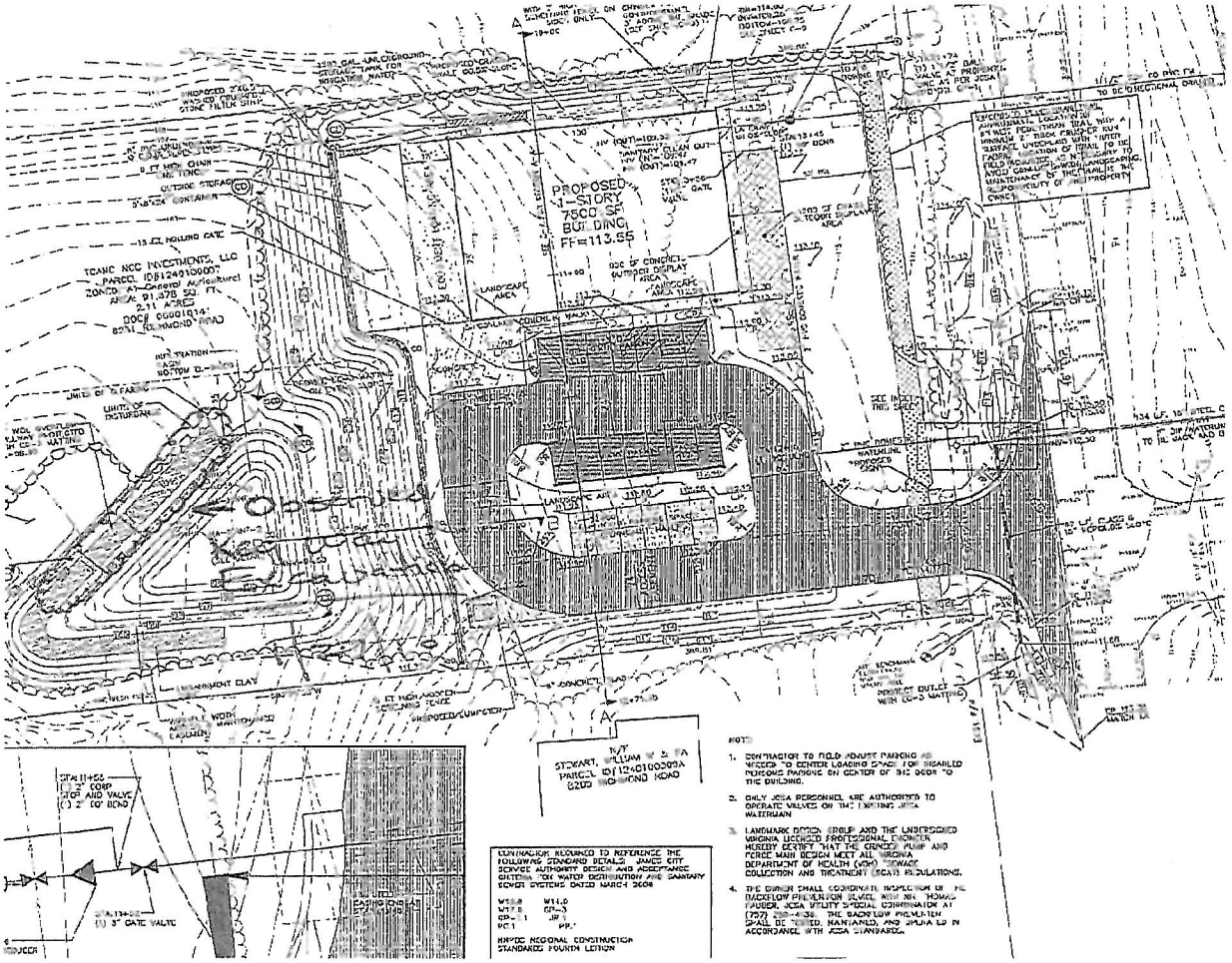
Distribution:
nicks52@cox.net

Reviewed By:

J. Wheeler
G E T Solutions, Inc.

G E T Solutions, Inc.
1592-E Penniman Road
Williamsburg, Virginia 23185
Tel: (757) 564-6452
Fax:(757) 564-6453

Figure 1



Locations are approximate

LOCATION SKETCH

PROJECT:	**Nicks Lawn Equipment**	
	James City County, Virginia	**SCALE: NTS**
PROJECT NO:	**WM09-197T**	**DATE: 1-27-10**
CLIENT:	**Mr. Nick Cianelli**	**PLOT BY: JW**

G E T Solutions, Inc.
1592-E Penniman Road
Williamsburg, Virginia 23185
Tel: (757) 564-6452
Fax:(757) 564-6453

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FIELD REPORT No. 5
Page 1 of 1

Project No: **WM09-197T**
Permit No:
Permit Date:

Project Name:
Nicks Lawn Equipment
Location:
James City County, Virginia
Client:
Mr. Nick Cianelli
Contractor:
David Nice Builders, Inc.

Day/Date:
Fri/2 Apr 10
Weather/Temp:
Sunny/60's
Scope of Services:
Site Observations

Deficiency Observed ☐ No Deficiency Observed ☒

As requested, a **G E T** representative visited the project site in order to observe the construction of the infiltration trench. **G E T** observed the PVC perforated pipe, stone, and associated filter fabric being installed. Based on our field observations, it appeared that the construction of the infiltration trench was in general accordance with project plans and specifications.

By:
J. Wagner
G E T Solutions, Inc.

Distribution:
nicks52@cox.net

Reviewed By:

J. Wheeler
G E T Solutions, Inc.

Scott Thomas

From: Scott Thomas
Sent: Friday, January 28, 2011 5:29 PM
To: 'Amy Kessler'
Cc: Joe Buchite; William Cain; Michael Majdeski
Subject: RE: Nicks Lawn Equipment

Yes, we have received the information. Thanks.

Scott J. Thomas
Director

Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6639
F: 757-259-4032
jccEgov.com

From: Amy Kessler [mailto:AKessler@davidnicebuilders.com]
Sent: Friday, January 28, 2011 2:23 PM
To: Scott Thomas
Cc: William Cain; Joe Buchite; Michael Majdeski; Jose Ribeiro; Christy Parrish; Brandon Nice; Andy Mckown
Subject: RE: Nicks Lawn Equipment

Good afternoon Scott, I am following up to confirm you have received all the documentation required to release the bond at Nicks Lawn Care.

Steve Romeo was to have dropped off the certifications to your office this week. Please confirm this happened. Thanks!

Amy M. Kessler, PMA
David A. Nice Builders, Inc.
4571 Ware Creek Road
Williamsburg, VA 23188
O 757-566-3032
F 757-566-4686
C 757-715-3267

DAVID A. NICE
Builders, Inc.

4571 Ware Creek Road
Williamsburg
Virginia 23188

Telephone: (757) 566-3032
Fax: (757) 566-4686

January 7, 2011

Environmental Division
JAN 07 2011
RECEIVED

Mr. Scott Thomas, Director
James City County Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23185

REF: Nicks Lawn Equipment
Toano, VA

Dear Mr. Thomas,

Please find enclosed the additional information that was referenced as forthcoming in David Nice's January 4, 2011 correspondence. Attached you will find the revised as-built drawing and an elevation comparison chart, both provided by Steve Romeo with VHB.

We trust this will address the concerns expressed with regard to releasing the bond. Please contact David Nice at our office if you need to discuss this any further.

Sincerely,

Amy M. Kessler
Project Management Assistant

cc: David A. Nice, President
Brandon Nice, Project Manager

TOLD DAVID NICE VIA phone 1-11-11 @ 2:30 pm, that we need const cert. SAID OK.

- Met Dec 22, 2010
- Gave List
  1. Pond const delivery
  2. Const. Cert.
- Sent email Jan 4
- Phone call 1-11-11 @ 2:30
- VISIT FRI JAN 21 LOBBY CONVERSATION (RAISED VOICE)

DAVID A. NICE
Builders, Inc.

4571 Ware Creek Road
Williamsburg
Virginia 23188

Telephone: (757) 566-3032
Fax: (757) 566-4686

January 7, 2011

Environmental Division
JAN 07 2011
RECEIVED

Mr. Scott Thomas, Director
James City County Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23185

REF: Nicks Lawn Equipment
Toano, VA

Dear Mr. Thomas,

Please find enclosed the additional information that was referenced as forthcoming in David Nice's January 4, 2011 correspondence. Attached you will find the revised as-built drawing and an elevation comparison chart, both provided by Steve Romeo with VHB.

We trust this will address the concerns expressed with regard to releasing the bond. Please contact David Nice at our office if you need to discuss this any further.

Sincerely,

Amy M. Kessler
Project Management Assistant

cc: David A. Nice, President
Brandon Nice, Project Manager

Kim Nice-Woodroffe

From: Romeo, Stephen [SRomeo@VHB.com]
Sent: Thursday, January 06, 2011 9:12 AM
To: Kim Nice-Woodroffe
Cc: Nick Cianelli
Subject: updated bmp record drawing
Attachments: 2011-01-05 Nick's BMP Record Drawing R-1.pdf

David,

Attached is copy showing extra shots taken yesterday. Volume @ 8% short of design. We'll have updated calculations done by noon.

Stephen Romeo, LS
Principal

VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6239 | Fax: 757.220.8544
Mobile: 757.592.6300
sromeo@vhb.com

www.vhb.com

Environmental Division
JAN 07 2011
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Kessler

From: Romeo, Stephen [SRomeo@VHB.com]
Sent: Thursday, January 06, 2011 4:36 PM
To: Amy Kessler
Subject: nick's bmp
Attachments: Comparison Chart.pdf

Attached is the comparison.
The emergency spillway will have to be raised to elev=99.15, with the 100-year storm peaking at elev=99.30 and the top of the dam will have to be raised to minimum elev=100.30

Stephen Romeo, LS
Principal
VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services
351 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6239| Fax: 757.220.8544
Mobile: 757.592.6300
sromeo@vhb.com
www.vhb.com
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Environmental Division
JAN 07 2011
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Storm Event	Max WSEL	Max Volume (CF)	Discharge (cfs)
2-year (Design)	97.39	6900	0.00
2-year (As-built)	97.62	7036	0.00
2-year (Repair)	97.62	7036	0.00
10-year (Design)	98.77	12083	0.00
10-year (As-built)	98.58	10305	1.23
10-year (Repair)	99.09	12338	0.00
100-year (Design)	98.96	12906	3.02
100-year (As-built)	98.67	10654	3.76
100-year (Repair)	99.30	13227	3.00

Environmental Division
JAN 07 20
RECEIVED

DAVID A. NICE
Builders, Inc.

4571 Ware Creek Road
Williamsburg
Virginia 23188

Telephone: (757) 566-3032
Fax: (757) 566-4686

January 4, 2011

Environmental Division
JAN 04 2011
RECEIVED

Mr. Scott Thomas, Director
James City County Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23185

REF: Nicks Lawn Equipment
Toano, VA

Dear Mr. Thomas,

I just spoke with Mr. Steve Romeo at Landmark Design about this project. He will have additional topographical points taken on Wednesday afternoon and incorporate them into a complete set of revised as-builts by the end of the week. I will deliver them to you as soon as I have them so the volume changes can be verified. I am enclosing the original topographic as-builts and drawings from VHB showing what has to be done to correct the BMP from the original design.

I would certainly hope that you can released the bond based on the attached, as well as the new survey, and my letter stating that we will make the necessary repairs. If you wish to discuss this, please contact me at your earliest convenience.

Sincerely,

David A. Nice
President

DN/amk

cc: Brandon Nice, Project Manager
Steve Romeo, VHB

Scott Thomas

From: Scott Thomas
Sent: Tuesday, January 04, 2011 4:37 PM
To: Jose Ribeiro
Subject: RE: Nicks Lawn Equipment

I don't believe you need to. David Nice is taking the lead. I copied Carla just in case the applicant would contact her.

Scott J. Thomas
Director
James City County Environmental Division

From: Jose Ribeiro
Sent: Tuesday, January 04, 2011 3:29 PM
To: Scott Thomas
Subject: FW: Nicks Lawn Equipment

Can I forward this e-mail to the applicant?

From: Scott Thomas
Sent: Tuesday, January 04, 2011 11:14 AM
To: 'Amy Kessler'
Cc: William Cain; Joe Buchite; Michael Majdeski; Jose Ribeiro; Christy Parrish
Subject: RE: Nicks Lawn Equipment

Amy

Our Division is in receipt of your email and subsequent letter dated December 22, 2010 related to inconsistencies with the construction of the infiltration basin as approved for the Nick's Lawn Care, County Plan No. SP-74-09 (SUP-06-09). The letter also outlined some of the results and plan of action discussed with David at a meeting held at the County complex on December 22, 2010.

Although our Division agrees that the contents and action plan as spelled out in the letter is consistent with discussions at the meeting, the action on release or reduction of the siltation bond for the project cannot proceed until the "necessary modifications" as indicated in the letter are further defined better. The Division notes provided to David at the meeting, and as referenced in the letter, provided some preliminary guidance and ideas on how to approach and resolve the issue.

Once we receive additional information to further define some of the "necessary modifications" and a formal asbuilt (record drawing) and construction certification submittal for the infiltration facility, we can begin to move forward with that discussed at our meeting and as outlined in David's letter. We have not received any type of formal submittal of this information yet.

Attached is a copy of the letter provided to us and note provided from Division staff at the December 22nd meeting.

Please forward this response to David for me please and we look forward to getting this additional information and working to resolve this issue.

Thanks.

Scott Thomas

From: Scott Thomas
Sent: Tuesday, January 04, 2011 11:14 AM
To: 'Amy Kessler'
Cc: William Cain; Joe Buchite; Michael Majdeski; Jose Ribeiro; Christy Parrish
Subject: RE: Nicks Lawn Equipment
Attachments: Nicks_SP7409_SUP0609.pdf

Amy

Our Division is in receipt of your email and subsequent letter dated December 22, 2010 related to inconsistencies with the construction of the infiltration basin as approved for the Nick's Lawn Care County Plan No. SP-74-09 (SUP-06-09) The letter also outlined some of the results and plan of action discussed with David at a meeting held at the County complex on December 22, 2010.

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Please forward this response to David for me please and we look forward to getting this additional information and working to resolve this issue.

Thanks.

Scott J. Thomas
Director
Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6639
F: 757-259-4032
jccegov.com

From: Amy Kessler [mailto:AKessler@davidnicebuilders.com]
Sent: Wednesday, December 22, 2010 3:27 PM
To: Scott Thomas
Cc: Brandon Nice; William Cain; nicks52@cox.net
Subject: Nicks Lawn Equipment

See attached correspondence

Amy M. Kessler, PMA
David A. Nice Builders, Inc.
4571 Ware Creek Road
Williamsburg, VA 23188
O 757-566-3032
F 757-566-4686
C 757-715-3267

DAVID A. NICE
Builders, Inc.

SP-74-09
SUP-06-09

4571 Ware Creek Road
Williamsburg
Virginia 23188

Telephone: (757) 566-3032
Fax: (757) 566-4686

December 22, 2010

e mailed on 12/22/10

Mr. Scott Thomas, Director
James City County
Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23185

Environmental Division
DEC 30 2010

REF: Nicks Lawn Equipment
Toano, VA

Dear Mr. Thomas,

Per our meeting this morning, I am providing the following:

RECEIVED

- David A. Nice Builders promises and agrees to perform the necessary modifications to the BMP structure location at Nicks Lawn Equipment, as directed by the James City County Environmental Division, to bring the BMP into full compliance with the conditions of the SUP;
- Any modifications required will be preformed as soon as the weather permits, but not later than June 1, 2011.

I very much appreciate your willingness to release the bond currently being held by Mr. Nick Cianelli for the purpose of facilitating closure of his loan. It will be helpful if the release is processed as quickly as possible.

I have sent the notes you gave me this morning to Steve Romeo for his thoughts. Please let me know if you need anything else and thank you again for your help.

Sincerely,

David A. Nice
President

DAN/ak
cc: William Cain, Chief Engineer JCC Environmental

Scott Thomas

From: William Cain
Sent: Tuesday, December 28, 2010 8:55 AM
To: Scott Thomas
Subject: FW: Nicks Lawn Equipment
Attachments: JCC Env. 12-22-10.pdf

Scott,

See the attachment in the email from Amy Kessler. The first bullet has got to be changed as it is not US that remains to be satisfied but the approved plans. This bullet should read:

"David A. Nice Builders agrees to perform the required improvements to the infiltration basin BMP as shown on site plan application SP-0074-2009 as approved by James City County on October 27, 2009. This is required as survey information provided to the Environmental Division indicates that the basin currently does not contain the design volume as is required under the applicable State regulations and as was contained in the approved documents. David Nice Builders Inc. understands and has informed the owner of Nick's Lawn Care that should this work not be completed per the above referenced documents, the site could be found to be in violation of the SUP."

I know that this may sound a little aggressive, but I do not want the message here to convey that *WE* have not been satisfied with the way the site looks.

William Cain, P.E.
Chief Civil Engineer
Environmental Division
101F Mounts Bay Road
Williamsburg, VA 23187
P: (757) 253-6702
F: (757) 259-4032
jccegov.com

From: Amy Kessler [mailto:AKessler@davidnicebuilders.com]
Sent: Wednesday, December 22, 2010 3:27 PM
To: Scott Thomas
Cc: Brandon Nice; William Cain; nicks52@cox.net
Subject: Nicks Lawn Equipment

See attached correspondence

Amy M. Kessler, PMA
David A. Nice Builders, Inc.
4571 Ware Creek Road
Williamsburg, VA 23188
O 757-566-3032
F 757-566-4686
C 757-715-3267

DAVID A. NICE
Builders, Inc.

4571 Ware Creek Road
Williamsburg
Virginia 23188

Telephone: (757) 566-3032
Fax: (757) 566-4686

December 22, 2010

Mr. Scott Thomas, Director
James City County
Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23185

REF: Nicks Lawn Equipment
Toano, VA

Dear Mr. Thomas,

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I have sent the notes you gave me this morning to Steve Romeo for his thoughts. Please let me know if you need anything else and thank you again for your help.

Sincerely,

David A. Nice
President

DAN/ak
cc: William Cain, Chief Engineer JCC Environmental

Scott Thomas

From: Amy Kessler [AKessler@davidnicebuilders.com]
Sent: Wednesday, December 22, 2010 3:27 PM
To: Scott Thomas
Cc: Brandon Nice; William Cain; nicks52@cox.net
Subject: Nicks Lawn Equipment
Attachments: JCC Env. 12-22-10.pdf

See attached correspondence

Amy M. Kessler, PMA
David A. Nice Builders, Inc.
4571 Ware Creek Road
Williamsburg, VA 23188
O 757-566-3032
F 757-566-4686
C 757-715-3267

Nicks

Scott Thomas

From: Scott Thomas
Sent: Thursday, December 16, 2010 10:00 AM
To: 'Romeo, Stephen'
Subject: RE: Nick's (JCC Case #SP-0074-2009) 2 of 2

Steve

I have taken the time to review the case file and talk with our plan review staff about this particular issue. One of the primary issues during the legislative phase of the project, which we did not want to hold off until the site plan stage, and of course during the site plan stage was that no adequate, defined receiving channel existing immediately downstream of the facility. It appears commitments were made to obtain legislative approval to control all event storms in this facility to address this situation and obtain approval. This commitment followed during review of the plan of development.

In my review of case file material, I ran across many of the items and documentation that you attached in your subsequent email. However, I do see some other relative materials. First, the original geotechnical report in 2009 (SUP-6-09) had a test in the vicinity of the future basin which showed rates only in the 2.7 to 2.9 inches per hour range. This was then looked at again by the geotech in August 2009 when they issued a letter stating the range from 4.05 to 8.2 inches per hour. The geotechnical engineer themselves concurred with a 3.07 inch/hour value to be used in the design and considered it appropriate. Based on both of these, it appears the design should reflect a 3.07 inches per hour design.

Based on review of the design hydraulics for the basin 3.07 in/hr was used. The plan moved forward in that manner to approval. It has now become apparent that it was not constructed in that manner and now an attempt is being made to say not let's use 3.07 inch/hr but use something in the 6 to 8 inch per hour range.

We have always been flexible on the use of the factor of safety of 2 as outlined in the Virginia Stormwater Management Handbook. Our flexibility exists in the type of BMP facility most feasible for the site, looking at all geotechnical information available for the site, any other geotechnical reports from adjacent sites and whether there is adequate receiving channel and bypass systems to receive discharged runoff from the facility. This is if should over time the infiltration-permeability nature of the basins decrease from geotechnical recommendations, which is common due clogging of the surface layer of soils in the basin due such things such as sedimentation, leaf matter, consolidation due to water impoundment, frequent saturation, as well as maintenance which we hope will be performed perfectly, but as we know this is not always the case. Please reference page 3.10-14 of the VSMH.

Our typical approach to these situations, and one which we deal with regularly, is to construct the facility per the approved plan before bond is reduced or released or provide an asbuilt hydraulic re-routing of the pond to show that even though not built exactly perfectly it can still function to meet the parameters of design (WQ – SCPV) and any established allowable discharges imposed.

It is clear comparing the graphic picture of the approved plan to the asbuilt that the facility was not built per plan. The average infiltration rate based on geotech was used and FS of 2 applied to get the 3.07 in/hr used. That is the design parameter.

If you need anything else let me know.

Scott J. Thomas
Director

EL. 94 1,102 SF

EL. 100 18,156 CF

AB EL. 98.96 12,906 CF
70% of design volume

Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6639
F: 757-259-4032
jccegov.com

From: Romeo, Stephen [mailto:SRomeo@VHB.com]
Sent: Wednesday, December 15, 2010 5:07 PM
To: Scott Thomas
Cc: knice@davidnicebuilders.com; William Cain; Nick Cianelli
Subject: FW: Nick's (JCC Case #SP-0074-2009) 2 of 2

Scott,

Per message I left in your voice mail this afternoon, I want to discuss with you use of actual infiltration rate as part of effort needed for SUP compliance, County acceptance and release of surety posted by Nick Cianelli. The other part is work David A. Nice, Contractor needs to do. Please call me at your earliest convenience.

Stephen Romeo, LS
Principal

VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

251 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6239 | Fax: 757.220.8544
Mobile: 757.592.6300
sromeo@vhb.com

www.vhb.com
VHB+LandMark | Legacy. Leadership. Results

From: Romeo, Stephen
Sent: Wednesday, December 15, 2010 12:02 PM
To: 'knice@davidnicebuilders.com'
Cc: 'Nick Cianelli'
Subject: FW: Nick's (JCC Case #SP-0074-2009)

David,

Attached is copy of e-mail from JCC Env. Div. along with copy of the SUP, applicable regulations and summary of design versus as-built. Also attached is color copy of as-built survey with all spot elevations turned on. Even if we're able to secure approval from JCC Environmental Director (Scott Thomas) to accept actual infiltration rate, some physical modifications are needed to reduce the 10 year event discharge to zero. Additionally, part of the embankment will need to be raised as well as 1 foot of freeboard above the 100 year event max. volume is required.

Stephen Romeo, LS
Principal

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Transportation | Land Development | Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6235 | Fax: 757.220.8544
Mobile: 757.592.6300
sromeo@vhb.com

www.vhb.com
VHB+LandMark | Legacy. Leadership. Results

From: William Cain [mailto:wacain@james-city.va.us]
Sent: Friday, December 10, 2010 10:44 AM
To: Romeo, Stephen
Cc: Christy Parrish; Scott Thomas; Michael Majdeski
Subject: FW: Nick's (JCC Case #SP-0074-2009)

Steve,

I understand from the email below that the BMP has been constructed with considerably less volume than was originally approved. I visited the site and see that there are other issues that will need to be addressed prior to the release of the bonds. First and foremost is the issue that you have presented in your email below. There are other items of consideration than just the construction as presented. Condition #3 of the SUP requires that the Director of Environmental approve the BMP design. As what was approved is not what was constructed, this condition remains outstanding. There are two options in getting this issue resolved to prevent a violation of the Special Use Permit. The most preferred option requires that the basin be excavated to provide the volume as contained in the approved plan and supporting documentation. Regardless of the condition of the vegetation on the slopes surrounding the facility, under-sizing this facility will prove a far greater detriment to areas downstream of this site than the reestablishment of vegetation in proximity to the basin. Impacts to established vegetation can be minimized by entering the basin from southwestern corner of the site off the newly constructed parking area. Providing the necessary volume will also remove accumulated sediment from the basin as well. This basin does not contain twice the required volume as is indicated in your email below, but rather the required volume as established in the state design requirements. This design of this basin was approved as the well established and required factor of safety was provided on the infiltration rates in accordance with established engineering design standards and specifications.

The other option would be to take the record drawing information and show that the basin contains the volume that is required under the applicable design standards for infiltration facilities. This information must be approved by the Director of the Environmental Division and must indicate that the basin will continue to function as was originally intended.

Should you have any questions, please do not hesitate to let me know.

William Cain, P.E.
Chief Civil Engineer

Environmental Division
101E Mounts Bay Road
Williamsburg, VA 23187
P: (757) 253-6702
F: (757) 259-4032
jcclgov.com

From: Michael Majdeski
Sent: Tuesday, November 23, 2010 2:10 PM
To: William Cain
Subject: FW: Nick's (JCC Case #SP-0074-2009)

Bill,
See the message from Steve Romeo below. He had called me about this issue this morning. I wanted you to get your eyes on it and let me know your thoughts about it before I got back to him. Barry reviewed this plan originally. They have not yet done the formal submission of as-builts, this only represents one part of it.

Thanks for your input.
Mike

Michael Majdeski
Senior Environmental Inspector
Environmental
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6689
F: 757-259-4032
jccfgov.com/environmental

From: Romeo, Stephen [mailto:SRomeo@VHB.com]
Sent: Tuesday, November 23, 2010 12:28 PM
To: Michael Majdeski
Cc: Nick Cianelli; knice@davidnicebuilders.com
Subject: Nick's (JCC Case #SP-0074-2009)

Mike,

Per our telephone conversation earlier today, attached is the BMP record drawing for the referenced project. As I mentioned, the volume constructed is less than that designed, however, the design used a safety factor of 2, which essentially provides for double the required volume. Given the observed BMP performance and how well it's been stabilized, I don't think that the disturbance associated with remedying the volume deficiency is justifiable. Please let me know if you need additional information.

Thanks,

Stephen Romeo, LS
Principal

VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6239 | Fax: 757.220.8544
Mobile: 757.592.6300
sromeo@vhb.com

Scott Thomas

From: Scott Thomas
Sent: Monday, December 13, 2010 10:42 AM
To: Carla Brittle
Cc: William Cain; Michael Majdeski
Subject: FW: Nick's (JCC Case #SP-0074-2009)
Attachments: 3327700-REC-BMP-BW-R1.pdf

Carla – as mentioned, we are trying to work through the situation of the stormwater facility not being built per the approved plan. We sent out some information on Friday. This was copied to me to keep me appraised of the situation. Right now it is with the consultant who submitted some of the BMP certification materials.

Scott J. Thomas
Director
Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6639
F: 757-259-4032
jccEgov.com

From: William Cain
Sent: Friday, December 10, 2010 10:44 AM
To: 'sromeo@vhb.com'
Cc: Christy Parrish; Scott Thomas; Michael Majdeski
Subject: FW: Nick's (JCC Case #SP-0074-2009)

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William Cain, P.E.
Chief Civil Engineer

Environmental Division
101E Mounts Bay Road
Williamsburg, VA 23187
P: (757) 253-6702
F: (757) 259-4032
jccegov.com

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Sent: Tuesday, November 23, 2010 2:10 PM
To: William Cain
Subject: FW: Nick's (JCC Case #SP-0074-2009)

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Thanks for your input,
Mike

Michael Majdeski
Senior Environmental Inspector

Environmental
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6389
F: 757-259-4032
jccegov.com/environmental

From: Romeo, Stephen [mailto:SRomeo@VHB.com]
Sent: Tuesday, November 23, 2010 12:28 PM
To: Michael Majdeski
Cc: Nick Cianelli; knice@davidnicebuilders.com
Subject: Nick's (JCC Case #SP-0074-2009)

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Thanks,

Stephen Romeo, LS
Principal

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Transportation | Land Development | Environmental Services

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ENVIRONMENTAL – STORMWATER TRANSMITTAL

PROTECTING RESOURCES PRIDE IN DELICATE ENVIRONMENTS

COUNTY PLAN NO: SP-074-09

BMP ID CODE: DC-019

WATERSHED: Diascund Creek

BMP – reduced volume per design issue. All correspondence.

2-01-11

- ☐ **ENTIRE RECORD FILE**
- ☑ **ASBUILTS**
- ☑ **CONSTRUCTION CERTIFICATION**
- ☑ **COMPUTATIONS**
- ☑ **OTHER:** includes spill containment plan required per SVP-6-09.

RECEIVED ON FEB 02 '11 Stormwater Division

NAME: Mike Majdeski

SIGNATURE: Mike P. Majdeski

DATE: 1/31/11

Kim Nice-Woodroffe

From: Romeo, Stephen [SRomeo@VHB.com]
Sent: Monday, December 20, 2010 5:09 PM
To: Kim Nice-Woodroffe
Cc: Nick Cianelli
Subject: nick's bmp
Attachments: 20101220163751107.pdf

Environmental Division

JAN 04 2011

RECEIVED

David,

Attached is exhibit showing what needs to be done to satisfy County.

Stephen Romeo, LS
Principal

VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services

351 McLaws Circle, Suite 3
Williamsburg, VA 23185
Phone: 757.220.0500 ext. 6239 | Fax: 757.220.8544
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Kim Nice-Woodroffe

From: Romeo, Stephen [SRomeo@VHB.com]
Sent: Monday, December 20, 2010 5:09 PM
To: Kim Nice-Woodroffe
Cc: Nick Cianelli
Subject: nick's bmp
Attachments: 20101220163751107.pdf

Environmental Division

JAN 04 2011

RECEIVED

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Stephen Romeo, LS
Principal

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Transportation | Land Development | Environmental Services

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SOUTH ZONE (NAD83).

2. ELEVATIONS HEREON ARE IN FEET AND ARE BASED ON NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29).

3. THIS SURVEY DOES NOT IMPLY IN ANY WAY THAT:
(1) INSPECTIONS WERE MADE DURING THE CONSTRUCTION
(2) TO THE QUALITY OF THE WORK, OR
(3) TO ANY ELEMENT OR STRUCTURE NOT VISIBLE OR DEPICTED ON THESURVEY.

4. RECORD INFORMATION SHOWN ON THIS PLAN ARE BASED UPON AN ACTUAL ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BY VHB IN OCTOBER 2010.

5. HORIZONTAL AND VERTICAL DATUM BASED ON JAMES CITY COUNTY

AND BELIEF THA
CONDITION OF TH
FACILITY. THE FA
PROVISIONS OF T
AND STORMWATE
NOTED.

STEPHEN A. ROM

DC019-NICKS_LAWN_EQUIP_REPAIR-103

JAMES CITY SERVICE AUTHORITY
101-E Mounts Bay Road, P.O. Box 8784, Williamsburg, Virginia 23187-8784
Phone: (757) 253-6805 Fax: (757) 253-6850
E-mail: jcsa@james-city.va.us Website: www.jccEgov.com/jcsa

October 16, 2009

James W. Brawley, P.E.
Landmark Design Group
4029 Ironbound Road
Williamsburg, VA 23188

Re: Flow Acceptance Letter for the Nick's Lawn Equipment PS/FM, Project SP-0074-2009, Latest revision date August 24, 2009.

Dear Mr. Brawley,
This letter pertains to the Nick's Lawn Equipment PS/FM Project planned located in James City County. Plans and engineering calculations were submitted by Landmark Design Group for review by the James City Service Authority (JCSA) related to provision of sanitary sewer service. This project meets the requirements for a short form Flow Acceptance Letter. The JCSA has reached the following conclusions regarding this application for sanitary sewer service:

- Based on these plans, calculations and estimates of sewage flow rates, the JCSA accepts the flow into our sanitary sewer system for conveyance to HRSD for transmission and treatment. This application is for an average daily flow of 2,480 gallons per day and a peak daily flow of 7,440 gallons per day.
- This two (2) new E-ONE GRINDER pump has a designed operating point of 11.5 gpm @ 85 feet TDH.
- As shown on the submitted plans, the proposed grinder pump station discharges into a proposed private 43' force main then into a proposed 350' – 1 ½" JCSA force main which goes into an existing JCSA 12" force main for approx. 4300' that discharges into a 20" HRSD force main at the intersection of Richmond Road and Rochambeau Drive. The grinder pump station and all force mains outside the right-of-way will be privately owned and maintained.
- Based on your certification in the original application, this project has been designed in accordance with the Regional Design Guidelines.
- A Flow Acceptance Letter dated Oct. 15, 2009 has been obtained from HRSD for this project.

This flow acceptance letter is good for a period of five years from the date of issuance provided that the site plan approval for the project is current. If the project has not been constructed and a certificate to operate from VDEQ has not been issued within that time, this flow acceptance will be null and void.

If you have any questions regarding this matter, please do not hesitate to contact us.

Sincerely,

C. L. Pittman

Craig Pittman, P.E.
Senior Engineer
James City Service Authority

CC: file

Scott Thomas

From: Scott Thomas
Sent: Tuesday, February 01, 2011 12:04 PM
To: 'Amy Kessler'
Cc: William Cain; Melanie Davis; Carla Brittle; Jose Ribeiro; Michael Majdeski
Subject: Nick's Lawn Care - Infiltration Basin (SP-74-09; County BMP ID Code DC019)

Amy (and David)

Our Division was in receipt of a formal record drawing (asbuilt) and construction certification submittal for the above referenced project on January 26, 2010. All materials attached with this transmittal, and information as previously received by letter on January 7, 2011, was reviewed by the Division and found to be satisfactory.

As the infiltration basin for Nick's had an fill embankment with engineered soil backfill and a clay core, the construction certification was a critical piece of information needed to close out the project. In addition, pursuant to our December 22, 2010 meeting, the additional survey information from the consultant showed that actual constructed volumes for the 100-year design storm event are about 8 percent less than design and, of particular concern to our Division, the bottom area of the basin meets the required area per design of 1,100 square feet.

The information as provided fulfills the terms of that agreed upon at our meeting here at the County complex on December 22, 2010.

The consultant, in the report forwarded in your January 7, 2011 letter indicates a recommendation to raise the emergency spillway from current elevation 98.5 to elevation 99.15. They also recommend the top of dam to be raised to minimum elevation 110.30, which would be along the south and west fill portions of the dam. If the spillway is modified, the consultant indicates the 100-year design storm would peak at elevation 99.30, instead of elevation 98.96 per design and 98.67 per asbuilt conditions.

Pursuant to your letter dated December 22, 2010 your firm committed to perform any necessary modifications, in accordance with any of this analyses and recommendations, in the spring when weather is better but no later than June 1, 2011. Based on our review of all information, additional survey data shows that volume provided (per construction) is within a more reasonable tolerance of that required per design, around 8 percent less than our initial determination of around 30 percent (17 percent by consultant). In addition, the recommendation to raise the spillway to elevation 99.15 and the repair pond analyses shows a 100-year event to reach elevation 99.30, which would still discharge through the spillway. This would be no different to current (asbuilt) conditions where the spillway is at elevation 98.5 and the 100-year peak elevation is 98.67.

In summary, our Division has reviewed the information and will immediately proceed with the release of the siltation bond for the project. At this time, there is no need for David A. Nice Builders, Inc. as contractor for the project, to perform any additional field work or modifications in the spring. A letter will go out to the bank today authorizing release of the $25,000 escrow letter. I cannot speak for when the bank will release the funds.

Thank you for working through this matter with us in a timely manner. If you have any questions, please contact me at 757-253-6639 or by email at scottt@james-city.va.us

Scott J. Thomas
Director

Environmental Division
101-E Mounts Bay Road
Williamsburg, VA 23187
P: 757-253-6639
F: 757-259-4032
jcegov.com

01/28/2011

Bill they did calculate impervious cover wrong. Should be 27887 sf #

01/28/2011

Bill

Ready for approval. LDP required for 820 sf #
Thanks Zu

Scott, 1/31/11

When you get to this one, let me know. We need to discuss thoughts on sign and future development for this site. Currently they're non-conforming both legally and illegally. With no administrative support, I figure I've done what I can for now.

Bill

TRANSMITTAL

RECEIVED
JAN 21 2011
Environmental Division

DATE: January 21, 2011

TO: Environmental Division
JCSA

FROM: Brian Elmore, Development Management Assistant

SUBJECT: SP- 0001-2011 Jamestown Feed & Seed Greenhouse SP Amend.

ITEMS ATTACHED: Revised Site Plan, Applicant Response Letter

ACTION: **Please review and return comments no later than February 4, 2011**

1st revision

Thank you for your review,
Brian Elmore
JCC Development Management Assistant

Jamestown Feed & Seed

Home & Garden - Hardware - Greenhouse - Pet Supplies - Mulch

January 20, 2011

Environmental Division

JAN 21 2011

Development Management
101-A Mounts Bay Road
Williamsburg VA 23187-8784

Re: SP-0001-2011 Jamestown Feed & Seed Greenhouse SP Amendment

RECEIVED

James City County Environment Division

1) Application being submitted 1-20-11. √
2) Allen Parker Builders √
3) Miss Utility will be contacted 24 hours to any work excavations. √
4) Understood and noted on plans. √
5) 17,517 sq. ft. noted on plan. √
6) Understood. √

RECEIVED
JAN 2011
Planning Department

James City Service Authority

1) Understood.
2) Indicated on plans.
3) Discussed with Dion.
4) No water and sewer connections. No private well on premises.

Donald H. Fitch
Owner

7348 Richmond Road
Norge, VA 23127
757-564-8528
Fax 757-564-3821

Development Management
101-A Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784
P: 757-253-6671
F: 757-253-6822
devman@james-city.va.us

Code Compliance
(757) 253-6620
codecomp@james-city.va.us

Environmental Division
(757) 253-6670
environ@james-city.va.us

Planning and Zoning
(757) 253-6685
planning@james-city.va.us

Environmental Division
JAN 21 2011
RECEIVED

January 19, 2011

Donald Fitch
The Palmetto Group
706 Todds Lane
Hampton VA 23666

RE: SP-0001-2011 Jamestown Feed & Seed Greenhouse SP Amendment

Dear Mr. Fitch

Planning Staff has completed its initial review of the above-referenced case and offers the following comments:

James City County Planning Division

1) See agency comments.

James City County Fire Department

1) Approved as a site plan only.

James City County Environmental Division

General:

1) A Land-Disturbing Permit and Siltation Agreement, with surety, are required for this project.

2.) RLD. The applicant must provide the name of an individual holding a valid Responsible Land Disturber (RLD) certificate who will be responsible for the land-disturbing activity prior to engaging in the land-disturbing activity. This will be necessary prior to issuance of land-disturbing for the project, not during the erosion and sediment control plan approval process. It will be required that the assigned RLD attend the preconstruction conference for the project.

3) Miss Utility. Provide standard notes requiring contact of Miss Utility prior to any utility or site work excavations.

4) Plan Number. Please reference the assigned County plan number SP-001-11 on all subsequent submissions.

Impervious Cover:

5) Impervious cover. Total square footage of the impervious cover need to include extensions proposed in the site plans from 2009 and 2011. Please provide proper correction with the next submittal.

Stormwater Management / Drainage:

6) Stormwater Management/BMP's. Be advised that Section 23-10(4) of the Chesapeake Bay Preservation Ordinance requires Best Management Practices (BMP's) for site plans with impervious cover exceeding 10 percent of site area. This being the case, however, much of the original site was constructed prior to the adoption of these regulations. Therefore, these regulations would only apply to portions of the site that were constructed beyond that which was presented in approved site plan SP-022-1990. Due to the minimal nature of this application on the overall impervious area, it will not be required at this time for the site to be brought into compliance; however, be advised that any future increases in impervious area will require stormwater compliance from all areas lying beyond the limits of the referenced application SP-022-90.

James City Service Authority
General:

1) The design engineer shall provide a response letter indicating actions taken and/or additional changes made with resubmittal of this project.

2) On this plan, it shows the water meter and water service line behind the building near the railroad tracks. In 2005 the water services were to be relocated to the Richmond Road side of the property. A water meter for this site has been located by GPS in the Northwestern corner of the property. Please verify where the existing water service and water meter are located. Show the location on the plans.

3) In a separate block, add the statement "No plumbing modifications are to be made under this plan." If that statement is not correct, then provide completed Water and Sewer Data sheets to JCSA. (See Attachment 1)

4) If there is to be water and sewer connections to the building, show the connections on the plan.

When the above comments have been reviewed, and corresponding corrections incorporated into the plans, please submit eight (8) sets of the modified plans, and a letter stating how each of these concerns was addressed, to the Planning Division for further review. Feel free to contact me, should you have any questions or concerns, at 253-6685.

Respectfully,

Brian Elmore
Development Management Assistant

ATTACHMENT:

1) JCSA Water and Sewer Datasheet.

TRANSMITTAL

DATE: **September 15, 2009**

TO: Environmental Division ✓
James City County Fire Department

FROM: Jose Ribeiro, Senior Planner

SUBJECT: SP-0074-2009, Nick's Lawn Care
SPILL CONTAINMENT PLAN

ITEMS ATTACHED: Site Plan (for your reference)
Spill Containment Plan

According to SUP-0006-2009, Condition No. 2: "Prior to final site plan approval, a spill prevention control plan which address chemical handling shall be submitted to the **Environmental Director** and the **Fire Chief** for their respective review and approval.

Please review and return comments as soon as possible

Thank you for your review,
José-Ricardo Linhares Ribeiro
JCC Planner

The Spill Containment Plan, as provided to meet Condition #2 of SUP-06-09, is approved by the Environmental Division (Note: This SPC plan is specific to this case only.)

10-09-09

"Call" protocol DEQ, DCR, County

SPILL CONTAINMENT PLAN

NICK'S LAWN EQUIPMENT SITE

Introduction

Following is an outline describing methods and systems to be incorporated or implemented with this site plan to prudently, environmentally, and economically handle, storage, and "clean-up" hazardous materials, petroleum products, or fertilizers (hereinafter referred to "hazardous materials") that can contaminate storm water runoff.

Description of Site

The site is located at 8231 Richmond Road to the southwest of Anderson's Corner. The owner's name and address for this site can be found on the cover sheet of the site plan document.

The site is developed with an existing structure consisting of approximately 800 +/- square feet. Topography at the site is slightly contoured. Approximately one-half of the site is wooded.

The proposed site improvements for this site include: the addition of an 7,500 square foot shop, warehouse and showroom (within one building), an associated parking lot, display areas, a fuel storage area, and drainage and grading improvements.

Site Plan Proposal

A review of the site plan will show the general storm water runoff patterns; the location of planned storm drains, swales, and best management practices; site drainage discharge points and adjacent surface water bodies (if any).

✓ 9/6/09
Barry - No comments.
Mke

With the exception of fuel storage and hazardous materials (within ... e stored "under cover" to prevent spills and hazard material runoff as ... l storage will occur at site-specific location (as shown on the site plan ... a fuel storage tray.

Spill Containment/Prevention Systems

9/09
SCOTT,
O.K. TO APPROVE FOR PROPOSED USE, AND ACTIVITIES.

Hazardous Material within Buildings

Since significant quantities of hazardous materials are to be st... proposed site improvements, the following methods to contai...

- The manager of the facility shall have information pos... and the proper handling of hazardous materials.

"Call" protocol DEQ, DCR, County

SPILL CONTAINMENT PLAN

NICK'S LAWN EQUIPMENT SITE

Introduction

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The proposed site improvements for this site include: the addition of an 7,500 square foot shop, warehouse and showroom (within one building), an associated parking lot, display areas, a fuel storage area, and drainage and grading improvements.

Site Plan Proposal

A review of the site plan will show the general storm water runoff patterns; the location of planned storm drains, swales, and best management practices; site drainage discharge points and adjacent surface water bodies (if any).

With the exception of fuel storage and hazardous materials (within the warehouse) , products will be stored "under cover" to prevent spills and hazard material runoff associated with rainfall event. Fuel storage will occur at site-specific location (as shown on the site plan), in an 8'x8'x24' container with a fuel storage tray.

Spill Containment/Prevention Systems

Hazardous Material within Buildings

Since significant quantities of hazardous materials are to be stored with the shop/warehouse of the proposed site improvements, the following methods to contain or prevent spills may be implemented:

- The manager of the facility shall have information posted on the proper use of "clean-up" kits, and the proper handling of hazardous materials.

- Containment areas for liquid hazardous materials – Within the building, designated storage areas of liquid hazardous materials may incorporate a "trayed" floor to direct spilled hazardous fluid to a containment collection point for clean up.
- "Clean-up" kits, in which the contents of the kit should be an appropriate quantity and type of material to be collected, shall be placed judicially throughout the shop/warehouse to assist in the clean-up of either "dry" or "liquid" hazardous materials.
- Spilled "dry" hazardous material shall not be flushed with water, or be treated to become a liquid form. Clean-up shall commence immediately with observation of the spill. Clean-up of dry, hazardous materials shall be performed by physical methods, to include vacuums, use of brooms, shovels, mechanical sweepers, and plows. The collected material shall be stored within an appropriate container within the building until the material can be properly disposed, or may be stored outdoors in a weather resistant container until properly disposed.

Outside Hazard Material Storage

With the outside storage of fuel, the following methods to contain or prevent spills may be implemented:

- The manager of the facility shall have information posted on the proper use of "clean-up" kits, and the proper handling of hazardous materials and fuel dispensing equipment.
- An adequately sized, concrete pad, or other appropriate, solid surface pad will be provided at the fuel dispensing location to prevent soil contamination by spilled fuel.
- Fuel to be stored in 8'x8'24' container with a fuel storage tray, acting as a spill containment vessel. The fuel dispensing area is to be located upland of the storm sewer system. ✓
- Absorbent shall be storage at the fuel dispensing location.
- A weather-resistant container shall be located at the vehicle dispensing location for the storage of used absorbent.
- A spill "clean-up" kit shall be available at the fuel dispensing location for immediate use.

Other Spill Containment Plan Commitments

In addition, the appropriate items listed above and the following should be observed as part of the spill containment plan:

- Periodic storm water contamination assessment – Periodically, the site should be inspected or evidence of hazardous material transport by storm water. Evidence of damage of failing plant materials, odors, and discolored runoffs shall be investigated as for the presence of hazardous materials.
- Storm water systems shall be periodically be inspected for accumulation of hazardous materials.
- The facility operator should keep detailed records of on-site hazardous materials.
- Hazardous material spills should be recorded, citing date, time, likely cause of spill and action taken.

- Employees should be periodically trained on the proper handling, clean-up and dispensing of hazardous materials.
- If a spill has not been appropriately contained or "clean-up", the facility manager shall immediately secure additional assistance to contain or clean-up the spill. Additionally, the facility manager shall report the spill, or inability to contain the spill, to local/state authorities.
- The Spill Prevention Plan should be reviewed at least once a year, and following any spills, to measure the Spill Prevention Plan's implementation and to suggest any improvements to the plan.

BEM/MDW

ENVIRONMENTAL DIVISION REVIEW COMMENTS
8231 Richmond Road, Sale and Repair of Lawn Equipment
COUNTY PLAN NO. SUP-006-09
March 6, 2009

General:

1. Please note that this project falls within the Diascund Creek Watershed.

2. Please clarify what the crosshatching signifies for the 5' Concrete Sidewalk and Outdoor Display Area.

3. It was noted during a recent site visit that trash, junk and abandoned structures are distributed throughout the site. During construction it will need to be ensured that all deleterious material will be removed from the site and disposed of in an approved facility.

4. Site Demolition. Specify on the plan which structures will be demolished and removed from the site. The Existing Barn structure adjacent to the Infiltration Trench BMP does not provide adequate separation of infiltration type BMP's from structures per the County BMP Guidelines. Also, indicate if any specimen trees are present on site and where they might need to be removed and/or preserved.

5. Well and Septic. Indicate whether the site will use well and septic fields or, be connected to JCSA water and sewer. Septic fields and wells must have adequate separation from infiltration BMP's per County BMP Guidelines. Any connection to water and/or sewer is reportedly on the opposite side of Richmond Road from this site.

6. Stormwater Hotspots. Provide further information about types of equipment and the scope of service and maintenance that will take place on site. Vehicle service and maintenance facilities, and similar activities, are considered stormwater hotspots according to the County BMP Guidelines and should generally not drain towards infiltration type BMP's.

7. Use of low-impact development principles and techniques are fully encouraged for use in site design to reduce and control impacts associated with increased stormwater runoff. This includes minimizing disturbance, minimizing impervious area, disconnection of impervious areas, saving existing trees, preserving existing topography and HSG A&B soils, use of flatter site grades, reduced slope heights, increasing time of concentration flow paths, maintaining sheet flow, increasing surface roughness coefficients, use of wide and flat stormwater conveyance channels, minimizing use of storm drain pipe, encouraging infiltration and use of bioretention cells with appropriate landscaping. The proposed cisterns appear to be sized to capture ¼ inch of runoff from the building roof. Other opportunities to implement LID principles do appear to be present on the site.

8. Adequate Outflows. Outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel (Refer to VSMH page 5 – 61). If no receiving channel is present at the BMP outfall, offsite downstream improvements and/or drainage easements may be necessary on adjacent parcels. If access to a defined receiving channel, whether natural or man-made is not feasible, an infiltration basin with no surface discharge can be used. If no surface discharge is proposed, a full

geotechnical investigation would be required to show that the underlying soils beneath the trench are permeable and will infiltrate all increased runoff from the proposed development.

9. Geotechnical. No data was submitted to show Initial Feasibility Testing and/or Concept Design Testing requirements were met in accordance with the Appendix E of the JCC BMP manual for the infiltration type BMP. While soils map data and the presence of infiltration type BMP's on nearby parcels may suffice for concept level determinations, be advised that soil borings will be required prior to site plan approval to verify the suitability of the site soils and groundwater levels for an infiltration type BMP. Also, since the site specific geotechnical information may preclude the use of an infiltration type BMP, it is recommended that narrative and/or notes on the plan be provided to specify alternatives, such as bioretention with an underdrain or, other suitable BMP.

10. BMP Points. Be advised that, during the site plan approval process, the project will need to achieve 10 BMP points per the County BMP Guidelines through structural BMP points in combination with natural open space . Assigned BMP point values indicated in Table 1 of the County BMP manual assume all features consistent with the manual are provided such as pretreatment forebays, aquatic shelves, stream channel protection volume, pond buffers, etc. Full point credit value for the BMP in the calculation worksheet, requires that all applicable design features be present.

APPROVED NARRATIVE

8) Proceed with construction of the proposed building.
9) Install underground irrigation tank.
10) Install asphalt paving, concrete walks and pavers.
11) Upon completion of final site stabilization and receiving authorization from the assigned James city county environmental division inspector, final grading and installation for infiltration basin & gravel filter strip may commence. After the final grading is completed, the basin floor shall be deep tilled to provide a well aerated, highly porous surface texture.
12) Install landscaping as shown on landscaping plans.
13) complete permanent seeding, fertilize and mulch as required.
14) After an acceptable and stable ground cover has been established, remove silt fence, tree protection and temporary sediment control measures. However, no erosion and sediment control measures shall be removed without first authorization from the assigned James City County Environmental inspector.
15) During all phases of construction and immediately following a rain event, the contractor shall monitor and inspect all erosion and sediment control measures installed on the project. Contractor shall use additional E&S control measures in accordance with Virginia Erosion and Sediment Control Manual as needed.

Stormwater Management:

An Infiltration Basin with an approximate floor area of 1,102 square feet is proposed for treating the runoff from this site.

The attached geotechnical report (Sheet C-4) indicates that infiltration rates in the area of the proposed Infiltration Basin vary from the 4.06 to 8.21 inches per hour with a median infiltration rate of 6.14 inches per hour. A safety factor of 2 (3.07 inches per hour) has been used for the design infiltration rate per VSMH standards.

The proposed Infiltration Basin has been designed to completely infiltrate the runoff from the 1, 2 and 10 year storm event within 48 hours and safely convey the runoff from the 25 and 100 year storm events through the stabilized emergency spillway.
Parking lot landscaping areas will be graded as depressions as a measure to increase opportunities for groundwater recharge during smaller, more frequent rain events.

In addition, the entire building roof area of 7500 square feet drains to the 1,200 gallons underground tank that will store water for irrigation. Any excess roof drainage overflow will be routed directly to the Infiltration Basin.
Grass and gravel filter strips are proposed as pretreatment devices to treat stormwater runoff before it enters the Infiltration Basin. The gravel filter strip has been designed with an under drain system that discharges into the gravel trench on the bottom of the proposed Infiltration Basin.
The total post-development impervious cover treated on-site is approximately 0.602 acre.

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Infiltration Basin and Trench Facilities

County BMP ID Code (if known): DC019

Name of Facility: NICKS LAWN EQUIP REPAIR - INFIL BASIN BMP No.: 1 OF 1 Date: 1/27/11

Location: ADJACENT TO RT. 60 W

Name of Owner: TOANO INVESTMENTS NCC LLC.

Name of Inspector: M. MAJDESKI

Type of Facility: INFILTRATION BASIN

Weather Conditions: CLOUDY 40° Type: ☑ Final Inspection ☐ County BMP Inspection Program ☐ Owners 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 prevent damage to the facility.

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

Facility Item	O.K.	Routine	Urgent	Comments
Accessibility:				
Roads	✓			
Parking Areas	✓			
Gates				N/A
Locks				N/A
Safety Fencing				N/A
Observation Wells/Areas:				
Trap Doors				N/A
Manhole Covers	✓			
Grates				N/A
Steps				N/A
Pretreatment Devices: ☐ Inlet ☐ Sump ☐ Forebay ☐ Other				
Sediment	✓			
Trash & Debris	✓			
Structure	✓			
Other				

Facility Item	O.K.	Routine	Urgent	Comments
Primary Storage/ Infiltration Area:				
Trash & Debris	✓			
Sediment	✓	✓		NEEDS VEGETATION ESTABLISHMENT
Ponding / Drawdown	✓			
Surface Aggregates	✓			
Aesthetics	✓			
Other				
Inlet Structure # 1 (Describe Location): FILTER STRIP (GRAVEL)				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other				
Inlet Structure # 2 (Describe Location):				
Condition of Structure				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Inlet Structure # 3 (Describe Location):				
Condition of Structure				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Outlets - Overflow or Bypass Control Structures (Describe Location): PRIMARY OVERFLOW				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Other				
Nuisance Type Conditions:				

Facility Item	O.K.	Routine	Urgent	Comments
Mosquito Breeding	✓			
Animals, Rodents	✓			
Graffiti	✓			
Other				
Perimeter (Contributing Drainage Area) Conditions:				
Stabilization	✓			
Vegetation Condition	✓			
Trash and Debris	✓			
Aesthetics	✓			
Other				

Remarks:

3/5

Overall Environmental Division Internal Rating: 3/5

Signature: [signature] **Date:** 1/27/11

Title: Sr. Environmental Inspector

SWMProg\BMP\CoInspProg\SubDetInfil.wpd

Project Name: NICKS LAWN CARE

Location: 8231 RICHMOND ROAD

Project Number: SP-074-09

Date of Inspection: _____

Inspector(s): M. MAJDESKI

Date: _____

BMP Number: _____

Time: _____

Infiltration and Filtering Practice Construction Inspection Checklist

Development Status (Active, Inactive, Complete): ACTIVE

Stage of Construction (Pre-Construction, Installation, etc): ON-GOING

Key Questions		
Item	**X**	**Comments**
1. Type of facility (check all that apply)		
a. Infiltration - C1, C2, C3 or C4	X	
b. Filtration - D2, D3, D4, D5, or D6		
c. Bioretention - D1		
d. Extended detention (storage for Cpv)		
2. Facility Location		
a. Surface	X	
b. Underground		
3. Filtration Media		
a. No filtration media (e.g. dry well)		
b. Sand		
c. Bioretention soil		
d. Peat		
e. Other	X	STONE FILTER STRIP
4. Hydraulic configuration		
a. On-line facility		
b. Off-line facility		
5. Type of pretreatment facility		Pretreatment must be provided
a. Sediment forebay (above ground)		
b. Sedimentation chamber		
c. Grass channel		
d. Grass filter strip		
e. Plunge pool		
f. Stone diaphragm	X	
g. Other		Type:

A. Pre-Construction S = Satisfactory U = Unsatisfactory N/A = Not Applicable				
Item	**S**	**U**	**N/A**	**Comments**
1. Pre-construction meeting	X			11/17/09
a. Review of facility details, testing reqts and sequence of construction	X			
b. Review of required inspections, geo-tech reports, checklists & certificates	X			

B. Site Preparation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. If infiltration practice, facility is not used for sediment control during construction				
2. Stormwater runoff diverted around facility				
3. Tree save and non-compaction areas			✓	1/12/10
4. Facility location staked out and cleared	✓			

C. Excavation/Grading

S = Satisfactory U = Unsatisfactory N/A = Not Applicable (INFILTRATION BASIN)

Item	S	U	N/A	Comments
1. Excavation and grading conform to plans	✓			**BENCHMARK INSPECTION** 1/27/10 - ENGINEER ON-SITE
a. Location, size and depth of facility are correct	✓			
2. If infiltration practice, underlying soils not compacted during excavation	✓			
3. Embankment/berm constructed according to plan	✓			1/27/10 - GET SOLUTIONS (GEOTECH) ON-SITE
a. Suitable fill material used for construction of embankment/berm	✓			
b. Compaction completed in accordance with approved plans and specifications	✓			
c. Embankment/berm elevations, slopes and top widths are correct				

D. Installation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. If off-line facility, flow diversion structure installed according to plans				
2. Pretreatment facility installed according to approved plans				
3. Inlet(s) and inlet protection installed				
4. Structural components (e.g. foundation, walls) installed according to plans				
5. Underground chambers or pipes installed correctly with bedding if required	✓			**BENCHMARK INSPECTION** FILTER STRIP 4/1/10 : 4/2/10
6. Liner installed correctly, if applicable	✓			**BENCHMARK INSPECTION** FILTER STRIP 4/1/10 : 4/2/10
7. Filter bed composition, depth and installation conforms to approved plans and	✓			**BENCHMARK INSPECTION** FILTER STRIP 4/1/10 : 4/2/10
8. Riser/outlet structure installed correctly	✓			
a. Location, dimensions and type of riser are correct	✓			6/9/10
b. Riser equipped with removable trash rack or maintenance access	✓			
c. Location, dimensions and type of low flow orifice are correct				
d. Low flow orifice installed correctly and adequately protected from clogging				

	e. If a filtration system, underdrain system installed correctly				
8.	Emergency overflow structure/spillway installed according to plans				

E. Vegetation (INFILTRATION BASIN)

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Vegetation complies with approved planting plan and specifications	✓			6/9/10

F. Final Inspection

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Contributing drainage area stabilized				
2.	If off-line facility, flow diversion installed and operational				
3.	Pretreatment facility installed and operational				
4.	Inlet(s) installed and operational				
5.	Configuration, size and depth of bioretention facility conforms with approved plans				
7.	Vegetation established				
8.	Riser/Outlet Structure installed and operational				
9.	Emergency overflow structure/spillway installed and operational				
10.	Maintenance access routes provided				
11.	Observation Ports Installed				
12.	Flow diversions removed; runoff reaches facility				

G. Permit Approval and Documentation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

	Item	S	U	N/A	Comments
1.	Construction certification submitted				
2.	As-built plans submitted and approved				
3.	Performance bond status				
	a. Not released				
	b. Partial release				
	c. Full release				
4.	Certificate of completion issued				

Additional Comments:

Actions to be Taken:	X	
1. No action necessary; continue routine inspections		
2. Correct noted deficiencies		Correct by:
a. 1st notice		
b. 2nd notice		
3. Submit modifications to project plans		Submit by:

rev 9/08

Project Name: NICKS LAWN CARE
Location: RT 60, TOANO
Project Number: SP-074-09
Date of Inspection:
Inspector(s): M. MAJDESKI
Date:
Time:

Closed Storm Drain System Construction Inspection Checklist

Development Status (Active, Inactive, Complete): ACTIVE

Stage of Construction (Pre-Construction, Installation, etc): ON-GOING

Key Questions		
Item	X	Comments
1. Type of closed pipe system		
a. Round	X	
b. Elliptical		
c. Other		
2. Type of pipe material		
a. Reinforced concrete pipe (RCP)	X	
b. HPDE	X	
c. Corrugated metal		
d. Other		

A. Pre-Construction
S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. Pre-construction meeting	X			11/13/09
a. Review of plan details, and sequence of construction	X			↓
b. Review of required inspections, geo-tech reports, checklists & certificates	X			↓

B. Site Preparation
S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. Pipe and structures delivered and inspected prior to construction	X			
a. Inspect for material, diameter, dimensions and condition	X			

C. Excavation/Grading
S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. Excavation and grading conform to plans	X			
a. Trench bottom shaped to permit barrel of pipe to be in direct contact with soil or bedding				
b. Areas excavated below established grade shall be backfilled with VDOT #25 or 26 aggregate (unless water is encountered - then #57 aggregate shall be used).	X			

2. All earthwork shall be in conformance with VDOT Standard and Specification #303				

D. Installation

S = Satisfactory U = Unsatisfactory N/A = Not Applicable

Item	S	U	N/A	Comments
1. Bedding per VDOT 302.03(a)2(b)	✓			
a. Material shall be VDOT #25 or #26 aggregate or as specificied on the approved plans (unless water is encountered - then #57 aggregate shall be used)	✓			4 to
b. Shall be lightly compacted and shaped so pipe is in full contact with bedding	✓			
c. Shall be shaped to accommodate the bell when bell and spigot pipe is used	✓			
2. Placing Pipe per VDOT 302.03(a)2c	✓			
a. Pipe shall be placed beginning at downstream end with bell or groove ends of rigid pipe facing upstream	✓			
b. Pipe shall be inspected before backfill is placed	✓			
3. Joining Pipe per VDOT 302.03(a)2(d)				
a. Rigid pipe sections shall have ends fully entered and inner surfaces flush and even				
b. Joints shall be sealed to form a leak-resistant joint				
c. Flexible pipe sections shall be firmly joined by approved coupling bands to form a leak-resistant joint				
d. When pipes enter structure, the inside of the pipe/structure joint shall be flush and fully mortared				
e. Lift holes in rigid pipe shall be plugged with a lift hole plug furnished by the manufacturer (302.03)				
4. Backfill shall be compacted in horizontal layers not more that six inches in thickness, loose measurement. VDOT 303.04(g)				
5. Compaction of backfill shall be in accordance with VTM-1 to the following densities:				
a. 95% beneath pavement, walks and road shoulders				
b. 90% in other unpaved areas				
6. Testing and Inspection				
a. Each lift shall be tested for compaction on alternating sides of the pipe at intervals not to exceed 300 feet				
b. Pipe shall be inspected before any backfill is placed. (VDOT 302.03(a)2c)				

E. Final Inspection S = Satisfactory U = Unsatisfactory N/A = Not Applicable				
Item	S	U	N/A	Comments
1. Pipes and structures shall be free of sediment and debris				
2. All inlet protection measures removed				
3. All joints sealed				
4. Outlet protection installed and operational				
5. Configuration and dimensions of pipe system conforms with approved plans				

G. Permit Approval and Documentation S = Satisfactory U = Unsatisfactory N/A = Not Applicable				
Item	S	U	N/A	Comments
1. Construction certification submitted and				
2. As-built plans submitted and approved				
3. Performance bond status				
a. Not released				
b. Partial release				
c. Full release				
4. Certificate of completion issued				

Additional Comments:

Actions to be Taken:		X	
1. No action necessary; continue routine			
2. Correct noted deficiencies			Correct by:
a.	1st notice		
b.	2nd notice		
3. Submit modifications to project plans			Submit by:

rev 9/08

Stormwater Facilities Inspection Fee Program Preconstruction Policy and Checklist

Purpose

In accordance with Chapters 19 and 24 of the James City County Code, inspections are required for stormwater facilities constructed for all development projects. This policy establishes the guidelines for the stormwater inspection program preconstruction meeting and contains necessary documentation of the meeting.

Guidelines

1. The meeting will be held in conjunction with the Erosion and Sediment Control preconstruction meeting conducted by the Environmental Division. It is the responsibility of the owner/developer to schedule the preconstruction meeting. If a joint meeting is not possible because of unusual extenuating circumstances, then an alternate meeting can be arranged on a case-by-case basis. However, no work on any stormwater facility (BMP or storm drain pipes) can begin until the meeting is conducted.

2. Representatives of the owner/developer, general contractor, site contractor, pipe contractor, and a geotechnical engineer responsible for certifying the facilities' construction must be in attendance at the meeting. If all these representatives are not in attendance at the meeting, the meeting will be rescheduled and a Certificate to Construct stormwater Facilities will not be issued.

3. The stormwater portion of the meeting shall be conducted by the Stormwater Division (Division) representative who will inform the attendees of the minimum requirements and procedures necessary to document and certify the construction of the stormwater facilities in accordance with the approved development plans. Checklists, documentation requirements, and inspection schedules will be presented and discussed by the Division representative.

4. The approved construction plans will be reviewed at the meeting to ensure all parties are aware of the various stormwater facilities and the construction requirements including the timing of installation associated with each facility.

5. The Division representative will inform the attendees about the enforcement procedures that will be undertaken to correct any deficiencies found during the inspection process. All observations of noncompliance with the approved plans and specifications shall be documented and communicated to the contractor. If the noncompliance is not corrected immediately, the contractor and owner will be given a Notice to Comply with and appropriate time frame for correction. If the work has not been corrected, a Stop Work Order will be issued and remain in force until the problem is corrected.

6. Certification requirements will also be discussed. At the completion of the project, all stormwater facilities will require completion of a construction certification and record drawings. In addition, any temporary sediment control measure that will be converted to a permanent BMP will be required to have an interim certification completed by the geotechnical engineer.

7. The signature of each of the meeting attendees and their contact information shall be required on the checklist at the conclusion of the meeting.

- No formal asbuilt submittal yet. Only email. #
- can't adjust the design infiltration rate at this time (not preferred).

Only way would be a formal written variance request to amend the approved plan, with information to support not using 3.07 inches/hour as design basis.

- More spot shot data along the slopes may show that facility as constructed is not as far off as thought. (Contours are being interpolated)

- Important - bottom elev at least to EL. 94 and minimum 1,100 square feet of flat bottom surface area.

- Slopes generally per plan & stabilized.

- 1) Certified asbuilt
  2) Construction Certification

MEETING 12/22/10
DAVID NICE, BILL CAIN, SCOTT THOMAS

STORMWATER DIVISION

Preconstruction Meeting

Project: Nick's Lawn Care Date: 11/17/09

1. Is the person who will be certifying the construction of the stormwater facilities present?

   YES ☑ NO ☑ Name: _____

2. Is the contractor (s) who will be installing the stormwater facilities present?

   YES ☑ NO ☐ Name: David Nice Builders

3. Is a representative of the owner/developer present?

   YES ☐ NO ☑ Name: _____

4. Is a representative of the general contractor present?

   YES ☑ NO ☐ Name: Andy McKown, Brandon Nice

5. A copy of the approved site plan is required to be on the project site daily.

6. Are there any proposed revisions to the approved plan pending?

   YES ☐ NO ☑

7. Any proposed changes to the approved plan must be submitted to James City County for review and approval prior to implementation.

8. Are any representative present aware of any discrepancies, errors or deficiencies with the approved plan?

   YES ☐ NO ☑

9. Are all representatives aware of the inspection and documentation requirements for the project?

   YES ☑ NO ☐

County Representative: _____

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STORMWATER DIVISION

Preconstruction Meeting Checklist

Project: Nick's Lawn Care

Date: 11/17/09 **Time:** 1:15 ☐ AM ☑ PM

Permittee: Toano NCC Investments, LLC **Address:** 15402 Rolfe Ct Lanexa, VA 23089

Contractor: David Nice Builders

Phone No.: _____ **Fax No.:** _____

Address: _____

1. **Timing of Installation of Stormwater Facilities:**

   A. **Narrative Plan**

   (B.) **Contractor-Developed Sequence of Construction**

2. **Inspection Requirements for Stormwater Facilities:**

____	Wet Ponds	____	Extended Dry Detention
____	Wetlands	____	Outlet Protection
✓	Infiltration	____	Stormwater Conveyance Channels
____	Filtering Systems	✓	Storm Drainage System (Pipe)
____	Open Channel Systems	____	Other
____	Sediment Basins		

3. **Inspection and Enforcement Procedures**

   A. **Permittee/Contractor Inspections:** ✓

   B. **County Inspections:** ✓

      1. **Benchmark:** ✓

      2. **Routine:** ✓

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Stormwater Division

Preconstruction Meeting Checklist

C. Enforcement Actions: ✓

1. Inspection Reports & Initial Contact: ✓
2. Notice Comply: ✓
3. Stop Work Order: ✓
4. Legal Proceedings: ✓

4. Limits of Clearing and Non-compaction Areas Protection Measures Inspection

A. Non-compaction Areas protected adequately ☐ Yes ☐ No N/A

B. Color of Flagging: GREEN / WHITE

C. Non-compaction Areas Protection Measures, Type: N/A

5. Issuance of Stormwater Facility Inspection, Record Drawing and Construction Certification; Standard Forms and Instructions (as applicable to project) ✓

6. Attendees – Identify contract Person for Stormwater Facilities Construction

Signature: _____ _____ _____

Printed Name: Andy McKown Brandon Nice _____

Affiliation: David Nice Builders. David Nice Builders. _____

Address: _____ _____ _____

_____ _____ _____

Phone No.: _____ _____ _____

7. Comments: _____

_____

County Representative: _____ Date: 11/17/09

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SUP-6-09

PROJECT NAME 8231 Richmond Road
LMDG JOB NO. 2007190-000.00
DATE July 21, 2009

TABLE 2

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP POINTS		FRACTION OF SITE SERVED BY BMP		WEIGHTED BMP POINTS
Infiltration Basin	10	x	2.13 / 2.11	=	10.09
	TOTAL WEIGHTED STRUCTURAL BMP POINTS:				10.09

B. NATURAL OPEN SPACE CREDIT

FRACTION OF SITE		NATURAL OPEN SPACE CREDIT		POINTS FOR NATURAL OPEN SPACE
0.00 /	2.11	x (0.1 per 1%)	=	0.00
0.00 /	2.11	x (0.15 per 1%)	=	0.00
	TOTAL NATURAL OPEN SPACE CREDIT:			0.00

C. TOTAL WEIGHTED POINTS

10.09		0.00		10.09
STRUCTURAL BMP POINTS	+	NATURAL OPEN SPACE POINTS	=	TOTAL

JAMES CITY COUNTY BMP GUIDELINES, TABLE 1, PAGE 7, SECTION C4

INFILTRATION BASIN 1.0 in/imp Ac, 60%, 10 POINTS

PROPOSED IMP AREA = 0.51Ac

REQUIRED STORAGE VOLUME

$2 \times \frac{0.5}{12} \times 0.51\,Ac \times 43560\,ft^2 = 1851\,ft^3$

PROVIDED STORAGE VOLUME FOR WATER QUALITY

$12,384\,ft^3$ at elevation 98.80

Scan pages
that were
missed

Stormwater Division

MEMORANDUM

DATE: August 25, 2014
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jacob Smith, Stormwater Intern
PO: 110426
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	NICKS LAWN EQUIPMENT REPAIR INFILTRATION BASIN		
BMP ID OR GEN FILE NUMBER:	DC019	**OWNER NAME:**	TOANO INVESTMENTS LLC
PIN:	1240100007	**SITE ADDRESS:**	8231 RICHMOND ROAD
		LEGAL DESCRIPTION:	LOT ADJ JENSON

MAINTENANCE AGREEMENT IN FILE:	N/A	**BOOK/PAGE OR DOCUMENT NO.:**	N/A	**OTHER DESCRIPTION:**	N/A

BOX NO.:	6	**COMMENTS:**	VARIOUS FILES

Stage-Area-Storage for Pond Infiltration Basin: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.00	1,088	0
94.10	1,132	111
94.20	1,176	226
94.30	1,221	346
94.40	1,267	471
94.50	1,314	600
94.60	1,362	734
94.70	1,411	872
94.80	1,460	1,016
94.90	1,511	1,164
95.00	1,562	1,318
95.10	1,620	1,477
95.20	1,680	1,642
95.30	1,740	1,813
95.40	1,802	1,990
95.50	1,865	2,173
95.60	1,928	2,363
95.70	1,993	2,559
95.80	2,059	2,762
95.90	2,126	2,971
96.00	2,194	3,187
96.10	2,263	3,410
96.20	2,332	3,640
96.30	2,403	3,876
96.40	2,475	4,120
96.50	2,548	4,371
96.60	2,622	4,630
96.70	2,697	4,896
96.80	2,773	5,169
96.90	2,850	5,450
97.00	2,928	5,739
97.10	3,007	6,036
97.20	3,087	6,341
97.30	3,168	6,653
97.40	3,251	6,974
97.50	3,334	7,304
97.60	3,418	7,641
97.70	3,504	7,987
97.80	3,590	8,342
97.90	3,677	8,705
98.00	3,766	9,077
98.10	3,855	9,458
98.20	3,946	9,848
98.30	4,038	10,248
98.40	4,130	10,656
98.50	4,224	11,074
98.60	4,319	11,501
98.70	4,414	11,937
98.80	**4,511**	**12,384**
98.90	4,609	12,840
99.00	4,708	13,306
99.10	4,808	13,781
99.20	4,908	14,267
99.30	5,010	14,763
99.40	5,113	15,269
99.50	5,217	15,786
99.60	5,322	16,313
99.70	5,428	16,850
99.80	5,535	17,398
99.90	5,643	17,957
100.00	**5,752**	**18,527**

REQUIRED STORAGE VOLUME FOR WQ 1,651ft³

PROVIDED STORAGE VOLUME FOR WATER QUALITY 12,384ft³ @ EL 98.80

Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.130 ac, 0.00% Impervious, Inflow Depth = 1.02" for 2-Year event
Inflow = 0.82 cfs @ 0.09 hrs, Volume= 0.182 af
Outflow = 0.22 cfs @ 2.76 hrs, Volume= 0.157 af, Atten= 73%, Lag= 160.4 min
Primary = 0.22 cfs @ 2.76 hrs, Volume= 0.157 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 97.21' @ 2.76 hrs Surf.Area= 3,096 sf Storage= 6,374 cf

Plug-Flow detention time= 265.9 min calculated for 0.157 af (86% of inflow)
Center-of-Mass det. time= 255.6 min (339.1 - 83.6)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,527 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,088	148.0	0	0	1,088
95.00	1,562	167.0	1,318	1,318	1,590
96.00	2,194	202.0	1,869	3,187	2,634
97.00	2,928	236.0	2,552	5,739	3,839
98.00	3,766	270.0	3,338	9,077	5,231
99.00	4,708	305.0	4,228	13,306	6,858
100.00	5,752	339.0	5,221	18,527	8,630

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.22 cfs @ 2.76 hrs HW=97.21' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.22 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=94.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.130 ac, 0.00% Impervious, Inflow Depth = 1.97" for 10-Year event
Inflow = 0.76 cfs @ 0.09 hrs, Volume= 0.350 af
Outflow = 0.30 cfs @ 5.60 hrs, Volume= 0.227 af, Atten= 61%, Lag= 330.7 min
Primary = 0.30 cfs @ 5.60 hrs, Volume= 0.227 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 98.50' @ 5.60 hrs Surf.Area= 4,224 sf Storage= 11,075 cf

Plug-Flow detention time= 272.0 min calculated for 0.227 af (65% of inflow)
Center-of-Mass det. time= 213.6 min (382.6 - 169.1)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,527 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,088	148.0	0	0	1,088
95.00	1,562	167.0	1,318	1,318	1,590
96.00	2,194	202.0	1,869	3,187	2,634
97.00	2,928	236.0	2,552	5,739	3,839
98.00	3,766	270.0	3,338	9,077	5,231
99.00	4,708	305.0	4,228	13,306	6,858
100.00	5,752	339.0	5,221	18,527	8,630

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.30 cfs @ 5.60 hrs HW=98.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.30 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=94.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.130 ac, 0.00% Impervious, Inflow Depth = 2.06" for 100-Year event
Inflow = 2.95 cfs @ 0.09 hrs, Volume= 0.366 af
Outflow = 2.90 cfs @ 1.49 hrs, Volume= 0.284 af, Atten= 2%, Lag= 84.1 min
Primary = 0.33 cfs @ 1.49 hrs, Volume= 0.237 af
Secondary = 2.57 cfs @ 1.49 hrs, Volume= 0.048 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 98.94' @ 1.49 hrs Surf.Area= 4,649 sf Storage= 13,029 cf

Plug-Flow detention time= 254.7 min calculated for 0.284 af (78% of inflow)
Center-of-Mass det. time= 244.6 min (292.2 - 47.6)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,527 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,088	148.0	0	0	1,088
95.00	1,562	167.0	1,318	1,318	1,590
96.00	2,194	202.0	1,869	3,187	2,634
97.00	2,928	236.0	2,552	5,739	3,839
98.00	3,766	270.0	3,338	9,077	5,231
99.00	4,708	305.0	4,228	13,306	6,858
100.00	5,752	339.0	5,221	18,527	8,630

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.33 cfs @ 1.49 hrs HW=98.94' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.33 cfs)

Secondary OutFlow Max=2.54 cfs @ 1.49 hrs HW=98.94' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.54 cfs @ 0.91 fps)

VHB *Computations*

Project: NICK'S
Location: JCC
Calculated by:
Checked by:
Title

Project #
Sheet of
Date: 12-14-10
Date:

EVENT	MAX. ELEV.	MAX. VOLUME CF	DISCHARGE CFS
2yr des 3.07	97.39	6900	0
2yr ab 3.07	97.91	7037	0
Δ	0.52 ft	137 CF	
2yr des 6.14	97.03	5808	0
2yr ab 6.14	97.55	5975	0
Δ	0.52 ft	167 CF	
10 yr des 3.07	98.77	12083	0
10 yr ab 3.07	98.60	9350	1.61
Δ	0.17 ft	2733 CF	1.61 cfs
10 yr des 6.14	98.14	9522	0
10 yr ab 6.14	98.57	9238	0.92
Δ	0.43 ft	284 CF	0.92 cfs
100 yr des 3.07	98.96	12906	3.02
100 yr ab 3.07	98.68	9663	4.11
Δ	0.28 ft	3243 CF	1.09 cfs
100 yr des 6.14	98.94	12822	2.51
100 yr ab 6.14	98.67	9621	3.73
Δ	0.27	3201 CF	1.22 CFS

Asbuilt data

8231 Richmond Road

JAMES CITY COUNTY
VIRGINIA

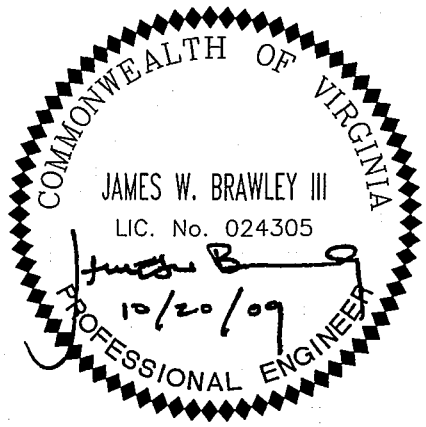
AUGUST 24, 2009

REVISED OCTOBER 20, 2009

JCC SP-0074-2009

LMDG FILE NO. 2007190-000.00

SUPPORTING ENGINEERING DOCUMENTS



SP-74-09
FINAL

LANDMARK
DESIGN GROUP

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

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PROJECT NARRATIVE

Nick's Lawn Equipment
8231 Richmond Road
James City County
Virginia

PROJECT NARRATIVE

Project Description:

The scope of this project includes the construction of the 7500 square foot proposed building which will include two 200 square foot offices, a 2000 square foot showroom and a 5100 square foot storage/shop area. The proposed facility will be used for lawn equipment sales and repairs and for sale of plant and garden supplies.

