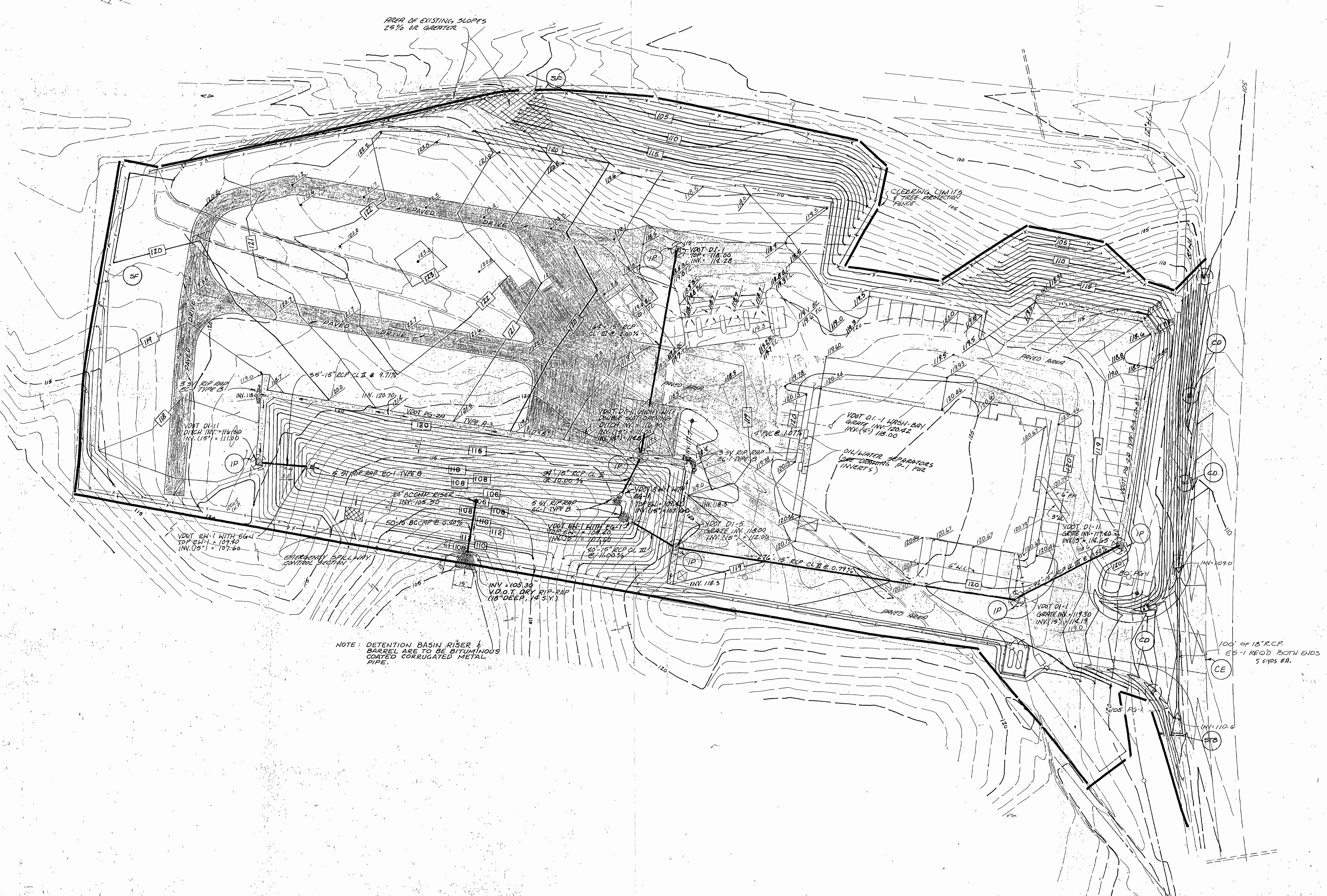


ENGINEERS ○ ARCHITECTS ○ SURVEYORS
INTERIOR DESIGNERS ○ PLANNERS
P.O. BOX 197 WILLIAMSBURG, VIRGINIA 23187 (804) 253-0673

1. 2/21/91 REV'D. AS PER COUNTY COMMENTS DATED: 11/19/90.
2. 4/17/91 REV'D AS PER COUNTY COMMENTS DATED: 4/3/91
3. 7/8/91 COMPACTED STONE AREAS TO BE PAVED DETENTION POND OUTFALL RELOCATED.

GRADING & EROSION

OPERATIONS & MAINTENANCE CENTER
WILLIAMSBURG-JAMES CITY COUNTY
PUBLIC SCHOOLS

SCALE	1" = 30'
DESIGNED	L.D.E.
DRAWN	L.B.A.
CHECKED	L.D.E.
DATE	6/24/91
PROJECT NO.	1890460
SHEET	C-2

"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."

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
11/01/11
LAND SURVEYOR

Thomas C. Sublett 11/01/11
THOMAS C. SUBLETT DATE

BMP RECORD DRAWINGS

For

WJCC OPERATIONS CENTER

POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

JCC SP-0022-2010

GENERAL NOTES

1 TAX MAP PARCEL NO. (22-4)(1-9) SITE ADDRESS 597 JOLLY POND ROAD WILLIAMSBURG, VIRGINIA 23188

2 SITE IS CURRENTLY ZONED "PL" TMP (22-4) (1-9) BY THE JAMES CITY COUNTY BOARD OF SUPERVISORS APPROVAL OF ZONING CASE JCC Z-0004-2009 AT THE FEBRUARY 9, 2010 BOARD MEETING. SETBACKS FRONT 35' SIDE 15' REAR 35'

3 IN ADDITION THE JAMES CITY COUNTY BOARD OF SUPERVISORS APPROVED JCC SUP-0027-2009 WITH CONDITIONS AT THE FEBRUARY 9, 2010 BOARD MEETING

4 THIS PROPERTY IS IN FLOOD ZONE "X" AS SHOWN ON MAP NUMBER 51095C0110C, PANEL 0110 FOR COMMUNITY NUMBER 510201 DATED 9/28/2007 OF THE FLOOD INSURANCE RATE MAPS FOR JAMES CITY COUNTY, VIRGINIA

5 HORIZONTAL DATUM: NAD83 (1986) VIRGINIA STATE PLAIN COORDINATE SYSTEM SOUTH ZONE
VERTICAL DATUM: NGVD29 VIRGINIA STATE PLAIN COORDINATE SYSTEM SOUTH ZONE
JAMES CITY COUNTY MONUMENTS USED: 341, 342

6 PROJECT LIES WITHIN TIDAL SUBWATERSHED OF YARMOUTH CREEK WATERSHED

7 SITE IS SERVED BY PUBLIC WATER AND PRIVATE ON-LOT SEWER

8 NO ADDITIONAL WATER OR SEWER CONNECTION ARE REQUIRED FOR THIS PROJECT

9 ON-SITE EXTERIOR CONCRETE IS TO BE A MINIMUM OF 3500 PSI WITH 5% TO 7% AIR ENTRAINMENT

10 ALL ERRORS OR DISCREPANCIES WITH THE PLANS OR EXISTING SITE CONDITIONS SHALL BE REPORTED TO THE ENGINEER OR SURVEYOR OF RECORD BEFORE PROCEEDING WITH THE WORK

11 CONTOUR INTERVAL IS 1 FOOT. EXISTING GRADE IS FROM SURVEY PROVIDED BY AES

12 ANY EXISTING UNUSED WELLS SHALL BE ABANDONED IN ACCORDANCE WITH THE VIRGINIA PRIVATE WELL REGULATIONS AND JAMES CITY COUNTY CODE

13 THE CONTRACTOR SHALL MAINTAIN A COMPLETE SET OF THE APPROVED PLANS AT THE PROJECT SITE AT ALL TIMES DURING CONSTRUCTION

14 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 A PRIVATE UTILITY LOCATOR FOR THE LOCATING OF PRIVATE UTILITIES

15 THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE LAWS, ORDINANCES, RULES, REGULATIONS, AND ORDERS OF ANYBODY HAVING JURISDICTION. THE CONTRACTOR SHALL ERECT AND MAINTAIN, AS REQUIRED BY THE CONDITIONS AND PROGRESS OF THE WORK, ALL NECESSARY SAFEGUARDS FOR SAFETY AND PROTECTION

16 ALL CONSTRUCTION METHODS AND MATERIALS SHALL CONFORM WITH THE CURRENT JAMES CITY COUNTY STANDARDS AND SPECIFICATIONS, VIRGINIA DEPARTMENT OF TRANSPORTATION ROAD AND BRIDGE STANDARDS AND SPECIFICATIONS, VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS, AND ANY OTHER APPLICABLE CITY OR STATE ORDINANCES, CODES, AND LAWS PRIOR TO ANY CONSTRUCTION ACTIVITY

17 THE OWNER IS RESPONSIBLE FOR OBTAINING VSMP/ VIRGINIA STORMWATER PERMITS AND JAMES CITY COUNTY LAND DISTURBING PERMIT PRIOR TO COMMENCEMENT OF WORK

18 THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL OTHER NECESSARY PERMITS PRIOR TO COMMENCEMENT OF WORK INCLUDING, BUT NOT LIMITED TO, RIGHT-OF-WAY, AND UTILITY PERMITS.

19 CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION OF CONSTRUCTION EFFORTS WITH THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT), LOCAL EMERGENCY SERVICES, AND ALL NECESSARY UTILITY COMPANIES INCLUDING, BUT NOT LIMITED TO, ELECTRICITY, NATURAL GAS, TELECOMMUNICATIONS, CABLE TELEVISION, WATER, SEWER, PRIVATE LIGHTING, AND OTHERS THAT MAY BE REQUIRED

20 THE CONTRACTOR SHALL SATISFY HIMSELF AS TO ALL SITE CONDITIONS PRIOR TO CONSTRUCTION

21 ALL UTILITIES WILL BE UNDERGROUND

22 THE CONTRACTOR IS RESPONSIBLE FOR MAINTENANCE OF ALL SITE IMPROVEMENTS, INCLUDING LANDSCAPING, AS SHOWN ON THE APPROVED PLAN.

23 THE CONTRACTOR SHALL REMOVE ALL EXCESS MATERIAL, INCLUDING SOIL AND DEBRIS, FROM THE SITE

24 THE CONTRACTOR SHALL COMPLY WITH ALL PROVISIONS OF THE VIRGINIA UNDERGROUND UTILITY DAMAGE PREVENTION ACT (SECTION 56-265.14 ET. SEQ. CODE OF VIRGINIA, 1950, AS AMENDED) AND HEREBY AGREES TO HOLD THE DEVELOPER AND THE ENGINEER HARMLESS AGAINST ANY LOSS, DAMAGE, OR CLAIMS OF ANY NATURE WHATSOEVER ARISING OUT OF THE CONTRACTOR'S FAILURE TO COMPLY WITH THE REQUIREMENTS OF SAID ACT.

