



See also PC208

## 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.

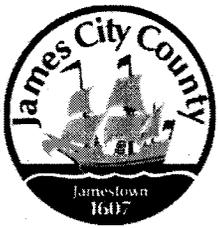
**BMP NUMBER:** PC207

**DATE VERIFIED:** May 23, 2012

**QUALITY ASSURANCE TECHNICIAN:** Leah Hardenbergh

  
\_\_\_\_\_

**LOCATION:** WILLIAMSBURG, VIRGINIA



# Stormwater Division

## MEMORANDUM

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

---

**BMP ID or General File ID** PC207

**PIN:** 3233100001A

**Subdivision, Tract, Business or Owner**

**Name (if known):**

Fords Colony

**Property Description:**

Greenways Section 12

**Site Address:**

*(For internal use only)*

**Box:** FC001

**Drawer:** 1

**Agreements:** (in file as of scan date)

Y

**Book or Doc#:**

030002434

**Page:**

970003361

**Comments:**

This is a combined folder with PC208

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 21<sup>st</sup> day of JANUARY, 2003,  
 between PENTEC, INC AND FORD'S COLONY AT WILLIAMSBURG HOMEOWNERS ASSOCIATION  
 and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property: \_\_\_\_\_  
FORD'S COLONY AT WILLIAMSBURG  
 project name, SECTION XII (LOTS 2-72)  
 Document No. 970003361, Deed Book \_\_\_\_\_, Page No. \_\_\_\_\_; Instrument No. \_\_\_\_\_,  
 and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.
2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.
3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.
4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.
5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

*Instrument # 030 002 434* Page 1

Revised 01/02

*Recorded on Jan. 27, 2003*

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

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

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

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

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

COVENANTOR(S)



Print Name/Title

DREW R. MULHARE  
REALTEC, INC  
V.P. OPERATIONS

ATTEST:

---

COVENANTOR(S)



Print Name/Title

DREW R. MULHARE  
FORD'S COLONY AT WILLIAMSBURG  
HOMEOWNERS ASSOCIATION  
MANAGING AGENT

ATTEST:

---

COMMONWEALTH OF VIRGINIA  
CITY/COUNTY OF James City

I hereby certify that on this 21<sup>st</sup> day of January, 2003, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Drew R. Mulhare and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 21<sup>st</sup> day of January, 2003.

Lynn W. Combs  
Notary Public

My Commission expires: November 30, 2003

Approved as to form:

[Signature]  
County Attorney

This Declaration of Covenants prepared by:

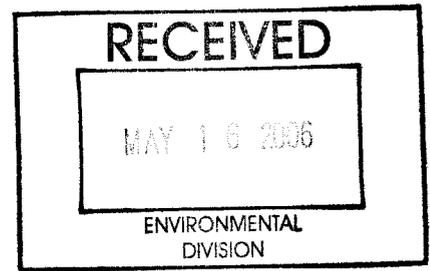
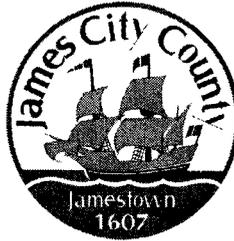
DES CONSULTING ENGINEERS  
(Print Name)

\_\_\_\_\_  
(Title)

5248 ADE TOWN RD. STE. 1  
(Address)

WILLIAMSBURG VA 23188  
(City) (State) (Zip)

drainage.pre



James City County, Virginia  
Environmental Division

Stormwater Management / BMP Facilities  
Record Drawing and Construction Certification Forms

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

**Section 1 – Site Information:**

Project Name: Ford's Colony Section XII  
Structure/BMP Name: Dry Pond No. 1  
Project Location: Off Country Club Drive, Ford's Colony  
BMP Location: Northeast of Kilton Forest cul-de-sac  
County Plan No.: S - 51 - 02

Project Type:  Residential  Business Tax Map/Parcel No.: (32-3)(1-11)  
 Commercial  Office BMP ID Code (if known): PC 207  
 Institutional  Industrial Zoning District: R 4  
 Public  Roadway Land Use: \_\_\_\_\_  
 Other \_\_\_\_\_ Site Area (sf or acres): \_\_\_\_\_

Brief Description of Stormwater Management/BMP Facility: Timber Wall BMP

Nearest Visible Landmark to SWM/BMP Facility: 200'+ East of Kilton Forest

Nearest Vertical Ground Control (if known):  
 JCC Geodetic Ground Control  USGS  Temporary  Arbitrary  Other  
Station Number or Name: SS#12-C-2  
Datum or Reference Elevation: 66.25  
Control Description: Top of Curb Inlet

Control Location from Subject Facility: 200'+ East of the western most portion of the wall

**Section 2 – Stormwater Management / BMP Facility Construction Information:**

PreConstruction Meeting Held for Construction of SWM/BMP Facility:  Yes  No  Unknown  
Approx. Construction Start Date for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Facility Monitored by County Representative during Construction:  Yes  No  Unknown  
Name of Site Work Contractor Who Constructed Facility: \_\_\_\_\_ Longhill Excavation, Inc.  
Name of Professional Firm Who Routinely Monitored Construction: \_\_\_\_\_ AES  
Date of Completion for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Date of Record Drawing/Construction Certification Submittal: \_\_\_\_\_ 5/26/04

***(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: \_\_\_\_\_ Realtec, Inc.  
Mailing Address: \_\_\_\_\_ One Ford's Colony Drive  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-258-4230 Fax: \_\_\_\_\_ 757-258-4065  
Contact Person: \_\_\_\_\_ Drew Mulhare 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: \_\_\_\_\_ AES Consulting Engineers  
Mailing Address: \_\_\_\_\_ 5248 Olde Towne Road, Suite 1  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-253-0040  
Fax: \_\_\_\_\_ 757-220-8994  
Responsible Plan Preparer: \_\_\_\_\_ V. Marc Bennett, P.E.  
Title: \_\_\_\_\_ Project Manager  
Plan Name: \_\_\_\_\_ Ford's Colony at Williamsburg Section 12  
Firm's Project No. \_\_\_\_\_ 5652-12  
Plan Date: \_\_\_\_\_ 10/25/00  
Sheet No.'s Applicable to SWM/BMP Facility: \_\_\_\_\_ 1 / \_\_\_\_\_ 11 / \_\_\_\_\_ 23 / \_\_\_\_\_ / \_\_\_\_\_

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

Name: \_\_\_\_\_ Longhill Excavating, Inc.  
Mailing Address: \_\_\_\_\_ 5099 Longhill Road  
\_\_\_\_\_ Williamsburg, VA 23185  
Business Phone: \_\_\_\_\_ 757-220-0760  
Fax: \_\_\_\_\_ 757-220-2494  
Contact Person: \_\_\_\_\_ Jimmy Minor  
Site Foreman/Supervisor: \_\_\_\_\_  
Specialty Subcontractors & Purpose (for BMP Construction Only):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Section 4 – Professional Certifications:**

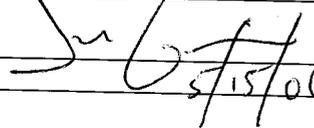
Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional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

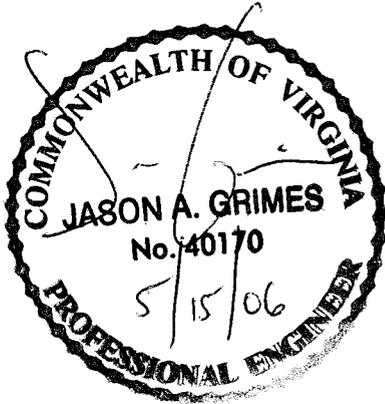
**Record Drawing Certification**

Firm Name: AES Consulting Engineers  
Mailing Address: 5248 Olde Towne Road  
Williamsburg, VA 23188  
Business Phone: 757-253-0040  
Fax: 757-220-8994

Name: Jason Grimes, P.E.  
Title: Project Manager

Signature:   
Date: 5/15/06

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.



\_\_\_\_\_  
(Seal)  
Virginia Registered Professional Engineer  
Or Certified Land Surveyor

**Construction Certification**

Firm Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
Business Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_

Name: \_\_\_\_\_  
Title: \_\_\_\_\_

Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

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

\_\_\_\_\_  
(Seal)  
Virginia Registered  
Professional Engineer

## 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 plans sheet revision blocks modified to indicate date and record drawing status.
- XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

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

- XX 1. All requirements of Section I (Methods and Presentation) apply to this section.
- XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.
- XX 4. Top widths, berm widths and embankment side slopes.
- XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.
- N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.
- N/A 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.
- XX 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.**
- N/A 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.
- N/A 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.
- N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

## STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

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

- VIII.    Group F – Extended Dry Detention** *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*
- XX    F1.    All requirements of Section II, Minimum Standards, apply to Group F facilities.
  - XX    F2.    Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
  - XX    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.
  - XX    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.
  - XX    F8.    Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.
  - XX    F9.    Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
  - XX    F10.    Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
  - XX    F11.    Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
  - XX    F12.    Stilling basin or standard outlet protection provided at principal spillway outlet.
  - XX    F13.    Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.
  - XX    F14.    No visual signs of undercutting of timber walls or clogging of the low orifice were present.
  - XX    F15.    No visual signs of erosion or channel degradation immediately downstream of facility.
  - XX    F16.    No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

## STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

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

**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.
- XX    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.)*

- N/A    O1.    All requirements of Section II, Minimum Standards, apply to this section.
- N/A    O2.    Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 21<sup>st</sup> day of JANUARY, 2003,  
 between RENTEC, INC AND FORD'S COLONY AT WILLIAMSBURG HOMEOWNERS ASSOCIATION  
 and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property: \_\_\_\_\_  
FORD'S COLONY AT WILLIAMSBURG  
 project name, SECTION XII (LOTS 2-72)  
 Document No. 970003361, Deed Book \_\_\_\_\_, Page No. \_\_\_\_\_; Instrument No. \_\_\_\_\_,  
 \_\_\_\_\_, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.
2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.
3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.
4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.
5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

*Instrument # 030002434 Page 1*

Revised 01/02

*Recorded on Jan. 27, 2003*

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

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

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

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

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

COVENANTOR(S)



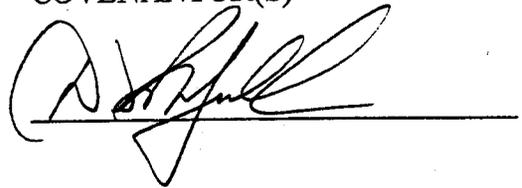
Print Name/Title

DREW R. MULHARE  
REALTEC, INC  
V.P. OPERATIONS

ATTEST:

---

COVENANTOR(S)



Print Name/Title

DREW R. MULHARE  
FORD'S COLONY AT WILLIAMSBURG  
HOMEOWNERS ASSOCIATION  
MANAGING AGENT

ATTEST:

---

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF James City

I hereby certify that on this 21<sup>st</sup> day of January, 20 03, before the subscribed, a Notary Public of the State of Virginia, and for the City/County of James City, aforesaid personally appeared Drew R. Mulhare and did acknowledge the foregoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 21<sup>st</sup> day of January, 20 03.

[Signature]  
Notary Public

My Commission expires: November 30, 2003

Approved as to form:

[Signature]  
County Attorney

This Declaration of Covenants prepared by:

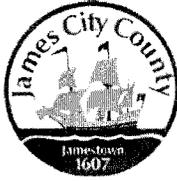
ACS CONSULTING ENGINEERS  
(Print Name)

\_\_\_\_\_  
(Title)

524B ADE TAME RD. STE. 1  
(Address)

WILLIAMSBURG VA 23188  
(City) (State) (Zip)

drainage.pre



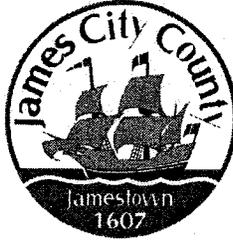
**James City County Environmental Division  
Stormwater Management/BMP Record Drawing &  
Construction Certification Review  
Tracking Form**

Project Name: FORD'S COLONY SEC 12  
 County Plan No.: S-51-02  
 Stormwater Management Facility: TIMBER WALL DRY POND #1  
 BMP Phase #:  I  II  III  
 Information Package Received. Date/By: 05/15/06 AES  
 Completeness Check:  
 Record Drawing Date/By: 5/16/06 / 11/19/07  
 Construction Certification Date/By: 11/19/07 AES Jason Grimes, P.E.  
 RD/CC Standard Forms (Required for all BMPs after Feb 1<sup>st</sup> 2001 Only)  
 Insp/Maint Agreement # / Date: Comm #4 JUNE 21 2002, 030002434  
 BMP Maintenance Plan Location: page 23 JAN 27 2003  
 Other:  
 Standard E&S Note on Approved Plan Requiring RD/CC or County comment in plan review  
 Yes  No Location: page 21 note #20  
 Assign County BMP ID Code #: Code: PC 207  
 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: 9/13/07  
 Record Drawing (RD) Review Date: 9/14/07  
 Construction Certification (CC) Review Date: 11/19/07  
 Actions:  
 No comments.  
 Comments. Letter Forwarded. Date: 9/17/07  
 Record Drawing (RD)  
 Construction Certification (CC)  
 Construction-Related (CR)  
 Site Issues (SI)  
 Other :  
 Second Submission: 11/19/07  
 Reinspection (if necessary): 10/23/07  
 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.

**Final Sign-Off**

Plan Reviewer: Jason Baker AG Date: 11/21/07

\*\*\* See separate checklist, if needed.



James City County, Virginia  
Environmental Division

Stormwater Management / BMP Facilities  
Record Drawing and Construction Certification Forms

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

Section 1 – Site Information:

Project Name: Ford's Colony Section XII  
Structure/BMP Name: Dry Pond No. 1  
Project Location: Off Country Club Drive, Ford's Colony  
BMP Location: Northeast of Kilton Forest cul-de-sac  
County Plan No.: S - 51 - 02

Project Type:  Residential  Business Tax Map/Parcel No.: (32-3)(1-11)  
 Commercial  Office BMP ID Code (if known): PC207  
 Institutional  Industrial Zoning District: R 4  
 Public  Roadway Land Use:  
 Other Site Area (sf or acres):

Brief Description of Stormwater Management/BMP Facility: Timber Wall BMP

Nearest Visible Landmark to SWM/BMP Facility: 200'+ East of Kilton Forest

Nearest Vertical Ground Control (if known):  
 JCC Geodetic Ground Control  USGS  Temporary  Arbitrary  Other  
Station Number or Name: SS#12-C-2  
Datum or Reference Elevation: 66.25  
Control Description: Top of Curb Inlet

Control Location from Subject Facility: 200'+ East of the western most portion of the wall

**Section 2 – Stormwater Management / BMP Facility Construction Information:**

PreConstruction Meeting Held for Construction of SWM/BMP Facility:  Yes  No  Unknown  
Approx. Construction Start Date for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Facility Monitored by County Representative during Construction:  Yes  No  Unknown  
Name of Site Work Contractor Who Constructed Facility: \_\_\_\_\_ Longhill Excavation, Inc.  
Name of Professional Firm Who Routinely Monitored Construction: \_\_\_\_\_ AES  
Date of Completion for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Date of Record Drawing/Construction Certification Submittal: \_\_\_\_\_ 5/26/04

*(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: \_\_\_\_\_ Realtec, Inc.  
Mailing Address: \_\_\_\_\_ One Ford's Colony Drive  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-258-4230 Fax: \_\_\_\_\_ 757-258-4065  
Contact Person: \_\_\_\_\_ Drew Mulhare 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: \_\_\_\_\_ AES Consulting Engineers  
Mailing Address: \_\_\_\_\_ 5248 Olde Towne Road, Suite 1  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-253-0040  
Fax: \_\_\_\_\_ 757-220-8994  
Responsible Plan Preparer: \_\_\_\_\_ V. Marc Bennett ,P.E.  
Title: \_\_\_\_\_ Project Manager  
Plan Name: \_\_\_\_\_ Ford's Colony at Williamsburg Section 12  
Firm's Project No. \_\_\_\_\_ 5652-12  
Plan Date: \_\_\_\_\_ 10/25/00  
Sheet No.'s Applicable to SWM/BMP Facility: \_\_\_\_\_ 1 / 11 / 23 / \_\_\_\_\_ / \_\_\_\_\_

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

Name: \_\_\_\_\_ Longhill Excavating, Inc.  
Mailing Address: \_\_\_\_\_ 5099 Longhill Road  
\_\_\_\_\_ Williamsburg, VA 23185  
Business Phone: \_\_\_\_\_ 757-220-0760  
Fax: \_\_\_\_\_ 757-220-2494  
Contact Person: \_\_\_\_\_ Jimmy Minor  
Site Foreman/Supervisor: \_\_\_\_\_  
Specialty Subcontractors & Purpose (for BMP Construction Only):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Section 4 – Professional Certifications:**

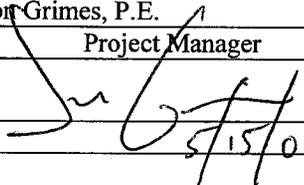
Certifying Professionals: *(Note: A Registered Professional Engineer or Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional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

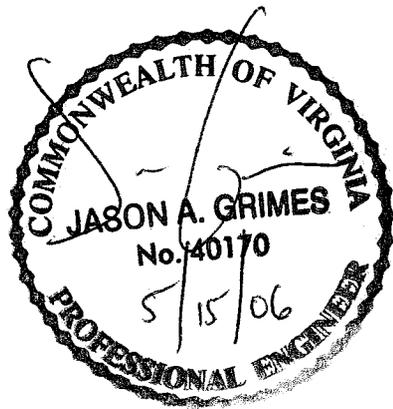
**Record Drawing Certification**

Firm Name: AES Consulting Engineers  
Mailing Address: 5248 Olde Towne Road  
Williamsburg, VA 23188  
Business Phone: 757-253-0040  
Fax: 757-220-8994

Name: Jason Grimes, P.E.  
Title: Project Manager

Signature:   
Date: 5/15/06

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.



\_\_\_\_\_ (Seal)

Virginia Registered Professional Engineer  
Or Certified Land Surveyor

**Construction Certification**

Firm Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
Business Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_

Name: \_\_\_\_\_  
Title: \_\_\_\_\_

Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

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

\_\_\_\_\_ (Seal)

Virginia Registered  
Professional Engineer

## 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 plans sheet revision blocks modified to indicate date and record drawing status.
- XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

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

- XX 1. All requirements of Section I (Methods and Presentation) apply to this section.
- XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.
- XX 4. Top widths, berm widths and embankment side slopes.
- XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.
- N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.
- N/A 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.
- XX 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.**
- N/A 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.
- N/A 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.
- N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

**STORMWATER MANAGEMENT / BMP FACILITIES  
RECORD DRAWING CHECKLIST**

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

**VIII.    Group F – Extended Dry Detention** (Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)

- XX    F1.    All requirements of Section II, Minimum Standards, apply to Group F facilities.
- XX    F2.    Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
- XX    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.
- XX    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.
- XX    F8.    Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.
- XX    F9.    Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
- XX    F10.   Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
- XX    F11.   Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
- XX    F12.   Stilling basin or standard outlet protection provided at principal spillway outlet.
- XX    F13.   Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.
- XX    F14.   No visual signs of undercutting of timber walls or clogging of the low orifice were present.
- XX    F15.   No visual signs of erosion or channel degradation immediately downstream of facility.
- XX    F16.   No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

## STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

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

### **X.     Storm Drainage Systems (Associated with BMP's Only)**

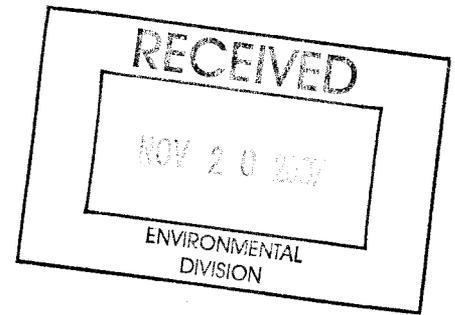
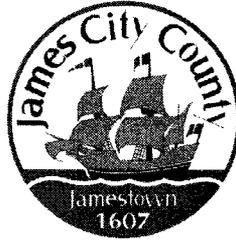
*(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated 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.
- XX    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.)*

- N/A    O1.    All requirements of Section II, Minimum Standards, apply to this section.
- N/A    O2.    Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.



James City County, Virginia  
Environmental Division

Stormwater Management / BMP Facilities  
Record Drawing and Construction Certification Forms

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

Section 1 – Site Information:

Project Name: Ford's Colony Section XII  
Structure/BMP Name: Dry Pond No. 1/ PC207  
Project Location: Off Country Club Drive, Ford's Colony  
BMP Location: Northeast of Kilton Forest cul-de-sac  
County Plan No.: S - 51 - 02

Project Type:  Residential  Business Tax Map/Parcel No.: (32-3)(1-11)  
 Commercial  Office BMP ID Code (if known):  
 Institutional  Industrial Zoning District: R 4  
 Public  Roadway Land Use:  
 Other Site Area (sf or acres):

Brief Description of Stormwater Management/BMP Facility: Timber Wall BMP

Nearest Visible Landmark to SWM/BMP Facility: 200'+ East of Kilton Forest

Nearest Vertical Ground Control (if known):  
 JCC Geodetic Ground Control  USGS  Temporary  Arbitrary  Other  
Station Number or Name: SS#12-C-2  
Datum or Reference Elevation: 66.25  
Control Description: Top of Curb Inlet

Control Location from Subject Facility: 200'+ East of the western most portion of the wall

**Section 2 – Stormwater Management / BMP Facility Construction Information:**

PreConstruction Meeting Held for Construction of SWM/BMP Facility:  Yes  No  Unknown  
Approx. Construction Start Date for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Facility Monitored by County Representative during Construction:  Yes  No  Unknown  
Name of Site Work Contractor Who Constructed Facility: \_\_\_\_\_ Longhill Excavation, Inc.  
Name of Professional Firm Who Routinely Monitored Construction: \_\_\_\_\_ AES  
Date of Completion for SWM/BMP Facility: \_\_\_\_\_ Unknown  
Date of Record Drawing/Construction Certification Submittal: \_\_\_\_\_ 5/26/04

*(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: \_\_\_\_\_ Realtec, Inc.  
Mailing Address: \_\_\_\_\_ One Ford's Colony Drive  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-258-4230 Fax: \_\_\_\_\_ 757-258-4065  
Contact Person: \_\_\_\_\_ Drew Mulhare 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: \_\_\_\_\_ AES Consulting Engineers  
Mailing Address: \_\_\_\_\_ 5248 Olde Towne Road, Suite 1  
\_\_\_\_\_ Williamsburg, VA 23188  
Business Phone: \_\_\_\_\_ 757-253-0040  
Fax: \_\_\_\_\_ 757-220-8994  
Responsible Plan Preparer: \_\_\_\_\_ V. Marc Bennett ,P.E.  
Title: \_\_\_\_\_ Project Manager  
Plan Name: \_\_\_\_\_ Ford's Colony at Williamsburg Section 12  
Firm's Project No. \_\_\_\_\_ 5652-12  
Plan Date: \_\_\_\_\_ 10/25/00  
Sheet No.'s Applicable to SWM/BMP Facility: \_\_\_\_\_ 1 / 11 / 23 / \_\_\_\_\_ / \_\_\_\_\_

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

Name: \_\_\_\_\_ Longhill Excavating, Inc.  
Mailing Address: \_\_\_\_\_ 5099 Longhill Road  
\_\_\_\_\_ Williamsburg, VA 23185  
Business Phone: \_\_\_\_\_ 757-220-0760  
Fax: \_\_\_\_\_ 757-220-2494  
Contact Person: \_\_\_\_\_ Jimmy Minor  
Site Foreman/Supervisor: \_\_\_\_\_  
Specialty Subcontractors & Purpose (for BMP Construction Only):  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Section 4 – Professional Certifications:**

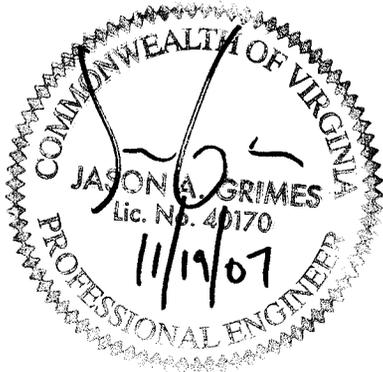
Certifying Professionals: *(Note: A Registered Professional Engineer of Certified Land Surveyor is responsible for preparation of a Record Drawing, sometimes referred to as an As-Built plan, for the drainage system for the project including any Stormwater Management/BMP Facilities. A Registered Professional 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: AES Consulting Engineers  
Mailing Address: 5248 Olde Towne Road  
Williamsburg, VA 23188  
Business Phone: 757-253-0040  
Fax: 757-220-8994  
Name: Jason Grimes, P.E.  
Title: Project Manager  
Signature:   
Date: 11/19/07

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.



\_\_\_\_\_  
(Seal)

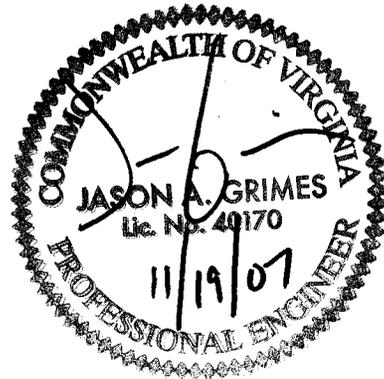
Virginia Registered Professional Engineer  
Or Certified Land Surveyor

**Construction Certification**

Firm Name: \_\_\_\_\_  
Mailing Address: \_\_\_\_\_  
Business Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_  
Name: \_\_\_\_\_  
Title: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

*SAME*

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.



\_\_\_\_\_  
(Seal)

Virginia Registered  
Professional Engineer

## 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 plans sheet revision blocks modified to indicate date and record drawing status.
- XX 5. All plan sheets have certification statements and certifying professional's signature and seal.

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

- XX 1. All requirements of Section I (Methods and Presentation) apply to this section.
- XX 2. Plan Views: Show general location, arrangement and dimensions. Location and alignment shall generally match approved design plans.
- XX 3. Profile or elevations along top or berm of the facility. At a minimum, elevations are required at each end, at intervals not to exceed 50 feet and where low spots may be present. Top of embankment or berm elevations must be no less than design elevation plus any settlement allowances.
- XX 4. Top widths, berm widths and embankment side slopes.
- XX 5. Show length, width and depth of facility or grading, contours or spot elevations as required to verify permanent pool and design storage volumes were met or were reasonably close to the approved design. Evaluation of as-built grading, contours, spot elevations, or cross-sections, may be necessary by the professional to ensure approved design configurations, depths and volumes were closely maintained. If grading or elevations are significantly different from the approved plan, the Environmental Division shall be contacted immediately to determine whether the variation is acceptable or whether further evidence will be required. Facilities which do not closely resemble approved plan grades, elevations or configurations may require regrading by the Contractor; check volumetric computations; and/or a check hydraulic routing to ensure approved design water surface elevations, discharges or freeboard were closely maintained.
- N/A 6. Cross-section of the embankment through the principal spillway or outlet barrel. Must extend at least 100 ft. downstream of the pipe outlet or to recorded site property line, whichever is closer. Proper correlation is required between principal spillway (control structure) crest, emergency spillway crest, orifice and weirs and the top of the dam or facility. All elevations and dimensions must reasonably match the design plan or be sequentially relative to each other and the facility must reflect the required design storage volume(s) and/or design depth.
- N/A 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.
- XX 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.**
- N/A 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.
- N/A 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.
- N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

## STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

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

**VIII.    Group F – Extended Dry Detention** *(Includes F-1 Timber Walls; and F-2 Dry Extended Detention with Forebay)*

- XX    F1.    All requirements of Section II, Minimum Standards, apply to Group F facilities.
- XX    F2.    Basin bottom has positive slope and drainage from all basin inflow points to the riser (or outflow) location.
- XX    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.
- XX    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.
- XX    F8.    Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.
- XX    F9.    Timbers properly reinforced or concrete footing provided if soil conditions were prohibitive.
- XX    F10.    Timber wall cross members extended to a minimum depth of two (2) feet below ground elevation.
- XX    F11.    Protection against erosion and scour from the low flow orifice and weir-flow trajectory provided.
- XX    F12.    Stilling basin or standard outlet protection provided at principal spillway outlet.
- XX    F13.    Adequate, direct access provided to the facility. Access corridor to facility is at least ten (10) feet wide, slope is less than twenty (20) percent and appropriate stabilization provided for equipment and vehicle use. Access extends to forebay, standpipe and timber wall, as applicable.
- XX    F14.    No visual signs of undercutting of timber walls or clogging of the low orifice were present.
- XX    F15.    No visual signs of erosion or channel degradation immediately downstream of facility.
- XX    F16.    No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

## STORMWATER MANAGEMENT / BMP FACILITIES RECORD DRAWING CHECKLIST

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

### **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.
- XX    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.)*

- N/A    O1.    All requirements of Section II, Minimum Standards, apply to this section.
- N/A    O2.    Certification criteria to be determined on a case-by-case basis by the Environmental Division specific to the proposed SWM/BMP facility.

OP #12-A-1  
 PROVIDE CLASS 1 RIP RAP  
 APRON W/ FILTER FABRIC (14 C.Y.)  
 UPSTREAM WIDTH=7.5'  
 DOWNSTREAM WIDTH=17.5'  
 LENGTH=15'  
 DEPTH=2'

OP #12-C-1  
 PROVIDE CLASS 1 RIP RAP  
 APRON W/ FILTER FABRIC (2 C.Y.)  
 UPSTREAM WIDTH=3'  
 DOWNSTREAM WIDTH=6'  
 LENGTH=5'  
 DEPTH=2'

OP #12-B-1  
 PROVIDE CLASS 1 RIP RAP  
 APRON W/ FILTER FABRIC (2 C.Y.)  
 UPSTREAM WIDTH=3'  
 DOWNSTREAM WIDTH=6'  
 LENGTH=5'  
 DEPTH=2'

OP #12-D-1  
 PROVIDE CLASS 1 RIP RAP  
 APRON W/ FILTER FABRIC (17 C.Y.)  
 UPSTREAM WIDTH=6'  
 DOWNSTREAM WIDTH=26'  
 LENGTH=16'  
 DEPTH=2'

**EROSION AND SEDIMENTATION CONTROL LEGEND**

- CE CONSTRUCTION ENTRANCE (SPEC. 3.02)
- SF SILT FENCE (SPEC. 3.05)
- SF SUPER SILT FENCE (WITH WIRE) (SPEC. 3.05)
- P INLET PROTECTION (SPEC. 3.07)
- IP OULVERT INLET PROTECTION (SPEC. 3.08-1 WITH STONE COMBIN. INSTEAD OF SILT FENCE)
- DD TEMPORARY DIVERSION DIKE (SPEC. 3.09)
- OP OUTLET PROTECTION (SPEC. 3.18)
- CD CHECK DAM (SPEC. 3.20)

NOTE:  
 SEE VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK FOR EROSION CONTROL SPECIFICATIONS (SPEC.) AND DETAILS.

**RECORD DRAWING BASED ON INFORMATION AS SURVEYED 5/26/04 BY A.E.S. CONSULTING ENGINEERS**

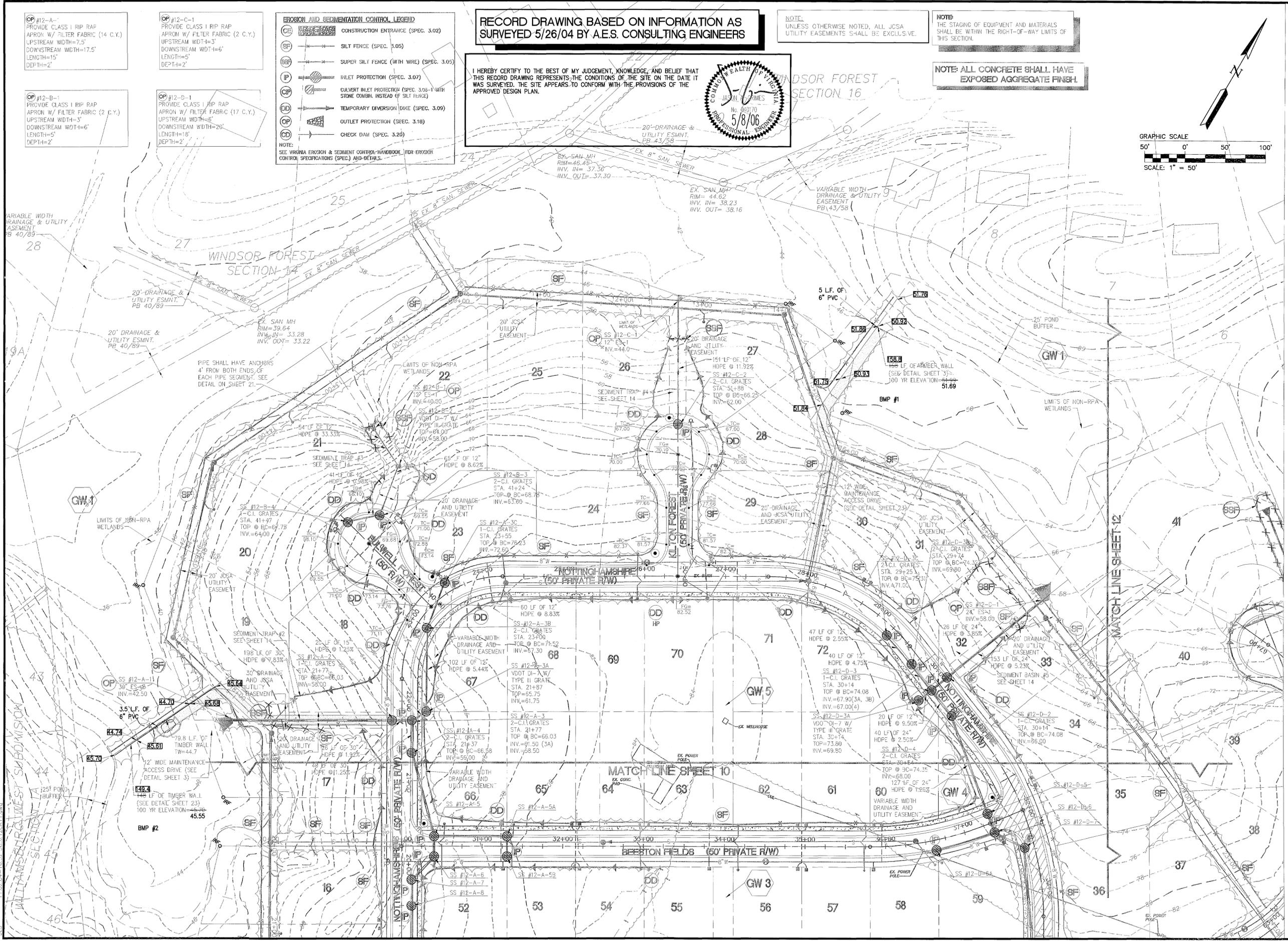
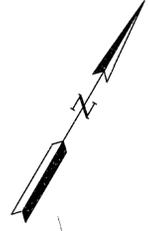
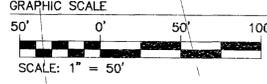
I HEREBY CERTIFY TO THE BEST OF MY JUDGEMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CONDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.



NOTE:  
 UNLESS OTHERWISE NOTED, ALL JCSA UTILITY EASEMENTS SHALL BE EXCLUSIVE.

NOTE:  
 THE STAGING OF EQUIPMENT AND MATERIALS SHALL BE WITHIN THE RIGHT-OF-WAY LIMITS OF THIS SECTION.

NOTE: ALL CONCRETE SHALL HAVE EXPOSED AGGREGATE FINISH.



NO.	DATE	REVISION / COMMENT	BY
5	11/02/04	DAM AS-BUILT	JSW
4	10/19/04	RECORD DRAWINGS	GBR
3	2/19/03	REVISED PER ACC COMMENTS DATED 1/24/03	GBR
2	12/9/02	REVISED PER ACC COMMENTS DATED 11/25/02	GBR
1	10/2/02	REVISED PER ACC COMMENTS DATED 8/9/02	GBR

5248 Old Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax (757) 220-8994



**DRAINAGE AND EROSION AND SEDIMENT CONTROL PLAN**  
**FORD'S COLONY**  
**AT WILLIAMSBURG**  
 SECTION XII  
 OWNER / DEVELOPER: REALTEC INCORPORATED  
 POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	CBR	Drawn	LBA
Scale	1"=50'	Date	5/22/02
Project No.	5652-12		
Drawing No.	2 OF 3		

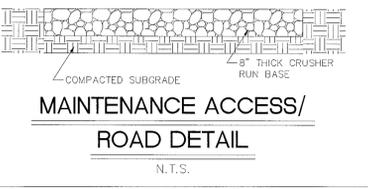
**STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN**

PROPER MAINTENANCE OF THIS FACILITY IS ENCOURAGED TO PREVENT THE INTRODUCTION OF DEBRIS AND SEDIMENT IN TO THE FACILITY, SPILLWAY(S) AND DOWNSTREAM WATERWAYS. FOLLOWING INSTALLATION OF THE FACILITY AND ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS, INSPECTIONS FOR SEDIMENT BUILDUPS WILL BE PERFORMED AT LEAST QUARTERLY. IT IS ANTICIPATED THAT UNDER NORMAL CONDITIONS, SEDIMENT REMOVAL FROM THE FACILITY WILL BE REQUIRED ONCE EVERY 10 YEARS. IF OTHER CONSTRUCTION OR RELATED ACTIVITIES ARE PERFORMED ON UPSLOPE PARCELS, ADEQUATE PROTECTION SHOULD BE PROVIDED AND INSPECTIONS PERFORMED AT LEAST ONCE WEEKLY.

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE SWM 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, A REPRESENTATIVE OF THE COUNTY MAY JOINTLY INSPECT THE STRUCTURE. APPROPRIATE ACTION, PERFORMED AT THE COST OF THE OWNER, WILL BE TAKEN TO ENSURE APPROPRIATE MAINTENANCE. WHERE STRUCTURES ARE TO BE MAINTAINED JOINTLY, ALLOCATION OF MAINTENANCE COSTS WILL BE IN ACCORDANCE WITH THE TERMS ESTABLISHED IN MAINTENANCE AGREEMENTS. KEYS TO LOCKED ACCESS POINTS SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

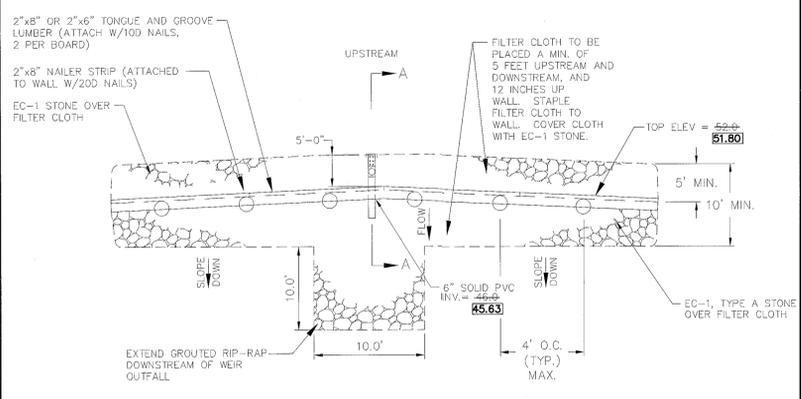
INSPECTION AND MAINTENANCE OF THE FACILITY WILL CONSIST OF THE FOLLOWING ADDITIONAL MEASURES:

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. IF THE DEPTH OF SEDIMENT REACHES THE DEPTH OF 1.0 FL ABOVE THE BOTTOM OF THE LOW FLOW ORIFICE IN THE TIMBER WALL, REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THIS TIME, THE STILLING BASINS LOCATED AT THE OUTFALLS OF THE STORM SEWER PIPE SYSTEMS SHALL ALSO BE INSPECTED. IF THE DEPTH OF SEDIMENT WITHIN THE STILLING BASINS REACHES A DEPTH OF 18" ABOVE THE BOTTOM OF THE BASIN OR 6" ABOVE THE INVERT OF THE OUTFALL PIPE, REMOVAL OF THE MATERIAL IS REQUIRED. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, CLEAN THE OUTLET PIPES WITHIN THE TIMBER WALL DETENTION BASINS OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA.
2. PERFORM QUARTERLY INSPECTIONS OF THE TIMBER STRUCTURE AND SPILLWAY DEVICES FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE.
3. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE TIMBER WALL, ORIFICE/ WEIR(S), OUTLET DEVICE AND STONE APRONS. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE INTEGRITY OF THE STRUCTURE.
4. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE DETENTION FACILITY FOR SIGNS OF ANIMAL/ RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING AS APPROPRIATE.
5. RECORD KEEPING. THE OWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OR INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.
6. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

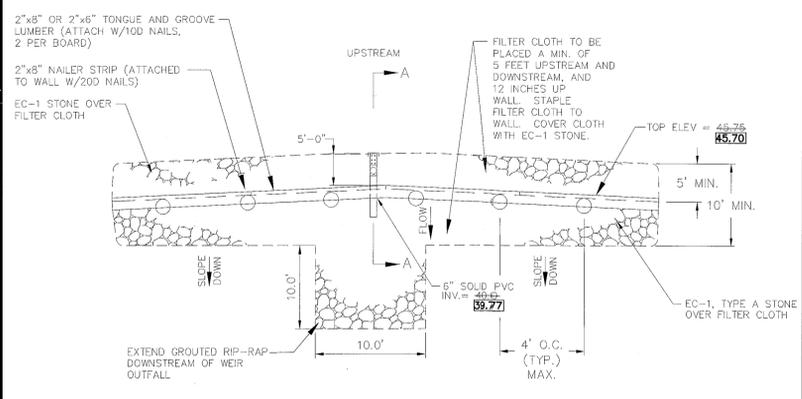


**RECORD DRAWING BASED ON INFORMATION AS SURVEYED 5/26/04 BY A.E.S. CONSULTING ENGINEERS**

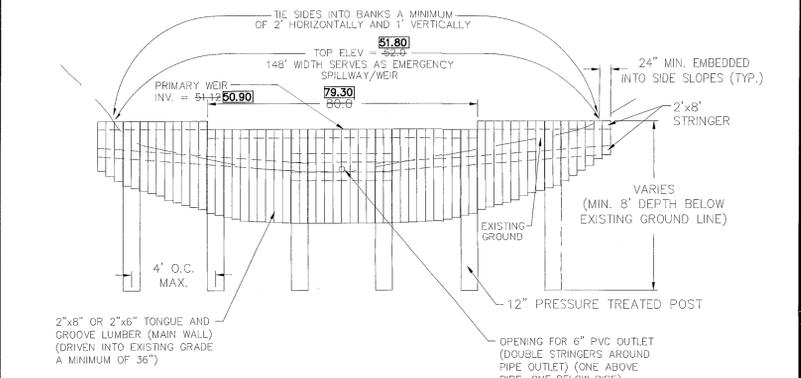
I HEREBY CERTIFY TO THE BEST OF MY JUDGEMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CONDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.



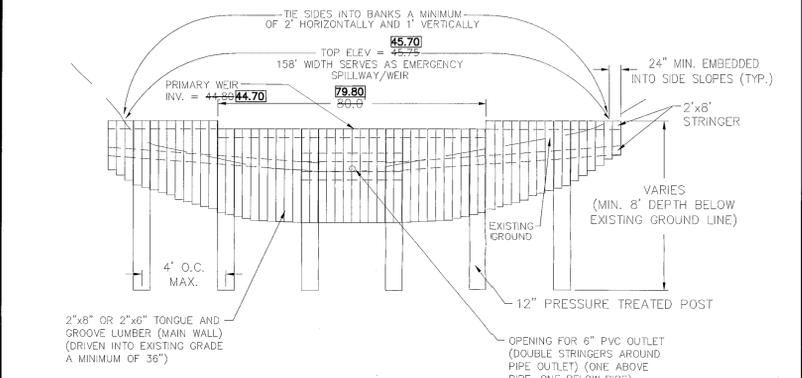
**PLAN VIEW**  
**DRY POND #1 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.



**PLAN VIEW**  
**DRY POND #2 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.



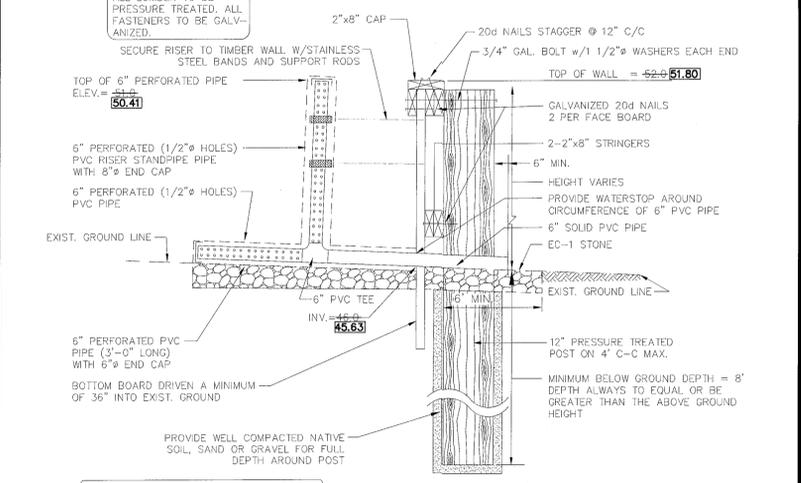
**UPSTREAM ELEVATION**  
**DRY POND #1 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.



**UPSTREAM ELEVATION**  
**DRY POND #2 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.

1 YEAR STORM ELEVATION	51.11	50.24
2 YEAR STORM ELEVATION	51.39	51.39
10 YEAR STORM ELEVATION	51.69	51.69
100 YEAR STORM ELEVATION	51.99	51.99

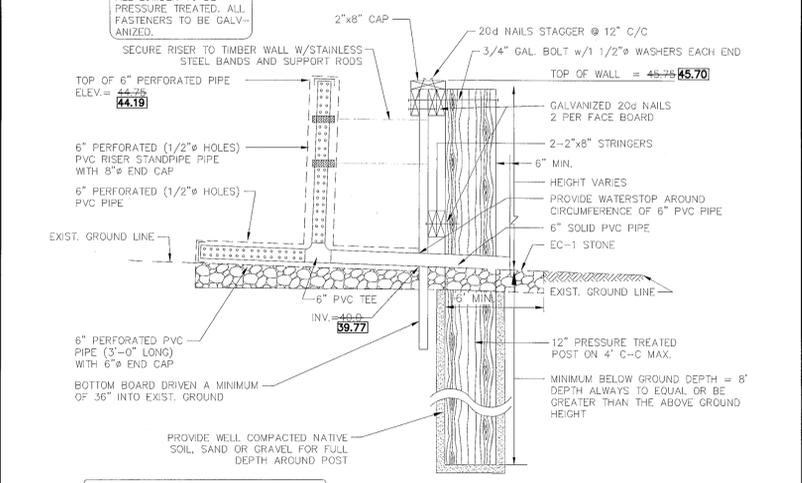
NOTE: ALL LUMBER TO BE PRESSURE TREATED. ALL FASTENERS TO BE GALVANIZED.



**SECTION A-A**  
**DRY POND #1 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.

1 YEAR STORM ELEVATION	44.75	44.31
2 YEAR STORM ELEVATION	45.04	45.23
10 YEAR STORM ELEVATION	45.79	45.55
100 YEAR STORM ELEVATION	46.79	46.55

NOTE: ALL LUMBER TO BE PRESSURE TREATED. ALL FASTENERS TO BE GALVANIZED.



**SECTION A-A**  
**DRY POND #2 PRESSURE TREATED WOOD DRY DETENTION STRUCTURE**  
SCALE: N.T.S.

No.	DATE	REVISION / COMMENT / NOTE
1	11/02/04	DWG AS-BUILT
2	10/19/04	RECORD DRAWINGS
3	2/29/05	REVISED PER ACC COMMENTS DATED 1/24/03
4	12/19/02	REVISED PER ACC COMMENTS DATED 11/29/02
5	10/22/02	REVISED PER ACC COMMENTS DATED 9/9/02

5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia, 23188  
(757) 253-0040  
Fax (757) 220-8994



NOTES AND DETAILS  
**FORD'S COLONY AT WILLIAMSBURG**  
SECTION XII  
OWNER / DEVELOPER: REALTEC INCORPORATED  
POW-HATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	CBR	Drawn	LBA
Scale	NONE	Date	5/22/02
Project No.	5652-12		
Drawing No.	3 OF 3		

(757) 253-0040  
 FAX (757) 220-8994

DATE 11/20/07	JOB NO. 5652-12
ATTENTION JASON BECK	
RE: FC Sect 12 As-builts for PC 207+208	

TO JCC ENVIRONMENTAL

---

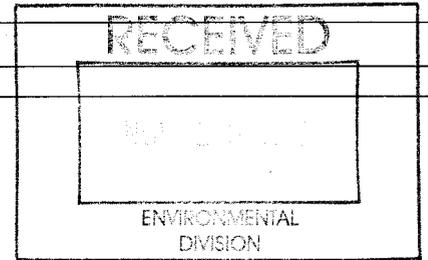


---

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings   
  Prints   
  Plans   
  Samples   
  Specifications  
 Copy of letter   
  Change order   
  \_\_\_\_\_

COPIES	DATE	NO.	DESCRIPTION
1			Mylar As-built drawings (3 sheets) Certification forms · PC 207/ BMP #1 · PC 208/ BMP #2

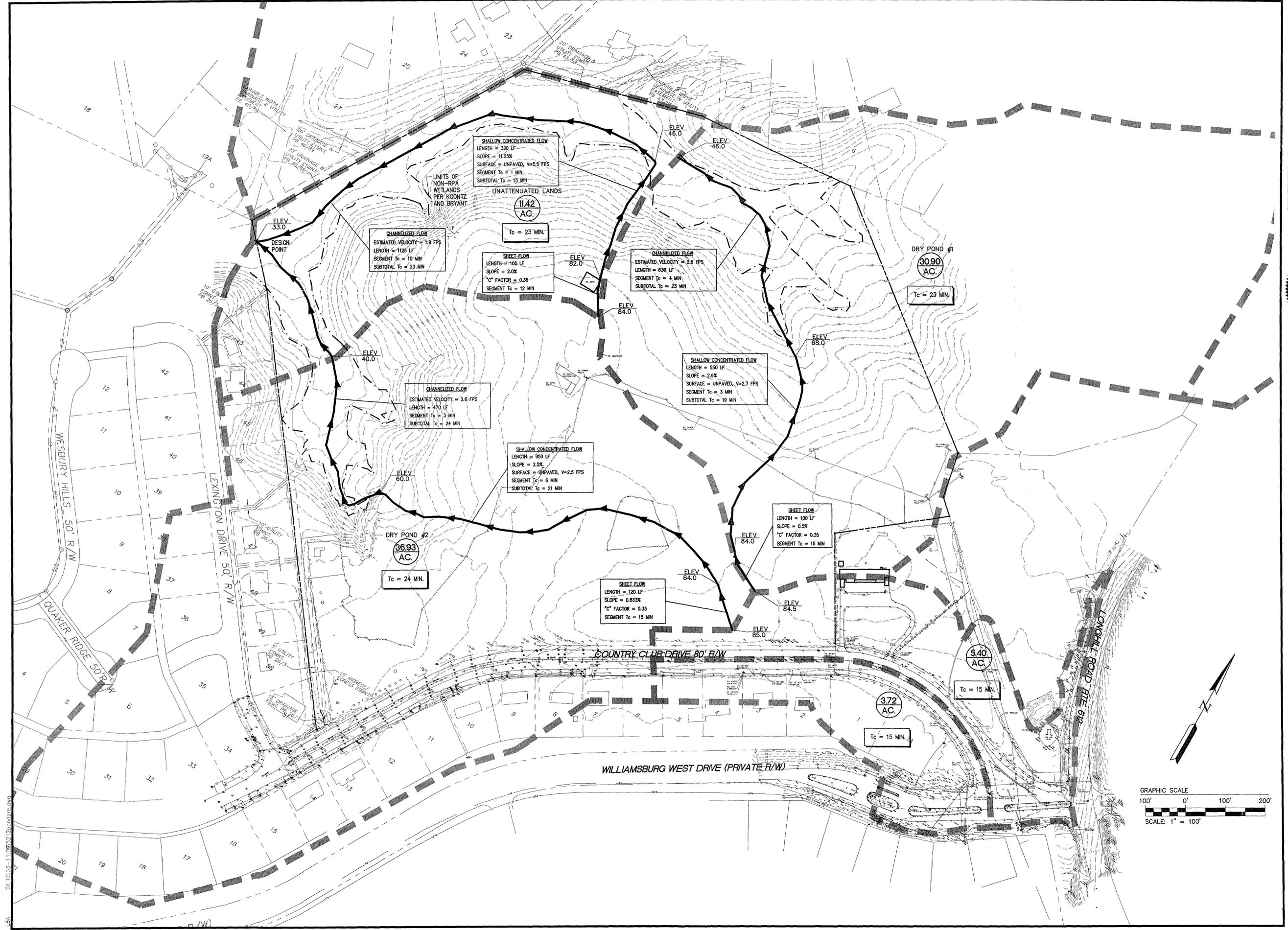


THESE ARE TRANSMITTED as checked below:

- For approval   
  Approved as submitted   
  Resubmit \_\_\_\_\_ copies for approval  
 For your use   
  Approved as noted   
  Submit \_\_\_\_\_ copies for distribution  
 As requested   
  Returned for corrections   
  Return \_\_\_\_\_ corrected prints  
 For review and comment   
  \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_   
  PRINTS RETURNED AFTER LOAN TO US

REMARKS

COPY TO \_\_\_\_\_ SIGNED: JASON GRIMES



NO.	DATE	REVISION / COMMENT / NOTE	BY
1	10/22/02	REVISED PER ACC COMMENTS DATED 8/29/02	CBR

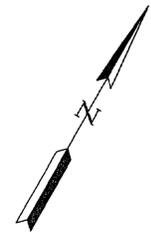
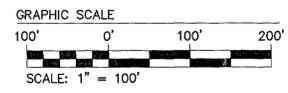


5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax (757) 220-8994



PRE-DEVELOPMENT DRAINAGE AREA MAP  
**FORD'S COLONY AT WILLIAMSBURG**  
 SECTION XII  
 OWNER / DEVELOPER: REALTEC INCORPORATED  
 FOWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Designed CBR	Drawn LBA
Scale 1"=100'	Date 5/22/02
Project No. 5652-12	
Drawing No. 1 OF 2	



LEA 01\_10\_03-11\_03ES212condorc.dwg



# FORD'S COLONY AT WILLIAMSBURG REALTEC INCORPORATED

RECORD DRAWING BASED ON INFORMATION AS SURVEYED 5/26/04 BY A.E.S. CONSULTING ENGINEERS

## JAMES CITY COUNTY, VIRGINIA POWHATAN DISTRICT SECTION XII (LOTS 2-72) CONSTRUCTION PLANS

I HEREBY CERTIFY TO THE BEST OF MY JUDGEMENT, KNOWLEDGE, AND BELIEF THAT THIS RECORD DRAWING REPRESENTS THE CONDITIONS OF THE SITE ON THE DATE IT WAS SURVEYED. THE SITE APPEARS TO CONFORM WITH THE PROVISIONS OF THE APPROVED DESIGN PLAN.



