CERTIFICATE OF AUTHENTICITY

THIS IS TO CERTIFY THAT THE FOLLOWING ELECTRONIC RECORDS ARE TRUE AND ACCURATE REPRODUCTIONS OF THE ORIGINAL RECORDS OF JAMES CITY COUNTY GENERAL SERVICES DEPARTMENT- STORMWATER DIVISION; WERE SCANNED IN THE REGULAR COURSE OF BUSINESS PURSUANT TO GUIDELINES ESTABLISHED BY THE LIBRARY OF VIRGINIA AND ARCHIVES; AND HAVE BEEN VERIFIED IN THE CUSTODY OF THE INDIVIDUAL LISTED BELOW.

BMP NUMBER: **YC027**

DATE VERIFIED: **January 30, 2013**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

FINAL
CONST CERT
YC 027

June 27, 2003

Mr. Brian Rettman
US Home Corporation
6895 Richmond Road
Williamsburg, Virginia 23188

ECS Project No. 07:6055-A

Reference: 18th Hole Dam Evaluation and Construction Certification
Colonial Heritage
James City County, Virginia

Dear Mr. Rettman,

Engineering Consulting Services (ECS), Ltd. was retained to provide earthwork observation and testing for the storm water management pond at the 18th Hole of the planned residential community. Personnel with ECS, Ltd. provided earthwork observation and testing during the construction of the dam embankment and storm sewer.

We performed subgrade observations and compaction testing of the embankment fill and backfill for the storm sewer during construction. Our density tests indicated compaction of the approved fill material to a minimum of 95 percent of the Standard Proctor maximum dry density per ASTM D-698. A follow up site visit was performed on June 26, 2003 to observe the condition of the dam embankment. At the time of this site visit, the dam embankment appeared to be structurally sound and covered with vegetation.

Based on test data and the follow up inspection, it is our professional opinion that the BMP embankment appears to have been constructed in accordance with acceptable construction practices and in accordance with the approved project plans and specifications.

General Comments

This report has been prepared in order to aid in the evaluation of this stormwater management facility. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to the embankment characteristics.

We appreciate being of continued service to you on this project. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Michael J. Galli, P.E.
Geotechnical Engineer

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030684
PROFESSIONAL ENGINEER

Copies: AES Consulting Engineers (Mr. Howard Price)

Eakes/let/6055-A-18cert.doc

ENGINEERING CONSULTING SERVICES, LTD.
Geotechnical • Construction Materials • Environmental

June 27, 2003

JUL 2003
RECEIVED
PLANNING DEPARTMENT

Mr. Brian Rettman
US Home Corporation
6895 Richmond Road
Williamsburg, Virginia 23188

ECS Project No. 07:6055-A

Reference: 18th Hole Dam Evaluation and Construction Certification
Colonial Heritage
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108 Ingram Road, Unit 1, Williamsburg, Virginia 23188 • (757) 229-6677 • Fax (757) 229-9978
Offices: Richmond, VA • Chesapeake, VA • Washington, D.C. • Williamsburg, VA • Roanoke, VA • Fredericksburg, VA • Danville, VA • Winchester, VA
Aberdeen, MD • Baltimore, MD • Frederick, MD • Research Triangle Park, NC • Wilmington, NC • Charlotte, NC • Greensboro, NC • Greenville, SC • Atlanta, GA

We appreciate being of continued service to you on this project. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

ENGINEERING CONSULTING SERVICES, LTD.

Michael J. Galli, P.E.
Geotechnical Engineer

COMMONWEALTH OF VIRGINIA
MICHAEL J. GALLI
No. 030884
PROFESSIONAL ENGINEER

Attachment: Construction Certification

Copies: AES Consulting Engineers (Mr. Howard Price)

Eakes/let/6055-A-18cert.doc

Stormwater Division

MEMORANDUM

DATE: March 13, 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: YC027

PIN: 2341800003

Subdivision, Tract, Business or Owner Name (if known): Colonial Heritage

Property Description: Golf Course

Site Address: 4300 Colonial Heritage Blvd

(For internal use only) **Box** 24 **Drawer:** 9

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

Comments

Colonial Heritage LLC
6895 Richmond Road
Williamsburg VA 23188

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

Project Name: Colonial Heritage PH 1 BLVD.
County Plan No.: SP-75-02; AMEND SP-36-03
Stormwater Management Facility: MASTER PLAN POND #3, 9th HOLE POND (Form. 18TH HOLE)
BMP Phase #: ☐ I ☐ II ☒ III
☐ Information Package Received. Date/By: 04/26/06 AES
☐ Completeness Check:
- ☒ Record Drawing Date/By: 4/26/06 AES 4/24/06
- ☒ Construction Certification Date/By: ECS 6/25/03
- ☒ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☐ Insp/Maint Agreement # / Date:
- ☐ BMP Maintenance Plan Location: Note 9, Sheet 20
- ☐ Other:

INTERIM CERT ISSUED Aug 4, 2003

☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
☒ Yes ☐ No Location: Note 20 Sheet 4;
☐ Assign **County BMP ID Code #**: Code: YC 027

44.22 AC.

☒ 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.).
NO ☐ 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: 07/27/06 SJT, MM
☒ Record Drawing (RD) Review Date: 07/27/06
☒ Construction Certification (CC) Review Date: 07/27/06
☐ Actions:
- ☒ No comments. MINOR
- ☐ Comments. Letter Forwarded. Date: EMAIL FORWARDED
- ☐ Record Drawing (RD)
- ☐ Construction Certification (CC)
- ☐ Construction-Related (CR)
- ☐ Site Issues (SI)
- ☐ Other :

☐ Second Submission:
☐ Reinspection (if necessary):
☒ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
☒ Complete "Surety Request Form".
☒ Check/Clean active file of any remaining material and finish "As-Built" file.
☒ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
☒ Copy Final Inspection Report into County BMP Inspection Program file.
☒ Obtain Digital Photographs of BMP and save into County BMP Inventory.
☒ Request mylar/reproducible from As-Built plan preparer. ✔
☒ Complete "As-built Tracking Log".
☒ Last check of BMP Access Database (County BMP Inventory).
☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
NO ☐ Add BMP to Municipal BMP list (if a County-owned facility)
☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Plan Reviewer: Date: 09-06-06

*** See separate checklist, if needed.

Colonial Heritage LLC
6895 Richmond Road
Williamsburg VA 23188

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

Project Name: Colonial Heritage PH 1 BLVD.
County Plan No.: SP-75-02; AMEND SP-36-03
Stormwater Management Facility: MASTER PLAN POND #3, 9th HOLE POND (Form. 18TH HOLE)
BMP Phase #: ☐ I ☐ II ☒ III
☐ Information Package Received. Date/By: 04/26/06 AES
☐ Completeness Check:
- ☒ Record Drawing Date/By: 4/26/06 AES 4/24/06
- ☒ Construction Certification Date/By: ECS 6/25/03
- ☒ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
- ☐ Insp/Maint Agreement # / Date:
- ☐ BMP Maintenance Plan Location: Note 9, Sheet 20
- ☐ Other:

INTERIM CERT ISSUED Aug 4, 2003

☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
☒ Yes ☐ No Location: Note 20 Sheet 4;
☐ Assign **County BMP ID Code #**: Code: YC 027

44.22 AC.

☒ 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.).
NO ☐ 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: 07/27/06 SJT, MM
☒ Record Drawing (RD) Review Date: 07/27/06
☒ Construction Certification (CC) Review Date: 07/27/06
☐ Actions:
- ☒ No comments. MINOR
- ☐ Comments. Letter Forwarded. Date: EMAIL FORWARDED
- ☐ Record Drawing (RD)
- ☐ Construction Certification (CC)
- ☐ Construction-Related (CR)
- ☐ Site Issues (SI)
- ☐ Other :

☐ Second Submission:
☐ Reinspection (if necessary):
☒ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
☒ Complete "Surety Request Form".
☒ Check/Clean active file of any remaining material and finish "As-Built" file.
☒ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
☒ Copy Final Inspection Report into County BMP Inspection Program file.
☒ Obtain Digital Photographs of BMP and save into County BMP Inventory.
☒ Request mylar/reproducible from As-Built plan preparer. ✔
☒ Complete "As-built Tracking Log".
☒ Last check of BMP Access Database (County BMP Inventory).
☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
NO ☐ Add BMP to Municipal BMP list (if a County-owned facility)
☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Plan Reviewer: [signature] Date: 09-06-06

*** See separate checklist, if needed.

Master Plan Revo #3
18-TH Hole Revo

SP-75-02
AMEND SP-36-03

YC027

Record Drawing & Construction Certification
Interim Certification Review Checklist

(Note: Consistent with plan review comments and/or Page 4 of the James City County Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions, interim certification is required for BMP facilities which serve dual purpose as temporary sediment basins during construction and as permanent stormwater management / BMP facilities following construction. For these dual purpose facilities, construction certification is required once the temporary sediment basin phase of construction is complete. Interim 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-Disturbing permit for construction. 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.)

Nice curvilinear shape to basin

Yes **No**

Record Drawings (Asbuilts):

- ☐ ☐ Top of dam elevation per plan.
- ☑ ☐ Finished contours or spot elevations reflect storage volume per plan.
- ☑ ☐ Riser arrangement, type, size and crest elevation per plan.
- ☑ ☐ Barrel type, size and slope per plan.
- ☑ ☐ Temporary dewatering device/size shown.
- ☑ ☐ Asbuilt certification provided.
- ☑ ☐ Standard forms (fully completed) provided.

8-1-03
INTERIM
FI

Construction Certification:

- ☐ ☑ Signed and sealed construction certification.
- ☐ ☐ Optional - Field inspection, proctor and compaction test reports provided.

Construction (Field) Related:

Inspection Date/By: _____
BMP Rating (1-5): _____

- ☐ ☐ Dam sideslopes per plan.
- ☒ ☐ Primary Structure - trash rack, riser and barrel in place per plan.
- ☐ ☒ Emergency spillway in place per plan. NA
- ☒ ☐ All flow control unobstructed of debris, sediment, vegetation and functional.
- ☒ ☐ Stabilization acceptable, especially top and side slopes of dam.
- ☒ ☐ No major seeps or dam slope erosion present.
- ☒ ☐ Forebay(s) installed per plan.
- ☒ ☐ Outlet protection per plan.
- ☒ ☐ Low flow orifice installed, but temporarily blocked. (OPEN)
- ☒ ☐ Stormwater function appears acceptable.
- ☒ ☐ Structural integrity appears acceptable.

Bench 20' full perimeter
BARREL MH1 CLEAN (MH#1
" " MH#2
OP/pipe outfall ok.

- MH STEPS NEEDED
- MARK LEADING LOCATION STICK PAINTED

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: Colonial Heritage Boulevard
Structure/BMP Name: SWMP #3 (18th hole Pond)
Project Location: James City County, VA
BMP Location: SWMP #3 (18th hole Pond)
County Plan No.: SP - 75 - 02

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

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

Brief Description of Stormwater Management/BMP Facility: _____

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: _____

YC027_COLONIAL_HERITAGE_PHASE_1_BLVD - 006

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: _____
Mailing Address: _____
_____
Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

_____ (Seal)

Virginia Registered Professional Engineer
or Certified Land Surveyor

Construction Certification

Firm Name: ECS, Ltd.
Mailing Address: 108 Ingram Rd., Unit 1
Williamsburg, VA 23188
Business Phone: (757) 229-6677
Fax: (757) 229-9978

Name: Michael J. Galli, P.E.
Title: Principal Engineer

Signature: [signature]
Date: 6/25/03

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
MICHAEL J. GALLI
No. 030684
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered
Professional Engineer

(INTERIM)

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities Record Drawing and Construction Certification

Standard Forms & Instructions

Contents — Page

Record Drawing and Construction Certification Forms

Section 1 – Site Information		1
Section 2 – Construction Information		2
Section 3 – Owner / Designer / Contractor Information		2
Section 4 – Professional Certifications		3
Section 5 – Certification Requirements and Instructions		4

Record Drawing Checklist

I.	Methods and Presentation	(Required for All Facilities)	6
II.	Minimum Standards	(Required for All Facilities)	6
III.	Group A – Wet Ponds		8
IV.	Group B – Wetlands		9
V.	Group C – Infiltration Practices		10
VI.	Group D – Filtering Systems		11
VII.	Group E – Open Channel Systems		12
VIII.	Group F – Extended Dry Detention		13
IX.	Group G – Open Spaces		14
X.	Storm Drainage Systems	(Associated with BMP's Only)	15
XII.	Other Systems		15
XIII.	References		16

Issue Date
February 1, 2001

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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Section 1 – Site Information:

Project Name: Colonial Heritage Boulevard, Phase I
Structure/BMP Name: SWMP #3 (18th Hole Pond-BMP)
Project Location: Richmond Road - James City Virginia
BMP Location: adjacent to 18th Hole
County Plan No.: SP - 75 - 02 AMEND SP-36-03

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

Tax Map/Parcel No.: _____
BMP ID Code (if known): YC027
Zoning District: _____
Land Use: _____
Site Area (sf or acres): _____

Brief Description of Stormwater Management/BMP Facility: _____

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: _____
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: _____
Name of Professional Firm Who Routinely Monitored Construction: _____
Date of Completion for SWM/BMP Facility: August 1, 2003
Date of Record Drawing/Construction Certification Submittal: 7/11/03

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

Section 3 – Owner / Designer / Contractor Information:

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

Name: Colonial Heritage LLC
Mailing Address: 6895 Richmond Road
Williamsburg, VA. 23188
Business Phone: (757) 258-2705 Ext. 14 Fax: (757) 258-0516
Contact Person: Brian Rettman Title: Construction Manager

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: G. Archer Marston, III, P.E.
Title: Vice-President
Plan Name: Colonial Heritage Boulevard Phase I
Firm's Project No. 8881-05
Plan Date: 5/22/02
Sheet No.'s Applicable to SWM/BMP Facility: 9 / 18 / ____ / ____ / ____

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

Name: Jack L. Massie Contractor, Inc.
Mailing Address: 3900 Cokes Lane
Williamsburg, VA. 23188-7010
Business Phone: (757) 566-8643
Fax: (757) 566-8566
Contact Person: Scott Massie
Site Foreman/Supervisor: _____
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 – Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994

Name: G. Archer Marston, III, P.E.
Title: Vice-President

Signature:
Date: 7/10/03

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON III
No. 01[illegible]
PROFESSIONAL ENGINEER
7/10/03

_____ (Seal)

Virginia Registered Professional Engineer
Or Certified Land Surveyor

Construction Certification

Firm Name: _____
Mailing Address: _____

Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

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

_____ (Seal)

Virginia Registered
Professional Engineer

INTERIM

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities Record Drawing and Construction Certification

Standard Forms & Instructions

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IX.	Group G – Open Spaces		14
X.	Storm Drainage Systems	(Associated with BMP's Only)	15
XII.	Other Systems		15
XIII.	References		16

Issue Date
February 1, 2001

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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Section 1 – Site Information:

Project Name: Colonial Heritage Boulevard, Phase I
Structure/BMP Name: SWMP #3 (18th Hole Pond-BMP)
Project Location: Richmond Road - James City Virginia
BMP Location: adjacent to 18th Hole
County Plan No.: SP - 75 - 02

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

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

Brief Description of Stormwater Management/BMP Facility: _____

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: _____
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: _____
Name of Professional Firm Who Routinely Monitored Construction: _____
Date of Completion for SWM/BMP Facility: _____
Date of Record Drawing/Construction Certification Submittal: _____

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

Section 3 – Owner / Designer / Contractor Information:

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

Name: Colonial Heritage LLC
Mailing Address: 6895 Richmond Road
Williamsburg, VA. 23188
Business Phone: (757) 258-2705 Ext. 14 Fax: (757) 258-0516
Contact Person: Brian Rettman Title: Construction Manager

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: G. Archer Marston, III, P.E.
Title: Vice-President
Plan Name: Colonial Heritage Boulevard Phase I
Firm's Project No. 8881-05
Plan Date: 5/22/02
Sheet No.'s Applicable to SWM/BMP Facility: 9 / 18 / ____ / ____ / ____

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

Name: Jack L. Massie Contractor, Inc.
Mailing Address: 3900 Cokes Lane
Williamsburg, VA. 23188-7010
Business Phone: (757) 566-8643
Fax: (757) 566-8566
Contact Person: Scott Massie
Site Foreman/Supervisor: _____
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 – Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994

Name: G. Archer Marston, III, P.E.
Title: Vice-President

Signature:
Date: 7/10/03

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON III
No. 019722
PROFESSIONAL ENGINEER
7/10/03

_____ (Seal)

Virginia Registered Professional Engineer
Or Certified Land Surveyor

Construction Certification

Firm Name:
Mailing Address:

Business Phone:
Fax:

Name:
Title:

Signature:
Date:

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

_____ (Seal)

Virginia Registered
Professional Engineer

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: Colonial Heritage Boulevard
Structure/BMP Name: SWMP #3 (18th hole Pond)
Project Location: James City County, VA
BMP Location: SWMP #3 (18th hole Pond)
County Plan No.: SP - 75 - 02

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

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

Brief Description of Stormwater Management/BMP Facility: _____

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 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: _____
Mailing Address: _____
_____
Business Phone: _____
Fax: _____

Name: _____
Title: _____

Signature: _____
Date: _____

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

_____ (Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: ECS, Ltd.
Mailing Address: 10 Brogram Rd., Unit 1
Williamsburg, VA 23188
Business Phone: (757) 229-6677
Fax: (757) 229-9978

Name: Michael J. Galli, P.E.
Title: Principal Engineer

Signature: [signature]
Date: 6/25/03

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
MICHAEL J. GALLI
No. 030684
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer

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James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities Record Drawing and Construction Certification

Standard Forms & Instructions

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ENVIRONMENTAL DIVISION

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: Colonial Heritage Boulevard, Phase I
Structure/BMP Name: SWMP #3 (18th Hole Pond-BMP)
Project Location: Richmond Road - James City Virginia
BMP Location: adjacent to 18th Hole
County Plan No.: SP - 75 - 02

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

Tax Map/Parcel No.: (24-3)(1-32)
BMP ID Code (if known): YC 027
Zoning District: MU
Land Use: Mixed Use
Site Area (sf or acres): 14.51 Ac.

Brief Description of Stormwater Management/BMP Facility: _____

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: _____
Facility Monitored by County Representative during Construction: ☐ Yes ☐ No ☒ Unknown
Name of Site Work Contractor Who Constructed Facility: _____
Name of Professional Firm Who Routinely Monitored Construction: _____
Date of Completion for SWM/BMP Facility: 07/01/06
Date of Record Drawing/Construction Certification Submittal: 04/26/06

(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: Colonial Heritage LLC
Mailing Address: 6895 Richmond Road
Williamsburg, VA. 23188
Business Phone: (757) 220-1538 Ext. 203 Fax:(757) 220-6297
Contact Person: George Renault Title:Project Director

Design Professional: *(Note: Professional Engineer or Certified Land Surveyor responsible for the design and preparation of plans and specifications for the Stormwater Management / BMP facility.)*

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994
Responsible Plan Preparer: G. Archer Marston, III, P.E.
Title: Vice-President
Plan Name: Colonial Heritage Boulevard Phase I
Firm's Project No. 8881-05
Plan Date: 5/22/02
Sheet No.'s Applicable to SWM/BMP Facility: 9 / 18 / ____ / ____ / ____

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

Name: Jack L. Massie Contractor, Inc.
Mailing Address: 3900 Cokes Lane
Williamsburg, VA. 23188-7010
Business Phone: (757) 566-8643
Fax: (757) 566-8566
Contact Person: Mark Massie
Site Foreman/Supervisor: _____
Specialty Subcontractors & Purpose (for BMP Construction Only):

Section 4 – Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management / BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road, Suite 1
Williamsburg, VA. 23188
Business Phone: (757) 253-0040
Fax: (757) 220-8994

Name: G. Archer Marston, III, P.E.
Title: Vice-President

Signature:
Date: 4/24/06

I hereby certify to the best of my knowledge and belief that this record drawing represents the actual condition of the Stormwater Management / BMP facility. The facility appears to conform with the provisions of the approved design plan, specifications and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON III
No. 018232
4/24/16
PROFESSIONAL ENGINEER

_____ (Seal)

Virginia Registered Professional Engineer
Or Certified Land Surveyor

Construction Certification

Firm Name:
Mailing Address:

Business Phone:
Fax:

Name:
Title:

Signature:
Date:

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

_____ (Seal)

Virginia Registered
Professional Engineer

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 plans sheet revision blocks modified to indicate date and record drawing status.

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

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

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

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

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

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

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

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

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

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

XX	9.	Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.
XX	10.	Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.
XX	11.	Type and size of modified riser. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.
XX	12.	Type, location, size and number of anti-seep collars or documentation of other methods utilized for seepage control. **Per ECS inspection during construction.**
XX	13.	Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **Per ECS inspection during construction.**
XX	14.	Elevation of the principal spillway barrel (outlet pipe) inlet and outlet invert.
XX	15.	Outlet barrel diameter, length, slope, type and thickness class of material and type of flared end sections, headwall or endwall.
XX	16.	Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.
XX	17.	BMP interior and periphery landscaping zones conform with arrangements and requirements of the approved design plan.
XX	18.	Maintenance plan taken from approved design plan transposed onto record drawing set.
N/A	19.	Fencing location and type, if applicable to facility.
XX	20.	BMP vicinity properly cleaned of stockpiles and construction debris.
XX	21.	No visual signs of erosion or channel degradation immediately downstream of facility.
N/A	22.	Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT / BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

XX 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.

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

XX 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.

XX 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).

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

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

XX A10. Low flow orifice has a non-clogging mechanism.

XX A11. A pond drain pipe with valve was provided.

XX 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
RECORD DRAWING 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 diaphrahm provided in areas where lateral sheet flow from impervious surgaces 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.)

N/A SD1. All requirements of Section II, Minimum Standards, apply to Storm Drainage Systems.

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

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

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

N/A SD5. Class, length, width and depth of riprap and outlet protections or dimensions of special energy dissipation structures.

XII. Other Systems

(Includes any non-typical, specialty, manufactured or innovative stormwater management/BMP practices or systems generally accepted for use as or in conjunction with other acceptable stormwater management / BMP practices. Requires evidence of prior satisfactory industry use and prior Environmental Division approval, waiver or exception.)

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.

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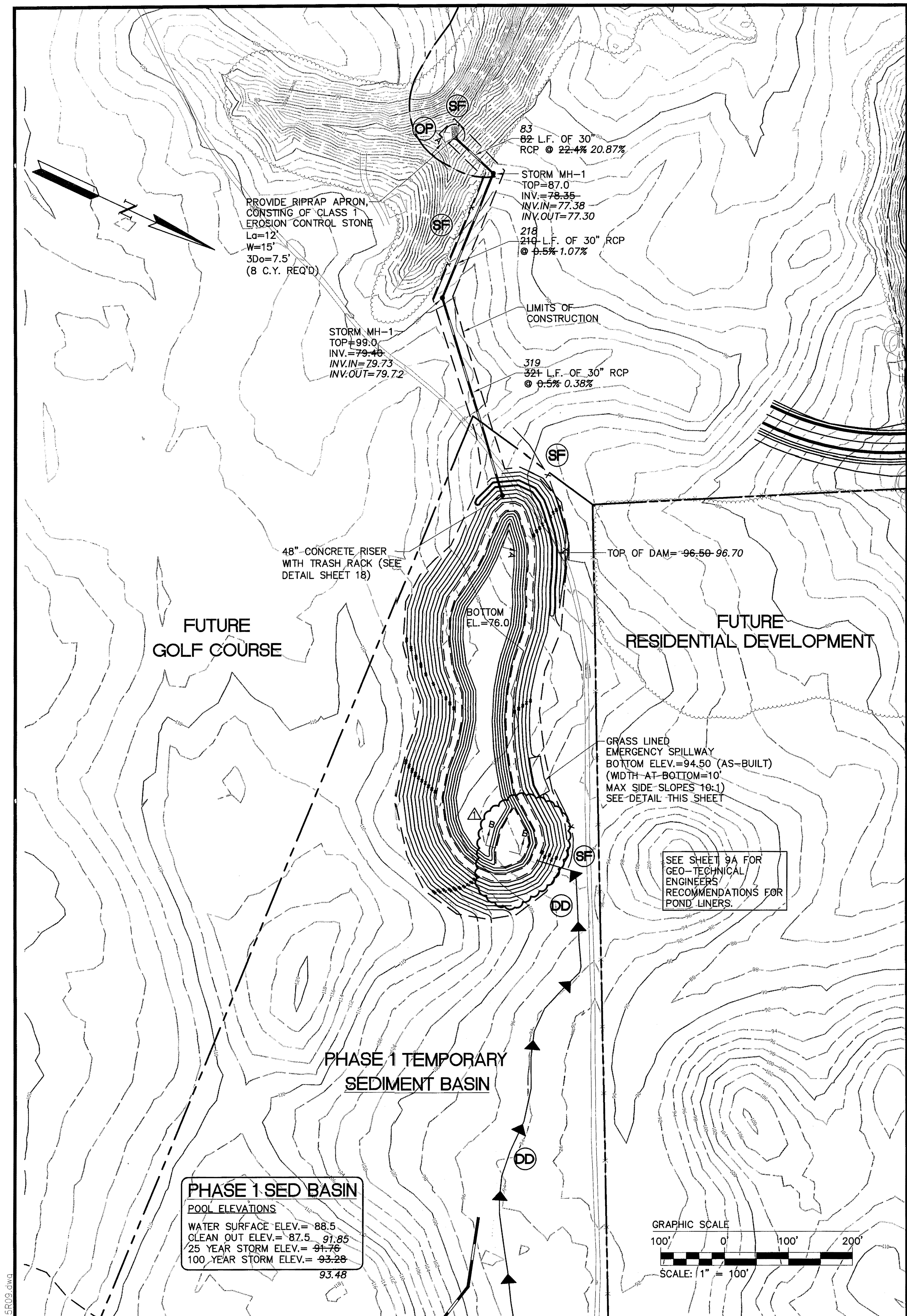
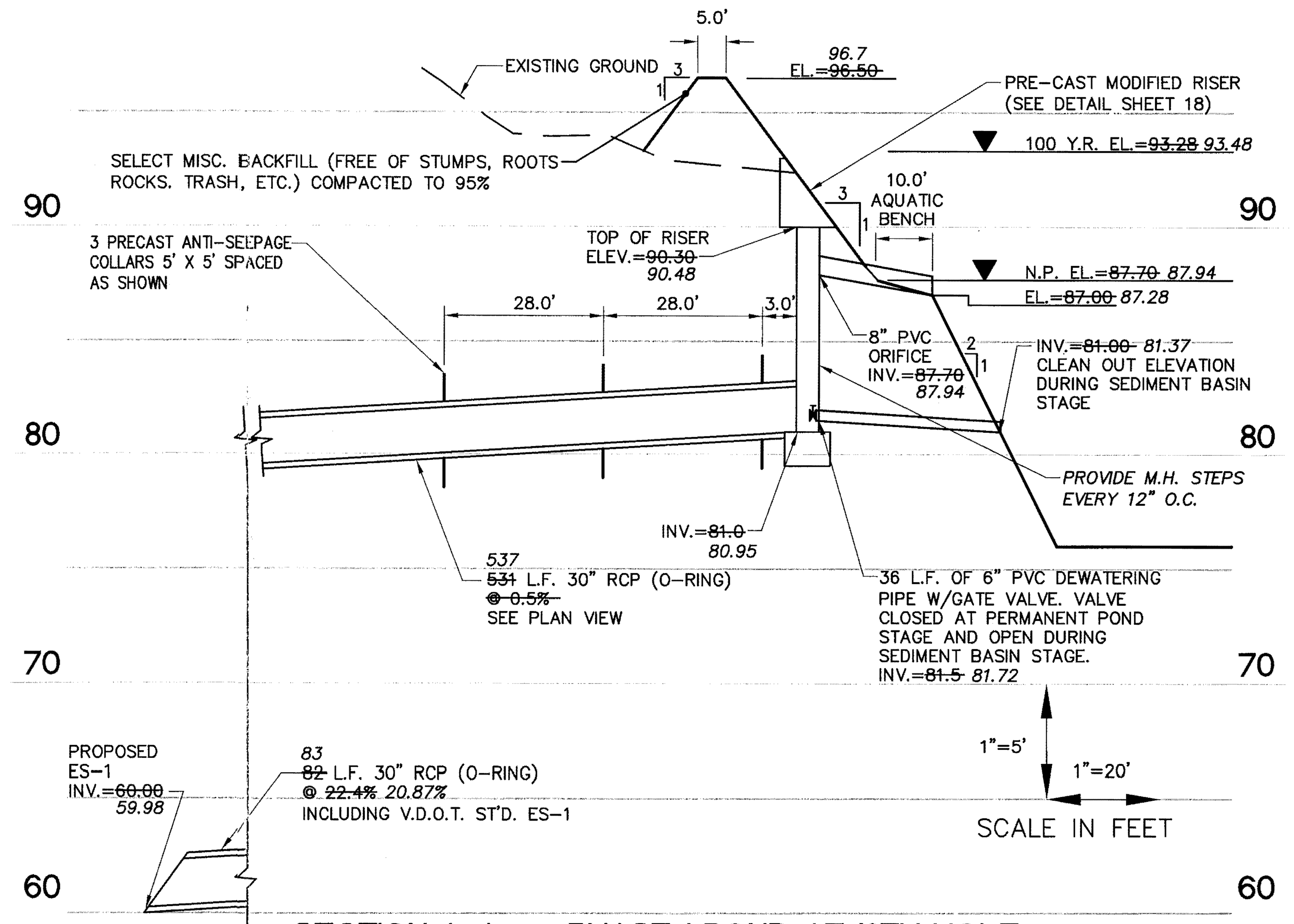
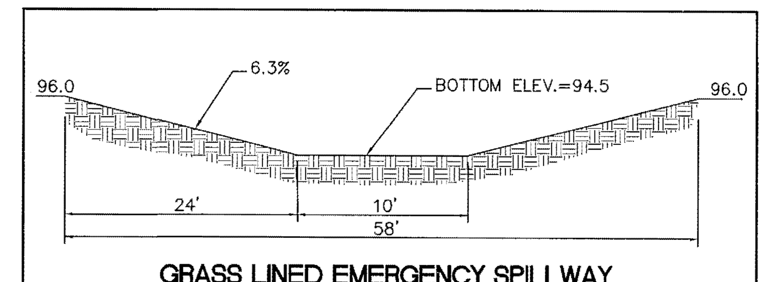
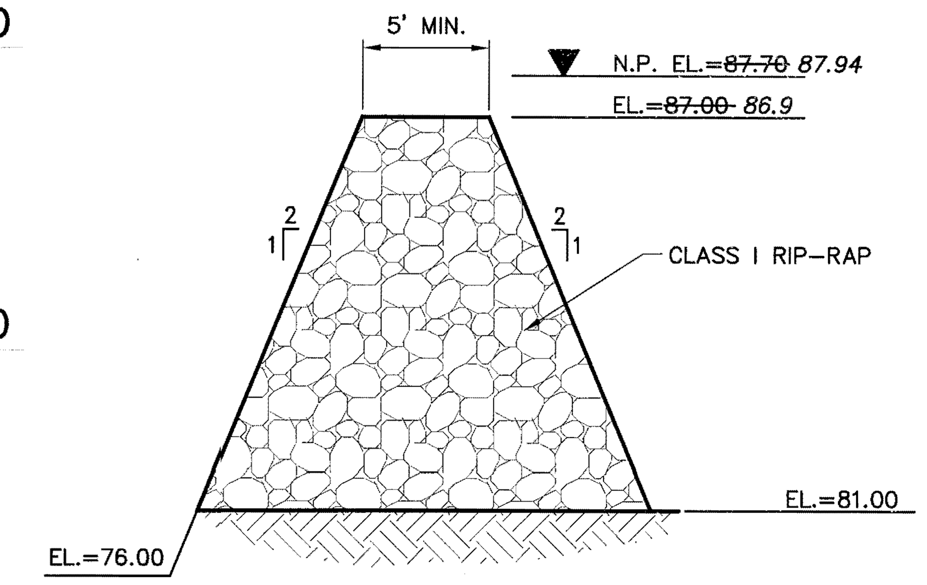




SECTION A-A PHASE 1 POND AT 18TH HOLE
(MASTER STORMWATER PLAN BMP #3)



GRASS LINED EMERGENCY SPILLWAY
NOT TO SCALE



SECTION B-B
N.T.S.

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

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

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE 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, 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 SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

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

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED 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 AS APPROPRIATE.

8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

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

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
4/24/06
PROFESSIONAL ENGINEER

GENERAL NOTES FOR CONSTRUCTION OF STORMWATER BASINS

1. THE CONTRACTOR SHALL PROVIDE ALL WORK AND MATERIALS NEEDED TO CONSTRUCT THE STORMWATER BASIN, STORMWATER MANAGEMENT PONDS, BEST MANAGEMENT PRACTICES, SEDIMENT BASINS AND SEDIMENT TRAPS. THE WORK SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT AND MATERIALS NEEDED FOR THE COMPLETION OF GRADING AND EARTHWORK ASSOCIATED WITH THE CONSTRUCTION.

2. THE CONTRACTOR SHALL CONSULT AND PROVIDE FOR THE SERVICES OF A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS, IDENTIFYING SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX, AND COMPACTION. ALL TESTS SHALL BE IN CONFORMANCE WITH ASTM STANDARDS. THE COST OF THE SERVICES OF THE GEOTECHNICAL ENGINEER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SATISFACTORY GEOTECHNICAL RESULTS ARE NEEDED PRIOR TO FINAL APPROVAL.

3. ALL INSPECTIONS REQUIRED FOR THE WORK SHALL BE PERFORMED BY A GEOTECHNICAL ENGINEER AT THE EXPENSE OF THE GENERAL CONTRACTOR.

4. ON-SITE EXCAVATED MATERIAL, IF DETERMINED SUITABLE FOR USE IN DAM CONSTRUCTION BY A GEOTECHNICAL ENGINEER, MAY BE USED FOR DAM CONSTRUCTION. SHOULD ADDITIONAL MATERIAL BE REQUIRED, THE CONTRACTOR SHALL IDENTIFY THE NEED FOR MATERIAL TO THE OWNER, AS ADDITIONAL BORROW MATERIAL MAY BE AVAILABLE ON THE PROPERTY. ALL EXCAVATED MATERIAL DETERMINED BY THE GEOTECHNICAL ENGINEER TO BE UNSUITABLE SHALL BE DISPOSED OF PROPERLY AT THE CONTRACTOR'S EXPENSE. ALL EXCAVATED MATERIAL NOT REQUIRED FOR BACKFILLING SHALL EITHER BE DEPOSITED ON SITE AND SPREAD BY THE CONTRACTOR, OR SHALL BE DEPOSITED IN AN AREA ON THE PROPERTY AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL PROVIDE PROPER STABILIZATION, AND EROSION AND SEDIMENT CONTROL MEASURES NEEDED TO CONTROL AS PER THE VESCH THIRD EDITION.

5. UNDERCUT FOR THE FOUNDATION OF THE DAM EMBANKMENT SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. THE FOUNDATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SM, SC, OR CL UNDER THE UNIFIED SOIL CLASSIFICATION SYSTEM. SOILS SHALL HAVE A MINIMUM OF 15% BY WEIGHT FINES, HAVING A PLASTICITY INDEX OF 30% AND A PERMEABILITY OF 0.0004 IN./SEC. OR LESS. FILL SHALL BE COMPACTED IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO A DRY DENSITY OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). EXCAVATION FOR THE DAM KEY SHALL BE IN ACCORDANCE TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. HEIGHT, DEPTH, AND WIDTH OF THE KEY SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. THE KEY SHALL BE FORMED USING SOILS CLASSIFIED AS SC OR CL, WITH A PERMEABILITY OF 0.0004 IN./SEC. OR LESS.

6. THE DAM CORE SHALL BE AS CONSTRUCTED WITH NON-EXPANSIVE SC OR CL CLAYEY MATERIAL WITH PERMEABILITY OF 0.0004 IN./SEC. OR LESS. THE FILL OF THE CORE SHALL BE MADE IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). SIZE, SHAPE, WIDTH, DEPTH, AND HEIGHT OF THE DAM CORE SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. TO COVER THE DAM CORE, A SILTY FINE SAND OR CLAYEY SOIL (SM, SC, OR CL) SHALL BE PLACED. A VEGETATIVE COVER USING VDOT EC-2 EROSION CONTROL BLANKETS SHALL BE PLACED ON DAM SLOPES AND CREST TO PREVENT EROSION.

7. THE STORMWATER MANAGEMENT / BMP FACILITIES SHOWN ON THESE PLANS REQUIRE THE SUBMISSION, REVIEW AND APPROVAL OF RECORD DRAWING(S) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND / SURETY. THE GEOTECHNICAL ENGINEER IS TO ENSURE THAT HIS / HER INSPECTION OF THE SWM / BMP CONSTRUCTION ACTIVITY IS PERFORMED DURING AND FOLLOWING CONSTRUCTION OF THE SWM / BMP IN ACCORDANCE WITH THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT / BMP FACILITIES DESIGN GUIDELINES HANDBOOK, DATED AUGUST 30, 2000.

8. THE CONTRACTOR SHALL PROVIDE INTERIM CERTIFICATION OF TEMPORARY SEDIMENT BASIN IN ACCORDANCE WITH SECTION 5 OF THE JAMES CITY COUNTY BMP, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN GUIDES.

APPROVED
James City County Environmental Division
By:
Date: 07-27-06

RECEIVED
APR 2 4 2006
ENVIRONMENTAL DIVISION

No.	DATE	REVISION / COMMENT / NOTE	BY
5	4/24/06	FINAL CERTIFICATION	HWP
4	7/8/03	INTERIM CERTIFICATION	HWP
3 (triangle)	5/02/03	REVISED STORM STRUCTURES	HWP
2 (triangle)	4/18/03	REVISED PER JCC COMMENTS	HWP
1 (triangle)	3/19/03	SITE PLAN AMENDMENT NO. 1	HWP
3	12/18/02	REVISED PER JCC COMMENTS	HWP
2	10/3/02	REVISED PER JCC COMMENTS	HWP
1	8/8/02	REVISED PER JCC COMMENT LETTER DATED 6/27/02	HWP

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
4/24/06
PROFESSIONAL ENGINEER

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

PHASE 1 BMP PLAN
COLONIAL HERITAGE BOULEVARD PHASE I

OWNER/DEVELOPER: COLONIAL HERITAGE LLC
STONEHOUSE JAMES CITY COUNTY VIRGINIA

Designed	Drawn
HWP/JAG	JAG/ARH
Scale	Date
NOTED	8/8/02

Project No. 8881-05
Drawing No. 9

RECORD DRAWING-4-24-06

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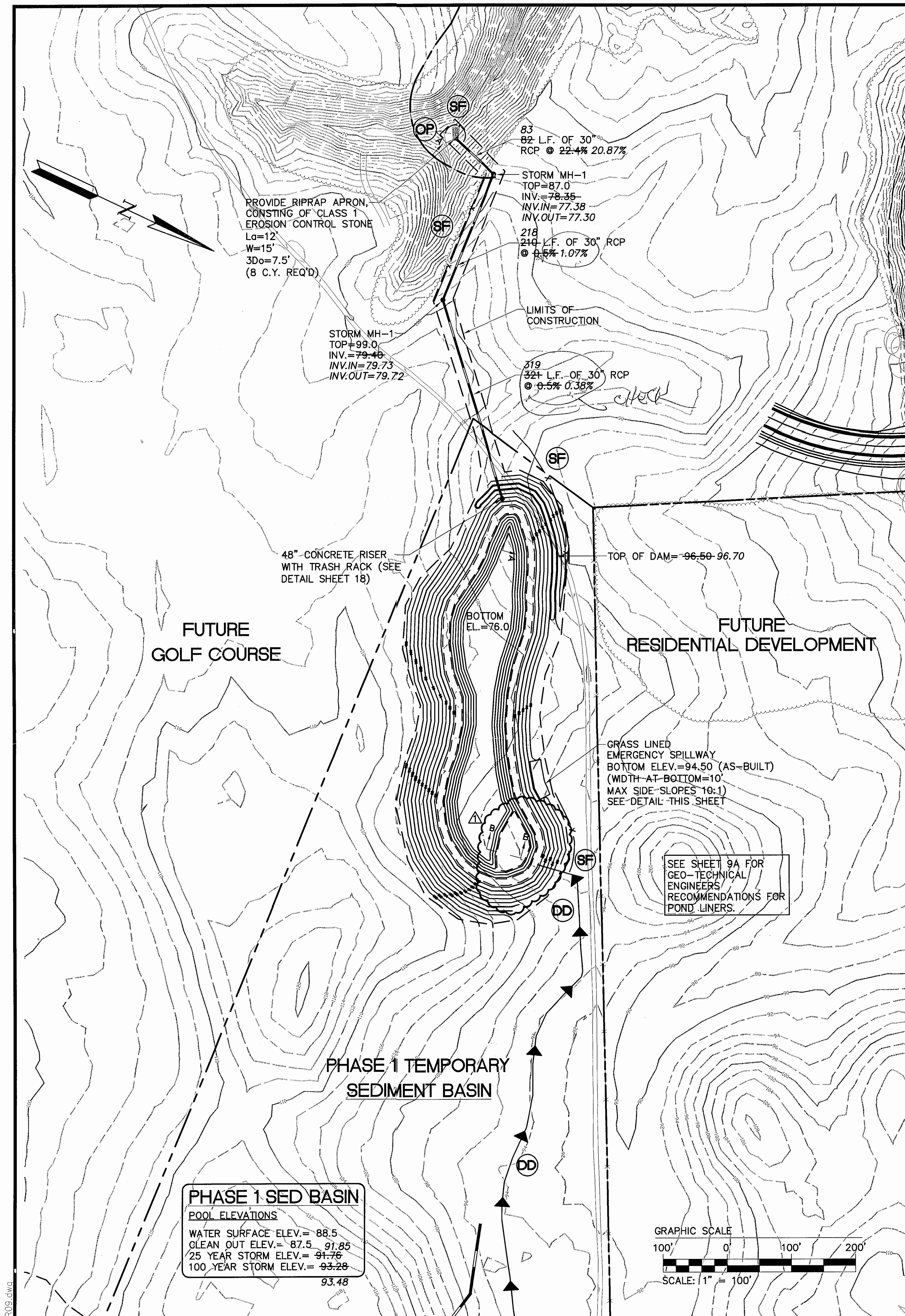
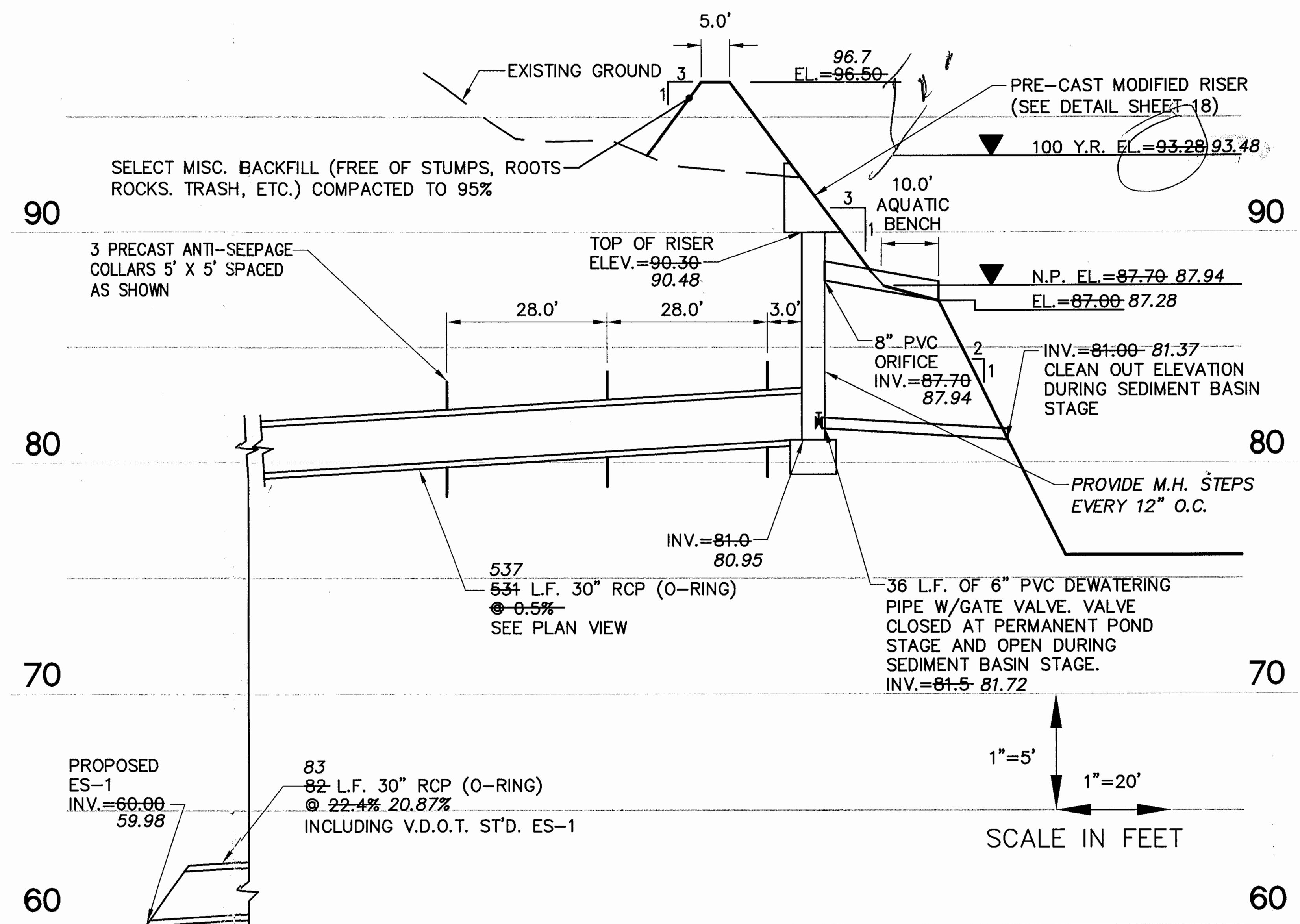
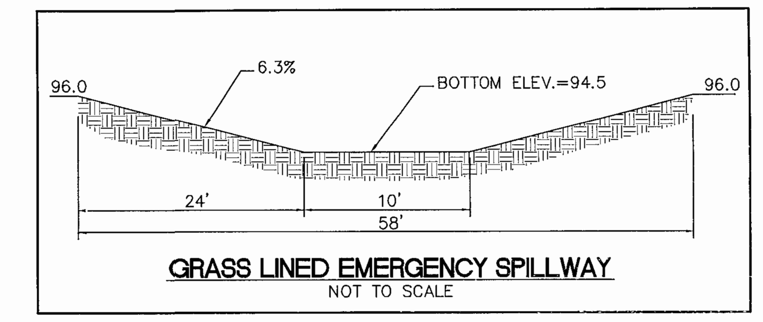




SECTION A-A

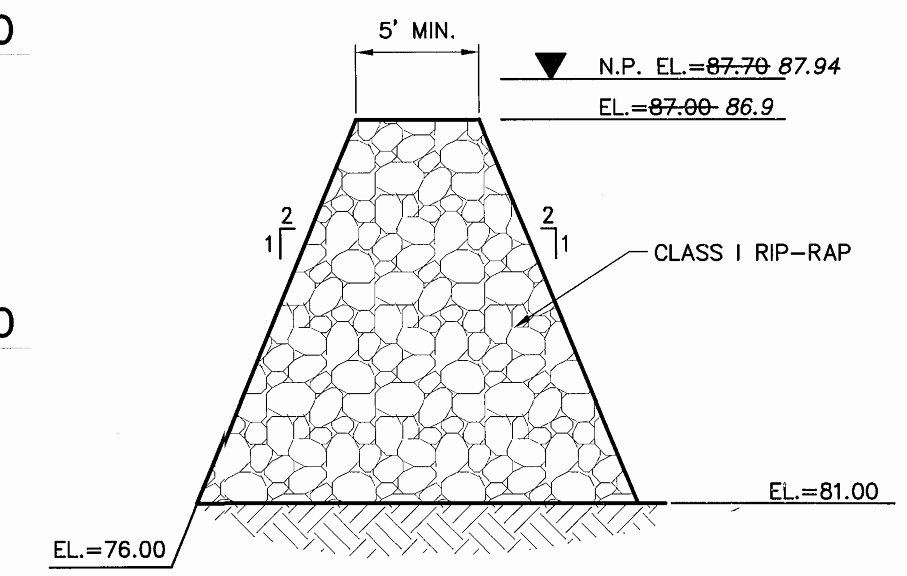
PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)



GRASS LINED EMERGENCY SPILLWAY

NOT TO SCALE



SECTION B-B

N.T.S.

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

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A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE 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, 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 SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

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

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED 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 AS APPROPRIATE.

8. RECORD KEEPING THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

GENERAL NOTES FOR CONSTRUCTION OF STORMWATER BASINS

1. THE CONTRACTOR SHALL PROVIDE ALL WORK AND MATERIALS NEEDED TO CONSTRUCT THE STORMWATER BASIN, STORMWATER MANAGEMENT PONDS, BEST MANAGEMENT PRACTICES, SEDIMENT BASINS AND SEDIMENT TRAPS. THE WORK SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT AND MATERIALS NEEDED FOR THE COMPLETION OF GRADING AND EARTHWORK ASSOCIATED WITH THE CONSTRUCTION.

2. THE CONTRACTOR SHALL CONSULT AND PROVIDE FOR THE SERVICES OF A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS, IDENTIFYING SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX, AND COMPACTION. ALL TESTS SHALL BE IN CONFORMANCE WITH ASTM STANDARDS. THE COST OF THE SERVICES OF THE GEOTECHNICAL ENGINEER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SATISFACTORY GEOTECHNICAL RESULTS ARE NEEDED PRIOR TO FINAL APPROVAL.

3. ALL INSPECTIONS REQUIRED FOR THE WORK SHALL BE PERFORMED BY A GEOTECHNICAL ENGINEER AT THE EXPENSE OF THE GENERAL CONTRACTOR.

4. ON-SITE EXCAVATED MATERIAL, IF DETERMINED SUITABLE FOR USE IN DAM CONSTRUCTION BY A GEOTECHNICAL ENGINEER, MAY BE USED FOR DAM CONSTRUCTION. SHOULD ADDITIONAL MATERIAL BE REQUIRED, THE CONTRACTOR SHALL IDENTIFY THE NEED FOR MATERIAL TO THE OWNER, AS ADDITIONAL BORROW MATERIAL MAY BE AVAILABLE ON THE PROPERTY. ALL EXCAVATED MATERIAL DETERMINED BY THE GEOTECHNICAL ENGINEER TO BE UNSUITABLE SHALL BE DISPOSED OF PROPERLY AT THE CONTRACTOR'S EXPENSE. ALL EXCAVATED MATERIAL NOT REQUIRED FOR BACKFILLING SHALL EITHER BE DEPOSITED ON SITE AND SPREAD BY THE CONTRACTOR, OR SHALL BE DEPOSITED IN AN AREA ON THE PROPERTY AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL PROVIDE PROPER STABILIZATION, AND EROSION AND SEDIMENT CONTROL MEASURES NEEDED TO CONTROL AS PER THE VESCH THIRD EDITION.

5. UNDERCUT FOR THE FOUNDATION OF THE DAM EMBANKMENT SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. THE FOUNDATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SM, SC, OR CL UNDER THE UNIFIED SOIL CLASSIFICATION SYSTEM. SOILS SHALL HAVE A MINIMUM OF 15% BY WEIGHT FINES, HAVING A PLASTICITY INDEX OF 30% AND A PERMEABILITY OF 0.0004 IN./SEC. OR LESS. FILL SHALL BE COMPACTED IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO A DRY DENSITY OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). EXCAVATION FOR THE DAM KEY SHALL BE IN ACCORDANCE TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. HEIGHT, DEPTH, AND WIDTH OF THE KEY SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. THE KEY SHALL BE FORMED USING SOILS CLASSIFIED AS SC OR CL, WITH A PERMEABILITY OF 0.0004 IN./SEC. OR LESS.

6. THE DAM CORE SHALL BE AS CONSTRUCTED WITH NON-EXPANSIVE SC OR CL CLAYEY MATERIAL WITH PERMEABILITY OF 0.0004 IN./SEC. OR LESS. THE FILL OF THE CORE SHALL BE MADE IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). SIZE, SHAPE, WIDTH, DEPTH, AND HEIGHT OF THE DAM CORE SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. TO COVER THE DAM CORE, A SILTY FINE SAND OR CLAYEY SOIL (SM, SC, OR CL) SHALL BE PLACED. A VEGETATIVE COVER USING VDOT EC-2 EROSION CONTROL BLANKETS SHALL BE PLACED ON DAM SLOPES AND CREST TO PREVENT EROSION.

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8. THE CONTRACTOR SHALL PROVIDE INTERIM CERTIFICATION OF TEMPORARY SEDIMENT BASIN IN ACCORDANCE WITH SECTION 5 OF THE JAMES CITY COUNTY BMP, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN GUIDES.

Final Asbuilt SIT Review Set
MP Pond #3 YC027; SP-25-02

RECEIVED APR 2 4 2006 ENVIRONMENTAL DIVISION

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

COMMONWEALTH OF VIRGINIA — G. ARCHER MARSTON, III — No. 018232 — 4/24/06 — PROFESSIONAL ENGINEER

No.	DATE	REVISION / COMMENT / NOTE	BY
5	4/24/06	FINAL CERTIFICATION	HWP
4	7/8/03	INTERIM CERTIFICATION	HWP
3	5/02/03	REVISED STORM STRUCTURES	HWP
2	4/18/03	REVISED PER JCC COMMENTS	HWP
1	3/19/03	SITE PLAN AMENDMENT NO. 1	HWP
3	12/18/02	REVISED PER JCC COMMENTS	HWP
2	10/3/02	REVISED PER JCC COMMENTS	HWP
1	8/8/02	REVISED PER JCC COMMENT LETTER DATED 6/27/02	HWP

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

PHASE 1 BMP PLAN
COLONIAL HERITAGE BOULEVARD
PHASE I
OWNER/DEVELOPER: COLONIAL HERITAGE LLC
STONEHOUSE JAMES CITY COUNTY VIRGINIA

Designed	Drawn
HWP/JAG	JAG/ARH
Scale	Date
NOTED	8/8/02
Project No.	
8881-05	
Drawing No.	
9	

RECORD DRAWING-4-24-06

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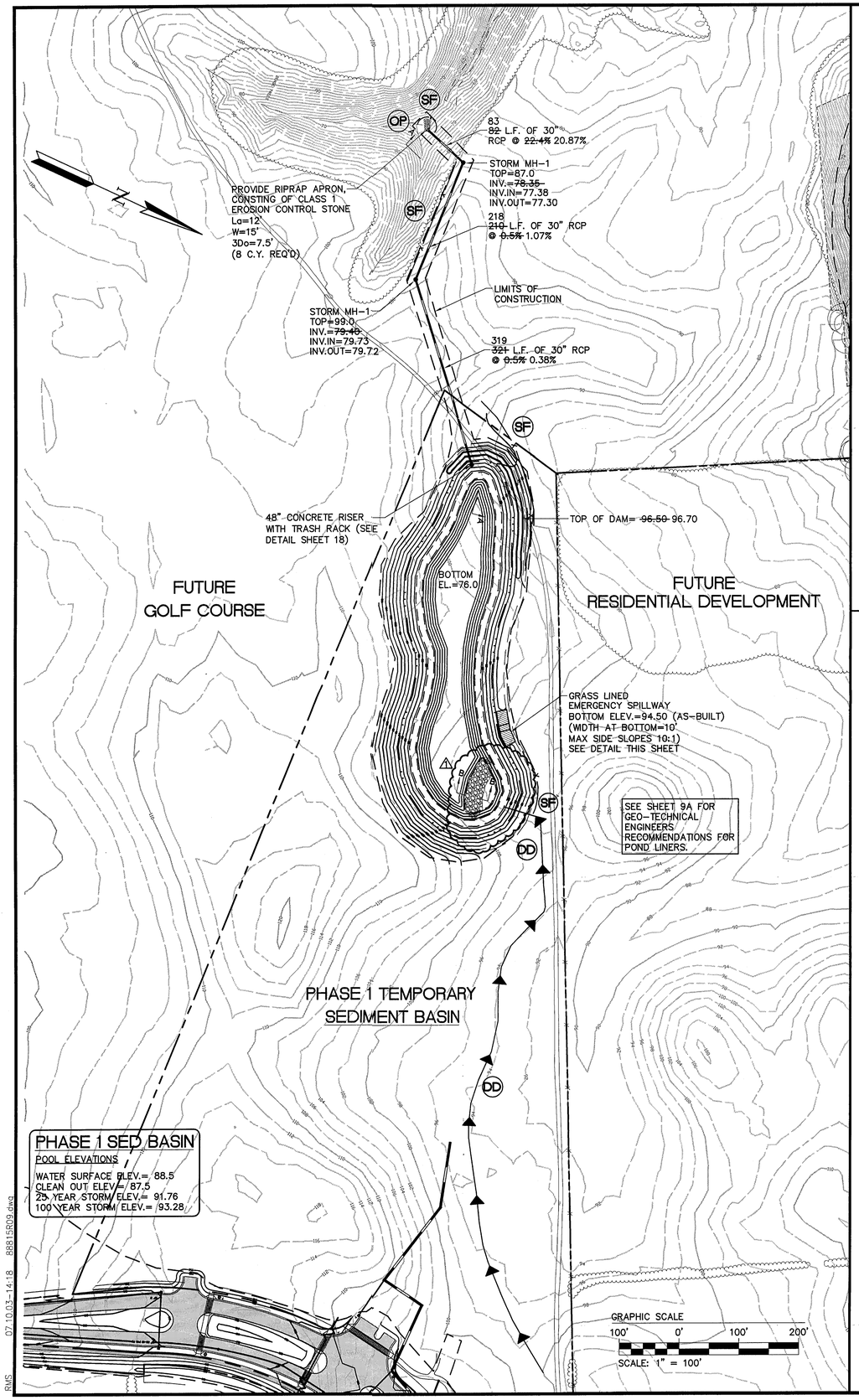
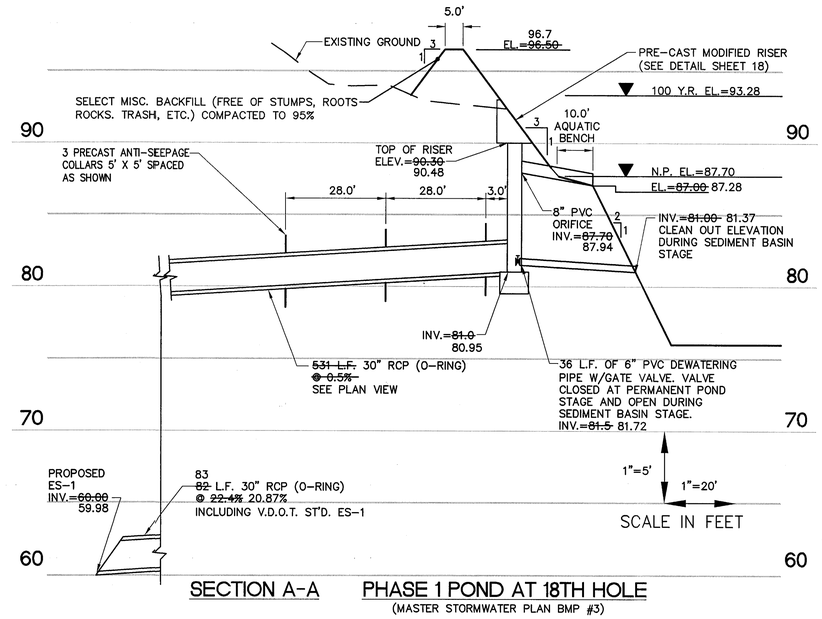
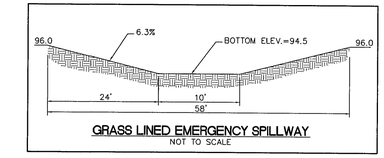




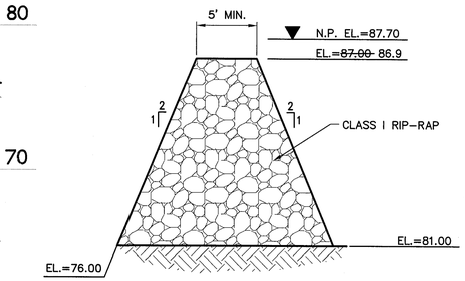
SECTION A-A PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)



GRASS LINED EMERGENCY SPILLWAY

NOT TO SCALE



SECTION B-B

N.T.S.

