Windsor Meade Villas

~~PC211~~ PC240

Order of Contents for Stormwater Management Facilities As-built Files

Each file is to contain:

1. Maintenance Agreement
2. Completed construction certification
3. As-built plan
4. Watershed Map - in calculation package
5. Construction Plan
6. Design Calculations
7. Geotechnical Reports
8. Correspondence with owners
9. Inspection Records (construction phase)
10. Enforcement Actions (construction phase)
11. Miscellaneous

COPY

COUNTY OF JAMES CITY, VIRGINIA

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF DRAINAGE SYSTEM

THIS DECLARATION, made this 10th day of May, 2005, between Virginia United Methodist Homes, Inc., and all successors in interest, ("COVENANTOR(S),") owner(s) of the following property:

Street Address: 144 Jesters Lane
Legal Description: 105.931 Ac CC Casey Limited Company
Project Name: Windsor Meade Villa Site Plan
Document No. 030023373, Deed Book —, Page No. —;
Instrument No. —, and the County of James City, Virginia ("COUNTY.")

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the drainage system including any runoff control facilities, conveyance systems and associated easements, hereinafter referred to as the "SYSTEM," located on and serving the above-described property to ensure that the SYSTEM is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations. The SYSTEM shall not include any elements located within any Virginia Department of Transportation rights-of-way.

2. If necessary, the COVENANTOR(S) shall levy regular or special assessments against all present or subsequent owners of property served by the SYSTEM to ensure that the SYSTEM is properly maintained.

3. The COVENANTOR(S) shall provide and maintain perpetual access from public right-of-ways to the SYSTEM for the COUNTY, its agent and its contractor.

4. The COVENANTOR(S) shall grant the COUNTY, its agent and its contractor a right of entry to the SYSTEM for the purpose of inspecting, monitoring, operating, installing, constructing, reconstructing, maintaining or repairing the SYSTEM.

5. If, after reasonable notice by the COUNTY, the COVENANTOR(S) shall fail to maintain the SYSTEM in accordance with the approved design standards and with the law and applicable executive regulations, the COUNTY may perform all necessary repair or maintenance work, and the COUNTY may assess the COVENANTOR(S) and/or all property served by the SYSTEM for the cost of the work and any applicable penalties.

Instrument # 050011883
Recorded on May 31, 2005

Revised 01/05

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

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

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

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

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

COVENANTOR(S)

Wm. Jeryl Finks, President

Print Name/Title Wm. Jeryl Finks, President

ATTEST:

Martha Seward

COVENANTOR(S)

_____

Print Name/Title _____

ATTEST:

_____

COMMONWEALTH OF VIRGINIA

CITY/COUNTY OF Henrico

I hereby certify that on this 20th day of May, 2005, before the subscribed, a Notary Public for the Commonwealth of Virginia, personally appeared Wm. Joseph Fink and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 20th day of May, 2005.

Judy M. Walker
Notary Public

My Commission expires: Sept. 30, 2008

Approved as to form:

County Attorney

This Declaration of Covenants prepared by:

JAMES D. FRANKLIN
(Print Name)

ENGINEERING & CONSTRUCTION MGR.
(Title)

453 McLAWS CIRCLE, SUITE 2
(Address)

WILLIAMSBURG, VA 23185
(City) (State) (Zip)

(757) 565-9670
(Phone Number)

drainage1.pre

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

Project Name: Windsor Meade - Villa BMP #1
County Plan No.: SP-03-04
Stormwater Management Facility: Wet Detention Pond
BMP Phase #: ☐ I ☐ II ☐ III

- ☒ Information Package Received. Date/By: 12/17/2008
- ☐ Completeness Check:
  - ☒ Record Drawing Date/By: 12/15/2008 - Mark Bennett
  - ☒ Construction Certification Date/By: 12/15/2008 - Mark Bennett
  - ☐ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - ☒ Insp/Maint Agreement # / Date: 050011883 5/31/2005
  - ☒ BMP Maintenance Plan Location: Sheet 25 Item 20
  - ☐ Other:
- ☒ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
  - ☒ Yes ☐ No Location: Sheet #4, Item 20
- ☒ Assign **County BMP ID Code #**: Code: PC 240
- ☒ Preliminary Input/Log into Division's "As-Built Tracking Log"
- ☒ Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
- ☒ Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☒ Active Project File Review (correspondence, H&H, design computations, etc.).
- ☒ Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.).
- ☒ Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
- ☒ Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
- ☒ Final Inspection (FI) Performed Date: 2/25/2009 - 6/8/2010
- ☒ Record Drawing (RD) Review Date: 2/24/2009
- ☒ Construction Certification (CC) Review Date: 2/24/2009
- ☒ Actions:
  - ☐ No comments.
  - ☐ Comments. Letter Forwarded. Date:
  - ☐ Record Drawing (RD)
  - ☐ Construction Certification (CC)
  - ☒ Construction-Related (CR)
  - ☐ Site Issues (SI)
  - ☐ Other :
- ☐ Second Submission: NA
- ☒ Reinspection (if necessary): 6/7/2010
- ☒ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
- ☒ Complete "Surety Request Form".
- ☒ Check/Clean active file of any remaining material and finish "As-Built" file.
- ☒ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
- ☒ Copy Final Inspection Report into County BMP Inspection Program file.
- ☒ Obtain Digital Photographs of BMP and save into County BMP Inventory.
- ☐ Request mylar/reproducible from As-Built plan preparer.
- ☒ Complete "As-built Tracking Log".
- ☒ Last check of BMP Access Database (County BMP Inventory).
- ☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
- ☐ Add BMP to Municipal BMP list (if a County-owned facility)
- ☐ Add BMP to PRIDE BMP ratings database.

Final Sign-Off

Inspector: [signature] Date: 6/10/2010

Chief Engineer: [signature] Date: 04/06/12

*** See separate checklist, if needed.

James City County, Virginia
Environmental Division

Stormwater Management / BMP Facilities
Record Drawing and Construction Certification Forms

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

Section 1 – Site Information:

Project Name: Villa Construction Plan Villa Windsor Meade of Williamsburg
Structure/BMP Name: Villa BMP#1 & [redacted]
Project Location: 3975 Windsormeade Way Williamsburg , VA 23188
BMP Location: Off of Castleside Circle, South of 169 Southport Lot
County Plan No.: SP - 03 - 04

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

Tax Map/Parcel No.: (38-3)(1-34A)
BMP ID Code (if known):
Zoning District: MU (Mixed Use)
Land Use: Single Family - Suburban
Site Area (sf or acres): 105.93 acres

Brief Description of Stormwater Management/BMP Facility: Both BMPs are Extended Detention Wet Pond JCC BMP Type A-3
Villa BMP #1 is located by the roadway Castleside Circle, Near the wooden bridge
Villa BMP #1 has a drainage area of 18.06 acres nearly all of the drainage area is single family homes.
Villa BMP #2 is by the roadway Corbridge Course, between two dwellings.
Villa BMP #2 has a drainage area of 10.36 acres nearly all of the drainage area are single family homes.

Nearest Visible Landmark to SWM/BMP Facility: Villa BMP#1: Wooden Bridge Villa BMP#2: Retaining Wall

Nearest Vertical Ground Control (if known):
☒ JCC Geodetic Ground Control ☐ USGS ☐ Temporary ☐ Arbitrary ☐ Other
Station Number or Name: #325
Datum or Reference Elevation: NAD-83
Control Description: Vertical NGVD 1929, VA State Plane Coordinates-South Zone (NAD83)(1986)
Control Location from Subject Facility: Control is located at Berkeley Elementary School.

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: Villa #1 BMP: May-2005, Villa #2 BMP: Sept.-2005
Facility Monitored by County Representative during Construction: ☒ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: C.A. Barrs Contractors, Inc.
Name of Professional Firm Who Routinely Monitored Construction: ECS Mid-Atlantic, LLC.
Date of Completion for SWM/BMP Facility: Villa #1 BMP: Oct.-2008, Villa #2 BMP: Oct.-2008
Date of Record Drawing/Construction Certification Submittal: Sept-2008

(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: Virginia United Methodist Homes, Inc.
Mailing Address: 4704 Shotley Way
Williamsburg, VA 23188
Business Phone: (757) 565-6200 Fax:(757) 941-3611
Contact Person: Richard Bottone Title:Executive 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: V. Marc Bennett, PE
Title: Senior Project Manager
Plan Name: Villa Construction Plan Villa Windsor Meade of Williamsburg
Firm's Project No. 8818-05
Plan Date: 01/09/2004
Sheet No.'s Applicable to SWM/BMP Facility: SH 1 / SH 12 / SH 16 / SH 25 / ____

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

Name: C.A. Barrs Contractors, Inc.
Mailing Address: P.O. Box 1489
Yorktown, VA 23692-1489
Business Phone: (757) 898-7282
Fax: (757) 898-1282
Contact Person: Erik R. Turkovish
Site Foreman/Supervisor: M. Scott St. Clair
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: Van Marc Bennett
Title: Senior Project Manager
Signature:
Date: 12/16/08

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
VAN MARC BENNETT
Lic. No. 026025
12/16/08
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered Professional Engineer
Or Certified Land Surveyor

Construction Certification

Firm Name: ECS Mid-Atlantic, LLC
Mailing Address: 108 Ingram Rd, Ste 1
Williamsburg, VA 23188
Business Phone: 229-6677
Fax: 229-9978

Name: Michael J. Galli
Title: Principal Engineer
Signature:
Date: 3/12/09

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
Lic. No. 030684
3/12/09
PROFESSIONAL ENGINEER

(Seal)

Virginia Registered
Professional Engineer

BMP RECORD DRAWINGS

RECEIVED
DEC 17 2008
ENVIRONMENTAL DIVISION

LEGEND

EXISTING		PROPOSED
W	WATER	W
S	GRAVITY SEWER	S
S	GRAVITY SEWER (BY OTHERS)	S
	STORM SEWER	
EX. FM	FORCE MAIN	
	MANHOLE	
	CURB DROP INLET	
	YARD DROP INLET	
	VALVE	
	FIRE HYDRANT ASSEMBLY	

EXISTING		PROPOSED
	BLOW-OFF ASSEMBLY	
	CLEAN OUT	CO
	WATER METER	
	WATER BOX	WB
	CENTERLINE/BASELINE	
	RIGHT OF WAY	
	PROPERTY LINE	
	℄ DITCH/SWALE	
	EXISTING TREELINE	
65	GROUND ELEVATION	
80	EXISTING CONTOUR ELEV.	

NOTES:

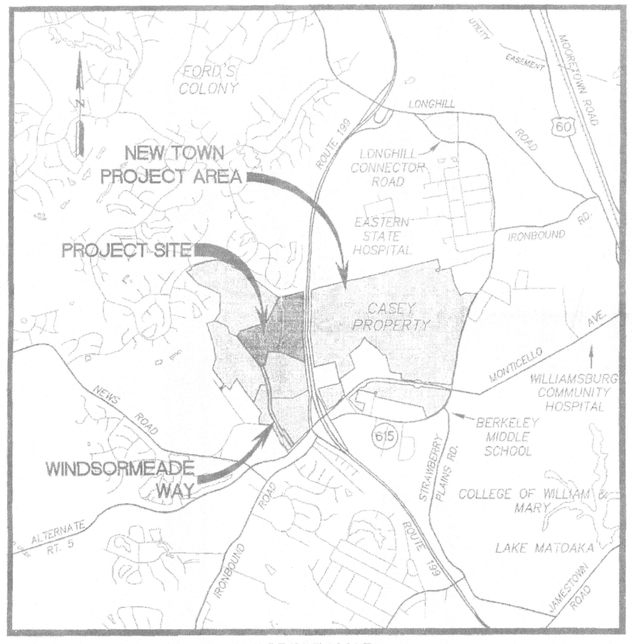
1. CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY FOR EXISTING UTILITY LOCATIONS PRIOR TO COMMENCING CONSTRUCTION.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF CONSTRUCTION EFFORTS WITH THE DOMINION VIRGINIA POWER COMPANY, VERIZON TELEPHONE, APPROPRIATE CABLE COMPANY AND OTHERS THAT MAY BE REQUIRED.
3. THE CONTRACTOR SHALL SATISFY HIMSELF AS TO ALL SITE CONDITIONS PRIOR TO CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS PRIOR TO COMMENCEMENT OF WORK TO INCLUDE, BUT NOT LIMITED TO, ANY DEMOLITION PERMITS, AND BURNING PERMITS.
5. RESEARCH HAS SHOWN NO EVIDENCE OF ENVIRONMENTAL OR HEALTH HAZARDS ON THIS SITE.
6. ALL UTILITIES WILL BE PLACED UNDERGROUND.
7. A PRECONSTRUCTION CONFERENCE SHALL BE HELD ON-SITE BETWEEN THE COUNTY, THE PROJECT ENGINEERS AND THE CONTRACTOR PRIOR TO ISSUANCE OF A LAND DISTURBING PERMIT.
8. ALL WATER AND SANITARY SEWER FACILITIES MUST HAVE A 5 FOOT MINIMUM HORIZONTAL SEPARATION DISTANCE BETWEEN IT AND ALL OTHER FIXED STRUCTURES, SUCH AS: DROP INLETS, FIRE HYDRANTS, LIGHT POLES, AND STORM SEWER PIPES, ETC.
9. ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH STATE PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE. PERMITS CAN BE ACQUIRED FROM THE VIRGINIA DEPARTMENT OF HEALTH, WILLIAMSBURG OFFICE. TELEPHONE NUMBER: 757-253-4813
10. ANY EXISTING SEPTIC SYSTEMS THAT MAY BE LOCATED ON SITE MUST BE ABANDONED IN ACCORDANCE WITH STATE HEALTH DEPARTMENT REGULATIONS. THE CONTRACTOR IS REQUIRED TO OBTAIN ALL NECESSARY PERMITS CAN BE ACQUIRED FROM THE VIRGINIA DEPARTMENT OF HEALTH, WILLIAMSBURG OFFICE. TELEPHONE NUMBER: 757-253-4813
11. THE TOPOGRAPHIC DATA REPRESENTED ON THIS DRAWING IS SUPPLIED BY OWNER/DEVELOPER. CONTOUR INTERVAL = 2 FEET.
12. ALL SECURITY LIGHTING IS TO BE LOCATED A MINIMUM OF 10' OFF THE EDGE OF PAVEMENT AND SHALL NOT BE POSITIONED IN DITCH LINES.
13. ALL PIPE SHALL BE HDPE (TYPE-S) SMOOTH WALLED PIPE OR CLASS III RCP UNLESS OTHERWISE NOTED.
14. ALL EXISTING STRUCTURES LOCATED ON THE SITE ARE TO BE DEMOLISHED AND WILL REQUIRE A DEMOLITION PERMIT. THIS PERMIT CAN BE ACQUIRED FROM THE JAMES CITY COUNTY CODE COMPLIANCE DEPARTMENT TELEPHONE NUMBER: 757-253-6626
15. NO TREES, SHRUBS, FENCES OR OBSTACLES SHALL BE PLACED WITHIN A J.C.S.A. EASEMENT WHICH WOULD RENDER THE EASEMENT INACCESSIBLE BY EQUIPMENT. SHRUBS SHALL BE A MINIMUM OF 5 FEET, AND TREES A MINIMUM OF 10 FEET, FROM THE CENTER OF WATER AND SEWER PIPELINES.
16. ALL ROADS SHALL BE PLACED WITHIN PRIVATE RIGHT-OF-WAYS AND SHALL NOT BE MAINTAINED BY JAMES CITY COUNTY OR VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT). THE PRIVATE RIGHT-OF-WAYS WILL REMAIN PRIVATELY OWNED, AND ALLOW FOR MAINTENANCE OF UTILITIES, ACCESS, AND INGRESS/EGRESS WITHIN THE PROPERTY.
17. J.C.S.A. SHALL BE GRANTED ACCESS EASEMENTS TO WATER AND SEWER LOCATED WITHIN PRIVATE RIGHT-OF-WAYS.
18. ALL IMPROVEMENTS, EXCEPT FOR THE WATERLINE CONNECTION IN FORD'S COLONY, IS WITHIN THE ORIGINAL BOUNDARY OF RECORD (P.B. 91, PG. 11-12).
19. ALL ROADWAY DIMENSIONS ARE TO BACK OF CURB UNLESS OTHERWISE NOTED.
20. SOLID WASTE PICKUP SHALL BE CONTRACTED THROUGH A PRIVATE HAULER PROVIDING PICKUP AT EACH INDIVIDUAL BUILDING OR RESIDENCE.
21. ONLY J.C.S.A. PERSONNEL ARE AUTHORIZED TO OPERATE VALVES ONTHE EXISTING MAIN.
22. ALL CONCRETE WORK SHALL BE BROOM FINISHED UNLESS OTHERWISENOTED.
23. STORM STRUCTURES SHALL CONFORM TO THE VDOT ROAD AND BRIDGE STANDARDS AND VDOT SPECIFICATIONS. ALL MANHOLES AND RISER STRUCTURES SHALL INCLUDE INLET SHAPING (IS-1) AND MANIOLES DEEPER THAN 4 FEET SHALL HAVE STEPS (ST-1). PIPE BEDDING SHALL BE IN ACCORDANCE WITH VDOT PB-1 AND MANUFAITURER'S SPECIFICATIONS/GUIDILINES.

CERTIFIED RESPONSIBLE LAND DISTURBER:
V. MARC BENNETT, P.E.
AES CONSULTING ENGINEERS
5248 OLDE TOWNE ROAD, SUITE 1
WILLIAMSBURG, VIRGINIA, 23188
TELEPHONE: 757-253-0040

OWNER/DEVELOPER INFORMATION:
VIRGINIA UNITED METHODISTS HOME, INC.
453 McLAWS CIRCLE, SUITE 2
WILLIAMSBURG, VIRGINIA, 23185
TELEPHONE: (757) 565-6200
CONTACT: JIM FRANKLIN

WINDSORMEADE
Of Williamsburg

JAMES CITY COUNTY, VIRGINIA



VICINITY MAP
SCALE: 1"=2000'

JANUARY, 2004
PROJECT NO.: 8818-5

JCC CASE #SP-03-04

"THE STORM DRAINAGE & BMP AS-BUILT LOCATIONS AND GRADES SHOWN ON THESE DRAWINGS, ARE ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF AND I CERTIFY THAT I, OR MY AGENT, HAVE MADE SUFFICIENT INSPECTION TO ENSURE THE ACCURACY OF THIS STATEMENT."

Thomas C. Sublett 8/18/08
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
8-18-2008
THOMAS C. SUBLETT
No. 1886
LAND SURVEYOR

THESE PLANS ARE SUBJECT TO THE SPECIAL CONDITIONS OF THE RPA EXCEPTION REQUEST DATED JULY 13, 2004 SIGNED BY DARRYL COOK OF JCC ENVIRONMENTAL AND W. JERYL FINK, PRESIDENT OF VIRGINIA UNITED METHODIST HOMES.

AES
CONSULTING ENGINEERS
WILLIAMSBURG • RICHMOND

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

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	COVER SHEET
~~2A~~	~~WINDSORMEADE OVERALL LAYOUT~~
~~2~~	~~ENVIRONMENTAL INVENTORY PLAN AND SHEET INDEX~~
~~3~~	~~INITIAL EROSION CONTROL PLAN~~
~~4~~	~~OVERALL EROSION CONTROL PLAN~~
~~5A~~	~~MASTER ROAD AND UTILITY PLAN~~
~~5~~	~~ROAD & UTILITY PLAN~~
~~6~~	~~ROAD & UTILITY PLAN~~
~~7~~	~~ROAD & UTILITY PLAN~~
~~8~~	~~ROAD & UTILITY PLAN~~
~~9~~	~~ROAD & UTILITY PLAN~~
~~10~~	~~ROAD & UTILITY PLAN~~
~~11~~	~~DRAINAGE AREAS~~
12	GRADING & DRAINAGE PLAN
~~13~~	~~GRADING & DRAINAGE PLAN~~
~~14~~	~~GRADING & DRAINAGE PLAN~~
~~15~~	~~GRADING & DRAINAGE PLAN~~
16	GRADING & DRAINAGE PLAN
~~17~~	~~GRADING & DRAINAGE PLAN~~
~~18~~	~~ROAD & UTILITY PROFILE - SHOTLEY WAY & CASTLESIDE CIRCLE~~
~~19~~	~~ROAD & UTILITY PROFILE - DOVEDALE DRIVE & CORGRIDGE COURSE~~
~~20~~	~~ROAD & UTILITY PROFILE - CORGRIDGE COURSE~~
~~21~~	~~ROAD & UTILITY PROFILE - CORGRIDGE COURSE, SHERINGHAM GREEN, BEERHURST GREEN, & CLUBHOUSE PARKING~~
~~22~~	~~ROAD & UTILITY PROFILE - EXBURY LANE~~
~~23A~~	~~ROAD & UTILITY PROFILE - OFF SITE WATER (TO FORD'S COLONY), MH#1 TO MH#23~~
~~23~~	~~ROAD & UTILITY PROFILE - STOURHEAD SQUARE & WINDSORMEADE WAY~~
~~24~~	~~GENERAL NOTES & DETAILS~~
25	GENERAL NOTES & DETAILS
~~26~~	~~WATER & SEWER NOTES & DETAILS~~
~~L-1~~	~~OVERALL PLANTING PLAN~~
~~L-2~~	~~REQUIRED PLANTING PLAN (SWMP)~~
~~L-3~~	~~TYPICAL VILLA PLANTING PLAN~~
~~L-4~~	~~NOT PROVIDED~~
~~L-5~~	~~NOT PROVIDED~~
~~L-6~~	~~NOT PROVIDED~~
~~L-7~~	~~CLUBHOUSE PLANTING PLAN~~
~~L-8~~	~~NOTES & DETAIL SHEET~~

SITE DATA: (WINDSORMEADE OVERALL)

TAX MAP PARCEL No.	(38-3)(1-34A)
ZONING:	MU (MIXED USE) WITH PROFFERS (JCC CASE NO. Z-2-01/MP-2-01)
TOTAL PROJECT AREA:	4,614,364 S.F.± 105.931 AC.± (ENTRANCE ROAD, WINDSOR HALL, VILLAS)
WATERSHED:	POWHATAN CREEK (SUBWATERSHED 209, CATCHMENTS 209-101-1)

SITE DATA: (VILLAS)

DISTURBED AREA:	1,215,324 S.F.± 32.2 AC.±	
WETLAND DISTURBED AREA:	11,326 S.F.± 0.26 AC.± (PERMITTED DISTURBANCE)	
FLOOD HAZARD MAP:	FEMA PANEL NUMBER 510201 0035 B, DATED 2/6/91 NOTE: SITE IS LOCATED IN ZONE "X" (AREAS DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN)	
MAXIMUM STRUCTURE HEIGHT:	60'-0"	
PROPOSED UNITS:	96 SINGLE FAMILY HOMES (VILLAS) 1 CLUBHOUSE (3,222 SF)	
RESIDENTIAL DENSITY:	1.7 SINGLE FAMILY HOMES PER ACRE	
TOTAL PARKING REQUIRED:	2 SPACES PER RESIDENTIAL UNIT, 96 UNITS 1 SPACE PER 200 SF, 3,222 SF CLUBHOUSE	= 192 SPACES = 16 SPACES
	TOTAL SPACES REQUIRED TOTAL HANDICAP SPACES (CLUBHOUSE ONLY) REQUIRED	= 208 SPACES = 1 SPACE
TOTAL PARKING PROVIDED:	384 SPACES @ HOMES (4 EACH, 2 GARAGE, 2 DRIVEWAY) 39 SPACES (ON STREET) 38 SPACES @ CLUBHOUSE (4 HANDICAP)	
RECREATION AREA:	CLUBHOUSE AND SURROUNDING LAWN AREA WILL SERVE AS A RECREATION AREA FOR RESIDENTS.	
COMMUNITY OPEN SPACE:	ALL AREAS OUTSIDE OF DESIGNATED VILLA UNITS WILL BE MAINTAINED AS COMMUNITY OPEN SPACE FOR THE BENEFIT OF THE ENTIRE DEVELOPMENT.	

No.	DATE	REVISION / COMMENT / NOTE	BY
2	5/21/04	REVISION PER JCC COMMENTS DATED 5/04	VMB
1	4/2/04	REVISION PER JCC COMMENTS DATED 2/04	VMB

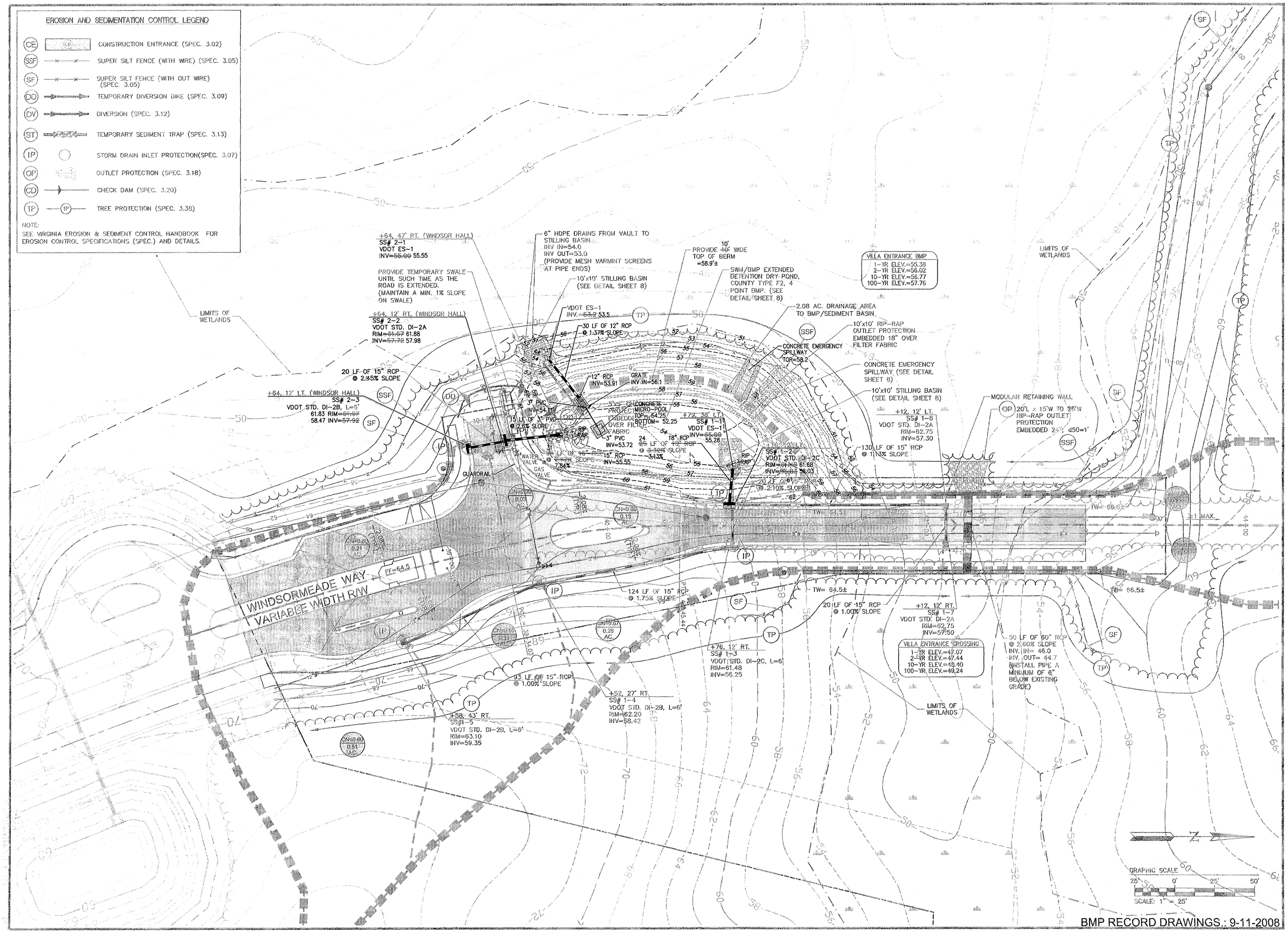
PC240

BMP RECORD DRAWINGS.: 8-18-2008

EROSION AND SEDIMENTATION CONTROL LEGEND

CE	CONSTRUCTION ENTRANCE (SPEC. 3.02)
SSF	SUPER SILT FENCE (WITH WIRE) (SPEC. 3.05)
SF	SUPER SILT FENCE (WITH OUT WIRE) (SPEC. 3.05)
DD	TEMPORARY DIVERSION DIKE (SPEC. 3.09)
DV	DIVERSION (SPEC. 3.12)
ST	TEMPORARY SEDIMENT TRAP (SPEC. 3.13)
IP	STORM DRAIN INLET PROTECTION(SPEC. 3.07)
OP	OUTLET PROTECTION (SPEC. 3.18)
CD	CHECK DAM (SPEC. 3.20)
TP	TREE PROTECTION (SPEC. 3.38)

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



BMP RECORD DRAWINGS.: 9-11-2008

No.	DATE	REVISION / COMMENT / NOTE		
2	5/12/04	REVISED PER JCC COMMENTS DATED 4/04	VMB	
1	12/29/04	REVISED PER JCC COMMENTS DATED 9/10/04	VMB	

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

GRADING, DRAINAGE AND EROSION & SEDIMENT CONTROL PLAN

WINDSORMEADE of Williamsburg

VILLA ENTRANCE & SEWER CONSTRUCTION PLAN

BERKELEY DISTRICT — JAMES CITY COUNTY — VIRGINIA

Designed VMB/JAG	Drawn SRL
Scale 1"=25'	Date 1/9/04
Project No. 8818-05	
Drawing No. 7	

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, UNLESS OTHER RECOMMENDATIONS ARE PROVIDED BY THE GEOTECHNICAL ENGINEER. 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 UNLESS OTHER RECOMMENDATIONS ARE PROVIDED BY THE GEOTECHNICAL ENGINEER.

6. THE DAM CORE, IF REQUIRED, 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 THE TEMPORARY SEDIMENT BASINS IN ACCORDANCE WITH SECTION 5 OF THE JAMES CITY COUNTY BMP, EROSION AND SEDIMENT CONTROL AND STORMWATER MANAGEMENT DESIGN GUIDES.

POND FACILITY MAINTENANCE PLAN

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

A DESIGNATED REPRESENTATIVE OF THE OWNER WILL INSPECT THE DETENTION POND 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 DETENTION POND 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 DETENTION POND AREAS, IF VEGETATION COVERS LESS THAN 40% OF SOIL SURFACES, LIME, FERTILIZE AND SEED IN ACCORDANCE WITH RECOMMENDATIONS FOR NEW SEEDLINGS, AS USTED 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.

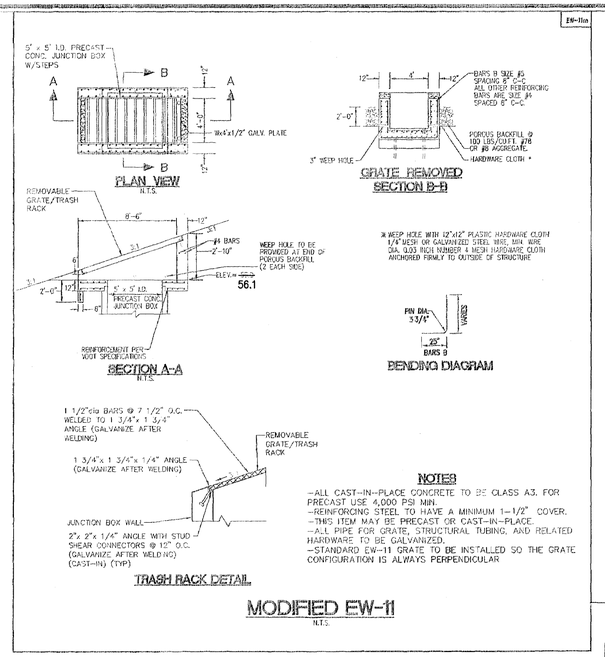
5. PERFORM QUARTERLY INSPECTIONS OF THE RELEASE STRUCTURES, RISER SECTION AND CREST OF SPILLWAY FOR THE OBSERVANCE OF COLLECTED DEBRIS. IMMEDIATELY REMOVE ANY DEBRIS TO MAINTAIN THE INTEGRITY OF THE STRUCTURE AND PROVIDE AN ATTRACTIVE APPEARANCE.

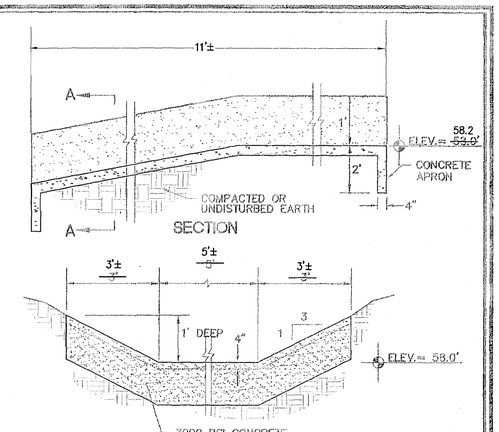
6. PERFORM YEARLY STRUCTURAL INSPECTIONS OF THE FACILITY FOR DAMAGE. STRUCTURAL INSPECTION SHALL BE PERFORMED ON THE CONCRETE RISER, ANTI-VORTEX DEVICE, TRASH RACK, ORIFICE/ WOR(S), OUTLET BARREL AND POND EMBANKMENT. IF DAMAGE IS EVIDENT, FURTHER INVESTIGATION BY A PROFESSIONAL ENGINEER MAY BE REQUIRED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

7. PERFORM QUARTERLY INSPECTIONS OF THE GRADED SIDE SLOPES OF THE FACILITY FOR SIGNS OF ANIMAL/ ROBENT 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 OR INSPECTIONS PERFORMED FOR THE STRUCTURE. RECORDS SHALL DOCUMENT ROUTINE MAINTENANCE AND/ OR REPAIRS PERFORMED. COPIES SHALL BE PROVIDED TO THE COUNTY UPON REQUEST.

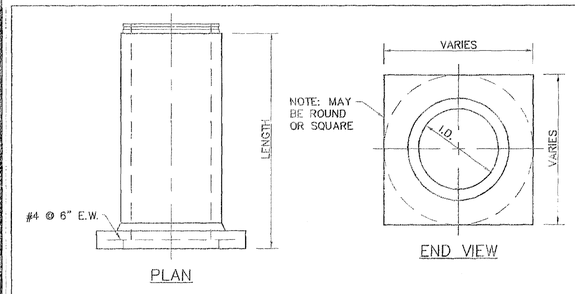
9. THE FACILITY SHALL NOT BE MODIFIED IN ANY WAY WITHOUT PRIOR CONSENT/ APPROVAL OF THE COUNTY.



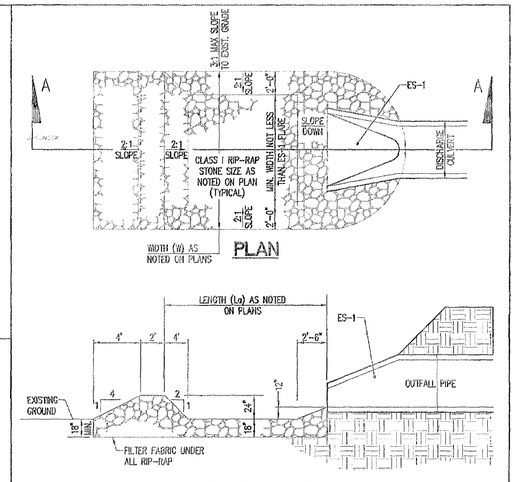


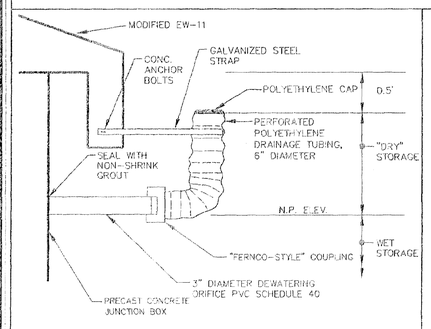
CONVERSION OF SEDIMENT BASINS INTO BMP FACILITIES

BMP FACILITY WILL INITIALLY BE CONSTRUCTED AS A SEDIMENT BASIN REQUIRING EXCAVATION TO PROVIDE ADEQUATE STORAGE. ONCE J.C.C. ENVIRONMENTAL DIVISION GIVES CONCURRENCE TO REMOVE THE SEDIMENT BASIN, ANY EXCESS EARTH OR SEDIMENT SHALL BE REMOVED AND DISPOSED OF BY CONTRACTOR. REMOVE ANY TEMPORARY BARRIERS, REGRADE AND SEED, AND REMOVE DEWATERING PIPE..



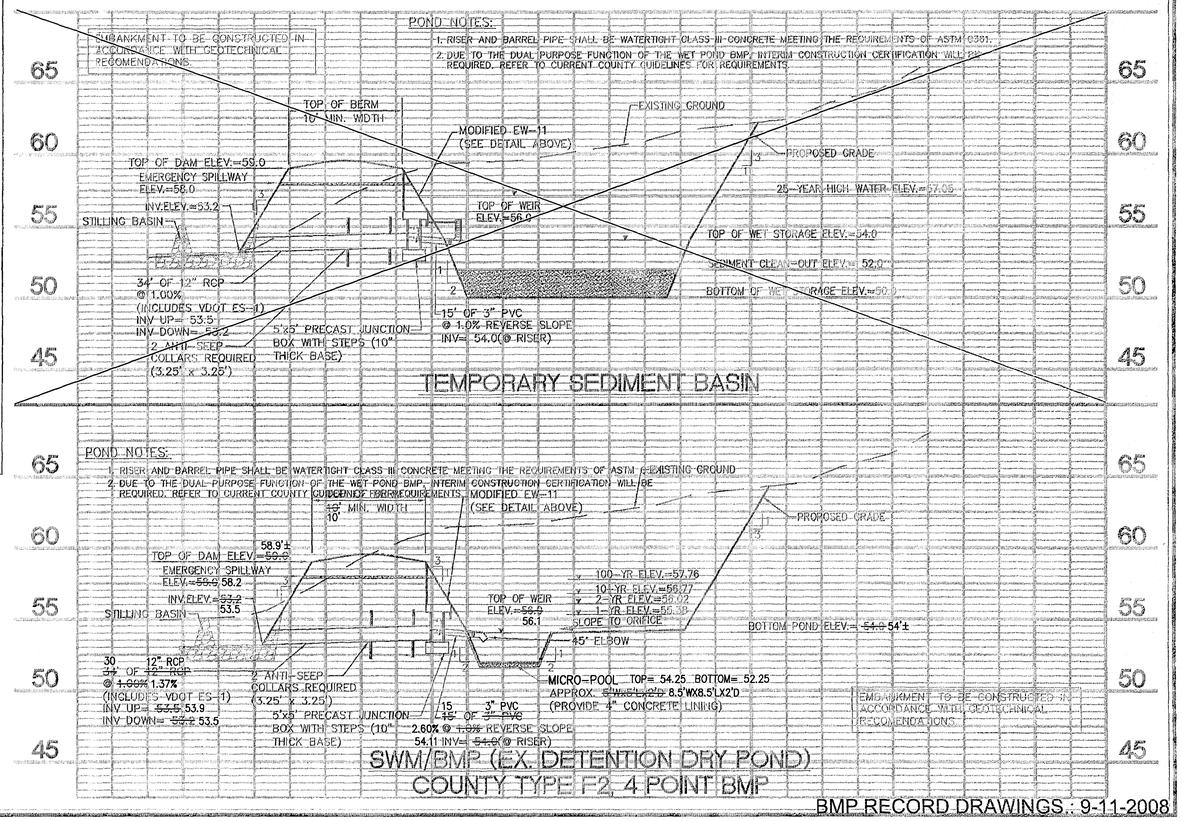
PRE-CAST CONCRETE ANTI-SEEP COLLAR
N.T.S.





DEWATERING PIPE FOR SEDIMENT BASIN

SOURCE: VA. DSWC PLATE. 3.14-15



BMP RECORD DRAWINGS.: 9-11-2008

No.	DATE	REVISION / COMMENT / NOTE	BY
2	5/12/04	REVISED PER JCC COMMENTS DATED 4/04	VMB
1	3/29/04	REVISED PER JCC COMMENTS DATED 2/10/04	VMB

5248 Olde Towne Road, Suite 1
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CONSULTING ENGINEERS

STORMWATER MANAGEMENT DETAILS

WINDSOR MEADE of Williamsburg

VILLA ENTRANCE & SEWER CONSTRUCTION PLAN

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
JAG	JAG
Scale	Date
N/A	1/9/04

Project No. 8818-05

Drawing No. 8

Windsormeade Way

Calculations
For
James City County Environmental Division

form SP-62-02
SP-93-03
2ND SUBMISSION

Prepared by

AES Consulting Engineers
5248 Olde Towne Road. Suite 1
Williamsburg, VA 23188
(757) 253-0040 Fax: (757) 220-8994
http://www.aesva.com

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- Pre and Post Development Drainage Maps

Storm Sewer System

- Storm Sewer Calculations
- Culvert Calculations

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- Temporary Sediment Basin Calculations
- SCS Hydrograph Calculations
- BMP Calculations

W.M. Way Pond 2

- Temporary Sediment Basin Calculations
- SCS Hydrograph Calculations
- BMP Calculations

Sediment Basin 3

- Temporary Sediment Basin Calculations
- SCS Hydrograph Calculations

ENDANGERED PLANT PRESERVE

? OFFSITE DRAINAGE

GRAPHIC SCALE

300' 0' 300' 600'

SCALE: 1" = 300'

N

39.0 AC.

2.31 AC.

44.9 AC.

9.04 AC.

5.03 AC.

2.94 AC.

ENDANGERED PLANT PRESERVE

S.R. 199

MONTICELLO AVENUE S.R. 321

OLD NEWS ROAD

TRAP NEEDS SIZED FOR THIS D.A.

No.	DATE	REVISION / COMMENT / NOTE	BY

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

CONSULTING ENGINEERS

WINDSORMEADE WAY

PRE-DEVELOPMENT DRAINAGE AREAS

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
AES	AES
Scale	Date
1"=300'	APRIL, 2002

Project No.
5818-04

Drawing No.
EXHIBIT A

GRAPHIC SCALE

300' 0' 300' 600'

SCALE: 1" = 300'

ENDANGERED PLANT PRESERVE

~~get closer to 22ac, not 15ac~~

What about Rt 199 drainage?

CN? 88
TC? 17min

~~suspect area~~

15.98 AC.

SEDIMENT BASIN No.3

99.5 AC.

CN? TC?

Q_{10} = 66.5cfs

TEMPORARY STREAM CROSSING

SEDIMENT BASIN No.3 OUTFALL

4.43 AC.

CN = 82
T.C. = 12 min
DETENTION POND No.2
SEDIMENT BASIN No.2

DETENTION POND No.2 OUTFALL

35.7 AC.

CN = 71.2
T.C. = 60 min

DUAL 60" RCP CULVERTS

ENDANGERED PLANT PRESERVE

DETENTION POND No.1 OUTFALL

7.9 AC.

CN = 73.4
T.C. = 63 min

7.3 AC.

CN = 82
T.C. = 21 min
DETENTION POND No.1
SEDIMENT BASIN No.1

CN = 78.5
T.C. = 37 min

3.1 AC.

37min? NO WAY in Pasture

SR 199

MONTICELLO AVENUE & R. 30

OLD NEWS ROAD

No.	DATE	REVISION / COMMENT / NOTE	BY

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

AES CONSULTING ENGINEERS

WINDSORMEADE WAY

POST-DEVELOPMENT DRAINAGE AREAS

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Designed	Drawn
AES	AES
Scale	Date
1"=300'	APRIL, 2002
Project No.	
8818-04	
Drawing No.	
EXHIBIT B	

VIRGINIA POLLUTANT DISCHARGE ELIMINATION SYSTEM (VPDES)
GENERAL PERMIT REGISTRATION STATEMENT
FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES - PERMIT NUMBER VAR4

(Please Type or Print All Information)

1. **Construction Activity Operator**

Name: C.C. CASEY, LTD. CO.

Mailing Address: 721 RICHMOND ROAD

City: WILLIAMSBURG State: VA. Zip: 23185 Phone: _____

2. **Location of Construction Activity**

Name: WINDSORMEADE WAY

Address: LOCATED BETWEEN ROUTE 199 AND OLD NEWS ROAD

City: WILLIAMSBURG State: VA. Zip: 23185

If street address unavailable: Latitude _____ Longitude _____

3. **Location of All Offsite Support Activities to be Covered Under The Permit**

Name: NONE REQUIRED FOR THIS PROJECT

Address: _____

City: _____ State: _____ Zip: _____

If street address unavailable: Latitude _____ Longitude _____

4. **Status:** Federal ☐ State ☐ Public ☐ Private ☑ (Check one only)

5. **Is Storm Water Runoff Discharged to a Municipal Separate Storm Sewer System (MS4)?** Yes ☑ No ☐

If yes, name of the MS4 operator VIRGINIA DEPT. OF TRANSPORTATION / JAMES CITY CO.

6. **Receiving Water Body of Direct Discharge or Municipal Separate Storm Sewer System (e.g. Clear Creek or Unnamed Tributary to Clear Creek):** STORM WATER MANAGEMENT FACILITY - JAMES CITY CO.

7. **Project Start Date** OCT. 2002

8. **Total Land Area of Site (acres)** 186.11 9. **Estimated Area to be Disturbed (acres)** 20.33

10. **Has a Storm Water Pollution Prevention Plan Been Prepared in Accordance with the Requirements of the VPDES General Permit for Storm Water Discharges From Construction Activities?** Yes ☑ No ☐

If no, explain _____

11. **Has an Erosion and Sediment Control Plan for the Construction Activity Been Approved by an Appropriate State or Local Plan Approving Authority?** Yes ☐ No ☑ **If not, is this activity exempt from the plan requirements of the Virginia Erosion and Sediment Control Regulation?** Yes ☐ No ☑ [redacted]

Give the name of approving authority or cite the basis for plan exemption _____

12. **Certification:** "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations."

Print Name: _____

Title: _____

Signature: _____ Date: _____

For Department of Environmental Quality Use Only [DEQ-WATER FORM ***SWGP99-004-REG*** (6/99)]

Accepted/Not Accepted by: _____ Date: _____

Basin _____ Stream Class _____ Section _____ Special Standards _____

SITE ENTRANCE

PROJECT: WINDSORMEADE WAY

STATION: 11+10 ±

SHEET 1 OF 1

CULVERT DESIGN FORM

DESIGNER / DATE: R. SMITH / 7/11/02

REVIEWER / DATE: ____ / ____

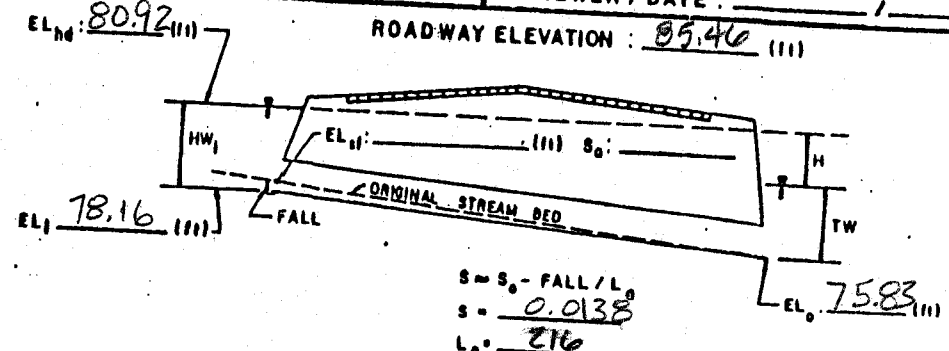
HYDROLOGICAL DATA

SEE ADD'L. SHTS.