### PROPERTY INFORMATION

PROPERTY ZONING: RESIDENTIAL PLANNED COMMUNITY DISTRICT, R-4 WITH PROFFERS.

PROPERTY TAX PARCEL NO.: PART OF (32-3) (1-11)

THIS CONSTRUCTION PLAN IS FOR FORD'S COLONY SECTION XII, 71 LOT SUBDIVISION (JCC CASE NO. SP-51-02).

OWNER/ DEVELOPER: REALTEC, INC.  
1 FORD'S COLONY DR.  
WILLIAMSBURG, VA 23188  
TELEPHONE: 757-258-4230  
CONTACT: MR. DREW MULHARE

#### NOTE:

CHARLES B. RECORDS, A 'RESPONSIBLE LAND DISTURBER' WILL BE ACTING AS THE 'RESPONSIBLE LAND DISTURBER' FOR THE OWNER FOR THIS PROJECT.

CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY FOR EXISTING UTILITY LOCATIONS PRIOR TO COMMENCING CONSTRUCTION.

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

ONLY JCSA PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ON THE EXISTING WATER MAIN.

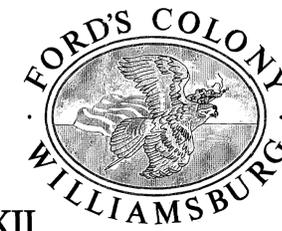
ANY EXISTING, UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE.

CONTRACTOR SHALL PROVIDE CERTIFICATION THAT CONSTRUCTION OF ALL STREETS WAS IN ACCORDANCE WITH V.D.O.T. CONSTRUCTION STANDARDS TO SATISFY ADMINISTRATIVE GUIDELINES FOR CERTIFICATION OF PRIVATE STREET CONSTRUCTION.

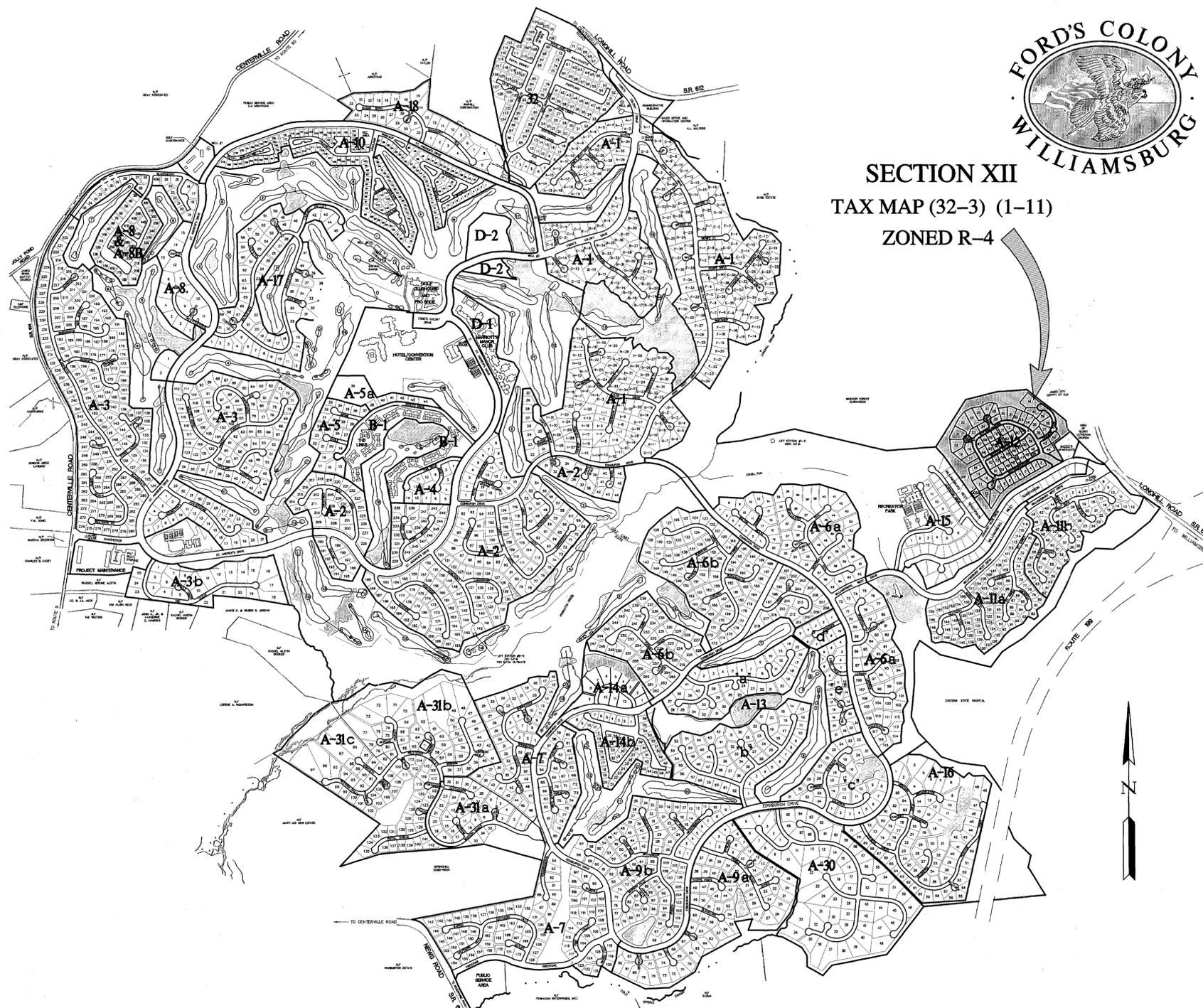
A PRE-CONSTRUCTION CONFERENCE SHALL BE HELD ON-SITE BETWEEN THE COUNTY, THE DEVELOPER, THE PROJECT ENGINEER AND THE CONTRACTOR PRIOR TO ISSUANCE OF A LAND DISTURBING PERMIT. THE CONTRACTOR SHALL SUBMIT A NARRATIVE PLAN TO THE COUNTY PRIOR TO THE PRE-CONSTRUCTION CONFERENCE DETAILING THE SEQUENCE OF CONSTRUCTION FOR THE PROJECT, INCLUDING INSTALLATION OF EROSION CONTROL MEASURES.

THIS PROJECT WAS REVIEWED BY THE DEVELOPMENT REVIEW COMMITTEE ON OCTOBER 30, 2002, IN ACCORDANCE WITH SECTION 19-23 OF THE JAMES CITY COUNTY SUBDIVISION ORDINANCE.

No.	DATE	REVISION / COMMENT / NOTE	BY
5	11/02/04	DAM AS-BUILTS	JSM
4	2/19/03	RECORDS DRAWINGS	CBR
3	2/19/03	REVISED PER JCC COMMENTS DATED 1/24/03	CBR
2	12/9/02	REVISED PER JCC COMMENTS DATED 11/5/02	CBR
1	10/2/02	REVISED PER JCC COMMENTS DATED 8/9/02	CBR



### SECTION XII TAX MAP (32-3) (1-11) ZONED R-4



### INDEX OF SHEETS

1. COVER SHEET
2. OVERALL LAND PLAN
3. PRELIMINARY PLAT
4. OVERALL SANITARY SEWER PLAN
5. OVERALL WATER DISTRIBUTION PLAN
6. ROAD AND UTILITY PLAN
7. ROAD AND UTILITY PLAN
8. ROAD AND UTILITY PLAN
9. OVERALL DRAINAGE PLAN
10. DRAINAGE AND EROSION AND SEDIMENT CONTROL PLAN
11. DRAINAGE AND EROSION AND SEDIMENT CONTROL PLAN
12. DRAINAGE AND EROSION AND SEDIMENT CONTROL PLAN
13. SALES ROAD AND TEMPORARY DRAINAGE PLAN
14. SALES ROAD AND TEMPORARY DRAINAGE PLAN
15. SALES ROAD AND TEMPORARY DRAINAGE PLAN
16. ENVIRONMENTAL INVENTORY PLAN
17. ROAD AND UTILITY PROFILES (ROAD 'A')
18. ROAD AND UTILITY PROFILES (ROAD 'B', 'C', 'D', 'E', 'F')
19. CROSS COUNTRY SANITARY SEWER (TRUNK LINE 'A-1', AND 'A-4')
20. CROSS COUNTRY SANITARY SEWER (TRUNK LINE 'A-2' AND 'A-3')
21. NOTES AND DETAILS
22. NOTES AND DETAILS
23. NOTES AND DETAILS
24. SEDIMENT TRAP AND BASIN DETAILS

### LEGEND

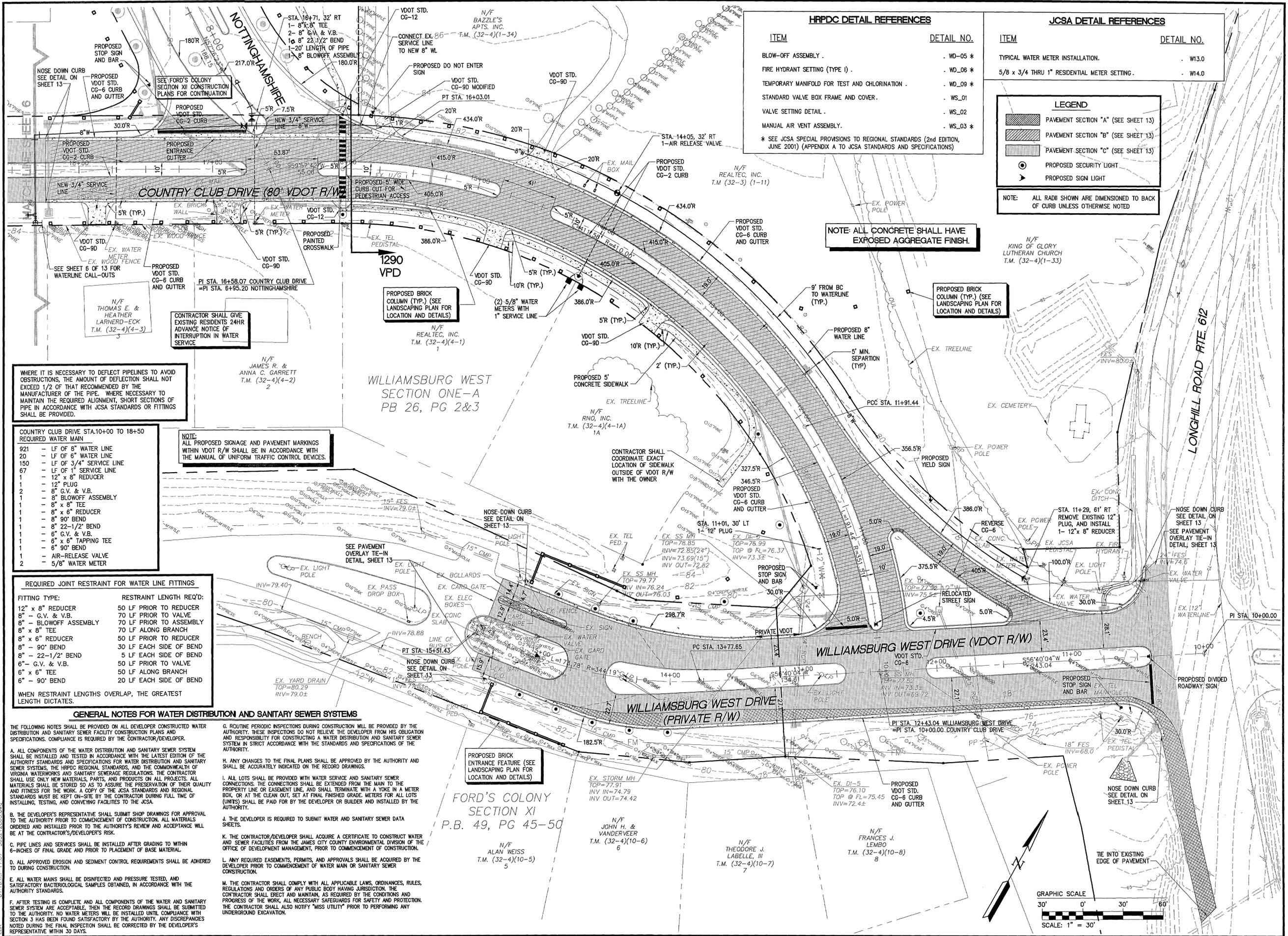
EXISTING	PROPOSED
W	W
S	S
S	S
S	S
EX. FM	FM
MANHOLE	MANHOLE
CURB DROP INLET	CURB DROP INLET
YARD DROP INLET	YARD DROP INLET
VALVE	VALVE
FIRE HYDRANT ASSEMBLY	FIRE HYDRANT ASSEMBLY
BLOW-OFF ASSEMBLY	BLOW-OFF ASSEMBLY
CLEAN OUT	CLEAN OUT
WATER METER	WATER METER
CENTERLINE/BASELINE	CENTERLINE/BASELINE
RIGHT OF WAY	RIGHT OF WAY
PROPERTY LINE	PROPERTY LINE
DITCH/SWALE	DITCH/SWALE
TREELINE/CLEARING LIMITS	TREELINE/CLEARING LIMITS
GROUND ELEVATION	GROUND ELEVATION
CONTOUR ELEV.	CONTOUR ELEV.



5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax (757) 220-8994

SCALE 1"= 800'

COVER SHEET



ITEM	DETAIL NO.
BLOW-OFF ASSEMBLY .	WD-05 *
FIRE HYDRANT SETTING (TYPE I) .	WD-06 *
TEMPORARY MANIFOLD FOR TEST AND CHLORINATION .	WD-09 *
STANDARD VALVE BOX FRAME AND COVER .	WS_01
VALVE SETTING DETAIL .	WS_02
MANUAL AIR VENT ASSEMBLY .	WS_03 *

ITEM	DETAIL NO.
TYPICAL WATER METER INSTALLATION .	W13.0
5/8 x 3/4 THRU 1" RESIDENTIAL METER SETTING .	W14.0

**LEGEND**

- [Pattern] PAVEMENT SECTION "A" (SEE SHEET 13)
- [Pattern] PAVEMENT SECTION "B" (SEE SHEET 13)
- [Pattern] PAVEMENT SECTION "C" (SEE SHEET 13)
- [Symbol] PROPOSED SECURITY LIGHT
- [Symbol] PROPOSED SIGN LIGHT

NOTE: ALL RADI SHOWN ARE DIMENSIONED TO BACK OF CURB UNLESS OTHERWISE NOTED

NOTE: ALL CONCRETE SHALL HAVE EXPOSED AGGREGATE FINISH.

PROPOSED BRICK COLUMN (TYP.) (SEE LANDSCAPING PLAN FOR LOCATION AND DETAILS)

WHERE IT IS NECESSARY TO DEFLECT PIPELINES TO AVOID OBSTRUCTIONS, THE AMOUNT OF DEFLECTION SHALL NOT EXCEED 1/2 OF THAT RECOMMENDED BY THE MANUFACTURER OF THE PIPE. WHERE NECESSARY TO MAINTAIN THE REQUIRED ALIGNMENT, SHORT SECTIONS OF PIPE IN ACCORDANCE WITH JCSA STANDARDS OR FITTINGS SHALL BE PROVIDED.

COUNTRY CLUB DRIVE STA.10+00 TO 18+50 REQUIRED WATER MAIN

921	- LF OF 8" WATER LINE
20	- LF OF 6" WATER LINE
150	- LF OF 3/4" SERVICE LINE
67	- LF OF 1" SERVICE LINE
1	- 12" x 8" REDUCER
1	- 12" PLUG
1	- 8" G.V. & V.B.
1	- 8" BLOWOFF ASSEMBLY
1	- 8" x 8" TEE
1	- 8" x 6" REDUCER
1	- 8" 90° BEND
1	- 8" 22-1/2° BEND
1	- 6" G.V. & V.B.
1	- 6" x 6" TAPPING TEE
1	- 6" 90° BEND
2	- AIR-RELEASE VALVE
1	- 5/8" WATER METER

NOTE: ALL PROPOSED SIGNAGE AND PAVEMENT MARKINGS WITHIN VDOT R/W SHALL BE IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

REQUIRED JOINT RESTRAINT FOR WATER LINE FITTINGS

FITTING TYPE:	RESTRAINT LENGTH REQ'D:
12" x 8" REDUCER	50 LF PRIOR TO REDUCER
8" - G.V. & V.B.	70 LF PRIOR TO VALVE
8" - BLOWOFF ASSEMBLY	70 LF PRIOR TO ASSEMBLY
8" x 8" TEE	70 LF ALONG BRANCH
8" x 6" REDUCER	50 LF PRIOR TO REDUCER
8" - 90° BEND	30 LF EACH SIDE OF BEND
8" - 22-1/2° BEND	5 LF EACH SIDE OF BEND
6" - G.V. & V.B.	50 LF PRIOR TO VALVE
6" x 6" TEE	50 LF ALONG BRANCH
6" - 90° BEND	20 LF EACH SIDE OF BEND

WHEN RESTRAINT LENGTHS OVERLAP, THE GREATEST LENGTH DICTATES.

**GENERAL NOTES FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS**

- THE FOLLOWING NOTES SHALL BE PROVIDED ON ALL DEVELOPER CONSTRUCTED WATER DISTRIBUTION AND SANITARY SEWER FACILITY CONSTRUCTION PLANS AND SPECIFICATIONS. COMPLIANCE IS REQUIRED BY THE CONTRACTOR/DEVELOPER.
- ALL COMPONENTS OF THE WATER DISTRIBUTION AND SANITARY SEWER SYSTEM SHALL BE INSTALLED AND TESTED IN ACCORDANCE WITH THE LATEST EDITION OF THE AUTHORITY STANDARDS AND SPECIFICATIONS FOR WATER DISTRIBUTION AND SANITARY SEWER SYSTEMS, THE HRPDC REGIONAL STANDARDS, AND THE COMMONWEALTH OF VIRGINIA WATERWORKS AND SANITARY SEWERAGE REGULATIONS. THE CONTRACTOR SHALL USE ONLY NEW MATERIALS, PARTS, AND PRODUCTS ON ALL PROJECTS. ALL MATERIALS SHALL BE STORED SO AS TO ASSURE THE PRESERVATION OF THEIR QUALITY AND FITNESS FOR THE WORK. A COPY OF THE JCSA STANDARDS AND REGIONAL STANDARDS MUST BE KEPT ON-SITE BY THE CONTRACTOR DURING FULL TIME OF INSTALLING, TESTING, AND CONVEYING FACILITIES TO THE JCSA.
  - THE DEVELOPER'S REPRESENTATIVE SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL TO THE AUTHORITY PRIOR TO COMMENCEMENT OF CONSTRUCTION. ALL MATERIALS ORDERED AND INSTALLED PRIOR TO THE AUTHORITY'S REVIEW AND ACCEPTANCE WILL BE AT THE CONTRACTOR'S/DEVELOPER'S RISK.
  - PIPE LINES AND SERVICES SHALL BE INSTALLED AFTER GRADING TO WITHIN 6-INCHES OF FINAL GRADE AND PRIOR TO PLACEMENT OF BASE MATERIAL.
  - ALL APPROVED EROSION AND SEDIMENT CONTROL REQUIREMENTS SHALL BE ADHERED TO DURING CONSTRUCTION.
  - ALL WATER MAINS SHALL BE DISINFECTED AND PRESSURE TESTED, AND SATISFACTORY BACTERIOLOGICAL SAMPLES OBTAINED, IN ACCORDANCE WITH THE AUTHORITY STANDARDS.
  - AFTER TESTING IS COMPLETE AND ALL COMPONENTS OF THE WATER AND SANITARY SEWER SYSTEM ARE ACCEPTABLE, THEN THE RECORD DRAWINGS SHALL BE SUBMITTED TO THE AUTHORITY. NO WATER METERS WILL BE INSTALLED UNTIL COMPLIANCE WITH SECTION 3 HAS BEEN FOUND SATISFACTORY BY THE AUTHORITY. ANY DISCREPANCIES NOTED DURING THE FINAL INSPECTION SHALL BE CORRECTED BY THE DEVELOPER'S REPRESENTATIVE WITHIN 30 DAYS.
  - ROUTINE PERIODIC INSPECTIONS DURING CONSTRUCTION WILL BE PROVIDED BY THE AUTHORITY. THESE INSPECTIONS DO NOT RELIEVE THE DEVELOPER FROM HIS OBLIGATION AND RESPONSIBILITY FOR CONSTRUCTING A WATER DISTRIBUTION AND SANITARY SEWER SYSTEM IN STRICT ACCORDANCE WITH THE STANDARDS AND SPECIFICATIONS OF THE AUTHORITY.
  - ANY CHANGES TO THE FINAL PLANS SHALL BE APPROVED BY THE AUTHORITY AND SHALL BE ACCURATELY INDICATED ON THE RECORD DRAWINGS.
  - ALL LOTS SHALL BE PROVIDED WITH WATER SERVICE AND SANITARY SEWER CONNECTIONS. THE CONNECTIONS SHALL BE EXTENDED FROM THE MAIN TO THE PROPERTY LINE OR EASEMENT LINE, AND SHALL TERMINATE WITH YOKES IN A METER BOX OR AT THE CLEAN OUT, SET AT FINAL FINISHED GRADE. METERS FOR ALL LOTS (UNITS) SHALL BE PAID FOR BY THE DEVELOPER OR BUILDER AND INSTALLED BY THE AUTHORITY.
  - THE DEVELOPER IS REQUIRED TO SUBMIT WATER AND SANITARY SEWER DATA SHEETS.
  - THE CONTRACTOR/DEVELOPER SHALL ACQUIRE A CERTIFICATE TO CONSTRUCT WATER AND SEWER FACILITIES FROM THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION OF THE OFFICE OF DEVELOPMENT MANAGEMENT, PRIOR TO COMMENCEMENT OF CONSTRUCTION.
  - ANY REQUIRED EASEMENTS, PERMITS, AND APPROVALS SHALL BE ACQUIRED BY THE DEVELOPER PRIOR TO COMMENCEMENT OF WATER MAIN OR SANITARY SEWER CONSTRUCTION.
  - THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS AND ORDERS OF ANY PUBLIC BODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION. THE CONTRACTOR SHALL ALSO NOTIFY "MISS UTILITY" PRIOR TO PERFORMING ANY UNDERGROUND EXCAVATION.

NO.	DATE	REVISION / COMMENT / NOTE	BY
1	12/9/02	REV PER JCC COMMENTS	CBR



5248 Old Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax (757) 220-8994



ROAD AND UTILITY PLAN  
**FORD'S COLONY AT WILLIAMSBURG**  
WILLIAMSBURG WEST AND COUNTRY CLUB DRIVE  
IMPROVEMENT PLANS  
OWNER / DEVELOPER: REALTEC INCORPORATED

DESIGNED: CBR  
DRAWN: LBA  
SCALE: 1"=30'  
DATE: 10/2/02  
PROJECT NO.: 5652-12  
DRAWING NO.: 5 OF 13





**Stormwater Management Design Calculations**

Ford's Colony at Williamsburg

Section XII (Lots 2-72)

James City County

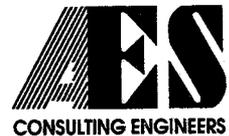
*S-51-02  
3RD SUBMISSION*

*Timber Wall #1 & #2  
PC207 & PC208*

Prepared by:  
AES Consulting Engineers  
5248 Olde Towne Rd.  
Williamsburg, Va. 23188  
(757) 253-0040

Date: May 22, 2002

Revised: December 13, 2002



**Narrative and Supporting Data**

---

## FORD'S COLONY, SECTION XII (LOTS 2-72)

### *STORMWATER MANAGEMENT/BMP NARRATIVE*

---

#### *General:*

This project is comprised of the construction of roadways, water and sanitary utilities, and stormwater management systems in the development of a 71-lot, single-family subdivision in Section XII of the Ford's Colony at Williamsburg development, located in James City County, Virginia. Additionally, this report contains calculations to support a second plan entitled, "Country Club Drive and Williamsburg West Drive Roadway Improvement Plans". Those plans are for the associated work being done in the VDOT right-of-way to improve the existing roadways with curb and gutter and entrance features.

The existing subdivision terrain is gently rolling with elevations ranging from 92 to 32 feet. A majority of the site drains naturally towards two ravines located on the Northern and Western edges of the parcel. The entire proposed stormwater system is comprised of two SWM dry detention ponds (#1 and #2) and five separate stormwater conveyance systems (A, B, C, D and E). Two proposed storm systems (D&E) convey stormwater to proposed Dry Pond #1. Additionally, one proposed storm system (A) conveys stormwater to proposed Dry Pond #2. The remaining storm systems (B & C) and the rest of the subdivision area drain naturally towards the existing ravine located at the northwestern edge of the parcel.

Two other storm systems (F&G) convey stormwater to the existing Williamsburg West and Longhill Road drainage systems. These systems are being modified to intercept drainage from the retrofitted curb and gutter system. In the post-developed scenario, both of these drainage systems will be conveying much smaller flows to their respective outfalls. This is accomplished by rerouting a large majority of the existing drainage to Dry Pond #1.

#### *Water Quality Considerations:*

**In complying with James City County's BMP policies, the Ford's Colony at Williamsburg overall development, which includes this property, already has a point value exceeding ten (10) points. Therefore, Section XII does not require any additional water quality treatment.** Mr. Darryl Cook, with the JCC Environmental Division, approved the BMP Master Plan for the development during the 1998 Master Plan Amendment for the Ford's Colony at Williamsburg development. Please see the Overall BMP Plan and Worksheet.

#### *Water Quantity Considerations:*

The Master Stormwater Management Plan for the overall development indicates that due to over-attenuation in other facilities within the project, Section XII does not require any on-site facilities. Although, even if from a Master Plan standpoint no additional attenuation is required for the development, channel adequacy issues have been identified. Upon design of the subdivision, it

was recognized that some form of attenuation would be required for the proposed development in lieu of performing any channel improvements. Therefore in an effort to minimize impacts to the existing channels, 18-hour detention of the 1-year, 24-hour design storm has been provided via two dry pond facilities (#1 and #2). It is also important to note that these facilities provide attenuation for off-site drainage from the Windsor Forest and Williamsburg West subdivisions along with other adjacent properties.

The two proposed SWM/BMP facilities previously mentioned are the main quantity control devices for the project. The remaining runoff area of the subdivision, consisting of 10.91 acres, does not drain to a BMP facility. To alleviate the impact of stormwater runoff through these lands, the two proposed dry pond facilities overattenuate the 2-year design storm. Please see the table below for a breakdown of pre-development vs. routed post-development flow rates at the critical locations. The design point for the calculations is located in the northwestern corner of the project. (See overall drainage maps.)

**Pre-Development vs. Post-Development Flowrate Comparison**

	Drainage Area (Acres)	CN	T <sub>c</sub> (min)	Q1-yr (cfs)	Q2-yr (cfs)	Q10-yr (cfs)	Q100-yr (cfs)
<b>Pre-development</b>							
Dry Pond #1	30.9	71.2	23	16.8	29.6	80.0	133.5
Dry Pond #2	36.93	68.9	24	16.6	31.0	89.0	151.9
Unattenuated Lands	11.42	74.9	23	8.5	13.8	33.6	54.0
<b>Total Pre-Development Flowrate at Design Point =</b>				41.9	74.4	202.6	339.4
<b>Post-development - Routed</b>							
Dry Pond #1 PC207	35.05	76.1	16	2.4	25.4	106.3	171.8
Dry Pond #2 PC208	37.22	74.5	16	1.8	26.4	109.6	178.4
Unattenuated Lands	10.91	80.4	19	11.2	16.9	36.9	56.6
<b>Total Post-Development Flowrate at Design Point =</b>				15.4	68.7	252.8	406.8

68.7 < 74.4 OK.

- The flowrates indicated are peak release rates, See supporting calculations for additional information concerning the watersheds.

As stated previously, every effort has been made to capture drainage within the proposed right-of-way and attenuate it in one of the two detention facilities. Although, due to the topography in the northwestern extremities of the site, portions of Road D and E, conveyed via storm systems B and C, respectively, are released directly into outlet protection stilling basins.

1-yr	BMP #1	BMP #2
2.41 cfs @ 51.11	1.24 cfs @ 44.78	
25.44 cfs @ 51.35	26.40 cfs @ 45.04	
116.11 cfs @ 51.79	116.83 cfs @ 45.47	
171.79 cfs @ 51.99	178.37 cfs @ 45.70	

\* INCREASE  
100-YEAR  
67.4 CFS

**Additional Information:**

The timber wall dry pond was selected for several reasons. From the James City County BMP Policy Manual, the timber wall design type was chosen because it was “a viable option for areas where wetlands or forest conservation regulations will not permit the construction of traditional stormwater management BMP’s.” Additionally, in an effort to minimize wetlands impacts, the dry pond was chosen due to its “hand-built” construction type.

There is a 25’ buffer, in easement, around both of the SWM/BMP facilities. The remainder of this report includes calculations for each of the five stormwater conveyance systems and the two dry ponds.

## Supporting Calculations

### Dry Pond #1

#### Pre Composite CN Calculation

Total Area= **30.90 AC**

	% of DA
%b soil	26.5%
%c soil	62.8%
%d soil	10.7%
	100.0%

	Acreage	CN	% of site *CN
Wooded	24.07	70	54.53
Field	2.85	71	6.55
Buildings	0.07	98	0.22
Windsor Forest	3.91	78	9.87
	30.90	<b>CN=</b>	<b>71.2</b>

#### Post Composite CN Calculation

Total Area= **35.05 AC**

	% of DA
%b soil	30.4%
%c soil	59.9%
%d soil	9.7%
	100.0%

	Acreage	CN	% of site *CN
Lots	16.25	81	37.55
Open (Field)	0.33	71	0.67
Open (Woods)	2.43	70	4.85
Woods	11.92	70	23.81
Buildings	0.07	98	0.20
Windsor Forest	4.05	78	9.01
	35.05	<b>CN=</b>	<b>76.1</b>

\*See Overall Drainage area map for Tc Calculations

### Dry Pond #2

#### Pre Composite CN Calculation

Total Area= **36.93 AC**

	% of DA
%b soil	85.2%
%c soil	14.8%
	100.0%

	Acreage	CN	% of site *CN
Wooded	10.91	62	18.32
Field	8.58	63	14.64
Buildings	0.04	98	0.11
Will. West Sub.	17.4	76	35.81
	36.93	<b>CN=</b>	<b>68.9</b>

#### Post Composite CN Calculation

Total Area= **37.22 AC**

	% of DA
%b soil	85.3%
%c soil	14.7%
	100.0%

	Acreage	CN	% of site *CN
Lots	15.74	76	32.14
Open (Field)	2.03	63	3.44
Open (Woods)	2.05	62	3.41
Will. West Sub.	17.4	76	35.53
	37.22	<b>CN=</b>	<b>74.5</b>

\*See Overall Drainage area map for Tc Calculations

## **Unattenuated Lands**

### **Pre Composite CN Calculation**

**Total Area= 11.42 AC**

	<b>% of DA</b>
%b soil	9.9%
%c soil	58.0%
%d soil	32.1%
	100.0%

	<b>Acreage</b>	<b>CN</b>	<b>% of site *CN</b>
Wooded	10.47	74	67.84
Will. West Sub.	0.92	84	6.77
Buildings	0.03	98	0.26
	<b>11.42</b>	<b>CN=</b>	<b>74.9</b>

### **Post Composite CN Calculation**

**Total Area= 10.91 AC**

	<b>% of DA</b>
%b soil	5.6%
%c soil	60.8%
%d soil	33.6%
	100.0%

	<b>Acreage</b>	<b>CN</b>	<b>% of site *CN</b>
Lots	6.04	84	46.50
Open (Woods)	3.95	74	26.79
Will. West Sub.	0.92	84	7.08
	<b>10.91</b>	<b>CN=</b>	<b>80.4</b>

\*See Overall Drainage area map for Tc Calculations

**Stormwater Management/BMP Facilities**

# Reservoir Report

Reservoir No. 1 - Dry Pond #1

Hydraflow Hydrographs by Intelisolve

## Pond Data

Pond storage is based on known contour areas. Average end area method used.

## Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	46.00	00	0	0
1.00	47.00	1,536	768	768
2.00	48.00	5,383	3,460	4,228
3.00	49.00	11,062	8,223	12,450
4.00	50.00	17,781	14,422	26,872
5.00	51.00	25,502	21,642	48,513
6.00	52.00	34,039	29,771	78,284

## Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 6.0	0.0	0.0	0.0
Span in	= 6.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 46.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

## Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 80.00	0.00	0.00	0.00
Crest El. ft	= 51.12	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 47.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

## Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	46.00	0.00	---	---	---	0.00	---	---	---	---	0.00
0.10	77	46.10	0.00	---	---	---	0.00	---	---	---	---	0.00
0.20	154	46.20	0.00	---	---	---	0.00	---	---	---	---	0.00
0.30	230	46.30	0.00	---	---	---	0.00	---	---	---	---	0.00
0.40	307	46.40	0.00	---	---	---	0.00	---	---	---	---	0.00
0.50	384	46.50	0.00	---	---	---	0.00	---	---	---	---	0.00
0.60	461	46.60	0.00	---	---	---	0.00	---	---	---	---	0.00
0.70	538	46.70	0.00	---	---	---	0.00	---	---	---	---	0.00
0.80	614	46.80	0.00	---	---	---	0.00	---	---	---	---	0.00
0.90	691	46.90	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	768	47.00	0.00	---	---	---	0.00	---	---	---	---	0.00
1.10	1,114	47.10	0.30	---	---	---	0.00	---	---	---	---	0.30
1.20	1,460	47.20	0.42	---	---	---	0.00	---	---	---	---	0.42
1.30	1,806	47.30	0.52	---	---	---	0.00	---	---	---	---	0.52
1.40	2,152	47.40	0.60	---	---	---	0.00	---	---	---	---	0.60
1.50	2,498	47.50	0.67	---	---	---	0.00	---	---	---	---	0.67
1.60	2,844	47.60	0.73	---	---	---	0.00	---	---	---	---	0.73
1.70	3,190	47.70	0.79	---	---	---	0.00	---	---	---	---	0.79

Continues on next page...

**Stage / Storage / Discharge Table**

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
1.80	3,536	47.80	0.85	---	---	---	0.00	---	---	---	---	0.85
1.90	3,882	47.90	0.90	---	---	---	0.00	---	---	---	---	0.90
2.00	4,228	48.00	0.95	---	---	---	0.00	---	---	---	---	0.95
2.10	5,050	48.10	0.99	---	---	---	0.00	---	---	---	---	0.99
2.20	5,872	48.20	1.04	---	---	---	0.00	---	---	---	---	1.04
2.30	6,694	48.30	1.08	---	---	---	0.00	---	---	---	---	1.08
2.40	7,517	48.40	1.12	---	---	---	0.00	---	---	---	---	1.12
2.50	8,339	48.50	1.16	---	---	---	0.00	---	---	---	---	1.16
2.60	9,161	48.60	1.20	---	---	---	0.00	---	---	---	---	1.20
2.70	9,983	48.70	1.23	---	---	---	0.00	---	---	---	---	1.23
2.80	10,806	48.80	1.27	---	---	---	0.00	---	---	---	---	1.27
2.90	11,628	48.90	1.30	---	---	---	0.00	---	---	---	---	1.30
3.00	12,450	49.00	1.34	---	---	---	0.00	---	---	---	---	1.34
3.10	13,892	49.10	1.37	---	---	---	0.00	---	---	---	---	1.37
3.20	15,334	49.20	1.40	---	---	---	0.00	---	---	---	---	1.40
3.30	16,776	49.30	1.43	---	---	---	0.00	---	---	---	---	1.43
3.40	18,219	49.40	1.46	---	---	---	0.00	---	---	---	---	1.46
3.50	19,661	49.50	1.49	---	---	---	0.00	---	---	---	---	1.49
3.60	21,103	49.60	1.52	---	---	---	0.00	---	---	---	---	1.52
3.70	22,545	49.70	1.55	---	---	---	0.00	---	---	---	---	1.55
3.80	23,987	49.80	1.58	---	---	---	0.00	---	---	---	---	1.58
3.90	25,429	49.90	1.61	---	---	---	0.00	---	---	---	---	1.61
4.00	26,872	50.00	1.64	---	---	---	0.00	---	---	---	---	1.64
4.10	29,036	50.10	1.66	---	---	---	0.00	---	---	---	---	1.66
4.20	31,200	50.20	1.69	---	---	---	0.00	---	---	---	---	1.69
4.30	33,364	50.30	1.72	---	---	---	0.00	---	---	---	---	1.72
4.40	35,528	50.40	1.74	---	---	---	0.00	---	---	---	---	1.74
4.50	37,692	50.50	1.77	---	---	---	0.00	---	---	---	---	1.77
4.60	39,856	50.60	1.79	---	---	---	0.00	---	---	---	---	1.79
4.70	42,021	50.70	1.82	---	---	---	0.00	---	---	---	---	1.82
4.80	44,185	50.80	1.84	---	---	---	0.00	---	---	---	---	1.84
4.90	46,349	50.90	1.87	---	---	---	0.00	---	---	---	---	1.87
5.00	48,513	51.00	1.89	---	---	---	0.00	---	---	---	---	1.89
5.10	51,490	51.10	1.91	---	---	---	0.00	---	---	---	---	1.91
5.20	54,467	51.20	1.94	---	---	---	4.71	---	---	---	---	6.64
5.30	57,444	51.30	1.96	---	---	---	15.88	---	---	---	---	17.84
5.40	60,421	51.40	1.98	---	---	---	30.82	---	---	---	---	32.80
5.50	63,398	51.50	2.01	---	---	---	48.72	---	---	---	---	50.73
5.60	66,375	51.60	2.03	---	---	---	69.17	---	---	---	---	71.20
5.70	69,352	51.70	2.05	---	---	---	91.87	---	---	---	---	93.92
5.80	72,329	51.80	2.07	---	---	---	116.63	---	---	---	---	118.70
5.90	75,306	51.90	2.09	---	---	---	143.28	---	---	---	---	145.38
6.00	78,284	52.00	2.11	---	---	---	171.71	---	---	---	---	173.82

...End

# Reservoir Report

## Reservoir No. 2 - Dry Pond #2

Hydraflow Hydrographs by Intelisolve

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	40.00	00	0	0
1.00	41.00	2,606	1,303	1,303
2.00	42.00	7,352	4,979	6,282
3.00	43.00	13,446	10,399	16,681
4.00	44.00	20,676	17,061	33,742
5.00	45.00	29,207	24,942	58,684
6.00	46.00	37,293	33,250	91,934

### Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 6.0	0.0	0.0	0.0
Span in	= 6.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 80.00	0.00	0.00	0.00
Crest El. ft	= 44.80	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 41.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

### Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	40.00	0.00	---	---	---	0.00	---	---	---	---	0.00
0.10	130	40.10	0.00	---	---	---	0.00	---	---	---	---	0.00
0.20	261	40.20	0.00	---	---	---	0.00	---	---	---	---	0.00
0.30	391	40.30	0.00	---	---	---	0.00	---	---	---	---	0.00
0.40	521	40.40	0.00	---	---	---	0.00	---	---	---	---	0.00
0.50	652	40.50	0.00	---	---	---	0.00	---	---	---	---	0.00
0.60	782	40.60	0.00	---	---	---	0.00	---	---	---	---	0.00
0.70	912	40.70	0.00	---	---	---	0.00	---	---	---	---	0.00
0.80	1,042	40.80	0.00	---	---	---	0.00	---	---	---	---	0.00
0.90	1,173	40.90	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	1,303	41.00	0.00	---	---	---	0.00	---	---	---	---	0.00
1.10	1,801	41.10	0.30	---	---	---	0.00	---	---	---	---	0.30
1.20	2,299	41.20	0.42	---	---	---	0.00	---	---	---	---	0.42
1.30	2,797	41.30	0.52	---	---	---	0.00	---	---	---	---	0.52
1.40	3,295	41.40	0.60	---	---	---	0.00	---	---	---	---	0.60
1.50	3,793	41.50	0.67	---	---	---	0.00	---	---	---	---	0.67
1.60	4,290	41.60	0.73	---	---	---	0.00	---	---	---	---	0.73
1.70	4,788	41.70	0.79	---	---	---	0.00	---	---	---	---	0.79

Continues on next page...

**Stage / Storage / Discharge Table**

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
1.80	5,286	41.80	0.85	---	---	---	0.00	---	---	---	---	0.85
1.90	5,784	41.90	0.90	---	---	---	0.00	---	---	---	---	0.90
2.00	6,282	42.00	0.95	---	---	---	0.00	---	---	---	---	0.95
2.10	7,322	42.10	0.99	---	---	---	0.00	---	---	---	---	0.99
2.20	8,362	42.20	1.04	---	---	---	0.00	---	---	---	---	1.04
2.30	9,402	42.30	1.08	---	---	---	0.00	---	---	---	---	1.08
2.40	10,442	42.40	1.12	---	---	---	0.00	---	---	---	---	1.12
2.50	11,482	42.50	1.16	---	---	---	0.00	---	---	---	---	1.16
2.60	12,521	42.60	1.20	---	---	---	0.00	---	---	---	---	1.20
2.70	13,561	42.70	1.23	---	---	---	0.00	---	---	---	---	1.23
2.80	14,601	42.80	1.27	---	---	---	0.00	---	---	---	---	1.27
2.90	15,641	42.90	1.30	---	---	---	0.00	---	---	---	---	1.30
3.00	16,681	43.00	1.34	---	---	---	0.00	---	---	---	---	1.34
3.10	18,387	43.10	1.37	---	---	---	0.00	---	---	---	---	1.37
3.20	20,093	43.20	1.40	---	---	---	0.00	---	---	---	---	1.40
3.30	21,799	43.30	1.43	---	---	---	0.00	---	---	---	---	1.43
3.40	23,505	43.40	1.46	---	---	---	0.00	---	---	---	---	1.46
3.50	25,212	43.50	1.49	---	---	---	0.00	---	---	---	---	1.49
3.60	26,918	43.60	1.52	---	---	---	0.00	---	---	---	---	1.52
3.70	28,624	43.70	1.55	---	---	---	0.00	---	---	---	---	1.55
3.80	30,330	43.80	1.58	---	---	---	0.00	---	---	---	---	1.58
3.90	32,036	43.90	1.61	---	---	---	0.00	---	---	---	---	1.61
4.00	33,742	44.00	1.64	---	---	---	0.00	---	---	---	---	1.64
4.10	36,236	44.10	1.66	---	---	---	0.00	---	---	---	---	1.66
4.20	38,730	44.20	1.69	---	---	---	0.00	---	---	---	---	1.69
4.30	41,224	44.30	1.72	---	---	---	0.00	---	---	---	---	1.72
4.40	43,719	44.40	1.74	---	---	---	0.00	---	---	---	---	1.74
4.50	46,213	44.50	1.77	---	---	---	0.00	---	---	---	---	1.77
4.60	48,707	44.60	1.79	---	---	---	0.00	---	---	---	---	1.79
4.70	51,201	44.70	1.82	---	---	---	0.00	---	---	---	---	1.82
4.80	53,695	44.80	1.84	---	---	---	0.00	---	---	---	---	1.84
4.90	56,189	44.90	1.87	---	---	---	6.58	---	---	---	---	8.44
5.00	58,684	45.00	1.89	---	---	---	18.60	---	---	---	---	20.49
5.10	62,009	45.10	1.91	---	---	---	34.18	---	---	---	---	36.09
5.20	65,334	45.20	1.94	---	---	---	52.62	---	---	---	---	54.56
5.30	68,659	45.30	1.96	---	---	---	73.54	---	---	---	---	75.50
5.40	71,984	45.40	1.98	---	---	---	96.67	---	---	---	---	98.65
5.50	75,309	45.50	2.01	---	---	---	121.82	---	---	---	---	123.82
5.60	78,634	45.60	2.03	---	---	---	148.83	---	---	---	---	150.86
5.70	81,959	45.70	2.05	---	---	---	177.59	---	---	---	---	179.64
5.80	85,284	45.80	2.07	---	---	---	208.00	---	---	---	---	210.07
5.90	88,609	45.90	2.09	---	---	---	239.96	---	---	---	---	242.06
6.00	91,934	46.00	2.11	---	---	---	273.42	---	---	---	---	275.54

...End

# Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	16.81	29.64	-----	-----	79.99	-----	-----	133.53	Dry Pond #1 - Pre-Development
2	SCS Runoff	-----	16.59	31.03	-----	-----	89.03	-----	-----	151.88	Dry Pond #2 - Pre-Development
3	SCS Runoff	-----	8.54	13.82	-----	-----	33.62	-----	-----	53.95	Unattenuated Lands - Pre-Develope
5	SCS Runoff	-----	28.10	44.71	-----	-----	106.26	-----	-----	168.98	Dry Pond #1 - Post-Development
6	SCS Runoff	-----	27.83	45.05	-----	-----	109.56	-----	-----	175.83	Dry Pond #2 - Post-Development
7	SCS Runoff	-----	11.24	16.87	-----	-----	36.87	-----	-----	56.64	Unattenuated Lands - Post-Develope
9	Reservoir	5	2.41	25.44	-----	-----	116.11	-----	-----	171.79	Dry Pond #1 - Routed
10	Reservoir	6	1.84	26.40	-----	-----	116.83	-----	-----	178.37	Dry Pond #2 - Routed

Proj. file: 565212ponds1yr.gpw

Run date: 09-30-2002

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	16.81	8	728	68,157	---	----	----	Dry Pond #1 - Pre-Development
2	SCS Runoff	16.59	8	728	71,062	---	----	----	Dry Pond #2 - Pre-Development
3	SCS Runoff	8.54	8	728	32,355	---	----	----	Unattenuated Lands - Pre-Develope
5	SCS Runoff	28.10	8	728	105,299	---	----	----	Dry Pond #1 - Post-Development
6	SCS Runoff	27.83	8	728	105,451	---	----	----	Dry Pond #2 - Post-Development
7	SCS Runoff	11.24	8	728	40,918	---	----	----	Unattenuated Lands - Post-Develope
9	Reservoir	2.41	8	824	104,532	5	51.11	51,805	Dry Pond #1 - Routed
10	Reservoir	1.84	8	888	104,148	6	44.78	53,178	Dry Pond #2 - Routed

Proj. file: 565212ponds1yr.gpw

Return Period: 1 yr

Run date: 09-30-2002

# Hydrograph Report

## Hyd. No. 1

Dry Pond #1 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.81 cfs
Storm frequency	=	1 yrs	Time interval	=	8 min
Drainage area	=	30.90 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	23 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 68,157 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.87	4.17
12.00	12.48
12.13	16.81 <<
12.27	12.78
12.40	8.05
12.53	4.35
12.67	3.58
12.80	3.03
12.93	2.68
13.07	2.45
13.20	2.26
13.33	2.11
13.47	1.98
13.60	1.86
13.73	1.75

...End

# Hydrograph Report

## Hyd. No. 2

Dry Pond #2 - Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 16.59 cfs
Storm frequency	= 1 yrs	Time interval	= 8 min
Drainage area	= 36.93 ac	Curve number	= 69
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 24 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 71,062 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.87	3.31
12.00	11.69
12.13	16.59 <<
12.27	12.97
12.40	8.39
12.53	4.62
12.67	3.82
12.80	3.24
12.93	2.87
13.07	2.63
13.20	2.43
13.33	2.27
13.47	2.13
13.60	2.01
13.73	1.89
13.87	1.79
14.00	1.69

...End

# Hydrograph Report

## Hyd. No. 3

### Unattenuated Lands - Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 8.54 cfs
Storm frequency	= 1 yrs	Time interval	= 8 min
Drainage area	= 11.42 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,355 cuft

### Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.87	2.84
12.00	6.85
12.13	8.54 <<
12.27	6.25
12.40	3.77
12.53	1.98
12.67	1.62
12.80	1.37
12.93	1.20
13.07	1.10
13.20	1.01
13.33	0.94
13.47	0.88

...End

# Hydrograph Report

## Hyd. No. 5

### Dry Pond #1 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.10 cfs
Storm frequency	=	1 yrs	Time interval	=	8 min
Drainage area	=	35.05 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 105,299 cuft

### Hydrograph Discharge Table

#### Time -- Outflow (min      cfs)

704	2.83
712	9.82
720	22.87
728	28.10 <<
736	20.40
744	12.21
752	6.37
760	5.22
768	4.39
776	3.86
784	3.52
792	3.24
800	3.01
808	2.81

...End

# Hydrograph Report

## Hyd. No. 6

Dry Pond #2 - Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 27.83 cfs
Storm frequency	= 1 yrs	Time interval	= 8 min
Drainage area	= 37.22 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 105,451 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.87	9.26
12.00	22.33
12.13	27.83 <<
12.27	20.36
12.40	12.29
12.53	6.45
12.67	5.29
12.80	4.45
12.93	3.92
13.07	3.58
13.20	3.29
13.33	3.06
13.47	2.86

...End

# Hydrograph Report

## Hyd. No. 7

Unattenuated Lands - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.24 cfs
Storm frequency	=	1 yrs	Time interval	=	8 min
Drainage area	=	10.91 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	19 min
Total precip.	=	2.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 40,918 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	1.58
11.87	4.56
12.00	9.58
12.13	11.24 <<
12.27	7.96
12.40	4.62
12.53	2.36
12.67	1.92
12.80	1.61
12.93	1.41
13.07	1.28
13.20	1.18

...End

# Hydrograph Report

## Hyd. No. 9

### Dry Pond #1 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Inflow hyd. No. = 5  
 Max. Elevation = 51.11 ft

Peak discharge = 2.41 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #1  
 Max. Storage = 51,805 cuft

Storage Indication method used.

Outflow hydrograph volume = 104,532 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
11.73	2.83	47.18	0.40	----	----	----	----	----	----	----	----	0.40
11.87	9.82	47.97	0.93	----	----	----	----	----	----	----	----	0.93
12.00	22.87	48.88	1.29	----	----	----	----	----	----	----	----	1.29
12.13	28.10 <<	49.73	1.56	----	----	----	----	----	----	----	----	1.56
12.27	20.40	50.32	1.72	----	----	----	----	----	----	----	----	1.72
12.40	12.21	50.64	1.80	----	----	----	----	----	----	----	----	1.80
12.53	6.37	50.81	1.84	----	----	----	----	----	----	----	----	1.84
12.67	5.22	50.90	1.87	----	----	----	----	----	----	----	----	1.87
12.80	4.39	50.96	1.88	----	----	----	----	----	----	----	----	1.88
12.93	3.86	51.01	1.89	----	----	----	----	----	----	----	----	1.89
13.07	3.52	51.04	1.90	----	----	----	----	----	----	----	----	1.90
13.20	3.24	51.06	1.90	----	----	----	----	----	----	----	----	1.90
13.33	3.01	51.08	1.91	----	----	----	----	----	----	----	----	1.91
13.47	2.81	51.10	1.91	----	----	----	----	----	----	----	----	1.91
13.60	2.64	51.11	1.92	----	----	----	0.32	----	----	----	----	2.24
13.73	2.48	51.11 <<	1.92	----	----	----	0.50	----	----	----	----	2.41 <<
13.87	2.33	51.11	1.92	----	----	----	0.49	----	----	----	----	2.41
14.00	2.20	51.11	1.92	----	----	----	0.41	----	----	----	----	2.33
14.13	2.08	51.11	1.92	----	----	----	0.31	----	----	----	----	2.23
14.27	1.98	51.10	1.92	----	----	----	0.20	----	----	----	----	2.12
14.40	1.92	51.10	1.91	----	----	----	0.11	----	----	----	----	2.03
14.53	1.87	51.10	1.91	----	----	----	0.04	----	----	----	----	1.95
14.67	1.83	51.10	1.91	----	----	----	----	----	----	----	----	1.91
14.80	1.78	51.10	1.91	----	----	----	----	----	----	----	----	1.91
14.93	1.74	51.10	1.91	----	----	----	----	----	----	----	----	1.91
15.07	1.69	51.09	1.91	----	----	----	----	----	----	----	----	1.91
15.20	1.65	51.09	1.91	----	----	----	----	----	----	----	----	1.91
15.33	1.60	51.08	1.91	----	----	----	----	----	----	----	----	1.91
15.47	1.56	51.08	1.91	----	----	----	----	----	----	----	----	1.91
15.60	1.51	51.07	1.91	----	----	----	----	----	----	----	----	1.91
15.73	1.46	51.07	1.91	----	----	----	----	----	----	----	----	1.91
15.87	1.42	51.06	1.90	----	----	----	----	----	----	----	----	1.90
16.00	1.37	51.05	1.90	----	----	----	----	----	----	----	----	1.90
16.13	1.32	51.04	1.90	----	----	----	----	----	----	----	----	1.90
16.27	1.29	51.03	1.90	----	----	----	----	----	----	----	----	1.90
16.40	1.26	51.02	1.90	----	----	----	----	----	----	----	----	1.90
16.53	1.25	51.01	1.89	----	----	----	----	----	----	----	----	1.89
16.67	1.23	51.00	1.89	----	----	----	----	----	----	----	----	1.89

Continues on next page...

