Stormwater Division

MEMORANDUM

DATE: March 4, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: PC204

PIN: 3210100018

Subdivision, Tract, Business or Owner Name (if known): Williamsburg James City County Schools

Property Description: Warhill High School

Site Address: 4615 Opportunity Way

(For internal use only) **Box** 5 **Drawer:** 3

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

Comments

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- STORMW ATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HA VE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMPNUMBER: **PC204**

DATE VERIFIED: **April 21, 2016**

QUALITY ASSURANCE TECHNICIAN: **Charles E. Lovett II**

LOCATION: WILLIAMSBURG, VIRGINIA

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There is no grantor's tax (Section 58.1-802 of the Code of Virginia) payable on recording this instrument since the conveyance hereunder is made subject to liens which have a value which is greater than the value of the property hereby conveyed and the amount of consideration paid and/or credited to the grantor.

DEED

THIS DEED, made as of this 30th day of December, 1993, by and among **WARHILL ASSOCIATES LIMITED PARTNERSHIP**, a Virginia limited partnership (hereinafter referred to as "Warhill"), grantor for purposes of indexing, and **TMB SERVICE CORP.**, a Kansas corporation ("TMB"), grantee for purposes of indexing, whose address is 5201 Johnson Drive, Mission, Kansas 66205.

WHEREAS, Warhill filed a petition for relief under Chapter 11 of the Bankruptcy Code, 11 U.S.C. § 1101, et seq., in the United States Bankruptcy Court for the Eastern District of Virginia, Newport News Division (the "Bankruptcy Court"), Bankruptcy Case No. 93-41345-T (the "Bankruptcy Case"); and

WHEREAS, on or about October 28, 1993, Warhill filed a Motion to Sell Real Property Free and Clear (the "Motion to Sell"), its ± 835 acres of undeveloped real property located in James City County, Virginia (the "Property"), which Property is hereinafter more fully described, to The Mission Bank, a Kansas banking corporation ("Mission"), or its designee; and

WHEREAS, TMB is the designee of Mission for purposes of the Motion to Sell; and

WHEREAS, the Property was made subject to, inter alia, the following liens and encumbrances:

(A) The lien of that certain deed of trust in favor of Mission, dated May 30, 1991 (the "First Deed of Trust"), recorded in the Clerk's Office of the Circuit Court of the City of Williamsburg and County of James City, Virginia (the "Clerk's Office") in Deed Book 518 at page 81, securing repayment of a certain promissory note dated May 31, 1991, in the original principal amount of $8,800,000 (the "First Note");

(B) The lien of that certain deed of trust in favor of Virginia International Finance and Development Inc. ("VIFD"), dated May 30, 1991 (the "Second Deed of Trust"), recorded in the Clerk's Office in Deed Book 518 at page 115, securing repayment of a certain promissory note dated May 30, 1991, in the original principal amount of $1,000,000;

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RET TO WILLCOX & SAVAGE, 1800 NATIONSBANK CENTER, NORFOLK, VA 23501 1/28/94

(C) The lien of that certain deed of trust in favor of Mission dated May 30, 1991 (the "Third Deed of Trust"), recorded in the Clerk's Office in Deed Book 518 at page 139, securing repayment of a certain promissory note dated May 30, 1991, in the original principal amount of $3,200,000;

(D) The lien of that certain deed of trust in favor of Mission, dated May 30, 1991 (the "Fourth Deed of Trust"), recorded in the Clerk's Office in Deed Book 518 at page 173, securing repayment of a certain promissory note dated May 30, 1991, in the original principal amount of $3,800,000; and

(E) A lien, pursuant to Virginia law, securing repayment of the real property taxes assessed by the County of James City, Virginia (the "Tax Lien"); and

WHEREAS, pursuant to the terms of the Motion to Sell, Warhill was to sell the Property to Mission or its designee free and clear of all liens, encumbrances and/or interests including the Second Deed of Trust, but not free and clear of the liens evidenced by the First Deed of Trust, Third Deed of Trust, Fourth Deed of Trust and any and all liens and encumbrances superior in priority to the First Deed of Trust; and

WHEREAS, a hearing on the Motion to Sell was held before the Bankruptcy Court on December 28, 1993, and at such hearing the Bankruptcy Court approved the sale contemplated by the Motion to Sell; and

WHEREAS, the Motion to Sell is part of a global settlement involving, inter alia, Warhill, Mission, VIFD and the Estate of Michael J. Floersheim, as set forth in that certain Motion to Approve Compromise and Settlement, filed by Warhill on October 28, 1993, which settlement was approved by the Bankruptcy Court at a hearing held on December 28, 1993; and

WHEREAS, pursuant to the terms of the Motion to Sell, and as partial consideration for the transfer of the Property, Mission shall credit $7,250,000.00 to the indebtedness evidenced by the First Note.

WITNESSETH:

That for and in consideration of the sum of $7,250,000.00 to be credited to the indebtedness evidenced by the First Note, repayment of which is secured by the lien of the First Deed of Trust, and for other good and valuable consideration, the receipt of which is hereby acknowledged, Warhill does hereby grant, bargain, sell and convey, with special warranty, unto TMB the following described property, to-wit:

See Exhibit A attached hereto which is incorporated herein by this reference.

TO HAVE AND TO HOLD the above-described Property, with all and singular the rights, privileges, appurtenances and immunities belonging or in any manner pertaining to said above-described Property, unto TMB and its successors and assigns forever.

This conveyance is expressly made subject to the liens evidenced by the First Deed of Trust, Third Deed of Trust, Fourth Deed of Trust, and any and all encumbrances, rights, reservations, covenants, conditions, easements, restrictions and statutory liens, if any, having priority over the First Deed of Trust as they may lawfully affect the Property, and to no other liens, encumbrances, rights, reservations covenants, conditions, easements, restrictions or statutory liens.

Conveyance of the Property hereunder is an absolute conveyance and is made not for purposes of additional security but rather in consideration of the above-described credit against the indebtedness secured by the First Deed of Trust.

Such conveyance is not intended to cause any merger of any of the liens or security interests created in favor of Mission under the First Deed of Trust, the Third Deed of Trust and/or the Fourth Deed of Trust with or into the fee simple title to the Property, notwithstanding the fact that TMB is a wholly-owned subsidiary of Mission.

WITNESS the following signature as of the day and year first hereinabove written.

WARHILL ASSOCIATES LIMITED PARTNERSHIP

By: PARK CENTRAL PLAZA DEVELOPMENT CORPORATION, as General Partner

By: _____
Name: Mark W. Whitesell
Title: President

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ACKNOWLEDGMENT

STATE OF Missouri)
) ss.
COUNTY OF Jackson)

On this 30th day of December, 1993, before me appeared Mark W. Untersee, to me personally known, who being duly sworn, did say that he /she is the President of PARK CENTRAL PLAZA DEVELOPMENT CORPORATION, a Missouri corporation, and that said corporation is a General Partner of WARHILL ASSOCIATES LIMITED PARTNERSHIP, a Virginia limited partnership, and said President acknowledged execution of the foregoing instrument to be the free act and deed of said corporation in its capacity as General Partner of WARHILL ASSOCIATES LIMITED PARTNERSHIP.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my official seal the day and year last above written.

Molly A. Force
Notary Public

My Commission Expires:

MOLLY A. FORCE
Notary Public-State of Missouri
Commissioned in Jackson County
My Commission Expires July 16, 1994

MOLLY A. FORCE NOTARY SEAL NOTARY PUBLIC STATE OF MISSOURI

WARHILL.DOT
09/12/93/DAG/dh/14

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EXHIBIT A

TO
DEED

{Legal Description of Property}

That certain tract of land situate in James City County, Virginia, known as "Warhill", containing 835.8 acres, more or less, but sold in gross and not by the acre, all as shown in plat of survey consisting of three sheets entitled, "BOUNDARY SURVEY OF WARHILL TRACT, JAMES CITY COUNTY, BERKELEY DISTRICT, VIRGINIA", dated May 13, 1991, made by Rickmond Engineering, Inc., a copy of which is recorded in the Clerk's Office of the Circuit court of the County of James City, Virginia, in Plat Book 54, page 44-46. Included within the property here conveyed is all of that certain subdivided property as shown on plat entitled, "WARHILL, SECTION ONE, SUBDIVISION PLAT, JAMES CITY COUNTY, VIRGINIA", made by Rickmond Engineering, Inc., dated August 31, 1987, recorded in the Clerk's Office for the Circuit Court of the City of Williamsburg and County of James City in Plat Book 53, pages 52 and 53.

LESS AND EXCEPT that certain portion of property described under certificate of take recorded by instruments recorded in the aforesaid Clerk's Office in Deed Book 605, page 377; in Deed Book 549, page 218; Deed Book 608, page 402; Deed Book 619, page 685.

...Williamsburg and County of James City, to Wit:
...for the City of Williamsburg and County of
J... 10... of ... Jne ... 19 94
T... ...state and admitted to record
at 2:14 ...as required by Sect. 58-54 (a) and (b) of the code.
Ne...

	STATE TAX	ADDITIONAL TAX
$	10,815.10	$ 3615.00 $ 369.52

Teste: ... Clerk
By: Deputy Clerk

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N:\HOME\BIVERS\WARHILL.DEE

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BOOK 435 PAGE 207

THIS AGREEMENT, Made this 23rd day of May, 1989, between VIRGINIA INTERNATIONAL FINANCE AND DEVELOPMENT, INC., a Virginia corporation, hereinafter called "Owners"; and VIRGINIA ELECTRIC AND POWER COMPANY, a Virginia corporation; hereinafter called "Company".

W I T N E S S E T H:

That, for the sum of TEN DOLLARS ($ 10.00), the receipt whereof is hereby acknowledged, Owners hereby grants unto Company, its successors and assigns, the perpetual non-exclusive right, privilege and easement of right of way to improve, operate and maintain a roadway over, upon and across the lands of Owner situated in the County of James City, Virginia, as shown on Plat No. C & D, hereto attached and made a part of this agreement, for ingress to and egress from certain property owned or to be purchased by Company, the approximate location of said right of way being shown on said plat and being described as follows:

Parcel C

Beginning at a point in the property line dividing Owner's property and property to be purchased by Virginia Electric and Power Company; thence S. 55° 53' 00" W. 50.00 feet along said property line to a point in the northeasterly boundary line of a certain existing 200-foot right of way of Company; thence N. 34° 07' 00" W. 2187.07 feet along said right of way line to a point; thence N. 55° 53' 00" E. 50.00 feet to a point; thence S. 34° 07' 00" E. 2187.07 feet to the point of beginning.

Parcel D

Beginning at a point in the centerline of a proposed 50-foot access road easement, which point is N. 55° 53' 00" E. 25.00 feet from a point in the northerly line of an existing 200-foot right of way of Company; thence northeastwardly being a curve to the right, having a radius of 76.26 feet, an arc distance of 100.10 feet to a point; thence N. 41° 05' 34" E. 175.19 feet to a point; thence northeastwardly being a curve to the right having a radius of 849.32 feet, an arc distance of 399.15 feet to a point; thence N. 68° 01' 10" E. 141.62 feet to a point; thence northeastwardly being a curve to the right having a radius of 1321.14 feet, an arc distance of

Returned to Gordon Abstract & Escrow Co., P. O. Box 885, Hayes, Va. 23072-0885 6/2/89

147.21 feet to a point; thence N. 74° 24' 14" E. 331.26 feet to a point; thence northeastwardly being a curve to the left having a radius of 1794.81 feet, an arc distance of 431.57 feet to a point; thence N. 60° 37' 36" E. 181.79 feet to a point; thence northeastwardly being a curve to the left having a radius of 6465.56 feet, an arc distance of 179.99 feet to a point; thence N. 62° 13' 19" E. 164.71 feet to a point; thence northwesterly being a curve to the left having a radius of 114.03 feet, an arc distance of 164.31 feet to a point thence northwestwardly being a curve to the right having a radius of 286.11 feet, an arc distance of 76.32 feet to a point; thence N. 5° 03' 22" W. 232.99 feet to a point in the southerly line of State Highway Route No. 614 (Centerville Road), which point is westwardly 842 feet, more or less, along said road line from its intersection with the centerline of the east bound lane of State Highway Route No. 60.

The parties hereto hereby agree that use of the perpetual non-exclusive right, privilege and easement of right of way shall not be inconsistent with the rights herein conveyed and shall not interfere with the use of such easement by Company for the purposes aforesaid.

Company shall be liable for all damages to road caused by the exercise of right of ingress and egress, and Company shall make necessary repairs to the road when such damage results from Company's use of the road.

Owners covenant that they are seised of and have the right to convey said easement of right of way, rights and privileges; that Company shall have quiet and peaceable possession, use and enjoyment of said right of way, rights and privileges, and that Owners shall execute such further assurances thereof as may be requisite.

IN WITNESS WHEREOF: the Owner has caused its corporate name to be signed hereto by its President, all as of the day and year first above written.

VIRGINIA INTERNATIONAL FINANCE AND DEVELOPMENT, INC.

By _____
President

STATE OF Virginia Beach)
) To-wit:
City OF Williamsburg

I, Claire B. Buckle, a Notary Public in and for the City aforesaid, ~~County aforesaid,~~ State of Virginia at Large, whose commission expires on the 8th day of December, 1991, do hereby certify that Walter J. Scruggs, whose name is signed to the forgoing writing dated the 23rd day of May, 1989, as President, of Virginia International Finance & Development Inc, acknowledged the same before me in the City aforesaid this 23rd day of May, 1989.

Claire B. Buckle
Notary Public

VIRGINIA: City of Williamsburg and County of James City, to Wit:
In the Clerk's office of the Circuit Court of the City of Williamsburg and County of James City the 23 day of May, 1989. This Agree was presented with certificate annexed and admitted to record at 3:39 o'clock
Teste: Helene S. Ward, Clerk
by Helene S. Ward
Deputy Clerk

PLAT RECORDED IN
P.B. NO. 50 PAGE 28 & 79

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

Project Name: Third HS (Warhill HS) WJCC Schools
County Plan No.: SP-41-05
Stormwater Management Facility: ~~1~~ #3 Pond/Wetland System
BMP Phase #: ☐ I ☐ II ☒ III
☑ Information Package Received. Date/By: Aug 8 2007 Timmons
☐ Completeness Check:
- ☑ Record Drawing Date/By: 8/8/07 Timmons
- ☑ Construction Certification Date/By: 8/8/07 Timmons
- ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☐ Insp/Maint Agreement # / Date: (Need)
- ☐ BMP Maintenance Plan Location: C-26
- ☐ Other:

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

☐ 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: 8/9/07 SJT
☑ Record Drawing (RD) Review Date: 8/14/07 SJT
☑ Construction Certification (CC) Review Date: 8/14/07 SJT
☐ Actions:
- ☐ No comments.
- ☑ Comments. Letter Forwarded. Date: 8/14/07
- ☑ Record Drawing (RD)
- ☐ Construction Certification (CC)
- ☑ Construction-Related (CR)
- ☐ Site Issues (SI)
- ☐ Other : No ilm agreement ever obtained.

☐ Second Submission:
☑ Reinspection (if necessary): PERFORMED BY SJT - REGULAR WEEKLY TREA INSPECTION PROCESS.
☑ 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. 2-29-08
☑ 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: Matthew J. Timmons Date: 02/28/08

*** See separate checklist, if needed.

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification

Standard Forms & Instructions

Pc 204

Issue Date
February 1, 2001

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: Third High School (Warhill HS)
Structure/BMP Name: Third High School BMP
Project Location: Southwest of the Intersection of U.S. Rt. 60 and Rt. 199
BMP Location: South End of School Site
County Plan No.: SP - 41 - 05

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

Tax Map/Parcel No.: _____
BMP ID Code (if known): PC 207
Zoning District:: _____
Land Use: Public School
Site Area (sf or acres): 54.5 ACRES

Brief Description of Stormwater Management/BMP Facility: BMP to SERVE the JAMES City County Eighth ELEMENTARY School

Nearest Visible Landmark to SWM/BMP Facility: _____

Nearest Vertical Ground Control (if known):
☐ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: _____
Datum or Reference Elevation: _____
Control Description: _____
Control Location from Subject Facility: _____

Section 2 - Stormwater Management / BMP Facility Construction Information:

PreConstruction Meeting Held for Construction of SWM/BMP Facility: ☐ Yes ☐ No ☒ Unknown
Approx. Construction Start Date for SWM/BMP Facility: NOVEMBER 2005
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: Curtis Contracting
Name of Professional Firm Who Routinely Monitored Construction: ENGINEERING Consulting SERVICES
Date of Completion for SWM/BMP Facility: JANUARY 2006
Date of Record Drawing/Construction Certification Submittal: 8/8/07

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

Section 3 - Owner / Designer / Contractor Information:

Owner/Developer: *(Note: Site Owner or Applicant responsible for development of the project.)*

Name: JAMES City County Public Schools
Mailing Address: 101-D MOUNTS BAY Road
Williamsburg, VA 23185
Business Phone: (757) 253-6777 Fax: (757) 229-3027
Contact Person: MICHAEL THORTON 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: Timmons Group
Mailing Address: 1001 Boulders Parkway, Suite 300
Richmond, VA 23225
Business Phone: (804) 200-6500
Fax: (804) 560-1016
Responsible Plan Preparer: Steve Baugh
Title: Project MANAGER
Plan Name: Third High School
Firm's Project No. 21151
Plan Date: July 3, 2005
Sheet No.'s Applicable to SWM/BMP Facility: C0.0 C2.6 C4.2 C5.11

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

Name: Curtis Contracting
Mailing Address: 7481 Theron Rd. PO Box 769
West Point, VA 23181
Business Phone: (804) 843-4633
Fax: (804) 843-2545
Contact Person:
Site Foreman/Supervisor:
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: Timmons Group
Mailing Address: 1001 Boulders Parkway Suite 300 Richmond, VA 23225
Business Phone: (804) 200-6500
Fax: (804) 794-1899

Name: GENE W. HATCHER
Title: SENIOR ENGINEER
Signature:
Date: 8/8/07

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.

COMMONWEALTH OF VIRGINIA
GENE W. HATCHER
Lic. No. 013067
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: Timmons Group
Mailing Address: 1001 Boulders Parkway, Suite 300 Richmond, VA 23225
Business Phone: (804) 200-6500
Fax: (804) 794-1899

Name: GENE W. HATCHER
Title: SENIOR ENGINEER
Signature:
Date: 8/8/07

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

COMMONWEALTH OF VIRGINIA
GENE W. HATCHER
Lic. No. 013067
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer

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

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

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

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

XX 4. All plan sheet revision blocks modified to indicate date and record drawing status.

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

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

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

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

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.

N/A 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.

N/A 8. Elevation of the principal spillway crest or outlet crest of the structure.

N/A	9.	Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.
N/A	10.	Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.
XX	11.	Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.
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.
N/A	16.	Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.
N/A	17.	BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.
N/A	18.	Maintenance plan taken from approved design plan transposed onto record drawing set.
N/A	19.	Fencing location and type, if applicable to facility.
XX	20.	BMP vicinity properly cleaned of stockpiles and construction debris.
XX	21.	No visual signs of erosion or channel degradation immediately downstream of facility.
XX	22.	Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

III. Group A - Wet Ponds *(Includes A-1 Small Wet Ponds; A-2 Wet Ponds; A-3 Wet Ext Det Ponds.)*

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

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

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

N/A A4. Access for maintenance and equipment is provided to the forebay(s). Access corridors are at least 12 ft. wide, have a maximum slope of 15 percent and are adequately stabilized to withstand heavy equipment or vehicle use.

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

N/A A6. Pond liner (if required) provided. Either clay liners, polyliners, bentonite liners or use of chemical soil additives based on requirements of the approved plan.

N/A A7. Minimum 6 percent slope safety bench extending a minimum of 15 feet outward from normal pool edge and/or an aquatic bench extending a minimum of 10 feet inward from the normal shoreline with a maximum depth of 12 inches below the normal pool elevation, if applicable, per the approved design plans. (Note: Safety benches may be waived if pond side slopes are no steeper than 4H:1V).

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

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

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

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

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

N/A A13. End walls above barrels (outlet pipe) greater than 48 inch in diameter are fenced to prevent a fall hazard.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

IV. Group B - Wetlands *(Includes B-1 Shallow Marsh; B-2 Ext Det Shallow Wetlands; B-3 Pond Wetland System and B-4 Pocket Wetland)*

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

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

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

N/A B4. Wetland type landscaping provided in accordance with approved plan. Includes correct pondscaping zones, plant species, planting arrangements, wetland beds, etc. Wetland plants include 5 to 7 emergent wetland species. Individual plants at 18 inches on center in clumps.

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

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

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

N/A B8. Planting zones staked or flagged in field and locations subsequently established by appropriate field surveying methods for record drawing presentation.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

V. Group C - Infiltration Practices *(Includes C-1 Infiltration Trench; C-2 Infiltration Trench; C-3 Infiltration Basin; and C-4 Infiltration Basin)*

N/A C1. All requirements of Section II, Minimum Standards, apply to Group C facilities as applicable.

N/A C2. Facility is not located on fill slopes or on natural ground in excess of six (6) percent.

N/A C3. Pretreatment devices provided prior to entry into the infiltration facility. Acceptable pretreatment devices include sediment forebays, sediment basins, sediment traps, sump pits or inlets, grass channels, plunge pools or other acceptable measures.

N/A C4. Three (3) or more of the following pretreatment devices provided to protect long term integrity of structure: grass channel; grass filter strip; bottom sand layer; upper filter fabric layer; use of washed bank run gravel aggregate.

N/A C5. Sides of infiltration practice lined with filter fabric.

N/A C6. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A C7. Stabilization and acceptable vegetative cover established over contributing drainage area prior to conveyance of stormwater to the facility.

N/A C8. Minimum one hundred (100) foot separation horizontally from any known water supply well and minimum one hundred (100) foot separation upslope from any building.

N/A C9. Minimum twenty-five (25) foot separation down gradient from any structure.

N/A C10. Stormwater outfalls provided for overflow associated with larger design storms.

N/A C11. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A C12. Facility does not currently cause any apparent surface or subsurface water problems to downgrade properties.

N/A C13. Observation well provided.

N/A C14. Adequate, direct access provided to the facility for future maintenance, operation and inspection.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

VI. Group D - Filtering Systems *(Includes D-1 Bioretention Cells; D-2 Surface Sand Filters; D-3 Underground Sand Filters; D-4 Perimeter Sand Filters; D-5 Organic Filters; and D-6 Pocket Sand Filters)*

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

N/A D2. Sediment pretreatment devices provided.

N/A D3. For D-1 BMPs (Bioretention Cells), pretreatment consisting of a grass filter strip below level spreader (deflector); a gravel diaphragm; and mulch and planting soil layers were provided.

N/A D4. For D-1 BMPs (Bioretention Cells), plantings consist of native plant species; vegetation provided was based on zones of hydric tolerances; trees and understory of shrubs and herbaceous materials were provided; woody vegetation is absent from inflow locations; and trees are located around facility perimeter.

N/A D5. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

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

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

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

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

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

N/A D11. Minimum fifty (50) foot separation from any slope fifteen (15) percent or greater. Minimum one hundred (100) foot separation horizontally from any known water supply well. Minimum one hundred (100) foot separation upslope and twenty-five (25) foot separation downslope from any building.

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

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

N/A D14. Adequate, direct access provided to the pretreatment area and/or filter bed for future maintenance.

STORMWATER MANAGEMENT / BMP FACILITIES
AS-BUILT PLAN CHECKLIST

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

VII. Group E - Open Channel Systems *(Includes E-1 Wet Swales (Check Dams); E-2 Dry Swales;and E-3 Biofilters)*

N/A	E1.	All requirements of Section II, Minimum Standards, apply to Group E facilities as applicable.
N/A	E2.	Open channel system has constructed longitudinal slope of less than four (4) percent.
N/A	E3.	No visual signs of erosion in the open channel system's soil and/or vegetative cover.
N/A	E4.	Open channel side slopes are no steeper than 2H:1V at any location. Preferred channel sideslope is 3H:1V or flatter.
N/A	E5.	No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).
N/A	E6.	For E-2 BMPs (Dry Swales), an underdrain system was provided.
N/A	E7.	Treated timber or rock check dams provided as pretreatment devices for the open channel system.
N/A	E8.	Gravel diaphragm provided in areas where lateral sheet flow from impervious surfaces are directly connected to the open channel system.
N/A	E9.	Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.
N/A	E10.	Open channel system areas with grass covers higher than four (4) to six (6) inches were properly mowed.
N/A	E11.	Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.
N/A	E12.	No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.
N/A	E13.	For E-3 BMPs (Biofilters), the bottom width is six (6) feet maximum at any location.
N/A	E14.	For E-3 BMPs (Biofilters), sideslopes are 3H:1V maximum at any location.
N/A	E15.	For E-3 BMPs (Biofilters), the constructed channel slope is less than or equal to three (3) percent at any location.
N/A	E16.	For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

N/A F1. All requirements of Section II, Minimum Standards, apply to Group F facilities.

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

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

N/A F4. Forebay provided approximately 20 ft. upstream of the facility. Forebays generally 4 to 6 feet in depth.

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

N/A F6. Principal spillway and outlet barrel provided consisting of reinforced concrete pipe with O-Ring gaskets for watertight joint construction.

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

N/A F8. Low flow orifice, if used, has a minimum diameter of three (3) inches or two (2) inches if internal orifice control was utilized and a small, cage type external trash rack.

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

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

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

N/A F12. Stilling basin or standard outlet protection provided at principal spillway outlet.

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

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

N/A F15. No visual signs of erosion or channel degradation immediately downstream of facility.

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

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

IX. Group G - Open Spaces *(Includes All Open Space Types G-1; G-2; and G-3)*

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

N/A G2. Constructed impervious areas appear to conform with locations indicated on the approved plan and appear less than sixty (60) percent impervious in accordance with the requirements of the James City County Chesapeake Bay Preservation Ordinance.

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

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

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

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

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

(Includes all incidental stormwater drainage conveyance systems associated with SWM/BMP facilities such as onsite or offsite storm drains, open channels, inlets, manholes, junctions, outlet protections, deflectors, etc. These facilities are external to the treatment function of, but are directly associated with drainage to and/or from a constructed SWM/BMP facility. The intent of this portion of the certification is to accurately identify the type and quantity of inflow or outflow points associated with the facility for future reference. The Professional may use his/her own discretion to determine inclusive facilities to meet the intent of this section. As a general rule, storm drainage systems would include incidental facilities to the nearest access structure upslope or downslope from the normal physical limits of the facility or 800 feet of storm drainage conveyance system length, whichever is less.)

XX SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

XX SD2. Horizontal location of all pipe and structures relative to the SWM/BMP facility.

XX SD3. Type, top elevation and invert elevation of all access type structures (inlets, manholes, etc.).

XX SD4. Material type, size or diameter, class, invert elevations, lengths and slopes for all pipe segments.

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.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

XIII. References *(The James City County Record Drawing and Construction Certification Forms and Checklists for Stormwater Management / BMP facilities were developed using the following sources and references.)*

- ☐ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.
- ☐ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).
- ☐ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.
- ☐ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.
- ☐ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.
- ☐ Prince William County, Virginia, Stormwater Management Fact Sheet.
- ☐ Stafford County, Virginia, As-Built Plan Checklist.
- ☐ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.
- ☐ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.
- ☐ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.
- ☐ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.
- ☐ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

File: Shared\SWMProg\BMP\Certif\RDCC.wpd

THIRD HIGH SCHOOL

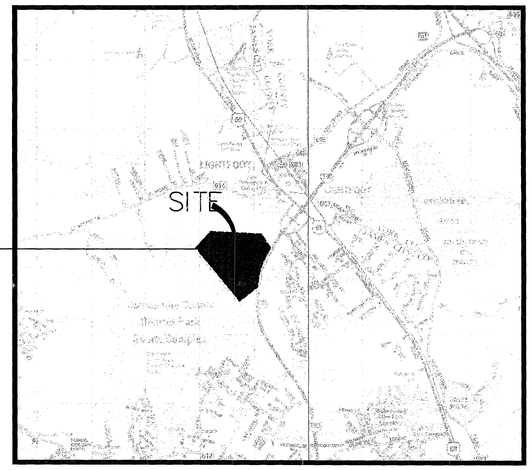
WILLIAMSBURG – JAMES CITY COUNTY, VIRGINIA

SITE PLAN

BMP AS-BUILT

RESPONSIBLE LAND DISTURBER
SITE PLAN REVIEW: STEVE RAUGH
CONSTRUCTION:

BMP AS-BUILT DRAWINGS:
THE STORMWATER MANAGEMENT/BMP FACILITIES FOR THIS PROJECT WILL REQUIRE SUBMISSION, REVIEW AND APPROVAL OF RECORD DRAWINGS (AS-BUILTS) AND CONSTRUCTION CERTIFICATIONS PRIOR TO RELEASE OF THE POSTED BOND/SURETY. ALL RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS SHALL COMPLY WITH COUNTY GUIDELINES.



VICINITY MAP
SCALE: 1" = 2,000'

SHEET INDEX

SITE DATA

TAX MAP/PARCEL NOS: (32-1)(1-12) AND (32-1)(1-13)
ADDRESS: 4615 OPPORTUNITY WAY
ZONING: PUD-R, WITH PROFFERS (CASE NO. Z-6-05)
MAGISTERIAL DISTRICT: POWHATAN

TOTAL PROJECT AREA:	2374029 S.F.±	54.5 AC.±
IMPERVIOUS AREA:	739189 S.F.±	16.9 AC.±
OPEN SPACE:	1634840 S.F.±	37.6 AC.±
DISTURBED AREA:	1864375 S.F.±	42.8 AC.±

FLOOR AREA: 247,500 S.F.±
NUMBER OF FLOORS: ONE STORY AND TWO STORY
BUILDING HEIGHT: 41'±

NOTE:

1. THIS SITE PLAN WAS REVIEWED BY THE DEVELOPMENT REVIEW COMMITTEE ON JUNE 1, 2005, IN ACCORDANCE WITH SECTION 24-147 OF THE JAMES CITY COUNTY ZONING ORDINANCE.
2. ALL SIGNAGE SHALL BE IN ACCORDANCE WITH ARTICLE II, SECTION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE.
3. ALL UTILITIES SHALL BE PLACED UNDERGROUND.
4. THIS PROJECT IS SITUATED WITHIN THE POWHATAN CREEK WATERSHED, SUB-WATERSHED 205, AND CATCHMENTS 205-106-1, 205-107-1 AND 205-108-1.

OWNER & DEVELOPER
JAMES CITY COUNTY
PUBLIC SCHOOLS
MR. MICHAEL THORNTON
101-D MOUNTS BAY ROAD
WILLIAMSBURG, VIRGINIA 23185
PHONE: (757) 253-6777
FAX: (757) 229-3027

ENGINEER
TIMMONS GROUP
MR. STEVE RAUGH
1001 BOULDERS PARKWAY, SUITE 300
RICHMOND, VIRGINIA 23225
PHONE: (804) 200-6500
FAX: (804) 560-1016

Pc 204
CASE NO. SP-41-05

RECEIVED
JAN 16 2008
ENVIRONMENTAL DIVISION

APPROVAL

APPROVED
James City County
Environmental Division
By: _____
Date: _____

APPROVED
James City County
Environmental Division
By: [signature]
Date: 02-14-08

REVISIONS

NO.	SHEET NUMBER	REVISION DESCRIPTION	DATE
1	ALL DRAWINGS	COUNTY COMMENTS	07-03-05
2	ALL DRAWINGS	COUNTY COMMENTS	10-20-05
3	ALL DRAWINGS	COUNTY COMMENTS	11-30-05
4	C1.2, C1.3, C4.5, C5.0	COUNTY COMMENTS	12-21-05

STORMWATER RECORD DRAWINGS-1/15/08

MOSELEY ARCHITECTS
A PROFESSIONAL CORPORATION
601 SOUTH LAKE BOULEVARD, RICHMOND, VIRGINIA, 23236
PHONE (804) 794-7555 FAX (804) 379-8660
MOSELEYARCHITECTS.COM

TIMMONS GROUP
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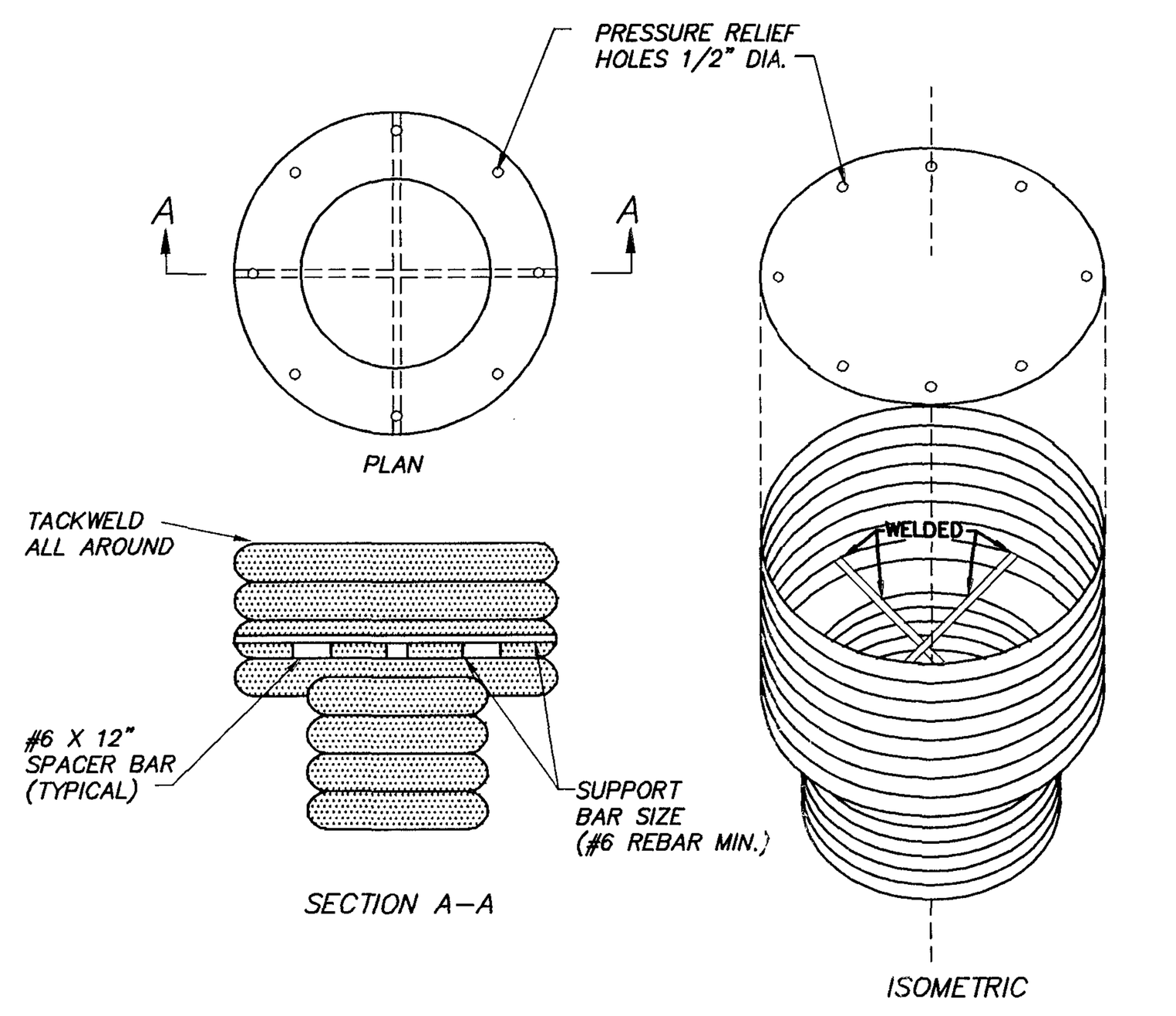
CORPORATE OFFICE
1001 Boulders Parkway, Suite 300
Richmond, VA 23225
TEL 804.560.1010
FAX 804.560.1016
www.timmons.com

THIRD HIGH SCHOOL
SDE NO. 131-17A
WILLIAMSBURG - JAMES CITY COUNTY PUBLIC SCHOOLS
WILLIAMSBURG - JAMES CITY COUNTY, VIRGINIA

PROJECT NO: 430200
DATE: JULY 3, 2005
REVISIONS: MARCH 1, 2006
DRAWN BY: CJT
REVIEWED BY: SEB

COVER SHEET

C0.0



TOP IS 16 GAGE CORRUGATED METAL OR 1/8" STEEL PLATE. PRESSURE RELIEF HOLES MAY BE OMITTED, IF ENDS OF CORRUGATIONS ARE LEFT FULLY OPEN WHEN THE TOP IS ATTACHED.

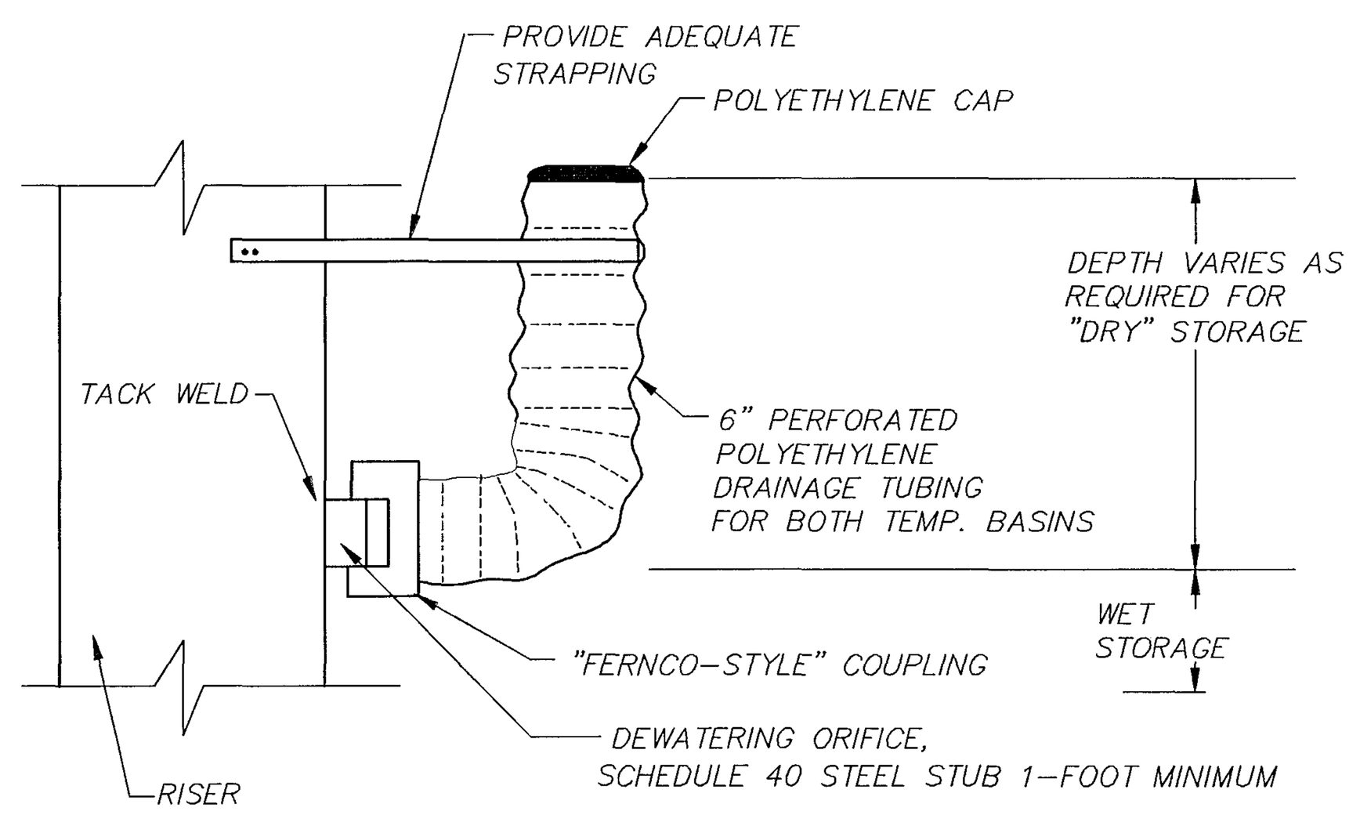
CYLINDER IS 16 GAGE CORRUGATED METAL PIPE OR FABRICATED FROM 1/8" STEEL PLATE.

NOTES:

1. THE CYLINDER MUST BE FIRMLY FASTENED TO THE TOP OF THE RISER.
2. SUPPORT BARS ARE WELDED TO THE TOP OF THE RISER OR ATTACHED BY STRAPS BOLTED TO THE TOP OF RISER.

ANTI – VORTEX DEVICE DESIGN

NO SCALE



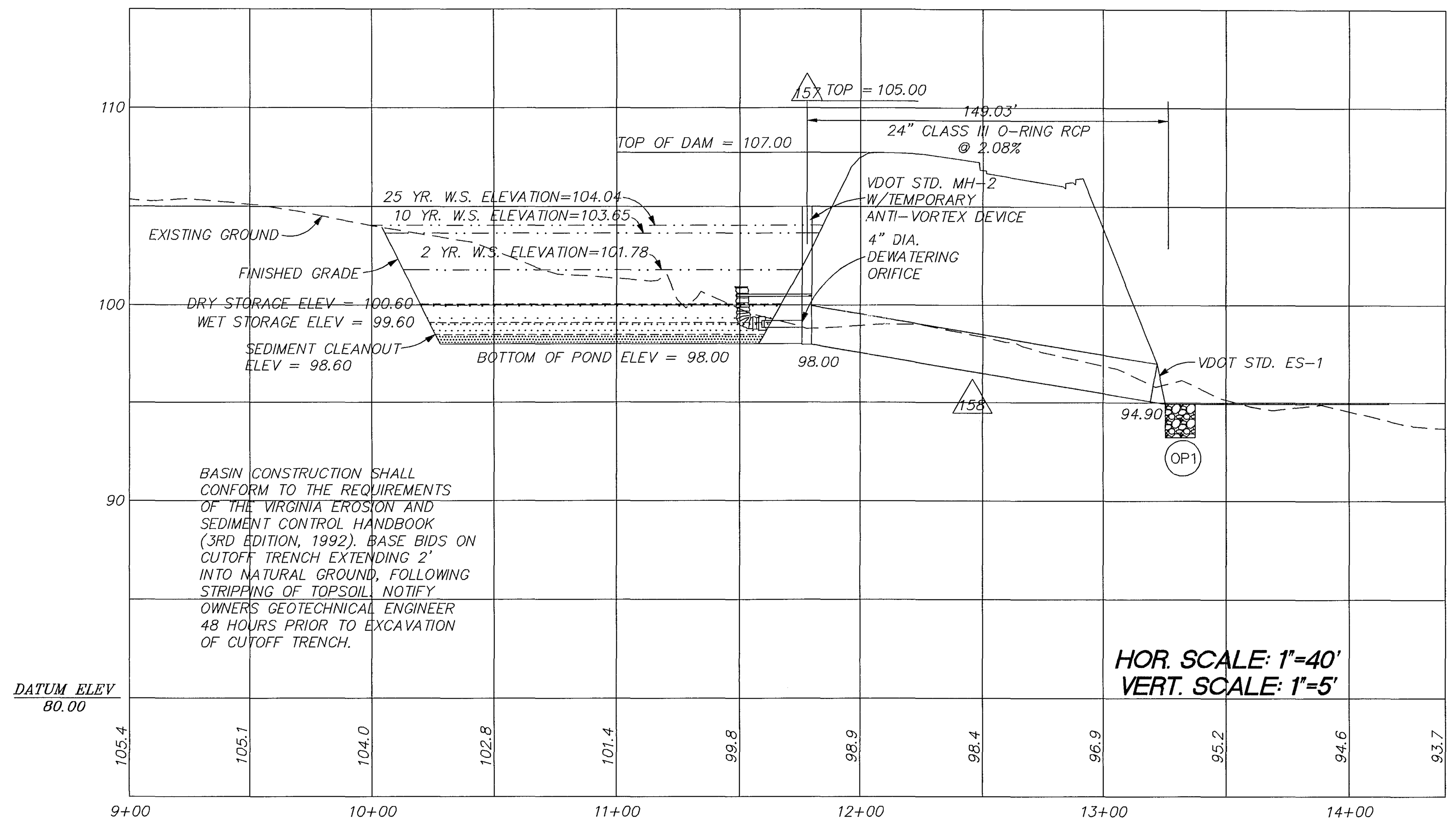
DRAINAGE TUBING SHALL COMPLY WITH ASTM F667 AND AASHTO M294

DEWATERING SYSTEM FOR SEDIMENT BASINS

NO SCALE

GENERAL CONSTRUCTION NOTES: GEOTECHNICAL NOTES

1. A QUALIFIED GEOTECHNICAL ENGINEER SHALL BE ON-SITE DURING ALL FILLING OPERATIONS. PLACEMENT AND COMPACTION OF THE CLAY CORE AND GENERAL DAM FILL SHALL BE MONITORED AND TESTED BY THE GEOTECHNICAL ENGINEER. ALL SUBGRADES TO RECEIVE FILL SHALL BE EXAMINED BY THE GEOTECHNICAL ENGINEER.
2. MATERIAL USED FOR FILL SHALL BE CLASSIFIED AS SC MATERIAL FREE FROM ROCKS, ROOT MASS OR CLODS. FILL SHALL BE PLACED IN LIFTS NOT TO EXCEED 8" AND EACH LIFT SHALL BE COMPACTED TO A MINIMUM 95% OF STANDARD PROCTOR.
3. THE DESIGN HEIGHT OF THE EMBANKMENT SHALL BE INCREASED BY THE AMOUNT NEEDED TO ENSURE THAT THE DESIGN TOP OF FILL ELEVATION WILL BE MAINTAINED AFTER SETTLEMENT HAS TAKEN PLACE.
4. MINIMUM COMPACTION REQUIREMENTS MUST BE MET AT CRITICAL POINTS (AGAINST THE CONCRETE WEIR, AND WING WALLS). THE MOISTURE CONTENT OF THE FILL MATERIALS SHALL BE MAINTAINED IN THE RANGE OF +/- TWO TO THREE PERCENTAGE POINTS OF OPTIMUM MOISTURE CONTENT.
5. CONTRACTOR SHALL PLACE EXCAVATED MATERIAL THAT IS UNSUITABLE FOR USE AS FILL AT DESIGNATED AREAS. THIS LOCATION SHALL BE APPROVED BY THE OWNER PRIOR TO THE PLACEMENT OF MATERIAL. CONTRACTOR SHALL GRADE AND SEED EXCESS MATERIAL PER EROSION AND SEDIMENT MEASURES SPECIFIED ON THIS SHEET.
6. MATERIAL FOR CLAY CORE SHALL BE CLASSIFIED CL OR ML AND HAVE A MINIMUM PERMEABILITY OF $1x10^{-5}$ CM/S AND SHALL HAVE A MINIMUM 70% PASSING THE NO. 200 SIEVE, LIQUID LIMIT OF 50 AND PLASTICITY INDEX OF 25.
7. PLACE THREE INCHES OF TOPSOIL ON DAM SLOPES AFTER GRADING COMPLETION. TOPSOIL SHALL BE TRACKED (PERPENDICULAR TO THE AXIS OF THE DAM) WITH TRACKING EQUIPMENT. PERMANENTLY SEED THE DAM SLOPE PER SEEDING NOTES ON THIS SHEET.
8. CORE MATERIAL SHALL BE PLACED IN 6 INCH THICK LOOSE LIFTS, AT A MOISTURE CONTENT 2-3 PERCENTAGE POINTS ABOVE THE OPTIMUM MOISTURE CONTENT. EACH LIFT SHALL BE COMPACTED TO MINIMUM 95% OF STANDARD PROCTOR.



TEMPORARY SEDIMENT BASIN #1 PROFILE

BMP MAINTENANCE PLAN

A maintenance program is required to ensure the Stormwater Management (SWM) / Best Management Practice (BMP) facility functions as designed and to provide for reasonable aesthetic conditions. Proper maintenance is encouraged to prevent the introduction of debris and sediment at inflow locations, pretreatment areas, the BMP itself, its principal control structures and downstream waterways. Following installation and establishment of vegetation in disturbed site areas, inspections for sediment buildups will be performed at least quarterly. It is anticipated that under normal conditions, sediment removal will be required once every 5 to 10 years. If other construction or related land-disturbing activities are performed upslope of the BMP, adequate protection measures should be implemented with inspections performed at least once weekly.

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

BMP Description: The Third High School BMP (James City County Type B-3 BMP) serves a drainage area of approximately 37 acres associated with development of the new Third High School. The facility is a 10 point, pond/wetland facility based on James City County design standards. This type of pond temporarily stores runoff and normally maintains a permanent wet pool with high and low marsh areas during non-rainfall periods. Typically draw down times range from 24 to 72 hours following a storm event. Principal structures associated with the BMP consist of a concrete riser and a 24" concrete outfall pipe with three low flow orifices. There is 3" orifice at elevation 92.2 to provide for water quality drawdown. There is 3" orifice at elevation 93.0 to provide for the 1-year 24 hour drawdown requirement with a flow not greater than 0.5 cfs. There is 10" orifice at elevation 96.4 to provide for the 10-year storm atenuation with a flow not greater than 5.0 cfs. During the 100-year storm, the maximum water level should rise to about 1.0 feet above the top of the riser and within 2.0 feet below the top of dam. During this type of larger storm event, the principal spillway will discharge the flow. If functioning properly, normal storm events should reach elevations below the top of the riser and the pond should draw down in about 24 to 36 hours. The majority of drainage to the pond will enter through the storm sewer system.

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

1. Inspect the BMP for sediment buildup by visual observation and a physical determination of sediment depth within the deep pool areas. If the sediment reaches a depth of 2' above the bottom removal is required. At the same time, or at least once per year, clean the inlet box and outlet pipes of accumulated sediments. Dispose of sediments removed from the facility at an acceptable disposal area.

2. Perform maintenance mowing of pond grasses on side slopes at least twice each year. Grasses such as tall fescue should be mowed in early summer after emergence of the heads on cool season grasses and in late fall to prevent seeds of annual weeds from maturing. Mowing of legumes can be less frequent. Trees, shrubs and woody vegetation are not be permitted to grow along or on any part of the embankment that was constructed using engineered (compacted) fills and must be cleared to a point at least 25 feet beyond the toe of slope of the embankment.

3. Perform soil sampling on stabilized pond soil areas at least once every 4 years. Soil sampling and testing should be performed by qualified independent soil testing laboratory such as VPI&SU. Apply additional lime and fertilizer in accordance with test recommendations.

4. In stabilized pond areas, if vegetation covers less than 40 % of soil surfaces, lime, fertilize and seed in accordance with recommendations for new seedlings. If vegetation covers more than 40 % but less than 70 % of soil surfaces, lime, fertilize and over seed in accordance with current seeding recommendations or requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).

5. Perform quarterly inspections of the inlet box and crest spillway for the observance of collected trash and debris. Immediately remove any trash or debris that prevents the movement of water. Remove any trash and litter downstream and at storm drain or channel inflow locations to maintain the integrity of the structure and provide an attractive appearance.

