CERTIFICATE OF AUTHENTICITY

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

BMP NUMBER: **PC060**

DATE VERIFIED: **May 23, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: February 24, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

BMP ID or General File ID PC060

PIN: 3730200001A

Subdivision, Tract, Business or Owner Name (if known): Greensprings General: Greenpsrings Apartments & Condos; Greensprings Plantation; Greensprings West; Legacy Golf Links; Williamsburg National Golf Course; Greensprings Office Park

Property Description: Common Area Parcel 1 Greensprings Plantation Resort Timeshares

Site Address: 3700 Welcome Center Drive

(For internal use only) **Box:** GP001 **Drawer:** 1

Agreements: (in file as of scan date) Y **Book or Doc#:** 707 **Page:** 100-103

Comments:

015715

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 21st day of September, 1994, between Greensprings Plantation, Inc., and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the LAKE "A" (As shown in Yellow on Exhibit "A") following property: Legacy Golf Links at Greensprings (Plat Book 58, Pages 96-102), and James City County, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

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

1. The COVENANTOR(S) shall provide maintenance for the runoff control facility, hereinafter referred to as the "FACILITY," located on and serving the above-described property to ensure that the FACILITY is and remains in proper working condition in accordance with approved design standards, and with the law and applicable executive regulations.

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

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

1-4

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

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

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

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

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

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

24

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 21ST day of SEPTEMBER, 1994.

COVENANTOR(S)
GREENSPRINGS PLANTATION, INC.

Marc B. Sharp
MARC B. SHARP, President

ATTEST:

Michele Z. Ball

STATE OF VIRGINIA
~~CITY~~/COUNTY OF

I hereby certify that on this 21st day of September 1994, before the subscribed, a Notary Public of the State of Virginia, and for the ~~City~~/County of James City, aforesaid personally appeared before me Marc B. Sharp
(Name of Acknowledging Party)
and did acknowledge the aforegoing instrument to be their Act.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal this 21st day of September, 1994.

Lisa N. Strond
Notary Public

My commission expires: 10-31-97

Approved as to form:

Lee P. Rogers

0621U
Revised 3/91

VIRGINIA: City of Williamsburg and County of James City, to Wit:
In the Clerk's office of the Circuit Court of the City of Williamsburg and County of James City the 26 day of Sept, 1994. This Covenants was presented with certificate annexed and admitted to record at 3:31 o'clock
Teste: Helene S. Ward, Clerk
by Helene S. Ward
~~Depar~~ Clerk

PLAT RECORDED IN
DB 707 PAGE 103

34

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

Project Name: Greensprings Plantation Resort PH I Timeshares
County Plan No.: SP-13-94
Stormwater Management Facility: LAKE A WETPOND
BMP Phase #: ☒ I ☐ II ☐ III
☐ Information Package Received. Date/By: _____
☐ Completeness Check:
- ☐ Record Drawing Date/By: Need
- ☐ Construction Certification Date/By: _____
- ☐ RD/CC Standard Forms NA (Required for all BMPs after Feb 1st 2001Only)
- ☒ Insp/Maint Agreement # / Date: ? NEEDED BUT QUESTIONABLE WHETHER BOT. LOG SHOWS GLOBAL I/M FOR LARGE TRACT ~1995
- ☐ BMP Maintenance Plan Location: NONE
- ☐ Other: _____

☒ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review
- ☐ Yes ☒ No Location: Division Comment #2 dated 2/17/94 reqd AB + CC

☒ Assign **County BMP ID Code #**: Code: PC 060
☒ 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: _____
☐ Record Drawing (RD) Review Date: _____
☐ Construction Certification (CC) Review Date: _____
☐ Actions:
- ☐ No comments.
- ☐ Comments. Letter Forwarded. Date: _____
- ☐ Record Drawing (RD)
- ☐ Construction Certification (CC)
- ☐ Construction-Related (CR)
- ☐ Site Issues (SI)
- ☐ Other : _____

☐ Second Submission: _____
☐ Reinspection (if necessary): _____
☐ Acceptable for SWM Purposes (RD/CC/CR/Other). Ok to proceed with bond release.
☐ Complete "Surety Request Form".
☐ Check/Clean active file of any remaining material and finish "As-Built" file.
☒ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
☐ Copy Final Inspection Report into County BMP Inspection Program file.
☐ Obtain Digital Photographs of BMP and save into County BMP Inventory.
☐ Request mylar/reproducible from As-Built plan preparer.
☐ Complete "As-built Tracking Log".
☐ Last check of BMP Access Database (County BMP Inventory).
☐ Add BMP to JCC Hydrology & Hydraulic database (optional).
☐ Add BMP to Municipal BMP list (if a County-owned facility)
☐ Add BMP to PRIDE BMP ratings database.

USACOE PERMIT # 92-0200-08

Final Sign-Off

Plan Reviewer: _____ Date: _____

*** See separate checklist, if needed.

EXISTING TREELINE

DRAINAGE DIVIDE

RPA BUFFER

LIMITS OF JURISDICTIONA

LAKE A

PC060

POWI
CREE

RIPRAP SPECIFIED B
RICKMOND ENGINEERING
(SEE DETAIL ON
SHEET C3)

GREENSPRINGS PLANTATION
RESORT PHASE I

15A

16A

1

2

3

4

30.3

32.2

32.3

31.5

GENERAL NOTES

1. BMP REPRESENTS LAKE A IN THE GREENSPRINGS MASTER STORMWATER PLAN APPROVED BY JAMES CITY COUNTY ON JULY 13, 1993.

2. BMP IS DESIGNED IN CONFORMANCE WITH DESIGN CRITERIA SPECIFIED BY THE CHESAPEAKE BAY LOCAL ASSISTANCE DEPARTMENT FOR WET PONDS ACHIEVING A 50% PHOSPHORUS REMOVAL EFFICIENCY.

3. APPROXIMATELY .16 ACRES OF JURISDICTIONAL WETLANDS WILL BE IMPACTED DUE TO THE CONSTRUCTION OF LAKE A AND APPROXIMATELY .08 ACRES OF JURISDICTIONAL WETLANDS WILL BE IMPACTED DUE TO PLACEMENT OF A RIP RAP LINED CHANNEL SPECIFIED BY RICKMOND ENGINEERING. THESE IMPACTS ARE PERMITTED UNDER US ARMY CORPS OF ENGINEERS PERMIT # 92-0200-08.

4. UPON COMPLETION OF THE GEOTECHNICAL STUDY FOR THIS SITE, A DETAILED DAM DESIGN WILL BE EXECUTED AND A DAM DETAIL SHEET SUBMITTED BASED ON RECOMMENDATIONS IN THE GEOTECHNICAL REPORT.

5. CUT AND FILL SLOPES SHALL NOT EXCEED 3:1.

6. DAM EMBANKMENT SHALL BE STABILIZED IMMEDIATELY UPON COMPLETION OF LAND DISTURBANCE.

BMP Hydrology

Basin Characterisitcs	DA acres	CN	Tc hours
Pre-development			
Forest	28	72	1
Post-development			
Woods	15.15	72	1
Turf	5	74	1
Impervious	7.85	98	0.1

Top of Dam Elevation	30.75	ft (msl)
Normal Pool Elevation	24	ft (msl)

Hydrologic Summary	2-yr cfs	10-yr cfs	100-yr cfs
Pre-development	15	43	73
Proposed Condition Unrouted	42	73	103
Proposed Condition Routed	17	23	59

Routed Elevations

2-yr Elevation	25.66	ft (msl)
10-yr Elevation	28.96	ft (msl)
100-yr Elevation	29.77	ft (msl)

BMP Sizing

I Compute Rv

Drainage Area =	28	acre
Paved Area=	7.85	acre
Impervious %=	28.04	%
Golf Impervious	1	%
Total Impervious	29.04	%

Rv= (.05 + .009(Impervious %)
Rv= 0.31

II Compute Storage Volume

Design a wet pond to function as a 50% efficient BMP using guidelines presented in the Removal efficiencies are taken from Local Assistance Manual. (CBLAD,1989)

Design based on A Framework For Evaluating Compliance With The 10% Rule In the Chesapeake Bay Critical Area. (MWCOG 1987)

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.
EG Environmental Consultants
516-B SOUTH HENRY STREET
WILLIAMSBURG, VIRGINIA 23185
(804) 220 - 6869, FAX (804) 229 - 4507

PHASE I MASTER STORMWATER PLAN
GREENSPRINGS: PLANTATION RESORT PHASE I
JAMES CITY COUNTY, VIRGINIA

WETLANDS

AN

BMP Hydrology

Basin Characterisitcs	DA acres	CN	Tc hours
Pre-development			
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Post-development			
Woods	15.15	72	1
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Design based on A Framework For Evaluating Compliance With The 10% Rule In the Chesapeake Bay Critical Area. (MWCOG,1987)

Vol=4(Runoff from mean storm)
Vol=4(Rv)(Rainfall of Mean Storm)(Drainage Area)
Vol = 1.22 ac-ft
Vol= 53159.8 cu-ft

Volume Provided= 1.23 ac-ft

NOTE:
MASTER PLAN AND STORMSEWER DESIGN PREPARED BY RICKMOND ENGINEERING.

100 0 50 100 200 300

PHASE I MASTER STORMWATER PLAN
GREENSPRINGS: PLANTATION RESORT PHASE I
JAMES CITY COUNTY, VIRGINIA

COMMONWEALTH OF VIRGINIA
ERIK L. ALLEN
NO. 024783
PROFESSIONAL ENGINEER

DRAWN BY: TCM/ACAD
CHECKED BY: RB
DATE: 7/19/94
SCALE: AS SHOWN
SHEET:
C13
JOB NUMBER: 88

EXISTING TREELINE

AC

15A

VDOT CLASS I
RIP RAP LINED
CHANNEL BY
RICKMOND ENGINEERING

DRAINAGE DIVIDE

A

B

A'

B'

EMERGENCY SPILLWAY
ELEVATION 29.0'MSL

TOP OF DAM
ELEVATION 30.7 MSL

SILT FENCE

36" ACM
COLLAR.

24"
INV
INV

B-1

NORMAL POOL=24.0'

B-2

B-3

ES-2
INV 42.00
8'X10'X26'
VDOT CLASS I
RIP RAP APPRON

SEDIMENT TRAP #4
DESIGNED BY RICKMOND ENGINEERING

EXCAVATE LAKE TO
ELEVATION=18.5'MSL

PC060

INV=22.9'

SEDIMENT TRAP #4
DESIGNED BY RICKMOND ENGINEERING
SEDIMENT TRAP TO BE REMOVED DURING
CONSTRUCTION OF LAKE "A"

DI-1
TOP=30
INV=27.4'
INV=27.3'

13.0' OF 15" PVC
RCP AT 3.38%

C RCP • 4.11%

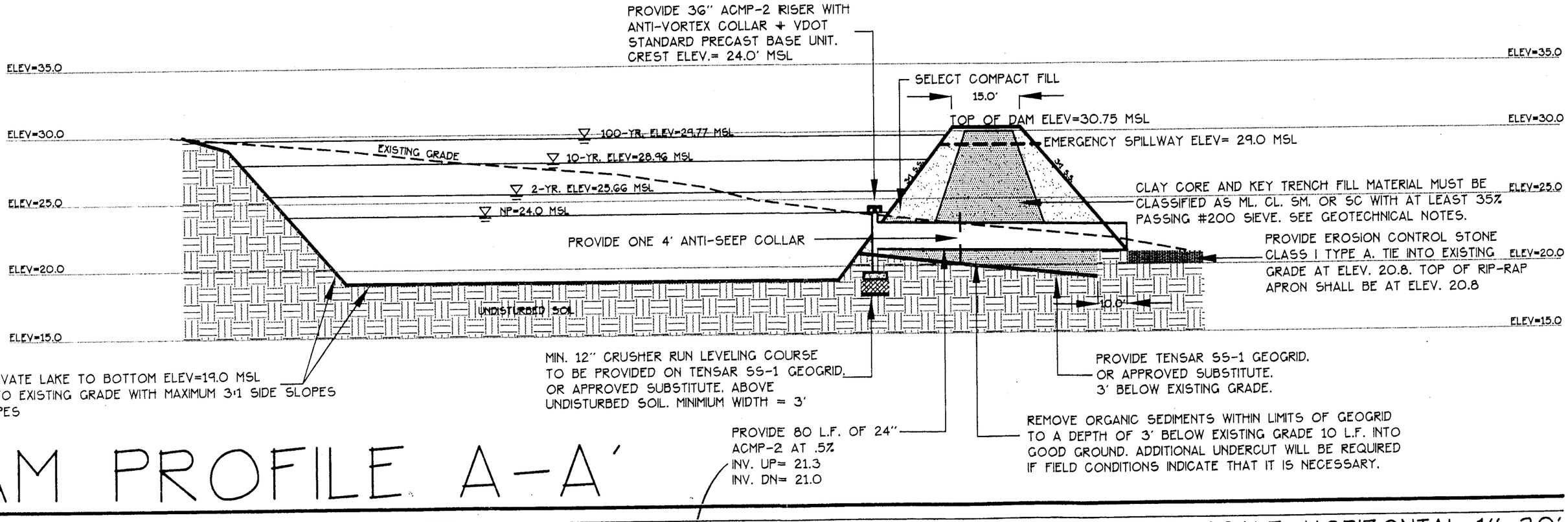
190'10F 15" PVC RCP • 11.51%

10

DI-3B, L=8'
TOP 67.91
INV 63.97

'AP AT
BY
'ONMENTAL

65 60 55 50 45 40 35



AM PROFILE A-A'

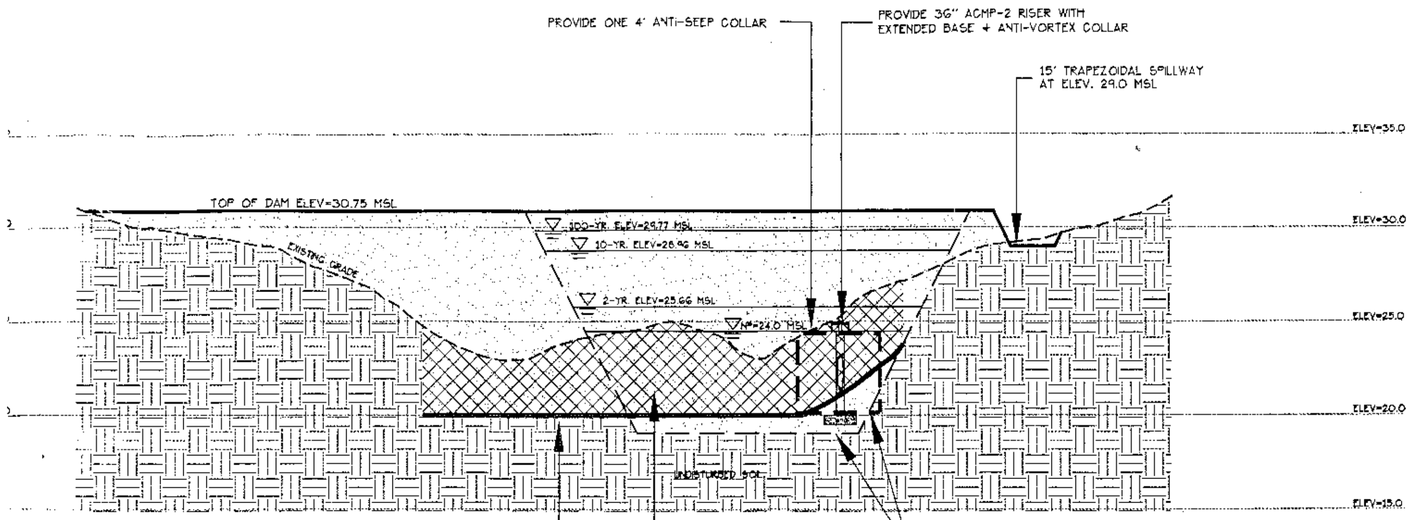
SCALE: HORIZONTAL 1"=30'

HDPE SUBSTITUTE? SEE LETTER.