- ☐ METHOD: ____
- ☐ DRAINAGE AREA: ____ ☐ STREAM SLOPE: ____
- ☐ CHANNEL SHAPE: ____
- ☐ ROUTING: ____ ☐ OTHER: ____

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
SS# 1	8.2	2.40
10 YRS	17.8	—



CULVERT DESCRIPTION:

MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	OUTLET CONTROL TW (5)	d_c	(d_c+D)/2	h_o (6)	h_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
RCP-CIR-36" - GROOVED - PROJECTED	26	26	0.6	2.76	Ø	80.92	2.40	1.6	2.3	2.4	0.2	2.55	80.18	80.92	6.7 FPS	OUTLET PROTECTION

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_o + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

$Q_{10} = C \cdot I_{10} \cdot A$

$Q_{10} = 0.36 \cdot 4.6 \cdot 10.7$

$Q_{10} = 17.8$ CFS

$C_W = 10.7 AC \cdot 60\% \cdot 0.9 = 5.8$

$10.7 AC \cdot 40\% \cdot 0.25 = 1.1$

6.9

$C_W = 6.9/10.7 = 0.64$

$T_C = 18$ MIN

CULVERT BARREL SELECTED:

SIZE: 36"

SHAPE: CIRCULAR

MATERIAL: RCP n 0.013

ENTRANCE: GROOVED-PROJECTED

3H30

PROJECT: Windsor Meade Way Culvert Crossing

STATION: 31+50

SHEET 1 OF 1

CULVERT DESIGN FORM

DESIGNER / DATE: ____ / ____

REVIEWER / DATE: ____ / ____

HYDROLOGICAL DATA

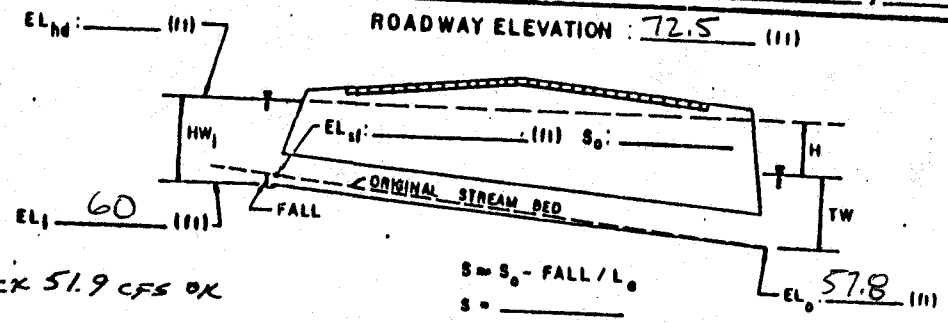
SEE ADD'L. SHTS.

- ☐ METHOD:
- ☐ DRAINAGE AREA: ____ ☐ STREAM SLOPE:
- ☐ CHANNEL SHAPE:
- ☐ ROUTING: ____ ☐ OTHER.

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
10yr	62.1	60
100yr	111.6	60

ROADWAY ELEVATION: 72.5 (ft)



CHECK 51.9 CFS OK

$S = S_o - FALL / L_o$

$S =$

$L_o =$

CULVERT DESCRIPTION: MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HEADWATER CALCULATIONS: INLET CONTROL HW i/D (2)	HW i	FALL (3)	EL hi (4)	OUTLET CONTROL TW (5)	d_c	$\frac{d_c+D}{2}$	h_o (6)	h_e	H (7)	EL ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
2-Conc.-Cir.-48"-Groved+Proj.	62	31	0.6	2.4	∅	62.4	60	1.6	2.8	60.6	0.2	0.2	60.8	62.4	4.9	OKAY
	112	66	0.85	3.4	∅	63.4	60	2.4	3.2	61	0.2	0.8	61.8	63.4		OKAY @ 100yr
Conc-Cir-60"-Grov.+Proj	62	62	0.65	3.25	∅	63.3	60	2.3	3.7	61.5	0.2	0.3	62.0	63.3	4.9	OKAY

INLET HW CONTROL

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{sf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

a. APPROXIMATE
f. CULVERT FACE
hd. DESIGN HEADWATER
hi. HEADWATER IN INLET CONTROL
ho. HEADWATER IN OUTLET CONTROL
i. INLET CONTROL SECTION
o. OUTLET
sf. STREAMBED AT CULVERT FACE
tw. TAILWATER

COMMENTS / DISCUSSION:

$Q_{10} = VA$ $\quad V_{10} = \frac{Q_{10}}{A} = \frac{31\,cfs}{6.3} = 4.9\,ft/s$

$\frac{62\,cfs}{12.6} = 4.9$

CULVERT BARREL SELECTED:

SIZE: 60"

SHAPE: CIR

MATERIAL: CONC

ENTRANCE: GROV + PROJ.

PROJECT: WINDSORMEADE WAY

STATION: TEMP STREAM X-ING

SHEET ____ OF ____

CULVERT DESIGN FORM

DESIGNER / DATE: J. GRIMES /

REVIEWER / DATE: ____ /

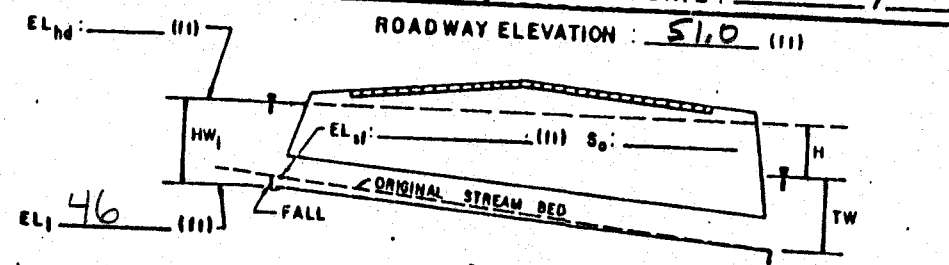
HYDROLOGICAL DATA

SEE ADD'L. SHTS.

- ☐ METHOD: SCS Method
- ☐ DRAINAGE AREA: 39.5 ☐ STREAM SLOPE: ____
- ☐ CHANNEL SHAPE: PARABOLIC
- ☐ ROUTING: ____ ☐ OTHER: CN = 71

DESIGN FLOWS/TAILWATER

R.I. (YEARS)	FLOW (cfs)	TW (ft)
10 YR	66.5	~46



$S \approx S_o - FALL / L_o$

$S = 5.71$

$L_o = 35$

CULVERT DESCRIPTION:

MATERIAL - SHAPE - SIZE - ENTRANCE	TOTAL FLOW Q (cfs)	FLOW PER BARREL Q/N (1)	HW_i/D (2)	HW_i	FALL (3)	EL_hi (4)	TW (5)	d_c	(d_c+D)/2	h_o (6)	h_e	H (7)	EL_ho (8)	CONTROL HEADWATER ELEVATION	OUTLET VELOCITY	COMMENTS
HDPE - CIR - 36" - GROV + PROJ	66.5	33.3	.9	2.7	Ø	48.7	2	1.75	2.4	2.4	.2	.45	46.5	48.7		OKAY
HDPE - CIR - 24" - GROV + PROJ	66.5	33.3	2.6	5.2	Ø	51.2										OVERTOPS ROAD

HEADWATER CALCULATIONS — INLET CONTROL: HW_i/D (2), HW_i, FALL (3), EL_hi (4); OUTLET CONTROL: TW (5), d_c, (d_c+D)/2, h_o (6), h_e, H (7), EL_ho (8)

TECHNICAL FOOTNOTES:

(1) USE Q/NB FOR BOX CULVERTS

(2) $HW_i/D = HW/D$ OR HW_i/D FROM DESIGN CHARTS

(3) $FALL = HW_i - (EL_{hd} - EL_{tf})$; FALL IS ZERO FOR CULVERTS ON GRADE

(4) $EL_{hi} = HW_i + EL_i$ (INVERT OF INLET CONTROL SECTION)

(5) TW BASED ON DOWN STREAM CONTROL OR FLOW DEPTH IN CHANNEL.

(6) $h_o = TW$ or $(d_c + D/2)$ (WHICHEVER IS GREATER)

(7) $H = \left[1 + h_e + (29n^2 L)/R^{1.33}\right] V^2/2g$

(8) $EL_{ho} = EL_o + H + h_o$

SUBSCRIPT DEFINITIONS:

- a. APPROXIMATE
- f CULVERT FACE
- hd. DESIGN HEADWATER
- hi. HEADWATER IN INLET CONTROL
- ho HEADWATER IN OUTLET CONTROL
- i INLET CONTROL SECTION
- o. OUTLET
- of STREAMBED AT CULVERT FACE
- tw. TAILWATER

COMMENTS / DISCUSSION:

Designed for current conditions only. Future X-ING TO BE DESIGNED FOR PERMENANT USE.

CULVERT BARREL SELECTED:

SIZE: 36"

SHAPE: CIR

MATERIAL: HDPE

ENTRANCE: GROV. + PROJ.

AES JOB #8818-4

1992

3.14

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project WINDSORMEADE WAY

Basin # SEDIMENT BASIN 1 Location STA. 24+50 ±

Total area draining to basin: 7.3 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 7.3 acres = 489 cu. yds.

2. Available basin volume = 1726 cu. yds. at elevation 74. (From storage - elevation curve) ✓

3. Excavate 1726 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 7.3 acres = 240.9 cu. yds.

5. Elevation corresponding to cleanout level = 71.8 *. ✓
   * BASED ON ½ AVAILABLE VOLUME
   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 2.2 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 7.3 acres = 489.1 cu. yds.

8. Total available basin volume at crest of riser* = 3115 cu. yds. at elevation 76. (From Storage - Elevation Curve) ✓

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

9. Diameter of dewatering orifice = 3 in. ?

10. Diameter of flexible tubing = N/A in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 76 ✓

Top of Dam = 80 ✓

Design High Water = 76.3 (25-YR STORM) 76.7 plan

Upstream Toe of Dam = 69

Basin Shape

12. Length of Flow / Effective Width — $\frac{L}{We}$ = $\frac{80}{80} = 1$

If > 2, baffles are not required _____

If < 2, baffles are required X

Runoff

13. Q_2 = 13.82 cfs (From Chapter 5)

14. Q_{25} = 33.67 cfs (From Chapter 5) CN 82

Principal Spillway Design

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

Without emergency spillway, required spillway capacity $Q_p = Q_{25} =$ 33.7 cfs. (riser and barrel)

16. ~~With emergency spillway:~~

~~Assumed available head (h) = _____ ft. (Using Q_2)~~

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

Without emergency spillway:

Assumed available head (h) = 0.3 ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = N/A* in. Actual head (h) = ____ ft.

(From Plate 3.14-8.) * MOD. EW-11 W/WEIR USED IN LIEU OF RISER.

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 122 ft.

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

(From Plate 3.14-7).

19. Barrel diameter = 2-24 in. ✓

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

20. Trash rack and anti-vortex device

Diameter = N/A inches.
Height = N/A inches.
BAR GRATE PROVIDED ON EW-11

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = N/A cfs.

22. Bottom width (b) = N/A 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) = 7 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) = 50 ft.

24. Number of collars required = 2 dimensions = 4.5' x 4.5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 80

Design High Water = 76.7 (25-YR STORM)

Emergency Spillway Crest = 80.1*

Principal Spillway Crest = 76

Dewatering Orifice Invert = 74

Cleanout Elevation = 71.8

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 69

* FINAL ROAD TO BE EMERGENCY SPILLWAY.

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - TEMP. SED. BASIN 1

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	69.00	7,060	0	0
1.00	70.00	7,790	7,425	7,425
3.00	72.00	9,320	17,110	24,535
4.00	73.00	10,130	9,725	34,260
5.00	74.00	14,545	12,338	46,598
6.00	75.00	19,605	17,075	63,673
7.00	76.00	21,250	20,428	84,100
9.00	78.00	24,715	45,965	130,065
11.00	80.00	28,634	53,349	183,414

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 24.0	3.0	0.0	0.0
Span in	= 24.0	3.0	0.0	0.0
No. Barrels	= 2	1	0	0
Invert El. ft	= 74.00	74.00	0.00	0.00
Length ft	= 122.0	0.0	0.0	0.0
Slope %	= 0.42	0.00	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 7.00	150.00	0.00	0.00
Crest El. ft	= 76.00	80.10	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Rect	Broad	---	---
Multi-Stage	= Yes	No	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	69.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.00	7,425	70.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.00	24,535	72.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	34,260	73.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
5.00	46,598	74.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	63,673	75.00	0.25	0.22	---	---	0.00	0.00	---	---	---	0.22
7.00	84,100	76.00	0.33	0.32	---	---	0.00	0.00	---	---	---	0.32
9.00	130,065	78.00	41.96	0.16	---	---	41.80	0.00	---	---	---	41.95
11.00	183,414	80.00	60.79	0.09	---	---	60.69	0.00	---	---	---	60.78

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

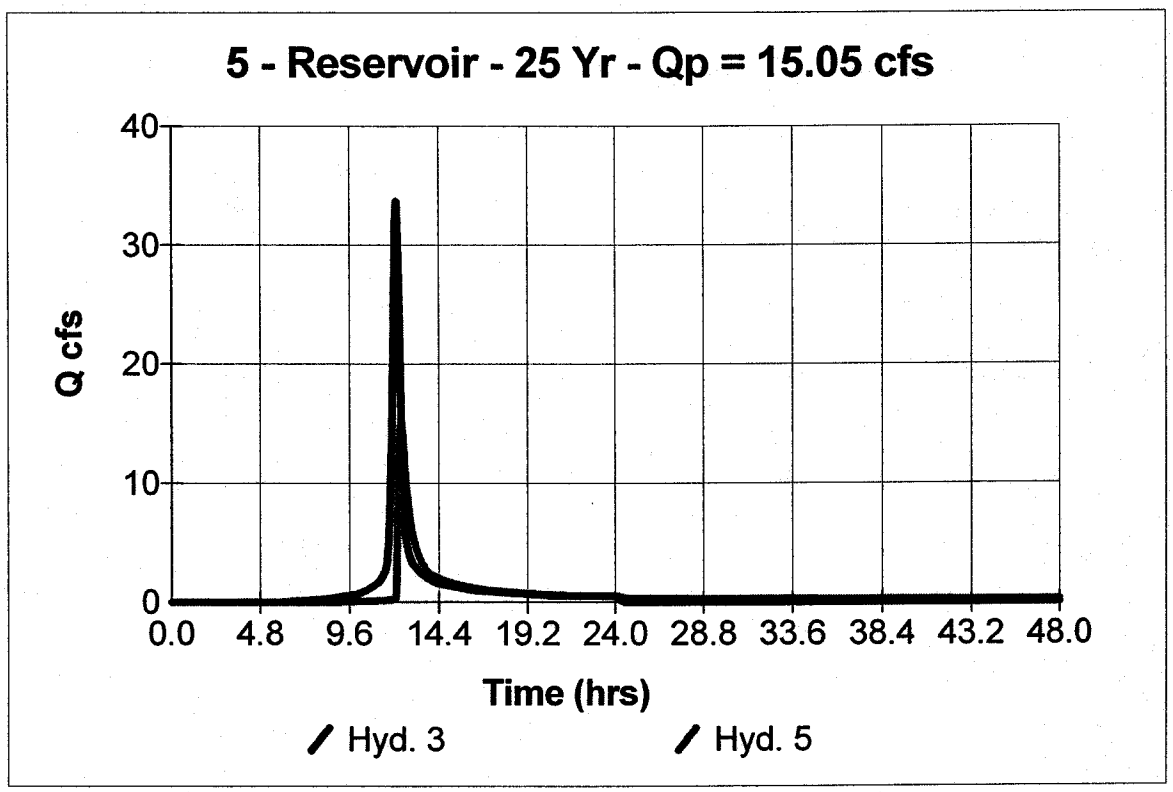
Hyd. No. 5

TEMP SED BASIN ROUTED

Hydrograph type	= Reservoir	Peak discharge	= 15.05 cfs
Storm frequency	= 25 yrs	Time interval	= 2 min
Inflow hyd. No.	= 3	Reservoir name	= TEMP. SED. BASI
Max. Elevation	= 76.73 ft	Max. Storage	= 100,985 cuft

Storage Indication method used.

Hydrograph Volume = 101,885 cuft



DHW TSB 25

WindsorMeade Way

CALCULATION FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION

FOR BMP / SWM 1

Project No. 8818-4

5/14/2003

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 2.94 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)	8-B Caroline	C	Woods (good)	0.62	72	45
2)	10-C Craven	C	Woods (good)	0.07	72	5
3)	15-D Emporia	C	Woods (good)	2.25	72	162
4)					0	0
5)					0	0
6)					0	0
7)					0	0
	Totals =			2.94		212
	Composite CN =					72

C. *Pre-Development Time of Concentration* Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Woods (light underbrush)	
Manning's roughness coefficient., n (table 5-7)	0.4	
Length of overland flow, L	300	Feet
2-year 24-hour rainfall, P2	3.6	inches
Average slope of overland flow , s	0.0133	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.96	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	180	Feet
Average slope of shallow concentrated flow, s	0.068	feet per foot
Average velocity, v	4.2	feet per second
Travel time, Tt = L/(3600*v)	0.01	hours

3) Channel or Pipe Flow

Length of channel flow, L	0	Feet
Average velocity of channel flow, v	2.5	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours

Total Time of Concentration = 0.97 hours or 58 minutes

II. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (for total site)

A. Post-Development Drainage Area to Point of Concern = 7.27 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)	10-C Craven	C	Commercial and Business	0.10	91	9
2)	10-C Craven	C	Woods (good)	0.02	72	1
3)	8-B Caroline	C	Commercial and Business	1.30	91	118
4)	8-B Caroline	C	Road	0.44	98	43
5)	8-B Caroline	C	Woods (good)	0.86	72	62
6)	14-B Emporia	C	Commercial and Business	0.72	91	66
7)	15-D Emporia	C	Commercial and Business	0.20	91	18
8)	15-D Emporia	C	Woods (good)	2.84	72	204
9)	15-D Emporia	C	Road	0.76	98	74
10)	17 - Johnston	D	Road	0.01	98	1
11)	17 - Johnston	D	Woods (good)	0.02	79	2
	Total Adjusted CN =			7.27		599
	Composite CN =					82

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Woods (light underbrush)	
Manning's roughness coefficient., n (table 5-7)	0.4	
Length of overland flow, L	250	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.063	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.33	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	0	Feet
Average slope of shallow concentrated flow, s	0	feet per foot
Average velocity, v	0.8	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours

3) Channel or Pipe Flow

Length of channel flow, L	240	Feet
Average velocity of channel flow, v	2.5	feet per second
Travel time, Tt = L/(3600*v)	0.03	hours
Total Time of Concentration =	0.36	hours
or	21	minutes

III. PROPOSED ESTIMATED POND(S) VOLUME ABOVE LOWER STAGE or 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.)
69.0		7060	0			
70.0	1.0	7790	7425	275	7425	275
72.0	2.0	9320	17110	634	24535	909
73.0	1.0	10130	9725	360	34260	1269
74.0	1.0	14545	12337.5	457	46598	1726
75.0	1.0	19605	17075	632	63673	2358
76.0	1.0	21250	20428	757	84100	3115
78.0	2.0	24715	45965	1702	130065	4817
80.0	2.0	28634	53349	1976	183414	6793

IV. DETERMINING REQUIRED WATER QUALITY VOLUME

Percent Impervious of the BMP Watershed, Post-Development	60%	
Drainage Area of the BMP Watershed	7.27	acres
Impervious Acres of BMP Watershed	4.36	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) *	4.36	=	31668 cu. Ft
1/2 WQ_v =	15834 cu. Ft		Required Volume for Permanent Pool
	34260 cu. Ft		Design Volume for Permanent Pool
1/2 WQ_v =	15834 cu. Ft		Volume to be Released in 24-Hours

Elevation of 1/2 WQv =

Elevation of release inlet for 1/2 water quality volume =

Average head, in feet, on release inlet = #VALUE!

Average release rate calculation

$$\frac{15{,}834.1 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 0.2 \text{ cfs}$$

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

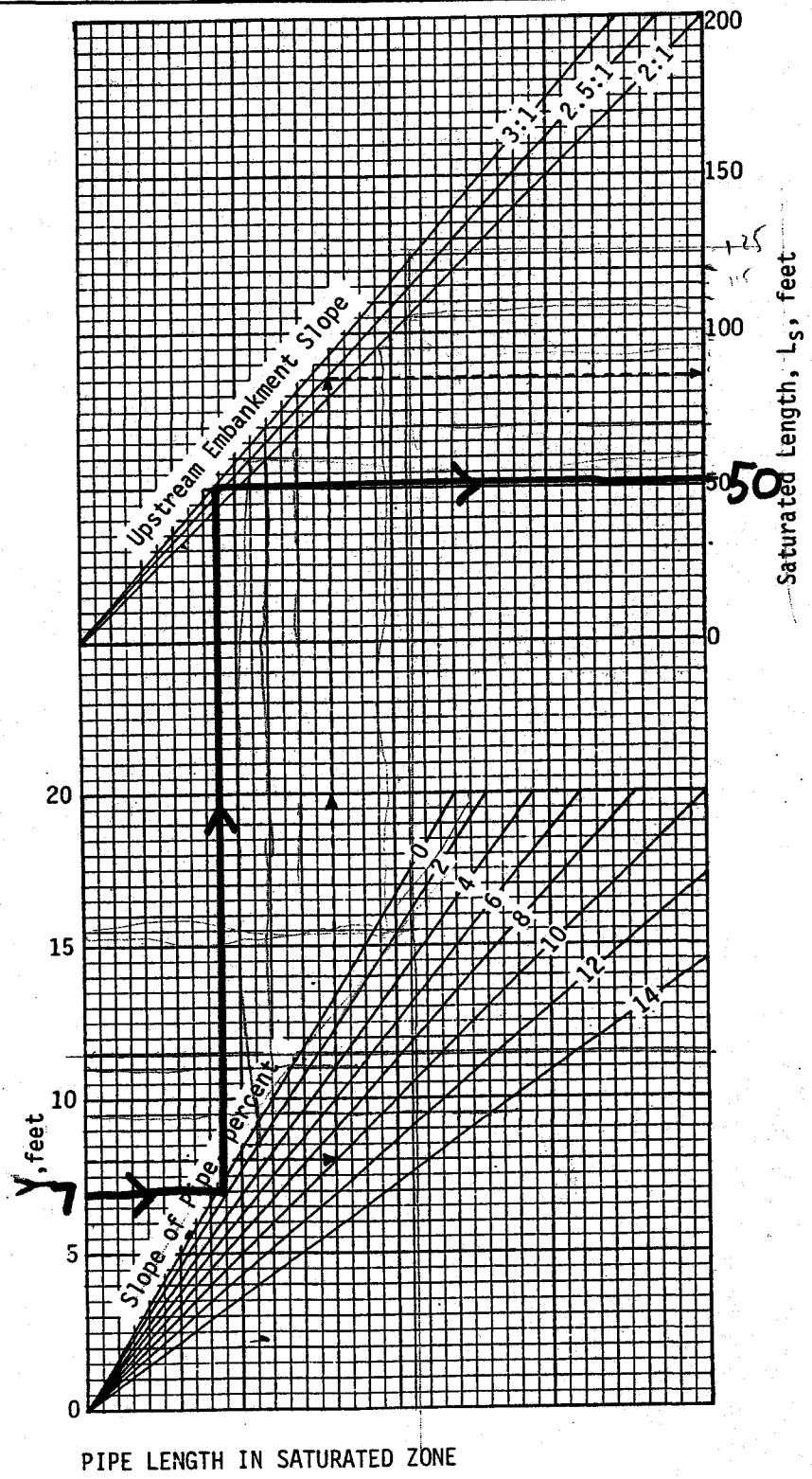
Diameter of Release Inlet = #VALUE! feet, or #VALUE! inches

100% of Water Quality Volume is stored in normal pool. No routing of WQV required.

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

Area=	7.27 Acres, or	0.0114 sq. mi.
CN=	82	
Tc=	0.36 hr.	
P=	1.8 in.	(Rainfall depth for 1-year return period)
Ia=	0.427	Initial abstraction is all losses before runoff begins. Ie surface depressions, water intercepted by vegitation, evaporation.....(SeeTR55 Chapter 2, Equation 2-1)
Qu=	624.64 csm/in.	Unit Peak Discharge - Peak discharge per square mile per inch of runoff (Units are "cubic square miles per ing
Direct Runoff=	0.5 in.	Runoff in inches (See TR55 Chapter 2, Equation 2-1)
Qi=	3.81 cfs	Peak Inflow Discharge
Qo/Qi=	0.028	Ratio of Peak Inflow Discharge to Peak Outflow Discharge (See TR55 Chapter 6)
Qo=	0.11 cfs	Peak Outflow Discharge (See TR55 Chapter 6) Taken from Maryland Dept. of Stormwater Management Appendix D.11, figured.11.2. The curve for 24hr detention used in Chart 1 was scaled and a curve was fit to the data points. The resulting equation, which appears on the chart yields a very good fit.
Vs/Vr=	0.643	Ratio of Volume Stored to Volume Released (See TR55 . Chapter 6). Value Computed using equation for Figure 6-1 as shown in Appendix F
Vs=	0.209 Ac-ft 9,124 cu. ft.	Required Storage Volume
Average Flow Rate (Qo)=	0.11 cfs	
Average Head=	2.5 ft	
Area of Orifice=	0.01 sq. ft.	
Orifice Diameter=	0.13 ft. 1.6 in.	(3" orifice used in design)

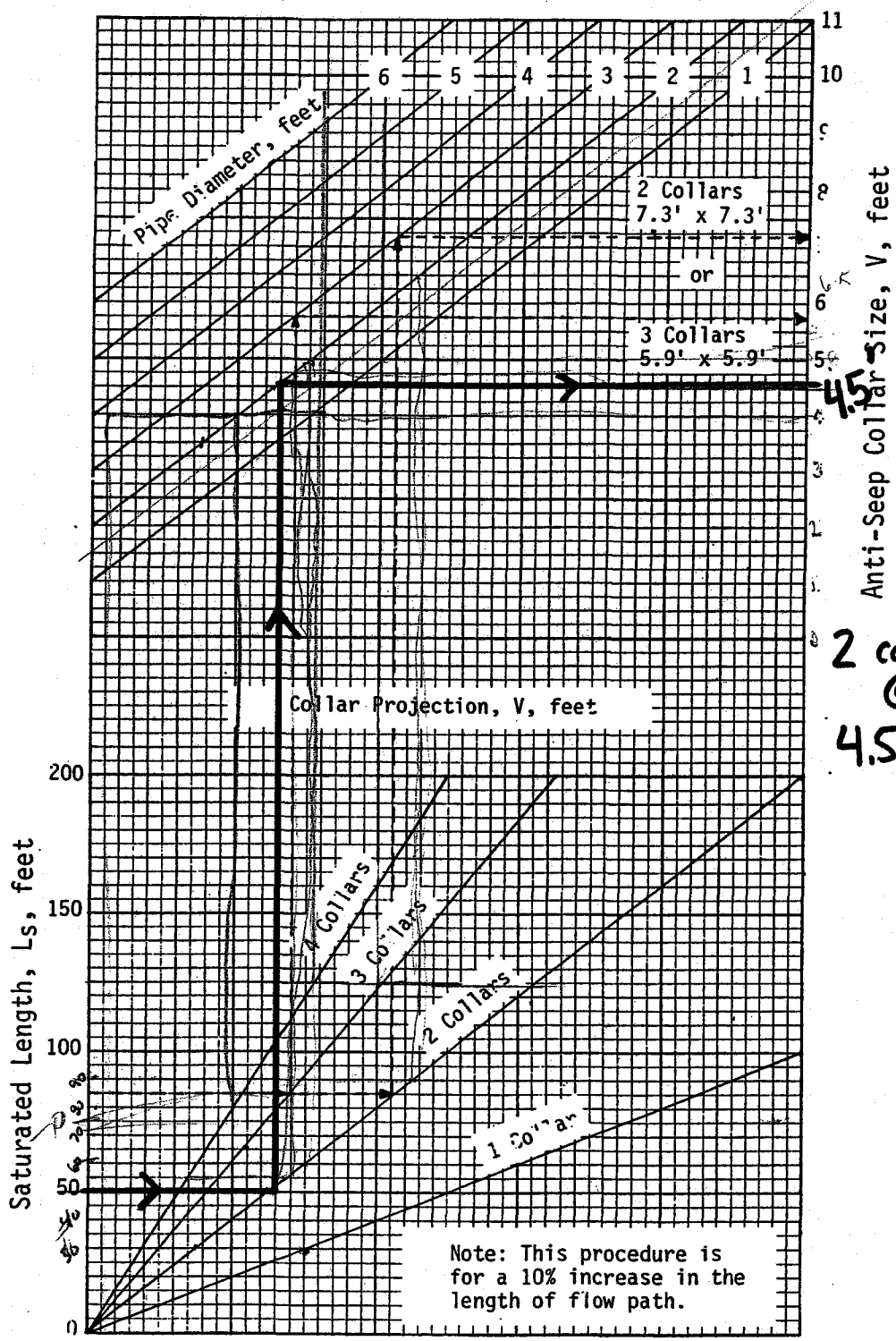
BASIN 1 1/2



Source: USDA-SCS

Plate 3.14-11

BASIN 1 2/2



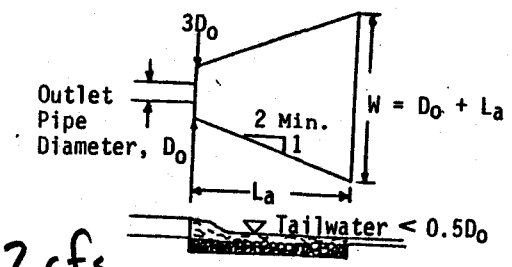
NUMBER OF ANTI-SEEP COLLARS REQUIRED

Source: USDA-SCS

Plate 3.14-12

SED. BASIN 1

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

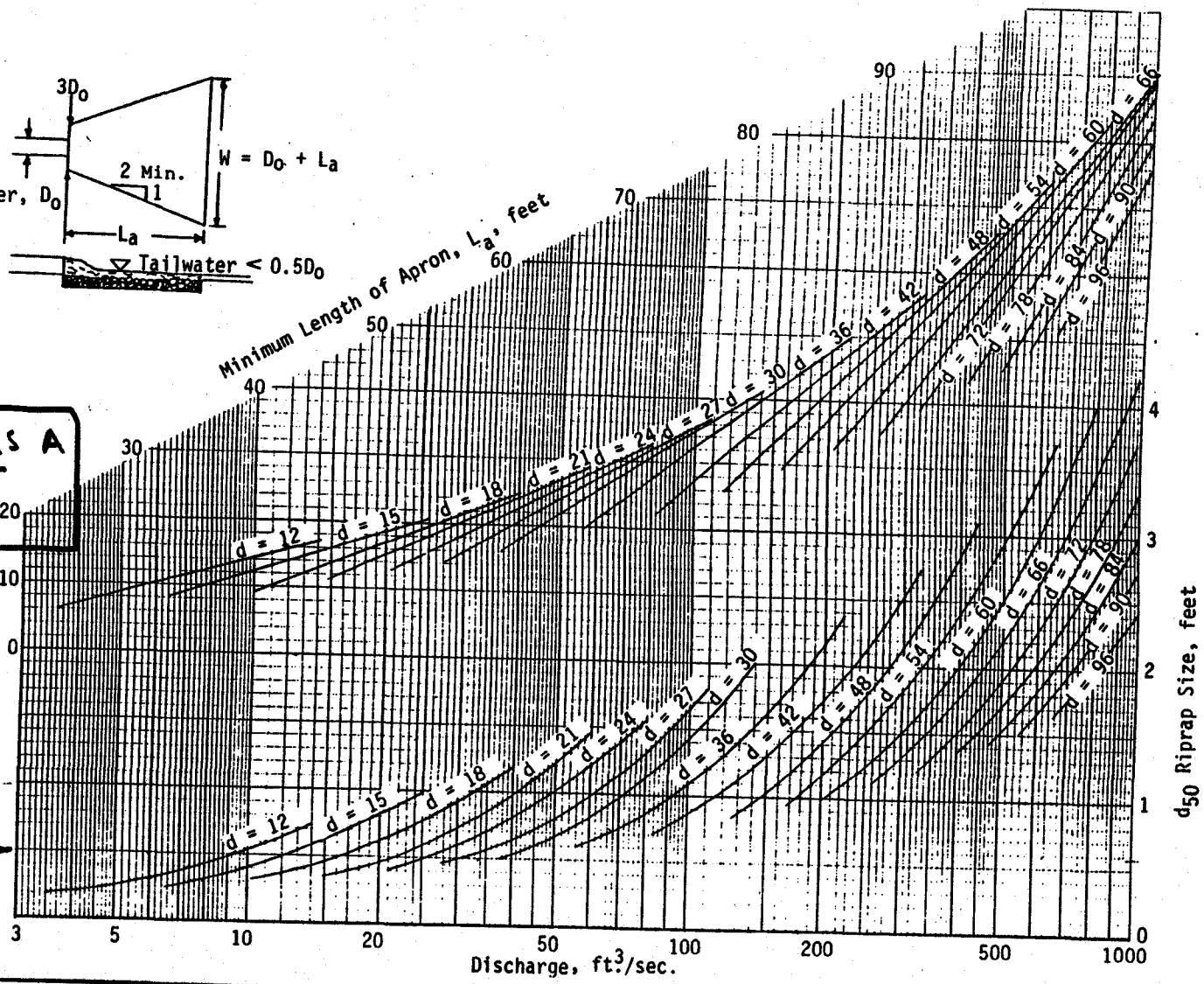


Q_{10} = 2.2 cfs

Ø = 24" x 2

Use 10'x10' AS A MIN. OUTLET PROTECTION

USE WITH SIZE PIPE SHOWN



Source: USDA-SCS

Plate 3.18-3

AES Projet No.: 8818-4
Project Title: BMP 1; WINDSORMEADE WAY 1-Year Channel Protection Volur

CONSULTING ENGINEERS

Channel Protection

Channel Protection Volume

Post Development Watershed Data

Area = 7.27 Acres 0.0114sq.mi.
Runoff Curve No. = 82
Time of Concentration = 0.360 hr.
Return Period = 1 Yr.

Runoff Depth = 2.8 in.

Initial Abstraction (From TR55 Equation 2-2)

Ia = (200/CN)-2

Ia = 0.439

Unit Peak Discharge (From TR55 Equation for Exhibit 4)

log(Qu) = C0+C1 log(Tc)+C2(log(Tc))²

Qu = 622.16 csm/in

Ratio of Peak Outflow Discharge to Peak Inflow Discarge

(From Maryland Stormwater Design Manual Figure D.11.2)

Qo/Qi = 0.028

Ratio of Volume of Storage to Volume of Runoff (From TR55 Figure 6.1)

Vs/Vr = C0+C1(Qo/Qi)+C2(Qo/Qi)²+C3(Qo/Qi)³

Vs/Vr = 0.643

Vs = 0.477 Ac-Ft
Vs = 20762 cu.ft.

Table F-2

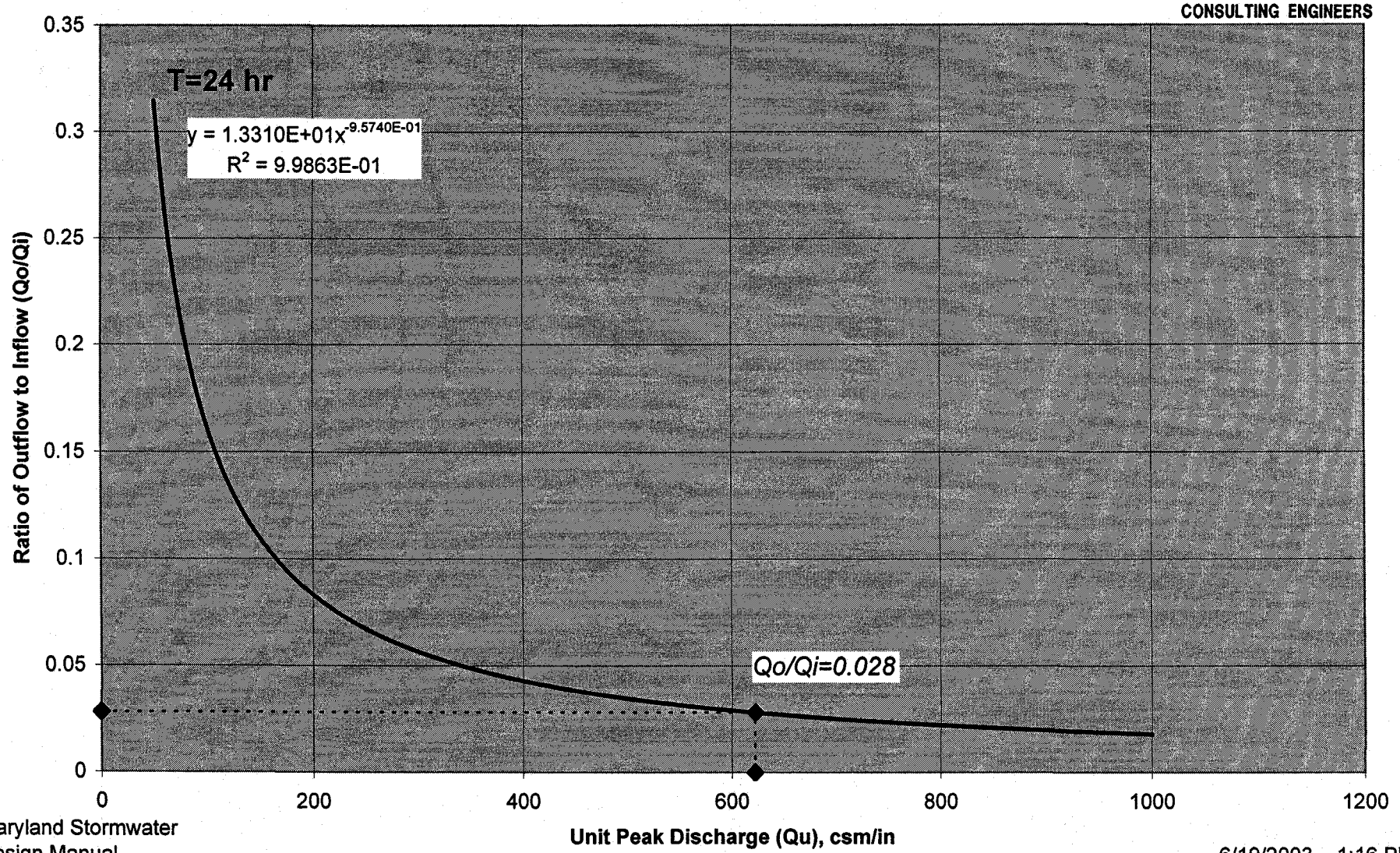
Coefficients for the equations used to generate figure 6-1

Rainfall Dist.	C0	C1	C2	C3
I, IA	0.66	-1.76	1.96	-0.73
II, III	0.682	-1.43	1.64	-0.804

Average Release Rate

Qi = 8.65 cfs
Qo/Qi = 0.03
Qo = 0.24 cfs

Detention Time Versus Discharge Ratios



Maryland Stormwater
Design Manual
Appendix D.11
Figure D.11.3

6/19/2003 1:16 PM
BMP1_1yr_24hr.xls
Chart1 1

CALCULATIONS FOR SEDIMENT FOREBAY
WINDSORMEADE WAY, BMP 1

AES Project No.: 8818-4
June 19, 2003

I. SEDIMENT FOREBAY SIZING

Forebay Volume (V) = 1" per Impervious Acre

Percent Impervious of the BMP Watershed, Post-Development	38.5%
Drainage Area to Forebay	7.27 acres
Impervious Acres to Forebay	2.80 acres

Volume Req'd = 10,164 cu.ft. ✓

WET 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.)
69.0		1854	0			
70.0	1.0	2240	2047	76	2047	76
72.0	2.0	3099	5339	198	7386	274
73.0	1.0	3572	3335.5	124	10721.5	397

Volume Provided = 10,722 cu.ft. ✓

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - WM Way BMP 1

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	69.00	7,060	0	0
1.00	70.00	7,790	7,425	7,425
3.00	72.00	9,320	17,110	24,535
4.00	73.00	10,130	9,725	34,260
5.00	74.00	14,545	12,338	46,598
6.00	75.00	19,605	17,075	63,673
7.00	76.00	21,250	20,428	84,100
9.00	78.00	24,715	45,965	130,065
11.00	80.00	28,634	53,349	183,414

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 24.0	3.0	0.0	0.0
Span in	= 24.0	3.0	0.0	0.0
No. Barrels	= 2	1	0	0
Invert El. ft	= 74.00	74.00	0.00	0.00
Length ft	= 122.0	0.0	0.0	0.0
Slope %	= 0.42	0.00	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 7.00	150.00	0.00	0.00
Crest El. ft	= 76.00	80.10	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Rect	Broad	---	---
Multi-Stage	= Yes	No	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	69.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
1.00	7,425	70.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
3.00	24,535	72.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	34,260	73.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
5.00	46,598	74.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	63,673	75.00	0.25	0.22	---	---	0.00	0.00	---	---	---	0.22
7.00	84,100	76.00	0.33	0.32	---	---	0.00	0.00	---	---	---	0.32
9.00	130,065	78.00	41.96	0.16	---	---	41.80	0.00	---	---	---	41.95
11.00	183,414	80.00	60.79	0.09	---	---	60.69	0.00	---	---	---	60.78

Hydrograph Plot

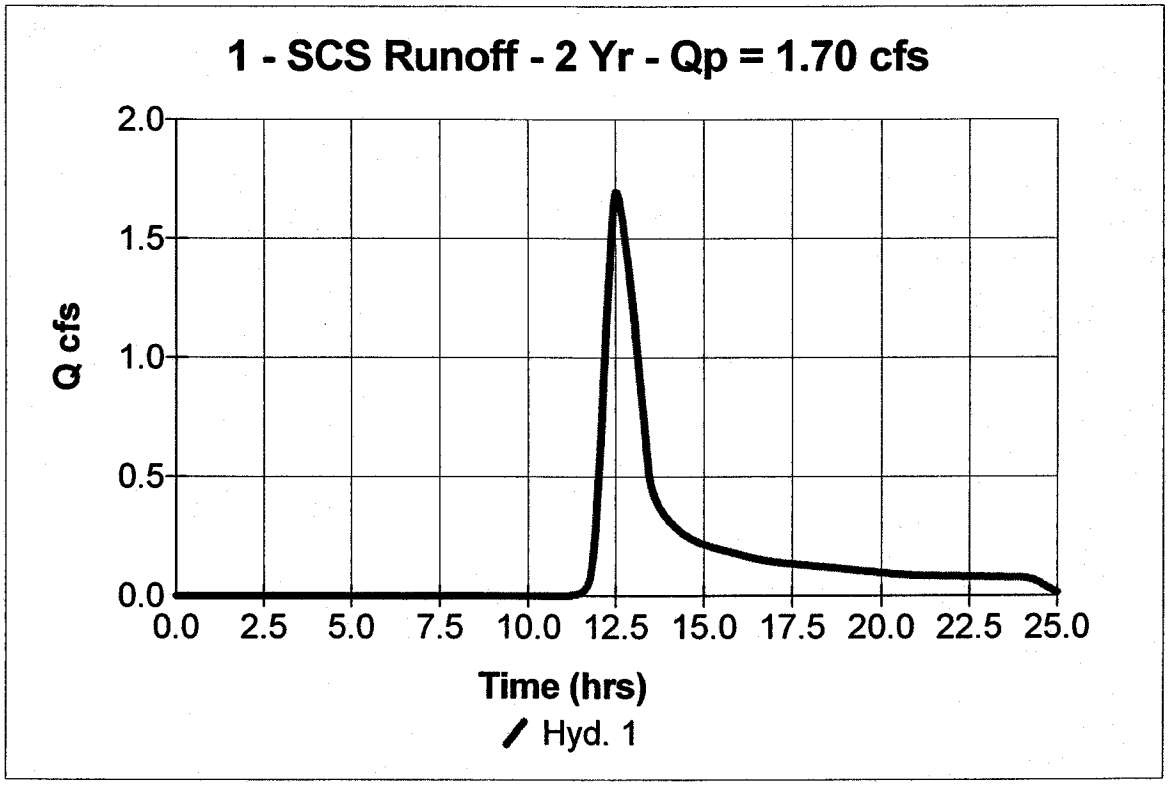
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 1.70 cfs
Storm frequency	= 2 yrs	Time interval	= 2 min
Drainage area	= 2.94 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 58 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,963 cuft



Hydrograph Plot

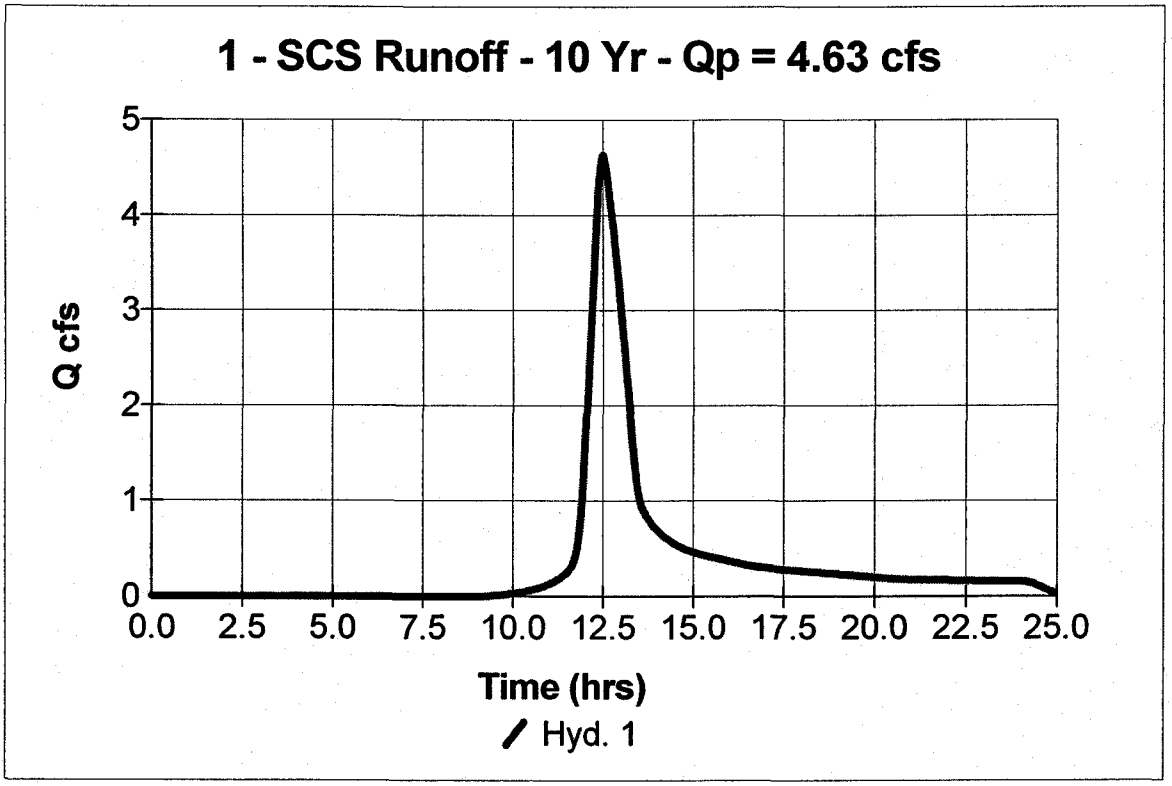
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

PRE-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 4.63 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Drainage area	= 2.94 ac	Curve number	= 72
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 58 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 30,207 cuft



