Stormwater Division

MEMORANDUM

DATE: March 12, 2010

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

FROM: Tina Cantwell, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: WC041

PIN: 0520500001A

Subdivision, Tract, Business or Owner Name (if known): Association at Stonehouse, Inc. (The)

Property Description: Near 3241 Oak Branch Lane

Site Address: Oak Branch Lane in Stonehouse Subdivision

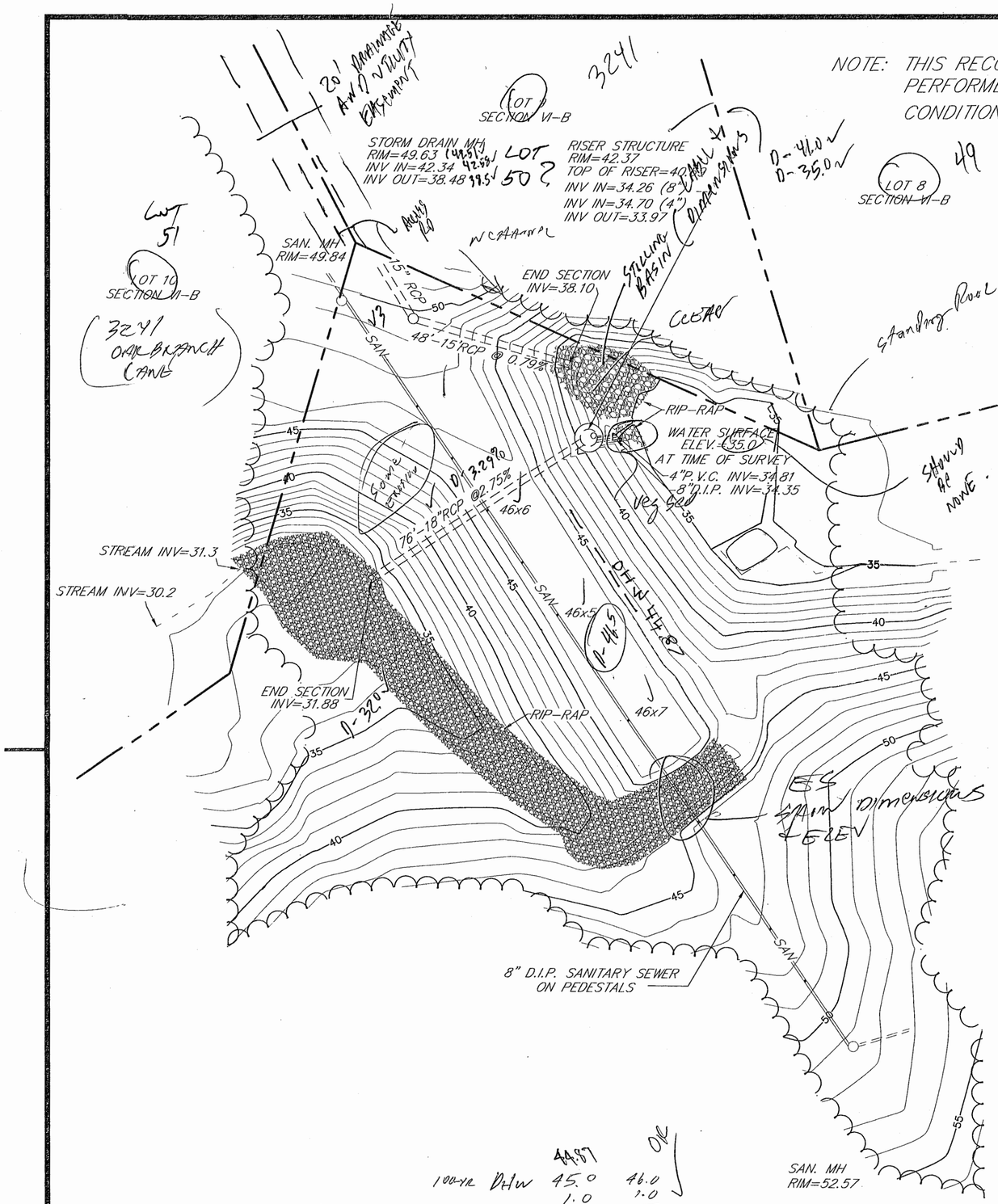
(For internal use only) **Box** 13 **Drawer:** 8

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

Comments

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, 07/00 AND REFLECTS CONDITIONS PRESENT AT THAT TIME.

RECORD



— Road Detail
— Address Info.
— Size Riser?
— Make sure LF of UF meet Dev Plan (8"/4")
— Lots #'s incorrect.

Reqd
A = 19.7 AC
C = 0.0
Tc = 0.3 hrs = 18 min.
Q2 = 6 cfs
10- 24 cfs
100- 61 cfs

Post Dev Inflow A = 27.5 AC; CN=73; Tc=0.14 HR (8.4 min)
2- 45 cfs
10- 98 cfs
100- 197 cfs

Routed
2- 42.4 cfs @ El. 41.13
10- 23.33 cfs @ 42.76
100- 142.92 cfs @ 44.87

Max Elev = 25% (27.5) = 6.87 AC
1.27 AC-FT
WQV

RECORD DRAWING
OF
STORMWATER ATTENUATION BASIN
SECTION VIB & SECTION III
AT STONEHOUSE

STONEHOUSE DISTRICT, JAMES CITY COUNTY, VIRGINIA

SCALE: 1"=25' 11/16/00

100-yr Delw
44.97
45.0
1.0
46.0
46.0
1.0
47.0
OK
45.97 < 46.5

SAT Appd SET 8/29/01

WC 041; 5-27-98

COMMONWEALTH OF VIRGINIA
11/16/00
CHARLES R. ORSBORNE
NO. 1381
LAND SURVEYOR

GRAPHIC SCALE
25 0 13 25 50 100
(IN FEET)
1 inch = 25 ft.

LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Consultants

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 229-0049
Email: lmdg@landmarkdgwb.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

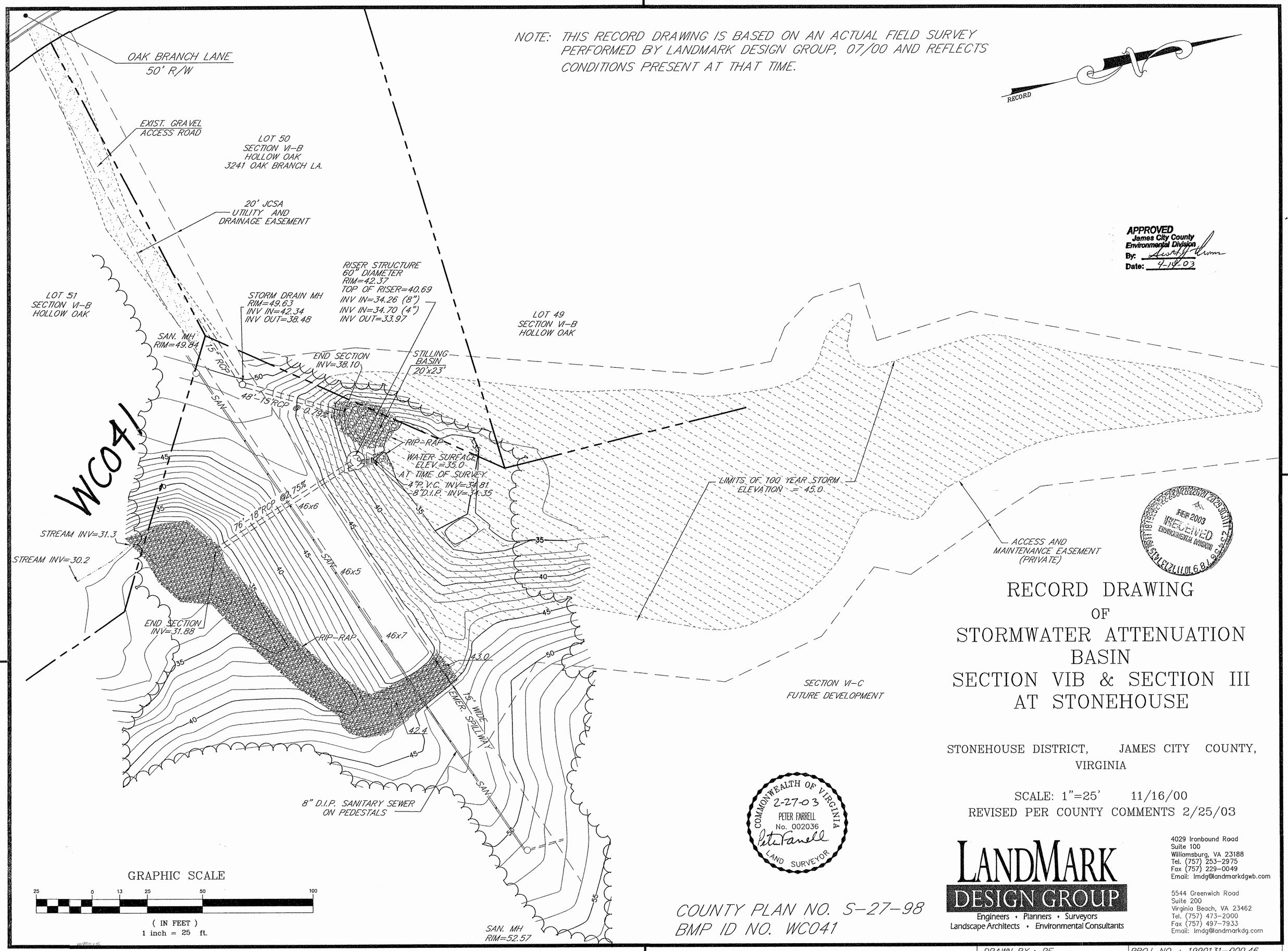
WC041_STONEHOUSE_HOLLOW_OAK - 002

DRAWN BY : PF	PROJ. NO. : 1990131-000.46

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, 07/00 AND REFLECTS CONDITIONS PRESENT AT THAT TIME.

RECORD

APPROVED
James City County
Environmental Division
By: Lustyl Lum
Date: 4-18-03



FEB 2003
RECEIVED
ENVIRONMENTAL DIVISION

RECORD DRAWING
OF
STORMWATER ATTENUATION BASIN
SECTION VIB & SECTION III
AT STONEHOUSE

STONEHOUSE DISTRICT, JAMES CITY COUNTY, VIRGINIA

SCALE: 1"=25' 11/16/00
REVISED PER COUNTY COMMENTS 2/25/03

COMMONWEALTH OF VIRGINIA
2-27-03
PETER FARRELL
No. 002036
Peter Farrell
LAND SURVEYOR

COUNTY PLAN NO. S-27-98
BMP ID NO. WC041

LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Consultants

4029 Ironbound Road
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Williamsburg, VA 23188
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Fax (757) 229-0049
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5544 Greenwich Road
Suite 200
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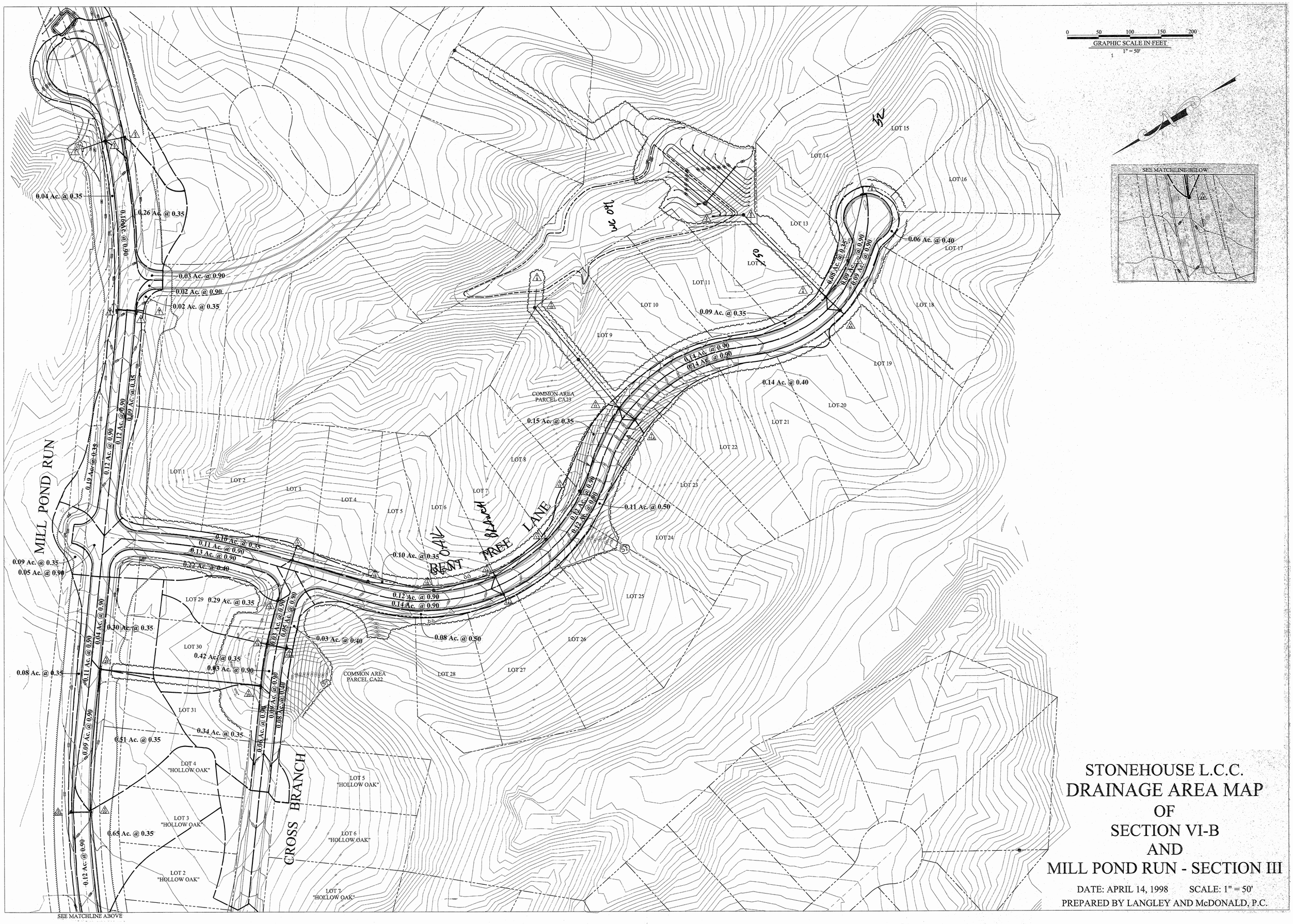
Tel. (757) 473-2000
Fax (757) 497-7933
Email: lmdg@landmarkdg.com

DRAWN BY : PF	PROJ. NO. : 1990131-000.46
CHKD. BY : RSP	DWG. NO. : 11686 W

WC041

WC041_STONEHOUSE_HOLLOW_OAK - 003

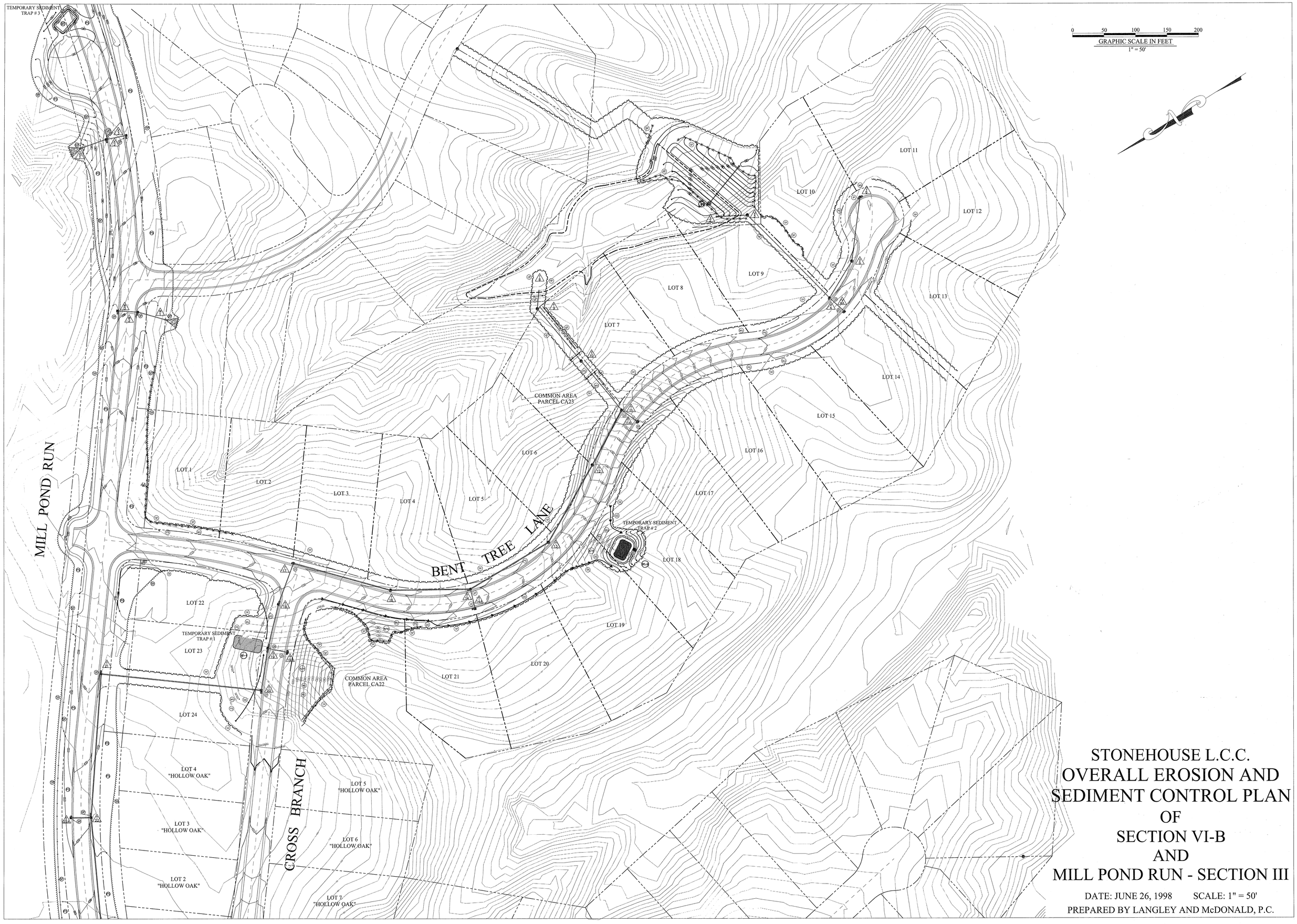


STONEHOUSE L.C.C.
DRAINAGE AREA MAP
OF
SECTION VI-B
AND
MILL POND RUN - SECTION III

DATE: APRIL 14, 1998 SCALE: 1" = 50'

PREPARED BY LANGLEY AND McDONALD, P.C.