**Hydrograph Discharge Table**

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
16.80	1.21	50.99	1.89	----	----	----	----	----	----	----	----	1.89
16.93	1.20	50.97	1.88	----	----	----	----	----	----	----	----	1.88
17.07	1.18	50.96	1.88	----	----	----	----	----	----	----	----	1.88
17.20	1.16	50.94	1.88	----	----	----	----	----	----	----	----	1.88
17.33	1.15	50.92	1.87	----	----	----	----	----	----	----	----	1.87
17.47	1.13	50.91	1.87	----	----	----	----	----	----	----	----	1.87
17.60	1.11	50.89	1.86	----	----	----	----	----	----	----	----	1.86
17.73	1.10	50.87	1.86	----	----	----	----	----	----	----	----	1.86
17.87	1.08	50.86	1.86	----	----	----	----	----	----	----	----	1.86
18.00	1.06	50.84	1.85	----	----	----	----	----	----	----	----	1.85
18.13	1.05	50.82	1.85	----	----	----	----	----	----	----	----	1.85
18.27	1.03	50.80	1.84	----	----	----	----	----	----	----	----	1.84
18.40	1.01	50.79	1.84	----	----	----	----	----	----	----	----	1.84
18.53	0.99	50.77	1.83	----	----	----	----	----	----	----	----	1.83
18.67	0.98	50.75	1.83	----	----	----	----	----	----	----	----	1.83
18.80	0.96	50.73	1.83	----	----	----	----	----	----	----	----	1.83
18.93	0.94	50.71	1.82	----	----	----	----	----	----	----	----	1.82
19.07	0.92	50.69	1.82	----	----	----	----	----	----	----	----	1.82
19.20	0.90	50.67	1.81	----	----	----	----	----	----	----	----	1.81
19.33	0.89	50.65	1.81	----	----	----	----	----	----	----	----	1.81
19.47	0.87	50.63	1.80	----	----	----	----	----	----	----	----	1.80
19.60	0.85	50.61	1.80	----	----	----	----	----	----	----	----	1.80
19.73	0.83	50.59	1.79	----	----	----	----	----	----	----	----	1.79
19.87	0.81	50.57	1.79	----	----	----	----	----	----	----	----	1.79
20.00	0.79	50.54	1.78	----	----	----	----	----	----	----	----	1.78
20.13	0.78	50.52	1.77	----	----	----	----	----	----	----	----	1.77
20.27	0.76	50.50	1.77	----	----	----	----	----	----	----	----	1.77
20.40	0.76	50.48	1.76	----	----	----	----	----	----	----	----	1.76
20.53	0.75	50.46	1.76	----	----	----	----	----	----	----	----	1.76
20.67	0.75	50.43	1.75	----	----	----	----	----	----	----	----	1.75
20.80	0.75	50.41	1.75	----	----	----	----	----	----	----	----	1.75
20.93	0.74	50.39	1.74	----	----	----	----	----	----	----	----	1.74
21.07	0.74	50.37	1.73	----	----	----	----	----	----	----	----	1.73
21.20	0.74	50.35	1.73	----	----	----	----	----	----	----	----	1.73
21.33	0.73	50.32	1.72	----	----	----	----	----	----	----	----	1.72
21.47	0.73	50.30	1.72	----	----	----	----	----	----	----	----	1.72
21.60	0.73	50.28	1.71	----	----	----	----	----	----	----	----	1.71
21.73	0.72	50.26	1.71	----	----	----	----	----	----	----	----	1.71
21.87	0.72	50.24	1.70	----	----	----	----	----	----	----	----	1.70
22.00	0.72	50.21	1.69	----	----	----	----	----	----	----	----	1.69
22.13	0.72	50.19	1.69	----	----	----	----	----	----	----	----	1.69
22.27	0.71	50.17	1.68	----	----	----	----	----	----	----	----	1.68
22.40	0.71	50.15	1.68	----	----	----	----	----	----	----	----	1.68
22.53	0.71	50.13	1.67	----	----	----	----	----	----	----	----	1.67
22.67	0.70	50.11	1.67	----	----	----	----	----	----	----	----	1.67
22.80	0.70	50.09	1.66	----	----	----	----	----	----	----	----	1.66
22.93	0.70	50.06	1.65	----	----	----	----	----	----	----	----	1.65
23.07	0.69	50.04	1.65	----	----	----	----	----	----	----	----	1.65
23.20	0.69	50.02	1.64	----	----	----	----	----	----	----	----	1.64
23.33	0.69	50.00	1.64	----	----	----	----	----	----	----	----	1.64
23.47	0.68	49.97	1.63	----	----	----	----	----	----	----	----	1.63

Continues on next page...

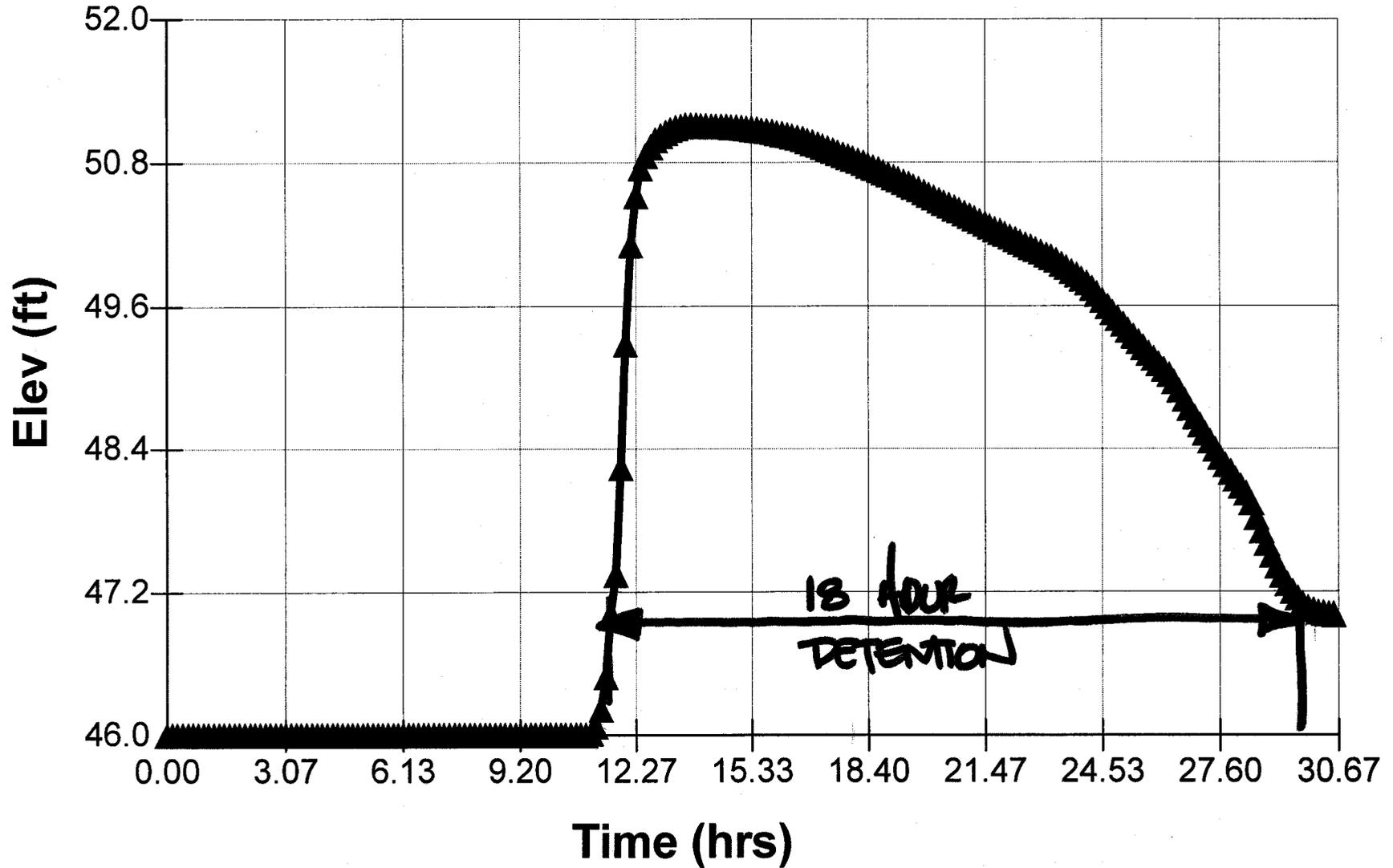
**Hydrograph Discharge Table**

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
23.60	0.68	49.94	1.62	----	----	----	----	----	----	----	----	1.62
23.73	0.67	49.91	1.61	----	----	----	----	----	----	----	----	1.61
23.87	0.67	49.87	1.60	----	----	----	----	----	----	----	----	1.60
24.00	0.67	49.84	1.59	----	----	----	----	----	----	----	----	1.59
24.13	0.53	49.81	1.58	----	----	----	----	----	----	----	----	1.58
24.27	0.27	49.77	1.57	----	----	----	----	----	----	----	----	1.57
24.40	0.09	49.73	1.56	----	----	----	----	----	----	----	----	1.56
24.53	0.00	49.68	1.55	----	----	----	----	----	----	----	----	1.55
24.67	0.00	49.62	1.53	----	----	----	----	----	----	----	----	1.53
24.80	0.00	49.57	1.52	----	----	----	----	----	----	----	----	1.52
24.93	0.00	49.52	1.50	----	----	----	----	----	----	----	----	1.50
25.07	0.00	49.47	1.49	----	----	----	----	----	----	----	----	1.49
25.20	0.00	49.42	1.47	----	----	----	----	----	----	----	----	1.47
25.33	0.00	49.38	1.46	----	----	----	----	----	----	----	----	1.46
25.47	0.00	49.33	1.44	----	----	----	----	----	----	----	----	1.44
25.60	0.00	49.28	1.43	----	----	----	----	----	----	----	----	1.43
25.73	0.00	49.23	1.41	----	----	----	----	----	----	----	----	1.41
25.87	0.00	49.19	1.40	----	----	----	----	----	----	----	----	1.40
26.00	0.00	49.14	1.38	----	----	----	----	----	----	----	----	1.38
26.13	0.00	49.09	1.37	----	----	----	----	----	----	----	----	1.37
26.27	0.00	49.05	1.35	----	----	----	----	----	----	----	----	1.35
26.40	0.00	49.00	1.34	----	----	----	----	----	----	----	----	1.34
26.53	0.00	48.93	1.31	----	----	----	----	----	----	----	----	1.31
26.67	0.00	48.85	1.29	----	----	----	----	----	----	----	----	1.29
26.80	0.00	48.78	1.26	----	----	----	----	----	----	----	----	1.26
26.93	0.00	48.71	1.23	----	----	----	----	----	----	----	----	1.23
27.07	0.00	48.63	1.21	----	----	----	----	----	----	----	----	1.21
27.20	0.00	48.56	1.18	----	----	----	----	----	----	----	----	1.18
27.33	0.00	48.50	1.16	----	----	----	----	----	----	----	----	1.16
27.47	0.00	48.43	1.13	----	----	----	----	----	----	----	----	1.13
27.60	0.00	48.36	1.10	----	----	----	----	----	----	----	----	1.10
27.73	0.00	48.30	1.08	----	----	----	----	----	----	----	----	1.08
27.87	0.00	48.24	1.05	----	----	----	----	----	----	----	----	1.05
28.00	0.00	48.18	1.03	----	----	----	----	----	----	----	----	1.03
28.13	0.00	48.12	1.00	----	----	----	----	----	----	----	----	1.00
28.27	0.00	48.06	0.97	----	----	----	----	----	----	----	----	0.97
28.40	0.00	48.01	0.95	----	----	----	----	----	----	----	----	0.95
28.53	0.00	47.88	0.89	----	----	----	----	----	----	----	----	0.89
28.67	0.00	47.77	0.83	----	----	----	----	----	----	----	----	0.83
28.80	0.00	47.66	0.76	----	----	----	----	----	----	----	----	0.76
28.93	0.00	47.55	0.70	----	----	----	----	----	----	----	----	0.70
29.07	0.00	47.46	0.64	----	----	----	----	----	----	----	----	0.64
29.20	0.00	47.38	0.58	----	----	----	----	----	----	----	----	0.58
29.33	0.00	47.30	0.52	----	----	----	----	----	----	----	----	0.52
29.47	0.00	47.23	0.45	----	----	----	----	----	----	----	----	0.45
29.60	0.00	47.17	0.39	----	----	----	----	----	----	----	----	0.39
29.73	0.00	47.12	0.33	----	----	----	----	----	----	----	----	0.33
29.87	0.00	47.08	0.25	----	----	----	----	----	----	----	----	0.25

...End

DRY POND #1

9 - Reservoir - 1 Yr - Max. El. = 51.11 ft



18 hour  
DETENTION

# Hydrograph Report

## Hyd. No. 10

Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 44.78 ft

Peak discharge = 1.84 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 53,178 cuft

Storage Indication method used.

Outflow hydrograph volume = 104,148 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
11.87	9.26	41.49	0.66	----	----	----	----	----	----	----	----	0.66
12.00	22.33	42.44	1.14	----	----	----	----	----	----	----	----	1.14
12.13	27.83 <<	43.33	1.44	----	----	----	----	----	----	----	----	1.44
12.27	20.36	43.97	1.63	----	----	----	----	----	----	----	----	1.63
12.40	12.29	44.26	1.71	----	----	----	----	----	----	----	----	1.71
12.53	6.45	44.41	1.74	----	----	----	----	----	----	----	----	1.74
12.67	5.29	44.48	1.76	----	----	----	----	----	----	----	----	1.76
12.80	4.45	44.54	1.78	----	----	----	----	----	----	----	----	1.78
12.93	3.92	44.59	1.79	----	----	----	----	----	----	----	----	1.79
13.07	3.58	44.63	1.80	----	----	----	----	----	----	----	----	1.80
13.20	3.29	44.66	1.81	----	----	----	----	----	----	----	----	1.81
13.33	3.06	44.69	1.81	----	----	----	----	----	----	----	----	1.81
13.47	2.86	44.71	1.82	----	----	----	----	----	----	----	----	1.82
13.60	2.69	44.73	1.82	----	----	----	----	----	----	----	----	1.82
13.73	2.52	44.74	1.83	----	----	----	----	----	----	----	----	1.83
13.87	2.38	44.75	1.83	----	----	----	----	----	----	----	----	1.83
14.00	2.24	44.76	1.83	----	----	----	----	----	----	----	----	1.83
14.13	2.12	44.77	1.84	----	----	----	----	----	----	----	----	1.84
14.27	2.02	44.77	1.84	----	----	----	----	----	----	----	----	1.84
14.40	1.96	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.53	1.91	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.67	1.87	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.80	1.82	44.78 <<	1.84	----	----	----	----	----	----	----	----	1.84 <<
14.93	1.78	44.78	1.84	----	----	----	----	----	----	----	----	1.84
15.07	1.73	44.78	1.84	----	----	----	----	----	----	----	----	1.84
15.20	1.69	44.77	1.84	----	----	----	----	----	----	----	----	1.84
15.33	1.64	44.77	1.84	----	----	----	----	----	----	----	----	1.84
15.47	1.59	44.77	1.83	----	----	----	----	----	----	----	----	1.83
15.60	1.55	44.76	1.83	----	----	----	----	----	----	----	----	1.83
15.73	1.50	44.76	1.83	----	----	----	----	----	----	----	----	1.83
15.87	1.45	44.75	1.83	----	----	----	----	----	----	----	----	1.83
16.00	1.40	44.74	1.83	----	----	----	----	----	----	----	----	1.83
16.13	1.35	44.73	1.83	----	----	----	----	----	----	----	----	1.83
16.27	1.32	44.72	1.82	----	----	----	----	----	----	----	----	1.82
16.40	1.29	44.71	1.82	----	----	----	----	----	----	----	----	1.82
16.53	1.27	44.70	1.82	----	----	----	----	----	----	----	----	1.82
16.67	1.26	44.69	1.82	----	----	----	----	----	----	----	----	1.82
16.80	1.24	44.68	1.81	----	----	----	----	----	----	----	----	1.81

Continues on next page...

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
16.93	1.23	44.67	1.81	----	----	----	----	----	----	----	----	1.81
17.07	1.21	44.66	1.81	----	----	----	----	----	----	----	----	1.81
17.20	1.19	44.65	1.81	----	----	----	----	----	----	----	----	1.81
17.33	1.18	44.64	1.80	----	----	----	----	----	----	----	----	1.80
17.47	1.16	44.62	1.80	----	----	----	----	----	----	----	----	1.80
17.60	1.14	44.61	1.80	----	----	----	----	----	----	----	----	1.80
17.73	1.12	44.60	1.79	----	----	----	----	----	----	----	----	1.79
17.87	1.11	44.58	1.79	----	----	----	----	----	----	----	----	1.79
18.00	1.09	44.57	1.79	----	----	----	----	----	----	----	----	1.79
18.13	1.07	44.56	1.78	----	----	----	----	----	----	----	----	1.78
18.27	1.05	44.54	1.78	----	----	----	----	----	----	----	----	1.78
18.40	1.04	44.53	1.78	----	----	----	----	----	----	----	----	1.78
18.53	1.02	44.52	1.77	----	----	----	----	----	----	----	----	1.77
18.67	1.00	44.50	1.77	----	----	----	----	----	----	----	----	1.77
18.80	0.98	44.49	1.76	----	----	----	----	----	----	----	----	1.76
18.93	0.96	44.47	1.76	----	----	----	----	----	----	----	----	1.76
19.07	0.95	44.46	1.76	----	----	----	----	----	----	----	----	1.76
19.20	0.93	44.44	1.75	----	----	----	----	----	----	----	----	1.75
19.33	0.91	44.42	1.75	----	----	----	----	----	----	----	----	1.75
19.47	0.89	44.41	1.74	----	----	----	----	----	----	----	----	1.74
19.60	0.87	44.39	1.74	----	----	----	----	----	----	----	----	1.74
19.73	0.85	44.37	1.74	----	----	----	----	----	----	----	----	1.74
19.87	0.83	44.36	1.73	----	----	----	----	----	----	----	----	1.73
20.00	0.82	44.34	1.73	----	----	----	----	----	----	----	----	1.73
20.13	0.80	44.32	1.72	----	----	----	----	----	----	----	----	1.72
20.27	0.79	44.30	1.72	----	----	----	----	----	----	----	----	1.72
20.40	0.78	44.29	1.71	----	----	----	----	----	----	----	----	1.71
20.53	0.77	44.27	1.71	----	----	----	----	----	----	----	----	1.71
20.67	0.77	44.25	1.70	----	----	----	----	----	----	----	----	1.70
20.80	0.77	44.23	1.70	----	----	----	----	----	----	----	----	1.70
20.93	0.76	44.21	1.69	----	----	----	----	----	----	----	----	1.69
21.07	0.76	44.20	1.69	----	----	----	----	----	----	----	----	1.69
21.20	0.76	44.18	1.69	----	----	----	----	----	----	----	----	1.69
21.33	0.75	44.16	1.68	----	----	----	----	----	----	----	----	1.68
21.47	0.75	44.14	1.68	----	----	----	----	----	----	----	----	1.68
21.60	0.75	44.12	1.67	----	----	----	----	----	----	----	----	1.67
21.73	0.74	44.11	1.67	----	----	----	----	----	----	----	----	1.67
21.87	0.74	44.09	1.66	----	----	----	----	----	----	----	----	1.66
22.00	0.74	44.07	1.66	----	----	----	----	----	----	----	----	1.66
22.13	0.73	44.05	1.65	----	----	----	----	----	----	----	----	1.65
22.27	0.73	44.04	1.65	----	----	----	----	----	----	----	----	1.65
22.40	0.73	44.02	1.64	----	----	----	----	----	----	----	----	1.64
22.53	0.72	44.00	1.64	----	----	----	----	----	----	----	----	1.64
22.67	0.72	43.98	1.63	----	----	----	----	----	----	----	----	1.63
22.80	0.72	43.95	1.62	----	----	----	----	----	----	----	----	1.62
22.93	0.71	43.93	1.62	----	----	----	----	----	----	----	----	1.62
23.07	0.71	43.90	1.61	----	----	----	----	----	----	----	----	1.61
23.20	0.71	43.87	1.60	----	----	----	----	----	----	----	----	1.60
23.33	0.70	43.85	1.60	----	----	----	----	----	----	----	----	1.60
23.47	0.70	43.82	1.59	----	----	----	----	----	----	----	----	1.59
23.60	0.70	43.80	1.58	----	----	----	----	----	----	----	----	1.58

Continues on next page...

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
23.73	0.69	43.77	1.57	----	----	----	----	----	----	----	----	1.57
23.87	0.69	43.75	1.57	----	----	----	----	----	----	----	----	1.57
24.00	0.69	43.73	1.56	----	----	----	----	----	----	----	----	1.56
24.13	0.55	43.70	1.55	----	----	----	----	----	----	----	----	1.55
24.27	0.27	43.67	1.54	----	----	----	----	----	----	----	----	1.54
24.40	0.09	43.63	1.53	----	----	----	----	----	----	----	----	1.53
24.53	0.00	43.59	1.52	----	----	----	----	----	----	----	----	1.52
24.67	0.00	43.54	1.51	----	----	----	----	----	----	----	----	1.51
24.80	0.00	43.50	1.50	----	----	----	----	----	----	----	----	1.50
24.93	0.00	43.46	1.48	----	----	----	----	----	----	----	----	1.48
25.07	0.00	43.42	1.47	----	----	----	----	----	----	----	----	1.47
25.20	0.00	43.38	1.46	----	----	----	----	----	----	----	----	1.46
25.33	0.00	43.34	1.44	----	----	----	----	----	----	----	----	1.44
25.47	0.00	43.30	1.43	----	----	----	----	----	----	----	----	1.43
25.60	0.00	43.26	1.42	----	----	----	----	----	----	----	----	1.42
25.73	0.00	43.22	1.41	----	----	----	----	----	----	----	----	1.41
25.87	0.00	43.18	1.39	----	----	----	----	----	----	----	----	1.39
26.00	0.00	43.14	1.38	----	----	----	----	----	----	----	----	1.38
26.13	0.00	43.10	1.37	----	----	----	----	----	----	----	----	1.37
26.27	0.00	43.06	1.36	----	----	----	----	----	----	----	----	1.36
26.40	0.00	43.02	1.34	----	----	----	----	----	----	----	----	1.34
26.53	0.00	42.98	1.33	----	----	----	----	----	----	----	----	1.33
26.67	0.00	42.91	1.31	----	----	----	----	----	----	----	----	1.31
26.80	0.00	42.86	1.29	----	----	----	----	----	----	----	----	1.29
26.93	0.00	42.80	1.27	----	----	----	----	----	----	----	----	1.27
27.07	0.00	42.74	1.25	----	----	----	----	----	----	----	----	1.25
27.20	0.00	42.68	1.23	----	----	----	----	----	----	----	----	1.23
27.33	0.00	42.62	1.20	----	----	----	----	----	----	----	----	1.20
27.47	0.00	42.57	1.18	----	----	----	----	----	----	----	----	1.18
27.60	0.00	42.52	1.16	----	----	----	----	----	----	----	----	1.16
27.73	0.00	42.46	1.14	----	----	----	----	----	----	----	----	1.14
27.87	0.00	42.41	1.12	----	----	----	----	----	----	----	----	1.12
28.00	0.00	42.36	1.10	----	----	----	----	----	----	----	----	1.10
28.13	0.00	42.31	1.08	----	----	----	----	----	----	----	----	1.08
28.27	0.00	42.26	1.06	----	----	----	----	----	----	----	----	1.06
28.40	0.00	42.21	1.04	----	----	----	----	----	----	----	----	1.04
28.53	0.00	42.16	1.02	----	----	----	----	----	----	----	----	1.02
28.67	0.00	42.12	1.00	----	----	----	----	----	----	----	----	1.00
28.80	0.00	42.07	0.98	----	----	----	----	----	----	----	----	0.98
28.93	0.00	42.03	0.96	----	----	----	----	----	----	----	----	0.96
29.07	0.00	41.96	0.93	----	----	----	----	----	----	----	----	0.93
29.20	0.00	41.88	0.88	----	----	----	----	----	----	----	----	0.88
29.33	0.00	41.79	0.84	----	----	----	----	----	----	----	----	0.84
29.47	0.00	41.71	0.80	----	----	----	----	----	----	----	----	0.80
29.60	0.00	41.64	0.76	----	----	----	----	----	----	----	----	0.76
29.73	0.00	41.57	0.71	----	----	----	----	----	----	----	----	0.71
29.87	0.00	41.50	0.67	----	----	----	----	----	----	----	----	0.67
30.00	0.00	41.44	0.63	----	----	----	----	----	----	----	----	0.63
30.13	0.00	41.38	0.58	----	----	----	----	----	----	----	----	0.58
30.27	0.00	41.33	0.54	----	----	----	----	----	----	----	----	0.54
30.40	0.00	41.28	0.50	----	----	----	----	----	----	----	----	0.50

Continues on next page...

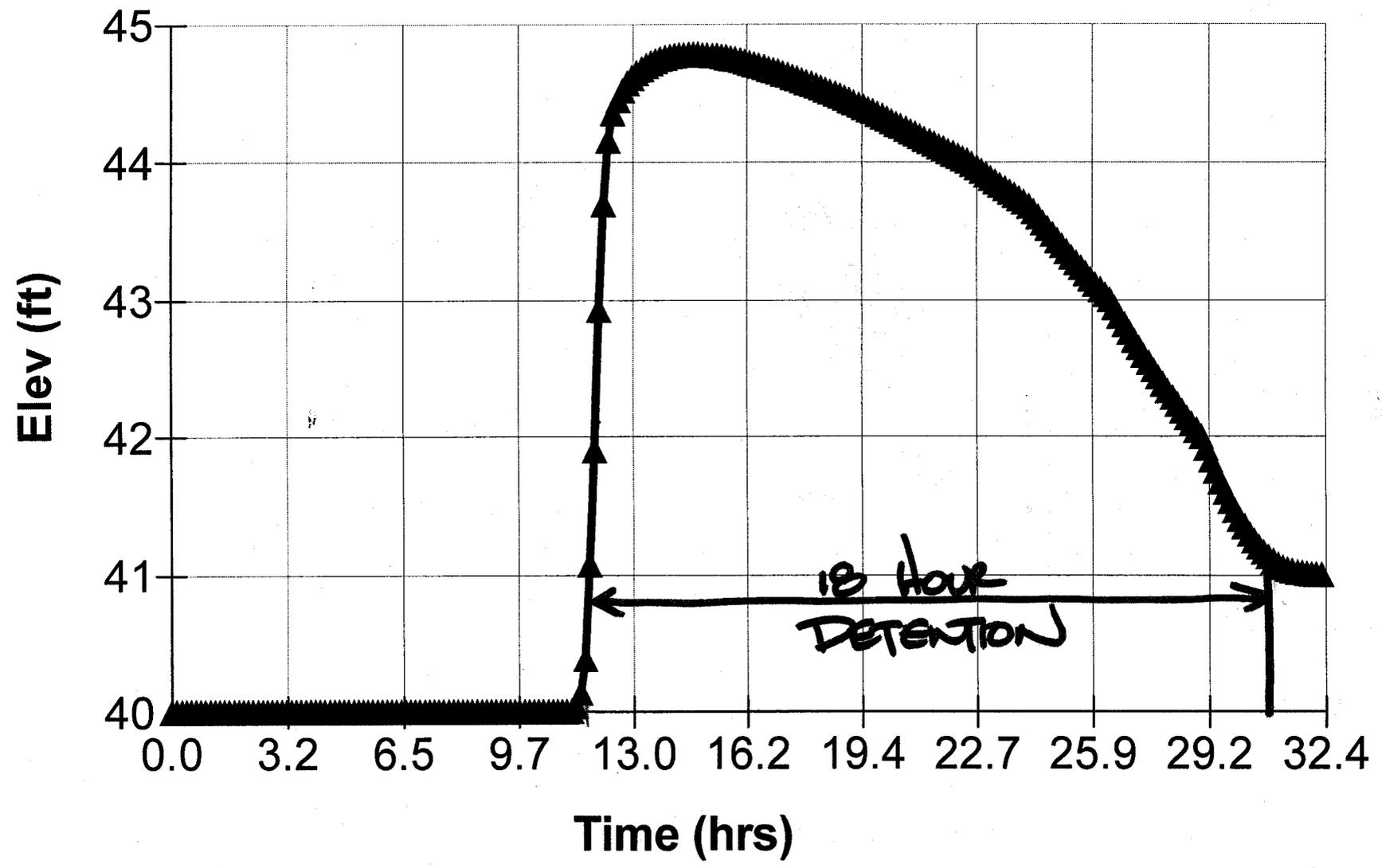
### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
30.53	0.00	41.23	0.45	----	----	----	----	----	----	----	----	0.45
30.67	0.00	41.19	0.41	----	----	----	----	----	----	----	----	0.41
30.80	0.00	41.15	0.36	----	----	----	----	----	----	----	----	0.36
30.93	0.00	41.12	0.32	----	----	----	----	----	----	----	----	0.32
31.07	0.00	41.09	0.27	----	----	----	----	----	----	----	----	0.27
31.20	0.00	41.07	0.20	----	----	----	----	----	----	----	----	0.20

...End

DRY POND #2

10 - Reservoir - 1 Yr - Max. El. = 44.78 ft



# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description	
1	SCS Runoff	29.64	8	728	111,860	---	---	---	Dry Pond #1 - Pre-Development	
2	SCS Runoff	31.03	8	728	119,890	---	---	---	Dry Pond #2 - Pre-Development	
3	SCS Runoff	13.82	8	728	50,593	---	---	---	Unattenuated Lands - Pre-Develope	
5	SCS Runoff	44.71	8	728	162,855	---	---	---	Dry Pond #1 - Post-Development	
6	SCS Runoff	45.05	8	728	164,892	---	---	---	Dry Pond #2 - Post-Development	
7	SCS Runoff	16.87	8	728	60,755	---	---	---	Unattenuated Lands - Post-Develope	
9	Reservoir	25.44	8	744	162,087	5	51.35	58,956	Dry Pond #1 - Routed	
10	Reservoir	26.40	8	744	163,589	6	45.04	59,942	Dry Pond #2 - Routed	
Proj. file: 565212ponds1yr.gpw				Return Period: 2 yr			Run date: 09-30-2002			

# Hydrograph Report

## Hyd. No. 1

Dry Pond #1 - Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 29.64 cfs
Storm frequency	= 2 yrs	Time interval	= 8 min
Drainage area	= 30.90 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 111,860 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.87	10.06
12.00	23.92
12.13	29.64 <<
12.27	21.62
12.40	13.01
12.53	6.82
12.67	5.59
12.80	4.70
12.93	4.14
13.07	3.77
13.20	3.47
13.33	3.22
13.47	3.02

...End

# Hydrograph Report

## Hyd. No. 2

Dry Pond #2 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.03 cfs
Storm frequency	=	2 yrs	Time interval	=	8 min
Drainage area	=	36.93 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	24 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 119,890 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.87	9.48
12.00	24.32
12.13	31.03 <<
12.27	22.97
12.40	14.06
12.53	7.45
12.67	6.12
12.80	5.16
12.93	4.55
13.07	4.15
13.20	3.83
13.33	3.56
13.47	3.33
13.60	3.13

...End

# Hydrograph Report

## Hyd. No. 3

Unattenuated Lands - Pre-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 13.82 cfs
Storm frequency	= 2 yrs	Time interval	= 8 min
Drainage area	= 11.42 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 23 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 50,593 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	1.82
11.87	5.42
12.00	11.66
12.13	13.82 <<
12.27	9.84
12.40	5.76
12.53	2.96
12.67	2.41
12.80	2.02
12.93	1.78
13.07	1.62
13.20	1.48

...End

# Hydrograph Report

## Hyd. No. 5

Dry Pond #1 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	44.71 cfs
Storm frequency	=	2 yrs	Time interval	=	8 min
Drainage area	=	35.05 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 162,855 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

704	6.23
712	18.04
720	38.05
728	44.71 <<
736	31.67
744	18.42
752	9.42
760	7.67
768	6.43
776	5.64
784	5.13
792	4.71

...End

# Hydrograph Report

## Hyd. No. 6

### Dry Pond #2 - Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 45.05 cfs
Storm frequency	= 2 yrs	Time interval	= 8 min
Drainage area	= 37.22 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 164,892 cuft

### Hydrograph Discharge Table

#### Time -- Outflow (hrs      cfs)

11.73	5.92
11.87	17.67
12.00	37.99
12.13	45.05 <<
12.27	32.08
12.40	18.77
12.53	9.64
12.67	7.86
12.80	6.59
12.93	5.79
13.07	5.26
13.20	4.84

...End

# Hydrograph Report

## Hyd. No. 7

Unattenuated Lands - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.87 cfs
Storm frequency	=	2 yrs	Time interval	=	8 min
Drainage area	=	10.91 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	19 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 60,755 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	2.84
11.87	7.48
12.00	14.82
12.13	16.87 <<
12.27	11.73
12.40	6.67
12.53	3.35
12.67	2.72
12.80	2.27
12.93	1.99
13.07	1.81

...End

# Hydrograph Report

## Hyd. No. 9

Dry Pond #1 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 2 yrs  
 Inflow hyd. No. = 5  
 Max. Elevation = 51.35 ft

Peak discharge = 25.44 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #1  
 Max. Storage = 58,956 cuft

Storage Indication method used.

Outflow hydrograph volume = 162,087 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.27	31.67	51.26	1.95	----	----	----	11.15	----	----	----	----	13.10
12.40	18.42	51.35	1.97	----	----	----	23.47	----	----	----	----	25.44 <<
12.53	9.42	51.26	1.95	----	----	----	11.55	----	----	----	----	13.51
12.67	7.67	51.22	1.94	----	----	----	6.86	----	----	----	----	8.80
12.80	6.43	51.20	1.94	----	----	----	5.20	----	----	----	----	7.14
12.93	5.64	51.19	1.94	----	----	----	4.39	----	----	----	----	6.32
13.07	5.13	51.18	1.93	----	----	----	3.87	----	----	----	----	5.81
13.20	4.71	51.17	1.93	----	----	----	3.38	----	----	----	----	5.32
13.33	4.36	51.16	1.93	----	----	----	2.96	----	----	----	----	4.88
13.47	4.08	51.16	1.93	----	----	----	2.59	----	----	----	----	4.52
13.60	3.82	51.15	1.93	----	----	----	2.28	----	----	----	----	4.20
13.73	3.58	51.14	1.92	----	----	----	2.00	----	----	----	----	3.93
13.87	3.37	51.14	1.92	----	----	----	1.75	----	----	----	----	3.68
14.00	3.17	51.13	1.92	----	----	----	1.53	----	----	----	----	3.45
14.13	2.99	51.13	1.92	----	----	----	1.33	----	----	----	----	3.25
14.27	2.85	51.12	1.92	----	----	----	1.15	----	----	----	----	3.07
14.40	2.76	51.12	1.92	----	----	----	1.00	----	----	----	----	2.92
14.53	2.69	51.12	1.92	----	----	----	0.89	----	----	----	----	2.81
14.67	2.62	51.12	1.92	----	----	----	0.81	----	----	----	----	2.72
14.80	2.56	51.12	1.92	----	----	----	0.73	----	----	----	----	2.65
14.93	2.49	51.11	1.92	----	----	----	0.66	----	----	----	----	2.58

...End

# Hydrograph Report

## Hyd. No. 10

Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 2 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 45.04 ft

Peak discharge = 26.40 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 59,942 cuft

Storage Indication method used.

Outflow hydrograph volume = 163,589 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.27	32.08	44.92	1.87	----	----	----	9.24	----	----	----	----	11.12
12.40	18.77	45.04 <<	1.90	----	----	----	24.50	----	----	----	----	26.40 <<
12.53	9.64	44.94	1.88	----	----	----	11.51	----	----	----	----	13.39
12.67	7.86	44.90	1.87	----	----	----	6.55	----	----	----	----	8.42
12.80	6.59	44.89	1.86	----	----	----	5.63	----	----	----	----	7.49
12.93	5.79	44.87	1.86	----	----	----	4.62	----	----	----	----	6.48
13.07	5.26	44.86	1.86	----	----	----	3.88	----	----	----	----	5.74
13.20	4.84	44.85	1.85	----	----	----	3.35	----	----	----	----	5.20
13.33	4.48	44.84	1.85	----	----	----	2.93	----	----	----	----	4.78
13.47	4.19	44.84	1.85	----	----	----	2.58	----	----	----	----	4.44
13.60	3.93	44.83	1.85	----	----	----	2.29	----	----	----	----	4.14
13.73	3.68	44.83	1.85	----	----	----	2.03	----	----	----	----	3.88
13.87	3.47	44.83	1.85	----	----	----	1.79	----	----	----	----	3.64
14.00	3.26	44.82	1.85	----	----	----	1.58	----	----	----	----	3.43
14.13	3.08	44.82	1.85	----	----	----	1.38	----	----	----	----	3.23
14.27	2.94	44.82	1.85	----	----	----	1.21	----	----	----	----	3.06
14.40	2.84	44.82	1.85	----	----	----	1.08	----	----	----	----	2.93
14.53	2.77	44.81	1.85	----	----	----	0.98	----	----	----	----	2.83
14.67	2.70	44.81	1.85	----	----	----	0.91	----	----	----	----	2.76
14.80	2.63	44.81	1.85	----	----	----	0.84	----	----	----	----	2.69

...End

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	79.99	8	728	287,967	---	---	---	Dry Pond #1 - Pre-Development
2	SCS Runoff	89.03	8	728	321,400	---	---	---	Dry Pond #2 - Pre-Development
3	SCS Runoff	33.62	8	728	120,957	---	---	---	Unattenuated Lands - Pre-Develope
5	SCS Runoff	106.26	8	728	382,674	---	---	---	Dry Pond #1 - Post-Development
6	SCS Runoff	109.56	8	728	394,222	---	---	---	Dry Pond #2 - Post-Development
7	SCS Runoff	36.87	8	728	133,709	---	---	---	Unattenuated Lands - Post-Develope
9	Reservoir	116.11	8	728	381,906	5	51.79	72,017	Dry Pond #1 - Routed
10	Reservoir	116.83	8	728	392,919	6	45.47	74,386	Dry Pond #2 - Routed

Proj. file: 565212ponds1yr.gpw

Return Period: 10 yr

Run date: 09-30-2002

# Hydrograph Report

## Hyd. No. 1

Dry Pond #1 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	79.99 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	30.90 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	23 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 287,967 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	13.58
11.87	35.63
12.00	70.37
12.13	79.99 <<
12.27	55.57
12.40	31.58
12.53	15.86
12.67	12.87
12.80	10.75
12.93	9.42
13.07	8.53

...End

# Hydrograph Report

## Hyd. No. 2

Dry Pond #2 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	89.03 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	36.93 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	24 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 321,400 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.73	14.18
11.87	38.35
12.00	77.43
12.13	89.03 <<
12.27	62.27
12.40	35.68
12.53	18.03
12.67	14.65
12.80	12.25
12.93	10.74
13.07	9.74
13.20	8.94

...End

# Hydrograph Report

## Hyd. No. 3

### Unattenuated Lands - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.62 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	11.42 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	23 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 120,957 cuft

### Hydrograph Discharge Table

#### Time -- Outflow (hrs      cfs)

11.73	6.36
11.87	15.87
12.00	30.18
12.13	33.62 <<
12.27	23.07
12.40	12.91
12.53	6.41
12.67	5.19
12.80	4.32
12.93	3.78
13.07	3.42

...End

# Hydrograph Report

## Hyd. No. 5

Dry Pond #1 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	106.26 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	35.05 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 382,674 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

704	20.60
712	50.82
720	95.85
728	106.26 <<
736	72.72
744	40.55
752	20.07
760	16.25
768	13.53
776	11.83
784	10.71

...End

# Hydrograph Report

## Hyd. No. 6

Dry Pond #2 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	109.56 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	37.22 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 394,222 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	20.74
11.87	51.71
12.00	98.36
12.13	109.56 <<
12.27	75.19
12.40	42.08
12.53	20.89
12.67	16.91
12.80	14.09
12.93	12.33
13.07	11.16

...End

# Hydrograph Report

## Hyd. No. 7

Unattenuated Lands - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	36.87 cfs
Storm frequency	=	10 yrs	Time interval	=	8 min
Drainage area	=	10.91 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	19 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 133,709 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs        cfs)**

11.60	3.82
11.73	7.80
11.87	18.51
12.00	33.84
12.13	36.87 <<
12.27	24.96
12.40	13.73
12.53	6.73
12.67	5.43
12.80	4.52
12.93	3.94

...End

# Hydrograph Report

## Hyd. No. 9

Dry Pond #1 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 10 yrs  
 Inflow hyd. No. = 5  
 Max. Elevation = 51.79 ft

Peak discharge = 116.11 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #1  
 Max. Storage = 72,017 cuft

Storage Indication method used.

Outflow hydrograph volume = 381,906 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.00	95.85	51.49	2.00	----	----	----	46.67	----	----	----	----	48.67
12.13	106.26 <<	51.79 <<	2.07	----	----	----	114.04	----	----	----	----	116.11 <<
12.27	72.72	51.64	2.04	----	----	----	78.98	----	----	----	----	81.02
12.40	40.55	51.50	2.00	----	----	----	48.30	----	----	----	----	50.31
12.53	20.07	51.36	1.97	----	----	----	25.16	----	----	----	----	27.13
12.67	16.25	51.30	1.96	----	----	----	15.43	----	----	----	----	17.39
12.80	13.53	51.27	1.95	----	----	----	13.06	----	----	----	----	15.02
12.93	11.83	51.25	1.95	----	----	----	10.85	----	----	----	----	12.80

...End

# Hydrograph Report

## Hyd. No. 10

Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 10 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 45.47 ft

Peak discharge = 116.83 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 74,386 cuft

Storage Indication method used.

Outflow hydrograph volume = 392,919 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.00	98.36	45.17	1.93	----	----	----	47.87	----	----	----	----	49.80
12.13	109.56 <<	45.47	2.00	----	----	----	114.84	----	----	----	----	116.83 <<
12.27	75.19	45.34	1.97	----	----	----	83.71	----	----	----	----	85.68
12.40	42.08	45.19	1.94	----	----	----	50.89	----	----	----	----	52.83
12.53	20.89	45.05	1.90	----	----	----	27.09	----	----	----	----	29.00
12.67	16.91	44.98	1.89	----	----	----	16.39	----	----	----	----	18.27
12.80	14.09	44.96	1.88	----	----	----	13.42	----	----	----	----	15.30
12.93	12.33	44.94	1.88	----	----	----	11.18	----	----	----	----	13.06

...End

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	133.53	8	728	481,536	---	---	---	Dry Pond #1 - Pre-Development
2	SCS Runoff	151.88	8	728	546,651	---	---	---	Dry Pond #2 - Pre-Development
3	SCS Runoff	53.95	8	728	195,938	---	---	---	Unattenuated Lands - Pre-Develope
5	SCS Runoff	168.98	8	728	615,231	---	---	---	Dry Pond #1 - Post-Development
6	SCS Runoff	175.83	8	728	638,599	---	---	---	Dry Pond #2 - Post-Development
7	SCS Runoff	56.64	8	728	208,846	---	---	---	Unattenuated Lands - Post-Develope
9	Reservoir	171.79	8	728	614,463	5	51.99	78,071	Dry Pond #1 - Routed
10	Reservoir	178.37	8	728	637,296	6	45.70	81,812	Dry Pond #2 - Routed

Proj. file: 565212ponds1yr.gpw

Return Period: 100 yr

Run date: 09-30-2002

# Hydrograph Report

## Hyd. No. 1

Dry Pond #1 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	133.53 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	30.90 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	23 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 481,536 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.73	26.58
11.87	64.79
12.00	121.07
12.13	133.53 <<
12.27	91.08
12.40	50.59
12.53	24.97
12.67	20.19
12.80	16.81
12.93	14.69

...End

# Hydrograph Report

## Hyd. No. 2

Dry Pond #2 - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	151.88 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	36.93 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	24 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 546,651 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.73	29.05
11.87	72.10
12.00	136.63
12.13	151.88 <<
12.27	104.10
12.40	58.17
12.53	28.84
12.67	23.35
12.80	19.45
12.93	17.01
13.07	15.40

...End

# Hydrograph Report

## Hyd. No. 3

Unattenuated Lands - Pre-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	53.95 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	11.42 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	23 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 195,938 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.60	5.67
11.73	11.53
11.87	27.24
12.00	49.63
12.13	53.95 <<
12.27	36.47
12.40	20.03
12.53	9.80
12.67	7.91
12.80	6.58
12.93	5.74

...End

# Hydrograph Report

## Hyd. No. 5

Dry Pond #1 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	168.98 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	35.05 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 615,231 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(min      cfs)

696	18.15
704	36.72
712	86.13
720	155.98
728	168.98 <<
736	113.99
744	62.45
752	30.50
760	24.61
768	20.45
776	17.85

...End

# Hydrograph Report

## Hyd. No. 6

Dry Pond #2 - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	175.83 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	37.22 ac	Curve number	=	75
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	16 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 638,599 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(hrs      cfs)**

11.60	18.48
11.73	37.59
11.87	88.80
12.00	161.75
12.13	175.83 <<
12.27	118.86
12.40	65.29
12.53	31.95
12.67	25.79
12.80	21.44
12.93	18.71

...End

# Hydrograph Report

## Hyd. No. 7

### Unattenuated Lands - Post-Development

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.64 cfs
Storm frequency	=	100 yrs	Time interval	=	8 min
Drainage area	=	10.91 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	19 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

Hydrograph Volume = 208,846 cuft

### Hydrograph Discharge Table

#### Time -- Outflow (hrs      cfs)

11.60	6.60
11.73	13.09
11.87	29.89
12.00	52.96
12.13	56.64 <<
12.27	37.90
12.40	20.56
12.53	9.97
12.67	8.03
12.80	6.66
12.93	5.81

...End

# Hydrograph Report

## Hyd. No. 9

Dry Pond #1 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 100 yrs  
 Inflow hyd. No. = 5  
 Max. Elevation = 51.99 ft

Peak discharge = 171.79 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #1  
 Max. Storage = 78,071 cuft

Storage Indication method used.

Outflow hydrograph volume = 614,463 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
11.87	86.13	51.58	2.02	----	----	----	65.40	----	----	----	----	67.42
12.00	155.98	51.87	2.09	----	----	----	136.34	----	----	----	----	138.42
12.13	168.98 <<	51.99	2.11	----	----	----	169.67	----	----	----	----	171.79 <<
12.27	113.99	51.84	2.08	----	----	----	127.82	----	----	----	----	129.90
12.40	62.45	51.62	2.03	----	----	----	72.63	----	----	----	----	74.66
12.53	30.50	51.44	1.99	----	----	----	38.01	----	----	----	----	40.00
12.67	24.61	51.35	1.97	----	----	----	23.88	----	----	----	----	25.85
12.80	20.45	51.33	1.97	----	----	----	20.25	----	----	----	----	22.22
12.93	17.85	51.31	1.96	----	----	----	16.90	----	----	----	----	18.86

...End

# Hydrograph Report

## Hyd. No. 10

Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 100 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 45.70 ft

Peak discharge = 178.37 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 81,812 cuft

Storage Indication method used.

Outflow hydrograph volume = 637,296 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
11.87	88.80	45.27	1.95	----	----	----	67.09	----	----	----	----	69.05
12.00	161.75	45.56	2.02	----	----	----	138.80	----	----	----	----	140.82
12.13	175.83 <<	45.70 <<	2.05	----	----	----	176.33	----	----	----	----	178.37 <<
12.27	118.86	45.55	2.02	----	----	----	134.76	----	----	----	----	136.77
12.40	65.29	45.32	1.96	----	----	----	77.42	----	----	----	----	79.39
12.53	31.95	45.14	1.92	----	----	----	40.90	----	----	----	----	42.83
12.67	25.79	45.05	1.90	----	----	----	25.65	----	----	----	----	27.55
12.80	21.44	45.02	1.89	----	----	----	21.49	----	----	----	----	23.38
12.93	18.71	44.99	1.89	----	----	----	17.98	----	----	----	----	19.87

...End

**Stormwater Conveyance Systems**



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 1 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM A

SS# A-13	STA= 12+11(R)	ROAD "A"	GRADE
DA= 0.47 AC.	C= 0.59	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.11 CFS	Carry Over=	0.00	
D= 0.15	K= 16.1		
Qi= 0.70 < 1.11 CFS			SPREAD= 5.8 LF
Use 2 Grate(s)	Qi= 0.77 CFS <	Qt= 1.11 CFS	
SS# A-12	STA= 14+36(R)	ROAD "A"	GRADE
DA= 0.51 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.52 CFS	Carry Over=	0.34	
D= 0.17	K= 16.1		
Qi= 0.85 < 1.52 CFS			SPREAD= 6.9 LF
Use 2 Grate(s)	Qi= 0.94 CFS <	Qt= 1.52 CFS	to E-4
SS# A-11	STA= 16+06(R)	ROAD "A"	GRADE
DA= 0.38 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.47 CFS	Carry Over=	0.58	
D= 0.17	K= 16.1		
Qi= 0.83 < 1.47 CFS			SPREAD= 6.8 LF
Use 2 Grate(s)	Qi= 0.92 CFS <	Qt= 1.47 CFS	
SS# A-10	STA= 17+23(R)	ROAD "A"	GRADE
DA= 0.06 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.0206 FT/FT
Qt= 0.73 CFS	Carry Over=	0.55	
D= 0.11	K= 18.3		
Qi= 0.49 > 0.73 CFS			SPREAD= 3.6 LF
Use 2 Grate(s)	Qi= 0.54 CFS <	Qt= 0.73 CFS	
SS# A-9	STA= 18+57(R)	ROAD "A"	GRADE
DA= 0.40 AC.	C= 0.56	I10= 4.00 IN/HR	S= 0.0206 FT/FT
Qt= 1.09 CFS	Carry Over=	0.19	
D= 0.13	K= 18.3		
Qi= 0.63 < 1.09 CFS			SPREAD= 5 LF
Use 2 Grate(s)	Qi= 0.69 CFS <	Qt= 1.09 CFS	



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 2 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM A

SS# A-8	STA= 19+50 (R)	ROAD "A"	GRADE
DA= 0.35 AC.	C= 0.55	I10= 4.00 IN/HR	S= 0.0206 FT/FT
Qt= 1.17 CFS	Carry Over=	0.40	
D= 0.14	K= 18.3		
Qi= 0.66 < 1.17 CFS			SPREAD= 4.8 LF
Use 2 Grate(s)	Qi= 0.72 CFS <	Qt= 1.17 CFS	
SS# A-5B	STA= 31+31 (R)	ROAD "C"	GRADE
DA= 0.56 AC.	C= 0.6	I10= 4.00 IN/HR	S= 0.089 FT/FT
Qt= 1.34 CFS	Carry Over=	0.00	
D= 0.11	K= 32.3		
Qi= 0.80 < 1.34 CFS			SPREAD= 3.2 LF
Use 2 Grate(s)	Qi= 0.88 CFS <	Qt= 1.34 CFS	
SS# A-6	STA= 30+40 (R)	ROAD "C"	GRADE
DA= 0.05 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.089 FT/FT
Qt= 0.62 CFS	Carry Over=	0.47	
D= 0.08	K= 32.3		
Qi= 0.49 < 0.62 CFS			SPREAD= 1.6 LF
Use 2 Grate(s)	Qi= 0.54 CFS <	Qt= 0.62 CFS	
SS# A-7	STA= 19+82 (R)	ROAD "A"	SUMP
DA= 0.34 AC.	C= 0.56	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.29 CFS	Carry Over=	0.53	
Use 2 Grate(s)	Qi= 1.48 CFS >	Qt= 1.29 CFS	
SS# A-5A	STA= 31+31 (L)	ROAD "C"	GRADE
DA= 0.52 AC.	C= 0.6	I10= 4.00 IN/HR	S= 0.089 FT/FT
Qt= 1.25 CFS	Carry Over=	0.00	
D= 0.11	K= 32.3		
Qi= 0.76 < 1.25 CFS			SPREAD= 2.9 LF
Use 2 Grate(s)	Qi= 0.84 CFS <	Qt= 1.25 CFS	



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 3 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM A

SS# A-5	STA= 30+40 (L)	ROAD "C"	GRADE
DA= 0.05 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.089 FT/FT
Qt= 0.56 CFS	Carry Over=	0.41	
D= 0.08	K= 32.3		
Qi= 0.46 < 0.56 CFS			SPREAD= 1.5 LF
Use 2 Grate(s)	Qi= 0.51 CFS <	Qt= 0.56 CFS	
SS# A-4	STA= 21+37(R)	ROAD "A"	GRADE
DA= 0.56 AC.	C= 0.55	I10= 4.00 IN/HR	S= 0.0206 FT/FT
Qt= 1.28 CFS	Carry Over=	0.05	
D= 0.14	K= 18.3		
Qi= 0.69 < 1.28 CFS			SPREAD= 5.2 LF
Use 2 Grate(s)	Qi= 0.76 CFS <	Qt= 1.28 CFS	
SS# A-3B	STA= 23+00 (R)	ROAD "A"	GRADE
DA= 0.38 AC.	C= 0.64	I10= 4.00 IN/HR	S= 0.09 FT/FT
Qt= 0.97 CFS	Carry Over=	0.00	
D= 0.10	K= 32.5		
Qi= 0.65 < 0.97 CFS			SPREAD= 2.3 LF
Use 2 Grate(s)	Qi= 0.72 CFS <	Qt= 0.97 CFS	
SS# A-3	STA= 21+77(R)	ROAD "A"	SUMP
DA= 0.18 AC.	C= 0.64	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.23 CFS	Carry Over=	0.77	
Use 2 Grate(s)	Qi= 1.48 CFS >	Qt= 1.23 CFS	
SS# A-3C	STA= 23+55(L)	ROAD "A"	GRADE
DA= 0.16 AC.	C= 0.65	I10= 4.00 IN/HR	S= 0.09 FT/FT
Qt= 0.42 CFS	Carry Over=	0.00	
D= 0.07	K= 32.5		
Qi= 0.38 < 0.42 CFS			SPREAD= 1.4 LF
Use 1 Grate(s)	Qi= 0.38 CFS <	Qt= 0.42 CFS	



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 4 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM A

SS# A-2	STA= 21+77(L)	ROAD "A"	SUMP
DA= 0.34 AC.	C= 0.65	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 0.88 CFS	Carry Over=	0.00	
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 0.88 CFS	
SS# A-13A	STA= 12+11(L)	ROAD "A"	GRADE
DA= 0.55 AC.	C= 0.62	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.36 CFS	Carry Over=	0.00	
D= 0.16	K= 16.1		
Qi= 0.80 <	1.36 CFS		
Use 2 Grate(s)	Qi= 0.88 CFS <	Qt= 1.36 CFS	SPREAD= 6.5 LF
SS# A-12A	STA= 14+36(L)	ROAD "A"	GRADE
DA= 0.50 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.65 CFS	Carry Over=	0.49	
D= 0.18	K= 16.1		
Qi= 0.90 <	1.65 CFS		
Use 2 Grate(s)	Qi= 0.99 CFS <	Qt= 1.65 CFS	SPREAD= 7 LF
SS# A-11A	STA= 16+06(L)	ROAD "A"	GRADE
DA= 0.37 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.52 CFS	Carry Over=	0.66	
D= 0.17	K= 16.1		
Qi= 0.85 <	1.52 CFS		
Use 2 Grate(s)	Qi= 0.94 CFS <	Qt= 1.52 CFS	SPREAD= 6.9 LF
SS# A-10A	STA= 21+30(L)	ROAD "B"	GRADE
DA= 0.54 AC.	C= 0.59	I10= 4.00 IN/HR	S= 0.0176 FT/FT
Qt= 1.86 CFS	Carry Over=	0.58	
D= 0.17	K= 17.7		
Qi= 0.89 <	1.86 CFS		
Use 2 Grate(s)	Qi= 0.98 CFS <	Qt= 1.86 CFS	SPREAD= 6.7 LF



5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994

PROJECT FORD'S COLONY  
PROJECT NO. 5652-12  
SUBJECT SPREAD CALCS.  
SHEET NO. 5 OF 12  
DATE 9/30/02  
BY QAM

SYSTEM A

SS# A-10B	STA= 21+77(CL)	ROAD "B"	SUMP
DA= 0.19 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.45 CFS	Carry Over=	0.88	
Use 2 Grate(s)	Qi= 1.48 CFS >	Qt= 1.45 CFS	