25 REMOVE NECESSARY FENCING AT TRAILER/BUS STORAGE AREA TO GAIN ACCESS AND PROVIDE TEMPORARY FENCING TO MAINTAIN SECURITY AT EXISTING FACILITY

26 ANY NEW SIGNS REQUIRED FOR THE PROJECT SHALL BE IN ACCORDANCE WITH ARTICLE II, DIVISION 3 OF THE JAMES CITY COUNTY ZONING ORDINANCE

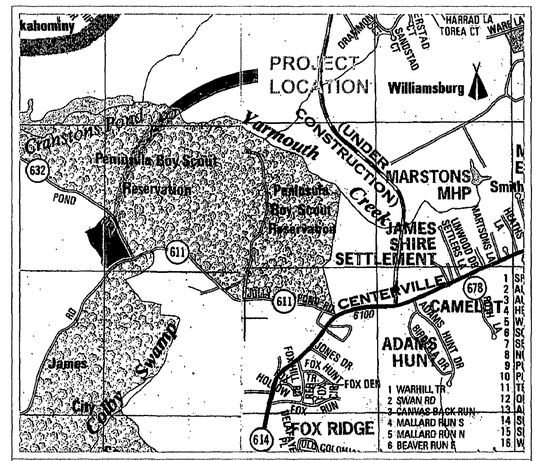
27 THE ENTRANCE ALONG CRANSTON'S MILL POND ROAD IS TO BE USED FOR CONSTRUCTION PERIOD AND UPON COMPLETION OF CONSTRUCTION THE ENTRANCE SHALL BE FOR ENTRY/EXIT EMERGENCY USE ONLY

28 APPROVED LANDSCAPING SHALL BE PLANTED WITHIN 6 MONTHS OF FINAL SITE PLAN APPROVAL UNLESS OTHERWISE DETERMINED BY THE DIRECTOR OF PLANNING OR DESIGNEE

29 THE TRAILER/BUS STORAGE AREA IS FOR THE USE AS LONG-TERM STORAGE OF TRAILERS, BUSES AND ANY OTHER VEHICLES STORED. THESE VEHICLES SHALL NOT BE MOVED FROM THE STORAGE AREA ON A DAILY BASIS

30 AN ARCHAEOLOGICAL SURVEY WAS CONDUCTED ONLY ON THE AREAS OF NEW CONSTRUCTION INDICATED WITH THESE CONSTRUCTION PLANS. FOR ANY FUTURE ADDITIONAL CONSTRUCT OF THIS SITE A ARCHAEOLOGICAL SURVEY WILL BE REQUIRE

31 WATER CONSERVATION STANDARDS ARE ON FILE WITH JCSA



VICINITY MAP
(Approximate Scale: 1"=2000')
Copyright ADC The Map People permitted use number 20905145

AES Job No.: 9888-19
Original Submittal Date: 3/2/2010
Revision Date: 3/30/2010
Approval Date: ?

LEGEND

EXISTING		PROPOSED
EX. WATER	WATER	
EX. SAN.	SANITARY SEWER	
EX. FORCEMAIN	STORM SEWER	
	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	
BCO	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	
25.1	EXISTING GROUND ELEVATION	
	PROPOSED SPOT GRADE	TC0.00
80	CONTOUR	80

INDEX OF SHEETS

SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
~~2~~	~~ENVIRONMENTAL INVENTORY~~
~~3~~	~~INITIAL EROSION & SEDIMENT CONTROL PLAN~~
~~4~~	~~LAYOUT & UTILITY PLAN~~
5	GRADING & DRAINAGE PLAN
~~6~~	~~LANDSCAPE PLAN~~
~~7~~	~~LIGHTING PLAN~~
8	STORMWATER MANAGEMENT NOTES & DETAILS
9	STORMWATER MANAGEMENT NOTES & DETAILS
~~10~~	~~STORMWATER MANAGEMENT NOTES & DETAILS~~
~~11~~	~~EROSION & SEDIMENT CONTROL NOTES & DETAILS~~
~~12~~	~~NOTES & DETAILS~~
~~13~~	~~LANDSCAPE & LIGHTING NOTES & DETAILS~~

OWNER/DEVELOPER INFORMATION:

WJCC WILLIAMSBURG-JAMES CITY COUNTY PUBLIC SCHOOLS
597 JOLLY POND RD
WILLIAMSBURG, VA 23188
CONTACT: ALAN T. ROBERTSON
PHONE NO.: (757) 259-7157
FAX NO.: (757) 565-1462

CERTIFIED RESPONSIBLE LAND DISTURBER:

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 CONTRACTOR 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 CONTRACTOR SHALL PROVIDE WRITTEN NOTIFICATION SHOULD THE "RESPONSIBLE LAND DISTURBER" CHANGE DURING CONSTRUCTION.

LAND USE SUMMARY TABLE:

TOTAL SITE AREA =	1,209,619 S.F. (27.769± AC.)	100.00%
EXISTING BUILDING AREA TOTAL =	21,369 S.F. (0.491± AC.)	1.77%
EXISTING IMPERVIOUS AREA =	124,160 S.F. (2.850± AC.)	10.26%
EXISTING OPEN SPACE =	1,064,090 S.F. (24.428± AC.)	87.97%
		100.00%
PROPOSED BUILDING AREA =	21,369 S.F. (0.491± AC.)	1.77%
PROPOSED IMPERVIOUS AREA =	178,127 S.F. (4.089± AC.)	14.72%
PROPOSED OPEN SPACE =	1,010,123 S.F. (23.189± AC.)	83.51%
		100.00%
PROPOSED DISTURBED AREA	104.789 SF (2.406± AC.)	

PARKING CALCULATIONS:

EXISTING BUS PARKING: 116 SPACES (PAVED & STONE)
EXISTING CAR PARKING: 46 SPACES (1 H.C. SPACES)

PROPOSED BUS PARKING 150 SPACES (PAVED & STONE)

PROPOSED CAR PARKING 43 PAVED SPACES (4 H.C. SPACES)
PROPOSED CAR PARKING 36 GRAVELED SPACES (EMPLOYEE PARKING)
TOTAL 79 CAR SPACES (4 H.C. SPACES)

Rev.	Date	Description	Revised By
2	1-03-11	REVISED DRAWINGS AFTER REPAIRS TO BMP	JFS
1	4-22-11	BMP RECORD DRAWINGS	JFS

GC013 GC014

AES CONSULTING ENGINEERS
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Williamsburg, VA 23188
Phone: (757) 565-1677
Fax: (757) 220-9994
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

BMP RECORD DRAWINGS
OPERATION CENTER
WILLIAMSBURG/JAMES CITY COUNTY PUBLIC SCHOOLS
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contact:	LBA
Project Number:	9888-19
Scale: AS NOTED	Date: 11/17/10
Sheet Title: COVER SHEET	