PROVIDE ONE 4' ANTI-SEEP COLLAR

PROVIDE 36" ACMP-2 RISER WITH EXTENDED BASE + ANTI-VORTEX COLLAR

15' TRAPEZOIDAL SPILLWAY AT ELEV. 29.0 MSL

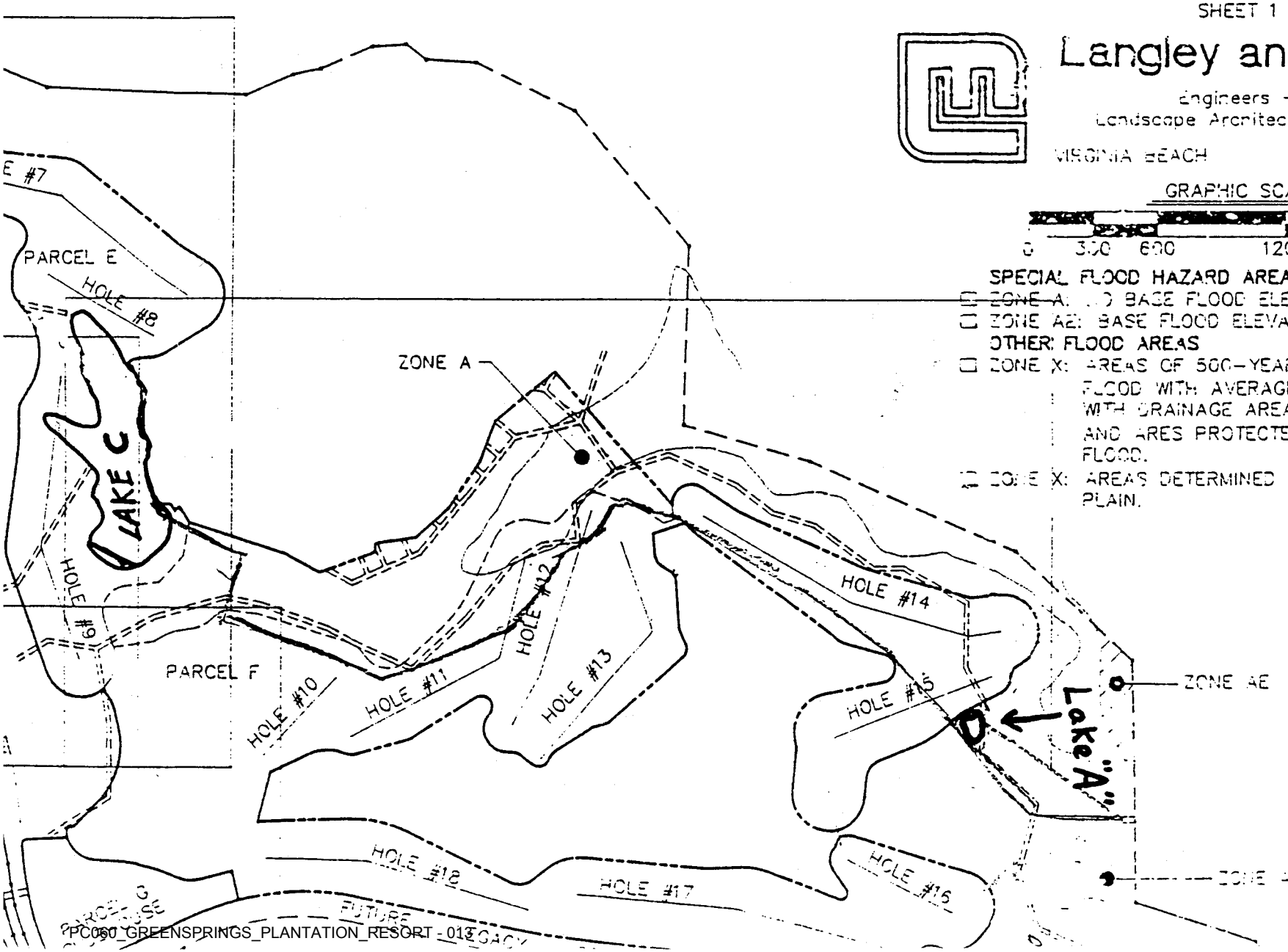


SECTION B-B'

SCALE: HORIZONTAL 1"=30'

LEGACY GOLF LINKS
AT GREENSPRINGS
BEING A
SUBDIVISION OF PROPERTY OF
GREENSPRINGS PLANTATION, INC.
BERKELEY DISTRICT
JAMES CITY COUNTY, VIRGINIA
FEBRUARY 18, 1994
SCALE: 1"=600'
SHEET 1 OF 7

Langley and McDonald
Engineers – Surveyors – Planners
Landscape Architects – Environmental Cons
VIRGINIA BEACH WIL



VICINITY MAP
SCALE: 1"=2000'

STATISTICAL INFORMATION

ZONED	R-4
SITE AREA	1402 ACRES
TAX MAP NO., PARCEL NO.	(46-1)(1-1)
NUMBER OF UNITS	16 (4 UNITS PER B
WATER	PUBLIC WATER
SEWER	PUBLIC SEWER
DISTURBED AREA	10.75 ACRES
PAVED AREA	4.50 ACRES
BUILDING AREA	0.13 ACRES
PARKING SPACES	
REQUIRED:	40 (2.5 SPACES PI
PROVIDED:	40
H/C REQUIRED:	2
H/C PROVIDED:	2
MAX HEIGHT	40'
BUILDING FLOOR AREA	5,748 SF (TOTAL 4
	THIRD FLOOR (148(
	SECOND FLOOR (14
	FIRST FLOOR (1317
	BASEMENT (1471 S

TOTAL NUMBER OF UNITS LANDBAY M-5	
3 UNIT BUILDINGS	22
4 UNIT BUILDINGS	42

GREENSPRINGS PLANTATION RESORT PH I
SP-13-94
PC 060
LAKE A

OWNER/DEVELOPER

GREENSPRINGS ASSOCIATES
4209 IRONBOUND ROAD, SUITE 206

PER FEMA COMMUNITY-PANEL NUM
510201-0035B THE SITE IS LOCATI

Greensprings Plantation Resort

Phase I

Drainage Calculations

Rickmond Engineering
1643 A Merrimac Trail
Williamsburg, VA 23185
(804) 229-1776

January 25, 1994

Revised July 20, 1994

Project Number 93209

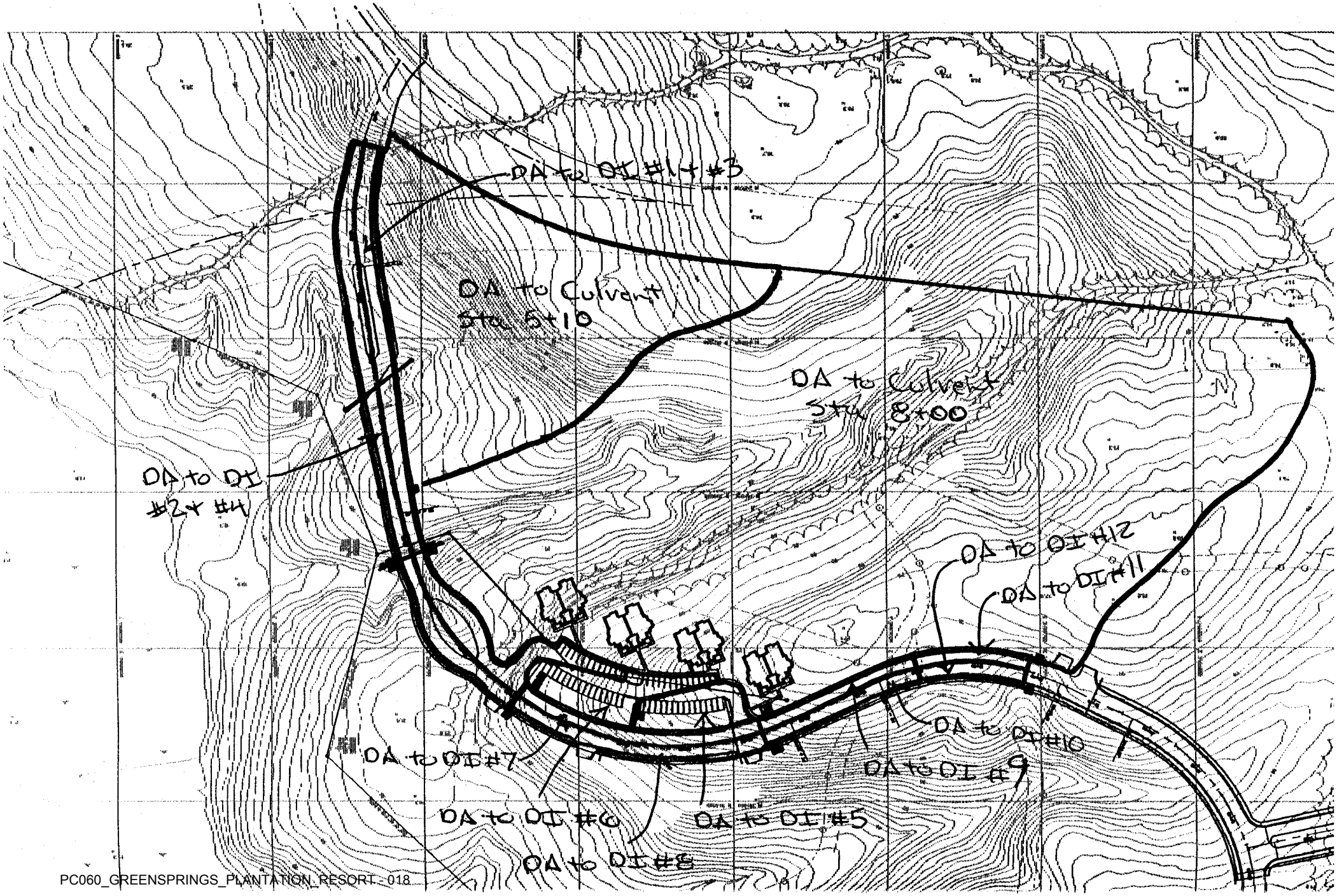
Table of Contents

Preface

The following drainage calculations pertain to Greensprings Plantation Resort, Phase I located in James City County, Virginia.

The entire site currently consists of 1402 acres of woodlands draining to Powhatan Swamp. After development this phase of the project will consist of 4 four-story time-share units, 56 parking spaces, approximately 3,200 linear feet of road, 3,700 linear feet of water line, and 1,100 linear feet of sanitary sewer.

The storm runoff from the road and site drain to a series of drainage inlets which discharge to natural streams and swales. The stormwater management and BMP analysis was provided by the Williamsburg Environmental Group.


DA to DI #1 + #3
DA to Culvert Sta. 5+10
DA to Culvert Sta. 8+00
DA to DI #2 + #4
DA to DI #12
DA to DI #11
DA to DI #10
DA to DI #9
DA to DI #7
DA to DI #6
DA to DI #5
DA to DI #8

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776

JOB 93209
SHEET NO. 2 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

CULVERT DESIGN

Sta 5+10

Greensprings Plant, Drive

c= .25
A= 3.82 Ac.

OVERLAND FLOW

L= 300 ft.
S= 9.17 %
Tc= 17 min.

CHANNEL FLOW

H= ____ ft.
L= ____ ft.
Tc= ____ min.

Shallow Concentrated Flow
L=300'
S=9.17%
V= 4.8 fps
Tc= 1.0 min

Tc= 18 min

i_{10}= 4.7 in/hr

Q=CAi=(.25)(3.82 Ac.)(4.7 in/hr)

Q= 4.49 cfs
L= 140 ft.
S= 0.71 %
HW= 6 ft.

Inv_i= 19.00
Inv_o= 18.00

INLET CONTROL

D= 15 in. or 1.25 ft.

HW/D= 1.05

HW=(1.25 ft.)(1.05)= 1.31 ft. < 6.0 ft.

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776
(804) 875-1785

JOB 93209
SHEET NO. 3 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

OUTLET CONTROL

d_c = 0.86

$h_o = \frac{d_c + D}{2} = \frac{0.86 + 1.25}{2} = 1.06$

$S_oL = (.0079)(140) = 1.0$

d_n = 0.83

$\frac{d}{D} = .66$ $\frac{r}{D} = .2899$ P.E. Manual Pg 3-43

R = .36

v = 5.18

$H = (1 + k_e + \frac{29n^2L}{R^{4/3}}) \frac{v^2}{2g} = 1.74$

$HW = H + h_o - S_oL = 1.8 < 6.0$

Outlet Control Governs

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776

JOB 93209
SHEET NO. 4 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

CULVERT DESIGN
Sta 8+00
Greensprings Plantation Drive

c=.26
A=15.56Ac.

OVERLAND FLOW

L=200 ft.
S=3.0 %
Tc=17.5 min.

	C	A	CA
Roof	.90	.17	.15
Golf Course	.25	15.39	3.85
		15.56	4.0

CHANNEL FLOW

H=4950 ft.
L=1300 ft.
Tc= 7 min.

Tc=24.5 min

i_{10}=4.0 in/hr

Q=CAi=(.26)(15.56 Ac.)(4.0 in/hr)

Q=16.18 cfs
L=105 ft.
S=1.43 %
HW=4.5 ft.

Inv_i= 20.50
Inv_o=19.00

INLET CONTROL

D= 24 in. or 2.0 ft.

HW/D=1.15

HW=(2.0 ft.)(1.15)=2.3 ft. < 4.5 ft.

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776
(804) 875-1785

JOB 93209
SHEET NO. 5 OF
CALCULATED BY KWS DATE 1/17/94
CHECKED BY DATE
SCALE

OUTLET CONTROL

$d_c = 1.45$

$h_o = \frac{d_c + D}{2} = \frac{1.45 + 2.0}{2} = 1.73$

$S_o L = (.0143)(105) = 1.50$

$d_n = 1.11$

$\frac{d}{D} = .56$ $\frac{r}{D} = .2676$ P.E. Manual Pg 3-43

$R = .54$

$v = 8.99$

$H = (1 + k_e + \frac{29n^2L}{R^{4/3}}) \frac{v^2}{2g} = 3.35$

$HW = H + h_o - S_o L = 3.58' < 4.5'$

Outlet Control Governs

RICKMOND ENGINEERING, INC.
1643 Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776

JOB 93209
SHEET NO. 6 OF
CALCULATED BY KMT DATE 1/17/94
CHECKED BY DATE
SCALE

DA- OI #1 Sta 7+25 West Side Greensprings Plant. On

c= .90
A= 1.59 Ac:

OVERLAND FLOW

L= 180 ft.
S= 6.96 %
Tc= — min.

CHANNEL FLOW

H= 13.5 ft.
L= 400 ft.
Tc= .5 min.

Tc= .5 min.

i_{10} = 7.2 in/hr

Q=CAi=(.90)(1.59 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 10.30 cfs

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 7 OF
CALCULATED BY KMS DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI #1

$Q = (.9)(1.59)(3.5) = 5.01$ cfs (Q = 4.00 cfs for this DI)

$S_x = .0208$ ft/ft

$W = 2'$

DI-3C

$L = 16'$

$P = L + 1.8(W) = 16 + 1.8(2) = 19.6$

From Chart 17, $d = .19$

$h = 5.5'' = 0.46'$, $\frac{d}{h} = \frac{.19}{.46} = .41 < 1.2$ inlet operates as weir

$T = \frac{d}{S_x} = \frac{.19}{.0208} = 9.13 < 9.50$

Use VDOT DI-3C, L=16

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 8 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI # 2

$Q = 1.01$ cfs
$n = .015$
$S = .0669$ ft/ft
$S_x = .0208$ ft/ft
CG-6, $S_w = .0833$ ft/ft
$W = 2$

From Chart 6 $T = 2'$ $d = .17'$

$\frac{W}{T} = \frac{2}{2} = 1.0$, $\frac{S_w}{S_x} = \frac{.0833}{.0208} = 4$

From Chart 10A, $E_o = 1.0$

$a = 12W(S_w - S_x)$ + local depression

$a = 12(2)(.0833 - .0208) + 2 = 3.5$ in

$S_w' = \frac{a}{12W} = \frac{3.5}{12(2)} = .146$ ft/ft

$S_e = S_x + S_w' E_o = .0208 + .146(1.0) = .17$ ft/ft

From Chart 15, $L_T = 10'$

Use VDOT DI-3B, $h = 10'$

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JOB 93209
SHEET NO. 9 OF
CALCULATED BY KWJ DATE 1/17/94
CHECKED BY DATE
SCALE

DA-DI#3 Sta 8+00 East Side Greensprings Plant. Dr.

c=.90
A=1.52 Ac:

OVERLAND FLOW

L= 12 ft.
S= 2.08 %
Tc= — min.

CHANNEL FLOW

H=30.5 ft.
L=575 ft.
Tc=.5 min.

Tc=.5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.90)(1.52 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q=9.85 cfs

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SHEET NO. 10 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI #3 & #4

$Q = (.90)(1.52)(3.5) = 4.79$ cfs (Q=4.00cfs for this DI)

See Calculations for DI #1, #2 for design of DI #3, #4

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SHEET NO. 11 OF
CALCULATED BY KMS DATE 1/17/94
CHECKED BY DATE
SCALE

DA- OI #5, #6

c= .57
A= .21 Ac.

OVERLAND FLOW

	C	A	CA
Road	.90	.11	.10
Grass	.20	.10	.02
		.21	.12

L= 140 ft.
S= 9.29 %
Tc= ___ min.

CHANNEL FLOW

H= — ft.
L= — ft.
Tc= — min.

Tc= 7 min.

i_{10} = 6.7 in/hr

Q=CAi=(.57)(.21 Ac.)(6.7 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 0.80 cfs

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CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN #5, #6

$Q = (.57)(.21)(3.5) = 0.42$ cfs
$S_x = .01$ ft/ft
$W = 2'$
DI-3A
$h = 2.5$

$P = h + 1.8W = 2.5 + 1.8(2) = 7.1$

From Chart 17, $d = .19$

$h = 5.5'' = 0.46'$, $\frac{d}{h} = \frac{.19}{.46} = .41 < 1.2$ inlet operates as weir

$T = \frac{d}{S_x} = \frac{.19}{.01} = 19'$ OK

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SHEET NO. 13 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DA- OI #7, #8

c= .90
A= .16 Ac:

OVERLAND FLOW

L= 19 ft.
S= 2.08 %
Tc= — min.

CHANNEL FLOW

H= 22 ft.
L= 375 ft.
Tc= .5 min.

Tc= .5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.90)(.16 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 1.04 cfs

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SHEET NO. 14 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI #7, #8

$Q = (.90)(.16)(3.5) = 0.50$ cfs
$n = .015$
$S = .0669$ ft/ft
$S_x = .0208$ ft/ft
$W = 2'$
$S_w = .0833$ ft/ft

From Chart 6, $T = 1.15'$ $d = .10'$

$\frac{W}{T} = \frac{2'}{1.15'} = 1.74$, $\frac{S_w}{S_x} = \frac{.0833}{.0208} = 4$

From Chart 10A, $E_o = 1.0$

$a = 12W(S_w - S_x)$ + local depression

$a = 12(2)(.0833 - .0208) + 2 = 3.5$ in

$S_w' = \frac{a}{12W} = \frac{3.5}{12(2)} = 0.146$ ft/ft

$S_e = S_x + S_w' E_o = .0208 + 0.146(1) = .17$ ft/ft

From Chart 15, $L_T = 8'$

Use VDOT DI-3B, $L = 8'$

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SHEET NO. 15 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DA- OI #9, #10

c= .90
A= .11 Ac.

OVERLAND FLOW

L= 19 ft.
S= 2.08 %
Tc= — min.

CHANNEL FLOW

H= 6 ft.
L= 250 ft.
Tc= .5 min.