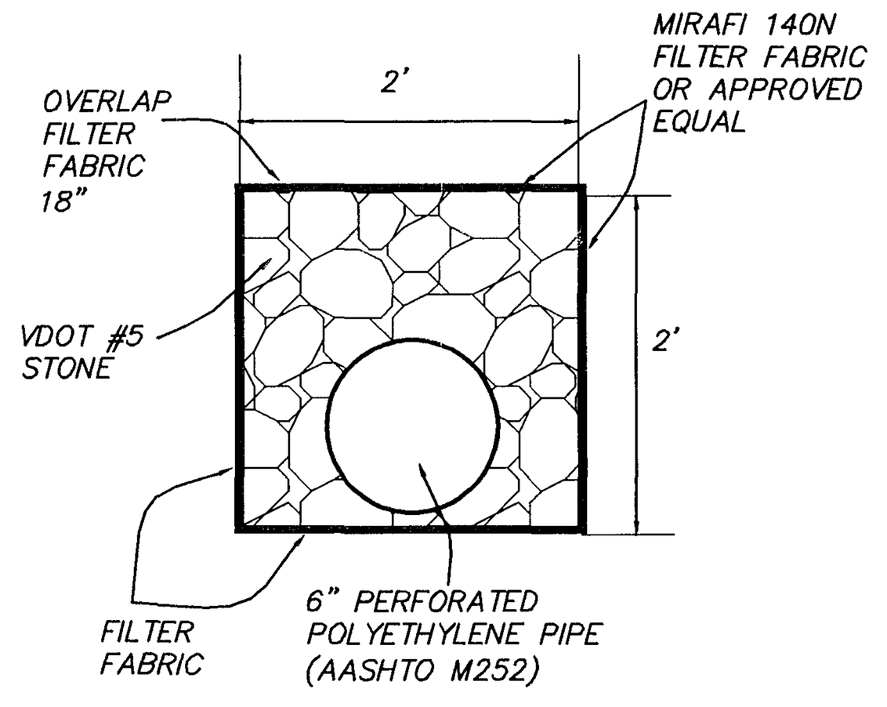
6. Perform yearly structural inspections of the facility for damage. Structural inspection shall be performed on the concrete inlet box, outlet culvert, concrete outlet channel along the downstream face of the dam and pond embankment. Exposed metal surfaces shall be re-painted or re-galvanized to minimize rust damage or replaced if rust damage is irreversible. If damage is evident, further investigation by a professional engineer may be required to assess the integrity of the structure.

7. Perform quarterly inspections of the graded side slopes of the facility for signs of animal/rodent borrows or slope erosion. Immediately perform necessary repairs, refilling or reseeding.

8. Perform yearly observations of perimeter areas surrounding the facility to ensure changes in land use, topography or access have not occurred and do not affect the operation, maintenance, access or safety features as provided. Appropriate action is required to ensure adequacy and to provide a clear, safe passage for maintenance vehicles to the engineered embankment and principal flow control structures.

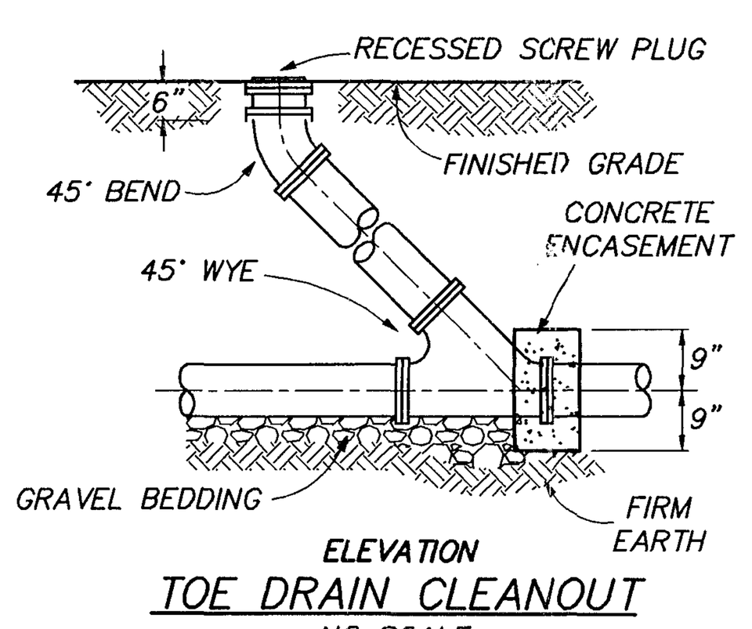
9. Record Keeping. The owner or designated representative shall keep reasonable, accurate written records of inspections performed for the structure. Records shall document routine maintenance and/or repairs performed. Copies shall be provided to the County upon request.

10. The facility shall not accept additional drainage or be modified in any way without prior consent or approval by the Environmental Division of James City County.



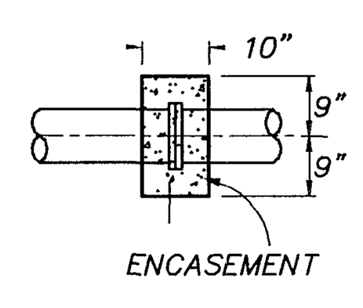
TOE DRAIN DETAIL

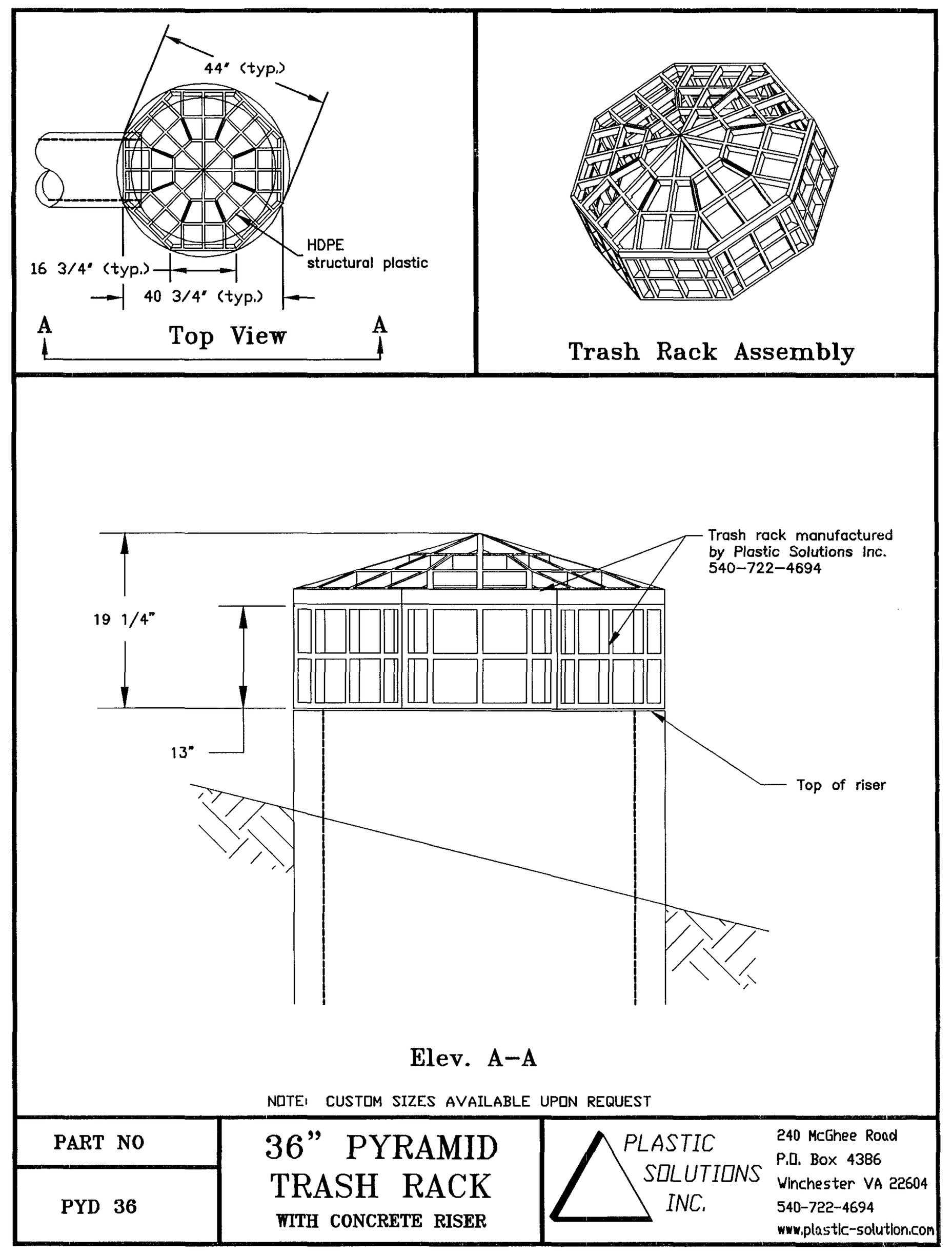
NO SCALE



TOE DRAIN CLEANOUT

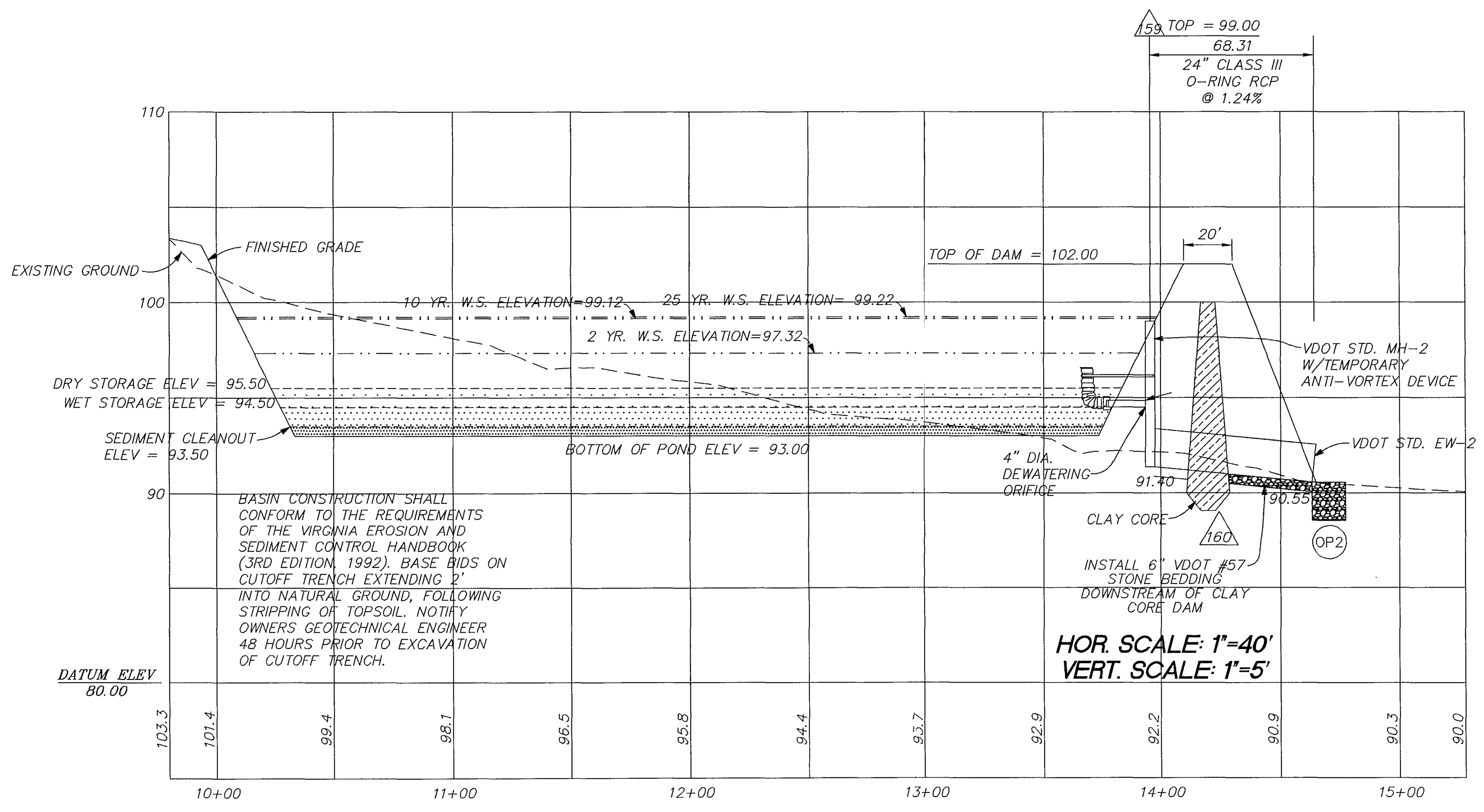
NO SCALE





PERMANENT ANTI – VORTEX DEVICE DESIGN

NO SCALE



TEMPORARY SEDIMENT BASIN #2 PROFILE

STORMWATER RECORD DRAWINGS-1/15/08

MOSELEYARCHITECTS
A PROFESSIONAL CORPORATION
601 SOUTHLAKE BOULEVARD, RICHMOND, VIRGINIA, 23236
PHONE (804) 794-7555 FAX (804) 379-8660
MOSELEYARCHITECTS.COM

TIMMONS GROUP
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VIRGINIA | NORTH CAROLINA | WEST VIRGINIA
THIS DRAWING PREPARED AT THE CORPORATE OFFICE
1001 Boulders Parkway, Suite 300
Richmond, VA 23225
TEL 804.200.6500
FAX 804.560.1016
www.timmons.com
Site Development | Residential | Infrastructure | Technology
21151

THIRD HIGH SCHOOL

SDE NO. 131-17A
WILLIAMSBURG - JAMES CITY COUNTY PUBLIC SCHOOLS
WILLIAMSBURG - JAMES CITY COUNTY, VIRGINIA

PROJECT NO: 430200
DATE: JULY 3, 2005
REVISIONS: MARCH 1, 2006
DRAWN BY: CIT
REVIEWED BY: SEB

TEMPORARY BASIN PROFILES

C2.6

DRAWING C43 MATCHLINE

POLE VAULT

LONG JUMP / TRIPLE JUMP

TRACK AND FIELD

REFER TO DRAWING C6 FOR TRACK DRAINAGE AND RELATED GRADING

LIMITS OF CLEARING

EX. GAS LINE

50' VA. POWER ACCESS ROAD EASEMENT D.B. 435, PG. 207

COORDINATE ACCESS AND WORK WITH ONGOING CONSTRUCTION ACTIVITIES (MARshall Pipe & Team)

500 S.Y. RIP-RAP WITH FILTER FABRIC. APPROXIMATE LIMITS OF AREA WITH JAMES CITY COUNTY EROSION AND SEDIMENT CONTROL INSPECTOR

50' CITY OF NEWPORT NEWS WATERLINE EASEMENT D.B. 198, PG. 1

20' USA/NEWPORT NEWS WATERLINE EASEMENT D.B. 34, PG. 195

200' VEPCO R/W D.B. 428 D.B. 48, PG. 301

25' BUFFER

APPROXIMATE LOCATION OF EX. WETLANDS FROM WARHAMPTON SITE PLANS

TOE DRAIN OUTLET W/CLEANOUT AT EVERY MANHOLE REFER TO DETAIL ON DWG C1.4

3'x2' GABION BASKET WRAPPED W/ FILTER FABRIC

EX. 15" CMP INV. IN = 89.44 INV. OUT = 89.14 NOT FOUND

OUTLET TO BE DRAIN THROUGH WINGWALLS

CLEAN OUT EX. 15" CMP AND REMOVE AND REPLACE WHERE IS COMPROMISED

HIGH MARSH ELEV.=92.3

LOW MARSH

POOL

APPROXIMATE LIMITS OF CLAY CORE DAM

50' VA. POWER ACCESS ROAD EASEMENT D.B. 435, PG. 207

EX. GAS LINE

RE-ESTABLISH EXISTING GRADES IN THIS AREA UPON REMOVAL OF TEMP. SEDIMENT TRAP

LIMITS OF CLEARING

EX. UNDERGROUND ELECTRIC LINE

EX. 15" CMP INV. IN = 89.44 INV. OUT = 89.14

BMY #1 WATER SURFACE ELEVATIONS (JAMES CITY COUNTY B-3 BMP)
1 YEAR = 96.36
2 YEAR = 97.07
10 YEAR = 98.94
100 YEAR = 100.02

GRAPHIC SCALE
(IN FEET)
1 inch = 40 ft.

COMPETITION BASEBALL FIELD

COMPETITION SOFTBALL FIELD

EX. FENCE

RE-ESTABLISH EXISTING GRADES

EX. UNDERGROUND ELECTRIC LINE

DRAWING C41 MATCHLINE

ROUTE 199

STORMWATER RECORD DRAWINGS-1/15/08

C4.2

GRADING & DRAINAGE PLAN

PROJECT NO: 430200
DATE: JULY 3, 2005
REVISIONS: MARCH 1, 2006
DRAWN BY: CIT
REVIEWED BY: SEB

THIRD HIGH SCHOOL

SDE NO. 131-17A
WILLIAMSBURG - JAMES CITY COUNTY PUBLIC SCHOOLS
WILLIAMSBURG - JAMES CITY COUNTY, VIRGINIA

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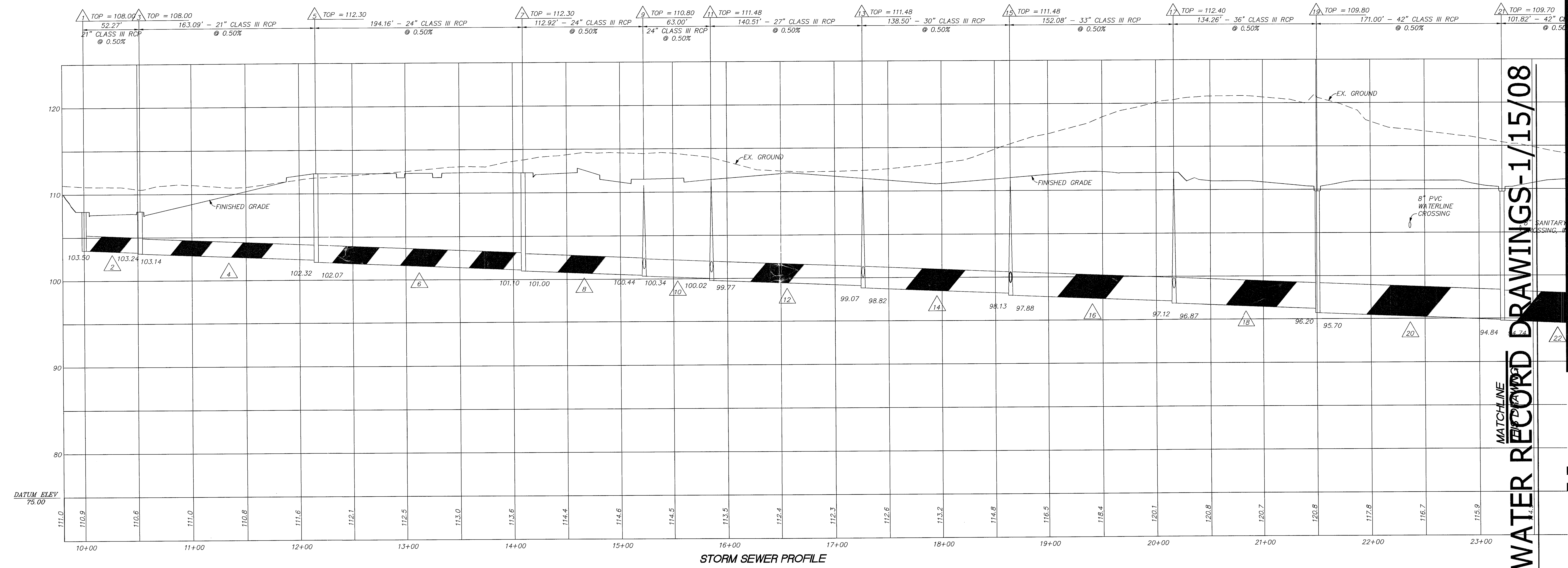

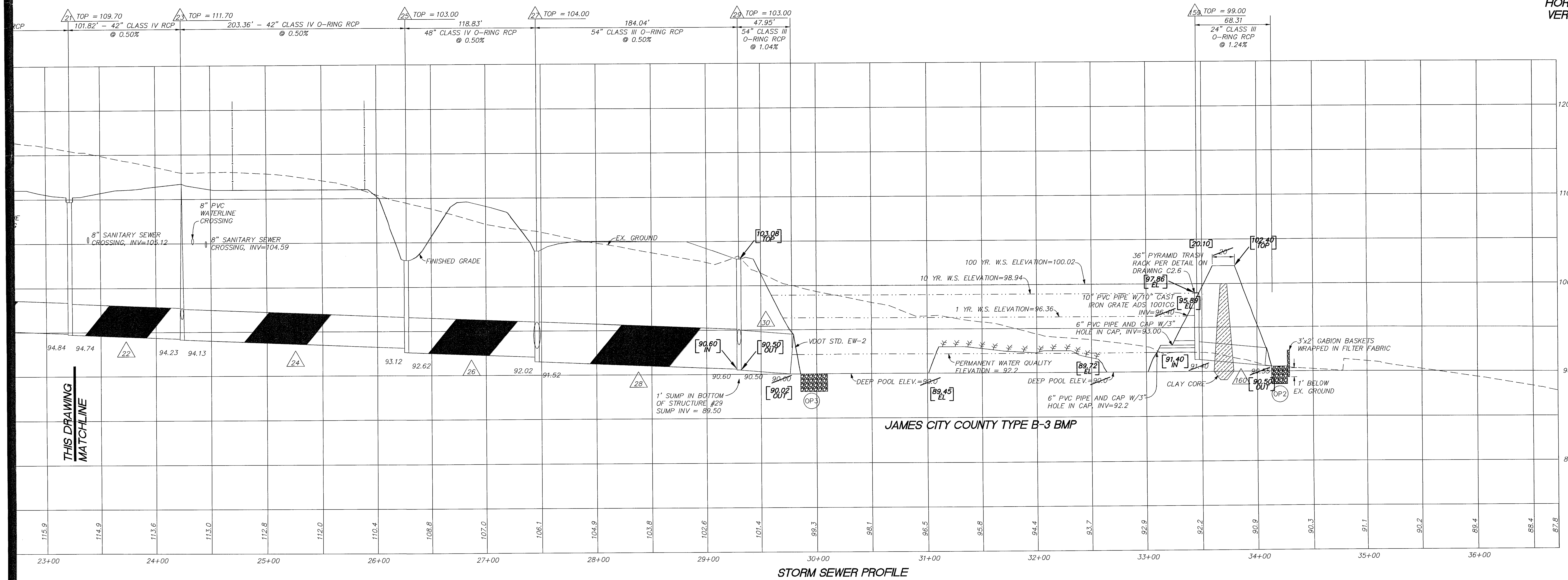

HOR. SCALE: 1"=40'
VERT. SCALE: 1"=5'

STORMWATER RECORD DRAWINGS-1/15/08

MOSELEYARCHITECTS
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TIMMONS GROUP

THIRD HIGH SCHOOL

SDE NO. 131-17A
WILLIAMSBURG - JAMES CITY COUNTY PUBLIC SCHOOLS
WILLIAMSBURG - JAMES CITY COUNTY, VIRGINIA

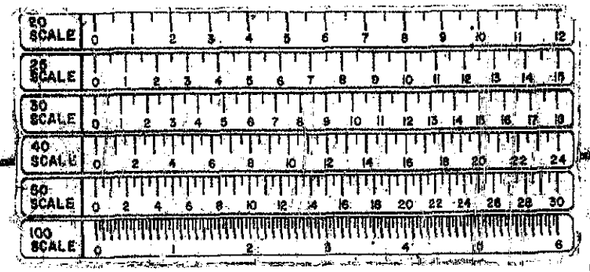
PROJECT NO: 430200
DATE: JULY 3, 2005
REVISIONS: MARCH 1, 2006
DRAWN BY: CIT
REVIEWED BY: SEB

STORM SEWER PROFILES

C5.1

PB64 PG30

64 PAGE 30



OWNER'S CERTIFICATE

THIS SUBDIVISION AS SHOWN ON THIS PLAT IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE DESIRE OF THE UNDERSIGNED OWNERS.

FOR TMB SERVICE CORPORATION — PRESIDENT — TITLE — 6-19-96 — DATE

CERTIFICATE OF NOTARIZATION

STATE OF VIRGINIA

CITY/~~COUNTY~~ OF Alexandria

I, [illegible], A NOTARY PUBLIC IN AND FOR THE CITY/COUNTY AND STATE AFORESAID, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN THE CITY/COUNTY AFORESAID. GIVEN UNDER MY NAME THIS 24 DAY OF June, 1996. MY COMMISSION EXPIRES October 31, 1998

SIGNATURE

CERTIFICATE OF SOURCE OF TITLE

THE PROPERTY SHOWN ON THIS PLAT WAS CONVEYED BY WARHILL ASSOCIATES LIMITED PARTNERSHIP TO TMB SERVICE CORPORATION PER DEED BOOK 664, PAGE 186, DATED DECEMBER 30, 1993.

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, THIS PLAT COMPLIES WITH ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF THE COUNTY OF JAMES CITY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY.

G.T. WILSON, JR. C.L.S. — 5-31-96 — DATE

CERTIFICATE OF APPROVAL

THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING SUBDIVISION REGULATIONS AND MAY BE ADMITTED TO RECORD.

SUBDIVISION AGENT OF JAMES CITY COUNTY — 6/24/96 — DATE

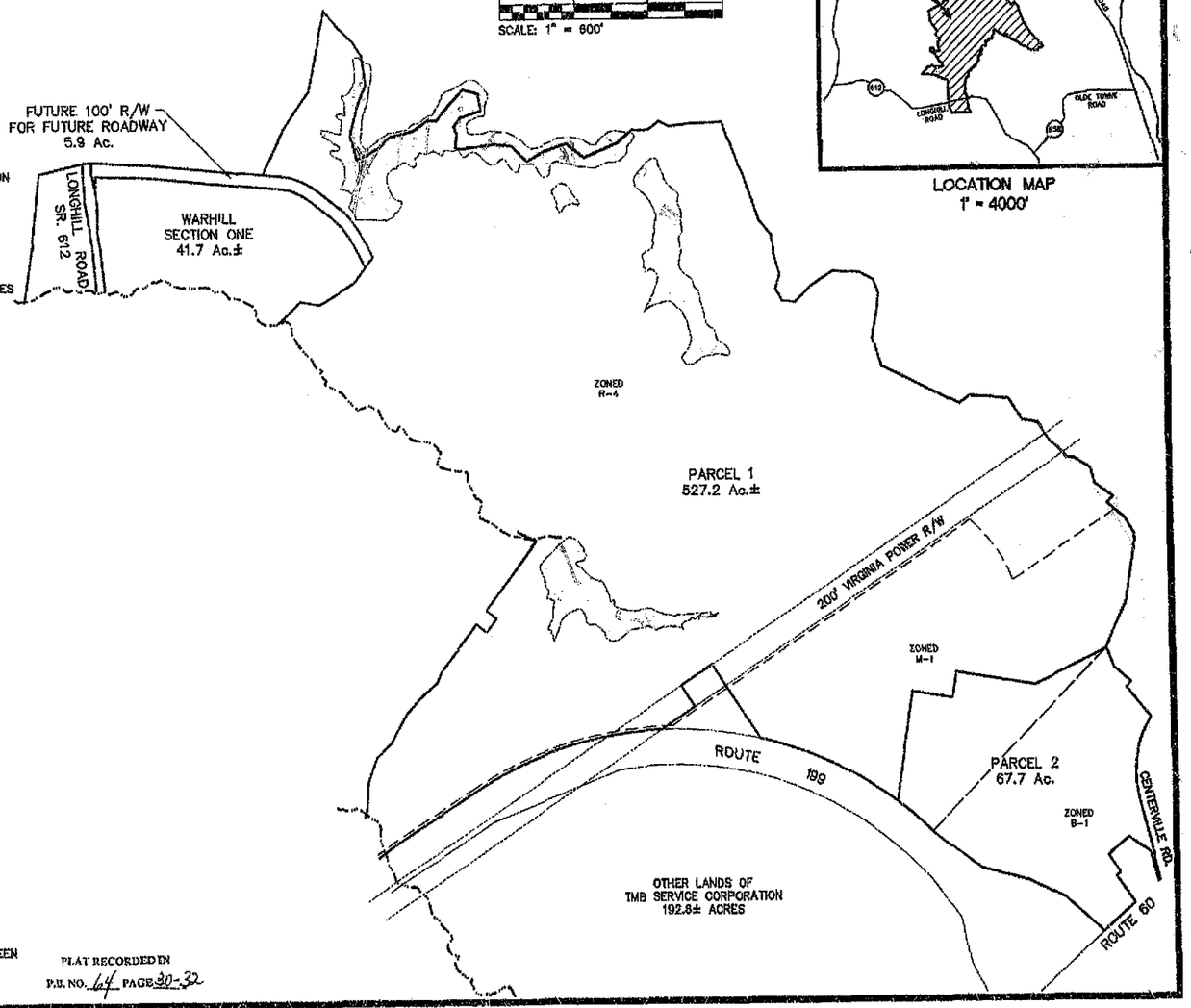
AREA TABULATION

FUTURE 100' R/W	5.9 Ac.±
WARHILL SECTION ONE (LESS FUTURE 100' R/W)	41.7 Ac.±
PARCEL 2	67.7 Ac.±
PARCEL 1 (INCLUDES PARCEL SOUTH OF LONGHILL RD.)	527.2 Ac.±
TOTAL AREA	642.5 Ac.±

NOTE: THIS IS A COMPOSITE PLAT TAKEN FROM PLAT BY RICKMOND ENGINEERING, INC. TITLED "BOUNDARY SURVEY OF WARHILL TRACT" DATED 4/18/95, AND FROM PLAT BY RICKMOND ENGINEERING, INC. TITLED "WARHILL SECTION ONE SUBDIVISION PLAT" DATED 8/31/87 AND RECORDED IN PLAT BOOK 53, PAGES 52-53, AND HAS NOT BEEN FIELD VERIFIED.

PLAT RECORDED IN P.B. NO. 64 PAGE 30-32

GRAPHIC SCALE
600' 0' 600' 1200'
SCALE: 1" = 600'



LOCATION MAP
1" = 4000'

CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

PLAT OF SUBDIVISION SHOWING A PORTION OF THE WARHILL TRACT

OWNER: TMB SERVICE CORPORATION

POWHATAN DISTRICT — JAMES CITY COUNTY — VIRGINIA

COMMONWEALTH OF VIRGINIA
5-31-96
G.T. WILSON, JR.
CERTIFICATE No. 1183
CERTIFIED LAND SURVEYOR

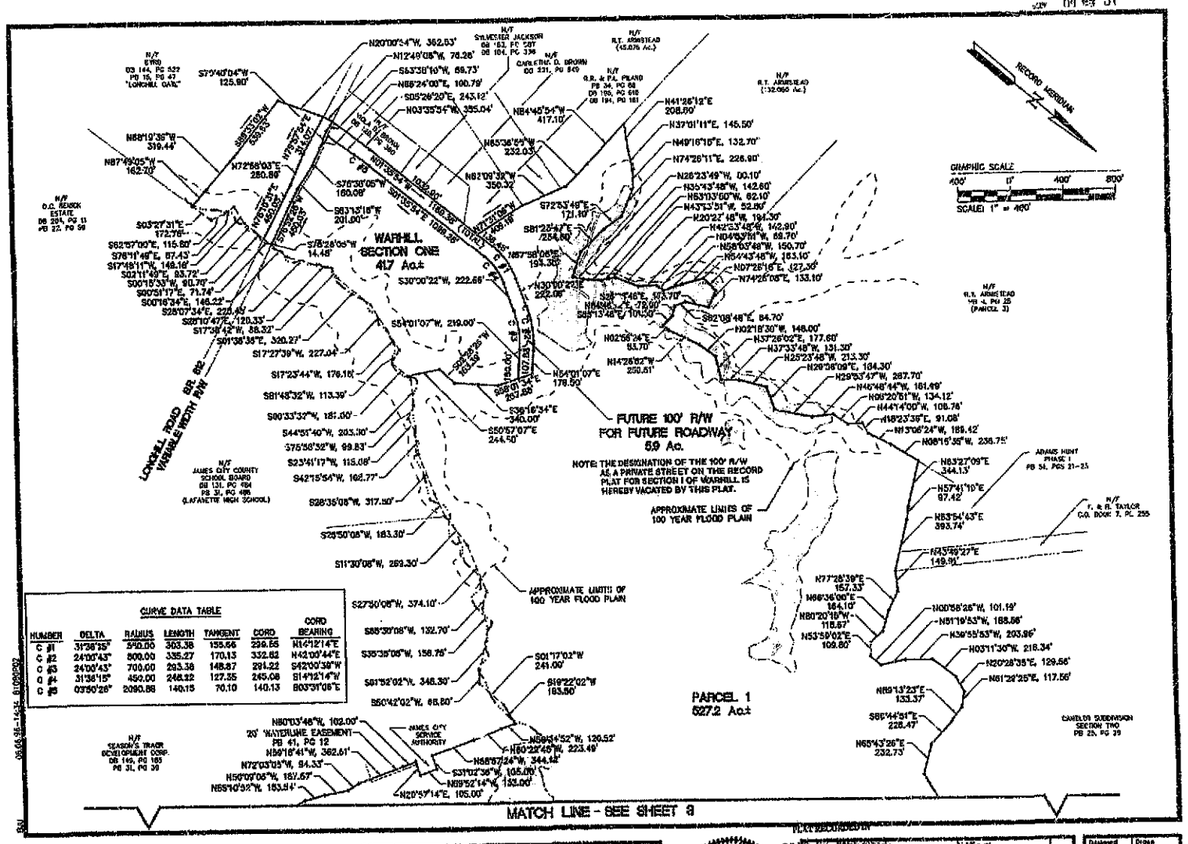
Recorded 5:35 p.m. this 5th day of June 1996

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn BJU
Scale 1" = 600'	Date MAY, 1996
Project No. 8108	
Drawing No. 1 OF 3	

06.06.96-14:32 8108DP01 BJU

PB64 PG31



NUMBER	DELTA	RADIUS	LENGTH	TANGENT	CORD	CORD BEARING
C #1	31°36'35"	540.00	303.36	155.66	236.55	N14°12'14"E
C #2	24°00'43"	800.00	335.27	170.13	332.82	N42°00'44"E
C #3	24°00'43"	700.00	293.38	148.87	291.22	S42°00'36"W
C #4	31°36'15"	450.00	248.22	127.35	245.08	S14°12'14"W
C #5	03°50'26"	2090.86	140.15	70.10	140.13	S03°01'08"E

AES CONSULTING ENGINEERS
6248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

PLAT OF SUBDIVISION
SHOWING A PORTION OF
THE WARHILL TRACT
OWNER: TMB SERVICE CORPORATION
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

G.T. WILSON, JR.
CERTIFICATE No. 1163

PLAT SUBDIVISION

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed —
Drawn BJJ
Scale 1"=400'
Date MAY, 1998
Project No. 8106
Drawing No. 2 OF 3

POND MAINTENANCE RECORD DRAWING

OF

PC-204

LOCATED AT

WARHILL HIGH SCHOOL

FOR

JCC STORMWATER DIVISION

VICINITY MAP

SCALE: 1" = 1 MILE

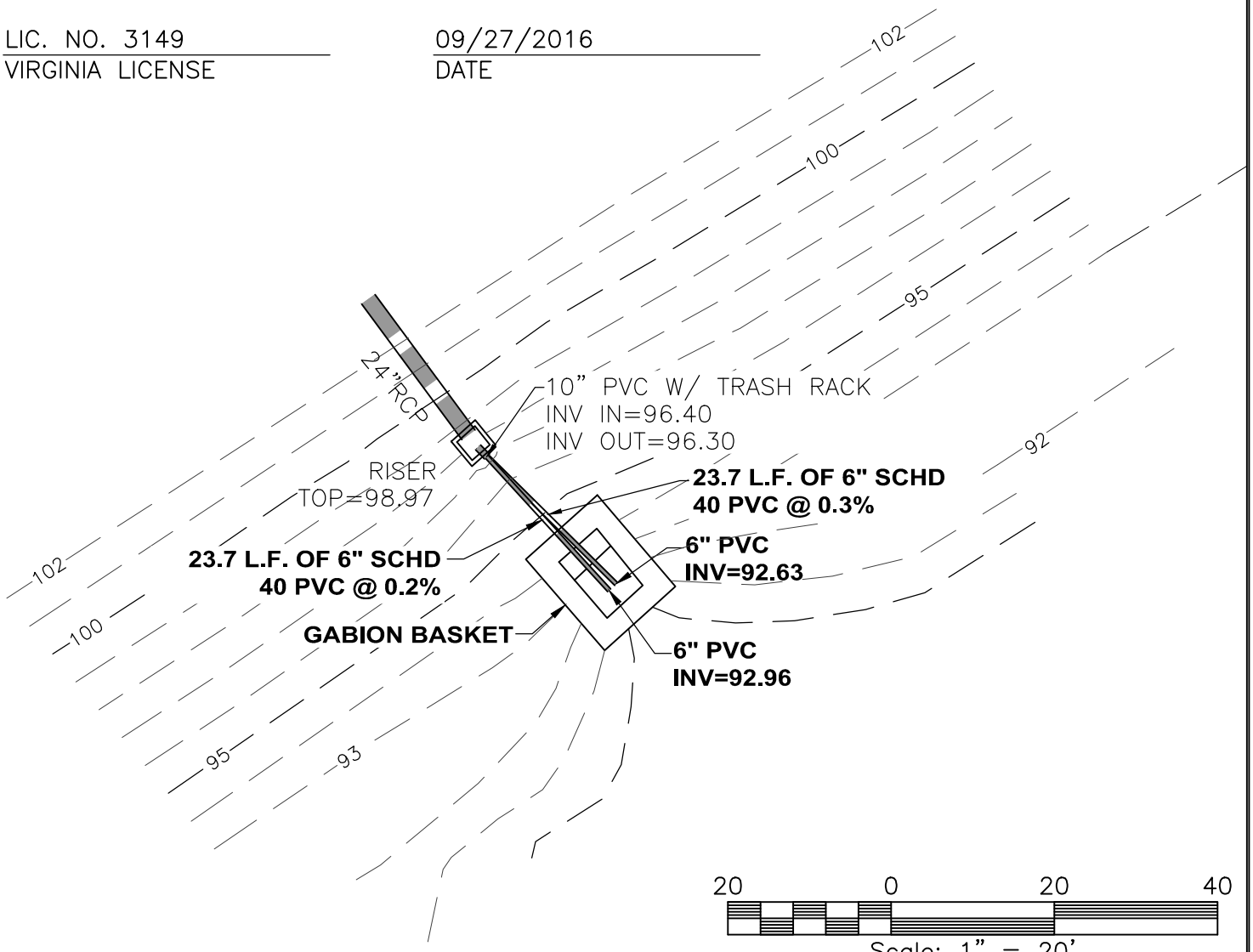
SHEET 1 OF 4

STORMWATER FACILITY CERTIFICATION:

I HEREBY CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF THE STORMWATER FACILITIES SHOWN ON THESE DRAWINGS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND SPECIFICATIONS.

JCC GIS MAPPING

WILLIAM S FELTS	
NAME	NAME
LIC. NO. 3149	09/27/2016
VIRGINIA LICENSE	DATE



20 0 20 40

Scale: 1" = 20'

SHEET 2 OF 4

COMMONWEALTH OF VIRGINIA
WILLIAM S. FELTS
Lic. No. 3149
09/27/2016
LAND SURVEYOR

POND MAINTENANCE RECORD DRAWING FOR

PC-204 LOCATED AT WARHILL HIGH SCHOOL

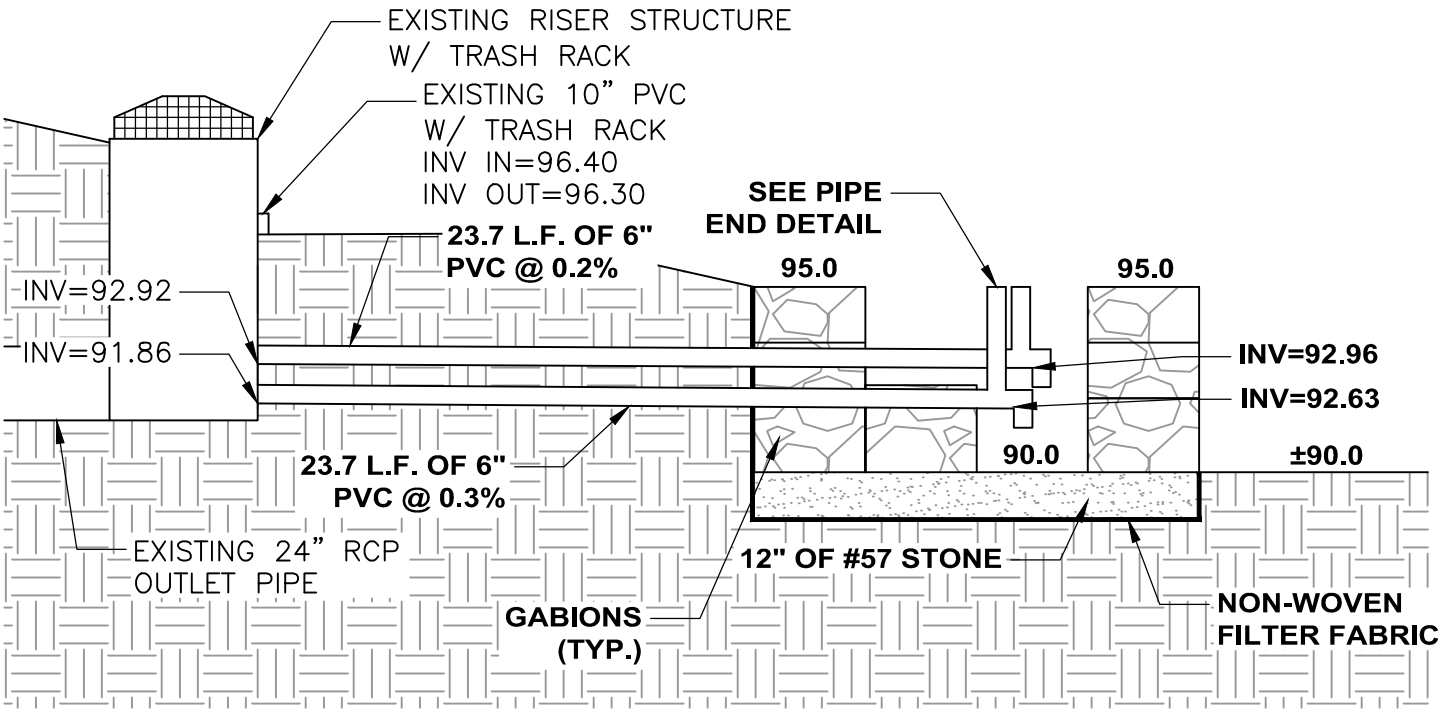
FOR

JCC STORMWATER DIVISION

JAMES CITY COUNTY **AS-BUILT CONDITIONS** VIRGINIA

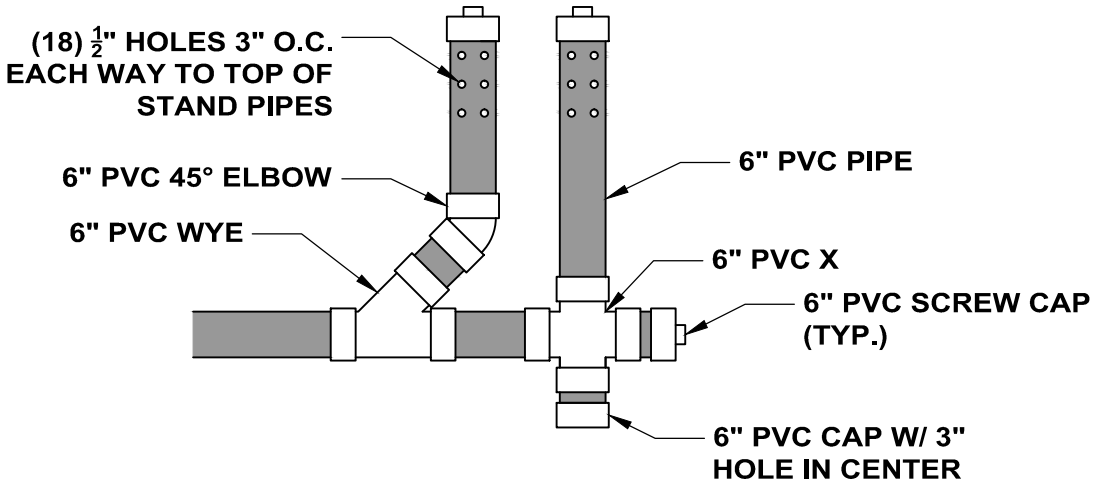
DATE: 09/27/16
SCALE: 1"=20'
JOB# 16-151
CAD File
16-151 - Design.dwg

LandTech Resources, Inc.
ENGINEERING & SURVEYING CONSULTANTS
3925 Midlands Road, Williamsburg, Virginia 23188
Telephone: 757-565-1677 Fax: 757-565-0782
Web: landtechresources.com



SECTION VIEW

N.T.S.



TYPICAL PIPE END DETAIL

N.T.S.

SHEET 3 OF 4

COMMONWEALTH OF VIRGINIA
WILLIAM S. FELTS
Lic. No. 3149
09/27/2016
LAND SURVEYOR

POND MAINTENANCE RECORD DRAWING FOR

PC-204 LOCATED AT WARHILL HIGH SCHOOL

FOR

JCC STORMWATER DIVISION

JAMES CITY COUNTY — DETAILS — VIRGINIA

DATE: 09/27/16
SCALE: N/A
JOB# 16-151
CAD File
16-151 - Design.dwg

LandTech Resources, Inc.
ENGINEERING & SURVEYING CONSULTANTS
3925 Midlands Road, Williamsburg, Virginia 23188
Telephone: 757-565-1677 Fax: 757-565-0782
Web: landtechresources.com

SHEET 4 OF 4

COMMONWEALTH OF VIRGINIA
WILLIAM S. FELTS
Lic. No. 3149
09/27/2016
LAND SURVEYOR

POND MAINTENANCE RECORD DRAWING FOR

PC-204 LOCATED AT WARHILL HIGH SCHOOL

FOR

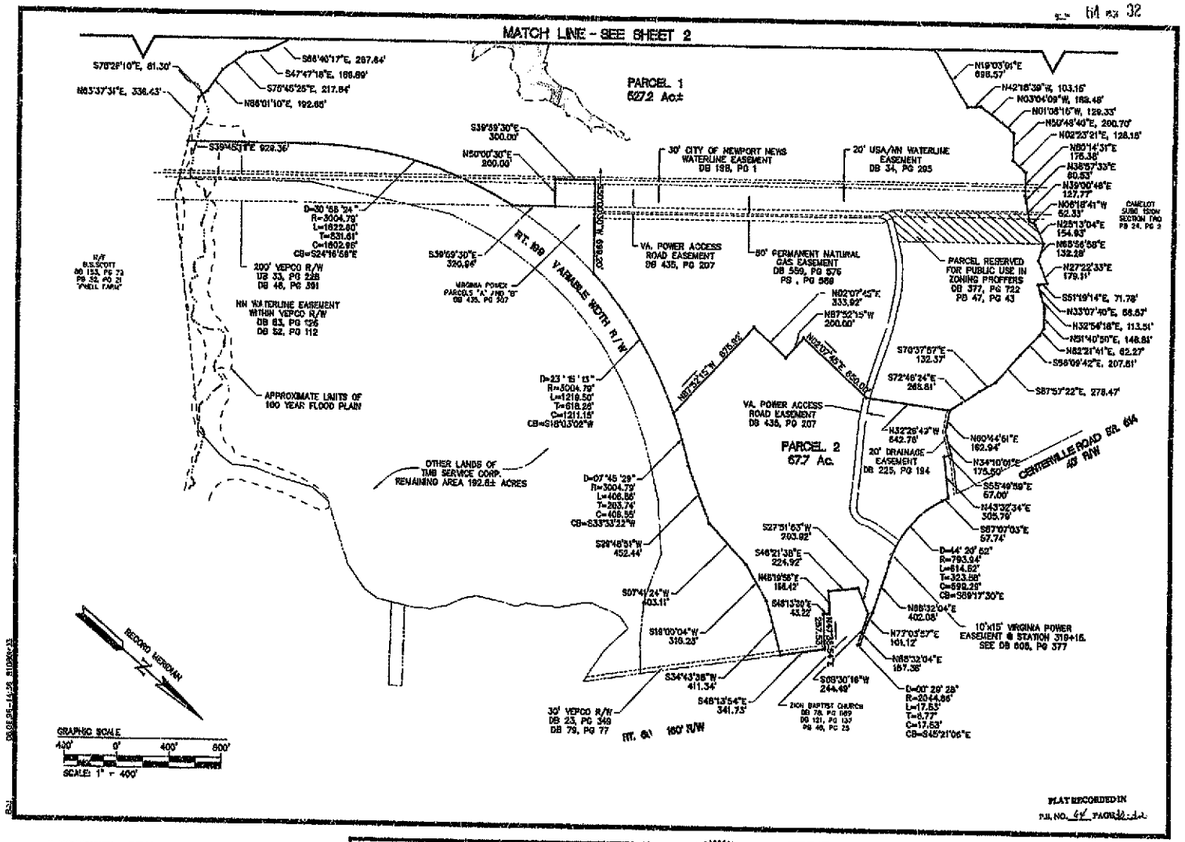
JCC STORMWATER DIVISION

JAMES CITY COUNTY **PICTURES** VIRGINIA

DATE: 09/27/16
SCALE: N/A
JOB# 16-151
CAD File
16-151 - Design.dwg

LandTech Resources, Inc.
ENGINEERING & SURVEYING CONSULTANTS
3925 Midlands Road, Williamsburg, Virginia 23188
Telephone: 757-565-1677 Fax: 757-565-0782
Web: landtechresources.com

PB64 PG 32



PLAT RECORDED IN P.B. NO. 64 PAGE 32 & 33

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(804) 253-0040
Fax (804) 220-8994

PLAT OF SUBDIVISION
SHOWING A PORTION OF
THE WARHILL TRACT
OWNER: TMB SERVICE CORPORATION
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

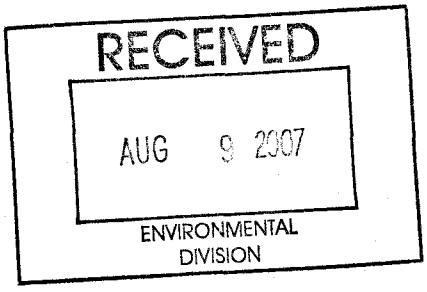
D.T. WILSON, JR.
CERTIFICATE No. 1163

No.	DATE	REVISION / COMMENT / NOTE	BY

Designed	Drawn
	BJU
Scale	Date
1"=400'	MAY, 1990
Project No.	
5106	
Drawing No.	
3 OF 3	

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

August 8, 2007



Mr. Scott Thomas
Environmental Engineer
101-E Mounts Bay Road
Williamsburg, VA 23188

Re: Third High School BMP Certification

Dear Mr. Thomas:

Enclosed in this submittal package are: one (1) copy of the Third High School BMP record drawings and one (1) copy of the completed Stormwater Management/BMP Facilities Record Drawing and Construction Certification Standard Forms and Instructions. Upon final submission, one set of reproducible drawings will also be submitted to the County.

Should you have any questions or comments in regards to this submittal package, please feel free to contact me at (804) 200-6435.

Respectfully submitted,
Timmons Group

Janet L. Rogel

Janet L. Rogel, E.I.T.
Project Engineer
JLR:jr
Encl:

PC204
SP-41-05
Warhill HS

1001 Boulders Parkway, Suite 300 | Richmond, Virginia 23225
TEL 804.200.6500 FAX 804.560.1016
www.timmons.com
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FINAL

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

	BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
TYPE B-3	BMP #1	10	x	37/54.5 = 0.68	=	6.80
TYPE F-2	INLET 157	4	x	1.53/54.5 = 0.03	=	0.12
*	RC 106 EAST POND	2	x	37/54.5 = 0.68	=	1.36
			x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 8.28

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
9.72/54.5 = 17.83%	x	0.10 (0.1 per 1%)	=	1.78
	x	(0.15 per 1%)	=	

TOTAL NATURAL OPEN SPACE CREDIT: _____

C. TOTAL WEIGHTED POINTS

8.28	+	1.78	=	10.06
Structural BMP Points		Natural Open Space Points		Total

THIRD H.S. BMP #2 (N. SCOTT'S POND)

SP. 41-03
BMP #2
OUTFALL

BMP OUTFLOWS

$Q_{1\text{-YR}}$ = 0.42 CFS @ EL. 96.36

$Q_{2\text{-YR}}$ = 1.45 CFS @ EL. 97.07

$Q_{10\text{-YR}}$ = 4.22 CFS @ EL. 98.93

$Q_{25\text{-YR}}$ = 9.60 CFS @ EL. 99.13

$Q_{100\text{-YR}}$ = 49.22 CFS @ EL. 100.04

Current Design (B-3 wetland) TYPE B-3

Perm. Pool = 92.2

DHW 100.04

T.O.D MIN 102.04
(NO EMERG. SPILLWAY)

DA = 38.65 AC (N=91)

T_C = 0.163 HRS.