WC041_STONEHOUSE_HOLLOW_OAK - 004



STONEHOUSE L.C.C.
OVERALL EROSION AND SEDIMENT CONTROL PLAN
OF
SECTION VI-B
AND
MILL POND RUN - SECTION III

DATE: JUNE 26, 1998 SCALE: 1" = 50'

PREPARED BY LANGLEY AND McDONALD, P.C.

WC041_STONEHOUSE_HOLLOW_OAK - 005

FUTURE
SECTION VI-C

SHEET 6

SHEET 13

SHEET 14

MILL POND

PART OF PARCEL Ⓐ
STONEHOUSE LIMITED LIABILITY COMPANY
NATURAL OPEN SPACE
PLAT BOOK NO. 67
PAGES 45-49

COMMON AREA PARCEL CA22
520,676.29 S.F.
11.9531 AC.

COMMON AREA PARCEL CA23

LOT 44
25,973.63 S.F.
0.5963 AC.

LOT 45
24,446.78 S.F.
0.5612 AC.

LOT 46
26,219.0 S.F.
0.6019 AC.

LOT 47

LOT 48
24,736.64 S.F.
0.5679 AC.

LOT 49
24,135.10 S.F.
0.5541 AC.

LOT 50

LOT 51
29,473.12 S.F.
0.6766 AC.

LOT 52
52,027.46 S.F.
1.1944 AC.

LOT 53
39,054.10 S.F.
0.8966 AC.

LOT 54
30,039.40 S.F.
0.6896 AC.

LOT 55
29,784.15 S.F.
0.6838 AC.

LOT 56
33,303.90 S.F.
0.7646 AC.

LOT 57
32,885.31 S.F.
0.7549 AC.

LOT 58
28,910.56 S.F.
0.6637 AC.

LOT 59
29,178.81 S.F.
0.6676 AC.

LOT 60
28,827.34 S.F.
0.6825 AC.

LOT 61
32,065.91 S.F.
0.7361 AC.

LOT 62
27,205.00 S.F.
0.6245 AC.

LOT 42
23,810.
0.5466 AC.

LOT 43
26,389.59
0.6061 AC.

VARIABLE WIDTH DRAINAGE AND UTILITY EASEMENT FOR USE BY J.C.S.A. (TYP. ALL LOTS)

10' DRAINAGE AND UTILITY EASEMENT (TYP. ALL LOTS)

FIRE HYDRANT ASSEMBLY (TYP.)

15' ACCESS AND MAINTENANCE EASEMENT

VARIABLE WIDTH DRAINAGE EASEMENT AND LIMITS OF 100 YEAR STORM WET STORAGE AREA

WC04H

50' BUFFER

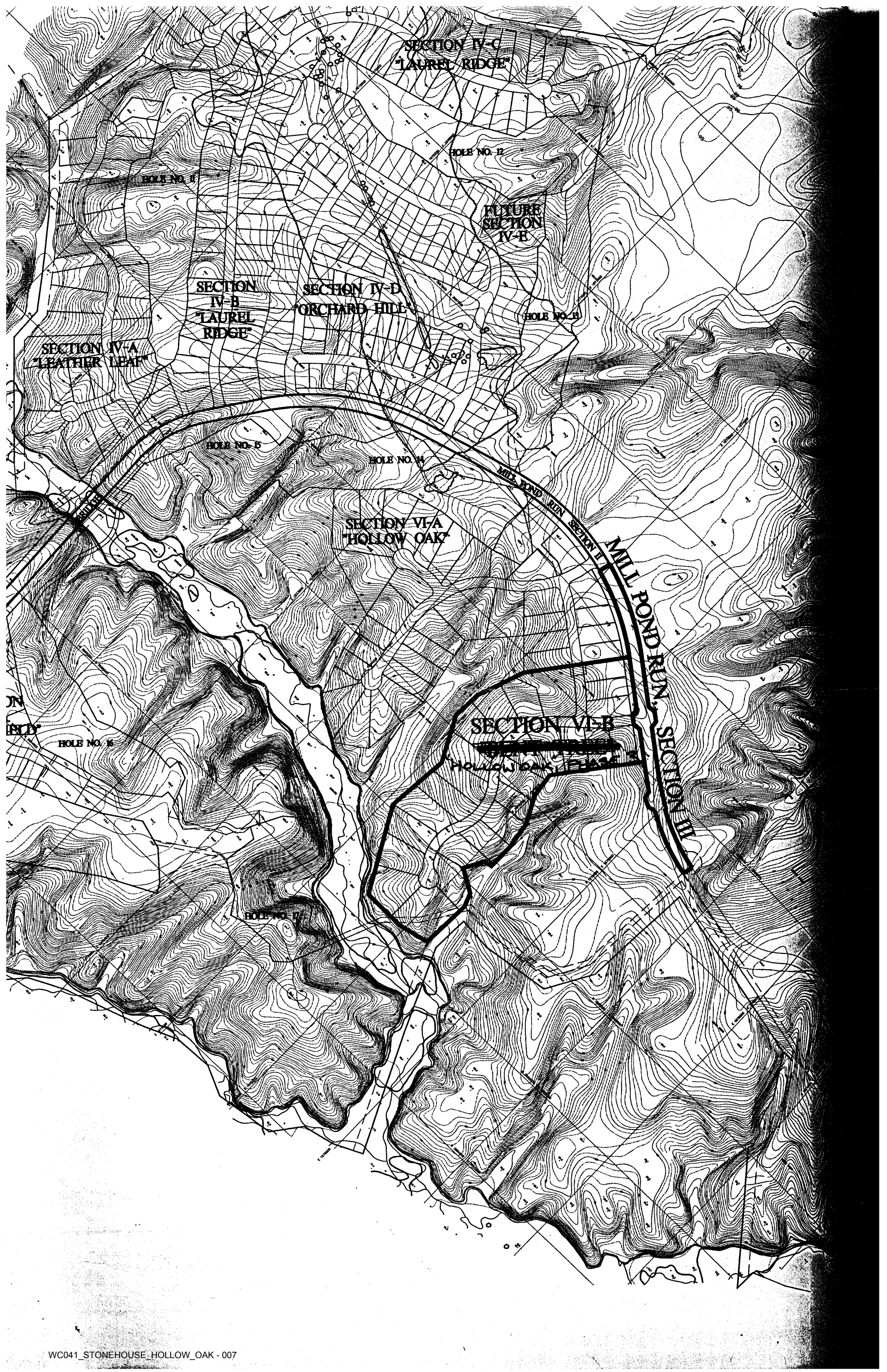
N/F
ALVIS L. GOLDEN
DEED BOOK 190
PAGE 137

COMMON AREA PARCEL CA22
520,676.29 S.F.
11.9531 AC.

GRAPHIC SCALE
SCALE : 1" = 10

100 0 50 100

TEMPORARY 25' IRRIGATION INTAKE EASEMENT
DEED BOOK 66
PAGES 80-88


SECTION IV-C
"LAUREL RIDGE"
HOLE NO. 12
HOLE NO. 11
FUTURE
SECTION
IV-E
SECTION
IV-B
"LAUREL
RIDGE"
SECTION IV-D
"ORCHARD HILL"
HOLE NO. 13
SECTION IV-A
"LEATHER LEAF"
HOLE NO. 15
HOLE NO. 14
MILL POND RUN
SECTION II
SECTION VI-A
"HOLLOW OAK"
MILL POND RUN
SECTION III
SECTION VI-B
HOLLOW OAK
HOLE NO. 16

SECTION IV-C
"LAUREL RIDGE"

HOLE NO. 12

HOLE NO. 11

FUTURE
SECTION
IV-E

SECTION
IV-B
"LAUREL
RIDGE"

SECTION IV-D
"ORCHARD HILL"

HOLE NO. 13

SECTION IV-A
"LEATHER LEAF"

HOLE NO. 15

HOLE NO. 14

MILL POND RUN SECTION II

SECTION VI-A
"HOLLOW OAK"

HOLE NO. 10

MILL PON

CEPTION CENTER

SECTION
III-A
"SUMMERFIELD"

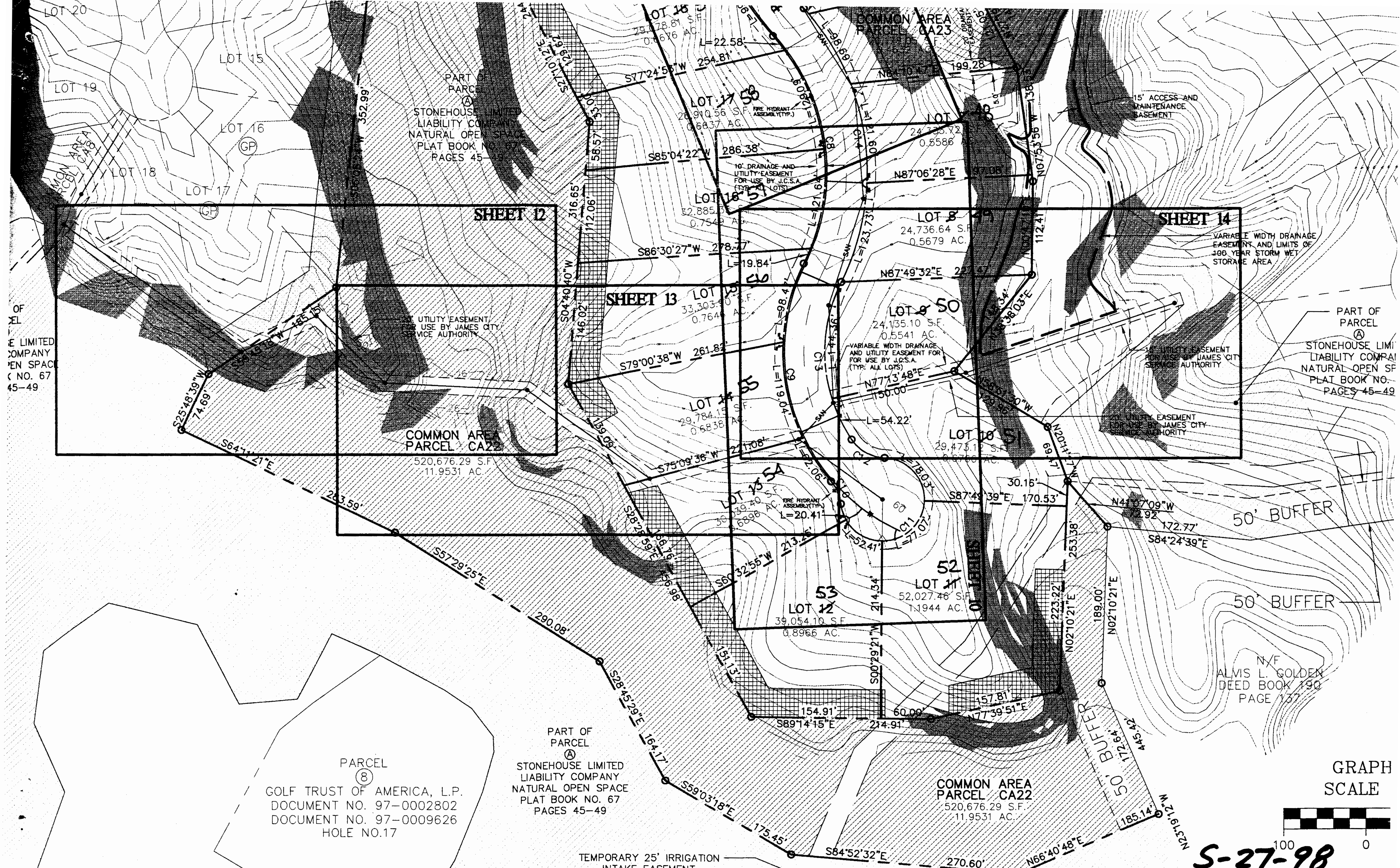
HOLE NO. 16

SECTION VI-B
~~[illegible]~~
HOLLOW OAK PHASE

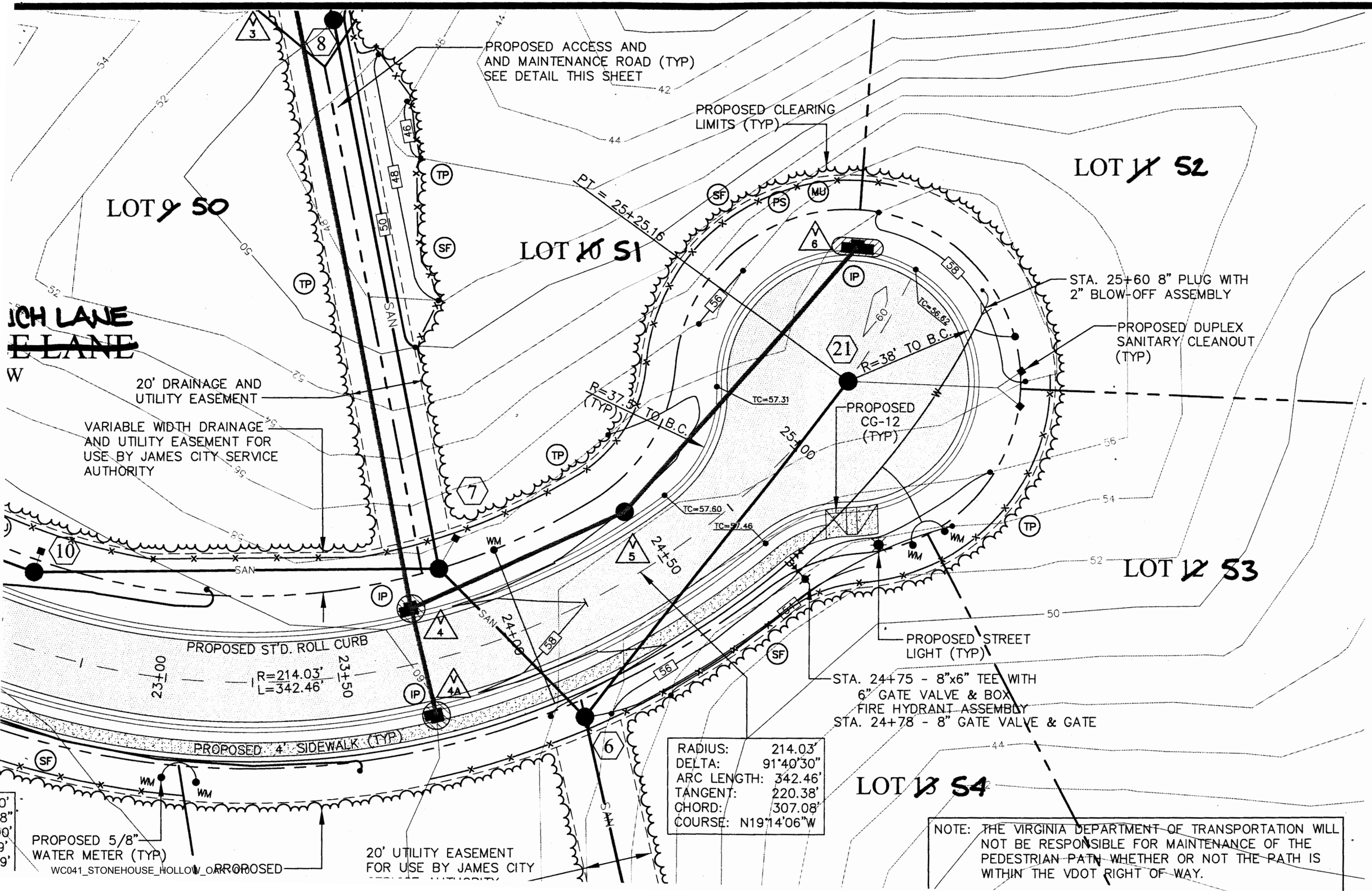
HOLE NO. 18

OURSE
OUSE

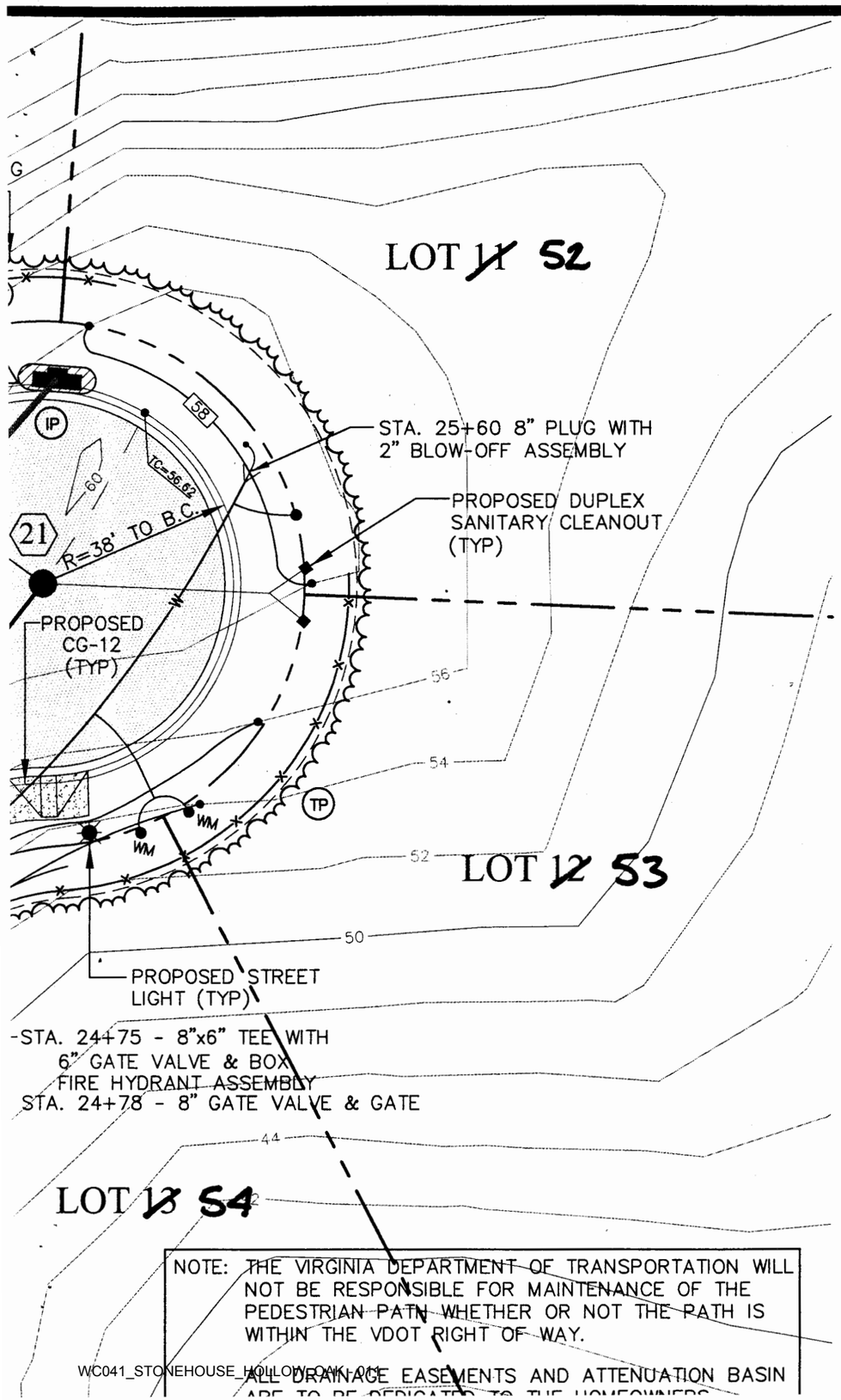
HOLE NO. 17



WC041_STONEHOUSE_HOLLOW_OAK - 009



WC041_STONEHOUSE_HOLLOW_OAK.DWG



WC041_STONEHOUSE_HOLLOW OAK_01

PROPOSED STORM SEWER SYSTEM "V"