Tc= .5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.90)(.11 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 0.71 cfs

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SHEET NO. 16 OF
CALCULATED BY KMT DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI #9, #10

$Q = (.90)(.11)(3.5) = .35$ cfs
$n = .015$
$S = .0669$ ft/ft
$S_x = .0208$ ft/ft
$W = 2'$
$S_w = .0833$ ft/ft

From Chart 6, $T = 1.35$ $d = .12$

$\frac{W}{T} = \frac{2}{1.35} = 1.48$, $\frac{S_w}{S_x} = \frac{.0833}{.0208} = 4$

From Chart 10A, $E_o = 1.0$

$a = 12W(S_w - S_x)$ + local depression

$a = 12(2)(.0833 - .0208) + 2 = 3.5$ in

$S_w' = \frac{a}{12W} = \frac{3.5}{12(2)} = 0.146$ ft/ft

$S_e = S_x + S_w' E_o = .17$ ft/ft

From Chart 15, $L_T = 8'$

USE VDOT DI-3B, $L = 8'$

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JOB 92309
SHEET NO. 17 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DA- OI #11, #12

c= .90
A= .09 Ac:

OVERLAND FLOW

L= 19 ft.
S= 2.08 %
Tc= — min.

CHANNEL FLOW

H= 3 ft.
L= 200 ft.
Tc= 0.5 min.

Tc= 0.5 min.

i_{10}= 7.2 in/hr

Q=CAi=(.90)(.09 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 0.58 cfs

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SHEET NO. 18 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI #11, #12

$Q = (.90)(.09)(3.5) = .28$ cfs

$n = .015$

$S = .0318$ ft/ft

$S_x = .0208$ ft/ft

$W = 2'$

$S_w = .0833$ ft/ft

From Chart 6, $T = 1.5'$ $d = .18'$

$\frac{W}{T} = \frac{2}{1.5} = 1.33$, $\frac{S_w}{S_x} = \frac{.0833}{.0208} = 4$

From Chart 10A, $E_o = 1.0$

$a = 12W(S_w - S_x)$ + local depression

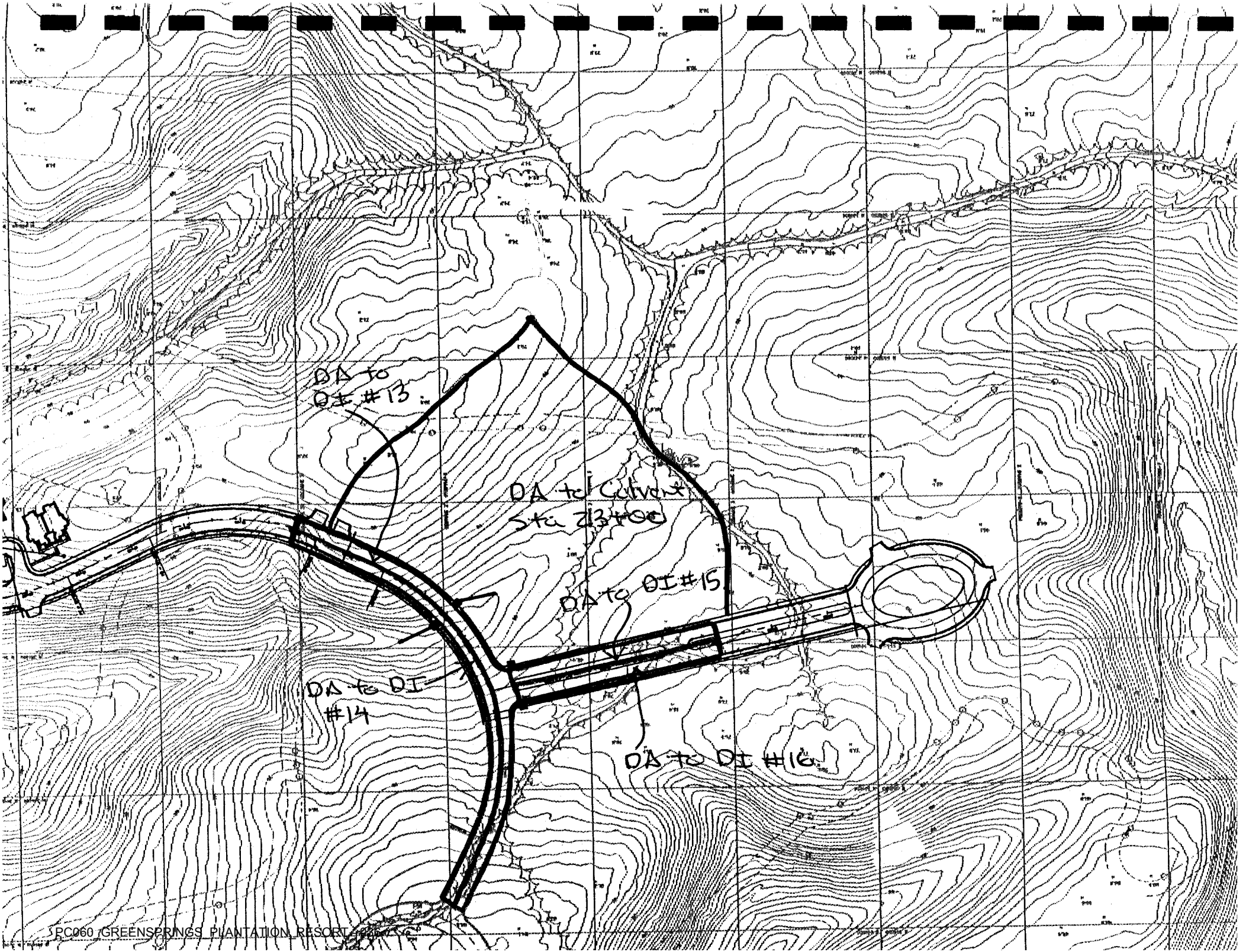
$a = 12(2)(.0833 - .0208) + 2 = 3.5$ in

$S_w' = \frac{a}{12W} = \frac{3.5}{12(2)} = 0.146$ ft/ft

$S_e = S_x + S_w' E_o = .17$ ft/ft

From Chart 15, $L_T = 6'$

USE VDOT DI-3B, $L = 6'$


DA to DI #13
DA to Culvert Sta 23+00
DA to DI #15
DA to DI #14
DA to DI #16

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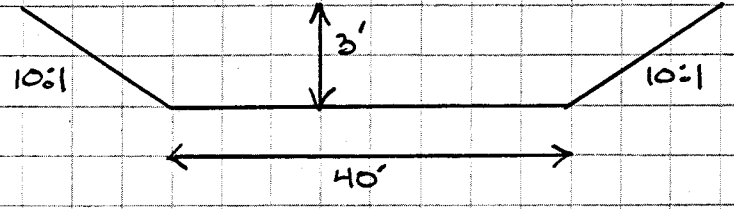
SHEET NO. 34 OF
CALCULATED BY KMJ DATE 4/27/94
CHECKED BY DATE
SCALE

CHECK CHANNEL ADEQUACY OF OUTFALL CHANNEL AFTER STA ST10 CULVERT UNDER GREENSPRINGS PLANTATION DR

$Q = 4.49$ cfs

$S = \frac{18 - 15}{110'} = .0273$ ft/ft

Channel Cross-Section:



$n = .05$ (dense growth of weeds with trees)

Permissible Velocity = 3.0 fps (Chickahominy Silt Loam)

$d = .10'$ $A = 4.23$ ft^2 $R = .10$

$V = \frac{1.49}{n} R^{2/3} S^{1/2}$

$V = \frac{1.49}{.05} (.10)^{2/3} (.0273)^{1/2}$

$V = 1.06$ fps < 3.0 fps Channel is adequate

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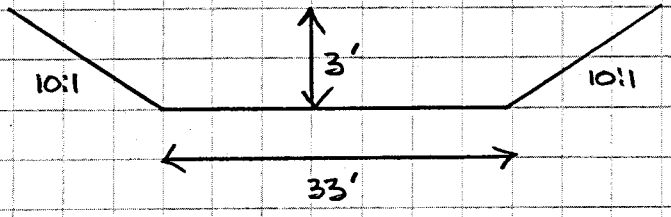
JOB 93209
SHEET NO. 35 OF
CALCULATED BY KMS DATE 4/27/94
CHECKED BY DATE
SCALE

CHECK CHANNEL ADEQUACY OF OUTFALL CHANNEL AFTER DI # 4

$Q = 17.44$ cfs

$S = \frac{19-17}{70} = .0286$ ft/ft

Channel Cross-Section:



$n = .05$ (dense growth of weeds with trees)

Permissible Velocity = 3.0 fps (Chickahominy Silt Loam)

$d = 0.26'$ $A = 9.18$ ft^2 $R = .24$

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$V = \frac{1.49}{.05} (.24)^{2/3} (.0286)^{1/2}$$

$V = 1.94$ fps < 3.0 fps Channel is adequate

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SHEET NO. 36 OF
CALCULATED BY KMJ DATE 4/27/94
CHECKED BY DATE
SCALE

DA- To Outfall Channel After DI #8, 10, 12, 14

c= .25
A= 23.69 Ac.

OVERLAND FLOW

L= 300 ft.
S= 2.67 %
Tc= 3 min.

CHANNEL FLOW

H= 52 ft.
L= 1950 ft.
Tc= 11 min.

Tc= 14 min.

$i_{\frac{10}{2}}$ = 4.14 in/hr

Q=CAi=(.25)(23.69 Ac.)(4.14 in/hr)(C_f)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 26.06 cfs

DA	C	A	CA
DI #5, #6	.57	.21	.12
DI #7, #8	.90	.16	.14
DI #9, #10	.90	.11	.10
DI #11, #12	.90	.09	.08
Culv 23+00	.34	5.69	1.95
Woods	.20	13.06	2.61
Golf Course	.20	4.37	.87
		23.69	5.87

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JOB 93209
SHEET NO. 37 OF
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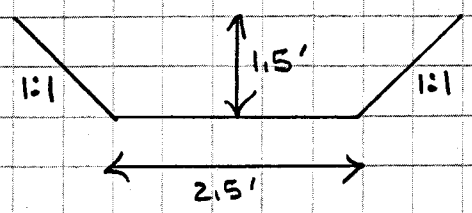
CHECKED BY DATE
SCALE

CHECK CHANNEL ADEQUACY OF OUT FALL CHANNEL AFTER DI # 8, 10, 12, 14

$Q = 26.06$ cfs

$S = \frac{67-15}{1950} = .0267$ ft/ft

Channel Cross-Section:



n = .04 (stream with no vegetation)

Permissible Velocity = 2.5 fps (Emporia fine sandy loam)

$d = 1.31'$ $A = 4.97$ $R = .80$ $D = 1.32$ $V = 5.27$

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

$$V = \frac{1.49}{.04} (.80)^{2/3} (.0267)^{1/2}$$

$V = 5.24$ fps > 2.5 fps Channel is inadequate & shall be lined with VDOT RIP RAP from DI # 10 ES-2 to Outlet to Powhatan Creek

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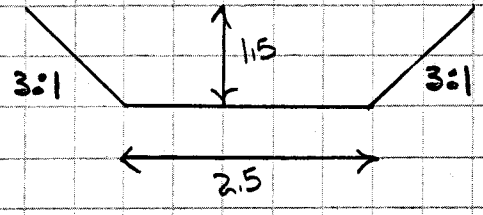
SHEET NO. 38 OF
CALCULATED BY KMT DATE 4/27/94
CHECKED BY DATE
SCALE

OK

DESIGN RIP RAP LINED OUTFALL CHANNEL

Channel Cross-Section:

S=.0267 ft/ft



D = 1.05
V = 4.6 fps
Q = 22.9

1) d_{50} = .5' = 6"

USE VDOT CLASS I RIP RAP APRON to line Channel

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SHEET NO. 39 OF
CALCULATED BY KWS DATE 4/28/94
CHECKED BY DATE
SCALE

DESIGN SEDIMENT TRAP #1
Greensprings Plantation Dr
Sta 5+10

Area = 3.82 ac

Initial storage = 3.82 ac x 134 cyd/ac = 512 cyd

Dry storage = 256 cyd

Wet storage = 256 cyd

Calculate Wet storage:

V_1 = 256 cyd = 6920 cf
D_1 = 4'

$V_1 = .85 \times A_1 \times D_1$

$6920\,cf = .85 \times A_1 \times 4$

$A_1 = 2035\,sf = 45' \times 45'$

Calculate Dry Storage:

V_2 = 256 cyd = 6920 cf
D_2 = 4'
A_1 = 2035 sf

$$V_2 = \frac{A_1 + A_2}{2} \times D_2 \Rightarrow 6920\,cf = \frac{2035\,sf + A_2}{2} \times 4'$$

$A_2 = 1{,}425\,sf$

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SHEET NO. 40 OF
CALCULATED BY KMJ DATE 4/28/94
CHECKED BY DATE
SCALE

DESIGN SEDIMENT TRAP #2
Greensprings Plantation Dr.
Sta 8+00

Area = 3.11 ac (Majority of drainage area is intercepted by sediment trap designed by WEG on 15th green)

Initial storage = 3.11 ac × 134 cyd/ac = 417 cyd

Dry storage = 208.5 cyd

Wet storage = 208.5 cyd

Calculate Wet storage:

V_1 = 208.5 cyd = 5635 cf
D_1 = 4'

$V_1 = .85 \times A_1 \times D_1$

$5635\,cf = .85 \times A_1 \times 4'$

A_1 = 1657 sf = 41' × 41'

Calculate Dry storage:

V_2 = 208.5 cyd = 5635 cf
D_2 = 4'
A_1 = 1657 sf

$$V_2 = \frac{A_1 + A_2}{2} + D_2 \Rightarrow \quad 5635cf = \frac{1657 + A_2}{2} \times 4'$$

A_2 = 1161 sf

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JOB 93209
SHEET NO. 20 OF
CALCULATED BY RMS DATE 1/17/94
CHECKED BY DATE
SCALE

CULVERT DESIGN

STA 23+00
Greensprings Plant Dr.

c=.34
A=5.69 Ac.

	C	A	CA
Woods	.20	4.54	.91
Roof/Road	.90	1.15	1.04
		5.69	1.95

OVERLAND FLOW

L=300 ft.
S=2.67 %
Tc=18 min.

CHANNEL FLOW

H=5.0 ft.
L=300 ft.
Tc=3 min.

Tc=21 min

i_{10}=4.4 in/hr

Q=CAi=(.34)(5.69 Ac.)(4.4 in/hr)

Q=8.51 cfs
L=200 ft.
S=1.50 %
HW=3.5 ft.

Inv_i=63.00
Inv_o=60.00

INLET CONTROL

D=18 in. or 1.5 ft.

HW/D=1.18

HW=(1.5 ft.)(1.18)=1.77 ft. < 3.5 ft.

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SHEET NO. 21 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

OUTLET CONTROL

$d_c = 1.13$

$h_o = \frac{d_c}{2} + D = \frac{1.13}{2} + 1.50 = 1.32$

$S_oL = (.015)(200) = 3.0$

$d_n = 0.89$

$\frac{d}{D} = .59$ $\frac{r}{D} = .2753$ P.E. Manual Pg 3-43

$R = .41$

$v = 7.78$ fps

$H = (1 + k_e + \frac{29n^2L}{R^{4/3}}) \frac{v^2}{2g} = 4.43$

$HW = H + h_o - S_oL = 2.75' < 3.5'$

Outlet Control Governs

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SHEET NO. 22 OF
CALCULATED BY KMS DATE 1/17/94
CHECKED BY DATE
SCALE

DA- DI #13, #14

c= .90
A= .37 Ac.

OVERLAND FLOW

L= 19 ft.
S= 2.08%
Tc= — min.

CHANNEL FLOW

H= 13 ft.
L= 500 ft.
Tc= 0.5 min.

Tc= 0.5 min.

i_{10} = 7.2 in/hr

Q=CAi=(.90)(.37 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 2.40 cfs

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JOB 93209
SHEET NO. 23 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN #13, #14

$Q = (.90)(.37)(3.5) = 1.17$ cfs
$S_x = .0208$ ft/ft
$W = 2'$
$L = 2.5'$

$P = L + 1.8W = 2.5' + 3.6' = 6.1'$

From Chart 17, $d = .18'$

$h = 5.5'' = 0.46'$, $\frac{d}{h} = \frac{.18'}{.46'} = .39 < 1.2$

$T = \frac{d}{S_x} = \frac{.18}{.0208} = 8.65' < 9.5'$ OK

USE VDOT DI-3A, L=2.5

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SHEET NO. 24 OF
CALCULATED BY KMS DATE 1/17/94
CHECKED BY DATE
SCALE

DA- DI # 15, #16

c= .65
A= .23 Ac:

	c	A	cA
Road	.90	.16	.14
Grass	.20	.07	.01
		.23	.15

OVERLAND FLOW

L= 29 ft.
S= 2.08 %
Tc= — min.

CHANNEL FLOW

H= 2.5 ft.
L= 350 ft.
Tc= 1 min.