Current Outfall 68.31' OF 24" RCP @ 1.24%

0	91.4	
68.31	90.55	
100	91.5	
135	90.03	INV 15" EX GND 91
165	91.0	INV 15'
220	90	
275	89	
322	85	
360	87	
417	86	
424	85	HEADCUT AREA

GAS 124

W_1 409

W_2 437

INFLOW VOLUMES / FLOWS

1-YR	6.072 AC-FT	97.64 CFS
2-YR	8.184 AC-FT	129.59 CFS
10-YR	14.391 AC-FT	220.20 CFS
25-YR	15.965 AC-FT	242.92 CFS
100-YR	22.3 AC-FT	333.41 CFS

Name.... Outlet 1

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

OUTLET STRUCTURE INPUT DATA

BMP #2

```
Structure ID      = 4
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    2.0000 ft   24"
Upstream Invert   =     91.40 ft
Dnstream Invert   =     91.00 ft
Horiz. Length     =     70.00 ft   68.31
Barrel Length     =     70.00 ft
Barrel Slope      =    .00571 ft/ft  1.24%

OUTLET CONTROL DATA...
Mannings n        =      .0120
Ke                =      .9000  (forward entrance loss)
Kb                =   .010575  (per ft of full flow)
Kr                =      .9000  (reverse entrance loss)
HW Convergence    =       .001  +/- ft

INLET CONTROL DATA...
Equation form     =          1
Inlet Control K   =      .0018
Inlet Control M   =     2.0000
Inlet Control c   =     .02920
Inlet Control Y   =      .7400
T1 ratio (HW/D)   =      1.059
T2 ratio (HW/D)   =      1.204
Slope Factor      =       -.500
Calc inlet only   = Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     93.52 ft  --->  Flow =     15.55 cfs
At T2 Elev =     93.81 ft  --->  Flow =     17.77 cfs
```

FREE OUTFALL CONDITIONS

```
Structure ID      = TW
Structure Type    = TW SETUP, DS Channel
-----------------------------------
FREE OUTFALL CONDITIONS SPECIFIED

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

BMP #1 WSEL

1-YR	96.36
2-YR	97.07
10-YR	98.94
100-YR	100.02

Name.... BMP OUT Tag: 1 Event: 1 yr
File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW
Storm... TypeII 24hr Tag: 1

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	97.64 cfs	at	12.0000 hrs
Peak Outflow	=	.42 cfs	at	23.8500 hrs
Peak Elevation	=	96.36 ft		
Peak Storage	=	5.655 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.072
- Infiltration	=	.000
- HYG Vol OUT	=	2.811
- Retained Vol	=	3.261
Unrouted Vol	=	-.001 ac-ft (.017% of Inflow Volume)

$V_{1-HR} = 6.072$ AC-FT

WARNING: Outflow hydrograph truncated on right side.

Type.... Pond Routing Summary
Name.... BMP OUT Tag: 2 Event: 2 yr
File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW
Storm... TypeII 24hr Tag: 2

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 2
Outflow HYG file = NONE STORED - BMP OUT 2

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	129.59 cfs	at	12.0000 hrs
Peak Outflow	=	1.45 cfs	at	22.7500 hrs
Peak Elevation	=	97.07 ft		
Peak Storage	=	7.033 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	8.184
- Infiltration	=	.000
- HYG Vol OUT	=	4.350
- Retained Vol	=	3.830
Unrouted Vol	=	-.003 ac-ft (.038% of Inflow Volume)

$V_{2\text{-yr}}$ 8.184 AC-FT.

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	220.20 cfs	at	12.0000 hrs
Peak Outflow	=	4.22 cfs	at	16.7000 hrs
Peak Elevation	=	98.93 ft		
Peak Storage	=	10.964 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	14.391
- Infiltration	=	.000
- HYG Vol OUT	=	10.091
- Retained Vol	=	4.298
Unrouted Vol	=	-.003 ac-ft (.021% of Inflow Volume)

$V_{10\text{-}HR} = 14.391$ AC-FT

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 25
Outflow HYG file = NONE STORED - BMP OUT 25

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	242.92 cfs	at	11.9500 hrs
Peak Outflow	=	9.60 cfs	at	13.8500 hrs
Peak Elevation	=	99.13 ft		
Peak Storage	=	11.402 ac-ft		

MASS BALANCE (ac-ft)

Initial Vol	=	.000
HYG Vol IN	=	15.965
Infiltration	=	.000
HYG Vol OUT	=	11.632
Retained Vol	=	4.329
Unrouted Vol	=	-.003 ac-ft (.020% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

$V_{25\text{-yr}} = 15.965$ AC-FT.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	333.41 cfs	at	11.9500 hrs
Peak Outflow	=	49.22 cfs	at	12.3500 hrs
Peak Elevation	=	100.04 ft		
Peak Storage	=	13.531 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	22.300
- Infiltration	=	.000
- HYG Vol OUT	=	17.912
- Retained Vol	=	4.385
Unrouted Vol	=	-.004 ac-ft (.016% of Inflow Volume)

$V_{100\text{-YR}} = 22.3$ ACRE-FT.

WARNING: Outflow hydrograph truncated on right side.

68.31'
24" CL III
@ 1.24%

$\frac{91.4 - 90.55}{68.31} = 1.24\%$

EL. 102.0V MIN

100.04

100 YR. W.S. ELEVATION=100.02

10 YR. W.S. ELEVATION=98.94

1 YR. W.S. ELEVATION=96.36

36" PYRAMID TRASH RACK PER DETAIL ON DRAWING C2.6

20'

10" PVC PIPE W/10" CAST IRON GRATE ADS 1001CG INV=96.40

6" PVC PIPE AND CAP W/3" HOLE IN CAP, INV=93.00

3'x2' GABION BASKETS WRAPPED IN FILTER FABRIC

PERMANENT WATER QUALITY ELEVATION = 92.2

DEEP POOL ELEV.=90.0

POOL ELEV.=90.0

6" PVC PIPE AND CAP W/3" HOLE IN CAP, INV=92.2

91.40

90.55

CLAY CORE

160

OP2

1' BELOW EX. GROUND

110

100

90

80

JAMES CITY COUNTY TYPE B-3 BMP

96.5 95.8 94.4 93.7 92.9 92.2 90.9 90.3 91.1 90.2 89.4 88.4 87.8

31+00 32+00 33+00 34+00 35+00 36+00

EX. 15" CMP
INV. IN = 90.85
INV. OUT NOT FOUND

90.55

50' CITY OF NEWPORT NEWS
WATERLINE EASEMENT
D.B. 198, PG. 1

20' USA/NEWPORT NEWS
WATERLINE EASEMENT
D.B. 34, PG. 195

25' BUFFER

Scott Thomas

From: Scott Thomas
Sent: Wednesday, January 25, 2006 4:13 PM
To: 'Steve Raugh'
Subject: RE: WJCC Third High School

We are ok with the substitution as long as proper field inspection and geotechnical testing are performed on the core materials and clay core construction is included in the construction certification required for the BMP. Some asbuilt data may also need to be collected during the construction process (ie. width, bottom elevation, top elevation, etc.)

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

-----Original Message-----
From: Steve Raugh [mailto:Steve.Raugh@timmons.com]
Sent: Wednesday, January 25, 2006 3:49 PM
To: Scott Thomas
Subject: WJCC Third High School

Scott,
The specs on the clay core of the dam are pretty tight and have made it difficult to find locally. The contractor has sent a spec sheet for a materially that he can get locally and has asked if he can substite it. Our Geotechnical Engineer said that it is still a pretty impermeable clay and doesn't have a problem with it especially since it is for an extended detention pond rather than a wet pond. Do you have a problem with this substitution?

The material is defined as follows:

Sandy Clay – CL
Liquid Limit – 40
Plastic Limit – 25
Plasticity Index – 15
Percent passing 200 sieve – 60.3

Thanks for your help.

Steve

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.
Stephen J. Raugh, P.E.
1001 Boulders Parkway
Suite 300
Richmond, VA 23225
Tel: 804.200.6467
Fax: 804.560.1016
E-mail: steve.raugh@timmons.com
www.timmons.com

THIRD HIGH SCHOOL

COUNTY SUBMITTAL
ENVIRONMENTAL DIVISION
CALCULATIONS PACKAGE

WILLIAMSBURG-JAMES CITY COUNTY

10 - Points Issue.

SP-41-05
3RD SUB

• STILL A BMP POINT PROBLEM 0.15 pt credit.

• NEED CONSERV ESMT PLATT FOR NUS AREAS.

October 20, 2005

Environmental:

General Comments

1. *Existing Utility Corridor. Previous comment # 6 remains unaddressed. Although the plan was revised to avoid most conflicts with the existing cross-country transmission line corridor in the southwest corner of the site, Sheets C1.2, C2.0, C2.5, C4.0, C4.3 and C4.5 clearly show clearing, grading and drainage improvements associated with this project across the corridor at the far west end of the project (ie. at the stadium access road). Our Division cannot authorize land-disturbing on or across existing easements/utilities without proper permission, whether that permission is obtained under the auspices of the Warhill PPEA project or this project. Provide evidence of permission to occupy or disturb the easements from applicable utilities.*

   Response: Per our phone conversation on 10-21-05 we have removed all land disturbing activities that extended into the utility corridor (past structure 156). The stadium project will tie to the stadium access road at that point.

2. *General. Provide a general construction note on Sheet C1.3 to indicate that proper coordination, as applicable, may be necessary with the established County Warhill PPEA Standing Team Committee especially as it pertains to adjacent, on-going road infrastructure, site and utility work.*

   Response: Refer to Drawing C1.3, General Construction Note #15.

Erosion & Sediment Control:

3. *Limits of Work. Existing conditions plan Sheet C2.0 shows an "offsite limits of disturbance" across the existing cross-country transmission line corridor and into the existing natural stream area near to the PPEA water/sewer line and stadium site. No other sheet in the plan set, except for Sheet C1.2, provides information or specifications for work proposed at this location. The response to previous comment # 43 gives some preliminary information by indicating that "500 square yards of riprap is being placed on the southern edge of the cross-country transmission line corridor". The construction plan must have adequate plan and detail information to support this statement. Show more detail for what work is proposed at this location (riprap class, depth, fabric, placement, etc.), ensure there are no associated wetland impacts or wetland permits necessary and that no permission is necessary from applicable utilities (ie. VEPCO, Newport News Waterworks, Virginia Natural Gas, etc.). (Note: The environmental inventory for the site must also include this offsite work area. Also, the riprap placement area coincides with work proposed by the JCSA for the Warhill 16-inch water main extension. Refer to County plan number SP-79-05 which is undergoing active review and has not been approved. County contact is Mr. Michael Vergakis with the JCSA at 757-253-6677.)*

   Response: Refer to Drawings C4.2 for rip-rap classification, depth and filter fabric information. Per our phone conversation on 10-21-

05 a note has been added to direct the contractor to coordinate the location of the rip-rap. The wetland line and buffer has been added to the drawings.

4. *Phase I E&SC. The Phase I E&SC plan as presented on plan Sheets C2.2 and detail Sheets 2.6, 2.7 and 2.8 is acceptable to our Division except for comments that remain (below) about Temporary Sediment Basin # 1.*

   Response: No response necessary.

5. *Sediment Basins. The following comments pertain to temporary sediment basins as proposed for the project site.*

   a. *Previous comment # 20k was not fully addressed. Clarify and address seepage control methods for pipe barrels through temporary sediment basins # 1/# 2 and address previous concerns that VDOT DI-1 flat grates would not comply with Minimum Standard & Spec. 3.14 of the VESCH. It is unclear how the trash rack/anti-vortex tops for the temporary sediment basins, as shown on Sheet C2.6, are to connect to the DI-1 riser units. The basin must conform with Minimum Standard & Spec. 3.14 of the VESCH.*

      Response: A clay core and cutoff trench has been added to the sediment basin (Drawing C2.6) to address seepage control. A toe drain has also been added to the basin dam and 6" of stone under the outfall pipe from the clay core to the toe of dam will also help water migrate to the toe drain. Refer to Drawings C2.6, C4.2 and C5.1 for notes, details and plan view of the seepage control measures. The reference to DI-1's on Drawing C2.6 has been revised to MH-2's and the flat grate has been replaced by a plastic trash rack (Drawing C2.6).

   b. *The temporary sediment basin design data sheets (item # 19) shows a 30-inch diameter barrel used for Sediment Basin # 1 and a 48-inch for Basin # 2; however, construction plan and hydraulic models (PondPack) show use of 24-inch barrels. Correct the data sheet and all applicable items if necessary.*

      Response: Notation has been added to the design data sheets stating that the ponds were routed and smaller barrel pipes were adequate for the temporary conditions.

6. *Sediment Traps. Show cleanout elevations for Temporary Sediment traps # 1, # 2 and # 3 on the tables on Sheets C2.1 and C2.2 or on the trap detail on Sheet C2.7.*

   Response: Refer to Drawing C2.1 and C2.2 for revised Temporary Sediment Trap Schedules.

7. *Phase III E&S. On the Phase III erosion and sediment control plan presented*

on plan Sheets C2.3, C2.4 and C2.5, add temporary rock check dams at select/strategic locations within onsite graded stormwater conveyance channels. This also includes for roadside channels along the stadium access road. (Note: These measures would be temporary, to be removed following completion of grading and stabilization of the site).

Response: Refer to Drawing C2.3, C2.4 and C2.5 for check dam locations.

8. *Phase II Sequence. Authorization of land-disturbance on the Phase 2 portion of the project is heavily dependent on the progress being made on interim improvements as required at the District Park East Pond PC 106. It must be demonstrated that the INTERIM east pond repair plan is going to move forward in a timely manner as it relates to clearing and grubbing on the Phase 2 High School site (lower part) and the east part of the stadium site. This has been discussed multiple times at the Warhill PPEA standing team committee meetings and is very near resolution. Therefore, the Phase II sequence of construction on Sheet C2.2 must have the following outlined as Step # 1 and the note currently in bold in the lower right-hand corner of the sheet can be removed:* ***INTERIM -EMERGENCY repairs for the District Park East Pond PC 106, as outlined in the approved PER for the District Park East Pond PC106 and being a part of the Warhill PPEA project, must be in place and functional prior to or concurrently with the land-disturbing activities associated with this site. If the INTERIM repairs are not performed in a timely manner as this project proceeds, the Environmental Division may take action to delay or halt land-disturbing activity in the Phase 2 portion of this site until such time as the INTERIM - EMERGENCY repairs are commenced and/or completed on the East Pond.***

   Response: Refer to Drawing C2.2 for revised Phase II Sequence of Construction.

9. *Phase III Sequence. Consistent with SSC criteria proposed under Measure # 7 (BMP Infiltration) on Sheet C1.2, the Phase III sequence must make mention about scarification of the bottom area of the BMP after accumulated sediments are removed. This would be done before landscaping is installed per Sheet L1.2. (The underlying principle proposed under this scenario was to promote infiltration to reduce the peak rate of runoff and attempt to keep increased runoff volumes to the downstream District Park East Pond to a minimum.)*

   Response: Refer to Drawing C2.3, Note #6 for scarification information.

10. *Dust Control. Dust control measures per the response to previous comment # 23 could not be found on Sheets C2.1 or C2.2. Dust control may be warranted due to the proximity of site work to US Route 199 and now since the secondary access road under the Warhill PPEA is or will shortly be in a paved condition.*

    Response: Refer to Drawing C2.1 and C2.2 for dust control measures.

11. *Roadside Channel. The roadside EC-2 lined channel along the north side of the Stadium Access Road (west of proposed inlet # 156) does not comply with Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations. This graded stormwater conveyance channel must outfall into a natural or manmade receiving (and adequate) channel. (This issue was raised when preliminary comments were made on the stadium access road grading/drainage sketches.)*

    Response: Per our phone conversation on 10-21-05 the stadium access road construction will end at structure 156. The stadium plans will connect to the stadium access road at that point and the will have curb and gutter on the western edge to pick-up the road drainage.

Stormwater Management / Drainage:

12. *Narrative/Plans. Pursuant to previous comment # 25, no indication was provided on the plans or narrative as to what County BMP type the BMP is supposed to be. Based on the plans, details and BMP worksheet, the pond appears to represent a County type B-3 pond/wetland systems BMP based on format, features and assigned point value (10 points per the worksheet). If this is the case, clearly show "County type B-3 BMP" designation on the detail on Sheet C5.1, the County BMP worksheet and applicable plan sheets. (Note: As 10-point compliance is being obtained onsite and not by use of the offsite District Park East Pond, this is an important piece of information that is needed to show compliance.)*

    Response: Refer to Drawing C5.1 for BMP note. All additional BMP notation has been revised to indicate the type of basin design.

13. *BMP Points. Previous comment # 26 addressed several issues associated with the BMP worksheet and compliance with the County 10-point system. There are still several issues outstanding. First the revised BMP worksheet shows a total of 6.8 points achieved for the site. As this is less than the 10 required, water quality compliance is not demonstrated and the plan cannot receive approval. Secondly, although it is shown that BMP # 1 is a 10-point BMP, there is no indication what County type the BMP is (ie. A-3, B-3, etc.). Thirdly, the previous plan set showed approximately 19.4 acres of natural open space credit being taken for the site; however, the revised plan shows none (zero). It would appear that as BMP # 1 does not physically serve the entire site area of 54.5 acres, it would be very difficult to obtain 10 BMP points for the site without a Natural Open Space component. No structural credit can be given for the District Park East Pond as interim/permanent improvements proposed are not to upgrade the basin to a BMP meeting current County requirements, but rather to make the east pond dam and spillway structures safe for public, infrastructure and dam safety permit purposes. Point compliance is a critical issue that must be addressed for this project. (Also, compliance with Special Stormwater Criteria for the Powhatan Creek Watershed is independent of traditional 10-point stormwater management compliance.)*

Response: Enclosed is a revised BMP point system worksheet with natural open space credits shown. Refer to Drawing C1.2 for open space areas.

14. *BMP # 1. Previous comment # 34 remains unaddressed. Page 2.01 of the PondPack model still shows time of concentration as "user defined" and there are no supporting computations showing breakdowns for time of concentration for BMP # 1. It is still unclear why the total time of concentration as used for BMP design (0.4 hours/24 minutes) is not reasonably close to the corresponding time of concentration as shown for onsite storm piping system design (9.82 minutes) at outfall structure # 30.*

    Response: The time of concentration has been revised to match the storm sewer time. Refer to the revised calculations.

15. *BMP # 1 Design. It is unclear why the detail on Sheet C5.1 shows two low flow orifices in basin BMP # 1. One is a 3-inch orifice at El. 93 and a second is a 3-inch orifice at El. 92.2. The supporting PondPack hydraulic model shows one 3-inch low flow orifice.*

    Response: The 3" orifice at elevation 92.2 is for the Type B-3 BMP extended detention volume. The 3" orifice at elevation 93 is for the 1-Year 24-hour draw down.

16. *WSEL's. List and label design water surface elevations for the 1-, 2-, 10- and 100-year design storms for permanent BMP # 1 on pond plan Sheet C4.2.*

    Response: Refer to Drawing C4.2 for the water surface elevations.

17. *Maintenance Plan. Previous comment # 37e was not addressed. Provide a maintenance plan for BMP # 1 within the construction plan set.*

    Response: Refer to Drawing C2.6 for the maintenance plan.

18. *Special Stormwater Criteria. Based on the current amount of disturbed area for the site (42.8 acres), it appears that 5 SSCP unit measures are necessary to meet Special Stormwater Criteria and at least 5 were provided. The measures and tabulations are shown on Sheet C1.2. Therefore, it appears SSC is achieved. However, some additional guidance is being offered which may result in a cost savings to the school.*

    a. *Circled measure # 7, BMP infiltration, can be designated in the table as an SSCP # 22 (Alternative Measures-Emerging Technology) and assigned a SSCP unit value of 1 unit, assuming the sequence of construction for Phase III of the project is corrected appropriately to allow for scarification of the pond bottom (see above related comment) and if the bottom area of BMP # 1 remains large in surface area (1.5 acres),*

        Response: Refer to Drawing C1.2 for the revised Special

b. *Due to the above, as the total SSCP's would now be 6 and only 5 are required, this can result in the elimination of 1 unit from other, more expensive measures such as the perforated pipe (# 6, SSCP # 16; 1 unit), enhanced landscaping (# 5, SSCP # 33; ½ unit) and sumped inlets (# 2, SSCP # 14; ½ unit), etc. The SSCP measure removed can be at the owner's/plan preparer's choice or kept to provide additional water quality benefit for the site.*

Response: At this time the owner has not decided which 1 point to eliminate.

19. *Channel Adequacy. As BMP # 1 was eliminated from the plan, channel adequacy must be demonstrated (consistent with Minimum Standard # 19 of the Virginia Erosion and Sediment Control regulations) for the uncontrolled outfall which flows to the natural receiving channel downstream of Inlet # 157 and pipe segment # 158. Provide pre- and postdevelopment computations and channel hydraulic information to show the receiving natural channel has adequate erosion resistance and capacity for the 2-year event. No storm sewer computations could be found in the design report for Pipe Segment # 158. (Permissible velocities in the natural section should not exceed thresholds decided upon during early Warhill PPEA discussions, 1 ft. per second or less.*

Response: Refer to the enclosed calculations.

20. *Inlets. Hydraulic grade line computations in the design report show that storm drainage inlet # 33 will surcharge for the 10-year design storm event. Ensure that this is not a desirable conditions for surrounding land use and will not be a detriment to the long term function of the onsite stormwater piping system.*

Response: Although inlet #33 does surcharge during the 10-year storm event it is located in a ditch behind the baseball field that can easily accommodate the surcharge without any adverse effects on the surrounding area.

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

PROJECT: Williamsburg-James City County Third High School

BASIN #: 1 LOCATION: Front Entrance

Total area draining to basin: 12.50 acres.

Basin Volume Design

Wet Storage:

1) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres)
67 cu. yds x 12.50 acres = 837.50 cu. yds.

2) Available basin volume = 1,193 cu. yds. at elevation 99.60

3) Excavate - cu. yds. to obtain required volume*.
* Elevation corresponding to required volume = invert of the dewatering orifice.

4) Available volume before cleanout required.
33 cu. yds. x 12.50 acres = 413 cu. yds.

5) Elevation corresponding to cleanout level = 98.60

6) Distance from invert of the dewatering orifice to cleanout level = 1.00 ft.

Dry Storage:

7) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).
67 cu. yds x 12.5 acres = 837.50 cu. yds.

8) Total available basin volume at crest of riser* = 2,110 cu. yds. at elevation 100.60
* Minimum = 134 cu. yds. / acre of total drainage area.

9) Diameter of dewatering orifice. 6 inches REVISED PER ATTACHED POND ROUTING

A = flow area of orifice, in square feet
d = diameter of circular orifice, in inches
h = average driving head (maximum possible head measured from radius of orifice to crest of principal spillway divided by 2), in feet
Q = volumetric flowrate through orifice needed to achieve approximate 6-hour drawdown, cubic feet per second
S = total storage available in dry storage area, cubic feet

h = 4.40 ft.
S = 24759 cu.ft.
Q = S / 21,000 seconds
= 1.18 cfs
A = Q / (SQRT(64.32 x (h/2))) x 0.6
= 0.165 sq.ft.
d = (2 x (SQRT(A / 3.14))) x 12
= 6 in.

Diameter of dewatering orifice should never be less than 3 inches in order to help prevent clogging by soil or debris.

Basin Volume Design (Cont.)

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Suite 300
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TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

Diameter of dewatering orifice. (cont.)

Note: Flexible tubimg used should be at least 2 inches larger in diameter than the calculated orifice to promote improved flow characteristics.

Preliminary Design Elevations

11)

Crest of Riser =	105.00
Top of Dam =	107.00
Design High Water =	105.00
Upstream Toe of Dam =	98.00

Basin Shape

12) Length-to-width Ratio = L / We

We = A / L = the effective width
A = the surface area of the normal pool
L = the length of the flow path from the inflow to the outflow. If there is more than one point, any inflow which carries more than 30% of the peak rate of inflow must me these criteria.

L =	150.00	ft.
A =	24,250	sq.ft.
We =	161.67	ft.
Length-to-width Ratio =	0.92784	

If > 2, baffles are required	
If < 2, baffles are not required	X

Runoff

Q = C x i x A

Q = peak rate of runoff in cubic feet per second
C = runoff coefficient
i = average intensity of rainfall for the time of concentration (Tc) for a selected desig
A = drainage area in acres

A =	12.50	acres
C =	0.6	Bare packed soil (rough)
i_2 =	3.25	in/hr
i_{25} =	5.75	in/hr

13) Q_2 = 24.38 cfs

14) Q_{25} = 43.13 cfs

Principal Spillway Design

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

15) With emergency spillway, required spillway capacity Qp = Q_2 = 24.38 cfs
(riser and barrel)
Without emergency spillway, required spillway capacity Qp = Q_{25} = 43.13 cfs
(riser and barrel)

16) With emergency spillway:
h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation
Assumed available head (h) = _____ ft.

Without emergency spillway:
h = Design High Water Elevation - Crest of Riser Elevation
Assumed available head (h) = 1.00 ft.

17) Riser diameter (Dr) = 48 in. REVISED PER ATTACHED POND ROUTING
Actual head (h) = 1.00 ft.
(From Plate 3.14-8 of the Virginia Erosion and Sediment Handbook third edition 1992)
Note: Aviod orifice flow conditions.

18) Barrel length (l) = 149 ft.
Head (H) on barrel through embankment = 10.00 ft.
(From Plate 3.14-7 of the Virginia Erosion and Sediment Handbook third edition 1992)

24"

19) Barrel diameter = 30 in. RCP REVISED PER POND ROUTINGS
(From Plate 3.14-A of the Virginia Erosion and Sediment Handbook third edition 1992 for corrugated pipe)
(From Plate 3.14-B of the Virginia Erosion and Sediment Handbook third edition 1992 for concrete pipe)

20) Trash rack and anti-vortex device
Diameter = 72 inches
Height = 36 inches
(From Plate 3.14-D of the Virginia Erosion and Sediment Handbook third edition 1992)

Emergency Spillway Design

21) Required spillway capacity Qe = Q25 - Qp = _____ 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) $Ls = Y \times (Z + 4) \times (1 + (S / (0.25 - S)))$

Ls = length of barrel in the saturated zone, feet
Y = the depth of water at the principal spillway crest, feet
Z = slope of the upstream face of embankment in Z feet horizontal to one vertical
S = slope of the barrel in feet per foot

Anti-Seep Collar Design (Cont.)

Y = 7.00 ft.
Z = 4.00 ft.
S = 0.0124 ft. / foot

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
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Ls = 58.92 ft.

24) Number of collars required = 2
Dimensions = 4.6'X4.6'
(From Plate 3.14-12 of the Virginia Erosion and Sediment Handbook third edition 1992)

Final Design Elevations

25)

Top of Dam =	107.00
Design High Water =	105.00
Emergency Spillway Crest =	N/A
Principal Spillway Crest =	104.00
Dewatering Orifice Invert =	99.60
Cleanout Elevation =	98.60
Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area " (if excavation was performed) =	98.00

Timmons Group
1001 Boulders Parkway
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TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

PROJECT: Williamsburg-James City County Third High School

BASIN #: 2 LOCATION: Transmission Line Corridor Outfall (Southern Property Line)

Total area draining to basin: 37.00 acres.

Basin Volume Design

Wet Storage:

1) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres)
67 cu. yds x 37.00 acres = 2,479.00 cu. yds.

2) Available basin volume = 3,820 cu. yds. at elevation 94.50

3) Excavate - cu. yds. to obtain required volume*.
* Elevation corresponding to required volume = invert of the dewatering orifice.

4) Available volume before cleanout required.
33 cu. yds. x 37.00 acres = 1,221 cu. yds.

5) Elevation corresponding to cleanout level = 93.50

6) Distance from invert of the dewatering orifice to cleanout level = 1.00 ft.

Dry Storage:

7) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).
67 cu. yds x 37 acres = 2,479.00 cu. yds.

8) Total available basin volume at crest of riser* = 6,599 cu. yds. at elevation 95.50
* Minimum = 134 cu. yds. / acre of total drainage area.

9) Diameter of dewatering orifice. 11 inches REVISED PER ATTACHED POND ROUTING

A = flow area of orifice, in square feet
d = diameter of circular orifice, in inches
h = average driving head (maximum possible head measured from radius of orifice to crest of principal spillway divided by 2), in feet
Q = volumetric flowrate through orifice needed to achieve approximate 6-hour drawdown, cubic feet per second
S = total storage available in dry storage area, cubic feet

h = 2.25 ft.
S = 75033 cu.ft.
Q = S / 21,000 seconds
= 3.57 cfs
A = Q / (SQRT(64.32 x (h/2))) x 0.6
= 0.700 sq.ft.
d = (2 x (SQRT(A / 3.14))) x 12
= 11 in.

Diameter of dewatering orifice should never be less than 3 inches in order to help prevent clogging by soil or debris.

Basin Volume Design (Cont.)

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1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

Diameter of dewatering orifice. (cont.)

Note: Flexible tubimg used should be at least 2 inches larger in diameter than the calculated orifice to promote improved flow characteristics.

Preliminary Design Elevations

11)

Crest of Riser =	99.00
Top of Dam =	102.00
Design High Water =	100.00
Upstream Toe of Dam =	93.00

Basin Shape

12) Length-to-width Ratio = L / We

We = A / L = the effective width
A = the surface area of the normal pool
L = the length of the flow path from the inflow to the outflow. If there is more than one point, any inflow which carries more than 30% of the peak rate of inflow must me these criteria.

L =	380.00	ft.
A =	71,875	sq.ft.
We =	189.14	ft.
Length-to-width Ratio =	2.00904	

If > 2, baffles are required	
If < 2, baffles are not required	X

Runoff

Q = C x i x A

Q = peak rate of runoff in cubic feet per second
C = runoff coefficient
i = average intensity of rainfall for the time of concentration (Tc) for a selected desig
A = drainage area in acres

A =	37.00	acres
C =	0.6	Bare packed soil (rough)
i_2 =	3.25	in/hr
i_{25} =	5.75	in/hr

13) Q_2 = 72.15 cfs

14) Q_{25} = 127.65 cfs

Principal Spillway Design

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

15) With emergency spillway, required spillway capacity Qp = Q_2 = 72.15 cfs
(riser and barrel)
Without emergency spillway, required spillway capacity Qp = Q_{25} = 127.65 cfs
(riser and barrel)

16) With emergency spillway:
h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation
Assumed available head (h) = _____ ft.

Without emergency spillway:
h = Design High Water Elevation - Crest of Riser Elevation
Assumed available head (h) = 1.00 ft.

17) Riser diameter (Dr) = 60 in. REVISED PER ATTACHED POND ROUTING
Actual head (h) = 1.80 ft.
(From Plate 3.14-8 of the Virginia Erosion and Sediment Handbook third edition 1992)
Note: Aviod orifice flow conditions.

18) Barrel length (l) = 68 ft.
Head (H) on barrel through embankment = 9.00 ft.
(From Plate 3.14-7 of the Virginia Erosion and Sediment Handbook third edition 1992)

19) Barrel diameter = 48 in. RCP REVISED PER POND ROUTINGS 24"
(From Plate 3.14-A of the Virginia Erosion and Sediment Handbook third edition 1992 for corrugated pipe)
(From Plate 3.14-B of the Virginia Erosion and Sediment Handbook third edition 1992 for concrete pipe)

20) Trash rack and anti-vortex device
Diameter = 72 inches
Height = 21 inches
(From Plate 3.14-D of the Virginia Erosion and Sediment Handbook third edition 1992)

Emergency Spillway Design

21) Required spillway capacity Qe = Q25 - Qp = _____ 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) $Ls = Y \times (Z + 4) \times (1 + (S / (0.25 - S)))$

Ls = length of barrel in the saturated zone, feet
Y = the depth of water at the principal spillway crest, feet
Z = slope of the upstream face of embankment in Z feet horizontal to one vertical
S = slope of the barrel in feet per foot

Anti-Seep Collar Design (Cont.)

Y = 6.00 ft.
Z = 4.00 ft.
S = 0.0124 ft. / foot

Timmons Group
1001 Boulders Parkway
Suite 300
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TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

Ls = 50.51 ft.

24) Number of collars required = 0
Dimensions = 0.00
(From Plate 3.14-12 of the Virginia Erosion and Sediment Handbook third edition 1992)

Final Design Elevations

25)

Top of Dam =	102.00
Design High Water =	100.00
Emergency Spillway Crest =	N/A
Principal Spillway Crest =	99.00
Dewatering Orifice Invert =	94.50
Cleanout Elevation =	93.50
Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area " (if excavation was performed) =	93.00

Table of Contents

Table of Contents (continued)

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .1630 hrs

Total Tc: .1630 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

Tc Equations used...

==== User Defined ==========

Tc = Value entered by user

Where: Tc = Time of concentration

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	Impervious Adjustment %UC	Adjusted CN
	[redacted]	38.650			91.00
COMPOSITE AREA & WEIGHTED CN --->		38.650			91.00 (91)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 1
Tc = .1630 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .02173 hrs
Computed Peak Time = 11.9751 hrs
Computed Peak Flow = 98.69 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 97.64 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.8856 in
6.073 ac-ft

HYG Volume... 6.072 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .16300 hrs (ID: STORM 10)
Computational Incr, Tm = .02173 hrs = 0.20000 Tp

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

Unit peak, qp = 268.66 cfs
Unit peak time Tp = .10867 hrs
Unit receding limb, Tr = .43467 hrs
Total unit time, Tb = .54333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 2
Tc = .1630 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .02173 hrs
Computed Peak Time = 11.9751 hrs
Computed Peak Flow = 131.42 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 129.59 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
8.185 ac-ft

HYG Volume... 8.184 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .16300 hrs (ID: STORM 10)
Computational Incr, Tm = .02173 hrs = 0.20000 Tp

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

Unit peak, qp = 268.66 cfs
Unit peak time Tp = .10867 hrs
Unit receding limb, Tr = .43467 hrs
Total unit time, Tb = .54333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 10
Tc = .1630 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .02173 hrs
Computed Peak Time = 11.9751 hrs
Computed Peak Flow = 224.38 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0000 hrs
Peak Flow, Interpolated Output = 220.20 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.4687 in
14.393 ac-ft

HYG Volume... 14.391 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .16300 hrs (ID: STORM 10)
Computational Incr, Tm = .02173 hrs = 0.20000 Tp

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

Unit peak, qp = 268.66 cfs
Unit peak time Tp = .10867 hrs
Unit receding limb, Tr = .43467 hrs
Total unit time, Tb = .54333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 25
Tc = .1630 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .02173 hrs
Computed Peak Time = 11.9751 hrs
Computed Peak Flow = 247.42 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 242.92 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.9572 in
15.966 ac-ft

HYG Volume... 15.965 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .16300 hrs (ID: STORM 10)
Computational Incr, Tm = .02173 hrs = 0.20000 Tp

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

Unit peak, qp = 268.66 cfs
Unit peak time Tp = .10867 hrs
Unit receding limb, Tr = .43467 hrs
Total unit time, Tb = .54333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 100
Tc = .1630 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .02173 hrs
Computed Peak Time = 11.9751 hrs
Computed Peak Flow = 338.95 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 11.9500 hrs
Peak Flow, Interpolated Output = 333.41 cfs
WARNING: The difference between calculated peak flow
and interpolated peak flow is greater than 1.50%
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

6.9245 in
22.303 ac-ft

HYG Volume... 22.300 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .16300 hrs (ID: STORM 10)
Computational Incr, Tm = .02173 hrs = 0.20000 Tp

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

Unit peak, qp = 268.66 cfs
Unit peak time Tp = .10867 hrs
Unit receding limb, Tr = .43467 hrs
Total unit time, Tb = .54333 hrs

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
93.00	-----	1.4782	.0000	.000	.000
94.00	-----	1.5986	4.6140	1.538	1.538
95.00	-----	1.7220	4.9798	1.660	3.198
96.00	-----	1.8485	5.3546	1.785	4.983
97.00	-----	1.9779	5.7385	1.913	6.896
98.00	-----	2.1100	6.1308	2.044	8.939
99.00	-----	2.2446	6.5309	2.177	11.116
100.00	-----	2.3813	6.9378	2.313	13.429
101.00	-----	2.5205	7.3517	2.451	15.879
102.00	-----	2.6622	7.7731	2.591	18.470

POND VOLUME EQUATIONS

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

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

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 93.00 ft
Increment = .50 ft
Max. Elev.= 102.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	3	--->	4	96.400	102.000
Inlet Box	1	--->	4	99.000	102.000
Orifice-Circular	2	--->	4	93.000	102.000
Culvert-Circular	4	--->	TW	91.400	102.000

TW SETUP, DS Channel

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 3
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	96.40 ft
Diameter	=	.8333 ft
Orifice Coeff.	=	.600

Structure ID = 1
Structure Type = Inlet Box

# of Openings	=	1
Invert Elev.	=	99.00 ft
Orifice Area	=	12.2500 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	19.33 ft
Weir Coeff.	=	3.000
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	=	No

Structure ID = 2
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	93.00 ft
Diameter	=	.2500 ft
Orifice Coeff.	=	.600

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

OUTLET STRUCTURE INPUT DATA

Bmp #2

24"

```
Structure ID      = 4
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    2.0000 ft
Upstream Invert   =     91.40 ft
Dnstream Invert   =     91.00 ft
Horiz. Length     =     70.00 ft
Barrel Length     =     70.00 ft
Barrel Slope      =    .00571 ft/ft

OUTLET CONTROL DATA...
Mannings n        =     .0120
Ke                =     .9000  (forward entrance loss)
Kb                =   .010575  (per ft of full flow)
Kr                =     .9000  (reverse entrance loss)
HW Convergence    =      .001  +/- ft

INLET CONTROL DATA...
Equation form     =         1
Inlet Control K   =     .0018
Inlet Control M   =    2.0000
Inlet Control c   =    .02920
Inlet Control Y   =     .7400
T1 ratio (HW/D)   =     1.059
T2 ratio (HW/D)   =     1.204
Slope Factor      =     -.500
Calc inlet only   = Yes
```

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =   93.52 ft ---> Flow =   15.55 cfs
At T2 Elev =   93.81 ft ---> Flow =   17.77 cfs

```
Structure ID      = TW
Structure Type    = TW SETUP, DS Channel
-----------------------------------
FREE OUTFALL CONDITIONS SPECIFIED

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
93.00	.00	Free Outfall		
93.50	.12	Free Outfall		2,4 (no Q: 3,1)
94.00	.17	Free Outfall		2,4 (no Q: 3,1)
94.50	.20	Free Outfall		2,4 (no Q: 3,1)
95.00	.24	Free Outfall		2,4 (no Q: 3,1)
95.50	.36	Free Outfall		2,4 (no Q: 3,1)
96.00	.40	Free Outfall		2,4 (no Q: 3,1)
96.40	.42	Free Outfall		2,4 (no Q: 3,1)
96.50	.46	Free Outfall		3,2,4 (no Q: 1)
97.00	1.28	Free Outfall		3,2,4 (no Q: 1)
97.50	2.53	Free Outfall		3,2,4 (no Q: 1)
98.00	3.23	Free Outfall		3,2,4 (no Q: 1)
98.50	3.79	Free Outfall		3,2,4 (no Q: 1)
99.00	4.29	Free Outfall		3,2,4 (no Q: 1)
99.50	25.22	Free Outfall		3,1,2,4
100.00	49.08	Free Outfall		1,4 (no Q: 3,2)
100.50	50.77	Free Outfall		1,4 (no Q: 3,2)
101.00	52.40	Free Outfall		1,4 (no Q: 3,2)
101.50	54.00	Free Outfall		1,4 (no Q: 3,2)
102.00	55.54	Free Outfall		1,4 (no Q: 3,2)

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	97.64 cfs	at	12.0000 hrs
Peak Outflow	=	.42 cfs	at	23.8500 hrs
Peak Elevation	=	96.36 ft		
Peak Storage	=	5.655 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.072
- Infiltration	=	.000
- HYG Vol OUT	=	2.811
- Retained Vol	=	3.261
Unrouted Vol	=	-.001 ac-ft (.017% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 2
Outflow HYG file = NONE STORED - BMP OUT 2

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	129.59 cfs	at	12.0000 hrs
Peak Outflow	=	1.45 cfs	at	22.7500 hrs
Peak Elevation	=	97.07 ft		
Peak Storage	=	7.033 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	8.184
- Infiltration	=	.000
- HYG Vol OUT	=	4.350
- Retained Vol	=	3.830
Unrouted Vol	=	-.003 ac-ft (.038% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	220.20 cfs	at	12.0000 hrs
Peak Outflow	=	4.22 cfs	at	16.7000 hrs
Peak Elevation	=	98.93 ft		
Peak Storage	=	10.964 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	14.391
- Infiltration	=	.000
- HYG Vol OUT	=	10.091
- Retained Vol	=	4.298
Unrouted Vol	=	-.003 ac-ft (.021% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 25
Outflow HYG file = NONE STORED - BMP OUT 25

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	242.92 cfs	at	11.9500 hrs
Peak Outflow	=	9.60 cfs	at	13.8500 hrs
Peak Elevation	=	99.13 ft		
Peak Storage	=	11.402 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	15.965
- Infiltration	=	.000
- HYG Vol OUT	=	11.632
- Retained Vol	=	4.329
Unrouted Vol	=	-.003 ac-ft (.020% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	333.41 cfs	at	11.9500 hrs
Peak Outflow	=	49.22 cfs	at	12.3500 hrs
Peak Elevation	=	100.04 ft		
Peak Storage	=	13.531 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	22.300
- Infiltration	=	.000
- HYG Vol OUT	=	17.912
- Retained Vol	=	4.385
Unrouted Vol	=	-.004 ac-ft (.016% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

Index of Starting Page Numbers for ID Names

Sheet C1.2 Areas for NOS 11.43 AC. ?? 11.66 AC ??

Table 2

SITE 54.5 AC.
DA BMP1 = 37 AC.

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
#1	10	x	37/54.5 = 0.68	=	6.8 ✓
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 6.8 ✓

B. NATURAL OPEN SPACE CREDIT 11.43/54.5 = 20.97% = 2.09 pts.

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
1.94/54.5 = 3.56×10^{-2}	x	(0.1)(3.56) (0.1 per 1%)	=	0.36
9.72/54.5 = 0.18	x	(0.15)(18.0) (0.18 per 1%)	=	2.70

11.66 AC.

TOTAL NATURAL OPEN SPACE CREDIT: 3.06

C. TOTAL WEIGHTED POINTS 2.09 8.89 pts.

6.8	+	3.06	=	9.9
Structural BMP Points		Natural Open Space Points		Total

WORKED BACK & FORTH ON THIS ONE, ABOUT THE BEST THERE IS TO GET 10 – THIS IN COMBINATION WITH O/S EAST POND CERTAINLY SHOWS COMPLIANCE W/ SYSTEM MINOR DISCREPANCY ~11.43/~11.66 AC NOS.

NO!

9.72 AC CREDIT EXTRA BUFFER RPA?

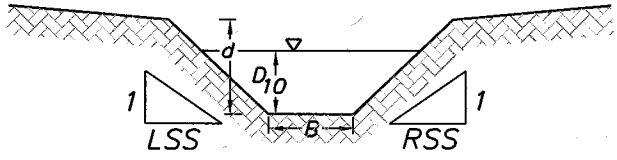
1.11 DEFICIT.

37/54.5

PC 106 AS 2 pt BMP?

EARTH DITCH CROSS SECTION

NO SCALE



SECT. H-H PRE
(PROVIDED BY JCC)
CN = 63
Tc = 85 min.
Q_2 = 2.55 cfs
Q_{10} = 9.63 cfs

SECT. H-H POST
n = 0.060
S = 2.70%
Q_2 = 1.90 cfs
Q_{10} = 2.40 cfs

V_2 = 1.20 fps
D_{10} = 0.25'
d = VARIABLE
B = 4.7'
LSS = 12:1
RSS = 12:1

~ 1 FPS ALLOWABLE

ALSO TSB 13 ACHIEVING MS-19 CRITERIA AS POST < PRE 2

Ditch Section H-H / 2 Year
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	H-H_2 year
Flow Element	Trapezoidal Cha
Method	Manning's Formu
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.060	
Slope	2.70	%
Left Side Slope	12.00	ft/ft (H:V)
Right Side Slope	12.00	ft/ft (H:V)
Bottom Width	4.70	ft
Discharge	1.90	cfs

Results		
Depth	0.22	ft
Flow Area	1.6	ft²
Wetted Perim	9.93	ft
Top Width	9.91	ft
Critical Depth	0.15	ft
Critical Slope	10.73	%
Velocity	1.20	ft/s
Velocity Head	0.02	ft
Specific Energ	0.24	ft
Froude Numb	0.53	
Flow Type	Subcritical	

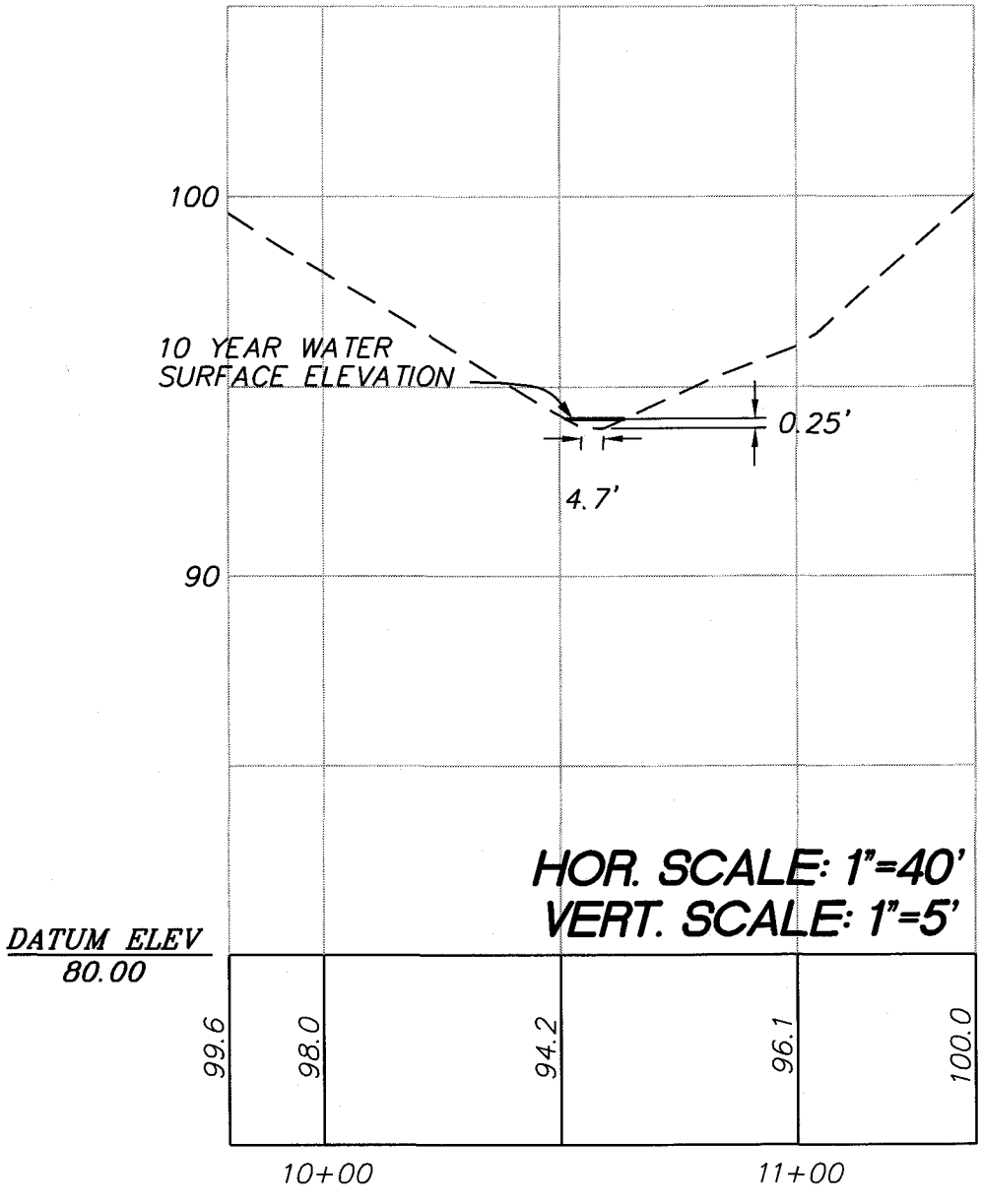
Ditch Section H-H / 10 Year
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	H-H_10 year
Flow Element	Trapezoidal Cha
Method	Manning's Form
Solve For	Channel Depth

Input Data		
Mannings Coeffic	.060	
Slope	2.70	%
Left Side Slope	12.00	ft/ft (H:V)
Right Side Slope	12.00	ft/ft (H:V)
Bottom Width	4.70	ft
Discharge	2.40	cfs

Results		
Depth	0.25	ft
Flow Area	1.9	ft²
Wetted Perim	10.60	ft
Top Width	10.58	ft
Critical Depth	0.17	ft
Critical Slope	10.33	%
Velocity	1.28	ft/s
Velocity Head	0.03	ft
Specific Energ	0.27	ft
Froude Numb	0.54	
Flow Type	Subcritical	

J. K. Timmons & Assoc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666



DITCH SECTION H-H

STORM SEWER DESIGN COMPUTATIONS

PROJECT: Third High School JOB # 21151
COUNTY: Williamsburg-James City County
DESCRIPTION: Storm Sewer
DATE: 10/23/2005

