SP-0002-2013

PLANNING DIVISION

MAR 12 2013

RECEIVED

COUNTY OF JAMES CITY
FINAL SITE PLAN

APPROVALS		DATE
Fire Dept.	JB/LC	1/17/13
Health Dept.		
Water	BH/LC	4/10/13
Sewer	GMS	4/12/13
Environ.	ST/LC	4/09/13
Planning Adm.	JP	4/12/13
Planning	GP	2/21/13
County Eng.		
HEA		
Other		

Environmental Division

APR 24 2013

RECEIVED

Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

SITE PLAN AMENDMENT

FOR

TOANO MIDDLE SCHOOL

DROP OFF AREA AND PARKING IMPROVEMENTS

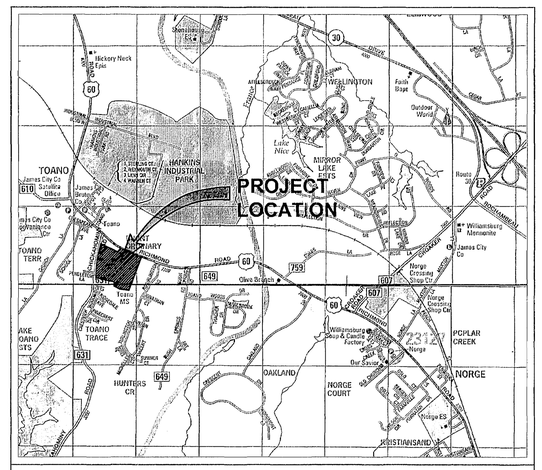
WILLIAMSBURG/JAMES CITY COUNTY PUBLIC SCHOOLS

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

GENERAL NOTES:

1. SITE IS CURRENTLY ZONED PUBLIC LANDS, PL. THIS PLAN IS AN AMENDMENT TO SP-040-07. A MASTER PLAN SUP-0012-2102 WAS APPROVED BY THE PLANNING COMMISSION ON 11/7/12 AND THE BOARD OF SUPERVISORS ON 12/11/12.
2. SITE ADDRESS: 7817 RICHMOND ROAD WILLIAMSBURG, VA
3. TAX MAP PARCEL NO. (12-4) (1-51)
4. APPLICANT: WILLIAMSBURG JAMES CITY PUBLIC SCHOOLS
   597 JOLLY POND ROAD
   WILLIAMSBURG VA. 23188-7328
   CONTACT: ALAN ROBERTSON
   PHONE: 757 259-7157
   FAX: 757 565-1462
5. PROPERTY SHOWN HEREON LIES IN ZONE "X", (AREA DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. #510201-0020B, DATED 2/6/91.
6. THIS SITE LIES WITHIN THE SUBWATERSHED 102 OF YARMOUTH CREEK WATERSHED.
7. THIS PROJECT IS SUBJECT TO SPECIAL STORMWATER CRITERIA (SSC).
8. SITE IS SERVED BY PUBLIC WATER AND SEWER.
9. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY (1-800-552-7001) FOR EXISTING UTILITY LOCATIONS AT LEAST 3 WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION AND ALSO HAVE A PRIVATE UTILITY LOCATOR FOR PRIVATE UTILITIES AT SAME TIME FRAME.
11. ANY UTILITIES NOT LOCATED BY MISS UTILITY OR PRIVATE LOCATOR AND ARE UNCOVERED DURING CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE OWNER IMMEDIATELY, SECURE THE AREA, AND REPAIRS ARE TO BE MADE.
12. ALL UTILITIES WILL BE PLACED UNDERGROUND.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR THIS PROJECT.
14. A LAND DISTURBING PERMIT AND SILTATION AGREEMENT, WITH SURETY, ARE REQUIRED FOR THIS PROJECT.
15. PRIOR TO OBTAINING A LAND DISTURBING PERMIT, THE CONTRACTOR SHALL OBTAIN A VSMP PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM DCR (DEPARTMENT OF CONSERVATION AND RECREATION) AND A VDOT LAND DISTURBING PERMIT FROM VDOT.
16. ON-SITE EXTERIOR CONCRETE IS TO BE A MINIMUM OF 3500 PSI WITH 5% TO 7% AIR ENTRAINMENT.
17. CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF ALL SITE IMPROVEMENTS, INCLUDING LANDSCAPING, AS SHOWN ON THE APPROVED PLAN.
18. ALL TRAFFIC CONTROL SIGNS AND MARKINGS TO CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (LATEST EDITION).
19. ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3, OF THE JAMES CITY COUNTY ZONING ORDINANCE.
20. THE PROFESSIONAL WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR PURPOSES OF PLAN APPROVAL ONLY. PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT, THE OWNER OR DEVELOPER SHALL PROVIDE THE NAME OF A "RESPONSIBLE LAND DISTURBER" WHO SHALL ASSUME RESPONSIBILITY AS THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT. THE OWNER OR DEVELOPER SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.
21. BENCHMARK STATION NO. 304, EASTING (X) 11977536.998, NORTHING (Y) 3665244.285, ELEVATION = 106.86
    HORIZONTAL DATUM: JAMES CITY COUNT GEODETIC CONTROL NETWORK
    VIRGINIA STATE PLANE COORDINATE SYSTEM – SOUTH ZONE
    NAD 83 (1994 VA HARN)
    VERTICAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK
    NGVD 29
22. TEMPORARY TRAFFIC CONTROL SHALL CONFORM TO THE VIRGINIA WORK AREA PROTECTION MANUAL, LATEST EDITION.
23. ANY CONSTRUCTION WITHIN VDOT RIGHT OF WAY SHALL CONFORM TO VDOT STANDARDS AND SPECIFICATIONS.
24. NO PLUMBING REVISIONS ARE TO BE COMPLETED UNDER THIS PLAN.

NOTE:
ALL STORMWATER/BMP CONSTRUCTION SHALL BE OBSERVED BY A QUALIFIED LICENSED PROFESSIONAL. PRIOR TO THE RELEASE OF RELATED POSTED BONDS AND SURVEY, RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS MUST BE PROVIDED TO, AND APPROVED BY THE JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION AND SHALL BE CONSISTENT WITH THE STORMWATER MANAGEMENT/BMP FACILITIES RECORD DRAWINGS AND CONSTRUCTION CERTIFICATION FORMS.



VICINITY MAP
(APPROXIMATE SCALE: 1"=2000')
MAP COPYRIGHT KAPPA MAP GROUP LLC
(800)829-6277
PERMITTED USE NUMBER 21004223

COUNTY PROJECT NO.: SP-002-13
ORIGINAL SUBMITTAL DATE: 1/11/13
APPROVAL DATE:

LEGEND

EXISTING		PROPOSED
EX. WATER	WATER	
EX. SAN.	SANITARY SEWER	
	STORM SEWER	
EX. FORCEMAIN	FORCE MAIN	
	SANITARY MANHOLE	
	STORM MANHOLE	
	CURB DROP INLET	
	YARD DROP INLET	
	FLARED END SECTION	
	VALVE	
	FIRE HYDRANT ASSEMBLY	
	BLOW-OFF VALVE	
	AIR RELEASE ASSEMBLY	
CO	CLEAN OUT	
WM	WATER METER	
	STREETLIGHT	

EXISTING		PROPOSED
	CENTERLINE/BASELINE	
	RIGHT OF WAY	
	PROPERTY LINE	
	℄ DITCH/SWALE	
	CONCRETE LINED DITCH	
	EXISTING TREELINE	
	LIMITS OF CLEARING	
	RIP RAP	
	CURB	
	CURB AND GUTTER	
	REVERSE GUTTER PAN	
	EDGE OF PAVEMENT	
2561	EXISTING GROUND ELEVATION	
	PROPOSED SPOT GRADE	TC0.00
80	CONTOUR	80

INDEX OF SHEETS:

SHEET NO.	SHEET DESCRIPTION
C-01	COVER SHEET
C-02	ENVIRONMENTAL INVENTORY
C-03	DEMOLITION AND INITIAL EROSION & SEDIMENT CONTROL PLAN
C-04	SITE LAYOUT PLAN
C-05	GRADING & DRAINAGE PLAN
C-06	EROSION & SEDIMENT CONTROL NOTES & DETAILS
C-07	STORMWATER NOTES & DETAILS
C-08	VDOT NOTES & DETAILS
C-09	LANDSCAPE PLAN
C-10	LIGHTING PLAN
C-11	LANDSCAPE & LIGHTING NOTES & DETAILS
C-12	ADDITIVE BID

CERTIFIED RESPONSIBLE LAND DISTURBER:

GRAHAM V. CORSON, P.E.
AES CONSULTING ENGINEERS
5248 OLDE TOWNE ROAD, SUITE 1
WILLIAMSBURG, VIRGINIA 23188
TELEPHONE: 757-253-0040

* FOR SITE PLAN REVIEW PROCESS ONLY. OWNER OR CONTRACTOR SHALL NAME RESPONSIBLE LAND DISTURBER FOR CONSTRUCTION PROCESS.

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
3/12/13
PROFESSIONAL ENGINEER

SITE DATA:

PROJECT LIMITS:	1,483,740 S.F.±,	34.06 AC.± (100%)
EXISTING IMPERVIOUS AREA:	215,625 S.F.±,	4.95 AC.± (14.5%)
PROPOSED IMPERVIOUS AREA:	11,775 S.F.±,	0.27 AC.± (0.8%)
PROPOSED IMPERVIOUS AREA (TOTAL):	227,400 S.F.±,	5.22 AC.± (15.3%)
OPEN SPACE:	1,256,340 S.F.±,	28.84 AC.± (84.7%)
ON-SITE DISTURBED AREA:	37,994 S.F.±,	0.87 AC.±
OFF-SITE DISTURBED AREA:	9,087 S.F.±,	0.21 AC.± (RICHMOND ROAD IMPROVEMENTS)
TOTAL DISTURBED AREA:	47,081 S.F.±,	1.08 AC.±

PARKING PROVIDED:

TOTAL EXISTING PARKING 117 / INCLUDING 3 HANDICAP SPACES
TOTAL EXISTING BUS PARKING 16 BUS SPACES

INCREASE OF 30 PARKING SPACES / INCLUDING 2 HANDICAP SPACES

TOTAL PROPOSED PARKING 147 / INCLUDING 5 HANDICAP SPACES
TOTAL PROPOSED BUS PARKING 16 BUS SPACES

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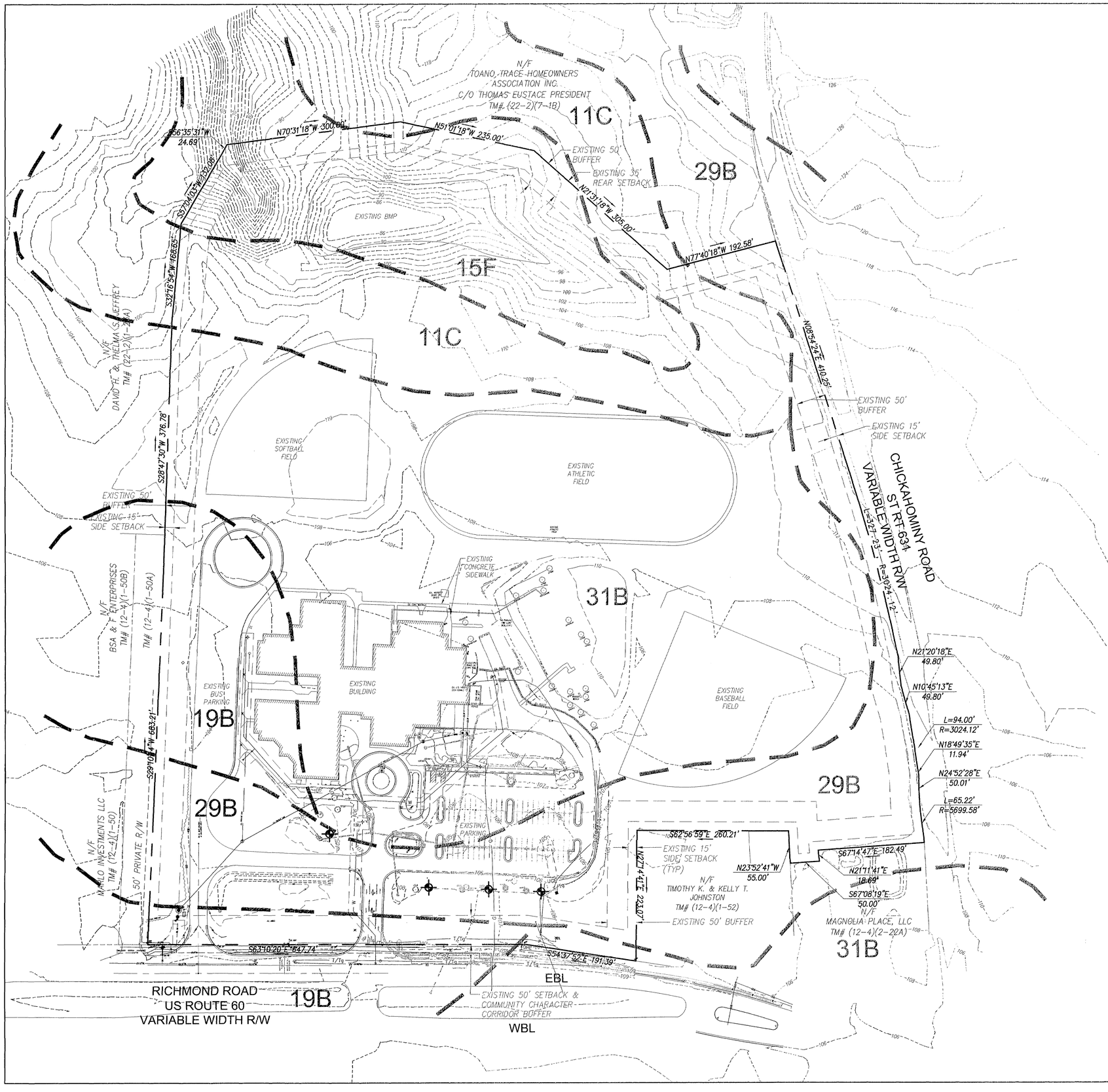
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: AS NOTED	Date: 1/11/13

Sheet Title:
COVER SHEET

Sheet Number
C-01



SOIL No.	SOIL NAME	TYPICAL SLOPES	EROSION FACTOR (K)	EROSION FACTOR (T)
11C	CRAVEN YELLOW FINE SANDY LOAM	2–10%	0.32–0.37	3
15F	EMPORIA COMPLEX	25–50%	0.20–0.28	4
19B	KEMPSVILLE–EMPORIA	2–6%	0.20–0.32	3–4
29B	SLAGLE	2–6%	0.24	3
31B	SUFFOLK FINE SANDY LOAM	2–6%	0.17–0.28	4

INFORMATION TAKEN FROM "SOIL SURVEY OF JAMES CITY AND YORK COUNTIES THE CITY OF WILLIAMSBURG, VIRGINIA" ISSUED IN APRIL, 1985, BY THE UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE IN COOPERATION WITH VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY.

SOIL SUSCEPTIBILITY TO EROSION CLASSIFICATION (K)
0.23 AND LOWER – LOW ERODIBILITY
0.23 TO 0.36 – MODERATE ERODIBILITY
0.36 AND UP – HIGH ERODIBILITY

THE MAP SHOWN IS A "BEST FIT MODEL" OF THE SCS MAPS WITH EXISTING BASE INFORMATION.

DENOTES 25% OR GREATER SLOPES

DENOTES 25% OR GREATER SLOPE IMPACTS

ENVIRONMENTAL INVENTORY IMPACTS

TIDAL WETLANDS:	NONE ON SITE
TIDAL SHORES:	NONE ON SITE
NON-TIDAL WETLANDS IN RPA:	NONE ON SITE
100 FT RPA BUFFER:	NONE ON SITE
NON-TIDAL WETLANDS IN RMA:	NONE ON SITE
25% SLOPE IMPACTS	NONE ON SITE

LEGEND

SOIL BORING LOCATION

GRAPHIC SCALE
80' 0' 80' 160'
SCALE: 1" = 80'

Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047397
3/12/13
PROFESSIONAL ENGINEER

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DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=80'	Date: 1/11/13

Sheet Title:
ENVIRONMENTAL INVENTORY

Sheet Number
C-02

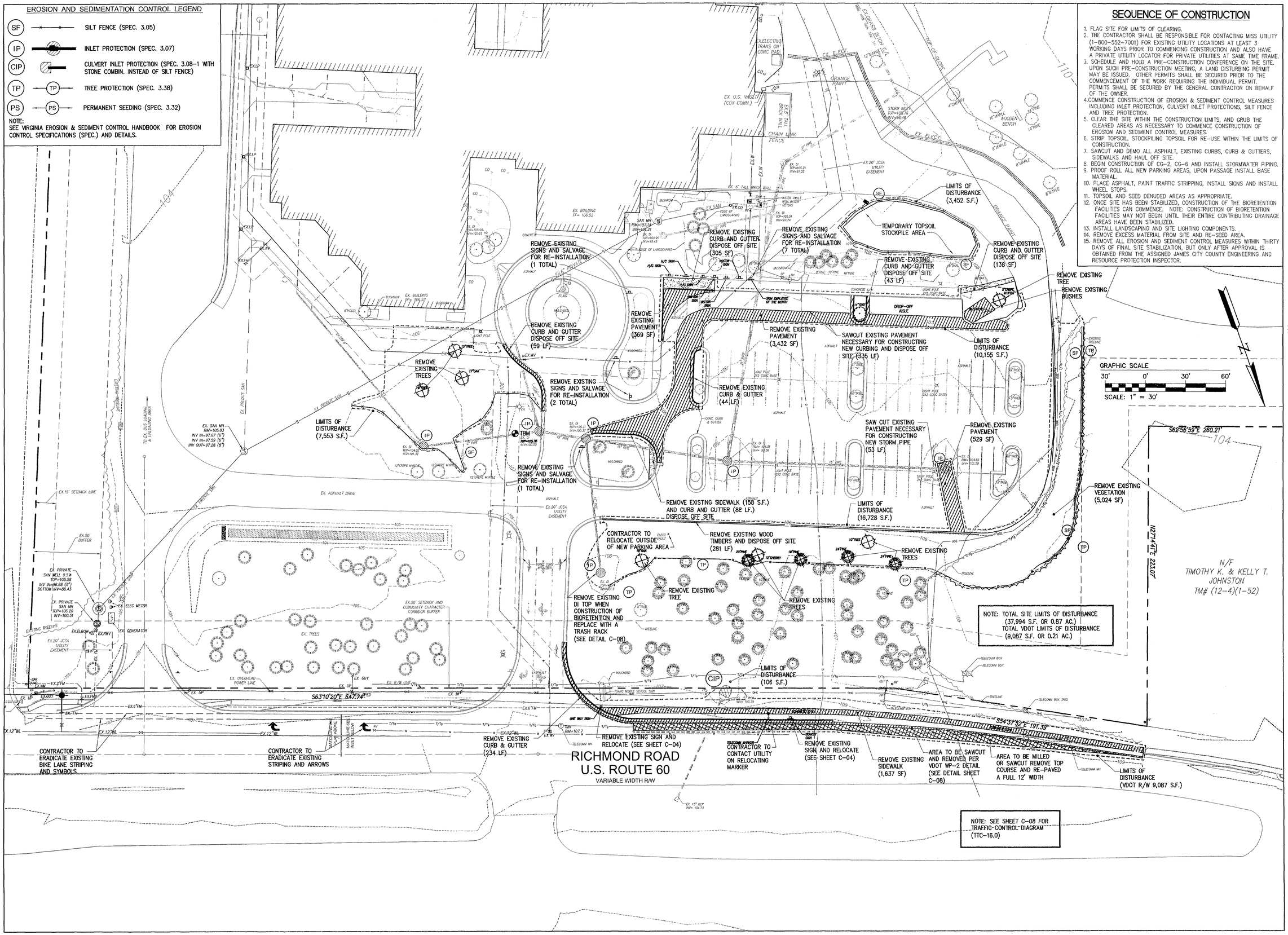
EROSION AND SEDIMENTATION CONTROL LEGEND

- SF — SILT FENCE (SPEC. 3.05)
- IP — INLET PROTECTION (SPEC. 3.07)
- CIP — CULVERT INLET PROTECTION (SPEC. 3.08-1 WITH STONE COMBIN. INSTEAD OF SILT FENCE)
- TP — TREE PROTECTION (SPEC. 3.38)
- PS — PERMANENT SEEDING (SPEC. 3.32)

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

SEQUENCE OF CONSTRUCTION

1. FLAG SITE FOR LIMITS OF CLEARING.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY (1-800-552-7001) FOR EXISTING UTILITY LOCATIONS AT LEAST 3 WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION AND ALSO HAVE A PRIVATE UTILITY LOCATOR FOR PRIVATE UTILITIES AT SAME TIME FRAME.
3. SCHEDULE AND HOLD A PRE-CONSTRUCTION CONFERENCE ON THE SITE. UPON SUCH PRE-CONSTRUCTION MEETING, A LAND DISTURBING PERMIT MAY BE ISSUED. OTHER PERMITS SHALL BE SECURED PRIOR TO THE COMMENCEMENT OF THE WORK REQUIRING THE INDIVIDUAL PERMIT. PERMITS SHALL BE SECURED BY THE GENERAL CONTRACTOR ON BEHALF OF THE OWNER.
4. COMMENCE CONSTRUCTION OF EROSION & SEDIMENT CONTROL MEASURES INCLUDING INLET PROTECTION, CULVERT INLET PROTECTIONS, SILT FENCE AND TREE PROTECTION.
5. CLEAR THE SITE WITHIN THE CONSTRUCTION LIMITS, AND GRUB THE CLEARED AREAS AS NECESSARY TO COMMENCE CONSTRUCTION OF EROSION AND SEDIMENT CONTROL MEASURES.
6. STRIP TOPSOIL, STOCKPILING TOPSOIL FOR RE-USE WITHIN THE LIMITS OF CONSTRUCTION.
7. SAWCUT AND DEMO ALL ASPHALT, EXISTING CURBS, CURB & GUTTERS, SIDEWALKS AND HAUL OFF SITE.
8. BEGIN CONSTRUCTION OF CG-2, CG-6 AND INSTALL STORMWATER PIPING.
9. PROOF ROLL ALL NEW PARKING AREAS, UPON PASSAGE INSTALL BASE MATERIAL.
10. PLACE ASPHALT, PAINT TRAFFIC STRIPPING, INSTALL SIGNS AND INSTALL WHEEL STOPS.
11. TOPSOIL AND SEED DENUDED AREAS AS APPROPRIATE.
12. ONCE SITE HAS BEEN STABILIZED, CONSTRUCTION OF THE BIORETENTION FACILITIES CAN COMMENCE. NOTE: CONSTRUCTION OF BIORETENTION FACILITIES MAY NOT BEGIN UNTIL THEIR ENTIRE CONTRIBUTING DRAINAGE AREAS HAVE BEEN STABILIZED.
13. INSTALL LANDSCAPING AND SITE LIGHTING COMPONENTS.
14. REMOVE EXCESS MATERIAL FROM SITE AND RE-SEED AREA.
15. REMOVE ALL EROSION AND SEDIMENT CONTROL MEASURES WITHIN THIRTY DAYS OF FINAL SITE STABILIZATION, BUT ONLY AFTER APPROVAL IS OBTAINED FROM THE ASSIGNED JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION INSPECTOR.



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COMMONWEALTH OF VIRGINIA
Graham V. Corson
GRAHAM V. CORSON
Lic. No. 047297
3/12/13
REGISTERED PROFESSIONAL ENGINEER

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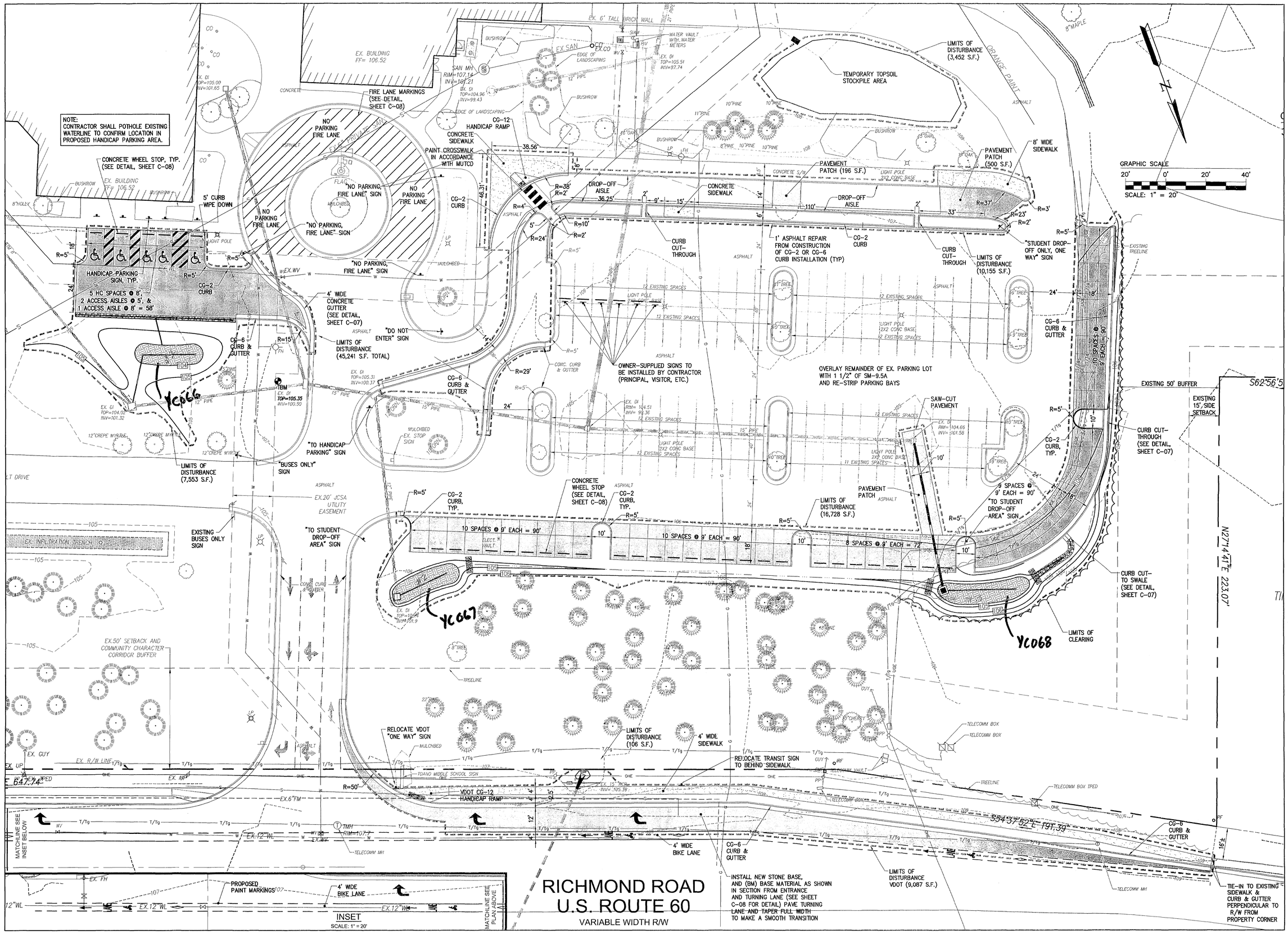
Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=30'	Date: 1/11/13

Sheet Title:
DEMO & INITIAL EROSION & SEDIMENT CONTROL PLAN

Sheet Number
C-03



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DROP OFF AREA AND PARKING IMPROVEMENTS

TOANO MIDDLE SCHOOL

WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS

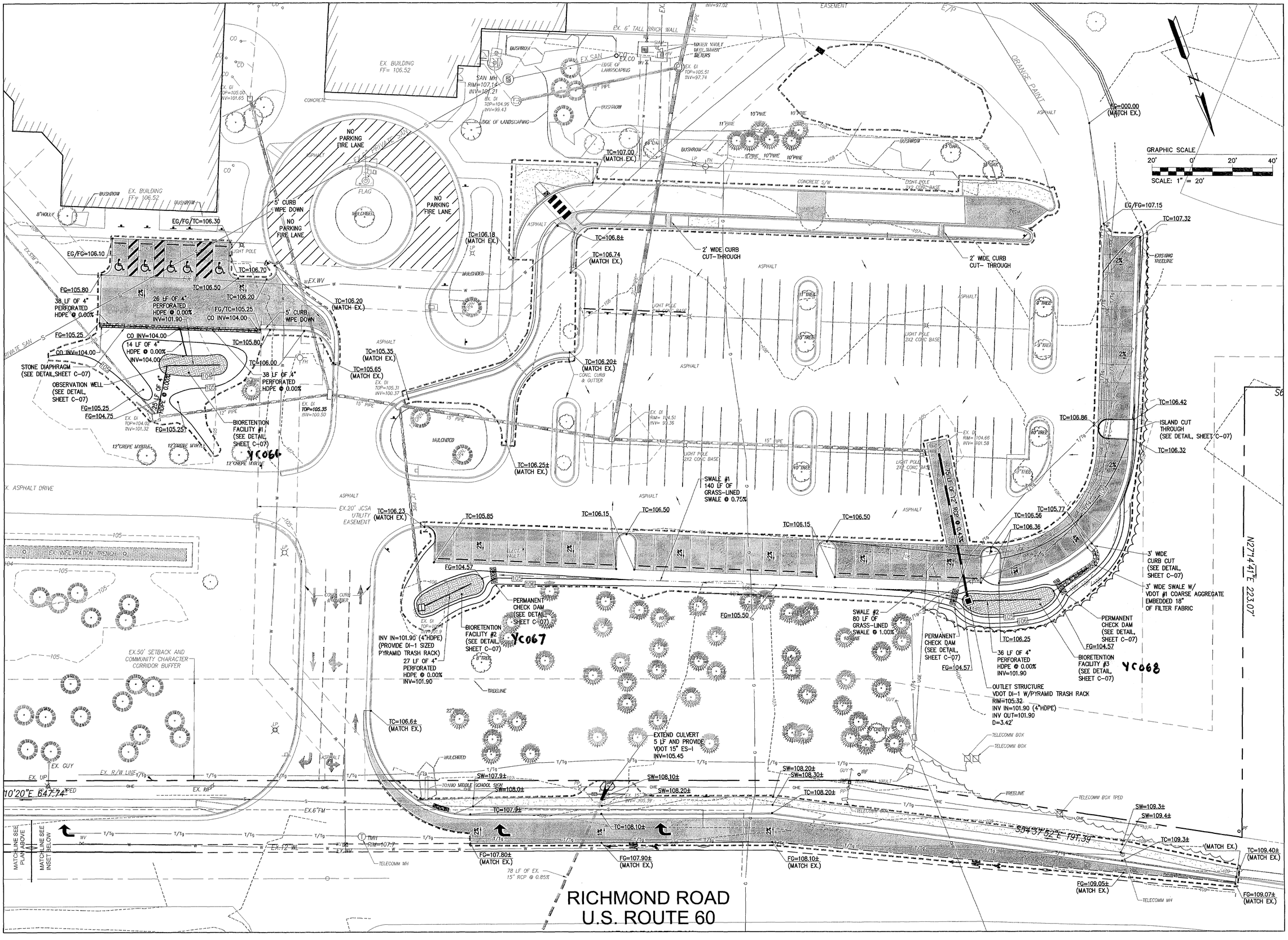
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=20'	Date: 1/11/13

Sheet Title: SITE LAYOUT PLAN

Sheet Number

C-04



Rev.	Date	Description	Revised By
2	4/9/13	REVISED PER VDOT COMMENTS	GVC
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

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DROP OFF AREA AND PARKING IMPROVEMENTS

TOANO MIDDLE SCHOOL

WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=20'	Date: 1/11/13

Sheet Title:
GRADING & DRAINAGE PLAN

Sheet Number
C-05

JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION STANDARD EROSION AND SEDIMENT CONTROL NOTES REVISED OCTOBER 1, 2009

THE FOLLOWING STANDARD EROSION AND SEDIMENT CONTROL (E&SC) NOTES SHALL BECOME PART OF APPROVED EROSION AND SEDIMENT CONTROL PLANS FOR ALL PLAN OF DEVELOPMENT PROJECTS IN JAMES CITY COUNTY, VIRGINIA.

1. ALL THE PROVISIONS OF VIRGINIA EROSION AND SEDIMENT CONTROL LAW AND REGULATIONS, MINIMUM STANDARDS, HANDBOOKS, AND TECHNICAL BULLETINS AS PUBLISHED BY THE VIRGINIA SOIL & WATER CONSERVATION BOARD AND/OR THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION, DIVISION OF SOIL & WATER CONSERVATION SHALL APPLY TO THE PROJECT.

2. MINIMUM STANDARDS # 1 THROUGH # 19 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS (4VAC50-30-40) SHALL APPLY TO THE PROJECT.

3. THE OWNER OR APPLICANT SHALL BE RESPONSIBLE TO REGISTER FOR COVERAGE UNDER THE GENERAL PERMIT FOR DISCHARGE OF STORMWATER FROM CONSTRUCTION ACTIVITIES, IN ACCORDANCE WITH CURRENT REQUIREMENTS OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) AND THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION.

4. THE OWNER OR APPLICANT SHALL PROVIDE THE NAME OF AN INDIVIDUAL HOLDING A VALID RESPONSIBLE LAND DISTURBER (RLD) CERTIFICATE OF COMPETENCE WHO WILL BE RESPONSIBLE FOR THE LAND-DISTURBING ACTIVITY PRIOR TO ENGAGING IN THE LAND-DISTURBING ACTIVITY. THIS WILL BE NECESSARY PRIOR TO ISSUANCE OF A LAND-DISTURBING PERMIT FOR THE PROJECT. THE RLD IS REQUIRED TO ATTEND THE PRECONSTRUCTION CONFERENCE FOR THE PROJECT.

5. THE CONTRACTOR IS RESPONSIBLE TO CONTACT MISS UTILITY (DIAL 811 IN VA OR 1-800-552-7001) PRIOR TO ANY UTILITY OR SITE WORK EXCAVATIONS.

6. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE PLANNED, DESIGNED, IMPLEMENTED, INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE PROVISIONS OF THE LATEST EDITION OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). THE CONTRACTOR SHALL MAINTAIN, INSPECT AND REPAIR ALL EROSION AND SEDIMENT CONTROL MEASURES AS NEEDED THROUGHOUT THE LIFE OF THE PROJECT TO ENSURE CONTINUED ACCEPTABLE PERFORMANCE.

7. A PRECONSTRUCTION CONFERENCE (MEETING) SHALL BE HELD ON SITE BETWEEN THE COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION, THE OWNER-APPLICANT, THE RESPONSIBLE LAND-DISTURBER (RLD), THE CONTRACTOR AND OTHER RESPONSIBLE AGENCIES, AS APPLICABLE, PRIOR TO ISSUANCE OF A LAND-DISTURBING PERMIT. THE OWNER OR APPLICANT IS REQUIRED TO COORDINATE SCHEDULING OF THE PRECONSTRUCTION CONFERENCE BETWEEN ALL APPLICABLE PARTIES. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION FOR REVIEW AND APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING.

8. ALL PERIMETER EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.

9. ADDITIONAL SAFETY FENCE OR DUST CONTROL MEASURES, IN ACCORDANCE WITH THE PROVISIONS OF MINIMUM STANDARDS & SPECS. 3.01 AND 3.39 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), MAY BE REQUIRED TO BE IMPLEMENTED IN ADDITION TO THAT SHOWN ON THE APPROVED PLAN IN ORDER TO ENSURE ADEQUATE PROTECTION OF THE HEALTH, SAFETY AND WELFARE OF THE PUBLIC OR IF SITE CONDITIONS CHANGE, BECOME APPARENT OR ALTER SIGNIFICANTLY FOLLOWING THE DATE OF PLAN APPROVAL.

10. EROSION AND SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT OR FOLLOWING TIME OF CONSTRUCTION TO ENSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED, TO ENSURE ADEQUATE PROTECTION OF THE HEALTH, SAFETY AND WELFARE OF THE PUBLIC, OR IF SITE CONDITIONS CHANGE, BECOME APPARENT OR ALTER SIGNIFICANTLY FOLLOWING THE DATE OF PLAN APPROVAL. COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION APPROVAL SHALL BE REQUIRED FOR ANY DEVIATION OF EROSION AND SEDIMENT CONTROL MEASURES FROM THE APPROVED PLAN.

11. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

12. CULVERT AND STORM DRAIN INLET PROTECTIONS, IN ACCORDANCE WITH THE PROVISIONS OF MINIMUM STANDARDS & SPECS. 3.07 & 3.08 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), MAY BE REMOVED AT THE DISCRETION OF THE ASSIGNED COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION INSPECTOR SHOULD PLACEMENT OF THE MEASURE RESULT IN EXCESSIVE ROAD FLOODING OR TRAFFIC HAZARD OR RESULT IN THE REDIRECTION OF DRAINAGE ONTO OR TOWARD EXISTING LOTS, DRIVEWAYS OR STRUCTURES. DECISIONS SHALL BE MADE ON A CASE-BY-CASE BASIS BASED ON FIELD SITUATIONS ENCOUNTERED.

13. DRAINAGE FACILITIES SHALL BE INSTALLED AND FUNCTIONAL WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT.

14. NO MORE THAN 300 FEET OF TRENCH MAY BE OPEN AT ONE TIME FOR UNDERGROUND UTILITY LINES, INCLUDING STORM WATER CONVEYANCES. ALL OTHER PROVISIONS OF MINIMUM STANDARD # 16 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS APPLY.

15. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH MINIMUM STANDARD & SPEC. 3.35 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

16. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION ON THE APPROVED PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED, IN ACCORDANCE WITH MINIMUM STANDARDS & SPECS. 3.29 THROUGH 3.37 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), AS APPLICABLE. IRRIGATION, IF NECESSARY, SHALL COMPLY WITH ALL APPLICABLE OUTDOOR WATER USE RESTRICTIONS OF THE JAMES CITY SERVICE AUTHORITY.

17. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL NOT BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. REMOVAL SHALL NOT OCCUR WITHOUT AUTHORIZATION BY THE COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION. DISTURBANCES ASSOCIATED WITH THE REMOVAL OF TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE PROPERLY STABILIZED.

18. NO SEDIMENT TRAP OR SEDIMENT BASIN SHALL BE REMOVED UNTIL A) AT LEAST 75 PERCENT OF THE SINGLE-FAMILY LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN HAVE BEEN SOLD TO A THIRD PARTY FOR THE CONSTRUCTION OF HOMES (UNRELATED TO THE DEVELOPER); AND/OR, B) 60 PERCENT OF THE SINGLE-FAMILY LOTS WITHIN THE DRAINAGE AREA TO THE TRAP OR BASIN ARE COMPLETED AND STABILIZED. A BULK SALE OF THE LOTS TO ANOTHER BUILDER DOES NOT SATISFY THIS PROVISION. SEDIMENT TRAPS AND SEDIMENT BASINS SHALL NOT BE REMOVED WITHOUT AUTHORIZATION OF THE COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION.

19. APPLICABLE PROVISIONS OF THE COUNTY BMP MANUAL (JAMES CITY COUNTY GUIDELINES FOR DESIGN AND CONSTRUCTION OF STORMWATER MANAGEMENT BMPS) AND THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK (VSMH) APPLY TO THE PROJECT.

20. DESIGN AND CONSTRUCTION OF PRIVATE-TYPE STORM DRAINAGE SYSTEMS, OUTSIDE VDOT RIGHT-OF-WAY, SHALL BE PERFORMED IN ACCORDANCE WITH THE CURRENT VERSION OF THE JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION, STORMWATER DRAINAGE CONVEYANCE SYSTEMS (NON-BMP RELATED), GENERAL DESIGN AND CONSTRUCTION GUIDELINES.

21. RECORD DRAWINGS (AS-BUILTS) AND CONSTRUCTION CERTIFICATIONS ARE REQUIRED FOR ALL STORMWATER FACILITIES INCLUDING STORMWATER MANAGEMENT/BMP FACILITIES AND STORM DRAINAGE CONVEYANCE SYSTEMS. RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS MUST MEET ESTABLISHED PROGRAM REQUIREMENTS OF BOTH THE COUNTY ENGINEERING AND RESOURCE PROTECTION AND STORMWATER DIVISIONS.

22. ALL STORMWATER FACILITIES INCLUDING BMPS, STORM DRAINAGE PIPES, STORMWATER CONVEYANCES, INLETS, MANHOLES, OUTFALLS AND ROADSIDE AND OTHER OPEN CHANNELS SHALL BE INSPECTED BY TD ROADSIDE AND OTHER OPEN CHANNELS SHALL BE INSPECTED BY THE JAMES CITY COUNTY COUNTY STORMWATER DIVISION AND GEOTECHNICAL ENGINEER IN ACCORDANCE WITH ESTABLISHED THE JAMES CITY COUNTY STORMWATER DIVISION PROGRAM REQUIREMENTS.

EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION

THE PROJECT IS AN AMENDMENT TO THE TOANO MIDDLE SCHOOL SITE THAT WILL PROVIDE FOR A DROP OFF AREA FOR STUDENTS, DESIGNATE THE ENTRANCE CIRCLE AS A FIRE LANE, AND RELOCATE THE HANDICAPPED SPACES CLOSER TO THE ENTRANCE AND ADD 30 ADDITIONAL REGULAR AND 3 ADDITIONAL ADA COMPLIANT SPACES TO SITE. THE PARKING ADDITIONS WILL PROVIDE THE SCHOOL SITE WITH 147 REGULAR AND 5 ADA COMPLIANT PARKING SPACES.

EXISTING SITE CONDITIONS

THIS SITE IS CURRENTLY DEVELOPED AS A MIDDLE SCHOOL. THE STORMWATER RUNOFF FROM THE SITE IS CURRENTLY CONVEYED OVERLAND TO EXISTING STORM SYSTEMS AND THEN TO AN ON-SITE WET POND BMP.

ADJACENT PROPERTY

THE PROPOSED SITE IS BORDERED ON THE SOUTH BY EXISTING WOODLANDS, ON THE EAST BY EXISTING COMMERCIAL PROPERTY, AND ON THE NORTH BY RICHMOND ROAD. WEST OF THE PROJECT IS CHICKAHOMINY ROAD.

OFFSITE AREAS

THERE ARE AREAS OF OFFSITE DISTURBANCE IN THE ASSOCIATED WITH THE CHANGES MADE TO RICHMOND ROAD.

SOILS

THE SOIL CONSERVATION SERVICE HAS IDENTIFIED THE PRESENCE OF THE SOILS TYPES AS INDICATED ON MAP NUMBER 22 OF THE SOIL SURVEY OF JAMES CITY AND YORK COUNTIES AND THE CITY OF WILLIAMSBURG, VIRGINIA. SEE THE ENVIRONMENTAL INVENTORY SHEET (SHEET C-02) FOR SOIL TYPES AND LOCATIONS.

CRITICAL AREAS

SEE THE ENVIRONMENTAL INVENTORY (SHEET C-02) FOR THE LOCATION OF 25% SLOPES. THERE AREA NO DISTURBED WETLANDS IN THE PROJECT AREA.

EROSION AND SEDIMENT CONTROL MEASURES

UNLESS OTHERWISE INDICATED, ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH). THE MINIMUM STANDARDS OF THE VESCH SHALL BE ADHERED TO UNLESS OTHERWISE WAIVED AND APPROVED BY THE ON-SITE E&S CONTROL INSPECTOR. THESE MEASURES SHALL INCLUDE BUT NOT BE LIMITED TO: CONSTRUCTION ENTRANCE, SILT FENCE,INLET PROTECTION, CULVERT INLET PROTECTION, DUST CONTROL, TEMPORARY SEEDING, AND PERMANENT SEEDING.

MANAGEMENT STRATEGIES

1. CONSTRUCTION WILL BE SEQUENCED SO THAT GRADING OPERATIONS CAN BEGIN AND END AS QUICKLY AS POSSIBLE
2. TEMPORARY SEEDING OR OTHER STABILIZATION WILL FOLLOW IMMEDIATELY AFTER GRADING.
3. AREAS WHICH ARE NOT TO BE DISTURBED WILL BE CLEARLY MARKED BY FLAGS, SIGNS, ETC.
4. THE CONTRACTOR SHALL HAVE A CERTIFIED RESPONSIBLE LAND DISTURBER AND SHALL BE RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION AND SEDIMENT CONTROL PRACTICES.
5. AFTER ACHIEVING ADEQUATE STABILIZATION, THE TEMPORARY E&S CONTROLS WILL BE CLEARED UP AND REMOVED.

PERMANENT STABILIZATION

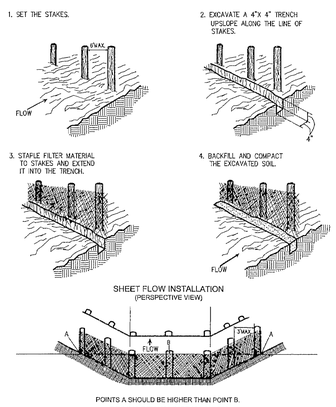
ALL AREAS DISTURBED BY CONSTRUCTION SHALL BE STABILIZED WITH PERMANENT OR TEMPORARY SEEDING IMMEDIATELY FOLLOWING FINISH GRADING.

MAINTENANCE

IN GENERAL, ALL EROSION AND SEDIMENT CONTROL MEASURES WILL BE CHECKED DAILY AND AFTER EACH SIGNIFICANT RAINFALL. THE FOLLOWING ITEMS WILL BE CHECKED IN PARTICULAR:

1. THE INLET PROTECTION WILL BE CHECKED REGULARLY FOR SEDIMENT BUILDUP, WHICH COULD PREVENT POSITIVE DRAINAGE. IF THE INLET PROTECTION IS CLOGGED BY SEDIMENT, IT SHALL BE REMOVED AND CLEANED OR REPLACED.
2. THE SILT FENCE BARRIER WILL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION OF THE FABRIC. SEDIMENT SHALL BE REMOVED WHEN THE LEVEL OF SEDIMENT DEPOSITION REACHES HALF WAY TO THE TOP OF THE BARRIER.
3. THE SEEDED AREAS WILL BE CHECKED REGULARLY TO ENSURE THAT A GOOD STAND IS MAINTAINED. AREAS SHOULD BE FERTILIZED AND RE-SEEDED AS NEEDED.

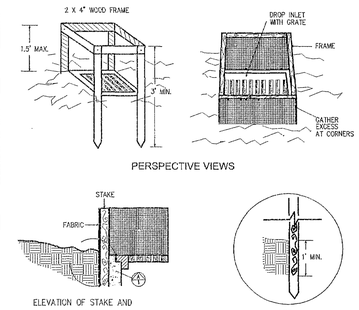
CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



SF

Plate 3.05-2

SILT FENCE DROP INLET PROTECTION



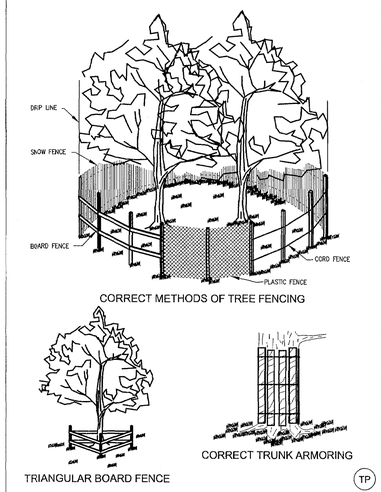
SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVERLAND FLOWS (NOT EXCEEDING 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS, SUCH AS IN STREET OR HIGHWAY MEDIANS.

IP

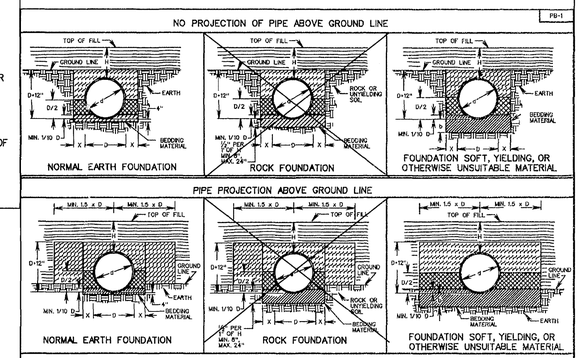
Plate 3.07-1

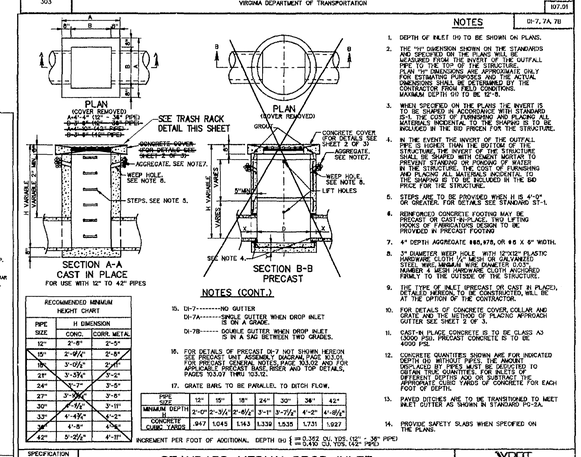
FENCING AND ARMORING



TP

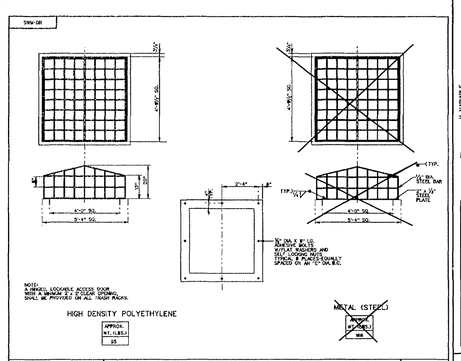
Plate 3.38-2

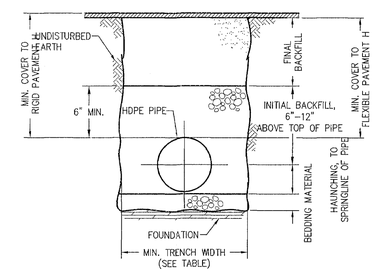




RECOMMENDED MINIMUM HEIGHT CHART		
PIPE SIZE	H DIMENSION CONC.	H DIMENSION CORR. METAL
12"	2'-8"	2'-5"
15"	2'-9½"	2'-9"
18"	3'-0½"	2'-11"
21"	3'-3½"	3'-2"
24"	3'-7"	3'-5"
27"	3'-10½"	3'-8"
30"	4'-1½"	3'-11"
33"	4'-4½"	4'-2"
36"	4'-8"	4'-5"
42"	5'-2½"	4'-10"

PIPE SIZE	12"	15"	18"	24"	30"	36"	42"
MINIMUM DEPTH H	2'-0"	2'-3½"	2'-6½"	3'-1"	3'-7½"	4'-2"	4'-8½"
CONCRETE CUBIC YARDS	.917	1.045	1.143	1.338	1.535	1.731	1.927





NOTES:

1. MATERIALS: UNLESS OTHERWISE SPECIFIED ON THE PLANS OR HEREIN, CORRUGATED POLYETHYLENE PIPE SHALL CONFORM TO AASHTO M-294, M-252, AND F-667, LATEST EDITION, STANDARD SPECIFICATION FOR CORRUGATED POLYETHYLENE PIPE.

   RESINS: CORRUGATED POLYETHYLENE PIPE SHALL BE MANUFACTURED FROM HIGH DENSITY POLYETHYLENE VIRGIN COMPOUNDS, AND SHALL CONFORM TO THE REQUIREMENTS OF ASTM D-3350 FOR THE CELL CLASSIFICATION 335400C.

   COUPLING BANDS: EXCEPT AS OTHERWISE REQUIRED HEREIN, COUPLING BANDS AND OTHER HARDWARE FOR CORRUGATED POLYETHYLENE PIPE SHALL DEMONSTRATE THAT THEY MEET THE SOIL TIGHTNESS REQUIREMENTS OF AASHTO SECTION 26 "STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES."

   COUPLING BANDS SHALL LAP EQUALLY ON EACH OF THE PIPES BEING CONNECTED TO FORM A TIGHTLY CLOSED JOINT AFTER INSTALLATION.
   THE CORRUGATIONS IN THE BAND SHALL INDEX THE CORRUGATIONS IN THE PIPE ENDS TO ENGAGE AT LEAST TWO FULL CORRUGATIONS FROM THE END OF EACH PIPE.
   WHEN INFILTRATION OR EXFILTRATION IS A CONCERN, THE COUPLING BANDS MAY BE REQUIRED TO HAVE GASKETS. THE GASKET MATERIAL SHALL BE CLOSED-CELL EXPANDED RUBBER OR NEOPRENE.
   OTHER COUPLINGS MAY BE BELL & SPIGOT AND CONFORM TO THE REQUIREMENTS OF AASHTO M294.

   DESIGNATION OF TYPE: THE PIPE SHALL BE THE FOLLOWING TYPE:
   TYPE S: THIS PIPE WILL HAVE A FULL CIRCULAR CROSS-SECTION, WITH AN OUTER CORRUGATED PIPE WALL AND A SMOOTH INNER LINER.

2. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL IN ACCORDANCE WITH ASTM D2321, LATEST EDITION. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING GEOTEXTILE MATERIAL.

3. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN ACCORDANCE WITH ASTM D2321, LATEST EDITION. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" FOR 4"-24"; 6" FOR 30"-60".

4. HAUNCHING AND INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.

5. MINIMUM TRENCH WIDTHS SHALL BE AS FOLLOWS:

DIAMETER	MIN. TRENCH WIDTH
4"	21"
6"	23"
8"	26"
10"	28"
12"	30"

DIAMETER	MIN. TRENCH WIDTH
15"	34"
18"	39"
24"	48"
30"	56"
36"	64"

DIAMETER	MIN. TRENCH WIDTH
42"	72"
48"	80"
54"	88"
60"	96"

THE TRENCH WIDTH MUST BE WIDE ENOUGH TO ACCOMMODATE COMPACTION EQUIPMENT.

6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS MEASURED FROM THE TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

	MINIMUM RECOMMENDED COVER	
	SURFACE LIVE LOADING CONDITION	
PIPE DIAM.	H-25	HEAVY CONSTRUCTION (75T AXLE LOAD)*
12"-48"	12"	48"
54"-60"	24"	60"

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

7. CONNECTION TO CONCRETE STRUCTURES: CONNECTIONS SHALL MEET SPECIFICATIONS ASTM C923.

8. PERFORATED HDPE PIPE SHALL HAVE FIVE HOLES, ONE INCH IN DIAMETER EVENLY SPACED AND PLACED WITHIN AN ARC OF 130 DEGREES, THE CENTER HOLE BEING DIRECTLY OPPOSITE THE TOP MARKING. SPACING OF EACH SET OF FIVE HOLES SHALL BE AT 6 INCH INTERVALS ALONG THE TUBE. THE HOLES WILL BE DRILLED AND BE FREE OF ANY DEFECTS. THE PERFORATED PIPE SHALL BE INSTALLED SO THAT THE CENTER HOLE IS IN THE HORIZONTAL PLANE AND INTERFACES WITH THE GRADED GRAVEL.

HDPE PIPE INSTALLATION DETAIL

N.T.S.

Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
3/12/13
PROFESSIONAL ENGINEER

AES CONSULTING ENGINEERS
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Hampton Roads | Central Virginia | Middle Peninsula

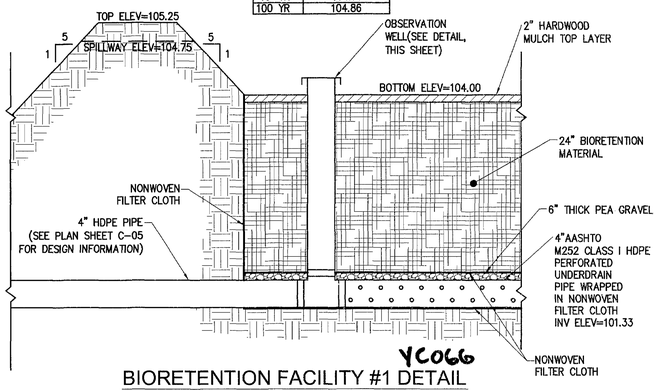
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=2'	Date: 1/11/13

Sheet Title:
EROSION & SEDIMENT CONTROL NOTES & DETAILS

Sheet Number
C-06

STORM EVENT	WATER SURFACE ELEVATION
1-YR	104.47
2-YR	104.55
10-YR	104.71
100 YR	104.86

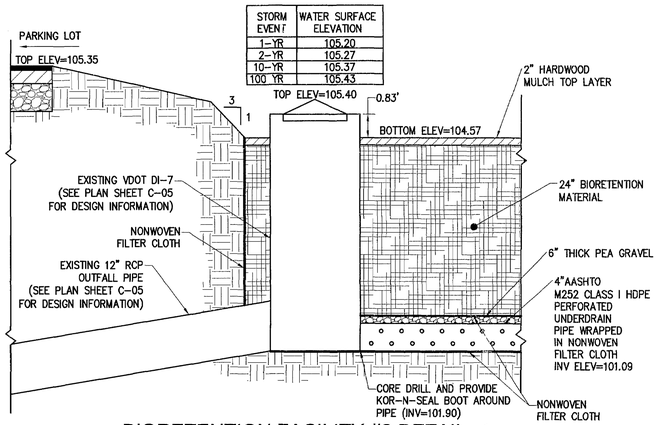


YC066

BIORETENTION FACILITY #1 DETAIL

N.T.S.

STORM EVENT	WATER SURFACE ELEVATION
1-YR	105.20
2-YR	105.27
10-YR	105.37
100 YR	105.43

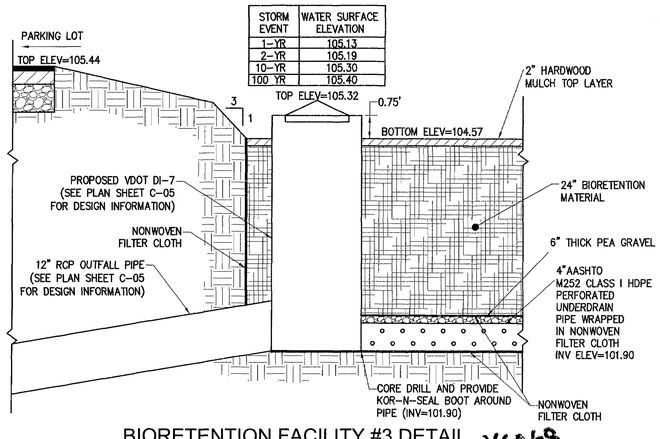


BIORETENTION FACILITY #2 DETAIL

YC067

N.T.S.

STORM EVENT	WATER SURFACE ELEVATION
1-YR	105.13
2-YR	105.19
10-YR	105.30
100 YR	105.40



BIORETENTION FACILITY #3 DETAIL

YC068

N.T.S.

BIORETENTION FACILITY MAINTENANCE PROGRAM & SCHEDULE

INSPECT AND REPAIR EROSION	MONTHLY
REMULCH ANY VOID AREAS	WHENEVER NEEDED
REMOVE PREVIOUS MULCH AND REAPPLY	EVERY 3 YEARS
REMOVAL AND REPLACEMENT OF ALL DISEASED VEGETATION CONSIDERED BEYOND TREATMENT	WHENEVER NEEDED
CHECK FOR ACCUMULATED SEDIMENTS	MONTHLY
INSPECT AND REMOVE ANY DEBRIS THAT MAY COLLECT AT THE DROP INLET AND WITHIN FACILITY	AFTER MAJOR STORM EVENTS/OR SEMI ANNUALLY
ADD FRESH LAYER OF MULCH	EVERY 6 MONTHS (SPRING & FALL)

SOIL SPECIFICATIONS

THE BIORETENTION AREAS SHALL CONTAIN A PLANTING SOIL MIXTURE OF 50% SAND, 30% LEAF COMPOST (FULLY COMPOSTED, NOT PARTIALLY ROTTED LEAVES), AND 20% TOPSOIL. TOPSOIL SHALL BE SANDY LOAM OR LOAMY SAND OF UNIFORM COMPOSITION, CONTAINING NO MORE THAN 5% CLAY, FREE OF STONES, STUMPS, ROOTS, OR SIMILAR OBJECTS GREATER THAN ONE INCH, BRUSH, OR ANY OTHER MATERIAL OR SUBSTANCE WHICH MAY BE HARMFUL TO PLANT GROWTH, OR A HINDRANCE TO PLANT GROWTH OR MAINTENANCE. THE TOPSOIL SHALL BE FREE OF PLANTS OR PLANT PARTS OF BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, MUGWORT, NUTSEDGE, POISON IVY, CANADIAN THISTLE, CATTAIL, OR OTHERS AS SPECIFIED. IT SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH.

THE TOP SOIL SHALL BE TESTED AND MEET THE MINIMUM CRITERIA SET FORTH IN SECTION 3.11-28 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK (LATEST EDITION).

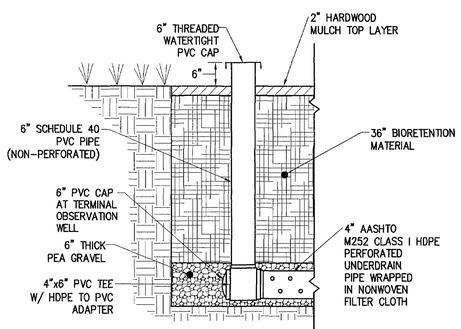
MULCH

A SURFACE LAYER OF SHREDDED HARDWOOD BARK SHALL BE PROVIDED ON TOP OF THE PLANTING SOIL. MULCH SHALL BE FREE OF WEED SEEDS, SOIL, ROOTS, OR ANY OTHER SUBSTANCE NOT CONSISTING OF EITHER BOLE OR BRANCH WOOD AND BARK. THE SHREDDED HARDWOOD BARK MULCH SHALL BE UNIFORMLY APPLIED.

STRAW MULCH SHALL NOT BE UTILIZED IN STABILIZATION OF BIORETENTION OR DRY SWALE AREA.

NOTES

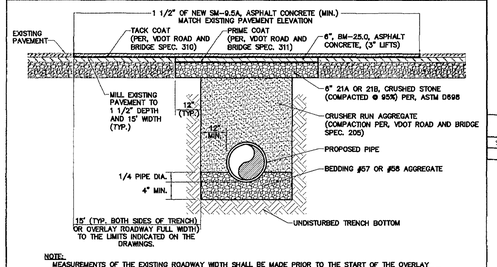
1. WATER PLANT MATERIAL EACH DAY FOR FOURTEEN CONSECUTIVE DAYS AFTER CONSTRUCTION.
2. CONTRACTOR SHALL REFER TO COUNTY BMP MANUAL (GROUP D, PGS. 48-50) AND MINIMUM STANDARD 3.11 AND 3.13 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK FOR METHODS/MATERIAL ASSOCIATED WITH CONSTRUCTION OF THE BIORETENTION CELLS.
3. VDOT SHALL BE SAVED HARMLESS FROM THE MAINTENANCE RESPONSIBILITY OR LIABILITY ASSOCIATED WITH ANY FAILURE OF THE STORM WATER MANAGEMENT FACILITY AND ITS STRUCTURES.
4. A PROFESSIONAL ENGINEER WHO HAS INSPECTED THE BASIN DURING CONSTRUCTION SHALL CERTIFY THE CONSTRUCTION OF THE BIORETENTION BASIN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE BIORETENTION BASIN CONSTRUCTION SCHEDULE WITH THE ENGINEER TO ENSURE ON SITE MONITORING.
5. 6" PERFORATED PIPE SHALL BE RIGID SMOOTH WALL PE IN ACCORDANCE WITH ASTMF810 OR 6" SCH40 PVC OR EQUIVALENT APPROVED BY JAMES CITY COUNTY ENVIRONMENTAL DIVISION.
6. CORE DRILL AND PROVIDE NEOPRENE SEAL (KOR-N-SEAL) OR EQUAL WHERE PLASTIC PIPE CONNECTS TO STORM STRUCTURE.



BIORETENTION BASIN OBSERVATION WELL DETAIL

N.T.S.

NOTE:
CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS AND CONSTRUCTION CERTIFICATION IN ACCORDANCE WITH JAMES CITY COUNTY GUIDELINES FOR THE PROPOSED BIORETENTION FACILITIES.



NOTE:
MEASUREMENTS OF THE EXISTING ROADWAY WIDTH SHALL BE MADE PRIOR TO THE START OF THE OVERLAY PLACEMENT. THESE MEASUREMENTS SHALL BE THE BASIS FOR PAVEMENT QUANTITY CALCULATIONS. ALL THE BACKFILLING AND COMPACTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS OUTLINED IN VDOT's ROAD AND BRIDGE SPECIFICATIONS (CURRENT EDITION). THE PERMITTEE WILL BE HELD RESPONSIBLE FOR ANY SETTLING OF BACKFILL OR PAVEMENT FOR A PERIOD OF 3 YEARS AFTER COMPLETION OF THE WORK. IF THE TRENCH WIDTH IS GREATER THAN 4' WIDE OR OPEN CUT GREATER THAN 16 SQUARE FEET, THE PERMITTEE SHALL THEN RESURFACE THE ROADWAY WITH LIKE MATERIAL THAT IS EXISTING, FOR A DISTANCE OF 15' ON EITHER SIDE OF THE DISTURBED AREA FROM THE EDGE OF PAVEMENT TO THE EDGE OF PAVEMENT. THIS APPLIES TO UTILITY INSTALLATION, EXCLUDING STORM SEWER PIPING.

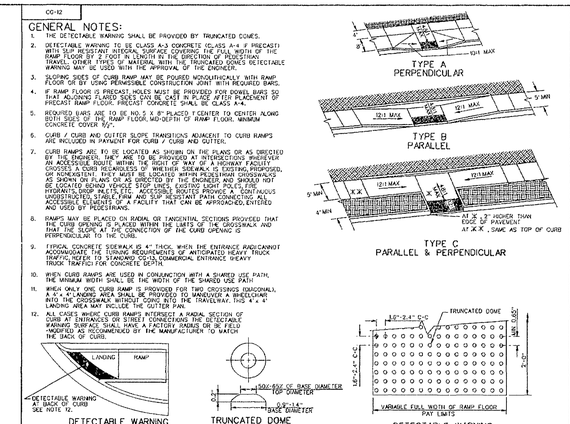
PAVEMENT PATCH

N.T.S.

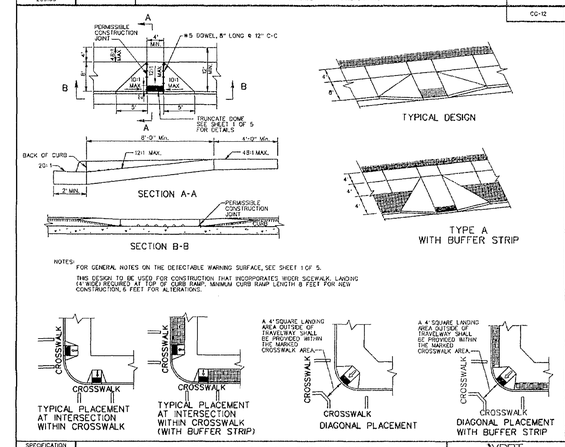
CG-12

GENERAL NOTES:

1. THE DETECTABLE WARNING SHALL BE PROVIDED BY TRUNCATED DOMES.
2. DETECTABLE WARNING TO BE CLASS A-3 CONCRETE (CLASS A-4 IF PRECAST) WITH SUFFICIENT INTEGRAL SURFACE CONTRAST TO COVER THE FULL WIDTH OF THE RAMP FLOOR BY 2' FOOT IN LENGTH IN THE DIRECTION OF PEDESTRIAN TRAVEL. OTHER TYPES OF MATERIAL WITH THE TRUNCATED DOMES DETECTABLE WARNING MAY BE USED WITH THE APPROVAL OF THE ENGINEER.
3. SLOPED SIDES OF CURB RAMP MAY BE POURED MONOLITHICALLY WITH RAMP FLOOR OR BY USING PERMISSIBLE CONSTRUCTION JOINT WITH REQUIRED BARS.
4. IF RAMP FLOOR IS PRECAST, HOLES MUST BE PROVIDED FOR DOWEL BARS SO THAT ADJOINING FLARED SIDES CAN BE CAST IN PLACE AFTER PLACEMENT OF PRECAST RAMP FLOOR. PRECAST CONCRETE SHALL BE CLASS A-4.
5. REQUIRED BARS ARE TO BE NO. 5 X 8' PLACED T-CENTER TO CENTER ALONG BOTH SIDES OF THE RAMP FLOOR, MID-DEPTH OF RAMP FLOOR. MINIMUM CONCRETE COVER 6½".
6. CURB / CURB AND GUTTER SLOPE TRANSITIONS ADJACENT TO CURB RAMPS ARE INCLUDED IN PAYMENT FOR CURB / CURB AND GUTTER.
7. CURB RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS OR AS DIRECTED BY THE ENGINEER. THEY ARE TO BE PROVIDED AT INTERSECTIONS WHERE EVER THE ADA REQUIRES A CURB RAMP IS PRESENT. THE ENGINEER MAY ALSO DIRECT CROSSWALKS WITH MEANDERS OF WHITLOCK SIDEWALK, SIDEWALKS PROPOSED, OR NONEXISTENT. THEY MUST BE LOCATED WITHIN PEDESTRIAN CROSSWALKS AS SHOWN ON PLANS OR AS DIRECTED BY THE ENGINEER AND SHOULD NOT BE LOCATED BEHIND VEHICLE STOP LINES. EXISTING SIGNS, POLES, FIRE HYDRANTS, UTILITY POLES, ETC. SHOULD BE LOCATED OUTSIDE OF CONTINUOUS UNOBSTRUCTED, STABLE RAMP AND SIDEWALK PATH CONNECTING ALL ACCESSIBLE ELEMENTS OF A FACILITY THAT CAN BE APPROACHED, ENTERED AND USED BY PEDESTRIANS.
8. RAMPS MAY BE PLACED ON RADIAL OR TANGENTIAL SECTIONS PROVIDED THAT THE CURB OPENING IS PLACED WITHIN THE LIMITS OF THE CROSSWALK AND THAT THE SLOPE AT THE CONNECTION OF THE CURB OPENING IS PERPENDICULAR TO THE CURB.
9. TYPICAL CONCRETE SIDEWALK IS 4" THICK. WHEN THE ENTRANCE RADII CANNOT ACCOMMODATE THE TURNING REQUIREMENTS OF ANTICIPATED HEAVY TRUCK TRAFFIC, REFER TO STANDARD CG-13, COMMERCIAL ENTRANCE (HEAVY TRUCK TRAFFIC) FOR CONCRETE DEPTH.
10. WHEN CURB RAMPS ARE USED IN CONJUNCTION WITH A SHARED USE PATH, THE MINIMUM WIDTH SHALL BE THE WIDTH OF THE SHARED USE PATH.
11. WHEN ONLY ONE CURB RAMP IS PROVIDED FOR TWO CROSSWALKS, A 4' x 4' LANDING AREA SHALL BE PROVIDED TO MANEUVER PEDESTRIANS INTO THE CROSSWALK WITHOUT GOING INTO THE TRAVELWAY. THE 4' x 4' LANDING AREA MAY INCLUDE THE GUTTER PAN.
12. ALL CASES WHERE CURB RAMPS INTERSECT A RADIUS, SECTION OF CURB AT ENTRANCES OR STREET CONNECTIONS THE DETECTABLE WARNING SURFACE SHALL HAVE A FACTORY ORDER OR BE FIELD FABRICATED AS RECOMMENDED BY THE MANUFACTURER TO MATCH THE BACK OF CURB.



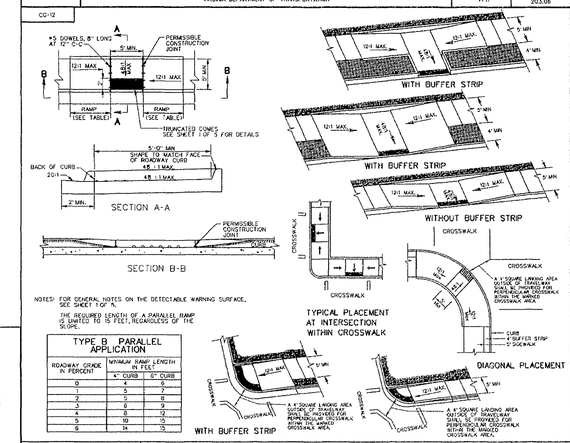
VDOT ROAD AND BRIDGE STANDARDS	CG-12 DETECTABLE WARNING SURFACE (GENERAL NOTES) VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE 105 502
SHEET 1 OF 5 / REVISION DATE 7/11 / 203.05		CG-12



NOTES: FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.

THIS DESIGN TO BE USED FOR CONSTRUCTION THAT INCORPORATES WIDER SIDEWALK, LANDING OR WIDER REQUIRED AT TOP OF CURB RAMP. MINIMUM CURB RAMP LENGTH 8 FEET FOR NEW CONSTRUCTION, 6 FEET FOR ALTERATIONS.

SPECIFICATION REFERENCE	CG-12 DETECTABLE WARNING SURFACE TYPE A (PERPENDICULAR) APPLICATION VIRGINIA DEPARTMENT OF TRANSPORTATION	VDOT ROAD AND BRIDGE STANDARDS
105 502		SHEET 2 OF 5 / REVISION DATE 7/11 / 203.06
CG-12		

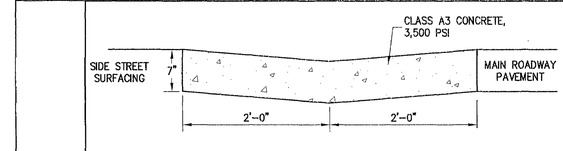


NOTES: FOR GENERAL NOTES ON THE DETECTABLE WARNING SURFACE, SEE SHEET 1 OF 5.

THE REQUIRED LENGTH OF A PARALLEL RAMP IS LIMITED TO 15 FEET, REGARDLESS OF THE SLOPE.

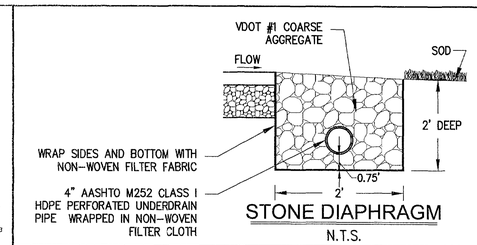
TYPE B PARALLEL APPLICATION		
ROADWAY GRADE IN PERCENT	MINIMUM RAMP LENGTH IN FEET	
	4" CURB	6" CURB
0	4	5
1	5	7
2	6	8
3	8	9
4	8	12
5	10	15
6	14	15

VDOT ROAD AND BRIDGE STANDARDS	CG-12 DETECTABLE WARNING SURFACE TYPE B (PARALLEL) APPLICATION VIRGINIA DEPARTMENT OF TRANSPORTATION	SPECIFICATION REFERENCE
SHEET 3 OF 5 / REVISION DATE 7/11 / 203.07		105 502



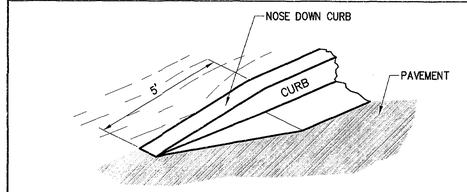
CONCRETE GUTTER

NOT TO SCALE



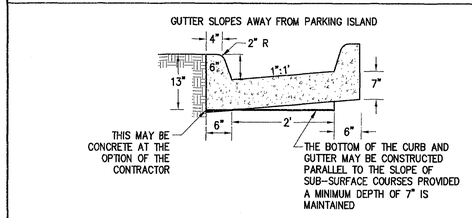
STONE DIAPHRAGM

N.T.S.



5FT NOSE DOWN CURB DETAIL

N.T.S.

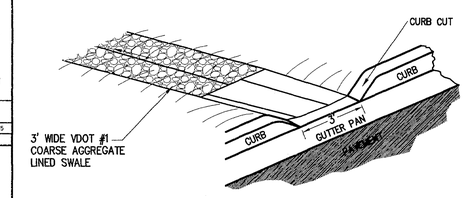


THIS ITEM MAY BE PRECAST OR CAST IN PLACE

CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 3,500 PSI IF PRECAST

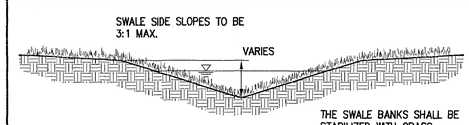
ISLAND CUT THROUGH

N.T.S.



CURB CUT TO SWALE

N.T.S.