## Ford's Colony Section 12

Depth of Flow (DI-7 Type III grate) for SS#12-A-11B

### Weir Flow Equation

$$Q = C_w P d^{3/2}$$

### Orifice Flow Equation

$$Q = C_d A \sqrt{2gd}$$

Weir Flow Equation			Orifice Flow Equation		
Description		Units	Description		Units
Q	3.96	CFS	Q	3.96	CFS
Width of bars	2	IN	Width of bars	2	IN
# of bars	12	EA	# of bars	12	EA
Width of grate	3	LF	Width of grate	3	LF
Length of grate and bars	3.5	LF	Length of grate and bars	3.5	LF
$C_w$	3.3	N/A	$C_d$	0.67	N/A
Total width of all bars (one side)	2	LF	$g$	32.2	LF/SEC <sup>2</sup>
Perimeter of Grate	13	LF	Area of grate	10.5	SF
Effective Perimeter	9	LF	Open Area	3.5	SF

By setting both equations equal to each other, the critical depth "d" is computed.

$$\text{Critical Depth} = d = \left( \frac{C_d A}{C_w P} \right) \sqrt{2g}$$

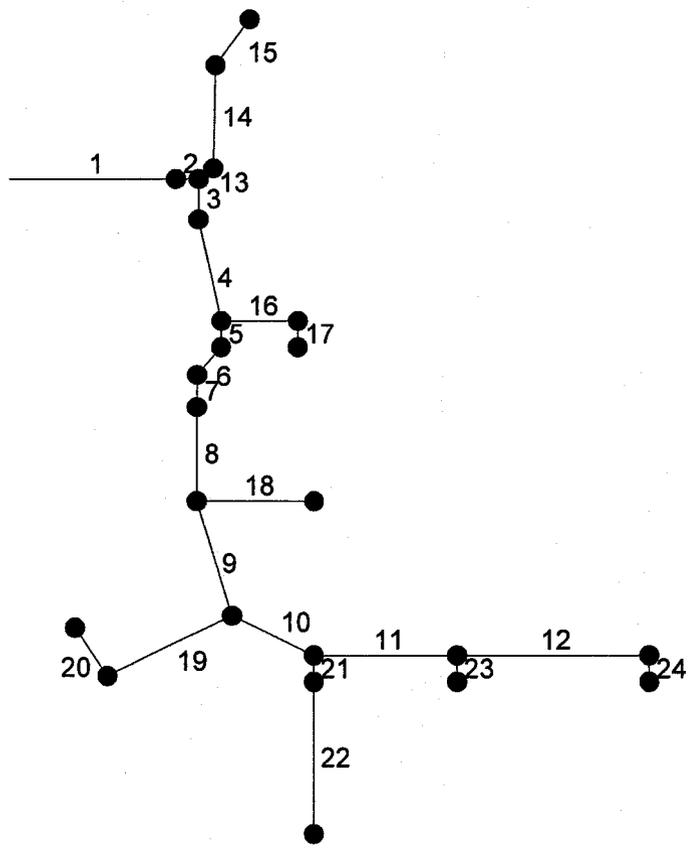
**Critical Depth = 7.6 INCHES** Flow transitions from weir flow to orifice flow.

$$\text{Weir Flow Depth} = d_w = \left( \frac{Q}{C_w P} \right)^{2/3}$$

$$\text{Orifice Flow Depth} = d_o = \frac{Q}{2g \left( \frac{Q}{C_d A} \right)^2}$$

**Weir Flow Depth = 3.1 INCHES**      **Orifice Flow Depth = 0.5 INCHES**

# Hydraflow Plan View



Project file: 565212storm_sysA.stm	IDF file: JCCstormsewer.IDF	No. Lines: 24	12-11-2002
------------------------------------	-----------------------------	---------------	------------



# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/ Rim El (ft)
22	21	150.0	0.0	MH	0.00	1.40	0.52	13.0	70.30	2.47	74.00	15	Cir	0.013	1.00	77.00	A-11A TO A-11B
23	11	26.0	90.0	MH	0.00	0.50	0.58	8.0	74.30	0.96	74.55	12	Cir	0.013	1.00	78.76	A-12 TO A-12A
24	12	26.0	90.0	MH	0.00	0.55	0.62	7.0	76.50	1.15	76.80	12	Cir	0.013	1.00	81.01	A-13 TO A-13A
Project File: 565212storm_sysA.stm					IDF File: JCCstormsewer.IDF					Total number of lines: 24					Date: 12-11-2002		

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	198.0	0.34	11.74	0.65	0.22	6.70	5.0	15.5	5.1	34.05	114.7	7.61	30	7.83	58.00	42.50	59.95	45.47	66.03	45.00	A-1 TO A-2
2	1	26.0	0.18	11.40	0.64	0.12	6.48	7.0	15.4	5.1	32.99	56.87	7.81	30	1.92	58.50	58.00	60.42	60.11	66.03	66.03	A-2 TO A-3
3	2	40.0	0.56	9.42	0.55	0.31	5.35	9.0	15.3	5.1	27.34	45.85	5.57	30	1.25	59.00	58.50	61.63	61.45	66.58	66.03	A-3 TO A-4
4	3	105.0	0.05	8.86	0.75	0.04	5.05	5.0	15.0	5.1	25.92	27.92	8.25	24	1.52	60.60	59.00	63.23	61.85	70.36	66.58	A-4 TO A-5
5	4	26.0	0.05	7.73	0.75	0.04	4.36	5.0	15.0	5.1	22.44	24.30	7.14	24	1.15	60.90	60.60	64.39	64.13	70.36	70.36	A-5 TO A-6
6	5	39.0	0.34	7.68	0.56	0.19	4.32	8.0	14.9	5.2	22.31	42.85	7.10	24	3.59	62.30	60.90	65.36	64.98	69.78	70.36	A-6 TO A-7
7	6	32.0	0.35	7.34	0.55	0.19	4.13	8.0	14.8	5.2	21.37	45.59	6.80	24	4.06	63.60	62.30	66.23	65.95	70.44	69.78	A-7 TO A-8
8	7	93.0	0.40	6.99	0.56	0.22	3.94	7.0	14.6	5.2	20.51	23.45	6.53	24	1.08	64.60	63.60	67.11	66.34	72.35	70.44	A-8 TO A-9
9	8	120.0	0.06	4.97	0.75	0.04	2.87	5.0	14.1	5.3	15.14	22.62	4.82	24	1.00	65.80	64.60	68.31	67.77	75.12	72.35	A-9 TO A-10
10	9	104.0	0.38	4.18	0.58	0.22	2.37	9.0	13.9	5.3	12.56	21.10	7.33	18	4.04	70.00	65.80	71.34	68.67	77.06	75.12	A-10 TO A-11
11	10	170.0	0.51	2.03	0.58	0.30	1.20	10.0	10.2	5.9	7.14	10.50	5.93	18	1.00	74.30	72.60	75.32	73.52	78.76	77.06	A-11 TO A-12
12	11	225.0	0.47	1.02	0.59	0.28	0.62	9.0	9.0	6.2	3.81	6.39	3.92	15	0.98	76.50	74.30	77.28	75.80	81.01	78.76	A-12 TO A-13
13	2	20.0	1.26	1.80	0.53	0.67	1.01	10.0	11.7	5.7	5.75	7.22	6.04	15	1.25	61.75	61.50	62.71	62.36	65.75	66.03	A-3 TO A-3A
14	13	102.0	0.38	0.54	0.64	0.24	0.35	11.0	11.0	5.8	2.01	8.31	3.31	12	5.44	67.30	61.75	67.90	63.14	71.52	65.75	A-3A TO A-3B
15	14	60.0	0.16	0.16	0.65	0.10	0.10	5.0	5.0	7.1	0.74	10.58	1.98	12	8.83	72.60	67.30	72.97	68.09	76.23	71.52	A-3B TO A-3C
16	4	90.0	0.52	1.08	0.60	0.31	0.65	11.0	11.0	5.8	3.75	11.81	5.10	12	11.00	72.50	62.60	73.32	64.13	77.05	70.36	A-5 TO A-5A
17	16	26.0	0.56	0.56	0.60	0.34	0.34	9.0	9.0	6.2	2.07	3.83	2.64	12	1.15	72.80	72.50	73.87	73.78	77.05	77.05	A-5A TO A-5B
18	8	138.0	1.62	1.62	0.52	0.84	0.84	14.0	14.0	5.3	4.46	9.78	5.87	12	7.54	75.00	64.60	75.89	67.77	78.00	72.35	A-9 TO A-9A
19	9	152.0	0.54	0.73	0.59	0.32	0.46	11.0	11.0	5.8	2.67	3.65	3.40	12	1.05	67.40	65.80	69.52	68.67	72.72	75.12	A-10 TO A-10A
20	19	62.0	0.19	0.19	0.75	0.14	0.14	5.0	5.0	7.1	1.02	3.50	1.29	12	0.97	68.00	67.40	69.72	69.67	72.25	72.72	A-10A TO A-10B
21	10	26.0	0.37	1.77	0.58	0.21	0.94	9.0	13.8	5.3	5.02	6.94	4.09	15	1.15	70.30	70.00	72.25	72.09	77.06	77.06	A-11 TO A-11A

Project File: 565212storm\_sysA.stm      IDF File: JCCstormsewer.IDF      Total number of lines: 24      Run Date: 12-11-2002

NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 45.47 (ft)

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	150.0	1.40	1.40	0.52	0.73	0.73	13.0	13.0	5.4	3.96	10.14	4.02	15	2.47	74.00	70.30	74.80	72.29	77.00	77.06	A-11A TO A-11B
23	11	26.0	0.50	0.50	0.58	0.29	0.29	8.0	8.0	6.4	1.85	3.49	2.36	12	0.96	74.55	74.30	75.87	75.80	78.76	78.76	A-12 TO A-12A
24	12	26.0	0.55	0.55	0.62	0.34	0.34	7.0	7.0	6.6	2.25	3.83	2.93	12	1.15	76.80	76.50	77.71	77.63	81.01	81.01	A-13 TO A-13A

Project File: 565212storm_sysA.stm	IDF File: JCCstormsewer.IDF	Total number of lines: 24	Run Date: 12-11-2002
------------------------------------	-----------------------------	---------------------------	----------------------

NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 45.47 (ft)





5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994

PROJECT FORD'S COLONY  
PROJECT NO. 5652-12  
SUBJECT SPREAD CALCS.  
SHEET NO. 6 OF 12  
DATE 9/30/02  
BY QAM

SYSTEM B

SS# B-2	STA= 41+24(R)	ROAD "D"	GRADE
DA= 0.1 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.0606 FT/FT
Qt= 0.34 CFS	Carry Over=	0.04	
D= 0.07	K= 26.5		
Qi= 0.31	< 0.34 CFS		SPREAD= 1.4 LF
Use 2 Grate(s)	Qi= 0.34 CFS >	Qt= 0.34 CFS	
SS# B-3	STA= 41+47 (CL)	ROAD "D"	SUMP
DA= 0.15 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 0.45 CFS	Carry Over=	0.00	
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 0.45 CFS	



# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	54.0	54.0	MH	0.00	0.00	0.00	0.0	40.00	33.33	58.00	12	Cir	0.013	0.85	68.78	B-1 TO B-2
2	1	65.0	54.0	MH	0.00	0.10	0.75	5.0	58.00	8.62	63.60	12	Cir	0.013	0.85	67.75	B-2 TO B-3
3	2	41.0	57.0	MH	0.00	0.15	0.75	5.0	63.60	0.98	64.00	12	Cir	0.013	1.00	0.00	B-3 TO B-4
Project File: 565212storm_sysB.stm					IDF File: JCCstormsewer.IDF						Total number of lines: 3				Date: 09-30-2002		

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	54.0	0.00	0.25	0.00	0.00	0.19	0.0	6.3	6.8	1.27	20.56	2.52	12	33.33	58.00	40.00	58.48	41.00	68.78	59.00	B-1 TO B-2
2	1	65.0	0.10	0.25	0.75	0.08	0.19	5.0	5.7	6.9	1.30	10.45	2.97	12	8.62	63.60	58.00	64.08	58.63	67.75	68.78	B-2 TO B-3
3	2	41.0	0.15	0.15	0.75	0.11	0.11	5.0	5.0	7.1	0.80	3.52	2.22	12	0.98	64.00	63.60	64.38	64.24	0.00	67.75	B-3 TO B-4

Project File: 565212storm\_sysB.stm      IDF File: JCCstormsewer.IDF      Total number of lines: 3      Run Date: 09-30-2002

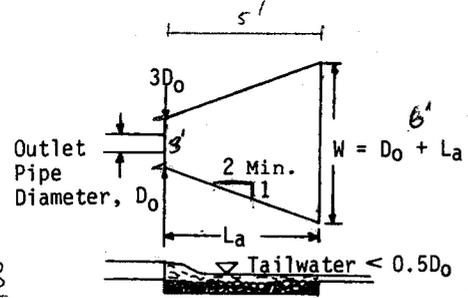
NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 41.00 (ft)

Source: USDA-SCS

III - 164

Plate 3.18-3

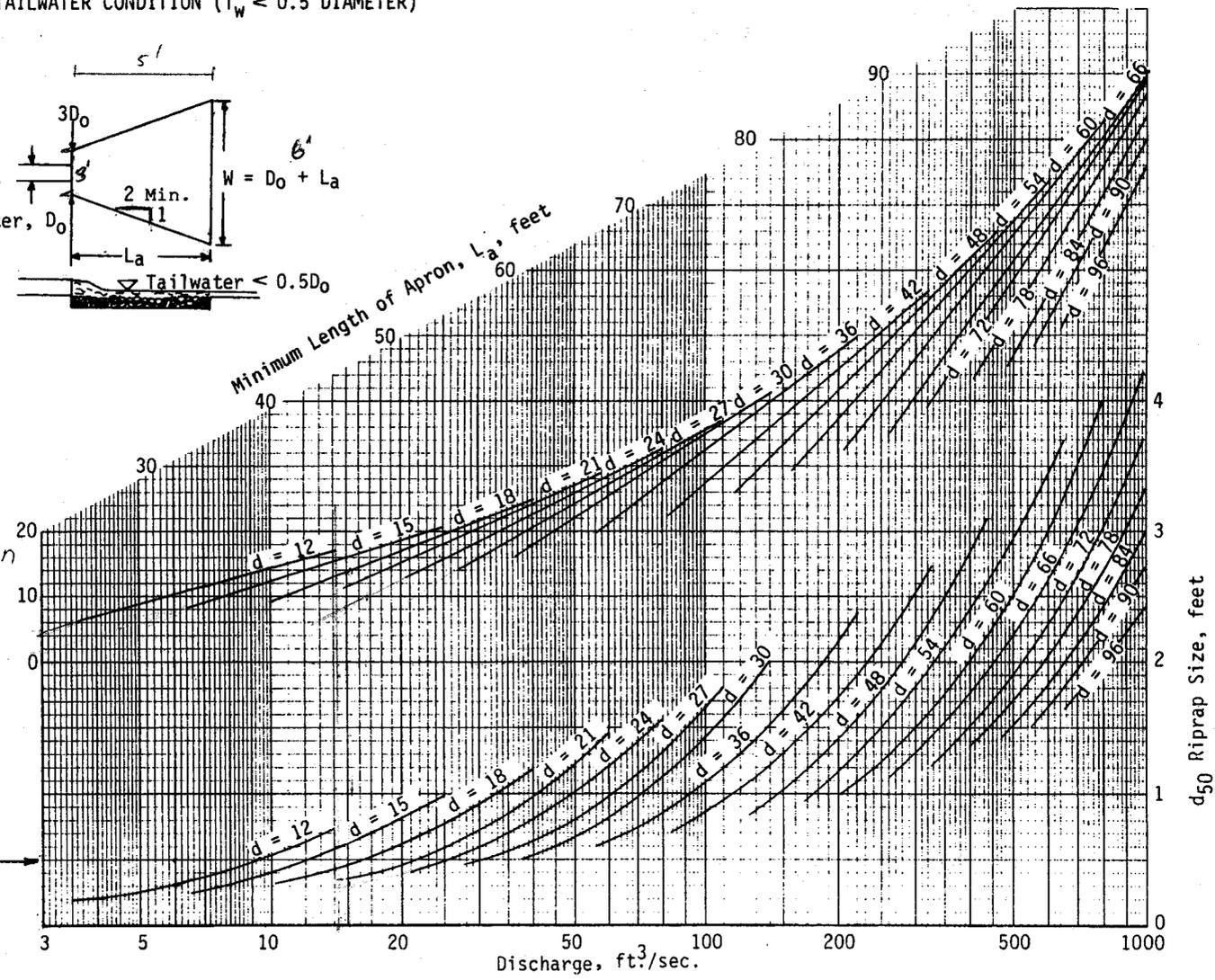
DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL  
MINIMUM TAILWATER CONDITION ( $T_w < 0.5$  DIAMETER)



System B  
 12" Outfall  
 $Q_{10} = 1.3$  CFS  
 $L_a = 5'$

Class AI Apron  
 2' Deep  
 (2 CY)

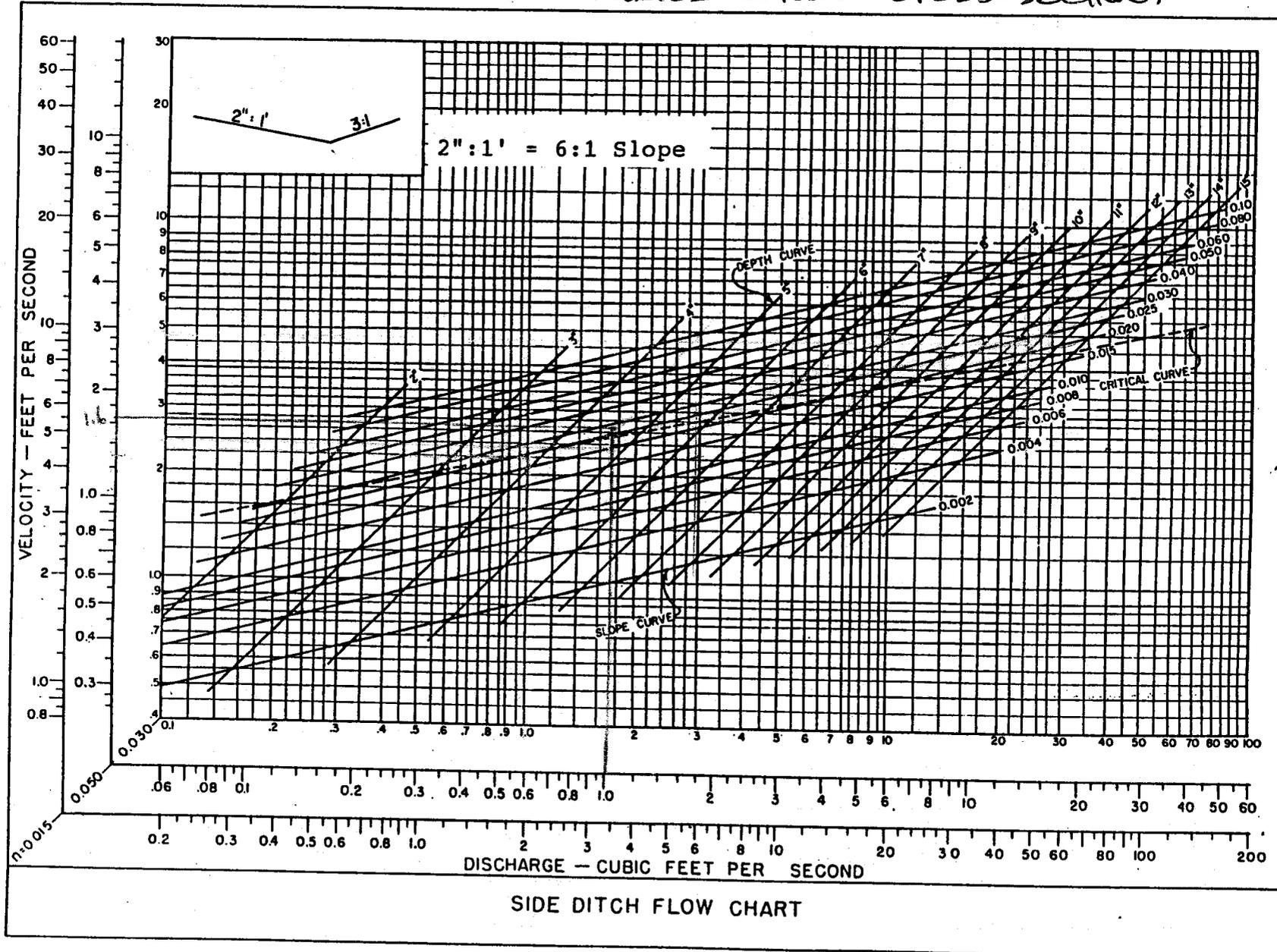
Recommended Min.  
 $d_{50} = 6''$



$d_{50}$  Riprap Size, feet

System B

CROSS SECTION OF OUTFALL CHANNEL WAS SURVEYED  
AND MONOGRAPH <sup>BEST</sup> APPROXIMATES ACTUAL CROSS-SECTION.



2-48

FIG. 2.817

ACCURACY CALCULATION



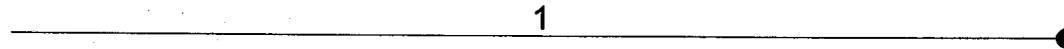
5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994

PROJECT FORD'S COLONY  
PROJECT NO. 5652-12  
SUBJECT SPREAD CALCS.  
SHEET NO. 7 OF 12  
DATE 9/30/02  
BY QAM

SYSTEM C

SS# C-2	STA= 51+88 (CL)	ROAD "E"	SUMP
DA= 0.29 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 0.87 CFS	Carry Over=	0.00	
Use 2 Grate(s)	Qi= 1.18 CFS >	Qt= 0.87 CFS	

# Hydraflow Plan View



Project file: 565212storm\_sysC.stm

IDF file: JCCstormsewer.IDF

No. Lines: 1

12-11-2002

# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/ Rim El (ft)
1	End	146.0	0.0	MH	0.00	0.29	0.75	5.0	44.00	12.33	62.00	12	Cir	0.013	1.00	66.25	C-1 TO C-2
Project File: 565212storm_sysC.stm					IDF File: JCCstormsewer.IDF					Total number of lines: 1				Date: 12-11-2002			

# Hydraflow Storm Sewer Tabulation

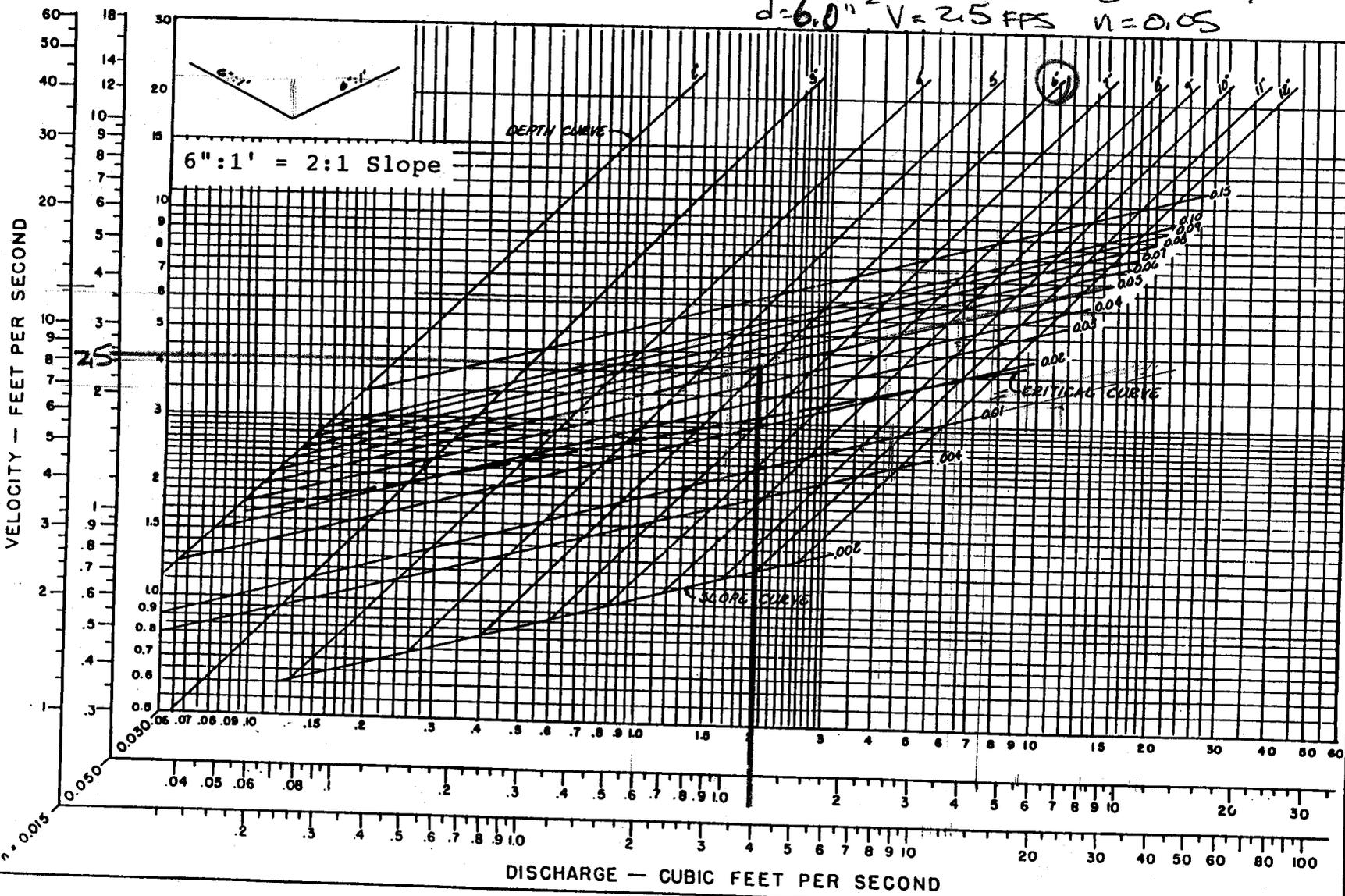
Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	146.0	0.29	0.29	0.75	0.22	0.22	5.0	5.0	7.1	1.55	12.50	2.83	12	12.33	62.00	44.00	62.53	45.00	66.25	56.00	C-1 TO C-2
Project File: 565212storm_sysC.stm						IDF File: JCCstormsewer.IDF						Total number of lines: 1				Run Date: 12-11-2002						
NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 45.00 (ft)																						



CROSS SECTION OF OUTFALL CHANNEL WAS SURVEYED AND NOMOGRAPH BEST APPROXIMATES ACTUAL CROSS-SECTION

System C

$Q = 1.2$  CFS  $S = 0.05\%$   
 $d = 6.0$ "  $V = 2.5$  FPS  $n = 0.05$



2-54

FIG. 2.8.23 Accuracy of  
 GAUSSIAN & GRASS  
 PAPER

1100



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 8 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM D

SS# D-3B	STA= 29+25(R)	ROAD "A"	GRADE
DA= 0.56 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.0358 FT/FT
Qt= 1.30 CFS	Carry Over=	0.00	
D= 0.13	K= 21.4		
Qi= 0.69 < 1.30 CFS			SPREAD= 4.4 LF
Use 2 Grate(s)	Qi= 0.76 CFS <	Qt= 1.30 CFS	
SS# D-3A	STA= 29+74(R)	ROAD "A"	GRADE
DA= 0.18 AC.	C= 0.56	I10= 4.00 IN/HR	S= 0.0358 FT/FT
Qt= 0.94 CFS	Carry Over=	0.54	
D= 0.11	K= 21.4		
Qi= 0.56 < 0.94 CFS			SPREAD= 3.5 LF
Use 2 Grate(s)	Qi= 0.62 CFS <	Qt= 0.94 CFS	
SS# D-5	STA= 37+35(L)	ROAD "C"	GRADE
DA= 0.16 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.0265 FT/FT
Qt= 0.80 CFS	Carry Over=	0.32	
D= 0.11	K= 19.5		
Qi= 0.51 < 0.80 CFS			SPREAD= 3.4 LF
Use 2 Grate(s)	Qi= 0.56 CFS <	Qt= 0.80 CFS	
SS# D-4	STA= 30+54(R)	ROAD "A"	GRADE
DA= 0.35 AC.	C= 0.59	I10= 4.00 IN/HR	S= 0.0276 FT/FT
Qt= 1.07 CFS	Carry Over=	0.24	
D= 0.12	K= 19.7		
Qi= 0.61 < 1.07 CFS			SPREAD= 4.4 LF
Use 2 Grate(s)	Qi= 0.67 CFS <	Qt= 1.07 CFS	
SS# D-3	STA= 30+14(R)	ROAD "A"	SUMP
DA= 0.05 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 0.87 CFS	Carry Over=	0.72	
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 0.87 CFS	



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 9 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM D

SS# D-6A	STA= 36+61(R)	ROAD "C"	GRADE
DA= 0.48 AC.	C= 0.58	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.11 CFS	Carry Over=	0.00	
D= 0.15	K= 16.1		
Qi= 0.70 <	1.11 CFS		
Use 2 Grate(s)	Qi= 0.77 CFS <	Qt= 1.11 CFS	SPREAD= 5.8 LF
SS# D-6	STA= 37+35(R)	ROAD "C"	GRADE
DA= 0.15 AC.	C= 0.60	I10= 4.00 IN/HR	S= 0.0265 FT/FT
Qt= 0.70 CFS	Carry Over=	0.34	
D= 0.11	K= 19.5		
Qi= 0.47 <	0.70 CFS		
Use 2 Grate(s)	Qi= 0.52 CFS <	Qt= 0.70 CFS	SPREAD= 3 LF
SS# D-8	STA= 33+84(R)	ROAD "A"	GRADE
DA= 0.3 AC.	C= 0.6	I10= 4.00 IN/HR	S= 0.0102 FT/FT
Qt= 0.72 CFS	Carry Over=	0.00	
D= 0.13	K= 16.2		
Qi= 0.53 <	0.72 CFS		
Use 2 Grate(s)	Qi= 0.59 CFS <	Qt= 0.72 CFS	SPREAD= 4.6 LF
SS# D-7	STA= 32+46(R)	ROAD "A"	SUMP
DA= 0.3 AC.	C= 0.6	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.04 CFS	Carry Over=	0.32	
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 1.04 CFS	



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 10 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM D

SS# D-14	STA= 9+60(R)	ROAD "A"	GRADE
DA= 0.18 AC.	C= 0.54	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 0.39 CFS	Carry Over=	0.00	
D= 0.10	K= 16.1		
Qi= 0.36 = 0.39 CFS			SPREAD= 2.8 LF
Use 1 Grate(s)	Qi= 0.36 CFS=	Qt= 0.39 CFS	
SS# D-9	STA= 34+37(R)	ROAD "A"	GRADE
DA= 0.54 AC.	C= 0.54	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 1.19 CFS	Carry Over=	0.03	
D= 0.16	K= 16.1		
Qi= 0.73 = 1.19 CFS			SPREAD= 6.3 LF
Use 2 Grate(s)	Qi= 0.81 CFS=	Qt= 1.19 CFS	
SS# D-13	STA= 62+62(R)	ROAD "F"	GRADE
DA= 0.19 AC.	C= 0.57	I10= 4.00 IN/HR	S= 0.01 FT/FT
Qt= 0.43 CFS	Carry Over=	0.00	
D= 0.11	K= 16.1		
Qi= 0.39 < 0.43 CFS			SPREAD= 3 LF
Use 1 Grate(s)	Qi= 0.39 CFS <	Qt= 0.43 CFS	
SS# D-12	STA= 61+58(R)	ROAD "F"	GRADE
DA= 0.31 AC.	C= 0.56	I10= 4.00 IN/HR	S= 0.0261 FT/FT
Qt= 0.74 CFS	Carry Over=	0.04	
D= 0.11	K= 19.4		
Qi= 0.48 < 0.74 CFS			SPREAD= 3.2 LF
Use 2 Grate(s)	Qi= 0.53 CFS <	Qt= 0.74 CFS	
SS# D-11	STA= 60+48(R)	ROAD "F"	SUMP
DA= 0.16 AC.	C= 0.65	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.01 CFS	Carry Over=	0.59	
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 1.01 CFS	



5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994

PROJECT FORD'S COLONY  
PROJECT NO. 5652-12  
SUBJECT SPREAD CALCS.  
SHEET NO. 11 OF 12  
DATE 9/30/02  
BY QAM

SYSTEM D

SS# D-11A	STA= 60+48(L)	ROAD "F"	SUMP
DA= 0.16 AC.	C= 0.65	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 0.42 CFS	Carry Over=	0.00	
Use 1 Grate(s)	<u>Qi= 1.18 CFS &gt; Qt= 0.42 CFS</u>		
SS# D-2	STA= 30+14(L)	ROAD "A"	SUMP
DA= 0.43 AC.	C= 0.65	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.12 CFS	Carry Over=	0.00	
Use 1 Grate(s)	<u>Qi= 1.18 CFS &gt; Qt= 1.12 CFS</u>		



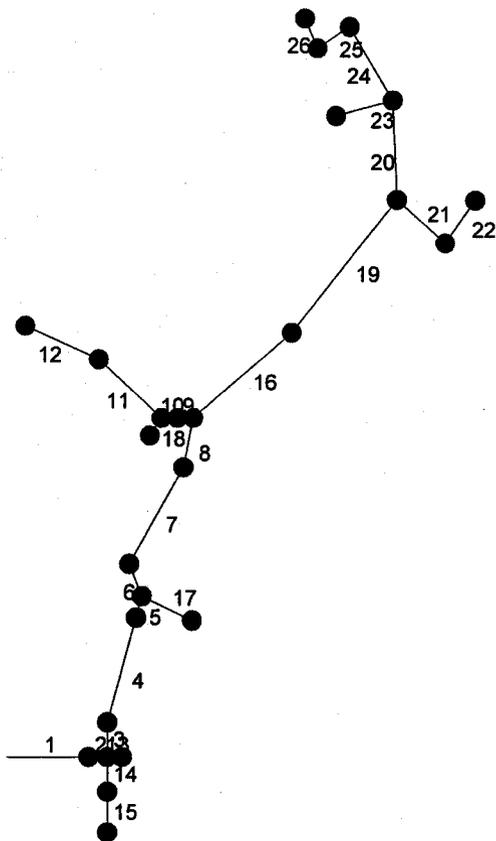
5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY SEC. 12  
 PROJECT NO. 5652-12  
 SUBJECT Spread Calculations  
 SHEET NO. 1  
 DATE SEPT. 30, 2002  
 BY QAM

### STORM WATER INLET COMPUTATIONS

INLET			Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Q1 Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T (Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo (#10)	n	Local Dep.	a	Sw = a/(12W)	Se (ft/ft) = Sx + SwEo	L1 (ft) 15 P Effic L	L/LT (ft) d	E (#16) h (ft)	Q Int CFS d/h	Q Carryover Spread	Remark											
Number	Type	Length																																							
COUNTRY CLUB DRIVE - LEFT																																									
GRADE	3B	4	16+45L	0.4	0.56	0.224	0.224	4	0.896		0.896	0.01	0.021	5.2	2	0.385	0.083	3.999	0.7	0.015	2	3.5	0.146	0.123	6.29	0.636	0.838	0.751	0.145												
ROAD "A" - RIGHT																																									
GRADE	3B	4	7+20 R	0.58	0.57	0.331	0.331	4	1.322		1.322	0.01	0.02	6.3	2	0.317	0.08	4	0.8	0.015	2	3.5	0.146	0.137	6.95	0.575	0.786	1.039	0.283												
COUNTRY CLUB DRIVE - RIGHT																																									
GRADE	3B	4	15+00 R	0.55	0.54	0.297	0.297	4	1.188		1.188	0.01	0.02	6	2	0.333	0.08	4	0.78	0.015	2	3.5	0.146	0.134	6.73	0.594	0.803	0.954	0.234												
COUNTRY CLUB DRIVE - RIGHT																																									
SUMP	3C	6	15+38 R	0.2	0.54	0.108	0.108	4	0.432	0.234	0.666	0.001	0.02	8	Flow Approaching From Down Station																										
				0.41	0.57	0.234	0.234	4	0.935	0.283	1.218	0.001	0.02	10	Flow Approaching From Up Station																										
COUNTRY CLUB DRIVE - LEFT																																									
SUMP	3C	6	15+38 L	0.3	0.56	0.168	0.168	4	0.672		0.672	0.001	0.02	8	Flow Approaching From Down Station																										
				0.28	0.56	0.157	0.157	4	0.627	0.145	0.773	0.001	0.02	8.5	Flow Approaching From Up Station																										

# Hydraflow Plan View



Project file: 565212storm\_sysD.stm

IDF file: JCCstormsewer.IDF

No. Lines: 26

12-12-2002

# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data							Line ID	
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)		Inlet/ Rim El (ft)
1	End	127.0	0.0	MH	0.00	0.43	0.65	5.0	59.00	5.51	66.00	24	Cir	0.013	0.15	74.08	D-1 TO D-2
2	1	26.0	0.0	MH	0.00	0.05	0.75	5.0	66.00	3.85	67.00	24	Cir	0.013	1.00	74.08	D-2 TO D-3
3	2	40.0	-90.0	MH	0.00	0.35	0.59	7.0	67.00	2.50	68.00	24	Cir	0.013	0.45	74.35	D-3 TO D-4
4	3	127.0	18.0	MH	0.00	0.16	0.75	5.0	68.00	1.26	69.60	24	Cir	0.013	0.15	79.18	D-4 TO D-5
5	4	26.0	0.0	MH	0.00	0.15	0.60	8.0	69.60	1.15	69.90	24	Cir	0.013	1.00	79.18	D-5 TO D-6
6	5	41.0	-43.0	MH	0.00	0.30	0.60	7.0	69.90	0.98	70.30	24	Cir	0.013	0.85	79.13	D-6 TO D-7
7	6	134.0	59.0	MH	0.00	0.30	0.60	11.0	70.30	0.97	71.60	24	Cir	0.013	0.45	80.78	D-7 TO D-8
8	7	59.0	-21.0	MH	0.00	0.54	0.56	10.0	71.60	1.02	72.20	24	Cir	0.013	1.00	81.32	D-8 TO D-9
9	8	22.0	-103.0	MH	0.00	0.68	0.52	11.0	72.20	12.73	75.00	15	Cir	0.013	0.15	80.50	D-9 TO D-10
10	9	22.0	0.0	MH	0.00	0.16	0.65	7.0	75.00	0.91	75.20	15	Cir	0.013	0.75	80.16	D-10 TO D-11
11	10	111.0	38.0	MH	0.00	0.31	0.56	9.0	75.20	1.62	77.00	15	Cir	0.013	0.45	82.69	D-11 TO D-12
12	11	109.0	-17.0	MH	0.00	0.19	0.57	10.0	77.00	0.92	78.00	15	Cir	0.013	1.00	84.28	D-12 TO D-13
13	2	20.0	0.0	MH	0.00	0.78	0.52	10.0	67.90	9.50	69.80	12	Cir	0.013	1.00	73.80	D-3 TO D-3A
14	2	40.0	90.0	MH	0.00	0.18	0.56	8.0	67.90	4.75	69.80	12	Cir	0.013	0.15	74.32	D-3 TO D-3B
15	14	47.0	0.0	MH	0.00	0.56	0.58	8.0	69.80	2.55	71.00	12	Cir	0.013	1.00	75.31	D-3B TO D-3C
16	8	168.0	41.0	MH	0.00	0.18	0.56	8.0	72.20	0.54	73.10	24	Cir	0.013	0.45	83.05	D-9 TO D-14
17	5	75.0	94.0	MH	0.00	0.48	0.58	12.0	74.50	2.67	76.50	12	Cir	0.013	1.00	80.80	D-6 TO D-6A
18	10	26.0	-52.0	MH	0.00	0.16	0.65	5.0	75.20	1.15	75.50	12	Cir	0.013	1.00	80.16	D-11 TO D-11A
19	16	212.0	-11.0	MH	0.00	0.35	0.58	8.0	73.10	0.52	74.20	24	Cir	0.013	1.00	82.70	D-14 TO D-15
20	19	115.0	-46.0	MH	0.00	0.40	0.56	8.0	74.20	0.52	74.80	24	Cir	0.013	1.00	81.85	D-15 TO D-16
21	19	84.0	84.0	MH	0.00	0.38	0.58	8.0	75.75	1.07	76.65	15	Cir	0.013	1.00	82.50	D-15 TO D-15A

Project File: 565212storm\_sysD.stm

IDF File: JCCstormsewer.IDF

Total number of lines: 26

Date: 12-12-2002

# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
22	21	65.0	-87.0	MH	0.00	0.53	0.56	8.0	76.65	4.38	79.50	12	Cir	0.013	1.00	82.50	D-15A TO D-15B
23	20	80.0	-100.0	MH	0.00	0.58	0.57	8.0	74.80	0.56	75.25	12	Cir	0.013	1.00	81.95	D-16 TO D-16A
24	20	104.0	-32.0	MH	0.00	0.58	0.56	8.0	75.40	0.96	76.40	18	Cir	0.013	1.00	81.18	D-16 TO D-17
25	24	51.0	-84.0	MH	0.00	0.61	0.56	8.0	76.40	0.98	76.90	15	Cir	0.013	1.00	81.18	D-17 TO D-18
26	25	39.0	92.0	MH	0.00	0.55	0.54	8.0	76.90	0.90	77.25	12	Cir	0.013	1.00	81.25	D-18 TO D-19
Project File: 565212storm_sysD.stm						IDF File: JCCstormsewer.IDF						Total number of lines: 26				Date: 12-12-2002	

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	127.0	0.43	9.94	0.65	0.28	5.69	5.0	16.2	5.0	28.32	53.10	9.19	24	5.51	66.00	59.00	67.84	61.00	74.08	62.00	D-1 TO D-2
2	1	26.0	0.05	9.51	0.75	0.04	5.41	5.0	16.1	5.0	26.96	44.36	8.80	24	3.85	67.00	66.00	68.81	68.04	74.08	74.08	D-2 TO D-3
3	2	40.0	0.35	7.94	0.59	0.21	4.54	7.0	16.1	5.0	22.69	35.76	7.22	24	2.50	68.00	67.00	70.48	70.07	74.35	74.08	D-3 TO D-4
4	3	127.0	0.16	7.59	0.75	0.12	4.33	5.0	15.8	5.0	21.83	25.39	6.95	24	1.26	69.60	68.00	72.03	70.84	79.18	74.35	D-4 TO D-5
5	4	26.0	0.15	7.43	0.60	0.09	4.21	8.0	15.7	5.0	21.26	24.30	6.77	24	1.15	69.90	69.60	72.37	72.14	79.18	79.18	D-5 TO D-6
6	5	41.0	0.30	6.80	0.60	0.18	3.84	7.0	15.6	5.1	19.45	22.34	6.19	24	0.98	70.30	69.90	73.38	73.08	79.13	79.18	D-6 TO D-7
7	6	134.0	0.30	6.50	0.60	0.18	3.66	11.0	15.2	5.1	18.72	22.28	5.96	24	0.97	71.60	70.30	74.81	73.89	80.78	79.13	D-7 TO D-8
8	7	59.0	0.54	6.20	0.56	0.30	3.48	10.0	15.1	5.1	17.88	22.81	5.69	24	1.02	72.20	71.60	75.43	75.06	81.32	80.78	D-8 TO D-9
9	8	22.0	0.68	1.50	0.52	0.35	0.84	11.0	15.0	5.1	4.34	23.04	3.99	15	12.73	75.00	72.20	75.93	75.93	80.50	81.32	D-9 TO D-10
10	9	22.0	0.16	0.82	0.65	0.10	0.49	7.0	14.8	5.2	2.53	6.16	2.85	15	0.91	75.20	75.00	75.96	75.97	80.16	80.50	D-10 TO D-11
11	10	111.0	0.31	0.50	0.56	0.17	0.28	9.0	13.4	5.4	1.51	8.22	2.50	15	1.62	77.00	75.20	77.49	76.08	82.69	80.16	D-11 TO D-12
12	11	109.0	0.19	0.19	0.57	0.11	0.11	10.0	10.0	6.0	0.65	6.19	1.88	15	0.92	78.00	77.00	78.32	77.57	84.28	82.69	D-12 TO D-13
13	2	20.0	0.78	0.78	0.52	0.41	0.41	10.0	10.0	6.0	2.42	10.98	3.74	12	9.50	69.80	67.90	70.46	70.07	73.80	74.08	D-3 TO D-3A
14	2	40.0	0.18	0.74	0.56	0.10	0.43	8.0	8.3	6.3	2.69	7.76	4.02	12	4.75	69.80	67.90	70.50	70.07	74.32	74.08	D-3 TO D-3B
15	14	47.0	0.56	0.56	0.58	0.32	0.32	8.0	8.0	6.4	2.07	5.69	3.71	12	2.55	71.00	69.80	71.61	70.55	75.31	74.32	D-3B TO D-3C
16	8	168.0	0.18	4.16	0.56	0.10	2.34	8.0	10.5	5.9	13.73	16.55	4.37	24	0.54	73.10	72.20	76.55	75.93	83.05	81.32	D-9 TO D-14
17	5	75.0	0.48	0.48	0.58	0.28	0.28	12.0	12.0	5.6	1.56	5.82	4.98	12	2.67	76.50	74.50	77.03	74.85	80.80	79.18	D-6 TO D-6A
18	10	26.0	0.16	0.16	0.65	0.10	0.10	5.0	5.0	7.1	0.74	3.83	1.29	12	1.15	75.50	75.20	76.08	76.08	80.16	80.16	D-11 TO D-11A
19	16	212.0	0.35	3.98	0.58	0.20	2.24	8.0	9.7	6.0	13.50	16.29	4.30	24	0.52	74.20	73.10	77.44	76.68	82.70	83.05	D-14 TO D-15
20	19	115.0	0.40	2.72	0.56	0.22	1.52	8.0	9.0	6.2	9.35	16.34	2.98	24	0.52	74.80	74.20	77.92	77.73	81.85	82.70	D-15 TO D-16
21	19	84.0	0.38	0.91	0.58	0.22	0.52	8.0	8.4	6.3	3.25	6.68	2.65	15	1.07	76.65	75.75	77.90	77.73	82.50	82.70	D-15 TO D-15A

Project File: 565212storm\_sysD.stm

IDF File: JCCstormsewer.IDF

Total number of lines: 26

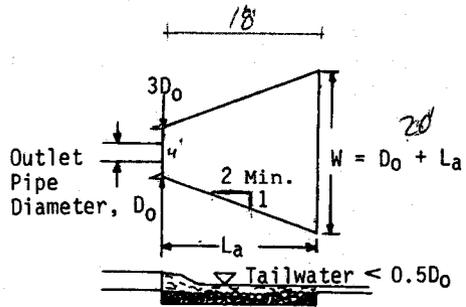
Run Date: 12-12-2002

NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 61.00 (ft)

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
22	21	65.0	0.53	0.53	0.56	0.30	0.30	8.0	8.0	6.4	1.89	7.46	3.20	12	4.38	79.50	76.65	80.08	78.01	82.50	82.50	D-15A TO D-15B
23	20	80.0	0.58	0.58	0.57	0.33	0.33	8.0	8.0	6.4	2.11	2.67	2.69	12	0.56	75.25	74.80	78.34	78.06	81.95	81.85	D-16 TO D-16A
24	20	104.0	0.58	1.74	0.56	0.32	0.96	8.0	8.5	6.3	6.04	10.30	3.42	18	0.96	76.40	75.40	78.40	78.06	81.18	81.85	D-16 TO D-17
25	24	51.0	0.61	1.16	0.56	0.34	0.64	8.0	8.3	6.3	4.04	6.39	3.29	15	0.98	76.90	76.40	78.78	78.59	81.18	81.18	D-17 TO D-18
26	25	39.0	0.55	0.55	0.54	0.30	0.30	8.0	8.0	6.4	1.90	3.37	2.41	12	0.90	77.25	76.90	79.06	78.95	81.25	81.18	D-18 TO D-19
Project File: 565212storm_sysD.stm									IDF File: JCCstormsewer.IDF						Total number of lines: 26				Run Date: 12-12-2002			
NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 61.00 (ft)																						

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL  
 MINIMUM TAILWATER CONDITION ( $T_w < 0.5$  DIAMETER)

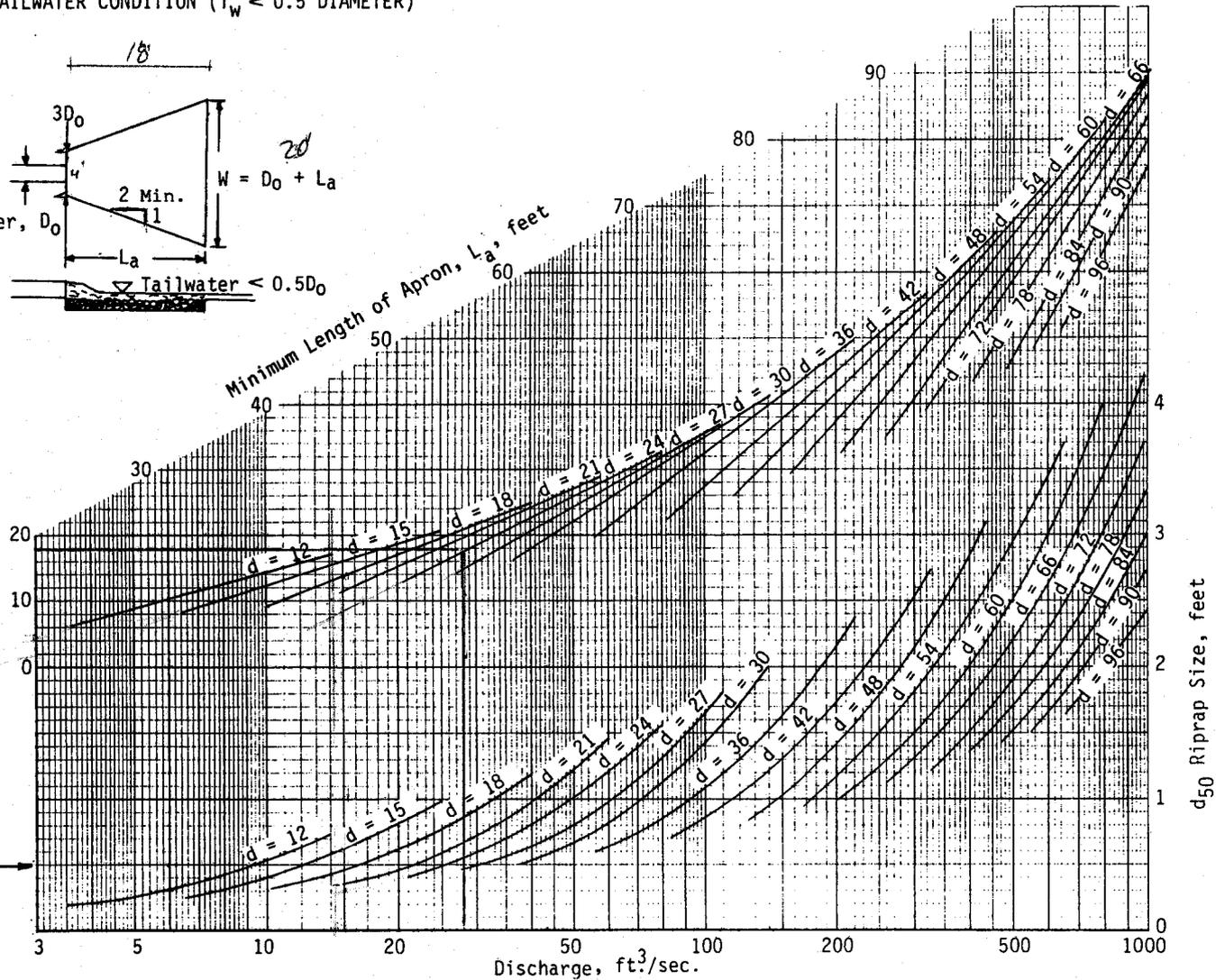


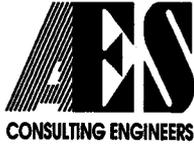
System D

24" Outfall  
 $Q_{10} = 28$  CFS  
 $L_a = 18'$

Class AI Apron  
 2' Deep  
 (17CY)

Recommended Min.  
 $d_{50} = 6''$





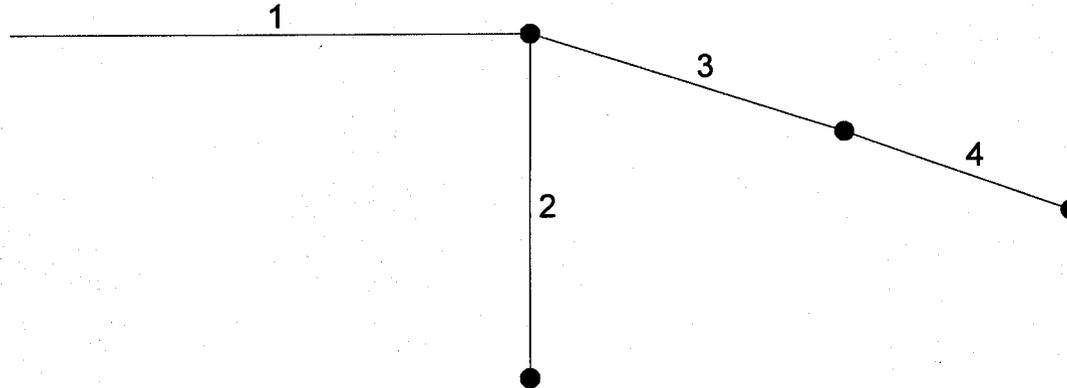
5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

PROJECT FORD'S COLONY  
 PROJECT NO. 5652-12  
 SUBJECT SPREAD CALCS.  
 SHEET NO. 12 OF 12  
 DATE 9/30/02  
 BY QAM

SYSTEM E

SS# 12-E-4	STA= 66+00 (L)	ROAD "F"	GRADE
DA= 0.17 AC.	C= 0.46	I10= 4.00 IN/HR	S= 0.0748 FT/FT
Qt= 0.31 CFS	Carry Over=	0.00	
D= 0.06	K= 29.4		
Qi= 0.31 = 0.31 CFS			SPREAD= 3.65 LF
Use 1 Grate(s)	Qi= 0.31 CFS=	Qt= 0.31 CFS	
SS# 12-E-3	STA= 66+48 (R)	ROAD "F"	GRADE
DA= 0.76 AC.	C= 0.46	I10= 4.00 IN/HR	S= 0.0748 FT/FT
Qt= 1.40 CFS	Carry Over=	0.00	
D= 0.11	K= 29.4		
Qi= 0.79 < 1.40 CFS			SPREAD= 5.31 LF
Use 2 Grate(s)	Qi= 0.87 CFS <	Qt= 1.40 CFS	
SS# 12-E-2A	STA= 67+29 (CL)	ROAD "F"	SUMP
DA= 0.21 AC.	C= 0.75	I10= 4.00 IN/HR	S= 0.001 FT/FT
Qt= 1.17 CFS	Carry Over=	0.54	
			SPREAD= 5.24 LF
Use 1 Grate(s)	Qi= 1.18 CFS >	Qt= 1.17 CFS	