Storm Frequency 10 year
n = 0.013
* = Manual Input of Data

FROM POINT	PIPE NAME	TO POINT	DRAINAGE AREA (acres)	RUNOFF)EFFICIE	CA INCRE.	CA ACCUM.	INLET TIME (min)	RAIN-FALL (in/hr)	RUNOFF Q (cfs)	TOP STR (elev)	HEIGHT STR (ft)	INV UPPER (ft)	INV. LOWER (ft)	LENGTH (ft)	SLOPE (ft/ft)	DIA (in)	CAPACITY (cfs)	VELOCITY (ft/s)	FLOW TIME (min)	Additiona BLDG Al	Additional C*A	STR TYPE
1	2	3	1.20	0.77	0.92	0.92	5.00	7.00	6.5	108.00	4.50	103.50	103.24	52.27	0.0050	21	11.2	4.83	0.18	0	0	DI-3B, L=6'
3	4	5	0.60	0.65	0.39	1.31	5.18	6.98	9.2	108.00	4.86	103.14	102.32	163.09	0.0050	21	11.2	5.21	0.52	0	0	DI-3C, L=6'
5	6	7	0.15	0.90	0.14	1.45	5.70	6.86	9.9	112.30	10.23	102.07	101.10	194.16	0.0050	24	16.0	5.38	0.60	0	0	DI-3BB, L=6'
7	8	9	0.13	0.92	0.12	1.57	6.30	6.71	10.5	112.30	11.30	101.00	100.44	112.92	0.0050	24	16.0	5.45	0.35	0	0	DI-3BB, L=6'
37	38	9	1.20	0.67	0.80	0.80	5.00	7.00	5.6	109.50	4.50	105.00	101.19	92.10	0.0414	15	13.1	10.31	0.15	0	0	DI-3C, L=6'
9	10	11	0.00	0.30	0.00	2.37	6.65	6.62	15.7	111.50	11.16	100.34	100.02	63.00	0.0050	24	16.0	5.82	0.18	0	0	MH-2
69	70	71	0.17	0.70	0.12	0.17	5.00	7.00	1.2	112.90	3.40	109.50	109.12	76.07	0.0050	15	4.6	3.13	0.41	0.053	0.05062	18" NYLOPLAS
71	72	73	0.12	0.63	0.08	0.33	5.41	6.92	2.3	112.90	3.88	109.02	108.71	62.33	0.0050	15	4.6	3.74	0.28	0.092	0.0874	18" NYLOPLAS
73	74	75	0.12	0.76	0.09	0.42	5.68	6.88	2.9	112.90	4.29	108.61	104.50	81.83	0.0502	15	14.5	9.25	0.15	0	0	18" NYLOPLAS
75	76	11	0.15	0.45	0.07	0.49	5.83	6.84	3.4	113.10	8.70	104.40	100.77	71.17	0.0510	15	14.6	9.68	0.12	0	0	18" NYLOPLAS
11	12	13	0.00	0.30	0.00	2.86	6.83	6.56	18.8	111.48	11.71	99.77	99.07	140.51	0.0050	27	21.9	6.21	0.38	0	0	MH-2
77	78	79	0.09	0.80	0.07	0.19	5.00	7.00	1.3	113.20	4.00	109.20	109.01	37.91	0.0050	15	4.6	3.23	0.20	0.124	0.1178	18" NYLOPLAS
79	80	BEND	0.14	0.90	0.13	0.32	5.20	6.98	2.2	113.20	4.29	108.91	108.67	47.36	0.0050	15	4.6	3.70	0.21	0	0	18" NYLOPLAS
BEND	80A	81	0.00	0.30	0.00	0.32	5.41	6.92	2.2	114.00	5.33	108.67	108.63	8.14	0.0050	15	4.6	3.69	0.04	0	0	18" NYLOPLAS
81	82	83	0.11	0.78	0.09	0.40	5.45	6.92	2.8	113.00	4.47	108.53	108.27	51.70	0.0050	15	4.6	3.91	0.22	0	0	18" NYLOPLAS
83	84	85	0.11	0.82	0.09	0.49	5.45	6.92	3.4	112.80	4.63	108.17	107.74	87.00	0.0050	15	4.6	4.09	0.36	0	0	18" NYLOPLAS
85	86	87	0.09	0.35	0.03	0.52	5.20	6.98	3.7	111.90	4.26	107.64	107.38	51.70	0.0050	15	4.6	4.14	0.21	0	0	18" NYLOPLAS
87	88	13	0.16	0.74	0.12	0.67	5.95	6.82	4.5	113.00	5.72	107.28	100.07	78.50	0.0919	15	19.6	13.02	0.10	0.026	0.0247	18" NYLOPLAS
13	14	15	0.00	0.30	0.00	3.53	7.21	6.46	22.8	111.48	12.66	98.82	98.13	138.50	0.0050	30	29.0	6.56	0.35	0	0	MH-2
35	36	15	1.25	0.81	1.01	1.01	5.00	7.00	7.1	109.50	4.50	105.00	99.38	114.11	0.0493	15	14.3	11.67	0.16	0	0	DI-3C, L=6'
89	90	91	0.09	0.80	0.07	0.23	5.00	7.00	1.6	113.20	4.00	109.20	109.02	36.91	0.0050	15	4.6	3.42	0.18	0.171	0.16245	18" NYLOPLAS
91	92	BEND2	0.14	0.90	0.13	0.36	5.18	6.98	2.5	113.30	4.38	108.92	108.68	47.36	0.0050	15	4.6	3.82	0.21	0	0	18" NYLOPLAS
BEND2	92A	93	0.00	0.30	0.00	0.36	5.39	6.94	2.5	113.20	4.52	108.68	108.64	8.14	0.0050	15	4.6	3.81	0.04	0	0	18" NYLOPLAS
93	94	95	0.11	0.78	0.09	0.45	5.42	6.92	3.1	113.00	4.46	108.54	108.28	51.70	0.0050	15	4.6	4.01	0.22	0	0	18" NYLOPLAS
95	96	97	0.11	0.82	0.09	0.54	5.42	6.92	3.7	112.80	4.62	108.18	107.74	87.00	0.0050	15	4.6	4.16	0.35	0	0	18" NYLOPLAS
97	98	99	0.09	0.35	0.03	0.57	5.18	6.98	4.0	111.90	4.26	107.64	107.39	51.70	0.0050	15	4.6	4.20	0.21	0	0	18" NYLOPLAS
99	100	15	0.16	0.74	0.12	0.69	7.56	6.40	4.4	113.00	5.71	107.29	99.38	78.50	0.1007	15	20.5	13.33	0.10	0	0	18" NYLOPLAS
15	16	17	0.00	0.30	0.00	5.23	7.56	6.40	33.5	111.48	13.60	97.88	97.12	152.08	0.0050	33	37.4	7.14	0.36	0	0	MH-2
101	102	103	0.13	0.70	0.09	0.10	5.00	7.00	0.7	113.10	3.60	109.50	109.11	77.67	0.0050	15	4.6	2.73	0.47	0.014	0.0133	18" NYLOPLAS
103	104	105	0.11	0.78	0.09	0.27	5.47	6.92	1.9	112.90	3.89	109.01	108.70	62.33	0.0050	15	4.6	3.56	0.29	0.088	0.0836	18" NYLOPLAS
105	106	107	0.07	0.80	0.06	0.33	5.77	6.86	2.3	113.30	4.70	108.60	108.21	77.50	0.0050	15	4.6	3.72	0.35	0	0	18" NYLOPLAS
107	108	17	0.08	0.56	0.04	0.40	6.11	6.77	2.7	112.75	4.64	108.11	98.62	78.46	0.1210	15	22.5	12.37	0.11	0.025	0.02375	18" NYLOPLAS
17	18	19	0.00	0.30	0.00	5.63	7.91	6.32	35.6	112.40	15.53	96.87	96.20	134.26	0.0050	36	47.2	7.35	0.31	0	0	MH-2
19	20	21	0.48	0.85	0.41	6.04	8.22	6.26	37.8	109.80	14.10	95.70	94.84	171.00	0.0050	42	71.1	7.52	0.38	0	0	JB-1 W/DI-1 TO
21	22	23	0.86	0.72	0.62	6.65	8.60	6.20	41.3	109.70	14.96	94.74	94.23	101.82	0.0050	42	71.1	7.68	0.22	0	0	JB-1 W/DI-1 TO
132	134	135	0.12	0.90	0.11	0.39	5.00	7.00	2.8	109.85	1.67	108.18	107.03	76.94	0.0150	15	7.9	5.88	0.22	0.3	0.285	ZURN
138	140	135	0.05	0.90	0.05	0.05	5.00	7.00	0.3	110.20	1.67	108.53	107.03	67.98	0.0221	15	9.6	3.60	0.32	0	0	ZURN
135	136	23	0.00	0.30	0.00	0.44	5.22	6.96	3.0	111.50	4.57	106.93	96.48	68.45	0.1526	15	25.2	13.92	0.08	0	0	MH-2
23	24	25	0.00	0.30	0.00	7.09	8.82	6.14	43.5	111.70	17.57	94.13	93.12	203.36	0.0050	42	71.1	7.78	0.44	0	0	MH-2
25	26	27	2.37	0.58	1.37	8.47	9.26	6.07	51.4	103.00	10.38	92.62	92.02	118.83	0.0050	48	101.6	8.12	0.24	0	0	JB-1 W/DI-1 TO
39	40	41	1.72	0.80	1.38	1.38	5.00	7.00	9.6	107.40	5.66	101.74	101.30	88.13	0.0050	21	11.2	5.25	0.28	0	0	DI-3B, L=6'
41	42	43	0.23	0.84	0.19	1.57	5.28	6.96	10.9	108.30	7.10	101.20	100.29	182.26	0.0050	21	11.2	5.32	0.57	0	0	DI-3B, L=6'
61	62	43	0.24	0.83	0.20	0.20	5.00	7.00	1.4	109.90	4.90	105.00	100.79	35.21	0.1196	15	22.3	10.15	0.06	0	0	DI-3B, L=6'
43	44	45	0.00	0.30	0.00	1.77	5.85	6.84	12.1	110.50	10.46	100.04	99.66	75.88	0.0050	24	16.0	5.61	0.23	0	0	MH-2
63	64	65	0.65	0.75	0.49	0.49	5.00	7.00	3.4	106.75	4.75	102.00	101.62	76.64	0.0050	18	7.4	4.12	0.31	0	0	DI-3B, L=6'
65	66	45	1.31	0.86	1.13	1.61	5.31	6.94	11.2	106.00	4.88	101.12	99.66	185.00	0.0079	24	20.1	6.58	0.47	0	0	DI-1
45	46	47	0.07	0.67	0.05	3.43	6.08	6.80	23.3	110.00	10.84	99.16	98.46	140.00	0.0050	30	28.0	6.58	0.35	0	0	DI-7 W/DI-1 TOI
67	68	47	1.42	0.85	1.21	1.21	5.00	7.00	8.4	108.00	3.00	105.00	99.71	185.00	0.0286	15	10.9	9.85	0.31	0	0	DI-1
47	48	49	0.08	0.71	0.06	4.69	6.08	6.80	31.9	110.50	12.29	98.21	97.43	157.57	0.0050	33	37.4	7.09	0.37	0	0	DI-7 W/DI-1 TOI
49	50	51	0.00	0.30	0.00	4.69	6.45	6.68	31.4	112.60	15.42	97.18	95.87	261.90	0.0050	36	47.2	7.15	0.61	0	0	MH-2
55	56	57	2.02	0.29	0.59	0.59	5.00	7.00	4.1	104.25	2.75	101.50	100.86	128.51	0.0050	15	4.6	4.22	0.51	0	0	DI-1
57	58	59	0.79	0.32	0.25	0.84	5.51	6.90	5.8	104.25	3.64	100.61	99.61	199.99	0.0050	18	7.4	4.66	0.72	0	0	DI-1
59	60	51	0.91	0.34	0.31	1.15	6.22	6.74	7.7	104.25	5.14	99.11	96.77	120.66	0.0194	24	31.5	8.31	0.24	0	0	DI-1
51	52	53	0.00	0.30	0.00	5.84	7.06	6.50	38.0	105.00	9.23	95.77	95.37	79.33	0.0050	36	47.2	7.44	0.18	0	0	MH-2
109	110	111	0.08	0.68	0.05	0.50	5.00	7.00	3.5	112.50	3.00	109.50	109.24	51.55	0.0050	15	4.6	4.11	0.21	0.471	0.44745	18" NYLOPLAS
111	112	113	0.08	0.42	0.03	0.54	5.21	6.96	3.7	113.10	3.96	109.14	108.78	71.50	0.0050	15	4.6	4.16	0.29	0	0	18" NYLOPLAS
113	114	115	0.05	0.34	0.02	0.62	5.50	6.92	4.3	113.10	4.42	108.68	108.25	86.28	0.0050	15	4.6	4.24	0.34	0.074	0.0703	18" NYLOPLAS
115	116	117	0.09	0.59	0.05	0.68	5.84	6.84	4.6	112.80	4.65	108.15	107.93	43.75	0.0050	15	4.6	4.25	0.17	0	0	18" NYLOPLAS
117	118	BEND	0.07	0.70	0.05	0.82	5.84	6.84	5.6	113.20	5.52	107.68	107.20	96.68	0.0050	18	7.4	4.62	0.35	0.096	0.0912	18" NYLOPLAS
BEND	118A	119	0.00	0.30	0.00	0.82	5.21	6.96	5.7	113.21	6.00	107.20	107.03	34.99	0.0050	18	7.4	4.64	0.13	0	0	18" NYLOPLAS
119	120	121	0.11	0.44	0.05	1.11	6.47	6.68	7.4	112.90	6.37	106.53	106.22	61.17	0.0050	24	16.0	5.00	0.20	0.257	0.24415	24" NYLOPLAS
121	122	BEND	0.14	0.58	0.08	1.69	6.47	6.68	11.3	112.90	6.78	106.12	105.95	33.67	0.0050	24	16.0	5.53	0.10	0.531	0.50445	24" NYLOPLAS
BEND	122A	123	0.00	0.30	0.00	1.69	6.01	6.80	11.5	113.22	7.27	105.95	105.37	115.61	0.0050	24	16.0	5.55	0.35	0	0	24" NYLOPLAS
123	124	125	0.16	0.71	0.11	1.96	6.35	6.71	13.2	112.90	7.63	105.27	104.97	60.00	0.0050	24	16.0	5.70	0.18	0.162	0.1539	24" NYLOPLAS
125	126	127	0.13	0.66	0.09	2.05	6.53	6.65	13.6	112.90	8.03	104.87	104.58	58.17	0.0050	24	16.0	5.73	0.17	0	0	24" NYLOPLAS
127	128	129	0.07	0.66	0.05	2.09	6.57	6.65	13.9	112.90	8.42	104.48	102.29	39.52	0.0555	24	53.3	14.30	0.05	0	0	24" NYLOPLAS
141	142	143	0.04	0.80	0.03	0.09	5.00	7.00	0.6	113.20	4.20	109.00	108.78	44.73	0.0050	15	4.6	2.63	0.28	0.062	0.0589	24" NYLOPLAS
143	144	145	0.06	0.41	0.02	0.12	5.28	6.96	0.8	112.80	4.12	108.68	108.37	61.14	0.0050	15	4.6	2.81	0.36	0	0	24" NYLOPLAS
145	146	147	0.09	0.36	0.03	0.39	5.65	6.88	2.7	112.80	4.53	108.27	107.92	69.24	0.0050	15	4.6	3.87	0.30	0.252	0.2394	24" NYLOPLAS
147	148	129	0.09	0.59	0.05	0.44	5.95	6.82	3.0	112.90	5.08	107.82	103.14	47.57	0.0985	15	20.3	11.86	0.07	0	0	24" NYLOPLAS
129	130	53	0.13	0.36	0.05	2.58	6.61	6.62	17.1	112.90	10.71	102.19	96.37	91.82	0.0634	24	55.9	15.88	0.10	0	0	24" NYLOPLAS
53	54	27	0.58	0.51	0.30	8.72	7.06	6.50	56.7	104.25	8.98	95.27	93.02	173.01	0.0130	36	73.0	11.82	0.24	0	0	DI-7 W/DI-1 TOI
27	28	29	0.45	0.46	0.21	17.39	9.50	6.04	105.0	104.00	12.48	91.52	90.60	184.04	0.0050	54	139.1	9.63	0.32	0	0	JB-1 W/DI-1 TO
31	32	33	0.69	0.30	0.21	0.21	5.00	7.00	1.4	103.00	3.00	100.00	95.37	173.17	0.0267	15	10.6	6.04	0.48	0	0	DI-1
33	34	29	3.20	0.31	0.99	1.20	5.48	6.92	8.3	100.00	5.13	94.87	93.35	304.35	0.0050	21	11.2	5.11	0.99	0	0	DI-1
29	30	END	3.59	0.51	1.83	20.42	9.82	5.98	122.1	103.00	12.50	90.50	90.00	47.95	0.0104	54	201.0	13.27	0.06	0	0	JB-1 W/DI-1 TO
157	158	END	1.53	0.32	0.49	0.49	16.00	5.00	2.4	105.00	7.00	98.00	94.90	149.00	0.0208	24	32.6	6.12	0.41	0	0	DI-1

STORM SEWER DESIGN COMPUTATIONS

PROJECT: Third High School JOB # 21151
COUNTY: Williamsburg-James City County
DESCRIPTION: Storm Sewer
DATE: 10/23/2005

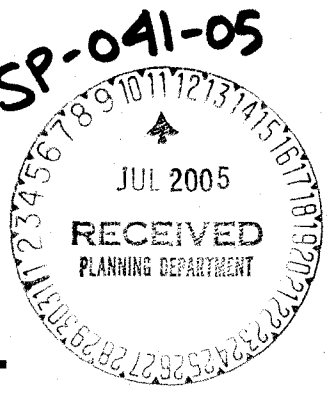
Storm Frequency 2 year
n = 0.013
* = Manual Input of Data

FROM POINT	PIPE NAME	TO POINT	DRAINAGE AREA (acres)	RUNOFF)EFFICIE	CA INCRE.	CA ACCUM.	INLET TIME (min)	RAIN- FALL (in/hr)	RUNOFF Q (cfs)	TOP STR (elev)	HEIGHT STR (ft)	INV UPPER (ft)	INV. LOWER (ft)	LENGTH (ft)	SLOPE (ft/ft)	DIA (in)	CAPACITY (cfs)	VELOCITY (ft/s)	FLOW TIME (min)	Additiona BLDG A	Additional C*A	STR TYPE
157	158	END	1.53	0.32	0.49	0.49	16.00	3.85	1.9	105.00	7.00	98.00	94.90	149.00	0.0208	24	32.6	5.66	0.44	0	0	DI-1

DA:	STR 157			
	C-factor	Area		
Lawns	0.30	1.48	0.444	
Pavement	0.95	0	0	
Roof	0.95	0	0	
Woods	0.25	0	0	
Walks	0.80	0.05	0.04	
		Area	Total C-factor	
		1.53	**0.316**	
Tc:				
	Overland:			
		Length =	200	ft
		Slope =	2.0	%
		c-factor =	0.31	
			tc =	14.1 minutes
	Concentrated:			
		Length =	161	ft
		H =	2	ft
				2.3 minutes
			Tc =	**16.4 minutes**

I_2 =	3.81	**Q_2 =**	**1.8 cfs**
I_{10} =	4.95	**Q_{10} =**	**2.4 cfs**
I_{25} =	5.70	**Q_{25} =**	**2.8 cfs**
I_{50} =	7.61	**Q_{50} =**	**3.7 cfs**
I_{100} =	8.67	**Q_{100} =**	**4.2 cfs**

SP-041-05



THIRD HIGH SCHOOL

COUNTY SUBMITTAL
CALCULATIONS PACKAGE

WILLIAMSBURG-JAMES CITY COUNTY

2ND REVIEW

- D.P. East Pond does not serve as BMP for this site.
- 10 points?
- SWM checklist check n/a for conserv easements
- MAINT PLAN? BMP #1

July 3, 2005

THIRD HIGH SCHOOL
DESIGN CALCULATION PACKAGE

TABLE OF CONTENTS

James City County, Virginia
Environmental Division

Erosion and Sediment Control and Stormwater Management Design Plan Checklists

Table of Contents

GENERAL INFORMATION

Project Name: THIRD HIGH SCHOOL
Owner / Applicant: JAMES CITY COUNTY PUBLIC SCHOOLS
Plan Preparer: TIMMONS GROUP Email:
Project Location: 6450 CENTERVILLE ROAD & 5700 WARHILL TRAIL
Tax Map / Parcel: (32-1)(1-12) (32-1)(1-13)
County Plan No. (if known): SP-41-05
County BMP Type: WET EXTENDED DETENTION POND (A - 3)
Other information submitted in addition to this checklist (Check all that apply):

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

Issue Date
March 1, 2001

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

I. *GENERAL:*

Yes No N/A

☑ ☐ ☐ *FAMILIARITY* with current versions of Chapter 8, Erosion and Sedimentation Control and Chapter 23, Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia and the Virginia Erosion and Sediment Control Handbook (VESCH).

☑ ☐ ☐ *LAND DISTURBING PERMIT AND SILTATION AGREEMENT* with surety are required for the project.

☐ ☐ ☑ *VARIANCE* if necessary, requested in writing, for the plan approving authority to waive or modify any of the minimum standards and specifications of the VESCH deemed inappropriate based on site conditions specific to this review case only. Variances which are approved shall be properly documented in the plan and become part of the approved erosion and sediment control plan for the site.

II. *SITE PLAN:*

Yes No N/A

☑ ☐ ☐ *VICINITY MAP* locating the site in relation to the surrounding area. Include any major landmarks which might assist in physically locating the site.

☑ ☐ ☐ *INDICATE NORTH* direction in relation to the site.

☑ ☐ ☐ *LIMITS OF CLEARING AND GRADING* for the site including that required for implementation of erosion and sediment controls, stockpile areas and utilities.

☑ ☐ ☐ *DISTURBED AREA ESTIMATES* in acres or square feet for the project.

☑ ☐ ☐ *EXISTING TOPOGRAPHY* or contours for the site at no more than 5 foot contour interval.

☑ ☐ ☐ *FINAL TOPOGRAPHY*, contours or proposed site grading in accordance with the design plan which indicates changes to existing topography and drainage patterns at no more than 2 foot contour interval (or 1 foot contours where required).

☑ ☐ ☐ *EXISTING AND PROPOSED SPOT ELEVATIONS* to supplement existing and proposed contours, topography or site grading information. Spot elevations may replace final contours in some instances, especially if terrain is in a low lying area or relatively flat.

☑ ☐ ☐ *EXISTING VEGETATION* including existing tree lines, grassed or unique vegetation areas.

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

Yes No N/A

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

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

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

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

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

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

III. *NARRATIVE:*

Yes No N/A

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

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

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

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

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

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

Yes No N/A

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

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

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

IV. *CALCULATIONS:*

Yes No N/A

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

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

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

I. ***GENERAL:***

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

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

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

II. ***STORMWATER CONVEYANCE SYSTEMS:***

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

Yes No N/A

☐ ☐ ☐ *STORMWATER CONVEYANCE SYSTEM COMPUTATIONS*

☑ ☐ ☐ Storm Sewer Design computations based on 10-year design event.

☑ ☐ ☐ Hydraulic Grade Line computations based on 10-year design event.

☑ ☐ ☐ Inlet computations based on current VDOT procedure for spread, ponding depth and grate size required.

☐ ☐ ☑ Culvert Headwater computations. Design based on 10-year design storm event and check only for 100-year storm event.

☑ ☐ ☐ Open Channel computations based on 2-year design event for velocity and 10-year design event for capacity.

☑ ☐ ☐ Standard outlet protection or special energy dissipators.

☐ ☐ ☑ Pipe thickness design computations, as required, for selected pipe type (live load, minimum cover, maximum height of cover, etc.).

☐ ☐ ☑ Adequate channel computations for receiving channels (based on field measured channel section data).

III. *STORMWATER MANAGEMENT / BMP FACILITIES*:

Yes No N/A

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

☑ ☐ ☐ Runoff Curve Number or Coefficient determinations: predeveloped and ultimate development land use scenarios.

☑ ☐ ☐ Time of concentration: predeveloped and ultimate development indicating overland, shallow concentrated, and channel flow components (200 ft. maximum length for overland flow).

☑ ☐ ☐ Hydrograph generation (tabular or graphical): pre- and postdevelopment conditions for the 1-, 2-, 10-, and 100-year design storm events.

☐ ☐ ☐ *FACILITY CONFIGURATION and MINIMUM SEPARATIONS*

☑ ☐ ☐ Screening and layout consistent with Section 24-98(d) of the Chapter 24 Zoning ordinance (landscaping, screening, visibility, etc.).

☑ ☐ ☐ Basic considerations for safety and unauthorized entry.

☑ ☐ ☐ Proper length to width ratio (Typically 2H:1V).

☑ ☐ ☐ Facilities with deep pools (4 feet or more in depth) provided with two benches. Fifteen (15) ft. safety bench outward from normal pool at maximum 6 percent slope and aquatic bench inward from normal shoreline below normal pool. Narrower widths may be considered on a case-by-case basis.

☑ ☐ ☐ Pond buffer minimum 25 feet outward from maximum design WSEL. Additional setbacks may be required to permanent structures.

☑ ☐ ☐ No trees, shrubs or woody plants within 15 feet of embankment toe or 25 feet from principal spillway structure.

Yes	No	N/A	
☑	☐	☐	Infiltration and filtering system facilities generally located at least 100 feet horizontally from any water supply well; 100 feet from any downslope building; and 25 feet from any upslope buildings, unless site specific investigation allows for reduced separation.

Yes	No	N/A	
☐	☐	☐	*HYDRAULIC COMPUTATIONS*
☑	☐	☐	Elevation- or Stage- Storage curve and/or tabular data.
☑	☐	☐	Weir / Orifice Control - Extended Detention.
☑	☐	☐	Weir / Orifice Control - riser 1-year control for channel protection.
☑	☐	☐	Weir / Orifice Control - riser 2-year control for quantity (if required).
☑	☐	☐	Weir / Orifice Control - riser 10-year control for quantity (if required).
☑	☐	☐	Inlet / Outlet (barrel) control - (All Storms).
☑	☐	☐	Check for barrel control prior to riser orifice flow to prevent slug flow-water hammer conditions.
☑	☐	☐	Emergency spillway capacity and depth of flow.
☑	☐	☐	Elevation - Discharge (Outlet Rating) curve and/or table. Provide all supporting calculations and/or design assumptions.
☑	☐	☐	Adequate channel computations for receiving channel. May be waived if facility is designed based on current Stream Channel Protection criteria.

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

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

Yes No N/A

- ☐ ☐ ☐ Riser / base structure flotation analyses. FS = 1.25 minimum.
- ☐ ☐ ☑ Downstream danger reach study and/or emergency action plan (if conditions warrant).
- ☐ ☐ ☑ Upstream backwater analyses onto offsite adjacent property (if conditions warrant).
- ☐ ☐ ☑ 100 year floodplain impacts (if conditions warrant).

Yes No N/A

☐ ☐ ☐ *GEOTECHNICAL REQUIREMENTS*

- ☑ ☐ ☐ Geotechnical Report with recommendations specific to BMP facility type selected. Report prepared by a registered professional engineer. Requires submission, review and approval prior to issuance of Land Disturbance Permit.
- ☑ ☐ ☐ Initial Feasibility Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
- ☑ ☐ ☐ Concept Design Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
- ☑ ☐ ☐ Minimum Boring locations: borrow area, pool area, principal control structure, top of facility near one abutment and emergency spillway if provided.
- ☑ ☐ ☐ Boring logs with Unified Soil Classification (ASTM D2487), soils descriptions and depths to bedrock and the seasonal water table indicated.
- ☑ ☐ ☑ Standard County Record Drawing/Construction Certification note provided on plan. *Note: It is understood that preparation of record drawings and construction certifications as required for project facilities may not necessarily be performed by the plan preparer. These components may be performed by others.*

cover ↓ note on C2.8

☐ ☐ ☐ *PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS*

☐ ☐ ☐ *EXISTING GROUND AND PROPOSED GRADE*

- ☑ ☐ ☐ Embankment or excavation side slopes labeled (3H:1V maximum).
- ☑ ☐ ☐ Minimum top width labeled (per VESCH or VSMH requirements).
- ☑ ☐ ☐ Removal of unsuitable material under proposed facility (per Geotechnical Report requirements).

Yes No N/A

☐ ☐ ☒ *CORE TRENCH*

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

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

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

☐ ☐ ☐ *PRINCIPAL CONTROL STRUCTURE OUTLET BARREL*

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

☐ ☐ ☐ *SEEPAGE CONTROL*

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

☐ ☐ ☒ *ANTI-SEEP COLLARS*

- ☐ ☐ ☐ Anti-seep collar, concrete preferred.
- ☐ ☐ ☐ Size - 15 percent increase in length of saturation using outside pipe diameter.
- ☐ ☐ ☐ Spacing and location on barrel (located at least 2 feet from a pipe joint).
- ☐ ☐ ☐ *FILTER DIAPHRAGMS*
- ☐ ☐ ☐ Design based on latest NRCS design methods and certified by a professional engineer.

Yes No N/A

☐ ☐ ☐ *ELEVATION AND DIMENSIONAL DESIGN DATA*

☑ ☐ ☐ Top of facility - construction height and settled height (10 percent settlement).

☑ ☐ ☐ Crest of principal control structure spillway at least one (1) foot below crest of emergency spillway, if provided.

☐ ☐ ☑ Minimum freeboard of one (1) foot above the 100-year design high water elevation for facilities <u>with</u> an emergency spillway.

☑ ☐ ☐ Minimum freeboard of two (2) feet above the 100-year design high water elevation for facilities <u>without</u> an emergency spillway or in accordance with the SCS National Engineering Handbook (prior approval required).

☐ ☑ ☐ Basin Sediment Clean-Out elevation (permanent mode). Typically 10 to 25 percent of water quality volume.

☐ ☐ ☐ *CROSS SECTION THROUGH FACILITY*

☑ ☐ ☐ Existing Ground.

☑ ☐ ☐ Proposed grade.

☑ ☐ ☐ Top of facility - constructed and settled.

☐ ☐ ☑ Location of emergency spillway with side slopes labeled (emergency spillway in cut).

☐ ☐ ☐ Bottom of core trench (4' minimum).

☐ ☐ ☑ Location of each soil boring.

☑ ☐ ☐ Barrel location.

☐ ☐ ☑ Existing and proposed utility location/protection.

☐ ☐ ☑ *EMERGENCY SPILLWAY PROFILE*

☐ ☐ ☐ Existing ground.

☐ ☐ ☐ Inlet, level (control) and outlet sections per SCS.

☐ ☐ ☐ Spillway and crest elevations.

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

Yes No N/A

☐ ☐ ☐ *CONSTRUCTION SPECIFICATIONS and NOTES*

☑ ☐ ☐ Anticipated sequence of construction for BMP (consistent with erosion and sediment control plan).

☑ ☐ ☐ Provisions to control base stream or storm flow conditions encountered during construction.

☑ ☐ ☐ Site and subgrade preparation requirements.

☑ ☐ ☐ Embankment, fill and backfill material soil and placement (lift) thickness requirements.

☑ ☐ ☐ Compaction and soil moisture content requirements.

☑ ☐ ☐ Geosynthetics for drainage, filtration, moisture barrier, separation, and reinforcement purposes.

☐ ☐ ☑ Clay or synthetic (PVC or HDPE) pond liners.

☑ ☐ ☐ Storm drain, underdrain and pipe conduit requirements.

☑ ☐ ☐ Minimum depth of pipe cover for temporary (construction) and final cover conditions.

☐ ☑ ☐ Permanent shutoff valve and pond drain.

☑ ☐ ☐ Concrete requirements for structural components.

☑ ☐ ☐ Riprap and slope protection.

☑ ☐ ☐ Access or maintenance road surface, base, subbase.

☑ ☐ ☐ Temporary and permanent stabilization measures.

☑ ☐ ☐ Temporary or permanent safety fencing.

☑ ☐ ☐ BMP Landscaping (deep, shallow, fringe, perimeter,etc.)

☑ ☐ ☐ Dust and traffic control (if warranted).

☑ ☐ ☐ Construction monitoring and certification by professional.

☐ ☐ ☐ Other: _____

☐ ☐ ☐ Other: _____.

☐ ☐ ☐ *MAINTENANCE PROVISIONS*

☐ ☐ ☑ Entity responsible for maintenance identified..

☐ ☐ ☑ Maintenance Plan which outlines the long-term schedule for inspection/maintenance of the facility and forebays

☐ ☐ ☑ Maintenance access from public right-of-way or publicly traveled road.

Need.

☐ ☐ ☑ Maintenance easement provided encompassing high water pool and buffer, principal and emergency spillways, outlet structures, forebays, embankment area and possible sediment-removal stockpile areas.

☑ ☐ ☐ Minimum 6 foot wide public safety shelf (landing) or alternative fencing.

IV. *OUTLET PROTECTIONS:*

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

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

Plan Preparer: _____

Date: _____

SWMProg/BMP/Checklist/ChkList

TEMPORARY

SEDIMENT BASIN #1

CALCULATIONS

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

PROJECT: Williamsburg-James City County Third High School

BASIN #: 1 LOCATION: Front Entrance

Total area draining to basin: 12.50 acres.

Basin Volume Design

Wet Storage:

1) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres)
   67 cu. yds x 12.50 acres = 837.50 cu. yds.

2) Available basin volume = 1,193 cu. yds. at elevation 99.60

3) Excavate - cu. yds. to obtain required volume*.
   * Elevation corresponding to required volume = invert of the dewatering orifice.

4) Available volume before cleanout required.
   33 cu. yds. x 12.50 acres = 413 cu. yds.

5) Elevation corresponding to cleanout level = 98.60

6) Distance from invert of the dewatering orifice to cleanout level = 1.00 ft.

Dry Storage:

7) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).
   67 cu. yds x 12.5 acres = 837.50 cu. yds.

8) Total available basin volume at crest of riser* = 2,110 cu. yds. at elevation 100.60
   * Minimum = 134 cu. yds. / acre of total drainage area.

9) Diameter of dewatering orifice. 6 inches REVISED PER ATTACHED POND ROUTING

A = flow area of orifice, in square feet
d = diameter of circular orifice, in inches
h = average driving head (maximum possible head measured from radius of orifice to crest of principal spillway divided by 2), in feet
Q = volumetric flowrate through orifice needed to achieve approximate 6-hour drawdown, cubic feet per second
S = total storage available in dry storage area, cubic feet

h = 4.40 ft.
S = 24759 cu.ft.
Q = S / 21,000 seconds
= 1.18 cfs
A = Q / (SQRT(64.32 x (h/2))) x 0.6
= 0.165 sq.ft.
d = (2 x (SQRT(A / 3.14))) x 12
= 6 in.

4" ON PLAN

Diameter of dewatering orifice should never be less than 3 inches in order to help prevent clogging by soil or debris.

Basin Volume Design (Cont.)

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

Diameter of dewatering orifice. (cont.)

Note: Flexible tubimg used should be at least 2 inches larger in diameter than the calculated orifice to promote improved flow characteristics.

Preliminary Design Elevations

11)

Crest of Riser =	105.00
Top of Dam =	107.00
Design High Water =	105.00
Upstream Toe of Dam =	98.00

✓ ✓ 25-YR 104.04

Basin Shape

12) Length-to-width Ratio = L / We

We = A / L = the effective width
A = the surface area of the normal pool
L = the length of the flow path from the inflow to the outflow. If there is more than one point, any inflow which carries more than 30% of the peak rate of inflow must me these criteria.

L =	150.00 ft.
A =	24,250 sq.ft.
We =	161.67 ft.
Length-to-width Ratio =	0.92784

If > 2, baffles are required	
If < 2, baffles are not required	X

Runoff

Q = C x i x A

Q = peak rate of runoff in cubic feet per second
C = runoff coefficient
i = average intensity of rainfall for the time of concentration (Tc) for a selected desig
A = drainage area in acres

A =	12.50	acres
C =	0.6	Bare packed soil (rough)
i_2 =	3.25	in/hr
i_{25} =	5.75	in/hr

13) Q_2 = 24.38 cfs

14) Q_{25} = 43.13 cfs

Principal Spillway Design

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

15) With emergency spillway, required spillway capacity Qp = Q_2 = 24.38 cfs
(riser and barrel)
Without emergency spillway, required spillway capacity Qp = Q_{25} = 43.13 cfs
(riser and barrel)

16) With emergency spillway:
h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation
Assumed available head (h) = _____ ft.

Without emergency spillway:
h = Design High Water Elevation - Crest of Riser Elevation
Assumed available head (h) = 1.00 ft.

17) Riser diameter (Dr) = 48 in. REVISED PER ATTACHED POND ROUTING D-1
Actual head (h) = 1.00 ft.
(From Plate 3.14-8 of the Virginia Erosion and Sediment Handbook third edition 1992)
Note: Aviod orifice flow conditions.

18) Barrel length (l) = 149 ft.
Head (H) on barrel through embankment = 10.00 ft.
(From Plate 3.14-7 of the Virginia Erosion and Sediment Handbook third edition 1992)

19) Barrel diameter = 30 in. RCP 24" ON PLAN & PONDPACK
(From Plate 3.14-A of the Virginia Erosion and Sediment Handbook third edition 1992 for corrugated pipe)
(From Plate 3.14-B of the Virginia Erosion and Sediment Handbook third edition 1992 for concrete pipe)

20) Trash rack and anti-vortex device
Diameter = 72 inches
Height = 36 inches
(From Plate 3.14-D of the Virginia Erosion and Sediment Handbook third edition 1992)

Emergency Spillway Design

21) Required spillway capacity Qe = Q25 - Qp = _____ 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) Ls = Y x (Z + 4) x (1 + (S / (0.25 -S)))

Ls = length of barrel in the saturated zone, feet
Y = the depth of water at the principal spillway crest, feet
Z = slope of the upstream face of embankment in Z feet horizontal to one vertical
S = slope of the barrel in feet per foot

Anti-Seep Collar Design (Cont.)

Y = 7.00 ft.
Z = 4.00 ft.
S = 0.0124 ft. / foot

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

Ls = 58.92 ft.

24) Number of collars required = 2
Dimensions = 4.6'X4.6'

(From Plate 3.14-12 of the Virginia Erosion and Sediment Handbook third edition 1992)

Final Design Elevations

25)

Top of Dam =	107.00
Design High Water =	105.00
Emergency Spillway Crest =	N/A
Principal Spillway Crest =	104.00
Dewatering Orifice Invert =	99.60
Cleanout Elevation =	98.60
Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area " (if excavation was performed) =	98.00

TEMPORARY

SEDIMENT BASIN #1

POND PACK ROUTING

Table of Contents

Table of Contents (continued)

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

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

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 100

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .2800 hrs

==========
Total Tc: .2800 hrs
==========

16.8 min.

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

Tc Equations used...

==== User Defined ==========

Tc = Value entered by user

Where: Tc = Time of concentration

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
	91	12.500			91.00
COMPOSITE AREA & WEIGHTED CN --->		12.500			91.00 (91)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 1
Tc = .2800 hrs
Drainage Area = 12.500 acres Runoff CN= 91

==========
Computational Time Increment = .03733 hrs
Computed Peak Time = 12.0587 hrs
Computed Peak Flow = 27.01 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 26.86 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 12.500 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.8856 in
1.964 ac-ft

HYG Volume... 1.964 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .28000 hrs (ID: STORM 10)
Computational Incr, Tm = .03733 hrs = 0.20000 Tp

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

Unit peak, qp = 50.58 cfs
Unit peak time Tp = .18667 hrs
Unit receding limb, Tr = .74667 hrs
Total unit time, Tb = .93333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 2
Tc = .2800 hrs
Drainage Area = 12.500 acres Runoff CN= 91

==========
Computational Time Increment = .03733 hrs
Computed Peak Time = 12.0587 hrs
Computed Peak Flow = 35.97 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 35.81 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 12.500 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
2.647 ac-ft

HYG Volume... 2.647 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .28000 hrs (ID: STORM 10)
Computational Incr, Tm = .03733 hrs = 0.20000 Tp

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

Unit peak, qp = 50.58 cfs
Unit peak time Tp = .18667 hrs
Unit receding limb, Tr = .74667 hrs
Total unit time, Tb = .93333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 10
Tc = .2800 hrs
Drainage Area = 12.500 acres Runoff CN= 91

==========
Computational Time Increment = .03733 hrs
Computed Peak Time = 12.0587 hrs
Computed Peak Flow = 61.45 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 61.25 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 12.500 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.4687 in
4.655 ac-ft

HYG Volume... 4.655 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .28000 hrs (ID: STORM 10)
Computational Incr, Tm = .03733 hrs = 0.20000 Tp

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

Unit peak, qp = 50.58 cfs
Unit peak time Tp = .18667 hrs
Unit receding limb, Tr = .74667 hrs
Total unit time, Tb = .93333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 25
Tc = .2800 hrs
Drainage Area = 12.500 acres Runoff CN= 91

==========
Computational Time Increment = .03733 hrs
Computed Peak Time = 12.0587 hrs
Computed Peak Flow = 67.77 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 67.56 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 12.500 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.9572 in
5.164 ac-ft

HYG Volume... 5.164 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .28000 hrs (ID: STORM 10)
Computational Incr, Tm = .03733 hrs = 0.20000 Tp

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

Unit peak, qp = 50.58 cfs
Unit peak time Tp = .18667 hrs
Unit receding limb, Tr = .74667 hrs
Total unit time, Tb = .93333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 100
Tc = .2800 hrs
Drainage Area = 12.500 acres Runoff CN= 91

==========
Computational Time Increment = .03733 hrs
Computed Peak Time = 12.0587 hrs
Computed Peak Flow = 92.86 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.0500 hrs
Peak Flow, Interpolated Output = 92.62 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 12.500 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

6.9245 in
7.213 ac-ft

HYG Volume... 7.213 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .28000 hrs (ID: STORM 10)
Computational Incr, Tm = .03733 hrs = 0.20000 Tp

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

Unit peak, qp = 50.58 cfs
Unit peak time Tp = .18667 hrs
Unit receding limb, Tr = .74667 hrs
Total unit time, Tb = .93333 hrs

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Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
98.00	-----	.3974	.0000	.000	.000
99.00	-----	.4672	1.2955	.432	.432
100.00	-----	.5567	1.5339	.511	.943
101.00	-----	.6562	1.8173	.606	1.549
102.00	-----	.7819	2.1544	.718	2.267
103.00	-----	.9913	2.6536	.885	3.152
104.00	-----	1.2702	3.3836	1.128	4.279
105.00	-----	1.7274	4.4789	1.493	5.772
106.00	-----	2.3781	6.1323	2.044	7.816
107.00	-----	3.0642	8.1417	2.714	10.530

POND VOLUME EQUATIONS

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

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

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 98.00 ft
Increment = .50 ft
Max. Elev.= 107.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	1	--->	2	105.000	107.000
Orifice-Circular	3	--->	2	99.600	107.000
Culvert-Circular	2	--->	TW	98.000	107.000

TW SETUP, DS Channel

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 1
Structure Type = Inlet Box

D1-1

# of Openings	=	1
Invert Elev.	=	105.00 ft
Orifice Area	=	12.2500 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	19.33 ft
Weir Coeff.	=	3.000
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	=	No

Structure ID = 3
Structure Type = Orifice-Circular

4"

# of Openings	=	1
Invert Elev.	=	99.60 ft
Diameter	=	.3333 ft
Orifice Coeff.	=	.600

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 2
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	2.0000	ft
Upstream Invert	=	98.00	ft
Dnstream Invert	=	94.90	ft
Horiz. Length	=	149.00	ft
Barrel Length	=	149.03	ft
Barrel Slope	=	.02081	ft/ft

24" OK. DATA sheet shows 30"

OUTLET CONTROL DATA...

Mannings n	=	.0120	
Ke	=	.9000	(forward entrance loss)
Kb	=	.010575	(per ft of full flow)
Kr	=	.9000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0018
Inlet Control M	=	2.0000
Inlet Control c	=	.02920
Inlet Control Y	=	.7400
T1 ratio (HW/D)	=	1.052
T2 ratio (HW/D)	=	1.197
Slope Factor	=	-.500
Calc inlet only	=	Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 100.10 ft ---> Flow = 15.55 cfs
At T2 Elev = 100.39 ft ---> Flow = 17.77 cfs

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

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
98.00	.00	Free Outfall		
98.50	.00	Free Outfall		
99.00	.00	Free Outfall		
99.50	.00	Free Outfall		
99.60	.00	Free Outfall		
100.00	.19	Free Outfall		3,2 (no Q: 1)
100.50	.28	Free Outfall		3,2 (no Q: 1)
101.00	.47	Free Outfall		3,2 (no Q: 1)
101.50	.55	Free Outfall		3,2 (no Q: 1)
102.00	.63	Free Outfall		3,2 (no Q: 1)
102.50	.69	Free Outfall		3,2 (no Q: 1)
103.00	.75	Free Outfall		3,2 (no Q: 1)
103.50	.79	Free Outfall		3,2 (no Q: 1)
104.00	.83	Free Outfall		3,2 (no Q: 1)
104.50	.86	Free Outfall		3,2 (no Q: 1)
105.00	.90	Free Outfall		3,2 (no Q: 1)
105.50	21.22	Free Outfall		1,3,2
106.00	47.02	Free Outfall		1,2 (no Q: 3)
106.50	48.78	Free Outfall		1,2 (no Q: 3)
107.00	50.49	Free Outfall		1,2 (no Q: 3)

Name.... FRONT BASIN
File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 1
Outflow HYG file = NONE STORED - FRONT BASIN OUT 1

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
98.00	.00	.000	.3974	.00	.00	.00
98.50	.00	.207	.4316	.00	.00	100.28
99.00	.00	.432	.4672	.00	.00	209.01
99.50	.00	.676	.5110	.00	.00	327.32
99.60	.00	.728	.5200	.00	.00	352.27
100.00	.19	.943	.5567	.00	.19	456.66
100.50	.28	1.234	.6054	.00	.28	597.33
101.00	.47	1.549	.6562	.00	.47	750.14
101.50	.55	1.892	.7177	.00	.55	916.40
102.00	.63	2.267	.7819	.00	.63	1097.87
102.50	.69	2.683	.8835	.00	.69	1299.32
103.00	.75	3.152	.9913	.00	.75	1526.10
103.50	.79	3.681	1.1264	.00	.79	1782.22
104.00	.83	4.279	1.2702	.00	.83	2072.07
104.50	.86	4.969	1.4900	.00	.86	2405.74
105.00	.90	5.772	1.7274	.00	.90	2794.74
105.50	21.22	6.713	2.0398	.00	21.22	3270.36
106.00	47.02	7.816	2.3781	.00	47.02	3830.20
106.50	48.78	9.088	2.7103	.00	48.78	4447.22
107.00	50.49	10.530	3.0642	.00	50.49	5147.20

Name.... FRONT BASIN
File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #1.PPW

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 1
Outflow HYG file = NONE STORED - FRONT BASIN OUT 1

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 1
Outflow HYG file = NONE STORED - FRONT BASIN OUT 1

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	26.86 cfs	at	12.0500 hrs
Peak Outflow	=	.47 cfs	at	18.9000 hrs
Peak Elevation	=	101.01 ft		
Peak Storage	=	1.555 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	1.964
- Infiltration	=	.000
- HYG Vol OUT	=	1.233
- Retained Vol	=	.731
Unrouted Vol	=	-.000 ac-ft (.006% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 2
Outflow HYG file = NONE STORED - FRONT BASIN OUT 2

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	35.81 cfs	at	12.0500 hrs
Peak Outflow	=	.59 cfs	at	18.2000 hrs
Peak Elevation	=	101.78 ft		
Peak Storage	=	2.098 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	2.647
- Infiltration	=	.000
- HYG Vol OUT	=	1.910
- Retained Vol	=	.737
Unrouted Vol	=	-.000 ac-ft (.011% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 10
Outflow HYG file = NONE STORED - FRONT BASIN OUT 10

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	61.25 cfs	at	12.0500 hrs
Peak Outflow	=	.80 cfs	at	18.3000 hrs
Peak Elevation	=	103.65 ft		
Peak Storage	=	3.851 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	4.655
- Infiltration	=	.000
- HYG Vol OUT	=	3.832
- Retained Vol	=	.821
Unrouted Vol	=	-.002 ac-ft (.039% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 25
Outflow HYG file = NONE STORED - FRONT BASIN OUT 25

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	67.56 cfs	at	12.0500 hrs
Peak Outflow	=	.83 cfs	at	19.8500 hrs
Peak Elevation	=	104.04 ft		
Peak Storage	=	4.326 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	5.164
- Infiltration	=	.000
- HYG Vol OUT	=	4.274
- Retained Vol	=	.889
Unrouted Vol	=	-.001 ac-ft (.026% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - FRONT BASIN IN 100
Outflow HYG file = NONE STORED - FRONT BASIN OUT 100

Pond Node Data = FRONT BASIN
Pond Volume Data = FRONT BASIN
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	98.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	92.62 cfs	at	12.0500 hrs
Peak Outflow	=	2.18 cfs	at	16.6000 hrs
Peak Elevation	=	105.03 ft		
Peak Storage	=	5.827 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	7.213
- Infiltration	=	.000
- HYG Vol OUT	=	5.932
- Retained Vol	=	1.280
Unrouted Vol	=	-.002 ac-ft (.023% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

Index of Starting Page Numbers for ID Names

TEMPORARY

SEDIMENT BASIN #2

CALCULATIONS

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

PROJECT: Williamsburg-James City County Third High School

BASIN #: 2 LOCATION: Transmission Line Corridor Outfall (Southern Property Line)

19 ACRS INITIAL
37 AC. FINAL

Total area draining to basin: 37.00 acres.

Basin Volume Design

Wet Storage:

1) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres)
   67 cu. yds x 37.00 acres = 2,479.00 cu. yds.

2) Available basin volume = 3,820 cu. yds. at elevation 94.50 ✓

3) Excavate - cu. yds. to obtain required volume*.
   * Elevation corresponding to required volume = invert of the dewatering orifice.

4) Available volume before cleanout required.
   33 cu. yds. x 37.00 acres = 1,221 cu. yds.

5) Elevation corresponding to cleanout level = 93.50 ✓

6) Distance from invert of the dewatering orifice to cleanout level = 1.00 ft.

Dry Storage:

7) Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).
   67 cu. yds x 37 acres = 2,479.00 cu. yds.

8) Total available basin volume at crest of riser* = 6,599 cu. yds. at elevation 95.50
   * Minimum = 134 cu. yds. / acre of total drainage area.

9) Diameter of dewatering orifice. 11 inches REVISED PER ATTACHED POND ROUTING
   4" PER PLAN

A = flow area of orifice, in square feet
d = diameter of circular orifice, in inches
h = average driving head (maximum possible head measured from radius of orifice to crest of principal spillway divided by 2), in feet
Q = volumetric flowrate through orifice needed to achieve approximate 6-hour drawdown, cubic feet per second
S = total storage available in dry storage area, cubic feet

h = 2.25 ft.
S = 75033 cu.ft.
Q = S / 21,000 seconds
= 3.57 cfs
A = Q / (SQRT(64.32 x (h/2))) x 0.6
= 0.700 sq.ft.
d = (2 x (SQRT(A / 3.14))) x 12
= 11 in.

Diameter of dewatering orifice should never be less than 3 inches in order to help prevent clogging by soil or debris.

Basin Volume Design (Cont.)

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

Diameter of dewatering orifice. (cont.)

Note: Flexible tubimg used should be at least 2 inches larger in diameter than the calculated orifice to promote improved flow characteristics.

Preliminary Design Elevations

11)

Crest of Riser =	99.00
Top of Dam =	102.00
Design High Water =	100.00
Upstream Toe of Dam =	93.00

99.22

Basin Shape

12) Length-to-width Ratio = L / We

We = A / L = the effective width
A = the surface area of the normal pool
L = the length of the flow path from the inflow to the outflow. If there is more than one point, any inflow which carries more than 30% of the peak rate of inflow must me these criteria.

L =	380.00	ft.
A =	71,875	sq.ft.
We =	189.14	ft.
Length-to-width Ratio =	2.00904	

If > 2, baffles are required	
If < 2, baffles are not required	X

Runoff

Q = C x i x A

Q = peak rate of runoff in cubic feet per second
C = runoff coefficient
i = average intensity of rainfall for the time of concentration (Tc) for a selected desig
A = drainage area in acres

A =	37.00	acres
C =	0.6	Bare packed soil (rough)
i_2 =	3.25	in/hr
i_{25} =	5.75	in/hr

13) Q_2 = 72.15 cfs

14) Q_{25} = 127.65 cfs

Principal Spillway Design

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

15) With emergency spillway, required spillway capacity Qp = Q_2 = 72.15 cfs
(riser and barrel)
Without emergency spillway, required spillway capacity Qp = Q_{25} = 127.65 cfs
(riser and barrel)

16) With emergency spillway:
h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation
Assumed available head (h) = _____ ft.

Without emergency spillway:
h = Design High Water Elevation - Crest of Riser Elevation
Assumed available head (h) = 1.00 ft.

17) Riser diameter (Dr) = 60 in. REVISED PER ATTACHED POND ROUTING
Actual head (h) = 1.80 ft.
(From Plate 3.14-8 of the Virginia Erosion and Sediment Handbook third edition 1992)
Note: Aviod orifice flow conditions.

18) Barrel length (l) = 68 ft.
Head (H) on barrel through embankment = 9.00 ft.
(From Plate 3.14-7 of the Virginia Erosion and Sediment Handbook third edition 1992)

19) Barrel diameter = 48 in. RCP 24" PER PLAN
(From Plate 3.14-A of the Virginia Erosion and Sediment Handbook third edition 1992 for corrugated pipe)
(From Plate 3.14-B of the Virginia Erosion and Sediment Handbook third edition 1992 for concrete pipe)

20) Trash rack and anti-vortex device
Diameter = 72 inches
Height = 21 inches
(From Plate 3.14-D of the Virginia Erosion and Sediment Handbook third edition 1992)

Emergency Spillway Design

21) Required spillway capacity Qe = Q25 - Qp = _____ 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) $Ls = Y \times (Z + 4) \times (1 + (S / (0.25 - S)))$

Ls = length of barrel in the saturated zone, feet
Y = the depth of water at the principal spillway crest, feet
Z = slope of the upstream face of embankment in Z feet horizontal to one vertical
S = slope of the barrel in feet per foot

Anti-Seep Collar Design (Cont.)

Y = 6.00 ft.
Z = 4.00 ft.
S = 0.0124 ft. / foot

Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, Virginia 23225
Telephone: (804) 200-6500

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET
(with or without an emengency spillway)

Revised:7/8/2005

Ls = 50.51 ft.