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

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

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE 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, 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 SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

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8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

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APPROVED
James City County
Environmental Division
By: _____
Date: 11-1-03

INTERIM CERTIFICATION

No.	DATE	REVISION / COMMENT / NOTE	BY
4	5/02/03	AS-BUILTS	HWP
4	5/02/03	REVISED STORM STRUCTURES	HWP
4	4/18/03	REVISED PER JCC COMMENTS	HWP
3	3/19/03	SITE PLAN AMENDMENT NO. 1	HWP
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1	8/8/02	REVISED PER JCC COMMENT LETTER DATED 8/27/02	HWP

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 016232
3/19/03
PROFESSIONAL ENGINEER

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

PHASE 1 BMP PLAN

COLONIAL HERITAGE BOULEVARD PHASE I

OWNER/DEVELOPER: COLONIAL HERITAGE LLC

STONEHOUSE JAMES CITY COUNTY VIRGINIA

Designed	Drawn
HWP/JAG	JAG/ARH
Scale	Date
NOTED	8/8/02

Project No. 8881-05

Drawing No. 9

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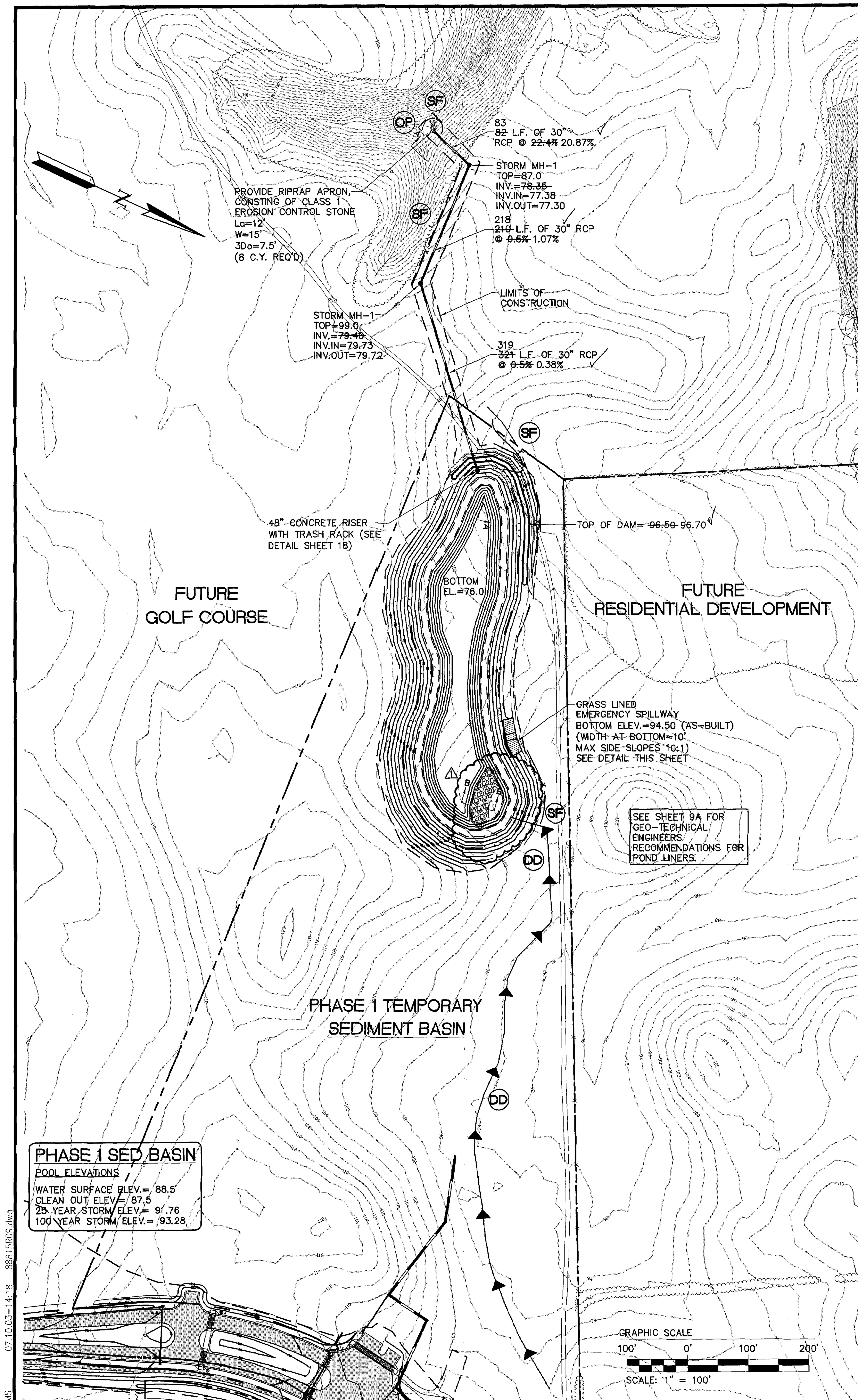

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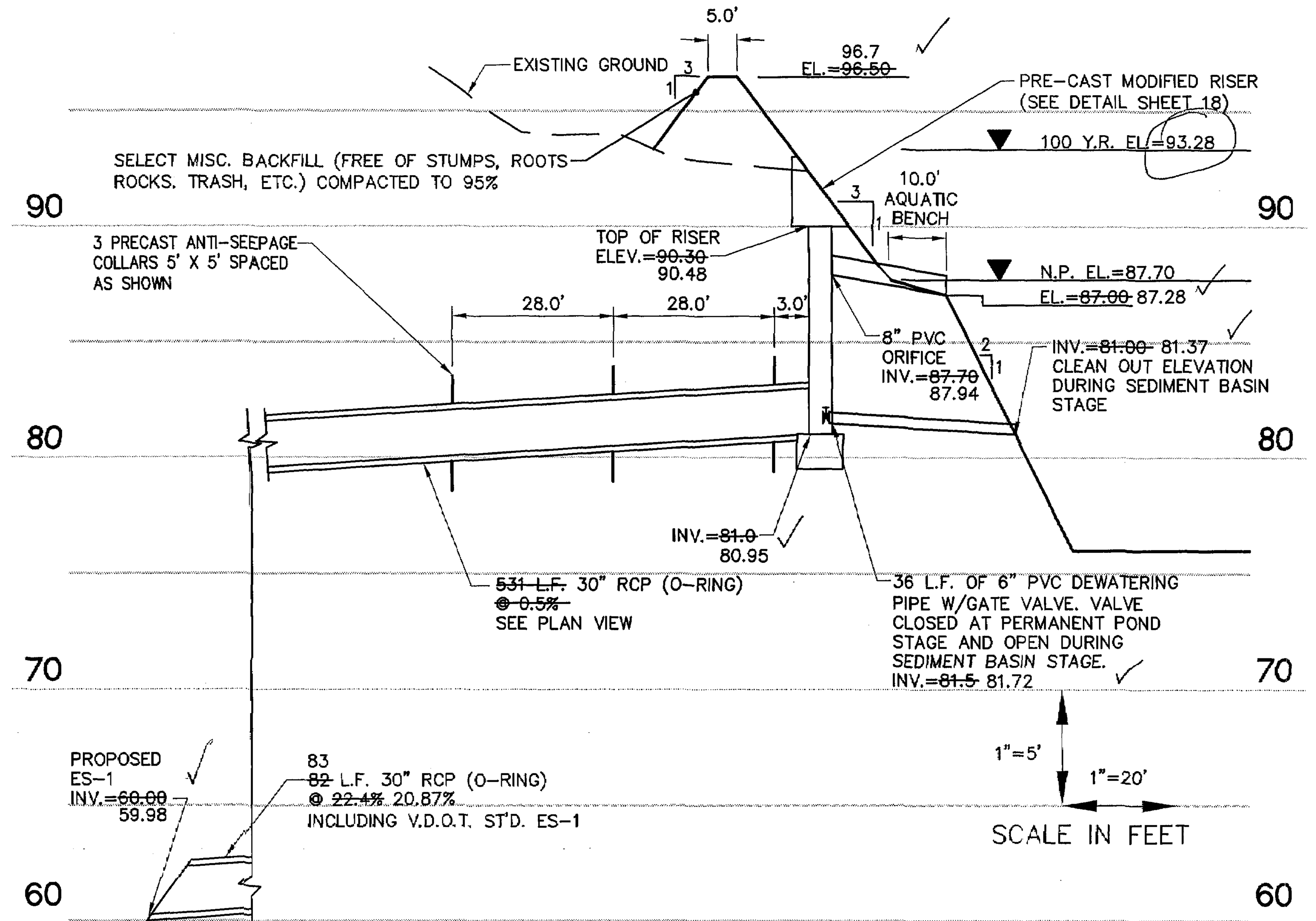
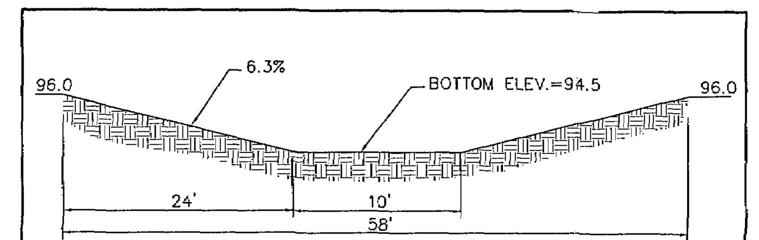
HMS



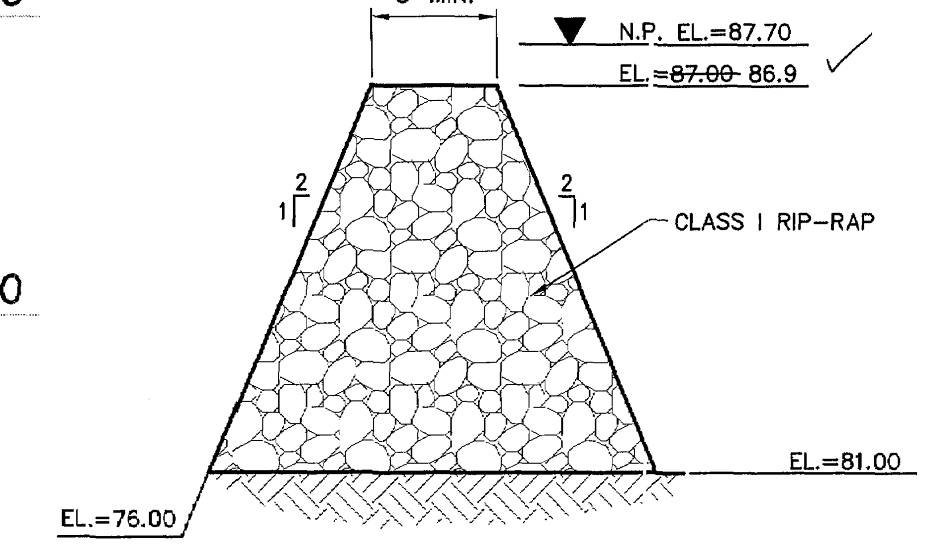
SECTION A-A PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)



GRASS LINED EMERGENCY SPILLWAY

NOT TO SCALE



SECTION B-B

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

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, *SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO* FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED 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 AS APPROPRIATE.

8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO *THE COUNTY UPON REQUEST.*

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

GENERAL NOTES FOR CONSTRUCTION OF STORMWATER BASINS

1. THE CONTRACTOR SHALL PROVIDE ALL WORK AND MATERIALS NEEDED TO CONSTRUCT THE STORMWATER BASIN, STORMWATER MANAGEMENT PONDS, BEST MANAGEMENT PRACTICES, SEDIMENT BASINS AND SEDIMENT TRAPS. THE WORK SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT AND MATERIALS NEEDED FOR THE COMPLETION OF GRADING AND EARTHWORK ASSOCIATED WITH THE CONSTRUCTION.

2. THE CONTRACTOR SHALL CONSULT AND PROVIDE FOR THE SERVICES OF A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS, IDENTIFYING SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX, AND COMPACTION. ALL TESTS SHALL BE IN CONFORMANCE WITH ASTM STANDARDS. THE COST OF THE SERVICES OF THE GEOTECHNICAL ENGINEER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SATISFACTORY GEOTECHNICAL RESULTS ARE NEEDED PRIOR TO FINAL APPROVAL.

3. ALL INSPECTIONS REQUIRED FOR THE WORK SHALL BE PERFORMED BY *A GEOTECHNICAL ENGINEER AT THE EXPENSE OF THE GENERAL* CONTRACTOR.

4. ON-SITE EXCAVATED MATERIAL, IF DETERMINED SUITABLE FOR USE IN DAM CONSTRUCTION BY A GEOTECHNICAL ENGINEER, MAY BE USED FOR DAM CONSTRUCTION. SHOULD ADDITIONAL MATERIAL BE REQUIRED, THE CONTRACTOR SHALL IDENTIFY THE NEED FOR MATERIAL TO THE OWNER, AS ADDITIONAL BORROW MATERIAL MAY BE AVAILABLE ON THE PROPERTY. ALL EXCAVATED MATERIAL DETERMINED BY THE GEOTECHNICAL ENGINEER TO BE UNSUITABLE SHALL BE DISPOSED OF PROPERLY AT THE CONTRACTOR'S EXPENSE. ALL EXCAVATED MATERIAL NOT REQUIRED *FOR BACKFILLING SHALL EITHER BE DEPOSITED ON SITE AND SPREAD* BY THE CONTRACTOR, OR SHALL BE DEPOSITED IN AN AREA ON THE PROPERTY AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL PROVIDE PROPER STABILIZATION, AND EROSION AND SEDIMENT CONTROL MEASURES NEEDED TO CONTROL AS PER THE VESCH THIRD EDITION.

5. UNDERCUT FOR THE FOUNDATION OF THE DAM EMBANKMENT SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. THE FOUNDATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SM, SC, OR CL UNDER THE UNIFIED SOIL CLASSIFICATION SYSTEM. SOILS SHALL HAVE A MINIMUM OF 15% BY WEIGHT FINES, HAVING A PLASTICITY INDEX OF 30% AND A PERMEABILITY OF 0.0004 IN./SEC. OR LESS. FILL SHALL BE COMPACTED IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO A DRY DENSITY OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). EXCAVATION FOR THE DAM KEY SHALL BE IN ACCORDANCE TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. HEIGHT, DEPTH, AND WIDTH OF THE KEY SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. THE KEY SHALL BE FORMED USING SOILS CLASSIFIED AS SC OR CL, WITH A PERMEABILITY OF 0.0004 IN./SEC. OR LESS.

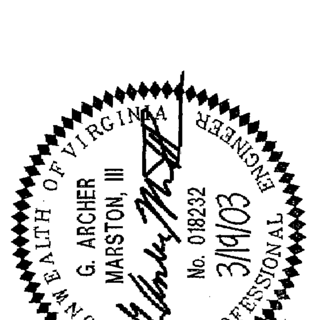
6. THE DAM CORE SHALL BE AS CONSTRUCTED WITH NON-EXPANSIVE SC OR CL CLAYEY MATERIAL WITH PERMEABILITY OF 0.0004 IN./SEC. OR LESS. THE FILL OF THE CORE SHALL BE MADE IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). SIZE, SHAPE, WIDTH, DEPTH, AND HEIGHT OF THE DAM CORE SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. TO COVER THE DAM CORE, A SILTY FINE SAND OR CLAYEY SOIL (SM, SC, OR CL) SHALL BE PLACED. A VEGETATIVE COVER USING VDOT EC-2 EROSION CONTROL BLANKETS SHALL BE PLACED ON DAM SLOPES AND CREST TO PREVENT EROSION.

7. THE STORMWATER MANAGEMENT / BMP FACILITIES SHOWN ON THESE PLANS REQUIRE THE SUBMISSION, REVIEW AND APPROVAL OF RECORD DRAWING(S) AND CONSTRUCTION CERTIFICATION PRIOR TO RELEASE OF THE POSTED BOND / SURETY. *THE GEOTECHNICAL ENGINEER IS TO ENSURE THAT HIS / HER INSPECTION OF THE* SWM / BMP CONSTRUCTION ACTIVITY IS PERFORMED DURING AND FOLLOWING CONSTRUCTION OF THE SWM / BMP IN ACCORDANCE WITH THE JAMES CITY COUNTY ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT / BMP FACILITIES DESIGN GUIDELINES HANDBOOK, DATED AUGUST 30, 2000.

8. THE CONTRACTOR SHALL PROVIDE INTERIM CERTIFICATION OF TEMPORARY SEDIMENT BASIN IN ACCORDANCE WITH SECTION 5 OF THE JAMES CITY COUNTY BMP, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN GUIDES.

INTERIM CERT MP #3
SP-75-02; YC027 PH1 BLVD
SJT REVIEW SET.

No.	DATE	REVISION / COMMENT / NOTE	BY
4	5/02/03	AS-BUILTS	HWP
3 (triangle)	5/02/03	REVISED STORM STRUCTURES	HWP
2 (triangle)	4/18/03	REVISED PER JCC COMMENTS	HWP
1 (triangle)	3/19/03	SITE PLAN AMENDMENT NO. 1	HWP
3	12/18/02	REVISED PER JCC COMMENTS	HWP
2	10/3/02	REVISED PER JCC COMMENTS	HWP
1	8/8/02	REVISED PER JCC COMMENT LETTER DATED 6/27/02	HWP

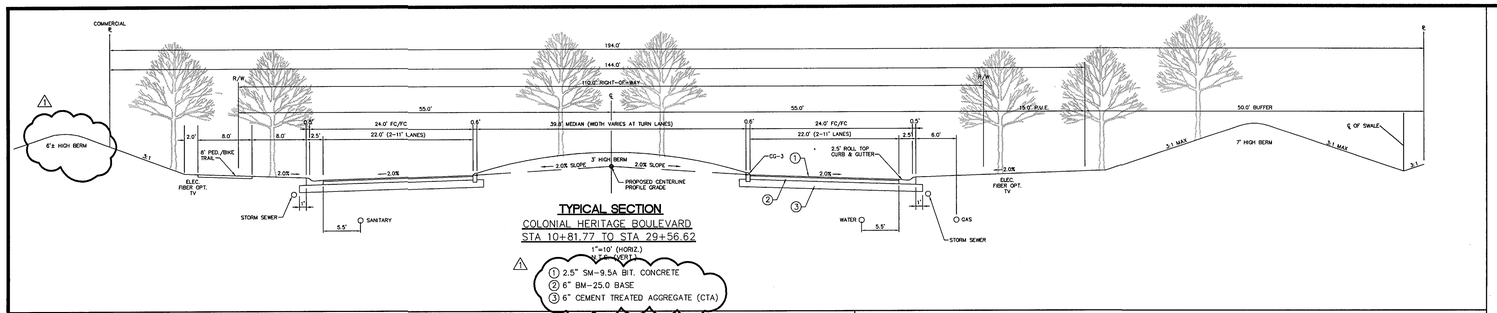


5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
(757) 253-0040
Fax (757) 220-8994

CONSULTING ENGINEERS

PHASE 1 BMP PLAN
COLONIAL HERITAGE BOULEVARD
PHASE I
OWNER/DEVELOPER: COLONIAL HERITAGE LLC
STONEHOUSE JAMES CITY COUNTY VIRGINIA

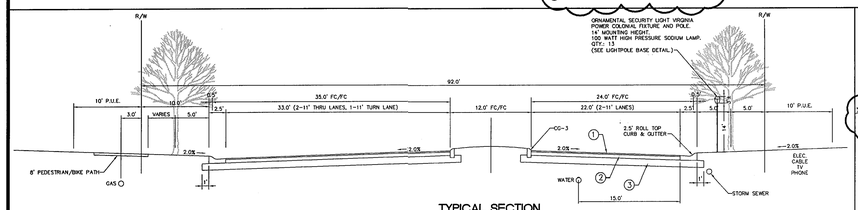
Designed	Drawn
HWP/JAG	JAG/ARH
Scale	Date
NOTED	8/8/02
Project No.	
8881-05	
Drawing No.	
9	



TYPICAL SECTION
COLONIAL HERITAGE BOULEVARD
STA 10+81.77 TO STA 29+56.62

1"=10' (HORIZ.)
N.T.S. (VERT.)

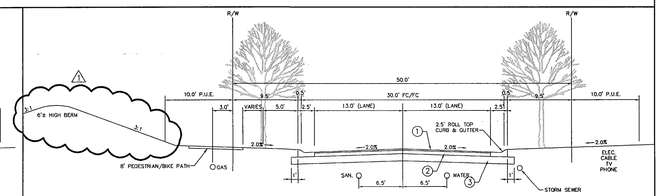
1. 2.5" SM-9.5A BIT. CONCRETE
2. 6" BM-25.0 BASE
3. 6" CEMENT TREATED AGGREGATE (CTA)



TYPICAL SECTION
ARTHUR HILLS DRIVE
STA 10+00 TO STA 11+00

1"=10' (HORIZ.)
N.T.S. (VERT.)

1. 2.5" SM-9.5A BIT. CONCRETE
2. 3" BM-25.0 BASE
3. 6" CEMENT TREATED AGGREGATE (CTA)



TYPICAL SECTION
COLONIAL HERITAGE BOULEVARD
AT STA 29+56.62

1"=10' (HORIZ.)
N.T.S. (VERT.)

1. 2.5" SM-9.5A BIT. CONCRETE
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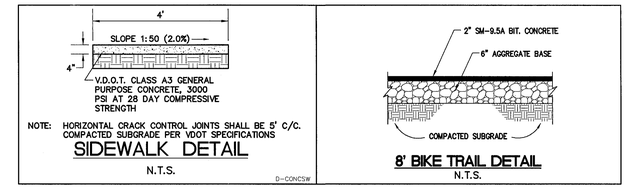
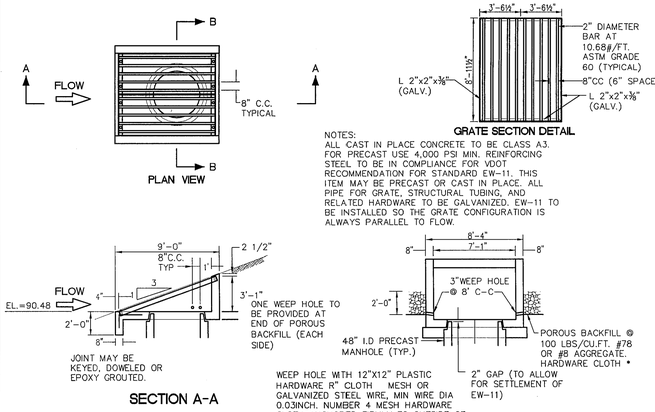
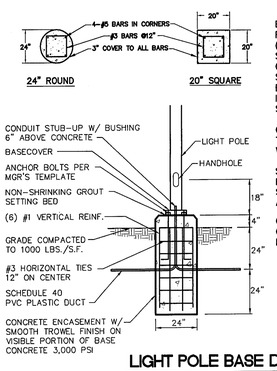


SIDEWALK DETAIL
N.T.S.

8' BIKE TRAIL DETAIL
N.T.S.



MODIFIED EW-11 WITH GRATE
NOT TO SCALE



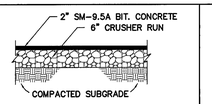
LIGHT POLE BASE DETAIL
N.T.S.

ELECTRICAL CONDUITS SHALL MEET NEC REQUIREMENTS AND VDOT SPECIFICATIONS (SECTION 700 OF VDOT ROAD AND BRIDGE SPECIFICATIONS) AND SHALL BE A MINIMUM OF 18" BELOW GRADE. CONDUIT PULL BOXES SHALL BE CONFORMING TO VDOT ROAD AND BRIDGE STANDARD JB-3A AND SHALL BE INSTALLED IN ACCORDANCE TO VDOT SPECIFICATIONS.

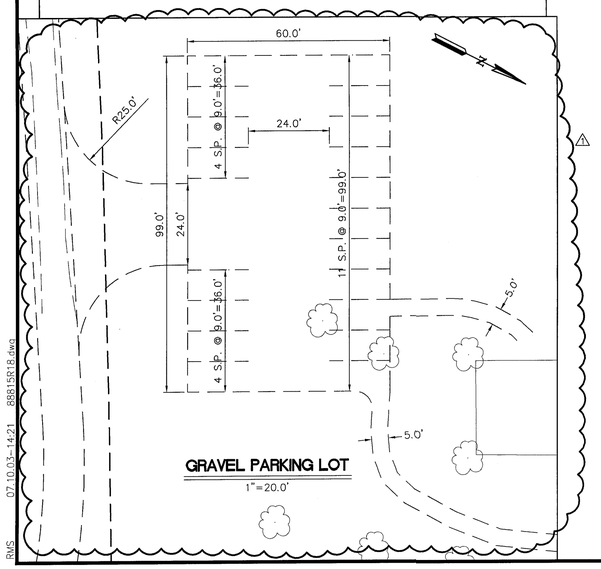
CONDUIT ELBOWS SHALL HAVE A 90° BEND. THE BEND RADIUS SHALL BE IN ACCORDANCE WITH THE NEC.

SIZING OF ELECTRICAL SERVICE WIRING SHALL BE THE CONTRACTORS RESPONSIBILITY AND SHALL MEET NEC REQUIREMENTS FOR APPLICATION.

CONTRACTOR SHALL ENSURE THE COMPATIBILITY OF LAMP, FIXTURE, POLE, AND POLE BASE.



TYPICAL PAVEMENT SECTION
N.T.S.



GRAVEL PARKING LOT
1"=20.0'

COLONIAL HERITAGE
'OUTLINE OF THE INSPECTION PROCEDURE FOR CONSTRUCTION OF PRIVATE STREETS'

1. THE ENGINEER WILL CONTACT A SOILS TESTING FIRM (GEOTECHNICAL ENGINEER) TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF THE CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL INCLUDE AS A MINIMUM THE FOLLOWING:

   A) NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.

   B) SOILS ENGINEERING ANALYSIS.

   C) RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE, MODIFICATIONS TO THE SUBBASE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.

2. UPON COMPLETION OF ROAD GRADING TO SUBGRADE, THE GEOTECHNICAL ENGINEER SHALL BE PRESENT FOR A PROOFROLL TO DETERMINE ADEQUACY OF COMPACTION. ANY RECOMMENDATIONS FOR UNSUITABLE MATERIAL WILL BE GIVEN AT THIS TIME.

3. SUBBASE AND BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.

4. A COPY OF THE GEOTECHNICAL ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF SUBBASE AND BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE GEOTECHNICAL ENGINEER'S REPORT, SUBBASE AND BASE MATERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY GEOTECHNICAL ENGINEER'S RECOMMENDATION) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE SUBBASE AND BASE MATERIAL AT LEAST ONCE EVERY 250 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.

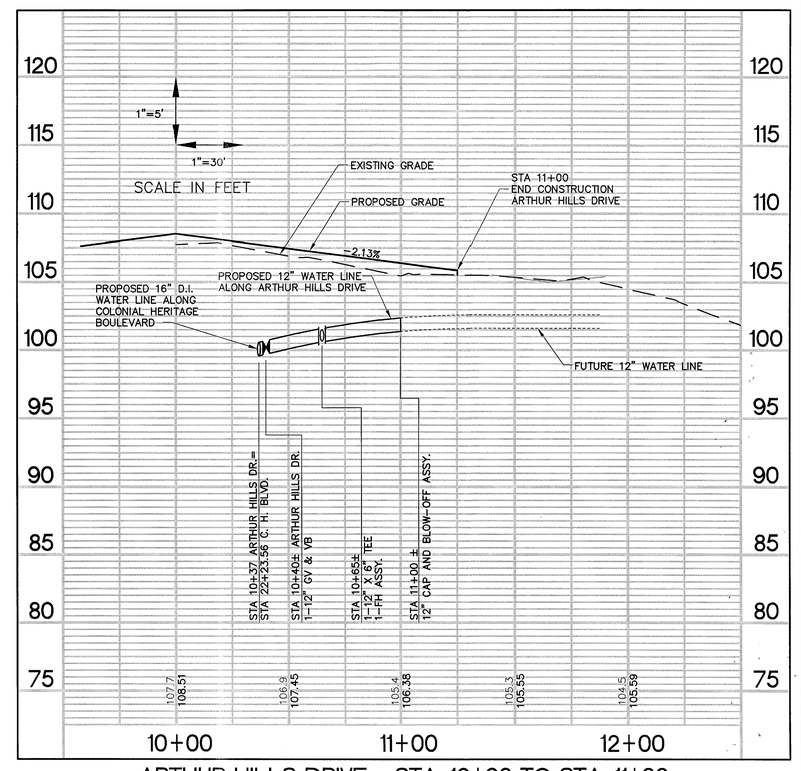
5. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFICATE AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.

6. DURING THE PLACEMENT OF THE BITUMINOUS CONCRETE AND PRIOR TO ITS COMPACTION, PRE-ROLLED DEPTH MEASUREMENTS OF THE ASPHALT SHALL BE INSPECTED BY THE ENGINEER, IN THE PRESENCE OF THE CONTRACTOR, AT A MINIMUM OF 500 FT. INTERVALS. FOR PURPOSES OF DETERMINING THE PRE-ROLLED DEPTH ADD AN ADDITIONAL 1/4 INCH OF PRE-ROLLED ASPHALT FOR EACH 1.5 INCHES OF ROLLED/COMPACTED DEPTH CALLED FOR ON THE PLANS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE TO BE IMMEDIATELY INSTALLED BY THE CONTRACTOR AT THE APPROPRIATE LOCATIONS. THE ENGINEER WILL PRESENT THE TEST RESULTS TO THE COUNTY ENGINEER. THE INSTALLATION OF MULTIPLE COURSES WILL REQUIRE THE TESTING/INSPECTION OF EACH INDIVIDUAL COURSE.

7. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. THE NUMBER OF SAMPLES IN EACH CASE WILL BE, AS A MINIMUM, THE TOTAL LENGTH OF ROADS TESTED DIVIDED BY THE REQUIRED INTERVAL. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY PRIOR TO THE ACTUAL INSPECTIONS.

8. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO PARTIAL RELEASE OF SURETY.

9. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).



ARTHUR HILLS DRIVE - STA. 10+00 TO STA. 11+00

No.	DATE	REVISION / COMMENT / NOTE	BY
4	5/02/03	REVISED STORM STRUCTURES	HWP
5	5/02/03	REVISED PER JCC COMMENTS	HWP
4	4/18/03	SITE PLAN AMENDMENT NO. 1	HWP
3	3/19/03	REVISED PER JCC COMMENTS	HWP
3	12/18/02	REVISED PER JCC COMMENTS	HWP
2	10/1/02	REVISED PER JCC COMMENT LETTER DATED 6/27/02	HWP
1	8/8/02	AS-BUILTS	HWP

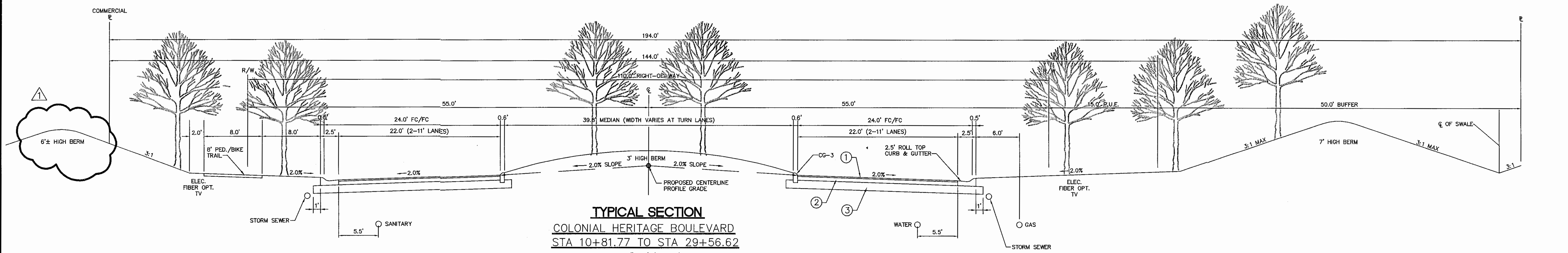
COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
PROFESSIONAL ENGINEER
3/19/03

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

NOTES AND DETAILS
COLONIAL HERITAGE BOULEVARD
PHASE I
OWNER/DEVELOPER: COLONIAL HERITAGE LLC
JAMES CITY COUNTY VIRGINIA

Designed HWP	Drawn ARH
Scale AS SHOWN	Date 8/8/02
Project No. 8881-05	
Drawing No. 18	

07.10.03-14:21 8881SR18.dwg
RWS



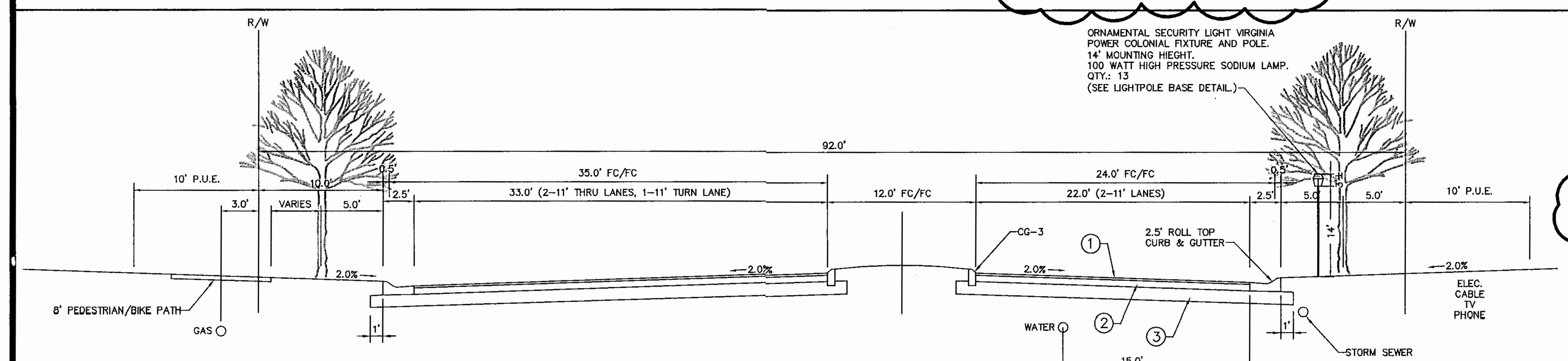
TYPICAL SECTION

COLONIAL HERITAGE BOULEVARD

STA 10+81.77 TO STA 29+56.62

1"=10' (HORIZ.)
N.T.S. (VERT.)

1. 2.5" SM-9.5A BIT. CONCRETE
2. 6" BM-25.0 BASE
3. 6" CEMENT TREATED AGGREGATE (CTA)



TYPICAL SECTION

ARTHUR HILLS DRIVE

STA 10+00 TO STA 11+00

1"=10' (HORIZ.)
N.T.S. (VERT.)

1. 2.5" SM-9.5A BIT. CONCRETE
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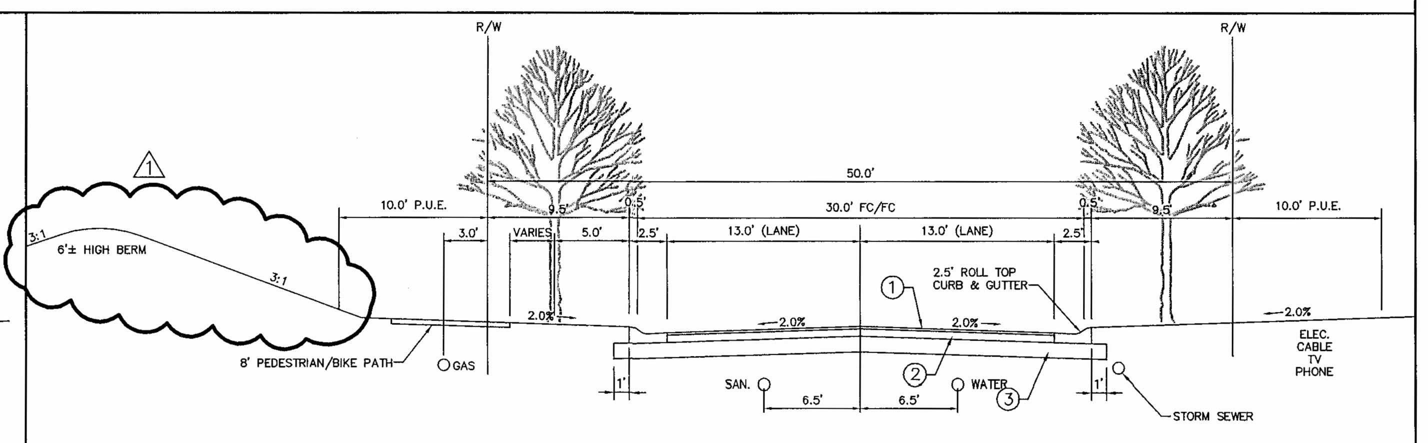

TYPICAL SECTION

COLONIAL HERITAGE BOULEVARD

AT STA 29+56.62

1"=10' (HORIZ.)
N.T.S. (VERT.)

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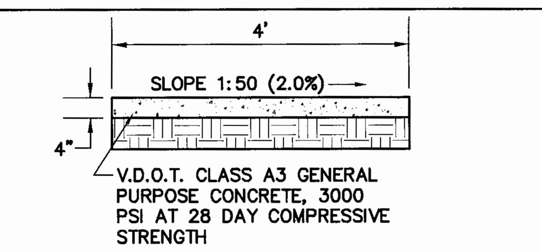
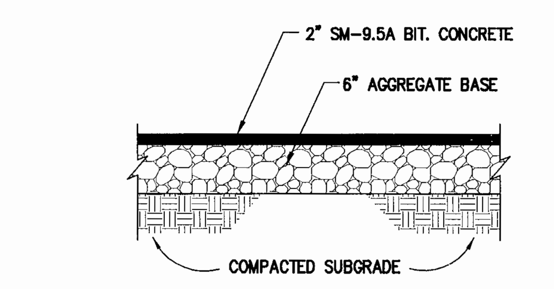


NOTE: HORIZONTAL CRACK CONTROL JOINTS SHALL BE 5' C/C. COMPACTED SUBGRADE PER VDOT SPECIFICATIONS

SIDEWALK DETAIL

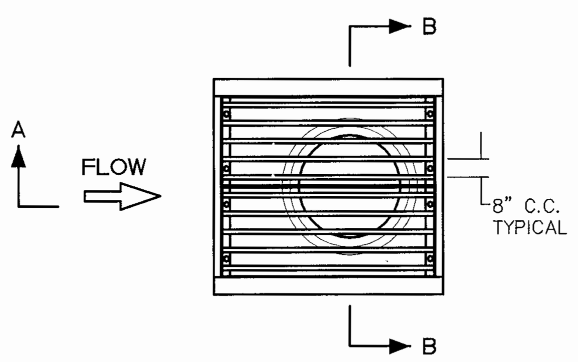
N.T.S.

D-CONCSW

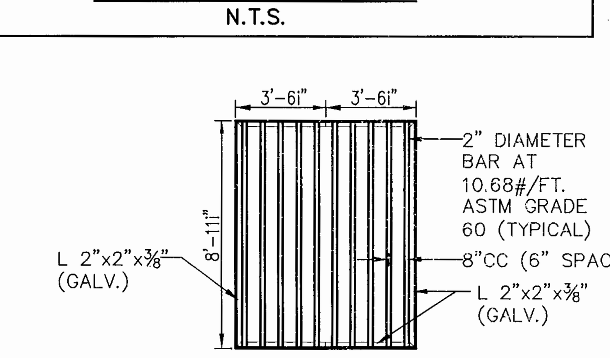


8' BIKE TRAIL DETAIL

N.T.S.

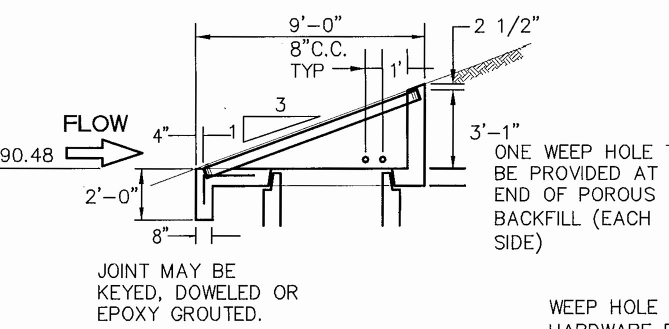


PLAN VIEW

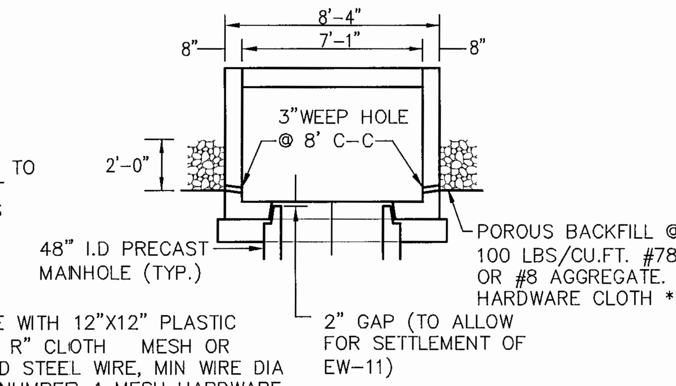


GRATE SECTION DETAIL

NOTES:
ALL CAST IN PLACE CONCRETE TO BE CLASS A3. FOR PRECAST USE 4,000 PSI MIN. REINFORCING STEEL TO BE IN COMPLIANCE FOR VDOT RECOMMENDATION FOR STANDARD EW-11. THIS ITEM MAY BE PRECAST OR CAST IN PLACE. ALL PIPE FOR GRATE, STRUCTURAL TUBING, AND RELATED HARDWARE TO BE GALVANIZED. EW-11 TO BE INSTALLED SO THE GRATE CONFIGURATION IS ALWAYS PARALLEL TO FLOW.



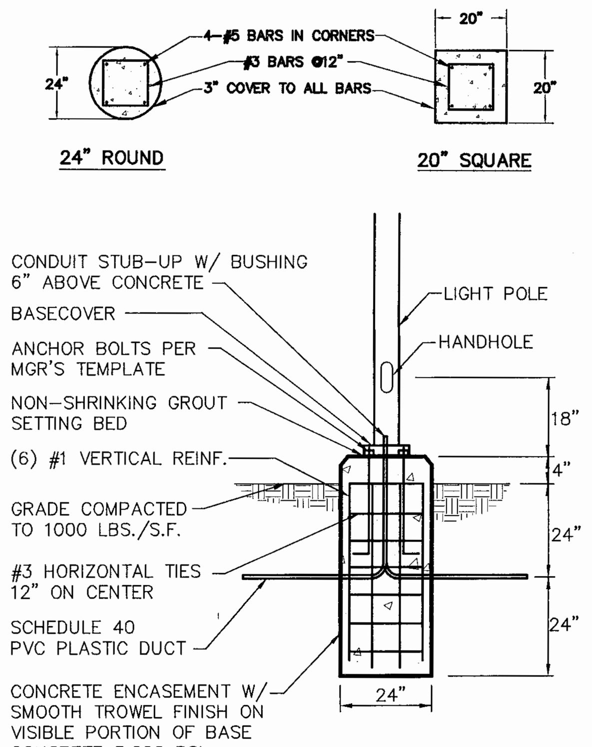
SECTION A-A



GRATE REMOVED SECTION B-B

MODIFIED EW-11 WITH GRATE

NOT TO SCALE



ELECTRICAL CONDUITS SHALL MEET NEC REQUIREMENTS AND VDOT SPECIFICATIONS (SECTION 700 OF VDOT ROAD AND BRIDGE SPECIFICATIONS) AND SHALL BE A MINIMUM OF 18" BELOW GRADE. CONDUIT PULL BOXES SHALL BE CONFORMING TO VDOT ROAD AND BRIDGE STANDARD JB-3A AND SHALL BE INSTALLED IN ACCORDANCE TO VDOT SPECIFICATIONS.

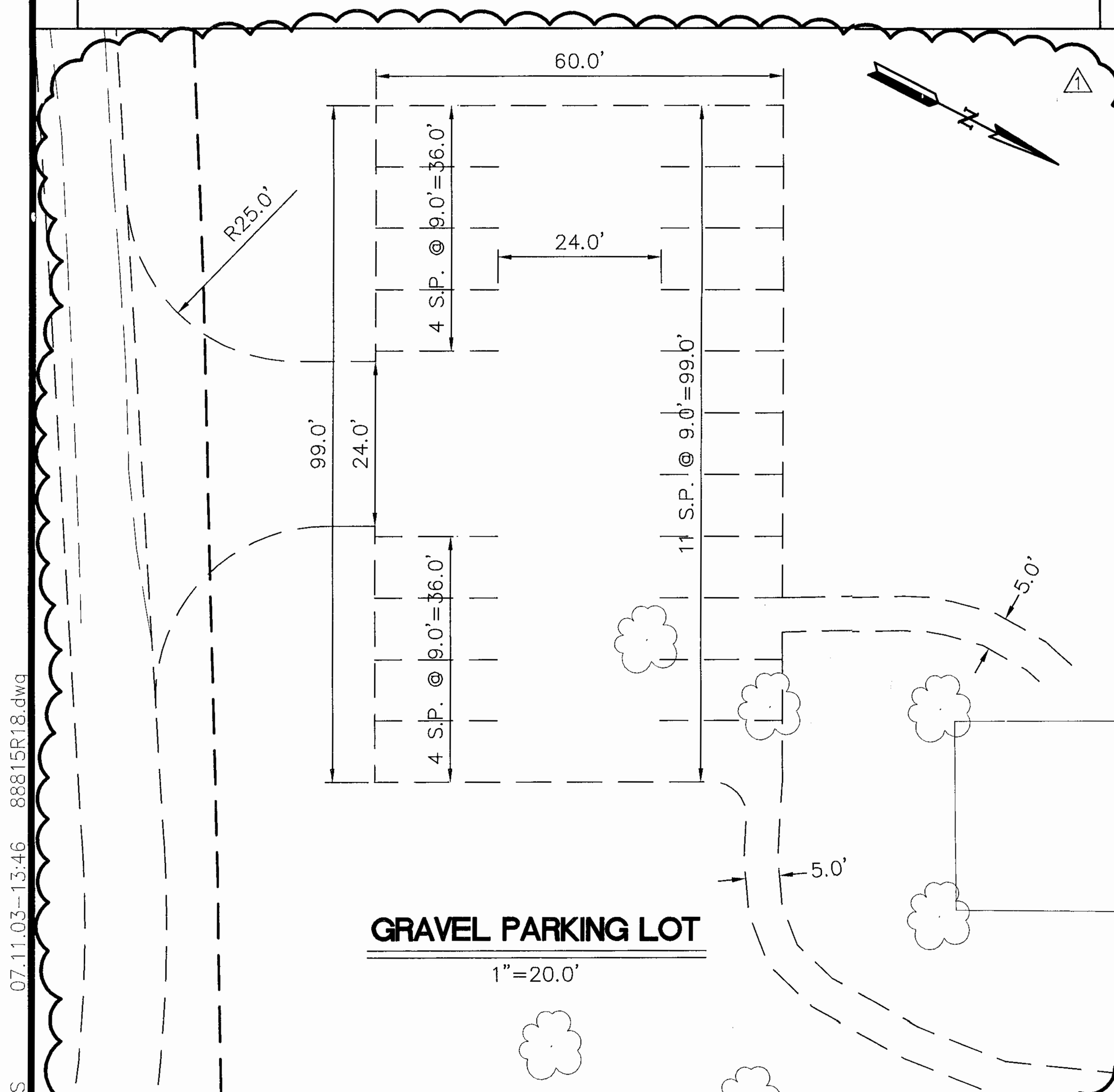
CONDUIT ELBOWS SHALL HAVE A 90° BEND. THE BEND RADIUS SHALL BE IN ACCORDANCE WITH THE NEC.

SIZING OF ELECTRICAL SERVICE WIRING SHALL BE THE CONTRACTOR'S RESPONSIBILITY AND SHALL MEET NEC REQUIREMENTS FOR APPLICATION.

CONTRACTOR SHALL ENSURE THE COMPATIBILITY OF LAMP, FIXTURE, POLE, AND POLE BASE.

LIGHT POLE BASE DETAIL

N.T.S.



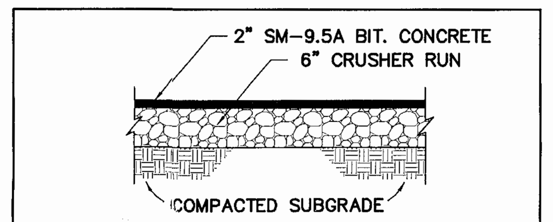
GRAVEL PARKING LOT

1"=20.0'

COLONIAL HERITAGE

"OUTLINE OF THE INSPECTION PROCEDURE FOR CONSTRUCTION OF PRIVATE STREETS"

1. THE ENGINEER WILL CONTACT A SOILS TESTING FIRM (GEOTECHNICAL ENGINEER) TO OBTAIN REPRESENTATIVE CBR SAMPLES. THE LOCATION AND NUMBER OF THE CBR (CALIFORNIA BEARING RATIO) SAMPLES IS TO BE DETERMINED BY THE SOILS ENGINEER. THE SOILS ENGINEER SHALL THEN PREPARE A REPORT WHICH SHALL INCLUDE AS A MINIMUM THE FOLLOWING:
   - A) NUMBER AND LOCATION (INCLUDING MAP) OF CBR SAMPLES AND TEST RESULTS OF THE SAMPLES.
   - B) SOILS ENGINEERING ANALYSIS.
   - C) RECOMMENDATIONS INCLUDING REQUIRED ALTERATIONS OF THE BASE MATERIAL APPLICATION RATE, MODIFICATIONS TO THE SUBBASE IF REQUIRED, ETC. FROM THOSE DESIGNS SHOWN ON THE APPROVED CONSTRUCTION DRAWINGS.
2. UPON COMPLETION OF ROAD GRADING TO SUBGRADE, THE GEOTECHNICAL ENGINEER SHALL BE PRESENT FOR A PROOFROLL TO DETERMINE ADEQUACY OF COMPACTION. ANY RECOMMENDATIONS FOR UNSUITABLE MATERIAL WILL BE GIVEN AT THIS TIME.
3. SUBBASE AND BASE MATERIAL WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFIED AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
4. A COPY OF THE GEOTECHNICAL ENGINEERING REPORT SHALL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO THE PLACEMENT OF SUBBASE AND BASE MATERIAL. AFTER THE COUNTY ENGINEER HAS REVIEWED AND APPROVED THE GEOTECHNICAL ENGINEER'S REPORT, SUBBASE AND BASE MATERIAL WILL BE APPLIED AT THE DEPTHS NECESSARY TO PROVIDE REQUIRED DEPTH (EITHER BY PLAN OR BY GEOTECHNICAL ENGINEER'S RECOMMENDATION) AFTER COMPACTION. THE CONTRACTOR, IN THE PRESENCE OF THE ENGINEER, WILL TEST THE DEPTH OF THE SUBBASE AND BASE MATERIAL AT LEAST ONCE EVERY 250 LINEAR FEET AND REPORT THE RESULTS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL MATERIAL AND SUBSEQUENT RETESTING. THE ENGINEER WILL PROVIDE THE TEST RESULTS TO THE COUNTY ENGINEER.
5. BITUMINOUS CONCRETE WILL BE SUPPLIED AND CERTIFIED BY A VDOT CERTIFICATE AND BONDED SOURCE. EVIDENCE OF THIS WILL BE PROVIDED VIA INVOICES FROM SUPPLIER.
6. DURING THE PLACEMENT OF THE BITUMINOUS CONCRETE AND PRIOR TO ITS COMPACTION, PRE-ROLLED DEPTH MEASUREMENTS OF THE ASPHALT SHALL BE INSPECTED BY THE ENGINEER, IN THE PRESENCE OF THE CONTRACTOR, AT A MINIMUM OF 500 FT. INTERVALS. FOR PURPOSES OF DETERMINING THE PRE-ROLLED DEPTH ADD AN ADDITIONAL 1/4 INCH OF PRE-ROLLED ASPHALT FOR EACH 1.5 INCHES OF ROLLED/COMPACTED DEPTH CALLED FOR ON THE PLANS. INADEQUATE DEPTHS WILL REQUIRE ADDITIONAL BITUMINOUS CONCRETE TO BE IMMEDIATELY INSTALLED BY THE CONTRACTOR AT THE APPROPRIATE LOCATIONS. THE ENGINEER WILL PRESENT THE TEST RESULTS TO THE COUNTY ENGINEER. THE INSTALLATION OF MULTIPLE COURSES WILL REQUIRE THE TESTING/INSPECTION OF EACH INDIVIDUAL COURSE.
7. REPORTING WILL BE PERFORMED BY A CONTRACTOR AND THE LICENSED ENGINEER AS OUTLINED ABOVE. THE NUMBER OF SAMPLES IN EACH CASE WILL BE, AS A MINIMUM, THE TOTAL LENGTH OF ROADS TESTED DIVIDED BY THE REQUIRED INTERVAL. IN ORDER TO PRESERVE THE INTEGRITY OF THE PROJECT'S CONSTRUCTION, A PLAN DEPICTING THE SAMPLING LOCATIONS WILL BE PROVIDED TO THE COUNTY PRIOR TO THE ACTUAL INSPECTIONS.
8. INTERIM STATEMENTS FROM THE ENGINEER, WITH ACCOMPANYING DOCUMENTATION, WILL BE SUBMITTED TO THE COUNTY ENGINEER PRIOR TO PARTIAL RELEASE OF SURETY.
9. APPLICATION FOR FINAL RELEASE OF SURETY WILL BE ACCOMPANIED BY THE CONTRACTOR'S STATEMENT AND CERTIFICATION THAT THE SPECIFICALLY NAMED PRIVATE STREETS HAVE BEEN CONSTRUCTED IN ACCORDANCE WITH THE APPROVED PLANS AND APPLICABLE VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARDS. CONTRACTOR'S CERTIFICATION SHALL BE SUPPORTED BY THE INSPECTIONS PERFORMED BY THE ENGINEER (SEE ABOVE).

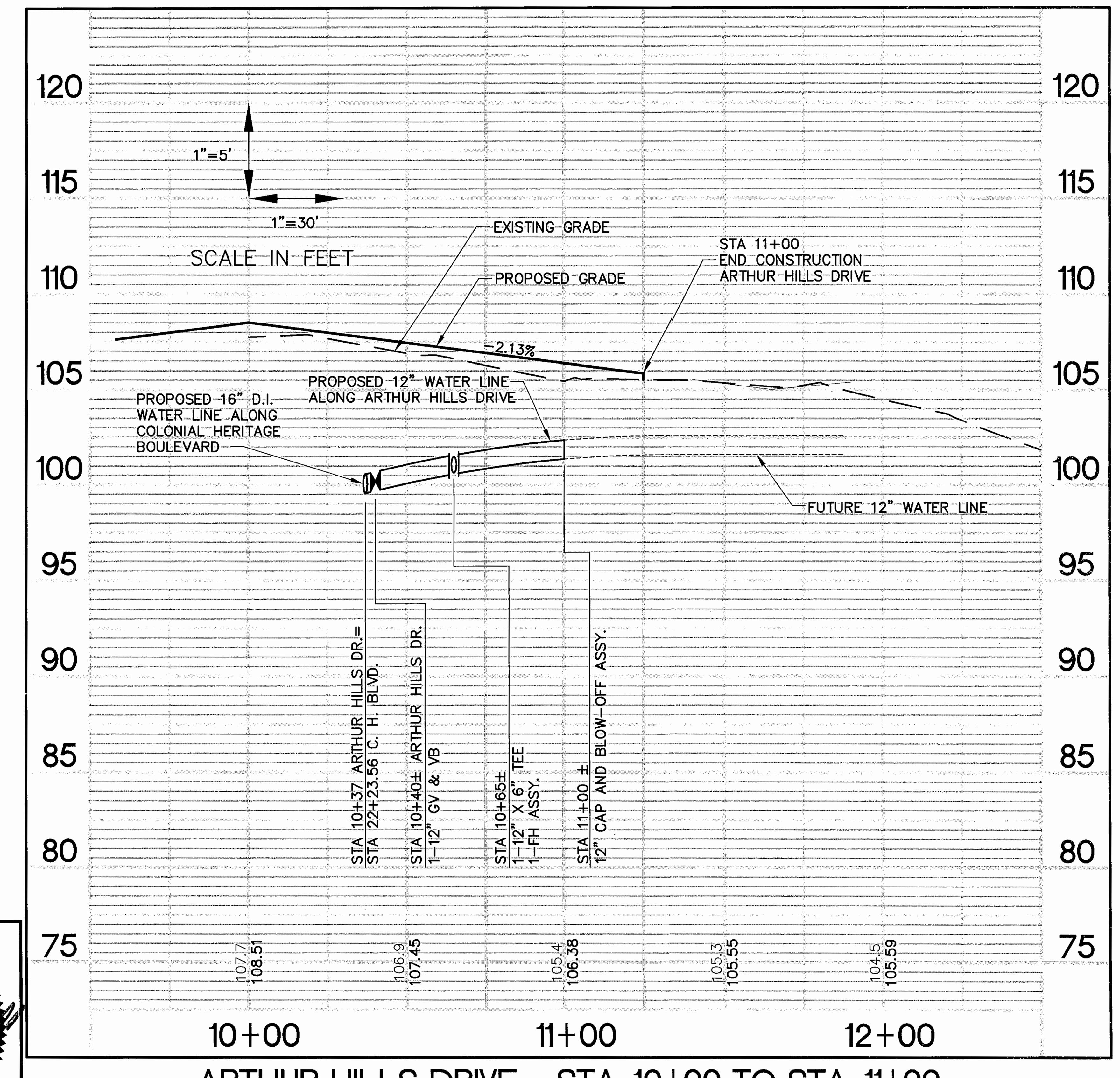


TYPICAL PAVEMENT SECTION

N.T.S.

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

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
4/24/06
PROFESSIONAL ENGINEER



ARTHUR HILLS DRIVE - STA. 10+00 TO STA. 11+00

No.	DATE	REVISION / COMMENT / NOTE	BY
5	4/24/06	FINAL CERTIFICATION	HWP
4	7/8/03	INTERIM CERTIFICATION	HWP
3	5/02/03	REVISED STORM STRUCTURES	HWP
2	4/18/03	REVISED PER JCC COMMENTS	HWP
1	3/19/03	SITE PLAN AMENDMENT NO. 1	HWP
3	12/18/02	REVISED PER JCC COMMENTS	HWP
2	10/3/02	REVISED PER JCC COMMENTS	HWP
1	8/8/02	REVISED PER JCC COMMENT LETTER DATED 6/27/02	HWP

COMMONWEALTH OF VIRGINIA
G. ARCHER MARSTON, III
No. 018232
4/24/06
PROFESSIONAL ENGINEER

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

AES CONSULTING ENGINEERS

NOTES AND DETAILS
COLONIAL HERITAGE BOULEVARD PHASE I

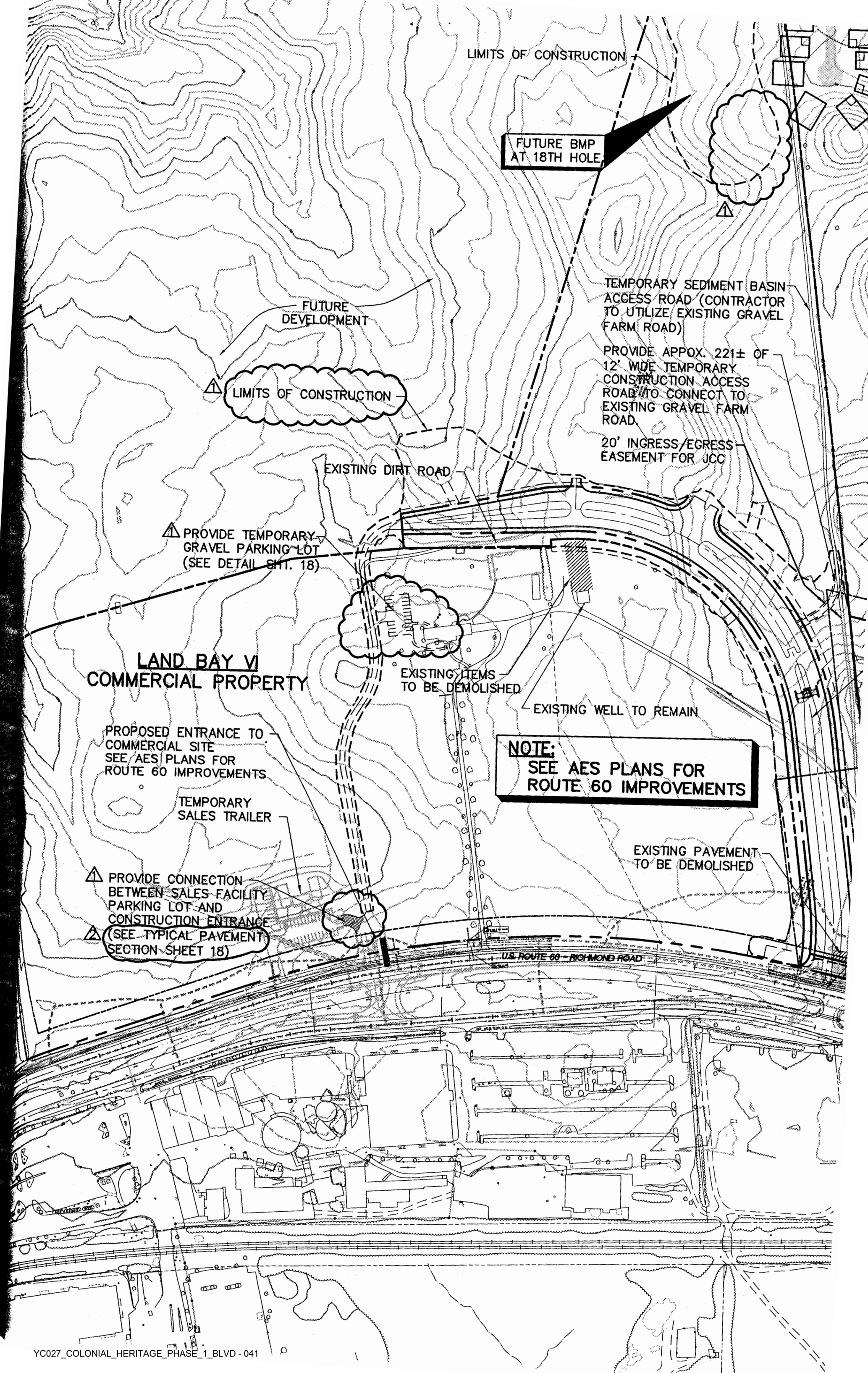
OWNER/DEVELOPER: COLONIAL HERITAGE LLC

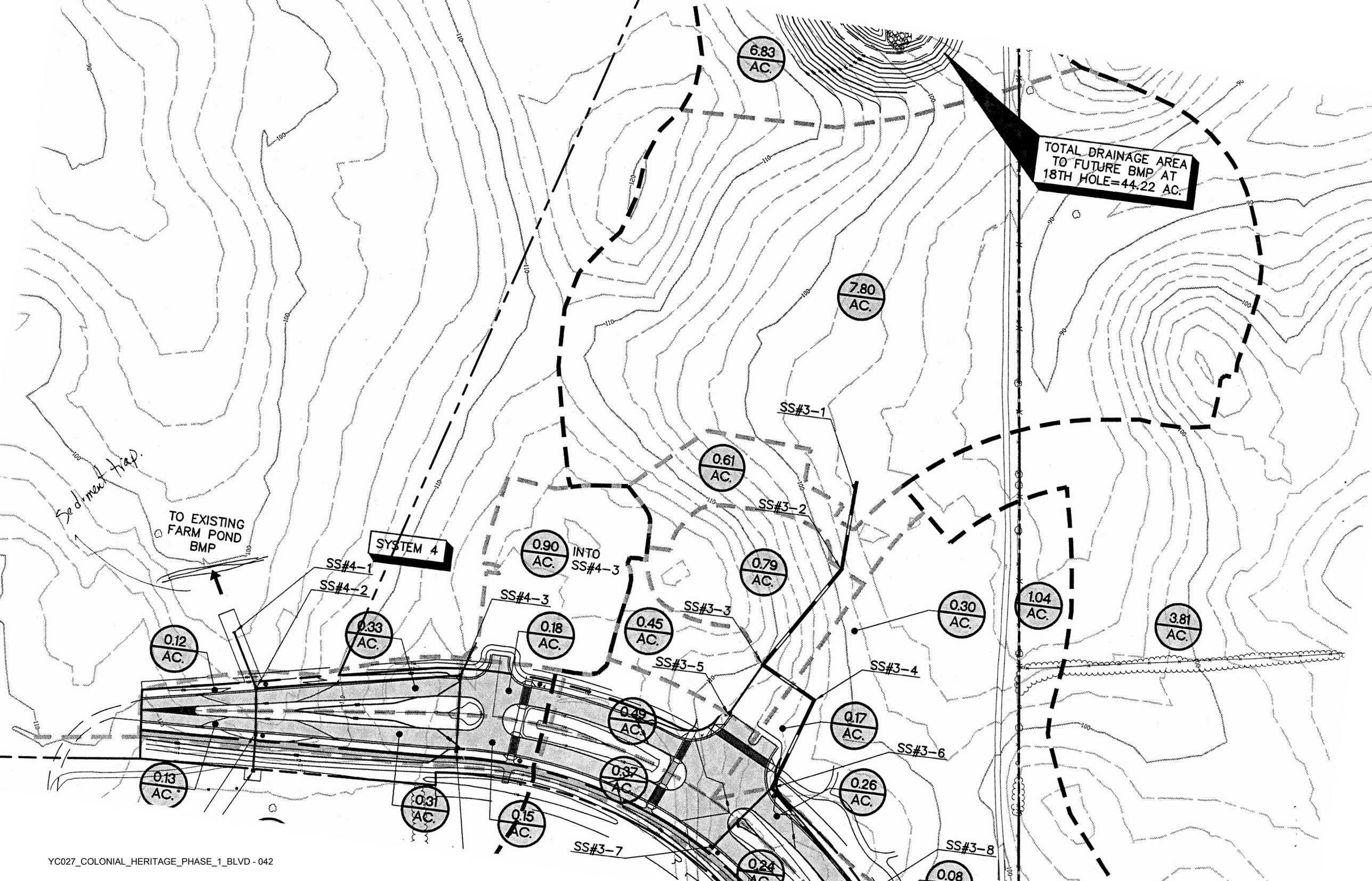
STONEHOUSE JAMES CITY COUNTY VIRGINIA

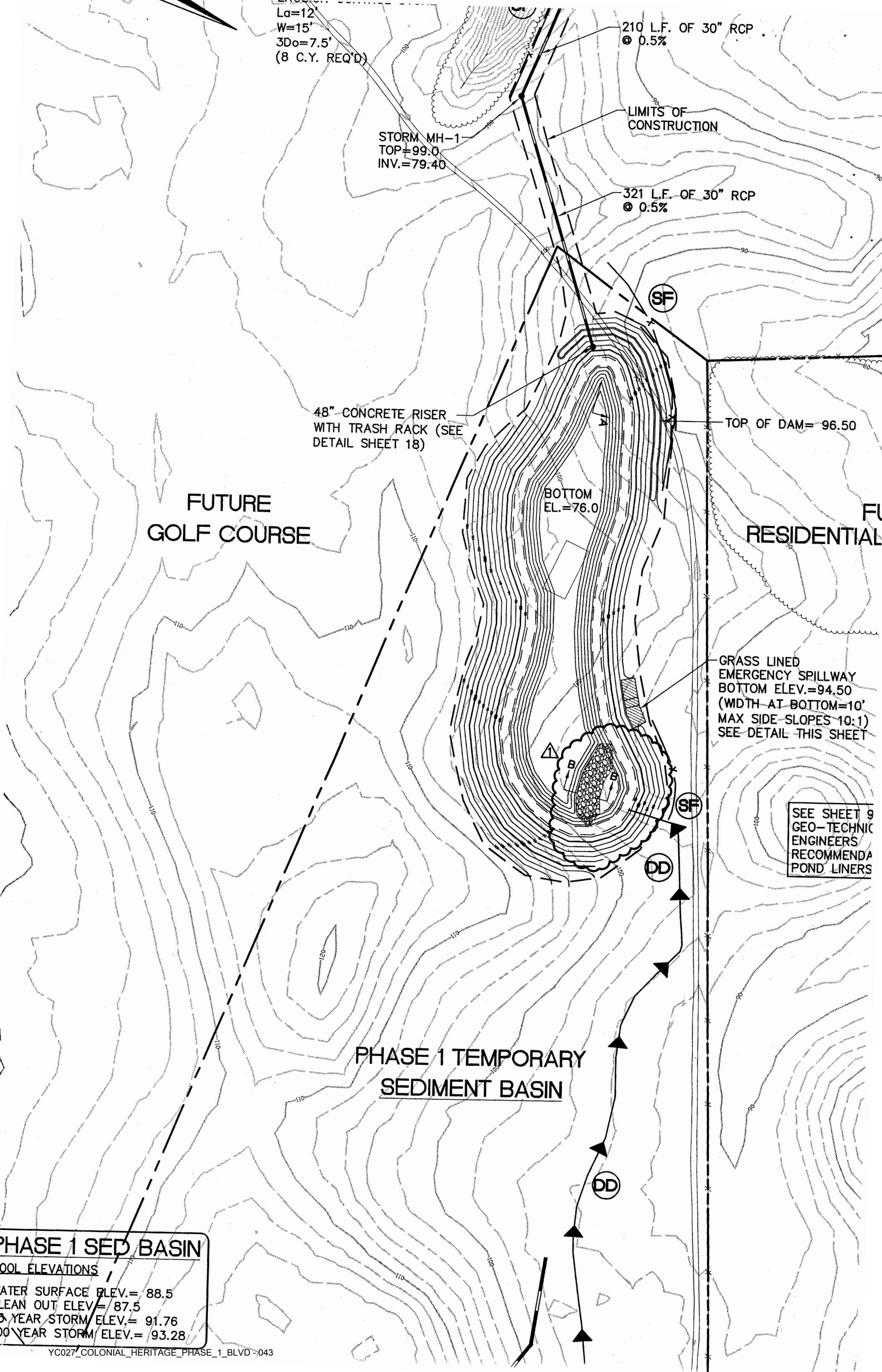
Designed	Drawn
HWP	ARH
Scale	Date
AS SHOWN	8/8/02
Project No.	
8881-05	
Drawing No.	
18	