# Hydraflow Plan View



Project file: 565212storm\_sysE.stm

IDF file: JCCstormsewer.IDF

No. Lines: 4

10-01-2002

# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	116.0	0.0	MH	0.00	2.16	0.35	15.0	58.20	0.52	58.80	18	Cir	0.013	1.00	65.00	E-1 TO E-2
2	1	80.0	90.0	MH	0.00	0.21	0.75	5.0	58.80	1.25	59.80	12	Cir	0.013	1.00	65.25	E-2 TO E-2A
3	1	74.0	18.0	MH	0.00	0.76	0.46	16.0	59.40	7.16	64.70	12	Cir	0.013	0.15	70.17	E-2 TO E-3
4	3	54.0	2.0	MH	0.00	0.17	0.75	5.0	64.70	8.89	69.50	12	Cir	0.013	1.00	73.50	E-3 TO E-4

Project File: 565212storm\_sysE.stm

IDF File: JCCstormsewer.IDF

Total number of lines: 4

Date: 10-01-2002

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	116.0	2.16	3.30	0.35	0.76	1.39	15.0	16.4	5.0	6.89	7.55	4.01	18	0.52	58.80	58.20	60.14	59.70	65.00	59.70	E-1 TO E-2
2	1	80.0	0.21	0.21	0.75	0.16	0.16	5.0	5.0	7.1	1.12	3.98	1.70	12	1.25	59.80	58.80	60.48	60.41	65.25	65.00	E-2 TO E-2A
3	1	74.0	0.76	0.93	0.46	0.35	0.48	16.0	16.0	5.0	2.39	9.53	3.71	12	7.16	64.70	59.40	65.36	60.41	70.17	65.00	E-2 TO E-3
4	3	54.0	0.17	0.17	0.75	0.13	0.13	5.0	5.0	7.1	0.91	10.62	2.30	12	8.89	69.50	64.70	69.90	65.40	73.50	70.17	E-3 TO E-4

Project File: 565212storm\_sysE.stm

IDF File: JCCstormsewer.IDF

Total number of lines: 4

Run Date: 10-01-2002

NOTES: Intensity =  $143.72 / (\text{Inlet time} + 19.20)^{0.94}$ ; Return period = 10 Yrs. ; Initial tailwater elevation = 59.70 (ft)

Ford's Colony Sec. 12

System E

Q = 6.9 CFS

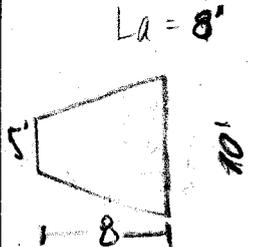
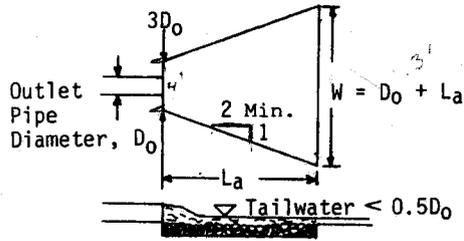
Road "F"

Source: USDA-SCS

III - 164

Plate 3.18-3

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL  
MINIMUM TAILWATER CONDITION ( $T_w < 0.5$  DIAMETER)



$$A = \frac{1}{2}(a+b)h$$

$$= \frac{1}{2}(15)(8)$$

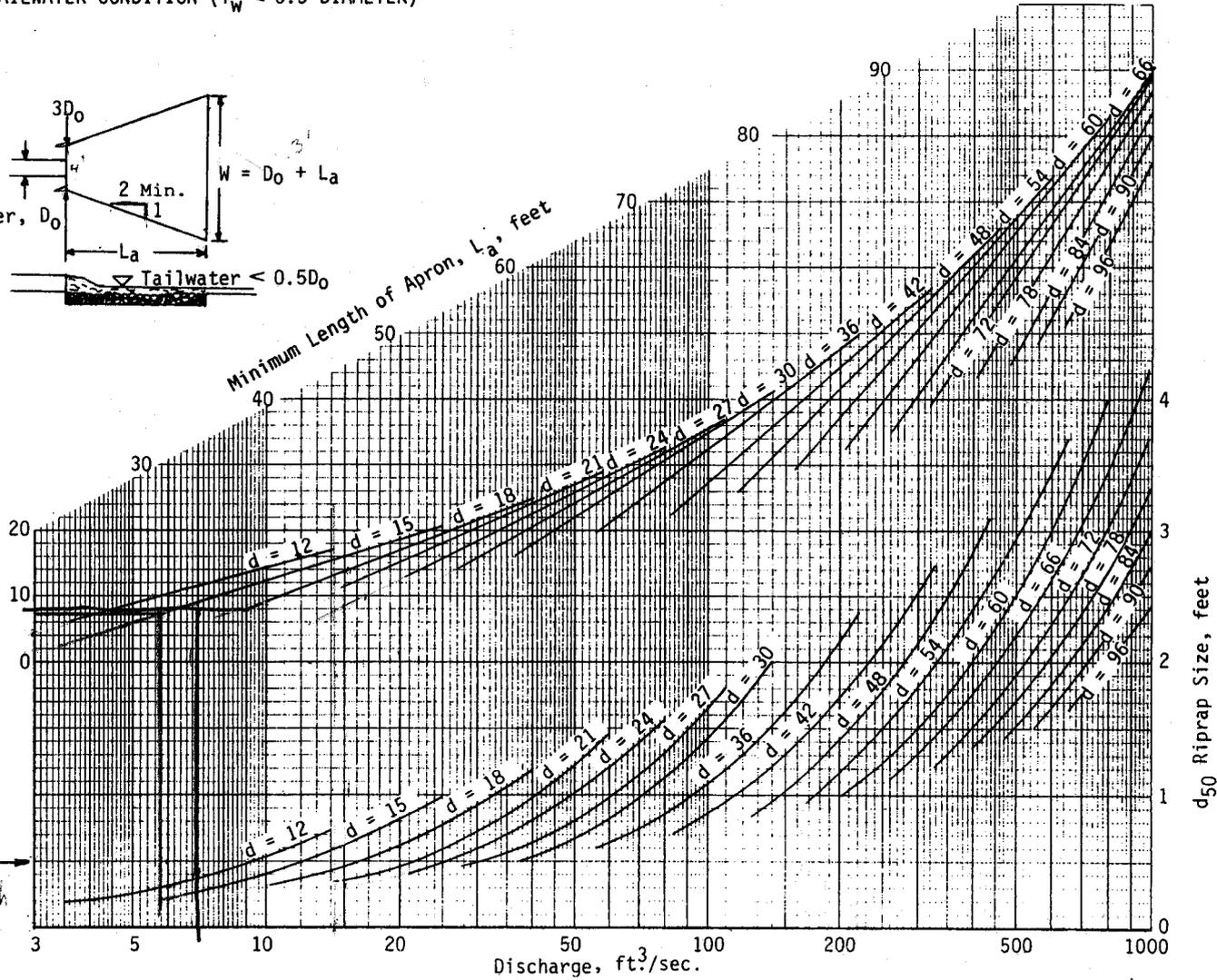
$$= 60 \text{ SF}$$

Recommended Min.  $d_{50} = 6''$

Class AT = 2' depth

$$V = \frac{120 \text{ ft}^3}{24} = 5 \text{ cy}$$

4.4 cy



1992

3.18

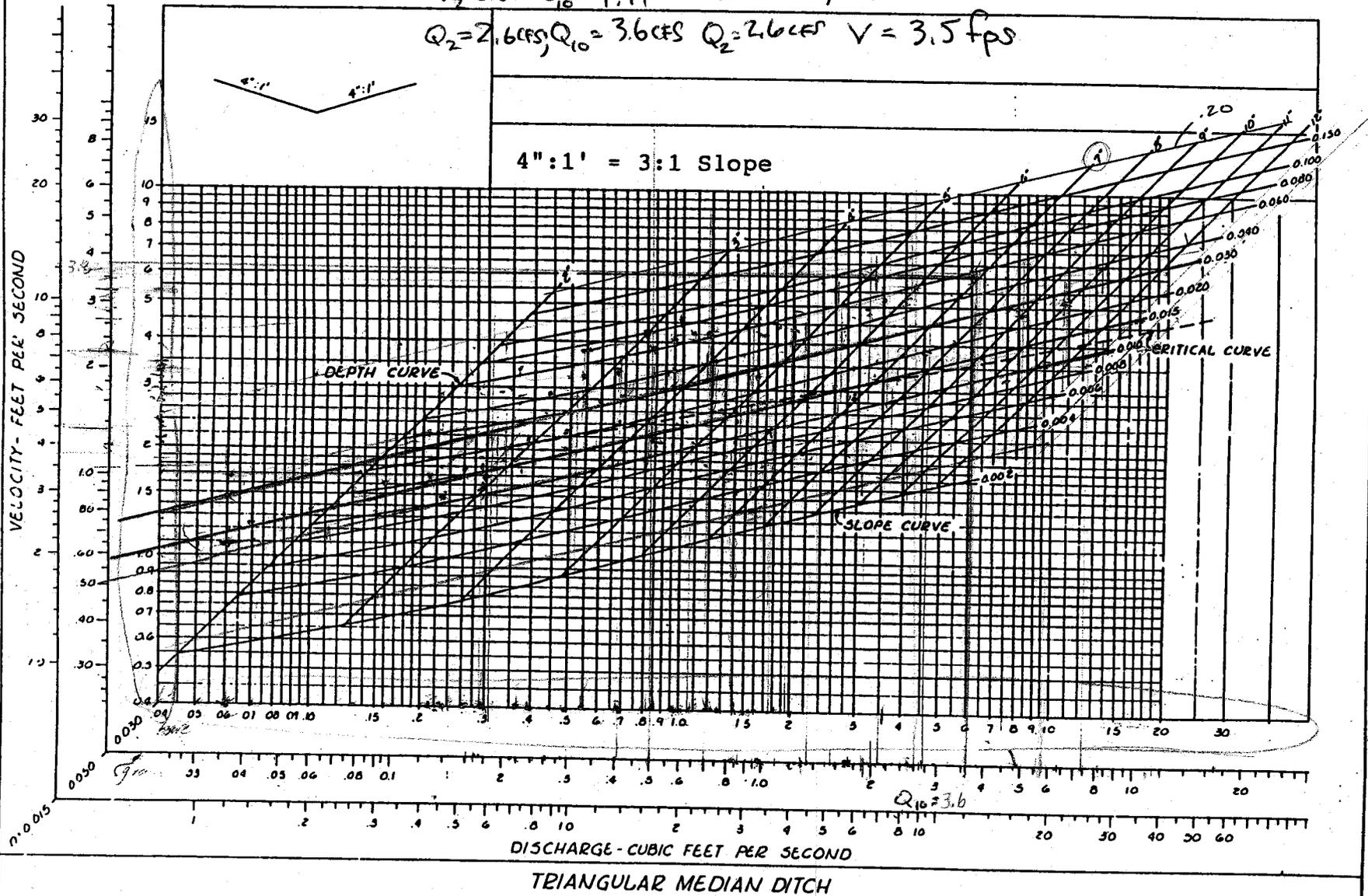


V-DITCH CHANNEL DRAINING TO YARD DRAIN INLET (DI-7) (SS #12-E-2)  
 (1 FOOT DEPTH)

DA = 2.16  
 C = 0.35  
 $T_c = 18 \text{ min}$   
 $i_7 = 3.57$   $i_{10} = 4.74$   $Q_{10} = 3.6 \text{ cfs}$   $d_{10} = 7''$

$Q_2 = 2.6 \text{ cfs}$ ,  $Q_{10} = 3.6 \text{ cfs}$   $Q_2 = 2.6 \text{ cfs}$   $V = 3.5 \text{ fps}$

4":1' = 3:1 Slope



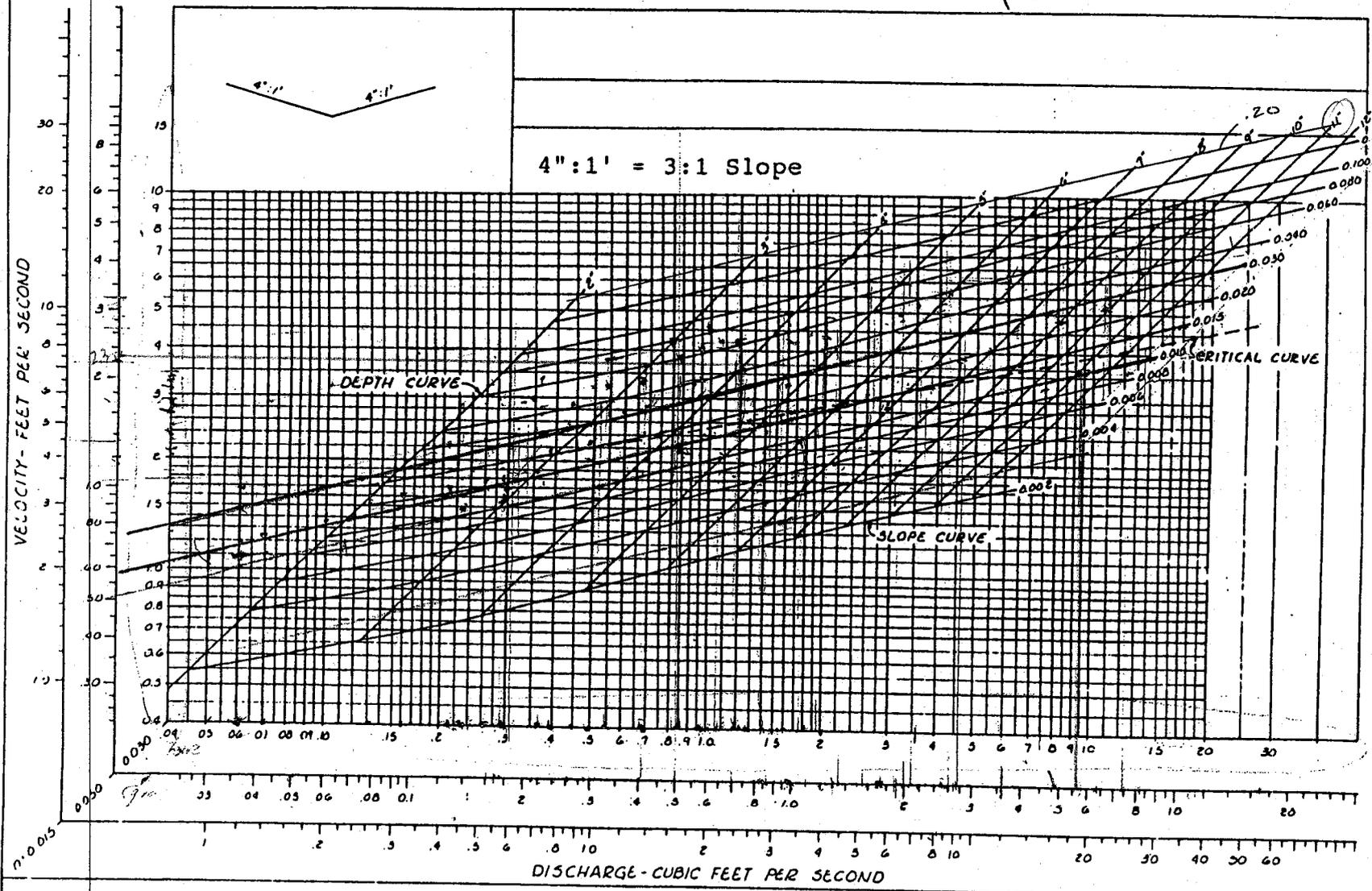
2-53

FIG. 2.8.22

5-074

V-DITCH CHANNEL AT OUTFALL OF STORM SYSTEM (SS # 12-E-1)  
 (1 FOOT DEPTH)

$Q_{10} \approx 5.7 \text{ cfs}$      $d = 11'$   
 $V = 2.3 \text{ fps}$



2.53

FIG. 2.9.22

5-24

System E

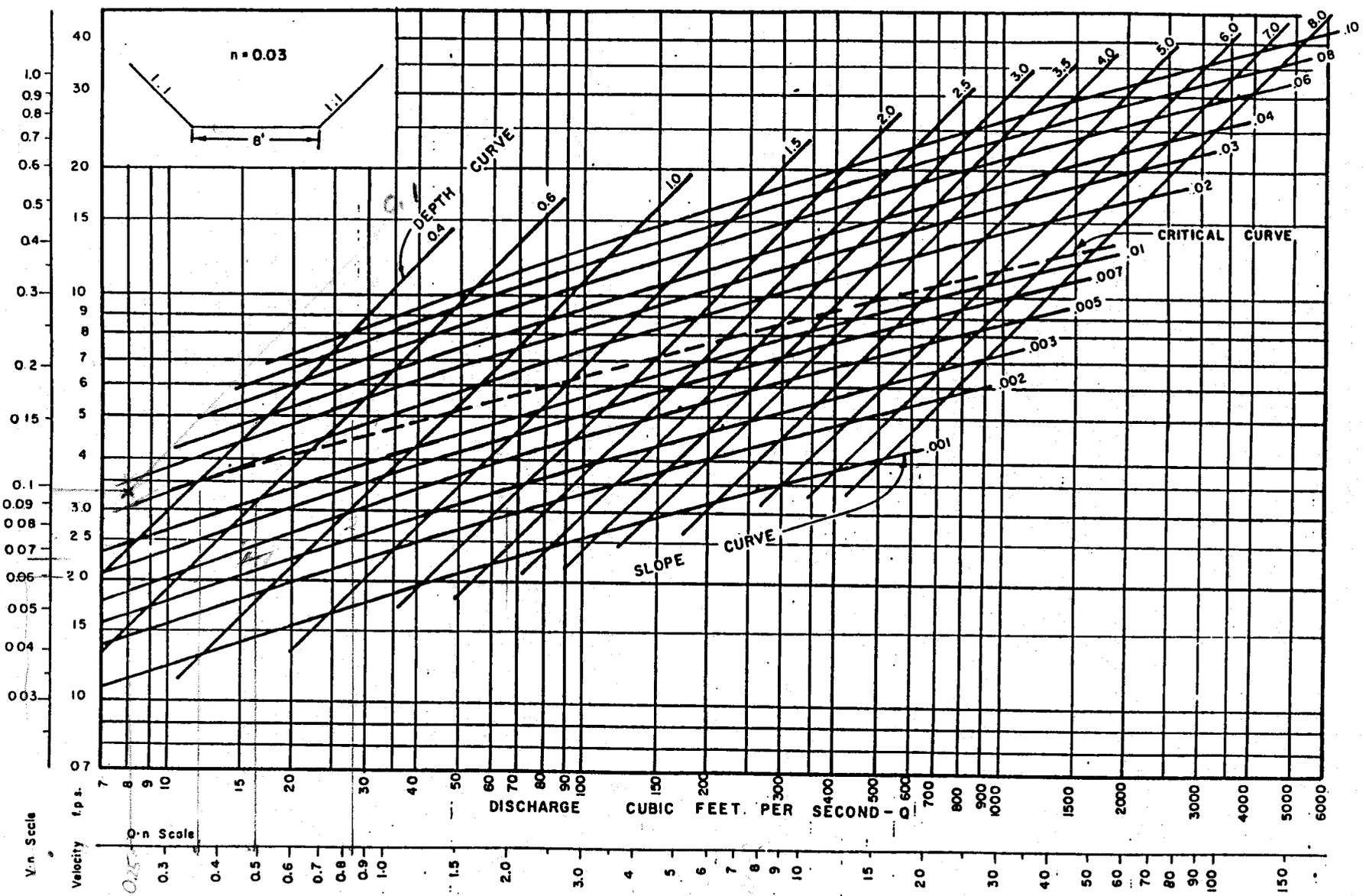
$d = 0.1 \times 12 = 1.2''$

$\eta = 0.05$

$S_c = 0.027$

$Q = 5.02 \text{ CFS (2-YR STORM)}$

29-2



CROSS SECTION OF OUTFALL  
 WAS SURVEYED AND NOMOGRAPH  
 BEST APPROXIMATES ACTUAL  
 CROSS-SECTION

**CHANNEL CHART**  
 SIDE SLOPE 1:1 b = 8 FT.

FIG. 2.8.31

APPROXIMATE CALCULATION



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994

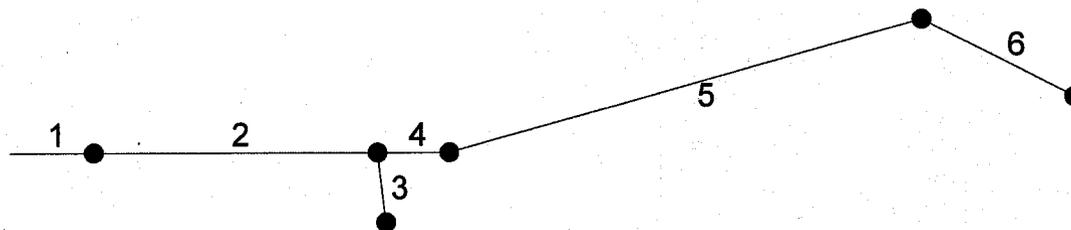
PROJECT  
 PROJECT NO.  
 SUBJECT  
 SHEET NO.  
 DATE  
 BY

FORD'S COLONY SEC. 12  
 5652-12  
 Spread Calculations  
 1  
 SEPT. 30, 2002  
 QAM

### STORM WATER INLET COMPUTATIONS

INLET				Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T (Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	S <sub>w</sub> = a/(12W)	S <sub>e</sub> (ft/ft) = S <sub>x</sub> + S <sub>w</sub> E <sub>o</sub>	L <sub>t</sub> (ft) 15 P Effic L	L/L <sub>t</sub> (ft)	d	E(#16) h (ft)	Q Int CFS d/h	Q Carryover Spread	Remark							
Number	Type	Length	Station																																			
COUNTRY CLUB DRIVE - RIGHT																																						
GRADE	3B	8	12+24 R	0.86	0.47	0.404	0.404	4	1.617		1.617	0.008	0.02	7.7	2	0.26	0.083	4.165	0.6405	0.015	2	3.5	0.146	0.113	7.79	1	1	1.617	0									
COUNTRY CLUB DRIVE - LEFT																																						
GRADE	3B	4	12+24 L	0.4	0.6	0.24	0.24	4	0.96		0.96	0.008	0.02	5.9	2	0.339	0.083	4.165	0.7729	0.015	2	3.5	0.146	0.133	5.70	0.702	0.887	0.852	0.108									
WILLIAMSBURG WEST DRIVE - RIGHT																																						
SUMP	3C	6	13+02 R	0.27	0.8	0.216	0.216	4	0.864	0.108	0.972	0.001	0.02	9.3	Flow Approaching From Up Station																							
				0.17	0.8	0.136	0.136	4	0.544		0.544	0.001	0.02	7.4	Flow Approaching From Down Station																							
WILLIAMSBURG WEST DRIVE - RIGHT																																						
SUMP	3C	6	10+65 R	0.57	0.8	0.456	0.456	4	1.824		1.824	0.001	0.02	12	Flow Approaching From Up Station																							
				0.05	0.61	0.031	0.031	4	0.122		0.122	0.001	0.02	3.4	Flow Approaching From Down Station																							
WILLIAMSBURG WEST DRIVE - LEFT																																						
GRADE	3B	4	13+08 L	0.27	0.8	0.216	0.216	4	0.864		0.864	0.007	0.02	5.8	2	0.345	0.083	4.165	0.7729	0.015	2	3.5	0.146	0.133	5.25	0.762	0.925	0.799	0.065									
WILLIAMSBURG WEST DRIVE - LEFT																																						
GRADE	3B	4	10+37 L	0.26	0.8	0.208	0.208	4	0.832	0.065	0.897	0.013	0.02	4.9	2	0.408	0.083	4.165	0.879	0.015	2	3.5	0.146	0.148	5.90	0.678	0.87	0.781	0.116									

# Hydraflow Plan View



Project file: 565212storm\_sysF.WW.stm

IDF file: JCChydrographs.IDF

No. Lines: 6

10-01-2002

# Hydrarflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert El Dn (ft)	Line slope (%)	Invert El Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim El (ft)	
1	End	23.0	0.0	MH	0.00	0.27	0.75	5.0	72.40	0.48	72.51	24	Cir	0.013	0.15	79.10	EX. DI-5 TO F-1
2	1	78.0	0.0	MH	0.00	0.00	0.00	0.0	72.51	0.44	72.85	24	Cir	0.013	1.00	78.85	F-1 TO EX. SSMH
3	2	20.0	83.0	MH	0.00	0.44	0.75	5.0	74.50	2.00	74.90	12	Cir	0.013	1.00	79.45	EX. SSMH TO F-2
4	2	20.0	0.0	MH	0.00	0.99	0.47	15.0	72.85	2.25	73.30	24	Cir	0.013	0.45	76.99	EX. SSMH TO EX. DI
5	4	135.0	-16.0	MH	0.00	0.40	0.60	8.0	73.30	2.19	76.26	15	Cir	0.013	0.75	80.53	EX DI-5 TO F-3
6	5	47.0	44.0	MH	0.00	0.86	0.60	12.0	76.26	0.51	76.50	15	Cir	0.013	1.00	80.53	F-3 TO F-4
Project File: 565212storm_sysF.WW.stm					IDF File: JCChydrographs.IDF					Total number of lines: 6					Date: 10-01-2002		

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	23.0	0.27	2.96	0.75	0.20	1.75	5.0	15.7	5.0	8.85	15.64	2.84	24	0.48	72.51	72.40	74.43	74.40	79.10	76.10	EX. DI-5 TO F-1
2	1	78.0	0.00	2.69	0.00	0.00	1.55	0.0	15.2	5.1	7.94	14.93	2.70	24	0.44	72.85	72.51	74.52	74.45	78.85	79.10	F-1 TO EX. SSM
3	2	20.0	0.44	0.44	0.75	0.33	0.33	5.0	5.0	7.1	2.35	5.04	5.24	12	2.00	74.90	74.50	75.55	74.99	79.45	78.85	EX. SSMH TO F-
4	2	20.0	0.99	2.25	0.47	0.47	1.22	15.0	15.0	5.1	6.28	33.93	2.51	24	2.25	73.30	72.85	74.60	74.64	76.99	78.85	EX. SSMH TO E
5	4	135.0	0.40	1.26	0.60	0.24	0.76	8.0	12.3	5.6	4.20	9.56	4.17	15	2.19	76.26	73.30	77.08	74.66	80.53	76.99	EX DI-5 TO F-3
6	5	47.0	0.86	0.86	0.60	0.52	0.52	12.0	12.0	5.6	2.89	4.61	2.75	15	0.51	76.50	76.26	77.42	77.36	80.53	80.53	F-3 TO F-4

Project File: 565212storm\_sysF.WW.stm

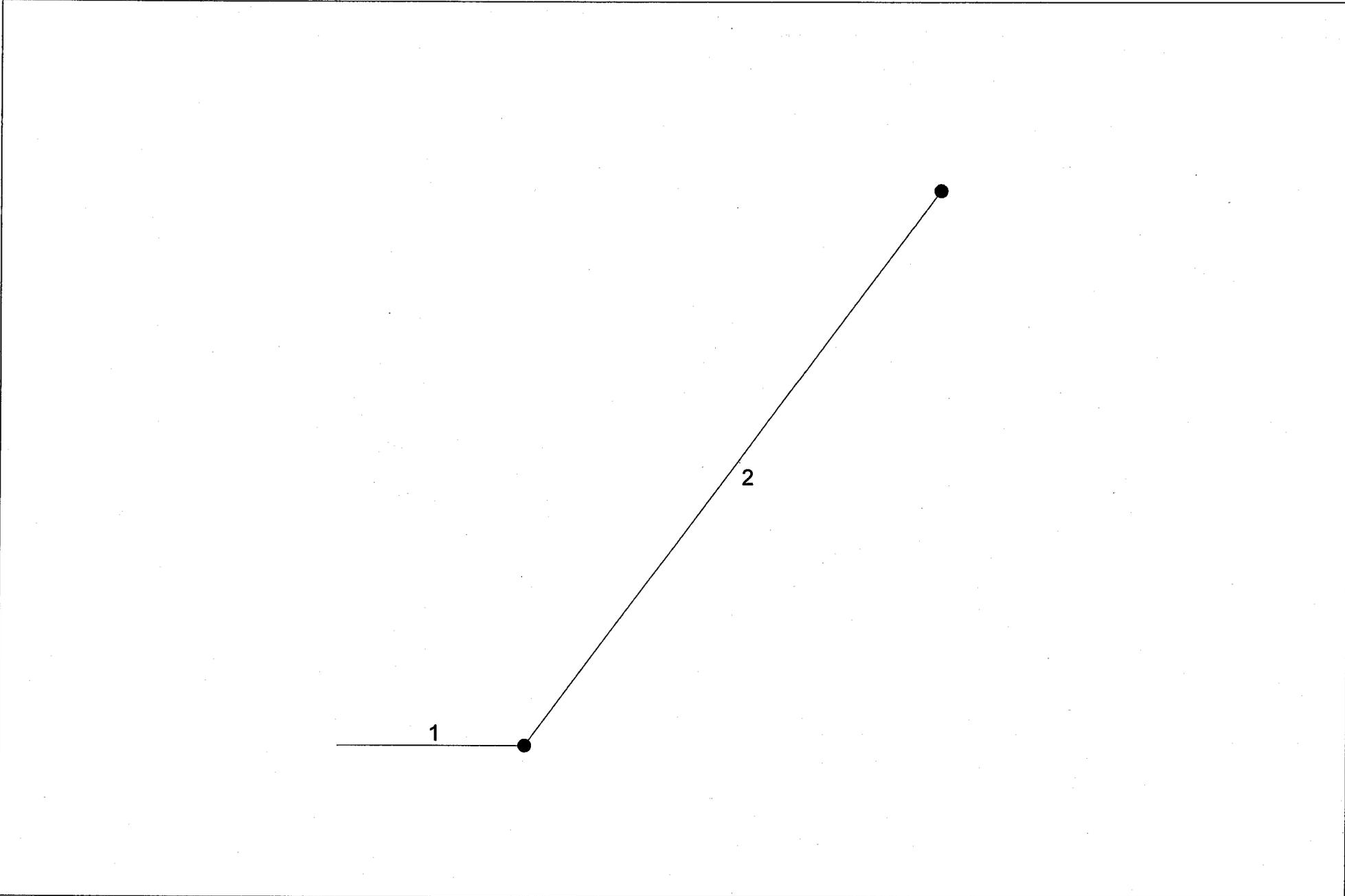
IDF File: JCChydrographs.IDF

Total number of lines: 6

Run Date: 10-01-2002

NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 74.40 (ft)

# Hydraflow Plan View



Project file: 565212storm\_sysG.WW.stm

IDF file: JCChydrographs.IDF

No. Lines: 2

10-01-2002

# Hydraflow Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr line No.	Line length (ft)	Defl angle (deg)	Junc type	Known Q (cfs)	Drng area (ac)	Runoff coeff (C)	Inlet time (min)	Invert EI Dn (ft)	Line slope (%)	Invert EI Up (ft)	Line size (in)	Line type	N value (n)	J-loss coeff (K)	Inlet/ Rim EI (ft)	
1	End	32.0	0.0	MH	0.00	0.26	0.80	5.0	69.50	4.22	70.85	24	Cir	0.013	0.75	76.55	G-1 TO G-2
2	1	106.0	-48.0	MH	0.00	1.95	0.75	15.0	70.85	3.54	74.60	24	Cir	0.013	1.00	76.60	G-2 TO EX. 24 IN.

Project File: 565212storm\_sysG.WW.stm

IDF File: JCChydrographs.IDF

Total number of lines: 2

Date: 10-01-2002

# Hydraflow Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	32.0	0.26	2.21	0.80	0.21	1.67	5.0	15.7	5.0	8.42	46.46	3.93	24	4.22	70.85	69.50	71.88	71.50	76.55	71.50	G-1 TO G-2
2	1	106.0	1.95	1.95	0.75	1.46	1.46	15.0	15.0	5.1	7.52	42.54	4.17	24	3.54	74.60	70.85	75.57	72.19	76.60	76.55	G-2 TO EX. 24 IN

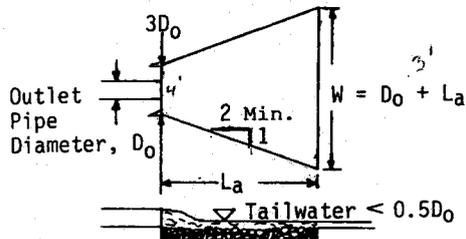
Project File: 565212storm\_sysG.WW.stm      IDF File: JCChydrographs.IDF      Total number of lines: 2      Run Date: 10-01-2002

NOTES: Intensity = 143.72 / (Inlet time + 19.20) ^ 0.94; Return period = 10 Yrs. ; Initial tailwater elevation = 71.50 (ft)

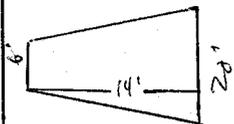
# System G

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL  
MINIMUM TAILWATER CONDITION ( $T_w < 0.5$  DIAMETER)

$Q = 8.42$  CFS ;  $D_o = 24"$



$D_o = 2'$   
 $L_a = 14'$   
 $3D_o = 6'$   
 $W = D_o + L_a = 20'$

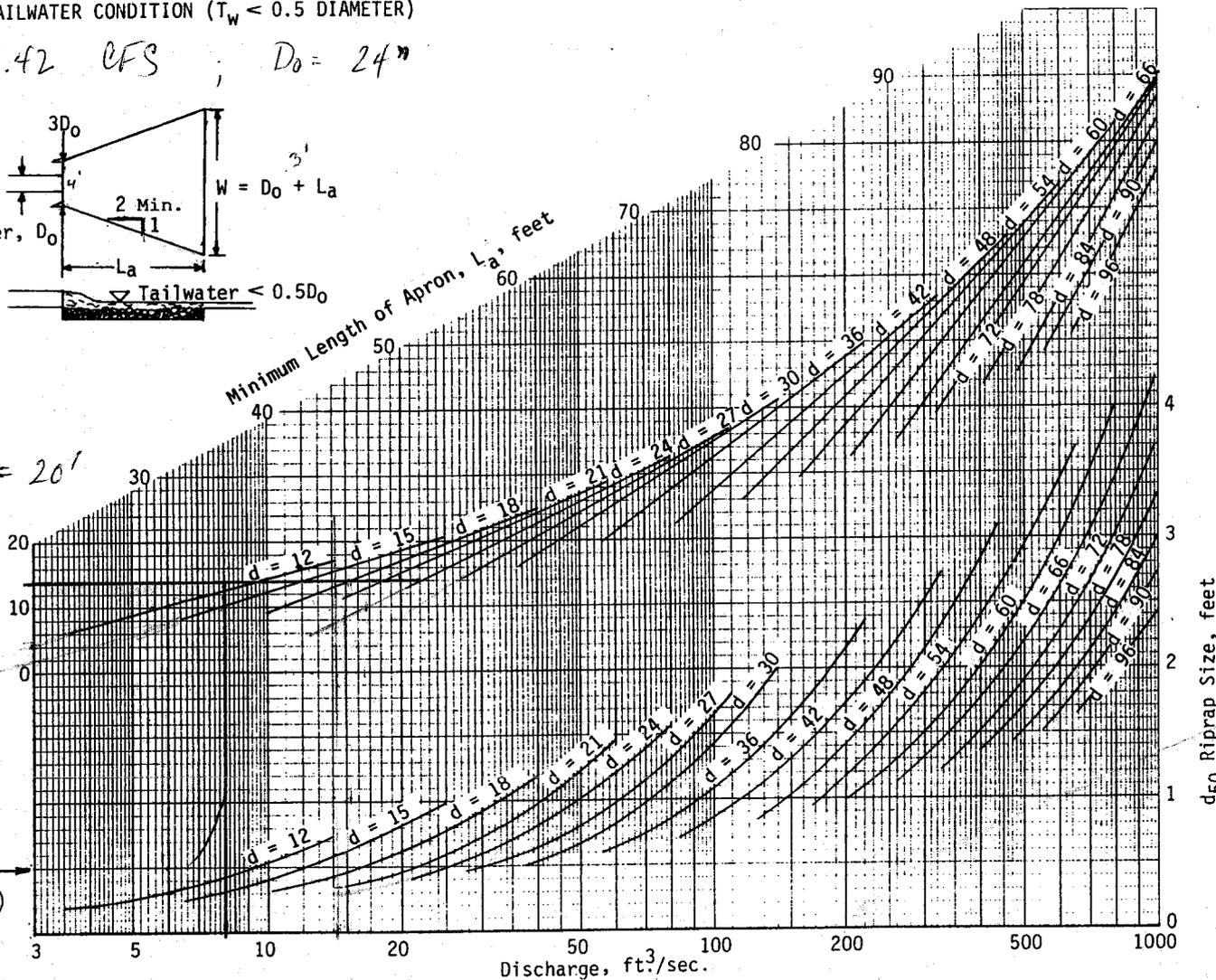


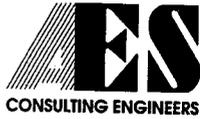
$A = \frac{(a+b)h}{2}$   
 $= \frac{(6+20)(3)}{2}$   
 $= 182$  SF

Recommended Min.  $d_{50} = 6"$

Class AT (2' deep)

$V = 13.5$  CY





5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994  
E-Mail: aes@aesva.com

PROJECT Ford's Colony - CC/WW/MP  
PROJECT NO. 5652-12  
SUBJECT Ditch Calculation  
SHEET NO. 1 OF 1  
CALCULATED BY CBP DATE 12/10/07

### SYSTEM "G" OUTFALL CHANNEL

PROPOSED DITCH HAS 3:1 SS AND 12" DEEP

→ VERIFY ADEQUACY

$n = 0.50$  grass

$S_u = 0.035\%$

$$Q_{10} = 8.4 \text{ cfs}$$

$$Q_2 = 6.1 \text{ cfs}$$

FROM VDOT DRAINAGE MANUAL PLATE 2-53:

$$d_{10} = 10''$$

$$; V_2 = 3.5 \text{ fps}$$

∴ 2" FIBERBOARD FOR  $Q_{10}$

3.5 fps is acceptable for grass-lined ditch.

PROPOSED SWALE TIES INTO EX. DRAINAGE SWALE CARRYING PRE-DEVELOPMENT FLOW FROM 24" OUTFALL. PLEASE SEE THE PREV. POST-DEVELOPMENT CALCULATIONS FOR SYSTEM "G" WHICH VERIFIES THE ADEQUACY OF THE EXISTING CHANNEL.

**Sediment Traps/Basin**

## Ford's Colony - Section 12

### Sediment Trap #1 Sizing Calculations

Drainage Area = 1.23 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
56	2665	2470	7731	286
55	2274	2093	5261	195
54	1911	1744	3169	117
53	1577	1425	1425	53
52	1272	0	0	0

Cleanout Elevation = 42 CY @ Elevation 52.8

Top of Wet Storage = 82 CY @ Elevation 53.5

Top of Dry Storage = 165 CY @ Elevation 54.7

Length of Outlet = 7 FT

## Ford's Colony - Section 12

### Sediment Trap #2 Sizing Calculations

Drainage Area = 2.38 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
52	2400	2188	9292	344
51	1976	1780	7104	263
50	1584	1404	5324	197
49	1224	1060	3920	145
48	896	820	2860	106
47	744	672	2040	76
46	600	532	1368	51
45	464	400	836	31
44	336	276	436	16
43	216	160	160	6
42	104	0	0	0

Cleanout Elevation = 81 CY @ Elevation 47.2

Top of Wet Storage = 159 CY @ Elevation 49.3

Top of Dry Storage = 319 CY @ Elevation 51.7

Length of Outlet = 14 FT

## Ford's Colony - Section 12

### Sediment Trap #3 Sizing Calculations

Drainage Area = 0.55 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
62	832	717	2289	85
61	602	503	1572	58
60	403	360	1070	40
59	316	277	710	26
58	237	202	434	16
57	166	134	232	9
56	102	75	98	4
55	47	24	24	1
54	0	0	0	0

Cleanout Elevation = 19 CY @ Elevation 58.3

Top of Wet Storage = 37 CY @ Elevation 59.8

Top of Dry Storage = 74 CY @ Elevation 61.6

Length of Outlet = 3 FT

## Ford's Colony - Section 12

### Sediment Trap #4 Sizing Calculations

Drainage Area = 0.42 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
50	1080	1632	2412	89
48	552	704	780	29
46	152	76	76	3
45	0	0	0	0

Cleanout Elevation = 14 CY @ Elevation 46.9

Top of Wet Storage = 28 CY @ Elevation 48.0

Top of Dry Storage = 56 CY @ Elevation 49.0

Length of Outlet = 3 FT

## Ford's Colony - Section 12

### Sediment Basin #5 Sizing Calculations

Drainage Area = 5.86 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
64	5810	10460	36640	1357
62	4650	8268	26180	970
60	3618	6332	17912	663
58	2714	4652	11580	429
56	1938	3228	6928	257
54	1290	2060	3700	137
52	770	1148	1640	61
50	378	492	492	18
48	114	0	0	0

Cleanout Elevation = 193 CY @ Elevation 55.0

Top of Wet Storage = 393 CY @ Elevation 57.6

Top of Dry Storage = 785 CY @ Elevation 60.8 -Increased to 61.85

## TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project FORD'S COLONY SECTION XII  
 Basin # 5 Location STA 29+50, NOTTINGHAMSHIRE  
 Total area draining to basin: 5.86 acres.

### Basin Volume Design

#### Wet Storage:

1. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).  

$$67 \text{ cu. yds.} \times \underline{5.86} \text{ acres} = \underline{393} \text{ cu. yds.}$$
2. Available basin volume = 395 cu. yds. at elevation 57.6. (From storage - elevation curve)
3. Excavate 395 cu. yds. to obtain required volume\*.  
 \* Elevation corresponding to required volume = invert of the dewatering orifice.
4. Available volume before cleanout required.  

$$33 \text{ cu. yds.} \times \underline{5.86} \text{ acres} = \underline{194} \text{ cu. yds.}$$
5. Elevation corresponding to cleanout level = 55.0.  
 (From Storage - Elevation Curve)
6. Distance from invert of the dewatering orifice to cleanout level = 2.6 ft.  
 (Min. = 1.0 ft.) ✓

#### Dry Storage:

7. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).  

$$67 \text{ cu. yds.} \times \underline{5.86} \text{ acres} = \underline{393} \text{ cu. yds.}$$

8. Total available basin volume at crest of riser\* = 786 cu. yds. at elevation 60.8. (From Storage - Elevation Curve)  
**Set @ 61.85 for 1 yr control** | **CLEARANCE OF 24" OUTFALL &**
- \* Minimum = 134 cu. yds./acre of total drainage area. = 785 **ANTI-VORTEX DEVICE**
9. Diameter of dewatering orifice = 3 in.
10. Diameter of flexible tubing = 6 in. (diameter of dewatering orifice plus 2 inches). **ACTUAL DRY VOLUME = 947-395 = 5529**

$$A = \frac{\pi r^2}{144} = 0.0491 \text{ SF}_{.5}$$

$$h = \frac{61.85 - 56.7}{2} = 2.58'$$

$$Q = A(64.32 \times h)(0.6) = 0.3795 \text{ CFS}$$

$$Q = \frac{S}{\text{TIME}}$$

$$\text{TIME} = \frac{S}{Q} = \frac{552(27)}{.3795} = 39,272 = 10.9 \text{ HRS}$$

$$W_e = 49$$

$$L = \approx 100$$

Preliminary Design Elevations

11. Crest of Riser = 61.85
- Top of Dam = 64.0
- Design High Water = 62.65 (25-YEAR)
- Upstream Toe of Dam = 62.05

Basin Shape

12.  $\frac{\text{Length of Flow}}{\text{Effective Width}} = \frac{L}{W_e} = \frac{100}{49} \approx 2$
- If > 2, baffles are not required ✓
- If < 2, baffles are required \_\_\_\_\_

Runoff

13.  $Q_2 = \underline{13.1}$  cfs (From Chapter 5)
14.  $Q_{25} = \underline{30.0}$  cfs (From Chapter 5)

**SEE ROUTING CALCULATIONS**

Principal Spillway Design

15. With emergency spillway, required spillway capacity  $Q_p = Q_2 = \underline{\hspace{2cm}}$  cfs. (riser and barrel)
- Without emergency spillway, required spillway capacity  $Q_p = Q_{25} = \underline{\hspace{2cm}}$  cfs. (riser and barrel)

## 16. With emergency spillway:

Assumed available head (h) = \_\_\_\_\_ ft. (Using  $Q_2$ )

$h$  = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

## Without emergency spillway:

Assumed available head (h) = \_\_\_\_\_ ft. (Using  $Q_{25}$ )

$h$  = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter ( $D_r$ ) = \_\_\_\_\_ in. Actual head (h) = \_\_\_\_\_ ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

## 18. Barrel length (l) = \_\_\_\_\_ ft.

Head (H) on barrel through embankment = \_\_\_\_\_ ft.

(From Plate 3.14-7).

## 19. Barrel diameter = \_\_\_\_\_ in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

## 20. Trash rack and anti-vortex device

Diameter = \_\_\_\_\_ inches.

Height = \_\_\_\_\_ inches.

(From Table 3.14-D).

Emergency Spillway Design21. Required spillway capacity  $Q_e = Q_{25} - Q_p =$  \_\_\_\_\_ cfs.

## 22. Bottom width (b) = \_\_\_\_\_ ft.; the slope of the exit channel (s) = \_\_\_\_\_ ft./foot; and the minimum length of the exit channel (x) = \_\_\_\_\_ ft.

(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = ~5 ft.  
 Slope of upstream face of embankment (Z) = 2 :1.  
 Slope of principal spillway barrel ( $S_b$ ) = 1.0 %  
 Length of barrel in saturated zone ( $L_s$ ) = ~30 ft.
24. Number of collars required = 1 dimensions = 5.0' x 5.0'  
 (from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 64.0  
 Design High Water = 62.65 (25-yr)  
 Emergency Spillway Crest = 62.85  
 Principal Spillway Crest = 61.85  
 Dewatering Orifice Invert = 57.6  
 Cleanout Elevation = 55.0  
 Elevation of Upstream Toe of Dam  
 or Excavated Bottom of "Wet Storage  
 Area" (if excavation was performed) = 48.0

# Reservoir Report

Reservoir No. 1 - New Pond1

Hydraflow Hydrographs by Intelisolve

## Pond Data

Pond storage is based on known contour areas. Average end area method used.

## Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	48.00	114	0	0
2.00	50.00	378	492	492
4.00	52.00	770	1,148	1,640
6.00	54.00	1,290	2,060	3,700
8.00	56.00	1,938	3,228	6,928
10.00	58.00	2,714	4,652	11,580
12.00	60.00	3,618	6,332	17,912
14.00	62.00	4,650	8,268	26,180
16.00	64.00	5,810	10,460	36,640

## Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 24.0	3.0	0.0	0.0
Span in	= 24.0	3.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 57.00	57.60	0.00	0.00
Length ft	= 34.0	1.0	0.0	0.0
Slope %	= 1.47	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

## Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 12.56	10.00	0.00	0.00
Crest El. ft	= 61.85	62.85	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 57.00 ft

## Stage / Storage / Discharge Table

Note: All outflows have been analyzed under inlet and outlet control.

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	48.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	492	50.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	1,640	52.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	3,700	54.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	6,928	56.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
10.00	11,580	58.00	0.13	0.12	---	---	0.00	0.00	---	---	---	0.12
12.00	17,912	60.00	0.41	0.36	---	---	0.00	0.00	---	---	---	0.36
14.00	26,180	62.00	2.93	0.49	---	---	2.43	0.00	---	---	---	2.92
16.00	36,640	64.00	36.89	0.05	---	---	36.83	32.06	---	---	---	68.94

# Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	9.17	13.09	-----	-----	26.49	30.01	-----	-----	Post-development to basin
3	Reservoir	1	0.89	7.72	-----	-----	25.66	28.53	-----	-----	routed sed. basin

Proj. file: 565212sedbasin5.gpw

Run date: 12-09-2002

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description	
1	SCS Runoff	9.17	6	720	28,353	—	—	—	Post-development to basin routed sed. basin	
3	Reservoir	0.89	6	774	27,888	1	61.83	25,493		
Proj. file: 565212sedbasin5.gpw				Return Period: 1 yr			Run date: 12-09-2002			

# Hydrograph Report

## Hyd. No. 1

Post-development to basin

Hydrograph type	= SCS Runoff	Peak discharge	= 9.17 cfs
Storm frequency	= 1 yrs	Time interval	= 6 min
Drainage area	= 5.86 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 28,353 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min        cfs)**

702	1.45
708	2.93
714	6.00
720	9.17 <<
726	8.67
732	5.61
738	2.98
744	1.70
750	1.46
756	1.23
762	1.06
768	0.95

...End

# Hydrograph Report

## Hyd. No. 3

routed sed. basin

Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Inflow hyd. No. = 1  
 Max. Elevation = 61.83 ft

Peak discharge = 0.89 cfs  
 Time interval = 6 min  
 Reservoir name = New Pond1  
 Max. Storage = 25,493 cuft

Storage Indication method used.

Outflow hydrograph volume = 27,888 cuft

### Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
690	0.52	57.92	0.10	0.10	----	----	----	----	----	----	----	0.10
696	0.74	58.00	0.13	0.12	----	----	----	----	----	----	----	0.12
702	1.45	58.11	0.15	0.15	----	----	----	----	----	----	----	0.15
708	2.93	58.34	0.20	0.19	----	----	----	----	----	----	----	0.19
714	6.00	58.83	0.27	0.25	----	----	----	----	----	----	----	0.25
720	9.17 <<	59.66	0.34	0.33	----	----	----	----	----	----	----	0.33
726	8.67	60.48	0.41	0.39	----	----	----	----	----	----	----	0.39
732	5.61	61.07	0.45	0.43	----	----	----	----	----	----	----	0.43
738	2.98	61.40	0.50	0.45	----	----	----	----	----	----	----	0.45
744	1.70	61.57	0.50	0.46	----	----	----	----	----	----	----	0.46
750	1.46	61.66	0.50	0.47	----	----	----	----	----	----	----	0.47
756	1.23	61.74	0.50	0.47	----	----	----	----	----	----	----	0.47
762	1.06	61.80	0.50	0.48	----	----	----	----	----	----	----	0.48
768	0.95	61.83	0.85	0.48	----	----	0.35	----	----	----	----	0.83
774	0.88	61.83 <<	0.91	0.48	----	----	0.41	----	----	----	----	0.89 <<
780	0.82	61.83	0.88	0.48	----	----	0.38	----	----	----	----	0.86
786	0.77	61.83	0.84	0.48	----	----	0.34	----	----	----	----	0.81
792	0.72	61.82	0.79	0.48	----	----	0.29	----	----	----	----	0.77
798	0.68	61.82	0.74	0.48	----	----	0.24	----	----	----	----	0.72
804	0.65	61.82	0.70	0.48	----	----	0.20	----	----	----	----	0.68
810	0.62	61.81	0.67	0.48	----	----	0.17	----	----	----	----	0.65
816	0.59	61.81	0.64	0.48	----	----	0.14	----	----	----	----	0.62
822	0.56	61.81	0.61	0.48	----	----	0.11	----	----	----	----	0.59
828	0.53	61.81	0.58	0.48	----	----	0.08	----	----	----	----	0.56
834	0.51	61.80	0.56	0.48	----	----	0.05	----	----	----	----	0.53
840	0.49	61.80	0.53	0.48	----	----	0.03	----	----	----	----	0.51
846	0.46	61.80	0.51	0.48	----	----	0.01	----	----	----	----	0.49
852	0.45	61.80	0.50	0.48	----	----	----	----	----	----	----	0.48
858	0.44	61.80	0.50	0.48	----	----	----	----	----	----	----	0.48
864	0.43	61.79	0.50	0.48	----	----	----	----	----	----	----	0.48
870	0.42	61.79	0.50	0.48	----	----	----	----	----	----	----	0.48
876	0.41	61.78	0.50	0.48	----	----	----	----	----	----	----	0.48
882	0.40	61.78	0.50	0.48	----	----	----	----	----	----	----	0.48
888	0.40	61.77	0.50	0.48	----	----	----	----	----	----	----	0.48
894	0.39	61.76	0.50	0.47	----	----	----	----	----	----	----	0.47
900	0.38	61.75	0.50	0.47	----	----	----	----	----	----	----	0.47
906	0.37	61.75	0.50	0.47	----	----	----	----	----	----	----	0.47
912	0.36	61.74	0.50	0.47	----	----	----	----	----	----	----	0.47

Continues on next page...

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description	
1	SCS Runoff	13.09	6	720	40,211	---	-----	-----	Post-development to basin routed sed. basin	
3	Reservoir	7.72	6	732	39,746	1	62.15	26,990		
Proj. file: 565212sedbasin5.gpw					Return Period: 2 yr			Run date: 12-09-2002		

# Hydrograph Report

## Hyd. No. 1

Post-development to basin

Hydrograph type	= SCS Runoff	Peak discharge	= 13.09 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 5.86 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 40,211 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

702	2.28
708	4.46
714	8.79
720	13.09 <<
726	12.19
732	7.80
738	4.08
744	2.32
750	1.99
756	1.67
762	1.43

...End

# Hydrograph Report

## Hyd. No. 3

routed sed. basin

Hydrograph type = Reservoir  
Storm frequency = 2 yrs  
Inflow hyd. No. = 1  
Max. Elevation = 62.15 ft

Peak discharge = 7.72 cfs  
Time interval = 6 min  
Reservoir name = New Pond1  
Max. Storage = 26,990 cuft

Storage Indication method used.