24) Number of collars required = 0
Dimensions = 0.00
(From Plate 3.14-12 of the Virginia Erosion and Sediment Handbook third edition 1992)

Final Design Elevations

25)

Top of Dam =	102.00
Design High Water =	100.00
Emergency Spillway Crest =	N/A
Principal Spillway Crest =	99.00
Dewatering Orifice Invert =	94.50
Cleanout Elevation =	93.50
Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area " (if excavation was performed) =	93.00

TEMPORARY

SEDIMENT BASIN #2

POND PACK ROUTING

Table of Contents

Table of Contents (continued)

Name.... James City Count

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .4000 hrs

24 minutes?

==========
Total Tc: .4000 hrs
==========

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

Tc Equations used...

==== User Defined ==========

Tc = Value entered by user

Where: Tc = Time of concentration

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
	91	38.650			91.00
COMPOSITE AREA & WEIGHTED CN --->		38.650			91.00 (91)

37.00?

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 1
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 70.50 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 69.93 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.8856 in
6.073 ac-ft

HYG Volume... 6.077 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 2
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 94.22 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 93.50 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
8.185 ac-ft

HYG Volume... 8.189 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 10
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 161.75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 160.66 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.4687 in
14.393 ac-ft

HYG Volume... 14.401 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 25
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 178.51 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 177.33 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.9572 in
15.966 ac-ft

HYG Volume... 15.976 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 100
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 245.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 243.55 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

6.9245 in
22.303 ac-ft

HYG Volume... 22.316 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
93.00	-----	1.4782	.0000	.000	.000
94.00	-----	1.5986	4.6140	1.538	1.538
95.00	-----	1.7220	4.9798	1.660	3.198
96.00	-----	1.8485	5.3546	1.785	4.983
97.00	-----	1.9779	5.7385	1.913	6.896
98.00	-----	2.1100	6.1308	2.044	8.939
99.00	-----	2.2446	6.5309	2.177	11.116
100.00	-----	2.3813	6.9378	2.313	13.429
101.00	-----	2.5205	7.3517	2.451	15.879
102.00	-----	2.6622	7.7731	2.591	18.470

POND VOLUME EQUATIONS

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

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

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 93.00 ft
Increment = .50 ft
Max. Elev.= 102.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	1	--->	4	99.000	102.000
Orifice-Circular	2	--->	4	94.500	102.000
Culvert-Circular	4	--->	TW	91.400	102.000

TW SETUP, DS Channel

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 1
Structure Type = Inlet Box

# of Openings	=	1
Invert Elev.	=	99.00 ft
Orifice Area	=	12.2500 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	19.33 ft
Weir Coeff.	=	3.000
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	=	No