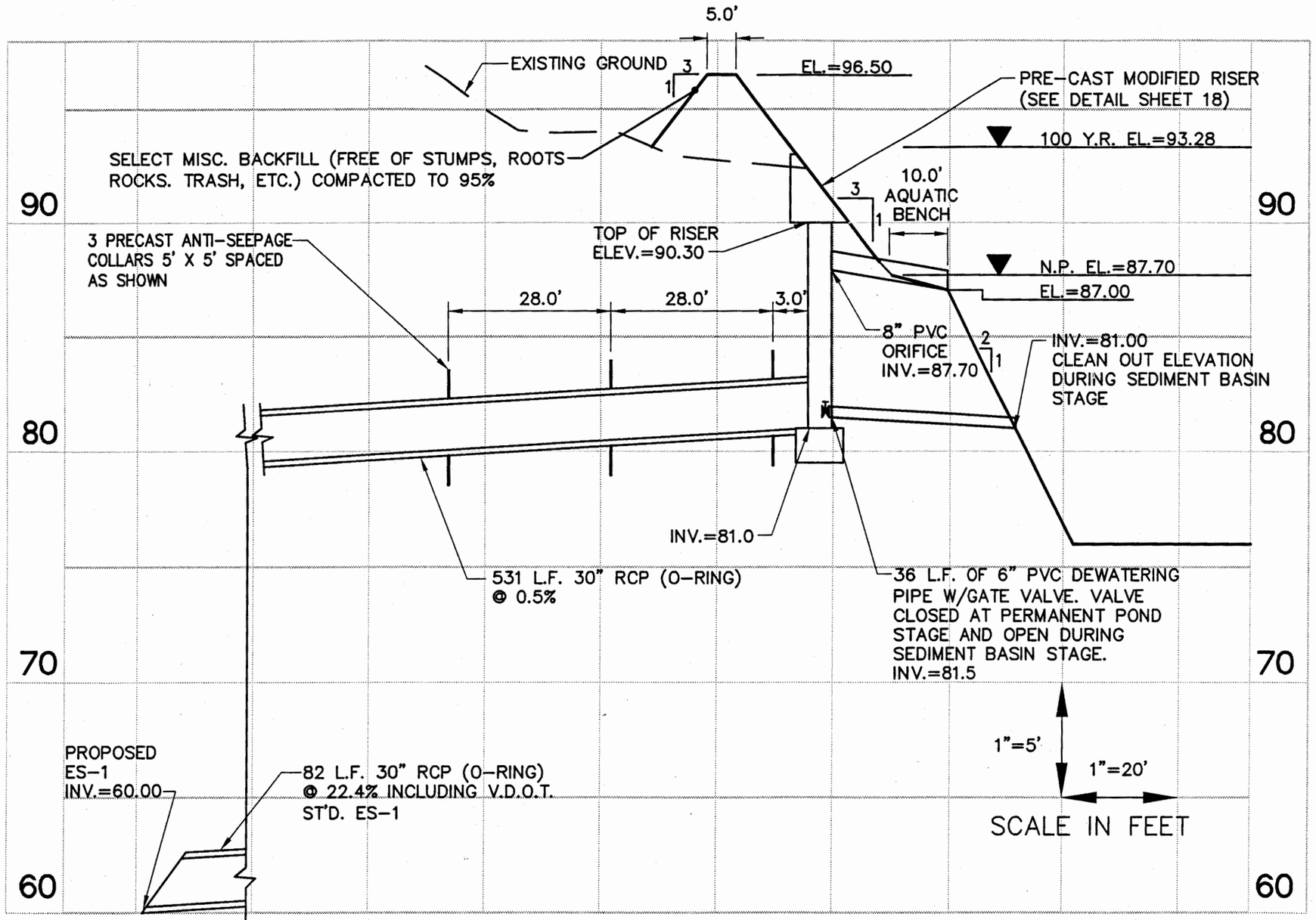
RECORD DRAWING-4-24-06

S:\Jobs\8881\05-ENTR\dwg\Cad\ColH-Dr-Amendment-1\Interim Certification\88815R18.dwg, 4/21/2006 10:45:32 AM, trs
RMS 07.11.03-13:46 88815R18.dwg
YC027_COLONIAL_HERITAGE_PHASE_1_BLVD - 040


LIMITS OF CONSTRUCTION
FUTURE BMP AT 18TH HOLE
TEMPORARY SEDIMENT BASIN ACCESS ROAD (CONTRACTOR TO UTILIZE EXISTING GRAVEL FARM ROAD)
PROVIDE APPOX. 221± OF 12' WIDE TEMPORARY CONSTRUCTION ACCESS ROAD TO CONNECT TO EXISTING GRAVEL FARM ROAD
20' INGRESS/EGRESS EASEMENT FOR JCC
FUTURE DEVELOPMENT
LIMITS OF CONSTRUCTION
EXISTING DIRT ROAD
PROVIDE TEMPORARY GRAVEL PARKING LOT (SEE DETAIL SHT. 18)
LAND BAY VI
COMMERCIAL PROPERTY
EXISTING ITEMS TO BE DEMOLISHED
EXISTING WELL TO REMAIN
PROPOSED ENTRANCE TO COMMERCIAL SITE SEE AES PLANS FOR ROUTE 60 IMPROVEMENTS
NOTE:
SEE AES PLANS FOR ROUTE 60 IMPROVEMENTS
TEMPORARY SALES TRAILER
EXISTING PAVEMENT TO BE DEMOLISHED
PROVIDE CONNECTION BETWEEN SALES FACILITY PARKING LOT AND CONSTRUCTION ENTRANCE
(SEE TYPICAL PAVEMENT SECTION SHEET 18)
U.S. ROUTE 60 - RICHMOND ROAD


6.83 AC.
TOTAL DRAINAGE AREA TO FUTURE BMP AT 18TH HOLE=44.22 AC.
7.80 AC.
SS#3-1
0.61 AC.
SS#3-2
Sediment Trap.
TO EXISTING FARM POND BMP
SYSTEM 4
0.90 AC.
INTO SS#4-3
0.79 AC.
SS#4-1
SS#4-2
SS#4-3
SS#3-3
0.30 AC.
1.04 AC.
3.81 AC.
0.12 AC.
0.33 AC.
0.18 AC.
0.45 AC.
SS#3-5
SS#3-4
0.49 AC.
0.17 AC.
SS#3-6
0.13 AC.
0.37 AC.
0.26 AC.
0.31 AC.
0.15 AC.
SS#3-7
SS#3-8
0.24 AC.
0.08

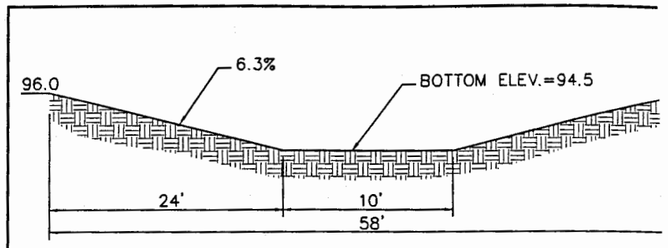

La=12'
W=15'
3Do=7.5'
(8 C.Y. REQ'D)
210 L.F. OF 30" RCP
@ 0.5%
LIMITS OF
CONSTRUCTION
STORM MH-1
TOP=99.0
INV.=79.40
321 L.F. OF 30" RCP
@ 0.5%
SF
48" CONCRETE RISER
WITH TRASH RACK (SEE
DETAIL SHEET 18)
TOP OF DAM= 96.50
BOTTOM
EL.=76.0
FUTURE
GOLF COURSE
FU
RESIDENTIAL
GRASS LINED
EMERGENCY SPILLWAY
BOTTOM ELEV.=94.50
(WIDTH AT BOTTOM=10'
MAX SIDE SLOPES 10:1)
SEE DETAIL THIS SHEET
SF
SEE SHEET 9
GEO-TECHNIC
ENGINEERS
RECOMMENDA
POND LINERS
DD
PHASE 1 TEMPORARY
SEDIMENT BASIN
DD
PHASE 1 SED BASIN
OOL ELEVATIONS
ATER SURFACE ELEV.= 88.5
LEAN OUT ELEV.= 87.5
YEAR STORM ELEV.= 91.76
00 YEAR STORM ELEV.= 93.28



SECTION A-A

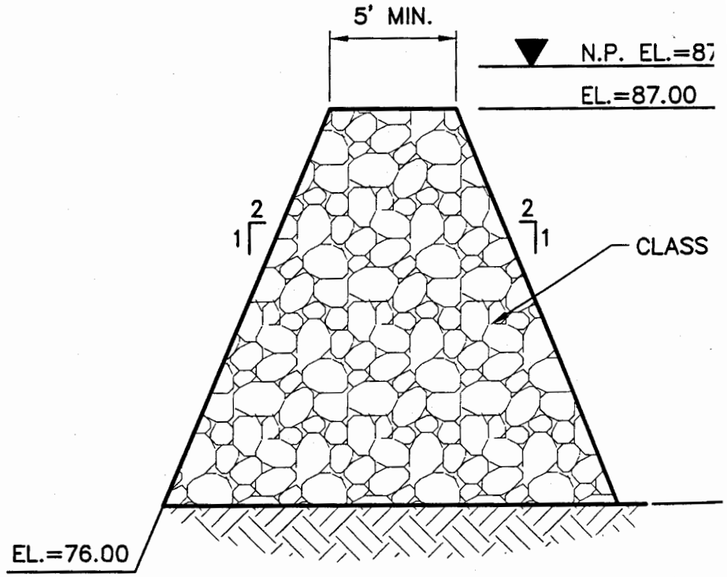
PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)



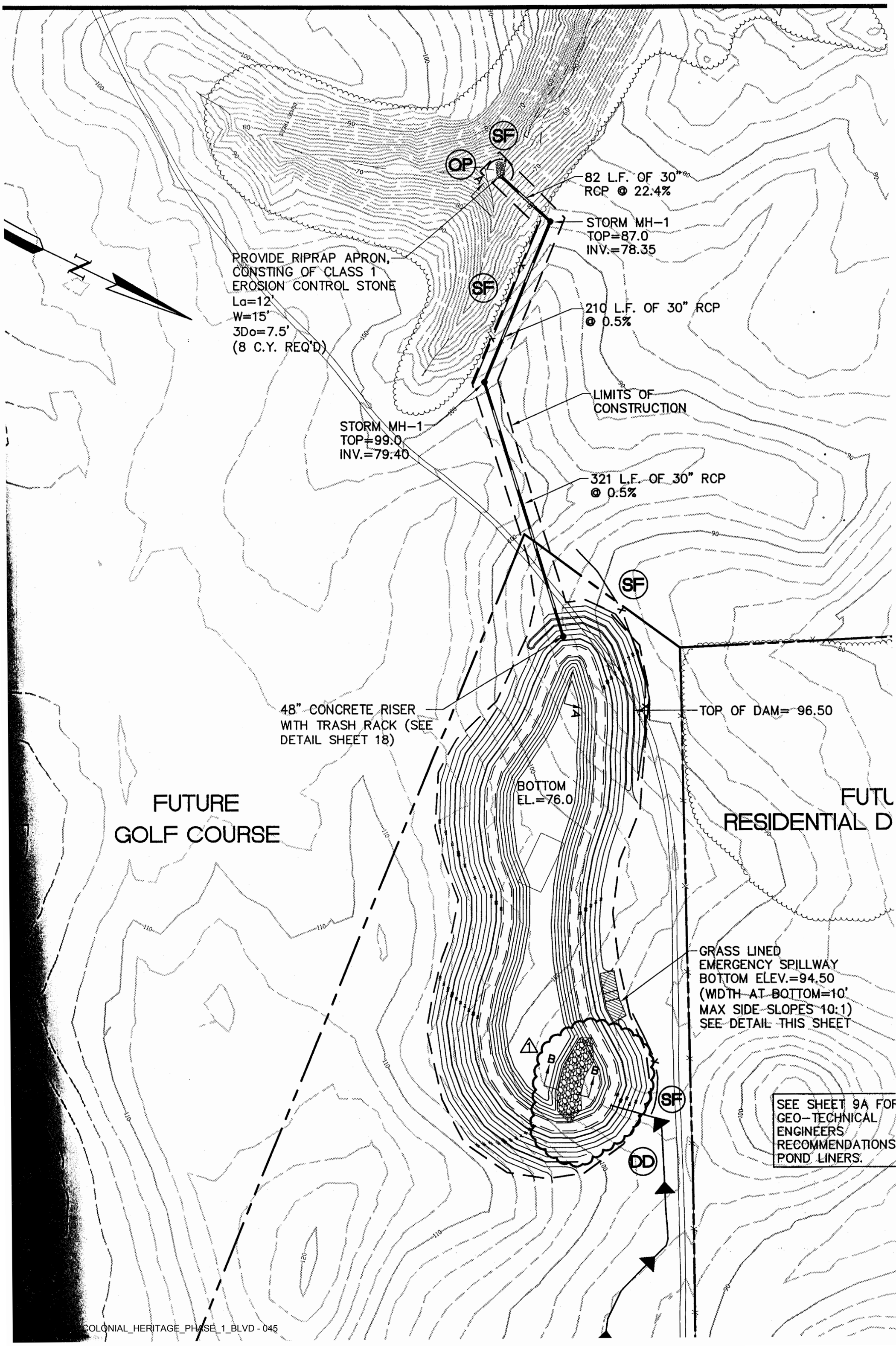
GRASS LINED EMERGENCY SPILLWAY

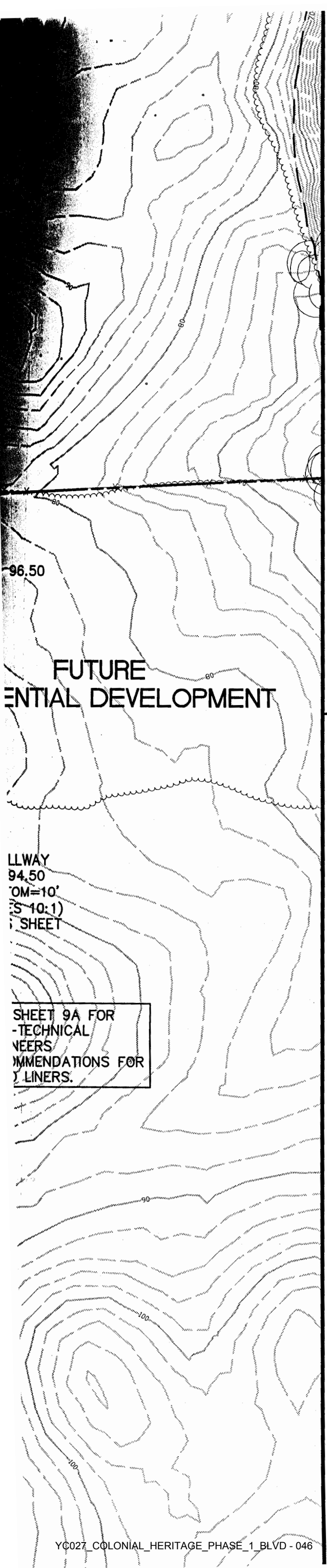
NOT TO SCALE

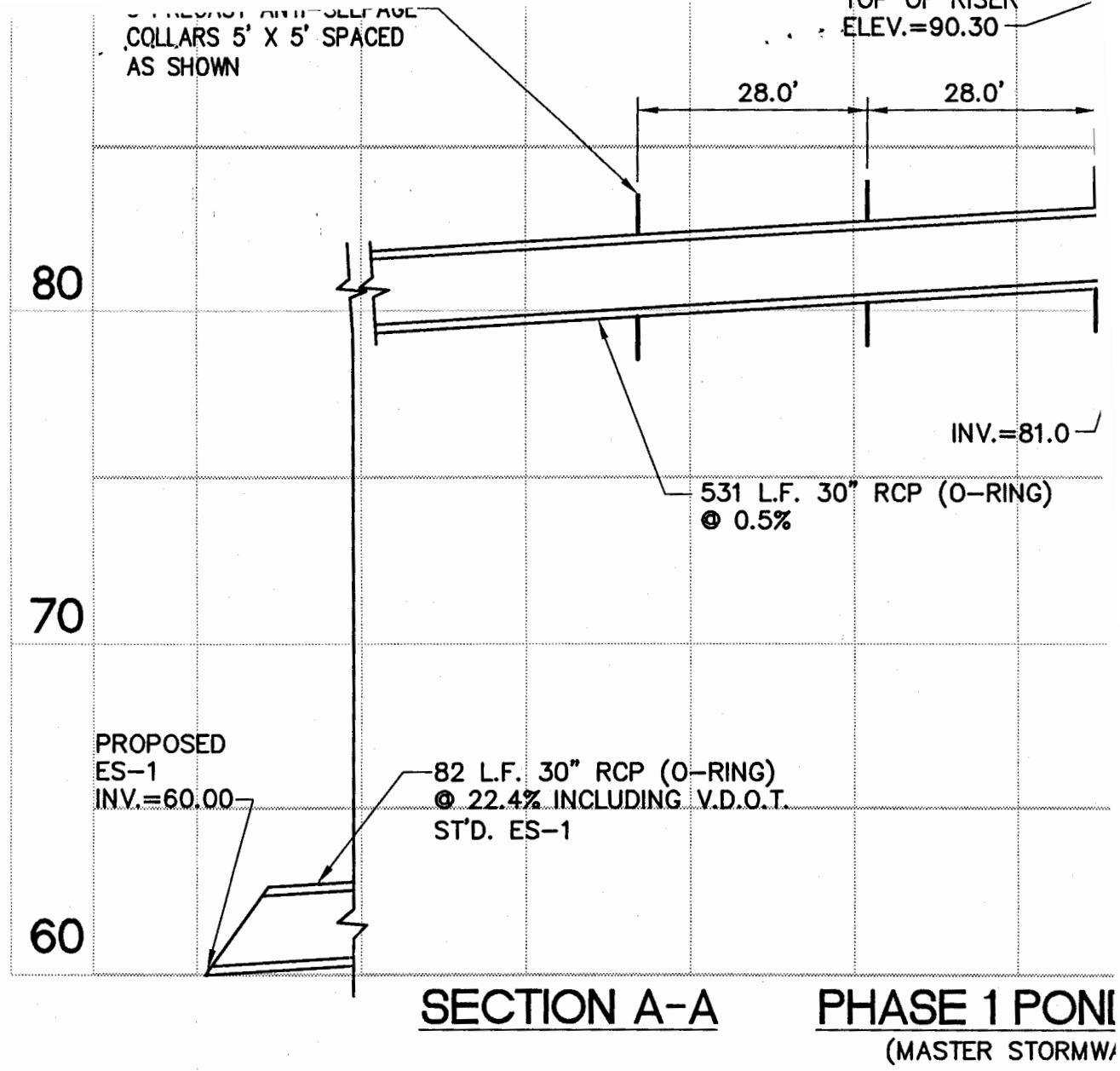


SECTION B-B

N.T.S.


82 L.F. OF 30" RCP @ 22.4%
STORM MH-1 TOP=87.0 INV.=78.35
PROVIDE RIPRAP APRON, CONSTING OF CLASS 1 EROSION CONTROL STONE La=12' W=15' 3Do=7.5' (8 C.Y. REQ'D)
210 L.F. OF 30" RCP @ 0.5%
LIMITS OF CONSTRUCTION
STORM MH-1 TOP=99.0 INV.=79.40
321 L.F. OF 30" RCP @ 0.5%
48" CONCRETE RISER WITH TRASH RACK (SEE DETAIL SHEET 18)
TOP OF DAM= 96.50
BOTTOM EL.=76.0
FUTURE GOLF COURSE
FUTU RESIDENTIAL D
GRASS LINED EMERGENCY SPILLWAY BOTTOM ELEV.=94.50 (WIDTH AT BOTTOM=10' MAX SIDE SLOPES 10:1) SEE DETAIL THIS SHEET
SEE SHEET 9A FOR GEO-TECHNICAL ENGINEERS RECOMMENDATIONS POND LINERS.
SF
OP
DD





SECTION A-A

PHASE 1 PONI
(MASTER STORMW

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

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

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE 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, 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 SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

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

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

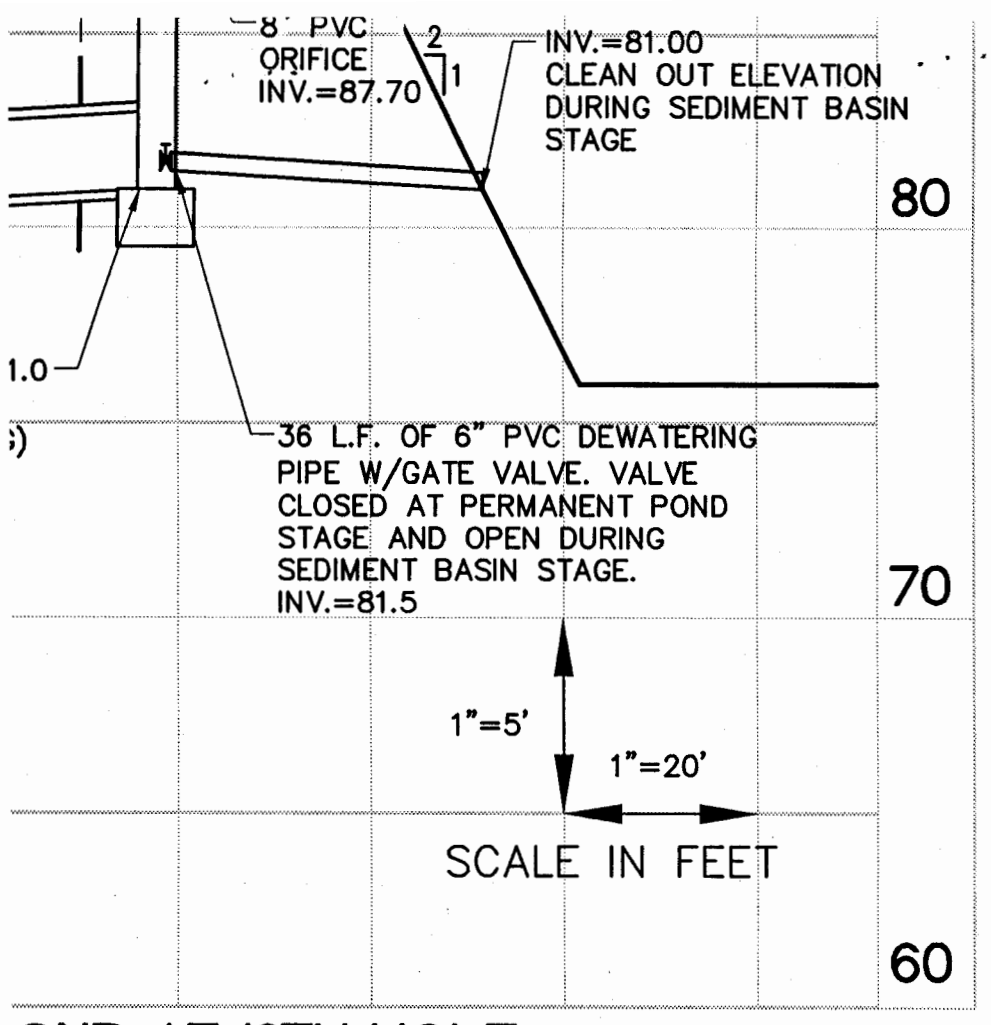
4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED INTEGRITY OF THE STRUCTURE.

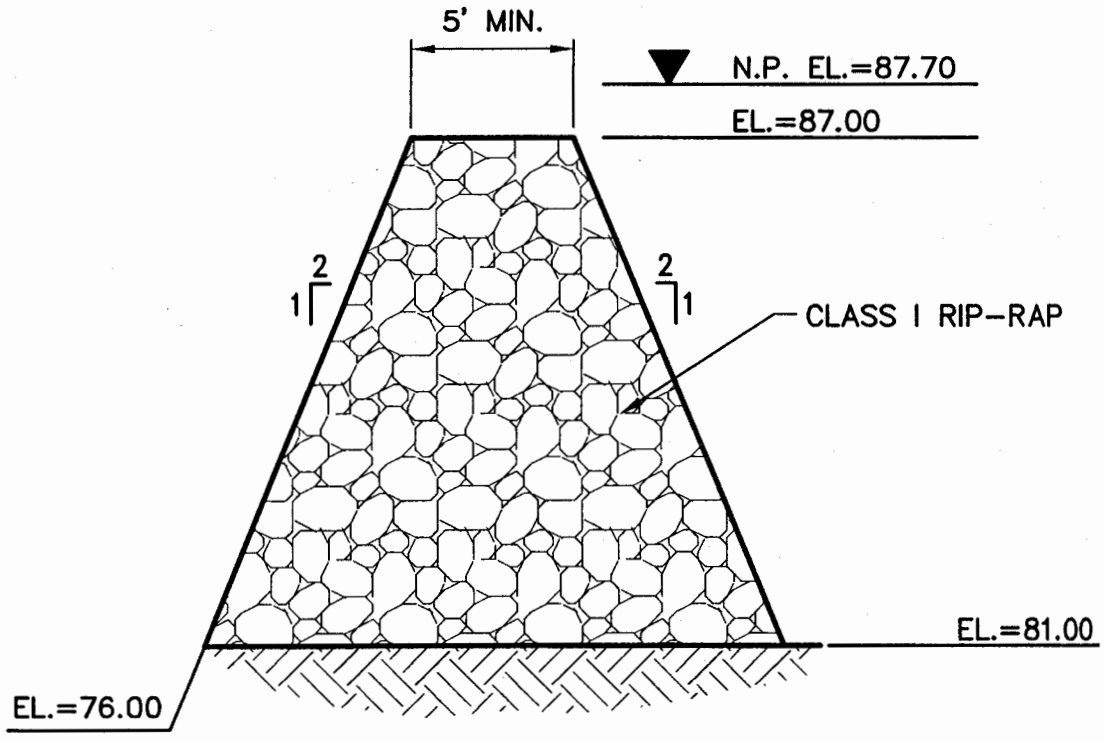
7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/ RODENT BORROWS OR SLOPE EROSION. IMMEDIATELY PERFORM NECESSARY REPAIRS, REFILLING OR RESEEDING AS APPROPRIATE.

8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND / OR REPAIRS PERFORMED



OND AT 18TH HOLE

ORMWATER PLAN BMP #3)



SECTION B-B

N.T.S.

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GENERAL NOTES FOR CONSTRUCTION OF STORMWATER BASINS

1. THE CONTRACTOR SHALL PROVIDE ALL WORK AND MATERIALS NEEDED TO CONSTRUCT THE STORMWATER BASIN, STORMWATER MANAGEMENT PONDS, BEST MANAGEMENT PRACTICES, SEDIMENT BASINS AND SEDIMENT TRAPS. THE WORK SHALL INCLUDE ALL LABOR, MATERIALS, EQUIPMENT AND MATERIALS NEEDED FOR THE COMPLETION OF GRADING AND EARTHWORK ASSOCIATED WITH THE CONSTRUCTION.

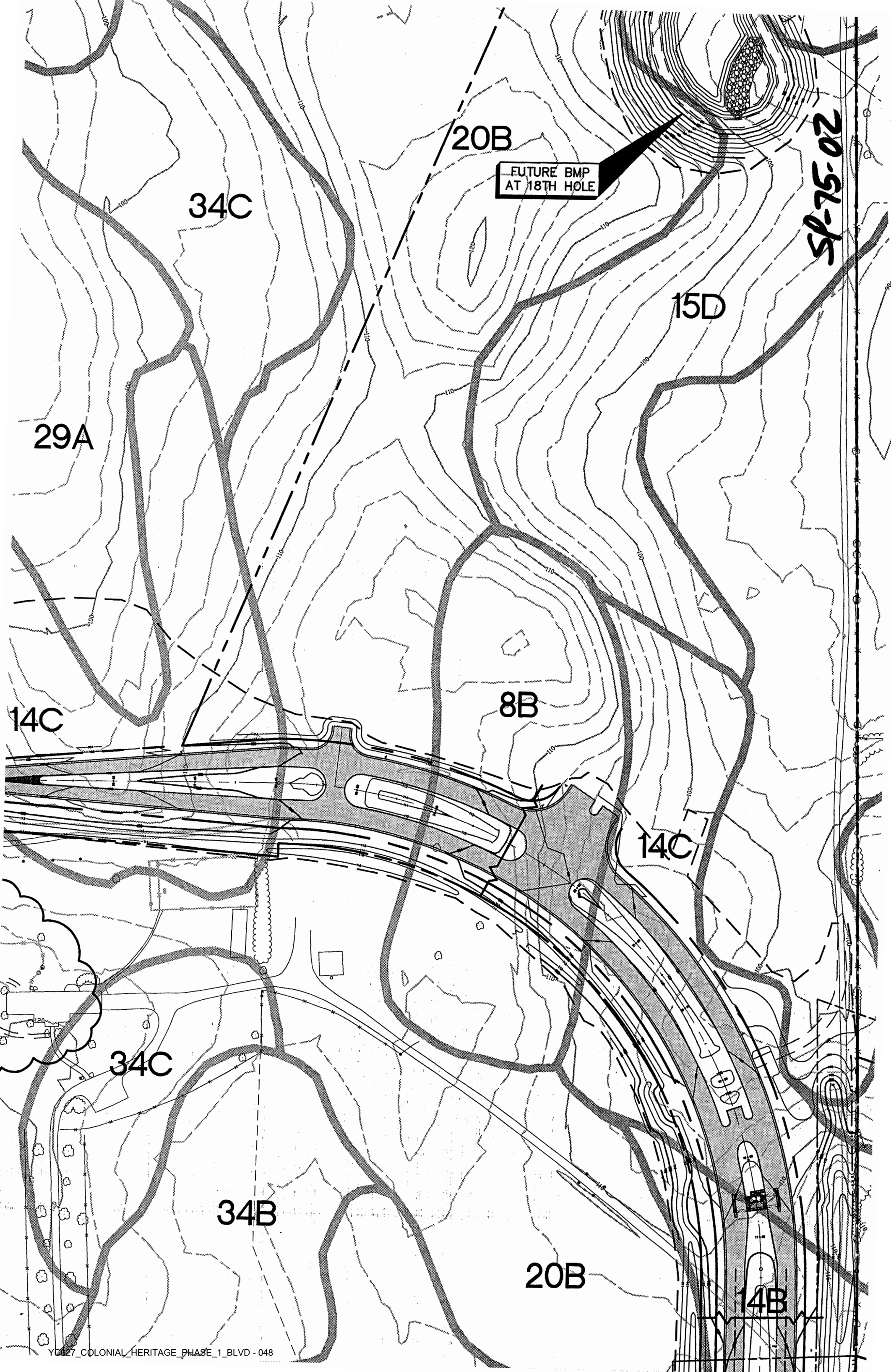
2. THE CONTRACTOR SHALL CONSULT AND PROVIDE FOR THE SERVICES OF A GEOTECHNICAL ENGINEER. THE GEOTECHNICAL ENGINEER SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS, IDENTIFYING SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX, AND COMPACTION. ALL TESTS SHALL BE IN CONFORMANCE WITH ASTM STANDARDS. THE COST OF THE SERVICES OF THE GEOTECHNICAL ENGINEER SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. SATISFACTORY GEOTECHNICAL RESULTS ARE NEEDED PRIOR TO FINAL APPROVAL.

3. ALL INSPECTIONS REQUIRED FOR THE WORK SHALL BE PERFORMED BY A GEOTECHNICAL ENGINEER AT THE EXPENSE OF THE GENERAL CONTRACTOR.

4. ON-SITE EXCAVATED MATERIAL, IF DETERMINED SUITABLE FOR USE IN DAM CONSTRUCTION BY A GEOTECHNICAL ENGINEER, MAY BE USED FOR DAM CONSTRUCTION. SHOULD ADDITIONAL MATERIAL BE REQUIRED, THE CONTRACTOR SHALL IDENTIFY THE NEED FOR MATERIAL TO THE OWNER, AS ADDITIONAL BORROW MATERIAL MAY BE AVAILABLE ON THE PROPERTY. ALL EXCAVATED MATERIAL DETERMINED BY THE GEOTECHNICAL ENGINEER TO BE UNSUITABLE SHALL BE DISPOSED OF PROPERLY AT THE CONTRACTOR'S EXPENSE. ALL EXCAVATED MATERIAL NOT REQUIRED FOR BACKFILLING SHALL EITHER BE DEPOSITED ON SITE AND SPREAD BY THE CONTRACTOR, OR SHALL BE DEPOSITED IN AN AREA ON THE PROPERTY AS DIRECTED BY THE OWNER. THE CONTRACTOR SHALL PROVIDE PROPER STABILIZATION, AND EROSION AND SEDIMENT CONTROL MEASURES NEEDED TO CONTROL AS PER THE VESCH THIRD EDITION.

5. UNDERCUT FOR THE FOUNDATION OF THE DAM EMBANKMENT SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. THE FOUNDATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SM, SC, OR CL UNDER THE UNIFIED SOIL CLASSIFICATION SYSTEM. SOILS SHALL HAVE A MINIMUM OF 15% BY WEIGHT FINES, HAVING A PLASTICITY INDEX OF 30% AND A PERMEABILITY OF 0.0004 IN./SEC. OR LESS. FILL SHALL BE COMPACTED IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO A DRY DENSITY OF 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). EXCAVATION FOR THE DAM KEY SHALL BE IN ACCORDANCE TO THE GEOTECHNICAL ENGINEER'S RECOMMENDATION. HEIGHT, DEPTH, AND WIDTH OF THE KEY SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S RECOMMENDATIONS. THE KEY SHALL BE FORMED USING SOILS CLASSIFIED AS SC OR CL, WITH A PERMEABILITY OF 0.0004 IN./SEC. OR LESS.

6. THE DAM CORE SHALL BE AS CONSTRUCTED WITH NON-EXPANSIVE SC OR CL CLAYEY MATERIAL WITH PERMEABILITY OF 0.0004 IN./SEC. OR LESS. THE FILL OF THE CORE SHALL BE MADE IN 12-INCH LIFTS, OR AS DIRECTED BY THE GEOTECHNICAL ENGINEER, TO AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). SIZE, SHAPE, WIDTH, DEPTH, AND HEIGHT OF THE DAM CORE SHALL BE IN ACCORDANCE WITH THE GEOTECHNICAL ENGINEER'S


20B
FUTURE BMP
AT 18TH HOLE
34C
15D
29A
8B
14C
14C
34C
34B
20B
14B
SP-75-02

TOTAL DRAINAGE AREA TO SEDIMENT BASIN AT 18TH HOLE=31.96 AC.

TEMPORARY TRAPEZOIDAL 1000 L.F. OF GRASS DIVERSION 6' BOTTOM 3:1SS 12" DEEP @ 0.75%

DV

STOCKPILE AREA

TEMPORARY SEDIMENT BASIN ACCESS ROAD (CONTRACTOR TO UTILIZE EXISTING GRAVEL FARM ROAD)

ST SEDIMENT TRAP #1
PROVIDE 110' WIDE X 90' LONG X 2' DEEP TRIANGULAR SHAPED TRAP WITH 15' ROCK OUTLET CONSISTING OF CLASS I EROSION CONTROL STONE
TOP=102.00
BOTTOM=100.00

PROVIDE RIPRAP APRON, CONSISTING OF CLASS 1 EROSION CONTROL STONE
La=10'
W=12'
3Do=6'
(5 C.Y. REQ'D)

NOTE:
SEE SHEET 9 FOR SEDIMENT BASIN AND PHASE I BMP DESIGN.

IDE RIPRAP APRON,
ISTING OF CLASS 1
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.5'
4.5'
Y. REQ'D)

104.30

.F. OF "V"
, 3:1SS,
DEEP @
, PROVIDE
MATTING
G DITCH

TEMPORARY TOPSOIL STOCKPILE

81 L.F. OF DITCH @ 1.23%, PROVIDE EC-2 MATTING ALONG DITCH

FILL AREA

226 L.F. OF TEMPORARY 24" HDPE PIPE @ 0.88%
INV. IN=103.00
INV. OUT=101.00

OP DV CD TS DD 2.40 AC. 100 102

PROVIDE APPOX. 221± OF 12' WIDE TEMPORARY CONSTRUCTION ACCESS ROAD TO CONNECT TO EXISTING

82 L.F. OF 30" RCP @ 22.4%

STORM MH-1
TOP=87.0
INV.=78.35

210 L.F. OF 30" RCP @ 0.5%

LIMITS OF CONSTRUCTION

321 L.F. OF 30" RCP @ 0.5%

TOP OF DAM= 96.50

BOTTOM EL.=76.0

FUTURE RESIDENTIAL DEVELOPMENT

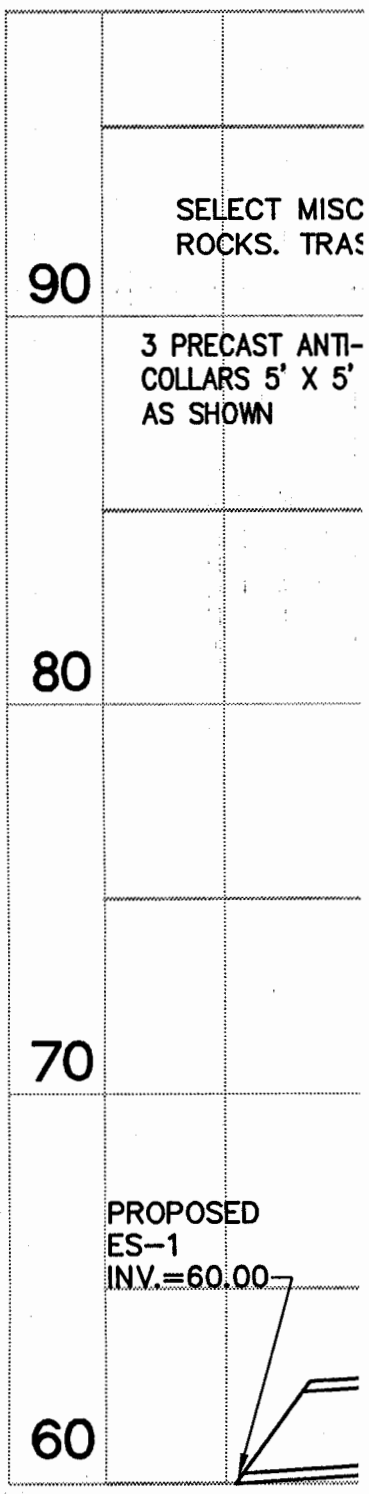
GRASS LINED EMERGENCY SPILLWAY
BOTTOM ELEV.=94.50
(WIDTH AT BOTTOM=10'
MAX SIDE SLOPES 10:1)
SEE DETAIL THIS SHEET

SEE SHEET 9A FOR GEO-TECHNICAL ENGINEERS RECOMMENDATIONS FOR POND LINERS.

SF

OP

DD



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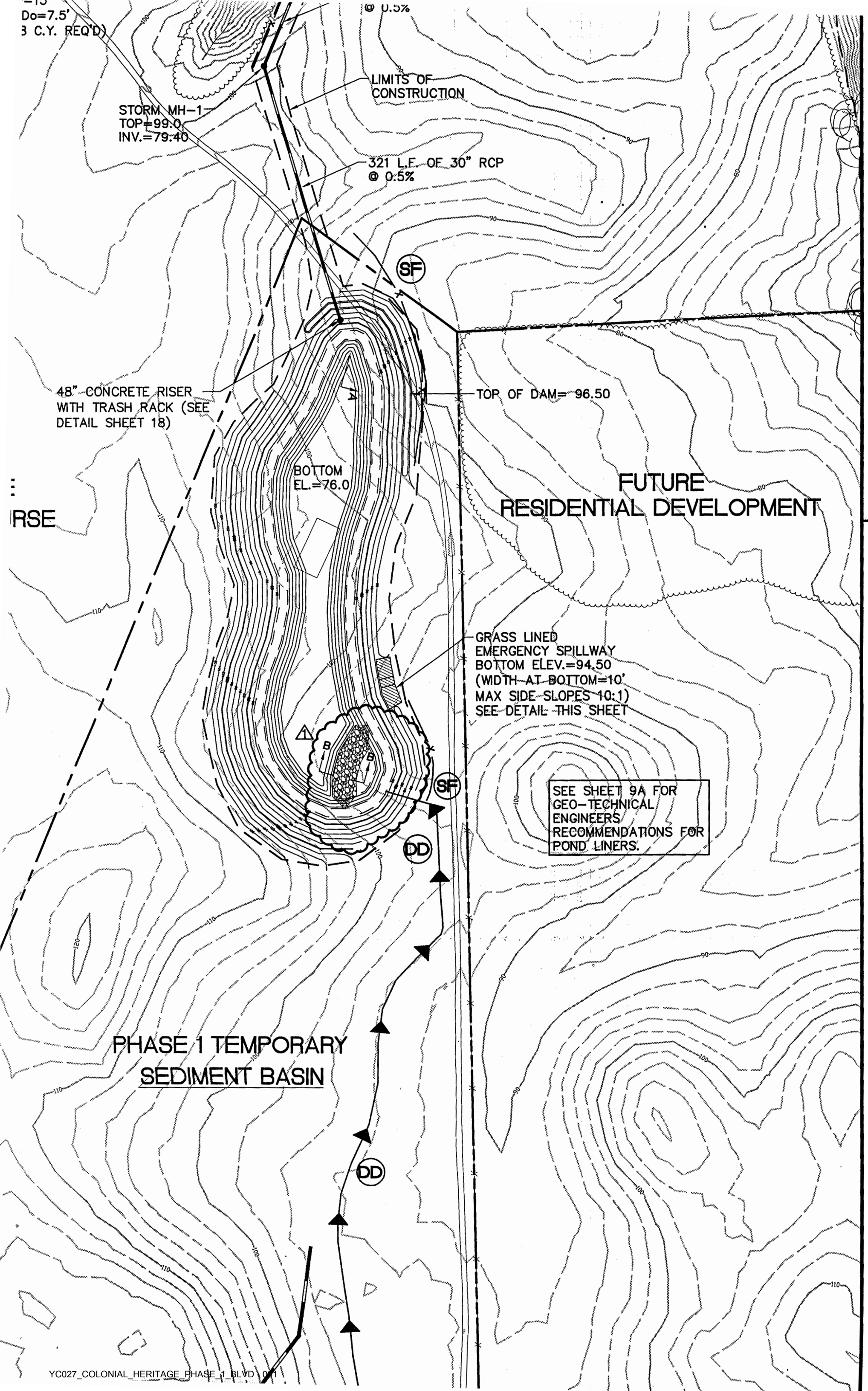
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Do=7.5'
3 C.Y. REQ'D)
@ 0.5%
LIMITS OF
CONSTRUCTION
STORM MH-1
TOP=99.0
INV.=79.40
321 L.F. OF 30" RCP
@ 0.5%
SF
48" CONCRETE RISER
WITH TRASH RACK (SEE
DETAIL SHEET 18)
TOP OF DAM= 96.50
BOTTOM
EL.=76.0
FUTURE
RESIDENTIAL DEVELOPMENT
RSE
GRASS LINED
EMERGENCY SPILLWAY
BOTTOM ELEV.=94.50
(WIDTH AT BOTTOM=10'
MAX SIDE SLOPES 10:1)
SEE DETAIL THIS SHEET
SF
SEE SHEET 9A FOR
GEO-TECHNICAL
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RECOMMENDATIONS FOR
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PHASE 1 TEMPORARY
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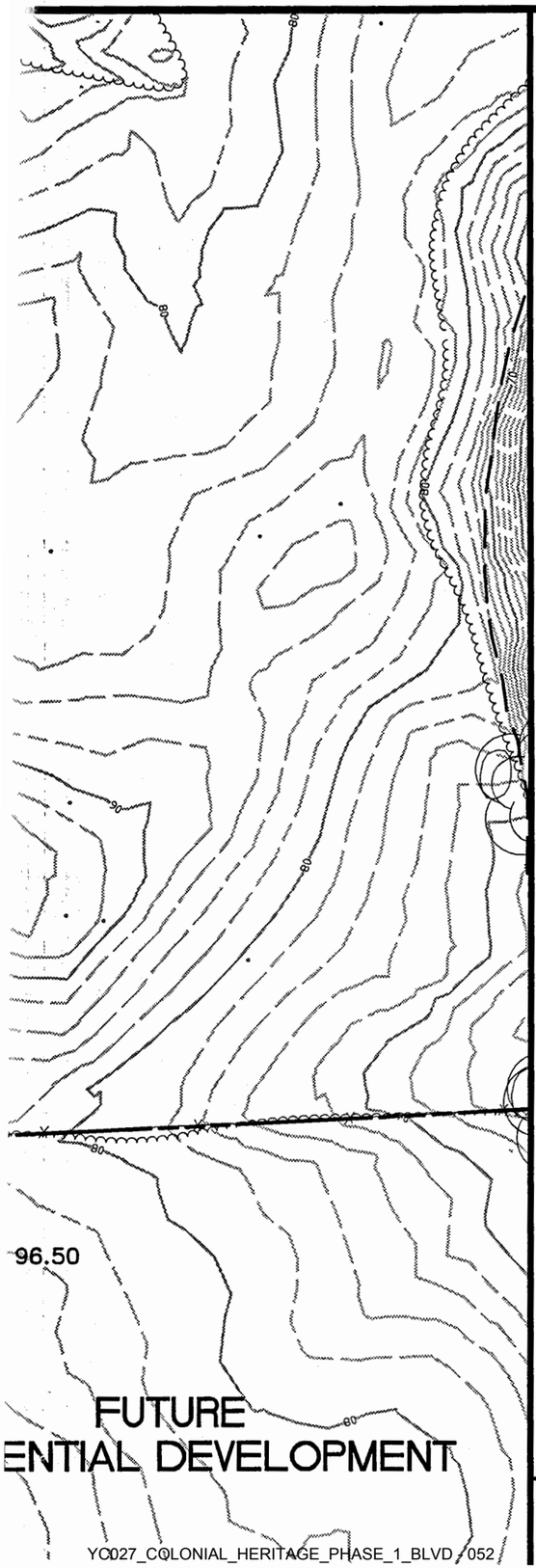
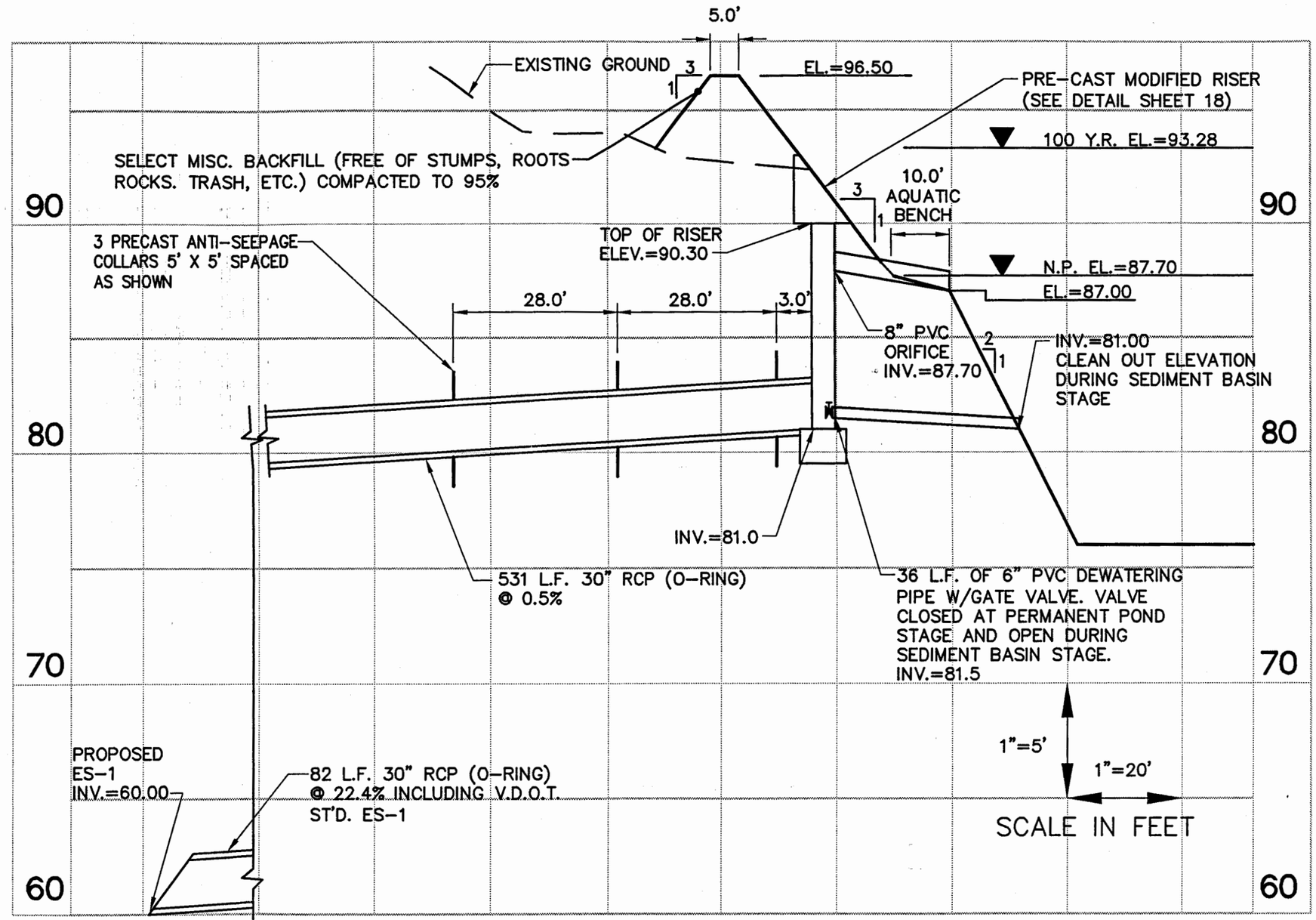
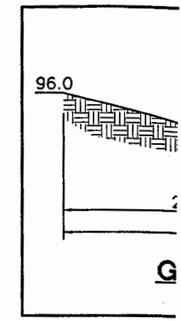


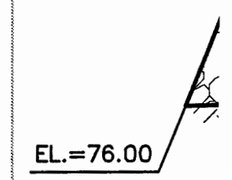


SECTION A-A

PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)





STORMWATER MANAGEMENT/ BMP

GENERAL NOTES
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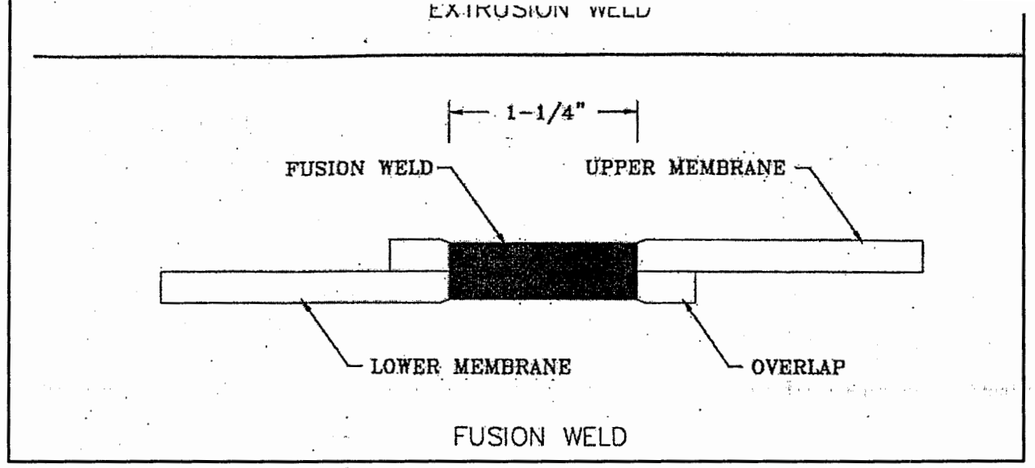

TYPICAL WELDING DETAILS

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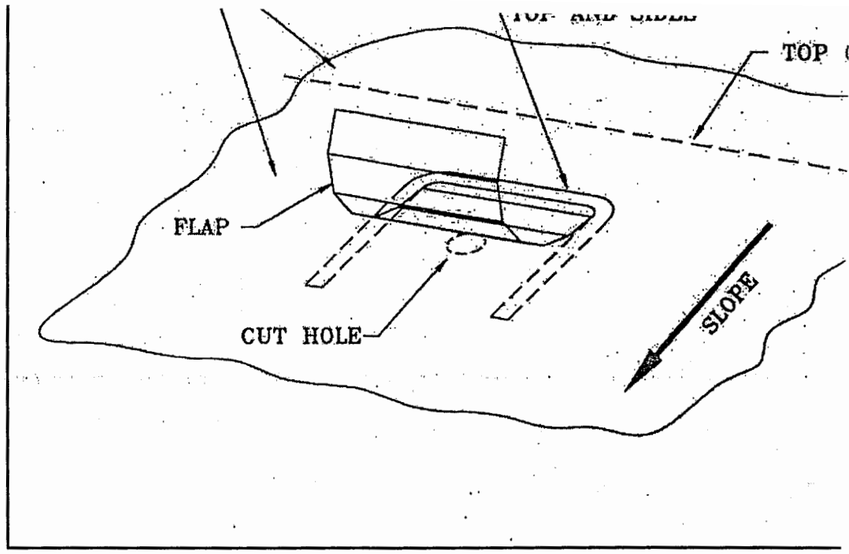


VENT POCKET DETAIL

N.T.S.

FLEXIBLE LINER INSTALLATION DETAILS

GEO-TECHNICAL ENGINEER

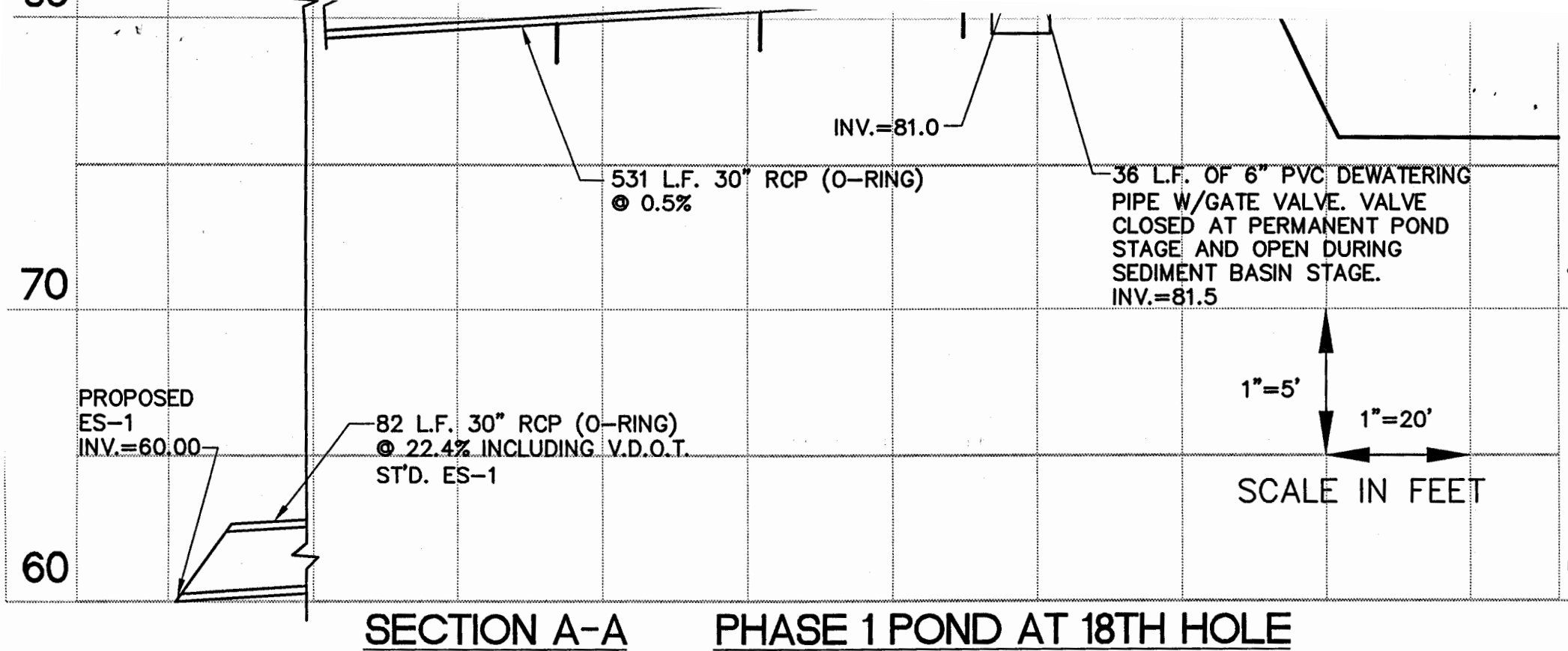
RECOMMENDATION FOR POND LINERS

THE FOLLOWING EXCERPT IS THE RECOMMENDED ALTERNATIVES FOR THE POND LINER AS PROVIDED IN THE SOILS REPORT FROM ECS LTD. TITLED:
"SUBSURFACE EXPLORATION AND GEO-TECHNICAL ENGINEERING ANALYSIS
COLONIAL HERITAGE – FARM POND DAM EVALUATION
RICHMOND ROAD
JAMES CITY COUNTY ECS PROJECT NO. 07:5876"
THE REPORT IS DATED OCTOBER 23, 2002.

1. COMPACTED CLAY SOIL LINER – A MINIMUM LAYER OF 12 INCHES OF MODERATELY TO HIGHLY PLASTIC CLAY SOILS SHOULD BE PLACED ON THE SLOPES. PRIOR TO THE PLACEMENT OF THIS LAYER, ALL TOPSOIL AND ORGANICS SHOULD BE REMOVED TO SUITABLE NATURAL OR COMPACTED FILL SOILS. GENERALLY, WE ENCOUNTERED ON-SITE CLAYEY SOILS AT VARIOUS LOCATIONS AND DEPTHS ACROSS THE PROJECT SITE IN ROADWAY AREAS THAT WOULD BE CONSIDERED SUITABLE FOR POND LINER MATERIAL. THE SOIL BORING LOGS FROM THE VARIOUS STUDIES SHOULD BE REVIEWED FOR POTENTIAL ON-SITE BORROW SOURCES. SOILS SHOULD CLASSIFY AS CL AND CH MATERIAL. THESE MATERIALS SHOULD BE SUITABLE WHEN COMPACTED WITH A SHEEPSFOOT COMPACTOR AT A MOISTURE CONTENT SLIGHTLY ABOVE OPTIMUM MOISTURE CONTENT TO AT LEAST 90 PERCENT OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). WE ALSO RECOMMEND A 12 INCH LAYER OF A SUITABLE PROTECTIVE SURFACE COVER BE PLACED ON THE CLAY SOIL LINER TO ACT AS A BUFFER DURING DRY MONTHS WHERE THE SOILS WILL TEND TO DESICCATE.

2. GEOCOMPOSITE CLAY LINER (GCL) – AFTER EXCAVATION OF ABOUT 6 INCHES OF THE EXISTING TOPSOIL, A GCL SUCH AS CETCO BENTOMAT ST MAY BE PLACED ON THE SLOPE. THE GCL MUST BE PLACED IN AN ANCHOR TRENCH AT THE TOP OF THE SLOPE AND THEN COVERED WITH A 12 INCH LAYER OF SOIL. THIS LAYER OF PROTECTIVE SOIL COULD BE ANY TYPE OF ON-SITE SOIL AS LONG AS SUITABLE COMPACTION, AS REFERENCED ABOVE, COULD BE ATTAINED.

3. GEOMEMBRANE LINER – POND LINERS ARE AVAILABLE IN A NUMBER OF MATERIALS SUCH AS PVC, POLYPROPYLENE, HDPE, VLDPE AND LLDPE. INSTALLATION IS SIMILAR TO THE GCL IN THE USE OF AN ANCHOR TRENCH AND SOIL COVER. THERE ARE MATERIALS WHICH CAN BE LEFT EXPOSED, BUT THIS MIGHT BE AN AESTHETIC PROBLEM OR COULD BE A SAFETY ISSUE AS THE MATERIAL COULD BE QUITE SLICK. TO KEEP A SOIL COVER FROM SLIDING OFF A SMOOTH PLASTIC LINER, A TEXTURED LINER SHOULD BE CONSIDERED. THE THINNEST TEXTURED LINERS APPEAR TO BE ABOUT 30 MILS (SUCH AS OXYGRIP 30 MIL TEXTURED PVC BY OCCIDENTAL CHEMICAL CORP. OR SOLMAX 630T TEXTURED VFPE-LDPE BY SOLMAX INTERNATIONAL). THE SELECTION OF AN APPROPRIATE MATERIAL SHOULD BE MADE AFTER DISCUSSIONS WITH LOCAL SUPPLIERS TO SEE WHICH MATERIALS ARE READILY AVAILABLE AT A REASONABLE COST.



SECTION A-A

PHASE 1 POND AT 18TH HOLE

(MASTER STORMWATER PLAN BMP #3)

STORMWATER MANAGEMENT/ BMP FACILITY MAINTENANCE PLAN

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

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE 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, 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 SHALL BE MADE AVAILABLE TO COUNTY INSPECTION PERSONNEL UPON REQUEST.

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

1. THE INSPECTION FOR SEDIMENT BUILDUP WILL BE PERFORMED BY VISUAL INSPECTION AND A PHYSICAL DETERMINATION OF SEDIMENT DEPTH WITHIN THE STORAGE AREA. SEDIMENT REMOVAL IS REQUIRED USING A RUBBER-WHEELED BACKHOE. AT THE SAME TIME, OR AT LEAST ONCE PER YEAR, THE RISER BOTTOM AND OUTLET PIPE SHALL BE CLEANED OF ACCUMULATED SEDIMENTS. DISPOSE OF SEDIMENTS REMOVED FROM THE FACILITY AT AN ACCEPTABLE DISPOSAL AREA. SEDIMENT SHALL NOT BE ALLOWED TO ACCUMULATE IN DEPTHS GREATER THAN 1-FOOT. NO SEDIMENT SHALL BE ALLOWED TO ACCUMULATE TO PREVENT THE PROPER FUNCTION OF ANY PIPE OR CULVERT.

2. PERFORM MAINTENANCE MOWING OF GRASSED AREAS AT LEAST TWICE EACH YEAR. GRASSES SUCH AS TALL FESCUE SHOULD BE MOWED IN EARLY SUMMER AFTER EMERGENCE OF THE HEADS ON COOL SEASON GRASSES AND IN LATE FALL TO PREVENT SEEDS OF ANNUAL WEEDS FROM MATURING. MOWING OF LEGUMES CAN BE LESS FREQUENT TREES AND SHRUBS SHOULD NOT BE PERMITTED TO GROW ON ANY PART OF THE GRADED EMBANKMENT.

3. PERFORM SOIL SAMPLING ON STABILIZED BMP SOIL AREAS ONCE EVERY FOUR (4) YEARS. SOIL SAMPLING AND TESTING SHOULD BE PERFORMED BY A QUALIFIED INDEPENDENT TESTING LABORATORY. APPLY ADDITIONAL LIME AND FERTILIZER IN ACCORDANCE WITH TEST RECOMMENDATIONS.

4. IN STABILIZED BMP AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS LISTED IN DAM CONSTRUCTION NOTES. IF VEGETATION COVERS MORE THAN 40% BUT LESS THAN 70% OF SOIL SURFACES, LIME FERTILIZE AND OVERSEED IN ACCORDANCE WITH CURRENT SEEDLING RECOMMENDATIONS.