Hydrograph Plot

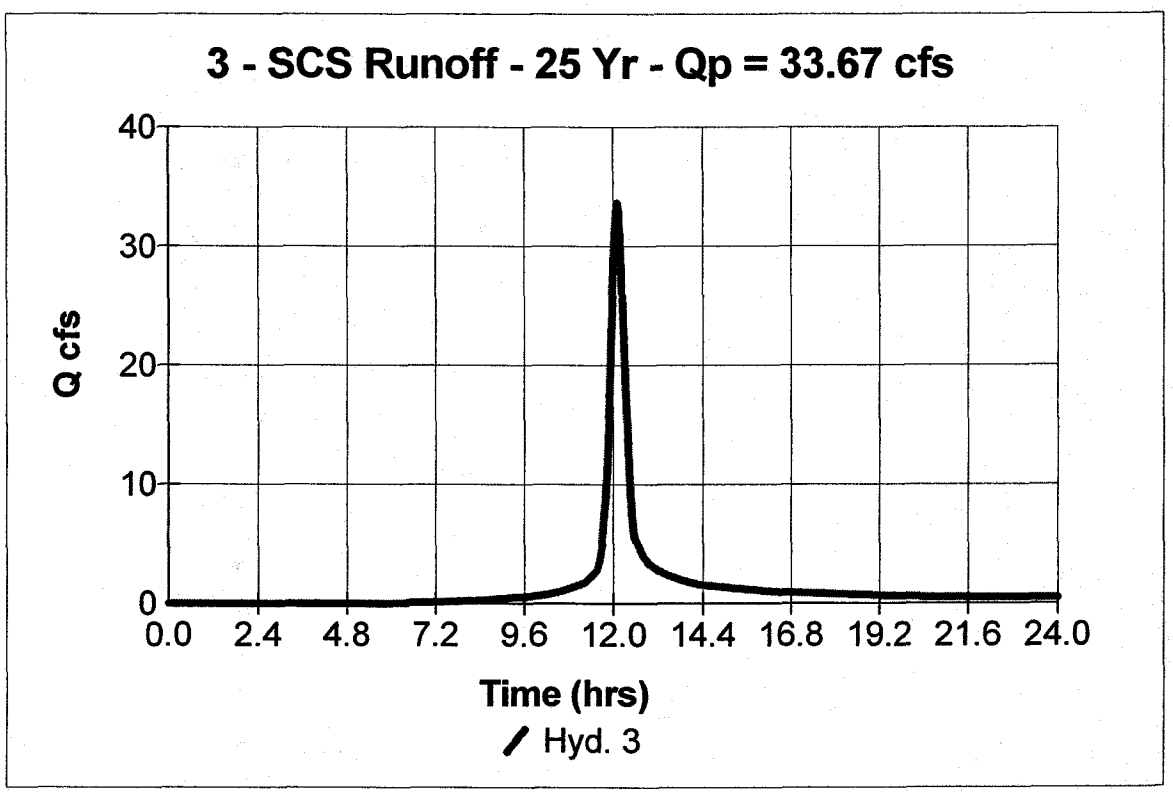
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 33.67 cfs
Storm frequency	= 25 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 117,025 cuft



Hydrograph Plot

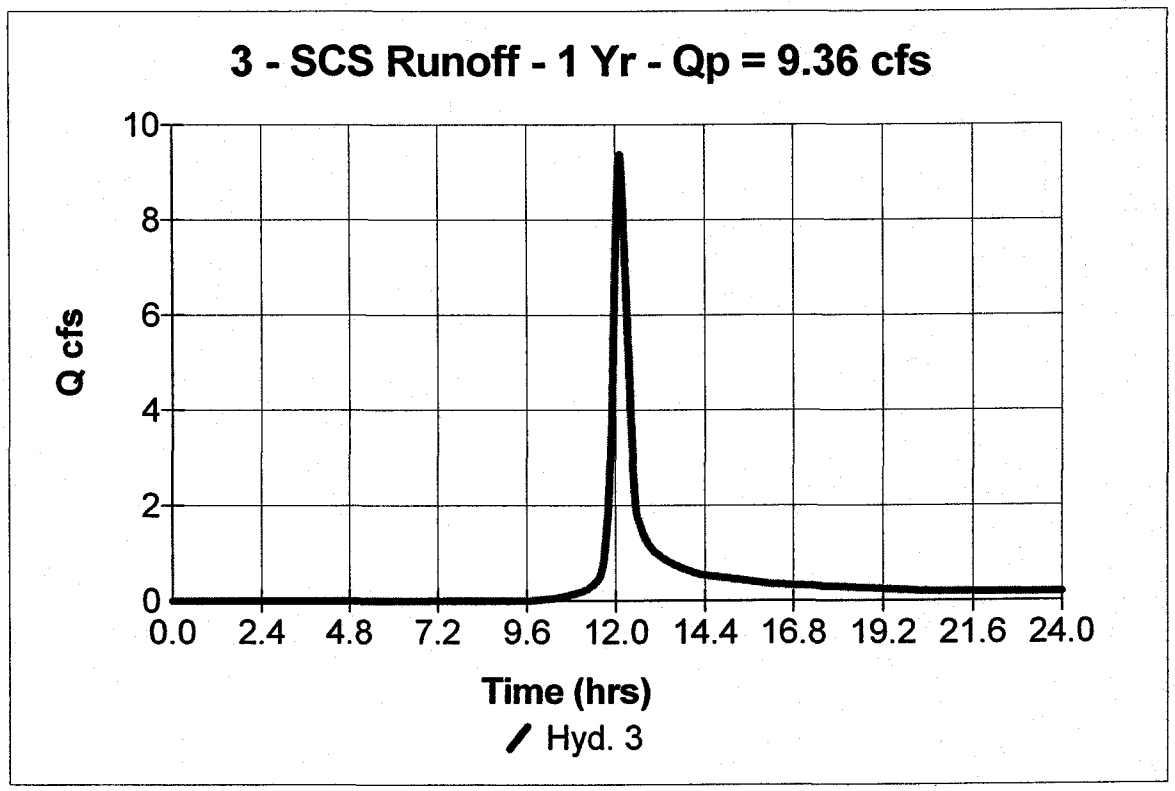
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 9.36 cfs
Storm frequency	= 1 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 32,864 cuft



Hydrograph Plot

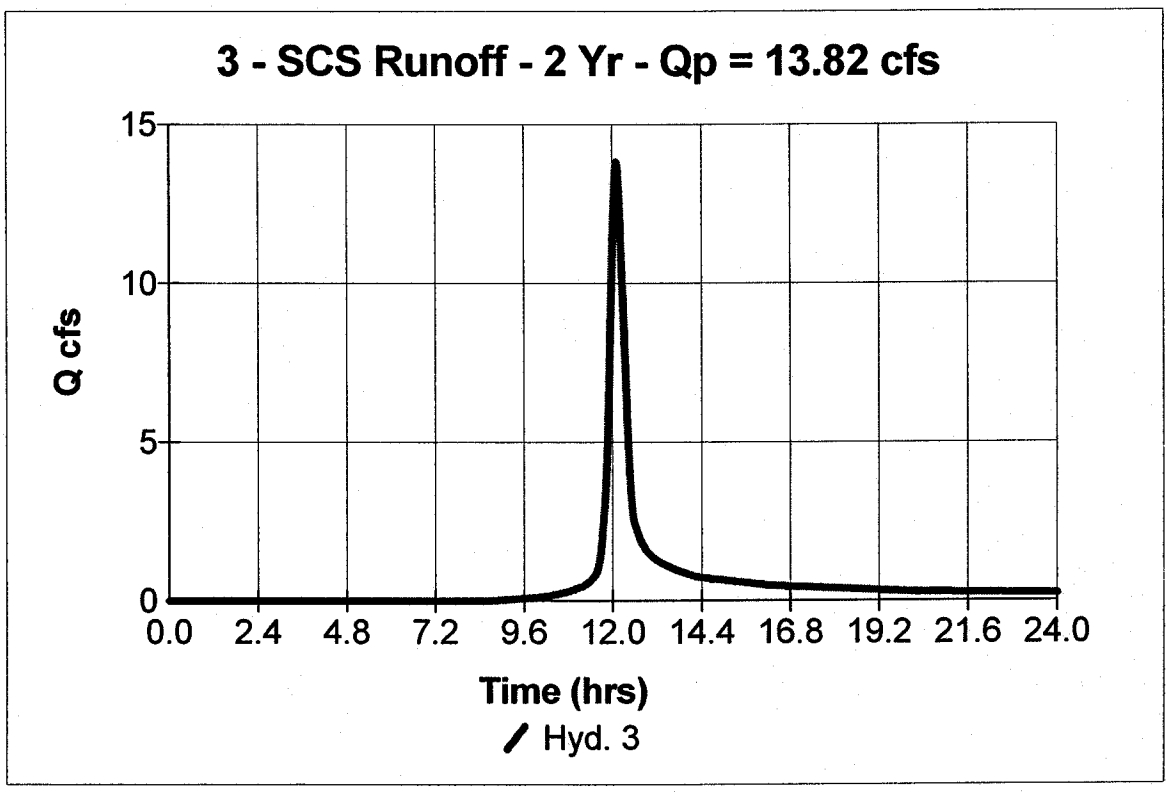
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 13.82 cfs
Storm frequency	= 2 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 47,883 cuft



Hydrograph Plot

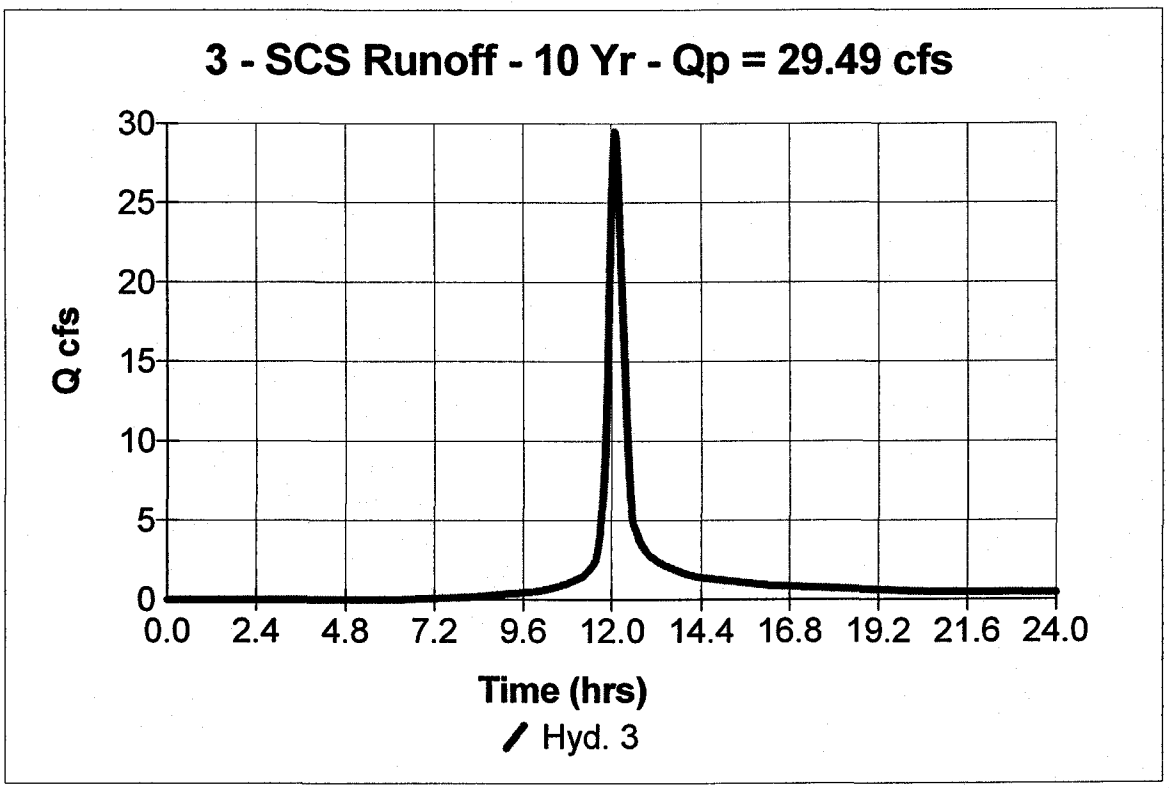
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 29.49 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 102,169 cuft



Hydrograph Plot

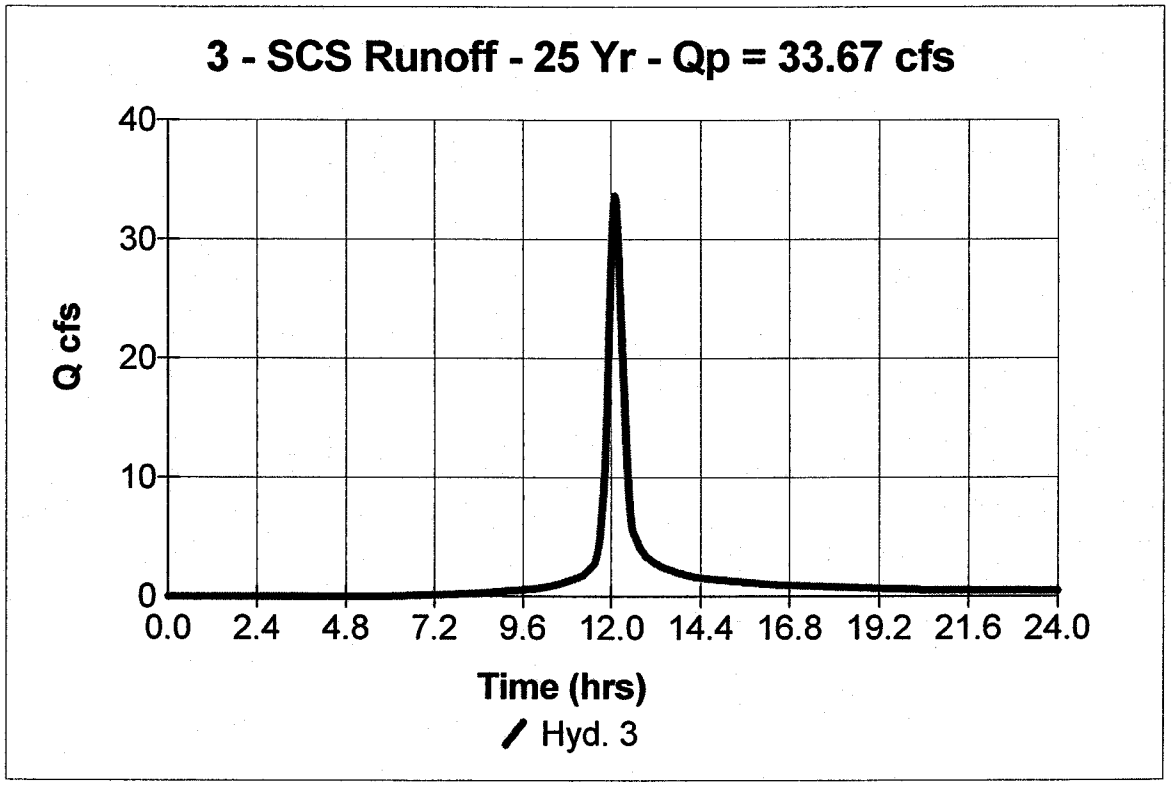
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 33.67 cfs
Storm frequency	= 25 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 117,025 cuft



Hydrograph Plot

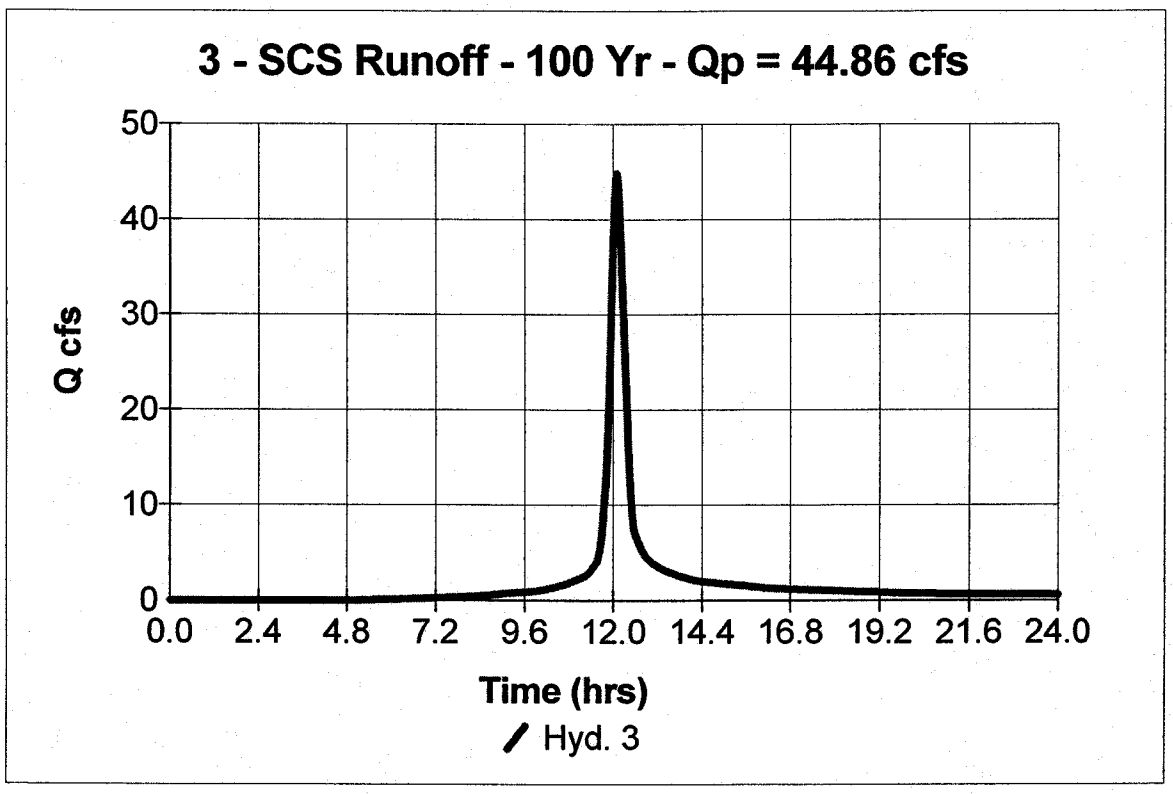
Hydraflow Hydrographs by Intelisolve

Hyd. No. 3

POST-DEVELOPMENT

Hydrograph type	= SCS Runoff	Peak discharge	= 44.86 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Drainage area	= 7.27 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 21 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 157,401 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

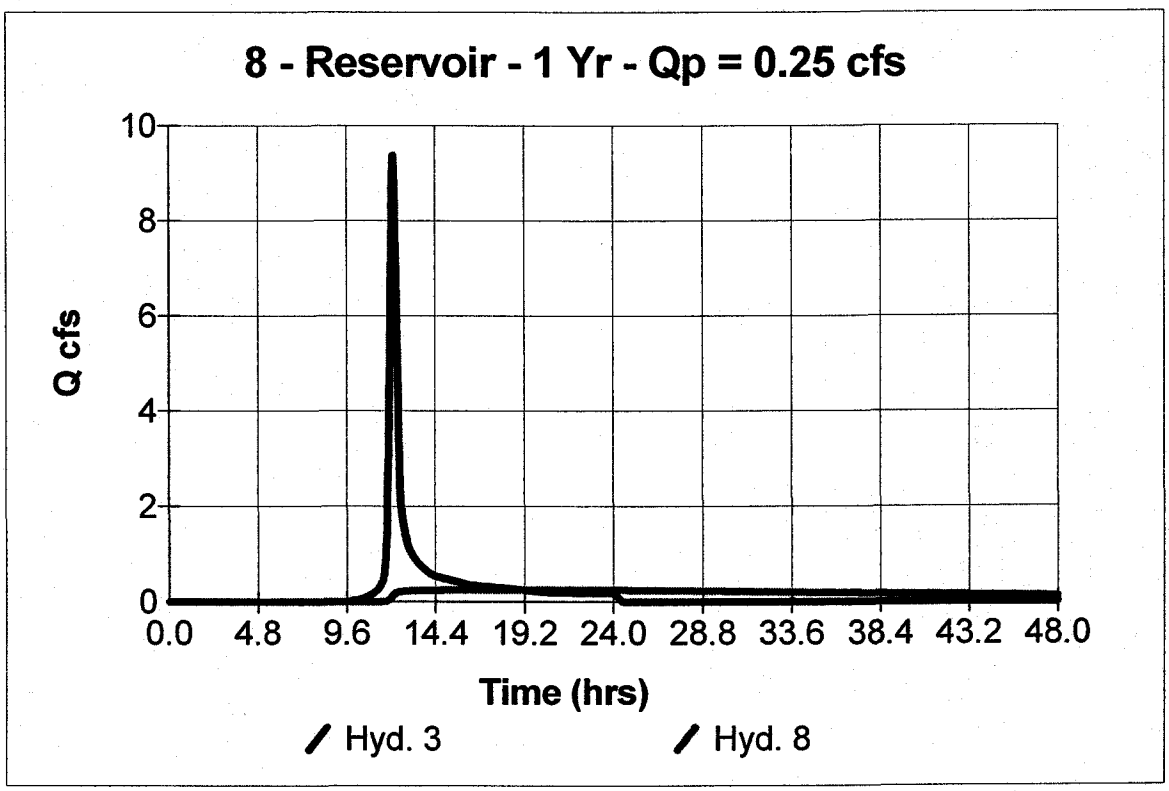
Hyd. No. 8

Wet Pond Route-no t.w.

Hydrograph type	= Reservoir	Peak discharge	= 0.25 cfs
Storm frequency	= 1 yrs	Time interval	= 2 min
Inflow hyd. No.	= 3	Reservoir name	= WM Way BMP 1
Max. Elevation	= 75.29 ft	Max. Storage	= 69,521 cuft

Storage Indication method used.

Hydrograph Volume = 26,667 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

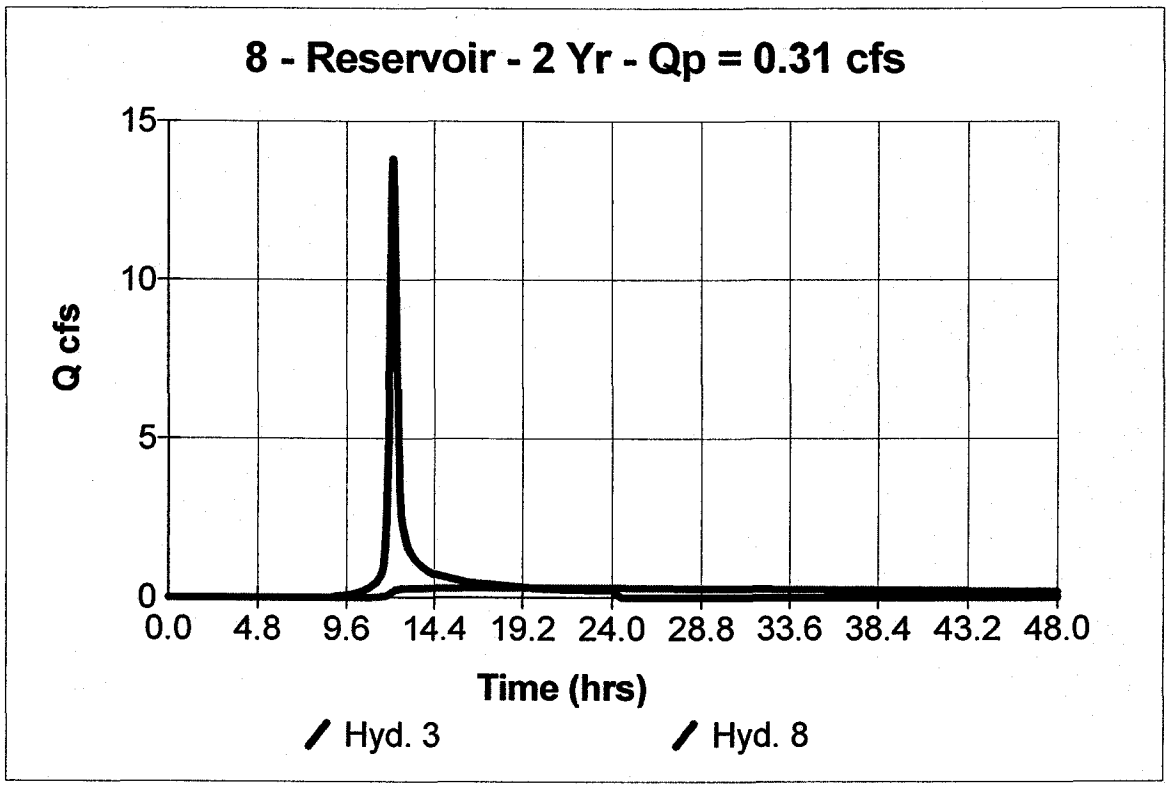
Hyd. No. 8

Wet Pond Route-no t.w.

Hydrograph type	= Reservoir	Peak discharge	= 0.31 cfs
Storm frequency	= 2 yrs	Time interval	= 2 min
Inflow hyd. No.	= 3	Reservoir name	= WM Way BMP 1
Max. Elevation	= 75.89 ft	Max. Storage	= 81,769 cuft

Storage Indication method used.

Hydrograph Volume = 34,909 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

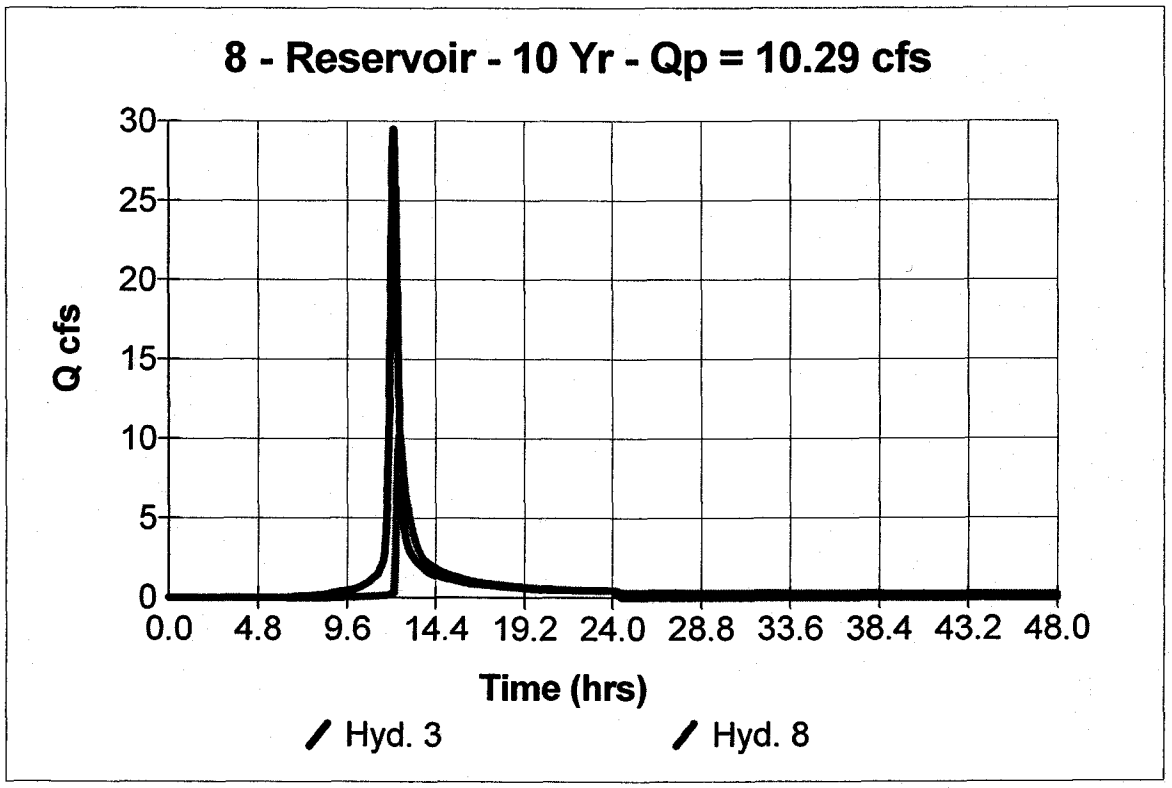
Hyd. No. 8

Wet Pond Route-no t.w.

Hydrograph type	= Reservoir	Peak discharge	= 10.29 cfs
Storm frequency	= 10 yrs	Time interval	= 2 min
Inflow hyd. No.	= 3	Reservoir name	= WM Way BMP 1
Max. Elevation	= 76.57 ft	Max. Storage	= 97,106 cuft

Storage Indication method used.

Hydrograph Volume = 87,080 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

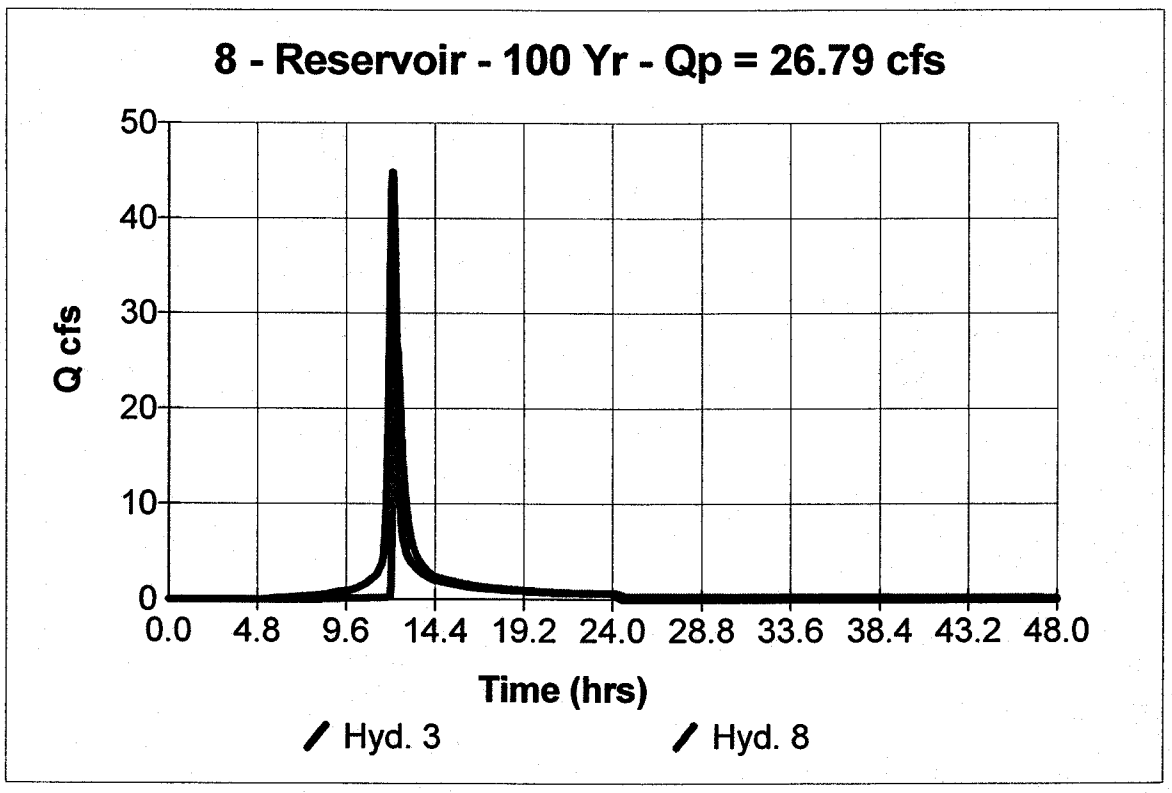
Hyd. No. 8

Wet Pond Route-no t.w.

Hydrograph type	= Reservoir	Peak discharge	= 26.79 cfs
Storm frequency	= 100 yrs	Time interval	= 2 min
Inflow hyd. No.	= 3	Reservoir name	= WM Way BMP 1
Max. Elevation	= 77.15 ft	Max. Storage	= 110,416 cuft

Storage Indication method used.

Hydrograph Volume = 142,148 cuft



AES JOB# 8818-4

1992

3.14

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

? No WQ comps for final BMP config.

Project WINDSORMEADE WAY

Basin # SEDIMENT BASIN 2 Location STA. 35+00 ±

Total area draining to basin: 4.4 acres.

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 4.4 acres = 294.8 cu. yds.

2. Available basin volume = 383 cu. yds. at elevation 59.7. (From storage - elevation curve) ✓

3. Excavate 354 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 4.4 acres = 145.2 cu. yds.

5. Elevation corresponding to cleanout level = 58. ✓

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 1.7 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 4.4 acres = 294.8 cu. yds.

8. Total available basin volume at crest of riser* = 1600 cu. yds. at elevation 65.8. (From Storage - Elevation Curve) ✓

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

9. Diameter of dewatering orifice = 3 in.

10. Diameter of flexible tubing = 5 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 65.8

Top of Dam = 70

Design High Water = 66.1 (25-YR STORM)

Upstream Toe of Dam = 56

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We}$ = $\frac{80}{70} = 1.1$

If > 2, baffles are not required _____

If < 2, baffles are required X

Runoff

13. Q_2 = 11.19 cfs (From Chapter 5)

14. Q_{25} = 28.87 cfs (From Chapter 5)

Principal Spillway Design

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

Without emergency spillway, required spillway capacity $Q_p = Q_{25} =$ 28.9 cfs. (riser and barrel)

16. ~~With emergency spillway:~~

~~Assumed available head (h) = _____ ft. (Using Q_2)~~

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

Without emergency spillway:

Assumed available head (h) = 0.3 ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 48* in. Actual head (h) = ____ ft.

(From Plate 3.14-8.) *Mod. EW-11 placed on top of riser ✓

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 182 ft.

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

(From Plate 3.14-7).

19. Barrel diameter = 24 in. PLAN shows 18 inch; Routing 12"

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

20. Trash rack and anti-vortex device

Diameter = N/A inches. EW-11 Trash rack

Height = N/A inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = N/A cfs.

22. Bottom width (b) = N/A 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) = 9.8 ft.

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

Slope of principal spillway barrel (S_b) = 1.5 %

Length of barrel in saturated zone (L_s) = 75 ft.

24. Number of collars required = 3 dimensions = 4.5' x 4.5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 70

Design High Water = 66.1 (25 yr storm)

Emergency Spillway Crest = 70*

Principal Spillway Crest = 65.8

Dewatering Orifice Invert = 59.7

Cleanout Elevation = 58

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 56

* Top of road embankment

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 1 - TEMP SEDIMENT BASIN

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	54.00	00	0	0
2.00	56.00	1,620	1,620	1,620
4.00	58.00	2,365	3,985	5,605
6.00	60.00	3,212	5,577	11,182
8.00	62.00	4,680	7,892	19,074
10.00	64.00	6,380	11,060	30,134
12.00	66.00	8,315	14,695	44,829
14.00	68.00	10,480	18,795	63,624
16.00	70.00	12,880	23,360	86,984

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 12.0	3.0	0.0	0.0
Span in	= 12.0	3.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 59.70	59.70	0.00	0.00
Length ft	= 182.0	1.0	0.0	0.0
Slope %	= 1.44	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	= 4.00	200.00	0.00	0.00
Crest El. ft	= 65.80	71.50	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Rect	Broad	---	---
Multi-Stage	= Yes	No	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	54.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
2.00	1,620	56.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
4.00	5,605	58.00	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
6.00	11,182	60.00	0.09	0.09	---	---	0.00	0.00	---	---	---	0.09
8.00	19,074	62.00	0.34	0.34	---	---	0.00	0.00	---	---	---	0.34
10.00	30,134	64.00	0.47	0.47	---	---	0.00	0.00	---	---	---	0.47
12.00	44,829	66.00	1.75	0.56	---	---	1.19	0.00	---	---	---	1.75
14.00	63,624	68.00	7.42	0.03	---	---	7.38	0.00	---	---	---	7.41
16.00	86,984	70.00	8.14	0.01	---	---	8.11	0.00	---	---	---	8.12

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

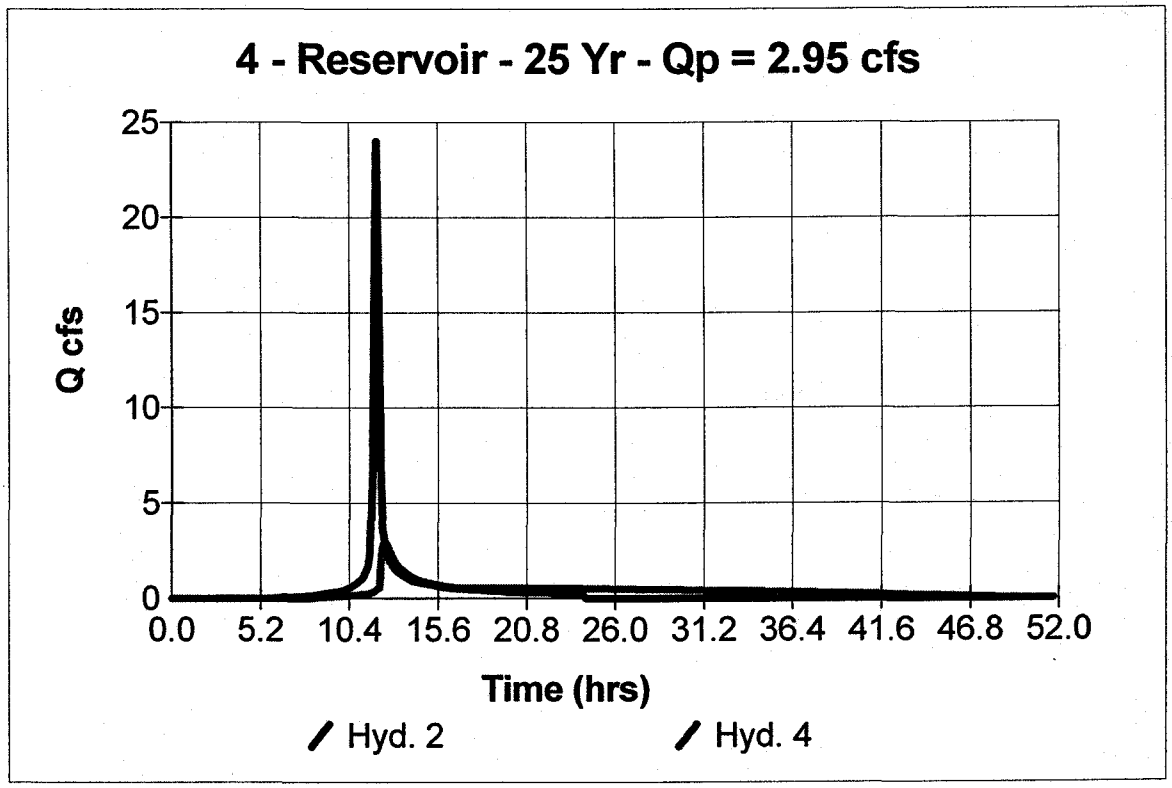
Hyd. No. 4

Sediment basin routed

Hydrograph type	= Reservoir	Peak discharge	= 2.95 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Reservoir name	= TEMP SEDIMENT B
Max. Elevation	= 66.11 ft	Max. Storage	= 45,881 cuft

Storage Indication method used.

Hydrograph Volume = 65,680 cuft



DHW 25 12" using barrel

WINDSORMEADE WAY

CALCULATION FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION

FOR BMP / SWM 2

8818-04

5/14/2003

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 2.31 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)	10-C Craven	C	Woods (good)	0.70	72	50
2)	17 - Johnston	D	Pavement and Roofs (Com.)	0.04	98	4
3)	17 - Johnston	D	Woods (good)	0.08	79	6
4)	15-D Emporia	C	Pavement and Roofs (Com.)	0.29	98	28
5)	15-D Emporia	C	Woods (good)	1.20	72	86
6)					0	0
7)					0	0
	Totals =			2.31		175
	Composite CN =					76

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Woods (light underbrush)	
Manning's roughness coefficient., n (table 5-7)	0.4	
Length of overland flow, L	300	Feet
2-year 24-hour rainfall, P2	3.6	inches
Average slope of overland flow , s	0.097	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.43	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	110	Feet
Average slope of shallow concentrated flow, s	0.054	feet per foot
Average velocity, v	3.6	feet per second
Travel time, Tt = L/(3600*v)	0.01	hours

3) Channel or Pipe Flow

Length of channel flow, L		Feet
Average velocity of channel flow, v	2.5	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours
Total Time of Concentration =	0.44	hours
or	26	minutes

II. POST-DEVELOPMENT CONDITIONS TO POINT OF CONCERN (for total site)

A. Post-Development Drainage Area to Point of Concern = 4.43 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)	15-D Emporia	C	Woods (good)	0.19	72	14
2)	15-D Emporia	C	Road	0.19	98	19
3)	17 - Johnston	D	Woods (good)	0.57	79	45
4)	17 - Johnston	D	Road	0.78	98	76
5)	15-D Emporia	C	Woods (good)	1.50	72	108
6)	15-D Emporia	C	Road	0.51	98	50
7)	10-C Craven	C	Woods (good)	0.69	72	50
8)					0	0
9)					0	0
10)					0	0
11)					0	0
	Total Adjusted CN =			4.43		361
	Composite CN =					82

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Woods (light underbrush)	
Manning's roughness coefficient., n (table 5-7)	0.4	
Length of overland flow, L	200	Feet
25-year 24-hour rainfall, P25	6.5	inches
Average slope of overland flow , s	0.13	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.21	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	unpaved	
Length of shallow concentrated flow, L	0	Feet
Average slope of shallow concentrated flow, s	0	feet per foot
Average velocity, v	0.2	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours

3) Channel or Pipe Flow

Length of channel flow, L	0	Feet
Average velocity of channel flow, v	2.5	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours

Total Time of Concentration =	0.21	hours	
or	12	minutes	

III. PROPOSED ESTIMATED POND(S) VOLUME ABOVE LOWER STAGE or 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.)
54.0		270	0			
56.0	2.0	750	1020	38	1020	38
58.0	2.0	1410	2160	80	3180	118
60.0	2.0	2170	3580	133	6760	250
62.0	2.0	3205	5375	199	12135	449
64.0	2.0	4945	8150	302	20285	751
66.0	2.0	7550	12495	463	32780	1214
68.0	2.0	10185	17735	657	50515	1871
70.0	2.0	13200	23385	866	73900	2737

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

Area=	4.43	Acres, or	0.0069 sq. mi.
CN=	82		
Tc=	0.21	hr.	
P=	1.8	in.	(Rainfall depth for 1-year return period)
Ia=	0.439		Initial abstraction is all losses before runoff begins. Ie surface depressions, water intercepted by vegitation, evaporation.....(SeeTR55 Chapter 2, Equation 2-1)
Qu=	784.97	csm/in.	Unit Peak Discharge - Peak discharge per square mile per inch of runoff (Units are "cubic square miles per ing
Direct Runoff=	0.5	in.	Runoff in inches (See TR55 Chapter 2, Equation 2-1)
Qi=	2.83	cfs	Peak Inflow Discharge
Qo/Qi=	0.023		Ratio of Peak Inflow Discharge to Peak Outflow Discharge (See TR55 Chapter 6)
Qo=	0.06	cfs	Peak Outflow Discharge (See TR55 Chapter 6) Taken from Maryland Dept. of Stormwater Management Appendix D.11, figured.11.2. The curve for 24hr detention used in Chart 1 was scaled and a curve was fit to the data points. The resulting equation, which appears on the chart yields a very good fit.
Vs/Vr=	0.651		Ratio of Volume Stored to Volume Released (See TR55 . Chapter 6). Value Computed using equation for Figure 6-1 as shown in Appendix F
Vs=	0.125	Ac-ft	Required Storage Volume
	5,450	cu. ft.	
Average Flow Rate (Qo)=	0.06	cfs	
Average Head=	3.12	ft	
Area of Orifice=	0.01	sq. ft.	
Orifice Diameter=	0.10	ft.	
	1.2	in.	(3" orrifice used for protection from clogging)

AES Projet No.: 8818-4
Project Title: BMP 2; WINDSORMEADE WAY 1-Year Channel Protection Volur

CONSULTING ENGINEERS

Channel Protection

Channel Protection Volume

Post Development Watershed Data

Area = 4.43 Acres 0.0069sq.mi.
Runoff Curve No. = 82
Time of Concentration = 0.210 hr.
Return Period = 1 Yr.

Runoff Depth = 2.8 in.

Initial Abstraction (From TR55 Equation 2-2)

Ia = (200/CN)-2

Ia = 0.439

Unit Peak Discharge (From TR55 Equation for Exhibit 4)

log(Qu) = C0+C1 log(Tc)+C2(log(Tc))²

Qu = 784.97 csm/in

Ratio of Peak Outflow Discharge to Peak Inflow Discarge

(From Maryland Stormwater Design Manual Figure D.11.2)

Qo/Qi = 0.023

Ratio of Volume of Storage to Volume of Runoff (From TR55 Figure 6.1)

Vs/Vr = C0+C1(Qo/Qi)+C2(Qo/Qi)²+C3(Qo/Qi)³

Vs/Vr = 0.651

Vs = 0.294 Ac-Ft
Vs = 12800 cu.ft.