Outflow hydrograph volume = 39,746 cuft

### Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
732	7.80	62.15 <<	7.75	0.47	----	----	7.25	----	----	----	----	7.72 <<
738	4.08	62.10	5.90	0.48	----	----	5.41	----	----	----	----	5.88
744	2.32	62.01	3.13	0.49	----	----	2.63	----	----	----	----	3.11
750	1.99	61.96	2.40	0.49	----	----	1.90	----	----	----	----	2.38
756	1.67	61.92	2.01	0.48	----	----	1.51	----	----	----	----	2.00
762	1.43	61.90	1.71	0.48	----	----	1.21	----	----	----	----	1.69
768	1.28	61.88	1.48	0.48	----	----	0.98	----	----	----	----	1.46
774	1.19	61.87	1.32	0.48	----	----	0.82	----	----	----	----	1.30
780	1.11	61.86	1.22	0.48	----	----	0.72	----	----	----	----	1.20
786	1.03	61.85	1.13	0.48	----	----	0.63	----	----	----	----	1.11
792	0.97	61.85	1.06	0.48	----	----	0.56	----	----	----	----	1.04
798	0.92	61.84	0.99	0.48	----	----	0.49	----	----	----	----	0.97
804	0.87	61.84	0.94	0.48	----	----	0.44	----	----	----	----	0.92
810	0.83	61.83	0.89	0.48	----	----	0.39	----	----	----	----	0.87
816	0.79	61.83	0.85	0.48	----	----	0.35	----	----	----	----	0.83
822	0.75	61.83	0.81	0.48	----	----	0.31	----	----	----	----	0.79

...End

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description	
1	SCS Runoff	26.49	6	720	82,046	---	---	---	Post-development to basin	
3	Reservoir	25.66	6	720	81,581	1	62.56	29,132	routed sed. basin	
Proj. file: 565212sedbasin5.gpw					Return Period: 10 yr			Run date: 12-09-2002		

# Hydrograph Report

## Hyd. No. 1

Post-development to basin

Hydrograph type	= SCS Runoff	Peak discharge	= 26.49 cfs
Storm frequency	= 10 yrs	Time interval	= 6 min
Drainage area	= 5.86 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 82,046 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

696	2.90
702	5.30
708	9.94
714	18.53
720	26.49 <<
726	24.05
732	15.13
738	7.76
744	4.36
750	3.72
756	3.12
762	2.67

...End

# Hydrograph Report

## Hyd. No. 3

routed sed. basin

Hydrograph type = Reservoir  
 Storm frequency = 10 yrs  
 Inflow hyd. No. = 1  
 Max. Elevation = 62.56 ft

Peak discharge = 25.66 cfs  
 Time interval = 6 min  
 Reservoir name = New Pond1  
 Max. Storage = 29,132 cuft

Storage Indication method used.

Outflow hydrograph volume = 81,581 cuft

### Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
714	18.53	62.02	3.40	0.49	----	----	2.90	----	----	----	----	3.38
720	26.49 <<	62.56 <<	25.66	0.29	----	----	25.37	----	----	----	----	25.66 <<
726	24.05	62.55	25.17	0.30	----	----	24.86	----	----	----	----	25.17
732	15.13	62.41	18.13	0.40	----	----	17.73	----	----	----	----	18.13
738	7.76	62.23	10.23	0.46	----	----	9.75	----	----	----	----	10.20
744	4.36	62.09	5.81	0.48	----	----	5.31	----	----	----	----	5.79
750	3.72	62.03	4.00	0.48	----	----	3.50	----	----	----	----	3.98
756	3.12	62.02	3.41	0.49	----	----	2.91	----	----	----	----	3.40
762	2.67	62.00	2.90	0.49	----	----	2.40	----	----	----	----	2.89
768	2.39	61.98	2.65	0.49	----	----	2.15	----	----	----	----	2.64

...End

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	30.01	6	720	93,350	---	-----	-----	Post-development to basin routed sed. basin
3	Reservoir	28.53	6	726	92,885	1	62.65	29,590	

Proj. file: 565212sedbasin5.gpw

Return Period: 25 yr

Run date: 12-09-2002

# Hydrograph Report

## Hyd. No. 1

Post-development to basin

Hydrograph type	= SCS Runoff	Peak discharge	= 30.01 cfs
Storm frequency	= 25 yrs	Time interval	= 6 min
Drainage area	= 5.86 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 93,350 cuft

## Hydrograph Discharge Table

**Time -- Outflow**  
**(min      cfs)**

696	3.36
702	6.13
708	11.42
714	21.12
720	30.01 <<
726	27.16
732	17.04
738	8.71
744	4.89
750	4.17
756	3.49

...End

# Hydrograph Report

## Hyd. No. 3

routed sed. basin

Hydrograph type = Reservoir  
Storm frequency = 25 yrs  
Inflow hyd. No. = 1  
Max. Elevation = 62.65 ft

Peak discharge = 28.53 cfs  
Time interval = 6 min  
Reservoir name = New Pond1  
Max. Storage = 29,590 cuft

Storage Indication method used.

Outflow hydrograph volume = 92,885 cuft

### Hydrograph Discharge Table

Time (min)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
714	21.12	62.28	12.45	0.44	----	----	11.99	----	----	----	----	12.43
720	30.01 <<	62.64	28.25	0.25	----	----	28.01	----	----	----	----	28.25
726	27.16	62.65 <<	28.53	0.24	----	----	28.29	----	----	----	----	28.53 <<
732	17.04	62.47	20.96	0.36	----	----	20.60	----	----	----	----	20.96
738	8.71	62.25	11.22	0.45	----	----	10.75	----	----	----	----	11.20
744	4.89	62.11	6.42	0.47	----	----	5.92	----	----	----	----	6.40
750	4.17	62.05	4.48	0.48	----	----	3.98	----	----	----	----	4.47
756	3.49	62.03	3.82	0.49	----	----	3.32	----	----	----	----	3.81
762	2.99	62.01	3.23	0.49	----	----	2.74	----	----	----	----	3.22

...End

## Ford's Colony - Section 12

### Sediment Trap #6 Sizing Calculations

Drainage Area = 0.61 AC

Elevation (FT)	Contour Area (SF)	Incremental Volume (CF)	Cumulative Volume (CF)	Cumulative Volume (CY)
62	1408	1208	3272	121
61	1008	824	2064	76
60	640	554	1240	46
59	468	386	686	25
58	304	226	300	11
57	148	74	74	3
56	0	0	0	0

Cleanout Elevation = 21 CY @ Elevation 59.0

Top of Wet Storage = 41 CY @ Elevation 60.0

Top of Dry Storage = 82 CY @ Elevation 61.25

Length of Outlet = 4 FT

**Stormwater Management Design Calculations**

Ford's Colony at Williamsburg

Section XII (Lots 2-72)

James City County

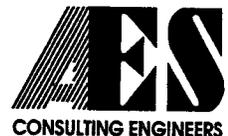
*S-51-02  
3RD SUBMISSION*

*DRY Pond #2  
PC 208  
see Full  
Report in  
PC 207*

Prepared by:  
AES Consulting Engineers  
5248 Olde Towne Rd.  
Williamsburg, Va. 23188  
(757) 253-0040

Date: May 22, 2002

Revised: December 13, 2002



---

## FORD'S COLONY, SECTION XII (LOTS 2-72)

### STORMWATER MANAGEMENT/BMP NARRATIVE

---

#### General:

This project is comprised of the construction of roadways, water and sanitary utilities, and stormwater management systems in the development of a 71-lot, single-family subdivision in Section XII of the Ford's Colony at Williamsburg development, located in James City County, Virginia. Additionally, this report contains calculations to support a second plan entitled, "Country Club Drive and Williamsburg West Drive Roadway Improvement Plans". Those plans are for the associated work being done in the VDOT right-of-way to improve the existing roadways with curb and gutter and entrance features.

The existing subdivision terrain is gently rolling with elevations ranging from 92 to 32 feet. A majority of the site drains naturally towards two ravines located on the Northern and Western edges of the parcel. The entire proposed stormwater system is comprised of two SWM dry detention ponds (#1 and #2) and five separate stormwater conveyance systems (A, B, C, D and E). Two proposed storm systems (D&E) convey stormwater to proposed Dry Pond #1. Additionally, one proposed storm system (A) conveys stormwater to proposed Dry Pond #2. The remaining storm systems (B & C) and the rest of the subdivision area drain naturally towards the existing ravine located at the northwestern edge of the parcel.

Two other storm systems (F&G) convey stormwater to the existing Williamsburg West and Longhill Road drainage systems. These systems are being modified to intercept drainage from the retrofitted curb and gutter system. In the post-developed scenario, both of these drainage systems will be conveying much smaller flows to their respective outfalls. This is accomplished by rerouting a large majority of the existing drainage to Dry Pond #1.

#### Water Quality Considerations:

In complying with James City County's BMP policies, the Ford's Colony at Williamsburg overall development, which includes this property, already has a point value exceeding ten (10) points. Therefore, Section XII does not require any additional water quality treatment. Mr. Darryl Cook, with the JCC Environmental Division, approved the BMP Master Plan for the development during the 1998 Master Plan Amendment for the Ford's Colony at Williamsburg development. Please see the Overall BMP Plan and Worksheet.

#### Water Quantity Considerations:

The Master Stormwater Management Plan for the overall development indicates that due to over-attenuation in other facilities within the project, Section XII does not require any on-site facilities. Although, even if from a Master Plan standpoint no additional attenuation is required for the development, channel adequacy issues have been identified. Upon design of the subdivision, it

was recognized that some form of attenuation would be required for the proposed development in lieu of performing any channel improvements. Therefore in an effort to minimize impacts to the existing channels, 18-hour detention of the 1-year, 24-hour design storm has been provided via two dry pond facilities (#1 and #2). It is also important to note that these facilities provide attenuation for off-site drainage from the Windsor Forest and Williamsburg West subdivisions along with other adjacent properties.

The two proposed SWM/BMP facilities previously mentioned are the main quantity control devices for the project. The remaining runoff area of the subdivision, consisting of 10.91 acres, does not drain to a BMP facility. To alleviate the impact of stormwater runoff through these lands, the two proposed dry pond facilities overattenuate the 2-year design storm. Please see the table below for a breakdown of pre-development vs. routed post-development flow rates at the critical locations. The design point for the calculations is located in the northwestern corner of the project. (See overall drainage maps.)

**Pre-Development vs. Post-Development Flowrate Comparison**

	Drainage Area (Acres)	CN	T <sub>c</sub> (min)	Q1-yr (cfs)	Q2-yr (cfs)	Q10-yr (cfs)	Q100-yr (cfs)
<b>Pre-development</b>							
Dry Pond #1	30.9	71.2	23	16.8	29.6	80.0	133.5
Dry Pond #2	36.93	68.9	24	16.6	31.0	89.0	151.9
Unattenuated Lands	11.42	74.9	23	8.5	13.8	33.6	54.0
<b>Total Pre-Development Flowrate at Design Point =</b>				41.9	74.4	202.6	339.4
<b>Post-development - Routed</b>							
Dry Pond #1 PC207	35.05	76.1	16	2.4	25.4	106.3	171.8
Dry Pond #2 PC208	37.22	74.5	16	1.8	26.4	109.6	178.4
Unattenuated Lands	10.91	80.4	19	11.2	16.9	36.9	56.6
<b>Total Post-Development Flowrate at Design Point =</b>				15.4	68.7	252.8	406.8

68.7 < 74.4 OK.

- The flowrates indicated are peak release rates, See supporting calculations for additional information concerning the watersheds.

As stated previously, every effort has been made to capture drainage within the proposed right-of-way and attenuate it in one of the two detention facilities. Although, due to the topography in the northwestern extremities of the site, portions of Road D and E, conveyed via storm systems B and C, respectively, are released directly into outlet protection stilling basins.

1-yr	BMP #1 2.41 cfs @ 51.11	BMP #2 1.84 cfs @ 44.78
2-yr	25.44 cfs @ 51.35	26.40 cfs @ 45.04
10-yr	116.11 cfs @ 51.79	116.83 cfs @ 45.47
100-yr	171.79 cfs @ 51.99	178.37 cfs @ 45.70

\* INCREASE  
100-YEAR  
67.4 CFS

# Supporting Calculations

## Dry Pond #1

### Pre Composite CN Calculation

Total Area=	30.90	AC
	% of DA	
%b soil	26.5%	
%c soil	62.8%	
%d soil	10.7%	
	100.0%	

	Acreage	CN	% of site *CN
Wooded	24.07	70	54.53
Field	2.85	71	6.55
Buildings	0.07	98	0.22
Windsor Forest	3.91	78	9.87
	30.90	<b>CN=</b>	<b>71.2</b>

### Post Composite CN Calculation

Total Area=	35.05	AC
	% of DA	
%b soil	30.4%	
%c soil	59.9%	
%d soil	9.7%	
	100.0%	

	Acreage	CN	% of site *CN
Lots	16.25	81	37.55
Open (Field)	0.33	71	0.67
Open (Woods)	2.43	70	4.85
Woods	11.92	70	23.81
Buildings	0.07	98	0.20
Windsor Forest	4.05	78	9.01
	35.05	<b>CN=</b>	<b>76.1</b>

\*See Overall Drainage area map for Tc Calculations

## Dry Pond #2

### Pre Composite CN Calculation

Total Area=	36.93	AC
	% of DA	
%b soil	85.2%	
%c soil	14.8%	
	100.0%	

	Acreage	CN	% of site *CN
Wooded	10.91	62	18.32
Field	8.58	63	14.64
Buildings	0.04	98	0.11
Will. West Sub.	17.4	76	35.81
	36.93	<b>CN=</b>	<b>68.9</b>

### Post Composite CN Calculation

Total Area=	37.22	AC
	% of DA	
%b soil	85.3%	
%c soil	14.7%	
	100.0%	

	Acreage	CN	% of site *CN
Lots	15.74	76	32.14
Open (Field)	2.03	63	3.44
Open (Woods)	2.05	62	3.41
Will. West Sub.	17.4	76	35.53
	37.22	<b>CN=</b>	<b>74.5</b>

\*See Overall Drainage area map for Tc Calculations

# Reservoir Report

## Reservoir No. 2 - Dry Pond #2

Hydraflow Hydrographs by Intelisolve

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	40.00	00	0	0
1.00	41.00	2,606	1,303	1,303
2.00	42.00	7,352	4,979	6,282
3.00	43.00	13,446	10,399	16,681
4.00	44.00	20,676	17,061	33,742
5.00	45.00	29,207	24,942	58,684
6.00	46.00	37,293	33,250	91,934

### Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 6.0	0.0	0.0	0.0
Span in	= 6.0	0.0	0.0	0.0
No. Barrels	= 1	0	0	0
Invert El. ft	= 40.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 80.00	0.00	0.00	0.00
Crest El. ft	= 44.80	0.00	0.00	0.00
Weir Coeff.	= 2.60	0.00	0.00	0.00
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 41.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

### Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	40.00	0.00	---	---	---	0.00	---	---	---	---	0.00
0.10	130	40.10	0.00	---	---	---	0.00	---	---	---	---	0.00
0.20	261	40.20	0.00	---	---	---	0.00	---	---	---	---	0.00
0.30	391	40.30	0.00	---	---	---	0.00	---	---	---	---	0.00
0.40	521	40.40	0.00	---	---	---	0.00	---	---	---	---	0.00
0.50	652	40.50	0.00	---	---	---	0.00	---	---	---	---	0.00
0.60	782	40.60	0.00	---	---	---	0.00	---	---	---	---	0.00
0.70	912	40.70	0.00	---	---	---	0.00	---	---	---	---	0.00
0.80	1,042	40.80	0.00	---	---	---	0.00	---	---	---	---	0.00
0.90	1,173	40.90	0.00	---	---	---	0.00	---	---	---	---	0.00
1.00	1,303	41.00	0.00	---	---	---	0.00	---	---	---	---	0.00
1.10	1,801	41.10	0.30	---	---	---	0.00	---	---	---	---	0.30
1.20	2,299	41.20	0.42	---	---	---	0.00	---	---	---	---	0.42
1.30	2,797	41.30	0.52	---	---	---	0.00	---	---	---	---	0.52
1.40	3,295	41.40	0.60	---	---	---	0.00	---	---	---	---	0.60
1.50	3,793	41.50	0.67	---	---	---	0.00	---	---	---	---	0.67
1.60	4,290	41.60	0.73	---	---	---	0.00	---	---	---	---	0.73
1.70	4,788	41.70	0.79	---	---	---	0.00	---	---	---	---	0.79

Continues on next page...

# Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	16.81	29.64	-----	-----	79.99	-----	-----	133.53	Dry Pond #1 - Pre-Development
2	SCS Runoff	-----	16.59	31.03	-----	-----	89.03	-----	-----	151.88	Dry Pond #2 - Pre-Development
3	SCS Runoff	-----	8.54	13.82	-----	-----	33.62	-----	-----	53.95	Unattenuated Lands - Pre-Develope
5	SCS Runoff	-----	28.10	44.71	-----	-----	106.26	-----	-----	168.98	Dry Pond #1 - Post-Development
6	SCS Runoff	-----	27.83	45.05	-----	-----	109.56	-----	-----	175.83	Dry Pond #2 - Post-Development
7	SCS Runoff	-----	11.24	16.87	-----	-----	36.87	-----	-----	56.64	Unattenuated Lands - Post-Develope
9	Reservoir	5	2.41	25.44	-----	-----	116.11	-----	-----	171.79	Dry Pond #1 - Routed
10	Reservoir	6	1.84	26.40	-----	-----	116.83	-----	-----	178.37	Dry Pond #2 - Routed

Proj. file: 565212ponds1yr.gpw

Run date: 09-30-2002

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	16.81	8	728	68,157	---	----	----	Dry Pond #1 - Pre-Development
2	SCS Runoff	16.59	8	728	71,062	---	----	----	Dry Pond #2 - Pre-Development
3	SCS Runoff	8.54	8	728	32,355	---	----	----	Unattenuated Lands - Pre-Develop
5	SCS Runoff	28.10	8	728	105,299	---	----	----	Dry Pond #1 - Post-Development
6	SCS Runoff	27.83	8	728	105,451	---	----	----	Dry Pond #2 - Post-Development
7	SCS Runoff	11.24	8	728	40,918	---	----	----	Unattenuated Lands - Post-Develop
9	Reservoir	2.41	8	824	104,532	5	51.11	51,805	Dry Pond #1 - Routed
10	Reservoir	1.84	8	888	104,148	6	44.78	53,178	Dry Pond #2 - Routed

# Hydrograph Report

## Hyd. No. 6

Dry Pond #2 - Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 27.83 cfs
Storm frequency	= 1 yrs	Time interval	= 8 min
Drainage area	= 37.22 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 105,451 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.87	9.26
12.00	22.33
12.13	27.83 <<
12.27	20.36
12.40	12.29
12.53	6.45
12.67	5.29
12.80	4.45
12.93	3.92
13.07	3.58
13.20	3.29
13.33	3.06
13.47	2.86

...End

# Hydrograph Report

## Hyd. No. 10

### Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 1 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 44.78 ft

Peak discharge = 1.84 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 53,178 cuft

Storage Indication method used.

Outflow hydrograph volume = 104,148 cuft

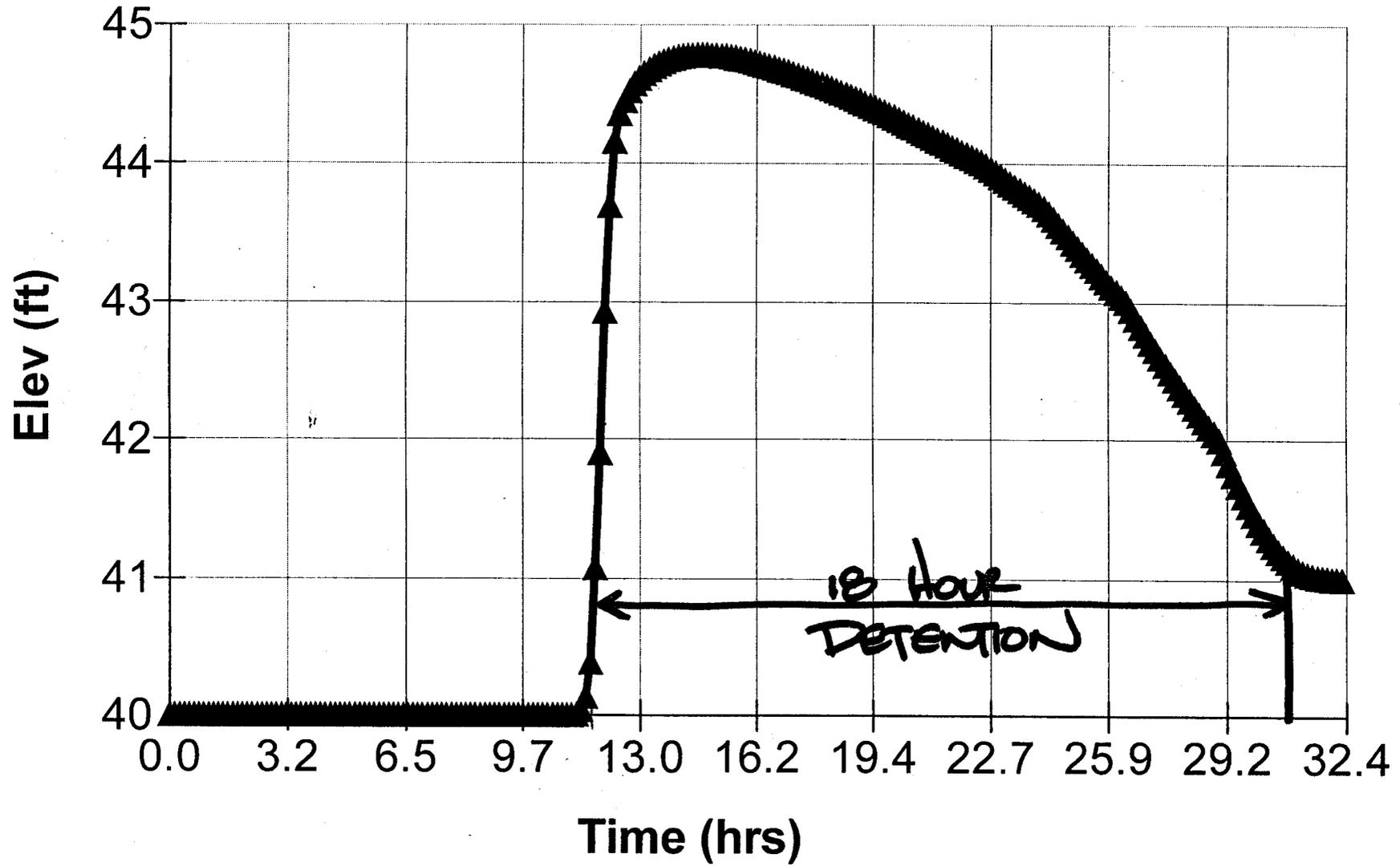
### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
11.87	9.26	41.49	0.66	----	----	----	----	----	----	----	----	0.66
12.00	22.33	42.44	1.14	----	----	----	----	----	----	----	----	1.14
12.13	27.83 <<	43.33	1.44	----	----	----	----	----	----	----	----	1.44
12.27	20.36	43.97	1.63	----	----	----	----	----	----	----	----	1.63
12.40	12.29	44.26	1.71	----	----	----	----	----	----	----	----	1.71
12.53	6.45	44.41	1.74	----	----	----	----	----	----	----	----	1.74
12.67	5.29	44.48	1.76	----	----	----	----	----	----	----	----	1.76
12.80	4.45	44.54	1.78	----	----	----	----	----	----	----	----	1.78
12.93	3.92	44.59	1.79	----	----	----	----	----	----	----	----	1.79
13.07	3.58	44.63	1.80	----	----	----	----	----	----	----	----	1.80
13.20	3.29	44.66	1.81	----	----	----	----	----	----	----	----	1.81
13.33	3.06	44.69	1.81	----	----	----	----	----	----	----	----	1.81
13.47	2.86	44.71	1.82	----	----	----	----	----	----	----	----	1.82
13.60	2.69	44.73	1.82	----	----	----	----	----	----	----	----	1.82
13.73	2.52	44.74	1.83	----	----	----	----	----	----	----	----	1.83
13.87	2.38	44.75	1.83	----	----	----	----	----	----	----	----	1.83
14.00	2.24	44.76	1.83	----	----	----	----	----	----	----	----	1.83
14.13	2.12	44.77	1.84	----	----	----	----	----	----	----	----	1.84
14.27	2.02	44.77	1.84	----	----	----	----	----	----	----	----	1.84
14.40	1.96	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.53	1.91	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.67	1.87	44.78	1.84	----	----	----	----	----	----	----	----	1.84
14.80	1.82	44.78 <<	1.84	----	----	----	----	----	----	----	----	1.84 <<
14.93	1.78	44.78	1.84	----	----	----	----	----	----	----	----	1.84
15.07	1.73	44.78	1.84	----	----	----	----	----	----	----	----	1.84
15.20	1.69	44.77	1.84	----	----	----	----	----	----	----	----	1.84
15.33	1.64	44.77	1.84	----	----	----	----	----	----	----	----	1.84
15.47	1.59	44.77	1.83	----	----	----	----	----	----	----	----	1.83
15.60	1.55	44.76	1.83	----	----	----	----	----	----	----	----	1.83
15.73	1.50	44.76	1.83	----	----	----	----	----	----	----	----	1.83
15.87	1.45	44.75	1.83	----	----	----	----	----	----	----	----	1.83
16.00	1.40	44.74	1.83	----	----	----	----	----	----	----	----	1.83
16.13	1.35	44.73	1.83	----	----	----	----	----	----	----	----	1.83
16.27	1.32	44.72	1.82	----	----	----	----	----	----	----	----	1.82
16.40	1.29	44.71	1.82	----	----	----	----	----	----	----	----	1.82
16.53	1.27	44.70	1.82	----	----	----	----	----	----	----	----	1.82
16.67	1.26	44.69	1.82	----	----	----	----	----	----	----	----	1.82
16.80	1.24	44.68	1.81	----	----	----	----	----	----	----	----	1.81

Continues on next page...

DRY POND #2

10 - Reservoir - 1 Yr - Max. El. = 44.78 ft



# Hydrograph Report

## Hyd. No. 6

Dry Pond #2 - Post-Development

Hydrograph type	= SCS Runoff	Peak discharge	= 45.05 cfs
Storm frequency	= 2 yrs	Time interval	= 8 min
Drainage area	= 37.22 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 16 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 164,892 cuft

## Hydrograph Discharge Table

Time -- Outflow  
(hrs      cfs)

11.73	5.92
11.87	17.67
12.00	37.99
12.13	45.05 <<
12.27	32.08
12.40	18.77
12.53	9.64
12.67	7.86
12.80	6.59
12.93	5.79
13.07	5.26
13.20	4.84

...End

# Hydrograph Report

## Hyd. No. 10

Dry Pond #2 - Routed

Hydrograph type = Reservoir  
 Storm frequency = 2 yrs  
 Inflow hyd. No. = 6  
 Max. Elevation = 45.04 ft

Peak discharge = 26.40 cfs  
 Time interval = 8 min  
 Reservoir name = Dry Pond #2  
 Max. Storage = 59,942 cuft

Storage Indication method used.

Outflow hydrograph volume = 163,589 cuft

### Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.27	32.08	44.92	1.87	----	----	----	9.24	----	----	----	----	11.12
12.40	18.77	45.04 <<	1.90	----	----	----	24.50	----	----	----	----	26.40 <<
12.53	9.64	44.94	1.88	----	----	----	11.51	----	----	----	----	13.39
12.67	7.86	44.90	1.87	----	----	----	6.55	----	----	----	----	8.42
12.80	6.59	44.89	1.86	----	----	----	5.63	----	----	----	----	7.49
12.93	5.79	44.87	1.86	----	----	----	4.62	----	----	----	----	6.48
13.07	5.26	44.86	1.86	----	----	----	3.88	----	----	----	----	5.74
13.20	4.84	44.85	1.85	----	----	----	3.35	----	----	----	----	5.20
13.33	4.48	44.84	1.85	----	----	----	2.93	----	----	----	----	4.78
13.47	4.19	44.84	1.85	----	----	----	2.58	----	----	----	----	4.44
13.60	3.93	44.83	1.85	----	----	----	2.29	----	----	----	----	4.14
13.73	3.68	44.83	1.85	----	----	----	2.03	----	----	----	----	3.88
13.87	3.47	44.83	1.85	----	----	----	1.79	----	----	----	----	3.64
14.00	3.26	44.82	1.85	----	----	----	1.58	----	----	----	----	3.43
14.13	3.08	44.82	1.85	----	----	----	1.38	----	----	----	----	3.23
14.27	2.94	44.82	1.85	----	----	----	1.21	----	----	----	----	3.06
14.40	2.84	44.82	1.85	----	----	----	1.08	----	----	----	----	2.93
14.53	2.77	44.81	1.85	----	----	----	0.98	----	----	----	----	2.83
14.67	2.70	44.81	1.85	----	----	----	0.91	----	----	----	----	2.76
14.80	2.63	44.81	1.85	----	----	----	0.84	----	----	----	----	2.69

...End

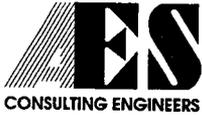
# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	79.99	8	728	287,967	---	---	---	Dry Pond #1 - Pre-Development
2	SCS Runoff	89.03	8	728	321,400	---	---	---	Dry Pond #2 - Pre-Development
3	SCS Runoff	33.62	8	728	120,957	---	---	---	Unattenuated Lands - Pre-Develope
5	SCS Runoff	106.26	8	728	382,674	---	---	---	Dry Pond #1 - Post-Development
6	SCS Runoff	109.56	8	728	394,222	---	---	---	Dry Pond #2 - Post-Development
7	SCS Runoff	36.87	8	728	133,709	---	---	---	Unattenuated Lands - Post-Develope
9	Reservoir	116.11	8	728	381,906	5	51.79	72,017	Dry Pond #1 - Routed
10	Reservoir	116.83	8	728	392,919	6	45.47	74,386	Dry Pond #2 - Routed
Proj. file: 565212ponds1yr.gpw						Return Period: 10 yr		Run date: 09-30-2002	

# Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	133.53	8	728	481,536	---	----	----	Dry Pond #1 - Pre-Development
2	SCS Runoff	151.88	8	728	546,651	---	----	----	Dry Pond #2 - Pre-Development
3	SCS Runoff	53.95	8	728	195,938	---	----	----	Unattenuated Lands - Pre-Develope
5	SCS Runoff	168.98	8	728	615,231	---	----	----	Dry Pond #1 - Post-Development
6	SCS Runoff	175.83	8	728	638,599	---	----	----	Dry Pond #2 - Post-Development
7	SCS Runoff	56.64	8	728	208,846	---	----	----	Unattenuated Lands - Post-Develope
9	Reservoir	171.79	8	728	614,463	5	51.99	78,071	Dry Pond #1 - Routed
10	Reservoir	178.37	8	728	637,296	6	45.70	81,812	Dry Pond #2 - Routed

*DHW*



5248 Olde Towne Road, Suite 1  
Williamsburg, Virginia 23188  
(757) 253-0040  
Fax: (757) 220-8994  
E-Mail: aes@aesva.com

PROJECT F.C. SEC. 12  
PROJECT NO. 5652-12  
SUBJECT ADEQUACY CALCS  
SHEET NO. 1 OF 1  
CALCULATED BY CBR DATE 12/02

## ADEQUACY CALCULATIONS FOR EXISTING STORM SYSTEM @ LONGHILL ROAD (SYSTEM "G")

SEE PRE & POST DEVELOPMENT DRAINAGE AREA MAPS FOR TOTAL DA.

### PRE-DEV ←

$$DA = 5.40 \text{ AC}$$

$$C = 0.46$$

$$T_c = 15 \text{ MIN}; i_2 = 3.8 \text{ IN/HR}$$

$$i_{10} = 5.1 \text{ IN/HR}$$

$$Q_2 = C i_2 A$$
$$= 0.46 (3.8) 5.40$$
$$= \underline{9.44 \text{ CFS}}$$

$$\text{IMP AREA} = 1.11 \text{ AC} \leftarrow C = 0.9$$
$$\text{PERV. AREA} = 4.29 \text{ AC} \leftarrow C = 0.35$$
$$C = 0.46$$

$$Q_{10} = 0.46 (5.1) 5.40$$
$$= \underline{12.67 \text{ CFS}}$$

### POST-DEV ←

$$DA = 2.21 \text{ AC}$$

$$C = 0.49$$

$$T_c = 15 \text{ MIN}; i_2 = 3.8 \text{ IN/HR}$$

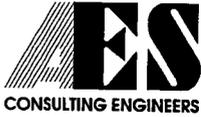
$$i_{10} = 5.1 \text{ IN/HR}$$

$$Q_2 = 0.49 (3.8) 2.21$$
$$= \underline{4.12 \text{ CFS}}$$

$$\text{IMP AREA} = 0.57 \text{ AC} \leftarrow C = 0.9$$
$$\text{PERV AREA} = 1.64 \text{ AC} \leftarrow C = 0.35$$
$$C = 0.49$$

$$Q_{10} = 0.49 (5.1) 2.21$$
$$= \underline{5.52 \text{ CFS}}$$

→ IMPROVEMENTS RESULT IN 56.4% DECREASE IN  $Q_2$  AND 56.4% DECREASE IN  $Q_{10}$ .



5248 Olde Towne Road, Suite 1  
 Williamsburg, Virginia 23188  
 (757) 253-0040  
 Fax: (757) 220-8994  
 E-Mail: aes@aesva.com

PROJECT FC Sec. 12  
 PROJECT NO. 5652-12  
 SUBJECT ADEQUACY CALCS  
 SHEET NO. 1 OF 1  
 CALCULATED BY CBP DATE 12/02

ADEQUACY CALCULATIONS FOR EXISTING STORM SYSTEM @ SECTION 11, LOTS 7 & 8 (SYSTEM "F")

See PRE & POST DEVELOPMENT DRAINAGE AREA MAPS FOR TOTAL DA.

PRE-DEV. ←

$$DA = 3.72 \text{ AC}$$

$$C = 0.46$$

$$T_c = 15 \text{ MIN}; \begin{cases} i_2 = 3.8 \text{ "/hr} \\ i_{10} = 5.1 \text{ "/hr} \end{cases}$$

$$\begin{aligned} Q_2 &= C i_2 A \\ &= .46(3.8)3.72 \\ &= \underline{6.5 \text{ CFS}} \end{aligned}$$

$$\begin{aligned} \text{IMP. AREA} &= 0.72 \text{ AC} \leftarrow C = 0.9 \\ \text{PERV. AREA} &= 3.00 \text{ AC} \leftarrow C = 0.35 \\ &C = 0.46 \end{aligned}$$

$$\begin{aligned} Q_{10} &= .46(5.1)3.72 \\ &= \underline{8.73 \text{ CFS}} \end{aligned}$$

POST-DEV. ←

$$DA = 2.99 \text{ AC}$$

$$C = 0.46$$

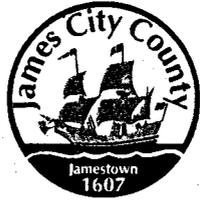
$$T_c = 15 \text{ MIN}; \begin{cases} i_2 = 3.8 \text{ "/hr} \\ i_{10} = 5.1 \text{ "/hr} \end{cases}$$

$$\begin{aligned} Q_2 &= .46(3.8)2.99 \\ &= \underline{5.23 \text{ CFS}} \end{aligned}$$

$$\begin{aligned} \text{IMP. AREA} &= 0.60 \text{ AC} \leftarrow C = 0.9 \\ \text{PERV AREA} &= 2.39 \text{ AC} \leftarrow C = 0.35 \\ &C = 0.46 \end{aligned}$$

$$\begin{aligned} Q_{10} &= .46(5.1)2.99 \\ &= \underline{7.01 \text{ CFS}} \end{aligned}$$

→ IMPROVEMENTS RESULT IN 19.5% DECREASE IN  $Q_2$  AND 19.7% DECREASE IN  $Q_{10}$ .



## DEVELOPMENT MANAGEMENT

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

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

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

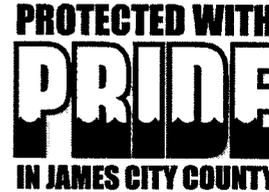
PLANNING  
(757) 253-6685  
planning@james-city.va.us

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

March 20, 2003

George & Shirley Livingston  
119 Windsor Way  
Williamsburg, Va. 23188

Re: Windsor Forest  
Watershed and Stormwater Issues



Dear Mr. & Mrs. Livingston:

It was a pleasure to talk with you and Mr. & Mrs. Spitzkovsky on Monday March 17<sup>th</sup> 2003 relative to wetland, Resource Protection Area, watershed, stormwater drainage, litter and adjacent development issues as it relates to your section of Windsor Forest.

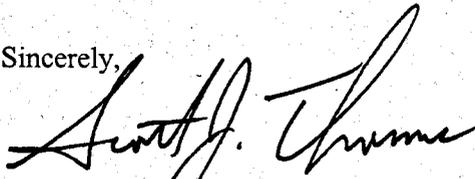
As discussed, I am forwarding you some "*first contact*" information for your community association to use relative to watershed education and stormwater drainage. If you desire, you can forward this material on to your contacts within the homeowners association and work with us further to pursue watershed education efforts within Windsor Forest.

In general, Windsor Forest was developed well before the time of stormwater management as we currently know it. Therefore, most of the stormwater drainage network within the subdivision is "uncontrolled" - meaning overland and sheet flow drainage from impervious surfaces such as homes, patios, sidewalks, driveways, roadways, cul-de-sacs, etc. directly connects to onsite open channels, culverts and underground storm piping systems and is not conveyed to a downstream stormwater management or best management practice (BMP) for water quantity or quality control. Stormwater drainage is directly discharged into receiving natural channels and wetlands. Therefore, watershed education and pollution prevention from the development are even more important as practices (good or bad) within the watershed can have a direct and substantial effect on downstream natural channel and wetland systems.

Information as attached includes: several watershed education brochures from our PRIDE program ([www.protectedwithpride.org](http://www.protectedwithpride.org)); watershed awareness tips and some general maps of Windsor Forest and the area at the end of Windsor Way. In the meantime, I will do my best to research the feasibility of an outfall repair project at the storm drainage pipe along your lot under the County Drainage Improvement Program (DIP), see if I can assist with contacting VDOT as it relates to the subsidence area along the storm drain pipe near the cul-de-sac and try and investigate and pursue the upstream littering issue.

Our division is always readily available to assist owners and HOA representatives with guidance related to stormwater management and drainage and we sincerely look forward working with you in the future. In the meantime, if you have any additional questions or comments, call me at 757-253-6639.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott J. Thomas". The signature is fluid and cursive, with a large initial "S" and "T".

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

Attachments  
SJT/sjt

cc: Beth Davis, JCC Environmental Division

SWMProg\Education\Subdivisions\WindsorForest.fc

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Thursday, April 04, 2002 5:03 PM  
**To:** Darryl Cook; Wayland Bass  
**Subject:** New Fords Colony Sec 12

Schedule this for engineers meeting next week.

By the end of next week, I need to respond to Charles Records (AES) request about the new section of Fords Colony Sec 12 and what requirements will be imposed by us for WQ and Quantity control and how development on this site corresponds to the previously approved master plan. I just do not have the history of what was allowed when Sections 6, 11 and 15 were approved.

Their two questions are:

1. **Quantity/Quality Control.** Per master plan approved earlier, a pond was put in along the east side of Williamsburg West Drive. They contend that this pond provides overcompensation for Section 15 and Section 6, which is discharged in an uncontrolled fashion. They are saying that this section (Sec 12) will fall under the same criteria. *(Note: He is contending that per the master plan approved around 1987 that the pond along the east side of Williamsburg West Drive, Section 6 and 11 provides overcompensating control for quantity purposes and the master plan shows that currently they are ok with BMP points. Channel adequacy from their new section to Chisel Run RPA would still be an issue, although they are saying that when the master plan was approved that MS-19 was not in effect. I dispute this. Me and Wayland walked this section of natural stream channel from the large pipe outfall in Windsor Forest to Chisel Run. There is a spider network of low flow channels within the natural floodplain. I see no difference in what John told us about Avid Medical in the Stonehouse Commerce Park and this area in Fords Colony as we may have difficulty in imposing current requirements to a previously approved master plan.)*

2. **Regional/Onsite Control.** If quantity/quality control is necessary, is the County receptive to participate in a regional type pond to provide control for this area with the new section being Fords Colony responsibility and Windsor Forest being others responsibility. The drainage area to the regional pond siting area is 250 acres of which 45 acres (18%) is the new FC Sec 12 area. If control is necessary, they want to know if a regional siting is possible with County involvement or if they should stick to onsite control which would most likely be two timber crib walls. *(Note: I believe due to wetland impacts, a wet pond is out of the question. If a dry detention timber crib wall is used we would have to concede on the 24-hour extended detention issue and a very long wall would be needed to span the natural floodplain at the proposed regional pond location.)*

They are pretty clean as far as I can see as compared to the Powhatan Creek Watershed Management Plan with no RTE, Conservation Areas or Special Stormwater Criteria. No regional ponds or retrofits are proposed for the general area. I don't see too much in the plan to provide direction on this matter.

Answers to their questions are beyond me individually and I need help from you both.

Scott

**Beth Davis**

---

**From:** Scott Thomas  
**Sent:** Thursday, March 20, 2003 10:24 AM  
**To:** 'gcl@widowmaker.com'  
**Cc:** Beth Davis  
**Subject:** Windsor Forest Response

Thanks for meeting with us earlier this week. In response to our meeting, I am providing you with the following contact information for wetland permitting associated with the Ford's Colony Section 12 project (County Plan No. S-51-02)

US Army Corps of Engineers

Lesley Leonard  
Environmental Scientist  
757-441-7540  
fax 757-441-7678  
email: [Lesley.D.Leonard@NAO02.USACE.ARMY.MIL](mailto:Lesley.D.Leonard@NAO02.USACE.ARMY.MIL)

Debra Trent  
Virginia Department of Environmental Quality (DEQ)  
757-518-2128  
email: [djtrent@deq.state.va.us](mailto:djtrent@deq.state.va.us)

I will also be putting together a "first contact" packet of information to forward to you and Shirley with watershed education information which can be distributed to the HOA if you desire to assist.

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

Visit:  
[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)  
and  
[www.protectedwithpride.org](http://www.protectedwithpride.org)

**Scott Thomas**

---

**From:** Scott Thomas  
**Sent:** Wednesday, April 13, 2005 8:59 AM  
**To:** 'Records, Charles B.'  
**Cc:** Christopher Johnson; Jordan Anglin  
**Subject:** Timber Crib Walls - Fords Colony Sec 12

I got your voice mail message concerning the low flow pipe change as proposed for the timber crib walls at Ford's Colony Sec 12. The proposal is to modify the flow control from a Schedule 80 perforated PVC with gravel envelope to a reverse slope pipe design as used successfully on other timber crib wall applications. You are authorized to make this field change for the permanent BMP configurations. Please followup by providing me a sketch of the configuration for our record files (a site plan amendment will not be necessary) and ensure the asbuilts and construction certification cover the modification.

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

Visit:

[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)  
and  
[www.protectedwithpride.org](http://www.protectedwithpride.org)

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Friday, June 15, 2007 1:11 PM  
**To:** 'Drew Mulhare'; 'jgrimes@aesva.com'  
**Attachments:** 110402.S5102.pdf; DetRet.pdf

I have received a package from M. Howard Thomas with Koontz-Bryant, PC. The reports as provided will not suffice to meet condition # 5 from a detention time BMP waiver request as issued for Ford's Colony Section 12 (S-51-02) dated November 4, 2002. A copy of that waiver letter is attached.

The reports as provided by Koontz-Bryant only really address the status of vegetation and wetland systems within the BMPs. Inspections and reports to meet our purposes are mainly geared toward stormwater function and structural integrity of the BMP and it's associated structures. If these inspections have not been performed since waiver and site plan approval, they should start immediately twice yearly. Release or reduction of bonds for the project may be hampered if this information is not available at that time.

I've attached a County template inspection form which can be used by the Owner or designated representative. It is preferred that a registered engineer with a background in BMP design and construction perform the inspection (s).

**Scott J. Thomas, P.E.**  
*Chief Engineer - Stormwater*  
*James City County*  
*Environmental Division*

Visit:  
[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)  
and  
[www.protectedwithpride.org](http://www.protectedwithpride.org)

6/15/2007



## DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784

(757) 253-6671

ENVIRONMENTAL DIVISION

(757) 253-6670

EnvDiv@james-city.va.us

PLANNING

(757) 253-6685

planning@james-city.va.us

COUNTY ENGINEER

(757) 253-6678

E-MAIL: devman@james-city.va.us

FAX: (757) 253-6822

INTEGRATED PEST MANAGEMENT

(757) 259-4116

September 17, 2007

Realtec, Inc.  
Attn: Drew Maulhare  
One Ford's Colony Drive  
Williamsburg, VA 23188

Re: Ford's Colony Section XII  
County Plan No. S-51-02  
County BMP ID Code: PC207 & PC208

Dear Mr. Mulhare:

The Environmental Divisions has received a record drawing (asbuilt) for the stormwater management facilities for the above referenced project. The record drawing provides as-built information for a timber crib wall #1 situated in the Northeast corner and timber crib wall # 2 situated in the Southwest corner of the site.

Based on our review of the project and a concurrent field inspection as performed on September 13, 2007, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

**Record Drawings:**

1. Submit one mylar set of the record drawing to me.

**Construction Certification:**

2. In accordance with the Note # 20 on Sheet 23 of the approved plan, construction certification for the stormwater management/BMP facility is required. None was provided. The certification can be in letter format or by use of the certification statements in Section 4 of the JCC, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.
3. A professional engineer's seal and signature is required on construction certifications.
4. If possible add the following County identifiers to the construction certification documents:  
County Plan Number S-51-02 and BMP ID No. PC207 & PC208.

**Construction - Related Items:**

***PC207/ Timber Crib Wall #1***

5. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along both sides of the timber crib wall.
6. Install 6" PVC pipe at the lowest elevation along the wall as shown on the approved plan. Remove the existing 6" PVC pipe and riser and repair wall or seal off half of the perforated riser starting from the base and moving up.
7. Fill and stabilize the scour hole on both sides of the timber crib wall approximately 50 feet from the Southwest end of the wall.
8. Remove the vegetation and repair the erosion on the maintenance road.

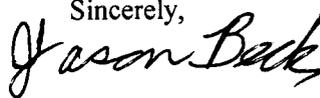
***PC207/ Timber Crib Wall #2***

9. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along the South side of the timber crib wall.

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

Please contact me at 757-259-4026 or Chief Engineer, Bill Cain, at 757-253-6702 if you have any further comments or questions.

Sincerely,



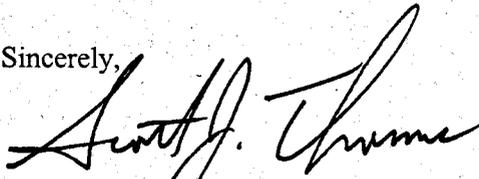
Jason L. Beck  
Environmental Inspector  
James City County  
Environmental Division

cc: Jason Grimes, P.E., AES  
Bill Cain, P.E., Chief Engineer

G:\AsBuilts\review\final\S5102.pc207

Our division is always readily available to assist owners and HOA representatives with guidance related to stormwater management and drainage and we sincerely look forward working with you in the future. In the meantime, if you have any additional questions or comments, call me at 757-253-6639.

Sincerely,

A handwritten signature in black ink, appearing to read "Scott J. Thomas". The signature is fluid and cursive, with a large, sweeping initial "S".

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

Attachments  
SJT/sjt

cc: Beth Davis, JCC Environmental Division

SWMProg\Education\Subdivisions\WindsorForest.fc

**Beth Davis**

---

**From:** Scott Thomas  
**Sent:** Thursday, March 20, 2003 10:24 AM  
**To:** 'gcl@widowmaker.com'  
**Cc:** Beth Davis  
**Subject:** Windsor Forest Response

Thanks for meeting with us earlier this week. In response to our meeting, I am providing you with the following contact information for wetland permitting associated with the Ford's Colony Section 12 project (County Plan No. S-51-02)

US Army Corps of Engineers

Lesley Leonard  
Environmental Scientist  
757-441-7540  
fax 757-441-7678  
email: [Lesley.D.Leonard@NAO02.USACE.ARMY.MIL](mailto:Lesley.D.Leonard@NAO02.USACE.ARMY.MIL)

Debra Trent  
Virginia Department of Environmental Quality (DEQ)  
757-518-2128  
email: [djtrent@deq.state.va.us](mailto:djtrent@deq.state.va.us)

I will also be putting together a "first contact" packet of information to forward to you and Shirley with watershed education information which can be distributed to the HOA if you desire to assist.

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

Visit:  
[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)  
and  
[www.protectedwithpride.org](http://www.protectedwithpride.org)

**Scott Thomas**

---

**From:** Scott Thomas  
**Sent:** Wednesday, April 13, 2005 8:59 AM  
**To:** 'Records, Charles B.'  
**Cc:** Christopher Johnson; Jordan Anglin  
**Subject:** Timber Crib Walls - Fords Colony Sec 12

I got your voice mail message concerning the low flow pipe change as proposed for the timber crib walls at Ford's Colony Sec 12. The proposal is to modify the flow control from a Schedule 80 perforated PVC with gravel envelope to a reverse slope pipe design as used successfully on other timber crib wall applications. You are authorized to make this field change for the permanent BMP configurations. Please followup by providing me a sketch of the configuration for our record files (a site plan amendment will not be necessary) and ensure the asbuilts and construction certification cover the modification.

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

Visit:

[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)

and

[www.protectedwithpride.org](http://www.protectedwithpride.org)

## Scott Thomas

---

**From:** Scott Thomas  
**Sent:** Friday, June 15, 2007 1:11 PM  
**To:** 'Drew Mulhare'; 'jgrimes@aesva.com'  
**Attachments:** 110402.S5102.pdf; DetRet.pdf

I have received a package from M. Howard Thomas with Koontz-Bryant, PC. The reports as provided will not suffice to meet condition # 5 from a detention time BMP waiver request as issued for Ford's Colony Section 12 (S-51-02) dated November 4, 2002. A copy of that waiver letter is attached.

The reports as provided by Koontz-Bryant only really address the status of vegetation and wetland systems within the BMPs. Inspections and reports to meet our purposes are mainly geared toward stormwater function and structural integrity of the BMP and it's associated structures. If these inspections have not been performed since waiver and site plan approval, they should start immediately twice yearly. Release or reduction of bonds for the project may be hampered if this information is not available at that time.

I've attached a County template inspection form which can be used by the Owner or designated representative. It is preferred that a registered engineer with a background in BMP design and construction perform the inspection (s).

***Scott J. Thomas, P.E.***  
*Chief Engineer - Stormwater*  
*James City County*  
*Environmental Division*

Visit:  
[http://www.james-city.va.us/resources/devmgmt/div\\_devmgmt\\_environ.html](http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html)  
and  
[www.protectedwithpride.org](http://www.protectedwithpride.org)

6/15/2007



## DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784

(757) 253-6671

ENVIRONMENTAL DIVISION

(757) 253-6670

EnvDiv@james-city.va.us

PLANNING

(757) 253-6685

planning@james-city.va.us

COUNTY ENGINEER

(757) 253-6678

E-MAIL: devman@james-city.va.us

FAX: (757) 253-6822

INTEGRATED PEST MANAGEMENT

(757) 259-4116

September 17, 2007

Realtec, Inc.  
Attn: Drew Maulhare  
One Ford's Colony Drive  
Williamsburg, VA 23188

Re: Ford's Colony Section XII  
County Plan No. S-51-02  
County BMP ID Code: PC207 & PC208

Dear Mr. Mulhare:

The Environmental Divisions has received a record drawing (asbuilt) for the stormwater management facilities for the above referenced project. The record drawing provides as-built information for a timber crib wall #1 situated in the Northeast corner and timber crib wall # 2 situated in the Southwest corner of the site.

Based on our review of the project and a concurrent field inspection as performed on September 13, 2007, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

**Record Drawings:**

1. Submit one mylar set of the record drawing to me.

**Construction Certification:**

2. In accordance with the Note # 20 on Sheet 23 of the approved plan, construction certification for the stormwater management/BMP facility is required. None was provided. The certification can be in letter format or by use of the certification statements in Section 4 of the JCC, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.
3. A professional engineer's seal and signature is required on construction certifications.
4. If possible add the following County identifiers to the construction certification documents:  
County Plan Number S-51-02 and BMP ID No. PC207 & PC208.

**Construction - Related Items:**

***PC207/ Timber Crib Wall #1***

5. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along both sides of the timber crib wall.
6. Install 6" PVC pipe at the lowest elevation along the wall as shown on the approved plan. Remove the existing 6" PVC pipe and riser and repair wall or seal off half of the perforated riser starting from the base and moving up.
7. Fill and stabilize the scour hole on both sides of the timber crib wall approximately 50 feet from the Southwest end of the wall.
8. Remove the vegetation and repair the erosion on the maintenance road.

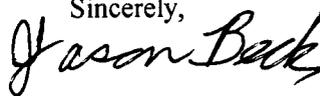
***PC207/ Timber Crib Wall #2***

9. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along the South side of the timber crib wall.

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

Please contact me at 757-259-4026 or Chief Engineer, Bill Cain, at 757-253-6702 if you have any further comments or questions.

Sincerely,



Jason L. Beck  
Environmental Inspector  
James City County  
Environmental Division

cc: Jason Grimes, P.E., AES  
Bill Cain, P.E., Chief Engineer

G:\AsBuilts\review\final\S5102.pc207

**Scott Thomas**

**From:** Scott Thomas  
**Sent:** Friday, May 10, 2002 2:27 PM  
**To:** 'Charles Records'  
**Cc:** Darryl Cook; Wayland Bass  
**Subject:** RE: Ford's Colony Projects

S-51-02

I will try my best to answer your questions. Sorry for the delay.

1. Fords Colony Driving Range. Beth approached me on this matter. If the changes are solely sequencing and the stockpile areas are within the limit of work approved under the previous plan, then I don't think I need to see a plan revision. However, adjustments to the sequence of construction, whether temporary or permanent, should be coordinated with Beth. E&SC of the new stockpile areas should follow VESCH requirements at the inspectors discretion. In areas where the previous plan showed work and that work would not be performed at this time, then generally E&SC measures per the plan would not be necessary. In summary, I suggest the details with this be worked out with Beth as field changes, rather than a plan change, as I believe the plan was rather general in nature to begin with.

2. FC Section A-12. I spoke with both Darryl and Wayland on the issue. Firstly, it does not appear that a regional pond solution will occur due to RPA, wetland and backwater-lot impact issues as well as the siting location of the impounding structure (length). Secondly, we would fully review and comment on the development plan for Sec A-12 when presented both as it correlates to the overall master plan and onsite stormwater management plan. However, to give you some upfront guidance, this is generally what we have discussed so far. Although quality provisions associated with this undeveloped section of FC may (I say may) be satisfied as part of the overall master plan BMP point calculation, certainly erosion and sediment control and postdevelopment quantity aspects must be resolved. MS-19 would call for adequacy of the natural receiving channel either in the land-disturbing phase and in the postdevelopment phases. If it is not adequate, then the options are: 1) Improve the natural receiving channel for capacity for the 10-year and erosion resistance for the 2-year; 2) Develop a site design (new onsite BMP option, etc.) which meets quantity control criteria which would be current standards per Chapter 8 ordinance for 24-hour detention of the 1-year, 24-hour storm criteria; 3) or a combination which is satisfactory to the plan-approving authority to prevent downstream erosion.