5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE. DURING QUARTERLY INSPECTIONS, THE POND DRAIN VALVE, USUALLY LEFT IN THE VALVE "CLOSED" POSITION, SHALL BE INSPECTED AND OPERATED THROUGH TWO COMPLETE FULL-OPEN TO FULL-CLOSE TO FULL-OPEN CYCLES.

6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WEIR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED TO ASSESS THE CONTINUED 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 AS APPROPRIATE.

8. RECORD KEEPING. THE LANDOWNER OR DESIGNATED REPRESENTATIVE SHALL KEEP REASONABLE, ACCURATE WRITTEN RECORDS OF INSPECTIONS PERFORMED ON THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.

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Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-------	3.48	5.72	-------	-------	8.41	14.33	-------	23.35	PRE-DEVELOP
3	SCS Runoff	-------	35.40	53.98	-------	-------	75.13	120.02	-------	186.27	POST-DEVELOP (TO BMP)
5	SCS Runoff	-------	0.86	1.74	-------	-------	2.87	5.54	-------	9.89	POST-DEVELOP (TO CHANNEL)
7	Reservoir	3	1.70	2.30	-------	-------	5.19	25.20	-------	47.62	WET POND ROUTED
9	Combine	5, 7,	1.98	3.28	-------	-------	5.52	28.04	-------	54.45	TOTAL POST-DEVELOPMENT (TO

Proj. file: 02 18thHOLEPOND (Certification).gpw | Thursday, Apr 20 2006, 11:39 AM

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.48	5	745	21,970	----	------	------	PRE-DEVELOP
3	SCS Runoff	35.40	5	735	180,283	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	0.86	5	745	6,753	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	1.70	5	1080	159,941	3	89.30	575,982	WET POND ROUTED
9	Combine	1.98	5	765	166,694	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

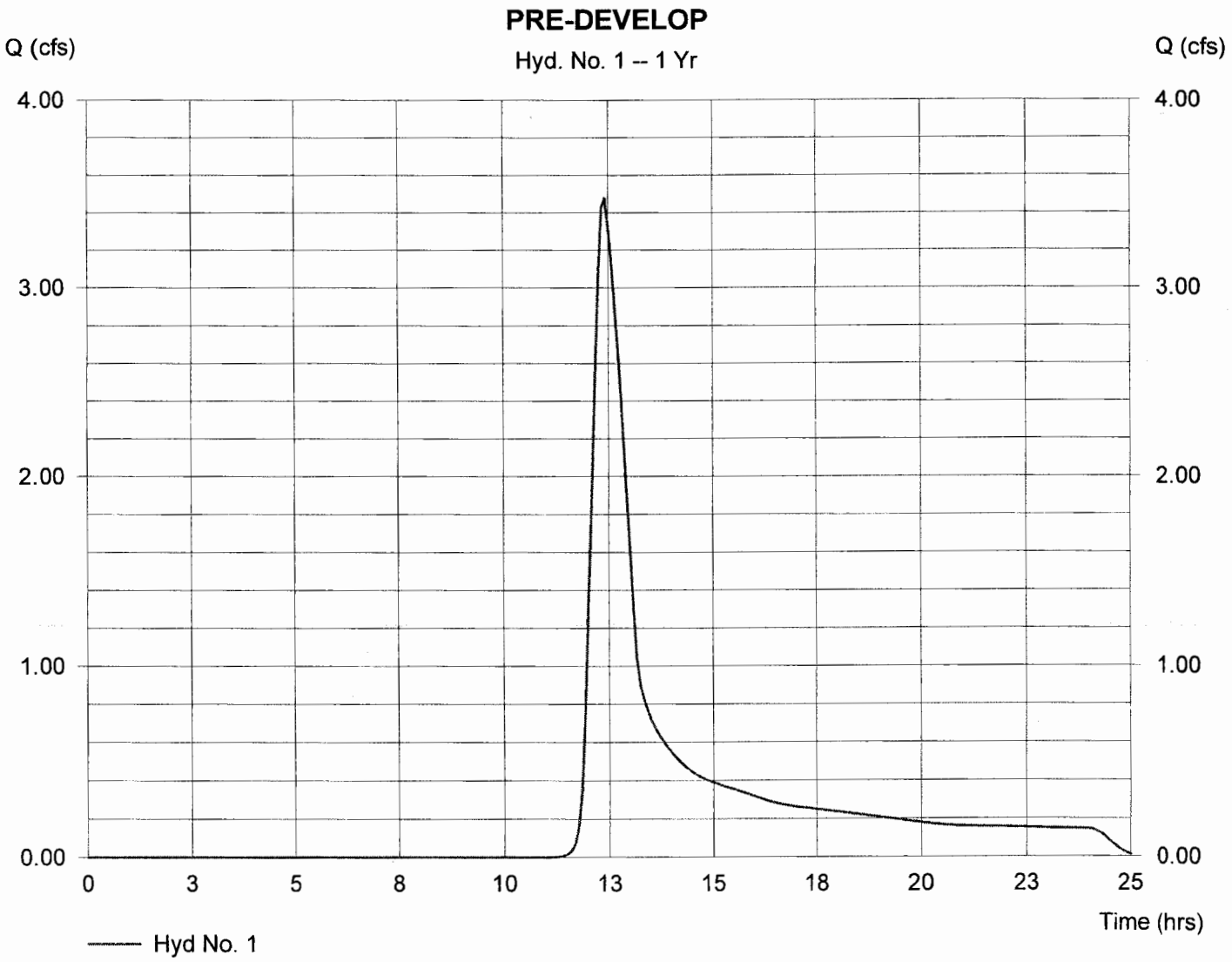
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 3.48 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 21,970 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

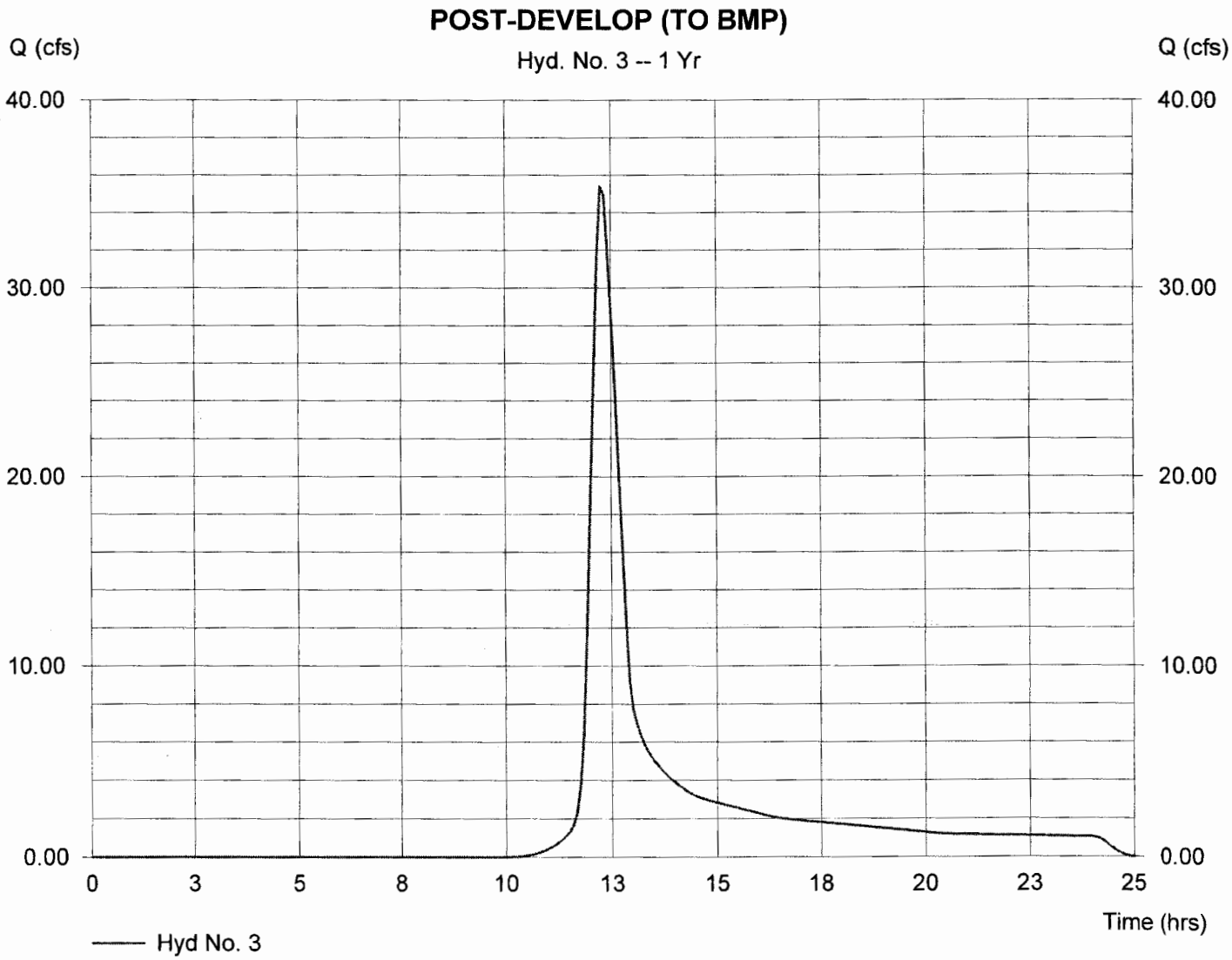
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 35.40 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 180,283 cuft



Hydrograph Plot

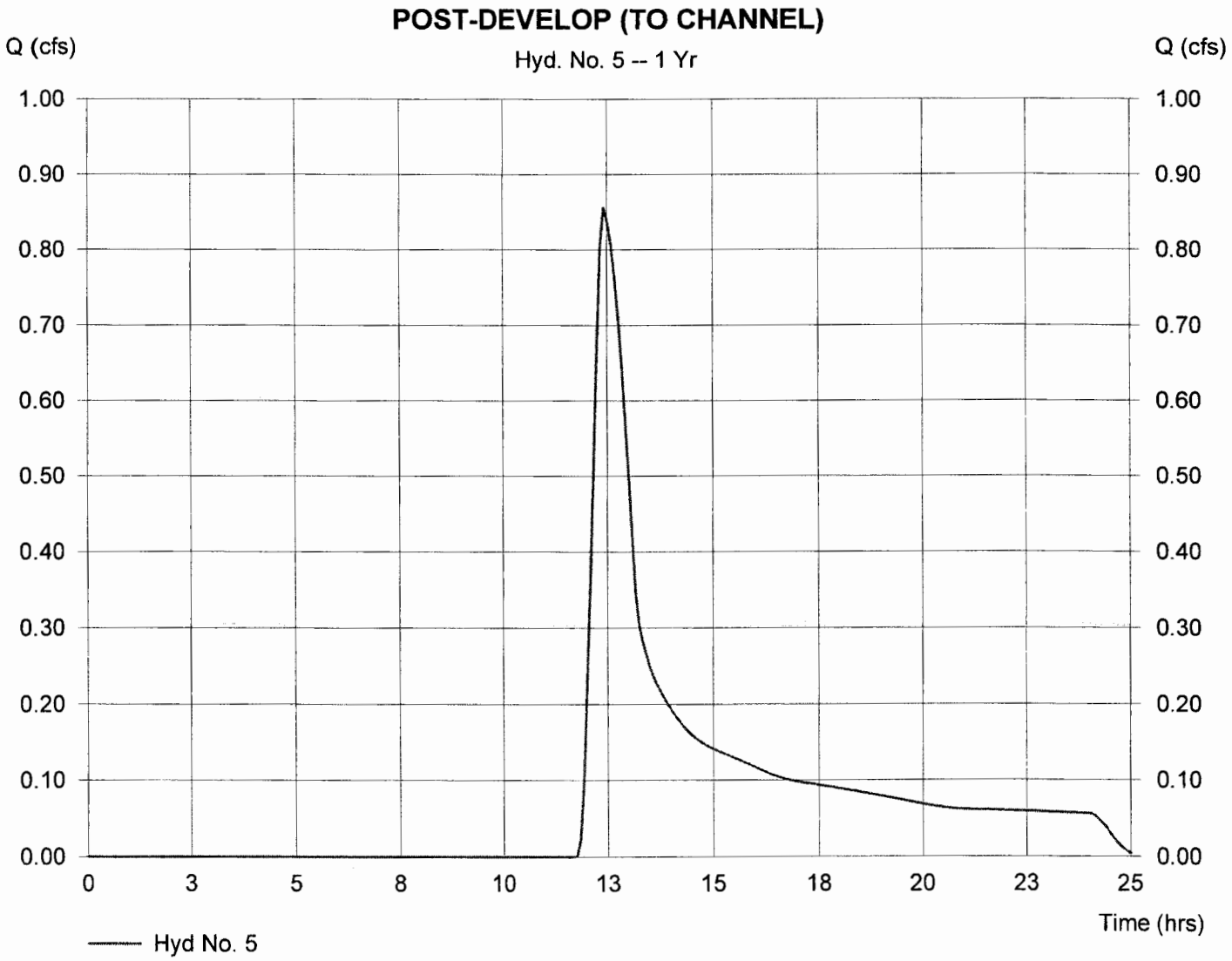
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.86 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,753 cuft



Hydrograph Plot

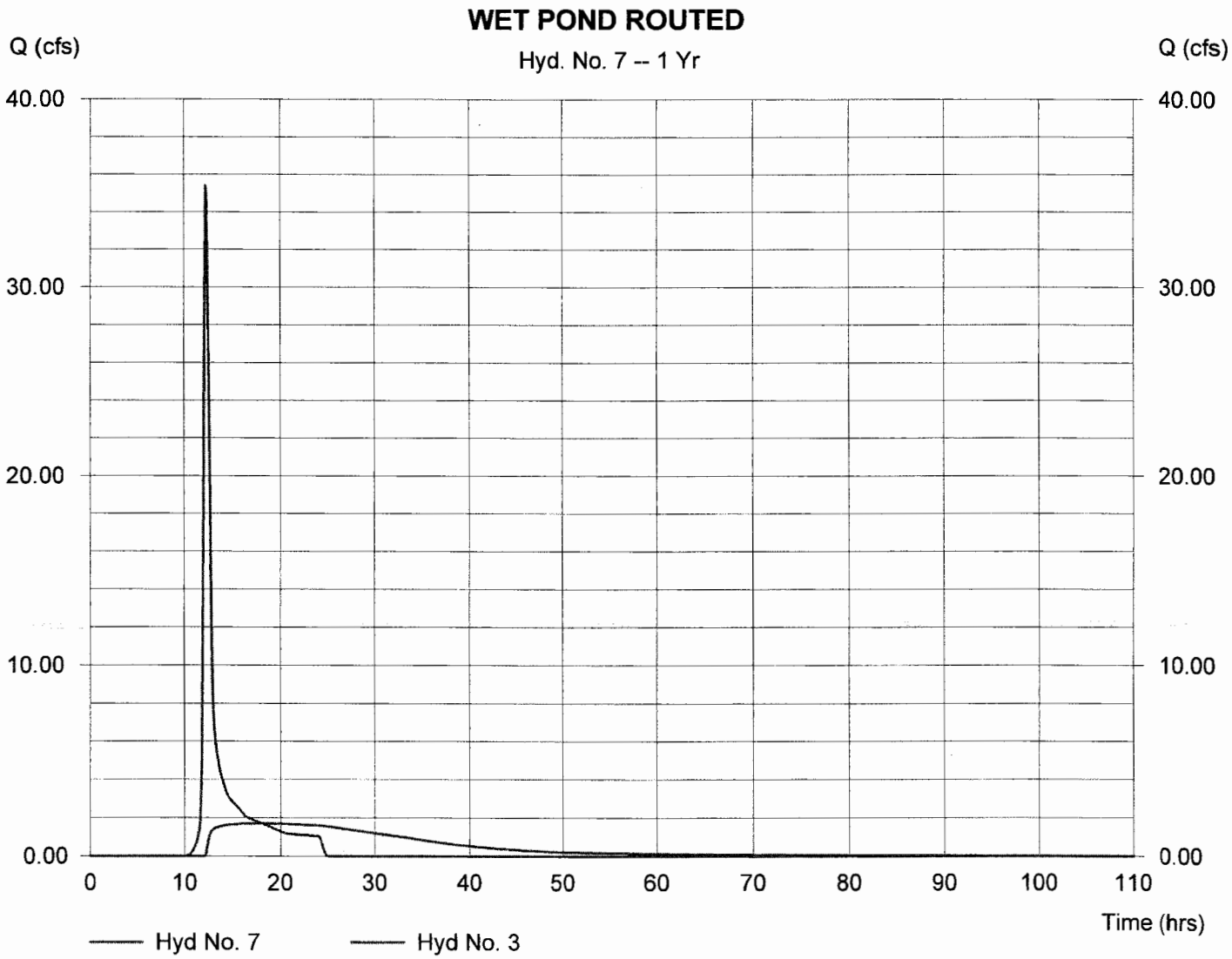
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 1.70 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Max. Elevation	= 89.30 ft
Reservoir name	= WET POND @ HOLE 18	Max. Storage	= 575,982 cuft

Storage Indication method used. Wet pond routing start elevation = 87.64 ft. — Hydrograph Volume = 159,941 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Pond No. 4 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	23,235	0	0
2.00	78.00	27,637	50,872	50,872
4.00	80.00	32,185	59,822	110,694
6.00	82.00	40,036	72,221	182,915
8.00	84.00	44,967	85,003	267,918
10.00	86.00	49,990	94,957	362,875
11.00	87.00	52,538	51,264	414,139
11.10	87.10	65,663	5,910	420,049
12.00	88.00	69,309	60,737	480,786
14.00	90.00	77,577	146,886	627,672
16.00	92.00	86,075	163,652	791,324
18.00	94.00	100,725	186,800	978,124
20.00	96.00	200,000	300,725	1,278,850

Culvert / Orifice Structures

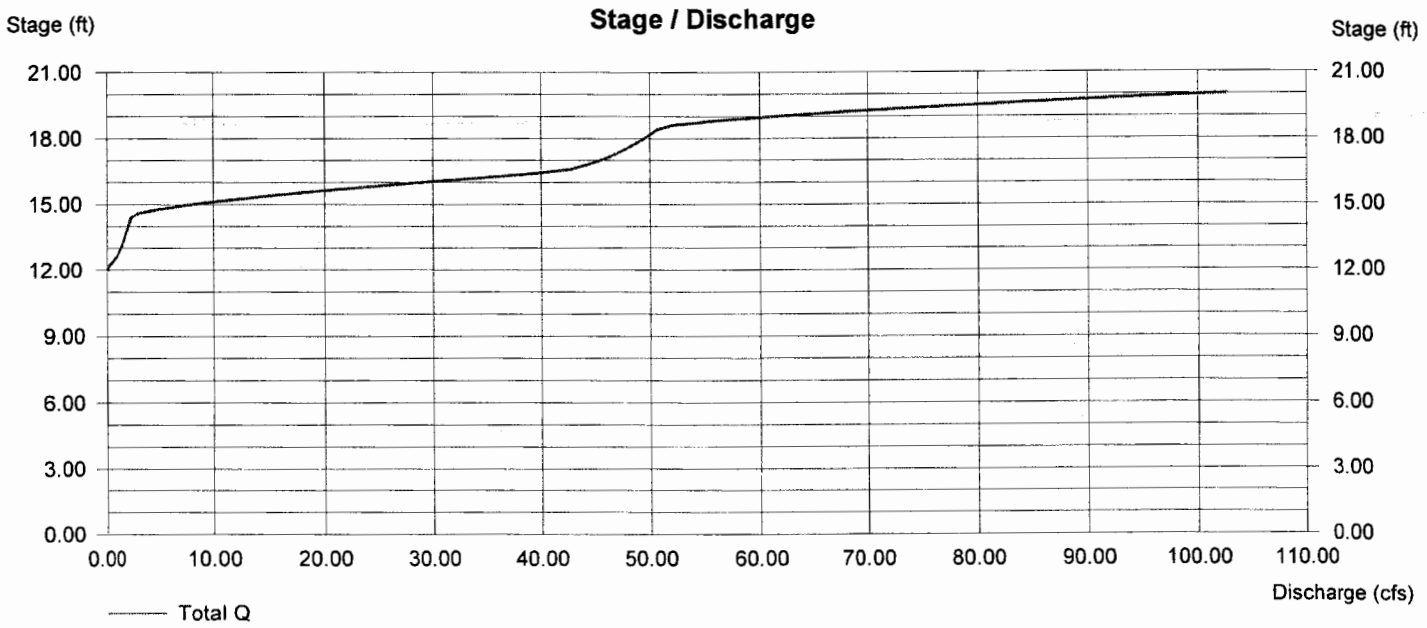
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	8.00	0.00	0.00
Span (in)	= 30.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.95	87.94	0.00	0.00
Length (ft)	= 537.00	10.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	4.13	0.00	0.00
Crest El. (ft)	= 94.50	90.48	0.00	0.00
Weir Coeff.	= 2.60	3.33	0.00	0.00
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

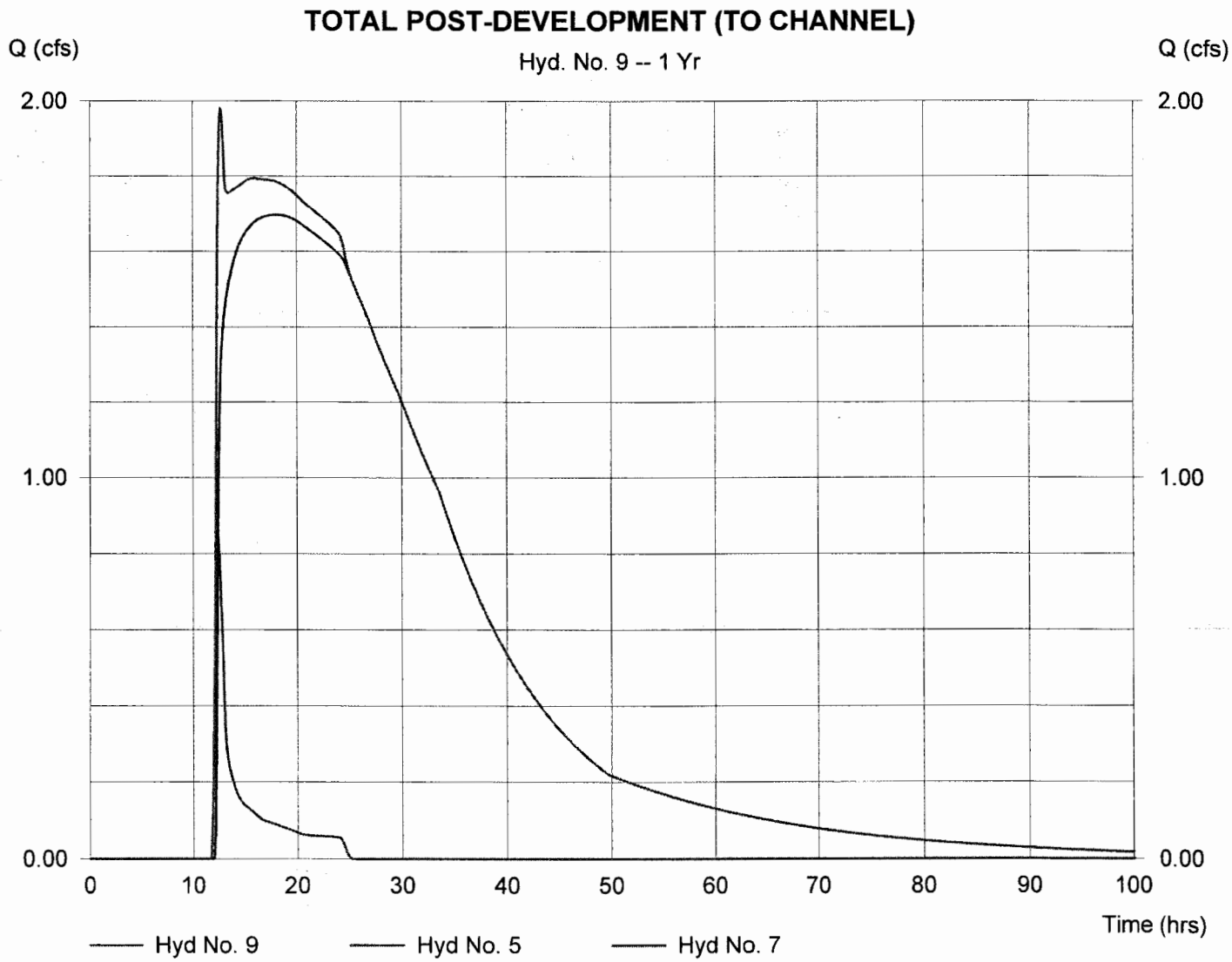
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 1.98 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 166,694 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	5.72	5	745	34,355	----	------	------	PRE-DEVELOP
3	SCS Runoff	53.98	5	735	267,682	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	1.74	5	745	11,757	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	2.30	5	1090	247,188	3	90.15	639,961	WET POND ROUTED
9	Combine	3.28	5	755	258,945	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO

02 18thHOLEPOND (Certification).gpw Return Period: 2 Year Thursday, Apr 20 2006, 11:39 AM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

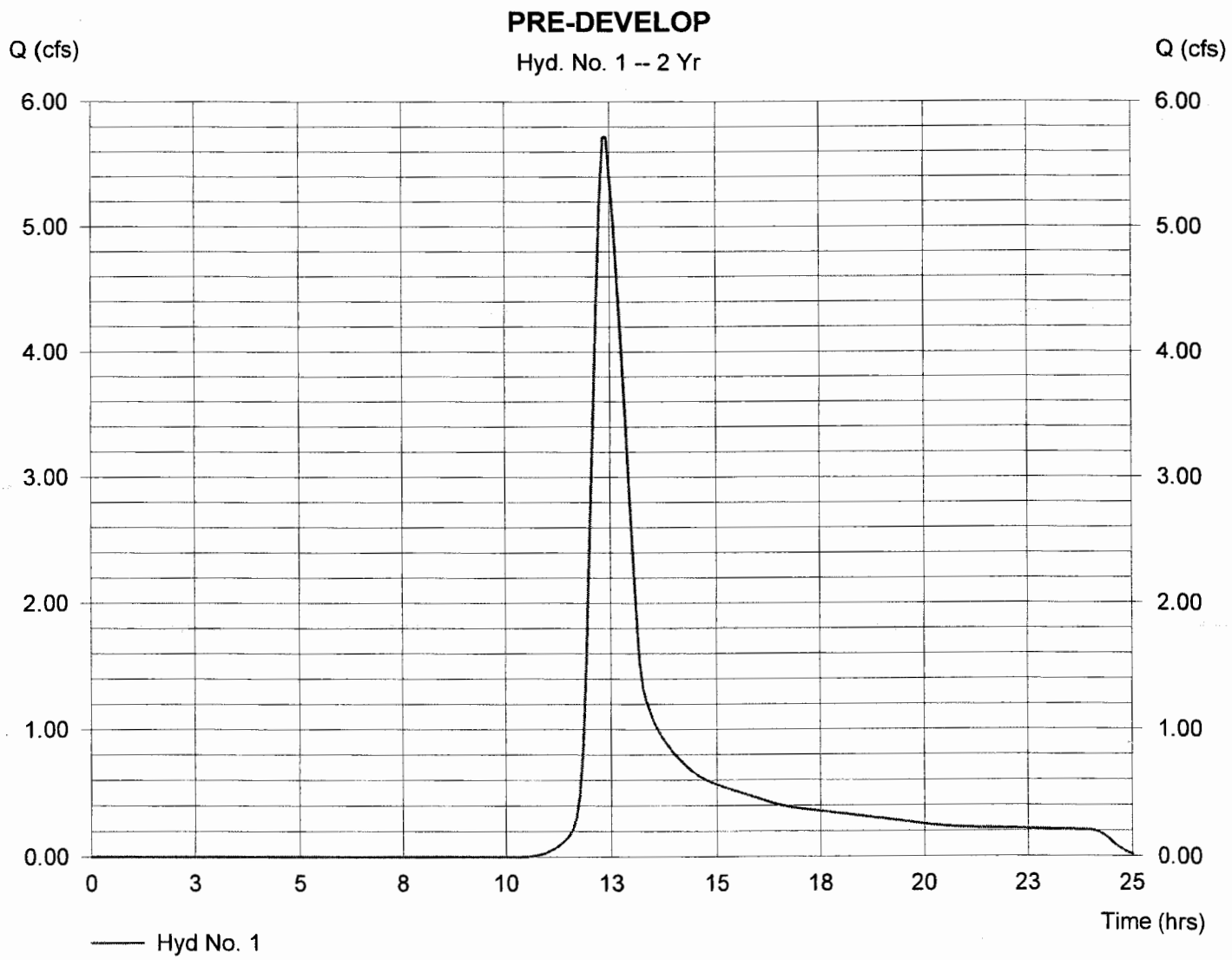
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 5.72 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 34,355 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

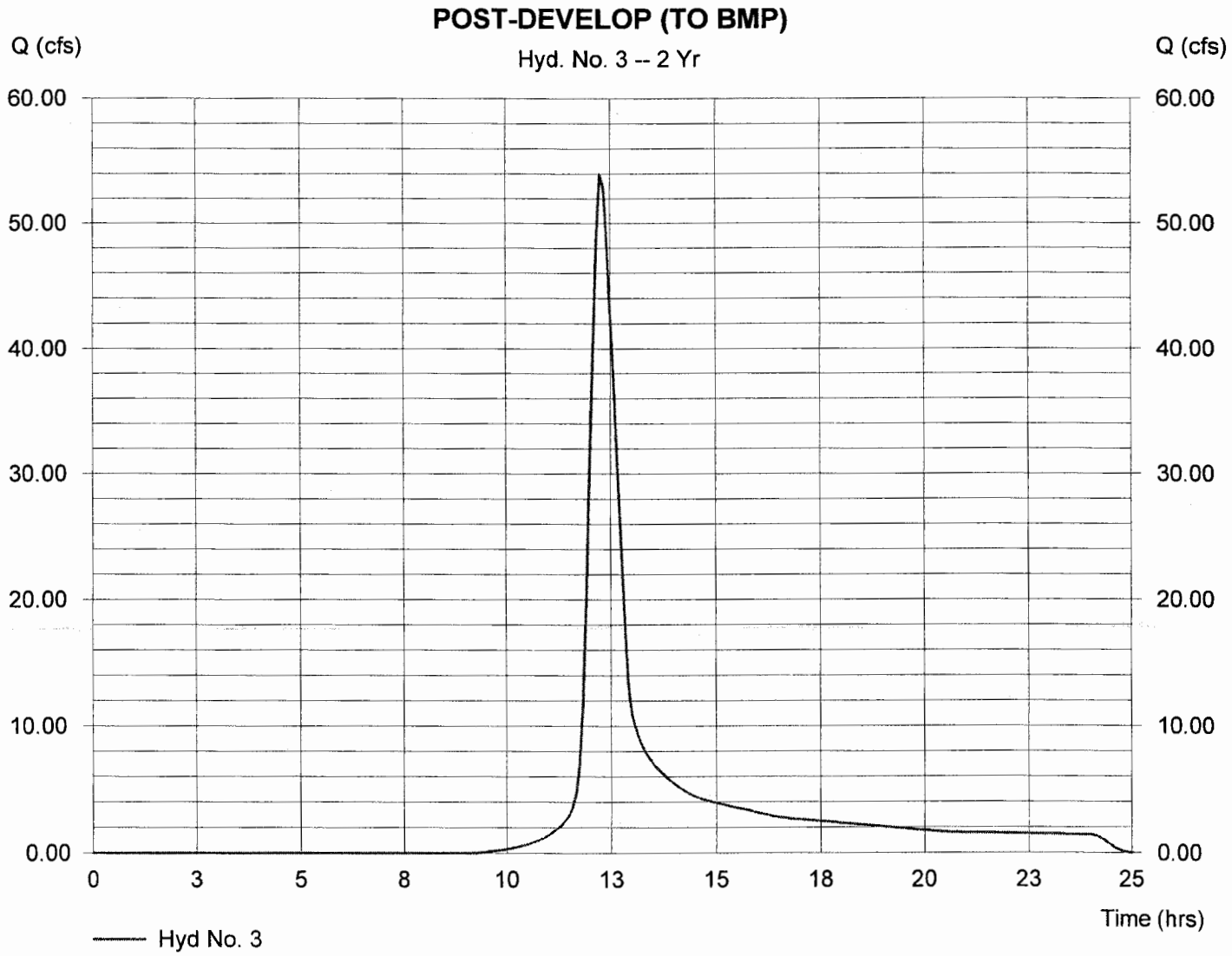
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 53.98 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 267,682 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

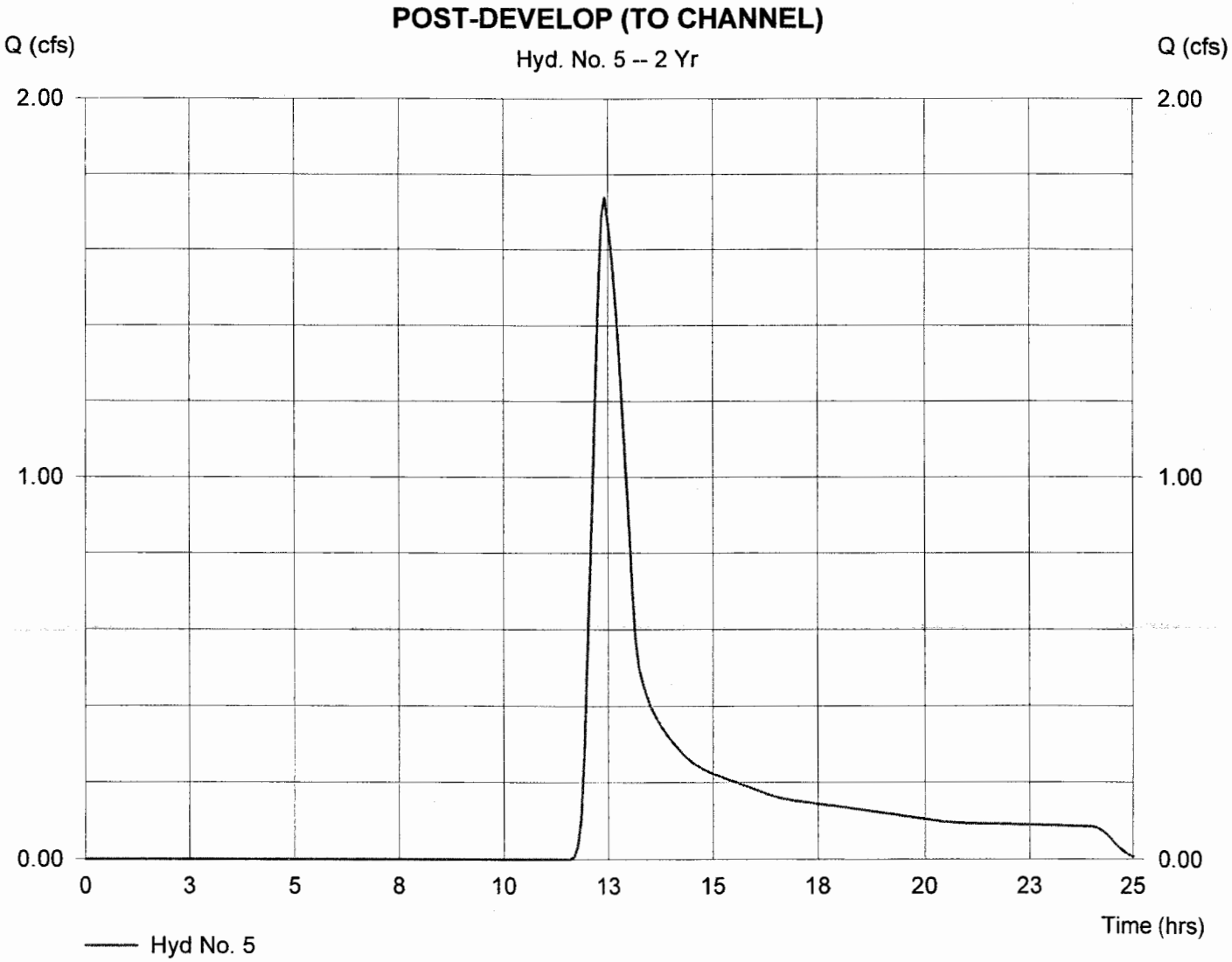
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.74 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,757 cuft



Hydrograph Plot

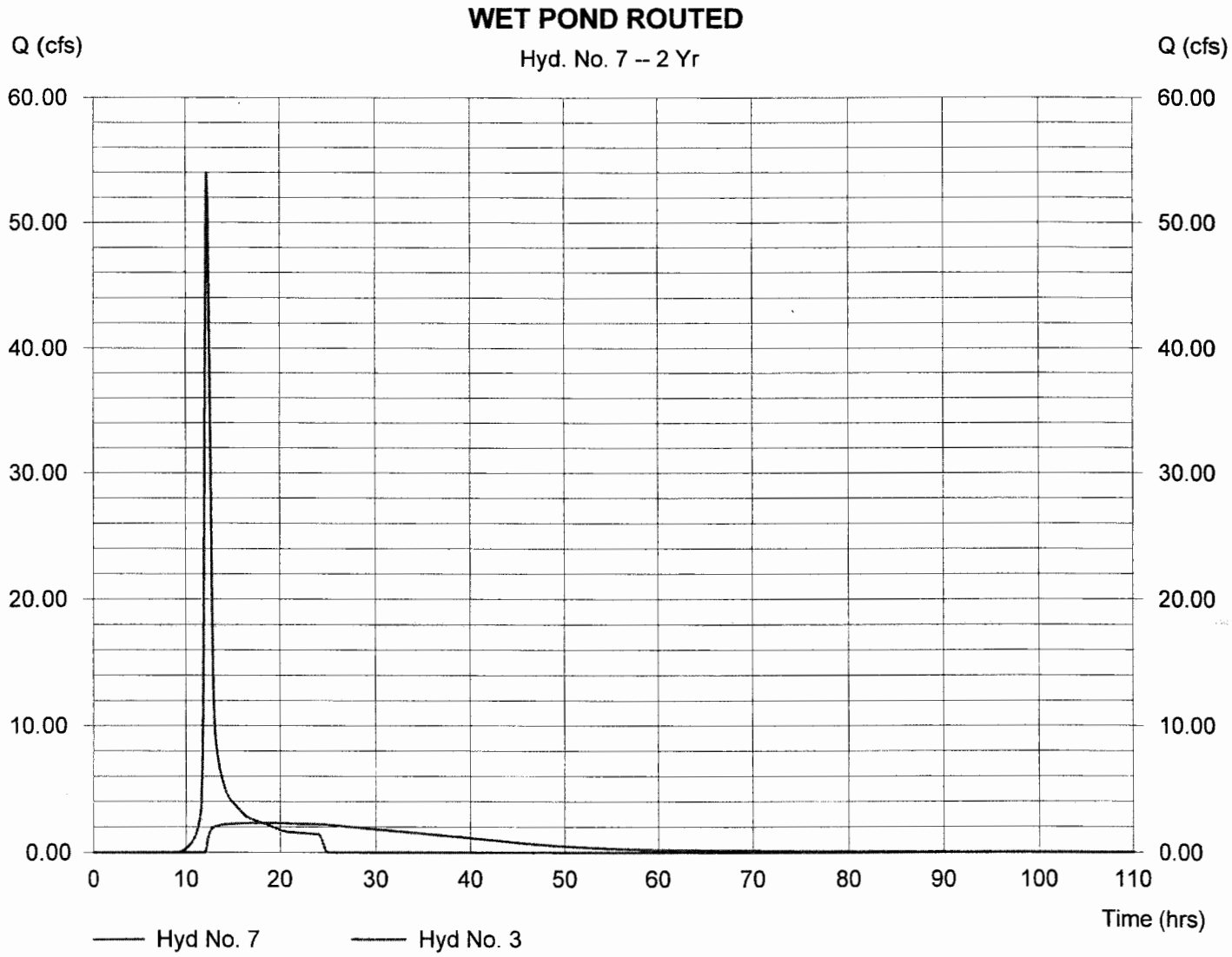
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 2.30 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Max. Elevation	= 90.15 ft
Reservoir name	= WET POND @ HOLE 18	Max. Storage	= 639,961 cuft

Storage Indication method used. Wet pond routing start elevation = 87.64 ft. — Hydrograph Volume = 247,188 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Pond No. 4 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	23,235	0	0
2.00	78.00	27,637	50,872	50,872
4.00	80.00	32,185	59,822	110,694
6.00	82.00	40,036	72,221	182,915
8.00	84.00	44,967	85,003	267,918
10.00	86.00	49,990	94,957	362,875
11.00	87.00	52,538	51,264	414,139
11.10	87.10	65,663	5,910	420,049
12.00	88.00	69,309	60,737	480,786
14.00	90.00	77,577	146,886	627,672
16.00	92.00	86,075	163,652	791,324
18.00	94.00	100,725	186,800	978,124
20.00	96.00	200,000	300,725	1,278,850

Culvert / Orifice Structures

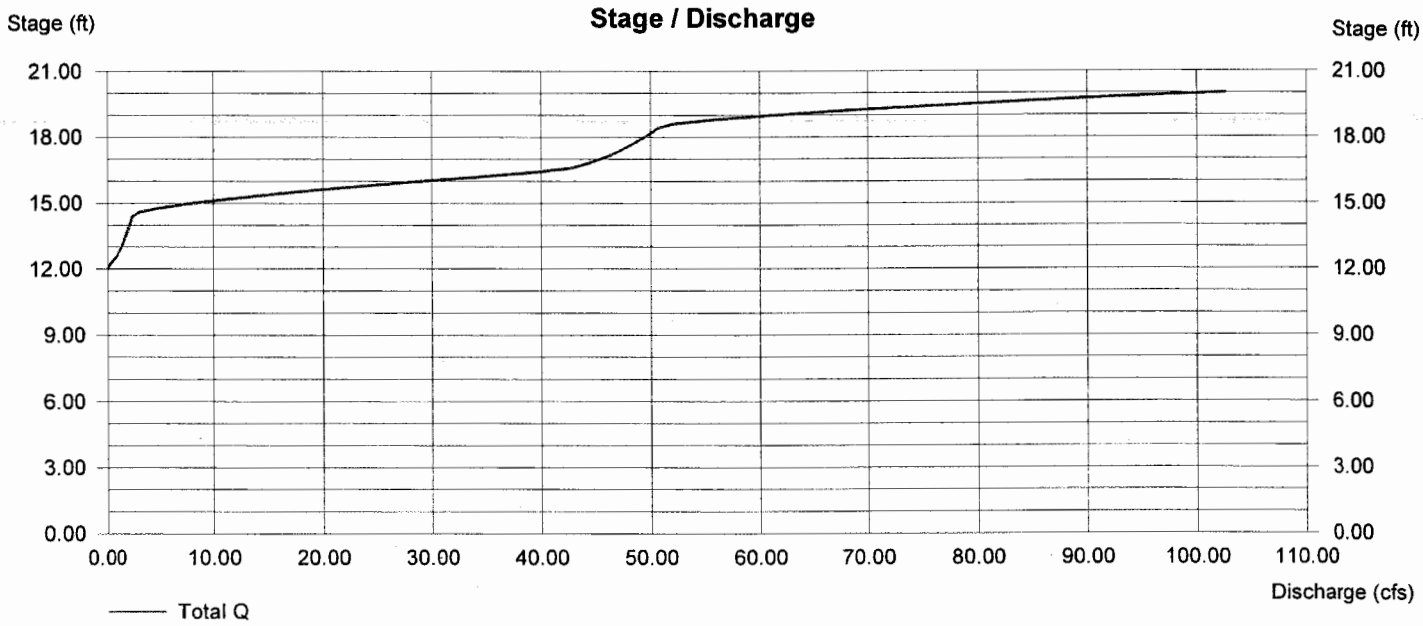
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	8.00	0.00	0.00
Span (in)	= 30.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.95	87.94	0.00	0.00
Length (ft)	= 537.00	10.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	4.13	0.00	0.00
Crest El. (ft)	= 94.50	90.48	0.00	0.00
Weir Coeff.	= 2.60	3.33	0.00	0.00
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

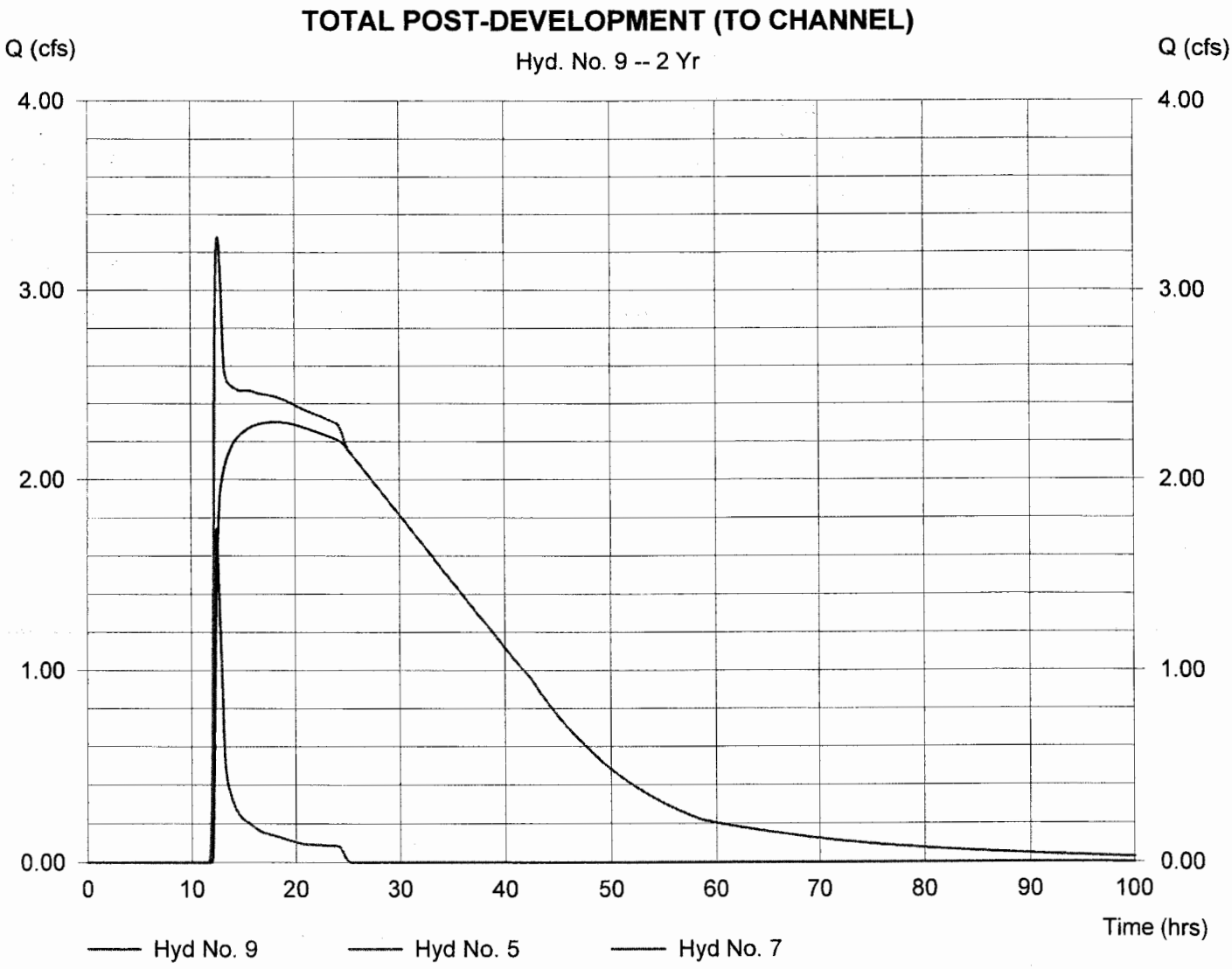
Hydraflow Hydrographs by Intelisolve | Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 3.28 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 258,945 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.41	5	740	48,991	----	------	------	PRE-DEVELOP
3	SCS Runoff	75.13	5	735	368,064	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	2.87	5	745	18,000	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	5.19	5	895	347,491	3	90.80	693,323	WET POND ROUTED
9	Combine	5.52	5	890	365,491	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO

02 18thHOLEPOND (Certification).gpw Return Period: 10 Year Thursday, Apr 20 2006, 11:39 AM

Hydrograph Plot

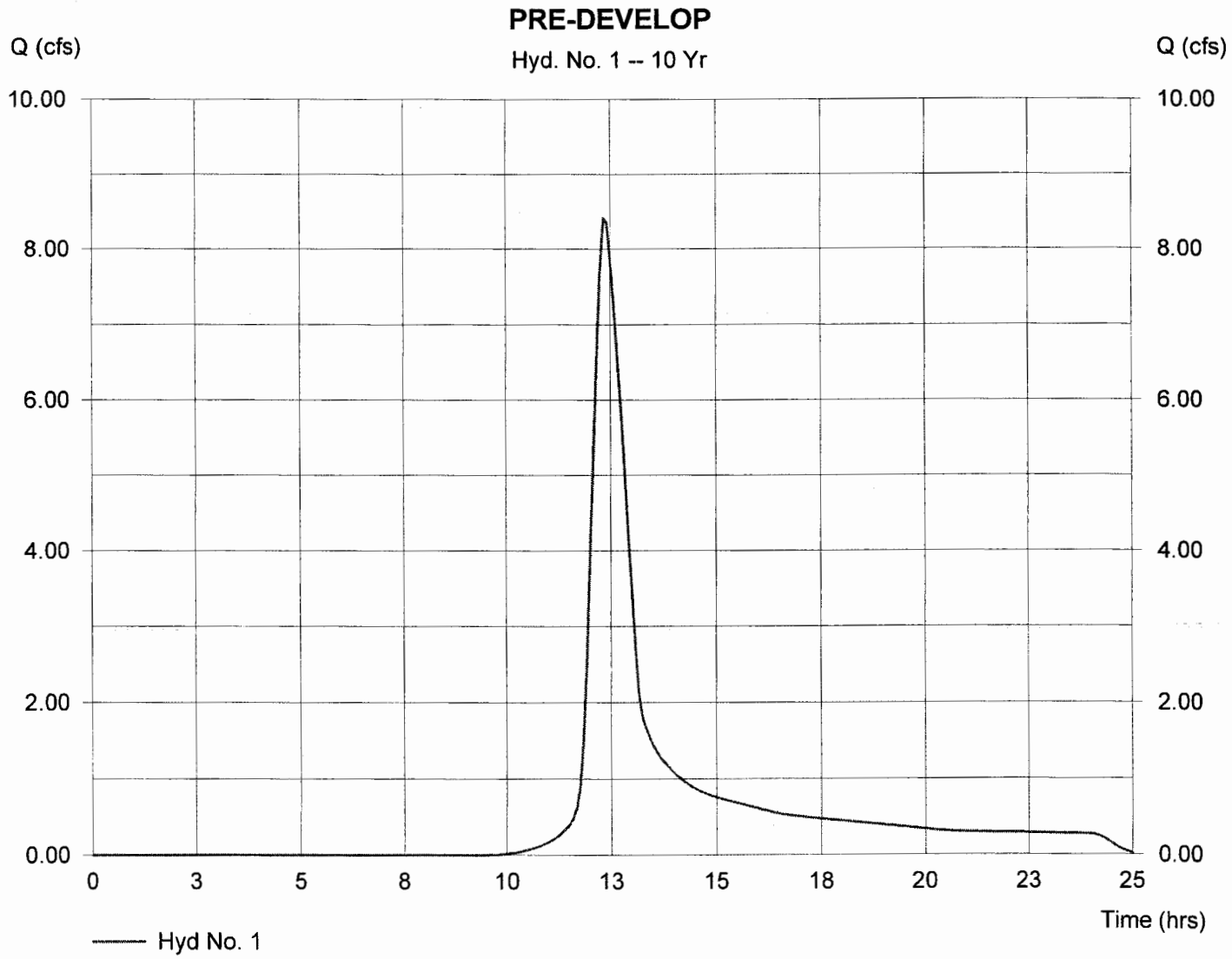
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 8.41 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 48,991 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

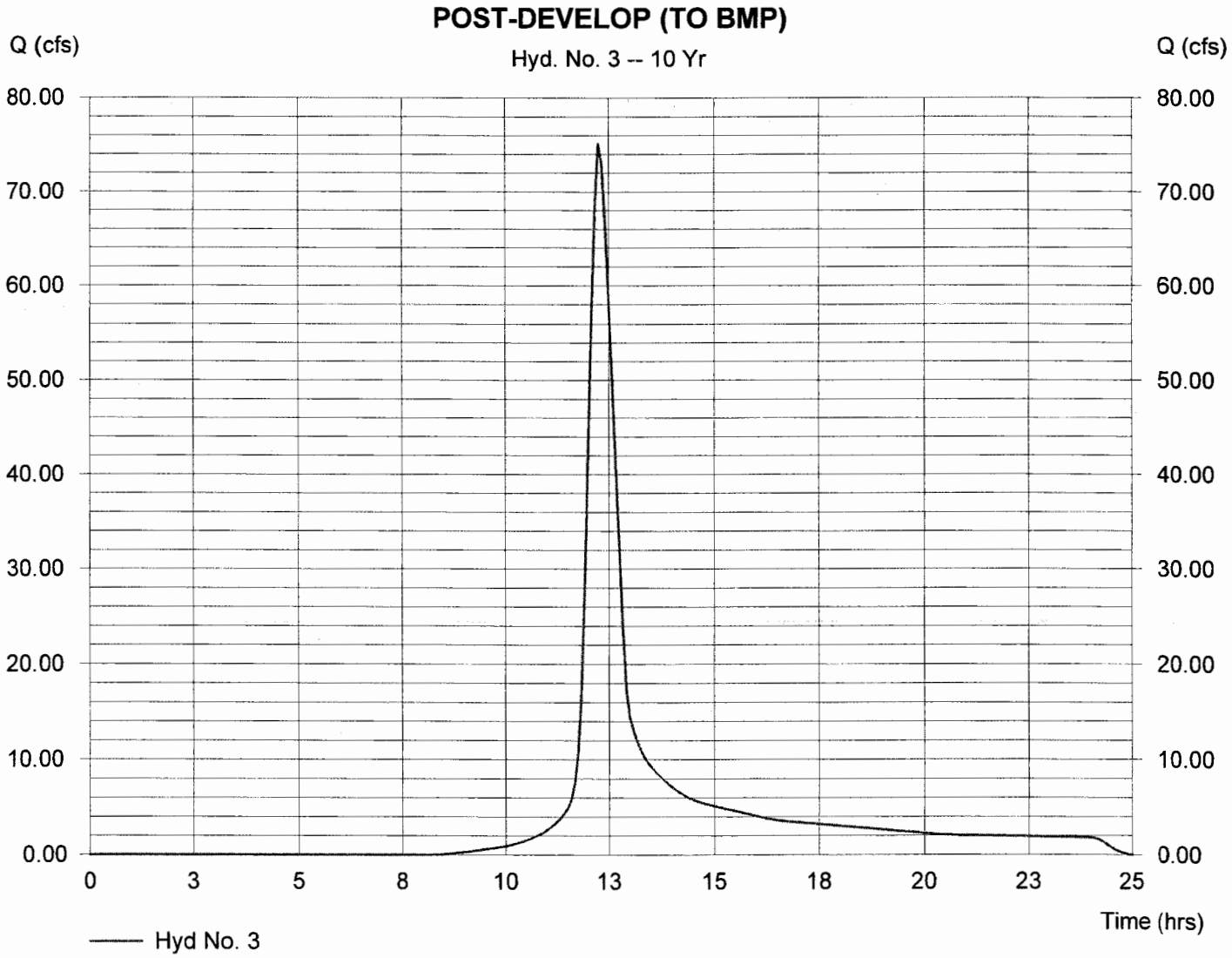
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 75.13 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 368,064 cuft



Hydrograph Plot

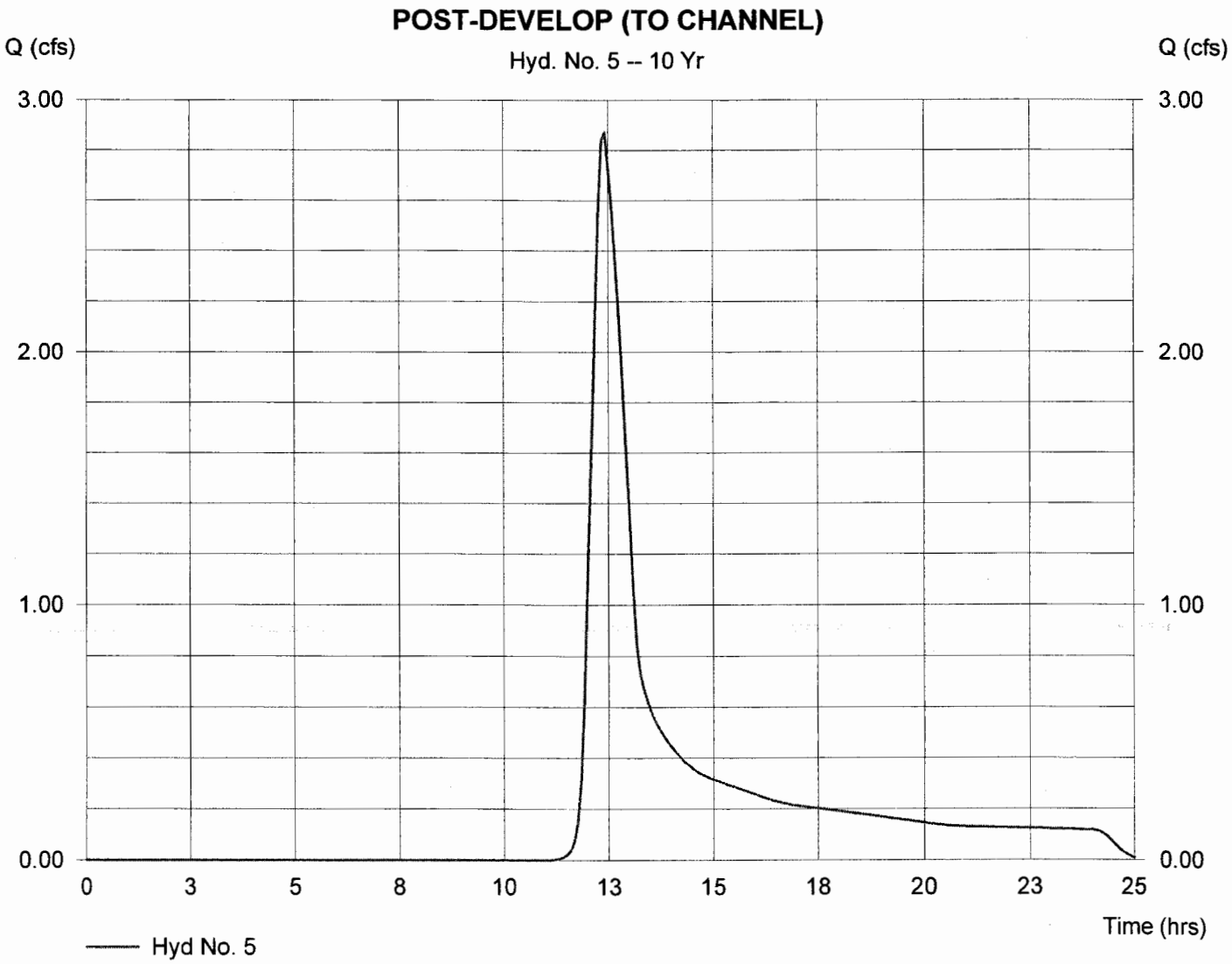
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.87 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 18,000 cuft



Hydrograph Plot

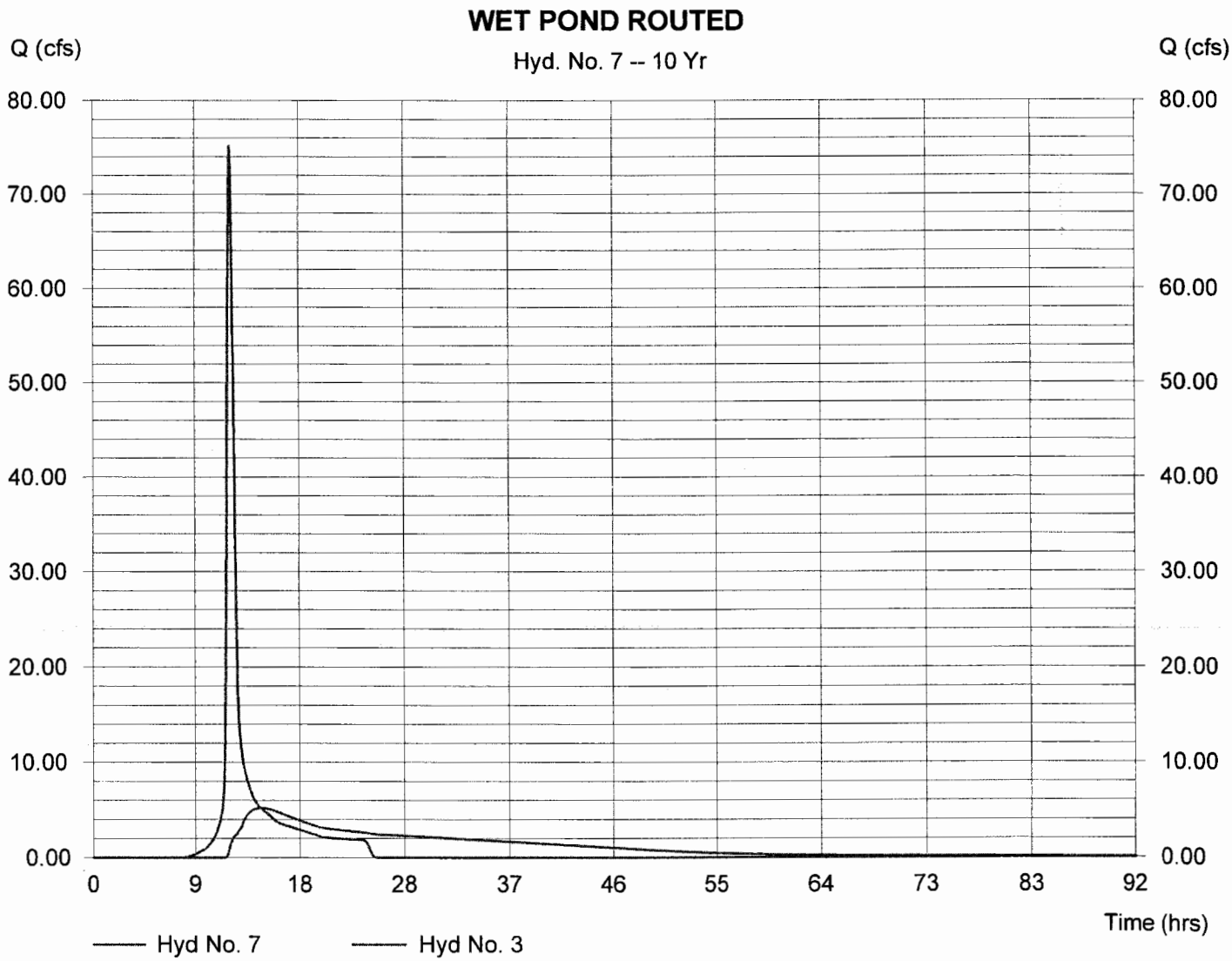
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 5.19 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Max. Elevation	= 90.80 ft
Reservoir name	= WET POND @ HOLE 18	Max. Storage	= 693,323 cuft

Storage Indication method used. Wet pond routing start elevation = 87.64 ft. — Hydrograph Volume = 347,491 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Pond No. 4 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	23,235	0	0
2.00	78.00	27,637	50,872	50,872
4.00	80.00	32,185	59,822	110,694
6.00	82.00	40,036	72,221	182,915
8.00	84.00	44,967	85,003	267,918
10.00	86.00	49,990	94,957	362,875
11.00	87.00	52,538	51,264	414,139
11.10	87.10	65,663	5,910	420,049
12.00	88.00	69,309	60,737	480,786
14.00	90.00	77,577	146,886	627,672
16.00	92.00	86,075	163,652	791,324
18.00	94.00	100,725	186,800	978,124
20.00	96.00	200,000	300,725	1,278,850