6 — DI-3C, STA. 25+60, L=8.0', TOP EL.= 56.77,
INV. OUT=51.98

6 5 — 102 L.F. 15" CLASS III RCP @ 0.50%

5 — VDOT ST'D. MH-1, STA. 24+49, TOP EL.=58.00,
INV. IN=51.47, INV. OUT=51.37

5 4 — 68 L.F. 15" RCP @ 0.50%

4A — DI-3B, STA. 23+75, L=4.0', TOP EL.=58.47,
INV. OUT= 52.32

4A 4 — 32 L.F. 15" CLASS III RCP @ 1.00%

4 — DI-3B, STA. 23+75, L=4.0', TOP EL.=58.47,
INV.IN=51.02(V5), INV.IN=52.00 (V4A), INV.OUT=50.90

4 3 — 185 L.F. 15" CLASS III RCP @ 4.50%

3 — VDOT ST'D. MH-1, TOP EL.=49.50, INV. IN=42.58,
INV. OUT=38.50

3 2 — 50 L.F. 15" CLASS III RCP @ 1.00%

2 — VDOT ST'D. ES-1, INV. OUT=38.00

PROPOSED SANITARY SEWER

12 11 — 130 L.F.-8" P.V.C. SAN. SEWER @ 9.21%

11 — PROP. SAN. MANHOLE
STA. 21+22, 19' LT.
RIM = 65.75
INV. IN = 60.10
INV. OUT = 60.00

11 10 — 135 L.F.-8" P.V.C. SAN. SEWER @ 6.29%

10 — PROP. SAN. MANHOLE
STA. 22+53, 19' LT.
RIM = 60.30
INV. IN = 51.51
INV. OUT = 49.61

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023634
PROFESSIONAL ENGINEER

Langley and McDonald, P.C.
Engineers · Surveyors · Planners
Landscape Architects · Environmental Consultants
WILLIAMSBURG
VIRGINIA BEACH

VIRGINIA STATE PLANE SYSTEM (SOUTH ZONE)

MATCHLINE STATION 20+50
SEE SHEET 13

OAK BRANCH TREE LANE

LOT ~~9~~ 50

LOT ~~10~~ 51

LIMITS OF THE 100 YEAR STORM WATER SURFACE ELEVATION (W.S.E.)

PROPOSED CLEARING LIMITS (TYP)

PROP. SAN. MANHOLE
STA: 20+73.23
RIM=58.75
INV. IN=42.52
INV. OUT=42.42

PROP. SAN. MANHOLE
STA: 20+12.95
RIM=57.25
INV. IN=42.12
INV. OUT=42.02

PROP. SAN. MANHOLE
STA: 22+35.82
RIM=50.50
INV. IN=43.43
INV. OUT=43.33

PROPOSED WETLAND LIMITS (TYP)

22+50
23+00
23+50
24+00
24+50
21+00
21+50
20+50
SAN

0 25
GRAP

59.5 55.7 49.2 47.2 50.4 32.6 36.5

70

LIMITS OF THE 100 YEAR STORM WATER SURFACE ELEVATION (W.S.E.)

LIMITS OF THE 100 YEAR STORM WATER SURFACE ELEVATION (W.S.E.)

END OF PROJECT STATION 25+05

5' -8" D.I.P. STUB (TO SERVE FUTURE SECTION VI-C SUBDIVISION)

PROP. SAN. MANHOLE
25+00
RIM=53.20
INV. IN=48.35
INV. OUT=48.25

PROPOSED 15' SANITARY SEWER EASEMENT (TYP)

CLEARING

PROP. SAN. MANHOLE
STA: 22+35.82
RIM=50.50
INV. IN=43.43
INV. OUT=43.33

LOT ~~10~~ 51

PROPOSED WETLAND LIMITS (TYP)

0 25 50 75 100

GRAPHIC SCALE IN FEET

1" = 25'

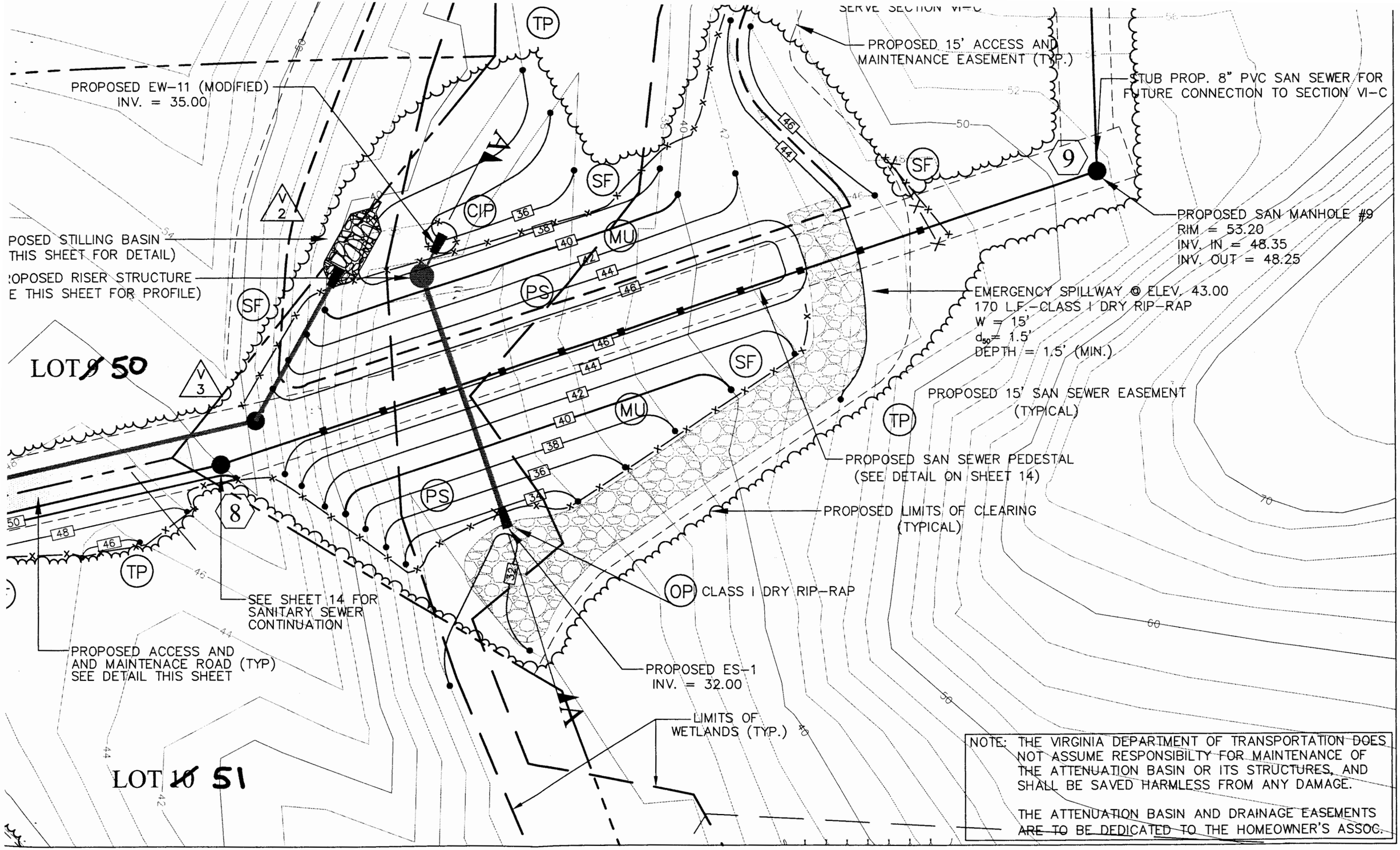
1/2" DI.
EXPAN
4 1/2"
IMBEDD

SEE
DET

1" CHAM

47.2 50.4 32.6 36.5 41.7 46.5 51.7 60.0

WC041_STONEHOUSE_HOLLOW_OAK - 013

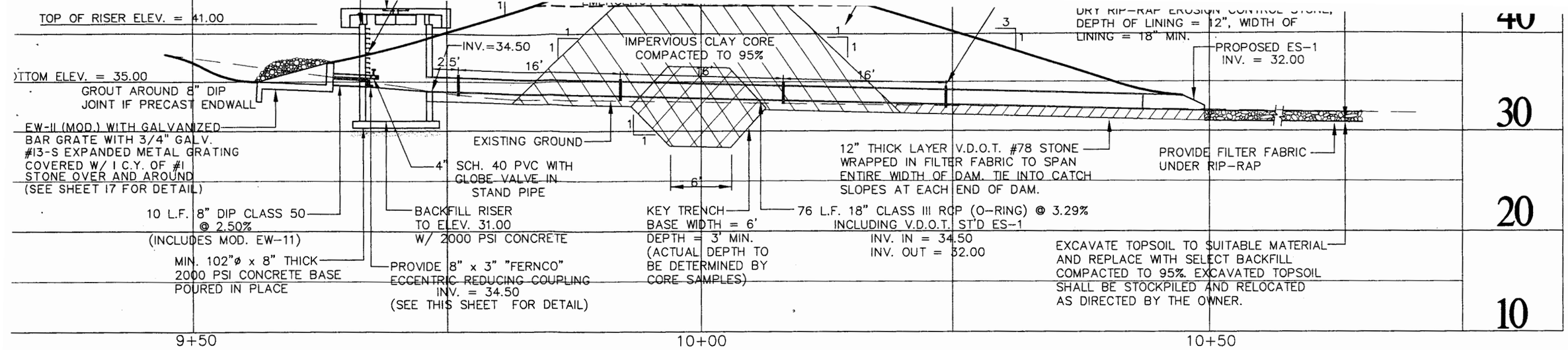


NOTE: THE VIRGINIA DEPARTMENT OF TRANSPORTATION DOES NOT ASSUME RESPONSIBILTY FOR MAINTENANCE OF THE ATTENUATION BASIN OR ITS STRUCTURES, AND SHALL BE SAVED HARMLESS FROM ANY DAMAGE.

THE ATTENUATION BASIN AND DRAINAGE EASEMENTS ARE TO BE DEDICATED TO THE HOMEOWNER'S ASSOC.

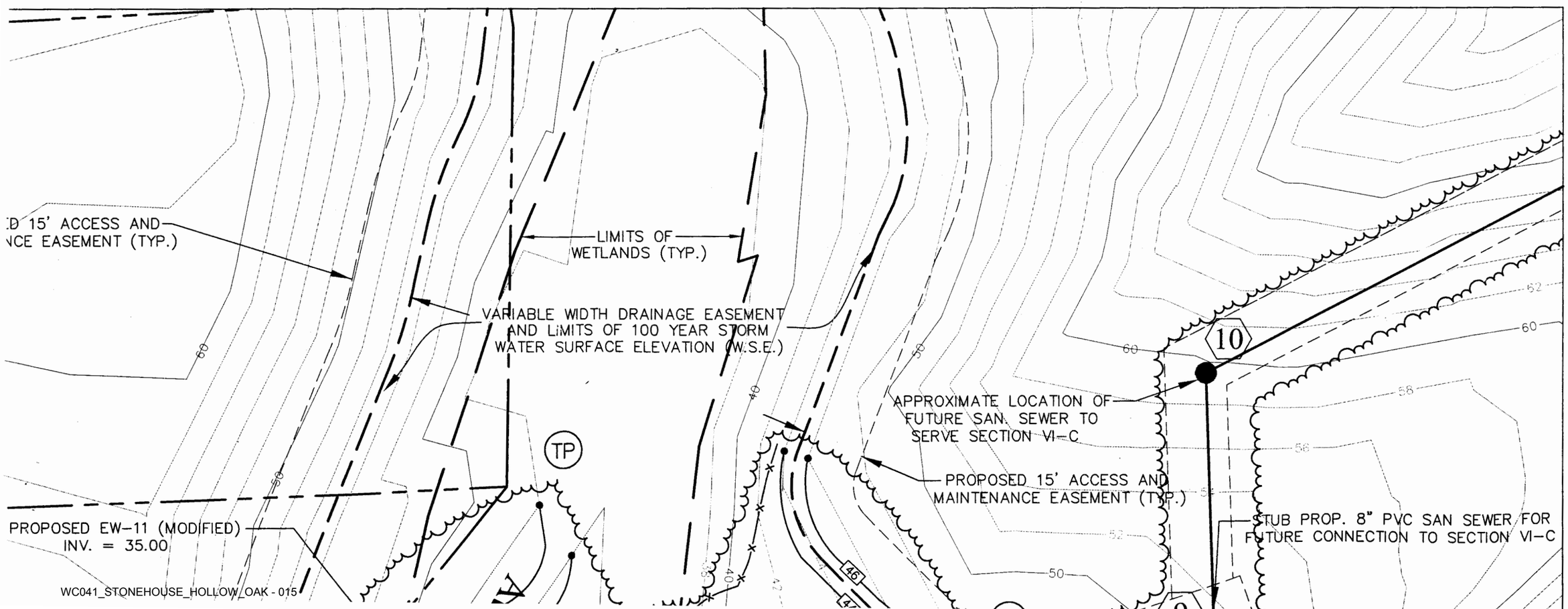
STORMWATER ATTENUATION BASIN " PLAN

SCALE: 1" = 25' (HORIZONTAL)



STORMWATER ATTENUATION BASIN "H" SECTION A-A

SCALE: 1" = 10' (HORIZONTAL)
1" = 10' (VERTICAL)



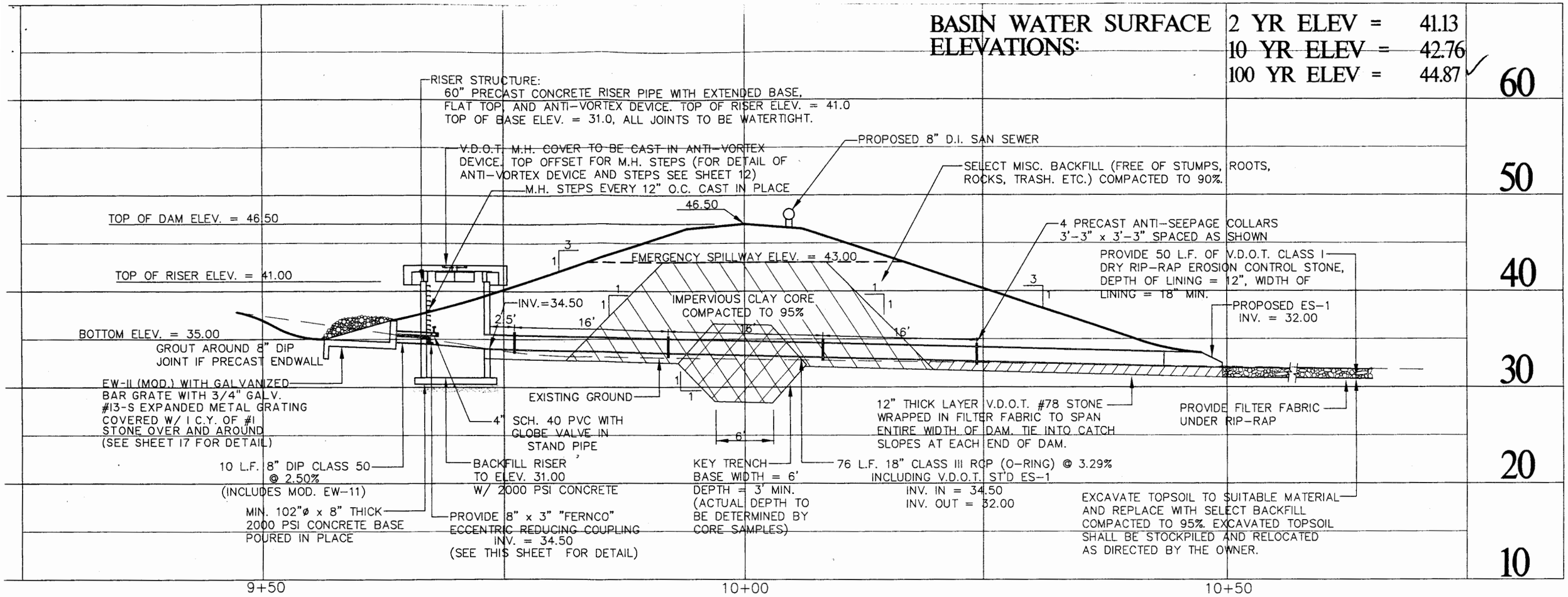
70
65
60
55
50
45
40
35

CONFORM T
SHAPE OF

A

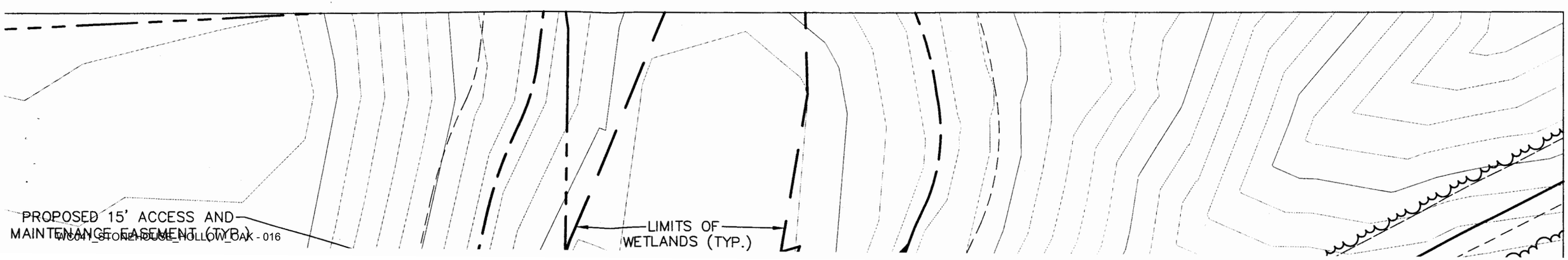
BASIN WATER SURFACE ELEVATIONS:

2 YR ELEV =	41.13
10 YR ELEV =	42.76
100 YR ELEV =	44.87



STORMWATER ATTENUATION BASIN "H" SECTION A-A

SCALE: 1" = 10' (HORIZONTAL)
1" = 10' (VERTICAL)



EARTHWORK FOR STORMWATER BASINS

1. SCOPE: WORK INCLUDED HEREIN CONSISTS OF FURNISHING ALL LABOR, MATERIAL, EQUIPMENT AND SUPPLIES FOR COMPLETION OF ALL EARTHWORK ASSOCIATED WITH THE STORMWATER MANAGEMENT BASIN.