TYP. SWALE DETAIL

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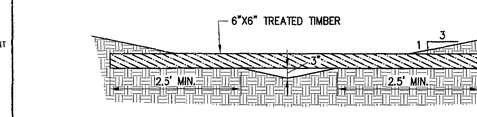
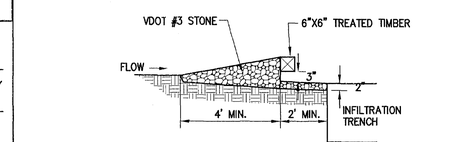


SECTION B-B



SECTION A-A

PERMANENT CHECK DAM DETAIL

N.T.S.

2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC
Rev.	Date	Description	Revised By

COMMONWEALTH OF VIRGINIA — GRAHAM V. CORSON — Lic. No. 047297 — 3/12/13 — PROFESSIONAL ENGINEER

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DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT | JAMES CITY COUNTY | VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=30'	Date: 1/11/13

Sheet Title:
STORMWATER MANAGEMENT NOTES & DETAILS

Sheet Number
C-07

VIRGINIA DEPARTMENT OF TRANSPORTATION STANDARD NOTES
HAMPTON ROADS DISTRICT
OCTOBER 2011

1.0 GENERAL INFORMATION

1.1 ~~THESE PLANS WERE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF (SELECT ONE):~~
~~VDOT SUBDIVISION STREET REQUIREMENTS (SSR)~~
~~VDOT SUBDIVISION STREET ACCEPTANCE REQUIREMENTS (SSAR)~~
N/A

1.2 ~~VDOT APPROVED EXCEPTIONS (SELECT ONE):~~
~~ACCESS MANAGEMENT DATE OF APPROVAL _____~~
~~SSAR: DATE OF APPROVAL _____~~
~~OTHER: DATE OF APPROVAL _____~~
N/A

1.3 ~~TRIP GENERATION DATA:~~
~~USE: NO PROPOSED DEVELOPMENT~~
~~ITE CODE: _____~~
~~TOTAL DAILY TRIPS: _____ VPD~~
~~AM PEAK HOUR TRIPS: _____ VPH~~
~~PM PEAK HOUR TRIPS: _____ VPH~~

1.4 A LAND USE PERMIT MUST BE OBTAINED FROM VDOT BEFORE ANY CONSTRUCTION IS STARTED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS. CONTACT THE VDOT DISTRICT OFFICE AT (757) 925-2500 FOR THE PERMIT FEE AND BOND AMOUNT. ALL LAND USE PERMIT APPLICATIONS MUST HAVE ONE (1) SET OF APPROVED PLANS, A COPY OF THE PLAN APPROVAL LETTER, A CHECK FOR THE PROCESSING FEE MADE PAYABLE TO TREASURER OF VIRGINIA, AND SURETY OR BOND IN THE REQUIRED AMOUNT.

1.5 THE VDOT DISTRICT OFFICE IS TO RECEIVE WRITTEN NOTIFICATION 48 HOURS PRIOR TO THE START OF ANY WORK WITHIN STATE MAINTAINED RIGHT OF WAY. A PRE-CONSTRUCTION MEETING SHOULD BE HELD AT LEAST ONE WEEK PRIOR TO ANY LAND DISTURBANCE OR WHEN CONSTRUCTION ACTIVITIES WILL AFFECT TRAFFIC OPERATIONS OF ANY ARTERIAL CORRIDOR.

1.6 ALL CONSTRUCTION METHODS AND MATERIALS WITHIN STATE MAINTAINED RIGHT OF WAY SHALL COMPLY WITH THE CURRENT STANDARDS AND SPECIFICATIONS OF THE VIRGINIA DEPARTMENT OF TRANSPORTATION.

1.7 THE CONTRACTOR SHALL HAVE AVAILABLE A COPY OF THE LAND USE PERMIT(S), FINAL APPROVED PLANS, ANY APPROVED REVISIONS, AND A COPY OF THE APPROVAL LETTER ON SITE.

1.8 ANY ERRORS, CONFLICTS, OR DISCREPANCIES FOUND ON THE APPROVED PLANS SHALL BE REPORTED TO THE DEVELOPER'S ENGINEER. THE VDOT DISTRICT OFFICE SHOULD BE NOTIFIED FOR RESOLUTION BEFORE PROCEEDING FURTHER WITH THE WORK IF THE STATE MAINTAINED RIGHT OF WAY IS AFFECTED.

1.9 THE DEVELOPER IS RESPONSIBLE FOR ANY DAMAGE TO EXISTING ROADS, UTILITIES, AND ANY OTHER INSTALLATIONS ALREADY IN PLACE WHICH OCCUR AS A RESULT OF PROJECT CONSTRUCTION WITHIN OR CONTIGUOUS TO STATE RIGHT OF WAY LIMITS.

1.10 THE COMMONWEALTH TRANSPORTATION BOARD MEMBERS OF THE BOARD, THE COMMONWEALTH AND ALL COMMONWEALTH EMPLOYEES, AGENTS, AND OFFICES, SHALL BE ABSOLVED FROM ALL RESPONSIBILITIES, DAMAGES AND LIABILITIES AS A RESULT OF WORK ARISING FROM THE EXERCISE OF THE PRIVILEGES GRANTED BY PLAN AND/OR PERMIT APPROVAL.

2.0 DRAINAGE & EROSION CONTROL

2.1 VDOT SHALL NOT BE RESPONSIBLE FOR THE MAINTENANCE OF ANY STORMWATER MANAGEMENT FACILITY OR OUTFALL STRUCTURE LOCATED OUTSIDE OF STATE MAINTAINED RIGHT OF WAY LIMITS AND SHALL BE ABSOLVED FROM ALL RESPONSIBILITIES, DAMAGES AND LIABILITIES AS A RESULT OF SUCH.

2.2 ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR IN ACCORDANCE WITH THE VIRGINIA EROSION & SEDIMENT CONTROL HANDBOOK AND VIRGINIA STORMWATER MANAGEMENT PROGRAM. AN INDIVIDUAL CERTIFIED BY THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION, HOLDING A RESPONSIBLE LAND DISTURBER CERTIFICATION, IS TO BE IN CHARGE OF THE LAND DISTURBING ACTIVITY AND ON THE WORK SITE AT ALL TIMES.

2.3 TEMPORARY DRAINAGE MEASURES SHALL BE INSTALLED DURING CONSTRUCTION TO PREVENT PONDING AND DIVERT SEDIMENT LADEN WATER.

2.4 ALL NECESSARY PRECAUTIONS SHALL BE TAKEN TO ENSURE AGAINST SILTATION OF ADJACENT PROPERTIES, DITCHES, STREAMS, ETC. ADDITIONAL DITCH LININGS OR SILTATION AND EROSION CONTROL MEASURES SHALL BE PROVIDED AS DETERMINED NECESSARY BY VDOT AND/OR THE COUNTY/TOWN DURING FIELD REVIEW. ALL COSTS SHALL BE ASSUMED BY THE DEVELOPER.

2.5 ALL DISTURBED AREAS SHALL BE STABILIZED IMMEDIATELY UPON THE END OF EACH DAY'S WORK AND RESEEDED IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS.

3.0 MATERIALS

3.1 WHEN UNSUITABLE MATERIALS ARE ENCOUNTERED DURING CONSTRUCTION SUCH MATERIALS SHALL BE UNDERCUT AND BACKFILLED WITH VDOT TYPE II SELECT MATERIAL MINIMUM CBR 20 ACCORDING TO VDOT SPECIFICATIONS.

3.2 PAVEMENT DESIGN SHALL BE PROVIDED IN ACCORDANCE WITH THE PAVEMENT DESIGN GUIDE FOR SUBDIVISION AND SECONDARY ROADS IN VIRGINIA. FOR PRIMARY ROADS AND INTERSTATE HIGHWAYS WHERE TRUCK TRAFFIC EXCEEDS 5%, PAVEMENT DESIGN SHALL BE PROVIDED IN ACCORDANCE WITH AASHTO GUIDELINES. TYPICAL PAVEMENT SECTIONS SHALL DEPICT THE TOP 6" OF THE SUBGRADE IMMEDIATELY UNDER THE PAVEMENT STRUCTURE COMPACTED TO 100% OF THE THEORETICAL MAXIMUM DRY DENSITY.

3.3 ASPHALT PAVEMENT WIDENING SHALL CONFORM TO VDOT STANDARD WP-2.

3.4 INSTALLATION OF PIPE CULVERTS AND STORM SEWERS SHALL CONFORM TO VDOT STANDARD PB-1.

3.5 THE DEPARTMENT USUALLY PROHIBITS THE OPEN-CUTTING OF HARD-SURFACED ROADS EXCEPT IN EXTENUATING CIRCUMSTANCES. THEREFORE, ALL UNDERGROUND UTILITIES WITHIN STATE MAINTAINED RIGHT OF WAY, AS DETERMINED NECESSARY BY GOOD ENGINEERING PRACTICE TO SERVE THE COMPLETE DEVELOPMENT OF ADJACENT PROPERTIES, SHALL BE INSTALLED DURING THE STREETS INITIAL CONSTRUCTION AND PRIOR TO THE APPLICATION OF ITS FINAL PAVEMENT SURFACE COURSE. THIS SHALL INCLUDE EXTENSIONS OF ALL NECESSARY CROSS-STREET CONNECTIONS OR SERVICE LINES TO AN APPROPRIATE LOCATION BEYOND THE PAVEMENT AND PREFERABLY THE RIGHT OF WAY LINE. IN THE EVENT IT IS NECESSARY TO OPEN THE STREET PAVEMENT TO WORK ON UTILITIES AFTER THE SURFACE HAS BEEN PLACED, ADDITIONAL COMPACTION TESTS AND PAVING AS NECESSARY TO RESTORE THE INTEGRITY AND APPEARANCE OF THE ROADWAY MAY BE REQUIRED.

4.0 RIGHT OF WAY & UTILITIES

4.1 ALL FIXED OBJECTS SUCH AS UTILITY CABINETS, PEDESTALS, AND STREETLIGHTS SHALL BE LOCATED IN ACCORDANCE WITH CLEAR ZONE REQUIREMENTS, AS NOTED IN THE ROAD DESIGN MANUAL OR AASHTO ROADSIDE DESIGN GUIDE. THERE SHALL NOT BE ANY CABINETS, PEDESTALS, OR FIRE HYDRANTS LOCATED ON THE SHOULDER.

4.2 FLOWERS, SHRUBS, AND TREES SHALL NOT BE PLACED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS WITHOUT AN APPROVED SET OF PLANS AND AN APPROVED PLANTING AGREEMENT. NO IRRIGATION (SPRINKLER) SYSTEMS, BRICK COLUMNS, ENDWALLS, AND/OR BRICK MAILBOXES WILL BE CONSTRUCTED OR INSTALLED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS WITHOUT A PERMIT. ANY OF THE ABOVE ITEMS FOUND IN THE RIGHT OF WAY WITHOUT A PERMIT WILL BE REMOVED, AND ALL COSTS OF THE REMOVAL WILL BE BORNE BY THE OWNER AND/OR DEVELOPER.

4.3 THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND AND OVERHEAD UTILITIES, WHETHER OR NOT THEY ARE SHOWN ON THE PLANS, PRIOR TO CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR REPAIRS AT HIS OWN EXPENSE OF ANY UTILITIES DAMAGED BY HIS CONSTRUCTION METHODS. MISS UTILITY MUST BE CONTACTED AT 811 AT LEAST 72 HOURS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

4.4 AUTHORIZED UNDERGROUND UTILITY INSTALLATIONS SHALL MAINTAIN A MINIMUM OF 36 INCHES OF COVER.

4.5 OVERHEAD UTILITY INSTALLATIONS WITHIN LIMITED ACCESS AND NON LIMITED ACCESS RIGHT OF WAY SHALL BE INSTALLED IN ACCORDANCE WITH VDOT LAND USE PERMIT REGULATIONS.

4.6 ALL ~~ROADWAY LIGHTING SHALL BE DESIGNED IN ACCORDANCE WITH IESNA LIGHTING CRITERIA AND INSTALLED IN ACCORDANCE WITH VDOT ROAD AND BRIDGE SPECIFICATIONS. ALL ROADWAY LIGHTING SHALL ADHERE TO THE VIRGINIA LIGHTING LAW.~~

5.0 TRAFFIC

5.1 CONTACT TRAFFIC ENGINEERING OPERATIONS AT (757) 925-1659 OR (757) 925-1653 A MINIMUM OF 48 HOURS IN ADVANCE WHENEVER EXCAVATION IS WITHIN 500 FEET OF A TRAFFIC SIGNAL, SO THE LINES CAN BE MARKED. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

5.2 CONTACT ROADWAY LIGHTING OPERATIONS AT (757) 484-9015 OR (757) 484-8940 A MINIMUM OF 48 HOURS IN ADVANCE WHENEVER PLANNED CONSTRUCTION ACTIVITIES ARE LOCATED WITHIN LIMITED ACCESS HIGHWAYS. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

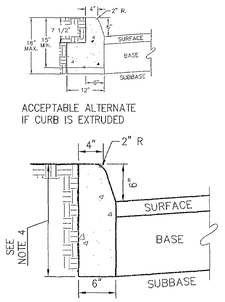
5.3 CONTACT TRAFFIC OPERATIONS CENTER MAINTENANCE MANAGER AT (757) 424-9903 A MINIMUM OF 48 HOURS IN ADVANCE OF ALL CONSTRUCTION ACTIVITIES LOCATED WITHIN LIMITED ACCESS HIGHWAYS. FAILURE TO DO SO COULD BE A COSTLY REPAIR FOR THE DEVELOPER.

5.4 SIGHT DISTANCES AT ENTRANCES AND INTERSECTIONS SHALL BE MAINTAINED AT ALL TIMES DURING AND AFTER CONSTRUCTION. ANY OBJECT OR LANDSCAPING THAT OBSTRUCTS DRIVER VIEW SHALL BE RELOCATED AT THE DEVELOPER'S EXPENSE OR THE ENTRANCE MAY BE CLOSED AT VDOT'S DISCRETION.

5.5 DURING CONSTRUCTION, THE MAINTENANCE OF TRAFFIC SHALL CONFORM TO THE REQUIREMENTS IN THE MOST RECENT VERSION OF THE VIRGINIA WORK AREA PROTECTION MANUAL AND THE MUTCD.

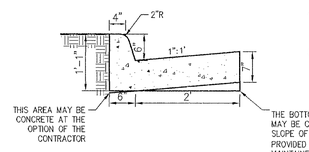
6.0 ENVIRONMENTAL

6.1 THE PERMITTEE IS RESPONSIBLE FOR PURSUING AND OBTAINING ANY AND ALL ENVIRONMENTAL CLEARANCES AND/OR PERMITS, INCLUDING, BUT NOT LIMITED TO, WATER QUALITY, THREATENED AND ENDANGERED SPECIES, HAZARDOUS MATERIALS, AND CULTURAL RESOURCES, REQUIRED TO PURSUE THE PROPOSED ACTIVITY BEFORE ANY CONSTRUCTION IS STARTED WITHIN STATE MAINTAINED RIGHT OF WAY LIMITS. DOCUMENTS RELATED TO THESE ACTIVITIES SHALL BE SUBMITTED WITH THE LAND USE PERMIT APPLICATION.



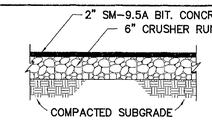
NOTES:
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 3500 PSI IF PRECAST.
3. CURB HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) WILL BE PAID FOR AS RADIAL CURB.
4. THE DEPTH OF CURB MAY BE REDUCED AS MUCH AS 3" (15" DEPTH) OR INCREASED AS MUCH AS 3" (21" DEPTH) IN ORDER THAT THE BOTTOM OF THE CURB WILL COINCIDE WITH THE TOP OF A COURSE OF THE PAVEMENT SUBSTRUCTURE. OTHERWISE, THE DEPTH IS TO BE 18" AS SHOWN. NO ADJUSTMENT IN THE PRICE BID IS TO BE MADE FOR A DECREASE OR AN INCREASE IN DEPTH.
5. CG-2 IS TO BE USED ON ROADWAYS MEETING THE REQUIREMENTS FOR CG-6 AS SHOWN IN APPENDIX A OF THE VDOT ROAD DESIGN MANUAL.

STANDARD 6" CURB
N.T.S.

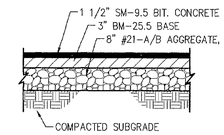


NOTES:
1. THIS ITEM MAY BE PRECAST OR CAST IN PLACE.
2. CONCRETE TO BE CLASS A3 IF CAST IN PLACE, 3500 PSI IF PRECAST.
3. COMBINATION CURB AND GUTTER HAVING A RADIUS OF 300' OR LESS (ALONG FACE OF CURB) SHALL BE PAID FOR AS A RADIAL COMBINATION CURB AND GUTTER.
4. FOR USE WITH STABILIZED OPEN-GRADED DRAINAGE LAYER, THE BOTTOM OF THE CURB AND GUTTER SHALL BE CONSTRUCTED PARALLEL TO THE SLOPE OF THE PAVEMENT.
5. ALLOWABLE CRITERIA FOR THE USE OF CG-6 IS BASED ON ROADWAY CLASSIFICATION AND DESIGN SPEED AS SHOWN IN APPENDIX A OF THE VDOT ROAD DESIGN MANUAL.

COMBINATION CURB AND GUTTER
N.T.S.

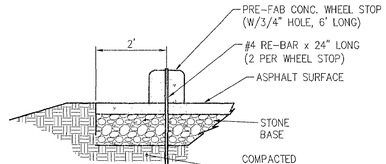


TYPICAL PAVEMENT SECTION
N.T.S.

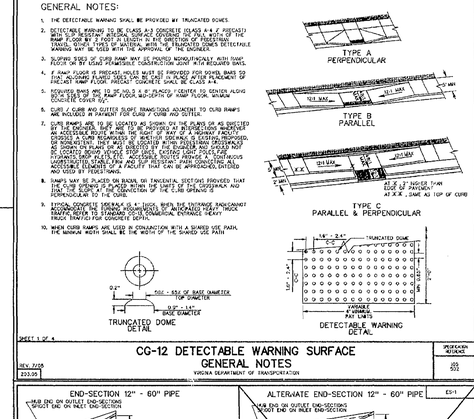


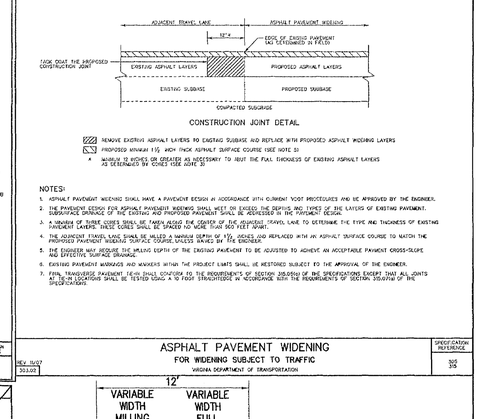
ENTRANCE ROAD & TURN LANE SECTION
N.T.S.

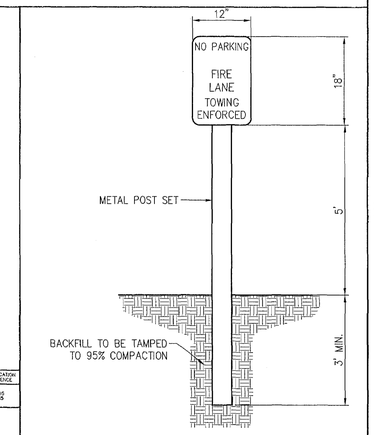
Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC



CONC. WHEEL STOP DETAIL
N.T.S.

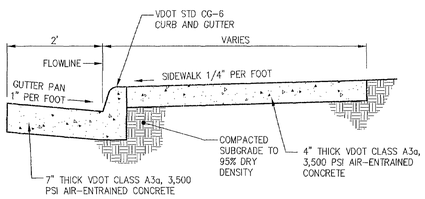






NOTE:
1. THE SIGN SHALL BE FABRICATED IN ACCORDANCE WITH SECTION 701 AND INSTALLED PER INSTALLATION DETAIL WSP-1 TYPE A OF THE VDOT ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS.
2. SIGN COLORS: RED LETTERS AND BORDER ON A REFLECTING WHITE BACKGROUND.
3. LETTERS: TWO (2) INCH "C" SERIES.
4. THIS DRAWING IS FOR GUIDANCE ONLY. FOR MORE ACCURATE DETAILS RELATED TO SIGN FABRICATION SPECIFICATIONS REFER TO THE VIRGINIA MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.

FIRE LANE SIGN DETAIL
N.T.S.



COMBINATION CG-6 CURB AND SIDEWALK
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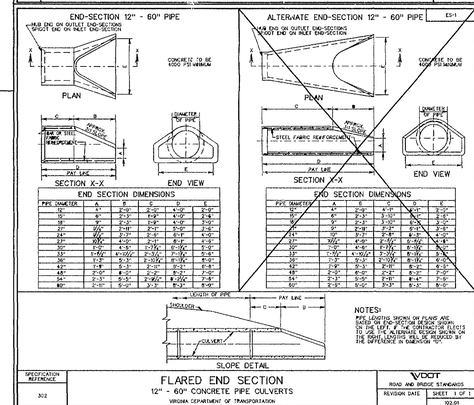

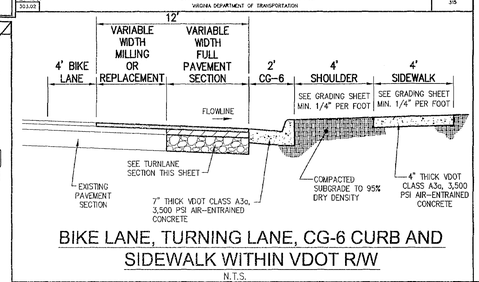

BIKE LANE, TURNING LANE, CG-6 CURB AND SIDEWALK WITHIN VDOT R/W
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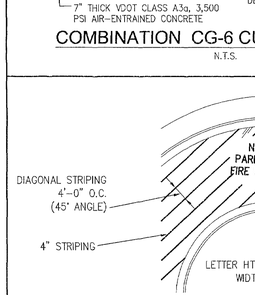
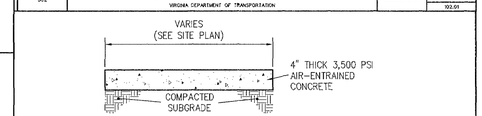


NOTES:
1. ALL PAVEMENT STRIPING/LETTERING TO BE TRAFFIC YELLOW
2. ALL REQUIRED SIGNAGE TO MEET FIRE DEPT. SPECIFICATIONS
3. THIS DRAWING IS FOR INFORMATION ONLY AND MAY NOT REFLECT ALL REQUIREMENTS.

FIRE LANE PAINT STRIPING
N.T.S.



TYPICAL SIDEWALK SECTION
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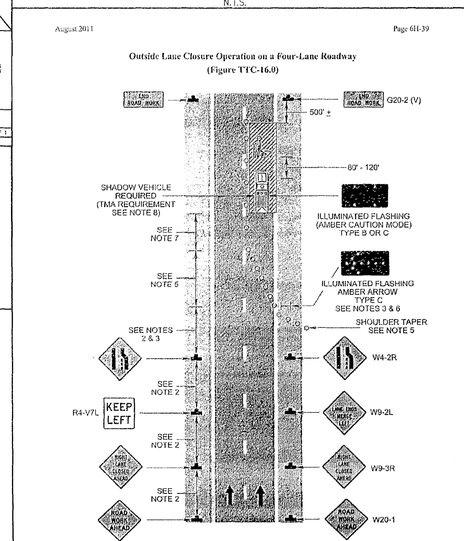
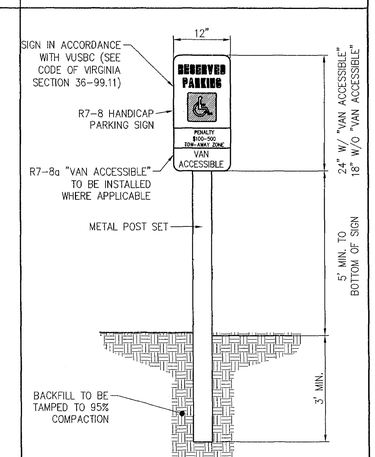
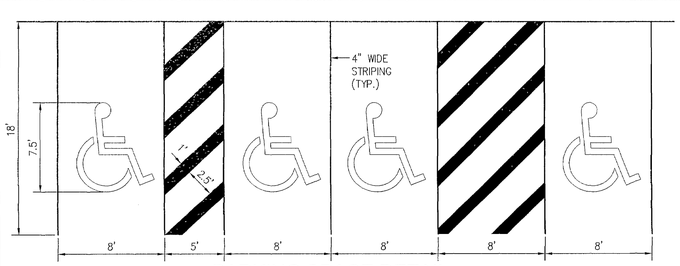




NOTES:
1. THE SIGN SHALL BE FABRICATED IN ACCORDANCE WITH SECTION 701 THE VIRGINIA DEPARTMENT OF ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS.

HANDICAP SIGN DETAIL
N.T.S.



PARKING SPACE DETAIL
N.T.S.

5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 220-8980
Fax: (757) 220-8994
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AES CONSULTING ENGINEERS
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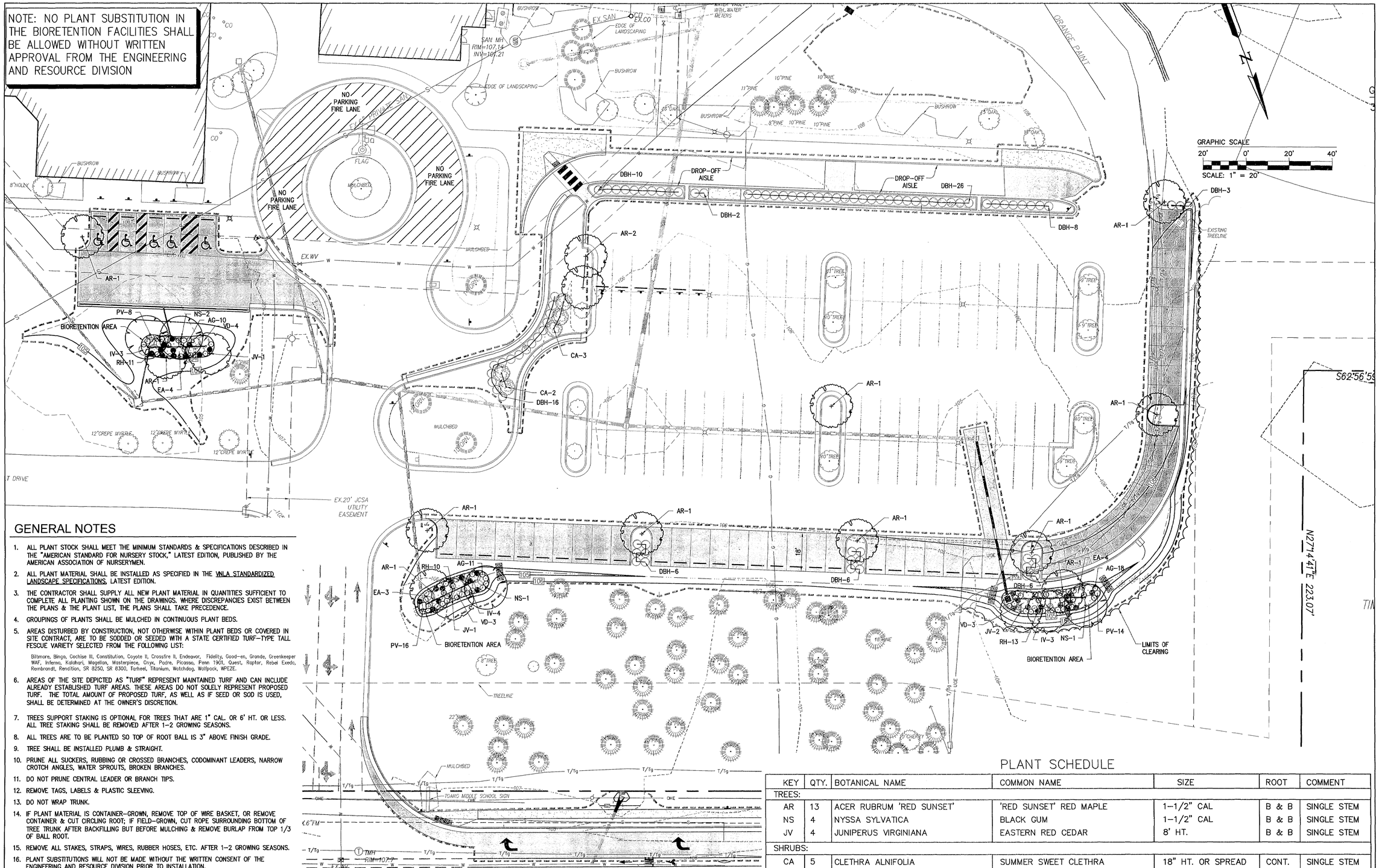
COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
3/12/13
PROFESSIONAL ENGINEER

DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT | JAMES CITY COUNTY | VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: AS- SHOWN	Date: 1/11/13
Sheet Title: VDOT NOTES & DETAILS	

Sheet Number
C-08

NOTE: NO PLANT SUBSTITUTION IN THE BIORETENTION FACILITIES SHALL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE ENGINEERING AND RESOURCE DIVISION



GENERAL NOTES

1. ALL PLANT STOCK SHALL MEET THE MINIMUM STANDARDS & SPECIFICATIONS DESCRIBED IN THE "AMERICAN STANDARD FOR NURSERY STOCK," LATEST EDITION, PUBLISHED BY THE AMERICAN ASSOCIATION OF NURSERYMEN.
2. ALL PLANT MATERIAL SHALL BE INSTALLED AS SPECIFIED IN THE VNLA STANDARDIZED LANDSCAPE SPECIFICATIONS, LATEST EDITION.
3. THE CONTRACTOR SHALL SUPPLY ALL NEW PLANT MATERIAL IN QUANTITIES SUFFICIENT TO COMPLETE ALL PLANTING SHOWN ON THE DRAWINGS. WHERE DISCREPANCIES EXIST BETWEEN THE PLANS & THE PLANT LIST, THE PLANS SHALL TAKE PRECEDENCE.
4. GROUPINGS OF PLANTS SHALL BE MULCHED IN CONTINUOUS PLANT BEDS.
5. AREAS DISTURBED BY CONSTRUCTION, NOT OTHERWISE WITHIN PLANT BEDS OR COVERED IN SITE CONTRACT, ARE TO BE SODDED OR SEEDED WITH A STATE CERTIFIED TURF-TYPE TALL FESCUE VARIETY SELECTED FROM THE FOLLOWING LIST:

   Biltmore, Bingo, Cochise III, Constitution, Coyote II, Crossfire II, Endeavor, Fidelity, Good-en, Grande, Greenkeeper WAF, Inferno, Kalahari, Magellan, Masterpiece, Onyx, Padre, Picasso, Penn 1901, Quest, Raptor, Rebel Exeda, Rembrandt, Rendition, SR 8250, SR 8300, Tarheel, Titanium, Watchdog, Wolfpack, WPEZE.
6. AREAS OF THE SITE DEPICTED AS "TURF" REPRESENT MAINTAINED TURF AND CAN INCLUDE ALREADY ESTABLISHED TURF AREAS. THESE AREAS DO NOT SOLELY REPRESENT PROPOSED TURF. THE TOTAL AMOUNT OF PROPOSED TURF, AS WELL AS IF SEED OR SOD IS USED, SHALL BE DETERMINED AT THE OWNER'S DISCRETION.
7. TREES SUPPORT STAKING IS OPTIONAL FOR TREES THAT ARE 1" CAL. OR 6' HT. OR LESS. ALL TREE STAKING SHALL BE REMOVED AFTER 1-2 GROWING SEASONS.
8. ALL TREES ARE TO BE PLANTED SO TOP OF ROOT BALL IS 3" ABOVE FINISH GRADE.
9. TREE SHALL BE INSTALLED PLUMB & STRAIGHT.
10. PRUNE ALL SUCKERS, RUBBING OR CROSSED BRANCHES, CODOMINANT LEADERS, NARROW CROTCH ANGLES, WATER SPROUTS, BROKEN BRANCHES.
11. DO NOT PRUNE CENTRAL LEADER OR BRANCH TIPS.
12. REMOVE TAGS, LABELS & PLASTIC SLEEVING.
13. DO NOT WRAP TRUNK.
14. IF PLANT MATERIAL IS CONTAINER-GROWN, REMOVE TOP OF WIRE BASKET, OR REMOVE CONTAINER & CUT CIRCLING ROOT; IF FIELD-GROWN, CUT ROPE SURROUNDING BOTTOM OF TREE TRUNK AFTER BACKFILLING BUT BEFORE MULCHING & REMOVE BURLAP FROM TOP 1/3 OF BALL ROOT.
15. REMOVE ALL STAKES, STRAPS, WIRES, RUBBER HOSES, ETC. AFTER 1-2 GROWING SEASONS.
16. PLANT SUBSTITUTIONS WILL NOT BE MADE WITHOUT THE WRITTEN CONSENT OF THE ENGINEERING AND RESOURCE DIVISION PRIOR TO INSTALLATION.
17. ALL INSTALLED PLANT MATERIAL SHALL BE SUBJECT TO REGULAR MAINTENANCE, INCLUDING FERTILIZATION, PRUNING, REPLACEMENT, INSECT AND DISEASE CONTROL, WATERING, MULCHING, AND WEED CONTROL.
18. CONTRACTORS ARE RESPONSIBLE FOR LOCATING ALL UTILITIES PRIOR TO THE BEGINNING OF WORK AND AVOIDING THEM DURING LANDSCAPING OPERATIONS.

JAMES CITY COUNTY LANDSCAPE REQUIREMENTS

AREAS		TREES AND SHRUBS		
LANDSCAPE YARD	TOTAL QTY PROVIDED	RATIO	MIN. NUMBER REQUIRED	NEW PLANTINGS PROVIDED*
PARKING	52 SPACES	1 TREE AND 2 SHRUBS: 5 PARKING SPACES	10 TREES AND 21 SHRUBS	10 TREES AND 21 SHRUBS

RICHMOND ROAD
U.S. ROUTE 60
VARIABLE WIDTH R/W

PLANT SCHEDULE

KEY	QTY.	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	COMMENT
TREES:						
AR	13	ACER RUBRUM 'RED SUNSET'	'RED SUNSET' RED MAPLE	1-1/2" CAL	B & B	SINGLE STEM
NS	4	NYSSA SYLVATICA	BLACK GUM	1-1/2" CAL	B & B	SINGLE STEM
JV	4	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	8' HT.	B & B	SINGLE STEM
SHRUBS:						
CA	5	CLETHRA ALNIFOLIA	SUMMER SWEET CLETHRA	18" HT. OR SPREAD	CONT.	SINGLE STEM
DBH	83	ILEX CORNUTA 'DWARF BURFORD'	DWARF BURFORD HOLLY	18" HT. OR SPREAD	CONT.	SINGLE STEM
EA	11	EUONYMUS ALATUS	WINGED EUONYMUS	18" HT. OR SPREAD	CONT.	SINGLE STEM
IV	10	ILEX VERTICILATA	WINTERBERRY	18" HT. OR SPREAD	CONT.	SINGLE STEM
VD	11	VIBURNUM DENTATUM	ARROW-WOOD	18" HT. OR SPREAD	CONT.	SINGLE STEM
OTHER:						
AG	39	ANDROPOGON GERARDII	BIG BLUESTEM	#1 CONT.	CONT.	30" O.C.
PV	34	PANICUM VIRGATUM 'HAMELIN'	'HAMELIN' DWARF FOUNTAIN GRASS	#1 CONT.	CONT.	30" O.C.
RH	38	RUDBECKIA HIRTA	BLACK-EYED SUSAN	#1 CONT.	CONT.	30" O.C.

Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

COMMONWEALTH OF VIRGINIA
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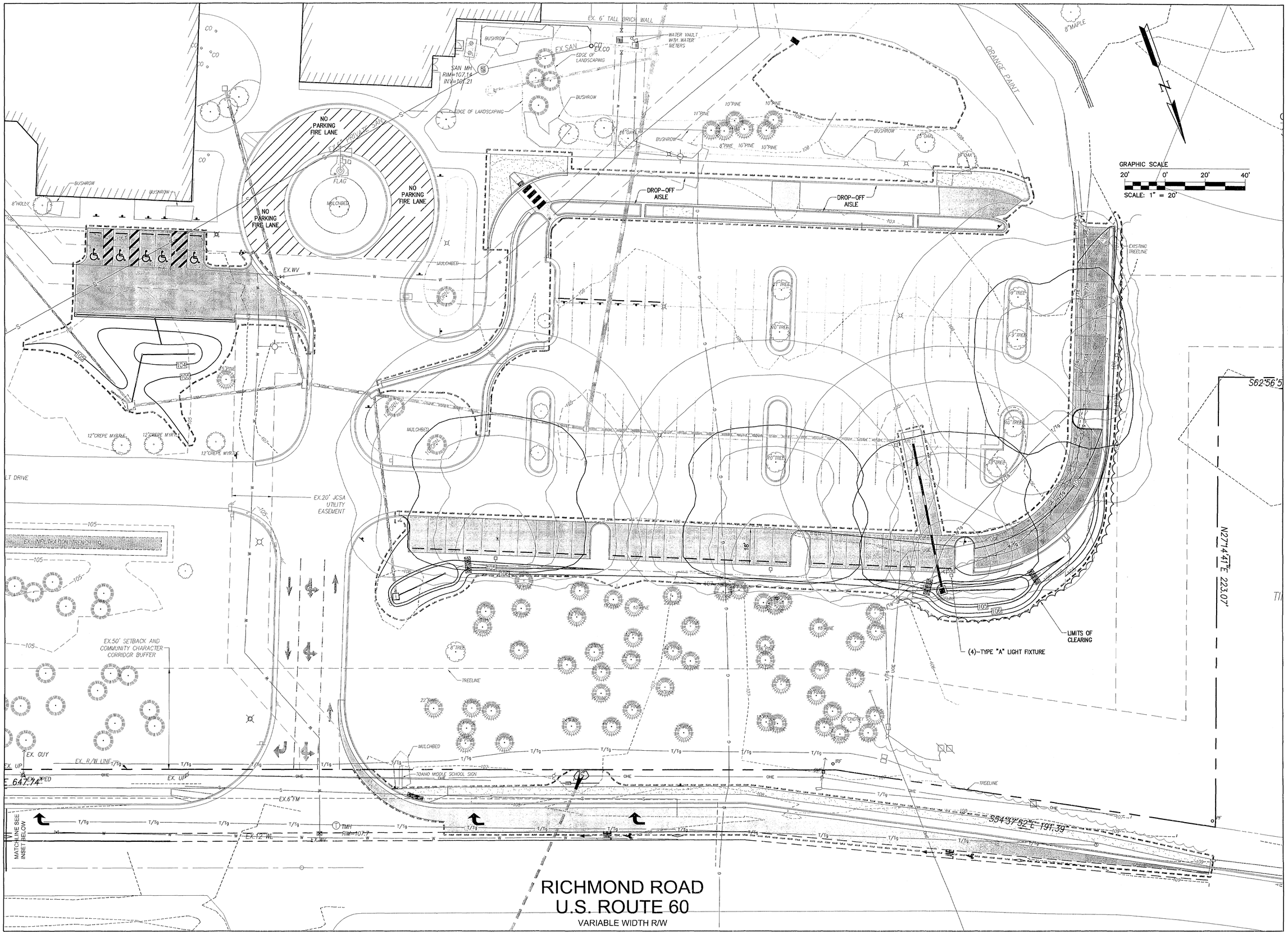
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=20'	Date: 1/11/13

Sheet Title:
LANDSCAPE PLAN

Sheet Number
C-09



Rev.	Date	Description	Revised By
2	3/12/13	REVISED PER VDOT COMMENTS	GVC
1	2/18/13	REVISED PER COUNTY COMMENTS 01/13	GVC

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DROP OFF AREA AND PARKING IMPROVEMENTS

TOANO MIDDLE SCHOOL

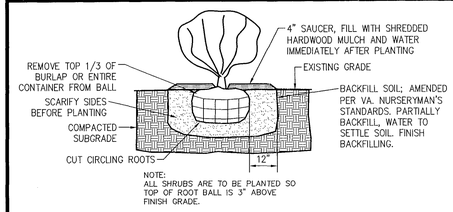
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=20'	Date: 1/11/13

Sheet Title:
LIGHTING PLAN

Sheet Number
C-10



SHRUB PLANTING METHOD

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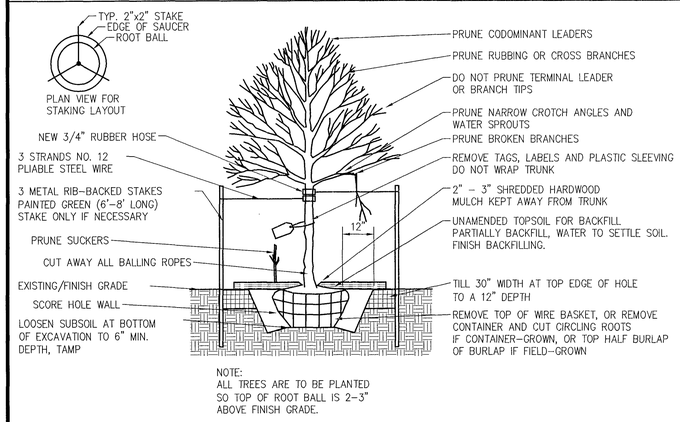
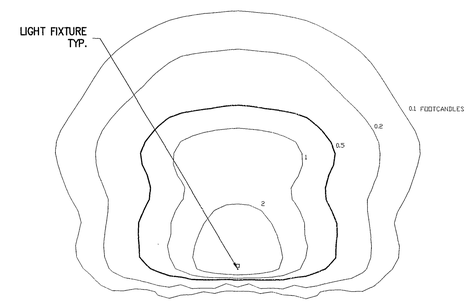


DECIDUOUS TREE PLANTING METHOD

N.T.S.

LIGHTING NOTES AND DETAILS

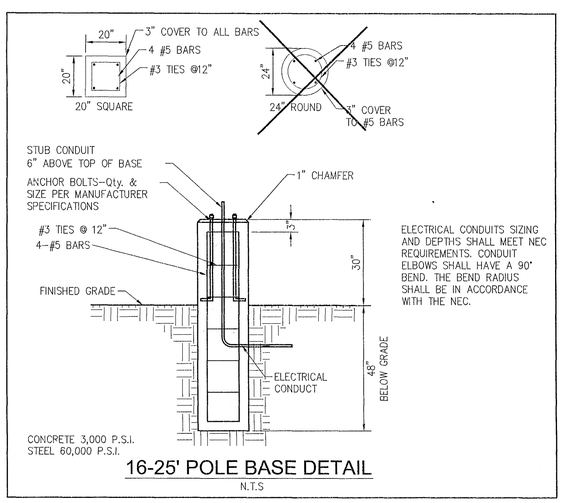


TYPE "A" ISO FOOTCANDLE DIAGRAM

N.T.S

LIGHTING SCHEDULE

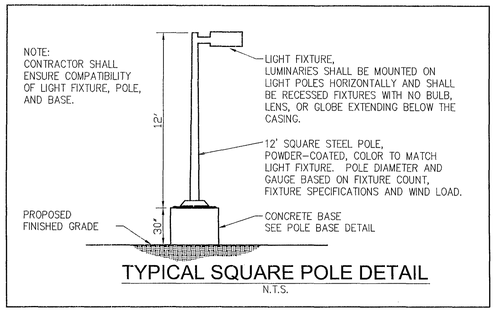
KEY	FIXTURE TYPE	MOUNTING HEIGHT	POLE TYPE/ MOUNTING INSTRUCTIONS	FIXTURES PER POLE	TOTAL FIXTURES
A	LITHONIA MODEL#: KSF2 250S R4SC DESCRIPTION 250 WATT HIGH PREASURE SODIUM FIXTURE WITH TYPE IV SHARP CUTOFF DISTRIBUTION; COLOR: BLACK	12'	LITHONIA STRAIGHT, SQUARE, STEEL POLE COLOR: BLACK	1	4



ELECTRICAL CONDUITS SIZING AND DEPTHS SHALL MEET NEC REQUIREMENTS. CONDUIT ELBOWS SHALL HAVE A 90° BEND. THE BEND RADIUS SHALL BE IN ACCORDANCE WITH THE NEC.

16-25' POLE BASE DETAIL

N.T.S



TYPICAL SQUARE POLE DETAIL

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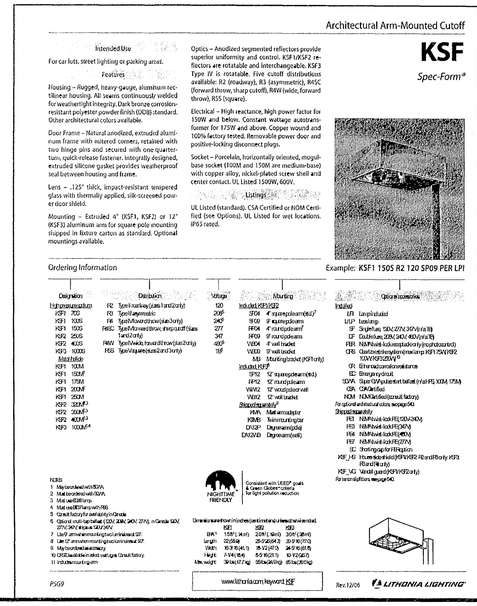

2	3/12/13
1	2/18/13
Rev.	Date
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	REVISED PER COUNTY COMMENTS 01/13
	Description
	GVC
	GVC
	Review By

COMMONWEALTH OF VIRGINIA
JAMES S. PETERS
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3/12/13
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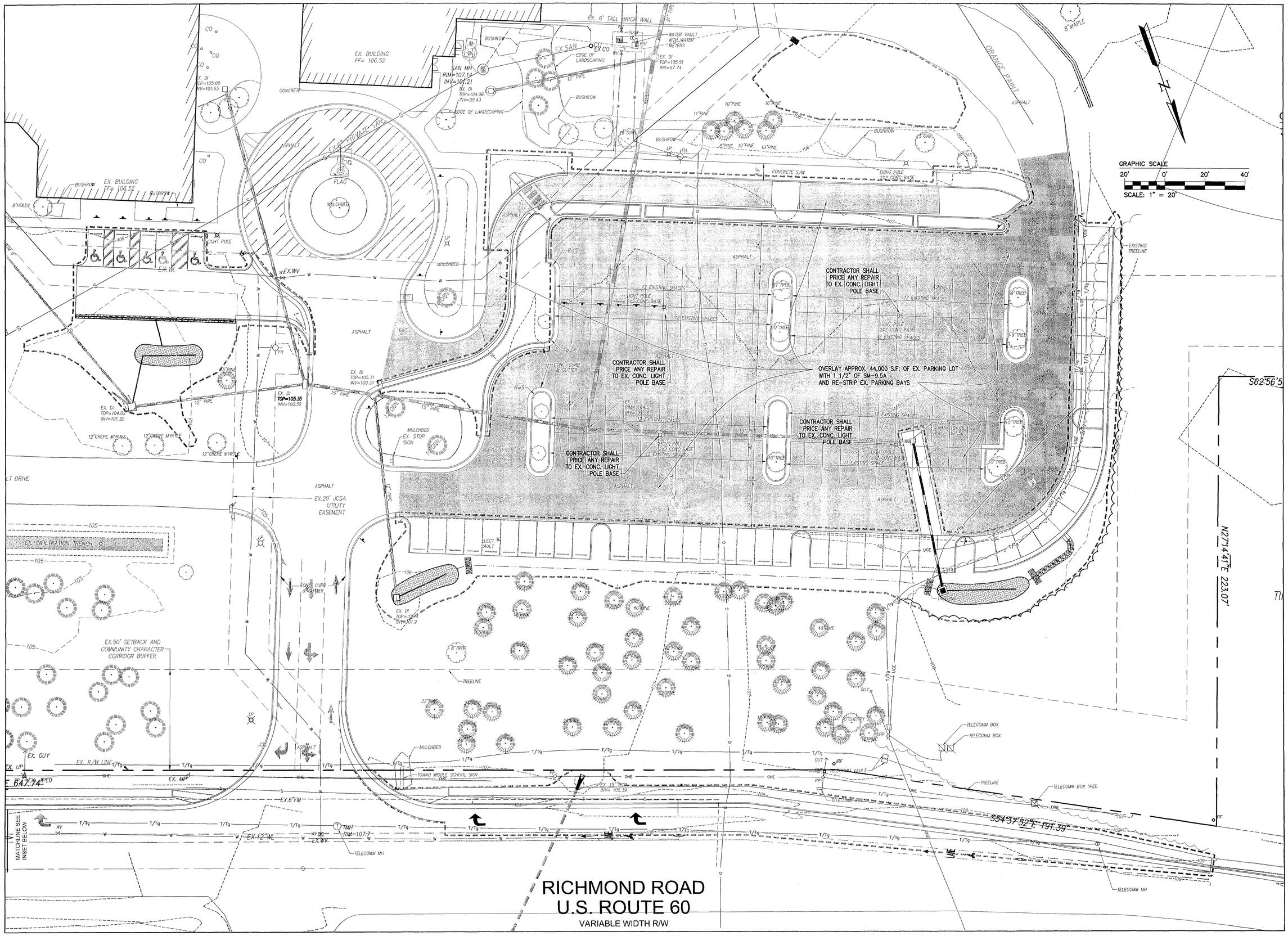
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: AS-SHOWN	Date: 1/11/13

Sheet Title:
LANDSCAPE & LIGHTING NOTES & DETAILS

Sheet Number
C-11



Rev.	Date	Description	By
1	2/13/13	PER COUNTY COMMENTS 01/13	GVC
2	3/12/13	PER COUNTY COMMENTS 02/13	GVC

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DROP OFF AREA AND PARKING IMPROVEMENTS
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STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

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Scale: 1"=20'	Date: 1/11/13
Sheet Title: ADDITIVE BID	
Sheet Number: C-12	

WOF
JCC

TOANO MIDDLE SCHOOL
PARKING IMPROVEMENTS
SP-0022-13
4/24/13

DRAINAGE CALCULATIONS

FOR

TOANO MIDDLE SCHOOL

Environmental Division
FEB 20 2013
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SITE:

James City County

SUBMITTED TO:

Engineering and Resource Protection
James City County

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
PROFESSIONAL ENGINEER

Prepared By:

AES Consulting Engineers
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188

January 11, 2013
Revised: February 19, 2013

SP-2-13
FINAL
COMPS

AES Project No. 9888-01

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9888-01_Stormwater Management Report.doc

PLANNING DIVISION
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TABLE OF CONTENTS

Stormwater Narrative

I PROJECT DESCRIPTION
II EXISING SITE CONDITIONS
III ADJACENT PROPERTIES
IV OFFSITE AREAS
V SOILS
VI CRITICAL EROSION AREAS
VII EROSION & SEDIMENT CONTROL MEASURES
VIII STORMWATER MANAGEMENT & WATER QUALITY
X RESULTS AND CONCLUSIONS

APPENDIX A Swale and Storm System Calculations

APPENDIX B Stormwater Management Calculations

APPENDIX C Drainage Maps

STORM WATER NARRATIVE

I PROJECT DESCRIPTION

The project is an amendment to the Toano Middle School site that will provide for a drop off area for students, designate the entrance circle as a fire lane, and relocate the handicapped spaces closer to the entrance and add 30 additional regular and 3 additional ADA compliant spaces to site. The parking additions will provide the school site with 147 regular and 5 ADA compliant parking spaces.

II EXISTING SITE CONDITIONS

The site is currently developed as a Middle School.

III ADJACENT PROPERTIES

The site is bordered to the north by Richmond Road (Route 60), to the west by Chickahominy Road (Route 631), to the south by existing woodlands, and to the east by existing commercial property.

IV OFFSITE AREAS

There are areas of offsite disturbance associated with the changes to Richmond Road.

V SOILS

The soils onsite consist of 11C Craven Yellow Fine Sandy Loam, 15F Emporia Complex, 19B Kempsville-Emporia, 29B Slagle, and 31B Suffolk Fine Sandy Loam.

VI CRITICAL EROSION AREAS

There are no critical erosion areas associated with this project.

VII EROSION & SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all erosion and sediment control measures shall be installed in accordance with the Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards of the VESCH shall be adhered to unless otherwise waived and approved by the on-site E&S Control Inspector. These measures shall include but not be limited to: construction entrance, silt fence, inlet protection, culvert inlet protection, dust control, temporary seeding, and permanent seeding.

VIII STORMWATER MANAGEMENT & WATER QUALITY

All stormwater runoff from the proposed impervious areas will be collected into proposed Bioretention Facilities before entering the existing storm system. There are three Bioretention Facilities that have been sized to provide water quality volume for the proposed drainage areas. Due to poor soil conditions, the facilities will be provided with underdrains to help drain stormwater. The calculations show that the storm system is less taxed in the post-development conditions than in pre-development conditions. Through the use of the Bioretention Facilities, the stormwater runoff is attenuated to less than pre-developed conditions and therefore the existing storm system will be provided some relief with the proposed design. Calculations are provided for the storm system in its existing condition and in its proposed condition to show this relief.

Each proposed swale on site has been analyzed to determine velocity and capacity during 2-year and 10-year events. These computations can be found in the attached information for each swale.

X RESULTS & CONCLUSIONS

Stormwater Quality for the proposed impervious area associated with this project is provided by the three proposed Bioretention Facilities. Through the use of these Bioretention Facilities, the stormwater runoff is attenuated to less than pre-developed conditions and therefore the existing storm system is less taxed. Channel Protection Volume for the site is provided by the existing on-site BMP. Because the peak flows from the drainage area the proposed construction areas will be attenuated to less than pre-developed conditions, the existing BMP will not be overburdened by the runoff from impervious area associated with this project.

APPENDIX A

SWALE AND STORM SYSTEM CALCULATIONS

Swale Adequacy Calculations
Existing Storm System Analysis
Proposed Storm System Analysis

CONSULTING ENGINEERS
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Gloucester (804) 693-4450
Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Channel Design
Date:	September 20, 2012
Calculated By:	GVC

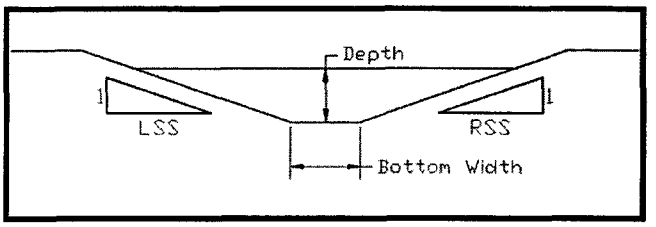
Design Point: **Swale #1**

2 Year Storm - Velocity Check

Drainage Area	=	0.20	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.50 x 5.70 x 0.20
= 0.57 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	0.75	%
Mannings (n)	=	0.050	**Fallow**

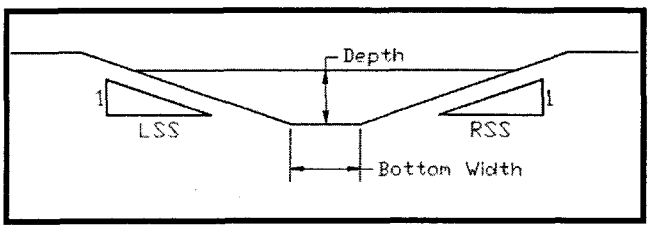
Depth of Flow	=	0.45	Ft.	
Area	=	0.62	SF	Wetted Perimeter = 2.87 Ft.
Hydraulic Radius	=	0.21	Ft.	
Velocity (V)	=	0.92	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.57	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

Drainage Area	=	0.20	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)
= 0.50 x 7.20 x 0.20
= 0.72 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	0.75	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.49	Ft.	
Area	=	0.73	SF	Wetted Perimeter = 3.12 Ft.
Hydraulic Radius	=	0.23	Ft.	
Velocity (V)	=	0.98	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.72	CFS	(From Continuity Equation Q=AV)

AES CONSULTING ENGINEERS
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Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Channel Design
Date:	September 20, 2012
Calculated By:	GVC

Design Point: **Swale #2**

2 Year Storm - Velocity Check

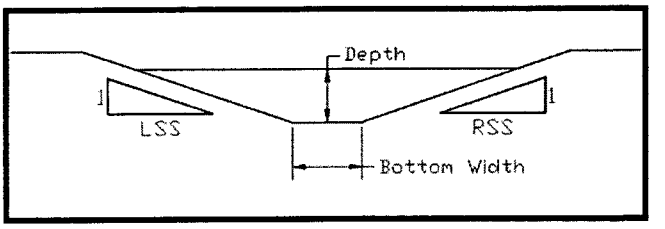
Drainage Area	=	**0.10**	Acres	(Area draining to Design Point)
C	=	**0.80**		(Runoff Coefficient)
I	=	**5.70**	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= **0.80** x **5.70** x **0.10**

= **0.46** CFS

Channel Characteristics



Rt. Sideslope	=	**3.00**	:1
Lt. Sideslope	=	**3.00**	:1
Base Width	=	**0.00**	Ft.
Max. Depth	=	**1.00**	Ft.
Channel Slope	=	**1.00**	%
Mannings (n)	=	**0.050**	**Fallow**

Depth of Flow	=	**0.40**	Ft.	
Area	=	**0.47**	SF	Wetted Perimeter = **2.50** Ft.
Hydraulic Radius	=	**0.19**	Ft.	
Velocity (V)	=	**0.97**	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	**0.46**	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

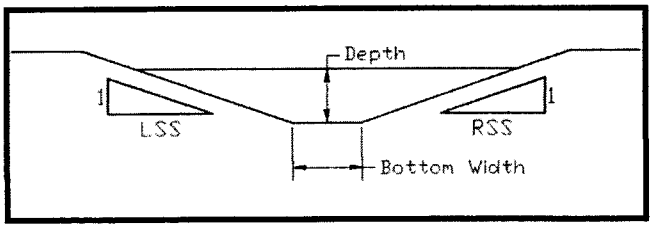
Drainage Area	=	**0.10**	Acres	(Area draining to Design Point)
C	=	**0.80**		(Runoff Coefficient)
I	=	**7.20**	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= **0.80** x **7.20** x **0.10**

= **0.58** CFS

Channel Characteristics

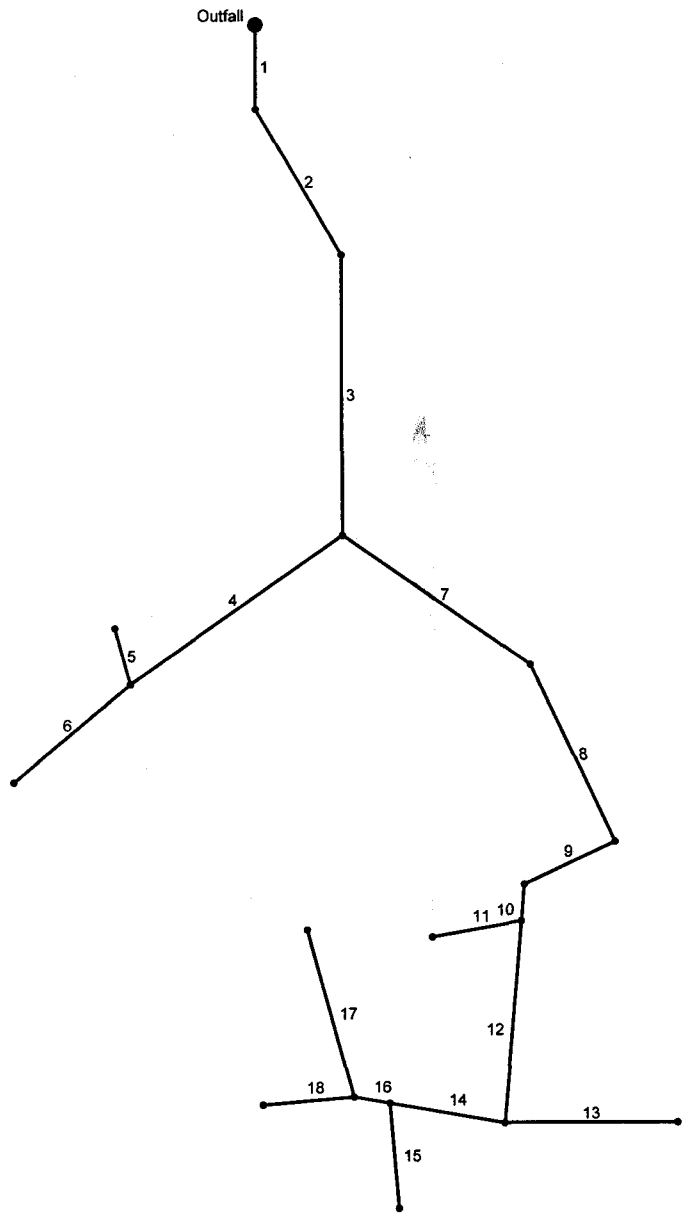


Rt. Sideslope	=	**3.00**	:1
Lt. Sideslope	=	**3.00**	:1
Base Width	=	**0.00**	Ft.
Max. Depth	=	**1.00**	Ft.
Channel Slope	=	**1.00**	%
Mannings (n)	=	**0.050**	**Fallow**

Depth of Flow	=	**0.43**	Ft.	
Area	=	**0.56**	SF	Wetted Perimeter = **2.73** Ft.
Hydraulic Radius	=	**0.20**	Ft.	
Velocity (V)	=	**1.03**	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	**0.57**	CFS	(From Continuity Equation Q=AV)

967300 Toano Middle School

EXISTING STORM SYSTEM



Project File: 951717 Toano Middle School (Overall).stm	Number of lines: 18	Date: 2/19/2013

Storm Sewers v9.00

Storm Sewer Tabulation

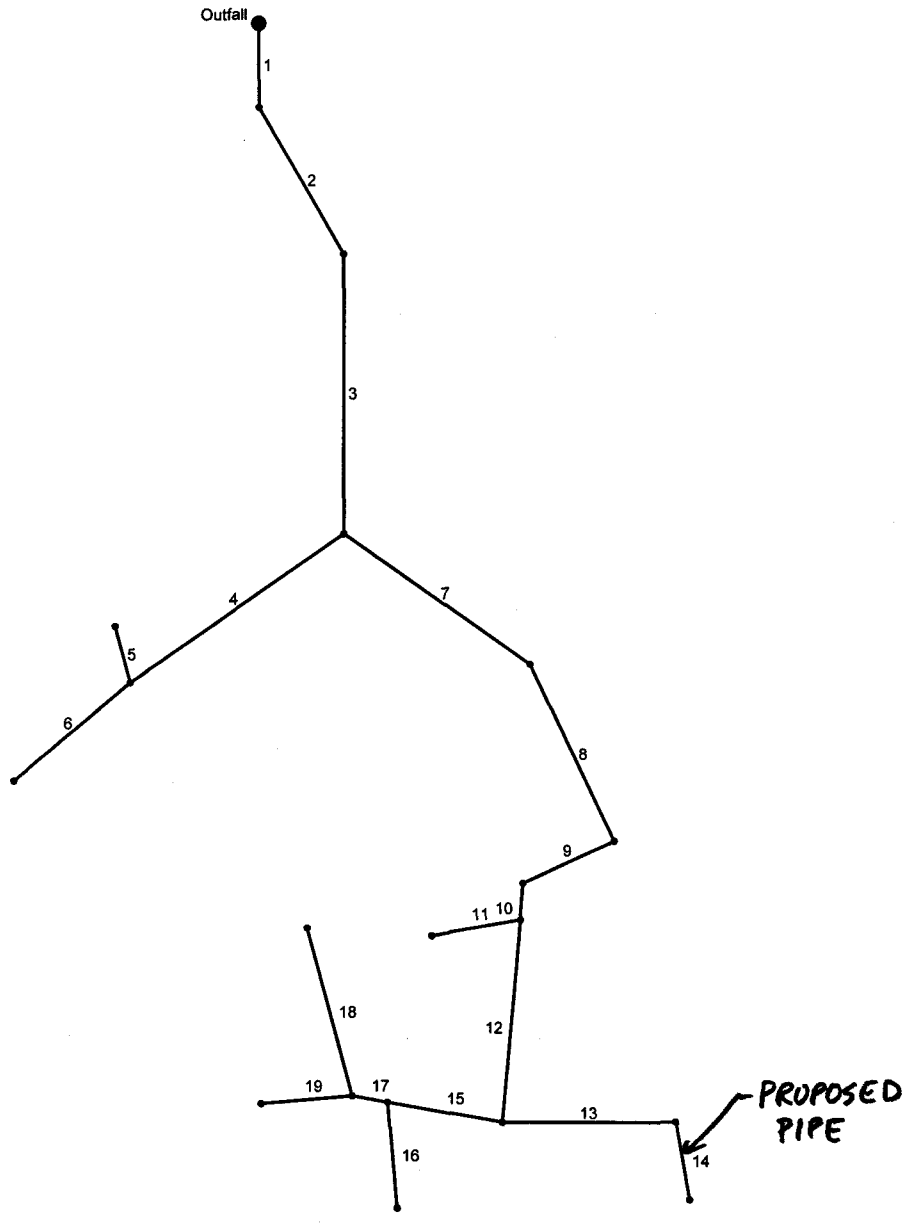
Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	80.000	1.80	14.78	0.40	0.72	7.97	6.0	25.0	4.0	31.90	36.68	8.02	30	0.80	89.50	90.14	91.39	92.03	0.00	105.50	100 - 99
2	1	160.000	1.40	12.98	0.40	0.56	7.25	16.0	24.6	4.0	29.29	39.71	5.97	30	0.94	90.14	91.64	93.69	94.50	105.50	107.00	101 - 100
3	2	265.000	2.18	11.58	0.44	0.96	6.69	14.0	23.8	4.1	27.50	31.47	5.60	30	0.59	91.64	93.20	94.96	96.15	107.00	103.98	102 - 101
4	3	245.000	0.37	2.25	0.90	0.33	1.60	4.0	9.4	6.2	9.89	16.95	6.06	18	2.60	93.20	99.58	97.09	100.78	103.98	107.00	113 - 102
5	4	55.000	0.18	0.18	0.40	0.07	0.07	4.0	4.0	7.5	0.54	8.88	1.64	12	6.22	99.58	103.00	101.90	103.31	107.00	107.50	114 - 113
6	4	145.000	1.70	1.70	0.70	1.19	1.19	9.0	9.0	6.3	7.49	7.39	6.10	15	1.31	99.83	101.73	101.90	103.85	107.00	103.83	115 - 113
7	3	215.000	1.83	7.15	0.40	0.73	4.14	17.0	23.2	4.2	17.25	22.62	5.49	24	1.00	93.20	95.35	97.09	98.34	103.98	104.55	103 - 102
8	7	185.000	0.59	5.32	0.40	0.24	3.41	16.0	22.5	4.2	14.41	17.52	4.59	24	0.60	95.35	96.46	98.73	99.48	104.55	105.76	104 - 103
9	8	95.000	0.28	4.73	0.90	0.25	3.17	4.0	22.2	4.3	13.50	12.16	5.61	21	0.59	96.46	97.02	99.97	100.66	105.76	105.21	105 - 104
10	9	35.000	0.33	4.45	0.45	0.15	2.92	4.0	22.1	4.3	12.46	22.72	5.18	21	2.06	97.02	97.74	101.31	101.53	105.21	105.51	105A - 105
11	10	85.000	0.29	0.29	0.76	0.22	0.22	3.0	3.0	7.5	1.65	5.02	2.10	12	1.99	97.74	99.43	102.14	102.32	105.51	104.96	116 - 105A
12	10	193.000	0.62	3.83	0.90	0.56	2.55	6.0	21.4	4.3	11.06	14.51	4.60	21	0.84	97.74	99.36	102.14	103.08	105.51	104.51	106 - 105A
13	12	163.000	0.73	0.73	0.90	0.66	0.66	3.0	3.0	7.5	4.93	8.22	4.01	15	1.62	99.36	102.00	103.82	104.77	104.51	105.20	107 - 106
14	12	110.000	0.44	2.48	0.84	0.37	1.33	6.0	21.0	4.4	5.84	6.19	4.76	15	0.92	99.36	100.37	103.82	104.72	104.51	105.31	108 - 106
15	14	101.000	0.33	0.33	0.20	0.07	0.07	10.0	10.0	6.1	0.40	4.38	0.51	12	1.51	100.37	101.90	105.25	105.26	105.31	105.40	108A - 108
16	14	34.000	0.32	1.71	0.76	0.24	0.90	6.0	20.8	4.4	3.95	3.99	3.22	15	0.38	100.37	100.50	105.25	105.38	105.31	105.35	109 - 108
17	16	165.000	0.23	0.23	0.78	0.18	0.18	4.0	4.0	7.5	1.34	2.97	1.71	12	0.70	100.50	101.65	105.60	105.83	105.35	105.00	112 - 109
18	16	86.000	1.16	1.16	0.41	0.48	0.48	20.0	20.0	4.5	2.13	6.31	1.74	15	0.95	100.50	101.32	105.60	105.69	105.35	104.02	110 - 109

967300 Toano Middle School | Number of lines: 18 | Run Date: 2/19/2013

NOTES:Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period =Yrs. 10 ; c = cir e = ellip b = box

967300 Toano Middle School

PROPOSED STORM SYSTEM



Project File: 951717 Toano Middle School (Overall)-Revised.stm	Number of lines: 19	Date: 2/19/2013

Storm Sewers v9.00

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	80.000	1.80	14.19	0.40	0.72	7.84	6.0	25.6	4.0	31.21	36.68	7.93	30	0.80	89.50	90.14	91.37	92.01	0.00	105.50	100 - 99
2	1	160.000	1.40	12.39	0.40	0.56	7.12	16.0	25.1	4.0	28.65	39.71	5.84	30	0.94	90.14	91.64	93.62	94.40	105.50	107.00	101 - 100
3	2	265.000	2.18	10.99	0.44	0.96	6.56	14.0	24.2	4.1	26.89	31.47	5.48	30	0.59	91.64	93.20	94.84	95.98	107.00	103.98	102 - 101
4	3	245.000	0.37	2.25	0.90	0.33	1.60	4.0	9.4	6.2	9.89	16.95	6.06	18	2.60	93.20	99.58	96.87	100.78	103.98	107.00	113 - 102
5	4	55.000	0.18	0.18	0.40	0.07	0.07	4.0	4.0	7.5	0.54	8.88	1.64	12	6.22	99.58	103.00	101.90	103.31	107.00	107.50	114 - 113
6	4	145.000	1.70	1.70	0.70	1.19	1.19	9.0	9.0	6.3	7.49	7.39	6.10	15	1.31	99.83	101.73	101.90	103.85	107.00	103.83	115 - 113
7	3	215.000	1.83	6.56	0.40	0.73	4.00	17.0	23.5	4.1	16.74	22.62	5.33	24	1.00	93.20	95.35	96.87	98.05	103.98	104.55	103 - 102
8	7	185.000	0.59	4.73	0.40	0.24	3.27	16.0	22.8	4.2	13.93	17.52	4.43	24	0.60	95.35	96.46	98.42	99.12	104.55	105.76	104 - 103
9	8	95.000	0.28	4.14	0.90	0.25	3.03	4.0	22.5	4.2	13.02	12.16	5.41	21	0.59	96.46	97.02	99.58	100.22	105.76	105.21	105 - 104
10	9	35.000	0.33	3.86	0.45	0.15	2.78	4.0	22.4	4.2	11.99	22.72	4.98	21	2.06	97.02	97.74	100.82	101.03	105.21	105.51	105A - 105
11	10	85.000	0.29	0.29	0.76	0.22	0.22	3.0	3.0	7.5	1.65	5.02	2.10	12	1.99	97.74	99.43	101.59	101.77	105.51	104.96	116 - 105A
12	10	193.000	0.62	3.24	0.90	0.56	2.41	6.0	21.7	4.3	10.60	14.51	4.41	21	0.84	97.74	99.36	101.59	102.45	105.51	104.51	106 - 105A
13	12	163.000	0.73	0.73	0.95	0.69	0.69	3.0	14.8	5.2	3.68	7.54	3.00	15	1.36	99.36	101.58	103.13	103.66	104.51	105.20	107 - 106
14	13	75.000	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	0.10	2.33	0.13	12	0.43	101.58	101.90	103.87	103.87	105.20	105.32	Bioretention #3 O
15	12	110.000	0.44	1.89	0.84	0.37	1.16	6.0	21.3	4.4	5.16	6.19	4.20	15	0.92	99.36	100.37	103.13	103.83	104.51	105.31	108 - 106
16	15	101.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.10	4.38	0.13	12	1.51	100.37	101.90	104.25	104.25	105.31	105.40	Bioretention #2 O
17	15	34.000	0.32	1.45	0.76	0.24	0.79	6.0	21.1	4.4	3.46	3.99	2.82	15	0.38	100.37	100.50	104.25	104.34	105.31	105.35	109 - 108
18	17	165.000	0.23	0.23	0.78	0.18	0.18	4.0	4.0	7.5	1.34	2.97	1.71	12	0.70	100.50	101.65	104.51	104.75	105.35	105.00	112-109
19	17	86.000	0.90	0.90	0.41	0.37	0.37	20.0	20.0	4.5	1.66	6.31	1.35	15	0.95	100.50	101.32	104.51	104.57	105.35	104.02	110 - 109

967300 Toano Middle School | Number of lines: 19 | Run Date: 2/19/2013

NOTES:Intensity = 55.61 / (Inlet time + 10.00) ^ 0.74; Return period =Yrs. 10 ; c = cir e = ellip b = box

APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

Water Quality Calculations
Water Quality Volume Calculations
Bioretention Facility Hydraflow Report

Bioretention Facility #1 YC 066				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.40	0.74	0.00	104.47
2-Year Storm	0.47	0.87	0.00	104.55
10-Year Storm	0.62	1.12	0.01	104.71
100-Year Storm	0.82	1.5	0.32	104.86

Bioretention Facility #2 YC 067				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.32	0.81	0.00	105.20
2-Year Storm	0.38	0.95	0.00	105.27
10-Year Storm	0.50	1.24	0.01	105.37
100-Year Storm	0.66	1.65	0.14	105.43

Bioretention Facility #3 YC 068				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.22	0.86	0.00	105.13
2-Year Storm	0.25	1.02	0.00	105.19
10-Year Storm	0.33	1.32	0.00	105.30
100-Year Storm	0.44	1.76	0.41	105.40

AES CONSULTING ENGINEERS

Project:	**Toano Middle School**
Project No.:	**9888-01**
Subject:	**Water Quality Calculations**
	Situation 4
Date:	**1/8/2013**
Calculated By:	**GVC**

Performance-Based Water Quality Calculations - Situation 4

(Appendix 5D - Virginia Stormwater Management Handbook Volume II)

Land development where the existing percent impervious cover ($I_{existing}$) is served by an existing stormwater management BMP(s) that addresses water quality.

Requirement: The pollutant discharge after development (L_{post}) shall not exceed the existing pollutant discharge based on the existing percent impervious cover while served by the existing BMP ($Lpre_{(existingBMP)}$). The existing BMP shall be shown to have been designed and constructed in accordance with proper design standards and specifications, and to be in proper functioning condition.