Culvert / Orifice Structures

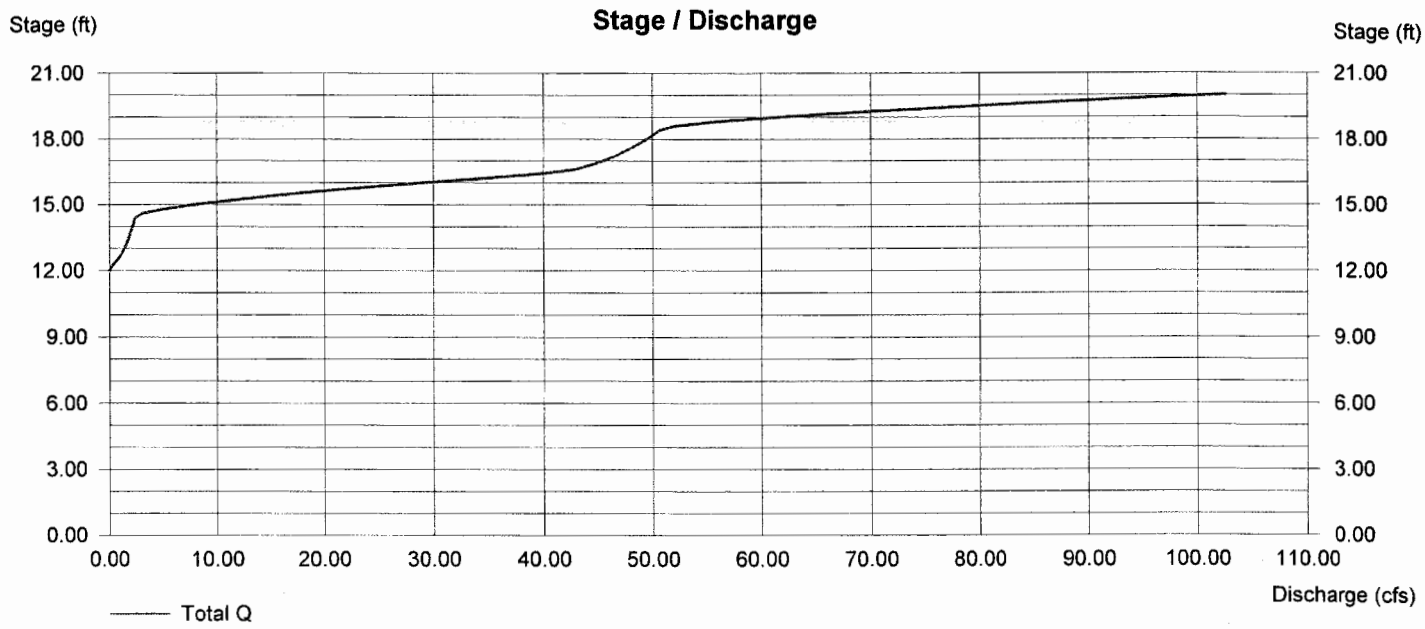
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	8.00	0.00	0.00
Span (in)	= 30.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.95	87.94	0.00	0.00
Length (ft)	= 537.00	10.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	4.13	0.00	0.00
Crest El. (ft)	= 94.50	90.48	0.00	0.00
Weir Coeff.	= 2.60	3.33	0.00	0.00
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) **Tailwater Elev. =** 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Apr 20 2006, 11:39 AM

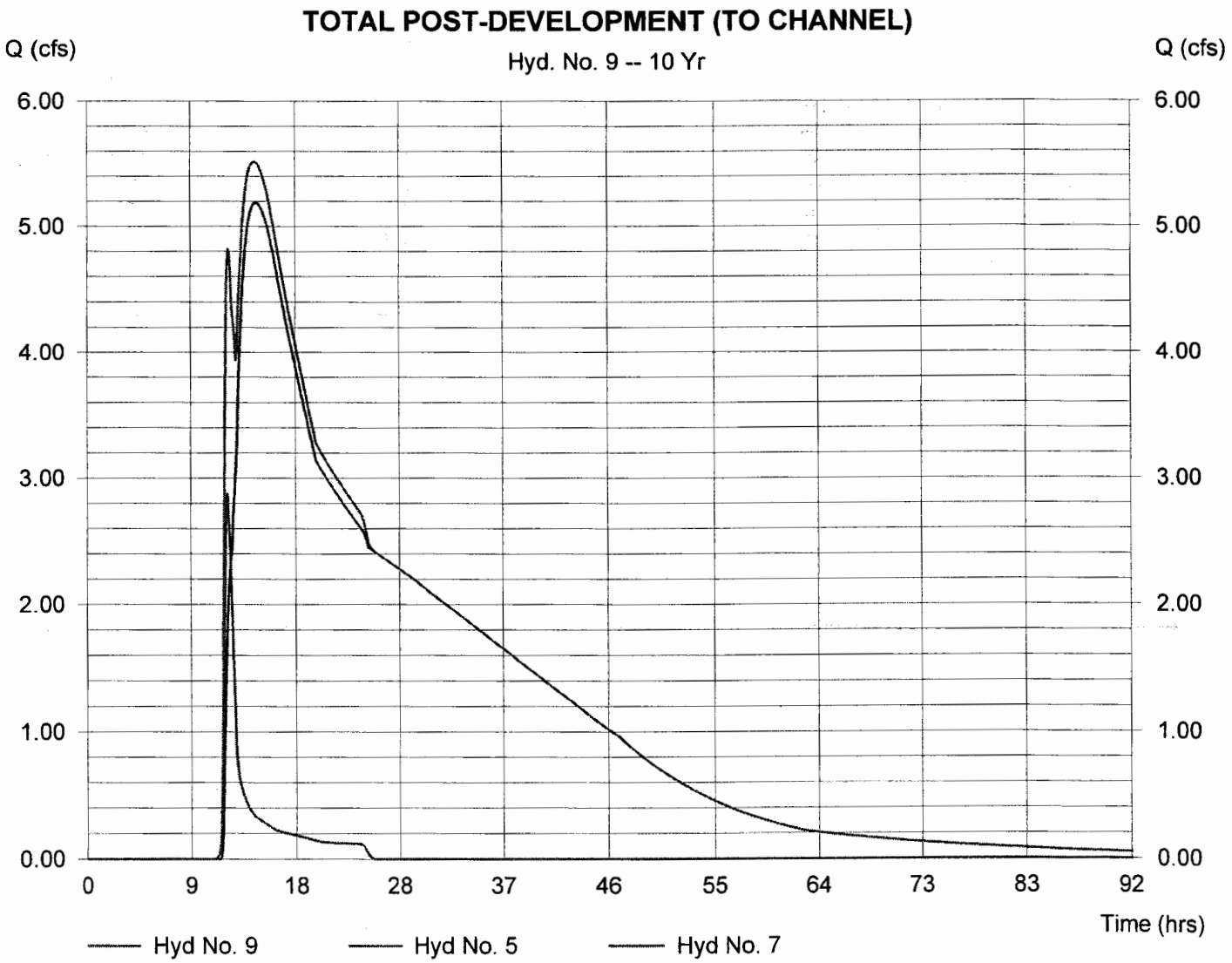
Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type = Combine
Storm frequency = 10 yrs
Inflow hyds. = 5, 7

Peak discharge = 5.52 cfs
Time interval = 5 min

Hydrograph Volume = 365,491 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.33	5	740	81,466	----	------	------	PRE-DEVELOP
3	SCS Runoff	120.02	5	735	584,711	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	5.54	5	740	32,610	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	25.20	5	775	564,116	3	91.85	778,842	WET POND ROUTED
9	Combine	28.04	5	775	596,725	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO

02 18thHOLEPOND (Certification).gpw Return Period: 25 Year Thursday, Apr 20 2006, 11:39 AM

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

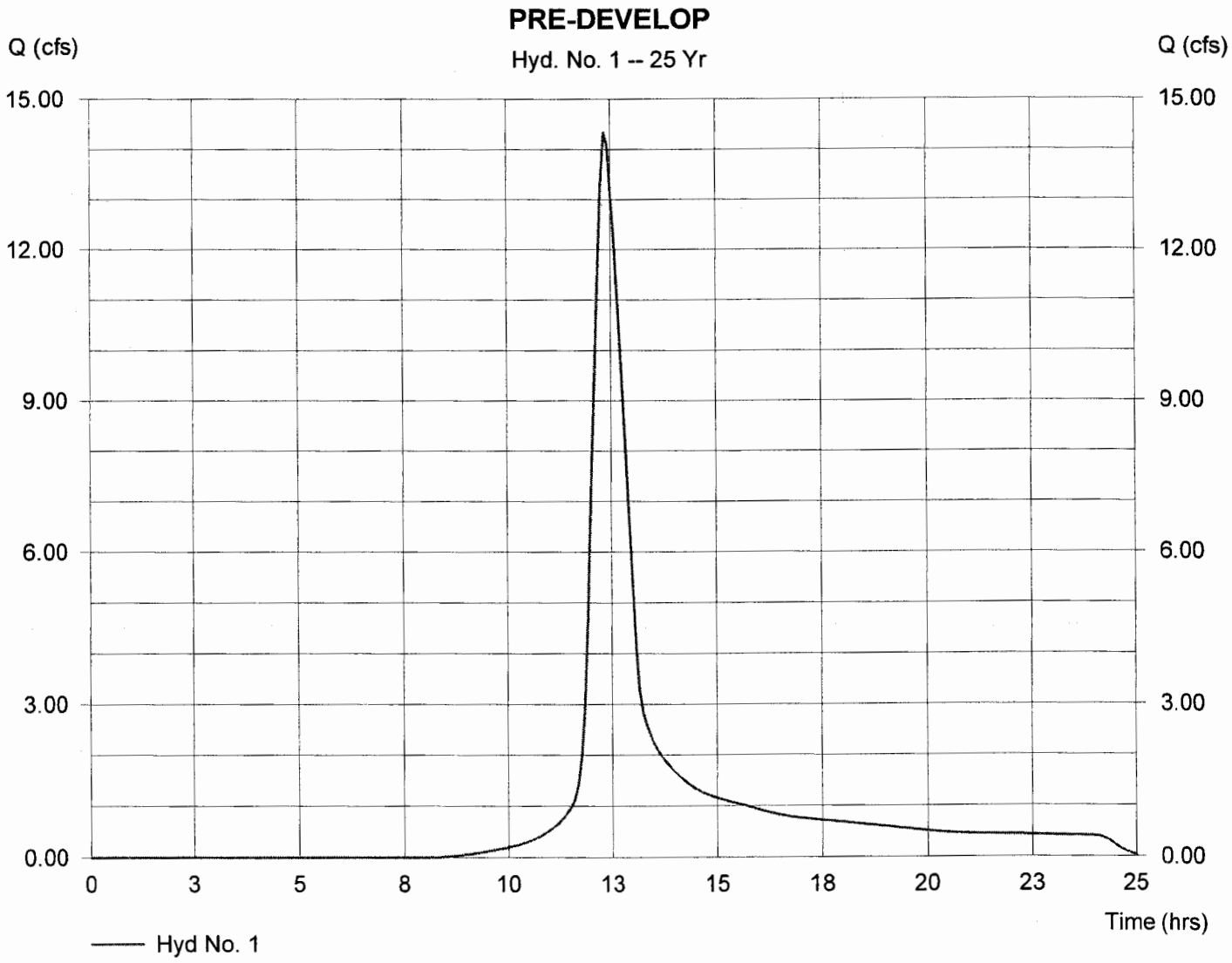
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 14.33 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 81,466 cuft



Hydrograph Plot

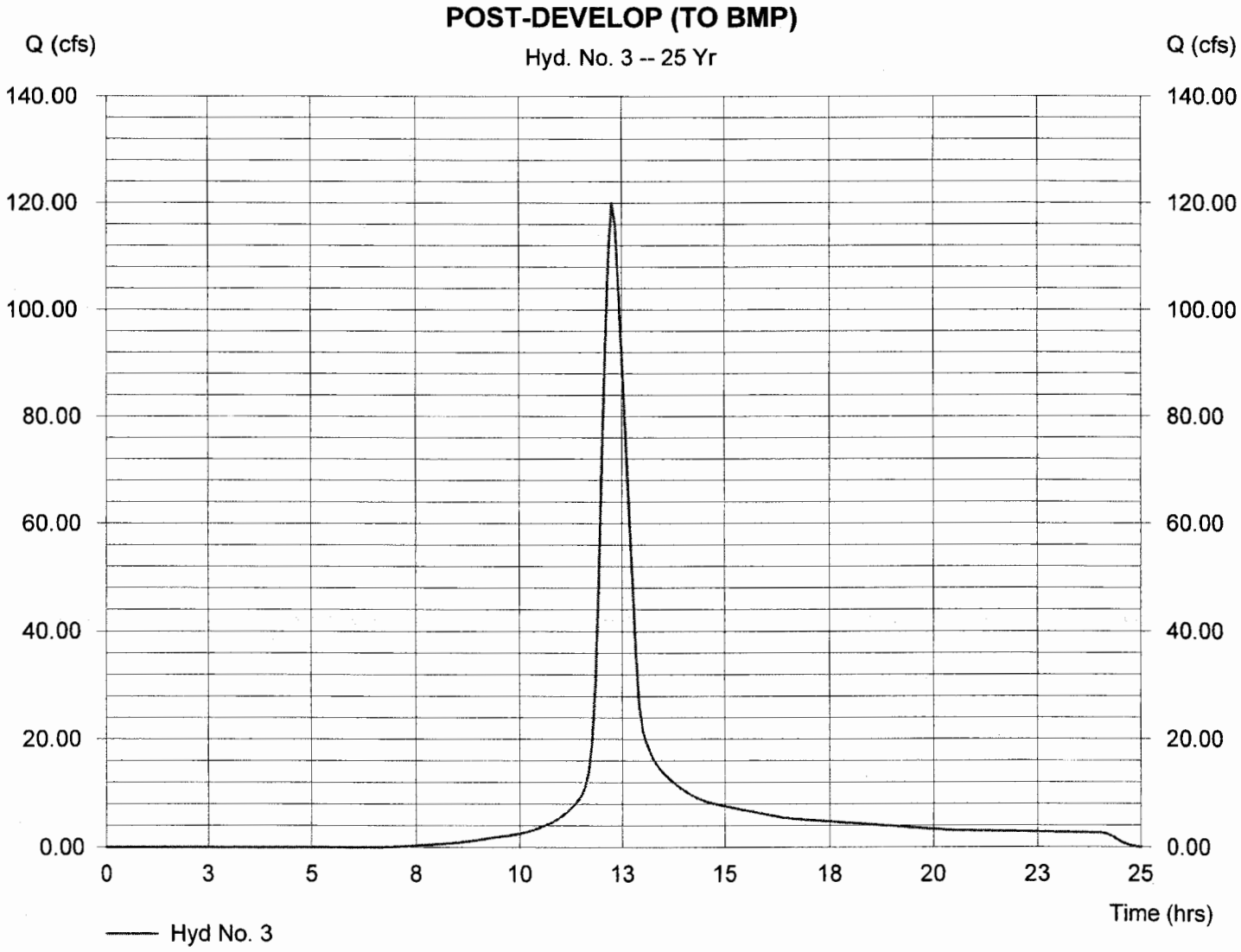
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 120.02 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 584,711 cuft



Hydrograph Plot

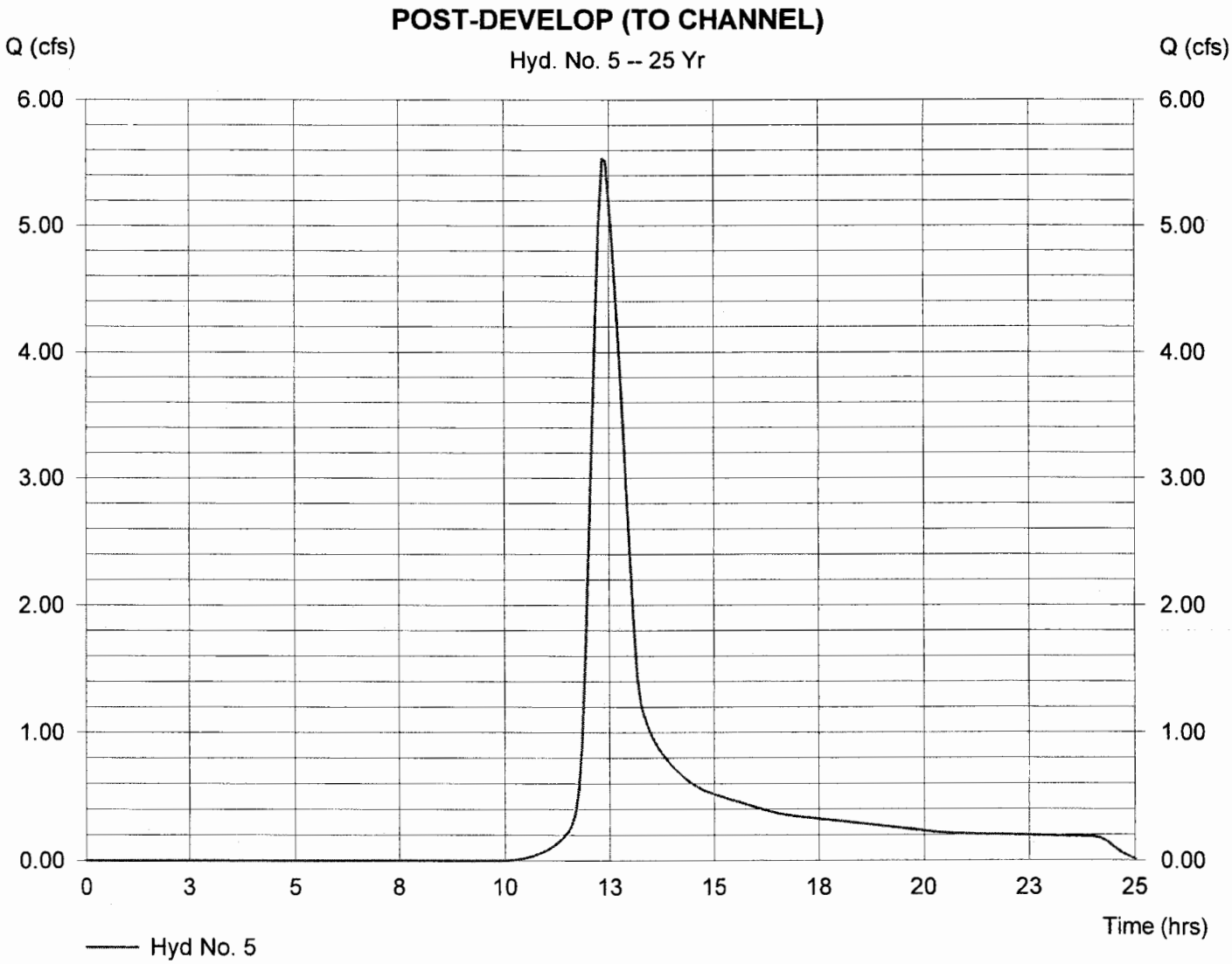
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 5.54 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,610 cuft



Hydrograph Plot

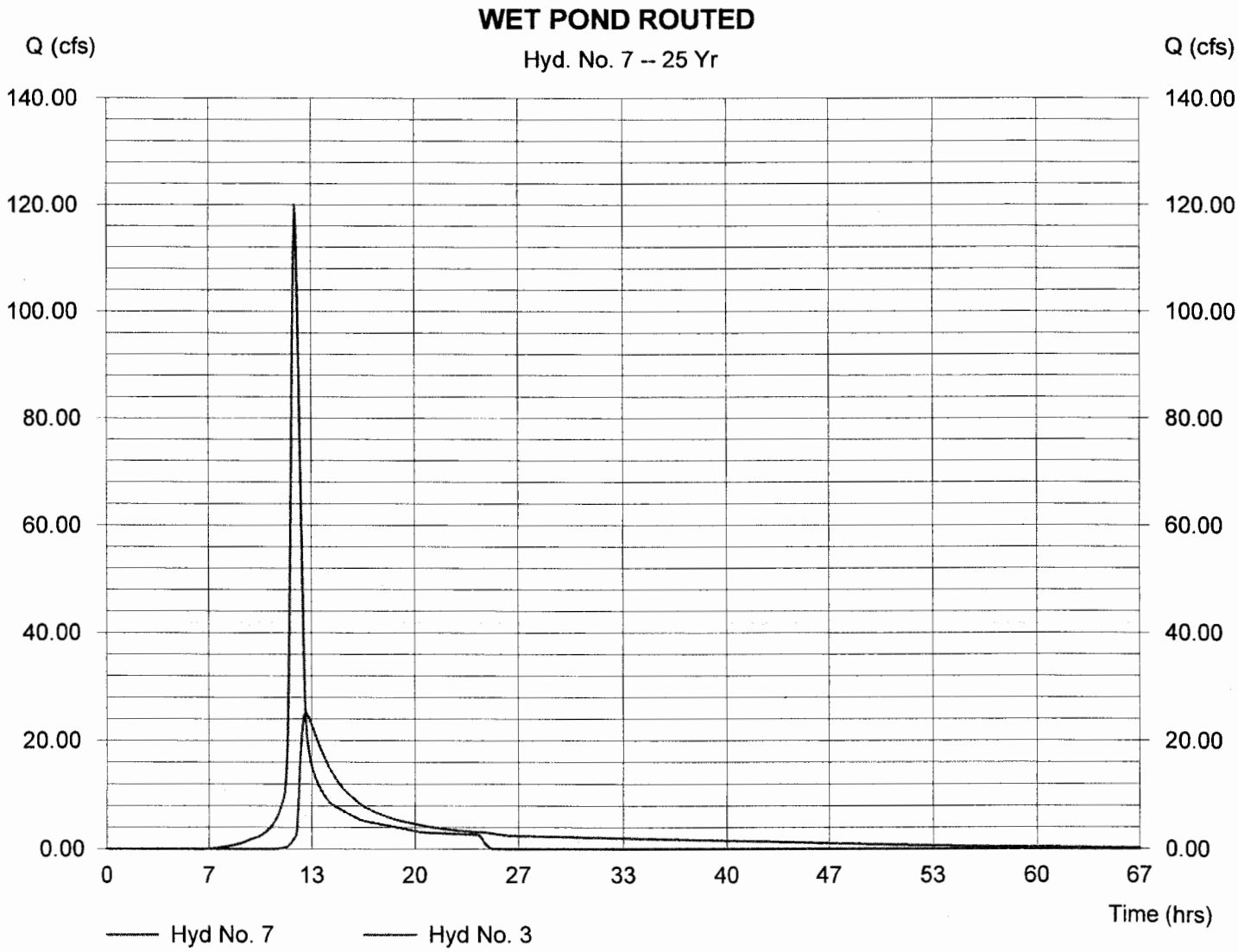
Hydraflow Hydrographs by Intelisolve | Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 25.20 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Max. Elevation	= 91.85 ft
Reservoir name	= WET POND @ HOLE 18	Max. Storage	= 778,842 cuft

Storage Indication method used. Wet pond routing start elevation = 87.64 ft. | Hydrograph Volume = 564,116 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Pond No. 4 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	23,235	0	0
2.00	78.00	27,637	50,872	50,872
4.00	80.00	32,185	59,822	110,694
6.00	82.00	40,036	72,221	182,915
8.00	84.00	44,967	85,003	267,918
10.00	86.00	49,990	94,957	362,875
11.00	87.00	52,538	51,264	414,139
11.10	87.10	65,663	5,910	420,049
12.00	88.00	69,309	60,737	480,786
14.00	90.00	77,577	146,886	627,672
16.00	92.00	86,075	163,652	791,324
18.00	94.00	100,725	186,800	978,124
20.00	96.00	200,000	300,725	1,278,850

Culvert / Orifice Structures

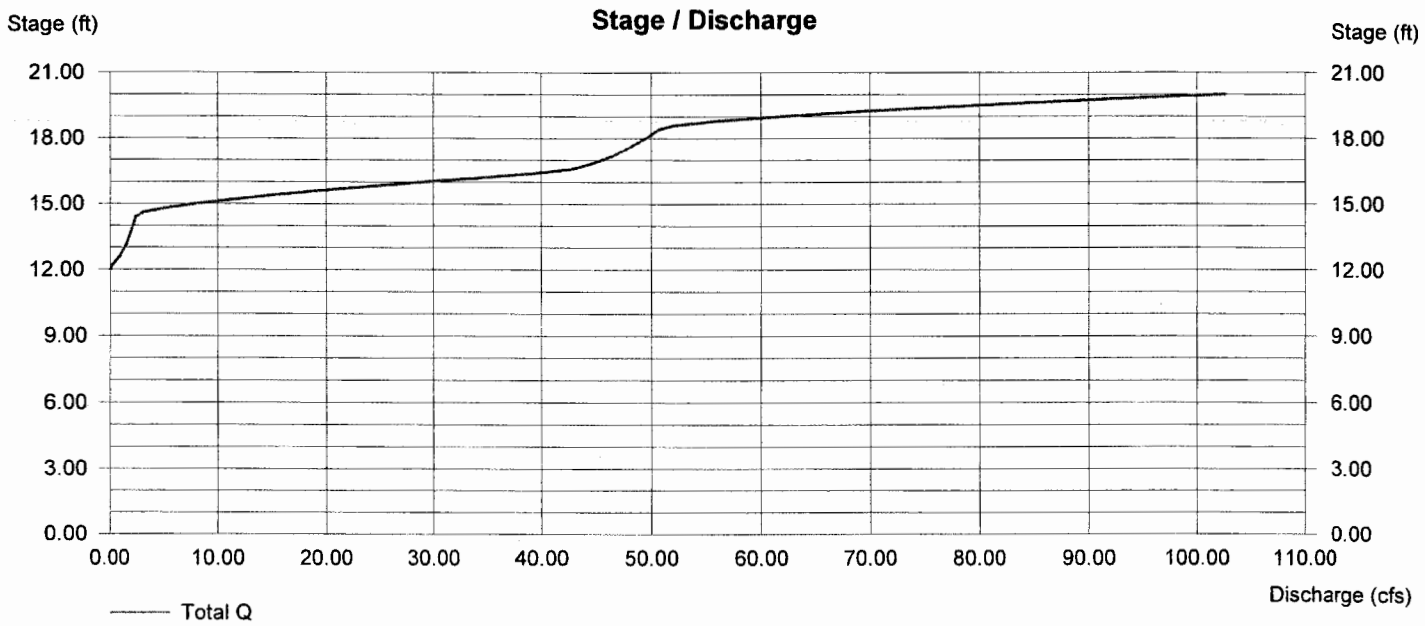
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	8.00	0.00	0.00
Span (in)	= 30.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.95	87.94	0.00	0.00
Length (ft)	= 537.00	10.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	4.13	0.00	0.00
Crest El. (ft)	= 94.50	90.48	0.00	0.00
Weir Coeff.	= 2.60	3.33	0.00	0.00
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) **Tailwater Elev. =** 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

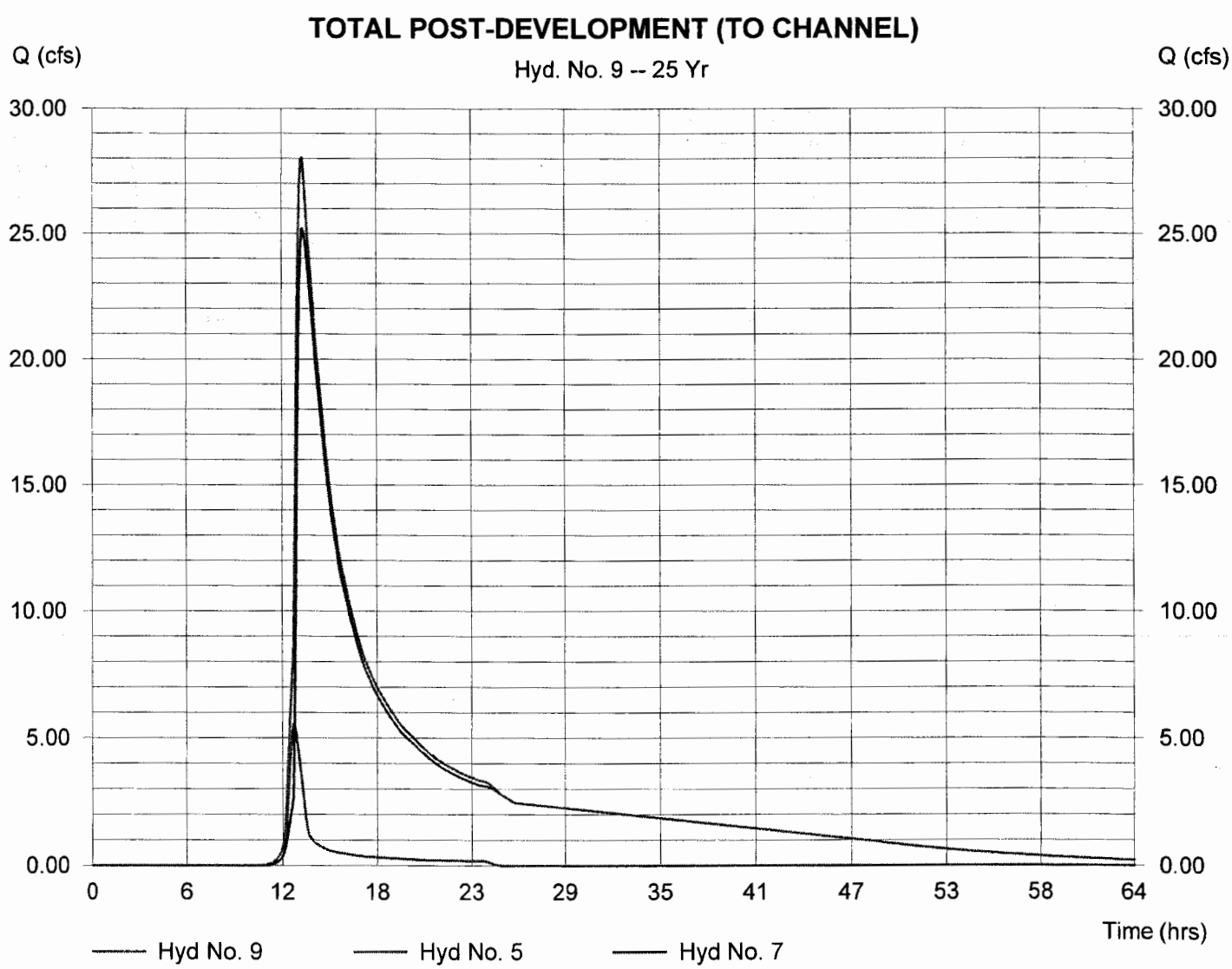
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 28.04 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 596,725 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	23.35	5	740	131,860	----	------	------	PRE-DEVELOP
3	SCS Runoff	186.27	5	735	912,495	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	9.89	5	740	56,425	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	47.62	5	770	891,885	3	93.48	929,834	WET POND ROUTED
9	Combine	54.45	5	760	948,309	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO

02 18thHOLEPOND (Certification).gpw Return Period: 100 Year Thursday, Apr 20 2006, 11:39 AM

Hydraflow Hydrographs by Intelisolve

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

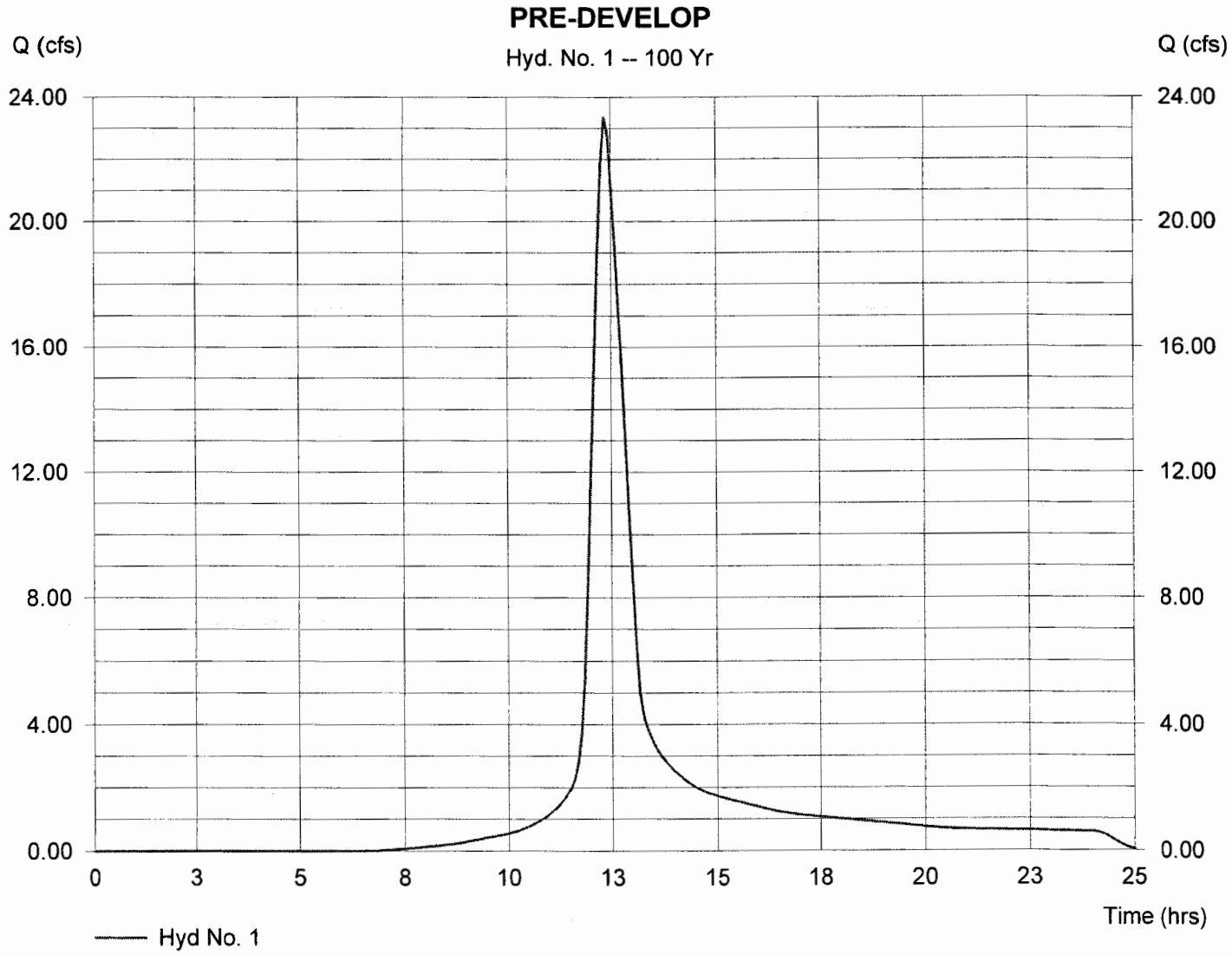
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 23.35 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 131,860 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

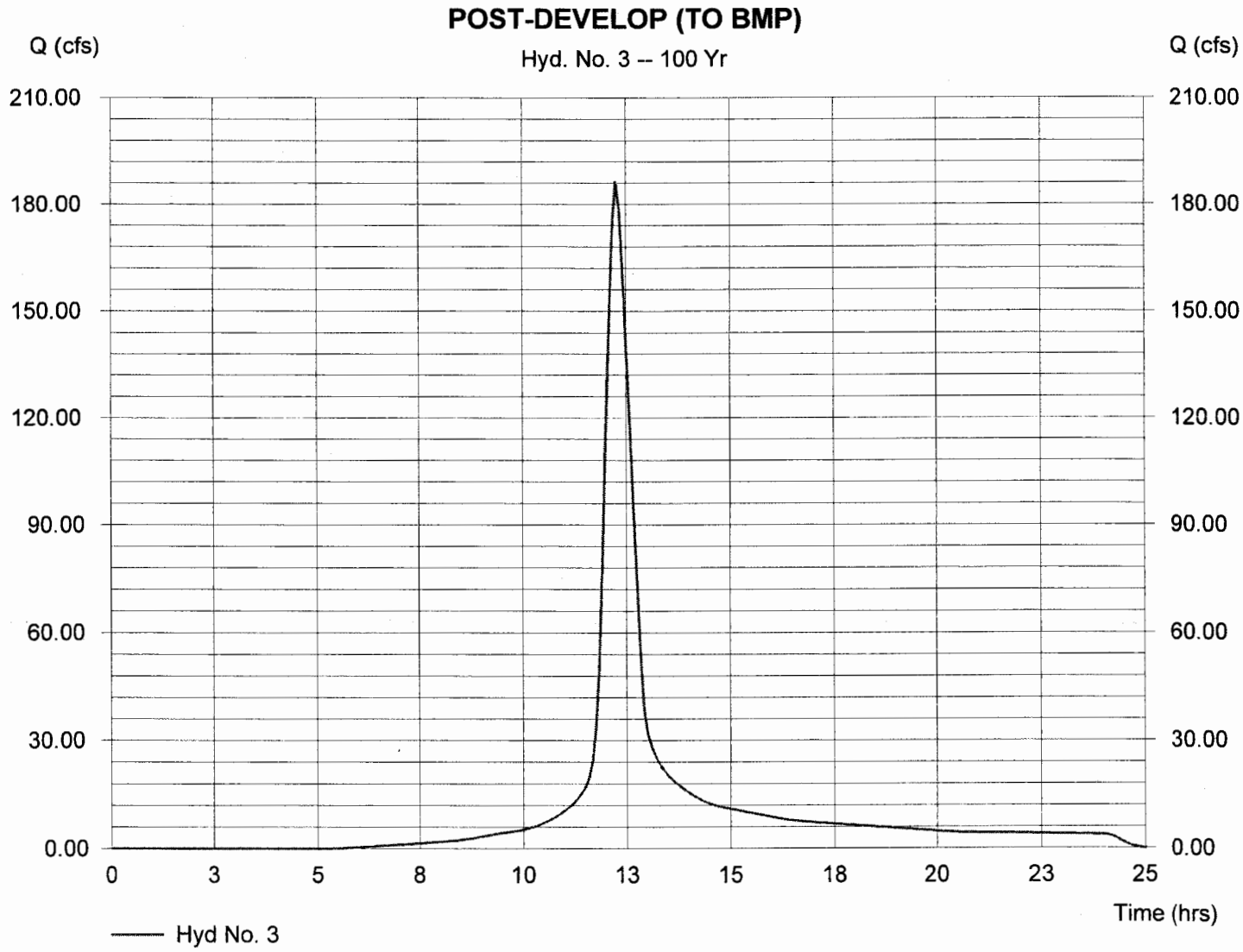
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 186.27 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 912,495 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

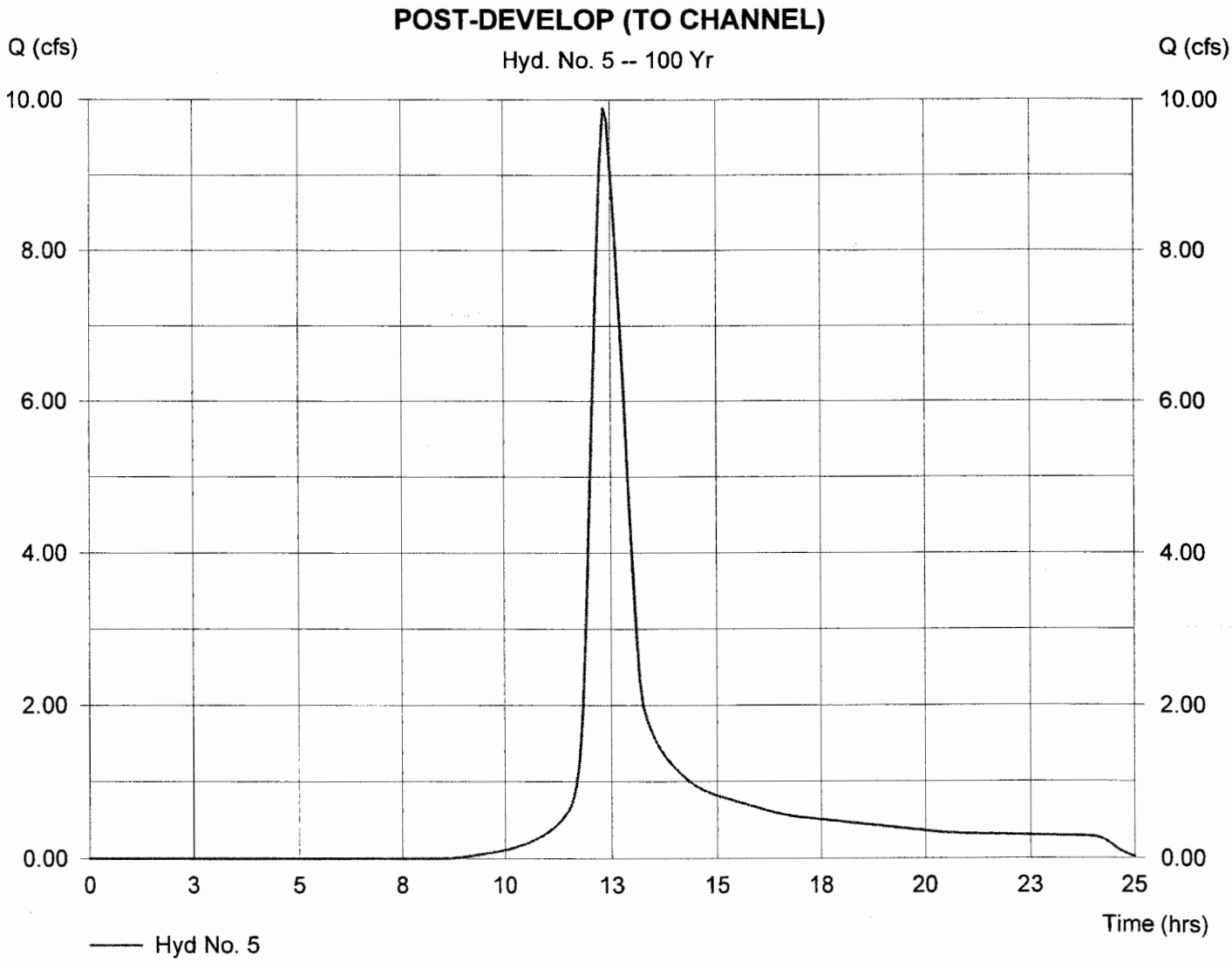
Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.89 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 56,425 cuft



Hydrograph Plot

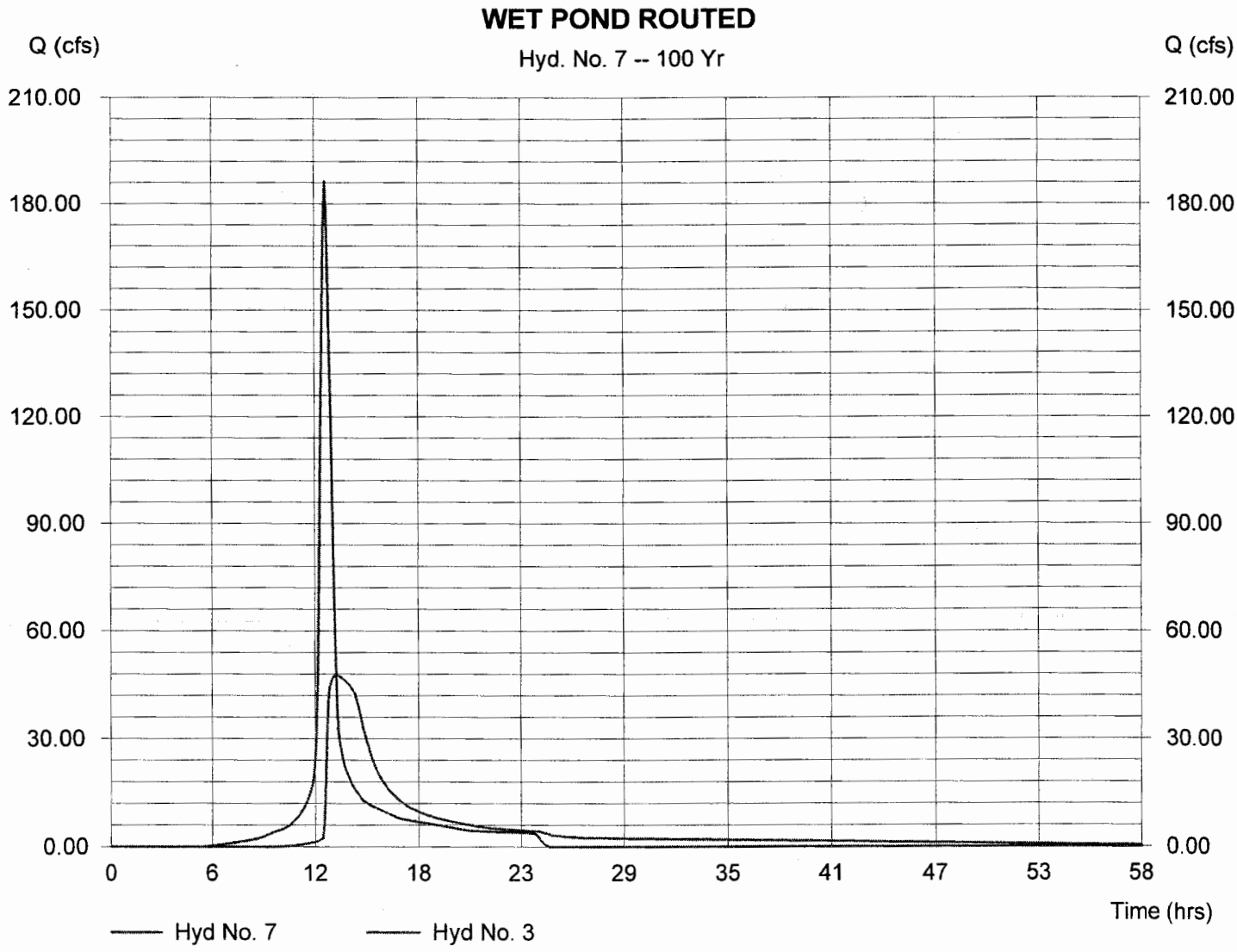
Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 47.62 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Max. Elevation	= 93.48 ft
Reservoir name	= WET POND @ HOLE 18	Max. Storage	= 929,834 cuft

Storage Indication method used. Wet pond routing start elevation = 87.64 ft. — Hydrograph Volume = 891,885 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve — Thursday, Apr 20 2006, 11:39 AM

Pond No. 4 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	76.00	23,235	0	0
2.00	78.00	27,637	50,872	50,872
4.00	80.00	32,185	59,822	110,694
6.00	82.00	40,036	72,221	182,915
8.00	84.00	44,967	85,003	267,918
10.00	86.00	49,990	94,957	362,875
11.00	87.00	52,538	51,264	414,139
11.10	87.10	65,663	5,910	420,049
12.00	88.00	69,309	60,737	480,786
14.00	90.00	77,577	146,886	627,672
16.00	92.00	86,075	163,652	791,324
18.00	94.00	100,725	186,800	978,124
20.00	96.00	200,000	300,725	1,278,850

Culvert / Orifice Structures

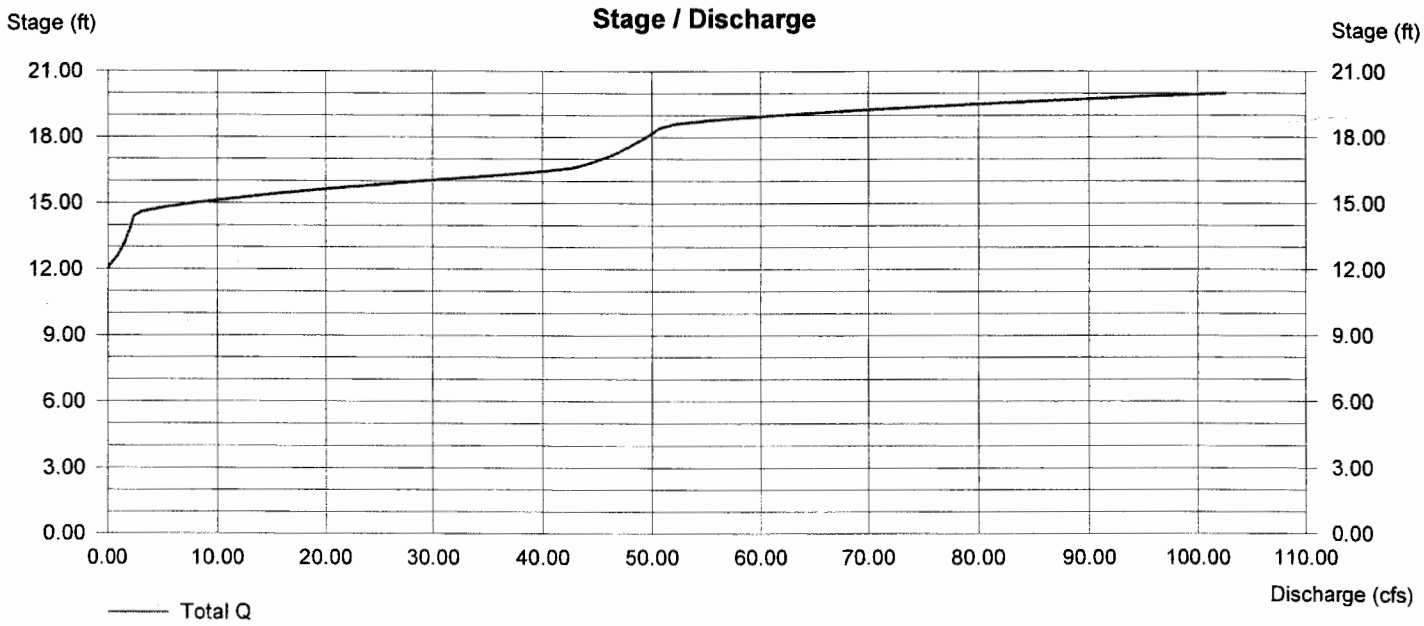
	[A]	[B]	[C]	[D]
Rise (in)	= 30.00	8.00	0.00	0.00
Span (in)	= 30.00	8.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 80.95	87.94	0.00	0.00
Length (ft)	= 537.00	10.00	0.00	0.00
Slope (%)	= 0.01	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	4.13	0.00	0.00
Crest El. (ft)	= 94.50	90.48	0.00	0.00
Weir Coeff.	= 2.60	3.33	0.00	0.00
Weir Type	= Broad	Rect	---	---
Multi-Stage	= No	Yes	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Plot

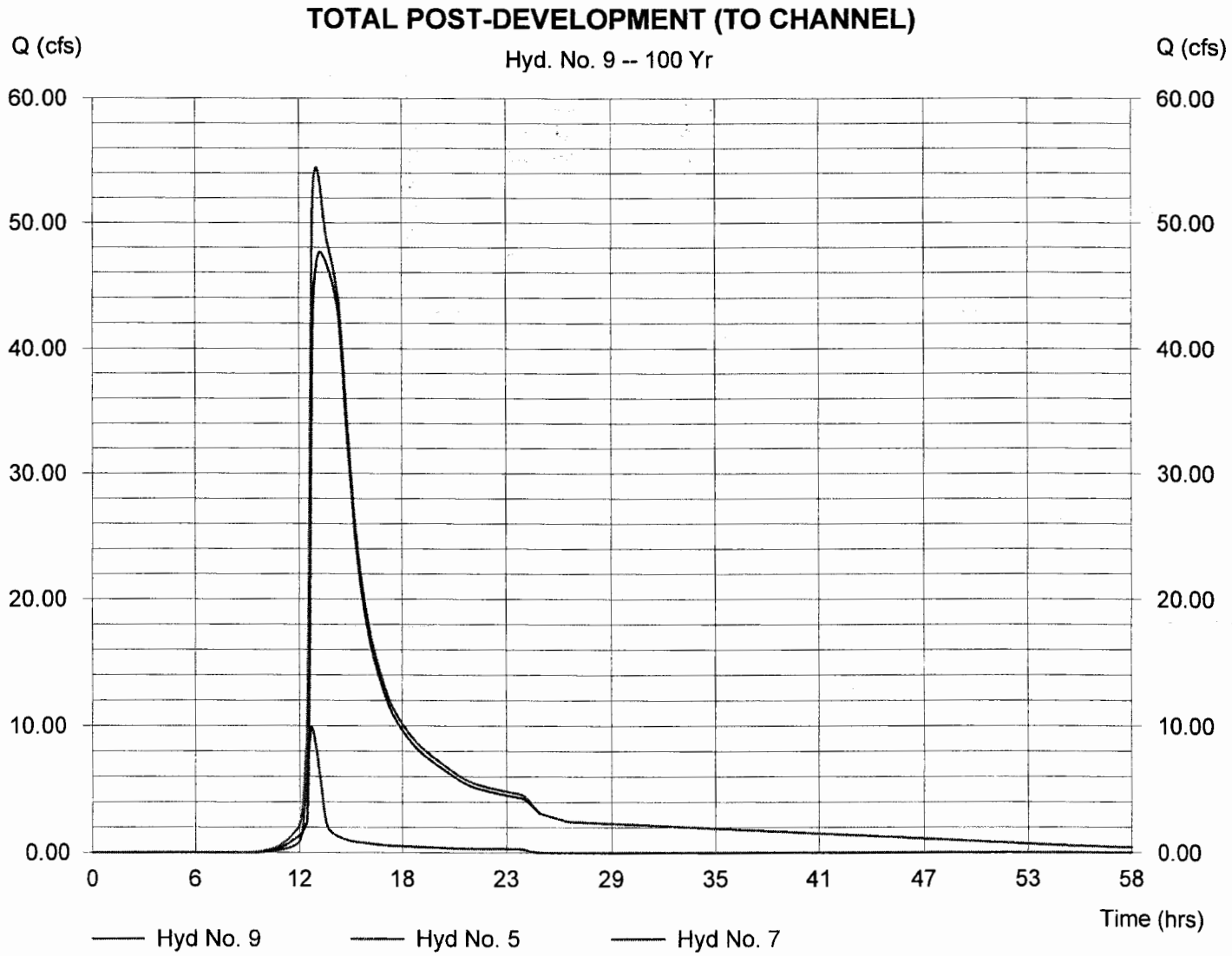
Hydraflow Hydrographs by Intelisolve | Thursday, Apr 20 2006, 11:39 AM

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 54.45 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 948,309 cuft



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.48	5	745	21,970	----	------	------	PRE-DEVELOP
3	SCS Runoff	35.42	5	735	180,283	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	0.86	5	745	6,759	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	1.85	5	1035	173,038	3	89.24	464,814	WET POND ROUTED
9	Combine	2.22	5	765	179,797	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	1.87	5	1030	174,757	3	89.24	464,354	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 1 yr

Run date: 09-27-2002

Hydraflow Hydrographs by Intelisolve

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	5.72	5	745	34,355	----	------	------	PRE-DEVELOP
3	SCS Runoff	54.03	5	735	267,683	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	1.74	5	745	11,757	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	2.42	5	1065	259,972	3	90.11	529,359	WET POND ROUTED
9	Combine	3.46	5	755	271,729	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	2.44	5	1060	261,747	3	90.10	528,922	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 2 yr

Run date: 09-27-2002

Hydraflow Hydrographs by Intelisolve

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.42	5	740	48,991	----	------	------	PRE-DEVELOP
3	SCS Runoff	75.20	5	735	368,064	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	2.87	5	745	18,000	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	6.72	5	845	360,164	3	90.66	574,267	WET POND ROUTED
9	Combine	7.14	5	840	378,165	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	6.70	5	845	361,979	3	90.66	574,124	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 10 yr

Run date: 09-27-2002

Hydraflow Hydrographs by Intelisolve

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	23.38	5	740	131,860	----	------	------	PRE-DEVELOP
3	SCS Runoff	186.50	5	735	912,495	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	9.90	5	740	56,425	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	57.65	5	770	904,461	3	93.18	794,541	WET POND ROUTED
9	Combine	64.84	5	755	960,886	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	57.63	5	770	906,307	3	93.18 DHW	794,185	SED BASIN ROUTED

PLAN 93.28

Proj. file: 01_18thHOLEPOND.gpw Return Period: 100 yr

Run date: 09-27-2002

Hydraflow Hydrographs by Intelisolve

II. POST-DEVELOPMENT CONDITIONS TO BMP

A. Post-Development Drainage Area to Point of Concern = 46.22 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	8-B Caroline	C	Commercial	2.70	94	254
2)	8-B Caroline	C	Roadway	0.99	98	97
3)	8-B Caroline	C	Country Club (apprx 72% imper.)	1.24	91	113
4)	8-B Caroline	C	Open Space	1.45	74	107
5)	11-B Craven-Uchee	C	Open Space	0.14	74	10
6)	14-B and C Emporia Fine Sandy Loam	C	Commercial	0.24	94	23
7)	14-B and C Emporia Fine Sandy Loam	C	Roadway	2.54	98	249
8)	14-B and C Emporia Fine Sandy Loam	C	Country Club (apprx 72% imper.)	0.87	91	79
9)	14-B and C Emporia Fine Sandy Loam	C	Open Space	0.86	74	64
10)	15-D and F Emporia Complex	C	Golf Course	1.79	74	132
11)	15-D and F Emporia Complex	C	Country Club (apprx 72% imper.)	2.87	91	261
12)	15-D and F Emporia Complex	C	Pond	1.27	76	97
13)	20-B Kenansville	A	Open Space	1.52	39	59
14)	20-B Kenansville	A	Golf Course	2.08	39	81
15)	20-B Kenansville	A	Commercial	5.40	89	481
16)	20-B Kenansville	A	Roadway	1.88	98	184
17)	20-B Kenansville	A	Country Club (apprx 72% imper.)	1.64	81	133
18)	29-A Slagle	C	Roadway	0.11	98	11
19)	29-A Slagle	C	Golf Course	2.58	74	191
20)	29-A Slagle	C	Open Space	1.46	74	108
21)	29-A Slagle	C	Country Club (apprx 72% imper.)	3.06	91	278
22)	34-B and C Uchee	A	Commercial	6.18	89	550
23)	34-B and C Uchee	A	Pond	0.42	99	42
24)	34-B and C Uchee	A	Golf Course	2.46	39	96
25)	34-B and C Uchee	A	Open Space	0.47	39	18
	Total Adjusted CN =			46.22		3,700
	Composite CN =					80

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	grass	
Manning's roughness coefficient., n (table 5-7)	0.24	
Length of overland flow, L	300	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.008	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.58	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	200	Feet
Average slope of shallow concentrated flow, s	0.01	feet per foot
Average velocity, v	1.6	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours

3) Channel or Pipe Flow

Length of channel flow, L	1100	Feet
Average velocity of channel flow, v	19	feet per second
Travel time, Tt = L/(3600*v)	0.02	hours
Total Time of Concentration =	0.63	hours
or	38	minutes

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.00	35,303	0	0
2.00	82.00	40,107	75,410	75,410
4.00	84.00	45,015	85,122	160,532
6.00	86.00	50,023	95,038	255,570
7.00	87.00	52,566	51,295	306,865
7.10	87.10	65,663	5,911	312,776
8.00	88.00	69,309	60,737	373,513
10.00	90.00	77,577	146,886	520,399
12.00	92.00	86,075	163,652	684,051
14.00	94.00	100,725	186,800	870,851
16.00	96.00	200,000	300,725	1,171,576

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	8.0	0.0	0.0
Span in	= 30.0	8.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 81.00	87.70	0.00	0.00
Length ft	= 400.0	10.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00	7.00	0.00	0.00
Crest El. ft	= 94.50	90.30	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	Yes	No	No

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

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	80.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	75,410	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	160,532	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	255,570	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.00	306,865	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.10	312,776	87.10	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	373,513	88.00	0.29	0.29	---	---	0.00	0.00	---	---	---	0.29
10.00	520,399	90.00	2.36	2.36	---	---	0.00	0.00	---	---	---	2.36
12.00	684,051	92.00	43.69	3.35	---	---	0.00	40.34	---	---	---	43.69
14.00	870,851	94.00	60.46	0.97	---	---	0.00	59.48	---	---	---	60.45
16.00	1,171,576	96.00	65.73	0.58	---	---	47.77	65.13	---	---	---	113.48

IV. PROPOSED ESTIMATED POND(S) VOLUME ABOVE NORMAL POOL BY ELEVATION

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
87.0		52566	0	0	0	0
88.0	1.0	69309	60938	2257	60938	2257
90.0	2	77577	146886	5440	207824	7697
92.0	2	86075	163652	6061	371476	13758
94.0	2	94802	180877	6699	552353	20458

VII. DETERMINING REQUIRED WATER QUALITY VOLUME

Due to preliminary considerations, it is desired to provide this site extended detention wet pond to achieve a 10 point BMP rating for the facility. Under the James City County guide lines for storm water management BMPs, the extended detention wet pond may have one half of the water quality volume stored in the permanent pool and one half of the water quality volume released in a 24-hour period.

Percent Impervious of the BMP Watershed, Post-Development	33.4%	
Drainage Area of the BMP Watershed	46.22	acres
Impervious Acres of BMP Watershed	**15.42**	acres

Calculation for Water Quality Volume, WQ_v

WQ_v = (2.0 inches per impervious acre) *(impervious acres of BMP watershed)

WQv = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre) * (impervious acres of BMP watershed)

WQ_v = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre)	15.42	=	**111949 cu. Ft**
1/2 WQ_v =	55975 cu. Ft		Required Volume for Permanent Pool
	111949 cu. Ft		Design Volume for Permanent Pool (2" per Impervious Acre)
1/2 WQ_v =	0 cu. Ft		Volume to be Released in 24-Hours

Elevation of 1/2 WQv =	80.2
Elevation of release inlet for 1/2 water quality volume =	90.0
Average head, in feet, on release inlet =	0.0

Average release rate calculation

$$\frac{0.0 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 0.0 \text{ cfs}$$

Calculation of size of release inlet for 1/2 Water Quality Volume

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)

where, Q equals Average Release Rate, in cfs

h equals Average Head, in feet

Diameter of Release Inlet = 0.00 feet, or 0 inches

100% of Water Quality Volume
is contained within Permanent Pool
Therefore, no routing is Required

V. DETERMINING RELEASE RATE OF 1-YEAR, 24-HOUR DETAINED FOR 24 HOURS FOR STREAM CHANNEL PROTECTION

Volume of 1-Year, 24-Hour Storm (based upon Hydrograph #1) = 180,283 cubic feet

Elevation of water surface associated with 1-Year, 24-Hour Storm Volume = 90.5

Elevation of Release Inlet for Channel Protection = 88.0

Average Head, in feet, on Release Inlet 1.3

Average Release Rate Calculation

$$\frac{180{,}283 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} =$$

2.1 cfs -not correct way to compute 1-yr ~~Exemption~~ detention

Calculation of Size of Release Inlet

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)
where, Q equals Average Release Rate, in cfs
h equals Average Head, in feet

Diameter of Release Inlet = 0.80 feet, or 10 inches (8" used in design)

VI. SEDIMENT FOREBAY SIZING

Forebay Volume (V) = 0.1" per Impervious Acre

Percent Impervious of the BMP Watershed, Post-Development 33.4%

Drainage Area of the BMP Watershed 46.22 acres

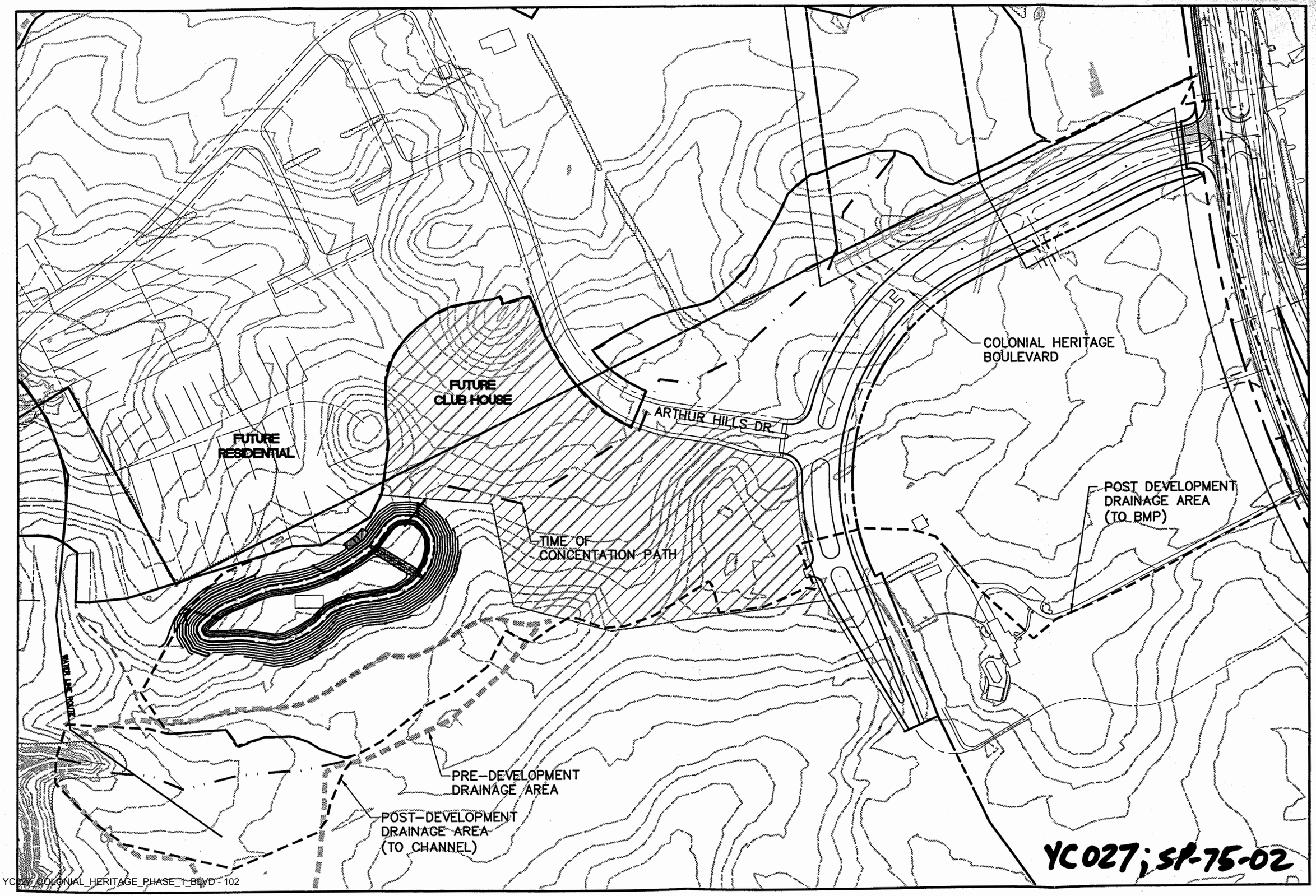
Impervious Acres of BMP Watershed 15.42 acres

Volume Req'd = 5,597 cu.ft.