Table F-2

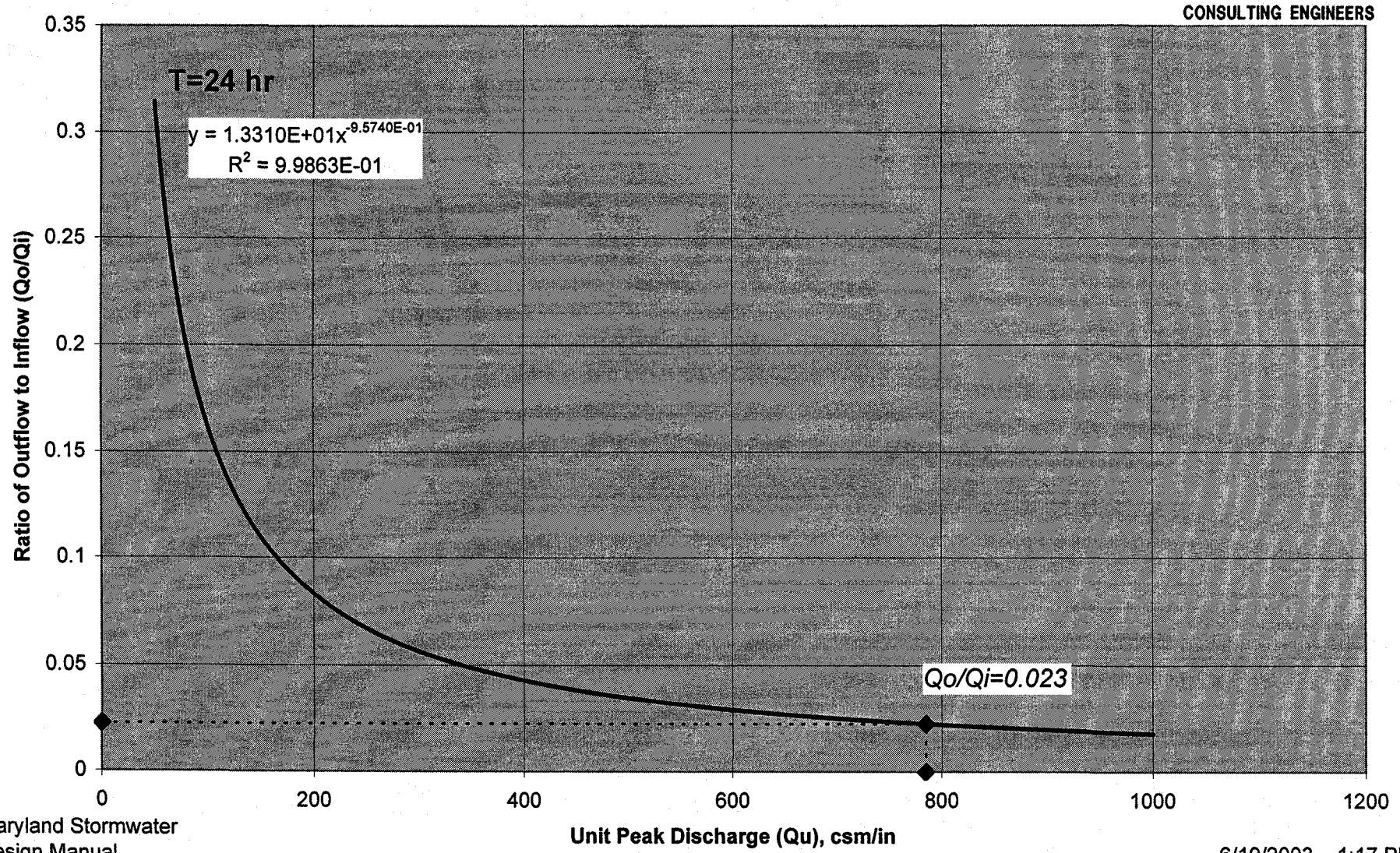
Coefficients for the equations used to generate figure 6-1

Rainfall Dist.	C0	C1	C2	C3
I, IA	0.66	-1.76	1.96	-0.73
II, III	0.682	-1.43	1.64	-0.804

Average Release Rate

Qi = 6.65 cfs
Qo/Qi = 0.02
Qo = 0.15 cfs

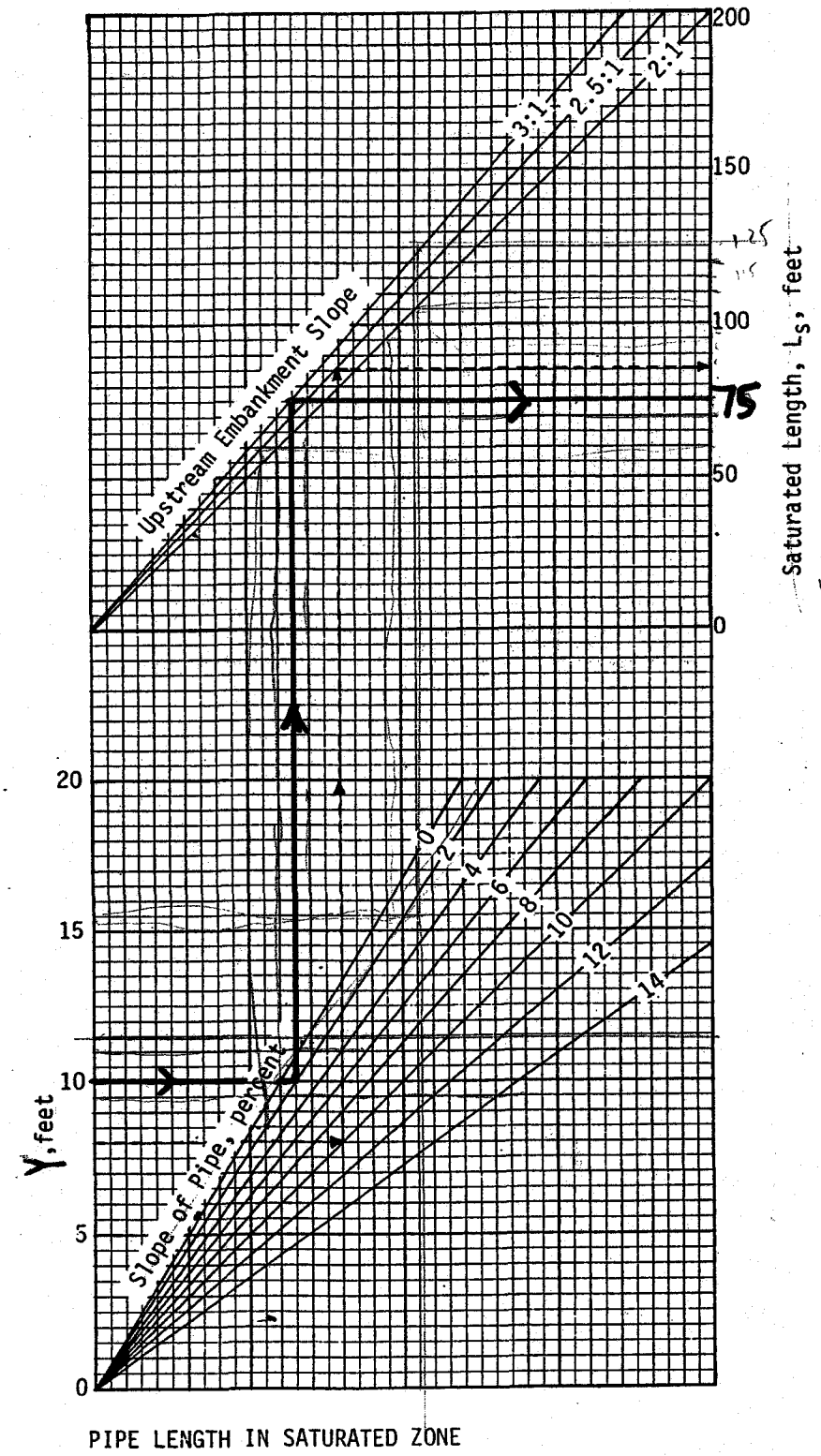
Detention Time Versus Discharge Ratios



Maryland Stormwater
Design Manual
Appendix D.11
Figure D.11.3

6/19/2003 1:17 PM
BMP2_1yr_24hr.xls
Chart1 1

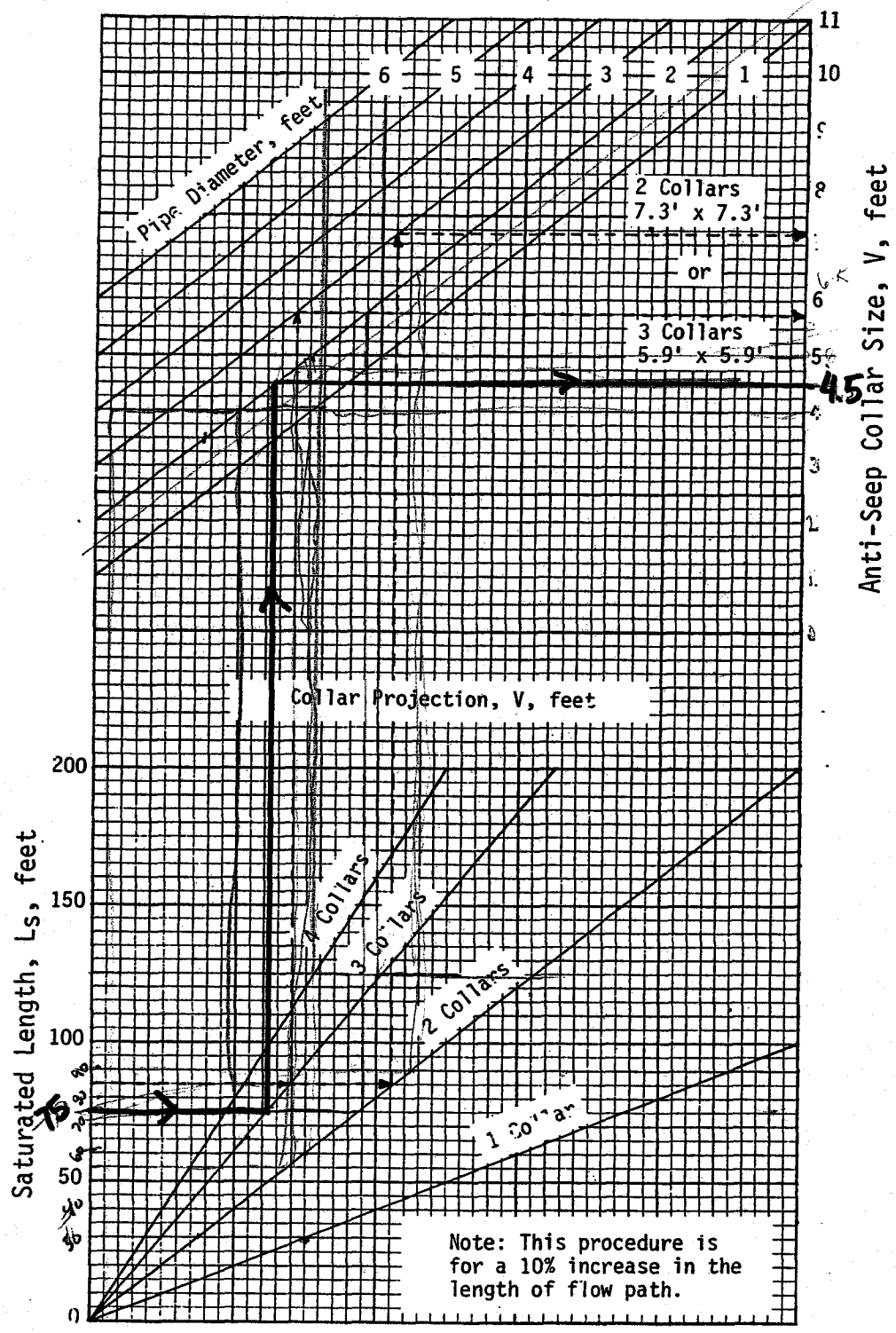
BASIN #2 1/2



Source: USDA-SCS

Plate 3.14-11

BASIN 2 2/2



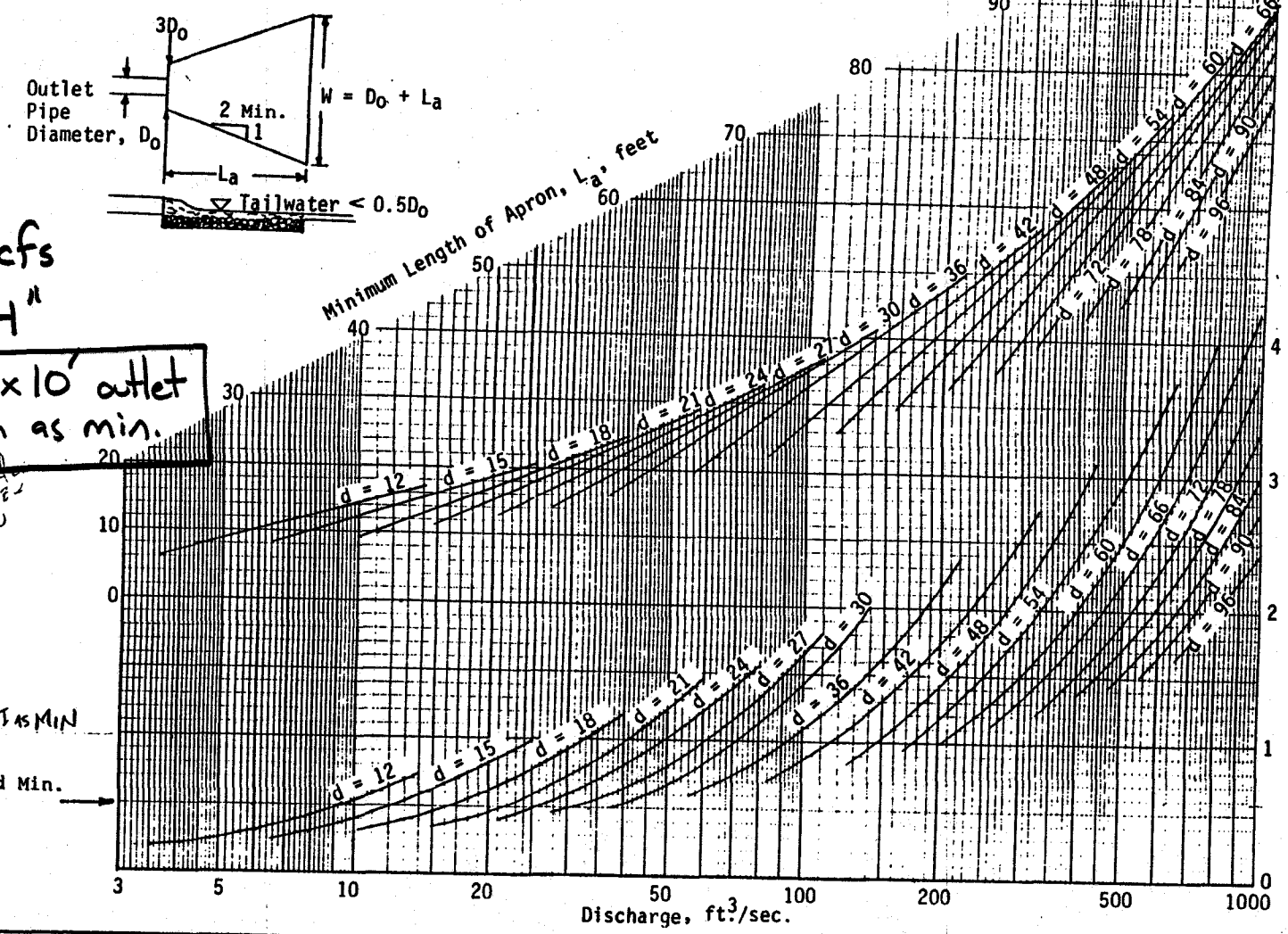
NUMBER OF ANTI-SEEP COLLARS REQUIRED

Source: USDA-SCS

Plate 3.14-12

SED. BASIN #2

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



Q_{10} = 1 cfs

ϕ = 24"

Use 10'x10' outlet protection as min.

USE CLASS I AS MIN

Source: USDA-SCS

Plate 3.18-3

Reservoir Report

Hydraflow Hydrographs by Intelisolve

Reservoir No. 2 - WM WAY BMP 2 (DETENTION)

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	59.67	50	0	0
0.33	60.00	3,212	538	538
2.33	62.00	4,680	7,892	8,430
4.33	64.00	6,380	11,060	19,490
6.33	66.00	8,315	14,695	34,185
8.33	68.00	10,480	18,795	52,980
10.33	70.00	12,880	23,360	76,340

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 24.0	3.0	0.0	0.0
Span in	= 24.0	3.0	0.0	0.0
No. Barrels	= 1	1	0	0
Invert El. ft	= 59.70	59.70	0.00	0.00
Length ft	= 182.0	1.0	0.0	0.0
Slope %	= 1.44	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	= 4.00	200.00	0.00	0.00
Crest El. ft	= 65.80	70.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	0.00	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 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	59.67	0.00	0.00	---	---	0.00	0.00	---	---	---	0.00
0.33	538	60.00	0.10	0.10	---	---	0.00	0.00	---	---	---	0.10
2.33	8,430	62.00	0.34	0.34	---	---	0.00	0.00	---	---	---	0.34
4.33	19,490	64.00	0.50	0.47	---	---	0.00	0.00	---	---	---	0.47
6.33	34,185	66.00	1.91	0.57	---	---	1.19	0.00	---	---	---	1.76
8.33	52,980	68.00	36.54	0.24	---	---	36.29	0.00	---	---	---	36.54
10.33	76,340	70.00	42.63	0.11	---	---	42.52	0.00	---	---	---	42.63

Hydrograph Plot

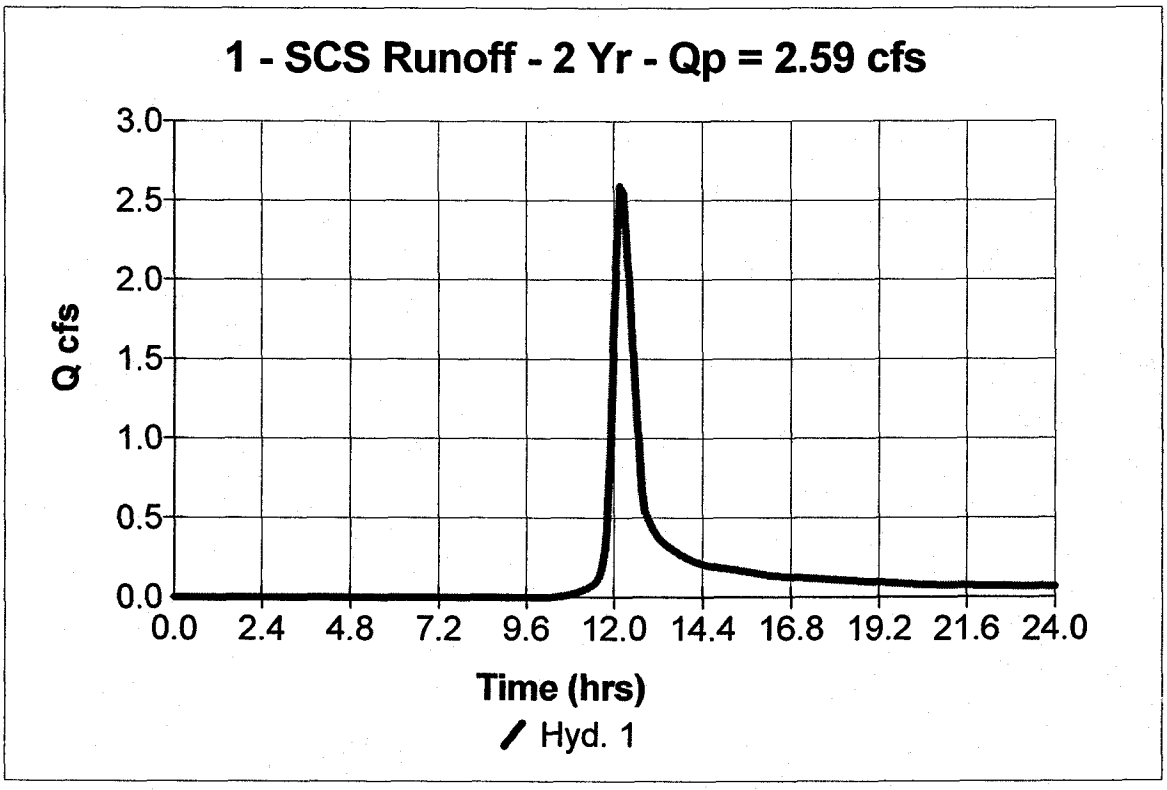
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Pre-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.59 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 2.31 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 26 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 11,806 cuft



Hydrograph Plot

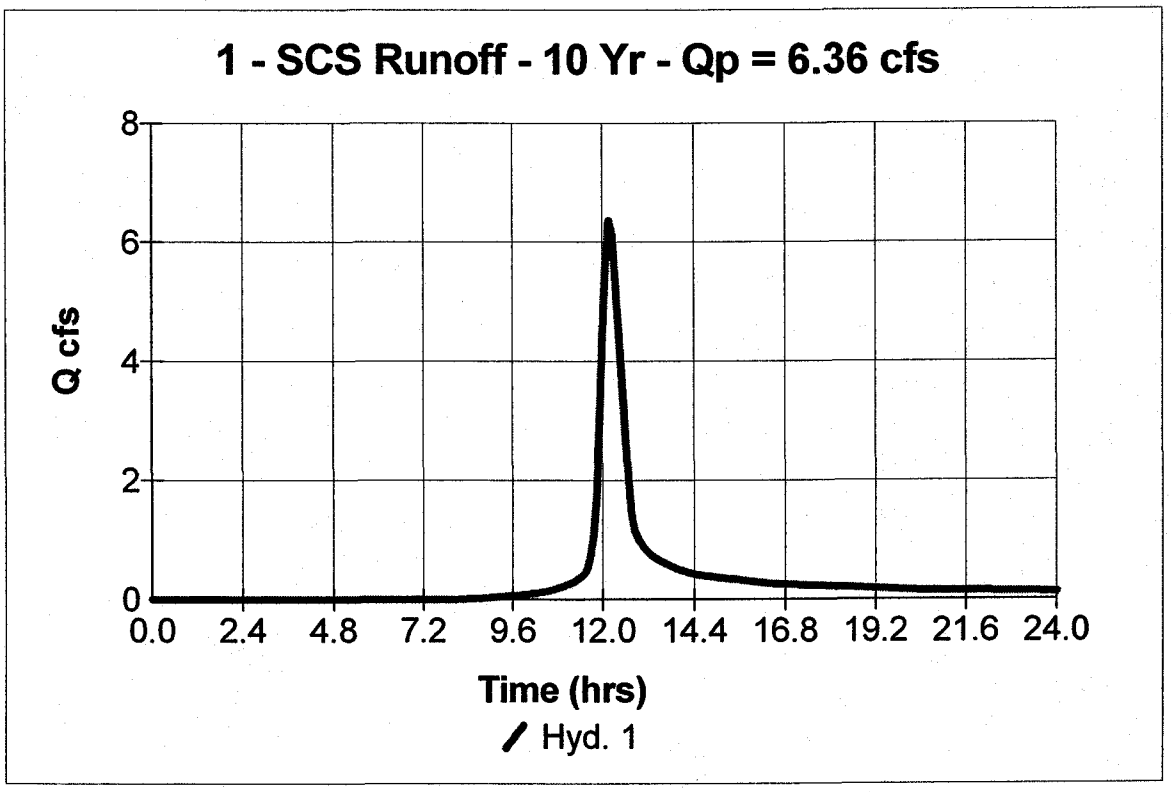
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

Pre-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.36 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 2.31 ac	Curve number	= 76
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 26 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 27,742 cuft



Hydrograph Plot

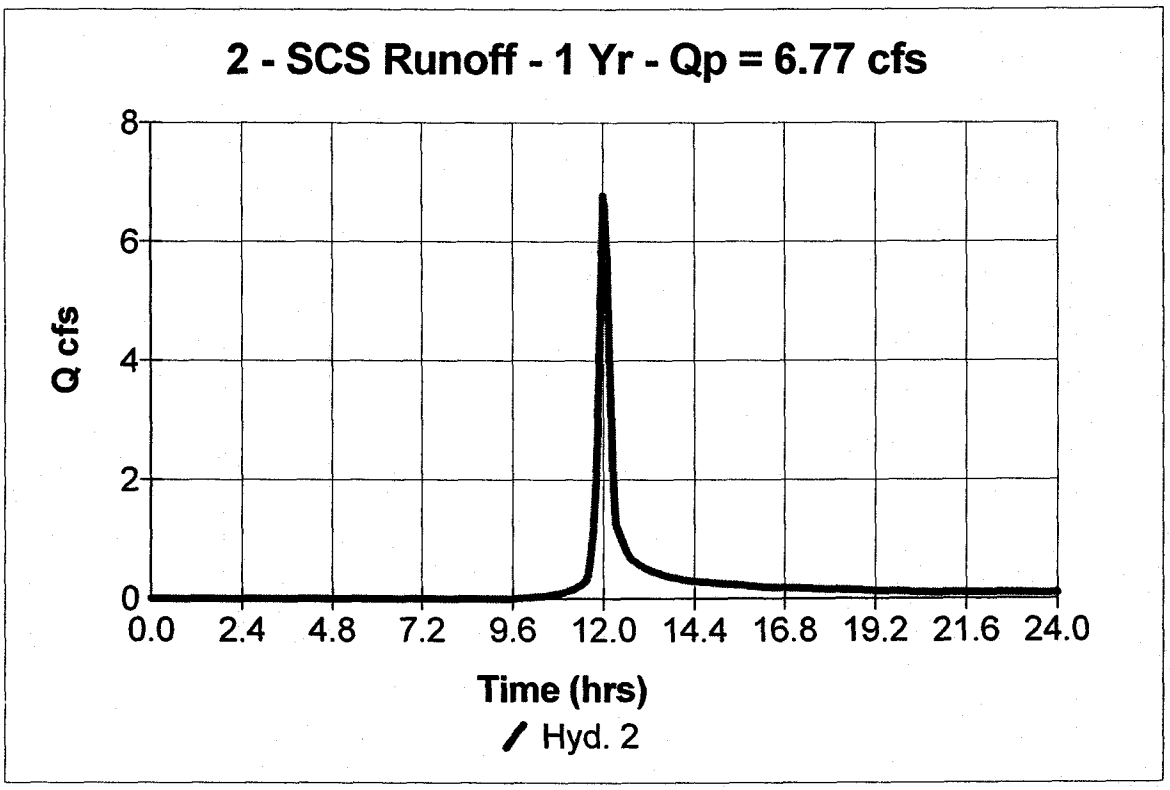
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.77 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Drainage area	= 4.43 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 18,445 cuft



Hydrograph Plot

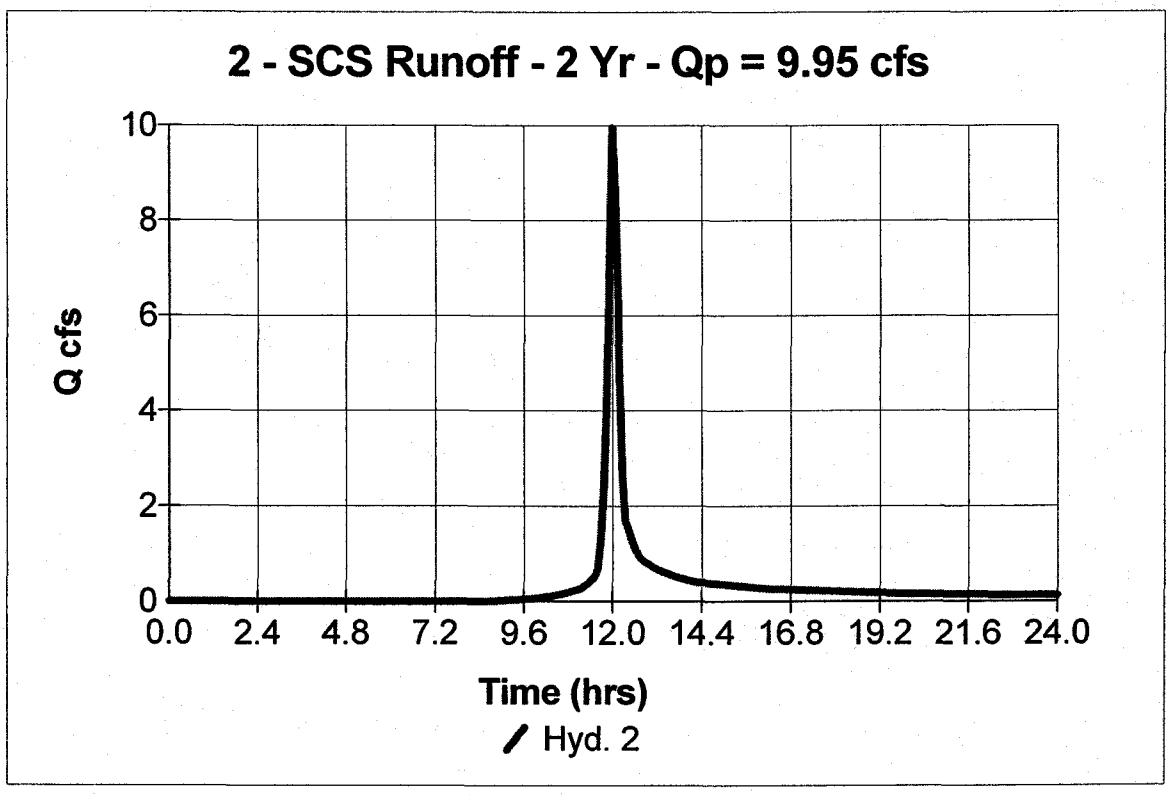
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 9.95 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Drainage area	= 4.43 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 26,874 cuft



Hydrograph Plot

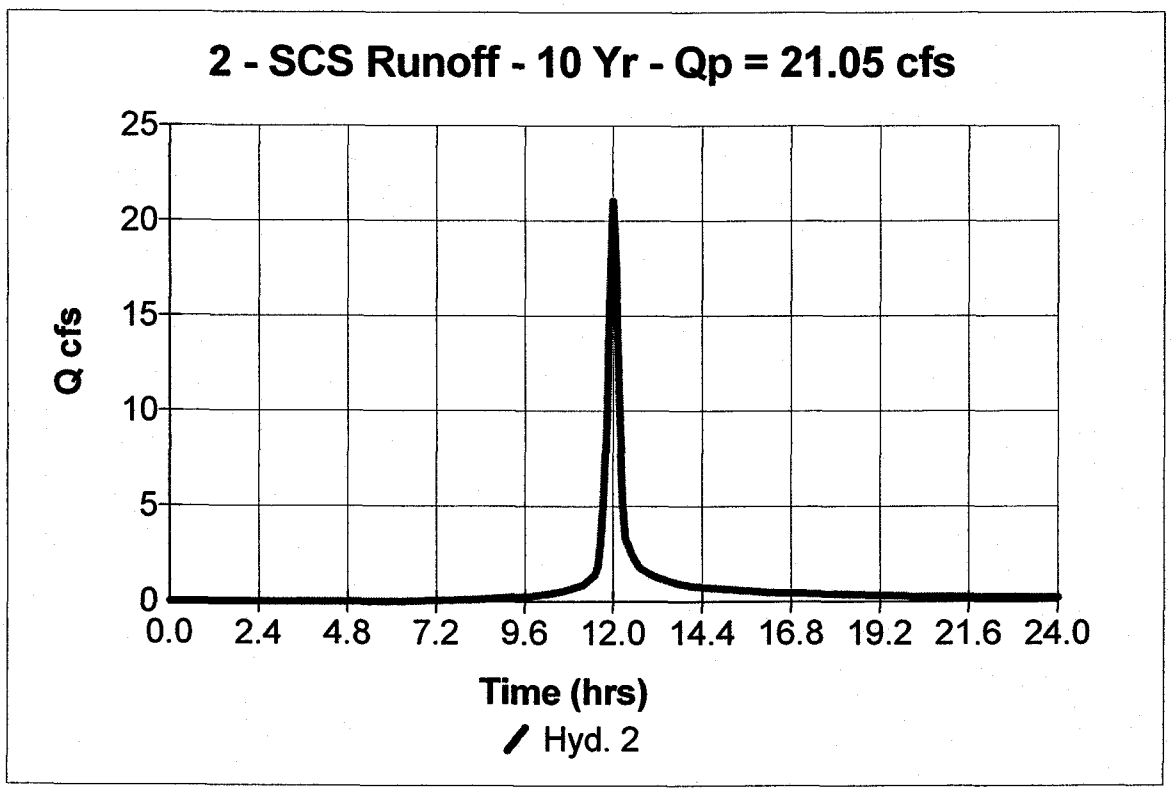
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 21.05 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Drainage area	= 4.43 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 57,342 cuft



Hydrograph Plot

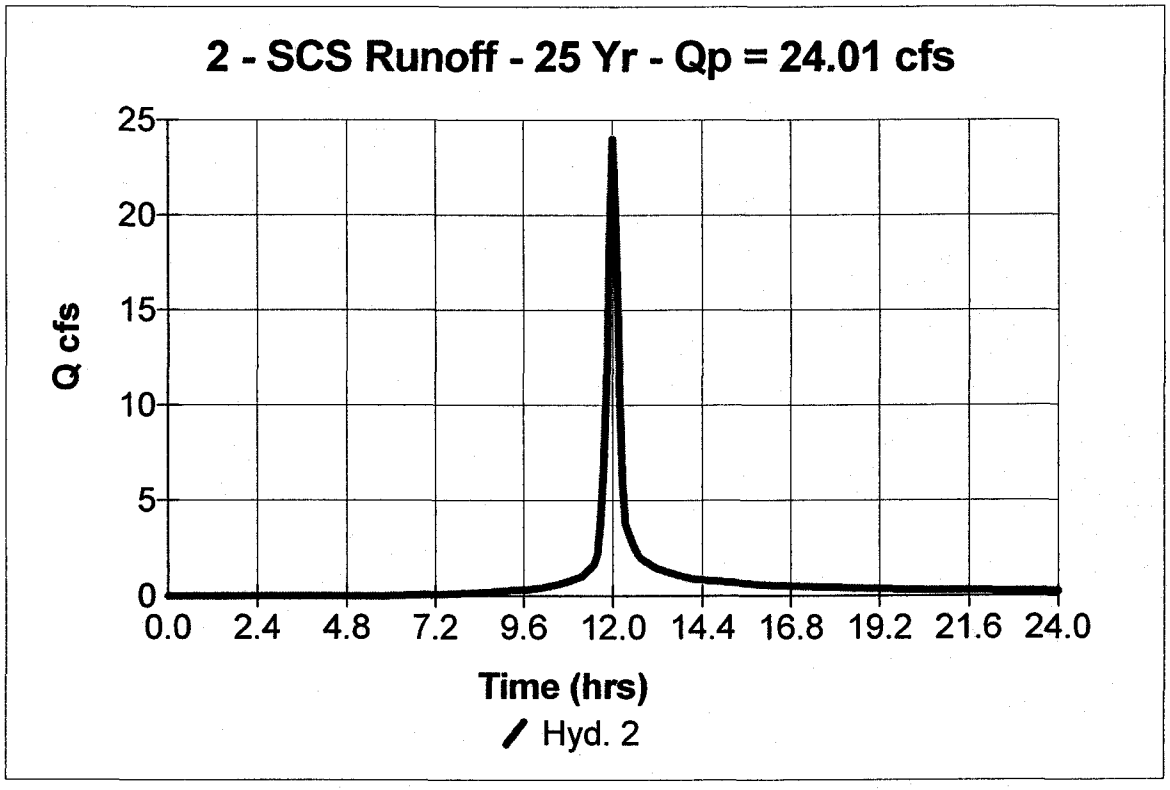
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 24.01 cfs
Storm frequency	= 25 yrs	Time interval	= 5 min
Drainage area	= 4.43 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 65,680 cuft



Hydrograph Plot

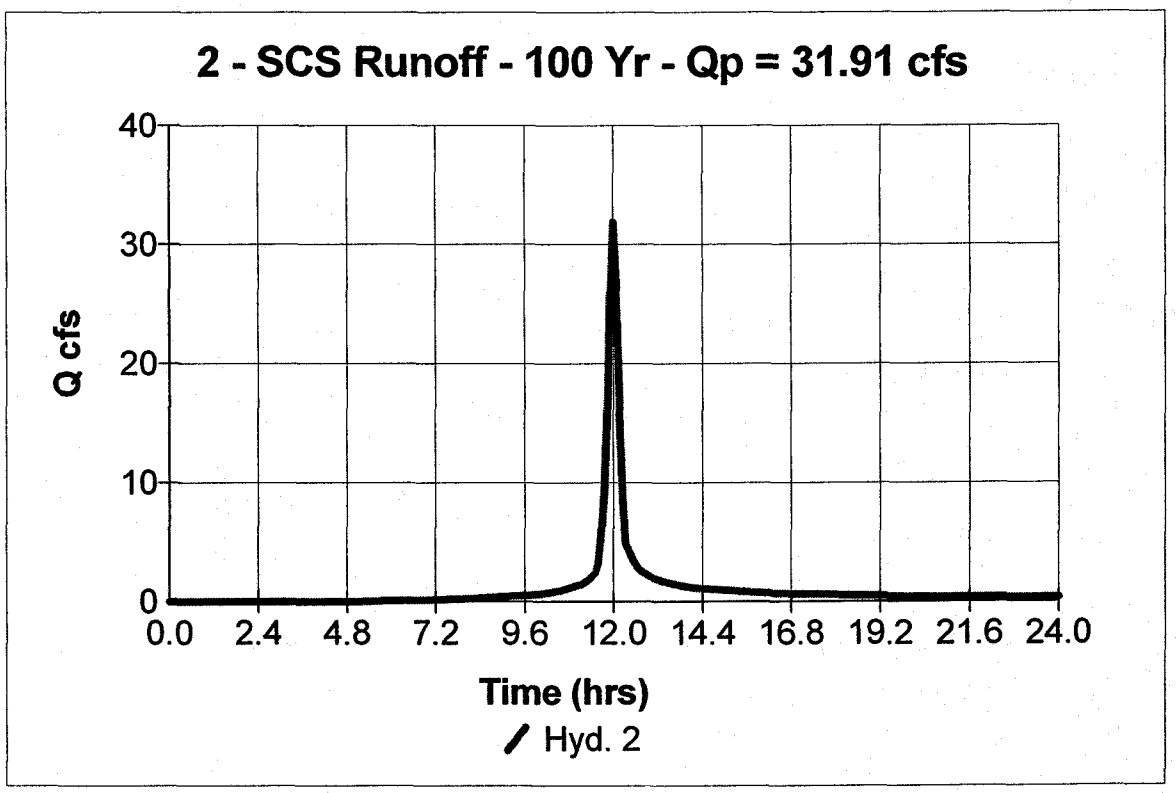
Hydraflow Hydrographs by Intelisolve

Hyd. No. 2

Post-development (5-14-03)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.91 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Drainage area	= 4.43 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 12 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 88,341 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

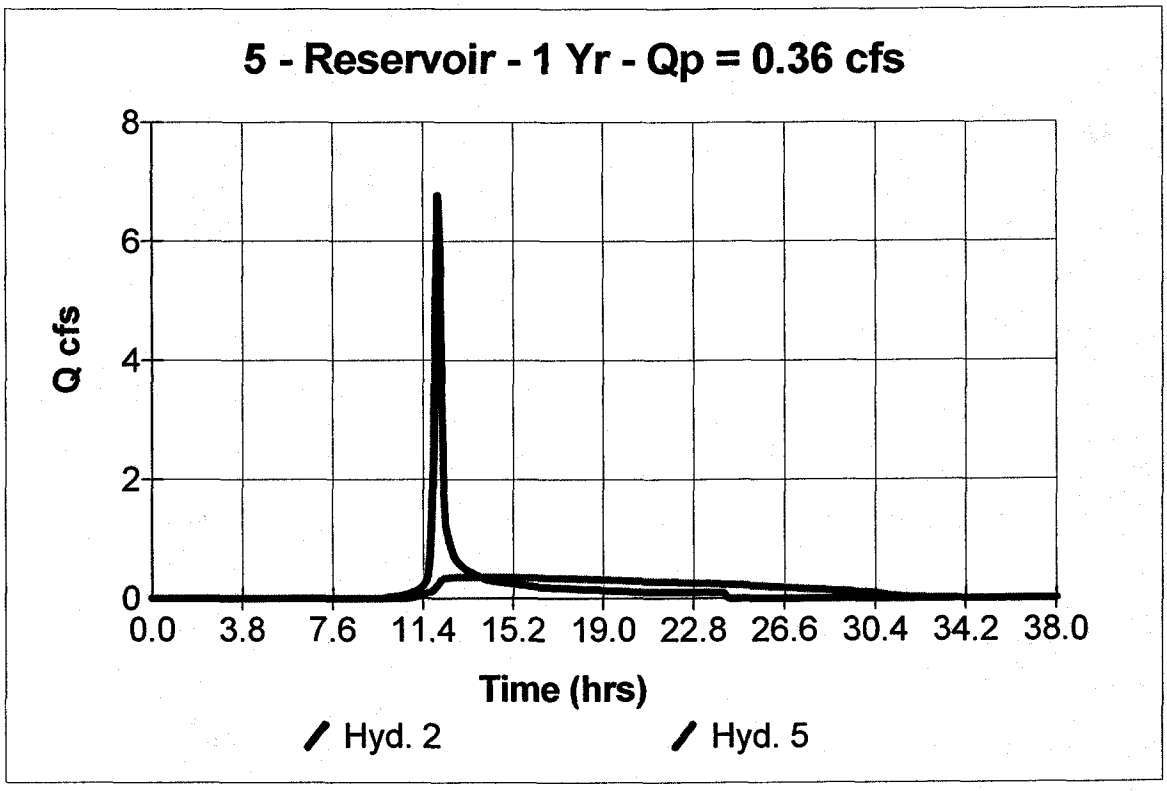
Hyd. No. 5

Detention Pond Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.36 cfs
Storm frequency	= 1 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Reservoir name	= WM WAY BMP 2 (
Max. Elevation	= 62.25 ft	Max. Storage	= 9,809 cuft

Storage Indication method used.

Hydrograph Volume = 18,396 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

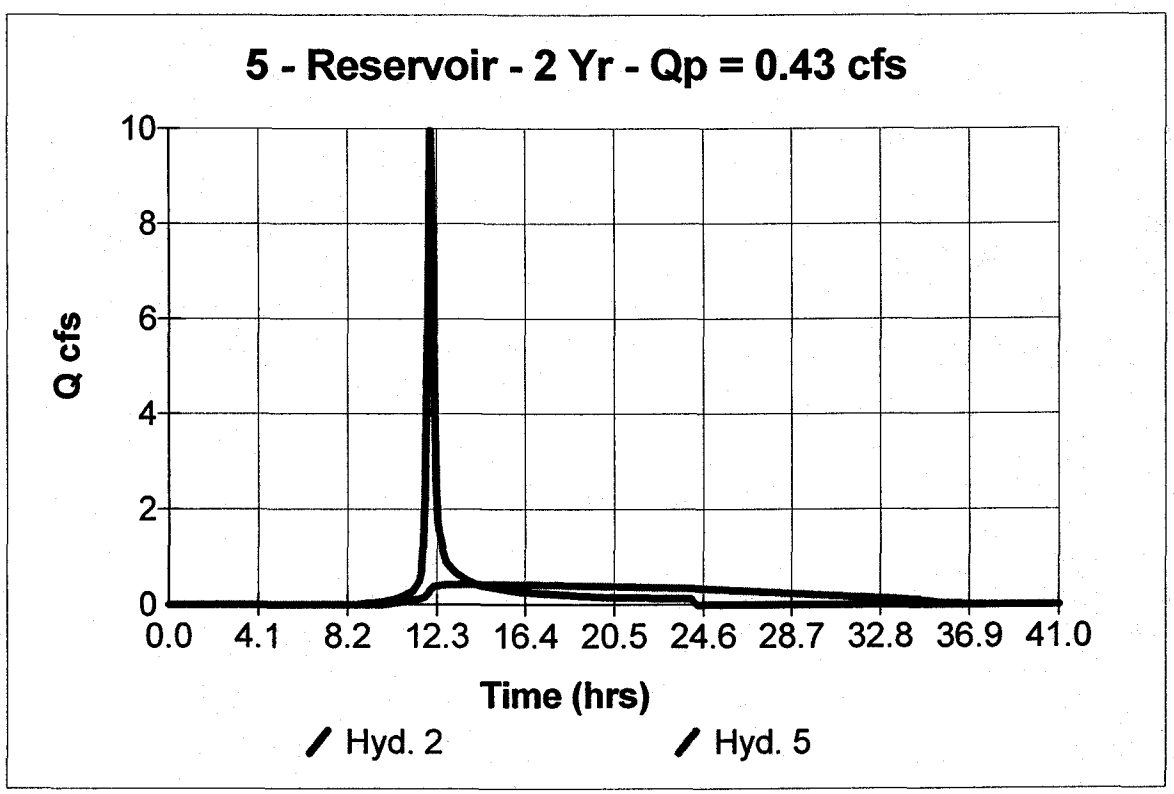
Hyd. No. 5

Detention Pond Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.43 cfs
Storm frequency	= 2 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Reservoir name	= WM WAY BMP 2 (
Max. Elevation	= 63.25 ft	Max. Storage	= 15,327 cuft

Storage Indication method used.

Hydrograph Volume = 26,826 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

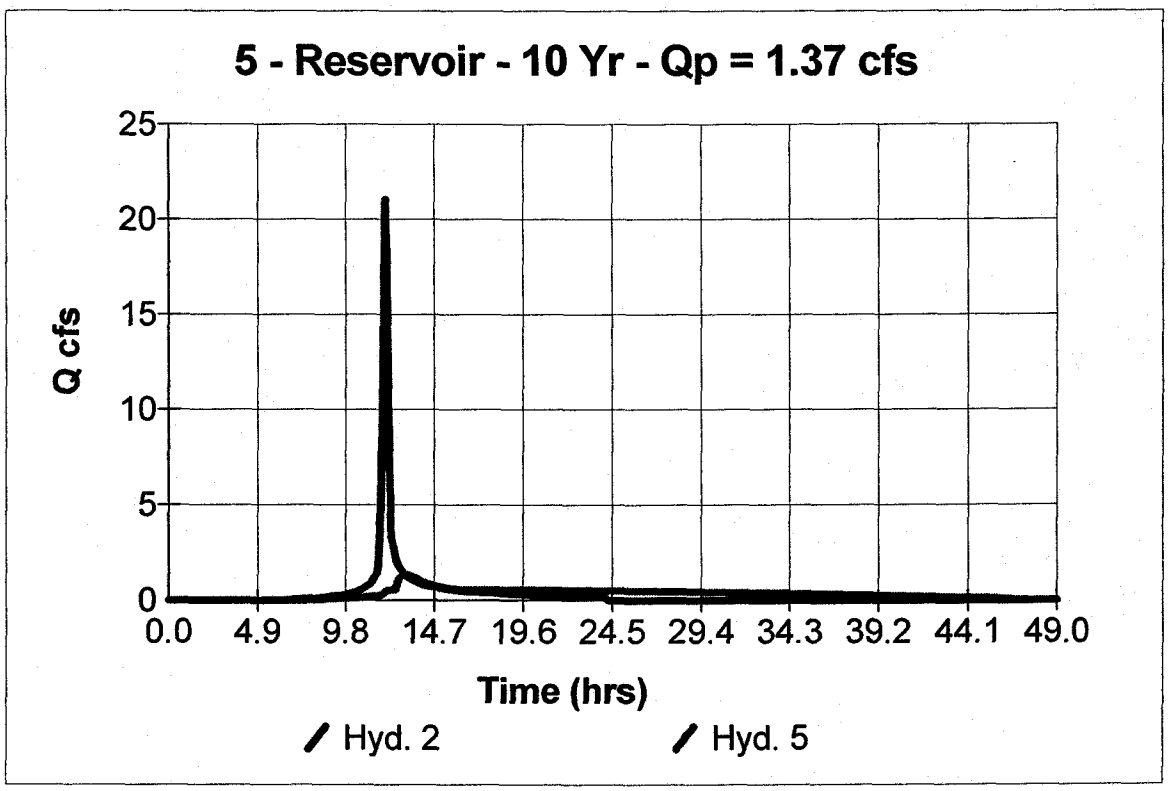
Hyd. No. 5

Detention Pond Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.37 cfs
Storm frequency	= 10 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Reservoir name	= WM WAY BMP 2 (
Max. Elevation	= 65.93 ft	Max. Storage	= 33,700 cuft

Storage Indication method used.

Hydrograph Volume = 57,292 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

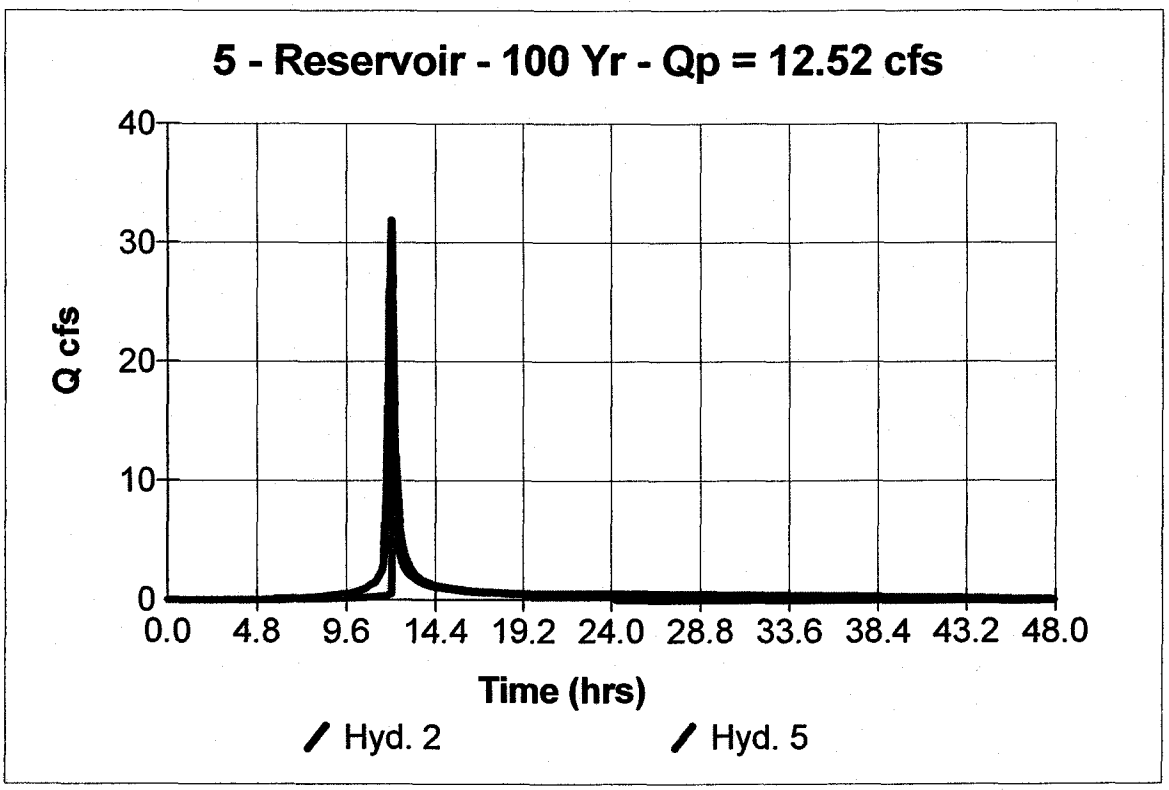
Hyd. No. 5

Detention Pond Routed

Hydrograph type	= Reservoir	Peak discharge	= 12.52 cfs
Storm frequency	= 100 yrs	Time interval	= 5 min
Inflow hyd. No.	= 2	Reservoir name	= WM WAY BMP 2 (
Max. Elevation	= 66.73 ft	Max. Storage	= 41,036 cuft

Storage Indication method used.

Hydrograph Volume = 88,291 cuft



AES JOB # 8818-4

1992

3.14

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project WINDSORMEADE WAY

Basin # SEDIMENT BASIN 3 Location BORROW SITE

Total area draining to basin: 15.98* acres.
*Ultimate Condition

Basin Volume Design

Wet Storage:

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

   67 cu. yds. x 16 acres = 1072 cu. yds.

2. Available basin volume = 3345 cu. yds. at elevation 51. (From storage - elevation curve) ✓

3. Excavate 3345 cu. yds. to obtain required volume*. (ALL EXCAVATION)

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x 16 acres = 528 cu. yds.

5. Elevation corresponding to cleanout level = ~ 44.5 **
   **(@ half available storage volume = 48.0) ✓
   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 3 ft. (Min. = 1.0 ft.)

Dry Storage:

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

   67 cu. yds. x 16 acres = 1072 cu. yds.