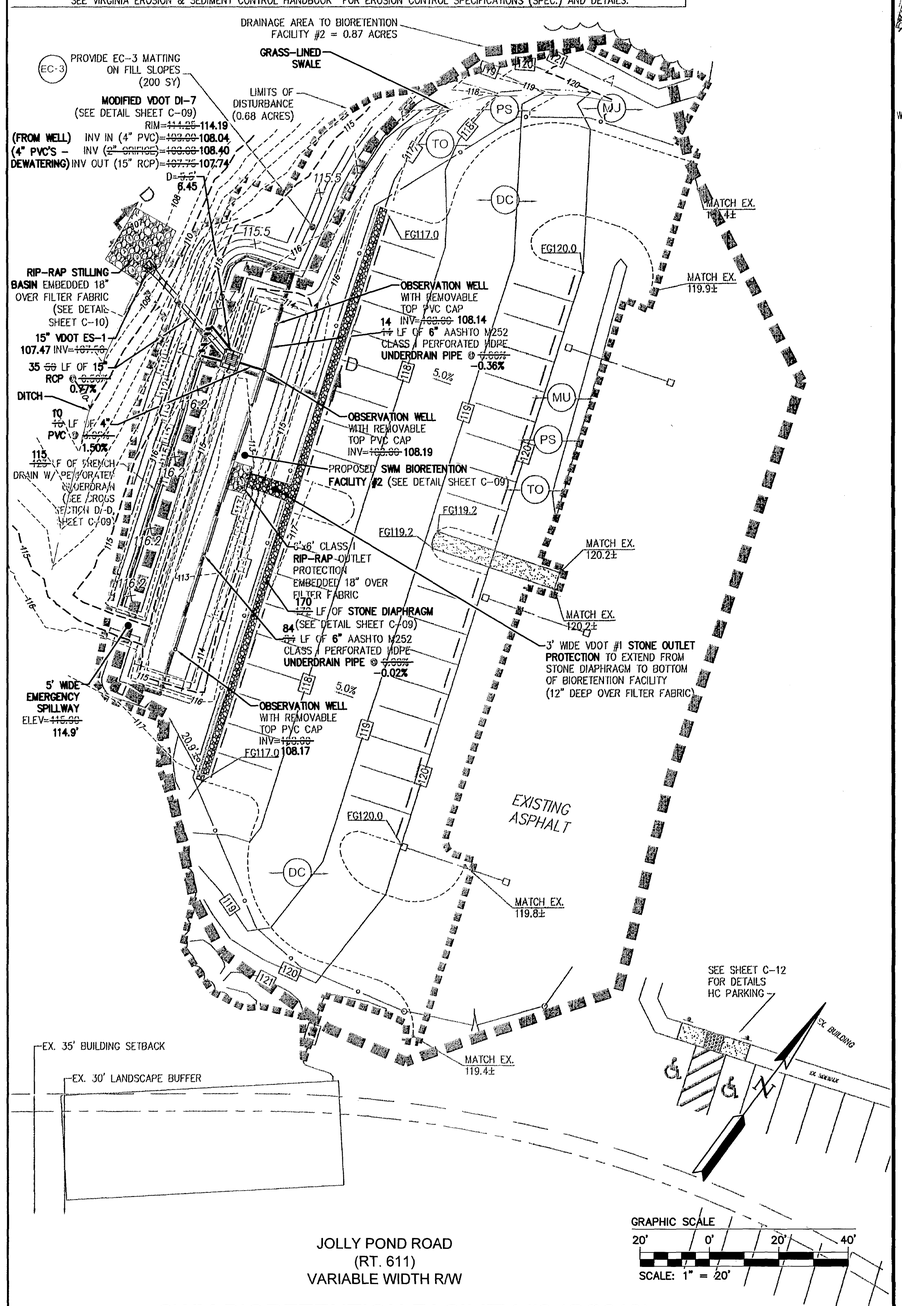
Sheet Number
R-01

RECORD DRAWING (SP-0022-2010) 11/17/11, AND BMP ID CODE: GC013 AND GC014

EROSION AND SEDIMENTATION CONTROL LEGEND

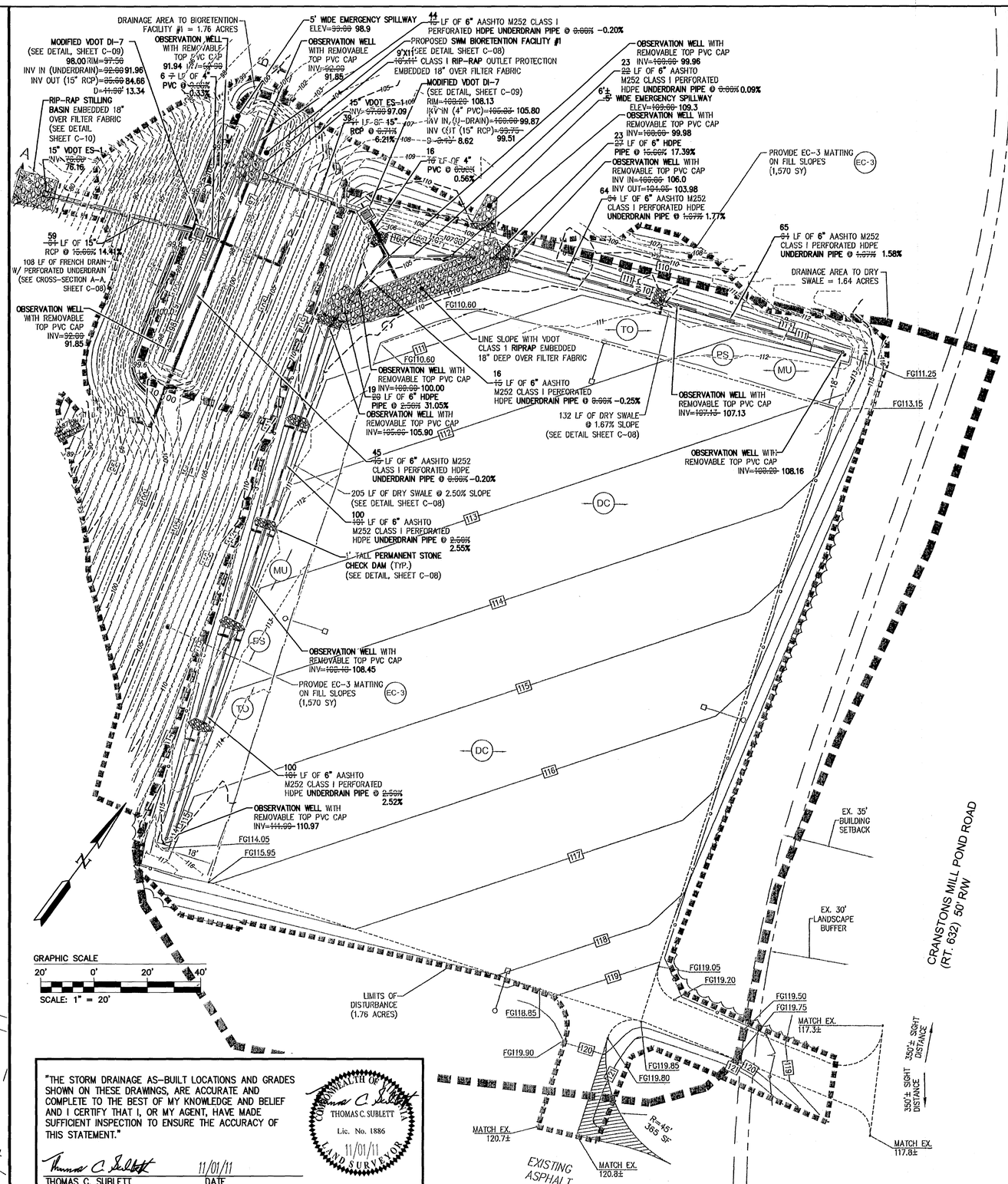
CE	CONSTRUCTION ENTRANCE (SPEC. 3.02)	TO	TOP SOIL (SPEC. 3.30)
SF	SILT FENCE (SPEC. 3.05)	PS	PERMANENT SEEDING (SPEC. 3.32)
DD	TEMPORARY DIVERSION DIKE (SPEC. 3.09)	MU	MULCHING (SPEC. 3.35)
ST	TEMPORARY SEDIMENT TRAP (SPEC. 3.13)	TP	TREE PROTECTION (SPEC. 3.38)
OP	OUTLET PROTECTION (SPEC. 3.18)	EC-3	TREATMENT 2 SOIL STABILIZATION MATTING (SPEC. 3.36)
CD	CHECK DAM (SPEC. 3.20)	DC	DUST CONTROL (SPEC. 3.39)

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



SWM BIORETENTION FACILITY #2 (GC013)

ADDITIONAL PARKING AREA



"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 11/01/11

COMMONWEALTH OF VIRGINIA — THOMAS C. SUBLETT — Lic. No. 1886 — 11/01/11 — LAND SURVEYOR

SWM BIORETENTION FACILITY #1 (GC014)

TRAILER & BUS STORAGE AREA

Rev.	Date	Description	Revised By
2	11/01/11	REVISED DRAWINGS AFTER REPAIRS TO BMP	JFS
1	4/22/11	BMP RECORD DRAWINGS	JFS

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
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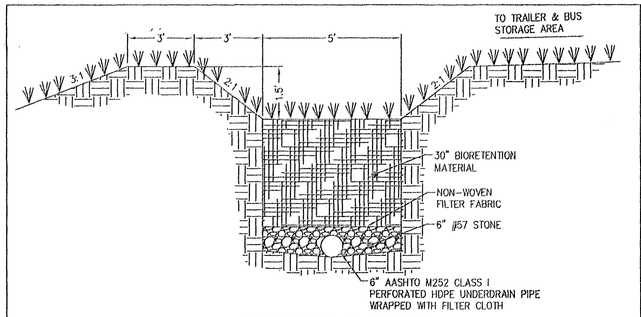
Hampton Roads | Central Virginia | Middle Peninsula

BMP RECORD DRAWINGS
OPERATION CENTER
WILLIAMSBURG/JAMES CITY COUNTY PUBLIC SCHOOLS
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

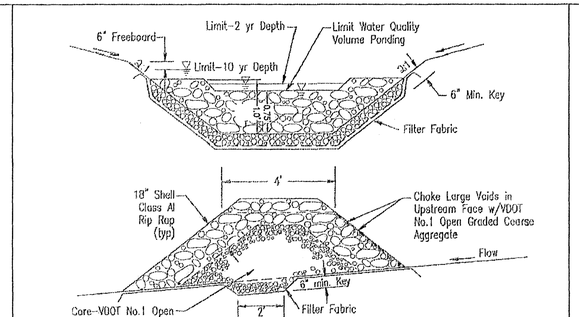
Project Contacts:	LBA
Project Number:	9888-19
Scale: AS NOTED	Date: 11/17/10
Sheet Title: GRADING & DRAINAGE PLAN	
Sheet Number	R-05

RECORD DRAWING (SP-0022-2010) 11/17/11, AND BMP ID CODE: GC013 AND GC014



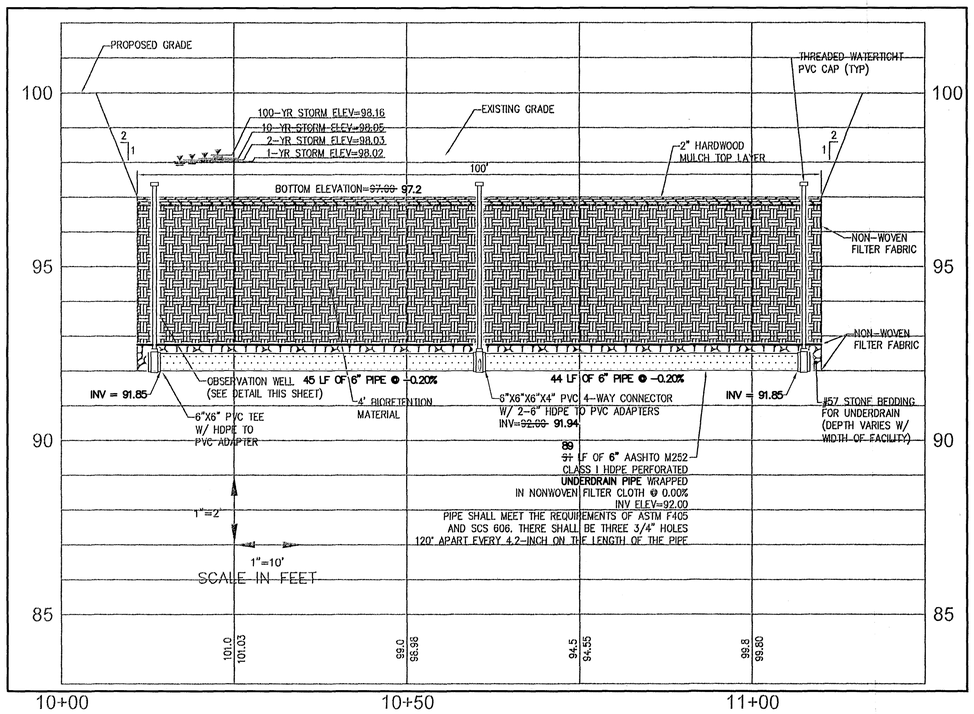
DRY SWALE DETAIL

N.T.S.

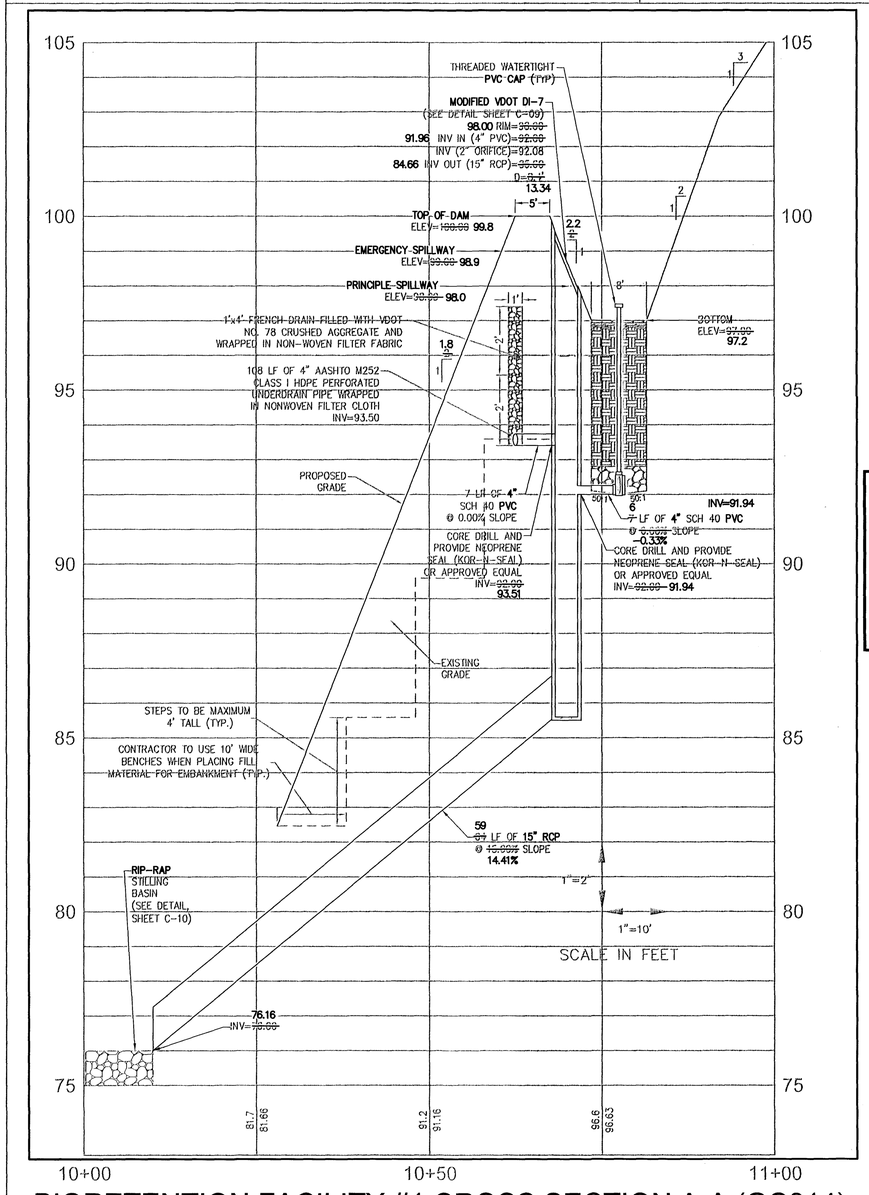


RIP RAP WATER QUALITY CHECK DAM

No Scale



BIORETENTION FACILITY #1 CROSS SECTION B-B (GC014)