The project drains to Diascund Creek. There are no wetlands or Resource Protection Areas found within limits of this project. A minor impact of 1135 square feet is proposed to on- site steep slopes. All disturbed areas will receive permanent seeding applied in accordance with Virginia Erosion and Sediment Control Handbook standards. All slopes 3:1 and steeper will be protected with soil stabilization matting. Stormwater runoff from the project site will be managed by the proposed Infiltration Basin. The total site disturbed area is approximately 1.56 acres.

Existing Site Conditions:

This site is approximately 2.11 acres and is mostly wooded with access cleared for the existing building. Site elevations range from approximately 95.0 to 117.0 with moderate to steep slopes. Site utilities including; water, sanitary electricity and telecommunications are available along Richmond Road.

Offsite Disturbed Area:

Minimal offsite disturbance, within VDOT Right of Way, for the installation of utility lines and site entrance of approximately 0.14 Ac is proposed. No other offsite disturbance is anticipated.

Soils:

The predominant site soils are: Craven-Uchee Complex, Emporia Complex and Kempsville Fine Sandy Loam

> *Craven-Uchee complex* (11C) consists of moderately well drained Craven soils and well-drained Uchee soils. Areas of this complex are on narrow ridge tops.

Slopes are relatively uneven. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer is pale olive fine sandy loam 5 inches thick. The subsoil extends to a depth of 42 inches and is yellowish brown clay in the upper part and yellowish brown sandy clay loam mottled with gray in the middle and lower parts. The permeability of this soil is slow, and available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential. A seasonal high water table is at a depth of 2 to 3 feet in the Craven soils and 3.5 to 5 feet in the Uchee soils. This soil is in capability subclass IIIe. The hydrologic soil group for this soil is C.

Emporia complex (15E) appears on side slopes along drainage ways. Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 4 inches thick. The subsoil extends to a depth of 45-50 inches and is yellowish brown loam with mostly strong brown mottles in the upper parts; yellowish brown, firm sandy clay loam with strong brown and gray mottles in the middle part; and mottled gray and brown, firm sandy clay loam in the lower part. The substratum is variegated gray, brown, and red, firm sandy clay loam to a depth of at least 75 inches. In this Emporia soil, permeability is moderate in the upper part of the subsoil and moderately slow to slow in the lower part. The available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has moderate shrink-swell potential. A perched high water table is at a depth of 3 to 4 ½ feet in winter and spring. This soil is in capability subclass VIIe. The hydrologic soil group for this soil is C.

Kempsville Fine Sandy Loam (18B) this soil is deep, gently sloping and well drained. It is on broad uplands and side slopes. Slopes commonly are 200'-600' long. Areas of this soil are elongated, irregularly rectangular, or oval. The range is from about 3-60 acres. The permeability of this soil is mutative and available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The surface layer is friable and slope is the main limitations of this soil for community development. The permeability of subsoil and slope limit use of the soil as a site for septic tank absorption fields, sewage lagoons, and small commercial buildings. This soil is capability subclass IIe.

Critical Erosion Areas:

Areas with Craven-Uchee soils shall be monitored due to the high erodiability factor.

Erosion and Sediment Control Measures

All vegetative and structural erosion and sediment control practices will be constructed and maintained in accordance with the minimum standards and specifications of the Virginia Erosion and Sediment Control Handbook, Third edition dated 1992.

Structural Practices:

1. Temporary Construction Entrance (3.02): Construction entrance will be installed to prevent tracking onto the existing roadway.

2. Silt Fence (3.05): Silt fence shall be installed along the toe of all slopes and all other areas that may carry silt beyond the right of way. Silt fence shall also be installed on the downhill side of the utility extensions.

3. Diversion Dikes (3.09): Will be utilized to minimize offsite drainage onto exposed areas.

4. Rock Check Dam (3.20): Install rock check dams in ditches where shown on the plans.

5. Outlet Protection (3.18): Will be utilized at all outfall points using Class I riprap.

6. Permanent Seeding (3.32): Permanent seeding shall be applied to all disturbed areas on the site once final grades have been established.

7. Slope Stabilization Blankets & Matting (3.36): All ditches shall be lined with treatment 1 matting (VDOT EC-2). All slopes steeper than 3:1 shall be treated with treatment 1 matting.

8. Tree Protection (3.38): Tree protection shall be installed prior to clearing operations.

Management Strategies and Sequence of Construction:

Sequence of construction

1) Notify James City County Environmental division a minimum of 48 hours prior to the commencement of any construction operations.
2) conduct an on-site pre-construction meeting between the contractor, the owner, the engineer, and the James City County environmental division inspector.
3) Install the construction entrance and flag the limits of construction as indicated on the erosion & sediment control plans.
4) Clear and grub area within the limits of clearing and required for installation of all temporary erosion and sediment control measures as indicated on plans.
5) Complete installation of all temporary erosion and sediment control measures indicated on the plans.
6) Proceed with demolition and grading. All slopes 3:1 or steeper shall be stabilized with soil stabilization mats.
7) Upon completion of grading operations, install wire reinforced supersilt fence at top of the fill slope.

8) Proceed with construction of the proposed building.
9) Install underground irrigation tank.
10) Install asphalt paving, concrete walks and pavers.
11) Upon completion of final site stabilization and receiving authorization from the assigned James city county environmental division inspector, final grading and installation for infiltration basin & gravel filter strip may commence. After the final grading is completed, the basin floor shall be deep tilled to provide a well aerated, highly porous surface texture.
12) Install landscaping as shown on landscaping plans.
13) complete permanent seeding, fertilize and mulch as required.
14) After an acceptable and stable ground cover has been established, remove silt fence, tree protection and temporary sediment control measures. However, no erosion and sediment control measures shall be removed without first authorization from the assigned James City County Environmental inspector.
15) During all phases of construction and immediately following a rain event, the contractor shall monitor and inspect all erosion and sediment control measures installed on the project. Contractor shall use additional E&S control measures in accordance with Virginia Erosion and Sediment Control Manual as needed.

Stormwater Management:

An Infiltration Basin with an approximate floor area of 1,102 square feet is proposed for treating the runoff from this site.

The attached geotechnical report (Sheet C-4) indicates that infiltration rates in the area of the proposed Infiltration Basin vary from the 4.06 to 8.21 inches per hour with a median infiltration rate of 6.14 inches per hour. A safety factor of 2 (3.07 inches per hour) has been used for the design infiltration rate per VSMH standards.

The proposed Infiltration Basin has been designed to completely infiltrate the runoff from the 1, 2 and 10 year storm event within 48 hours and safely convey the runoff from the 25 and 100 year storm events through the stabilized emergency spillway.
Parking lot landscaping areas will be graded as depressions as a measure to increase opportunities for groundwater recharge during smaller, more frequent rain events.

In addition, the entire building roof area of 7500 square feet drains to the 1,200 gallons underground tank that will store water for irrigation. Any excess roof drainage overflow will be routed directly to the Infiltration Basin.
Grass and gravel filter strips are proposed as pretreatment devices to treat stormwater runoff before it enters the Infiltration Basin. The gravel filter strip has been designed with an under drain system that discharges into the gravel trench on the bottom of the proposed Infiltration Basin.
The total post-development impervious cover treated on-site is approximately 0.602 acre.

EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

James City County, Virginia
Environmental Division

Erosion and Sediment Control and Stormwater Management Design Plan Checklists

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GENERAL INFORMATION

Project Name: NICK'S LAWN EQUIPMENT
Owner / Applicant: JAMES W. BRAWLEY
Plan Preparer: LAND MAR. DESIGN GROUP Email: jbrawley@landmarkdg.com
Project Location: 8231 RICHMOND RD, JAMES CITY COUNTY, VIRGINIA
Tax Map / Parcel: (1-7) (1-24) / 1240100007
County Plan No. (if known): JCC-SUP-006-2009 / JCC-C-0036-2009
County BMP Type: INFILTRATION BASIN (-)
Other information submitted in addition to this checklist (Check all that apply):

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

Issue Date
March 1, 2001

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

I. *GENERAL:*

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

II. *SITE PLAN:*

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

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

Yes No N/A

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

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

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

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

☑ ☐ ☐ *STANDARD COUNTY NOTES* are required to be placed on the erosion and sediment control plan. Refer to the standard James City County Erosion and Sediment Control Notes, latest version.

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

III. *NARRATIVE:*

Yes No N/A

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

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

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

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

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

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

Yes No N/A

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

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

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

IV. *CALCULATIONS:*

Yes No N/A

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

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

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

I. *GENERAL:*

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

Yes No N/A

☑ ☐ ☐ *SOILS MAP* with soil symbols, boundaries and legend in accordance with the current Soil Survey of James City and York Counties and the City of Williamsburg, Virginia with approximate locations of the project site, BMPs and applicable drainage basins.

☑ ☐ ☐ *STORMWATER MANAGEMENT NARRATIVE* in a brief and simple format which describes the project; location; site and drainage basin soil characteristics; receiving water or drainage facility; existing site and drainage basin conditions (topography, land use, cover, slopes, etc.); proposed site development; proposed stormwater management and drainage plan including County BMP type selected; summary of hydrology and hydraulics; maintenance program; and any special assumptions utilized for development of the stormwater management and drainage design plan or computations.

☑ ☐ ☐ *TEMPORARY STORMWATER MANAGEMENT* (if applicable) for control of stormwater runoff encountered during construction activities in addition to measures provided in the erosion and sediment control plan or stormwater management/drainage plan for the site. Adequate protection measures or sequencing provided.

☑ ☐ ☐ *MODIFICATION PLAN* clearly defined for temporary sediment control structures which will be converted to permanent SWM/BMP structures. Includes appropriate hydrologic and hydraulic computations, conversions, sequencing and cleanout information or details. Normally related to primary control structures associated with dry detention or wet retention ponds. Normally not permitted for Group C or D categories such as bioretention, infiltration and filtering system facilities.

☑ ☐ ☐ *STORMWATER MANAGEMENT and DRAINAGE DESIGN REPORT* in a bound 8-1/2 x 11 inch size format. Report shall generally include a title sheet, date, project identification, owner and preparer information, table of contents, narrative, summaries and computations as required. Computations may include: backwater, closed conduit, headwater, hydraulic, hydraulic grade line, hydrology, inlet, open channel, storm sewer, water quality, extended detention or stream channel protection and muti-stage storm routing calculations, as applicable, for the project. Computation data may include hand or computer generated computations, maps or schematics. All information should be presented in a clear, easy to follow format and should closely match construction plan information.

☑ ☐ ☐ *PLAN VIEW* at 1 inch = 50 ft. scale or less (1" = 40', 1" = 30', etc.)

- ☑ ☐ ☐ North arrow and plan legend.
- ☑ ☐ ☐ Property lines.
- ☑ ☐ ☐ Adjacent property information.
- ☑ ☐ ☐ Existing site features and existing impervious cover areas.
- ☑ ☐ ☐ Impervious cover tabulations.
- ☑ ☐ ☐ Existing drainage facilities (natural or manmade).
- ☑ ☐ ☐ Existing environmentally sensitive areas (RPA, wetlands, floodplain, steep slopes, critical soils, buffers, etc.).
- ☑ ☐ ☐ Existing and proposed contours (1' or 2' contour interval) and spot elevations as necessary to define high and low topography.
- ☑ ☐ ☐ Existing and proposed easement locations.

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

II. ***STORMWATER CONVEYANCE SYSTEMS:***

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

Yes No N/A

☑ ☐ ☐ *STORMWATER CONVEYANCE SYSTEM COMPUTATIONS*

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

III. *STORMWATER MANAGEMENT / BMP FACILITIES:*

Yes No N/A

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

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

☑ ☐ ☐ *FACILITY CONFIGURATION and MINIMUM SEPARATIONS*

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

Yes No N/A

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

Yes No N/A

☑ ☐ ☐ *HYDRAULIC COMPUTATIONS*

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

☑ ☐ ☐ *POND or RESERVOIR ROUTING*

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

☑ ☐ ☐ *MISCELLANEOUS COMPUTATIONS*

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

Yes No N/A

- ☐ ☐ ☑ Riser / base structure flotation analyses. FS = 1.25 minimum.
- ☐ ☐ ☑ Downstream danger reach study and/or emergency action plan (if conditions warrant).
- ☐ ☐ ☑ Upstream backwater analyses onto offsite adjacent property (if conditions warrant).
- ☐ ☐ ☑ 100 year floodplain impacts (if conditions warrant).

Yes No N/A

☑ ☐ ☐ *GEOTECHNICAL REQUIREMENTS*

- ☑ ☐ ☐ Geotechnical Report with recommendations specific to BMP facility type selected. Report prepared by a registered professional engineer. Requires submission, review and approval prior to issuance of Land Disturbance Permit.
- ☑ ☐ ☐ Initial Feasibility Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
- ☑ ☐ ☐ Concept Design Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
- ☑ ☐ ☐ Minimum Boring locations: borrow area, pool area, principal control structure, top of facility near one abutment and emergency spillway if provided.
- ☑ ☐ ☐ Boring logs with Unified Soil Classification (ASTM D2487), soils descriptions and depths to bedrock and the seasonal water table indicated.
- ☑ ☐ ☐ Standard County Record Drawing/Construction Certification note provided on plan. *Note: It is understood that preparation of record drawings and construction certifications as required for project facilities may not necessarily be performed by the plan preparer. These components may be performed by others.*

☐ ☐ ☑ *PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS*

☐ ☐ ☐ *EXISTING GROUND AND PROPOSED GRADE*

- ☐ ☐ ☐ Embankment or excavation side slopes labeled (3H:1V maximum).
- ☐ ☐ ☐ Minimum top width labeled (per VESCH or VSMH requirements).
- ☐ ☐ ☐ Removal of unsuitable material under proposed facility (per Geotechnical Report requirements).

Yes No N/A

☐ ☐ ☑ *CORE TRENCH*

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

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

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

☐ ☐ ☑ *PRINCIPAL CONTROL STRUCTURE OUTLET BARREL*

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

☐ ☐ ☑ *SEEPAGE CONTROL*

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

- ☐ ☐ ☐ *ANTI-SEEP COLLARS*
  - ☐ ☐ ☐ Anti-seep collar, concrete preferred.
  - ☐ ☐ ☐ Size - 15 percent increase in length of saturation using outside pipe diameter.
  - ☐ ☐ ☐ Spacing and location on barrel (located at least 2 feet from a pipe joint).
  - ☐ ☐ ☐ *FILTER DIAPHRAGMS*
  - ☐ ☐ ☐ Design based on latest NRCS design methods and certified by a professional engineer.

Yes	No	N/A	
☑	☐	☐	*ELEVATION AND DIMENSIONAL DESIGN DATA*
☑	☐	☐	Top of facility - construction height and settled height (10 percent settlement).
☐	☐	☑	Crest of principal control structure spillway at least one (1) foot below crest of emergency spillway, if provided.
☑	☐	☐	Minimum freeboard of one (1) foot above the 100-year design high water elevation for facilities <u>with</u> an emergency spillway.
☐	☐	☑	Minimum freeboard of two (2) feet above the 100-year design high water elevation for facilities <u>without</u> an emergency spillway or in accordance with the SCS National Engineering Handbook (prior approval required).
☐	☐	☑	Basin Sediment Clean-Out elevation (permanent mode). Typically 10 to 25 percent of water quality volume.
☑	☐	☐	*CROSS SECTION THROUGH FACILITY*
☑	☐	☐	Existing Ground.
☑	☐	☐	Proposed grade.
☑	☐	☐	Top of facility - constructed and settled.
☑	☐	☐	Location of emergency spillway with side slopes labeled (emergency spillway in cut).
☑	☐	☐	Bottom of core trench (4' minimum).
☑	☐	☐	Location of each soil boring.
☐	☐	☑	Barrel location.
☑	☐	☐	Existing and proposed utility location/protection.
☑	☐	☐	*EMERGENCY SPILLWAY PROFILE*
☑	☐	☐	Existing ground.
☑	☐	☐	Inlet, level (control) and outlet sections per SCS.
☑	☐	☐	Spillway and crest elevations.
☑	☐	☐	*PRETREATMENT DEVICES* of adequate depth and properly designed using required pretreatment volumes for the selected County BMP facility type. Including, but not limited to: sediment forebays, sediment basins, sumps, grass channels, gravel diaphragms, plunge pools, chamber separators, manufactured systems or other acceptable methods.

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

IV. ***OUTLET PROTECTIONS:***

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

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

Plan Preparer: James V Pe 9

Date: 8-24-09

STEEP SLOPES WAIVER REQUEST

Development Management
101-A Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784
P: 757-253-6671
F: 757-253-6822
devman@james-city.va.us

jccEgov.com

Code Compliance
757-253-6620
codecomp@james-city.va.us

Environmental Division
757-253-6670
environ@james-city.va.us

Planning and Zoning
757-253-6685
planning@james-city.va.us

October 13, 2009

Mr. James W. Brawley
Senior Associate
LandMark Design Group
4029 Ironbound Road, Suite 100
Williamsburg, VA 23188

Re: Exception for Disturbance of Steep Slopes
Nicks Lawn Equipment
County Plan No.: SP-74-09

Dear Mr. Brawley:

The Environmental Division is in receipt of your written request dated August 25th 2009 to obtain exception from Section 23-5 of the County's Chesapeake Bay Preservation ordinance for disturbance of slopes 25 percent or greater associated with the above referenced project. Pursuant to the provisions of 23-14(e) of the County's Chesapeake Bay Preservation ordinance, an exception is hereby granted. Applicable conditions are as follows:

1. Steep slope disturbances are only authorized within the defined limits of work for the project.
2. Steep slope disturbances are limited to a total of 0.026 acres as defined on the environmental inventory.
3. Approved erosion and sediment control plan measures must be fully implemented downstream of applicable steep slope areas prior to their disturbance.

Please note that approval of this exception, with the conditions stated, in no way implies final approval of a site or subdivision plan as required by the Chapter 24 Zoning or Chapter 19 Subdivisions of the County Code; nor does it constitute final approval of an erosion and sediment control or stormwater management plan as required by Chapter 8 Erosion and Sediment Control and Chapter 23 Chesapeake Bay Preservation of the County Code. Approval of this exception is also contingent upon no major (substantial) changes in the development plan, or if site conditions change, become apparent or alter significantly following the date of this approval.

Thank you for your efforts to protect the Chesapeake Bay and its tributaries from the effects of non-point source pollution associated with land use activities. Please contact me at 253-6639 if you have any questions about this exception or any of its associated conditions.

Sincerely,

Scott J. Thomas, P.E.
Director
Environmental Division

SJT/sjt
ChesBay\SteepSlope\SP7409.approval

LANDMARK
DESIGN GROUP

August 25, 2009

Mr. Scott Thomas, P.E.
Director
Environmental Division
P.O. Box 8784
Williamsburg, VA 23187-8784

RE: **Steep Slope Waiver Request, JCC-C-0036-2009**
Nicks Lawn Equipment
8231 Richmond Road, Williamsburg, VA

Dear Mr. Thomas:

On behalf of our Client, owner of the above referenced property/project, the LandMark Design Group, Inc., requests a waiver of part of Section 23-5 of the James City County Chesapeake Bay Preservation Ordinance as the referenced project requires impacting 0.026 acres (1130 s.f.) of slopes in excess of 25%. The impact areas are associated with the proposed site development and are shown on the Environmental Inventory sheet, C-2.

We trust that this request is satisfactory for your approval. Please advise us if you need any additional information or would like to discuss this further.

Sincerely,

The LandMark Design Group, Inc.

James W. Brawley, P.E.
Senior Associate

4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdg.com

GEOTECHNICAL LETTER

GET Solutions, Inc.

Geotechnical • Environmental • Testing

August 20, 2009

To: **James City County, Environmental Division**
101 Mounts Bay Road
Williamsburg, VA 23187

Attn: Mr. Barry Moses, P.E.

Re: BMP Soil Design Parameters
8231 Richmond Road
James City County, Virginia
GET Project No: WM09-115G

Dear Mr. Moses:

GET Solutions, Inc. has reviewed the model used by LandMark Design Group in designing the BMP pond at the above referenced project site. It is noted that **GET Solutions, Inc.** is the geotechnical engineer of record for this project, and has initially performed the subsurface soil exploration at this site in order to develop the soil permeability design parameters to be used by the civil engineer (LandMark Design Group) in sizing the BMP basin.

Our field exploration activities included performing a series of two in-situ infiltration tests, as reported in a submittal dated June 22, 2009. These tests indicated coefficient of permeability values of the natural subsurface soils to be 8.2 in/hr and 4.05 in/hr.

In accordance with their calculations, the civil engineer has indicated that the BMP basin design is based on an infiltration/runoff volume of 12,384 cf; an infiltration time of 18.75 hrs; and a drainage area of 2.14 acres (C=0.48). With that, the civil engineer used a coefficient of permeability of 3.07 in/hr in their design (which is equivalent to an average of the two test values with an applied safety factor of 2.0). In this respect, it is our opinion that the use of the indicated permeability value of 3.07 in/hr for design is appropriate .

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

Respectfully Submitted,
G E T Solutions, Inc.

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

1592 Penniman Road, Suite E • Williamsburg, VA 23185 • Phone (757) 564-6452 • Fax (757) 564-6453
info@getsolutionsinc.com

WORKSHEET FOR BMP POINT SYSTEM

PROJECT NAME 8231 Richmond Road
LMDG JOB NO. 2007190-000.00
DATE October 19, 2009

TABLE 2

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP POINTS		FRACTION OF SITE SERVED BY BMP		WEIGHTED BMP POINTS
Infiltration Basin	10	x	2.20 / 2.11	=	10.43
			TOTAL WEIGHTED STRUCTURAL BMP POINTS:		10.43

B. NATURAL OPEN SPACE CREDIT

FRACTION OF SITE		NATURAL OPEN SPACE CREDIT		POINTS FOR NATURAL OPEN SPACE
0.00 /	2.11	x (0.1 per 1%)	=	0.00
0.00 /	2.11	x (0.15 per 1%)	=	0.00
		TOTAL NATURAL OPEN SPACE CREDIT:		0.00

C. TOTAL WEIGHTED POINTS

10.43	+	0.00	=	10.43
STRUCTURAL BMP POINTS		NATURAL OPEN SPACE POINTS		TOTAL

PRE-DEVELOPMENT AND POST-DEVELOPMENT SUMMARY TABLE

Pre-Development and Post Development Summary Table

Storm Event	Pre-Development Drainage Area ID	Pre-Development Flow Rate (cfs)	Post-Development Drainage Area ID	Post-Development Flow Rate (cfs)	Difference
2-year storm	**POI 1 PRE**	3.26	**POI 1 POST**	1.66	**-1.60**
	DA-1 PRE	1.44	DA-1 POST	1.52	0.08
	DA-2 PRE	1.89	DA-2A POST	3.05	4.29
			DA-2B POST	3.13	
			BMP	0.00	-1.89
	POI 2 PRE	2.58	**POI 2 POST**	2.41	**-0.17**
	DA-3 PRE	2.58	DA-3 POST	2.41	-0.17
10-year storm	**POI 1 PRE**	4.26	**POI 1 POST**	2.14	**-2.12**
	DA-1 PRE	1.88	DA-1 POST	1.98	0.10
	DA-2 PRE	2.47	DA-2A POST	3.96	5.55
			DA-2B POST	4.06	
			BMP	0.00	-2.47
	POI 2 PRE	3.38	**POI 2 POST**	3.13	**-0.25**
	DA-3 PRE	3.38	DA-3 POST	3.13	-0.25
25-year storm	**POI 1 PRE**	4.85	**POI 1 POST**	2.54	**-2.31**
	DA-1 PRE	2.14	DA-1 POST	2.26	0.12
	DA-2 PRE	2.81	DA-2A POST	4.48	6.27
			DA-2B POST	4.60	
			BMP	1.58	-1.23
	POI 2 PRE	3.86	**POI 2 POST**	3.54	**-0.32**
	DA-3 PRE	3.86	DA-3 POST	3.54	-0.32
100-year storm	**POI 1 PRE**	5.65	**POI 1 POST**	4.48	**-1.17**
	DA-1 PRE	2.49	DA-1 POST	2.63	0.14
	DA-2 PRE	3.27	DA-2A POST	5.27	7.41
			DA-2B POST	5.41	
			BMP	2.03	-1.24
	POI 2 PRE	4.51	**POI 2 POST**	4.17	**-0.34**
	DA-3 PRE	4.51	DA-3 POST	4.17	-0.34

PRE-DEVELOPMENT DRAINAGE AREAS SUMMARY

Summary for Subcatchment DA-1 PRE: DA-1 PRE

Runoff = 0.84 cfs @ 0.10 hrs, Volume= 0.008 af, Depth= 0.08"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=6 min, Inten=5.51 in/hr

Area (ac)	C	Description
0.250	0.35	Existing Lawn
0.850	0.30	Existing Woods
1.100	0.31	Weighted Average
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
12.4	279	Total			

Summary for Subcatchment DA-2 PRE: DA-2 PRE

Runoff = 1.03 cfs @ 0.10 hrs, Volume= 0.009 af, Depth= 0.08"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=6 min, Inten=5.51 in/hr

Area (ac)	C	Description
0.503	0.35	Existing Lawn
0.900	0.30	Existing Woods
0.037	0.90	Existing Imp
1.440	0.33	Weighted Average
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
3.6	247	0.0526	1.15		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
14.0	347	Total			

Summary for Subcatchment DA-3 PRE: DA-3 PRE

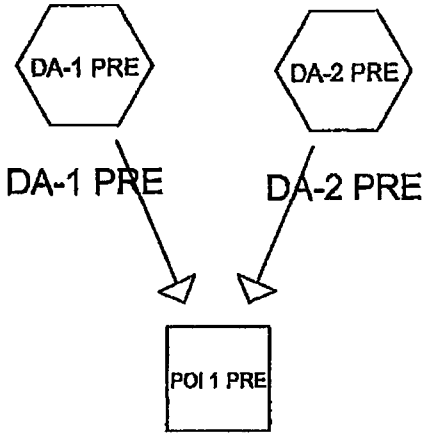
Runoff = 0.83 cfs @ 0.10 hrs, Volume= 0.007 af, Depth= 0.08"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=6 min, Inten=5.51 in/hr

Area (ac)	C	Description
0.693	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.125	0.90	Exisitng Impervious Area
1.105	0.40	Weighted Average
1.105		100.00% Pervious Area

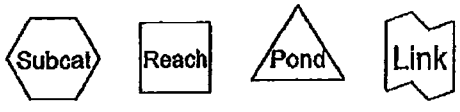
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

PRE-DEVELOPMENT CALCULATIONS



Point of Investigation 1
PRE

Point of Investigation 2
PRE



Drainage Diagram for Infiltration Basin
Prepared by LandMark Design Group , Printed 8/24/2009
HydroCAD® 9.00 s/n 02414 © 2009 HydroCAD Software Solutions LLC

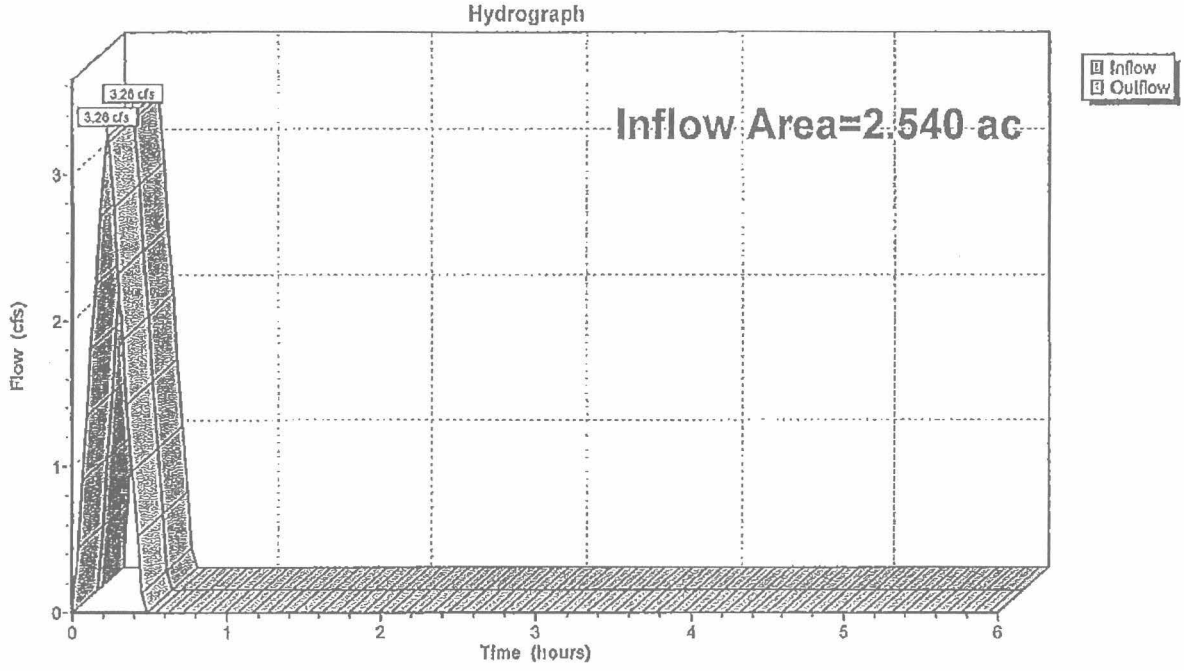
2-YEAR STORM

Summary for Reach POI 1 PRE: Point of Investigation 1 PRE

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 3.26 cfs @ 0.23 hrs, Volume= 0.064 af
Outflow = 3.26 cfs @ 0.23 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 1 PRE: Point of Investigation 1 PRE



Summary for Subcatchment DA-1 PRE: DA-1 PRE

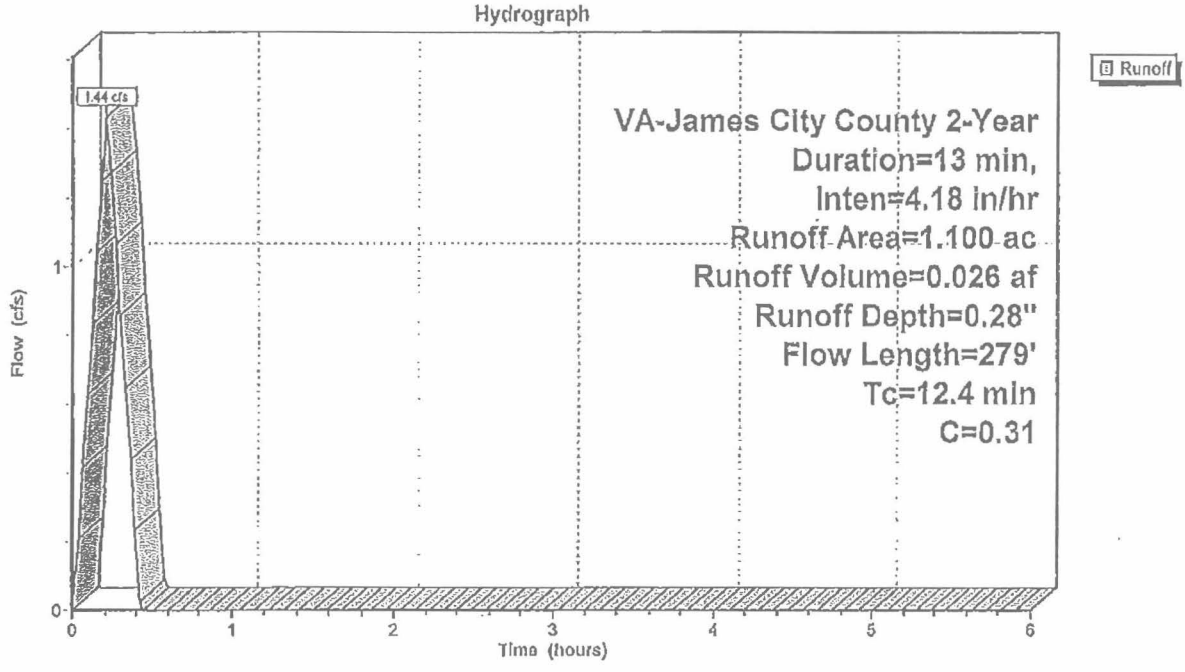
Runoff = 1.44 cfs @ 0.21 hrs, Volume= 0.026 af, Depth= 0.28"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=13 min, Inten=4.18 in/hr

Area (ac)	C	Description
0.250	0.35	Existing Lawn
0.850	0.30	Existing Woods
1.100	0.31	Weighted Average
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 PRE: DA-1 PRE



Summary for Subcatchment DA-2 PRE: DA-2 PRE

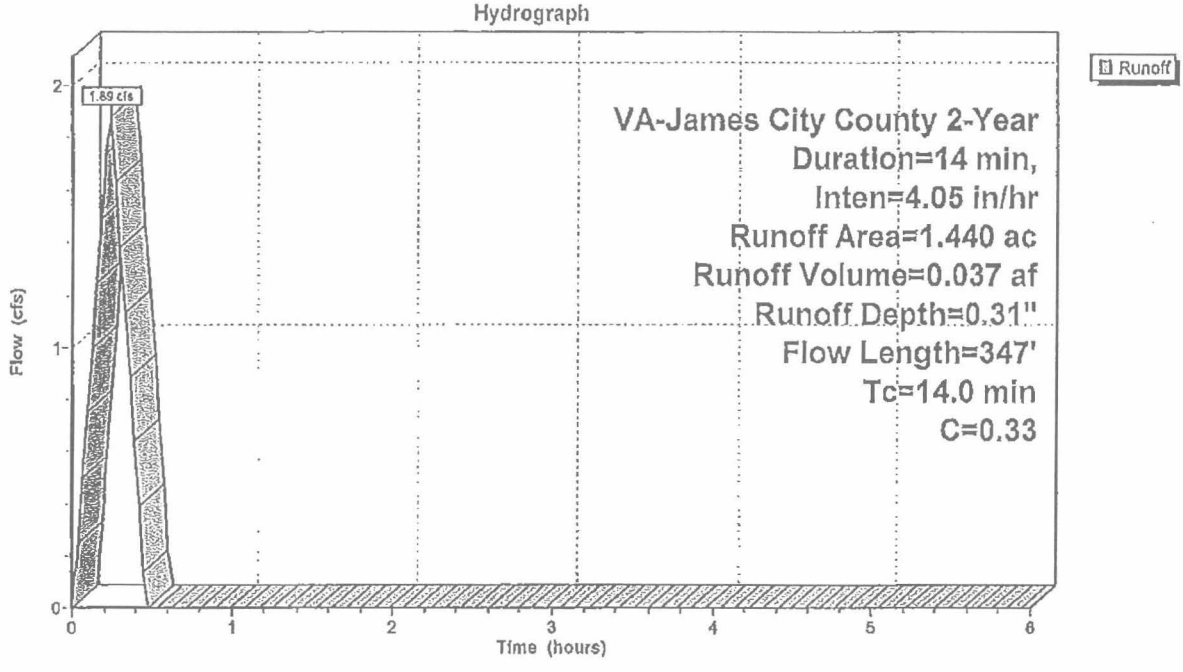
Runoff = 1.89 cfs @ 0.24 hrs, Volume= 0.037 af, Depth= 0.31"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=14 min, Inten=4.05 in/hr

Area (ac)	C	Description
0.503	0.35	Existing Lawn
0.900	0.30	Existing Woods
0.037	0.90	Existing Imp
1.440	0.33	Weighted Average
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
3.6	247	0.0526	1.15		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
14.0	347	Total			

Subcatchment DA-2 PRE: DA-2 PRE

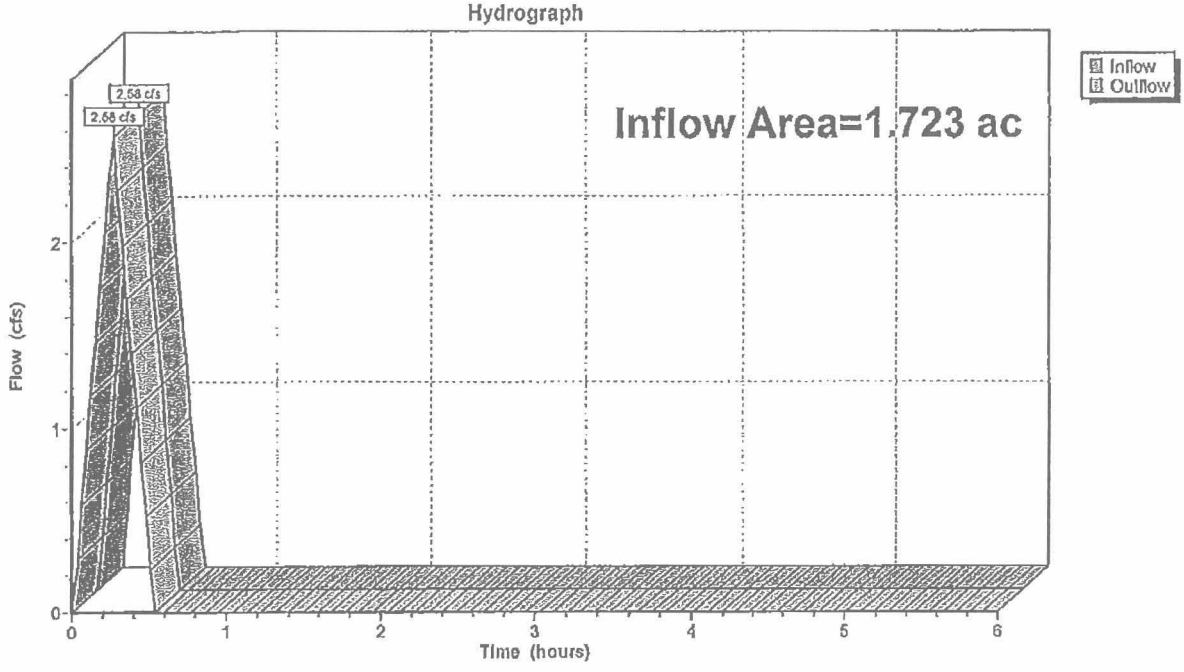


Summary for Reach POI 2 PRE: Point of Investigation 2 PRE

Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.40" for 2-Year event
Inflow = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af
Outflow = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 2 PRE: Point of Investigation 2 PRE



Summary for Subcatchment DA-3 PRE: DA-3 PRE

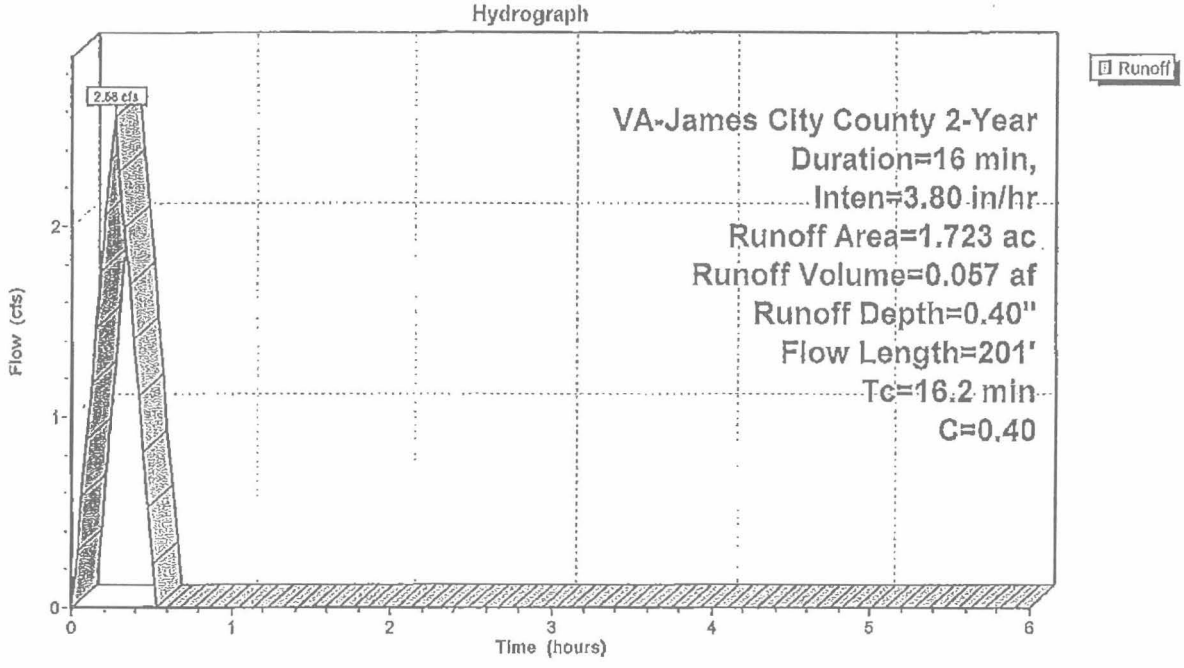
Runoff = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af, Depth= 0.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=16 min, Inten=3.80 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE: DA-3 PRE



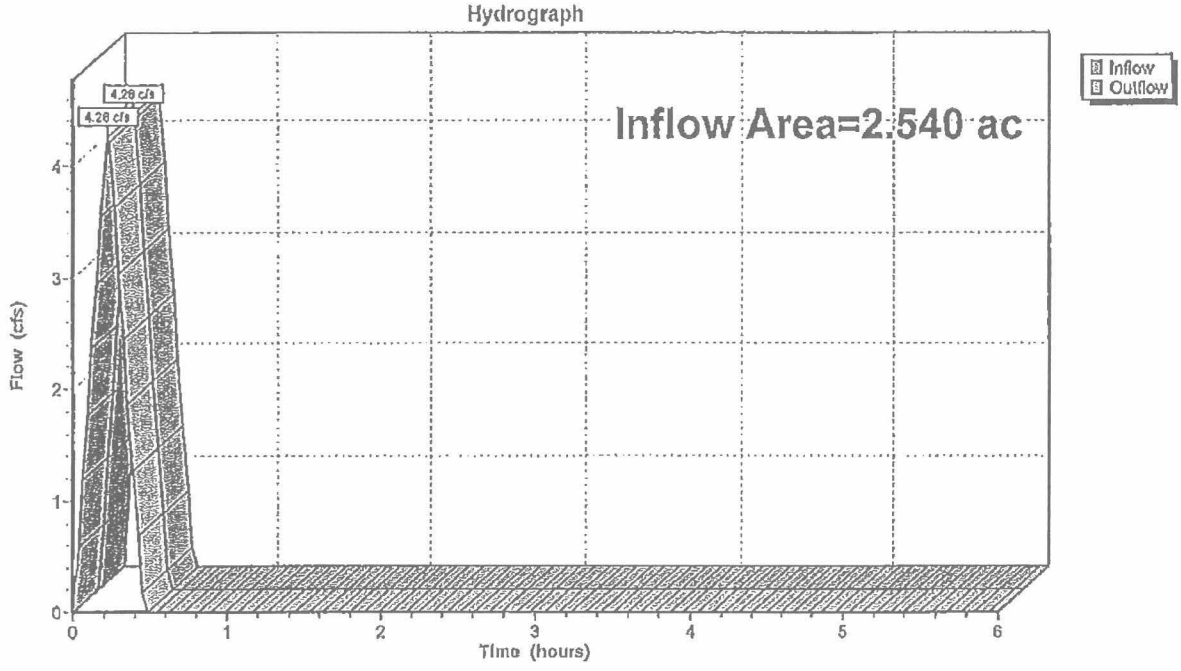
10-YEAR STORM

Summary for Reach POI 1 PRE: Point of Investigation 1 PRE

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 0.40" for 10-Year event
Inflow = 4.26 cfs @ 0.23 hrs, Volume= 0.084 af
Outflow = 4.26 cfs @ 0.23 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 1 PRE: Point of Investigation 1 PRE



Summary for Subcatchment DA-1 PRE: DA-1 PRE

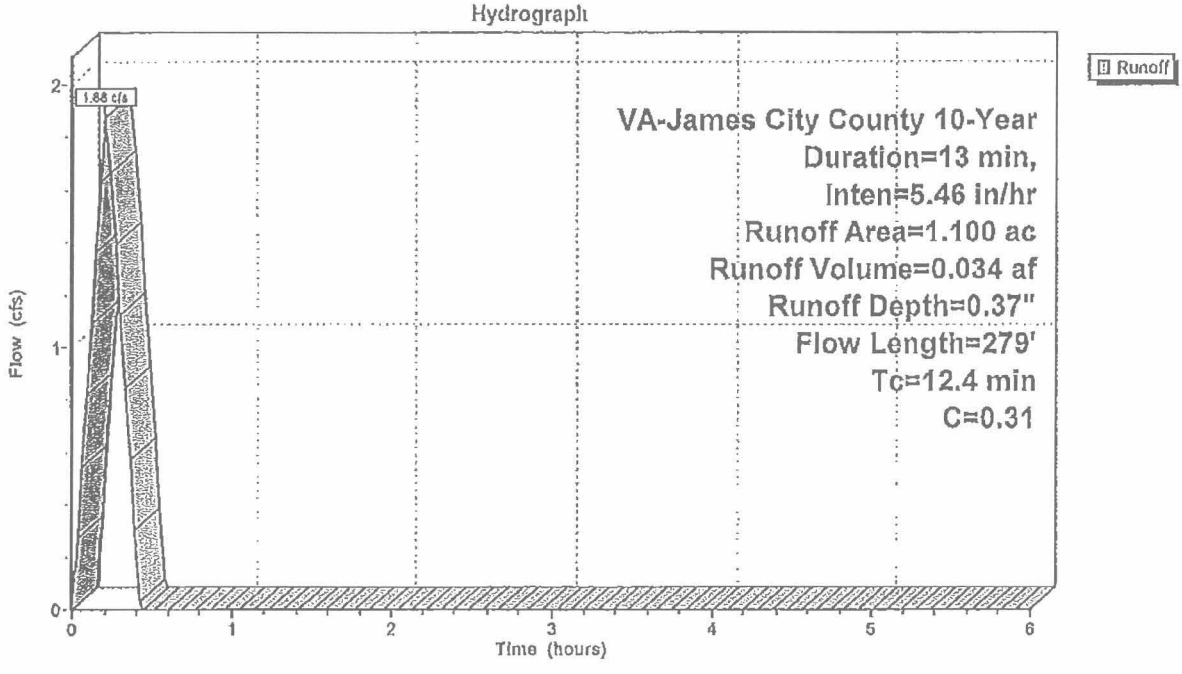
Runoff = 1.88 cfs @ 0.21 hrs, Volume= 0.034 af, Depth= 0.37"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 10-Year Duration=13 min, Inten=5.46 in/hr

Area (ac)	C	Description
0.250	0.35	Existing Lawn
0.850	0.30	Existing Woods
1.100	0.31	Weighted Average
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		Sheet Flow, Sheet flow Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		Shallow Concentrated Flow, Shallow concentrated flow Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 PRE: DA-1 PRE



Summary for Subcatchment DA-2 PRE: DA-2 PRE

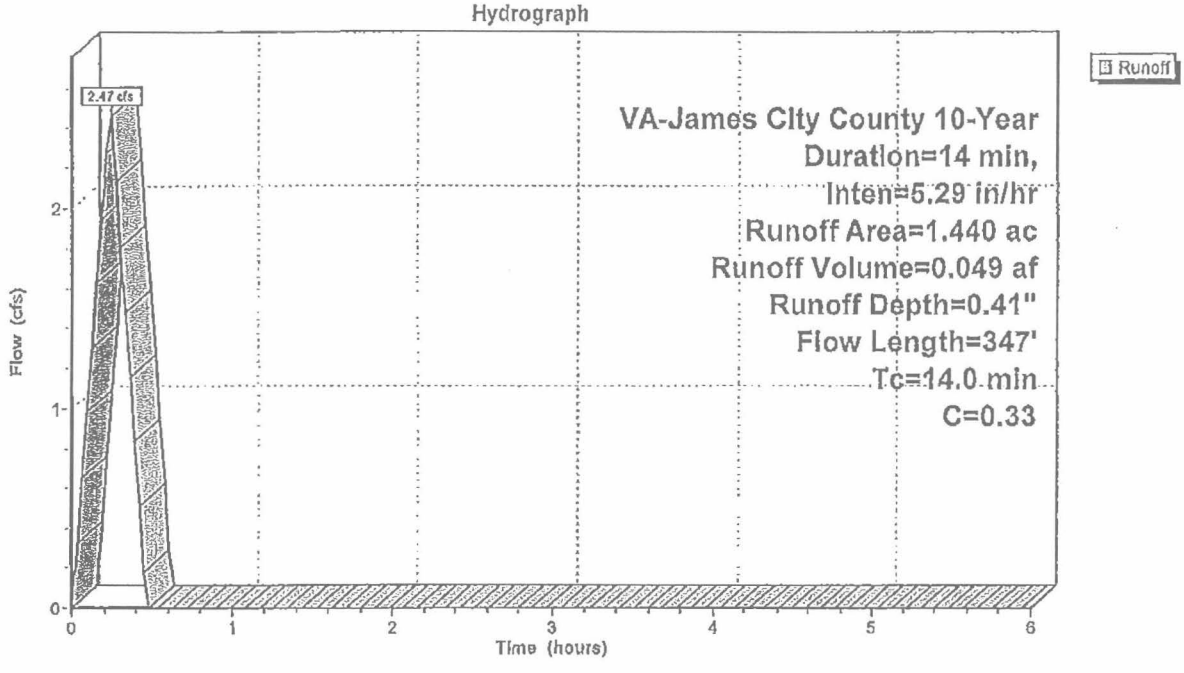
Runoff = 2.47 cfs @ 0.24 hrs, Volume= 0.049 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 10-Year Duration=14 min, Inten=5.29 in/hr

Area (ac)	C	Description
0.503	0.35	Existing Lawn
0.900	0.30	Existing Woods
0.037	0.90	Existing Imp
1.440	0.33	Weighted Average
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
3.6	247	0.0526	1.15		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
14.0	347	Total			

Subcatchment DA-2 PRE: DA-2 PRE

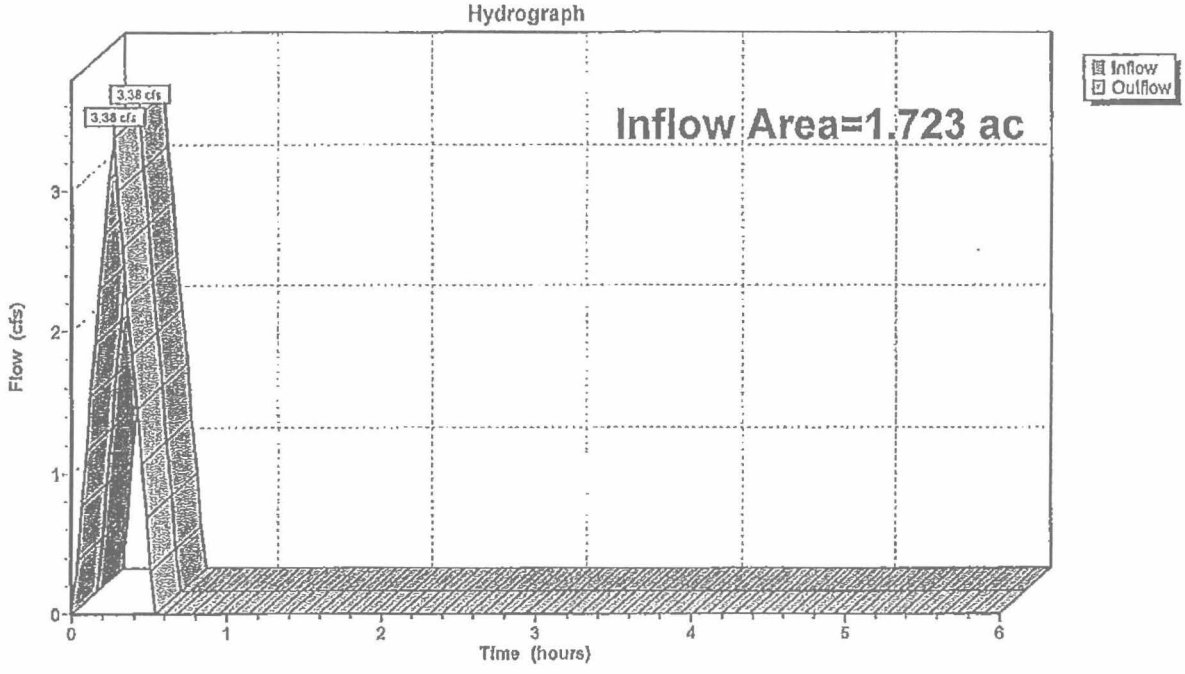


Summary for Reach POI 2 PRE: Point of Investigation 2 PRE

Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.53" for 10-Year event
Inflow = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af
Outflow = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 2 PRE: Point of Investigation 2 PRE



Summary for Subcatchment DA-3 PRE: DA-3 PRE

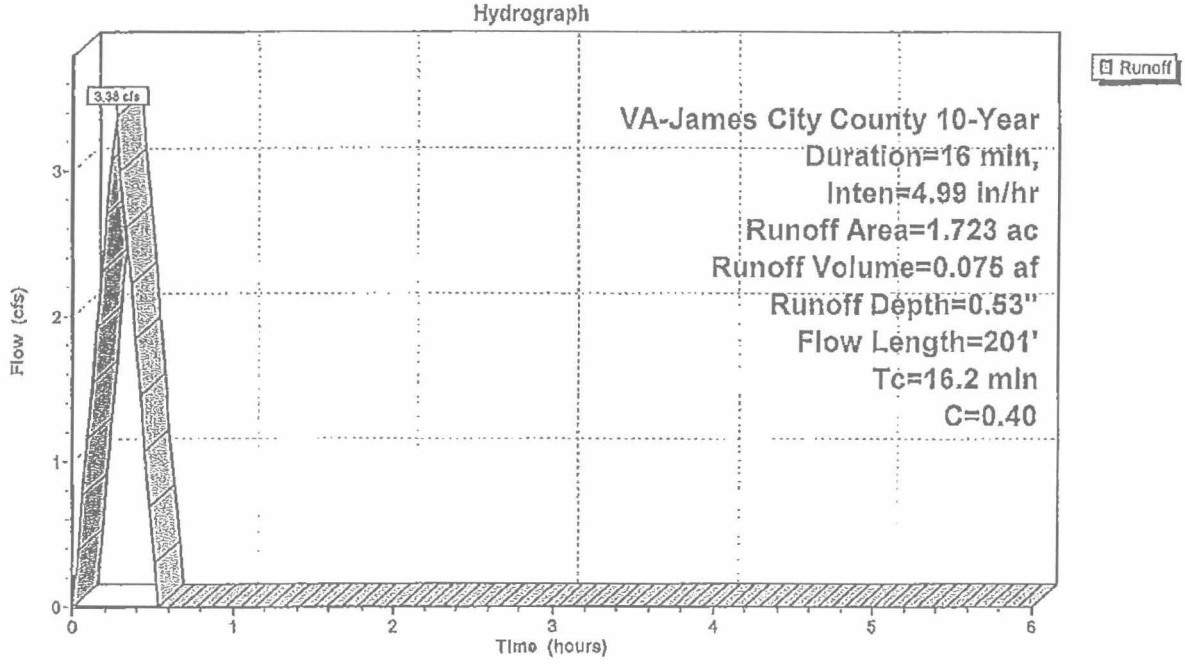
Runoff = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af, Depth= 0.53"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 10-Year Duration=16 min, Inten=4.99 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE: DA-3 PRE



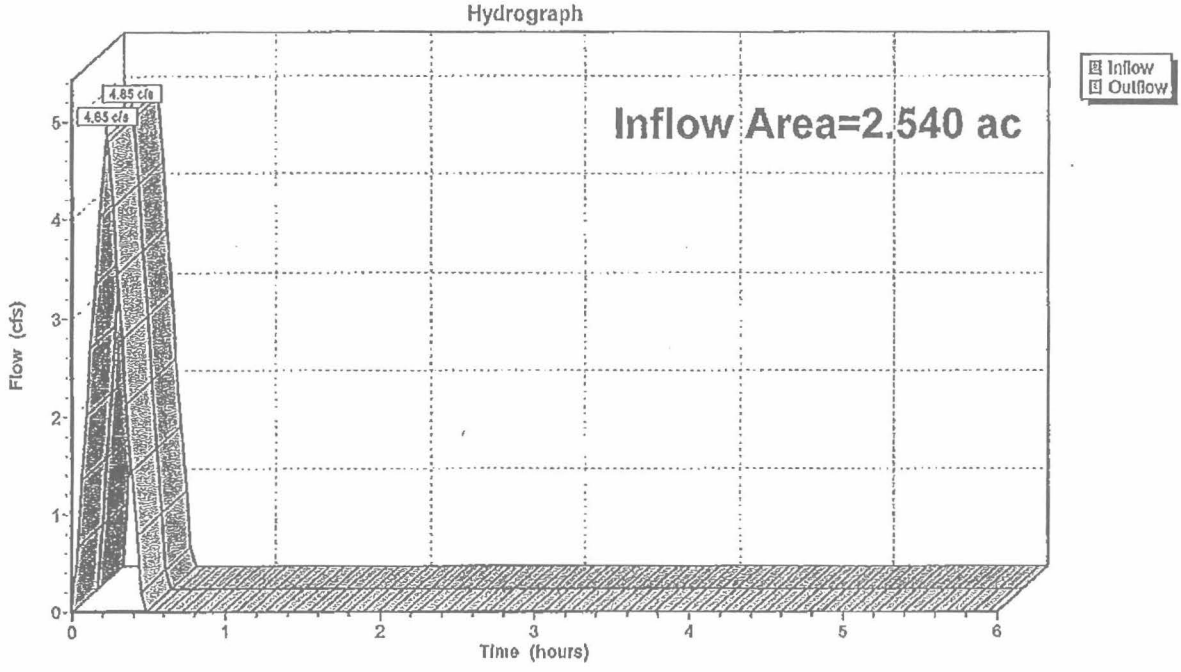
25-YEAR STORM

Summary for Reach POI 1 PRE: Point of Investigation 1 PRE

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 0.45" for 25-Year event
Inflow = 4.85 cfs @ 0.23 hrs, Volume= 0.096 af
Outflow = 4.85 cfs @ 0.23 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 1 PRE: Point of Investigation 1 PRE



Summary for Subcatchment DA-1 PRE: DA-1 PRE

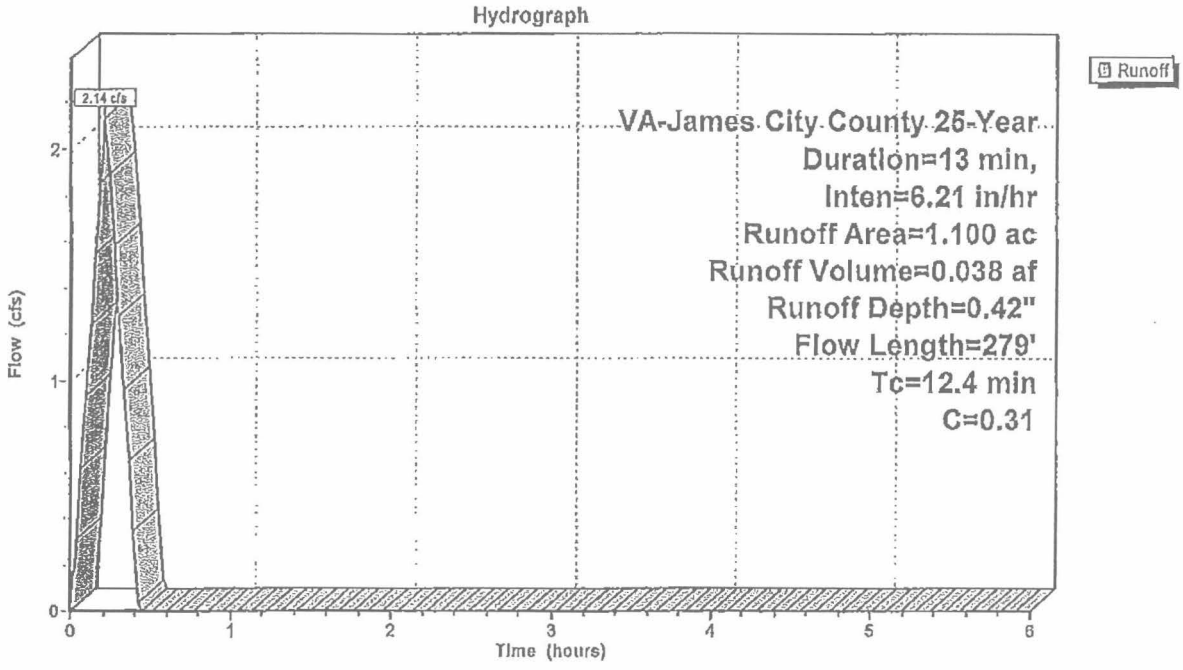
Runoff = 2.14 cfs @ 0.21 hrs, Volume= 0.038 af, Depth= 0.42"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 25-Year Duration=13 min, Inten=6.21 in/hr

Area (ac)	C	Description
0.250	0.35	Existing Lawn
0.850	0.30	Existing Woods
1.100	0.31	Weighted Average
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 PRE: DA-1 PRE



Summary for Subcatchment DA-2 PRE: DA-2 PRE

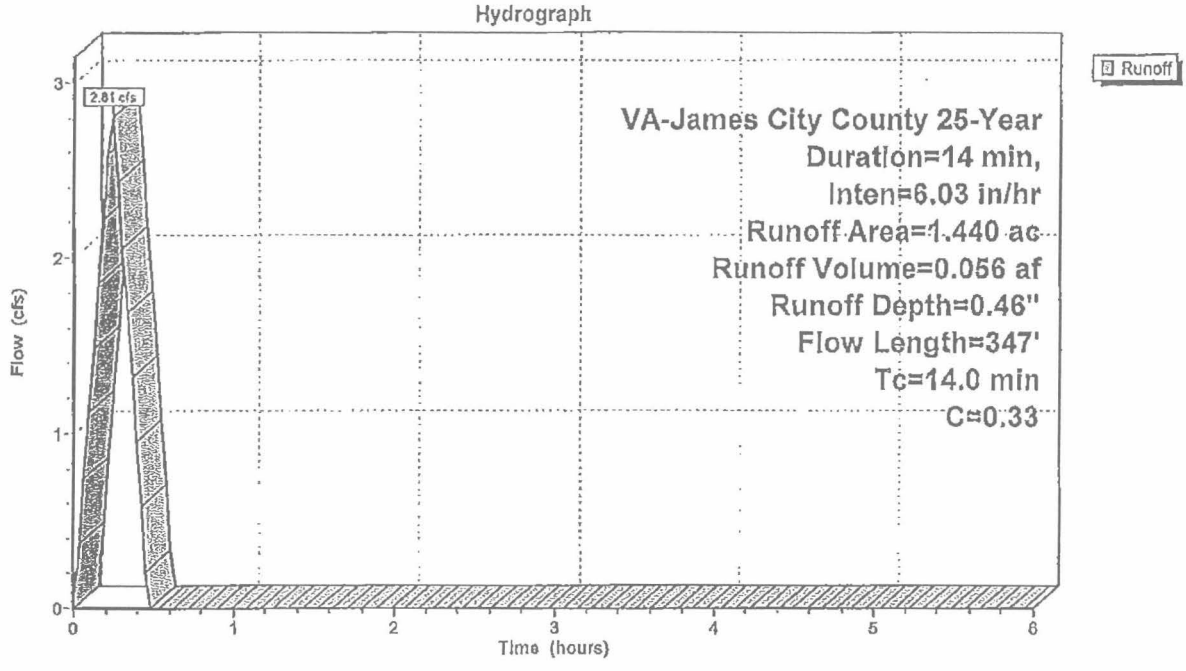
Runoff = 2.81 cfs @ 0.24 hrs, Volume= 0.056 af, Depth= 0.46"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 25-Year Duration=14 min, Inten=6.03 in/hr

Area (ac)	C	Description
0.503	0.35	Existing Lawn
0.900	0.30	Existing Woods
0.037	0.90	Existing Imp
1.440	0.33	Weighted Average
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
3.6	247	0.0526	1.15		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
14.0	347	Total			

Subcatchment DA-2 PRE: DA-2 PRE

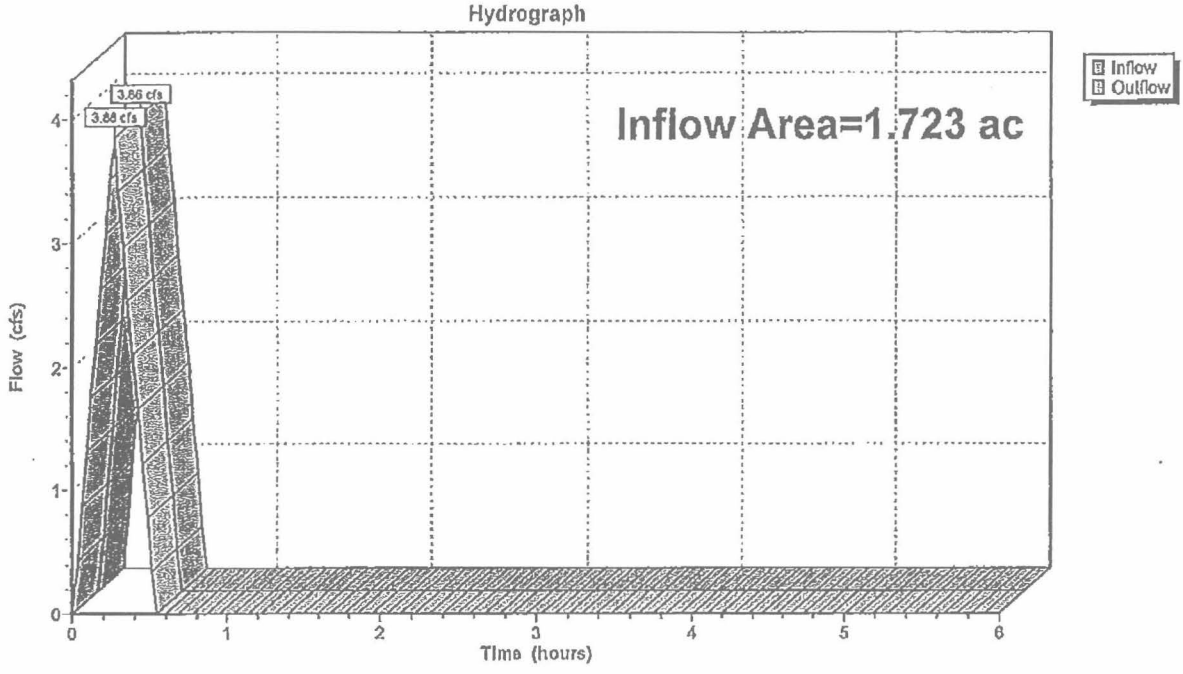


Summary for Reach POI 2 PRE: Point of Investigation 2 PRE

Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.60" for 25-Year event
Inflow = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af
Outflow = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 2 PRE: Point of Investigation 2 PRE



Summary for Subcatchment DA-3 PRE: DA-3 PRE

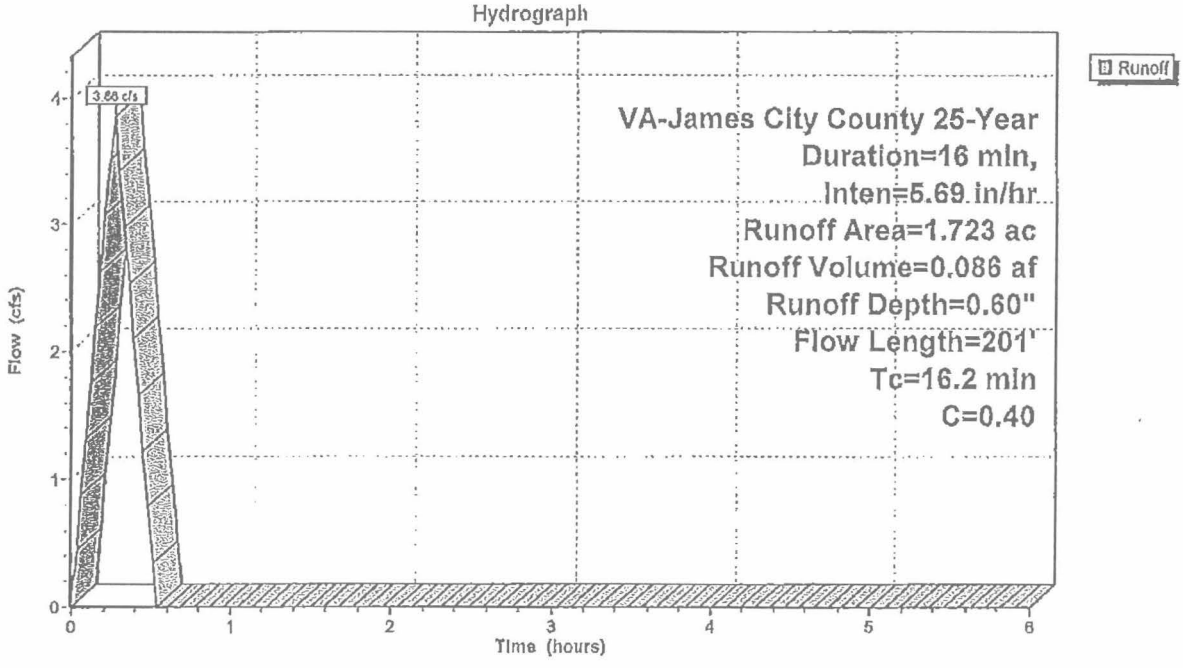
Runoff = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af, Depth= 0.60"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 25-Year Duration=16 min, Inten=5.69 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE: DA-3 PRE



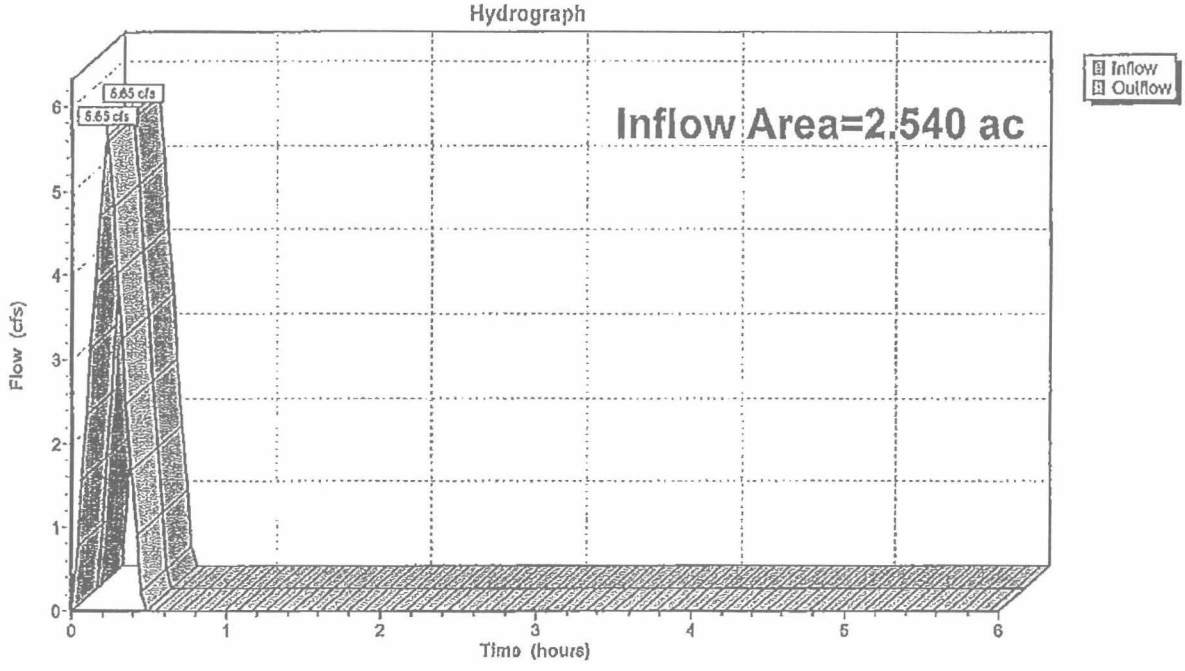
100-YEAR STORM

Summary for Reach POI 1 PRE: Point of Investigation 1 PRE

Inflow Area = 2.540 ac, 0.00% Impervious, Inflow Depth = 0.53" for 100-Year event
Inflow = 5.65 cfs @ 0.23 hrs, Volume= 0.111 af
Outflow = 5.65 cfs @ 0.23 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 1 PRE: Point of Investigation 1 PRE



Summary for Subcatchment DA-1 PRE: DA-1 PRE

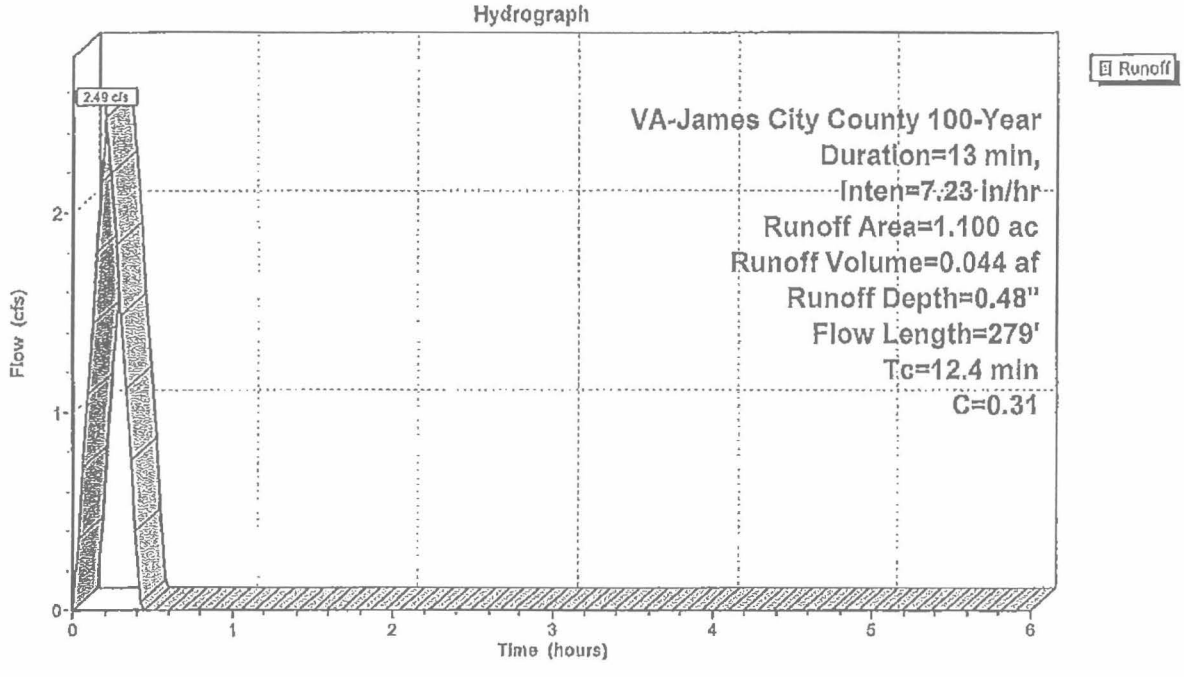
Runoff = 2.49 cfs @ 0.21 hrs, Volume= 0.044 af, Depth= 0.48"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 100-Year Duration=13 min, Inten=7.23 in/hr

Area (ac)	C	Description
0.250	0.35	Existing Lawn
0.850	0.30	Existing Woods
1.100	0.31	Weighted Average
1.100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 PRE: DA-1 PRE



Summary for Subcatchment DA-2 PRE: DA-2 PRE

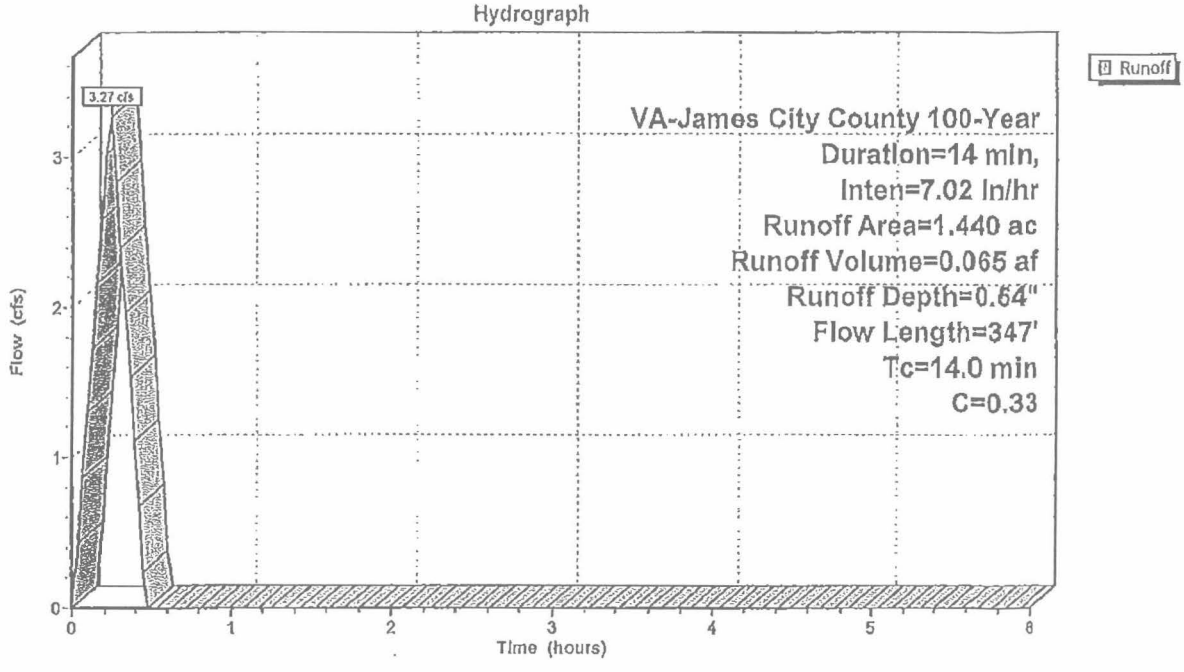
Runoff = 3.27 cfs @ 0.24 hrs, Volume= 0.065 af, Depth= 0.54"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 100-Year Duration=14 min, Inten=7.02 in/hr

Area (ac)	C	Description
0.503	0.35	Existing Lawn
0.900	0.30	Existing Woods
0.037	0.90	Existing Imp
1.440	0.33	Weighted Average
1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.4	100	0.1100	0.16		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
3.6	247	0.0526	1.15		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
14.0	347	Total			