Tc= 1 min.

i_{10}= 7.2 in/hr

Q=CAi=(.65)(.23 Ac.)(7.2 in/hr)(C_f 1.0)

C_f for storms 25 yr+
(VDOT Manual Pg. 1-11)

Q= 1.08 cfs

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SHEET NO. 25 OF
CALCULATED BY KMJ DATE 1/17/94
CHECKED BY DATE
SCALE

DESIGN DI # 15, #16

$Q = (.65)(.23)(3.5) = .52$ cfs

$n = .015$

$S = .0075$ ft/ft

$S_x = .0208$ ft/ft

$W = 2'$

$S_w = .0833$ ft/ft

From Chart 6, $T = 3.2'$ $d = .20'$

$\frac{W}{T} = \frac{2}{3.2} = .63$, $\frac{S_w}{S_x} = 4$

From Chart 10A, $E_o = .98$

$a = 12W(S_w - S_x)$ + local depression

$a = 12(2)(.0833 - .0208) + 2 = 3.5$

$S_w' = \frac{a}{12W} = \frac{3.5}{12(2)} = 0.146$ ft/ft

$S_e = S_x + S_w' E_o = .0208 + (.146)(.98) = .16$ ft/ft

From Chart 15, $L_T = 4'$

USE VDOT DI-33, $L = 4'$

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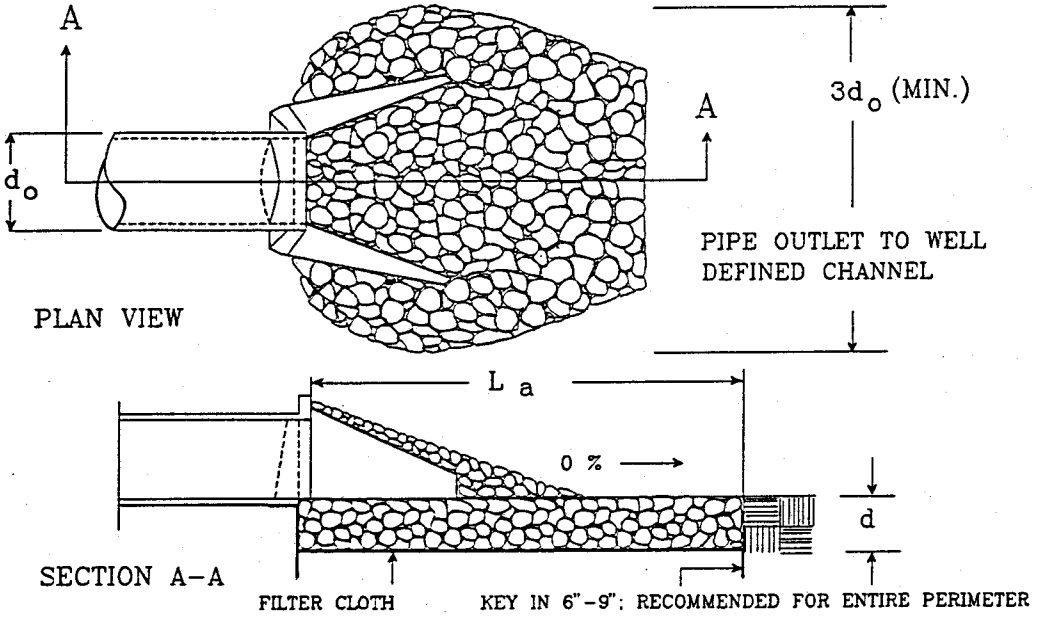
SHEET NO. 26 OF
CALCULATED BY KMJ DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR CULVERT AT STA. 5+10



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

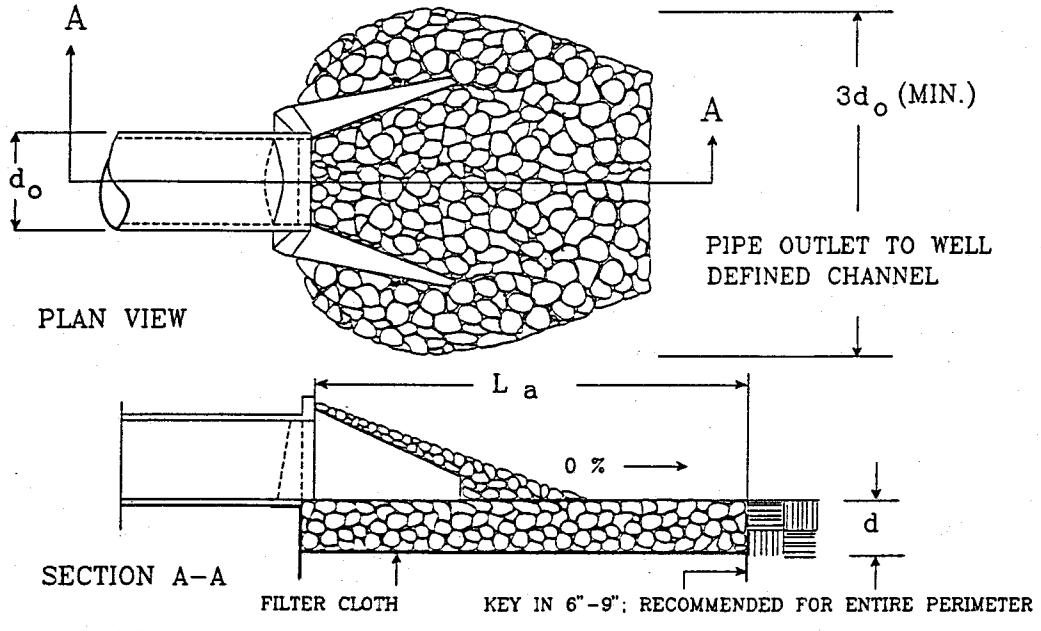
$Q = 4.49$ cfs
$d_o = 1.25'$
$3d_o = 4'$
$La = 8'$
$W = 5'$

USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 27 OF
CALCULATED BY KMJ DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #4



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

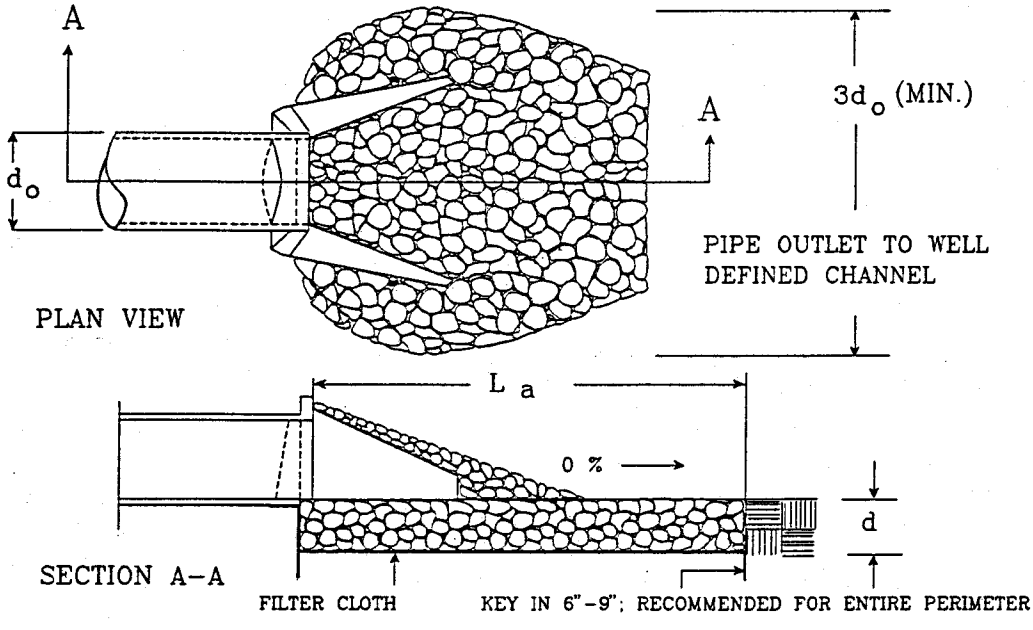
$Q = 17.44$ cfs
$d_o = 2'$
$3d_o = 6'$
$La = 10'$
$W = 6'$

USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 28 OF
CALCULATED BY KWS DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #10



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

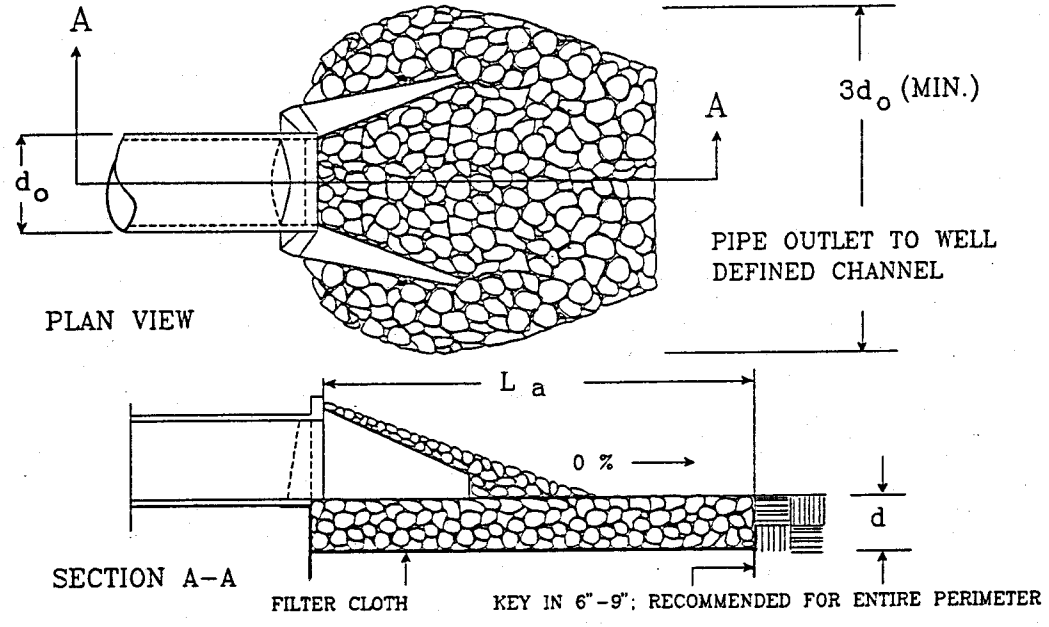
$Q = 1.44$ cfs
$d_o = 1.25'$
$3d_o = 4'$
$La = 8'$
$W = 10'$

USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 29 OF
CALCULATED BY KMJ DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #12



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

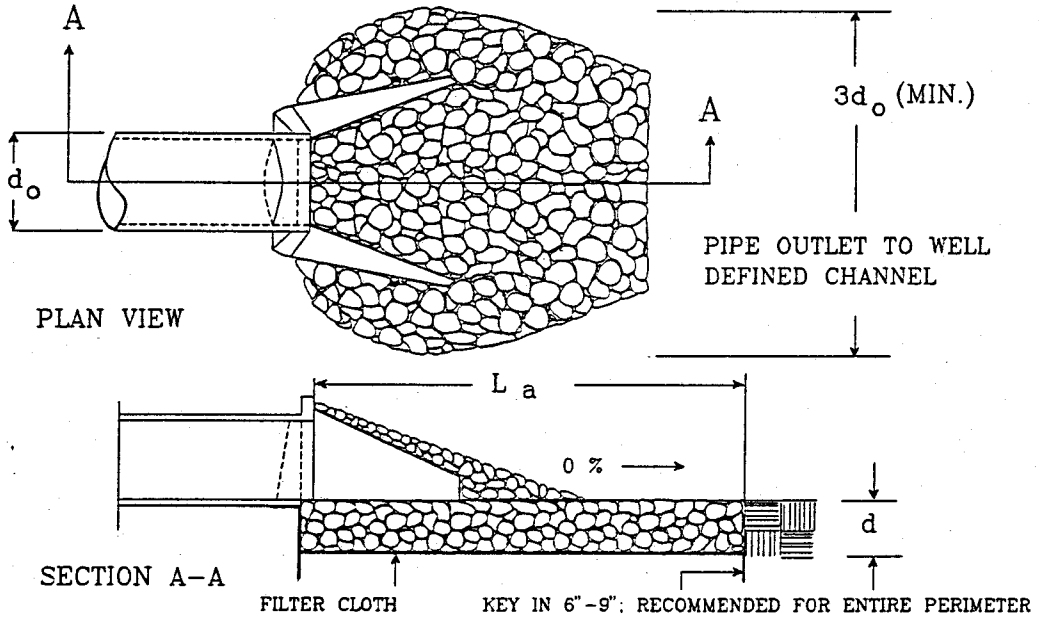
$Q = 1.16$ cfs
$d_o = 1.25'$
$3d_o = 4'$
$L_a = 8'$
$W = 10'$

USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 30 OF
CALCULATED BY KMS DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #14



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

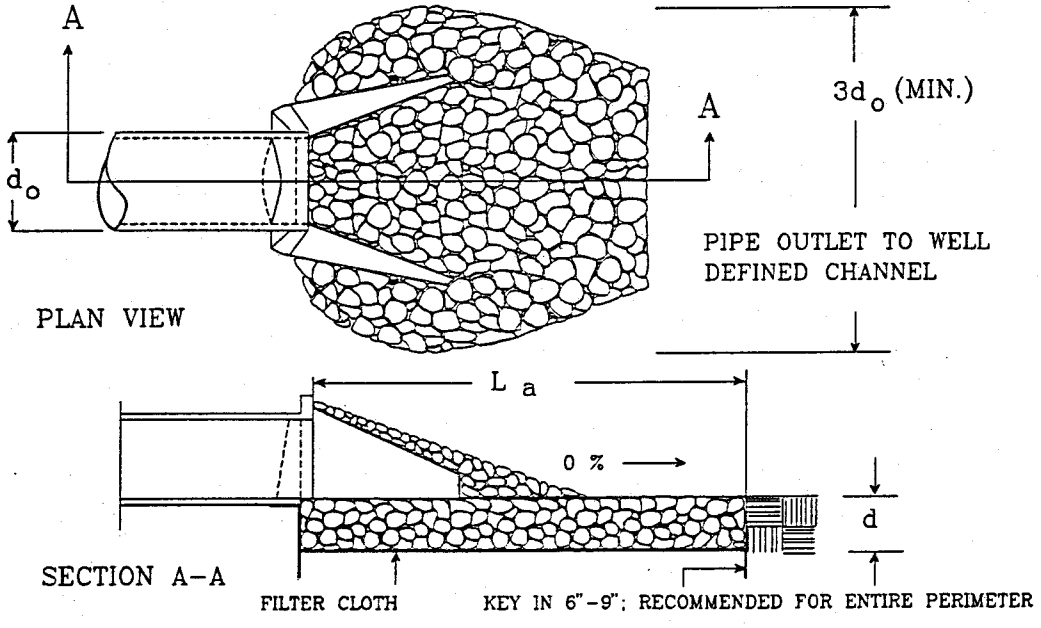
$Q = 11.40$ cfs
$d_o = 1.5$
$3d_o = 5'$
$La = 9'$
$W = 5'$

USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 31 OF
CALCULATED BY KWT DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #15



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

$Q = 2.16$ cfs
$d_o = 1.25'$
$3d_o = 4'$
$La = 8'$
$W = 10'$

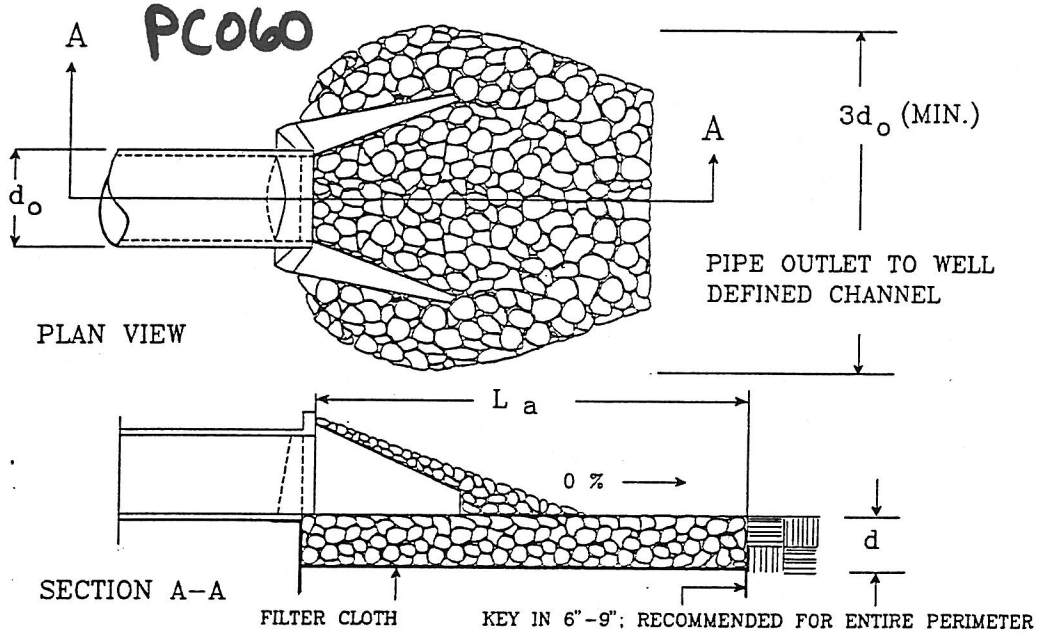
USE VDOT CLASS I RIP RAP

RICKMOND ENGINEERING, INC.
1643 C Merrimac Trail
Williamsburg, Virginia 23185-5624
(804) 229-1776 or (804) 898-4149
Fax Number (804) 220-9370

JOB 93209
SHEET NO. 31 OF
CALCULATED BY KMS DATE 1/18/94
CHECKED BY DATE
SCALE

DESIGN OUTLET PROTECTION FOR ES-2 FROM DI #14

PC060



NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION BASKET, OR CONCRETE.
2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4.
3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

$Q = 11.40$ cfs
$d_o = 1.5$
$3d_o = 5'$
$La = 9'$
$W = 5'$

USE VDOT CLASS I RIP RAP

HYDRAULIC CALCULATION SHEET

M.H.	INV.	D	W.S.	RIM	A	K	V	Q	$\frac{V^2}{2g}$	E.G.	S_f	$\frac{K_{avg}}{S_f}$	L	h_f	h_b	h_j	h_{mh}	h_c	E.G.
ES-2	60.00	18	61.00				9.10	11.40	1.29	62.29		.0137	75	1.03			.10		
14	61.03	18	62.13	66.78			9.17	9.94	1.31	63.44		.015	38	.57			.21		
13	61.70	18	62.91	66.78			8.85	8.51	1.22	64.13		.015	80	1.20					
ES-2	63.00	18	64.11	66.50															
ES-2	54.00	15	54.19				9.76	1.16	1.48	55.67		.0898	155	13.92			.06		
12	67.92	15	68.17	71.63			2.87	0.58	.13	68.30		.005	38	.19					
11	68.31	15	68.36	71.63															
ES-2	42.00	15	42.20				11.57	1.44	2.08	44.28		.1215	190	23.08			.10		
10	65.08	15	65.38	68.62			3.06	0.72	.15	65.53		.005	38	.19					
9	65.37	15	65.57	68.79															
ES-2	28.00	15	28.40				10.18	3.48	1.61	30.01		.0411	190	7.80			.08		
8	35.80	15	36.28	42.39			4.34	2.55	.29	36.57		.005	40	.20			.01		
7	36.10	15	36.49	42.86			3.38	1.60	.18	36.67		.005	35	.18			.18		
6	36.38	15	36.85	39.90			8.25	0.80	1.06	37.91		.0765	170	13.00					
5	49.48	15	49.85	52.90															
ES-2	19.00	24	20.05				10.40	17.44	1.68	21.73		.0143	30	.43		.85			
4	19.43	24	21.33	26.18			7.76	5.88	0.94	22.27		.0143	40	.57			.05		
2	20.00	24	21.95	26.18			7.18	4.49	0.80	22.75		.0143	35	.50					
ES-2	20.50	24	22.45																
4	19.43	24	21.33	26.18			6.78	16.42	0.71	22.04		.005	100	.50	.72				
3	20.03	18	22.55	24.87			5.65	8.21	.50	23.05		.005	38	.19					
1	20.32	18	22.74	24.87															
ES-2	63.25	15	63.75				4.75	2.16	.35	64.10		.0071	115	.83			.02		
15	64.08	15	64.60	67.83			3.43	1.08	.18	64.78		.005	60	.30					
16	64.48	15	64.90	68.40															