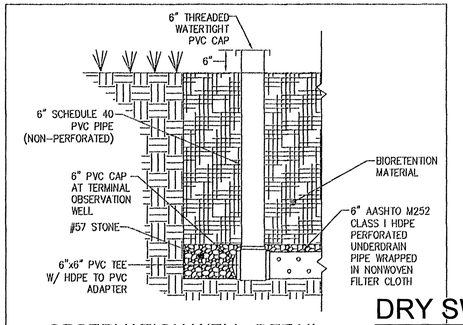
BIORETENTION FACILITY #1 CROSS SECTION A-A (GC014)

"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 11/01/11

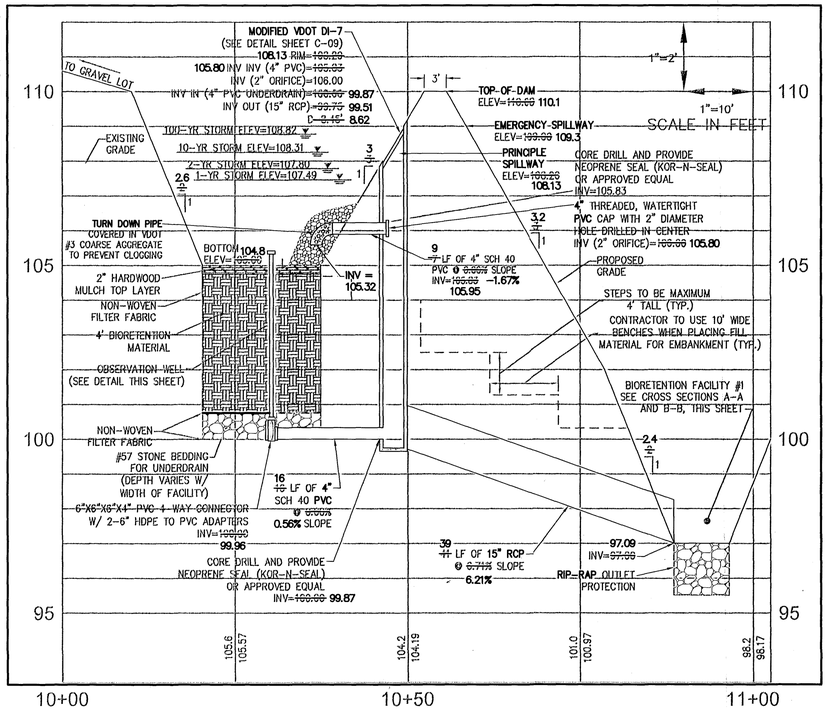
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
11/01/11
LAND SURVEYOR



OBSERVATION WELL DETAIL

N.T.S.



DRY SWALE/BIORETENTION FACILITY #1 CROSS SECTION C-C (GC014)

Rev.	Date	Description	Revised By
2	11/01/11	REVISED DRAWINGS AFTER REPAIRS TO BMP	JFS
1	4/22/11	BMP RECORD DRAWINGS	JFS

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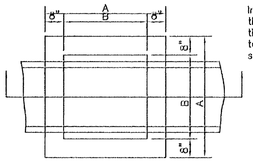
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9888-19
Scale: AS NOTED	Date: 11/17/10

Sheet Title: STORMWATER MANAGEMENT NOTES & DETAILS

Sheet Number R-08

RECORD DRAWING (SP-0022-2010) 11/17/11, AND BMP ID CODE: GC013 AND GC014

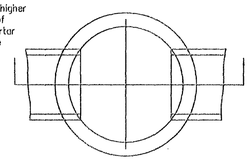


In the event the invert of the out fall pipe is higher than the bottom of the structure, the invert of the structure shall be shaped with cement mortar to prevent standing or ponding of water in the structure.

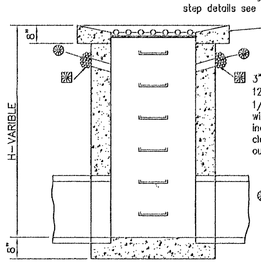
A=4'-4"(12"-36" Pipe)
B=3'-0"(12"-36" Pipe)
A=4'-10"(42" Pipe)
B=3'-6"(42" Pipe)

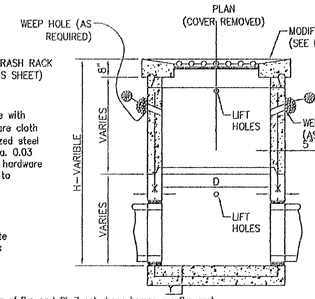
PLAN
(COVER REMOVED)

⚠ Steps are to be provided when 'H' is 4'-0" or greater. For step details see St'd ST-1.



PLAN
(COVER REMOVED)





Pipe Size	12"	15"	18"	24"	30"	36"	42"
Minimum Depth, H	2'-0"	2'-3 1/4"	2'-6 1/2"	3'-1"	3'-7 1/2"	4'-2"	4'-8 1/2"
Cu. Yds. Conc.	.947	1.045	1.143	1.339	1.535	1.731	1.927

Increment per foot of ∫ =0.362 cu. yds. (12"-36" Pipe) =0.410 cu. additional depth (H) ∖ yds. (42" Pipe)

Reinforcing concrete footing may be pre cast or cast in place. Two lifting hooks of fabricators design to be provided in pre cast footing.

For details of Pre cast DI-7 not shown hereon see Pre cast Unit Assembly Diagram, page 103.01, Pre cast General Notes, page 103.02 and Applicable Pre cast Base, Riser, and Top Details, pages 103.07 thru 103.12.

GENERAL NOTES

When specified on plans the invert is to be shaped in accordance with St'd. IS-1.

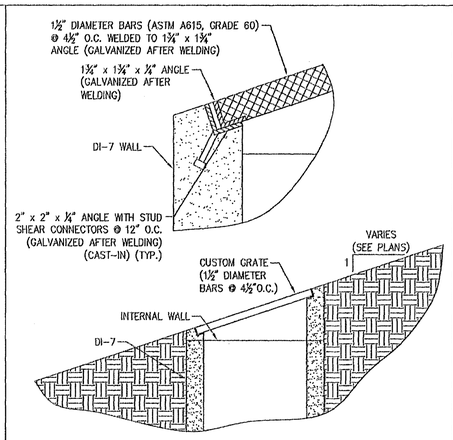
Increments shown are for inlets without pipes. Pipe displacements must be deducted to obtain true quantities. Paved ditches are to be transitioned to meet inlet gutter as shown in St'd. PG-1.

Safety Slabs are to be provided at 8' minimum and 12' maximum vertical intervals and are to be spaced so as not to conflict with openings for pipes as directed by the Engineer.

DI-7 STANDARD MEDIAN DROP INLET

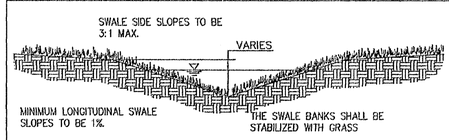
N.T.S.

VIRGINIA DEPARTMENT OF TRANSPORTATION



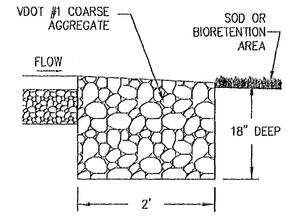
MODIFIED DI-7 TRASH RACK DETAIL

N.T.S.



TYP. SWALE DETAIL

N.T.S.



STONE DIAPHRAGM

N.T.S.

BIORETENTION FACILITIES #1 AND #2 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.

Rev.	Date	Description	Revised By
2	11/01/11	REVISED DRAWINGS AFTER REPAIRS TO BMP	JFS
1	4/22/11	BMP RECORD DRAWINGS	JFS

EMBANKMENT CONSTRUCTION NOTES

1. A GEOTECHNICAL SUBSURFACE EXPLORATION AT THE PROPOSED DAM SITE HAS BE PERFORMED TO ENSURE SUITABILITY OF THE SUBGRADE. THESE RECOMMENDATIONS ARE HEREBY MADE A PART OF THE DAM'S CONSTRUCTION SPECIFICATIONS. A REPRESENTATIVE OF THE GEOTECHNICAL CONSULTANT SHALL BE ON SITE DURING CONSTRUCTION TO ENSURE PROPER MATERIALS AND DAM CONSTRUCTION METHODS ARE UTILIZED. FOLLOWING DAM CONSTRUCTION, THE GEOTECHNICAL CONSULTANT SHALL PROVIDE WRITTEN DOCUMENTATION, SIGNED BY A PROFESSIONAL ENGINEER, THAT THE DAM WAS BUILT IN ACCORDANCE WITH THEIR RECOMMENDATIONS, PLANS, AND SPECIFICATIONS. THE GEOTECHNICAL CONSULTANT SHALL COORDINATE WITH THE DESIGN ENGINEER IN ORDER TO COMPLETE THE JCC ENVIRONMENTAL DIVISION STORMWATER MANAGEMENT/BMP FACILITIES CONSTRUCTION AND AS-BUILT CERTIFICATION FORM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THE DAM CONSTRUCTION SCHEDULE WITH THE GEOTECHNICAL CONSULTANT IN ORDER TO ENSURE ON-SITE MONITORING.

2. SITE PREPARATION:
SUBGRADE PREPARATION SHOULD CONSIST OF REMOVING ALL TOPSOIL AND ANY OTHER SOFT OR UNSUITABLE MATERIAL FROM THE EXPANDED 2-FOOT ENGINEERED FILL LIMITS. TOPSOIL WAS OBSERVED TO BE 4 TO 20 INCHES DEEP. HOWEVER, THE NEAR SURFACE SOILS ARE EXCESSIVELY LOOSE AND CONTAIN ORGANICS. THEREFORE, FOR PLANNING PURPOSES, A MINIMUM STRIPPING DEPTH OF 12 INCHES CAN BE ASSUMED WITH THE UNDERSTANDING THAT DEEPER STRIPPING MAY BE REQUIRED IN SOME AREAS.