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

-----Original Message-----

**From:** Charles Records [mailto:crecords@aesva.com]  
**Sent:** Friday, May 10, 2002 1:55 PM  
**To:** Scott Thomas  
**Subject:** Ford's Colony Projects

Scott,

This email is to inform you of a few items that we need to wrap up within Ford's Colony for the Driving Range and Section A-12. I have not been able to get in touch with you by phone and therefore I believe this may be the best form of communication for us.

As you know the Driving Range erosion and sediment control plan was granted approval and Jimmy Minor has had a pre-construction meeting with Beth Davis to begin land disturbance. Beth asked Jimmy Minor to have us revise the sequence of construction for the plan and have you review it. Beth wants the sequence revised because not all of the work proposed on the plan will be happening as part of the immediate land



## DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784

(757) 253-6671

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

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

COUNTY ENGINEER  
(757) 253-6678

E-MAIL: devman@james-city.va.us

FAX: (757) 253-6822

INTEGRATED PEST MANAGEMENT  
(757) 259-4116

September 17, 2007

Realtec, Inc.  
Attn: Drew Maulhare  
One Ford's Colony Drive  
Williamsburg, VA 23188

*Reinspected  
10/23/07*

Re: Ford's Colony Section XII  
County Plan No. S-51-02  
County BMP ID Code: PC207 & PC208

Dear Mr. Mulhare:

The Environmental Divisions has received a record drawing (asbuilt) for the stormwater management facilities for the above referenced project. The record drawing provides as-built information for a timber crib wall #1 situated in the Northeast corner and timber crib wall # 2 situated in the Southwest corner of the site.

Based on our review of the project and a concurrent field inspection as performed on September 13, 2007, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

**Record Drawings:**

1. Submit one mylar set of the record drawing to me.

**Construction Certification:**

2. In accordance with the Note # 20 on Sheet 23 of the approved plan, construction certification for the stormwater management/BMP facility is required. None was provided. The certification can be in letter format or by use of the certification statements in Section 4 of the JCC, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.
3. A professional engineer's seal and signature is required on construction certifications.
4. If possible add the following County identifiers to the construction certification documents:  
County Plan Number S-51-02 and BMP ID No. PC207 & PC208.

**Construction - Related Items:**

***PC207/ Timber Crib Wall #1***

5. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along both sides of the timber crib wall.
6. Install 6" PVC pipe at the lowest elevation along the wall as shown on the approved plan. Remove the existing 6" PVC pipe and riser and repair wall or seal off half of the perforated riser starting from the base and moving up.
7. Fill and stabilize the scour hole on both sides of the timber crib wall approximately 50 feet from the Southwest end of the wall.
8. Remove the vegetation and repair the erosion on the maintenance road.

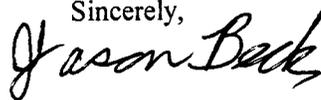
***PC207/ Timber Crib Wall #2***

9. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along the South side of the timber crib wall.

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

Please contact me at 757-259-4026 or Chief Engineer, Bill Cain, at 757-253-6702 if you have any further comments or questions.

Sincerely,



Jason L. Beck  
Environmental Inspector  
James City County  
Environmental Division

cc: Jason Grimes, P.E., AES  
Bill Cain, P.E., Chief Engineer

G:\AsBuilts\review\final\S5102.pc207'



## DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784

(757) 253-6671

ENVIRONMENTAL DIVISION  
(757) 253-6670

EnvDiv@james-city.va.us

PLANNING  
(757) 253-6685

planning@james-city.va.us

COUNTY ENGINEER  
(757) 253-6678

E-MAIL: devman@james-city.va.us

FAX: (757) 253-6822

INTEGRATED PEST MANAGEMENT  
(757) 259-4116

September 17, 2007

Realtec, Inc.  
Attn: Drew Maulhare  
One Ford's Colony Drive  
Williamsburg, VA 23188

Re: Ford's Colony Section XII  
County Plan No. S-51-02  
County BMP ID Code: PC207 & PC208

*Reinspected  
10/23/07*

Dear Mr. Mulhare:

The Environmental Divisions has received a record drawing (asbuilt) for the stormwater management facilities for the above referenced project. The record drawing provides as-built information for a timber crib wall #1 situated in the Northeast corner and timber crib wall # 2 situated in the Southwest corner of the site.

Based on our review of the project and a concurrent field inspection as performed on September 13, 2007, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project:

**Record Drawings:**

1. Submit one mylar set of the record drawing to me.

**Construction Certification:**

2. In accordance with the Note # 20 on Sheet 23 of the approved plan, construction certification for the stormwater management/BMP facility is required. None was provided. The certification can be in letter format or by use of the certification statements in Section 4 of the JCC, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.
3. A professional engineer's seal and signature is required on construction certifications.
4. If possible add the following County identifiers to the construction certification documents:  
County Plan Number S-51-02 and BMP ID No. PC207 & PC208.

**Construction - Related Items:**

***PC207/ Timber Crib Wall #1***

5. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along both sides of the timber crib wall.
6. Install 6" PVC pipe at the lowest elevation along the wall as shown on the approved plan. Remove the existing 6" PVC pipe and riser and repair wall or seal off half of the perforated riser starting from the base and moving up.
7. Fill and stabilize the scour hole on both sides of the timber crib wall approximately 50 feet from the Southwest end of the wall.
8. Remove the vegetation and repair the erosion on the maintenance road.

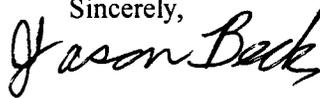
***PC207/ Timber Crib Wall #2***

9. Cut the vegetation and brush to a height of 2 to 3 inches 5ft in width along the South side of the timber crib wall.

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

Please contact me at 757-259-4026 or Chief Engineer, Bill Cain, at 757-253-6702 if you have any further comments or questions.

Sincerely,



Jason L. Beck  
Environmental Inspector  
James City County  
Environmental Division

cc: Jason Grimes, P.E., AES  
Bill Cain, P.E., Chief Engineer

G:\AsBuilts\review\final\S5102.pc207

**AES CONSULTING ENGINEERS**  
**Engineering, Surveying, and Planning**  
 5248 Olde Towne Road, Suite 1  
 WILLIAMSBURG, VIRGINIA 23188

**Phone: (757) 253-0040**  
**Fax: (757) 220-8994**

**LETTER OF TRANSMITTAL**



**ATTN: Mr. Scott Thomas**

**co.: JCC Environmental Division**

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

cc: \_\_\_\_\_

\_\_\_\_\_

DATE	1-10-03	JOB NO.	652-12
FROM:	Charles Records		
RE	Ford's Colony Section XII		

WE ARE SENDING YOU THE FOLLOWING ITEMS:

- Attached  
 Under separate cover via
- Original(s)    Print(s)    Plan(s)    Specification(s)    Change Order
- Copy of letter(s)    Other:

COPIES	DATE	No. of Pages	DESCRIPTION
2		2	Updated Plan (Subdivision and Road Impr.) indicating additional lighting
2		2	Drainage Calculations for existing systems for Road Impr. Project Pre and Post Drainage Area maps with Tc Breakdown
2		2	

THESE ARE TRANSMITTED as checked below:

- For your approval    For your signature    For review and comment
- For your use    As you requested    As requested by:
- Other:

**REMARKS:**

Scott,  
 I have been trying to get in touch with you for the last three weeks to no avail. I believe you are missing the attached items from the last submittal we made on the two Section XII projects. Please let me know if you have any questions. Thanks.

Thanks,  
 Charles Records

*If enclosures are not as noted, kindly notify us at once.*

**AES CONSULTING ENGINEERS**

Engineering, Surveying and Planning  
 5248 Olde Towne Road, Suite 1  
 WILLIAMSBURG, VIRGINIA 23188

**LETTER OF TRANSMITTAL**

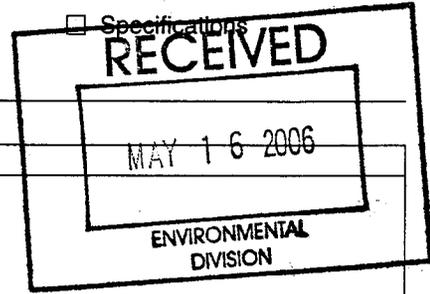
(757) 253-0040  
 FAX (757) 220-8994

DATE 5/15/06	JOB NO. 5652-12
ATTENTION	
RE: Ford's Colony Sect 12 BMP As-builts	

TO JCC Environmental

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings   
  Prints   
  Plans   
  Samples   
  Specifications  
 Copy of letter   
  Change order   
  \_\_\_\_\_



COPIES	DATE	NO.	DESCRIPTION
2			Section 12 As-built Drawings BMP #1 Checklist (PC 207) BMP #2 Checklist (PC 208)

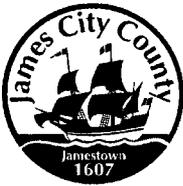
S-51-02

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   
  Returned for corrections   
  Return \_\_\_\_\_ corrected prints  
 For review and comment   
  \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_   
  PRINTS RETURNED AFTER LOAN TO US

REMARKS

SIGNED: JASON GRIMES



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

County BMP ID Code (if known): PC-207  
 Name of Facility: Ford's Colony Section XII BMP No.: 21 of 2 Date: 9/21/07  
 Location: \_\_\_\_\_  
 Name of Owner: Realtec, Inc.  
 Name of Inspector: Jason Beck  
 Type of Facility: timber crib wall #1  
 Weather Conditions: Sunny / Hot Humid Type:  Final Inspection  County BMP Inspection Program  Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
<b>Embankments and Side Slopes:</b>				
Grass Height	✓			<u>Timber crib wall</u>  <u>Natural cut 5ft area</u> <u>down both sides</u>
Vegetation Condition	✓	✓		
Tree Growth	/			
Erosion	/			
Trash & Debris	/			
Seepage	/			
Fencing or Benches				
<b>Interior Landscaping/Planted Areas:</b> <input type="checkbox"/> None <input checked="" type="checkbox"/> Constructed Wetland/Shallow Marsh <input checked="" type="checkbox"/> Naturally Established Vegetation				
Vegetated Conditions	/			
Trash & Debris	/			
Floating Material	/			
Erosion	/			
Sediment	/			
Dead Plant	/			
Aesthetics	/			
Other				
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
<b>Water Pools:</b> <input type="checkbox"/> Permanent Pool (Retention Basin) <input checked="" type="checkbox"/> Shallow Marsh (Detention Basin) <input type="checkbox"/> None, Dry (Detention Basin)				
Shoreline Erosion	/	✓		micro-pool ? scouring fill
Algae	/			
Trash & Debris	/			
Sediment	/			
Aesthetics	/			
Other				
<b>Inflows (Describe Types/Locations):</b>				
Condition of Structure	✓			24" HPDE
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other				
<b>Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):</b>				
Condition of Structure	✓			6" PVC 5' L.A. 11'
Corrosion	✓			needs to stratated at the low point
Trash and Debris	✓			per plan
Sediment	✓			
Vegetation	✓			wetland vegetation
Other		✓		use loose boards along top of wall
<b>Principal Outlet Structure - Barrel, Conduit, etc. :</b>				
Condition of Structure	✓			6" PVC
Settlement	✓			
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			
Other				
<b>Emergency Spillway (Overflow):</b>				
Vegetation	✓			
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
<b>Nuisance Type Conditions:</b>				
Mosquito Breeding	/			
Animal Burrows	/			
Graffiti	/			
Other				
<b>Surrounding Perimeter Conditions:</b>				
Land Uses	/			Single-family
Vegetation	/			Woods & wetlands
Trash & Debris	/			
Aesthetics	/			
Access /Maintenance Roads or Paths	/	✓		Eroding + overgrown with grass
Other				
<b>Remarks:</b>				
Overall Environmental Division Internal Rating: <u>  3  </u>				
Signature: <u>  <i>John Bud</i>  </u> Date: <u>  9/11/07  </u>				
Title: <u>  Environmental Inspector  </u> <u>  9/13/07 w/scott  </u>				

SWMPProg\BMP\CoInspProg\InspForms\DetRet.wpd

10/23/07 Reinspected  
o'Kay



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

County BMP ID Code (if known): PC-208  
 Name of Facility: Ford's Colony Section XII BMP No.: 1 of 2 Date: 9/10/07  
 Location: Located at rear of Lot 17 on Nottinghamshire  
 Name of Owner: Realtec, Inc.  
 Name of Inspector: Jason Beck  
 Type of Facility: timbercrib wall #2  
 Weather Conditions: overcast/Hot/Humid Type:  Final Inspection  County BMP Inspection Program  Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
<b>Embankments and Side Slopes:</b>				
Grass Height	✓			Natural area <del>Ⓢ</del>
Vegetation Condition	✓			
Tree Growth	✓			
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	✓			
<b>Interior Landscaping/Planted Areas:</b> <input type="checkbox"/> None <input type="checkbox"/> Constructed Wetland/Shallow Marsh <input checked="" type="checkbox"/> Naturally Established Vegetation				
Vegetated Conditions	✓			
Trash & Debris	✓			
Floating Material	✓			
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics				
Other				
Notes:	<u>sidewalk across the out fall side of timber wall concrete</u>			

Facility Item	O.K.	Routine	Urgent	Comments
<b>Water Pools:</b> <input type="checkbox"/> Permanent Pool (Retention Basin) <input checked="" type="checkbox"/> Shallow Marsh (Detention Basin) <input type="checkbox"/> None, Dry (Detention Basin)				
Shoreline Erosion	/			
Algae	/			
Trash & Debris	/			
Sediment	/			
Aesthetics	/			
Other	/			• wetland vegetation
<b>Inflows (Describe Types/Locations):</b>				
Condition of Structure	/			30" RCP pipe
Erosion	/			
Trash and Debris	/			
Sediment	/			
Outlet Protection	/			RipRap
Other	/			
<b>Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):</b>				
Condition of Structure	/			6" PVC pipe
Corrosion	/			
Trash and Debris	/			
Sediment	/			
Vegetation	/			
Other	/			
<b>Principal Outlet Structure - Barrel, Conduit, etc. :</b>				
Condition of Structure	/			6" steel pipe
Settlement	/			
Trash & Debris	/			
Erosion/Sediment	/			
Outlet Protection	/			
Other	/			
<b>Emergency Spillway (Overflow):</b>				
Vegetation	/			
Lining	/			
Erosion	/			
Trash & Debris	/			
Other	/			
Notes:				



Jason,

Here are asbuilt files setup  
for Fords Colony SEC 12  
The first file is a "general"  
file. The second file is for  
Timber Crib Wall BMP #1 PC207  
The 3rd file is for Timber  
Crib Wall BMP #2 PC208

I sorted through the active  
permit file & pulled out  
computations & relative  
information & put it in these  
files accordingly.

Just  
8-30-07

**James City County, Virginia  
Environmental Division  
Stormwater Management Program**

**Stormwater Management Design Plan  
Staff "Quick" Review**

Plan No. S-51-02 Date/Time: 9:30am 6/19/02  
 Project Name: FORD'S COLONY SEC 12 (71 LOTS)  
 Rough Location: COUNTRY CLUB DRIVE NEAR WILLIAMSBURG WEST  
 ADC Map: Sheet 5 Grid: F-3  First Review  
 Flood Map / Zone: 510201- 00 35B Zone: X  Review  
 Description: OUTSIDE 500-YEAR  
 Onsite  Offsite

Drainage Area:  
Submitted:

- |                                     |                                       |  |   |
|-------------------------------------|---------------------------------------|--|---|
| <input type="checkbox"/> Y          | <input checked="" type="checkbox"/> N |  |   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Demolition Plan (if applicable)  | Sheets:   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Site, Geometric or Layout Plan   | Sheets: <u>2, 3, 4, 5, 6, 7, 8</u>                      |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Grading Plan   | Sheets:   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Storm Drainage Plan  | Sheets: <u>9, 10, 11</u>                                |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | E&SC Plan  | Sheets: <u>10, 11, 12, (13, 14, 15) TEMP SALES ROAD</u> |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Profiles (Storm)   | Sheets: <u>17, 18</u>                                   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Environmental Inventory  | Sheets: <u>16</u>                                       |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Note & Detail Sheets   | Sheets: <u>21</u>                                       |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Drainage Map(s)  | <u>Sheet 9 &amp; Exhibit Map</u>                        |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Soils Map/Narrative  | <u>Sheet 16</u>   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | E&SC/SWM Design Plan Checklist (Required).   |   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | E&SC/Stormwater Management / Drainage Narratives.  |   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | E&SC/Stormwater Management Design Report with Calculations (Attachment).   |   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Geotechnical Report ( Attachment ).  |   |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/>   | Waivers, Variances, or Exceptions (Attachments in Writing).  |   |
| <input type="checkbox"/>            | <input type="checkbox"/>              | <input type="checkbox"/> VESCH <input checked="" type="checkbox"/> CBP Ord (RPA, Steep Slope Policy) <input type="checkbox"/> JCC BMP Manual |   |
| <input type="checkbox"/>            | <input type="checkbox"/>              | Other (List):  |   |

JCC GIS Database: Zoning: R-4 Tax Parcel/GPIN: 3230100011  
 Receiving Water: UTOF POW CREEK Site Acreage: 45.64 acres / s.f.

Other Approvals (SUP, etc.):

Site Plan Information: Owner: REALTEC INC  
 Zoning: R-4 Description: RES PLANNED COMM  
 Site Area: 45.865 acres / s.f.  
 Disturbed Area: 8.5 acres / s.f. (18.53%)  
 Disturbance > 5 acres, VPDES Notice of Intent required.  
 Impervious Cover: ? acres / s.f. ( . %)   
 Less than or equal to 60 percent. Meets CBPO requirements.  
 More than 60 percent. Does Not Meet CBPO requirements.  
 Open / Green Space: 11.376 acres / s.f. (24.8 %)

Site Development Plan:

- |   |  |  |  |
|---|--|--|--|
| <input checked="" type="checkbox"/> Residential, Lots, etc. | <input type="checkbox"/> Commercial (B / O / R)        | <input type="checkbox"/> Govern./Institutional       | <input type="checkbox"/> Industrial                |
| <input checked="" type="checkbox"/> Roadways or Entrances   | <input type="checkbox"/> Parking or Loading            | <input checked="" type="checkbox"/> Water            | <input checked="" type="checkbox"/> Sanitary Sewer |
| <input checked="" type="checkbox"/> Landscaping             | <input checked="" type="checkbox"/> SWM/BMP facilities | <input checked="" type="checkbox"/> Manmade Drainage | <input type="checkbox"/> Parks, Amenities          |
| <input type="checkbox"/> Pump/Lift Station                  | <input type="checkbox"/> Dams (regulated)              | <input type="checkbox"/> Other,                      |  |

Description: 71 LOTS; DENSITY 1.55 LOTS/AC; AVG SIZE 16, 24 S.F. (0.37 AC.)

Soils Information:  
Soil Survey Sheet

Site: 10B, 14B, 150, 15E, 17, 29A, 29B, 31B  
 DA: same  
 BMP: 15E + 17  
 Description of Soils at BMP: \_\_\_\_\_

Hydric:  Yes  No (17)  
 HSG: C4V6, B-L-D  
 Hydric:  Yes  No

BMP Control:  
BMP Types:

None  Onsite  Offsite  Previously Approved  Manufactured BMP  
 1- Name: BMP #1 (JCC BMP Type F - 2), Points 4  
 2- Name: BMP #2 (JCC BMP Type F - 2), Points 4  
 3- Name: EXIST PC092 (JCC BMP Type \_\_\_\_\_), Points \_\_\_\_\_  
 Reinforced Concrete Pipe  Corrugated Metal Pipe  Aluminum Type Pipe  
 Corrugated Polyethylene Pipe  PVC Type Pipe  Open Channel Type  
 Storm Drain  Culverts Type: \_\_\_\_\_  
 Inlets C.1.  Other (Specify): \_\_\_\_\_

Onsite Drainage:

1. VDOT Standards & Specifications Referenced for work **within** R/W:  Yes  No  
 2. VDOT Standards & Specifications Referenced for work **outside** R/W:  Yes  No

Site Limitations:

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

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

<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	#		
	<u>BMP #1</u>	<u>Timber Crib NE WINDSOR FOREST.</u>	
Predev (Present)	DA = <u>30.9</u> ac.	C/CN = <u>71.2</u>	Tc = <u>23</u> (min) hrs.
2-year	<u>29.64</u>	cfs	
10-year	<u>?</u>	cfs	
100-year	<u>133.53</u>	cfs	
PostDev w/o Detention (Inflow)	DA = <u>33.9</u> ac.	C/CN = <u>76.1</u>	Tc = <u>19</u> (min) hrs.
1-year	<u>?</u>	<u>?</u>	
2-year	<u>43.24</u>	cfs	
10-year	<u>?</u>	cfs	
100-year	<u>163.44</u>	cfs	
PostDev with Detention (Routed)	DA = <u>33.9</u> ac.	C/CN = <u>76.1</u>	Tc = <u>19</u> (min) hrs.
2-year	<u>23.9</u>	cfs	at El. <u>48.80</u>
10-year	<u>?</u>	cfs	at El.
100-year (DHW)	<u>158.33</u>	cfs	at El. <u>49.73</u>

Downstream Tailwater Assumption for Pond Routing: EL. 45.8? E6.46.0  
 Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables:  Yes  No  
 Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements:  Yes  No

BYPASS SUBAREA PRE  
11.42 AC  
CN = 74.9  
Tc = 23

POST  
10.91 AC  
CN = 80.4  
Tc = 19

AT BMP #1

Soils Information:  
Soil Survey Sheet

Site: 10B, 14B, 150, 15E, 17, 29A, 29B, 31B  
 DA: same  
 BMP: 15E+17  
 Description of Soils at BMP: \_\_\_\_\_

Hydric:  Yes  No (17)  
 HSG: CAV, B-L-D  
 Hydric:  Yes  No

BMP Control:  
BMP Types:

None  Onsite  Offsite  Previously Approved  Manufactured BMP  
 1- Name: BMP #1 (JCC BMP Type F - 2), Points 4  
 2- Name: BMP #2 (JCC BMP Type F - 2), Points 4  
 3- Name: EXIST PC092 (JCC BMP Type \_\_\_\_\_), Points \_\_\_\_\_

Onsite Drainage:

Reinforced Concrete Pipe  Corrugated Metal Pipe  Aluminum Type Pipe  
 Corrugated Polyethylene Pipe  PVC Type Pipe  Open Channel Type  
 Storm Drain  Culverts Type: \_\_\_\_\_  
 Inlets C.I.  Other (Specify): \_\_\_\_\_

1. VDOT Standards & Specifications Referenced for work within R/W:  Yes  No  
 2. VDOT Standards & Specifications Referenced for work outside R/W:  Yes  No

Site Limitations:

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

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

<input type="checkbox"/> Yes <input type="checkbox"/> No	#	Bmp #	Location
		<u>BMP #2</u>	<u>Timber Crib SW WILLIAMS BLVD WEST.</u>
<b>PreDev (Present)</b>	DA = <u>36.93</u> ac.	C/CN = <u>68.9</u>	Tc = <u>24</u> min/hrs.
2-year	<u>31.0</u>	cfs	
10-year	<u>(?)</u>	cfs	
100-year	<u>151.9</u>	cfs	
<b>PostDev w/o Detention (Inflow)</b>	DA = <u>37.22</u> ac.	C/CN = <u>74.5</u>	Tc = <u>16</u> min/hrs.
1-year			
2-year	<u>45.05</u>	cfs	
10-year	<u>(?)</u>	cfs	
100-year	<u>175.83</u>	cfs	
<b>PostDev with Detention (Routed)</b>	DA = <u>37.22</u> ac.	C/CN = <u>74.5</u>	Tc = <u>16</u> min/hrs.
2-year	<u>26.0</u>	cfs	at El. <u>42.65</u>
10-year	<u>(?)</u>	cfs	at El.
100-year (DHW)	<u>174.32</u>	cfs	at El. <u>43.78</u>

Downstream Tailwater Assumption for Pond Routing: 39.50 ✓  
 Routed Peak Discharges (Outflows) from BMP meet Predevelopment Allowables:  Yes  No  
 Appears to Meet VESCH / E&SC Ordinance / CBP Ordinance Requirements:  Yes  No

NOT ANALYSES PT.

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

Check if None  Provided: BMP # 1 Type: Timber Crib NE WINDSOR  
 \* See Below for Pertinent WQv /Stream CPv Design Information.

Y N  
  Top of Facility (Dam Crest) El. 50.0  
  Design High Water (100-year) El. 49.73  
  Emergency Spillway (ES) Crest El. 50.00 BW: \_\_\_\_\_ SS: \_\_\_\_\_  
  FreeBoard FOR TCW 0.25' 1 ft. or > with Emerg. Spillway.  
  Acceptable  Not Acceptable. 2 ft. or > w/o Emerg. Spillway.  
  Principal Spillway (Riser) Crest El. 49.0 Size/Type: 80' WEIR  
  Principal Spillway Crest 1 ft. below Crest of Emergency Spillway.  Yes  No  N/A  
  Stage-Storage Curve or Data  
  Outlet Rating Curve or Table (Composite Structure)  
  Extended Detention for WQ Provided (Min. 24 hours)  Yes  No  N/A  
  1-year, 24 hour detention criteria for Stream Channel Protection.  Yes  No  N/A  
  1-year design storm El. \_\_\_\_\_ or Volume \_\_\_\_\_  
  Normal/Permanent Pool El. \_\_\_\_\_  
  Orifice/Weir #1 (Highest El.) El. 49.0 50.0 Type: N/A  
  Orifice/Weir #2 El. 48.0 49.0 Type: 145' WEIR E.S  
  Orifice/Weir #3 El. 45.0 Type: 80' WEIR PRINCIPAL, 1' deep.  
  Orifice/Weir #4 El. \_\_\_\_\_ Type: 2'x2' SQUARE.  
  Orifice/Weir #5 (Lowest El.) El. \_\_\_\_\_ Type: \_\_\_\_\_  
  Low Flow Orifice (ExDet, CPv) El. 45.0 Type: 2x2  
  Pond Drain w/ Valve (24 hr.) El. \_\_\_\_\_ Type: \_\_\_\_\_  
  Pond Bottom (Positive Drain) El. 45.0 Riser Height: NA  
  Steps or Access Provided (for over 4 ft. depth)  N/A  
  Riser Base Bottom El. \_\_\_\_\_ Type: \_\_\_\_\_  
  Core Trench  N/A  
  Anti-Seep Collars or other Acceptable Seepage Control Method.  N/A  
  Principal Spillway Anti-Vortex/Trash Rack Device Type: Timber Stringer RACK  
  Low Flow Orifice Trash Rack. Type: \_\_\_\_\_  
  Outlet Barrel: Type/Class: \_\_\_\_\_ Size: \_\_\_\_\_  
 Inv. U/S: \_\_\_\_\_ Inv D/S: \_\_\_\_\_  
 Slope: \_\_\_\_\_ Length: \_\_\_\_\_ (ft.)  
  Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.  
  Outlet Protection.  
  Standard Riprap Outlet Protection (OP) Type: EC-1  
  Special Dissipator Structure (SDS) Type: \_\_\_\_\_  
  BMP Cleanout Elevation El. \_\_\_\_\_ or Depth 1'-0"  
  Adequate Channel Downstream of BMP:  1-year, 24-hour; or  MS #19 criteria. ?

Sketch or Notes, If Necessary:

LWAN = 145'  
100-year DHW 49.73  
Need 24 det, 1-yr storm

\* WQv / Stream CPv Design Summary

Imperv. Area	<u>?</u>
WQTV (Per JCC Man)	<u>None</u>
WQ Vol. Required	<u>None</u>
WQ Vol. Provided	<u>None</u>
1-yr SCPv Required	<u>?</u>
1-yr SCPv Provided	<u>?</u>
Ext Det Orifice Size	<u>2'x2'</u>

Sediment Trap & Basins

Temporary Sediment Trap # 1 NA DA = \_\_\_\_\_ < 3 acres  
 Temporary Sediment Trap # 2 \_\_\_\_\_ DA = \_\_\_\_\_ < 3 acres  
 Temporary Sediment Basin # 1 \_\_\_\_\_ DA = \_\_\_\_\_  BMP # \_\_\_\_\_ convert.  
 Temporary Sediment Basin # 2 \_\_\_\_\_ DA = \_\_\_\_\_  BMP # \_\_\_\_\_ convert.

E&SC Plan Comments: \_\_\_\_\_

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

- Check if None  Provided: BMP # 2 Type: Timber Comb SW wmbg west
- Y  N \* See Below for Pertinent WQv/Stream CPv Design Information.
- Top of Facility (Dam Crest) El. 44.0
  - Design High Water (100-year) El. 43.78
  - Emergency Spillway (ES) Crest El. 44.0 BW: \_\_\_\_\_ SS: \_\_\_\_\_
  - FreeBoard FOR TCW \_\_\_\_\_ 1 ft. or > with Emerg. Spillway.
  - Acceptable  Not Acceptable. \_\_\_\_\_ 2 ft. or > w/o Emerg. Spillway.
  - Principal Spillway (Riser) Crest El. 43.0 Size/Type: 80' weir
  - Principal Spillway Crest 1 ft. below Crest of Emergency Spillway.  Yes  No  N/A
  - Stage-Storage Curve or Data \_\_\_\_\_
  - Outlet Rating Curve or Table (Composite Structure) \_\_\_\_\_
  - Extended Detention for WQ Provided (Min. 24 hours)  Yes  No  N/A
  - 1-year, 24 hour detention criteria for Stream Channel Protection.  Yes  No  N/A
  - 1-year design storm El. \_\_\_\_\_ or Volume \_\_\_\_\_
  - Normal/Permanent Pool El. \_\_\_\_\_  N/A
  - Orifice/Weir #1 (Highest El.) El. NA Type: 125' weir
  - Orifice/Weir #2 El. 43.0 Type: 80' weir, 1' deep
  - Orifice/Weir #3 El. 38.5 Type: 2x2 square
  - Orifice/Weir #4 El. \_\_\_\_\_ Type: \_\_\_\_\_
  - Orifice/Weir #5 (Lowest El.) El. \_\_\_\_\_ Type: \_\_\_\_\_
  - Low Flow Orifice (ExDet, CPv) El. 38.5 Type: 2x2 sq.
  - Pond Drain w/ Valve (24 hr.) El. \_\_\_\_\_ Type: \_\_\_\_\_
  - Pond Bottom (Positive Drain) El. 38.5 Riser Height: \_\_\_\_\_
  - Steps or Access Provided (for over 4 ft. depth)  N/A
  - Riser Base Bottom El. \_\_\_\_\_ Type: \_\_\_\_\_
  - Core Trench  N/A
  - Anti-Seep Collars or other Acceptable Seepage Control Method.  N/A
  - Principal Spillway Anti-Vortex/Trash Rack Device Type: Timber Stringer Device
  - Low Flow Orifice Trash Rack. Type: \_\_\_\_\_
  - Outlet Barrel: Type/Class: \_\_\_\_\_ Size: \_\_\_\_\_
  - Inv. U/S: \_\_\_\_\_ Inv D/S: \_\_\_\_\_
  - Slope: \_\_\_\_\_ Length: \_\_\_\_\_ (ft.)
  - Flared End Section/Wingwalls. Matches Outlet Barrel material type, over 48 inch with fence.
  - Outlet Protection.
    - Standard Riprap Outlet Protection (OP) Type: CC-1
    - Special Dissipator Structure (SDS) Type: \_\_\_\_\_
  - BMP Cleanout Elevation El. \_\_\_\_\_ or Depth 1'-0"
  - Adequate Channel Downstream of BMP:  1-year, 24-hour; or  MS # 19 criteria. ?

Sketch or Notes, If Necessary:

$L_{wall} = 125'$   
 $DHW = 43.78$   
 Need 24 hr det, 1-yr storm.

\* WQv / Stream CPv Design Summary

Imperv. Area	?
WQTV (Per JCC Man)	None
WQ Vol. Required	None
WQ Vol. Provided	None
1-yr SCPv Required	?
1-yr SCPv Provided	?
Ext Det Orifice Size	2x2 square

Sediment Trap & Basins

- Temporary Sediment Trap # 1 \_\_\_\_\_ DA = \_\_\_\_\_ < 3 acres
- Temporary Sediment Trap # 2 \_\_\_\_\_ DA = \_\_\_\_\_ < 3 acres
- Temporary Sediment Basin # 1 \_\_\_\_\_ DA = \_\_\_\_\_  BMP # \_\_\_\_\_ convert.
- Temporary Sediment Basin # 2 \_\_\_\_\_ DA = \_\_\_\_\_  BMP # \_\_\_\_\_ convert.

E&SC Plan Comments: \_\_\_\_\_



**AES CONSULTING ENGINEERS**

Engineering, Surveying and Planning

5248 Olde Towne Road, Suite 1  
WILLIAMSBURG, VIRGINIA 23188

**LETTER OF TRANSMITTAL**

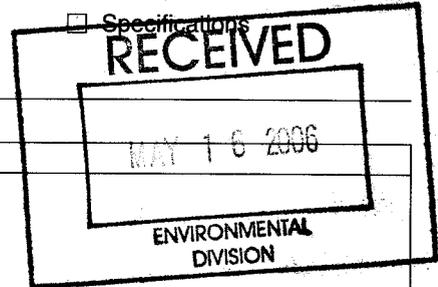
(757) 253-0040  
FAX (757) 220-8994

DATE 5/15/06	JOB NO. 5652-12
ATTENTION	
RE: Ford's Colony Sect 12 BMP As-builts	

TO JCC Environmental

WE ARE SENDING YOU  Attached  Under separate cover via \_\_\_\_\_ the following items:

- Shop drawings   
  Prints   
  Plans   
  Samples   
  Specifications  
 Copy of letter   
  Change order   
  \_\_\_\_\_



COPIES	DATE	NO.	DESCRIPTION
2			Section 12 As-built Drawings BMP #1 Checklist (PC 207) BMP #2 Checklist (PC 208)

S-51-02

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   
  Returned for corrections   
  Return \_\_\_\_\_ corrected prints  
 For review and comment   
  \_\_\_\_\_  
 FOR BIDS DUE \_\_\_\_\_   
 PRINTS RETURNED AFTER LOAN TO US

REMARKS

COPY TO \_\_\_\_\_ SIGNED: JASON GRIMES

ENVIRONMENTAL DIVISION REVIEW COMMENTS  
FORD'S COLONY SECTION 12  
COUNTY PLAN NO. S - 51 - 02  
June 21, 2002

MOW/SJT

General Comments:

1. A Land-Disturbing Permit and Siltation Agreement, with surety, are required for this project.
2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of lots.
3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.
4. A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facilities associated with this project.
5. Responsible Land-Disturber Notification. Provide the name of an individual who will be in charge of and responsible for carrying out the land-disturbing activity. Permits or plans without this information are deemed incomplete and not approved until proper notification is received.
6. Record Drawing and Construction Certification. The stormwater management/BMP facilities as proposed for this project will require submission, review and approval of a record drawing (as-built) and construction certification prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines.
7. Wetlands. It appears that non-tidal jurisdictional wetlands will be impacted due to sanitary sewer, storm drain outfall, lot development and BMP construction. Prior to initiating grading or other on-site activities on any portion of a lot or parcel, all wetland permits required by federal, state and county laws and regulations shall be obtained and evidence of such submitted to the Environmental Division. Refer to Section 23-9(b)(8) and 23-10(7)(d) of the Chapter 23 Chesapeake Bay Preservation ordinance. *(Note: This includes securing necessary wetland permits through the U.S. Army Corps of Engineers Norfolk District and under the Virginia Department of Environmental Quality nontidal wetlands programs, which became effective October 1<sup>st</sup> 2001.)*
8. VPDES. It appears land disturbance for the project may exceed five (5) acres. Therefore, it is the owners responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq.
9. Powhatan Creek. This project is situated in the Powhatan Creek watershed. Please note the James City County Board of Supervisors, by resolution dated February 26<sup>th</sup> 2002, adopted *in concept* eight goals and 21 priorities associated with the Powhatan Creek Watershed Management Plan. This project is subject to the contents of that plan. The owner, applicant, developer and plan preparer should be advised of and completely review the goals, priorities (tools) and entire contents of this study, including subwatershed maps, as layout and design of the proposed project could be affected by and should remain consistent with these items. Refer to the draft watershed management plan and it's associated subwatershed maps for environmental sensitive areas, features and/or recommendations that may apply to the subwatershed in which the project area is situated. Specific items that may apply include: aquatic buffer area; potential site for a regional stormwater facility; and watershed education target area.

10. Sheet layout. Provide a logical site plan sheet layout that places plan requirements in a logical order, starting with the preliminary plat, environmental inventory, interim sales road plan, and final road and drainage configuration. The erosion and sediment control narrative and construction sequence should be placed early in the plan set to allow for clear direction on the intent of the plan.
11. Matchlines. Properly show match lines on sheets as applicable between the south and north parts of the project and for the east Road F part of the project.
12. Plan Information. Provide the "Country Club Drive and Williamsburg West Drive Roadway Improvement Plans" as noted on Sheet 10 of the plan set. It is difficult to review the drainage plan for the site entrance area due to the scale of the sheets provided. The existing driveway culverts to the Bazzles Parcel (32-4)(1-34) may need realigned, replaced or upgraded to conform with the drainage plan due to the new entrance road Road A configuration.
13. Plan Information. Show approximate locations of existing structures (houses) which border the site to the west at Lots 43 to 51 in Williamsburg West Section 1A, to the north at Lots 6-10 and 23 to 27 in Windsor Forest Section 14 and 16 and to the south at Lots 2 through 13 Williamsburg West Section 1A. Also, show the disturbed area estimate as provided on Sheet 9 in the site tabulation on Sheet 3.
14. Plan Information. Explain the meaning of the "FD 1" designated tract of land in the southeast corner of the site to the east of Roads A and F. It is unclear if this is designated greenway area or reserved for future development. Also, greenway area # 2 (GW 2) could not be found on Preliminary Plat Sheet 3.

**Chesapeake Bay Preservation:**

15. Environmental Inventory. Although an environmental inventory sheet was provided in the plan set, an inventory showing whether or not components as listed under Section 23-10(2) of the Chesapeake Bay Preservation ordinance was not provided/listed. *(Also provide an estimate for anticipated nontidal wetland impacts associated with sanitary sewer, storm outfall, lot and BMP construction.)*
16. Steep Slope Areas. Section 23-5 of the Chesapeake Bay Preservation Ordinance does not allow land disturbing activities to be performed on slopes of 25 percent or greater. It appears that steep slope areas are impacted due to sanitary sewer, storm drain and possibly lot development; therefore, a request for a waiver or exception is required, in writing.
17. Wetlands. Lots 13 through 16, 20 and 21, 25 and 26, 30 through 33 and 40 will have non-tidal delineated wetland situated directly on the lots as these wetland areas protrude out (are not contained within) of proposed greenways. Explain what efforts will be taken to minimize impacts and protect these sensitive wetland areas from impacts due to lot development, construction and backlot drainage.

**Erosion and Sediment Control Plan:**

18. Design Checklist. Please provide a completed standard James City County Erosion and Sediment Control and Stormwater Management Design Plan Checklist, specific to this project.
19. Master Plan. Map Sheet 5 from the 1987 Stormwater Master Plan and 1998 Master Plan Amendment showed two temporary sediment basins to be included within this section. Please indicate how this provision has been satisfied as it appears that rather than primary downstream sediment trapping control have not been utilized in the drainage plan.

20. Temporary Stockpile Areas. Show any temporary soil stockpile, staging and equipment storage areas (with required erosion and sediment controls) or indicate on the plans that none are anticipated for the project site.
21. Offsite Land Disturbing Areas. Road profile Sheets 17 and 18 indicate most of the road alignments in cut section, thus a considerable amount of waste material may be generated during land-disturbing activities. Identify any offsite land disturbing areas waste, or disposal sites (with required erosion and sediment controls) or indicate on the plans that none are anticipated for this project. *(Note: Sheet 14 indicates that stockpiling will take place at one of the approved Ford's Colony stockpile areas. Provide evidence that these areas are covered under existing land-disturbing permits and show their location.)*
22. Sequence of construction. The two BMP's need to be constructed first, prior to any storm drain systems being installed to mitigate for the impact of increased runoff being conveyed to the wetland systems during land-disturbing activities. Modify the sequence accordingly. Add a note on the plan that these two BMP's are not to be used as sediment trapping facilities, that the contractor must remove all sedimentation that occurs immediately after it occurs, and that this removal must **not** be done with mechanized equipment.
23. Sequence of construction. Modify the last step to state that removal of E&S measures will not take place without the written approval of the assigned Environmental Inspector.
24. Grading Plan. Provide additional proposed contour information or grading to aid in determining drainage patterns, grade changes and impacts to lot area and environmentally sensitive features, especially if there is a significant change between interim temporary sales road plan grading and the final grading configuration.
25. Sediment Trapping Facilities. Per Minimum Standard & Spec. 3.20 of the VESCH (page III-86), rock check dams are not a substitute for use of primary perimeter trapping measures such as sediment traps. The entire erosion and sediment control for the interim sales road phase of the project is based on use of temporary diversion dikes to rock check dams as primary perimeter sediment trapping control. Therefore, the erosion and sediment control plan as proposed is inadequate to prevent sedimentation. Include the appropriate sediment trapping measures on the plan, taking into account the entire drainage area (unless clean water diversion are proposed and design correctly) and sized accordingly. Due to the inadequate control on this proposed plan set, further comments will be made as necessary on future submissions.
26. Outlet Protections. On the outlet protection information "boxes" on Sheet 11, change the designation of Class A1 to Class I for riprap associated with all outlet protections. Also, this information should be shown on the temporary sales road plans as this is the time when the OP's will be installed.
27. Drainage Map. Provide a drainage area map show the proposed drainage patterns for the temporary sales road erosion and sediment control plan (Phase I Erosion and Sediment Control Plan), including the size of each drainage area to each sediment trapping measure and any temporary slope drains or culverts.
28. E&SC Plan. As the sediment trapping measure and drainage outfall associated with Road B is not at the true low point in topography, it is possible due to the diversion dike system that most of the cul-de-sac will impound water during a storm event. Therefore place notes on the plan stating that the diversion dike system needs to be of sufficient height to not overtop (short circuit) and to properly convey drainage to the sediment trapping measure.

29. Clean Water Diversion. The temporary drain pipe (15-inch temporary culvert) between Lots 51 and 15 needs to be upgraded to a 24-inch minimum pipe according to the VESCH, based upon drainage area to the pipe. The pipe will need a minimum of 1-foot of cover as it crosses under Road "A", placing the invert in to this pipe system at approximately 7 feet below existing grade. This temporary pipe will need to be extended to the west side of the proposed sanitary sewer system and daylighted onto undisturbed ground with the appropriate outlet protection measures per Minimum Standard & Spec. 3.18 & 3.19 of the VESCH.
30. Clean Water diversion. Provide for temporary drain pipes between Lots 65 and 66 and on Lot 59. The temporary drain pipes should be sized to handle the approximately 2.4 and 1.6 acres of undisturbed drainage (see VESCH Std and Spec 3.15), outlet below any proposed sanitary sewer lines and have the appropriate amount of outlet protection required. Otherwise, this drainage will be conveyed onto the disturbed roadway corridor.
31. Clean Water Diversion. The erosion and sediment control plan for the interim sales road portion of the project on Sheet 15 shows diversion dikes to a culvert at Lots 41, 42 and 43. If the intent is to divert upslope drainage through disturbed corridors (to avoid treatment) then the diversion must safely pass upslope drainage through the site. Currently the configuration could allow drainage to impound upstream onto Lot 42 and will convey/discharge drainage directly to and across Lots 35, 34 and 33.
32. Stilling Basins. The outfalls from Storm Drainage Systems A through E vary in depth below existing ground from 1.5 to 6 ft. The "Outlet Protection" stilling basin detail on Sheet 21 needs to show intended graded slope between top of riprap to tie back with existing ground at the surface. A surface erosion problem should not be created due to installation of the OPs.
33. BMPs. The plan or narrative does not specify whether the two onsite BMP facilities are to be utilized as temporary sediment trapping facilities. If the facilities are not to be utilized for sediment trapping purposes, the narrative and construction plan shall clearly reflect this intent.

**Stormwater Management / Drainage:**

34. Master Plan. The plan preparer has indicated in the design report that the basis of the stormwater management plan for this site is that provisions for water quality have been satisfied due to 10 points being achieved by the overall master plan for the site (ie. structural BMPs in combination with dedicated open space) and for quantity control purposes, the provisions of the master plan allowed for this site to bypass uncontrolled due to overcompensation as provided by other facilities in the proximity. More specifically, the subject facility which provides overcompensation is a wet pond BMP situated between Sections 6 and 11. The BMP is an old design type 5 classification, 6 point BMP with assigned County BMP ID Code: PC 092. In order to achieve the objective of the master plan as stated by the plan preparer, it must be shown that this facility is in good working order and functioning at the intended design level of service. Provide an engineer's inspection and certification that the BMP is structurally sound and working properly from a stormwater function aspect in accordance with previously established design parameters for water quality and quantity control.
35. Drainage Easements. Provide drainage easements of sufficient width at the following locations: Lot 65 between storm structures # 12-A-3A and # 12-A-3; along the entire drainage swale in back of Lots 44 through 58; and along the entire drainage swale which leads to storm drain structure SS # 12-A-11B behind Lots 1 through 7.
36. Lot-to-Lot Drainage. Address or provide a plan to prevent conveyance of increased or concentrated drainage due to lot development at the following locations: Lot 6 to Lot 7; Lot 8 to Lot 9; Lot 9 to Lot 10; Lot 10 to Lot 11; Lot 13 to Lot 14; Lot 21 (extend outfall through lot); Lot 22 to 21; Lot 23 to 24; Lot 28 to 27; Lot 35 to 34; Lots 37, 38 and 39 through Lots 34, 33 and 32; Lot 62 to 63; Lot 63 to 64; Lot 64 to Lot 65; Lot 67 to Lot 66 and Lot 68 to Lot 67.

37. Site Hydrology. Provide computations to support times of concentration as used in pre- and postdevelopment hydrologic analyses for BMP # 1, BMP # 2 and the unattenuated (bypass) area. Although total Tc's were shown in the design report and on the inset 100 scale drainage maps, assumptions and individual component calculations for overland, shallow concentrated and channel flow components must be provided for review.
38. Quantity Control. The plan preparer has indicated in the design report that quantity control requirements for this site were satisfied under the provisions of the master plan which allowed for this site to be released into natural channels in an uncontrolled nature. This was due to "overcompensation" by the wet pond along Williamsburg West Drive between Fords Colony Sections 6 and 11 (ie. County BMP ID Code: PC 092). Reduced peak discharges from the BMP in combination with uncontrolled bypass from this area would result in postdevelopment discharges not exceeding predevelopment allowables at a downstream "ultimate" analyses point. The ultimate analyses point is where discharge from existing BMP PC 092 combines with drainage from this site along the Chisel Run tributary of Powhatan Creek. In order to accomplish the intent of the master plan and meet the regulatory provisions of MS-19, this scenario would dictate that all receiving natural channels downstream of the proposed site the whole way to the ultimate analyses point must be adequate for erosion resistance for the 2-year storm and for capacity for the 10-year storm. As the current development plan utilizes onsite dry pond BMPs, it is assumed that either the downstream receiving channels could not be shown to be adequate or it was not preferred to improve the channels to meet the provisions of MS-19. Therefore, since the site cannot be released uncontrolled as intended per the master plan stormwater arrangement and new onsite BMPs are to be provided, the facilities would need to meet current stream channel protection requirements as outlined in the Chapter 8 Erosion and Sediment Control ordinance. Evaluate the feasibility of meeting current stream channel protection criteria at proposed onsite BMP # 1 and # 2. Current stream channel protection criteria for James City County requires 24-hour extended detention of the runoff from the 1-year frequency storm (post-developed) instead of reduction of the 2-year peak rate as previously required by MS-19 of the Virginia Erosion and Sediment Control regulations. The traditional SCS Type II, 24-hour storm duration rainfall depth for the 1-year storm event in James City County is 2.8 inches.
39. Peak Discharge Analyses. Individual computations were provided to show predevelopment 2-year peak discharge allowables were not exceeded at BMP # 1 and BMP # 2. However, there is an uncontrolled (unattenuated) bypass area consisting of 10.91 acres which combines with discharges from both BMPs and ends up at the design analyses point as shown on the 100 ft. scale inset drainage maps. The summary table in the design report indicates the Q (2) values were added to show predevelopment 2-year is not exceeded for postdevelopment 2-year at the design point. Adding values mathematically is not proper procedure based on SCS hydrologic methods. Another computer model run is necessary combining the three subareas using outflow hydrographs and travel time from the BMPs to the design point in combination with the bypass subarea. Clearly show the 2-year predevelopment discharge at the design analyses point is not exceeded under the 2-year postdevelopment conditions. *(Note: The same is true even if 24-hour detention of the 1-year, 24 hour storm volume control is provided within the two onsite BMPs. Discharges from the facilities must be routed in combination with bypass area to show consistency with MS-19 for the 2-year design storm event at the interim analyses point at the border of the site..)*
40. Channel Adequacy. There are 2 areas associated with this development plan which discharge into existing onsite natural drainage channels in an uncontrolled manner. One is the natural channel downstream of the Storm System B outfall (SS # 12-B-1) and the second is the natural channel downstream of Storm System C (SS # 12-C-1). Submit adequacy analyses for these receiving natural drainage facilities from the pipe outfall to the downstream wetland in accordance with VESCH, MS-19 procedure to verify that the natural channels are adequate for velocity and capacity using the 2-year design storm event and for capacity based on the 10-year event. Evaluate natural channels based on permissible velocities using existing soil and cover conditions. Refer to Chapter 5 of the VESCH and Technical Bulletin # 1 of the VSMH.

41. BMP Configurations. Ensure the two onsite BMP structures and extended detention and larger design storm pools are adequately screened, separated and buffered from existing adjacent offsite lots and structures within Williamsburg West Section 1A and Windsor Forest Section 16.
42. BMP Configurations. Timber crib walls and design high water are situated on Lot 27 for BMP # 1 and Lots 16 and 18 for BMP # 2. Stormwater management/BMP facilities (structures or design high water pools) should not be located within individual single-family lots. BMP structures and pond buffers/setbacks should be situated in common area or easements of sufficient width should be provided to and around the facility to ensure adequate access and maintenance of crucial components. A pond buffer should be provided that extends a minimum of 25 feet outward (landward) from the design high water surface elevation of the ponds. *(Note: Based on the current configurations, the pond buffer/setback would encroach onto Lots 27, 29 and 30 for BMP # 1 and Lots 15, 16 and 18 for BMP # 2. Pond buffers/setbacks shall be accurately depicted on Sheets 2, 3, 10 and 11.)*
43. BMP Designs. Show the 10-year design storm event hydraulic routings for BMP's # 1 and # 2. The 10-year water surface elevations for the BMPs should be contained within the 1 ft. deep "principal spillway" weirs for both facilities and not crest over the tops of the walls (designated as emergency spillways on Sheet 23).
44. BMP # 1 Design. The tailwater elevation assumption used for design of BMP # 1 is at an elevation well below existing ground at the base of wall based on topography on Sheet 11. Assumptions for base tailwater should accurately depict depth of flow in the existing receiving channel.
45. BMP Pretreatment. Address BMP pretreatment requirements by use of a sediment forebay or other equivalent measure for both timber wall BMP facilities. Sediment forebays are generally sized to contain 0.1 inch per impervious area and can be counted toward the total water quality volume requirement.
46. BMP Construction. The sequence of construction on Sheet 21 does not indicate when the timber crib wall BMPs are to be constructed.
47. BMP # 1. Reroute the proposed sanitary sewer between Manholes # 12-A-11 and # 12-A-12 to avoid direct conflict with the timber crib wall structure for BMP # 1. The sewer cannot pass directly under the wall.
48. BMP Structural. Show maximum spacing of the 6-inch by 6-inch posts for the BMP walls on the details on Sheet 23. Ensure post spacing and embedment depth below ground for the 6-inch by 6-inch treated posts as shown on the same detail is sufficient for structural stability of the walls for both BMPs.
49. BMP Maintenance Roads. The 12' wide gravel maintenance roads to the BMPs cannot extend outside easement areas onto Lots 18 and 27. If there is a conflict with property lines or manhole structures, a lesser width section can be used at those locations only. Clarify on the detail on Sheet 23.
50. Storm sewer system "B". Due to the nature of the soils and steep slopes below the proposed outfall, the area in question has the potential to erode significantly into the mature hardwood floodplain wetland system. Therefore, extend the pipe system to the base of the slope and outlet the system into the floodplain around elevation 40. It is acknowledged that this will create additional wetland impacts, however the nature of the wetland system impacted (seep driven), steep slopes and highly erodible soils, it is believed that this is a feasible solution for long term stability.

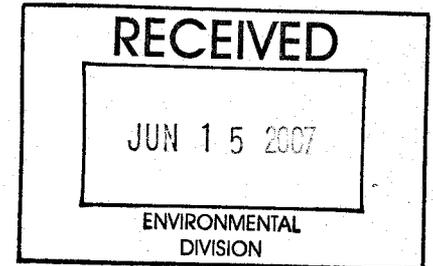
51. Inlet # SS-12-A-11B. As this inlet is not situated in an existing waterway, ensure this inlet grate is adequately sized to intercept all conveyance from the upstream grass swale, as the overflow path downstream is directly through the back of Lots 8, 9, 10, 11 and 12. Minor grading or berming may be necessary to ensure all drainage, even those above the 10-year design storm, is directed into or contained around the inlet as to not create a future drainage problem.
52. Storm System C. Per Sheet 11, the proposed invert elevation of storm pipe outfall SS # 12-C-1 is almost 8 ft. above existing ground. Check proposed design elevations/inverts for this entire storm drainage system.
53. Storm sewer system "D" and "E": Due to the nature of the soils, proposed sanitary sewer construction and increased runoff associated with the back of Lots 37-39 and Lots 36-31, the area has the potential to erode significantly from the System D and E outfalls to proposed BMP # 1. Evaluate the feasibility of creating a drainage easement parallel to the sanitary sewer easement and connecting both storm systems together and extending the outfall closer to the BMP. At the system juncture, a yard inlet could be utilized to capture lot-to-lot drainage. It is acknowledged that this option will create additional wetland impacts, however, all additional impacts will be of a temporary nature except for outlet protection measures.
54. DI-7's. Ensure all VDOT DI-7 being utilized for the onsite drainage systems have proper call outs for Type I or Type III grates. Type III grates may be warranted in yard areas where pedestrian/children access could occur.
55. Storm Structure. The storm drain structure situated at Road F, Sta. 62+50 right, is not labeled on Sheet 10. Show structure type, rim and invert elevation.
56. HDPE Pipe. On the detail on Sheet 22 which shows bedding/backfill requirements for installation of onsite corrugated polyethylene pipe, add a note referencing installation shall be in accordance with ASTM D 2321 and the Corrugated Polyethylene Pipe Association.
57. Stormwater Conveyance Channel Computations. Provide calculations to support the design of all stormwater conveyance (open) channels both within and outside road right-of-way. Provide typical sections with construction data for all proposed onsite stormwater conveyance (open) channels.
58. Due to the extensive nature of the comments, especially those related to the erosion and sediment control plan, lot-to-lot drainage issues and the stormwater drainage plan, the Environmental Division reserves the right to further comment on these components as comments are addressed and plans revised or reconfigured.