STORM SEWER DESIGN

MH From	MH To	Area Ac.	C	A x C	Total Section A.R.	Total Trunk A.R.	Inten. D/Hr	Q CFS	Length of Pipe	Size Pipe in	Slope Ft/Ft	Fall in Feet	M.H. Drop	Invert Up Stream	Invert Down Stream	Actual Cap. CFS	Vel FPS	Time Sect Min	Time Accum Min	ENTRY TIME Min
1	3	1.27	.90	1.14			7.2	8.21	38	18	.005	.19		20.32	20.13	9.44	5.65	.11	.61	.5
3	4	1.27	.90	1.14	2.28	2.28	7.2	16.42	100	24	.005	.50	.10	20.03	19.53	20.34	6.78	.25	.86	
ES-2	2	3.82	.25	.96			4.7	4.49	35	24	.0143	.50		20.50	20.00	34.39	7.18	.08	24.58	24.5
2	4	.32	.90	.29	1.25	1.25	4.7	5.88	40	24	.0143	.57		20.00	19.43	34.39	7.76	.09	24.67	
4	ES-2	.25	.90	.18	3.71	3.71	4.7	17.44	30	24	.0143	.43		19.43	19.00	34.39	10.40	.05	24.72	
5	6	.21	.57	.12			6.7	0.80	170	15	.0765	13.00		49.48	36.48	22.71	8.25	.34	7.34	7.0
6	7	.21	.57	.12	.24	.24	6.7	1.60	35	15	.005	.18	.10	36.38	36.20	5.81	3.38	.17	7.51	
7	8	.16	.90	.14	.38	.38	6.7	2.55	40	15	.005	.20	.10	36.10	35.90	5.81	4.34	.15	7.66	
8	ES-2	.16	.90	.14	.52	.52	6.7	3.48	190	15	.0411	7.80	.10	35.80	28.00	16.65	10.18	.31	7.97	
9	10	.11	.90	.10			7.2	0.72	38	15	.005	.19		65.37	65.18	5.81	3.06	.21	.71	.5
10	ES-2	.11	.90	.10	.20	.20	7.2	1.44	190	15	.1215	23.08	.10	65.08	42.00	28.63	11.57	.27	.98	
11	12	.09	.90	.08			7.2	0.58	38	15	.005	.19		68.21	68.02	5.81	2.87	.22	.72	.5
12	ES-2	.09	.90	.08	.16	.16	7.2	1.16	155	15	.0898	13.92	.10	67.92	54.00	24.61	9.76	.26	.96	
ES-2	13	5.69	.34	1.93			4.4	8.51	80	18	.015	1.20		63.00	61.80	16.36	8.85	.15	21.15	21
13	14	.37	.90	.33	2.26	2.26	4.4	9.94	38	18	.015	.57	.10	61.70	61.13	16.36	9.17	.07	21.22	
14	ES-2	.37	.90	.33	2.59	2.59	4.4	11.40	75	18	.037	1.03	.10	61.03	60.00	15.63	9.10	.14	21.36	
16	15	.23	.65	.15			7.2	1.08	60	15	.005	.30		64.48	64.18	5.81	3.43	.29	1.29	1.0
15	ES-2	.23	.65	.15	.30	.30	7.2	2.16	115	15	.007	.83		64.08	63.25	6.97	4.75	.40	1.69	

Greensprings Plantation Resort - Phase I
SP-13-94

SUBDIV — $15,000
EOS — $9,000

LAKE A PC060 28.0% impervious (7.85 ac)
Wet Pond 50% removal

DA 28 AC.

Routed 2 - 17 cfs
10 - 23 cfs

10YR-1HR DHW 29.77
WQV = 1.23 AC-FT
SKPV - NO

Greensprings Assoc
4029 Ironbound Rd
Suite 200
Wmsbg VA 23188

Greensprings Assoc.
C/O Sunterra Resorts
6000 Foster Circle
Wmsb 23188

EOS Notes on Sheet C12 did not require AB or CC

Comm #3 Div Code Compl Feb 17, 1994 " as built drawings & engineer cert must be provided for the det basin upon completion. Response: others/developer

I/M Agreement needed per Comm #2 Feb 17 1994 (CAN'T FIND)

WILLIAMSBURG
ENVIRONMENTAL
GROUP, INC.

Environmental Consultants

Greensprings Lake A
Hydrologic/Hydraulic Computations

PC060

516-B South Henry Street Williamsburg, Virginia 23185 (804) 220-6869 FAX (804) 229-4507

Time of Concentration Computations

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 14:14:08 07-16-1994 c:\pondpack\GSA.TCT

Greensprings Lake A

? COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		1	
Surface description		Woods	
Manning's roughness coeff., n		0.6000	
Flow length, L (total < or = 300)	ft	300.0	
Two-yr 24-hr rainfall, P2	in	3.600	
Land slope, s	ft/ft	0.0330	
$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$	hrs	0.92	= 0.92

SHALLOW CONCENTRATED FLOW

Segment ID		2	
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	800.0	
Watercourse slope, s	ft/ft	0.0313	
$Avg.V = Csf * (s)^{0.5}$	ft/s	2.8545	
where: Unpaved Csf = 16.1345			
Paved Csf = 20.3282			
T = L / (3600*V)	hrs	0.08	= 0.08

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	0.00	
Wetted perimeter, Pw	ft	0.00	
Hydraulic radius, r = a/Pw	ft	0.000	
Channel slope, s	ft/ft	0.0000	
Manning's roughness coeff., n		0.0000	
$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$	ft/s	0.0000	
Flow length, L	ft	0	
T = L / (3600*V)	hrs	0.00	= 0.00

TOTAL TIME (hrs) 1.00

Quick TR-55 Ver.5.44 S/N:1315400034
Executed: 14:14:08 07-16-1994 c:\pondpack\GSA.TCT

SUMMARY SHEET FOR Tc or Tt COMPUTATIONS
(Solved for Time using TR-55 Methods)

Greensprings Lake A

Subarea descr.	Tc or Tt	Time (hrs)
	?	1.00

Pre-development Hydrology Computations

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR2.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	28.00	72.0	1.00	0.00	3.50	1.12	I .22 .22

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 15 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
oods	1.00	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR2.HYD

Greensprings Pond A

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
woods	0	0	0	1	1	1	2	3	6
Total (cfs)	0	0	0	1	1	1	2	3	6

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
woods	9	11	14	15	15	11	9	7	5
Total (cfs)	9	11	14	15	15	11	9	7	5

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
woods	5	4	3	2	2	2	2	1	1
Total (cfs)	5	4	3	2	2	2	2	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
woods	1	1	1	1	0
Total (cfs)	1	1	1	1	0

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR10.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	28.00	72.0	1.00	0.00	5.80	2.83	I.13 .13

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 43 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
oods	1.00	0.00	**	**	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR10.HYD

Greensprings Pond A

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
woods	1	2	2	3	4	5	8	13	19
Total (cfs)	1	2	2	3	4	5	8	13	19

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
woods	27	34	39	43	38	29	22	17	13
Total (cfs)	27	34	39	43	38	29	22	17	13

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
woods	11	8	6	5	4	4	3	3	3
Total (cfs)	11	8	6	5	4	4	3	3	3

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
woods	3	2	2	2	0
Total (cfs)	3	2	2	2	0

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR100.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	28.00	72.0	1.00	0.00	8.00	4.69	I.1 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 73 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
woods	1.00	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
** Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:14:40
Watershed file: --> C:\PONDPACK\GSAPRE .MOP
Hydrograph file: --> C:\PONDPACK\GSAPR100.HYD

Greensprings Pond A

Composite Hydrograph Summary (cfs)

Subarea Description	11.0 hr	11.3 hr	11.6 hr	11.9 hr	12.0 hr	12.1 hr	12.2 hr	12.3 hr	12.4 hr
woods	2	3	4	6	7	10	15	23	34
otal (cfs)	2	3	4	6	7	10	15	23	34

Subarea Description	12.5 hr	12.6 hr	12.7 hr	12.8 hr	13.0 hr	13.2 hr	13.4 hr	13.6 hr	13.8 hr
woods	47	59	68	73	64	49	36	27	21
otal (cfs)	47	59	68	73	64	49	36	27	21

Subarea Description	14.0 hr	14.3 hr	14.6 hr	15.0 hr	15.5 hr	16.0 hr	16.5 hr	17.0 hr	17.5 hr
woods	17	13	10	8	7	6	5	5	4
otal (cfs)	17	13	10	8	7	6	5	5	4

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
woods	4	3	3	2	0
otal (cfs)	4	3	3	2	0

Post-development Hydrology Computations

Return Frequency: 2 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:15:06
Watershed file: --> C:\PONDPACK\GSAPST .MOP
Hydrograph file: --> C:\PONDPACK\GSAPS2.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	15.15	72.0	1.00	0.00	3.50	1.12	I.22 .22
Turf	5.00	74.0	1.00	0.00	3.50	1.24	I.2 .20
Impervious	7.85	98.0	0.10	0.00	3.50	3.27	I.01 .10

should be lower?

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 42 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	Input Values * Tt (hr)	Rounded Values Tc (hr)	Rounded Values * Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
woods	1.00	0.00	**	**	Yes	--
Turf	1.00	0.00	**	**	Yes	--
Impervious	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
* Tc & Tt are available in the hydrograph tables.

Return Frequency: 10 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:15:06
Watershed file: --> C:\PONDPACK\GSAPST .MOP
Hydrograph file: --> C:\PONDPACK\GSAPS10.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	15.15	72.0	1.00	0.00	5.80	2.83	I.13 .13
Turf	5.00	74.0	1.00	0.00	5.80	3.02	I.12 .12
Impervious	7.85	98.0	0.10	0.00	5.80	5.56	I.01 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 73 cfs

>>>> Computer Modifications of Input Parameters <<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
woods	1.00	0.00	**	**	Yes	--
Turf	1.00	0.00	**	**	Yes	--
Impervious	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
* Tc & Tt are available in the hydrograph tables.

Return Frequency: 100 years

TR-55 TABULAR HYDROGRAPH METHOD
Type II. Distribution
(24 hr. Duration Storm)

Executed: 07-16-1994 14:15:06
Watershed file: --> C:\PONDPACK\GSAPST .MOP
Hydrograph file: --> C:\PONDPACK\GSAPS100.HYD

Greensprings Pond A

>>>> Input Parameters Used to Compute Hydrograph <<<<

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
woods	15.15	72.0	1.00	0.00	8.00	4.69	I.1 .10
Turf	5.00	74.0	1.00	0.00	8.00	4.93	I.09 .10
Impervious	7.85	98.0	0.10	0.00	8.00	7.76	I.01 .10

* Travel time from subarea outfall to composite watershed outfall point.
I -- Subarea where user specified interpolation between Ia/p tables.

Total area = 28.00 acres or 0.04375 sq.mi
Peak discharge = 103 cfs

>>>> Computer Modifications of Input Parameters <<<<<

Subarea Description	Input Values Tc (hr)	* Tt (hr)	Rounded Values Tc (hr)	* Tt (hr)	Ia/p Interpolated (Yes/No)	Ia/p Messages
woods	1.00	0.00	**	**	No	Computed Ia/p < .1
Turf	1.00	0.00	**	**	No	Computed Ia/p < .1
Impervious	0.10	0.00	**	**	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.
* Tc & Tt are available in the hydrograph tables.

Post-development Outlet Structure Computations

POND-2 Version: 5.15
S/N: 1295100016

CALCULATED 07-16-1994 14:44:07
DISK FILE: c:\pondpack\GSA1 .VOL

Planimeter scale: 1 inch = 1 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
18.50	5,808.00	0.13	0.00	0.00	0.00
19.00	7,000.00	0.16	0.44	0.07	0.07
20.00	8,192.00	0.19	0.52	0.17	0.25
24.00	*I*	0.31	0.74	0.98	1.23
25.00	14,890.00	0.34	0.78	1.31	1.55
28.00	19,626.00	0.45	1.18	1.18	2.74
29.00	19,626.00	0.45	1.35	0.45	3.19
30.00	19,626.00	0.45	1.35	0.45	3.64

I ---> Interpolated area from closest two planimeter readings.

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

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

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

Elevation (ft)	Q (cfs)	Contributing Structures
22.00	0.0	
22.20	0.0	
22.40	0.0	
22.60	0.0	
22.80	0.0	
23.00	0.0	
23.20	0.0	
23.40	0.0	
23.60	0.0	
23.80	0.0	
24.00	0.0	1
24.20	1.9	1
24.40	5.3	1
24.60	9.7	1
24.80	13.5	1
25.00	15.1	1
25.20	15.8	2
25.40	16.4	2
25.60	16.8	2
25.80	17.3	2
26.00	17.7	2
26.20	18.2	2
26.40	18.6	2
26.60	19.0	2
26.80	19.4	2
27.00	19.8	2
27.20	20.2	2
27.40	20.6	2
27.60	21.0	2
27.80	21.3	2
28.00	21.7	2
28.20	22.1	2
28.40	22.4	2
28.60	22.7	2
28.80	23.1	2
29.00	23.4	2 +4
29.20	28.2	2 +4
29.40	36.7	2 +4
29.60	47.6	2 +4
29.80	60.5	2 +4
30.00	87.0	1 +4

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outlet Structure File: c:\pondpack\GSA .STR
Planimeter Input File: c:\pondpack\GSA1 .VOL
Rating Table Output File: c:\pondpack\GSA .PND

Min. Elev.(ft) = 22 Max. Elev.(ft) = 30 Incr.(ft) = .2

Additional elevations (ft) to be included in table:
* *

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
STAND PIPE	1		->	1
CULVERT-CR	2	? 1	->	3
WEIR-VR	4		->	4

Outflow rating table summary was stored in file:
c:\pondpack\GSA .PND

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>>> Structure No. 1 <<<<<<
(Input Data)

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)? 24
E2 elev.(ft)? 30.001
Crest elev.(ft)? 24
Diameter (ft)? 2
Weir coefficient? 3.33
Orifice coefficient? .6
Start transition elev.(ft) @ ?
Transition height (ft)?

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>>> Structure No. 2 <<<<<<
(Input Data)

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	24
E2 elev.(ft)?	30
Diam. (ft)?	1.5
Inv. el.(ft)?	21
Slope (ft/ft)?	.01
T1 ratio?	
T2 ratio?	
K Coeff.?	.0098
M Coeff.?	2
c Coeff.?	.0398
Y Coeff.?	.67
Form 1 or 2?	1
Slope factor?	-.5

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>>> Structure No. 4 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)? 29
E2 elev.(ft)? 30.001
Weir coefficient? 3.33
Weir elev.(ft)? 29.0
Length (ft)? 15
Contracted/Suppressed (C/S)? S

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outflow Rating Table for Structure #1
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
22.00	0.0	E < Inv.El.= 24
22.20	0.0	E < El= 24
22.40	0.0	E < El= 24
22.60	0.0	E < El= 24
22.80	0.0	E < El= 24
23.00	0.0	E < El= 24
23.20	0.0	E < El= 24
23.40	0.0	E < El= 24
23.60	0.0	E < El= 24
23.80	0.0	E < El= 24
24.00	0.0	Weir: H =0.0
24.20	1.9	Weir: H =.2
24.40	5.3	Weir: H =.4
24.60	9.7	Weir: H =.6
24.80	13.5	Orifice: H =.8
25.00	15.1	Orifice: H =1.0
25.20	16.6	Orifice: H =1.2
25.40	17.9	Orifice: H =1.4
25.60	19.1	Orifice: H =1.6
25.80	20.3	Orifice: H =1.8
26.00	21.4	Orifice: H =2.0
26.20	22.4	Orifice: H =2.2
26.40	23.4	Orifice: H =2.4
26.60	24.4	Orifice: H =2.6
26.80	25.3	Orifice: H =2.8
27.00	26.2	Orifice: H =3.0
27.20	27.1	Orifice: H =3.2
27.40	27.9	Orifice: H =3.4
27.60	28.7	Orifice: H =3.6
27.80	29.5	Orifice: H =3.8
28.00	30.3	Orifice: H =4.0
28.20	31.0	Orifice: H =4.2

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #1
STAND PIPE Stand Pipe with weir or orifice flow

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
28.40	31.7	Orifice: H =4.4
28.60	32.4	Orifice: H =4.6
28.80	33.1	Orifice: H =4.8
29.00	33.8	Orifice: H =5.0
29.20	34.5	Orifice: H =5.2
29.40	35.2	Orifice: H =5.4
29.60	35.8	Orifice: H =5.6
29.80	36.4	Orifice: H =5.8
30.00	37.1	Orifice: H =6.0

Weir Cw = 3.33 Weir length = 6.283186 ft
Orifice Co = .6 Orifice area = 3.141593 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 24.72297 ft