3. SUBGRADE INSPECTION AND VERIFICATION:
AFTER STRIPPING OF TOPSOIL AND OTHER MATERIALS AND CUTTING/BENCHING TO THE DESIRED GRADE, AND PRIOR TO ENGINEERED FILL PLACEMENT, THE CUT SURFACE SHOULD BE OBSERVED BY AN EXPERIENCED GEOTECHNICAL ENGINEER OR HIS AUTHORIZED REPRESENTATIVE. ANY SOFT OR UNSUITABLE MATERIALS ENCOUNTERED SHOULD BE REMOVED AND REPLACED WITH AN APPROVED BACKFILL (GENERAL ENGINEERED FILL, DAM EMBANKMENT FILL, OR POROUS ENGINEERED FILL, AS APPROPRIATE) COMPACTED TO THE CRITERIA OUTLINED IN THE FOLLOWING PARAGRAPHS. SUITABLE MATERIALS WHICH ARE EXCESSIVELY WET SHOULD BE AERATED, DRIED, AND RE-COMPACTED TO THE SPECIFICATIONS BELOW. THE CONTRACTOR SHOULD BE PREPARED TO MOISTURE CONDITION SOILS WITHIN THE SURFACE LAYER, PARTICULARLY DURING TYPICALLY WET SEASONAL CONDITIONS.

SUBGRADES BELOW THE BIORETENTION ZONE SHOULD BE OBSERVED BY A REPRESENTATIVE OF THE GEOTECHNICAL ENGINEER PRIOR TO BACKFILLING, AND UNSUITABLE MATERIALS SHOULD BE REMOVED AT THE ENGINEER'S DIRECTION. IF AN INFILTRATION COMPONENT TO THE POND IS REQUIRED, UNDERCUTTING OF LOW-PERMEABILITY MATERIALS AND REPLACEMENT WITH POROUS ENGINEERED FILL MAY BE REQUIRED.

4. ENGINEERED FILL COMPACTION:
ALL GENERAL ENGINEERED FILL AND DAM EMBANKMENT FILL SHOULD BE MOISTURE CONDITIONED TO WITHIN +/- 3% OF OPTIMUM MOISTURE CONTENT THEN BE COMPACTED TO A DRY DENSITY AT LEAST 95% OF THAT SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). LIFTS SHOULD BE A MAXIMUM OF 8 INCHES IN LOOSE THICKNESS. FIELD DENSITY TESTING OF EACH LIFT OF FILL SHOULD BE PERFORMED AT A RATE OF NO LESS THAN ONE TEST PER 2,500 SQUARE FEET, BUT NOT LESS THAN 2 TESTS PER LIFT.

ALL POROUS ENGINEERED FILL (EXCEPTING NO. 57 STONE) SHOULD BE MOISTURE CONDITIONED TO WITHIN +/- 3% OF OPTIMUM MOISTURE CONTENT THEN BE COMPACTED TO A DRY DENSITY OF NOT LESS THAN 92% NOR MORE THAN 98% OF THAT SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698). TO MAINTAIN POROUS ENGINEERED FILL PERMEABILITY, IT SHOULD NOT BE OVER-COMPACTED. POROUS ENGINEERED FILL LIFTS SHOULD BE A MAXIMUM OF 10 INCHES IN LOOSE THICKNESS. FIELD DENSITY TESTING OF EACH LIFT OF FILL SHOULD BE PERFORMED AT A RATE OF NO LESS THAN ONE TEST PER 2,500 SQUARE FEET, BUT NOT LESS THAN 2 TESTS PER LIFT.

5. ENGINEERED FILL MATERIALS:
DAM EMBANKMENT FILL (FOR USE AS ENGINEERED FILL WITHIN 20 FEET HORIZONTALLY OF THE DOWNHILL EDGE OF THE BIORETENTION ZONE): FILL MATERIAL USED FOR EMBANKMENT SHALL BE INORGANIC SOIL MATERIAL CLASSIFIED AS SM, SC, CL, OR CH WHICH CONTAINS AT LEAST 20% BY WEIGHT SILT AND/OR CLAY AND HAS A MAXIMUM LIQUID LIMIT OF 65 AND MAXIMUM PLASTICITY INDEX OF 40. MAXIMUM AGGREGATE SIZE SHOULD BE 4 INCHES. MOST NATURAL SOILS EXCAVATED FROM THE PONDS WITHIN THE TOP 15 FEET (EXCLUDING SOME CH MATERIALS) SHOULD BE SUITABLE FOR THIS USE.

POROUS ENGINEERED FILL (FOR USE AS BACKFILL WHERE INFILTRATION IS REQUIRED): INORGANIC SOIL MATERIAL CLASSIFIED AS SW, SP, SM-SP, OR SM WITH A MAXIMUM 30% BY WEIGHT SILT AND A MINIMUM COMPACTED INFILTRATION RATE OF 5 INCHES PER HOUR, OR AS OTHERWISE SPECIFIED BY THE PROJECT CIVIL ENGINEER. ALTERNATIVELY, VDOT NO. 57 STONE OR ASTM C-33 WASHED CONCRETE SAND COULD BE USED WITH THE SPECIFIC APPROVAL OF THE PROJECT CIVIL ENGINEER. MATERIALS SUITABLE FOR THIS USE ARE SELECTIVELY AVAILABLE ON-SITE IN LIMITED QUANTITY.

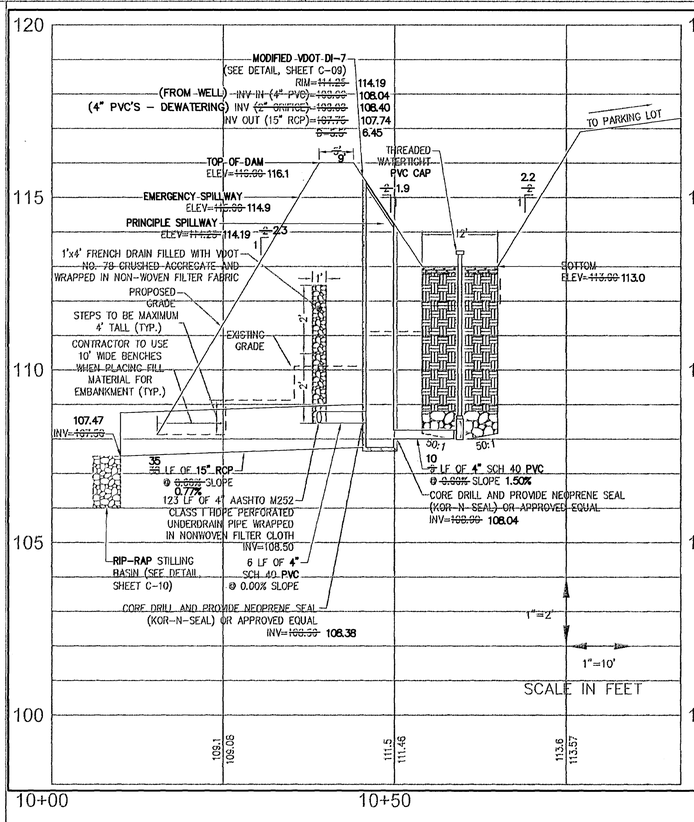
IT IS RECOMMENDED THAT ALL MATERIALS TO BE USED FOR ENGINEERED FILL BE ANALYZED AND APPROVED BY THE GEOTECHNICAL ENGINEER PRIOR TO THEIR USE ON THE SITE.

6. FRENCH DRAINS:
UPON THE RECOMMENDATION OF THE GEOTECHNICAL ENGINEER, FRENCH DRAINS WILL BE UTILIZED IN THE EMBANKMENTS OF BIORETENTION FACILITY #1 AND #2. TRENCH SHALL BE 1' WIDE AND 4' TALL, FILLED WITH VDOT NO. 78 CRUSHED AGGREGATE AND WRAPPED IN NON-WOVEN FILTER FABRIC. ANY SEEPAGE COLLECTED IN THE FRENCH DRAIN WILL BE CAPTURED BY 4" PERFORATED UNDERDRAIN PIPE WRAPPED IN FILTER FABRIC AND PIPED INTO THE DI-7 OUTLET STRUCTURES.

7. PRINCIPAL SPILLWAY:
THE BOTTOM OF THE SPILLWAY RISER FOUNDATION BASE EXCAVATION SHALL BE OBSERVED BY THE GEOTECHNICAL ENGINEER TO ENSURE THAT ALL UNSUITABLE AND LOOSE MATERIALS ARE REMOVED AND THAT ACCEPTABLE BEARING CONDITIONS EXIST IN THE FOUNDATION'S BASE. ALL JOINTS IN THE PRINCIPAL SPILLWAY STRUCTURE SHALL BE WATERTIGHT CONSTRUCTION. POROUS MATERIALS SUCH AS SAND, GRAVEL OR CRUSHED STONE SHALL NOT BE USED AS BACKFILL AROUND THE BARREL. FILL MATERIAL SHALL BE PLACED AROUND THE PIPE IN 4 INCH LAYERS AND COMPACTED BY HAND TO THE SAME DENSITY AS THE EMBANKMENT. A MINIMUM OF TWO FEET OF FILL SHALL BE HAND-COMPACTED OVER THE BARREL BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.

8. VEGETATIVE STABILIZATION:
FINAL VEGETATIVE COVER (STABILIZATION) SHALL CONSIST OF TOP SOILING, LIMING, FERTILIZING, SEEDING, AND MULCHING TO ASSURE A FIRM STAND OF GRASS AS SOON AS PRACTICAL. SEDIMENT BASINS AND OTHER TEMPORARY EROSION CONTROL MEASURES ARE TO BE REMOVED ONLY WHEN STABILIZATION IS COMPLETE. FINAL VEGETAL COVER SHALL BE PROVIDED IN ACCORDANCE WITH THE FOLLOWING:

TOPSOIL:	AT LEAST 4" THICKNESS OBTAINED FROM STOCKPILES ON SITE, FREE OF LARGE DEBRIS.
LIME:	4,000#/ACRE (90#/1,000 S.F.)
SEED:	KENTUCKY 31 TALL FESCUE 250#/ACRE (6#/1,000 S.F.)
FERTILIZER:	10/10/10 MIX, 1,000#/ACRE FALL (23#/1,000 S.F.)
MULCH:	STRAW OR HAY (LOCALLY OBTAINED) 4,000#/ACRE (90#/1,000 S.F.)