STEP 1

34.06	Acres	Applicable Area
5.22	Acres	Post-development Impervious Cover
15.3	%	I_{post} (Total Post-development Impervious Cover / A x 100)

STEP 2

18	%	$I_{watershed}$
4.95	Acres	Existing Impervious Cover
14.5	%	$I_{existing}$ (Total Existing Impervious Cover / A x 100)

STEP 4

$L_{pre(existing)}$ = relative pre-development total pollutant load

$$L_{pre(existing)} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{14.5}}_{I_{existing}}\ )\ ] \times \underbrace{\mathbf{34.06}}_{A} \times 2.28$$

$L_{pre(existing)}$ = **14.0** pounds per year

$L_{pre(watershed)}$ = relative pre-development total pollutant load

$$L_{pre(watershed)} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{18}}_{I_{watershed}}\ )\ ] \times \underbrace{\mathbf{34.06}}_{A} \times 2.28$$

$L_{pre(watershed)}$ = **16.5** pounds per year

Ex. BMP **Existing Retention Basin**

28.33 Acres Drainage Area of proposed BMP
4.67 Acres Pre-development Impervious Cover for BMP Drainage Area

16.5 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

$L_{Ex.\ BMP}$ = pollutant load entering existing BMP

$$L_{Ex.\ BMP} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\mathbf{16.5}}\ )\ ] \times \underset{A_{BMP}}{\mathbf{28.33}} \times 2.28$$

$L_{Ex.\ BMP}$ = **12.8** pounds per year

$L_{removed/Ex.BMP}$ = pollutant load removed by proposed BMP

$$L_{removed/Ex.\ BMP} = \underset{EFF}{\mathbf{50.0}} \times \underset{L_{BMP}}{\mathbf{12.8}}$$

$L_{removed/Ex.\ BMP}$ = **6.4** pounds per year

$L_{pre(existingBMP)} = L_{pre(existing)} - L_{removed/Ex.\ BMP}$

$L_{pre(existingBMP)}$ = **14.0** - **6.4**

$L_{pre(existingBMP)}$ = **7.6** pounds per year

STEP 5

L_{post} = relative post-development total pollutant load

$$L_{post} = [\ 0.05 + (\ 0.009 \times \underset{I_{post}}{\mathbf{15.3}}\ )\ ] \times \underset{A}{\mathbf{34.06}} \times 2.28$$

L_{post} = **14.6** pounds per year

STEP 6

RR = relative pollutant removal requirement

L_{post} $L_{pre(existingBMP)}$

RR = **14.6** - **7.6**

RR = **7.0** pounds per year

STEP 7

EFF = required pollutant removal efficiency

RR L_{post}

EFF = **7.0** / **14.6** x 100

EFF = **47.7** %

BMP #1 **Existing Retention Basin**

28.33 Acres Drainage Area of proposed BMP

4.94 Acres Post-development Impervious Cover for BMP Drainage Area

17.4 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP1} = pollutant load entering BMP

I_{BMP} A_{BMP}

L_{BMP1} = [0.05 + (0.009 x **17.4**)] x **28.33** x 2.28

L_{BMP1} = **13.4** pounds per year

$L_{removed/BMP1}$ = pollutant load removed by proposed BMP

EFF L_{BMP}

$L_{removed/BMP1}$ = **50.0** x **13.4**

$L_{removed/BMP1}$ = **6.68** pounds per year

BMP #2 **Bioretention Facility #1** YC066

0.20 Acres Drainage Area of proposed BMP
0.10 Acres Post-development Impervious Cover for BMP Drainage Area

50.0 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP2} = pollutant load entering BMP

$$L_{BMP2} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{50.0}}_{I_{BMP}}\ )\ ] \times \underbrace{\mathbf{0.20}}_{A_{BMP}} \times 2.28$$

L_{BMP2} = **0.2** pounds per year

$L_{removed/BMP2}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP2} = \underbrace{\mathbf{50.0}}_{EFF} \times \underbrace{\mathbf{0.2}}_{L_{BMP}}$$

$L_{removed/BMP2}$ = **0.11** pounds per year

BMP #3 **Bioretention Facility #2** YC067

0.33 Acres Drainage Area of proposed BMP
0.07 Acres Post-development Impervious Cover for BMP Drainage Area

21.2 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP3} = pollutant load entering BMP

$$L_{BMP3} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{21.2}}_{I_{BMP}}\ )\ ] \times \underbrace{\mathbf{0.33}}_{A_{BMP}} \times 2.28$$

L_{BMP3} = **0.2** pounds per year

$L_{removed/BMP3}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP3} = \underbrace{\mathbf{50.0}}_{EFF} \times \underbrace{\mathbf{0.2}}_{L_{BMP}}$$

$L_{removed/BMP3}$ = **0.09** pounds per year

BMP #4 **Bioretention Facility #3** YC068

0.22 Acres Drainage Area of proposed BMP
0.11 Acres Post-development Impervious Cover for BMP Drainage Area

50.0 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP4} = pollutant load entering BMP

$$L_{BMP4} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\underline{\mathbf{50.0}}}\ )\ ] \times \underset{A_{BMP}}{\underline{\mathbf{0.22}}} \times 2.28$$

L_{BMP4} = **0.3** pounds per year

$L_{removed/BMP4}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP4} = \underset{EFF}{\underline{\mathbf{50.0}}} \times \underset{L_{BMP}}{\underline{\mathbf{0.3}}}$$

$L_{removed/BMP4}$ = **0.1** pounds per year

BMP #5 _____

BMP #6 _____

$L_{removed/total}$ = $L_{removed/BMP1} + L_{removed/BMP2} + L_{removed/BMP3} + L_{removed/BMP4} + L_{removed/BMP5} + L_{removed/BMP6}$

= **6.7** + **0.1** + **0.1** + **0.1** + **0.0** + **0.0**

= **7.0** pounds per year

Compliance Check

$L_{removed/total} \geq RR$

7.0 ≥ **7.0**

AES
CONSULTING ENGINEERS

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Water Quality Volume
Date:	1/8/2013
Calculated By:	GVC

BMP Type = **Bioretention #1** YC066

Water Quality Volume = 0.5 in. x **0.1** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.1**)

= **182** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **182**

= **363** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **182**

= **363** CF

Dry Storage Volume Provided = **530** CF Elevation = **104.75 - Riser Elevation**

AES
CONSULTING ENGINEERS

Project:	**Toano Middle School**
Project No.:	**9888-01**
Subject:	**Water Quality Volume**
Date:	**1/8/2013**
Calculated By:	**GVC**

BMP Type = **Bioretention #2** YC067

Water Quality Volume = 0.5 in. x **0.07** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.07**)

= **127** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **127**

= **254.1** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **127**

= **254** CF

Dry Storage Volume Provided = **500** CF Elevation = **105.40 - Riser Elevation**

AES
CONSULTING ENGINEERS

Project:	**Toano Middle School**
Project No.:	**9888-01**
Subject:	**Water Quality Volume**
Date:	**1/8/2013**
Calculated By:	**GVC**

BMP Type = **Bioretention #3** Yc068

Water Quality Volume = 0.5 in. x **0.11** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.11**)

= **200** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **200**

= **399.3** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **200**

= **399** CF

Dry Storage Volume Provided = **618** CF Elevation = **105.32 - Riser Elevation**

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.402	1	5	181	------	------	------	Pre-Development Flow
2	Rational	0.735	1	5	331	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	104.47	331	Post Routed

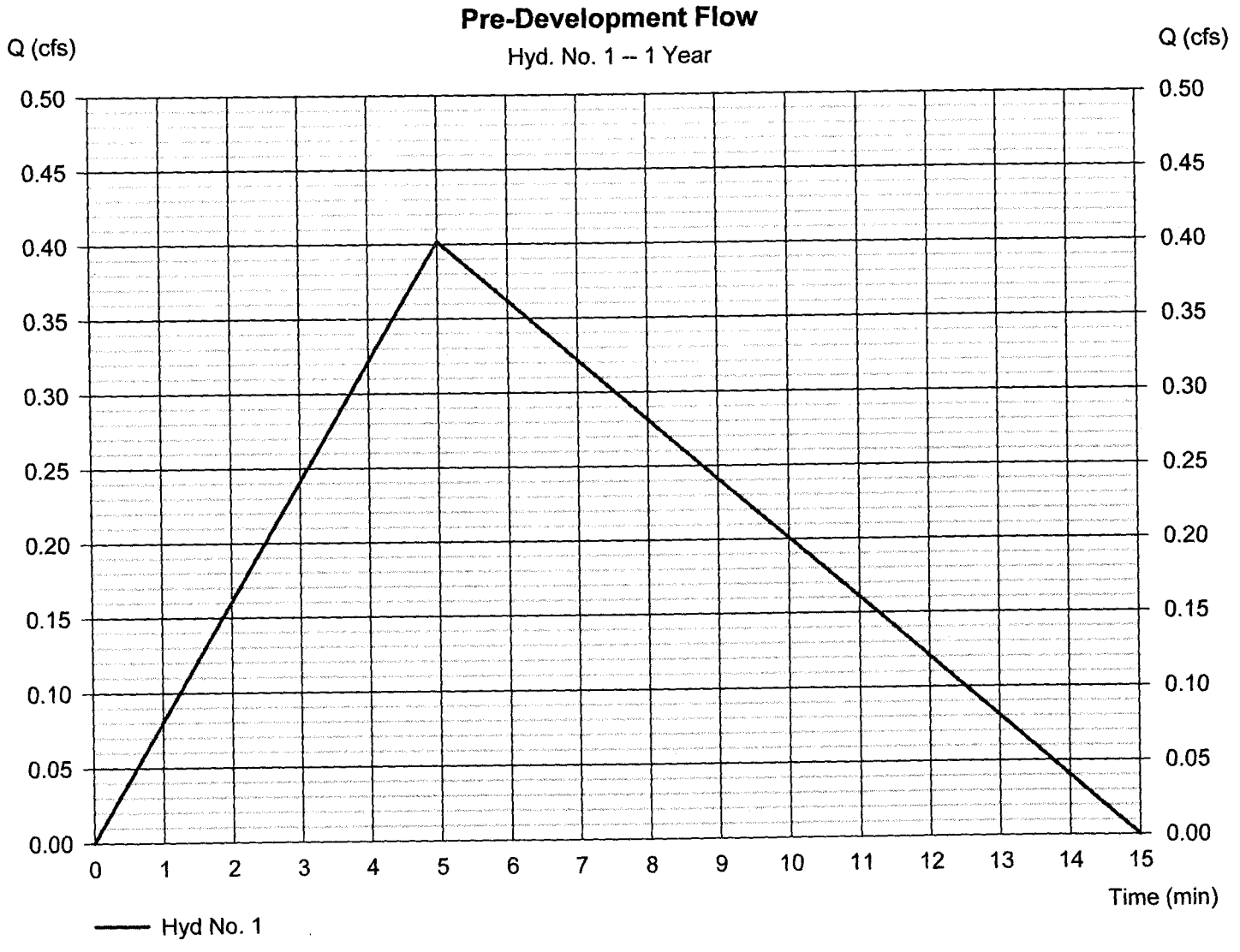
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.402 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 181 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



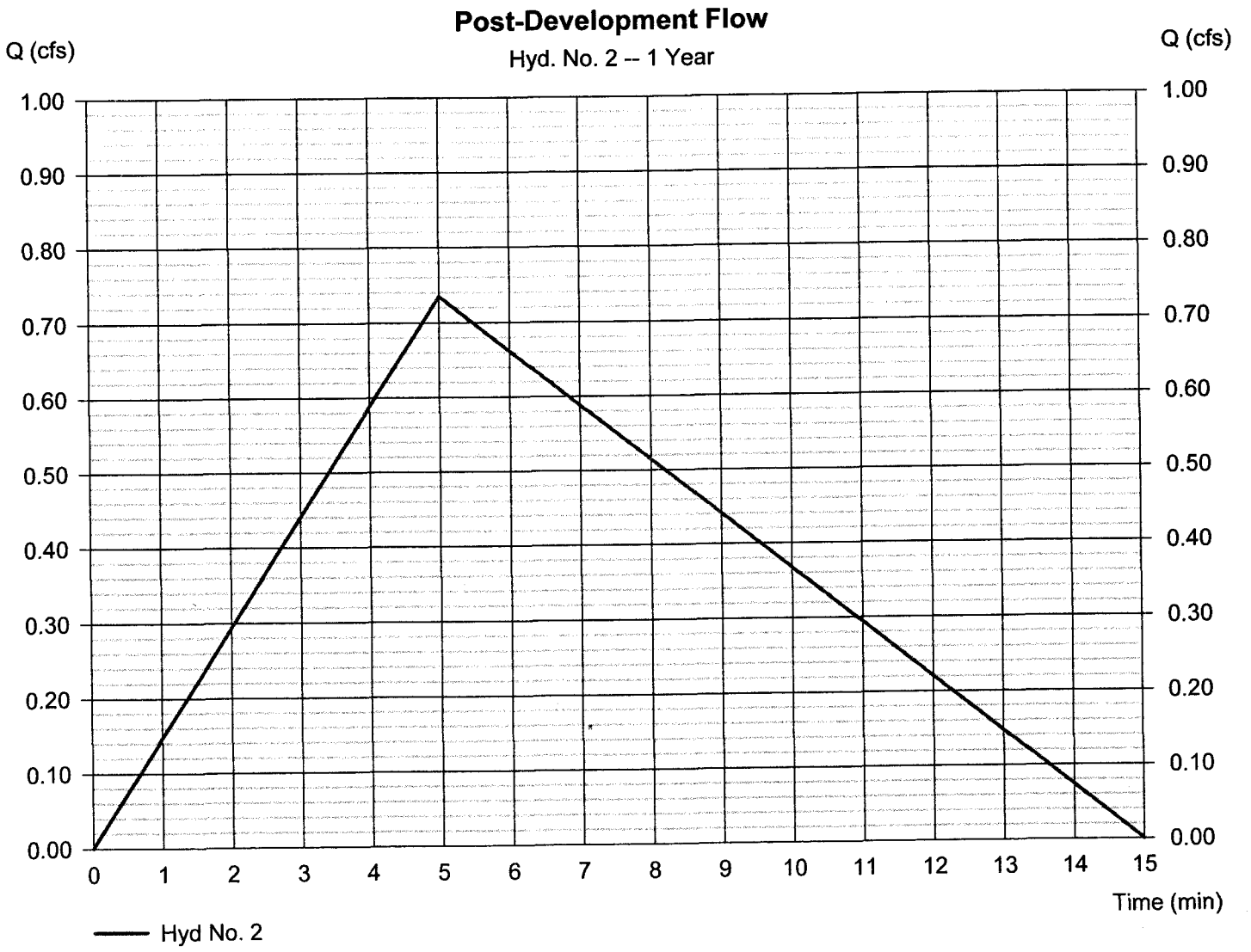
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.735 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 331 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

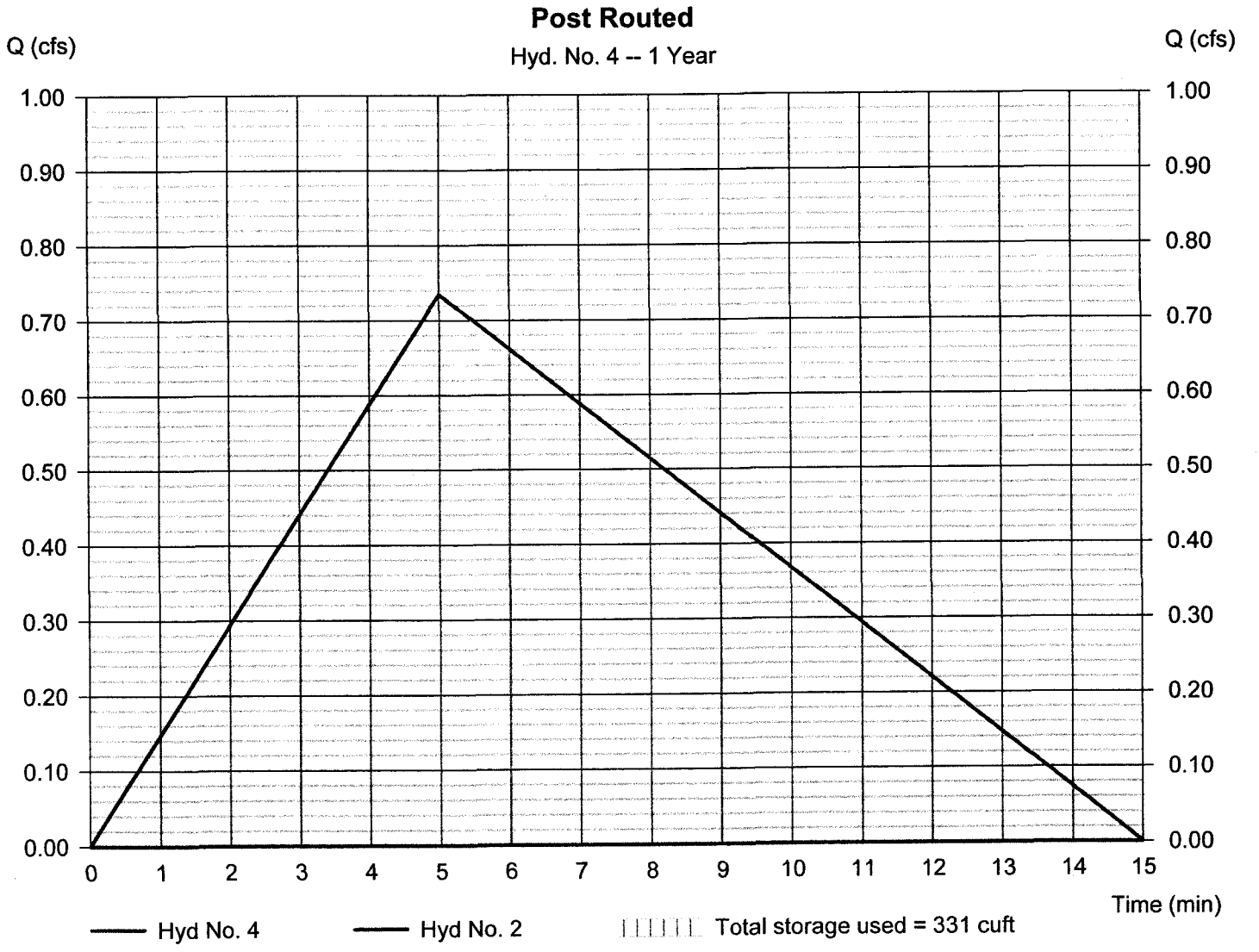
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.47 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 331 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Pond No. 1 - Bioretention Facility #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.00	319	0	0
1.00	105.00	1,188	707	707
1.25	105.25	2,600	462	1,170

Culvert / Orifice Structures

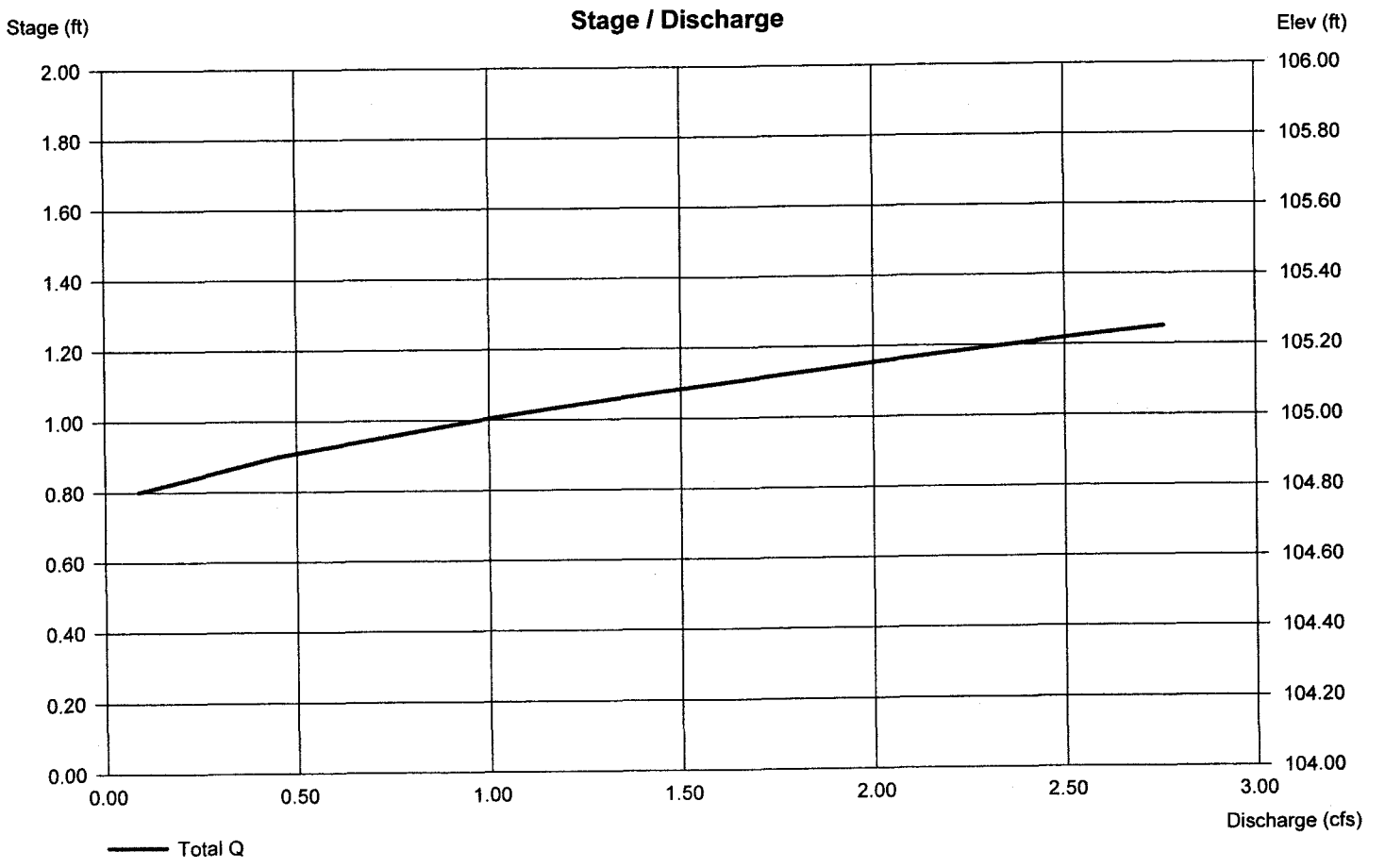
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 104.75	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.474	1	5	213	------	------	------	Pre-Development Flow
2	Rational	0.868	1	5	390	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	104.55	390	Post Routed

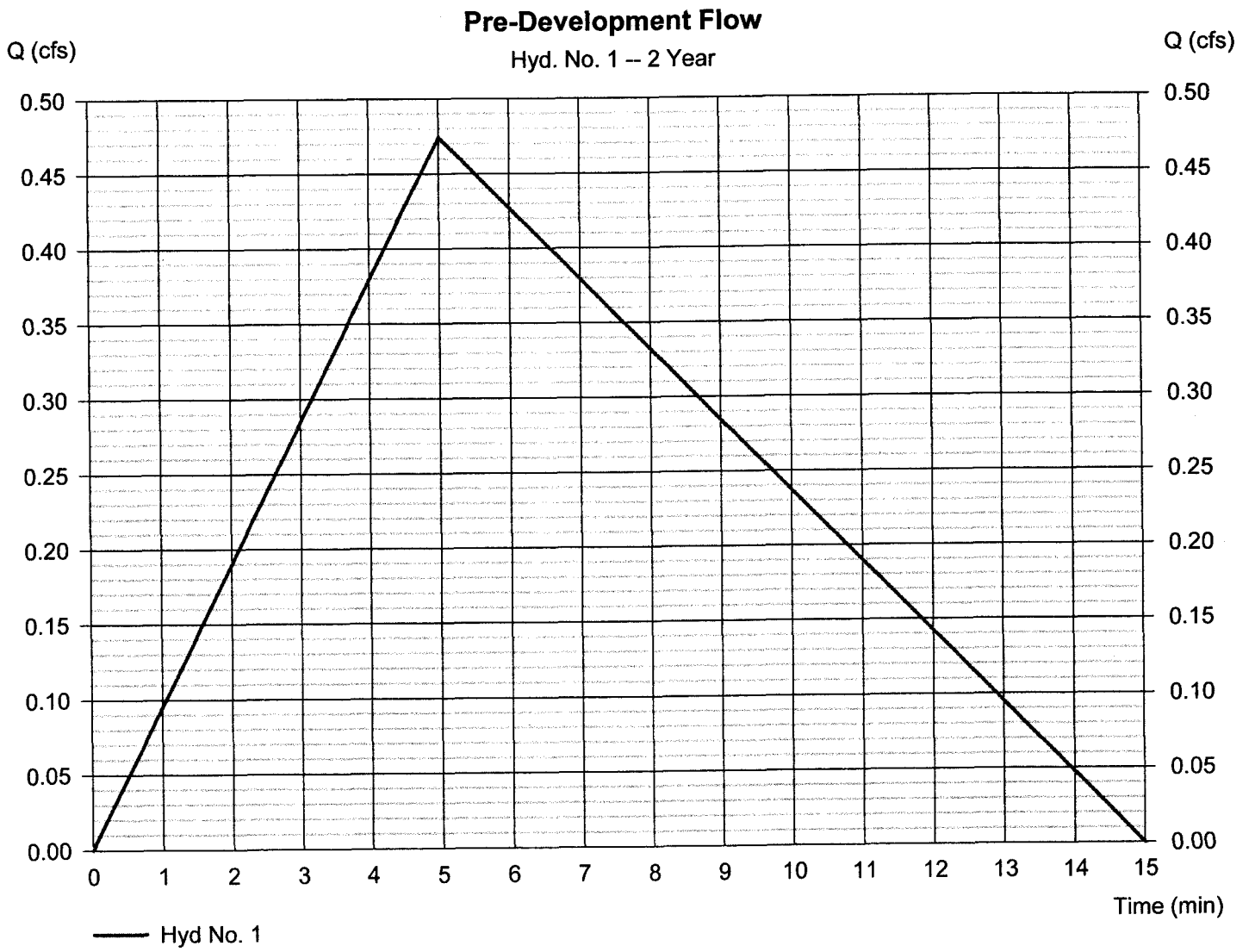
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.474 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 213 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



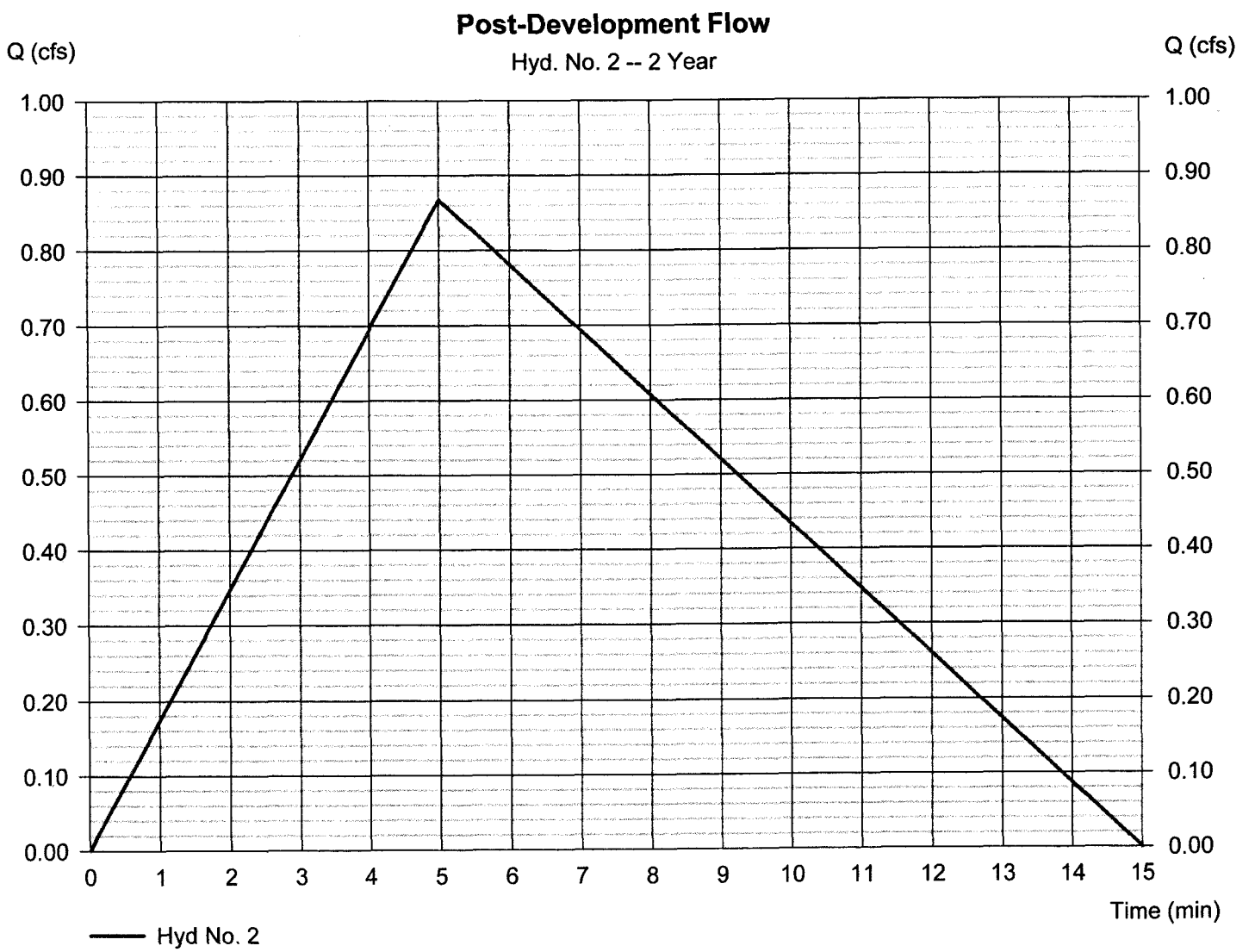
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.868 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 390 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

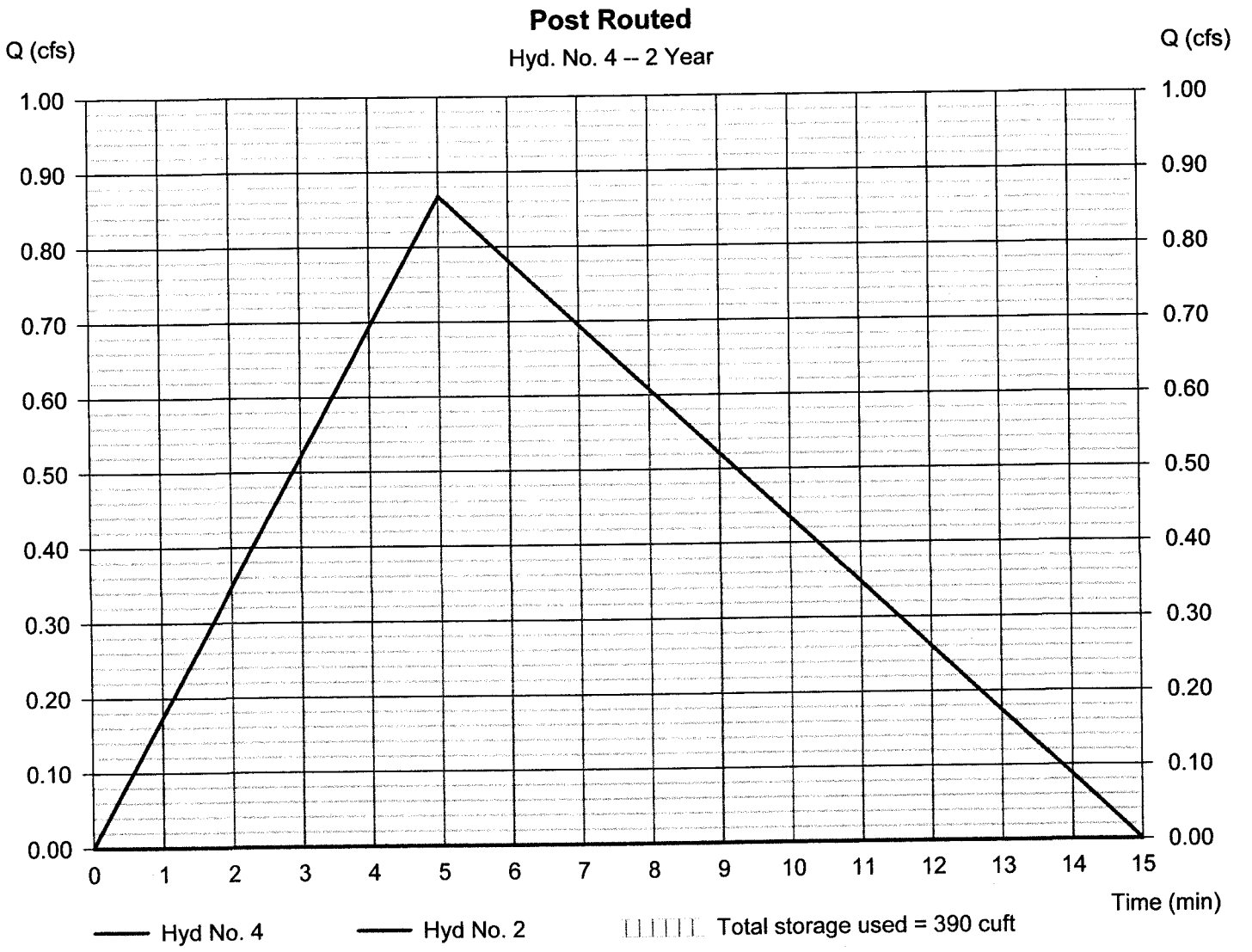
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.55 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 390 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.615	1	5	277	------	------	------	Pre-Development Flow
2	Rational	1.124	1	5	506	------	------	------	Post-Development Flow
4	Reservoir	0.012	1	15	10	2	104.71	505	Post Routed

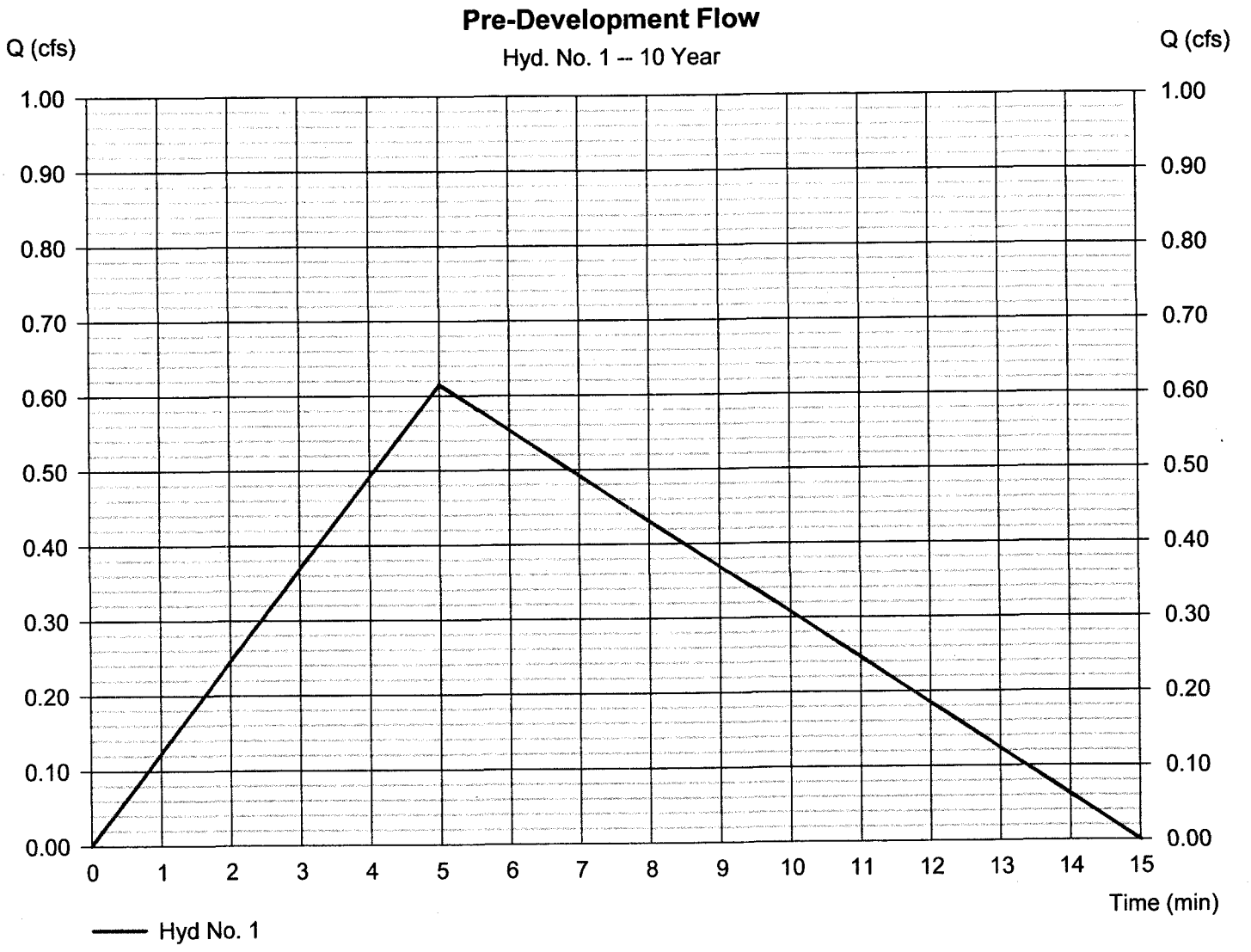
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.615 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 277 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



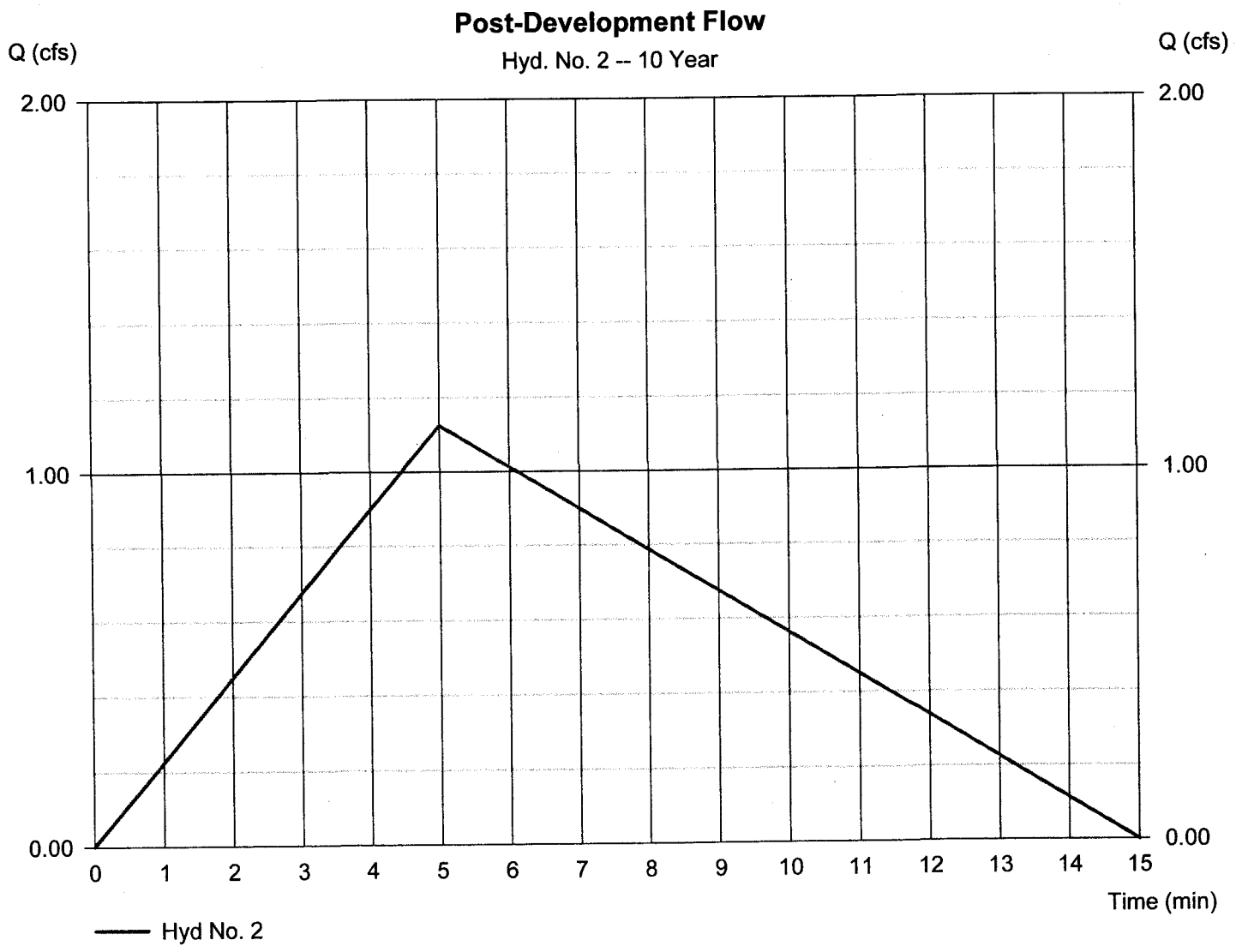
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.124 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 506 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

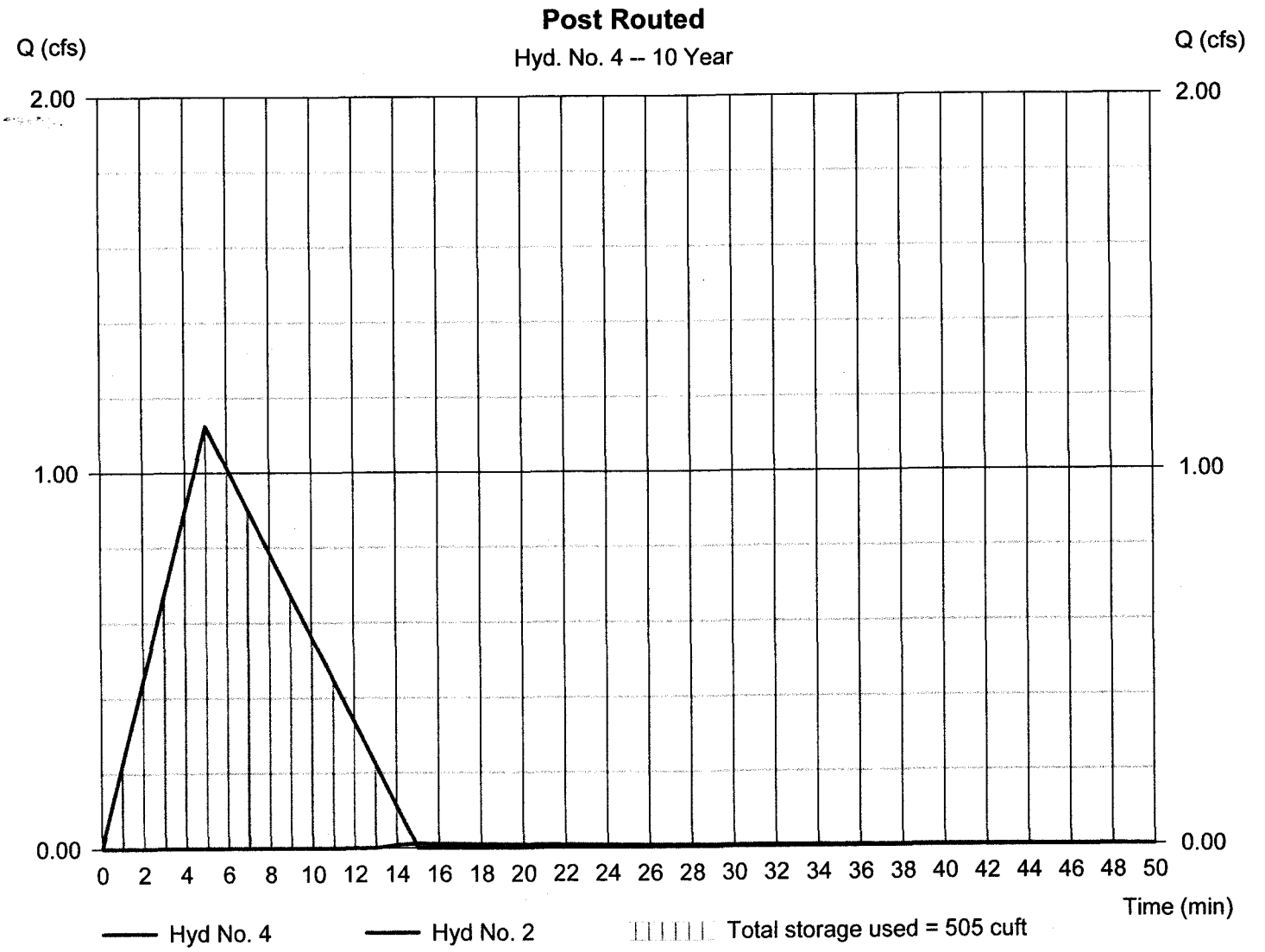
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.012 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 10 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.71 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 505 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.819	1	5	369	------	------	------	Pre-Development Flow
2	Rational	1.498	1	5	674	------	------	------	Post-Development Flow
4	Reservoir	0.317	1	13	178	2	104.86	610	Post Routed

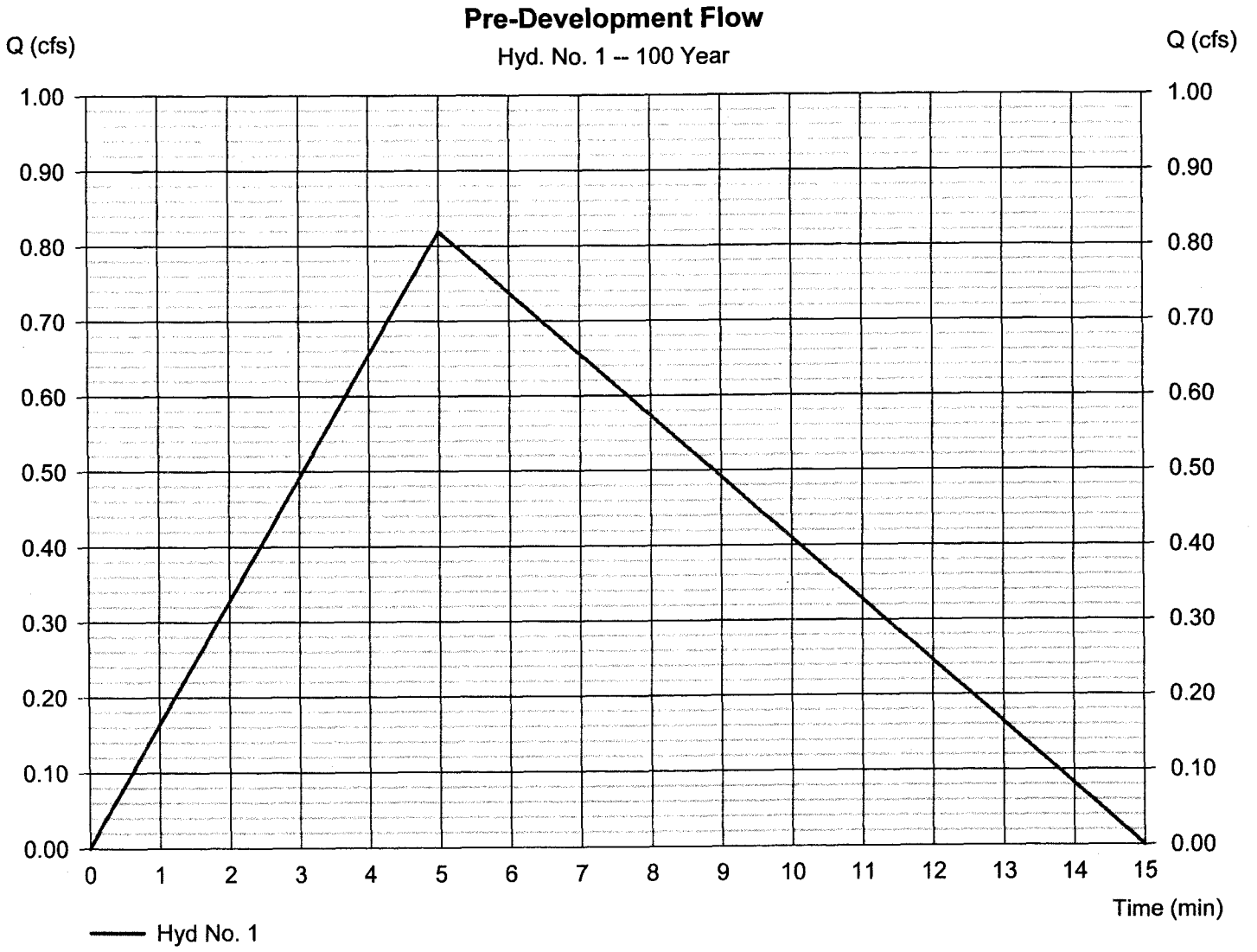
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.819 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 369 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



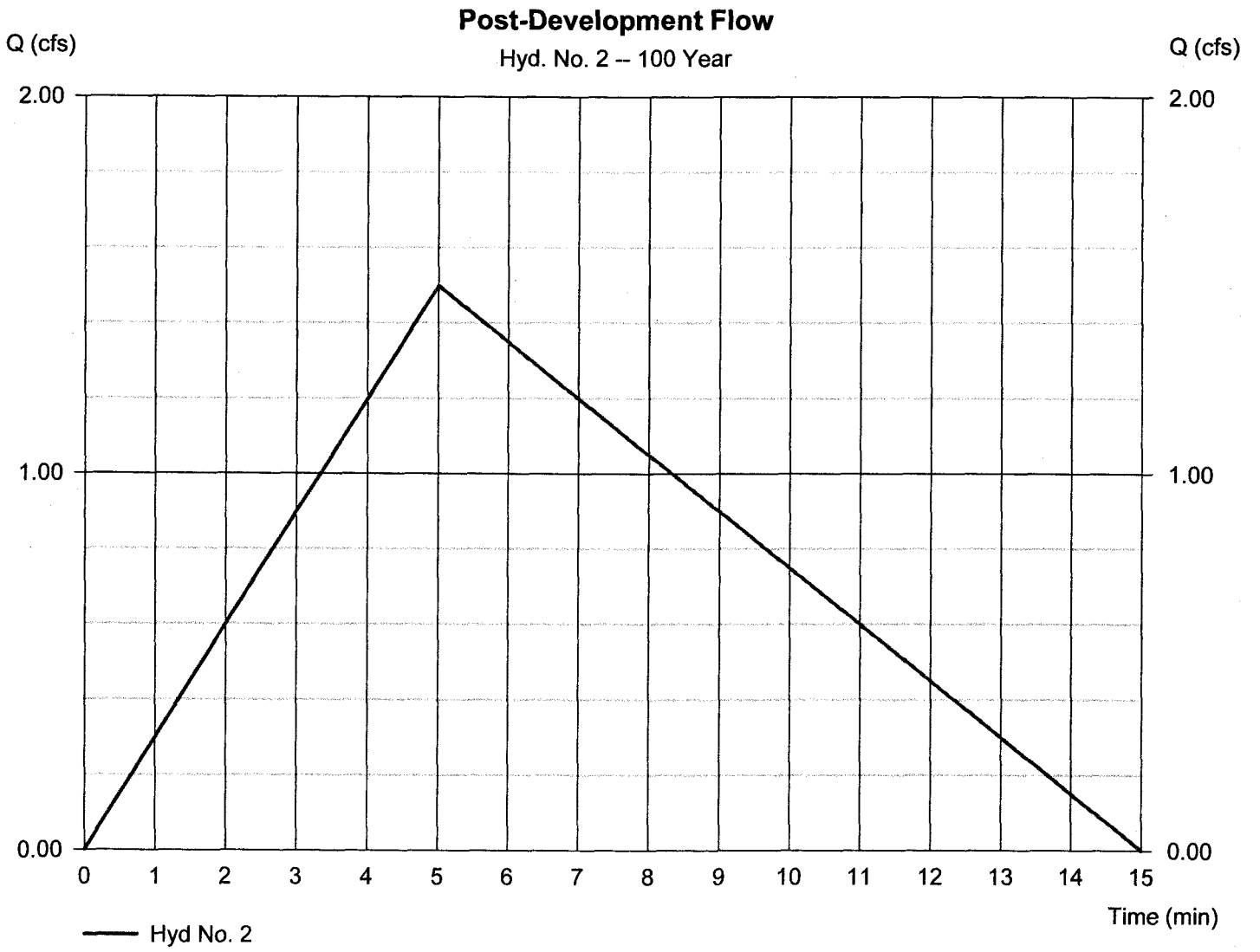
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.498 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 674 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

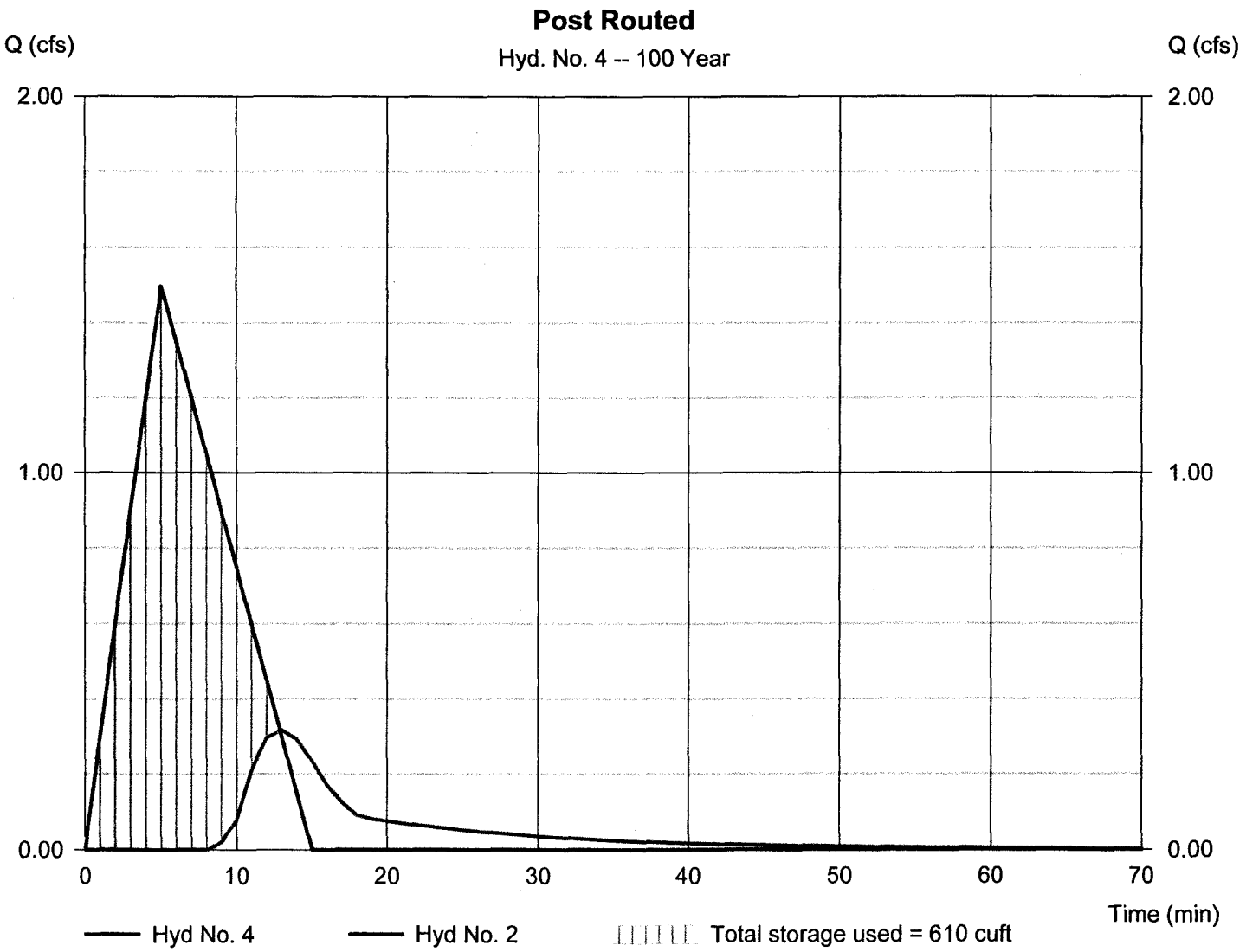
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 178 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.86 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 610 cuft

Storage Indication method used.



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.323	1	5	145	------	------	------	Pre-Development Flow
2	Rational	0.808	1	5	364	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.20	364	Post Routed

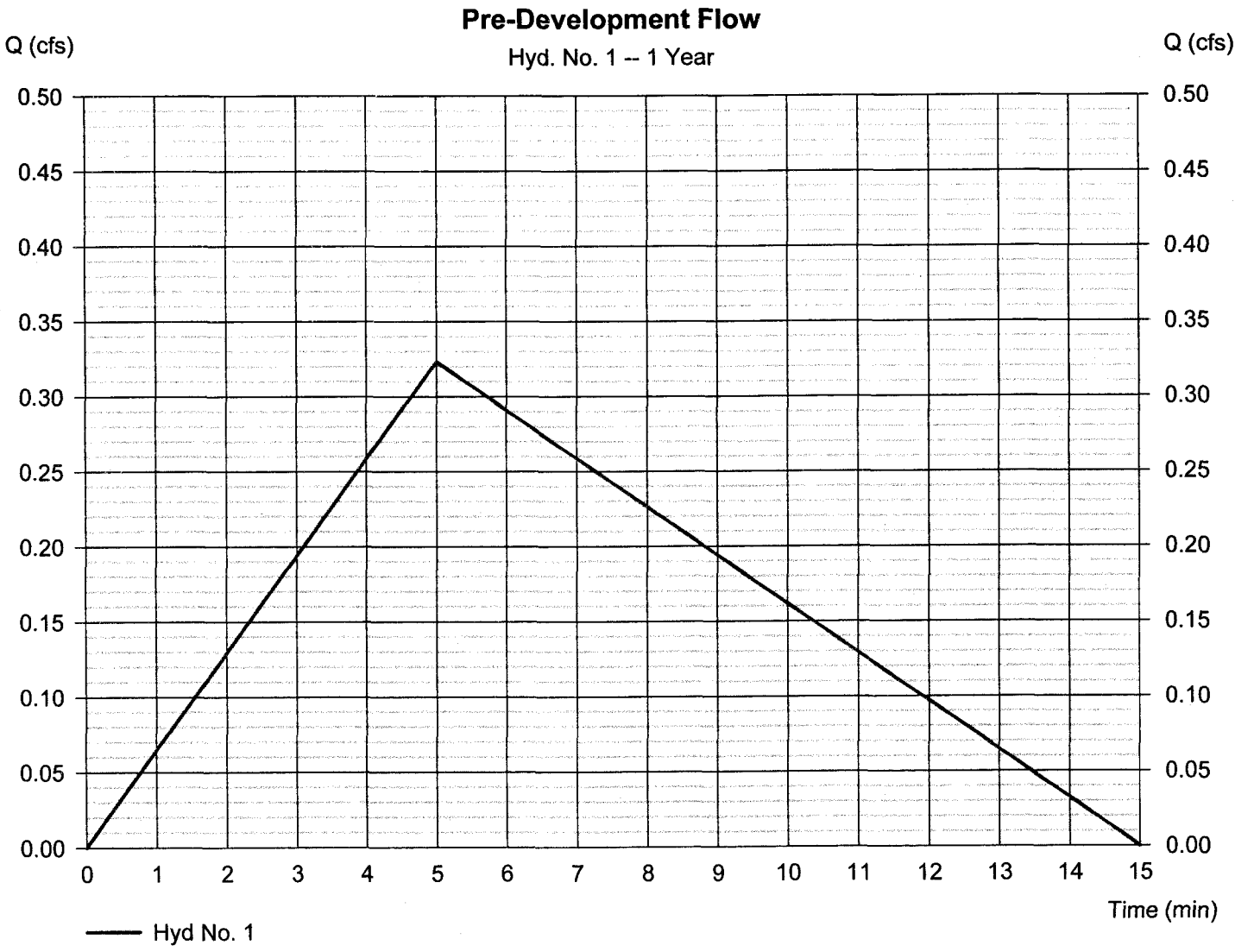
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.323 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 145 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



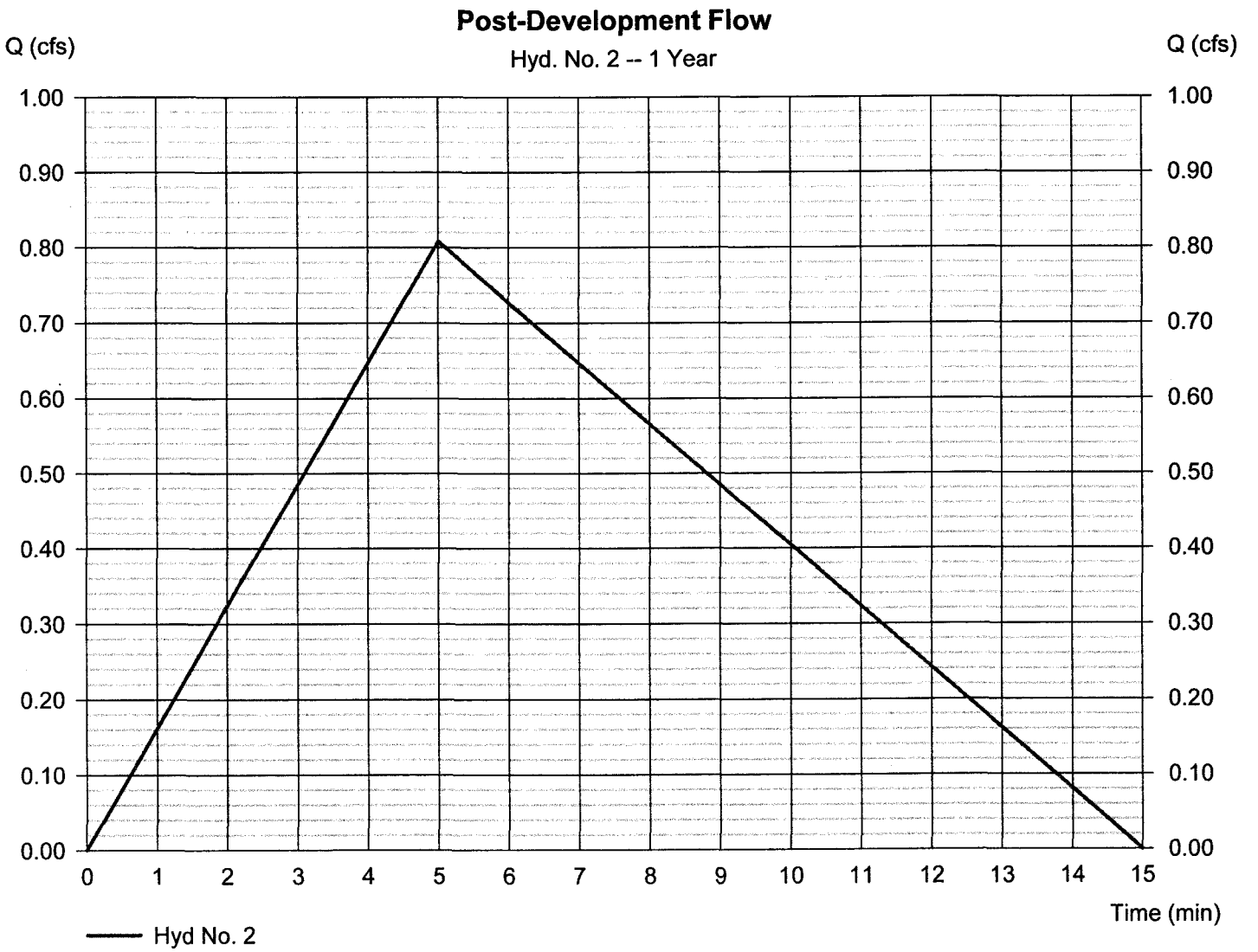
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.808 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 364 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

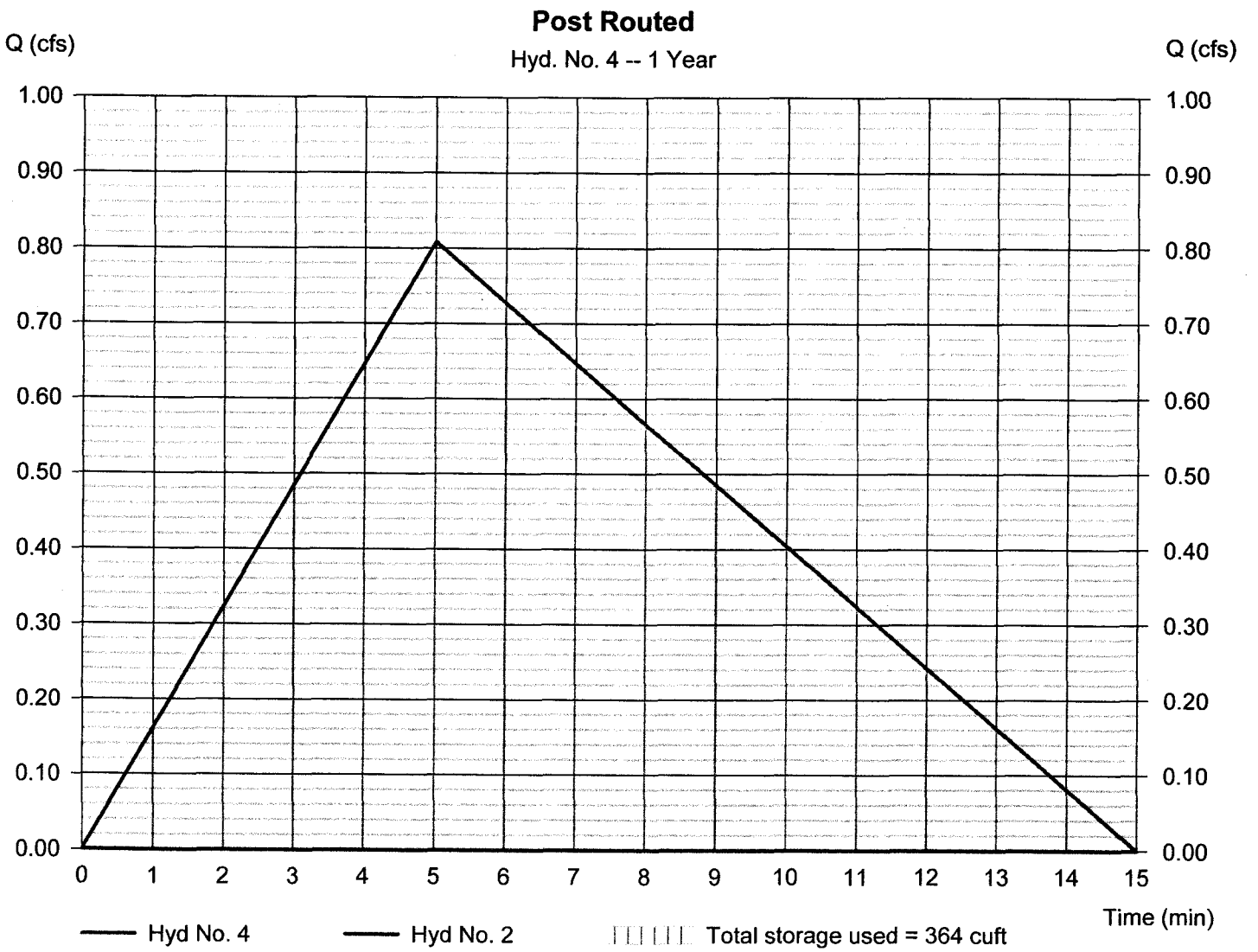
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.20 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 364 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Pond No. 1 - Bioretention Facility #2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.57 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.57	321	0	0
0.43	105.00	565	188	188
0.78	105.35	1,245	309	497
1.43	105.70	4,500	1,757	2,254

Culvert / Orifice Structures

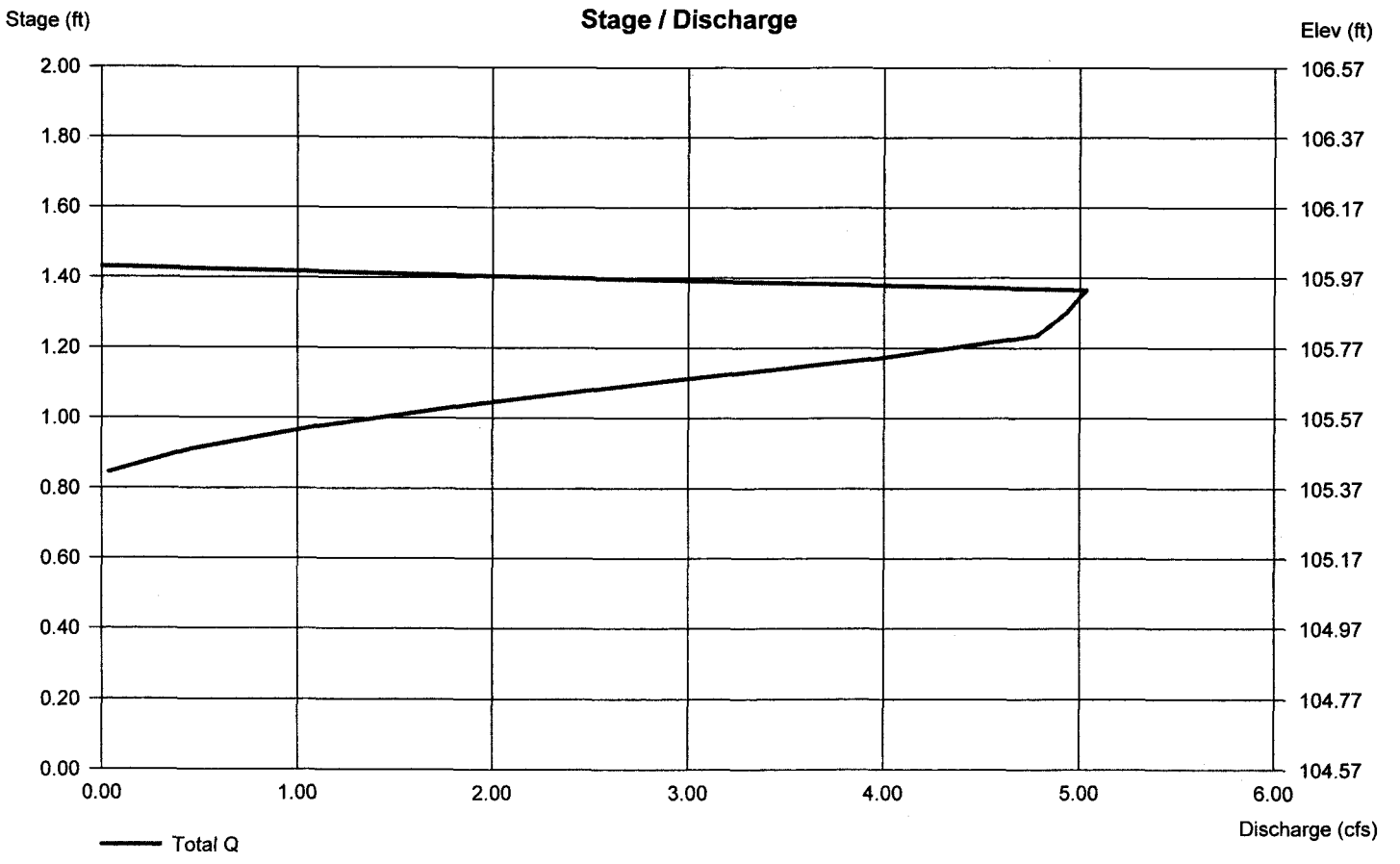
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 101.90	0.00	0.00	0.00
Length (ft)	= 99.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 105.40	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.382	1	5	172	------	------	------	Pre-Development Flow
2	Rational	0.954	1	5	429	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.27	429	Post Routed

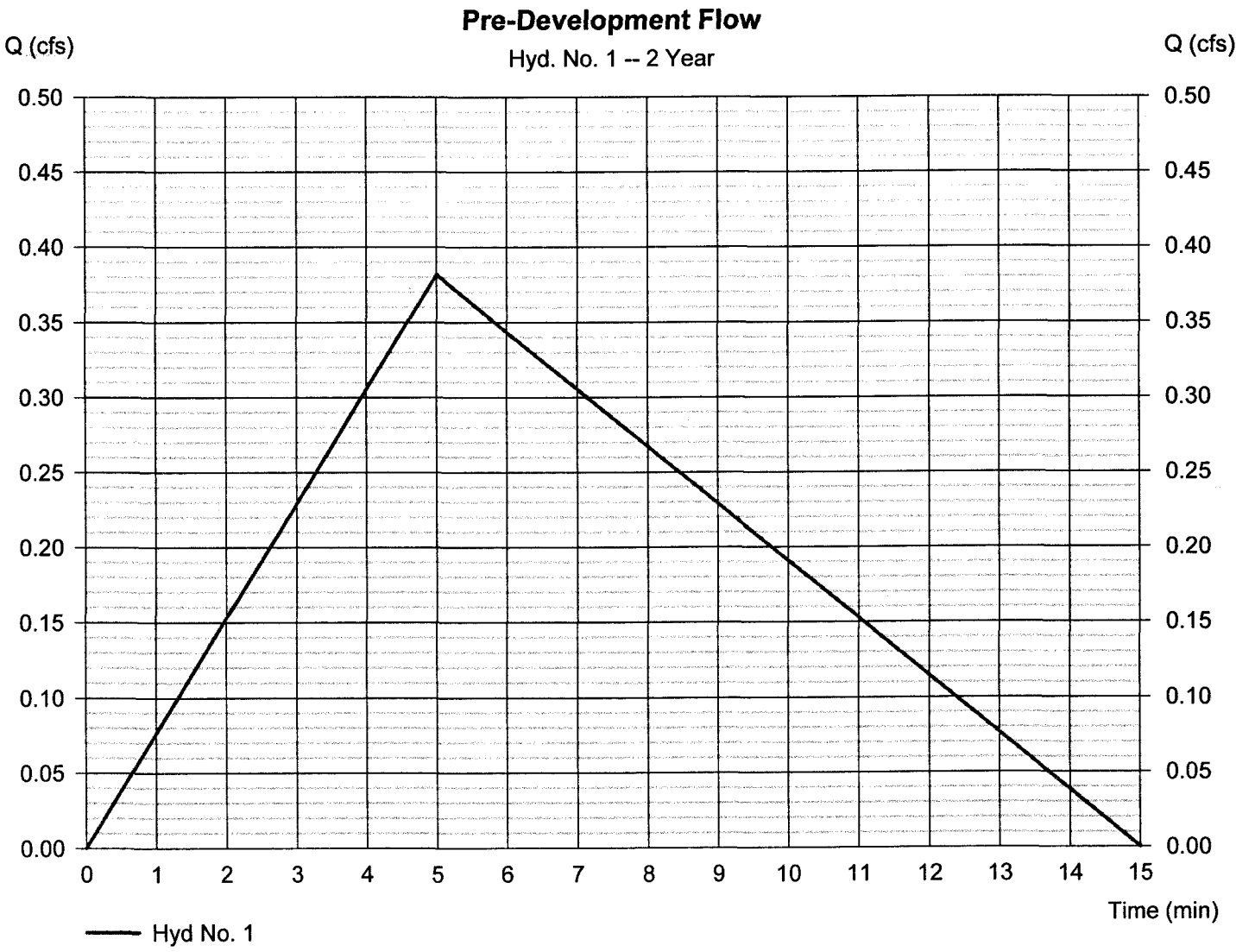
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.382 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 172 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



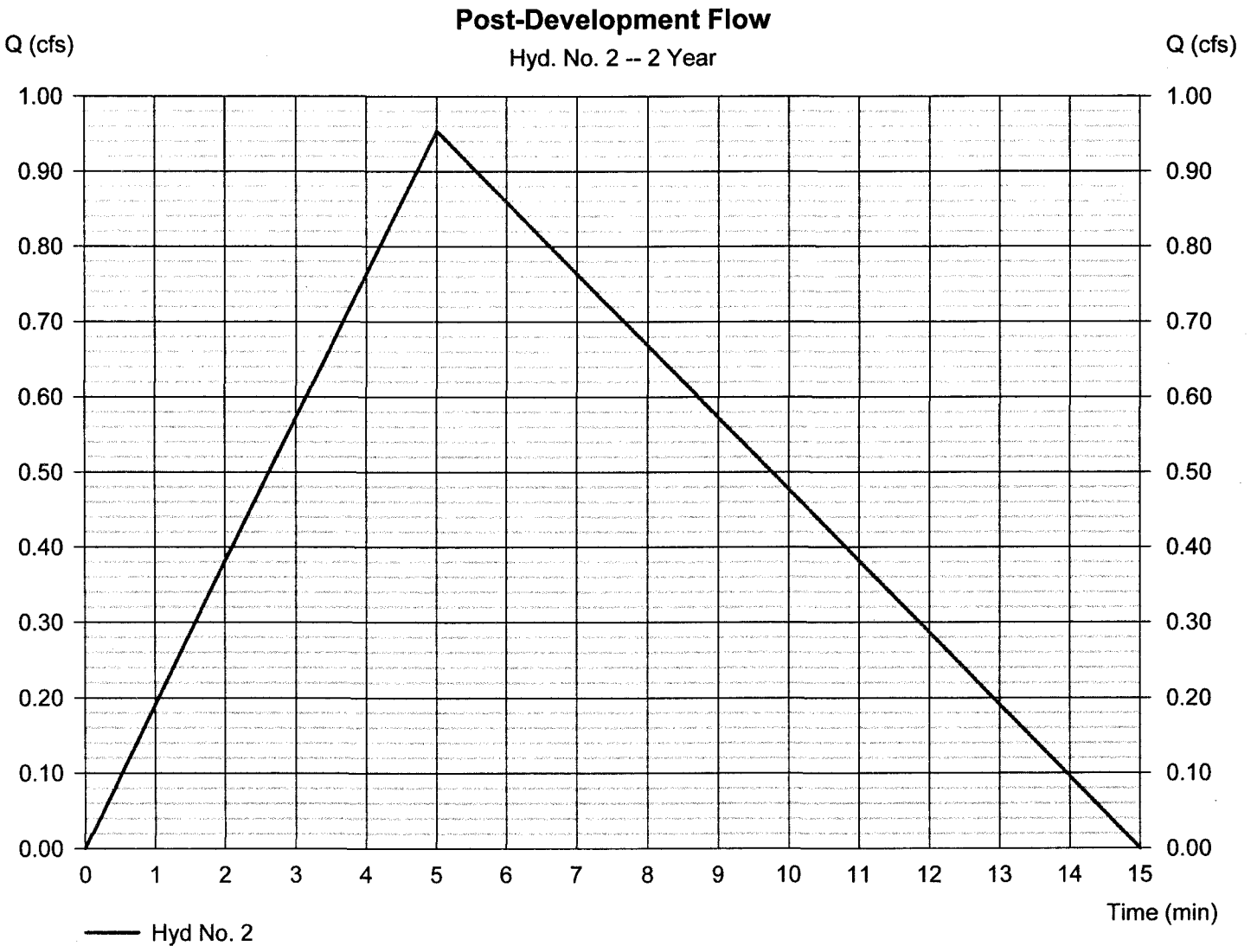
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.954 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 429 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