✓ 01-1

Structure ID = 2
Structure Type = Orifice-Circular

# of Openings	=	1
Invert Elev.	=	94.50 ft
Diameter	=	.3333 ft
Orifice Coeff.	=	.600

4" ORIF

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

OUTLET STRUCTURE INPUT DATA

24" BARREL

```
Structure ID      = 4
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    2.0000 ft
Upstream Invert   =     91.40 ft
Dnstream Invert   =     91.00 ft
Horiz. Length     =     70.00 ft
Barrel Length     =     70.00 ft
Barrel Slope      =    .00571 ft/ft

OUTLET CONTROL DATA...
Mannings n        =     .0120
Ke                =     .9000  (forward entrance loss)
Kb                =   .010575  (per ft of full flow)
Kr                =     .9000  (reverse entrance loss)
HW Convergence    =      .001  +/- ft

INLET CONTROL DATA...
Equation form     =         1
Inlet Control K   =     .0018
Inlet Control M   =    2.0000
Inlet Control c   =    .02920
Inlet Control Y   =     .7400
T1 ratio (HW/D)   =     1.059
T2 ratio (HW/D)   =     1.204
Slope Factor      =     -.500
Calc inlet only   = Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     93.52 ft  --->  Flow =     15.55 cfs
At T2 Elev =     93.81 ft  --->  Flow =     17.77 cfs
```

```
Structure ID      = TW
Structure Type    = TW SETUP, DS Channel
-----------------------------------
FREE OUTFALL CONDITIONS SPECIFIED

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
93.00	.00	Free Outfall		
93.50	.00	Free Outfall		
94.00	.00	Free Outfall		
94.50	.00	Free Outfall		
95.00	.21	Free Outfall		2,4 (no Q: 1)
95.50	.29	Free Outfall		2,4 (no Q: 1)
96.00	.48	Free Outfall		2,4 (no Q: 1)
96.50	.57	Free Outfall		2,4 (no Q: 1)
97.00	.64	Free Outfall		2,4 (no Q: 1)
97.50	.71	Free Outfall		2,4 (no Q: 1)
98.00	.76	Free Outfall		2,4 (no Q: 1)
98.50	.82	Free Outfall		2,4 (no Q: 1)
99.00	.88	Free Outfall		2,4 (no Q: 1)
99.50	21.17	Free Outfall		1,2,4
100.00	49.08	Free Outfall		1,4 (no Q: 2)
100.50	50.77	Free Outfall		1,4 (no Q: 2)
101.00	52.40	Free Outfall		1,4 (no Q: 2)
101.50	54.00	Free Outfall		1,4 (no Q: 2)
102.00	55.54	Free Outfall		1,4 (no Q: 2)

Name.... BMP
File.... R:\300 - Site Development\301\21151\Calcs\PondPack\TEMP SB #2.PPW

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
93.00	.00	.000	1.4782	.00	.00	.00
93.50	.00	.754	1.5378	.00	.00	364.91
94.00	.00	1.538	1.5986	.00	.00	744.40
94.50	.00	2.353	1.6597	.00	.00	1138.63
95.00	.21	3.198	1.7220	.00	.21	1548.00
95.50	.29	4.075	1.7847	.00	.29	1972.38
96.00	.48	4.983	1.8485	.00	.48	2412.16
96.50	.57	5.923	1.9127	.00	.57	2867.32
97.00	.64	6.896	1.9779	.00	.64	3338.13
97.50	.71	7.901	2.0434	.00	.71	3824.76
98.00	.76	8.939	2.1100	.00	.76	4327.35
98.50	.82	10.011	2.1768	.00	.82	4846.09
99.00	.88	11.116	2.2446	.00	.88	5381.11
99.50	21.17	12.255	2.3124	.00	21.17	5952.79
100.00	49.08	13.429	2.3813	.00	49.08	6548.62
100.50	50.77	14.637	2.4504	.00	50.77	7134.93
101.00	52.40	15.879	2.5205	.00	52.40	7738.02
101.50	54.00	17.157	2.5909	.00	54.00	8358.07
102.00	55.54	18.470	2.6622	.00	55.54	8995.21

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	69.93 cfs	at	12.1000 hrs
Peak Outflow	=	.54 cfs	at	23.6500 hrs
Peak Elevation	=	96.33 ft		
Peak Storage	=	5.600 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.077
- Infiltration	=	.000
- HYG Vol OUT	=	2.785
- Retained Vol	=	3.290
Unrouted Vol	=	-.001 ac-ft (.025% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 2
Outflow HYG file = NONE STORED - BMP OUT 2

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	93.50 cfs	at	12.1000 hrs
Peak Outflow	=	.69 cfs	at	23.5000 hrs
Peak Elevation	=	97.32 ft		
Peak Storage	=	7.544 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	8.189
- Infiltration	=	.000
- HYG Vol OUT	=	4.073
- Retained Vol	=	4.115
Unrouted Vol	=	-.001 ac-ft (.008% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	160.66 cfs	at	12.1000 hrs
Peak Outflow	=	5.71 cfs	at	15.6500 hrs
Peak Elevation	=	99.12 ft		
Peak Storage	=	11.384 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	14.401
- Infiltration	=	.000
- HYG Vol OUT	=	8.068
- Retained Vol	=	6.330
Unrouted Vol	=	-.004 ac-ft (.028% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 25
Outflow HYG file = NONE STORED - BMP OUT 25

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	177.33 cfs	at	12.1000 hrs
Peak Outflow	=	9.91 cfs	at	14.0000 hrs
Peak Elevation	=	99.22 ft		
Peak Storage	=	11.619 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	15.976
- Infiltration	=	.000
- HYG Vol OUT	=	9.627
- Retained Vol	=	6.345
Unrouted Vol	=	-.004 ac-ft (.025% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	243.55 cfs	at	12.1000 hrs
Peak Outflow	=	49.27 cfs	at	12.6500 hrs
Peak Elevation	=	100.06 ft		
Peak Storage	=	13.563 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	22.316
- Infiltration	=	.000
- HYG Vol OUT	=	15.924
- Retained Vol	=	6.387
Unrouted Vol	=	-.004 ac-ft (.018% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

Index of Starting Page Numbers for ID Names

BMP

CALCULATIONS

SITE 74.5 AC! 48.2 AC. IS DISTURBED AREA SEE SSC LETTER 1ST SUB

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
B3 #2 FRONT	10	x	8.8 / 48.2 = .18	=	1.8
B3 #1 - REAR	10	x	28.5 / 48.2 = .59	=	5.9
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 7.7

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
	x	(0.1 per 1%)	=	
19.4 / 67.6 = .29 (WHERE FROM WHERE)	x	.15 (28.7%) (0.15 per 1%)	=	4.3

TOTAL NATURAL OPEN SPACE CREDIT: 4.3

C. TOTAL WEIGHTED POINTS

Structural BMP Points	+	Natural Open Space Points	=	Total
7.7		4.3		12.0

NOT CORRECT.

ENP SWB

SITE 54.5 AC.

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

	BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
B-3	#1	10	x	37/54.5 = 0.68	=	6.8
			x		=	
			x		=	
			x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 6.8

B. NATURAL OPEN SPACE CREDIT

NOT?

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
	x	(0.1 per 1%)	=	
	x	(0.15 per 1%)	=	

TOTAL NATURAL OPEN SPACE CREDIT: 0

C. TOTAL WEIGHTED POINTS

6.8 (Structural BMP Points) + 0 (Natural Open Space Points) = 6.8 (Total)

NOT 10

Drainage Area = 37.00 Ac
Impervious Area = 16.9 Ac
Forbay Volume Required = 0.10 inch per impervious area = 0.14 ac-ft
Water Quality Volume Required = 1 inch per impervious area = 1.41 ac-ft
Water Quality Elevation = 93.0 ft

Forbay Volumes

Elevation	Area (ac)	Ave Area (ac)	depth (ft)	Incremental Volume (ac-ft)	Volume (ac-ft)
90.0	0.07				0.00
91.0	0.09	0.08	1.00	0.08	0.08
92.0	0.11	0.10	1.00	0.10	0.18
93.0	0.13	0.12	1.00	0.12	0.30

Total Water Quality Volumes

Elevation	Area (ac)	Ave Area (ac)	depth (ft)	Incremental Volume (ac-ft)	Volume (ac-ft)
90.0	0.16				0.00
91.0	0.24	0.20	1.00	0.20	0.20
91.5	0.34	0.29	0.50	0.15	0.35
92.0	0.53	0.44	0.50	0.22	0.56
92.5	0.78	0.66	0.50	0.33	0.89
93.0	1.28	1.03	0.50	0.52	1.41

Extended Detention Design
1/2 Water Quality Volume = 0.71 Ac-ft at elevation 92.2 ft
Desired Drawdown time = 30 hours
Q = vol./time = 0.29 cfs
H = 0.80 ft
$A_{orifice}$ = 0.0673 sf
Use 3" diameter water quality opening at elevation 92.2 ft

THIRD HIGH SCHOOL JAMES CITY COUNTY

BMP DRAWDOWN CALCULATIONS:

1 YEAR PEAK OUTFLOW = 0.42 cfs
1 YEAR VOLUME = 249034 ft^3

1 YEAR DRAWDOWN TIME = $\frac{249034\ ft^3}{0.42\ ft^3/s}$

= 592938 s
= 164.7 hr.

6.86 days

SPOKE TO OLC

1 YEAR DRAWDOWN = 164.7 Hours

VOL 1-YR
6.023 AC-FT
264,539 CF.

HWM 96.36 - 92.2 = 4.16/2 = 2.08

$\frac{264{,}539\ CF}{(24\ HR)(60)(60)} = 3.06\ CFS$

$\frac{3.06\ CFS}{0.6\sqrt{64.4 \times 2.08}} = 0.4407$

$\frac{\pi d^2}{4} = 0.4407\ SF$

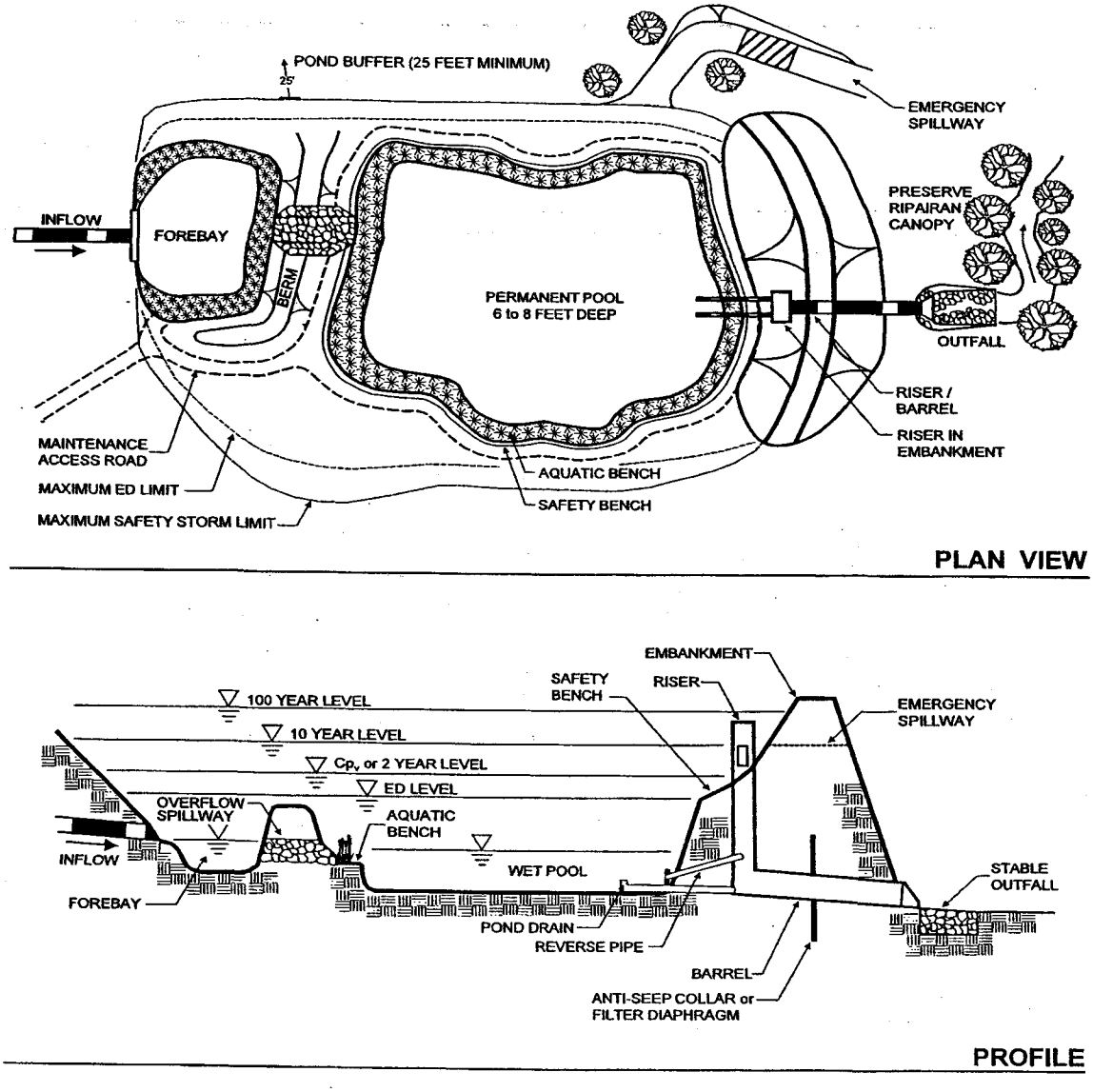
$\pi d^2 = 1.7626$

$d = 0.749\ ft$

8.98"

SAY 8" ORIF TO MEET 24 hr.

A-3	**Figure 2** Example of a Wet Extended Detention Pond	A-3



The wet ED pond provides water quality storage through a combination of permanent pool and extended detention storage.

BMP

POND PACK ROUTINGS

Table of Contents

Table of Contents (continued)

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\
Title... Project Date: 2/9/2005
Project Engineer: Timmons Group
Project Title: Third High School
Project Comments:

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 1

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

Storm Tag Name = 2

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

Storm Tag Name = 10

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 10 yr
Total Rainfall Depth= 5.5000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 25

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 25 yr
Total Rainfall Depth= 6.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

Storm Tag Name = 50

Data Type, File, ID = Synthetic Storm TypeII 24hr
Storm Frequency = 50 yr
Total Rainfall Depth= 7.0000 in
Duration Multiplier = 1
Resulting Duration = 24.0000 hrs
Resulting Start Time= .0000 hrs Step= .1000 hrs End= 24.0000 hrs

DESIGN STORMS SUMMARY

Design Storm File,ID = James City Count

Storm Tag Name = 100

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .4000 hrs

==========
Total Tc: .4000 hrs
==========

24 min.

Approximately 1327 min
0.22 hrs.

How To Breakdown

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

Tc Equations used...

==== User Defined ==========

Tc = Value entered by user

Where: Tc = Time of concentration

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
	91	38.650			91.00
COMPOSITE AREA & WEIGHTED CN --->		38.650			91.00 (91)

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 1 year storm
Duration = 24.0000 hrs Rain Depth = 2.8000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 1
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 70.50 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 69.93 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

1.8856 in
6.073 ac-ft

HYG Volume... 6.077 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 2 year storm
Duration = 24.0000 hrs Rain Depth = 3.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 2
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 94.22 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 93.50 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

2.5411 in
8.185 ac-ft

HYG Volume... 8.189 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 10 year storm
Duration = 24.0000 hrs Rain Depth = 5.5000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 10
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 161.75 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 160.66 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.4687 in
14.393 ac-ft

HYG Volume... 14.401 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 25 year storm
Duration = 24.0000 hrs Rain Depth = 6.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 25
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 178.51 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 177.33 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

4.9572 in
15.966 ac-ft

HYG Volume... 15.976 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 8.0000 in
Rain Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Rain File -ID = - TypeII 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
HYG File - ID = - STORM 10 100
Tc = .4000 hrs
Drainage Area = 38.650 acres Runoff CN= 91

==========
Computational Time Increment = .05333 hrs
Computed Peak Time = 12.1067 hrs
Computed Peak Flow = 245.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 12.1000 hrs
Peak Flow, Interpolated Output = 243.55 cfs
==========

DRAINAGE AREA

ID:STORM 10
CN = 91
Area = 38.650 acres
S = .9890 in
0.2S = .1978 in

Cumulative Runoff

6.9245 in
22.303 ac-ft

HYG Volume... 22.316 ac-ft (area under HYG curve)

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

Time Concentration, Tc = .40000 hrs (ID: STORM 10)
Computational Incr, Tm = .05333 hrs = 0.20000 Tp

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

Unit peak, qp = 109.48 cfs
Unit peak time Tp = .26667 hrs
Unit receding limb, Tr = 1.06667 hrs
Total unit time, Tb = 1.33333 hrs

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
93.00	-----	1.4782	.0000	.000	.000
94.00	-----	1.5986	4.6140	1.538	1.538
95.00	-----	1.7220	4.9798	1.660	3.198
96.00	-----	1.8485	5.3546	1.785	4.983
97.00	-----	1.9779	5.7385	1.913	6.896
98.00	-----	2.1100	6.1308	2.044	8.939
99.00	-----	2.2446	6.5309	2.177	11.116
100.00	-----	2.3813	6.9378	2.313	13.429
101.00	-----	2.5205	7.3517	2.451	15.879
102.00	-----	2.6622	7.7731	2.591	18.470

POND VOLUME EQUATIONS

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

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

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 93.00 ft
Increment = .50 ft
Max. Elev.= 102.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Orifice-Circular	3	--->	4	96.400	102.000
Inlet Box	1	--->	4	99.000	102.000
Orifice-Circular	2	--->	4	93.000	102.000
Culvert-Circular	4	--->	TW	91.400	102.000

TW SETUP, DS Channel

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 3
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 96.40 ft
Diameter = .8333 ft
Orifice Coeff. = .600

Structure ID = 1
Structure Type = Inlet Box

# of Openings = 1
Invert Elev. = 99.00 ft
Orifice Area = 12.2500 sq.ft
Orifice Coeff. = .600
Weir Length = 19.33 ft
Weir Coeff. = 3.000
K, Reverse = 1.000
Mannings n = .0000
Kev,Charged Riser = .000
Weir Submergence = No

Structure ID = 2
Structure Type = Orifice-Circular

# of Openings = 1
Invert Elev. = 93.00 ft
Diameter = .2500 ft
Orifice Coeff. = .600

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 4
Structure Type = Culvert-Circular

No. Barrels	=	1
Barrel Diameter	=	2.0000 ft
Upstream Invert	=	91.40 ft
Dnstream Invert	=	91.00 ft
Horiz. Length	=	70.00 ft
Barrel Length	=	70.00 ft
Barrel Slope	=	.00571 ft/ft

✓ 24" BARREL

OUTLET CONTROL DATA...

Mannings n	=	.0120	
Ke	=	.9000	(forward entrance loss)
Kb	=	.010575	(per ft of full flow)
Kr	=	.9000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0018
Inlet Control M	=	2.0000
Inlet Control c	=	.02920
Inlet Control Y	=	.7400
T1 ratio (HW/D)	=	1.059
T2 ratio (HW/D)	=	1.204
Slope Factor	=	-.500
Calc inlet only	=	Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 93.52 ft ---> Flow = 15.55 cfs
At T2 Elev = 93.81 ft ---> Flow = 17.77 cfs

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

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

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

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP.PPW

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

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
93.00	.00	Free Outfall		
93.50	.12	Free Outfall		2,4 (no Q: 3,1)
94.00	.17	Free Outfall		2,4 (no Q: 3,1)
94.50	.20	Free Outfall		2,4 (no Q: 3,1)
95.00	.24	Free Outfall		2,4 (no Q: 3,1)
95.50	.36	Free Outfall		2,4 (no Q: 3,1)
96.00	.40	Free Outfall		2,4 (no Q: 3,1)
96.40	.42	Free Outfall		2,4 (no Q: 3,1)
96.50	.46	Free Outfall		3,2,4 (no Q: 1)
97.00	1.28	Free Outfall		3,2,4 (no Q: 1)
97.50	2.53	Free Outfall		3,2,4 (no Q: 1)
98.00	3.23	Free Outfall		3,2,4 (no Q: 1)
98.50	3.79	Free Outfall		3,2,4 (no Q: 1)
99.00	4.29	Free Outfall		3,2,4 (no Q: 1)
99.50	25.22	Free Outfall		3,1,2,4
100.00	49.08	Free Outfall		1,4 (no Q: 3,2)
100.50	50.77	Free Outfall		1,4 (no Q: 3,2)
101.00	52.40	Free Outfall		1,4 (no Q: 3,2)
101.50	54.00	Free Outfall		1,4 (no Q: 3,2)
102.00	55.54	Free Outfall		1,4 (no Q: 3,2)

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
93.00	.00	.000	1.4782	.00	.00	.00
93.50	.12	.754	1.5378	.00	.12	365.03
94.00	.17	1.538	1.5986	.00	.17	744.56
94.50	.20	2.353	1.6597	.00	.20	1138.83
95.00	.24	3.198	1.7220	.00	.24	1548.03
95.50	.36	4.075	1.7847	.00	.36	1972.45
96.00	.40	4.983	1.8485	.00	.40	2412.08
96.40	.42	5.732	1.8997	.00	.42	2774.92
96.50	.46	5.923	1.9127	.00	.46	2867.21
97.00	1.28	6.896	1.9779	.00	1.28	3338.76
97.50	2.53	7.901	2.0434	.00	2.53	3826.57
98.00	3.23	8.939	2.1100	.00	3.23	4329.82
98.50	3.79	10.011	2.1768	.00	3.79	4849.06
99.00	4.29	11.116	2.2446	.00	4.29	5384.53
99.50	25.22	12.255	2.3124	.00	25.22	5956.84
100.00	49.08	13.429	2.3813	.00	49.08	6548.62
100.50	50.77	14.637	2.4504	.00	50.77	7134.93
101.00	52.40	15.879	2.5205	.00	52.40	7738.02
101.50	54.00	17.157	2.5909	.00	54.00	8358.07
102.00	55.54	18.470	2.6622	.00	55.54	8995.21

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

Elevation	Outflow	Storage	Area	Infilt.	Q Total	2S/t + O
ft	cfs	ac-ft	acres	cfs	cfs	cfs

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	69.93 cfs	at	12.1000 hrs
Peak Outflow	=	.42 cfs	at	24.0500 hrs
Peak Elevation	=	96.36 ft		
Peak Storage	=	5.656 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.077
- Infiltration	=	.000
- HYG Vol OUT	=	2.811
- Retained Vol	=	3.265
Unrouted Vol	=	-.001 ac-ft (.018% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

PEAK OUT 0.42 CFS
VOL = 6.077 AC-FT.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 2
Outflow HYG file = NONE STORED - BMP OUT 2

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	93.50 cfs	at	12.1000 hrs
Peak Outflow	=	1.45 cfs	at	23.1500 hrs
Peak Elevation	=	97.07 ft		
Peak Storage	=	7.036 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	8.189
- Infiltration	=	.000
- HYG Vol OUT	=	4.352
- Retained Vol	=	3.835
Unrouted Vol	=	-.003 ac-ft (.038% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	160.66 cfs	at	12.1000 hrs
Peak Outflow	=	4.23 cfs	at	17.0000 hrs
Peak Elevation	=	98.94 ft		
Peak Storage	=	10.979 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	14.401
- Infiltration	=	.000
- HYG Vol OUT	=	10.095
- Retained Vol	=	4.303
Unrouted Vol	=	-.003 ac-ft (.021% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 25
Outflow HYG file = NONE STORED - BMP OUT 25

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	177.33 cfs	at	12.1000 hrs
Peak Outflow	=	9.68 cfs	at	14.0500 hrs
Peak Elevation	=	99.13 ft		
Peak Storage	=	11.406 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	15.976
- Infiltration	=	.000
- HYG Vol OUT	=	11.639
- Retained Vol	=	4.333
Unrouted Vol	=	-.003 ac-ft (.021% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	243.55 cfs	at	12.1000 hrs
Peak Outflow	=	49.13 cfs	at	12.6500 hrs
Peak Elevation	=	100.02 ft		
Peak Storage	=	13.467 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	22.316
- Infiltration	=	.000
- HYG Vol OUT	=	17.923
- Retained Vol	=	4.389
Unrouted Vol	=	-.004 ac-ft (.016% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

Index of Starting Page Numbers for ID Names

STORM SEWER DESIGN COMPUTATIONS

PROJECT: Third High School JOB # 21151
COUNTY: Williamsburg-James City County
DESCRIPTION: Storm Sewer
DATE: 7/8/2005

Storm Frequency 10 year
n = 0.013
* = Manual Input of Data

FROM POINT	PIPE NAME	TO POINT	DRAINAGE AREA (acres)	RUNOFF)EFFICIE	CA INCRE.	CA ACCUM.	INLET TIME (min)	RAIN-FALL (in/hr)	RUNOFF Q (cfs)	TOP STR (elev)	HEIGHT STR (ft)	INV UPPER (ft)	INV. LOWER (ft)	LENGTH (ft)	SLOPE (ft/ft)	DIA (in)	CAPACITY (cfs)	VELOCITY (ft/s)	FLOW TIME (min)	Additiona BLDG A	Additional C*A	STR TYPE
1	2	3	1.20	0.77	0.92	0.92	5.00	7.00	6.5	108.00	4.50	103.50	103.24	52.27	0.0050	21	11.2	4.83	0.18	0	0	DI-3B, L=6'
3	4	5	0.60	0.65	0.39	1.31	5.18	6.98	9.2	108.00	4.86	103.14	102.32	163.09	0.0050	21	11.2	5.21	0.52	0	0	DI-3C, L=6'
5	6	7	0.15	0.90	0.14	1.45	5.70	6.86	9.9	112.30	10.23	102.07	101.10	194.16	0.0050	24	16.0	5.38	0.60	0	0	DI-3BB, L=6'
7	8	9	0.13	0.92	0.12	1.57	6.30	6.71	10.5	112.30	11.30	101.00	100.44	112.92	0.0050	24	16.0	5.45	0.35	0	0	DI-3BB, L=6'
37	**38**	**9**	**1.20**	**0.67**	**0.80**	**0.80**	**5.00**	**7.00**	**5.6**	**109.50**	**4.50**	**105.00**	**101.19**	**92.10**	**0.0414**	**15**	**13.1**	**10.31**	**0.15**	**0**	**0**	**DI-3C, L=6'**
9	10	11	0.00	0.30	0.00	2.37	6.65	6.62	15.7	111.50	11.16	100.34	100.02	63.00	0.0050	24	16.0	5.82	0.18	0	0	MH-2
69	70	71	0.17	0.70	0.12	0.17	5.00	7.00	1.2	112.90	3.40	109.50	109.12	76.07	0.0050	15	4.6	3.13	0.41	0.053	0.05062	18" NYLOPLAS
71	72	73	0.12	0.63	0.08	0.33	5.41	6.92	2.3	112.90	3.88	109.02	108.71	62.33	0.0050	15	4.6	3.74	0.28	0.092	0.0874	18" NYLOPLAS
73	74	75	0.12	0.76	0.09	0.42	5.68	6.88	2.9	112.90	4.29	108.61	104.50	81.83	0.0502	15	14.5	9.25	0.15	0	0	18" NYLOPLAS
75	76	11	0.15	0.45	0.07	0.49	5.83	6.84	3.4	113.10	8.70	104.40	100.77	71.17	0.0510	15	14.6	9.68	0.12	0	0	18" NYLOPLAS
11	12	13	0.00	0.30	0.00	2.86	6.83	6.56	18.8	111.48	11.71	99.77	99.07	140.51	0.0050	27	21.9	6.21	0.38	0	0	MH-2
77	78	79	0.09	0.80	0.07	0.19	5.00	7.00	1.3	113.20	4.00	109.20	109.01	37.91	0.0050	15	4.6	3.23	0.20	0.124	0.1178	18" NYLOPLAS
79	80	BEND	0.14	0.90	0.13	0.32	5.20	6.98	2.2	113.20	4.29	108.91	108.67	47.36	0.0050	15	4.6	3.70	0.21	0	0	18" NYLOPLAS
BEND	80A	81	0.00	0.30	0.00	0.32	5.41	6.92	2.2	114.00	5.33	108.67	108.63	8.14	0.0050	15	4.6	3.69	0.04	0	0	18" NYLOPLAS
81	82	83	0.11	0.78	0.09	0.40	5.45	6.92	2.8	113.00	4.47	108.53	108.27	51.70	0.0050	15	4.6	3.91	0.22	0	0	18" NYLOPLAS
83	84	85	0.11	0.82	0.09	0.49	5.45	6.92	3.4	112.80	4.63	108.17	107.74	87.00	0.0050	15	4.6	4.09	0.36	0	0	18" NYLOPLAS
85	86	87	0.09	0.35	0.03	0.52	5.20	6.98	3.7	111.90	4.26	107.64	107.38	51.70	0.0050	15	4.6	4.14	0.21	0	0	18" NYLOPLAS
87	88	13	0.16	0.74	0.12	0.67	5.95	6.82	4.5	113.00	5.72	107.28	100.07	78.50	0.0919	15	19.6	13.02	0.10	0.026	0.0247	18" NYLOPLAS
13	14	15	0.00	0.30	0.00	3.53	7.21	6.46	22.8	111.48	12.66	98.82	98.13	138.50	0.0050	30	29.0	6.56	0.35	0	0	MH-2
35	**36**	**15**	**1.25**	**0.81**	**1.01**	**1.01**	**5.00**	**7.00**	**7.1**	**109.50**	**4.50**	**105.00**	**99.38**	**114.11**	**0.0493**	**15**	**14.3**	**11.67**	**0.16**	**0**	**0**	**DI-3C, L=6'**
89	90	91	0.09	0.80	0.07	0.23	5.00	7.00	1.6	113.20	4.00	109.20	109.02	36.91	0.0050	15	4.6	3.42	0.18	0.171	0.16245	18" NYLOPLAS
91	92	BEND2	0.14	0.90	0.13	0.36	5.18	6.98	2.5	113.30	4.38	108.92	108.68	47.36	0.0050	15	4.6	3.82	0.21	0	0	18" NYLOPLAS
BEND2	92A	93	0.00	0.30	0.00	0.36	5.39	6.94	2.5	113.20	4.52	108.68	108.64	8.14	0.0050	15	4.6	3.81	0.04	0	0	18" NYLOPLAS
93	94	95	0.11	0.78	0.09	0.45	5.42	6.92	3.1	113.00	4.46	108.54	108.28	51.70	0.0050	15	4.6	4.01	0.22	0	0	18" NYLOPLAS
95	96	97	0.11	0.82	0.09	0.54	5.42	6.92	3.7	112.80	4.62	108.18	107.74	87.00	0.0050	15	4.6	4.16	0.35	0	0	18" NYLOPLAS
97	98	99	0.09	0.35	0.03	0.57	5.18	6.98	4.0	111.90	4.26	107.64	107.39	51.70	0.0050	15	4.6	4.20	0.21	0	0	18" NYLOPLAS
99	100	15	0.16	0.74	0.12	0.69	7.56	6.40	4.4	113.00	5.71	107.29	99.38	78.50	0.1007	15	20.5	13.33	0.10	0	0	18" NYLOPLAS
15	16	17	0.00	0.30	0.00	5.23	7.56	6.40	33.5	111.48	13.60	97.88	97.12	152.08	0.0050	33	37.4	7.14	0.36	0	0	MH-2
101	102	103	0.13	0.70	0.09	0.10	5.00	7.00	0.7	113.10	3.60	109.50	109.11	77.67	0.0050	15	4.6	2.73	0.47	0.014	0.0133	18" NYLOPLAS
103	104	105	0.11	0.78	0.09	0.27	5.47	6.92	1.9	112.90	3.89	109.01	108.70	62.33	0.0050	15	4.6	3.56	0.29	0.088	0.0836	18" NYLOPLAS
105	106	107	0.07	0.80	0.06	0.33	5.77	6.86	2.3	113.30	4.70	108.60	108.21	77.50	0.0050	15	4.6	3.72	0.35	0	0	18" NYLOPLAS
107	108	17	0.08	0.56	0.04	0.40	6.11	6.77	2.7	112.75	4.64	108.11	98.62	78.46	0.1210	15	22.5	12.37	0.11	0.025	0.02375	18" NYLOPLAS
17	18	19	0.00	0.30	0.00	5.63	7.91	6.32	35.6	112.40	15.53	96.87	96.20	134.26	0.0050	36	47.2	7.35	0.31	0	0	MH-2
19	20	21	0.48	0.85	0.41	6.04	8.22	6.26	37.8	109.80	14.10	95.70	94.84	171.00	0.0050	42	71.1	7.52	0.38	0	0	JB-1 W/DI-1 TO
21	22	23	0.86	0.72	0.62	6.65	8.60	6.20	41.3	109.70	14.96	94.74	94.23	101.82	0.0050	42	71.1	7.68	0.22	0	0	JB-1 W/DI-1 TO
132	134	135	0.12	0.90	0.11	0.39	5.00	7.00	2.8	109.85	1.67	108.18	107.03	76.94	0.0150	15	7.9	5.88	0.22	0.3	0.285	ZURN
138	**140**	**135**	**0.05**	**0.90**	**0.05**	**0.05**	**5.00**	**7.00**	**0.3**	**110.20**	**1.67**	**108.53**	**107.03**	**67.98**	**0.0221**	**15**	**9.6**	**3.60**	**0.32**	**0**	**0**	**ZURN**
135	136	23	0.00	0.30	0.00	0.44	5.22	6.96	3.0	111.50	4.57	106.93	96.48	68.45	0.1526	15	25.2	13.92	0.08	0	0	MH-2
23	24	25	0.00	0.30	0.00	7.09	8.82	6.14	43.5	111.70	17.57	94.13	93.12	203.36	0.0050	42	71.1	7.78	0.44	0	0	MH-2
25	26	27	2.37	0.58	1.37	8.47	9.26	6.07	51.4	103.00	10.38	92.62	92.02	118.63	0.0050	48	101.6	8.12	0.24	0	0	JB-1 W/DI-1 TO
39	40	41	1.72	0.80	1.38	1.38	5.00	7.00	9.6	107.40	5.66	101.74	101.30	88.13	0.0050	21	11.2	5.25	0.28	0	0	DI-3B, L=6'
41	42	43	0.23	0.84	0.19	1.57	5.28	6.96	10.9	108.30	7.10	101.20	100.29	182.26	0.0050	21	11.2	5.32	0.57	0	0	DI-3B, L=6'
61	62	43	0.24	0.83	0.20	0.20	5.00	7.00	1.4	109.90	4.90	105.00	100.79	35.21	0.1196	15	22.3	10.15	0.06	0	0	DI-3B, L=6'
43	44	45	0.00	0.30	0.00	1.77	5.85	6.84	12.1	110.50	10.46	100.04	99.66	75.88	0.0050	24	16.0	5.61	0.23	0	0	MH-2
63	64	65	0.65	0.75	0.49	0.49	5.00	7.00	3.4	106.75	4.75	102.00	101.62	76.64	0.0050	18	7.4	4.12	0.31	0	0	DI-3B, L=6'
65	66	45	1.31	0.86	1.13	1.61	5.31	6.94	11.2	106.00	4.88	101.12	99.66	185.00	0.0079	24	20.1	6.58	0.47	0	0	DI-1
45	46	47	0.07	0.67	0.05	3.43	6.08	6.80	23.3	110.00	10.84	99.16	98.46	140.00	0.0050	30	29.0	6.58	0.35	0	0	DI-7 W/DI-1 TOI
67	68	47	1.42	0.85	1.21	1.21	5.00	7.00	8.4	108.00	3.00	105.00	99.71	185.00	0.0286	15	10.9	9.85	0.31	0	0	DI-1
47	48	49	0.08	0.71	0.06	4.69	6.08	6.80	31.9	110.50	12.29	98.21	97.43	157.57	0.0050	33	37.4	7.09	0.37	0	0	DI-7 W/DI-1 TOI
49	50	51	0.00	0.30	0.00	4.69	6.45	6.68	31.4	112.60	15.42	97.18	95.87	261.90	0.0050	36	47.2	7.15	0.61	0	0	MH-2
55	56	57	2.02	0.29	0.59	0.59	5.00	7.00	4.1	104.25	2.75	101.50	100.86	128.51	0.0050	15	4.6	4.22	0.51	0	0	DI-1
57	58	59	0.79	0.32	0.25	0.84	5.51	6.90	5.8	104.25	3.64	100.61	99.61	199.99	0.0050	18	7.4	4.66	0.72	0	0	DI-1
59	60	51	0.91	0.34	0.31	1.15	6.22	6.74	7.7	104.25	5.14	99.11	96.77	120.66	0.0194	24	31.5	8.31	0.24	0	0	DI-1
51	52	53	0.00	0.30	0.00	5.84	7.06	6.50	38.0	105.00	9.23	95.77	95.37	79.33	0.0050	36	47.2	7.44	0.18	0	0	MH-2
109	110	111	0.08	0.68	0.05	0.50	5.00	7.00	3.5	112.50	3.00	109.50	109.24	51.55	0.0050	15	4.6	4.11	0.21	0.471	0.44745	18" NYLOPLAS
111	112	113	0.08	0.42	0.03	0.54	5.21	6.96	3.7	113.10	3.96	109.14	108.78	71.50	0.0050	15	4.6	4.16	0.29	0	0	18" NYLOPLAS
113	114	115	0.05	0.34	0.02	0.62	5.50	6.92	4.3	113.10	4.42	108.68	108.25	86.28	0.0050	15	4.6	4.24	0.34	0.074	0.0703	18" NYLOPLAS
115	116	117	0.09	0.59	0.05	0.68	5.84	6.84	4.6	112.80	4.65	108.15	107.93	43.75	0.0050	15	4.6	4.25	0.17	0	0	18" NYLOPLAS
117	118	BEND	0.07	0.70	0.05	0.82	5.84	6.84	5.6	113.20	5.52	107.68	107.20	96.68	0.0050	18	7.4	4.62	0.35	0.096	0.0912	18" NYLOPLAS
BEND	118A	119	0.00	0.30	0.00	0.82	5.21	6.96	5.7	113.21	6.00	107.20	107.03	34.99	0.0050	18	7.4	4.64	0.13	0	0	18" NYLOPLAS
119	120	121	0.11	0.44	0.05	1.11	6.47	6.68	7.4	112.90	6.37	106.53	106.22	61.17	0.0050	24	16.0	5.00	0.20	0.257	0.24415	24" NYLOPLAS
121	122	BEND	0.14	0.58	0.08	1.69	6.47	6.68	11.3	112.90	6.78	106.12	105.95	33.67	0.0050	24	16.0	5.53	0.10	0.531	0.50445	24" NYLOPLAS
BEND	122A	123	0.00	0.30	0.00	1.69	6.01	6.80	11.5	113.22	7.27	105.95	105.37	115.61	0.0050	24	16.0	5.55	0.35	0	0	24" NYLOPLAS
123	124	125	0.16	0.71	0.11	1.96	6.35	6.71	13.2	112.90	7.63	105.27	104.97	60.00	0.0050	24	16.0	5.70	0.18	0.162	0.1539	24" NYLOPLAS
125	126	127	0.13	0.66	0.09	2.05	6.53	6.65	13.6	112.90	8.03	104.87	104.58	58.17	0.0050	24	16.0	5.73	0.17	0	0	24" NYLOPLAS
127	128	129	0.07	0.66	0.05	2.09	6.57	6.65	13.9	112.90	8.42	104.48	102.29	39.52	0.0555	24	53.3	14.30	0.05	0	0	24" NYLOPLAS
141	**142**	**143**	**0.04**	**0.80**	**0.03**	**0.09**	**5.00**	**7.00**	**0.6**	**113.20**	**4.20**	**109.00**	**108.78**	**44.73**	**0.0050**	**15**	**4.6**	**2.63**	**0.28**	**0.062**	**0.0589**	**24" NYLOPLAS**
143	**144**	**145**	**0.06**	**0.41**	**0.02**	**0.12**	**5.28**	**6.96**	**0.8**	**112.80**	**4.12**	**108.68**	**108.37**	**61.14**	**0.0050**	**15**	**4.6**	**2.81**	**0.36**	**0**	**0**	**24" NYLOPLAS**
145	**146**	**147**	**0.09**	**0.36**	**0.03**	**0.39**	**5.65**	**6.88**	**2.7**	**112.80**	**4.53**	**108.27**	**107.92**	**69.24**	**0.0050**	**15**	**4.6**	**3.87**	**0.30**	**0.252**	**0.2394**	**24" NYLOPLAS**
147	**148**	**129**	**0.09**	**0.59**	**0.05**	**0.44**	**5.95**	**6.82**	**3.0**	**112.90**	**5.08**	**107.82**	**103.14**	**47.57**	**0.0985**	**15**	**20.3**	**11.86**	**0.07**	**0**	**0**	**24" NYLOPLAS**
129	130	53	0.13	0.36	0.05	2.58	6.61	6.62	17.1	112.90	10.71	102.19	96.37	91.82	0.0634	24	56.9	15.88	0.10	0	0	24" NYLOPLAS
53	54	27	0.58	0.51	0.30	8.72	7.06	6.50	56.7	104.25	8.98	95.27	93.02	173.01	0.0130	36	76.0	11.82	0.24	0	0	DI-7 W/DI-1 TOI
27	28	29	0.48	0.48	0.21	17.39	9.50	6.04	105.0	104.00	12.48	91.52	90.60	184.04	0.0050	54	139.1	9.63	0.32	0	0	JB-1 W/DI-1 TO
31	**32**	**33**	**0.69**	**0.30**	**0.21**	**0.21**	**5.00**	**7.00**	**1.4**	**103.00**	**3.00**	**100.00**	**95.37**	**173.17**	**0.0267**	**15**	**10.6**	**6.04**	**0.48**	**0**	**0**	**DI-1**
33	**34**	**29**	**3.20**	**0.31**	**0.99**	**1.20**	**5.48**	**6.92**	**8.3**	**100.00**	**5.13**	**94.87**	**93.35**	**304.35**	**0.0050**	**21**	**11.2**	**5.11**	**0.99**	**0**	**0**	**DI-1**
29	30	END	3.59	0.51	1.83	20.42	9.82	5.98	122.1	103.00	12.50	90.50	90.00	47.95	0.0104	54	201.0	13.27	0.06	0	0	JB-1 W/DI-1 TO
157	158	END	1.53	0.32	0.49	0.49	5.00	7.00	3.4	105.00	7.00	98.00	94.90	149.00	0.0208	24	32.6	6.75	0.37	0	0	DI-1

OUTFALL BMP #1

Rpt 158 ?

Tc to BMP # 9.82 min. 13.27 min

Tc ?

Hydraulic Grade Line Analysis

Mannings N Value: 0.013 Job #: 21151 Project: Third High School Date: 7/8/2005

Initial Water Surface Elevation	Inlet Sta.	Inlet Q	Outfall Invert Elev.	Outlet Water Surf. Elev.	Do	Qo	Lo	Sfo %	Hf	Junction Loss Vo	Ho	Qi	Vi	QiVi	Vi sq. 2g	Hi	Ang.	H delta	Ht	1.30 Ht	0.50 Ht	Final H	Inlet Water Surf. Elev.	Rim Elev.	Fig. Hi Y/N	Fig. H delta Y/N	Shap Inlet Y/N	Comments 10 year Storm	
98.94	29	10.95	90.00	98.94	54"	122.12	47.9	0.39%	0.18	7.68	0.23	105.05	6.61	693.9	0.68	0.24	36	0.26	0.72		0.36	0.55	99.49	103.00	y	y	Y	OK	-3.51 Ft.
99.49	27	1.25	90.60	99.49	54"	105.05	184.0	0.29%	0.53	6.61	0.17	51.40	4.09	210.2	0.26	0.09	76	0.17	0.43		0.22	0.74	100.23	104.00	y	y	Y	OK	-3.77 Ft.
100.23	25	8.34	92.02	100.23	48"	51.40	118.8	0.13%	0.15	4.09	0.06	43.55	4.53	197.1	0.32	0.11	90	0.23	0.40		0.20	0.35	100.58	103.00	y	y	Y	OK	-2.42 Ft.
100.58	23		93.12	100.58	42"	43.55	203.4	0.19%	0.38	4.53	0.08	41.26	4.29	176.9	0.29	0.10	90	0.20	0.38		0.19	0.57	101.15	111.70	y	y	Y	OK	-10.55 Ft.
101.15	21	3.84	94.23	101.15	42"	41.26	101.8	0.17%	0.17	4.29	0.07	37.78	3.93	148.4	0.24	0.08			0.16		0.08	0.25	101.40	109.70	y	y	Y	OK	-8.30 Ft.
101.40	19	2.55	94.84	101.40	42"	37.78	171.0	0.14%	0.24	3.93	0.06	35.57	5.03	178.9	0.39	0.14	59	0.22	0.41		0.21	0.45	101.85	109.80	y	y	Y	OK	-7.95 Ft.
101.85	17		96.20	101.85	36"	35.57	134.3	0.28%	0.38	5.03	0.10	33.47	5.63	188.6	0.49	0.17	31	0.19	0.46		0.23	0.61	102.46	112.40	y	y	Y	OK	-9.94 Ft.
102.46	15		97.12	102.46	33"	33.47	152.1	0.40%	0.61	5.63	0.12	22.81	4.65	106.0	0.34	0.12			0.24		0.12	0.73	103.19	111.48	y	y	Y	OK	-8.29 Ft.
103.19	13		98.13	103.19	30"	22.81	138.5	0.31%	0.43	4.65	0.08	18.79	4.73	88.8	0.35	0.12			0.21		0.10	0.53	103.72	111.48	y	y	Y	OK	-7.76 Ft.
103.72	11		99.07	103.72	27"	18.79	140.5	0.37%	0.52	4.73	0.09	15.71	5.00	78.5	0.39	0.14			0.22		0.11	0.63	104.35	111.48	y	y	Y	OK	-7.13 Ft.
104.35	9		100.02	104.35	24"	15.71	63.0	0.48%	0.30	5.00	0.10	10.53	3.35	35.3	0.17	0.06	90	0.12	0.28		0.14	0.44	104.79	111.50	y	y	Y	OK	-6.71 Ft.
104.79	7	0.80	100.44	104.79	24"	10.53	112.9	0.22%	0.24	3.35	0.04	9.94	3.16	31.5	0.16	0.05			0.10		0.05	0.29	105.09	112.30	y	y	Y	OK	-7.21 Ft.
105.09	5	0.93	101.10	105.09	24"	9.94	194.2	0.19%	0.37	3.16	0.04	9.17	3.81	35.0	0.23	0.08	72	0.15	0.27		0.13	0.51	105.60	112.30	y	y	Y	OK	-6.70 Ft.
105.60	3	2.72	102.32	105.60	21"	9.17	163.1	0.34%	0.55	3.81	0.06	6.47	2.69	17.4	0.11	0.04	86	0.08	0.18	0.23	0.11	0.66	106.26	108.00	y	y	Y	OK	-1.74 Ft.
106.26	1	6.47	103.24	106.26	21"	6.47	52.3	0.17%	0.09	2.69	0.03								0.03	0.04	0.02	0.11	106.36	108.00	y	y	Y	OK	-1.64 Ft.
104.79	37	5.63	101.19	104.79	15"	5.63	92.1	0.76%	0.70	4.59	0.08								0.08	0.11	0.05	0.75	105.55	109.50	y	y	Y	OK	-3.95 Ft.
103.19	35	7.09	99.38	103.19	15"	7.09	114.1	1.20%	1.37	5.78	0.13								0.13	0.17	0.08	1.46	104.65	109.50	y	y	Y	OK	-4.85 Ft.
99.49	33	6.86	93.35	99.49	21"	8.30	304.3	0.27%	0.83	3.45	0.05	1.45	1.18	1.7	0.02	0.01	77	0.01	0.07	0.09	0.04	0.88	100.37	100.00	y	y	Y	Overfl	0.37 Ft.
100.37	31	1.45	95.37	100.37	15"	1.45	173.2	0.05%	0.09	1.18	0.01								0.01	0.01	0.00	0.09	100.46	103.00	y	y	Y	OK	-2.54 Ft.
100.23	53	1.92	93.02	100.23	36"	56.67	173.0	0.72%	1.25	8.02	0.25	37.97	5.37	203.9	0.45	0.16	48		0.41		0.20	1.45	101.68	104.25	y	y	Y	OK	-2.57 Ft.
101.68	51		95.37	101.68	36"	37.97	79.3	0.32%	0.26	5.37	0.11	31.35	4.44	139.0	0.31	0.11	90	0.14	0.36		0.18	0.44	102.12	105.00	y	y	Y	OK	-2.88 Ft.
102.12	49		95.87	102.12	36"	31.35	261.9	0.22%	0.58	4.44	0.08	31.91	5.37	171.5	0.45	0.16	20	0.32	0.55		0.28	0.85	102.97	112.60	y	y	Y	OK	-9.63 Ft.
102.97	47	0.39	97.43	102.97	33"	31.91	157.6	0.36%	0.57	5.37	0.11	23.32	4.75	110.8	0.35	0.12	20	0.06	0.29		0.15	0.72	103.69	110.50	y	y	Y	OK	-6.81 Ft.
103.69	45	0.32	98.46	103.69	30"	23.32	140.0	0.32%	0.45	4.75	0.09	12.10	3.85	46.6	0.23	0.08	13	0.04	0.21		0.10	0.56	104.25	110.00	y	y	Y	OK	-5.75 Ft.
104.25	43		99.66	104.25	24"	12.10	75.9	0.29%	0.22	3.85	0.06	10.92	4.54	49.6	0.32	0.11	13	0.03	0.20		0.10	0.32	104.56	110.50	y	y	Y	OK	-5.94 Ft.
104.56	41	1.34	100.29	104.56	21"	10.92	182.3	0.48%	0.87	4.54	0.08	9.63	4.00	38.6	0.25	0.09	39	0.09	0.26		0.13	1.00	105.56	108.30	y	y	Y	OK	-2.74 Ft.
105.56	39	9.63	101.30	105.56	21"	9.63	88.1	0.37%	0.33	4.00	0.06								0.06	0.08	0.04	0.37	105.93	107.40	y	y	Y	OK	-1.47 Ft.
104.56	61	1.39	100.79	104.56	15"	1.39	35.2	0.05%	0.02	1.14	0.01								0.01	0.01	0.00	0.02	104.58	109.90	y	y	Y	OK	-5.32 Ft.
103.69	67	8.45	99.71	103.69	15"	8.45	185.0	1.71%	3.16	6.88	0.18								0.18	0.24	0.12	3.28	106.98	108.00	y	y	Y	OK	-1.02 Ft.
104.25	65	7.82	99.66	104.25	24"	11.20	185.0	0.25%	0.45	3.57	0.05	1.45	1.93	2.8	0.06	0.02	78	0.04	0.11	0.14	0.07	0.52	104.77	106.00	y	y	Y	OK	-1.23 Ft.
104.77	63	3.41	101.62	104.77	18"	3.41	76.6	0.11%	0.08	1.93	0.01								0.01	0.02	0.01	0.09	104.86	106.75	y	y	Y	OK	-1.89 Ft.
102.12	59	2.09	96.77	102.12	24"	7.74	120.7	0.12%	0.14	2.46	0.02	5.79	3.27	18.9	0.17	0.06			0.08	0.11	0.05	0.19	102.31	104.25	y	y	Y	OK	-1.94 Ft.
102.31	57	1.74	99.61	102.31	18"	5.79	200.0	0.30%	0.61	3.27	0.04	4.10	3.34	13.7	0.17	0.06	99	0.12	0.23	0.29	0.15	0.75	103.07	104.25	y	y	Y	OK	-1.18 Ft.
103.07	55	4.10	100.86	103.07	15"	4.10	128.5	0.40%	0.52	3.34	0.04								0.04	0.06	0.03	0.55	103.61	104.25	y	y	Y	OK	-0.64 Ft.
104.35	75	0.46	100.77	104.35	15"	3.36	71.2	0.27%	0.19	2.74	0.03	2.92	2.38	6.9	0.09	0.03			0.06			0.25	104.60	113.10	y	y	N	OK	-8.50 Ft.
104.60	73	0.63	104.50	105.50	15"	2.92	81.8	0.20%	0.17	2.38	0.02	2.30	1.88	4.3	0.05	0.02			0.04	0.05		0.22	105.72	112.90	y	y	N	OK	-7.18 Ft.
105.72	71	0.52	108.71	109.71	15"	2.30	62.3	0.13%	0.08	1.88	0.01	1.19	0.97	1.1	0.01	0.01			0.02	0.02		0.10	109.81	112.90	y	y	N	OK	-3.09 Ft.
109.81	69	0.83	109.12	110.12	15"	1.19	76.1	0.03%	0.03	0.97	0.00								0.00	0.00		0.03	110.15	112.90	y	y	N	OK	-2.75 Ft.
103.72	87	0.81	100.07	103.72	15"	4.55	78.5	0.50%	0.39	3.70	0.05	3.65	2.98	10.9	0.14	0.05	76	0.09	0.19			0.58	104.30	113.00	y	y	N	OK	-8.70 Ft.
104.30	85	0.22	107.38	108.38	15"	3.65	51.7	0.32%	0.17	2.98	0.03	3.40	2.77	9.4	0.12	0.04	76	0.08	0.15			0.32	108.70	111.90	y	y	N	OK	-3.20 Ft.
108.70	83	0.62	107.74	108.74	15"	3.40	87.0	0.28%	0.24	2.77	0.03	2.78	2.26	6.3	0.08	0.03	76	0.05	0.11			0.35	109.09	112.80	y	y	N	OK	-3.71 Ft.
109.09	81	0.59	108.27	109.27	15"	2.78	51.7	0.19%	0.10	2.26	0.02	2.19	1.78	3.9	0.05	0.02	31	0.02	0.06	0.07		0.17	109.44	113.00	y	y	N	OK	-3.56 Ft.
109.44	BEND		108.63	109.63	15"	2.19	8.1	0.11%	0.01	1.78	0.01	2.20	1.80	4.0	0.05	0.02	45	0.02	0.05			0.06	109.70	114.00	y	y	N	OK	-4.30 Ft.
109.70	79	0.88	108.67	109.70	15"	2.20	47.4	0.12%	0.06	1.80	0.01	1.33	1.08	1.4	0.02	0.01	86	0.01	0.03	0.04		0.10	109.79	113.20	y	y	N	OK	-3.41 Ft.
109.79	77	0.50	109.01	110.01	15"	1.33	37.9	0.04%	0.02	1.08	0.00								0.00	0.01		0.02	110.03	113.20	y	y	N	OK	-3.17 Ft.
103.19	99	0.76	99.38	103.19	15"	4.39	78.5	0.46%	0.36	3.58	0.05	3.96	3.23	12.8	0.16	0.06	76	0.11	0.21			0.58	103.77	113.00	y	y	N	OK	-9.23 Ft.
103.77	97	0.22	107.39	108.39	15"	3.96	51.7	0.38%	0.19	3.23	0.04	3.71	3.02	11.2	0.14	0.05	76	0.09	0.18			0.38	108.76	111.90	y	y	N	OK	-3.14 Ft.
108.76	95	0.62	107.74	108.76	15"	3.71	87.0	0.33%	0.29	3.02	0.04	3.09	2.52	7.8	0.10	0.03	76	0.06	0.13			0.42	109.19	112.80	y	y	N	OK	-3.61 Ft.
109.19	93	0.59	108.28	109.28	15"	3.09	51.7	0.23%	0.12	2.52	0.02	2.50	2.04	5.1	0.06	0.02	31	0.02	0.07			0.19	109.47	113.00	y	y	N	OK	-3.53 Ft.
109.47	BEND		108.64	109.64	15"	2.50	8.1	0.15%	0.01	2.04	0.02	2.52	2.05	5.2	0.07	0.02	45	0.03	0.07			0.08	109.72	113.20	y	y	N	OK	-3.48 Ft.
109.72	91	0.88	108.68	109.72	15"	2.52	47.4	0.15%	0.07	2.05	0.02	1.64	1.34	2.2	0.03	0.01	86	0.02	0.05	0.06		0.13	109.85	113.30	y	y	N	OK	-3.45 Ft.
109.85	89	0.50	109.02	110.02	15"	1.64	36.9	0.06%	0.02	1.34	0.01								0.01	0.01		0.03	110.05	113.20	y	y	N	OK	-3.15 Ft.
102.46	107	0.30	98.62	102.46	15"	2.70	78.5	0.17%	0.14	2.20	0.02	2.26	1.84	4.2	0.05	0.02	15	0.01	0.04			0.18	102.64	112.75	y	y	N	OK	-10.11 Ft.
102.64	105	0.38	108.21	109.21	15"	2.26	77.5	0.12%	0.10	1.84	0.01	1.89	1.54	2.9	0.04	0.01			0.03			0.12	109.33	113.30	y	y	N	OK	-3.97 Ft.
109.33	103	0.59	108.70	109.70	15"	1.89	62.3	0.09%	0.05	1.54	0.01	0.73	0.59	0.4	0.01	0.00			0.01	0.01		0.07	109.77	112.90	y	y	N	OK	-3.13 Ft.
109.77	101	0.64	109.11	110.11	15"	0.73	77.7	0.01%	0.01	0.59	0.00								0.00	0.00		0.01	110.12	113.10	y	y	N	OK	-2.98 Ft.
101.15	135		96.48	101.15	15"	3.05	68.4	0.22%	0.15	2.48	0.02	2.75	2.24	6.2	0.08	0.03	42	0.04	0.09			0.24	101.39	111.50	y	y	N	OK	-10.11 Ft.
101.39	132	0.76	107.03	108.03	15"	2.75	76.9	0.18%	0.14	2.24	0.02								0.02	0.03		0.16	108.19	109.85	y	y	N	OK	-1.66 Ft.
101.39	138	0.32	107.03	108.03	15"	0.32	68.0	0.00%	0.00	0.26	0.00								0.00	0.00		0.00	108.03	110.20	y	y	N	OK	-2.17 Ft.
101.68	129	0.31	96.37	101.68	24"	17.09	91.8	0.57%	0.52	5.44	0.11	43.55	4.43	193.0	0.30	0.11	39	0.12	0.34			0.86	102.54	112.90	y	y	N	OK	-10.36 Ft.
102.54	127	0.31	102.29	103.89	24"	13.92	39.5	0.38%	0.15	4.43	0.08	13.62	4.33	59.0	0.29	0.10	39	0.11	0.29			0.44	104.33	112.90	y	y	N	OK	-8.57 Ft.
104.33	125	0.57	104.58	106.18	24"	13.62	58.2	0.36%	0.21	4.33	0.07	13.16	4.19	55.2	0.27	0.10			0.17			0.38	106.56	112.90	y	y	N	OK	-6.34 Ft.
106.56	123	0.76	104.97	106.57	24"	13.16	60.0	0.34%	0.20	4.19	0.07	11.52	3.67	42.3	0.21	0.07			0.14			0.34	106.92	112.90	y	y	N	OK	-5.98 Ft.
106.92	BEND		105.37	106.97	24"	11.52	115.6	0.26%	0.30	3.67	0.05	11.32	3.60	40.8	0.20	0.07	45	0.09	0.22			0.52	107.49	113.22	y	y	N	OK	-5.73 Ft.
107.49	121	0.54	105.95	107.55	24"	11.32	33.7	0.25%	0.08	3.60	0.05	7.41	2.36	17.5	0.09	0.03	45	0.04	0.12			0.21	107.76	112.90	y	y	N	OK	-5.14 Ft.
107.76	119	0.32	106.22	107.82	24"	7.41	61.2	0.11%	0.07	2.36	0.02	5.68	3.21	18.3	0.16	0.06	45	0.08	0.15			0.22	108.04	112.90	y	y	N	OK	-4.86 Ft.
108.04	BEND		107.03	108.23	18"	5.68	35.0	0.29%	0.10	3.21	0.04	5.58	3.16	17.6	0.15	0.05	45	0.07	0.17			0.27	108.50	113.21	y	y	N	OK	-4.71 Ft.
108.50	117	0.34	107.20	108.50	18"	5.58	96.7	0.28%	0.27	3.16	0.04	4.62	3.77	17.4	0.22	0.08	6	0.02	0.14			0.41	108.91	113.20	y	y	N	OK	-4.29 Ft.
108.91	115	0.36	107.93	108.93	15"	4.62	43.8	0.51%	0.22	3.77	0.06	4.31	3.51	15.1	0.19	0.07	80	0.13	0.25			0.47	109.41	112.80	y	y	N	OK	-3.39 Ft.
109.41	113	0.12	108.25	109.41	15"	4.31	86.3	0.44%	0.38	3.51	0.05	3.73	3.04	11.3	0.14	0.05	3	0.01	0.11			0.50	109.90	113.10	y	y	N	OK	-3.20 Ft.
109.90	111	0.23	108.78	109.90	15"	3.73	71.5	0.33%	0.24	3.04	0.04	3.51	2.86	10.1	0.13	0.04	11	0.01	0.09			0.33	110.23	113.10	y	y	N	OK	-2.87 Ft.
110.23	109	0.38	109.24	110.24	15"	3.51	51.5	0.30%	0.15	2.86	0.03								0.03			0.18	110.43	112.50	y	y	N	OK	-2.07 Ft.
102.54	147	0.36	103.14	109.90	15"	3.00	47.6	0.22%	0.10	2.45	0.02	2.67	2.17	5.8	0.07	0.03	80	0.05	0.10			0.20	110.10	112.90	y	y	N	OK	-2.80 Ft.
110.10	145	0.22	107.92	110.10	15"	2.67	69.2	0.17%	0.12	2.17	0.02	0.80	0.66	0.5	0.01	0.00			0.02			0.14	110.24	112.80	y	y	N	OK	-2.56 Ft.
110.24	143	0.17	108.37	110.24	15"	0.80	61.1	0.02%	0.01	0.66	0.00	0.64	0.52	0.3	0.00	0.00	90	0.00	0.01	0.01		0.02	110.26	112.80	y	y	N	OK	-2.54 Ft.
110.26	141	0.22	108.78	110.26	15"	0.64	44.7	0.01%	0.00	0.52	0.00								0.00	0.00		0.01	110.27	113.20	y	y	N	OK	-2.93 Ft.

100 YEAR

STORM SEWER

CALCULATIONS

STORM SEWER DESIGN COMPUTATIONS

PROJECT: Third High School JOB # 21151
COUNTY: Williamsburg-James City County
DESCRIPTION: Storm Sewer
DATE: 7/8/2005

Storm Frequency 100 year
n = 0.013
* = Manual Input of Data

FROM POINT	PIPE NAME	TO POINT	DRAINAGE AREA (acres)	RUNOFF)EFFICIE	CA INCRE.	CA ACCUM.	INLET TIME (min)	RAIN-FALL (in/hr)	RUNOFF Q (cfs)	TOP STR (elev)	HEIGHT STR (ft)	INV UPPER (ft)	INV. LOWER (ft)	LENGTH (ft)	SLOPE (ft/ft)	DIA (in)	CAPACITY (cfs)	VELOCITY (ft/s)	FLOW TIME (min)	Additiona BLDG Al	Additional C*A	STR TYPE
1	2	3	1.20	0.77	0.92	0.92	5.00	9.30	8.6	108.00	4.50	103.50	103.24	52.27	0.0050	21	11.2	5.15	0.17	0	0	DI-3B, L=6'
3	4	5	0.60	0.65	0.39	1.31	5.17	9.28	12.2	108.00	4.86	103.14	102.32	163.09	0.0050	21	11.2	5.07	0.54	0	0	DI-3C, L=6'
5	6	7	0.15	0.90	0.14	1.45	5.71	9.16	13.3	112.30	10.23	102.07	101.10	194.16	0.0050	24	16.0	5.71	0.57	0	0	DI-3BB, L=6'
7	8	9	0.13	0.92	0.12	1.57	6.27	9.03	14.2	112.30	11.30	101.00	100.44	112.92	0.0050	24	16.0	5.76	0.33	0	0	DI-3BB, L=6'
37	38	9	1.20	0.67	0.80	0.80	5.00	9.30	7.5	109.50	4.50	105.00	101.19	92.10	0.0414	15	13.1	11.07	0.14	0	0	DI-3C, L=6'
9	10	11	0.00	0.30	0.00	2.37	6.60	8.93	21.2	111.50	11.16	100.34	100.02	63.00	0.0050	24	16.0	6.74	0.16	0	0	MH-2
69	70	71	0.17	0.70	0.12	0.17	5.00	9.30	1.6	112.90	3.40	109.50	109.12	76.07	0.0050	15	4.6	3.39	0.37	0.053	0.05062	18" NYLOPLA
71	72	73	0.12	0.63	0.08	0.33	5.37	9.24	3.1	112.90	3.88	109.02	108.71	62.33	0.0050	15	4.6	4.00	0.26	0.092	0.0874	18" NYLOPLA
73	74	75	0.12	0.76	0.09	0.42	5.63	9.18	3.9	112.90	4.29	108.61	104.50	81.83	0.0502	15	14.5	10.02	0.14	0	0	18" NYLOPLA
75	76	11	0.15	0.45	0.07	0.49	5.77	9.16	4.5	113.10	8.70	104.40	100.77	71.17	0.0510	15	14.6	10.49	0.11	0	0	18" NYLOPLA
11	12	13	0.00	0.30	0.00	2.86	6.76	8.86	25.4	111.48	11.71	99.77	99.07	140.51	0.0050	27	21.9	6.38	0.37	0	0	MH-2
77	78	79	0.09	0.80	0.07	0.19	5.00	9.30	1.8	113.20	4.00	109.20	109.01	37.91	0.0050	15	4.6	3.49	0.18	0.124	0.1178	18" NYLOPLA
79	80	BEND	0.14	0.90	0.13	0.32	5.18	9.28	2.9	113.20	4.29	108.91	108.67	47.36	0.0050	15	4.6	3.96	0.20	0	0	18" NYLOPLA
BEND	80A	81	0.00	0.30	0.00	0.32	5.38	9.24	2.9	114.00	5.33	108.67	108.63	8.14	0.0050	15	4.6	3.96	0.03	0	0	18" NYLOPLA
81	82	83	0.11	0.78	0.09	0.40	5.41	9.22	3.7	113.00	4.47	108.53	108.27	51.70	0.0050	15	4.6	4.15	0.21	0	0	18" NYLOPLA
83	84	85	0.11	0.82	0.09	0.49	5.41	9.22	4.5	112.80	4.63	108.17	107.74	87.00	0.0050	15	4.6	4.25	0.34	0	0	18" NYLOPLA
85	86	87	0.09	0.35	0.03	0.52	5.18	9.28	4.9	111.90	4.26	107.64	107.38	51.70	0.0050	15	4.6	4.21	0.21	0	0	18" NYLOPLA
87	88	13	0.16	0.74	0.12	0.67	5.88	9.14	6.1	113.00	5.72	107.28	100.07	78.50	0.0919	15	19.6	14.11	0.09	0.026	0.0247	18" NYLOPLA
13	14	15	0.00	0.30	0.00	3.53	7.12	8.73	30.8	111.48	12.66	98.82	98.13	138.50	0.0050	30	29.0	6.68	0.35	0	0	MH-2
35	36	15	1.25	0.81	1.01	1.01	5.00	9.30	9.4	109.50	4.50	105.00	99.38	114.11	0.0493	15	14.3	12.49	0.15	0	0	DI-3C, L=6'
89	90	91	0.09	0.80	0.07	0.23	5.00	9.30	2.2	113.20	4.00	109.20	109.02	36.91	0.0050	15	4.6	3.69	0.17	0.171	0.16245	18" NYLOPLA
91	92	BEND2	0.14	0.90	0.13	0.36	5.17	9.28	3.3	113.30	4.38	108.92	108.68	47.36	0.0050	15	4.6	4.07	0.19	0	0	18" NYLOPLA
BEND2	92A	93	0.00	0.30	0.00	0.36	5.36	9.24	3.3	113.20	4.52	108.68	108.64	8.14	0.0050	15	4.6	4.07	0.03	0	0	18" NYLOPLA
93	94	95	0.11	0.78	0.09	0.45	5.39	9.24	4.1	113.00	4.46	108.54	108.28	51.70	0.0050	15	4.6	4.22	0.20	0	0	18" NYLOPLA
95	96	97	0.11	0.82	0.09	0.54	5.39	9.24	5.0	112.80	4.62	108.18	107.74	87.00	0.0050	15	4.6	4.04	0.36	0	0	18" NYLOPLA
97	98	99	0.09	0.35	0.03	0.57	5.17	9.28	5.3	111.90	4.26	107.64	107.39	51.70	0.0050	15	4.6	4.30	0.20	0	0	18" NYLOPLA
99	100	15	0.16	0.74	0.12	0.69	7.47	8.67	6.0	113.00	5.71	107.29	99.38	78.50	0.1007	15	20.5	14.50	0.09	0	0	18" NYLOPLA
15	16	17	0.00	0.30	0.00	5.23	7.47	8.67	45.3	111.48	13.60	97.88	97.12	152.08	0.0050	33	37.4	7.63	0.33	0	0	MH-2
101	102	103	0.13	0.70	0.09	0.10	5.00	9.30	1.0	113.10	3.60	109.50	109.11	77.67	0.0050	15	4.6	2.96	0.44	0.014	0.0133	18" NYLOPLA
103	104	105	0.11	0.78	0.09	0.27	5.44	9.22	2.5	112.90	3.89	109.01	108.70	62.33	0.0050	15	4.6	3.82	0.27	0.088	0.0836	18" NYLOPLA
105	106	107	0.07	0.80	0.06	0.33	5.71	9.16	3.0	113.30	4.70	108.60	108.21	77.50	0.0050	15	4.6	3.99	0.32	0	0	18" NYLOPLA
107	108	17	0.08	0.56	0.04	0.40	6.03	9.10	3.6	112.75	4.64	108.11	98.62	78.46	0.1210	15	22.5	13.47	0.10	0.025	0.02375	18" NYLOPLA
17	18	19	0.00	0.30	0.00	5.63	7.80	8.61	48.5	112.40	15.53	96.87	96.20	134.26	0.0050	36	47.2	7.62	0.29	0	0	MH-2
19	20	21	0.48	0.85	0.41	6.04	8.09	8.55	51.6	109.80	14.10	95.70	94.84	171.00	0.0050	42	71.1	8.08	0.35	0	0	JB-1 W/DI-1 T
21	22	23	0.86	0.72	0.62	6.65	8.45	8.45	56.2	109.70	14.96	94.74	94.23	101.82	0.0050	42	71.1	8.22	0.21	0	0	JB-1 W/DI-1 T
132	134	135	0.12	0.90	0.11	0.39	5.00	9.30	3.7	109.85	1.67	108.18	107.03	76.94	0.0150	15	7.9	6.33	0.20	0.3	0.285	ZURN
138	140	135	0.05	0.90	0.05	0.05	5.00	9.30	0.4	110.20	1.67	108.53	107.03	67.98	0.0221	15	9.6	3.92	0.29	0	0	ZURN
135	136	23	0.00	0.30	0.00	0.44	5.20	9.26	4.1	111.50	4.57	106.93	96.48	68.45	0.1526	15	25.2	15.12	0.08	0	0	MH-2
23	24	25	0.00	0.30	0.00	7.09	8.65	8.40	59.6	111.70	17.57	94.13	93.12	203.36	0.0050	42	71.1	8.30	0.41	0	0	MH-2
25	26	27	2.37	0.58	1.37	8.47	9.06	8.30	70.3	103.00	10.38	92.62	92.02	118.83	0.0050	48	101.6	8.74	0.23	0	0	JB-1 W/DI-1 T
39	40	41	1.72	0.80	1.38	1.38	5.00	9.30	12.8	107.40	5.66	101.74	101.30	88.13	0.0050	21	11.2	5.32	0.28	0	0	DI-3B, L=6'
41	42	43	0.23	0.84	0.19	1.57	5.28	9.26	14.5	108.30	7.10	101.20	100.29	182.26	0.0050	21	11.2	6.04	0.50	0	0	DI-3B, L=6'
61	62	43	0.24	0.83	0.20	0.20	5.00	9.30	1.9	109.90	4.90	105.00	100.79	35.21	0.1196	15	22.3	11.04	0.05	0	0	DI-3B, L=6'
43	44	45	0.00	0.30	0.00	1.77	5.78	9.16	16.2	110.50	10.46	100.04	99.66	75.88	0.0050	24	16.0	5.82	0.22	0	0	MH-2
63	64	65	0.65	0.75	0.49	0.49	5.00	9.30	4.5	106.75	4.75	102.00	101.62	76.64	0.0050	18	7.4	4.42	0.29	0	0	DI-3B, L=6'
65	66	45	1.31	0.86	1.13	1.61	5.29	9.26	14.9	106.00	4.88	101.12	99.66	185.00	0.0079	24	20.1	7.02	0.44	0	0	DI-1
45	46	47	0.07	0.67	0.05	3.43	6.00	9.12	31.3	110.00	10.84	99.16	98.46	140.00	0.0050	30	29.0	6.37	0.37	0	0	DI-7 W/DI-1 T
67	68	47	1.42	0.85	1.21	1.21	5.00	9.30	11.2	108.00	3.00	105.00	99.71	185.00	0.0286	15	10.9	10.16	0.30	0	0	DI-1
47	48	49	0.08	0.71	0.06	4.69	6.00	9.12	42.8	110.50	12.29	98.21	97.43	157.57	0.0050	33	37.4	7.21	0.36	0	0	DI-7 W/DI-1 T
49	50	51	0.00	0.30	0.00	4.69	6.36	9.00	42.2	112.60	15.42	97.18	95.87	261.90	0.0050	36	47.2	7.56	0.58	0	0	MH-2
55	56	57	2.02	0.29	0.59	0.59	5.00	9.30	5.4	104.25	2.75	101.50	100.86	128.51	0.0050	15	4.6	4.44	0.48	0	0	DI-1
57	58	59	0.79	0.32	0.25	0.84	5.48	9.22	7.7	104.25	3.64	100.61	99.61	199.99	0.0050	18	7.4	4.79	0.70	0	0	DI-1
59	60	51	0.91	0.34	0.31	1.15	6.18	9.07	10.4	104.25	5.14	99.11	96.77	120.66	0.0194	24	31.5	9.01	0.22	0	0	DI-1
51	52	53	0.00	0.30	0.00	5.84	6.94	8.79	51.3	105.00	9.23	95.77	95.37	79.33	0.0050	36	47.2	7.26	0.18	0	0	MH-2
109	110	111	0.08	0.68	0.05	0.50	5.00	9.30	4.7	112.50	3.00	109.50	109.24	51.55	0.0050	15	4.6	4.25	0.20	0.471	0.44745	18" NYLOPLA
111	112	113	0.08	0.42	0.03	0.54	5.20	9.26	5.0	113.10	3.96	109.14	108.78	71.50	0.0050	15	4.6	4.04	0.30	0	0	18" NYLOPLA
113	114	115	0.05	0.34	0.02	0.62	5.50	9.22	5.7	113.10	4.42	108.68	108.25	86.28	0.0050	15	4.6	4.68	0.31	0.074	0.0703	18" NYLOPLA
115	116	117	0.09	0.59	0.05	0.68	5.80	9.14	6.2	112.80	4.65	108.15	107.93	43.75	0.0050	15	4.6	5.03	0.15	0	0	18" NYLOPLA
117	118	BEND	0.07	0.70	0.05	0.82	5.80	9.14	7.5	113.20	5.52	107.68	107.20	96.68	0.0050	18	7.4	4.80	0.34	0.096	0.0912	18" NYLOPLA
BEND	118A	119	0.00	0.30	0.00	0.82	5.20	9.26	7.6	113.21	6.00	107.20	107.03	34.99	0.0050	18	7.4	4.80	0.12	0	0	18" NYLOPLA
119	120	121	0.11	0.44	0.05	1.11	6.40	8.96	9.9	112.90	6.37	106.53	106.22	61.17	0.0050	24	16.0	5.38	0.19	0.257	0.24415	24" NYLOPLA
121	122	BEND	0.14	0.58	0.08	1.69	6.40	8.96	15.2	112.90	6.78	106.12	105.95	33.67	0.0050	24	16.0	5.81	0.10	0.531	0.50445	24" NYLOPLA
BEND	122A	123	0.00	0.30	0.00	1.69	5.95	9.12	15.5	113.22	7.27	105.95	105.37	115.61	0.0050	24	16.0	5.82	0.33	0	0	24" NYLOPLA
123	124	125	0.16	0.71	0.11	1.96	6.28	9.03	17.7	112.90	7.63	105.27	104.97	60.00	0.0050	24	16.0	5.64	0.18	0.162	0.1539	24" NYLOPLA
125	126	127	0.13	0.66	0.09	2.05	6.46	8.96	18.3	112.90	8.03	104.87	104.58	58.17	0.0050	24	16.0	5.84	0.17	0	0	24" NYLOPLA
127	128	129	0.07	0.66	0.05	2.09	6.50	8.96	18.8	112.90	8.42	104.48	102.29	39.52	0.0555	24	53.3	15.52	0.04	0	0	24" NYLOPLA
141	142	143	0.04	0.80	0.03	0.09	5.00	9.30	0.8	113.20	4.20	109.00	108.78	44.73	0.0050	15	4.6	2.85	0.26	0.062	0.0589	24" NYLOPLA
143	144	145	0.06	0.41	0.02	0.12	5.26	9.26	1.1	112.80	4.12	108.68	108.37	61.14	0.0050	15	4.6	3.04	0.34	0	0	24" NYLOPLA
145	146	147	0.09	0.36	0.03	0.39	5.60	9.20	3.6	112.80	4.53	108.27	107.92	69.24	0.0050	15	4.6	4.13	0.28	0.252	0.2394	24" NYLOPLA
147	148	129	0.09	0.59	0.05	0.44	5.88	9.14	4.0	112.90	5.08	107.82	103.14	47.57	0.0985	15	20.3	12.90	0.06	0	0	24" NYLOPLA
129	130	53	0.13	0.36	0.05	2.58	6.54	8.93	23.0	112.90	10.71	102.19	96.37	91.82	0.0634	24	56.9	17.20	0.09	0	0	24" NYLOPLA
53	54	27	0.58	0.51	0.30	8.72	6.94	8.79	76.6	104.25	8.98	95.27	93.02	173.01	0.0130	36	76.0	12.30	0.24	0	0	DI-7 W/DI-1 T
27	28	29	0.45	0.46	0.21	17.39	9.29	8.28	143.9	104.00	12.48	91.52	90.60	184.04	0.0050	54	139.1	9.97	0.31	0	0	JB-1 W/DI-1 T
31	32	33	0.69	0.30	0.21	0.21	5.00	9.30	1.9	103.00	3.00	100.00	95.37	173.17	0.0267	15	10.6	6.56	0.44	0	0	DI-1
33	34	29	3.20	0.31	0.99	1.20	5.44	9.22	11.1	100.00	5.13	94.87	93.35	304.35	0.0050	21	11.2	5.32	0.95	0	0	DI-1
29	30	END	3.59	0.51	1.83	20.42	9.60	8.24	168.3	103.00	12.50	90.50	90.00	47.95	0.0104	54	201.0	14.18	0.06	0	0	JB-1 W/DI-1 T

Hydraulic Grade Line Analysis

Mannings N Value: 0.013 Job #: 21151 Project: Third High School Date: 7/8/2005

Initial Water Surface Elevation	Inlet Sta.	Inlet Q	Outfall Invert Elev.	Outlet Water Surf. Elev.	Do	Qo	Lo	Sfo %	Hf	Junction Loss Vo	Ho	Qi	Vi	QiVi	Vi sq. 2g	Hi	Ang.	H delta	Ht	1.30 Ht	0.50 Ht	Final H	Inlet Water Surf. Elev.	Rim Elev.	Fig. Hi Y/N	Fig. H delta Y/N	Shap Inlet Y/N	Comments 100 year Storm	
100.02	29	15.09	90.00	100.02	54"	168.28	47.9	0.73%	0.35	10.58	0.43	143.94	9.05	1302.7	1.27	0.45	36	0.48	1.36		0.68	1.03	101.05	103.00	y	y	Y	OK	-1.95 Ft.
101.05	27	1.71	90.60	101.05	54"	143.94	184.0	0.54%	0.99	9.05	0.32	70.28	5.59	393.0	0.49	0.17	76	0.32	0.81		0.40	1.39	102.44	104.00	y	y	Y	OK	-1.56 Ft.
102.44	25	11.41	92.02	102.44	48"	70.28	118.8	0.24%	0.28	5.59	0.12	59.58	6.19	368.9	0.60	0.21	90	0.42	0.75		0.38	0.66	103.10	103.00	y	y	Y	Overfl	0.10 Ft.
103.10	23		93.12	103.10	42"	59.58	203.4	0.35%	0.71	6.19	0.15	56.23	5.84	328.6	0.53	0.19	90	0.38	0.71		0.36	1.07	104.17	111.70	y	y	Y	OK	-7.53 Ft.
104.17	21	5.23	94.23	104.17	42"	56.23	101.8	0.31%	0.32	5.84	0.13	51.60	5.36	276.8	0.45	0.16			0.29		0.14	0.46	104.63	109.70	y	y	Y	OK	-5.07 Ft.
104.63	19	3.49	94.84	104.63	42"	51.60	171.0	0.26%	0.45	5.36	0.11	48.45	6.85	332.1	0.73	0.26	59	0.40	0.77		0.38	0.83	105.47	109.80	y	y	Y	OK	-4.33 Ft.
105.47	17		96.20	105.47	36"	48.45	134.3	0.53%	0.71	6.85	0.18	45.34	7.63	346.1	0.90	0.32	31	0.34	0.84		0.42	1.13	106.60	112.40	y	y	Y	OK	-5.80 Ft.
106.60	15		97.12	106.60	33"	45.34	152.1	0.73%	1.12	7.63	0.23	30.82	6.28	193.5	0.61	0.21			0.44		0.22	1.34	107.94	111.48	y	y	Y	OK	-3.54 Ft.
107.94	13		98.13	107.94	30"	30.82	138.5	0.56%	0.78	6.28	0.15	25.36	6.38	161.7	0.63	0.22			0.37		0.19	0.97	108.91	111.48	y	y	Y	OK	-2.57 Ft.
108.91	11		99.07	108.91	27"	25.36	140.5	0.67%	0.94	6.38	0.16	21.18	6.74	142.7	0.71	0.25			0.40		0.20	1.14	110.05	111.48	y	y	Y	OK	-1.43 Ft.
110.05	9		100.02	110.05	24"	21.18	63.0	0.88%	0.55	6.74	0.18	14.16	4.51	63.9	0.32	0.11	90	0.22	0.51		0.26	0.81	110.86	111.50	y	y	Y	OK	-0.64 Ft.
110.86	7	1.08	100.44	110.86	24"	14.16	112.9	0.39%	0.44	4.51	0.08	13.27	4.22	56.1	0.28	0.10			0.18		0.09	0.53	111.39	112.30	y	y	Y	OK	-0.91 Ft.
111.39	5	1.24	101.10	111.39	24"	13.27	194.2	0.34%	0.67	4.22	0.07	12.19	5.07	61.8	0.40	0.14	72	0.26	0.47		0.24	0.90	112.29	112.30	y	y	Y	OK	-0.01 Ft.
112.29	3	3.62	102.32	112.29	21"	12.19	163.1	0.59%	0.97	5.07	0.10	8.59	3.57	30.7	0.20	0.07	86	0.14	0.31	0.40	0.20	1.17	113.46	108.00	y	y	Y	Overfl	5.46 Ft.
113.46	1	8.59	103.24	113.46	21"	8.59	52.3	0.29%	0.15	3.57	0.05								0.05	0.06	0.03	0.19	113.65	108.00	y	y	Y	Overfl	5.65 Ft.
110.86	37	7.48	101.19	110.86	15"	7.48	92.1	1.34%	1.23	6.09	0.14								0.14	0.19	0.09	1.33	112.19	109.50	y	y	Y	Overfl	2.69 Ft.
107.94	35	9.42	99.38	107.94	15"	9.42	114.1	2.12%	2.42	7.67	0.23								0.23	0.30	0.15	2.57	110.51	109.50	y	y	Y	Overfl	1.01 Ft.
101.05	33	9.15	93.35	101.05	21"	11.06	304.3	0.49%	1.48	4.60	0.08	1.93	1.57	3.0	0.04	0.01	77	0.03	0.12	0.16	0.08	1.56	102.61	100.00	y	y	Y	Overfl	2.61 Ft.
102.61	31	1.93	95.37	102.61	15"	1.93	173.2	0.09%	0.15	1.57	0.01								0.01	0.01	0.01	0.16	102.77	103.00	y	y	Y	OK	-0.23 Ft.
102.44	53	2.60	93.02	102.44	36"	76.59	173.0	1.32%	2.28	10.83	0.46	51.32	7.26	372.5	0.82	0.29	48		0.74		0.37	2.65	105.10	104.25	y	y	Y	Overfl	0.85 Ft.
105.10	51		95.37	105.10	36"	51.32	79.3	0.59%	0.47	7.26	0.20	42.22	5.97	252.1	0.55	0.19	90	0.26	0.66		0.33	0.80	105.89	105.00	y	y	Y	Overfl	0.89 Ft.
105.89	49		95.87	105.89	36"	42.22	261.9	0.40%	1.05	5.97	0.14	42.80	7.21	308.4	0.81	0.28	20	0.57	0.99		0.50	1.55	107.44	112.60	y	y	Y	OK	-5.16 Ft.
107.44	47	0.52	97.43	107.44	33"	42.80	157.6	0.65%	1.03	7.21	0.20	31.28	6.37	199.3	0.63	0.22	20	0.10	0.52		0.26	1.29	108.73	110.50	y	y	Y	OK	-1.77 Ft.
108.73	45	0.43	98.46	108.73	30"	31.28	140.0	0.58%	0.81	6.37	0.16	16.20	5.16	83.5	0.41	0.14	13	0.07	0.37		0.18	1.00	109.73	110.00	y	y	Y	OK	-0.27 Ft.
109.73	43		99.66	109.73	24"	16.20	75.9	0.51%	0.39	5.16	0.10	14.53	6.04	87.8	0.57	0.20	13	0.06	0.36		0.18	0.57	110.30	110.50	y	y	Y	OK	-0.20 Ft.
110.30	41	1.79	100.29	110.30	21"	14.53	182.3	0.84%	1.53	6.04	0.14	12.80	5.32	68.1	0.44	0.15	39	0.17	0.46		0.23	1.76	112.06	108.30	y	y	Y	Overfl	3.76 Ft.
112.06	39	12.80	101.30	112.06	21"	12.80	88.1	0.65%	0.57	5.32	0.11								0.11	0.14	0.07	0.65	112.71	107.40	y	y	Y	Overfl	5.31 Ft.
110.30	61	1.85	100.79	110.30	15"	1.85	35.2	0.08%	0.03	1.51	0.01								0.01	0.01	0.01	0.03	110.33	109.90	y	y	Y	Overfl	0.43 Ft.
108.73	67	11.23	99.71	108.73	15"	11.23	185.0	3.02%	5.59	9.15	0.32								0.32	0.42	0.21	5.80	114.53	108.00	y	y	Y	Overfl	6.53 Ft.
109.73	65	10.43	99.66	109.73	24"	14.95	185.0	0.44%	0.81	4.76	0.09	1.93	2.57	4.9	0.10	0.04	78	0.07	0.19	0.25	0.12	0.93	110.66	106.00	y	y	Y	Overfl	4.66 Ft.
110.66	63	4.53	101.62	110.66	18"	4.53	76.6	0.19%	0.14	2.57	0.03								0.03	0.03	0.02	0.16	110.82	106.75	y	y	Y	Overfl	4.07 Ft.
105.89	59	2.80	96.77	105.89	24"	10.41	120.7	0.21%	0.26	3.31	0.04	7.73	4.38	33.8	0.30	0.10			0.15	0.19	0.10	0.35	106.24	104.25	y	y	Y	Overfl	1.99 Ft.
106.24	57	2.33	99.61	106.24	18"	7.73	200.0	0.54%	1.08	4.38	0.07	5.45	4.44	24.2	0.31	0.11	99	0.22	0.40	0.52	0.26	1.34	107.59	104.25	y	y	Y	Overfl	3.34 Ft.
107.59	55	5.45	100.86	107.59	15"	5.45	128.5	0.71%	0.91	4.44	0.08								0.08	0.10	0.05	0.96	108.55	104.25	y	y	Y	Overfl	4.30 Ft.
110.05	75	0.62	100.77	110.05	15"	4.50	71.2	0.49%	0.35	3.67	0.05	3.89	3.17	12.3	0.16	0.05			0.11			0.45	110.50	113.10	y	y	N	OK	-2.60 Ft.
110.50	73	0.84	104.50	110.50	15"	3.89	81.8	0.36%	0.30	3.17	0.04	3.07	2.50	7.7	0.10	0.03			0.07	0.10		0.39	110.89	112.90	y	y	N	OK	-2.01 Ft.
110.89	71	0.70	108.71	110.89	15"	3.07	62.3	0.23%	0.14	2.50	0.02	1.58	1.29	2.0	0.03	0.01			0.03	0.04		0.18	111.08	112.90	y	y	N	OK	-1.82 Ft.
111.08	69	1.11	109.12	111.08	15"	1.58	76.1	0.06%	0.05	1.29	0.01								0.01	0.01		0.05	111.13	112.90	y	y	N	OK	-1.77 Ft.
108.91	87	1.08	100.07	108.91	15"	6.09	78.5	0.89%	0.70	4.96	0.10	4.86	3.96	19.2	0.24	0.09	76	0.16	0.34			1.04	109.94	113.00	y	y	N	OK	-3.06 Ft.
109.94	85	0.29	107.38	109.94	15"	4.86	51.7	0.57%	0.29	3.96	0.06	4.53	3.69	16.8	0.21	0.07	76	0.14	0.27			0.57	110.51	111.90	y	y	N	OK	-1.39 Ft.
110.51	83	0.83	107.74	110.51	15"	4.53	87.0	0.49%	0.43	3.69	0.05	3.70	3.02	11.2	0.14	0.05	76	0.09	0.20			0.62	111.14	112.80	y	y	N	OK	-1.66 Ft.
111.14	81	0.79	108.27	111.14	15"	3.70	51.7	0.33%	0.17	3.02	0.04	2.92	2.38	6.9	0.09	0.03	31	0.03	0.10	0.13		0.30	111.44	113.00	y	y	N	OK	-1.56 Ft.
111.44	BEND		108.63	111.44	15"	2.92	8.1	0.20%	0.02	2.38	0.02	2.93	2.39	7.0	0.09	0.03	45	0.04	0.09			0.11	111.55	114.00	y	y	N	OK	-2.45 Ft.
111.55	79	1.17	108.67	111.55	15"	2.93	47.4	0.21%	0.10	2.39	0.02	1.77	1.44	2.5	0.03	0.01	86	0.02	0.06	0.07		0.17	111.72	113.20	y	y	N	OK	-1.48 Ft.
111.72	77	0.67	109.01	111.72	15"	1.77	37.9	0.07%	0.03	1.44	0.01								0.01	0.01		0.04	111.76	113.20	y	y	N	OK	-1.44 Ft.
107.94	99	1.03	99.38	107.94	15"	5.95	78.5	0.85%	0.67	4.85	0.09	5.27	4.30	22.6	0.29	0.10	76	0.19	0.38			1.05	108.98	113.00	y	y	N	OK	-4.02 Ft.
108.98	97	0.29	107.39	108.98	15"	5.27	51.7	0.67%	0.34	4.30	0.07	4.96	4.04	20.0	0.25	0.09	76	0.17	0.33			0.67	109.66	111.90	y	y	N	OK	-2.24 Ft.
109.66	95	0.83	107.74	109.66	15"	4.96	87.0	0.59%	0.51	4.04	0.06	4.12	3.36	13.9	0.18	0.06	76	0.12	0.24			0.75	110.41	112.80	y	y	N	OK	-2.39 Ft.
110.41	93	0.79	108.28	110.41	15"	4.12	51.7	0.41%	0.21	3.36	0.04	3.33	2.71	9.0	0.11	0.04	31	0.04	0.13			0.34	110.75	113.00	y	y	N	OK	-2.25 Ft.
110.75	BEND		108.64	110.75	15"	3.33	8.1	0.27%	0.02	2.71	0.03	3.35	2.73	9.1	0.12	0.04	45	0.05	0.12			0.14	110.89	113.20	y	y	N	OK	-2.31 Ft.
110.89	91	1.17	108.68	110.89	15"	3.35	47.4	0.27%	0.13	2.73	0.03	2.18	1.78	3.9	0.05	0.02	86	0.03	0.08	0.11		0.23	111.12	113.30	y	y	N	OK	-2.18 Ft.
111.12	89	0.67	109.02	111.12	15"	2.18	36.9	0.11%	0.04	1.78	0.01								0.01	0.02		0.06	111.18	113.20	y	y	N	OK	-2.02 Ft.
106.60	107	0.41	98.62	106.60	15"	3.62	78.5	0.31%	0.25	2.95	0.03	3.02	2.46	7.4	0.09	0.03	15	0.01	0.08			0.32	106.92	112.75	y	y	N	OK	-5.83 Ft.
106.92	105	0.51	108.21	109.21	15"	3.02	77.5	0.22%	0.17	2.46	0.02	2.52	2.06	5.2	0.07	0.02			0.05			0.22	109.43	113.30	y	y	N	OK	-3.87 Ft.
109.43	103	0.79	108.70	109.70	15"	2.52	62.3	0.15%	0.10	2.06	0.02	0.97	0.79	0.8	0.01	0.00			0.02	0.03		0.12	109.82	112.90	y	y	N	OK	-3.08 Ft.
109.82	101	0.85	109.11	110.11	15"	0.97	77.7	0.02%	0.02	0.79	0.00								0.00	0.00		0.02	110.13	113.10	y	y	N	OK	-2.97 Ft.
104.17	135		96.48	104.17	15"	4.06	68.4	0.39%	0.27	3.31	0.04	3.66	2.98	10.9	0.14	0.05	42	0.06	0.16			0.43	104.60	111.50	y	y	N	OK	-6.90 Ft.
104.60	132	1.00	107.03	108.03	15"	3.66	76.9	0.32%	0.25	2.98	0.03								0.03	0.04		0.29	108.32	109.85	y	y	N	OK	-1.53 Ft.
104.60	138	0.42	107.03	108.03	15"	0.42	68.0	0.00%	0.00	0.34	0.00								0.00	0.00		0.00	108.03	110.20	y	y	N	OK	-2.17 Ft.
105.10	129	0.42	96.37	105.10	24"	23.04	91.8	1.04%	0.95	7.33	0.21	59.58	5.97	355.8	0.55	0.19	39	0.21	0.61			1.56	106.66	112.90	y	y	N	OK	-6.24 Ft.
106.66	127	0.41	102.29	106.66	24"	18.76	39.5	0.69%	0.27	5.97	0.14	18.35	5.84	107.1	0.53	0.19	39	0.20	0.52			0.80	107.46	112.90	y	y	N	OK	-5.44 Ft.
107.46	125	0.77	104.58	107.46	24"	18.35	58.2	0.66%	0.38	5.84	0.13	17.72	5.64	99.9	0.49	0.17			0.31			0.69	108.14	112.90	y	y	N	OK	-4.76 Ft.
108.14	123	1.03	104.97	108.14	24"	17.72	60.0	0.61%	0.37	5.64	0.12	15.45	4.92	76.0	0.38	0.13			0.25			0.62	108.77	112.90	y	y	N	OK	-4.13 Ft.
108.77	BEND		105.37	108.77	24"	15.45	115.6	0.47%	0.54	4.92	0.09	15.18	4.83	73.3	0.36	0.13	45	0.17	0.39			0.93	109.70	113.22	y	y	N	OK	-3.53 Ft.
109.70	121	0.73	105.95	109.70	24"	15.18	33.7	0.45%	0.15	4.83	0.09	9.93	3.16	31.4	0.16	0.05	45	0.07	0.22			0.37	110.07	112.90	y	y	N	OK	-2.83 Ft.
110.07	119	0.43	106.22	110.07	24"	9.93	61.2	0.19%	0.12	3.16	0.04	7.56	4.28	32.3	0.28	0.10	45	0.13	0.27			0.39	110.46	112.90	y	y	N	OK	-2.44 Ft.
110.46	BEND		107.03	110.46	18"	7.56	35.0	0.52%	0.18	4.28	0.07	7.46	4.22	31.5	0.28	0.10	45	0.13	0.30			0.48	110.94	113.21	y	y	N	OK	-2.27 Ft.
110.94	117	0.45	107.20	110.94	18"	7.46	96.7	0.50%	0.49	4.22	0.07	6.18	5.03	31.1	0.39	0.14	6	0.04	0.25			0.73	111.67	113.20	y	y	N	OK	-1.53 Ft.
111.67	115	0.49	107.93	111.67	15"	6.18	43.8	0.91%	0.40	5.03	0.10	5.74	4.68	26.9	0.34	0.12	80	0.22	0.44			0.84	112.51	112.80	y	y	N	OK	-0.29 Ft.
112.51	113	0.16	108.25	112.51	15"	5.74	86.3	0.79%	0.68	4.68	0.08	4.96	4.04	20.0	0.25	0.09	3	0.03	0.20			0.88	113.39	113.10	y	y	N	Overfl	0.29 Ft.
113.39	111	0.31	108.78	113.39	15"	4.96	71.5	0.59%	0.42	4.04	0.06	4.67	3.80	17.7	0.22	0.08	11	0.02	0.16			0.59	113.98	113.10	y	y	N	Overfl	0.88 Ft.
113.98	109	0.51	109.24	113.98	15"	4.67	51.5	0.52%	0.27	3.80	0.06								0.06			0.33	114.30	112.50	y	y	N	Overfl	1.80 Ft.
106.66	147	0.49	103.14	106.66	15"	4.03	47.6	0.39%	0.18	3.28	0.04	3.56	2.90	10.3	0.13	0.05	80	0.09	0.17			0.36	107.02	112.90	y	y	N	OK	-5.88 Ft.
107.02	145	0.30	107.92	113.39	15"	3.56	69.2	0.30%	0.21	2.90	0.03	1.07	0.87	0.9	0.01	0.00			0.04			0.25	113.64	112.80	y	y	N	Overfl	0.84 Ft.
113.64	143	0.23	108.37	113.64	15"	1.07	61.1	0.03%	0.02	0.87	0.00	0.85	0.69	0.6	0.01	0.00	90	0.01	0.01	0.01		0.03	113.67	112.80	y	y	N	Overfl	0.87 Ft.
113.67	141	0.30	108.78	113.67	15"	0.85	44.7	0.02%	0.01	0.69	0.00								0.00	0.00		0.01	113.68	113.20	y	y	N	Overfl	0.48 Ft.

STORM SEWER INLET

CALCULATIONS

Label	Worksheet Type	Discharge (cfs)	Slope (%)	Spread (ft)	Gutter Width (ft)	Gutter Cross Slope (%)	Road Cross Slope (%)	Mannings Coefficient	Local Depression (in)	Local Depression Width (ft)	Efficiency	Curb Opening Length (ft)	Intercepted Flow (cfs)	Bypass Flow (cfs)	Depth (in)	Flow Area (ft^2)	Gutter Depression (in)	Total Depression (in)	Velocity (ft/s)	Equivalent Cross Slope (%)	Length Factor	Total Interception Length (ft)
01	Curb	5.40	0.50	13.52	2.00	8.33	2.00	0.013	2.0	2.00	0.90	10.75	4.86	0.54	4.8	2.0	1.5	3.5	2.76	8.38	0.72	14.90
03	Curb	2.20	0.00	1.90	2.00	8.33	0.50		2.0	2.00		1.77			3.8		1.9	3.9				
05	Curb	0.80	0.70	4.14	2.00	8.33	2.50	0.013	2.0	2.00	0.90	3.68	0.72	0.08	2.6	0.3	1.4	3.4	2.42	15.53	0.72	5.10
07	Curb	0.70	0.70	3.76	2.00	8.33	2.50	0.013	2.0	2.00	0.90	3.44	0.63	0.07	2.5	0.3	1.4	3.4	2.39	15.88	0.72	4.76
19	Grate	2.30	0.00	3.44	4.90	8.33	3.25		0.0	0.00					3.4		3.0	3.0				
21	Grate	2.30	0.00	3.44	4.90	8.33	3.25		0.0	0.00					3.4		3.0	3.0				
25	Ditch	7.80	0.00	14.59					0.0	0.00					7.2							
27	Ditch	1.20	0.00	5.28					0.0	0.00					1.7							
29	Ditch	0.40	0.00	13.61					0.0	0.00					0.8							
31	Ditch	1.20	0.00	5.13					0.0	0.00					1.7							
33	Ditch	5.60	0.00	5.37					0.0	0.00					4.7							
35	Curb	5.70	0.00	1.90	2.00	8.33	2.00		2.0	2.00		10.31			3.8		1.5	3.5				
37	Curb	4.60	0.00	1.90	2.00	8.33	2.00		2.0	2.00		7.63			3.8		1.5	3.5				
39	Curb	7.70	0.50	16.44	2.00	8.33	1.85	0.013	2.0	2.00	0.90	13.70	6.93	0.77	5.2	2.6	1.6	3.6	2.93	7.17	0.72	18.99
41	Curb	1.20	1.67	10.11	2.00	8.33	0.50	0.013	2.0	2.00	0.90	6.13	1.08	0.12	2.5	0.4	1.9	3.9	2.91	13.65	0.72	8.49
45	Ditch	0.30	0.00	3.79					0.0	0.00					0.7							
47	Ditch	0.30	0.00	4.01					0.0	0.00					0.7							
53	Ditch	1.70	0.00	4.43					0.0	0.00					2.1							
55	Ditch	3.30	0.00	9.67					0.0	0.00					3.3							
57	Ditch	1.40	0.00	5.51					0.0	0.00					1.9							
59	Ditch	1.70	0.00	5.14					0.0	0.00					2.1							
61	Curb	1.10	2.00	7.54	2.00	8.33	0.60	0.013	2.0	2.00	0.90	5.93	0.99	0.11	2.4	0.3	1.9	3.9	3.38	14.85	0.72	8.21
63	Curb	2.80	1.25	9.23	2.00	8.33	1.63	0.013	2.0	2.00	0.90	8.96	2.52	0.28	3.4	0.8	1.6	3.6	3.38	11.35	0.72	12.41
65	Ditch	6.40	0.00	11.92					0.0	0.00					5.2							
67	Ditch	6.80	0.00	13.20					0.0	0.00					5.5							

DITCH

CALCULATIONS

Trapezoidal Report

Label	Mannings Coefficient	Slope (%)	Depth (ft)	Left Side Slope (ft/ft (H:V))	Right Side Slope (ft/ft (H:V))	Bottom Width (ft)	Discharge (cfs)	Flow Area (ft^2)	Wetted Perimeter (ft)	Top Width (ft)	Critical Depth (ft)	Critical Slope (%)	Velocity (ft/s)	Velocity Head (ft)	Specific Energy (ft)	Froude Number	Flow Type
A-A_10 yea	0.030	1.00	0.18	4.00	4.00	1.00	0.40	0.3	2.52	2.47	0.14	2.86	1.25	0.02	0.21	0.61	Subcritica
A-A_2 year	0.030	1.00	0.16	4.00	4.00	1.00	0.30	0.3	2.31	2.27	0.12	2.98	1.15	0.02	0.18	0.60	Subcritica
B-B_10 yea	0.030	1.00	0.56	3.00	4.00	1.00	3.90	1.7	5.08	4.92	0.48	2.06	2.35	0.09	0.65	0.71	Subcritica
B-B_2 year	0.030	1.00	0.51	3.00	4.00	1.00	3.10	1.4	4.68	4.54	0.43	2.12	2.21	0.08	0.58	0.70	Subcritica
C-C_10 yea	0.030	1.00	0.13	5.00	15.00	1.00	0.30	0.3	3.70	3.68	0.10	3.24	0.96	0.01	0.15	0.58	Subcritica
C-C_2 year	0.030	1.00	0.11	5.00	15.00	1.00	0.20	0.2	3.23	3.21	0.08	3.44	0.86	0.01	0.12	0.56	Subcritica
D-D_10 yea	0.030	0.80	0.43	3.00	3.00	1.00	1.80	1.0	3.72	3.58	0.34	2.27	1.83	0.05	0.48	0.61	Subcritica
D-D_2 year	0.030	0.80	0.38	3.00	3.00	1.00	1.40	0.8	3.41	3.29	0.29	2.35	1.71	0.05	0.43	0.60	Subcritica
E-E_10 yea	0.030	1.25	0.39	6.00	4.00	1.00	2.40	1.2	4.98	4.90	0.34	2.26	2.09	0.07	0.46	0.76	Subcritica
E-E_2 year	0.030	1.25	0.35	6.00	4.00	1.00	1.90	1.0	4.58	4.51	0.30	2.33	1.96	0.06	0.41	0.75	Subcritica
F-F_10 yea	0.030	1.08	0.39	4.00	4.00	0.50	1.50	0.8	3.73	3.63	0.33	2.35	1.86	0.05	0.44	0.69	Subcritica
F-F_2 year	0.030	1.08	0.36	4.00	4.00	0.50	1.20	0.7	3.43	3.34	0.30	2.42	1.76	0.05	0.40	0.68	Subcritica
G-G_10 ye	0.030	1.40	0.40	4.00	3.00	0.50	1.60	0.7	3.39	3.27	0.36	2.32	2.14	0.07	0.47	0.79	Subcritica
G-G_2 yea	0.030	1.40	0.35	4.00	3.00	0.50	1.20	0.6	3.05	2.95	0.31	2.41	1.99	0.06	0.41	0.78	Subcritica

 J. K. Timmons & Assoc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

THIRD H.S. BMP #2 (N. SCOTT'S POND)

BMP OUTFLOWS

$Q_{1\text{-YR}}$ = 0.42 CFS @ EL. 96.36

$Q_{2\text{-YR}}$ = 1.45 CFS @ EL. 97.07

$Q_{10\text{-YR}}$ = 4.22 CFS @ EL. 98.93

$Q_{\overset{25}{100}\text{-YR}}$ = 9.60 CFS @ EL. 99.13

$Q_{100\text{-YR}}$ = 49.22 CFS @ EL. 100.04

BMP #2 OUTFALL

Current Design (B-3 wetland)

Perm. Pool = 92.2

DHW 100.04

T.O.D MIN 102.04
(NO EMERG. SPILLWAY)

Current Outfall 68.31' OF 24" RCP @ 1.24%

0	91.4	
68.31	90.55	
100	98.5	
135	90.03	INV 15" EX GND 91
165	91.0	INV 15'
220	90	
275	89	
322	88	
360	87	
417	86	
424	85	HERDCUT AREA

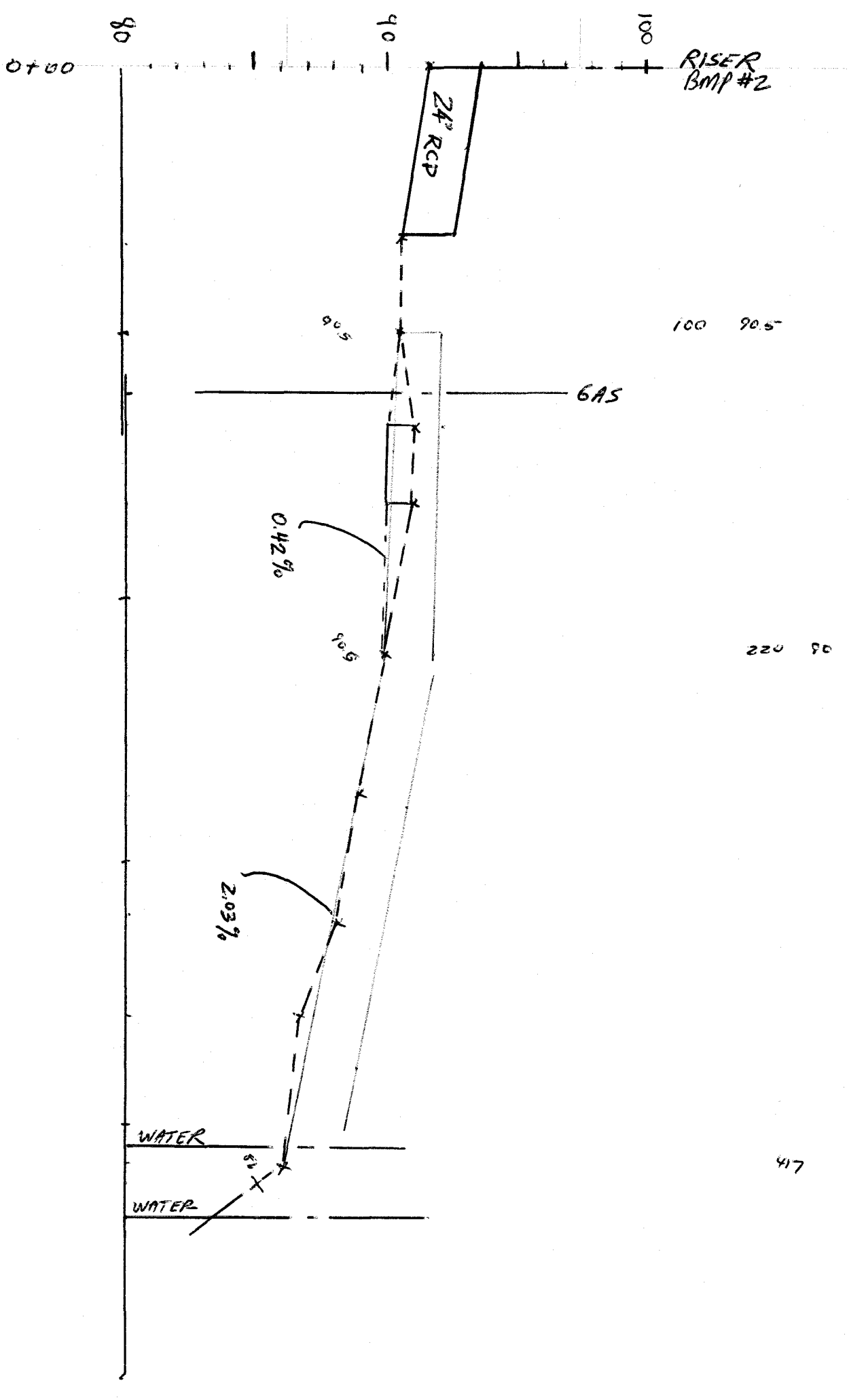
GAS 124

W_1 409

W_2 437

INFLOW VOLUMES / FLOWS

1-YR	6.072 AC-FT	97.64 CFS
2-YR	8.184 AC-FT	129.59 CFS
10-YR	14.391 AC-FT	220.20 CFS
25-YR	15.965 AC-FT	242.92 CFS
100-YR	22.3 AC-FT	333.41 CFS


0+00
80
90
100
RISER
BMP #2
24" RCP
90.5
100 90.5
GAS
0.42%
90.6
220 90
2.03%
WATER
WATER
417

File.... R:\300 - Site Development\301\21151\Calcs\PondPack\THIRD HS BMP REV 10-14.PPW

OUTLET STRUCTURE INPUT DATA

Bmp #2