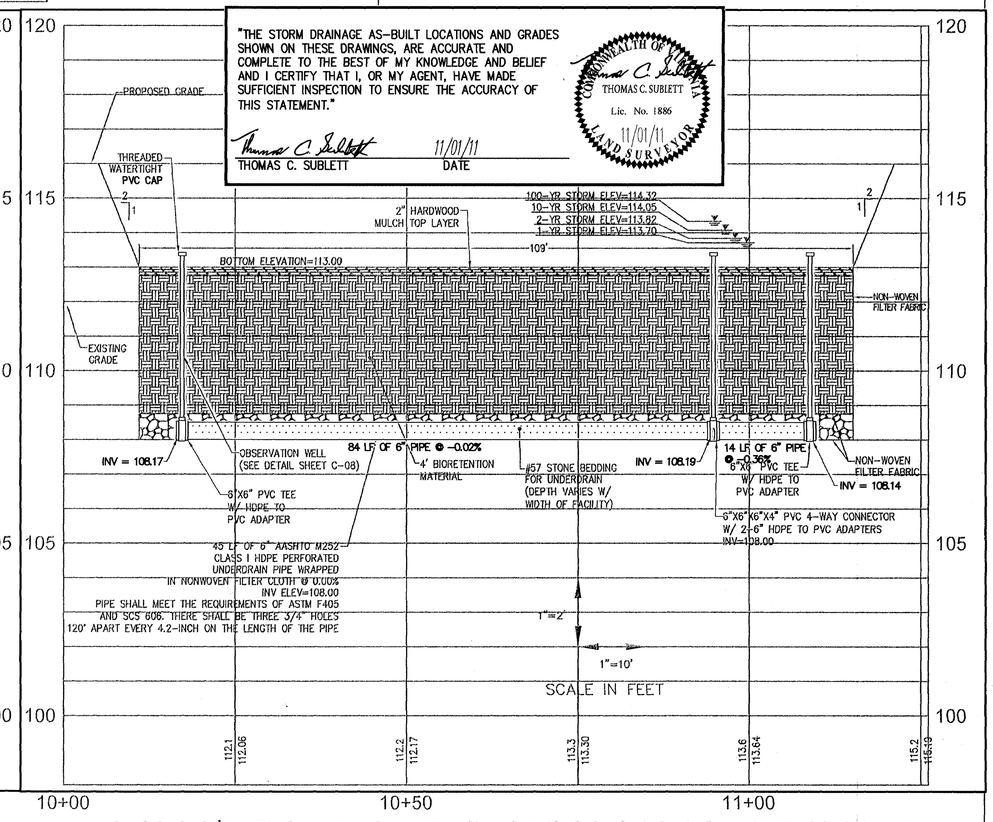


BIORETENTION FACILITY #2 CROSS SECTION D-D (GC013)

"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 11/01/11
THOMAS C. SUBLETT DATE

COMMONWEALTH OF VIRGINIA
THOMAS C. SUBLETT
Lic. No. 1886
11/01/11
LAND SURVEYOR



BIORETENTION FACILITY #2 CROSS SECTION E-E (GC013)

AES CONSULTING ENGINEERS
5248 Olde Towne Road, Suite 1
Williamsburg, Virginia 23188
Phone: (757) 220-0449
Fax: (757) 220-9694
www.aesva.com
Hampton Roads | Central Virginia | Middle Peninsula

BMP RECORD DRAWINGS
OPERATION CENTER
WILLIAMSBURG/JAMES CITY COUNTY PUBLIC SCHOOLS
POWHATAN DISTRICT JAMES CITY COUNTY VIRGINIA

Project Contacts:	LBA
Project Number:	9688-19
Scale: AS NOTED	Date: 11/17/10

Sheet Title:
STORMWATER MANAGEMENT NOTES & DETAILS

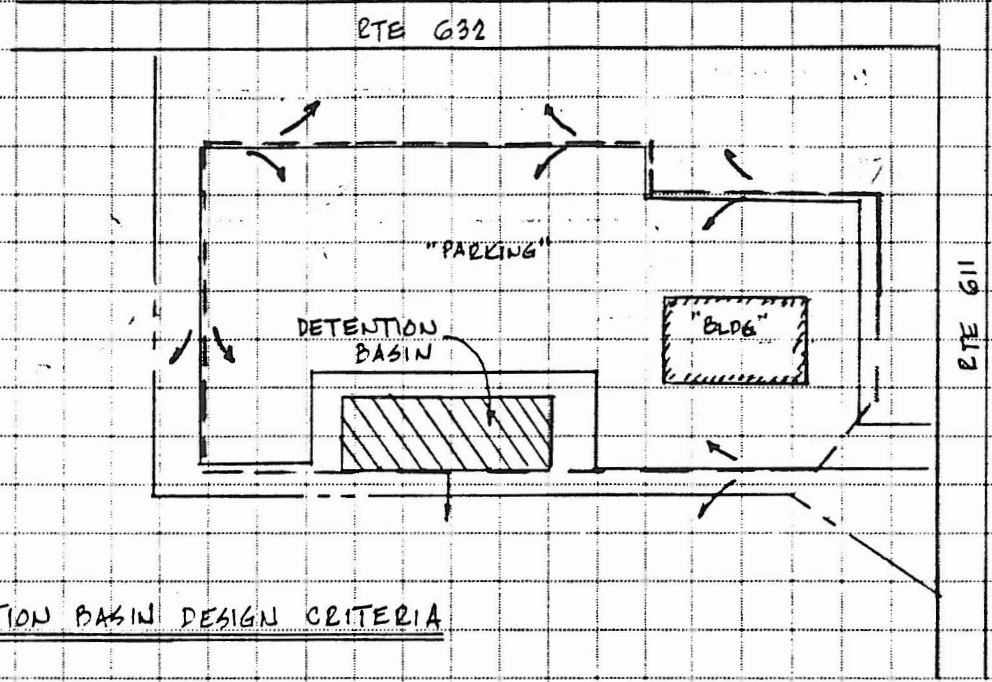
Sheet Number
R-09

RECORD DRAWING (SP-0022-2010) 11/17/11, AND BMP ID CODE: GC013 AND GC014

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

SP-52-90

JOB #1890460 OPERATIONS CENTER
SHEET NO. 1 OF
CALCULATED BY PENI DATE OCT 14, 1990
CHECKED BY DATE
SCALE REVISED 11/23/90



DETENTION BASIN DESIGN CRITERIA

- Wet Pond Design #7 (4.0 V): volume equal to 4 times mean storm
  set minimum pool elevation & 2yr storm release orifice at "Design #7" volume
- Post development 2yr. storm release not to exceed pre-development 2yr storm rate
- 2yr 6-hour storm rainfall = 2.5"
- 10yr 6-hour storm rainfall = 3.7"
- 100yr 6-hour storm rainfall = 5.8"
- 100yr 24-hour storm rainfall = 8.0" : use to size emergency spillway

DATA FILES:

JCC2YR - 2YR POST DEVELOPMENT

JCC10YR - 10YR POST DEVELOPMENT

JCC100Y - 100YR POST DEVELOPMENT

SSDJ2 - STAGE, STORAGE, DISCHARGE

'05-1 NESBIT Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

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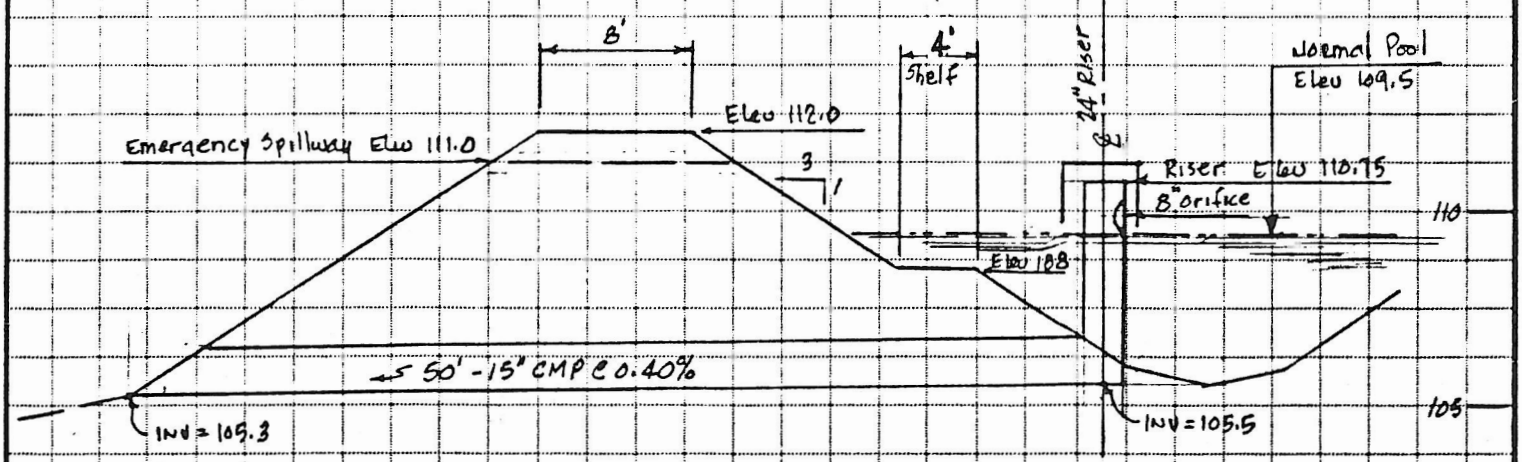
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB #1890460
SHEET NO. 2 OF
CALCULATED BY PENCI DATE
CHECKED BY DATE
SCALE REVISED 11/23/90

DETENTION BASIN DESIGN

- Total area to basin = 5.12 Acres (0.0080 s.m.)
- Soils on site per SCS soil survey: Craven-Uchee complex, 6 to 10 percent (11C)
  Kempsville-Emporia, 2 to 6 percent (19B)
- Hydrologic Soil Group
  (11C) → A/C } Use Group B/C Average
  (19B) → B/C }
- Pre-developed condition
  CN = 73 (TR-55 woods fair condition) 64
  Hydraulic Length = 550'
  watershed slope = 8% avg.
- Developed condition
  CN = 98 Building & Pav't (TR-55 impervious)
  CN = 68 open space (TR-55 grass good condition)
  - 2.70 Ac @ CN=98 ✓ } CN = 84 avg.
  - 2.42 Ac @ CN=68 ✓ }
  Hydraulic Length = 550'
  watershed slope = 2% avg.

- Principal Spillway Section:



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JOB #1890460
SHEET NO. 3 OF
CALCULATED BY PENZI DATE
CHECKED BY DATE
SCALE REVISED 11/23/90

REQUIRED STORAGE VOLUME = 4.0 V

- Mean storm = 0.50"
- Impervious ratio = 2.70 ÷ 5.12 = 53%
- $R_v = 0.05 + 0.009(I)$
  $= 0.05 + 0.009(53)$
  $= 0.527$
- Volume = (0.527)(0.50)(4.0) = 1.05" = 0.0878' per acre
  (0.0878)(5.12)(43560) = 19,582 CF

ESTABLISH MINIMUM POOL ELEVATION TO ACCOMODATE REQ'D VOLUME

Basin Storage to Level shelf @ Elev. 108.00 :

Elev.	Area (SF)	$\Sigma(A_i+A_j)/2$	Volume (CF)	Σ Volume (CF)
105.5	0	0	0	0
106.0	1755	878	439	439
108.0	4905	3330	6660	7099

19,582 Req'd
7099 Available
12,483 Needed above Elev 108

Basin storage above level shelf @ Elev 108.00 :

Elev	Area (SF)	$\Sigma(A_i+A_j)/2$	Volume (CF	Σ Volum (CF)
108.0	0	0	0	0
108.1	7164	3582	358	358
110.0	10,944	9054	17203	17561

7099

storage algorithm: $z_1 = 0.1$ $z_2 = 2.0$ $S_1 = 358$ $S_2 = 17,561$

$$b = \frac{\ln\left(\frac{S_2}{S_1}\right)}{\ln\left(\frac{z_2}{z_1}\right)} = 1.299 \qquad k_s = \frac{S_2}{z_2^{\,b}} = 7137$$

$$z = \left(\frac{S}{7137}\right)^{\frac{1}{1.299}}$$

Additional storage required above Elev. 108 = 12,483

$$z = \left(\frac{12,483}{7137}\right)^{\frac{1}{1.299}} = 1.537'$$

∴ SET MIN. POOL ELEV. @ Elevation 109.50 (within 0.037' of calculated) ✓OE

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471 To Order PHONE TOLL FREE 1-800-225-6380