Subcatchment DA-2 PRE: DA-2 PRE

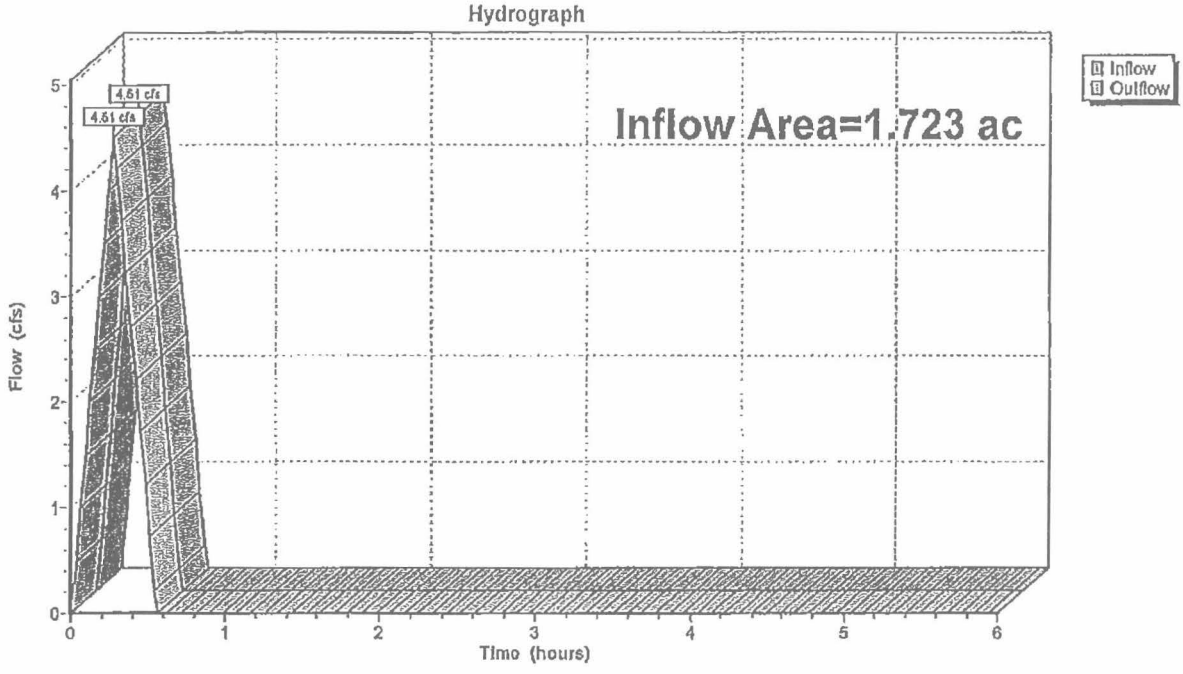


Summary for Reach POI 2 PRE: Point of Investigation 2 PRE

Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.73" for 100-Year event
Inflow = 4.51 cfs @ 0.27 hrs, Volume= 0.105 af
Outflow = 4.51 cfs @ 0.27 hrs, Volume= 0.105 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3

Reach POI 2 PRE: Point of Investigation 2 PRE



Summary for Subcatchment DA-3 PRE: DA-3 PRE

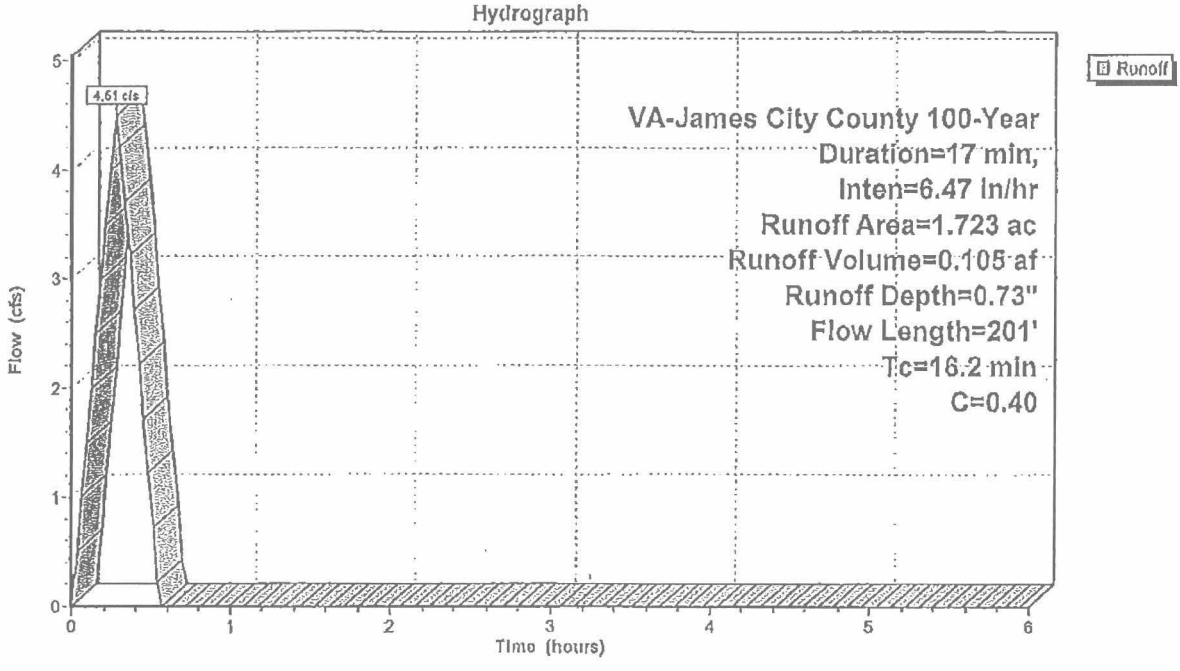
Runoff = 4.51 cfs @ 0.27 hrs, Volume= 0.105 af, Depth= 0.73"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 100-Year Duration=17 min, Inten=6.47 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE: DA-3 PRE



POST-DEVELOPMENT DRAINAGE AREAS SUMMARY

Summary for Subcatchment DA-1 Post: DA-1 POST

Runoff = 1.41 cfs @ 0.08 hrs, Volume= 0.010 af, Depth= 0.11"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.365	0.35	Lawn
0.760	0.30	Woods
1.125	0.32	Weighted Average
1.125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
12.4	279	Total			

Summary for Subcatchment DA-2A POST: DA-2A POST

Runoff = 5.27 cfs @ 0.08 hrs, Volume= 0.038 af, Depth= 0.35"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.172	0.90	Impervious
1.057	0.35	Lawn
0.063	0.30	Woods
1.292	0.42	Weighted Average
1.292		100.00% Pervious Area

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

Summary for Subcatchment DA-2B Post: DA-2 POST

Runoff = 5.41 cfs @ 0.08 hrs, Volume= 0.039 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.430	0.90	Impervious
0.455	0.35	Lawn
0.028	0.30	Woods
0.913	0.61	Weighted Average
0.913		100.00% Pervious Area

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

Summary for Subcatchment DA-3 POST: DA-3 POST

Runoff = 4.17 cfs @ 0.08 hrs, Volume= 0.030 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.748	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.932	0.46	Weighted Average
0.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Input**

WATER QUALITY CALCULATIONS

Subject WATER QUALITY CALCULATIONS

Computed P.S. Checked

LANDMARK DESIGN GROUP

Project # 2007910-000.00

Client NICK'S OUTDOOR BUFFET

Date October 09 Sheet #

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

PROPOSED DRAINAGE AREA TO BMP DA-2 POST = 2.15 AC

IMP AREA TO BMP = 0.602 AC

REQUIRED STORAGE AREA FOR WATER QUALITY

INFILTRATION BASIN 1.0 inch/imp/ac (60% REMOVAL EFFICIENCY)

$$2 \times \frac{0.5 \text{ inch}}{12 \text{ inch}} \times 0.602 \text{ Ac} \times 43560 \frac{\text{ft}}{\text{Ac}} = 2,185 \text{ ft}^3$$

STORAGE VOLUME PROVIDED FOR WATER QUALITY 12,206 ft³
AT ELEVATION 98.80 (BOTTOM OF EMERGENCY SPILLWAY)

12,206 ft³ > 2,185 ft³ ok

THE PROPOSED INFILTRATION BASIN HAS BEEN DESIGN TO INFILTRATE RUNOFF FROM 1-year, 2-year and 10-year STORM EVENT AND SATEH PASS RUNOFF FROM 25-year and 100-year STORM EVENT

Stage-Area-Storage for Pond Infiltration Basin: Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
94.00	1,102	0
94.02	1,111	22
94.04	1,120	44
94.06	1,128	67
94.08	1,137	90
94.10	1,146	112
94.12	1,155	135
94.14	1,164	159
94.16	1,173	182
94.18	1,182	206
94.20	1,191	229
94.22	1,200	253
94.24	1,209	277
94.26	1,218	302
94.28	1,227	326
94.30	1,237	351
94.32	1,246	375
94.34	1,255	400
94.36	1,265	426
94.38	1,274	451
94.40	1,283	477
94.42	1,293	502
94.44	1,302	528
94.46	1,312	554
94.48	1,321	581
94.50	1,331	607
94.52	1,340	634
94.54	1,350	661
94.56	1,360	688
94.58	1,369	715
94.60	1,379	743
94.62	1,389	770
94.64	1,399	798
94.66	1,408	826
94.68	1,418	855
94.70	1,428	883
94.72	1,438	912
94.74	1,448	941
94.76	1,458	970
94.78	1,468	999
94.80	1,478	1,028
94.82	1,488	1,058
94.84	1,499	1,088
94.86	1,509	1,118
94.88	1,519	1,148
94.90	1,529	1,179
94.92	1,540	1,209
94.94	1,550	1,240
94.96	1,560	1,271
94.98	1,571	1,303
95.00	1,581	1,334
95.02	1,592	1,366
95.04	1,603	1,398
95.06	1,614	1,430
95.08	1,625	1,463
95.10	1,636	1,495
95.12	1,647	1,528
95.14	1,658	1,561
95.16	1,670	1,594
95.18	1,681	1,628
95.20	1,692	1,662
95.22	1,703	1,696
95.24	1,715	1,730
95.26	1,726	1,764
95.28	1,738	1,799
95.30	1,749	1,834
95.32	1,761	1,869
95.34	1,772	1,904
95.36	1,784	1,940
95.38	1,795	1,975
95.40	1,807	2,011
95.42	1,819	2,048
95.44	1,830	2,084
95.46	1,842	2,121
95.48	1,854	2,158
95.50	1,866	2,195
95.52	1,878	2,232
95.54	1,890	2,270
95.56	1,901	2,308
95.58	1,913	2,346
95.60	1,925	2,385
95.62	1,938	2,423
95.64	1,950	2,462
95.66	1,962	2,501
95.68	1,974	2,541
95.70	1,986	2,580
95.72	1,998	2,620
95.74	2,011	2,660
95.76	2,023	2,700
95.78	2,035	2,741
95.80	2,048	2,782
95.82	2,060	2,823
95.84	2,073	2,864
95.86	2,085	2,906
95.88	2,098	2,948
95.90	2,110	2,990
95.92	2,123	3,032
95.94	2,136	3,075
95.96	2,148	3,118
95.98	2,161	3,161
96.00	2,174	3,204
96.02	2,187	3,248
96.04	2,200	3,291
96.06	2,213	3,336

REQUIRED STORAGE VOLUME FOR WATER QUALITY 2,185ft³

Stage-Area-Storage for Pond Infiltration Basin: Infiltration Basin (continued)

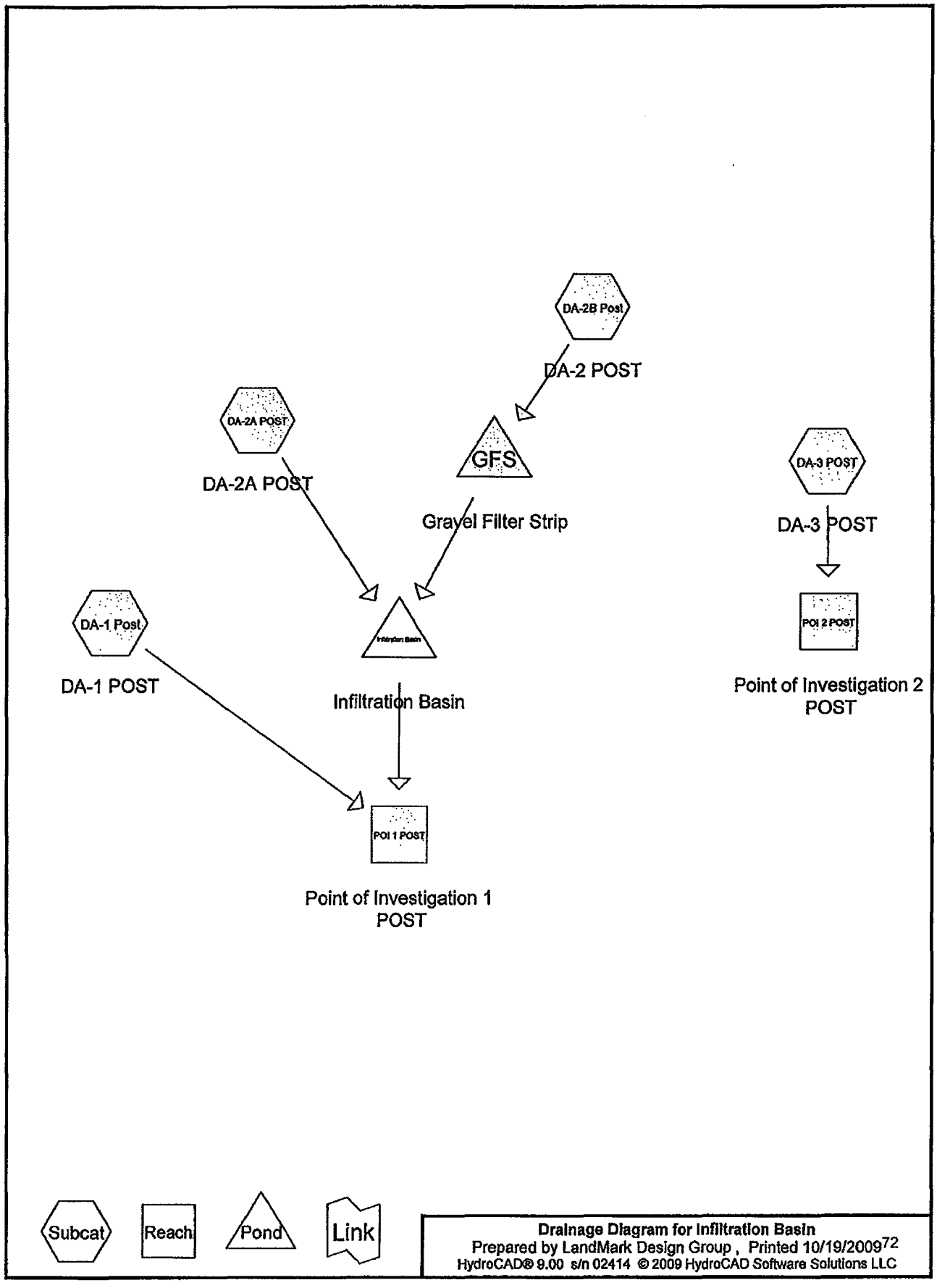
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
96.08	2,227	3,380	97.12	2,968	6,072
96.10	2,240	3,425	97.14	2,983	6,131
96.12	2,253	3,470	97.16	2,998	6,191
96.14	2,267	3,515	97.18	3,013	6,251
96.16	2,280	3,560	97.20	3,029	6,312
96.18	2,293	3,606	97.22	3,044	6,373
96.20	2,307	3,652	97.24	3,060	6,434
96.22	2,320	3,698	97.26	3,075	6,495
96.24	2,334	3,745	97.28	3,091	6,557
96.26	2,347	3,792	97.30	3,106	6,619
96.28	2,361	3,839	97.32	3,122	6,681
96.30	2,375	3,886	97.34	3,137	6,743
96.32	2,388	3,934	97.36	3,153	6,806
96.34	2,402	3,982	97.38	3,169	6,870
96.36	2,416	4,030	97.40	3,184	6,933
96.38	2,430	4,078	97.42	3,200	6,997
96.40	2,443	4,127	97.44	3,216	7,061
96.42	2,457	4,176	97.46	3,232	7,126
96.44	2,471	4,225	97.48	3,248	7,190
96.46	2,485	4,275	97.50	3,264	7,255
96.48	2,499	4,325	97.52	3,280	7,321
96.50	2,513	4,375	97.54	3,296	7,387
96.52	2,527	4,425	97.56	3,312	7,453
96.54	2,541	4,476	97.58	3,328	7,519
96.56	2,556	4,527	97.60	3,344	7,586
96.58	2,570	4,578	97.62	3,360	7,653
96.60	2,584	4,630	97.64	3,376	7,720
96.62	2,598	4,681	97.66	3,393	7,788
96.64	2,613	4,734	97.68	3,409	7,856
96.66	2,627	4,786	97.70	3,425	7,924
96.68	2,641	4,839	97.72	3,442	7,993
96.70	2,656	4,892	97.74	3,458	8,062
96.72	2,670	4,945	97.76	3,475	8,131
96.74	2,685	4,998	97.78	3,491	8,201
96.76	2,699	5,052	97.80	3,508	8,271
96.78	2,714	5,106	97.82	3,524	8,341
96.80	2,729	5,161	97.84	3,541	8,412
96.82	2,743	5,215	97.86	3,557	8,483
96.84	2,758	5,271	97.88	3,574	8,554
96.86	2,773	5,326	97.90	3,591	8,626
96.88	2,787	5,381	97.92	3,608	8,698
96.90	2,802	5,437	97.94	3,624	8,770
96.92	2,817	5,494	97.96	3,641	8,843
96.94	2,832	5,550	97.98	3,658	8,916
96.96	2,847	5,607	98.00	3,675	8,989
96.98	2,862	5,664	98.02	3,692	9,063
97.00	2,877	5,721	98.04	3,709	9,137
97.02	2,892	5,779	98.06	3,726	9,211
97.04	2,907	5,837	98.08	3,743	9,286
97.06	2,922	5,895	98.10	3,760	9,361
97.08	2,937	5,954	98.12	3,777	9,436
97.10	2,952	6,013	98.14	3,794	9,512

Stage-Area-Storage for Pond Infiltration Basin: Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
98.16	3,811	9,588
98.18	3,828	9,664
98.20	3,845	9,741
98.22	3,862	9,818
98.24	3,880	9,896
98.26	3,897	9,973
98.28	3,914	10,051
98.30	3,932	10,130
98.32	3,949	10,209
98.34	3,966	10,288
98.36	3,984	10,367
98.38	4,001	10,447
98.40	4,019	10,527
98.42	4,037	10,608
98.44	4,054	10,689
98.46	4,072	10,770
98.48	4,090	10,852
98.50	4,107	10,934
98.52	4,125	11,016
98.54	4,143	11,099
98.56	4,161	11,182
98.58	4,179	11,265
98.60	4,197	11,349
98.62	4,215	11,433
98.64	4,233	11,518
98.66	4,251	11,602
98.68	4,269	11,688
98.70	4,287	11,773
98.72	4,305	11,859
98.74	4,324	11,945
98.76	4,342	12,032
98.78	4,360	12,119
98.80	4,379	12,206
98.82	4,397	12,294
98.84	4,415	12,382
98.86	4,434	12,471
98.88	4,452	12,560
98.90	4,471	12,649
98.92	4,489	12,738
98.94	4,508	12,828
98.96	4,527	12,919
98.98	4,545	13,010
99.00	4,564	13,101
99.02	4,583	13,192
99.04	4,602	13,284
99.06	4,621	13,376
99.08	4,640	13,469
99.10	4,660	13,562
99.12	4,679	13,655
99.14	4,698	13,749
99.16	4,717	13,843
99.18	4,737	13,938
99.20	4,756	14,033
99.22	4,776	14,128
99.24	4,795	14,224
99.26	4,814	14,320
99.28	4,834	14,416
99.30	4,854	14,513
99.32	4,873	14,610
99.34	4,893	14,708
99.36	4,913	14,806
99.38	4,932	14,904
99.40	4,952	15,003
99.42	4,972	15,103
99.44	4,992	15,202
99.46	5,012	15,302
99.48	5,032	15,403
99.50	5,052	15,503
99.52	5,072	15,605
99.54	5,092	15,706
99.56	5,112	15,808
99.58	5,132	15,911
99.60	5,152	16,014
99.62	5,172	16,117
99.64	5,193	16,221
99.66	5,213	16,325
99.68	5,233	16,429
99.70	5,254	16,534
99.72	5,274	16,639
99.74	5,294	16,745
99.76	5,315	16,851
99.78	5,336	16,958
99.80	5,356	17,064
99.82	5,377	17,172
99.84	5,397	17,280
99.86	5,418	17,388
99.88	5,439	17,496
99.90	5,460	17,605
99.92	5,480	17,715
99.94	5,501	17,824
99.96	5,522	17,935
99.98	5,543	18,045
100.00	5,564	18,156

PROVIDED STORAGE VOLUME FOR WATER QUALITY EMERGENCY SPILLWAY EL=98.80

POST-DEVELOPMENT CALCULATIONS



Drainage Diagram for Infiltration Basin
Prepared by LandMark Design Group , Printed 10/19/2009 72
HydroCAD® 9.00 s/n 02414 © 2009 HydroCAD Software Solutions LLC

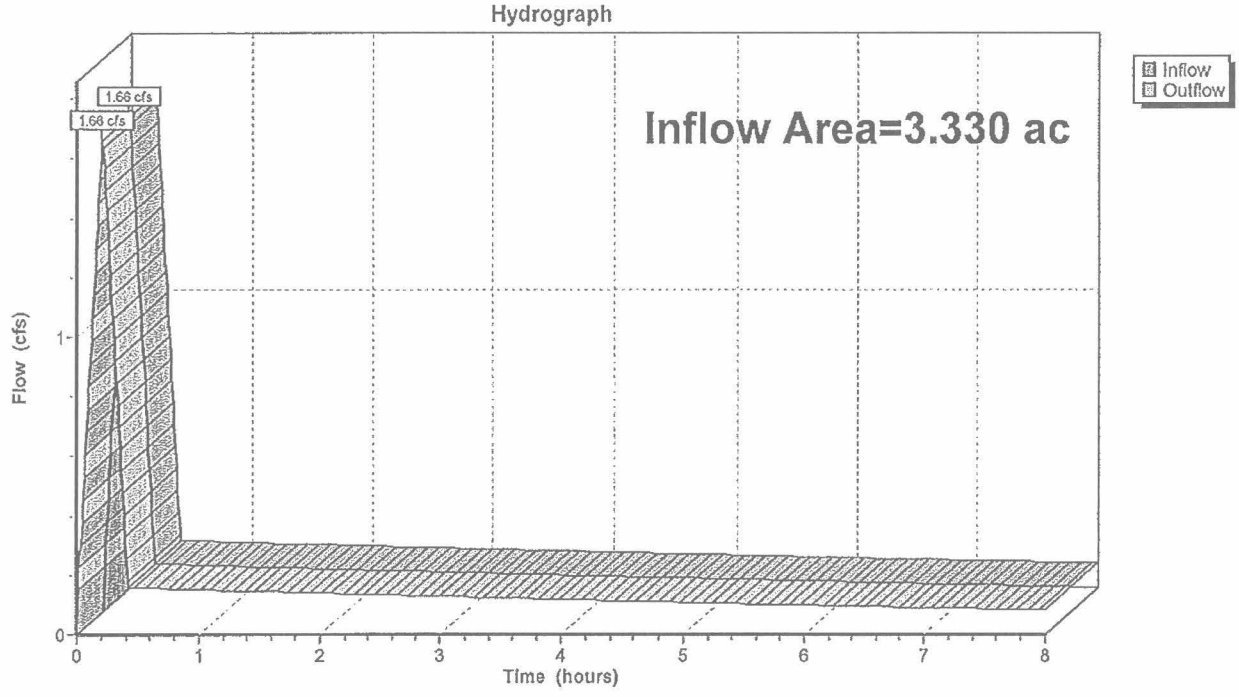
2-YEAR STORM

Summary for Reach POI 1 POST: Point of Investigation 1 POST

Inflow Area = 3.330 ac, 0.00% Impervious, Inflow Depth > 0.38" for 2-Year event
Inflow = 1.66 cfs @ 0.21 hrs, Volume= 0.106 af
Outflow = 1.66 cfs @ 0.21 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 1 POST: Point of Investigation 1 POST



Summary for Subcatchment DA-1 Post: DA-1 POST

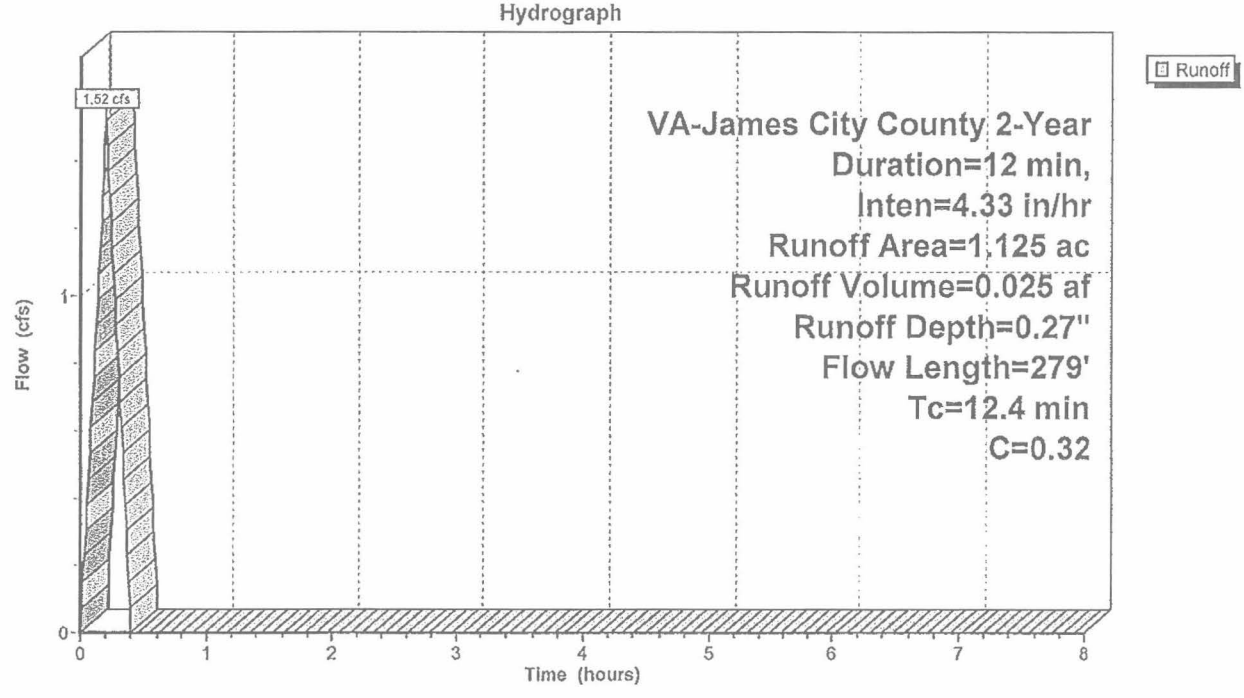
Runoff = 1.52 cfs @ 0.20 hrs, Volume= 0.025 af, Depth= 0.27"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 2-Year Duration=12 min, Inten=4.33 in/hr

Area (ac)	C	Description
0.365	0.35	Lawn
0.760	0.30	Woods
1.125	0.32	Weighted Average
1.125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 Post: DA-1 POST



Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.205 ac, 0.00% Impervious, Inflow Depth = 1.08" for 2-Year event
Inflow = 0.84 cfs @ 0.89 hrs, Volume= 0.198 af
Outflow = 0.23 cfs @ 2.92 hrs, Volume= 0.119 af, Atten= 73%, Lag= 122.1 min
Primary = 0.23 cfs @ 2.92 hrs, Volume= 0.119 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Peak Elev= 97.39' @ 2.92 hrs Surf.Area= 3,176 sf Storage= 6,900 cf

Plug-Flow detention time= 193.6 min calculated for 0.119 af (60% of inflow)
Center-of-Mass det. time= 159.6 min (249.0 - 89.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

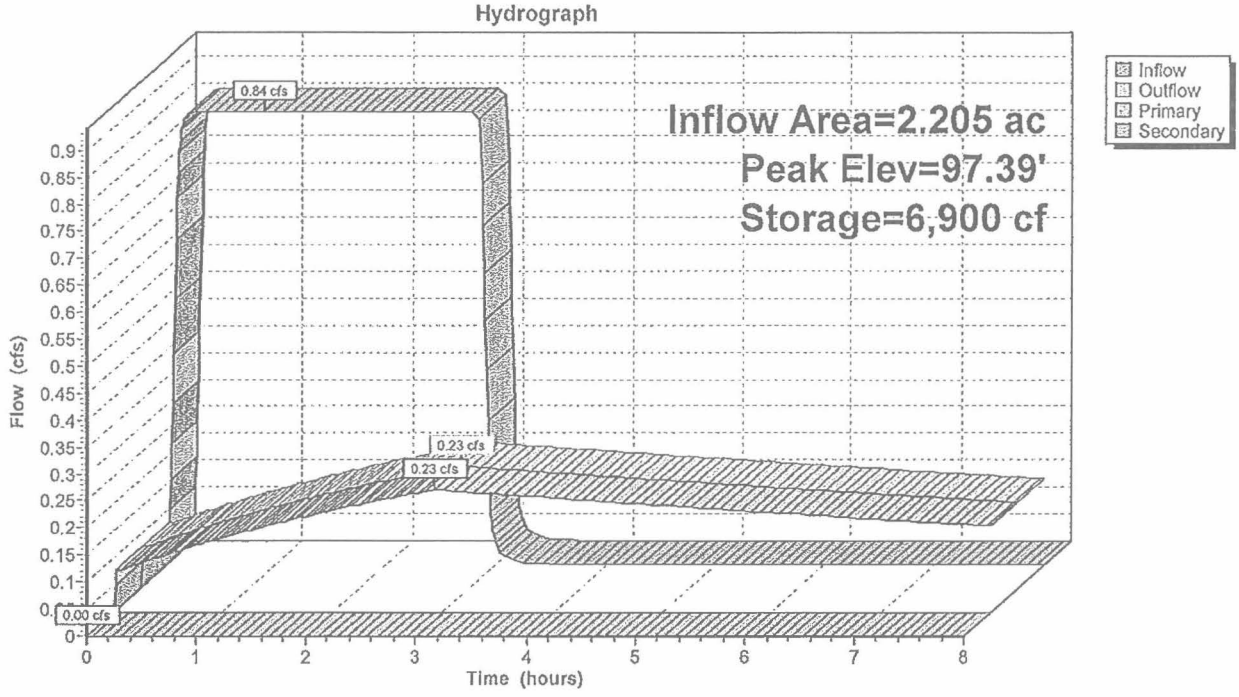
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.23 cfs @ 2.92 hrs HW=97.39' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.23 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=94.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Infiltration Basin: Infiltration Basin



Hydrograph for Pond Infiltration Basin: Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	94.00	0.00	0.00	0.00
0.02	0.10	0	94.00	0.08	0.08	0.00
0.04	0.22	6	94.01	0.08	0.08	0.00
0.06	0.39	22	94.02	0.08	0.08	0.00
0.08	0.60	52	94.05	0.08	0.08	0.00
0.10	0.73	95	94.08	0.08	0.08	0.00
0.12	0.79	144	94.13	0.08	0.08	0.00
0.14	0.82	195	94.17	0.08	0.08	0.00
0.16	0.83	249	94.22	0.09	0.09	0.00
0.18	0.83	302	94.26	0.09	0.09	0.00
0.20	0.84	356	94.30	0.09	0.09	0.00
0.22	0.84	410	94.35	0.09	0.09	0.00
0.24	0.84	464	94.39	0.09	0.09	0.00
0.26	0.84	518	94.43	0.09	0.09	0.00
0.28	0.84	572	94.47	0.09	0.09	0.00
0.30	0.84	625	94.51	0.10	0.10	0.00
0.32	0.84	679	94.55	0.10	0.10	0.00
0.34	0.84	732	94.59	0.10	0.10	0.00
0.36	0.84	786	94.63	0.10	0.10	0.00
0.38	0.84	839	94.67	0.10	0.10	0.00
0.40	0.84	892	94.71	0.10	0.10	0.00
0.42	0.84	945	94.74	0.10	0.10	0.00
0.44	0.84	998	94.78	0.10	0.10	0.00
0.46	0.84	1,051	94.82	0.11	0.11	0.00
0.48	0.84	1,104	94.85	0.11	0.11	0.00
0.50	0.84	1,156	94.89	0.11	0.11	0.00
0.52	0.84	1,209	94.92	0.11	0.11	0.00
0.54	0.84	1,261	94.95	0.11	0.11	0.00
0.56	0.84	1,314	94.99	0.11	0.11	0.00
0.58	0.84	1,366	95.02	0.11	0.11	0.00
0.60	0.84	1,418	95.05	0.11	0.11	0.00
0.62	0.84	1,471	95.08	0.12	0.12	0.00
0.64	0.84	1,523	95.12	0.12	0.12	0.00
0.66	0.84	1,575	95.15	0.12	0.12	0.00
0.68	0.84	1,627	95.18	0.12	0.12	0.00
0.70	0.84	1,678	95.21	0.12	0.12	0.00
0.72	0.84	1,730	95.24	0.12	0.12	0.00
0.74	0.84	1,782	95.27	0.12	0.12	0.00
0.76	0.84	1,833	95.30	0.12	0.12	0.00
0.78	0.84	1,885	95.33	0.13	0.13	0.00
0.80	0.84	1,936	95.36	0.13	0.13	0.00
0.82	0.84	1,987	95.39	0.13	0.13	0.00
0.84	0.84	2,038	95.41	0.13	0.13	0.00
0.86	0.84	2,090	95.44	0.13	0.13	0.00
0.88	0.84	2,141	95.47	0.13	0.13	0.00
0.90	0.84	2,191	95.50	0.13	0.13	0.00
0.92	0.84	2,242	95.53	0.13	0.13	0.00
0.94	0.84	2,293	95.55	0.13	0.13	0.00
0.96	0.84	2,344	95.58	0.14	0.14	0.00
0.98	0.84	2,394	95.61	0.14	0.14	0.00
1.00	0.84	2,445	95.63	0.14	0.14	0.00
1.02	0.84	2,495	95.66	0.14	0.14	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.84	2,546	95.68	0.14	0.14	0.00
1.06	0.84	2,596	95.71	0.14	0.14	0.00
1.08	0.84	2,646	95.73	0.14	0.14	0.00
1.10	0.84	2,696	95.76	0.14	0.14	0.00
1.12	0.84	2,746	95.78	0.14	0.14	0.00
1.14	0.84	2,796	95.81	0.15	0.15	0.00
1.16	0.84	2,846	95.83	0.15	0.15	0.00
1.18	0.84	2,896	95.86	0.15	0.15	0.00
1.20	0.84	2,946	95.88	0.15	0.15	0.00
1.22	0.84	2,995	95.90	0.15	0.15	0.00
1.24	0.84	3,045	95.93	0.15	0.15	0.00
1.26	0.84	3,095	95.95	0.15	0.15	0.00
1.28	0.84	3,144	95.97	0.15	0.15	0.00
1.30	0.84	3,193	96.00	0.15	0.15	0.00
1.32	0.84	3,243	96.02	0.16	0.16	0.00
1.34	0.84	3,292	96.04	0.16	0.16	0.00
1.36	0.84	3,341	96.06	0.16	0.16	0.00
1.38	0.84	3,390	96.08	0.16	0.16	0.00
1.40	0.84	3,439	96.11	0.16	0.16	0.00
1.42	0.84	3,488	96.13	0.16	0.16	0.00
1.44	0.84	3,537	96.15	0.16	0.16	0.00
1.46	0.84	3,586	96.17	0.16	0.16	0.00
1.48	0.84	3,634	96.19	0.16	0.16	0.00
1.50	0.84	3,683	96.21	0.16	0.16	0.00
1.52	0.84	3,731	96.23	0.17	0.17	0.00
1.54	0.84	3,780	96.26	0.17	0.17	0.00
1.56	0.84	3,828	96.28	0.17	0.17	0.00
1.58	0.84	3,877	96.30	0.17	0.17	0.00
1.60	0.84	3,925	96.32	0.17	0.17	0.00
1.62	0.84	3,973	96.34	0.17	0.17	0.00
1.64	0.84	4,021	96.36	0.17	0.17	0.00
1.66	0.84	4,069	96.38	0.17	0.17	0.00
1.68	0.84	4,117	96.40	0.17	0.17	0.00
1.70	0.84	4,165	96.42	0.17	0.17	0.00
1.72	0.84	4,213	96.44	0.18	0.18	0.00
1.74	0.84	4,261	96.45	0.18	0.18	0.00
1.76	0.84	4,308	96.47	0.18	0.18	0.00
1.78	0.84	4,356	96.49	0.18	0.18	0.00
1.80	0.84	4,404	96.51	0.18	0.18	0.00
1.82	0.84	4,451	96.53	0.18	0.18	0.00
1.84	0.84	4,499	96.55	0.18	0.18	0.00
1.86	0.84	4,546	96.57	0.18	0.18	0.00
1.88	0.84	4,593	96.59	0.18	0.18	0.00
1.90	0.84	4,640	96.60	0.18	0.18	0.00
1.92	0.84	4,688	96.62	0.18	0.18	0.00
1.94	0.84	4,735	96.64	0.19	0.19	0.00
1.96	0.84	4,782	96.66	0.19	0.19	0.00
1.98	0.84	4,829	96.68	0.19	0.19	0.00
2.00	0.84	4,876	96.69	0.19	0.19	0.00
2.02	0.84	4,922	96.71	0.19	0.19	0.00
2.04	0.84	4,969	96.73	0.19	0.19	0.00
2.06	0.84	5,016	96.75	0.19	0.19	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.84	5,063	96.76	0.19	0.19	0.00
2.10	0.84	5,109	96.78	0.19	0.19	0.00
2.12	0.84	5,156	96.80	0.19	0.19	0.00
2.14	0.84	5,202	96.82	0.19	0.19	0.00
2.16	0.84	5,248	96.83	0.20	0.20	0.00
2.18	0.84	5,295	96.85	0.20	0.20	0.00
2.20	0.84	5,341	96.87	0.20	0.20	0.00
2.22	0.84	5,387	96.88	0.20	0.20	0.00
2.24	0.84	5,433	96.90	0.20	0.20	0.00
2.26	0.84	5,479	96.92	0.20	0.20	0.00
2.28	0.84	5,525	96.93	0.20	0.20	0.00
2.30	0.84	5,571	96.95	0.20	0.20	0.00
2.32	0.84	5,617	96.96	0.20	0.20	0.00
2.34	0.84	5,663	96.98	0.20	0.20	0.00
2.36	0.84	5,709	97.00	0.20	0.20	0.00
2.38	0.84	5,755	97.01	0.21	0.21	0.00
2.40	0.84	5,800	97.03	0.21	0.21	0.00
2.42	0.84	5,846	97.04	0.21	0.21	0.00
2.44	0.84	5,891	97.06	0.21	0.21	0.00
2.46	0.84	5,937	97.07	0.21	0.21	0.00
2.48	0.84	5,982	97.09	0.21	0.21	0.00
2.50	0.84	6,027	97.10	0.21	0.21	0.00
2.52	0.84	6,073	97.12	0.21	0.21	0.00
2.54	0.84	6,118	97.14	0.21	0.21	0.00
2.56	0.84	6,163	97.15	0.21	0.21	0.00
2.58	0.84	6,208	97.17	0.21	0.21	0.00
2.60	0.84	6,253	97.18	0.21	0.21	0.00
2.62	0.84	6,298	97.20	0.21	0.21	0.00
2.64	0.84	6,343	97.21	0.22	0.22	0.00
2.66	0.84	6,388	97.23	0.22	0.22	0.00
2.68	0.84	6,433	97.24	0.22	0.22	0.00
2.70	0.84	6,478	97.25	0.22	0.22	0.00
2.72	0.84	6,522	97.27	0.22	0.22	0.00
2.74	0.84	6,567	97.28	0.22	0.22	0.00
2.76	0.84	6,612	97.30	0.22	0.22	0.00
2.78	0.84	6,656	97.31	0.22	0.22	0.00
2.80	0.84	6,700	97.33	0.22	0.22	0.00
2.82	0.84	6,745	97.34	0.22	0.22	0.00
2.84	0.84	6,789	97.35	0.22	0.22	0.00
2.86	0.78	6,832	97.37	0.22	0.22	0.00
2.88	0.63	6,867	97.38	0.23	0.23	0.00
2.90	0.45	6,890	97.39	0.23	0.23	0.00
2.92	0.27	**6,900**	**97.39**	**0.23**	**0.23**	0.00
2.94	0.12	6,897	97.39	0.23	0.23	0.00
2.96	0.08	6,888	97.39	0.23	0.23	0.00
2.98	0.05	6,876	97.38	0.23	0.23	0.00
3.00	0.04	6,863	97.38	0.23	0.23	0.00
3.02	0.03	6,850	97.37	0.22	0.22	0.00
3.04	0.02	6,835	97.37	0.22	0.22	0.00
3.06	0.02	6,821	97.36	0.22	0.22	0.00
3.08	0.02	6,806	97.36	0.22	0.22	0.00
3.10	0.01	6,791	97.35	0.22	0.22	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.01	6,775	97.35	0.22	0.22	0.00
3.14	0.01	6,760	97.35	0.22	0.22	0.00
3.16	0.01	6,744	97.34	0.22	0.22	0.00
3.18	0.01	6,729	97.34	0.22	0.22	0.00
3.20	0.01	6,713	97.33	0.22	0.22	0.00
3.22	0.01	6,698	97.33	0.22	0.22	0.00
3.24	0.00	6,682	97.32	0.22	0.22	0.00
3.26	0.00	6,667	97.32	0.22	0.22	0.00
3.28	0.00	6,651	97.31	0.22	0.22	0.00
3.30	0.00	6,635	97.31	0.22	0.22	0.00
3.32	0.00	6,620	97.30	0.22	0.22	0.00
3.34	0.00	6,604	97.30	0.22	0.22	0.00
3.36	0.00	6,588	97.29	0.22	0.22	0.00
3.38	0.00	6,573	97.29	0.22	0.22	0.00
3.40	0.00	6,557	97.28	0.22	0.22	0.00
3.42	0.00	6,541	97.28	0.22	0.22	0.00
3.44	0.00	6,526	97.27	0.22	0.22	0.00
3.46	0.00	6,510	97.26	0.22	0.22	0.00
3.48	0.00	6,494	97.26	0.22	0.22	0.00
3.50	0.00	6,479	97.25	0.22	0.22	0.00
3.52	0.00	6,463	97.25	0.22	0.22	0.00
3.54	0.00	6,448	97.24	0.22	0.22	0.00
3.56	0.00	6,432	97.24	0.22	0.22	0.00
3.58	0.00	6,417	97.23	0.22	0.22	0.00
3.60	0.00	6,401	97.23	0.22	0.22	0.00
3.62	0.00	6,385	97.22	0.22	0.22	0.00
3.64	0.00	6,370	97.22	0.22	0.22	0.00
3.66	0.00	6,355	97.21	0.22	0.22	0.00
3.68	0.00	6,339	97.21	0.22	0.22	0.00
3.70	0.00	6,324	97.20	0.22	0.22	0.00
3.72	0.00	6,308	97.20	0.22	0.22	0.00
3.74	0.00	6,293	97.19	0.21	0.21	0.00
3.76	0.00	6,277	97.19	0.21	0.21	0.00
3.78	0.00	6,262	97.18	0.21	0.21	0.00
3.80	0.00	6,247	97.18	0.21	0.21	0.00
3.82	0.00	6,231	97.17	0.21	0.21	0.00
3.84	0.00	6,216	97.17	0.21	0.21	0.00
3.86	0.00	6,201	97.16	0.21	0.21	0.00
3.88	0.00	6,185	97.16	0.21	0.21	0.00
3.90	0.00	6,170	97.15	0.21	0.21	0.00
3.92	0.00	6,155	97.15	0.21	0.21	0.00
3.94	0.00	6,140	97.14	0.21	0.21	0.00
3.96	0.00	6,124	97.14	0.21	0.21	0.00
3.98	0.00	6,109	97.13	0.21	0.21	0.00
4.00	0.00	6,094	97.13	0.21	0.21	0.00
4.02	0.00	6,079	97.12	0.21	0.21	0.00
4.04	0.00	6,064	97.12	0.21	0.21	0.00
4.06	0.00	6,048	97.11	0.21	0.21	0.00
4.08	0.00	6,033	97.11	0.21	0.21	0.00
4.10	0.00	6,018	97.10	0.21	0.21	0.00
4.12	0.00	6,003	97.10	0.21	0.21	0.00
4.14	0.00	5,988	97.09	0.21	0.21	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.00	5,973	97.09	0.21	0.21	0.00
4.18	0.00	5,958	97.08	0.21	0.21	0.00
4.20	0.00	5,943	97.08	0.21	0.21	0.00
4.22	0.00	5,928	97.07	0.21	0.21	0.00
4.24	0.00	5,913	97.07	0.21	0.21	0.00
4.26	0.00	5,898	97.06	0.21	0.21	0.00
4.28	0.00	5,883	97.06	0.21	0.21	0.00
4.30	0.00	5,868	97.05	0.21	0.21	0.00
4.32	0.00	5,853	97.05	0.21	0.21	0.00
4.34	0.00	5,839	97.04	0.21	0.21	0.00
4.36	0.00	5,824	97.04	0.21	0.21	0.00
4.38	0.00	5,809	97.03	0.21	0.21	0.00
4.40	0.00	5,794	97.03	0.21	0.21	0.00
4.42	0.00	5,779	97.02	0.21	0.21	0.00
4.44	0.00	5,765	97.02	0.21	0.21	0.00
4.46	0.00	5,750	97.01	0.20	0.20	0.00
4.48	0.00	5,735	97.00	0.20	0.20	0.00
4.50	0.00	5,720	97.00	0.20	0.20	0.00
4.52	0.00	5,706	96.99	0.20	0.20	0.00
4.54	0.00	5,691	96.99	0.20	0.20	0.00
4.56	0.00	5,676	96.98	0.20	0.20	0.00
4.58	0.00	5,662	96.98	0.20	0.20	0.00
4.60	0.00	5,647	96.97	0.20	0.20	0.00
4.62	0.00	5,633	96.97	0.20	0.20	0.00
4.64	0.00	5,618	96.96	0.20	0.20	0.00
4.66	0.00	5,603	96.96	0.20	0.20	0.00
4.68	0.00	5,589	96.95	0.20	0.20	0.00
4.70	0.00	5,574	96.95	0.20	0.20	0.00
4.72	0.00	5,560	96.94	0.20	0.20	0.00
4.74	0.00	5,545	96.94	0.20	0.20	0.00
4.76	0.00	5,531	96.93	0.20	0.20	0.00
4.78	0.00	5,516	96.93	0.20	0.20	0.00
4.80	0.00	5,502	96.92	0.20	0.20	0.00
4.82	0.00	5,488	96.92	0.20	0.20	0.00
4.84	0.00	5,473	96.91	0.20	0.20	0.00
4.86	0.00	5,459	96.91	0.20	0.20	0.00
4.88	0.00	5,445	96.90	0.20	0.20	0.00
4.90	0.00	5,430	96.90	0.20	0.20	0.00
4.92	0.00	5,416	96.89	0.20	0.20	0.00
4.94	0.00	5,402	96.89	0.20	0.20	0.00
4.96	0.00	5,387	96.88	0.20	0.20	0.00
4.98	0.00	5,373	96.88	0.20	0.20	0.00
5.00	0.00	5,359	96.87	0.20	0.20	0.00
5.02	0.00	5,345	96.87	0.20	0.20	0.00
5.04	0.00	5,330	96.86	0.20	0.20	0.00
5.06	0.00	5,316	96.86	0.20	0.20	0.00
5.08	0.00	5,302	96.85	0.20	0.20	0.00
5.10	0.00	5,288	96.85	0.20	0.20	0.00
5.12	0.00	5,274	96.84	0.20	0.20	0.00
5.14	0.00	5,260	96.84	0.20	0.20	0.00
5.16	0.00	5,246	96.83	0.20	0.20	0.00
5.18	0.00	5,232	96.83	0.20	0.20	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	5,218	96.82	0.19	0.19	0.00
5.22	0.00	5,204	96.82	0.19	0.19	0.00
5.24	0.00	5,190	96.81	0.19	0.19	0.00
5.26	0.00	5,176	96.81	0.19	0.19	0.00
5.28	0.00	5,162	96.80	0.19	0.19	0.00
5.30	0.00	5,148	96.80	0.19	0.19	0.00
5.32	0.00	5,134	96.79	0.19	0.19	0.00
5.34	0.00	5,120	96.78	0.19	0.19	0.00
5.36	0.00	5,106	96.78	0.19	0.19	0.00
5.38	0.00	5,092	96.77	0.19	0.19	0.00
5.40	0.00	5,078	96.77	0.19	0.19	0.00
5.42	0.00	5,064	96.76	0.19	0.19	0.00
5.44	0.00	5,051	96.76	0.19	0.19	0.00
5.46	0.00	5,037	96.75	0.19	0.19	0.00
5.48	0.00	5,023	96.75	0.19	0.19	0.00
5.50	0.00	5,009	96.74	0.19	0.19	0.00
5.52	0.00	4,996	96.74	0.19	0.19	0.00
5.54	0.00	4,982	96.73	0.19	0.19	0.00
5.56	0.00	4,968	96.73	0.19	0.19	0.00
5.58	0.00	4,954	96.72	0.19	0.19	0.00
5.60	0.00	4,941	96.72	0.19	0.19	0.00
5.62	0.00	4,927	96.71	0.19	0.19	0.00
5.64	0.00	4,914	96.71	0.19	0.19	0.00
5.66	0.00	4,900	96.70	0.19	0.19	0.00
5.68	0.00	4,886	96.70	0.19	0.19	0.00
5.70	0.00	4,873	96.69	0.19	0.19	0.00
5.72	0.00	4,859	96.69	0.19	0.19	0.00
5.74	0.00	4,846	96.68	0.19	0.19	0.00
5.76	0.00	4,832	96.68	0.19	0.19	0.00
5.78	0.00	4,819	96.67	0.19	0.19	0.00
5.80	0.00	4,805	96.67	0.19	0.19	0.00
5.82	0.00	4,792	96.66	0.19	0.19	0.00
5.84	0.00	4,778	96.66	0.19	0.19	0.00
5.86	0.00	4,765	96.65	0.19	0.19	0.00
5.88	0.00	4,752	96.65	0.19	0.19	0.00
5.90	0.00	4,738	96.64	0.19	0.19	0.00
5.92	0.00	4,725	96.64	0.19	0.19	0.00
5.94	0.00	4,711	96.63	0.19	0.19	0.00
5.96	0.00	4,698	96.63	0.18	0.18	0.00
5.98	0.00	4,685	96.62	0.18	0.18	0.00
6.00	0.00	4,672	96.62	0.18	0.18	0.00
6.02	0.00	4,658	96.61	0.18	0.18	0.00
6.04	0.00	4,645	96.61	0.18	0.18	0.00
6.06	0.00	4,632	96.60	0.18	0.18	0.00
6.08	0.00	4,619	96.60	0.18	0.18	0.00
6.10	0.00	4,605	96.59	0.18	0.18	0.00
6.12	0.00	4,592	96.59	0.18	0.18	0.00
6.14	0.00	4,579	96.58	0.18	0.18	0.00
6.16	0.00	4,566	96.58	0.18	0.18	0.00
6.18	0.00	4,553	96.57	0.18	0.18	0.00
6.20	0.00	4,540	96.57	0.18	0.18	0.00
6.22	0.00	4,527	96.56	0.18	0.18	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.00	4,514	96.55	0.18	0.18	0.00
6.26	0.00	4,501	96.55	0.18	0.18	0.00
6.28	0.00	4,487	96.54	0.18	0.18	0.00
6.30	0.00	4,474	96.54	0.18	0.18	0.00
6.32	0.00	4,461	96.53	0.18	0.18	0.00
6.34	0.00	4,449	96.53	0.18	0.18	0.00
6.36	0.00	4,436	96.52	0.18	0.18	0.00
6.38	0.00	4,423	96.52	0.18	0.18	0.00
6.40	0.00	4,410	96.51	0.18	0.18	0.00
6.42	0.00	4,397	96.51	0.18	0.18	0.00
6.44	0.00	4,384	96.50	0.18	0.18	0.00
6.46	0.00	4,371	96.50	0.18	0.18	0.00
6.48	0.00	4,358	96.49	0.18	0.18	0.00
6.50	0.00	4,345	96.49	0.18	0.18	0.00
6.52	0.00	4,333	96.48	0.18	0.18	0.00
6.54	0.00	4,320	96.48	0.18	0.18	0.00
6.56	0.00	4,307	96.47	0.18	0.18	0.00
6.58	0.00	4,294	96.47	0.18	0.18	0.00
6.60	0.00	4,282	96.46	0.18	0.18	0.00
6.62	0.00	4,269	96.46	0.18	0.18	0.00
6.64	0.00	4,256	96.45	0.18	0.18	0.00
6.66	0.00	4,243	96.45	0.18	0.18	0.00
6.68	0.00	4,231	96.44	0.18	0.18	0.00
6.70	0.00	4,218	96.44	0.18	0.18	0.00
6.72	0.00	4,206	96.43	0.18	0.18	0.00
6.74	0.00	4,193	96.43	0.17	0.17	0.00
6.76	0.00	4,180	96.42	0.17	0.17	0.00
6.78	0.00	4,168	96.42	0.17	0.17	0.00
6.80	0.00	4,155	96.41	0.17	0.17	0.00
6.82	0.00	4,143	96.41	0.17	0.17	0.00
6.84	0.00	4,130	96.40	0.17	0.17	0.00
6.86	0.00	4,118	96.40	0.17	0.17	0.00
6.88	0.00	4,105	96.39	0.17	0.17	0.00
6.90	0.00	4,093	96.39	0.17	0.17	0.00
6.92	0.00	4,080	96.38	0.17	0.17	0.00
6.94	0.00	4,068	96.38	0.17	0.17	0.00
6.96	0.00	4,056	96.37	0.17	0.17	0.00
6.98	0.00	4,043	96.37	0.17	0.17	0.00
7.00	0.00	4,031	96.36	0.17	0.17	0.00
7.02	0.00	4,018	96.36	0.17	0.17	0.00
7.04	0.00	4,006	96.35	0.17	0.17	0.00
7.06	0.00	3,994	96.35	0.17	0.17	0.00
7.08	0.00	3,981	96.34	0.17	0.17	0.00
7.10	0.00	3,969	96.33	0.17	0.17	0.00
7.12	0.00	3,957	96.33	0.17	0.17	0.00
7.14	0.00	3,945	96.32	0.17	0.17	0.00
7.16	0.00	3,932	96.32	0.17	0.17	0.00
7.18	0.00	3,920	96.31	0.17	0.17	0.00
7.20	0.00	3,908	96.31	0.17	0.17	0.00
7.22	0.00	3,896	96.30	0.17	0.17	0.00
7.24	0.00	3,884	96.30	0.17	0.17	0.00
7.26	0.00	3,872	96.29	0.17	0.17	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	3,859	96.29	0.17	0.17	0.00
7.30	0.00	3,847	96.28	0.17	0.17	0.00
7.32	0.00	3,835	96.28	0.17	0.17	0.00
7.34	0.00	3,823	96.27	0.17	0.17	0.00
7.36	0.00	3,811	96.27	0.17	0.17	0.00
7.38	0.00	3,799	96.26	0.17	0.17	0.00
7.40	0.00	3,787	96.26	0.17	0.17	0.00
7.42	0.00	3,775	96.25	0.17	0.17	0.00
7.44	0.00	3,763	96.25	0.17	0.17	0.00
7.46	0.00	3,751	96.24	0.17	0.17	0.00
7.48	0.00	3,739	96.24	0.17	0.17	0.00
7.50	0.00	3,727	96.23	0.17	0.17	0.00
7.52	0.00	3,715	96.23	0.17	0.17	0.00
7.54	0.00	3,704	96.22	0.16	0.16	0.00
7.56	0.00	3,692	96.22	0.16	0.16	0.00
7.58	0.00	3,680	96.21	0.16	0.16	0.00
7.60	0.00	3,668	96.21	0.16	0.16	0.00
7.62	0.00	3,656	96.20	0.16	0.16	0.00
7.64	0.00	3,644	96.20	0.16	0.16	0.00
7.66	0.00	3,633	96.19	0.16	0.16	0.00
7.68	0.00	3,621	96.19	0.16	0.16	0.00
7.70	0.00	3,609	96.18	0.16	0.16	0.00
7.72	0.00	3,597	96.18	0.16	0.16	0.00
7.74	0.00	3,586	96.17	0.16	0.16	0.00
7.76	0.00	3,574	96.17	0.16	0.16	0.00
7.78	0.00	3,562	96.16	0.16	0.16	0.00
7.80	0.00	3,551	96.16	0.16	0.16	0.00
7.82	0.00	3,539	96.15	0.16	0.16	0.00
7.84	0.00	3,527	96.15	0.16	0.16	0.00
7.86	0.00	3,516	96.14	0.16	0.16	0.00
7.88	0.00	3,504	96.14	0.16	0.16	0.00
7.90	0.00	3,493	96.13	0.16	0.16	0.00
7.92	0.00	3,481	96.13	0.16	0.16	0.00
7.94	0.00	3,470	96.12	0.16	0.16	0.00
7.96	0.00	3,458	96.11	0.16	0.16	0.00
7.98	0.00	3,447	96.11	0.16	0.16	0.00
8.00	0.00	3,435	96.10	0.16	0.16	0.00

Summary for Subcatchment DA-2A POST: DA-2A POST

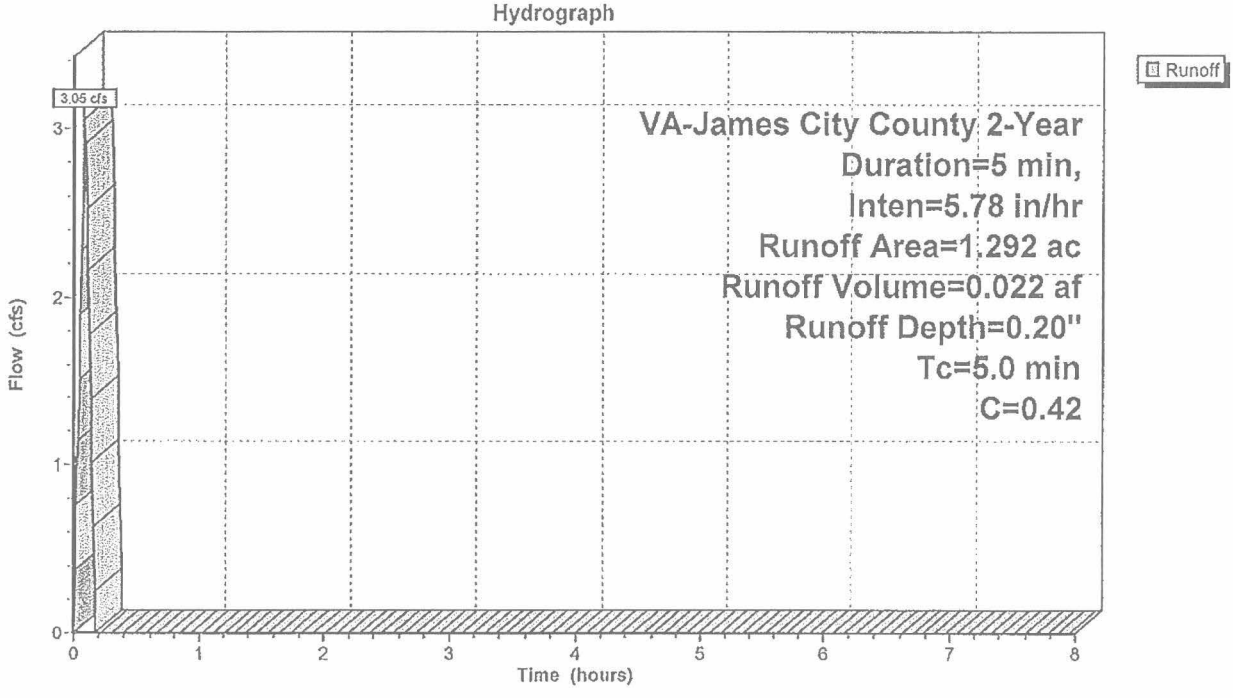
Runoff = 3.05 cfs @ 0.08 hrs, Volume= 0.022 af, Depth= 0.20"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 2-Year Duration=5 min, Inten=5.78 in/hr

Area (ac)	C	Description
0.172	0.90	Impervious
1.057	0.35	Lawn
0.063	0.30	Woods
1.292	0.42	Weighted Average
1.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2A POST: DA-2A POST



Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.44" for 2-Year event
Inflow = 2.72 cfs @ 0.09 hrs, Volume= 0.034 af
Outflow = 2.33 cfs @ 0.16 hrs, Volume= 0.034 af, Atten= 14%, Lag= 4.3 min
Primary = 2.33 cfs @ 0.16 hrs, Volume= 0.034 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Starting Elev= 107.00' Surf.Area= 435 sf Storage= 435 cf
Peak Elev= 109.25' @ 0.16 hrs Surf.Area= 435 sf Storage= 827 cf (392 cf above start)

Plug-Flow detention time= 6.1 min calculated for 0.024 af (70% of inflow)
Center-of-Mass det. time= 2.8 min (9.8 - 7.0)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

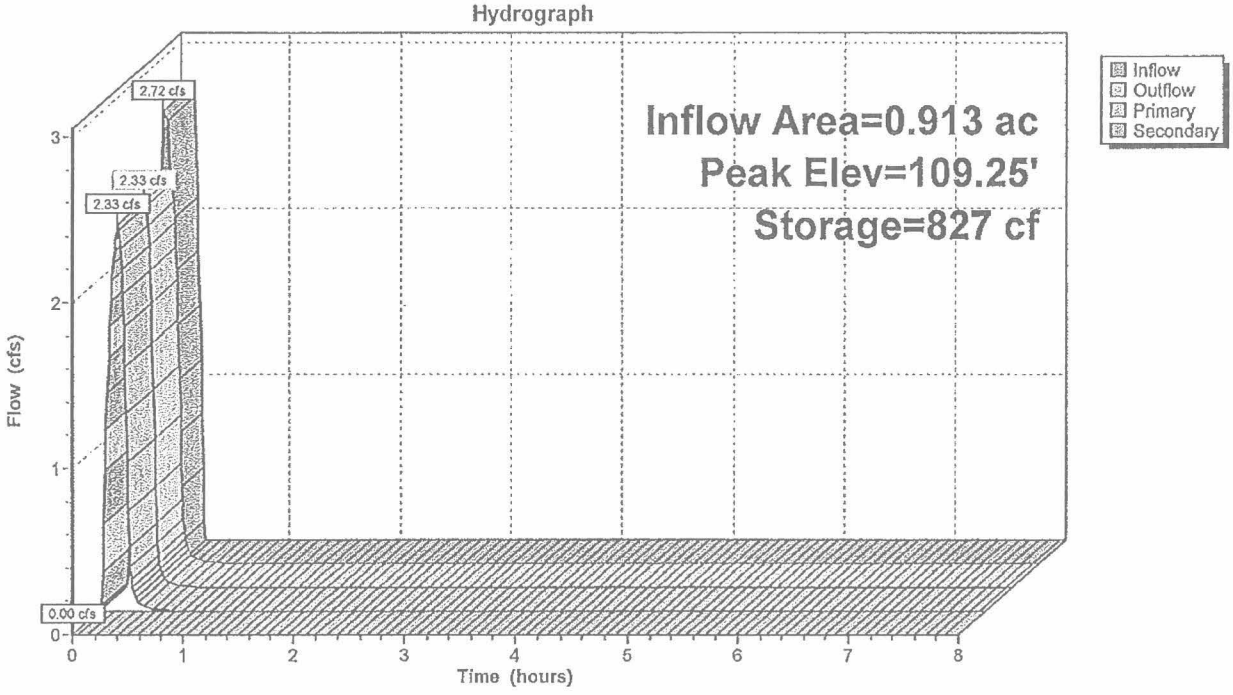
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=2.32 cfs @ 0.16 hrs HW=109.25' TW=95.32' (Dynamic Tailwater)
- **1=Orifice/Grate** (Passes 2.32 cfs of 56.45 cfs potential flow)
  - **2=Culvert** (Passes 2.32 cfs of 6.27 cfs potential flow)
    - **3=Culvert** (Passes 2.32 cfs of 3.74 cfs potential flow)
      - **4=Culvert** (Passes 2.32 cfs of 3.73 cfs potential flow)
        - **5=Culvert** (Inlet Controls 2.32 cfs @ 6.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.00' TW=94.00' (Dynamic Tailwater)
- **6=Broad-Crested Weir** (Controls 0.00 cfs)

Pond GFS: Gravel Filter Strip



Hydrograph for Pond GFS: Gravel Filter Strip

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	435	107.00	0.00	0.00	0.00
0.02	0.65	457	107.13	0.06	0.06	0.00
0.04	1.31	509	107.43	0.52	0.52	0.00
0.06	1.96	567	107.76	1.10	1.10	0.00
0.08	2.61	637	108.16	1.53	1.53	0.00
0.10	2.72	708	108.57	1.87	1.87	0.00
0.12	2.72	761	108.87	2.09	2.09	0.00
0.14	2.72	801	109.10	2.24	2.24	0.00
0.16	2.39	826	109.25	2.33	2.33	0.00
0.18	1.74	809	109.15	2.27	2.27	0.00
0.20	1.09	755	108.84	2.06	2.06	0.00
0.22	0.44	673	108.37	1.71	1.71	0.00
0.24	0.00	580	107.83	1.19	1.19	0.00
0.26	0.00	515	107.46	0.60	0.60	0.00
0.28	0.00	486	107.29	0.27	0.27	0.00
0.30	0.00	471	107.21	0.14	0.14	0.00
0.32	0.00	463	107.16	0.09	0.09	0.00
0.34	0.00	458	107.13	0.06	0.06	0.00
0.36	0.00	454	107.11	0.04	0.04	0.00
0.38	0.00	451	107.09	0.03	0.03	0.00
0.40	0.00	449	107.08	0.02	0.02	0.00
0.42	0.00	448	107.07	0.02	0.02	0.00
0.44	0.00	447	107.07	0.02	0.02	0.00
0.46	0.00	446	107.06	0.01	0.01	0.00
0.48	0.00	445	107.06	0.01	0.01	0.00
0.50	0.00	444	107.05	0.01	0.01	0.00
0.52	0.00	443	107.05	0.01	0.01	0.00
0.54	0.00	443	107.04	0.01	0.01	0.00
0.56	0.00	442	107.04	0.01	0.01	0.00
0.58	0.00	442	107.04	0.01	0.01	0.00
0.60	0.00	441	107.04	0.00	0.00	0.00
0.62	0.00	441	107.04	0.00	0.00	0.00
0.64	0.00	441	107.03	0.00	0.00	0.00
0.66	0.00	441	107.03	0.00	0.00	0.00
0.68	0.00	440	107.03	0.00	0.00	0.00
0.70	0.00	440	107.03	0.00	0.00	0.00
0.72	0.00	440	107.03	0.00	0.00	0.00
0.74	0.00	440	107.03	0.00	0.00	0.00
0.76	0.00	439	107.03	0.00	0.00	0.00
0.78	0.00	439	107.02	0.00	0.00	0.00
0.80	0.00	439	107.02	0.00	0.00	0.00
0.82	0.00	439	107.02	0.00	0.00	0.00
0.84	0.00	439	107.02	0.00	0.00	0.00
0.86	0.00	439	107.02	0.00	0.00	0.00
0.88	0.00	439	107.02	0.00	0.00	0.00
0.90	0.00	438	107.02	0.00	0.00	0.00
0.92	0.00	438	107.02	0.00	0.00	0.00
0.94	0.00	438	107.02	0.00	0.00	0.00
0.96	0.00	438	107.02	0.00	0.00	0.00
0.98	0.00	438	107.02	0.00	0.00	0.00
1.00	0.00	438	107.02	0.00	0.00	0.00
1.02	0.00	438	107.02	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.00	438	107.02	0.00	0.00	0.00
1.06	0.00	438	107.02	0.00	0.00	0.00
1.08	0.00	438	107.02	0.00	0.00	0.00
1.10	0.00	438	107.02	0.00	0.00	0.00
1.12	0.00	438	107.02	0.00	0.00	0.00
1.14	0.00	438	107.01	0.00	0.00	0.00
1.16	0.00	438	107.01	0.00	0.00	0.00
1.18	0.00	437	107.01	0.00	0.00	0.00
1.20	0.00	437	107.01	0.00	0.00	0.00
1.22	0.00	437	107.01	0.00	0.00	0.00
1.24	0.00	437	107.01	0.00	0.00	0.00
1.26	0.00	437	107.01	0.00	0.00	0.00
1.28	0.00	437	107.01	0.00	0.00	0.00
1.30	0.00	437	107.01	0.00	0.00	0.00
1.32	0.00	437	107.01	0.00	0.00	0.00
1.34	0.00	437	107.01	0.00	0.00	0.00
1.36	0.00	437	107.01	0.00	0.00	0.00
1.38	0.00	437	107.01	0.00	0.00	0.00
1.40	0.00	437	107.01	0.00	0.00	0.00
1.42	0.00	437	107.01	0.00	0.00	0.00
1.44	0.00	437	107.01	0.00	0.00	0.00
1.46	0.00	437	107.01	0.00	0.00	0.00
1.48	0.00	437	107.01	0.00	0.00	0.00
1.50	0.00	437	107.01	0.00	0.00	0.00
1.52	0.00	437	107.01	0.00	0.00	0.00
1.54	0.00	437	107.01	0.00	0.00	0.00
1.56	0.00	437	107.01	0.00	0.00	0.00
1.58	0.00	437	107.01	0.00	0.00	0.00
1.60	0.00	437	107.01	0.00	0.00	0.00
1.62	0.00	437	107.01	0.00	0.00	0.00
1.64	0.00	437	107.01	0.00	0.00	0.00
1.66	0.00	437	107.01	0.00	0.00	0.00
1.68	0.00	437	107.01	0.00	0.00	0.00
1.70	0.00	437	107.01	0.00	0.00	0.00
1.72	0.00	437	107.01	0.00	0.00	0.00
1.74	0.00	437	107.01	0.00	0.00	0.00
1.76	0.00	437	107.01	0.00	0.00	0.00
1.78	0.00	436	107.01	0.00	0.00	0.00
1.80	0.00	436	107.01	0.00	0.00	0.00
1.82	0.00	436	107.01	0.00	0.00	0.00
1.84	0.00	436	107.01	0.00	0.00	0.00
1.86	0.00	436	107.01	0.00	0.00	0.00
1.88	0.00	436	107.01	0.00	0.00	0.00
1.90	0.00	436	107.01	0.00	0.00	0.00
1.92	0.00	436	107.01	0.00	0.00	0.00
1.94	0.00	436	107.01	0.00	0.00	0.00
1.96	0.00	436	107.01	0.00	0.00	0.00
1.98	0.00	436	107.01	0.00	0.00	0.00
2.00	0.00	436	107.01	0.00	0.00	0.00
2.02	0.00	436	107.01	0.00	0.00	0.00
2.04	0.00	436	107.01	0.00	0.00	0.00
2.06	0.00	436	107.01	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.00	436	107.01	0.00	0.00	0.00
2.10	0.00	436	107.01	0.00	0.00	0.00
2.12	0.00	436	107.01	0.00	0.00	0.00
2.14	0.00	436	107.01	0.00	0.00	0.00
2.16	0.00	436	107.01	0.00	0.00	0.00
2.18	0.00	436	107.01	0.00	0.00	0.00
2.20	0.00	436	107.01	0.00	0.00	0.00
2.22	0.00	436	107.01	0.00	0.00	0.00
2.24	0.00	436	107.01	0.00	0.00	0.00
2.26	0.00	436	107.01	0.00	0.00	0.00
2.28	0.00	436	107.01	0.00	0.00	0.00
2.30	0.00	436	107.01	0.00	0.00	0.00
2.32	0.00	436	107.01	0.00	0.00	0.00
2.34	0.00	436	107.01	0.00	0.00	0.00
2.36	0.00	436	107.01	0.00	0.00	0.00
2.38	0.00	436	107.01	0.00	0.00	0.00
2.40	0.00	436	107.01	0.00	0.00	0.00
2.42	0.00	436	107.01	0.00	0.00	0.00
2.44	0.00	436	107.01	0.00	0.00	0.00
2.46	0.00	436	107.01	0.00	0.00	0.00
2.48	0.00	436	107.01	0.00	0.00	0.00
2.50	0.00	436	107.01	0.00	0.00	0.00
2.52	0.00	436	107.01	0.00	0.00	0.00
2.54	0.00	436	107.01	0.00	0.00	0.00
2.56	0.00	436	107.01	0.00	0.00	0.00
2.58	0.00	436	107.01	0.00	0.00	0.00
2.60	0.00	436	107.01	0.00	0.00	0.00
2.62	0.00	436	107.01	0.00	0.00	0.00
2.64	0.00	436	107.01	0.00	0.00	0.00
2.66	0.00	436	107.01	0.00	0.00	0.00
2.68	0.00	436	107.01	0.00	0.00	0.00
2.70	0.00	436	107.01	0.00	0.00	0.00
2.72	0.00	436	107.01	0.00	0.00	0.00
2.74	0.00	436	107.01	0.00	0.00	0.00
2.76	0.00	436	107.01	0.00	0.00	0.00
2.78	0.00	436	107.01	0.00	0.00	0.00
2.80	0.00	436	107.01	0.00	0.00	0.00
2.82	0.00	436	107.01	0.00	0.00	0.00
2.84	0.00	436	107.01	0.00	0.00	0.00
2.86	0.00	436	107.00	0.00	0.00	0.00
2.88	0.00	436	107.00	0.00	0.00	0.00
2.90	0.00	436	107.00	0.00	0.00	0.00
2.92	0.00	436	107.00	0.00	0.00	0.00
2.94	0.00	436	107.00	0.00	0.00	0.00
2.96	0.00	436	107.00	0.00	0.00	0.00
2.98	0.00	436	107.00	0.00	0.00	0.00
3.00	0.00	436	107.00	0.00	0.00	0.00
3.02	0.00	436	107.00	0.00	0.00	0.00
3.04	0.00	436	107.00	0.00	0.00	0.00
3.06	0.00	436	107.00	0.00	0.00	0.00
3.08	0.00	436	107.00	0.00	0.00	0.00
3.10	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.00	436	107.00	0.00	0.00	0.00
3.14	0.00	436	107.00	0.00	0.00	0.00
3.16	0.00	436	107.00	0.00	0.00	0.00
3.18	0.00	436	107.00	0.00	0.00	0.00
3.20	0.00	436	107.00	0.00	0.00	0.00
3.22	0.00	436	107.00	0.00	0.00	0.00
3.24	0.00	436	107.00	0.00	0.00	0.00
3.26	0.00	436	107.00	0.00	0.00	0.00
3.28	0.00	436	107.00	0.00	0.00	0.00
3.30	0.00	436	107.00	0.00	0.00	0.00
3.32	0.00	436	107.00	0.00	0.00	0.00
3.34	0.00	436	107.00	0.00	0.00	0.00
3.36	0.00	436	107.00	0.00	0.00	0.00
3.38	0.00	436	107.00	0.00	0.00	0.00
3.40	0.00	436	107.00	0.00	0.00	0.00
3.42	0.00	436	107.00	0.00	0.00	0.00
3.44	0.00	436	107.00	0.00	0.00	0.00
3.46	0.00	436	107.00	0.00	0.00	0.00
3.48	0.00	436	107.00	0.00	0.00	0.00
3.50	0.00	436	107.00	0.00	0.00	0.00
3.52	0.00	436	107.00	0.00	0.00	0.00
3.54	0.00	436	107.00	0.00	0.00	0.00
3.56	0.00	436	107.00	0.00	0.00	0.00
3.58	0.00	436	107.00	0.00	0.00	0.00
3.60	0.00	436	107.00	0.00	0.00	0.00
3.62	0.00	436	107.00	0.00	0.00	0.00
3.64	0.00	436	107.00	0.00	0.00	0.00
3.66	0.00	436	107.00	0.00	0.00	0.00
3.68	0.00	436	107.00	0.00	0.00	0.00
3.70	0.00	436	107.00	0.00	0.00	0.00
3.72	0.00	436	107.00	0.00	0.00	0.00
3.74	0.00	436	107.00	0.00	0.00	0.00
3.76	0.00	436	107.00	0.00	0.00	0.00
3.78	0.00	436	107.00	0.00	0.00	0.00
3.80	0.00	436	107.00	0.00	0.00	0.00
3.82	0.00	436	107.00	0.00	0.00	0.00
3.84	0.00	436	107.00	0.00	0.00	0.00
3.86	0.00	436	107.00	0.00	0.00	0.00
3.88	0.00	436	107.00	0.00	0.00	0.00
3.90	0.00	436	107.00	0.00	0.00	0.00
3.92	0.00	436	107.00	0.00	0.00	0.00
3.94	0.00	436	107.00	0.00	0.00	0.00
3.96	0.00	436	107.00	0.00	0.00	0.00
3.98	0.00	436	107.00	0.00	0.00	0.00
4.00	0.00	436	107.00	0.00	0.00	0.00
4.02	0.00	436	107.00	0.00	0.00	0.00
4.04	0.00	436	107.00	0.00	0.00	0.00
4.06	0.00	436	107.00	0.00	0.00	0.00
4.08	0.00	436	107.00	0.00	0.00	0.00
4.10	0.00	436	107.00	0.00	0.00	0.00
4.12	0.00	436	107.00	0.00	0.00	0.00
4.14	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.00	436	107.00	0.00	0.00	0.00
4.18	0.00	436	107.00	0.00	0.00	0.00
4.20	0.00	436	107.00	0.00	0.00	0.00
4.22	0.00	436	107.00	0.00	0.00	0.00
4.24	0.00	436	107.00	0.00	0.00	0.00
4.26	0.00	436	107.00	0.00	0.00	0.00
4.28	0.00	436	107.00	0.00	0.00	0.00
4.30	0.00	436	107.00	0.00	0.00	0.00
4.32	0.00	436	107.00	0.00	0.00	0.00
4.34	0.00	436	107.00	0.00	0.00	0.00
4.36	0.00	436	107.00	0.00	0.00	0.00
4.38	0.00	436	107.00	0.00	0.00	0.00
4.40	0.00	436	107.00	0.00	0.00	0.00
4.42	0.00	436	107.00	0.00	0.00	0.00
4.44	0.00	436	107.00	0.00	0.00	0.00
4.46	0.00	436	107.00	0.00	0.00	0.00
4.48	0.00	436	107.00	0.00	0.00	0.00
4.50	0.00	436	107.00	0.00	0.00	0.00
4.52	0.00	436	107.00	0.00	0.00	0.00
4.54	0.00	436	107.00	0.00	0.00	0.00
4.56	0.00	436	107.00	0.00	0.00	0.00
4.58	0.00	436	107.00	0.00	0.00	0.00
4.60	0.00	436	107.00	0.00	0.00	0.00
4.62	0.00	436	107.00	0.00	0.00	0.00
4.64	0.00	436	107.00	0.00	0.00	0.00
4.66	0.00	436	107.00	0.00	0.00	0.00
4.68	0.00	436	107.00	0.00	0.00	0.00
4.70	0.00	436	107.00	0.00	0.00	0.00
4.72	0.00	436	107.00	0.00	0.00	0.00
4.74	0.00	435	107.00	0.00	0.00	0.00
4.76	0.00	435	107.00	0.00	0.00	0.00
4.78	0.00	435	107.00	0.00	0.00	0.00
4.80	0.00	435	107.00	0.00	0.00	0.00
4.82	0.00	435	107.00	0.00	0.00	0.00
4.84	0.00	435	107.00	0.00	0.00	0.00
4.86	0.00	435	107.00	0.00	0.00	0.00
4.88	0.00	435	107.00	0.00	0.00	0.00
4.90	0.00	435	107.00	0.00	0.00	0.00
4.92	0.00	435	107.00	0.00	0.00	0.00
4.94	0.00	435	107.00	0.00	0.00	0.00
4.96	0.00	435	107.00	0.00	0.00	0.00
4.98	0.00	435	107.00	0.00	0.00	0.00
5.00	0.00	435	107.00	0.00	0.00	0.00
5.02	0.00	435	107.00	0.00	0.00	0.00
5.04	0.00	435	107.00	0.00	0.00	0.00
5.06	0.00	435	107.00	0.00	0.00	0.00
5.08	0.00	435	107.00	0.00	0.00	0.00
5.10	0.00	435	107.00	0.00	0.00	0.00
5.12	0.00	435	107.00	0.00	0.00	0.00
5.14	0.00	435	107.00	0.00	0.00	0.00
5.16	0.00	435	107.00	0.00	0.00	0.00
5.18	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	435	107.00	0.00	0.00	0.00
5.22	0.00	435	107.00	0.00	0.00	0.00
5.24	0.00	435	107.00	0.00	0.00	0.00
5.26	0.00	435	107.00	0.00	0.00	0.00
5.28	0.00	435	107.00	0.00	0.00	0.00
5.30	0.00	435	107.00	0.00	0.00	0.00
5.32	0.00	435	107.00	0.00	0.00	0.00
5.34	0.00	435	107.00	0.00	0.00	0.00
5.36	0.00	435	107.00	0.00	0.00	0.00
5.38	0.00	435	107.00	0.00	0.00	0.00
5.40	0.00	435	107.00	0.00	0.00	0.00
5.42	0.00	435	107.00	0.00	0.00	0.00
5.44	0.00	435	107.00	0.00	0.00	0.00
5.46	0.00	435	107.00	0.00	0.00	0.00
5.48	0.00	435	107.00	0.00	0.00	0.00
5.50	0.00	435	107.00	0.00	0.00	0.00
5.52	0.00	435	107.00	0.00	0.00	0.00
5.54	0.00	435	107.00	0.00	0.00	0.00
5.56	0.00	435	107.00	0.00	0.00	0.00
5.58	0.00	435	107.00	0.00	0.00	0.00
5.60	0.00	435	107.00	0.00	0.00	0.00
5.62	0.00	435	107.00	0.00	0.00	0.00
5.64	0.00	435	107.00	0.00	0.00	0.00
5.66	0.00	435	107.00	0.00	0.00	0.00
5.68	0.00	435	107.00	0.00	0.00	0.00
5.70	0.00	435	107.00	0.00	0.00	0.00
5.72	0.00	435	107.00	0.00	0.00	0.00
5.74	0.00	435	107.00	0.00	0.00	0.00
5.76	0.00	435	107.00	0.00	0.00	0.00
5.78	0.00	435	107.00	0.00	0.00	0.00
5.80	0.00	435	107.00	0.00	0.00	0.00
5.82	0.00	435	107.00	0.00	0.00	0.00
5.84	0.00	435	107.00	0.00	0.00	0.00
5.86	0.00	435	107.00	0.00	0.00	0.00
5.88	0.00	435	107.00	0.00	0.00	0.00
5.90	0.00	435	107.00	0.00	0.00	0.00
5.92	0.00	435	107.00	0.00	0.00	0.00
5.94	0.00	435	107.00	0.00	0.00	0.00
5.96	0.00	435	107.00	0.00	0.00	0.00
5.98	0.00	435	107.00	0.00	0.00	0.00
6.00	0.00	435	107.00	0.00	0.00	0.00
6.02	0.00	435	107.00	0.00	0.00	0.00
6.04	0.00	435	107.00	0.00	0.00	0.00
6.06	0.00	435	107.00	0.00	0.00	0.00
6.08	0.00	435	107.00	0.00	0.00	0.00
6.10	0.00	435	107.00	0.00	0.00	0.00
6.12	0.00	435	107.00	0.00	0.00	0.00
6.14	0.00	435	107.00	0.00	0.00	0.00
6.16	0.00	435	107.00	0.00	0.00	0.00
6.18	0.00	435	107.00	0.00	0.00	0.00
6.20	0.00	435	107.00	0.00	0.00	0.00
6.22	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.00	435	107.00	0.00	0.00	0.00
6.26	0.00	435	107.00	0.00	0.00	0.00
6.28	0.00	435	107.00	0.00	0.00	0.00
6.30	0.00	435	107.00	0.00	0.00	0.00
6.32	0.00	435	107.00	0.00	0.00	0.00
6.34	0.00	435	107.00	0.00	0.00	0.00
6.36	0.00	435	107.00	0.00	0.00	0.00
6.38	0.00	435	107.00	0.00	0.00	0.00
6.40	0.00	435	107.00	0.00	0.00	0.00
6.42	0.00	435	107.00	0.00	0.00	0.00
6.44	0.00	435	107.00	0.00	0.00	0.00
6.46	0.00	435	107.00	0.00	0.00	0.00
6.48	0.00	435	107.00	0.00	0.00	0.00
6.50	0.00	435	107.00	0.00	0.00	0.00
6.52	0.00	435	107.00	0.00	0.00	0.00
6.54	0.00	435	107.00	0.00	0.00	0.00
6.56	0.00	435	107.00	0.00	0.00	0.00
6.58	0.00	435	107.00	0.00	0.00	0.00
6.60	0.00	435	107.00	0.00	0.00	0.00
6.62	0.00	435	107.00	0.00	0.00	0.00
6.64	0.00	435	107.00	0.00	0.00	0.00
6.66	0.00	435	107.00	0.00	0.00	0.00
6.68	0.00	435	107.00	0.00	0.00	0.00
6.70	0.00	435	107.00	0.00	0.00	0.00
6.72	0.00	435	107.00	0.00	0.00	0.00
6.74	0.00	435	107.00	0.00	0.00	0.00
6.76	0.00	435	107.00	0.00	0.00	0.00
6.78	0.00	435	107.00	0.00	0.00	0.00
6.80	0.00	435	107.00	0.00	0.00	0.00
6.82	0.00	435	107.00	0.00	0.00	0.00
6.84	0.00	435	107.00	0.00	0.00	0.00
6.86	0.00	435	107.00	0.00	0.00	0.00
6.88	0.00	435	107.00	0.00	0.00	0.00
6.90	0.00	435	107.00	0.00	0.00	0.00
6.92	0.00	435	107.00	0.00	0.00	0.00
6.94	0.00	435	107.00	0.00	0.00	0.00
6.96	0.00	435	107.00	0.00	0.00	0.00
6.98	0.00	435	107.00	0.00	0.00	0.00
7.00	0.00	435	107.00	0.00	0.00	0.00
7.02	0.00	435	107.00	0.00	0.00	0.00
7.04	0.00	435	107.00	0.00	0.00	0.00
7.06	0.00	435	107.00	0.00	0.00	0.00
7.08	0.00	435	107.00	0.00	0.00	0.00
7.10	0.00	435	107.00	0.00	0.00	0.00
7.12	0.00	435	107.00	0.00	0.00	0.00
7.14	0.00	435	107.00	0.00	0.00	0.00
7.16	0.00	435	107.00	0.00	0.00	0.00
7.18	0.00	435	107.00	0.00	0.00	0.00
7.20	0.00	435	107.00	0.00	0.00	0.00
7.22	0.00	435	107.00	0.00	0.00	0.00
7.24	0.00	435	107.00	0.00	0.00	0.00
7.26	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	435	107.00	0.00	0.00	0.00
7.30	0.00	435	107.00	0.00	0.00	0.00
7.32	0.00	435	107.00	0.00	0.00	0.00
7.34	0.00	435	107.00	0.00	0.00	0.00
7.36	0.00	435	107.00	0.00	0.00	0.00
7.38	0.00	435	107.00	0.00	0.00	0.00
7.40	0.00	435	107.00	0.00	0.00	0.00
7.42	0.00	435	107.00	0.00	0.00	0.00
7.44	0.00	435	107.00	0.00	0.00	0.00
7.46	0.00	435	107.00	0.00	0.00	0.00
7.48	0.00	435	107.00	0.00	0.00	0.00
7.50	0.00	435	107.00	0.00	0.00	0.00
7.52	0.00	435	107.00	0.00	0.00	0.00
7.54	0.00	435	107.00	0.00	0.00	0.00
7.56	0.00	435	107.00	0.00	0.00	0.00
7.58	0.00	435	107.00	0.00	0.00	0.00
7.60	0.00	435	107.00	0.00	0.00	0.00
7.62	0.00	435	107.00	0.00	0.00	0.00
7.64	0.00	435	107.00	0.00	0.00	0.00
7.66	0.00	435	107.00	0.00	0.00	0.00
7.68	0.00	435	107.00	0.00	0.00	0.00
7.70	0.00	435	107.00	0.00	0.00	0.00
7.72	0.00	435	107.00	0.00	0.00	0.00
7.74	0.00	435	107.00	0.00	0.00	0.00
7.76	0.00	435	107.00	0.00	0.00	0.00
7.78	0.00	435	107.00	0.00	0.00	0.00
7.80	0.00	435	107.00	0.00	0.00	0.00
7.82	0.00	435	107.00	0.00	0.00	0.00
7.84	0.00	435	107.00	0.00	0.00	0.00
7.86	0.00	435	107.00	0.00	0.00	0.00
7.88	0.00	435	107.00	0.00	0.00	0.00
7.90	0.00	435	107.00	0.00	0.00	0.00
7.92	0.00	435	107.00	0.00	0.00	0.00
7.94	0.00	435	107.00	0.00	0.00	0.00
7.96	0.00	435	107.00	0.00	0.00	0.00
7.98	0.00	435	107.00	0.00	0.00	0.00
8.00	0.00	435	107.00	0.00	0.00	0.00