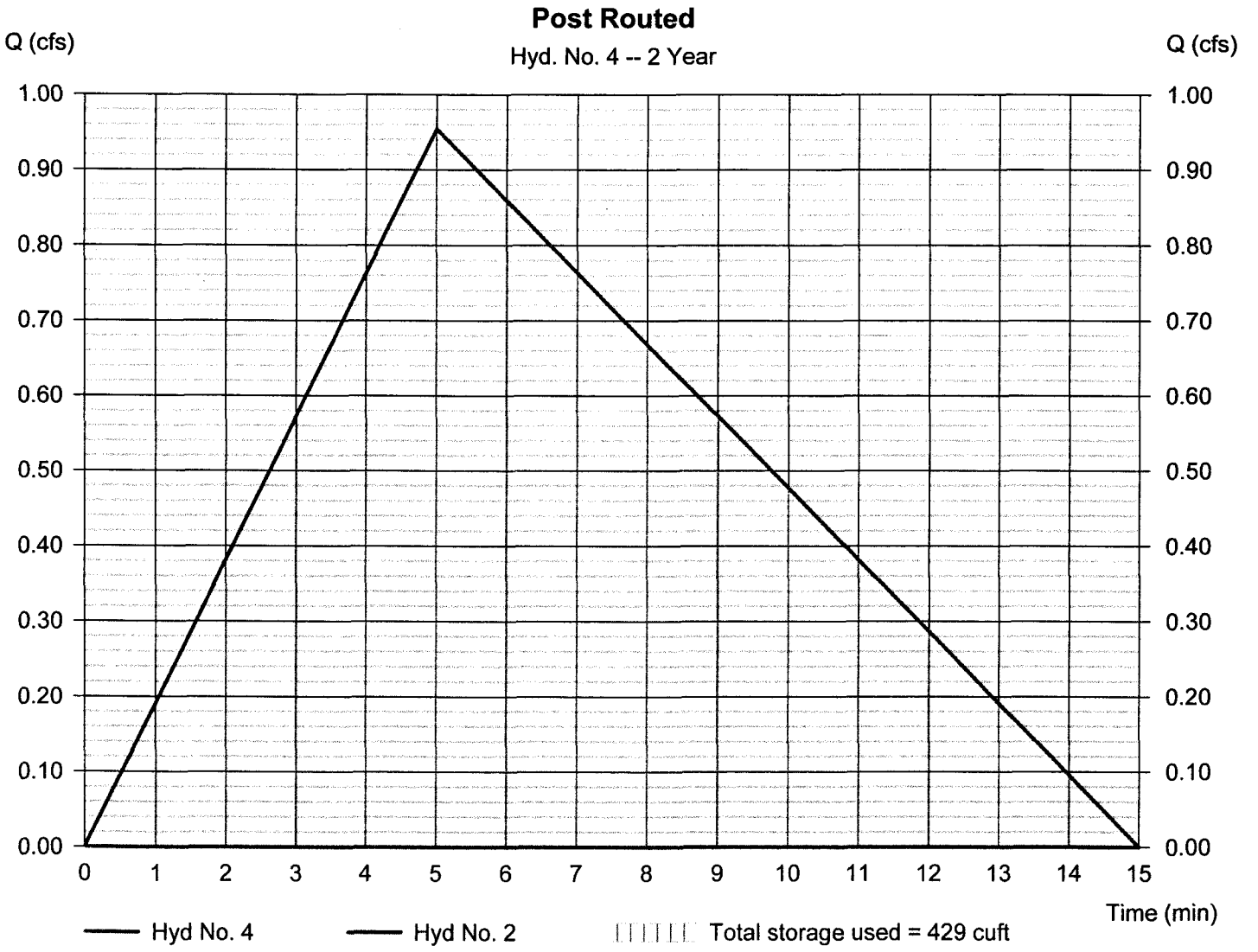
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.27 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 429 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.495	1	5	223	------	------	------	Pre-Development Flow
2	Rational	1.237	1	5	557	------	------	------	Post-Development Flow
4	Reservoir	0.012	1	15	55	2	105.37	555	Post Routed

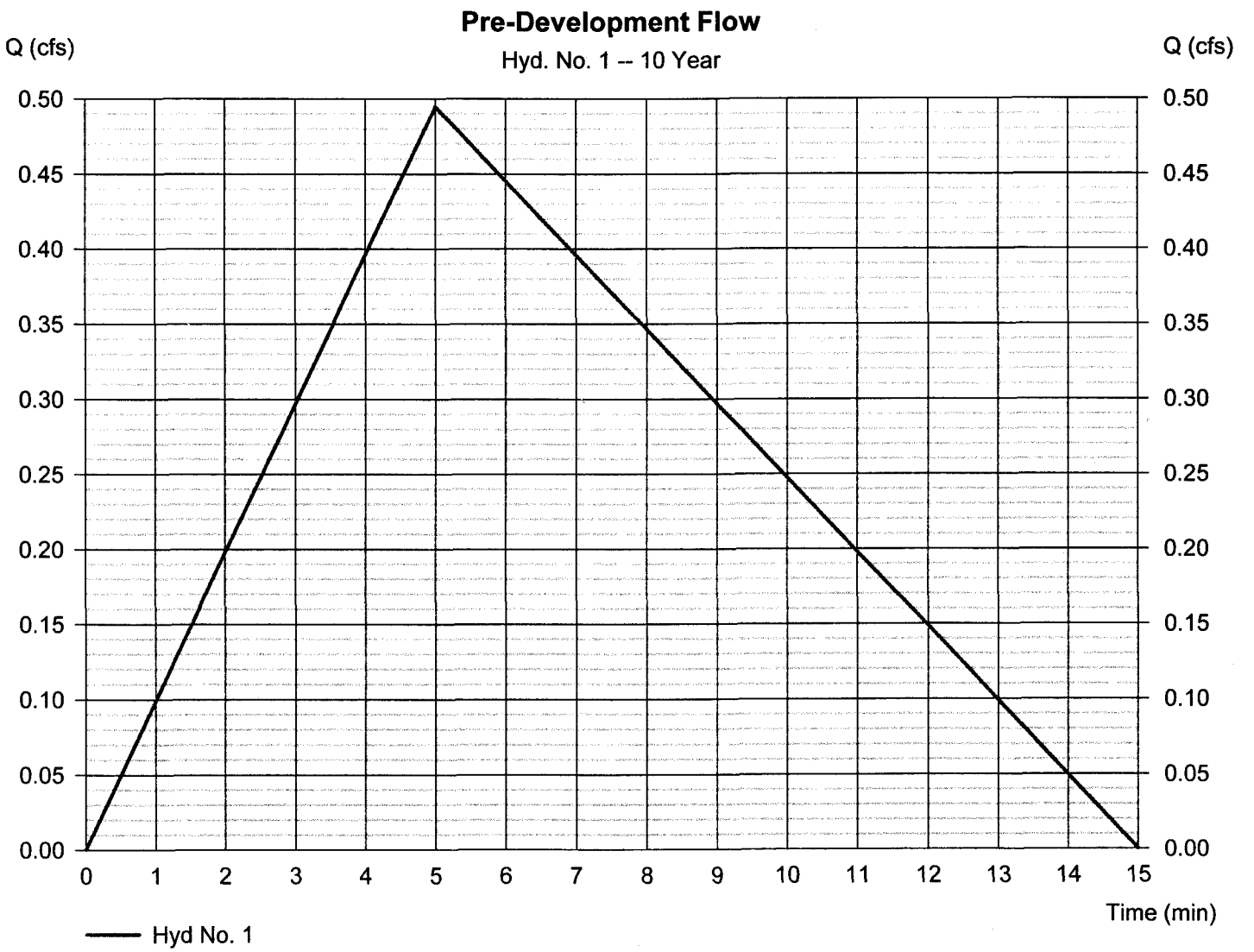
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.495 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 223 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



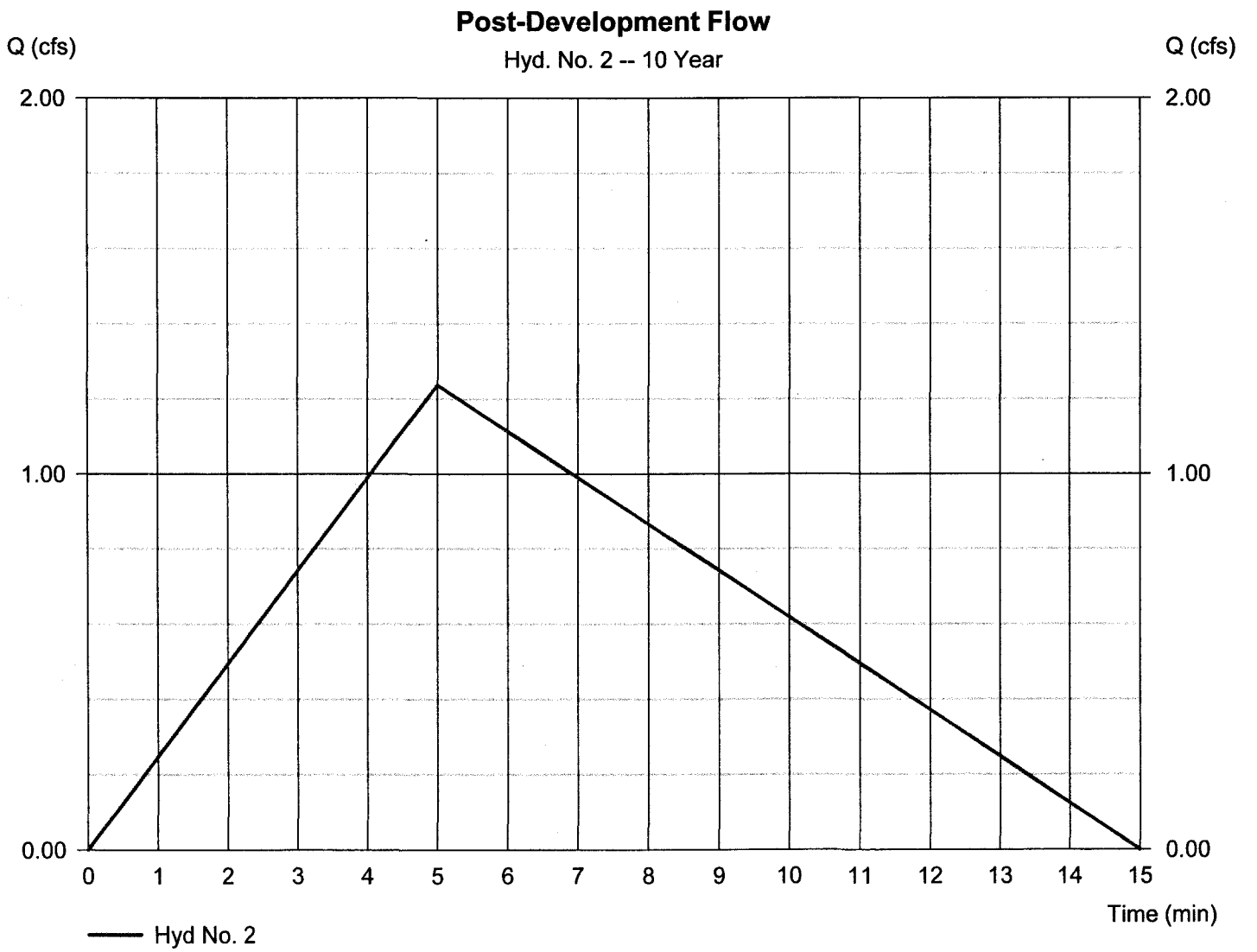
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.237 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 557 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

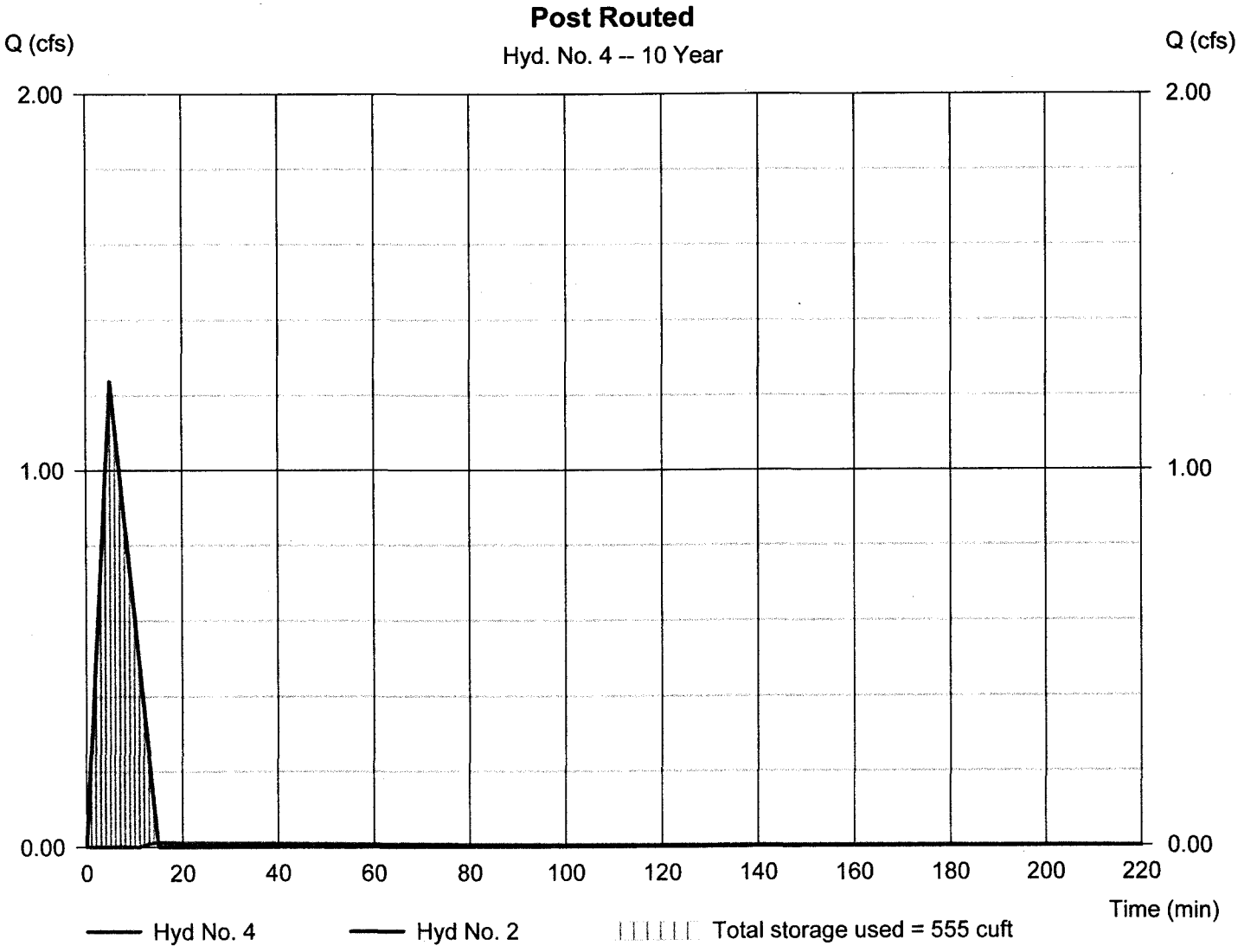
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.012 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 55 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.37 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 555 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.659	1	5	297	------	------	------	Pre-Development Flow
2	Rational	1.648	1	5	742	------	------	------	Post-Development Flow
4	Reservoir	0.139	1	14	240	2	105.43	716	Post Routed

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.659 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 297 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2

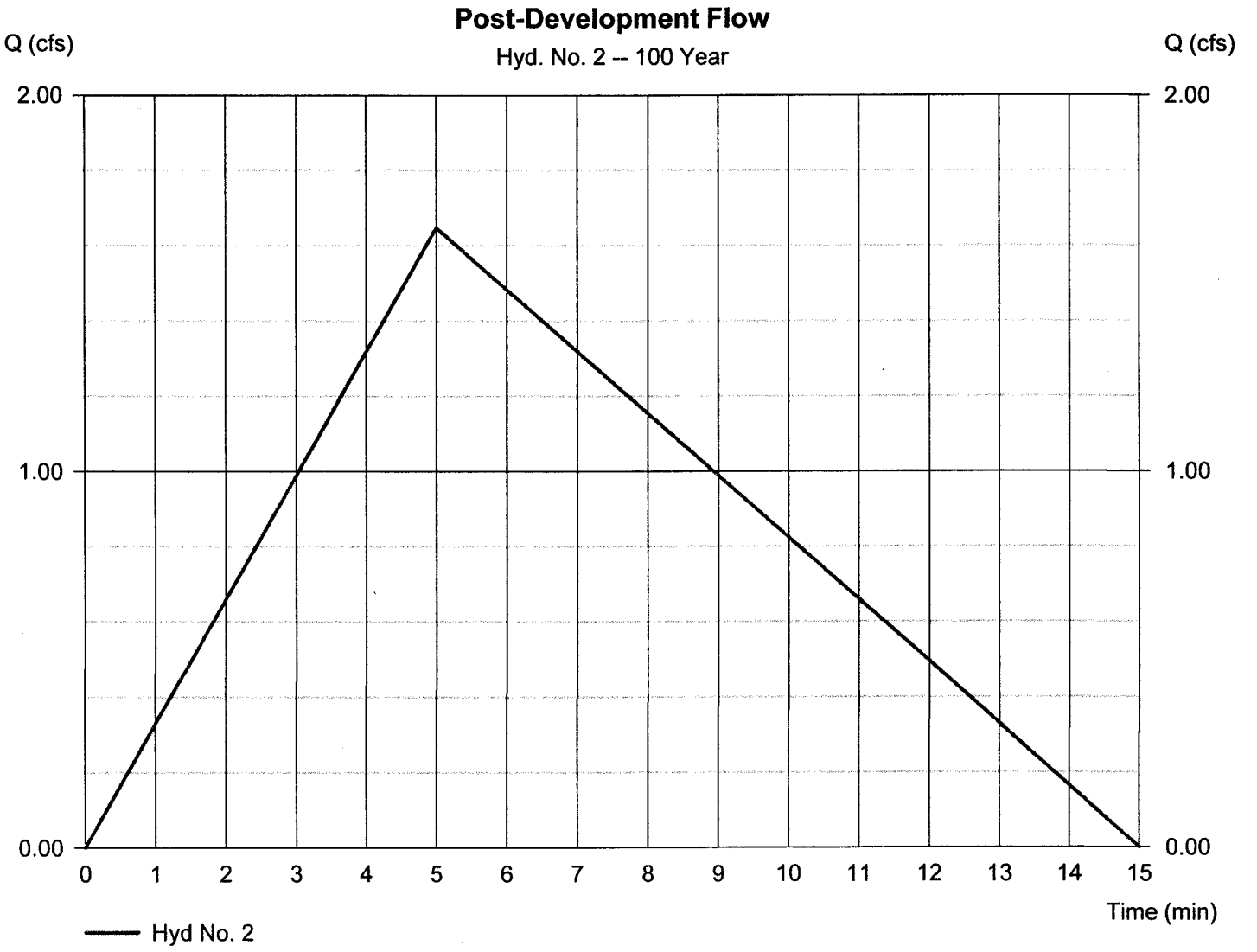
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.648 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 742 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

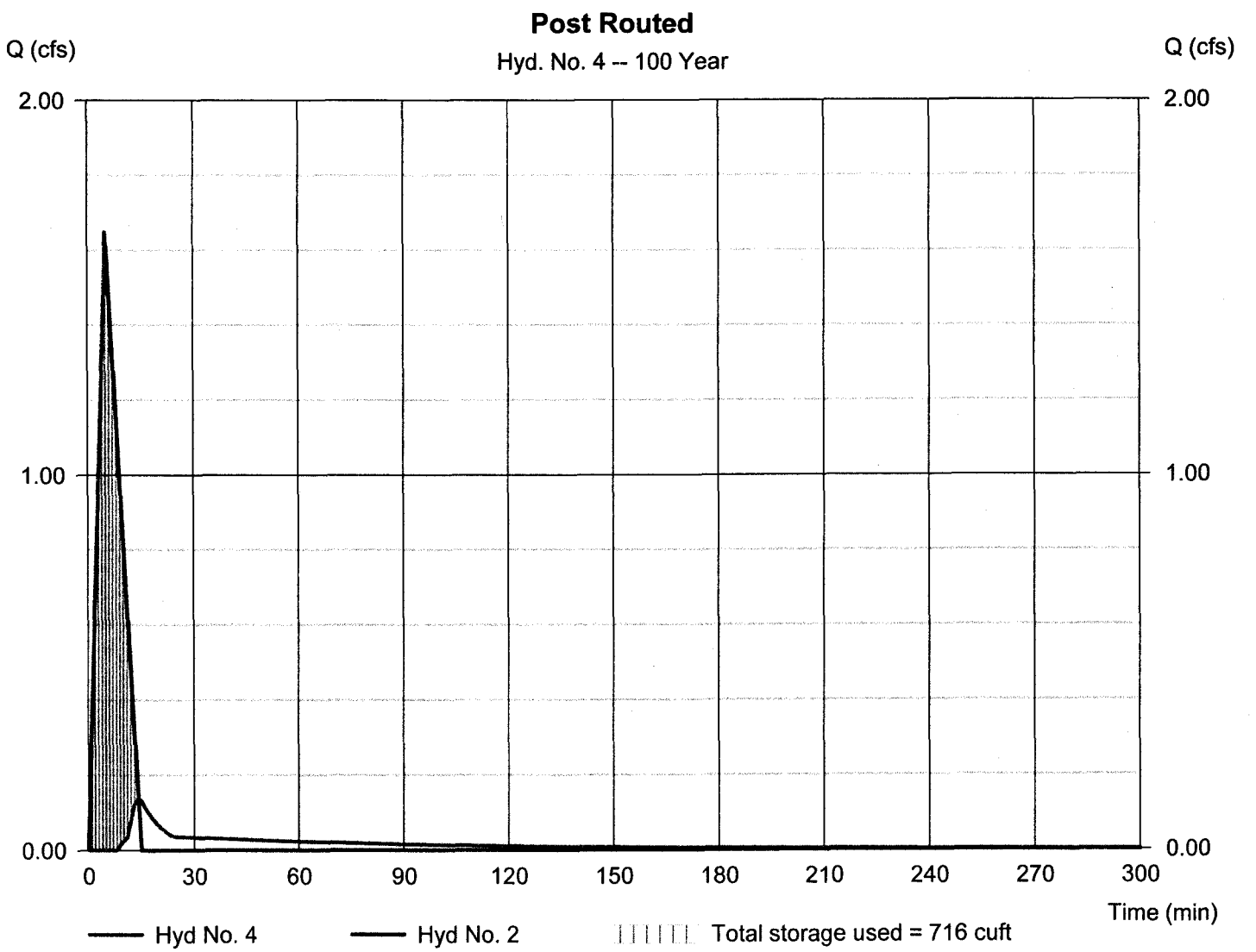
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.139 cfs
Storm frequency	= 100 yrs	Time to peak	= 14 min
Time interval	= 1 min	Hyd. volume	= 240 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.43 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 716 cuft

Storage Indication method used.



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9888-01_Bioretention Pond #3.gpw

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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.216	1	5	97	------	------	------	Pre-Development Flow
2	Rational	0.862	1	5	388	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.13	388	Post Routed

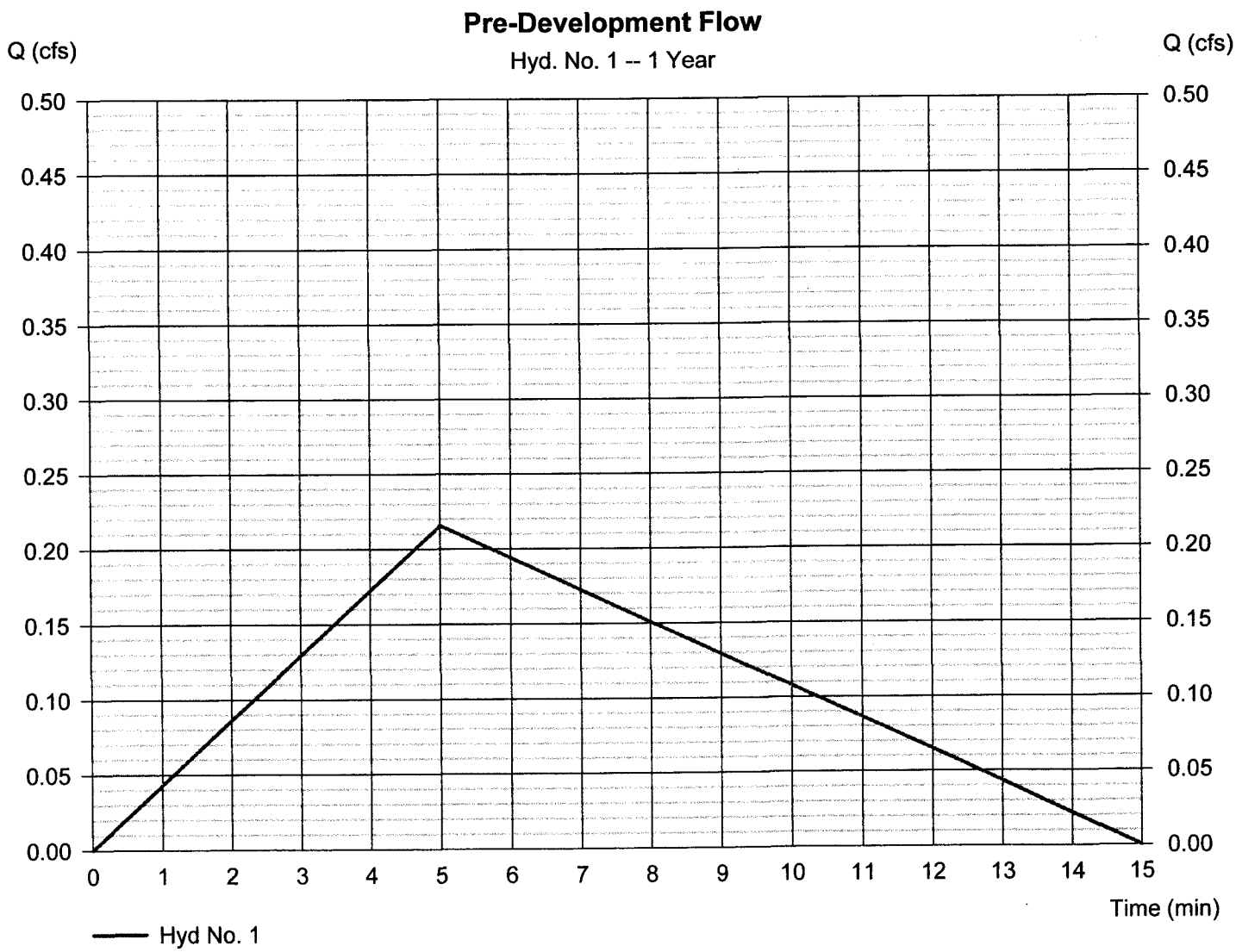
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.216 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 97 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



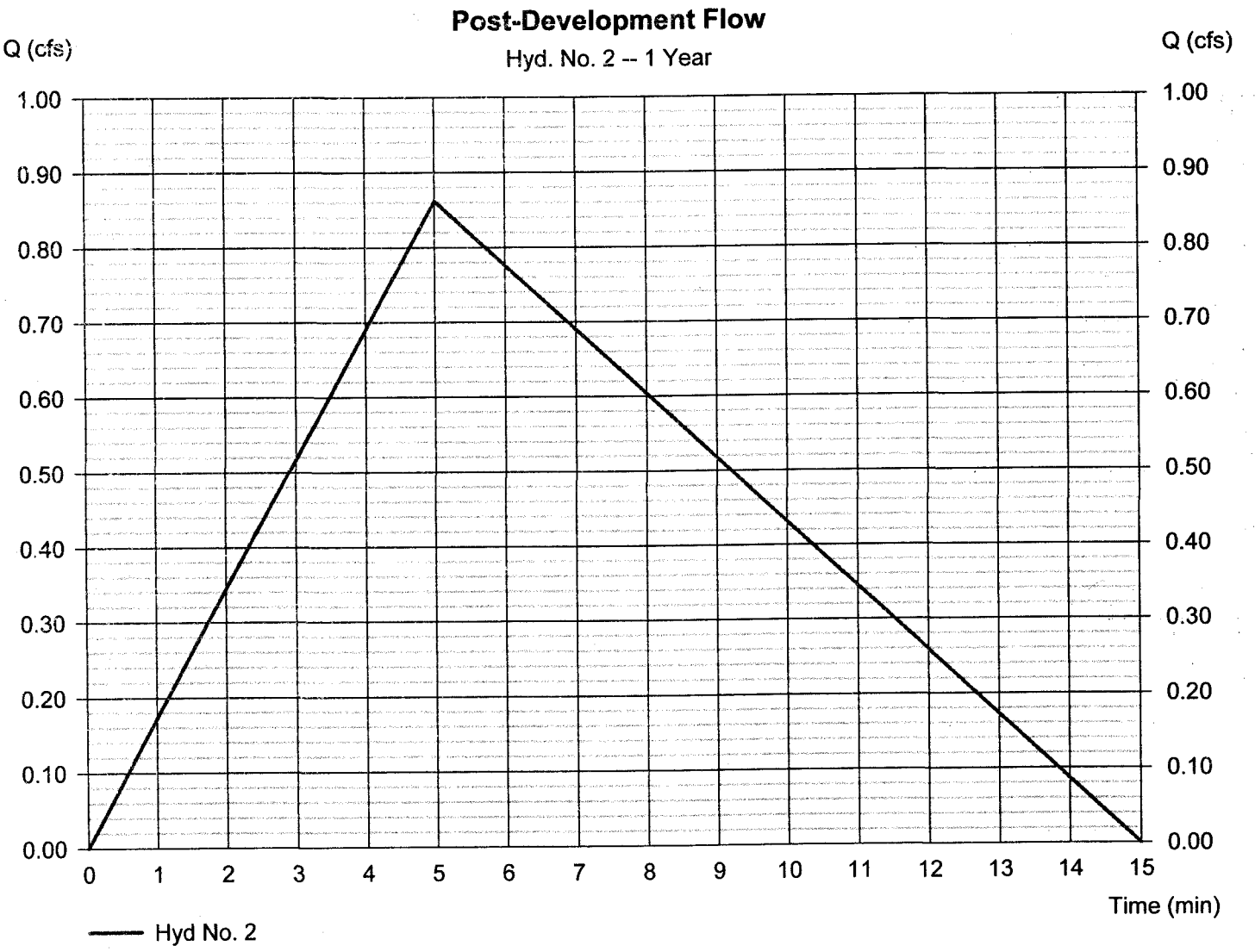
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.862 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 388 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

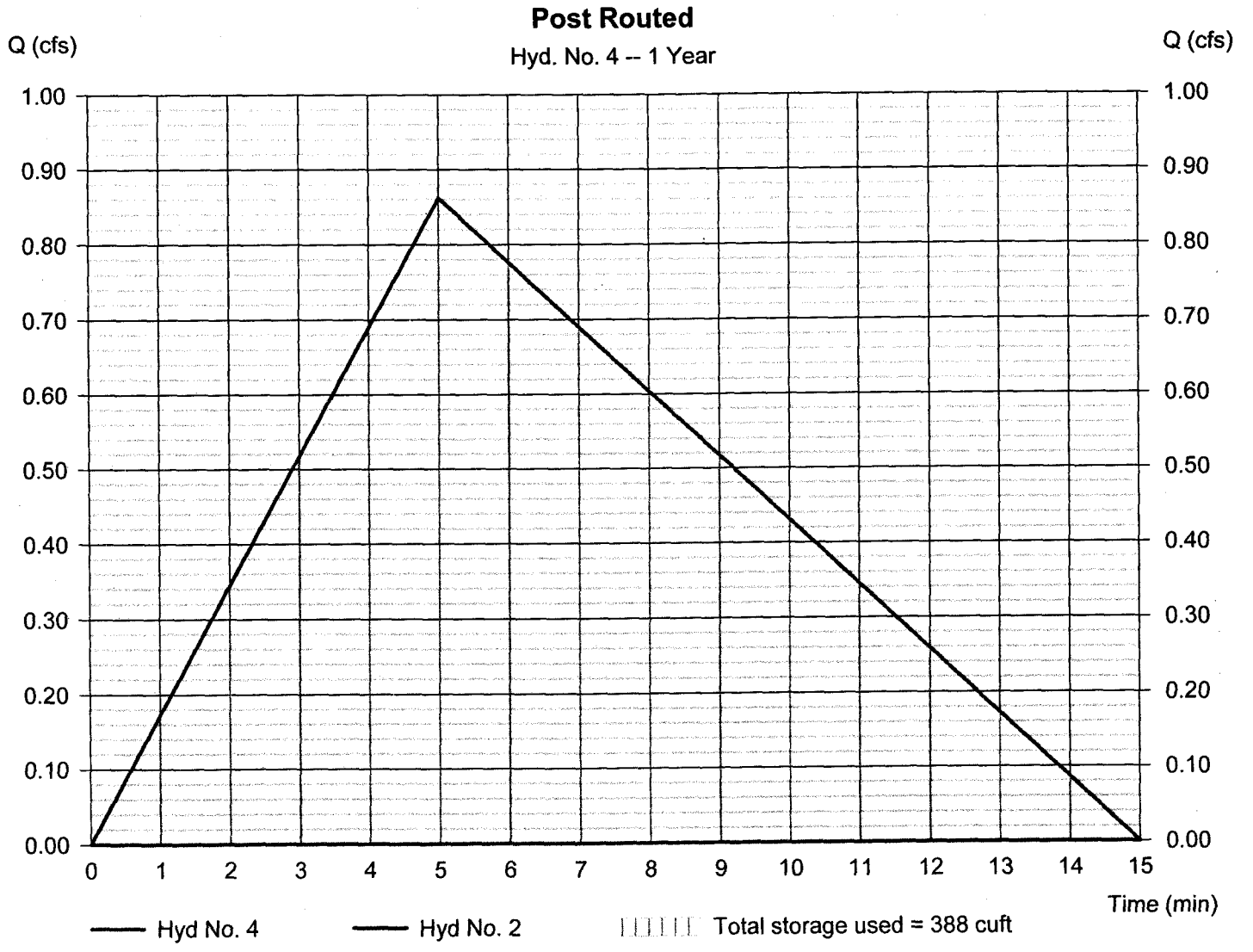
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.13 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 388 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Pond No. 1 - Bioretention Facility #3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.57 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.57	426	0	0
0.43	105.00	690	238	238
0.87	105.44	1,771	523	761
1.43	106.00	4,500	1,697	2,458

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 101.90	0.00	0.00	0.00
Length (ft)	= 99.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

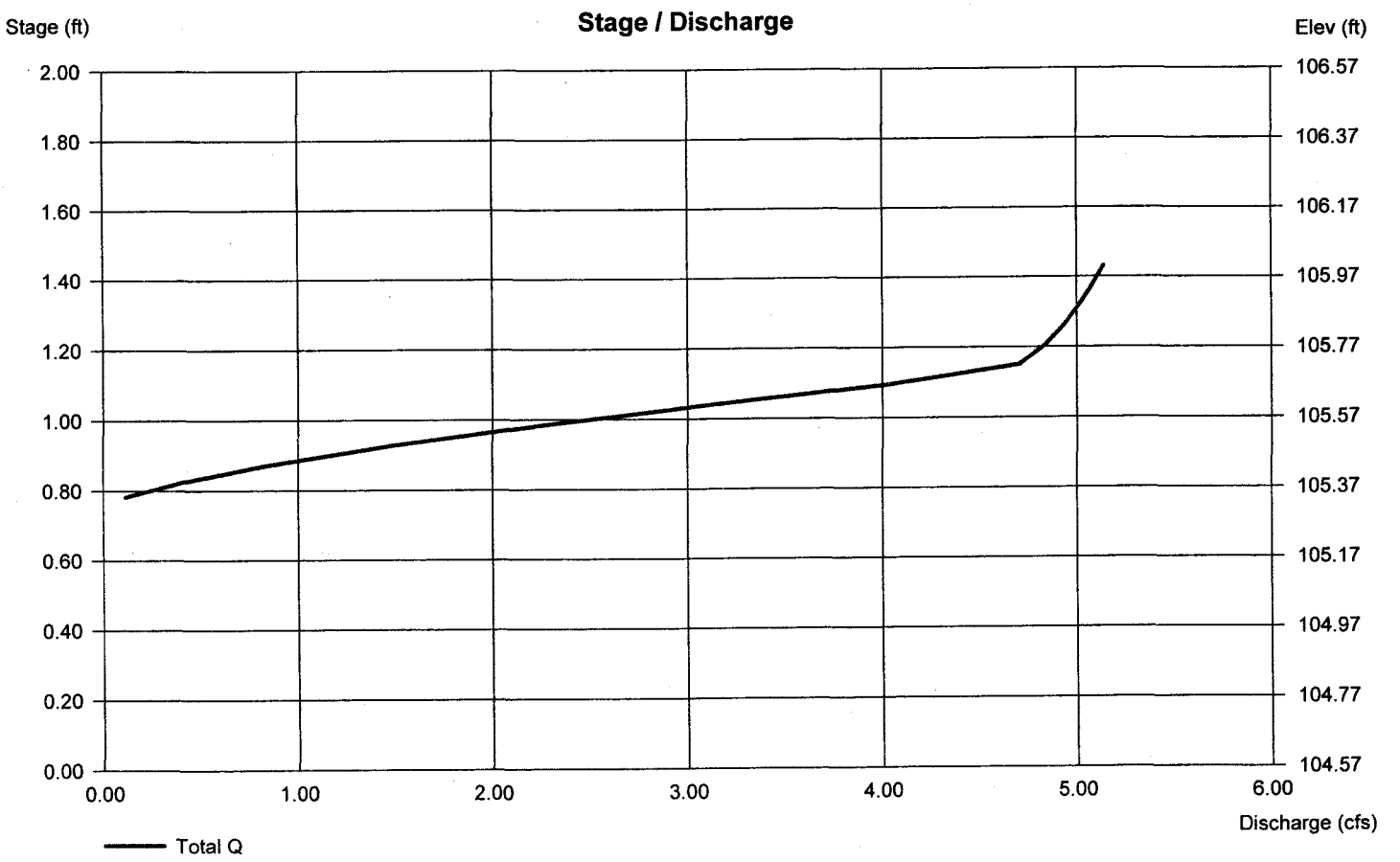
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 105.32	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.254	1	5	115	------	------	------	Pre-Development Flow
2	Rational	1.018	1	5	458	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.19	458	Post Routed

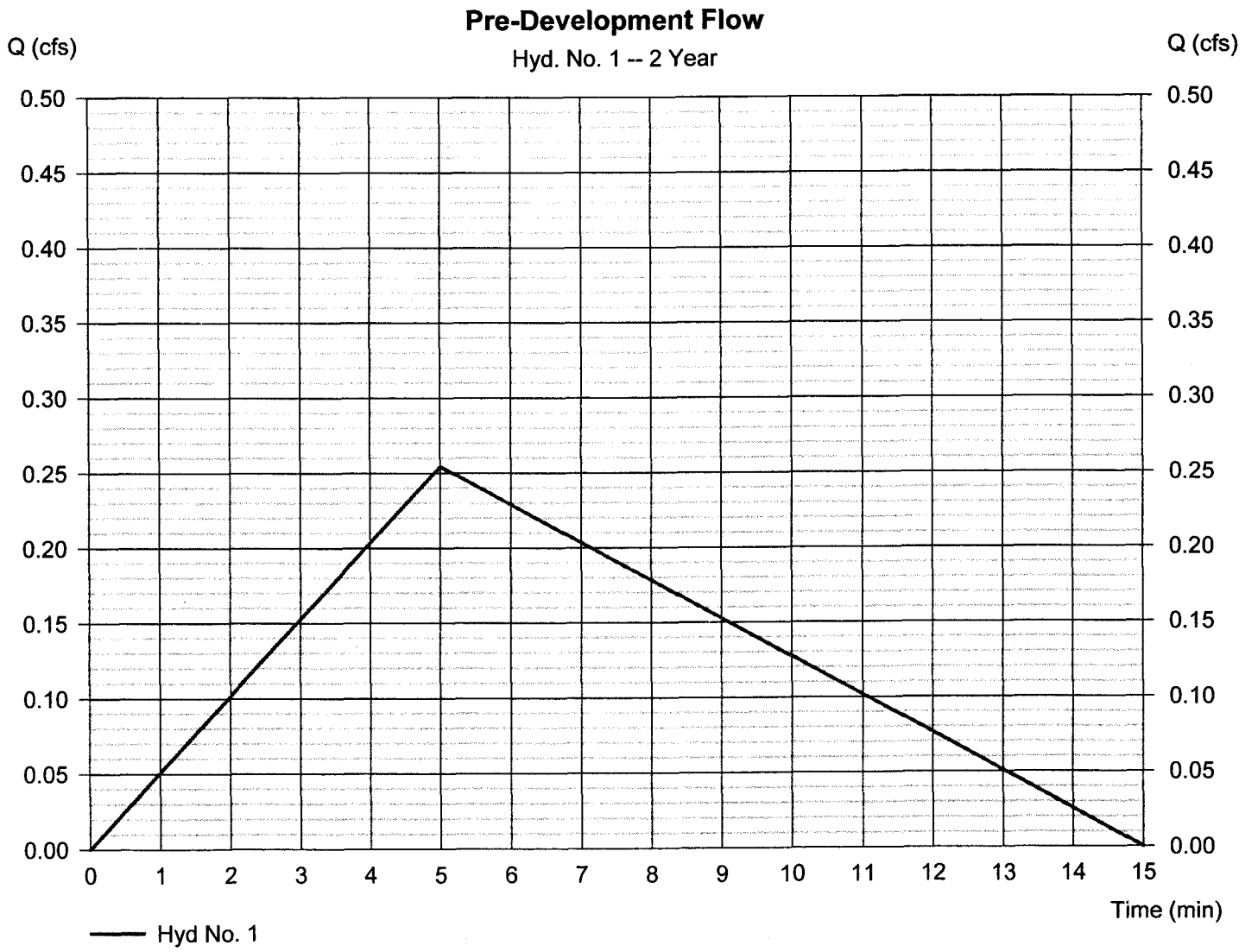
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.254 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 115 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



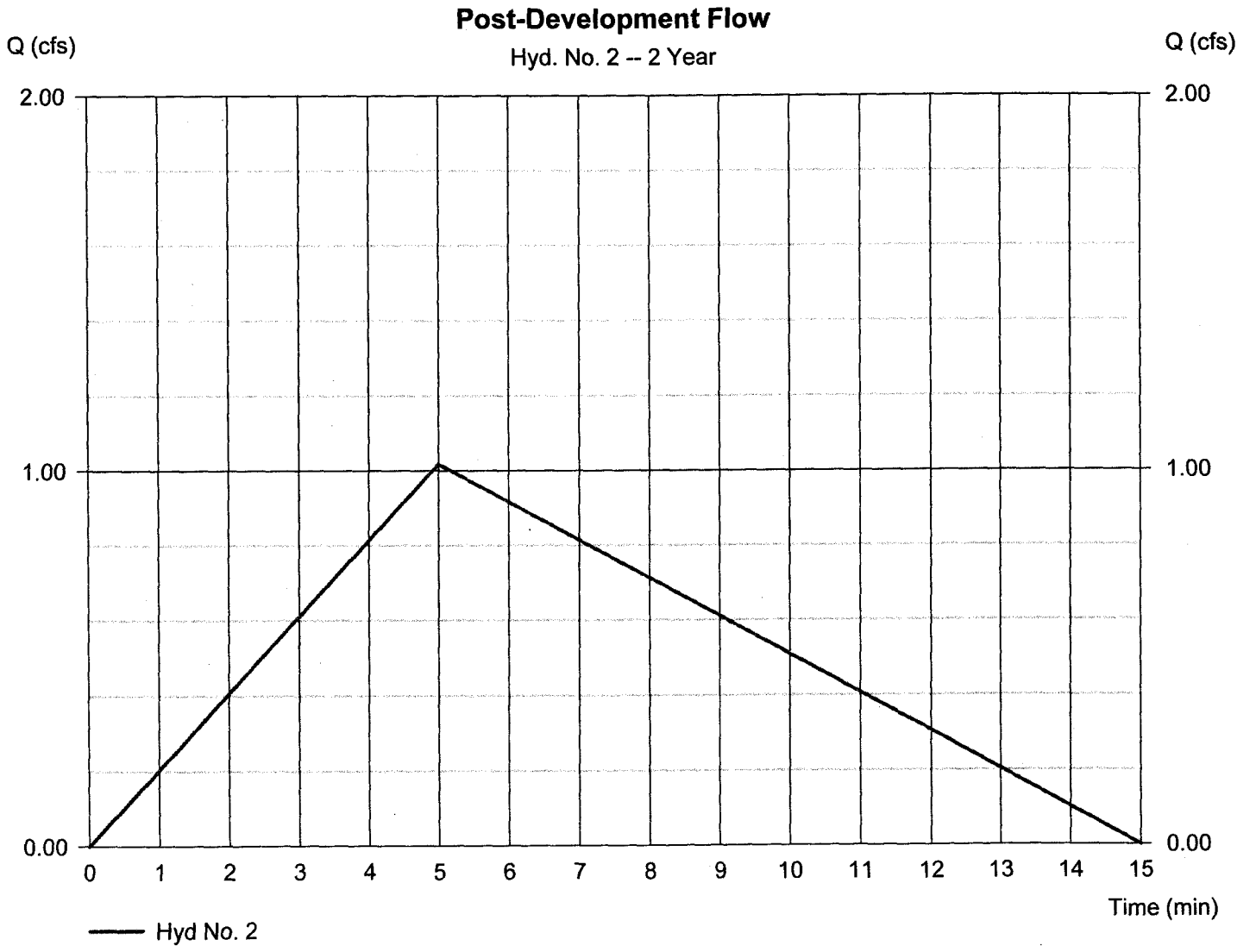
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.018 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 458 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

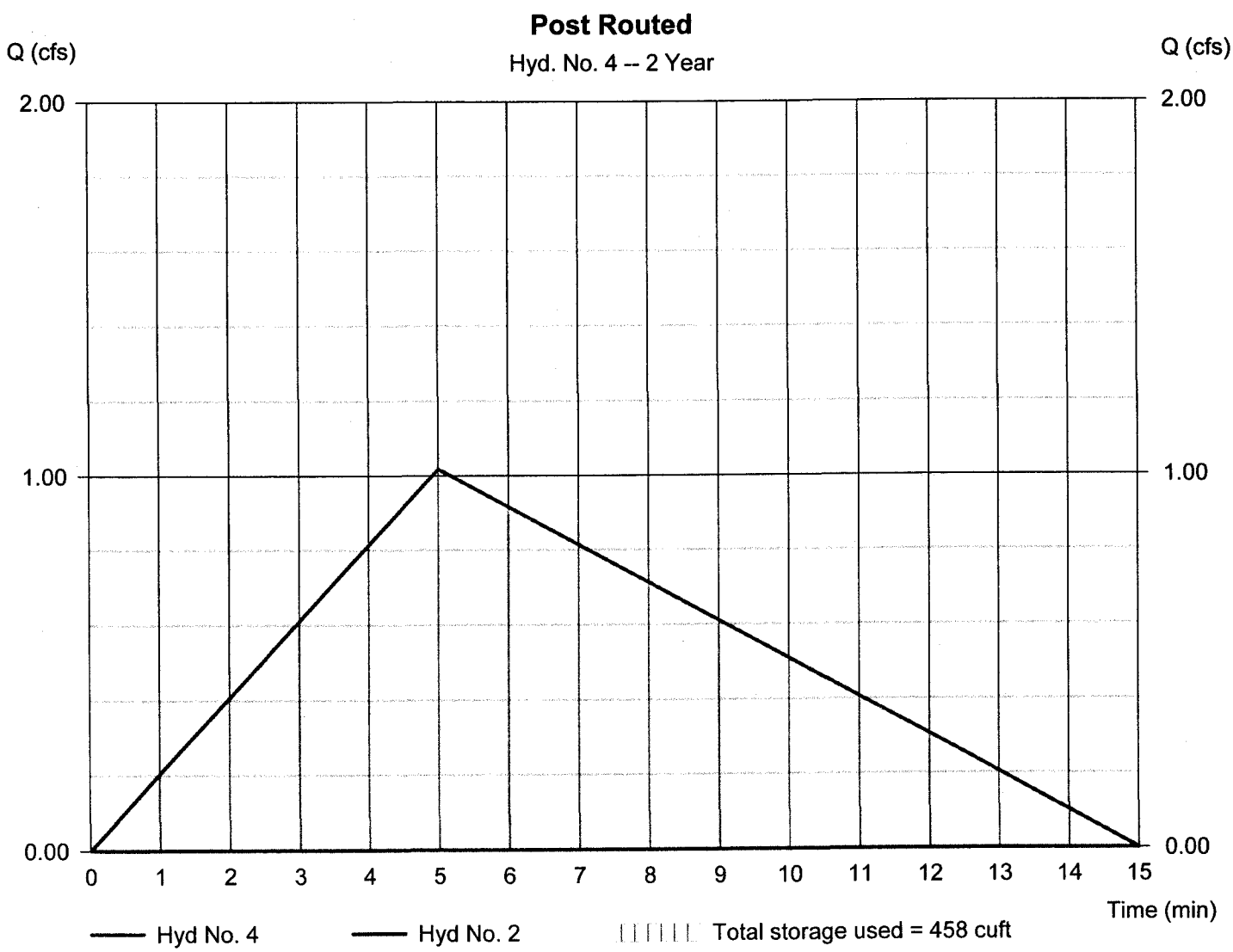
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.19 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 458 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.330	1	5	148	------	------	------	Pre-Development Flow
2	Rational	1.319	1	5	594	------	------	------	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.30	594	Post Routed

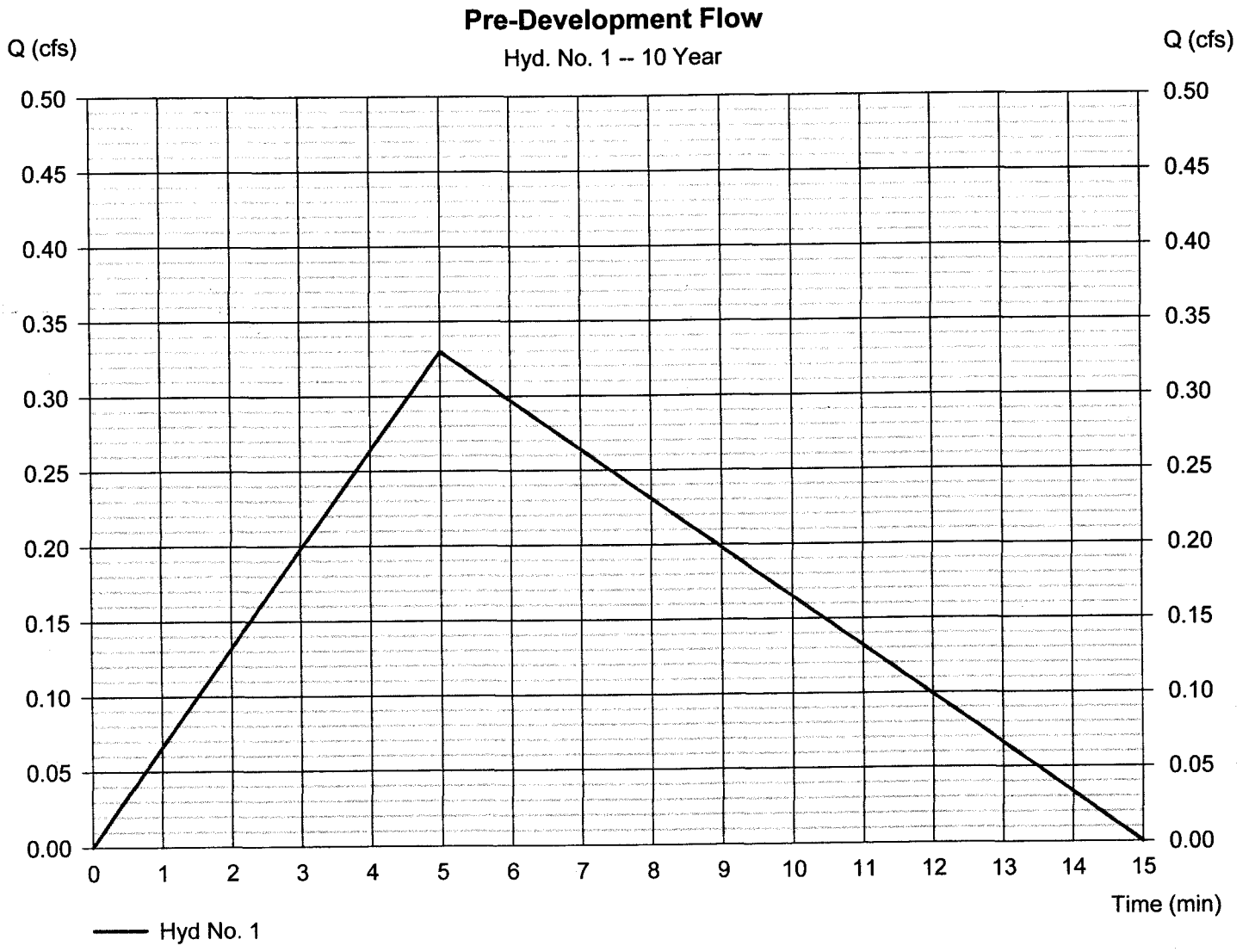
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.330 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 148 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



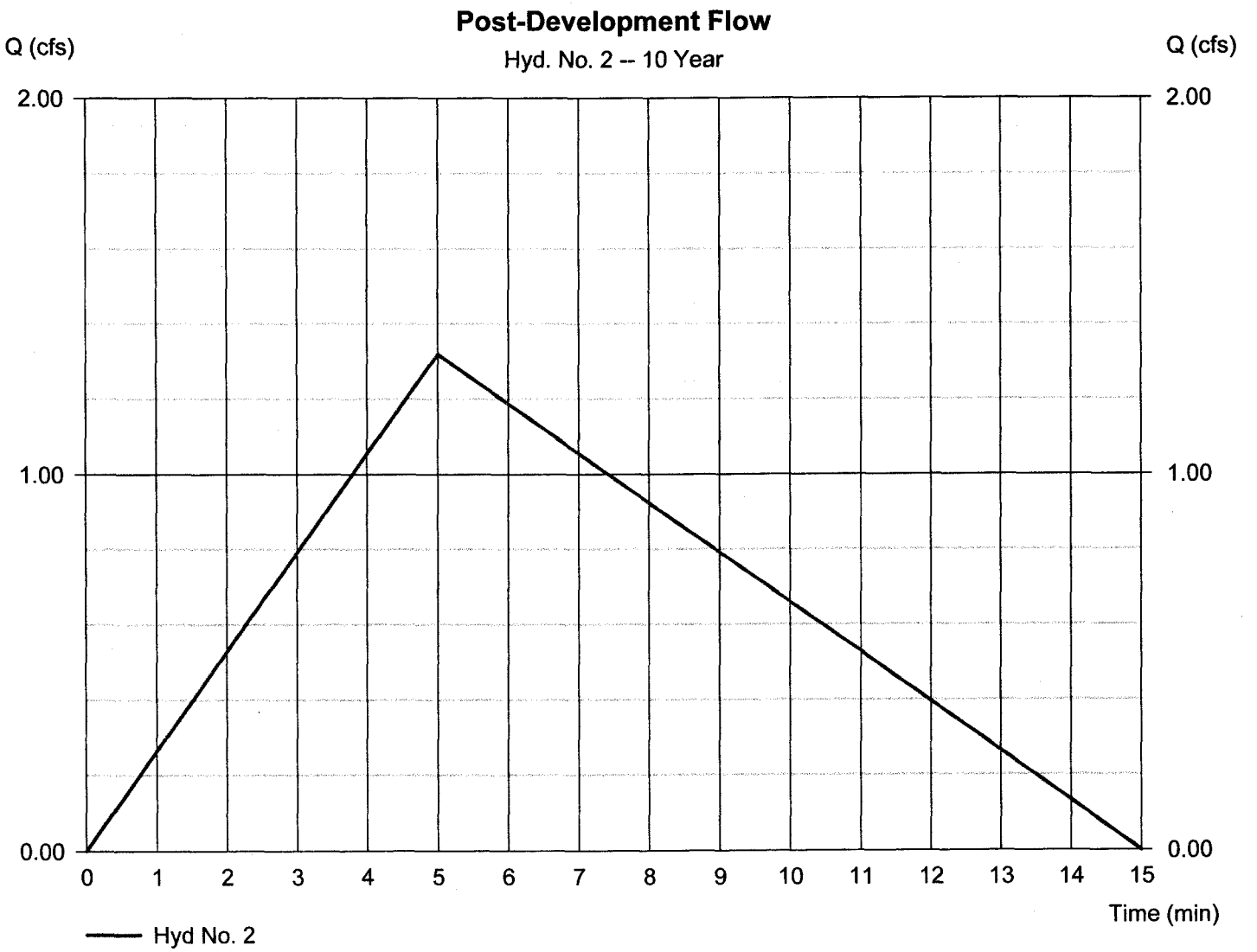
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.319 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 594 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

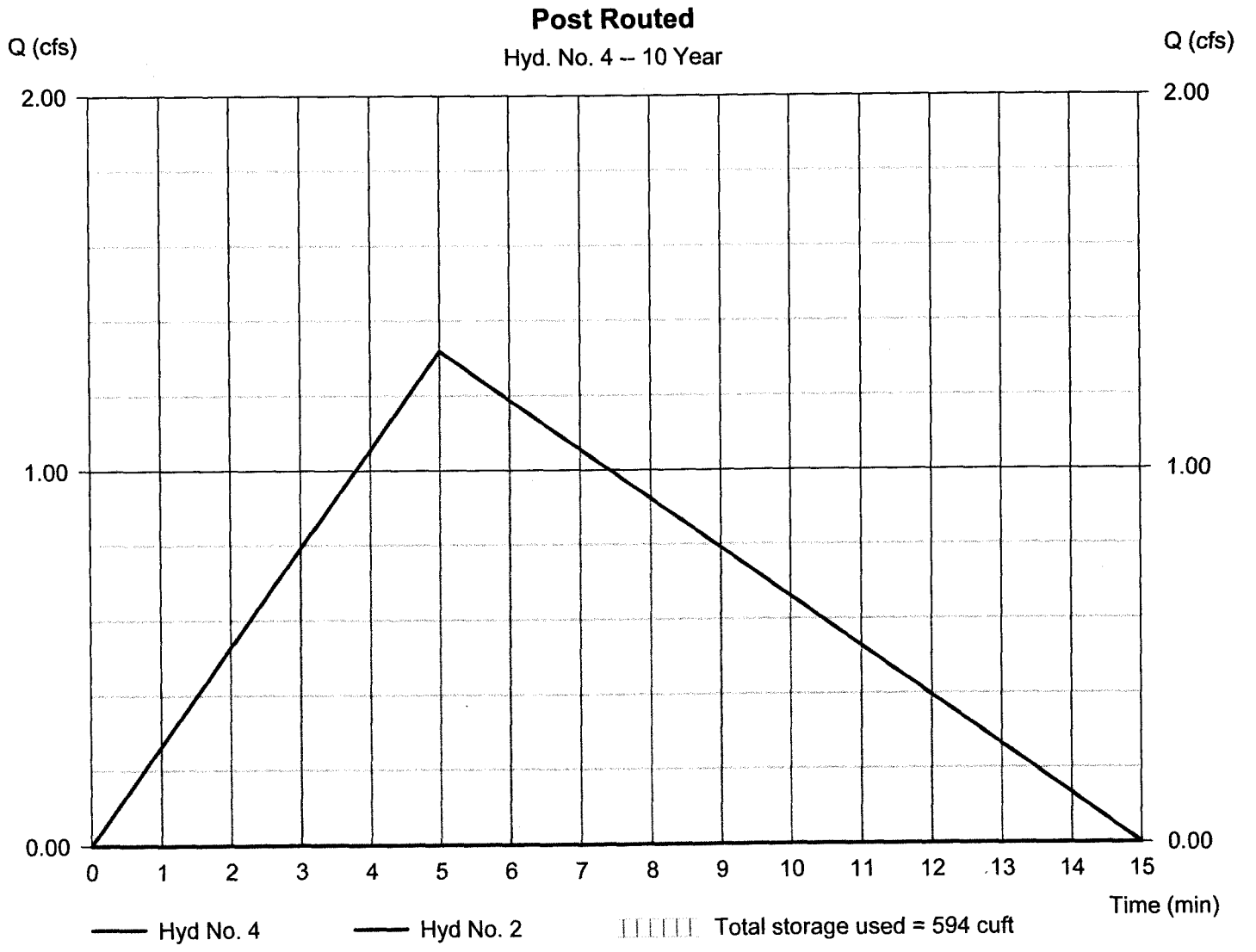
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.30 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 594 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.439	1	5	198	------	------	------	Pre-Development Flow
2	Rational	1.758	1	5	791	------	------	------	Post-Development Flow
4	Reservoir	0.414	1	13	187	2	105.40	708	Post Routed

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.439 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 198 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2

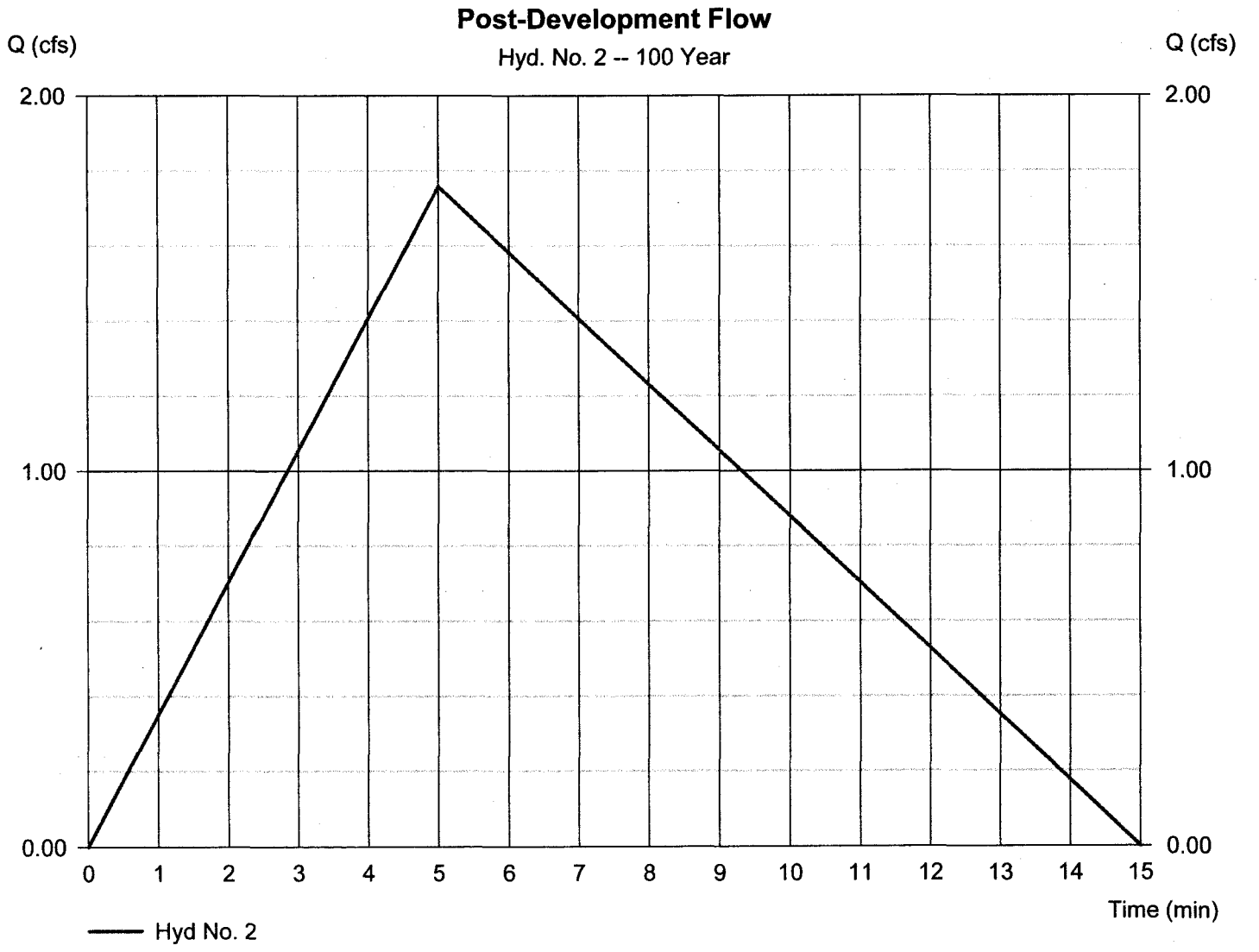
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.758 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 791 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

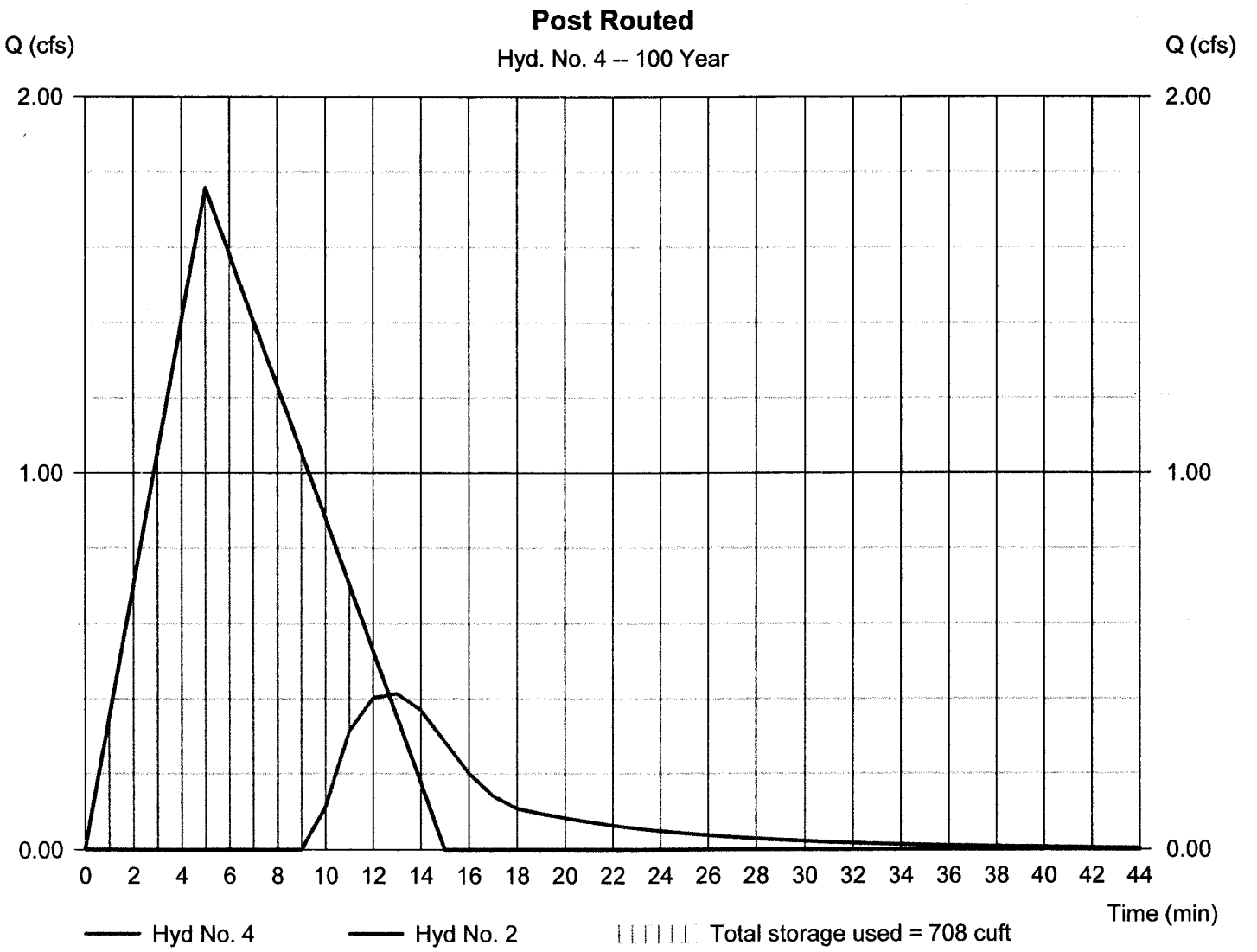
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 19, 2013

Hyd. No. 4

Post Routed

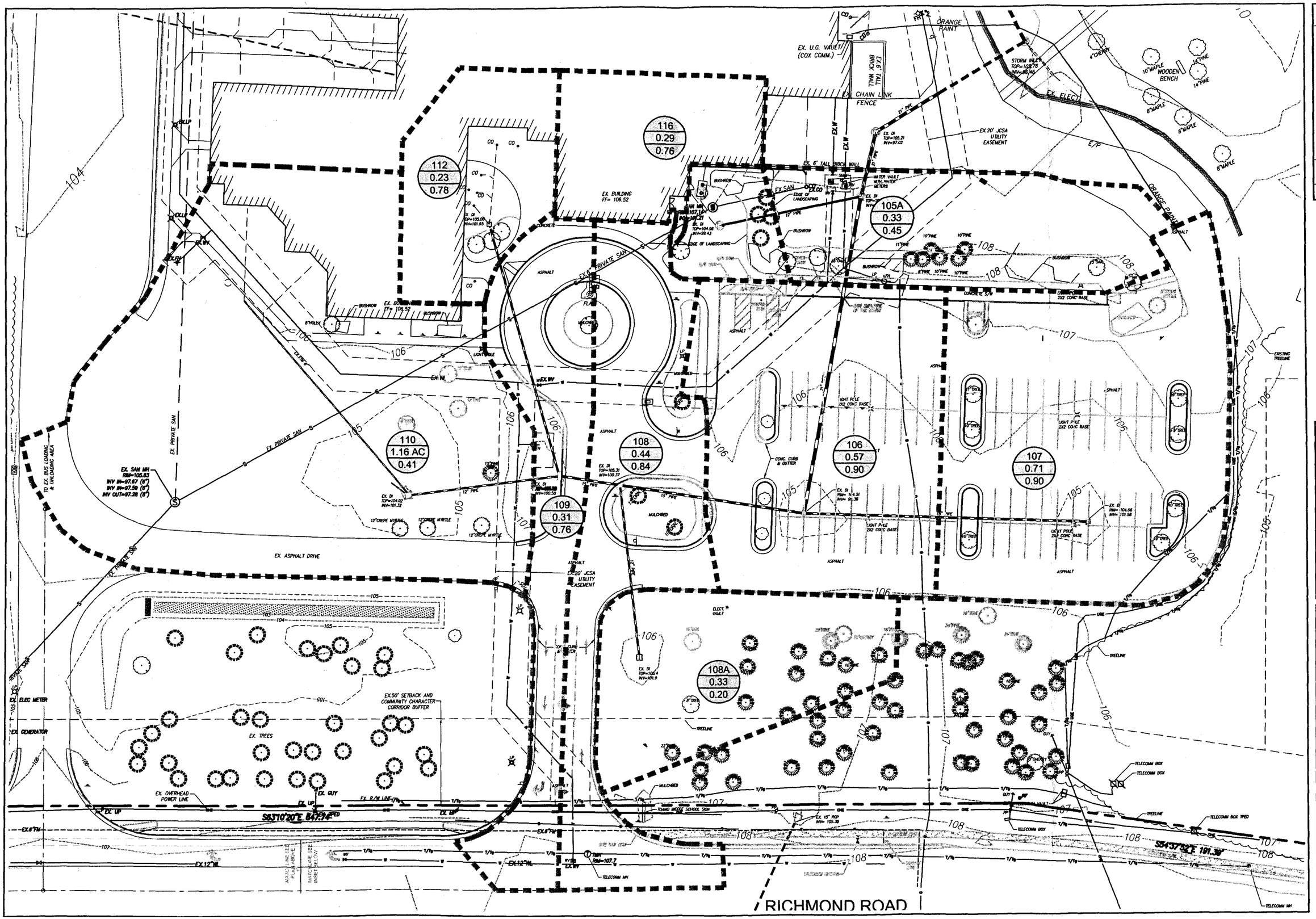
Hydrograph type	= Reservoir	Peak discharge	= 0.414 cfs
Storm frequency	= 100 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 187 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.40 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 708 cuft

Storage Indication method used.