8. Total available basin volume at crest of riser* = 7484 cu. yds. at elevation 55.5. (From Storage - Elevation Curve)

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

9. Diameter of dewatering orifice = 4 in.

10. Diameter of flexible tubing = 6 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 55.5 ✓

Top of Dam = 58.5 ✓

Design High Water = 56.4 (25-YR STORM) ✓

Upstream Toe of Dam = 42

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We}$ = $\frac{240}{90} = 2.7$

If > 2, baffles are not required X

If < 2, baffles are required _____

Runoff

13. Q_2 = 43.59 cfs (From Chapter 5)

14. Q_{25} = 93.14 cfs (From Chapter 5)

Principal Spillway Design

15. With emergency spillway, required spillway capacity $Q_p = Q_2$ = 43.59 cfs. (riser and barrel)

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

16. With emergency spillway:

Assumed available head (h) = 49 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) = 60 in. Actual head (h) = ____ ft. ✓

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 65 ft.

Head (H) on barrel through embankment = _____ 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

Diameter = 72 inches.

Height = 24 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 49.55 cfs. ✓

22. Bottom width (b) = 20 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) = 13.5 ft.

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

Slope of principal spillway barrel (S_b) = 1 %

Length of barrel in saturated zone (L_s) = 95 ft.

24. Number of collars required = 3 dimensions = 5.5'x5.5'

(from Plate 3.14-12).

Final Design Elevations

25. Top of Dam = 58.5

Design High Water = 56.4

Emergency Spillway Crest = 57

Principal Spillway Crest = 55.5

Dewatering Orifice Invert = 51

Cleanout Elevation = 48

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 42

AES Projet No.: 8818-4
Project Title: SEDIMENT BASIN 3; WINDSORMEADE WAY 1-Year Channel Pı

CONSULTING ENGINEERS

Channel Protection

Channel Protection Volume

Post Development Watershed Data

Area = 15.98 Acres 0.0250sq.mi.
Runoff Curve No. = 88
Time of Concentration = 0.280 hr.
Return Period = 1 Yr.

Runoff Depth = 2.8 in.

Initial Abstraction (From TR55 Equation 2-2)

Ia = (200/CN)-2

Ia = 0.273

Unit Peak Discharge (From TR55 Equation for Exhibit 4)

log(Qu) = C0+C1 log(Tc)+C2(log(Tc))²

Qu = 696.96 csm/in

Ratio of Peak Outflow Discharge to Peak Inflow Discarge

(From Maryland Stormwater Design Manual Figure D.11.2)

Qo/Qi = 0.025

Ratio of Volume of Storage to Volume of Runoff (From TR55 Figure 6.1)

Vs/Vr = C0+C1(Qo/Qi)+C2(Qo/Qi)²+C3(Qo/Qi)³

Vs/Vr = 0.647

Vs = 1.414 Ac-Ft
Vs = 61603 cu.ft.

Table F-2

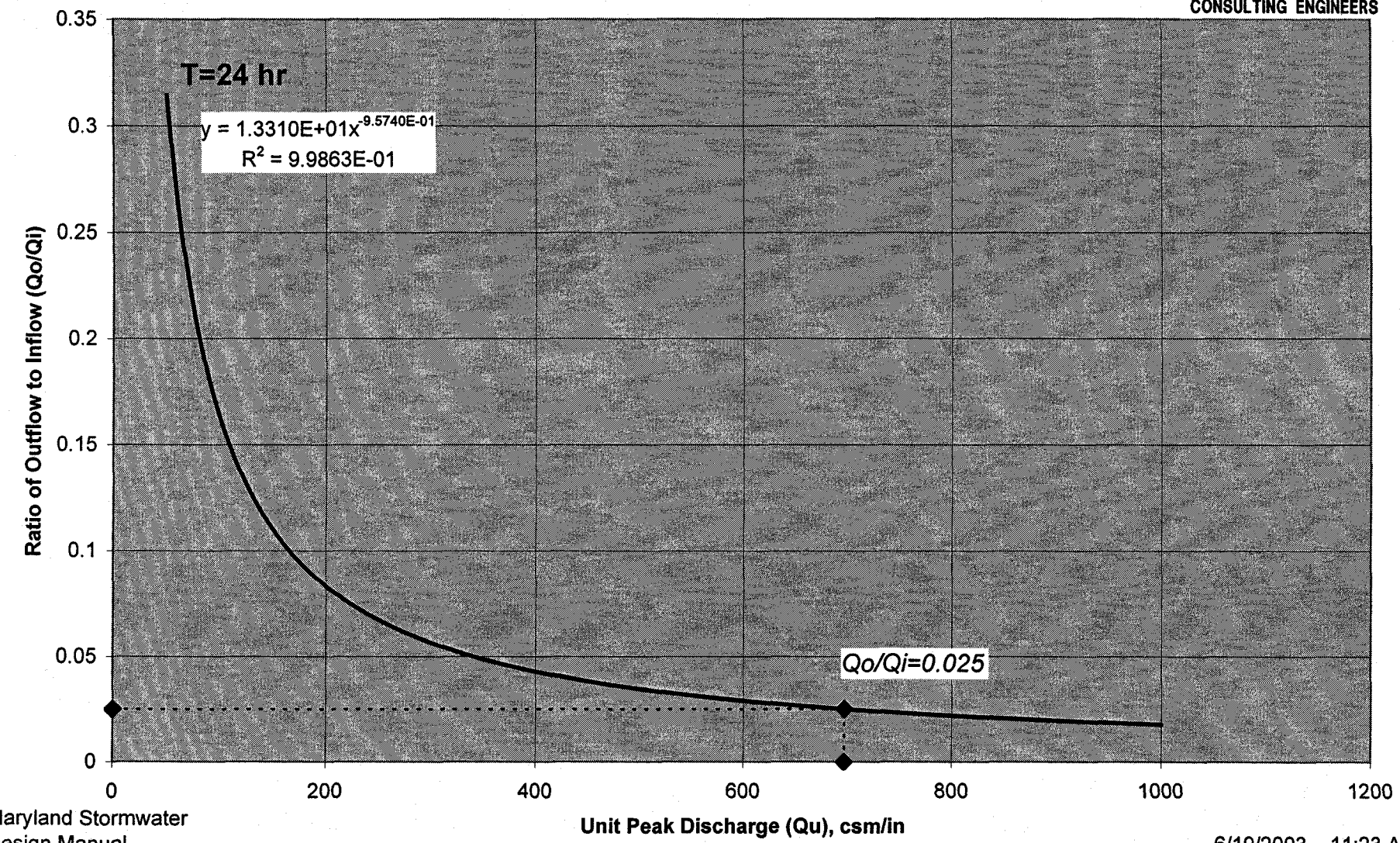
Coefficients for the equations used to generate figure 6-1

Rainfall Dist.	C0	C1	C2	C3
I, IA	0.66	-1.76	1.96	-0.73
II, III	0.682	-1.43	1.64	-0.804

Average Release Rate

Qi = 28.57 cfs
Qo/Qi = 0.03
Qo = 0.72 cfs

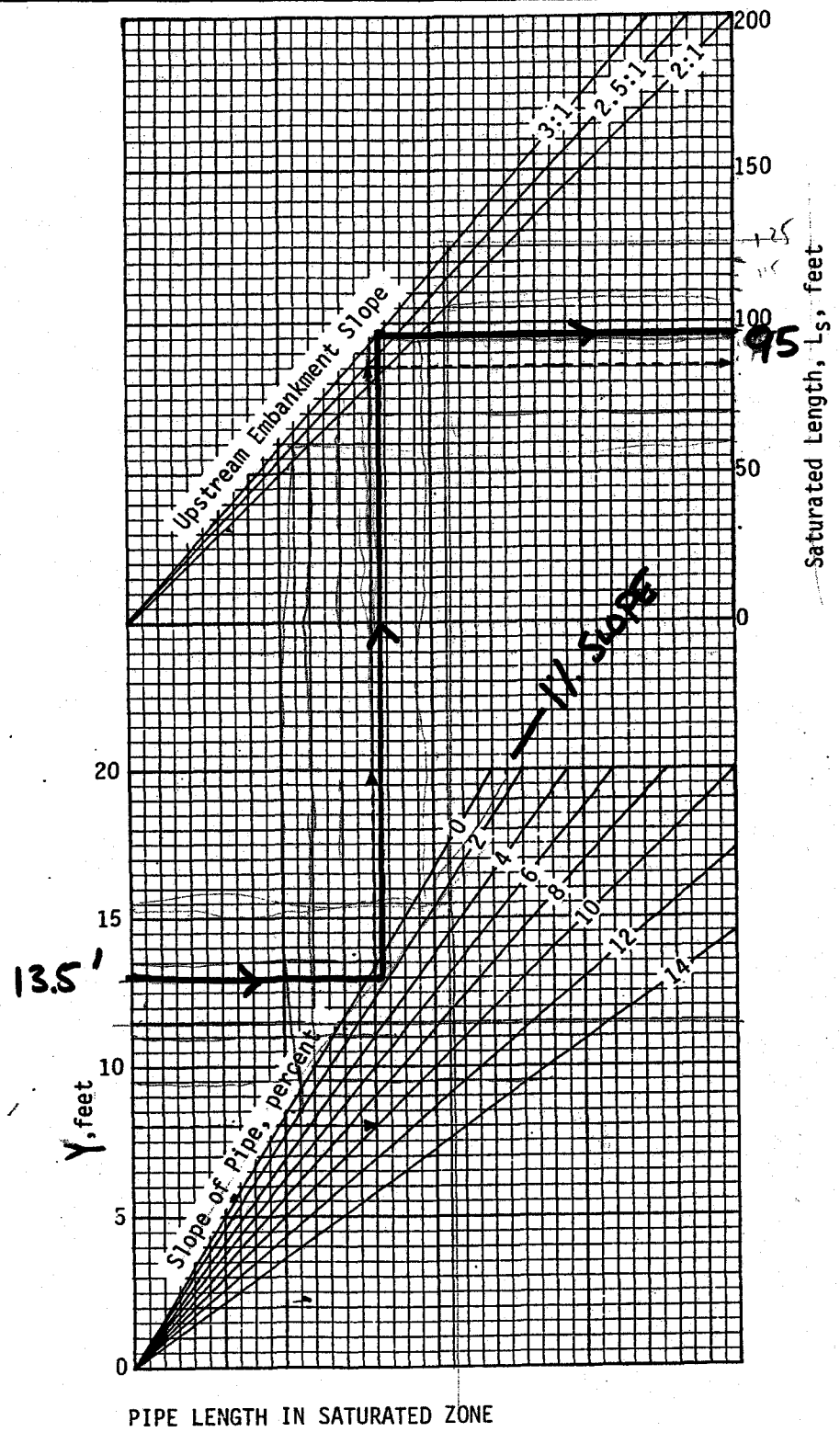
Detention Time Versus Discharge Ratios



Maryland Stormwater
Design Manual
Appendix D.11
Figure D.11.3

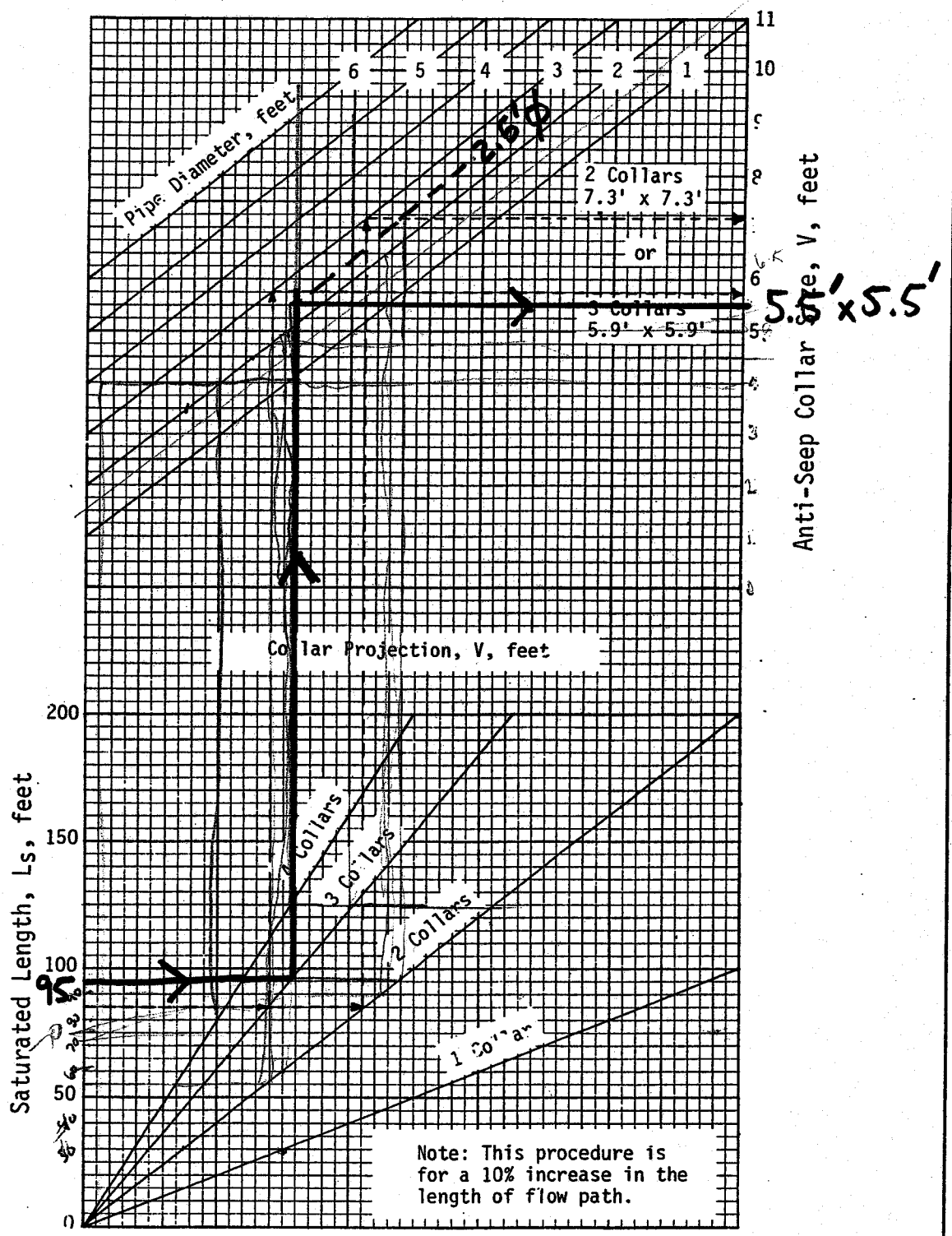
6/19/2003 11:23 AM
1yr_24hr_Worksheet.xls
Chart1 1

BASIN 3



Source: USDA-SCS

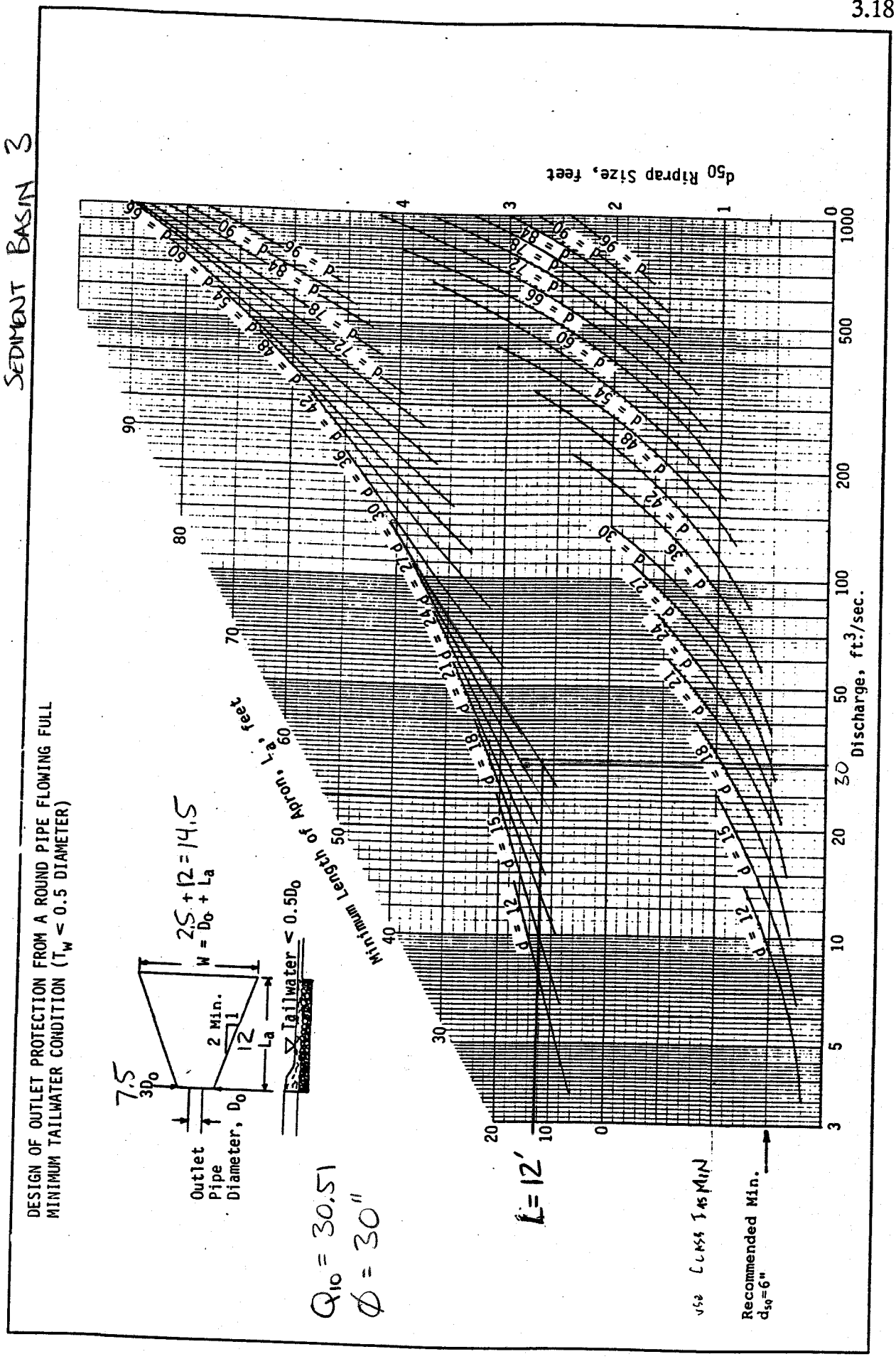
Plate 3.14-11



NUMBER OF ANTI-SEEP COLLARS REQUIRED

Source: USDA-SCS

Plate 3.14-12



Source: USDA-SCS

Plate 3.18-3

CALCULATIONS FOR SCS HYDROGRAPH GENERATION AND CHANNEL PROTECTION
FOR SEDIMENT BASIN 3 (VILLAS BMP 1)
WINDSOR MEADE
AES Project No.: 8818-04
April 21, 2003

I. PRE-DEVELOPMENT CONDITIONS TO POINT OF CONCERN

A. Pre-Development Drainage Area to Point of Concern = 2.80 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-D Emporia Complex	C	Wooded, Fair	1.66	73	121
2)	14-B Emporia Fine Sandy Loam	C	Wooded, Fair	0.31	73	23
3)	17 Johnston Complex	D	Wooded, Fair	0.80	79	63
	Totals =			2.8		207
	Composite CN =					74

C. Pre-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	Wooded	
Manning's roughness coefficient., n (table 5-7)	0.4	
Length of overland flow, L	300	Feet
2-year 24-hour rainfall, P2	3.6	inches
Average slope of overland flow , s	0.053	feet per foot
Travel time, Tt = (0.007*(n*L)^0.8)/(P2^0.5*s^0.4)	0.55	hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	Unpaved	
Length of shallow concentrated flow, L	100	Feet
Average slope of shallow concentrated flow, s	0.1	feet per foot
Average velocity, v	5.0	feet per second
Travel time, Tt = L/(3600*v)	0.01	hours

3) Channel or Pipe Flow

Length of channel flow, L	0	Feet
Average velocity of channel flow, v	0.00	feet per second
Travel time, Tt = L/(3600*v)	0.00	hours
Total Time of Concentration =	0.56	hours
or	33	minutes

II. POST-DEVELOPMENT CONDITIONS TO BMP

A. Post-Development Drainage Area to Point of Concern = 15.98 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-C Craven-Uchee	C	Impervious(roads/homes)	1.79	98	175
2)	11-C Craven-Uchee	C	Open Space/Landscaped	2.33	74	172
3)	14-B and C Emporia Fine Sandy Loam	C	Impervious(roads/homes)	1.57	98	154
4)	14-B and C Emporia Fine Sandy Loam	C	Open Space/Landscaped	1.23	74	91
5)	15-D Emporia Complex	C	Impervious(roads/homes)	3.39	98	332
6)	15-D Emporia Complex	C	Open Space/Landscaped	1.92	74	142
7)	17 Johnston Complex	D	Impervious(roads/pond)	1.32	98	129
8)	17 Johnston Complex	D	Open Spc (Grass/Landscaped	0.55	80	44
9)	18-B Kempsville Fine Sandy Loam	B	Impervious(roads/homes)	1.23	98	121
10)	18-B Kempsville Fine Sandy Loam	B	Open Space/Wooded	0.65	61	40
	Total Adjusted CN =			15.98		1,401
	Composite CN =					88

C. Post-Development Time of Concentration Calculations

1) Overland Flow (maximum 300 feet)

Surface description (table 5-7)	residential
Manning's roughness coefficient., n (table 5-7)	0.2
Length of overland flow, L	100 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)	0.19 hours

2) Shallow concentrated flow (maximum 300 feet)

Surface description, paved or unpaved	paved
Length of shallow concentrated flow, L	200 Feet
Average slope of shallow concentrated flow, s	0.2 feet per foot
Average velocity, v	3.0 feet per second
Travel time, Tt = L/(3600*v)	0.02 hours

3) Channel or Pipe Flow

Length of channel flow, L	1300 Feet
Average velocity of channel flow, v	5 feet per second
Travel time, Tt = L/(3600*v)	0.07 hours
Total Time of Concentration =	0.28 hours
or	17 minutes

III. 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.)
42.0		680	0			
44.0	2.0	1115	1795	66	1795	66
46.0	2.0	1760	2875	106	4670	173
48.0	2.0	2520	4280	159	8950	331
50.0	2	3410	5930	220	14880	551
52.0	2	8230	11640	431	26520	982
54.0	2	10500	18730	694	45250	1676
56.0	2	52714	63214	2341	108464	4017

IV. 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	58.2%	
Drainage Area of the BMP Watershed	15.98	acres
Impervious Acres of BMP Watershed	9.30	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) *	9.30	=	67518 cu. Ft
1/2 WQ_v =	33759 cu. Ft		Required Volume for Permanent Pool
	0 cu. Ft		Design Volume for Permanent Pool (2" per Impervious Acre)
1/2 WQ_v =	33759 cu. Ft		Volume to be Released in 24-Hours

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

Average release rate calculation

$$\frac{33{,}759.0 \text{ cubic feet}}{(24 \text{ hours} \times 60 \text{ minutes/hour} \times 60 \text{ seconds/ minute})} = 0.4 \text{ cfs}$$

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 = #DIV/0! *feet, or* #DIV/0! inches (4" use in Computer Routing)

Note: No routing of the WQV is required. 100% of the required Water Quality Volume is avilable in storage.

Reservoir Report

SEDIMENT BASIN #3

Hydraflow Hydrographs by Intelisolve

Reservoir No. 3 - Villas BMP 1 (4/23/03)

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	42.00	5,250	0	0
2.00	44.00	6,585	11,835	11,835
4.00	46.00	9,530	16,115	27,950
6.00	48.00	11,680	21,210	49,160
8.00	50.00	14,015	25,695	74,855
9.00	51.00	16,935	15,475	90,330
10.00	52.00	22,330	19,633	109,963
12.00	54.00	26,565	48,895	158,858
14.00	56.00	31,050	57,615	216,473
16.00	58.00	36,440	67,490	283,963

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 30.0	4.0	6.0	0.0
Span in	= 30.0	4.0	6.0	0.0
No. Barrels	= 1	1	1	0
Invert El. ft	= 46.60	51.00	54.00	0.00
Length ft	= 65.0	0.0	0.0	0.0
Slope %	= 1.00	0.00	0.00	0.00
N-Value	= .013	.013	.013	.000
Orif. Coeff.	= 0.60	0.60	0.60	0.00
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 15.71	20.00	0.00	0.00
Crest El. ft	= 55.50	57.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	0.00
Weir Type	= Riser	Broad	---	---
Multi-Stage	= Yes	No	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	42.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
2.00	11,835	44.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
4.00	27,950	46.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
6.00	49,160	48.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
8.00	74,855	50.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
9.00	90,330	51.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	0.00
10.00	109,963	52.00	0.38	0.38	0.00	---	0.00	0.00	---	---	---	0.38
12.00	158,858	54.00	0.72	0.71	0.00	---	0.00	0.00	---	---	---	0.71
14.00	216,473	56.00	20.88	0.92	1.25	---	18.50	0.00	---	---	---	20.67
16.00	283,963	58.00	74.85	0.14	0.33	---	74.37	52.00	---	---	---	126.84

Hydrograph Plot

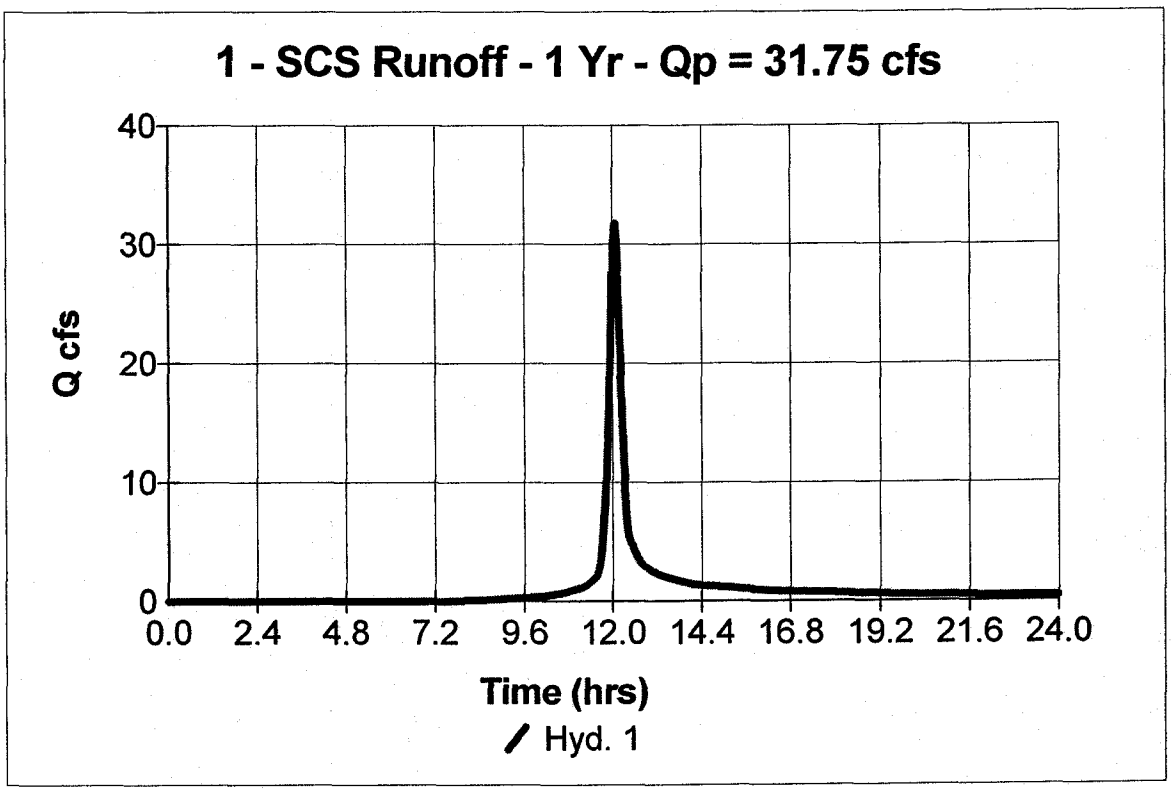
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

VILLAS 1 -POST

Hydrograph type	= SCS Runoff	Peak discharge	= 31.75 cfs
Storm frequency	= 1 yrs	Time interval	= 1 min
Drainage area	= 15.98 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 2.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 93,794 cuft



Hydrograph Plot

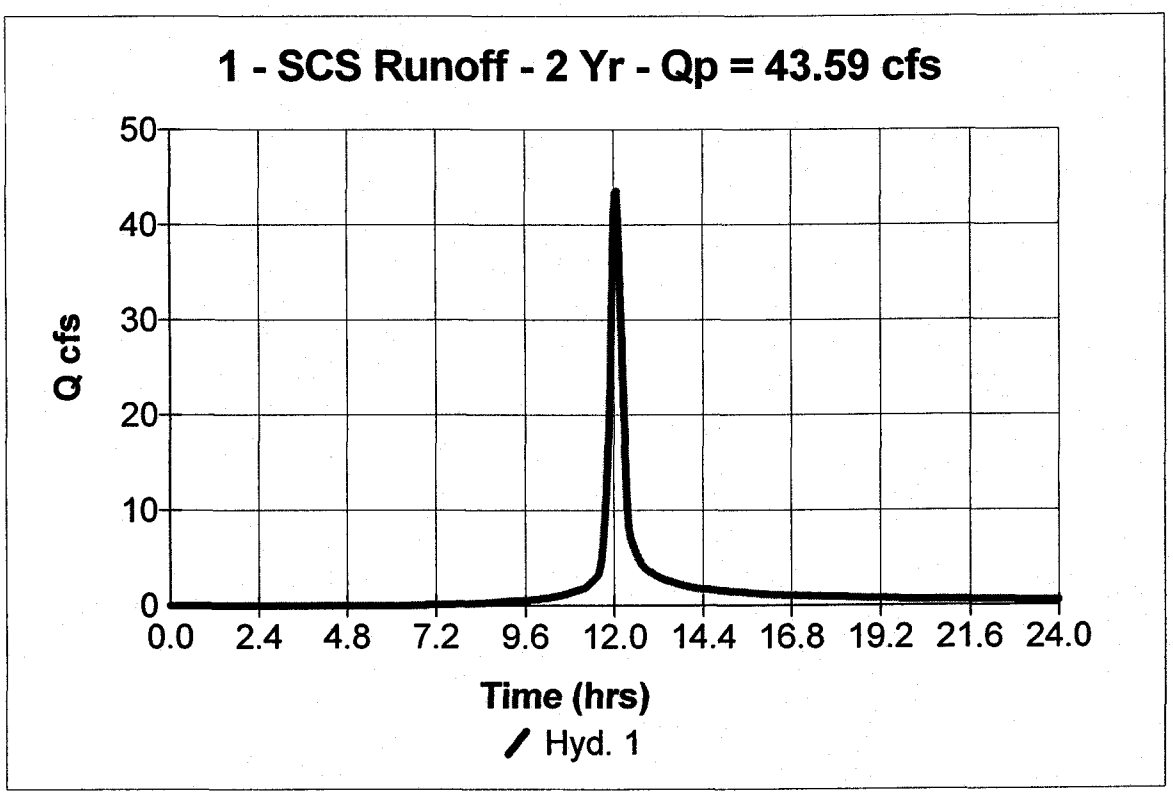
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

VILLAS 1 -POST

Hydrograph type	= SCS Runoff	Peak discharge	= 43.59 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Drainage area	= 15.98 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 129,655 cuft



Hydrograph Plot

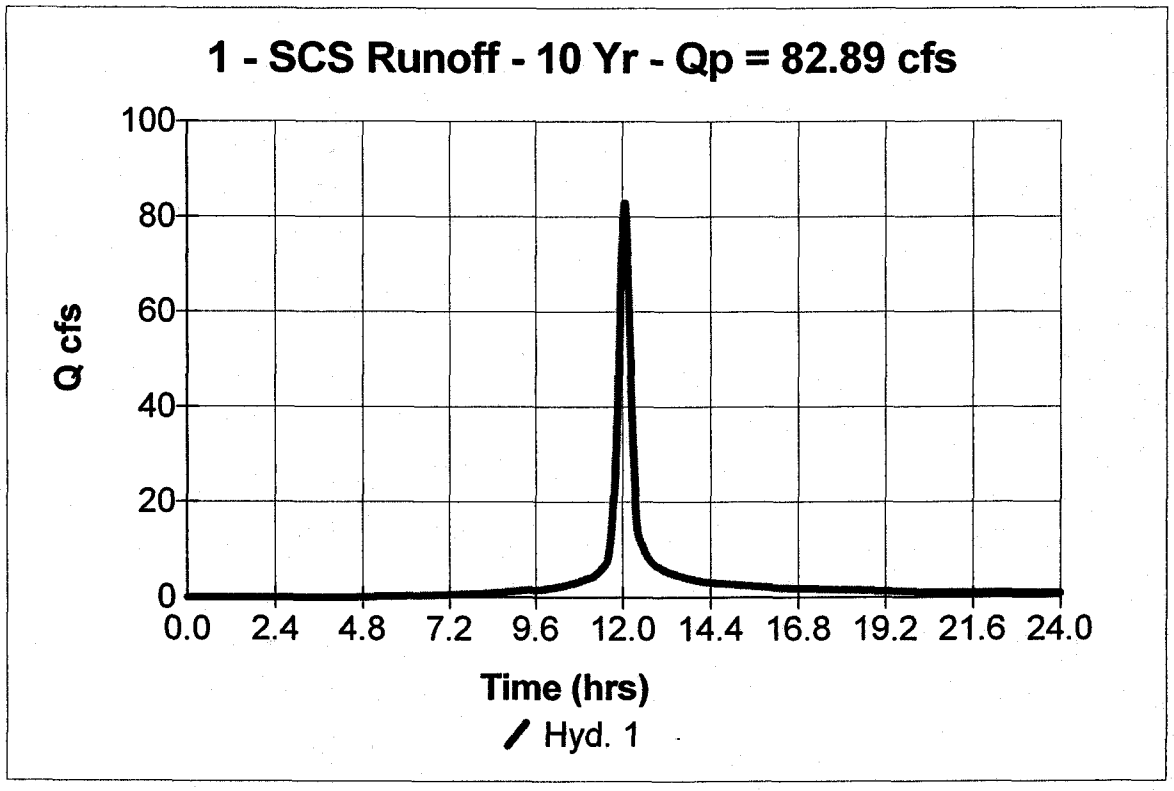
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

VILLAS 1 -POST

Hydrograph type	= SCS Runoff	Peak discharge	= 82.89 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 15.98 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 253,467 cuft



Hydrograph Plot

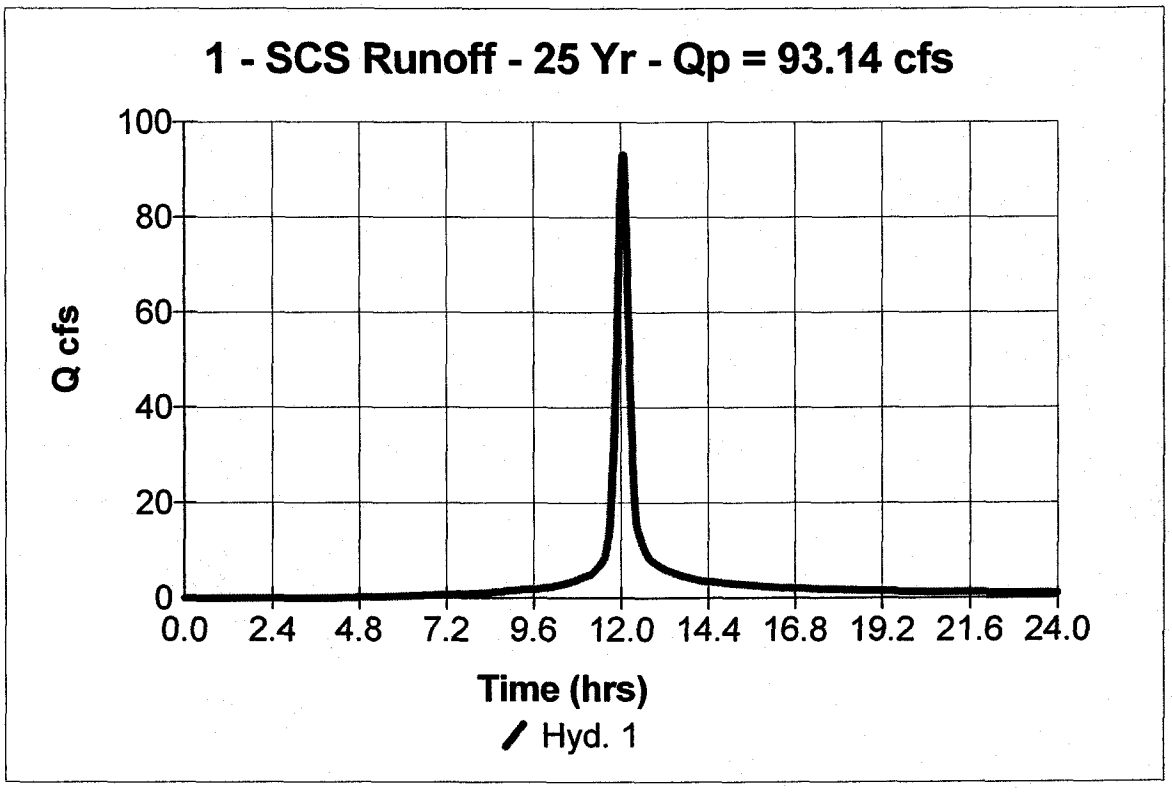
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

VILLAS 1 -POST

Hydrograph type	= SCS Runoff	Peak discharge	= 93.14 cfs
Storm frequency	= 25 yrs	Time interval	= 1 min
Drainage area	= 15.98 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 286,549 cuft



Hydrograph Plot

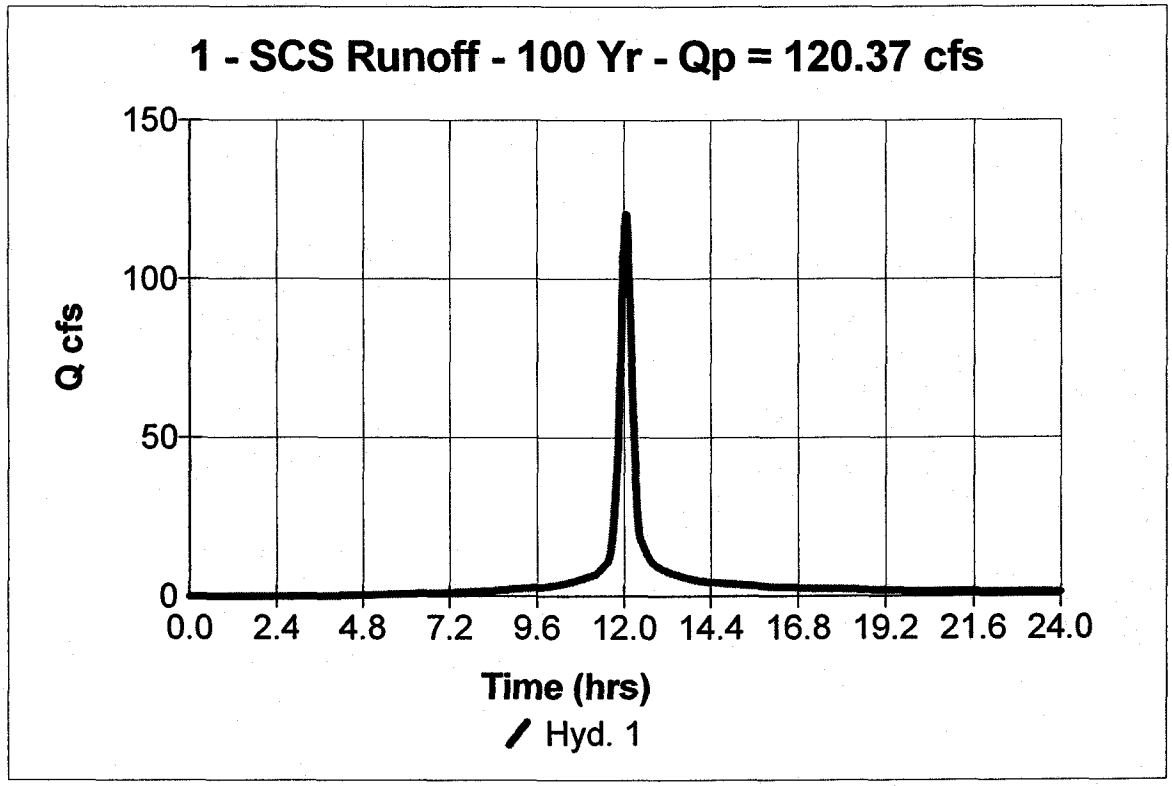
Hydraflow Hydrographs by Intelisolve

Hyd. No. 1

VILLAS 1 -POST

Hydrograph type	= SCS Runoff	Peak discharge	= 120.37 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 15.98 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 17 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 375,571 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

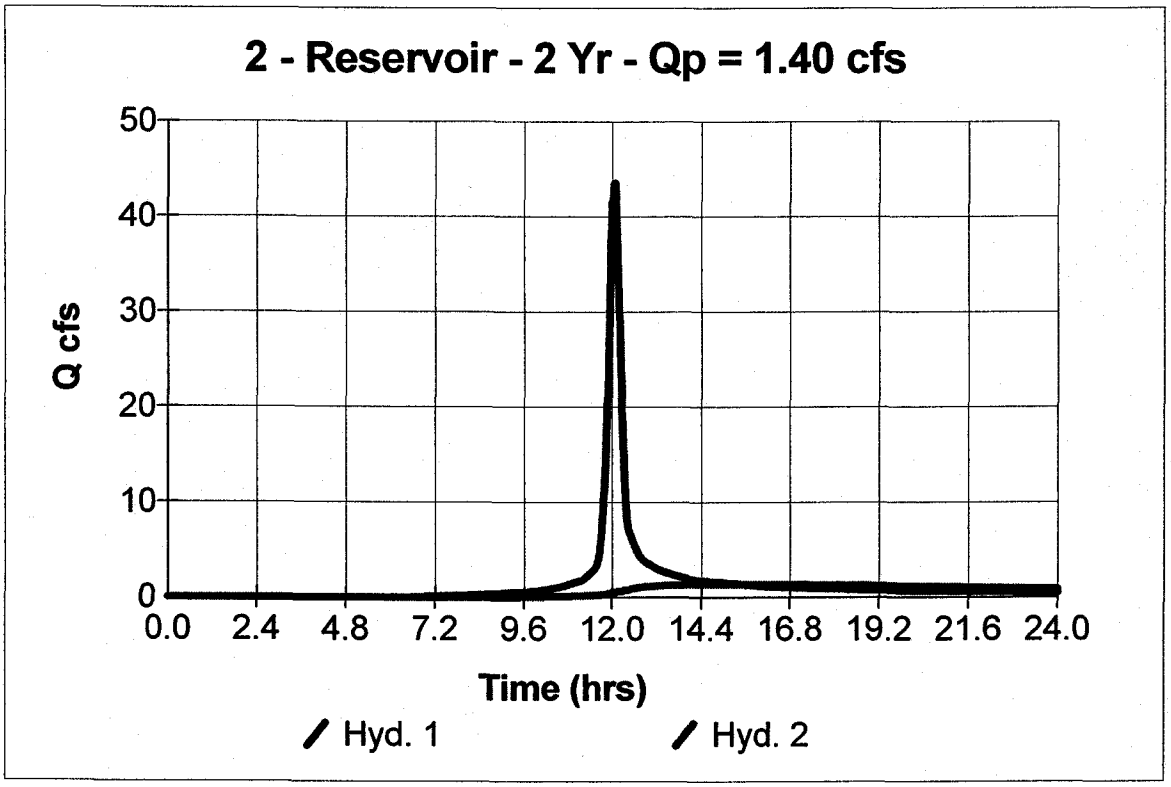
Hyd. No. 2

SED. BASIN 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.40 cfs
Storm frequency	= 2 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Reservoir name	= Villas BMP 1 (4
Max. Elevation	= 54.68 ft	Max. Storage	= 178,386 cuft

Storage Indication method used.

Hydrograph Volume = 53,847 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

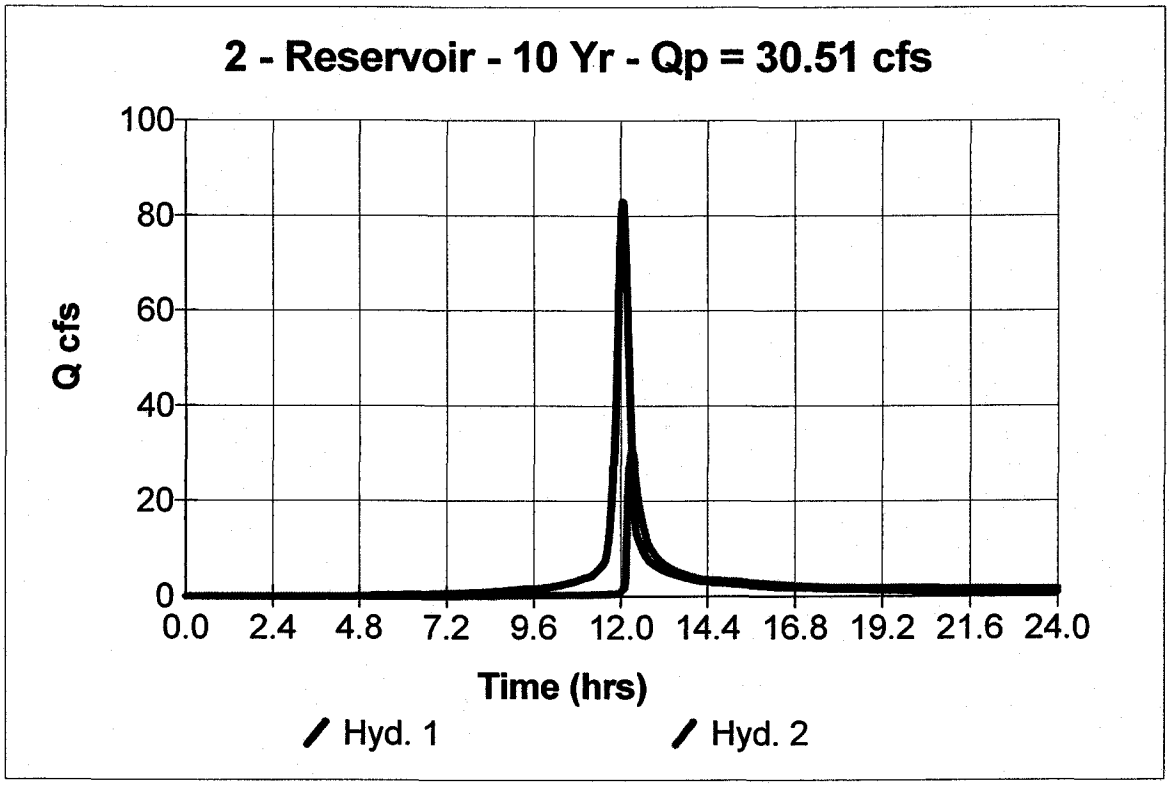
Hyd. No. 2

SED. BASIN 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 30.51 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Reservoir name	= Villas BMP 1 (4
Max. Elevation	= 56.16 ft	Max. Storage	= 221,900 cuft

Storage Indication method used.