Summary for Subcatchment DA-2B Post: DA-2B POST

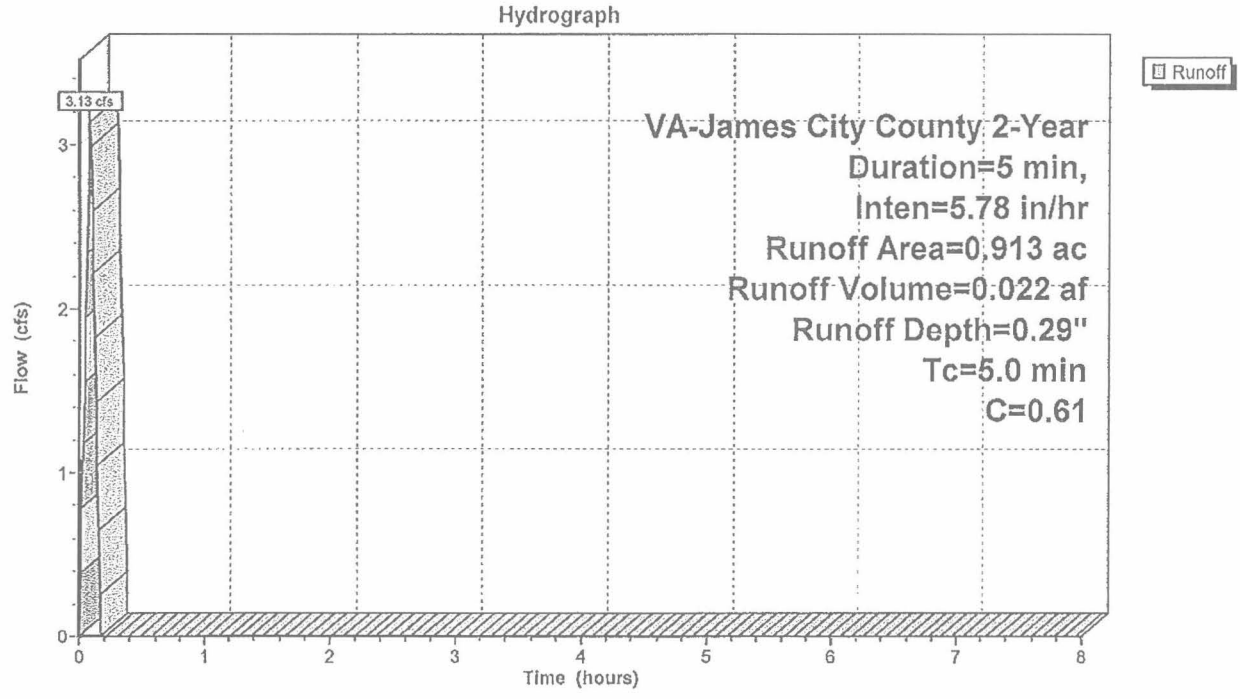
Runoff = 3.13 cfs @ 0.08 hrs, Volume= 0.022 af, Depth= 0.29"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 2-Year Duration=5 min, Inten=5.78 in/hr

Area (ac)	C	Description
0.430	0.90	Impervious
0.455	0.35	Lawn
0.028	0.30	Woods
0.913	0.61	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2B Post: DA-2B POST

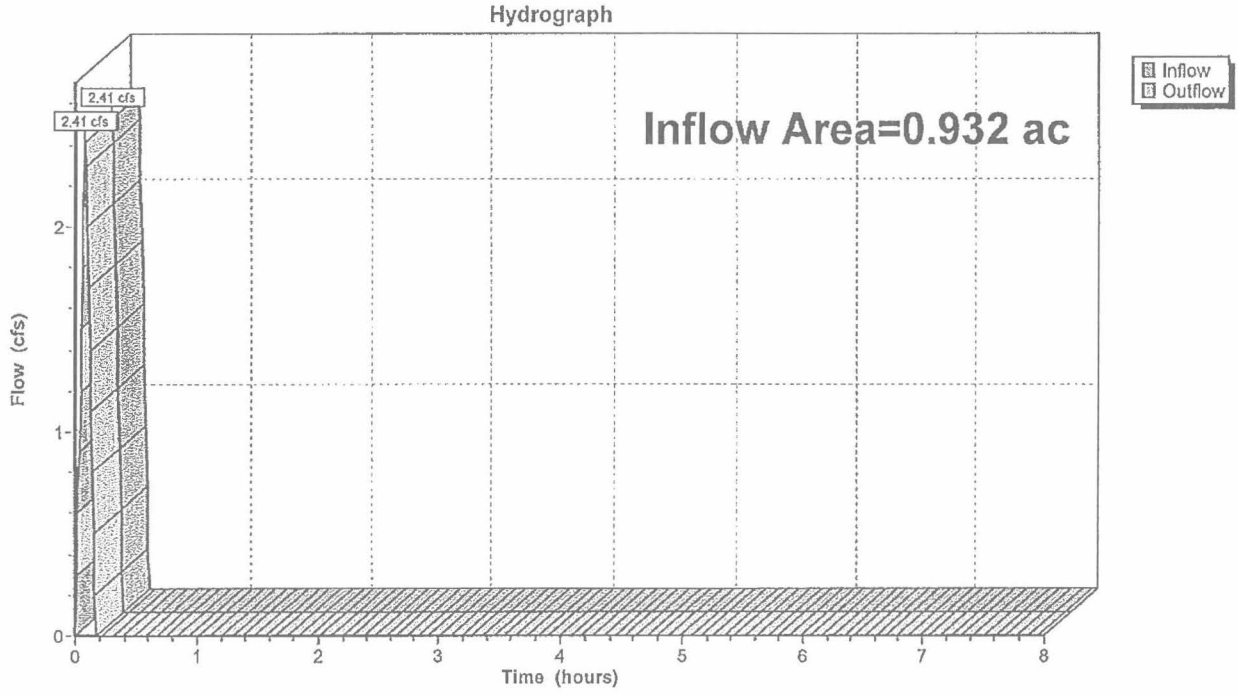


Summary for Reach POI 2 POST: Point of Investigation 2 POST

Inflow Area = 0.932 ac, 0.00% Impervious, Inflow Depth = 0.22" for 2-Year event
Inflow = 2.41 cfs @ 0.08 hrs, Volume= 0.017 af
Outflow = 2.41 cfs @ 0.08 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 2 POST: Point of Investigation 2 POST



Summary for Subcatchment DA-3 POST: DA-3 POST

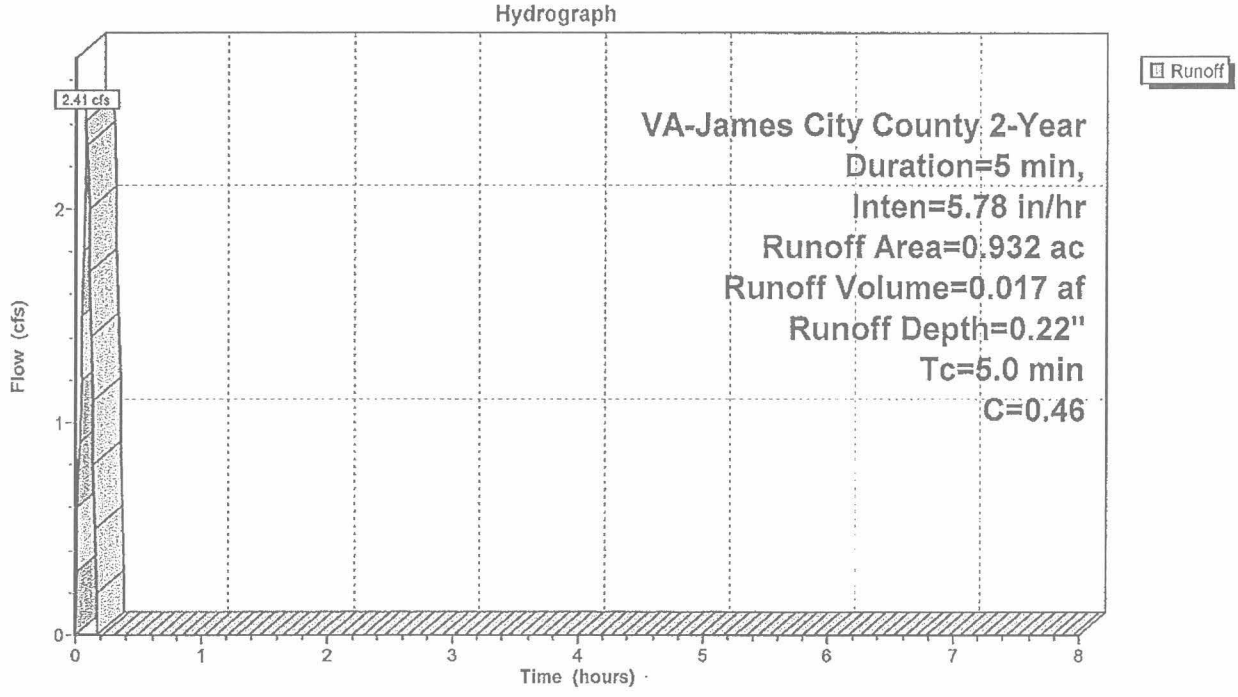
Runoff = 2.41 cfs @ 0.08 hrs, Volume= 0.017 af, Depth= 0.22"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 2-Year Duration=5 min, Inten=5.78 in/hr

Area (ac)	C	Description
0.748	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.932	0.46	Weighted Average
0.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST: DA-3 POST



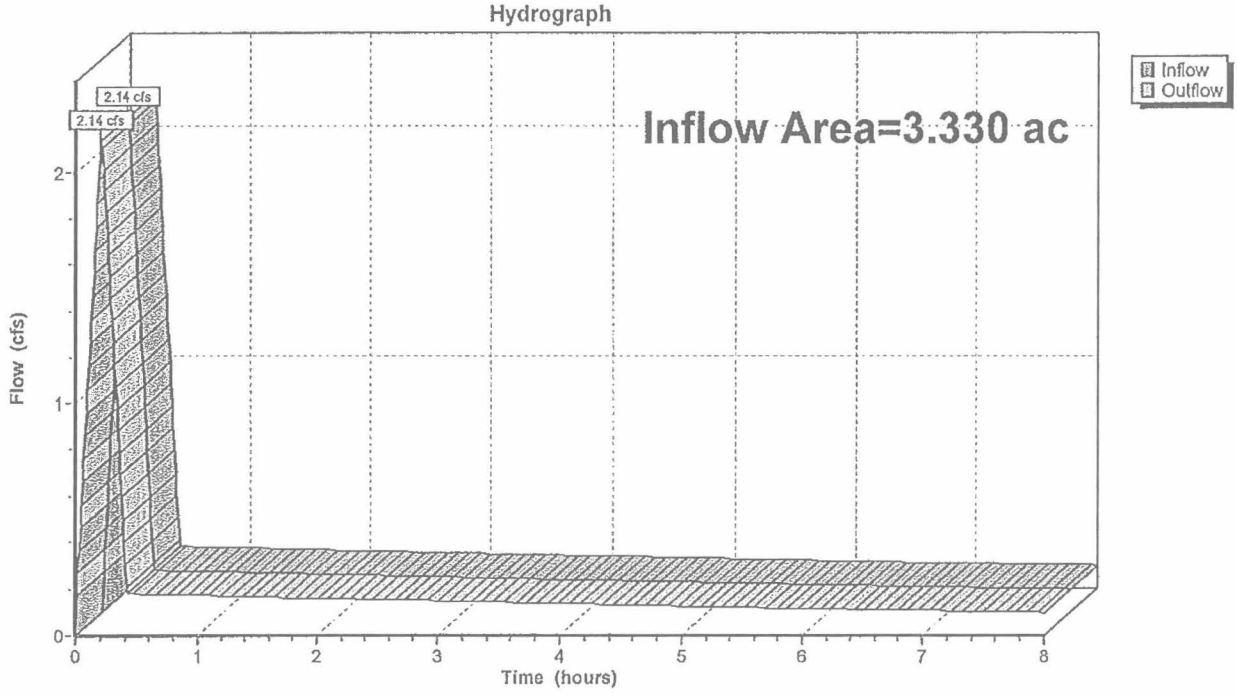
10-YEAR STORM

Summary for Reach POI 1 POST: Point of Investigation 1 POST

Inflow Area = 3.330 ac, 0.00% Impervious, Inflow Depth > 0.46" for 10-Year event
Inflow = 2.14 cfs @ 0.21 hrs, Volume= 0.126 af
Outflow = 2.14 cfs @ 0.21 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 1 POST: Point of Investigation 1 POST



Summary for Subcatchment DA-1 Post: DA-1 POST

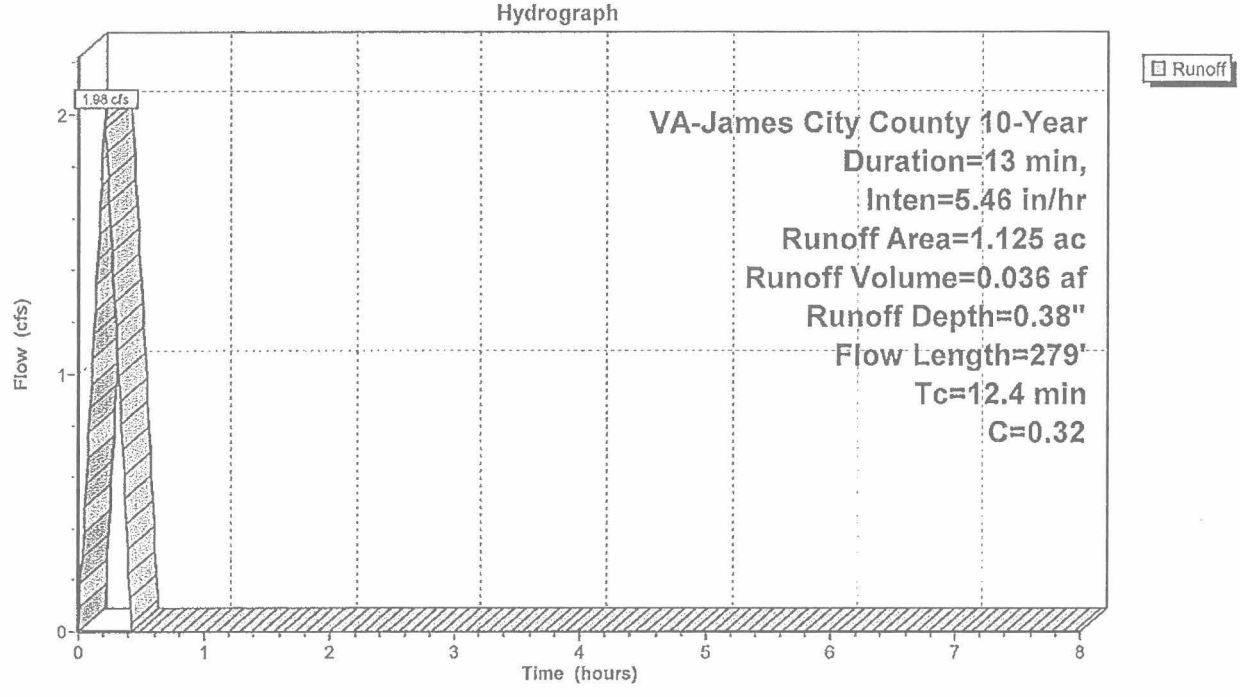
Runoff = 1.98 cfs @ 0.21 hrs, Volume= 0.036 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 10-Year Duration=13 min, Inten=5.46 in/hr

Area (ac)	C	Description
0.365	0.35	Lawn
0.760	0.30	Woods
1.125	0.32	Weighted Average
1.125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 Post: DA-1 POST



Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.205 ac, 0.00% Impervious, Inflow Depth > 2.09" for 10-Year event
Inflow = 0.78 cfs @ 0.91 hrs, Volume= 0.384 af
Outflow = 0.31 cfs @ 6.01 hrs, Volume= 0.153 af, Atten= 60%, Lag= 306.2 min
Primary = 0.31 cfs @ 6.01 hrs, Volume= 0.153 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Peak Elev= 98.77' @ 6.01 hrs Surf.Area= 4,353 sf Storage= 12,083 cf

Plug-Flow detention time= 202.7 min calculated for 0.153 af (40% of inflow)
Center-of-Mass det. time= 95.7 min (278.0 - 182.4)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

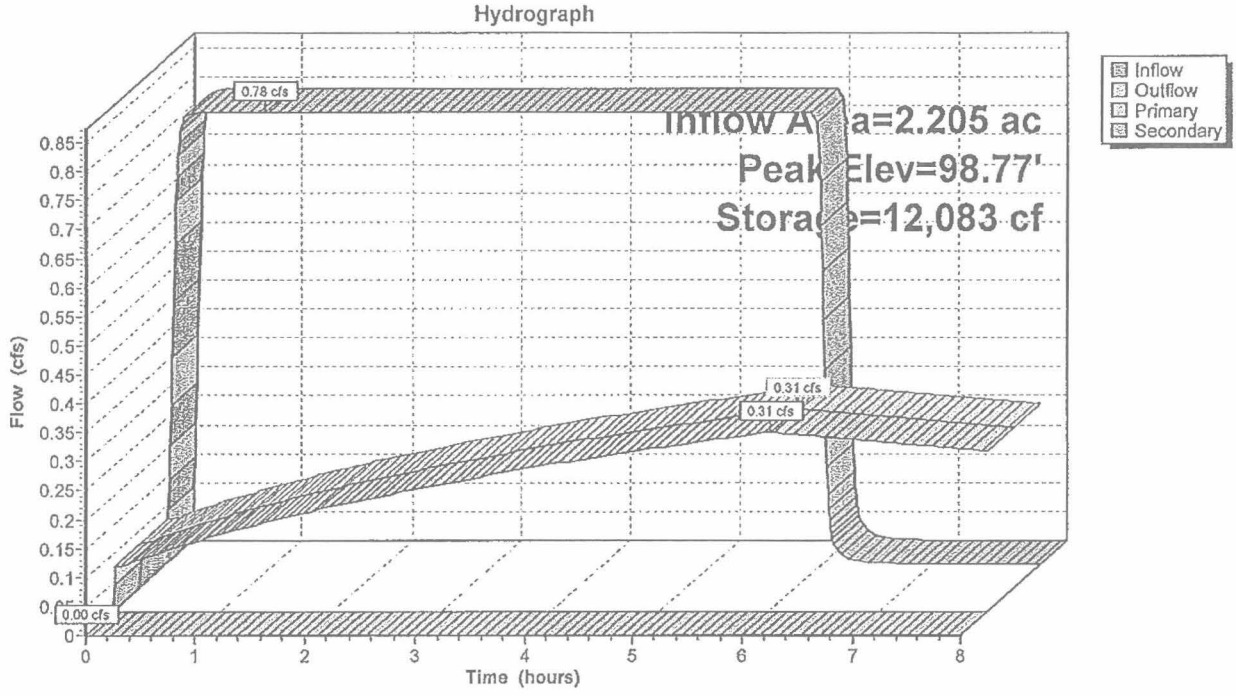
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 Inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.31 cfs @ 6.01 hrs HW=98.77' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration Half of the average 6.14 Inch/hr** (Exfiltration Controls 0.31 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=94.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Infiltration Basin: Infiltration Basin



Hydrograph for Pond Infiltration Basin: Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	94.00	0.00	0.00	0.00
0.02	0.09	0	94.00	0.08	0.08	0.00
0.04	0.20	5	94.00	0.08	0.08	0.00
0.06	0.36	20	94.02	0.08	0.08	0.00
0.08	0.55	47	94.04	0.08	0.08	0.00
0.10	0.67	85	94.08	0.08	0.08	0.00
0.12	0.73	130	94.12	0.08	0.08	0.00
0.14	0.76	177	94.16	0.08	0.08	0.00
0.16	0.77	226	94.20	0.08	0.08	0.00
0.18	0.78	276	94.24	0.09	0.09	0.00
0.20	0.78	326	94.28	0.09	0.09	0.00
0.22	0.78	375	94.32	0.09	0.09	0.00
0.24	0.78	425	94.36	0.09	0.09	0.00
0.26	0.78	475	94.40	0.09	0.09	0.00
0.28	0.78	524	94.44	0.09	0.09	0.00
0.30	0.78	574	94.47	0.09	0.09	0.00
0.32	0.78	623	94.51	0.09	0.09	0.00
0.34	0.78	672	94.55	0.10	0.10	0.00
0.36	0.78	721	94.58	0.10	0.10	0.00
0.38	0.78	771	94.62	0.10	0.10	0.00
0.40	0.78	820	94.66	0.10	0.10	0.00
0.42	0.78	868	94.69	0.10	0.10	0.00
0.44	0.78	917	94.72	0.10	0.10	0.00
0.46	0.78	966	94.76	0.10	0.10	0.00
0.48	0.78	1,015	94.79	0.10	0.10	0.00
0.50	0.78	1,063	94.82	0.11	0.11	0.00
0.52	0.78	1,112	94.86	0.11	0.11	0.00
0.54	0.78	1,160	94.89	0.11	0.11	0.00
0.56	0.78	1,209	94.92	0.11	0.11	0.00
0.58	0.78	1,257	94.95	0.11	0.11	0.00
0.60	0.78	1,305	94.98	0.11	0.11	0.00
0.62	0.78	1,353	95.01	0.11	0.11	0.00
0.64	0.78	1,401	95.04	0.11	0.11	0.00
0.66	0.78	1,449	95.07	0.12	0.12	0.00
0.68	0.78	1,497	95.10	0.12	0.12	0.00
0.70	0.78	1,545	95.13	0.12	0.12	0.00
0.72	0.78	1,592	95.16	0.12	0.12	0.00
0.74	0.78	1,640	95.19	0.12	0.12	0.00
0.76	0.78	1,687	95.22	0.12	0.12	0.00
0.78	0.78	1,735	95.24	0.12	0.12	0.00
0.80	0.78	1,782	95.27	0.12	0.12	0.00
0.82	0.78	1,829	95.30	0.12	0.12	0.00
0.84	0.78	1,877	95.32	0.13	0.13	0.00
0.86	0.78	1,924	95.35	0.13	0.13	0.00
0.88	0.78	1,971	95.38	0.13	0.13	0.00
0.90	0.78	2,018	95.40	0.13	0.13	0.00
0.92	0.78	2,064	95.43	0.13	0.13	0.00
0.94	0.78	2,111	95.45	0.13	0.13	0.00
0.96	0.78	2,158	95.48	0.13	0.13	0.00
0.98	0.78	2,205	95.51	0.13	0.13	0.00
1.00	0.78	2,251	95.53	0.13	0.13	0.00
1.02	0.78	2,298	95.55	0.13	0.13	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.78	2,344	95.58	0.14	0.14	0.00
1.06	0.78	2,390	95.60	0.14	0.14	0.00
1.08	0.78	2,437	95.63	0.14	0.14	0.00
1.10	0.78	2,483	95.65	0.14	0.14	0.00
1.12	0.78	2,529	95.67	0.14	0.14	0.00
1.14	0.78	2,575	95.70	0.14	0.14	0.00
1.16	0.78	2,621	95.72	0.14	0.14	0.00
1.18	0.78	2,667	95.74	0.14	0.14	0.00
1.20	0.78	2,713	95.77	0.14	0.14	0.00
1.22	0.78	2,759	95.79	0.15	0.15	0.00
1.24	0.78	2,804	95.81	0.15	0.15	0.00
1.26	0.78	2,850	95.83	0.15	0.15	0.00
1.28	0.78	2,895	95.85	0.15	0.15	0.00
1.30	0.78	2,941	95.88	0.15	0.15	0.00
1.32	0.78	2,986	95.90	0.15	0.15	0.00
1.34	0.78	3,032	95.92	0.15	0.15	0.00
1.36	0.78	3,077	95.94	0.15	0.15	0.00
1.38	0.78	3,122	95.96	0.15	0.15	0.00
1.40	0.78	3,167	95.98	0.15	0.15	0.00
1.42	0.78	3,212	96.00	0.15	0.15	0.00
1.44	0.78	3,257	96.02	0.16	0.16	0.00
1.46	0.78	3,302	96.04	0.16	0.16	0.00
1.48	0.78	3,347	96.07	0.16	0.16	0.00
1.50	0.78	3,392	96.09	0.16	0.16	0.00
1.52	0.78	3,437	96.11	0.16	0.16	0.00
1.54	0.78	3,481	96.13	0.16	0.16	0.00
1.56	0.78	3,526	96.14	0.16	0.16	0.00
1.58	0.78	3,570	96.16	0.16	0.16	0.00
1.60	0.78	3,615	96.18	0.16	0.16	0.00
1.62	0.78	3,659	96.20	0.16	0.16	0.00
1.64	0.78	3,703	96.22	0.16	0.16	0.00
1.66	0.78	3,748	96.24	0.17	0.17	0.00
1.68	0.78	3,792	96.26	0.17	0.17	0.00
1.70	0.78	3,836	96.28	0.17	0.17	0.00
1.72	0.78	3,880	96.30	0.17	0.17	0.00
1.74	0.78	3,924	96.32	0.17	0.17	0.00
1.76	0.78	3,968	96.33	0.17	0.17	0.00
1.78	0.78	4,012	96.35	0.17	0.17	0.00
1.80	0.78	4,056	96.37	0.17	0.17	0.00
1.82	0.78	4,099	96.39	0.17	0.17	0.00
1.84	0.78	4,143	96.41	0.17	0.17	0.00
1.86	0.78	4,187	96.42	0.17	0.17	0.00
1.88	0.78	4,230	96.44	0.18	0.18	0.00
1.90	0.78	4,274	96.46	0.18	0.18	0.00
1.92	0.78	4,317	96.48	0.18	0.18	0.00
1.94	0.78	4,360	96.49	0.18	0.18	0.00
1.96	0.78	4,404	96.51	0.18	0.18	0.00
1.98	0.78	4,447	96.53	0.18	0.18	0.00
2.00	0.78	4,490	96.55	0.18	0.18	0.00
2.02	0.78	4,533	96.56	0.18	0.18	0.00
2.04	0.78	4,576	96.58	0.18	0.18	0.00
2.06	0.78	4,619	96.60	0.18	0.18	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.78	4,662	96.61	0.18	0.18	0.00
2.10	0.78	4,705	96.63	0.19	0.19	0.00
2.12	0.78	4,748	96.65	0.19	0.19	0.00
2.14	0.78	4,791	96.66	0.19	0.19	0.00
2.16	0.78	4,833	96.68	0.19	0.19	0.00
2.18	0.78	4,876	96.69	0.19	0.19	0.00
2.20	0.78	4,918	96.71	0.19	0.19	0.00
2.22	0.78	4,961	96.73	0.19	0.19	0.00
2.24	0.78	5,003	96.74	0.19	0.19	0.00
2.26	0.78	5,046	96.76	0.19	0.19	0.00
2.28	0.78	5,088	96.77	0.19	0.19	0.00
2.30	0.78	5,130	96.79	0.19	0.19	0.00
2.32	0.78	5,173	96.80	0.19	0.19	0.00
2.34	0.78	5,215	96.82	0.19	0.19	0.00
2.36	0.78	5,257	96.84	0.20	0.20	0.00
2.38	0.78	5,299	96.85	0.20	0.20	0.00
2.40	0.78	5,341	96.87	0.20	0.20	0.00
2.42	0.78	5,383	96.88	0.20	0.20	0.00
2.44	0.78	5,425	96.90	0.20	0.20	0.00
2.46	0.78	5,467	96.91	0.20	0.20	0.00
2.48	0.78	5,508	96.93	0.20	0.20	0.00
2.50	0.78	5,550	96.94	0.20	0.20	0.00
2.52	0.78	5,592	96.95	0.20	0.20	0.00
2.54	0.78	5,633	96.97	0.20	0.20	0.00
2.56	0.78	5,675	96.98	0.20	0.20	0.00
2.58	0.78	5,716	97.00	0.20	0.20	0.00
2.60	0.78	5,758	97.01	0.21	0.21	0.00
2.62	0.78	5,799	97.03	0.21	0.21	0.00
2.64	0.78	5,840	97.04	0.21	0.21	0.00
2.66	0.78	5,882	97.06	0.21	0.21	0.00
2.68	0.78	5,923	97.07	0.21	0.21	0.00
2.70	0.78	5,964	97.08	0.21	0.21	0.00
2.72	0.78	6,005	97.10	0.21	0.21	0.00
2.74	0.78	6,046	97.11	0.21	0.21	0.00
2.76	0.78	6,087	97.13	0.21	0.21	0.00
2.78	0.78	6,128	97.14	0.21	0.21	0.00
2.80	0.78	6,169	97.15	0.21	0.21	0.00
2.82	0.78	6,210	97.17	0.21	0.21	0.00
2.84	0.78	6,251	97.18	0.21	0.21	0.00
2.86	0.78	6,291	97.19	0.21	0.21	0.00
2.88	0.78	6,332	97.21	0.22	0.22	0.00
2.90	0.78	6,373	97.22	0.22	0.22	0.00
2.92	0.78	6,413	97.23	0.22	0.22	0.00
2.94	0.78	6,454	97.25	0.22	0.22	0.00
2.96	0.78	6,494	97.26	0.22	0.22	0.00
2.98	0.78	6,534	97.27	0.22	0.22	0.00
3.00	0.78	6,575	97.29	0.22	0.22	0.00
3.02	0.78	6,615	97.30	0.22	0.22	0.00
3.04	0.78	6,655	97.31	0.22	0.22	0.00
3.06	0.78	6,696	97.32	0.22	0.22	0.00
3.08	0.78	6,736	97.34	0.22	0.22	0.00
3.10	0.78	6,776	97.35	0.22	0.22	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.78	6,816	97.36	0.22	0.22	0.00
3.14	0.78	6,856	97.38	0.22	0.22	0.00
3.16	0.78	6,896	97.39	0.23	0.23	0.00
3.18	0.78	6,936	97.40	0.23	0.23	0.00
3.20	0.78	6,976	97.41	0.23	0.23	0.00
3.22	0.78	7,015	97.43	0.23	0.23	0.00
3.24	0.78	7,055	97.44	0.23	0.23	0.00
3.26	0.78	7,095	97.45	0.23	0.23	0.00
3.28	0.78	7,134	97.46	0.23	0.23	0.00
3.30	0.78	7,174	97.47	0.23	0.23	0.00
3.32	0.78	7,214	97.49	0.23	0.23	0.00
3.34	0.78	7,253	97.50	0.23	0.23	0.00
3.36	0.78	7,292	97.51	0.23	0.23	0.00
3.38	0.78	7,332	97.52	0.23	0.23	0.00
3.40	0.78	7,371	97.54	0.23	0.23	0.00
3.42	0.78	7,410	97.55	0.23	0.23	0.00
3.44	0.78	7,450	97.56	0.24	0.24	0.00
3.46	0.78	7,489	97.57	0.24	0.24	0.00
3.48	0.78	7,528	97.58	0.24	0.24	0.00
3.50	0.78	7,567	97.59	0.24	0.24	0.00
3.52	0.78	7,606	97.61	0.24	0.24	0.00
3.54	0.78	7,645	97.62	0.24	0.24	0.00
3.56	0.78	7,684	97.63	0.24	0.24	0.00
3.58	0.78	7,723	97.64	0.24	0.24	0.00
3.60	0.78	7,762	97.65	0.24	0.24	0.00
3.62	0.78	7,801	97.66	0.24	0.24	0.00
3.64	0.78	7,840	97.68	0.24	0.24	0.00
3.66	0.78	7,878	97.69	0.24	0.24	0.00
3.68	0.78	7,917	97.70	0.24	0.24	0.00
3.70	0.78	7,956	97.71	0.24	0.24	0.00
3.72	0.78	7,994	97.72	0.24	0.24	0.00
3.74	0.78	8,033	97.73	0.25	0.25	0.00
3.76	0.78	8,071	97.74	0.25	0.25	0.00
3.78	0.78	8,110	97.75	0.25	0.25	0.00
3.80	0.78	8,148	97.76	0.25	0.25	0.00
3.82	0.78	8,186	97.78	0.25	0.25	0.00
3.84	0.78	8,225	97.79	0.25	0.25	0.00
3.86	0.78	8,263	97.80	0.25	0.25	0.00
3.88	0.78	8,301	97.81	0.25	0.25	0.00
3.90	0.78	8,339	97.82	0.25	0.25	0.00
3.92	0.78	8,377	97.83	0.25	0.25	0.00
3.94	0.78	8,415	97.84	0.25	0.25	0.00
3.96	0.78	8,453	97.85	0.25	0.25	0.00
3.98	0.78	8,491	97.86	0.25	0.25	0.00
4.00	0.78	8,529	97.87	0.25	0.25	0.00
4.02	0.78	8,567	97.88	0.25	0.25	0.00
4.04	0.78	8,605	97.89	0.25	0.25	0.00
4.06	0.78	8,643	97.90	0.26	0.26	0.00
4.08	0.78	8,681	97.92	0.26	0.26	0.00
4.10	0.78	8,718	97.93	0.26	0.26	0.00
4.12	0.78	8,756	97.94	0.26	0.26	0.00
4.14	0.78	8,794	97.95	0.26	0.26	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.78	8,831	97.96	0.26	0.26	0.00
4.18	0.78	8,869	97.97	0.26	0.26	0.00
4.20	0.78	8,906	97.98	0.26	0.26	0.00
4.22	0.78	8,944	97.99	0.26	0.26	0.00
4.24	0.78	8,981	98.00	0.26	0.26	0.00
4.26	0.78	9,018	98.01	0.26	0.26	0.00
4.28	0.78	9,056	98.02	0.26	0.26	0.00
4.30	0.78	9,093	98.03	0.26	0.26	0.00
4.32	0.78	9,130	98.04	0.26	0.26	0.00
4.34	0.78	9,167	98.05	0.26	0.26	0.00
4.36	0.78	9,204	98.06	0.26	0.26	0.00
4.38	0.78	9,241	98.07	0.27	0.27	0.00
4.40	0.78	9,279	98.08	0.27	0.27	0.00
4.42	0.78	9,316	98.09	0.27	0.27	0.00
4.44	0.78	9,352	98.10	0.27	0.27	0.00
4.46	0.78	9,389	98.11	0.27	0.27	0.00
4.48	0.78	9,426	98.12	0.27	0.27	0.00
4.50	0.78	9,463	98.13	0.27	0.27	0.00
4.52	0.78	9,500	98.14	0.27	0.27	0.00
4.54	0.78	9,537	98.15	0.27	0.27	0.00
4.56	0.78	9,573	98.16	0.27	0.27	0.00
4.58	0.78	9,610	98.17	0.27	0.27	0.00
4.60	0.78	9,647	98.18	0.27	0.27	0.00
4.62	0.78	9,683	98.18	0.27	0.27	0.00
4.64	0.78	9,720	98.19	0.27	0.27	0.00
4.66	0.78	9,756	98.20	0.27	0.27	0.00
4.68	0.78	9,793	98.21	0.27	0.27	0.00
4.70	0.78	9,829	98.22	0.27	0.27	0.00
4.72	0.78	9,865	98.23	0.28	0.28	0.00
4.74	0.78	9,902	98.24	0.28	0.28	0.00
4.76	0.78	9,938	98.25	0.28	0.28	0.00
4.78	0.78	9,974	98.26	0.28	0.28	0.00
4.80	0.78	10,011	98.27	0.28	0.28	0.00
4.82	0.78	10,047	98.28	0.28	0.28	0.00
4.84	0.78	10,083	98.29	0.28	0.28	0.00
4.86	0.78	10,119	98.30	0.28	0.28	0.00
4.88	0.78	10,155	98.31	0.28	0.28	0.00
4.90	0.78	10,191	98.32	0.28	0.28	0.00
4.92	0.78	10,227	98.32	0.28	0.28	0.00
4.94	0.78	10,263	98.33	0.28	0.28	0.00
4.96	0.78	10,299	98.34	0.28	0.28	0.00
4.98	0.78	10,335	98.35	0.28	0.28	0.00
5.00	0.78	10,370	98.36	0.28	0.28	0.00
5.02	0.78	10,406	98.37	0.28	0.28	0.00
5.04	0.78	10,442	98.38	0.28	0.28	0.00
5.06	0.78	10,477	98.39	0.28	0.28	0.00
5.08	0.78	10,513	98.40	0.29	0.29	0.00
5.10	0.78	10,549	98.41	0.29	0.29	0.00
5.12	0.78	10,584	98.41	0.29	0.29	0.00
5.14	0.78	10,620	98.42	0.29	0.29	0.00
5.16	0.78	10,655	98.43	0.29	0.29	0.00
5.18	0.78	10,691	98.44	0.29	0.29	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.78	10,726	98.45	0.29	0.29	0.00
5.22	0.78	10,761	98.46	0.29	0.29	0.00
5.24	0.78	10,797	98.47	0.29	0.29	0.00
5.26	0.78	10,832	98.48	0.29	0.29	0.00
5.28	0.78	10,867	98.48	0.29	0.29	0.00
5.30	0.78	10,902	98.49	0.29	0.29	0.00
5.32	0.78	10,938	98.50	0.29	0.29	0.00
5.34	0.78	10,973	98.51	0.29	0.29	0.00
5.36	0.78	11,008	98.52	0.29	0.29	0.00
5.38	0.78	11,043	98.53	0.29	0.29	0.00
5.40	0.78	11,078	98.53	0.29	0.29	0.00
5.42	0.78	11,113	98.54	0.29	0.29	0.00
5.44	0.78	11,148	98.55	0.30	0.30	0.00
5.46	0.78	11,183	98.56	0.30	0.30	0.00
5.48	0.78	11,218	98.57	0.30	0.30	0.00
5.50	0.78	11,252	98.58	0.30	0.30	0.00
5.52	0.78	11,287	98.59	0.30	0.30	0.00
5.54	0.78	11,322	98.59	0.30	0.30	0.00
5.56	0.78	11,357	98.60	0.30	0.30	0.00
5.58	0.78	11,391	98.61	0.30	0.30	0.00
5.60	0.78	11,426	98.62	0.30	0.30	0.00
5.62	0.78	11,460	98.63	0.30	0.30	0.00
5.64	0.78	11,495	98.63	0.30	0.30	0.00
5.66	0.78	11,530	98.64	0.30	0.30	0.00
5.68	0.78	11,564	98.65	0.30	0.30	0.00
5.70	0.78	11,598	98.66	0.30	0.30	0.00
5.72	0.78	11,633	98.67	0.30	0.30	0.00
5.74	0.78	11,667	98.68	0.30	0.30	0.00
5.76	0.78	11,702	98.68	0.30	0.30	0.00
5.78	0.78	11,736	98.69	0.30	0.30	0.00
5.80	0.78	11,770	98.70	0.30	0.30	0.00
5.82	0.78	11,804	98.71	0.31	0.31	0.00
5.84	0.78	11,838	98.72	0.31	0.31	0.00
5.86	0.78	11,873	98.72	0.31	0.31	0.00
5.88	0.78	11,907	98.73	0.31	0.31	0.00
5.90	0.78	11,941	98.74	0.31	0.31	0.00
5.92	0.78	11,975	98.75	0.31	0.31	0.00
5.94	0.78	12,009	98.75	0.31	0.31	0.00
5.96	0.73	12,042	98.76	0.31	0.31	0.00
5.98	0.58	12,067	98.77	0.31	0.31	0.00
6.00	0.42	**12,081**	**98.77**	**0.31**	**0.31**	0.00
6.02	0.25	**12,083**	**98.77**	**0.31**	**0.31**	0.00
6.04	0.12	12,073	98.77	0.31	0.31	0.00
6.06	0.08	12,058	98.77	0.31	0.31	0.00
6.08	0.05	12,040	98.76	0.31	0.31	0.00
6.10	0.04	12,021	98.76	0.31	0.31	0.00
6.12	0.03	12,001	98.75	0.31	0.31	0.00
6.14	0.02	11,981	98.75	0.31	0.31	0.00
6.16	0.02	11,960	98.74	0.31	0.31	0.00
6.18	0.01	11,939	98.74	0.31	0.31	0.00
6.20	0.01	11,918	98.73	0.31	0.31	0.00
6.22	0.01	11,897	98.73	0.31	0.31	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.01	11,876	98.72	0.31	0.31	0.00
6.26	0.01	11,854	98.72	0.31	0.31	0.00
6.28	0.01	11,833	98.71	0.31	0.31	0.00
6.30	0.01	11,811	98.71	0.31	0.31	0.00
6.32	0.01	11,790	98.70	0.30	0.30	0.00
6.34	0.00	11,768	98.70	0.30	0.30	0.00
6.36	0.00	11,746	98.69	0.30	0.30	0.00
6.38	0.00	11,725	98.69	0.30	0.30	0.00
6.40	0.00	11,703	98.68	0.30	0.30	0.00
6.42	0.00	11,682	98.68	0.30	0.30	0.00
6.44	0.00	11,660	98.67	0.30	0.30	0.00
6.46	0.00	11,638	98.67	0.30	0.30	0.00
6.48	0.00	11,617	98.66	0.30	0.30	0.00
6.50	0.00	11,595	98.66	0.30	0.30	0.00
6.52	0.00	11,574	98.65	0.30	0.30	0.00
6.54	0.00	11,552	98.65	0.30	0.30	0.00
6.56	0.00	11,531	98.64	0.30	0.30	0.00
6.58	0.00	11,509	98.64	0.30	0.30	0.00
6.60	0.00	11,488	98.63	0.30	0.30	0.00
6.62	0.00	11,466	98.63	0.30	0.30	0.00
6.64	0.00	11,445	98.62	0.30	0.30	0.00
6.66	0.00	11,423	98.62	0.30	0.30	0.00
6.68	0.00	11,402	98.61	0.30	0.30	0.00
6.70	0.00	11,380	98.61	0.30	0.30	0.00
6.72	0.00	11,359	98.60	0.30	0.30	0.00
6.74	0.00	11,337	98.60	0.30	0.30	0.00
6.76	0.00	11,316	98.59	0.30	0.30	0.00
6.78	0.00	11,295	98.59	0.30	0.30	0.00
6.80	0.00	11,273	98.58	0.30	0.30	0.00
6.82	0.00	11,252	98.58	0.30	0.30	0.00
6.84	0.00	11,231	98.57	0.30	0.30	0.00
6.86	0.00	11,209	98.57	0.30	0.30	0.00
6.88	0.00	11,188	98.56	0.30	0.30	0.00
6.90	0.00	11,167	98.56	0.30	0.30	0.00
6.92	0.00	11,146	98.55	0.30	0.30	0.00
6.94	0.00	11,125	98.55	0.29	0.29	0.00
6.96	0.00	11,103	98.54	0.29	0.29	0.00
6.98	0.00	11,082	98.54	0.29	0.29	0.00
7.00	0.00	11,061	98.53	0.29	0.29	0.00
7.02	0.00	11,040	98.53	0.29	0.29	0.00
7.04	0.00	11,019	98.52	0.29	0.29	0.00
7.06	0.00	10,998	98.52	0.29	0.29	0.00
7.08	0.00	10,977	98.51	0.29	0.29	0.00
7.10	0.00	10,956	98.51	0.29	0.29	0.00
7.12	0.00	10,935	98.50	0.29	0.29	0.00
7.14	0.00	10,914	98.50	0.29	0.29	0.00
7.16	0.00	10,893	98.49	0.29	0.29	0.00
7.18	0.00	10,872	98.48	0.29	0.29	0.00
7.20	0.00	10,851	98.48	0.29	0.29	0.00
7.22	0.00	10,830	98.47	0.29	0.29	0.00
7.24	0.00	10,809	98.47	0.29	0.29	0.00
7.26	0.00	10,788	98.46	0.29	0.29	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	10,768	98.46	0.29	0.29	0.00
7.30	0.00	10,747	98.45	0.29	0.29	0.00
7.32	0.00	10,726	98.45	0.29	0.29	0.00
7.34	0.00	10,705	98.44	0.29	0.29	0.00
7.36	0.00	10,685	98.44	0.29	0.29	0.00
7.38	0.00	10,664	98.43	0.29	0.29	0.00
7.40	0.00	10,643	98.43	0.29	0.29	0.00
7.42	0.00	10,623	98.42	0.29	0.29	0.00
7.44	0.00	10,602	98.42	0.29	0.29	0.00
7.46	0.00	10,581	98.41	0.29	0.29	0.00
7.48	0.00	10,561	98.41	0.29	0.29	0.00
7.50	0.00	10,540	98.40	0.29	0.29	0.00
7.52	0.00	10,520	98.40	0.29	0.29	0.00
7.54	0.00	10,499	98.39	0.29	0.29	0.00
7.56	0.00	10,479	98.39	0.28	0.28	0.00
7.58	0.00	10,458	98.38	0.28	0.28	0.00
7.60	0.00	10,438	98.38	0.28	0.28	0.00
7.62	0.00	10,417	98.37	0.28	0.28	0.00
7.64	0.00	10,397	98.37	0.28	0.28	0.00
7.66	0.00	10,376	98.36	0.28	0.28	0.00
7.68	0.00	10,356	98.36	0.28	0.28	0.00
7.70	0.00	10,336	98.35	0.28	0.28	0.00
7.72	0.00	10,315	98.35	0.28	0.28	0.00
7.74	0.00	10,295	98.34	0.28	0.28	0.00
7.76	0.00	10,275	98.34	0.28	0.28	0.00
7.78	0.00	10,255	98.33	0.28	0.28	0.00
7.80	0.00	10,234	98.33	0.28	0.28	0.00
7.82	0.00	10,214	98.32	0.28	0.28	0.00
7.84	0.00	10,194	98.32	0.28	0.28	0.00
7.86	0.00	10,174	98.31	0.28	0.28	0.00
7.88	0.00	10,154	98.31	0.28	0.28	0.00
7.90	0.00	10,134	98.30	0.28	0.28	0.00
7.92	0.00	10,113	98.30	0.28	0.28	0.00
7.94	0.00	10,093	98.29	0.28	0.28	0.00
7.96	0.00	10,073	98.29	0.28	0.28	0.00
7.98	0.00	10,053	98.28	0.28	0.28	0.00
8.00	0.00	10,033	98.28	0.28	0.28	0.00

Summary for Subcatchment DA-2A POST: DA-2A POST

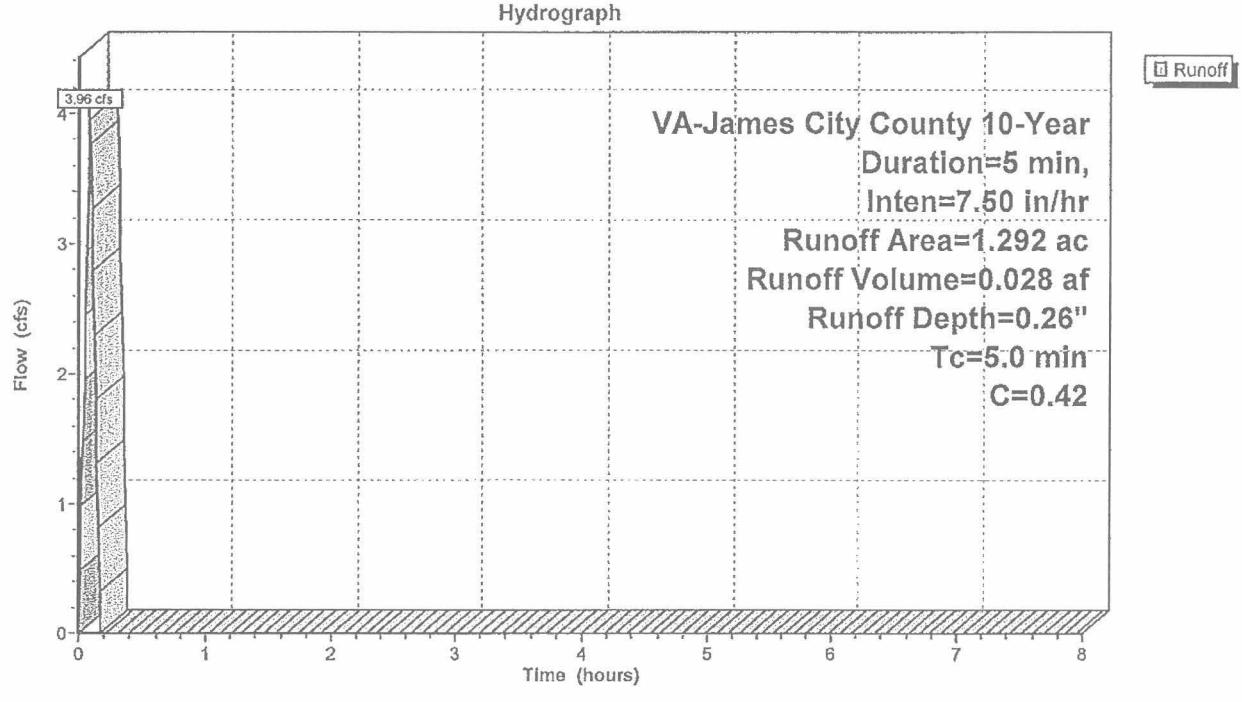
Runoff = 3.96 cfs @ 0.08 hrs, Volume= 0.028 af, Depth= 0.26"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 10-Year Duration=5 min, Inten=7.50 in/hr

Area (ac)	C	Description
0.172	0.90	Impervious
1.057	0.35	Lawn
0.063	0.30	Woods
1.292	0.42	Weighted Average
1.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2A POST: DA-2A POST



Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.61" for 10-Year event
Inflow = 3.40 cfs @ 0.09 hrs, Volume= 0.047 af
Outflow = 2.87 cfs @ 0.18 hrs, Volume= 0.047 af, Atten= 16%, Lag= 5.4 min
Primary = 2.87 cfs @ 0.18 hrs, Volume= 0.047 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Starting Elev= 107.00' Surf.Area= 435 sf Storage= 435 cf
Peak Elev= 110.25' @ 0.18 hrs Surf.Area= 435 sf Storage= 1,001 cf (566 cf above start)

Plug-Flow detention time= 5.7 min calculated for 0.037 af (79% of inflow)
Center-of-Mass det. time= 3.1 min (10.6 - 7.5)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

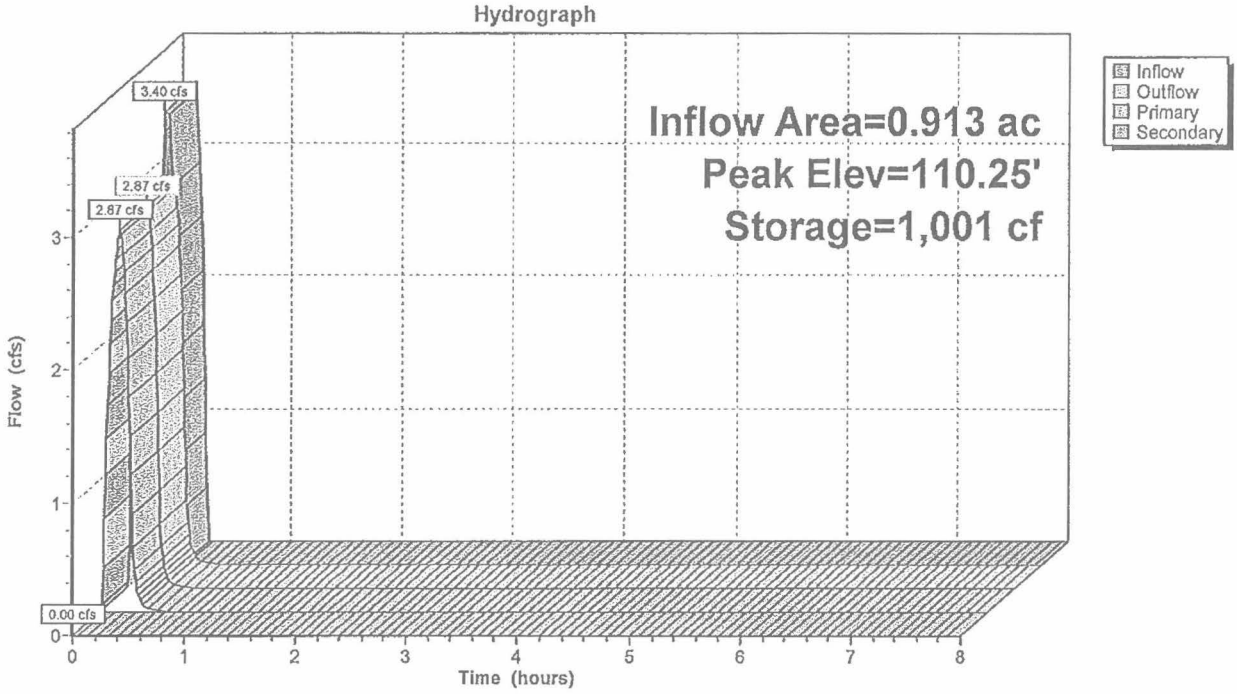
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=2.87 cfs @ 0.18 hrs HW=110.25' TW=95.75' (Dynamic Tailwater)
└1=**Orifice/Grate** (Passes 2.87 cfs of 57.61 cfs potential flow)
└2=**Culvert** (Passes 2.87 cfs of 6.40 cfs potential flow)
└3=**Culvert** (Passes 2.87 cfs of 4.11 cfs potential flow)
└4=**Culvert** (Passes 2.87 cfs of 4.09 cfs potential flow)
└5=**Culvert** (Inlet Controls 2.87 cfs @ 8.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.00' TW=94.00' (Dynamic Tailwater)
└6=**Broad-Crested Weir** (Controls 0.00 cfs)

Pond GFS: Gravel Filter Strip



Hydrograph for Pond GFS: Gravel Filter Strip

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	435	107.00	0.00	0.00	0.00
0.02	0.82	463	107.16	0.09	0.09	0.00
0.04	1.63	525	107.51	0.71	0.71	0.00
0.06	2.45	598	107.94	1.31	1.31	0.00
0.08	3.27	692	108.48	1.80	1.80	0.00
0.10	3.40	790	109.04	2.20	2.20	0.00
0.12	3.40	867	109.48	2.46	2.46	0.00
0.14	3.40	927	109.83	2.66	2.66	0.00
0.16	3.40	976	110.11	2.80	2.80	0.00
0.18	2.86	1,001	110.25	2.87	2.87	0.00
0.20	2.04	973	110.09	2.79	2.79	0.00
0.22	1.22	897	109.66	2.56	2.56	0.00
0.24	0.41	785	109.01	2.18	2.18	0.00
0.26	0.00	655	108.26	1.62	1.62	0.00
0.28	0.00	559	107.71	1.04	1.04	0.00
0.30	0.00	505	107.40	0.48	0.48	0.00
0.32	0.00	481	107.26	0.23	0.23	0.00
0.34	0.00	469	107.19	0.13	0.13	0.00
0.36	0.00	461	107.15	0.08	0.08	0.00
0.38	0.00	457	107.12	0.05	0.05	0.00
0.40	0.00	453	107.11	0.04	0.04	0.00
0.42	0.00	451	107.09	0.03	0.03	0.00
0.44	0.00	449	107.08	0.02	0.02	0.00
0.46	0.00	448	107.07	0.02	0.02	0.00
0.48	0.00	446	107.06	0.02	0.02	0.00
0.50	0.00	445	107.06	0.01	0.01	0.00
0.52	0.00	444	107.05	0.01	0.01	0.00
0.54	0.00	444	107.05	0.01	0.01	0.00
0.56	0.00	443	107.05	0.01	0.01	0.00
0.58	0.00	443	107.04	0.01	0.01	0.00
0.60	0.00	442	107.04	0.01	0.01	0.00
0.62	0.00	442	107.04	0.01	0.01	0.00
0.64	0.00	441	107.04	0.00	0.00	0.00
0.66	0.00	441	107.03	0.00	0.00	0.00
0.68	0.00	441	107.03	0.00	0.00	0.00
0.70	0.00	440	107.03	0.00	0.00	0.00
0.72	0.00	440	107.03	0.00	0.00	0.00
0.74	0.00	440	107.03	0.00	0.00	0.00
0.76	0.00	440	107.03	0.00	0.00	0.00
0.78	0.00	440	107.03	0.00	0.00	0.00
0.80	0.00	439	107.03	0.00	0.00	0.00
0.82	0.00	439	107.02	0.00	0.00	0.00
0.84	0.00	439	107.02	0.00	0.00	0.00
0.86	0.00	439	107.02	0.00	0.00	0.00
0.88	0.00	439	107.02	0.00	0.00	0.00
0.90	0.00	439	107.02	0.00	0.00	0.00
0.92	0.00	439	107.02	0.00	0.00	0.00
0.94	0.00	438	107.02	0.00	0.00	0.00
0.96	0.00	438	107.02	0.00	0.00	0.00
0.98	0.00	438	107.02	0.00	0.00	0.00
1.00	0.00	438	107.02	0.00	0.00	0.00
1.02	0.00	438	107.02	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.00	438	107.02	0.00	0.00	0.00
1.06	0.00	438	107.02	0.00	0.00	0.00
1.08	0.00	438	107.02	0.00	0.00	0.00
1.10	0.00	438	107.02	0.00	0.00	0.00
1.12	0.00	438	107.02	0.00	0.00	0.00
1.14	0.00	438	107.02	0.00	0.00	0.00
1.16	0.00	438	107.01	0.00	0.00	0.00
1.18	0.00	438	107.01	0.00	0.00	0.00
1.20	0.00	437	107.01	0.00	0.00	0.00
1.22	0.00	437	107.01	0.00	0.00	0.00
1.24	0.00	437	107.01	0.00	0.00	0.00
1.26	0.00	437	107.01	0.00	0.00	0.00
1.28	0.00	437	107.01	0.00	0.00	0.00
1.30	0.00	437	107.01	0.00	0.00	0.00
1.32	0.00	437	107.01	0.00	0.00	0.00
1.34	0.00	437	107.01	0.00	0.00	0.00
1.36	0.00	437	107.01	0.00	0.00	0.00
1.38	0.00	437	107.01	0.00	0.00	0.00
1.40	0.00	437	107.01	0.00	0.00	0.00
1.42	0.00	437	107.01	0.00	0.00	0.00
1.44	0.00	437	107.01	0.00	0.00	0.00
1.46	0.00	437	107.01	0.00	0.00	0.00
1.48	0.00	437	107.01	0.00	0.00	0.00
1.50	0.00	437	107.01	0.00	0.00	0.00
1.52	0.00	437	107.01	0.00	0.00	0.00
1.54	0.00	437	107.01	0.00	0.00	0.00
1.56	0.00	437	107.01	0.00	0.00	0.00
1.58	0.00	437	107.01	0.00	0.00	0.00
1.60	0.00	437	107.01	0.00	0.00	0.00
1.62	0.00	437	107.01	0.00	0.00	0.00
1.64	0.00	437	107.01	0.00	0.00	0.00
1.66	0.00	437	107.01	0.00	0.00	0.00
1.68	0.00	437	107.01	0.00	0.00	0.00
1.70	0.00	437	107.01	0.00	0.00	0.00
1.72	0.00	437	107.01	0.00	0.00	0.00
1.74	0.00	437	107.01	0.00	0.00	0.00
1.76	0.00	437	107.01	0.00	0.00	0.00
1.78	0.00	437	107.01	0.00	0.00	0.00
1.80	0.00	437	107.01	0.00	0.00	0.00
1.82	0.00	436	107.01	0.00	0.00	0.00
1.84	0.00	436	107.01	0.00	0.00	0.00
1.86	0.00	436	107.01	0.00	0.00	0.00
1.88	0.00	436	107.01	0.00	0.00	0.00
1.90	0.00	436	107.01	0.00	0.00	0.00
1.92	0.00	436	107.01	0.00	0.00	0.00
1.94	0.00	436	107.01	0.00	0.00	0.00
1.96	0.00	436	107.01	0.00	0.00	0.00
1.98	0.00	436	107.01	0.00	0.00	0.00
2.00	0.00	436	107.01	0.00	0.00	0.00
2.02	0.00	436	107.01	0.00	0.00	0.00
2.04	0.00	436	107.01	0.00	0.00	0.00
2.06	0.00	436	107.01	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.00	436	107.01	0.00	0.00	0.00
2.10	0.00	436	107.01	0.00	0.00	0.00
2.12	0.00	436	107.01	0.00	0.00	0.00
2.14	0.00	436	107.01	0.00	0.00	0.00
2.16	0.00	436	107.01	0.00	0.00	0.00
2.18	0.00	436	107.01	0.00	0.00	0.00
2.20	0.00	436	107.01	0.00	0.00	0.00
2.22	0.00	436	107.01	0.00	0.00	0.00
2.24	0.00	436	107.01	0.00	0.00	0.00
2.26	0.00	436	107.01	0.00	0.00	0.00
2.28	0.00	436	107.01	0.00	0.00	0.00
2.30	0.00	436	107.01	0.00	0.00	0.00
2.32	0.00	436	107.01	0.00	0.00	0.00
2.34	0.00	436	107.01	0.00	0.00	0.00
2.36	0.00	436	107.01	0.00	0.00	0.00
2.38	0.00	436	107.01	0.00	0.00	0.00
2.40	0.00	436	107.01	0.00	0.00	0.00
2.42	0.00	436	107.01	0.00	0.00	0.00
2.44	0.00	436	107.01	0.00	0.00	0.00
2.46	0.00	436	107.01	0.00	0.00	0.00
2.48	0.00	436	107.01	0.00	0.00	0.00
2.50	0.00	436	107.01	0.00	0.00	0.00
2.52	0.00	436	107.01	0.00	0.00	0.00
2.54	0.00	436	107.01	0.00	0.00	0.00
2.56	0.00	436	107.01	0.00	0.00	0.00
2.58	0.00	436	107.01	0.00	0.00	0.00
2.60	0.00	436	107.01	0.00	0.00	0.00
2.62	0.00	436	107.01	0.00	0.00	0.00
2.64	0.00	436	107.01	0.00	0.00	0.00
2.66	0.00	436	107.01	0.00	0.00	0.00
2.68	0.00	436	107.01	0.00	0.00	0.00
2.70	0.00	436	107.01	0.00	0.00	0.00
2.72	0.00	436	107.01	0.00	0.00	0.00
2.74	0.00	436	107.01	0.00	0.00	0.00
2.76	0.00	436	107.01	0.00	0.00	0.00
2.78	0.00	436	107.01	0.00	0.00	0.00
2.80	0.00	436	107.01	0.00	0.00	0.00
2.82	0.00	436	107.01	0.00	0.00	0.00
2.84	0.00	436	107.01	0.00	0.00	0.00
2.86	0.00	436	107.01	0.00	0.00	0.00
2.88	0.00	436	107.01	0.00	0.00	0.00
2.90	0.00	436	107.00	0.00	0.00	0.00
2.92	0.00	436	107.00	0.00	0.00	0.00
2.94	0.00	436	107.00	0.00	0.00	0.00
2.96	0.00	436	107.00	0.00	0.00	0.00
2.98	0.00	436	107.00	0.00	0.00	0.00
3.00	0.00	436	107.00	0.00	0.00	0.00
3.02	0.00	436	107.00	0.00	0.00	0.00
3.04	0.00	436	107.00	0.00	0.00	0.00
3.06	0.00	436	107.00	0.00	0.00	0.00
3.08	0.00	436	107.00	0.00	0.00	0.00
3.10	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.00	436	107.00	0.00	0.00	0.00
3.14	0.00	436	107.00	0.00	0.00	0.00
3.16	0.00	436	107.00	0.00	0.00	0.00
3.18	0.00	436	107.00	0.00	0.00	0.00
3.20	0.00	436	107.00	0.00	0.00	0.00
3.22	0.00	436	107.00	0.00	0.00	0.00
3.24	0.00	436	107.00	0.00	0.00	0.00
3.26	0.00	436	107.00	0.00	0.00	0.00
3.28	0.00	436	107.00	0.00	0.00	0.00
3.30	0.00	436	107.00	0.00	0.00	0.00
3.32	0.00	436	107.00	0.00	0.00	0.00
3.34	0.00	436	107.00	0.00	0.00	0.00
3.36	0.00	436	107.00	0.00	0.00	0.00
3.38	0.00	436	107.00	0.00	0.00	0.00
3.40	0.00	436	107.00	0.00	0.00	0.00
3.42	0.00	436	107.00	0.00	0.00	0.00
3.44	0.00	436	107.00	0.00	0.00	0.00
3.46	0.00	436	107.00	0.00	0.00	0.00
3.48	0.00	436	107.00	0.00	0.00	0.00
3.50	0.00	436	107.00	0.00	0.00	0.00
3.52	0.00	436	107.00	0.00	0.00	0.00
3.54	0.00	436	107.00	0.00	0.00	0.00
3.56	0.00	436	107.00	0.00	0.00	0.00
3.58	0.00	436	107.00	0.00	0.00	0.00
3.60	0.00	436	107.00	0.00	0.00	0.00
3.62	0.00	436	107.00	0.00	0.00	0.00
3.64	0.00	436	107.00	0.00	0.00	0.00
3.66	0.00	436	107.00	0.00	0.00	0.00
3.68	0.00	436	107.00	0.00	0.00	0.00
3.70	0.00	436	107.00	0.00	0.00	0.00
3.72	0.00	436	107.00	0.00	0.00	0.00
3.74	0.00	436	107.00	0.00	0.00	0.00
3.76	0.00	436	107.00	0.00	0.00	0.00
3.78	0.00	436	107.00	0.00	0.00	0.00
3.80	0.00	436	107.00	0.00	0.00	0.00
3.82	0.00	436	107.00	0.00	0.00	0.00
3.84	0.00	436	107.00	0.00	0.00	0.00
3.86	0.00	436	107.00	0.00	0.00	0.00
3.88	0.00	436	107.00	0.00	0.00	0.00
3.90	0.00	436	107.00	0.00	0.00	0.00
3.92	0.00	436	107.00	0.00	0.00	0.00
3.94	0.00	436	107.00	0.00	0.00	0.00
3.96	0.00	436	107.00	0.00	0.00	0.00
3.98	0.00	436	107.00	0.00	0.00	0.00
4.00	0.00	436	107.00	0.00	0.00	0.00
4.02	0.00	436	107.00	0.00	0.00	0.00
4.04	0.00	436	107.00	0.00	0.00	0.00
4.06	0.00	436	107.00	0.00	0.00	0.00
4.08	0.00	436	107.00	0.00	0.00	0.00
4.10	0.00	436	107.00	0.00	0.00	0.00
4.12	0.00	436	107.00	0.00	0.00	0.00
4.14	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.00	436	107.00	0.00	0.00	0.00
4.18	0.00	436	107.00	0.00	0.00	0.00
4.20	0.00	436	107.00	0.00	0.00	0.00
4.22	0.00	436	107.00	0.00	0.00	0.00
4.24	0.00	436	107.00	0.00	0.00	0.00
4.26	0.00	436	107.00	0.00	0.00	0.00
4.28	0.00	436	107.00	0.00	0.00	0.00
4.30	0.00	436	107.00	0.00	0.00	0.00
4.32	0.00	436	107.00	0.00	0.00	0.00
4.34	0.00	436	107.00	0.00	0.00	0.00
4.36	0.00	436	107.00	0.00	0.00	0.00
4.38	0.00	436	107.00	0.00	0.00	0.00
4.40	0.00	436	107.00	0.00	0.00	0.00
4.42	0.00	436	107.00	0.00	0.00	0.00
4.44	0.00	436	107.00	0.00	0.00	0.00
4.46	0.00	436	107.00	0.00	0.00	0.00
4.48	0.00	436	107.00	0.00	0.00	0.00
4.50	0.00	436	107.00	0.00	0.00	0.00
4.52	0.00	436	107.00	0.00	0.00	0.00
4.54	0.00	436	107.00	0.00	0.00	0.00
4.56	0.00	436	107.00	0.00	0.00	0.00
4.58	0.00	436	107.00	0.00	0.00	0.00
4.60	0.00	436	107.00	0.00	0.00	0.00
4.62	0.00	436	107.00	0.00	0.00	0.00
4.64	0.00	436	107.00	0.00	0.00	0.00
4.66	0.00	436	107.00	0.00	0.00	0.00
4.68	0.00	436	107.00	0.00	0.00	0.00
4.70	0.00	436	107.00	0.00	0.00	0.00
4.72	0.00	436	107.00	0.00	0.00	0.00
4.74	0.00	436	107.00	0.00	0.00	0.00
4.76	0.00	436	107.00	0.00	0.00	0.00
4.78	0.00	435	107.00	0.00	0.00	0.00
4.80	0.00	435	107.00	0.00	0.00	0.00
4.82	0.00	435	107.00	0.00	0.00	0.00
4.84	0.00	435	107.00	0.00	0.00	0.00
4.86	0.00	435	107.00	0.00	0.00	0.00
4.88	0.00	435	107.00	0.00	0.00	0.00
4.90	0.00	435	107.00	0.00	0.00	0.00
4.92	0.00	435	107.00	0.00	0.00	0.00
4.94	0.00	435	107.00	0.00	0.00	0.00
4.96	0.00	435	107.00	0.00	0.00	0.00
4.98	0.00	435	107.00	0.00	0.00	0.00
5.00	0.00	435	107.00	0.00	0.00	0.00
5.02	0.00	435	107.00	0.00	0.00	0.00
5.04	0.00	435	107.00	0.00	0.00	0.00
5.06	0.00	435	107.00	0.00	0.00	0.00
5.08	0.00	435	107.00	0.00	0.00	0.00
5.10	0.00	435	107.00	0.00	0.00	0.00
5.12	0.00	435	107.00	0.00	0.00	0.00
5.14	0.00	435	107.00	0.00	0.00	0.00
5.16	0.00	435	107.00	0.00	0.00	0.00
5.18	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	435	107.00	0.00	0.00	0.00
5.22	0.00	435	107.00	0.00	0.00	0.00
5.24	0.00	435	107.00	0.00	0.00	0.00
5.26	0.00	435	107.00	0.00	0.00	0.00
5.28	0.00	435	107.00	0.00	0.00	0.00
5.30	0.00	435	107.00	0.00	0.00	0.00
5.32	0.00	435	107.00	0.00	0.00	0.00
5.34	0.00	435	107.00	0.00	0.00	0.00
5.36	0.00	435	107.00	0.00	0.00	0.00
5.38	0.00	435	107.00	0.00	0.00	0.00
5.40	0.00	435	107.00	0.00	0.00	0.00
5.42	0.00	435	107.00	0.00	0.00	0.00
5.44	0.00	435	107.00	0.00	0.00	0.00
5.46	0.00	435	107.00	0.00	0.00	0.00
5.48	0.00	435	107.00	0.00	0.00	0.00
5.50	0.00	435	107.00	0.00	0.00	0.00
5.52	0.00	435	107.00	0.00	0.00	0.00
5.54	0.00	435	107.00	0.00	0.00	0.00
5.56	0.00	435	107.00	0.00	0.00	0.00
5.58	0.00	435	107.00	0.00	0.00	0.00
5.60	0.00	435	107.00	0.00	0.00	0.00
5.62	0.00	435	107.00	0.00	0.00	0.00
5.64	0.00	435	107.00	0.00	0.00	0.00
5.66	0.00	435	107.00	0.00	0.00	0.00
5.68	0.00	435	107.00	0.00	0.00	0.00
5.70	0.00	435	107.00	0.00	0.00	0.00
5.72	0.00	435	107.00	0.00	0.00	0.00
5.74	0.00	435	107.00	0.00	0.00	0.00
5.76	0.00	435	107.00	0.00	0.00	0.00
5.78	0.00	435	107.00	0.00	0.00	0.00
5.80	0.00	435	107.00	0.00	0.00	0.00
5.82	0.00	435	107.00	0.00	0.00	0.00
5.84	0.00	435	107.00	0.00	0.00	0.00
5.86	0.00	435	107.00	0.00	0.00	0.00
5.88	0.00	435	107.00	0.00	0.00	0.00
5.90	0.00	435	107.00	0.00	0.00	0.00
5.92	0.00	435	107.00	0.00	0.00	0.00
5.94	0.00	435	107.00	0.00	0.00	0.00
5.96	0.00	435	107.00	0.00	0.00	0.00
5.98	0.00	435	107.00	0.00	0.00	0.00
6.00	0.00	435	107.00	0.00	0.00	0.00
6.02	0.00	435	107.00	0.00	0.00	0.00
6.04	0.00	435	107.00	0.00	0.00	0.00
6.06	0.00	435	107.00	0.00	0.00	0.00
6.08	0.00	435	107.00	0.00	0.00	0.00
6.10	0.00	435	107.00	0.00	0.00	0.00
6.12	0.00	435	107.00	0.00	0.00	0.00
6.14	0.00	435	107.00	0.00	0.00	0.00
6.16	0.00	435	107.00	0.00	0.00	0.00
6.18	0.00	435	107.00	0.00	0.00	0.00
6.20	0.00	435	107.00	0.00	0.00	0.00
6.22	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.00	435	107.00	0.00	0.00	0.00
6.26	0.00	435	107.00	0.00	0.00	0.00
6.28	0.00	435	107.00	0.00	0.00	0.00
6.30	0.00	435	107.00	0.00	0.00	0.00
6.32	0.00	435	107.00	0.00	0.00	0.00
6.34	0.00	435	107.00	0.00	0.00	0.00
6.36	0.00	435	107.00	0.00	0.00	0.00
6.38	0.00	435	107.00	0.00	0.00	0.00
6.40	0.00	435	107.00	0.00	0.00	0.00
6.42	0.00	435	107.00	0.00	0.00	0.00
6.44	0.00	435	107.00	0.00	0.00	0.00
6.46	0.00	435	107.00	0.00	0.00	0.00
6.48	0.00	435	107.00	0.00	0.00	0.00
6.50	0.00	435	107.00	0.00	0.00	0.00
6.52	0.00	435	107.00	0.00	0.00	0.00
6.54	0.00	435	107.00	0.00	0.00	0.00
6.56	0.00	435	107.00	0.00	0.00	0.00
6.58	0.00	435	107.00	0.00	0.00	0.00
6.60	0.00	435	107.00	0.00	0.00	0.00
6.62	0.00	435	107.00	0.00	0.00	0.00
6.64	0.00	435	107.00	0.00	0.00	0.00
6.66	0.00	435	107.00	0.00	0.00	0.00
6.68	0.00	435	107.00	0.00	0.00	0.00
6.70	0.00	435	107.00	0.00	0.00	0.00
6.72	0.00	435	107.00	0.00	0.00	0.00
6.74	0.00	435	107.00	0.00	0.00	0.00
6.76	0.00	435	107.00	0.00	0.00	0.00
6.78	0.00	435	107.00	0.00	0.00	0.00
6.80	0.00	435	107.00	0.00	0.00	0.00
6.82	0.00	435	107.00	0.00	0.00	0.00
6.84	0.00	435	107.00	0.00	0.00	0.00
6.86	0.00	435	107.00	0.00	0.00	0.00
6.88	0.00	435	107.00	0.00	0.00	0.00
6.90	0.00	435	107.00	0.00	0.00	0.00
6.92	0.00	435	107.00	0.00	0.00	0.00
6.94	0.00	435	107.00	0.00	0.00	0.00
6.96	0.00	435	107.00	0.00	0.00	0.00
6.98	0.00	435	107.00	0.00	0.00	0.00
7.00	0.00	435	107.00	0.00	0.00	0.00
7.02	0.00	435	107.00	0.00	0.00	0.00
7.04	0.00	435	107.00	0.00	0.00	0.00
7.06	0.00	435	107.00	0.00	0.00	0.00
7.08	0.00	435	107.00	0.00	0.00	0.00
7.10	0.00	435	107.00	0.00	0.00	0.00
7.12	0.00	435	107.00	0.00	0.00	0.00
7.14	0.00	435	107.00	0.00	0.00	0.00
7.16	0.00	435	107.00	0.00	0.00	0.00
7.18	0.00	435	107.00	0.00	0.00	0.00
7.20	0.00	435	107.00	0.00	0.00	0.00
7.22	0.00	435	107.00	0.00	0.00	0.00
7.24	0.00	435	107.00	0.00	0.00	0.00
7.26	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	435	107.00	0.00	0.00	0.00
7.30	0.00	435	107.00	0.00	0.00	0.00
7.32	0.00	435	107.00	0.00	0.00	0.00
7.34	0.00	435	107.00	0.00	0.00	0.00
7.36	0.00	435	107.00	0.00	0.00	0.00
7.38	0.00	435	107.00	0.00	0.00	0.00
7.40	0.00	435	107.00	0.00	0.00	0.00
7.42	0.00	435	107.00	0.00	0.00	0.00
7.44	0.00	435	107.00	0.00	0.00	0.00
7.46	0.00	435	107.00	0.00	0.00	0.00
7.48	0.00	435	107.00	0.00	0.00	0.00
7.50	0.00	435	107.00	0.00	0.00	0.00
7.52	0.00	435	107.00	0.00	0.00	0.00
7.54	0.00	435	107.00	0.00	0.00	0.00
7.56	0.00	435	107.00	0.00	0.00	0.00
7.58	0.00	435	107.00	0.00	0.00	0.00
7.60	0.00	435	107.00	0.00	0.00	0.00
7.62	0.00	435	107.00	0.00	0.00	0.00
7.64	0.00	435	107.00	0.00	0.00	0.00
7.66	0.00	435	107.00	0.00	0.00	0.00
7.68	0.00	435	107.00	0.00	0.00	0.00
7.70	0.00	435	107.00	0.00	0.00	0.00
7.72	0.00	435	107.00	0.00	0.00	0.00
7.74	0.00	435	107.00	0.00	0.00	0.00
7.76	0.00	435	107.00	0.00	0.00	0.00
7.78	0.00	435	107.00	0.00	0.00	0.00
7.80	0.00	435	107.00	0.00	0.00	0.00
7.82	0.00	435	107.00	0.00	0.00	0.00
7.84	0.00	435	107.00	0.00	0.00	0.00
7.86	0.00	435	107.00	0.00	0.00	0.00
7.88	0.00	435	107.00	0.00	0.00	0.00
7.90	0.00	435	107.00	0.00	0.00	0.00
7.92	0.00	435	107.00	0.00	0.00	0.00
7.94	0.00	435	107.00	0.00	0.00	0.00
7.96	0.00	435	107.00	0.00	0.00	0.00
7.98	0.00	435	107.00	0.00	0.00	0.00
8.00	0.00	435	107.00	0.00	0.00	0.00