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
22.00	0.0	E < E1=24
22.20	0.0	E < E1=24
22.40	0.0	E < E1=24
22.60	0.0	E < E1=24
22.80	0.0	E < E1=24
23.00	0.0	E < E1=24
23.20	0.0	E < E1=24
23.40	0.0	E < E1=24
23.60	0.0	E < E1=24
23.80	0.0	E < E1=24
24.00	12.5	Submerged: HW =3.0
24.20	13.2	Submerged: HW =3.2
24.40	13.7	Submerged: HW =3.4
24.60	14.3	Submerged: HW =3.6
24.80	14.8	Submerged: HW =3.8
25.00	15.4	Submerged: HW =4.0
25.20	15.8	Submerged: HW =4.2
25.40	16.4	Submerged: HW =4.4
25.60	16.8	Submerged: HW =4.6
25.80	17.3	Submerged: HW =4.8
26.00	17.7	Submerged: HW =5.0
26.20	18.2	Submerged: HW =5.2
26.40	18.6	Submerged: HW =5.4
26.60	19.0	Submerged: HW =5.6
26.80	19.4	Submerged: HW =5.8
27.00	19.8	Submerged: HW =6.0
27.20	20.2	Submerged: HW =6.2
27.40	20.6	Submerged: HW =6.4
27.60	21.0	Submerged: HW =6.6
27.80	21.3	Submerged: HW =6.8
28.00	21.7	Submerged: HW =7.0

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #2
CULVERT-CR Circular Culvert (With Inlet Control)

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
28.20	22.1	Submerged: HW =7.2
28.40	22.4	Submerged: HW =7.400
28.60	22.7	Submerged: HW =7.6
28.80	23.1	Submerged: HW =7.8
29.00	23.4	Submerged: HW =8.0
29.20	23.8	Submerged: HW =8.200
29.40	24.1	Submerged: HW =8.400
29.60	24.4	Submerged: HW =8.6
29.80	24.7	Submerged: HW =8.8
30.00	0.0	E = or > E2=30

Used Unsubmerged Equ. Form (1) for elev. less than 22.73 ft
Used Submerged Equation for elevations greater than 22.95 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=22.73 ft; Q1=7.58 cfs; Dc=1.07 ft; E2=22.95 ft; Q2=8.66 cfs

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
22.00	0.0	E < Inv.El.= 29
22.20	0.0	E < Inv.El.= 29
22.40	0.0	E < Inv.El.= 29
22.60	0.0	E < Inv.El.= 29
22.80	0.0	E < Inv.El.= 29
23.00	0.0	E < Inv.El.= 29
23.20	0.0	E < Inv.El.= 29
23.40	0.0	E < Inv.El.= 29
23.60	0.0	E < Inv.El.= 29
23.80	0.0	E < Inv.El.= 29
24.00	0.0	E < Inv.El.= 29
24.20	0.0	E < Inv.El.= 29
24.40	0.0	E < Inv.El.= 29
24.60	0.0	E < Inv.El.= 29
24.80	0.0	E < Inv.El.= 29
25.00	0.0	E < Inv.El.= 29
25.20	0.0	E < Inv.El.= 29
25.40	0.0	E < Inv.El.= 29
25.60	0.0	E < Inv.El.= 29
25.80	0.0	E < Inv.El.= 29
26.00	0.0	E < Inv.El.= 29
26.20	0.0	E < Inv.El.= 29
26.40	0.0	E < Inv.El.= 29
26.60	0.0	E < Inv.El.= 29
26.80	0.0	E < Inv.El.= 29
27.00	0.0	E < Inv.El.= 29
27.20	0.0	E < Inv.El.= 29
27.40	0.0	E < Inv.El.= 29
27.60	0.0	E < Inv.El.= 29
27.80	0.0	E < Inv.El.= 29
28.00	0.0	E < Inv.El.= 29
28.20	0.0	E < Inv.El.= 29
28.40	0.0	E < Inv.El.= 29
28.60	0.0	E < Inv.El.= 29

Outlet Structure File: GSA .STR

POND-2 Version: 5.15 S/N: 1295100016
Date Executed: Time Executed:

>>>>> CONTINUED from previous page <<<<<

Outflow Rating Table for Structure #4
WEIR-VR Weir - Vertical Rectangular

***** INLET CONTROL ASSUMED *****

Elevation (ft)	Q (cfs)	Computation Messages
28.80	0.0	E < Inv.El.= 29
29.00	0.0	H =0.0
29.20	4.5	H =.2
29.40	12.6	H =.4
29.60	23.2	H =.6
29.80	35.7	H =.8
30.00	50.0	H =1.0

C = 3.33 L (ft) = 15
H (ft) = Table elev. - Invert elev. (29 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Post-development Stormwater Routings

****
* *
* Greensprings *
* Lake A *
* Stormwater Routings *
* *
* *
****

Inflow Hydrograph: c:\pondpack\GSAPS2 .HYD
Rating Table file: c:\pondpack\GSA .PND

----INITIAL CONDITIONS----
Elevation = 24.00 ft
Outflow = 0.00 cfs
Storage = 1.23 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
22.00	0.0	0.679
22.20	0.0	0.728
22.40	0.0	0.779
22.60	0.0	0.830
22.80	0.0	0.884
23.00	0.0	0.938
23.20	0.0	0.993
23.40	0.0	1.050
23.60	0.0	1.109
23.80	0.0	1.168
24.00	0.0	1.229
24.20	1.9	1.291
24.40	5.3	1.355
24.60	9.7	1.419
24.80	13.5	1.486
25.00	15.1	1.553
25.20	15.8	1.622
25.40	16.4	1.693
25.60	16.8	1.765
25.80	17.3	1.838
26.00	17.7	1.912
26.20	18.2	1.988
26.40	18.6	2.066
26.60	19.0	2.145
26.80	19.4	2.225
27.00	19.8	2.307
27.20	20.2	2.390
27.40	20.6	2.475
27.60	21.0	2.561
27.80	21.3	2.649
28.00	21.7	2.738

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
164.2	164.2
176.2	176.2
188.4	188.4
201.0	201.0
213.8	213.8
227.0	227.0
240.4	240.4
254.2	254.2
268.3	268.3
282.7	282.7
297.4	297.4
312.4	314.3
327.8	333.1
343.5	353.2
359.5	373.0
375.9	391.0
392.6	408.4
409.7	426.1
427.0	443.8
444.7	462.0
462.8	480.5
481.2	499.4
499.9	518.5
519.0	538.0
538.4	557.8
558.2	578.0
578.4	598.6
598.9	619.5
619.8	640.8
641.0	662.3
662.6	684.3

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
28.20	22.1	2.828
28.40	22.4	2.918
28.60	22.7	3.008
28.80	23.1	3.099
29.00	23.4	3.189
29.20	28.2	3.279
29.40	36.7	3.369
29.60	47.6	3.459
29.80	60.5	3.549
30.00	87.0	3.639

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
684.4	706.5
706.2	728.6
728.1	750.8
749.9	773.0
771.7	795.1
793.5	821.7
815.3	852.0
837.1	884.7
858.9	919.4
880.7	967.7

Time increment (t) = 0.100 hrs.

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: c:\pondpack\GSA .PND
Inflow Hydrograph: c:\pondpack\GSAPS2 .HYD
Outflow Hydrograph: c:\pondpack\GSAS2O .HYD

Starting Pond W.S. Elevation = 24.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	42.00 cfs
Peak Outflow	=	16.96 cfs
Peak Elevation	=	25.66 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	1.23 ac-ft
Peak Storage From Storm	=	0.56 ac-ft
Total Storage in Pond	=	1.79 ac-ft

Warning: Inflow hydrograph truncated on left side.

****
* *
* Greensprings *
* Lake A *
* Stormwater Routings *
* *
* *
****

Inflow Hydrograph: c:\pondpack\GSAPS10 .HYD
Rating Table file: c:\pondpack\GSA .PND

----INITIAL CONDITIONS----
Elevation = 24.00 ft
Outflow = 0.00 cfs
Storage = 1.23 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
22.00	0.0	0.679	164.2	164.2
22.20	0.0	0.728	176.2	176.2
22.40	0.0	0.779	188.4	188.4
22.60	0.0	0.830	201.0	201.0
22.80	0.0	0.884	213.8	213.8
23.00	0.0	0.938	227.0	227.0
23.20	0.0	0.993	240.4	240.4
23.40	0.0	1.050	254.2	254.2
23.60	0.0	1.109	268.3	268.3
23.80	0.0	1.168	282.7	282.7
24.00	0.0	1.229	297.4	297.4
24.20	1.9	1.291	312.4	314.3
24.40	5.3	1.355	327.8	333.1
24.60	9.7	1.419	343.5	353.2
24.80	13.5	1.486	359.5	373.0
25.00	15.1	1.553	375.9	391.0
25.20	15.8	1.622	392.6	408.4
25.40	16.4	1.693	409.7	426.1
25.60	16.8	1.765	427.0	443.8
25.80	17.3	1.838	444.7	462.0
26.00	17.7	1.912	462.8	480.5
26.20	18.2	1.988	481.2	499.4
26.40	18.6	2.066	499.9	518.5
26.60	19.0	2.145	519.0	538.0
26.80	19.4	2.225	538.4	557.8
27.00	19.8	2.307	558.2	578.0
27.20	20.2	2.390	578.4	598.6
27.40	20.6	2.475	598.9	619.5
27.60	21.0	2.561	619.8	640.8
27.80	21.3	2.649	641.0	662.3
28.00	21.7	2.738	662.6	684.3

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
28.20	22.1	2.828
28.40	22.4	2.918
28.60	22.7	3.008
28.80	23.1	3.099
29.00	23.4	3.189
29.20	28.2	3.279
29.40	36.7	3.369
29.60	47.6	3.459
29.80	60.5	3.549
30.00	87.0	3.639

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
684.4	706.5
706.2	728.6
728.1	750.8
749.9	773.0
771.7	795.1
793.5	821.7
815.3	852.0
837.1	884.7
858.9	919.4
880.7	967.7

Time increment (t) = 0.100 hrs.

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: c:\pondpack\GSA .PND
Inflow Hydrograph: c:\pondpack\GSAPS10 .HYD
Outflow Hydrograph: c:\pondpack\GSAS10O .HYD

Starting Pond W.S. Elevation = 24.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	73.00 cfs
Peak Outflow	=	23.34 cfs
Peak Elevation	=	28.96 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	1.23 ac-ft
Peak Storage From Storm	=	1.94 ac-ft
Total Storage in Pond	=	3.17 ac-ft

Warning: Inflow hydrograph truncated on left side.

****
* *
* Greensprings *
* Lake A *
* Stormwater Routings *
* *
* *
****

Inflow Hydrograph: c:\pondpack\GSAPS100.HYD
Rating Table file: c:\pondpack\GSA .PND

----INITIAL CONDITIONS----
Elevation = 24.00 ft
Outflow = 0.00 cfs
Storage = 1.23 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
22.00	0.0	0.679
22.20	0.0	0.728
22.40	0.0	0.779
22.60	0.0	0.830
22.80	0.0	0.884
23.00	0.0	0.938
23.20	0.0	0.993
23.40	0.0	1.050
23.60	0.0	1.109
23.80	0.0	1.168
24.00	0.0	1.229
24.20	1.9	1.291
24.40	5.3	1.355
24.60	9.7	1.419
24.80	13.5	1.486
25.00	15.1	1.553
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25.40	16.4	1.693
25.60	16.8	1.765
25.80	17.3	1.838
26.00	17.7	1.912
26.20	18.2	1.988
26.40	18.6	2.066
26.60	19.0	2.145
26.80	19.4	2.225
27.00	19.8	2.307
27.20	20.2	2.390
27.40	20.6	2.475
27.60	21.0	2.561
27.80	21.3	2.649
28.00	21.7	2.738

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
164.2	164.2
176.2	176.2
188.4	188.4
201.0	201.0
213.8	213.8
227.0	227.0
240.4	240.4
254.2	254.2
268.3	268.3
282.7	282.7
297.4	297.4
312.4	314.3
327.8	333.1
343.5	353.2
359.5	373.0
375.9	391.0
392.6	408.4
409.7	426.1
427.0	443.8
444.7	462.0
462.8	480.5
481.2	499.4
499.9	518.5
519.0	538.0
538.4	557.8
558.2	578.0
578.4	598.6
598.9	619.5
619.8	640.8
641.0	662.3
662.6	684.3

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
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29.80	60.5	3.549
30.00	87.0	3.639

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2S/t (cfs)	2S/t + O (cfs)
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706.2	728.6
728.1	750.8
749.9	773.0
771.7	795.1
793.5	821.7
815.3	852.0
837.1	884.7
858.9	919.4
880.7	967.7

Time increment (t) = 0.100 hrs.

********** SUMMARY OF ROUTING COMPUTATIONS **********

Pond File: c:\pondpack\GSA .PND
Inflow Hydrograph: c:\pondpack\GSAPS100.HYD
Outflow Hydrograph: c:\pondpack\GSAS100O.HYD

Starting Pond W.S. Elevation = 24.00 ft

***** Summary of Peak Outflow and Peak Elevation *****

Peak Inflow	=	103.00 cfs
Peak Outflow	=	58.70 cfs
Peak Elevation	=	29.77 ft

***** Summary of Approximate Peak Storage *****

Initial Storage	=	1.23 ac-ft
Peak Storage From Storm	=	2.31 ac-ft
Total Storage in Pond	=	3.54 ac-ft

Warning: Inflow hydrograph truncated on left side.

GEOTECHNICAL NOTES:

GEOTECH NOTES

EXECUTIVE SUMMARY

ENGINEERING CONSULTING SERVICES, LTD (1900 MOUNTAIN ROAD, SUITE 100, GLEN ALLEN, VIRGINIA, 23060, (804) 266-5777), HAS COMPLETED A GEOTECHNICAL STUDY FOR THE PROPOSED DAM FOR THE STORMWATER MANAGEMENT POND TO BE CONSTRUCTED IN CONJUNCTION WITH GREENSPRINGS PLANTATION RESORT PHASE I IN JAMES CITY COUNTY, VIRGINIA. THIS INVESTIGATION WAS ACCOMPLISHED BY PERFORMING TWO SOIL BORINGS IN THE LOCATION OF THE DAM EMBANKMENT TO ASCERTAIN FOUNDATION BEARING QUALITY OF THE IN-SITU SOILS. A THIRD SHALLOW BORING WAS PERFORMED WITHIN THE IMPOUNDMENT AREA FROM WHICH SOIL FILL MAY BE EXCAVATED FOR DAM CONSTRUCTION.

THE RESULTS OF THE SOIL BORINGS INDICATE THE SHALLOWER 25 FEET DIRECTLY BELOW THE DAM'S CENTER CONSISTS OF SOFT AND COMPRESSIBLE FLUVIAL/ALLUVIAL SEDIMENT. THIS LAYER WAS ENCOUNTERED TO A DEPTH OF 10 FEET IN THE SHOULDER OF THE DAM. SOILS ENCOUNTERED WITHIN THE IMPOUNDMENT WERE PRIMARILY GRANULAR AND NOT WELL SUITED TO DAM CONSTRUCTION.

GROUNDWATER WAS ENCOUNTERED AT THE DAM SITE IN THE BOTTOM OF THE IMPOUNDMENT RAVINE. AT THE SHOULDER BORING LOCATION, GROUNDWATER WAS AT A DEPTH OF 2.5 FEET BELOW THE SURFACE. THEREFORE, DEWATERING AND DIVERTING OF WATER WILL BE OF CONCERN DURING CONSTRUCTION. FURTHERMORE, THE PRESENCE OF HEAVY ORGANICS AND HIGHLY PERMEABLE SANDS WITHIN THE RAVINE BOTTOM WILL REQUIRE UNDERCUTTING FROM BELOW THE DAM. THE USE OF A GEOTEXTILE LINER BELOW THE DAM TO HELP STABILIZE THE DAM FILL, AND CONSTRUCTION OF A KEY. DUE TO THE CONSOLIDATION SETTLEMENTS ANTICIPATED TO OCCUR WHEN THE WEIGHT OF THE DAM IS APPLIED TO THE SUBSURFACE SOIL, THE PROPOSED SPILLWAY SHOULD BE LOCATED TO THE SIDE OF THE IMPOUNDMENT.

THE RECOMMENDATIONS CONTAINED HEREIN WERE DEVELOPED FROM THE DATA OBTAINED IN THE SOIL TEST BORINGS WHICH INDICATE SUBSURFACE CONDITIONS AT THESE SPECIFIC LOCATIONS AT THE TIME OF THE EXPLORATION. SOIL CONDITIONS MAY VARY BETWEEN THE BORINGS. IF DURING THE COURSE OF CONSTRUCTION VARIATIONS APPEAR EVIDENT, THE GEOTECHNICAL ENGINEER SHOULD BE INFORMED SO THAT THE CONDITIONS CAN BE ADDRESSED.

THE PURPOSES OF THIS EXPLORATION WERE TO EXPLORE THE SOIL AND GROUNDWATER CONDITIONS AT THE SITE AND TO DEVELOP ENGINEERING RECOMMENDATIONS TO GUIDE DESIGN AND CONSTRUCTION PROCEDURES. THESE PURPOSES WERE ACCOMPLISHED BY DRILLING BORINGS TO EXPLORE THE SUBSURFACE SOILS AND GROUNDWATER CONDITIONS, PERFORMING A FIELD RECONNAISSANCE OF THE SITE TO EXPLORE THE QUALITY OF FILL SOILS AVAILABLE WITHIN THE IMPOUNDMENT, PERFORMING LABORATORY TESTS ON SELECTED REPRESENTATIVE SOIL SAMPLES FROM THE BORINGS TO EVALUATE PERTINENT ENGINEERING PROPERTIES, AND ANALYZING THE FIELD AND LABORATORY TEST RESULTS TO DEVELOP APPROPRIATE ENGINEERING RECOMMENDATIONS.

SOIL CONDITIONS

THE THREE SOIL BORINGS PERFORMED ON THIS SITE ENCOUNTERED VARIABLE SUBSURFACE SOIL CONDITIONS. NOTE SHOULD BE MADE OF THE ESTIMATED

DAM KEY

1. IN ORDER TO MINIMIZE SEEPAGE AND REMOVE HEAVY ORGANICS BELOW AROUND THE DAM, A KEY SHOULD BE CONSTRUCTED.

2. THE KEY SHOULD EXTEND TO A DEPTH OF AT LEAST 3 FEET BELOW THE EMBANKMENT RELATIVELY FLAT INTO THE SHOULDER OF THE DAM.