```
Structure ID       = 4
Structure Type     = Culvert-Circular
-----------------------------------
No. Barrels        =         1
Barrel Diameter    =    2.0000 ft   24"
Upstream Invert    =     91.40 ft
Dnstream Invert    =     91.00 ft
Horiz. Length      =     70.00 ft   68.31
Barrel Length      =     70.00 ft
Barrel Slope       =    .00571 ft/ft  1.24%

OUTLET CONTROL DATA...
Mannings n         =      .0120
Ke                 =      .9000  (forward entrance loss)
Kb                 =   .010575  (per ft of full flow)
Kr                 =      .9000  (reverse entrance loss)
HW Convergence     =       .001  +/- ft

INLET CONTROL DATA...
Equation form      =          1
Inlet Control K    =     .0018
Inlet Control M    =    2.0000
Inlet Control c    =    .02920
Inlet Control Y    =     .7400
T1 ratio (HW/D)    =     1.059
T2 ratio (HW/D)    =     1.204
Slope Factor       =     -.500
Calc inlet only    = Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     93.52 ft  --->  Flow =     15.55 cfs
At T2 Elev =     93.81 ft  --->  Flow =     17.77 cfs
```

FREE OUTFALL CONDITIONS

```
Structure ID       = TW
Structure Type     = TW SETUP, DS Channel
-----------------------------------
FREE OUTFALL CONDITIONS SPECIFIED

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

BMP #1 WSEL

1-YR	96.36
2-YR	97.07
10-YR	98.94
100-YR	100.02

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	97.64 cfs	at	12.0000 hrs
Peak Outflow	=	.42 cfs	at	23.8500 hrs
Peak Elevation	=	96.36 ft		
Peak Storage	=	5.655 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	6.072
- Infiltration	=	.000
- HYG Vol OUT	=	2.811
- Retained Vol	=	3.261
Unrouted Vol	=	-.001 ac-ft (.017% of Inflow Volume)

$V_{1-42} = 6.072$ AC-FT

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 2
Outflow HYG file = NONE STORED - BMP OUT 2

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	129.59 cfs	at	12.0000 hrs
Peak Outflow	=	1.45 cfs	at	22.7500 hrs
Peak Elevation	=	97.07 ft		
Peak Storage	=	7.033 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	8.184
- Infiltration	=	.000
- HYG Vol OUT	=	4.350
- Retained Vol	=	3.830
Unrouted Vol	=	-.003 ac-ft (.038% of Inflow Volume)

$V_{2\text{-yr}}$ 8.184 AC-FT.

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	220.20 cfs	at	12.0000 hrs
Peak Outflow	=	4.22 cfs	at	16.7000 hrs
Peak Elevation	=	98.93 ft		
Peak Storage	=	10.964 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	14.391
- Infiltration	=	.000
- HYG Vol OUT	=	10.091
- Retained Vol	=	4.298
Unrouted Vol	=	-.003 ac-ft (.021% of Inflow Volume)

$V_{10-HR} = 14.391$ AC-FT

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 25
Outflow HYG file = NONE STORED - BMP OUT 25

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	242.92 cfs	at	11.9500 hrs
Peak Outflow	=	9.60 cfs	at	13.8500 hrs
Peak Elevation	=	99.13 ft		
Peak Storage	=	11.402 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	15.965
- Infiltration	=	.000
- HYG Vol OUT	=	11.632
- Retained Vol	=	4.329
Unrouted Vol	=	-.003 ac-ft (.020% of Inflow Volume)

$V_{25\text{-}YR} = 15.965$ AC-FT.

WARNING: Outflow hydrograph truncated on right side.

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\301\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	93.00 ft
Starting Volume	=	.000 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	333.41 cfs	at	11.9500 hrs
Peak Outflow	=	49.22 cfs	at	12.3500 hrs
Peak Elevation	=	100.04 ft		
Peak Storage	=	13.531 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	.000
+ HYG Vol IN	=	22.300
- Infiltration	=	.000
- HYG Vol OUT	=	17.912
- Retained Vol	=	4.385
Unrouted Vol	=	-.004 ac-ft (.016% of Inflow Volume)

$V_{100-YR} = 22.3$ ACRE-FT.

WARNING: Outflow hydrograph truncated on right side.

BMP #1

OUTFALL #1

1"=100'

EX. 15" CMP
INV. IN = 90.83
INV. OUT NOT FOUND

90.55

3+77

50' CITY OF NEWPORT NEWS
WATERLINE EASEMENT
D.B. 198, PG. 1

20' USA/NEWPORT NEWS
WATERLINE EASEMENT
D.B. 34, PG. 195

25' BUFFER

68.31'
24" CL III
@ 1.24%

$\frac{91.4 - 90.55}{68.31} = 1.24\%$

EL. 102.0V MIN

100.04

100 YR. W.S. ELEVATION=100.02

10 YR. W.S. ELEVATION=98.93

1 YR. W.S. ELEVATION=96.36

36" PYRAMID TRASH RACK PER DETAIL ON DRAWING C2.6

20'

10" PVC PIPE W/10" CAST IRON GRATE ADS 1001CG INV=96.40

6" PVC PIPE AND CAP W/3" HOLE IN CAP, INV=93.00

3'x2' GABION BASKETS WRAPPED IN FILTER FABRIC

D. EW-2

PERMANENT WATER QUALITY ELEVATION = 92.2

91.40

90.55

1' BELOW EX. GROUND

OP2

160

CLAY CORE

DEEP POOL ELEV.=90.0

DEEP POOL ELEV.=90.0

6" PVC PIPE AND CAP W/3" HOLE IN CAP, INV=92.2

120

110

100

90

80

JAMES CITY COUNTY TYPE B-3 BMP

98.1 | 96.5 | 95.8 | 94.4 | 93.7 | 92.9 | 92.2 | 90.9 | 90.3 | 91.1 | 90.2 | 89.4 | 88.4 | 87.8

31+00 | 32+00 | 33+00 | 34+00 | 35+00 | 36+00

Scott Thomas

From: Scott Thomas
Sent: Monday, March 13, 2006 11:23 AM
To: 'Robertson, Alan'
Cc: Wayland Bass
Subject: RE: Irrigation

Alan

This was an issue that came up in the Warhill Tract discussion even before the PPEA contractor was selected. Someone questioned whether stormwater from a treatment pond would be safe to use on a public use site (fields, etc.). The irrigation thing is not really our Division's issue, other than land-disturbing associated with running the irrigation line from the pond to the HS tract. I think your starting point is with Bernie Farmer because they are using to pond to irrigate the soccer fields and it's been a real sensitive issue with him. As far as permitting, I do not know. Perhaps the Virginia DEQ would regulate this activity. Someone from JCSA would probably know who issues water withdrawl permits.

Before the PPEA, a feasibility analyses was done on the Warhill Tract by Timmons. This report was called "***Feasibility Study for the Regional Stormwater Management Plan for Lightfoot/Warhill Area of James City County"*** dated August 31, 2004. At that time, the trunk line was going to go to the East Pond. As it ended up the trunk line goes to the West Pond. However, the feasibility study had a Tab # 8 which was a Center for Watershed Protection memorandum called "***The Use of Recycled Stormwater for Use in Irrigation***". You should probably see this report as it was specifically prepared to address the issue for the District Park ponds use for irrigation purposes.

Tell me where you are and I will drop a copy in the pony.

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

-----Original Message-----
From: Robertson, Alan [mailto:ROBERTSONA@wjcc.k12.va.us]
Sent: Friday, March 10, 2006 9:56 AM
To: Scott Thomas
Subject: Irrigation

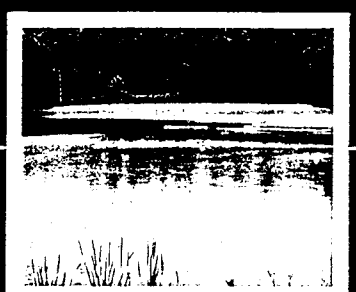
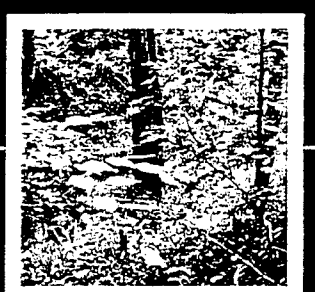
Scott,

Good chance we will try to add a field irrigation system back into this HS project. Who would I contact to ask about whether using the eastern p[ond as a source (like Rec) is even a possibility? Otherwise, I'll plan for a deep well. I figure JCSA would prefer the pond.

Alan

Alan T. Robertson
Facilities Manager
WJCC Schools
597 Jolly Pond Road
Williamsburg, VA 23188

ITY STUDY FOR THE REGIONAL
STER MANAGEMENT PLAN
COT / WARHILL AREA OF
COUNTY


August 31, 2004
Revised 11/18/04

CONTACT:
TIMMONS GROUP
Andrew Gould, PE
711 N. Courthouse Rd.
Richmond, VA 23236
804.379.6116
andrew.gould@timmons.com

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Memorandum

CENTER FOR WATERSHED PROTECTION
8390 Main Street, 2nd Floor
Ellicott City, MD 21043
410.461.8323
FAX 410.461.8324
www.cwp.org
www.stormwatercenter.net

Date: September 30, 2004

To: Wayland Bass, P.E.
County Engineer
James City County

From: Paul Sturm
Center for Watershed Protection

Re: Technical Memo: *The Use of Recycled Stormwater for Use in Irrigation*

This memorandum provides a summary and recommendations on the use of recycled stormwater for irrigation of playing fields at the James City County District Sports Complex. Specific guidance and additional resources are also provided on potential incorporation of storm water recycling into James City County's stormwater management program. The technical memo is organized into the following parts:

I. Introduction

This technical memorandum provides a summary of the research conducted by the Center for Watershed Protection (CWP) for James City County (JCC) on the use of stormwater collection systems for irrigation. The evaluation considered two water sources for use in irrigation of sports fields: typical urban stormwater runoff and rooftop runoff. There are significant differences in the water chemistry and quality of rooftop runoff versus typical urban stormwater runoff. Stormwater practices for capturing the two types of runoff were evaluated for their advantages, limitations, operation and maintenance, and cost.

(1) The County currently uses water from the existing pond to irrigate the soccer fields. Table 2 indicates that the existing pond water may contain E. Coli bacteria in excess of recreation standards.

II. Urban Stormwater Runoff as a Water Source for Irrigation

The capture of urban runoff from suburban and urban land uses for the purpose of irrigation is a commonly used practice in many parts of the world. In the US, the most common applications tend to be for irrigation of golf courses and landscaped areas. For the purpose of this memo, urban stormwater runoff is defined as runoff from developed land including streets, parking lots, rooftops, and turf. There are two primary collection methods used to capture and store urban runoff: stormwater ponds and underground storage.

Certain pollutants in urban stormwater can be a concern with regard to human contact recreation especially when physical contact with the turf is expected. Examples of pollutants of concern include fecal coliform, E. Coli, Fecal strep and poly aromatic hydrocarbons (PAHs) (originating from the from the oil and grease associated with automobiles). Table 1 summarizes the concentrations from the National Stormwater Quality Database (NSQD) for several pollutants that may be of concern in urban stormwater (Pitt et. al., 2004).

Table 1. Summary of Available Stormwater Data Included in the NSQD, version 1.0.

Land Use	Fecal Coliform (mpn/100 mL)	Fecal Strep. (mpn/100 mL)	Total E. Coli (mpn/100 mL)	Oil and Grease (mg/L)
Mixed Residential				
Number of observations	313	156	11	258
% of samples above detection	94.9	98.1	90.9	68.2
Median	11000 (1)	26000	1050	4.4
Coefficient of variation	3.3	2.2	2.1	2.4
Water Contact Recreation Standards Fecal coliform <200 mpn per 100ml E. Coli <126mpn per 100ml freshwater swimming (USEPA, 1998)				

Stormwater ponds and underground detention have limited treatment capabilities for bacteria and other pollutants of concern. While up to 90% of bacteria may die in the water column within 2-5 days, effluent concentrations will still commonly exceed water contact standards by a factor of 5 (Schueler, 1999). (1)

CWP's research found no epidemiological studies that relate the potential health impacts to children or adult athletes playing on fields that have been watered using recycled stormwater. As a result, the actual hazard posed by the practice of applying untreated stormwater to playing fields is not fully known at this time. Other jurisdictions have exercised caution when applying stormwater to playing fields. Two locations in Australia that are recycling stormwater for playing fields have performed considerable water treatment including the use of sand filters and oil and grit separators in series before applying it to fields (City of Holroyd, 2000; Monash University, 2004). (2)

A summary follows of the advantages, limitations, operation and maintenance, and cost associated with stormwater ponds and underground storage.

Stormwater Wet Ponds

Stormwater wet ponds collect water in a permanent pool and tend to be either on-line facilities or off-line facilities. On-line facilities (in-stream) capture stream baseflow and are not as dependent on stormwater runoff for maintaining a permanent pool in the facility. Off-line facilities are often located on a development site and do not receive flow from a perennial stream.

In James City County, stormwater ponds are designed for water quality and channel protection criteria. The JCC water quality criteria specifies that the practices must achieve 10 points through a combination of structural BMPs and preservation of natural open space (Zielinski, 2001). Channel protection criteria specifies the extended detention of the 1-year, 24 hour storm for 24 hours, so it is released at a slower rate to reduce the occurrence of channel erosion.

Advantages

Advantages to the use of stormwater ponds for collecting stormwater for irrigation include:

- Generally there is a consistent water supply
- Stormwater ponds can hold a significant storage volume
- Facility may already exist (no additional capital cost)

Limitations

Limitations to the use of stormwater ponds as the collection mechanism for stormwater for irrigation of playing fields include:

- On-line facilities may result in the depletion of stream baseflow during drought conditions, reducing downstream flows and potentially impacting stream biota (droughts often coincide with the time of year for the highest need for watering). Poff et. al. (1997) report that a stable natural flow regime is one of the most important factors affecting stream habitat and biological diversity.
- Concentrations of pollutants in stormwater being applied to playing fields where contact with the turf or playing surface is expected, may exceed recreational contact standards.
- There can be mosquito and aesthetic concerns due to water level fluctuation resulting from depletions of the permanent pool in a pond. Disease vector mosquitoes have a more fertile environment for reproduction in stormwater BMPs with variable and small residual volumes of water (Metzger et. al., 2002).
- Some pretreatment may be necessary. Most locations that have used urban stormwater for irrigation have employed pretreatment before distributing the water (City of Holroyd, 2000; Monash University, 2004)
- Maintenance of facility and ensuring adequate operational volume is

necessary due to sedimentation in on-line stormwater ponds with the normal or accelerated bank erosion rates associated with urban streams (Trimble, 1997). (2)

- Sediment may cause clogging of sprinkler heads and interfere with proper function of pumping equipment especially where ponds are drawn down to very small residual volumes. (2)

Operation and Maintenance

Operation and maintenance of a stormwater pond as a supply source for irrigation water has a number of important considerations reported in the literature.

- Regular routine maintenance and effective pretreatment is needed so that sediment or debris does not interfere with the mechanical functioning of the pump or the intake structure (CASQA, 2003) (2)
- Sediment is a concern filling up the wet well
- On-line ponds have a tendency to experience high sedimentation rates due to bank erosion and normal stream sediment transport
- Stormwater ponds that are at lower elevations than playing fields require a pump with sufficient horsepower to overcome the head difference between the pond elevation and the elevation of the playing fields. This may result in increased energy costs when compared to a practice where there is little or no head differential.

Case Study

Gables Central Park
Austin, TX

The Gables Central Park is an apartment community in Austin that was completed in 1997 and has a number of green building features. The stormwater management for the complex is a wet detention pond that is also used to irrigate the landscaping. The complex is able to provide for 100% of its annual irrigation needs from the wet pond and consequently does not have to use city water for irrigation.

Cost

New wet pond $8,000 per acre treated (Minton, 2003)
Cost for an irrigation system would include a pump, wet well, rainfall sensor (to avoid unnecessary watering), and a water filter.

Underground Storage Practices

Underground storage practices can also be used to irrigate landscaped areas or fields. The practices function by detaining water in an underground vault system (Figure 1). Stormwater can be pumped from the vault system for irrigation purposes. There are currently very few examples of these practices being used for irrigation in the literature.

(2) The existing pond is 800 feet long by 200 feet wide with an estimated average depth of 5 feet. The pond contains 3 times the County required post development water quality volume. The settlement time and chlorination should help reduce bacteria to acceptable levels, reduce sediment concentrations and the intake structure could be constructed to exclude oils.

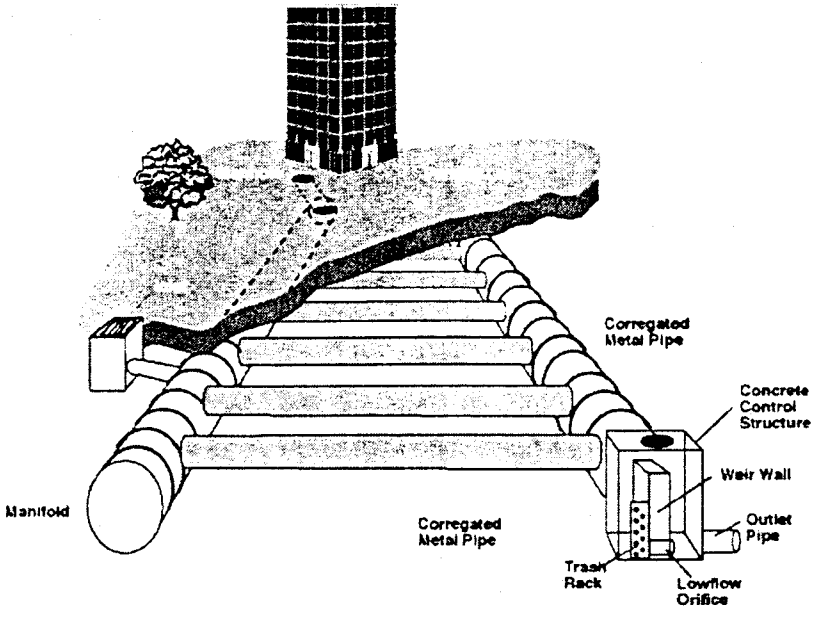

Figure 1. Underground storage schematic (Montgomery County - MD, 2004)

Advantages

Advantages to the use of underground storage for collecting stormwater for irrigation include:

- Economy of space (can share land use with parking or other open space/recreational needs)
- Reduced likelihood of outside bacteria sources such as waterfowl

Limitations

There are two primary limitations to the use of underground storage as a collection practice for irrigation of playing fields.

- Need for extensive pretreatment. Filtration or other mechanism may be needed to improve water quality before application to playing fields.
- Expensive to build

Operation and Maintenance

Operation and maintenance for underground storage practices that receive surface stormwater runoff is similar to that for stormwater ponds. Maintenance frequency may even be higher due to the constrained space and limited pretreatment area that can fill with trash, debris and sediment. Specific constraints include:

- Costs tend to be higher due to space and access constraints
- Confined space entry training (OSHA regulations) may be needed for maintenance staff
- Special maintenance equipment is needed

Cost
Wet vault storage $12,000 – $100,000 per acre treated (does not include land costs). (Minton, 2003)
Cost for an irrigation system would include a pump, rainfall sensor (to avoid unnecessary watering), and a water filter.

Case Study
City of Holroyd
Sydney, Australia
Underground detention is being used to store stormwater generated from a high-density residential area for irrigation of sporting fields. Two continuous deflection separators (CDS), three oil and grease separators and a sand filter are being used to provide treatment of the stormwater before application to the fields. The project is supplying up to 90% of the annual irrigation needs for the playing fields and captured 8 tons of litter from the residential area in the first six months of operation (City of Holroyd, 2000).

III. Rooftop Runoff as a Water Source for Irrigation

Rooftop runoff can be classified into two categories; prone and non-prone. Roofs that are overhung by trees or frequently used by birds and/or squirrels characterize prone rooftops; non-prone rooftops do not have trees above them and do not have significant bird or squirrel activity. Runoff from non-prone rooftops are generally a cleaner water source than runoff from prone rooftops or typical urban stormwater runoff (Shergill and Pitt, 2004). Table 2 shows concentrations of E. coli and Enterococci (two potential pathenogenic types of bacteria) from several source areas monitored in Tuscaloosa, AL. Concentrations of E. coli bacteria are low for non-prone streets (10.5 col/100ml) compared to concentrations for prone rooftops and prone streets, which average 574 and 1330 col/ 100ml, respectively. The standard for E. coli for freshwater swimming is < 126 col/ 100ml (EPA, 1998). This limited data set suggests that non-prone rooftop runoff may be a good low risk source of irrigation water for playing fields. Discussion of cistern collection systems for rooftop runoff is provided below.

Table 2. Comparison of bacteria geometric means for different urban source areas (Shergill and Pitt, 2004)		
	E. coli (MPN/100 mL)	Enterococci (MPN/100 mL)
Source Area	Warm Above 50^0 F	Warm Above 50^0 F
Roof – Prone	>574	>684
Roof - Not prone	10.5	8.7
Streets- Prone	>1330	>4530
Streets- Not prone	>470	>1500
Parking lot - Prone	129	>640
Parking lot- Not prone	45.8	>1010
Open space- Prone	>130	>3500
Open space- Not prone	110	>6100

Cisterns

Cisterns are the primary mechanism for capturing rooftop runoff for irrigation. Cisterns are large enclosed containers that serve as a reservoir for rooftop runoff. For the purpose of this memo, we are defining cisterns as accepting rooftop runoff only, so they are not confused with underground storage. Cisterns can be placed above or below ground. Water enters near the top of the structure and is usually screened to filter out larger particles or the first flush is diverted to minimize collection of debris and pollutants associated with atmospheric deposition. Water is then dispensed from the reservoir using a pump system.

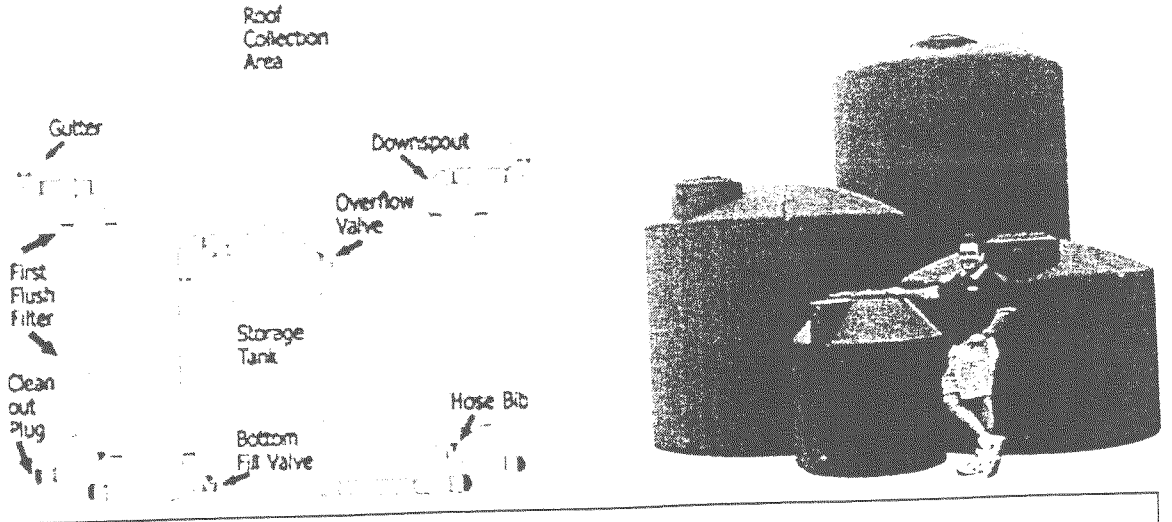

Figure 2. Cistern schematic (City of Austin, 2004) and photo of plastic cistern tanks (www.watertanks.com)

Advantages

Several advantages to using cisterns to capture rooftop runoff for irrigation of playing fields include:

- Less maintenance is needed for cisterns than other practices due to reduced sediment, trash and debris loading
- Less chance of bacteria, metals*(2), hydrocarbons or pesticide contamination

Limitations

There are two primary limitations to the use of cisterns as a collection practice for irrigation of playing fields.

- Potential for fecal contamination (may need to monitor to ensure roof is not prone to contamination by birds or squirrels); though concentrations are likely to be much lower than for urban stormwater runoff.
- Cost for cisterns and associated distribution system

Operation and Maintenance

Operation and maintenance of cisterns is less intensive than stormwater ponds and underground storage tanks primarily because runoff tends to be cleaner for sediment, bacteria, trash and debris. Specific considerations include:

- First flush bypass, screening or other pretreatment is necessary for the removal of large particles or debris
- Periodic clean out of cistern by dewatering and use of a wet/dry vacuum
- May want some initial monitoring to identify whether rooftop is prone to bacteria contamination
- Water distribution pump will typically require less horsepower than a pond or underground storage system due to hydraulic that cistern provides.

Cost

Fiberglass 10,000 gallon tank $10,000 (www.lid-stormwater.net)
Plastic 10,000 gallon tank $5,115 (www.watertanks.com)
Corrugated Steel 40,000 gallon tank $28,000 (www.watertanks.com)
Cost for an irrigation system would include a pump, rainfall sensor (to avoid unnecessary watering), and water filter or first flush bypass.

Case Study

AMD Corporation
Austin, TX
AMD is a computer chip company that is using cisterns to capture rooftop runoff and supply irrigation water for extensive landscaping at their corporate offices and production facility. The system reduces their public water use by an estimated 5,000 gallons/day. The system is estimated to save AMD almost $6,000 a year and is expected to pay for itself within five years.

(3) note some metal roofing materials may generate runoff with high concentrations of metals, though this would not be expected to pose a significant health risk from contact recreation

VI. Recommendations/ Key Considerations

This section highlights the most appropriate stormwater collection techniques and irrigation approaches for James City County to consider for specific application on County lands including the County Regional Sports Complex.

The summary of available literature reveals that there are a number of concerns associated with using mixed urban stormwater as the water source for irrigation of the Regional Sports Complex fields. The two primary concerns are the risk associated with applying water that would likely have bacteria concentrations above the water contact standard for recreation and the loss in stream baseflow in Subwatershed 205 that may occur with the use of the existing regional stormwater facility for irrigation. Subwatershed 205 contains the most sensitive streams in the Powhatan Creek Watershed according to the watershed plan (Sturm and Kitchell, 2001), and maintaining baseflow is important for their overall health. The small area of the catchment (less than 0.25 square miles) which drains to the regional pond at the Sports Complex in Subwatershed 205 coupled with the high estimated water demand for playing fields would significantly reduce the baseflow, especially during drought conditions. If this approach is pursued it is recommended that:

1. Treatment be performed to the water to reduce bacteria levels at least below the level of the recreational standard [2]
2. A minimum flowthrough level be considered to maintain baseflow in the receiving stream (this would require further investigation of estimated baseflow conditions)
3. Water quality and channel protection should be evaluated for inclusion into upstream new development to ensure uncontrolled flows do not erode existing channels leading to the regional facility
4. On-site reforestation and stormwater recharge practices should be an integral part of the new development to assist in maintaining downstream baseflow
5. Consideration is given to using recycled stormwater for application to playing fields and landscaping on proposed new development of high school and community college

Some of the secondary maintenance concerns associated with on-line ponds including sediment, debris clogging, and mosquito problems may be minimized with a large regional facility which maintains a permanent pool.

Though rooftop runoff is a cleaner water source it is likely not a viable approach for the irrigation of Regional Sports Complex fields due to the relatively small roof drainage area compared to the field area and water demand.

While not an explicit aspect of this task memo, it appears worthwhile for James City County to consider the incorporation of stormwater reuse for landscaping purposes into its stormwater management manual particularly given the limited water supply on the Lower Peninsula. Stormwater reuse and recycling for landscape irrigation could be beneficial in terms of regional water demand and increased shallow groundwater

recharge on development sites. In addition, reuse could help developers meet or exceed water quality and channel protection criteria.

Table 3 summarizes the recommended uses of stormwater practices to recycle water for irrigation and could be used in an addendum to the County's stormwater manual along with material provided in Appendix A. Appendix A contains stormwater reuse chapters from the California Stormwater Best Management Practices Manual and the Pennsylvania Draft Stormwater Management Manual.

Table 3. Summary of appropriate use of stormwater practices for irrigation purposes

Type of Stormwater Recycling system	Cost	Maintenance	Sports fields	Landscaping	Golf Course
Existing Detention pond (on-line)*	Medium	Medium	○	○	○
Existing Detention pond (off-line)*	Medium	Medium	○		◆
Cistern	Medium	Low	○	◆	○
Underground storage	High	High	X	◆	◆

◆ Good application for practice

○ Potential application for practice (may depend on subwatershed conditions or supply/demand and bacteria concentrations for the use of cisterns for sports fields)

X Not recommended at this time. Additional research and monitoring is needed before pursuing further.

* May require treatment to reduce bacteria concentrations when used for sports fields

In future County development projects, where irrigation of stormwater may be beneficial, a number of important variables should be determined to establish the viability of using stormwater for irrigation, these include:

- annual water need for irrigation of landscaping, playing fields or other watering needs
- frequency of watering and timeframe
- concentration of pollutants from the rooftop or stormwater facility if water is to be used for playing fields [(2)]
- volume of water likely available from rooftop or surface runoff collection systems to be used for playing fields

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Appendix A.

California Stormwater BMP Handbook
TC-12 Retention / Irrigation

Draft Pennsylvania Stormwater Management Manual
Section 5 – Structural BMPs
BMP #: Capture and Reuse

Scott Thomas

From: Scott Thomas
Sent: Friday, May 27, 2005 2:47 PM
To: 'Shannon Browning'; 'steve.raugh@timmons.com'
Cc: Wayland Bass; John Horne; William Porter
Subject: RE: Third High School 100 Year EC Calcs

PRE-PLAN ANALYSES OF TSB IN SOUTH PART OF SCHOOL.

Wayland Bass and myself have had a chance to review the information as forwarded to us on Thursday May 26 pertaining to the 100-year drainage analyses from the 3rd High School site. At this time we do ***not*** concur with the results as forwarded pending resolve of the following:

1. ***Drainage Area***. The predevelopment model includes a portion of the existing cross-country transmission line corridor; however, construction phase conditions do not. This drainage subarea either needs to be removed from the predevelopment model or added to the construction phase model so that the comparative analyses is the same. Just adding it to the predevelopment model and not the other would result in inflated predevelopment allowable discharges.

2. ***Model***. Basics of hydrology would dictate that you cannot just mathematically "add" flows for an analyses like this. The pre- and construction phase models must account for the travel time path (channel reach routing) between the subareas and basins/traps to a common analyses point at the District Park East Pond. Although drainage areas common to both the pre- and construction phase analyses do not need to be in both models (as runoff is the same), the routing must account for channel reach routing. This is especially true for the construction phase model in which there is very little detention time in the traps. Timing of peak hydrograph peaks may dictate whether this scenario works or does not work. Use Pondpack to set up a comparative pre- vs. construction phase model with a common analyses point at the District Park east pond which includes channel reach routing below the subareas/basins.

3. ***Diversion.*** The construction phase analyses shows the elimination of one trap and it's drainage subarea being diverted to the large sediment basin. It must be clarified how this will be done in the field, whether a diversion can be situated along natural topography to positively drain to the sediment basin; or alternatively, if an intermediate fill is required in that valley in order to get a diversion dike to work properly.

4. ***TR55.*** It is unclear why hydrology computations were done by hand for predevelopment and construction phase sediment trap hydrology and then later hydrology was done for the construction phase to the temporary sediment basin using PondPack v9.0. All hydrology should be performed consistently using hand or the computer application. PondPack is preferred.

5. ***PREDEV CN.*** A predevelopment runoff curve number of 63 was used for predevelopment conditions. Although in passing at the last Warhill PPEA meeting this value was thrown out by County staff, it should be supported by PondPack computations. It could be lower based on soils in the drainage area. Provide the breakdown to show the composite value used for predevelopment using wooded condition cover and HSG soils within the drainage subarea.

6. ***Times of Concentration.*** Site hydrology shows a user input value for times of concentration. Similarly to # 5 above, provide PondPack SCS computations showing time of concentration assumptions for overland, shallow concentrated and concentrated flow. Also, as it relates to time of concentration, it is unclear why

the travel path location would change between that for predevelopment conditions to Outfall # 1 and for construction phase conditions to the BMP/Temporary Sediment Basin. It would seem that the travel path from the most remote point in the watershed would be the same between the two conditions; however, the time would change due to change in cover conditions (wooded to disturbed soil).

If you need to discuss any of these matters you can call either Wayland or myself or a meeting can be set next week.

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

Visit:
http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html
and
www.protectedwithpride.org

-----Original Message-----
From: Shannon Browning [mailto:Shannon.Browning@timmons.com]
Sent: Thursday, May 26, 2005 8:42 AM
To: Wayland Bass; Scott Thomas
Cc: Steve Raugh
Subject: Third High School 100 Year EC Calcs

Attached are the Pre-Developed vs. Erosion Control Phase Calculations for the Third High School Site. As shown in the calculations the 100 year erosion control flows are less than the 100 year existing condition flows. If you need any additional information let me know.

Thanks

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.
Shannon Browning
1001 Boulders Parkway
Suite 300
Richmond, VA 23225
Tel: 804.200.6462
Fax: 804.560.1016
www.timmons.com

Scott Thomas

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To: Wayland Bass; Scott Thomas
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Subject: Third High School 100 Year EC Calcs

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Thanks

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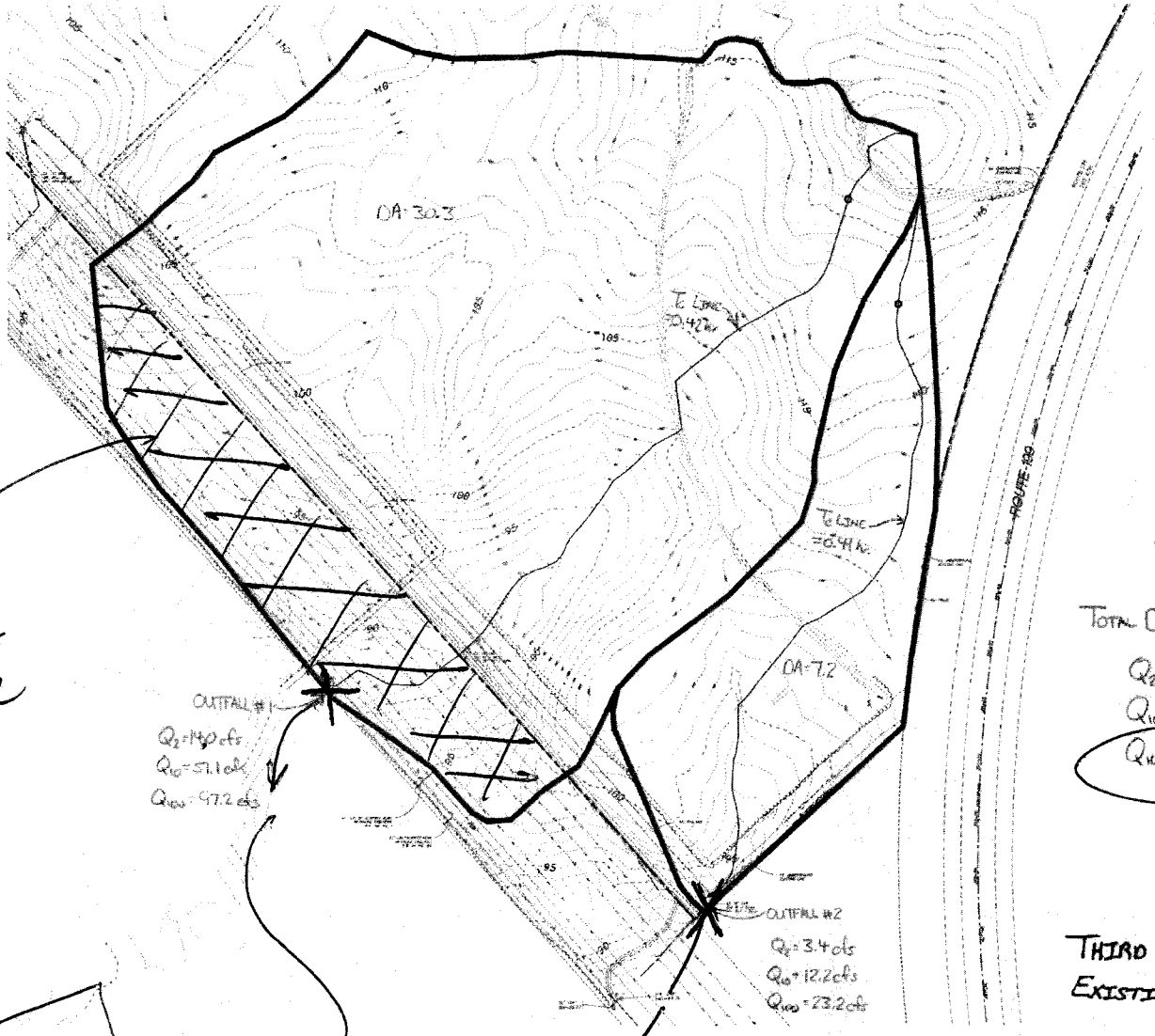
NOTE! PLAYING WITH NUMBERS,

(Analyses points not the same.)

1. DA problem – exist cross-country transmission line problem. Must Delete from pre- or add to post.
2. Model problem – can't just add flows, must model in Pondpack with D/s network and Tt in channel reach East Pond is outfall node.
3. Diversion – how will flow from eliminated sed trap DA get to by sed basin. DD, Fill Pete.
4. TR55 – WHY were PreDev and postdev sed trap comps done by hand but TSB postdev hydrology was done using Pondpack 9.0. Be consistent
5. PreDev CN of 63 – Show composite breakdown woods – HSG. Confirm
6. Tc – Need Comps for all Tc assumptions. Overland, Shallow + channel flow Path Components. Path shown NOT CHANGE for Outfall #1 and ANALYSES



CAN'T INCLUDE THIS AREA, IT IS SAME FOR BOTH OR MUST ADD IN TO POSTDEV Model.

INFLATES PREDEV VALUES!

ANALYSES POINT

EX. CONDITIONS
CN=63 ✓

(check w/ wayland AMC COND. 7456?

TOTAL DISCHARGES:

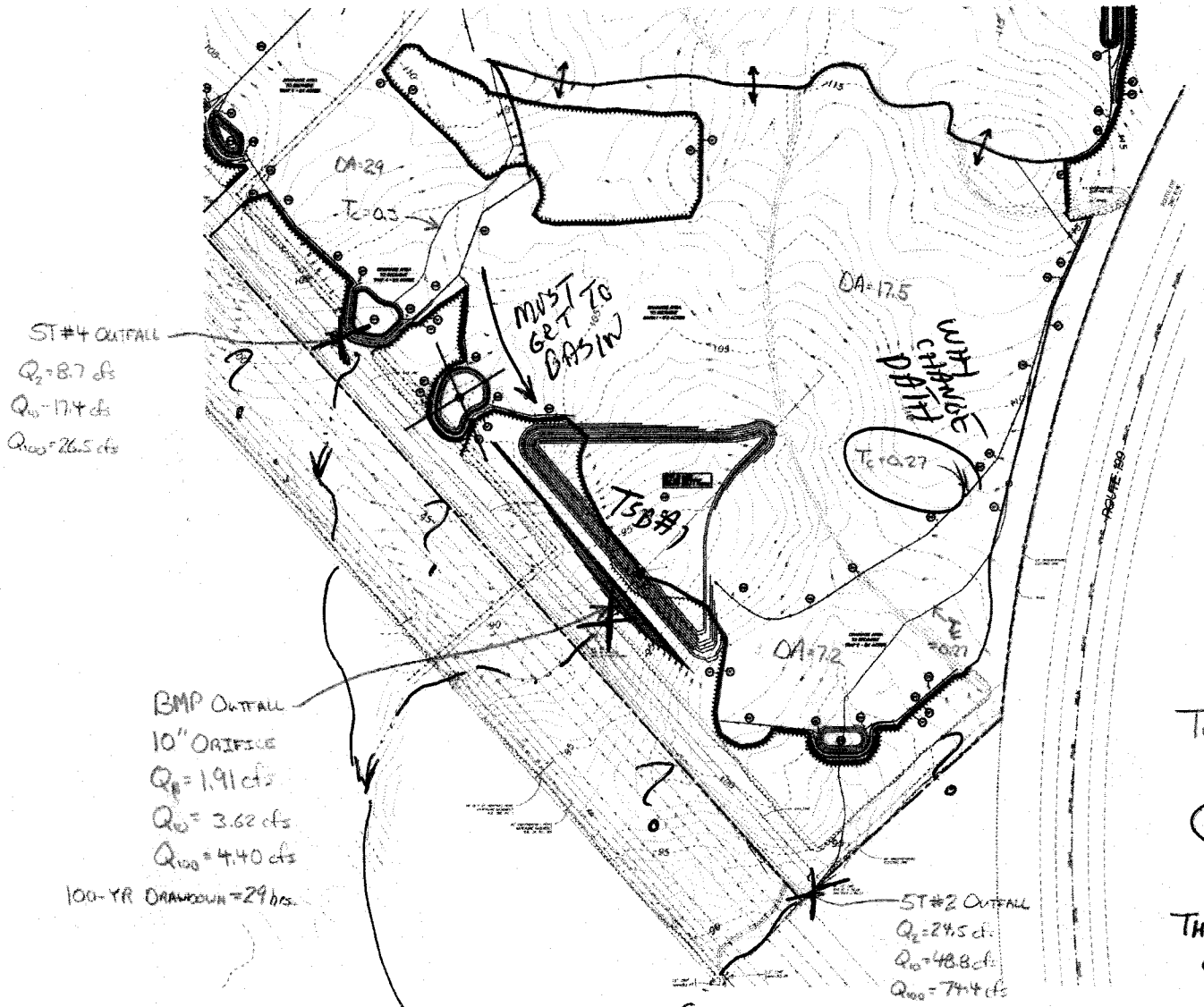
Q_2=17.4 cfs

Q_{10}=63.3 cfs

Q_{100}=120.4 cfs

You can't just add...

THIRD HIGH SCHOOL
EXISTING CONDITIONS



EROSION CONTROL CONDITIONS

CN=91 ✓

You can't just add these together. Model in pondpack thru D/S REACH TO POND

TOTAL DISCHARGE:

$Q_{100} = 105.3$ cfs

THIRD HIGH SCHOOL
EROSION CONTROL PHASE

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project THIRD HIGH SCHOOL

Basin # 1 Location ADJACENT TO UTILITY EASEMENTS

Total area draining to basin: 17.5 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 17.5 acres = 1172.5 cu. yds.

2. Available basin volume = 1240 cu. yds. at elevation 93.5. (From storage - elevation curve)

3. Excavate _____ cu. yds. to obtain required volume*.

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x 17.5 acres = 577.5 cu. yds.