PROPOSED POND VOLUME FOR SEDIMENT FOREBAY

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
80.0		6980	0			
84.0	4.0	8329	30618	1134	30618	1134
86.0	2.0	9695	18024	668	48642	1802

Volume Provided = 48,642 cu.ft.



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

COLONIAL HERITAGE BOULEVARD
18TH HOLE POND
DRAINAGE AREAS

Designed AES	Drawn AES
Scale 1"=200'	Date 10/19/01
Project No. 9028-08	
Drawing No. 1	

Colonial Heritage
Colonial Heritage Blvd, Phase 1

Colonial Heritage

WILLIAMSBURG, VIRGINIA

James City County Environmental

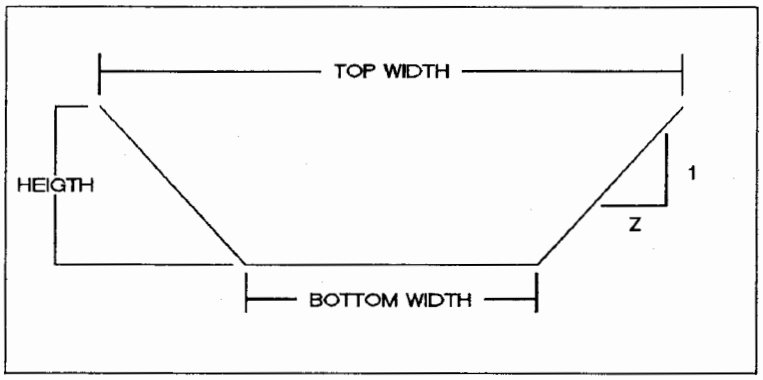
Revised: October 2, 2002

SP-75-02
AMEND SP-36-03

YC027

Adequate Channel Analysis of Proposed Swale
Colonial Heritage Boulevard, Phase I
September 30,2002
Project No. 8881-05
System #3 Diversion

CHANNEL GEOMETRY



TOP WIDTH =	18 FT
BOTTOM WIDTH =	6 FT
HEIGHT =	2 FT
Z =	3.0 FT
SLOPE (S)	0.0075 FT/FT
MANNING'S N	0.18 .05

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

V = AVERAGE VELOCITY
N = MANNING'S ROUGHNESS COEF.
R = HYDRAULIC RADIUS = A / WP
S = SLOPE OF CHANNEL
A = AREA OF CROSS SECTION
WP = WETTED PERIMETER

MAX. PERMISSIBLE VELOCITY = **2.5 FT /SEC** GRASSED CHANNEL

2-YEAR STORM EVENT

TIME OF CONCENTRATION =	20	MIN.
RAINFALL INTENSITY =	3.3	IN/HR
RUNOFF COEF. =	0.25	
POST-DEV. DRAINAGE AREA =	16.2	AC.

- 2.74'/sec

PEAK FLOW RATE =	**13.37**	**CFS**	
PEAK VELOCITY =	**0.76**	**FT/SEC**	(SEE BELOW)
DEPTH=	**1.62**	**FT**	(SEE BELOW)

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 2.0'. CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	6.00	0.00	0.00	0.00
0.10	0.63	6.63	0.09	0.15	0.09
0.20	1.32	7.26	0.18	0.23	0.30
0.30	2.07	7.90	0.26	0.29	0.61
0.40	2.88	8.53	0.34	0.35	1.00
0.50	3.75	9.16	0.41	0.40	1.48
0.60	4.68	9.79	0.48	0.44	2.05
0.70	5.67	10.43	0.54	0.48	2.71
0.80	6.72	11.06	0.61	0.51	3.46
0.90	7.83	11.69	0.67	0.55	4.30
1.00	9.00	12.32	0.73	0.58	5.23
1.10	10.23	12.96	0.79	0.61	6.26
1.20	11.52	13.59	0.85	0.64	7.40
1.30	12.87	14.22	0.90	0.67	8.63
1.40	14.28	14.85	0.96	0.70	9.97
1.50	15.75	15.49	1.02	0.72	11.42
1.60	17.28	16.12	1.07	0.75	12.98
1.62	17.66	16.27	1.09	0.76	13.37
1.70	18.87	16.75	1.13	0.78	14.65
1.80	20.52	17.38	1.18	0.80	16.43
1.90	22.23	18.02	1.23	0.82	18.33
2.00	24.00	18.65	1.29	0.85	20.36
2.02	24.28	18.75	1.30	0.85	20.68
2.10	25.83	19.28	1.34	0.87	22.50
2.20	27.72	19.91	1.39	0.89	24.77
2.30	29.67	20.55	1.44	0.92	27.17
2.40	31.68	21.18	1.50	0.94	29.70
2.50	33.75	21.81	1.55	0.96	32.37
2.60	35.88	22.44	1.60	0.98	35.17
2.70	38.07	23.08	1.65	1.00	38.10
2.80	40.32	23.71	1.70	1.02	41.18
2.90	42.63	24.34	1.75	1.04	44.40
3.00	45.00	24.97	1.80	1.06	47.77
3.10	47.43	25.61	1.85	1.08	51.28
3.20	49.92	26.24	1.90	1.10	54.95
3.30	52.47	26.87	1.95	1.12	58.76
3.40	55.08	27.50	2.00	1.14	62.73
3.50	57.75	28.14	2.05	1.16	66.86
3.60	60.48	28.77	2.10	1.18	71.15
3.70	63.27	29.40	2.15	1.19	75.60
3.80	66.12	30.03	2.20	1.21	80.22
3.90	69.03	30.67	2.25	1.23	85.00
4.00	72.00	31.30	2.30	1.25	89.95

10-YEAR STORM EVENT

TIME OF CONCENTRATION =	20	MIN.
RAINFALL INTENSITY =	4.5	IN/HR
RUNOFF COEF. =	0.25	
POST-DEV. DRAINAGE AREA =	16.2	AC.

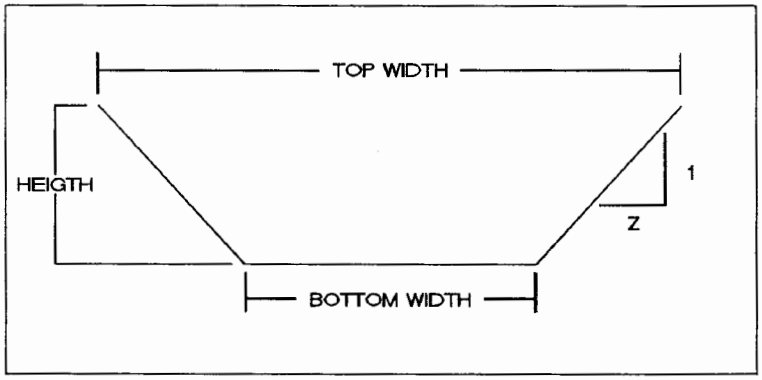
PEAK FLOW RATE =	**18.23**	**CFS**	
PEAK VELOCITY =	**0.82**	**FT/SEC**	(SEE BELOW)
DEPTH=	**1.89**	**FT**	(SEE BELOW)

* **VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 2.0'. CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	6.00	0.00	0.00	0.00
0.10	0.63	6.63	0.09	0.15	0.09
0.20	1.32	7.26	0.18	0.23	0.30
0.30	2.07	7.90	0.26	0.29	0.61
0.40	2.88	8.53	0.34	0.35	1.00
0.50	3.75	9.16	0.41	0.40	1.48
0.60	4.68	9.79	0.48	0.44	2.05
0.70	5.67	10.43	0.54	0.48	2.71
0.80	6.72	11.06	0.61	0.51	3.46
0.90	7.83	11.69	0.67	0.55	4.30
1.00	9.00	12.32	0.73	0.58	5.23
1.10	10.23	12.96	0.79	0.61	6.26
1.20	11.52	13.59	0.85	0.64	7.40
1.30	12.87	14.22	0.90	0.67	8.63
1.40	14.28	14.85	0.96	0.70	9.97
1.50	15.75	15.49	1.02	0.72	11.42
1.60	17.28	16.12	1.07	0.75	12.98
1.67	18.39	16.56	1.11	0.77	14.14
1.70	18.87	16.75	1.13	0.78	14.65
1.80	20.52	17.38	1.18	0.80	16.43
1.89	22.14	17.98	1.23	0.82	18.23
1.90	22.23	18.02	1.23	0.82	18.33
2.00	24.00	18.65	1.29	0.85	20.36
2.02	24.28	18.75	1.30	0.85	20.68
2.10	25.83	19.28	1.34	0.87	22.50
2.20	27.72	19.91	1.39	0.89	24.77
2.30	29.67	20.55	1.44	0.92	27.17
2.40	31.68	21.18	1.50	0.94	29.70
2.50	33.75	21.81	1.55	0.96	32.37
2.60	35.88	22.44	1.60	0.98	35.17
2.70	38.07	23.08	1.65	1.00	38.10
2.80	40.32	23.71	1.70	1.02	41.18
2.90	42.63	24.34	1.75	1.04	44.40
3.00	45.00	24.97	1.80	1.06	47.77
3.10	47.43	25.61	1.85	1.08	51.28
3.20	49.92	26.24	1.90	1.10	54.95
3.30	52.47	26.87	1.95	1.12	58.76
3.40	55.08	27.50	2.00	1.14	62.73
3.50	57.75	28.14	2.05	1.16	66.86
3.60	60.48	28.77	2.10	1.18	71.15
3.70	63.27	29.40	2.15	1.19	75.60
3.80	66.12	30.03	2.20	1.21	80.22
3.90	69.03	30.67	2.25	1.23	85.00
4.00	72.00	31.30	2.30	1.25	89.95

Adequate Channel Analysis of Proposed Swale
Colonial Heritage Route 60 Improvements Channel Sta 15+50
9/17/02
Project No. 8881-05

CHANNEL GEOMETRY



TOP WIDTH =	7 FT
BOTTOM WIDTH =	1 FT
HEIGHT =	2 FT
Z =	3.0 FT
SLOPE (S)	0.0117 FT/FT
MANNING'S N	0.18

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

V = AVERAGE VELOCITY
N = MANNING'S ROUGHNESS COEF.
R = HYDRAULIC RADIUS = A / WP
S = SLOPE OF CHANNEL
A = AREA OF CROSS SECTION
WP = WETTED PERIMETER

MAX. PERMISSIBLE VELOCITY = **2.5 FT /SEC** GRASSED CHANNEL

2-YEAR STORM EVENT

TIME OF CONCENTRATION =	5	MIN.
RAINFALL INTENSITY =	5.6	IN/HR
RUNOFF COEF. =	0.45	
POST-DEV. DRAINAGE AREA =	3.26	AC.

2.95'/sec

PEAK FLOW RATE =	**8.2**	**CFS**	
PEAK VELOCITY =	**0.82**	**FT/SEC**	(SEE BELOW)
DEPTH=	**1.67**	**FT**	(SEE BELOW)

* **VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 2.0'. CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	1.00	0.00	0.00	0.00
0.10	0.13	1.63	0.08	0.17	0.02
0.20	0.32	2.26	0.14	0.24	0.08
0.30	0.57	2.90	0.20	0.30	0.17
0.40	0.88	3.53	0.25	0.35	0.31
0.50	1.25	4.16	0.30	0.40	0.50
0.60	1.68	4.79	0.35	0.45	0.75
0.70	2.17	5.43	0.40	0.49	1.05
0.80	2.72	6.06	0.45	0.52	1.43
0.90	3.34	6.70	0.50	0.56	1.88
1.00	4.00	7.32	0.55	0.60	2.39
1.10	4.73	7.96	0.59	0.63	2.99
1.20	5.52	8.59	0.64	0.67	3.68
1.30	6.37	9.22	0.69	0.70	4.46
1.40	7.28	9.85	0.74	0.73	5.33
1.50	8.25	10.49	0.79	0.76	6.30
1.60	9.28	11.12	0.83	0.79	7.37
1.67	10.06	11.57	0.87	0.82	8.20
1.70	10.37	11.75	0.88	0.82	8.54
1.80	11.52	12.38	0.93	0.85	9.83
1.90	12.73	13.02	0.98	0.88	11.23
2.00	14.00	13.65	1.03	0.91	12.75
2.02	14.20	13.75	1.03	0.92	13.00
2.10	15.33	14.28	1.07	0.94	14.39
2.20	16.72	14.91	1.12	0.97	16.16
2.30	18.17	15.55	1.17	0.99	18.05
2.40	19.68	16.18	1.22	1.02	20.08
2.50	21.25	16.81	1.26	1.05	22.24
2.60	22.88	17.44	1.31	1.07	24.55
2.70	24.57	18.08	1.36	1.10	26.99
2.80	26.32	18.71	1.41	1.12	29.59
2.90	28.13	19.34	1.45	1.15	32.33
3.00	30.00	19.97	1.50	1.17	35.23
3.10	31.93	20.61	1.55	1.20	38.28
3.20	33.92	21.24	1.60	1.22	41.50
3.30	35.97	21.87	1.64	1.25	44.87
3.40	38.08	22.50	1.69	1.27	48.42
3.50	40.25	23.14	1.74	1.30	52.13
3.60	42.48	23.77	1.79	1.32	56.02
3.70	44.77	24.40	1.83	1.34	60.08
3.80	47.12	25.03	1.88	1.36	64.32
3.90	49.53	25.67	1.93	1.39	68.74
4.00	52.00	26.30	1.98	1.41	73.35

25-YEAR STORM EVENT

TIME OF CONCENTRATION =	5	MIN.
RAINFALL INTENSITY =	7.9	IN/HR
RUNOFF COEF. =	0.45	
POST-DEV. DRAINAGE AREA =	3.26	AC.
PEAK FLOW RATE =	**11.6**	**CFS**
PEAK VELOCITY =	**0.89**	**FT/SEC** (SEE BELOW)
DEPTH=	**1.93**	**FT** (SEE BELOW)

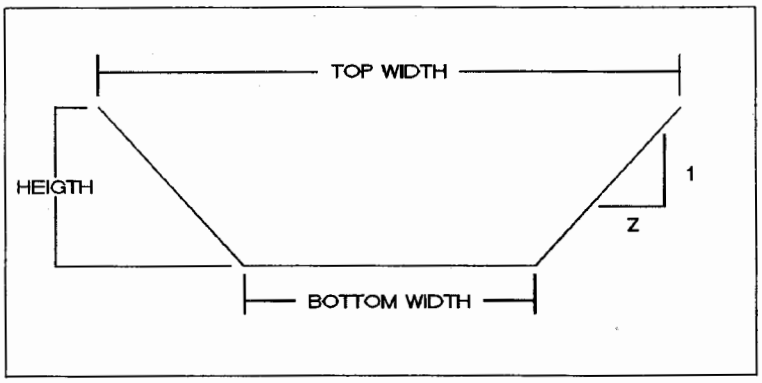
3.2'/sec

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 2.00 FT.CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	1.00	0.00	0.00	0.00
0.10	0.13	1.63	0.08	0.17	0.02
0.20	0.32	2.26	0.14	0.24	0.08
0.30	0.57	2.90	0.20	0.30	0.17
0.40	0.88	3.53	0.25	0.35	0.31
0.50	1.25	4.16	0.30	0.40	0.50
0.60	1.68	4.79	0.35	0.45	0.75
0.70	2.17	5.43	0.40	0.49	1.05
0.80	2.72	6.06	0.45	0.52	1.43
0.90	3.33	6.69	0.50	0.56	1.87
1.00	4.00	7.32	0.55	0.60	2.39
1.10	4.73	7.96	0.59	0.63	2.99
1.20	5.52	8.59	0.64	0.67	3.68
1.30	6.37	9.22	0.69	0.70	4.46
1.40	7.28	9.85	0.74	0.73	5.33
1.50	8.25	10.49	0.79	0.76	6.30
1.60	9.28	11.12	0.83	0.79	7.37
1.67	10.04	11.56	0.87	0.81	8.18
1.70	10.37	11.75	0.88	0.82	8.54
1.80	11.52	12.38	0.93	0.85	9.83
1.90	12.73	13.02	0.98	0.88	11.23
1.93	13.04	13.18	0.99	0.89	11.60
2.00	14.00	13.65	1.03	0.91	12.75
2.02	14.20	13.75	1.03	0.92	13.00
2.10	15.33	14.28	1.07	0.94	14.39
2.20	16.72	14.91	1.12	0.97	16.16
2.30	18.17	15.55	1.17	0.99	18.05
2.40	19.68	16.18	1.22	1.02	20.08
2.50	21.25	16.81	1.26	1.05	22.24
2.60	22.88	17.44	1.31	1.07	24.55
2.70	24.57	18.08	1.36	1.10	26.99
2.80	26.32	18.71	1.41	1.12	29.59
2.90	28.13	19.34	1.45	1.15	32.33
3.00	30.00	19.97	1.50	1.17	35.23
3.10	31.93	20.61	1.55	1.20	38.28
3.20	33.92	21.24	1.60	1.22	41.50
3.30	35.97	21.87	1.64	1.25	44.87
3.40	38.08	22.50	1.69	1.27	48.42
3.50	40.25	23.14	1.74	1.30	52.13
3.60	42.48	23.77	1.79	1.32	56.02
3.70	44.77	24.40	1.83	1.34	60.08
3.80	47.12	25.03	1.88	1.36	64.32
3.90	49.53	25.67	1.93	1.39	68.74
4.00	52.00	26.30	1.98	1.41	73.35

Adequate Channel Analysis of Proposed Swale
Colonial Heritage Boulevard
9/30/02
Project No. 8881-05
Revised channel Rte 60 sta 15+50

CHANNEL GEOMETRY



TOP WIDTH =	7 FT
BOTTOM WIDTH =	1 FT
HEIGHT =	2 FT
Z =	3.0 FT
SLOPE (S)	0.0117 FT/FT
MANNING'S N	0.18

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

V = AVERAGE VELOCITY
N = MANNING'S ROUGHNESS COEF.
R = HYDRAULIC RADIUS = A / WP
S = SLOPE OF CHANNEL
A = AREA OF CROSS SECTION
WP = WETTED PERIMETER

MAX. PERMISSIBLE VELOCITY = **2.5 FT /SEC** GRASSED CHANNEL

2-YEAR STORM EVENT

TIME OF CONCENTRATION =	5	MIN.
RAINFALL INTENSITY =	5.6	IN/HR
RUNOFF COEF. =	0.45	
POST-DEV. DRAINAGE AREA =	0.6	AC.

PEAK FLOW RATE =	**1.5**	**CFS**	
PEAK VELOCITY =	**0.53**	**FT/SEC**	(SEE BELOW)
DEPTH=	**0.82**	**FT**	(SEE BELOW)

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 1.0'. CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	1.00	0.00	0.00	0.00
0.10	0.13	1.63	0.08	0.17	0.02
0.20	0.32	2.26	0.14	0.24	0.08
0.30	0.57	2.90	0.20	0.30	0.17
0.40	0.88	3.53	0.25	0.35	0.31
0.50	1.25	4.16	0.30	0.40	0.50
0.60	1.68	4.79	0.35	0.45	0.75
0.70	2.17	5.43	0.40	0.49	1.05
0.80	2.72	6.06	0.45	0.52	1.43
0.82	2.82	6.17	0.46	0.53	1.50
0.90	3.34	6.70	0.50	0.56	1.88
1.00	4.00	7.32	0.55	0.60	2.39
1.10	4.73	7.96	0.59	0.63	2.99
1.20	5.52	8.59	0.64	0.67	3.68
1.30	6.37	9.22	0.69	0.70	4.46
1.40	7.28	9.85	0.74	0.73	5.33
1.50	8.25	10.49	0.79	0.76	6.30
1.60	9.28	11.12	0.83	0.79	7.37
1.70	10.37	11.75	0.88	0.82	8.54
1.80	11.52	12.38	0.93	0.85	9.83
1.90	12.73	13.02	0.98	0.88	11.23
2.00	14.00	13.65	1.03	0.91	12.75
2.02	14.20	13.75	1.03	0.92	13.00
2.10	15.33	14.28	1.07	0.94	14.39
2.20	16.72	14.91	1.12	0.97	16.16
2.30	18.17	15.55	1.17	0.99	18.05
2.40	19.68	16.18	1.22	1.02	20.08
2.50	21.25	16.81	1.26	1.05	22.24
2.60	22.88	17.44	1.31	1.07	24.55
2.70	24.57	18.08	1.36	1.10	26.99
2.80	26.32	18.71	1.41	1.12	29.59
2.90	28.13	19.34	1.45	1.15	32.33
3.00	30.00	19.97	1.50	1.17	35.23
3.10	31.93	20.61	1.55	1.20	38.28
3.20	33.92	21.24	1.60	1.22	41.50
3.30	35.97	21.87	1.64	1.25	44.87
3.40	38.08	22.50	1.69	1.27	48.42
3.50	40.25	23.14	1.74	1.30	52.13
3.60	42.48	23.77	1.79	1.32	56.02
3.70	44.77	24.40	1.83	1.34	60.08
3.80	47.12	25.03	1.88	1.36	64.32
3.90	49.53	25.67	1.93	1.39	68.74
4.00	52.00	26.30	1.98	1.41	73.35

25-YEAR STORM EVENT

TIME OF CONCENTRATION =	5	MIN.
RAINFALL INTENSITY =	7.9	IN/HR
RUNOFF COEF. =	0.45	
POST-DEV. DRAINAGE AREA =	0.6	AC.

PEAK FLOW RATE =	**2.1**	**CFS**	
PEAK VELOCITY =	**0.47**	**FT/SEC**	(SEE BELOW)
DEPTH=	**0.65**	**FT**	(SEE BELOW)

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.5 CFS THEREFORE, CHANNEL IS ADEQUATE. FLOW DEPTH IS LESS THAN 1.0 FT.CHANNEL DEPTH IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	1.00	0.00	0.00	0.00
0.10	0.13	1.63	0.08	0.17	0.02
0.20	0.32	2.26	0.14	0.24	0.08
0.30	0.57	2.90	0.20	0.30	0.17
0.40	0.88	3.53	0.25	0.35	0.31
0.50	1.25	4.16	0.30	0.40	0.50
0.60	1.68	4.79	0.35	0.45	0.75
0.65	1.91	5.10	0.37	0.47	0.89
0.70	2.17	5.43	0.40	0.49	1.05
0.80	2.72	6.06	0.45	0.52	1.43
0.90	3.33	6.69	0.50	0.56	1.87
1.00	4.00	7.32	0.55	0.60	2.39
1.10	4.73	7.96	0.59	0.63	2.99
1.20	5.52	8.59	0.64	0.67	3.68
1.30	6.37	9.22	0.69	0.70	4.46
1.40	7.28	9.85	0.74	0.73	5.33
1.50	8.25	10.49	0.79	0.76	6.30
1.60	9.28	11.12	0.83	0.79	7.37
1.67	10.04	11.56	0.87	0.81	8.18
1.70	10.37	11.75	0.88	0.82	8.54
1.80	11.52	12.38	0.93	0.85	9.83
1.90	12.73	13.02	0.98	0.88	11.23
2.00	14.00	13.65	1.03	0.91	12.75
2.02	14.20	13.75	1.03	0.92	13.00
2.10	15.33	14.28	1.07	0.94	14.39
2.20	16.72	14.91	1.12	0.97	16.16
2.30	18.17	15.55	1.17	0.99	18.05
2.40	19.68	16.18	1.22	1.02	20.08
2.50	21.25	16.81	1.26	1.05	22.24
2.60	22.88	17.44	1.31	1.07	24.55
2.70	24.57	18.08	1.36	1.10	26.99
2.80	26.32	18.71	1.41	1.12	29.59
2.90	28.13	19.34	1.45	1.15	32.33
3.00	30.00	19.97	1.50	1.17	35.23
3.10	31.93	20.61	1.55	1.20	38.28
3.20	33.92	21.24	1.60	1.22	41.50
3.30	35.97	21.87	1.64	1.25	44.87
3.40	38.08	22.50	1.69	1.27	48.42
3.50	40.25	23.14	1.74	1.30	52.13
3.60	42.48	23.77	1.79	1.32	56.02
3.70	44.77	24.40	1.83	1.34	60.08
3.80	47.12	25.03	1.88	1.36	64.32
3.90	49.53	25.67	1.93	1.39	68.74
4.00	52.00	26.30	1.98	1.41	73.35

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - SED BASIN @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.00	35,303	0	0
2.00	82.00	40,107	75,410	75,410
4.00	84.00	45,015	85,122	160,532
6.00	86.00	50,023	95,038	255,570
7.00	87.00	52,566	51,295	306,865
7.10	87.10	65,663	5,911	312,776 — NP = 87.7 ≈ 470,000 ft³
8.00	88.00	69,309	60,737	373,513
10.00	90.00	77,577	146,886	520,399
12.00	92.00	86,075	163,652	684,051
14.00	94.00	100,725	186,800	870,851
16.00	96.00	146,200	246,925	1,117,776

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	8.0 ✓	0.0	0.0
Span in	= 30.0	8.0 ✓	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 81.00	87.67	0.00	0.00
Length ft	= 400.0	1.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00 ✓	7.00	0.00	0.00
Crest El. ft	= 94.50 ✓	90.30 ✓	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	Yes	No	No

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

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	80.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	75,410	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	160,532	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	255,570	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.00	306,865	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.10	312,776	87.10	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	373,513	88.00	0.37	0.34	---	---	0.00	0.00	---	---	---	0.34
10.00	520,399	90.00	2.61	2.37	---	---	0.00	0.00	---	---	---	2.37
12.00	684,051	92.00	43.70	3.36	---	---	0.00	40.34	---	---	---	43.70
14.00	870,851	94.00	60.46	0.97	---	---	0.00	59.48	---	---	---	60.45
16.00	1,117,776	96.00	65.73	0.58	---	---	47.77	65.13	---	---	---	113.48

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project COLONIAL HERITAGE BLVD

Basin # _____ Location @ 18th golf hole

Total area draining to basin: 46.22 acres.

*Note: PERM. BMP FACILITY TO ACT AS TEMP. SED. BASIN. (VOLUME HAS BEEN ADDED TO ACCOMIDATE POSSIBLE SEDIMENT BUILD UP)

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 46.22 acres = 3097 cu. yds.

2. Available basin volume = 11,365 cu. yds. at elevation 87. (From storage - elevation curve)

3. Excavate 11,365 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 46.22 acres = 1525 cu. yds.

5. Elevation corresponding to cleanout level = ≈ 81.

   (From Storage - Elevation Curve) (Forebay to be used as part of BMP facility)

6. Distance from invert of the dewatering orifice to cleanout level = 6.5 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 46.22 acres = 3097 cu. yds.

8. Total available basin volume at crest of riser* = 19,275 cu. yds. at elevation 90. (From Storage - Elevation Curve)

* Minimum = 134 cu. yds./acre of total drainage area.

9. Diameter of dewatering orifice = 8 in.

10. ~~Diameter of flexible tubing = _____ in. (diameter of dewatering orifice plus 2 inches).~~

Preliminary Design Elevations

11. Crest of Riser = 90.3

Top of Dam = 96.5

Design High Water = 91.7 (25 yr high water)

Upstream Toe of Dam = 80

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We} = \frac{600}{150} = 4$

If > 2, baffles are not required X

If < 2, baffles are required _____

Runoff

13. Q_2 = 54.03 cfs (From Chapter 5)

14. Q_{25} = 120.15 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2 =$ 54.03 cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25} =$ 120.15 cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = 4 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) = 48 in. Actual head (h) = 1 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 400 ft.

Head (H) on barrel through embankment = 12.7 ft.

(From Plate 3.14-7).

19. Barrel diameter = 30 in.

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

20. ~~Trash rack and anti-vortex device~~ (EW-11 USED FOR TRASH RACK)

~~Diameter = _____ inches.~~

~~Height = _____ inches.~~

(From Table 3.14-D).

Emergency Spillway Design (Token Spillway -- not used in 100 or 500 yr storms)

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 66.12 cfs.

22. Bottom width (b) = 10 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) = 11 ft.

Slope of upstream face of embankment (Z) = 3 :1.

Slope of principal spillway barrel (S_b) = 0.5 %

Length of barrel in saturated zone (L_s) = 65 ft.

24. Number of collars required = 3 dimensions = 5'x5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 96.5

Design High Water = 91.7 (25 yr storm)

Emergency Spillway Crest = 94.5

Principal Spillway Crest = 90.3

Dewatering Orifice Invert = 87.7

Cleanout Elevation = N/A (forebay)

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 80

CALCULATIONS FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION
FOR BMP @ 18TH HOLE
COLONIAL HERITAGE BLVD.
AES Project No.: 8818-05
July 24, 2002

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 7.27 Acres

B. Pre-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Pre-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	15-F	C	Wooded, Fair	0.2	73	15
2)	11-B Craven-Uchee	C	Pasture, Grass, Fair	0.46	79	36
3)	14-B Emporia Fine Sandy Loam	C	Pasture, Grass, Fair	0.14	79	11
4)	20B	A	Pasture, Grass, Fair	4.95	73	361
5)	29A	C	Pasture, Grass, Fair	1.52	79	120
	Totals =			7.3		543
	Composite CN =					75

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Pasture/Grass
Manning's roughness coefficient., n (table 5-7)	0.24
Length of overland flow, L	300 Feet
2-year 24-hour rainfall, P2	3.6 inches
Average slope of overland flow , s	0.02 feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.54 hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved, grass
Length of shallow concentrated flow, L	300 Feet
Average slope of shallow concentrated flow, s	0.01 feet per foot
Average velocity, v	1.6 feet per second
Travel time, Tt = L/(3600*v)	0.05 hours

3) Channel or Pipe Flow

Length of channel flow, L	1740 Feet
Average velocity of channel flow, v	3.5 feet per second
Travel time, Tt = L/(3600*v)	0.14 hours
Total Time of Concentration =	0.73 hours
or	44 minutes

II. POST-DEVELOPMENT CONDITIONS TO BMP

A. Post-Development Drainage Area to Point of Concern = 46.22 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	8-B Caroline	C	Commercial	2.70	94	254
2)	8-B Caroline	C	Roadway	0.99	98	97
3)	8-B Caroline	C	Country Club (apprx 72% imper.)	1.24	91	113
4)	8-B Caroline	C	Open Space	1.45	74	107
5)	11-B Craven-Uchee	C	Open Space	0.14	74	10
6)	14-B and C Emporia Fine Sandy Loam	C	Commercial	0.24	94	23
7)	14-B and C Emporia Fine Sandy Loam	C	Roadway	2.54	98	249
8)	14-B and C Emporia Fine Sandy Loam	C	Country Club (apprx 72% imper.)	0.87	91	79
9)	14-B and C Emporia Fine Sandy Loam	C	Open Space	0.86	74	64
10)	15-D and F Emporia Complex	C	Golf Course	1.79	74	132
11)	15-D and F Emporia Complex	C	Country Club (apprx 72% imper.)	2.87	91	261
12)	15-D and F Emporia Complex	C	Pond	1.27	76	97
13)	20-B Kenansville	A	Open Space	1.52	39	59
14)	20-B Kenansville	A	Golf Course	2.08	39	81
15)	20-B Kenansville	A	Commercial	5.40	89	481
16)	20-B Kenansville	A	Roadway	1.88	98	184
17)	20-B Kenansville	A	Country Club (apprx 72% imper.)	1.64	81	133
18)	29-A Slagle	C	Roadway	0.11	98	11
19)	29-A Slagle	C	Golf Course	2.58	74	191
20)	29-A Slagle	C	Open Space	1.46	74	108
21)	29-A Slagle	C	Country Club (apprx 72% imper.)	3.06	91	278
22)	34-B and C Uchee	A	Commercial	6.18	89	550
23)	34-B and C Uchee	A	Pond	0.42	99	42
24)	34-B and C Uchee	A	Golf Course	2.46	39	96
25)	34-B and C Uchee	A	Open Space	0.47	39	18
	Total Adjusted CN =			46.22		3,700
	Composite CN =					80

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	grass	
Manning's roughness coefficient., n (table 5-7)	0.24	
Length of overland flow, L	300	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.008	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.58	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	200	Feet
Average slope of shallow concentrated flow, s	0.01	feet per foot
Average velocity, v	1.6	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours

3) Channel or Pipe Flow

Length of channel flow, L	1100	Feet
Average velocity of channel flow, v	19	feet per second
Travel time, Tt = L/(3600*v)	0.02	hours
Total Time of Concentration =	0.63	hours
or	38	minutes

III. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (EXCLUDING RUNOFF TO BMP)

A. Post-Development Drainage Area to Point of Concern = 3.81 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-B Craven-Uchee	C	Golf Course	0.44	74	33
2)	14-B and C Emporia Fine Sandy Loam	C	Golf Course	0.14	74	10
3)	15-D and F Emporia Complex	C	Golf Course	0.20	74	15
4)	20-B Kenansville	A	Golf Course	0.83	39	32
5)	20-B Kenansville	A	Reidential - 1/4 acre lots	0.67	61	41
6)	29-A Slagle	B	Golf Course	0.18	74	13
7)	29-A Slagle	B	Reidential - 1/4 acre lots	1.35	83	112
	Total Adjusted CN =			3.81		256
	Composite CN =					67

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Golf Course	
Manning's roughness coefficient., n (table 5-7)	0.41	
Length of overland flow, L	300	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.014	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.71	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	250	Feet
Average slope of shallow concentrated flow, s	0.025	feet per foot
Average velocity, v	2.6	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours

3) Channel or Pipe Flow

Length of channel flow, L	115	Feet
Average velocity of channel flow, v	16	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours
Total Time of Concentration =	0.74	hours
or	44	minutes

IV. PROPOSED ESTIMATED POND(S) VOLUME ABOVE NORMAL POOL BY ELEVATION

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
87.0		52566	0	0	0	0
88.0	1.0	69309	60938	2257	60938	2257
90.0	2	77577	146886	5440	207824	7697
92.0	2	86075	163652	6061	371476	13758
94.0	2	94802	180877	6699	552353	20458

V. DETERMINING RELEASE RATE OF 1-YEAR, 24-HOUR DETAINED FOR 24 HOURS FOR STREAM CHANNEL PROTECTION

Volume of 1-Year, 24-Hour Storm (based upon Hydrograph #1) = 180,283 cubic feet

Elevation of water surface associated with 1-Year, 24-Hour Storm Volume = 90.5

Elevation of Release Inlet for Channel Protection = 88.0

Average Head, in feet, on Release Inlet 1.3

Average Release Rate Calculation

$$\frac{180{,}283 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 2.1 \text{ cfs}$$

- not correct way to compute 1-yr detention ~~Empir~~

Calculation of Size of Release Inlet

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)
where, Q equals Average Release Rate, in cfs
h equals Average Head, in feet

Diameter of Release Inlet = 0.80 feet, or 10 inches (8" used in design)

VI. SEDIMENT FOREBAY SIZING

Forebay Volume (V) = 0.1" per Impervious Acre

Percent Impervious of the BMP Watershed, Post-Development 33.4%

Drainage Area of the BMP Watershed 46.22 acres

Impervious Acres of BMP Watershed 15.42 acres

Volume Req'd = 5,597 cu.ft.

PROPOSED POND VOLUME FOR SEDIMENT FOREBAY

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
80.0		6980	0			
84.0	4.0	8329	30618	1134	30618	1134
86.0	2.0	9695	18024	668	48642	1802

Volume Provided = 48,642 cu.ft.

VII. DETERMINING REQUIRED WATER QUALITY VOLUME

Due to preliminary considerations, it is desired to provide this site extended detention wet pond to achieve a 10 point BMP rating for the facility. Under the James City County guide lines for storm water management BMPs, the extended detention wet pond may have one half of the water quality volume stored in the permanent pool and one half of the water quality volume released in a 24-hour period.

Percent Impervious of the BMP Watershed, Post-Development	33.4%	
Drainage Area of the BMP Watershed	46.22	acres
Impervious Acres of BMP Watershed	15.42	acres

Calculation for Water Quality Volume, WQ_v

WQ_v = (2.0 inches per impervious acre) *(impervious acres of BMP watershed)

WQv = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre) * (impervious acres of BMP watershed)

WQ_v = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre)	15.42	=	111949 cu. Ft
1/2 WQ_v =	55975 cu. Ft		Required Volume for Permanent Pool
	111949 cu. Ft		Design Volume for Permanent Pool (2" per Impervious Acre)
1/2 WQ_v =	0 cu. Ft		Volume to be Released in 24-Hours

Elevation of 1/2 WQv =	80.2
Elevation of release inlet for 1/2 water quality volume =	90.0
Average head, in feet, on release inlet =	0.0

Average release rate calculation

$$\frac{0.0 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 0.0 \text{ cfs}$$

Calculation of size of release inlet for 1/2 Water Quality Volume

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)

where, Q equals Average Release Rate, in cfs

h equals Average Head, in feet

Diameter of Release Inlet = 0.00 feet, or 0 inches

100% of Water Quality Volume
is contained within Permanent Pool
Therefore, no routing is Required

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.00	35,303	0	0
2.00	82.00	40,107	75,410	75,410
4.00	84.00	45,015	85,122	160,532
6.00	86.00	50,023	95,038	255,570
7.00	87.00	52,566	51,295	306,865
7.10	87.10	65,663	5,911	312,776
8.00	88.00	69,309	60,737	373,513
10.00	90.00	77,577	146,886	520,399
12.00	92.00	86,075	163,652	684,051
14.00	94.00	100,725	186,800	870,851
16.00	96.00	200,000	300,725	1,171,576

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	8.0	0.0	0.0
Span in	= 30.0	8.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 81.00	87.70	0.00	0.00
Length ft	= 400.0	10.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00	7.00	0.00	0.00
Crest El. ft	= 94.50	90.30	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	Yes	No	No

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

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	80.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	75,410	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	160,532	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	255,570	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.00	306,865	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.10	312,776	87.10	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	373,513	88.00	0.29	0.29	---	---	0.00	0.00	---	---	---	0.29
10.00	520,399	90.00	2.36	2.36	---	---	0.00	0.00	---	---	---	2.36
12.00	684,051	92.00	43.69	3.35	---	---	0.00	40.34	---	---	---	43.69
14.00	870,851	94.00	60.46	0.97	---	---	0.00	59.48	---	---	---	60.45
16.00	1,171,576	96.00	65.73	0.58	---	---	47.77	65.13	---	---	---	113.48

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	3.48	5	745	21,970	----	------	------	PRE-DEVELOP
3	SCS Runoff	35.42	5	735	180,283	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	0.86	5	745	6,759	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	1.85	5	1035	173,038	3	89.24	464,814	WET POND ROUTED
9	Combine	2.22	5	765	179,797	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	1.87	5	1030	174,757	3	89.24	464,354	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 1 yr

Run date: 09-27-2002

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	5.72	5	745	34,355	----	------	------	PRE-DEVELOP
3	SCS Runoff	54.03	5	735	267,683	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	1.74	5	745	11,757	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	2.42	5	1065	259,972	3	90.11	529,359	WET POND ROUTED
9	Combine	3.46	5	755	271,729	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	2.44	5	1060	261,747	3	90.10	528,922	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 2 yr

Run date: 09-27-2002

Hydraflow Hydrographs by Intelisolve

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	8.42	5	740	48,991	----	------	------	PRE-DEVELOP
3	SCS Runoff	75.20	5	735	368,064	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	2.87	5	745	18,000	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	6.72	5	845	360,164	3	90.66	574,267	WET POND ROUTED
9	Combine	7.14	5	840	378,165	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	6.70	5	845	361,979	3	90.66	574,124	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 10 yr

Run date: 09-27-2002

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	14.35	5	740	81,466	----	------	------	PRE-DEVELOP
3	SCS Runoff	120.15	5	735	584,711	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	5.54	5	740	32,610	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	32.24	5	770	576,727	3	91.66	656,552	WET POND ROUTED
9	Combine	35.61	5	770	609,337	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	32.17	5	770	578,561	3	91.66	656,328	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 25 yr

Run date: 09-27-2002

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	23.38	5	740	131,860	----	------	------	PRE-DEVELOP
3	SCS Runoff	186.50	5	735	912,495	----	------	------	POST-DEVELOP (TO BMP)
5	SCS Runoff	9.90	5	740	56,425	----	------	------	POST-DEVELOP (TO CHANNEL)
7	Reservoir	57.65	5	770	904,461	3	93.18	794,541	WET POND ROUTED
9	Combine	64.84	5	755	960,886	5, 7,	------	------	TOTAL POST-DEVELOPMENT (TO
11	Reservoir	57.63	5	770	906,307	3	93.18	794,185	SED BASIN ROUTED

Proj. file: 01_18thHOLEPOND.gpw Return Period: 100 yr

Run date: 09-27-2002

Hydrograph Plot

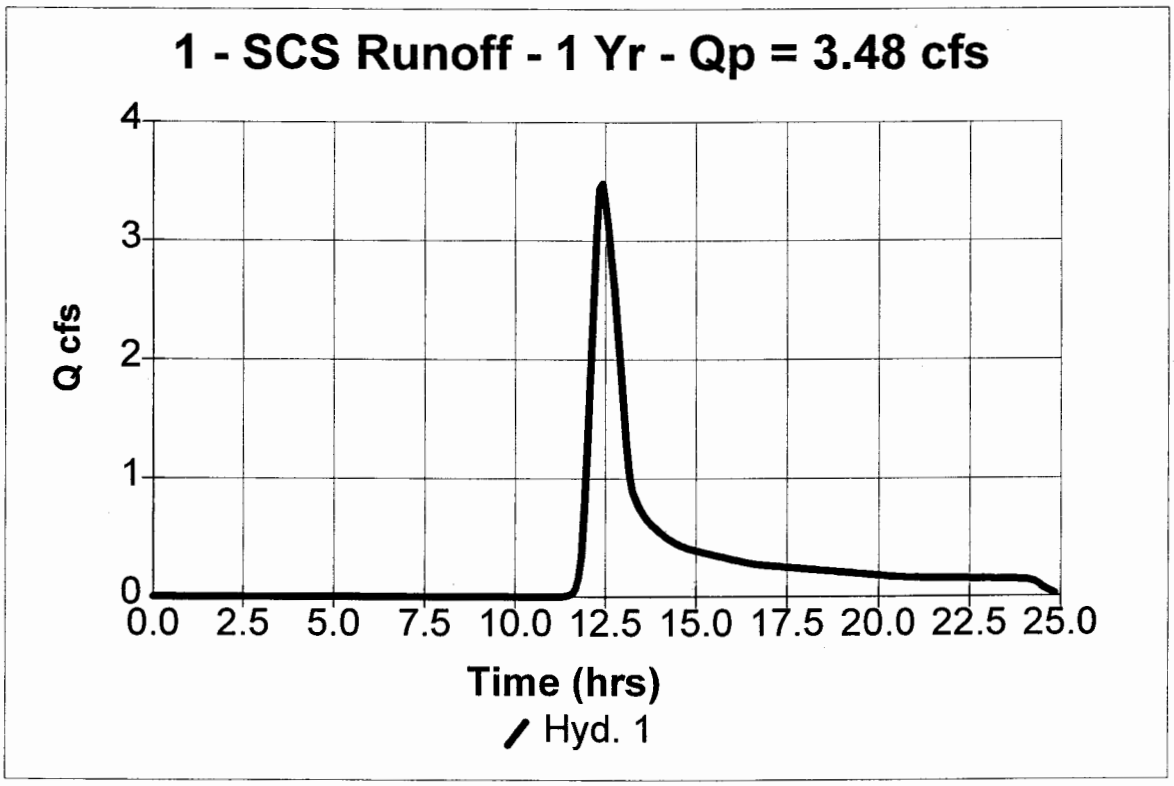
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 3.48 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 21,970 cuft



Hydrograph Plot

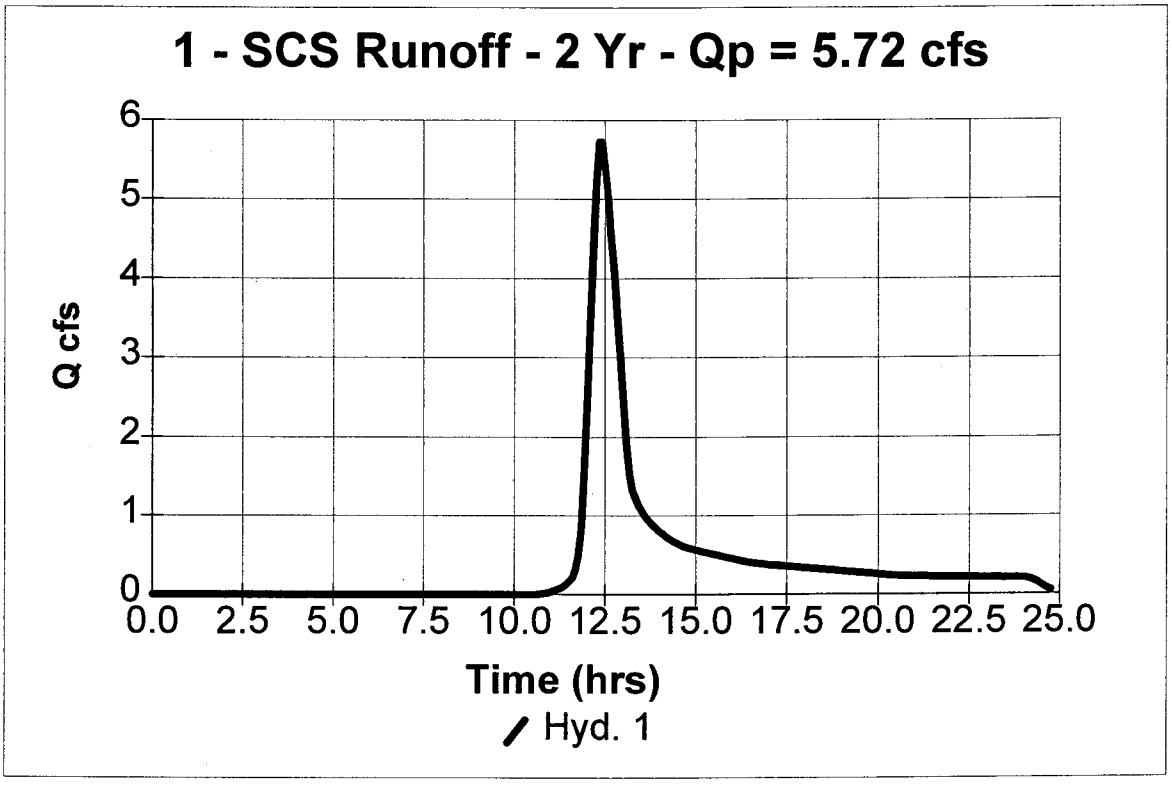
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 5.72 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 34,355 cuft



Hydrograph Plot

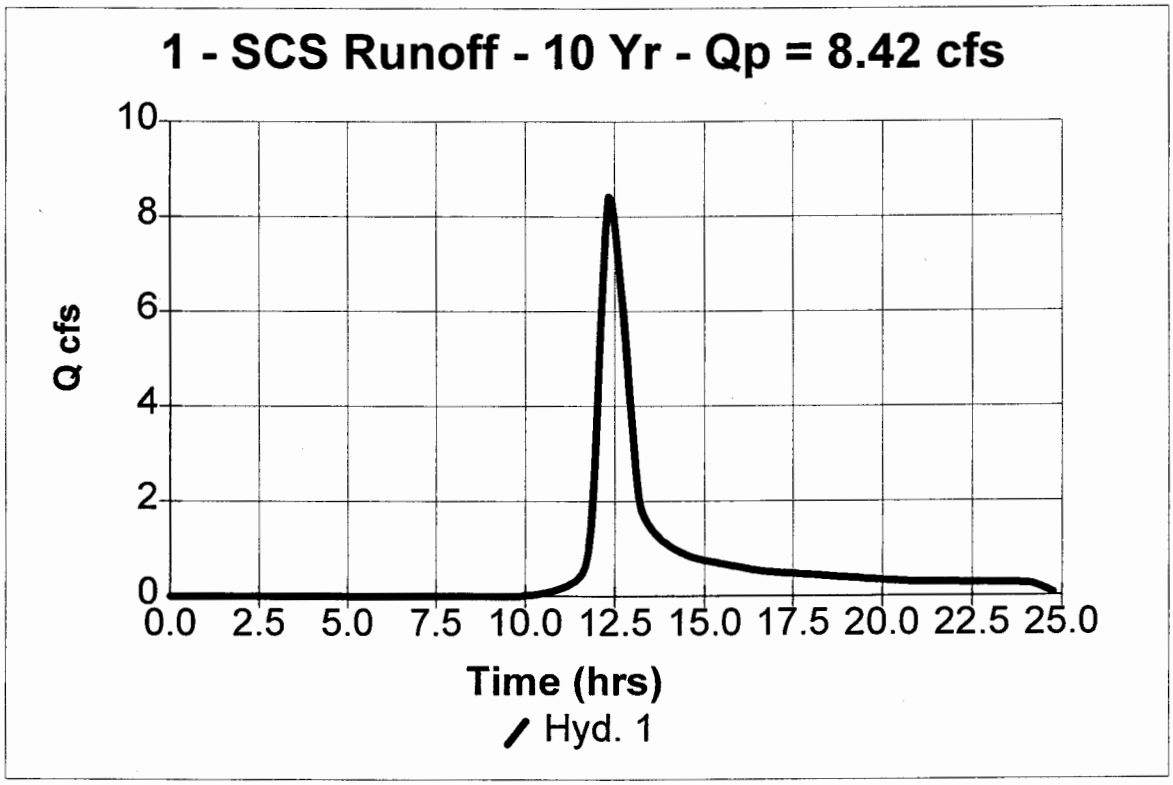
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 8.42 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 48,991 cuft



Hydrograph Plot

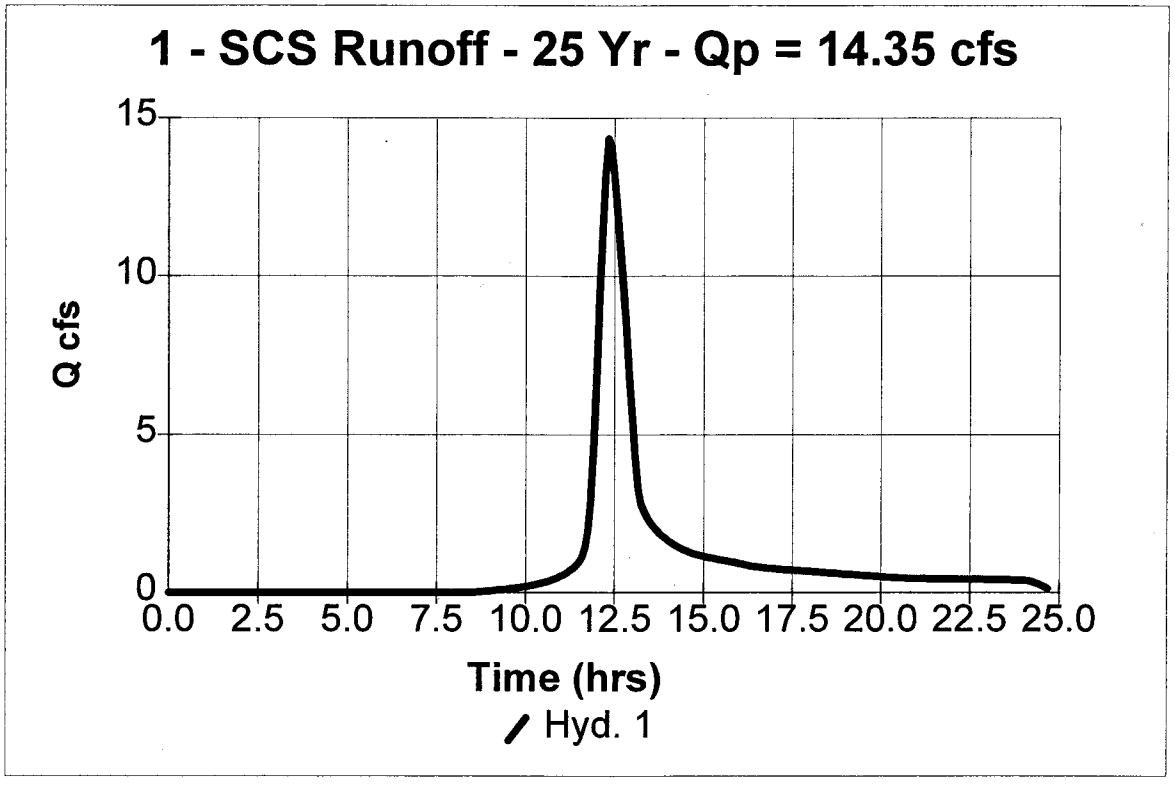
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 14.35 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 81,466 cuft



Hydrograph Plot

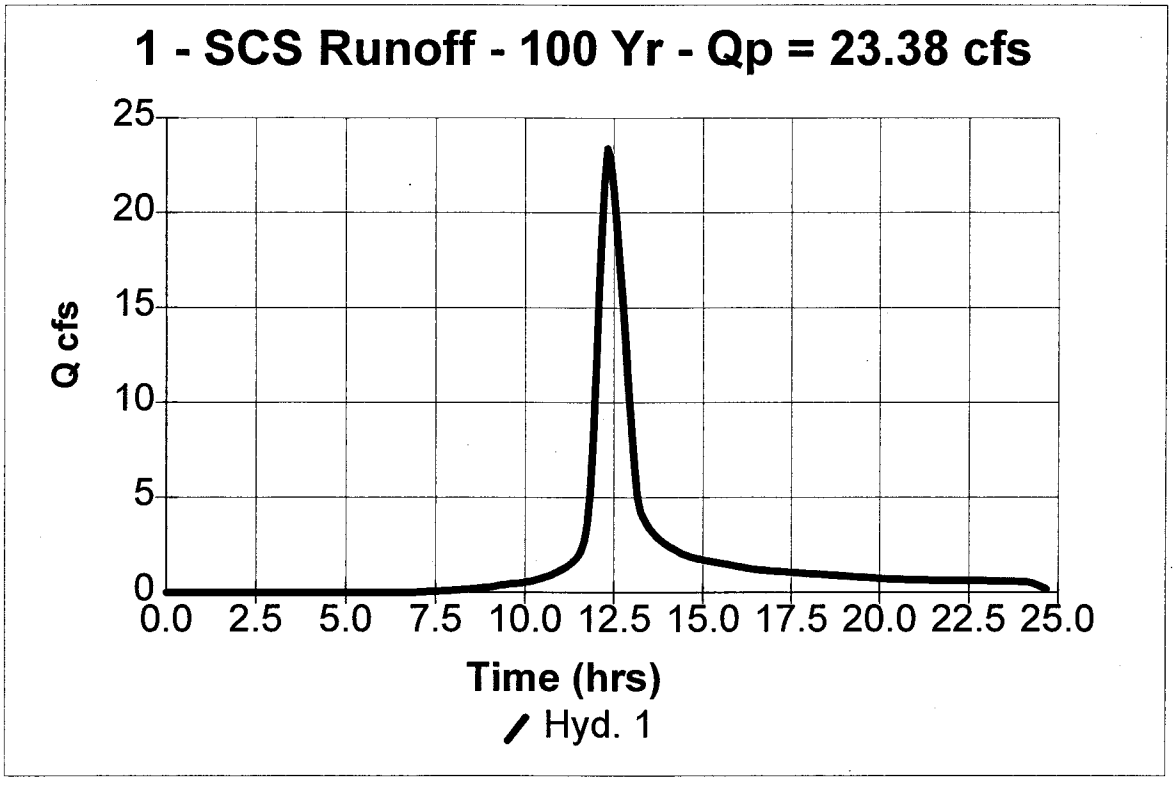
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOP

Hydrograph type	= SCS Runoff	Peak discharge	= 23.38 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 7.27 ac	Curve number	= 75
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 131,860 cuft



Hydrograph Plot

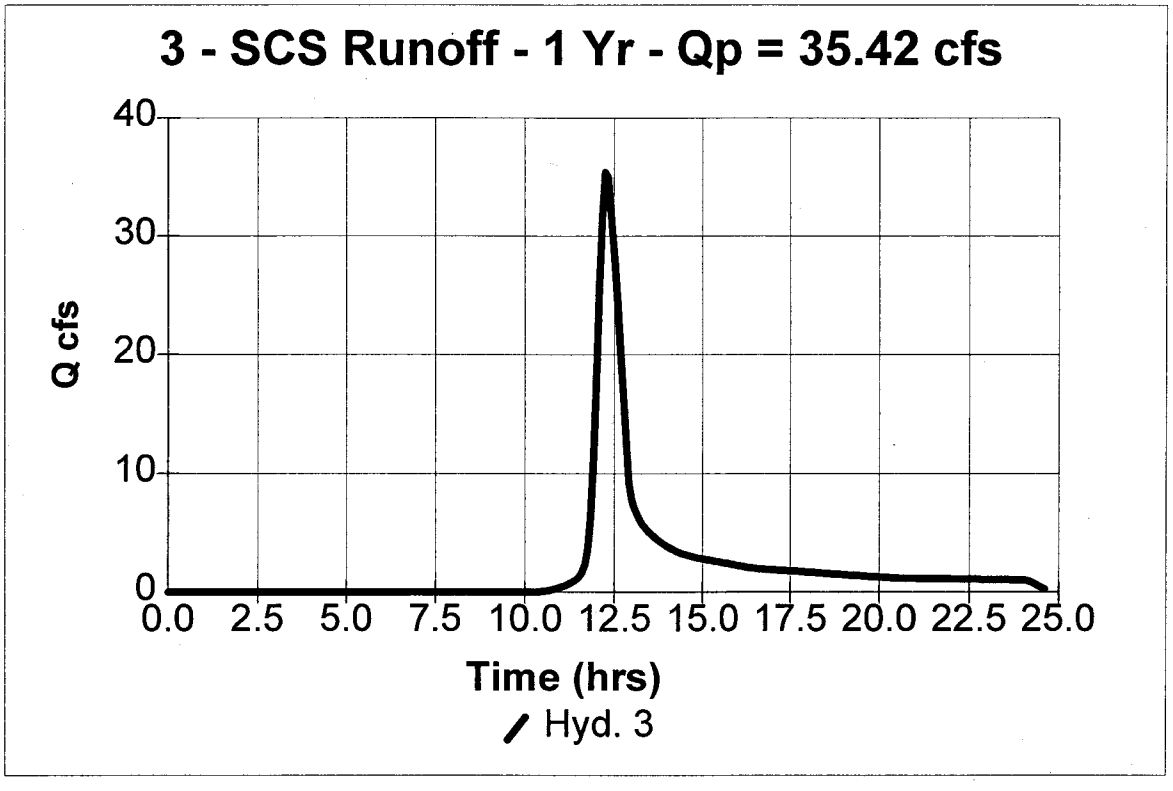
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 35.42 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 180,283 cuft



Hydrograph Plot

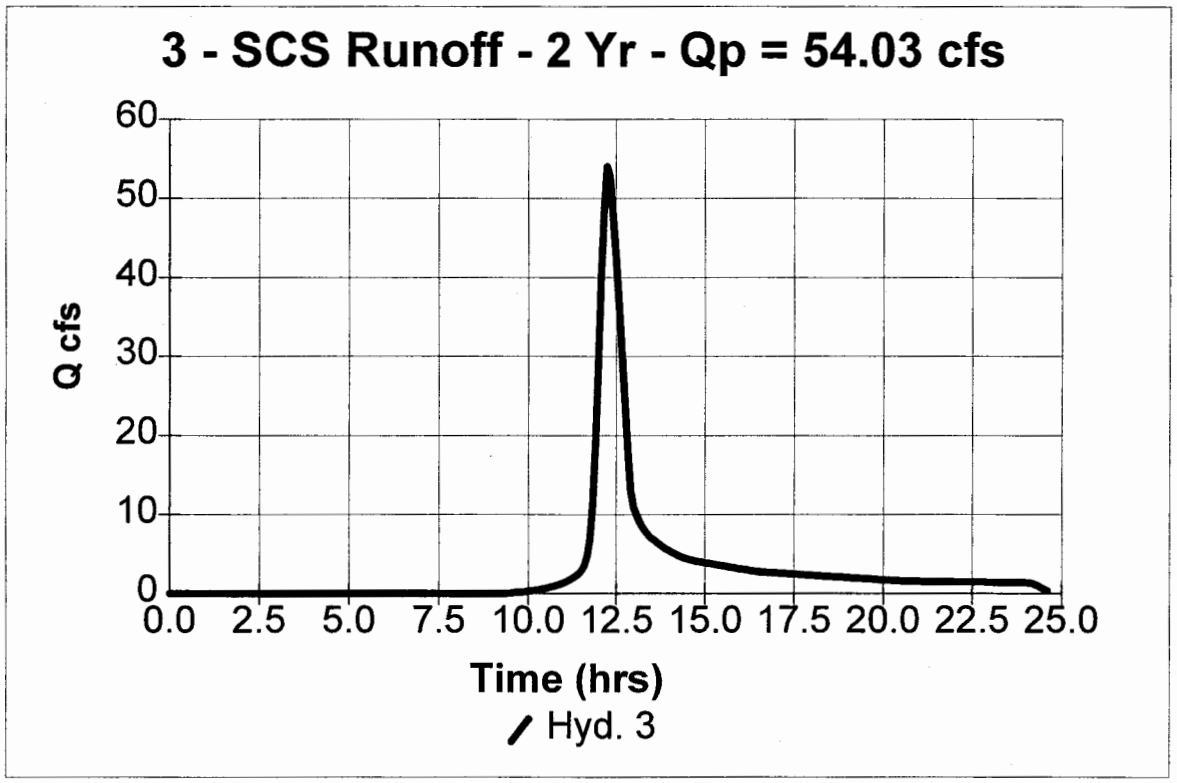
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 54.03 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 267,683 cuft



Hydrograph Plot

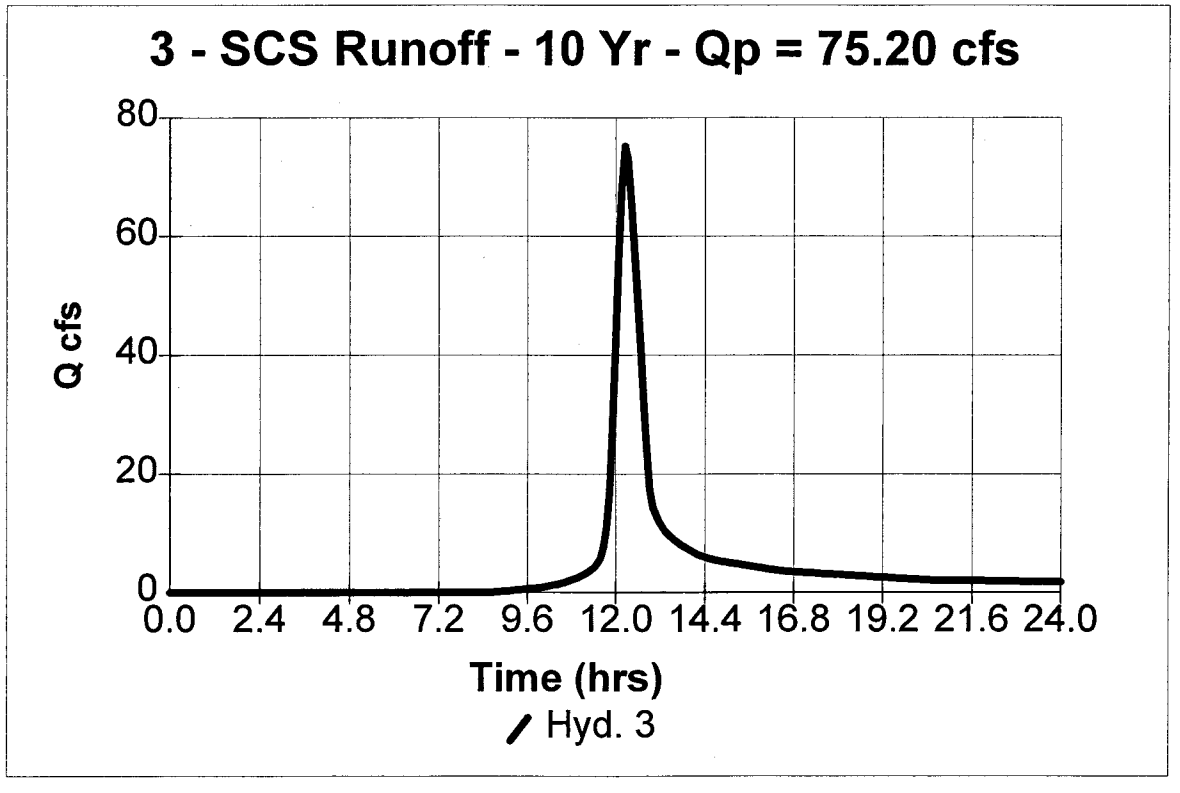
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 75.20 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 368,064 cuft