Summary for Subcatchment DA-2B Post: DA-2B POST

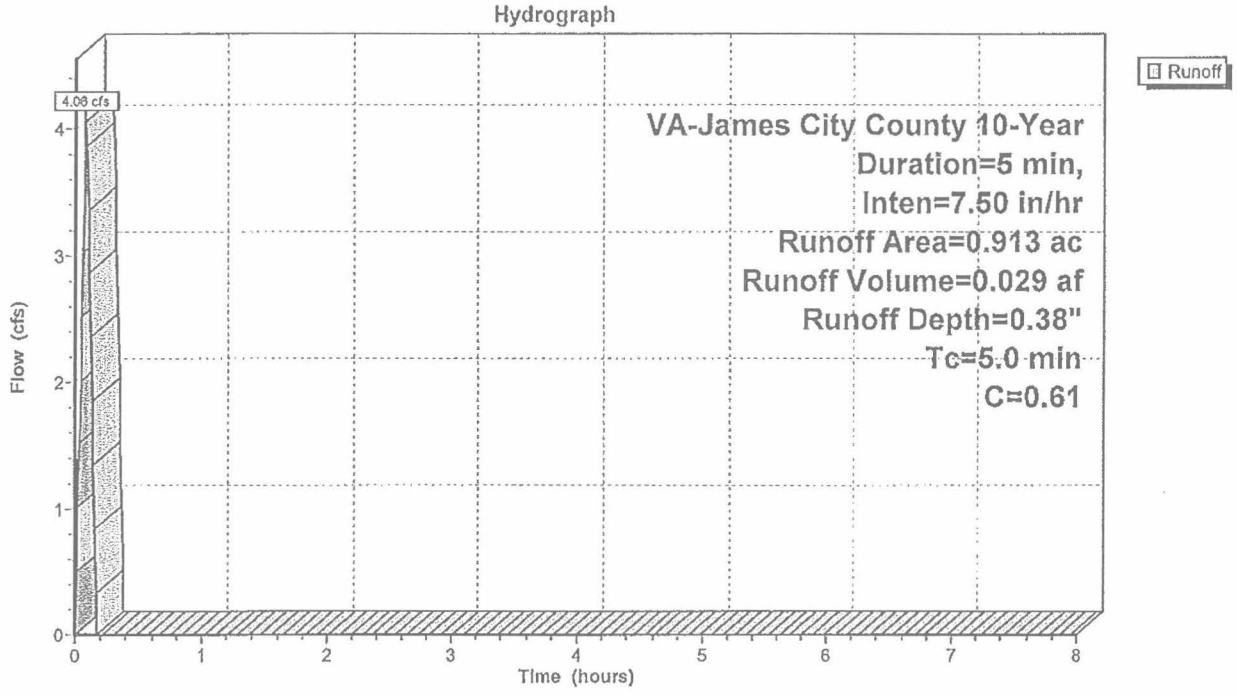
Runoff = 4.06 cfs @ 0.08 hrs, Volume= 0.029 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 10-Year Duration=5 min, Inten=7.50 in/hr

Area (ac)	C	Description
0.430	0.90	Impervious
0.455	0.35	Lawn
0.028	0.30	Woods
0.913	0.61	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2B Post: DA-2B POST

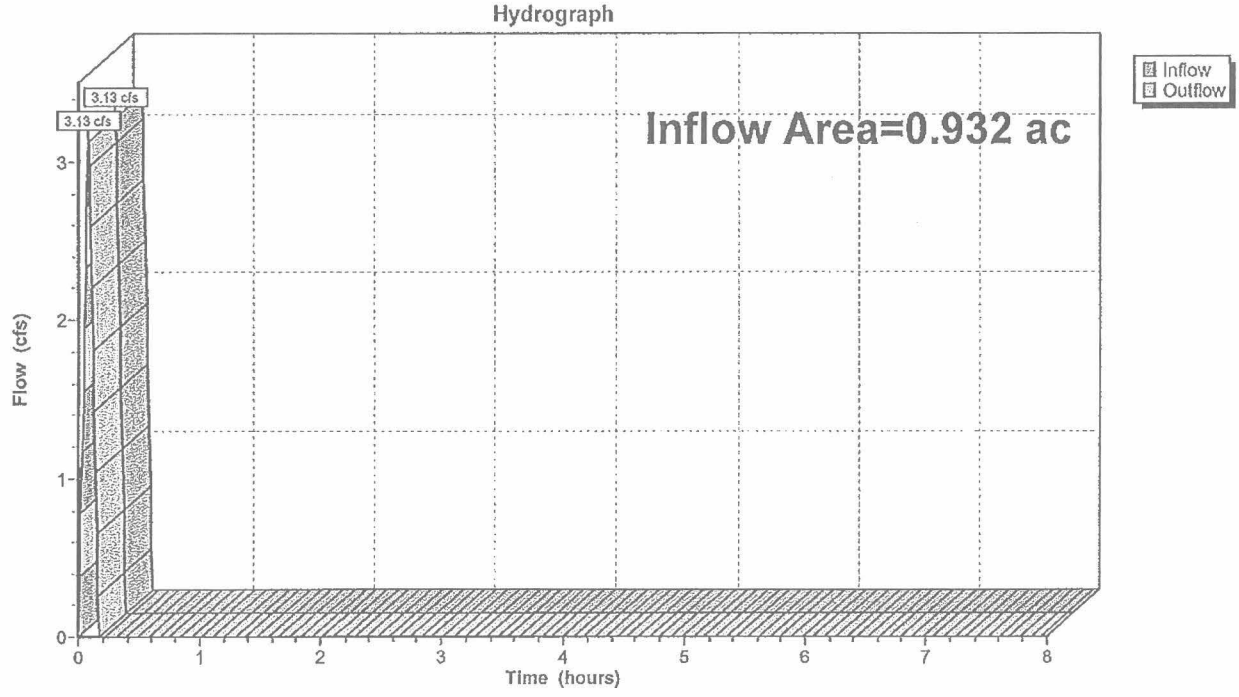


Summary for Reach POI 2 POST: Point of Investigation 2 POST

Inflow Area = 0.932 ac, 0.00% Impervious, Inflow Depth = 0.29" for 10-Year event
Inflow = 3.13 cfs @ 0.08 hrs, Volume= 0.022 af
Outflow = 3.13 cfs @ 0.08 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 2 POST: Point of Investigation 2 POST



Summary for Subcatchment DA-3 POST: DA-3 POST

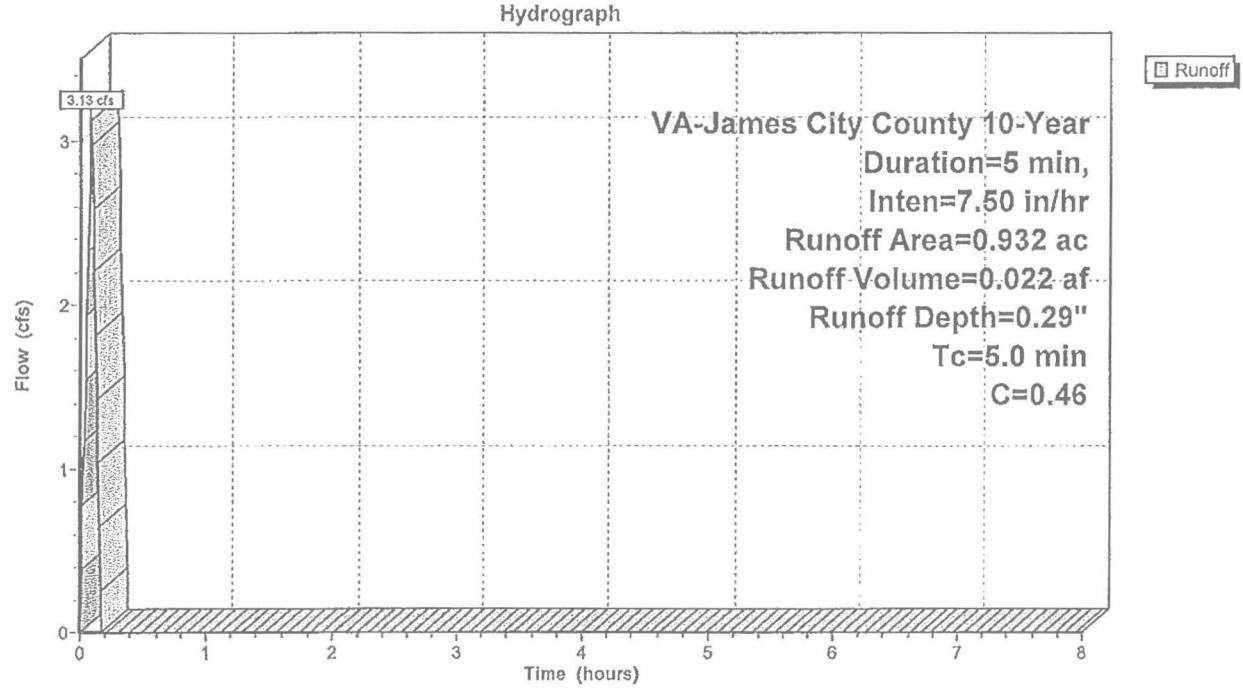
Runoff = 3.13 cfs @ 0.08 hrs, Volume= 0.022 af, Depth= 0.29"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 10-Year Duration=5 min, Inten=7.50 in/hr

Area (ac)	C	Description
0.748	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.932	0.46	Weighted Average
0.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST: DA-3 POST



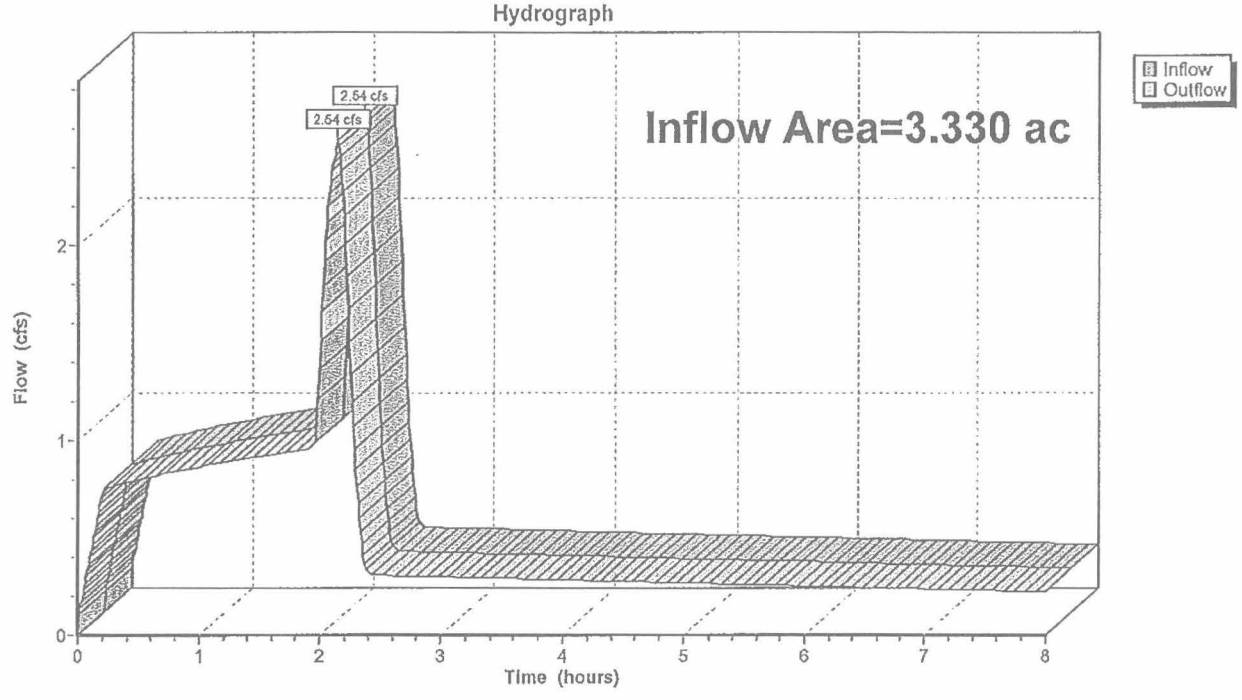
25-YEAR STORM

Summary for Reach POI 1 POST: Point of Investigation 1 POST

Inflow Area = 3.330 ac, 0.00% Impervious, Inflow Depth > 1.12" for 25-Year event
Inflow = 2.54 cfs @ 2.15 hrs, Volume= 0.312 af
Outflow = 2.54 cfs @ 2.15 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 1 POST: Point of Investigation 1 POST



Summary for Subcatchment DA-1 Post: DA-1 POST

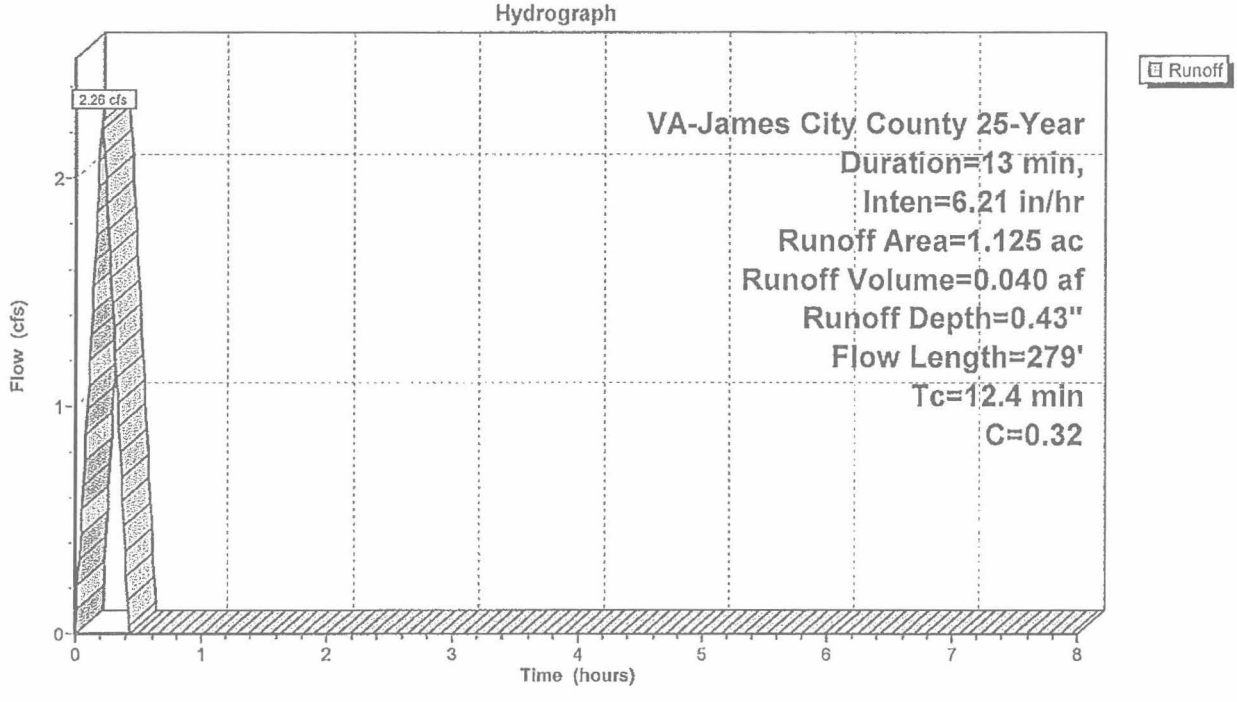
Runoff = 2.26 cfs @ 0.21 hrs, Volume= 0.040 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 25-Year Duration=13 min, Inten=6.21 in/hr

Area (ac)	C	Description
0.365	0.35	Lawn
0.760	0.30	Woods
1.125	0.32	Weighted Average
1.125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 Post: DA-1 POST



Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.205 ac, 0.00% Impervious, Inflow Depth = 1.92" for 25-Year event
Inflow = 1.99 cfs @ 1.26 hrs, Volume= 0.353 af
Outflow = 1.89 cfs @ 2.16 hrs, Volume= 0.261 af, Atten= 5%, Lag= 53.8 min
Primary = 0.32 cfs @ 2.16 hrs, Volume= 0.233 af
Secondary = 1.58 cfs @ 2.16 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
Peak Elev= 98.90' @ 2.16 hrs Surf.Area= 4,472 sf Storage= 12,656 cf

Plug-Flow detention time= 268.8 min calculated for 0.261 af (74% of inflow)
Center-of-Mass det. time= 252.0 min (320.1 - 68.1)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

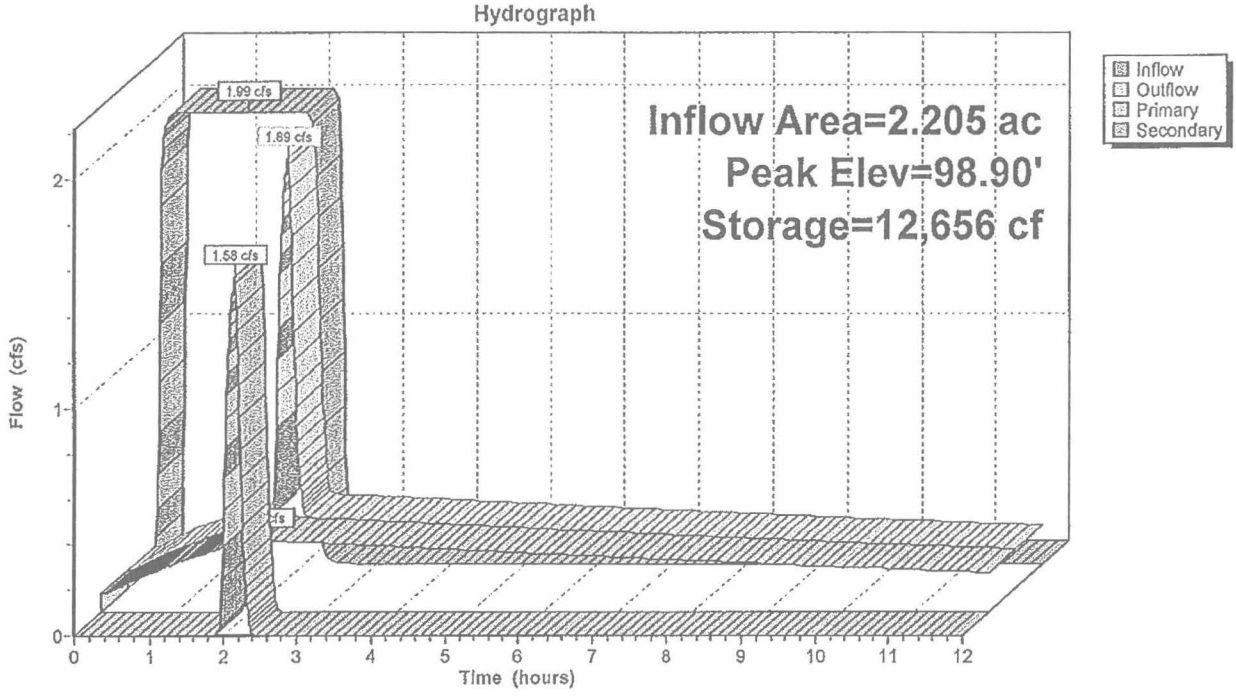
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 Inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.32 cfs @ 2.16 hrs HW=98.90' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration Half of the average 6.14 Inch/hr** (Exfiltration Controls 0.32 cfs)

Secondary OutFlow Max=1.57 cfs @ 2.16 hrs HW=98.90' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.57 cfs @ 0.77 fps)

Pond Infiltration Basin: Infiltration Basin



Hydrograph for Pond Infiltration Basin: Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	94.00	0.00	0.00	0.00
0.05	0.80	50	94.04	0.08	0.08	0.00
0.10	1.82	287	94.25	0.09	0.09	0.00
0.15	1.95	614	94.51	0.09	0.09	0.00
0.20	1.98	951	94.75	0.10	0.10	0.00
0.25	1.99	1,288	94.97	0.11	0.11	0.00
0.30	1.99	1,625	95.18	0.12	0.12	0.00
0.35	1.99	1,961	95.37	0.13	0.13	0.00
0.40	1.99	2,295	95.55	0.13	0.13	0.00
0.45	1.99	2,627	95.72	0.14	0.14	0.00
0.50	1.99	2,959	95.89	0.15	0.15	0.00
0.55	1.99	3,289	96.04	0.16	0.16	0.00
0.60	1.99	3,618	96.19	0.16	0.16	0.00
0.65	1.99	3,946	96.33	0.17	0.17	0.00
0.70	1.99	4,272	96.46	0.18	0.18	0.00
0.75	1.99	4,598	96.59	0.18	0.18	0.00
0.80	1.99	4,922	96.71	0.19	0.19	0.00
0.85	1.99	5,245	96.83	0.20	0.20	0.00
0.90	1.99	5,567	96.95	0.20	0.20	0.00
0.95	1.99	5,888	97.06	0.21	0.21	0.00
1.00	1.99	6,208	97.17	0.21	0.21	0.00
1.05	1.99	6,526	97.27	0.22	0.22	0.00
1.10	1.99	6,844	97.37	0.22	0.22	0.00
1.15	1.99	7,161	97.47	0.23	0.23	0.00
1.20	1.99	7,477	97.57	0.24	0.24	0.00
1.25	1.99	7,792	97.66	0.24	0.24	0.00
1.30	1.99	8,105	97.75	0.25	0.25	0.00
1.35	1.99	8,418	97.84	0.25	0.25	0.00
1.40	1.99	8,730	97.93	0.26	0.26	0.00
1.45	1.99	9,041	98.01	0.26	0.26	0.00
1.50	1.99	9,351	98.10	0.27	0.27	0.00
1.55	1.99	9,661	98.18	0.27	0.27	0.00
1.60	1.99	9,969	98.26	0.28	0.28	0.00
1.65	1.99	10,276	98.34	0.28	0.28	0.00
1.70	1.99	10,583	98.41	0.29	0.29	0.00
1.75	1.99	10,889	98.49	0.29	0.29	0.00
1.80	1.99	11,193	98.56	0.30	0.30	0.00
1.85	1.99	11,498	98.64	0.30	0.30	0.00
1.90	1.99	11,801	98.71	0.31	0.31	0.00
1.95	1.99	12,103	98.78	0.31	0.31	0.00
2.00	1.99	12,384	98.84	0.71	0.31	0.40
2.05	1.99	12,551	98.88	1.37	0.32	1.06
2.10	1.99	12,625	98.89	1.73	0.32	1.41
2.15	1.99	**12,655**	**98.90**	**1.89**	**0.32**	**1.57**
2.20	1.07	**12,611**	**98.89**	**1.66**	**0.32**	**1.34**
2.25	0.17	12,465	98.86	1.01	0.31	0.69
2.30	0.06	12,344	98.83	0.58	0.31	0.27
2.35	0.03	12,266	98.81	0.39	0.31	0.08
2.40	0.02	12,208	98.80	0.31	0.31	0.00
2.45	0.01	12,154	98.79	0.31	0.31	0.00
2.50	0.01	12,100	98.78	0.31	0.31	0.00
2.55	0.01	12,045	98.76	0.31	0.31	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.60	0.00	11,991	98.75	0.31	0.31	0.00
2.65	0.00	11,936	98.74	0.31	0.31	0.00
2.70	0.00	11,881	98.73	0.31	0.31	0.00
2.75	0.00	11,827	98.71	0.31	0.31	0.00
2.80	0.00	11,772	98.70	0.30	0.30	0.00
2.85	0.00	11,718	98.69	0.30	0.30	0.00
2.90	0.00	11,663	98.67	0.30	0.30	0.00
2.95	0.00	11,609	98.66	0.30	0.30	0.00
3.00	0.00	11,555	98.65	0.30	0.30	0.00
3.05	0.00	11,501	98.64	0.30	0.30	0.00
3.10	0.00	11,447	98.62	0.30	0.30	0.00
3.15	0.00	11,393	98.61	0.30	0.30	0.00
3.20	0.00	11,340	98.60	0.30	0.30	0.00
3.25	0.00	11,286	98.59	0.30	0.30	0.00
3.30	0.00	11,233	98.57	0.30	0.30	0.00
3.35	0.00	11,180	98.56	0.30	0.30	0.00
3.40	0.00	11,127	98.55	0.29	0.29	0.00
3.45	0.00	11,074	98.53	0.29	0.29	0.00
3.50	0.00	11,021	98.52	0.29	0.29	0.00
3.55	0.00	10,968	98.51	0.29	0.29	0.00
3.60	0.00	10,916	98.50	0.29	0.29	0.00
3.65	0.00	10,863	98.48	0.29	0.29	0.00
3.70	0.00	10,811	98.47	0.29	0.29	0.00
3.75	0.00	10,759	98.46	0.29	0.29	0.00
3.80	0.00	10,707	98.44	0.29	0.29	0.00
3.85	0.00	10,655	98.43	0.29	0.29	0.00
3.90	0.00	10,604	98.42	0.29	0.29	0.00
3.95	0.00	10,552	98.41	0.29	0.29	0.00
4.00	0.00	10,501	98.39	0.29	0.29	0.00
4.05	0.00	10,450	98.38	0.28	0.28	0.00
4.10	0.00	10,399	98.37	0.28	0.28	0.00
4.15	0.00	10,348	98.36	0.28	0.28	0.00
4.20	0.00	10,297	98.34	0.28	0.28	0.00
4.25	0.00	10,246	98.33	0.28	0.28	0.00
4.30	0.00	10,196	98.32	0.28	0.28	0.00
4.35	0.00	10,145	98.30	0.28	0.28	0.00
4.40	0.00	10,095	98.29	0.28	0.28	0.00
4.45	0.00	10,045	98.28	0.28	0.28	0.00
4.50	0.00	9,995	98.27	0.28	0.28	0.00
4.55	0.00	9,945	98.25	0.28	0.28	0.00
4.60	0.00	9,895	98.24	0.28	0.28	0.00
4.65	0.00	9,846	98.23	0.27	0.27	0.00
4.70	0.00	9,796	98.21	0.27	0.27	0.00
4.75	0.00	9,747	98.20	0.27	0.27	0.00
4.80	0.00	9,698	98.19	0.27	0.27	0.00
4.85	0.00	9,649	98.18	0.27	0.27	0.00
4.90	0.00	9,600	98.16	0.27	0.27	0.00
4.95	0.00	9,552	98.15	0.27	0.27	0.00
5.00	0.00	9,503	98.14	0.27	0.27	0.00
5.05	0.00	9,455	98.12	0.27	0.27	0.00
5.10	0.00	9,406	98.11	0.27	0.27	0.00
5.15	0.00	9,358	98.10	0.27	0.27	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	9,310	98.09	0.27	0.27	0.00
5.25	0.00	9,262	98.07	0.27	0.27	0.00
5.30	0.00	9,215	98.06	0.26	0.26	0.00
5.35	0.00	9,167	98.05	0.26	0.26	0.00
5.40	0.00	9,120	98.04	0.26	0.26	0.00
5.45	0.00	9,072	98.02	0.26	0.26	0.00
5.50	0.00	9,025	98.01	0.26	0.26	0.00
5.55	0.00	8,978	98.00	0.26	0.26	0.00
5.60	0.00	8,931	97.98	0.26	0.26	0.00
5.65	0.00	8,884	97.97	0.26	0.26	0.00
5.70	0.00	8,838	97.96	0.26	0.26	0.00
5.75	0.00	8,791	97.95	0.26	0.26	0.00
5.80	0.00	8,745	97.93	0.26	0.26	0.00
5.85	0.00	8,699	97.92	0.26	0.26	0.00
5.90	0.00	8,653	97.91	0.26	0.26	0.00
5.95	0.00	8,607	97.89	0.25	0.25	0.00
6.00	0.00	8,561	97.88	0.25	0.25	0.00
6.05	0.00	8,515	97.87	0.25	0.25	0.00
6.10	0.00	8,470	97.86	0.25	0.25	0.00
6.15	0.00	8,424	97.84	0.25	0.25	0.00
6.20	0.00	8,379	97.83	0.25	0.25	0.00
6.25	0.00	8,334	97.82	0.25	0.25	0.00
6.30	0.00	8,289	97.81	0.25	0.25	0.00
6.35	0.00	8,244	97.79	0.25	0.25	0.00
6.40	0.00	8,199	97.78	0.25	0.25	0.00
6.45	0.00	8,155	97.77	0.25	0.25	0.00
6.50	0.00	8,110	97.75	0.25	0.25	0.00
6.55	0.00	8,066	97.74	0.25	0.25	0.00
6.60	0.00	8,022	97.73	0.25	0.25	0.00
6.65	0.00	7,978	97.72	0.24	0.24	0.00
6.70	0.00	7,934	97.70	0.24	0.24	0.00
6.75	0.00	7,890	97.69	0.24	0.24	0.00
6.80	0.00	7,847	97.68	0.24	0.24	0.00
6.85	0.00	7,803	97.66	0.24	0.24	0.00
6.90	0.00	7,760	97.65	0.24	0.24	0.00
6.95	0.00	7,716	97.64	0.24	0.24	0.00
7.00	0.00	7,673	97.63	0.24	0.24	0.00
7.05	0.00	7,630	97.61	0.24	0.24	0.00
7.10	0.00	7,588	97.60	0.24	0.24	0.00
7.15	0.00	7,545	97.59	0.24	0.24	0.00
7.20	0.00	7,502	97.57	0.24	0.24	0.00
7.25	0.00	7,460	97.56	0.24	0.24	0.00
7.30	0.00	7,417	97.55	0.23	0.23	0.00
7.35	0.00	7,375	97.54	0.23	0.23	0.00
7.40	0.00	7,333	97.52	0.23	0.23	0.00
7.45	0.00	7,291	97.51	0.23	0.23	0.00
7.50	0.00	7,250	97.50	0.23	0.23	0.00
7.55	0.00	7,208	97.49	0.23	0.23	0.00
7.60	0.00	7,166	97.47	0.23	0.23	0.00
7.65	0.00	7,125	97.46	0.23	0.23	0.00
7.70	0.00	7,084	97.45	0.23	0.23	0.00
7.75	0.00	7,043	97.43	0.23	0.23	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.80	0.00	7,001	97.42	0.23	0.23	0.00
7.85	0.00	6,961	97.41	0.23	0.23	0.00
7.90	0.00	6,920	97.40	0.23	0.23	0.00
7.95	0.00	6,879	97.38	0.23	0.23	0.00
8.00	0.00	6,839	97.37	0.22	0.22	0.00
8.05	0.00	6,798	97.36	0.22	0.22	0.00
8.10	0.00	6,758	97.34	0.22	0.22	0.00
8.15	0.00	6,718	97.33	0.22	0.22	0.00
8.20	0.00	6,678	97.32	0.22	0.22	0.00
8.25	0.00	6,638	97.31	0.22	0.22	0.00
8.30	0.00	6,598	97.29	0.22	0.22	0.00
8.35	0.00	6,559	97.28	0.22	0.22	0.00
8.40	0.00	6,519	97.27	0.22	0.22	0.00
8.45	0.00	6,480	97.26	0.22	0.22	0.00
8.50	0.00	6,441	97.24	0.22	0.22	0.00
8.55	0.00	6,402	97.23	0.22	0.22	0.00
8.60	0.00	6,363	97.22	0.22	0.22	0.00
8.65	0.00	6,324	97.20	0.22	0.22	0.00
8.70	0.00	6,285	97.19	0.21	0.21	0.00
8.75	0.00	6,247	97.18	0.21	0.21	0.00
8.80	0.00	6,208	97.17	0.21	0.21	0.00
8.85	0.00	6,170	97.15	0.21	0.21	0.00
8.90	0.00	6,132	97.14	0.21	0.21	0.00
8.95	0.00	6,093	97.13	0.21	0.21	0.00
9.00	0.00	6,056	97.11	0.21	0.21	0.00
9.05	0.00	6,018	97.10	0.21	0.21	0.00
9.10	0.00	5,980	97.09	0.21	0.21	0.00
9.15	0.00	5,942	97.08	0.21	0.21	0.00
9.20	0.00	5,905	97.06	0.21	0.21	0.00
9.25	0.00	5,868	97.05	0.21	0.21	0.00
9.30	0.00	5,830	97.04	0.21	0.21	0.00
9.35	0.00	5,793	97.02	0.21	0.21	0.00
9.40	0.00	5,756	97.01	0.21	0.21	0.00
9.45	0.00	5,719	97.00	0.20	0.20	0.00
9.50	0.00	5,683	96.99	0.20	0.20	0.00
9.55	0.00	5,646	96.97	0.20	0.20	0.00
9.60	0.00	5,610	96.96	0.20	0.20	0.00
9.65	0.00	5,573	96.95	0.20	0.20	0.00
9.70	0.00	5,537	96.94	0.20	0.20	0.00
9.75	0.00	5,501	96.92	0.20	0.20	0.00
9.80	0.00	5,465	96.91	0.20	0.20	0.00
9.85	0.00	5,429	96.90	0.20	0.20	0.00
9.90	0.00	5,393	96.88	0.20	0.20	0.00
9.95	0.00	5,358	96.87	0.20	0.20	0.00
10.00	0.00	5,322	96.86	0.20	0.20	0.00
10.05	0.00	5,287	96.85	0.20	0.20	0.00
10.10	0.00	5,251	96.83	0.20	0.20	0.00
10.15	0.00	5,216	96.82	0.19	0.19	0.00
10.20	0.00	5,181	96.81	0.19	0.19	0.00
10.25	0.00	5,146	96.79	0.19	0.19	0.00
10.30	0.00	5,112	96.78	0.19	0.19	0.00
10.35	0.00	5,077	96.77	0.19	0.19	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
10.40	0.00	5,042	96.76	0.19	0.19	0.00
10.45	0.00	5,008	96.74	0.19	0.19	0.00
10.50	0.00	4,974	96.73	0.19	0.19	0.00
10.55	0.00	4,939	96.72	0.19	0.19	0.00
10.60	0.00	4,905	96.71	0.19	0.19	0.00
10.65	0.00	4,871	96.69	0.19	0.19	0.00
10.70	0.00	4,837	96.68	0.19	0.19	0.00
10.75	0.00	4,804	96.67	0.19	0.19	0.00
10.80	0.00	4,770	96.65	0.19	0.19	0.00
10.85	0.00	4,737	96.64	0.19	0.19	0.00
10.90	0.00	4,703	96.63	0.19	0.19	0.00
10.95	0.00	4,670	96.62	0.18	0.18	0.00
11.00	0.00	4,637	96.60	0.18	0.18	0.00
11.05	0.00	4,604	96.59	0.18	0.18	0.00
11.10	0.00	4,571	96.58	0.18	0.18	0.00
11.15	0.00	4,538	96.56	0.18	0.18	0.00
11.20	0.00	4,506	96.55	0.18	0.18	0.00
11.25	0.00	4,473	96.54	0.18	0.18	0.00
11.30	0.00	4,441	96.53	0.18	0.18	0.00
11.35	0.00	4,408	96.51	0.18	0.18	0.00
11.40	0.00	4,376	96.50	0.18	0.18	0.00
11.45	0.00	4,344	96.49	0.18	0.18	0.00
11.50	0.00	4,312	96.47	0.18	0.18	0.00
11.55	0.00	4,280	96.46	0.18	0.18	0.00
11.60	0.00	4,248	96.45	0.18	0.18	0.00
11.65	0.00	4,217	96.44	0.18	0.18	0.00
11.70	0.00	4,185	96.42	0.17	0.17	0.00
11.75	0.00	4,154	96.41	0.17	0.17	0.00
11.80	0.00	4,122	96.40	0.17	0.17	0.00
11.85	0.00	4,091	96.39	0.17	0.17	0.00
11.90	0.00	4,060	96.37	0.17	0.17	0.00
11.95	0.00	4,029	96.36	0.17	0.17	0.00
12.00	0.00	3,998	96.35	0.17	0.17	0.00

Summary for Subcatchment DA-2A POST: DA-2A POST

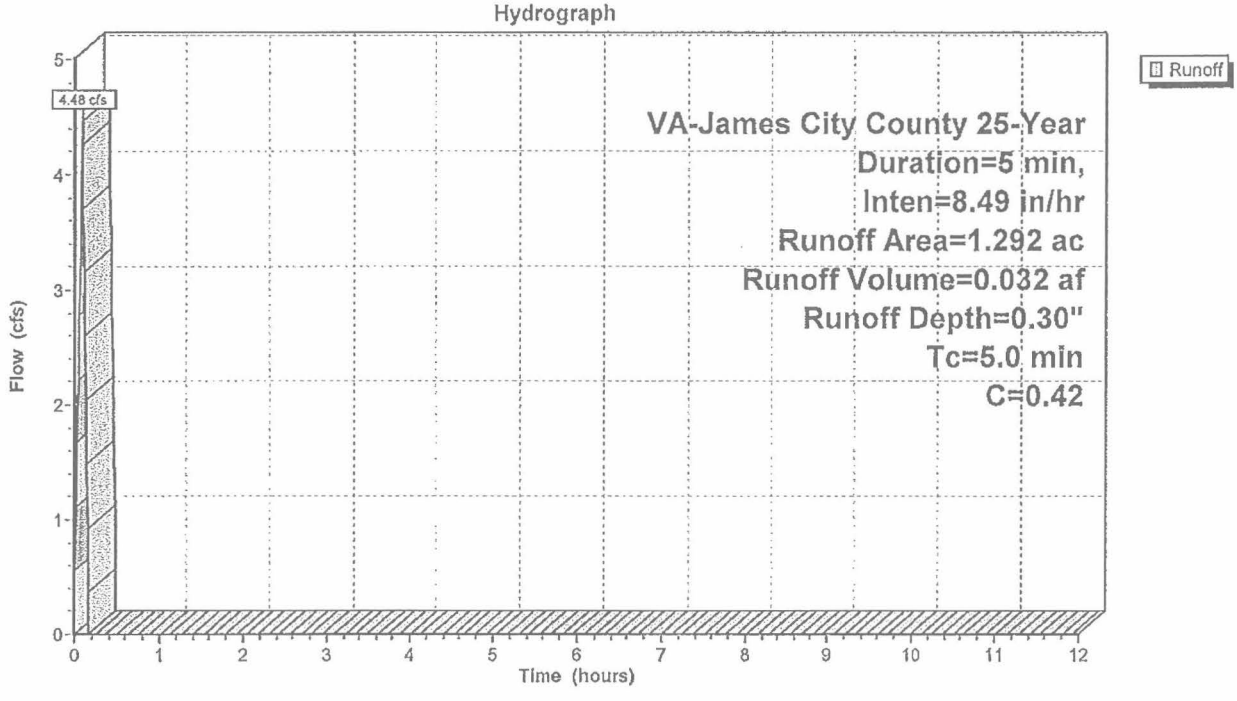
Runoff = 4.48 cfs @ 0.08 hrs, Volume= 0.032 af, Depth= 0.30"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 25-Year Duration=5 min, Inten=8.49 in/hr

Area (ac)	C	Description
0.172	0.90	Impervious
1.057	0.35	Lawn
0.063	0.30	Woods
1.292	0.42	Weighted Average
1.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2A POST: DA-2A POST



Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.70" for 25-Year event
Inflow = 3.86 cfs @ 0.09 hrs, Volume= 0.053 af
Outflow = 3.18 cfs @ 0.18 hrs, Volume= 0.053 af, Atten= 18%, Lag= 5.5 min
Primary = 3.18 cfs @ 0.18 hrs, Volume= 0.053 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Starting Elev= 107.00' Surf.Area= 435 sf Storage= 435 cf
Peak Elev= 110.90' @ 0.18 hrs Surf.Area= 435 sf Storage= 1,114 cf (679 cf above start)

Plug-Flow detention time= 5.6 min calculated for 0.043 af (81% of inflow)
Center-of-Mass det. time= 3.2 min (10.7 - 7.5)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

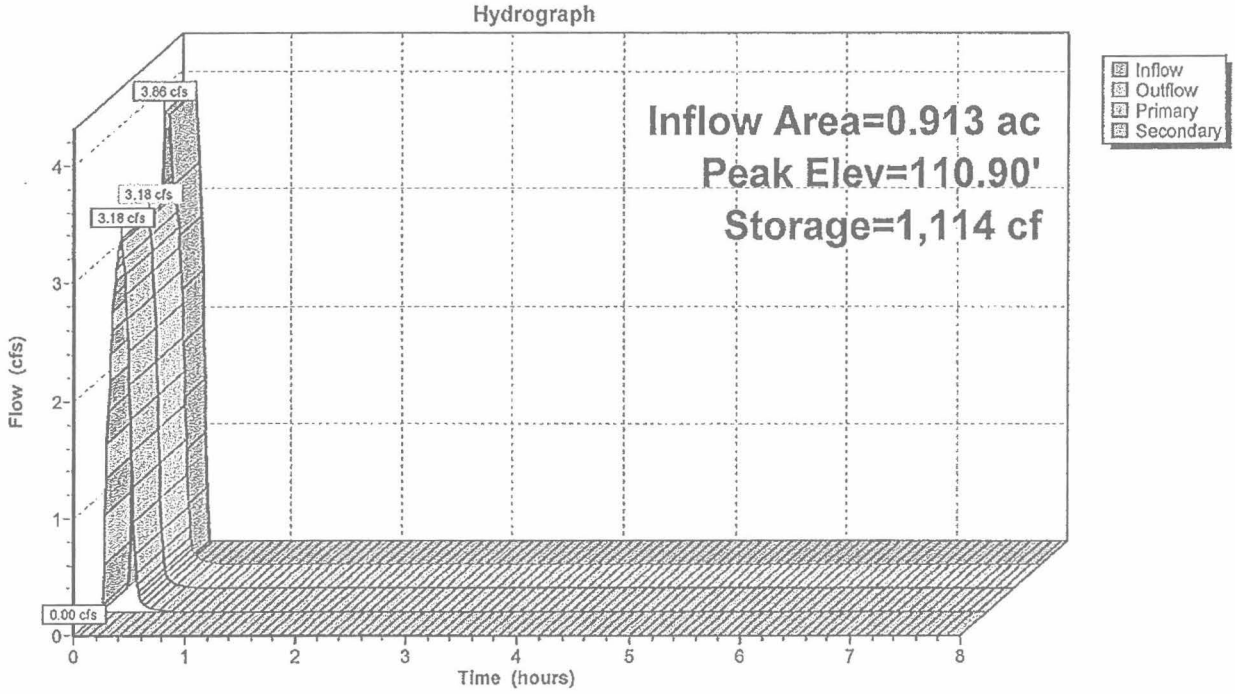
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.17 cfs @ 0.18 hrs HW=110.90' TW=95.93' (Dynamic Tailwater)
└1=**Orifice/Grate** (Passes 3.17 cfs of 58.53 cfs potential flow)
└2=**Culvert** (Passes 3.17 cfs of 6.50 cfs potential flow)
└3=**Culvert** (Passes 3.17 cfs of 4.32 cfs potential flow)
└4=**Culvert** (Passes 3.17 cfs of 4.31 cfs potential flow)
└5=**Culvert** (Inlet Controls 3.17 cfs @ 9.09 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.00' TW=94.00' (Dynamic Tailwater)
└6=**Broad-Crested Weir** (Controls 0.00 cfs)

Pond GFS: Gravel Filter Strip



Hydrograph for Pond GFS: Gravel Filter Strip

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	435	107.00	0.00	0.00	**0.00**
0.02	0.93	466	107.18	0.11	0.11	0.00
0.04	1.85	535	107.57	0.82	0.82	0.00
0.06	2.78	620	108.06	1.43	1.43	0.00
0.08	**3.70**	731	108.70	1.96	1.96	0.00
0.10	**3.86**	848	109.37	2.40	2.40	0.00
0.12	3.86	942	109.91	2.70	2.70	0.00
0.14	3.86	1,017	110.35	2.92	2.92	0.00
0.16	3.86	1,079	110.70	3.08	3.08	0.00
0.18	3.24	**1,114**	**110.90**	**3.18**	**3.18**	0.00
0.20	2.32	1,087	110.75	3.11	3.11	0.00
0.22	1.39	1,004	110.27	2.88	2.88	0.00
0.24	0.46	877	109.54	2.50	2.50	0.00
0.26	0.00	725	108.67	1.94	1.94	0.00
0.28	0.00	606	107.98	1.36	1.36	0.00
0.30	0.00	530	107.54	0.77	0.77	0.00
0.32	0.00	492	107.33	0.33	0.33	0.00
0.34	0.00	475	107.23	0.17	0.17	0.00
0.36	0.00	465	107.17	0.10	0.10	0.00
0.38	0.00	459	107.14	0.07	0.07	0.00
0.40	0.00	455	107.12	0.05	0.05	0.00
0.42	0.00	452	107.10	0.03	0.03	0.00
0.44	0.00	450	107.09	0.03	0.03	0.00
0.46	0.00	448	107.08	0.02	0.02	0.00
0.48	0.00	447	107.07	0.02	0.02	0.00
0.50	0.00	446	107.06	0.01	0.01	0.00
0.52	0.00	445	107.06	0.01	0.01	0.00
0.54	0.00	444	107.05	0.01	0.01	0.00
0.56	0.00	443	107.05	0.01	0.01	0.00
0.58	0.00	443	107.05	0.01	0.01	0.00
0.60	0.00	442	107.04	0.01	0.01	0.00
0.62	0.00	442	107.04	0.01	0.01	0.00
0.64	0.00	442	107.04	0.01	0.01	0.00
0.66	0.00	441	107.04	0.00	0.00	0.00
0.68	0.00	441	107.03	0.00	0.00	0.00
0.70	0.00	441	107.03	0.00	0.00	0.00
0.72	0.00	440	107.03	0.00	0.00	0.00
0.74	0.00	440	107.03	0.00	0.00	0.00
0.76	0.00	440	107.03	0.00	0.00	0.00
0.78	0.00	440	107.03	0.00	0.00	0.00
0.80	0.00	439	107.03	0.00	0.00	0.00
0.82	0.00	439	107.02	0.00	0.00	0.00
0.84	0.00	439	107.02	0.00	0.00	0.00
0.86	0.00	439	107.02	0.00	0.00	0.00
0.88	0.00	439	107.02	0.00	0.00	0.00
0.90	0.00	439	107.02	0.00	0.00	0.00
0.92	0.00	439	107.02	0.00	0.00	0.00
0.94	0.00	439	107.02	0.00	0.00	0.00
0.96	0.00	438	107.02	0.00	0.00	0.00
0.98	0.00	438	107.02	0.00	0.00	0.00
1.00	0.00	438	107.02	0.00	0.00	0.00
1.02	0.00	438	107.02	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.00	438	107.02	0.00	0.00	0.00
1.06	0.00	438	107.02	0.00	0.00	0.00
1.08	0.00	438	107.02	0.00	0.00	0.00
1.10	0.00	438	107.02	0.00	0.00	0.00
1.12	0.00	438	107.02	0.00	0.00	0.00
1.14	0.00	438	107.02	0.00	0.00	0.00
1.16	0.00	438	107.02	0.00	0.00	0.00
1.18	0.00	438	107.01	0.00	0.00	0.00
1.20	0.00	438	107.01	0.00	0.00	0.00
1.22	0.00	437	107.01	0.00	0.00	0.00
1.24	0.00	437	107.01	0.00	0.00	0.00
1.26	0.00	437	107.01	0.00	0.00	0.00
1.28	0.00	437	107.01	0.00	0.00	0.00
1.30	0.00	437	107.01	0.00	0.00	0.00
1.32	0.00	437	107.01	0.00	0.00	0.00
1.34	0.00	437	107.01	0.00	0.00	0.00
1.36	0.00	437	107.01	0.00	0.00	0.00
1.38	0.00	437	107.01	0.00	0.00	0.00
1.40	0.00	437	107.01	0.00	0.00	0.00
1.42	0.00	437	107.01	0.00	0.00	0.00
1.44	0.00	437	107.01	0.00	0.00	0.00
1.46	0.00	437	107.01	0.00	0.00	0.00
1.48	0.00	437	107.01	0.00	0.00	0.00
1.50	0.00	437	107.01	0.00	0.00	0.00
1.52	0.00	437	107.01	0.00	0.00	0.00
1.54	0.00	437	107.01	0.00	0.00	0.00
1.56	0.00	437	107.01	0.00	0.00	0.00
1.58	0.00	437	107.01	0.00	0.00	0.00
1.60	0.00	437	107.01	0.00	0.00	0.00
1.62	0.00	437	107.01	0.00	0.00	0.00
1.64	0.00	437	107.01	0.00	0.00	0.00
1.66	0.00	437	107.01	0.00	0.00	0.00
1.68	0.00	437	107.01	0.00	0.00	0.00
1.70	0.00	437	107.01	0.00	0.00	0.00
1.72	0.00	437	107.01	0.00	0.00	0.00
1.74	0.00	437	107.01	0.00	0.00	0.00
1.76	0.00	437	107.01	0.00	0.00	0.00
1.78	0.00	437	107.01	0.00	0.00	0.00
1.80	0.00	437	107.01	0.00	0.00	0.00
1.82	0.00	436	107.01	0.00	0.00	0.00
1.84	0.00	436	107.01	0.00	0.00	0.00
1.86	0.00	436	107.01	0.00	0.00	0.00
1.88	0.00	436	107.01	0.00	0.00	0.00
1.90	0.00	436	107.01	0.00	0.00	0.00
1.92	0.00	436	107.01	0.00	0.00	0.00
1.94	0.00	436	107.01	0.00	0.00	0.00
1.96	0.00	436	107.01	0.00	0.00	0.00
1.98	0.00	436	107.01	0.00	0.00	0.00
2.00	0.00	436	107.01	0.00	0.00	0.00
2.02	0.00	436	107.01	0.00	0.00	0.00
2.04	0.00	436	107.01	0.00	0.00	0.00
2.06	0.00	436	107.01	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.00	436	107.01	0.00	0.00	0.00
2.10	0.00	436	107.01	0.00	0.00	0.00
2.12	0.00	436	107.01	0.00	0.00	0.00
2.14	0.00	436	107.01	0.00	0.00	0.00
2.16	0.00	436	107.01	0.00	0.00	0.00
2.18	0.00	436	107.01	0.00	0.00	0.00
2.20	0.00	436	107.01	0.00	0.00	0.00
2.22	0.00	436	107.01	0.00	0.00	0.00
2.24	0.00	436	107.01	0.00	0.00	0.00
2.26	0.00	436	107.01	0.00	0.00	0.00
2.28	0.00	436	107.01	0.00	0.00	0.00
2.30	0.00	436	107.01	0.00	0.00	0.00
2.32	0.00	436	107.01	0.00	0.00	0.00
2.34	0.00	436	107.01	0.00	0.00	0.00
2.36	0.00	436	107.01	0.00	0.00	0.00
2.38	0.00	436	107.01	0.00	0.00	0.00
2.40	0.00	436	107.01	0.00	0.00	0.00
2.42	0.00	436	107.01	0.00	0.00	0.00
2.44	0.00	436	107.01	0.00	0.00	0.00
2.46	0.00	436	107.01	0.00	0.00	0.00
2.48	0.00	436	107.01	0.00	0.00	0.00
2.50	0.00	436	107.01	0.00	0.00	0.00
2.52	0.00	436	107.01	0.00	0.00	0.00
2.54	0.00	436	107.01	0.00	0.00	0.00
2.56	0.00	436	107.01	0.00	0.00	0.00
2.58	0.00	436	107.01	0.00	0.00	0.00
2.60	0.00	436	107.01	0.00	0.00	0.00
2.62	0.00	436	107.01	0.00	0.00	0.00
2.64	0.00	436	107.01	0.00	0.00	0.00
2.66	0.00	436	107.01	0.00	0.00	0.00
2.68	0.00	436	107.01	0.00	0.00	0.00
2.70	0.00	436	107.01	0.00	0.00	0.00
2.72	0.00	436	107.01	0.00	0.00	0.00
2.74	0.00	436	107.01	0.00	0.00	0.00
2.76	0.00	436	107.01	0.00	0.00	0.00
2.78	0.00	436	107.01	0.00	0.00	0.00
2.80	0.00	436	107.01	0.00	0.00	0.00
2.82	0.00	436	107.01	0.00	0.00	0.00
2.84	0.00	436	107.01	0.00	0.00	0.00
2.86	0.00	436	107.01	0.00	0.00	0.00
2.88	0.00	436	107.01	0.00	0.00	0.00
2.90	0.00	436	107.00	0.00	0.00	0.00
2.92	0.00	436	107.00	0.00	0.00	0.00
2.94	0.00	436	107.00	0.00	0.00	0.00
2.96	0.00	436	107.00	0.00	0.00	0.00
2.98	0.00	436	107.00	0.00	0.00	0.00
3.00	0.00	436	107.00	0.00	0.00	0.00
3.02	0.00	436	107.00	0.00	0.00	0.00
3.04	0.00	436	107.00	0.00	0.00	0.00
3.06	0.00	436	107.00	0.00	0.00	0.00
3.08	0.00	436	107.00	0.00	0.00	0.00
3.10	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.00	436	107.00	0.00	0.00	0.00
3.14	0.00	436	107.00	0.00	0.00	0.00
3.16	0.00	436	107.00	0.00	0.00	0.00
3.18	0.00	436	107.00	0.00	0.00	0.00
3.20	0.00	436	107.00	0.00	0.00	0.00
3.22	0.00	436	107.00	0.00	0.00	0.00
3.24	0.00	436	107.00	0.00	0.00	0.00
3.26	0.00	436	107.00	0.00	0.00	0.00
3.28	0.00	436	107.00	0.00	0.00	0.00
3.30	0.00	436	107.00	0.00	0.00	0.00
3.32	0.00	436	107.00	0.00	0.00	0.00
3.34	0.00	436	107.00	0.00	0.00	0.00
3.36	0.00	436	107.00	0.00	0.00	0.00
3.38	0.00	436	107.00	0.00	0.00	0.00
3.40	0.00	436	107.00	0.00	0.00	0.00
3.42	0.00	436	107.00	0.00	0.00	0.00
3.44	0.00	436	107.00	0.00	0.00	0.00
3.46	0.00	436	107.00	0.00	0.00	0.00
3.48	0.00	436	107.00	0.00	0.00	0.00
3.50	0.00	436	107.00	0.00	0.00	0.00
3.52	0.00	436	107.00	0.00	0.00	0.00
3.54	0.00	436	107.00	0.00	0.00	0.00
3.56	0.00	436	107.00	0.00	0.00	0.00
3.58	0.00	436	107.00	0.00	0.00	0.00
3.60	0.00	436	107.00	0.00	0.00	0.00
3.62	0.00	436	107.00	0.00	0.00	0.00
3.64	0.00	436	107.00	0.00	0.00	0.00
3.66	0.00	436	107.00	0.00	0.00	0.00
3.68	0.00	436	107.00	0.00	0.00	0.00
3.70	0.00	436	107.00	0.00	0.00	0.00
3.72	0.00	436	107.00	0.00	0.00	0.00
3.74	0.00	436	107.00	0.00	0.00	0.00
3.76	0.00	436	107.00	0.00	0.00	0.00
3.78	0.00	436	107.00	0.00	0.00	0.00
3.80	0.00	436	107.00	0.00	0.00	0.00
3.82	0.00	436	107.00	0.00	0.00	0.00
3.84	0.00	436	107.00	0.00	0.00	0.00
3.86	0.00	436	107.00	0.00	0.00	0.00
3.88	0.00	436	107.00	0.00	0.00	0.00
3.90	0.00	436	107.00	0.00	0.00	0.00
3.92	0.00	436	107.00	0.00	0.00	0.00
3.94	0.00	436	107.00	0.00	0.00	0.00
3.96	0.00	436	107.00	0.00	0.00	0.00
3.98	0.00	436	107.00	0.00	0.00	0.00
4.00	0.00	436	107.00	0.00	0.00	0.00
4.02	0.00	436	107.00	0.00	0.00	0.00
4.04	0.00	436	107.00	0.00	0.00	0.00
4.06	0.00	436	107.00	0.00	0.00	0.00
4.08	0.00	436	107.00	0.00	0.00	0.00
4.10	0.00	436	107.00	0.00	0.00	0.00
4.12	0.00	436	107.00	0.00	0.00	0.00
4.14	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.00	436	107.00	0.00	0.00	0.00
4.18	0.00	436	107.00	0.00	0.00	0.00
4.20	0.00	436	107.00	0.00	0.00	0.00
4.22	0.00	436	107.00	0.00	0.00	0.00
4.24	0.00	436	107.00	0.00	0.00	0.00
4.26	0.00	436	107.00	0.00	0.00	0.00
4.28	0.00	436	107.00	0.00	0.00	0.00
4.30	0.00	436	107.00	0.00	0.00	0.00
4.32	0.00	436	107.00	0.00	0.00	0.00
4.34	0.00	436	107.00	0.00	0.00	0.00
4.36	0.00	436	107.00	0.00	0.00	0.00
4.38	0.00	436	107.00	0.00	0.00	0.00
4.40	0.00	436	107.00	0.00	0.00	0.00
4.42	0.00	436	107.00	0.00	0.00	0.00
4.44	0.00	436	107.00	0.00	0.00	0.00
4.46	0.00	436	107.00	0.00	0.00	0.00
4.48	0.00	436	107.00	0.00	0.00	0.00
4.50	0.00	436	107.00	0.00	0.00	0.00
4.52	0.00	436	107.00	0.00	0.00	0.00
4.54	0.00	436	107.00	0.00	0.00	0.00
4.56	0.00	436	107.00	0.00	0.00	0.00
4.58	0.00	436	107.00	0.00	0.00	0.00
4.60	0.00	436	107.00	0.00	0.00	0.00
4.62	0.00	436	107.00	0.00	0.00	0.00
4.64	0.00	436	107.00	0.00	0.00	0.00
4.66	0.00	436	107.00	0.00	0.00	0.00
4.68	0.00	436	107.00	0.00	0.00	0.00
4.70	0.00	436	107.00	0.00	0.00	0.00
4.72	0.00	436	107.00	0.00	0.00	0.00
4.74	0.00	436	107.00	0.00	0.00	0.00
4.76	0.00	436	107.00	0.00	0.00	0.00
4.78	0.00	436	107.00	0.00	0.00	0.00
4.80	0.00	435	107.00	0.00	0.00	0.00
4.82	0.00	435	107.00	0.00	0.00	0.00
4.84	0.00	435	107.00	0.00	0.00	0.00
4.86	0.00	435	107.00	0.00	0.00	0.00
4.88	0.00	435	107.00	0.00	0.00	0.00
4.90	0.00	435	107.00	0.00	0.00	0.00
4.92	0.00	435	107.00	0.00	0.00	0.00
4.94	0.00	435	107.00	0.00	0.00	0.00
4.96	0.00	435	107.00	0.00	0.00	0.00
4.98	0.00	435	107.00	0.00	0.00	0.00
5.00	0.00	435	107.00	0.00	0.00	0.00
5.02	0.00	435	107.00	0.00	0.00	0.00
5.04	0.00	435	107.00	0.00	0.00	0.00
5.06	0.00	435	107.00	0.00	0.00	0.00
5.08	0.00	435	107.00	0.00	0.00	0.00
5.10	0.00	435	107.00	0.00	0.00	0.00
5.12	0.00	435	107.00	0.00	0.00	0.00
5.14	0.00	435	107.00	0.00	0.00	0.00
5.16	0.00	435	107.00	0.00	0.00	0.00
5.18	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	435	107.00	0.00	0.00	0.00
5.22	0.00	435	107.00	0.00	0.00	0.00
5.24	0.00	435	107.00	0.00	0.00	0.00
5.26	0.00	435	107.00	0.00	0.00	0.00
5.28	0.00	435	107.00	0.00	0.00	0.00
5.30	0.00	435	107.00	0.00	0.00	0.00
5.32	0.00	435	107.00	0.00	0.00	0.00
5.34	0.00	435	107.00	0.00	0.00	0.00
5.36	0.00	435	107.00	0.00	0.00	0.00
5.38	0.00	435	107.00	0.00	0.00	0.00
5.40	0.00	435	107.00	0.00	0.00	0.00
5.42	0.00	435	107.00	0.00	0.00	0.00
5.44	0.00	435	107.00	0.00	0.00	0.00
5.46	0.00	435	107.00	0.00	0.00	0.00
5.48	0.00	435	107.00	0.00	0.00	0.00
5.50	0.00	435	107.00	0.00	0.00	0.00
5.52	0.00	435	107.00	0.00	0.00	0.00
5.54	0.00	435	107.00	0.00	0.00	0.00
5.56	0.00	435	107.00	0.00	0.00	0.00
5.58	0.00	435	107.00	0.00	0.00	0.00
5.60	0.00	435	107.00	0.00	0.00	0.00
5.62	0.00	435	107.00	0.00	0.00	0.00
5.64	0.00	435	107.00	0.00	0.00	0.00
5.66	0.00	435	107.00	0.00	0.00	0.00
5.68	0.00	435	107.00	0.00	0.00	0.00
5.70	0.00	435	107.00	0.00	0.00	0.00
5.72	0.00	435	107.00	0.00	0.00	0.00
5.74	0.00	435	107.00	0.00	0.00	0.00
5.76	0.00	435	107.00	0.00	0.00	0.00
5.78	0.00	435	107.00	0.00	0.00	0.00
5.80	0.00	435	107.00	0.00	0.00	0.00
5.82	0.00	435	107.00	0.00	0.00	0.00
5.84	0.00	435	107.00	0.00	0.00	0.00
5.86	0.00	435	107.00	0.00	0.00	0.00
5.88	0.00	435	107.00	0.00	0.00	0.00
5.90	0.00	435	107.00	0.00	0.00	0.00
5.92	0.00	435	107.00	0.00	0.00	0.00
5.94	0.00	435	107.00	0.00	0.00	0.00
5.96	0.00	435	107.00	0.00	0.00	0.00
5.98	0.00	435	107.00	0.00	0.00	0.00
6.00	0.00	435	107.00	0.00	0.00	0.00
6.02	0.00	435	107.00	0.00	0.00	0.00
6.04	0.00	435	107.00	0.00	0.00	0.00
6.06	0.00	435	107.00	0.00	0.00	0.00
6.08	0.00	435	107.00	0.00	0.00	0.00
6.10	0.00	435	107.00	0.00	0.00	0.00
6.12	0.00	435	107.00	0.00	0.00	0.00
6.14	0.00	435	107.00	0.00	0.00	0.00
6.16	0.00	435	107.00	0.00	0.00	0.00
6.18	0.00	435	107.00	0.00	0.00	0.00
6.20	0.00	435	107.00	0.00	0.00	0.00
6.22	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.00	435	107.00	0.00	0.00	0.00
6.26	0.00	435	107.00	0.00	0.00	0.00
6.28	0.00	435	107.00	0.00	0.00	0.00
6.30	0.00	435	107.00	0.00	0.00	0.00
6.32	0.00	435	107.00	0.00	0.00	0.00
6.34	0.00	435	107.00	0.00	0.00	0.00
6.36	0.00	435	107.00	0.00	0.00	0.00
6.38	0.00	435	107.00	0.00	0.00	0.00
6.40	0.00	435	107.00	0.00	0.00	0.00
6.42	0.00	435	107.00	0.00	0.00	0.00
6.44	0.00	435	107.00	0.00	0.00	0.00
6.46	0.00	435	107.00	0.00	0.00	0.00
6.48	0.00	435	107.00	0.00	0.00	0.00
6.50	0.00	435	107.00	0.00	0.00	0.00
6.52	0.00	435	107.00	0.00	0.00	0.00
6.54	0.00	435	107.00	0.00	0.00	0.00
6.56	0.00	435	107.00	0.00	0.00	0.00
6.58	0.00	435	107.00	0.00	0.00	0.00
6.60	0.00	435	107.00	0.00	0.00	0.00
6.62	0.00	435	107.00	0.00	0.00	0.00
6.64	0.00	435	107.00	0.00	0.00	0.00
6.66	0.00	435	107.00	0.00	0.00	0.00
6.68	0.00	435	107.00	0.00	0.00	0.00
6.70	0.00	435	107.00	0.00	0.00	0.00
6.72	0.00	435	107.00	0.00	0.00	0.00
6.74	0.00	435	107.00	0.00	0.00	0.00
6.76	0.00	435	107.00	0.00	0.00	0.00
6.78	0.00	435	107.00	0.00	0.00	0.00
6.80	0.00	435	107.00	0.00	0.00	0.00
6.82	0.00	435	107.00	0.00	0.00	0.00
6.84	0.00	435	107.00	0.00	0.00	0.00
6.86	0.00	435	107.00	0.00	0.00	0.00
6.88	0.00	435	107.00	0.00	0.00	0.00
6.90	0.00	435	107.00	0.00	0.00	0.00
6.92	0.00	435	107.00	0.00	0.00	0.00
6.94	0.00	435	107.00	0.00	0.00	0.00
6.96	0.00	435	107.00	0.00	0.00	0.00
6.98	0.00	435	107.00	0.00	0.00	0.00
7.00	0.00	435	107.00	0.00	0.00	0.00
7.02	0.00	435	107.00	0.00	0.00	0.00
7.04	0.00	435	107.00	0.00	0.00	0.00
7.06	0.00	435	107.00	0.00	0.00	0.00
7.08	0.00	435	107.00	0.00	0.00	0.00
7.10	0.00	435	107.00	0.00	0.00	0.00
7.12	0.00	435	107.00	0.00	0.00	0.00
7.14	0.00	435	107.00	0.00	0.00	0.00
7.16	0.00	435	107.00	0.00	0.00	0.00
7.18	0.00	435	107.00	0.00	0.00	0.00
7.20	0.00	435	107.00	0.00	0.00	0.00
7.22	0.00	435	107.00	0.00	0.00	0.00
7.24	0.00	435	107.00	0.00	0.00	0.00
7.26	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	435	107.00	0.00	0.00	0.00
7.30	0.00	435	107.00	0.00	0.00	0.00
7.32	0.00	435	107.00	0.00	0.00	0.00
7.34	0.00	435	107.00	0.00	0.00	0.00
7.36	0.00	435	107.00	0.00	0.00	0.00
7.38	0.00	435	107.00	0.00	0.00	0.00
7.40	0.00	435	107.00	0.00	0.00	0.00
7.42	0.00	435	107.00	0.00	0.00	0.00
7.44	0.00	435	107.00	0.00	0.00	0.00
7.46	0.00	435	107.00	0.00	0.00	0.00
7.48	0.00	435	107.00	0.00	0.00	0.00
7.50	0.00	435	107.00	0.00	0.00	0.00
7.52	0.00	435	107.00	0.00	0.00	0.00
7.54	0.00	435	107.00	0.00	0.00	0.00
7.56	0.00	435	107.00	0.00	0.00	0.00
7.58	0.00	435	107.00	0.00	0.00	0.00
7.60	0.00	435	107.00	0.00	0.00	0.00
7.62	0.00	435	107.00	0.00	0.00	0.00
7.64	0.00	435	107.00	0.00	0.00	0.00
7.66	0.00	435	107.00	0.00	0.00	0.00
7.68	0.00	435	107.00	0.00	0.00	0.00
7.70	0.00	435	107.00	0.00	0.00	0.00
7.72	0.00	435	107.00	0.00	0.00	0.00
7.74	0.00	435	107.00	0.00	0.00	0.00
7.76	0.00	435	107.00	0.00	0.00	0.00
7.78	0.00	435	107.00	0.00	0.00	0.00
7.80	0.00	435	107.00	0.00	0.00	0.00
7.82	0.00	435	107.00	0.00	0.00	0.00
7.84	0.00	435	107.00	0.00	0.00	0.00
7.86	0.00	435	107.00	0.00	0.00	0.00
7.88	0.00	435	107.00	0.00	0.00	0.00
7.90	0.00	435	107.00	0.00	0.00	0.00
7.92	0.00	435	107.00	0.00	0.00	0.00
7.94	0.00	435	107.00	0.00	0.00	0.00
7.96	0.00	435	107.00	0.00	0.00	0.00
7.98	0.00	435	107.00	0.00	0.00	0.00
8.00	0.00	435	107.00	0.00	0.00	0.00

Summary for Subcatchment DA-2B Post: DA-2B POST

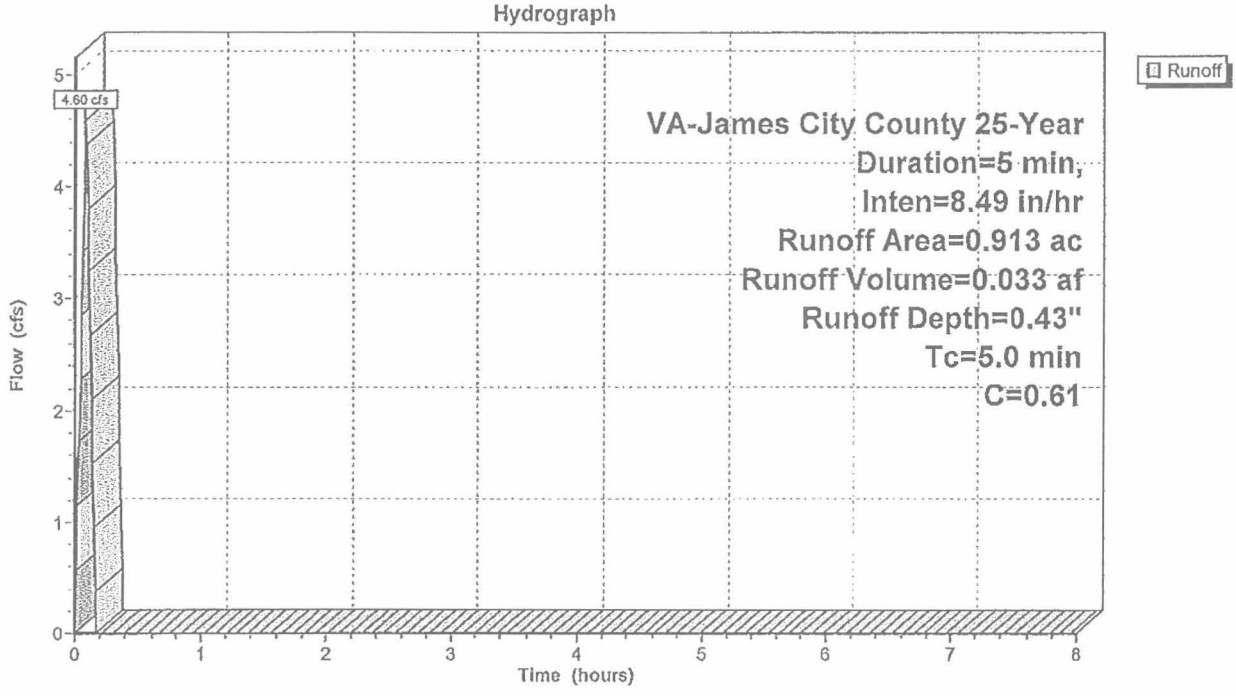
Runoff = 4.60 cfs @ 0.08 hrs, Volume= 0.033 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 25-Year Duration=5 min, Inten=8.49 in/hr

Area (ac)	C	Description
0.430	0.90	Impervious
0.455	0.35	Lawn
0.028	0.30	Woods
0.913	0.61	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2B Post: DA-2B POST

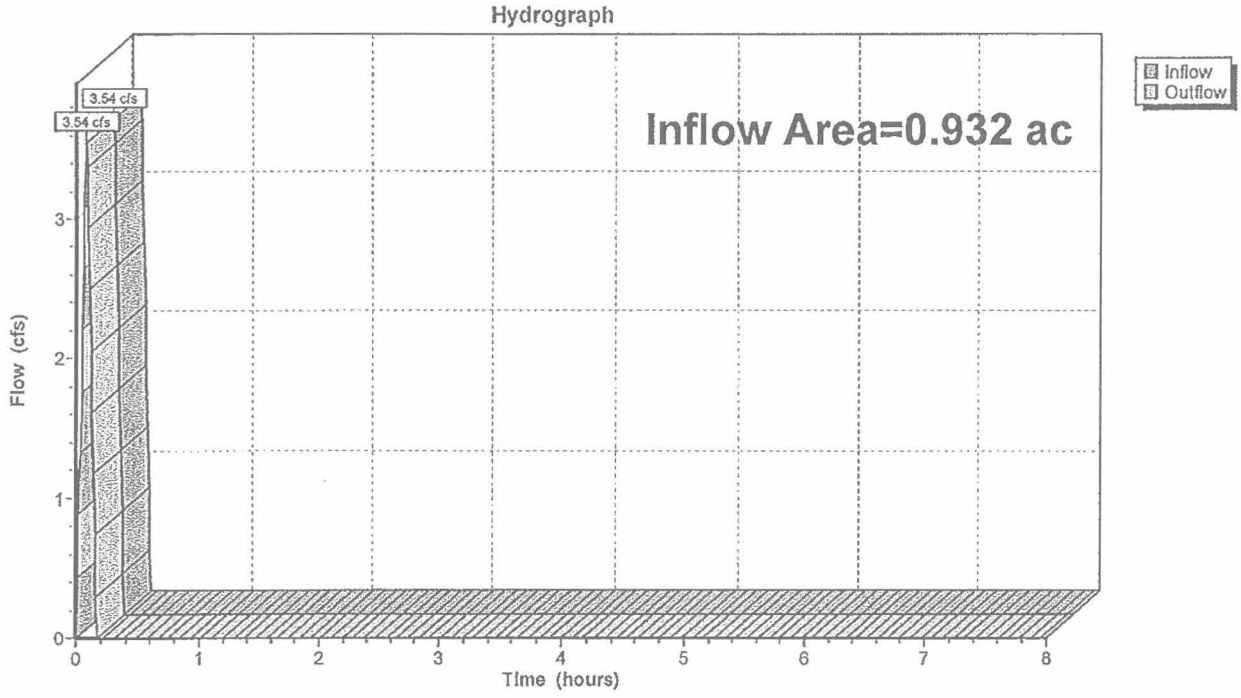


Summary for Reach POI 2 POST: Point of Investigation 2 POST

Inflow Area = 0.932 ac, 0.00% Impervious, Inflow Depth = 0.32" for 25-Year event
Inflow = 3.54 cfs @ 0.08 hrs, Volume= 0.025 af
Outflow = 3.54 cfs @ 0.08 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 2 POST: Point of Investigation 2 POST