5. Elevation corresponding to cleanout level = 93.25.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 0.5 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 17.5 acres = 1172.5 cu. yds.

8. Total available basin volume at crest of riser* = 2481 cu. yds. at elevation 94.0. (From Storage - Elevation Curve)

* Minimum = 134 cu. yds./acre of total drainage area.

Seems Low

9. Diameter of dewatering orifice = 10 in.

10. Diameter of flexible tubing = 12 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 99.5 ✓

Top of Dam = 102.00

Design High Water = 97.77

Upstream Toe of Dam = _____

Basin Shape

12. Length of Flow / Effective Width — $\frac{L}{We}$ = _____

If > 2, baffles are not required _____

If < 2, baffles are required _____

Runoff

13. Q_2 = _____ cfs (From Chapter 5)

14. Q_{25} = _____ cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = _____ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = _____ 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 Design

21. 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) = ____ ft.

Slope of upstream face of embankment (Z) = _____:1.

Slope of principal spillway barrel (S_b) = _____%

Length of barrel in saturated zone (L_s) = _____ ft.

24. Number of collars required = _____ dimensions = _____

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 102.00

Design High Water = _____

Emergency Spillway Crest = _____

Principal Spillway Crest = _____

Dewatering Orifice Invert = _____

Cleanout Elevation = 93.25

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = _____

BMP #1

#Units=Elevation,ft,Area,ac,Volume,ft3,Volume,ft3

# Elev	Area	Cumml Avg	Cumml Conic
# ft	ac	ft3	ft3
102.0000	2.6622	804708.4746	804568.8632
101.0000	2.5205	691830.0273	691704.4864
100.0000	2.3813	585069.9531	584958.7634
99.0000	2.2446	484318.7168	484222.1927
98.0000	2.1100	389474.8633	389393.4310
97.0000	1.9779	300440.2344	300374.3221
96.0000	1.8485	217103.1211	217053.1006
95.0000	1.7220	139337.7188	139303.9491
94.0000	1.5986	67013.5234	66996.4099
93.0000	1.4782	0.0000	0.0000

— 18.5 AC-FT.

tmp#1.txt

BMP #1

#Units=Elevation,ft,Area,ac,Volume,ft3,Volume,ft3

# Elev	Area	Cumml Avg	Cumml Conic
# ft	ac	ft3	ft3
102.0000	2.6622	804708.4746	804568.8632
101.0000	2.5205	691830.0273	691704.4864
100.0000	2.3813	585069.9531	584958.7634
99.0000	2.2446	484318.7168	484222.1927
98.0000	2.1100	389474.8633	389393.4310
97.0000	1.9779	300440.2344	300374.3221
96.0000	1.8485	217103.1211	217053.1006
95.0000	1.7220	139337.7188	139303.9491
94.0000	1.5986	67013.5234	66996.4099
93.0000	1.4782	0.0000	0.0000

THIRD HIGH SCHOOL (OUTFALL #1)

PRE-DEVELOPED DISCHARGES FOR SOUTHERN OUTFALL AT UTILITY EASEMENT

RAINFALL DEPTH (P)

2-YR = 3.5 in

10-YR = 5.75 in

100-YR = 8.0 in

CN = 63 (PROVIDED BY JCC)

I_a = 1.175 in

Ex. D.A. = 30.3 ACRES

= 0.0473 mi²

Show composite wooded-pasture

RUNOFF DEPTH: $Q = \frac{(P-0.2S)^2}{P+0.8S}$

$S = \frac{1000}{CN} - 10$

$= \frac{1000}{63} - 10$

$S = 5.87$

$Q_2 = \frac{[3.5-(0.2)(5.87)]^2}{3.5+(0.8)(5.87)}$

$Q_2 = 0.66$ in

$Q_{10} = \frac{[5.75-(0.2)(5.87)]^2}{5.75+(0.8)(5.87)}$

$Q_{10} = 2$ in

$Q_{100} = \frac{[8-(0.2)(5.87)]^2}{8+(0.8)(5.87)}$

$Q_{100} = 3.67$ in

T_c = 25.2 min.

= 0.42 hr.

Comply

WHY DONE BY HAND. CHECK IN POND PACK?

2 YR: $P_2 = 3.5$ in, $Q_2 = 0.66$ in

$I_a/P_2 = \frac{1.175}{3.5} = 0.34$

$Q_u = 450$ csm/in

$Q_2 = Q_u A_m Q_2 = (450)(0.0473)(0.66) = 14.0$ cfs

10 YR: $P_{10} = 5.75$ in, $Q_{10} = 2.0$ in

$I_a/P_{10} = \frac{1.175}{5.75} = 0.20$

$Q_u = 540$ csm/in

$Q_{10} = Q_u A_m Q_{10} = (540)(0.0473)(2.0) = 51.1$ cfs

100 YR: $P_{100} = 8.0$ in, $Q_{100} = 3.67$ in

$I_a/P_{100} = \frac{1.175}{8.0} = 0.15$

$Q_u = 560$ csm/in

$Q_{100} = Q_u A_m Q_{100} = (560)(0.0473)(3.67) = 97.2$ cfs

$Q_2 = 14.0$ cfs

$Q_{10} = 51.1$ cfs

$Q_{100} = 97.2$ cfs

THIRD HIGH SCHOOL (OUTFALL #2)

PRE-DEVELOPED

EX D.A. = 7.2 ACRES
= 0.0113 mi²

T_c = 24.6 min.
= 0.41 hr.

$Q_2 = (450)(0.0113)(0.66)$
= 3.4 cfs

$Q_{10} = (540)(0.0113)(2.0)$
= 12.2 cfs

$Q_{100} = (580)(0.0113)(3.67)$
= 23.2 cfs

EROSION CONTROL PHASE

CN = 91 (PROVIDED BY JCE)
I_a = ~~0.198~~ in

SEDIMENT TRAP #2

DRAINAGE AREA = 7.2 ACRES = 0.0112 mi²

TIME OF CONC. = 16.0 min.
= 0.27 hr.

Comply

$S = \frac{1000}{91} - 10$
= 0.99

RUNOFF DEPTH:

$Q_2 = \frac{[3.5 - (0.2)(0.99)]^2}{3.5 + (0.8)(0.99)}$
= 2.54 in

$Q_{10} = \frac{[5.75 - (0.2)(0.99)]^2}{5.75 + (0.8)(0.99)}$
= 4.71 in

$Q_{100} = \frac{[8.0 - (0.2)(0.99)]^2}{8.0 + (0.8)(0.99)}$
= 6.92 in

$I_a/P_2 = \frac{0.198}{3.5}$
= 0.056

$I_a/P_{10} = \frac{0.198}{5.75}$
= 0.034

$I_a/P_{100} = \frac{0.198}{8.0}$
= 0.025

Q_u = 860 csm/in

Q_u = 925 csm/in

Q_u = 960 csm/in

$Q_2 = (860)(0.0112)(2.54)$
= 24.5 cfs

$Q_{10} = (925)(0.0112)(4.71)$
= 48.8 cfs

$Q_{100} = (960)(0.0112)(6.92)$
= 74.4 cfs

SEDIMENT TRAP #4

DRAINAGE AREA = 2.9 ACRES = 0.004 mi²

T_c = 17.8 min
= 0.30 hr

$Q_2 = (860)(0.004)(2.54)$
= 8.7 cfs

$Q_{10} = (925)(0.004)(4.71)$
= 17.4 cfs

$Q_{100} = (960)(0.004)(6.92)$
= 26.5 cfs

Table of Contents

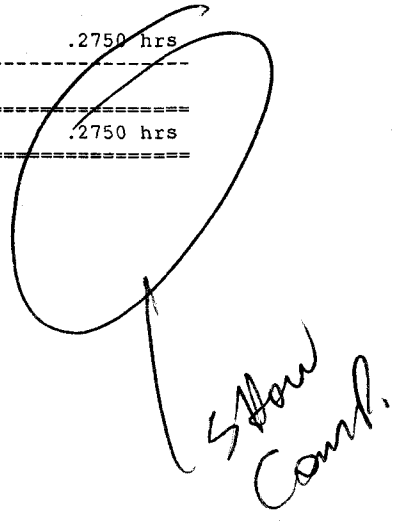
File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

::
TIME OF CONCENTRATION CALCULATOR
::

Segment #1: Tc: User Defined

Segment #1 Time: .2750 hrs

Total Tc: .2750 hrs



File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

Tc Equations used...

==== User Defined ==========

Tc = Value entered by user

Where: Tc = Time of concentration

File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

RUNOFF CURVE NUMBER DATA

Soil/Surface Description	CN	Area acres	Impervious Adjustment %C	%UC	Adjusted CN
	91	17.500			91.00
COMPOSITE AREA & WEIGHTED CN --->		17.500			91.00 (91)

File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
93.00	-----	1.4782	.0000	.000	.000
94.00	-----	1.5986	4.6140	1.538	1.538
95.00	-----	1.7220	4.9798	1.660	3.198
96.00	-----	1.8485	5.3546	1.785	4.983
97.00	-----	1.9779	5.7385	1.913	6.896
98.00	-----	2.1100	6.1308	2.044	8.939
99.00	-----	2.2446	6.5309	2.177	11.116
100.00	-----	2.3813	6.9378	2.313	13.429
101.00	-----	2.5205	7.3517	2.451	15.879
102.00	-----	2.6622	7.7731	2.591	18.470

POND VOLUME EQUATIONS

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

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

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

File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 93.00 ft
Increment = .50 ft
Max. Elev.= 102.00 ft

****
OUTLET CONNECTIVITY
****

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

Structure	No.		Outfall	E1, ft	E2, ft
Inlet Box	1	--->	3	99.500	102.000
Orifice-Circular	2	--->	3	94.000	102.000
Culvert-Circular	3	--->	TW	93.000	102.000

TW SETUP, DS Channel

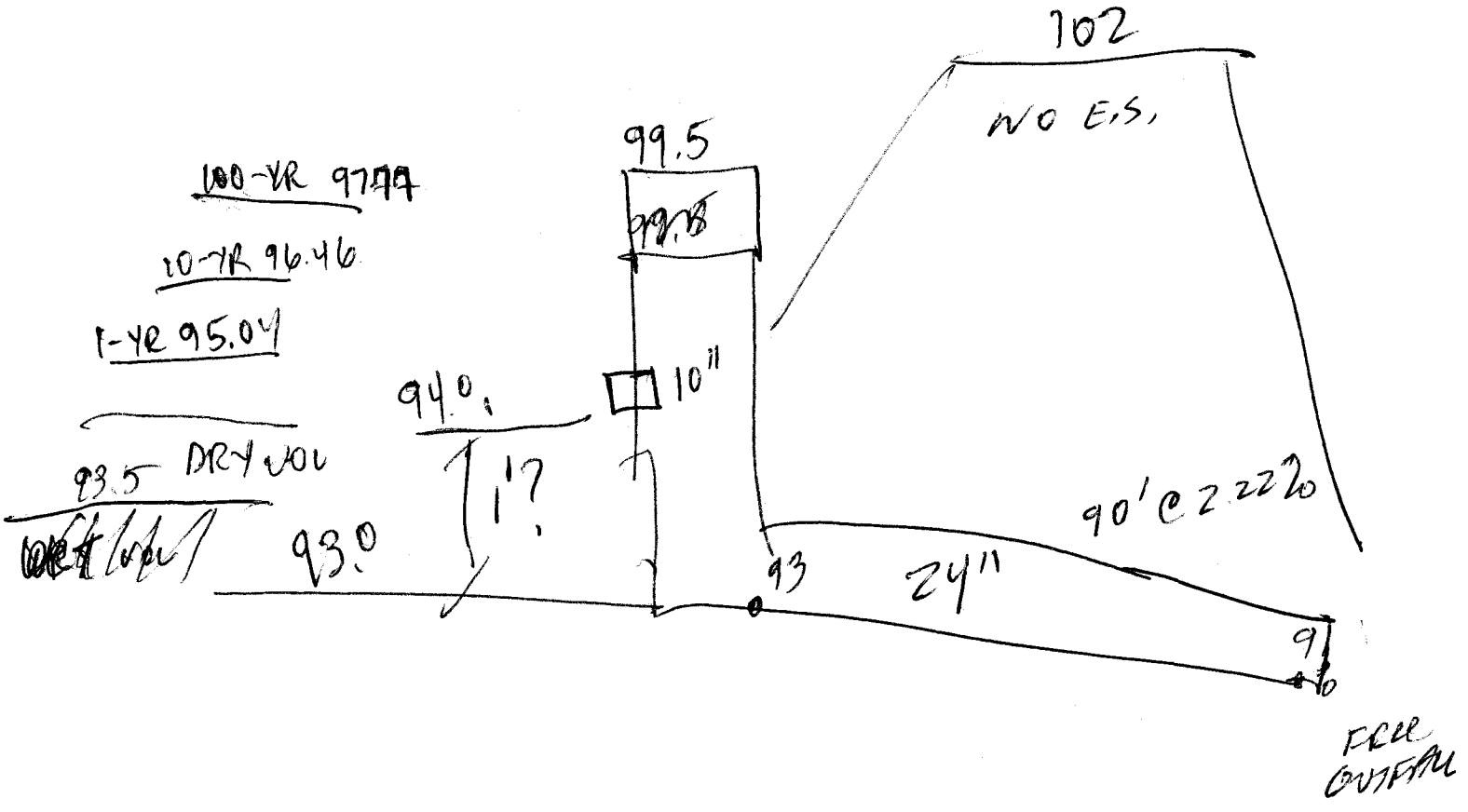
File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID	= 1	
Structure Type	= Inlet Box	
# of Openings	=	1
Invert Elev.	=	99.50 ft
Orifice Area	=	12.2500 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	19.33 ft
Weir Coeff.	=	3.000
K, Reverse	=	1.000
Mannings n	=	.0000
Kev,Charged Riser	=	.000
Weir Submergence	= No	

Structure ID	= 2	
Structure Type	= Orifice-Circular	
# of Openings	=	1
Invert Elev.	=	94.00 ft
Diameter	=	.8300 ft
Orifice Coeff.	=	.600

102.00
97.77
4.23' FB



File.... R:\300 - Site Development\21151\Calcs\PondPack\THIRD HS BMP.PPW

OUTLET STRUCTURE INPUT DATA

Structure ID = 3
Structure Type = Culvert-Circular

No. Barrels	=	1	
Barrel Diameter	=	2.0000	ft
Upstream Invert	=	93.00	ft
Dnstream Invert	=	91.00	ft
Horiz. Length	=	90.00	ft
Barrel Length	=	90.02	ft
Barrel Slope	=	.02222	ft/ft

OUTLET CONTROL DATA...

Mannings n	=	.0120	
Ke	=	.9000	(forward entrance loss)
Kb	=	.010575	(per ft of full flow)
Kr	=	.9000	(reverse entrance loss)
HW Convergence	=	.001	+/- ft

INLET CONTROL DATA...

Equation form	=	1
Inlet Control K	=	.0018
Inlet Control M	=	2.0000
Inlet Control c	=	.02920
Inlet Control Y	=	.7400
T1 ratio (HW/D)	=	1.051
T2 ratio (HW/D)	=	1.196
Slope Factor	=	-.500
Calc inlet only	=	Yes

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev = 95.10 ft ---> Flow = 15.55 cfs
At T2 Elev = 95.39 ft ---> Flow = 17.77 cfs

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

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...

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

LEVEL POOL ROUTING DATA

HYG Dir = R:\300 - Site Development\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev = 94.00 ft
Starting Volume = 1.538 ac-ft
Starting Outflow = .00 cfs
Starting Infiltr. = .00 cfs
Starting Total Qout= .00 cfs
Time Increment = .0500 hrs

Elevation ft	Outflow cfs	Storage ac-ft	Area acres	Infilt. cfs	Q Total cfs	2S/t + O cfs
93.00	.00	.000	1.4782	.00	.00	.00
93.50	.00	.754	1.5378	.00	.00	364.91
94.00	.00	1.538	1.5986	.00	.00	744.40
94.50	.68	2.353	1.6597	.00	.68	1139.31
95.00	1.84	3.198	1.7220	.00	1.84	1549.64
95.50	2.72	4.075	1.7847	.00	2.72	1974.80
96.00	3.28	4.983	1.8485	.00	3.28	2414.95
96.50	3.65	5.923	1.9127	.00	3.65	2870.40
97.00	3.96	6.896	1.9779	.00	3.96	3341.45
97.50	4.24	7.901	2.0434	.00	4.24	3828.29
98.00	4.53	8.939	2.1100	.00	4.53	4331.12
98.50	4.78	10.011	2.1768	.00	4.78	4850.05
99.00	5.03	11.116	2.2446	.00	5.03	5385.26
99.50	5.67	12.255	2.3124	.00	5.67	5937.29
100.00	25.01	13.429	2.3813	.00	25.01	6524.55
100.50	45.19	14.637	2.4504	.00	45.19	7129.35
101.00	47.02	15.879	2.5205	.00	47.02	7732.64
101.50	48.79	17.157	2.5909	.00	48.79	8352.86
102.00	50.49	18.470	2.6622	.00	50.49	8990.16

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 1
Outflow HYG file = NONE STORED - BMP OUT 1

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	94.00 ft
Starting Volume	=	1.538 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	37.84 cfs	at	12.0500 hrs
Peak Outflow	=	1.91 cfs	at	13.8000 hrs
Peak Elevation	=	95.04 ft		
Peak Storage	=	3.261 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	1.538
+ HYG Vol IN	=	2.750
- Infiltration	=	.000
- HYG Vol OUT	=	2.746
- Retained Vol	=	1.542
Unrouted Vol	=	-.000 ac-ft (.003% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 10
Outflow HYG file = NONE STORED - BMP OUT 10

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	94.00 ft
Starting Volume	=	1.538 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	86.20 cfs	at	12.0500 hrs
Peak Outflow	=	3.62 cfs	at	14.0500 hrs
Peak Elevation	=	96.46 ft		
Peak Storage	=	5.842 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	1.538
+ HYG Vol IN	=	6.518
- Infiltration	=	.000
- HYG Vol OUT	=	6.508
- Retained Vol	=	1.548
Unrouted Vol	=	-.000 ac-ft (.003% of Inflow Volume)

LEVEL POOL ROUTING SUMMARY

HYG Dir = R:\300 - Site Development\21151\Calcs\PondPack\
Inflow HYG file = NONE STORED - BMP IN 100
Outflow HYG file = NONE STORED - BMP OUT 100

Pond Node Data = BMP
Pond Volume Data = BMP
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS

Starting WS Elev	=	94.00 ft
Starting Volume	=	1.538 ac-ft
Starting Outflow	=	.00 cfs
Starting Infiltr.	=	.00 cfs
Starting Total Qout	=	.00 cfs
Time Increment	=	.0500 hrs

INFLOW/OUTFLOW HYDROGRAPH SUMMARY

Peak Inflow	=	130.31 cfs	at	12.0500 hrs
Peak Outflow	=	4.40 cfs	at	14.6500 hrs
Peak Elevation	=	97.77 ft		
Peak Storage	=	8.453 ac-ft		

MASS BALANCE (ac-ft)

+ Initial Vol	=	1.538
+ HYG Vol IN	=	10.100
- Infiltration	=	.000
- HYG Vol OUT	=	10.080
- Retained Vol	=	1.557
Unrouted Vol	=	-.000 ac-ft (.003% of Inflow Volume)

WARNING: Outflow hydrograph truncated on right side.

Scott Thomas

From: Scott Thomas
Sent: Monday, April 09, 2007 10:42 AM
To: 'Mike Claud'; 'Steve Raugh'; 'andrew.gould@timmons.com'
Cc: Andy Curtis (b.richards@curtiscontracting.net)
Subject: Third HS BMP

I've assigned a County BMP ID Code number to the Type B-3 wet pond BMP for the Third High School (Warhill), County Plan No. SP-41-05. It is **PC 204**. You can use this code on future asbuilt and construction certification documents.

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
and
www.protectedwithpride.org

David Greshamer

From: Frances Geissler
Sent: Tuesday, April 21, 2009 1:16 PM
To: David Greshamer
Subject: FW: Plan for Planting A Garden at Warhill High School

Can you add this to the Warhill as-built file?

THANKS

-----Original Message-----
From: Scott Whyte
Sent: Tuesday, April 21, 2009 10:45 AM
To: John Horne; Craig Nordeman; Frances Geissler; Scott Thomas; 'Whyte, Ethel'; 'fieldsd@wjcc.k12.va.us'
Subject: FW: Plan for Planting A Garden at Warhill High School

-----Original Message-----
From: Scott Whyte
Sent: Tuesday, April 21, 2009 10:40 AM
To: 'Amanda Anderson'
Subject: RE: Plan for Planting A Garden at Warhill High School

Amanda, I have received approval from the Storm Water, Environmental, Operations, and School Divisions for you to proceed with your project. Operations is concerned about being able to perform their maintenance tasks without damaging your plants. Your plants are small and being planted in grass areas that are mowed about twice a year. The smaller plants should be planted in prepared beds that can be seen by bush hog operators and easily mowed around. Keep in mind that these are big machines on steep slopes, and sliding over small plants in 4 foot high grass would be very easy. Do not expect them to be able to mow between plants, only around groups of plants. The trees should have large mulch rings and be staked, so they can also be seen and avoided by the tractor operators. Always leaving room to get the tractors all the way around the plants. They also want you to realize that they will not be responsible for watering and maintenance of the plants and beds. If you would like me to come out and help lay the beds out, I would be happy to do so. Good luck and don't hesitate to call if you have any questions or concerns. (253-6867)

W. Scott Whyte
James City County
Senior Landscape Planner

-----Original Message-----
From: Amanda Anderson [mailto:afanderson@wm.edu]
Sent: Thursday, April 16, 2009 1:07 AM
To: Scott Whyte
Subject: Plan for Planting A Garden at Warhill High School

Mr. Whyte,

My name is Amanda Anderson, and I'm a teaching fellow for the Sharpe Community Scholars Program at the College of William and Mary. I was also one of students who contacted you

about the native landscaping project at Warhill High School last year. This year, my students have been working closely with Debra Olechnowich, an English teacher at the high school, and her environmental club to plan a native pollinators garden/ bird sanctuary over by the retention pond area behind the school. We've put together a plan for you to look over and approve before our planting date. We've been working with the Virginia Native Plant Society to put together a list of native plants that we'd like to install that will attract native pollinators and birds to the area; many of the plants are actually rescue plants that are from the original Warhill property before it was developed. Caroline and Frank Will, members of the Virginia Native Plant Society, have identified the best areas for each of the plant species to go. We've bought minimal soil and mulch for the project, as we want the area to be as natural and sustainable as possible. Because the plants are native, they require little if any maintenance. All watering will be done with water collected by a rain barrel situated near the shed in the area. Two or three drip irrigation lines will be attached to this rain barrel and laid throughout the newly planted area. Watering will only need to be done during the times of extreme drought and will be maintained by Ms. Olechnowich and Mr. and Mrs. Will over the summer months. We hope this garden will provide Warhill students with the opportunity to more closely study native plants, native pollinators, and birds, and understand the importance of native landscaping's ability to reduce energy and water use.

We've had a dialogue with the school administration as well about our garden, and they are in support of our efforts. I've contacted Ms. Utility as well, and received an email back from them. They gave us the go ahead to plant. I will CC you that email for your records.

My students and I hope you enjoy our plan. We've put a lot of time and effort into it. If you have any questions, concerns, or comments, please feel free to contact me.

Thank you,

Amanda Anderson

Sharpe Fellow for the Living With the Environment Seminar

The College of William and Mary

Phone: (630) 363-8806

Proposal for Native Pollinator Garden and Bird Sanctuary

The proposed Native Pollinator Garden will be constructed on the land surrounding the retention pond behind Warhill High School. Currently, the space is unused land that has very few native plants left. By establishing a garden that consists of native flowers, bushes, and trees, the pollinators that are native to this area will be encouraged to return to this area where they may feed, find shelter, and reproduce. Native pollinators are vital to the health of the ecosystems in which they reside; however, the destruction of habitat and lack of knowledge about their importance has lead to a significant decrease in their numbers. Pollinators that will be attracted to the plants that we will reintroduce include various birds, butterflies, bees, and many types of small insects.

There are many benefits to using native plants for this pollinator garden. The native plants will be most familiar for the native pollinators which we hope to attract. Additionally, the native plants will require no maintenance once they have been established in the soil. This means that there will be no need to fertilize, trim, or water the pollinator garden once it is has been established. In order to establish the plants in the soil, there must be a little maintenance for the first year. When the plants are initially put into the soil, there will be a small amount of topsoil mixed in, just to give the plants extra nutrients and protection. Additionally, the plants must have some water source, especially during the first summer to prevent them from drying out. The proposed rain barrel and irrigation system will solve this problem. By collecting rain water and dispersing it by gravity and only as needed, the system will be able to be self sufficient over the summer and the plants will be able to establish themselves in the garden.

The second part of the pollinator garden is the inclusion of a bird sanctuary. The Warhill High School Environmental Club has already put up a few bird houses near the proposed location for the native pollinator garden. Providing a food source with our native plants is not enough to sustain a bird population. Bird houses will be created and integrated into the native pollinator garden to provide extra habitat.

TIMMONS GROUP

YOUR VISION ACHIEVED THROUGH OURS.

January 15, 2008

RECEIVED
JAN 16 2008
ENVIRONMENTAL DIVISION

Mr. Scott Thomas
Environmental Engineer
101-E Mounts Bay Road
Williamsburg, VA 23188

Re: Third High School BMP Certification

Dear Mr. Thomas:

Attached to this letter are the as-built drawings revised in response to your letter dated August 14, 2007. Per conversation with the contractor, the construction related items have been addressed; and the wetland plantings were primarily placed in the general arrangement and positions called for in the approved plan. Any minor modifications to the wetland plants were done under the direction of the County. Because the construction certification form dated August 8, 2007 was deemed satisfactory, an additional copy was not submitted with the as-built drawings.

Upon approval of the as-built drawings, Milar or another type of reproducible drawings will be submitted to the County.

Should you have any questions or comments in regards to this submittal package, please feel free to contact me at (804) 200-6435.

Respectfully submitted,
Timmons Group

Janet L. Rogel

Janet L. Rogel, E.I.T.
Project Engineer
JLR:jr
Encl:

SP-41-05
PC 204

32/01/00012
5700 Warhill Trail
Opportunity Way

1001 Boulders Parkway, Suite 300 | Richmond, Virginia 23225
TEL 804.200.6500 FAX 804.560.1016
Site Development | Residential | Infrastructure | Technology
www.timmons.com

ENVIRONMENTAL – STORMWATER
TRANSMITTAL

PROTECTING RESOURCES PRIDE IN DELICATE ENVIRONMENTS

COUNTY PLAN NO: SP-41-05

BMP ID CODE: PC 204

WATERSHED: Powhatan

- [x] **ENTIRE RECORD FILE**
- [x] **ASBUILTS**
- [x] **CONSTRUCTION CERTIFICATION**
- [x] **COMPUTATIONS**
- [x] **OTHER:** Warhill (3RD) High School as part of the Warhill PPEA process (County Warhill Tract – Opportunity Way)

NAME: Scott J. Thomas

SIGNATURE: Scott J. Thomas

DATE: 02/29/08

DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671
E-MAIL: devman@james-city.va.us
FAX: (757) 253-6822

ENVIRONMENTAL DIVISION (757) 253-6670 EnvDiv@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
INTEGRATED PEST MANAGEMENT (757) 259-4116

August 14, 2007

Ms. Janet Rogel
Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, VA 23225

Re: Third High School (Warhill HS)
County Plan No. SP-41-05
County BMP ID Code: PC 204

Dear Ms. Rogel:

The Environmental Division has reviewed record drawing and construction certification information as submitted to our office on August 9, 2007 for the BMP at the above referenced project. The BMP for this project is a County type B-3 pond/wetland system BMP situated at the south end of the high school complex. The BMP serves a drainage area of about 37 acres and treats 98 percent of impervious cover associated with the school building and parking areas.

Based on our review of the project and observations made at several recent (weekly) field inspections, the following items must be addressed prior to closing out the project:

Record Drawing:

1. It appears that top of dam is low at select points in the middle portion of the embankment. As design high water is at El. 100.02 (100-year storm) and there is no emergency spillway, freeboard from high water to top of dam is required to be 2 feet. This would result in a minimum top of dam elevation required at El. 102. There are multiple spot elevations which show top of dam less than this elevation. One is about ½ foot low.

✓ RECEIVED + RESOLVED

2. The asbuilt drawing needs to reflect the outlet invert elevation of the 24-inch barrel through the dam (Structure # 160). 90.50

3. The asbuilt drawing needs to reflect the invert elevation of the primary 54-inch storm drain inflow pipe into the BMP (Structure # 30) and additional asbuilt data to at least one structure back (Structure # 29). Show asbuilt information for the last segment of pipe between Structure # 29 and # 30 including size, slope and invert elevations. 90.02

4. Confirm if wetland plantings were placed in the general arrangement and positions as called for on the approved plan. This may require coordination with the contractor and/or landscaper.

PER LETTER

Construction Certification:

5. The construction certification dated August 8, 2007 is **satisfactory**.

Construction - Related Items:

6. Minimum top of dam elevation needs to be at El. 102 along it's entire length. Fill and grade all low spots in the top of dam as required to achieve minimum top of dam elevation. Once completed, check top of dam elevations at 25 ft. intervals.

7. Clean the deep pool forebay area of accumulated sediments. This is at the outfall of the 54-inch storm drain pipe (Structure # 30). The primary storm drain outfall pipe shall not be obstructed by sediments.

8. Clean the 54-inch storm drain pipe, between Structures # 29 and # 30, of any accumulated sediment.

9. Install the "enhanced outlet protection" at Outfall No. 1 as required per the special stormwater criteria. This consists of the riprap outlet protection pad and the gabion basket device as required at the outfall end of the 24-inch barrel through the dam (ie. Structure # 160).

10. Once all upslope areas are stabilized, convert the basin to final BMP mode in accordance with the approved plan. This would include removing the dewatering tube and sealing the 4-inch orifice (El. 94.5) and ensuring the 3-inch orifices at normal pool El. 92.2 and El. 93 are functional.

11. Clean the riser structure (Structure # 159) of all accumulated sediment, debris and obstructions.

Once this work is satisfactorily completed, contact our office appropriately for re-inspection. Once the record (asbuilt) drawings are corrected, submit one additional blue/black line copy and one reproducible set. Please contact me at 757-253-6639 if you have any further comments or questions.

Scott J. Thomas, P.E.
Director
Environmental Division

SJT/sjt

cc: Bill Richards, Curtis Contracting (via email)

Asbuilts/Reviews/Final.SP4105.pc204

Home of America's 400th Anniversary
James City County
1607-2007 Jamestown

DEVELOPMENT MANAGEMENT

101-A MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671
E-MAIL: devman@james-city.va.us
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ENVIRONMENTAL DIVISION (757) 253-6670 EnvDiv@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
INTEGRATED PEST MANAGEMENT (757) 259-4116

August 14, 2007

Ms. Janet Rogel
Timmons Group
1001 Boulders Parkway
Suite 300
Richmond, VA 23225

Re: Third High School (Warhill HS)
County Plan No. SP-41-05
County BMP ID Code: PC 204

Dear Ms. Rogel:

The Environmental Division has reviewed record drawing and construction certification information as submitted to our office on August 9, 2007 for the BMP at the above referenced project. The BMP for this project is a County type B-3 pond/wetland system BMP situated at the south end of the high school complex. The BMP serves a drainage area of about 37 acres and treats 98 percent of impervious cover associated with the school building and parking areas.

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1. It appears that top of dam is low at select points in the middle portion of the embankment. As design high water is at El. 100.02 (100-year storm) and there is no emergency spillway, freeboard from high water to top of dam is required to be 2 feet. This would result in a minimum top of dam elevation required at El. 102. There are multiple spot elevations which show top of dam less than this elevation. One is about ½ foot low.

2. The asbuilt drawing needs to reflect the outlet invert elevation of the 24-inch barrel through the dam (Structure # 160).

3. The asbuilt drawing needs to reflect the invert elevation of the primary 54-inch storm drain inflow pipe into the BMP (Structure # 30) and additional asbuilt data to at least one structure back (Structure # 29). Show asbuilt information for the last segment of pipe between Structure # 29 and # 30 including size, slope and invert elevations.

4. Confirm if wetland plantings were placed in the general arrangement and positions as called for on the approved plan. This may require coordination with the contractor and/or landscaper.

Construction Certification:

5. The construction certification dated August 8, 2007 is **satisfactory**.

Construction - Related Items:

6. Minimum top of dam elevation needs to be at El. 102 along it's entire length. Fill and grade all low spots in the top of dam as required to achieve minimum top of dam elevation. Once completed, check top of dam elevations at 25 ft. intervals.

7. Clean the deep pool forebay area of accumulated sediments. This is at the outfall of the 54-inch storm drain pipe (Structure # 30). The primary storm drain outfall pipe shall not be obstructed by sediments.

8. Clean the 54-inch storm drain pipe, between Structures # 29 and # 30, of any accumulated sediment.

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10. Once all upslope areas are stabilized, convert the basin to final BMP mode in accordance with the approved plan. This would include removing the dewatering tube and sealing the 4-inch orifice (El. 94.5) and ensuring the 3-inch orifices at normal pool El. 92.2 and El. 93 are functional.

11. Clean the riser structure (Structure # 159) of all accumulated sediment, debris and obstructions.

Once this work is satisfactorily completed, contact our office appropriately for re-inspection. Once the record (asbuilt) drawings are corrected, submit one additional blue/black line copy and one reproducible set. Please contact me at 757-253-6639 if you have any further comments or questions.

Scott J. Thomas, P.E.
Director
Environmental Division

SJT/sjt

cc: Bill Richards, Curtis Contracting (via email)

Asbuilts/Reviews/Final.SP4105.pc204

Date Record Created:

Created By:

WS_BMPNO: PC204

PRINTED ON
Thursday, March 04, 2010
4:36:45 PM

WATERSHED	PC
BMP ID NO	204
PLAN NO	SP-41-05
TAX PARCEL	(32-1)(1-12)
PIN NO	3210100012
CONSTRUCTION DATE	1/1/2006
PROJECT NAME	WJCC - Warhill (Third) High School
FACILITY LOCATION	4615 Opportunity Way
CITY-STATE	Williamsburg, VA 23185
CURRENT OWNER	WJCC Schools
OWNER ADDRESS	101-D Mounts Bay Road
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, VA 23185
OWNER PHONE	
MAINT AGREEMENT	No
EMERG ACTION PLAN	No

Get Last BMP No | Return to Menu | Print Record

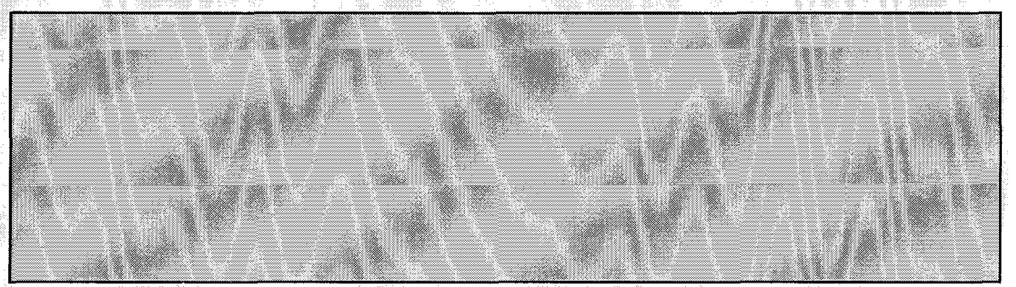
MAINTENANCE PLAN	Yes
SITE AREA acre	54.5
LAND USE	High School
old BMP TYP	Wetland
JCC BMP CODE	B3 Pond/Wetland System
POINT VALUE	10
SVC DRAIN AREA acres	38.65
SERVICE AREA DESCRI	School Building, Parking & Yard areas
IMPERV AREA acres	16.90
RECV STREAM	UT of Pow Creek/PC106
EXT DET-WQ-CTRL	Yes
WTR QUAL VOL acre-ft	1.41
CHAN PROT CTRL	Yes
CHAN PROT VOL acre-ft	6.073
SW/FLOOD CONTROL	No
GEOTECH REPORT	No

CTRL STRUC DESC	Conc. Struct
CTRL STRUC SIZE inches	
OTLT BARRL DESC	RCP
OTLT BARRL SIZE inch	24
EMERG SPILLWAY	No
DESIGN HW ELEV	100.0
PERM POOL ELEV	92.2
2-YR OUTFLOW cfs	1.45
10-YR OUTFLOW cfs	4.22
REC DRAWING	Yes
CONSTR CERTIF	Yes
LAST INSP DATE	8/8/2007
Inspected by:	
INTERNAL RATING	4

MISC/COMMENTS

Drains to East Pond PC 106. CN of 91.
Also relies on PC106 for 10-pt compliance.

Additional Comments:



PC 204

USDA

United States Department of Agriculture

Animal and Plant Health Inspection Service

Wildlife Services

PO Box 130
Moseley, Va 23120

(P) 804-739-7739
(F) 804-793-7738

May 5th, 2015

To: Pat Menichino
Stormwater Specialist
Stormwater Division

MEMORANDUM FOR RECORD

Subject: Follow-up of Beaver Site Visit at Warhill Storm Water Pond.

In April of 2015, Wildlife Services (WS) was asked by Pat Menichino to conduct a site visit and assess damage caused by beavers in a storm water pond at Warhill High School. Upon conducting the site visit, WS was shown a storm water pond that had been planted as a wetland. Sometime over the winter months beavers had stopped up the outflow pipe, built a lodge on the upstream side of the pond, and had cut down every tree that was planted in and around the storm water pond. The beaver lodge and dam had previously been removed. At the time of the site visit, there was no fresh sign of the beaver(s); neither the dam, nor the lodge had been repaired. There were no fresh cuts present around the storm water pond.

WS also inspected a nearby pond at the WISC facility that had beavers living in it previously. There was no fresh sign at this location. The spillway was still clear of debris and the lodge did not appear to have any fresh beaver cuttings around it. It did not appear that there were beavers living in the area at this time. WS made the recommendation that any new trees being planted be wrapped in ¼" steel hardware cloth or mesh to prevent beavers and muskrats from cutting saplings. WS is capable to removing beavers if they are causing damages; however, at this time it does not appear that there are beaver(s) present. It would not be cost effective to attempt to remove beavers at this time. WS recommends continued monitoring by Stormwater Division throughout the year to identify beaver damage in the beginning stages. WS is available to further consultation if needed.

Thank you,

Adam Priestley
Wildlife Specialist
USDA-Wildlife Services
Adam.Priestley@aphis.usda.gov
(757)209-1201

PC 204

Joanna Ripley

From: Pat Menichino
Sent: Monday, May 11, 2015 1:32 PM
To: Joanna Ripley
Subject: RE: Warhill Beaver Follow-up Letter

Follow Up Flag: Follow up
Flag Status: Flagged

PC- 204 / Warhill High School

Patrick T. Menichino
Project Manager
Stormwater Specialist

James City County VIRGINIA Jamestown 1607

General Services
5320 Palmer Lane, Suite 2A
Williamsburg, VA 23188
P: 757-259-1443
F: 757-259-5833
jamescitycountyva.gov
pat.menichino@jamescitycountyva.gov

From: Joanna Ripley
Sent: Monday, May 11, 2015 1:08 PM
To: Pat Menichino
Subject: FW: Warhill Beaver Follow-up Letter

Pat,

Could you tell me the BMP id's that this letter is referencing, so I can make sure it gets scanned to the proper file? Thanks, Jo Anna

---

From: Fran Geissler
Sent: Monday, May 11, 2015 8:40 AM
To: Joanna Ripley; Suzanne Dyba; Pat Menichino
Subject: FW: Warhill Beaver Follow-up Letter

We need to keep this letter in both BMPs as-built files.

Pat: can we get a price for replanting and armoring from Sue?

THANKS

From: Pat Menichino
Sent: Monday, May 11, 2015 7:44 AM

PC 204

To: Fran Geissler
Subject: FW: Warhill Beaver Follow-up Letter

See the attached letter from USDA

Do we want to consider a new planting of trees on the islands?

Patrick T. Menichino
Project Manager
Stormwater Specialist

James City County VIRGINIA Jamestown 1607

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5320 Palmer Lane, Suite 2A
Williamsburg, VA 23188
P: 757-259-1443
F: 757-259-5833
jamescitycountyva.gov
pat.menichino@jamescitycountyva.gov

From: Priestley, Adam S - APHIS [mailto:Adam.Priestley@aphis.usda.gov]
Sent: Friday, May 08, 2015 2:59 PM
To: Pat Menichino
Subject: Warhill Beaver Follow-up Letter

Pat,

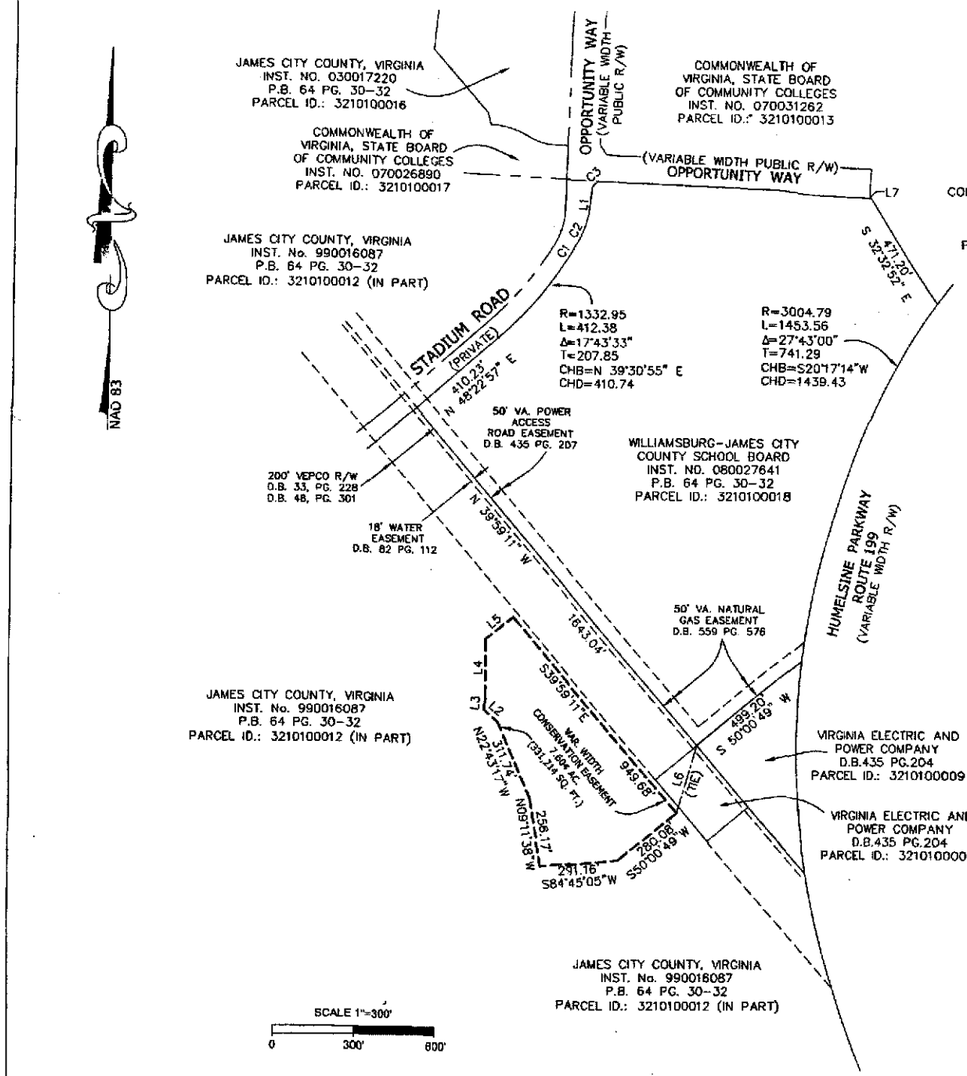
I thank you again for asking WS assistance in your beaver conflict at Warhill HS. I have attached a memo for record as a follow-up of our site visit. I do not feel that it would be cost effective to attempt to trap beavers at this time. I feel that the damage created in the stormwater pond was most likely from 1 young beaver and that he/she has moved out of the area. As suggested at the site visit, I would recommend wrapping any trees that you may plant in steel hardware cloth to prevent beavers (and muskrats) from girdling your new trees. Please let me know if I can be of any further assistance.

Have a great weekend,

Adam Priestley
Wildlife Specialist
USDA, Wildlife Services
(757)209-1201
Adam.Priestley@aphis.usda.gov

PC 204

100008359



CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	DELTA	CHORD BEARING	CHORD
C1	338.66'	28.89'	14.45'	4°53'14"	N27°29'26"E	28.88'
C2	333.00'	162.85'	83.09'	28°01'13"	N19°45'31"E	161.23'
C3	37.00'	56.02'	34.96'	86°45'02"	N49°08'35"E	50.82'

LINE TABLE		
LINE	BEARING	DISTANCE
L1	N05°46'04"E	83.26'
L2	N48°19'20"W	68.74'
L3	N07°34'36"E	43.39'
L4	N00°00'00"E	222.08'
L5	N50°38'19"E	130.92'
L6	S16°22'46"W	264.24'
L7	S87°28'54"E	6.72'

NOTES:
THIS PLAT WAS PREPARED WITHOUT THE BENEFIT OF A TITLE BINDER, THEREFOR ALL EXISTING EASEMENTS MAY NOT BE SHOWN.

COMMONWEALTH OF VIRGINIA
PAUL N. HUBER
Lic. No.2379
1-22-10
LAND SURVEYOR

REVISED: 1-22-10 (COMMENTS)
REVISED: 1-6-10 (COMMENTS)

Large/Small Plat(s) Recorded herewith as # 100008359

City of Williamsburg & County of James City
Circuit Court: This PLAT was recorded on 4-30-2010
at 2:13 AM/PM. PB — PG —
DOCUMENT # 100008359
BETSY B. WOOLRIDGE, CLERK
Clerk

PLAT SHOWING A VARIABLE WIDTH CONSERVATION EASEMENT ACROSS THE PROPERTY OF JAMES CITY COUNTY, VIRGINIA

Powhatan District	James City County, Va
DATE: SEPT.9, 2009	SCALE: 1"=300'
SHEET: 1 OF 1	J.N.: 24136
DRAWN BY: M.S.F.	CHECK BY: M.C.S.

THIS DRAWING PREPARED AT THE COMMONWEALTH OFFICE
7201 Boulders Parkway Suite 200 | Richmond, VA 23225
TEL 804.560.4800 FAX 804.560.1016 | www.timmons.com

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.
Site Development | Residential | Infrastructure | Technology

Warhill High School
Pin: 3210100018

PC204

Exhibit A

Those certain pieces or parcels of land shown and set out as "Future 100' R/W For Future Road 5.9 Ac." and "Parcel 1 527.2 Ac ±" (which includes the land on the south side of Longhill Road, State Route 612) on the plat of subdivision entitled "Plat of Subdivision showing a Portion of the Warhill Tract Owner: TMB Service Corporation" made by AES Consulting Engineers and dated May, 1996 recorded in Plat Book 64 at pages 30 - 32.

Together with a non-exclusive, temporary access easement for vehicular and pedestrian, ingress and egress from Centerville Road, State Route 614 to Parcel 1 over and across the portion of "Parcel 2" shown and set out on the aforesaid plat as "Va. Power Access Easement, DB 435, PG 207". At such time as a paved road is constructed connecting Centerville Road and Parcel 1, the temporary easement granted above shall terminate and Grantee shall have a non-exclusive access easement for vehicular and pedestrian traffic over and across the new road from Centerville Road to Parcel 1. The easements granted hereby shall be appurtenant to and runwith title to Parcel 1. If the new road from Centerville Road to Parcel 1 is dedicated and accepted as a public road, all easement rights therein granted to Grantee hereunder shall thereupon terminate.

Grantor hereby reserves for itself and its successors in title to all or any part of the parcel of land shown on and set out as "Warhill Section One, 41.7 Ac. ±" on the aforesaid plat a temporary, non-exclusive access easement for pedestrian and vehicular ingress and egress over and across the area shown and set out as "Future 100' R/W For Future Roadway, 5.9 Ac." on the aforesaid plat from each of the existing entrances into Warhill Section One to Longhill Road, State Route 612. At such time as a road constructed in this easement area (extending from Longhill Road to the northern entrance into Warhill Section One) is dedicated and accepted as a public road, the access easement reserved hereby shall terminate. The easement reserved hereby shall be appurtenant to and run with title to all or any part of Warhill Section One.

The foregoing conveyance is made subject to all easements, conditions or restrictions of record or apparent on the ground insofar as they may lawfully affect the property conveyed hereby.

Being a portion of the property conveyed to the Grantor by Deed dated December 30, 1993, from Warhill Associates Limited Partnership and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City in James City Deed Book 664, at page 186.

1 Large/Small Plat(s) Recorded herewith as # 10600835

VIRGINIA: CITY OF WILLIAMSBURG & COUNTY OF JAMES CITY
This document was admitted to record on 4-30-2010
at 2:13 AM/PM. The taxes imposed by Virginia Code
Section 58.1-801, 58.1-802 & 58.1-814 have been paid.
STATE TAX LOCAL TAX ADDITIONAL TAX
$ $ $
TESTE: BETSY B. WOOLRIDGE, CLERK
BY Betsy B Woolridge Clerk

40839

plats

~~65/7~~ ✓

~~64/30-32~~ Warhill

~~44/86~~ ✓

~~91/21~~ ✓

DB ~~808/589~~ ✓

~~209/430~~ don't need

~~129/378~~ don't need

~~258/79~~

Case Transmittal Sheet

Date: 04/25/2016

To: Deputy Zoning Administrator
ERP
Parks and Recreation

Engineering & Resource Protection
APR 28 2016
RECEIVED

From: Roberta Sulouff, Planner (6783)

Subject: C-0037-2016, Natural Resources and Farm Link Center, Community Gardens

Submittal No.: 1

Items Attached: Conceptual Plan

Action: Please review this application by 05/09/2016

Application Subject to the Following	
☐	Proffers – Case No.
☐	SUP – Case No.
☐	Agricultural Forestal District
☐	Special Flood Hazard Area
✓	Other: Z-06-05/MP-04-05; SUP-17-03/MP-05-03

Public Meetings (Tentative Dates)		
☐	Planning Commission	Date:
☐	Board of Supervisors	Date:
✓	DRC	Date: 5/25/2016
☐	Dev. Roundtable	Date:
☐	Other:	Date:

Other Comments:

Conceptual plan for 1st phase of resource center project. This plan includes information regarding the total project, with the first phase being community garden plots. Please note: the plan proposes sharing parking with the stadium and WISC lots, with walking trails leading to the plots.

SEE ATTACHED.

James City County VIRGINIA Jamestown 1607

Engineering and Resource Protection

Project: Natural Resources and Farm Link Center Community Gardens at Warhill Sports Complex (Colonial Soil & Water Conservation District)

County Plan No.: C-37-16

Date: May 6, 2016

The Engineering and Resource Protection Division has no comments on the conceptual development plan application.

As a note, the director of Engineering and Resource Protection has been involved in this project with district manager and board of directors from the Colonial Soil & Water District. County staff role is of technical and advisory nature. County involvement thus far includes providing a letter of support for the initial grant application, assistance with obtaining the *License and Use Agreement dated 11/04/14*, initial soil amendment work (composting), seasonal nurse crop planting (annual ryegrass), wildflower plot planting (cosmos), and coordination for the groundbreaking ceremony held on June 12, 2016. This concept plan and master plan consistency determination is necessary for next steps associated with the grant and the overall project concept.

The project is consistent with the overall purpose of the Rural Economic Development Committee (REDC) and approved Comprehensive Plan GSA's ED6.3, ED8.2, ED8.3, ED8.4, ED8.5, ENV1.2.3, ENV1.16, ENV2.1, CC1.7, PR1.3, PR10.1, LU6.1 and especially LU6.1.4.

05-06-16

Engineering and Resource Protection Division
P: 757-253-6670
ResourceProtection@jamescitycountyva.gov

101-E Mounts Bay Road, P.O. Box 8784
F: 757-259-4032

Williamsburg, VA 23185
jamescitycountyva.gov