September 15, 2004

Ms. Lesley Leonard  
U.S. Army Corps of Engineers  
803 Front Street  
Norfolk, VA 23510

Ms. Debra Trent  
Department of Environmental Quality  
5636 Southern Boulevard  
Virginia Beach, VA 23462

RE: Permit # 02-V2002  
Section 12 – Fords Colony

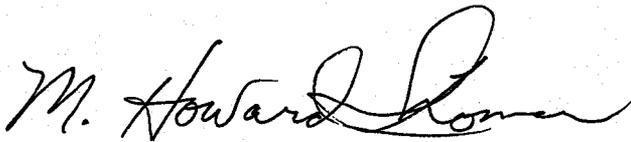


Dear Lesley and Debra:

Enclosed please find the first annual monitoring report for the stormwater management ponds in Section 12 at Fords Colony. We have included vegetation data and sedimentation data for all eight sampling stations, as well as photographs from all twelve photo stations shown on the enclosed maps.

If you have any questions or need additional information, please give me a call.

Sincerely,  
Koontz-Bryant, P.C.



A handwritten signature in cursive script, appearing to read "M. Howard Thomas".

M. Howard Thomas, P.W.S.  
Director of Environmental Services

Enclosures

Copy: Mr. Drew Mulhare

MHT/swg/99465

**FORDS COLONY – SECTION 12  
STATUS REPORT 2004  
STORMWATER MANAGEMENT PONDS  
PERMIT #02-V2002**

The enclosed data and information constitutes the first annual monitoring report for the above-cited stormwater management ponds.

**Photographic Analysis**

Photographs were taken in the same relative positions as in the baseline report submitted May 15, 2003. These photographic stations are shown on the enclosed maps.

**Vegetation Analysis**

We have gathered vegetation data and provided a list of existing species at each sampling station. Each of the eight sampling sites have an aerial coverage of approximately 85%. However, recent storm events have blown several trees down. A large Tulip Poplar is dying near data station 6 which may damage wall #1. There were no major changes in species type from the baseline report in any of the sites. We recommend that the stormwater management ponds be left to progress without disturbance.

**Sedimentation Analysis**

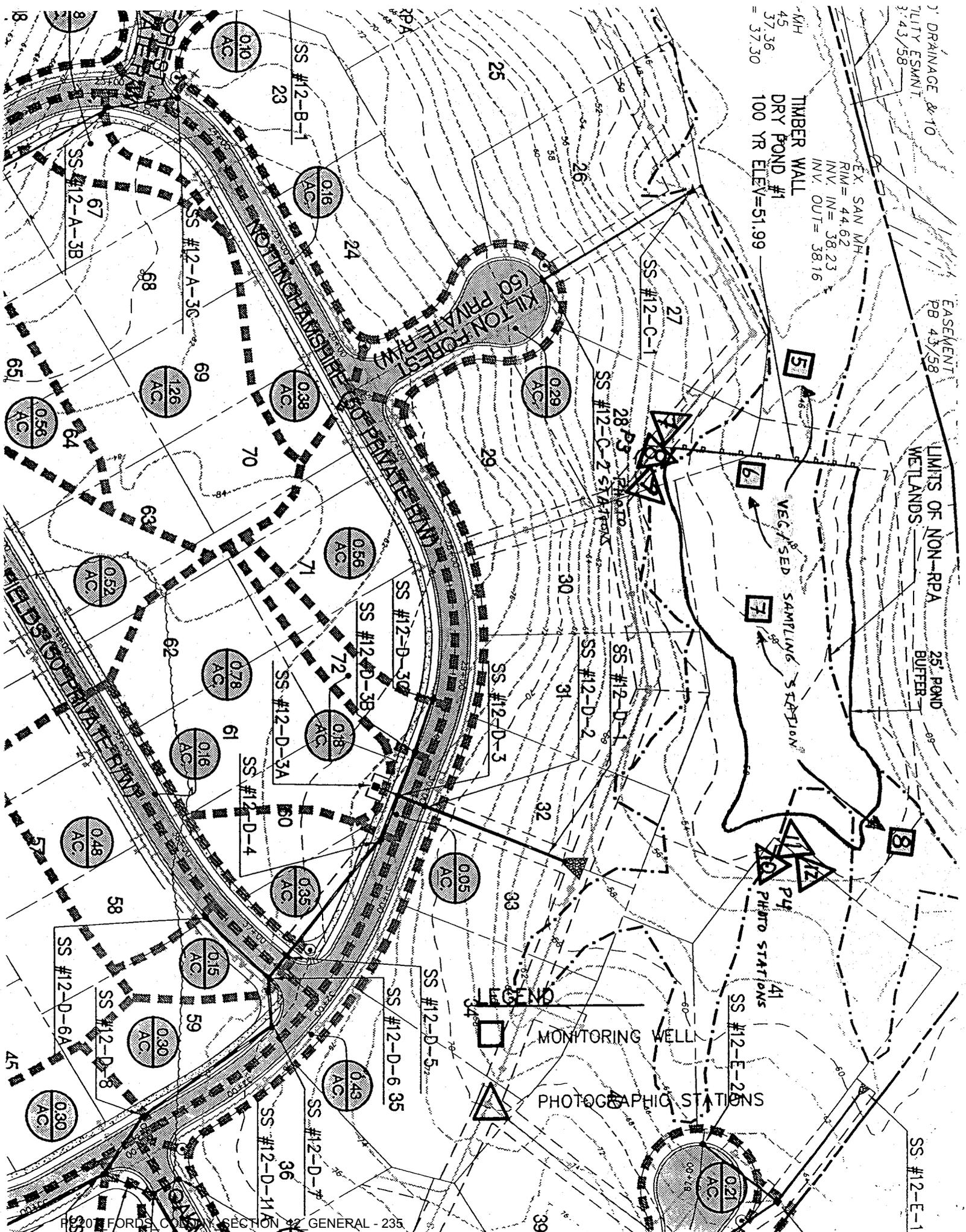
- D-1: No sediment deposition
- D-2: No sediment deposition
- D-3: No sediment deposition
- D-4: No sediment deposition
- D-5: No sediment deposition
- D-6: 0.25-0.5" little sedimentation
- D-7: No sediment deposition
- D-8: No sediment deposition

Photo Station 8 shows sedimentation from adjacent home site Lot 29.

**Summary**

Based on the data above and enclosed, we recommend that the stormwater management ponds be left to progress naturally without any disturbance. Our second year report will be submitted by September 15, 2005. If you have any questions or comments, please contact Steve Gibson at Koontz-Bryant, P.C., (804) 740-9200.





7' DRAINAGE & 10  
 UTILITY ESMNT.  
 3:43/58

EX. SAN MH  
 RIM= 44.62  
 INV. IN= 38.23  
 INV. OUT= 38.16

TIMBER WALL  
 DRY POND #1  
 100 YR ELEV=51.99

45  
 37.36  
 = 37.30

EASEMENT  
 PB 43/58

LIMITS OF NON-RPA  
 WETLANDS

25' POND  
 BUFFER

LEGEND

□ MONITORING WELL

△ PHOTOGRAPHIC STATIONS

**FORDS COLONY - SECTION 12 - STORMWATER MANAGEMENT PONDS  
PLANT LIST (9/13/04)**

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station- 1</b>	Red Maple	Acer rubrum	T	FAC
	Southern Red Oak	Quercus falcata	T	FACU-
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Green Ash	Fraxinus pennsylvanica	T	FACW
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sweetbay Magnolia	Magnolia virginiana	T/S	FACW+
	American Elm	Ulmus americana	T	FACW-
	Spicebush	Lindera benzoin	S	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Black Gum	Nyssa sylvatica	S	FAC
	Common Alder	Alnus serrulata	S	OBL
	Lizard Tail	Saururus cernuus	H	OBL
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Bog Hemp	Boehmeria cylindrica	H	FACW+
	New York Fern	Thelypteris noveboracensis	H	FAC
	Blue Violet	Viola papilionacea	H	FAC
	Golden Ragwort	Senecio aureus	H	FACW
	<b>Aerial coverage = 90%</b>		<b>Percent Wetland Species = ~79 %</b>	

<b>Data Station - 2</b>	Green Ash	Fraxinus pennsylvanica	T	FACW
	Red Maple	Acer rubrum	T	FAC
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Spicebush	Lindera benzoin	S	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Sweet Bay Magnolia	Magnolia virginiana	S	FACW+
	Black Gum	Nyssa sylvatica	S	FAC
	Common Alder	Alnus serrulata	S	OBL
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Poison Ivy	Toxicodendron radicans	V	FAC
	Roundleaf Grape	Vitis rotundifolia	V	FAC-
	Lizard Tail	Saururus cernuus	H	OBL
<b>Aerial coverage = 80-85%</b>		<b>Percent Wetland Species = ~85%</b>		
<b>Top blown out of a large Red Maple</b>				

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 3</b>	Red Maple	Acer rubrum	T	FAC
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Willow Oak	Quercus phellos	T	FAC+
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Black Gum	Nyssa sylvatica	T	FAC
	Sycamore	Platanus occidentalis	S	FACW-
	Ironwood	Carpinus caroliniana	S	FAC
	Green Ash	Fraxinus pennsylvanica	S	FACW
	Spicebush	Lindera benzoin	S	FACW-
	Sweetbay Magnolia	Magnolia virginiana	S	FACW+
	Golden Ragwort	Senecio aureus	H	FACW
	Lizard Tail	Saururus cernuus	H	OBL
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Bog Hemp	Boehmeria cylindrica	H	FACW+
	Blue Violet	Viola papilionacea	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	<b>Aerial coverage = 95-100%</b>		<b>Percent Wetland Species = ~93%</b>	
<b>Tulip Poplar down in wetlands</b>				

<b>Data Station - 4</b>	Sweet Gum	Liquidambar styraciflua	T	FAC
	Red Maple	Acer rubrum	T	FAC
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sycamore	Platanus occidentalis	T	FACW-
	Spicebush	Lindera benzoin	S	FACW-
	American Elm	Ulmus americana	S	FACW-
	Green Ash	Fraxinus pennsylvanica	T/S	FACW
	Lizard Tail	Saururus cernuus	H	OBL
	Golden Ragwort	Senecio aureus	H	FACW
	Winterberry	Ilex verticillata	H	FACW+
	Bog Hemp	Boehmeria cylindrica	H	FACW+
	Japanese honeysuckle	Lonicera japonica	H	FAC-
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Poison Ivy	Toxicodendron radicans	H	FAC
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Common Greenbrier	Smilax rotundifolia	H	FAC
Cinnamon Fern	Osmunda cinnamomea	H	FACW	
<b>Aerial coverage = 90%</b>		<b>Percent Wetland Species = ~78%</b>		
<b>A few Tulip Poplars blown down</b>				

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 5</b>	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Red Maple	Acer rubrum	T	FAC
	Spicebush	Lindera benzoin	T	FACW-
	Dwarf Paw Paw	Asimina parviflora	T	UPL
	Green Ash	Fraxinus pennsylvanica	T	FACW
	Ironwood	Carpinus caroliniana	S	FAC
	Sweetbay Magnolia	Magnolia virginiana	S	FACW+
	American Holly	Ilex opaca	S	FACU+
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Lizard Tail	Saururus cernuus	H	OBL
	Trumpet Creeper	Campsis radicans	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Japanese honeysuckle	Lonicera japonica	H	FAC-
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Wild Grape	Vitis sp.	H	FAC-
	Bog Hemp	Boehmeria cylindrica	H	FACW+
	<b>Aerial coverage = 80-85%</b>		<b>Percent Wetland Species = ~68%</b>	

<b>Data Station - 6</b>	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Black Gum	Nyssa sylvatica	T	FAC
	Red Maple	Acer rubrum	T	FAC
	American Holly	Ilex opaca	T	FACU+
	Sycamore	Platanus occidentalis	T	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Spicebush	Lindera benzoin	S	FACW-
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Golden Ragwort	Senecio aureus	H	FACW
	Green Ash	Fraxinus pennsylvanica	H	FACW
	Ironwood	Carpinus caroliniana	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Southern Raisin	Viburnum nudum	H	OBL
	Japanese honeysuckle	Lonicera japonica	V	FAC-
	Common Greenbrier	Smilax rotundifolia	H	FAC
	<b>Aerial coverage = 80%</b>		<b>Percent Wetland Species = ~ 69%</b>	
<b>Herbaceous vegetation stressed due to recent storm event</b>				

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 7</b>	Sweet Gum	Liquidambar styraciflua	T/S	FAC
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Green Ash	Fraxinus pennsylvanica	T	FACW
	American Elm	Ulmus americana	T	FACW-
	Black Gum	Nyssa sylvatica	T	FAC
	American Holly	Ilex opaca	T/S	FACU+
	Flowering Dogwood	Comus florida	S/T	FACU-
	Ironwood	Carpinus caroliniana	S/T	FAC
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Spicebush	Lindera benzoin	S	FACW-
	Swamp White Oak	Quercus bicolor	S	FACW+
	Lady Fern	Athyrium thelypteroides	H	FAC
	Royal Fern	Osmunda regalis	H	OBL
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Royal Fern	Osmunda regalis	H	OBL
	Cinnamon Fern	Osmunda cinnamomea	H	FACW
	Black Locust	Robinia pseudoacacia	S	FACU-
	Wild Grape	Vitis sp.	V	FAC-
<b>Aerial coverage = 70%</b>		<b>Percent Wetland Species = ~70%</b>		
<b>A Black Cherry has fallen and destroyed a large Flowering Dogwood</b>				

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR	
<b>Data Station - 8</b>	Red Maple	Acer rubrum	T	FAC	
	Black Gum	Nyssa sylvatica	T	FAC	
	Sweet Gum	Liquidambar styraciflua	T	FAC	
	Tulip Poplar	Liriodendron tulipifera	T	FACU	
	Green Ash	Fraxinus pennsylvanica	T/S	FACW	
	American Holly	Ilex opaca	T/S	FACU+	
	Persimmon	Diospyros virginiana	T/S	FAC-	
	Ironwood	Carpinus caroliniana	S/T	FAC	
	Spicebush	Lindera benzoin	S	FACW-	
	Swamp White Oak	Quercus bicolor	T	FACW+	
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-	
	Sphagnum	Sphagnum sp.	H	OBL	
	Golden Ragwort	Senecio aureus	H	FACW	
	Partridge Berry	Mitchella repens	H	FACU	
	Royal Fern	Osmunda regalis	H	OBL	
	Sensitive Fern	Onoclea sensibilis	H	FACW	
	Cinnamon Fern	Osmunda cinnamomea	H	FACW	
	<b>Aerial coverage = 90-95%</b>		<b>Percent Wetland Species = ~83%</b>		
	<b>Top blown out of a large Red Maple</b>				



Photo Station 1



Photo Station 2



Photo Station 3



Photo Station 4



Photo Station 5



Photo Station 6



Upstream Dry Pond #2



Upstream Dry Pond #2



Downstream Dry Pond #2

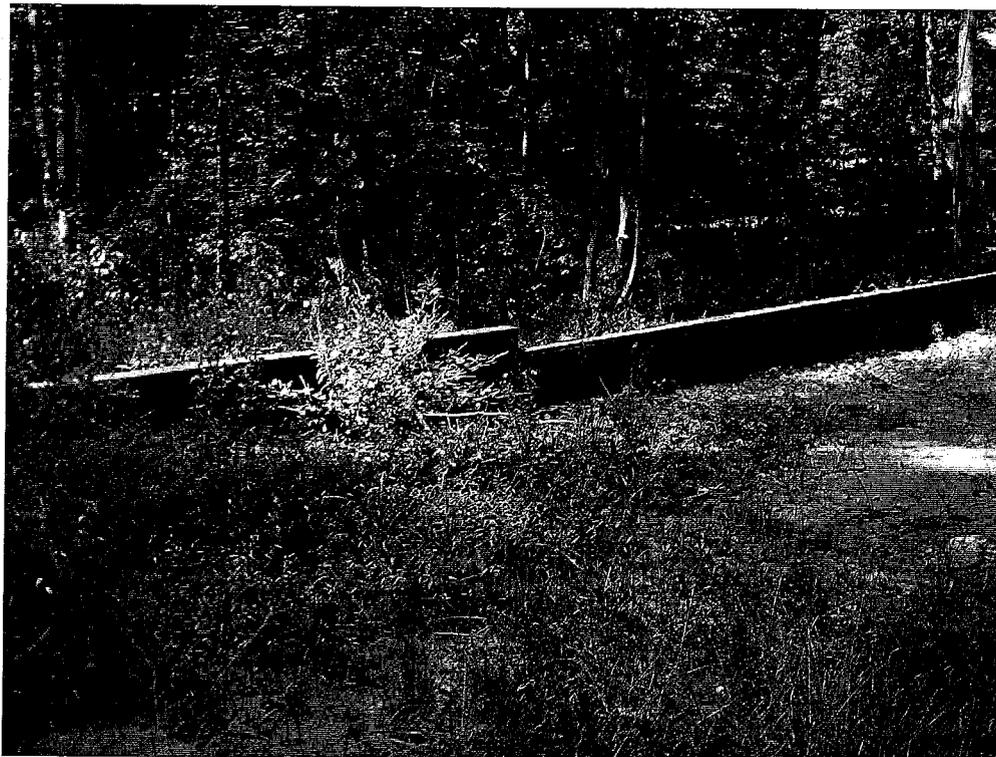


Photo Station 7



Photo Station 8



Photo Station 9



Photo Station 10



Photo Station 11

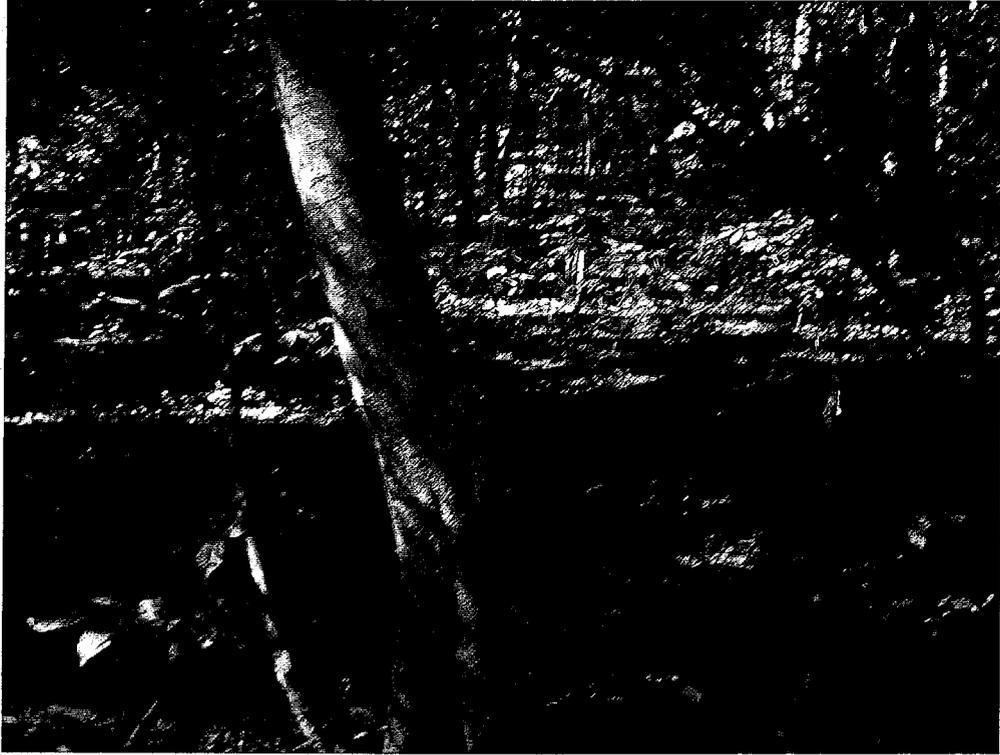


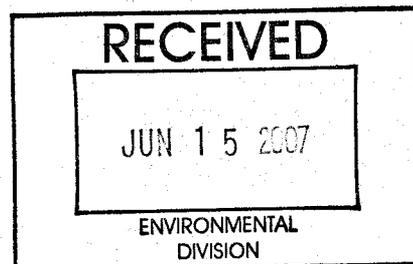
Photo Station 12

September 30, 2005

Ms. Lesley Leonard  
U.S. Army Corps of Engineers  
803 Front Street  
Norfolk, VA 23510

Ms. Debra Trent  
Department of Environmental Quality  
5636 Southern Boulevard  
Virginia Beach, VA 23462

RE: Permit # 02-V2002  
Section 12 – Fords Colony



Dear Lesley and Debra:

Enclosed please find the second annual monitoring report for the stormwater management ponds in Section 12 at Fords Colony. We have included vegetation data and sedimentation data for all eight sampling stations, as well as photographs from all twelve photo stations shown on the enclosed maps.

If you have any questions or need additional information, please give me a call.

Sincerely,  
Koontz-Bryant, P.C.



M. Howard Thomas, P.W.S.  
Director of Environmental Services

Enclosures

Copy: Mr. Drew Mulhare

MHT/swg/99465

**FORDS COLONY – SECTION 12  
STATUS REPORT 2005  
STORMWATER MANAGEMENT PONDS  
PERMIT #02-V2002**

The enclosed data and information constitutes the second annual monitoring report for the above-cited stormwater management ponds.

**Photographic Analysis**

Photographs were taken in the same relative positions as in the baseline report submitted May 15, 2003. These photographic stations are shown on the enclosed maps.

**Vegetation Analysis**

We have gathered vegetation data and provided a list of existing species at each sampling station. Each of the eight sampling sites have an aerial coverage of approximately 85%. Vines have killed a red maple just downstream of data station D-1. There were no major changes in species type from the baseline report in any of the sites. We recommend that the stormwater management ponds be left to progress without disturbance.

**Sedimentation Analysis**

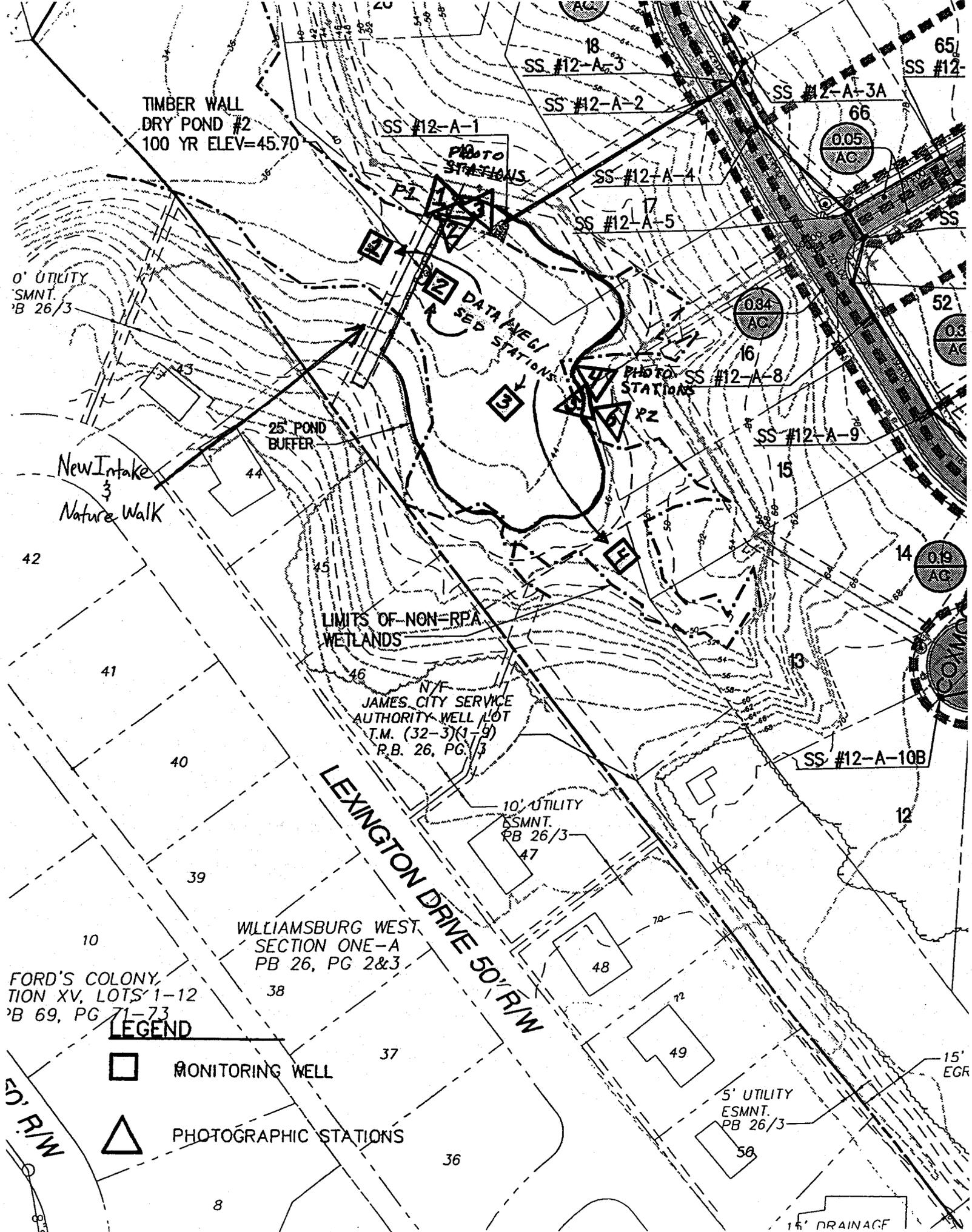
- D-1: No sediment deposition
- D-2: No sediment deposition
- D-3: No sediment deposition
- D-4: 0.25-0.5" little sedimentation
- D-5: 0.25-0.5" little sedimentation
- D-6: 0.25-0.5" little sedimentation
- D-7: 1-2" in channel no visible deposition in wetland
- D-8: No sediment deposition

The photo showing the new intake structure and nature trail was taken at cribwall #1 to document the completion of COE approved modifications.

Displaced infiltration stone at cribwall #2 should be replaced in the 3 ft area shown on the attached photo and map.

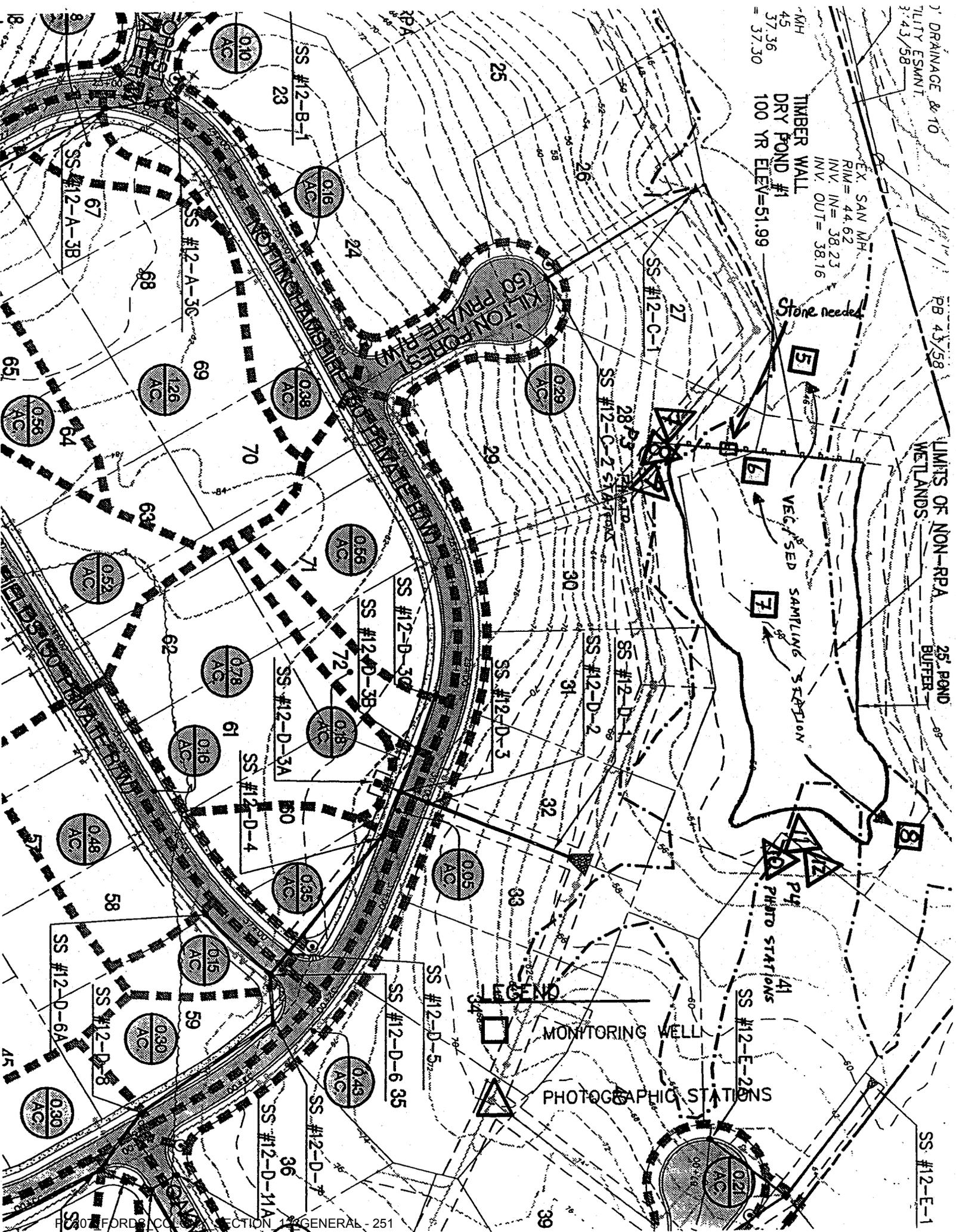
**Summary**

Based on the data above and enclosed, we recommend the addition of stone above and below the 3 ft section along cribwall #2 once completed the stormwater management ponds should be left to progress naturally without any disturbance. Our third year report will be submitted by September 30, 2006. If you have any questions or comments, please contact Steve Gibson at Koontz-Bryant, P.C., (804) 740-9200.



**LEGEND**

-  MONITORING WELL
-  PHOTOGRAPHIC STATIONS



1' DRAINAGE & 10  
UTILITY ESMNT  
3:43/58

EX. SAN MH  
RIM = 44.62  
INV. IN = 38.23  
INV. OUT = 38.16

45  
37.36  
37.30

100 YR ELEV = 51.99

Stone needed

PB 43/58

LIMITS OF NON-RPA  
WETLANDS

25' POND  
BUFFER

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

61

62

63

64

65

66

67

68

69

70

71

72

73

74

75

76

77

78

79

80

81

82

83

84

85

86

87

88

89

90

91

92

93

94

95

96

97

98

99

100

**FORDS COLONY - SECTION 12 - STORMWATER MANAGEMENT PONDS  
PLANT LIST (9/29/05)**

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station- 1</b>	Red Maple	Acer rubrum	T	FAC
	Southern Red Oak	Quercus falcata	T	FACU-
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Green Ash	Fraxinus pennsylvanica	T	FACW
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sweetbay Magnolia	Magnolia virginiana	T/S	FACW+
	American Elm	Ulmus americana	T	FACW-
	Spicebush	Lindera benzoin	S	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Black Gum	Nyssa sylvatica	S	FAC
	Common Alder	Alnus serrulata	S	OBL
	Lizard Tail	Saururus cernuus	H	OBL
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Bog Hemp	Boehmeria cylindria	H	FACW+
	New York Fern	Thelypteris noveborncensis	H	FAC
	Blue Violet	Viola papilionacea	H	FAC
	Golden Ragwort	Senecio aureus	H	FACW
	<b>Aerial coverage = 90%</b>		<b>Percent Wetland Species =</b>	<b>~79 %</b>
Vines killed a Red Maple				

<b>Data Station - 2</b>	Green Ash	Fraxinus pennsylvanica	T	FACW
	Red Maple	Acer rubrum	T	FAC
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Spicebush	Lindera benzoin	S	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Sweet Bay Magnolia	Magnolia virginiana	S	FACW+
	Black Gum	Nyssa sylvatica	S	FAC
	Common Alder	Alnus serrulata	S	OBL
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Poison Ivy	Toxicodendron radicans	V	FAC
	Roundleaf Grape	Vitis rotundifolia	V	FAC-
Lizard Tail	Saururus cernuus	H	OBL	
<b>Aerial coverage = 80-85%</b>		<b>Percent Wetland Species =</b>	<b>~85%</b>	

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 3</b>	Red Maple	Acer rubrum	T	FAC
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Willow Oak	Quercus phellos	T	FAC+
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Black Gum	Nyssa sylvatica	T	FAC
	Sycamore	Platanus occidentalis	S	FACW-
	Ironwood	Carpinus caroliniana	S	FAC
	Green Ash	Fraxinus pennsylvanica	S	FACW
	Spicebush	Lindera benzoin	S	FACW-
	Sweetbay Magnolia	Magnolia virginiana	S	FACW+
	Golden Ragwort	Senecio aureus	H	FACW
	Lizard Tail	Saururus cernuus	H	OBL
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Bog Hemp	Boehmeria cylindria	H	FACW+
	Blue Violet	Viola papilionacea	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	<b>Aerial coverage = 95-100%</b>		<b>Percent Wetland Species = ~93%</b>	

<b>Data Station - 4</b>	Sweet Gum	Liquidambar styraciflua	T	FAC
	Red Maple	Acer rubrum	T	FAC
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sycamore	Platanus occidentalis	T	FACW-
	Spicebush	Lindera benzoin	S	FACW-
	American Elm	Ulmus americana	S	FACW-
	Green Ash	Fraxinus pennsylvanica	T/S	FACW
	Lizard Tail	Saururus cernuus	H	OBL
	Golden Ragwort	Senecio aureus	H	FACW
	Winterberry	Ilex verticillata	H	FACW+
	Bog Hemp	Boehmeria cylindria	H	FACW+
	Japanese honeysuckle	Lonicera japonica	H	FAC-
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Poison Ivy	Toxicodendron radicans	H	FAC
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Common Greenbrier	Smilax rotundifolia	H	FAC
Cinnamon Fern	Osmunda cinnamomea	H	FACW	
<b>Aerial coverage = 90%</b>		<b>Percent Wetland Species = ~78%</b>		

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 5</b>	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Sweet Gum	Liquidambar styraciflua	T	FAC
	Red Maple	Acer rubrum	T	FAC
	Spicebush	Lindera benzoin	T	FACW-
	Dwarf Paw Paw	Asimina parviflora	T	UPL
	Green Ash	Fraxinus pennsylvanica	T	FACW
	Ironwood	Carpinus caroliniana	S	FAC
	Sweetbay Magnolia	Magnolia virginiana	S	FACW+
	American Holly	Ilex opaca	S	FACU+
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Lizard Tail	Saururus cernuus	H	OBL
	Trumpet Creeper	Campsis radicans	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Virginia Creeper	Parthenocissus quinquefolia	H	FACU
	Japanese honeysuckle	Lonicera japonica	H	FAC-
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Wild Grape	Vitis sp.	H	FAC-
	Bog Hemp	Boehmeria cylindria	H	FACW+
	<b>Aerial coverage = 80-85%</b>		<b>Percent Wetland Species = ~68%</b>	

<b>Data Station - 6</b>	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Black Gum	Nyssa sylvatica	T	FAC
	Red Maple	Acer rubrum	T	FAC
	American Holly	Ilex opaca	T	FACU+
	Sycamore	Platanus occidentalis	T	FACW-
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Spicebush	Lindera benzoin	S	FACW-
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Golden Ragwort	Senecio aureus	H	FACW
	Green Ash	Fraxinus pennsylvanica	H	FACW
	Ironwood	Carpinus caroliniana	H	FAC
	Sensitive Fern	Onoclea sensibilis	H	FACW
	Southern Raisin	Viburnum nudum	H	OBL
	Japanese honeysuckle	Lonicera japonica	V	FAC-
	Common Greenbrier	Smilax rotundifolia	H	FAC
	<b>Aerial coverage = 80%</b>		<b>Percent Wetland Species = ~69%</b>	

STATION #	COMMON NAME	SCIENTIFIC NAME	STRATUM	INDICATOR
<b>Data Station - 7</b>	Sweet Gum	Liquidambar styraciflua	T/S	FAC
	Tulip Poplar	Liriodendron tulipifera	T	FACU
	Green Ash	Fraxinus pennsylvanica	T	FACW
	American Elm	Ulmus americana	T	FACW-
	Black Gum	Nyssa sylvatica	T	FAC
	American Holly	Ilex opaca	T/S	FACU+
	Flowering Dogwood	Cornus florida	S/T	FACU-
	Ironwood	Carpinus caroliniana	S/T	FAC
	Dwarf Paw Paw	Asimina parviflora	S	UPL
	Spicebush	Lindera benzoin	S	FACW-
	Swamp White Oak	Quercus bicolor	S	FACW+
	Lady Fern	Athyrium thelypteroides	H	FAC
	Royal Fern	Osmunda regalis	H	OBL
	Christmas Fern	Polystichum acrostichoides	H	FACU-
	Golden Ragwort	Senecio aureus	H	FACW
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-
	Royal Fern	Osmunda regalis	H	OBL
	Cinnamon Fern	Osmunda cinnamomea	H	FACW
	Black Locust	Robinia pseudoacacia	S	FACU-
	Wild Grape	Vitis sp.	V	FAC-
<b>Aerial coverage = 70%</b>		<b>Percent Wetland Species = ~70%</b>		

<b>Data Station - 8</b>	Red Maple	Acer rubrum	T	FAC	
	Black Gum	Nyssa sylvatica	T	FAC	
	Sweet Gum	Liquidambar styraciflua	T	FAC	
	Tulip Poplar	Liriodendron tulipifera	T	FACU	
	Green Ash	Fraxinus pennsylvanica	T/S	FACW	
	American Holly	Ilex opaca	T/S	FACU+	
	Persimmon	Diospyros virginiana	T/S	FAC-	
	Ironwood	Carpinus caroliniana	S/T	FAC	
	Spicebush	Lindera benzoin	S	FACW-	
	Swamp White Oak	Quercus bicolor	T	FACW+	
	Jack in the Pulpit	Arisaema triphyllum	H	FACW-	
	Sphagnum	Sphagnum sp.	H	OBL	
	Golden Ragwort	Senecio aureus	H	FACW	
	Partridge Berry	Mitchella repens	H	FACU	
	Royal Fern	Osmunda regalis	H	OBL	
	Sensitive Fern	Onoclea sensibilis	H	FACW	
	Cinnamon Fern	Osmunda cinnamomea	H	FACW	
	<b>Aerial coverage = 90-95%</b>		<b>Percent Wetland Species = ~83%</b>		



Photo Station 1

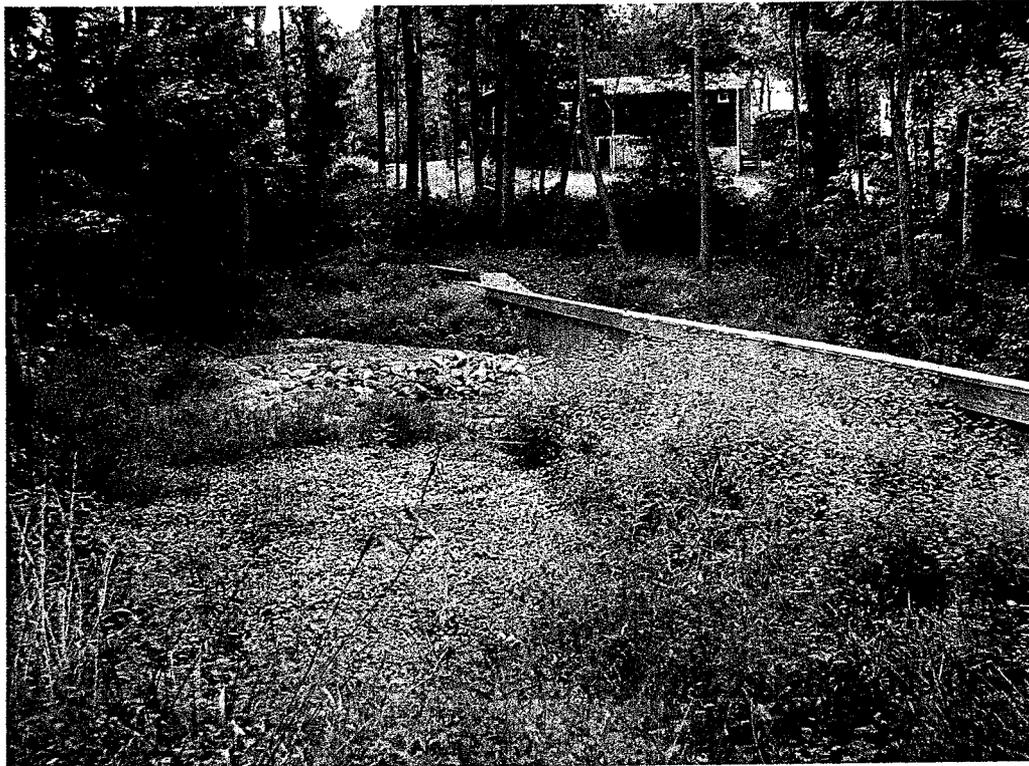


Photo Station 2



New intake structure above cribwall #1



Photo Station 3



Photo Station 4



Photo Station 5



Photo Station 6



Photo Station 7



Photo showing displaced infiltration stone in a 3ft area along cribwall #2



Photo Station 8



Photo Station 9



Photo Station 10



Photo Station 11



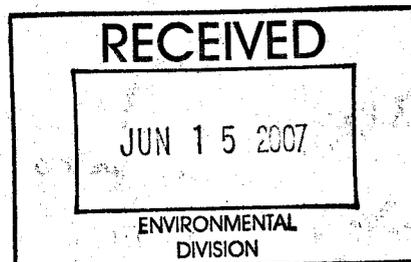
Photo Station 12

December 20, 2006

Ms. Lesley Leonard  
U.S. Army Corps of Engineers  
803 Front Street  
Norfolk, VA 23510

Ms. Debra Trent  
Department of Environmental Quality  
5636 Southern Boulevard  
Virginia Beach, VA 23462

RE: Permit # 02-V2002  
Section 12 – Fords Colony

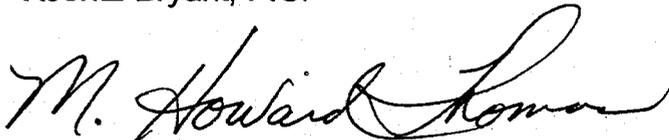


Dear Lesley and Debra:

Enclosed please find the third annual monitoring report for the stormwater management ponds in Section 12 at Fords Colony. We have included sedimentation data for all eight sampling stations, as well as photographs from all twelve photo stations shown on the enclosed maps.

If you have any questions or need additional information, please give me a call.

Sincerely,  
Koontz-Bryant, P.C.



M. Howard Thomas, P.W.S.  
Director of Environmental Services

Enclosures

Copy: Mr. Drew Mulhare

MHT/swg/99465

5-51-02

**FORDS COLONY – SECTION 12  
STATUS REPORT 2006  
STORMWATER MANAGEMENT PONDS  
PERMIT #02-V2002**

The enclosed data and information constitutes the second annual monitoring report for the above-cited stormwater management ponds.

**Photographic Analysis**

Photographs were taken in the same relative positions as in the baseline report submitted May 15, 2003. These photographic stations are shown on the enclosed maps.

**Vegetation Analysis**

No changes were noted in the assessment of existing species at each sampling station. Each of the eight sampling sites have an aerial coverage of approximately 85%. A 20" Tulip Poplar and a 8" Sweet Gum have died just upstream of cribwall #2. There were no major changes in species type from the baseline report in any of the sites. We recommend that the stormwater management ponds be left to progress without disturbance.

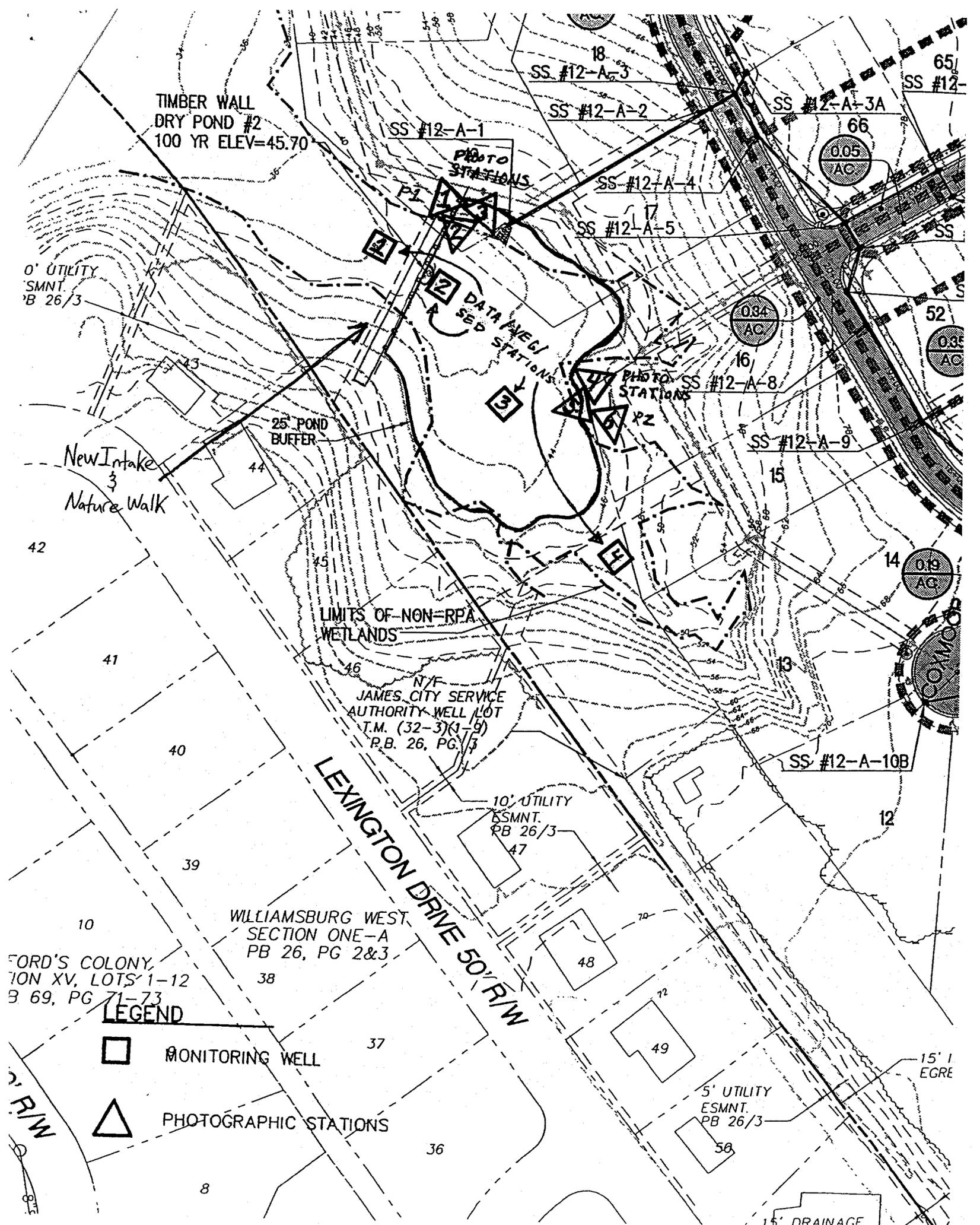
**Sedimentation Analysis**

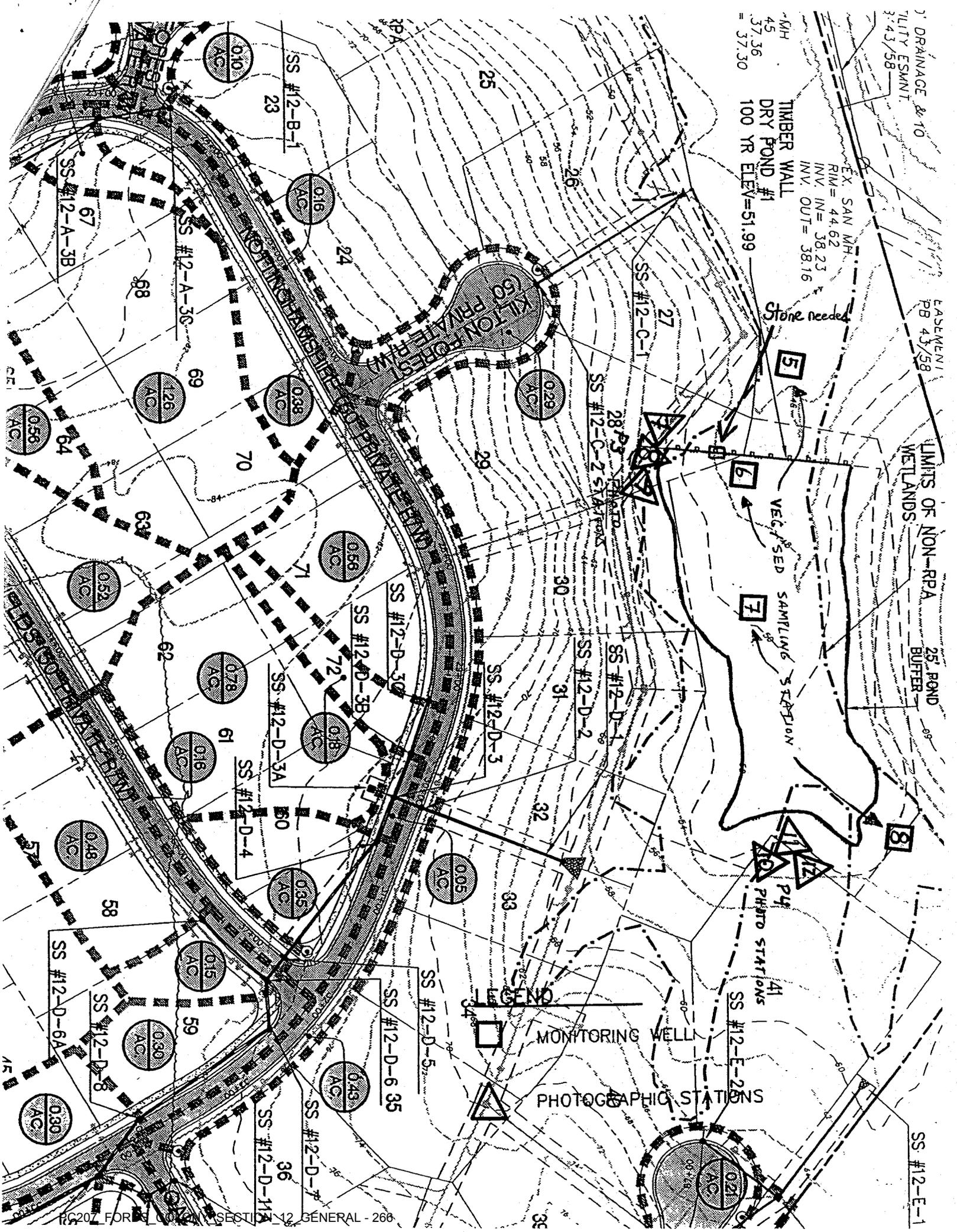
- D-1: No sediment deposition
- D-2: No sediment deposition
- D-3: No sediment deposition
- D-4: 0.25-0.5" little sedimentation
- D-5: 0.25-0.5" little sedimentation
- D-6: 0.25-0.5" little sedimentation
- D-7: 1-2" in channel no visible deposition in wetland
- D-8: No sediment deposition

Displaced infiltration stone at cribwall #2 should be replaced in the 3 ft area shown on the attached photo #7.

**Summary**

Based on the data above and enclosed, we recommend the addition of stone above and below the 3 ft section along cribwall #2 once completed the stormwater management ponds should be left to progress naturally without any disturbance. Our fifth year report will be submitted by September 30, 2008. If you have any questions or comments, please contact Steve Gibson at Koontz-Bryant, P.C., (804) 740-9200.





3' DRAINAGE & 10  
 UTILITY ESMNT  
 3:43/58  
 EX. SAN MH  
 RIM = 44.62  
 INV. IN = 38.23  
 INV. OUT = 38.16  
 TIMBER WALL  
 DRY POND #1  
 100 YR ELEV = 51.99  
 45  
 37.36  
 37.30

EASEMENT  
 PB 43/58

LIMITS OF NON-RPA  
 WETLANDS  
 25' POND  
 BUFFER

Stone Needed

5

6

VEG. SED  
 SAMPLING  
 STATION

7

8

PHOTO  
 STATIONS

41

SS #12-E-2

LEGEND

MONITORING WELL

PHOTOGRAPHIC STATIONS



Photo Station 1



Photo Station 2



Photo Station 3



Photo Station 4



Photo Station 5



Photo Station 6



Photo Station 7



Photo Station 8



Photo Station 9



Photo Station 10



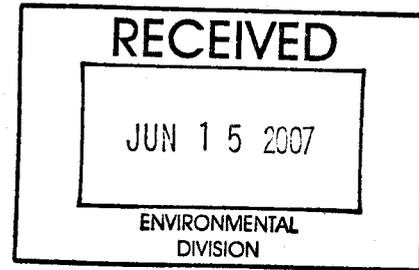
Photo Station 11



Photo Station 12

June 14, 2007

Mr. Scott Thomas  
James City County  
P.O. Box 8784  
Williamsburg, VA 23187-8784



RE: Fords Colony Crib Walls

Dear Mr. Thomas:

Attached please find crib wall monitoring reports for **Sections 12 and 30** at Fords Colony. The Corps of Engineers and Department of Environmental Quality have approved all monitoring reports to date. We will send you the final monitoring reports upon completion.

The data collections to date (approximately 4 years) have not identified any significant sediment deposition within the wetlands above the crib walls. Only a few minor areas with less than 2" of sediment have occurred. There has been no detectable change in the vegetation above or below the crib walls. One could say that the crib walls have been an excellent alternative to the typical BMP. If you have any questions or need additional information, please give me a call (804) 874-9315.

Sincerely,  
Koontz-Bryant, P.C.



M. Howard Thomas, P.W.S.  
Director of Environmental Services

Enclosures

CC: Mr. Drew Mulhare  
Mr. Jason Grimes

MHT/swg/9465