Hydrograph Volume = 157,124 cuft



Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

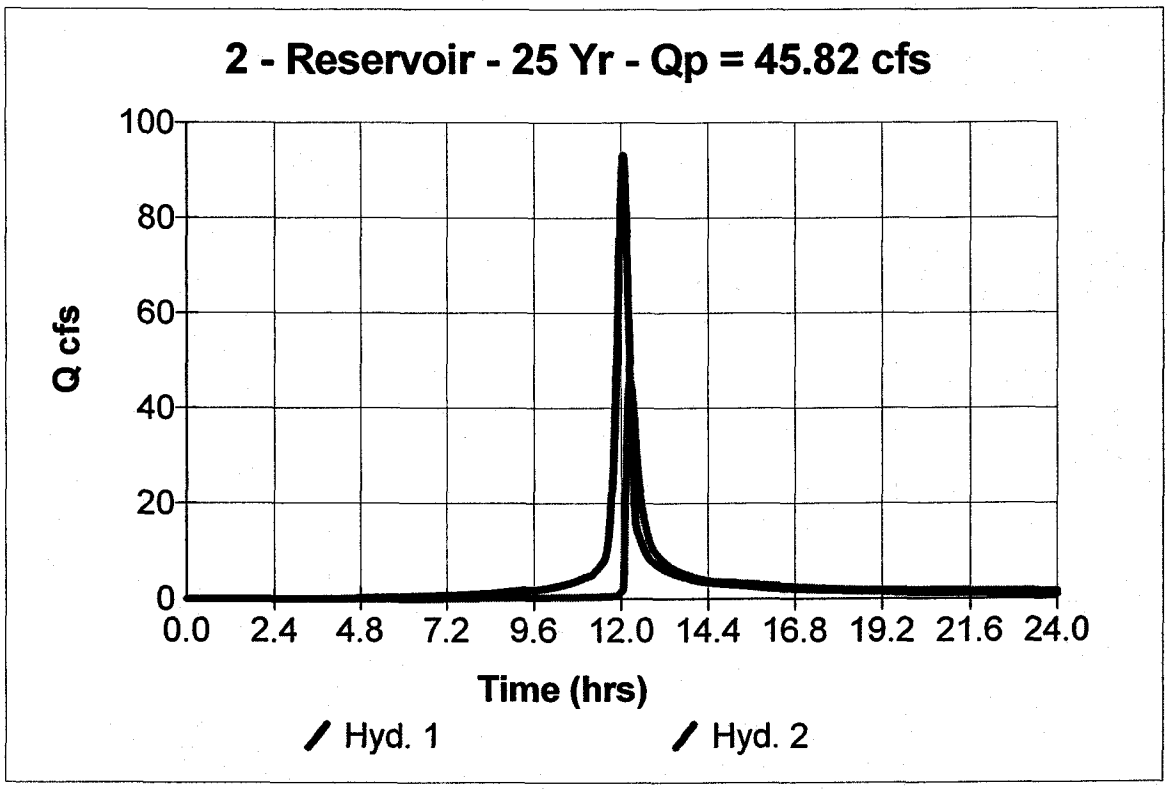
Hyd. No. 2

SED. BASIN 3 Routed

Hydrograph type	= Reservoir	Peak discharge	= 45.82 cfs
Storm frequency	= 25 yrs	Time interval	= 1 min
Inflow hyd. No.	= 1	Reservoir name	= Villas BMP 1 (4
Max. Elevation	= 56.38 ft	Max. Storage	= 229,425 cuft

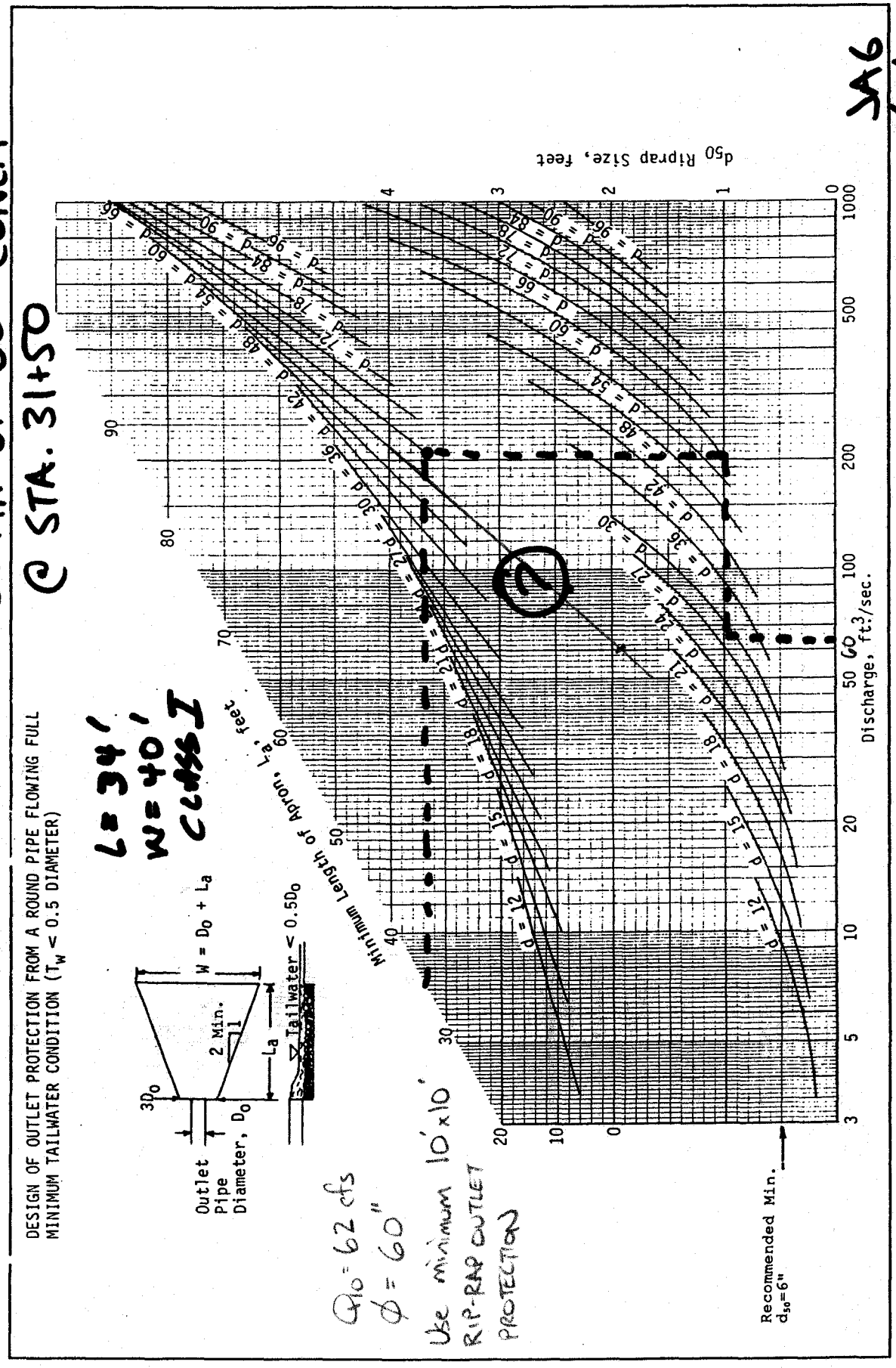
Storage Indication method used.

Hydrograph Volume = 187,700 cuft



Outfall of 60" Culvert @ STA. 31+50

JAG 6/10/03



Source: USDA-SCS

Plate 3.18-3

CONSULTING ENGINEERS

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

PROJECT WindsorMeade Way
PROJECT NO. 8818-04
SUBJECT Spread Calc's
SHEET NO. 1
DATE 3/14/2002 REV 5/2003 by J.Grimes
BY R. Smith

STORM WATER INLET COMPUTATIONS FOR WINDSORMEADE WAY

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	d L/Lt (ft)	h E(#16) (ft)	Q Int CFS d/h	Q Carryover Spread	Remark
HIGH POINT																														
⇩			11+06 L	0.14	0.95	0.133	0.133	4	0.532		0.532	0.001	0.02	7.3	Flow Approaching From Down Station 10+00 L															
SUMP	DI-4C	6									1.101	0.001	0.02		2		0.08								9.6	0.128	0.27	0.474	6.4	
⇧			11+06 L	0.16	0.7	0.112	0.112	4	0.448	0.121	0.569	0.001	0.02	7.5	Flow Approaching From Up Station 12+00 L															
GRADE	DI-3B	8	12+00 L	0.5	0.37	0.185	0.185	4	0.74	0.252	0.992	0.033	0.02	3.5	2	0.571	0.08	4	0.962	0.015	2	3.44	0.143	0.158	11.6	0.69	0.878	0.872	0.121	Assumes future connection
⇧ GRADE	DI-3B	8	12+95 L	1.44	0.36	0.518	0.518	4	2.074	0	2.074	0.025	0.02	6.7	2	0.299	0.08	4	0.705	0.015	2	3.44	0.143	0.121	11.6	0.69	0.878	1.821	0.252	Assumes future connection
HIGH POINT			16+05 L																											
HIGH POINT			16+05 L																											
GRADE	DI-3B	8	18+25 L	1.19	0.34	0.405	0.405	4	1.618	0	1.618	0.015	0.02	6.7	2	0.299	0.08	4	0.705	0.015	2	3.44	0.143	0.121	11.6	0.69	0.878	1.421	0.197	Assumes future connection
GRADE	DI-3B	6	19+25 L	0.46	0.36	0.166	0.166	4	0.662	0.197	0.859	0.034	0.02	3	2	0.667	0.08	4	0.984	0.015	2	3.44	0.143	0.161	9.6	0.625	0.829	0.712	0.147	Assumes future connection
GRADE	DI-3B	6	21+00 L	0.67	0.53	0.355	0.355	4	1.42	0.147	1.567	0.015	0.02	6.5	2	0.308	0.08	4	0.74	0.015	2	3.44	0.143	0.126	9.6	0.625	0.829	1.299	0.268	
GRADE	DI-3B	8	22+00 L	0.79	0.33	0.261	0.261	4	1.043	0.268	1.311	0.019	0.02	5.5	2	0.364	0.08	4	0.821	0.015	2	3.44	0.143	0.138	11.6	0.69	0.878	1.151	0.16	
⇩				0.44	0.47	0.207	0.207	4	0.827	0.16	0.987	0.001	0.02	9.4	Flow Approaching From Down Station 22+00 L															
SUMP	DI-3C	6	23+82 L								1.405	0.001	0.02		2		0.08								9.6	0.142	0.27	0.526	7.1	
⇧				0.11	0.95	0.105	0.105	4	0.418	0	0.418	0.001	0.02	6.6	Flow Approaching From Up Station 25+40 L															
HIGH POINT			25+40 L																											
HIGH POINT			25+40 L																											
⇩ GRADE	DI-3B	4	30+25 L	0.52	0.62	0.322	0.322	4	1.29	0	1.29	0.014	0.02	5.8	2	0.345	0.08	4	0.767	0.015	2	3.44	0.143	0.13	7.6	0.526	0.739	0.954	0.336	
⇩			30+74 L	0.05	0.69	0.035	0.035	4	0.138	0.336	0.474	0.001	0.02	7	Flow Approaching From Down Station 28+50 L															
SUMP	DI-3C	6									0.77	0.001	0.02		2		0.08								9.6	0.11	0.27	0.407	5.5	
⇧			30+74 L	0.08	0.7	0.056	0.056	4	0.224	0.072	0.296	0.001	0.02	5.4	Flow Approaching From Up Station 33+69 L															
GRADE	DI-3B	8	31+60 L	0.21	0.7	0.147	0.147	4	0.588	0	0.588	0.016	0.02	3.3	2	0.606	0.08	4	0.977	0.015	2	3.44	0.143	0.16	11.6	0.69	0.878	0.516	0.072	
HIGH POINT			33+69 L																											

CONSULTING ENGINEERS

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PROJECT WindsorMeade Way
PROJECT NO. 8818-04
SUBJECT Spread Calc's
SHEET NO. 2
DATE 3/14/2002
BY R. Smith REV 5/2003 by J.Grimes

STORM WATER INLET COMPUTATIONS FOR WINDSORMEADE WAY

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
HIGH POINT			33+69 L																													
GRADE	DI-3B	4	36+00 L	0.21	0.69	0.145	0.145	4	0.58	0	0.58	0.023	0.02	2.7	2	0.741	0.08	4	0.989	0.015	2	3.44	0.143	0.162	7.6	0.526		0.739		0.429	0.151	
				0.25	0.83	0.208	0.208	4	0.83	0.151	0.981	0.001	0.02	9.3	Flow Approaching From Down Station 36+00 L																
SUMP	DI-3C	6	37+25 L								1.261	0.001	0.02		2		0.08								9.6	0.134		0.27		0.496	6.7	
				0.1	0.7	0.07	0.07	4	0.28	0	0.28	0.001	0.02	5.2	Flow Approaching From Up Station 37+62 L																
HIGH POINT																																

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PROJECT: WindsorMeade Way
PROJECT NO.: 8818-04
SUBJECT: Spread Calc's
SHEET NO.: 3
DATE: 3/14/2002
BY: R. Smith REV 5/2003 by J.Grimes

STORM WATER INLET COMPUTATIONS FOR WINDSORMEADE WAY

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
HIGH POINT																														
GRADE	DI-3B	10	10+95 R	0.38	0.81	0.308	0.308	4	1.231	0	1.231	0.014	0.02	5.7	2	0.351	0.08	4	0.767	0.015	2	3.44	0.143	0.13	13.6	0.735	0.909	1.119	0.113	
⇩				0.15	0.8	0.12	0.12	4	0.48	0.113	0.593	0.001	0.02	7.6	Flow Approaching From Down Station 10+95 L														
SUMP	DI-4C	6	11+17 R								1.003	0.001	0.02		2		0.08								9.6	0.124	0.27	0.459	6.2	
⇧				0.1	0.73	0.073	0.073	4	0.292	0.119	0.411	0.001	0.02	6.5	Flow Approaching From Up Station 12+00 L														
GRADE	DI-3B	4	12+00 R	0.12	0.75	0.09	0.09	4	0.36	0.095	0.455	0.033	0.02	1.8	2	1.111	0.08	4	1	0.015	2	3.44	0.143	0.163	7.6	0.526	0.739	0.336	0.119	
⇧																														
GRADE	DI-3B	6	13+00 R	0.12	0.75	0.09	0.09	4	0.36	0.195	0.555	0.025	0.02	2.5	2	0.8	0.08	4	0.995	0.015	2	3.44	0.143	0.163	9.6	0.625	0.829	0.46	0.095	
⇧																														
GRADE	DI-3B	4	14+00 R	0.25	0.75	0.188	0.188	4	0.75	0	0.75	0.015	0.02	4.2	2	0.476	0.08	4	0.915	0.015	2	3.44	0.143	0.151	7.6	0.526	0.739	0.555	0.195	
⇧																														
HIGH POINT			16+05 R																											
HIGH POINT			16+05 R																											
GRADE	DI-3B	6	18+25 R	0.33	0.76	0.251	0.251	4	1.003	0	1.003	0.015	0.02	5.1	2	0.392	0.08	4	0.848	0.015	2	3.44	0.143	0.142	9.6	0.625	0.829	0.832	0.172	
⇩																														
GRADE	DI-3B	6	19+25 R	0.11	0.76	0.084	0.084	4	0.334	0.172	0.506	0.034	0.02	1.9	2	1.053	0.08	4	1	0.015	2	3.44	0.143	0.163	9.6	0.625	0.829	0.419	0.087	
⇩																														
GRADE	DI-3B	6	20+00 R	0.1	0.76	0.076	0.076	4	0.304	0.087	0.391	0.015	0.02	2.4	2	0.833	0.08	4	0.995	0.015	2	3.44	0.143	0.163	9.6	0.625	0.829	0.324	0.067	
⇩																														
GRADE	DI-3B	4	22+00 R	0.24	0.73	0.175	0.175	4	0.701	0.067	0.768	0.019	0.02	3.9	2	0.513	0.08	4	0.941	0.015	2	3.44	0.143	0.155	7.6	0.526	0.739	0.568	0.2	
⇩				0.21	0.73	0.153	0.153	4	0.613	0.2	0.813	0.001	0.02	8.7	Flow Approaching From Down Station 22+00 L														
SUMP	DI-3C	6	23+82 R								1.353	0.001	0.02		2		0.08								9.6	0.14	0.27	0.519	7	
⇧				0.18	0.75	0.135	0.135	4	0.54	0	0.54	0.001	0.02	7.4	Flow Approaching From Up Station 25+66 L														
HIGH POINT			25+40 R																											
HIGH POINT			25+40 R																											
GRADE	DI-3A	2.8	28+50 R	0.28	0.7	0.196	0.196	4	0.784	0	0.784	0.015	0.02	4.3	2	0.465	0.08	4	0.915	0.015	2	3.44	0.143	0.151	6.4	0.438	0.645	0.506	0.278	
GRADE	DI-3B	4	30+25 R	0.18	0.7	0.126	0.126	4	0.504	0.278	0.782	0.015	0.02	4.3	2	0.465	0.08	4	0.915	0.015	2	3.44	0.143	0.151	7.6	0.526	0.739	0.578	0.204	
⇩				0.06	0.7	0.042	0.042	4	0.168	0.204	0.372	0.001	0.02	6.2	Flow Approaching From Down Station 30+25 L														
SUMP	DI-3C	6	30+74 R								1.268	0.001	0.02		2		0.08								9.6	0.134	0.27	0.496	6.7	
⇧				0.32	0.7	0.224	0.224	4	0.896	0	0.896	0.001	0.02	9	Flow Approaching From Up Station 33+69 L														
HIGH POINT			33+69 R																											

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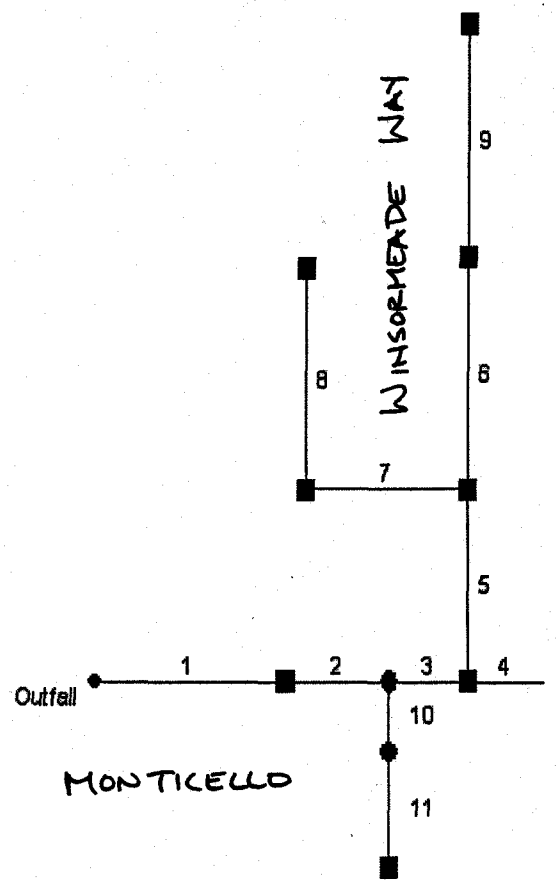
PROJECT: WindsorMeade Way
PROJECT NO.: 8818-04
SUBJECT: Spread Calc's
SHEET NO.: 4
DATE: 3/14/2002
BY: R. Smith REV 5/2003 by J.Grimes

STORM WATER INLET COMPUTATIONS FOR WINDSORMEADE WAY

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	d L/Lt (ft)	h E(#16) (ft)	Q Int CFS d/h	Q Carryover Spread	Remark
HIGH POINT			33+69 R																											
⇩																														
GRADE	DI-3B	6	36+00 R	0.23	0.7	0.161	0.161	4	0.644	0	0.644	0.015	0.02	3.7	2	0.541	0.08	4	0.955	0.015	2	3.44	0.143	0.157	9.6	0.625	0.829	0.534	0.11	
⇩																														
GRADE	DI-3B	6	37+25 R	0.12	0.7	0.084	0.084	4	0.336	0.11	0.446	0.015	0.02	2.7	2	0.741	0.08	4	0.989	0.015	2	3.44	0.143	0.162	9.6	0.625	0.829	0.37	0.076	

Hydraflow Plan View

WM WAY STORM SYSTEM #1



Project file: 8818-04-STRM-SYS-1.JAG.stm	No. Lines: 11	06-20-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

STORM SYSTEM #1

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	92.0	0.38	13.18	0.55	0.21	5.27	5.0	15.7	4.9	25.97	78.36	6.65	36	1.38	77.10	75.83	78.72	77.45	85.39	76.87	SS1-2 TO SS1-1
2	1	50.0	0.00	12.80	0.00	0.00	5.06	5.0	15.4	5.0	25.10	78.35	5.83	36	1.38	77.87 77.79	77.10	79.39	79.07	86.14	85.39	SS1-3 TO SS1-2
3	2	38.0	0.34	12.35	0.75	0.26	4.75	5.0	15.2	5.0	23.66	47.16	4.32	36	0.50	77.98	77.87 77.79	80.07	80.06	85.46	86.14	SS1-4 TO SS1-3
4	3	36.0	10.70	10.70	0.33	3.53	3.53	15.0	15.0	5.0	17.72	47.16	2.85	36	0.50	78.16	77.98	80.55	80.54	80.21	85.46	SS1-5 TO SS 1-4
5	3	83.0	0.22	1.31	0.75	0.17	0.96	5.0	6.9	6.5	6.23	12.30	5.50	15	3.63	81.41	78.40	82.41	80.54	86.47	85.46	SS1-6 TO SS1-4
6	5	100.0	0.25	0.63	0.75	0.19	0.47	5.0	6.0	6.7	3.17	13.48	3.49	15	4.36	85.77	81.41	86.48	83.23	89.77	86.47	SS1-9 TO SS1-6
7	5	78.0	0.13	0.46	0.70	0.09	0.32	5.0	6.2	6.7	2.15	6.46	1.81	15	1.00	82.19	81.41	83.30	83.23	86.19	86.47	SS1-7 TO SS 1-6
8	7	95.0	0.33	0.33	0.70	0.23	0.23	5.0	5.0	7.0	1.62	12.04	2.39	15	3.47	85.49	82.19	86.00	83.38	89.49	86.19	SS1-8 TO SS1-7
9	6	100.0	0.38	0.38	0.75	0.29	0.29	5.0	5.0	7.0	1.99	10.75	2.95	15	2.77	88.54	85.77	89.11	86.63	92.54	89.77	SS1-9 TO SS1-10
10	2	30.0	0.00	0.45	0.00	0.00	0.32	5.0	5.7	6.8	2.15	20.56	1.22	18	3.83	78.61	77.46	80.07	80.06	86.37	86.14	SS1-2 TO EX1-2
11	10	50.0	0.45	0.45	0.70	0.32	0.32	5.0	5.0	7.0	2.20	28.14	2.43	18	7.18	82.20	78.61	82.77	80.07	86.00	86.37	EX1-1 TO EX1-2

VEL OK

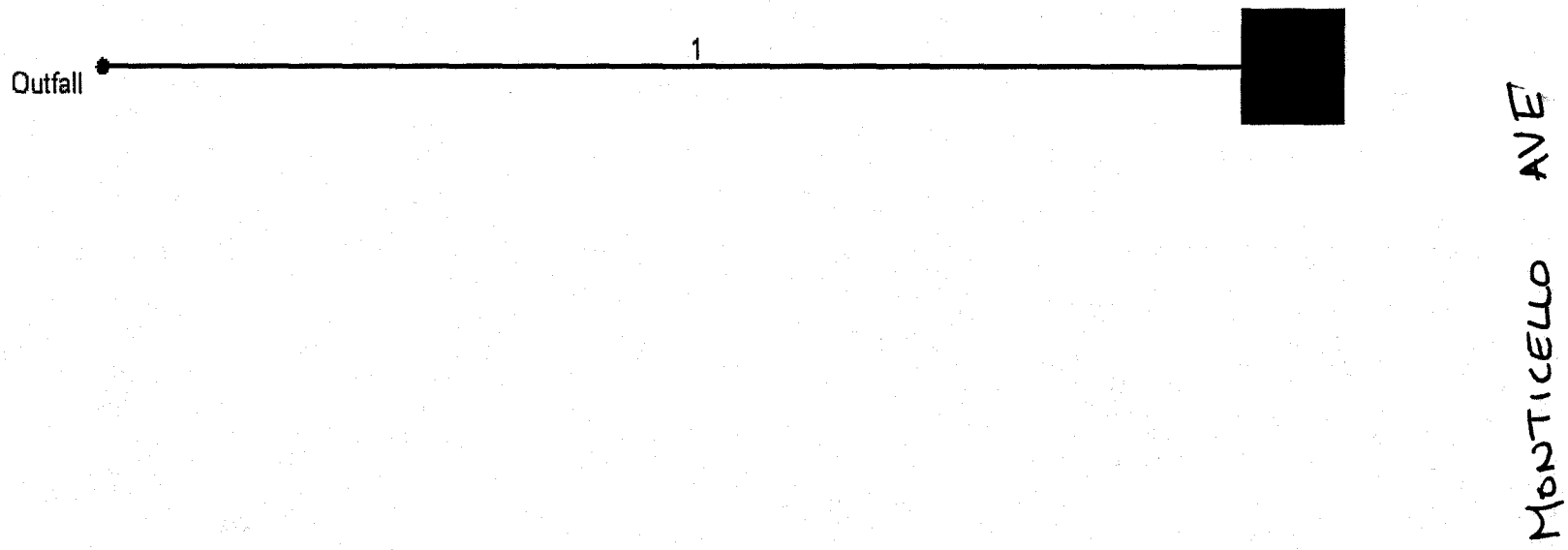
SS #1-5 to SS #1-4 surcharges at SS #1-5. This is ok, open end culvert, HW comps OK.

Project File: 8818-04-STRM-SYS-1.JAG.stm | Number of lines: 11 | Run Date: 06-20-2003

NOTES: Intensity = 80.56 / (Inlet time + 14.90) ^ 0.82; Return period = 10 Yrs.

Hydraflow Plan View

WM WAY STORM SEWER #2



Project file: 8818-04-STRM-SYS-2.JAG.stm	No. Lines: 1	06-20-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

STORM SEWER #2

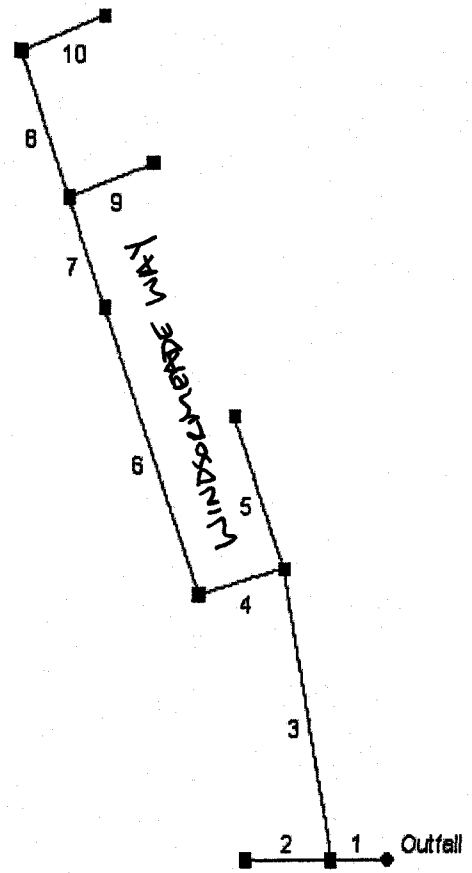
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	24.0	0.38	0.38	0.81	0.31	0.31	5.0	5.0	7.1	2.19	13.18	3.83	15	4.17	80.00	79.00	80.59	79.59	85.00	79.25	SS2-2 TO SS2-1

Project File: 8818-04-STRM-SYS-2.JAG.stm | Number of lines: 1 | Run Date: 06-20-2003

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

Hydraflow Plan View

WM WAY STORM SYSTEM #3



Project file: 8818-04-STRM-SYS-3.jag.stm	No. Lines: 10	06-20-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

WM WAY STORM SYSTEM #3

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	40.0	0.44	4.94	0.50	0.22	3.43	12.0	15.6	5.1	17.36	29.00	3.54	30	0.50	74.20	74.00	76.68	76.61	79.46	76.00	SS3-2 TO SS3-1
2	1	61.0	0.17	0.17	0.85	0.14	0.14	5.0	5.0	7.1	1.03	7.21	0.84	15	1.25	75.46	74.70	76.99	76.97	79.46	79.46	SS3-3 TO SS3-2
3	1	189.0	0.79	4.33	0.50	0.40	3.07	12.0	14.6	5.2	15.94	42.29	4.61	30	1.06	76.21	74.20	77.54	76.97	82.02	79.46	SS3-4 TO SS3-3
4	3	64.0	0.22	2.87	0.85	0.19	2.24	5.0	14.2	5.3	11.78	41.01	3.24	30	1.00	76.85	76.21	78.33	78.38	82.02	82.02	SS3-5 TO SS3-4
5	3	104.0	0.67	0.67	0.65	0.44	0.44	10.0	10.0	6.0	2.60	9.89	3.38	15	2.35	79.90	77.46	80.55	78.38	83.90	82.02	SS3-6 TO SS3-4
6	4	197.0	0.19	2.65	0.85	0.16	2.05	5.0	13.2	5.4	11.09	26.23	5.37	24	1.35	80.00	77.35	81.18	78.68	86.32 ~~84.79~~	82.02	SS3-7 TO SS3-5
7	6	75.0	0.11	2.46	0.85	0.09	1.89	5.0	12.9	5.5	10.33	42.75	4.93	24	3.57	82.68	80.00	83.82	81.44	88.68	84.79	SS3-8 TO SS3-7
8	7	100.0	0.33	1.89	0.85	0.28	1.45	5.0	12.2	5.6	8.09	39.82	3.87	24	3.10	85.78	82.68	86.79	84.55	91.78	88.68	SS3-9 TO SS3-8
9	7	64.0	0.46	0.46	0.75	0.35	0.35	8.0	8.0	6.4	2.20	6.46	2.87	15	1.00	84.07	83.43	84.66	84.55	88.68	88.68	SS3-10 TO SS3-
10	8	64.0	1.56	1.56	0.75	1.17	1.17	12.0	12.0	5.6	6.56	6.46	6.00	15	1.00	87.17	86.53	88.23	87.56	91.78	91.78	SS3-11 TO SS3-

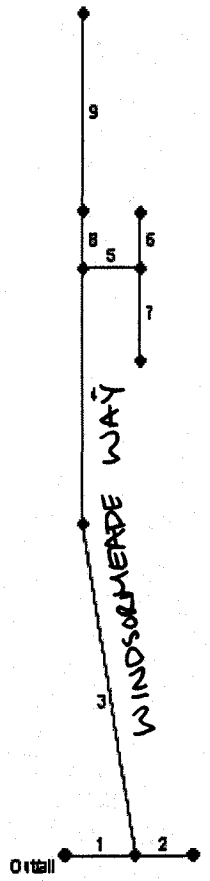
CAP OK VOK HGL OK

Project File: 8818-04-STRM-SYS-3.jag.stm | Number of lines: 10 | Run Date: 06-20-2003

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

Hydraflow Plan View

WM WAY STORM SYSTEM #4



Project file: 8818-04-STRM-SYS-4.JAG.stm	No. Lines: 9	06-20-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

STORM SYSTEM #4

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	71.0	0.00	0.00	0.00	0.00	0.00	5.0	9.8	0.0	9.61	12.00	3.06	24	0.28 15" PLAN	59.87	59.67	63.65	63.52	70.80	66.00	SS4-2 TO SS4-1
2	1	58.0	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	1.08	33.21	1.75	18	10.00	65.80	60.00	66.20	63.79	70.80	70.80	SS4-3 TO SS4-2
3	1	303.0	0.00	0.00	0.00	0.00	0.00	0.0	8.6	0.0	7.64	11.71	4.32	18	0.50 PLAN 1.24	63.64	59.87	65.40	63.79	75.50	70.80	SS4-4 TO SS4-2
4	3	231.0	0.00	0.00	0.00	0.00	0.00	5.0	8.0	0.0	7.64	6.46	6.23	15	1.00	65.95	63.64	68.68	65.44	71.55	75.50	SS4-5 TO SS4-4
5	4	58.0	0.00	0.00	0.00	0.00	0.00	5.0	7.0	0.0	3.11	4.57	2.53	15	0.50	66.24	65.95	69.41	69.28	71.55	71.55	SS4-6 TO SS4-5
6	5	48.0	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	1.64	11.53	1.34	15	3.19	67.77	66.24	69.54	69.51	71.77	71.55	SS4-7 TO SS4-6
7	5	84.0	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	0.84	7.05	0.68	15	1.19	67.24	66.24	69.53	69.51	71.77	71.55	SS4-8 TO SS4-6
8	4	50.0	0.00	0.00	0.00	0.00	0.00	5.0	7.6	0.0	2.80	9.79	2.28	15	2.30	67.10	65.95	69.37	69.28	72.28	71.55	SS4-9 TO SS4-5
9	8	178.0	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	1.40	6.46	1.67	15	1.00	68.88	67.10	69.52	69.38	75.07	72.28	SS4-10 TO SS4-

4-3 to 4-2
Comps show 18"
PLAN show 15"

Project File: 8818-04-STRM-SYS-4.JAG.stm

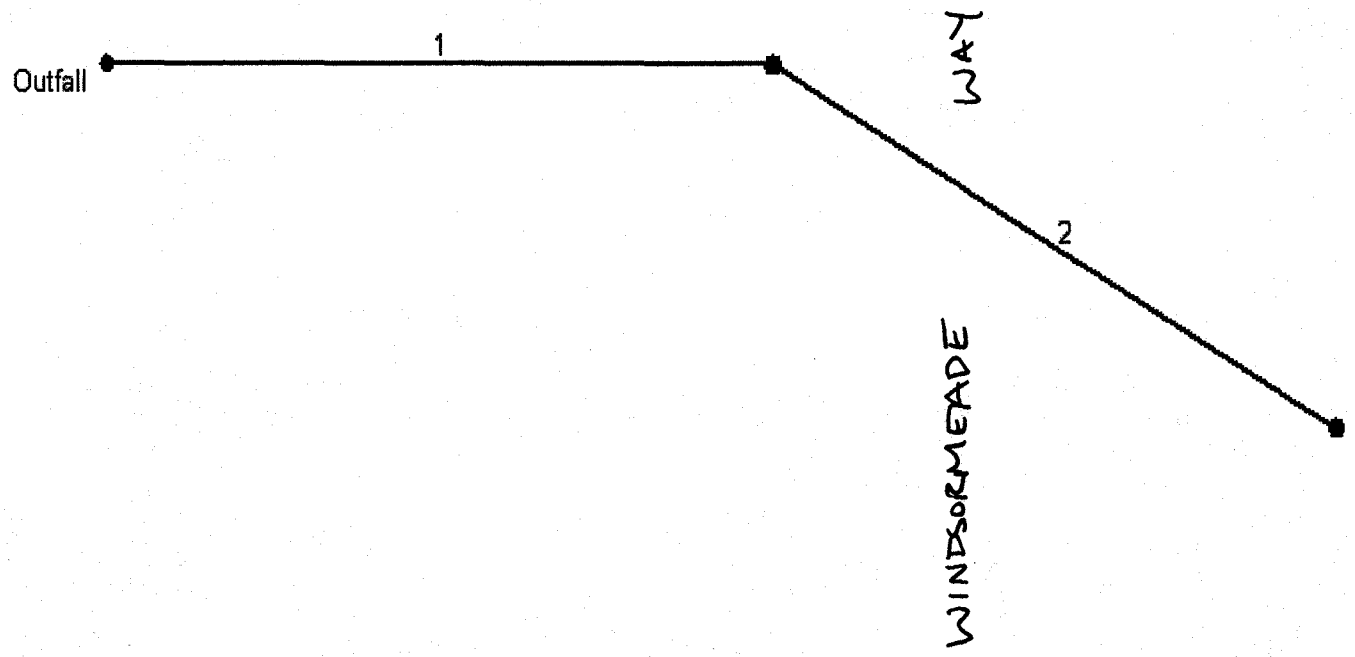
Number of lines: 9

Run Date: 06-20-2003

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

Hydraflow Plan View

WM WAY STORM SYSTEM #5



Project file: 8818-04-STRM-SYS-5.JAG.stm	No. Lines: 2	06-20-2003

Hydraflow Storm Sewers 2003

Storm Sewer Tabulation

STORM SYSTEM #5

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	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	92.0	0.00	0.00	0.00	0.00	0.00	5.0	6.2	0.0	3.86	9.23	3.15	15	2.04	61.55	59.67	63.85	63.52	66.50	60.92	SS5-1 TO SS5-2
2	1	90.0	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	1.59	4.57	1.30	15	0.50	62.00	61.55	63.97	63.92	66.00	66.50	SS5-2 TO SS5-3

Project File: 8818-04-STRM-SYS-5.JAG.stm | Number of lines: 2 | Run Date: 06-20-2003

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

GRAPHIC SCALE

300' 0' 300' 600'

SCALE: 1" = 300'

N

ENDANGERED PLANT PRESERVE

15.98 AC.

SEDIMENT BASIN No.3

39.5 AC.

CN = 73
T.C. = 41 min

TEMPORARY STREAM CROSSING

DUAL 30"

SEDIMENT BASIN No.3 OUTFALL

4.43 AC.

CN = 82
T.C. = 12 min

DETENTION POND No.2
SEDIMENT BASIN No.2

DETENTION POND No.2 OUTFALL

DUAL 60" RCP CULVERTS

SINGLE 60"

35.7 AC.

CN = 71.2
T.C. = 60 min

ENDANGERED PLANT PRESERVE

DETENTION POND No.1 OUTFALL

DUAL 24"

7.9 AC.

CN = 73.4
T.C. = 63 min

SR 199

MONTICELLO AVENUE S.R. 31

7.3 AC.

CN = 82
T.C. = 21 min

DETENTION POND No.1
SEDIMENT BASIN No.1

CN = 78.5
T.C. = 15 min

3.1 AC.

OLD NEWS ROAD

No.	DATE	REVISION / COMMENT / NOTE	BY

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

AES CONSULTING ENGINEERS

WINDSORMEADE WAY

POST-DEVELOPMENT DRAINAGE AREAS

BERKELEY DISTRICT JAMES CITY COUNTY VIRGINIA

Designed AES	Drawn AES
Scale 1"=300'	Date APRIL 2002
Project No. 8818-04	
Drawing No. EXHIBIT B	

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

County BMP ID Code (if known): PC-240

Name of Facility: Windsor Meade Villas BMP #1 BMP No.: 1 of 2 Date: 3/19/2009

Location:

Name of Owner:

Name of Inspector: Gregory B. Johnson

Type of Facility: Wet Detention Pond

Weather Conditions: Sunny 48° Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

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

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height	✓			
Vegetation Condition		✓		More grass should be planted
Tree Growth		✓		Cut trees on dam flush with slope
Erosion			✓	Upper end has erosion occuring
Trash & Debris	✓			
Seepage	✓			
Fencing or Benches	✓			
Interior Landscaping/Planted Areas: ☐ None ☐ Constructed Wetland/Shallow Marsh ☒ Naturally Established Vegetation				
Vegetated Conditions	✓			
Trash & Debris	✓			
Floating Material	✓			
Erosion	✓			Upper end of BMP slopes eroding
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion			✓	Erosion upper end of BMP
Algae	✓			
Trash & Debris		✓		
Sediment	✓			
Aesthetics	✓			
Other			✓	Four bay needs repaired
Inflows (Describe Types/Locations):				
Condition of Structure	✓			Unable to determine under water
Erosion			✓	Above location of inlet
Trash and Debris		✓		
Sediment	✓			
Outlet Protection	✓			
Other	✓			
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type):				
Condition of Structure	✓			
Corrosion	✓			
Trash and Debris		✓		Backside of structure
Sediment	✓			
Vegetation	✓			
Other				
Principal Outlet Structure - Barrel, Conduit, etc. :				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris		✓		Remove trash and debris
Erosion/Sediment	✓			
Outlet Protection			✓	Rip raps needs to be placed per plan below lip of flare
Other				
Emergency Spillway (Overflow):				
Vegetation	✓			
Lining	✓			
Erosion	✓			
Trash & Debris	✓			
Other				
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other	✓			
Surrounding Perimeter Conditions:				
Land Uses	✓			
Vegetation	✓			
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			
Other	✓			

Remarks:

Overall Environmental Division Internal Rating: ___ _____

Signature: _____ **Date:** _____

Title: _____

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

From: Greg Johnson
Sent: Friday, April 03, 2009 9:02 AM
To: 'rbottone@vumh.org'
Subject: Windsor Meade Villas BMP 1

Environmental Division
101-E Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784
P-757-253-6683
C-757-259-4032
gregj@james-city.va.us

April 3, 2009

Windsor Meade Villa BMP 1
ATTN: Rich Bottone
453 McLaws Circle Suite 3
Williamsburg, Virginia 23185

JCC BMP : PC-240
County Plan No. SP-03-04

Dear Mr. Bottone:

The Environmental Divisions has received a record drawing (as-built) for the stormwater management facility for the above referenced project. The record drawing provides as-built information for a wet pond retention BMP located on the.

Based on our review of the project and a concurrent field inspection as performed on March 18, the following items must be addressed prior to release of the developer's surety instrument for the stormwater management/BMP facility at the site and to proceed with closing out the project.

Record Drawing:

1. The record drawing set dated **8/08/2008** is **satisfactory**.

Construction - Related Items (Outfall and Dam):

1. Remove Silt Fence and stakes from the outside slopes of the dam.

2. Apply more grass stabilization to all areas.

3. Outfall needs to be construction per plan. Rip rap needs to be placed below lip of flare and reorganized per plan.

4. Upper end of BMP slopes are eroding and needs to be repaired and stabilized.

5. Rip rap for four bay needs to be repaired. Appears there is not enough stone or stone has been displaced.

6. Cut trees on slopes of dam flush with the surface of the dam.

7. Clean trash and debris from around the principal structure. Also ensure there is no erosion occurring in this area.

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

Please contact me at 757-253-6683 if you have any further comments or questions.

Sincerely,

Gregory B. Johnson
Inspector

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, P.E.**

CO.: James City County Environmental

Address:

cc:

DATE	JOB NO.
12-17-08	8818-05

FROM: Wesley Baker, PE

RE
WindsorMeade Villa BMP Record Draws

RECEIVED
DEC 17 2008
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	08/18/08	4	WindsorMeade Villa BMP Record Draws
1	12/17/08		BMP Cert.
1	12/17/08		Checklist
1	12/17/08		Letter to Scott Thomas P.E.

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.

08/07/2008 10:42

08/07/2008 10:43

08/07/2008 10:37

08/07/2008 10:42

08/07/2008 10:42

RECEIVED
JUN 2004

Water Quality Impact Assessment

Of

Proposed Site Improvements

Of the

WindsorMeade Project

Virginia United Methodist Homes

COMMONWEALTH OF VIRGINIA
VAN MARC BENNETT
6/9/04
No. 26628
PROFESSIONAL ENGINEER

June 1, 2004

AES Project Number 8818-5

Table of Contents

I. INTRODUCTION

II. CLASSIFICATION OF IMPACTS

III. MAJOR WATER QUALITY IMPACT ASSESSMENT

a. Site Narrative

b. Review of RPA Impacts, Minimization, and Mitigation

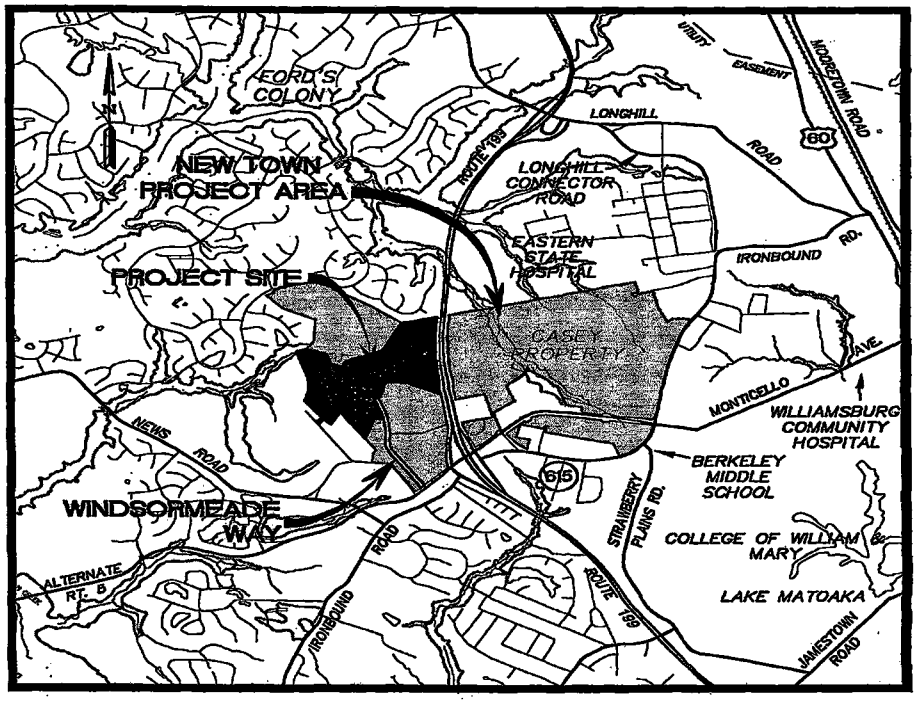
IV. CONCLUSION

V. APPENDIX

- **Exhibit A:** Impact Locations (WindsorMeade Site Plans, current)
- **Exhibit B:** Impact Locations (WindsorMeade Master Plan, July 2001)

I. INTRODUCTION

Virginia United Methodists Homes, through the services of AES Consulting Engineers and Freeman-White Architects, prepared a Master Plan and Rezoning for the WindsorMeade Project Site in James City County, Virginia. This new development was approved with a detailed master plan in July 2001 by the James City County Board of Supervisors as a Mixed Use Community. Located on the north side of Monticello Avenue and West of Route 199 and South of the recently completed Ford's Colony Section 30, the proposed age-restricted development includes various forms of residential development (single family, multifamily and assisted care facilities). The original master plan approved 125 individual dwelling units (currently known as WindsorMeade Villas) at a density of 2.35 units/acre. The master plan has evolved into the current design in order to satisfy Virginia Department of Environmental Quality (DEQ) and U.S. Army Corps of Engineers (Corps) concerns about the wetland impacts for the project. The current design significantly reduces the wetlands impacts through clustering the development and reduces the residential density for the single-family component of the development (WindsorMeade Villas) to 1.7 units/acre (a total of 96 single-family units). It should be noted that since the rezoning, this project has been in constant development with the Project Team, and periodic reviews (by DEQ, the Corps, the Design Review Board for New Town, and the James City County Development Review Committee (a sub-committee of the James City County Planning Commission).



The topics of this Water Quality Impact Assessment are focused on those proposed impacts to the ~~Extended~~ Resource Protection Areas (RPAs) resulting from the planned development on the 105.9-acre site of WindsorMeade. There are six (6) primary impacts:

- Impact 1 – Clearing, grading and installation of entrance roads for Villa and Hall areas from the end of the VDOT right-of-way of WindsorMeade Way. SP-5-04 SP-4-04
- Impact 2 - Clearing, site grading and installation of Windsor Hall Drive and associated parking with the Hall. SP-4-04
- Impact 3 - Clearing, site grading and stormwater management construction with outfalls, within the ~~Extended~~ RPA Buffer. These impacts include Villa Entrance Dry Pond, Windsor Hall Wet Ponds 1 & 2 and Villa BMP 1. SP-93-03 SP-5-04 SP-4-04 SP-3-04
- Impact 4 - Sanitary and Pedestrian Bridge. Clearing and installation of timber bridge (low impact design) and retaining wall walkway. OVERLOOK SP-4-04
- Impact 5 – Clearing, site grading and installation of sanitary sewer from WindsorMeade Way to Ford's Colony Section 30. SP-5-04
- Impact 6 – Clearing and site grading for Villa Single Family Units 1, 2 and 3. These single-family units locations are based upon approved master plan. SP-3-04

In this assessment, please note: The term "Extended RPA Buffer" refers to the RPA Buffers established with perennial stream, and wetlands, if any, associated and adjacent to perennial streams, as defined with the latest amendment of the Chesapeake Bay Preservation Ordinance (Chapter 23 of the Code of James City), becoming effective January 1, 2004.

delete

Impact 4 - Ramp/overlook in Windsor Hall would be part of the CBB approval, in addition to sanitary/ped bridge

Impact 2 - I don't believe the parking area in Windsor Hall is per admin review (the roads not the parking)

II. CLASSIFICATION OF IMPACTS

Using the latest amendment of the Chesapeake Bay Preservation Ordinance (Chapter 23 of the Code of James City) as guidance, this assessment attempts to classify the proposed impacts:

- (i) Roads and Driveways
  - Impact 1 – Clearing, grading and installation of entrance roads for Villa and Hall areas from the end of the VDOT right-of-way of WindsorMeade Way. (Administrative Review) ADMIN
  - Impact 2 - Clearing, site grading and installation of Windsor Hall Drive and associated parking with the Hall. (Administrative Review) ? parking ?
- (ii) Flood Control or Stormwater Management
  - Impact 3 - Clearing, site grading and stormwater management construction with outfalls, within the ~~Extended~~ RPA Buffer. These impacts include Villa Entrance Dry Pond, Windsor Hall Wet Ponds 1 & 2 and Villa BMP 1. (Administrative Review) ADMIN
- (iii) Utility Connections ALSO RAMP/OVERLOOK IS NOT PART OF UTILITY (CHES BAY)
  - Impact 4 – Sanitary and Pedestrian Bridge. Clearing and installation of timber Bridge (low impact design) and retaining wall walkway. CHES BAY BUILD
  - Impact 5 – Clearing, Site Grading and installation of sanitary sewer from WindsorMeade Way to Ford's Colony Section 30.
- (iv) Accessory Structures
  - Impact 6 - Clearing and Site Grading for Villa Single Family Units 1, 2 and 3. These units locations based upon approved master plan. CHES BOUNDARY

Exhibit A identifies the relative locations of these impacts on the WindsorMeade project site. For comparison, Exhibit B identifies the locations of impacts associated with the WindsorMeade master plan as approved in July 2001.