Summary for Subcatchment DA-3 POST: DA-3 POST

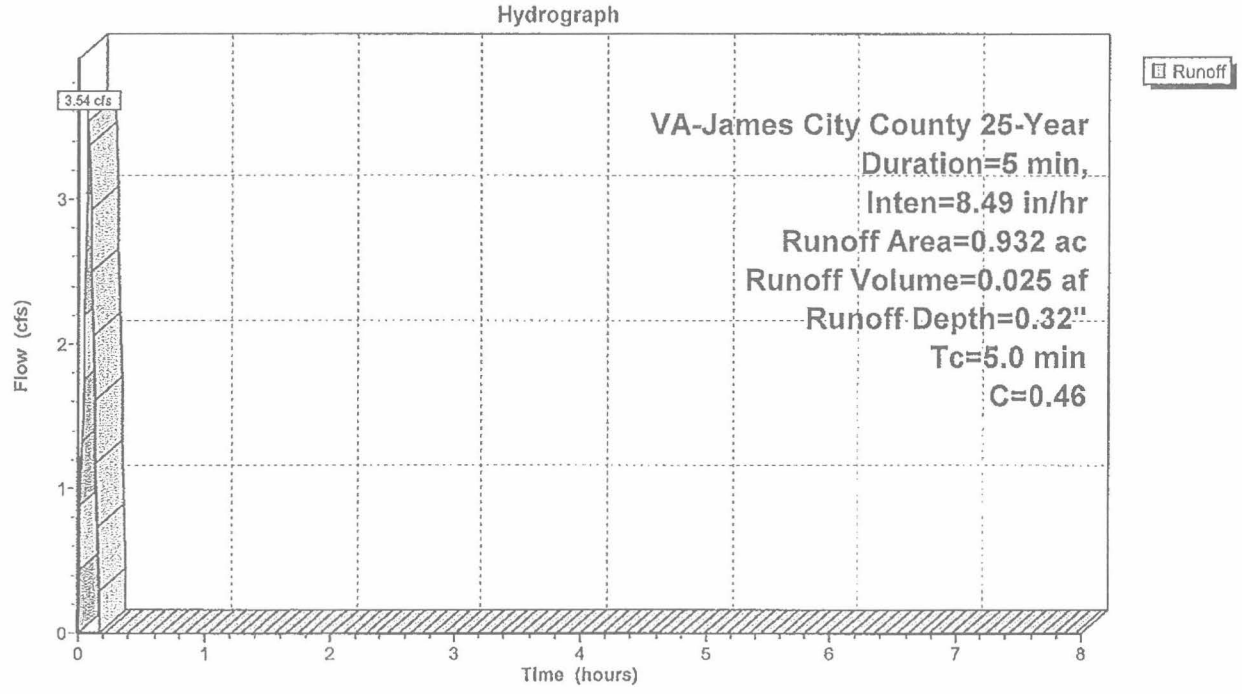
Runoff = 3.54 cfs @ 0.08 hrs, Volume= 0.025 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 25-Year Duration=5 min, Inten=8.49 in/hr

Area (ac)	C	Description
0.748	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.932	0.46	Weighted Average
0.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST: DA-3 POST



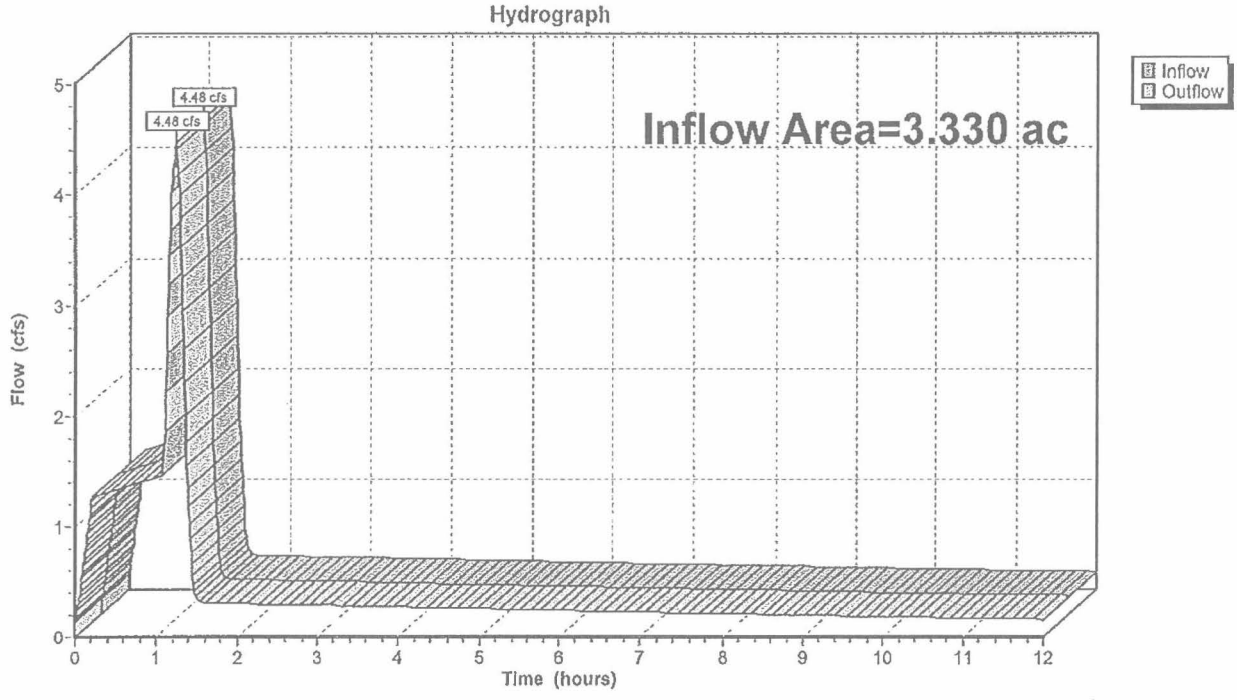
100-YEAR STORM

Summary for Reach POI 1 POST: Point of Investigation 1 POST

Inflow Area = 3.330 ac, 0.00% Impervious, Inflow Depth > 1.44" for 100-Year event
Inflow = 4.48 cfs @ 1.25 hrs, Volume= 0.400 af
Outflow = 4.48 cfs @ 1.25 hrs, Volume= 0.400 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs

Reach POI 1 POST: Point of Investigation 1 POST



Summary for Subcatchment DA-1 Post: DA-1 POST

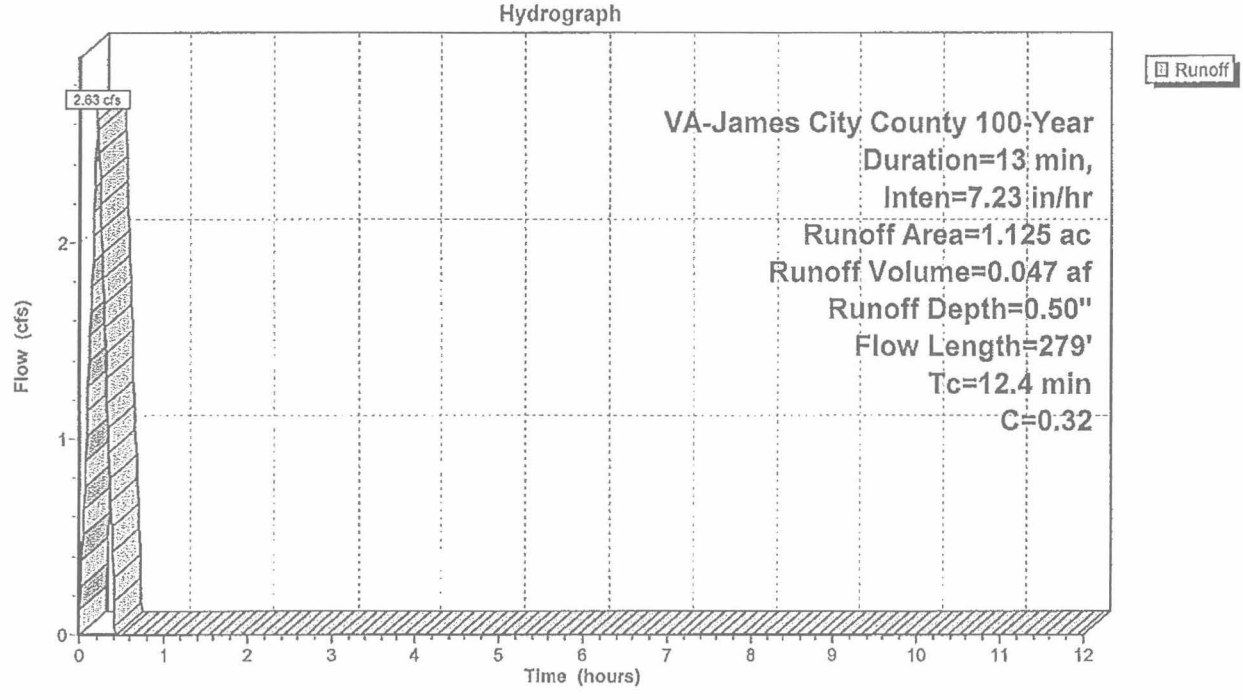
Runoff = 2.63 cfs @ 0.21 hrs, Volume= 0.047 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=13 min, Inten=7.23 in/hr

Area (ac)	C	Description
0.365	0.35	Lawn
0.760	0.30	Woods
1.125	0.32	Weighted Average
1.125		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1250	0.17		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.50"
2.5	179	0.0560	1.18		**Shallow Concentrated Flow, Shallow Concentrated** Woodland Kv= 5.0 fps
12.4	279	Total			

Subcatchment DA-1 Post: DA-1 POST



Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.205 ac, 0.00% Impervious, Inflow Depth = 1.97" for 100-Year event
Inflow = 3.50 cfs @ 1.25 hrs, Volume= 0.361 af
Outflow = 3.35 cfs @ 1.26 hrs, Volume= 0.281 af, Atten= 4%, Lag= 0.4 min
Primary = 0.32 cfs @ 1.26 hrs, Volume= 0.230 af
Secondary = 3.03 cfs @ 1.26 hrs, Volume= 0.051 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
Peak Elev= 98.96' @ 1.26 hrs Surf.Area= 4,524 sf Storage= 12,906 cf

Plug-Flow detention time= 251.5 min calculated for 0.281 af (78% of inflow)
Center-of-Mass det. time= 243.5 min (284.7 - 41.2)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

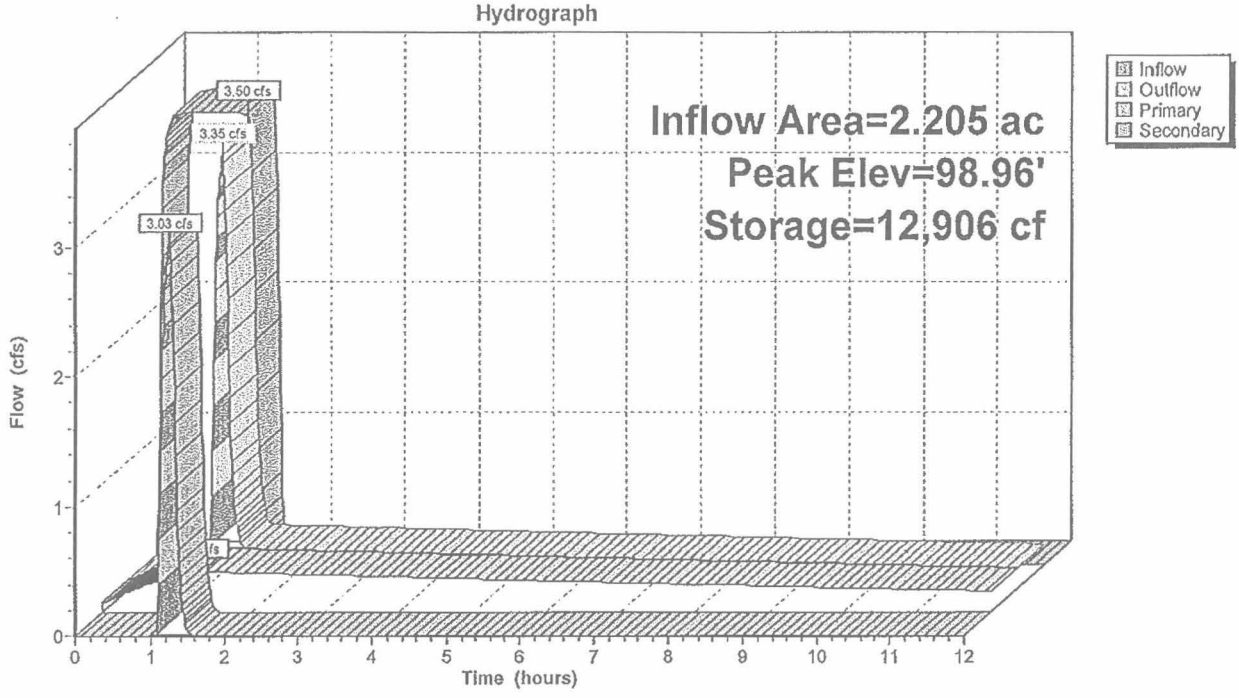
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.32 cfs @ 1.26 hrs HW=98.96' TW=0.00' (Dynamic Tailwater)
↑—**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.32 cfs)

Secondary OutFlow Max=3.02 cfs @ 1.26 hrs HW=98.96' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.02 cfs @ 0.96 fps)

Pond Infiltration Basin: Infiltration Basin



Hydrograph for Pond Infiltration Basin: Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	94.00	0.00	0.00	0.00
0.05	1.53	104	94.09	0.08	0.08	0.00
0.10	3.07	535	94.44	0.09	0.09	0.00
0.15	3.34	1,098	94.85	0.11	0.11	0.00
0.20	3.43	1,688	95.22	0.12	0.12	0.00
0.25	3.47	2,287	95.55	0.13	0.13	0.00
0.30	3.49	2,888	95.85	0.15	0.15	0.00
0.35	3.49	3,488	96.13	0.16	0.16	0.00
0.40	3.50	4,087	96.38	0.17	0.17	0.00
0.45	3.50	4,684	96.62	0.18	0.18	0.00
0.50	3.50	5,279	96.84	0.20	0.20	0.00
0.55	3.50	5,873	97.05	0.21	0.21	0.00
0.60	3.50	6,464	97.25	0.22	0.22	0.00
0.65	3.50	7,054	97.44	0.23	0.23	0.00
0.70	3.50	7,641	97.62	0.24	0.24	0.00
0.75	3.50	8,227	97.79	0.25	0.25	0.00
0.80	3.50	8,811	97.95	0.26	0.26	0.00
0.85	3.50	9,393	98.11	0.27	0.27	0.00
0.90	3.50	9,974	98.26	0.28	0.28	0.00
0.95	3.50	10,553	98.41	0.29	0.29	0.00
1.00	3.50	11,130	98.55	0.29	0.29	0.00
1.05	3.50	11,706	98.68	0.30	0.30	0.00
1.10	3.50	12,278	98.82	0.41	0.31	0.10
1.15	3.50	12,686	98.91	2.05	0.32	1.73
1.20	3.50	12,849	98.94	2.99	0.32	2.67
1.25	**3.50**	**12,904**	**98.96**	**3.34**	**0.32**	**3.02**
1.30	2.09	**12,838**	**98.94**	**2.92**	**0.32**	**2.60**
1.35	0.36	12,620	98.89	1.71	0.32	1.39
1.40	0.08	12,430	98.85	0.87	0.31	0.56
1.45	0.04	12,320	98.83	0.51	0.31	0.20
1.50	0.02	12,248	98.81	0.36	0.31	0.04
1.55	0.01	12,192	98.80	0.31	0.31	0.00
1.60	0.01	12,138	98.78	0.31	0.31	0.00
1.65	0.01	12,084	98.77	0.31	0.31	0.00
1.70	0.00	12,029	98.76	0.31	0.31	0.00
1.75	0.00	11,974	98.75	0.31	0.31	0.00
1.80	0.00	11,919	98.73	0.31	0.31	0.00
1.85	0.00	11,865	98.72	0.31	0.31	0.00
1.90	0.00	11,810	98.71	0.31	0.31	0.00
1.95	0.00	11,755	98.70	0.30	0.30	0.00
2.00	0.00	11,701	98.68	0.30	0.30	0.00
2.05	0.00	11,647	98.67	0.30	0.30	0.00
2.10	0.00	11,592	98.66	0.30	0.30	0.00
2.15	0.00	11,538	98.64	0.30	0.30	0.00
2.20	0.00	11,484	98.63	0.30	0.30	0.00
2.25	0.00	11,431	98.62	0.30	0.30	0.00
2.30	0.00	11,377	98.61	0.30	0.30	0.00
2.35	0.00	11,323	98.59	0.30	0.30	0.00
2.40	0.00	11,270	98.58	0.30	0.30	0.00
2.45	0.00	11,217	98.57	0.30	0.30	0.00
2.50	0.00	11,163	98.56	0.30	0.30	0.00
2.55	0.00	11,110	98.54	0.29	0.29	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.60	0.00	11,057	98.53	0.29	0.29	0.00
2.65	0.00	11,005	98.52	0.29	0.29	0.00
2.70	0.00	10,952	98.50	0.29	0.29	0.00
2.75	0.00	10,900	98.49	0.29	0.29	0.00
2.80	0.00	10,847	98.48	0.29	0.29	0.00
2.85	0.00	10,795	98.47	0.29	0.29	0.00
2.90	0.00	10,743	98.45	0.29	0.29	0.00
2.95	0.00	10,691	98.44	0.29	0.29	0.00
3.00	0.00	10,639	98.43	0.29	0.29	0.00
3.05	0.00	10,588	98.42	0.29	0.29	0.00
3.10	0.00	10,536	98.40	0.29	0.29	0.00
3.15	0.00	10,485	98.39	0.28	0.28	0.00
3.20	0.00	10,434	98.38	0.28	0.28	0.00
3.25	0.00	10,383	98.36	0.28	0.28	0.00
3.30	0.00	10,332	98.35	0.28	0.28	0.00
3.35	0.00	10,281	98.34	0.28	0.28	0.00
3.40	0.00	10,231	98.33	0.28	0.28	0.00
3.45	0.00	10,180	98.31	0.28	0.28	0.00
3.50	0.00	10,130	98.30	0.28	0.28	0.00
3.55	0.00	10,080	98.29	0.28	0.28	0.00
3.60	0.00	10,029	98.27	0.28	0.28	0.00
3.65	0.00	9,980	98.26	0.28	0.28	0.00
3.70	0.00	9,930	98.25	0.28	0.28	0.00
3.75	0.00	9,880	98.24	0.28	0.28	0.00
3.80	0.00	9,831	98.22	0.27	0.27	0.00
3.85	0.00	9,781	98.21	0.27	0.27	0.00
3.90	0.00	9,732	98.20	0.27	0.27	0.00
3.95	0.00	9,683	98.18	0.27	0.27	0.00
4.00	0.00	9,634	98.17	0.27	0.27	0.00
4.05	0.00	9,585	98.16	0.27	0.27	0.00
4.10	0.00	9,537	98.15	0.27	0.27	0.00
4.15	0.00	9,488	98.13	0.27	0.27	0.00
4.20	0.00	9,440	98.12	0.27	0.27	0.00
4.25	0.00	9,391	98.11	0.27	0.27	0.00
4.30	0.00	9,343	98.10	0.27	0.27	0.00
4.35	0.00	9,295	98.08	0.27	0.27	0.00
4.40	0.00	9,248	98.07	0.27	0.27	0.00
4.45	0.00	9,200	98.06	0.26	0.26	0.00
4.50	0.00	9,152	98.04	0.26	0.26	0.00
4.55	0.00	9,105	98.03	0.26	0.26	0.00
4.60	0.00	9,058	98.02	0.26	0.26	0.00
4.65	0.00	9,011	98.01	0.26	0.26	0.00
4.70	0.00	8,964	97.99	0.26	0.26	0.00
4.75	0.00	8,917	97.98	0.26	0.26	0.00
4.80	0.00	8,870	97.97	0.26	0.26	0.00
4.85	0.00	8,823	97.95	0.26	0.26	0.00
4.90	0.00	8,777	97.94	0.26	0.26	0.00
4.95	0.00	8,731	97.93	0.26	0.26	0.00
5.00	0.00	8,685	97.92	0.26	0.26	0.00
5.05	0.00	8,639	97.90	0.26	0.26	0.00
5.10	0.00	8,593	97.89	0.25	0.25	0.00
5.15	0.00	8,547	97.88	0.25	0.25	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	8,501	97.87	0.25	0.25	0.00
5.25	0.00	8,456	97.85	0.25	0.25	0.00
5.30	0.00	8,410	97.84	0.25	0.25	0.00
5.35	0.00	8,365	97.83	0.25	0.25	0.00
5.40	0.00	8,320	97.81	0.25	0.25	0.00
5.45	0.00	8,275	97.80	0.25	0.25	0.00
5.50	0.00	8,230	97.79	0.25	0.25	0.00
5.55	0.00	8,186	97.78	0.25	0.25	0.00
5.60	0.00	8,141	97.76	0.25	0.25	0.00
5.65	0.00	8,097	97.75	0.25	0.25	0.00
5.70	0.00	8,052	97.74	0.25	0.25	0.00
5.75	0.00	8,008	97.72	0.24	0.24	0.00
5.80	0.00	7,964	97.71	0.24	0.24	0.00
5.85	0.00	7,920	97.70	0.24	0.24	0.00
5.90	0.00	7,877	97.69	0.24	0.24	0.00
5.95	0.00	7,833	97.67	0.24	0.24	0.00
6.00	0.00	7,790	97.66	0.24	0.24	0.00
6.05	0.00	7,746	97.65	0.24	0.24	0.00
6.10	0.00	7,703	97.63	0.24	0.24	0.00
6.15	0.00	7,660	97.62	0.24	0.24	0.00
6.20	0.00	7,617	97.61	0.24	0.24	0.00
6.25	0.00	7,574	97.60	0.24	0.24	0.00
6.30	0.00	7,532	97.58	0.24	0.24	0.00
6.35	0.00	7,489	97.57	0.24	0.24	0.00
6.40	0.00	7,447	97.56	0.24	0.24	0.00
6.45	0.00	7,404	97.55	0.23	0.23	0.00
6.50	0.00	7,362	97.53	0.23	0.23	0.00
6.55	0.00	7,320	97.52	0.23	0.23	0.00
6.60	0.00	7,278	97.51	0.23	0.23	0.00
6.65	0.00	7,237	97.49	0.23	0.23	0.00
6.70	0.00	7,195	97.48	0.23	0.23	0.00
6.75	0.00	7,154	97.47	0.23	0.23	0.00
6.80	0.00	7,112	97.46	0.23	0.23	0.00
6.85	0.00	7,071	97.44	0.23	0.23	0.00
6.90	0.00	7,030	97.43	0.23	0.23	0.00
6.95	0.00	6,989	97.42	0.23	0.23	0.00
7.00	0.00	6,948	97.40	0.23	0.23	0.00
7.05	0.00	6,907	97.39	0.23	0.23	0.00
7.10	0.00	6,867	97.38	0.23	0.23	0.00
7.15	0.00	6,826	97.37	0.22	0.22	0.00
7.20	0.00	6,786	97.35	0.22	0.22	0.00
7.25	0.00	6,746	97.34	0.22	0.22	0.00
7.30	0.00	6,706	97.33	0.22	0.22	0.00
7.35	0.00	6,666	97.32	0.22	0.22	0.00
7.40	0.00	6,626	97.30	0.22	0.22	0.00
7.45	0.00	6,586	97.29	0.22	0.22	0.00
7.50	0.00	6,547	97.28	0.22	0.22	0.00
7.55	0.00	6,507	97.26	0.22	0.22	0.00
7.60	0.00	6,468	97.25	0.22	0.22	0.00
7.65	0.00	6,429	97.24	0.22	0.22	0.00
7.70	0.00	6,390	97.23	0.22	0.22	0.00
7.75	0.00	6,351	97.21	0.22	0.22	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.80	0.00	6,312	97.20	0.22	0.22	0.00
7.85	0.00	6,273	97.19	0.21	0.21	0.00
7.90	0.00	6,235	97.17	0.21	0.21	0.00
7.95	0.00	6,196	97.16	0.21	0.21	0.00
8.00	0.00	6,158	97.15	0.21	0.21	0.00
8.05	0.00	6,120	97.14	0.21	0.21	0.00
8.10	0.00	6,082	97.12	0.21	0.21	0.00
8.15	0.00	6,044	97.11	0.21	0.21	0.00
8.20	0.00	6,006	97.10	0.21	0.21	0.00
8.25	0.00	5,968	97.08	0.21	0.21	0.00
8.30	0.00	5,931	97.07	0.21	0.21	0.00
8.35	0.00	5,893	97.06	0.21	0.21	0.00
8.40	0.00	5,856	97.05	0.21	0.21	0.00
8.45	0.00	5,819	97.03	0.21	0.21	0.00
8.50	0.00	5,782	97.02	0.21	0.21	0.00
8.55	0.00	5,745	97.01	0.20	0.20	0.00
8.60	0.00	5,708	97.00	0.20	0.20	0.00
8.65	0.00	5,671	96.98	0.20	0.20	0.00
8.70	0.00	5,635	96.97	0.20	0.20	0.00
8.75	0.00	5,598	96.96	0.20	0.20	0.00
8.80	0.00	5,562	96.94	0.20	0.20	0.00
8.85	0.00	5,526	96.93	0.20	0.20	0.00
8.90	0.00	5,490	96.92	0.20	0.20	0.00
8.95	0.00	5,454	96.91	0.20	0.20	0.00
9.00	0.00	5,418	96.89	0.20	0.20	0.00
9.05	0.00	5,382	96.88	0.20	0.20	0.00
9.10	0.00	5,347	96.87	0.20	0.20	0.00
9.15	0.00	5,311	96.85	0.20	0.20	0.00
9.20	0.00	5,276	96.84	0.20	0.20	0.00
9.25	0.00	5,241	96.83	0.20	0.20	0.00
9.30	0.00	5,205	96.82	0.19	0.19	0.00
9.35	0.00	5,170	96.80	0.19	0.19	0.00
9.40	0.00	5,136	96.79	0.19	0.19	0.00
9.45	0.00	5,101	96.78	0.19	0.19	0.00
9.50	0.00	5,066	96.77	0.19	0.19	0.00
9.55	0.00	5,032	96.75	0.19	0.19	0.00
9.60	0.00	4,997	96.74	0.19	0.19	0.00
9.65	0.00	4,963	96.73	0.19	0.19	0.00
9.70	0.00	4,929	96.71	0.19	0.19	0.00
9.75	0.00	4,895	96.70	0.19	0.19	0.00
9.80	0.00	4,861	96.69	0.19	0.19	0.00
9.85	0.00	4,827	96.68	0.19	0.19	0.00
9.90	0.00	4,793	96.66	0.19	0.19	0.00
9.95	0.00	4,760	96.65	0.19	0.19	0.00
10.00	0.00	4,726	96.64	0.19	0.19	0.00
10.05	0.00	4,693	96.62	0.18	0.18	0.00
10.10	0.00	4,660	96.61	0.18	0.18	0.00
10.15	0.00	4,627	96.60	0.18	0.18	0.00
10.20	0.00	4,594	96.59	0.18	0.18	0.00
10.25	0.00	4,561	96.57	0.18	0.18	0.00
10.30	0.00	4,528	96.56	0.18	0.18	0.00
10.35	0.00	4,495	96.55	0.18	0.18	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
10.40	0.00	4,463	96.53	0.18	0.18	0.00
10.45	0.00	4,431	96.52	0.18	0.18	0.00
10.50	0.00	4,398	96.51	0.18	0.18	0.00
10.55	0.00	4,366	96.50	0.18	0.18	0.00
10.60	0.00	4,334	96.48	0.18	0.18	0.00
10.65	0.00	4,302	96.47	0.18	0.18	0.00
10.70	0.00	4,270	96.46	0.18	0.18	0.00
10.75	0.00	4,239	96.45	0.18	0.18	0.00
10.80	0.00	4,207	96.43	0.18	0.18	0.00
10.85	0.00	4,175	96.42	0.17	0.17	0.00
10.90	0.00	4,144	96.41	0.17	0.17	0.00
10.95	0.00	4,113	96.39	0.17	0.17	0.00
11.00	0.00	4,082	96.38	0.17	0.17	0.00
11.05	0.00	4,051	96.37	0.17	0.17	0.00
11.10	0.00	4,020	96.36	0.17	0.17	0.00
11.15	0.00	3,989	96.34	0.17	0.17	0.00
11.20	0.00	3,958	96.33	0.17	0.17	0.00
11.25	0.00	3,928	96.32	0.17	0.17	0.00
11.30	0.00	3,897	96.30	0.17	0.17	0.00
11.35	0.00	3,867	96.29	0.17	0.17	0.00
11.40	0.00	3,837	96.28	0.17	0.17	0.00
11.45	0.00	3,806	96.27	0.17	0.17	0.00
11.50	0.00	3,776	96.25	0.17	0.17	0.00
11.55	0.00	3,746	96.24	0.17	0.17	0.00
11.60	0.00	3,717	96.23	0.17	0.17	0.00
11.65	0.00	3,687	96.22	0.16	0.16	0.00
11.70	0.00	3,657	96.20	0.16	0.16	0.00
11.75	0.00	3,628	96.19	0.16	0.16	0.00
11.80	0.00	3,599	96.18	0.16	0.16	0.00
11.85	0.00	3,569	96.16	0.16	0.16	0.00
11.90	0.00	3,540	96.15	0.16	0.16	0.00
11.95	0.00	3,511	96.14	0.16	0.16	0.00
12.00	0.00	3,482	96.13	0.16	0.16	0.00

Summary for Subcatchment DA-2A POST: DA-2A POST

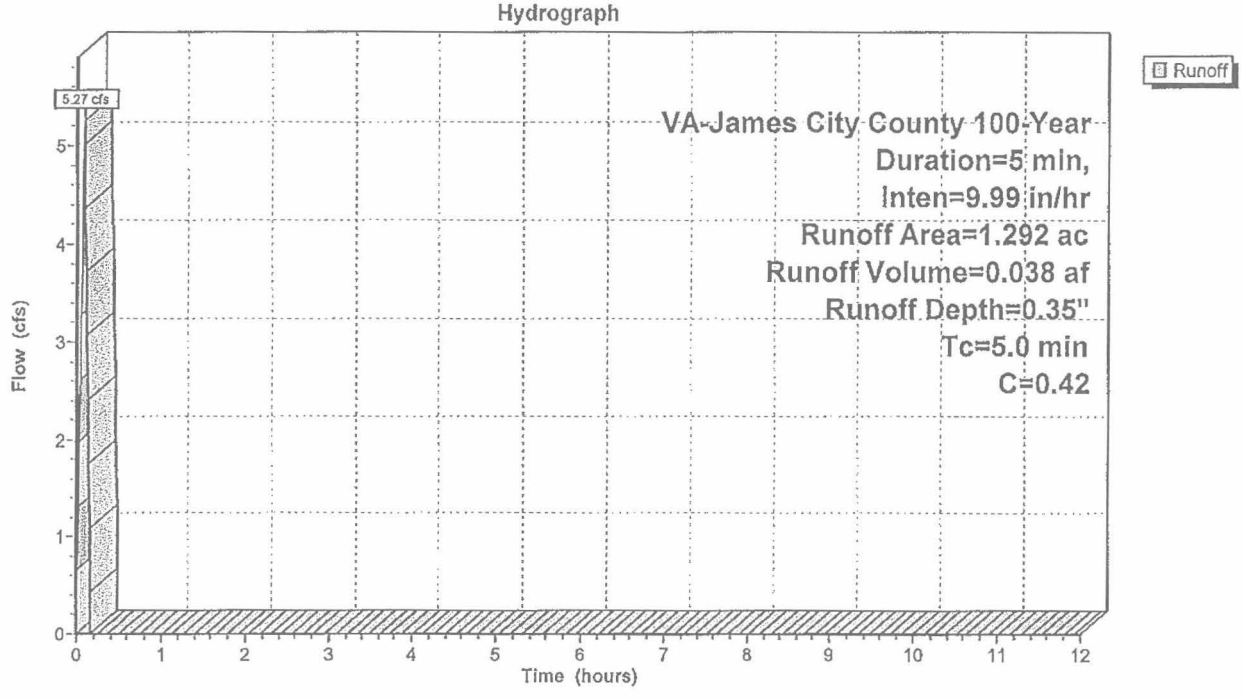
Runoff = 5.27 cfs @ 0.08 hrs, Volume= 0.038 af, Depth= 0.35"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-12.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.172	0.90	Impervious
1.057	0.35	Lawn
0.063	0.30	Woods
1.292	0.42	Weighted Average
1.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2A POST: DA-2A POST



Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.76" for 100-Year event
Inflow = 4.66 cfs @ 0.09 hrs, Volume= 0.058 af
Outflow = 5.74 cfs @ 0.14 hrs, Volume= 0.058 af, Atten= 0%, Lag= 3.0 min
Primary = 3.23 cfs @ 0.14 hrs, Volume= 0.054 af
Secondary = 2.51 cfs @ 0.14 hrs, Volume= 0.004 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Starting Elev= 107.00' Surf.Area= 435 sf Storage= 435 cf
Peak Elev= 111.03' @ 0.14 hrs Surf.Area= 435 sf Storage= 1,136 cf (701 cf above start)

Plug-Flow detention time= 5.1 min calculated for 0.048 af (83% of inflow)
Center-of-Mass det. time= 3.1 min (10.1 - 7.0)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

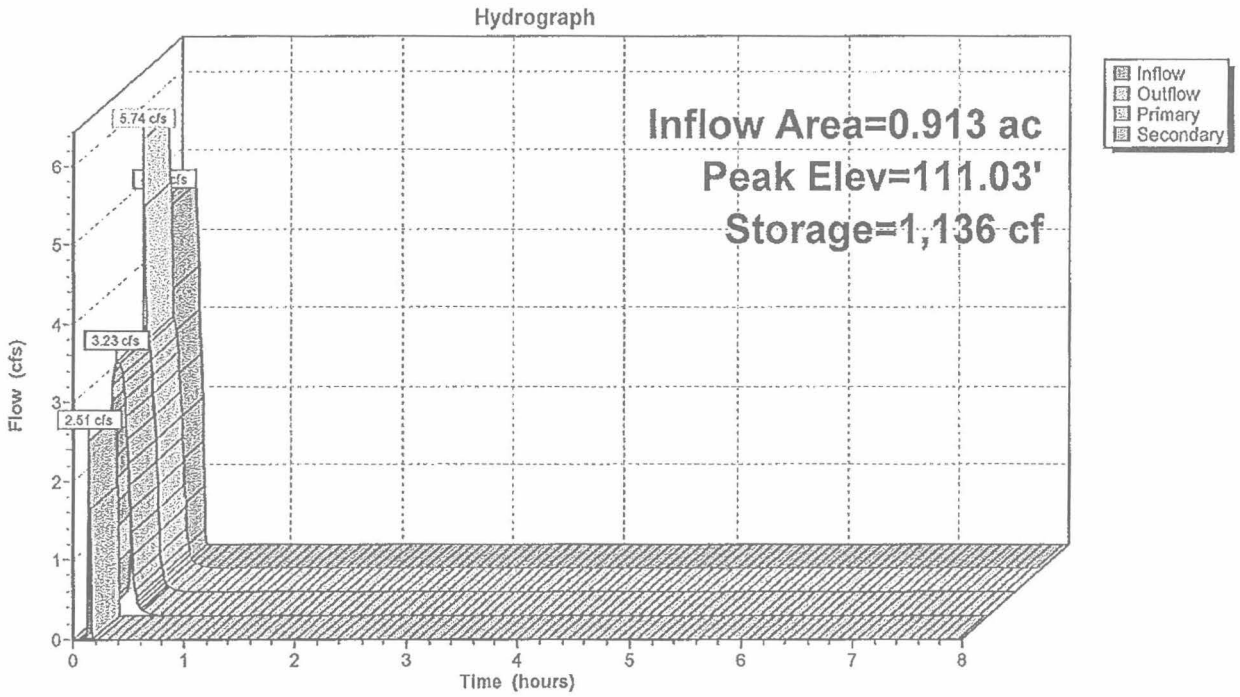
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.23 cfs @ 0.14 hrs HW=111.03' TW=95.66' (Dynamic Tailwater)
└1=**Orifice/Grate** (Passes 3.23 cfs of 59.30 cfs potential flow)
└2=**Culvert** (Passes 3.23 cfs of 6.59 cfs potential flow)
└3=**Culvert** (Passes 3.23 cfs of 4.37 cfs potential flow)
└4=**Culvert** (Passes 3.23 cfs of 4.35 cfs potential flow)
└5=**Culvert** (Inlet Controls 3.23 cfs @ 9.26 fps)

Secondary OutFlow Max=2.39 cfs @ 0.14 hrs HW=111.03' TW=95.67' (Dynamic Tailwater)
└6=**Broad-Crested Weir** (Weir Controls 2.39 cfs @ 0.39 fps)

Pond GFS: Gravel Filter Strip



Hydrograph for Pond GFS: Gravel Filter Strip

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	435	107.00	0.00	0.00	0.00
0.02	1.12	472	107.21	0.15	0.15	0.00
0.04	2.24	553	107.68	0.99	0.99	0.00
0.06	3.36	659	108.29	1.64	1.64	0.00
0.08	4.48	802	109.11	2.24	2.24	0.00
0.10	4.66	954	109.98	2.74	2.74	0.00
0.12	4.66	1,080	110.71	3.09	3.09	0.00
0.14	4.66	1,136	111.03	5.73	3.23	2.50
0.16	4.10	1,135	111.02	4.89	3.23	1.66
0.18	2.98	1,129	110.99	3.21	3.21	0.00
0.20	1.87	1,076	110.68	3.08	3.08	0.00
0.22	0.75	959	110.01	2.75	2.75	0.00
0.24	0.00	799	109.09	2.23	2.23	0.00
0.26	0.00	660	108.29	1.65	1.65	0.00
0.28	0.00	562	107.73	1.06	1.06	0.00
0.30	0.00	507	107.41	0.50	0.50	0.00
0.32	0.00	482	107.27	0.23	0.23	0.00
0.34	0.00	469	107.20	0.13	0.13	0.00
0.36	0.00	462	107.15	0.08	0.08	0.00
0.38	0.00	457	107.13	0.06	0.06	0.00
0.40	0.00	453	107.11	0.04	0.04	0.00
0.42	0.00	451	107.09	0.03	0.03	0.00
0.44	0.00	449	107.08	0.02	0.02	0.00
0.46	0.00	448	107.07	0.02	0.02	0.00
0.48	0.00	446	107.07	0.02	0.02	0.00
0.50	0.00	445	107.06	0.01	0.01	0.00
0.52	0.00	445	107.05	0.01	0.01	0.00
0.54	0.00	444	107.05	0.01	0.01	0.00
0.56	0.00	443	107.05	0.01	0.01	0.00
0.58	0.00	443	107.04	0.01	0.01	0.00
0.60	0.00	442	107.04	0.01	0.01	0.00
0.62	0.00	442	107.04	0.01	0.01	0.00
0.64	0.00	441	107.04	0.00	0.00	0.00
0.66	0.00	441	107.03	0.00	0.00	0.00
0.68	0.00	441	107.03	0.00	0.00	0.00
0.70	0.00	440	107.03	0.00	0.00	0.00
0.72	0.00	440	107.03	0.00	0.00	0.00
0.74	0.00	440	107.03	0.00	0.00	0.00
0.76	0.00	440	107.03	0.00	0.00	0.00
0.78	0.00	440	107.03	0.00	0.00	0.00
0.80	0.00	439	107.03	0.00	0.00	0.00
0.82	0.00	439	107.02	0.00	0.00	0.00
0.84	0.00	439	107.02	0.00	0.00	0.00
0.86	0.00	439	107.02	0.00	0.00	0.00
0.88	0.00	439	107.02	0.00	0.00	0.00
0.90	0.00	439	107.02	0.00	0.00	0.00
0.92	0.00	439	107.02	0.00	0.00	0.00
0.94	0.00	438	107.02	0.00	0.00	0.00
0.96	0.00	438	107.02	0.00	0.00	0.00
0.98	0.00	438	107.02	0.00	0.00	0.00
1.00	0.00	438	107.02	0.00	0.00	0.00
1.02	0.00	438	107.02	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
1.04	0.00	438	107.02	0.00	0.00	0.00
1.06	0.00	438	107.02	0.00	0.00	0.00
1.08	0.00	438	107.02	0.00	0.00	0.00
1.10	0.00	438	107.02	0.00	0.00	0.00
1.12	0.00	438	107.02	0.00	0.00	0.00
1.14	0.00	438	107.02	0.00	0.00	0.00
1.16	0.00	438	107.01	0.00	0.00	0.00
1.18	0.00	438	107.01	0.00	0.00	0.00
1.20	0.00	437	107.01	0.00	0.00	0.00
1.22	0.00	437	107.01	0.00	0.00	0.00
1.24	0.00	437	107.01	0.00	0.00	0.00
1.26	0.00	437	107.01	0.00	0.00	0.00
1.28	0.00	437	107.01	0.00	0.00	0.00
1.30	0.00	437	107.01	0.00	0.00	0.00
1.32	0.00	437	107.01	0.00	0.00	0.00
1.34	0.00	437	107.01	0.00	0.00	0.00
1.36	0.00	437	107.01	0.00	0.00	0.00
1.38	0.00	437	107.01	0.00	0.00	0.00
1.40	0.00	437	107.01	0.00	0.00	0.00
1.42	0.00	437	107.01	0.00	0.00	0.00
1.44	0.00	437	107.01	0.00	0.00	0.00
1.46	0.00	437	107.01	0.00	0.00	0.00
1.48	0.00	437	107.01	0.00	0.00	0.00
1.50	0.00	437	107.01	0.00	0.00	0.00
1.52	0.00	437	107.01	0.00	0.00	0.00
1.54	0.00	437	107.01	0.00	0.00	0.00
1.56	0.00	437	107.01	0.00	0.00	0.00
1.58	0.00	437	107.01	0.00	0.00	0.00
1.60	0.00	437	107.01	0.00	0.00	0.00
1.62	0.00	437	107.01	0.00	0.00	0.00
1.64	0.00	437	107.01	0.00	0.00	0.00
1.66	0.00	437	107.01	0.00	0.00	0.00
1.68	0.00	437	107.01	0.00	0.00	0.00
1.70	0.00	437	107.01	0.00	0.00	0.00
1.72	0.00	437	107.01	0.00	0.00	0.00
1.74	0.00	437	107.01	0.00	0.00	0.00
1.76	0.00	437	107.01	0.00	0.00	0.00
1.78	0.00	437	107.01	0.00	0.00	0.00
1.80	0.00	437	107.01	0.00	0.00	0.00
1.82	0.00	436	107.01	0.00	0.00	0.00
1.84	0.00	436	107.01	0.00	0.00	0.00
1.86	0.00	436	107.01	0.00	0.00	0.00
1.88	0.00	436	107.01	0.00	0.00	0.00
1.90	0.00	436	107.01	0.00	0.00	0.00
1.92	0.00	436	107.01	0.00	0.00	0.00
1.94	0.00	436	107.01	0.00	0.00	0.00
1.96	0.00	436	107.01	0.00	0.00	0.00
1.98	0.00	436	107.01	0.00	0.00	0.00
2.00	0.00	436	107.01	0.00	0.00	0.00
2.02	0.00	436	107.01	0.00	0.00	0.00
2.04	0.00	436	107.01	0.00	0.00	0.00
2.06	0.00	436	107.01	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
2.08	0.00	436	107.01	0.00	0.00	0.00
2.10	0.00	436	107.01	0.00	0.00	0.00
2.12	0.00	436	107.01	0.00	0.00	0.00
2.14	0.00	436	107.01	0.00	0.00	0.00
2.16	0.00	436	107.01	0.00	0.00	0.00
2.18	0.00	436	107.01	0.00	0.00	0.00
2.20	0.00	436	107.01	0.00	0.00	0.00
2.22	0.00	436	107.01	0.00	0.00	0.00
2.24	0.00	436	107.01	0.00	0.00	0.00
2.26	0.00	436	107.01	0.00	0.00	0.00
2.28	0.00	436	107.01	0.00	0.00	0.00
2.30	0.00	436	107.01	0.00	0.00	0.00
2.32	0.00	436	107.01	0.00	0.00	0.00
2.34	0.00	436	107.01	0.00	0.00	0.00
2.36	0.00	436	107.01	0.00	0.00	0.00
2.38	0.00	436	107.01	0.00	0.00	0.00
2.40	0.00	436	107.01	0.00	0.00	0.00
2.42	0.00	436	107.01	0.00	0.00	0.00
2.44	0.00	436	107.01	0.00	0.00	0.00
2.46	0.00	436	107.01	0.00	0.00	0.00
2.48	0.00	436	107.01	0.00	0.00	0.00
2.50	0.00	436	107.01	0.00	0.00	0.00
2.52	0.00	436	107.01	0.00	0.00	0.00
2.54	0.00	436	107.01	0.00	0.00	0.00
2.56	0.00	436	107.01	0.00	0.00	0.00
2.58	0.00	436	107.01	0.00	0.00	0.00
2.60	0.00	436	107.01	0.00	0.00	0.00
2.62	0.00	436	107.01	0.00	0.00	0.00
2.64	0.00	436	107.01	0.00	0.00	0.00
2.66	0.00	436	107.01	0.00	0.00	0.00
2.68	0.00	436	107.01	0.00	0.00	0.00
2.70	0.00	436	107.01	0.00	0.00	0.00
2.72	0.00	436	107.01	0.00	0.00	0.00
2.74	0.00	436	107.01	0.00	0.00	0.00
2.76	0.00	436	107.01	0.00	0.00	0.00
2.78	0.00	436	107.01	0.00	0.00	0.00
2.80	0.00	436	107.01	0.00	0.00	0.00
2.82	0.00	436	107.01	0.00	0.00	0.00
2.84	0.00	436	107.01	0.00	0.00	0.00
2.86	0.00	436	107.01	0.00	0.00	0.00
2.88	0.00	436	107.01	0.00	0.00	0.00
2.90	0.00	436	107.00	0.00	0.00	0.00
2.92	0.00	436	107.00	0.00	0.00	0.00
2.94	0.00	436	107.00	0.00	0.00	0.00
2.96	0.00	436	107.00	0.00	0.00	0.00
2.98	0.00	436	107.00	0.00	0.00	0.00
3.00	0.00	436	107.00	0.00	0.00	0.00
3.02	0.00	436	107.00	0.00	0.00	0.00
3.04	0.00	436	107.00	0.00	0.00	0.00
3.06	0.00	436	107.00	0.00	0.00	0.00
3.08	0.00	436	107.00	0.00	0.00	0.00
3.10	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
3.12	0.00	436	107.00	0.00	0.00	0.00
3.14	0.00	436	107.00	0.00	0.00	0.00
3.16	0.00	436	107.00	0.00	0.00	0.00
3.18	0.00	436	107.00	0.00	0.00	0.00
3.20	0.00	436	107.00	0.00	0.00	0.00
3.22	0.00	436	107.00	0.00	0.00	0.00
3.24	0.00	436	107.00	0.00	0.00	0.00
3.26	0.00	436	107.00	0.00	0.00	0.00
3.28	0.00	436	107.00	0.00	0.00	0.00
3.30	0.00	436	107.00	0.00	0.00	0.00
3.32	0.00	436	107.00	0.00	0.00	0.00
3.34	0.00	436	107.00	0.00	0.00	0.00
3.36	0.00	436	107.00	0.00	0.00	0.00
3.38	0.00	436	107.00	0.00	0.00	0.00
3.40	0.00	436	107.00	0.00	0.00	0.00
3.42	0.00	436	107.00	0.00	0.00	0.00
3.44	0.00	436	107.00	0.00	0.00	0.00
3.46	0.00	436	107.00	0.00	0.00	0.00
3.48	0.00	436	107.00	0.00	0.00	0.00
3.50	0.00	436	107.00	0.00	0.00	0.00
3.52	0.00	436	107.00	0.00	0.00	0.00
3.54	0.00	436	107.00	0.00	0.00	0.00
3.56	0.00	436	107.00	0.00	0.00	0.00
3.58	0.00	436	107.00	0.00	0.00	0.00
3.60	0.00	436	107.00	0.00	0.00	0.00
3.62	0.00	436	107.00	0.00	0.00	0.00
3.64	0.00	436	107.00	0.00	0.00	0.00
3.66	0.00	436	107.00	0.00	0.00	0.00
3.68	0.00	436	107.00	0.00	0.00	0.00
3.70	0.00	436	107.00	0.00	0.00	0.00
3.72	0.00	436	107.00	0.00	0.00	0.00
3.74	0.00	436	107.00	0.00	0.00	0.00
3.76	0.00	436	107.00	0.00	0.00	0.00
3.78	0.00	436	107.00	0.00	0.00	0.00
3.80	0.00	436	107.00	0.00	0.00	0.00
3.82	0.00	436	107.00	0.00	0.00	0.00
3.84	0.00	436	107.00	0.00	0.00	0.00
3.86	0.00	436	107.00	0.00	0.00	0.00
3.88	0.00	436	107.00	0.00	0.00	0.00
3.90	0.00	436	107.00	0.00	0.00	0.00
3.92	0.00	436	107.00	0.00	0.00	0.00
3.94	0.00	436	107.00	0.00	0.00	0.00
3.96	0.00	436	107.00	0.00	0.00	0.00
3.98	0.00	436	107.00	0.00	0.00	0.00
4.00	0.00	436	107.00	0.00	0.00	0.00
4.02	0.00	436	107.00	0.00	0.00	0.00
4.04	0.00	436	107.00	0.00	0.00	0.00
4.06	0.00	436	107.00	0.00	0.00	0.00
4.08	0.00	436	107.00	0.00	0.00	0.00
4.10	0.00	436	107.00	0.00	0.00	0.00
4.12	0.00	436	107.00	0.00	0.00	0.00
4.14	0.00	436	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
4.16	0.00	436	107.00	0.00	0.00	0.00
4.18	0.00	436	107.00	0.00	0.00	0.00
4.20	0.00	436	107.00	0.00	0.00	0.00
4.22	0.00	436	107.00	0.00	0.00	0.00
4.24	0.00	436	107.00	0.00	0.00	0.00
4.26	0.00	436	107.00	0.00	0.00	0.00
4.28	0.00	436	107.00	0.00	0.00	0.00
4.30	0.00	436	107.00	0.00	0.00	0.00
4.32	0.00	436	107.00	0.00	0.00	0.00
4.34	0.00	436	107.00	0.00	0.00	0.00
4.36	0.00	436	107.00	0.00	0.00	0.00
4.38	0.00	436	107.00	0.00	0.00	0.00
4.40	0.00	436	107.00	0.00	0.00	0.00
4.42	0.00	436	107.00	0.00	0.00	0.00
4.44	0.00	436	107.00	0.00	0.00	0.00
4.46	0.00	436	107.00	0.00	0.00	0.00
4.48	0.00	436	107.00	0.00	0.00	0.00
4.50	0.00	436	107.00	0.00	0.00	0.00
4.52	0.00	436	107.00	0.00	0.00	0.00
4.54	0.00	436	107.00	0.00	0.00	0.00
4.56	0.00	436	107.00	0.00	0.00	0.00
4.58	0.00	436	107.00	0.00	0.00	0.00
4.60	0.00	436	107.00	0.00	0.00	0.00
4.62	0.00	436	107.00	0.00	0.00	0.00
4.64	0.00	436	107.00	0.00	0.00	0.00
4.66	0.00	436	107.00	0.00	0.00	0.00
4.68	0.00	436	107.00	0.00	0.00	0.00
4.70	0.00	436	107.00	0.00	0.00	0.00
4.72	0.00	436	107.00	0.00	0.00	0.00
4.74	0.00	436	107.00	0.00	0.00	0.00
4.76	0.00	436	107.00	0.00	0.00	0.00
4.78	0.00	435	107.00	0.00	0.00	0.00
4.80	0.00	435	107.00	0.00	0.00	0.00
4.82	0.00	435	107.00	0.00	0.00	0.00
4.84	0.00	435	107.00	0.00	0.00	0.00
4.86	0.00	435	107.00	0.00	0.00	0.00
4.88	0.00	435	107.00	0.00	0.00	0.00
4.90	0.00	435	107.00	0.00	0.00	0.00
4.92	0.00	435	107.00	0.00	0.00	0.00
4.94	0.00	435	107.00	0.00	0.00	0.00
4.96	0.00	435	107.00	0.00	0.00	0.00
4.98	0.00	435	107.00	0.00	0.00	0.00
5.00	0.00	435	107.00	0.00	0.00	0.00
5.02	0.00	435	107.00	0.00	0.00	0.00
5.04	0.00	435	107.00	0.00	0.00	0.00
5.06	0.00	435	107.00	0.00	0.00	0.00
5.08	0.00	435	107.00	0.00	0.00	0.00
5.10	0.00	435	107.00	0.00	0.00	0.00
5.12	0.00	435	107.00	0.00	0.00	0.00
5.14	0.00	435	107.00	0.00	0.00	0.00
5.16	0.00	435	107.00	0.00	0.00	0.00
5.18	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	435	107.00	0.00	0.00	0.00
5.22	0.00	435	107.00	0.00	0.00	0.00
5.24	0.00	435	107.00	0.00	0.00	0.00
5.26	0.00	435	107.00	0.00	0.00	0.00
5.28	0.00	435	107.00	0.00	0.00	0.00
5.30	0.00	435	107.00	0.00	0.00	0.00
5.32	0.00	435	107.00	0.00	0.00	0.00
5.34	0.00	435	107.00	0.00	0.00	0.00
5.36	0.00	435	107.00	0.00	0.00	0.00
5.38	0.00	435	107.00	0.00	0.00	0.00
5.40	0.00	435	107.00	0.00	0.00	0.00
5.42	0.00	435	107.00	0.00	0.00	0.00
5.44	0.00	435	107.00	0.00	0.00	0.00
5.46	0.00	435	107.00	0.00	0.00	0.00
5.48	0.00	435	107.00	0.00	0.00	0.00
5.50	0.00	435	107.00	0.00	0.00	0.00
5.52	0.00	435	107.00	0.00	0.00	0.00
5.54	0.00	435	107.00	0.00	0.00	0.00
5.56	0.00	435	107.00	0.00	0.00	0.00
5.58	0.00	435	107.00	0.00	0.00	0.00
5.60	0.00	435	107.00	0.00	0.00	0.00
5.62	0.00	435	107.00	0.00	0.00	0.00
5.64	0.00	435	107.00	0.00	0.00	0.00
5.66	0.00	435	107.00	0.00	0.00	0.00
5.68	0.00	435	107.00	0.00	0.00	0.00
5.70	0.00	435	107.00	0.00	0.00	0.00
5.72	0.00	435	107.00	0.00	0.00	0.00
5.74	0.00	435	107.00	0.00	0.00	0.00
5.76	0.00	435	107.00	0.00	0.00	0.00
5.78	0.00	435	107.00	0.00	0.00	0.00
5.80	0.00	435	107.00	0.00	0.00	0.00
5.82	0.00	435	107.00	0.00	0.00	0.00
5.84	0.00	435	107.00	0.00	0.00	0.00
5.86	0.00	435	107.00	0.00	0.00	0.00
5.88	0.00	435	107.00	0.00	0.00	0.00
5.90	0.00	435	107.00	0.00	0.00	0.00
5.92	0.00	435	107.00	0.00	0.00	0.00
5.94	0.00	435	107.00	0.00	0.00	0.00
5.96	0.00	435	107.00	0.00	0.00	0.00
5.98	0.00	435	107.00	0.00	0.00	0.00
6.00	0.00	435	107.00	0.00	0.00	0.00
6.02	0.00	435	107.00	0.00	0.00	0.00
6.04	0.00	435	107.00	0.00	0.00	0.00
6.06	0.00	435	107.00	0.00	0.00	0.00
6.08	0.00	435	107.00	0.00	0.00	0.00
6.10	0.00	435	107.00	0.00	0.00	0.00
6.12	0.00	435	107.00	0.00	0.00	0.00
6.14	0.00	435	107.00	0.00	0.00	0.00
6.16	0.00	435	107.00	0.00	0.00	0.00
6.18	0.00	435	107.00	0.00	0.00	0.00
6.20	0.00	435	107.00	0.00	0.00	0.00
6.22	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
6.24	0.00	435	107.00	0.00	0.00	0.00
6.26	0.00	435	107.00	0.00	0.00	0.00
6.28	0.00	435	107.00	0.00	0.00	0.00
6.30	0.00	435	107.00	0.00	0.00	0.00
6.32	0.00	435	107.00	0.00	0.00	0.00
6.34	0.00	435	107.00	0.00	0.00	0.00
6.36	0.00	435	107.00	0.00	0.00	0.00
6.38	0.00	435	107.00	0.00	0.00	0.00
6.40	0.00	435	107.00	0.00	0.00	0.00
6.42	0.00	435	107.00	0.00	0.00	0.00
6.44	0.00	435	107.00	0.00	0.00	0.00
6.46	0.00	435	107.00	0.00	0.00	0.00
6.48	0.00	435	107.00	0.00	0.00	0.00
6.50	0.00	435	107.00	0.00	0.00	0.00
6.52	0.00	435	107.00	0.00	0.00	0.00
6.54	0.00	435	107.00	0.00	0.00	0.00
6.56	0.00	435	107.00	0.00	0.00	0.00
6.58	0.00	435	107.00	0.00	0.00	0.00
6.60	0.00	435	107.00	0.00	0.00	0.00
6.62	0.00	435	107.00	0.00	0.00	0.00
6.64	0.00	435	107.00	0.00	0.00	0.00
6.66	0.00	435	107.00	0.00	0.00	0.00
6.68	0.00	435	107.00	0.00	0.00	0.00
6.70	0.00	435	107.00	0.00	0.00	0.00
6.72	0.00	435	107.00	0.00	0.00	0.00
6.74	0.00	435	107.00	0.00	0.00	0.00
6.76	0.00	435	107.00	0.00	0.00	0.00
6.78	0.00	435	107.00	0.00	0.00	0.00
6.80	0.00	435	107.00	0.00	0.00	0.00
6.82	0.00	435	107.00	0.00	0.00	0.00
6.84	0.00	435	107.00	0.00	0.00	0.00
6.86	0.00	435	107.00	0.00	0.00	0.00
6.88	0.00	435	107.00	0.00	0.00	0.00
6.90	0.00	435	107.00	0.00	0.00	0.00
6.92	0.00	435	107.00	0.00	0.00	0.00
6.94	0.00	435	107.00	0.00	0.00	0.00
6.96	0.00	435	107.00	0.00	0.00	0.00
6.98	0.00	435	107.00	0.00	0.00	0.00
7.00	0.00	435	107.00	0.00	0.00	0.00
7.02	0.00	435	107.00	0.00	0.00	0.00
7.04	0.00	435	107.00	0.00	0.00	0.00
7.06	0.00	435	107.00	0.00	0.00	0.00
7.08	0.00	435	107.00	0.00	0.00	0.00
7.10	0.00	435	107.00	0.00	0.00	0.00
7.12	0.00	435	107.00	0.00	0.00	0.00
7.14	0.00	435	107.00	0.00	0.00	0.00
7.16	0.00	435	107.00	0.00	0.00	0.00
7.18	0.00	435	107.00	0.00	0.00	0.00
7.20	0.00	435	107.00	0.00	0.00	0.00
7.22	0.00	435	107.00	0.00	0.00	0.00
7.24	0.00	435	107.00	0.00	0.00	0.00
7.26	0.00	435	107.00	0.00	0.00	0.00

Hydrograph for Pond GFS: Gravel Filter Strip (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
7.28	0.00	435	107.00	0.00	0.00	0.00
7.30	0.00	435	107.00	0.00	0.00	0.00
7.32	0.00	435	107.00	0.00	0.00	0.00
7.34	0.00	435	107.00	0.00	0.00	0.00
7.36	0.00	435	107.00	0.00	0.00	0.00
7.38	0.00	435	107.00	0.00	0.00	0.00
7.40	0.00	435	107.00	0.00	0.00	0.00
7.42	0.00	435	107.00	0.00	0.00	0.00
7.44	0.00	435	107.00	0.00	0.00	0.00
7.46	0.00	435	107.00	0.00	0.00	0.00
7.48	0.00	435	107.00	0.00	0.00	0.00
7.50	0.00	435	107.00	0.00	0.00	0.00
7.52	0.00	435	107.00	0.00	0.00	0.00
7.54	0.00	435	107.00	0.00	0.00	0.00
7.56	0.00	435	107.00	0.00	0.00	0.00
7.58	0.00	435	107.00	0.00	0.00	0.00
7.60	0.00	435	107.00	0.00	0.00	0.00
7.62	0.00	435	107.00	0.00	0.00	0.00
7.64	0.00	435	107.00	0.00	0.00	0.00
7.66	0.00	435	107.00	0.00	0.00	0.00
7.68	0.00	435	107.00	0.00	0.00	0.00
7.70	0.00	435	107.00	0.00	0.00	0.00
7.72	0.00	435	107.00	0.00	0.00	0.00
7.74	0.00	435	107.00	0.00	0.00	0.00
7.76	0.00	435	107.00	0.00	0.00	0.00
7.78	0.00	435	107.00	0.00	0.00	0.00
7.80	0.00	435	107.00	0.00	0.00	0.00
7.82	0.00	435	107.00	0.00	0.00	0.00
7.84	0.00	435	107.00	0.00	0.00	0.00
7.86	0.00	435	107.00	0.00	0.00	0.00
7.88	0.00	435	107.00	0.00	0.00	0.00
7.90	0.00	435	107.00	0.00	0.00	0.00
7.92	0.00	435	107.00	0.00	0.00	0.00
7.94	0.00	435	107.00	0.00	0.00	0.00
7.96	0.00	435	107.00	0.00	0.00	0.00
7.98	0.00	435	107.00	0.00	0.00	0.00
8.00	0.00	435	107.00	0.00	0.00	0.00

Summary for Subcatchment DA-2B Post: DA-2B POST

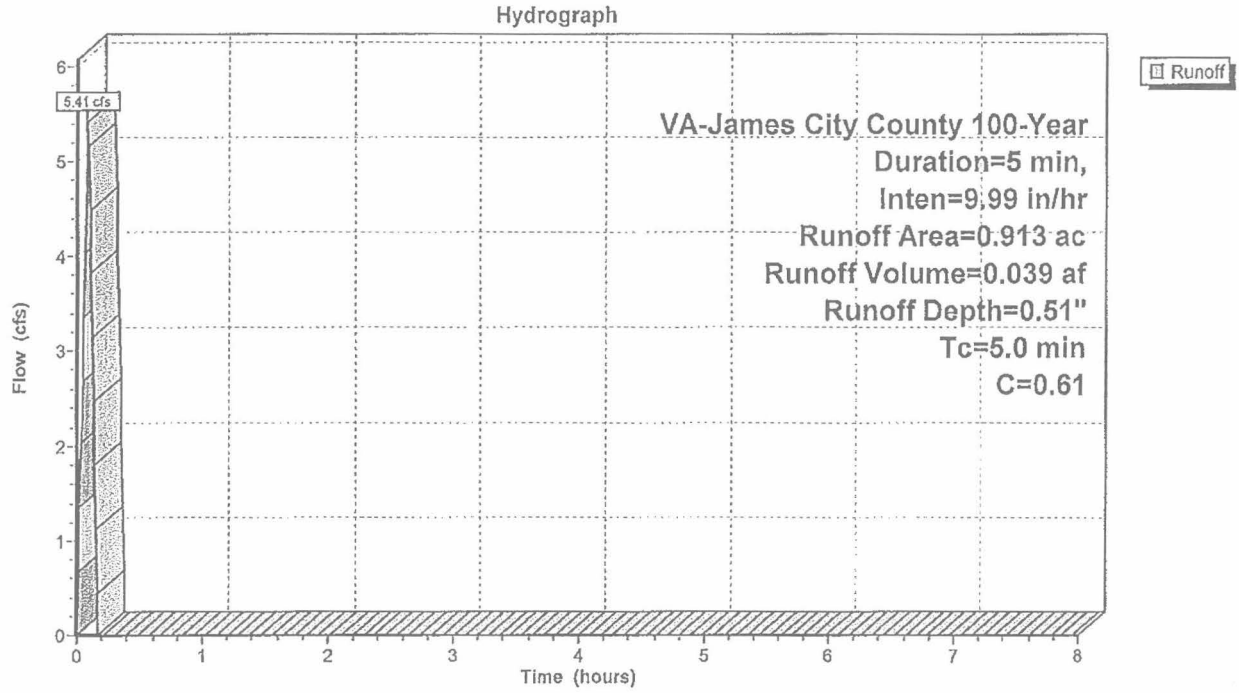
Runoff = 5.41 cfs @ 0.08 hrs, Volume= 0.039 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.430	0.90	Impervious
0.455	0.35	Lawn
0.028	0.30	Woods
0.913	0.61	Weighted Average
0.913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Entry

Subcatchment DA-2B Post: DA-2B POST

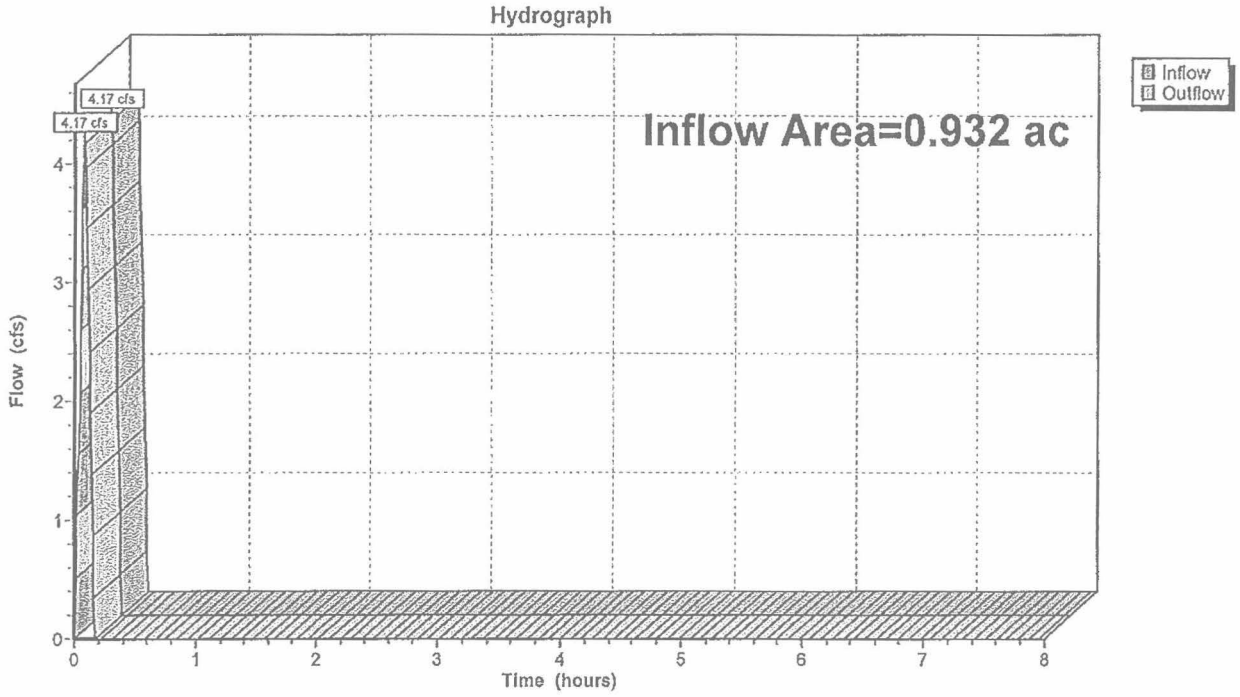


Summary for Reach POI 2 POST: Point of Investigation 2 POST

Inflow Area = 0.932 ac, 0.00% Impervious, Inflow Depth = 0.38" for 100-Year event
Inflow = 4.17 cfs @ 0.08 hrs, Volume= 0.030 af
Outflow = 4.17 cfs @ 0.08 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs

Reach POI 2 POST: Point of Investigation 2 POST



Summary for Subcatchment DA-3 POST: DA-3 POST

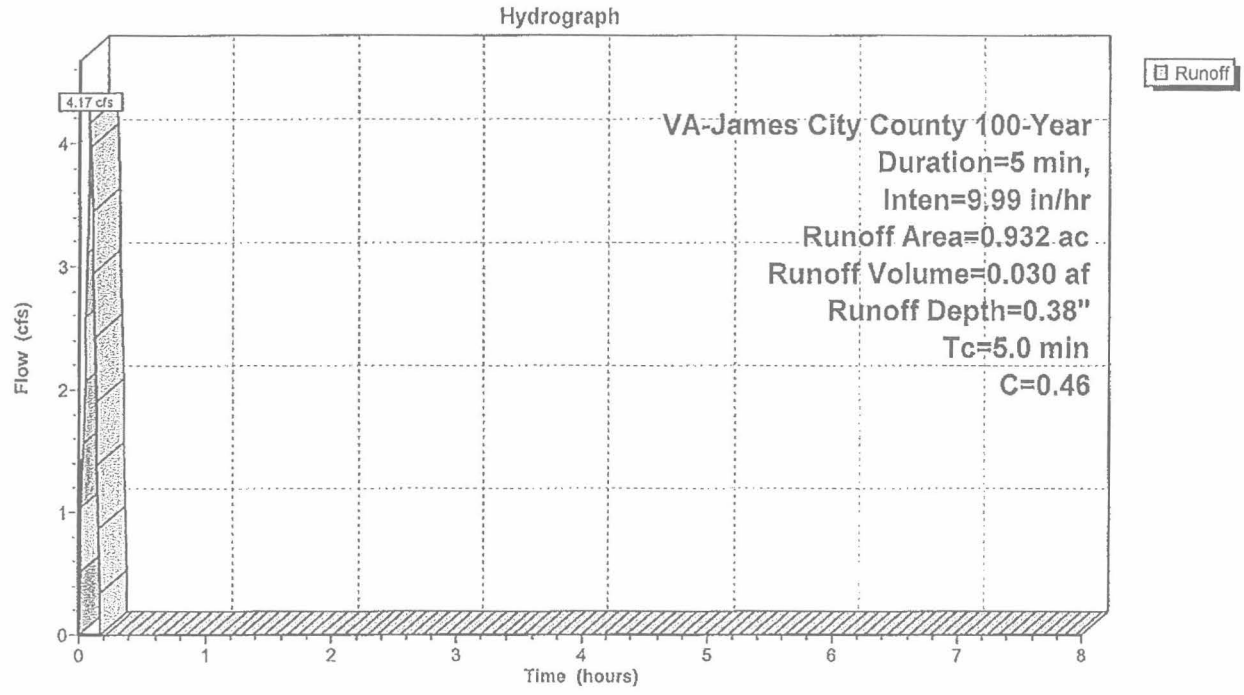
Runoff = 4.17 cfs @ 0.08 hrs, Volume= 0.030 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
VA-James City County 100-Year Duration=5 min, Inten=9.99 in/hr

Area (ac)	C	Description
0.748	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.932	0.46	Weighted Average
0.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST: DA-3 POST



INFILTRATION BASIN DRAWDOWN CALCULATIONS

Summary for Pond Infiltration Basin: Infiltration Basin

Inflow	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af
Outflow	=	0.31 cfs @	0.00 hrs, Volume=	0.280 af, Atten= 0%, Lag= 0.0 min
Primary	=	0.31 cfs @	0.00 hrs, Volume=	0.280 af
Secondary	=	0.00 cfs @	0.00 hrs, Volume=	0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Starting Elev= 98.80' Surf.Area= 4,379 sf Storage= 12,206 cf
Peak Elev= 98.80' @ 0.00 hrs Surf.Area= 4,379 sf Storage= 12,206 cf

Plug-Flow detention time= (not calculated: no plugs found)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

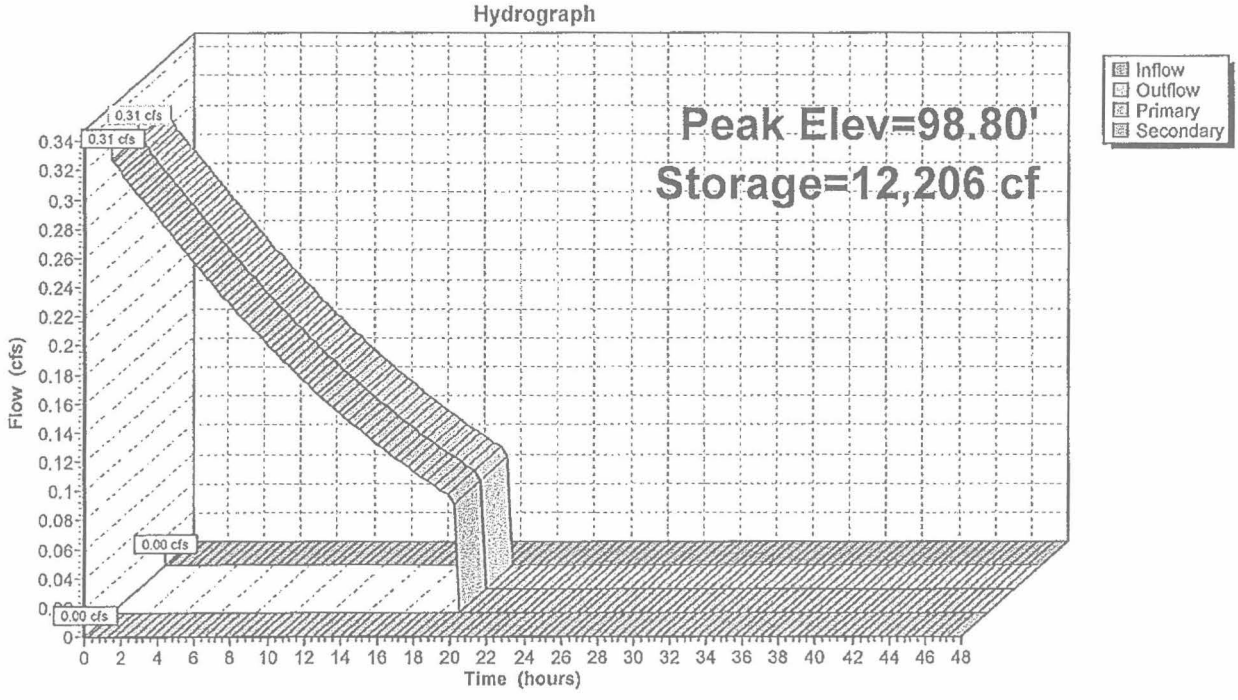
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.31 cfs @ 0.00 hrs HW=98.80' (Free Discharge)
↑—**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.31 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=98.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond Infiltration Basin: Infiltration Basin