3. DEPENDING ON THE CHARACTER OF SOIL ENCOUNTERED IN THE KEY TF ADDITIONAL EXCAVATION TO REMOVE EXCESSIVELY POROUS SOILS (SANDS ORGANICS) MAY BE REQUIRED.

4. POTENTIALLY UNSUITABLE SOILS ARE IDENTIFIED AS THOSE WITH A CLASSIFICATION OF Pt, SM OR SP ON THE BORINGS LOGS.

5. THE KEY TRENCH SHOULD EXTEND TO A DEPTH APPROVED BY THE GE ENGINEER.

6. THE KEY SHOULD EXTEND HORIZONTALLY INTO THE RAVINE SHOULDERS DISTANCE OF AT LEAST 10 FEET.

7. THE KEY SHOULD BE CONSTRUCTED UP AND DOWN STREAM TO POINTS THE UP AND DOWN STREAM FACES OF THE DAM. MATERIAL USED TO CO KEY SHOULD CONSIST OF A NON-EXPANSIVE MATERIAL CLASSIFIED AS ML, SC WITH AT LEAST 35% BY WEIGHT SILT OR CLAY. IT APPEARS MATERIAL FOR USE IN KEY CONSTRUCTION IS NOT AVAILABLE IN ABUNDANCE WITHIN T IMPOUNDMENT EXCAVATION.

DAM CORE AND COVER

1. DAM CORE TO BE PLACED UPON SUCCESSFUL COMPLETION OF FOUND PREPARATION AND KEY CONSTRUCTION.

2. CORE SHALL BE CONSTRUCTED WITH A BASE ELEVATION AT OR BELOV ELEVATION OF THE SPILLWAY CONDUIT.

3. THE DAM FOUNDATION SHOULD BE SCARIFIED TO A DEPTH OF 6 OR 8 TO PLACEMENT OF THE FIRST LIFT OF CORE MATERIAL.

4. THE CORE SHOULD BE CONSTRUCTED OF THE SAME MATERIAL UTILIZED

5. THE TOP OF THE CORE SHOULD BE POSITIONED AT LEAST AS HIGH A FLOOD ELEVATION WITH A MINIMUM CREST WIDTH OF 10 FEET AND MAXIMUM SLOPES OF 1 VERTICAL TO 1 HORIZONTAL.

GROUNDWATER AND SEEPAGE CONTROL

1. SURFICIAL FLOWS MIGHT BE ATTAINED BY TEMPORARY BERMS AND DAMS UPSTREAM OF THE WORK AREA.

2. IT IS ANTICIPATED THAT STAGED EXCAVATION SUPPORTED BY DEWATERI OF SUBSTANTIAL CAPACITY WILL BE REQUIRED TO ACCOMPLISH THE UNDER(BELOW GRADE.

3. IT SHOULD BE INCUMBENT ON THE CONTRACTOR TO PROVIDE DEWATER APPROPRIATE METHODS AND TO HAVE THESE METHODS APPROVED BY THE PRIOR TO CONSTRUCTION.

MAY BE EXCAVATED FOR DAM CONSTRUCTION.

THE RESULTS OF THE SOIL BORINGS INDICATE THE SHALLOWER 25 FEET DIRECTLY BELOW THE DAM'S CENTER CONSISTS OF SOFT AND COMPRESSIBLE FLUVIAL/ALLUVIAL SEDIMENT. THIS LAYER WAS ENCOUNTERED TO A DEPTH OF 10 FEET IN THE SHOULDER OF THE DAM. SOILS ENCOUNTERED WITHIN THE IMPOUNDMENT WERE PRIMARILY GRANULAR AND NOT WELL SUITED TO DAM CONSTRUCTION.

GROUNDWATER WAS ENCOUNTERED AT THE DAM SITE IN THE BOTTOM OF THE IMPOUNDMENT RAVINE. AT THE SHOULDER BORING LOCATION, GROUNDWATER WAS AT A DEPTH OF 2.5 FEET BELOW THE SURFACE. THEREFORE, DEWATERING AND DIVERTING OF WATER WILL BE OF CONCERN DURING CONSTRUCTION. FURTHERMORE, THE PRESENCE OF HEAVY ORGANICS AND HIGHLY PERMEABLE SANDS WITHIN THE RAVINE BOTTOM WILL REQUIRE UNDERCUTTING FROM BELOW THE DAM. THE USE OF A GEOTEXTILE LINER BELOW THE DAM TO HELP STABILIZE THE DAM FILL, AND CONSTRUCTION OF A KEY. DUE TO THE CONSOLIDATION SETTLEMENTS ANTICIPATED TO OCCUR WHEN THE WEIGHT OF THE DAM IS APPLIED TO THE SUBSURFACE SOIL, THE PROPOSED SPILLWAY SHOULD BE LOCATED TO THE SIDE OF THE IMPOUNDMENT.

THE RECOMMENDATIONS CONTAINED HEREIN WERE DEVELOPED FROM THE DATA OBTAINED IN THE SOIL TEST BORINGS WHICH INDICATE SUBSURFACE CONDITIONS AT THESE SPECIFIC LOCATIONS AT THE TIME OF THE EXPLORATION. SOIL CONDITIONS MAY VARY BETWEEN THE BORINGS. IF DURING THE COURSE OF CONSTRUCTION VARIATIONS APPEAR EVIDENT, THE GEOTECHNICAL ENGINEER SHOULD BE INFORMED SO THAT THE CONDITIONS CAN BE ADDRESSED.

THE PURPOSES OF THIS EXPLORATION WERE TO EXPLORE THE SOIL AND GROUNDWATER CONDITIONS AT THE SITE AND TO DEVELOP ENGINEERING RECOMMENDATIONS TO GUIDE DESIGN AND CONSTRUCTION PROCEDURES. THESE PURPOSES WERE ACCOMPLISHED BY DRILLING BORINGS TO EXPLORE THE SUBSURFACE SOILS AND GROUNDWATER CONDITIONS, PERFORMING A FIELD RECONNAISSANCE OF THE SITE TO EXPLORE THE QUALITY OF FILL SOILS AVAILABLE WITHIN THE IMPOUNDMENT, PERFORMING LABORATORY TESTS ON SELECTED REPRESENTATIVE SOIL SAMPLES FROM THE BORINGS TO EVALUATE PERTINENT ENGINEERING PROPERTIES, AND ANALYZING THE FIELD AND LABORATORY TEST RESULTS TO DEVELOP APPROPRIATE ENGINEERING RECOMMENDATIONS.

SOIL CONDITIONS

THE THREE SOIL BORINGS PERFORMED ON THIS SITE ENCOUNTERED VARIABLE SUBSURFACE SOIL CONDITIONS. NOTE SHOULD BE MADE OF THE ESTIMATED ELEVATIONS ON THE BORING LOGS.

NEAR THE CENTER OF THE DAM, SOFT AND HIGHLY ORGANIC SEDIMENTS WERE ENCOUNTERED AS DEEP AS ABOUT 24 FEET. THESE SEDIMENTS LIKELY FILLED A DEEPLY ERODED V SHAPED RAVINE. ON THE SHOULDERS OF THE DAM, THESE SEDIMENTS TAPER UP TO ABOUT A 6 FOOT DEPTH. SOILS AT SHALLOW DEPTHS WITHIN THE IMPOUNDMENT ARE CONTAMINATED WITH ORGANICS TO A DEPTH OF ABOUT 8 FEET. SOILS UNDERLYING THESE MATERIALS CONSIST PRIMARILY OF SANDS.

GROUNDWATER OBSERVATIONS

AT THE DAM SITE, GROUNDWATER WAS ENCOUNTERED AT THE SURFACE IN THE BOTTOM OF THE RAVINE (APPROXIMATELY ELE. 25 FT.). THE BORINGS INDICATED THAT GROUNDWATER ELEVATIONS INTO THE SHOULDERS OF THE RAVINE GENERALLY RISE, THIS DUE TO THE HIGH HYDRAULIC GRADIENT ASSOCIATED WITH THE SITE'S CONTOUR.

GROUNDWATER IN BORING B-1 WAS ENCOUNTERED AT ELEVATION 21.5 FEET. GROUNDWATER IN B-2 WAS OBSERVED AT ELEVATION 23.7 FEET WITHIN A RELATIVELY POROUS SAND LAYER. GROUNDWATER IN B-3 WAS OBSERVED AT ELEVATION 23.6 FEET. IT APPEARS THAT THE EXCAVATION ON THIS SITE WILL THEREFORE ENCOUNTER FREE FLOWING WATER. BASED ON THIS, IT IS ESTIMATED THAT THE GROUNDWATER TABLE EXTENDS INTO THE RAVINE SHOULDERS FROM THE CREEK SURFACE AT A GRADE OF ROUGHLY 1 VERTICAL TO 8 HORIZONTAL.

BASED ON THE RESULTS OF THE GEOTECHNICAL EXPLORATION AND ANALYSIS, IT DOES NOT APPEAR THAT SUFFICIENT SOIL OF ACCEPTABLE QUALITY WILL BE AVAILABLE FROM THE IMPOUNDMENT EXCAVATION TO CONSTRUCTION THE DAM. THIS IS DUE TO THE SOIL'S HIGH PERMEABILITY AND ORGANIC CONTENT. HOWEVER, SUITABLE SOILS DO EXIST WITHIN THE SURROUNDING DEVELOPMENT TO ALLOW FOR CONSTRUCTION OF A CORE WITH ON SITE MATERIAL USED AS COVER, OR TO CONSTRUCT THE ENTIRE DAM FROM IMPORTED SUITABLE MATERIAL.

ANALYSIS AND RECOMMENDATIONS

FOUNDATION PREPARATION

1. ORGANIC MATERIALS SHALL BE REMOVED FROM BELOW THE DAM TO A DEPTH OF AT LEAST 3 FEET BELOW THE EXISTING GRADES AND EXTENDING AT LEAST 10 FEET HORIZONTALLY INTO THE STABLE RAVINE SIDE SLOPE SOILS. ADDITIONAL EXCAVATION BELOW THIS 3 FOOT DEPTH MAY BE REQUIRED TO REMOVE POCKETS OF HIGHLY ORGANIC MATERIAL.

2. PROVISIONS FOR DEWATERING SHALL BE MADE. EXCESSIVELY SOFT SOILS SHALL BE REMOVED FROM UNDERNEATH DAM EMBANKMENT.

3. THE GEOTECHNICAL ENGINEER SHOULD BE PRESENT ON SITE TO OBSERVE THE EXCAVATION OPERATIONS AND ASSURE THAT A SUITABLE CUT HAS BEEN ACCOMPLISHED. UNDERCUTTING BELOW THE CENTER OF THE DAM WILL BE MOST CRITICAL, AND THE ENGINEER SHOULD BE ALLOWED TO DIRECT THIS EFFORT.

4. ONCE APPROVED, THE DAM SUBGRADE WITHIN THE EXISTING CREEK BOTTOM AREA SHOULD BE COVERED WITH A GEOTEXTILE MATERIAL SUCH AS TENSAR SS-1. AS AN ALTERNATE, A MEDIUM DUTY, NON-WOVEN FABRIC COULD BE EMPLOYED. DUE TO THE POTENTIAL FOR SEEPAGE PLANES TO DEVELOP ON THIS MATERIAL, ITS PLACEMENT SHOULD BE OBSERVED FULL TIME BY THE GEOTECHNICAL ENGINEER.

5. UPON REVIEW BY THE SOILS ENGINEER, THE EXCAVATION CAN BE BACKFILLED UTILIZING AN APPROVED BACKFILL MATERIAL. SUCH A MATERIAL SHOULD CONSIST OF

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DAM CORE AND COVER

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GROUNDWATER AND SEEPAG

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RAVINE BOTTOM WILL REQUIRE UNDERCUTTING FROM BELOW THE DAM. THE USE OF A GEOTEXTILE LINER BELOW THE DAM TO HELP STABILIZE THE DAM FILL, AND CONSTRUCTION OF A KEY. DUE TO THE CONSOLIDATION SETTLEMENTS ANTICIPATED TO OCCUR WHEN THE WEIGHT OF THE DAM IS APPLIED TO THE SUBSURFACE SOIL, THE PROPOSED SPILLWAY SHOULD BE LOCATED TO THE SIDE OF THE IMPOUNDMENT.

THE RECOMMENDATIONS CONTAINED HEREIN WERE DEVELOPED FROM THE DATA OBTAINED IN THE SOIL TEST BORINGS WHICH INDICATE SUBSURFACE CONDITIONS AT THESE SPECIFIC LOCATIONS AT THE TIME OF THE EXPLORATION. SOIL CONDITIONS MAY VARY BETWEEN THE BORINGS. IF DURING THE COURSE OF CONSTRUCTION VARIATIONS APPEAR EVIDENT, THE GEOTECHNICAL ENGINEER SHOULD BE INFORMED SO THAT THE CONDITIONS CAN BE ADDRESSED.

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GROUNDWATER IN BORING B-1 WAS ENCOUNTERED AT ELEVATION 21.5 FEET. GROUNDWATER IN B-2 WAS OBSERVED AT ELEVATION 23.7 FEET WITHIN A RELATIVELY POROUS SAND LAYER. GROUNDWATER IN B-3 WAS OBSERVED AT ELEVATION 23.6 FEET. IT APPEARS THAT THE EXCAVATION ON THIS SITE WILL THEREFORE ENCOUNTER FREE FLOWING WATER. BASED ON THIS, IT IS ESTIMATED THAT THE GROUNDWATER TABLE EXTENDS INTO THE RAVINE SHOULDERS FROM THE CREEK SURFACE AT A GRADE OF ROUGHLY 1 VERTICAL TO 8 HORIZONTAL.

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ANALYSIS AND RECOMMENDATIONS

FOUNDATION PREPARATION

1. ORGANIC MATERIALS SHALL BE REMOVED FROM BELOW THE DAM TO A DEPTH OF AT LEAST 3 FEET BELOW THE EXISTING GRADES AND EXTENDING AT LEAST 10 FEET HORIZONTALLY INTO THE STABLE RAVINE SIDE SLOPE SOILS. ADDITIONAL EXCAVATION BELOW THIS 3 FOOT DEPTH MAY BE REQUIRED TO REMOVE POCKETS OF HIGHLY ORGANIC MATERIAL.

2. PROVISIONS FOR DEWATERING SHALL BE MADE. EXCESSIVELY SOFT SOILS SHALL BE REMOVED FROM UNDERNEATH DAM EMBANKMENT.

3. THE GEOTECHNICAL ENGINEER SHOULD BE PRESENT ON SITE TO OBSERVE THE EXCAVATION OPERATIONS AND ASSURE THAT A SUITABLE CUT HAS BEEN ACCOMPLISHED. UNDERCUTTING BELOW THE CENTER OF THE DAM WILL BE MOST CRITICAL, AND THE ENGINEER SHOULD BE ALLOWED TO DIRECT THIS EFFORT.

4. ONCE APPROVED, THE DAM SUBGRADE WITHIN THE EXISTING CREEK BOTTOM AREA SHOULD BE COVERED WITH A GEOTEXTILE MATERIAL SUCH AS TENSAR SS-1. AS AN ALTERNATE, A MEDIUM DUTY, NON-WOVEN FABRIC COULD BE EMPLOYED. DUE TO THE POTENTIAL FOR SEEPAGE PLANES TO DEVELOP ON THIS MATERIAL, ITS PLACEMENT SHOULD BE OBSERVED FULL TIME BY THE GEOTECHNICAL ENGINEER.

5. UPON REVIEW BY THE SOILS ENGINEER, THE EXCAVATION CAN BE BACKFILLED UTILIZING AN APPROVED BACKFILL MATERIAL. SUCH A MATERIAL SHOULD CONSIST OF A SOIL CLASSIFIED AS SM, SC, ML, OR CL CONTAINING AT LEAST 35% BY WEIGHT FINES (SILT OR CLAY) AND HAVING A MAXIMUM PLASTICITY INDEX (PI) OF 30%.

6. THE FILL SHOULD BE COMPACTED IN MAXIMUM 8 INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). IN ORDER TO ATTAIN THIS COMPACTION, IT WILL BE NECESSARY TO EMPLOY HEAVY COMPACTION EQUIPMENT IN THE BASE OF THE CUT.

7. THE CONTRACTOR SHOULD BE PREPARED TO PROVIDE METHODS NECESSARY TO ATTAIN ADEQUATE DEWATERING AND EXCAVATION STABILITY.

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FOR USE IN KEY CONSTRUCTION IS NOT AVAILABLE IN ABUNDANCE WITHIN THE IMPOUNDMENT EXCAVATION.

DAM CORE AND COVER

1. DAM CORE TO BE PLACED UPON SUCCESSFUL COMPLETION OF FOUNDATION PREPARATION AND KEY CONSTRUCTION.

2. CORE SHALL BE CONSTRUCTED WITH A BASE ELEVATION AT OR BELOW THE INVERT ELEVATION OF THE SPILLWAY CONDUIT.

3. THE DAM FOUNDATION SHOULD BE SCARIFIED TO A DEPTH OF 6 OR 8 INCHES PRIOR TO PLACEMENT OF THE FIRST LIFT OF CORE MATERIAL.

4. THE CORE SHOULD BE CONSTRUCTED OF THE SAME MATERIAL UTILIZED IN THE KEY.

5. THE TOP OF THE CORE SHOULD BE POSITIONED AT LEAST AS HIGH AS THE 100 YEAR FLOOD ELEVATION WITH A MINIMUM CREST WIDTH OF 10 FEET AND MAXIMUM SIDE SLOPES OF 1 VERTICAL TO 1 HORIZONTAL.

GROUNDWATER AND SEEPAGE CONTROL

1. SURFICIAL FLOWS MIGHT BE ATTAINED BY TEMPORARY BERMS AND DAMS UPSTREAM OF THE WORK AREA.

2. IT IS ANTICIPATED THAT STAGED EXCAVATION SUPPORTED BY DEWATERING PUMPS OF SUBSTANTIAL CAPACITY WILL BE REQUIRED TO ACCOMPLISH THE UNDERCUTS BELOW GRADE.

3. IT SHOULD BE INCUMBENT ON THE CONTRACTOR TO PROVIDE DEWATERING BY APPROPRIATE METHODS AND TO HAVE THESE METHODS APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION.