2. TESTING: THE CONTRACTOR SHALL PROVIDE TEST RESULTS ON PLACED DAM MATERIALS IN THE AREAS OF SOIL CLASSIFICATION, PERMEABILITY, PLASTICITY INDEX AND COMPACTION. TESTING OF THE MATERIALS FOR USE IN THE CONSTRUCTION OF THE BASIN DAM STRUCTURE SHALL BE IN ACCORDANCE WITH ASTM STANDARDS AND SHALL BE PERFORMED BY A REGISTERED GEOTECHNICAL ENGINEER. CONTRACTOR'S GEOTECHNICAL ENGINEER SHALL BE APPROVED BY THE OWNER. COSTS FOR TESTING AND THE GEOTECHNICAL ENGINEER SHALL BE INCLUDED IN OTHER BID ITEMS ASSOCIATED WITH THE STORMWATER BASIN.

3. INSPECTION: ALL WORK PERFORMED IN RELATION TO THE STORMWATER MANAGEMENT BASIN STRUCTURE SHALL BE OVERSEEN BY A REGISTERED GEOTECHNICAL ENGINEER. THE CONTRACTOR SHALL PROVIDE THE GEOTECHNICAL ENGINEER AT HIS EXPENSE.

4. GENERAL EXCAVATION AND BACKFILLING: ALL EXCAVATED MATERIAL WHICH IS UNSATISFACTORY FOR BACKFILL SHALL BE WASTED AND ALL EXCAVATION NOT REQUIRED FOR BACKFILLING SHALL BE DEPOSITED ON SITE AND SPREAD BY THE CONTRACTOR, AS DIRECTED BY THE ENGINEER. ON-SITE EXCAVATED MATERIAL MAY BE USED FOR DAM CONSTRUCTION UNLESS THE GEOTECHNICAL ENGINEER DETERMINES THAT THE MATERIAL DOES NOT MEET THE STANDARDS SET FORTH IN THIS SPECIFICATION. SHOULD ADDITIONAL MATERIAL BE NEEDED, IT SHALL BE PROVIDED BY THE CONTRACTOR FROM APPROVED BORROW LOCATIONS ON THE STONEHOUSE L.L.C. PROPERTY.

5. FOUNDATION AND KEY PREPARATION:

   A. UNDERCUT EXCAVATION FOR THE FOUNDATION SHALL OCCUR TO A POINT WHICH IS 5 FEET BEYOND THE TOE OF THE DAM EMBANKMENT IN EACH DIRECTION. THE UNDERCUT SHALL BE AT LEAST 2 FEET DEEP AND SHALL CONTINUE TO THE DEPTH WHICH IS REQUIRED TO REMOVE ANY ORGANIC SOILS AS DIRECTED BY THE ON-SITE GEOTECHNICAL ENGINEER.

   B. THE FOUNDATION EXCAVATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED BY UNIFIED SOIL CLASSIFICATION SYSTEM AS SM, SC OR CL CONTAINING AT LEAST 15% BY WEIGHT FINES AND HAVING A MAXIMUM PLASTICITY INDEX OF 30%. THE FILL SHALL BE COMPACTED IN TEN INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698). IN ADDITION ANY SOILS PLACED IN THE AREA OF THE KEY SHALL BE CLASSIFIED AS SC OR CL AND HAVE A PERMEABILITY OF 0.001 CM/SEC OR LESS.

   C. EXCAVATION FOR THE KEY SHALL BE SIX FEET WIDE AND TO A DEPTH OF SIX FEET FROM THE EXISTING EMBANKMENT CONTOURS. THE KEY SHALL BE CONSTRUCTED PARALLEL TO THE DAM WITH FIVE FEET ON EACH SIDE OF THE DAM'S CENTERLINE. THE KEY SHOULD EXTEND UP THE EXISTING EMBANKMENT TO AN APPROXIMATE ELEVATION OF 33 WHERE IT WILL TAPER TO EXISTING GROUND AT A 1.5 HORIZONTAL TO 1 VERTICAL SLOPE.

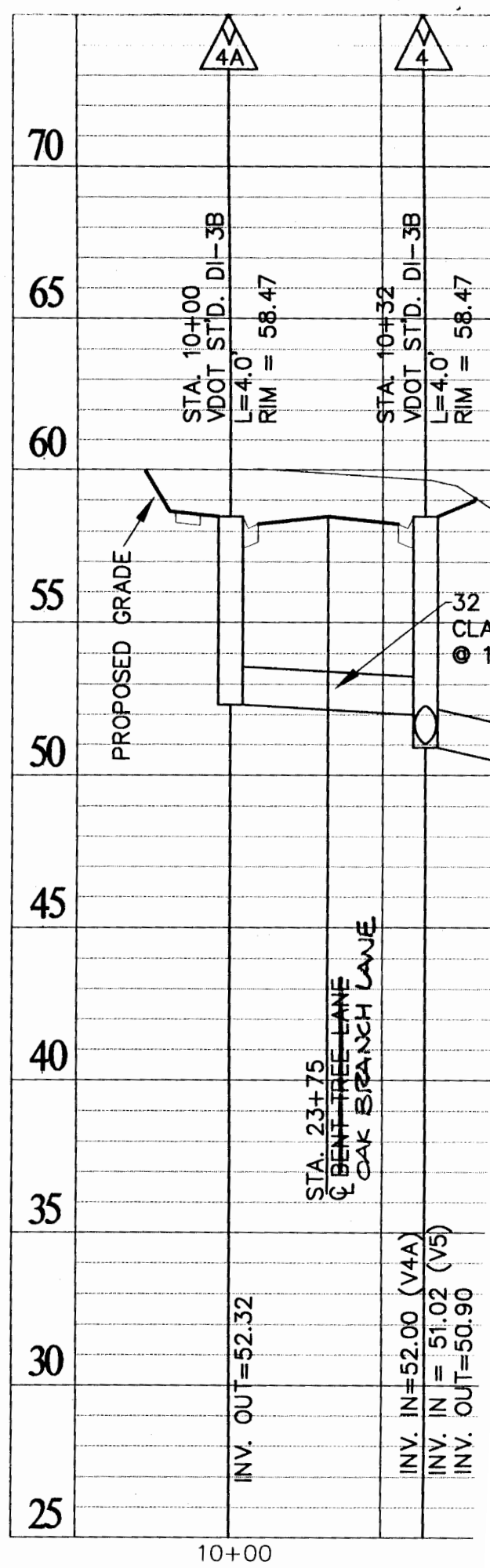
   D. THE KEY EXCAVATION SHALL BE BACKFILLED WITH SOILS CLASSIFIED AS SC OR CL AND HAVE A PERMEABILITY OF 0.001 CM/SEC OR LESS.

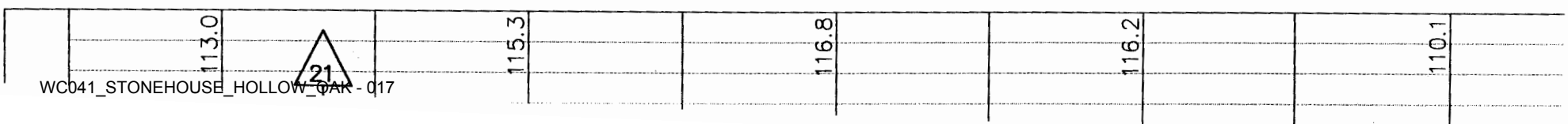
6. DAM CORE AND COVER:

   A. THE CORE SHALL BE CONSTRUCTED OF NON-EXPANSIVE CLAYEY MATERIAL (SC OR CL) WITH A PERMEABILITY OF 0.001 CM/SEC OR LESS. THE FILL SHALL BE COMPACTED IN TEN INCH LIFTS TO A DRY DENSITY OF AT LEAST 95% OF THE STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D-698) PRIOR TO PLACEMENT OF THE NEXT LAYER OF FILL. THE TOP OF THE CORE SHALL BE CONSTRUCTED TO A MINIMUM ELEVATION OF 42 WITH A MINIMUM CREST WIDTH OF 10 FEET AND MAXIMUM SIDE SLOPES OF 1.5 HORIZONTAL TO 1 VERTICAL. BEFORE ANY FILL IS PLACED FOR THE CORE THE FOUNDATION SHALL BE SCARIFIED TO A DEPTH OF SIX TO EIGHT INCHES.

   B. A SILTY FINE SAND OR CLAYEY (SM, SC, OR CL) COVER SHALL BE PLACED OVER THE CORE TO AN ELEVATION OF 55 WITH A MINIMUM CREST WIDTH OF TWELVE FEET. SIDE SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL ON THE UPSTREAM SIDE OF THE DAM AND 3 HORIZONTAL TO 1 VERTICAL ON THE DOWNSTREAM SIDE OF THE DAM. VEGETATIVE COVER WITH VDOT STD. EC-2 EROSION CONTROL BLANKET SHALL BE PLACED ON THE SIDE SLOPES AND CREST IN ORDER TO AVOID EROSION.

7. MEASUREMENT AND PAYMENT: PAYMENT FOR ALL WORK PERTAINING TO EXCAVATION, FILLING OR BACKFILLING, TESTING, INSPECTING, OR DEWATERING OF THE STORMWATER MANAGEMENT BASIN AND APPURTANCES SHALL BE INCLUDED IN THE LUMP SUM PRICE BID.

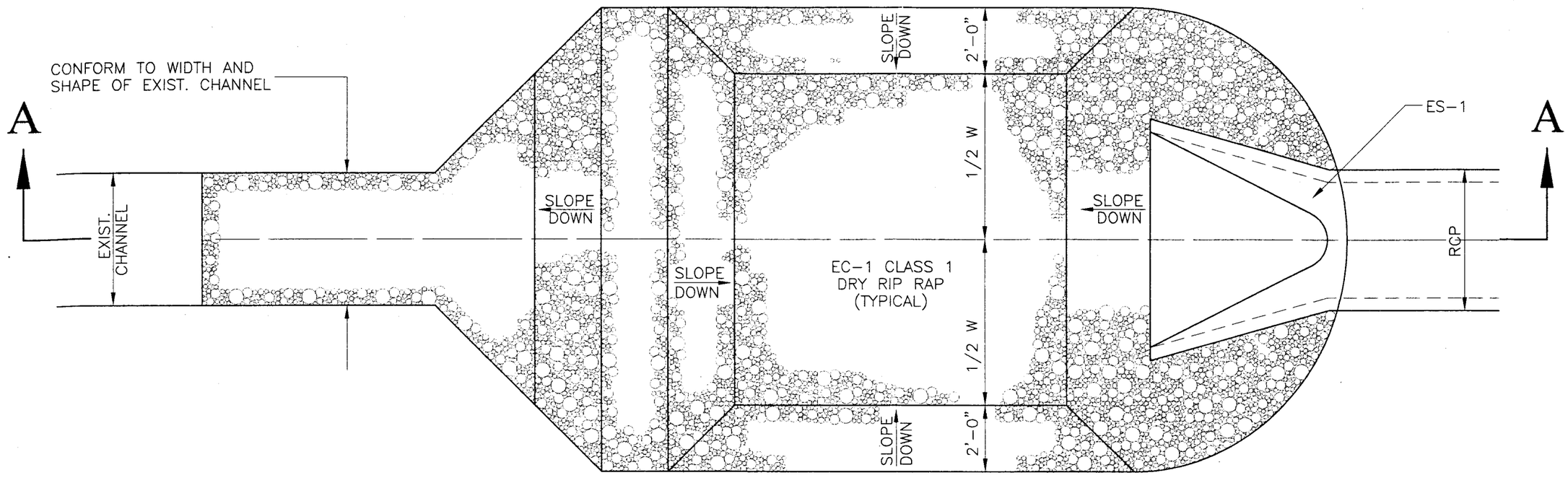




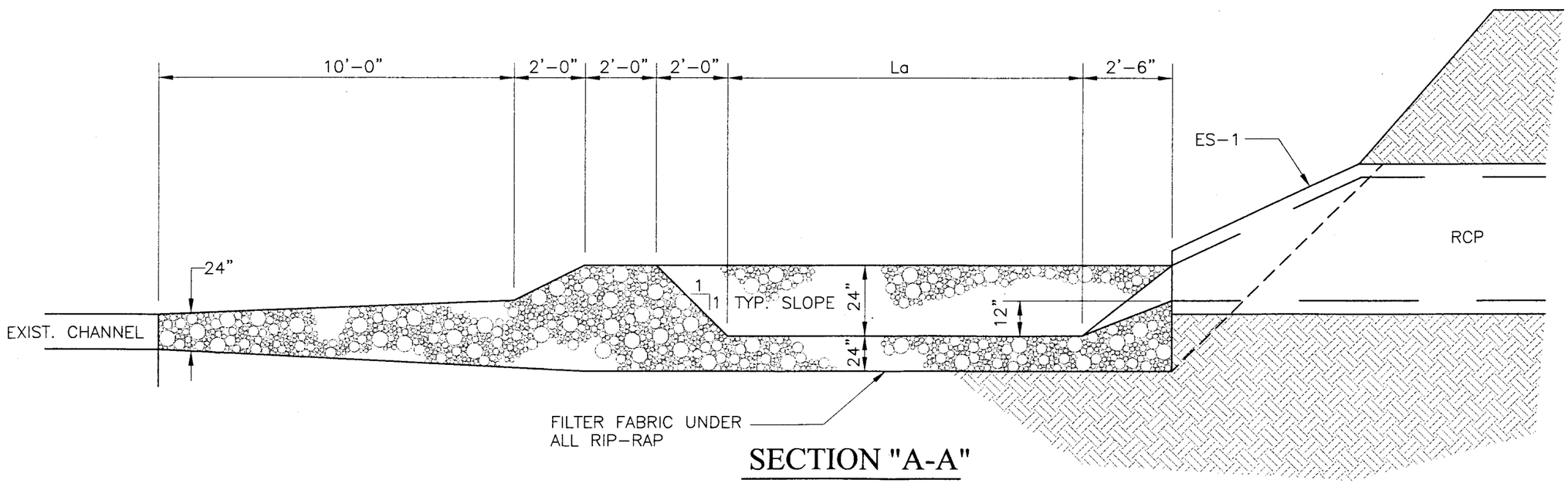
AN SEWER FOR
) SECTION VI-C

MANHOLE #9

25



PLAN



SECTION "A-A"

STILLING BASIN DETAIL

NOT TO SCALE

ORTATION DOES
TENANCE OF
TURES, AND
DAMAGE.

E EASEMENTS
WNER'S ASSOC.

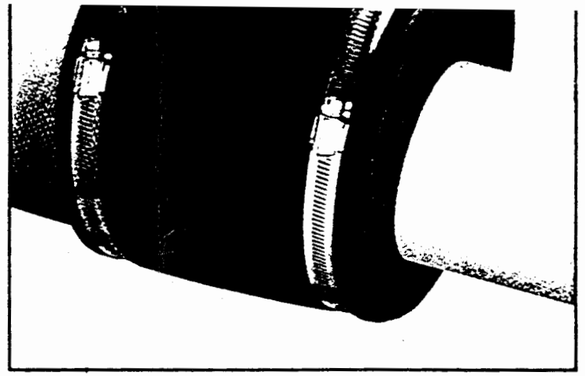
WC041_STONEHOUSE_HOLLOW_OAK - 018

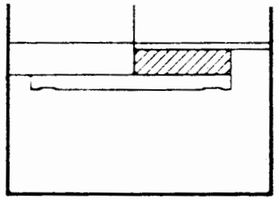
DES. D.L.B.