Hydrograph for Pond Infiltration Basin: Infiltration Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	12,206	98.80	0.31	0.31	0.00
0.10	0.00	12,095	98.77	0.31	0.31	0.00
0.20	0.00	11,984	98.75	0.31	0.31	0.00
0.30	0.00	11,873	98.72	0.31	0.31	0.00
0.40	0.00	11,763	98.70	0.30	0.30	0.00
0.50	0.00	11,654	98.67	0.30	0.30	0.00
0.60	0.00	11,545	98.65	0.30	0.30	0.00
0.70	0.00	11,437	98.62	0.30	0.30	0.00
0.80	0.00	11,329	98.60	0.30	0.30	0.00
0.90	0.00	11,222	98.57	0.30	0.30	0.00
1.00	0.00	11,116	98.54	0.29	0.29	0.00
1.10	0.00	11,010	98.52	0.29	0.29	0.00
1.20	0.00	10,905	98.49	0.29	0.29	0.00
1.30	0.00	10,800	98.47	0.29	0.29	0.00
1.40	0.00	10,696	98.44	0.29	0.29	0.00
1.50	0.00	10,593	98.42	0.29	0.29	0.00
1.60	0.00	10,490	98.39	0.29	0.29	0.00
1.70	0.00	10,388	98.37	0.28	0.28	0.00
1.80	0.00	10,286	98.34	0.28	0.28	0.00
1.90	0.00	10,185	98.31	0.28	0.28	0.00
2.00	0.00	10,084	98.29	0.28	0.28	0.00
2.10	0.00	9,984	98.26	0.28	0.28	0.00
2.20	0.00	9,885	98.24	0.28	0.28	0.00
2.30	0.00	9,786	98.21	0.27	0.27	0.00
2.40	0.00	9,687	98.19	0.27	0.27	0.00
2.50	0.00	9,590	98.16	0.27	0.27	0.00
2.60	0.00	9,492	98.13	0.27	0.27	0.00
2.70	0.00	9,396	98.11	0.27	0.27	0.00
2.80	0.00	9,300	98.08	0.27	0.27	0.00
2.90	0.00	9,204	98.06	0.26	0.26	0.00
3.00	0.00	9,109	98.03	0.26	0.26	0.00
3.10	0.00	9,015	98.01	0.26	0.26	0.00
3.20	0.00	8,921	97.98	0.26	0.26	0.00
3.30	0.00	8,827	97.96	0.26	0.26	0.00
3.40	0.00	8,735	97.93	0.26	0.26	0.00
3.50	0.00	8,642	97.90	0.26	0.26	0.00
3.60	0.00	8,551	97.88	0.25	0.25	0.00
3.70	0.00	8,459	97.85	0.25	0.25	0.00
3.80	0.00	8,369	97.83	0.25	0.25	0.00
3.90	0.00	8,279	97.80	0.25	0.25	0.00
4.00	0.00	8,189	97.78	0.25	0.25	0.00
4.10	0.00	8,100	97.75	0.25	0.25	0.00
4.20	0.00	8,012	97.73	0.24	0.24	0.00
4.30	0.00	7,924	97.70	0.24	0.24	0.00
4.40	0.00	7,837	97.67	0.24	0.24	0.00
4.50	0.00	7,750	97.65	0.24	0.24	0.00
4.60	0.00	7,664	97.62	0.24	0.24	0.00
4.70	0.00	7,578	97.60	0.24	0.24	0.00
4.80	0.00	7,493	97.57	0.24	0.24	0.00
4.90	0.00	7,408	97.55	0.23	0.23	0.00
5.00	0.00	7,324	97.52	0.23	0.23	0.00
5.10	0.00	7,240	97.50	0.23	0.23	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
5.20	0.00	7,157	97.47	0.23	0.23	0.00
5.30	0.00	7,074	97.44	0.23	0.23	0.00
5.40	0.00	6,992	97.42	0.23	0.23	0.00
5.50	0.00	6,911	97.39	0.23	0.23	0.00
5.60	0.00	6,829	97.37	0.22	0.22	0.00
5.70	0.00	6,749	97.34	0.22	0.22	0.00
5.80	0.00	6,669	97.32	0.22	0.22	0.00
5.90	0.00	6,589	97.29	0.22	0.22	0.00
6.00	0.00	6,510	97.27	0.22	0.22	0.00
6.10	0.00	6,432	97.24	0.22	0.22	0.00
6.20	0.00	6,354	97.21	0.22	0.22	0.00
6.30	0.00	6,276	97.19	0.21	0.21	0.00
6.40	0.00	6,199	97.16	0.21	0.21	0.00
6.50	0.00	6,123	97.14	0.21	0.21	0.00
6.60	0.00	6,047	97.11	0.21	0.21	0.00
6.70	0.00	5,971	97.09	0.21	0.21	0.00
6.80	0.00	5,896	97.06	0.21	0.21	0.00
6.90	0.00	5,822	97.03	0.21	0.21	0.00
7.00	0.00	5,748	97.01	0.20	0.20	0.00
7.10	0.00	5,674	96.98	0.20	0.20	0.00
7.20	0.00	5,601	96.96	0.20	0.20	0.00
7.30	0.00	5,529	96.93	0.20	0.20	0.00
7.40	0.00	5,456	96.91	0.20	0.20	0.00
7.50	0.00	5,385	96.88	0.20	0.20	0.00
7.60	0.00	5,314	96.86	0.20	0.20	0.00
7.70	0.00	5,243	96.83	0.20	0.20	0.00
7.80	0.00	5,173	96.80	0.19	0.19	0.00
7.90	0.00	5,103	96.78	0.19	0.19	0.00
8.00	0.00	5,034	96.75	0.19	0.19	0.00
8.10	0.00	4,966	96.73	0.19	0.19	0.00
8.20	0.00	4,897	96.70	0.19	0.19	0.00
8.30	0.00	4,830	96.68	0.19	0.19	0.00
8.40	0.00	4,762	96.65	0.19	0.19	0.00
8.50	0.00	4,696	96.63	0.18	0.18	0.00
8.60	0.00	4,629	96.60	0.18	0.18	0.00
8.70	0.00	4,563	96.57	0.18	0.18	0.00
8.80	0.00	4,498	96.55	0.18	0.18	0.00
8.90	0.00	4,433	96.52	0.18	0.18	0.00
9.00	0.00	4,368	96.50	0.18	0.18	0.00
9.10	0.00	4,304	96.47	0.18	0.18	0.00
9.20	0.00	4,241	96.45	0.18	0.18	0.00
9.30	0.00	4,178	96.42	0.17	0.17	0.00
9.40	0.00	4,115	96.40	0.17	0.17	0.00
9.50	0.00	4,053	96.37	0.17	0.17	0.00
9.60	0.00	3,991	96.34	0.17	0.17	0.00
9.70	0.00	3,930	96.32	0.17	0.17	0.00
9.80	0.00	3,869	96.29	0.17	0.17	0.00
9.90	0.00	3,809	96.27	0.17	0.17	0.00
10.00	0.00	3,749	96.24	0.17	0.17	0.00
10.10	0.00	3,689	96.22	0.16	0.16	0.00
10.20	0.00	3,630	96.19	0.16	0.16	0.00
10.30	0.00	3,571	96.16	0.16	0.16	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
10.40	0.00	3,513	96.14	0.16	0.16	0.00
10.50	0.00	3,456	96.11	0.16	0.16	0.00
10.60	0.00	3,398	96.09	0.16	0.16	0.00
10.70	0.00	3,341	96.06	0.16	0.16	0.00
10.80	0.00	3,285	96.04	0.16	0.16	0.00
10.90	0.00	3,229	96.01	0.16	0.16	0.00
11.00	0.00	3,173	95.99	0.15	0.15	0.00
11.10	0.00	3,118	95.96	0.15	0.15	0.00
11.20	0.00	3,063	95.93	0.15	0.15	0.00
11.30	0.00	3,009	95.91	0.15	0.15	0.00
11.40	0.00	2,955	95.88	0.15	0.15	0.00
11.50	0.00	2,901	95.86	0.15	0.15	0.00
11.60	0.00	2,848	95.83	0.15	0.15	0.00
11.70	0.00	2,796	95.81	0.15	0.15	0.00
11.80	0.00	2,743	95.78	0.14	0.14	0.00
11.90	0.00	2,691	95.76	0.14	0.14	0.00
12.00	0.00	2,640	95.73	0.14	0.14	0.00
12.10	0.00	2,589	95.70	0.14	0.14	0.00
12.20	0.00	2,538	95.68	0.14	0.14	0.00
12.30	0.00	2,488	95.65	0.14	0.14	0.00
12.40	0.00	2,438	95.63	0.14	0.14	0.00
12.50	0.00	2,389	95.60	0.14	0.14	0.00
12.60	0.00	2,339	95.58	0.14	0.14	0.00
12.70	0.00	2,291	95.55	0.13	0.13	0.00
12.80	0.00	2,242	95.53	0.13	0.13	0.00
12.90	0.00	2,195	95.50	0.13	0.13	0.00
13.00	0.00	2,147	95.47	0.13	0.13	0.00
13.10	0.00	2,100	95.45	0.13	0.13	0.00
13.20	0.00	2,053	95.42	0.13	0.13	0.00
13.30	0.00	2,007	95.40	0.13	0.13	0.00
13.40	0.00	1,961	95.37	0.13	0.13	0.00
13.50	0.00	1,915	95.35	0.13	0.13	0.00
13.60	0.00	1,870	95.32	0.13	0.13	0.00
13.70	0.00	1,825	95.30	0.12	0.12	0.00
13.80	0.00	1,781	95.27	0.12	0.12	0.00
13.90	0.00	1,736	95.24	0.12	0.12	0.00
14.00	0.00	1,693	95.22	0.12	0.12	0.00
14.10	0.00	1,649	95.19	0.12	0.12	0.00
14.20	0.00	1,606	95.17	0.12	0.12	0.00
14.30	0.00	1,564	95.14	0.12	0.12	0.00
14.40	0.00	1,521	95.12	0.12	0.12	0.00
14.50	0.00	1,480	95.09	0.12	0.12	0.00
14.60	0.00	1,438	95.06	0.11	0.11	0.00
14.70	0.00	1,397	95.04	0.11	0.11	0.00
14.80	0.00	1,356	95.01	0.11	0.11	0.00
14.90	0.00	1,316	94.99	0.11	0.11	0.00
15.00	0.00	1,275	94.96	0.11	0.11	0.00
15.10	0.00	1,236	94.94	0.11	0.11	0.00
15.20	0.00	1,196	94.91	0.11	0.11	0.00
15.30	0.00	1,157	94.89	0.11	0.11	0.00
15.40	0.00	1,118	94.86	0.11	0.11	0.00
15.50	0.00	1,080	94.83	0.11	0.11	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)	
15.60	0.00	1,042	94.81	0.11	0.11	0.00	
15.70	0.00	1,004	94.78	0.10	0.10	0.00	
15.80	0.00	967	94.76	0.10	0.10	0.00	
15.90	0.00	929	94.73	0.10	0.10	0.00	
16.00	0.00	893	94.71	0.10	0.10	0.00	
16.10	0.00	856	94.68	0.10	0.10	0.00	
16.20	0.00	820	94.66	0.10	0.10	0.00	
16.30	0.00	784	94.63	0.10	0.10	0.00	
16.40	0.00	749	94.60	0.10	0.10	0.00	
16.50	0.00	714	94.58	0.10	0.10	0.00	
16.60	0.00	679	94.55	0.10	0.10	0.00	
16.70	0.00	644	94.53	0.10	0.10	0.00	
16.80	0.00	610	94.50	0.09	0.09	0.00	
16.90	0.00	576	94.48	0.09	0.09	0.00	
17.00	0.00	542	94.45	0.09	0.09	0.00	
17.10	0.00	509	94.43	0.09	0.09	0.00	
17.20	0.00	476	94.40	0.09	0.09	0.00	
17.30	0.00	443	94.37	0.09	0.09	0.00	
17.40	0.00	411	94.35	0.09	0.09	0.00	
17.50	0.00	379	94.32	0.09	0.09	0.00	
17.60	0.00	347	94.30	0.09	0.09	0.00	
17.70	0.00	316	94.27	0.09	0.09	0.00	
17.80	0.00	285	94.25	0.09	0.09	0.00	
17.90	0.00	254	94.22	0.09	0.09	0.00	
18.00	0.00	223	94.19	0.08	0.08	0.00	
18.10	0.00	193	94.17	0.08	0.08	0.00	
18.20	0.00	163	94.14	0.08	0.08	0.00	
18.30	0.00	133	94.12	0.08	0.08	0.00	
18.40	0.00	104	94.09	0.08	0.08	0.00	
18.50	0.00	75	94.07	0.08	0.08	0.00	
18.60	0.00	46	94.04	0.08	0.08	0.00	
18.70	0.00	18	94.02	0.08	0.08	0.00	BOTTOM OF THE BMP
18.80	0.00	0	94.00	0.00	0.00	0.00	EL = 94.00
18.90	0.00	0	94.00	0.00	0.00	0.00	
19.00	0.00	0	94.00	0.00	0.00	0.00	TOTAL DRAWDOWN
19.10	0.00	0	94.00	0.00	0.00	0.00	TIME 18.75hrs.
19.20	0.00	0	94.00	0.00	0.00	0.00	
19.30	0.00	0	94.00	0.00	0.00	0.00	
19.40	0.00	0	94.00	0.00	0.00	0.00	
19.50	0.00	0	94.00	0.00	0.00	0.00	
19.60	0.00	0	94.00	0.00	0.00	0.00	
19.70	0.00	0	94.00	0.00	0.00	0.00	
19.80	0.00	0	94.00	0.00	0.00	0.00	
19.90	0.00	0	94.00	0.00	0.00	0.00	
20.00	0.00	0	94.00	0.00	0.00	0.00	
20.10	0.00	0	94.00	0.00	0.00	0.00	
20.20	0.00	0	94.00	0.00	0.00	0.00	
20.30	0.00	0	94.00	0.00	0.00	0.00	
20.40	0.00	0	94.00	0.00	0.00	0.00	
20.50	0.00	0	94.00	0.00	0.00	0.00	
20.60	0.00	0	94.00	0.00	0.00	0.00	
20.70	0.00	0	94.00	0.00	0.00	0.00	

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
20.80	0.00	0	94.00	0.00	0.00	0.00
20.90	0.00	0	94.00	0.00	0.00	0.00
21.00	0.00	0	94.00	0.00	0.00	0.00
21.10	0.00	0	94.00	0.00	0.00	0.00
21.20	0.00	0	94.00	0.00	0.00	0.00
21.30	0.00	0	94.00	0.00	0.00	0.00
21.40	0.00	0	94.00	0.00	0.00	0.00
21.50	0.00	0	94.00	0.00	0.00	0.00
21.60	0.00	0	94.00	0.00	0.00	0.00
21.70	0.00	0	94.00	0.00	0.00	0.00
21.80	0.00	0	94.00	0.00	0.00	0.00
21.90	0.00	0	94.00	0.00	0.00	0.00
22.00	0.00	0	94.00	0.00	0.00	0.00
22.10	0.00	0	94.00	0.00	0.00	0.00
22.20	0.00	0	94.00	0.00	0.00	0.00
22.30	0.00	0	94.00	0.00	0.00	0.00
22.40	0.00	0	94.00	0.00	0.00	0.00
22.50	0.00	0	94.00	0.00	0.00	0.00
22.60	0.00	0	94.00	0.00	0.00	0.00
22.70	0.00	0	94.00	0.00	0.00	0.00
22.80	0.00	0	94.00	0.00	0.00	0.00
22.90	0.00	0	94.00	0.00	0.00	0.00
23.00	0.00	0	94.00	0.00	0.00	0.00
23.10	0.00	0	94.00	0.00	0.00	0.00
23.20	0.00	0	94.00	0.00	0.00	0.00
23.30	0.00	0	94.00	0.00	0.00	0.00
23.40	0.00	0	94.00	0.00	0.00	0.00
23.50	0.00	0	94.00	0.00	0.00	0.00
23.60	0.00	0	94.00	0.00	0.00	0.00
23.70	0.00	0	94.00	0.00	0.00	0.00
23.80	0.00	0	94.00	0.00	0.00	0.00
23.90	0.00	0	94.00	0.00	0.00	0.00
24.00	0.00	0	94.00	0.00	0.00	0.00
24.10	0.00	0	94.00	0.00	0.00	0.00
24.20	0.00	0	94.00	0.00	0.00	0.00
24.30	0.00	0	94.00	0.00	0.00	0.00
24.40	0.00	0	94.00	0.00	0.00	0.00
24.50	0.00	0	94.00	0.00	0.00	0.00
24.60	0.00	0	94.00	0.00	0.00	0.00
24.70	0.00	0	94.00	0.00	0.00	0.00
24.80	0.00	0	94.00	0.00	0.00	0.00
24.90	0.00	0	94.00	0.00	0.00	0.00
25.00	0.00	0	94.00	0.00	0.00	0.00
25.10	0.00	0	94.00	0.00	0.00	0.00
25.20	0.00	0	94.00	0.00	0.00	0.00
25.30	0.00	0	94.00	0.00	0.00	0.00
25.40	0.00	0	94.00	0.00	0.00	0.00
25.50	0.00	0	94.00	0.00	0.00	0.00
25.60	0.00	0	94.00	0.00	0.00	0.00
25.70	0.00	0	94.00	0.00	0.00	0.00
25.80	0.00	0	94.00	0.00	0.00	0.00
25.90	0.00	0	94.00	0.00	0.00	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
26.00	0.00	0	94.00	0.00	0.00	0.00
26.10	0.00	0	94.00	0.00	0.00	0.00
26.20	0.00	0	94.00	0.00	0.00	0.00
26.30	0.00	0	94.00	0.00	0.00	0.00
26.40	0.00	0	94.00	0.00	0.00	0.00
26.50	0.00	0	94.00	0.00	0.00	0.00
26.60	0.00	0	94.00	0.00	0.00	0.00
26.70	0.00	0	94.00	0.00	0.00	0.00
26.80	0.00	0	94.00	0.00	0.00	0.00
26.90	0.00	0	94.00	0.00	0.00	0.00
27.00	0.00	0	94.00	0.00	0.00	0.00
27.10	0.00	0	94.00	0.00	0.00	0.00
27.20	0.00	0	94.00	0.00	0.00	0.00
27.30	0.00	0	94.00	0.00	0.00	0.00
27.40	0.00	0	94.00	0.00	0.00	0.00
27.50	0.00	0	94.00	0.00	0.00	0.00
27.60	0.00	0	94.00	0.00	0.00	0.00
27.70	0.00	0	94.00	0.00	0.00	0.00
27.80	0.00	0	94.00	0.00	0.00	0.00
27.90	0.00	0	94.00	0.00	0.00	0.00
28.00	0.00	0	94.00	0.00	0.00	0.00
28.10	0.00	0	94.00	0.00	0.00	0.00
28.20	0.00	0	94.00	0.00	0.00	0.00
28.30	0.00	0	94.00	0.00	0.00	0.00
28.40	0.00	0	94.00	0.00	0.00	0.00
28.50	0.00	0	94.00	0.00	0.00	0.00
28.60	0.00	0	94.00	0.00	0.00	0.00
28.70	0.00	0	94.00	0.00	0.00	0.00
28.80	0.00	0	94.00	0.00	0.00	0.00
28.90	0.00	0	94.00	0.00	0.00	0.00
29.00	0.00	0	94.00	0.00	0.00	0.00
29.10	0.00	0	94.00	0.00	0.00	0.00
29.20	0.00	0	94.00	0.00	0.00	0.00
29.30	0.00	0	94.00	0.00	0.00	0.00
29.40	0.00	0	94.00	0.00	0.00	0.00
29.50	0.00	0	94.00	0.00	0.00	0.00
29.60	0.00	0	94.00	0.00	0.00	0.00
29.70	0.00	0	94.00	0.00	0.00	0.00
29.80	0.00	0	94.00	0.00	0.00	0.00
29.90	0.00	0	94.00	0.00	0.00	0.00
30.00	0.00	0	94.00	0.00	0.00	0.00
30.10	0.00	0	94.00	0.00	0.00	0.00
30.20	0.00	0	94.00	0.00	0.00	0.00
30.30	0.00	0	94.00	0.00	0.00	0.00
30.40	0.00	0	94.00	0.00	0.00	0.00
30.50	0.00	0	94.00	0.00	0.00	0.00
30.60	0.00	0	94.00	0.00	0.00	0.00
30.70	0.00	0	94.00	0.00	0.00	0.00
30.80	0.00	0	94.00	0.00	0.00	0.00
30.90	0.00	0	94.00	0.00	0.00	0.00
31.00	0.00	0	94.00	0.00	0.00	0.00
31.10	0.00	0	94.00	0.00	0.00	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
31.20	0.00	0	94.00	0.00	0.00	0.00
31.30	0.00	0	94.00	0.00	0.00	0.00
31.40	0.00	0	94.00	0.00	0.00	0.00
31.50	0.00	0	94.00	0.00	0.00	0.00
31.60	0.00	0	94.00	0.00	0.00	0.00
31.70	0.00	0	94.00	0.00	0.00	0.00
31.80	0.00	0	94.00	0.00	0.00	0.00
31.90	0.00	0	94.00	0.00	0.00	0.00
32.00	0.00	0	94.00	0.00	0.00	0.00
32.10	0.00	0	94.00	0.00	0.00	0.00
32.20	0.00	0	94.00	0.00	0.00	0.00
32.30	0.00	0	94.00	0.00	0.00	0.00
32.40	0.00	0	94.00	0.00	0.00	0.00
32.50	0.00	0	94.00	0.00	0.00	0.00
32.60	0.00	0	94.00	0.00	0.00	0.00
32.70	0.00	0	94.00	0.00	0.00	0.00
32.80	0.00	0	94.00	0.00	0.00	0.00
32.90	0.00	0	94.00	0.00	0.00	0.00
33.00	0.00	0	94.00	0.00	0.00	0.00
33.10	0.00	0	94.00	0.00	0.00	0.00
33.20	0.00	0	94.00	0.00	0.00	0.00
33.30	0.00	0	94.00	0.00	0.00	0.00
33.40	0.00	0	94.00	0.00	0.00	0.00
33.50	0.00	0	94.00	0.00	0.00	0.00
33.60	0.00	0	94.00	0.00	0.00	0.00
33.70	0.00	0	94.00	0.00	0.00	0.00
33.80	0.00	0	94.00	0.00	0.00	0.00
33.90	0.00	0	94.00	0.00	0.00	0.00
34.00	0.00	0	94.00	0.00	0.00	0.00
34.10	0.00	0	94.00	0.00	0.00	0.00
34.20	0.00	0	94.00	0.00	0.00	0.00
34.30	0.00	0	94.00	0.00	0.00	0.00
34.40	0.00	0	94.00	0.00	0.00	0.00
34.50	0.00	0	94.00	0.00	0.00	0.00
34.60	0.00	0	94.00	0.00	0.00	0.00
34.70	0.00	0	94.00	0.00	0.00	0.00
34.80	0.00	0	94.00	0.00	0.00	0.00
34.90	0.00	0	94.00	0.00	0.00	0.00
35.00	0.00	0	94.00	0.00	0.00	0.00
35.10	0.00	0	94.00	0.00	0.00	0.00
35.20	0.00	0	94.00	0.00	0.00	0.00
35.30	0.00	0	94.00	0.00	0.00	0.00
35.40	0.00	0	94.00	0.00	0.00	0.00
35.50	0.00	0	94.00	0.00	0.00	0.00
35.60	0.00	0	94.00	0.00	0.00	0.00
35.70	0.00	0	94.00	0.00	0.00	0.00
35.80	0.00	0	94.00	0.00	0.00	0.00
35.90	0.00	0	94.00	0.00	0.00	0.00
36.00	0.00	0	94.00	0.00	0.00	0.00
36.10	0.00	0	94.00	0.00	0.00	0.00
36.20	0.00	0	94.00	0.00	0.00	0.00
36.30	0.00	0	94.00	0.00	0.00	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
36.40	0.00	0	94.00	0.00	0.00	0.00
36.50	0.00	0	94.00	0.00	0.00	0.00
36.60	0.00	0	94.00	0.00	0.00	0.00
36.70	0.00	0	94.00	0.00	0.00	0.00
36.80	0.00	0	94.00	0.00	0.00	0.00
36.90	0.00	0	94.00	0.00	0.00	0.00
37.00	0.00	0	94.00	0.00	0.00	0.00
37.10	0.00	0	94.00	0.00	0.00	0.00
37.20	0.00	0	94.00	0.00	0.00	0.00
37.30	0.00	0	94.00	0.00	0.00	0.00
37.40	0.00	0	94.00	0.00	0.00	0.00
37.50	0.00	0	94.00	0.00	0.00	0.00
37.60	0.00	0	94.00	0.00	0.00	0.00
37.70	0.00	0	94.00	0.00	0.00	0.00
37.80	0.00	0	94.00	0.00	0.00	0.00
37.90	0.00	0	94.00	0.00	0.00	0.00
38.00	0.00	0	94.00	0.00	0.00	0.00
38.10	0.00	0	94.00	0.00	0.00	0.00
38.20	0.00	0	94.00	0.00	0.00	0.00
38.30	0.00	0	94.00	0.00	0.00	0.00
38.40	0.00	0	94.00	0.00	0.00	0.00
38.50	0.00	0	94.00	0.00	0.00	0.00
38.60	0.00	0	94.00	0.00	0.00	0.00
38.70	0.00	0	94.00	0.00	0.00	0.00
38.80	0.00	0	94.00	0.00	0.00	0.00
38.90	0.00	0	94.00	0.00	0.00	0.00
39.00	0.00	0	94.00	0.00	0.00	0.00
39.10	0.00	0	94.00	0.00	0.00	0.00
39.20	0.00	0	94.00	0.00	0.00	0.00
39.30	0.00	0	94.00	0.00	0.00	0.00
39.40	0.00	0	94.00	0.00	0.00	0.00
39.50	0.00	0	94.00	0.00	0.00	0.00
39.60	0.00	0	94.00	0.00	0.00	0.00
39.70	0.00	0	94.00	0.00	0.00	0.00
39.80	0.00	0	94.00	0.00	0.00	0.00
39.90	0.00	0	94.00	0.00	0.00	0.00
40.00	0.00	0	94.00	0.00	0.00	0.00
40.10	0.00	0	94.00	0.00	0.00	0.00
40.20	0.00	0	94.00	0.00	0.00	0.00
40.30	0.00	0	94.00	0.00	0.00	0.00
40.40	0.00	0	94.00	0.00	0.00	0.00
40.50	0.00	0	94.00	0.00	0.00	0.00
40.60	0.00	0	94.00	0.00	0.00	0.00
40.70	0.00	0	94.00	0.00	0.00	0.00
40.80	0.00	0	94.00	0.00	0.00	0.00
40.90	0.00	0	94.00	0.00	0.00	0.00
41.00	0.00	0	94.00	0.00	0.00	0.00
41.10	0.00	0	94.00	0.00	0.00	0.00
41.20	0.00	0	94.00	0.00	0.00	0.00
41.30	0.00	0	94.00	0.00	0.00	0.00
41.40	0.00	0	94.00	0.00	0.00	0.00
41.50	0.00	0	94.00	0.00	0.00	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
41.60	0.00	0	94.00	0.00	0.00	0.00
41.70	0.00	0	94.00	0.00	0.00	0.00
41.80	0.00	0	94.00	0.00	0.00	0.00
41.90	0.00	0	94.00	0.00	0.00	0.00
42.00	0.00	0	94.00	0.00	0.00	0.00
42.10	0.00	0	94.00	0.00	0.00	0.00
42.20	0.00	0	94.00	0.00	0.00	0.00
42.30	0.00	0	94.00	0.00	0.00	0.00
42.40	0.00	0	94.00	0.00	0.00	0.00
42.50	0.00	0	94.00	0.00	0.00	0.00
42.60	0.00	0	94.00	0.00	0.00	0.00
42.70	0.00	0	94.00	0.00	0.00	0.00
42.80	0.00	0	94.00	0.00	0.00	0.00
42.90	0.00	0	94.00	0.00	0.00	0.00
43.00	0.00	0	94.00	0.00	0.00	0.00
43.10	0.00	0	94.00	0.00	0.00	0.00
43.20	0.00	0	94.00	0.00	0.00	0.00
43.30	0.00	0	94.00	0.00	0.00	0.00
43.40	0.00	0	94.00	0.00	0.00	0.00
43.50	0.00	0	94.00	0.00	0.00	0.00
43.60	0.00	0	94.00	0.00	0.00	0.00
43.70	0.00	0	94.00	0.00	0.00	0.00
43.80	0.00	0	94.00	0.00	0.00	0.00
43.90	0.00	0	94.00	0.00	0.00	0.00
44.00	0.00	0	94.00	0.00	0.00	0.00
44.10	0.00	0	94.00	0.00	0.00	0.00
44.20	0.00	0	94.00	0.00	0.00	0.00
44.30	0.00	0	94.00	0.00	0.00	0.00
44.40	0.00	0	94.00	0.00	0.00	0.00
44.50	0.00	0	94.00	0.00	0.00	0.00
44.60	0.00	0	94.00	0.00	0.00	0.00
44.70	0.00	0	94.00	0.00	0.00	0.00
44.80	0.00	0	94.00	0.00	0.00	0.00
44.90	0.00	0	94.00	0.00	0.00	0.00
45.00	0.00	0	94.00	0.00	0.00	0.00
45.10	0.00	0	94.00	0.00	0.00	0.00
45.20	0.00	0	94.00	0.00	0.00	0.00
45.30	0.00	0	94.00	0.00	0.00	0.00
45.40	0.00	0	94.00	0.00	0.00	0.00
45.50	0.00	0	94.00	0.00	0.00	0.00
45.60	0.00	0	94.00	0.00	0.00	0.00
45.70	0.00	0	94.00	0.00	0.00	0.00
45.80	0.00	0	94.00	0.00	0.00	0.00
45.90	0.00	0	94.00	0.00	0.00	0.00
46.00	0.00	0	94.00	0.00	0.00	0.00
46.10	0.00	0	94.00	0.00	0.00	0.00
46.20	0.00	0	94.00	0.00	0.00	0.00
46.30	0.00	0	94.00	0.00	0.00	0.00
46.40	0.00	0	94.00	0.00	0.00	0.00
46.50	0.00	0	94.00	0.00	0.00	0.00
46.60	0.00	0	94.00	0.00	0.00	0.00
46.70	0.00	0	94.00	0.00	0.00	0.00

Hydrograph for Pond Infiltration Basin: Infiltration Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
46.80	0.00	0	94.00	0.00	0.00	0.00
46.90	0.00	0	94.00	0.00	0.00	0.00
47.00	0.00	0	94.00	0.00	0.00	0.00
47.10	0.00	0	94.00	0.00	0.00	0.00
47.20	0.00	0	94.00	0.00	0.00	0.00
47.30	0.00	0	94.00	0.00	0.00	0.00
47.40	0.00	0	94.00	0.00	0.00	0.00
47.50	0.00	0	94.00	0.00	0.00	0.00
47.60	0.00	0	94.00	0.00	0.00	0.00
47.70	0.00	0	94.00	0.00	0.00	0.00
47.80	0.00	0	94.00	0.00	0.00	0.00
47.90	0.00	0	94.00	0.00	0.00	0.00
48.00	0.00	0	94.00	0.00	0.00	0.00

GRAVEL FILTER STRIP CALCULATIONS

Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 3.13 cfs @ 0.08 hrs, Volume= 0.022 af
Outflow = 1.62 cfs @ 0.13 hrs, Volume= 0.012 af, Atten= 48%, Lag= 2.6 min
Primary = 1.62 cfs @ 0.13 hrs, Volume= 0.012 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 108.26' @ 0.13 hrs Surf.Area= 435 sf Storage= 655 cf

Plug-Flow detention time= 6.2 min calculated for 0.012 af (55% of inflow)
Center-of-Mass det. time= 5.0 min (10.1 - 5.0)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.61 cfs @ 0.13 hrs HW=108.26' TW=94.77' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Passes 1.61 cfs of 55.55 cfs potential flow)
└─**2=Culvert** (Passes 1.61 cfs of 6.17 cfs potential flow)
└─**3=Culvert** (Passes 1.61 cfs of 3.35 cfs potential flow)
└─**4=Culvert** (Passes 1.61 cfs of 3.33 cfs potential flow)
└─**5=Culvert** (Inlet Controls 1.61 cfs @ 4.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.50' TW=94.00' (Dynamic Tailwater)
└─**6=Broad-Crested Weir** (Controls 0.00 cfs)

Subject FILTER STRIP SIZING CALCULATIONS
Computed P.S. Checked

LANDMARK DESIGN GROUP

Project # 2007190-000.00
Client NICK'S OUTDOOR POWER EQUIPMENT
Date OCT. 09 Sheet #

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

IMPERVIOUS AREA TO INFILTRATION BASIN = 0.60AC

WQ VOLUME REQUIRED FOR INFILTRATION BASIN

$2 \times \frac{0.5}{12} \times 0.60\,Ac \times 43560\,ft^2 = 2,178\,ft^3$

WATER QUALITY VOLUME REQUIRED FOR PRETREATMENT CELL 50% OF TOTAL WATER QUALITY VOLUME REQUIRED

$50\% \times 2,178\,ft^3 = 1,089\,ft^3$

PROVIDED STORAGE VOLUME IN GRAVEL FILTER STRIP

$1,131\,ft^3$ AT EL = 111.00

$1131\,ft^3 > 1,089\,ft^3$

OK

Stage-Area-Storage for Pond GFS: Gravel Filter Strip

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	435	0	105.54	435	181
104.52	435	3	105.56	435	184
104.54	435	7	105.58	435	188
104.56	435	10	105.60	435	191
104.58	435	14	105.62	435	195
104.60	435	17	105.64	435	198
104.62	435	21	105.66	435	202
104.64	435	24	105.68	435	205
104.66	435	28	105.70	435	209
104.68	435	31	105.72	435	212
104.70	435	35	105.74	435	216
104.72	435	38	105.76	435	219
104.74	435	42	105.78	435	223
104.76	435	45	105.80	435	226
104.78	435	49	105.82	435	230
104.80	435	52	105.84	435	233
104.82	435	56	105.86	435	237
104.84	435	59	105.88	435	240
104.86	435	63	105.90	435	244
104.88	435	66	105.92	435	247
104.90	435	70	105.94	435	251
104.92	435	73	105.96	435	254
104.94	435	77	105.98	435	258
104.96	435	80	106.00	435	261
104.98	435	84	106.02	435	264
105.00	435	87	106.04	435	268
105.02	435	90	106.06	435	271
105.04	435	94	106.08	435	275
105.06	435	97	106.10	435	278
105.08	435	101	106.12	435	282
105.10	435	104	106.14	435	285
105.12	435	108	106.16	435	289
105.14	435	111	106.18	435	292
105.16	435	115	106.20	435	296
105.18	435	118	106.22	435	299
105.20	435	122	106.24	435	303
105.22	435	125	106.26	435	306
105.24	435	129	106.28	435	310
105.26	435	132	106.30	435	313
105.28	435	136	106.32	435	317
105.30	435	139	106.34	435	320
105.32	435	143	106.36	435	324
105.34	435	146	106.38	435	327
105.36	435	150	106.40	435	331
105.38	435	153	106.42	435	334
105.40	435	157	106.44	435	338
105.42	435	160	106.46	435	341
105.44	435	164	106.48	435	345
105.46	435	167	106.50	435	348
105.48	435	171	106.52	435	351
105.50	435	174	106.54	435	355
105.52	435	177	106.56	435	358

Stage-Area-Storage for Pond GFS: Gravel Filter Strip (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.58	435	362	107.62	435	543
106.60	435	365	107.64	435	546
106.62	435	369	107.66	435	550
106.64	435	372	107.68	435	553
106.66	435	376	107.70	435	557
106.68	435	379	107.72	435	560
106.70	435	383	107.74	435	564
106.72	435	386	107.76	435	567
106.74	435	390	107.78	435	571
106.76	435	393	107.80	435	574
106.78	435	397	107.82	435	578
106.80	435	400	107.84	435	581
106.82	435	404	107.86	435	585
106.84	435	407	107.88	435	588
106.86	435	411	107.90	435	592
106.88	435	414	107.92	435	595
106.90	435	418	107.94	435	599
106.92	435	421	107.96	435	602
106.94	435	425	107.98	435	606
106.96	435	428	108.00	435	609
106.98	435	432	108.02	435	612
107.00	435	435	108.04	435	616
107.02	435	438	108.06	435	619
107.04	435	442	108.08	435	623
107.06	435	445	108.10	435	626
107.08	435	449	108.12	435	630
107.10	435	452	108.14	435	633
107.12	435	456	108.16	435	637
107.14	435	459	108.18	435	640
107.16	435	463	108.20	435	644
107.18	435	466	108.22	435	647
107.20	435	470	108.24	435	651
107.22	435	473	108.26	435	654
107.24	435	477	108.28	435	658
107.26	435	480	108.30	435	661
107.28	435	484	108.32	435	665
107.30	435	487	108.34	435	668
107.32	435	491	108.36	435	672
107.34	435	494	108.38	435	675
107.36	435	498	108.40	435	679
107.38	435	501	108.42	435	682
107.40	435	505	108.44	435	686
107.42	435	508	108.46	435	689
107.44	435	512	108.48	435	693
107.46	435	515	108.50	435	696
107.48	435	519	108.52	435	699
107.50	435	522	108.54	435	703
107.52	435	525	108.56	435	706
107.54	435	529	108.58	435	710
107.56	435	532	108.60	435	713
107.58	435	536	108.62	435	717
107.60	435	539	108.64	435	720

Stage-Area-Storage for Pond GFS: Gravel Filter Strip (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.66	435	724	109.70	435	905
108.68	435	727	109.72	435	908
108.70	435	731	109.74	435	912
108.72	435	734	109.76	435	915
108.74	435	738	109.78	435	919
108.76	435	741	109.80	435	922
108.78	435	745	109.82	435	926
108.80	435	748	109.84	435	929
108.82	435	752	109.86	435	933
108.84	435	755	109.88	435	936
108.86	435	759	109.90	435	940
108.88	435	762	109.92	435	943
108.90	435	766	109.94	435	947
108.92	435	769	109.96	435	950
108.94	435	773	109.98	435	954
108.96	435	776	110.00	435	957
108.98	435	780	110.02	435	960
109.00	435	783	110.04	435	964
109.02	435	786	110.06	435	967
109.04	435	790	110.08	435	971
109.06	435	793	110.10	435	974
109.08	435	797	110.12	435	978
109.10	435	800	110.14	435	981
109.12	435	804	110.16	435	985
109.14	435	807	110.18	435	988
109.16	435	811	110.20	435	992
109.18	435	814	110.22	435	995
109.20	435	818	110.24	435	999
109.22	435	821	110.26	435	1,002
109.24	435	825	110.28	435	1,006
109.26	435	828	110.30	435	1,009
109.28	435	832	110.32	435	1,013
109.30	435	835	110.34	435	1,016
109.32	435	839	110.36	435	1,020
109.34	435	842	110.38	435	1,023
109.36	435	846	110.40	435	1,027
109.38	435	849	110.42	435	1,030
109.40	435	853	110.44	435	1,034
109.42	435	856	110.46	435	1,037
109.44	435	860	110.48	435	1,041
109.46	435	863	110.50	435	1,044
109.48	435	867	110.52	435	1,047
109.50	435	870	110.54	435	1,051
109.52	435	873	110.56	435	1,054
109.54	435	877	110.58	435	1,058
109.56	435	880	110.60	435	1,061
109.58	435	884	110.62	435	1,065
109.60	435	887	110.64	435	1,068
109.62	435	891	110.66	435	1,072
109.64	435	894	110.68	435	1,075
109.66	435	898	110.70	435	1,079
109.68	435	901	110.72	435	1,082

Stage-Area-Storage for Pond GFS: Gravel Filter Strip (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
110.74	435	1,086
110.76	435	1,089
110.78	435	1,093
110.80	435	1,096
110.82	435	1,100
110.84	435	1,103
110.86	435	1,107
110.88	435	1,110
110.90	435	1,114
110.92	435	1,117
110.94	435	1,121
110.96	435	1,124
110.98	435	1,128
111.00	435	1,131
111.02	435	1,134
111.04	435	1,138
111.06	435	1,141
111.08	435	1,145
111.10	435	1,148
111.12	435	1,152
111.14	435	1,155
111.16	435	1,159
111.18	435	1,162
111.20	435	1,166
111.22	435	1,169
111.24	435	1,173
111.26	435	1,176
111.28	435	1,180
111.30	435	1,183
111.32	435	1,187
111.34	435	1,190
111.36	435	1,194
111.38	435	1,197
111.40	435	1,201
111.42	435	1,204
111.44	435	1,208
111.46	435	1,211
111.48	435	1,215
111.50	**435**	**1,218**

PROVIDED STORAGE VOLUME IN GRAVEL FILTER STRIP
$1,131 ft^3 > 1,089 ft^3$
ok

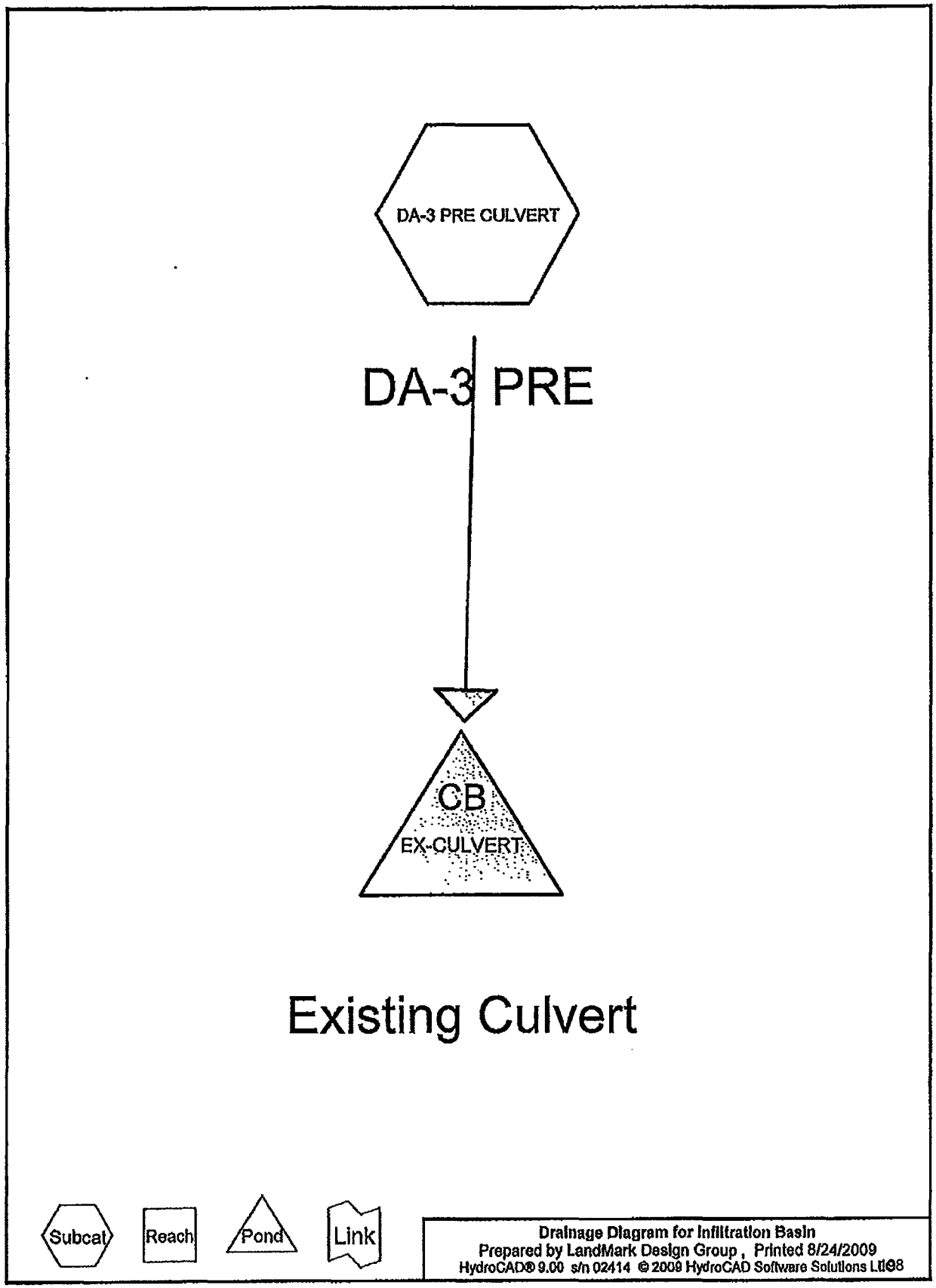
PRE-DEVELOPMENT AND POST-DEVELOPMENT SUMMARY TABLE FOR ENTRANCE CULVERT

Pre-Development and Post Development Summary Table

Entrance Culvert

Storm Event	Pre-Development Drainage Area ID	Pre-Development Flow Rate (cfs)	Post-Development Drainage Area ID	Post-Development Flow Rate (cfs)	Difference
2-year storm	EX-CULVERT	2.58	PR-CULVERT	2.38	-0.20
	DA-3 PRE	2.58	DA-3 POST	2.38	-0.20
10-year storm	EX-CULVERT	3.38	PR-CULVERT	3.08	-0.30
	DA-3 PRE	3.38	DA-3 POST	3.08	-0.30
25-year storm	EX-CULVERT	3.86	PR-CULVERT	3.49	-0.37
	DA-3 PRE	3.86	DA-3 POST	3.49	-0.37

PRE-DEVELOPMENT CALCULATIONS FOR ENTRANCE CULVERT


DA-3 PRE CULVERT
DA-3 PRE
CB
EX-CULVERT
Existing Culvert
Subcat
Reach
Pond
Link
Drainage Diagram for Infiltration Basin
Prepared by LandMark Design Group , Printed 8/24/2009
HydroCAD® 9.00 s/n 02414 © 2009 HydroCAD Software Solutions LLC

2-YEAR STORM

Summary for Pond EX-CULVERT: Existing Culvert

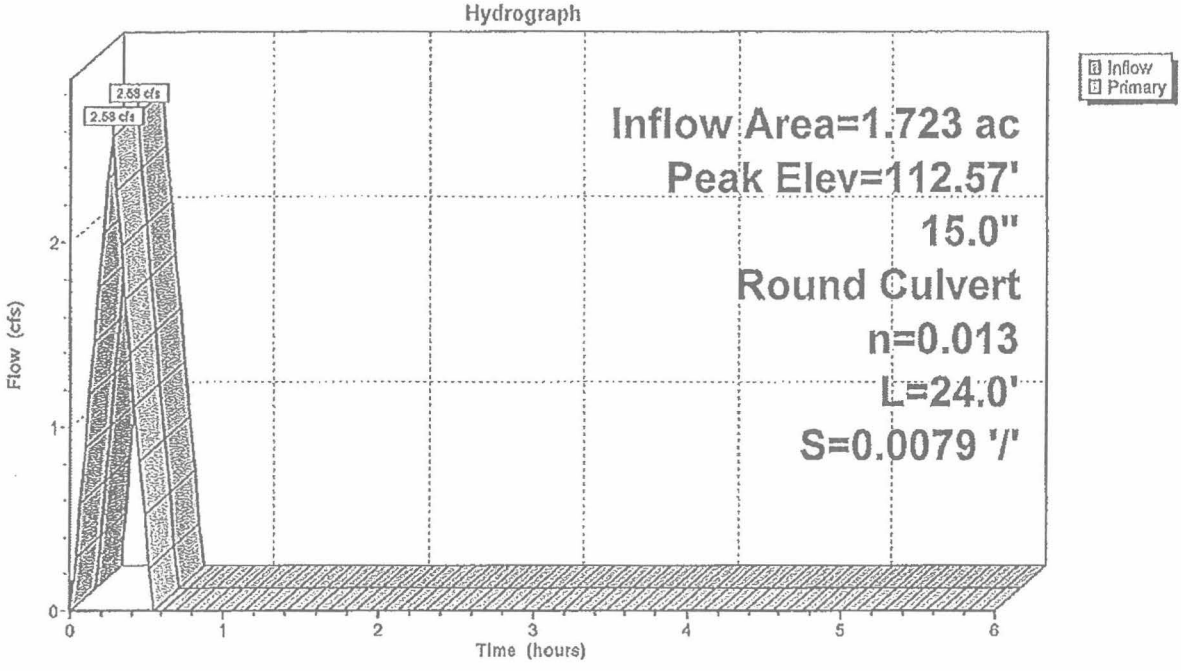
Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.40" for 2-Year event
Inflow = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af
Outflow = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min
Primary = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 112.57' @ 0.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.70'	**15.0" Round Culvert** L= 24.0' Ke= 0.100 Outlet Invert= 111.51' S= 0.0079 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.56 cfs @ 0.27 hrs HW=112.56' (Free Discharge)
└1=Culvert (Barrel Controls 2.56 cfs @ 3.99 fps)

Pond EX-CULVERT: Existing Culvert



Summary for Subcatchment DA-3 PRE CULVERT: DA-3 PRE

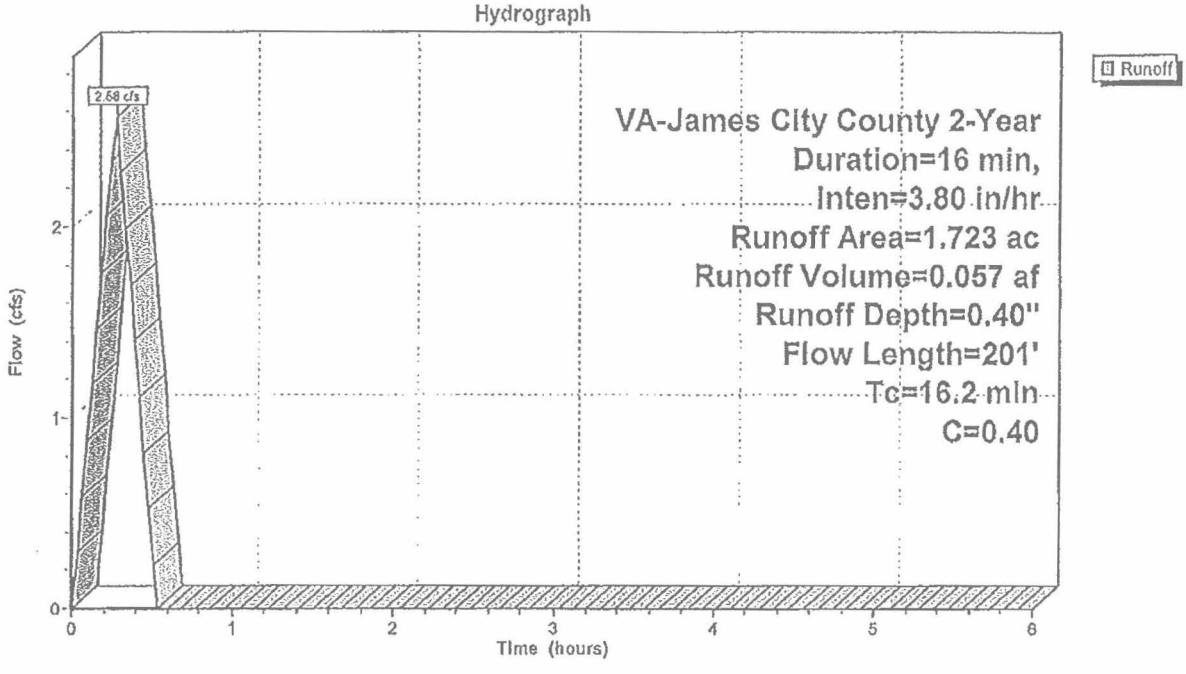
Runoff = 2.58 cfs @ 0.27 hrs, Volume= 0.057 af, Depth= 0.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=16 min, Inten=3.80 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE CULVERT: DA-3 PRE



10-YEAR STORM

Summary for Pond EX-CULVERT: Existing Culvert

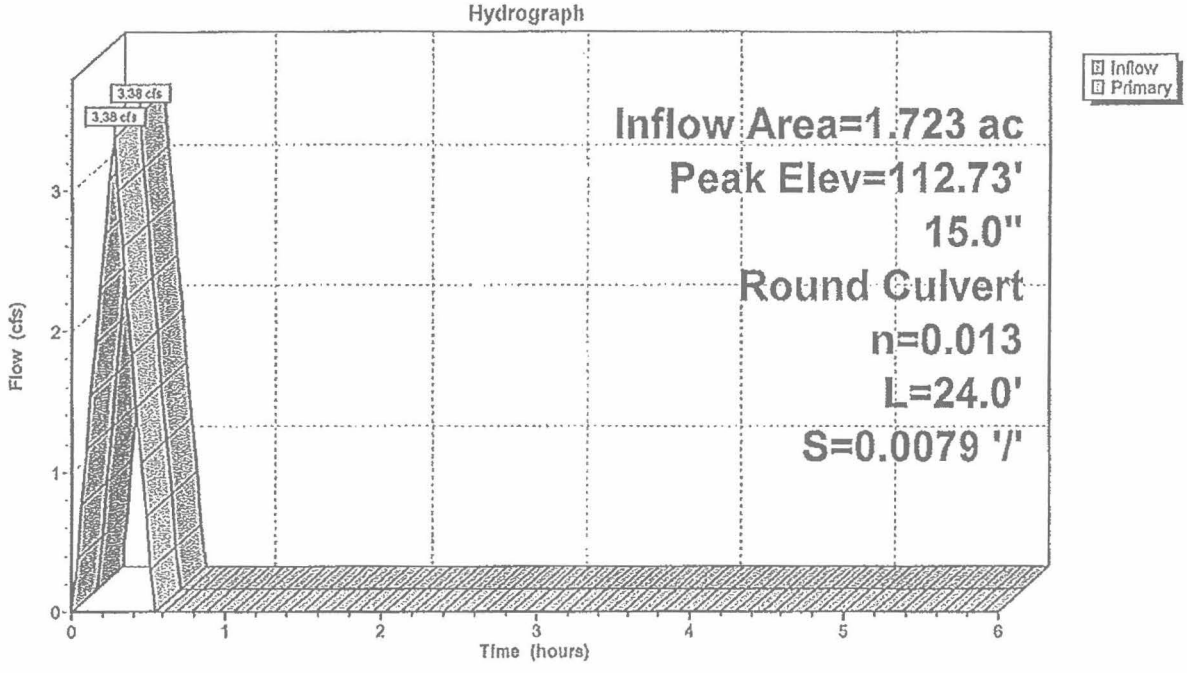
Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.53" for 10-Year event
Inflow = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af
Outflow = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 112.73' @ 0.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.70'	**15.0" Round Culvert** L= 24.0' Ke= 0.100 Outlet Invert= 111.51' S= 0.0079 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.36 cfs @ 0.27 hrs HW=112.72' (Free Discharge)
└1=Culvert (Barrel Controls 3.36 cfs @ 4.26 fps)

Pond EX-CULVERT: Existing Culvert



Summary for Subcatchment DA-3 PRE CULVERT: DA-3 PRE

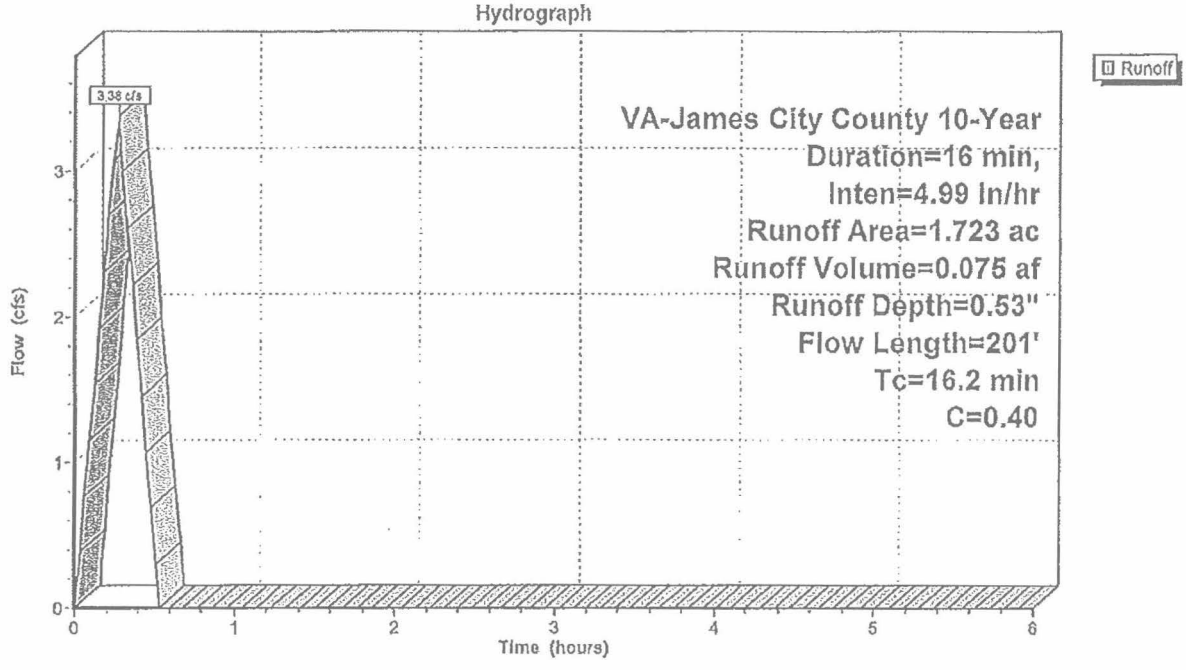
Runoff = 3.38 cfs @ 0.27 hrs, Volume= 0.075 af, Depth= 0.53"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 10-Year Duration=16 min, Inten=4.99 in/hr

Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE CULVERT: DA-3 PRE



25-YEAR STORM

Summary for Pond EX-CULVERT: Existing Culvert

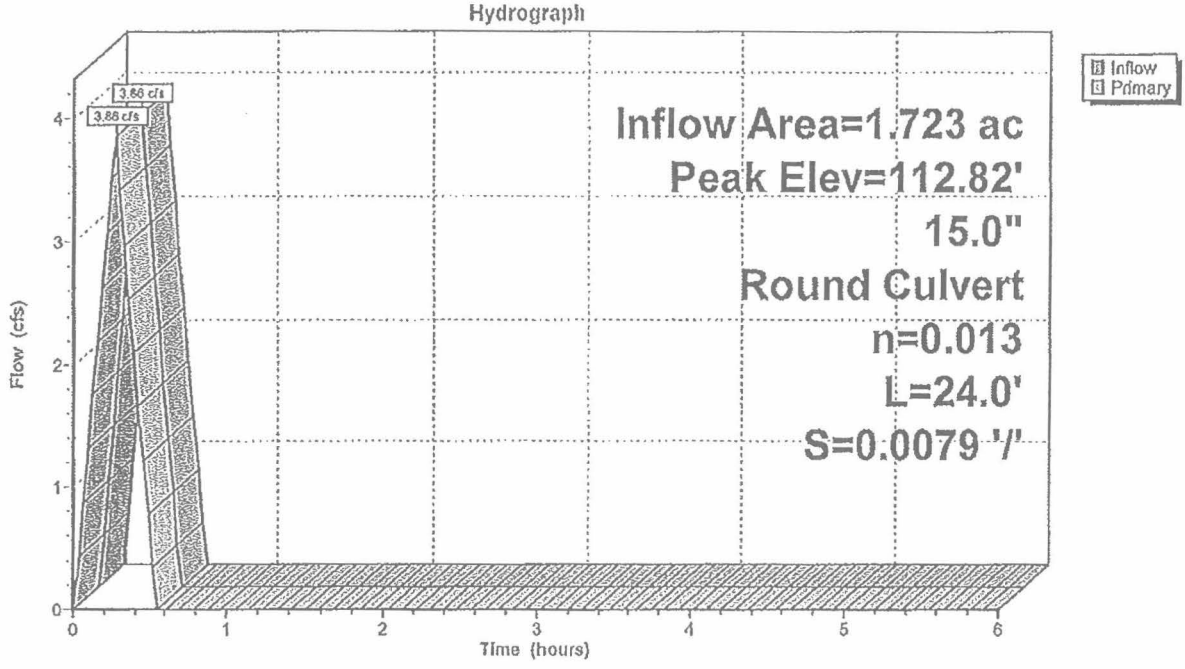
Inflow Area = 1.723 ac, 0.00% Impervious, Inflow Depth = 0.60" for 25-Year event
Inflow = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af
Outflow = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min
Primary = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 112.82' @ 0.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.70'	**15.0" Round Culvert** L= 24.0' Ke= 0.100 Outlet Invert= 111.51' S= 0.0079 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.84 cfs @ 0.27 hrs HW=112.81' (Free Discharge)
↑—1=Culvert (Barrel Controls 3.84 cfs @ 4.40 fps)

Pond EX-CULVERT: Existing Culvert



Summary for Subcatchment DA-3 PRE CULVERT: DA-3 PRE

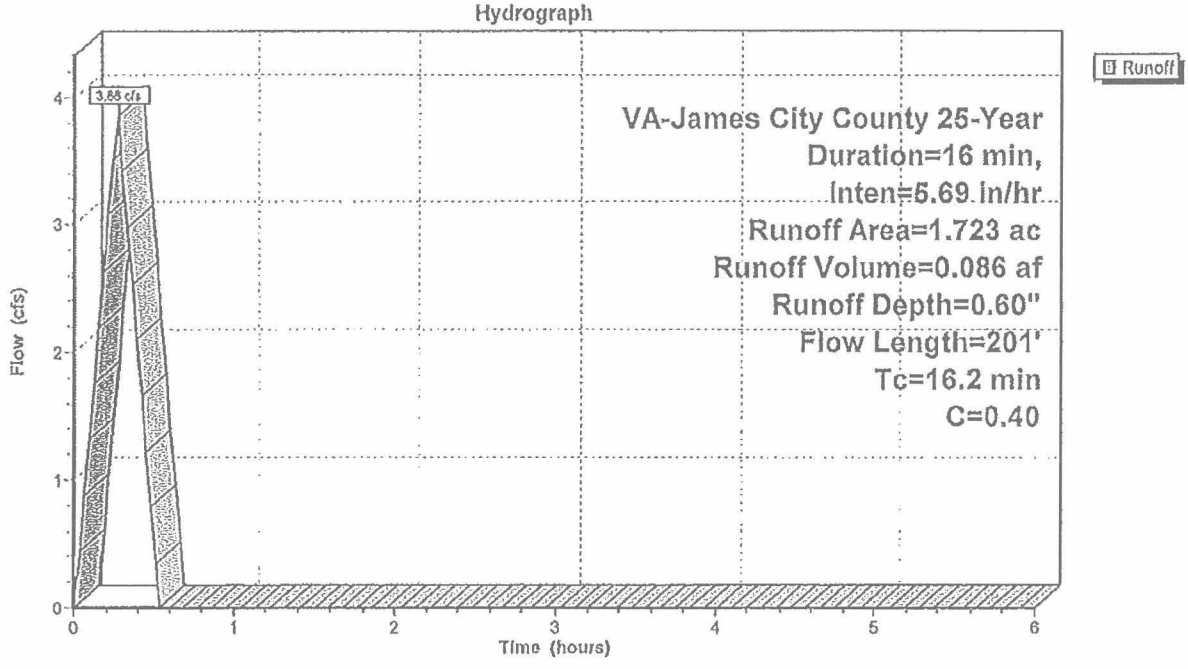
Runoff = 3.86 cfs @ 0.27 hrs, Volume= 0.086 af, Depth= 0.60"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 25-Year Duration=16 min, Inten=5.69 in/hr

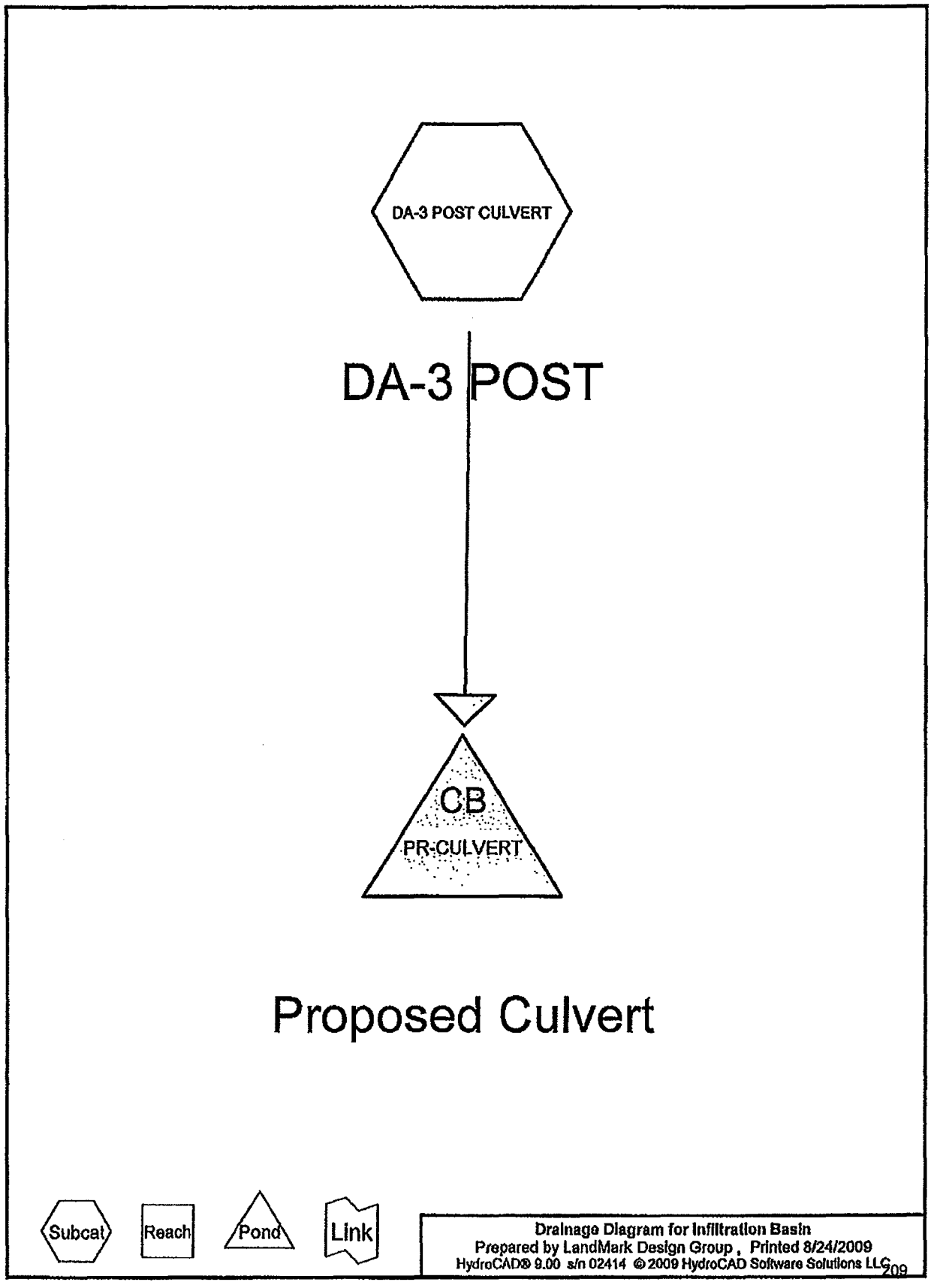
Area (ac)	C	Description
1.263	0.35	Existing Lawn
0.287	0.30	Existing Woods
0.173	0.90	Exisitng Impervious Area
1.723	0.40	Weighted Average
1.723		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	33	0.0300	0.17		**Sheet Flow, Sheet flow** Grass: Short n= 0.150 P2= 3.50"
10.8	67	0.0448	0.10		**Sheet Flow, Sheet flow** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	11	0.4540	3.37		**Shallow Concentrated Flow, Shallow concentrated flow** Woodland Kv= 5.0 fps
2.0	90	0.0111	0.74		**Shallow Concentrated Flow, Shallow concentrated flow** Short Grass Pasture Kv= 7.0 fps
16.2	201	Total			

Subcatchment DA-3 PRE CULVERT: DA-3 PRE



POST-DEVELOPMENT CALCULATIONS FOR ENTRANCE CULVERT


DA-3 POST CULVERT
DA-3 POST
CB
PR-CULVERT
Proposed Culvert
Subcat
Reach
Pond
Link
Drainage Diagram for Infiltration Basin
Prepared by LandMark Design Group , Printed 8/24/2009
HydroCAD® 9.00 s/n 02414 © 2009 HydroCAD Software Solutions LLC

2-YEAR STORM

Summary for Pond PR-CULVERT: Proposed Culvert

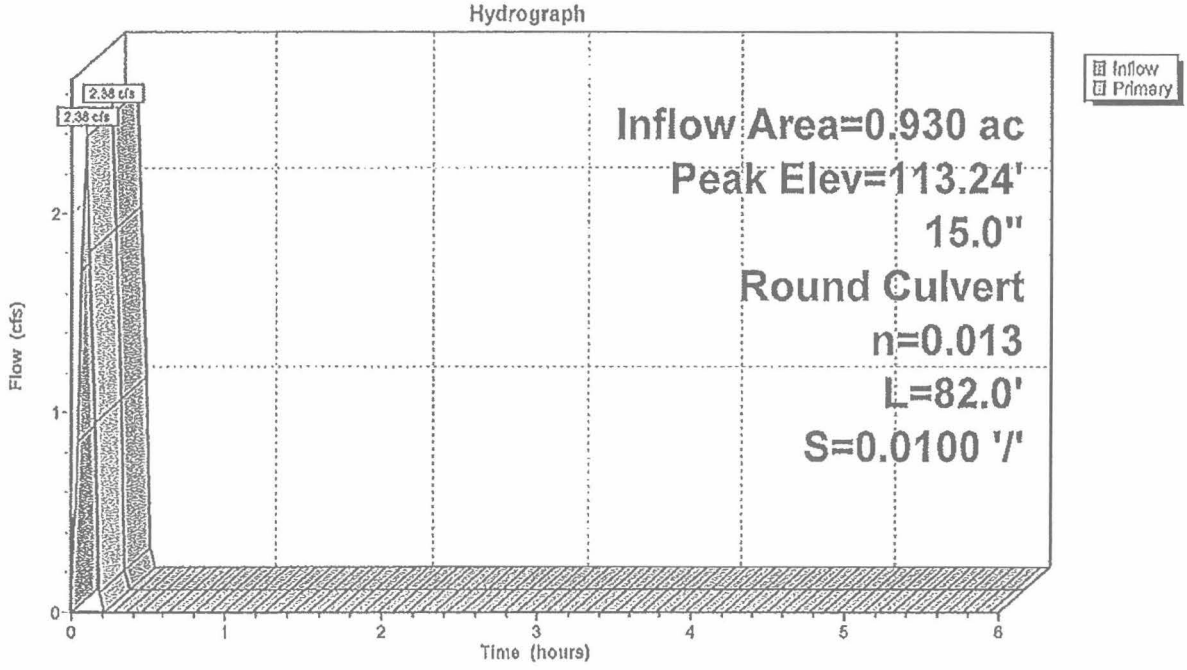
Inflow Area = 0.930 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2-Year event
Inflow = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af
Outflow = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 113.24' @ 0.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	112.50'	**15.0" Round Culvert** L= 82.0' Ke= 0.100 Outlet Invert= 111.68' S= 0.0100 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.36 cfs @ 0.09 hrs HW=113.24' (Free Discharge)
└1=Culvert (Barrel Controls 2.36 cfs @ 4.48 fps)

Pond PR-CULVERT: Proposed Culvert



Summary for Subcatchment DA-3 POST CULVERT: DA-3 POST

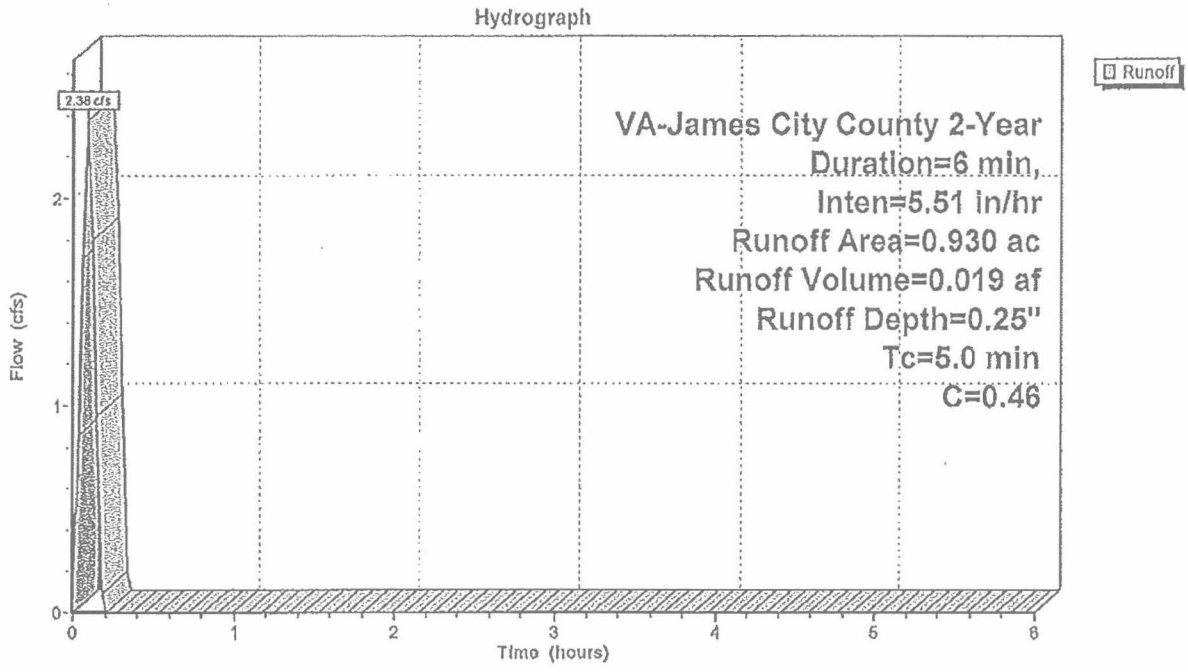
Runoff = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af, Depth= 0.25"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 2-Year Duration=6 min, Inten=5.51 in/hr

Area (ac)	C	Description
0.746	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.930	0.46	Weighted Average
0.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST CULVERT: DA-3 POST



10-YEAR STORM

Summary for Pond PR-CULVERT: Proposed Culvert

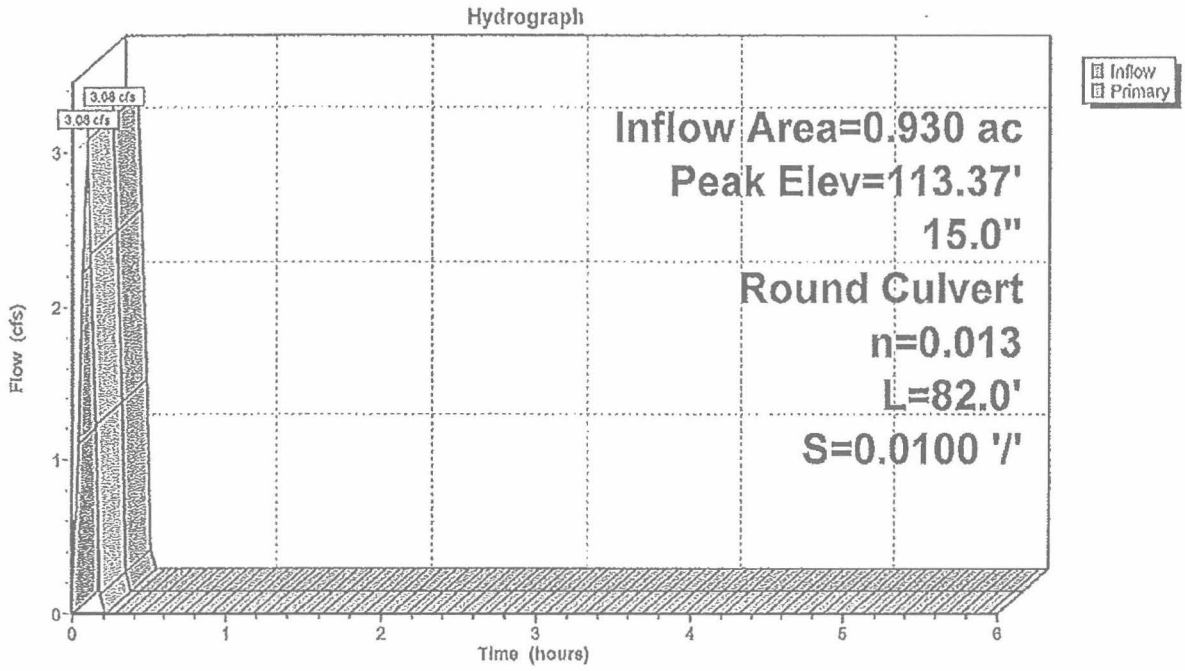
Inflow Area = 0.930 ac, 0.00% Impervious, Inflow Depth = 0.32" for 10-Year event
Inflow = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af
Outflow = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Primary = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 113.37' @ 0.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	112.50'	**15.0" Round Culvert** L= 82.0' Ke= 0.100 Outlet Invert= 111.68' S= 0.0100 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.05 cfs @ 0.09 hrs HW=113.36' (Free Discharge)
↑—1=Culvert (Barrel Controls 3.05 cfs @ 4.75 fps)

Pond PR-CULVERT: Proposed Culvert



Summary for Subcatchment DA-3 POST CULVERT: DA-3 POST

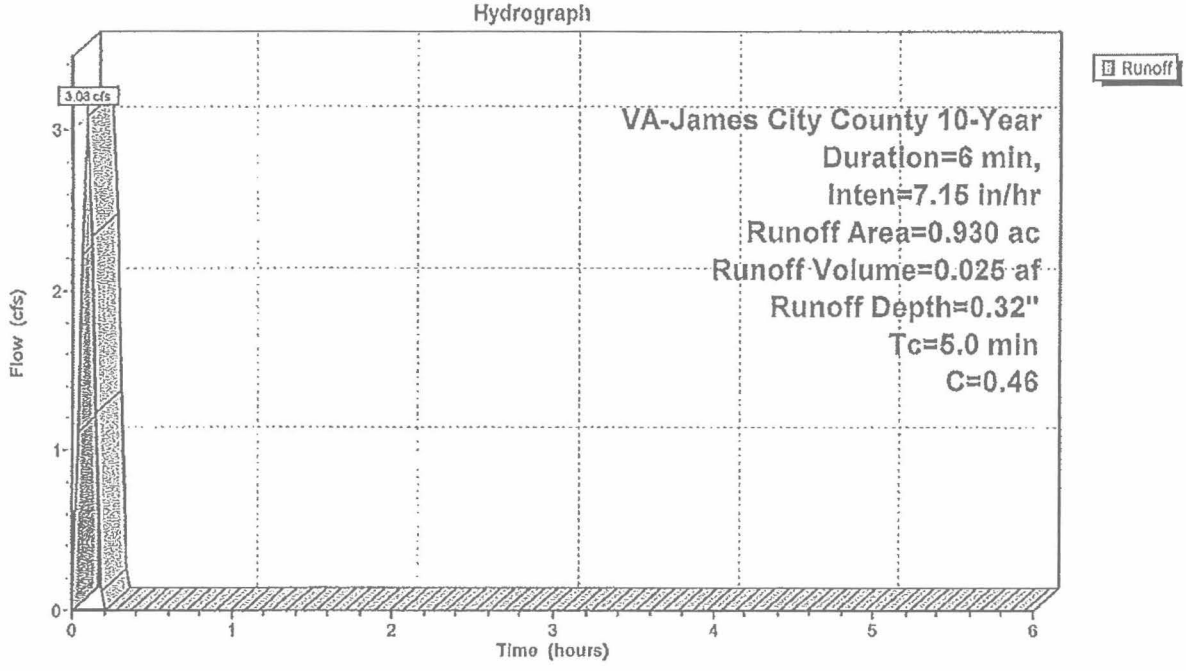
Runoff = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 10-Year Duration=6 min, Inten=7.15 in/hr

Area (ac)	C	Description
0.746	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.930	0.46	Weighted Average
0.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST CULVERT: DA-3 POST



25-YEAR STORM

Summary for Pond PR-CULVERT: Proposed Culvert

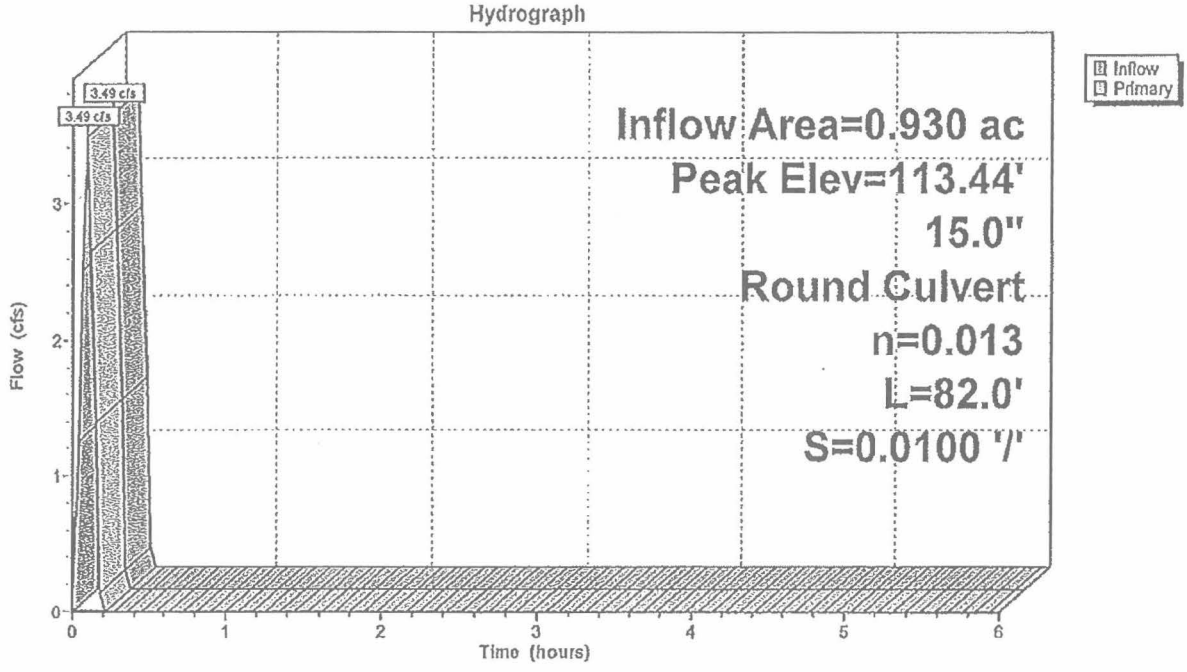
Inflow Area = 0.930 ac, 0.00% Impervious, Inflow Depth = 0.37" for 25-Year event
Inflow = 3.49 cfs @ 0.09 hrs, Volume= 0.028 af
Outflow = 3.49 cfs @ 0.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Primary = 3.49 cfs @ 0.09 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 113.44' @ 0.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	112.50'	**15.0" Round Culvert** L= 82.0' Ke= 0.100 Outlet Invert= 111.68' S= 0.0100 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.46 cfs @ 0.09 hrs HW=113.43' (Free Discharge)
↑—1=Culvert (Barrel Controls 3.46 cfs @ 4.88 fps)

Pond PR-CULVERT: Proposed Culvert



Summary for Subcatchment DA-3 POST CULVERT: DA-3 POST

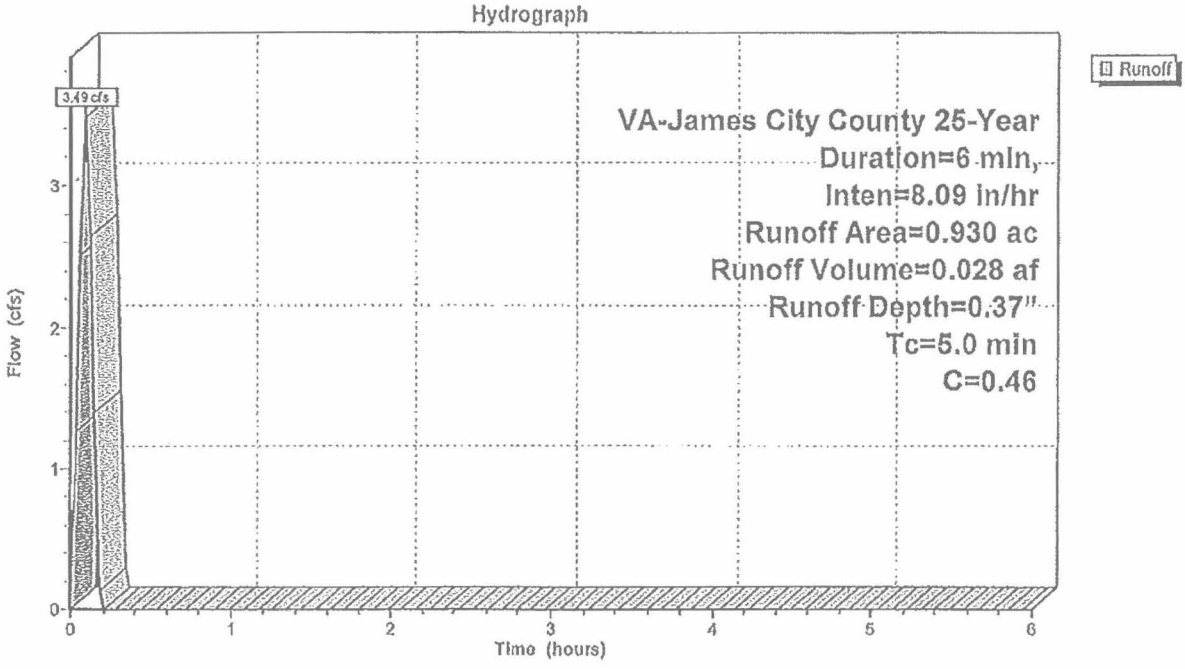
Runoff = 3.49 cfs @ 0.09 hrs, Volume= 0.028 af, Depth= 0.37"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs
VA-James City County 25-Year Duration=6 min, Inten=8.09 in/hr

Area (ac)	C	Description
0.746	0.35	Proposed Lawn
0.005	0.30	Proposed Woods
0.179	0.90	Proposed Impervious Area
0.930	0.46	Weighted Average
0.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry, Direct Input

Subcatchment DA-3 POST CULVERT: DA-3 POST



EMERGENCY SPILLWAY SLOPE PROTECTION CALCULATIONS

Summary for Pond Infiltration Basin: Infiltration Basin

Inflow Area = 2.205 ac, 0.00% Impervious, Inflow Depth = 1.97" for 100-Year event
Inflow = 3.50 cfs @ 1.25 hrs, Volume= 0.361 af
Outflow = 3.35 cfs @ 1.26 hrs, Volume= 0.220 af, Atten= 4%, Lag= 0.4 min
Primary = 0.32 cfs @ 1.26 hrs, Volume= 0.169 af
Secondary = 3.03 cfs @ 1.26 hrs, Volume= 0.051 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Peak Elev= 98.96' @ 1.26 hrs Surf.Area= 4,524 sf Storage= 12,906 cf

Plug-Flow detention time= 171.4 min calculated for 0.220 af (61% of inflow)
Center-of-Mass det. time= 157.0 min (198.2 - 41.2)

Volume	Invert	Avail.Storage	Storage Description
#1	94.00'	18,156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

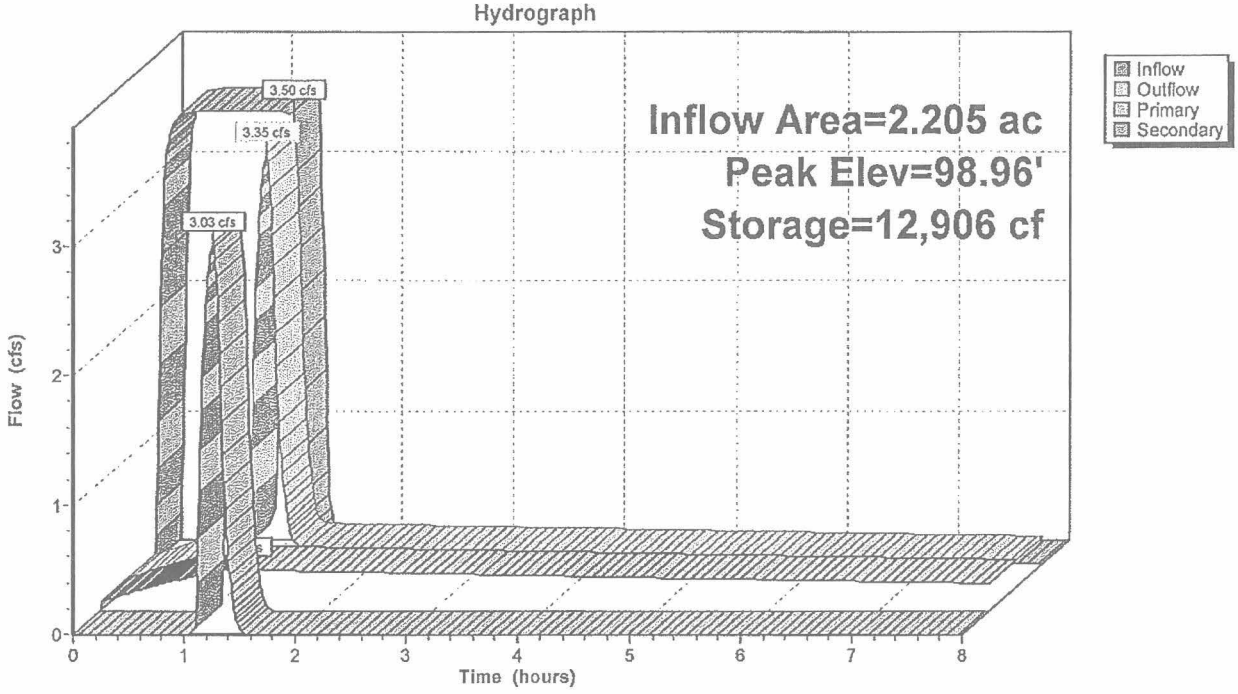
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
94.00	1,102	148.0	0	0	1,102
95.00	1,581	167.0	1,334	1,334	1,604
96.00	2,174	195.0	1,870	3,204	2,430
97.00	2,877	225.0	2,517	5,721	3,455
98.00	3,675	256.0	3,268	8,989	4,665
99.00	4,564	254.0	4,111	13,101	4,933
100.00	5,564	321.0	5,056	18,156	8,012

Device	Routing	Invert	Outlet Devices
#1	Primary	94.00'	**3.070 in/hr Exfiltration Half of the average 6.14 inch/hr over Surface area**
#2	Secondary	98.80'	**20.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.32 cfs @ 1.26 hrs HW=98.96' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration Half of the average 6.14 inch/hr** (Exfiltration Controls 0.32 cfs)

Secondary OutFlow Max=3.02 cfs @ 1.26 hrs HW=98.96' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.02 cfs @ 0.96 fps)

Pond Infiltration Basin: Infiltration Basin



Slope Flow 100-Year Storm on 3:1 Slope
Worksheet for Trapezoidal Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power equipment\calculations\slopefl.fm2
Worksheet	Slope Flow 100-year storm 3:1
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.333330	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	20.00	ft
Discharge	3.03	cfs

Results		
Depth	0.06	ft
Flow Area	1.18	ft²
Wetted Perimeter	20.37	ft
Top Width	20.35	ft
Critical Depth	0.09	ft
Critical Slope	0.082103	ft/ft
Velocity	2.57	ft/s
Velocity Head	0.10	ft
Specific Energy	0.16	ft
Froude Number	1.88	
Flow is supercritical.		