APPENDIX C

DRAINAGE AREA MAPS



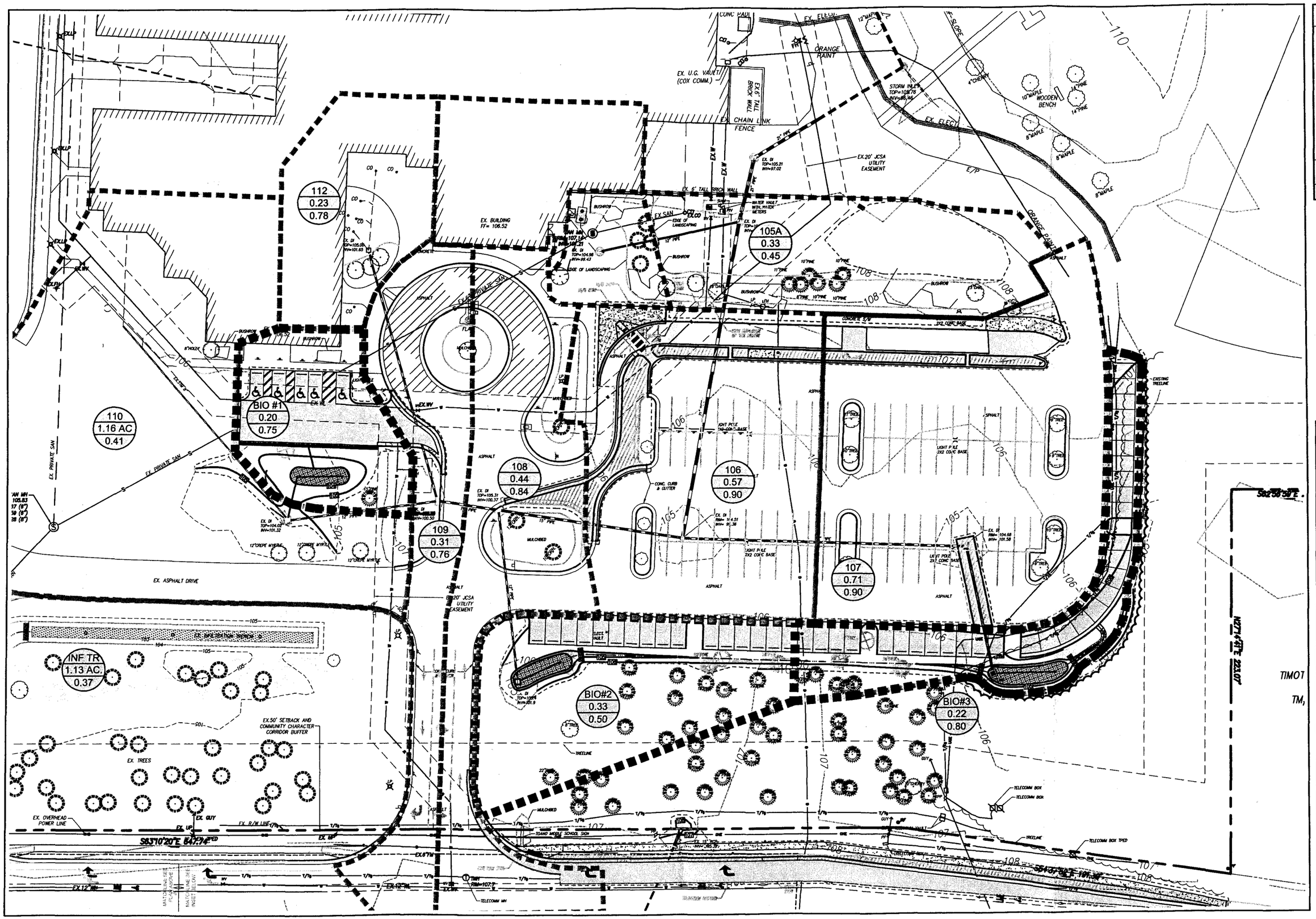
Rev.	Date	Description	Revised by

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 253-0040
Fax: (757) 220-9594
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

Project Contacts:	LBA
Project Number:	9868-01
Scale: 1"=200'	Date: 9/18/12

Sheet Title:
PRE-DEVELOPMENT DRAINAGE AREA DISPLAY

Sheet Number
1 OF 2



Rev.	Date	Description	Revised By

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Williamsburg, Virginia 23188
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TOANO MIDDLE SCHOOL
PARKING LOT EXPANSION

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9858-01
Scale: 1"=200'	Date: 9/18/12

Sheet Title:
POST-DEVELOPMENT DRAINAGE AREA MAP

Sheet Number
2 OF 2

TRANSMITTAL SHEET

ENGINEERING & RESOURCE PROTECTION → STORMWATER

Project: **W/JCC Toano MS – Drop Off and Parking Improvements**

County Plan No.: **SP-002-13**

Assigned BMP No.: **YC-066, YC067 and YC068**

added to DB 12/6/13 gmr
owner id 32

BMP Type: **Bioretentions**

Information Enclosed:

X Record Drawings (Asbuilts)

X Construction Certification

X Computations

X Other: Approved Plan:

Name: **Tina Creech**

Date: **11/21/2013**

Signature: Tina Creech

Environmental Division

SEP 19 2013

RECEIVED

AES
CONSULTING ENGINEERS

Hampton Roads | Central Virginia | Middle Peninsula

5240 Olde Towne Road, Suite 1, Williamsburg, Virginia 23188
Phone (757) 253-0040 / Fax (757) 220-8994

aesva.com

Letter of Transmittal

ATTN: **Bill Cain/Tina Creech**	DATE 9/18/13 / JOB NO. 9888-01
CO.: **JCC** (ERP)	FROM: L. Bruce Abbott
Address:	RE Toano Middle School Student drop off & additional parking
cc:	

WE ARE SENDING YOU THE FOLLOWING ITEMS: ☒ Attached ☐ Under separate cover via

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

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
1	9/18/13		CD for BMP's
1		17	Biortention #1 certification
1		17	Biortention #2 certification
1		17	Biortention #3 certification
			PIN# 1240100051

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:

VIA: ☒Hand Deliver ☐UPS Ground ☐UPS Next Day Air ☐USPS Mail ☐ Other:

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

BIODETENTION BASIN RECORD DRAWINGS

FOR

TOANO MIDDLE SCHOOL

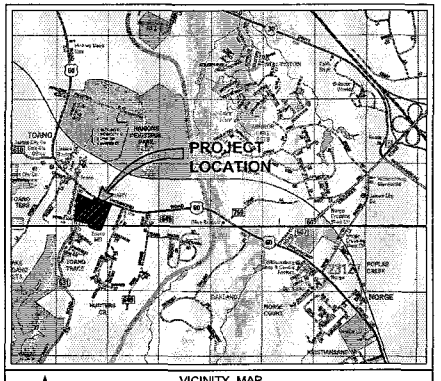
DROP OFF AREA AND PARKING IMPROVEMENTS
WILLIAMSBURG/JAMES CITY COUNTY PUBLIC SCHOOLS

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

GENERAL NOTES:

1. SITE IS CURRENTLY ZONED PUBLIC LANDS, PL. THIS PLAN IS AN AMENDMENT TO SP-040-07. A MASTER PLAN SUP-0012-2102 WAS APPROVED BY THE PLANNING COMMISSION ON 11/7/12 AND THE BOARD OF SUPERVISORS ON 12/11/12.
2. SITE ADDRESS: 7817 ROCHAMBEAU ROAD WILLIAMSBURG, VA
3. TAX MAP PARCEL NO. (12-4) (1-31)
4. APPLICANT: WILLIAMSBURG JAMES CITY PUBLIC SCHOOLS
   697 JOLLY POND ROAD
   WILLIAMSBURG, VA. 23188-7338
   CONTACT: ALAN ROBERTSON
   PHONE: 757 565-1757
   FAX: 757 565-1402
5. PROPERTY SHOWN HEREON LIES IN ZONE "X", (AREA DETERMINED TO BE OUTSIDE THE 500 YEAR FLOOD PLAIN) PER F.I.R.M. #5101201-0005, DATED 2/9/91.
6. THIS SITE LIES WITHIN THE STORMWATERSHED SUB OF TERRAPIN CREEK WATERSHED.
7. THIS PROJECT IS SUBJECT TO SPECIAL STORMWATER CRITERIA (SSC).
8. SITE IS SERVICED BY PUBLIC WATER AND SEWER.
9. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING MISS UTILITY (1-800-552-7001) FOR EXISTING UTILITY LOCATIONS AT LEAST 3 WORKING DAYS PRIOR TO COMMENCING CONSTRUCTION AND ALSO HAVE A PRIVATE UTILITY LOCATOR FOR PRIVATE UTILITIES AT SAME TIME FRAME.
11. ANY UTILITIES NOT LOCATED BY MISS UTILITY OR PRIVATE LOCATORS AND ARE UNCOVERED DURING CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE OWNER REPRESENTATIVE, TELCOM, THE AREA, AND HUMANS AND TO BE MADE.
12. ALL UTILITIES WILL BE PLACED UNDERGROUND.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FOR THIS PROJECT.
14. A LAND DISTURBING PERMIT AND MITIGATION AGREEMENT, WITH SURETY, ARE REQUIRED FOR THIS PROJECT.
15. PRIOR TO OBTAINING A LAND DISTURBING PERMIT, THE CONTRACTOR SHALL OBTAIN A VSMP PERMIT (VIRGINIA STORMWATER MANAGEMENT PROGRAM) FROM DCR (DEPARTMENT OF CONSERVATION AND RECREATION) AND A VDOT LAND DISTURBING PERMIT FROM VDOT.
16. ON-SITE EXTERIOR CONCRETE IS TO BE A MINIMUM OF 3500 PSI WITH 5% TO 7% AIR ENTRAINMENT.
17. CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF ALL SITE IMPROVEMENTS, INCLUDING LANDSCAPING, AS SHOWN ON THE APPROVED PLAN.
18. ALL TRAFFIC CONTROL SIGNS AND MARKINGS TO CONFORM TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS (LATEST EDITION).
19. ALL NEW SIGNS SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3, OF THE JAMES CITY COUNTY ZONING ORDINANCE.
20. THE PROFESSIONAL WHOSE SEAL IS AFFIXED HEREON SHALL ACT AS THE "RESPONSIBLE LAND DISTURBER" FOR PURPOSES OF PLAN APPROVAL ONLY. PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT, THE OWNER OR DEVELOPER SHALL PROVIDE THE NAME OF A "RESPONSIBLE LAND DISTURBER" WHO SHALL ASSUME RESPONSIBILITY AS THE "RESPONSIBLE LAND DISTURBER" FOR THE CONSTRUCTION PHASE OF THE PROJECT. THE OWNER OR DEVELOPER SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.
21. BENCHMARK STATION NO. 304, EXISTING (+) 1197376.998, NORTHING (+) 3865244.089, ELEVATION = 106.88
    HORIZONTAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK
    VIRGINIA STATE PLANE COORDINATE SYSTEM – SOUTH ZONE
    NAD 83 (1994 VA HARN)
    VERTICAL DATUM: JAMES CITY COUNTY GEODETIC CONTROL NETWORK
    NGVD 29
22. TEMPORARY TRAFFIC CONTROL SHALL CONFORM TO THE VIRGINIA WORK AREA PROTECTION MANUAL, LATEST EDITION.
23. ANY CONSTRUCTION WITHIN VDOT RIGHT OF WAY SHALL CONFORM TO VDOT STANDARDS AND SPECIFICATIONS.
24. NO PLUMBING REVISIONS ARE TO BE COMPLETED UNDER THIS PLAN.

NOTE:
ALL STORMWATER/BMP CONSTRUCTION SHALL BE OBSERVED BY A QUALIFIED LICENSED PROFESSIONAL. PRIOR TO THE RELEASE OF RELATED POSTED BONDS AND SURVEY, RECORD DRAWINGS AND CONSTRUCTION CERTIFICATIONS MUST BE PROVIDED TO, AND APPROVED BY THE JAMES CITY COUNTY ENGINEERING AND RESOURCE PROTECTION DIVISION AND SHALL BE CONSISTENT WITH THE STORMWATER MANAGEMENT/BMP FACILITIES RECORD DRAWINGS AND CONSTRUCTION CERTIFICATION FORMS.



VICINITY MAP
(APPROXIMATE SCALE: 1"=2000')
MAP COPYRIGHT KAPPA MAP GROUP LLC
(800)825-6277
PERMITTED USE NUMBER 21004223

COUNTY PROJECT NO.: SP-002-13
ORIGINAL SUBMITTAL DATE: 1/11/13

LEGEND

EXISTING		PROPOSED	EXISTING		PROPOSED
	WATER			CENTERLINE/BASELINE	
	SANITARY SEWER			RIGHT OF WAY	
	STORM SEWER			PROPERTY LINE	
	FORCE MAIN			E DITCH/SWALE	
	SANITARY MANHOLE			CONCRETE LINED DITCH	
	STORM MANHOLE			EXISTING TREELINE, LIMITS OF CLEARING	
	CURB DROP INLET			RIP RAP	
	YARD DROP INLET			CURB	
	FLARED END SECTION			CURB AND GUTTER	
	VALVE			PICKERS GUTTER PAN	
	FIRE HYDRANT ASSEMBLY			EDGE OF PAVEMENT	
	BLOW-OFF VALVE			EXISTING GROUND ELEVATION	
	AIR RELEASE ASSEMBLY			PROPOSED SPOT GRADE	
	CLEAN OUT			CONTOUR	
	WATER METER				
	STREETLIGHT				

INDEX OF SHEETS:

SHEET NO.	SHEET DESCRIPTION
R-01	COVER SHEET
C-02	CONFIGURATIONAL INVENTORY
C-03	DEMOLITION AND INITIAL SEDIMENT & EROSION CONTROL PLAN
C-04	GRADING PLAN
R-05	GRADING & DRAINAGE PLAN
C-06	EROSION & SEDIMENT CONTROL NOTES & DETAILS
R-07	STORMWATER NOTES & DETAILS
C-08	SITE DEMOLITION & DETAILS
C-09	LANDSCAPE PLAN
C-10	LIGHTING PLAN
C-11	LIGHTING DETAILS & NOTES
C-12	ADDITIONAL DETAILS

CERTIFIED RESPONSIBLE LAND DISTURBER:

CRAIGHILL, GORDON, P.E.
AES CONSULTING ENGINEERS
[illegible]
WILLIAMSBURG, VIRGINIA 23188
TELEPHONE: 757-253-2910

BEFORE SITE PLAN REVIEW PROCESS ONLY. OWNER OR CONTRACTOR SHOULD NAME RESPONSIBLE LAND DISTURBER FOR CONSTRUCTION PROCESS.

SITE DATA:

PROJECT LIMITS:	1,497,749 S.F.±	34.39 AC.± (100%)
EXISTING IMPERVIOUS AREA:	215,929 S.F.±	4.95 AC.± (14.4%)
PROPOSED IMPERVIOUS AREA:	11,779 S.F.±	0.27 AC.± (0.8%)
PROPOSED IMPERVIOUS AREA (TOTAL):	227,708 S.F.±	5.22 AC.± (15.2%)
OPEN SPACE:	1,270,041 S.F.±	29.17 AC.± (84.8%)
ON-SITE DISTURBED AREA:	27,164 S.F.±	0.62 AC.±
OFF-SITE DISTURBED AREA:	19,923 S.F.±	0.46 AC.± (FOR SIGNAL ROAD IMPROVEMENTS)
TOTAL DISTURBED AREA:	47,087 S.F.±	1.08 AC.±

PARKING PROVIDED: 107 AS PARKING SPACES, 11 (7 VAN & 4 STANDARD) HANDICAP SPACES
TOTAL PARKING FOR PARKING: 118 PARKING SPACES

INCREASE OF 10 PARKING SPACES (INCLUDING 3 HANDICAP SPACES)

TOTAL PROPOSED PARKING 107 (INCLUDING 3 HANDICAP SPACES)
TOTAL PROPOSED BUS PARKING: 14 BUS SPACES

"THE STORM DRAINAGE 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 8/26/13
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
8/26/13
LAND SURVEYOR

Rev.	Date	Description	Revised By
1	8/26/13	RECORD DRAWINGS FOR CONSTRUCTION	SJC
2	8/26/13	RECORD DRAWINGS FOR CERTIFICATION	SJC
3	8/26/13	REVISED PER COUNTY COMMENTS	SJC

AES CONSULTING ENGINEERS
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www.aescve.com
Hampton Roads | Central Virginia | Middle Peninsula

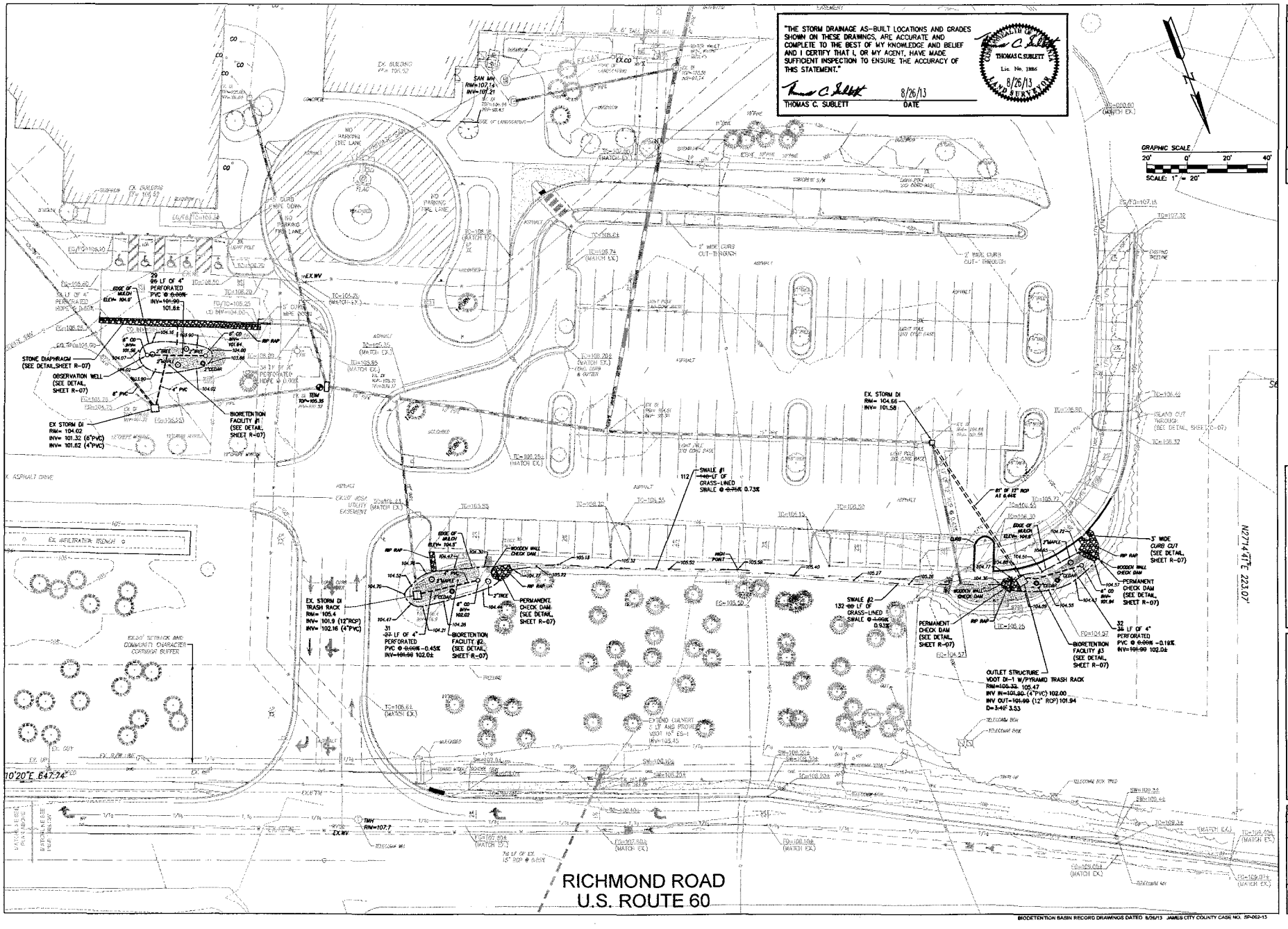
BIODETENTION BASIN RECORD DRAWINGS
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9868-01
Scale: AS NOTED	Date: 1/11/13
Sheet Title: COVER SHEET	
Sheet Number: R-01	

"THE STORM DRAINAGE 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 — DATE 8/26/13

COMMONWEALTH OF VIRGINIA — THOMAS C. SUBLETT — Lic. No. 1886 — 8/26/13 — LAND SURVEYOR



BIODETENTION BASIN RECORD DRAWINGS DATED 8/26/13 JAMES CITY COUNTY CASE NO. SP-062-13

No.	Date	Description	Revised By
1	8/13	REVISED TO AS-BUILT CONDITIONS	TCS
2	10/12	REVISED TO AS-BUILT CONDITIONS	TCS
3	10/12	REVISED TO AS-BUILT CONDITIONS	TCS
4	10/12	REVISED TO AS-BUILT CONDITIONS	TCS
5	10/12	REVISED TO AS-BUILT CONDITIONS	TCS

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Fax: (757) 565-0406
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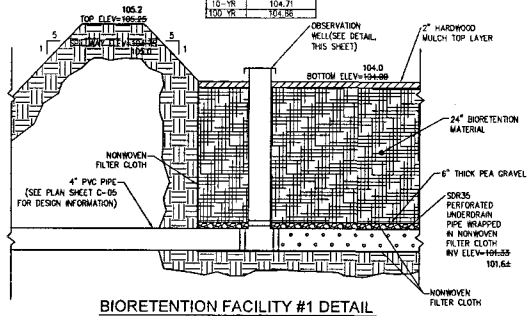
BIODETENTION BASIN RECORD DRAWINGS
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT — JAMES CITY COUNTY — VIRGINIA

Project Contacts:	LBA
Project Number:	5859-01
Scale: 1"=20'	Date: 1/11/13
Sheet Title: GRADING & DRAINAGE PLAN	
Sheet Number: R-05	

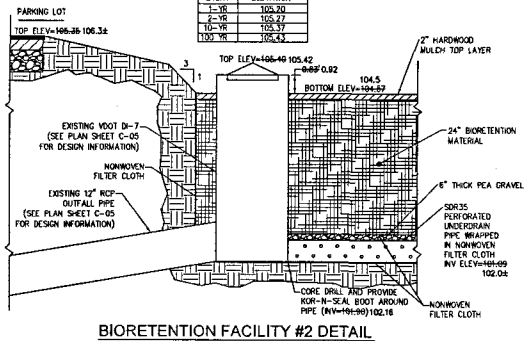
STORM EVENT	WATER SURFACE ELEVATION
1-YR	104.47
2-YR	104.55
10-YR	104.71
100 YR	104.86



BIORETENTION FACILITY #1 DETAIL

N.T.S.

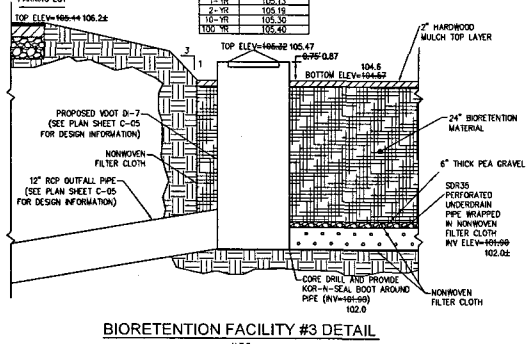
STORM EVENT	WATER SURFACE ELEVATION
1-YR	105.20
2-YR	105.27
10-YR	105.37
100 YR	105.43



BIORETENTION FACILITY #2 DETAIL

N.T.S.

STORM EVENT	WATER SURFACE ELEVATION
1-YR	105.13
2-YR	105.19
10-YR	105.30
100 YR	105.40



BIORETENTION FACILITY #3 DETAIL

N.T.S.

"THE STORM DRAINAGE 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 8/26/13
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 18386
8/26/13
LAND SURVEYOR

BIORETENTION FACILITY MAINTENANCE PROGRAM & SCHEDULE

INSPECT AND REPAIR EROSION	MONTHLY
REMULCH ANY VOID AREAS	WHENEVER NEEDED
REMOVE PREVIOUS MULCH AND REAPPLY	EVERY 3 YEARS
REMOVAL AND REPLACEMENT OF ALL DISEASED VEGETATION CONSIDERED BEYOND TREATMENT	WHENEVER NEEDED
CHECK FOR ACCUMULATED SEDIMENTS	MONTHLY
INSPECT AND REMOVE ANY DEBRIS THAT MAY COLLECT AT THE DROP INLET AND WITHIN FACILITY	AFTER MAJOR STORM EVENTS/OR SEMI ANNUALLY
ADD FRESH LAYER OF MULCH	EVERY 6 MONTHS (SPRING & FALL)

SOIL SPECIFICATIONS

THE BIORETENTION AREAS SHALL CONTAIN A PLANTING SOIL MIXTURE OF 50% SAND, 30% LEAF COMPOST (FULLY COMPOSTED, NOT PARTIALLY ROTTED LEAVES), AND 20% TOPSOIL. TOPSOIL SHALL BE SANDY LOAM OR LOAMY SAND OF UNIFORM COMPOSITION, CONTAINING NO MORE THAN 5% CLAY, FREE OF STONES, STUMPS, ROOTS, OR SIMILAR OBJECTS GREATER THAN ONE INCH, BRUSH, OR ANY OTHER MATERIAL OR SUBSTANCE WHICH MAY BE HARMFUL TO PLANT GROWTH, OR A HINDRANCE TO PLANT GROWTH OR MAINTENANCE. THE TOPSOIL SHALL BE FREE OF PLANTS OR PLANT PARTS OF BERMUDA GRASS, QUACK GRASS, JOHNSON GRASS, NUGWORT, NUTSEDGE, POISON IVY, CANADIAN THISTLE, CATTAIL, OR OTHERS AS SPECIFIED. IT SHALL NOT CONTAIN TOXIC SUBSTANCES HARMFUL TO PLANT GROWTH.

THE TOP SOIL SHALL BE TESTED AND MEET THE MINIMUM CRITERIA SET FORTH IN SECTION 3.11-28 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK (LATEST EDITION).

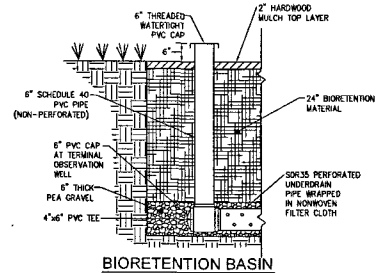
MULCH

A SURFACE LAYER OF SHREDDED HARDWOOD BARK SHALL BE PROVIDED ON TOP OF THE PLANTING SOIL. MULCH SHALL BE FREE OF WEED SEEDS, SOIL, ROOTS, OR ANY OTHER SUBSTANCE NOT CONSISTING OF EITHER BOLE OR BRANCH WOOD AND BARK. THE SHREDDED HARDWOOD BARK MULCH SHALL BE UNIFORMLY APPLIED.

STRAW MULCH SHALL NOT BE UTILIZED IN STABLIZATION OF BIORETENTION OR DRY SWALE AREA.

NOTES

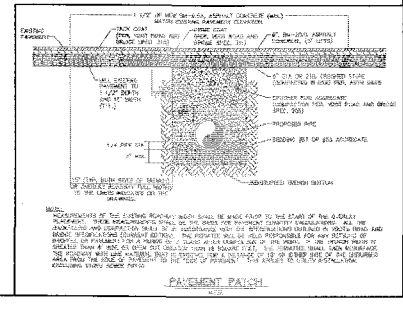
1. WATER PLANT MATERIAL EACH DAY FOR FOURTEEN CONSECUTIVE DAYS AFTER CONSTRUCTION.
2. CONTRACTOR SHALL REFER TO COUNTY BMP MANUAL (GROUP D, POS. 48-50) AND MINIMUM STANDARD 3.11 AND 3.13 OF THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK FOR METHODS/MATERIAL ASSOCIATED WITH CONSTRUCTION OF THE BIORETENTION CELLS.
3. VDOT SHALL BE SAVED HARMLESS FROM THE MAINTENANCE RESPONSIBILITY OR LIABILITY ASSOCIATED WITH ANY FAILURE OF THE STORM WATER MANAGEMENT FACILITY AND ITS STRUCTURES.
4. A PROFESSIONAL ENGINEER WHO HAS INSPECTED THE BASIN DURING CONSTRUCTION SHALL CERTIFY THE CONSTRUCTION OF THE BIORETENTION BASIN. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE BIORETENTION BASIN CONSTRUCTION SCHEDULE WITH THE ENGINEER TO ENSURE ON SITE MONITORING.
5. 6" PERFORATED PIPE SHALL BE RIGID SMOOTH WALL PE IN ACCORDANCE WITH ASTM#810 OR 6" SCH40 PVC OR EQUIVALENT APPROVED BY JAMES CITY COUNTY ENVIRONMENTAL DIVISION.
6. CORE DRILL AND PROVIDE NEOPRENE SEAL (KOR-N-SEAL) OR EQUAL WHERE PLASTIC PIPE CONNECTS TO STORM STRUCTURE.



BIORETENTION BASIN OBSERVATION WELL DETAIL

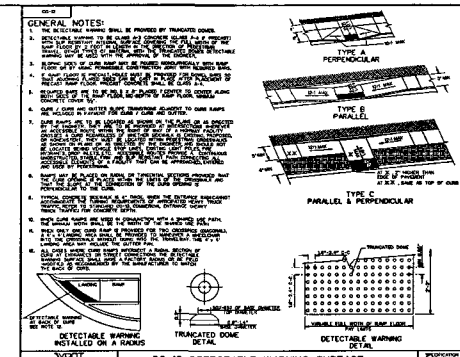
N.T.S.

NOTE:
CONTRACTOR SHALL PROVIDE AS-BUILT DRAWINGS AND CONSTRUCTION CERTIFICATION IN ACCORDANCE WITH JAMES CITY COUNTY GUIDELINES FOR THE PROPOSED BIORETENTION FACILITIES.



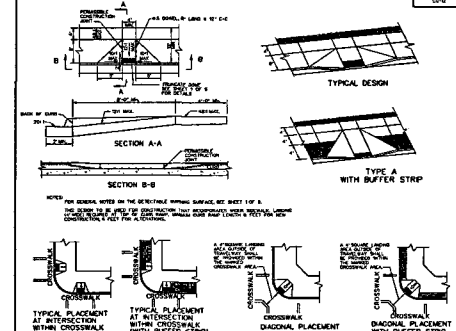
PAVEMENT PATCH

N.T.S.



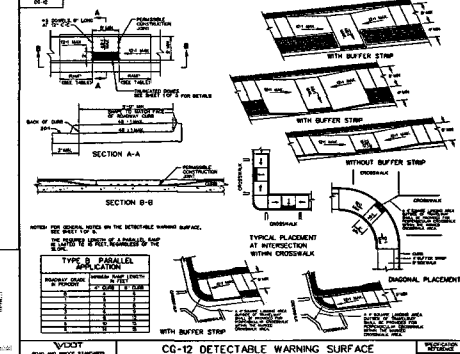
CG-12 DETECTABLE WARNING SURFACE

(GENERAL NOTES)



CG-12 DETECTABLE WARNING SURFACE

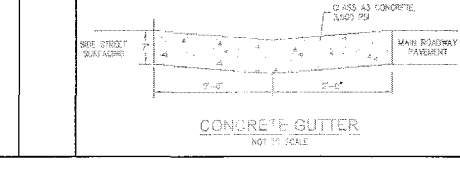
TYPE A (PERPENDICULAR) APPLICATION



TYPE B (PARALLEL) APPLICATION

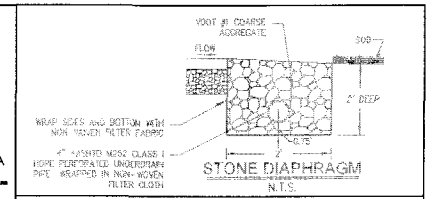
CG-12 DETECTABLE WARNING SURFACE

TYPE B (PARALLEL) APPLICATION



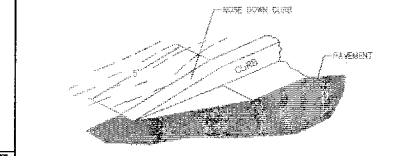
CONCRETE GUTTER

NOT TO SCALE



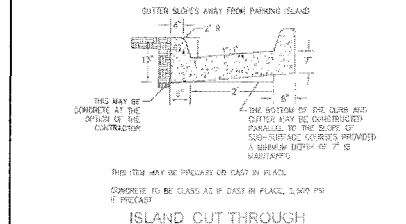
STONE DIAPHRAGM

N.T.S.



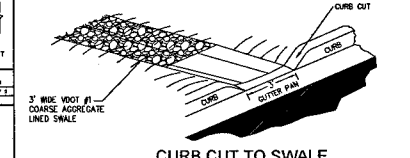
5FT NOSE DOWN CURB DETAIL

N.T.S.



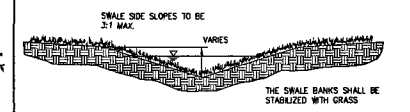
ISLAND CUT THROUGH

N.T.S.



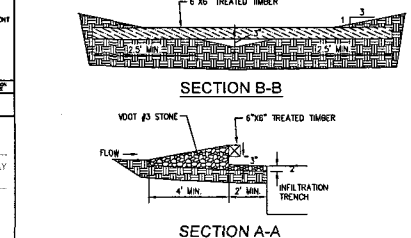
CURB CUT TO SWALE

N.T.S.



TYP. SWALE DETAIL

N.T.S.



SECTION B-B

SECTION A-A

PERMANENT CHECK DAM DETAIL

N.T.S.

BIORETENTION POND RECORD DRAWINGS DATED 8/26/13 JAMES CITY COUNTY CASE NO. SP-063-13

No.	Date	Description	Drawn By
1	8/26/13	REVISED PER VDOT COMMENTS	SCS
2	9/11/13	REVISED PER VDOT COMMENTS	SCS
3	9/23/13	REVISED PER VDOT COMMENTS	SCS

AES CONSULTING ENGINEERS
8484 Ohio Timber Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 565-1677
Fax: (757) 565-0804
www.aes-inc.com
Hampton Roads | Central Virginia | Middle Peninsula

BIORETENTION BASIN RECORD DRAWINGS
DROP OFF AREA AND PARKING IMPROVEMENTS
TOANO MIDDLE SCHOOL
WILLIAMSBURG/JAMES CITY COUNTY SCHOOLS
STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contact:	LBA
Project Number:	5686-01
Scale: 1"=30'	Date: 5/11/13

Sheet Title: STORMWATER MANAGEMENT NOTES & DETAILS

Sheet Number: R-07

YORKTOWN
MATERIALS

P.O. Box 1741 Yorktown. Virginia 23692
Tel: 757-898-4444 Fax: 757-^898-3962

Date: August 6, 2013

Graham Corson AES

RE: Toano Middle School Project

This is to certify that the BioSoils material, prepared by Yorktown Materials, is produced following Section 6.6 Filter Media and Surface Cover, Table 9.6 Bioretention Material Specifications of the Virginia Department of Conservation and Recreation's Specification No.9 Bioretention. The BioSoils material is generally classified as a Loamy Sand on the USDA Guide for Textural Classification with the following general composition:

50% Washed VDOT "A" Sand

20% Composted leaf organics

30% Sifted Topsoil

AES CONSULTING ENGINEERS
ENGINEERS, SURVEYORS & PLANNERS WILLIAMSBURG, VIRGINIA

APPROVED AS SUBMITTED ✓ APPROVED AS NOTED
REJECTED REVISE & RESUBMIT
SUBMIT SPECIFIED ITEM

CHECKING IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. ANY ACTION SHOWN IS SUBJECT TO THE REQUIREMENTS OF THE PLANS AND SPECIFICATIONS. CONTRACTOR IS RESPONSIBLE FOR DIMENSIONS WHICH SHALL BE CONFIRMED AND CORRELATED AT THE JOB SITE, FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION, COORDINATION OF HIS WORK WITH THAT OF ALL OTHER TRADES, AND THE MEANS, METHODS, TECHNIQUES, SEQUENCES, OR PROCEDURES OF CONSTRUCTION

BY Graham Corson DATE 8/8/13

Sincerely,

Don Boyd Yorktown
Materials

9889-01

Hardwood Mulch CORPORATION

15610 James River Drive
Disputanta, VA 23842

August 15, 2013

Ironbridge Nursery, LLC
P O Box 2636
Chesterfield, VA 23831

Our mulch is manufactured from hardwood bark and wood fiber. It is a 100 % natural product. This mulch has been doubled shredded.

Our manufacturing facility is located within 35 miles of 2409 Webber Ave Richmond, VA

Project Name:

Toano Middle School
7817 Richmond Road
Toano, Virginia

Sincerely,

M Garland Anderson

M Garland Anderson
Vice President

AES CONSULTING ENGINEERS
ENGINEERS, SURVEYORS & PLANNERS WILLIAMSBURG, VIRGINIA

APPROVED AS SUBMITTED
REJECTED
APPROVED AS NOTED
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BY _____ DATE 8/15/13

IRONBRIDGE NURSERY

P.O. Box 2636

Chesterfield, VA 23832
804-796-9135 O
804-796-3421 F

TOANO MIDDLE SCHOOL

7817 RICHMOND ROAD – TOANO, VIRGINIA

SUSTAINABLE DESIGN SUBMITTAL PROCESSING SHEET

Date: 8-15-13

Submittal Number: 1

Specification Section Landscape

Item: Double Shredded Hardwood Mulch

Manufacturer: Hardwood Mulch

Submitted By: M Kulash

Actual Material Cost (excluding labor, equipment $50 per sq yd DFI

Or Estimated Material Cost (total cost x 0.45)

Recycled Content: Pre Consumer

And/or Recycled Content: Post Consumer

Manufacturing Site Disputanta, VA

Site of Extraction, Harvesting or Recovery of Materials to Project Site

Distance (in air miles) from Manufacturing Site to Project Site

Distance (in air miles) from Site of Extraction, Harvesting Recovery of Materials to Project Site

Rapidly Renewable Materials	YES	NO	N/A
Certified Wood	YES	NO	N/A
VOC Content	YES	NO	N/A
Green Label Carpet	YES	NO	N/A
Added Urea-Formaldehyde Resins	YES	NO	N/A

Please attach supportive documentation or Manufacturer's or Supplier's Letterhead Documents information noted above

Environmental Division

SEP 19 2013

Stormwater Management/BMP Facilities Record Drawing and Construction Certification Forms

RECEIVED

(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: Toano Middle School- drop off and Parking Improvements
Structure/BMP Name: Bioretention #1
Project Location: 7817 Richmond Road Williamsburg
BMP Location: Located at the end of Handicap parking
County Plan No.: SP-002-2013

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

Tax Map/Parcel No.: (12-4) (1-51)
BMP ID Code (if known):
Zoning District: Pl Public Lands
Land Use: Educational
Site Area (sf or acres): 34.06

Brief Description of Stormwater Management/BMP Facility:
Bioretention facility to catch water from handicap parking for treatment and bus drive

Nearest Visible Landmark to SWM/BMP Facility: Located to the left of building and between handicap parking and

Nearest Vertical Ground Control (if known):

☐ JCC Geodetic Ground Control ☐ USGS ☑ Temporary ☐ Arbitrary ☐ Other

Station Number or Name: Temporary bench mark
Datum or Reference Elevation: 105.35
Control Description: Existing drop inlet
Control Location from Subject Facility:
65' South East of bioretention facility

Section 2 - Stormwater Management/BMP Facility Construction Information:

Pre-Construction Meeting Held for Construction of SWM/BMP Facility: ☑ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: 6/2013
Facility Monitored by County Representative during Construction: ☑ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: Keith Barber Construction Inc.
Name of Professional Firm Who Routinely Monitored Construction: AES Consulting Engineers
Date of Completion for SWM/BMP Facility: 8/2013
Date of Record Drawing/Construction Certification Submittal: 9/2013

(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 Engineering and Resource Protection 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: Williamsburg James City County Public Schools
Mailing Address: 597 Jolly Pond Road
Williamsburg, Va. 23188
Business Phone: 757-259-7157 Fax: 757-565-1462
Contact Person: Alan Robertson Title: Facilities Manager

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

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Responsible Plan Preparer: Graham V. Corson P.E.
Title: Project Engineer
Plan Name: Toano Middle School - Drop off area and Parking Improvements
Firm's Project No. 9888-01
Plan Date: 1/11/13
Sheet No.'s Applicable to SWM/BMP Facility: C-01 / C-05 / C-07 / ____ / ____

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

Firm Name: Keith Barber Construction, Inc.
Mailing Address: PO Box 531
Farmville Va. 23901
Business Phone: 757-707-0732

Fax: _____
Contact Person: Keith Barber
Site Foreman/Supervisor: Keith Barber
Specialty Subcontractors and Purpose (for BMP Construction Only): _____

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management/BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne RAES Consulting Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Thomas C. Sublett
Title: Survey Manager
Signature: Thomas C. Sublett
Date: 9-10-2013

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 to the provisions of the approved design plan, specifications, design, and stormwater management plan except as specifically noted.

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 001886
9/18/13
LAND SURVEYOR

_____(Seal)
Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: AES Consulting Engineers
Mailing Address: AES Consulting Engineers Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Graham V. Corson P.E.
Title: Senior Project Engineer
Signature: Graham V. Corson
Date: 9-10-2013

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 plan, specifications, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
9/18/13
PROFESSIONAL ENGINEER

_____(Seal)
Virginia Registered Professional Engineer

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

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

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

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

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

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

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

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

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

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

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

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

☑ Submission Requirements - Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system,

it is requested that the record drawings also be submitted to the Engineering and Resource Protection Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Engineering and Resource Protection Division staff at the time of final submission.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

N/A 4. Top widths, berm widths, and embankment side slopes.

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

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

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

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

N/A 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

X 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

N/A 12. Type, location, size, and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

N/A 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

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

N/A 15. Outlet barrel diameter, length, slope, type, and thickness class of material and type of flared end sections, headwall or endwall.

N/A 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

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

X 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 20. BMP vicinity properly cleaned of stockpiles and construction debris.

X 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

N/A 3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

X C5. Sides of infiltration practice lined with filter fabric.

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

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

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

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

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

X C11. No visual signs of erosion or channel degradation immediately downstream of facility.

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

N/A C13. Observation well provided.

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

X D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

X D2. Sediment pretreatment devices provided.

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

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

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

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

X D7. Filtering system is off-line from storm drainage conveyance system.

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

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

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

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

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

X D13. No visual signs of erosion or channel degradation immediately downstream of facility.

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

STORMWATER MANAGEMENT/BMP FACILITIES
AS-BUILT PLAN CHECKLIST

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

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

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

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

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

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

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

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

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

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

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

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

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

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

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

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

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Engineering and Resource Protection Division specific to the proposed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

☐ Baltimore County, Maryland Soil Conservation District, As-Built Stormwater Management Pond Checklist.

☐ James City County, Virginia, Guidelines for Design and Construction of Stormwater Management BMP's (October 1999).

☐ James City County, Virginia, Stormwater Detention/Retention Basin Design Checklist and Erosion and Sediment Control and Stormwater Management Design Plan Checklists.

☐ James City County Stormwater Policy Framework, Final Report of the James City County BMP Policy Project, October 1998, The Center for Watershed Protection.

☐ Prince Georges County, Maryland, As-Built Requirements Retention or Detention Pond/Basin.

☐ Prince William County, Virginia, Stormwater Management Fact Sheet.

☐ Stafford County, Virginia, As-Built Plan Checklist.

☐ Stormwater Management Design Manual, NRCS Maryland Code No. 378, Pond Standards and Specifications.

☐ USEPA/Watershed Management Institute, Stormwater Management Inspection Forms.

☐ Virginia Impounding Structure Regulations (Dam Safety), Department of Conservation & Recreation, 1997.

☐ Virginia Erosion and Sediment Control Handbook, Third Edition 1992, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

☐ Virginia Stormwater Management Handbook, 1999 edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation.

Environmental Division

SEP 19 2013

Stormwater Management/BMP Facilities
Record Drawing and Construction Certification Forms

RECEIVED

(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: Toano Middle School- drop off and Parking Improvements
Structure/BMP Name: Bioretention #2
Project Location: 7817 Richmond Road Williamsburg
BMP Location: Located west of main entrance
County Plan No.: SP-002-2013

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

Tax Map/Parcel No.: (12-4) (1-51)
BMP ID Code (if known):
Zoning District: Pl Public Lands
Land Use: Educational
Site Area (sf or acres): 34.06

Brief Description of Stormwater Management/BMP Facility:
Bioretention facility to catch water from VDOT road and newly constructed parking area

Nearest Visible Landmark to SWM/BMP Facility: Left of main entrance as entering parking lot

Nearest Vertical Ground Control (if known):

☐ JCC Geodetic Ground Control ☐ USGS ☑ Temporary ☐ Arbitrary ☐ Other

Station Number or Name: Temporary bench mark
Datum or Reference Elevation: 105.35
Control Description: Existing drop inlet
Control Location from Subject Facility:
110' South East of bioretention facility

Section 2 - Stormwater Management/BMP Facility Construction Information:

Pre-Construction Meeting Held for Construction of SWM/BMP Facility: ☑ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: 6/2013
Facility Monitored by County Representative during Construction: ☑ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: Keith Barber Construction Inc.
Name of Professional Firm Who Routinely Monitored Construction: AES Consulting Engineers
Date of Completion for SWM/BMP Facility: 8/2013
Date of Record Drawing/Construction Certification Submittal: 9/2013

(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 Engineering and Resource Protection 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: Williamsburg James City County Public Schools
Mailing Address: 597 Jolly Pond Road
Williamsburg, Va. 23188
Business Phone: 757-259-7157 Fax: 757-565-1462
Contact Person: Alan Robertson Title: Facilities Manager

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

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Responsible Plan Preparer: Graham V. Corson P.E.
Title: Project Engineer
Plan Name: Toano Middle School - Drop off area and Parking Improvements
Firm's Project No. 9888-01
Plan Date: 1/11/13
Sheet No.'s Applicable to SWM/BMP Facility: C-01 / C-05 / C-07 / ____ / ____

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

Firm Name: Keith Barber Construction, Inc.
Mailing Address: PO Box 531
Farmville Va. 23901
Business Phone: 757-707-0732

Fax: _____
Contact Person: Keith Barber
Site Foreman/Supervisor: Keith Barber
Specialty Subcontractors and Purpose (for BMP Construction Only): _____

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management/BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne RAES Consulting
Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Thomas C. Sublett
Title: Survey Manager
Signature: Thomas C. Sublett
Date: 9-10-2013

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 to the provisions of the approved design plan, specifications design, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 001886
9/18/13
LAND SURVEYOR

_____(Seal)
Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: AES Consulting Engineers
Mailing Address: AES Consulting Engineers
Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Graham V. Corson P.E.
Title: Senior Project Engineer
Signature: Graham V. Corson
Date: 9-10-2013

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 plan, specifications, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
GRAHAM V CORSON
Lic. No. 047297
9/18/13
PROFESSIONAL ENGINEER

_____(Seal)
Virginia Registered Professional Engineer

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

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

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

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

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

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

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

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

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

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

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

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

☑ Submission Requirements - Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system,

it is requested that the record drawings also be submitted to the Engineering and Resource Protection Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Engineering and Resource Protection Division staff at the time of final submission.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

N/A 4. Top widths, berm widths, and embankment side slopes.

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

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

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

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

N/A 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

X 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

N/A 12. Type, location, size, and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

N/A 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

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

N/A 15. Outlet barrel diameter, length, slope, type, and thickness class of material and type of flared end sections, headwall or endwall.

N/A 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

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

X 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 20. BMP vicinity properly cleaned of stockpiles and construction debris.

X 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

N/A 3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

N/A C13. Observation well provided.

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

X D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

X D2. Sediment pretreatment devices provided.

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

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

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

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

X D7. Filtering system is off-line from storm drainage conveyance system.

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

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

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

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

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

X D13. No visual signs of erosion or channel degradation immediately downstream of facility.

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

STORMWATER MANAGEMENT/BMP FACILITIES
AS-BUILT PLAN CHECKLIST

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

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

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

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

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

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

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

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

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

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

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

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

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

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

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

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

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Engineering and Resource Protection Division specific to the proposed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

Environmental Division

SEP 19 2013

Stormwater Management/BMP Facilities Record Drawing and Construction Certification Forms

RECEIVED

(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: Toano Middle School- drop off and Parking Improvements
Structure/BMP Name: Bioretention #3
Project Location: 7817 Richmond Road Williamsburg
BMP Location: Located North West of the parking lot
County Plan No.: SP-002-2013

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

Tax Map/Parcel No.: (12-4) (1-51)
BMP ID Code (if known):
Zoning District: Pl Public Lands
Land Use: Educational
Site Area (sf or acres): 34.06

Brief Description of Stormwater Management/BMP Facility:
Bioretention facility to catch water from newly constructed parking space additions

Nearest Visible Landmark to SWM/BMP Facility: Located North West of parking lot

Nearest Vertical Ground Control (if known):

☐ JCC Geodetic Ground Control ☐ USGS ☑ Temporary ☐ Arbitrary ☐ Other

Station Number or Name: Temporary bench mark
Datum or Reference Elevation: 105.35
Control Description: Existing drop inlet
Control Location from Subject Facility:
350' North West of bioretention facility

Section 2 - Stormwater Management/BMP Facility Construction Information:

Pre-Construction Meeting Held for Construction of SWM/BMP Facility: ☑ Yes ☐ No ☐ Unknown
Approx. Construction Start Date for SWM/BMP Facility: 6/2013
Facility Monitored by County Representative during Construction: ☑ Yes ☐ No ☐ Unknown
Name of Site Work Contractor Who Constructed Facility: Keith Barber Construction Inc.
Name of Professional Firm Who Routinely Monitored Construction: AES Consulting Engineers
Date of Completion for SWM/BMP Facility: 8/2013
Date of Record Drawing/Construction Certification Submittal: 9/2013

(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 Engineering and Resource Protection 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: Williamsburg James City County Public Schools
Mailing Address: 597 Jolly Pond Road
Williamsburg, Va. 23188
Business Phone: 757-259-7157 Fax: 757-565-1462
Contact Person: Alan Robertson Title: Facilities Manager

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

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne Road
Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Responsible Plan Preparer: Graham V. Corson P.E.
Title: Project Engineer
Plan Name: Toano Middle School - Drop off area and Parking Improvements
Firm's Project No. 9888-01
Plan Date: 1/11/13
Sheet No.'s Applicable to SWM/BMP Facility: C-01 / C-05 / C-07 / ____ / ____

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

Firm Name: Kieth Barber Construction, Inc.
Mailing Address: PO Box 531
Farmville Va. 23901
Business Phone: 757-707-0732

Fax: _____
Contact Person: Keith Barber
Site Foreman/Supervisor: Keith Barber
Specialty Subcontractors and Purpose (for BMP Construction Only): _____

Section 4 - Professional Certifications:

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

Record Drawing and Construction Certifications for Stormwater Management/BMP Facilities

Record Drawing Certification

Firm Name: AES Consulting Engineers
Mailing Address: 5248 Olde Towne RAES Consulting Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Thomas C. Sublett
Title: Survey Manager
Signature: Thomas C. Sublett
Date: 9-10-2013

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 to the provisions of the approved design plan, specifications design, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 001886
9/18/13
LAND SURVEYOR

_____(Seal)

Virginia Registered Professional Engineer or Certified Land Surveyor

Construction Certification

Firm Name: AES Consulting Engineers
Mailing Address: AES Consulting Engineers Williamsburg, Va. 23188
Business Phone: 757-253-0040
Fax: 757-220-8994
Name: Graham V. Corson P.E.
Title: Senior Project Engineer
Signature: Graham V. Corson
Date: 9-10-2013

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 plan, specifications, and stormwater management plan, except as specifically noted.

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
9/18/13
PROFESSIONAL ENGINEER

_____(Seal)

Virginia Registered Professional Engineer

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

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

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

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

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

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

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

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

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

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

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

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

☑ Submission Requirements - Initial and subsequent submissions for review shall consist of a minimum of one (1) blue/black line set for record drawings and one copy of the construction certification documents with appropriate transmittal. Under certain circumstances, it is understood that the record drawing and construction certification submissions may be performed by different professional firms. Therefore, record drawing submission may be in advance of construction certification or vice versa. Upon approval and prior to release of bond/surety, final submission shall include one (1) reproducible set of the record drawings, one (1) blue/black line set of the record drawings and one (1) copy of the construction certification. Also for current and/or future incorporation into the County BMP database and GIS system,

it is requested that the record drawings also be submitted to the Engineering and Resource Protection Division on a diskette or CD-ROM in an acceptable electronic file format such as *.dxf, *.dwg, etc. or in a standard scanned and readable format. The electronic file requirement can be discussed and coordinated with Engineering and Resource Protection Division staff at the time of final submission.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

N/A 4. Top widths, berm widths, and embankment side slopes.

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

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

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

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

N/A 9. Primary control structure (riser) diameter or dimensions, height, type of material and base size. Indicate provisions for access that are present such as steps, ladders, etc.

X 10. Dimensions, locations and elevations of outlet orifices, weirs, slots and drains.

N/A 11. Type and size of anti-vortex and trash rack device. Height, diameter, dimensions, bar spacings (if applicable) and elevations relative to the principal spillway crest. Indicate if lockable hatch is present or not.

N/A 12. Type, location, size, and number of anti-seep collars or documentation of other methods utilized for seepage control. **May need to obtain this information during construction.**

N/A 13. Top of impervious core embankment, core trench limits and elevation of cut-off trench bottom. **May need to obtain this information during construction.**

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

N/A 15. Outlet barrel diameter, length, slope, type, and thickness class of material and type of flared end sections, headwall or endwall.

N/A 16. Outfall protection dimension, type and depth of rock and if underlain filter fabric is present.

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

X 18. Maintenance plan taken from approved design plan transposed onto record drawing set.

N/A 19. Fencing location and type, if applicable to facility.

N/A 20. BMP vicinity properly cleaned of stockpiles and construction debris.

X 21. No visual signs of erosion or channel degradation immediately downstream of facility.

N/A 22. Any other information formally requested by the Environmental Division specific to the constructed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

N/A 3. Sediment forebays or pretreatment devices provided at inlets to pond. Generally 4 to 6 ft. deep.

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

N/A C13. Observation well provided.

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

X D1. All requirements of Section II, Minimum Standards, apply to Group D facilities.

X D2. Sediment pretreatment devices provided.

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

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

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

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

X D7. Filtering system is off-line from storm drainage conveyance system.

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

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

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

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

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

X D13. No visual signs of erosion or channel degradation immediately downstream of facility.

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

STORMWATER MANAGEMENT/BMP FACILITIES
AS-BUILT PLAN CHECKLIST

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

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

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

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

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

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

N/A E5. No visual signs of ponding are present at any location in the open channel system, except at rock check dam locations for E-1 systems (Wet Swales).

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

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

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

N/A E9. Grass cover/stabilization in the open channel system appears adaptable to the specific soils and hydric conditions for the site and along the channel system.

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

N/A E11. Facility was not used for erosion and sediment control purposes and sediment was prevented from entering the facility to the greatest extent possible during construction.

N/A E12. No visible signs of accumulated silt/sediment were present in the facility following construction or alternately, accumulated silt/sediment was properly removed and no adverse affects to the function of the facility are anticipated.

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

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

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

N/A E16. For E-3 BMPs (Biofilters), the constructed grass channel is approximately equivalent to the constructed roadway length.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

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

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

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

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

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

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

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

N/A O1. All requirements of Section II, Minimum Standards, apply to this section.

N/A O2. Certification criteria to be determined on a case-by-case basis by the Engineering and Resource Protection Division specific to the proposed SWM/BMP facility.

STORMWATER MANAGEMENT/BMP FACILITIES
RECORD DRAWING CHECKLIST

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

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

CONSTRUCTION ACTIVITY REPORT
John Deere BMP Repair

Environmental Division
SEP 19 2013
RECEIVED

DATE OF INSPECTION: **September 13, 2013**

INSPECTION BY: **Bruce Abbott**

SUBJECT: **Construction Progress Inspection**
Overall Completion 80%

ARRIVAL TIME: **9:30 am**

WEATHER: **76°F and rising, cloudy, rain Thursday night**

Items Under Construction

- This BMP WC055 or BMP #1 is 90% complete.
- No pipe work to date.
- Access road has been installed. (See photograph 1.)
- Pond grading complete. (See photograph 2.)
- Rip Rap complete as discussed with County at outfall. (See photograph 3.)
- Overview of BMP WC056.

Photograph 1

Photograph 2

Photograph 3

- BMP WC056 or BMP #2 is 75% complete.
- Access road is complete. (See photograph 4)
- Pond has been dredged. Seeding to that place. (See photograph 5)
- Rip Rap placement has been done at outfall. (See photograph 6)
- No placement of pipe at time of site visit.
- Contractor to supply this office with a cost to repair of the 30" end section, reset and re-riprap. (This has been sent to John Deere for review and approval)

Photograph 4

Photograph 5

Photograph 6

- BMP WC057 or BMP #3 is 100% complete. (See Photograph 7)
- Access road has been installed. (See photograph 8)
- Rip Rap placement has been done at outfall. (See photograph 9)
- No pipe work required.

Photograph 7

Photograph 8

Photograph 9

- BMP WC058 or BMP #4
- Clearing is in progress with approximately 80% of trees cleared. (See photograph 10 below.)
- Access road has not been placed to date.
- No pipe work to date.
- Overview of BMP WC058.

Photograph 10

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

jamescitycountyva.gov

Building Safety and Permits 757-253-6620
Engineering and Resource Protection 757-253-6670
Planning 757-253-6685
Zoning Enforcement 757-253-6671

October 24, 2013

Williamsburg James City County Public Schools
Toano Middle School – Drop off area and Parking Improvements
597 Jolly Pond Road
Williamsburg, VA 23188

Re: Toano Middle School – Drop off area and Parking Improvements
County Plan No. SP-002-13
County BMP ID Code: YC066, YC067, and YC068

Dear Mr. Robertson:

The Engineering and Resource Protection Division has received a record drawing (asbuilt) and construction certification for the stormwater management facility and associated conveyance system components for the above referenced project. The record drawing provides as-built information for three bioretentions basins situated in the parking lots and drop off areas on the site. Record Drawings (asbuilts) and construction certifications are required for the entirety of the stormwater conveyance and attenuation system which includes any stormwater management/BMP(s) and the associated conveyance system(s). Certifying to the construction of these systems and components indicates that all items were constructed in accordance with the associated plans and specifications. Record drawings and construction certifications must meet established program requirements of both the county engineering and resource protection and stormwater divisions.

Based on our review of the project, record drawing submittal, and concurrent field inspection as performed on September 10, 2013, the following items must be addressed prior to the release of surety and for our division to proceed with the closing out of the project:

Construction Certification:

1. If possible add the following County identifiers to the construction certification documents: County Plan Number SP-002-13 and BMP ID No. YC066, YC067, and YC068

Record Drawing:

2. Show the following additional information on the record drawing: contour or elevation data for bioretention #1 – YC066 must be shown to insure designed water quality is contained in the facility; the roof leader routing from the school to bioretention #1 – YC066.

Construction - Related Items:

3. As discussed in the field on September 10, 2013, please provide revised drainage calculations for bioretention #1 – YC066 since the facility was not installed per the approved plan. The current elevations indicate that the

minimal side slopes are at the same 104-elevation as the invert of the drop inlet/outlet structure. In the current condition it appears unable to function as originally designed concerning the storage area and the drainage pattern will bypass the bioretention and drain directly to the outlet.

Once this work has been completed, and prior to resubmitting the record drawing information for review and approval, please contact our office so that staff may reinspect the facility. Should it be confirmed by staff that to all items have been satisfactorily completed, a final submittal of the record drawing information will be requested on CD or DVD containing full sized pdf's of the record drawings and other relative information. Once all required information has been provided, staff will then proceed with final release of the surety and/or closing out the project.

Should you have any comments or questions, please contact me at your convenience at 757-253-6702 or via email at William.cain@jamescitycountyva.gov.

Sincerely,

William Cain, P.E, CFM
Chief Civil Engineer
Engineering and Resource Protection

cc: AES – Bruce Abbott – via email
Keith Barber Construction Inc. – via email
JCC ERP DIV inspector – Tina Creech – via email

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James City County Environmental Division
Stormwater Management / BMP Inspection Report
Bioretention Facilities

County BMP ID Code (if known): _____

Name of Facility: Toano MS drop off & parking improvements BMP No.: 1 Date: 9/10/13

Location: 7817 Richmond Rd (end of handicap parking)

Name of Owner: WJCC County Public Schools

Name of Inspector: Tina Creech / Bill Cain / Maggie Lewis

Type of Facility: Bioretention

Weather Conditions: Sunny 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 prevent damage to the facility.

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Condition				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Primary Infiltration (Bioretention Cell) Area: 6"				
Specialty Landscaping	✓			
Mulch Layer	✓			
Planting Soil/Sand	✓			
Subgrade Soil	✓			
Aggregate				
Underdrain 4"	✓			
Sediment	✓			
Aesthetics				
Overflow or Bypass Control Structure (Describe Type/Location): 4" PVC				
Condition	✓			
Erosion	✓			
Trash & Debris	✓			
Sediment	✓			
Other		✓		* provide drainage calculations for bioretention - not per plan - water will bypass the bio bed (flat) to DI instead.
Outlet Structure (Describe Type/Location): existing DI				
Condition	✓			
Erosion	✓			
Trash & Debris	✓			
Sediment	✓			
Other		✓		How are the roof leaders routed??
Contributing Drainage Area/Perimeter Conditions: Parking lot/asphalt/grass area				
Land Use	✓			
Stabilization	✓			
Trash & Debris	✓			
Pollutant Hazard	✓			
Other				

Facility Item	O.K.	Routine	Urgent	Comments

Sketch and/or Remarks:

Overall Environmental Division Internal Rating: _____

Signature: Nina Creed **Date:** 9/10/13

Title: Env Insp

SWMProg\BMP\CoInspProg\Bioret.wpd

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Bioretention Facilities

County BMP ID Code (if known): _____

Name of Facility: Toano MS drop off & parking improvements BMP No.: 2 Date: 9/10/13

Location: 7817 Richmond Rd. (West of main entrance)

Name of Owner: WJCC County Public Schools

Name of Inspector: Tina Creech / Bill Cain / Maggie Lewis

Type of Facility: Bioretention

Weather Conditions: Sunny 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 prevent damage to the facility.

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

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

Facility Item	O.K.	Routine	Urgent	Comments
Condition				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Primary Infiltration (Bioretention Cell) Area:				
Specialty Landscaping	✓			
Mulch Layer	✓			
Planting Soil/Sand	✓			
Subgrade Soil	✓			
Aggregate	✓			
Underdrain	✓			
Sediment	✓			
Aesthetics	✓			*Check Dams - may cut at sides - installed per Plan.
Overflow or Bypass Control Structure (Describe Type/Location): Exsisting DI				
Condition	✓			
Erosion	✓			
Trash & Debris	✓			
Sediment	✓			
Other				
Outlet Structure (Describe Type/Location): 4" PVC				
Condition	✓			
Erosion	✓			
Trash & Debris	✓			
Sediment	✓			
Other				
Contributing Drainage Area/Perimeter Conditions:				
Land Use	✓			
Stabilization	✓			
Trash & Debris	✓			
Pollutant Hazard	✓			
Other				

Facility Item	O.K.	Routine	Urgent	Comments

Sketch and/or Remarks:

Overall Environmental Division Internal Rating: _____

Signature: Nina Bruch **Date:** 9/10/13

Title: Env Insp

SWMProg\BMP\CoInspProg\Bioret.wpd

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Bioretention Facilities

County BMP ID Code (if known): _____

Name of Facility: Toano MS-drop off & parking improvements BMP No.: 3 Date: 9/10/13

Location: 7817 Richmond Rd. (NW of parking lot)

Name of Owner: WJCC County Public Schools

Name of Inspector: Tina Creech/Bill Cain/Maggie Lewis

Type of Facility: Bioretention

Weather Conditions: Sunny 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 prevent damage to the facility.

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

Facility Item	O.K.	Routine	Urgent	Comments
Accessibility:				
Roads	✓			
Parking Areas	✓			
Gates	✓			
Locks				
Safety Fencing				
Observation Wells/Areas:				
Trap Doors				
Manhole Covers	✓			
Grates				
Steps				
Pretreatment Devices: ☐ Inlet ☐ Sump ☐ Forebay ☐ Other 4" PVC				
Sediment	✓			
Trash & Debris	✓			
Structure	✓			
Other				
Inflow Structure (Describe Type/Location):				

Facility Item	O.K.	Routine	Urgent	Comments
Condition				
Erosion				
Trash and Debris				
Sediment				
Aesthetics				
Other				
Primary Infiltration (Bioretention Cell) Area:				
Specialty Landscaping	✓			
Mulch Layer	✓			
Planting Soil/Sand	✓			
Subgrade Soil	✓			
Aggregate	✓			
Underdrain	✓			
Sediment	✓			
Aesthetics	✓			*Check dam may cut on corners but installed per plan
Overflow or Bypass Control Structure (Describe Type/Location):				
Condition				
Erosion				
Trash & Debris				
Sediment				
Other				
Outlet Structure (Describe Type/Location): DI-1				
Condition	✓			
Erosion	✓			
Trash & Debris	✓			
Sediment	✓			
Other				
Contributing Drainage Area/Perimeter Conditions:				
Land Use	✓			
Stabilization	✓			
Trash & Debris	✓			
Pollutant Hazard	✓			
Other				

Facility Item	O.K.	Routine	Urgent	Comments

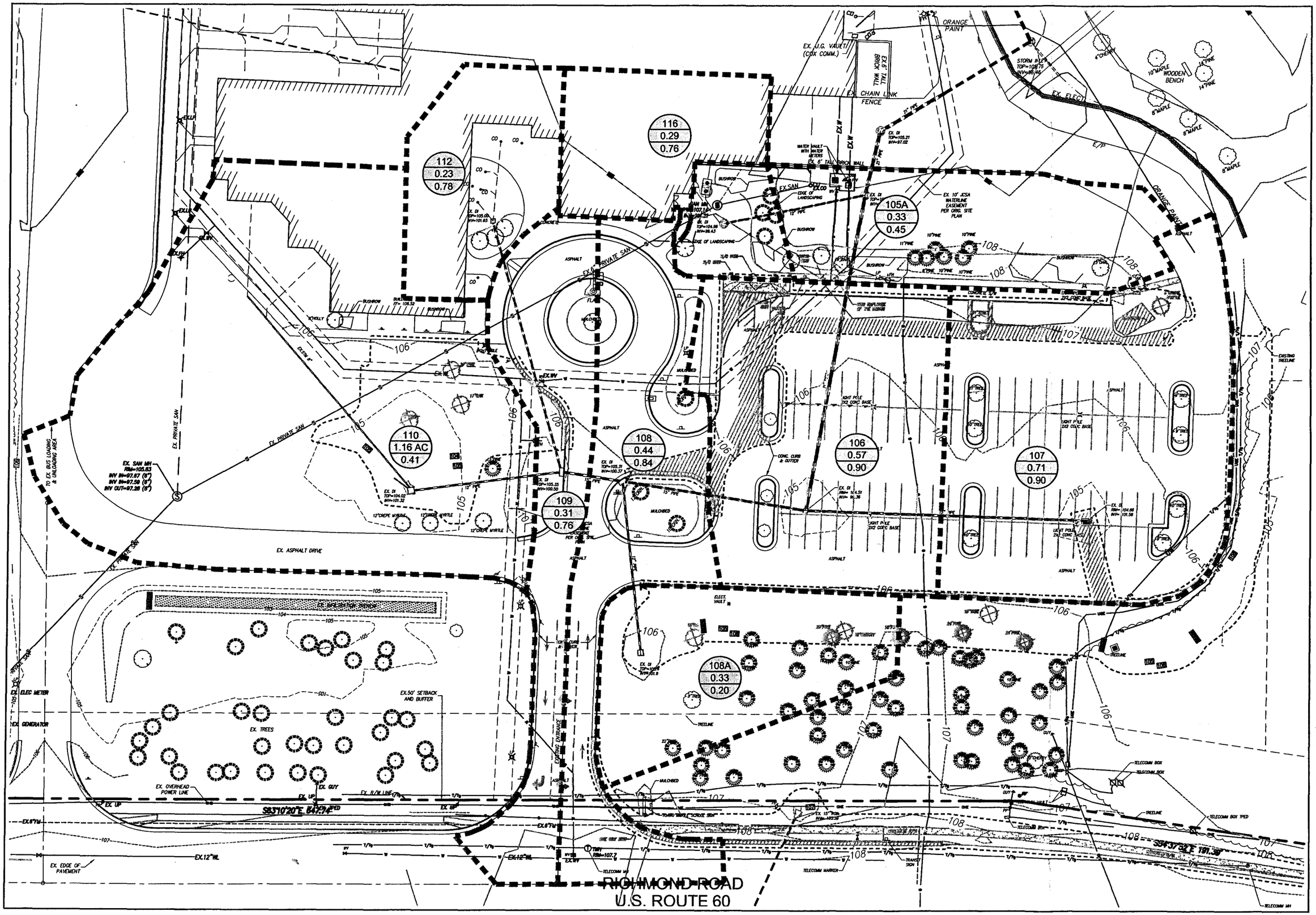
Sketch and/or Remarks:

Overall Environmental Division Internal Rating: _____

Signature: Nina Creech **Date:** 9/10/13

Title: Env Insp

SWMProg\BMP\CoInspProg\Bioret.wpd



Revised

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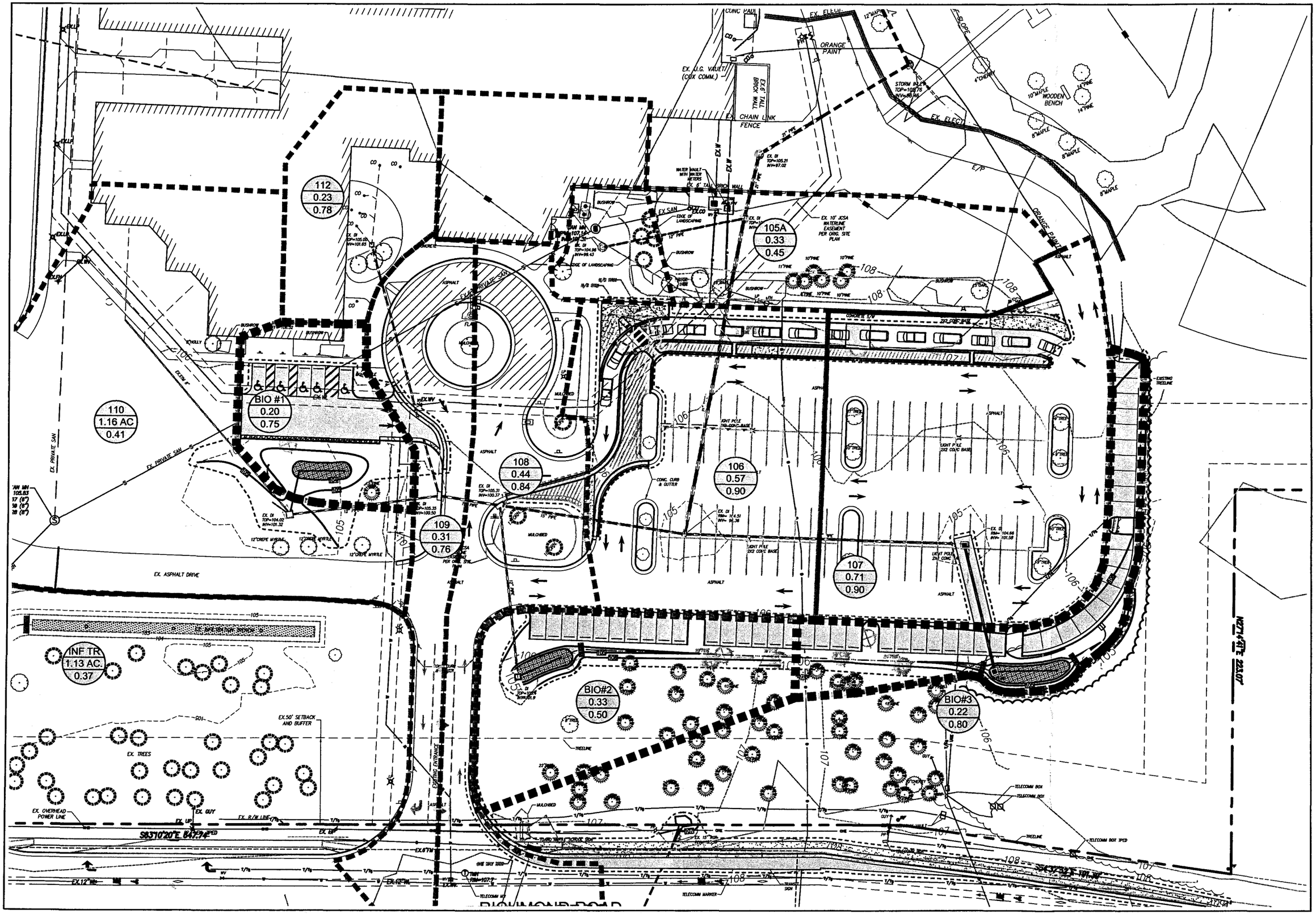
Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=200'	Date: 9/18/12

Sheet Title:
PRE-DEVELOPMENT DRAINAGE AREA DISPLAY

Sheet Number
1 OF 2



Revised	Description	Date	By

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TOANO MIDDLE SCHOOL
PARKING LOT EXPANSION

STONEHOUSE DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-01
Scale: 1"=200'	Date: 9/18/12

Sheet Title:
POST-DEVELOPMENT DRAINAGE AREA MAP

Sheet Number
2 OF 2

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	07:11636	HA-2	1 OF 1

PROJECT NAME: Toano Middle School Parking Expansion

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, James City County, Virginia

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100% — REC.%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; BOTTOM OF CASING; LOSS OF CIRCULATION; Soil Descriptions)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					2-inches of Topsoil				
					Silty Fine SAND, Trace Clay and Root Fragments, Tan, Moist, (SM)				
					Clayey Fine SAND, Orangish Brown, Moist, (SC)				15.4
2									
4									
6									
					Silty to Clayey Fine to Medium SAND, Tan and Reddish Brown, Moist, (SM-SC)				17.2
8									
10					End of Boring at 10.00-feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 8/31/2012	
WL(BCR) WL(ACR)	BORING COMPLETED 8/31/2012	CAVE IN DEPTH
WL	RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	07:11636	HA-3	1 OF 1

PROJECT NAME: Toano Middle School Parking Expansion

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, James City County, Virginia

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS; BOTTOM OF CASING; LOSS OF CIRCULATION; Soil Descriptions)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					1-inch of Topsoil				
					FILL - Silty Fine to Medium SAND, Trace Gravel, Clay, and Root Fragments, Tan and Dark Gray, Moist, (FILL)				
					Sandy Lean CLAY, Orangish Brown and Tan, Moist, (CL)				13.8
2									
4					Clayey Fine to Medium SAND, Orangish Brown, Moist, (SC)				
					Silty Fine SAND, Trace Clay, Tannish Orange, Moist, (SM)				14.8
6									
					Silty to Clayey Fine to Medium SAND, Orangish Brown, Moist, (SM-SC)				
8									
10					End of Boring at 10.00-feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY	WS☐ WD☐	BORING STARTED 8/31/2012	
WL(BCR)	WL(ACR)	BORING COMPLETED 8/31/2012	CAVE IN DEPTH
WL		RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	07:11636	HA-4	1 OF 1

PROJECT NAME: Toano Middle School Parking Expansion

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, James City County, Virginia

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (ENGLISH UNITS) — BOTTOM OF CASING / LOSS OF CIRCULATION — Soil Descriptions	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					3-inches of Topsoil				
					Silty Fine SAND, Trace Clay, Tan, Moist, (SM)				
					Clayey Fine to Medium SAND, Orangish Brown, Moist, (SC)				16.9
2									
4									
6									
8									
10					End of Boring at 10.00-feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY	WS☐ WD☐	BORING STARTED 8/31/2012	
WL(BCR)	WL(ACR)	BORING COMPLETED 8/31/2012	CAVE IN DEPTH
WL		RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	07:11636	HA-5	1 OF 1

PROJECT NAME: Toano Middle School Parking Expansion

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, James City County, Virginia

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100% — REC.% —

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

BOTTOM OF CASING — LOSS OF CIRCULATION

ENGLISH UNITS

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (Soil Descriptions)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					2-inches of Topsoil				
					Silty Fine SAND, Trace Clay and Root Fragments, Tan, Moist, (SM)				
					Clayey Fine to Medium SAND, Orangish Brown, Moist, (SC)				
2									16.0
4									
6									
8									
10					End of Boring at 10.00-feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 8/31/2012	
WL(BCR) WL(ACR)	BORING COMPLETED 8/31/2012	CAVE IN DEPTH
WL	RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

APPENDIX III

Laboratory Testing Summary

Engineering Consulting Services Mid Atlantic LLC

Williamsburg, VA

Laboratory Testing Summary

Date: 9/17/2012

Project Number: 11636 **Project Name:** Toano Middle School Parking Expansion

Project Engineer: SBP **Principal Engineer:** WLW **Summary By:** SBP

Boring Number	Sample Number	Depth (Feet)	Moisture Content (%)	USC	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
HA-1	2	1.5-2.0	16.1	SC	*	*	*	46.7	*	*	*	
HA-1	7	6.75-7.25	18.5	SM-SC	*	*	*	37.0	*	*	*	
HA-2	2	1.5-2.0	15.4	SC	*	*	*	46.3	*	*	*	
HA-2	8	7.75-8.25	17.2	SM-SC	*	*	*	35.5	*	*	*	
HA-3	2	1.5-2.0	13.8	CL	*	*	*	52.0	*	*	*	
HA-3	5	5.25-5.75	14.8	SM	*	*	*	29.8	*	*	*	
HA-4	2	2.0	16.9	SC	*	*	*	44.7	*	*	*	
HA-5	2	2.0	16.0	SC	*	*	*	41.0	*	*	*	

Summary Key:

V = Virginia Test Method
S = Standard Proctor
M= Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Stabilization

OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted

APPENDIX IV

Infiltration Test Results

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Toano Middle School Parking Exp.	**Parcel.....:**	Parking Lot
Boring No.....:	HA-1	**Date.....:**	8/31/2012
Investigators.:	SBP	**File Name.....:**	07:11636
Boring Depth.:	2.0-feet	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = $Q[\sinh^{-1}(H/r) - (r^2/H^2+1)^{.5} + r/H] / (2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
120		2:00:00 PM								
110	10	2:00:49 PM	0:00:49	0.82	12.24	0.010	1.65E-04	14.3	0.234	0.47
100	10	2:01:41 PM	0:00:52	0.87	11.54	0.009	1.56E-04	13.4	0.220	0.44
90	10	2:02:35 PM	0:00:54	0.90	11.11	0.009	1.50E-04	12.9	0.212	0.42
80	10	2:03:30 PM	0:00:55	0.92	10.91	0.009	1.47E-04	12.7	0.208	0.42
70	10	2:04:21 PM	0:00:51	0.85	11.76	0.010	1.59E-04	13.7	0.225	0.45
60	10	2:05:15 PM	0:00:54	0.90	11.11	0.009	1.50E-04	12.9	0.212	0.42
50	10	2:06:10 PM	0:00:55	0.92	10.91	0.009	1.47E-04	12.7	0.208	0.42
40	10	2:07:04 PM	0:00:54	0.90	11.11	0.009	1.50E-04	12.9	0.212	0.42
30	10	2:07:56 PM	0:00:52	0.87	11.54	0.009	1.56E-04	13.4	0.220	0.44
20	10	2:08:50 PM	0:00:54	0.90	11.11	0.009	1.50E-04	12.9	0.212	0.42

Natural Moisture:	16.1	**Init. Satur.Time:**	1:00:00 PM	**ESTIMATED FIELD Ksat.....:**				0.215	
Texture/Classif:	Clayey SAND	**Consistency:**	N/A	**Bedrock Dpth:**	N/A	**Notes:**	Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.		
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	N/A	**Imprm. Lyr.**	N/A				

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Toano Middle School Parking Exp.	**Parcel.....:**	Parking Lot
Boring No.....:	HA-2	**Date.....:**	8/31/2012
Investigators.:	SBP	**File Name.....:**	07:11636
Boring Depth.:	2.0-feet	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
120		2:20:00 PM								
110	10	2:20:31 PM	0:00:31	0.52	19.35	0.016	2.61E-04	22.5	0.370	0.74
100	10	2:20:59 PM	0:00:28	0.47	21.43	0.017	2.89E-04	25.0	0.409	0.82
90	10	2:21:26 PM	0:00:27	0.45	22.22	0.018	3.00E-04	25.9	0.425	0.85
80	10	2:21:55 PM	0:00:29	0.48	20.69	0.017	2.79E-04	24.1	0.395	0.79
70	10	2:22:22 PM	0:00:27	0.45	22.22	0.018	3.00E-04	25.9	0.425	0.85
60	10	2:22:51 PM	0:00:29	0.48	20.69	0.017	2.79E-04	24.1	0.395	0.79
50	10	2:23:22 PM	0:00:31	0.52	19.35	0.016	2.61E-04	22.5	0.370	0.74
40	10	2:23:54 PM	0:00:32	0.53	18.75	0.015	2.53E-04	21.8	0.358	0.72
30	10	2:24:27 PM	0:00:33	0.55	18.18	0.015	2.45E-04	21.2	0.347	0.69
20	10	2:25:05 PM	0:00:38	0.63	15.79	0.013	2.13E-04	18.4	0.302	0.60

Natural Moisture:	15.4	**Init. Satur.Time:**	1:00:00 PM	**ESTIMATED FIELD Ksat.....:**	0.336
Texture/Classif:	Clayey SAND	**Consistency:**	N/A	**Bedrock Dpth:**	N/A
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	N/A	**Imprm. Lyr.**	N/A

Notes: Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Toano Middle School Parking Exp.	**Parcel.....:**	Parking Lot
Boring No.....:	HA-3	**Date.....:**	8/31/2012
Investigators.:	SBP	**File Name.....:**	07:11636
Boring Depth.:	2.0-feet	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	0.0 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	14.9 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
120		2:30:00 PM								
110	10	2:30:50 PM	0:00:50	0.83	12.00	0.010	1.62E-04	14.0	0.229	0.46
100	10	2:31:45 PM	0:00:55	0.92	10.91	0.009	1.47E-04	12.7	0.208	0.42
90	10	2:32:41 PM	0:00:56	0.93	10.71	0.009	1.44E-04	12.5	0.205	0.41
80	10	2:33:32 PM	0:00:51	0.85	11.76	0.010	1.59E-04	13.7	0.225	0.45
70	10	2:34:25 PM	0:00:53	0.88	11.32	0.009	1.53E-04	13.2	0.216	0.43
60	10	2:35:19 PM	0:00:54	0.90	11.11	0.009	1.50E-04	12.9	0.212	0.42
50	10	2:36:11 PM	0:00:52	0.87	11.54	0.009	1.56E-04	13.4	0.220	0.44
40	10	2:37:02 PM	0:00:51	0.85	11.76	0.010	1.59E-04	13.7	0.225	0.45
30	10	2:38:55 PM	0:01:53	1.88	5.31	0.004	7.16E-05	6.2	0.101	0.20
20	10	2:39:50 PM	0:00:55	0.92	10.91	0.009	1.47E-04	12.7	0.208	0.42

Natural Moisture:	13.8	**Init. Satur.Time:**	1:30:00 PM	**ESTIMATED FIELD Ksat.....:**				0.178	
Texture/Classif:	Sandy CLAY	**Consistency:**	N/A	**Bedrock Dpth:**	N/A	**Notes:**	Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.		
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	N/A	**Imprm. Lyr.**	N/A				

November 7, 2012

Mr. Alan Robertson
Williamsburg-JCC Public Schools
597 Jolly Pond Road
Williamsburg, Virginia 23188

ECS Project No. 07:11695

Reference: Subsurface Exploration and Infiltration Testing
Toano Middle School Bioretention Pond #1
7817 Richmond Road
Toano, James City County, Virginia

Dear Mr. Robertson,

ECS Mid-Atlantic, LLC has completed a subsurface exploration and infiltration testing of the above referenced project. This report presents the results of the subsurface exploration and infiltration testing for the proposed bioretention pond #1.