Hydrograph Plot

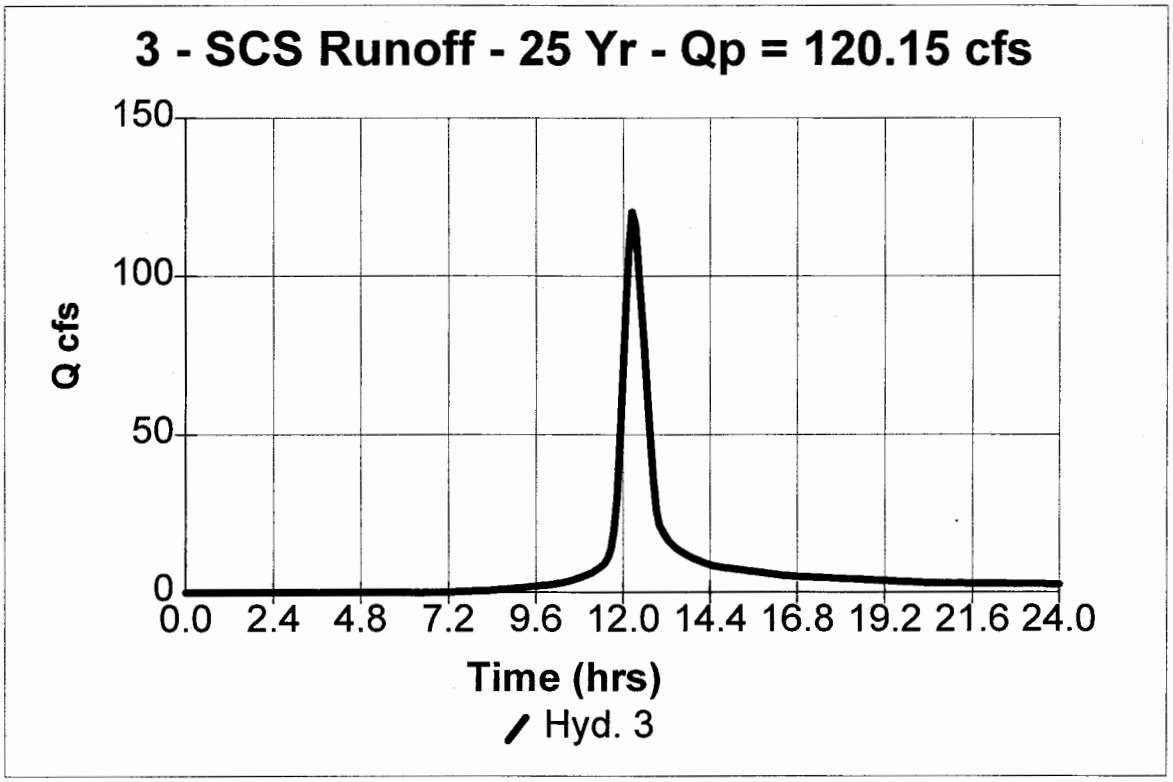
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 120.15 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 584,711 cuft



Hydrograph Plot

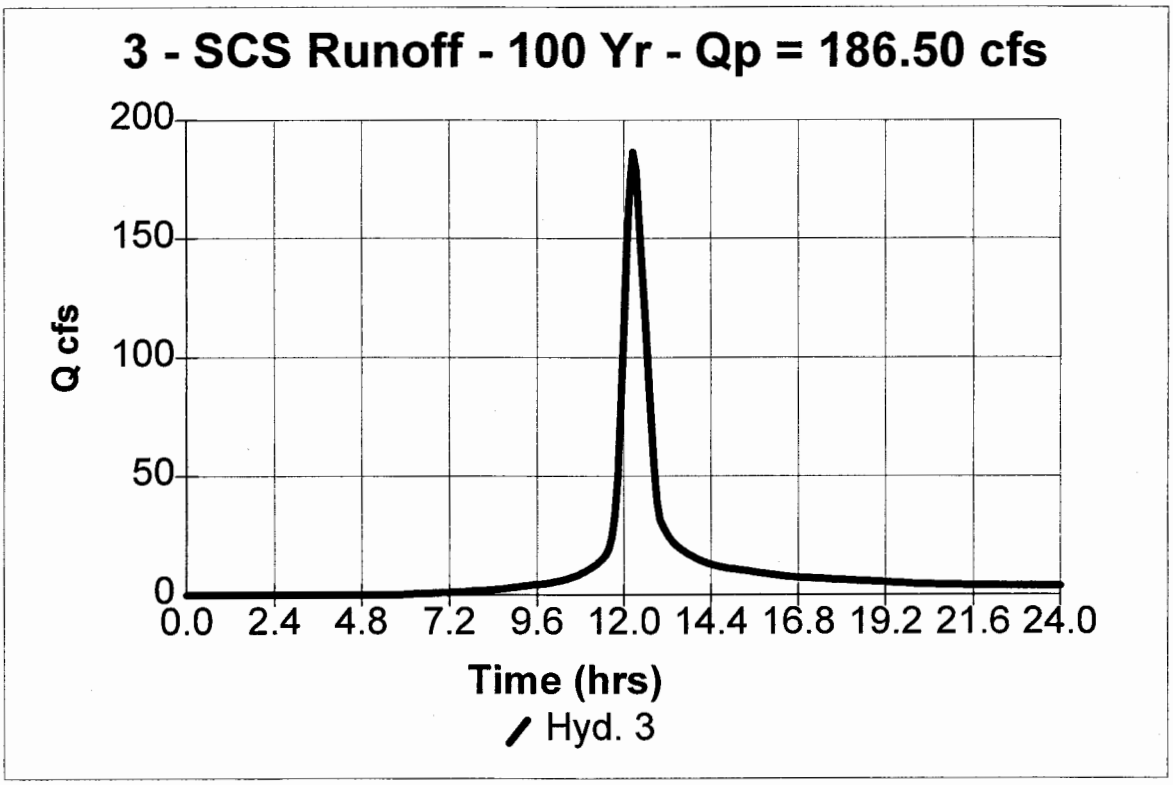
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOP (TO BMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 186.50 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 46.22 ac	Curve number	= 80
Basin Slope	= 2.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 38 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 912,495 cuft



Hydrograph Plot

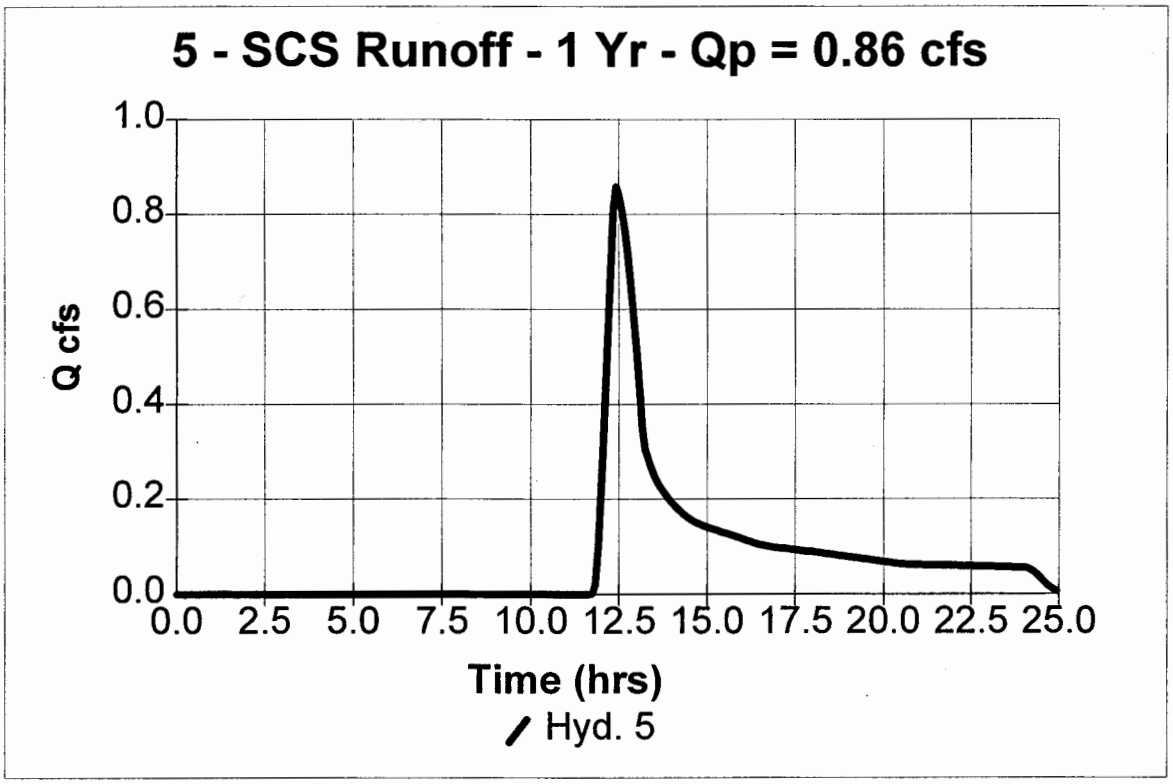
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.86 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 6,759 cuft



Hydrograph Plot

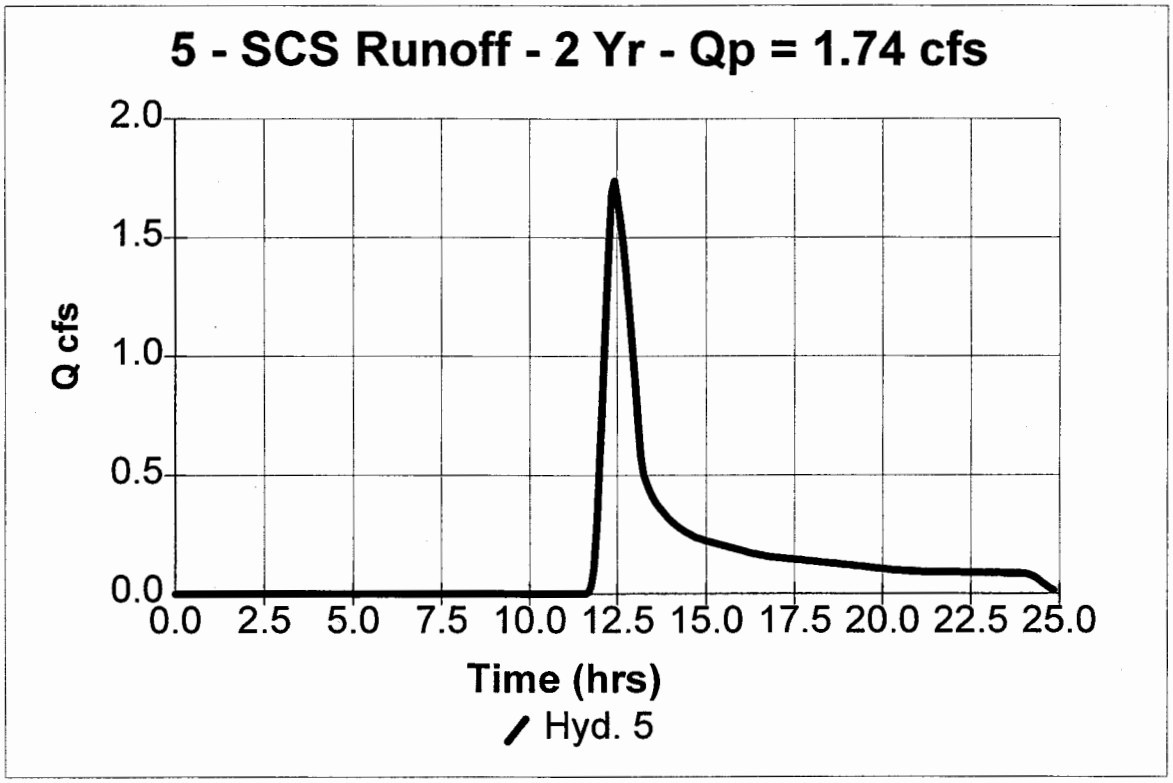
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.74 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,757 cuft



Hydrograph Plot

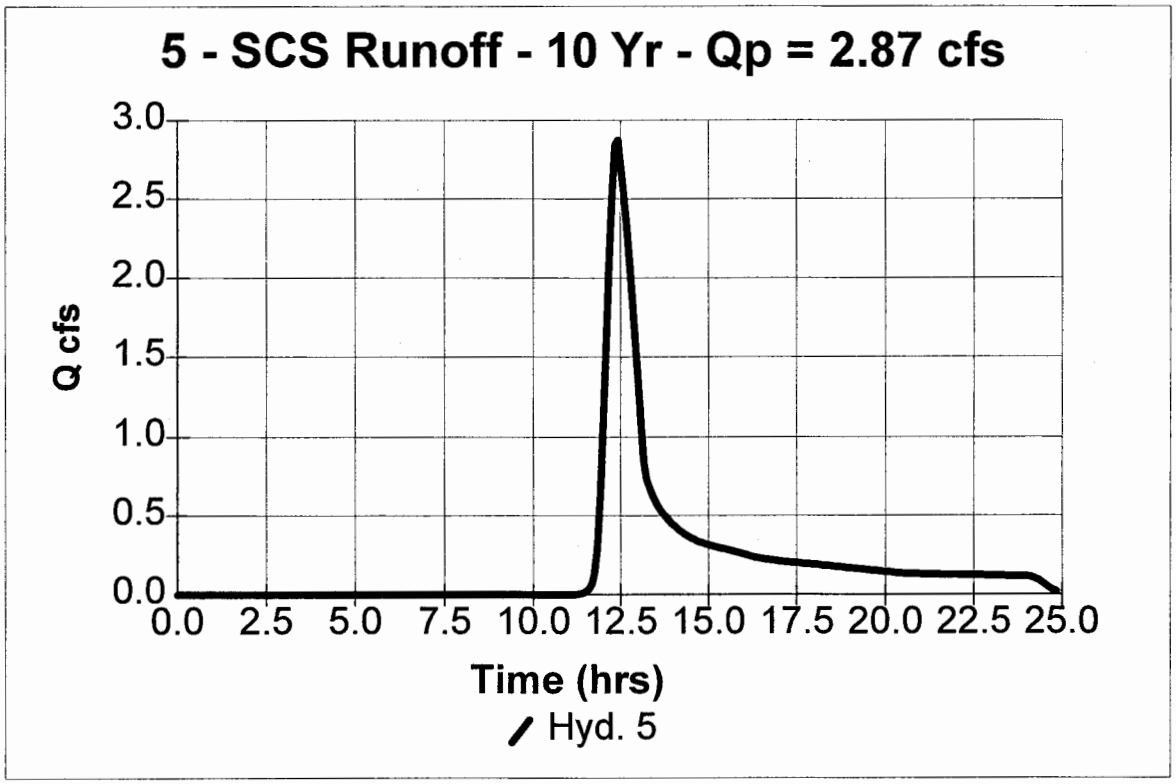
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.87 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 4.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 18,000 cuft



Hydrograph Plot

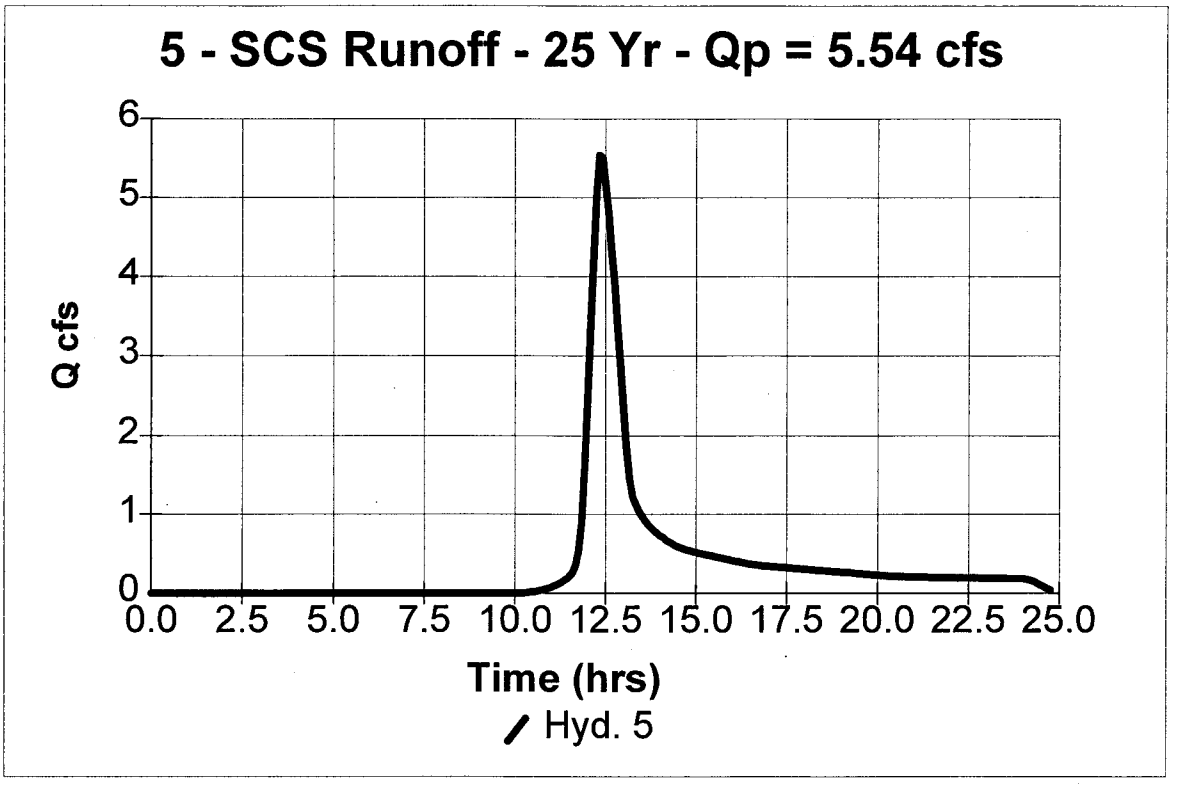
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 5.54 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,610 cuft



Hydrograph Plot

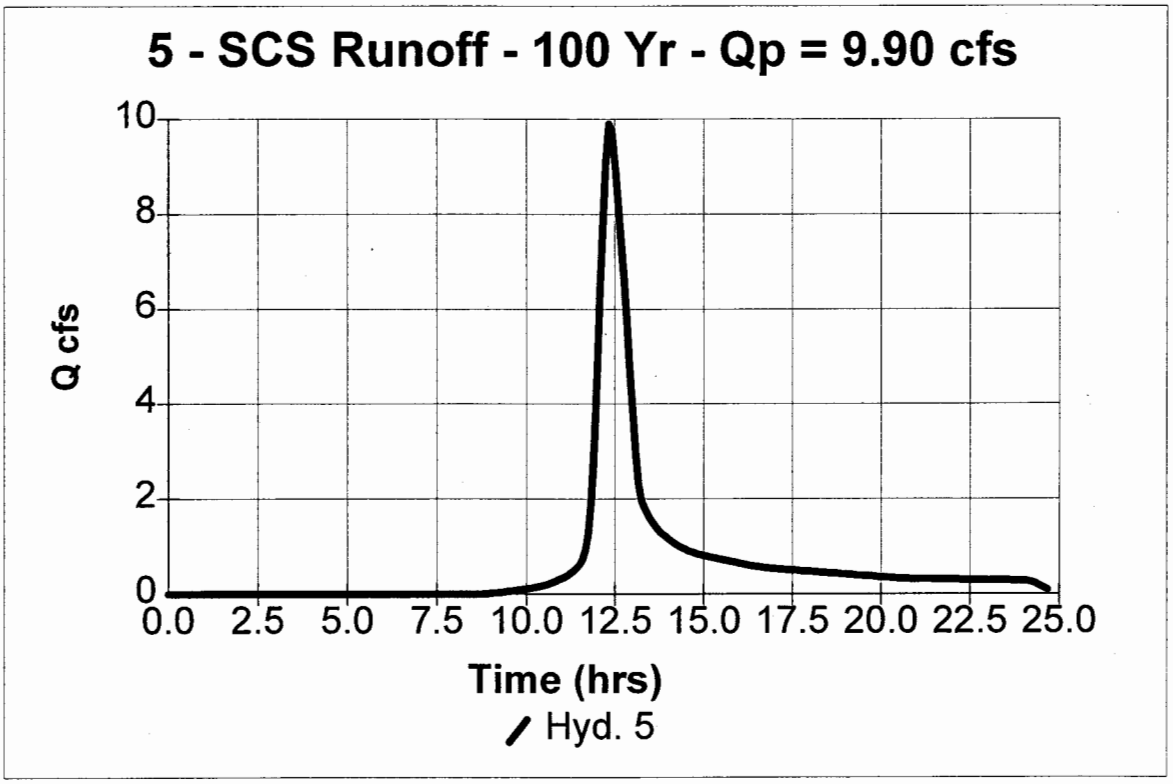
Hydraflow Hydrographs by Intelisolve

Hyd. No. 5

POST-DEVELOP (TO CHANNEL)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.90 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 3.81 ac	Curve number	= 67
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 44 min
Total precip.	= 7.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 56,425 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - SED BASIN @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.00	35,303	0	0
2.00	82.00	40,107	75,410	75,410
4.00	84.00	45,015	85,122	160,532
6.00	86.00	50,023	95,038	255,570
7.00	87.00	52,566	51,295	306,865
7.10	87.10	65,663	5,911	312,776
8.00	88.00	69,309	60,737	373,513
10.00	90.00	77,577	146,886	520,399
12.00	92.00	86,075	163,652	684,051
14.00	94.00	100,725	186,800	870,851
16.00	96.00	146,200	246,925	1,117,776

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	8.0	0.0	0.0
Span in	= 30.0	8.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 81.00	87.67	0.00	0.00
Length ft	= 400.0	1.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00	7.00	0.00	0.00
Crest El. ft	= 94.50	90.30	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	Yes	No	No

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

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	80.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	75,410	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	160,532	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	255,570	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.00	306,865	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.10	312,776	87.10	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	373,513	88.00	0.37	0.34	---	---	0.00	0.00	---	---	---	0.34
10.00	520,399	90.00	2.61	2.37	---	---	0.00	0.00	---	---	---	2.37
12.00	684,051	92.00	43.70	3.36	---	---	0.00	40.34	---	---	---	43.70
14.00	870,851	94.00	60.46	0.97	---	---	0.00	59.48	---	---	---	60.45
16.00	1,117,776	96.00	65.73	0.58	---	---	47.77	65.13	---	---	---	113.48

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

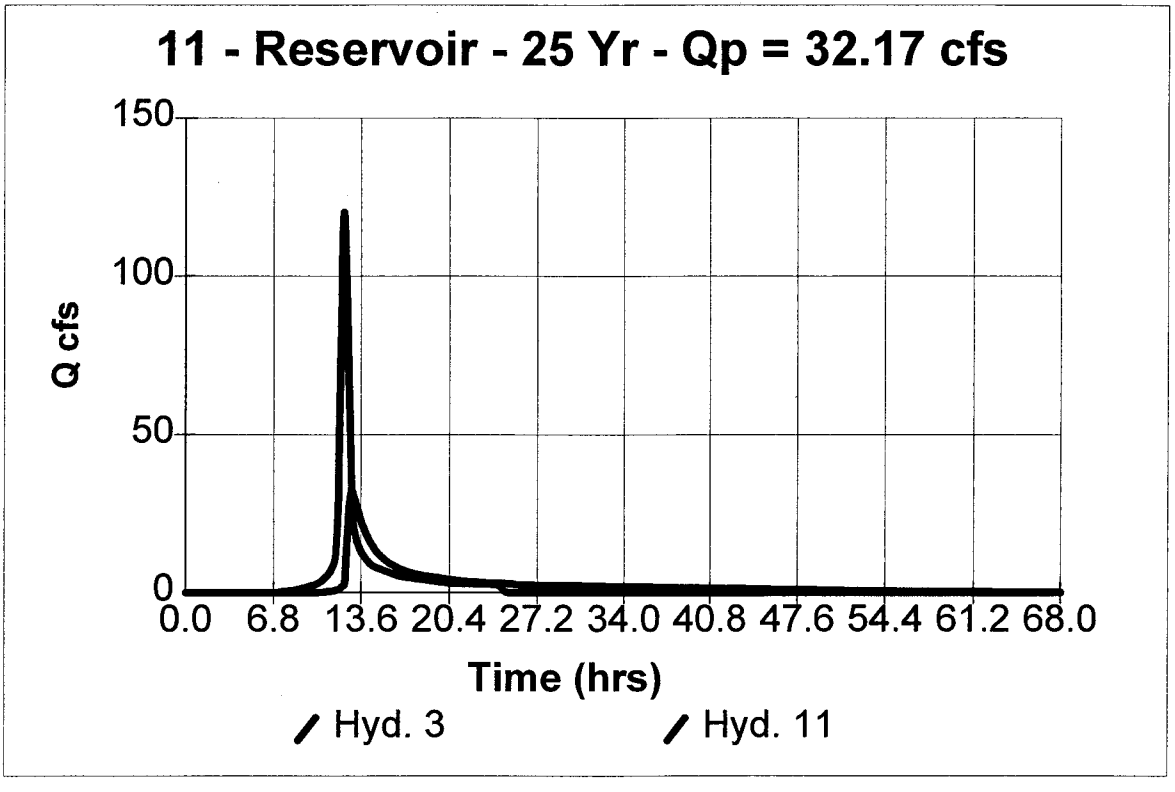
Hyd. No. 11

SED BASIN ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 32.17 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Reservoir name	= SED BASIN @ HOL
Max. Elevation	= 91.66 ft	Max. Storage	= 656,328 cuft

Storage Indication method used.

Hydrograph Volume = 578,561 cuft



Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - WET POND @ HOLE 18

Pond Data

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

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	80.00	35,303	0	0
2.00	82.00	40,107	75,410	75,410
4.00	84.00	45,015	85,122	160,532
6.00	86.00	50,023	95,038	255,570
7.00	87.00	52,566	51,295	306,865
7.10	87.10	65,663	5,911	312,776
8.00	88.00	69,309	60,737	373,513
10.00	90.00	77,577	146,886	520,399
12.00	92.00	86,075	163,652	684,051
14.00	94.00	100,725	186,800	870,851
16.00	96.00	200,000	300,725	1,171,576

87.7 → 353,267

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	8.0	0.0	0.0
Span in	= 30.0	8.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 81.00	87.70	0.00	0.00
Length ft	= 400.0	10.0	0.0	0.0
Slope %	= 0.50	0.00	0.00	0.00
N-Value	= .013	.013	.000	.000
Orif. Coeff.	= 0.60	0.60	0.00	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 10.00	7.00	0.00	0.00
Crest El. ft	= 94.50	90.30	0.00	0.00
Weir Coeff.	= 2.60	2.60	0.00	0.00
Weir Type	= Broad	Broad	---	---
Multi-Stage	= No	Yes	No	No

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

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	80.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	75,410	82.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	160,532	84.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	255,570	86.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.00	306,865	87.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
7.10	312,776	87.10	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
8.00	373,513	88.00	0.29	0.29	---	---	0.00	0.00	---	---	---	0.29
10.00	520,399	90.00	2.36	2.36	---	---	0.00	0.00	---	---	---	2.36
12.00	684,051	92.00	43.69	3.35	---	---	0.00	40.34	---	---	---	43.69
14.00	870,851	94.00	60.46	0.97	---	---	0.00	59.48	---	---	---	60.45
16.00	1,171,576	96.00	65.73	0.58	---	---	47.77	65.13	---	---	---	113.48

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Hyd. No. 7

WET POND ROUTED

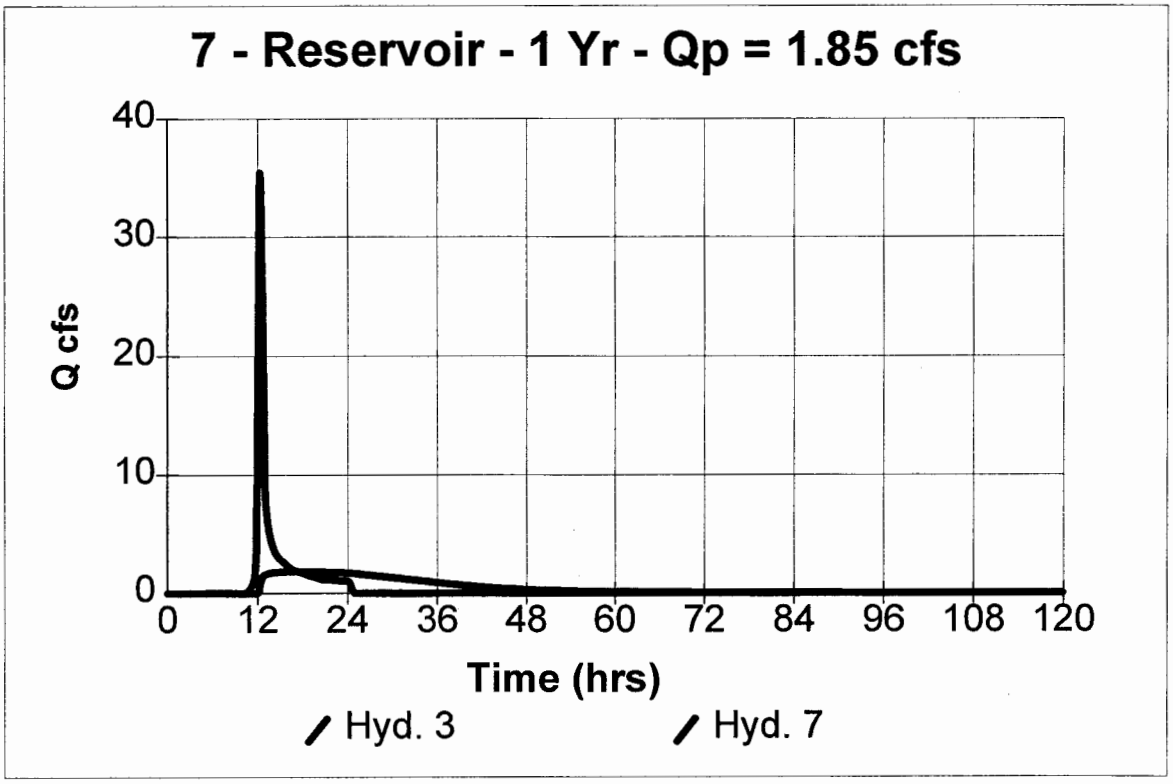
Hydrograph type	= Reservoir	Peak discharge	= 1.85 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Reservoir name	= WET POND @ HOLE
Max. Elevation	= 89.24 ft	Max. Storage	= 464,814 cuft

Storage Indication method used.

Hydrograph Volume = 173,038 cuft

STORAGE = 111,547 ft³

↳ 64% of Hyd. Vol - acceptable



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

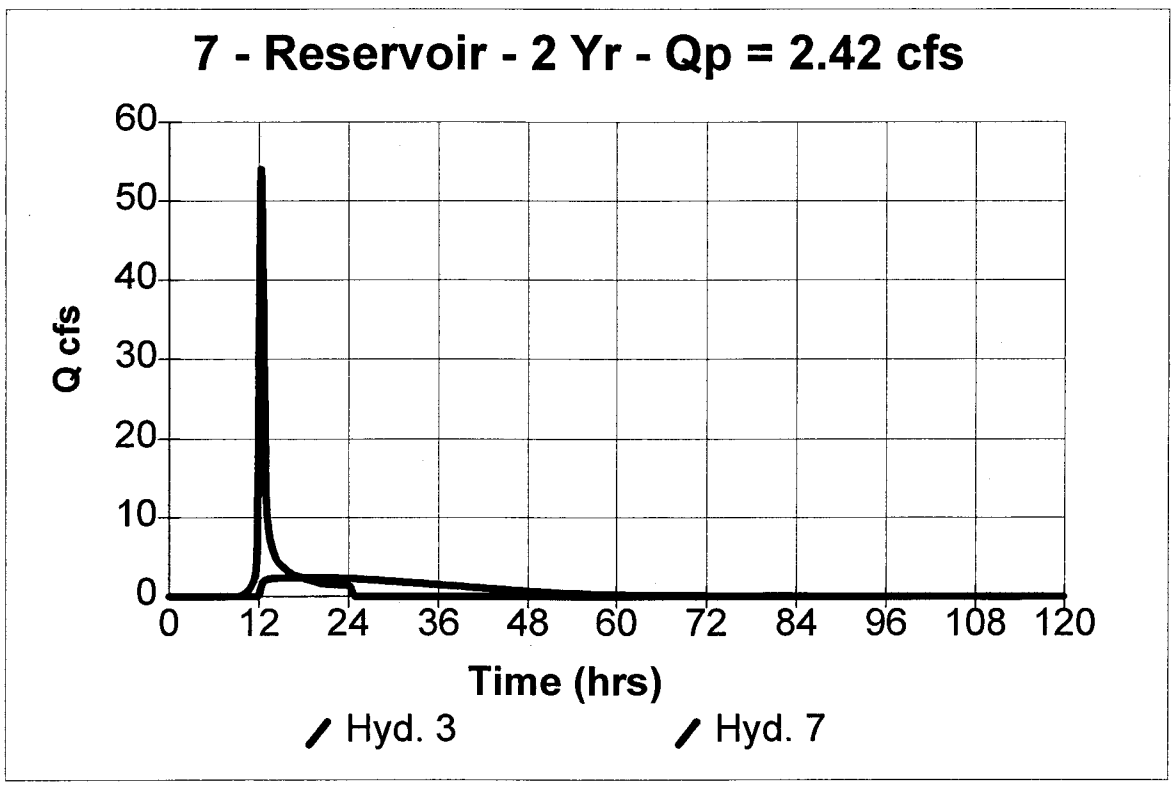
Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 2.42 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Reservoir name	= WET POND @ HOLE
Max. Elevation	= 90.11 ft	Max. Storage	= 529,359 cuft

Storage Indication method used.

Hydrograph Volume = 259,972 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

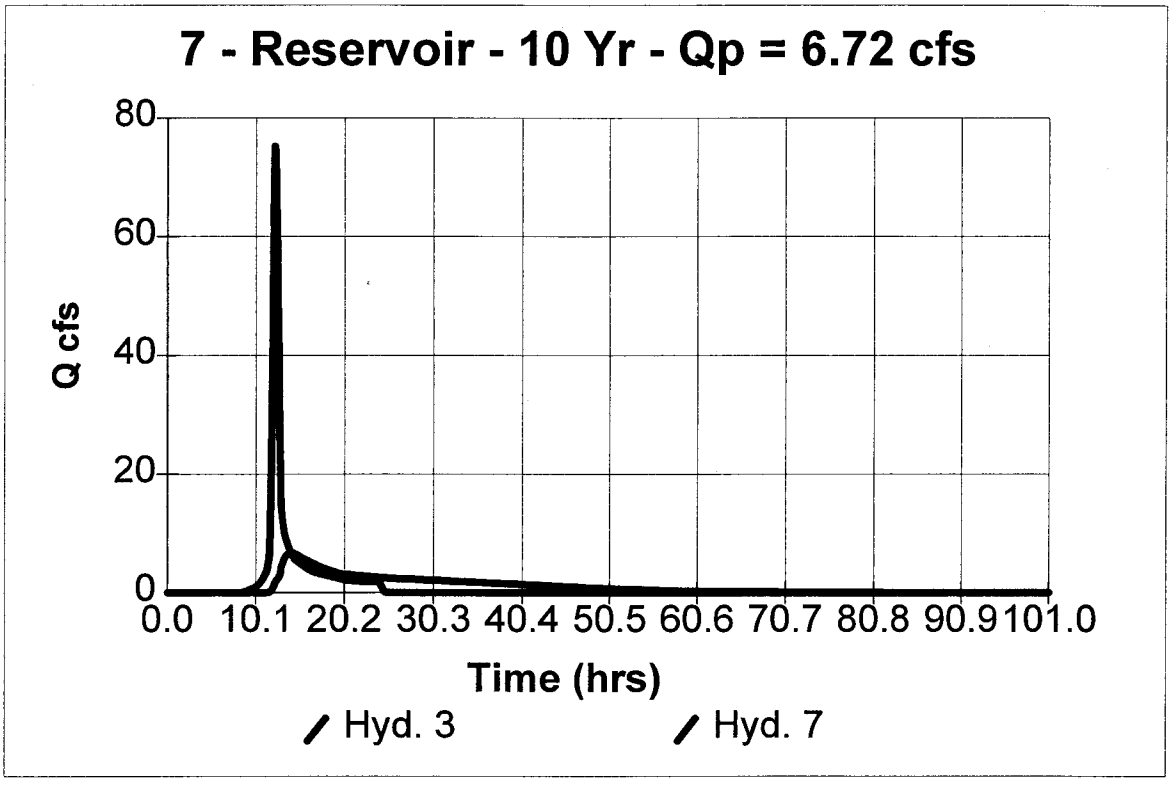
Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 6.72 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Reservoir name	= WET POND @ HOLE
Max. Elevation	= 90.66 ft	Max. Storage	= 574,267 cuft

Storage Indication method used.

Hydrograph Volume = 360,164 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

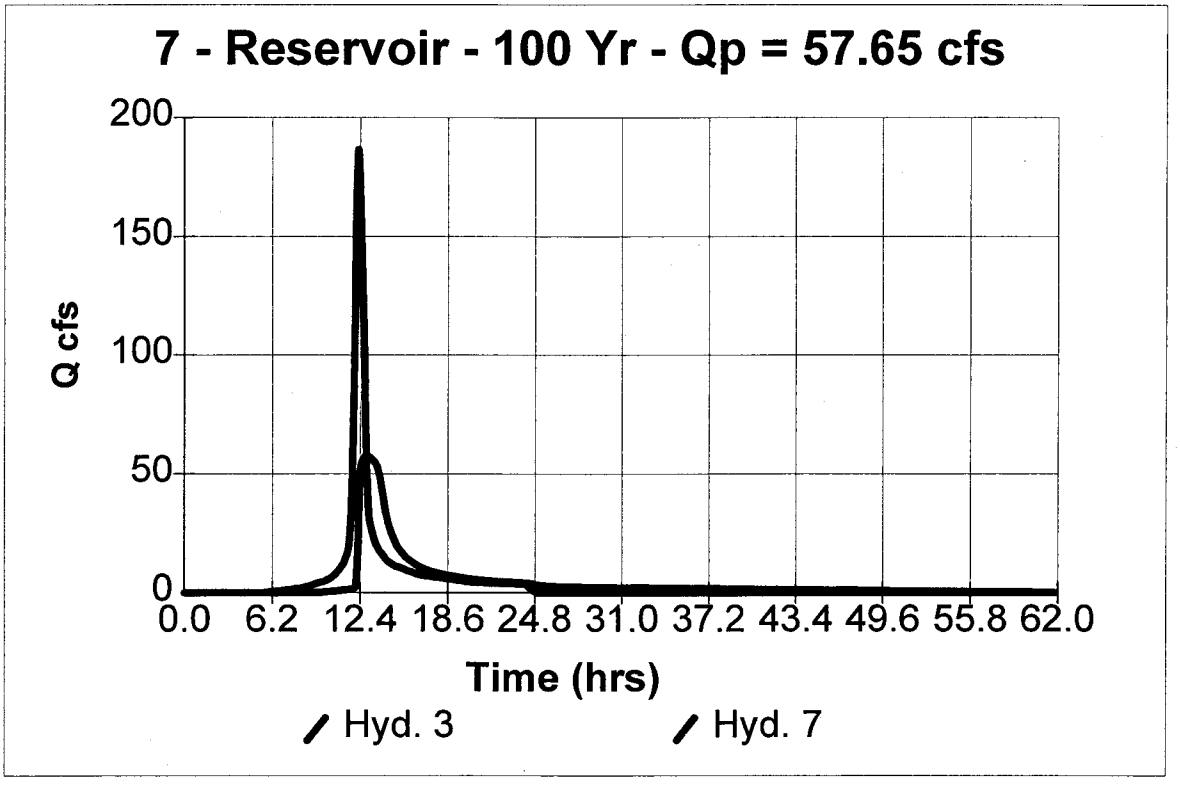
Hyd. No. 7

WET POND ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 57.65 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 3	Reservoir name	= WET POND @ HOLE
Max. Elevation	= 93.18 ft	Max. Storage	= 794,541 cuft

Storage Indication method used.

Hydrograph Volume = 904,461 cuft



Hydrograph Plot

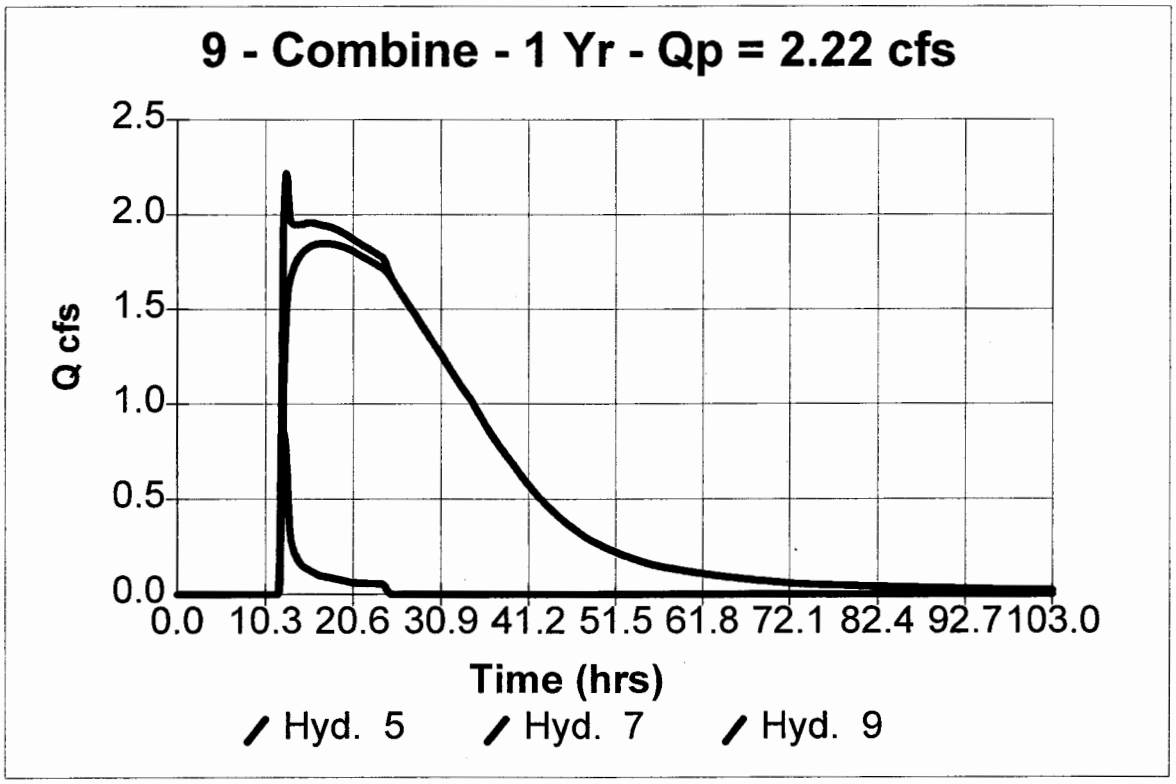
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 2.22 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 179,797 cuft



Hydrograph Plot

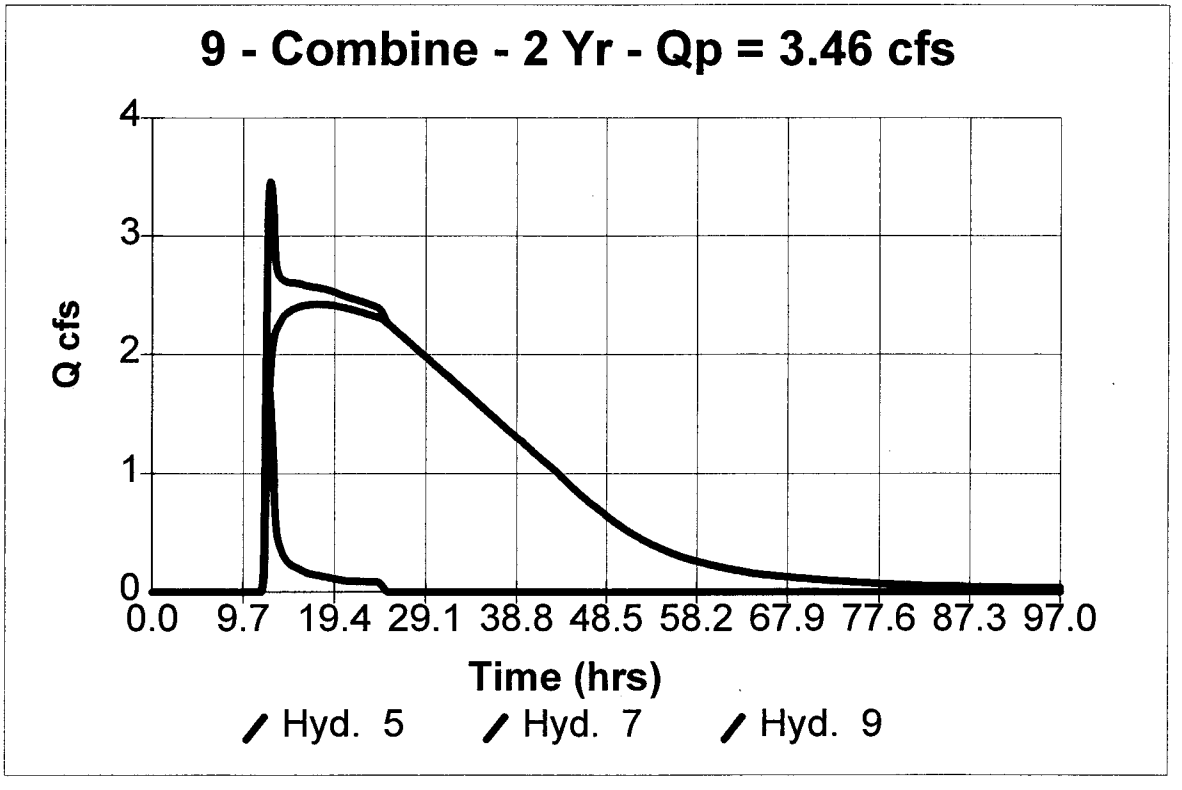
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 3.46 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 271,729 cuft



Hydrograph Plot

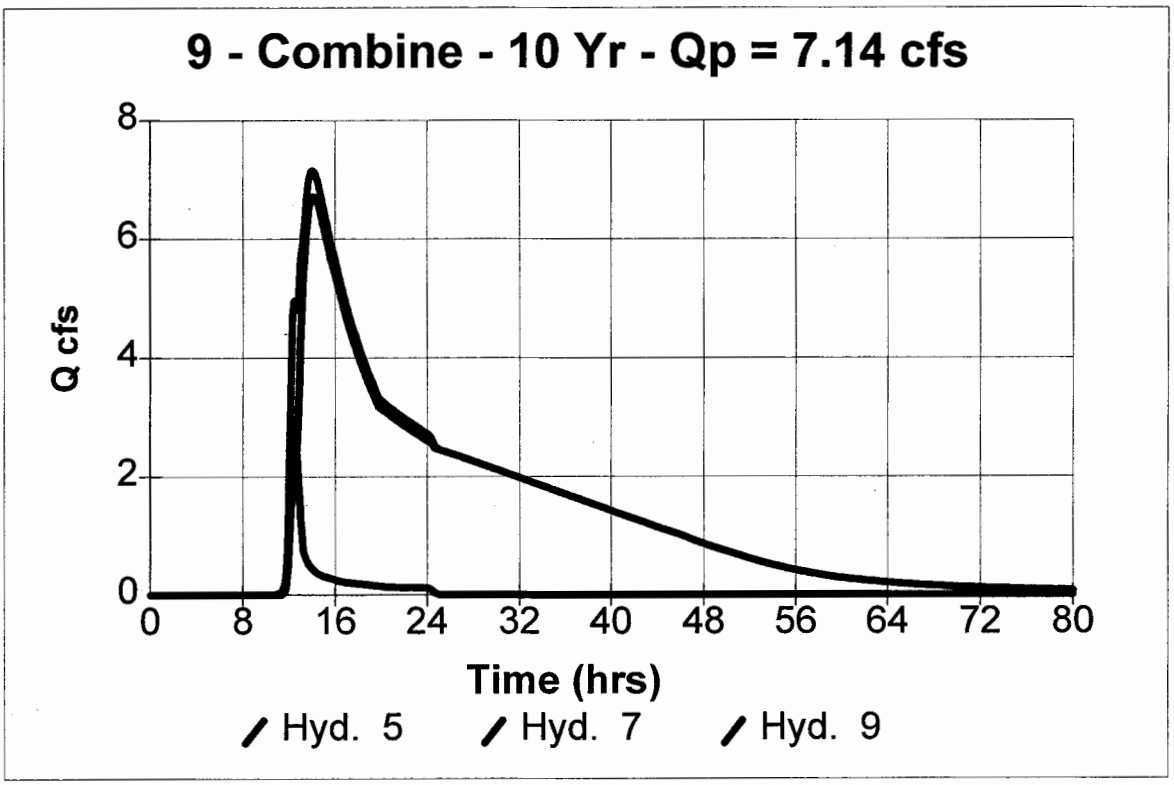
Hydraflow Hydrographs by Intelisolve

Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 7.14 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 378,165 cuft



Hydrograph Plot

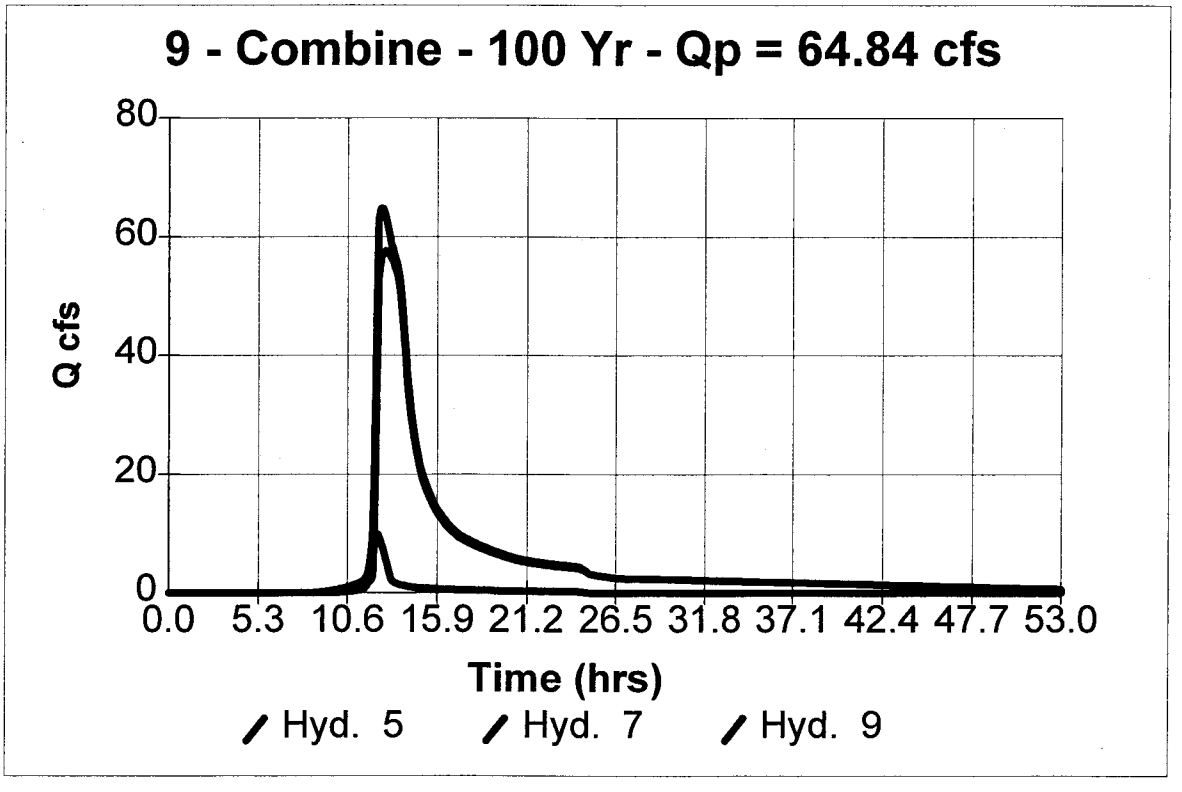
Hydraflow Hydrographs by Intelisolve

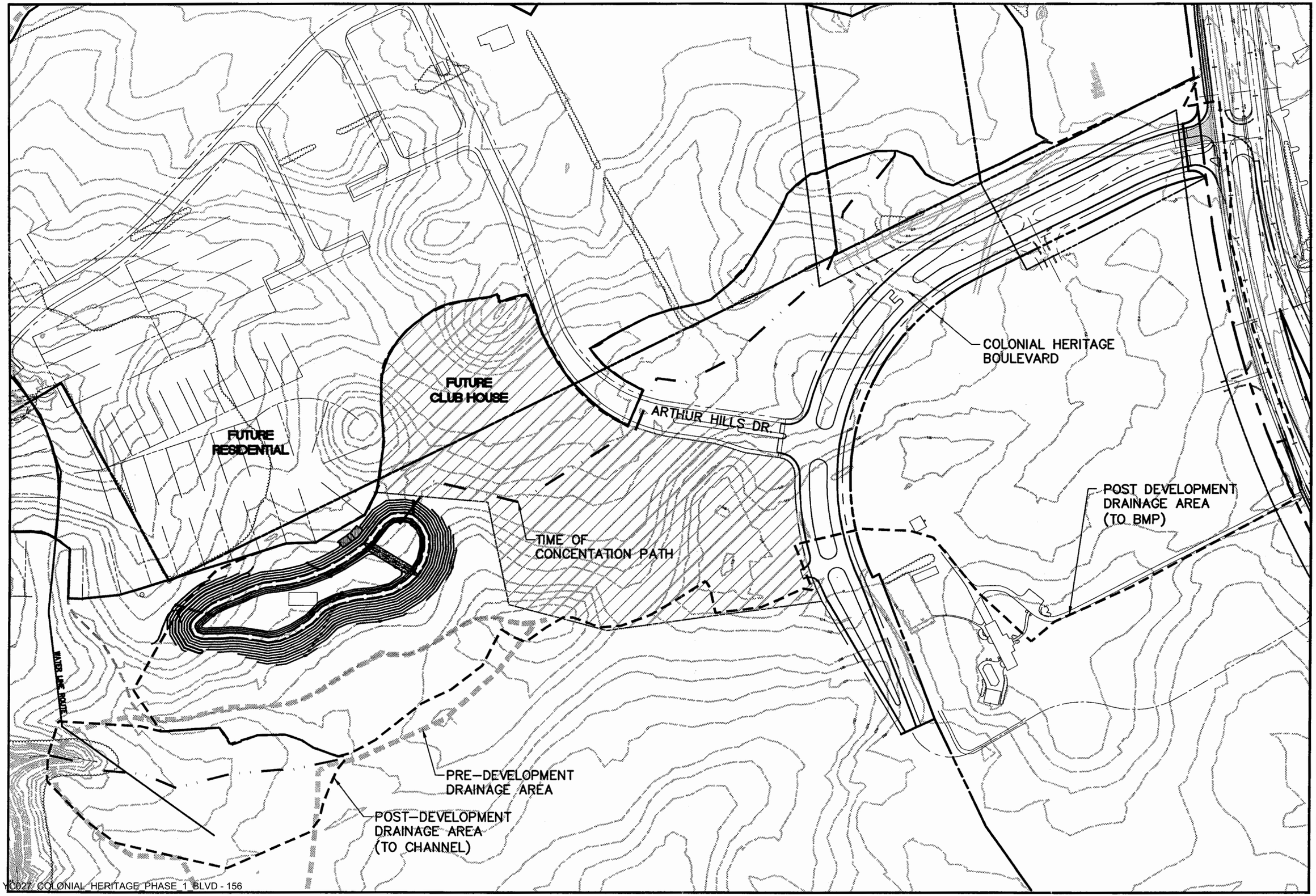
Hyd. No. 9

TOTAL POST-DEVELOPMENT (TO CHANNEL)

Hydrograph type	= Combine	Peak discharge	= 64.84 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyds.	= 5, 7		

Hydrograph Volume = 960,886 cuft





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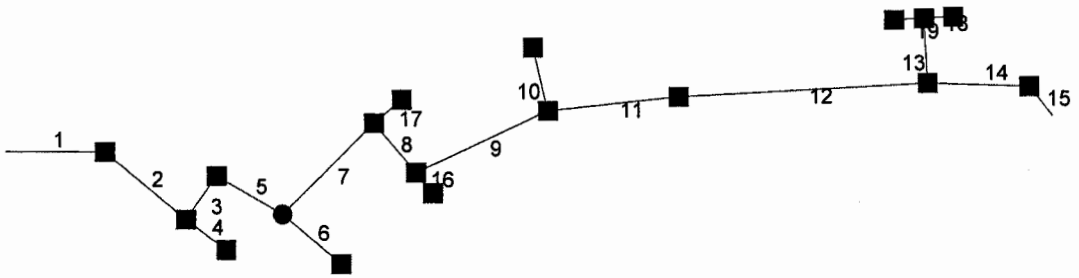
CONSULTING ENGINEERS

COLONIAL HERITAGE BOULEVARD
18TH HOLE POND DRAINAGE AREAS

Designed AES	Drawn AES
Scale 1"=200'	Date 10/19/01
Project No. 9028-08	
Drawing No. 1	

Hydraflow Plan View

MAR 2003
RECEIVED
PLANNING DEPARTMENT



Project file: 8881-05-STORM SYS 3 REV 2-25-03.stm	IDF file: sampleFHA.IDF	No. Lines: 19	03-18-2003

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	140.0	0.61	22.67	0.60	0.37	12.04	5.0	22.0	4.4	52.93	73.64	7.86	42	0.54	95.75	95.00	97.98	97.40	107.14	95.50	SS3-1 to SS3-2
2	1	151.0	1.24	22.06	0.35	0.43	11.68	10.0	21.5	4.4	51.82	70.90	5.78	42	0.50	96.50	95.75	99.38	99.13	105.10	107.14	SS3-2 to SS3-3
3	2	76.0	0.47	20.33	0.70	0.33	10.95	5.0	21.3	4.5	48.86	81.60	5.09	42	0.66	97.00	96.50	100.42	100.25	105.10	105.10	SS3-3 to SS3-4
4	2	72.0	0.49	0.49	0.60	0.29	0.29	5.0	5.0	7.2	2.13	17.85	2.76	15	7.64	102.00	96.50	102.58	100.25	106.19	105.10	SS3-3 to SS3-5
5	3	110.0	0.00	19.86	0.00	0.00	10.62	0.0	20.9	4.5	47.78	95.93	5.06	42	0.91	98.00	97.00	101.23	101.03	106.50	105.10	SS3-5 to SS3-6
6	5	110.0	0.37	0.37	0.70	0.26	0.26	5.0	5.0	7.2	1.87	39.10	0.38	30	0.91	99.00	98.00	101.58	101.58	107.17	106.50	SS3-6 to SS3-7
7	5	185.0	0.34	19.49	0.70	0.24	10.36	5.0	20.3	4.6	47.26	70.17	5.15	42	0.49	98.90	98.00	101.90	101.58	105.08	106.50	SS3-6 to SS3-8
8	7	93.0	0.55	18.77	0.70	0.38	9.86	5.0	20.1	4.6	45.21	48.90	6.40	36	0.54	99.40	98.90	103.00	102.58	105.08	105.08	SS3-8 to SS3-9
9	8	209.0	0.28	4.93	0.70	0.20	2.83	5.0	13.1	5.5	15.52	19.79	4.94	24	0.77	101.00	99.40	104.78	103.80	107.31	105.08	SS3-9 to SS3-10
10	9	93.0	0.68	0.68	0.70	0.48	0.48	5.0	5.0	7.2	3.45	9.47	2.81	15	2.15	103.00	101.00	105.62	105.35	107.31	107.31	SS3-10 - SS3-11
11	9	189.0	0.16	3.97	0.70	0.11	2.15	5.0	12.3	5.6	12.12	16.45	3.86	24	0.53	102.00	101.00	105.89	105.35	109.68	107.31	SS3-10 - SS3-12
12	11	357.0	0.58	3.81	0.70	0.41	2.04	5.0	10.8	5.9	12.05	16.93	3.84	24	0.56	104.00	102.00	107.02	106.01	108.82	109.68	SS3-12 - SS3-13
13	12	93.0	0.18	1.07	0.70	0.13	0.75	5.0	5.4	7.1	5.34	8.78	3.02	18	0.70	104.65	104.00	107.61	107.37	108.82	108.82	SS3-13 - SS3-14
14	12	145.0	0.08	2.16	0.70	0.06	0.89	5.0	10.2	6.0	5.33	7.39	4.34	15	1.31	105.90	104.00	108.36	107.37	109.73	108.82	SS3-13 - SS3-15
15	14	56.0	2.08	2.08	0.40	0.83	0.83	10.0	10.0	6.0	5.03	15.19	4.71	15	5.54	109.00	105.90	109.90	108.68	111.00	109.73	SS3-15 - SS3-16
16	8	38.0	13.29	13.29	0.50	6.64	6.64	20.0	20.0	4.6	30.53	69.62	9.85	24	9.47	103.00	99.40	104.87	103.80	107.00	105.08	SS3-7 to SS3-[illegible]
17	7	52.0	0.38	0.38	0.70	0.27	0.27	5.0	5.0	7.2	1.93	14.02	1.57	15	4.71	101.35	98.90	102.60	102.58	105.29	105.08	SS3-8 to SS3-18
18	13	42.0	0.46	0.46	0.70	0.32	0.32	5.0	5.0	7.2	2.33	5.81	1.90	15	0.81	104.99	104.65	107.87	107.82	108.91	108.82	SS3-14 - SS3-14
19	13	42.0	0.43	0.43	0.70	0.30	0.30	5.0	5.0	7.2	2.18	5.81	1.78	15	0.81	104.99	104.65	107.87	107.82	108.91	108.82	SS3-14 - SS3-14

Project File: 8881-05-STORM SYS 3 REV 2-25-03.stm | IDF File: sampleFHA.IDF | Total number of lines: 19 | Run Date: 03-18-2003

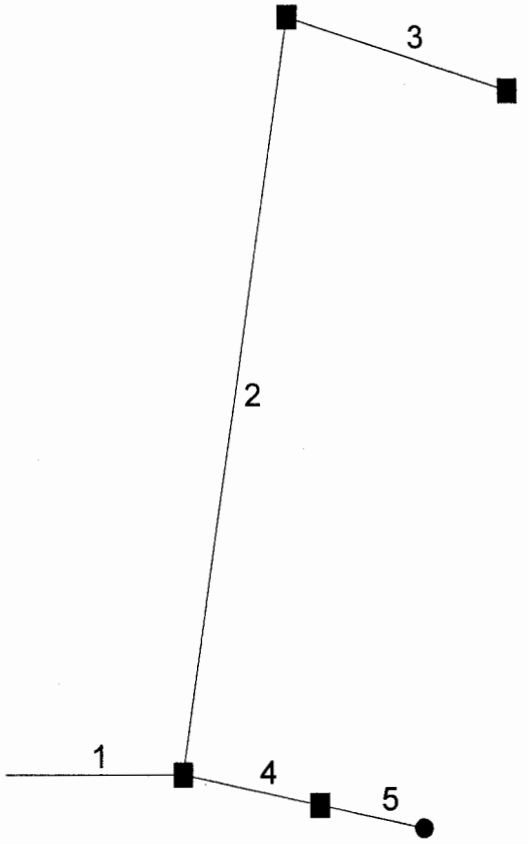
NOTES: Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period = 10 Yrs. ; Initial tailwater elevation = 97.40 (ft)