DEVELOPMENT AREA ONE, PHASE I
SECTION VIB AND MILL POND RUN - SECTION III

PROJ.N

SCALE:



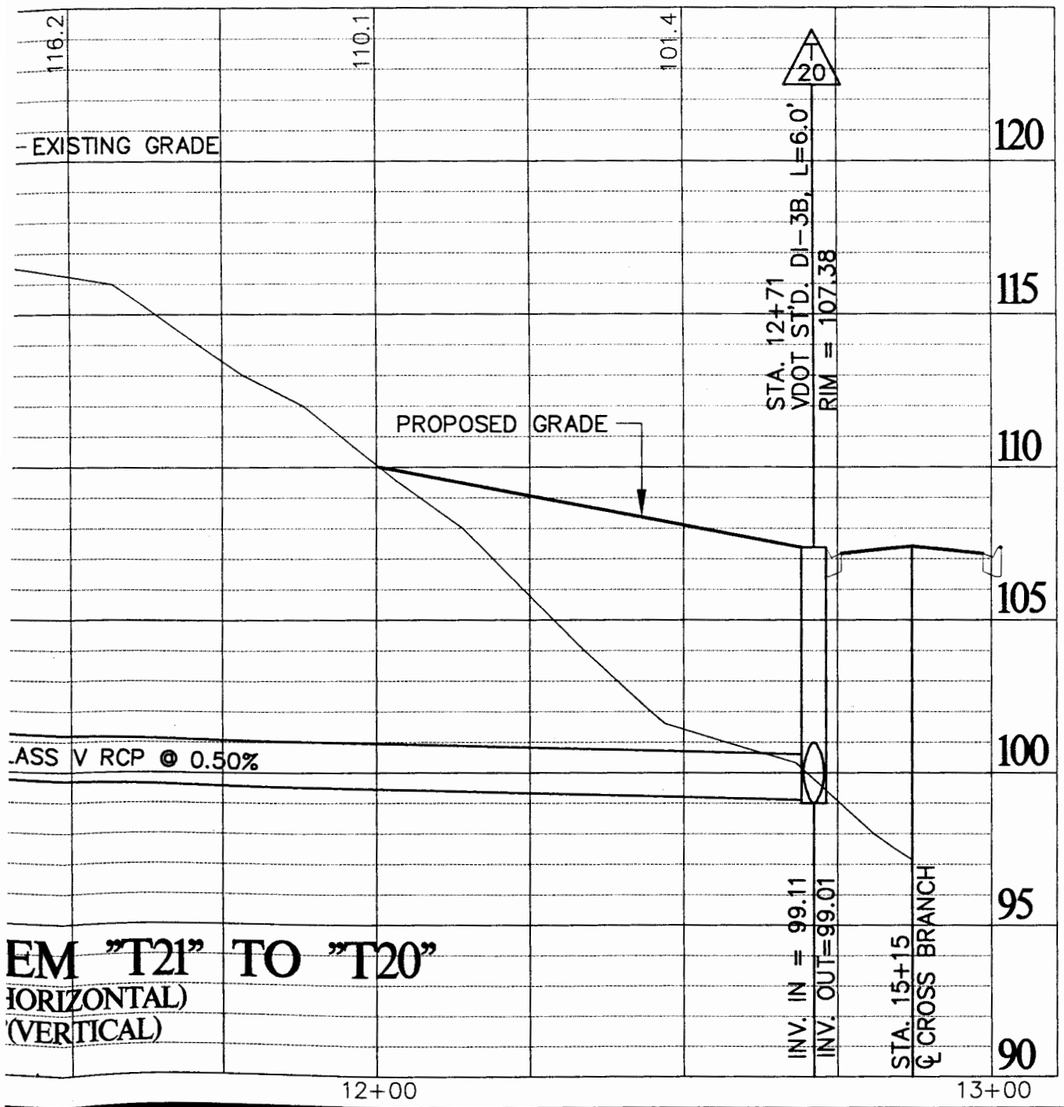


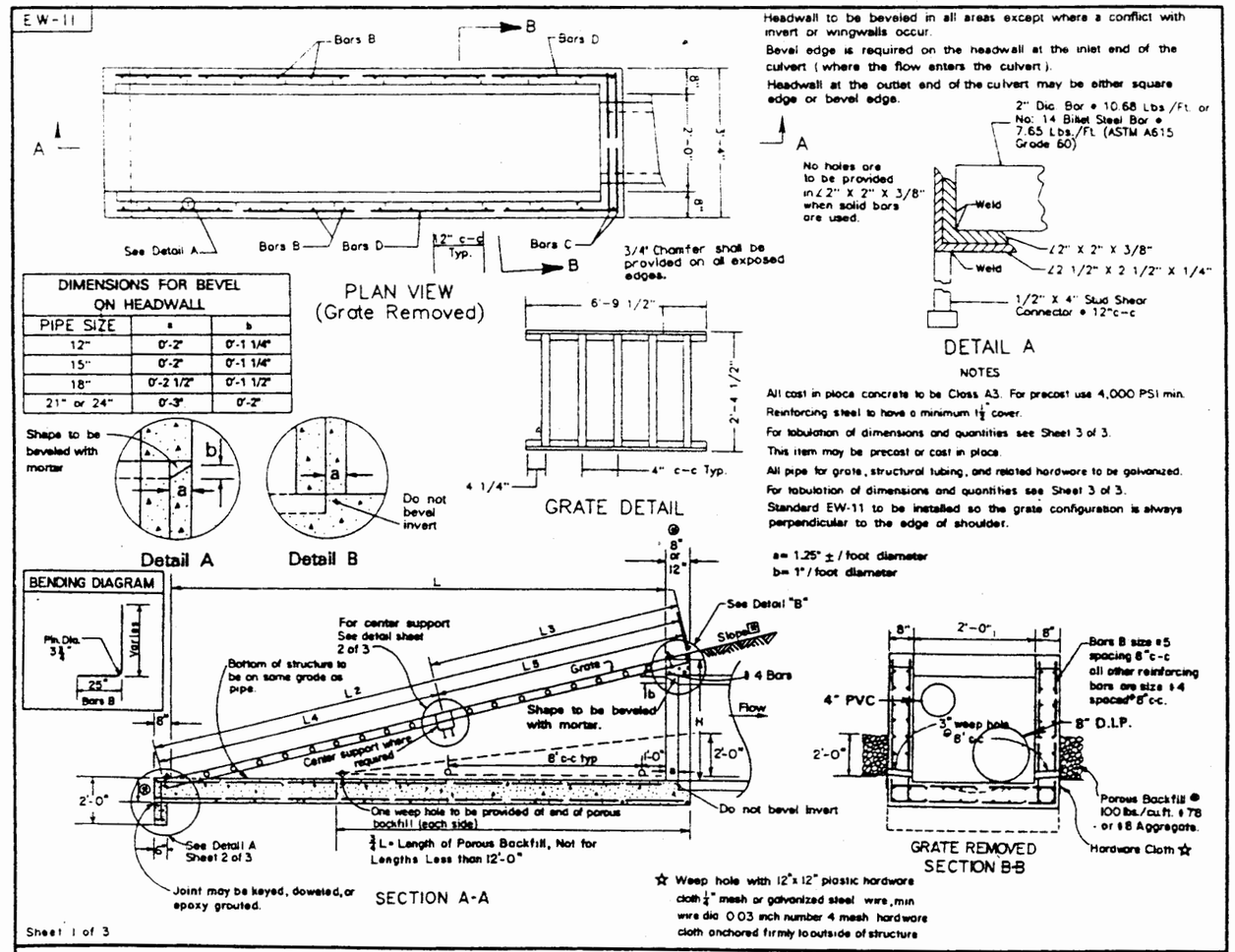
against infiltration and exfiltration. Eccentric bushings fit one end of Femco Standard Flexible Couplings.

Available for all common sewer pipe materials.

Clay to Clay Clay to CI/Plastic Clay to A-C/Ductile Concrete to Concrete	Concrete to CI/Plastic A-C/Ductile to CI/Plastic A-C/Ductile to A-C/Ductile CI/Plastic to CI/Plastic

When ordering, please provide size and piping materials to be connected.