Introduction

The project site is located at 7817 Richmond Road in Toano, James City County, Virginia. We understand that the project will consist of the construction of three (3) bioretention ponds and associated infiltration on the north side of Toano Middle School. Our scope of services is limited to the development of bioretention pond #1 only.

The purpose of this exploration was to explore the soil and groundwater conditions at the site and to provide infiltration testing to guide design and construction of the planned pervious concrete parking stalls. Our investigation included one (1) 10-foot deep hand auger boring to explore the subsurface soil and groundwater conditions, performing a site reconnaissance to observe general topography, performing one (1) infiltration test, and providing an engineering letter report with the infiltration rate for the planned construction. A Hand Auger Boring/Infiltration Location Plan is included in Appendix I.

Field and Laboratory Exploration Procedures

One (1) hand auger boring was completed to a depth of 10-feet below the existing site elevations in the proposed bioretention pond #1 footprint. Groundwater was not encountered within the hand auger boring. One (1) infiltration test was performed at the respective hand auger boring location.

In-situ saturated hydraulic conductivity (K_{sat}) testing was completed within the designated infiltration test area. Our infiltration testing was performed using a Johnson Precision Permeameter™ and the manufacturer's testing guidelines and procedures. The permeameter establishes a constant head of water at a predetermined depth in a borehole by use of a precision valve and float assembly. The rate of water flow into the borehole required to maintain the constant head is then determined at selected intervals. The permeameter can effectively measure saturated hydraulic conductivity at any desired depth in the vadose zone ranging from 0.5 feet to 98 feet and can measure K_{sat} in a range of 10^{-2} to 10^{-7} cm/sec. The use of the Precision Permeameter is a generally accepted method for measuring saturated hydraulic conductivity of in-situ soils.

A representative soil sample was selected and subjected to classification testing consisting of natural moisture content and gradation (including #200 wash) testing. The Hand Auger Boring Log is provided in Appendix II of this report while a Laboratory Testing Summary is provided in Appendix III.

Subsurface Conditions

Experienced personnel from our office classified each soil sample in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

The hand auger boring indicated that the ground surface was covered with up to approximately 4-inches of topsoil. Underlying the topsoil materials, the natural subgrade soils consisted of Clayey SAND (SC) to the boring termination depth of 10-feet below the existing site elevations.

The groundwater table was not encountered within the hand auger borings. Please note that groundwater levels are influenced by seasonal conditions and by periods of significant precipitation or prolonged drought

Infiltration Test Results

One (1) field infiltration test was completed utilizing the Johnson Meter at a depth of 2-feet below the existing site elevations. The infiltration test results are provided in Appendix IV.

Utilizing the Johnson Meter, we recorded the following in-situ infiltration values illustrated on the following page:

Table 1: Measured Infiltration Rates

Test Location	Infiltration Test No.	Ksat Test Depth (Feet)	Ksat Rate (in/hour)	USDA Soil Classification	Percent Passing the No. 200 Sieve (%)
HA-1	INF-1	2.0	0.088	SC	49.8

The measured rates fall into Hydrologic Soil Grouping D. Typically, soils with the Hydrologic Soil Group designations of A and B are considered suitable for infiltration purposes. Some soils designated as C type soils are considered suitable for infiltration practices, but these soils would need to be evaluated on a case specific basis. Soils with group designations of D are typically not considered suitable for infiltration.

Groundwater was not encountered within the hand auger borings. The soils encountered within the trench areas were generally granular and cohesive in nature and consisted of Clayey SAND (SC) in a medium dense condition, yielding low infiltration results. The existing condition of the soils encountered does not appear to support an infiltration component.

However, this information should be transmitted to the project civil engineer to determine the suitability of these soils for their intended design.

General Comments

This report has been prepared in order to aid in the evaluation of this site and to assist Williamsburg-JCC Public Schools. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

We have appreciated being of service to you during the design phase of this project and look forward to its successful construction. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

ECS MID-ATLANTIC, LLC.

Sara B. Phillips
Project Geologist

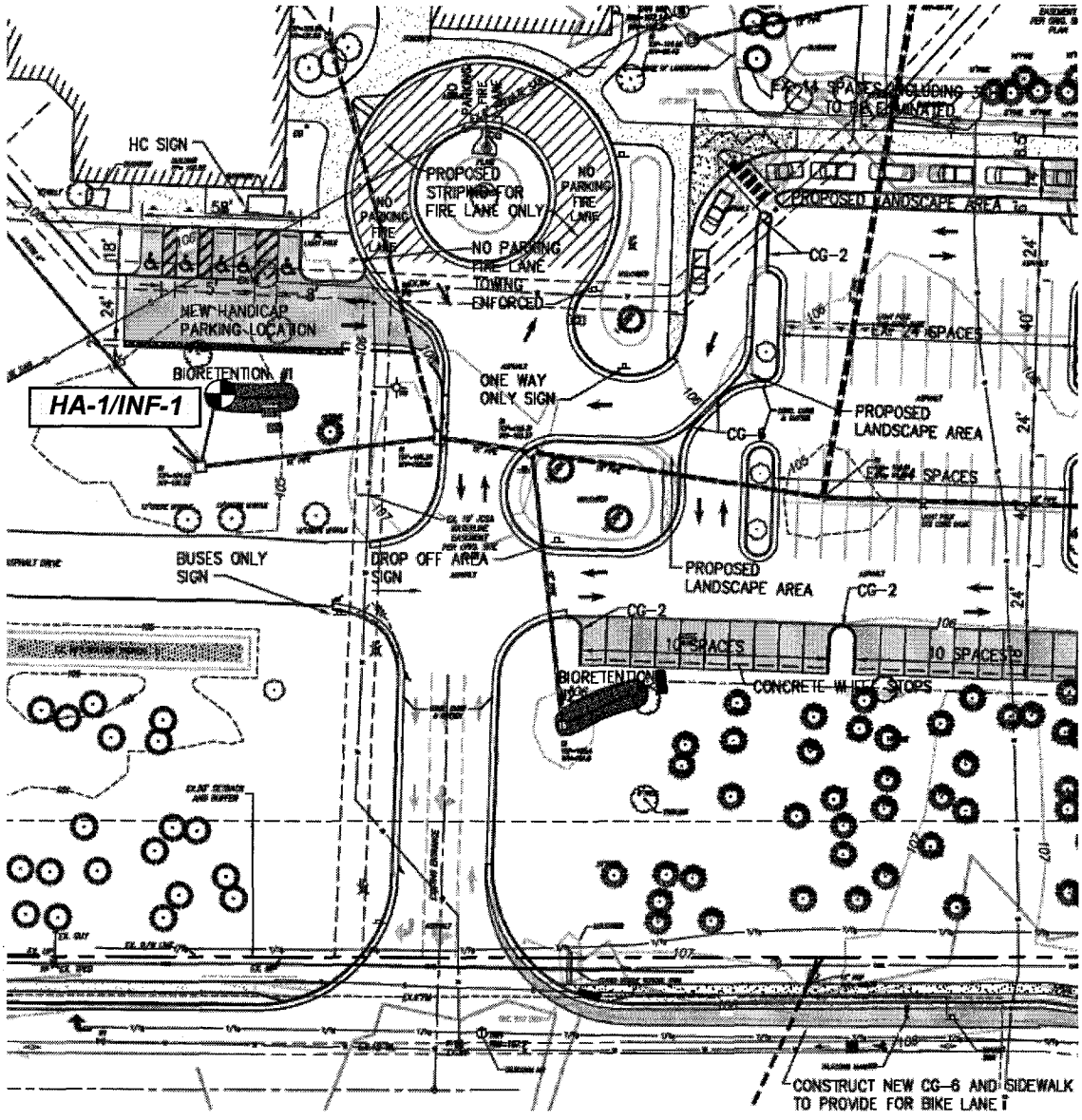
COMMONWEALTH OF VIRGINIA
W. LLOYD WARD
Lic. No. 034612
PROFESSIONAL ENGINEER

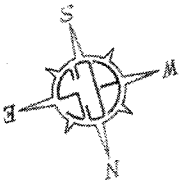
W. Lloyd Ward, P.E.
VP/Williamsburg Branch Manager

Appendix:
I. Hand Auger Boring/Infiltration Location Plan
II. Hand Auger Boring Log
III. Laboratory Testing Summary
IV. Infiltration Test Results

APPENDIX I

Hand Auger Boring/Infiltration Location Plan





LEGEND

- Approximate Hand Auger Boring and/or Infiltration Location

SCALE

NTS

SOURCE

AES Consulting Engineers

Undated

FIGURE 1
HAND AUGER BORING/INFILTRATION LOCATION PLAN
Toano Middle School
Bioretention Pond #1
James City County, Virginia

ECS PROJECT NO. 07:11695

APPENDIX II

Hand Auger Boring Log

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	11695	HA/INF-1	1 OF 1

PROJECT NAME: Toano Middle School Bioretention Pond #1

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, Toano, James City County

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% 20% 40% 60% 80% 100% — REC.% —

DESCRIPTION OF MATERIAL — ENGLISH UNITS

BOTTOM OF CASING — LOSS OF CIRCULATION

SURFACE ELEVATION

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					4-inches of Topsoil				
	1	HA	12	12	Silty Fine SAND, Light Tan, Moist, (SM)				
	2	HA	12	12	Clayey Fine to Medium SAND, Orangish Brown to Orangish Brown and Reddish Brown, Moist, (SC)				15.6
2	3	HA	12	12					
	4	HA	12	12					
4	5	HA	12	12					
	6	HA	12	12					
6	7	HA	12	12					
	8	HA	12	12					
8	9	HA	12	12					
	10	HA	12	12					
10					End of Hand Auger Boring at 10.00 Feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 10/26/2012	
WL(BCR) WL(ACR)	BORING COMPLETED 10/26/2012	CAVE IN DEPTH
WL	RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

APPENDIX III

Laboratory Testing Summary

Engineering Consulting Services Mid Atlantic LLC

Williamsburg, VA

Laboratory Testing Summary

Date: 11/7/2012

Project Number: 11695 **Project Name:** Toano Middle School Bioretention Pond #1

Project Engineer: SBP **Principal Engineer:** WLW **Summary By:** JMC

Boring Number	Sample Number	Depth (Feet)	Moisture Content (%)	USC	Liquid Limit	Plastic Limit	Plasticity Index	Percent Passing No. 200 Sieve	Compaction		CBR Value	Other
									Maximum Density (pcf)	Optimum Moisture (%)		
INF - 1	1	1.5-2.0	15.6	SC	*	*	*	49.8	*	*	*	

Summary Key:

V = Virginia Test Method
S = Standard Proctor
M= Modified Proctor

Hyd = Hydrometer
Con = Consolidation
DS = Direct Shear
GS = Specific Gravity

UCS = Unconfined Compression Soil
UCR = Unconfined Compression Rock
LS = Lime Stabilization
CS = Cement Stabilization

OC = Organic Content
SA = See Attached
NP = Non Plastic
* = Test Not Conducted

APPENDIX IV

Infiltration Test Results

ECS MID-ATLANTIC, LLC

SATURATED HYDRAULIC CONDUCTIVITY WORKSHEET

Sheet No.: 1

Project Name.:	Toano Middle School Bioretention #	**Parcel.....:**	Bioretention Pond #1
Boring No.....:	HA/INF-1	**Date.....:**	10/26/2012
Investigators.:	SBP	**File Name.....:**	07:11695
Boring Depth.:	2.0-feet	**WCU Base. Ht. h:**	14.9 **cm**
Boring Dia.....:	9.5 **cm**	**WCU Susp. Ht. S:**	15.2 **cm**
Boring Rad. (r):	4.76 **cm**	**Const. Wtr. Ht. H:**	30.1 **cm**

Terminology and Solution

Ksat : Saturated hydraulic conductivity

Q: Steady-state rate of water flow into the soil

H: Constant height of water in borehole

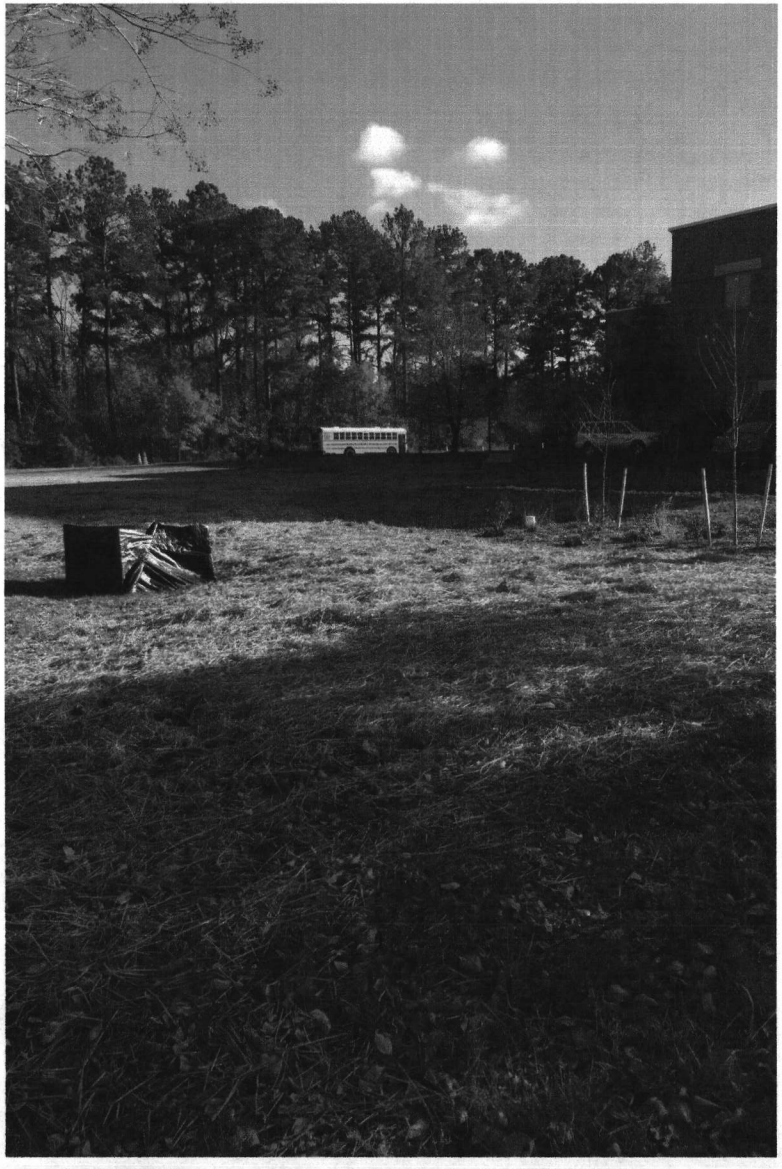
r: Radius of cylindrical borehole

Ksat = Q[sinh-1(H/r) - $(r^2/H^2+1)^{.5}$ + r/H] / $(2piH^2)$ [Glover, R. E.

VOLUME (ml)	Volume Out (ml) [a]	TIME (hr:min:sec a/p)	Elapsed Time (hr:min:sec)	Elapsed Time (min) [b]	Flow Rate Q (ml/min) [a/b]	Ksat Equivalent Values (cm/min)	(cm/sec)	(cm/day)	(in/hr)	(ft/day)
120		4:15:00 PM								
110	10	4:15:45 PM	0:00:45	0.75	13.33	0.004	6.59E-05	5.7	0.093	0.19
100	10	4:16:37 PM	0:00:52	0.87	11.54	0.003	5.71E-05	4.9	0.081	0.16
90	10	4:17:20 PM	0:00:43	0.72	13.95	0.004	6.90E-05	6.0	0.098	0.20
80	10	4:18:06 PM	0:00:46	0.77	13.04	0.004	6.45E-05	5.6	0.091	0.18
70	10	4:18:51 PM	0:00:45	0.75	13.33	0.004	6.59E-05	5.7	0.093	0.19
60	10	4:19:40 PM	0:00:49	0.82	12.24	0.004	6.05E-05	5.2	0.086	0.17
50	10	4:20:25 PM	0:00:45	0.75	13.33	0.004	6.59E-05	5.7	0.093	0.19
40	10	4:21:13 PM	0:00:48	0.80	12.50	0.004	6.18E-05	5.3	0.088	0.18
30	10	4:21:59 PM	0:00:46	0.77	13.04	0.004	6.45E-05	5.6	0.091	0.18
20	10	4:22:48 PM	0:00:49	0.82	12.24	0.004	6.05E-05	5.2	0.086	0.17
10	10	4:23:37 PM	0:00:49	0.82	12.24	0.004	6.05E-05	5.2	0.086	0.17

Natural Moisture:	15.6	**Init. Satur.Time:**	3:45:00 PM	**ESTIMATED FIELD Ksat.....:**				0.088	
Texture/Classif:	Clayey SAND	**Consistency:**	N/A	**Bedrock Dpth:**	N/A	**Notes:**	Estimated Field Ksat is determined by averaging and/or rounding of test results for final three or four intervals.		
Structure/Fabric:	N/A	**Water Tbl. Dpth:**	N/A	**Imprm. Lyr.**	N/A				

Final Repairs



9/26/13

Tina -

SP-2-13
TOANO MS DROP OFF AREA
& PARKING LOT

BIORETENTION #1 YC066
BIORETENTION #2 YC067
BIORETENTION #3 YC068

I put in MS Access database (preliminary info.) and GIS database. Copy of GIS map attached.

Scott

YC068
BIO #3
BIO #2
YC067
YC051
YC066
BIO #1
YC009

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

Project Name: Toano Middle School - drop off & parking improvements
County Plan No.: SP-002-13
Stormwater Management Facility: Bioretentions (3)
BMP Phase #: ☐ I ☐ II ☐ III

- ☑ Information Package Received. Date/By: 9/19/13
- ☐ Completeness Check:
  - ☑ Record Drawing Date/By: 9/19/13 AES
  - ☑ Construction Certification Date/By: 9/19/13 AES
  - ☑ RD/CC Standard Forms (Required for all BMPs after Feb 1st 2001Only)
  - ☐ Insp/Maint Agreement # / Date: N/A
  - ☐ BMP Maintenance Plan Location:
  - ☐ Other:
- ☐ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
  - ☐ Yes ☐ No Location:
- ☐ Assign **County BMP ID Code #**: Code: YC006, YC007, YC008
- ☑ Preliminary Input/Log into Division's "As-Built Tracking Log"
- ☑ Add Location to GIS Map. Obtain basic site information (GPIN, Owner, Address, etc.)
- ☑ Preliminary Log into Access Database (BMP ID #, Plan No., GPIN, Project Name, etc.)
- ☑ Active Project File Review (correspondence, H&H, design computations, etc.).
- ☑ Initial As-Built File setup (File label, folder, copy plan/details/design information, etc.).
- ☑ Inspector Check of RD/CC (forward to Inspector using transmittal for cursory review).
- ☐ Pre-Inspection Drawing Review of Approved Plan (Quick look prior to Field Inspection).
- ☑ Final Inspection (FI) Performed Date: 9/10/13
- ☑ Record Drawing (RD) Review Date: 9/18/13
- ☑ Construction Certification (CC) Review Date: 9/18/13
- ☐ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: 10/24/13
  - ☑ Record Drawing (RD)
  - ☑ Construction Certification (CC)
  - ☑ Construction-Related (CR)
  - ☑ Site Issues (SI) Complete 11/21/13
  - ☐ Other :
- ☑ Second Submission: 11-21-13
- ☑ Reinspection (if necessary): see pics
- ☑ 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: Nina Creech Date: 11-21-13

Chief Engineer: [signature] Date: 11/21/13

*** See separate checklist, if needed.

SP-0002-2013

Environmental Division

JAN 15 2013

RECEIVED

PLANNING DIVISION

JAN 11 2013

RECEIVED

DRAINAGE CALCULATIONS

FOR

TOANO MIDDLE SCHOOL

SITE:

James City County

SUBMITTED TO:

Environmental Division
James City County

COMMONWEALTH OF VIRGINIA
GRAHAM V. CORSON
Lic. No. 047297
1/11/13
PROFESSIONAL ENGINEER

Prepared By:

AES Consulting Engineers
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188

January 11, 2013

AES Project No. 9888-01

SP-2-13
FINAL
COMPS

9888-01_Stormwater Management Report.doc

AES
CONSULTING ENGINEERS

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I PROJECT DESCRIPTION
II EXISING SITE CONDITIONS
III ADJACENT PROPERTIES
IV OFFSITE AREAS
V SOILS
VI CRITICAL EROSION AREAS
VII EROSION & SEDIMENT CONTROL MEASURES
VIII STORMWATER MANAGEMENT & WATER QUALITY
X RESULTS AND CONCLUSIONS

APPENDIX A Swale Calculations

APPENDIX B Stormwater Management Calculations

APPENDIX C Drainage Maps

STORM WATER NARRATIVE

I PROJECT DESCRIPTION

The project is an amendment to the Toano Middle School site that will provide for a drop off area for students, designate the entrance circle as a fire lane, and relocate the handicapped spaces closer to the entrance and add 30 additional regular and 3 additional ADA compliant spaces to site. The parking additions will provide the school site with 147 regular and 5 ADA compliant parking spaces.

II EXISTING SITE CONDITIONS

The site is currently developed as a Middle School.

III ADJACENT PROPERTIES

The site is bordered to the north by Richmond Road (Route 60), to the west by Chickahominy Road (Route 631), to the south by existing woodlands, and to the east by existing commercial property.

IV OFFSITE AREAS

There are areas of offsite disturbance associated with the changes to Richmond Road.

V SOILS

The soils onsite consist of 11C Craven Yellow Fine Sandy Loam, 15F Emporia Complex, 19B Kempsville-Emporia, 29B Slagle, and 31B Suffolk Fine Sandy Loam.

VI CRITICAL EROSION AREAS

There are no critical erosion areas associated with this project.

VII EROSION & SEDIMENT CONTROL MEASURES

Unless otherwise indicated, all erosion and sediment control measures shall be installed in accordance with the Virginia Erosion and Sediment Control Handbook (VESCH). The minimum standards of the VESCH shall be adhered to unless otherwise waived and approved by the on-site E&S Control Inspector. These measures shall include but not be limited to: construction entrance, silt fence, inlet protection, culvert inlet protection, dust control, temporary seeding, and permanent seeding.

VIII STORMWATER MANAGEMENT & WATER QUALITY

All stormwater runoff from the proposed impervious areas will be collected into proposed Bioretention Facilities before entering the existing storm system. There are three Bioretention Facilities that have been sized to provide water quality volume for the proposed drainage areas. Due to poor soil conditions, the facilities will be provided with underdrains to help drain stormwater. The calculations show that the storm system is less taxed in the post-development conditions than in pre-development conditions. Through the use of the Bioretention Facilities, the stormwater runoff is attenuated to less than pre-developed conditions and therefore the existing storm system will be provided some relief with the proposed design.

Each proposed swale on site has been analyzed to determine velocity and capacity during 2-year and 10-year events. These computations can be found in the attached information for each swale.

X RESULTS & CONCLUSIONS

Stormwater Quality for the proposed impervious area associated with this project is provided by the three proposed Bioretention Facilities. Through the use of these Bioretention Facilities, the stormwater runoff is attenuated to less than pre-developed conditions and therefore the existing storm system is less taxed. Channel Protection Volume for the site is provided by the existing on-site BMP. Because the peak flows from the drainage area the proposed construction areas will be attenuated to less than pre-developed conditions, the existing BMP will not be overburdened by the work associated with this project.

APPENDIX A

SWALE CALCULATIONS

Swale Adequacy Calculations

CONSULTING ENGINEERS
Williamsburg (757) 253-0040
Gloucester (804) 693-4450
Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Channel Design
Date:	September 20, 2012
Calculated By:	GVC

Design Point: **Swale #1**

2 Year Storm - Velocity Check

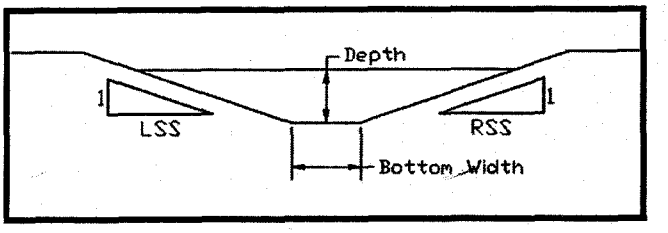
Drainage Area	=	0.20	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.50 x 5.70 x 0.20

= 0.57 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	0.75	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.45	Ft.	
Area	=	0.62	SF	Wetted Perimeter = 2.87 Ft.
Hydraulic Radius	=	0.21	Ft.	
Velocity (V)	=	0.92	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.57	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

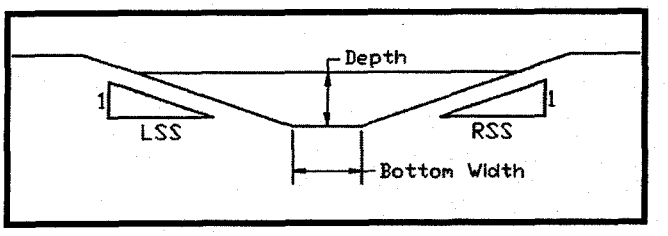
Drainage Area	=	0.20	Acres	(Area draining to Design Point)
C	=	0.50		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.50 x 7.20 x 0.20

= 0.72 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	0.75	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.49	Ft.	
Area	=	0.73	SF	Wetted Perimeter = 3.12 Ft.
Hydraulic Radius	=	0.23	Ft.	
Velocity (V)	=	0.98	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.72	CFS	(From Continuity Equation Q=AV)

AES CONSULTING ENGINEERS
Williamsburg (757) 253-0040
Gloucester (804) 693-4450
Richmond (804) 330-8040
Fredericksburg (540) 710-6606

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Channel Design
Date:	September 20, 2012
Calculated By:	GVC

Design Point: **Swale #2**

2 Year Storm - Velocity Check

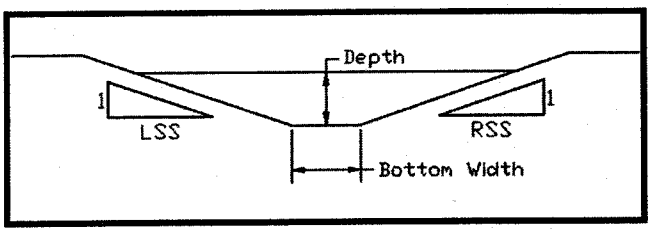
Drainage Area	=	0.10	Acres	(Area draining to Design Point)
C	=	0.80		(Runoff Coefficient)
I	=	5.70	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.80 x 5.70 x 0.10

= 0.46 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.40	Ft.	
Area	=	0.47	SF	Wetted Perimeter = 2.50 Ft.
Hydraulic Radius	=	0.19	Ft.	
Velocity (V)	=	0.97	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.46	CFS	(From Continuity Equation Q=AV)

10 Year Storm - Capacity Check

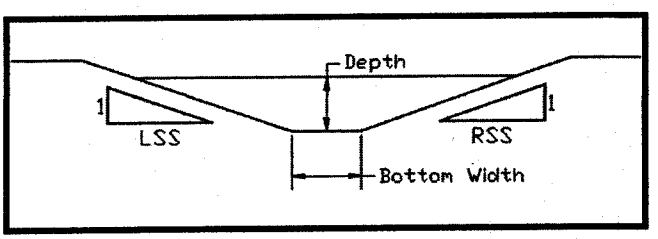
Drainage Area	=	0.10	Acres	(Area draining to Design Point)
C	=	0.80		(Runoff Coefficient)
I	=	7.20	in/hr	(Design Rainfall Intensity) **TC = 5 minutes**

Q = C I A (Peak Flow)

= 0.80 x 7.20 x 0.10

= 0.58 CFS

Channel Characteristics



Rt. Sideslope	=	3.00	:1
Lt. Sideslope	=	3.00	:1
Base Width	=	0.00	Ft.
Max. Depth	=	1.00	Ft.
Channel Slope	=	1.00	%
Mannings (n)	=	0.050	**Fallow**

Depth of Flow	=	0.43	Ft.	
Area	=	0.56	SF	Wetted Perimeter = 2.73 Ft.
Hydraulic Radius	=	0.20	Ft.	
Velocity (V)	=	1.03	Ft./sec.	(From Manning's Equation)
Flow (Q)	=	0.57	CFS	(From Continuity Equation Q=AV)

APPENDIX B

STORMWATER MANAGEMENT CALCULATIONS

Water Quality Calculations
Water Quality Volume Calculations
Bioretention Facility Hydraflow Report

Bioretention Facility #1				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.40	0.74	0.00	104.47
2-Year Storm	0.47	0.87	0.00	104.55
10-Year Storm	0.62	1.12	0.01	104.71
100-Year Storm	0.82	1.5	0.32	104.86

Bioretention Facility #2				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.32	0.81	0.00	105.20
2-Year Storm	0.38	0.95	0.00	105.27
10-Year Storm	0.50	1.24	0.01	105.37
100-Year Storm	0.66	1.65	0.14	105.43

Bioretention Facility #3				
	Pre-Development Runoff (cfs)	Post-Development Runoff (cfs)	Post Routed Runoff (cfs)	Pond Elevation (ft)
1-Year Storm	0.22	0.86	0.00	105.13
2-Year Storm	0.25	1.02	0.00	105.19
10-Year Storm	0.33	1.32	0.00	105.30
100-Year Storm	0.44	1.76	0.41	105.40

AES CONSULTING ENGINEERS

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Water Quality Calculations
	Situation 4
Date:	1/8/2013
Calculated By:	GVC

Performance-Based Water Quality Calculations - Situation 4
(Appendix 5D - Virginia Stormwater Management Handbook Volume II)

Land development where the existing percent impervious cover ($I_{existing}$) is served by an existing stormwater management BMP(s) that addresses water quality.

Requirement: The pollutant discharge after development (L_{post}) shall not exceed the existing pollutant discharge based on the existing percent impervious cover while served by the existing BMP ($Lpre_{(existingBMP)}$). The existing BMP shall be shown to have been designed and constructed in accordance with proper design standards and specifications, and to be in proper functioning condition.

STEP 1

34.06	Acres	Applicable Area
5.22	Acres	Post-development Impervious Cover
15.3	%	I_{post} (Total Post-development Impervious Cover / A x 100)

STEP 2

18	%	$I_{watershed}$
4.95	Acres	Existing Impervious Cover
14.5	%	$I_{existing}$ (Total Existing Impervious Cover / A x 100)

STEP 4

$L_{pre(existing)}$ = relative pre-development total pollutant load

$$L_{pre(existing)} = [\ 0.05 + (\ 0.009 \times \underbrace{14.5}_{I_{existing}}\ )\ ] \times \underbrace{34.06}_{A} \times 2.28$$

$L_{pre(existing)}$ = **14.0** pounds per year

$L_{pre(watershed)}$ = relative pre-development total pollutant load

$$L_{pre(watershed)} = [\ 0.05 + (\ 0.009 \times \underbrace{18}_{I_{watershed}}\ )\ ] \times \underbrace{34.06}_{A} \times 2.28$$

$L_{pre(watershed)}$ = **16.5** pounds per year

Ex. BMP **Existing Retention Basin**

28.33 Acres Drainage Area of proposed BMP
4.67 Acres Pre-development Impervious Cover for BMP Drainage Area

16.5 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

$L_{Ex.\ BMP}$ = pollutant load entering existing BMP

$$L_{Ex.\ BMP} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\underline{16.5}}\ )\ ] \times \underset{A_{BMP}}{\underline{28.33}} \times 2.28$$

$L_{Ex.\ BMP}$ = **12.8** pounds per year

$L_{removed/Ex.BMP}$ = pollutant load removed by proposed BMP

$$L_{removed/Ex.\ BMP} = \underset{EFF}{\underline{50.0}} \times \underset{L_{BMP}}{\underline{12.8}}$$

$L_{removed/Ex.\ BMP}$ = **6.4** pounds per year

$L_{pre(existingBMP)} = L_{pre(existing)} - L_{removed/Ex.\ BMP}$

$L_{pre(existingBMP)}$ = **14.0** - **6.4**

$L_{pre(existingBMP)}$ = **7.6** pounds per year

STEP 5

L_{post} = relative post-development total pollutant load

$$L_{post} = [\ 0.05 + (\ 0.009 \times \underset{I_{post}}{\underline{15.3}}\ )\ ] \times \underset{A}{\underline{34.06}} \times 2.28$$

L_{post} = **14.6** pounds per year

STEP 6

RR = relative pollutant removal requirement

L_{post} $L_{pre(existingBMP)}$

RR = **14.6** - **7.6**

RR = **7.0** pounds per year

STEP 7

EFF = required pollutant removal efficiency

RR L_{post}

EFF = **7.0** / **14.6** x 100

EFF = **47.7** %

BMP #1 **Existing Retention Basin**

28.33 Acres Drainage Area of proposed BMP

4.94 Acres Post-development Impervious Cover for BMP Drainage Area

17.4 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP1} = pollutant load entering BMP

I_{BMP} A_{BMP}

L_{BMP1} = [0.05 + (0.009 x **17.4**)] x **28.33** x 2.28

L_{BMP1} = **13.4** pounds per year

$L_{removed/BMP1}$ = pollutant load removed by proposed BMP

EFF L_{BMP}

$L_{removed/BMP1}$ = **50.0** x **13.4**

$L_{removed/BMP1}$ = **6.68** pounds per year

BMP #2 **Bioretention Facility #1**

0.20 Acres Drainage Area of proposed BMP
0.10 Acres Post-development Impervious Cover for BMP Drainage Area

50.0 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP2} = pollutant load entering BMP

$$L_{BMP2} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{50.0}}_{I_{BMP}}\ )\ ] \times \underbrace{\mathbf{0.20}}_{A_{BMP}} \times 2.28$$

L_{BMP2} = **0.2** pounds per year

$L_{removed/BMP2}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP2} = \underbrace{\mathbf{50.0}}_{EFF} \times \underbrace{\mathbf{0.2}}_{L_{BMP}}$$

$L_{removed/BMP2}$ = **0.11** pounds per year

BMP #3 **Bioretention Facility #2**

0.33 Acres Drainage Area of proposed BMP
0.07 Acres Post-development Impervious Cover for BMP Drainage Area

21.2 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP3} = pollutant load entering BMP

$$L_{BMP3} = [\ 0.05 + (\ 0.009 \times \underbrace{\mathbf{21.2}}_{I_{BMP}}\ )\ ] \times \underbrace{\mathbf{0.33}}_{A_{BMP}} \times 2.28$$

L_{BMP3} = **0.2** pounds per year

$L_{removed/BMP3}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP3} = \underbrace{\mathbf{50.0}}_{EFF} \times \underbrace{\mathbf{0.2}}_{L_{BMP}}$$

$L_{removed/BMP3}$ = **0.09** pounds per year

BMP #4 **Bioretention Facility #3**

0.22 Acres Drainage Area of proposed BMP
0.11 Acres Post-development Impervious Cover for BMP Drainage Area

50.0 % I_{BMP} (Total Post-dev Impervious Cover of BMP Drainage Area / A_{BMP} x 100)

L_{BMP4} = pollutant load entering BMP

$$L_{BMP4} = [\ 0.05 + (\ 0.009 \times \underset{I_{BMP}}{\underline{\mathbf{50.0}}}\ )\ ] \times \underset{A_{BMP}}{\underline{\mathbf{0.22}}} \times 2.28$$

L_{BMP4} = **0.3** pounds per year

$L_{removed/BMP4}$ = pollutant load removed by proposed BMP

$$L_{removed/BMP4} = \underset{EFF}{\underline{\mathbf{50.0}}} \times \underset{L_{BMP}}{\underline{\mathbf{0.3}}}$$

$L_{removed/BMP4}$ = **0.1** pounds per year

BMP #5 _____

BMP #6 _____

$$L_{removed/total} = L_{removed/BMP1} + L_{removed/BMP2} + L_{removed/BMP3} + L_{removed/BMP4} + L_{removed/BMP5} + L_{removed/BMP6}$$

$$= \underline{\mathbf{6.7}} + \underline{\mathbf{0.1}} + \underline{\mathbf{0.1}} + \underline{\mathbf{0.1}} + \underline{\mathbf{0.0}} + \underline{\mathbf{0.0}}$$

= **7.0** pounds per year

Compliance Check

$L_{removed/total} \geq RR$

$\underline{\mathbf{7.0}} \geq \underline{\mathbf{7.0}}$

AES CONSULTING ENGINEERS

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Water Quality Volume
Date:	1/8/2013
Calculated By:	GVC

BMP Type = **Bioretention #3**

Water Quality Volume = 0.5 in. x **0.11** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.11**)

= **200** CF

105.32'

104.57'

0.75'

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **200**

= **399.3** CF

618 FT³ / 0.75 FT = 824 S.F. ≈ 17% OF DA.

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **200**

= **399** CF

Dry Storage Volume Provided = **618** CF Elevation = **105.32 - Riser Elevation**

AES CONSULTING ENGINEERS

Project:	**Toano Middle School**
Project No.:	**9888-01**
Subject:	**Water Quality Volume**
Date:	**1/8/2013**
Calculated By:	**GVC**

BMP Type = **Bioretention #1**

Water Quality Volume = 0.5 in. x **0.1** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.1**)

= **182** CF

104.75

104

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **182**

= **363** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **182**

= **363** CF

Dry Storage Volume Provided = **530** CF Elevation = **104.75 - Riser Elevation**

AES CONSULTING ENGINEERS

Project:	Toano Middle School
Project No.:	9888-01
Subject:	Water Quality Volume
Date:	1/8/2013
Calculated By:	GVC

BMP Type = **Bioretention #2**

Water Quality Volume = 0.5 in. x **0.07** acres of impervious coverage

= (0.5 / 12) x (43,560 x **0.07**)

= **127** CF

Total Storage Volume Required = **2** x Water Quality Volume

= **2** x **127**

= **254.1** CF

Min. Dry Storage Volume Required = **2** x Water Quality Volume

= **2** x **127**

= **254** CF

Dry Storage Volume Provided = **500** CF Elevation = **105.40 - Riser Elevation**

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.402	1	5	181	-----	-----	-----	Pre-Development Flow
2	Rational	0.735	1	5	331	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	104.47	331	Post Routed

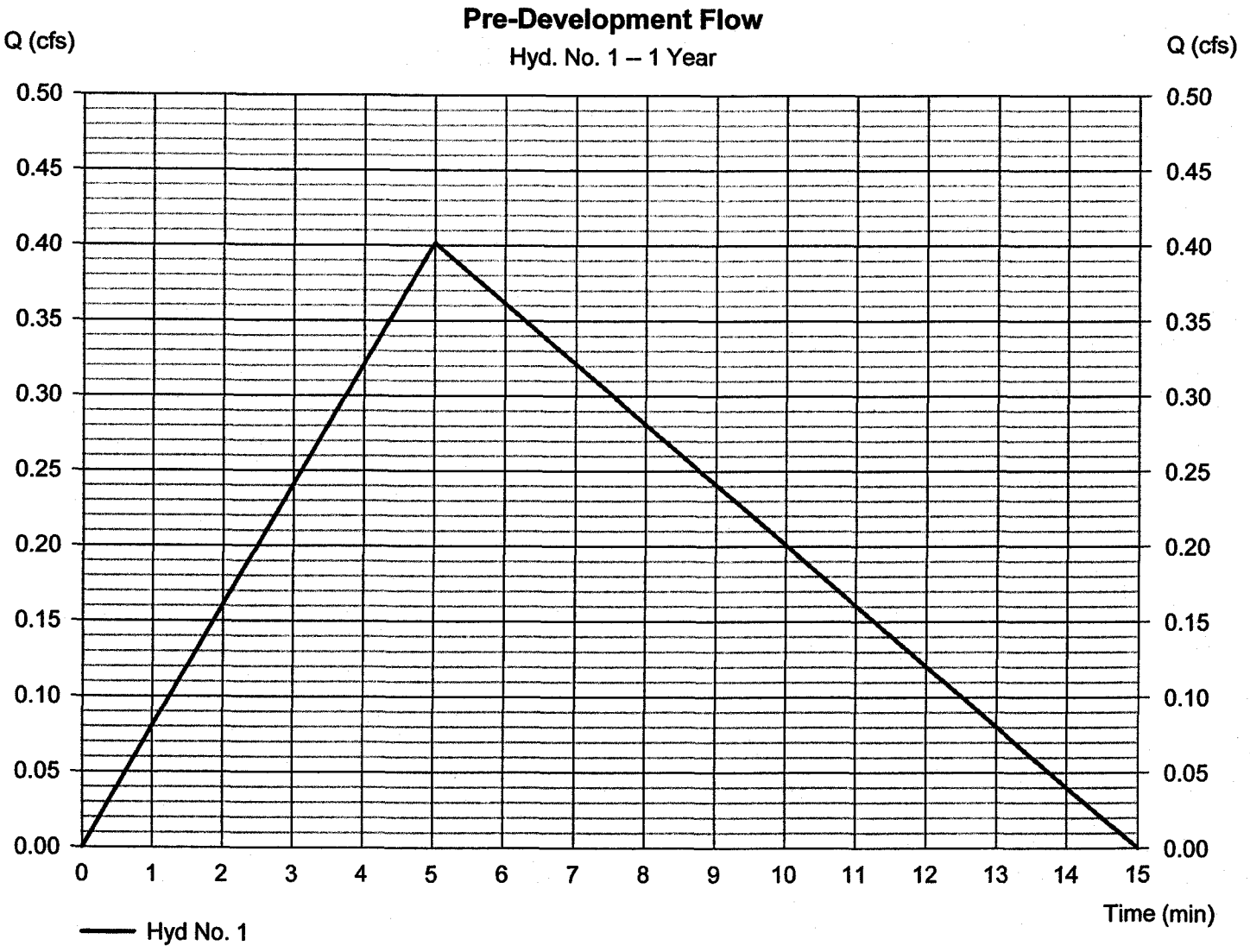
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.402 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 181 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



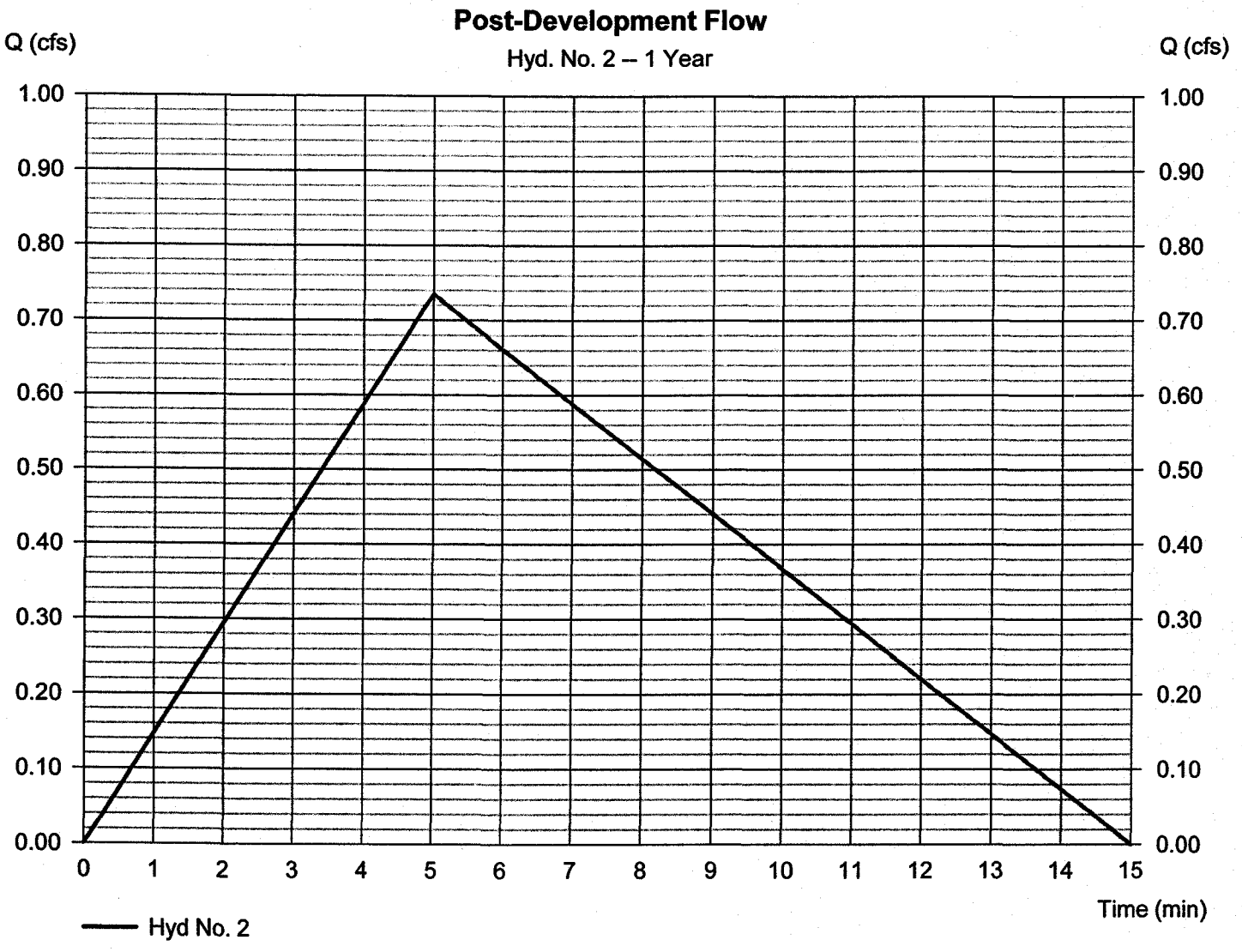
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.735 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 331 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

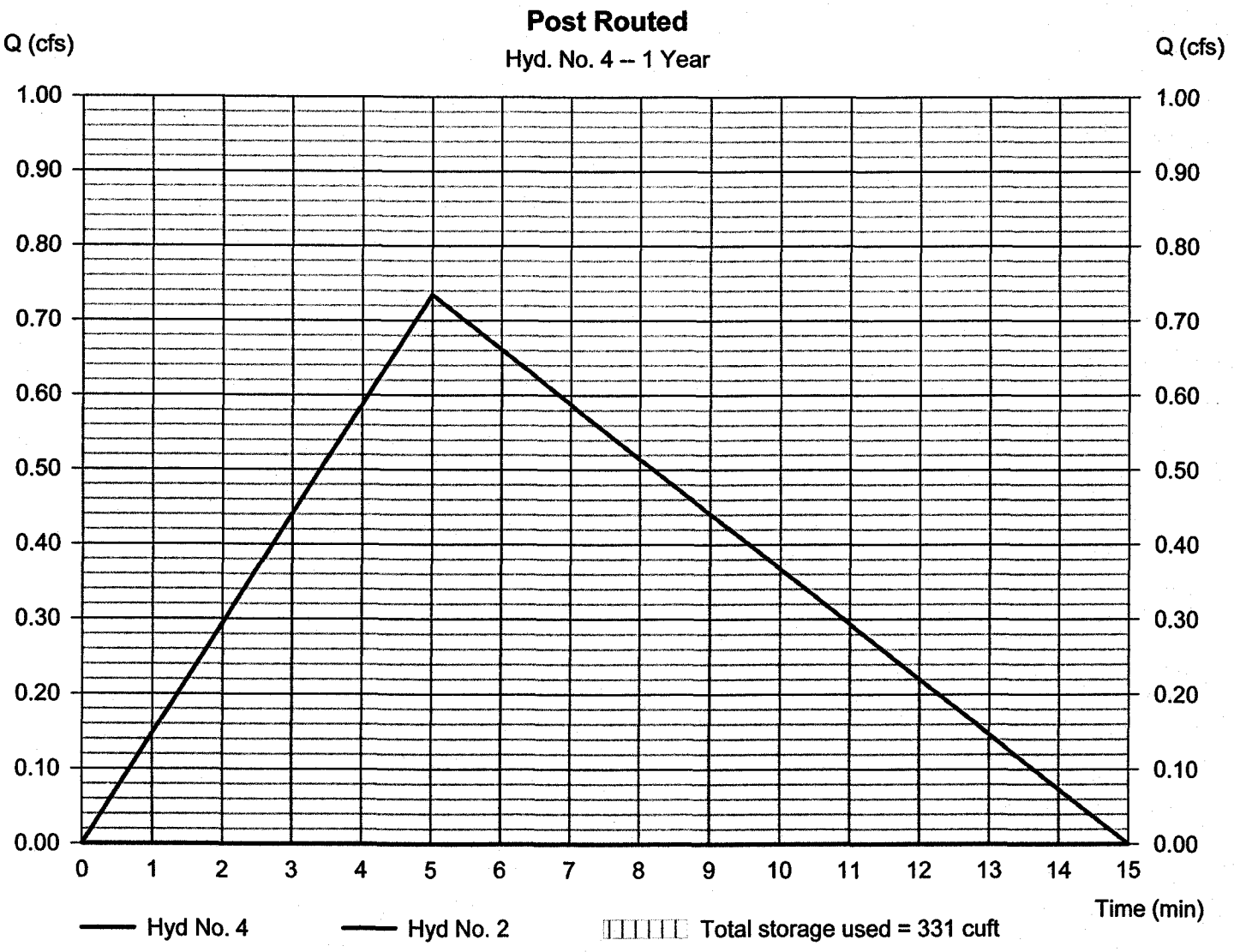
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.47 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 331 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Pond No. 1 - Bioretention Facility #1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.00	319	0	0
1.00	105.00	1,188	707	707
1.25	105.25	2,600	462	1,170

Culvert / Orifice Structures

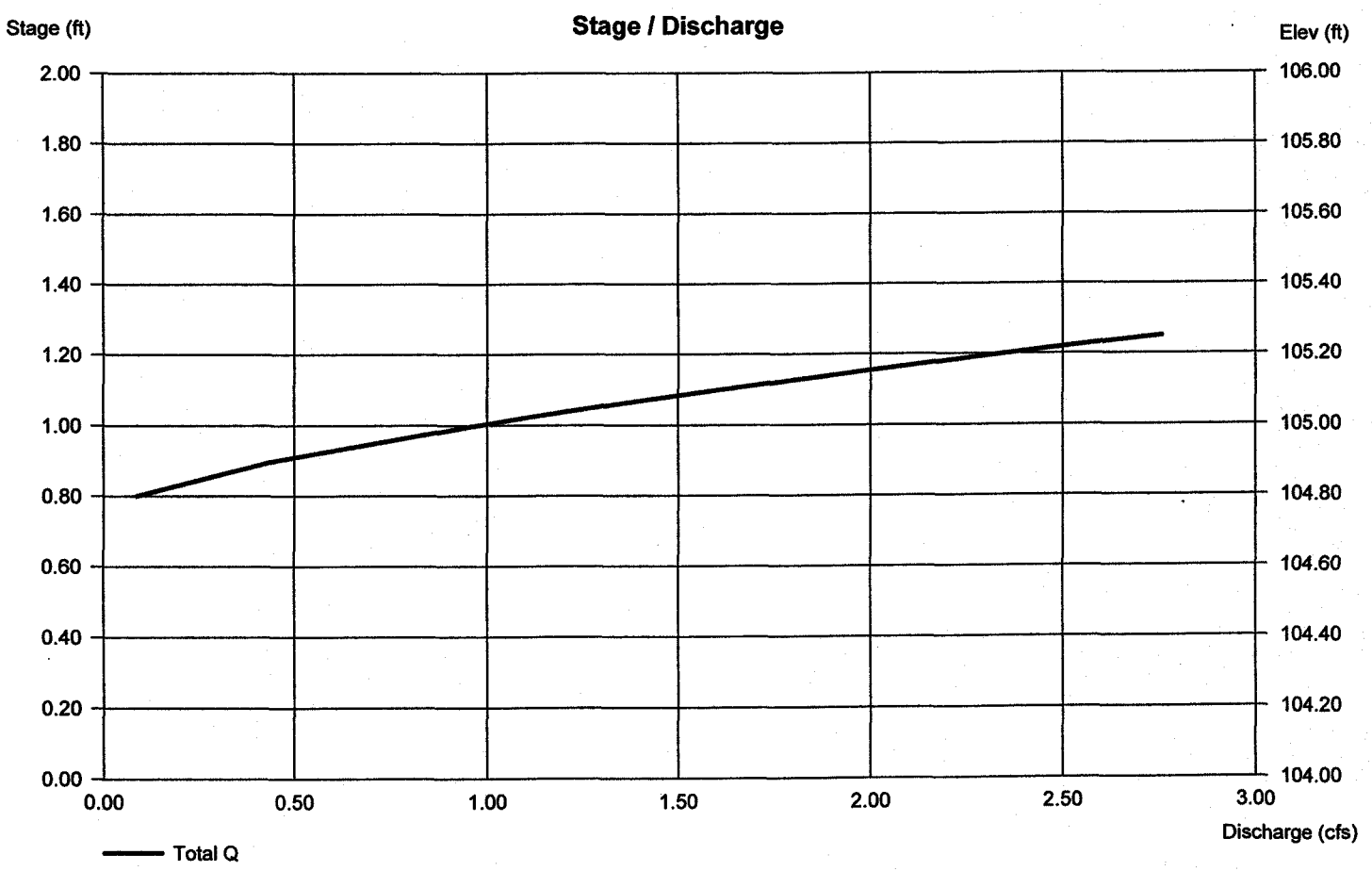
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.00	0.00	0.00	0.00
Crest El. (ft)	= 104.75	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.474	1	5	213	-----	-----	-----	Pre-Development Flow
2	Rational	0.868	1	5	390	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	104.55	390	Post Routed

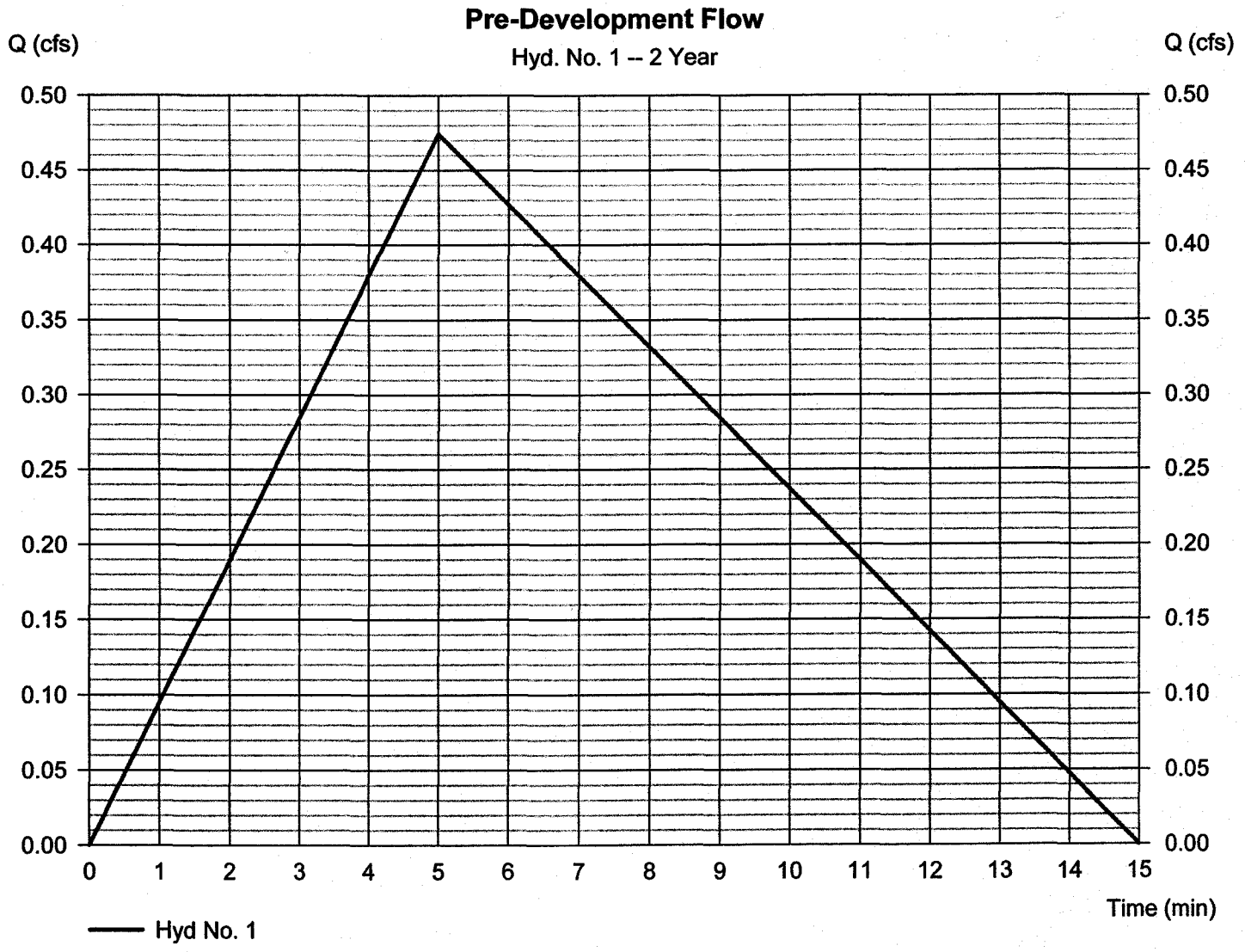
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.474 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 213 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



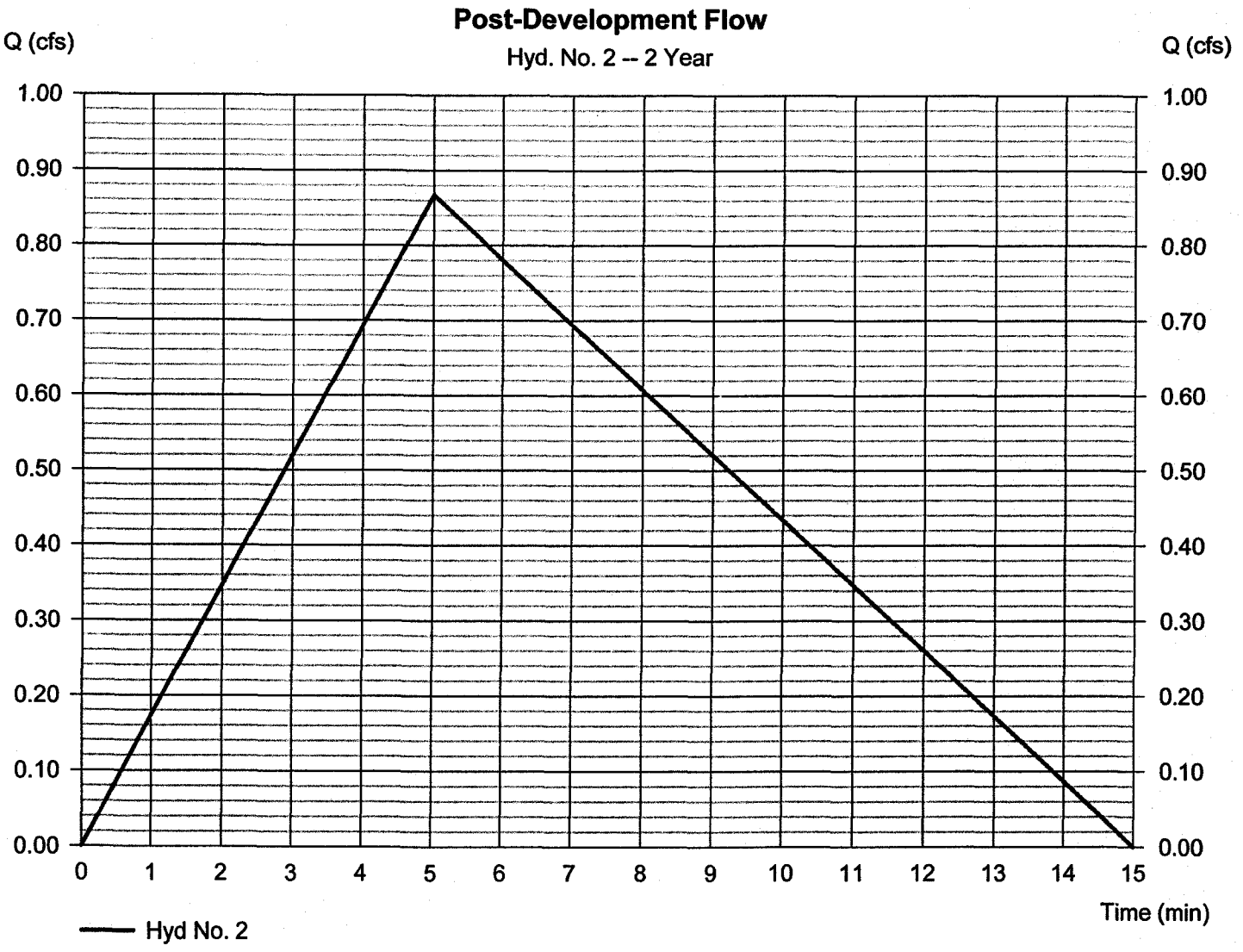
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.868 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 390 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

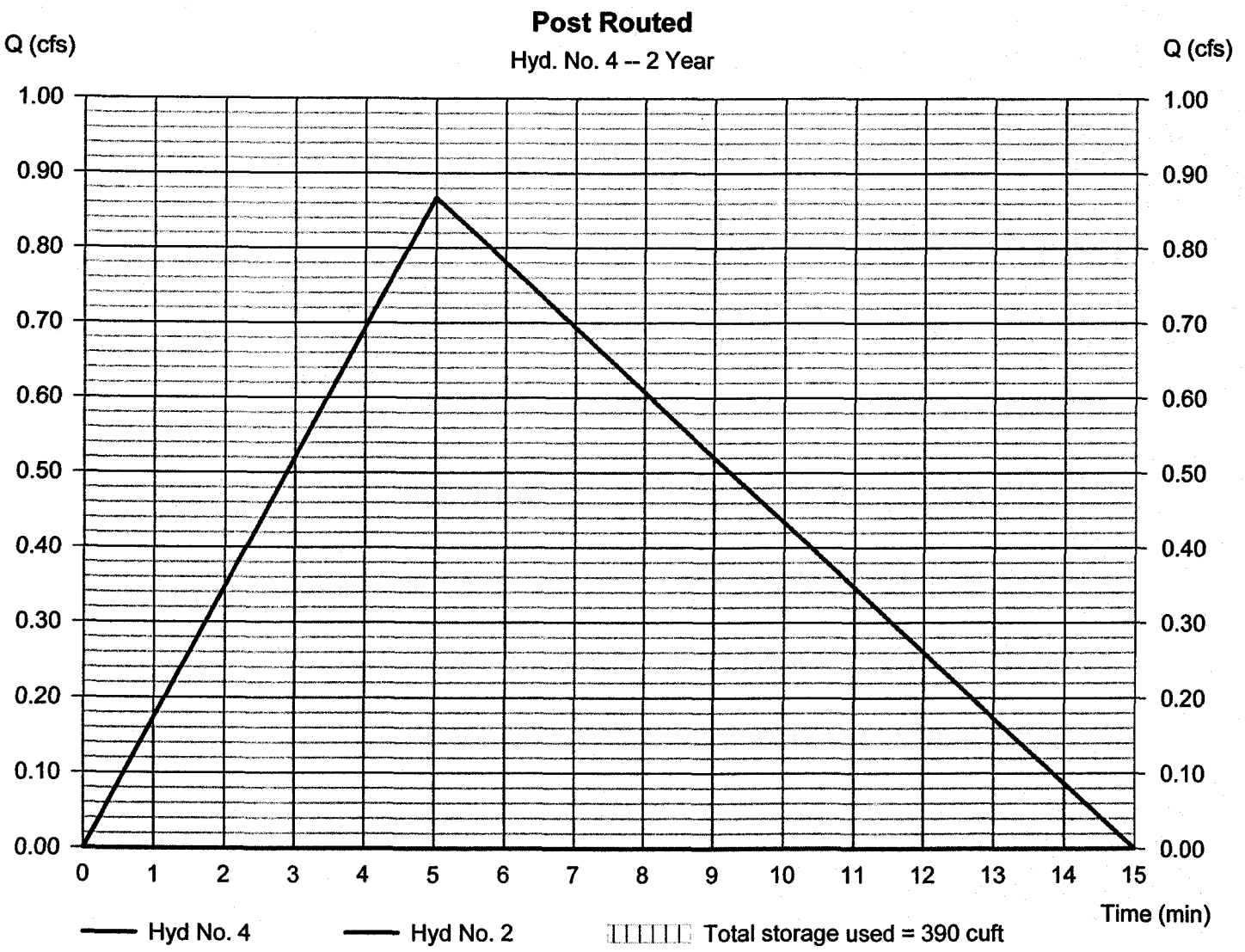
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.55 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 390 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.615	1	5	277	-----	-----	-----	Pre-Development Flow
2	Rational	1.124	1	5	506	-----	-----	-----	Post-Development Flow
4	Reservoir	0.012	1	15	10	2	104.71	505	Post Routed

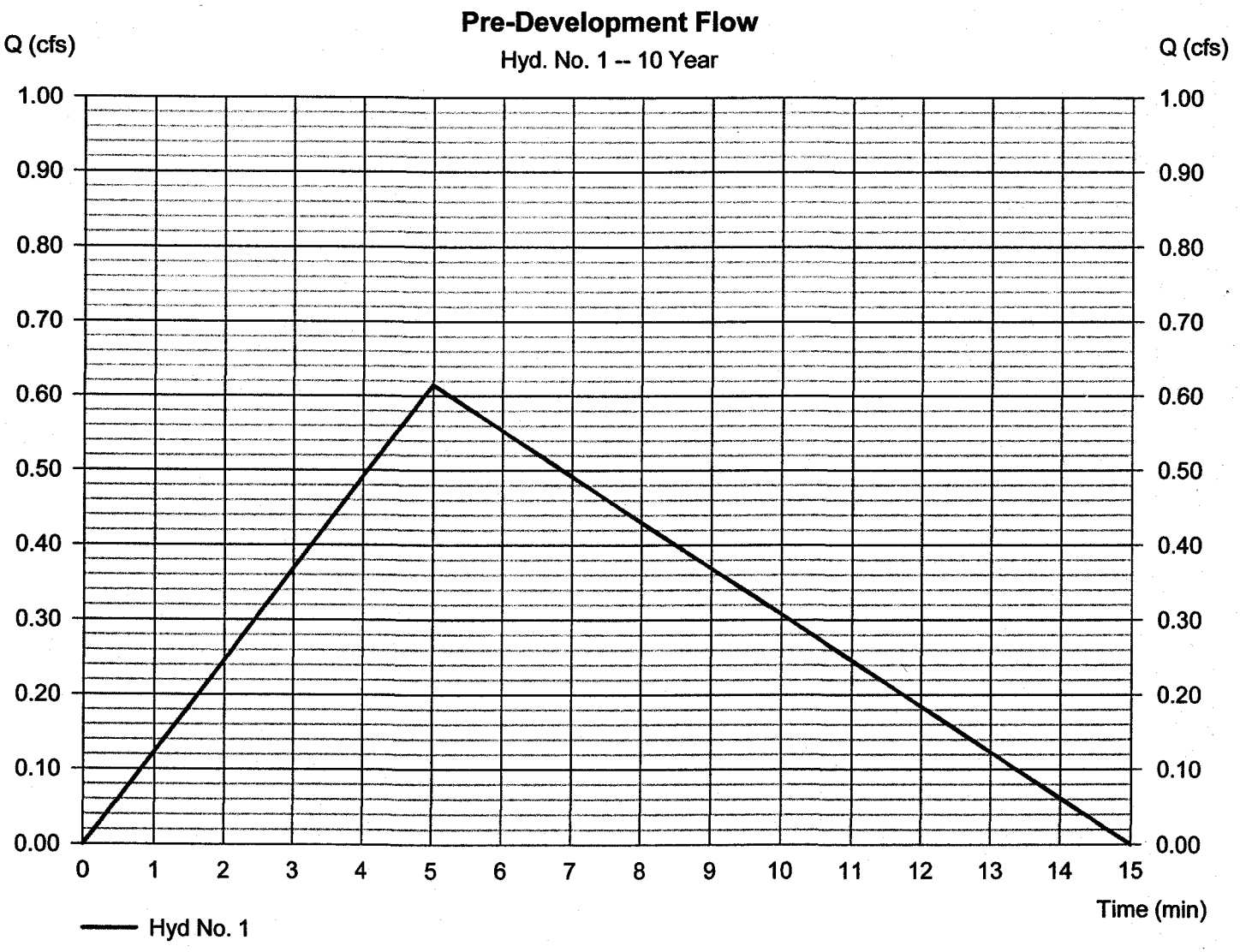
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.615 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 277 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



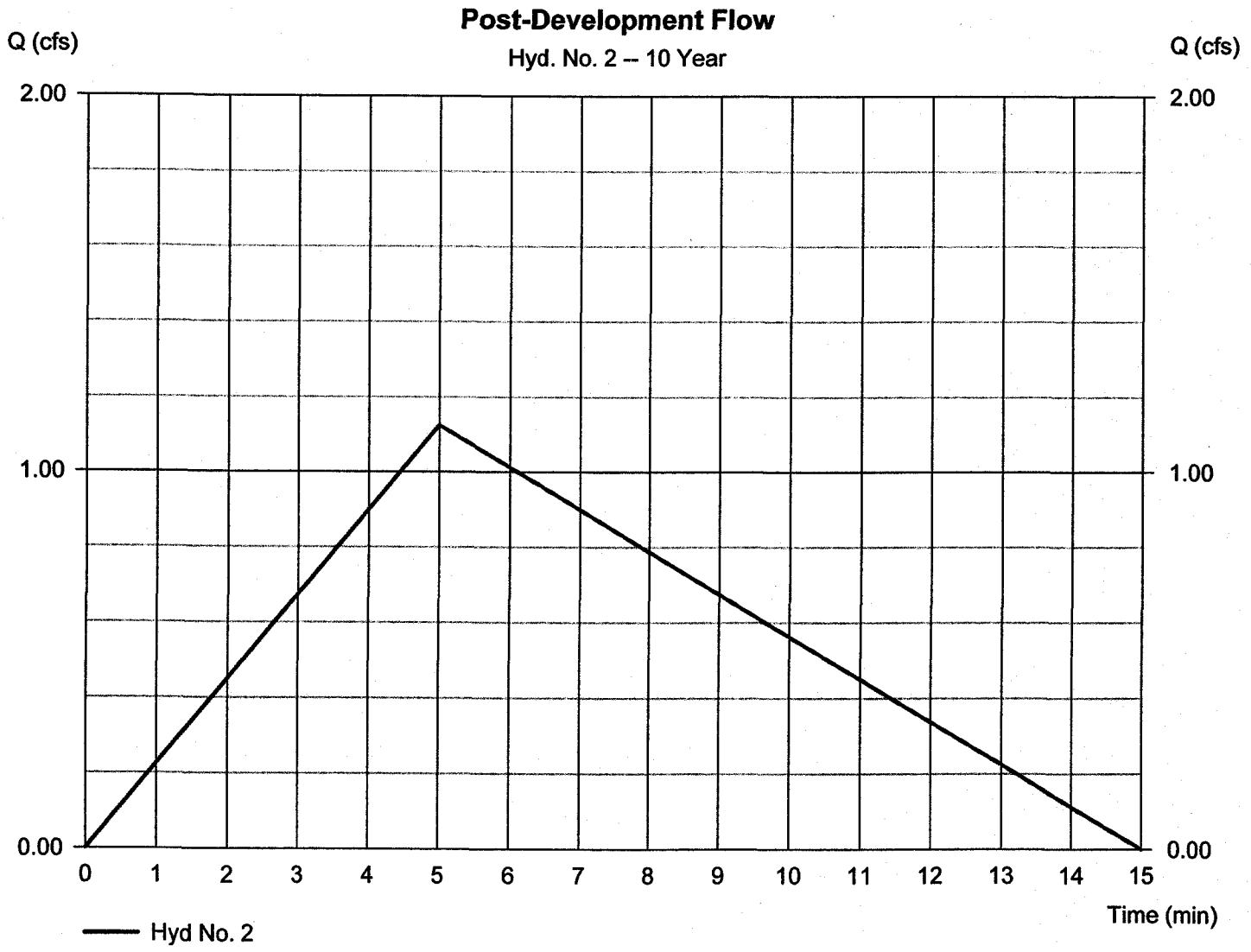
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.124 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 506 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