Further review of the amended ordinance and consulting with the Director of the James City County Environmental Division has revealed that exceptions for impacts to the RPA resulting from roads and driveways (Impacts 1 & 2) and stormwater management facilities (Impacts 3), are managed as an administrative process within the James City County Environmental Division. As for the RPA impacts resulting from AES STATES 1, 2 3 ADMIN 4, 5, 6 CBB

utilities and accessory structures (Impact 4, 5 and 6), exceptions from the provisions of the amended Chesapeake Bay Preservation Ordinance may require formal exceptions by the Chesapeake Bay Board, and therefore would require this Water Quality Impact Assessment. However, this assessment will evaluate all proposed RPA impacts.

All impacts require WQIA

III. MAJOR WATER QUALITY IMPACT ASSESSMENT

A. Site Narrative

The WindsorMeade site topography is generally rolling, and located along the unnamed tributaries draining to Powhatan Creek. The elevation range on this property is between 44 to 104 feet above mean sea level (msl). The site has limited areas of steep terrain (exceeding 25% slope), the surface runoff is directed towards the onsite channels.

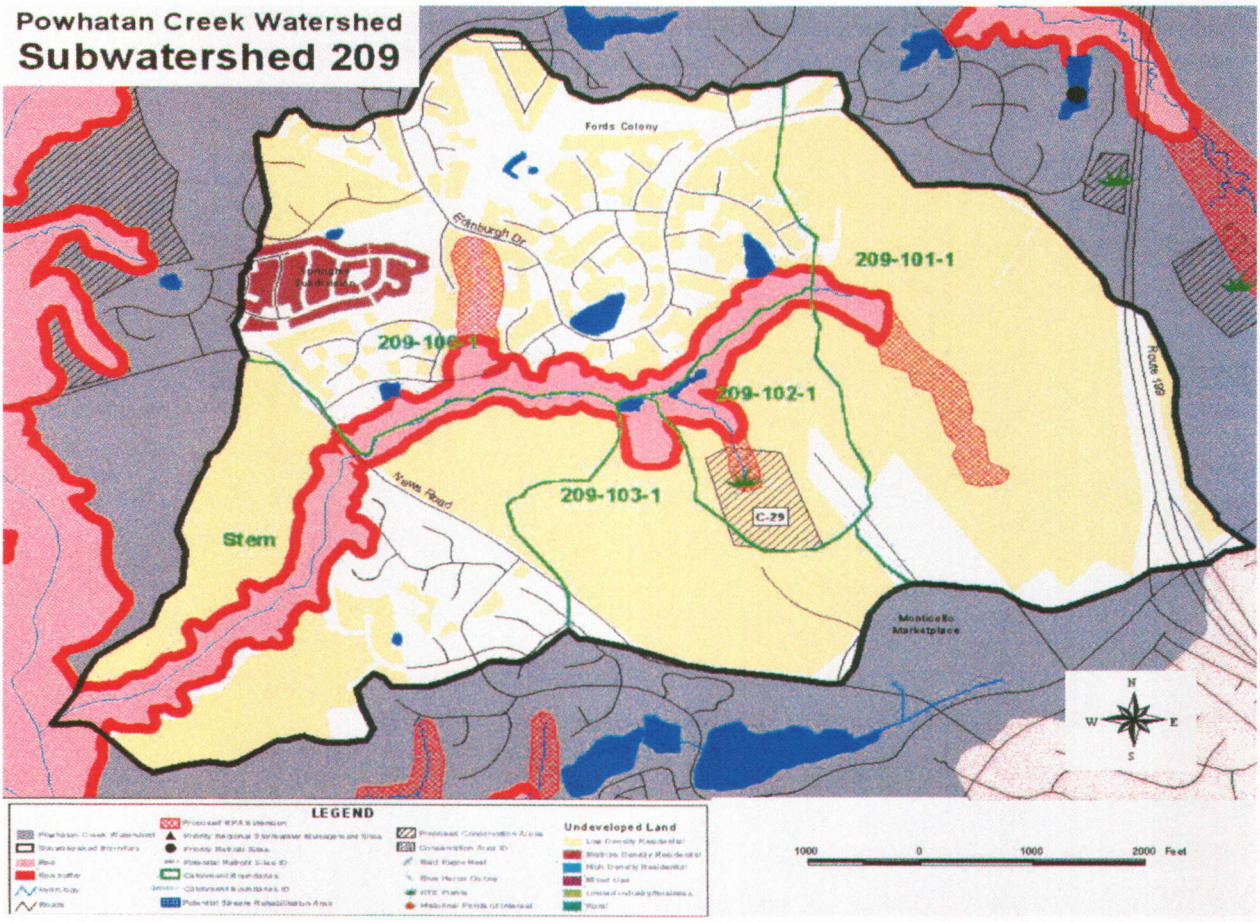
According to the James City County soil survey, the site is underlain by a variety of soil series. However, a common link between most of the soil series is the characteristic of moderately drained, highly erosive soils. The soils found on the site include the Emporia complex, Craven Uchee complex, and Caroline fine sandy loam. These soils are typically found on gently sloping to steep upland ridges, as can be found on the site.

The hydrologic classifications of the mapped soil types range from group C to group D (poorly drained) on the site. Among the mapped units, Johnston complex is classified by the NRCS as a hydric soil. However, Johnston soils are limited primarily in the areas of the wetlands.

Shrink-swell potential is low to moderate in all soils mapped within the site boundary, and the erosion hazard potential is high in all soils on slopes greater than 5%. The project site is a heavily forested area. The forested area was damaged from high winds during the past year.

Existing site runoff is associated with an unnamed perennial stream which is a tributary of Powhatan Creek. Powhatan Creek was the subject of investigation by the Center for Watershed Protection (CWP). The results of the research and investigation by CWP was reported in "The Powhatan Creek Watershed Management Plan, Draft Report" dated November, 2001, which serves as a "blueprint for the protection and restoration of Powhatan Creek." The WindsorMeade development is identified to be within

Subwatershed 209-101-1 of Powhatan Creek. In the report by CWP, it mentions that a management opportunity may be to cluster development to maintain density potential and optimize open space.



B. Review of RPA Impacts, Minimization, and Mitigation

Before further review of the RPA impacts proposed with the WindsorMeade Development, it should be noted that iterative site planning and civil engineering was very attentive towards wetlands impacts. This resulted in the current plan of development for the site, balancing adherence to the approved master plan for the site, geometric considerations, appropriate building separations, required stormwater management facilities, and public utility connections needs.

Impact 1 - Entrance Roads for Villa and Hall areas from WindsorMeade Way (0.54 acres of RPA impacts)

The WindsorMeade Site is split by a perennial stream, with Windsor Hall on the west side and the Villa single family units on the east. A crossing of the perennial wetland is required to access the Windsor Hall site. Additionally another wetland crossing is required to reach the Villa site. Both of these wetlands crossings were outlined in the Master Plan. The extension of WindsorMeade Way, from the end of the VDOT right-of-way, will impact the extended RPA buffer by 0.28 acres. The wetland crossing associated with Windsor Hall Drive will impact the extended RPA buffer by 0.26 acres (in addition to actual wetland impacts).

Retaining walls were used to limit the impacts to wetland and RPA by eliminating the need to provide 3:1 fills slopes beyond the road section. The retaining walls reduce the wetlands impacts (for both wetland crossings) by approximately 0.25 acres.

Impact 2 - Windsor Hall Drive and Parking Lot for Windsor Hall (0.45 acres of RPA impacts)

Again, located to the west side of the perennial stream site improvements, it is proposed to disturb approximately 0.45 acres of extend RPA buffer associated with the aforementioned perennial stream. This area is located on mildly sloped lands of the site (containing some areas of greater than 25% slopes). The purposes of Windsor Hall Drive is to provide proper vehicular circulation on site and provide perimeter access for emergency vehicles. Additionally the front parking area provides parking within close proximity to the dining facilities which will serve those living in the Villa units.

A retaining wall is provided to limit grading into the wetlands. Runoff from the parking, roadway and shoulder will be captured by the storm sewer system and directed to Windsor Hall BMP 1 & 2.

Impact 3 - Stormwater Management Construction for Villa Entrance Dry Pond, Windsor Hall Wet Ponds 1 & 2 and Villa BMP 1 (2.15 acres of RPA impacts)

Extensive design and analysis was conducted in the preparation of the development plans for selection and placement of stormwater management facilities. The original master

plan sought to install a centrally located extended detention wet pond in the perennial stream (at least 3.44 acres of wetland impact). This facility would have provided stormwater management for the entire site and additionally for other adjacent offsite parcels. The dam embankment for this facility would have been used for a road access between Windsor Hall and the Villa site (this roadway has since been abandoned in favor of a lower impact Sewer and Pedestrian bridge). In an effort to reduce wetlands impacts the BMP facility removed from the wetland bottom and replaced by individual facilities around the project. These facilities include one extended detention dry pond and 4 extended detention wet ponds, which have 0.10 acres of wetland impacts. How much RPA impact?

Stormwater management facilities are provided to lessen the effect of hydrology on downstream receiving channels. Based on the existing topography of the site, the proposed stormwater management facilities are strategically located on the site so as to efficiently capture and treat stormwater runoff while minimizing any further and unnecessary impacts on topography. Additional mitigation is seen as unnecessary for these impacts to the RPA buffer as the alterative would require significant impact to the perennial stream or result in significant loss of residential density for the project (which has already been reduced to relocate the BMP out of the wetland area). With the combination of natural open space, and the two stormwater management / best management practices designs for the site, the site achieves in excess of the 10 BMP points found necessary to demonstrate compliance with storm water quality runoff. I'm not sure I agree w/ this statement

Impact 4 - Clearing and Installation of Timber Sewer and Pedestrian Bridge and retaining wall walkway (0.35 acres of RPA impacts)

The sewer bridge is necessary to provide public sewer service to Windsor Hall site. The clearing for the wetland crossing and associated ~~extended~~ RPA buffer impacts, are limited to what is required to provide construction access for the pile construction. Note that this clearing is less than requirements for underground construction and provides a lower potential of transporting sediment downstream that may result from excavation type construction. NO MENTION OF RAMP/OVERWORK

The construction of the timber bridge was proposed to limit the impacts to the wetlands. The Corps has determined that open pile construction is a non-impact to the wetlands and as such no wetland permit is required for the pedestrian/ sewer bridge. The associated retaining wall walkway is required to provide adequate handicap access from the bridge to the site. It should be noted that the Master Plan provided a roadway crossing for the connection between the Villas and Windsor Hall, which provided for vehicular, pedestrian and sewer access between the sites.

– can be moved out of RPA

Impact 5 - Installation of Sanitary Sewer from WindsorMeade Way to Ford's Colony Section 30 (0.29 acres of RPA impacts)

The sanitary sewer connection is required to provide sanitary sewer for all of New Town West project area (including WindsorMeade Marketplace, up to 350 future apartments, Windsor Hall and WindsorMeade Villas). The designed alignment is necessary to provide required service and maintain proper alignment with the existing sanitary sewer within Ford's Colony.

Impact 6 - Clearing and Site Grading for Villa Single Family Units 1, 2 & 3 (0.31 acres of RPA impacts)

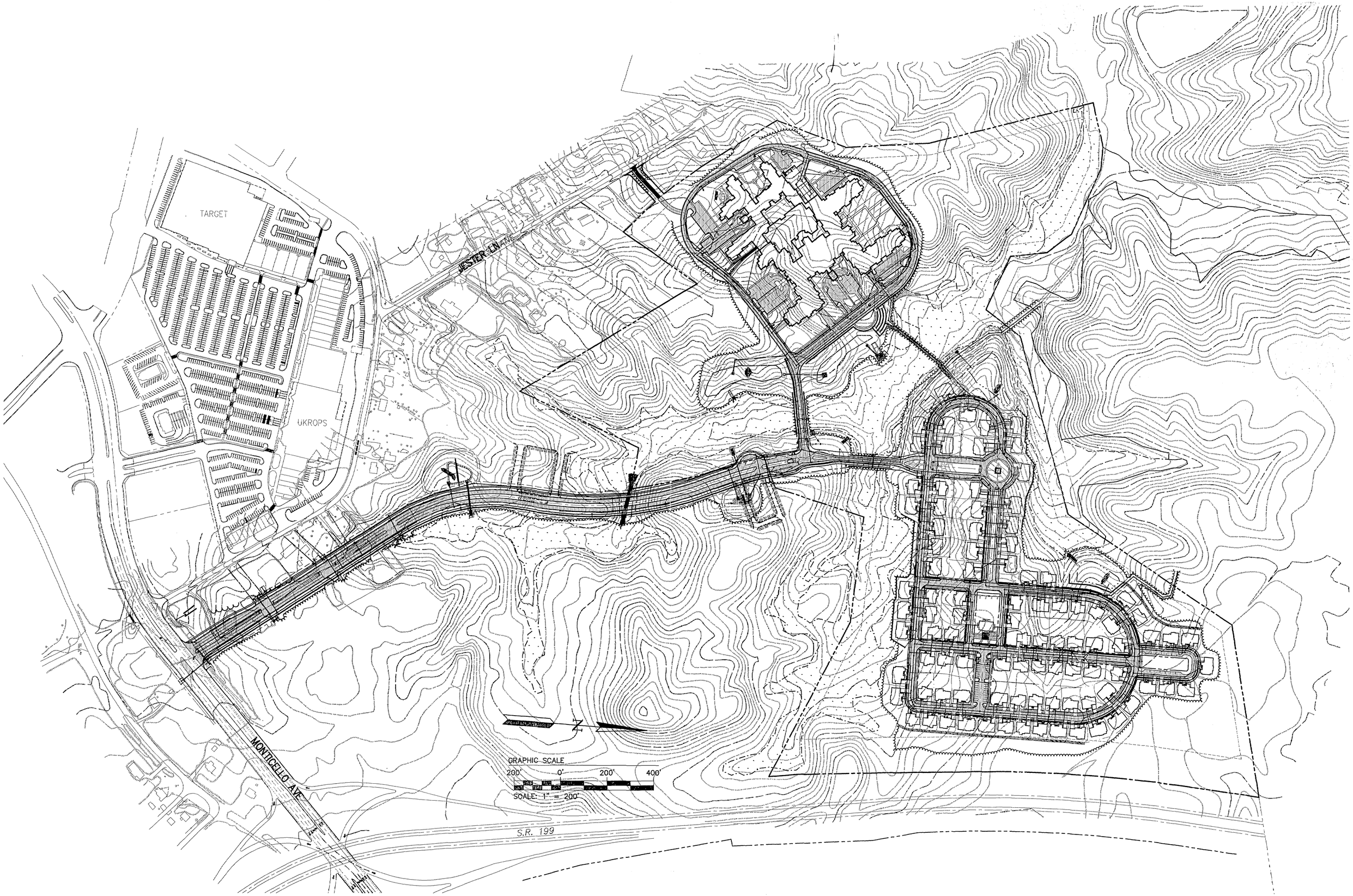
The location of Villa units 1, 2 and 3 in some measure occur within the Extended RPA. These units are in the same general location as indicated on the Master Plan. Additionally clearing and site grading will occur with the site preparation and construction of these units. Overall the Villa units were clustered and the roadways have been straightened to maximize the site density and create more open space surrounding the property. These units can not be relocated due to the current cluster style development and the only alternative to their location would be to remove the units and further reduce the density (as outlined within the Master Plan). It should be noted that cluster development is a suggested mitigation, as part of the Powhatan Creek study, to provide open space.

IV. CONCLUSION

In summary, the findings of this Water Quality Impact Analysis indicate that:

- The overall project density (single family) has been lowered (from 2.35 units/acre to 1.7 units/acre) to limit the impacts to the wetlands environments. Also the development has become more clustered which was a recommendation of the Powhatan Creek Watershed Study.
- Stormwater management facility and sanitary sewer connection impacts to RPA are required to prevent impacts within the delineated wetlands.
- Approximately 52% of the site is treated by a BMP. Additionally over 4 acres of offsite drainage is treated by the onsite BMP facilities.
- Over 40% of the site has been dedicated to natural open space (approximately 45 Acres).
- 4.67 acres of wetlands buffers were dedicated as open space (over the 2.12 aces requested by the U.S. Army Corp of Engineers).
- Onsite BMPs have been sized to handle additional offsite drainage currently draining uncontrolled to the perennial stream.
- Well-reasoned designs and methods have been employed to minimize impacts to the RPA. When unavoidable, the impacted areas have been minimized to "only those areas necessary."

Since extensive mitigation efforts are provided, it is noted that the intent of the Chesapeake Bay Preservation Ordinance has been honored and upheld in the current plan of development containing the necessary impacts to the Extended RPA.


TARGET
UKROPS
JESTER LN
MONTICELLO AVE
S.R. 199
GRAPHIC SCALE
200' 0' 200' 400'
SCALE: 1" = 200'

Windsor Meade - WQIA

1. Original Master Plan -

125 units in the Villas - 2.35 units/ac

Now 96 " " " " 1.7 unit/ac

overall Buffer Impacts - 6.64 ac vs 4.09 ac now

2. Impact 1 - Entrance roads to Villas + Hall

- same as MasterPlan 01 - ∴ Grandfathered

Impact 2 - Windsor Hall Dr + parking area

- same as MP 01 - ∴ Grandfathered

Impact 3 - BMPs (4)

- new impact - 2.15 ac vs 3.44 (wetlands alone)

Impact 4 - Sanitary + Pedistrian Bridge

- was a road previously - ok except for switchback/overlook area)

Impact 5 - Sanitary Sewer from WM Way to Fords Col 30

- was previously approved - 0.29 ac impact

Impact 6 - Villa Units 1, 2, 3 (from approved Master Plan)

- same as MP01 - ∴ Grandfathered

3. Project now includes 2 pogonia preserves

		HALL Area	48.6 ac
Original	Bldgs - 12.8 ac		17.79 Ac Imp
	Rds + other Imp - 27 ac	VILLAS	- 57.4
	Green Space - 66.2		16.63 Ac Imp
	106 ac.	Total	- 106 ; 34.4 ac imp