4. ONCE THE EMBANKMENT BASE ELEVATIONS HAVE BEEN ESTABLISHED WITH THE EMBANKMENT UNDERCUT AND KEY CONSTRUCTION COMPLETE, THE PRINCIPAL SPILLWAY RISER AND CONDUIT CAN BE INSTALLED AND THE WATER COURSE DIVERTED THROUGH IT.

PRINCIPAL SPILLWAY PIPE AND HEADWALL FOUNDATIONS

1. FOUNDATIONS SHALL BE PROVIDED WITH AT LEAST A 12 INCH LAYER OF CRUSHER RUN PLACED AND COMPACTED UNDER DRY CONDITIONS TO ESTABLISH A WORKING BASE. AS AN ALTERNATE, A LEAN CONCRETE COULD BE USED BELOW THE FOUNDATIONS AND SPILLWAY CONDUIT TO SERVE AS A WORKING MAT.

2. IN ORDER TO MINIMIZE INSTABILITY OF FOUNDATION STRUCTURES UNDER WET, POSSIBLY HYDROSTATIC CONDITIONS, FOUNDATIONS SHOULD BE PROVIDED WITH A MINIMUM WIDTH OF 3 FEET. SETTLEMENTS OF STRUCTURES BEARING WITHIN THE EMBANKMENT FILLS WILL VARY.

3. TOTAL SETTLEMENTS WITHIN THE CENTER OF THE DAM COULD APPROACH THREE (3) INCHES. SETTLEMENTS SHOULD DIMINISH UP AND DOWNSTREAM AND TOWARD THE SHOULDERS OF THE DAM.

EROSION CONTROL AND MAINTENANCE

1. SLOPE PROTECTION TO BE DETAINED BY SEEDING WITH HEAVY GRASS.

2. IF CONSTRUCTION OCCURS DURING A PERIOD NOT CONDUCIVE TO RAPID VEGETATIVE GROWTH, A TEMPORARY SYNTHETIC STABILIZATION MATTING WILL BE USED TO COVER THE SLOPE.

3. NO TREES SHALL BE PLANTED ON DAM EMBANKMENTS.

4. ROUTINE MAINTENANCE SHOULD BE PROVIDED FOR THE DAMS. THIS SHOULD INCLUDE ANNUAL INSPECTIONS FOR REMOVAL OF BUSHES AND TREES, FILLING OF ANIMAL BURROWS, INSPECTION FOR SURFACE EROSION OR VERTICAL CRACKS IN THE EMBANKMENT, ETC.

5. THE TOE DRAIN AND STILLING BASIN SHOULD BE INSPECTED FOR EROSION AND LOSS OF RIP RAP, SEEPAGE BEYOND THE TOE DRAIN, OR INCREASED FLOW OR MOVEMENT OF FINES THROUGH THE DRAINS.

CONSTRUCTION CONTROL

1. THE BASES OF ALL EXCAVATIONS SHOULD INSPECTED BY THE SOILS ENGINEER PRIOR TO PLACEMENT OF FILL OR CONCRETE.

2. WHERE UNSTABLE MATERIAL OR CONDITIONS ARE ENCOUNTERED, THEY SHOULD BE TREATED AT HIS DIRECTION.

3. A REPRESENTATIVE OF THE SOILS ENGINEER SHOULD BE ON SITE FULL TIME DURING THE EARTHWORK PHASES SUCH THAT THE NECESSARY TESTS AND INSPECTIONS CAN BE PERFORMED IN AN EXPEDITIOUS MANNER.

4. ALL FILL SHOULD BE PLACED AND COMPACTED TO A DRY DENSITY OF AT LEAST 95% OF THAT SOIL'S STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). THE COMPACTION SHOULD BE ACCOMPLISHED BY PLACING THE FILL IN 6 TO 10 INCH LOOSE LIFTS AND MECHANICALLY COMPACTING EACH LIFT TO THE REQUIRED DENSITY PRIOR TO PLACEMENT OF SUBSEQUENT LIFTS.

5. AT LEAST A 5 TON SHEEPSFOOT ROLLER SHOULD BE EMPLOYED TO ATTAIN COMPACTION OF MORE COHESIVE KEY AND CORE MATERIALS.

6. SILTY SANDS SHOULD BE COMPACTED USING SMOOTH DRUM ROLLERS.

7. HAND OPERATED EQUIPMENT SHOULD BE EMPLOYED AROUND AND IMMEDIATELY ABOVE PIPES AND FOUNDATIONS.

LEN.

ER

TION

DAM KEY

1. IN ORDER TO MINIMIZE SEEPAGE AND REMOVE HEAVY ORGANICS BELOW AND AROUND THE DAM, A KEY SHOULD BE CONSTRUCTED.

2. THE KEY SHOULD EXTEND TO A DEPTH OF AT LEAST 3 FEET BELOW THE BOTTOM OF THE EMBANKMENT RELATIVELY FLAT INTO THE SHOULDER OF THE DAM.

3. DEPENDING ON THE CHARACTER OF SOIL ENCOUNTERED IN THE KEY TRENCH, ADDITIONAL EXCAVATION TO REMOVE EXCESSIVELY POROUS SOILS (SANDS OR ORGANICS) MAY BE REQUIRED.

4. POTENTIALLY UNSUITABLE SOILS ARE IDENTIFIED AS THOSE WITH A CLASSIFICATION OF Pt, SM OR SP ON THE BORINGS LOGS.

5. THE KEY TRENCH SHOULD EXTEND TO A DEPTH APPROVED BY THE GEOTECHNICAL ENGINEER.

6. THE KEY SHOULD EXTEND HORIZONTALLY INTO THE RAVINE SHOULDERS AT A DISTANCE OF AT LEAST 10 FEET.

7. THE KEY SHOULD BE CONSTRUCTED UP AND DOWN STREAM TO POINTS 10 FEET FROM THE UP AND DOWN STREAM FACES OF THE DAM. MATERIAL USED TO CONSTRUCT THE KEY SHOULD CONSIST OF A NON-EXPANSIVE MATERIAL CLASSIFIED AS ML, CL, SM, OR SC WITH AT LEAST 35% BY WEIGHT SILT OR CLAY. IT APPEARS MATERIAL SUITABLE FOR USE IN KEY CONSTRUCTION IS NOT AVAILABLE IN ABUNDANCE WITHIN THE IMPOUNDMENT EXCAVATION.

DAM CORE AND COVER

1. DAM CORE TO BE PLACED UPON SUCCESSFUL COMPLETION OF FOUNDATION PREPARATION AND KEY CONSTRUCTION.

2. CORE SHALL BE CONSTRUCTED WITH A BASE ELEVATION AT OR BELOW THE INVERT ELEVATION OF THE SPILLWAY CONDUIT.

3. THE DAM FOUNDATION SHOULD BE SCARIFIED TO A DEPTH OF 6 OR 8 INCHES PRIOR TO PLACEMENT OF THE FIRST LIFT OF CORE MATERIAL.

4. THE CORE SHOULD BE CONSTRUCTED OF THE SAME MATERIAL UTILIZED IN THE KEY.

5. THE TOP OF THE CORE SHOULD BE POSITIONED AT LEAST AS HIGH AS THE 100 YEAR FLOOD ELEVATION WITH A MINIMUM CREST WIDTH OF 10 FEET AND MAXIMUM SIDE SLOPES OF 1 VERTICAL TO 1 HORIZONTAL.

GROUNDWATER AND SEEPAGE CONTROL

1. SURFICIAL FLOWS MIGHT BE ATTAINED BY TEMPORARY BERMS AND DAMS UPSTREAM OF THE WORK AREA.

2. IT IS ANTICIPATED THAT STAGED EXCAVATION SUPPORTED BY DEWATERING PUMPS OF SUBSTANTIAL CAPACITY WILL BE REQUIRED TO ACCOMPLISH THE UNDERCUTS BELOW GRADE.

3. IT SHOULD BE INCUMBENT ON THE CONTRACTOR TO PROVIDE DEWATERING BY APPROPRIATE METHODS AND TO HAVE THESE METHODS APPROVED BY THE ENGINEER PRIOR TO CONSTRUCTION.

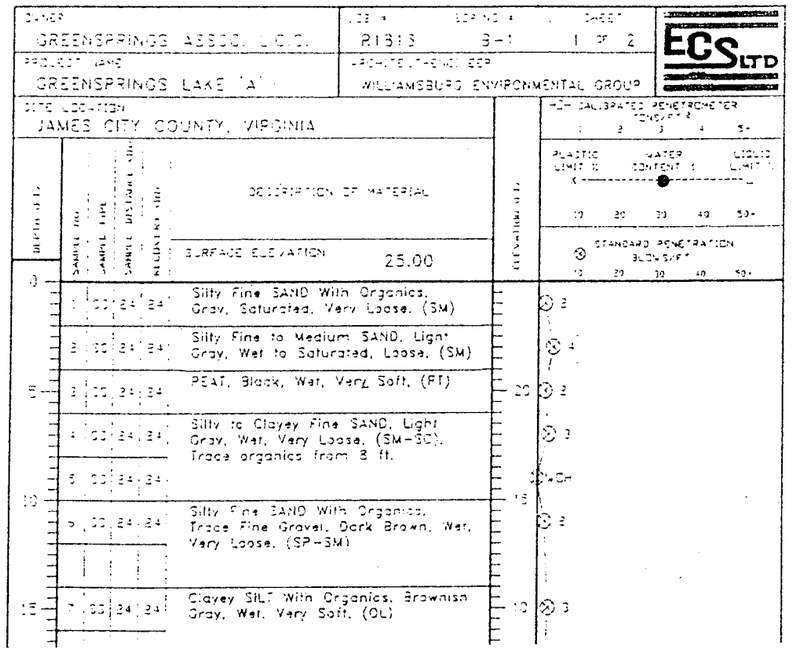
4. ONCE THE EMBANKMENT BASE ELEVATIONS HAVE BEEN

9. THE SURFACE OF EACH COMPACTED LIFT SHOULD BE SCARIFIED BY BA TO A DEPTH OF 2 INCHES PRIOR TO PLACEMENT OF THE NEXT LIFT, IN ORI PREVENT DEVELOPMENT OF HORIZONTAL SEEPAGE PLANES.

10. EMBANKMENT FILL SHOULD BE PLACED IN HORIZONTAL LIFTS AGAINST SLOPES NO STEEPER THAN 1 VERTICAL TO 4 HORIZONTAL. WHERE GREATE EXIST, AND THEY DO IN THE AREA OF THE DAM, THEY SHOULD BE BENCHE RECEIVE FILL. BENCH HEIGHTS SHOULD BE LIMITED TO 4 FEET.

11. THE NATURAL SHOULDERS OF THE RAVINES SHOULD BE CLEARED OF VEGETATION, ROOT MATTER, OR OTHER ORGANIC, UNSTABLE MATERIAL PRIOR PLACEMENT. UNSUITABLE MATERIALS WERE ENCOUNTERED AS DEEP AS 12 INCHES IN THE BORING LOCATIONS.

12. BACKFILL ALONG THE PRINCIPAL SPILLWAY CONDUIT SHOULD BE PLACED EQUALLY ON BOTH SIDES OF THE PIPE DURING FILLING.



7. In accordance with Section 20-53.C.3 of the Zoning Ordinance, provide a lighting plan with footcandle display for the parking lot .

8. In accordance with the Fair Housing Act Guidelines, indicate the location of handicap accessible units and associated parking.

9. Provide caliper sizes for all trees in accordance with Section 20-2 of the Zoning Ordinance. Arch Architect

10. Indicate that all evergreen shrubs shall be at least 18-inches in height at planting. Arch Architect

11. In accordance with the proffers, Owner shall make a contribution into an interest bearing escrow account with an institutional lender approved by the County Attorney of $2,000 per lot or unit payable upon sale by Owner of each of the first 475 lots or units on the property. Developer

12. The Planning Commission has approved your request for private streets within the development conditioned upon meeting the conditions under County Engineer and providing a proposal to correct the grade of the entrance when Route 5 is constructed.

Division of Code Compliance

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

2. An Inspection/Maintenance Agreement shall be executed with the County for the BMP facility for this project. The simplest way would be to execute one agreement for the entire Greensprings project. Developer

3. As-built drawings and engineering certification must be provided for the detention basin on completion. others / Developer

4. This plan must be prepared in accordance with the Master Stormwater Management Plan for Greensprings Plantation. There are two detention basins, Wetpond 1 and Lake A that provide stormwater management for this portion of the project. This section needs to be evaluated on the 10-point BMP criteria. will be provided by the Williamsburg Environmental Group who did the stormwater management plan

5. There are two No. 3 drainage inlets. Relabel one of these to be No. 2.

6. Provide riprap outlet protection for all pipe systems and culverts. Specify the amount of stone to be used in accordance with Specification

3.19 of the third edition of the Virginia Erosion Control Handbook (VESCH). already on plans

7. Provide sediment traps or basins at the end of each storm drain outfall. These basins/traps must be designed in accordance with the new VESCH criteria.

8. Revise the Erosion Control Notes on Sheet C 12 to reference the latest version of the Virginia Erosion Control Handbook.

9. Analyze the adequacy of all storm drain outfall channels to ensure that they do not erode after construction of the project.

James City Service Authority

General:

1. Plans show fire hydrants installed directly over the water main. Standard practice is to locate the hydrant off from the main using a fire hydrant assembly as shown on JCSA DWG. No. W 11 and your data sheet; this should be indicated. Actual offset is established by the Fire Department.

2. A consistent method of identifying fire hydrant assemblies should be established for plans and profiles. Each hydrant assembly requires a valve and valve box.

3. Every fire hydrant requires a tee in the main. Are you counting these tees as part of the fire hydrant assembly or as part of the main?

4. The dead ends of all lines should have a DEAD-END BLOW-OFF in lieu of the CAP. Assembly is shown on JCSA DWG. No. 9.0, and should be added to the detail sheets.

5. Before final site plan approval, provide a plat plan showing all dedicated and recorded JCSA easements. If this is a private system, the JCSA will have to be informed in writing and the JCSA responsibility will terminate at existing Manhole No. 7.

Sheet C2:

1. In the area between Station 1+00 and 12+00, what provisions are being made to ensure that the waterline is not compromised by settling during construction and when completed? The waterline has been revised & is being installed in existing earth to accomodate the future construction of Rt 614 & legacy Dr. "T" intersection. See Note #12 on sheets C2, C3, & C4

FILE - Greensprings - Phase I

Mike Crotty
ADS Sales
L/A M591

The Bush Companies

Full Service Real Estate Development
Construction • Property Management • Real Estate Brokerage • Mortgage Brokerage • Investments

HAND DELIVERED

August 23, 1994

Mark Eversole
James City County
Code & Compliance
101-E Mounts Bay
Williamsburg, VA 23185

Dear Mark:

Enclosed is the information you requested concerning the plasic pipe.

If you need anything else, please call.

Sincerely,

BUSH CONSTRUCTION CORPORATION

J. J. Digges
President

Enclosures (3)

Ok - called John - 9/9/94

Joe Haah - Dam Safety

Dam Safety Regs -
COE, SCS regs generally govern
General rule - concrete pipe
in low hazard dam - others would be acceptable
- Concerned about life, creep (maintaining its "round")

Barry Kintzer - SCS State Eng - 804-287-1657

Julius Tennyson - w/ SCS - 9/7 - he is checking on their matls.

SCS Tech Bull - recommend ASTM F667
1) No longer than 24"
2) Max fill ht of 20'
3) Good backfill
4) Protect

Anti-Seep Collars Are Available

Darryl,
John wants to substitute this ADS N-12 for the ACMP Barrell in Lake A (timeshare) He plans to use a precast Riser & Anti Vortex.

Is this a problem?

Mark

WILLIAMSBURG ENVIRONMENTAL GROUP, INC.

Environmental Consultants

TRANSMITTAL LETTER

TO DARRYL COOK

DATE 9-20-94

RE GREENSPRINGS LAKE A

WE ARE SENDING ☐ ATTACHED ☐ UNDER SEPERATE COVER VIA _____

☐ Plans ☐ Contracts ☐ Letters
☐ Prints ☐ Literature ☐ Other:
☐ Copies ☐ Samples

COPIES	DATED	DESCRIPTION
2	9-20-94	LAKE A DETAIL SHEET C15
2	9-20-94	GEOTECHNICAL NOTES & BORINGS SHEET C16
2	7-19-94	REVISED LAKE A SHEET C14
2	7-19-94	PHASE I MASTER STORMWATER PLAN (UNCHANGED)

THESE ARE BEING SENT:

☐ As per your request ☐ For your comments ☐ For your signature
☐ For your review ☐ For your use/files ☐ For your _____

NOTES PLEASE LET US KNOW HOW TO PROCEED.

THANKS ERIK

COPY TO

SIGNATURE Eric Allen

TITLE STAFF ENGINEER DATE 9-20-94

516-B South Henry Street Williamsburg, Virginia 23185 (804) 220-6869 FAX (804) 229-4507

CODE COMPLIANCE REVIEW COMMENTS
GREENSPRINGS PLANTATION, PHASE 1
PLAN NO. SP-13-94 DEC
February 17, 1994

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

2. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project. The simplest way would be to execute one agreement for the entire Greensprings project.

3. As-built drawings and engineering certification must be provided for the detention basin on completion.

4. This plan must be prepared in accordance with the Master Stormwater Management Plan for Greensprings Plantation. There are two detention basins, Wetpond 1 and Lake A that provide stormwater management for this portion of the project. This section needs to be evaluated on the 10 point BMP criteria.

5. There are two #3 drainage inlets. Relabel one of these to be #2.

6. Provide riprap outlet protection for all pipe systems and culverts. Specify the amount of stone to be used in accordance with Spec 3.19 of the third edition of the Virginia Erosion Control Handbook (VESCH).

7. Provide sediment traps or basins at the end of each storm drain outfall. These basins/traps must be designed in accordance with the new VESCH criteria.

8. Revise the Erosion Control Notes on sheet C12 to reference the latest version of the Virginia Erosion Control Handbook.

9. Analyze the adequacy of all storm drain outfall channels to ensure that they do not erode after construction of the project.