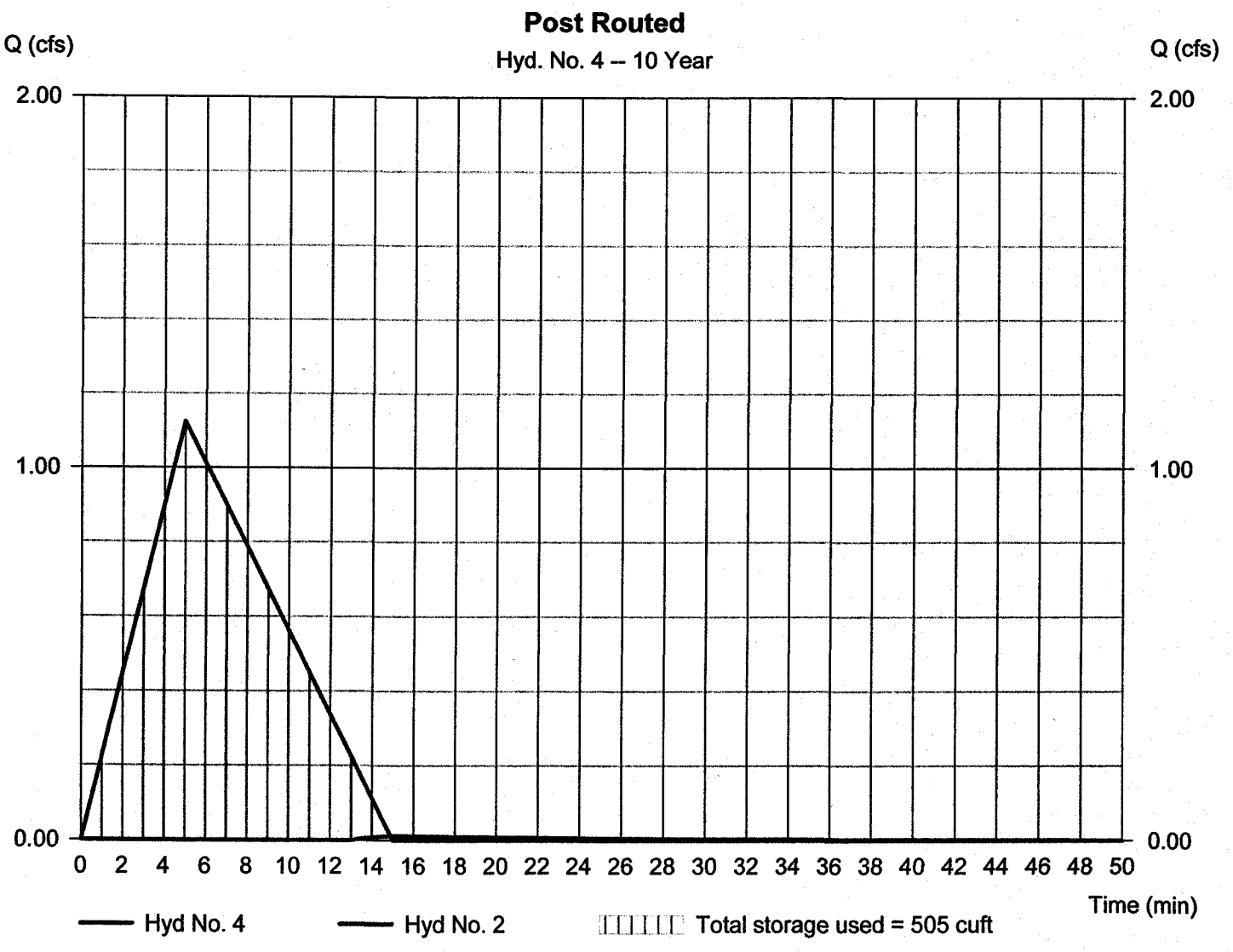
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.012 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 10 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.71 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 505 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.819	1	5	369	-----	-----	-----	Pre-Development Flow
2	Rational	1.498	1	5	674	-----	-----	-----	Post-Development Flow
4	Reservoir	0.317	1	13	178	2	104.86	610	Post Routed

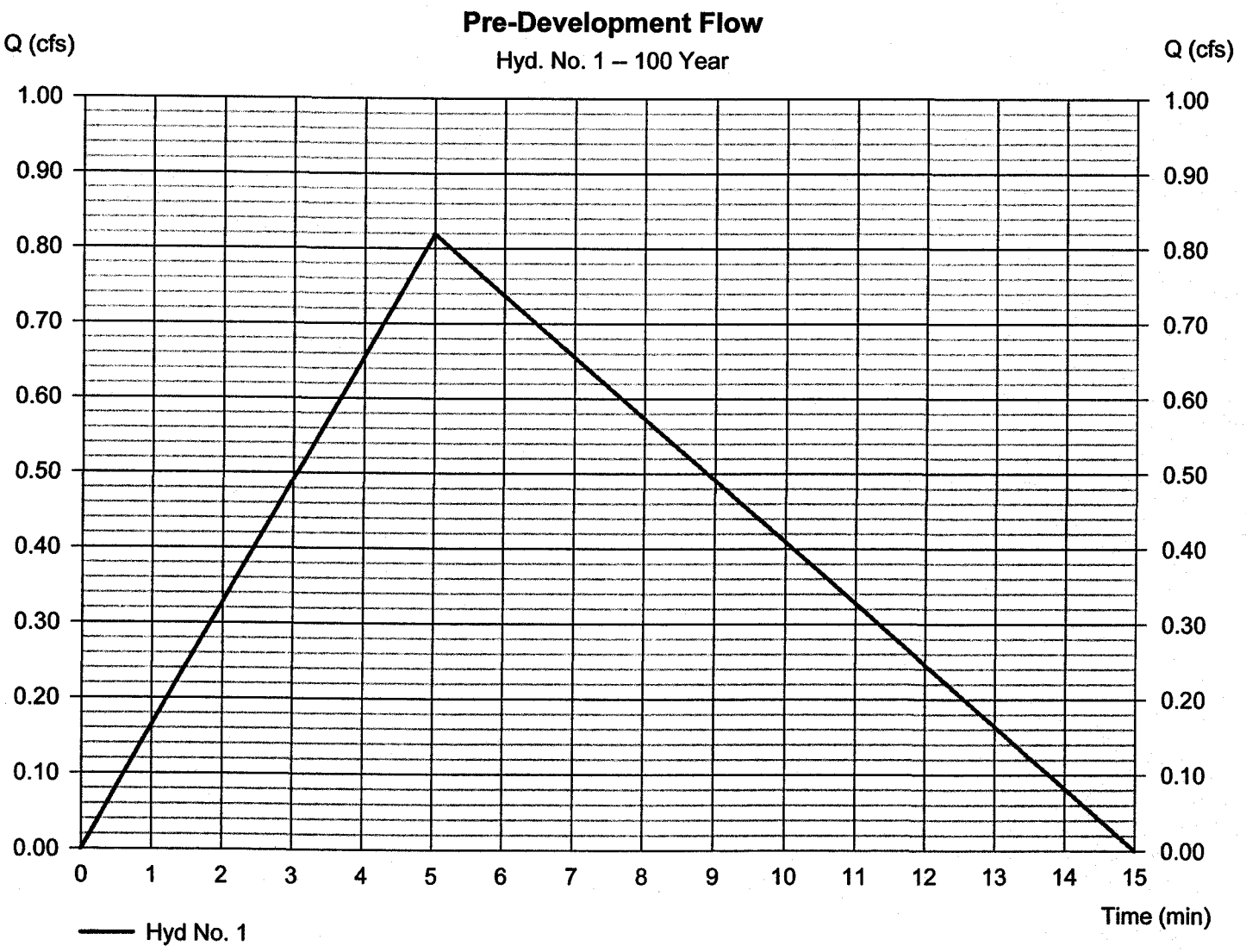
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.819 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 369 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.41
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



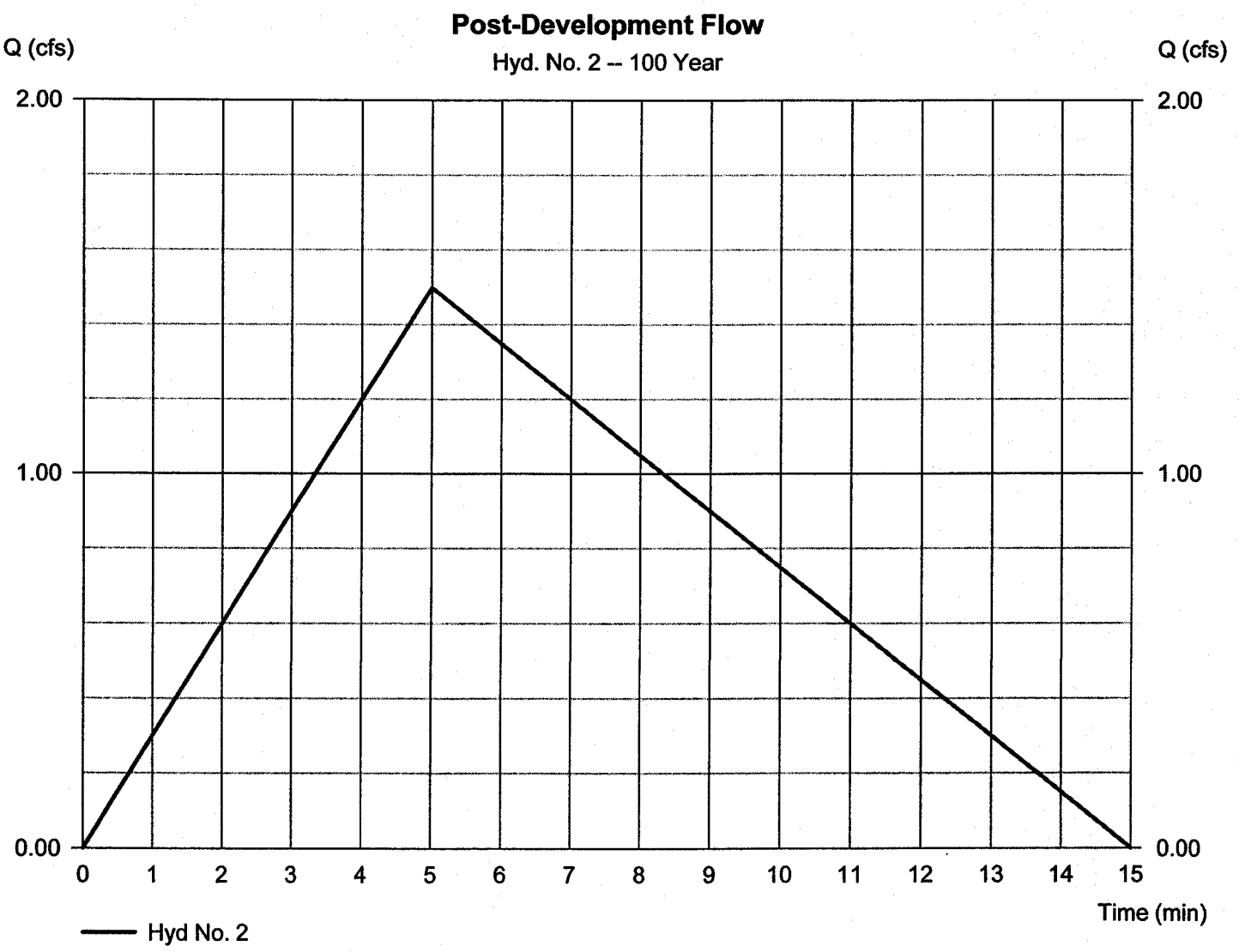
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.498 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 674 cuft
Drainage area	= 0.200 ac	Runoff coeff.	= 0.75
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

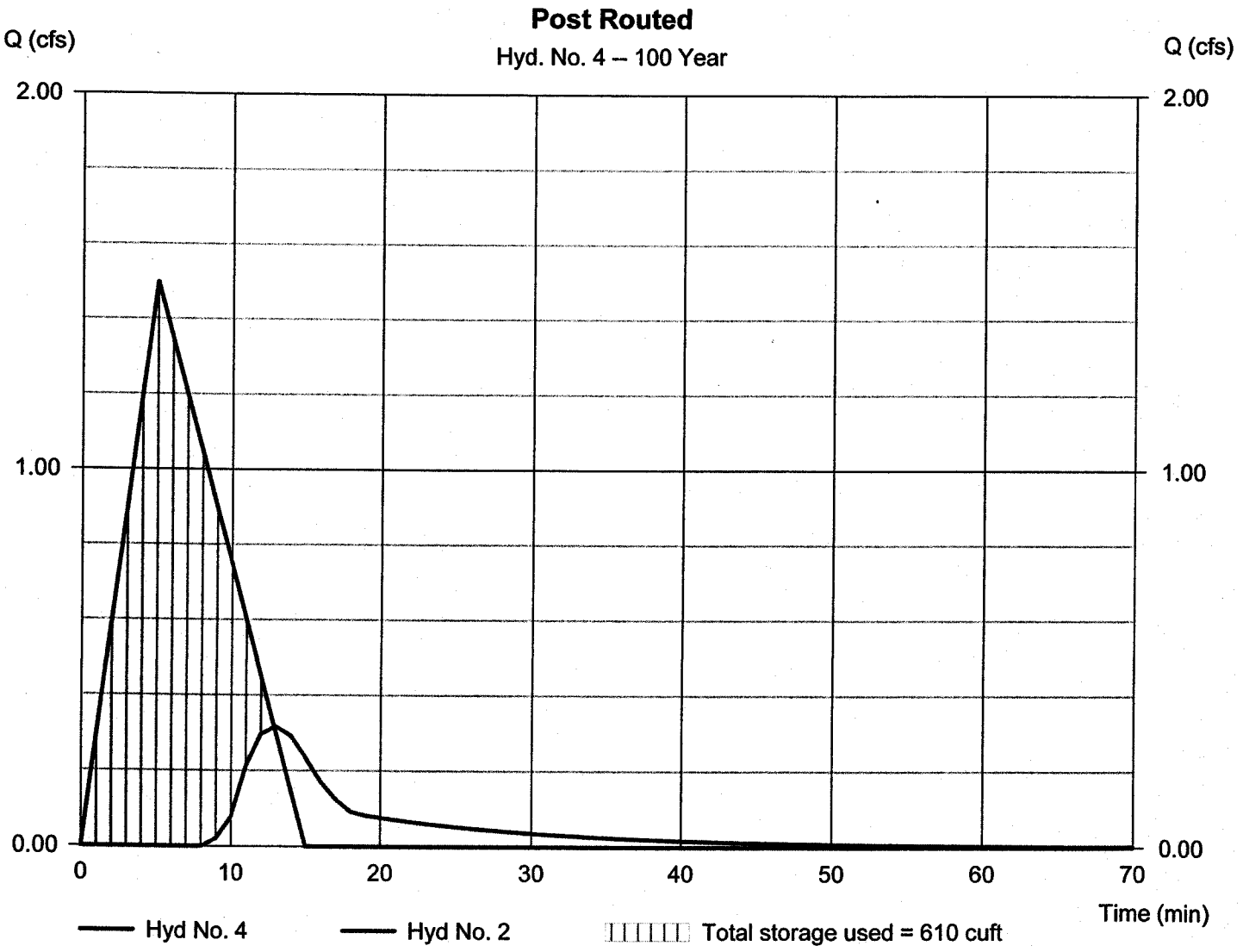
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.317 cfs
Storm frequency	= 100 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 178 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 104.86 ft
Reservoir name	= Bioretention Facility #1	Max. Storage	= 610 cuft

Storage Indication method used.



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.323	1	5	145	-----	-----	-----	Pre-Development Flow
2	Rational	0.808	1	5	364	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.20	364	Post Routed

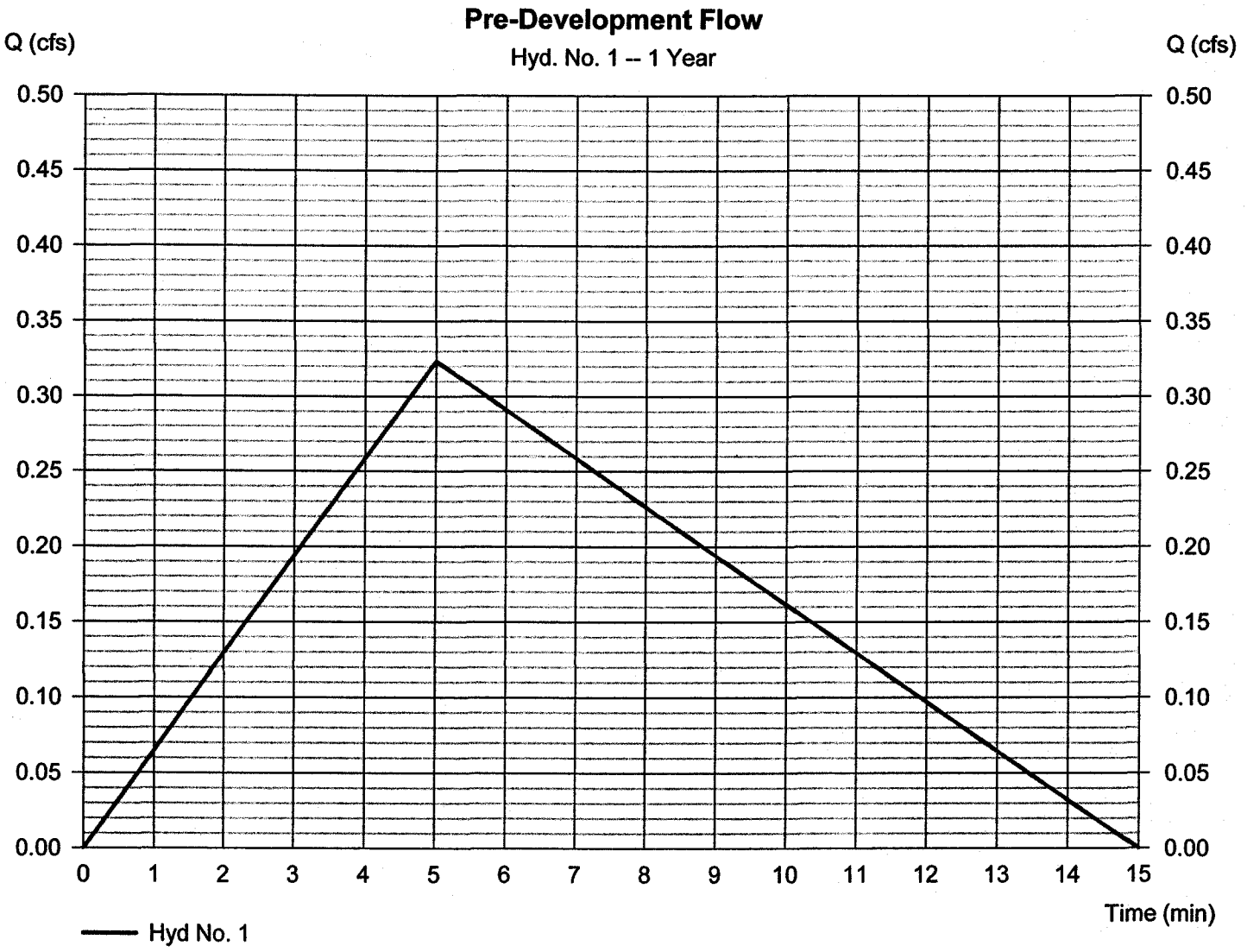
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.323 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 145 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



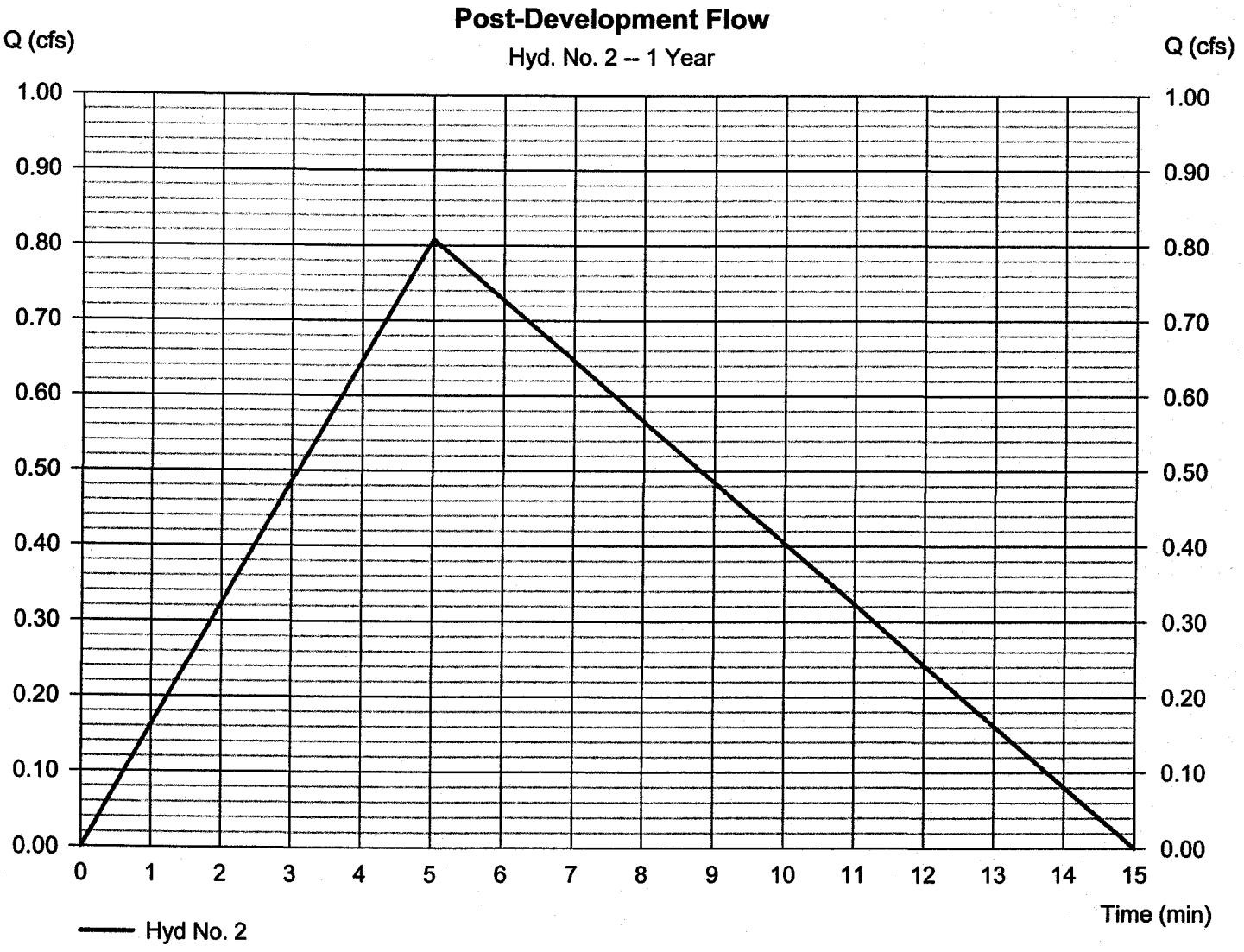
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.808 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 364 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

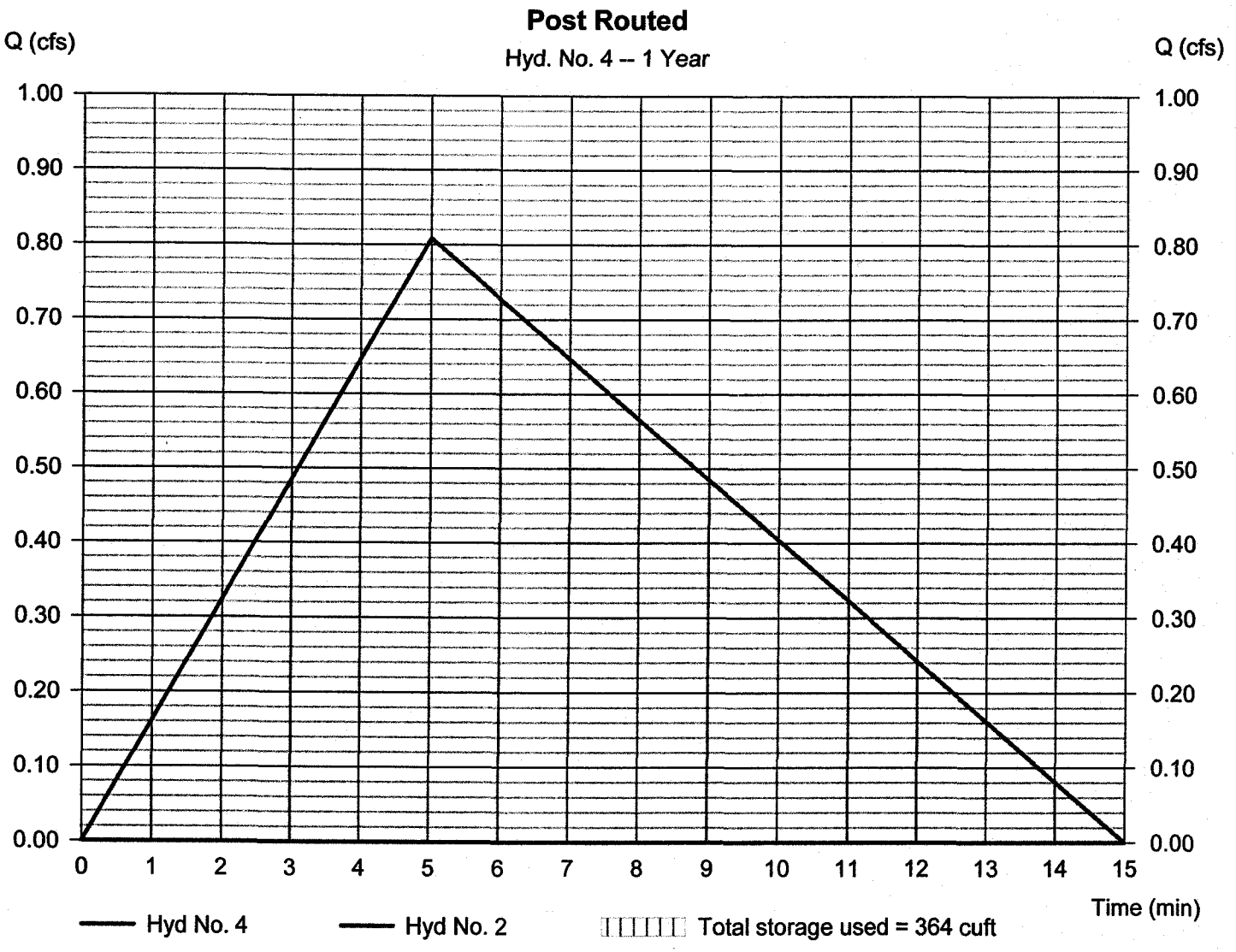
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.20 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 364 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Pond No. 1 - Bioretention Facility #2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.57 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.57	321	0	0
0.43	105.00	565	188	188
0.78	105.35	1,245	309	497
1.43	105.70	4,500	1,757	2,254

Culvert / Orifice Structures

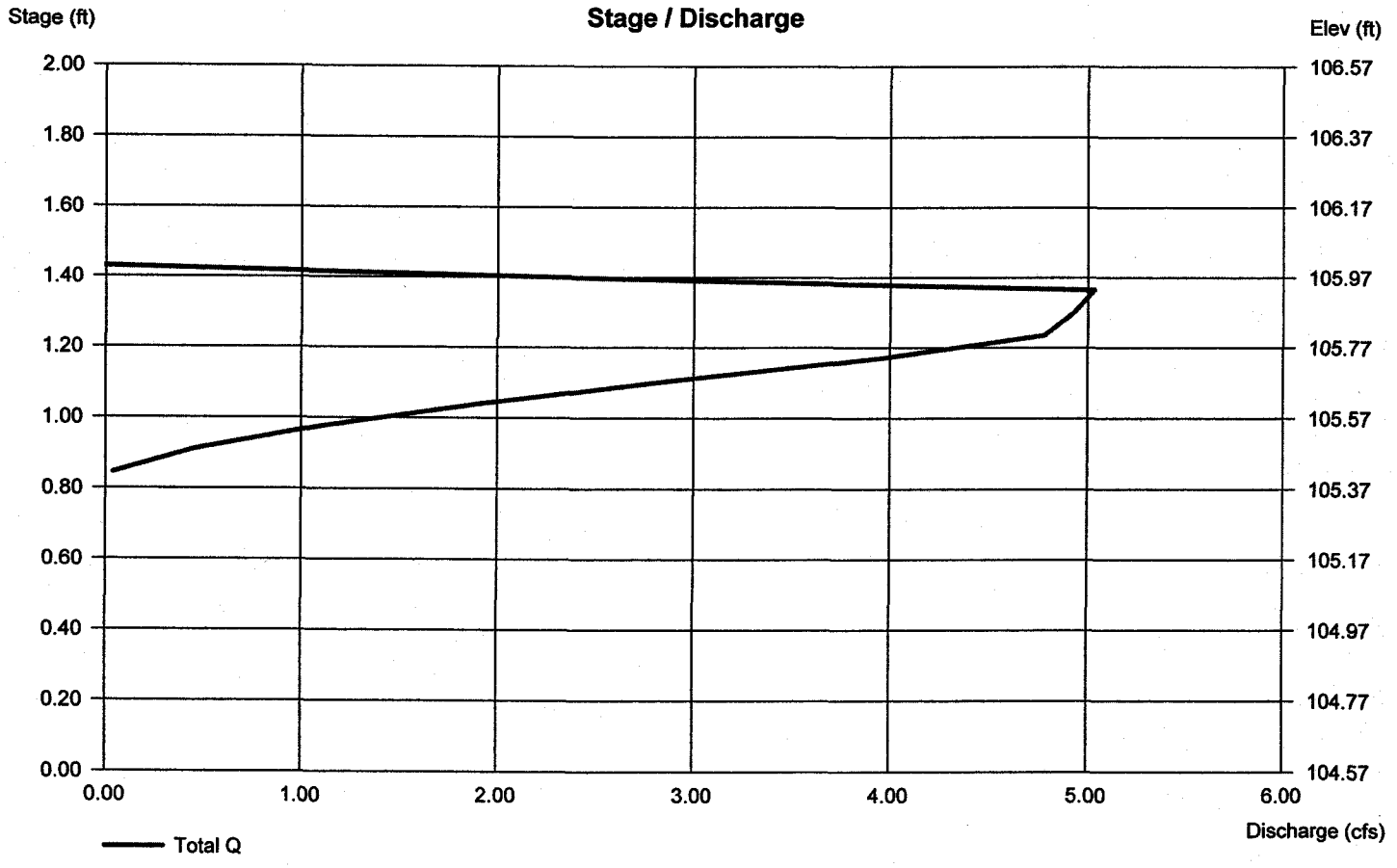
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 101.90	0.00	0.00	0.00
Length (ft)	= 99.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 105.40	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.382	1	5	172	-----	-----	-----	Pre-Development Flow
2	Rational	0.954	1	5	429	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.27	429	Post Routed

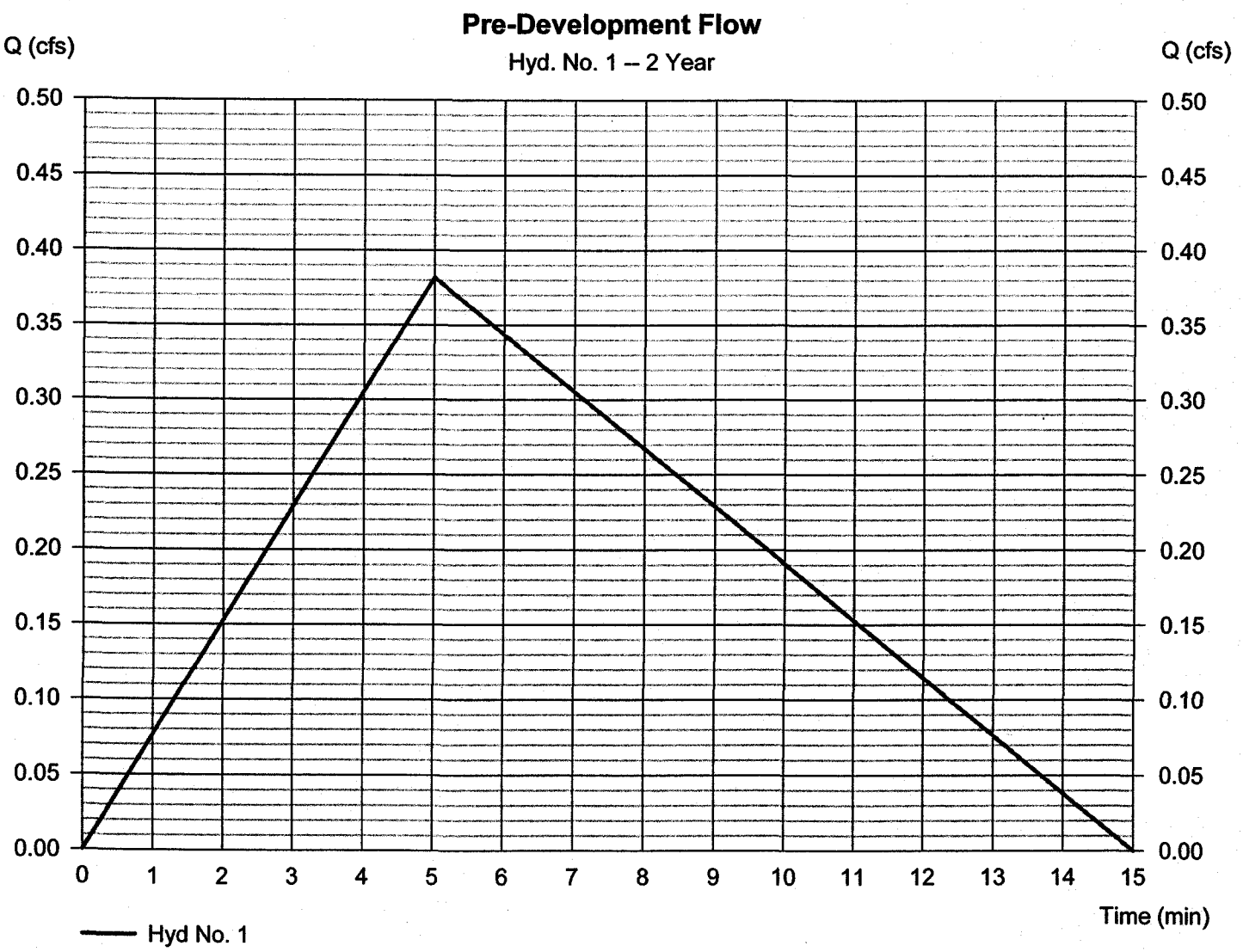
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.382 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 172 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



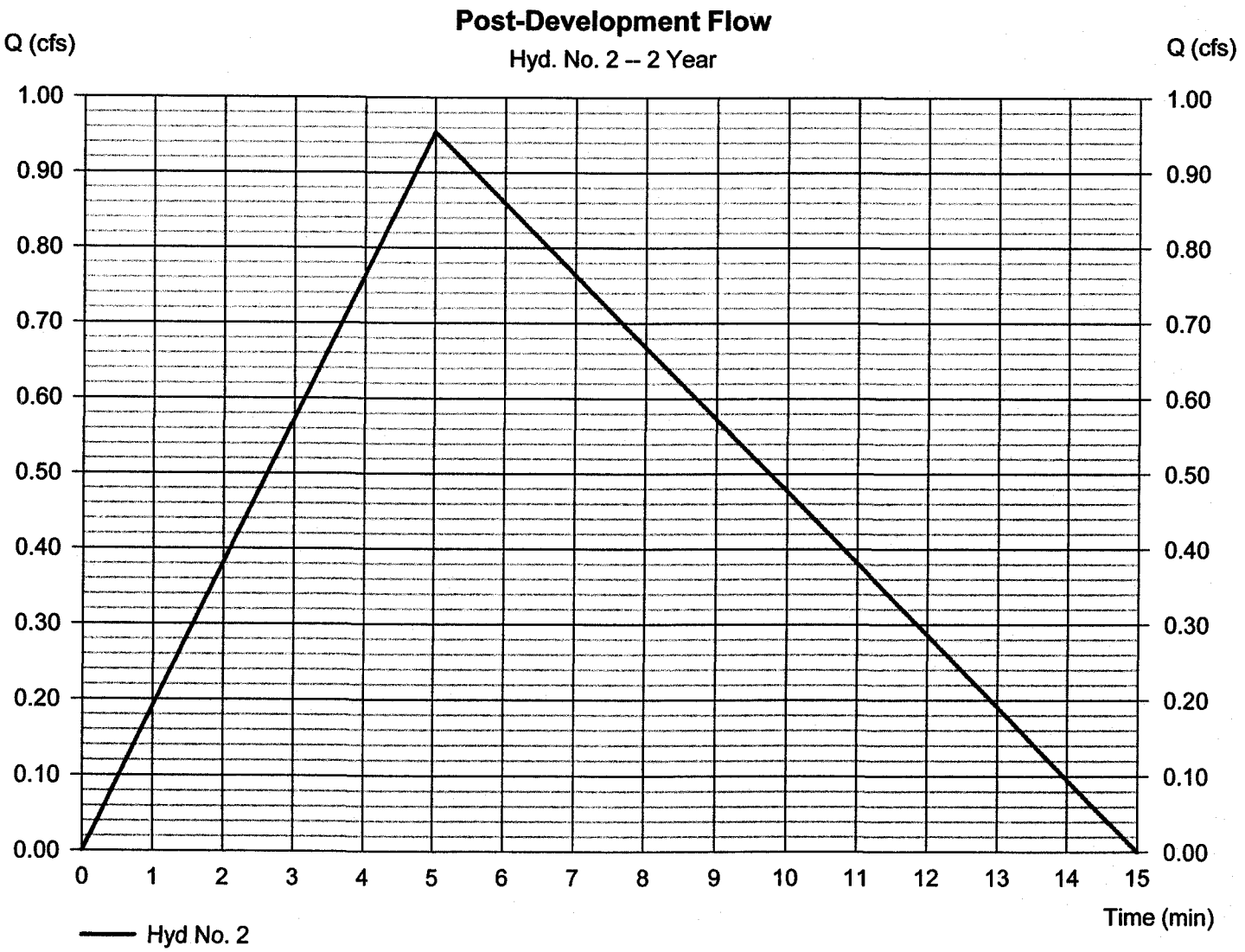
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.954 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 429 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

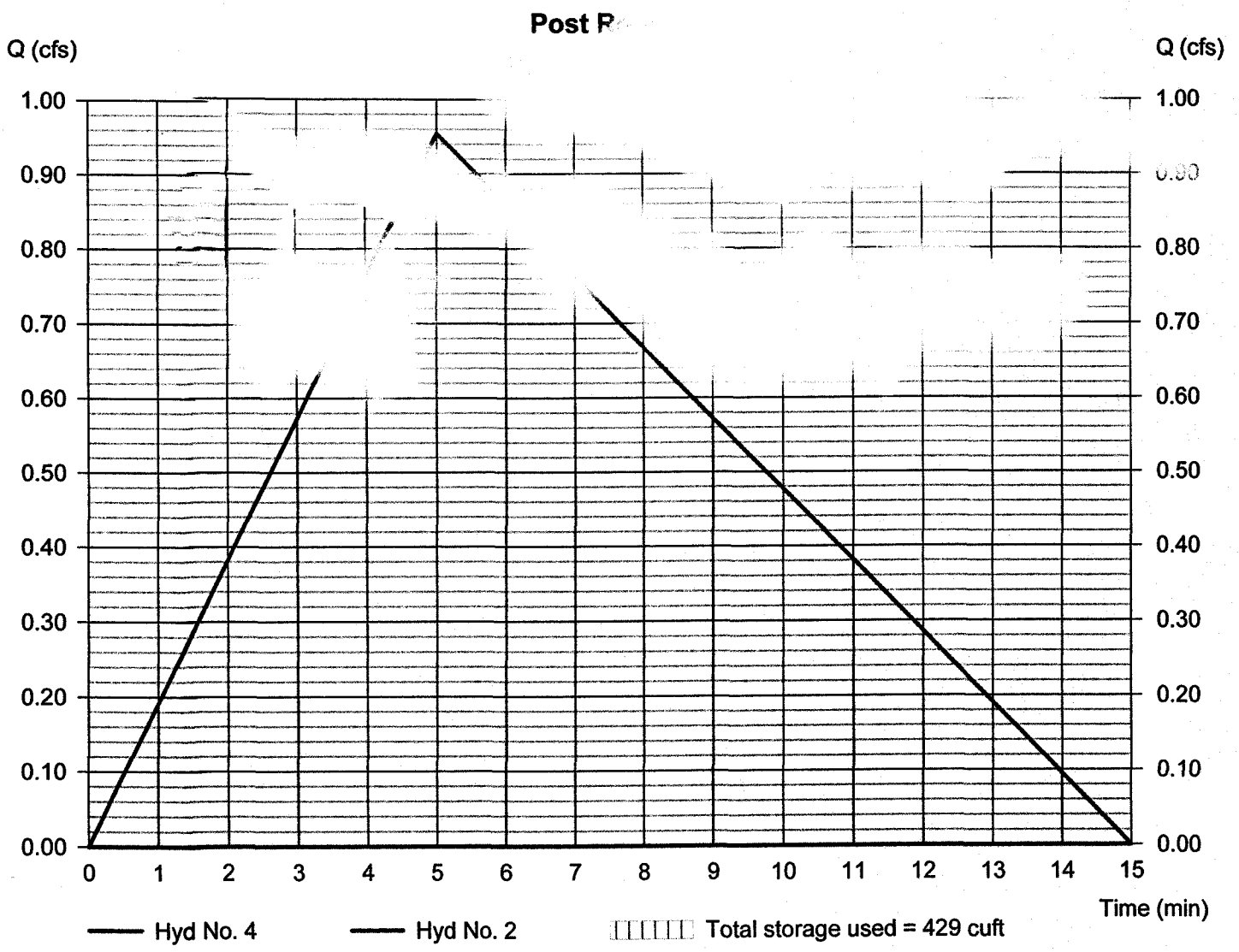
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.27 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 429 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.495	1	5	223	-----	-----	-----	Pre-Development Flow
2	Rational	1.237	1	5	557	-----	-----	-----	Post-Development Flow
4	Reservoir	0.012	1	15	55	2	105.37	555	Post Routed

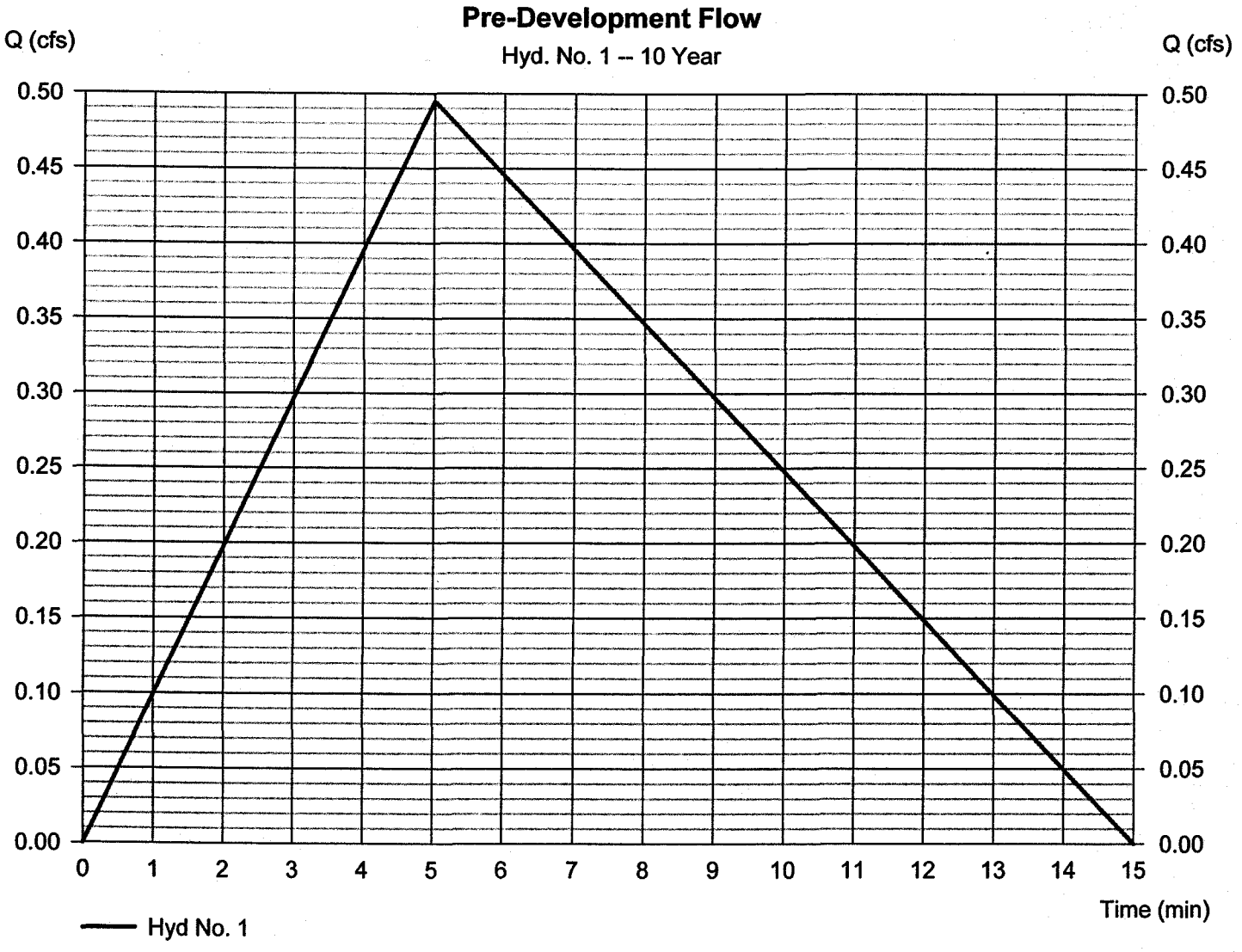
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.495 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 223 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



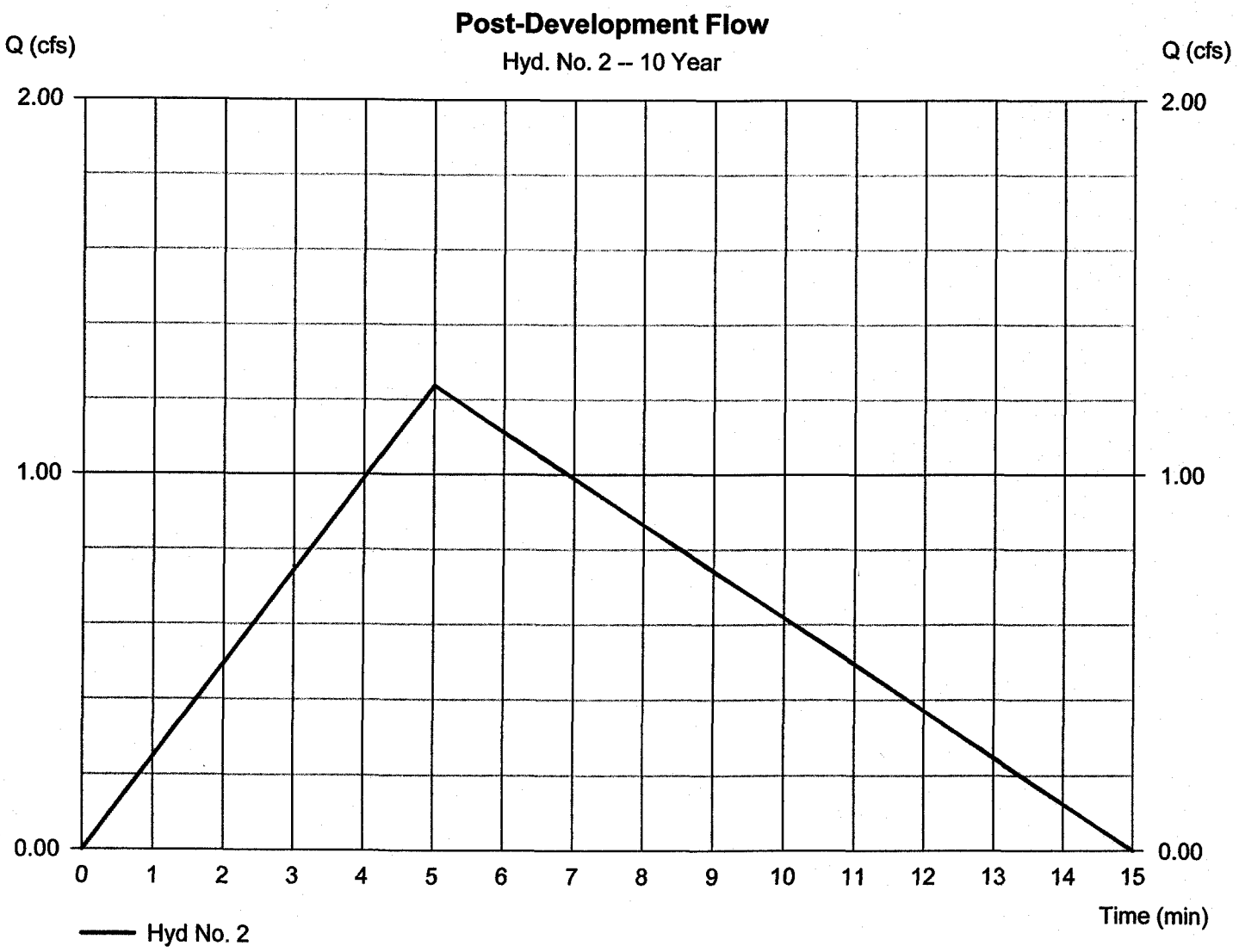
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.237 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 557 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

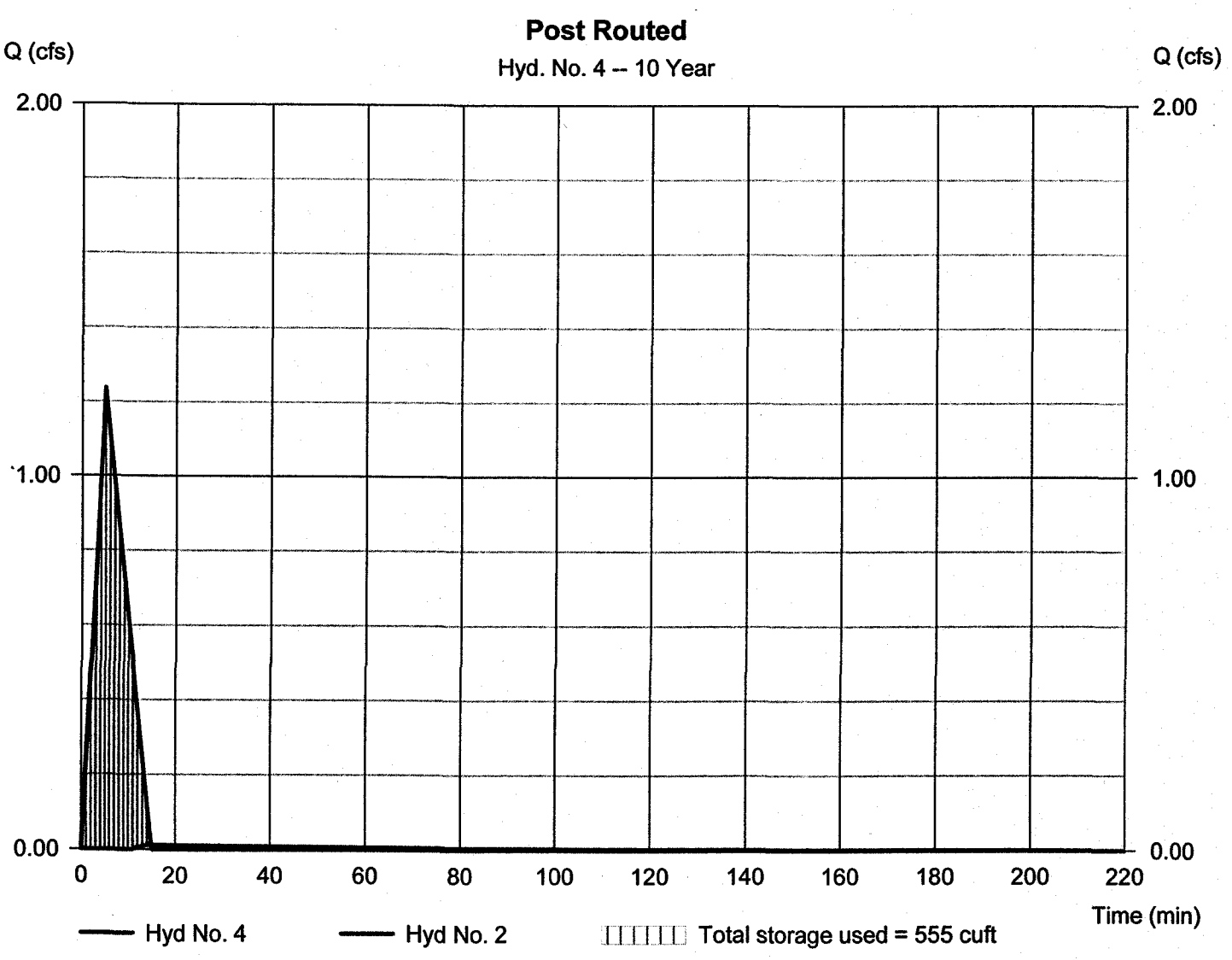
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.012 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 55 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.37 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 555 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.659	1	5	297	-----	-----	-----	Pre-Development Flow
2	Rational	1.648	1	5	742	-----	-----	-----	Post-Development Flow
4	Reservoir	0.139	1	14	240	2	105.43	716	Post Routed

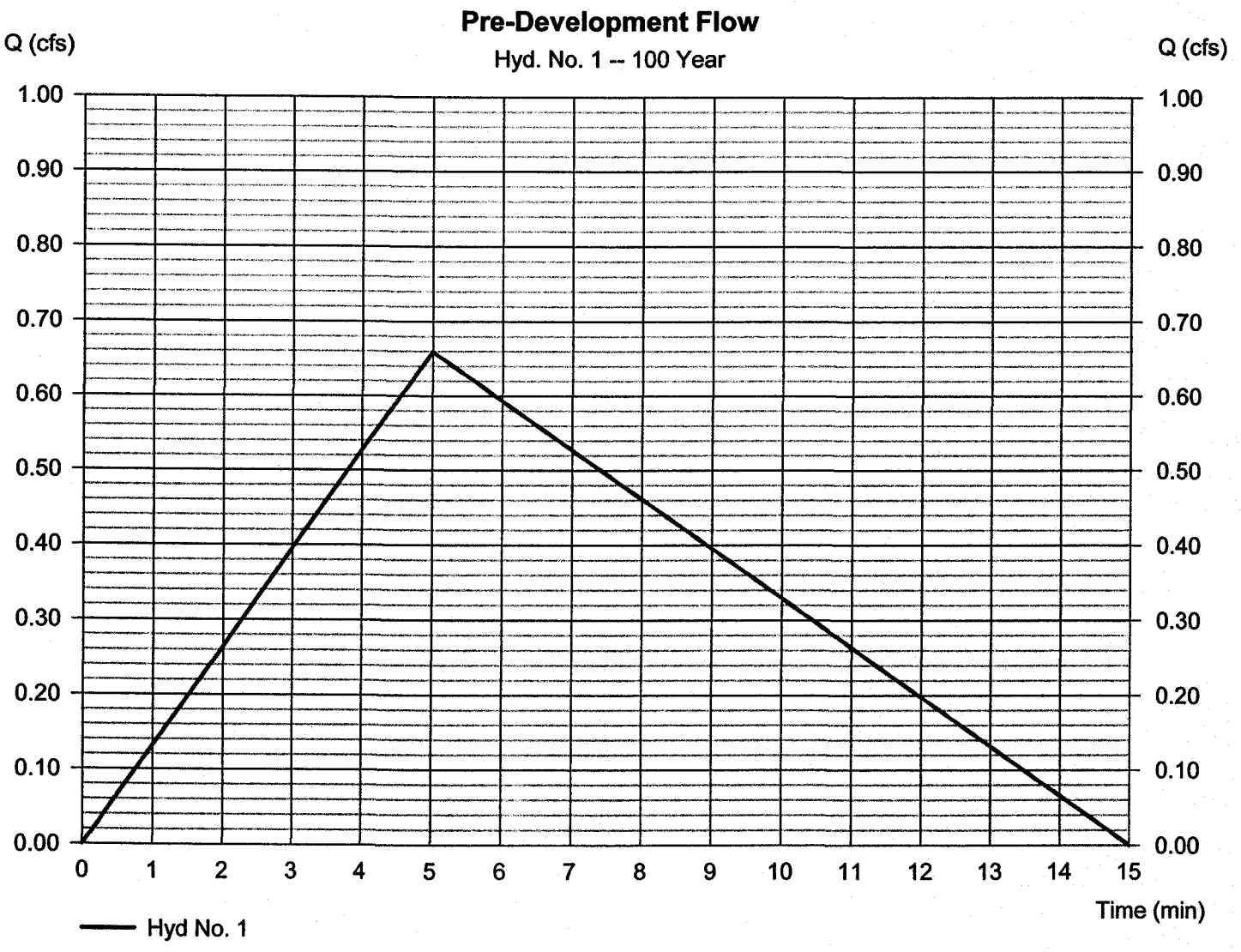
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.659 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 297 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.2
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



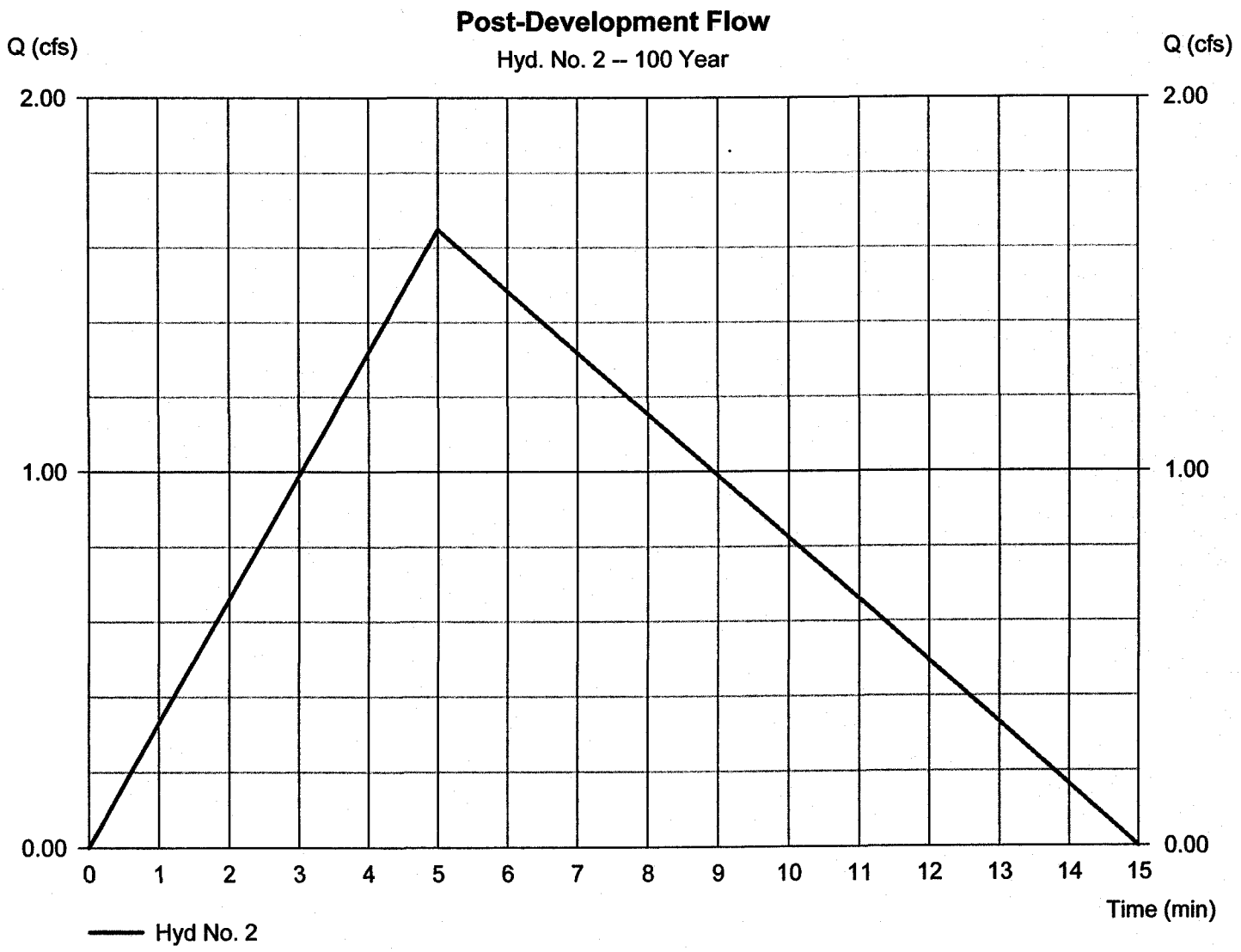
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.648 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 742 cuft
Drainage area	= 0.330 ac	Runoff coeff.	= 0.5
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

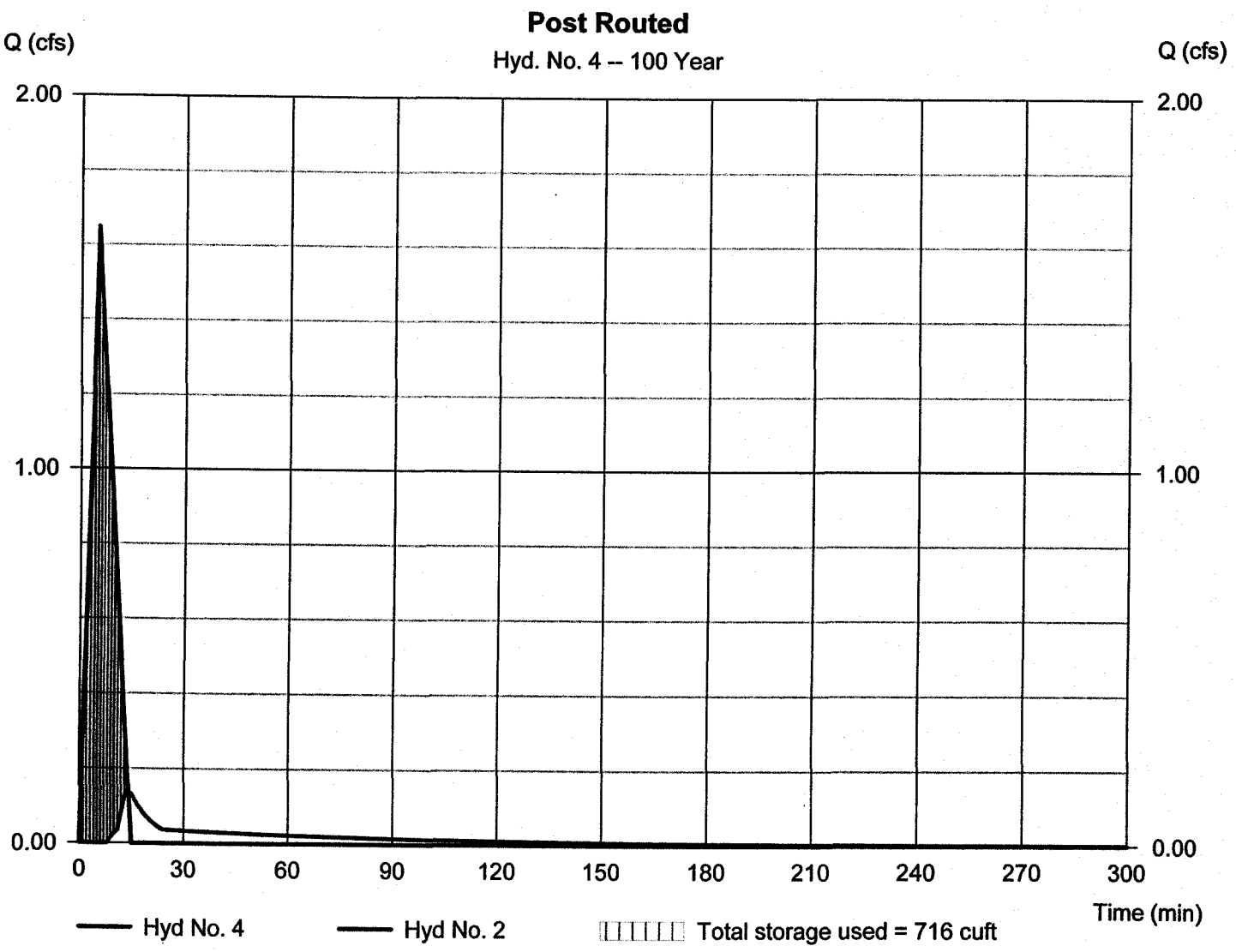
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.139 cfs
Storm frequency	= 100 yrs	Time to peak	= 14 min
Time interval	= 1 min	Hyd. volume	= 240 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.43 ft
Reservoir name	= Bioretention Facility #2	Max. Storage	= 716 cuft

Storage Indication method used.