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JOB #1890460
SHEET NO. 1 OF
CALCULATED BY PENCI DATE
CHECKED BY DATE
SCALE

Basin storage volume available above min. pool elev. 109.50

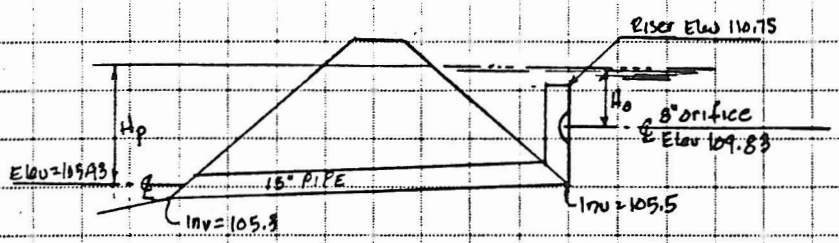
Elev.	Area (SF)	$\Sigma(A_i+A_j)/2$	Volume (CF)	Σ Volume (CF)
109.5	0	0	0	0
110.0	10,944	5472.0	2736	2736
112.0	14,985	12964.5	25,929	28,665

storage algorithm: $z_1 = 0.5$ $z_2 = 2.5$ $b = \frac{\ln(\frac{S_2}{S_1})}{\ln(\frac{Z_2}{Z_1})} = 1.460$ $K_s = \frac{S_2}{Z_2^b} = 7522$

$S_1 = 2736$ $S_2 = 28,665$

$S = 7522(z^{1.46})$ $z = \left(\frac{S}{7522}\right)^{\frac{1}{1.46}}$

Principal spillway: 24" riser with 15" barrel (50' length) CMP n=0.025
Pipe flow per table 1.26a page III-74 "Va. E&S Handbook"



Orifice Flow: 8"ϕ A = 0.349
C = 0.60
$Q = CA\sqrt{2gH_o}$

Pipe Flow Correction = 1.13 (Qp)

STAGE - DISCHARGE - STORAGE (SSDJ2)

Elev.	Stage	Hp	Qp	H_o	Q_o	ΣQ	Storage (CF)	Storage (AC-FT)
109.50	0	–	–	–	–	–	–	–
110.00	0.50	–	–	0.17	0.69	0.69	2734	0.0628
110.25	0.75	–	–	0.42	1.09	1.09	4942	0.1135
110.50	1.00	–	–	0.67	1.38	1.38	7522	0.1727
110.75	1.25	–	–	0.92	1.61	1.61	10,419	0.2392
111.00	1.50	5.07	(riser) 2.40	1.17	1.82	4.22	13,596	0.3121
111.25	1.75	5.32	(riser) 6.80	1.42	2.00	8.80	17,028	0.3909
111.50	2.00	5.57	9.27	1.67	2.17	11.44	20,694	0.4751
111.75	2.25	5.82	9.52	1.92	2.33	11.85	24,576	0.5642
112.00	2.50	6.07	9.68	2.17	2.48	12.16	28,663	0.6580

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EMERGENCY SPILLWAY DESIGN (100YR 24HR STORM)

100YR 24HR STORM

DRAINAGE AREA = .008 SQUARE MILES
TIME OF CONCENTRATION = .2037293 HOURS
RUNOFF CURVE NUMBER = 84
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 8 INCHES
RUNOFF = 6.10 INCHES = 2.60 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 0.98

*** MAXIMUM FLOW = 39.07 CFS AT 12.0 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
24.40	9.00	6.10	0.01

Q_{100} = 39.07 CFS
Q_{ps} = 4.22 CFS (capacity principal spillway @ Elev. 111.00)
34.85 CFS Req'd flow thru E.S.

For H_p = 1.0' & b = 15' (Table 1.26c)
$Q_{capacity}$ = 35.50 CFS ✓ (CP)

2YR PRE-DEVELOPMENT

DRAINAGE AREA = .008 SQUARE MILES
TIME OF CONCENTRATION = .1426342 HOURS
RUNOFF CURVE NUMBER = 73
STORM DURATION = 6 HOURS
SCS 6 HOUR STORM
RAINFALL = 2.5 INCHES
RUNOFF = 0.57 INCHES = 0.24 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 2.56 CFS AT 2.5 HOURS *** 2yr. Pre-development

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.50	0.09	0.00	0.00
1.00	0.20	0.00	0.00
1.50	0.34	0.00	0.00
2.00	0.57	0.00	0.00
2.50	1.50	0.13	2.56
3.00	1.75	0.22	0.98
3.50	1.95	0.30	0.89
4.00	2.09	0.36	0.66
4.50	2.21	0.42	0.64
5.00	2.31	0.47	0.53
5.50	2.41	0.52	0.55
6.00	2.50	0.57	0.49

2YR POST DEVELOPMENT

DRAINAGE AREA = .008 SQUARE MILES
TIME OF CONCENTRATION = .2037283 HOURS
RUNOFF CURVE NUMBER = 64
STORM DURATION = 6 HOURS
SCS 6 HOUR STORM
RAINFALL = 2.5 INCHES
RUNOFF = 1.12 INCHES = 0.48 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 0.98

*** MAXIMUM FLOW = 5.06 CFS AT 2.5 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.50	0.09	0.00	0.00
1.00	0.20	0.00	0.00
1.50	0.34	0.00	0.00
2.00	0.57	0.02	0.31
2.50	1.50	0.41	5.06
3.00	1.75	0.57	1.69
3.50	1.95	0.71	1.43
4.00	2.09	0.81	1.02
4.50	2.21	0.90	0.95
5.00	2.31	0.97	0.78
5.50	2.41	1.05	0.79
6.00	2.50	1.12	0.70

2YR POST DEVELOPMENT ROUTING

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
0	0	0
.5	.0628	.69
.75	.1135	1.09
1	.1727	1.38
1.25	.2392	1.61
1.5	.3121	4.22
1.75	.3909	8.8
2	.4751	11.44
2.25	.5642	11.85
2.5	.658	12.16

MAXIMUM INFLOW = 5.06 CFS AT 2.50 HOURS.
MAXIMUM RESERVOIR ELEVATION = 0.96 FEET AT 3.50 HOURS.
MAXIMUM OUTFLOW = 1.34 CFS AT 3.50 HOURS. 1 (ok) Less than 2yr Predevelopment Q = 2.56 cfs

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	0.00	0.00	0.00	---
0.50	0.00	0.00	0.00	0.00	---
1.00	0.00	0.00	0.00	0.00	---
1.50	0.00	0.00	0.00	0.00	---
2.00	0.31	0.03	0.00	0.04	
2.50	5.06	0.71	0.10	1.02	
3.00	1.69	0.94	0.16	1.31	
3.50	1.43	0.96	0.16	1.34	
4.00	1.02	0.93	0.16	1.30	
4.50	0.95	0.88	0.14	1.24	
5.00	0.78	0.81	0.13	1.16	
5.50	0.79	0.75	0.11	1.09	
6.00	0.70	0.69	0.10	0.99	

E +++ NOTE MEANS THAT THE RESERVOIR ELEVATION IS >= THE LARGEST VALUE ON THE
S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MAXIMUM VALUES.

E --- NOTE MEANS THAT THE RESERVOIR ELEVATION IS <= THE SMALLEST VALUE ON THE
S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MINIMUM VALUES.

10YR POST DEVELOPMENT

DRAINAGE AREA = .008 SQUARE MILES
TIME OF CONCENTRATION = .2037283 HOURS
RUNOFF CURVE NUMBER = 84
STORM DURATION = 6 HOURS
SCS 6 HOUR STORM
RAINFALL = 3.7 INCHES
RUNOFF = 2.11 INCHES = 0.90 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 0.98

*** MAXIMUM FLOW = 9.63 CFS AT 2.5 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.50	0.13	0.00	0.00
1.00	0.30	0.00	0.00
1.50	0.50	0.01	0.14
2.00	0.85	0.09	1.11
2.50	2.22	0.90	9.63
3.00	2.59	1.19	2.99
3.50	2.89	1.42	2.48
4.00	3.09	1.59	1.74
4.50	3.27	1.74	1.61
5.00	3.42	1.87	1.30
5.50	3.57	2.00	1.32
6.00	3.70	2.11	1.16

10YR POST DEVELOPMENT ROUTING

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
0	0	0
.5	.0628	.69
.75	.1135	1.09
1	.1727	1.38
1.25	.2392	1.61
1.5	.3121	4.22
1.75	.3909	8.8
2	.4751	11.44
2.25	.5642	11.85
2.5	.658	12.16

MAXIMUM INFLOW = 9.63 CFS AT 2.50 HOURS.
MAXIMUM RESERVOIR ELEVATION = 1.47 FEET AT 2.70 HOURS.
MAXIMUM OUTFLOW = 3.86 CFS AT 2.70 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	0.00	0.00	0.00	---
0.50	0.00	0.00	0.00	0.00	---
1.00	0.00	0.00	0.00	0.00	---
1.50	0.14	0.01	0.00	0.01	
2.00	1.11	0.19	0.02	0.26	
2.50	9.63	1.26	0.24	1.70	
3.00	2.99	1.43	0.29	3.47	
3.50	2.48	1.36	0.27	2.74	
4.00	1.74	1.29	0.25	2.05	
4.50	1.61	1.26	0.24	1.72	
5.00	1.30	1.22	0.23	1.58	
5.50	1.32	1.18	0.22	1.55	
6.00	1.16	1.13	0.21	1.50	

THE +++ NOTE MEANS THAT THE RESERVOIR ELEVATION IS >= THE LARGEST VALUE ON THE E-S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MAXIMUM VALUES.

THE --- NOTE MEANS THAT THE RESERVOIR ELEVATION IS <= THE SMALLEST VALUE ON THE E-S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MINIMUM VALUES.