< 10 ft/s ALLOWABLE FOR EC-3 MATTING

Slope Flow
Worksheet for Trapezoidal Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power equipment\calculations\slopefl.fm2
Worksheet	Slope Flow 100-year storm
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.043000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	25.00	ft
Discharge	3.03	cfs

Results		
Depth	0.09	ft
Flow Area	2.39	ft²
Wetted Perimeter	25.60	ft
Top Width	25.57	ft
Critical Depth	0.08	ft
Critical Slope	0.086096	ft/ft
Velocity	1.27	ft/s
Velocity Head	0.02	ft
Specific Energy	0.12	ft
Froude Number	0.73	
Flow is subcritical.		

TREATMENT -2 SOIL STABILIZATION MATTING HAS BEEN PROVIDED TO STABILIZED EMERGENCY SPILLWAY SLOPE

EC3 TREATMENT ALLOWABLE VELOCITY 10 f.p.s > 1.27 f.p.s. ok

GRAVEL FILTER STRIP DOWNSTREAM SLOPE PROTECTION CALCULATIONS

Summary for Pond GFS: Gravel Filter Strip

Inflow Area = 0.913 ac, 0.00% Impervious, Inflow Depth = 0.76" for 100-Year event
Inflow = 4.66 cfs @ 0.09 hrs, Volume= 0.058 af
Outflow = 5.74 cfs @ 0.14 hrs, Volume= 0.058 af, Atten= 0%, Lag= 3.0 min
Primary = 3.23 cfs @ 0.14 hrs, Volume= 0.054 af
Secondary = 2.51 cfs @ 0.14 hrs, Volume= 0.004 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-8.00 hrs, dt= 0.01 hrs
Starting Elev= 107.00' Surf.Area= 435 sf Storage= 435 cf
Peak Elev= 111.03' @ 0.14 hrs Surf.Area= 435 sf Storage= 1,136 cf (701 cf above start)

Plug-Flow detention time= 5.1 min calculated for 0.048 af (83% of inflow)
Center-of-Mass det. time= 3.1 min (10.1 - 7.0)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	1,218 cf	**Custom Stage Data (Irregular)** Listed below (Recalc) 3,045 cf Overall x 40.0% Voids

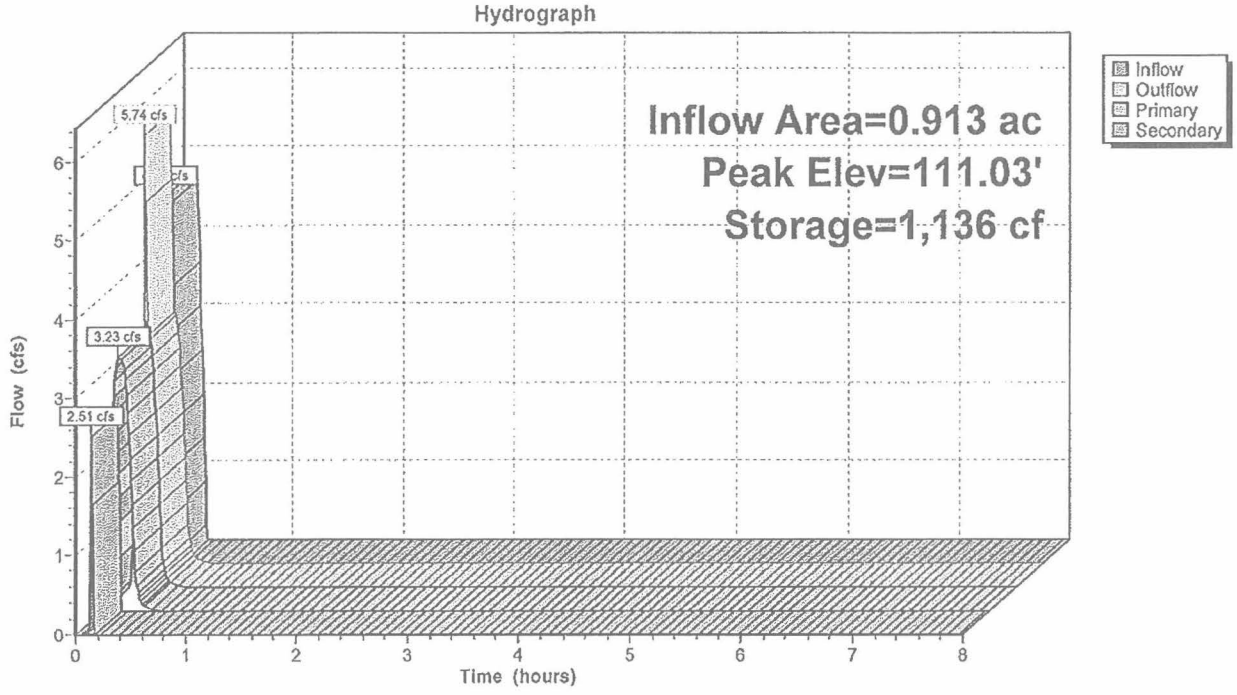
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
104.50	435	432.0	0	0	435
111.00	435	432.0	2,828	2,828	3,243
111.50	435	432.0	218	3,045	3,459

Device	Routing	Invert	Outlet Devices
#1	Primary	94.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	94.08'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Outlet Invert= 94.00' S= 0.0053 '/' Cc= 0.900 n= 0.011
#3	Device 2	103.95'	**8.0" Round Culvert** L= 31.0' Ke= 0.500 Outlet Invert= 94.08' S= 0.3184 '/' Cc= 0.900 n= 0.011
#4	Device 3	104.00'	**8.0" Round Culvert** L= 10.0' Ke= 0.500 Outlet Invert= 103.95' S= 0.0050 '/' Cc= 0.900 n= 0.011
#5	Device 4	107.00'	**8.0" Round Culvert** L= 8.0' Ke= 0.500 Outlet Invert= 104.00' S= 0.3750 '/' Cc= 0.900 n= 0.011
#6	Secondary	111.00'	**225.0' long x 5.0' breadth Broad-Crested Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.23 cfs @ 0.14 hrs HW=111.03' TW=95.66' (Dynamic Tailwater)
- **1=Orifice/Grate** (Passes 3.23 cfs of 59.30 cfs potential flow)
  - **2=Culvert** (Passes 3.23 cfs of 6.59 cfs potential flow)
    - **3=Culvert** (Passes 3.23 cfs of 4.37 cfs potential flow)
      - **4=Culvert** (Passes 3.23 cfs of 4.35 cfs potential flow)
        - **5=Culvert** (Inlet Controls 3.23 cfs @ 9.26 fps)

Secondary OutFlow Max=2.39 cfs @ 0.14 hrs HW=111.03' TW=95.67' (Dynamic Tailwater)
- **6=Broad-Crested Weir** (Weir Controls 2.39 cfs @ 0.39 fps)

Pond GFS: Gravel Filter Strip



Gravel Filter Strip Downstream Slope
Worksheet for Trapezoidal Channel

Project Description	
Project File	untitled.fm2
Worksheet	Gravel Filter Strip Downstream Slope
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	EC-3 MATTING
Channel Slope	0.333333	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	225.00	ft
Discharge	2.51	cfs

Results		
Depth	0.01	ft
Flow Area	2.75	ft²
Wetted Perimeter	225.08	ft
Top Width	225.07	ft
Critical Depth	0.02	ft
Critical Slope	0.145367	ft/ft
Velocity	0.91	ft/s
Velocity Head	0.01	ft
Specific Energy	0.03	ft
Froude Number	1.45	
Flow is supercritical.		

0.91 ft/s < 10 ft/s ALLOWABLE FOR EC-3 MATTING

GRASS SWALE CALCULATIONS

Subject DITCH
DA CALCULATIONS
Computed P.S. Checked

LANDMARK DESIGN GROUP

Project # 2007190-000.00
Client NICA'S LAWN EQUIPMENT
Date 10/20/09 Sheet #

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

D-1 = 0.28Ac C= 0.46

PERVIOUS = 0.225Ac
IMPERVIOUS = 0.055Ac

D-2 = 0.29Ac C= 0.57

PERVIOUS = 0.173Ac
IMPERVIOUS = 0.117Ac

D-3 = 0.08Ac C=0.35

D-4 = 0.27Ac C=0.35

D-5 = 0.03Ac C=0.35

D-6 = 0.04Ac C=0.35

Subject DITCH WQ CALCULATIONS
Computed P.S. Checked

LANDMARK DESIGN GROUP

Project # 2007-1910-000.00
Client NICKS LAWN EQUIPMENT
Date 10/20/09 Sheet #

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

TOTAL DA TO DITCH = 1.0Ac

TOTAL IMP AREA TO DITCH = 0.172Ac (17.2%)

$2 \times \frac{0.5}{12} \times 0.172Ac \times 43560ft^2 = 624ft^3$

MINIMUM 10% PRETREATMENT REQUIRED

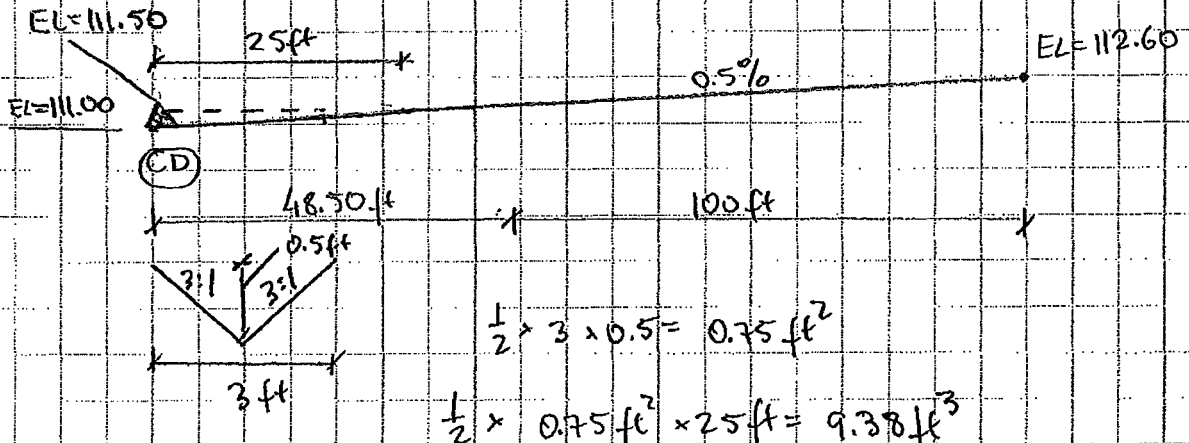
$10\% \times 624ft^3 = 62.4ft^3$

PRETREATMENT VOLUME PROVIDED

— 1200 GALLON IRRIGATION TANK

$1200 \text{ GALLONS} / 7 ft^3/\text{gallon} = 171.5ft^3$

— PERMANENT CHECK DAM



$\frac{1}{2} \times 3 \times 0.5 = 0.75ft^2$

$\frac{1}{2} \times 0.75ft^2 \times 25ft = 9.38ft^3$

TOTAL WQ VOLUME PROVIDED

$171.5ft^3 + 9.38ft^3 = 180.9ft^3$ (29%)

VDOT DITCH DESIGN FORM

Appendix 7B-1 LD-268 Roadside and Median Ditch Design Form

LD-268

SLOPE:	3	TO	1

PROJECT: Nick's Lawn Equipment
BY: PS
DATE: October-09
SHEET: 1 OF 1

____ LANE
R SIDE

STA.	TO STA.	FLOW	0.9 WS	0.9 CA	0.5 WS	0.5 CA	0.3 WS	0.3 CA	C A INCR.	C A ACC.	Tc	I_2	Q_2	C or F	Slope Ft/Ft	Allow VEL.	EARTH n=0.03 VEL	PROTECTIVE LINING n=0.05 Qn	n=0.05 VEL	n=0.05 DEP	n=0.015 Qn	n=0.015 DEP	I_{10}	Q_{10}	DEP	REMARKS
00+00.00	00+50.00	⇓	0.055	0.050	0.000	0.000	0.225	0.068	0.117	0.117	5.00	5.78	0.677		0.005				0.83	0.52			7.50	0.877	0.58	OK
00+50.00	01+15.15	⇓	0.117	0.105	0.000	0.000	0.173	0.052	0.157	0.274	6.00	5.51	1.512		0.005				1.01	0.71			7.15	1.959	0.78	OK
01+15.15	01+63.71	⇓	0.000	0.000	0.000	0.000	0.080	0.024	0.024	0.298	7.08	5.25	1.566		0.020				1.72	0.55			6.81	2.031	0.61	OK
01+63.71	01+81.65	⇓	0.000	0.000	0.000	0.000	0.270	0.081	0.081	0.379	7.55	5.15	1.951		0.280				4.88	0.36			6.67	2.531	0.40	OK
01+81.65	02+31.65	⇓	0.000	0.000	0.000	0.000	0.030	0.009	0.009	0.388	7.61	5.13	1.992		0.070				2.92	0.48			6.66	2.584	0.53	OK
02+31.65	02+92.95	⇓	0.000	0.000	0.000	0.000	0.040	0.012	0.012	0.400	7.90	5.07	2.029		0.070				2.93	0.48			6.58	2.633	0.53	OK

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	00+00.00 TO 00+50.00 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	0.68	cfs

Results		
Depth	0.52	ft
Flow Area	0.82	ft^2
Wetted Perimeter	3.30	ft
Top Width	3.13	ft
Critical Depth	0.32	ft
Critical Slope	0.072261	ft/ft
Velocity	0.83	ft/s
Velocity Head	0.01	ft
Specific Energy	0.53	ft
Froude Number	0.29	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	00+00.00 TO 00+50.00 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	0.88	cfs

Results		
Depth	0.58	ft
Flow Area	0.99	ft^2
Wetted Perimeter	3.64	ft
Top Width	3.45	ft
Critical Depth	0.35	ft
Critical Slope	0.069810	ft/ft
Velocity	0.88	ft/s
Velocity Head	0.01	ft
Specific Energy	0.59	ft
Froude Number	0.29	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	00+50.00 TO 01+15.15 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.51	cfs

Results		
Depth	0.71	ft
Flow Area	1.49	ft^2
Wetted Perimeter	4.46	ft
Top Width	4.23	ft
Critical Depth	0.44	ft
Critical Slope	0.064921	ft/ft
Velocity	1.01	ft/s
Velocity Head	0.02	ft
Specific Energy	0.72	ft
Froude Number	0.30	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	00+50.00 TO 01+15.15 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.96	cfs

Results		
Depth	0.78	ft
Flow Area	1.81	ft^2
Wetted Perimeter	4.92	ft
Top Width	4.66	ft
Critical Depth	0.48	ft
Critical Slope	0.062724	ft/ft
Velocity	1.08	ft/s
Velocity Head	0.02	ft
Specific Energy	0.80	ft
Froude Number	0.31	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+15.15 TO 01+63.71 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.020000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.57	cfs

Results		
Depth	0.55	ft
Flow Area	0.91	ft²
Wetted Perimeter	3.49	ft
Top Width	3.31	ft
Critical Depth	0.44	ft
Critical Slope	0.064624	ft/ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Specific Energy	0.60	ft
Froude Number	0.58	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+15.15 TO 01+63.71 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.020000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	2.03	cfs

Results		
Depth	0.61	ft
Flow Area	1.11	ft^2
Wetted Perimeter	3.84	ft
Top Width	3.65	ft
Critical Depth	0.49	ft
Critical Slope	0.062416	ft/ft
Velocity	1.83	ft/s
Velocity Head	0.05	ft
Specific Energy	0.66	ft
Froude Number	0.59	
Flow is subcritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+63.71 TO 01+81.65 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.280000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.95	cfs

Results		
Depth	0.36	ft
Flow Area	0.40	ft^2
Wetted Perimeter	2.31	ft
Top Width	2.19	ft
Critical Depth	0.48	ft
Critical Slope	0.062759	ft/ft
Velocity	4.88	ft/s
Velocity Head	0.37	ft
Specific Energy	0.74	ft
Froude Number	2.02	
Flow is supercritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+63.71 TO 01+81.65 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.280000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	2.50	cfs

Results		
Depth	0.40	ft
Flow Area	0.48	ft^2
Wetted Perimeter	2.53	ft
Top Width	2.40	ft
Critical Depth	0.53	ft
Critical Slope	0.060721	ft/ft
Velocity	5.19	ft/s
Velocity Head	0.42	ft
Specific Energy	0.82	ft
Froude Number	2.05	
Flow is supercritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+81.65 TO 02+31.65 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.070000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.99	cfs

Results		
Depth	0.48	ft
Flow Area	0.68	ft^2
Wetted Perimeter	3.02	ft
Top Width	2.86	ft
Critical Depth	0.49	ft
Critical Slope	0.062578	ft/ft
Velocity	2.92	ft/s
Velocity Head	0.13	ft
Specific Energy	0.61	ft
Froude Number	1.05	
Flow is supercritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	01+81.65 TO 02+31.65 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.070000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	2.58	cfs

Results		
Depth	0.53	ft
Flow Area	0.83	ft^2
Wetted Perimeter	3.33	ft
Top Width	3.15	ft
Critical Depth	0.54	ft
Critical Slope	0.060445	ft/ft
Velocity	3.12	ft/s
Velocity Head	0.15	ft
Specific Energy	0.68	ft
Froude Number	1.07	
Flow is supercritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	02+31.65 TO 02+92.95 2 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.070000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	2.03	cfs

Results		
Depth	0.48	ft
Flow Area	0.69	ft^2
Wetted Perimeter	3.04	ft
Top Width	2.88	ft
Critical Depth	0.49	ft
Critical Slope	0.062425	ft/ft
Velocity	2.93	ft/s
Velocity Head	0.13	ft
Specific Energy	0.61	ft
Froude Number	1.06	
Flow is supercritical.		

Grass Swale Calculations
Worksheet for Triangular Channel

Project Description	
Project File	k:\l&m\projects\2007190-000.00 nicks outdoor power
Worksheet	02+31.65 TO 02+92.95 10 YEAR
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.050	
Channel Slope	0.070000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	2.60	cfs

Results		
Depth	0.53	ft
Flow Area	0.83	ft^2
Wetted Perimeter	3.33	ft
Top Width	3.16	ft
Critical Depth	0.54	ft
Critical Slope	0.060402	ft/ft
Velocity	3.12	ft/s
Velocity Head	0.15	ft
Specific Energy	0.68	ft
Froude Number	1.07	
Flow is supercritical.		

UNDERDRAIN CALCULATIONS

Subject UNDERDRAIN PERFORATIONS CALCULATION

Computed P.S Checked

LANDMARK DESIGN GROUP

Project # 2007190-000.00

Client

Date Sheet #

Engineers • Planners • Surveyors • Landscape Architects • Environmental Scientists

OUTFALL PIPE FROM GRAVEL FILTER STRIP 8" PVC

$\pi r^2 = \pi \times (4")^2 = 50.3 \text{ inch}^2$ OPEN AREA

UNDERDRAIN PIPE 8" PVC 225 L.F

PROPOSED PERFORATIONS 1/2" ϕ (TYP) 3 IN EACH ROW WITH ROWS SPACED EVERY 12" O.C.

OPEN AREA OF THE PERFORATION

$\pi r^2 = \pi \times (0.25")^2 = 0.196 \text{ inch}^2$

225 L.F / 1.0 ft = 225 ROWS × 3 PERFORATION PER ROW = 675 PERF.

$0.196 \text{ inch}^2 \times 675 \text{ PERF} = 132.3 \text{ inch}^2$

$132 \text{ inch}^2 > 50.3 \text{ inch}^2$

ok

ENTRANCE CULVERT OUTLET PROTECTION CALCULATIONS

Summary for Pond PR-CULVERT: Proposed Culvert

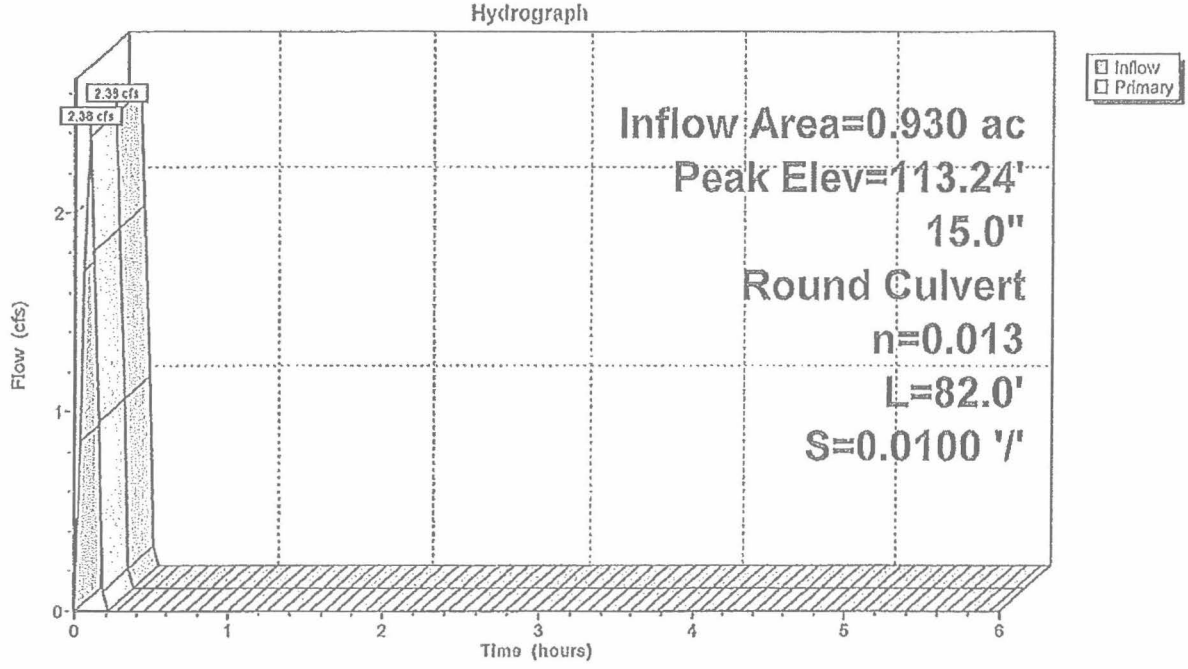
Inflow Area = 0.930 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2-Year event
Inflow = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af
Outflow = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 2.38 cfs @ 0.09 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 113.24' @ 0.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	112.50'	**15.0" Round Culvert** L= 82.0' Ke= 0.100 Outlet Invert= 111.68' S= 0.0100 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.36 cfs @ 0.09 hrs HW=113.24' (Free Discharge)
↑—1=**Culvert** (Barrel Controls 2.36 cfs @ 4.48 fps)

Pond PR-CULVERT: Proposed Culvert



DESIGN VELOCITY FOR 2-year STORM 4.48 fps.

EC-2 TREATMENT 1 ALLOWABLE VELOCITY 0-4 fps < 4.48 fps

EC-3 TREATMENT 2 ALLOWABLE VELOCITY 0-10 fps > 4.48 fps. ok

EC-3 TREATMENT -2 MATTING HAS BEEN SPECIFIED.

Summary for Pond PR-CULVERT: Proposed Culvert

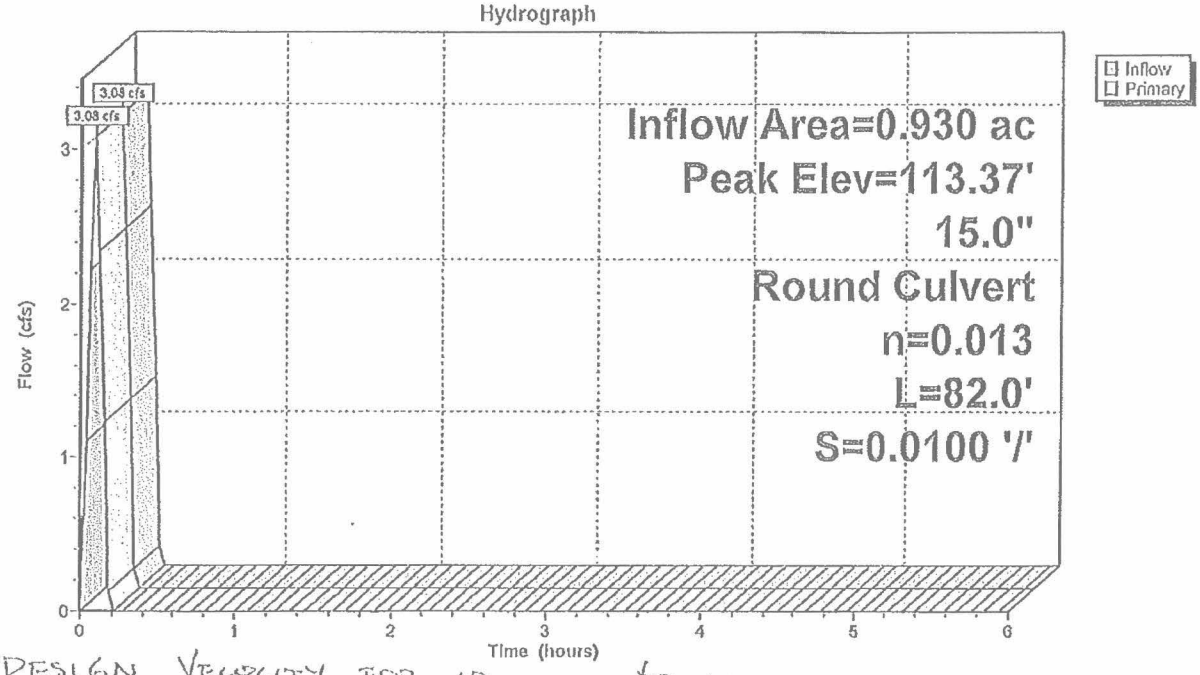
Inflow Area = 0.930 ac, 0.00% Impervious, Inflow Depth = 0.32" for 10-Year event
Inflow = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af
Outflow = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Primary = 3.08 cfs @ 0.09 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-6.00 hrs, dt= 0.03 hrs / 3
Peak Elev= 113.37' @ 0.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	112.50'	15.0" Round Culvert L= 82.0' Ke= 0.100 Outlet Invert= 111.68' S= 0.0100 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.05 cfs @ 0.09 hrs HW=113.36' (Free Discharge)
↑–1=Culvert (Barrel Controls 3.05 cfs @ 4.75 fps)

Pond PR-CULVERT: Proposed Culvert



DESIGN VELOCITY FOR 10-year storm
EC-2 TREATMENT-1 ALLOWABLE VELOCITY 0-4 f.p.s < 4.75 f.p.s.
EC-3 TREATMENT-2 ALLOWABLE VELOCITY 0-10 f.p.s > 4.75 f.p.s.
OK

EC-3 TREATMENT-2 MATTING HAS BEEN SPECIFIED

WATER METER SIZING CALCULATIONS

Nick' Lawn Equipment
Project # 2007190-000.00
Date: August 21, 2009
Prepared By: LandMark Design Group, Inc.

[a] METER SIZING CALCULATIONS

Fixture	Occupancy	Type of Supply Control	Quantity	Load Values, in Water Supply Fixture Units (WSFU)	Total
Bathroom Group	Private	Flush Tank	0	3.6	0.00
Bathroom Group	Private	Flush Valve	0	8.0	0.00
Bathtub	Private	Faucet	0	1.4	0.00
Bathtub	Public	Faucet	0	4.0	0.00
Bidet	Private	Faucet	0	2.0	0.00
Combination Fixture	Private	Faucet	0	3.0	0.00
Dishwashing Machine	Private	Automatic	0	1.4	0.00
Ice Maker / Water Fountain	Offices, etc.	3/8" Valve	3	0.25	0.75
Kitchen Sink	Private	Faucet	0	1.4	0.00
Kitchen Sink	Hotel, Restaurant	Faucet	0	4.0	0.00
Laundry Trays (1 to 3)	Private	Faucet	0	1.4	0.00
Lavatory	Private	Faucet	0	0.7	0.00
Lavatory	Public	Faucet	3	2.0	6.00
Service Sink	Offices, etc.	Faucet	0	3.0	0.00
Shower Head	Public	Mixing Valve	0	4.0	0.00
Shower Head	Private	Mixing Valve	0	1.4	0.00
Urinal	Public	1" Flush Valve	0	10.0	0.00
Urinal	Public	3/4" Flush Valve	0	5.0	0.00
Urinal	Public	Flush Tank	0	3.0	0.00
Washing Machine 8 lbs	Private	Automatic	0	1.4	0.00
Washing Machine 8 lbs	Public	Automatic	0	3.0	0.00
Washing Machine 15 lbs	Public	Automatic	0	4.0	0.00
Water Closet	Private	Flush Valve	0	6.0	0.00
Water Closet	Private	Flush Tank	0	2.2	0.00
Water Closet	Public	Flush Valve	0	10.0	0.00
Water Closet	Public	Flush Tank	3	5.0	15.00
Water Closet	Public or Private	Flushometer Tank	0	2.0	0.00
Hose Bib 1/2"	Public or Private	1/2 " Valve	3	3.0	9.00
Wall Hydrant 3/4"	Public or Private	3/4" Valve	0	3.0	0.00
Table E101B 2000 IPC			Total		30.75

[a] Reference Table E103.3(2), Load Values Assigned to Fixtures, 2003 International Plumbing Code , page 118

[b] Reference Table E103.3(3), Table For Estimating Demand, 2003 International Plumbing Code, Appendix E, Page 119

[b] Table for Estimating Demand	
WSFU	Demand gpm
30	23.3
30.75	23.54
35	24.9

A 3/4-inch meter in accordance with TABLE 6-1 *AWWA Meter Standards,* 2004 AWWA M22 Sizing Water Service Lines and Meters is adequate.

Nick' Lawn Equipment
Project # 2007190-000.00
Date: August 21, 2009
Prepared By: LandMark Design Group, Inc.

SINGLE DOMESTIC WATERLINE CALCULATIONS

Requirements:
* Velocity = $(Q)(0.4085)/(d^2)$
* Headloss = $0.002083*L*((100/C)^{1.85})*(gpm^{1.85}/d^{4.8655})$

Pipe Diameter	=	2.0	in				
Peak Flow (Q)	=	23.54	gpm	(Meter Sizing Calcs)			
Velocity	=	2.40	ft/sec	OK			
C Factor	=	130					
Pressure @ Main	=	57	psi	(Estimated)			
Elevation @ Main	=	110	ft				
Elevation @ Meter	=	114	ft				
Distance from connection to building	=	200	ft				
Static Headloss	=	-4	ft	=	-1.73	psi	
Friction Headloss	=	-3	ft	=	-1.31	psi	
Head Loss thru Meter	=	-10	psi				
Available Pressure after Meter	=	43.95	psi	OK			

FIRE FLOW CALCULATIONS

Guide Sheet For Determining Fire Flow Requirements

Project Title:	*Nick's Outdoor Power Equipment*			Plan #	
Calculated By:	cbn			Date:	
Building / Units Used for Fire Flow:	Sales / Shop				
Construction Type:		Height:		ft	Stories: 1
Occupancy:					
Use Class:		Hazard Class:			
Fire Walls Present:	Yes		No		Unknown X

	Area # 1		Area # 2
A. Ground Floor Area:	7,500	sq-ft	0
B. Number of Stories Used:	1		0
C. Total Floor Area:	7,500	sqft	0
D. Adjusted Floor Area:	7,500	sqft	Sum of Areas

E. Fire Flow from *Table B.*: 1,500 gpm

F. Occupancy Factor from *Table C.*: = 20% X E

= 300 gpm

G. SubTotal: 300 gpm

H. Sprinkler Factor from *Table D.*: = 0% X G

= 0 gpm

I. SubTotal: 0 gpm

J. Exposure Factor from *Table E.*:

North	150	ft	Add	0%
South	150	ft	Add	0%
East	150	ft	Add	0%
West	150	ft	Add	0%

Total % 0% X I = 0

K. SubTotal: 1,800

Fire Flow Adjustments: 1,800 gpm

ISO Comparison Calculation: $F = 18\ C\ (A^{0.5})$ + 0%

C = 0.8 F = 1,247 gpm

GRINDER PUMP CALCULATIONS

JAMES CITY SERVICE AUTHORITY
101-E Mounts Bay Road, P.O. Box 8784, Williamsburg, Virginia 23187-8784
Phone: (757) 253-6805 Fax: (757) 253-6850
E-mail: jcsa@james-city.va.us Website: www.jccEgov.com/jcsa

October 16, 2009

James W. Brawley, P.E.
Landmark Design Group
4029 Ironbound Road
Williamsburg, VA 23188

Re: Flow Acceptance Letter for the Nick's Lawn Equipment PS/FM, Project SP-0074-2009, Latest revision date August 24, 2009.

Dear Mr. Brawley,
This letter pertains to the Nick's Lawn Equipment PS/FM Project planned located in James City County. Plans and engineering calculations were submitted by Landmark Design Group for review by the James City Service Authority (JCSA) related to provision of sanitary sewer service. This project meets the requirements for a short form Flow Acceptance Letter. The JCSA has reached the following conclusions regarding this application for sanitary sewer service:

- Based on these plans, calculations and estimates of sewage flow rates, the JCSA accepts the flow into our sanitary sewer system for conveyance to HRSD for transmission and treatment. This application is for an average daily flow of 2,480 gallons per day and a peak daily flow of 7,440 gallons per day.
- This two (2) new E-ONE GRINDER pump has a designed operating point of 11.5 gpm @ 85 feet TDH.
- As shown on the submitted plans, the proposed grinder pump station discharges into a proposed private 43' force main then into a proposed 350' – 1 ½" JCSA force main which goes into an existing JCSA 12" force main for approx. 4300' that discharges into a 20" HRSD force main at the intersection of Richmond Road and Rochambeau Drive. The grinder pump station and all force mains outside the right-of-way will be privately owned and maintained.
- Based on your certification in the original application, this project has been designed in accordance with the Regional Design Guidelines.
- A Flow Acceptance Letter dated Oct. 15, 2009 has been obtained from HRSD for this project.

This flow acceptance letter is good for a period of five years from the date of issuance provided that the site plan approval for the project is current. If the project has not been constructed and a certificate to operate from VDEQ has not been issued within that time, this flow acceptance will be null and void.

If you have any questions regarding this matter, please do not hesitate to contact us.

Sincerely,

C. L. Pittman

Craig Pittman, P.E.
Senior Engineer
James City Service Authority

CC: file

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Sanitary Sewer Flows

Development Area	Type of Development	Design Units	Flow (gpd/Unit)	Flow Duration (hr)	Design Value	Average Daily Flow (gpm)	[a] Peak Daily Flow (gpm)
Showroom	Retail	Gross Sq Ft	0.20	12	2,000	0.56	1.67
Offices	Office	Gross Sq Ft	0.10	12	400	0.06	0.17
Shop	Service Station	Gross Sq Ft	0.40	12	5,100	2.83	8.50
Total					2,400	3.44	10.33

Average Daily Demand	=	2,480	gpd	=	3.40	gpm

Peak Daily Demand	=	7,440	gpd	=	10.33	gpm

Average Inflow	=	**4.00**	**gpm**
Pumping Rate	=	**11**	**gpm**

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Size Wet Well

Domestic Criteria:

Effective Storage = Average Daily Demand (ADD) x 5 minutes storage

Minimum Flow (MF) in gpm = 1/2 of Average Daily Demand

Average Daily Demand (ADD) = 3.40 gpm

MF = 2 gpm

Effective Storage = ADD x 5 = 17 gallons

Wet Storage Available (SA) = the available water between the Low Water Elevation and the Lead Pump On Elevation.

Volume (gal) = $((PI * D^2)/4))*Depth*7.48\ gal/ft^3$

Table IA: Volume of Various Size Wet Well Diameter Versus Various Depths						
Depth (ft)	Proposed Wet Well Diameter (ft)					
	3.15	4	6	8	10.5	12
0.33	19	31	70	124	214	279

Select						
Description	Diameter (ft)	Depth (ft)	Volume (gal)			
Proposed Domestic Storage	3.15	0.33	19			
Total			19	>	17	gal

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Wet Well Elevations

	Proposed
Rim Elevation:	114.00
Sanitary Sewer Influent Line Elevation:	109.25
Down to high water alarm:	-0.10
High water alarm elevation:	109.15
Down to lead pump on elevation:	-0.67
Lead pump on elevation:	108.48
Wet well storage depth per Table IA	-0.33
Low water level elevation to top of pump (Pump Off):	108.15
Down Pump Dimensions (see attached)	-1.90
Top of Bottom Slab Elevation:	106.25

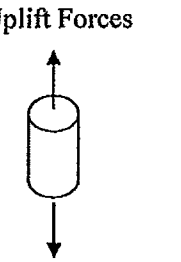
Depth: 7.75 ft

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Floatation Calculations

Floatation will not occur if the weight of the structure is more than the uplift forces.

Weight of Structure > Uplift Forces



Various Structure component weights:

Weight of Concrete W_{C1} =	150.0	lbs/ft^3 (Air)	Weight of No. 57 Stone W_S =	110.0	lbs/ft^3
Weight of Concrete W_{C2} =	150.0	lbs/ft^3 (H_2O)	Weight of Dry Backfill B_D =	110.0	lbs/ft^4
Weight of Water W_W =	62.4	lbs/ft^4	Weight of Wet Backfill B_W =	70.0	lbs/ft^5

Volume of Station:	22.00	ft^3	Tank Diameter D_{ID}:	37.8	in
Tank Weight:	470	lbs	Station Height:	93.5	in
Tank Diameter D_{OD}:	38.8	in			

Uplift Forces = (Density of Water)(Volume of Station)

= 1372.8 lbs

Check Flotation

Weight of the structure > Uplift Forces 470 < 1,373

Structure will Float

Determine Volume of Concrete:

Area = (Height)(Width)/2 Height = 8 in Width = 48 in

= 192 in^2

Volume= (Area)(Perimeter of Cyclinder)(1 ft^3/1728 in^3)

= 15.14 ft^3

Determine Volume of Wet Backfill

Area = (Height)(D_{OD} - D_{ID})/2 Height = 86 in Width = 1 in

= 42.75 in^2

Volume= (Area)(Perimeter of Cyclinder)(1 ft^3/1728 in^3)

= 0.04 ft^3

Determine Volume of Dry Backfill

Area = (Height)(D_{OD} - D_{ID})/2 Height = 0 in Width = 1 in

= 0 in^2

Volume= (Area)(Perimeter of Cyclinder)(1 ft^3/1728 in^3)

= 0.00 ft^3

Determine Combined Weight of Ballast:

Total = Concrete + Wet Backfill + Dry Backfill

= ($V_{concrete}$)(density of concrete in water) + (V_{soil})(density of wet backfill) + (V_{soil})(density of dry backfill)

= 2,274 lbs

Weight of the structure > Uplift Force = 2,274 > 1,373

Structure will not Float

Use an extended base structure with compacted soil to resist the uplift forces

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Proposed Force Main Size Selections

Requirements:

* Minimum velocity 2 ft/sec, maximum velocity 8 ft/sec
* Headloss = $0.002083*L*((100/C)^{1.85})*(gpm^{1.85}/d^{4.8655})$
* Velocity = $Q*0.4085/Dia^2$

Q = 11 gpm peak
C = 130

Force Main Size (inches)	Material	Nominal Pipe Diameter (inches)	Inside PVC Pipe Diameter (inches)	Velocity (ft/Sec)	Headloss (ft/100 ft)
1.25	PVC Sch 80	1.25	1.25	2.88	3.66
				OK	High
1.5	**PVC Sch 80**	**1.5**	**1.5**	**2.00**	**1.51**
				LOW	**OK**
2	PVC Sch 80	2	2	1.12	0.37
				LOW	OK

Select 1.50-Inch Force Main

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Force Main Piping

Proposed Piping:

Station Piping		1.25	Equivalent Length	Total Equivalent
Description	Quantity	Unit		Length (ft)
Piping	10	LF	1.00	10
Check valve	1	EA	11.50	11.5
90° bend	1	EA	3.45	3.45
Branch tee	1	EA	6.90	6.9
Flow through tee	1	EA	2.30	2.30
Gate valve	1	EA	0.92	0.92
Total Station Discharge Piping				35

Proposed Piping		1.5	Equivalent Length	Total Equivalent
Description	Quantity	Unit	per Unit (ft) *	Length (ft)
Piping	565	LF	1.00	565
Check valve	0	EA	13.40	0.0
90° bend	1	EA	4.03	4.03
Branch tee	1	EA	8.05	8.1
Flow through tee	0	EA	2.68	0.00
Gate valve	1	EA	1.07	1.07
Total Station Discharge Piping				578

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Existing Richmond Road		12	Equivalent Length	Total Equivalent
Description	Quantity	Unit	per Unit (ft) *	Length (ft)
Piping	5,500	LF	1.00	5,500
Check valve	0	EA	49.70	0.0
90° bend	0	EA	29.80	0.00
45° bend	4	EA	14.90	59.60
Branch tee	1	EA	59.70	59.7
Flow through tee	1	EA	19.90	19.90
Gate valve	1	EA	7.96	7.96
Total Station Discharge Piping				5,647
Existing Flow:	***None***			***0 gpm***

Existing Richmond Road		12	Equivalent Length	Total Equivalent
Description	Quantity	Unit	per Unit (ft) *	Length (ft)
Piping	2,000	LF	1.00	2,000
Check valve	0	EA	49.70	0.0
90° bend	0	EA	29.80	0.00
45° bend	4	EA	14.90	59.60
Branch tee	1	EA	59.70	59.7
Flow through tee	1	EA	19.90	19.90
Gate valve	1	EA	7.96	7.96
Total Station Discharge Piping				2,147
Existing Flow:	***JCSA LS 6-8, Private Grinders***			***619 gpm***

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
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System Head Calculation:

Low Water Elevation in the Pump Station	=	108.15	ft
Highest Point on Proposed Force Main	=	115.00	ft

Static Head = Highest Point on Proposed Force Main - Station Low Water Elevation

Static Head = 115.00 - 108.15 = 6.85 ft

HRSD Interceptor Head Conditions			
Treatment Plant Operating Elevation	=	73.00	ft
Centerline Elevation of Interceptor F.M. (CEI)	=	101.00	ft
Static Head b/t Plant and Interceptor F.M. (H_S)	=	-28.00	ft
HRSD Minimum Night Time Pressure	=	22.00	ft
HRSD Maximum Allowable Pressure	=	65.00	ft
Total Minimum HRSD Pressure @ Connection	=	**22.00**	**ft**
Total Maximum HRSD Pressure @ Connection	=	**65.00**	**ft**

Nick's Outdoor Power Equipment
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Using the Hazen and Williams Formula for calculating Headloss in pipe systems as follows:

$HeadLoss = 0.002083*L*((100/C)^{1.85})*(gpm^{1.85}/d^{4.8655})$

Where:

L = Length of pipe in feet
d = Diameter of the pipe in inches
C = 130

Total Dynamic Head										
Description	Inside Pipe Diameter (inches)	Length (ft)	Exist Flow (gpm)	Proposed Flow (gpm)						
				0	2	4	6	8	10	12	14	16
Station Piping	1.25	35	0	0.00	0.05	0.20	0.42	0.71	1.07	1.51	2.00	2.56
Proposed Piping	1.5	578	0	0.00	0.37	1.34	2.84	4.83	7.30	10.22	13.60	17.41
Existing Richmond	12	5,647	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Existing Richmond	12	2,147	619	2.26	2.27	2.28	2.30	2.31	2.33	2.34	2.35	2.37
Static Head (ft)				6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85
Maximum HRSD				65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00	65.00
Total Dynamic Head @ HRSD				74	75	76	77	80	83	86	90	94
Minimum HRSD				22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00
Total Dynamic Head @ HRSD Min				31	32	33	34	37	40	43	47	51

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
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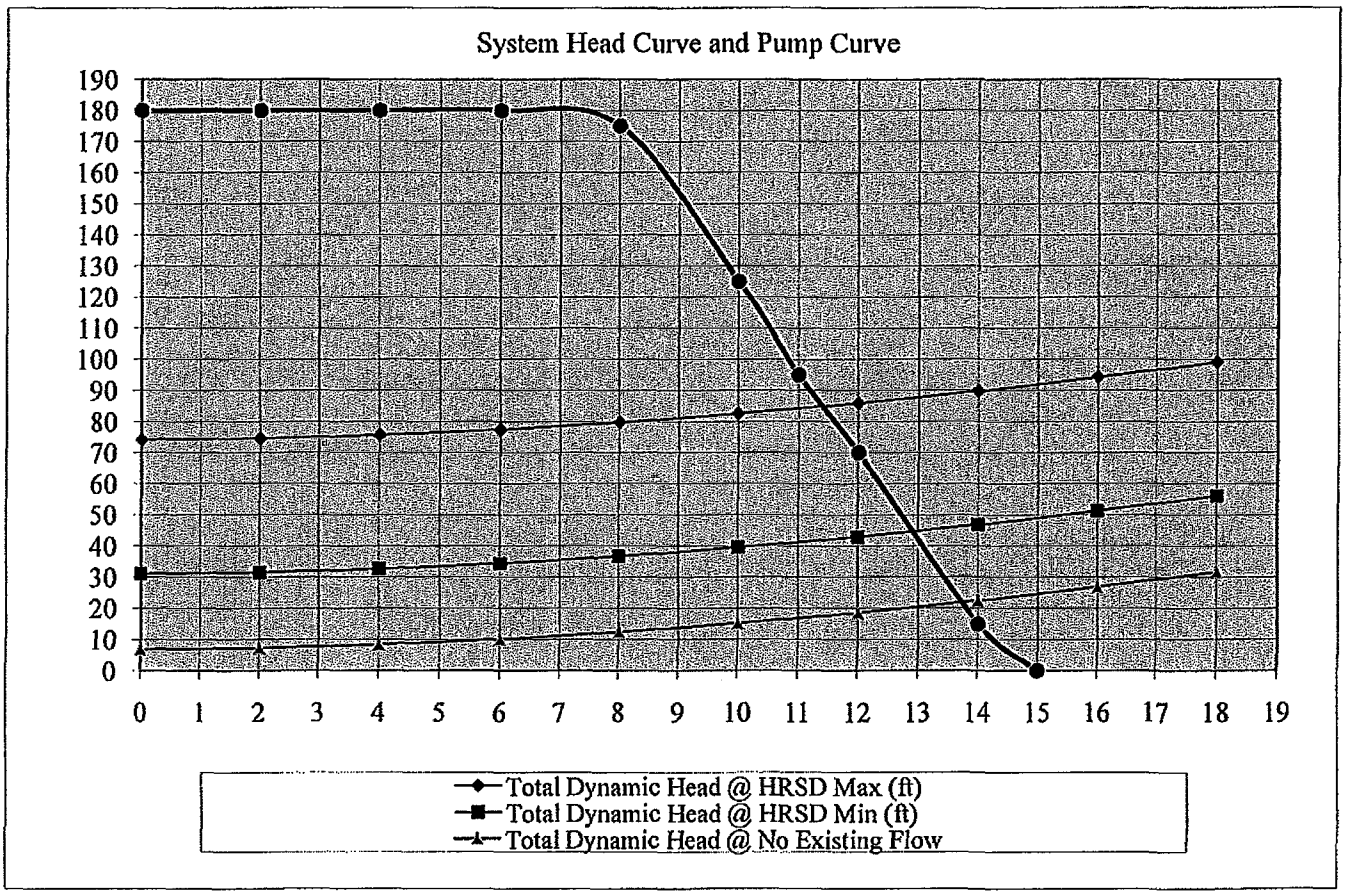
Total Dynamic Head												
Description	Inside Pipe Diameter	Length (ft)	Exist Flow	Proposed Flow (gpm)								
				0	2	4	6	8	10	12	14	16
Station Piping	1.25	35	0	0.00	0.05	0.20	0.42	0.71	1.07	1.51	2.00	2.56
Proposed Piping	1.5	578	0	0.00	0.37	1.34	2.84	4.83	7.30	10.22	13.60	17.41
Existing Richmond	12	5,647	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Existing Richmond	12	2,147	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Static Head (ft)				6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85
Total Dynamic Head @ No				7	7	8	10	12	15	19	22	27

Manufacturer:	Eone		HRSD Max Actual Pumping Rate:			
Manufacturer Model #:	2014					
*Impeller Size:	**Verify**	inch		HRSD Max	HRSD Min	No Flow
Horse Power:	**1**	Hp	GPM:	11.5	13	13.75
RPM:	**1725**	rpm	TDH:	85	39	22
VFD:	NO		RPM:	1,725	1,725	1,725

**** Impeller to be verified by pump manufacturer.***

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.



Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Pump Cycle Time @ HRSD Maximum

Average Gravity Flow:	4	gpm		
Pumping Rate:	11.50	gpm	RPM =	1,725
Lead Pump on Elevation :	108.48	ft		
Low Water Level Elevation:	108.15	ft		
Wet Well Diameter:	3.15	ft		

Fill Time = [(Change in Height)*(Wet Well Surface Area)*(7.48 gal/ft^3)]/(Average Gravity Flow)

Fill Time =	4.81	Minutes

Pump Run Time = $\frac{\text{(Change in Height)*(Wet Well surface Area)*(7.48 gal/ft}^3\text{)}}{\text{(Pumping Rate - Average Gravity Flow)}}$

Pump Run Time =	2.56	Minutes

Cycle Time = Pump Run Time + Fill Time

Cycle Time =	7.37	Minutes @ Average Flow

Number of pump starts per hour = (60 minutes/hour)/(Cycle Time)

Number of pump starts per hour =	8.1	@ Average Flow

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Pump Cycle Time @ HRSD Minimum

Average Gravity Flow:	4	gpm	
Pumping Rate:	13	gpm	RPM = 1,725
Lead Pump on Elevation :	108.48	ft	
Low Water Level Elevation:	108.15	ft	
Wet Well Diameter:	3.15	ft	

Fill Time = [(Change in Height)*(Wet Well Surface Area)*(7.48 gal/ft^3)]/(Average Gravity Flow)

Fill Time =	4.81	Minutes

Pump Run Time = $\dfrac{\text{(Change in Height)*(Wet Well surface Area)*(7.48 gal/ft}^3\text{)}}{\text{(Pumping Rate - Average Gravity Flow)}}$

Pump Run Time =	2.14	Minutes

Cycle Time = Pump Run Time + Fill Time

Cycle Time =	6.95	Minutes @ Average Flow

Number of pump starts per hour = (60 minutes/hour)/(Cycle Time)

Number of pump starts per hour =	8.6	@ Average Flow

Nick's Outdoor Power Equipment
Project No.: 2007190-000.00
Date: August 03, 2009
Prepared By: LandMark Design Group, Inc.

Pump Cycle Time @ No Flow

Average Gravity Flow:	4	gpm		
Pumping Rate:	13.75	gpm	RPM =	1,725
Lead Pump on Elevation :	108.48	ft		
Low Water Level Elevation:	108.15	ft		
Wet Well Diameter:	3.15	ft		

Fill Time = [(Change in Height)*(Wet Well Surface Area)*(7.48 gal/ft^3)]/(Average Gravity Flow)

Fill Time =	4.81	Minutes

Pump Run Time = $\dfrac{\text{(Change in Height)*(Wet Well surface Area)*(7.48 gal/ft}^3\text{)}}{\text{(Pumping Rate - Average Gravity Flow)}}$

Pump Run Time =	1.97	Minutes

Cycle Time = Pump Run Time + Fill Time

Cycle Time =	6.78	Minutes @ Average Flow

Number of pump starts per hour = (60 minutes/hour)/(Cycle Time)

Number of pump starts per hour =	8.8	@ Average Flow

GEOTECHNICAL REPORT

GET
Solutions, Inc.
Geotechnical • Environmental • Testing

June 22, 2009

To: **LandMark Design Group**
4029 Ironbound Road, Suite 100
Williamsburg, Virginia 23188

Attn: Mr. Stephen Romeo, LS

Re: Addendum No. 1
Subsurface Exploration and Geotechnical Engineering Services
8231 Richmond Road – Infiltration Testing
James City County, Virginia
GET Project No: WM09-115G

Dear Mr. Romeo:

The following is Addendum No. 1 to our report of subsurface investigation and geotechnical engineering services (WM09-115G) dated February 17, 2009, for the above referenced project. The purpose of this addendum is to provide the results of our hand auger borings and infiltration testing for the proposed stormwater management facility (BMP).

We understand that this portion of the project consists of the construction of an infiltration type BMP facility to support the development at 8231 Richmond Road in James City County, Virginia. The BMP facility will be a dry detention basin with a bottom elevation of 91 feet. Existing grades are at about 96 to 100 feet. Pond side slopes will be about 3H to 1V.

This investigation was accomplished by performing two hand auger borings to a depth of 11.5 feet below the existing grades at the location of the BMP facility, as indicated on the site plan prepared by the client in Appendix I, "Boring Location Plan" included with this report. In addition, two infiltration tests were performed at the respective hand auger boring locations at a depth of 11 feet below existing grades. Representative samples were returned to our laboratory for moisture content and washed sieve testing to ascertain groundwater levels and soil types. A boring location plan, hand auger boring logs, and infiltration test results are submitted with this letter.

Based on the results of our hand auger borings, the following geotechnical commentary is submitted:

1. Our hand auger borings encountered 6 to 8 inches of topsoil materials at the boring locations. Underlying the topsoil materials, a layer of FILL was encountered to depths ranging from 1 to 1.17 feet below existing site grades. The FILL was comprised of Silty, fine to medium SAND (SM) with trace Clay and Gravel. The shallow FILL materials appear to be associated with past clearing, grading, and construction activities for the adjacent barn structure.

Underlying the topsoil and FILL materials and extending to the boring termination depth of 11.5 feet below existing site elevations, the natural subsurface soils encountered were comprised of SAND (SM, SC, and SP-SM) with varying amounts of Silt and Clay. These soils are of relatively moderate to high permeability (see Appendix IV, "Infiltration Test Data"). In this regard, it appears that infiltration design will be feasible at the locations and depths explored. The results of our laboratory and infiltration testing are illustrated below.

Table I – Laboratory and Infiltration Test Results

Boring No.	Depth (Ft)	Natural Moisture (%)	Silt and Clay (%)	USCS Classification	Ksat Value (cm/sec)
HA-1	11	10.3	11.7	SP-SM	5.79×10^{-3}
HA-2	11	13.0	18.6	SM	2.86×10^{-3}

The laboratory test results are also included in Appendix II, "Boring Logs" and Appendix III, "Generalized Soil Profile."

2. The groundwater table was not encountered at the hand auger borings to the depth explored (11.5 feet below existing surface grades). In this regard, the groundwater table is not expected to affect dry detention.

3. The soils encountered should be stable on the proposed side slope of 3H:1V in their undisturbed condition or in a disturbed and recompacted condition. No unusual conditions which might affect slope stability were observed.

4. It is expected that the Sandy soils encountered at the proposed BMP facility are typical of other soils on the property. In this regard, they could be used as Structural Fill, where permitted by the project specifications.

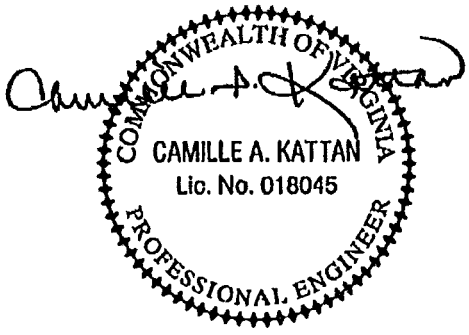
We trust that the information contained herein meets your immediate need, and we would ask that you call this office with any questions that you may have.

Respectfully Submitted,

G E T Solutions, Inc.

Sara B. Phillips
Project Geologist

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



Appendices: I. Boring Location Plan
II. Boring Logs
III. Subsurface Soil Profile
IV. Infiltration Test Data

Copies: (1) Client via e-mail for distribution: SRomeo@landmarkdg.com

APPENDICES

I. BORING LOCATION PLAN

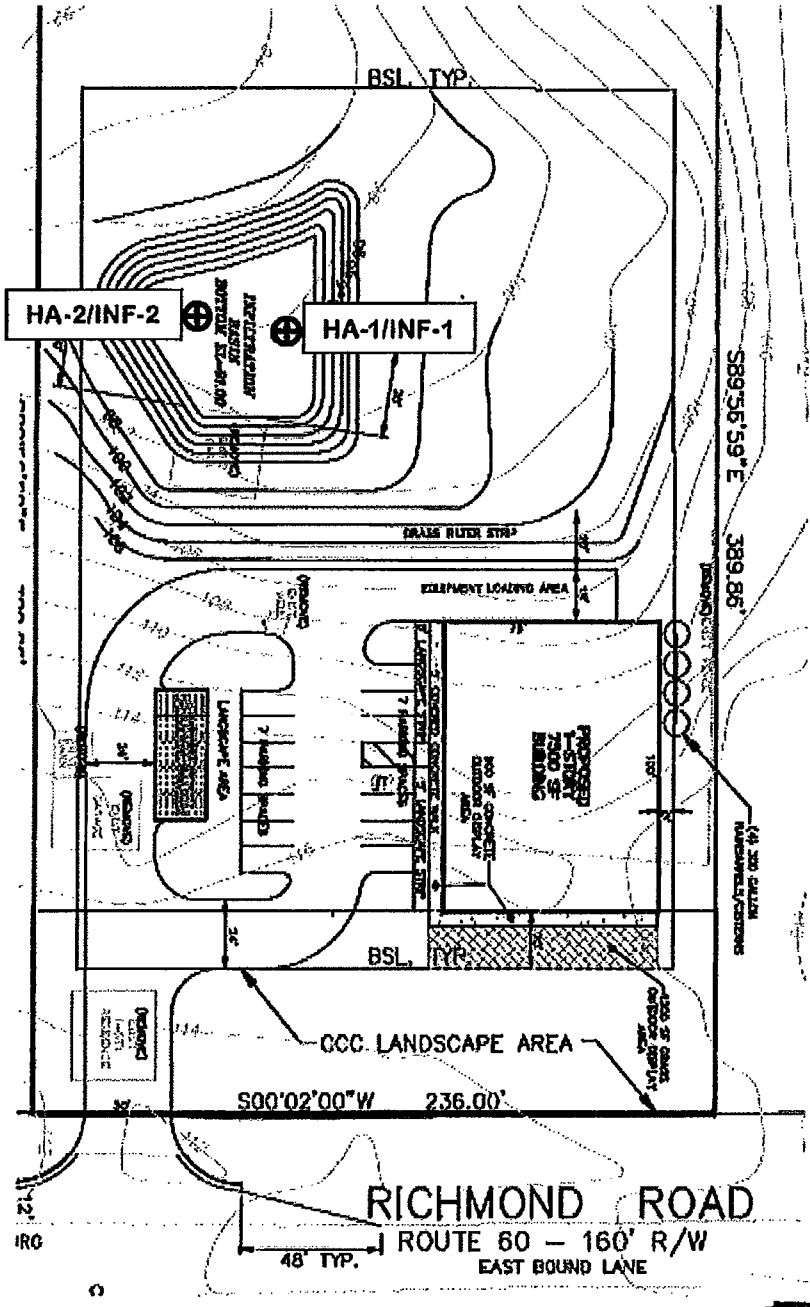
II. BORING LOGS

III. SUBSURFACE SOIL PROFILE

IV. INFILTRATION TEST DATA

APPENDIX I

BORING LOCATION PLAN



Locations are approximate

BORING LOCATION PLAN

PROJECT: 8231 Richmond Road – Infiltration Testing
James City County, Virginia

PROJECT NO: WM09-115G

CLIENT: LandMark Design Group

SCALE: NTS

DATE: 06/12/09

PLOT BY: SP

APPENDIX II

BORING LOGS

GET Solutions, Inc.

BORING LOG
HA/INF-1

PROJECT: 8231 Richmond Road - Infiltration Testing
CLIENT: LandMark Design Group
PROJECT LOCATION: James City County, Virginia — PROJECT NO.: WM09-115G
BORING LOCATION: See Attached Boring Location Plan — SURFACE ELEVATION: 98
DRILLER: GET Solutions, Inc. — LOGGED BY: SP
DRILLING METHOD: Hand Auger — DATE: 6/11/2009
DEPTH TO WATER - INITIAL*: ▼ NE AFTER 24 HOURS: ▼ NT CAVING> C

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
98	0	0	8 inches of Topsoil							
			0.67							
			Dark brown, moist, Silty, fine SAND (SM) with trace Clay, Gravel, and organics, FILL							
			1.17							
96		2	Grayish brown to tan, moist, Silty, fine SAND (SM) with trace Clay							
	0.8		3							
			Orangish brown, moist, Silty to Clayey SAND (SM-SC)							
94		4	4							
			Orangish brown, moist, Clayey, fine SAND (SC)							
	1.6									
92		6								
			7							
			Tan, moist, Silty, fine SAND (SM) with trace Clay							
90	2.4	8								
			9							
			Orangish brown, moist, poorly graded SAND (SP-SM) with Silt							12
88		10								
	3.2									
			Boring terminated at 11.5 ft.							
86		12								
	4									
84		14								
	4.8									
82		16								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

279

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

Notes:

*The initial groundwater reading may not be indicative of the static groundwater level.

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

GET Solutions, Inc.

BORING LOG
HA/INF-2

PROJECT: 8231 Richmond Road - Infiltration Testing
CLIENT: LandMark Design Group
PROJECT LOCATION: James City County, Virginia
PROJECT NO.: WM09-115G
BORING LOCATION: See Attached Boring Location Plan
SURFACE ELEVATION: 98
DRILLER: GET Solutions, Inc.
LOGGED BY: SP
DRILLING METHOD: Hand Auger
DATE: 6/11/2009
DEPTH TO WATER - INITIAL*: NE AFTER 24 HOURS: NT CAVING> C

Elevation (MSL) (ft)	Depth (meters)	Depth (feet)	Description	Graphic	Sample No.	Sample Recovery	Sample Type	Blows per 6"	N-Value	% < #200
98	0	0	6 inches of Topsoil							
			0.5 Dark brown, moist, Silty, fine SAND (SM) with trace Clay, Gravel, and organics, FILL							
			1 Grayish brown to brown, moist, Silty, fine SAND (SM) with trace Clay							
96		2								
	0.6									
			3 Orangish brown, moist, Clayey, fine SAND (SC)							
94		4								
	1.6		5 Tan, moist, Silty, fine SAND (SM) with trace Clay							
92		6								
90	2.4	8								
88		10								19
	3.2									
			Boring terminated at 11.5 ft.							
86		12								
	4									
84		14								
82	4.6	16								

TEST RESULTS
Plastic Limit ⊢ Liquid Limit
Moisture Content - ●
N-Value - ▨
10 20 30 40 50 60 70

280

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

Notes:

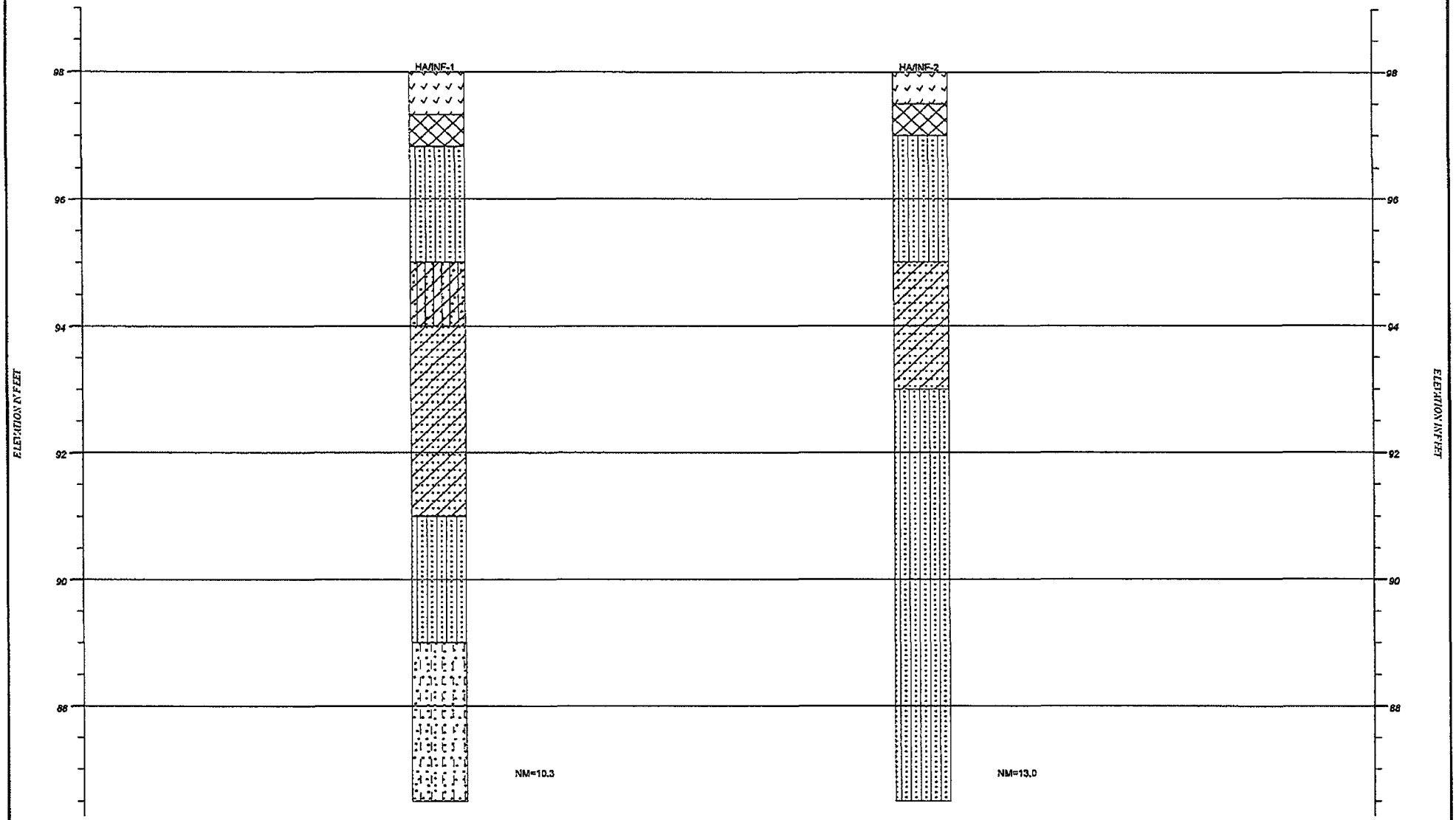
*The initial groundwater reading may not be indicative of the static groundwater level.

SS = Split Spoon Sample
ST = Shelby Tube Sample
HA = Hand Auger Sample
BS = Bulk Sample
WOH = Weight of Hammer

Standard Penetration Tests were performed in the field in general accordance with ASTM D 1586.

APPENDIX III

SUBSURFACE SOIL PROFILE



Strata symbols

- Topsoil
- Fill
- Silty Sand
- Silty Clayey Sand
- Clayey Sand
- Poorly graded Sand with Silt

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GET Solutions, Inc.

GENERALIZED SOIL PROFILE

HORIZONTAL SCALE: VERTICAL SCALE: 1"=2'	DRAWN BY/APPROVED BY	DATE DRAWN
	SP	6/22/2009

8231 Richmond Road - Infiltration Testing
James City County, Virginia

PROJECT NO. WM09-115G

FIGURE NUMBER 1

APPENDIX IV

INFILTRATION TEST DATA

G E T Solutions, Inc.		SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET		Sheet No.: 1
Project Name.:	8231 Richmond Road - Infiltration Testing	Parcel.....:	James City County, Virginia	**Terminology and Solution**
Boring No.....:	HA-1/INF-1	Date.....:	6/12/2009	Ksat : Saturated hydraulic conductivity
Investigators.:	S. Phillips	File Name.....:	WM09-115G	Q: Steady-state rate of water flow into the soil
Boring Depth.:	138 inches	WCU Base. Ht. h:	15.0 cm	H: Constant height of water in borehole
Boring Dia.....:	8.3 cm	WCU Susp. Ht. S:	15.2 cm	r: Radius of cylindrical borehole
Boring Rad. (r):	4.15 cm	Const. Wtr. Ht. H:	30.2 cm	Ksat = Q[sinh-1(H/r) - (r2/H2+1).5 + r/H] / (2pH2) [Glover Solution]

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2000	100	9:30:00 AM								
1900	100	9:30:05 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1800	100	9:30:10 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1700	100	9:30:15 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1600	100	9:30:21 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1500	100	9:30:26 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1400	100	9:30:31 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
1300	100	9:30:37 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1200	100	9:30:43 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
1000	100	9:30:48 AM	0:00:05	0.08	1200.00	0.379	6.32E-03	546.0	8.956	17.91
900	100	9:30:54 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
800	100	9:31:00 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
700	100	9:31:06 AM	0:00:06	0.10	1000.00	0.316	5.27E-03	455.0	7.463	14.93
Natural Moisture:	Moist	Init. Satur.Time:	9:00:00 AM	ESTIMATED FIELD KSAT:		0.348	5.79E-03	**500.5**	8.210	16.42
Texture/Classif:	SAND (SP-SM)	Consistency:	N/A	Depth to an Impermeable Layer:	N/A	Notes:	High			
Structure/Fabric:	N/A	Slope/Landsc:	Flat	Depth to Bedrock.....:	N/A					

G E T Solutions, Inc.		SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET		Sheet No.: 2
Project Name.:	8231 Richmond Road - Infiltration Testing	Parcel.....:	James City County, Virginia	Terminology and Solution
Boring No.....:	HA-2/INF-2	Date.....:	6/12/2009	Ksat : Saturated hydraulic conductivity
Investigators.:	DM/JW	File Name.....:	WM09-115G	Q: Steady-state rate of water flow into the soil
Boring Depth.:	138 inches	WCU Base. Ht. h:	15.0 cm	H: Constant height of water in borehole
Boring Dia.....:	8.3 cm	WCU Susp. Ht. S:	15.2 cm	r: Radius of cylindrical borehole
Boring Rad. (r):	4.15 cm	Const. Wtr. Ht. H:	30.2 cm	Ksat = Q[sinh-1(H/r) - (r2/H2+1).5 + r/H] / (2pH2) [Glover Solution]

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
2000	100	10:00:00 AM								
1900	100	10:00:10 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1800	100	10:00:20 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1700	100	10:00:31 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1600	100	10:00:41 AM	0:00:10	0.17	600.00	0.190	3.16E-03	273.0	4.478	8.96
1500	100	10:00:52 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1400	100	10:01:03 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1300	100	10:01:15 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
1200	100	10:01:26 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
1000	100	10:01:37 AM	0:00:11	0.18	545.45	0.172	2.87E-03	248.2	4.071	8.14
900	100	10:01:49 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
800	100	10:02:01 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
700	100	10:02:13 AM	0:00:12	0.20	500.00	0.158	2.63E-03	227.5	3.732	7.46
Natural Moisture:	Moist	Init. Satur.Time:	9:30:00 AM	ESTIMATED FIELD KSAT:		0.172	2.86E-03	**247.5**	4.060	8.12
Texture/Classif:	SAND (SM)	Consistency:	N/A	Depth to an Impermeable Layer:	N/A	Notes:	High			
Structure/Fabric:	N/A	Slope/Landsc:	Flat	Depth to Bedrock.....:	N/A					

DRAINAGE AREA MAPS