New - Now reduced density + clustered

39.8 - 34.4 / 39.8 = 5.4 ac less imp = 13.6%

I 1. - uses retaining walls for road xings -

I 2. - " " " to limit grading into RPA + wetlands

I 3 - What was original RPA impact

I 4 - Sewer / ped. bridge replaces road xing - needs to move handicap access

I 5 - 0.24 ac of RPA impact - ~~what was it~~ was approved before

I 6 - bldgs same as before - grandfathered

```
 1        .9447+06              7.00389              7.14789
 2        .1585+05               .52298               .46826
 3        .1584+04               .05227               .04968
 4        .1121+13            815.52634            815.51339
 5        .1080+14           7860.05933           7860.04639
 6        .3610+04               .11914               .11654
 7        .2118+06              6.99189              9.29589
      17.80000        23.00313

 OUTPUT FROM CYCLE  12    AVINFL = 283.93    OUTFLOW =  23.75 COL
     43.0       57.4  135148.7  134886.9      261.8
INFLOW AND OUTFLOW CONCENTRATIONS
 1        7.308 2        2.222 3         .228 4    .62+05 5    .61+(
 1        7.095 2         .492 3         .051 4    .93+03 5    .90+(

 1     2074.872 2      141.736 3       14.571 4    .18+12 5    .18+1
 1      168.493 2       11.681 3        1.211 4    .22+05 5    .21+(

 1    15600.736 2     1072.681 3      106.995 4    .13+13 5    .13+1
 1      686.741 2       47.365 3        4.883 4    .61+05 5    .59+(

 1        .9466+06              7.00441              7.14841
 2        .1598+05               .52625               .47153
 3        .1597+04               .05261               .05002
 4        .1277+13            927.20358            927.19063
 5        .1234+14           8961.87634           8961.86340
 6        .3718+04               .12247               .11987
 7        .2121+06              6.98789              9.29189
      17.80000        23.13310

 OUTPUT FROM CYCLE  13    AVINFL = 277.14    OUTFLOW =  26.89 COL
     43.0       57.4  135400.5  135148.7      251.8
INFLOW AND OUTFLOW CONCENTRATIONS
 1        7.312 2        2.241 3         .227 4    .60+05 5    .59+(
 1        7.099 2         .494 3         .051 4    .10+04 5    .10+(

 1     2026.481 2      139.499 3       14.142 4    .17+12 5    .17+
 1      190.857 2       13.278 3        1.378 4    .28+05 5    .27+

 1    17627.217 2     1212.180 3      121.137 4    .15+13 5    .15+
 1      877.598 2       60.644 3        6.261 4    .89+05 5    .86+

 1        .9484+06              7.00494              7.14894
 2        .1610+05               .52941               .47469
 3        .1610+04               .05293               .05034
 4        .1420+13           1029.46693           1029.45398
 5        .1376+14           9975.71423           9975.70129
 6        .3819+04               .12558               .12299
 7        .2124+06              6.98316              9.28716
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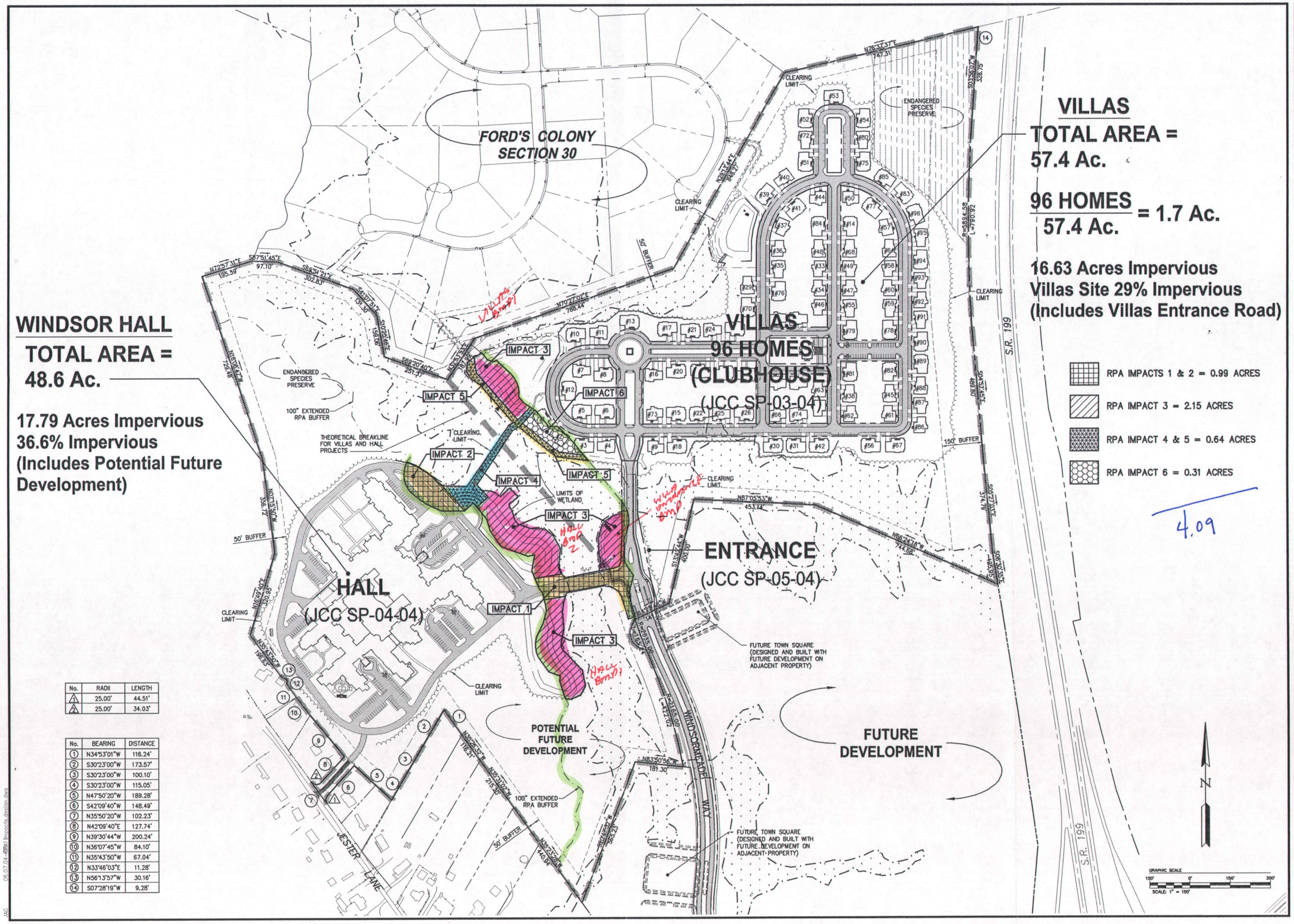

No.	RADII	LENGTH
1	25.00'	44.51'
2	25.00'	34.03'

No.	BEARING	DISTANCE
1	N34°53'01"W	116.24'
2	S30°23'00"W	173.57'
3	S30°23'00"W	100.10'
4	S30°23'00"W	115.05'
5	N47°50'20"W	189.28'
6	S42°09'40"W	148.49'
7	N35°50'20"W	102.23'
8	N42°08'40"E	127.74'
9	N39°30'44"W	200.24'
10	N36°07'45"W	84.10'
11	N35°43'50"W	67.04'
12	N33°46'03"E	11.28'
13	N56°13'57"W	30.16'
14	S07°28'19"W	9.28'

No.	DATE	REVISION / COMMENT / NOTE	BY

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

EXHIBIT A
WINDSORMEADE of Williamsburg
OVERALL PLAN
JAMES CITY COUNTY VIRGINIA
BERKELEY DISTRICT

Designed	Drawn
JAG	SRL
Scale	Date
1"=150'	6/2/04

Project No. 8818-5
Drawing No. 1

06-07-04-PBM1 (impacts-design.dwg)
JAG

100' EXTENDED RPA BUFFER IMPACT = 3.20 ACRES

WETLANDS IMPACT = 3.44 ACRES

N.F
POWHATAN ENTERPRISES, INC
(38-3)(1-1)

LIMITS OF SURVEYED WETLANDS (TYPICAL)

SITE 1998-6

SITE 2001-10

SITE 2001-9

SITE 2001-3

BUFFER LINE 2001-9

SITE 2001-2-8

SITE 2001-2-10

SITE 2001-3-5

IMPACT

IMPACT

IMPACT

IMPACT

PREVIOUSLY PROPOSED 10" SEWER TRUNK MAIN TO BE INSTALLED AS PART OF THE DEVELOPMENT OF FORD'S COLONY SECTION 30 (BY OTHERS)

FORD'S
FUTURE SI

JESTERS LANE

N.F
JESTERS LANE
(38-2)(2-1 THRU 2-33)

OLD NEWS ROAD

N.F
CASEY PROPERTY
(38-3)(2-34)

PROPOSED WINDSORMEADE WAY (BY OTHERS)

FUTURE SANITARY SEWER (BY OTHERS)

LIMITS OF SURVEYED WETLANDS (TYPICAL)

N/F
CASEY PROPERTY
(38-1)(1-5 THRU 1-8)

N.F
CASEY PROPERTY
(38-3)(1-2)

S.R. 199

S.R. 199

AVENUE

GRAPHIC SCALE
150' 0' 150' 300'
SCALE: 1" = 150'

No.	DATE	REVISION / COMMENT / NOTE	BY

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

EXHIBIT B

WINDSORMEADE of Williamsburg

OVERALL MASTER PLAN

JAMES CITY COUNTY VIRGINIA

BERKELEY DISTRICT

Designed	Drawn
JAG	SRL
Scale	Date
1"=150'	6/2/04
Project No.	
8818-5	
Drawing No.	
1	

06.08834.r08\8818\ master plan.dwg

JAG

GEOTECH REPORTS NOT REQUIRED
PRIOR to 2008 - Construction

Comment #50
1ST Review
VILLAS
2/13/07 required geotech
GTR was required in wintered
SP-

2.2.01

Community Impact Study

MAY 2001
RECEIVED
PLANNING DEPARTMENT

For

WINDSORMEADE
Of Williamsburg

January 18, 2001

Prepared By

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

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
Environmental Consultants
516-B South Henry Street, Williamsburg, Virginia 23185 (757) 220-6869

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1. Master Plan of WindsorMeade at Williamsburg (6 Sheets)
2. Traffic Impact Analysis, prepared by DRW Consultants
3. Fiscal Impact Analysis, prepared by The Wessex Group, Ltd.
4. Archeological Evaluation, prepared by Archeological and Cultural Solutions, Inc.
5. MU Master Plan and Design Guidelines, prepared by Freeman White

I. INTRODUCTION

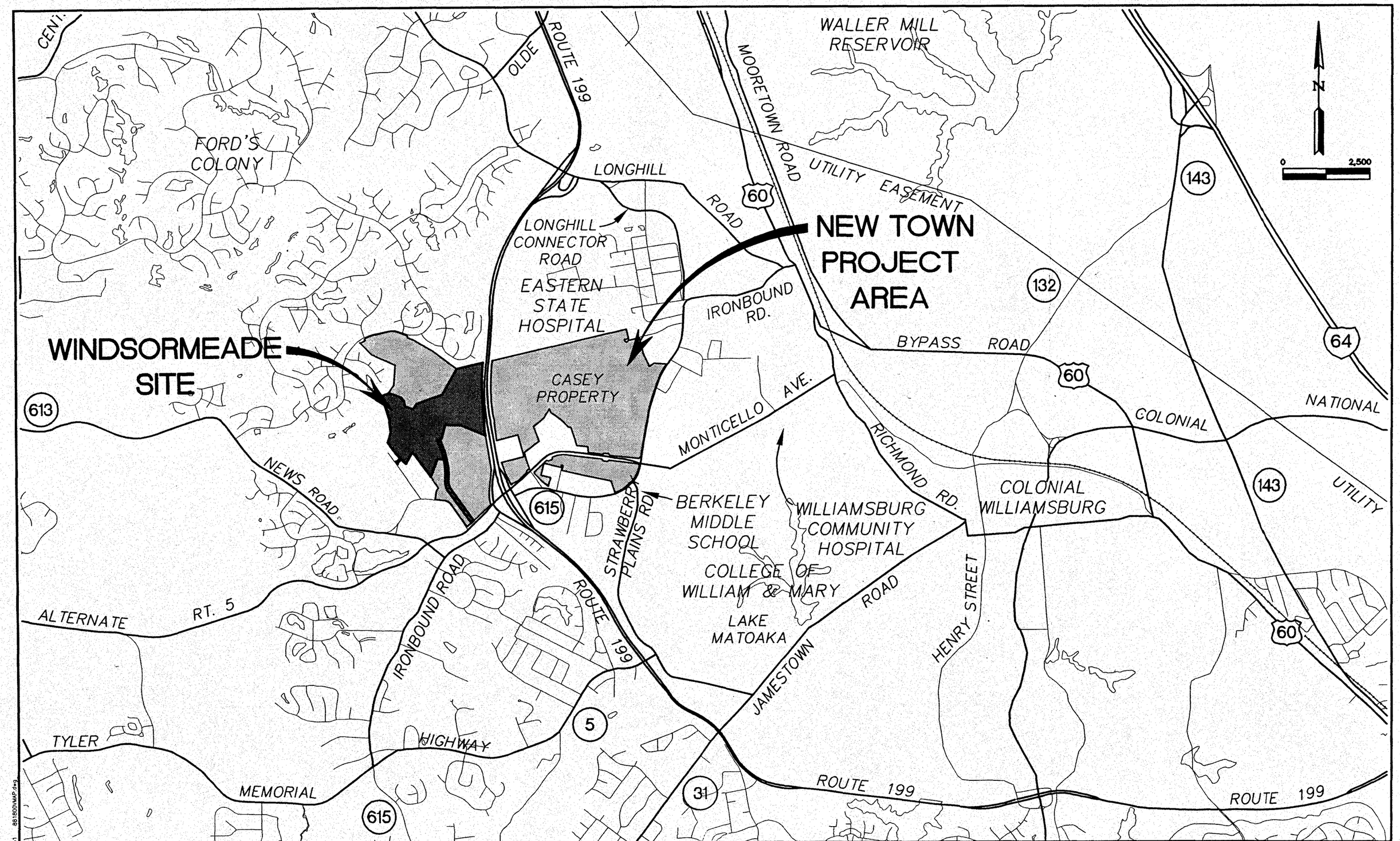
Virginia United Methodist Homes, Inc. (VUMH) proposes a master plan and rezoning for WindsorMeade of Williamsburg, a Continuing Care Retirement Community (CCRC) to be located in the northwest portion of the New Town project. The project is to consist of 300 independent living units, of which approximately 125 are proposed to be detached and attached (duplex) cottage style units and 175 are proposed to be apartment type units located in a main central facilities building. Also located in the main building is a 47 bed assisted living unit, a 56 bed nursing care unit, and a 16 bed unit dedicated to the care of resident with Alzheimer's related diseases, as well as all support facilities such as dining, administration, health and fitness, and commons areas.

This proposed CCRC will be VUMH's seventh such community, continuing a 52 year history of providing high quality communities for seniors throughout Virginia. Please refer to the separately bound document "WindsorMeade of Williamsburg, MU Master plan and Design Guidelines" for a more thorough description of the project and it's various programs.

II. THE PROJECT TEAM

The following organizations are involved in the planning and development of the property.

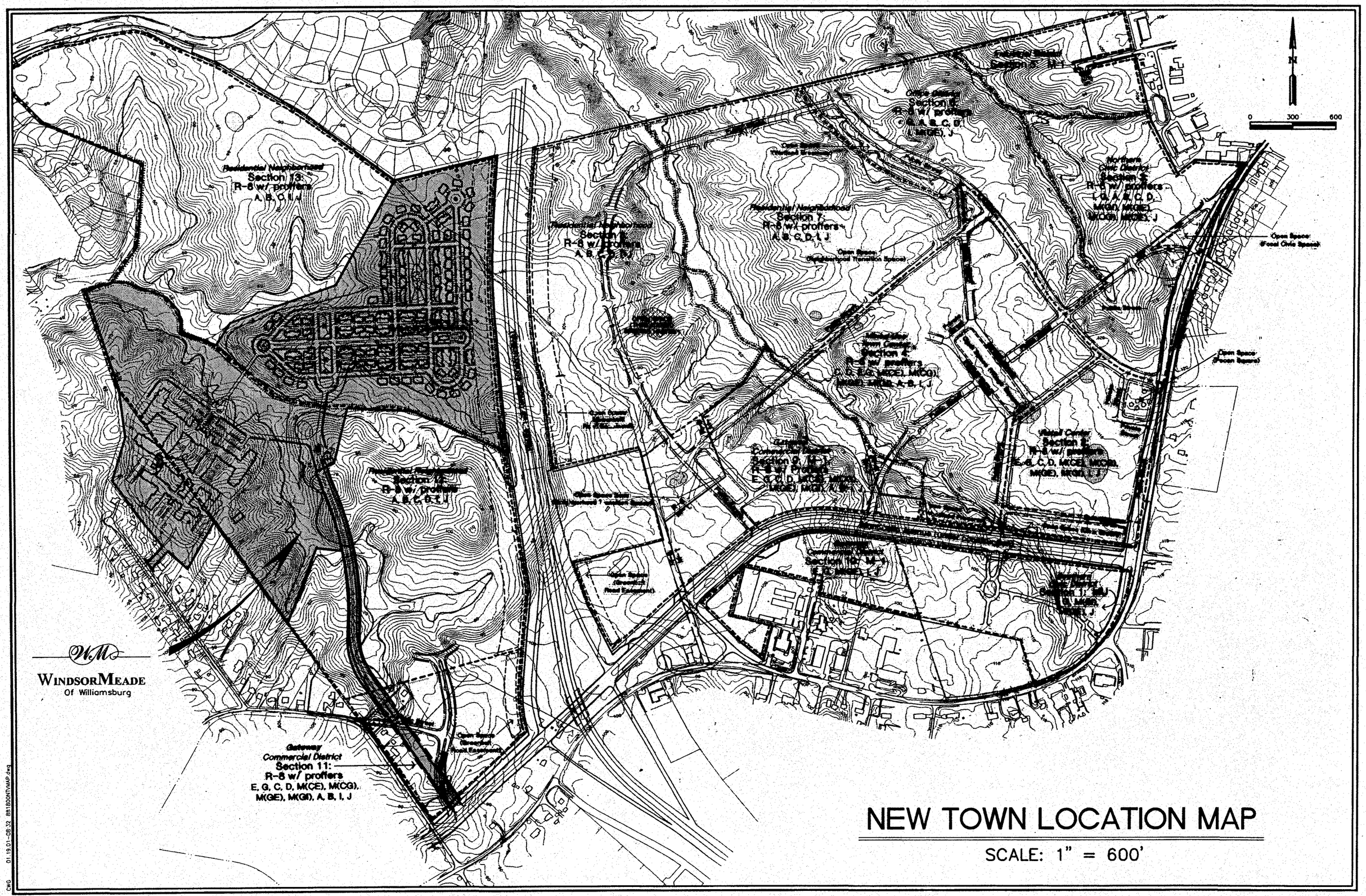
• Owner & Developer	Virginia United Methodist Homes, Inc. – Richmond, Virginia
• Legal Counsel	Kaufman & Canoles - Williamsburg, Virginia
• Civil Engineer	AES Consulting Engineers - Williamsburg, Virginia
• Land Planning/ Architecture	Freeman White – Charlotte, North Carolina
• Environmental	Williamsburg Environmental Group - Williamsburg, VA
• Traffic Planning	DRW Consultants - Richmond, Virginia
• Fiscal Impact	The Wessex Group - Williamsburg, Virginia
• Archeological	Archeological and Cultural Solutions - Williamsburg, Virginia



VICINITY MAP

SCALE: 1"= 2500'

RMS 01.15.01-16:51 881800\MAP.dwg



NEW TOWN LOCATION MAP

SCALE: 1" = 600'

CWG 01.19.01-08:32 88180NTVMAP.dwg

IV. ENVIRONMENTAL STUDIES

A. EXECUTIVE SUMMARY

The Williamsburg Environmental Group, Inc. (WEG) has prepared the following environmental resource inventory at the request of Virginia United Methodist Homes (VUMH) for the "WindsorMeade of Williamsburg" property located in James City County, Virginia. The site area totals approximately 106 acres and includes land immediately west of State Route 199 and north of Monticello Marketplace. Utilizing the best available offsite references coupled with onsite review, WEG examined the following resources:

- Topography
- Soils
- Surface Water
- Wetlands
- Floodplains
- Chesapeake Bay Preservation Areas
- Vegetation
- Wildlife
- Rare, Threatened and Endangered Species
- Other Unique and Environmentally Sensitive Areas
- Cultural Resources

Based on the results of this review, several of the above-listed resources are present on the WindsorMeade of Williamsburg property. Most resources are associated with an unnamed tributary to Powhatan Creek that generally runs east to west through the property. Powhatan Creek is located within the James River drainage basin.

A query was submitted to the Virginia Department of Games and Inland Fisheries requesting a list of sensitive species known to occur on the property. Based upon the data returned, two federally listed species have been confirmed to occur in James City County. These include the bald eagle (*Haliaeetus leucocephalus*) and the small whorled pogonia (*Isotria medeoloides*). No evidence of bald eagle activity has been documented on the property; however, the small whorled pogonia has been found within the project area. One colony of the plants and selected individual plants are shown on historic records for

the site. WEG is in the process of verifying whether the individual plants were moved during Route 199 construction.

Finally, a Phase II archeological study of a known site within the project area has resulted in a recommendation from a qualified archeologist that no further work or studies be performed.

1. Introduction

The WindsorMeade of Williamsburg property consists of approximately 106 acres in James City County, Virginia. The site lies immediately west of State Route 199 and generally north of Monticello Marketplace.

The WindsorMeade of Williamsburg property supports several environmental resources associated with the natural setting and limited historical land use. The Williamsburg Environmental Group, Inc. (WEG) inventoried these resources by analyzing the best available offsite reference material, including James City County base mapping, U. S. Geological Survey (USGS) 7.5 minute topographic mapping, Natural Resources Conservation Service (NRCS) soil surveys, Federal Emergency Management Agency (FEMA) floodplain mapping, aerial photography, and Virginia Department of Conservation and Recreation (DCR) and Virginia Department of Historic Resources (DHR) database files. This information was corroborated with site inspections performed by WEG in fall 2000.

During the offsite and onsite reviews, WEG evaluated the WindsorMeade of Williamsburg property for the following resources: topography, soils, surface water, wetlands, floodplains, Chesapeake Bay Preservation Areas, vegetation, wildlife, rare, threatened, and endangered species, unique and environmentally sensitive areas, and cultural resources. The results of this review are detailed in Section 2. of this document and summarized in Section 3.

2. Description of Existing Environment

The WindsorMeade of Williamsburg property harbors many environmental resources related to physiography, drainage, vegetation cover, and limited historical land use. In addition, the presence of Yarmouth Creek and several tributaries onsite relates many of these natural resources to water features and associated drainages. The environmental attributes of the WindsorMeade of Williamsburg property are described in the sections that follow.

a. Topography

The WindsorMeade of Williamsburg property is located in the Coastal Plain physiographic province in Virginia. The land in the Coastal Plain Province is generally level and does not contain severe slopes (Frye 1986). However, moderate slopes (i.e. 10-15% or greater grade) are present in certain regions of the WindsorMeade of Williamsburg property, as indicated by the United States Geological Survey (USGS) 7.5-minute topographic map for Norge, Virginia (1994). The Natural Resources Conservation Service (NRCS; formerly Soil Conservation Service) *Soil Survey of James City and York Counties and the City of Williamsburg, Virginia* (USDA 1985) indicates that some slopes along the unnamed tributary to Powhatan Creek can be classified as moderate.

The major drainageway on the property extends from the southeast to the northwest, which produces a topography characterized by nearly level ridgelines and moderately sloping valleys. Elevations on the property range from less than 40 feet mean sea level (msl) in the unnamed tributary at the northwestern end of the property to approximately 100 feet mean sea level in the eastern portion of the site.

b. Soils

The *Soil Survey of James City and York Counties and the City of Williamsburg, Virginia* (USDA 1985) maps several soil types within the WindsorMeade of Williamsburg property boundary. The hydrologic classifications of the mapped soil types range from group B (moderately well drained) to group D (poorly drained). Among the mapped units, Johnston complex is classified by the NRCS as a hydric soil. However, Johnston soils are limited primarily to floodplain areas in the unnamed drainage.

The WindsorMeade of Williamsburg property is predominantly situated on well-drained soils (e.g. Emporia, Craven, Slagle, Kenansville, Kempsville). Although inclusions of fine-textured soils are known to occur in these soil types, sampling during field inspections confirms that the majority of soils onsite are sandy in texture. Shrink-swell potential is low to moderate in all soils mapped within the site boundary, and the erosion hazard potential is slight in all soils with the exception of Emporia, which has a moderate erosion hazard potential.

c. Surface Water

Surface water features on the WindsorMeade of Williamsburg property are located within the unnamed tributary to Powhatan Creek, as shown on the attached Environmental Resource Inventory. Most of the creek channel and wetland complexes within this drainage system are located in forested regions of the property.

The unnamed tributary drains from offsite in the northwestern portion of the property, flowing westward approximately 1.8 miles to its confluence with Powhatan Creek. The drainage features associated with the lowlands and headwaters typically support wetlands derived from surface flow and seep drainage. Non-vegetated waters of the United States were not mapped as present on the property.

d. Wetlands

Wetlands are areas such as swamps, marshes, and bottomlands that support a predominance of vegetation typically adapted to saturated conditions (hydrophytic vegetation), soils that formed under saturated conditions (hydric soils), and sufficient water at or near the soil surface to produce chemically reducing conditions (wetland hydrology). All three of the above parameters must be present for an area to be determined a jurisdictional wetland as regulated by the U. S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. Technical criteria and field indicators for each parameter are presented in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987), hereinafter referred to as the 1987 Corps Manual.

The JD has expired.

The limits of jurisdictional wetlands and other waters of the United States were delineated by WEG on the property and confirmed by the U.S. Army Corps of Engineers on November 16, 1995. The technical procedures outlined in the 1987 Corps Manual were applied during the onsite study. The limits of field located wetlands are presented on the enclosed Environmental Resource Inventory.

Based upon the data collected, wetlands are located in bottomland areas along the unnamed tributary to Powhatan Creek within the James River drainage basin. These areas extend throughout the central region of the site. Wetland hydrology for these areas is derived from a combination of surface and seep drainage. Soils in wetland areas vary from organic substrates in the bottomland wetland complex to sandy materials in the headwater seep areas of the drainageways. Regardless of texture, wetland soils onsite display hydric characteristics such as reduced matrix (chroma /1 or /2 with mottles in Munsell soil color chart notation) and sulfidic odor. The dominant vegetation within the different wetland habitats is highly variable, as discussed in Section 2.g. below.

e. Floodplains

Information and technical data published by the Federal Emergency Management Agency (FEMA) were reviewed to determine the extent of the 100-year floodplain within the site. General limits of the 100-year floodplain are derived from the Flood Insurance Rate Map for James City County, Virginia. No portions of the WindsorMeade of Williamsburg property lie within the FEMA determined 100-year floodplain limits.

f. Chesapeake Bay Preservation Areas

The Chesapeake Bay Preservation Areas (CBPA) ordinances for James City County mandate that CBPA's be mapped in association with site development. CBPA's include both Resource Protection Areas (RPA) and Resource Management Areas (RMA).

The definition of RPA as outlined in the James City County Ordinance includes "tidal waters, tidal shores, non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or to tributary streams, and a 100-foot wide [vegetated] buffer" located adjacent to and landward of other RPA components. According to James City County the RPA buffer is an area of "natural or established vegetation managed to protect other components of resource protection areas and county and state waters from significant degradation due to land disturbances or uses".

Not according to the GIS

No RPA features are present on the subject property; however, James City County has ~~been designated as a RMA in its entirety~~. In addition, the James City County Ordinance lists "lands of particular sensitivity" for RMA designations. Areas subject to classification as RMA's in James City County include highly erodible soils, highly permeable soils, nontidal wetlands not in RPA's, floodplains, and hydric soils.

g. Vegetation

Information concerning the vegetative community present at the site was extracted from several resources. The site is located in the Coastal Plain Floristic

Province as described in *The Natural Geography of Plants* (Gleason and Cronquist 1964). The typical forest of this province contains extensive stands of pines with over two-dozen other hardwood species intermixed. The USGS 7.5 minute quadrangle map for Norge, Virginia (1994) and color infrared aerial images indicate that the WindsorMeade of Williamsburg property is mostly forested.

Vegetation communities on the WindsorMeade of Williamsburg property may be classified into three general categories based on species composition, stand structure and age, and degree of man-induced alteration or maintenance. The three community types include: 1) upland hardwoods; 2) secondary growth or scrub/shrub complexes; and 3) wetlands. The following paragraphs detail the different vegetation communities onsite.

Of the forested regions on the WindsorMeade of Williamsburg property, the predominant community type consists of hardwood stands with a small pine component. Forested uplands are situated on nearly level to steep slopes, and are characterized by a well-developed, layered structure, with most canopy specimens ranging from 40-70 feet in height. Typical canopy species include beech (*Fagus grandifolia*), oak (*Quercus* spp.), hickory (*Carya* spp.), tulip tree (*Liriodendron tulipifera*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and occasional loblolly pine (*Pinus taeda*). Understory species include American holly (*Ilex opaca*), mountain laurel (*Kalmia latifolia*), hardwood saplings, and huckleberry (*Gaylussacia* spp.). Ground cover specimens are not dominant, but partridge berry (*Mitchella repens*), strawberry bush (*Euonymus americana*), New York fern (*Thelypteris noveboracensis*), muscadine grape (*Vitis rotundifolia*), and Christmas fern (*Polystichum acrostichoides*) are found scattered along the forest floor.

Scrub and regenerative-growth communities are scattered along field margins and in utility easements on the property. The structure of these areas is indicative of recent disturbance, usually resulting from recent clearing or abandonment of previously cleared areas. Scrub and regenerative growth-communities are not dominant onsite, and occupy only a patchy distribution in the fields, at the headwaters of some drainageways, and in abandoned tree rows or cleared plots. Typical species include paradise tree (*Ailanthus*

altissima), common privet (*Ligustrum vulgare*), blackberry (*Rubus* spp.), and Japanese honeysuckle (*Lonicera japonica*), with several species of native or naturalized grasses and forbs.

Bottomland area within the unnamed tributary is dominated by forested nontidal wetlands. Wetland complexes are typically vegetated with green ash (*Fraxinus pensylvanica*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*) in the overstory, and understory species such as spice bush (*Lindera benzoin*), tag alder (*Alnus serrulata*), possum haw (*Viburnum nudum*), highbush blueberry (*Vaccinium corymbosum*), winterberry (*Ilex verticillata*), and ironwood (*Carpinus caroliniana*). Hydrophytic ferns and herbaceous species are also common, including netted chain fern (*Woodwardia virginica*), cinnamon fern (*Osmunda cinnamomea*), golden ragwort (*Senecio aureus*), microstegium (*Microstegium vimineum*), sedges (*Carex* spp.), spikerushes (*Cyperus* spp.), lizard's tail (*Saururus cernuus*), false nettle (*Boehmeria cylindrica*), smartweeds (*Polygonum* spp.), beggarticks (*Bidens laevis*), and rice cutgrass (*Leersia oryzoides*).

h. Wildlife

Information concerning the wildlife species present in the vicinity of the WindsorMeade of Williamsburg property was accessed through the Virginia Department of Game and Inland Fisheries (DGIF) Fish and Wildlife Information On-line Service, and supplemented with casual observations made during field visits. The databases accessed include the Breeding Bird Atlas and Survey, the Biota of Virginia, a database of all collections made by researchers under the Scientific Collection Permit program, and the Colonial Water Bird Database. This on-line service is a continuously updated, dynamic system with data provided for information and planning purposes only.

Birds dominate the list of wildlife inhabitants, with over 170 species listed on the DGIF registry. Several of Virginia's common mammals are listed, including species of rodents (e.g. beaver, chipmunk, mole, mouse, squirrel), bats, and larger mammals such as

deer and fox. Several species of insects are listed, dominated by butterfly species but also including groups of fly, gnat, tick, and moth.

i. Rare, Threatened And Endangered Species

Information concerning Virginia's threatened and endangered species, rare species, and unique natural communities is available from the databases maintained by the Virginia Department of Game and Inland Fisheries (DGIF), the Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR), and/or the United States Fish and Wildlife Service (FWS). A query was submitted to the DGIF requesting a list of sensitive species known to occur on the property. Based upon the data returned, two federally listed species have been confirmed to occur in James City County. These include the bald eagle (*Haliaeetus leucocephalus*) and the small whorled pogonia (*Isotria medeoloides)*. No evidence of bald eagle activity has been documented on the property; however, the small whorled pogonia has been found within the project area.

The small whorled pogonia is an orchid that has a very selective habitat, growing on the forest floor of mature hardwood stands positioned on shaded, well drained, north or east-facing slopes. Dr. Donna Ware, College of William and Mary, conducted a formal survey for this species on the property in September 1996. One colony of the plants and selected individual plants are shown on historic records for the site. WEG is in the process of verifying whether the individual plants were moved during Route 199 construction.

j. Cultural Resources

An archaeological site has been documented within the boundaries of the property. A Phase I archaeological investigation on the property was completed in 1990 and the report submitted to the Virginia Department of Historic Resources (VDHR). A single archaeological site was identified on the subject property (Site 9, 44JC621). The site was identified as a prehistoric procurement camp of the late archaic period. A Phase

II archaeological study was completed on this site in July 2000. Based upon the Phase I and Phase II studies, no treatment plan for the property is recommended and no further work or studies are recommended.

3. Summary and Recommendations

It is the conclusion of WEG that several environmental resources are present on the WindsorMeade of Williamsburg property in James City County, Virginia. These resources are related to topography, soils, drainage features, habitat types, and sensitive species.

It is recommended that development activities incorporate management practices that reduce the potential for erosion along slopes or moderately erodible soils (e.g. Emporia complex). Prudent stormwater management planning, including the use of Best Management Practices (BMPs), will reduce the potential for erosion and sedimentation within the surface water and wetland resources onsite.

If the proposed development will involve activities in waters of the United States, including wetlands, authorization from the U. S. Army Corps of Engineers (Corps) must be received before such activities may commence. The Corps permit review process may involve analysis of several development alternatives and consideration of different water quality enhancement methods. In addition, coordination with the Virginia Department of Environmental Quality, and the U.S. Fish and Wildlife Service may be required.

Because of the potential for small whorled pogonia habitat to occur onsite, a detailed survey for this species by a qualified professional may be required. This survey would need to be completed within a time frame specified by the U.S. Fish and Wildlife Service. The typical season for small whorled pogonia surveys runs from May 25 to July 15 in James City County.

A Phase II archeological study of a known site within the project area has resulted in a recommendation from a qualified archeologist that no further work or studies be performed.

4. References

DGIF (Virginia Department of Game and Inland Fisheries). 2000. Wildlife Species Database.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report No. 87-Y-1.

FEMA, 1970. Floodplain location map, James City County, Virginia.

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Gleason, H. A. and A. Cronquist. 1964. *The Natural Geography of Plants.* Columbia University Press. New York

James City County, Virginia. *Chesapeake Bay Preservation Regulations.* 2000.

Outlaw, A. C. and M. Clemons. 2000. *Phase II Archaeological Excavations of Site 44JC621 at WindsorMeade, James City County, Virginia.* Technical Report

USDA (United States Department of Agriculture). 1985. *Soil Survey of James City and York Counties and the City of Williamsburg, Virginia.* Soil Conservation Service.

USGS (United States Geological Survey). 1994. 7.5 minute series topographic quadrangle map. Norge, Virginia

B. STORMWATER MANAGEMENT

As a component of the project environmental planning, Williamsburg Environmental Group, Inc. (WEG) has developed a Master Stormwater Management Plan which meets James City County stormwater requirements for the future development of WindsorMeade of Williamsburg in James City County, Virginia. The plan uses a ~~regional approach~~ to meet County stormwater requirements such that BMP coverage is maximized while minimizing environmental impacts and cost. The plan ensures that the development of WindsorMeade of Williamsburg will not impact the environment due to potential increases in non-point source pollutants, downstream flooding, and erosion.

STORMWATER EVALUATION CRITERIA

James City County has implemented a 3-step, 10-point Best Management Practice (BMP) method to demonstrate compliance with the County's Chesapeake Bay Preservation Ordinance (CBPO). The County allocates open space credit for land which is not developed and structural BMP credit for all portions of the site which drain to adequately sized structural BMPs. Structural BMPs are assigned from 4 to 10 points depending on design and storage volume. Highly efficient wet ponds or marsh BMPs receive 9 or 10 points of credit. The total point value for the site is obtained by taking the fraction of the site served by a structural BMP or open space credit and multiplying it by its assigned point value and then summing the values. A total of ten points for the site is necessary to meet the County's ordinance.

Additionally, state and County stormwater regulations require that the development cannot contribute to downstream flooding or erosion. Specifically, James City County's stream channel protection design criteria specifies 24-hour detention of the 1-year, 24-hour storm event. These criteria replace the previous criteria requiring attenuation of the 2-year storm to its pre-development level.

PROPOSED STORMWATER PLAN

WEG performed an extensive alternatives analysis to determine the most appropriate combination of BMP locations based on stormwater treatment benefits, cost, and environmental impacts. Since, ~~WindsorMeade of Williamsburg is a 106-acre site within the 560-acre Casey Tract, a stormwater plan for the Casey Tract was developed which meets James City County's CBPO requirements and~~ minimizes cost and environmental impacts. The proposed development was evaluated with regard to proposed land use, topography, and wetlands in order to identify alternative BMP locations which would meet the County's CBPO requirements while minimizing wetland impacts.

~~The plan, which is presented on Sheet 5 of the Master Plan, utilizes five ten-point structural BMPs, one of which is on the WindsorMeade of Williamsburg parcel~~, and open space to meet the CBPO requirements for the overall Casey Property. The drainage areas for BMPs 2 and 8 contain some off-site undeveloped area totaling approximately 28 acres which is counted in the structural BMP point allocation. The ten-point compliance worksheet is provided as Table 2 of this document. The ten-point BMPs will be achieved using wet ponds or marsh enhanced extended detention basins. As final construction plans are generated for each BMP, the design which produces the least environmental impacts will be provided as the preferred alternative. Furthermore, peak attenuation will be provided at each proposed BMP to ensure that James City County's stream channel protection design criteria are met.

Approximately 60 acres of wetlands exist on the 560-acre Casey Property which includes the WindsorMeade of Williamsburg parcel. In addition, over 20 acres of open space was identified on the WindsorMeade of Williamsburg plan. None of the open space is in, or adjacent to, the Resource Protection Area (RPA) which provides a credit under the ten-point system of 0.15 points per 1% of the total site area. All other open space has a credit of 0.10 points per 1% of the total site area.

PHASING OF PLAN

Generally, BMPs will be constructed concurrently with the first phase of development planned within each individual BMP's treatment watershed. Final BMP construction plans will be submitted with site plans for the initial development within each watershed. The BMPs will be designed to accommodate all future development within their watersheds.

CONCLUSION

A conceptual stormwater management plan has been developed which minimizes impacts to the environment and meets the criteria specified in the James City County Chesapeake Bay Preservation Ordinance for treatment of nonpoint source pollutants. The plan utilizes structural BMPs and open space to meet the County's requirements.

Table 2
Worksheet for BMP Point System

Project Area = 560 acres

A. STRUCTURAL BMP POINT ALLOCATION

BMP	Area of Project Served by BMP (acres)	BMP Points	Fraction of Site Served by BMP	Weighted BMP Points
2	249.50	10	0.45	4.46
3	36.34	10	0.06	0.65
4	62.24	10	0.11	1.11
8	156.60	10	0.28	2.80
22	5.47	10	0.01	0.10
TOTAL				**9.11**

B.. NATURAL OPEN SPACE CREDIT

Area of Open Space (acres)	Fraction of Site	Natural Open Space Credit	Points for Natural Open Space
0.00	0.00	0.15 per 1% of site area	0.00
50.00	0.09	0.10 per 1% of site area	0.89
TOTAL			**0.89**

C. TOTAL WEIGHTED POINTS

Structural BMP Points	Natural Open Space Points		Total
9.11	0.89	=	**10.00**

C. COMMUNITY IRRIGATION WATER SUPPLY

A preliminary water supply analysis was performed to determine the availability of water sources sufficient to meet the irrigation demands of the WindsorMeade development. The goal of the analysis was to evaluate all potential irrigation supplies based on yield, quality, cost, and environmental impact and recommend the most feasible combination of sources.

DEMANDS

Williamsburg Environmental Group, Inc. (WEG) has estimated the irrigation demands for the development based on modeled evapotranspiration (ET) rates and long-term published climate data. Given the uncertainty of total irrigated area, a conservative estimate of 35.2 acres was assumed based on the land plan. This analysis indicates that normal year demands would be roughly 10 million gallons (MG) and drought year demands would be about 22 MG.

STORAGE AND RUNOFF

A proposed on-site pond is to provide the main irrigation supply for WindsorMeade. This facility, originally proposed for stormwater management, will be used for irrigation purposes as well. It is important that this pond maximizes surface runoff capture and storage volume. This can be accomplished by maximizing excavation of the pond and force draining much of the development to this facility. The forcing of stormwater runoff to the pond will also assist in treating a larger portion of the site for water quality. WEG has estimated that the irrigation lake is capable of 6.43 MG of storage collected from a forced drainage area of 156.9 acres. Based on this drainage area, it is estimated that runoff in a normal year would exceed 55 MG and approximately 35 MG would be received during a drought condition.

WATER BUDGET ANALYSIS

The water budget model was run to determine if the storage from this proposed stormwater pond with associated runoff and precipitation could meet irrigation demands. While the pond would handle any demand in a normal year without utilizing any

drawdown, the needed volume to meet demands in a drought year would require nearly total drawdown. This is generally considered to be aesthetically undesirable.

ALTERNATIVE SUPPLIES

Because of the unpredictability of rainfall and runoff, significant lake drawdown levels and projected drought year deficits, it is recommended that supplemental waters be identified. Potential sources of supplemental irrigation include 1.) Groundwater withdrawal 2.) Municipal water 3.) Effluent.

GROUNDWATER, MUNICIPAL WATER AND EFFLUENT

Though groundwater is likely available, withdrawal from subsurface aquifers does not appear to be a viable option. James City County uses groundwater as a potable water supply, therefore groundwater wells for irrigation usage are discouraged and highly regulated. Municipal water provides a reliable source of irrigation supply, but is expensive and use for turf irrigation would likely be prohibited in a drought situation. Due to the long distance between the James City County sewage treatment facility and the project site, use of effluent water for irrigation is not considered feasible. Based on these limitations, all three potential supplies are deemed unfeasible for the project.

WATER CONSERVATION

Since irrigation supplies may be limited for the development, it will be necessary to conserve and manage water wisely. Specific water conservation measures have been identified in an effort to help reduce the amount of water needed in order to sustain an attractive living environment. These measures include:

- Reducing the total irrigated area
- Using available soil moisture content and daily ET data
- Implementing a highly efficient irrigation system
- Using weather station data and other onsite information data
- Creating naturalized areas with drought tolerant vegetation
- Optimizing cultural practices
- Educating the public to accept less than perfect conditions

Although the completion of a detailed drought management plan was beyond the scope of this report, this section can function as a framework for decision-making in future planning of the proposed developments.

SUMMARY

In conclusion, the proposed stormwater pond volume should be optimized as a first step in meeting projected irrigation demands. WEG has found this pond would meet estimated normal year and drought year demands, however unacceptable pond drawdown would likely result in drought situations. Groundwater and effluent are not feasible and municipal water is not recommended due to high cost. As supply options are limited, water conservation will be important, and should be considered throughout the planning and design of the project.

GEOTECHNICAL

CONSULTING ENGINEERS

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

April 2, 2004

James City County Planning
Development Management
101-E Mounts Bay Road
Williamsburg, VA 23187-8784

RE: WindsorMeade – Villas Construction Plan
Former JCC Case No. SP-003-04
AES Project No. 8818-05

Dear Ms. Weisiger:

This letter is a response to the requested changes or revisions to the WindsorMeade Villa site plan. Changes or revisions were made to these documents to address the items provided in your letter of February 11, 2004.

Planning:

Item 1: Zoning Designation
The zoning designation has been modified as requested.

Item 2: DRB Review
The DRB has approved this project.

Item 3: General Layout Sheet
An overall WindsorMeade Project sheet has been added to the plan and should serve the purpose of showing the total project area.

Item 4: Tax Map Number
The tax map number has been revised as requested.

Item 5: Private Roads
General note 16 has been added to the cover sheet indicating that the roads are to remain private.

Item 6: Residential Density
The project area and the residential density for the villa site have been provided.

Item 7: Number Units

The units have been labeled on all plan sheets as requested.

Item 8: "Villa"

The term villa has been defined on the cover sheet as a single family unit as requested.

Item 9: DRC Review

The DRC has reviewed and approved the site plan.

Item 10: Small Whorled Pogonia Conservation Plan

The small whorled pogonia conservation plan is in the process of being developed. This will be passed along as soon as it is available.

Item 11: Water Source (Cash Contribution)

The owner/developer understands that a cash contribution for each unit will be required prior to final approval.

Item 12: Age Restriction Documents

The owner/developer is in the process of drafting the age restriction documentation and understands that these documents are required prior to final approval.

Item 13: Landscape Buffer

The right-of-way line for Route 199 is displayed and a label has been added to clearly identify the landscape buffer.

Item 14: Ginkgo Tree

The male form of the tree was specified on the previously submitted plans and is located in the "comment" section of the plant schedule.

Item 15: Recreation Area

The clubhouse, clock tower, and the Windsor Hall building will provide amenities for the Villa residents. After reviewing the proffers we could not find any reference for a recreation area requirement as such we have withheld indicating anything about recreation areas on the plans.

Item 16: Specimen Trees

There is no possibility of saving any particular trees or plants on site within the limits of construction due to the earth moving requirements.

JCSA:

General

Item 1: Coordinate with Other Sections

Comments from other sections have been taken into consideration while addressing issues with this site plan.

Item 2: Fire Flow Requirements

It is understood that 1000gpm fire flows will be required throughout the Villas (2500gpm at the clubhouse) and 2500gpm at the Hall. The hydrant that is located on the block with the clubhouse has sufficient flows and pressures to meet the fire department requirements. (See water model submitted with the Villa Entrance Plan, JCC SP-04-04)

Item 3: JCSA General Notes

The JCSA general notes have been added to the plans as requested.

Item 4: Fire Department

According to Planning, the Fire Department has reviewed and approved the hydrant layout.

Cover Sheet

Item 1: Unused Wells, General Note 9

General Note No. 9 has been revised as requested.

Item 2: Existing Valves, General Note

A note has been added to the general notes stating that only JCSA personnel shall operate existing valves.

Item 3: Owner/Developer

Jim Franklin has been added as a contact for the owner.

Sheet No. 5

Item 1: Private Sewer

The sewer has been revised and JCSA designation added to all JCSA utilities. Easements have been revised as necessary to only encompass JCSA utilities.

Item 2: Pedestrian Bridge Alignment

The bridge alignment has been modified as part of the Windsor Hall site plan.

Item 3: 10' Separation

The sanitary lateral and water service connection for bldg 7 & 10 have been shifted to provide 10' separation.

Item 4: Existing JCSA Easement

The JCSA easement for the sewer has been labeled as existing as requested.

Item 5: Sanitary Manhole 23

San MH#23 has been revised to correctly match the label in all the plan sets.

Sheet No. 6

Item 1: Station label

The station label for the 45-degree bend along WindsorMeade Way has been revised as requested.

Sheet No. 7

Item 1: 10' Separation

The sanitary lateral and water service connection for bldg 29 & 76 have been shifted to provide 10' separation.

Item 2: Water Valve

A gate valve has been added as requested at station 10+27.

Item 3: Community Pool

No pool is planned for the clubhouse. The pool facility for the residence is inside Windsor Hall.

Item 4: 45-degree Bends

Two 45-degree bends have been added to replace the 90-degree bend at station 52+07.

Item 5: Clubhouse Water Meter

No water meter is sized for the clubhouse as the site is master metered. Once fixture information has been provided to us, calculations will be shown to ensure that the 1" water line is correctly sized for the clubhouse.

Sheet No. 8

Item 1: 10' Separation

The sanitary lateral and water service connection for bldg 87 & 45 have been shifted to provide 10' separation.

Sheet No. 9

Item 1: 10' Separation

10' separation has been provided between the water service connection for bldg 36 and MH#14.

Item 2: JCSA Offsite Water Main, Sta. 10+50

The water line has been revised to eliminate the requirement of the air release valve.

Item 3: JCSA Offsite Water Main, Sta. 11+00 to 11+70

The offsite water line has been shifted to provide an unencumbered easement free of the retaining wall.

Item 4: Sta. 45+15

The air release has been relocated to station 44+40.

Sheet No. 10

Item 1: 10' Separation

The sanitary lateral and water service connection for bldg 96 & 57 have been shifted to provide 10' separation.

Sheet No. 18

Item 1: Conflict between water and sanitary laterals

The water main has been lowered to prevent possible conflicts between the water and the sanitary laterals.

Item 2: Sta. 18+60 to 19+25

The vertical separation has been indicated between the sanitary and water line.

Item 3: Sta. 22+87

The vertical separation has been indicated between the JCSA and private water line.

Item 4: Sta. 22+87

The 36" storm pipe has been removed from the profile.

Sheet No. 19

Item 1: Sta. 29+99 to 30+04

The fittings have been adjusted to match the layout in plan view.

Item 2: Sand Cushion (Sta. 36+10)

The sand cushion was removed as there was no conflict with the water line as previously depicted.

Item 3: Conflict between water and sanitary laterals

The water main has been lowered to prevent possible conflicts between the water and the sanitary laterals.

Sheet No. 20

Item 1: Conflict between water and sanitary laterals

The water main has been lowered to prevent possible conflicts between the water and the sanitary laterals.

Item 2: Sta. 47+54

The separation between the JCSA waterline and the private water has been adjusted to provide an 18" separation.

Sheet No. 21

Item 1: Outer Loop Road Profile (Cambridge Course)

a. **Sta. 52+07**– The separation between the JCSA waterline and the private water has been labeled as requested.
b. **Sta. 54+90**— The separation between the private water and sanitary crossing have been labeled as requested.

Item 2: South Clubhouse Profile (Weston on the Green- South)

a. **Sta. 10+38**– The storm size has been corrected.
b. **Conflict between water and sanitary laterals**--the water main has been lowered to prevent possible conflicts between the water and the sanitary laterals.

Sheet No. 22

Item 1: Conflict between water and sanitary lateral

The water main has been lowered to prevent possible conflicts between the water and the sanitary lateral serving bldg 84.

Item 2: Sta. 19+48

The sanitary sewer crossing has been shown in profile as requested.

Sheet No. 23A

Item 1: Sta. 10+00

The label has been corrected to indicate an 8" x 6" Tee.

Item 2: Sta. 10+50

The 4" private waterline has been indicated as requested.

Item 3: 24" storm sewer

The location of the 24" storm has been revised.

Item 4: Sta. 15+15

The elevation of the existing water main in Ford's Colony has been adjusted to match the elevation as depicted in the Ford's Colony section 30 plans.

Sheet No. 23

Item 1: One Way Loop Profile

a. **Sta. 10+38**—The storm sewer pipe size has been adjusted.
b. **Sta. 15+65**—The storm sewer size and elevation have been adjusted.

Item 2: WindsorMeade Way Profile

a. **Sta. 43+45**—The label has been changed to a blow off valve.
b. **Sta. 44+00 to 44+38**—The fittings have been adjusted to match those in plan view.

c. **Sand Cushion**—The sand cushion has been revised and a detail added.
d. **Ductile Iron Pipe (Sta.43+45 to 44+90)**-- Ductile iron pipe has been indicated on the JCSA line within the fill section.

Sheet No. 26

Item 1: Concrete Master Meter Vault Detail:
The master meter vault has been revised to provide a Neptune Protectus III meter and a bypass. Also a drain line has been added to drain the vault.

Item 2: HRPDC/ JCSA Detail List
The duplicate detail list has been removed from sheet 5 as requested.

Landscape Sheet

Item 1: Laterals and Water Services
The sanitary laterals and water services have been added to the plans as requested.

Sanitary Sewer Data Sheet

Item 1: Section 5
Sanitary sewer demand calculations will be provided once the architect has finalized the clubhouse plans. A demand of 300gpd has been assumed for all homes and the clubhouse at this time.

Item 2: Section 6&7
The sanitary sewer data sheet has been updated to only include the line and manhole being dedicated to JCSA.

Water Data Sheet

Item 1: Section 5B
The demand for the clubhouse has yet to be calculated and has been assumed to be 300gpd and all single family homes are calculated at 300gpd.

Item 2: Section 5C
The fire flow requirement has been indicated to be 2500 gpm for the clubhouse.

Item 3: Section 6
The water data sheet has been updated to only all the lines being dedicated to JCSA.

Item 4: Section 7
Water demand calculations will be provided once the architect has finalized the clubhouse plans. A demand of 300gpd has been assumed for all homes and the clubhouse at this time.

Item 5: Section 8

Only hydrants on JCSA lines have been included on the water data sheet.

Water Distribution Analysis

Item 1: Irrigation

The site is not to have irrigation systems supplied from the JCSA system.

Item 2: Ford's Colony Fire Flow Test

The fire flow test has been provided as requested.

Item 3: Summary Page

A summary page has been provided as requested.

Item 4: Windsor Hall Demands

The flow demand for the hall is still in flux and calculations will provided once they are finalized. The 500gpm shown in the current model is a rounded value, up from a 425-475gpm estimate from the architect, so we feel comfortable that the number will only be revised lower.

Item 5: Future Apartments

The apartment demands have been added as requested, however it should be understood that these demands are not fixed.

Item 6: Pipe Report

a. **Pipe Lengths (P-3 thru P-6; P-71 and P-83)**—Pipe lengths have been updated as requested.
b. **Pipe Size (P-72)** — The pipe size has been updated.
c. **Pipe Materials** – The pipe materials listed in the model are inconsequential and have been removed from the model to prevent future confusion.
d. **Pipe Status "Closed" (FC-1)** — For modeling purposes a check valve is provided on the pipe to prevent errors in the model. When the pressures on the WindsorMeade side are higher than those within Ford's Colony the pipe status becomes closed.
e. **Fire Flow (Windsor Hall)** — Calculations have been prepared for the fire department to justify the reduced fire flow requirement. A copy has been provided to JCSA with this submittal. Once the fire department has approved this calculation we will forward the fire departments approval.
f. **Fire Flow (Clubhouse)** — The clubhouse will have three hydrants within 300' (one of which will be off the JCSA line with 2500gpm @ 20psi). It is our determination that these hydrants are adequate to supply the required fire flow.

Water Conservation

No comments at this time

Environmental Department:

Item 1: Land Disturbing Permit and Siltation Agreement

A representative of owner will provide the required permits and agreements prior to construction.

Items 2: Water and Sewer Inspection Fees

A representative of owner will provide the required inspection fees.

Items 3: Wetlands

The wetlands permits have been provided for the overall project.

Item 4: Inspection and Maintenance Agreement

A representative of owner will provide the required inspection and maintenance agreement.

Item 5: Record Drawing and Construction Certification

Notes referencing the requirement of construction certification and interim certification are in the General Notes For Construction of Stormwater Basins and James City County Environmental Division Erosion and Sediment Control Notes on sheet 25.

Item 6: Interim Certification

Notes referencing the requirement of construction certification and interim certification are in the General Notes For Construction of Stormwater Basins and James City County Environmental Division Erosion and Sediment Control Notes on sheet 25.

Item 7: VPDES

It is understood that a VPDES permit is required for this project once plan approval has been obtained.

Item 8: Site Tabulation

A project area breakdown has been provided and an estimated impervious cover calculation has been provided on sheet 2A.

Item 9: Watershed

The watershed designation has been provided on the plan cover sheet.

Item 10: Retaining Walls

The supplier of the retaining walls will be providing engineering design for the structures. They have been provided information on the potential for saturation.

Item 11: Environmental Inventory

The environmental inventory has a clearly defined clearing limits and the retaining walls have been shown as requested.

Item 12: Steep Slopes

A wavier will be provided for the disturbance of the "steep" slopes that may be created with the WindsorMeade Way roadway as requested.

Erosion and Sediment Control Plan:

Item 13: Design Checklist

Erosion and Sediment Control and Stormwater Management Checklists have been provided as requested.

Item 14: Limits of Work

A distinct limit of work line has been provided around Villa BMP #1 as requested.

Item 15: E&SC Plan

Large amounts of grading will be required to bring the site to finished grades. It is the intention of the interior site sediment traps to stay in place as the roadways are brought to grade and then to have the road storm system convey the runoff to the sediment basins. At that time the sediment traps may be removed and the interior grades can be established. This is explained in steps 2-4 of the sequence of construction.

Item 16: Sequence of Construction

The sequence of construction has been revised as requested to include the removal of sediment trap #1 and the installation of the waterline into Ford's Colony.

Item 17: Perimeter E&S Controls

EC-3 matting has been indicated in locations of steep slopes adjacent to the wetlands. In addition silt fence is indicated to be installed at the top of the retaining walls once their construction has been completed.

Item 18: Temporary Sediment Basin (Villa BMP #1)

A copy of the sediment basin design sheets submitted with the WindsorMeade Way plan have been provided as requested.

Item 19: Temporary Sediment Basin (Villa BMP #2)

A calculation has been provided for sizing of the sediment basin orifice. This sizing was ignored for a more conservative 1-year 24 hour drawdown, which determined the orifice needed to be 3".

Item 20: BMPs

All BMPs on the plans have been labeled with JCC Environmental notation as requested.

Item 21: Open Space Credit

A conservation easement plat is being prepared for the WindsorMeade project.

Item 22: Pond Benches

A wavier letter requesting a variance on the bench widths for the BMPs has been provided.

Item 23: Pond Buffers

As discussed on the phone between Chris Basic of AES and Scott Thomas of JCC Environmental, the area of the buffer impacted by the wall was calculated as if the wall we not present, and that calculation determined the total quantity of required plant material for the buffer. It was therefore resolved that no further action be required.

Item 24: Villa BMP #2

An EW-11 detail has been provided indicating how the riser and the EW-11 attach as requested.

Item 25: BMP Designs

BMP storage volumes were provided to the bottom of the BMPs and not to the water surface. These volumes were ignored by the program in the routing (as indicated on the BMP "Reservoir Reports" – Stage Storage Discharge Table). However for the sake of clarity the volumes below water surface elevation have been removed to prevent further confusion.

Item 26: Stage Storage

The wet pool elevation was incorrectly labeled on sheet 16 and should be elevation 69.0.

Item 27: Pond Tailwater

A tailwater condition was analyzed while reviewing the pond routing. Due to a software issue, the tailwater was reset to zero as the tailwater did not influence the pond routing hydraulics.

Item 28: Emergency Spillway

An emergency spillway detail has been added as requested.

Item 29: Riser Structure (EW-11A Detail)

An EW-11 detail has been provided indicating how the riser and the EW-11 attach as requested.

Item 30: Concrete Riser and Barrel

A note has been added to the BMP sections indicating the use of watertight concrete pipe and dimensions have been provided for the riser bases as requested.

Item 31: Floatation Calculations

Buoyancy calculations have been provided with this submittal as requested.

Item 32: Low Flow Orifice Protection

Turn down elbows and reverse slope pipes have been provided to prevent clogging of low flow orifices.

Item 33: Low Flow Orifice (BMP 2)

The low flow orifice length has been updated to more correctly indicate the required pipe length as requested.

Item 34: Pond Drain/Valve

Due to the location of BMPs on this site it is not feasible to provide pond drains. These structures will require dewatering by pumping for any maintenance.

Item 35: Stilling Basins

The stilling basin detail has been provided. Also the outlet protection has been labeled on the erosion and sediment control sheets as requested.

Item 36: Adequate Outflow

The outfalls of the BMPs are located immediately adjacent to the wetlands and empty into stilling basins (the natural channels are within the wetland areas).

Item 37: HGL Computations

The tailwater condition on storm system #2 has been modified to match that of the 10-yr storm elevation and the calculations have been resubmitted.

Item 38: Stormwater Conveyance Channels

All swales requiring EC-2 lining have been labeled as such and reference the grass swale detail.

Item 39: Storm Profiles

The storm sewer depths have been verified for proper depth.

Item 40: Storm Design

The pipe length from #1-46 & 1-47 has been corrected to 168 feet (from 50 feet) in the calculations. Also the inlet numbering discrepancy has been corrected as requested.

Item 41: Inlet Calculations

The inlet performance curves have been revised and resubmitted.

Item 42: Inlet Depths

The inlet type for SS#1-1&2 have been modified due to there depth as requested.

Item 43: Drop Inlet Type

The inlet type for inlet (SS#1-7) has been revised as requested.

Item 44: Inlet Grates

Inlet grate types have been indicated on all DI-7 inlets as requested.

Item 45: Inlet Steps

A note has been added to the cover sheet indicating the requirement for steps within structures over 4 foot deep.

Item 46: Inlet Shaping (IS-1)

A note has been added to the cover sheet indicating the requirement for inlet shaping.

Item 47: End Treatment

A headwall has been indicated at the outfall of storm system 1 and a flared end section was added to the outfall of storm system 2.

Item 48: Pond Landscaping

Landscaping has been modified as not to interfere with the principal spillway as requested.

Item 49: Miscellaneous

Guardrail has been discussed for the requested location but after reviewing we would prefer to wait until the time of construction to determine the necessity for guardrail. It is our opinion that the curb, shoulder and associated planting will provide a substantial buffer between the road and the pond at the road design speed.

Item 50: Geotechnical

The geotechnical report as submitted with the WindsorMeade road construction plan includes information on all the proposed BMPs within the project. The report indicates that the soils in all locations have low to moderate permeability and that no liners are required for water retention. It also notes that soils should be evaluated during construction for the need of localized liners.

I would like to thank you and the other agencies involved for their assistance in the review of this project. Should any further questions arise, please feel free to contact us.

Sincerely,

AES Consulting Engineers

Jason Grimes
Project Engineer

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ENVIRONMENTAL DIVISION REVIEW COMMENTS
WINDSORMEADE VILLAS
COUNTY PLAN NO. SP - 03 - 04
February 13, 2004

General:

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

2. Water and sewer inspection fees, as applicable, must be paid in full prior to issuance of a Land-Disturbing Permit.

3. Wetlands. Provide evidence that any necessary wetlands permits have been obtained, have not expired or are not necessary for this project. Refer to Chapter 23 Chesapeake Bay Preservation ordinance, Section 23-9(b)(9) and 23-10(7)(d). The permit that the Environmental Division has on file shows fewer impacts to wetlands than the current plan of development for this site. *(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 non-tidal wetlands programs, which became effective October 1st 2001.)*

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. Record Drawing and Construction Certification. The stormwater management/BMP facilities as proposed for this project will require submission, review and approval of record drawings (as-builts) and construction certifications prior to release of the posted bond/surety. 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.

6. Interim Certification. Due to the characteristics and dual purpose function of Villa BMP #1, interim construction certification will be required. Refer to current County guidelines for requirements. *(Note: The embankment for this basin may have been initially constructed under approved County site plan SP-93-03.)*

7. VPDES. It appears land disturbance for the project may exceed one (1) acre. Therefore, it is the owner's 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.

8. Site Tabulation. Provide a total site area for this portion of the project (as defined by metes and bounds as shown on Sheets 2, 3, and 4) and an impervious cover estimate. If over 60 percent, it should be demonstrated that it is in compliance with the Chesapeake Bay ordinance or consistent with the overall approved master plan intent.

9. **Watershed.** Provide a note on the cover sheet of the plans indicating which County watershed, sub-watershed and/or catchment for which the project is situated in. *(Note: It appears the project is situated in Sub-Watershed 209, Catchments 209-101-1 of the Powhatan Creek Watershed.)*

10. **Modular** retaining walls are proposed for the project along the southern perimeter and adjacent to proposed Villa BMP #2. The retaining wall adjacent to BMP # 2 will be subjected to saturation during lower frequency storms. Indicate what measures will be provided to ensure the integrity of foundation of the proposed retaining wall in the location adjacent to BMP # 2. All of the proposed modular retaining walls shall be reviewed for compliance and building permit purposes with Codes Compliance.

Chesapeake Bay Preservation:

11. **Environmental Inventory.** An environmental inventory was provided on Sheet 2. The inventory needs to show the limit of work (clearing and grading) in the southwest portion of the site adjacent to Villa BMP # 1. Also, show the extent of the proposed modular retaining walls and show an outline for Villa BMP #2.

12. **Steep Slopes.** A waiver for steep slope impacts, in writing, is necessary regardless of whether the subject slope is natural or man-made. A disturbed, man-made slope of 25 percent or more will erode in the same manner as a denuded natural slope.

Erosion & Sediment Control Plan:

13. **Design Checklist.** Please provide a completed standard James City County Erosion and Sediment Control and Stormwater Management Design Plan Checklist, specific to this project. The intent of the checklist is to ensure the plan preparer has provided all items necessary for a complete and expeditious review.

14. **Limits of Work.** Show and label a distinct limit of work (clearing and grading) around the <u>entire</u> site periphery. Be sure to include work associated with installation of erosion and sediment controls and onsite or offsite utility connections. Ensure disturbed area estimates match land-disturbance inclusive within the limits of work. On Sheet 4, the final limits of clearing should include the waterline tie to Ford's Colony and the final limits of clearing should not extend into area identified as non-RPA wetlands along the southern boundary of the project site and the "Endangered Specie Preserve" in the northeast corner of the site.

15. **E&SC Plan.** The Phase I erosion and sediment control plan as presented on Sheet 3, which will handle initial clearing and grading operations, has three temporary sediment traps (# 2, # 3 and # 4) which are interior to the site. It initially appears that the locations of these traps will conflict with future site grading and site improvements. For example, temporary sediment trap # 3 which has a bottom at El. 80 is situated in an area that is proposed to be filled to Elev. 91.5 (11 ft. of fill). Address whether an erosion and sediment control plan as such will provide for adequate protection during all phases of the land-disturbing activity.

16. Sequence of Construction. The following comments pertain to the sequence of construction as presented on Sheet 3.

16a. The sequence of construction fails to include when Sediment Trap #1 will be removed.

16b. Reference offsite utility work related to the Ford's Colony waterline tie and the associated erosion and sediment control measures within the sequence of construction.

17. Perimeter E&S Controls. The site's existing slopes along the southern boundary of the project site average around 4 to 10 percent and slope lengths behind the silt fences are generally less than 100 ft. The runoff potential due to this amount of upslope "exposed" drainage area (which is greater than 3 acres) combined with the site's existing slopes and slope lengths behind the silt fences will pose maintenance concerns for silt fence. This scenario also increases the risk for "disturbed" site runoff to enter into the adjacent non-RPA wetlands. It is recommended that if silt fence is going to be used at this location as presented, that the area along the southern boundary of the Villa Project Site be graded in stages and immediately stabilized with erosion control slope matting as grading operations proceed following placement of the proposed sediment traps and basins. EC-3 turf-reinforcement matting is preferred as these slopes may be subject to concentrated runoff until the onsite storm drainage system is installed and functional. *(Note: Also adjust the sequence of construction accordingly to reflect staged grading and use of erosion control matting.)*

18. Temporary Sediment Basin (Villa BMP # 1). Submit Sediment Basin Design Data Sheets and associated computations to ensure this sediment basin design is in compliance with Minimum Standard & Specification 3.14 of the VESCH.

19. Temporary Sediment Basin (Villa BMP # 2). Include calculations for sizing of the dewatering orifice invert and size based on a 6-hour drawdown. Refer to Minimum Standard & Specification 3.14 of the VESCH. The included calculations for the temporary sediment basin indicate a diameter of 4" for the dewatering orifice. The detail entitled Sediment Basin # 2 (to be converted to Villa BMP #2) on Sheet 25 of the plans indicates a diameter of 3". Include calculations and correct the calculation sheets or the detail as necessary.

Stormwater Management / Drainage:

20. BMPs. Label all permanent BMPs as proposed for this site consistent with the BMP worksheet and nomenclature in the County BMP manual. For example, if wet extended detention ponds are to be used consistent with the overall master plan 10 point worksheet, label on the plans as wet extended detention pond, County type A-3 BMP, 10 point BMP.

21. Open Space Credit. Provide a conservation easement plat for all Natural Open Space areas as claimed in the master plan BMP worksheet and exhibit Sheet 1 "BMP Point Display" as provided in the design report.

22. Pond Benches. Provide a written request, in writing, to vary from minimum bench width standards for the aquatic and safety benches as provided within Villa BMP # 1 and Villa BMP # 2. Safety bench requirements may be waived if interior pond sideslopes are 4H: 1V or flatter.

23. Pond Buffers. Assigned BMP point values assume all features consistent with the County BMP manual are provided such as pretreatment forebays, aquatic shelves, stream channel protection volume, pond buffers, etc. As full 10 point credit value is being taken for Villa BMP # 2 in the calculation worksheet, all applicable design features must be present. It does not appear that a pond buffer, meeting the County BMP manual requirements will be present along the north and east sides of the basin due to the location of the retaining wall. Clarify how the loss of the pond buffer/setback will be mitigated. The same is also true for Villa BMP # 1, as the Outer Loop Road will be situated in the pond buffer along the east side of the facility.

24. Villa BMP # 2. Provide a detail within the plans for principal spillway and the proposed grate top unit (described as a modified DI-11 sitting on a 60" diameter manhole) for Villa BMP # 2. Provide appropriate riser, grate and bar details as applicable

25. BMP Designs. For stage-storage purposes, the invert of the lowest control orifice is zero storage. For extended detention (dry) basins, this corresponds to the bottom of the facility. For retention (wet) basins, this corresponds to elevation of the permanent (normal) pool. It appears from the stage-storage-discharge tables provided for Villa BMP #1 and #2 that zero storage corresponds to the bottom of the basins when it should correspond to the elevation of the permanent pool. Correct or provide additional evidence that this is not the case. *(Note: This may result in the basins being severely undersized for stream channel protection control purposes.)*

26. Stage-Storage. Please confirm that the permanent pool elevation for Villa Pond #2 is actually at El. 70.0' (as shown of plan Sheet 16) and not at El. 69.0'. Note that the invert of the 3" orifice is identified on the detail Sheet 25 at El. 69.0'. Review and revise the plans as necessary to show consistent information.

27. Pond Tailwater. Tailwater conditions directly downstream of the SWM/BMP facilities was not considered in any of the hydraulic routing for the both Villa Pond # 1 and # 2. Due to the presence of downstream wetlands, evaluate the potential for tailwater conditions at the outlet of the barrel and subsequent effects a tailwater condition may have to the outlet discharges and design water surface elevations for each of the BMP. Incorporate tailwater conditions in the hydraulic models in the design report as appropriate and/or justify the use of no tailwater conditions.

28. Emergency Spillway. Provide a detail or typical section for the 10 ft concrete emergency spillway shown on the plans for Villa BMP #2.

29. Riser Structure. The riser structure for Villa BMP # 2 is described as a 60" manhole. Provide details of how the modified EW-11A principal spillway crest is attached to the 60" manhole and provide details of the base that will anchor the riser structure firmly to the base and prevent floating.

30. Concrete Riser and Barrel. Specify watertight reinforced concrete pipe meeting the requirements of ASTM C361 or ASTM C76 for the reinforced concrete pipe riser and outlet barrel for Villa BMP # 1 and # 2. Provide dimensions and specifications for size of the anchor bases for both BMP risers. Include provisions or labels for access and steps within the risers for maintenance purposes. *(Note: Description of concrete outlet barrel, 50 ft of 24" concrete pipe, on plan Sheet 16 for Villa BMP # 2 is not consistent with details, 50 ft of 30" concrete pipe, on plan Sheet 25.*

Calculations in the design report for Villa BMP # 2 indicate a length of 100 ft. for the concrete outlet barrel. Provide consistency throughout and make corrections as necessary.)

31. Flotation Computations. Provide flotation (buoyancy) computations for the riser and base structures for both BMPs. A minimum factor of safety of 1.25 is recommended.

32. Low Flow Orifice Protection. Provide a non-clogging trash rack for the low flow orifices for both BMPs. HDPE trash racks per Technical Bulletin 7 of the VaDCR can be considered for review on a case-by-case basis.

33. Low Flow Orifice. Correct the specified length for the 3" Schedule 80 PVC pipe shown on the details for Sediment Basin 2 and Villa Pond # 2 on Sheet 25. The pipe extends under the 3:1 fill slope of the basin dam and also under a 6' safety bench and an additional 6' aquatic bench. The length specified of 10' is obviously incorrect.

34. Pond Drain/Valve. Include provisions for both BMPs to provide a pond drain and valve system that is capable of completely or partially draining the entire facility within 24 hours for future maintenance purposes. This is consistent with County BMP manual requirements. Include specifications for valve size, type and materials and supporting hardware.

35. Stilling Basin. Provide details for the stilling basin as proposed at the outfall of Villa BMP # 2. Also, on the initial and overall erosion and sediment control plan Sheets 3 and 4, label all outlet protections and stilling basins at storm drainage system and BMP outfalls consistent with VESCH Chapter 3 keys and symbols.

36. Adequate Outflow. Outflows from SWM/BMP facilities must be discharged to an adequate and well-defined channel. Facilities discharging onto flat areas with no defined channel usually require an onsite channel to be provided which can adequately convey design flows (discharges). Refer to VSMH page 5 - 61. *(Note: According to topography shown on the plans, both BMP outfalls are directed directly onto uniform slopes upland of wetlands, not natural defined receiving channels).*

37. HGL Computations. The tail water elevation utilized in the storm sewer tabulation computations for the system draining into Villa BMP # 2 (ie. System 2) should be corrected from El. 67.25 to correspond to the 10-yr depth of the routed pond calculations of El. 74.41, or at a minimum the 2-year water surface elevation of the pond. Ensure depths of flow at the inlets or inlet surcharging due to hydraulic grade or inlet/orifice control will not create an undesirable condition for intended uses at the site.

38. Stormwater Conveyance Channels. Reference the "Typical Swale Detail" shown on Sheet 25 to grading and drainage plan sheets as necessary. Identify or label EC-2 lined grassed swales (adjacent to landscaped berm) on grading and drainage plan Sheets 15 and 17. Clarify if all swales shown on the grading and drainage plans are to receive EC-2 lining.

39. Storm Drain Profiles. If storm drain (sewer) profiles are not to be provided within the project plan set, please check to ensure that minimum cover is maintained for all storm segments and all storm segment pipe wall types (if HDPE) or wall thicknesses (if RCP) are adequate and designed for maximum heights of cover.

40. Storm Design. The pipe segment length in the design report between storm drainage structure SS # 1-46 and SS # 1-47 is 50 feet; however, the length shown on the construction plans is 168 feet. Ensure the pipe segment (and corresponding downstream pipe segments) are of correct size for a larger pipe run which would have greater friction losses. Also, there are two storm drain structure labels for SS # 1-40 on Sheet 15.

41. Inlet Calculations: Some of the performance curves for DI-1 and DI-7 (from the VDOT Drainage Manual) as used to compute inlet depths are mislabeled and reference drop inlet drainage structures. Review for accuracy and revise to identify the correct drainage structure.

42. Inlet Depths. Inlets SS # 1-1, # 1-2 exceed 9' in depth and do not meet minimum depth requirements per VDOT standards for DI-2E and DI-2D drop inlets. Specify DI-2EE and DI-2DD to comply with VDOT Standards. Inlet SS # 2-1 exceeds 9' in depth and should be specified as DI-2AA to comply with VDOT Standards.

43. Drop Inlet Type. Inlet SS # 1-7 is specified as a DI-2B. In order to comply with VDOT Standards specify as a DI-2D since it has a 36" outlet pipe.

44. Inlet Grates. Specify inlet grate type to be used with VDOT Standard DI-7. Recommend Grate A, type III for use in pedestrian areas not subject to traffic loading unless there are concerns for pedestrian safety-access then use Grate type B.

45. Inlet Depths. Where inlets are greater than 4 ft., use notes or details to include steps in accordance with VDOT Standard ST-1.

46. IS-1 Shaping. Inlet shaping will help to minimize and prevent debris buildups due to changes in pipe alignment. Use notes or details to specify inlet shaping at all storm drain structures where changes in pipe alignments occur at structures in accordance with VDOT Standard IS-1.

47. End Treatment. In accordance with Items 4.17 and 5.10 of the *JCC Stormwater Drainage Conveyance Systems (Non-BMP related) General Design and Construction Guidelines*, provide standard headwalls for the ends of the storm drain systems at the following locations: the 42" pipe entering Villa BMP # 1 and the 24" pipe entering Villa BMP #2.

48. Pond Landscaping. On landscaping Sheet L-2, remove trees shown within 25 ft of the principal spillway structure for Villa BMP #2. Refer to Minimum Standard 3.05 of the VSMH for additional detailed guidance.

49. Miscellaneous. Due to the close proximity of Villa BMP # 1 to Outer Loop Road, it is highly recommended that a guiderail be installed along Outer Loop Road, between approximate road stations 17+30 and 18+70 right.

50. Geotechnical. Provide information (preliminary soil evaluations, logs, test results, reports, etc.) as necessary to substantiate that existing soils beneath Villa BMP's # 1 and # 2 are adequate to sustain a permanent pool as intended for water quality purposes.