100YR POST DEVELOPMENT

DRAINAGE AREA = .008 SQUARE MILES
TIME OF CONCENTRATION = .2037283 HOURS
RUNOFF CURVE NUMBER = 84
STORM DURATION = 6 HOURS
SCS 6 HOUR STORM
RAINFALL = 5.8 INCHES
RUNOFF = 4.01 INCHES = 1.71 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 0.98

*** MAXIMUM FLOW = 18.03 CFS AT 2.5 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.50	0.20	0.00	0.00
1.00	0.46	0.00	0.08
1.50	0.78	0.07	0.88
2.00	1.33	0.32	2.89
2.50	3.48	1.92	18.03
3.00	4.06	2.42	5.31
3.50	4.52	2.84	4.31
4.00	4.84	3.13	3.00
4.50	5.13	3.39	2.75
5.00	5.37	3.61	2.22
5.50	5.60	3.82	2.23
6.00	5.80	4.01	1.96

100YR POST DEVELOPMENT ROUTING

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
0	0	0
.5	.0628	.69
.75	.1135	1.09
1	.1727	1.38
1.25	.2392	1.61
1.5	.3121	4.22
1.75	.3909	8.8
2	.4751	11.44
2.25	.5642	11.85
2.5	.658	12.16

MAXIMUM INFLOW = 18.03 CFS AT 2.50 HOURS.
MAXIMUM RESERVOIR ELEVATION = 2.01 FEET AT 2.60 HOURS.
MAXIMUM OUTFLOW = 11.46 CFS AT 2.60 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	0.00	0.00	0.00	---
0.50	0.00	0.00	0.00	0.00	---
1.00	0.08	0.00	0.00	0.00	
1.50	0.88	0.14	0.02	0.19	
2.00	2.89	0.60	0.08	0.84	
2.50	18.03	1.91	0.45	10.52	
3.00	5.31	1.70	0.37	7.84	
3.50	4.31	1.53	0.32	4.69	
4.00	3.00	1.43	0.29	3.48	
4.50	2.75	1.38	0.28	2.94	
5.00	2.22	1.33	0.26	2.44	
5.50	2.23	1.31	0.26	2.27	
6.00	1.96	1.29	0.25	2.06	

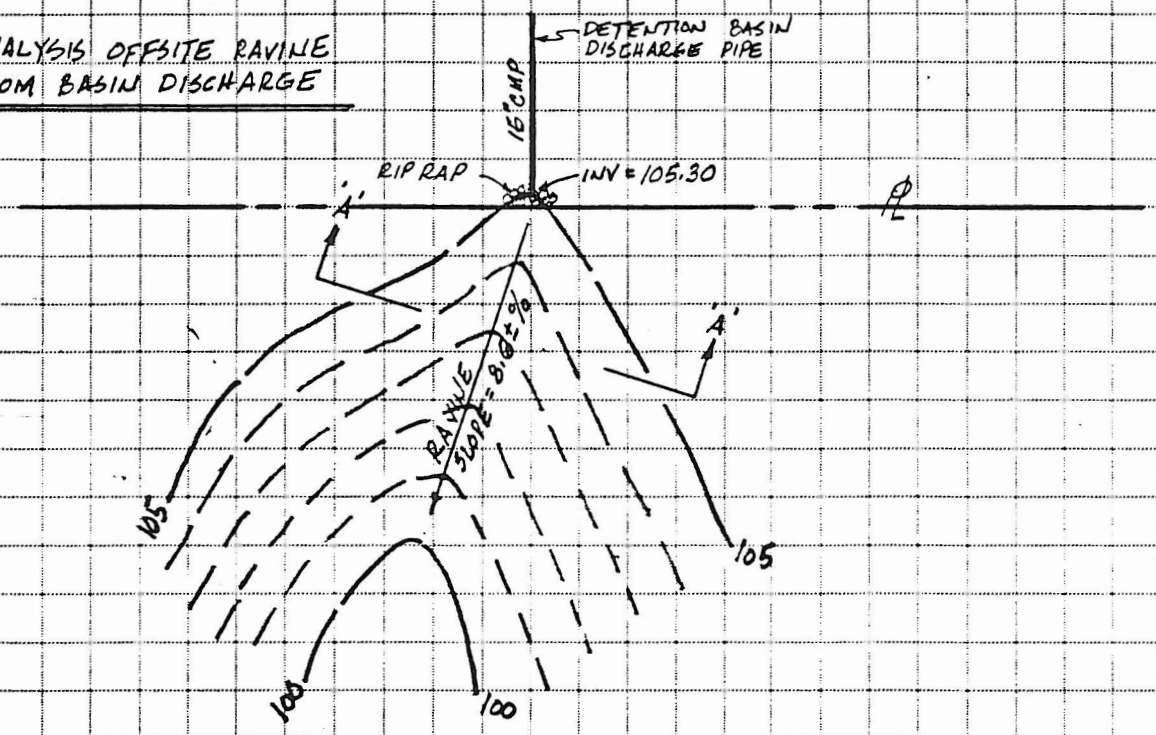
HE +++ NOTE MEANS THAT THE RESERVOIR ELEVATION IS >= THE LARGEST VALUE ON THE
-S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MAXIMUM VALUES.

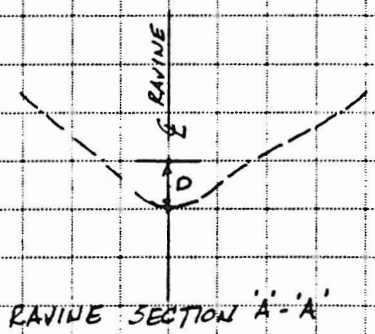
HE --- NOTE MEANS THAT THE RESERVOIR ELEVATION IS <= THE SMALLEST VALUE ON THE
-S-D CURVE. THE ELEVATION, STORAGE AND OUTFLOW ARE RESET TO MINIMUM VALUES.

THE DeYOUNG-JOHNSON GROUP, INC.
P.O. Box 3505
WILLIAMSBURG, VIRGINIA 23187
(804) 253-0673

JOB #1890460
SHEET NO. 13 OF
CALCULATED BY PENCI DATE 10/15/90
CHECKED BY DATE
SCALE 1"=30' HOR. & 1"=4' VERT. Rev 11/23/90

ANALYSIS OFFSITE RAVINE FROM BASIN DISCHARGE





RAVINE SECTION 'A'-'A'

VELOCITY ANALYSIS - DEVELOPED CONDITION

STORM	DISCHARGE	FLOW DEPTH	VELOCITY
2 YR	1.34 CFS	0.31'	1.26 FPS
10 YR	3.86 CFS	0.46'	1.64 FPS
100 YR	11.46 CFS	0.70'	2.15 FPS

PRODUCT 205-1 NEBS Inc., Groton, Mass. 01471. To Order PHONE TOLL FREE 1-800-225-6380

```
                              NATURAL CHANNELS

VARIABLES LIST:
        Y - FLOW ELEVATION      Q - FLOWRATE      S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y        Enter up to 20 cross-section points.
                                          Enter (Return) only for distance to end.
Q (CFS)     ? 1.34
S (FT/FT)   ? .0860
                                                CROSS-SECTION POINTS
                                          DIST  ELEV  COEFF   DIST  ELEV  COEFF
                                          -----------------   -----------------
                                          0     105   .10
                                          10    104   .10
                                          20    103   .10
     RESULTS                              32    104   .10
================                          47    105   .10
Y=      103.31 FT
A=        1.07 SF
P=        6.88 FT
V=        1.26 FPS
F=        0.56   SUB-CRITICAL FLOW

(Shift) (Prt Sc) print        (Return) repeat        (Space Bar) back to menu
-------------------------------------------------------------------------------
```

```
                              NATURAL CHANNELS

VARIABLES LIST:
        Y - FLOW ELEVATION      Q - FLOWRATE      S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y        Enter up to 20 cross-section points.
                                          Enter (Return) only for distance to end.
Q (CFS)     ? 3.86
S (FT/FT)   ? .0860
                                                CROSS-SECTION POINTS
                                          DIST  ELEV  COEFF   DIST  ELEV  COEFF
                                          -----------------   -----------------
                                          0     105   .10
                                          10    104   .10
     RESULTS                              20    103   .10
================                          32    104   .10
Y=      103.46 FT                         47    105   .10
A=        2.36 SF
P=       10.22 FT
V=        1.64 FPS
F=        0.60   SUB-CRITICAL FLOW

(Shift) (Prt Sc) print        (Return) repeat        (Space Bar) back to menu
-------------------------------------------------------------------------------
```

```
                              NATURAL CHANNELS

VARIABLES LIST:
        Y - FLOW ELEVATION      Q - FLOWRATE      S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y        Enter up to 20 cross-section points.
                                          Enter (Return) only for distance to end.
Q (CFS)     ? 11.46
S (FT/FT)   ? .0860
                                                CROSS-SECTION POINTS
                                          DIST  ELEV  COEFF   DIST  ELEV  COEFF
                                          -----------------   -----------------
                                          0     105   .10
                                          10    104   .10
     RESULTS                              20    103   .10
================                          32    104   .10
Y=      103.70 FT                         47    105   .10
A=        5.33 SF
P=       15.38 FT
V=        2.15 FPS
F=        0.64   SUB-CRITICAL FLOW

(Shift) (Prt Sc) print        (Return) repeat        (Space Bar) back to menu
-------------------------------------------------------------------------------
```

Calculated By: PENCI Date: 11/1/90
Checked By: Date:
n= 0.013
Storm Frequency 10 YEAR

P.O. Box 3505
Williamsburg, Virginia 23187

Project No.: 1890460
Project Desc. OPERATIONS CENTER

Sheet 1 of 1 Sheets

STORM DRAINAGE COMPUTATION SHEET

LOCATION				RUN-OFF										PIPE - CHANNEL DESIGN						HYDRAULIC GRADE LINE								
				AREA-ACRES					TIME OF FLOW - MIN.																			
LINE	RUN	FROM	TO	INCREMENT	TOTAL	RUN-OFF COEFF.	INCREMENTAL CA	ACCUMULATED CA	TO INLET/ UPPER REACH	WITHIN REACH CONVEYANCE	TIME OF CONCENTRATION	INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL C.F.S.	VELOCITY FULL F.P.S.	DESIGN VELOCITY F.P.S.	CONVEYANCE LENGTH FT.	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE FT./FT.	VELOCITY F.P.S.	$V^2/2G$ FT.	H.G.L. ELEV. UPSTREAM	H.G.L. ELEV. DOWNSTREAM	COVER ELEV. TOP OF BANK
A		1	2	0.60	0.60	0.84	0.50	0.50	7.0	0.4	7.0	6.70	3.35	15"		0.0050	4.56	3.71	4.0	92	114.65	114.19	0.0027	2.64				
		2	3	0.25	0.85	0.76	0.19	0.69		0.9	7.4	6.62	4.57	15"		0.0079	5.73	4.66	5.3	276	114.19	112.00	0.0050	3.72				
		3	4	0.53	1.38	0.86	0.46	1.15			8.3	6.42	7.38	15"		0.1100	21.40	17.40	16.9	40	112.00	107.60	0.0131	6.00				
B		1	2	1.01	1.01	0.63	0.64	0.64	5.0	0.4	5.0	7.10	4.54	15"		0.0200	9.12	7.41	7.7	164	114.28	111.00	0.0050	3.69				
		2	3	0.88	1.89	0.67	0.56	1.20			5.4	7.02	8.42	15"		0.1000	20.40	16.59	16.6	34	111.00	107.60	0.0170	6.85				
C		1	2	1.19	1.19	0.33	0.39	0.39	7.0		7.0	6.70	2.63	15"		0.0971	20.10	16.35	11.3	35	111.00	107.60	0.0017	2.14				

O = 109.5

STORM	Q_{pre}	Q_{post}	Q_{OUT}	Elev	STOR
2 - 6hr	2	8.0	2.3	1.2	0.2
10 - 6	5.6	13	9.4	1.7	0.4
100 - 24	10.5	15.4	15.1	1.9	0.4
100 - 6	10.7	19.0	17.7	1.9	0.5

9.5
1.7
111.2

NOT
AT
TEWNING
RD

JOLLY
POND
RD

Development
Managment

Attn: Cheryl

Grading
&
Erosion