LANE: COLONIAL HERITAGE BOULEVARD
SIDE: RIGHT

PROJECT: Colonial Heritage Boulevard, Phase I
BY HWP
DATE 5/21/02
REV: 3/17/03

STA. TO STA.		FLOW	C	A	C*A INCR.	C*A ACC.	Tc	I2	Q2	C or F	SLOPE	ALLOW. VEL.	EARTH n=.03 VEL.	GRASS n=.05 Qn	GRASS n=.05 VEL.	GRASS n=.05 DEP.	CONC. n=.015 Qn	CONC. n=.015 VEL.	CONC. n=.015 DEP.	I10	Q10	DEP.	REMARKS
					0.00				0.0			2.5											
Ditch	12+80		0.5	.20	0.10	0.22	5	5.6	1.2	C	.012	2.5			2.3	5				7.1	1.5	5.6	Grass V-Ditch 12"' Deep
12+80	16+20		0.5	.230	0.12	0.12	5	5.6	0.6	C	.014	2.5			2.1	4				7.1	0.8	5	
17+20	19+00		0.5	.430	0.22	0.22	5	5.6	1.2	C	.081	2.5			3.4	4				7.1	1.5	5	EC-2 lined V-Ditch 12"

Hydraflow Plan View



Project file: 8881-05-STORM SYS 4..stm	IDF file: sampleFHA.IDF	No. Lines: 5	08-09-2002

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	72.0	0.45	5.62	0.70	0.31	3.58	5.0	10.3	6.0	21.44	23.08	7.98	24	1.04	102.75	102.00	104.39	103.55	107.78	102.00	SS4-1 to Ss4-2
2	1	250.0	1.08	1.23	0.70	0.76	0.86	5.0	7.5	6.6	5.67	6.13	4.62	15	0.90	105.00	102.75	107.72	105.80	110.10	107.78	SS4-2 to SS4-3
3	2	93.0	0.15	0.15	0.70	0.11	0.11	5.0	5.0	7.2	0.76	6.70	0.62	15	1.08	106.00	105.00	108.23	108.22	110.10	110.10	SS4-3 to SS4-4
4	1	57.0	0.44	3.94	0.70	0.31	2.41	5.0	10.1	6.0	14.50	14.98	4.62	24	0.44	103.00	102.75	106.03	105.80	107.78	107.78	SS4-2 to SS4-5
5	4	43.0	3.50	3.50	0.60	2.10	2.10	10.0	10.0	6.0	12.69	16.01	7.18	18	2.33	104.00	103.00	106.83	106.20	112.00	107.78	SS4-5 to SS4-6

Project File: 8881-05-STORM SYS 4..stm | IDF File: sampleFHA.IDF | Total number of lines: 5 | Run Date: 08-09-2002

NOTES: Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period = 10 Yrs. ; Initial tailwater elevation = 103.55 (ft)

CONSULTING ENGINEERS

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PROJECT: Colonial Heritage Boulevard, Phase I
PROJECT NO.: 8881-5
SUBJECT: Spread Calc's
SHEET NO.: 1 OF 3
DATE: MAY 17,2002
BY: HWP

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	Sw =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 P Effec L	L/Lt (ft)	d E(#16) (ft)	h	Q Int CFS d/h	Q Carryover Spread	Remark
Colonial Heritage Boulevard, Phase I																															
SS 3-15	DI-3B	4	10+83L	0.08	0.7	0.056	0.056	4	0.224		0.224	0.009	0.02	1.8	2	1.111	0.08	4	1	0.015	2	3.44	0.143	0.163	2.871	1	1		0.224	0	SYSTEM 3
			12+42L	0.22	0.7	0.154	0.154	4	0.616	0	0.616	0.001	0.02	7.7	Flow Approaching From Down Station																
SS 3-13	DI-3C	6									1.624	0.001	0.02		2		0.08								9.6	0.16	0.27		0.593	8	
				0.36	0.7	0.252	0.252	4	1.008		1.008	0.001	0.02	9.4	Flow Approaching From Up Station																
HP																															
SS 3-12	DI-3B	4	16+00L	0.16	0.7	0.112	0.112	4	0.448		0.448	0.012	0.02	2.9	2	0.69	0.08	4	0.987	0.015	2	3.44	0.143	0.161	4.217	0.948	0.995		0.446	0.002	
SS 3-10	DI-3B	4	18+00L	0.28	0.7	0.196	0.196	4	0.784	0.002	0.786	0.012	0.02	4.6	2	0.435	0.08	4	0.888	0.015	2	3.44	0.143	0.147	5.641	0.709	0.892		0.701	0.085	
			20+27L	0.31	0.7	0.217	0.217	4	0.868	0.085	0.953	0.001	0.02	9.2	Flow Approaching From Down Station																
SS 3-9	DI-3C	6									1.875	0.001	0.02		2		0.08								9.6	0.18	0.27		0.667	9	
				0.24	0.7	0.168	0.168	4	0.672	0.25	0.922	0.001	0.02	9.1	Flow Approaching From Up Station																
SS 3-7	DI-3B	4	22+00L	0.37	0.7	0.259	0.259	4	1.036		1.036	0.019	0.02	4.8	2	0.417	0.08	4	0.875	0.015	2	3.44	0.143	0.145	7.327	0.546	0.759		0.786	0.25	
SS 3-14A	DI-3B	4	12+00R	0.46	0.7	0.322	0.322	3.5	1.127		1.127	0.009	0.02	3.3	2	0.606	0.08	4	0.977	0.015	2	3.44	0.143	0.16	5.729	0.698	0.884		0.997	0.13	
			12+42R	0.09	0.7	0.063	0.063	4	0.252	0.13	0.382	0.001	0.02	6.3	Flow Approaching From Down Station																
SS 3-14	DI-3A	2.5									0.755	0.001	0.02		2		0.08								6.1	0.128	0.27		0.474	6.4	
				0.09	0.7	0.063	0.063	4	0.252	0.121	0.373	0.001	0.02	6.2	Flow Approaching From Up Station																
SS 3-14B	DI-3B	4	12+85R	0.43	0.7	0.301	0.301	3.5	1.054		1.054	0.01	0.02	2.9	2	0.69	0.08	4	0.987	0.015	2	3.44	0.143	0.161	5.718	0.7	0.885		0.933	0.121	
HP																															
SS 3-11	DI-3B	4	18+00R	0.68	0.7	0.476	0.476	4	1.904		1.904	0.012	0.02	7.7	2	0.26	0.08	4	0.634	0.015	2	3.44	0.143	0.111	9.698	0.412	0.616		1.173	0.731	
SS 3-8A	DI-3B	4	19+75R	0.38	0.7	0.266	0.266	3.5	0.931	0.731	1.662	0.012	0.02	4.3	2	0.465	0.08	4	0.915	0.015	2	3.44	0.143	0.151	7.61	0.526	0.739		1.228	0.434	
			20+27R	0.08	0.7	0.056	0.056	4	0.224	0.434	0.658	0.001	0.02	8	Flow Approaching From Down Station																
SS 3-8	DI-4C	6									1.386	0.001	0.02		2		0.08								9.6	0.14	0.27		0.519	7	
				0.26	0.7	0.182	0.182	4	0.728		0.728	0.001	0.02	8.3	Flow Approaching From Up Station																
SS 4-4	DI-3B	4	25+70L	0.15	0.7	0.105	0.105	4	0.42		0.42	0.014	0.02	2.6	2	0.769	0.08	4	0.989	0.015	2	3.44	0.143	0.162	4.293	0.932	0.992		0.417	0.003	SYSTEM 4
			28+18L	0.31	0.7	0.217	0.217	4	0.868	0.003	0.871	0.001	0.02	8.9	Flow Approaching From Down Station																
SS 4-5	DI-3A	2.5									1.235	0.001	0.02		2		0.08								6.1	0.18	0.27		0.667	9	
				0.13	0.7	0.091	0.091	4	0.364		0.364	0.001	0.02	6.1	Flow Approaching From Up Station																
SS 4-3	DI-3B	4	25+70R	0.18	0.7	0.126	0.126	4	0.504		0.504	0.014	0.02	3.1	2	0.645	0.08	4	0.982	0.015	2	3.44	0.143	0.161	4.653	0.86	0.971		0.489	0.015	
			28+18R	0.33	0.7	0.231	0.231	4	0.924	0.015	0.939	0.001	0.02	9.2	Flow Approaching From Down Station																
SS 4-2	DI-3A	2.5									1.275	0.001	0.02		2		0.08								6.1	0.188	0.27		0.696	9.4	
				0.12	0.7	0.084	0.084	4	0.336		0.336	0.001	0.02	5.8	Flow Approaching From Up Station																

From 10+81 — 29+56 — All T_f = 12'
29+56 → All T 7.5

AES CONSULTING ENGINEERS
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PROJECT: Colonial Heritage Boulevard, Phase I
PROJECT NO.: 8881-5
SUBJECT: Spread Calc's
SHEET NO.: 2 OF 3
DATE: MAY 17,2002
BY: HWP

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	S'w =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 P Effec L	L/Lt (ft) d	E(#16) (ft) h	Q Int CFS d/h	Q Carryover Spread	Remark
ARTHUR HILLS DRIVE																														
SS 3-5	DI-3B	4	11+00L	0.49	0.6	0.294	0.294	4	1.176		1.176	0.021	0.021	5	2	0.4	0.08	3.846	0.87	0.015	2	3.421	0.143	0.145	7.984	0.501	0.714	0.839	0.337	
			11+72L	0.45	0.3	0.135	0.135	4	0.54	0.337	0.877	0.001	0.02	8.9	Flow Approaching From Down Station															
SS 3-3	DI-4CC	6									1.872	0.001	0.02		2		0.08								9.6	0.18	0.27	0.667	9	
				0.79	0.3	0.237	0.237	4	0.948	0.048	0.996	0.001	0.02	9.4	Flow Approaching From Up Station															
SS 3-2	DI-4BB	6	13+23L	0.61	0.6	0.366	0.366	3.5	1.281		1.281	0.016	0.02	2.9	2	0.69	0.08	4	0.987	0.015	2	3.44	0.143	0.161	7.147	0.839	0.963	1.233	0.048	
			11+72R	0.17	0.9	0.153	0.153	4	0.612		0.612	0.001	0.02	7.7	Flow Approaching From Down Station															
SS 3-4	DI-4C	6									1.692	0.001	0.02		2		0.08								9.6	0.164	0.27	0.607	8.2	
				0.3	0.9	0.27	0.27	4	1.08		1.08	0.001	0.02	9.6	Flow Approaching From Up Station															

CONSULTING ENGINEERS

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PROJECT
PROJECT NO.
SUBJECT
SHEET NO.
DATE
BY

STORM WATER INLET COMPUTATIONS

INLET Number	Type	Length	Station	Drainage Area (Ac)	C	CA	Σ CA	I in/hr	Q-Inter (CFS)	Q Carry-Over (CFS)	Qt Gutter Flow	S Gutter Slope (ft/ft)	Sx Cross Slope (ft/ft)	T(Spread)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo(#10)	n	Local Dep.	a	S'w =a/(12W)	Se (ft/ft) =Sx+SwEo	Lt (ft) 15 P Effec L	L/Lt (ft) d	E(#16) (ft) h	Q Int CFS d/h	Q Carryover Spread	Remark
SUMP						0	0	3.5	0		0	0.001	0.02	#N/A	Flow Approaching From Down Station															
											0	0.001	0.02		2		0.08								3.6	0.11	0.27	0.407	5.5	
						0	0	3.5	0		0	0.001	0.02	#N/A	Flow Approaching From Up Station															
GRADE				0.5	0.9	0.45	0.45	3.5	1.575		1.575		0.02	#N/A	2	#N/A	0.08	4	#N/A	0.015	2	3.44	0.143	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	

4"?

Table 2

Worksheet for BMP Point System

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
18th Hole	10	x	44.22 / 14.03	=	31.52
		x		=	
		x		=	
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 31.52

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
0	x	(0.1 per 1%)	=	
	x	(0.15 per 1%)	=	

TOTAL NATURAL OPEN SPACE CREDIT: 0

C. TOTAL WEIGHTED POINTS

31.52	+		=	31.52
Structural BMP Points		Natural Open Space Points		Total

NOTE: SITE DISTURBANCE ~ 14.03 Ac
12.81 Ac GOES TO 18th HOLE POND
1.22 Ac GOES TO EXISTING FARM POND.

LD-269
Rev 3-83

Project: COLONIAL HERITAGE BOULEVARD
PHASE 1 — TEMPORARY CULVERT

Plan Sheet No. 1 Designer HWP
Rev. Date 8/7/02 Date

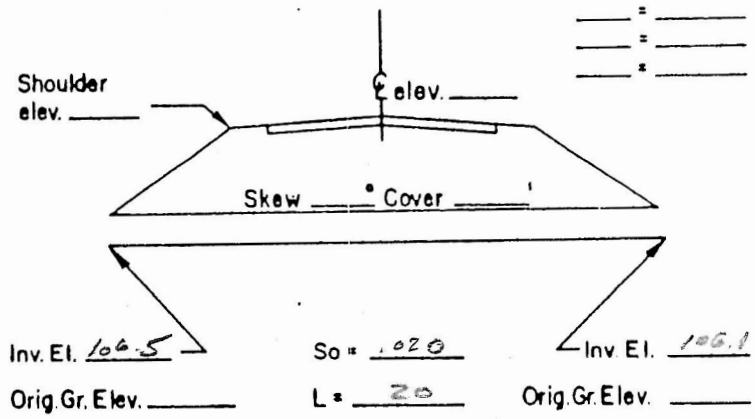
Sheet 1 of 1

HYDROLOGICAL DATA:
D.A. = 3.50 AC.
C = 0.30
Q = CIA
T_c = 10 MIN
I_2 = 4.5 IN/HR
I_{10} = 6.0 IN/HR

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

STATION ____

freq. TW elev.
____ = ____
____ = ____
____ = ____
____ = ____
____ = ____



DISCHARGES USED
Q 2 = 4.73 CFS
Q 10 = 6.30 CFS
Q ____ = ____ CFS
Q ____ = ____ CFS
Q ____ = ____ CFS

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

240 A

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS: INLET CONT. HW/D	INLET CONT. HW	OUTLET CONTROL Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW	CONT. HW. ELEV.	OUTLET VELOCITY C.M.	OUTLET VELOCITY Smooth	End Treat.	COMMENTS
18" HDPE	6.30		0.95	1.19		0.8	1.03	1.03	N.A.	0.40	0.63	107.7				INLET CONTROLS

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

22 (5-18)

Project: COLONIAL HERITAGE
TEMPORARY PIPE

Plan Sheet No. 1 Designer AWR
Rev. Date _____ Date 5/20/02

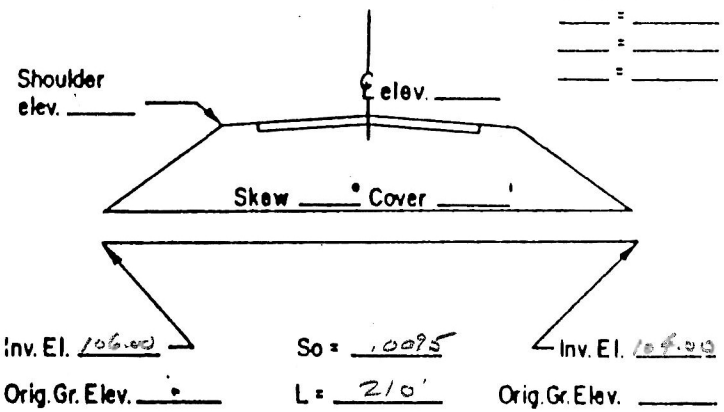
Sheet 1 of 1

HYDROLOGICAL DATA:
D.A. = 13.73 AC. C = 0.30 T_c: 20 min I_2: 3.0 in/hr
I_{10}: 4.0 in/hr
Q = CIA

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

STATION: _____

freq. TW elev.
_____ = _____
_____ = _____
_____ = _____
_____ = _____
_____ = _____



DISCHARGES USED
Q 2 = 12.36 CFS
Q 10 = 16.48 CFS
Q ____ = _____ CFS
Q ____ = _____ CFS
Q ____ = _____ CFS

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

CULVERT TYPE & SIZE	Q	Q/B	HEADWATER COMPUTATIONS										CONT. HW. ELEV.	OUTLET VELOCITY		End Treat.	COMMENTS
			INLET CONT.		OUTLET CONTROL												
			HW/D	HW	Ke	dc	$\frac{dc+D}{2}$	ho	H	LSo	HW			C.M.	Smooth		
24" PIPE	16.48		1.15	2.30		1.4	1.7	1.7	1.5	2.0	1.20	108.3					INLET CONTROLS

Design Flood Exceed. Prob. _____ Elev. _____
Overtop Flood Exceed. Prob. _____ Elev. _____
Base Flood 1% Exceed. Prob. _____ Elev. _____

SUMMARY & RECOMMENDATIONS:

(Rev 1/85)

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PROJECT Colonial Heritage Blvd, Ph 1
PROJECT NO. 5331-5
SUBJECT Drainage Calcs
SHEET NO. 1 OF 1
CALCULATED BY HWP DATE 5/21/02

TEMPORARY SEDIMENT TRAP #1

EVEN THOUGH OUR DISTURBED AREA EXCEEDS 3.0 ACRES, WE ARE USING A TRAP TO TEMPORARILY CONTROL THE FLOW PRIOR TO THE UNITED DRAINAGE AREA FLOWING INTO OUR SEDIMENT BASIN.

D.A. = 5.83 Ac

(5.83 Ac)(67) = 390.6 cu. yd. = 10,546 cu. ft

PROVIDE 180' LONG X 50' WIDE X 3' DEEP TRAP

= 27,000 cu. ft OR 13,500 cu. ft WET STORAGE
13,500 cu. ft DRY STORAGE

13,500 cu. ft > 10,546 cu. ft OK ✓

ROCK OUTLET (5.83)(6) = 34.98 USE 35'

TEMPORARY SEDIMENT TRAP #2 #1

D.A. = 2.40 Ac

(2.40 Ac)(67 cu yd/Ac) = 160.8 cu. yd = 4342 cu. ft

PROVIDE 110' WIDE X 90' LONG X 2' DEEP TRIANGULAR TRAP

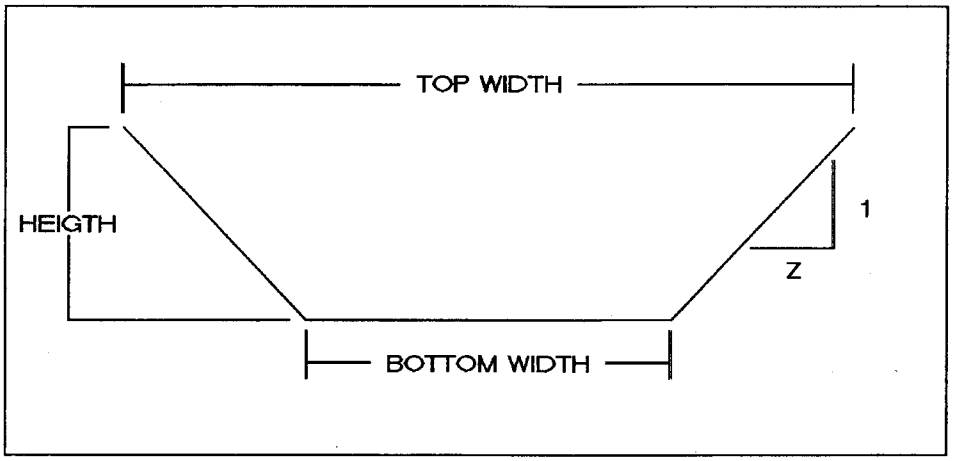
= 9900 cu. ft OR 4950 cu. ft WET STORAGE
4950 cu. ft DRY STORAGE

4950 cu. ft > 4342 cu. ft OK ✓

ROCK OUTLET (2.40)(6) = 14.4 USE 15'

Adequate Channel Analysis
Colonial Heritage Boulevard, Phase I
August 7, 2002
Project No. 8881-5

CHANNEL GEOMETRY OUTFALL FROM SOD TRAP #1



TOP WIDTH =	50	FT
BOTTOM WIDTH =	30	FT
HEIGHT =	1	FT
Z =	10.0	FT
SLOPE (S)	0.02	FT/FT
MANNING'S N	0.15	

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

V = AVERAGE VELOCITY
N = MANNING'S ROUGHNESS COEF.
R = HYDRAULIC RADIUS = A / WP
S = SLOPE OF CHANNEL
A = AREA OF CROSS SECTION
WP = WETTED PERIMETER

MANNING'S ROUGHNESS COEF.

N = (N1 + N2 + N3 + N4 + N5) * N6 + (N1 + N2 + N3 + N4 + N5)

WHERE:

N1 = CHANNEL IN EARTH	0.02
N2 = EROSION	0.03
N3 = SIZE/SHAPE OF CHANN	0.01
N4 = OBSTRUCTIONS	0.03
N5 = VEGETATION	0.04
N6 = MEANDER	0.15

N = 0.15

SOIL TYPE

FINE SAND

MAX. PERMISSIBLE VELOCITY = 2.37 FT /SEC

2-YEAR STORM EVENT

TIME OF CONCENTRATION	10 MIN.	
RAINFALL INTENSITY =	4.5	
RUNOFF COEF. =	0.46	
DRAINAGE AREA =	5.9 AC.	
PEAK FLOW RATE =	**12.213 CFS**	(SEE HYDROGRAPH)
PEAK VELOCITY =	**0.78 FPS**	(SEE FOLLOWING PAGE)

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.37 CFS THEREFORE, CHANNEL IS ADEQUATE.**

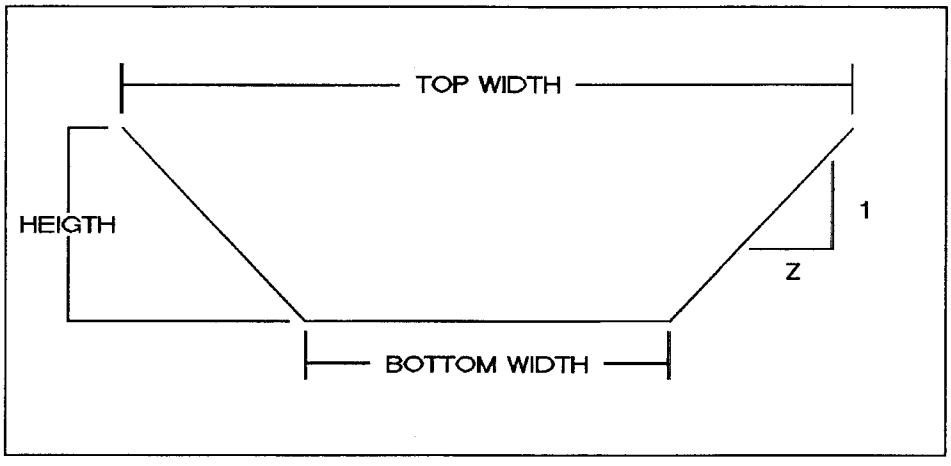
Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	30.00	0.00	0.00	0.00
0.10	0.30	32.01	0.01	0.06	0.02

0.20	2.40	34.02	0.07	0.24	0.58
0.30	8.10	36.03	0.22	0.52	4.22
0.37	15.50	37.49	0.41	**0.78**	12.12
0.40	19.20	38.04	0.50	0.89	17.16
0.50	37.50	40.05	0.94	1.35	50.59
0.60	64.80	42.06	1.54	1.88	121.84
0.70	102.90	44.07	2.33	2.48	255.27
0.80	153.60	46.08	3.33	3.15	483.10
0.90	218.70	48.09	4.55	3.87	846.13
1.00	300.00	50.10	5.99	4.65	1394.35
1.10	399.30	52.11	7.66	5.48	2187.49
1.20	518.40	54.12	9.58	6.36	3295.58
1.30	659.10	56.13	11.74	7.28	4799.37
1.40	823.20	58.14	14.16	8.25	6790.80
1.50	1012.50	60.15	16.83	9.26	9373.39
1.60	1228.80	62.16	19.77	10.30	12662.61
1.70	1473.90	64.17	22.97	11.39	16786.26
1.80	1749.60	66.18	26.44	12.51	21884.78
1.90	2057.70	68.19	30.18	13.66	28111.57
2.00	2400.00	70.20	34.19	14.85	35633.31
2.10	2778.30	72.21	38.48	16.06	44630.23
2.20	3194.40	74.22	43.04	17.31	55296.43
2.30	3650.10	76.23	47.88	18.59	67840.06
2.40	4147.20	78.24	53.01	19.89	82483.68
2.50	4687.50	80.25	58.41	21.22	99464.42
2.60	5272.80	82.26	64.10	22.58	119034.28
2.70	5904.90	84.27	70.07	23.96	141460.32
2.80	6585.60	86.28	76.33	25.36	167024.91
2.90	7316.70	88.29	82.87	26.79	196025.92
3.00	8100.00	90.30	89.70	28.24	228776.98
3.10	8937.30	92.31	96.82	29.72	265607.63
3.20	9830.40	94.32	104.22	31.22	306863.55
3.30	10781.10	96.33	111.92	32.73	352906.74
3.40	11791.20	98.34	119.90	34.27	404115.74
3.50	12862.50	100.35	128.18	35.83	460885.79
3.60	13996.80	102.36	136.74	37.41	523628.99
3.70	15195.90	104.37	145.60	39.01	592774.55
3.80	16461.60	106.38	154.74	40.63	668768.89
3.90	17795.70	108.39	164.18	42.26	752075.86
4.00	19200.00	110.40	173.91	43.92	843176.87

Adequate Channel Analysis
Colonial Heritage Boulevard, Phase I
August 7, 2002
Project No. 8881-5

CHANNEL GEOMETRY

OUTFALL @ 24" RCP



TOP WIDTH =	30 FT
BOTTOM WIDTH =	10 FT
HEIGHT =	1 FT
Z =	10.0 FT
SLOPE (S)	0.02 FT/FT
MANNING'S N	0.15

CALCULATION OF CHANNEL CAPACITY AND VELOCITY

MANNING'S EQUATION

$$V = 1.49 / N * R^{2/3} * S^{1/2}$$

WHERE:

V = AVERAGE VELOCITY
N = MANNING'S ROUGHNESS COEF.
R = HYDRAULIC RADIUS = A / WP
S = SLOPE OF CHANNEL
A = AREA OF CROSS SECTION
WP = WETTED PERIMETER

MANNING'S ROUGHNESS COEF.

N = (N1 + N2 + N3 + N4 + N5) * N6 + (N1 + N2 + N3 + N4 + N5)

WHERE:

N1 = CHANNEL IN EARTH	0.02
N2 = EROSION	0.03
N3 = SIZE/SHAPE OF CHANN	0.01
N4 = OBSTRUCTIONS	0.03
N5 = VEGETATION	0.04
N6 = MEANDER	0.15

N = 0.15

SOIL TYPE

FINE SAND

MAX. PERMISSIBLE VELOCITY = 2.37 FT /SEC

2-YEAR STORM EVENT

TIME OF CONCENTRATION	15 MIN.	
RAINFALL INTENSITY =	4.5	
RUNOFF COEF. =	0.3	
DRAINAGE AREA =	13.73 AC.	
PEAK FLOW RATE =	**18.5355 CFS**	(SEE HYDROGRAPH)
PEAK VELOCITY =	**1.17 FPS**	(SEE FOLLOWING PAGE)

*** VELOCITY FOR POST DEVELOPMENT 2-YEAR STORM IS LESS THAN MAXIMUM PERMISSIBLE VELOCITY OF 2.37 CFS THEREFORE, CHANNEL IS ADEQUATE.**

Incremental Depth (FT)	Area (SQ FT)	WP (FT)	Hydraulic Radius (FT)	Velocity (FT/SEC)	Flow (CFS)
0.00	0.00	10.00	0.00	0.00	0.00
0.10	0.10	12.01	0.01	0.06	0.01

0.20	0.80	14.02	0.06	0.21	0.17
0.30	2.70	16.03	0.17	0.43	1.16
0.40	6.40	18.04	0.35	0.71	4.52
0.50	12.50	20.05	0.62	1.03	12.86
0.54	15.82	20.87	0.76	**1.17**	18.54
0.60	21.60	22.06	0.98	1.39	30.02
0.70	34.30	24.07	1.43	1.78	61.22
0.80	51.20	26.08	1.96	2.21	113.15
0.90	72.90	28.09	2.60	2.66	194.05
1.00	100.00	30.10	3.32	3.14	313.82
1.10	133.10	32.11	4.15	3.64	484.10
1.20	172.80	34.12	5.06	4.16	718.28
1.30	219.70	36.13	6.08	4.70	1031.65
1.40	274.40	38.14	7.19	5.25	1441.39
1.50	337.50	40.15	8.41	5.83	1966.66
1.60	409.60	42.16	9.72	6.42	2628.63
1.70	491.30	44.17	11.12	7.02	3450.56
1.80	583.20	46.18	12.63	7.64	4457.82
1.90	685.90	48.19	14.23	8.28	5677.97
2.00	800.00	50.20	15.94	8.93	7140.75
2.10	926.10	52.21	17.74	9.59	8878.17
2.20	1064.80	54.22	19.64	10.26	10924.55
2.30	1216.70	56.23	21.64	10.94	13316.50
2.40	1382.40	58.24	23.74	11.64	16093.05
2.50	1562.50	60.25	25.93	12.35	19295.61
2.60	1757.60	62.26	28.23	13.07	22968.03
2.70	1968.30	64.27	30.63	13.80	27156.66
2.80	2195.20	66.28	33.12	14.54	31910.35
2.90	2438.90	68.29	35.71	15.29	37280.50
3.00	2700.00	70.30	38.41	16.04	43321.07
3.10	2979.10	72.31	41.20	16.81	50088.66
3.20	3276.80	74.32	44.09	17.59	57642.47
3.30	3593.70	76.33	47.08	18.38	66044.41
3.40	3930.40	78.34	50.17	19.17	75359.05
3.50	4287.50	80.35	53.36	19.98	85653.71
3.60	4665.60	82.36	56.65	20.79	96998.46
3.70	5065.30	84.37	60.04	21.61	109466.14
3.80	5487.20	86.38	63.52	22.44	123132.42
3.90	5931.90	88.39	67.11	23.28	138075.79
4.00	6400.00	90.40	70.80	24.12	154377.59

Delorme

CONSULTING ENGINEERS

AES Consulting Engineers Fax Memorandum

5248 Olde Towne Road, Suite 1 • Williamsburg, Virginia 23188
Telephone: (757) 253-0040 • *Facsimile:* (757) 220-8994 • *Email:* aes@aesva.com

To: DARRYL COOK	Org./Firm: JCC ENV. DIV.
Fax Number: 259-4032	Date: 2/13/03
From: RICK SMITH	Pages, including cover page: 8
cc:	cc Fax Number:

Subject: COLONIAL HERITAGE 18TH HOLE POND FOREBAY

☐ *Urgent* ☐ *For Your Information* ☐ *For Review* ☒ *Please Comment* ☐ *Please Reply*

Comments:

Revised forebay is acceptable. Plans needs to be amended to reflect the change - record drawings. DEC 2/19/03

DARRYL,

HOWARD PRICE OF AES HAS ASKED ME TO SEND THIS NEW FOREBAY CONFIGURATION TO YOU. THE REASON FOR THE CHANGE IS AN AESTHETIC ONE FOR GOLF COURSE REASONS. THE NEW FOREBAY VOLUME AS YOU CAN VERIFY IN THE CALCS. IS STILL TWICE WHAT IS NEEDED. THE ATTACHED DRAWING DEPICTS THE APPROVED LOCATION AND THE DESIRED CHANGE. PLEASE CALL HOWARD OR MYSELF IF YOU HAVE ANY QUESTIONS.

THANKS,
RICK SMITH
PROJECT ENGINEER

Confidentiality Note: The documents accompanying this fax may contain confidential information. This information is intended only for the use of the individual or entity named on the transmission sheet. If you are not the intended recipient, you are hereby notified that any disclosure, copying, distribution, or the taking of any action in reliance on the contents of this faxed information is strictly prohibited, and that the documents should be returned to AES Consulting Engineers. If you have received this fax in error, please notify us by telephone immediately at the number above so that we can arrange for the return of the original document at no cost to you.

CALCULATIONS FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION
FOR BMP @ 18TH HOLE
COLONIAL HERITAGE BLVD.
AES Project No.: 8818-05
July 24, 2002
Revised: February 13,2003

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 7.27 Acres

B. Pre-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Pre-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	15-F	C	Wooded, Fair	0.2	73	15
2)	11-B Craven-Uchee	C	Pasture, Grass, Fair	0.46	79	36
3)	14-B Emporia Fine Sandy Loam	C	Pasture, Grass, Fair	0.14	79	11
4)	20B	A	Pasture, Grass, Fair	4.95	73	361
5)	29A	C	Pasture, Grass, Fair	1.52	79	120
	Totals =			7.3		543
	Composite CN =					75

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Pasture/Grass
Manning's roughness coefficient., n (table 5-7)	0.24
Length of overland flow, L	300 Feet
2-year 24-hour rainfall, P2	3.5 inches
Average slope of overland flow , s	0.02 feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.54 hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved, grass
Length of shallow concentrated flow, L	300 Feet
Average slope of shallow concentrated flow, s	0.01 feet per foot
Average velocity, v	1.6 feet per second
Travel time, Tt = L/(3600*v)	0.05 hours

3) Channel or Pipe Flow

Length of channel flow, L	1740 Feet
Average velocity of channel flow, v	3.5 feet per second
Travel time, Tt = L/(3600*v)	0.14 hours
Total Time of Concentration =	0.73 hours
or	44 minutes

II. POST-DEVELOPMENT CONDITIONS TO BMP

A. Post-Development Drainage Area to Point of Concern = 46.22 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	8-B Caroline	C	Commercial	2.70	94	254
2)	8-B Caroline	C	Roadway	0.99	98	97
3)	8-B Caroline	C	Country Club (apprx 72% imper.)	1.24	91	113
4)	8-B Caroline	C	Open Space	1.45	74	107
5)	11-B Craven-Uchee	C	Open Space	0.14	74	10
6)	14-B and C Emporia Fine Sandy Loam	C	Commercial	0.24	94	23
7)	14-B and C Emporia Fine Sandy Loam	C	Roadway	2.54	98	249
8)	14-B and C Emporia Fine Sandy Loam	C	Country Club (apprx 72% imper.)	0.87	91	79
9)	14-B and C Emporia Fine Sandy Loam	C	Open Space	0.86	74	64
10)	15-D and F Emporia Complex	C	Golf Course	1.79	74	132
11)	15-D and F Emporia Complex	C	Country Club (apprx 72% imper.)	2.87	91	261
12)	15-D and F Emporia Complex	C	Pond	1.27	76	97
13)	20-B Kenansville	A	Open Space	1.52	39	59
14)	20-B Kenansville	A	Golf Course	2.08	39	81
15)	20-B Kenansville	A	Commercial	5.40	89	481
16)	20-B Kenansville	A	Roadway	1.88	98	184
17)	20-B Kenansville	A	Country Club (apprx 72% imper.)	1.64	81	133
18)	29-A Slagle	C	Roadway	0.11	98	11
19)	29-A Slagle	C	Golf Course	2.58	74	191
20)	29-A Slagle	C	Open Space	1.46	74	108
21)	29-A Slagle	C	Country Club (apprx 72% imper.)	3.06	91	278
22)	34-B and C Uchee	A	Commercial	6.18	89	550
23)	34-B and C Uchee	A	Pond	0.42	99	42
24)	34-B and C Uchee	A	Golf Course	2.46	39	96
25)	34-B and C Uchee	A	Open Space	0.47	39	18
	Total Adjusted CN =			46.22		3,700
	Composite CN =					80

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	grass	
Manning's roughness coefficient., n (table 5-7)	0.24	
Length of overland flow, L	300	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.008	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.58	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	200	Feet
Average slope of shallow concentrated flow, s	0.01	feet per foot
Average velocity, v	1.6	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours

3) Channel or Pipe Flow

Length of channel flow, L	1100	Feet
Average velocity of channel flow, v	19	feet per second
Travel time, Tt = L/(3600*v)	0.02	hours
Total Time of Concentration =	0.63	hours
or	38	minutes

III. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (EXCLUDING RUNOFF TO BMP)

A. Post-Development Drainage Area to Point of Concern = 3.81 Acres

B. Post-development Land Use, Soil Classification and Calculation of Composite Curve Number

	Soil Type	Soil Hydrologic Group	Post-Development Land Use	Area of Land Use (in Acres)	Curve Number for Land Use (CN)	Adjusted (CN)
1)	11-B Craven-Uchee	C	Golf Course	0.44	74	33
2)	14-B and C Emporia Fine Sandy Loam	C	Golf Course	0.14	74	10
3)	15-D and F Emporia Complex	C	Golf Course	0.20	74	15
4)	20-B Kenansville	A	Golf Course	0.83	39	32
5)	20-B Kenansville	A	Reidential - 1/4 acre lots	0.67	61	41
6)	29-A Slagle	B	Golf Course	0.18	74	13
7)	29-A Slagle	B	Reidential - 1/4 acre lots	1.35	83	112
	Total Adjusted CN =			3.81		256
	Composite CN =					67

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Golf Course	
Manning's roughness coefficient., n (table 5-7)	0.41	
Length of overland flow, L	300	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.014	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.71	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	250	Feet
Average slope of shallow concentrated flow, s	0.025	feet per foot
Average velocity, v	2.6	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours

3) Channel or Pipe Flow

Length of channel flow, L	115	Feet
Average velocity of channel flow, v	16	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours
Total Time of Concentration =	0.74	hours
or	44	minutes

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
87.0		52566	0	0	0	0
88.0	1.0	69309	60938	2257	60938	2257
90.0	2	77577	146886	5440	207824	7697
92.0	2	86075	163652	6061	371476	13758
94.0	2	94802	180877	6699	552353	20458

V. DETERMINING RELEASE RATE OF 1-YEAR, 24-HOUR DETAINED FOR 24 HOURS FOR STREAM CHANNEL PROTECTION

Volume of 1-Year, 24-Hour Storm (based upon Hydrograph #1) = 180,283 cubic feet

Elevation of water surface associated with 1-Year, 24-Hour Storm Volume = 90.5

Elevation of Release Inlet for Channel Protection = 89.0

Average Head, in feet, on Release Inlet 1.3

Average Release Rate Calculation

$$\frac{180{,}283 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 2.1 \text{ cfs}$$

Calculation of Size of Release Inlet

Diameter of Release Inlet = 2 * (Q / ((64.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)
where, Q equals Average Release Rate, in cfs
h equals Average Head, in feet

Diameter of Release Inlet = 0.80 feet, or 10 inches (8" used in design)

VI. SEDIMENT FOREBAY SIZING

Forebay Volume (V) = 0.1" per Impervious Acre

Percent Impervious of the BMP Watershed, Post-Development 33.4%

Drainage Area of the BMP Watershed 46.22 acres

Impervious Acres of BMP Watershed 15.42 acres

Volume Req'd = 5,597 cu.ft.

PROPOSED POND VOLUME FOR SEDIMENT FOREBAY

Elevation	Depth	Area (sq. ft.)	Incremental Volume (cu. ft.)	Inc. Volume (cu. yd.)	Sum Volume (cu. ft.)	Sum Volume (cu. yd.)
81.0		798	0			
82.0	1.0	1074	936	35	936	35
84.0	2.0	1731	2805	104	3741	139
86.0	2.0	2526	4257	158	7998	296
87.0	1.0	2977	2751.5	102	10749.5	398

Volume Provided = 10,750 cu.ft.

VII. DETERMINING REQUIRED WATER QUALITY VOLUME

Due to preliminary considerations, it is desired to provide this site extended detention wet pond to achieve a 10 point BMP rating for the facility. Under the James City County guide lines for storm water management BMPs, the extended detention wet pond may have one half of the water quality volume stored in the permanent pool and one half of the water quality volume released in a 24-hour period.

Percent Impervious of the BMP Watershed, Post-Development	33.4%	
Drainage Area of the BMP Watershed	46.22	acres
Impervious Acres of BMP Watershed	15.42	acres

Calculation for Water Quality Volume, WQ_v

WQ_v = (2.0 inches per impervious acre) *(impervious acres of BMP watershed)

WQv = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre) * (impervious acres of BMP watershed)

WQ_v = (2.0 inches)*(1 ft / 12 inches) * (43560 sq. Ft per acre)	15.42	=	111949 cu. Ft
1/2 WQ_v =	55975 cu. Ft		Required Volume for Permanent Pool
	111949 cu. Ft		Design Volume for Permanent Pool (2" per Impervious Acre)
1/2 WQ_v =	0 cu. Ft		Volume to be Released In 24-Hours

Elevation of 1/2 WQv =	80.2
Elevation of release inlet for 1/2 water quality volume =	90.0
Average head, in feet, on release inlet =	0.0

Average release rate calculation

$$\frac{0.0 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 0.0 \text{ cfs}$$

Calculation of size of release inlet for 1/2 Water Quality Volume

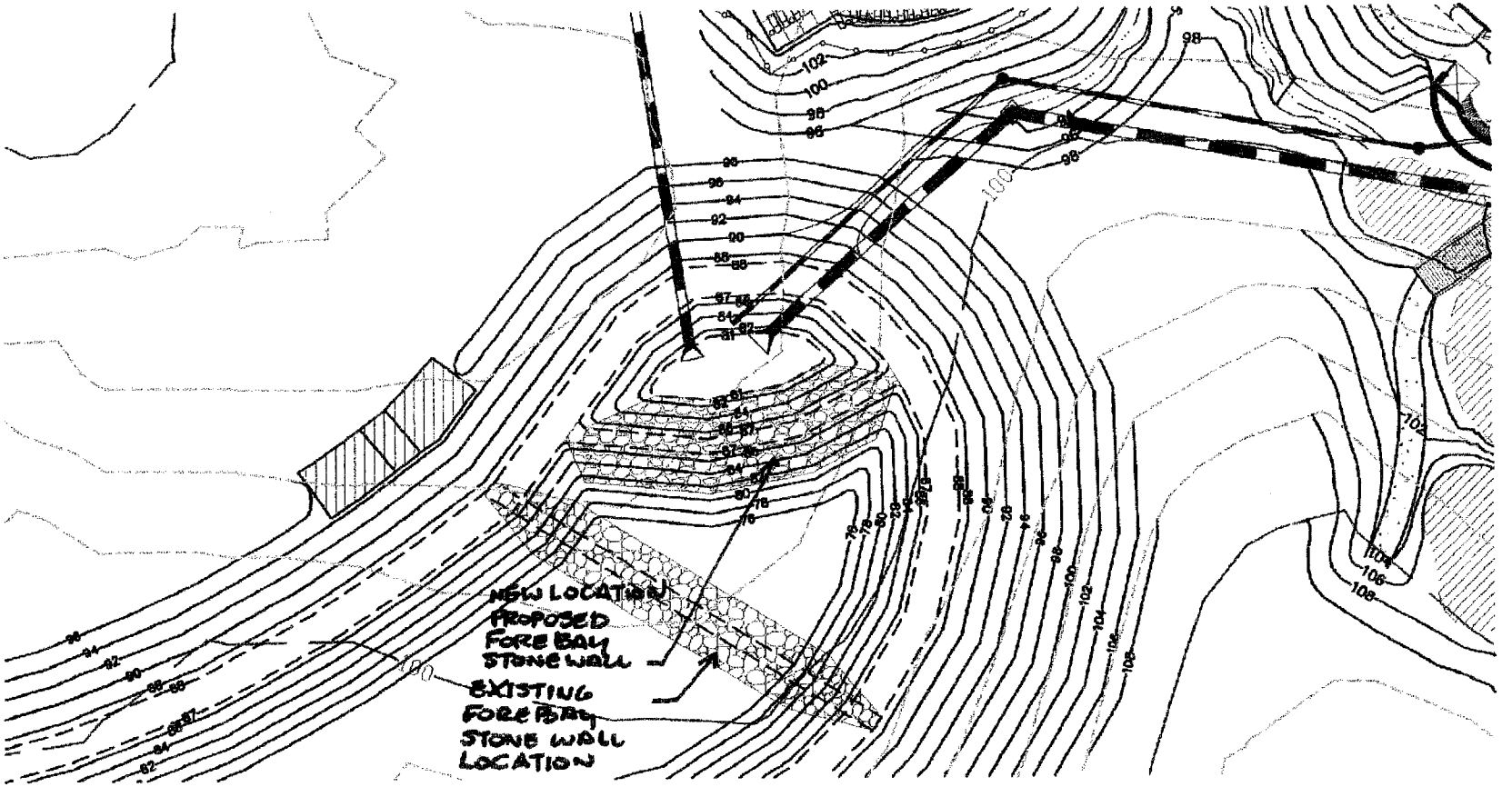
Diameter of Release Inlet = 2 * (Q / ((84.32 * (h / 2)) ^ (1/2) * 0.6 * 3.14))) ^ (1/2)

where, Q equals Average Release Rate, in cfs

h equals Average Head, in feet

Diameter of Release Inlet = 0.00 feet, or 0 inches

100% of Water Quality Volume
is contained within Permanent Pool
Therefore, no routing is Required


NEW LOCATION
PROPOSED
FORE BAY
STONE WALL
EXISTING
FORE BAY
STONE WALL
LOCATION

AB FILE

DEVELOPMENT MANAGEMENT

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

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

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

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

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 253-2620

August 4, 2003

Mr. Brian Rettman, Construction Manager
Colonial Heritage LLC
6895 Richmond Road
Williamsburg, Va. 23188

Re: Colonial Heritage Phase 1 Boulevard
County Plan No. SP-75-02; Amended SP-36-03
Interim Certification - Master Plan Pond # 3 (~~18th~~ NOW 9TH HOLE Hole Pond)
County BMP ID Code: YC 027

Dear Mr. Rettman:

Interim certification materials as forwarded to our office for the above referenced BMP facility were reviewed and found to be ***satisfactory***. The submission appears to address previous comment # 8 dated March 18th 2002 for County Plan No. SP-75-02 (Phase 1 Boulevard), comment # 5 dated February 14th 2003 for County Plan No. SP-10-03 (Clubhouse) and requirements imposed by the current James City County, Environmental Division, Stormwater Management/BMP Facilities, Record Drawing and Construction Certification, Standard Forms & Instructions.

Final record drawing and construction certification of additional permanent components is required once the BMP is properly converted from a temporary sediment basin to a permanent BMP and final basin construction is complete. It should be noted that based on our field inspection as performed on August 1st 2003, for final certification purposes, manhole steps will be required on the interior of the primary riser structure. Also, upstream end of the 8-inch low flow orifice pipe (El. 81.37) should be marked in the field with a painted stake or other similar method to aid with future required inspections.

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

Sincerely,

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

cc: Howard Price, AES - (via fax)
Michael Galli, ECS - (via fax)
Scott Massie, Jack L. Massie - (via fax)

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Scott Thomas

From: Scott Thomas
Sent: Monday, August 04, 2003 9:32 AM
To: Christopher Johnson
Subject: FW: JCC Env Div Comm SP-10-03

The attached comment recently issued by the Environmental Division dated July 31, 2003 has been properly addressed. This comment pertained to satisfying interim certification requirements for offsite Master Plan Pond # 3 (18th hole pond). The Colonial Heritage Club (County Plan No. SP-10-03) can now be approved for Land-Disturbing and Final Site Plan purposes from our Division.

(Note: Information needed to satisfy this comment does not result in the need to resubmit the project plans again through our division.)

If you need us to "officially" sign off on a transmittal form, please forward it to our office.

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

-----Original Message-----
From: Scott Thomas
Sent: Thursday, July 31, 2003 4:37 PM
To: 'Arch Marston'; 'Howard Price'; 'Rick Smith'
Cc: Christopher Johnson; Darryl Cook
Subject: JCC Env Div Comm SP-10-03

Arch Marston, Howard Price, Rick Smith
AES Consulting Engineers

Attached are advance James City County Environmental Division review comments for the Colonial Heritage Club, County Plan No. SP-10-03.

Please call me at 757-253-6639 or Mike Woolson at 757-253-6823 if you have any questions about the Environmental Division comments.

(Note: Comments are in Wordperfect v 9.0 format. Will also forward a hard copy fax.)

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

CONSULTING ENGINEERS

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

August 7, 2002

AUG 2002
RECEIVED
PLANNING DEPARTMENT

Mr. Dave Anderson
Planner
James City County
P.O. Box 8784
Williamsburg, 23187-8784

RE: U.S. Home/Colonial Heritage Blvd. Phase 1
JCC Case No. SP-075-02
AES Project No. 8881-05

Dear Mr. Anderson;

The following is a response to your comments, dated June 27, 2002. If you have any questions, or require clarification, please call.

Dave Anderson, Planner, James City County

Suggestions, June 24, 2002

1. Regarding the bike trail – it is my understanding that VDOT requires a minimum width of 10 feet for a shared facility trail, which would include both bike traffic and pedestrian traffic. I anticipate that the bike trail shown on the plans will be utilized as a shared facility. Although the proffers require a bike trail of a minimum width of 8 feet, a trail of 10 feet in width would allow for safer travel of pedestrians and cyclists. Please consider widening the trail to ten feet to provide this higher level of safety.

Response: U.S. Homes has concluded the 8' bike trail / pedestrian path as proffered will be adequate to serve this development. It is private and does not have to meet VDOT specs.

2. The sidewalk shown on the plans does not tie into the sidewalk along Route 60 located to the north side of Colonial Heritage Blvd. Is it possible to extend the sidewalk along the north side of the entry drive to connect to the sidewalk on Route 60? As it is currently proposed, pedestrians utilizing the sidewalks to the north side of the entry drive would have to cross the entry drive once to connect to the bike trail, travel along the bike trail to access the sidewalk along Route 60 to the south side of the entry drive, and cross the entry drive once again in order to access the sidewalk along Route 60 to the north side of the entry drive. This will be inconvenient for pedestrians and they will likely take the shortest route by cutting across the grass to access the sidewalk, thereby creating an unwanted dirt path between the two sidewalks. Furthermore, connecting these two sidewalks would eliminate the need, and the danger, to cross the entry drive for

pedestrians leaving the property and traveling north or pedestrians entering the property from the north.

Response: The Owner does not wish to provide pedestrian access on both sides of Colonial Heritage Blvd. The sidewalk / trail system as shown meets the requirements in the proffers.

Environmental Division Review Comments

General Comments

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

Response: The Owner/Developer will obtain these prior to construction.

2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of any plats.

Response: The Owner/Developer will provide.

3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.

Response: The Owner/Developer will provide.

4. A Standard Inspection / Maintenance Agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management /BMP facilities associated with this project.

Response: The Owner/Developer will provide.

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

Response: Please refer to the General Notes.

6. A Geotechnical Report, prepared by a professional, is required to be submitted for the BMP design prior to approval of this plan or issuance of a Land-Disturbing permit for the project. This will need to address how the replacement of the riser will occur when the basin is converted from sediment basin mode to permanent.

Response: The subcontractor, ECS Ltd. will provide.

7. Record Drawing and Construction Certification. The stormwater management/BMP facility as proposed for this project will require submission, review and approval of a

We trust that the information provided herein adequately responds to your comments. If you need more information or additional copies of the plans for your review, please do not hesitate to contact us.

Sincerely,

AES Consulting Engineers

Howard W. Price
Project Manager

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AES CONSULTING ENGINEERS
Engineering, Surveying and Planning
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-8994

LETTER OF TRANSMITTAL

DATE:	JOB NO.
August 1, 2003	8881-7
ATTENTION:	
RE: Colonial Heritage Clubhouse	

TO : JCC Planning c/o Scott Thomas

WE ARE SENDING YOU: [x] Attached [ ] Under separate cover via _____ the following items:

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [ ] Specifications

[x] Copy of letter [ ] Change order [ ] Other _____

COPIES	DATE	NO.	DESCRIPTION
1	6/27/03		Certification letter for 18th hole Dam (SWMP #3)

JUL 2003 RECEIVED ENVIRONMENTAL DIVISION

JUL 2003 RECEIVED PLANNING DEPARTMENT

THESE ARE TRANSMITTED as checked below:

[x] For approval [ ] Approved as submitted [ ] Resubmit _____ copies for approval

[ ] For your use [ ] Approved as noted [ ] Submit _____ copies for distribution

[x] As requested [ ] Returned for corrections [ ] Return _____ corrected prints

[ ] For review and comment [ ] Submit Specified Items _____

[ ] FOR BIDS DUE _____ [ ] PRINTS RETURNED AFTER LOAN TO US

REMARKS:

Attached is a copy of the certification letter you requested. A letter regarding the farm pond dam should have been sent to you directly from ECS. If you have not received that letter please notify me. Contact us with any questions.

COPIES TO: _____

SIGNED: Bryan Stevenson, P.E., Project Engineer

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

AES CONSULTING ENGINEERS
Engineering, Surveying, and Planning
5248 Olde Towne Road, Suite 1
Williamsburg, VA 23188

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

LETTER OF TRANSMITTAL

ATTN: **Scott Thomas**

CO.: JCC Environmental

Address:

cc:

DATE	JOB NO.
7-28-06	8881-05

FROM: Ryan Stephenson

RE
BMP #3 As-built mylars

RECEIVED
JUL 28 2006
ENVIRONMENTAL DIVISION

WE ARE SENDING YOU THE FOLLOWING ITEMS:

☒ Attached
☐ Under separate cover via

☐ Original(s) ☐ Print(s) ☒ Plan(s) ☐ Specification(s) ☐ Change Order

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
1	4-24-06	2	BMP #3 As-built mylars

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☐ For your use ☒ As you requested ☐ As requested by:

☐ Other:

REMARKS:

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

File name: http://192.168.0.3/fs_root/nav_root/Williamsburg/Transmittal Form - WMBG.doc
Form Rev. 7/02

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

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

LETTER OF TRANSMITTAL

COLONIAL HERITAGE
SWMP #3 (18TH HOLE)
YC027; SP-75-02

ATTN: **Scott Thomas**

CO.: JCC Environmental

Address:

cc:

DATE	JOB NO.
4/24/06	8881-05

FROM: Ryan Stephenson

RE
Final Certification SWMP #3

RECEIVED
APR 2 4 2006
ENVIRONMENTAL DIVISION

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Attached ☐ Under separate cover via

☐ Original(s) ☒ Print(s) ☒ Plan(s) ☐ Specification(s) ☐ Change Order

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
2			As-Builts: Sheets 9 and 18
2			Certification Documentation

THESE ARE TRANSMITTED as checked below:

☒ For your approval ☐ For your signature ☐ For review and comment

☒ For your use ☐ As you requested ☐ As requested by:

☐ Other:

REMARKS:

SCOTT,
THIS IS FOR FINAL CERTIFICATION OF BMP #3. INTERIM CERTIFICATION WAS PROVIDED BACK IN '03. THANKS.

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

File name: S:\Jobs\8881\05-ENTR\Wordproc\Document\Letter of Transmittal4-24-06.trs.doc
Form Rev. 7/02

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

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

LETTER OF TRANSMITTAL

ATTN: **Scott Thomas**

CO.: JCC Environmental

Address:

cc:

DATE	JOB NO.
7/10/03	8881-5

FROM: Howard Price

RE
Interim certification SWMP #3

Yc027, SP-75-02

JUL 2003
RECEIVED
ENVIRONMENTAL DIVISION

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Attached ☐ Under separate cover via

☐ Original(s) ☒ Print(s) ☐ Plan(s) ☐ Specification(s) ☐ Change Order

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
2	7/10/03	2	AS-Builts-sheets 9 and 18
2			Interim certification documentation

THESE ARE TRANSMITTED as checked below:

☒ For your approval ☐ For your signature ☐ For review and comment

☒ For your use ☐ As you requested ☐ As requested by:

☐ Other:

REMARKS:

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

File name: S:\JOBS\8881\05-ENTR\Wordproc\Document\Letter of Transmittal7-10-03.hwp.doc
Form Rev. 7/02

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

County BMP ID Code (if known): YC027

Name of Facility: CH PH 1 BLVD swmp # 3 BMP No.: ____ of ____ Date: 07/27/06

Location: Near Hole #9 (Formerly 18)

Name of Owner: Colonial Heritage

Name of Inspector: SJ Thomas, M Majdeski

Type of Facility: Wet Pond

Weather Conditions: Hot, 100's Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	Mainly Excav Pond 3H:1V, 10-12' Top			
Grass Height	✓			
Vegetation Condition	✓			
Tree Growth	✓			
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	N/A			
Interior Landscaping/Planted Areas:	☒ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation			
Vegetated Conditions	✓			Wet pool, 10-12' pool
Trash & Debris	✓			Very little shoreline veg
Floating Material	✓	✓		, Fallen trees in front portion
Erosion	✓	✓		of pond removed. 2-3
Sediment	✓			· Fix erosion at pond from
Dead Plant	✓			electric service line
Aesthetics	✓			
Other				

Notes: serves SF, PH1 Road & Golf Course.

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			grass is cut.
Algae	✓			
Trash & Debris	✓			
Sediment	✓			
Aesthetics	✓			
Other				
Inflows (Describe Types/Locations): Pipe near Clubhouse.				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			
Outlet Protection	✓			
Other	✓			
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): Conc Box w/ 01-Tgrates w/ 8" LFO.				
Condition of Structure	✓			10' deep
Corrosion	✓			
Trash and Debris	✓			Clean w/ Large Frogs.
Sediment	✓			
Vegetation	✓			Clear, just mowed.
Other	✓			Valve on drain pipe, closed
Principal Outlet Structure - Barrel, Conduit, etc. : 660' LONG 30" RCP				
Condition of Structure	✓			MH-1 in golf course, Fw could
Settlement	✓			not get off
Trash & Debris	✓			
Erosion/Sediment	✓			
Outlet Protection	✓			30" op – 10'x10' CI I RR
Other				ABOUT 100' DOWN of Timber Bridge
Emergency Spillway (Overflow): 10' WIDE ES GRASS				
Vegetation				
Lining				
Erosion				
Trash & Debris				
Other				
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			No threat.
Animal Burrows	✓			
Graffiti	✓			
Other				
Surrounding Perimeter Conditions: North- SF; East clubhouse; South-West Golf Course #18				
Land Uses	✓			
Vegetation	✓			Don't mow pond buffer
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			Fair. Must go thru/along clubhouse retaining wall.
Other				

Remarks:

- Remove 2-3 Fallen in front of pond
- Pond slope/erosion hole, electric line
- Buffer was mowed, ie. golf course - monitor
- ES DRAWS to fit SF, OHW < ES EL. (PH1, SEC 4 or 5)

Overall, Looks ok. some minor.

OHW 93.48

ok to release
Honor suggestions
3 items above.

Overall Environmental Division Internal Rating 3

Signature: [signature] **Date:** 07/27/06

Title: Chief Engineer ENV DIV

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

CONSULTING ENGINEERS

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Williamsburg, Virginia 23188-1986
Telephone: 757-253-0040
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aes@aesva.com
www.aesva.com

614 Moorefield Park Drive
Richmond, Virginia 23236-3655
Telephone: 804-330-8040
Fax: 804-330-9840

FIELD INSPECTION REPORT

Project Name:	COLONIAL HERITAGE BLVD., PHASE 1	**AES Project No.:**	8881-05
Client's Name:	U. S. HOME	**Date:**	7/8/03
Inspection of:	STORM SEWER FROM 18TH HOLE POND TO OUTFALL	**Inspector:**	ARCH MARSTON

Comments: On the above date the approximately 610 l.f. of storm sewer from the 18th hole pond principal spillway to the out fall was visually inspected internally using hand held lights. All runs of storm sewer appeared straight for both line and grade.

Please allow this inspection report to serve as AES' certification for line and grade for this run of storm sewer.

Approved: G. Archer Marston, III, P.E.

Date Record Created:

Created By:

WS_BMPNO: YC027

Print Form

PRINTED ON:
Saturday, March 13, 2010
3:20:58 PM

WATERSHED	YC
BMP ID NO	027
PLAN NO	SP-75-02
TAX PARCEL	(24-3)(1-32)
PIN NO	2430100032
CONSTRUCTION DATE	7/1/2006
PROJECT NAME	Colonial Heritage Ph 1 Blvd
FACILITY LOCATION	Near 9th golf hole (form. 18th)
CITY-STATE	Williamsburg, Va. 23188
CURRENT OWNER	Colonial Heritage LLC
OWNER ADDRESS	6895 Richmond Road
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, VA 23188
OWNER PHONE	258-2705
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN	Yes
SITE AREA acre	14.51
LAND USE	Mixed Use
old BMP TYP	Wet Pond
JCC BMP CODE	A3 Wet ED Pond
POINT VALUE	10
SVC DRAIN AREA acres	46.2
SERVICE AREA DESCRI	SF, roads, clubhouse & golf course
IMPERV AREA acres	15.42
RECV STREAM	UT of Yarmouth Creek
EXT DET-WQ-CTRL	Yes
WTR QUAL VOL acre-ft	2.57
CHAN PROT CTRL	Yes
CHAN PROT VOL acre-ft	4.13
SW/FLOOD CONTROL	Yes
GEOTECH REPORT	Yes

CTRL STRUC DESC	Modified EW
CTRL STRUC SIZE inches	8x8
OTLT BARRL DESC	RCP Barrel
OTLT BARRL SIZE inch	30
EMERG SPILLWAY	Yes
DESIGN HW ELEV	93.48
PERM POOL ELEV	87.94
2-YR OUTFLOW cfs	2.30
10-YR OUTFLOW cfs	5.19
REC DRAWING	Yes
CONSTR CERTIF	Yes

LAST INSP DATE 7/27/2006 Inspected by:

INTERNAL RATING 3

MISC/COMMENTS

Master plan pond # 3. Asbuilt routing provided.

Additional Comments:

ENVIRONMENTAL DIVISION REVIEW COMMENTS
Colonial Heritage Blvd, Phase 1
SP-075-02
June 19, 2002 MDW/DGC

General Comments

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

2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of any plats.

3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.

4. A Standard Inspection / Maintenance agreement is required to be executed with the County due to the proposed stormwater conveyance systems and Stormwater Management/BMP facilities associated with this project.

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

6. A Geotechnical Report, prepared by a professional engineer, is required to be submitted for the BMP design prior to approval of this plan or issuance of a Land-Disturbing permit for the project. This will need to address how the replacement of the riser will occur when the basin is converted from sediment basin mode to permanent.

7. Record Drawing and Construction Certification. The stormwater management/BMP facility as proposed for this project will require submission, review and approval of a record drawing (as-built) and construction certification prior to release of the posted bond/surety. Provide notes on the plan accordingly to ensure this activity is adequately coordinated and performed before, during and following construction in accordance with current County guidelines.

8. Interim Certification. Due to the characteristics and dual purpose function of the temporary sediment basin, interim construction certification will be required. Refer to current County guidelines for requirements.

9. Wetlands. Provide evidence of a Jurisdictional Determination by the Corps of Engineers outlining the boundaries of all wetland systems on the subject parcel.

10. Wetlands. Prior to initiating grading or other on-site activities for this project, all wetland permits required by federal, state and county laws and regulations shall be obtained and evidence of such submitted to the Environmental Division. Refer to Section 23-9(b)(8) and 23-10(7)(d) of the Chapter 23 Chesapeake Bay Preservation ordinance. *(Note: This includes securing necessary wetland permits through the U.S. Army Corps of Engineers Norfolk District and under the Virginia Department of Environmental Quality nontidal wetlands programs, which became effective October 1st 2001.)*

11. VPDES. It appears land disturbance for the project may exceed five (5) acres. Therefore, it is the owners responsibility to register for a General Virginia Pollutant Discharge Elimination System (VPDES) Permit for Discharges of Stormwater from Construction Activities, in accordance with current requirements of the Virginia Department of Environmental Quality and 9 VAC 25-180-10 et seq. Contact the Tidewater Regional Office of the DEQ at (757) 518-2000 or the Central Office at (804) 698-4000 for further information.

12. Revise note #10 on the cover sheet. The owner not the contractor is required to obtain the land disturbing permit.

13. Provide and label the limits of proposed work on the plan.

ENVIRONMENTAL DIVISION REVIEW COMMENTS
Colonial Heritage Blvd, Phase 1
SP-075-02
June 19, 2002 MDW/DEC

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12. Revise note #10 on the cover sheet. The owner not the contractor is required to obtain the land disturbing permit.

13. Provide and label the limits of proposed work on the plan.

ENVIRONMENTAL DIVISION REVIEW COMMENTS
THE COLONIAL HERITAGE CLUB (FORMERLY RESIDENCE CLUBHOUSE)
COUNTY PLAN NO. SP - 010 - 03
July 31, 2003

MDW/SJT

General Comments:

1. Land-Disturbing Permit. A Land-Disturbing permit cannot be issued for this plan of development until an interim construction certification is received and reviewed for Master Plan Pond # 3 (SP-75-02, Entrance Blvd.), otherwise known as the 18th Hole Pond. *(Note: Submission of an interim record drawing and asbuilt certification from AES Consulting Engineers dated July 10th 2003 is acknowledged. There are no comments on the interim record drawing as submitted.)*