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Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.216	1	5	97	-----	-----	-----	Pre-Development Flow
2	Rational	0.862	1	5	388	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.13	388	Post Routed

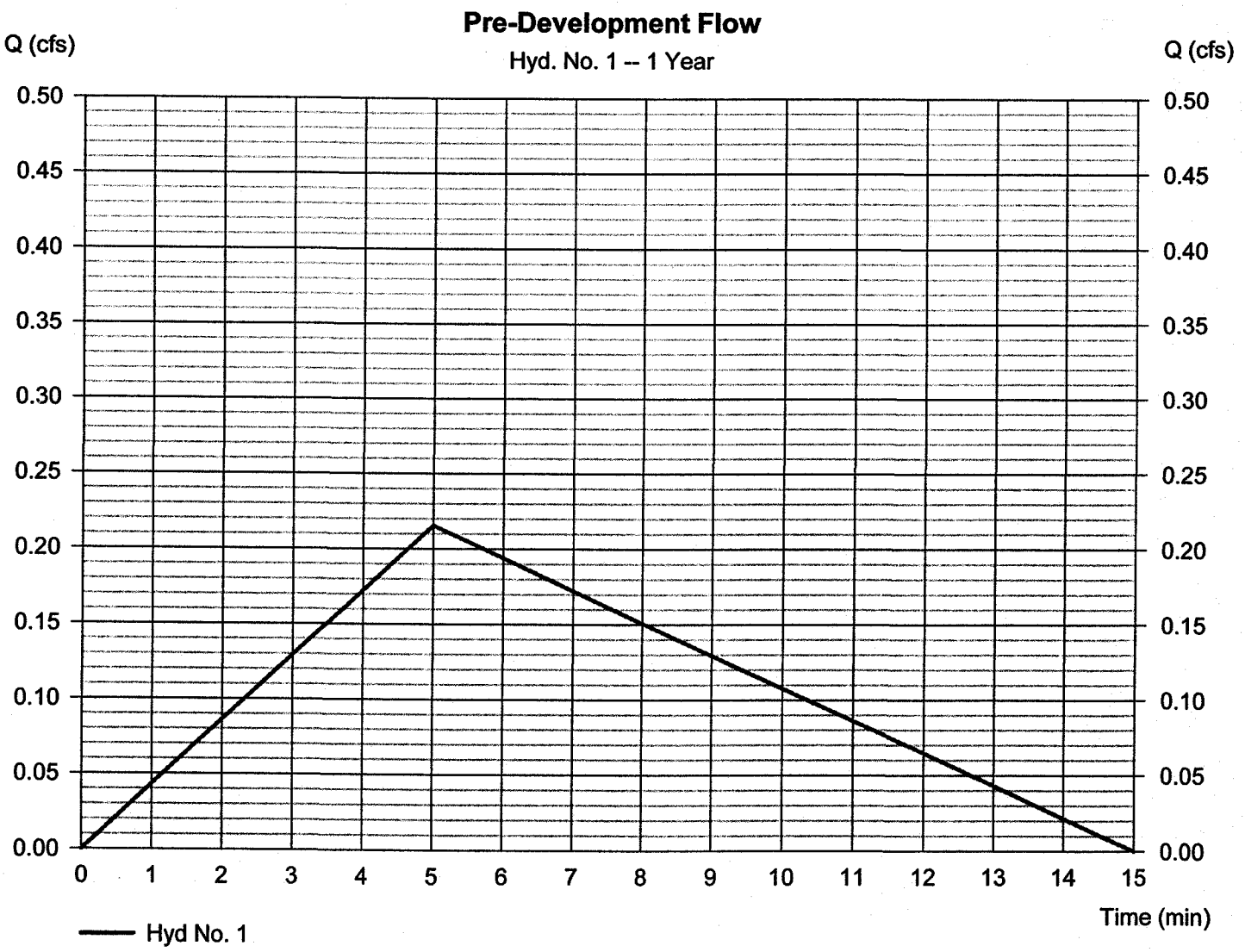
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.216 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 97 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



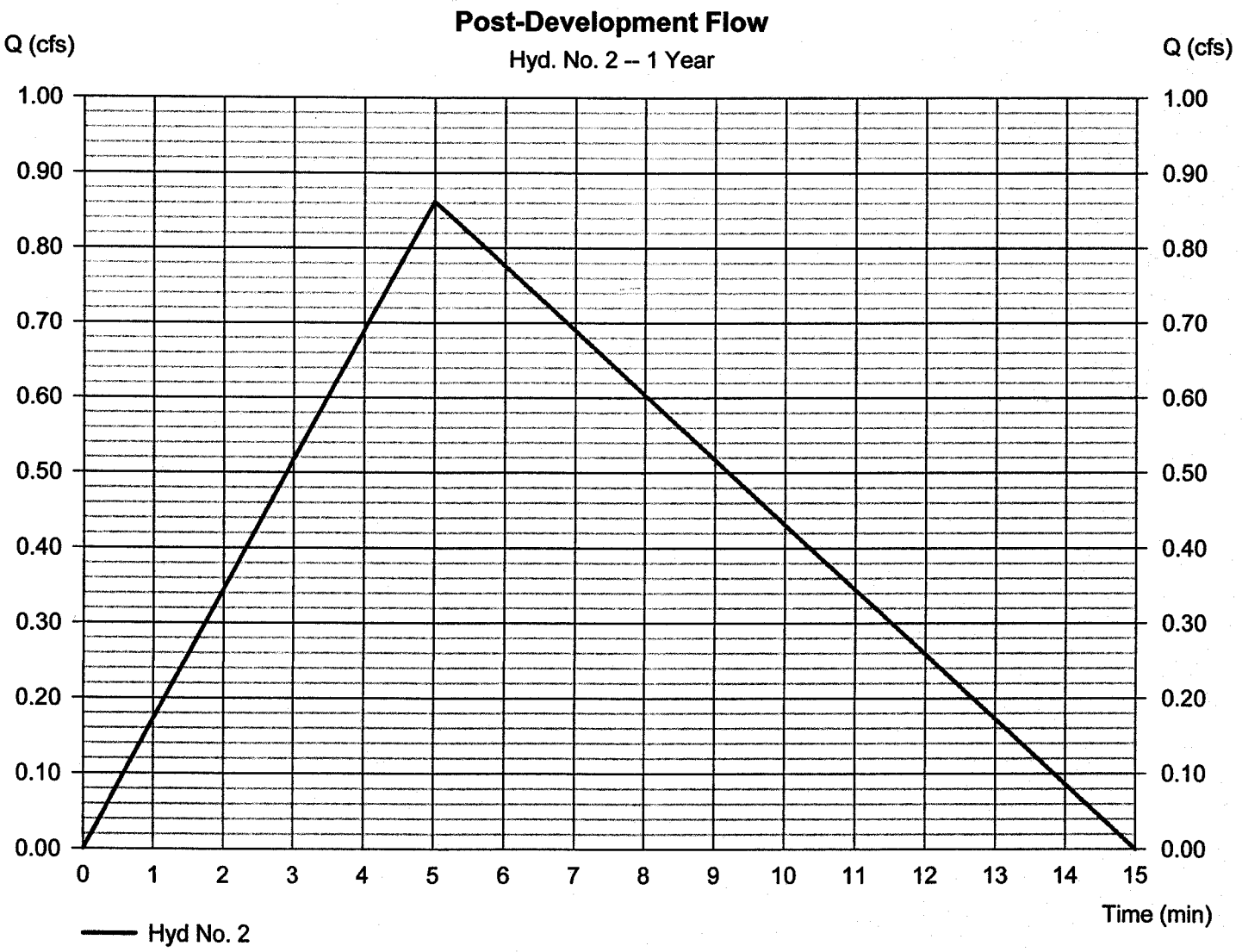
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.862 cfs
Storm frequency	= 1 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 388 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 4.898 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

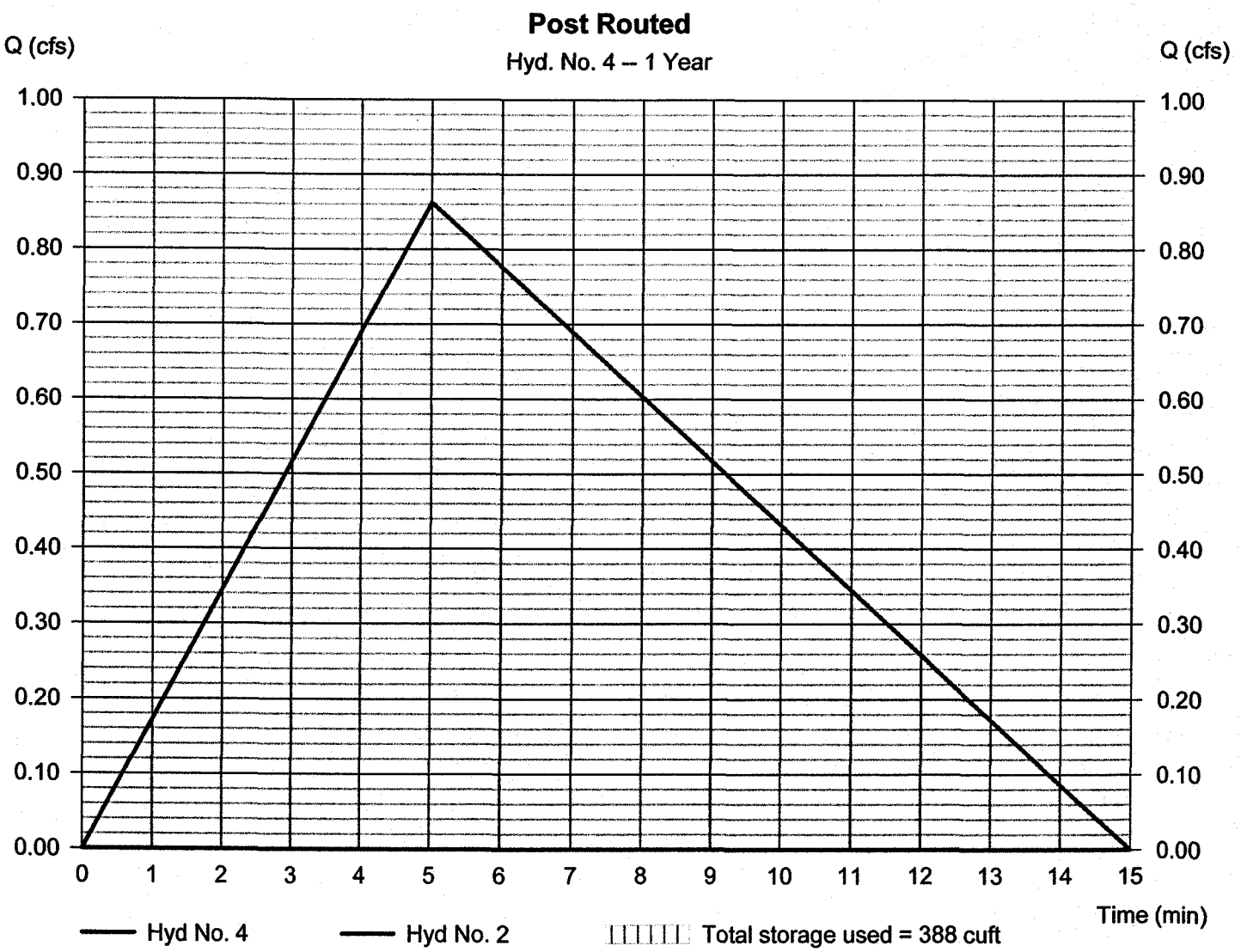
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.13 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 388 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Pond No. 1 - Bioretention Facility #3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 104.57 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	104.57	426	0	0
0.43	105.00	690	238	238
0.87	105.44	1,771	523	761
1.43	106.00	4,500	1,697	2,458

Culvert / Orifice Structures

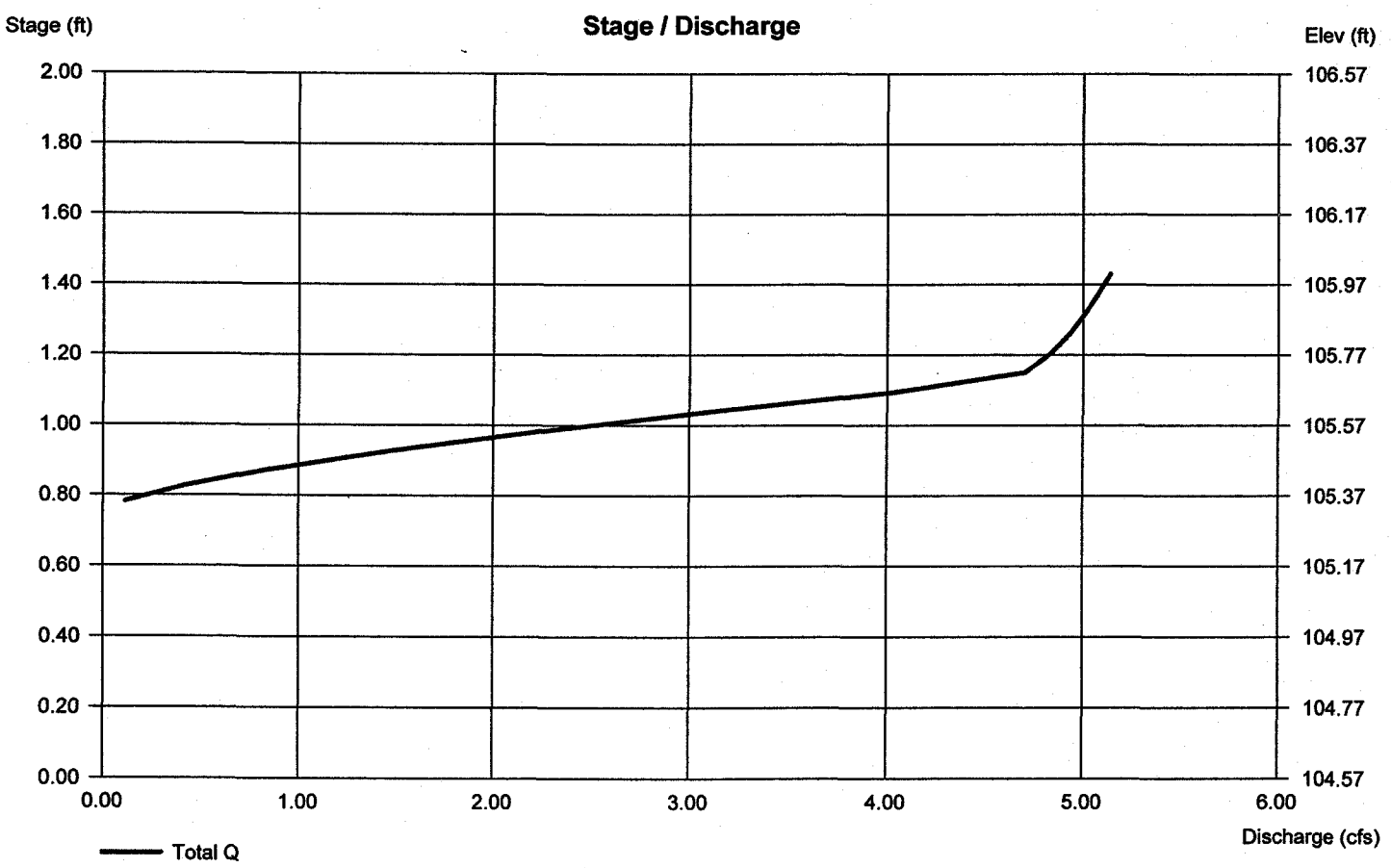
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 101.90	0.00	0.00	0.00
Length (ft)	= 99.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.00	0.00	0.00	0.00
Crest El. (ft)	= 105.32	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.254	1	5	115	-----	-----	-----	Pre-Development Flow
2	Rational	1.018	1	5	458	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.19	458	Post Routed

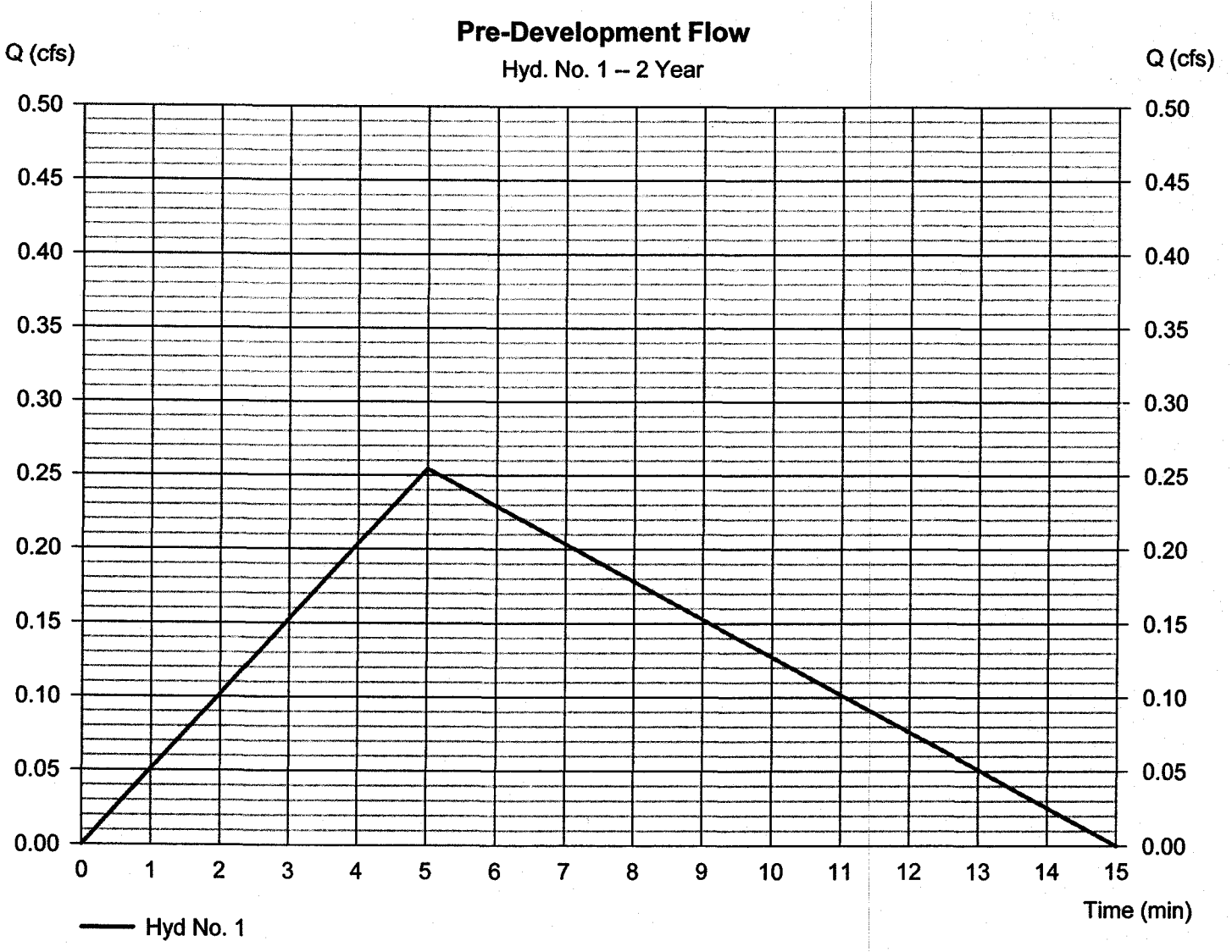
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.254 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 115 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



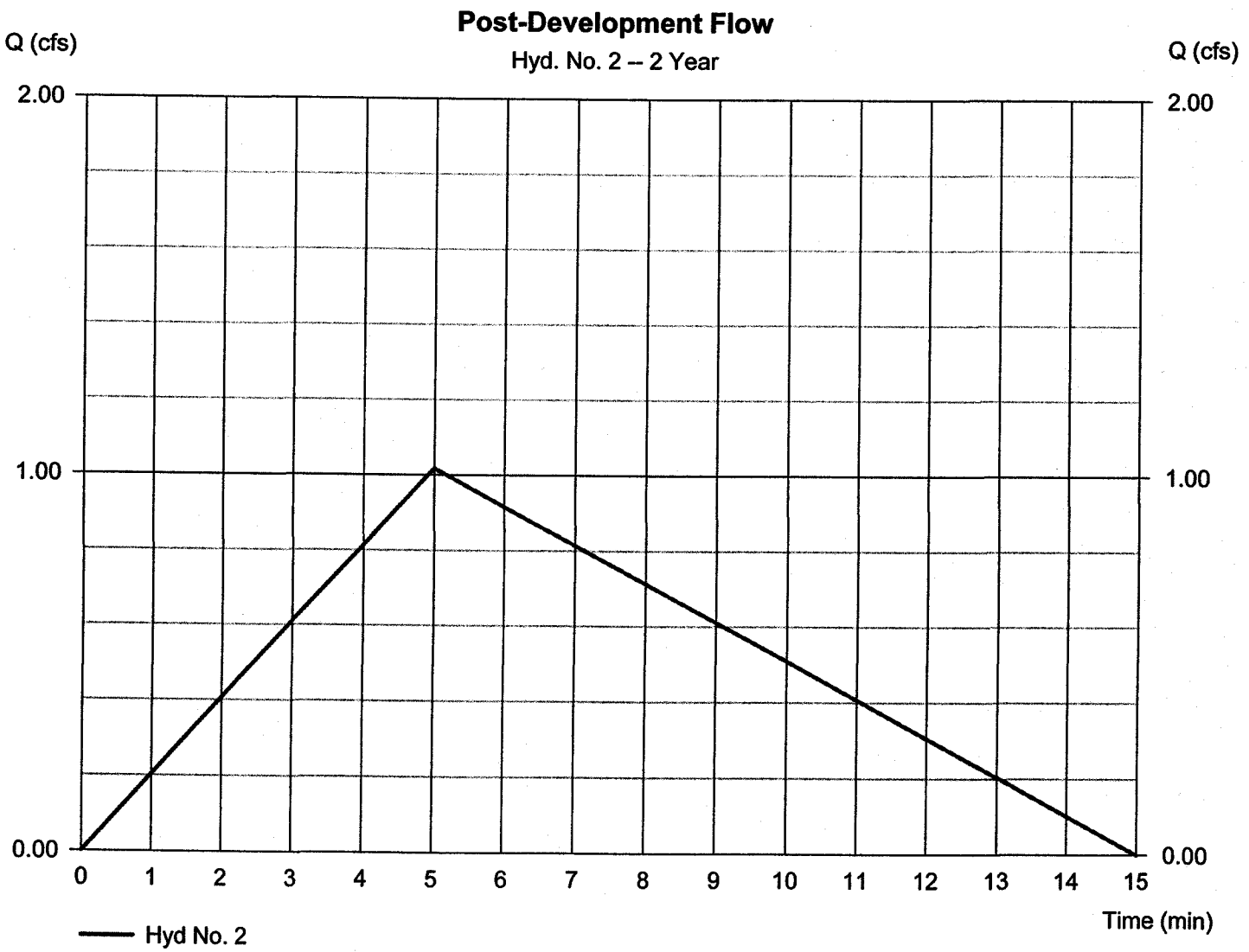
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.018 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 458 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 5.783 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

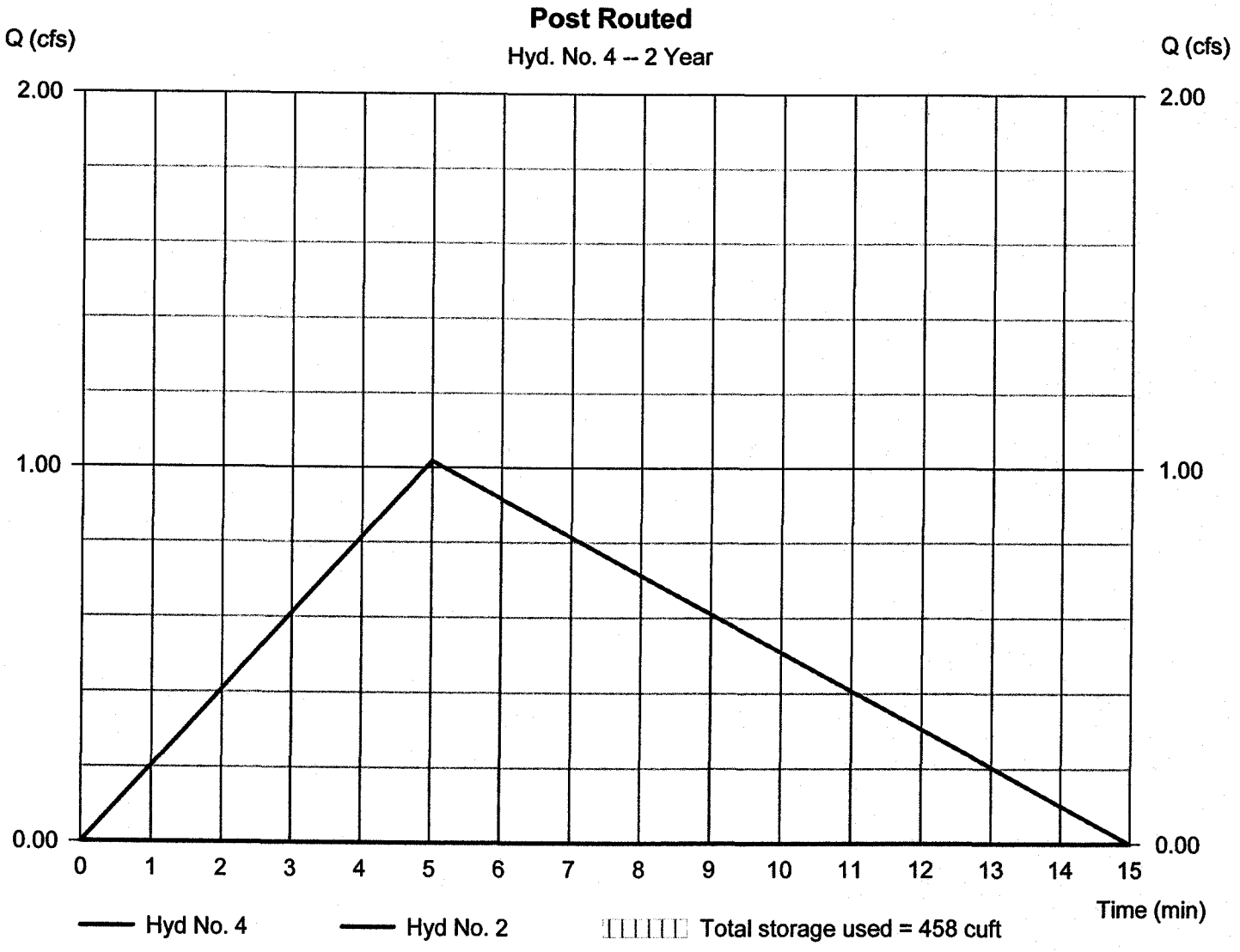
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.19 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 458 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.330	1	5	148	-----	-----	-----	Pre-Development Flow
2	Rational	1.319	1	5	594	-----	-----	-----	Post-Development Flow
4	Reservoir	0.000	1	n/a	0	2	105.30	594	Post Routed

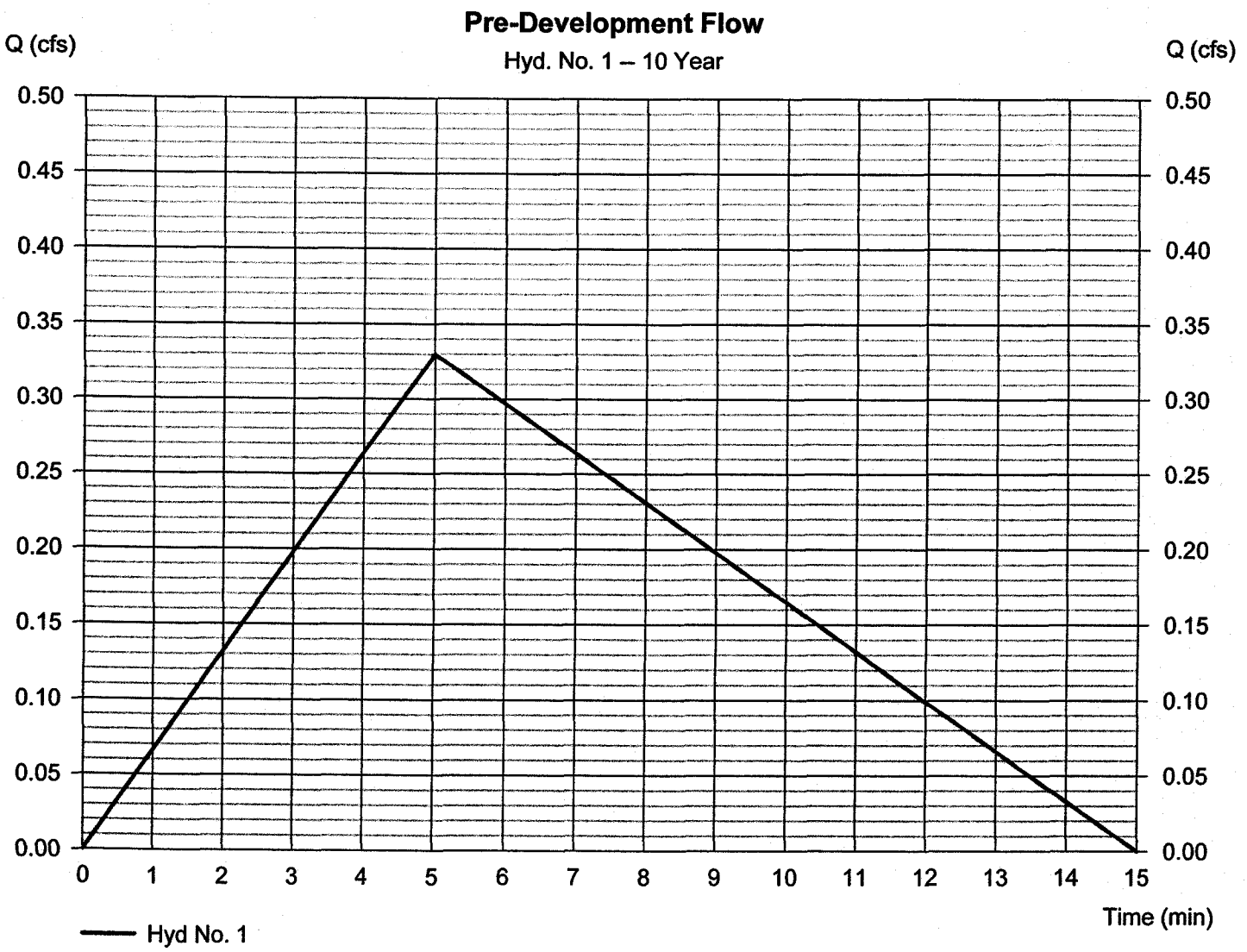
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.330 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 148 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



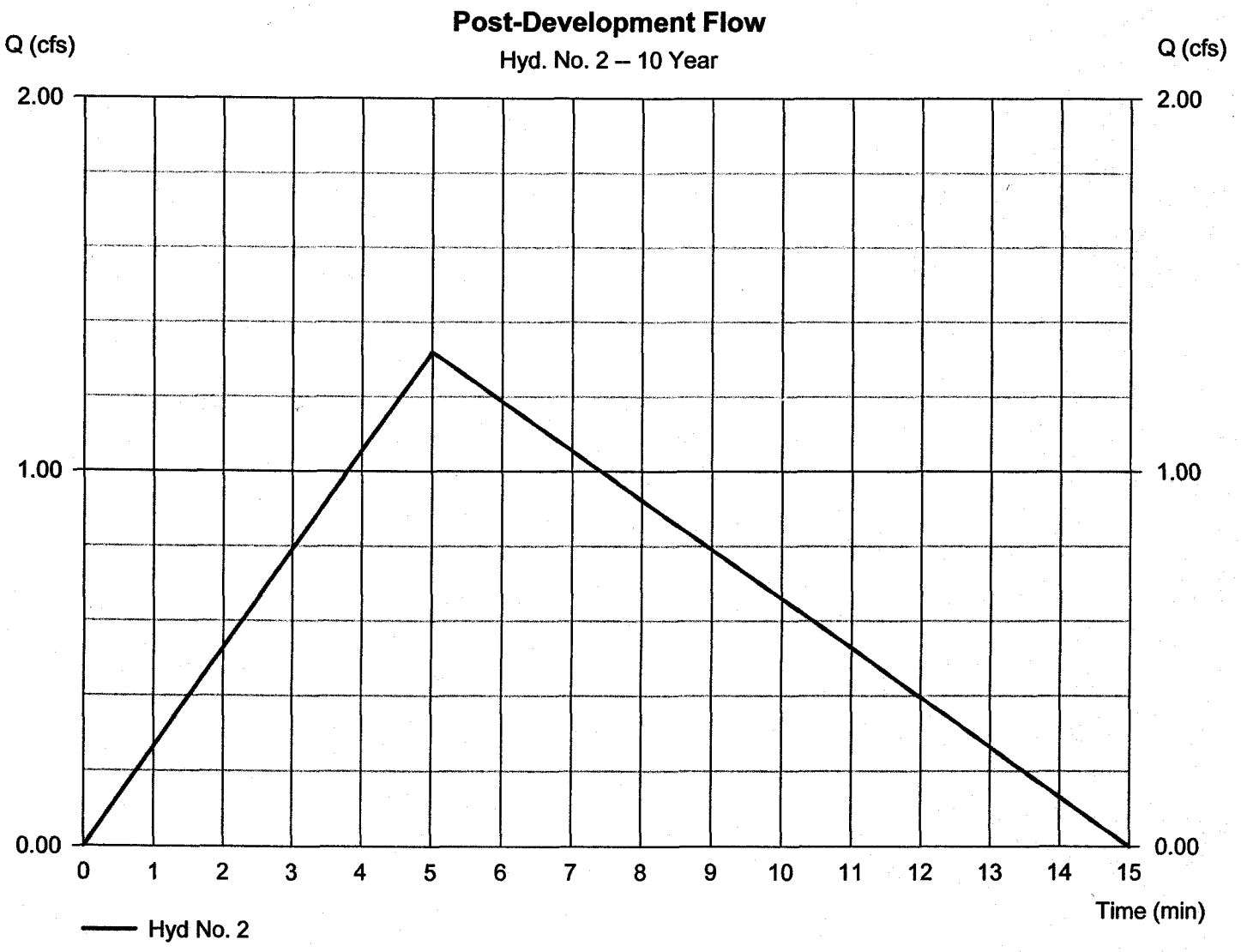
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.319 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 594 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 7.496 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

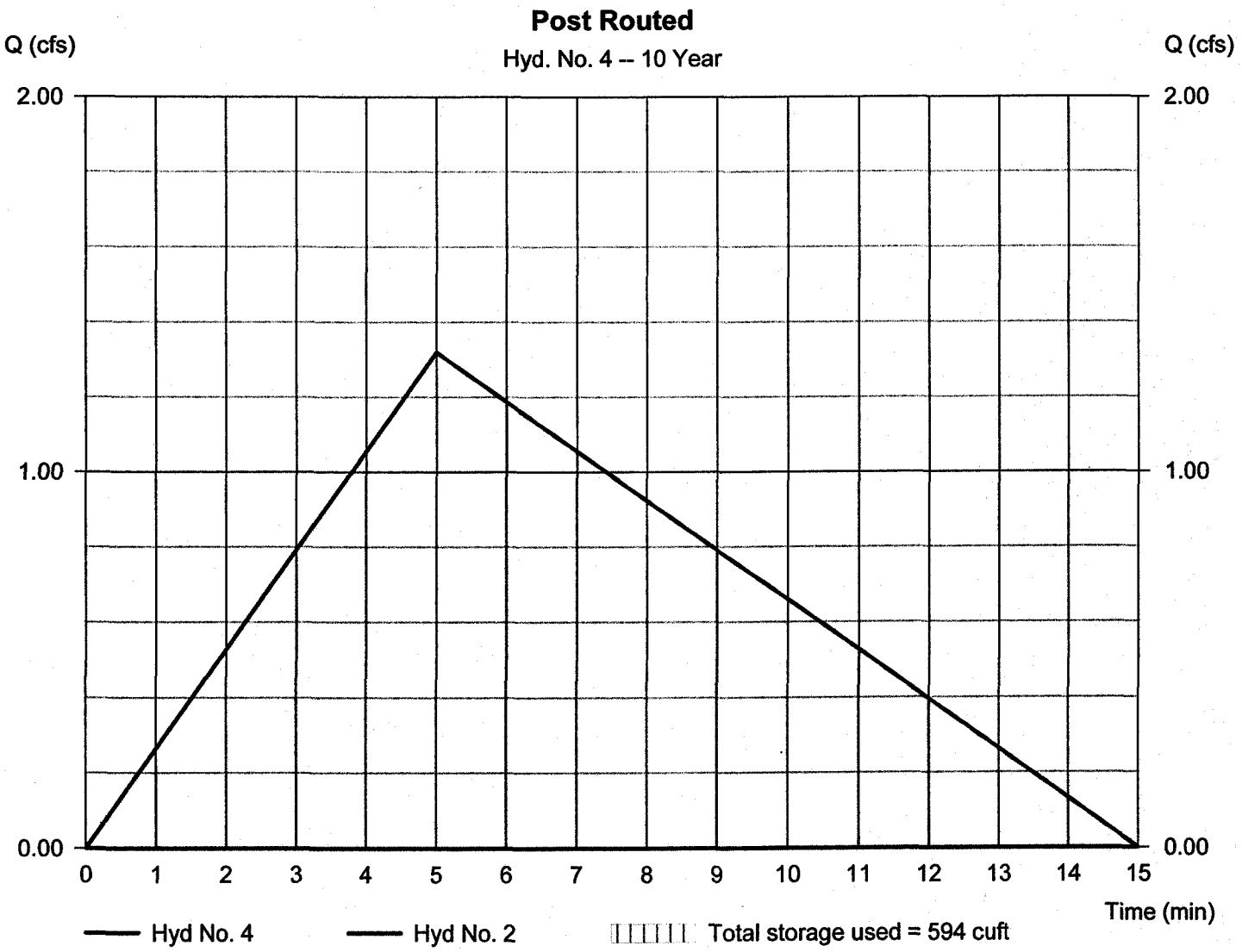
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.30 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 594 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.439	1	5	198	-----	-----	-----	Pre-Development Flow
2	Rational	1.758	1	5	791	-----	-----	-----	Post-Development Flow
4	Reservoir	0.414	1	13	187	2	105.40	708	Post Routed

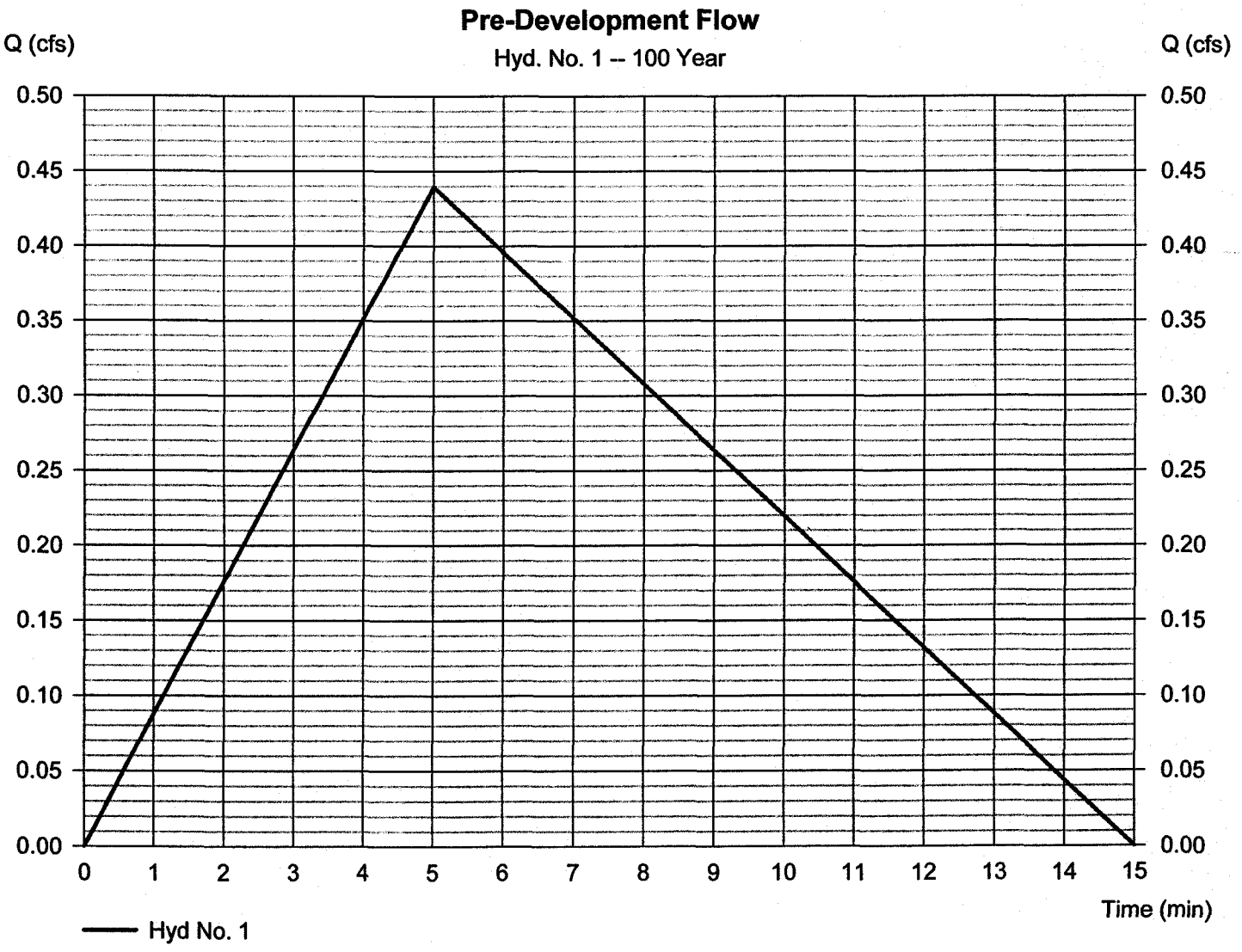
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 1

Pre-Development Flow

Hydrograph type	= Rational	Peak discharge	= 0.439 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 198 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.2
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



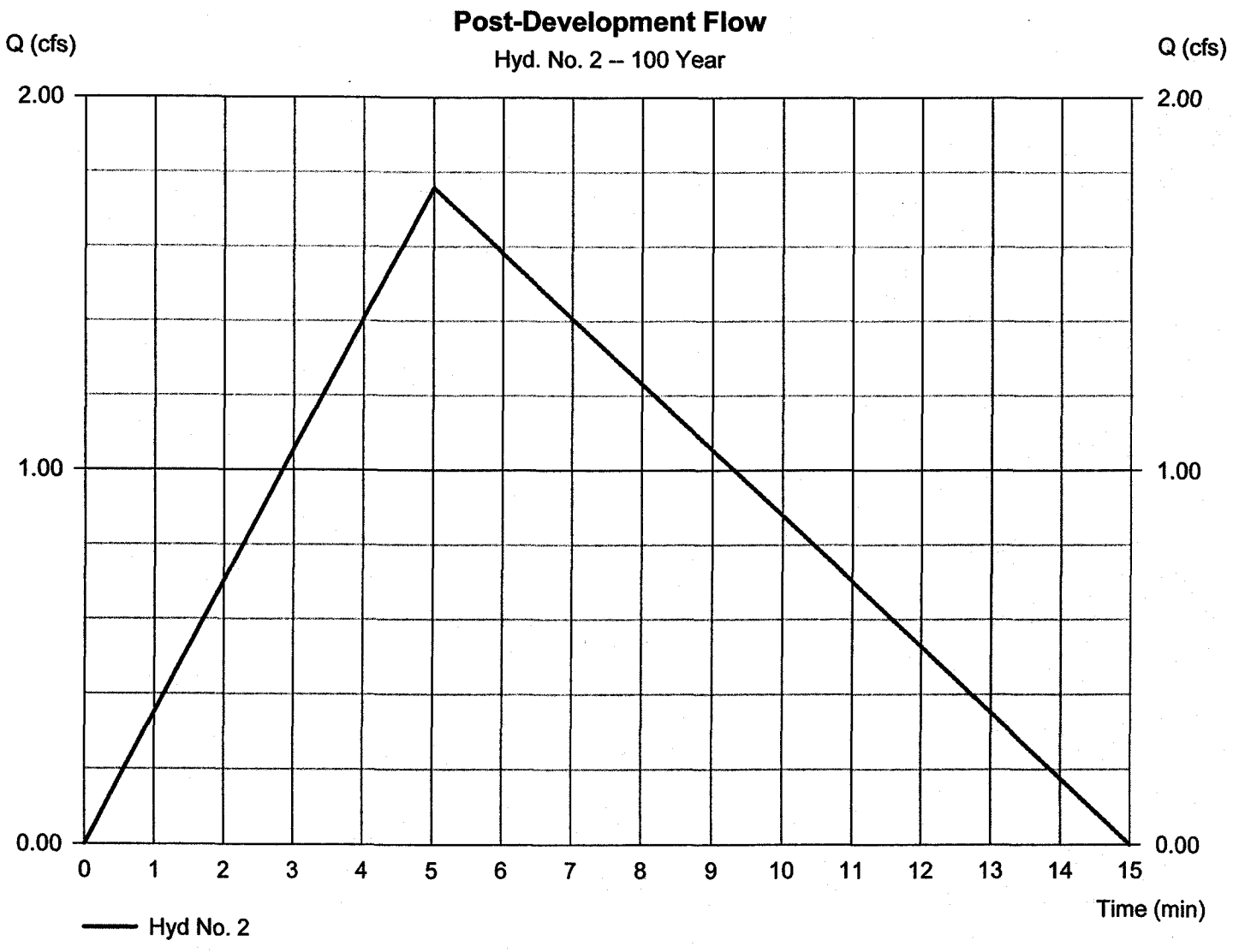
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 2

Post-Development Flow

Hydrograph type	= Rational	Peak discharge	= 1.758 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 791 cuft
Drainage area	= 0.220 ac	Runoff coeff.	= 0.8
Intensity	= 9.988 in/hr	Tc by User	= 5.00 min
IDF Curve	= JamesCity-NW-14.IDF	Asc/Rec limb fact	= 1/2



Hydrograph Report

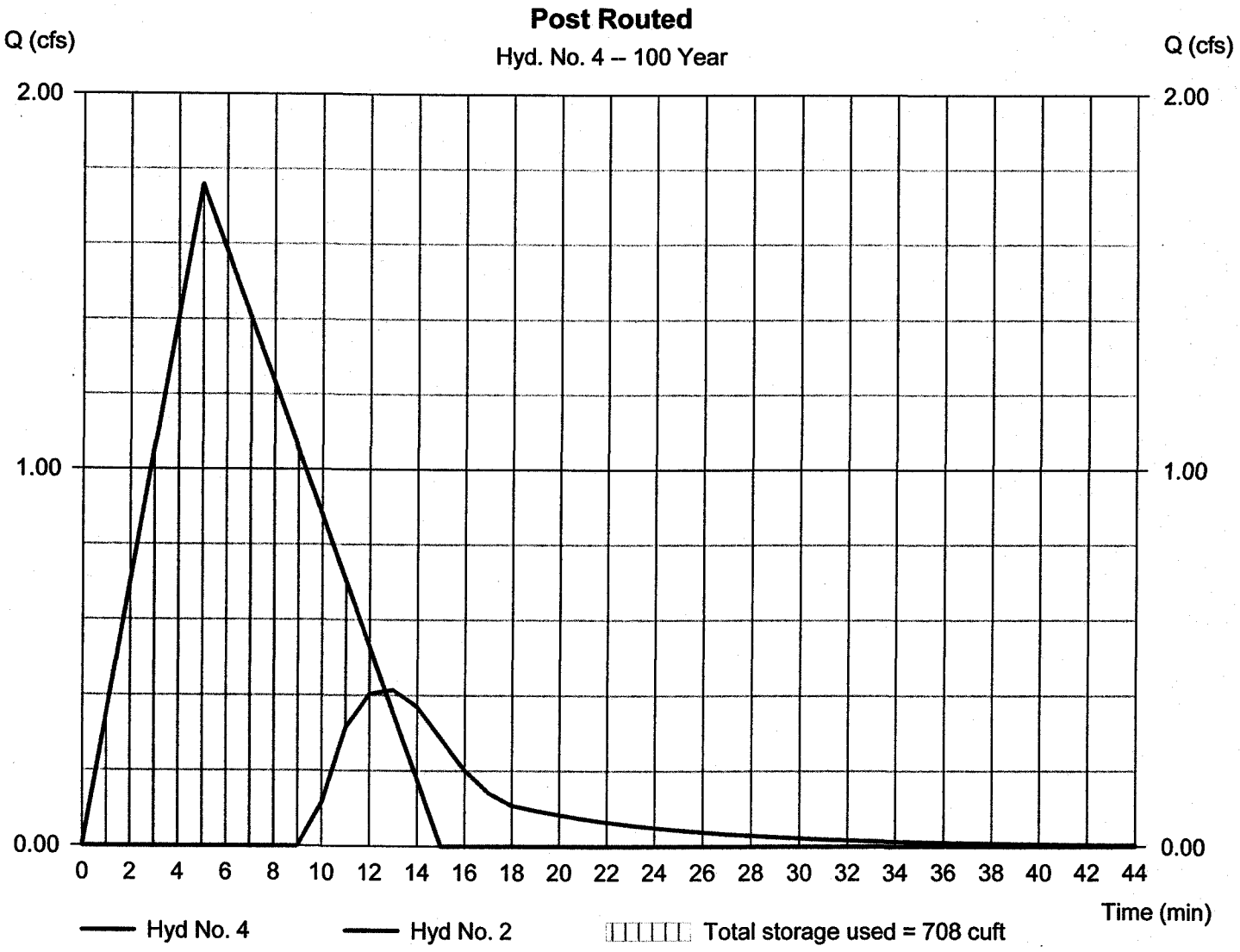
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Tuesday, 00 8, 2013

Hyd. No. 4

Post Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.414 cfs
Storm frequency	= 100 yrs	Time to peak	= 13 min
Time interval	= 1 min	Hyd. volume	= 187 cuft
Inflow hyd. No.	= 2 - Post-Development Flow	Max. Elevation	= 105.40 ft
Reservoir name	= Bioretention Facility #3	Max. Storage	= 708 cuft

Storage Indication method used.



APPENDIX C

DRAINAGE AREA MAPS

Environmental Division

NOV 20 2013

RECEIVED

AES
CONSULTING ENGINEERS

Hampton Roads | Central Virginia | Middle Peninsula

5240 Olde Towne Road, Suite 1, Williamsburg, Virginia 23188
Phone (757) 253-0040 / Fax (757) 220-8994

aesva.com

Letter of Transmittal

ATTN: **Bill Cain/Tina Creech**

CO.: **JCC**

Address:

cc:

DATE	JOB NO.
11/20/13	9888-01

FROM: L. Bruce Abbott

RE
Toano Middle School Student drop off & additional parking

WE ARE SENDING YOU THE FOLLOWING ITEMS:

☒ Attached
☐ Under separate cover via

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

☐ Copy of letter(s) ☐ Other:

COPIES	DATE	No. of Pages	DESCRIPTION
1	11/20/13		Response Letter CD with Bioretention #1 certification Bioretention #2 certification Bioretention #3 certification Record drawings Phots's
2		3	Paper copies of Record Drawings

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:

VIA: ☒Hand Deliver ☐UPS Ground ☐UPS Next Day Air ☐USPS Mail ☐ Other:

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

AES
CONSULTING ENGINEERS

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

Environmental Division
NOV 20 2013
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November 12, 2013

Mr. William Cain, P.E., CFM
Chief Civil Engineer
Engineering and Resource Protection
101-A Mounts Bay Road
Williamsburg, Virginia 23187

RE: Toano Middle School - Drop off area and Parking Improvements
County Plan No. SP-002-13
County BMP ID Code: YC066, YC067, and YC068
AES Project No. W09888-01

Dear Mr. Cain:

To follow are our responses to comments received concerning our submission of the above referenced project:

Construction Certification Review Comments:
October 24, 2013

1. If possible add the following County identifiers to the construction certification documents: County Plan Number SP-002-13 and BMP ID No. YC066, YC067, and YC068.
Response: The ID #'s have been added to certification documents.

Record Drawing Review Comments:
October 24, 2013

2. Show the following additional information on the record drawing: contour or elevation data for bioretention #1 - YC066 must be shown to insure designed water quality is contained in the facility; the roof leader routing from the school to bioretention #1 - YC066.
Response: Additional elevation information has been added and the roof drain remains in its original existing connection to the drop inlet and does not go into the bioretention.

Construction - Related Items Review Comments:
October 24, 2013

3. As discussed in the field on September 10, 2013, please provide revised drainage calculations for bioretention #1 - YC066 since the facility was not installed per the approved plan. The current elevations indicate that the minimal side slopes are at the same 104-elevation as the invert of the drop inlet/outer structure. In the current condition it appears unable to function as originally designed concerning the storage area and the drainage pattern will bypass the bioretention and drain directly to the outlet.

Response: Additional topographic information is provided that shows the outlet section of Bioretention Facility #1 as constructed. As shown, there is a spillway section at elevation 104.8 that will allow the bioretention to store runoff before entering the existing storm inlet. The bioretention facility actually has more storage volume in its as-built condition that in the original design. Updated Hydraflow calculations showing the adequacy of the bioretention facility are provided with this resubmittal.

I appreciate the time spent by staff in the review and guidance for this project. If anyone has any questions in reference to this project please do not hesitate to call me at 757-253-0040.

Sincerely,

AES Consulting Engineers

L. Bruce Abbott
Project Engineer
Bruce.abbott@aesva.com

S:\Jobs\9888\01-ToanoMS-2008\Admin\Forms & Comments\W09888-01 Response Ltr 2013-11-12.docx

Environmental Division
NOV 2 0 2013
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Benchmark Inspections for New Stormwater Systems

The James City County Engineering and Resource Protection Division is tasked with ensuring the proper installation of new stormwater facilities and their associated systems through the utilization of various benchmark inspections throughout the construction process.

In addition to these benchmark inspections, the contractor must utilize the services of a geo-technical engineer to carry out all inspections as outlined in the Stormwater Inspection Policy. All geo-technical documentation such as compaction reports for pipe systems, BMPs, and infiltration systems must be submitted to the assigned inspector during the course of construction.

It is the responsibility of the contractor or their representative to request the benchmark inspections by **calling the assigned Environmental Inspector no later than 4 pm the day before the inspection is needed.**

The following list represents the benchmark inspections that require the on-site presence of a representative of the Engineering and Resource Protection Division:

Wet Ponds and Extended Dry Detention Basins	Cont./Dev.	ERP Rep.	Date
☐ Construction of pond embankment and excavation of the dam core trench.			
☐ All pipe and appurtenance deliveries.			
☐ Riser installation and all associated work.			
☐ Installation of anti-seep collars.			
☐ Low flow orifice installation.			
☐ Pond drain system installation including any/all control valves.			
☐ Outfall pipe installation.			
Infiltration and Bio-Retention Systems			
☑ All excavation activities associated with installation.			6/13/10
☑ Installation of underground chambers, liner, and filter media if applicable.			6/13/13
Open Channel and Closed Pipe Systems			
☑ All grading and excavation activities associated with installation.			6/13/13
☑ Installation of underdrain, liner, and filter media if applicable.			6/13/13
☑ Critical drainage structures (i.e. Primary manhole structures; etc...)			6/13/13
☑ Full drainage system inspection per VDOT standards prior to surety release			6/13/13
☑ All pipe and appurtenance deliveries.			6/13/13

Site Specific Benchmark Inspection Requirements

☐ _____			
☐ _____			
☐ _____			

	Cont./Dev.	ERP Rep.	Date
☐ _____	_____	_____	___
☐ _____	_____	_____	___
☐ _____	_____	_____	___

Acknowledgement of benchmark inspection and geo-technical requirements during construction.

Developer/Contractor _____ Date 6/13/13

Geo-Technical Engineer _____ Date _____

County Representative Lia Creech Date 6/13/13

SP-0002-2013

Environmental Division
JAN 15 2013

PLANNING DIVISION
JAN 11 2013
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RECEIVED

James City County, Virginia
Environmental Division

Erosion and Sediment Control and Stormwater Management Design Plan Checklists

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Stormwater Management Design Plan		
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II.	Stormwater Conveyance Systems	7
III.	Stormwater Management / BMP Facilities	8
IV.	Outlet Protections	14
V.	Additional Comments and Information	14

GENERAL INFORMATION

Project Name: Toano Middle School
Owner / Applicant: Williamsburg/James City County Public Schools
Plan Preparer: AES Consulting Engineers Email: gcorson@aesva.com
Project Location: 7817 Richmond Rd.
Tax Map / Parcel: (12-4)(1-51)
County Plan No. (if known): _____
County BMP Type: Bioretention Facility (D-1)
Other information submitted in addition to this checklist (Check all that apply):

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

Issue Date
March 1, 2001

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

EROSION AND SEDIMENT CONTROL PLAN CHECKLIST

I. *GENERAL*:

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

II. *SITE PLAN*:

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

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

Yes	No	N/A	
☒	☐	☐	*MAINTENANCE PLAN* or alternately, appropriate reference to current minimum standards and specifications of the VESCH, outlining the inspection frequency and maintenance requirements for all erosion and sediment control measures proposed for the project.
☐	☐	☒	*TRENCH DEWATERING* methods and erosion and sediment controls, if anticipated for the project.
☒	☐	☐	*CONSTRUCTION SEQUENCE* outlining the anticipated sequence for installation of erosion and sediment controls and site, grading and utility work to be performed for the project by the site contractor.
☐	☐	☒	*PHASING PLAN* if required for larger project sites that are to be developed in stages or phases.
☒	☐	☐	*STANDARD COUNTY NOTES* are required to be placed on the erosion and sediment control plan. Refer to the standard James City County Erosion and Sediment Control Notes dated May 5, 1999.
☒	☐	☐	*PROFESSIONAL SEAL AND SIGNATURE* required on final and complete approved plans, drawings, technical reports and specifications.

III. ***NARRATIVE:***

Yes	No	N/A	
☒	☐	☐	*PROJECT DESCRIPTION* briefly describing the nature and purpose of the land disturbing activity and the acreage to be disturbed.
☒	☐	☐	*EXISTING SITE CONDITIONS* description of existing topography, land use, cover and drainage patterns at the site.
☒	☐	☐	*ADJACENT AREA* descriptions of neighboring onsite or offsite areas such as streams, lakes, property, roads, etc. and potential impacts due to concentrated flow or runoff from the land disturbing activity.
☒	☐	☐	*OFFSITE DISTURBED AREA* descriptions of proposed borrow sites, water or surplus areas, utility extensions and erosion and sediment controls to be implemented.
☒	☐	☐	*SOILS DESCRIPTION* briefly summarizing site, disturbed area and drainage basin soils including name, unit, hydrologic soil group (HSG) classification, surface runoff potential, erodibility, permeability, depth, texture, structure, erosion hazards, shrink-swell potential, limitations for use and anticipated depths to bedrock and the seasonal water table, as applicable.
☐	☐	☒	*CRITICAL AREAS* on the site which may have potentially serious erosion and sediment control problems and special considerations required (i.e. steep slopes, hydric soils, channels, springs, sinkholes, water supply reservoirs, groundwater recharge areas, etc.)

Yes	No	N/A	
☒	☐	☐	*PROPOSED EROSION & SEDIMENT CONTROL MEASURES* inclusive to the specific erosion and sediment control plan as proposed for the land disturbing activity. Measures should be consistent with those proposed on the site drawings. Address general use, installation, limitations, sequencing and maintenance requirements for each control measure.
☒	☐	☐	*STABILIZATION MEASURES* required for the site, either temporary or permanent, and during and following construction including temporary and permanent seeding and mulching, paving, stone, soil stabilization blankets and matting, sodding, landscaping or special stabilization techniques to be utilized at the site.
☒	☐	☐	*STORMWATER MANAGEMENT CONSIDERATIONS* for the site, either of temporary or permanent nature, and strategies, sequences and measures required for control. May reference the stormwater management plan for the site, if prepared, for permanent stormwater management facilities and control of drainage once the site is stabilized.

IV. ***CALCULATIONS:***

Yes	No	N/A	
☒	☐	☐	*CALCULATIONS AND COMPUTATIONS* associated with hydrology, hydraulics and design of proposed temporary and permanent erosion and sediment control measures including: sediment traps and basins, diversions, stormwater conveyance channels, culverts, slope drains, outlet protections, etc. Computations are not required on the construction plan and may be attached in a supplemental erosion and sediment control plan design report, if presented in a clear and organized format.
☐	☐	☒	*TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET* submitted for each basin along with schematic or sketch cross-section showing applicable design and construction data, storage volumes (wet-dry), dimensions and elevations. Peak design runoff to be based on the 2- or 25-year design storm event based on maximum disturbed site conditions (existing, interim or proposed conditions) in accordance with Minimum Standard 3.14 of the VESCH.

JAMES CITY COUNTY, VIRGINIA
ENVIRONMENTAL DIVISION

STORMWATER MANAGEMENT DESIGN PLAN CHECKLIST

I. *GENERAL*:

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

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

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

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

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

Yes	No	N/A	
☐	☐	☒	*STORMWATER CONVEYANCE SYSTEM COMPUTATIONS*
☐	☐	☒	Storm Sewer Design computations based on 10-year design event.
☐	☐	☒	Hydraulic Grade Line computations based on 10-year design event.
☐	☐	☒	Inlet computations based on current VDOT procedure for spread, ponding depth and grate size required.
☐	☐	☒	Culvert Headwater computations. Design based on 10-year design storm event and check only for 100-year storm event.
☐	☐	☒	Open Channel computations based on 2-year design event for velocity and 10-year design event for capacity.
☐	☐	☒	Standard outlet protection or special energy dissipators.
☐	☐	☒	Pipe thickness design computations, as required, for selected pipe type (live load, minimum cover, maximum height of cover, etc.).
☐	☐	☒	Adequate channel computations for receiving channels (based on field measured channel section data).

III. ***STORMWATER MANAGEMENT/BMP FACILITIES*:**

Yes	No	N/A	
☒	☐	☐	*HYDROLOGY* – An SCS based methodology is required for the design of stormwater management/BMP facilities with watersheds exceeding 20 acres. Under 20 acres, other generally accepted methodologies such as the modified rational, critical storm are allowable. Refer to Chapter 5 of the VESCH or Chapter 5 of the VSMH.
☒	☐	☐	Runoff Curve Number or Coefficient determinations: predeveloped and ultimate development land use scenarios.
☒	☐	☐	Time of concentration: predeveloped and ultimate development indicating overland, shallow concentrated, and channel flow components (200 ft. maximum length for overland flow).
☒	☐	☐	Hydrograph generation (tabular or graphical): pre- and postdevelopment conditions for the 1-, 2-, 10- and 100-year design storm events.
☐	☐	☒	*FACILITY CONFIGURATION and MINIMUM SEPARATIONS*
☐	☐	☒	Screening and layout consistent with Section 24-98(d) of the Chapter 24 Zoning ordinance (landscaping, screening, visibility, etc.).
☐	☐	☒	Basic considerations for safety and unauthorized entry.
☐	☐	☒	Proper length to width ratio (Typically 2H:1V).
☐	☐	☒	Facilities with deep pools (4 feet or more in depth) provided with two benches. Fifteen (15) ft. safety bench outward from normal pool at maximum 6 percent slope and aquatic bench inward from normal shoreline below normal pool. Narrower widths may be considered on a case-by-case basis.
☐	☐	☒	Pond buffer minimum 25 feet outward from maximum design WSEL. Additional setbacks may be required to permanent structures.
☐	☐	☒	No trees, shrubs or woody plants within 15 feet of embankment toe or 25 feet from principal spillway structure.
☒	☐	☐	Infiltration and filtering system facilities generally located at least 100 feet horizontally from any water supply well; 100 feet from any downslope building; and 25 feet from any upslope buildings, unless site specific investigation allows for reduced separation.

Yes	No	N/A	
☒	☐	☐	*HYDRAULIC COMPUTATIONS*
☒	☐	☐	Elevation- or Stage-Storage curve and/or tabular data.
☒	☐	☐	Weir / Orifice Control – Extended Detention.
☒	☐	☐	Weir / Orifice Control – riser 1-year control for channel protection.
☒	☐	☐	Weir / Orifice Control – riser 2-year control for quantity (if required).
☒	☐	☐	Weir / Orifice Control – riser 10-year control for quantity (if required).
☒	☐	☐	Inlet / Outlet (barrel) control – (All Storms).
☒	☐	☐	Check for barrel control prior to riser orifice flow to prevent slug flow-water hammer conditions.
☐	☐	☒	Emergency spillway capacity and depth of flow.
☒	☐	☐	Elevation – Discharge (Outlet Rating) curve and/or table. Provide all supporting calculations and/or design assumptions.
☒	☐	☐	Adequate channel computations for receiving channel. May be waived if facility is designed based on current Stream Channel Protection criteria.
☒	☐	☐	*POND or RESERVOIR ROUTING*
☒	☐	☐	Storage-Indication Routing of postdeveloped inflow hydrographs for the 1-, 2-, 10-, and 100-year design storms. Preference is for structure to discharge up to the 10-year storm through the principal spillway and pass the 100-year storm with a minimum 1 foot of freeboard through a combination principal and emergency spillways. If no emergency spillway is provided, riser must be large enough to pass the design high water flow and trash without overtopping the facility, have 3 square feet or more of cross-sectional area, contain a hood type inlet and have a minimum freeboard of 2 feet. Token spillways with minimum 8 ft. width are also recommended at or above the design 100-year storm elevation.
☒	☐	☐	Downstream hydrographs at established study points, if conditions warrant (i.e. facility discharge combined with uncontrolled bypass).
☒	☐	☐	*MISCELLANEOUS COMPUTATIONS*
☒	☐	☐	Water quality volume for permanent pool based on selected BMP treatment volume (WQv).
☒	☐	☐	Water quality volume for extended detention base on selected BMP treatment volume (WQv) with drawdown computations.
☒	☐	☐	Drawdown computations for the 1-year, 24 hour detention for stream channel protection criteria.
☐	☐	☒	Pond drain computations (within 24 hours).
☐	☐	☒	Anti-seep collar design (concrete preferred) or match material type.
☐	☐	☒	Filter diaphragm design (or alternative method of controlling seepage).
☐	☐	☒	Riser / base structure flotation analyses. FS = 1.25 minimum.
☐	☐	☒	Downstream danger reach study and/or emergency action plan (if conditions warrant).
☐	☐	☒	Upstream backwater analyses onto offsite adjacent property (if conditions warrant).
☐	☐	☒	100 year floodplain impacts (if conditions warrant).

Yes	No	N/A	
☒	☐	☐	*GEOTECHNICAL REQUIREMENTS*
☒	☐	☐	Geotechnical Report with recommendations specific to BMP facility type selected. Report prepared by a registered professional engineer. Requires submission, review and approval prior to issuance of Land Disturbance Permit.
☒	☐	☐	Initial Feasibility Testing requirements satisfied as per Appendix E of the James City County Guidelines fro Design and Construction of Stormwater Management BMPs manual. (Infiltration, Bioretention and Filtering System BMP types only).
☒	☐	☐	Concept Design Testing requirements satisfied as per Appendix E of the James City County Guidelines for Design and Construction of Stormwater Management BMPs manual. . (Infiltration, Bioretention and Filtering System BMP types only).
☒	☐	☐	Minimum Boring locations: borrow area, pool area, principal control structure, top of facility near one abutment and emergency spillway if provided.
☒	☐	☐	Boring logs with Unified Soil Classification (ASTM D2487), soils descriptions and depths to bedrock and the seasonal water table indicated.
☒	☐	☐	Standard County Record Drawing/Construction Certification note provided on plan. *Note: It is understood that preparation of record drawings and construction certifications as required for project facilities may not necessarily be performed by the plan preparer. These components may be performed by others.*
☐	☐	☒	*PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS*
☐	☐	☒	*EXISTING GROUND AND PROPOSED GRADE*
☐	☐	☒	Embankment or excavation side slopes labeled (3H:1V maximum).
☐	☐	☒	Minimum top width labeled (per VESCH or VSMH requirements).
☐	☐	☒	Removal of unsuitable material under proposed facility (per Geotechnical Report requirements).

Yes	No	N/A	
☐	☐	☒	*CORE TRENCH*
☐	☐	☒	Material (per plan or Geotechnical Report).
☐	☐	☒	Bottom width (4' minimum or greater as dictated by Geotechnial Report recommendations).
☐	☐	☒	Side slopes (1:1 maximum steepness)
☐	☐	☒	Depth (4' minimum or greater as dictated by Geotechnical Report).
☐	☐	☒	*PRINCIPAL CONTROL STRUCTURE. RISER OR SIMILAR STRUCTURE (DETAILS REQUIRED FOR ALL ITEMS)*
☐	☐	☒	Durable, watertight, resistant material (concrete preferred).
☐	☐	☒	Riser diameter is at least 1.25 times larger than barrel diameter.
☐	☐	☒	All pertinent dimensions and elevations shown.
☐	☐	☒	Control orifice or weir dimensions and elevations shown.
☐	☐	☒	Trash rack – removable – for each release.
☐	☐	☒	Anti-vortex device, baffle or plate.
☐	☐	☒	Riser base structure with dimensions and embedment specifications (concrete preferred).
☐	☐	☒	Interior access (steps, ladders, etc.) for maintenance for structures over 4 feet in height. Excessively high risers may need some form of exterior access on top portion.
☐	☐	☒	Low flow orifice with trash rack device.
☒	☐	☐	*PRINCIPAL CONTROL STRUCTURE OUTLET BARREL*
☒	☐	☐	Material (ASTM C-361 reinforced concrete pipe) with watertight joints. Prior approval required for all other pipe material (other RCP types, CMP, CPP, PVC, etc.).
☒	☐	☐	Support and bedding requirements for barrel – concrete cradles, etc. or as recommended by the Geotechnical Report.
☒	☐	☐	Pipe inverts, length, size, class and slope shown.
☒	☐	☐	Flared end section or endwall provided on barrel outlet.
☐	☐	☒	*SEEPAGE CONTROL*
☐	☐	☒	Phreatic line shown (4:1 slope measured from the intersection of the embankment and the principal spillway design high water).
☐	☐	☒	*ANTI-SEEP COLLARS*
☐	☐	☒	Anti-seep collar, concrete preferred.
☐	☐	☒	Size – 15 percent increase in length of saturation using outside pipe diameter.
☐	☐	☒	Spacing and location on barrel (located at least 2 feet from a pipe joint).
☐	☐	☒	*FILTER DIAPHRAGMS*
☐	☐	☒	Design based on latest NRCS design methods and certified by a professional engineer.

Yes	No	N/A	
☐	☐	☒	*ELEVATION AND DIMENSIONAL DESIGN DATA*
☐	☐	☒	Top of facility – construction height and settled height (10 percent settlement).
☐	☐	☐	Crest of principal control structure spillway at least one (1) foot below crest of emergency spillway, if provided.
☐	☐	☒	Minimum freeboard of one (1) foot above the 100-year design high water elevation for facilities <u>with</u> an emergency spillway.
☐	☐	☒	Minimum freeboard of two (2) feet above the 100-year design high water elevation for facilities <u>without</u> an emergency spillway or in accordance with the SCS National Engineering Handbook (prior approval required).
☐	☐	☒	Basin Sediment Clean-Out elevation (permanent mode). Typically 10 to 25 percent of water quality volume.
☒	☐	☐	*CROSS SECTION THROUGH FACILITY*
☒	☐	☐	Existing Ground.
☒	☐	☐	Proposed grade.
☒	☐	☐	Top of facility – constructed and settled.
☐	☐	☒	Location of emergency spillway with side slopes labeled (emergency spillway in cut).
☐	☐	☒	Bottom of core trench (4' minimum).
☒	☐	☐	Location of each soil boring.
☒	☐	☐	Barrel location.
☒	☐	☐	Existing and proposed utility location/protection.
☐	☐	☒	*EMERGENCY SPILLWAY PROFILE*
☐	☐	☒	Existing ground.
☐	☐	☒	Inlet, level (control) and outlet sections per SCS.
☐	☐	☒	Spillway and crest elevations.
☒	☐	☐	*PRETREATMENT DEVICES* of adequate depth and properly designed using required pretreatment volumes for the selected County BMP facility type. Including, but not limited to: sediment forebays, sediment basins, sumps, grass channels, gravel diaphragms, plunge pools, chamber separators, manufactured systems or other acceptable methods.

Yes	No	N/A	
☒	☐	☐	*CONSTRUCTION SPECIFICATIONS and NOTES*
☒	☐	☐	Anticipated sequence of construction for BMP (consistent with erosion and sediment control plan).
☒	☐	☐	Provisions to control base stream or storm flow conditions encountered during construction.
☒	☐	☐	Site and subgrade preparation requirements.
☐	☐	☒	Embankment, fill and backfill material soil and placement (lift) thickness requirements.
☒	☐	☐	Compaction and soil moisture content requirements.
☐	☐	☒	Geosynthetics for drainage, filtration, moisture barrier, separation, and reinforcement purposes.
☐	☐	☒	Clay or synthetic (PVC or HDPE) pond liners.
☒	☐	☐	Storm drain, underdrain and pipe conduit requirements.
☐	☐	☐	Minimum depth of pipe cover for temporary (construction) and final cover conditions.
☐	☐	☒	Permanent shutoff valve and pond drain.
☒	☐	☐	Concrete requirements for structural components.
☐	☐	☒	Riprap and slope protection.
☒	☐	☐	Access or maintenance road surface, base, subbase.
☒	☐	☐	Temporary and permanent stabilization measures.
☐	☐	☒	Temporary or permanent safety fencing.
☒	☐	☐	BMP Landscaping (deep, shallow, fringe, perimeter, etc.)
☒	☐	☐	Dust and traffic control (if warranted).
☒	☐	☐	Construction monitoring and certification by professional.
☐	☐	☐	Other: _____
☐	☐	☐	Other: _____
☒	☐	☐	*MAINTENANCE PROVISIONS*
☒	☐	☐	Entity responsible for maintenance identified.
☒	☐	☐	Maintenance Plan which outlines the long-term schedule for inspection/maintenance of the facility and forebays.
☒	☐	☐	Maintenance access from public right-of-way or publicly traveled road.
☐	☐	☒	Maintenance easement provided encompassing high water pool and buffer, principal and emergency spillways, outlet structures, forebays, embankment area and possible sediment-removal stockpile areas.
☐	☐	☒	Minimum 6 foot wide public safety shelf (landing) or alternative fencing.

IV. *OUTLET PROTECTIONS*:

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

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

Plan Preparer: Graham Coson, P.E
Date: 1/11/13

Copy of JCC: SWMProg/BMP/Checklist/ChkList

SP-0002-2013

ECS MID-ATLANTIC, LLC "Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

PLANNING DIVISION

JAN 11 2013

RECEIVED

September 18, 2012

Mr. Alan Robertson
Williamsburg-JCC Public Schools
597 Jolly Pond Road
Williamsburg, Virginia 23188

ECS Project No. 07:11636

Environmental Division

JAN 15 2013

RECEIVED

Reference: Subsurface Exploration and Infiltration Testing
Toano Middle School Parking Expansion
7817 Richmond Road
Toano, James City County, Virginia

Dear Mr. Robertson,

ECS Mid-Atlantic, LLC has completed a subsurface exploration and infiltration testing of the above referenced project. This report presents the results of the subsurface exploration and infiltration testing for the proposed pervious concrete parking stalls for the Toano Middle School parking expansion.

Introduction

The project site is located at 7817 Richmond Road in Toano, James City County, Virginia. We understand that the project will consist of the construction of forty-seven (47) new parking stalls that will contain pervious concrete and associated infiltration on the north and northwest side of the parking lot at Toano Middle School. Our scope of services is limited to the development of the pervious parking stalls only.

The purpose of this exploration was to explore the soil and groundwater conditions at the site and to provide infiltration testing to guide design and construction of the planned pervious concrete parking stalls. Our investigation included five (5) 10-foot deep hand auger borings to explore the subsurface soil and groundwater conditions, performing a site reconnaissance to observe general topography, performing three (3) infiltration tests, and providing an engineering letter report with infiltration rates for the planned construction. A Hand Auger Boring/Infiltration Location Plan is included in Appendix I.

Field and Laboratory Exploration Procedures

A total of five (5) hand auger borings were completed to a depth of 10-feet below the existing site elevations in the proposed parking lot expansion areas. Groundwater was not encountered within the hand auger borings. Approximately three (3) infiltration tests were also performed at the respective hand auger boring locations.

In-situ saturated hydraulic conductivity (K_{sat}) testing was completed within the designated infiltration test areas. Our infiltration testing was performed using a Johnson Precision Permeameter™ and the manufacturer's testing guidelines and procedures. The permeameter establishes a constant head of water at a predetermined depth in a borehole by use of a precision valve and float assembly. The rate of water flow into the borehole required to maintain the constant head is then determined at selected intervals. The permeameter can effectively measure saturated hydraulic conductivity at any desired depth in the vadose zone ranging from 0.5 feet to 98 feet and can measure K_{sat} in a range of 10^{-2} to 10^{-7} cm/sec. The use of the Precision Permeameter is a generally accepted method for measuring saturated hydraulic conductivity of in-situ soils.

Representative soil samples were selected and subjected to classification testing consisting of natural moisture content and gradation (including #200 wash) testing. The Hand Auger Boring Logs are provided in Appendix II of this report while a Laboratory Testing Summary is provided in Appendix III.

Subsurface Conditions

Experienced personnel from our office classified each soil sample in accordance with the Unified Soil Classification System (USCS). The group symbols for each soil type are indicated in parentheses following the soil descriptions on the boring logs. The geotechnical engineer grouped the various soil types into the major zones noted on the boring logs. The stratification lines designating the interfaces between earth materials on the boring logs are approximate; in situ, the transitions may be gradual.

The hand auger borings indicated that the ground surface was covered with up to approximately 6-inches of topsoil. Underlying the topsoil materials, a layer of uncontrolled FILL was encountered at hand auger boring location HA-3 to a depth of 1-foot below the existing site elevations. The uncontrolled FILL materials were granular in nature and consisted of Silty SAND (SM) with Gravel and Clay, and trace roots. Underlying the surface topsoil or uncontrolled FILL materials, the natural subgrade soils consisted of interbedded layers of Clayey SAND (SC) and Sandy CLAY (CL) with varying amounts of Sand to the boring termination depth of 10-feet below the existing site elevations.

The groundwater table was not encountered within the hand auger borings. Please note that groundwater levels are influenced by seasonal conditions and by periods of significant precipitation or prolonged drought

Infiltration Test Results

Three (3) field infiltration tests were completed utilizing the Johnson Meter at a depth of 2-feet below the existing surface elevations. The infiltration test results are provided in Appendix IV.

Utilizing the Johnson Meter, we recorded the following in-situ infiltration values illustrated below:

Table 1: Measured Infiltration Rates

Test Location	Infiltration Test No.	Ksat Test Depth (Feet)	Ksat Rate (in/hour)	USDA Soil Classification	Percent Passing the No. 200 Sieve (%)
HA-1	INF-1	2.0	0.215	SC	46.7
HA-2	INF-2	2.0	0.336	SC	46.3
HA-3	INF-3	2.0	0.178	CL	52.0

The measured rates fall into Hydrologic Soil Grouping D. Typically, soils with the Hydrologic Soil Group designations of A and B are considered suitable for infiltration purposes. Some soils designated as C type soils are considered suitable for infiltration practices, but these soils would need to be evaluated on a case specific basis. Soils with group designations of D are typically not considered suitable for infiltration.

Groundwater was not encountered within the hand auger borings. The soils encountered within the trench areas were generally granular and cohesive in nature and consisted of Clayey SAND (SC) and CLAY (CL) with varying amounts of Sand in a medium stiff to stiff condition, yielding low infiltration results. The existing condition of the soils encountered does not appear to support an infiltration component.

However, this information should be transmitted to the project civil engineer to determine the suitability of these soils for their intended design.

General Comments

This report has been prepared in order to aid in the evaluation of this site and to assist Williamsburg-JCC Public Schools. in the design and planning of the project. The report scope is limited to the specific project and location described, and the project description represents our understanding of the significant aspects relevant to soil and foundation characteristics.

We have appreciated being of service to you during the design phase of this project and look forward to its successful construction. If you should have any questions regarding the information and recommendations contained in this report or if we can be of any further assistance, please contact our office.

Respectfully,

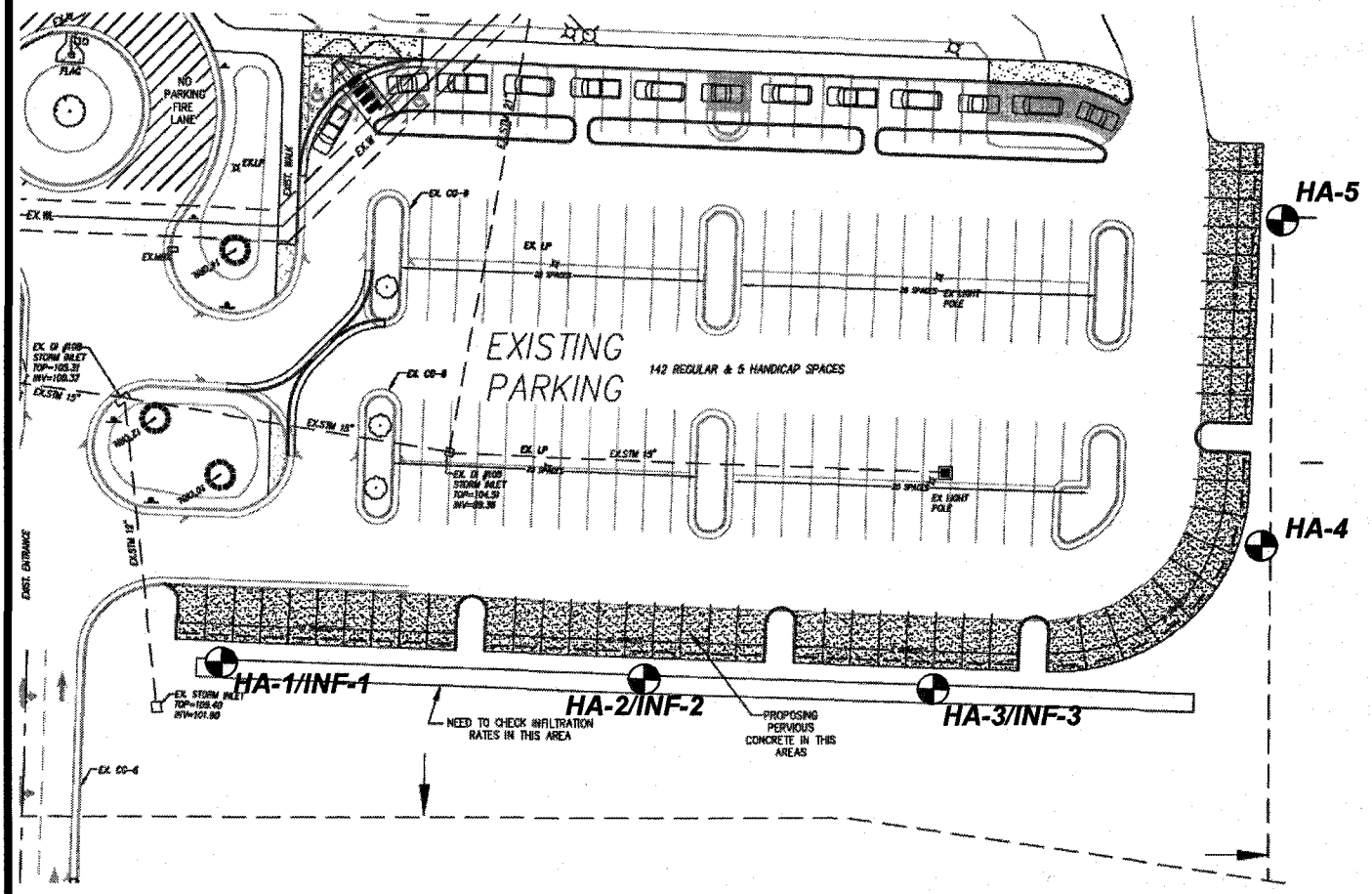
ECS MID-ATLANTIC, LLC.

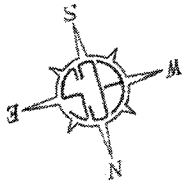
Sara B. Phillips
Project Geologist

COMMONWEALTH OF VIRGINIA
W. LLOYD WARD
Lic. No. 034612
PROFESSIONAL ENGINEER

W. Lloyd Ward, P.E.
VP/Williamsburg Branch Manager

Appendix:
I. Hand Auger Boring/Infiltration Location Plan
II. Hand Auger Boring Logs
III. Laboratory Testing Summary
IV. Infiltration Test Results





LEGEND

- Approximate Hand Auger Boring and/or Infiltration Location

SCALE

NTS

SOURCE

AES Consulting Engineers

Undated

FIGURE 1
HAND AUGER BORING/INFILTRATION LOCATION PLAN
Toano Middle School Parking Expansion
James City County, Virginia

ECS PROJECT NO. 07:11636

APPENDIX I

Hand Auger Boring/Infiltration Location Plan

CLIENT	JOB #	BORING #	SHEET
Williamsburg-JCC Public Schools	07:11636	HA-1	1 OF 1

PROJECT NAME: Toano Middle School Parking Expansion

ARCHITECT-ENGINEER:

SITE LOCATION: 7817 Richmond Road, James City County, Virginia

CALIBRATED PENETROMETER TONS/FT2: 1 2 3 4 5+

ROCK QUALITY DESIGNATION & RECOVERY: RQD% — — REC.% ——— 20% 40% 60% 80% 100%

PLASTIC LIMIT — WATER CONTENT % — LIQUID LIMIT %

STANDARD PENETRATION BLOWS/FT: 10 20 30 40 50+

BOTTOM OF CASING — LOSS OF CIRCULATION

ENGLISH UNITS

DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL (Soil Descriptions)	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	STANDARD PENETRATION BLOWS/FT
0					6-inches of Topsoil				
					Silty Fine SAND, Trace Clay and Root Fragments, Tan, Moist, (SM)				
					Clayey Fine to Medium SAND, Tannish Brown to Orangish Brown, Moist, (SC)				16.1
2									
4									
6					Silty to Clayey Fine to Medium SAND, With Clay, Orangish Brown and Reddish Brown, Moist, (SM-SC)				18.5
8									
10					End of Boring at 10.00 feet				
12									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL DRY WS☐ WD☐	BORING STARTED 8/31/2012	
WL(BCR) WL(ACR)	BORING COMPLETED 8/31/2012	CAVE IN DEPTH
WL	RIG N/A FOREMAN S. Phillips	DRILLING METHOD Hand Auger

APPENDIX II

Hand Auger Boring Logs