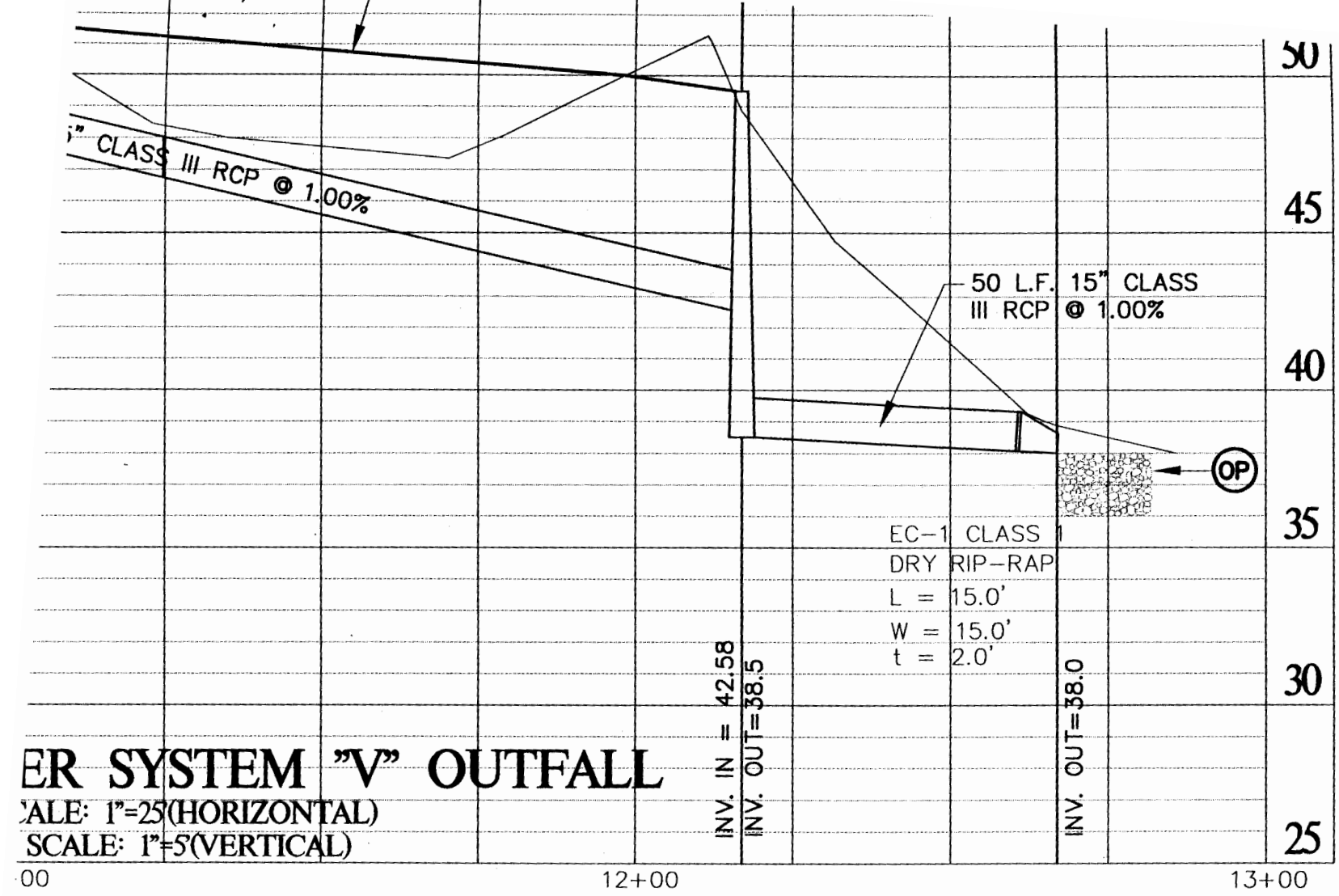


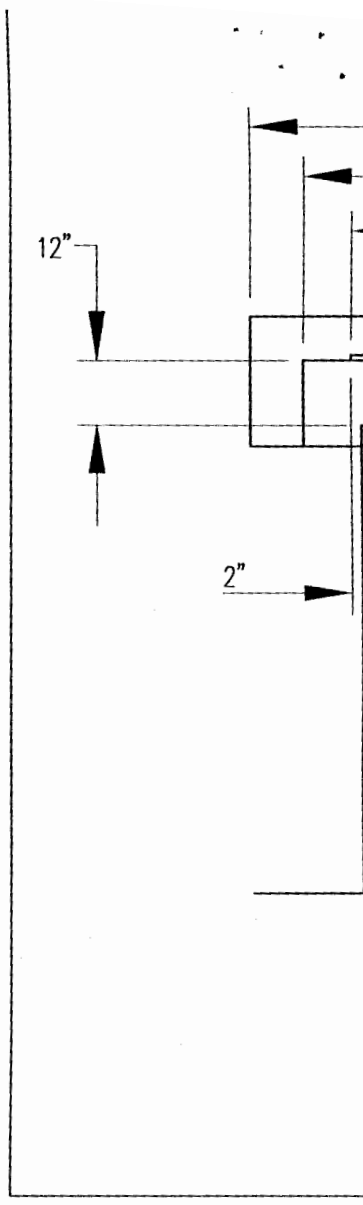


PIPE ENDWALL WITH LOAD-CARRYING GRATE
MODIFIED

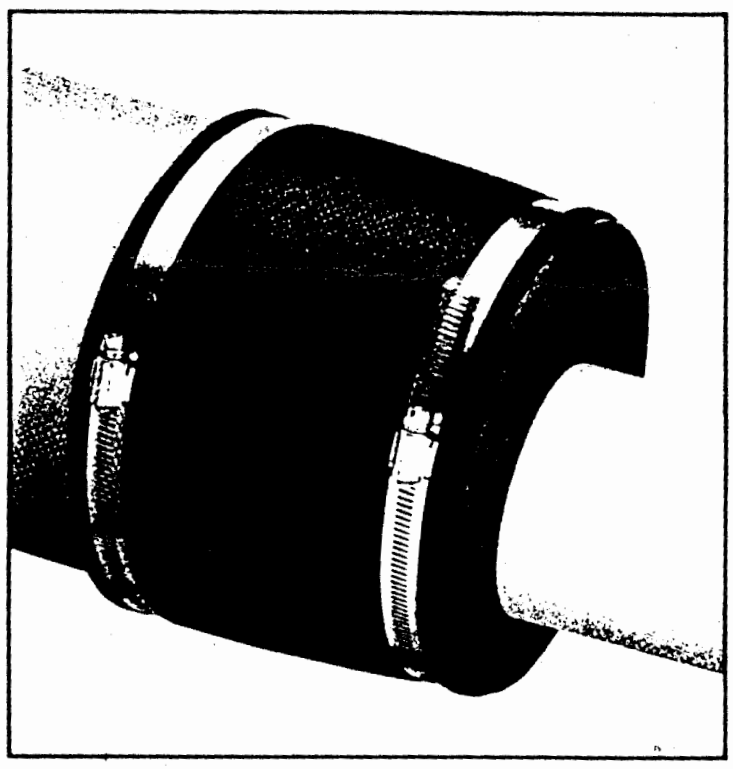
VIRGINIA DEPARTMENT OF TRANSPORTATION

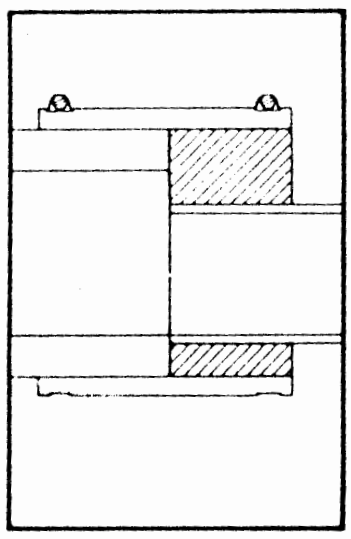
SPECIFICATION REFERENCE
106.04 241 302





ECCENTRIC COUPLINGS

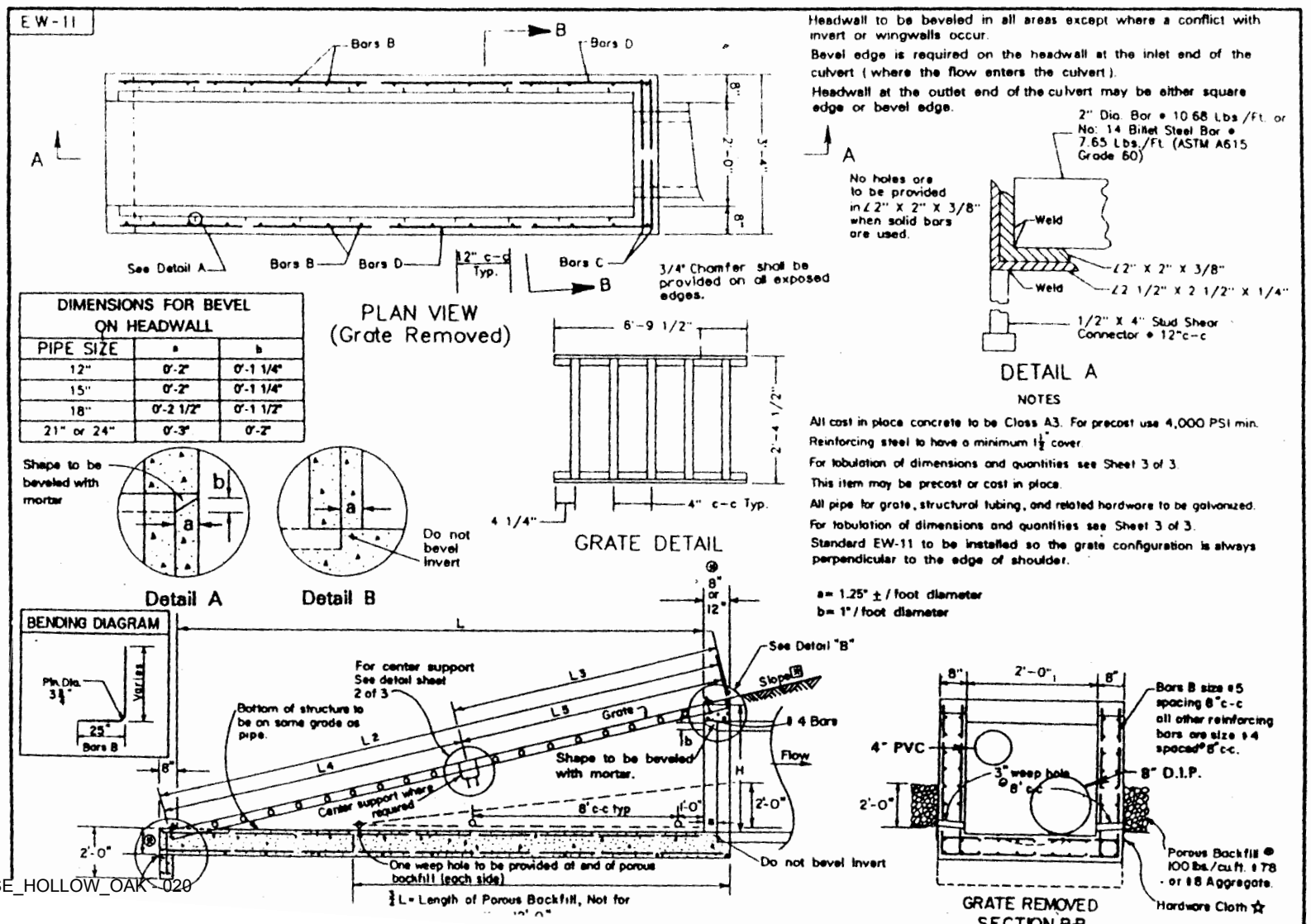


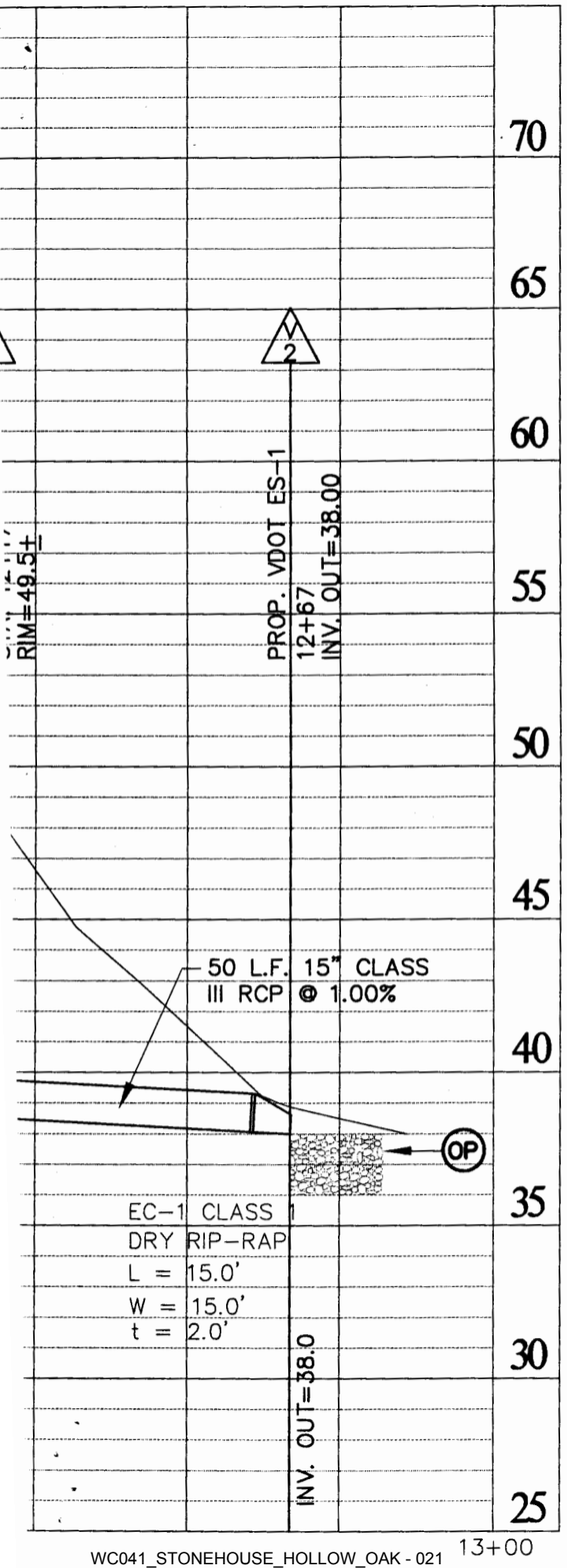


Fernco Eccentric Couplings help maintain an even, continuous flowline in **critical grade conditions.** They're easy to install and available to fit all common sewer pipe size combinations. Made of tough, flexible elastomeric PVC, Eccentric Couplings seal reliably against infiltration and exfiltration. Eccentric bushings fit one end of Fernco Standard Flexible Couplings.

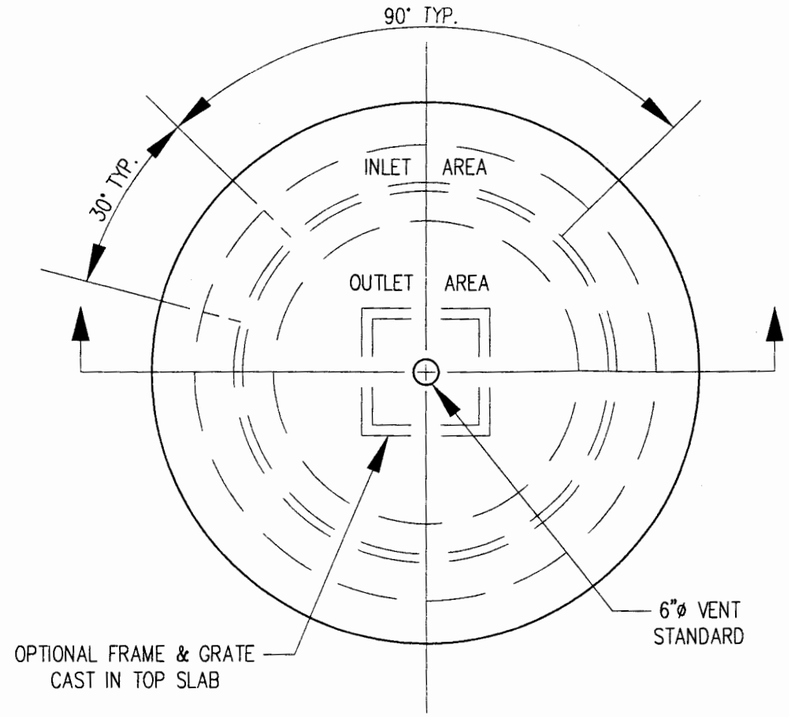
Available for all common sewer pipe materials.

Clay to Clay Clay to CI/Plastic Clay to A-C/Ductile Concrete to Concrete	Concrete to CI/Plastic A-C/Ductile to CI/Plastic A-C/Ductile to A-C/Ductile CI/Plastic to CI/Plastic
When ordering, please provide size and piping materials to be connected.	

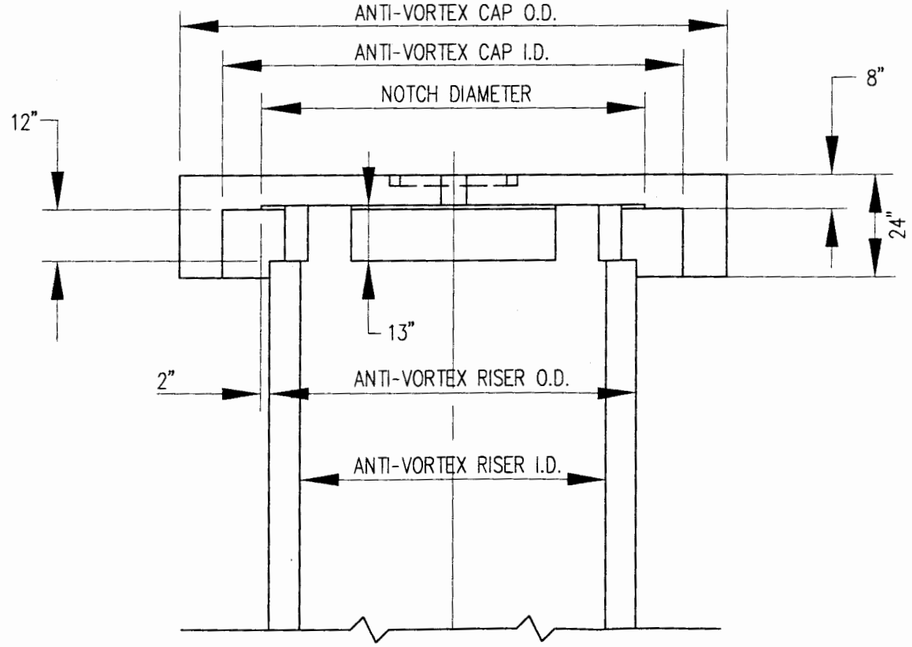




WC041_STONEHOUSE_HOLLOW_OAK - 021



PLAN



SECTION

NOTE:

1. ANTI-VORTEX DEVICE (CAP AND RISER) MANUFACTURED IN ACCORDANCE WITH ASTM C478.
2. DIMENSIONS SUBJECT TO PERMISSIBLE VARIATIONS OF ASTM C478.
3. INLET AREA (AREA BETWEEN DEVICE I.D. AND RISER O.D.) IS GREATER THAN OUTLET AREA (AREA OF RISER I.D.).
4. SLAB REIFORCEMENT TO BE ASTM A615 #4 BARS @ 8" E.W. CIRCUMFERENCIAL REINFORCEMENT TO BE Asc = 1 @ 0.150 2 x 6 W2.5 x W2.5 WWF MINIMUM. MATERIAL PROPERTIES: fy = 60 kei. fc = 4 ksi. CONCRETE COVER OVER REINFORCEMENT (CCOR) = 1", UNLESS NOTED.
5. DI-1 FRAME & GRATE IS UNAVAILABLE FOR 48" I.D. RISERS AND LARGER.

RISER		ANTI-VORTEX CAP		NOTCH DIAMETER	APPROX. CAP WEIGHT
I.D.	O.D.	I.D.	O.D.		
24"	30"	48"	58"	34"	1.49 T
27"	33-1/2"	60"	70" OR 72"	37-1/2"	2.28 T
30"	37"	60"	70" OR 72"	41"	2.26 T
36"	44"	60"	70" OR 72"	48"	2.22 T
42"	51"	72"	86"	55"	3.16 T
48"	58"	84"	100"	62"	4.27 T
54"	66-1/2"	84"	100"	70-1/2"	4.20 T
60"	72"	96"	114"	76"	5.48 T
66"	80-1/2"	96"	114"	84-1/2"	5.39 T
72"	86"	108"	128"	90"	6.83 T
78"	94-1/2"	126"	147"	98-1/2"	8.97 T
84'	100"	126"	147'	104"	8.90 T

ANTI-VORTEX DEVICE DETAIL

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

Langley and McDonald, P.C.
Engineers · Surveyors · Planners
Landscape Architects · Environmental Consultants
VIRGINIA BEACH WILLIAMSBURG

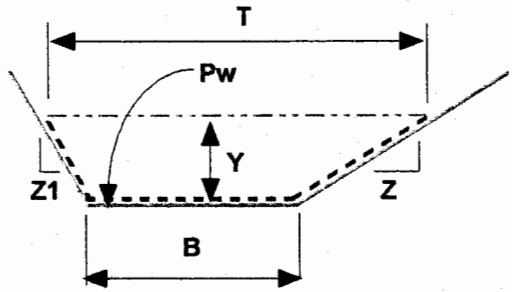
Open Channel Analysis / Uniform Flow :
(USING MANNING'S EQUATION :)
Project : Stonehouse
Location : James City County, VA

$$Q = \frac{1.486 \cdot A \cdot (R_h)^{\frac{2}{3}} \cdot \sqrt{S_o}}{n}$$

$$R_h := \frac{A}{P_w}$$

A = Area of Flow Section
P_w = Wetted Perimeter
R_h = Hydraulic Radius

$$T := B + y \cdot (Z_1 + Z_2)$$



TRAPEZOIDAL, RECTANGULAR or VEE CHANNEL CROSS SECTION

Cross Section Designation :
SECTION VIB SYSTEM "X" OUTFALL :

GIVEN :	Design flow, Q_{DESIGN} =	2.4	cubic ft. / sec.
	Bottom Width, B =	2	feet
	Channel Slope, S_o =	0.11	feet / foot
	Side Slopes, Z_1 =	10	Run / Unit rise
	Z_2 =	8	Run / Unit rise
	Manning's Coefficient, n =	0.03	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	5.08	feet	Y_{Normal} =	0.17	feet
R_{hn} =	0.12	feet	V_{Normal} =	3.97	f.p.s.
T_c =	6.47	feet	$Y_{Critical}$ =	0.25	feet
R_{hc} =	0.16	feet	$V_{Critical}$ =	2.29	f.p.s.
			$S_{Critical}$ =	0.0242	ft. / ft.
			F =	2.03	

Supercritical Flow / Steep Slope

Cross Section Designation :
SECTION VIB SYSTEM "W" OUTFALL :

GIVEN :	Design flow, Q_{DESIGN} =	2.23	cubic ft. / sec.
	Bottom Width, B =	15	feet
	Channel Slope, S_o =	0.1	feet / foot
	Side Slopes, Z_1 =	10	Run / Unit rise
	Z_2 =	10	Run / Unit rise
	Manning's Coefficient, n =	0.03	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	16.21	feet	Y_{Normal} =	0.06	feet
R_{hn} =	0.06	feet	V_{Normal} =	2.36	f.p.s.
T_c =	16.73	feet	$Y_{Critical}$ =	0.09	feet
R_{hc} =	0.08	feet	$V_{Critical}$ =	1.62	f.p.s.
			$S_{Critical}$ =	0.0302	ft. / ft.
			F =	1.72	

Supercritical Flow / Steep Slope

Cross Section Designation :
SECTION VIB SYSTEM "T" OUTFALL :

GIVEN :	**Design flow, Q_{DESIGN} =**	**16.9**	**cubic ft. / sec.**
	Bottom Width, B =	**10**	**feet**
	Channel Slope, S_o =	**0.05**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.03**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	11.91	feet	Y_{Normal} =	**0.32**	**feet**
R_{hn} =	0.29	feet	V_{Normal} =	**4.85**	**f.p.s.**
T_c =	12.56	feet	$Y_{Critical}$ =	**0.43**	**feet**
R_{hc} =	0.38	feet	$V_{Critical}$ =	**3.51**	**f.p.s.**
			$S_{Critical}$ =	**0.0183**	**ft. / ft.**
			F =	**1.58**	

Supercritical Flow / Steep Slope

Cross Section Designation :
SECTION VIB SYSTEM "V" OUTFALL :

GIVEN :	**Design flow, Q_{DESIGN} =**	**4.02**	**cubic ft. / sec.**
	Bottom Width, B =	**5**	**feet**
	Channel Slope, S_o =	**0.04**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.03**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	6.30	feet	Y_{Normal} =	**0.22**	**feet**
R_{hn} =	0.19	feet	V_{Normal} =	**3.29**	**f.p.s.**
T_c =	6.55	feet	$Y_{Critical}$ =	**0.26**	**feet**
R_{hc} =	0.22	feet	$V_{Critical}$ =	**2.70**	**f.p.s.**
			$S_{Critical}$ =	**0.0219**	**ft. / ft.**
			F =	**1.32**	

Supercritical Flow / Steep Slope

SEDIMENT TRAP DESIGN : **STONEHOUSE SECTION VIB**

ST- 1 **DRAINED AREA = 1.06 acres** **WS / DS VOLUME REQD = 71 c.y.**

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	conic
WET STORAGE :	46	21	966	2	4 /	30	5	150	83	74
DRY STORAGE :	58	33	1914	3	2	46	21	966	107	105

WET STORAGE SURFACE / GRATE ELEV. : 101.00
BOTTOM ELEV. : 97.00
DRY STORAGE SURFACE ELEV. : 103.00
EMBANKMENT TOP ELEV. : 104.00

TEMPORARY SEDIMENT TRAP ST- 1
DRAINED AREA = 1.06 Acre
WET STORAGE :
W.S. LENGTH : 46 feet
W.S. WIDTH : 21 feet
W.S. SURFACE ELEV.: 101.00
BOTTOM ELEV. : 97.00
WEIR : L_{OUTLET} = 7 feet
H_o = 2 feet
BERM ; W = 3 feet
H = 3 feet

ST- 2 **DRAINED AREA = 0.7 acres** **WS / DS VOLUME REQD = 47 c.y.**

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	conic
WET STORAGE :	35	20	700	2	3 /	23	8	184	49	46
DRY STORAGE :	44	29	1276	3	1.5	35	20	700	55	54

WET STORAGE SURFACE / GRATE ELEV. : 93.00
BOTTOM ELEV. : 90.00
DRY STORAGE SURFACE ELEV. : 94.50
EMBANKMENT TOP ELEV. : 96.00

TEMPORARY SEDIMENT TRAP ST- 2
DRAINED AREA = 0.7 Acre
WET STORAGE :
W.S. LENGTH : 35 feet
W.S. WIDTH : 20 feet
W.S. SURFACE ELEV.: 93.00
BOTTOM ELEV. : 90.00
WEIR : L_{OUTLET} = 5 feet
H_o = 1.5 feet
BERM ; W = 3 feet
H = 3 feet

ST- 3 **DRAINED AREA = 0.55 acres** **WS / DS VOLUME REQD = 37 c.y.**

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	conic
WET STORAGE :	30	20	600	2	3 /	18	8	144	41	38
DRY STORAGE :	45	35	1575	3	2.5	30	20	600	101	97

WET STORAGE SURFACE / GRATE ELEV. : 76.00
BOTTOM ELEV. : 73.00
DRY STORAGE SURFACE ELEV. : 78.50
EMBANKMENT TOP ELEV. : 80.00

TEMPORARY SEDIMENT TRAP ST- 3
DRAINED AREA = 0.55 Acre
WET STORAGE :
W.S. LENGTH : 30 feet
W.S. WIDTH : 20 feet
W.S. SURFACE ELEV.: 76.00
BOTTOM ELEV. : 73.00
WEIR : L_{OUTLET} = 4 feet
H_o = 2.5 feet
BERM ; W = 4 feet
H = 4 feet

ST- 4 DRAINED AREA = 0.59 acres WS / DS VOLUME REQD = 40 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	31	20	620	2	3	19	8	152	43	40
DRY STORAGE :	40	29	1160	3	1.5	31	20	620	49	49

WET STORAGE SURFACE / GRATE ELEV. : 88.00
BOTTOM ELEV. : 85.00
DRY STORAGE SURFACE ELEV. : 89.50
EMBANKMENT TOP ELEV. : 91.00

TEMPORARY SEDIMENT TRAP ST- 4
DRAINED AREA = 0.59 Acre
WET STORAGE :
W.S. LENGTH : 31 feet
W.S. WIDTH : 20 feet
W.S. SURFACE ELEV.: 88.00
BOTTOM ELEV. : 85.00
WEIR : L_{OUTLET} = 4 feet
H_o = 1.5 feet
BERM ; W = 3 feet
H = 3 feet

CHECK DAM DRAINED AREA = 1.47 acres WS / DS VOLUME REQD = 98 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED conic
BOTTOM:	10	20	200	2	0	10	20	200	0
TOP DAM:	30	50	1500	3	4	6	26	156	106

BOTTOM ELEV. : 82.00
CREST ELEV. : 86.00

TEMPORARY SEDIMENT TRAP CHECK DAM
DRAINED AREA = 1.47 Acre
STORAGE VOLUME = 106 c.y.

STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall Intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"tc"	"I"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM " T"		*	*							*	*	*		*				
ROAD PAVEMENT	T23	0.12	0.9	0.11	0.108	0.02	5.00	7.2	0.78									
SHOULDER	T23	0.65	0.35	0.23	0.336	0.04	5.00	7.2	2.42									
T23 DI -3B, L=8'	T22									102.80	101.80	197	0.0051	15	4.50	4.27	0.77	
PAVEMENT	T22	0.09	0.9	0.08	0.417	0.02	5.00	7.2	3.00									
LOT AREA	T22	0.51	0.35	0.18	0.595	0.02	5.00	7.2	4.29									
SHOULDER	T22A	0.011	0.9	0.01	0.01	1.48	5.00	7.2	0.07									
PAVEMENT	T22A	0.08	0.35	0.03	0.038	0.04	5.00	7.2	0.27									
T22A DI-3B, L=4'	T22									106.00	105.68	32	0.0100	15	6.31	6.00	0.09	
T22 DI-3B, L=8'	T21								4.56	101.55	100.45	222	0.0050	18	7.23	4.77	0.78	
PAVEMENT	T21	0.08	0.9	0.07	0.705	0.02	5.00	7.2	5.08									
CUT SLOPE / SHOULDER	T21	0.3	0.35	0.11	0.81	0.02	5.00	7.2	5.83									
T21 DI-3B, L=6'	T20									100.35	99.11	255	0.0049	18	7.16	4.72	0.90	
PAVEMENT	T20	0.06	0.9	0.05	0.864	0.01	5.00	7.2	6.22									
LOT AREA	T20	0.34	0.35	0.12	0.983	0.01	5.00	7.2	7.08									
T20 DI-3B, L=6'	T19									98.95	98.62	65	0.0051	18	7.32	4.83	0.22	
PAVEMENT	T19A	0.14	0.9	0.13	0.126	0.02	5.00	7.2	0.91									
SHOULDER	T19A	0.105	0.4	0.04	0.168	0.02	5.00	7.2	1.21									
T19A DI-3C, L=6'	T19									100.32	100.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T19	0.06	0.9	0.05	1.205	0.01	5.00	7.2	8.68									
LOT / SHOULDER	T19	0.71	0.35	0.25	1.453	0.01	5.00	7.2	10.47									
T19 DI-3C, L=12'	T18									98.12	97.77	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T18	0.13	0.9	0.12	1.57	0.04	5.00	7.2	11.31									
SHOULDER	T18	0.22	0.4	0.09	1.658	0.04	5.00	7.2	11.94									
T18 DI-3B, L=6'	T17									97.67	97.32	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T17	0.11	0.9	0.10	1.757	0.02	5.00	7.2	12.66									
DRAINAGE AREA	T17	0.1	0.35	0.04	1.792	0.02	5.00	7.2	12.91									
T17 DI-3B, L=4'	T16									97.22	96.60	125	0.0050	24	15.57	5.78	0.36	
T16 MH-1	T15									96.50	95.98	105	0.0050	24	15.56	5.78	0.30	
T15 MH-1	T14									95.88	93.88	100	0.0200	24	31.27	11.61	0.14	
PAVEMENT	T14A	0.138	0.9	0.12	0.124	0.03	5.00	7.2	0.89									
SHOULDER / SIDEWALK	T14A	0.08	0.5	0.04	0.164	0.04	5.00	7.2	1.18									
T14A DI-3B, L=6'	T14									94.20	93.88	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T14	0.123	0.9	0.11	2.067	0.03	5.63	7.0	14.51									
SHOULDER	T14	0.1	0.35	0.04	2.102	0.04	5.63	7.0	14.75									
T14 DI-3B L=6 '	T13									93.75	89.75	100	0.0400	24	44.23	16.41	0.10	
T13 MH-1	T12									89.65	83.00	95	0.0700	24	58.50	21.71	0.07	
T12 DROP MH-1	T11									80.45	70.30	145	0.0700	24	58.50	21.71	0.11	
PAVEMENT	T11A	0.12	0.9	0.11	0.108	0.03	5.00	7.2	0.78									
SHOULDER / SIDEWALK	T11A	0.11	0.5	0.06	0.163	0.04	5.00	7.2	1.17									
T11A DI-3B, L=8'	T11									71.00	70.68	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T11	0.12	0.9	0.11	2.373	0.04	6.00	6.9	16.40									
SHOULDER	T11	0.15	0.35	0.05	2.426	0.04	6.00	6.9	16.76									
T11 DI-3B, L=8'	T10									70.00	58.00	100	0.1200	24	76.60	28.43	0.06	
T10 DROP MH-1	T9									52.00	49.90	105	0.0200	24	31.27	11.61	0.15	
T9 DROP MH-1	ES-1									42.30	42.00	30	0.0100	24	22.11	8.21	0.06	
		4.757																

STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall Intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"to"	"I"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM "V"																		
PAVEMENT	V6	0.18	0.9	0.16	0.162	0.01	5.00	7.2	1.17									
SHOUL;DER / SIDEWALK	V6	0.14	0.4	0.06	0.218	0.02	5.00	7.2	1.57									
V6 DI-3C, L=8'	V5									52.00	51.47	107	0.0050	15	4.44	4.22	0.42	
V5 MH-1	V4									51.37	51.02	70	0.0050	15	4.46	4.24	0.28	
PAVEMENT	V4A	0.14	0.9	0.13	0.126	0.01	5.00	7.2	0.91									
SHOUL;DER / SIDEWALK	V4A	0.14	0.4	0.06	0.182	0.02	5.00	7.2	1.31									
V4A DI-3B, L=4'	V4									52.32	52.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	V4	0.14	0.9	0.13	0.526	0.01	5.00	7.2	3.79									
SHOUL;DER / SIDEWALK	V4	0.09	0.35	0.03	0.558	0.02	5.00	7.2	4.02									
V4 DI-3B, L=4'	V3									50.90	42.58	185	0.0450	15	13.39	12.72	0.24	
V3 MH-1	V2 ES-1	0.83								38.50	38.00	50	0.0100	15	6.31	6.00	0.14	
STORM SYSTEM "W"																		
PAVEMENT	W3	0.12	0.9	0.11	0.108	1.00	5.00	7.2	0.78									
SHOULDER	W3	0.09	0.35	0.03	0.14	1.00	5.00	7.2	1.00									
W3 DI-3B, L=6'	W2									103.25	102.93	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	W2	0.13	0.9	0.12	0.257	1.00	5.00	7.2	1.85									
SHOULDER	W2	0.15	0.35	0.05	0.309	1.00	5.00	7.2	2.23									
W2 DI-3B, L=6'	W1	0.49								102.83	102.00	57	0.0146	15	7.62	7.24	0.13	
STORM SYSTEM "X"																		
PAVEMENT	X3	0.07	0.9	0.06	0.063	1.00	5.00	7.2	0.45									
SHOULDER	X3	0.31	0.35	0.11	0.172	1.00	5.00	7.2	1.24									
X3 DI-3B, L=6'	X2									95.82	95.50	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	X2	0.16	0.9	0.14	0.316	1.00	5.00	7.2	2.27									
SHOULDER	X2	0.05	0.35	0.02	0.333	1.00	5.00	7.2	2.40									
X2 DI-3B, L=6'	X1	0.59								95.40	88.00	44	0.1682	15	25.89	24.60	0.03	

INLET STATION	Outlet Water Surface	FRICTION LOSS IN PIPE						JUNCTION LOSS												H Adjusted	Inlet Water Surface Elevation	Rim Elevation
		Do	Qo	Lo	no	Sfo	Hf	Vo	Ho	Qi	Vi	Qi x Vi	V²/ 2g	Hi	Δ	Hdelta	Ht	.3 x Ht	0.5 x Ht			
1	2	3	4	5	5A	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STORM SYSTEM "T"																						
STORM SYSTEM "T"																						
T9 MH-1 / DROP	43.60	24	16.9	30	0.013	0.0056	0.167	5.38	0.11	16.9	10.32	174.41	1.65	0.58	45	0.70	1.39	0.42	-0.70	1.28	44.88	54.50
T10 MH-1 / DROP	50.93	24	16.9	105	0.013	0.0056	0.586	5.38	0.11	16.9	19.89	336.14	6.14	2.15	0	0.00	2.26	0.68	-1.13	2.40	53.33	63.50
T11 DI-3B, L=8'	58.63	24	16.9	160	0.013	0.0056	0.558	5.38	0.11	14.89	15.82	235.56	3.89	1.36	74	2.45	3.92	1.18	-1.96	3.69	62.32	78.39
										1.17	4	4.68										
T12 MH-1 / DROP	70.98	24	14.89	146	0.013	0.0043	0.628	4.74	0.09	14.89	15.82	235.56	3.89	1.36	9	0.23	1.68	0.50	-0.84	1.97	72.95	90.25
T13 MH-1	72.95	24	14.89	96	0.013	0.0043	0.412	4.74	0.09	14.89	12.9	192.08	2.58	0.90	20	0.41	1.41	0.42	-0.70	1.54	74.49	95.75
										1.18	4											
T14 DI-3B, L=6'	74.49	24	14.89	100	0.013	0.0043	0.433	4.74	0.09	13.03	9.66	125.87	1.45	0.51	24	0.30	0.90	0.27	-0.45	1.15	75.64	99.29
T15 MH-1	75.64	24	13.03	100	0.013	0.0033	0.332	4.15	0.07	13.03	5.68	74.01	0.50	0.18	20	0.08	0.32	0.10	-0.16	0.59	76.23	103.00
T16 MH-1	76.23	24	13.03	106	0.013	0.0033	0.348	4.15	0.07	13.03	5.68	74.01	0.50	0.18	8	0.03	0.27	0.08	-0.13	0.56	76.79	106.25
T17 DI-3B, L=4'	76.79	24	13.03	126	0.013	0.0033	0.415	4.15	0.07	12.08	5.59	67.42	0.49	0.17	85	0.33	0.57	0.17	-0.28	0.87	77.66	106.76
T18 DI-3B, L=6'	77.66	24	12.08	70	0.013	0.0028	0.199	3.84	0.06	10.58	5.44	57.56	0.46	0.16	7	0.02	0.24	0.07	-0.12	0.39	78.05	107.45
T19 DI-3C, L=12'	78.05	24	10.58	70	0.013	0.0022	0.153	3.37	0.04	7.2	4.79	34.49	0.36	0.12	7	0.02	0.19	0.06	-0.09	0.30	78.35	106.84
T20 DI-3B, L=6'	78.35	18	7.2	65	0.013	0.0047	0.305	4.07	0.06	5.95	4.67	27.79	0.34	0.12	88	0.23	0.42	0.13	-0.21	0.64	78.99	107.38
T21 DI-3B, L=6'	78.99	18	5.95	265	0.013	0.0032	0.818	3.37	0.04	4.81	4.47	21.50	0.31	0.11	88	0.22	0.37	0.11	-0.18	1.11	80.10	114.47
T22 DI-3B, L=8'	80.10	18	4.81	222	0.013	0.0021	0.465	2.72	0.03	2.57	4.96	12.75	0.38	0.13	2	0.01	0.17	0.05	-0.08	0.60	80.70	110.63
T23 DI-3B, L=8'	80.70	16	2.57	100	0.013	0.0016	0.158	2.09	0.02			0.00	0.00	0.00	0	0.00	0.02	0.01	-0.01	0.17	80.87	106.82
T11A DI-3B, L=6'	71.04	16	1.17	32	0.013	0.0003	0.010	0.95	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	71.05	78.39
T14A DI-3B, L=6'	94.24	16	1.18	32	0.013	0.0003	0.011	0.96	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	94.25	99.29
T19A DI-3C, L=6'	100.37	16	1.21	32	0.013	0.0004	0.011	0.99	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	100.38	106.84
T22A DI-3B, L=6'	105.94	16	0.62	100	0.013	0.0001	0.009	0.51	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	105.95	111.13
STORM SYSTEM "V"																					39.00	
V2 ES-1	39.00	16	4.02	60	0.013	0.0039	0.194	3.28	0.04	4.02	10.08	40.52	1.58	0.55	0	0.00	0.59	0.18	-0.30	0.67	39.67	NA
V3 MH-1	39.67	16	4.02	130	0.013	0.0039	0.503	3.28	0.04	4.02	9.7	38.99	1.46	0.51	45	0.62	1.17	0.35	-0.59	1.44	41.11	49.50
V4 DI-3B, L=4'	41.11	16	4.02	100	0.013	0.0039	0.620	3.28	0.04	1.57	3.38	5.31	0.18	0.06	90	0.12	0.23	0.07	-0.11	0.80	41.91	58.47
										1.31	4.13	5.41	0.26	0.09	0	0.00	0.09	0.03	-0.05	0.07	41.19	
V5 MH-1	41.91	16	1.57	70	0.013	0.0006	0.041	1.28	0.01	1.57	3.38	5.31	0.18	0.06	20	0.03	0.10	0.03	-0.05	0.12	42.03	58.00
V6 DI-3C, L=8'	42.03	16	1.57	107	0.013	0.0006	0.063	1.28	0.01	0	0	0.00	0.00	0.00	0	0.00	0.01	0.00	-0.00	0.07	42.10	56.72
V4A DI-3B, L=4'	42.10	16	1.31	32	0.013	0.0004	0.013	1.07	0.00	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	-0.00	0.02	42.12	58.47

STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"tc"	"i"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM " T"		*	*							*	*	*		*				
ROAD PAVEMENT	T23	0.12	0.9	0.11	0.108	0.02	5.00	7.2	0.78									
SHOULDER	T23	0.65	0.35	0.23	0.336	0.04	5.00	7.2	2.42									
T23 DI -3B, L=8'	T22									102.80	101.80	197	0.0051	15	4.50	4.27	0.77	
PAVEMENT	T22	0.09	0.9	0.08	0.417	0.02	5.00	7.2	3.00									
LOT AREA	T22	0.51	0.35	0.18	0.595	0.02	5.00	7.2	4.29									
SHOULDER	T22A	0.011	0.9	0.01	0.01	1.48	5.00	7.2	0.07									
PAVEMENT	T22A	0.08	0.35	0.03	0.038	0.04	5.00	7.2	0.27									
T22A DI-3B, L=4'	T22									106.00	105.68	32	0.0100	15	6.31	6.00	0.09	
T22 DI-3B, L=8'	T21								4.56	101.55	100.45	222	0.0050	18	7.23	4.77	0.78	
PAVEMENT	T21	0.08	0.9	0.07	0.705	0.02	5.00	7.2	5.08									
CUT SLOPE / SHOULDER	T21	0.3	0.35	0.11	0.81	0.02	5.00	7.2	5.83									
T21 DI-3B, L=6'	T20									100.35	99.11	255	0.0049	18	7.16	4.72	0.90	
PAVEMENT	T20	0.06	0.9	0.05	0.864	0.01	5.00	7.2	6.22									
LOT AREA	T20	0.34	0.35	0.12	0.983	0.01	5.00	7.2	7.08									
T20 DI-3B, L=6'	T19									98.95	98.62	65	0.0051	18	7.32	4.83	0.22	
PAVEMENT	T19A	0.14	0.9	0.13	0.126	0.02	5.00	7.2	0.91									
SHOULDER	T19A	0.105	0.4	0.04	0.168	0.02	5.00	7.2	1.21									
T19A DI-3C, L=6'	T19									100.32	100.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T19	0.06	0.9	0.05	1.205	0.01	5.00	7.2	8.68									
LOT / SHOULDER	T19	0.71	0.35	0.25	1.453	0.01	5.00	7.2	10.47									
T19 DI-3C, L=12'	T18									98.12	97.77	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T18	0.13	0.9	0.12	1.57	0.04	5.00	7.2	11.31									
SHOULDER	T18	0.22	0.4	0.09	1.658	0.04	5.00	7.2	11.94									
T18 DI-3B, L=6'	T17									97.67	97.32	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T17	0.11	0.9	0.10	1.757	0.02	5.00	7.2	12.66									
DRAINAGE AREA	T17	0.1	0.35	0.04	1.792	0.02	5.00	7.2	12.91									
T17 DI-3B, L=4'	T16									97.22	96.60	125	0.0050	24	15.57	5.78	0.36	
T16 MH-1	T15									96.50	95.98	105	0.0050	24	15.56	5.78	0.30	
T15 MH-1	T14									95.88	93.88	100	0.0200	24	31.27	11.61	0.14	
PAVEMENT	T14A	0.138	0.9	0.12	0.124	0.03	5.00	7.2	0.89									
SHOULDER / SIDEWALK	T14A	0.08	0.5	0.04	0.164	0.04	5.00	7.2	1.18									
T14A DI-3B, L=6'	T14									94.20	93.88	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T14	0.123	0.9	0.11	2.067	0.03	5.63	7.0	14.51									
SHOULDER	T14	0.1	0.35	0.04	2.102	0.04	5.63	7.0	14.75									
T14 DI-3B L=6 '	T13									93.75	89.75	100	0.0400	24	44.23	16.41	0.10	
T13 MH-1	T12									89.65	83.00	95	0.0700	24	58.50	21.71	0.07	
T12 DROP MH-1	T11									80.45	70.30	145	0.0700	24	58.50	21.71	0.11	
PAVEMENT	T11A	0.12	0.9	0.11	0.108	0.03	5.00	7.2	0.78									
SHOULDER / SIDEWALK	T11A	0.11	0.5	0.06	0.163	0.04	5.00	7.2	1.17									
T11A DI-3B, L=8'	T11									71.00	70.68	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T11	0.12	0.9	0.11	2.373	0.04	6.00	6.9	16.40									
SHOULDER	T11	0.15	0.35	0.05	2.426	0.04	6.00	6.9	16.76									
T11 DI-3B, L=8'	T10									70.00	58.00	100	0.1200	24	76.60	28.43	0.06	
T10 DROP MH-1	T9									52.00	49.90	105	0.0200	24	31.27	11.61	0.15	
T9 DROP MH-1	ES-1									42.30	42.00	30	0.0100	24	22.11	8.21	0.06	
		4.757																

STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"tc"	"I"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM "V"																		
PAVEMENT	V6	0.18	0.9	0.16	0.162	0.01	5.00	7.2	1.17									
SHOUL;DER / SIDEWALK	V6	0.14	0.4	0.06	0.218	0.02	5.00	7.2	1.57									
V6 DI-3C, L=8'	V5									52.00	51.47	107	0.0050	15	4.44	4.22	0.42	
V5 MH-1	V4									51.37	51.02	70	0.0050	15	4.46	4.24	0.28	
PAVEMENT	V4A	0.14	0.9	0.13	0.126	0.01	5.00	7.2	0.91									
SHOUL;DER / SIDEWALK	V4A	0.14	0.4	0.06	0.182	0.02	5.00	7.2	1.31									
V4A DI-3B, L=4'	V4									52.32	52.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	V4	0.14	0.9	0.13	0.526	0.01	5.00	7.2	3.79									
SHOUL;DER / SIDEWALK	V4	0.09	0.35	0.03	0.558	0.02	5.00	7.2	4.02									
V4 DI-3B, L=4'	V3									50.90	42.58	185	0.0450	15	13.39	12.72	0.24	
V3 MH-1	V2 ES-1	0.83								38.50	38.00	50	0.0100	15	6.31	6.00	0.14	
STORM SYSTEM "W"																		
PAVEMENT	W3	0.12	0.9	0.11	0.108	1.00	5.00	7.2	0.78									
SHOULDER	W3	0.09	0.35	0.03	0.14	1.00	5.00	7.2	1.00									
W3 DI-3B, L=6'	W2									103.25	102.93	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	W2	0.13	0.9	0.12	0.257	1.00	5.00	7.2	1.85									
SHOULDER	W2	0.15	0.35	0.05	0.309	1.00	5.00	7.2	2.23									
W2 DI-3B, L=6'	W1	0.49								102.83	102.00	57	0.0146	15	7.62	7.24	0.13	
STORM SYSTEM "X"																		
PAVEMENT	X3	0.07	0.9	0.06	0.063	1.00	5.00	7.2	0.45									
SHOULDER	X3	0.31	0.35	0.11	0.172	1.00	5.00	7.2	1.24									
X3 DI-3B, L=6'	X2									95.82	95.50	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	X2	0.16	0.9	0.14	0.316	1.00	5.00	7.2	2.27									
SHOULDER	X2	0.05	0.35	0.02	0.333	1.00	5.00	7.2	2.40									
X2 DI-3B, L=6'	X1	0.59								95.40	88.00	44	0.1682	15	25.89	24.60	0.03	

SEDIMENT TRAP DESIGN : STONEHOUSE SECTION VIB

ST- 1 DRAINED AREA = 1.06 acres — WS / DS VOLUME REQD = 71 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	45	21	945	2	4 /	29	5	145	81	72
DRY STORAGE :	57	33	1881	3	2	45	21	945	105	103

WET STORAGE SURFACE / GRATE ELEV. : 101.00
BOTTOM ELEV. : 97.00
DRY STORAGE SURFACE ELEV. : 103.00
EMBANKMENT TOP ELEV. : 104.00

WEIR LENGTH REQD., L_{OUTLET} = 7 feet
H = 3 feet
W = 3 feet

ST- 2 DRAINED AREA = 0.7 acres — WS / DS VOLUME REQD = 47 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	35	20	700	2	3 /	23	8	184	49	46
DRY STORAGE :	44	29	1276	3	1.5	35	20	700	55	54

WET STORAGE SURFACE / GRATE ELEV. : 93.00
BOTTOM ELEV. : 90.00
DRY STORAGE SURFACE ELEV. : 94.50
EMBANKMENT TOP ELEV. : 96.00

WEIR LENGTH REQD., L_{OUTLET} = 5 feet
H = 3 feet
W = 3 feet

ST- 3 DRAINED AREA = 0.55 acres — WS / DS VOLUME REQD = 37 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	30	20	600	2	3 /	18	8	144	41	38
DRY STORAGE :	39	29	1131	3	1.5	30	20	600	48	47

WET STORAGE SURFACE / GRATE ELEV. : 76.00
BOTTOM ELEV. : 73.00
DRY STORAGE SURFACE ELEV. : 77.50
EMBANKMENT TOP ELEV. : 79.00

WEIR LENGTH REQD., L_{OUTLET} = 4 feet
H = 3 feet
W = 3 feet

ST- 4 DRAINED AREA = 0.59 acres — WS / DS VOLUME REQD = 40 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	31	20	620	2	3 /	19	8	152	43	40
DRY STORAGE :	40	29	1160	3	1.5	31	20	620	49	49

WET STORAGE SURFACE / GRATE ELEV. : 88.00
BOTTOM ELEV. : 85.00
DRY STORAGE SURFACE ELEV. : 89.50
EMBANKMENT TOP ELEV. : 91.00

WEIR LENGTH REQD., L_{OUTLET} = 4 feet
H = 3 feet
W = 3 feet

TEMPORARY SEDIMENT TRAP	WS ELEVATION	L_{TOP}	B_{TOP}	TOP EMBANKMENT ELEVATION	BOTTOM ELEVATION	H_O	DRAINAGE AREA	WET / DRY STORAGE REQUIRED	WET STORAGE PROVIDED	DRY STORAGE PROVIDED
ST - 1	89.00	45	21	92.00	87.00	1.2	0.92	62 C.Y.	64 C.Y.	> 62 C.Y.
ST - 2	90.00	35	20	93.00	87.50	1.67	2.52	169 C.Y.	180 C.Y.	>183 C.Y.
ST - 3	76.00	30	20	79.00	73.00	1.5	0.55	37 c.y.	41 c.y.	47 c.y.
ST - 4	88.00	31	20	91.00	85.00	1.5	0.59	40	40	49

68 Hollow OAK
PH 3
OAK DR LANE

WC
041

GPIN 044 01000 24
Stonehouse Dev Co LLC
120 Tredegar St
6th Floor
Richmond VA 23219

LOCATION: NEAR EAST OF 3241 OAK
BRANCH LANE
(LOT 50 PH 3)

DRAINAGE,

STORMWATER MANAGEMENT,

EROSION CONTROL, AND PAVEMENT DESIGN

CALCULATIONS

FOR

STONEHOUSE L.L.C.

DEVELOPMENT AREA ONE, PHASE I

SECTION VIB - "BENT TREE"

AND

MILL POND RUN, SECTION III

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

4/13/98

APRIL 3, 1998

Langley and McDonald, P.C.

Engineers
Surveyors
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Environmental Consultants

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(804) 253-2975 FAX: (804) 229-0049

DRAINAGE,

STORMWATER MANAGEMENT,

EROSION CONTROL, AND PAVEMENT DESIGN

CALCULATIONS

FOR

STONEHOUSE L.L.C.

DEVELOPMENT AREA ONE, PHASE I

SECTION VIB - "BENT TREE"

AND

MILL POND RUN, SECTION III

APRIL 3, 1998

STORMWATER

ATTENUATION BASIN

CALCULATIONS

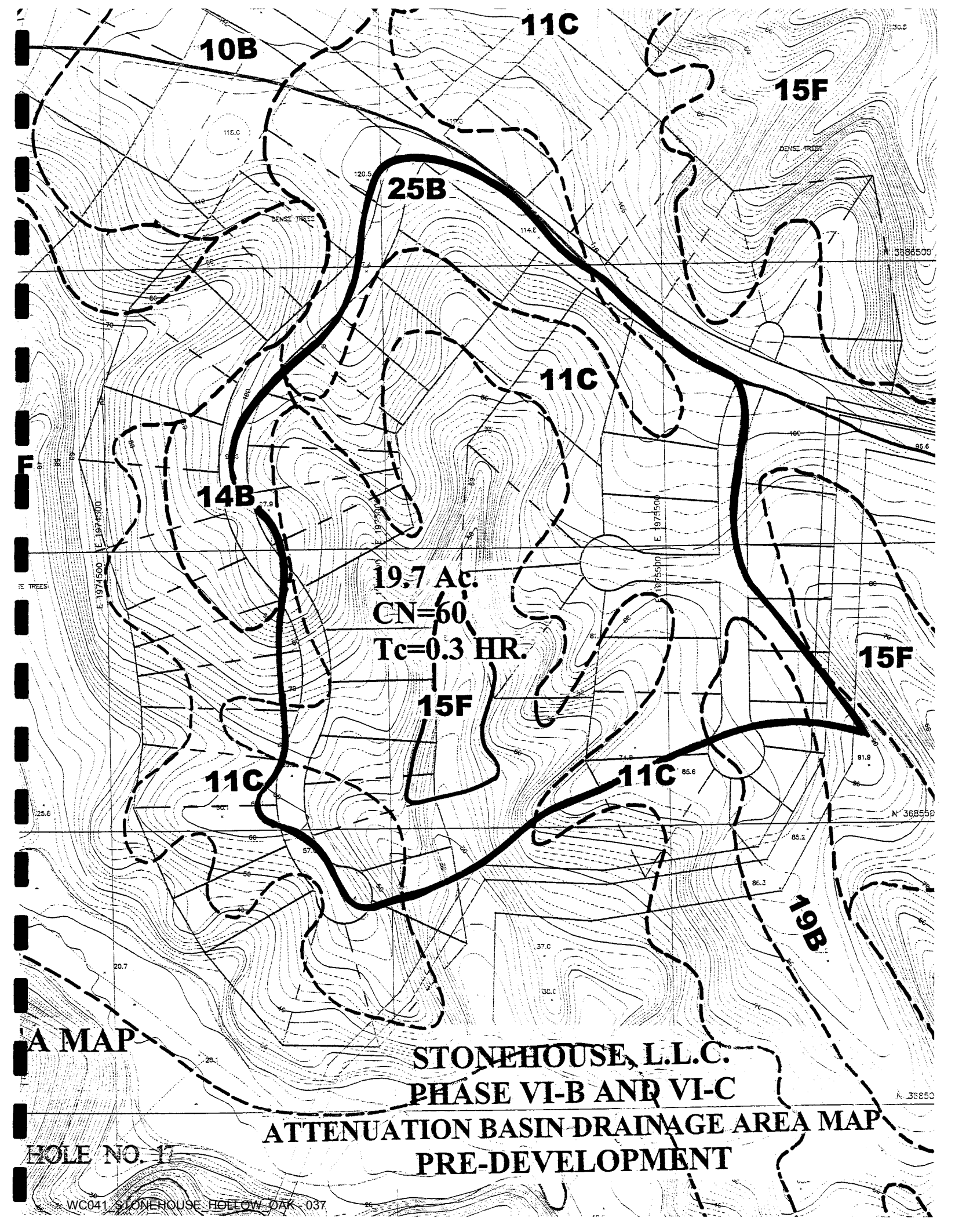
(WC041)

EXISTING CONDITION

RUNOFF CURVE NUMBERS

TC COMPUTATIONS

AND INFLOW HYDROGRAPH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11C
15F
25B
11C
14B
19.7 Ac.
CN=60
Tc=0.3 HR.
15F
15F
11C
11C
19B
A MAP
STONEHOUSE, L.L.C.
PHASE VI-B AND VI-C
ATTENUATION BASIN DRAINAGE AREA MAP
PRE-DEVELOPMENT
HOLE NO. 17
WC041 STONEHOUSE HOLLOW OAK - 037

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:13 02-17-1998 C:\96038\BMPS\6C-6B\EXIST.TCT

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID			
Surface description		WOODS	
Manning's roughness coeff., n		0.4000	
Flow length, L (total < or = 300)	ft	50.0	300 — needs to be inc
Two-yr 24-hr rainfall, P2	in	3.360	
Land slope, s	ft/ft	0.0170	

$$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$$ hrs 0.21 = 0.21

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?		Unpaved	
Flow length, L	ft	1270.0	
Watercourse slope, s	ft/ft	0.0700	

$$Avg.V = Csf * (s)^{0.5}$$ ft/s 4.2688

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) 0.30

low

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:13 02-17-1998 C:\96038\BMPS\6C-6B\EXIST.TCT

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

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

Subarea descr.	Tc or Tt	Time (hrs)
	Tc	0.30

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:55 02-17-1998

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	19.70	60

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:55 02-17-1998

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
WOODS, GOOD, C SOIL	13.00	70	
WOODS, GOOD, B SOIL	2.70	55	
WOODS, GOOD, A SOIL	4.00	30	
COMPOSITE AREA --->	19.70	59.8	(60)

::

Return Frequency: 2 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	19.70	60.0	0.30	0.00	3.36	0.47	I.4 .40

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

Total area = 19.70 acres or 0.03078 sq.mi
Peak discharge = 6 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
	0.30	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: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	6	12.3
Composite Watershed	6	12.3

Return Frequency: 2 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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
	0	0	0	0	0	2	5	6	5
Total (cfs)	0	0	0	0	0	2	5	6	5

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
	4	3	2	2	2	1	1	1	1
Total (cfs)	4	3	2	2	2	1	1	1	1

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
	1	1	1	1	1	1	1	1	1
Total (cfs)	1	1	1	1	1	1	1	1	1

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

Return Frequency: 10 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	19.70	60.0	0.30	0.00	5.04	1.32	I.26 .26

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

Total area = 19.70 acres or 0.03078 sq.mi
Peak discharge = 24 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
	0.30	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: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	24	12.3
Composite Watershed	24	12.3

Return Frequency: 10 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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
	0	0	0	1	4	12	23	24	18
Total (cfs)	0	0	0	1	4	12	23	24	18

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
	12	9	7	5	4	3	3	3	2
Total (cfs)	12	9	7	5	4	3	3	3	2

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
	2	2	2	2	2	1	1	1	1
Total (cfs)	2	2	2	2	2	1	1	1	1

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

Return Frequency: 100 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	19.70	60.0	0.30	0.00	7.68	3.10	I.17	.17

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

Total area = 19.70 acres or 0.03078 sq.mi
Peak discharge = 61 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
	0.30	0.00	**	**	Yes	--

* 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: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	61	12.3
Composite Watershed	61	12.3

Return Frequency: 100 years

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

Executed: 02-17-1998 19:14:25
Watershed file: --> C:\96038\BMPS\6C-6B\EXIST .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\EX-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
EXISTING CONDITIONS

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
	1	2	3	8	17	36	59	61	44
Total (cfs)	1	2	3	8	17	36	59	61	44

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
	28	20	15	12	8	7	6	6	5
Total (cfs)	28	20	15	12	8	7	6	6	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
	5	4	4	3	3	3	2	2	2
Total (cfs)	5	4	4	3	3	3	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	2	2	1	0
Total (cfs)	2	2	2	1	0

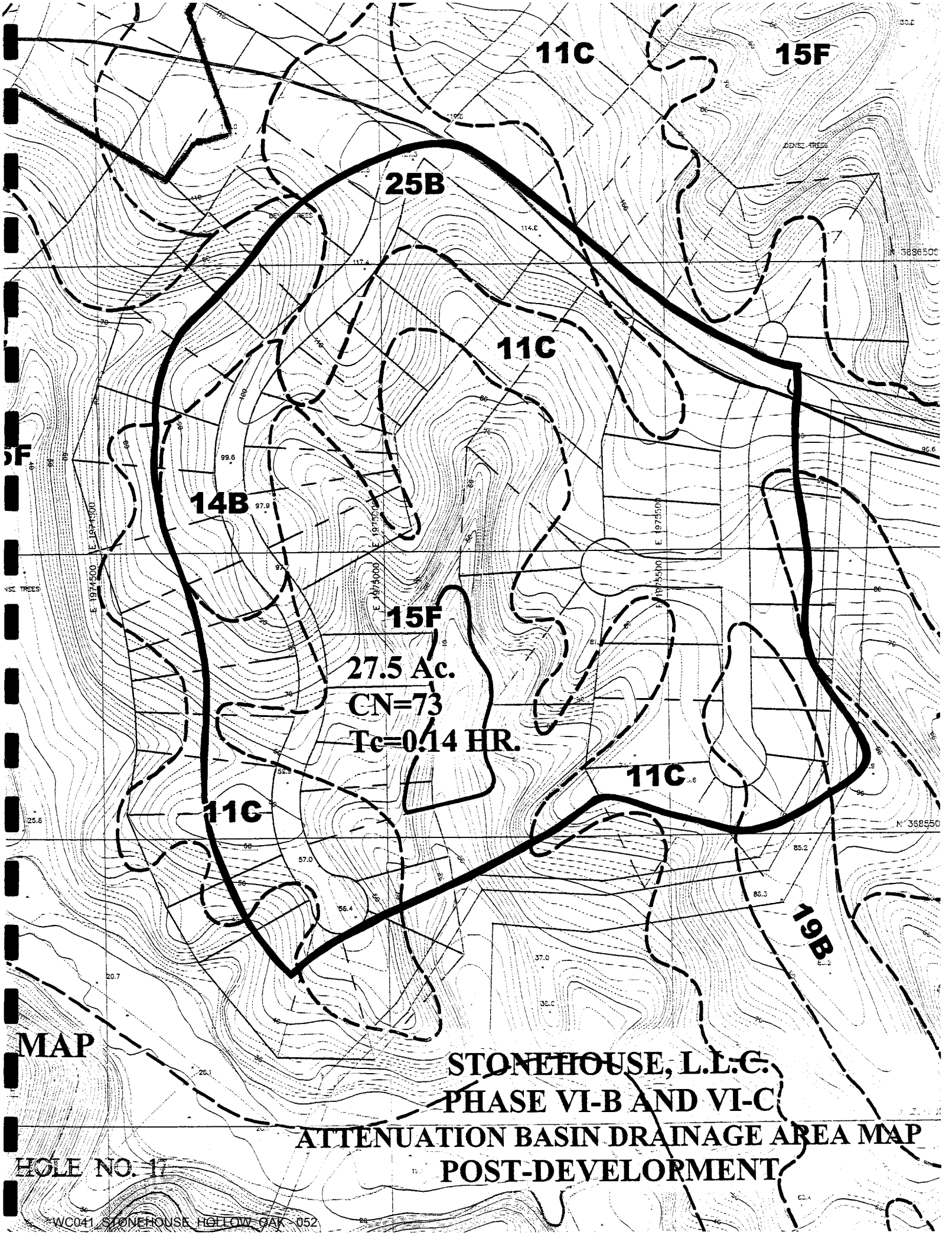
FUTURE CONDITION

RUNOFF CURVE NUMBERS

TC COMPUTATIONS

AND

INFLOW HYDROGRAPH


11C
15F
25B
11C
14B
15F
27.5 Ac.
CN=73
Tc=0.14 HR.
11C
11C
19B
MAP
STONEHOUSE, L.L.C.
PHASE VI-B AND VI-C
ATTENUATION BASIN DRAINAGE AREA MAP
POST-DEVELOPMENT
HOLE NO. 17
WC041 STONEHOUSE HOLLOW OAK 052

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:31 02-17-1998 C:\96038\BMPS\6C-6B\FUTURE.TCT

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

Tc COMPUTATIONS FOR:

SHEET FLOW (Applicable to Tc only)

Segment ID		5 MIN.	
Surface description		TO 1ST INLET	
Manning's roughness coeff., n		0.0900	
Flow length, L (total < or = 300)	ft	50.0	
Two-yr 24-hr rainfall, P2	in	3.360	
Land slope, s	ft/ft	0.0100	

$$T = \frac{.007 * (n*L)^{0.8}}{P2^{0.5} * s^{0.4}}$$ hrs 0.08 = 0.08

SHALLOW CONCENTRATED FLOW

Segment ID			
Surface (paved or unpaved)?			
Flow length, L	ft	0.0	
Watercourse slope, s	ft/ft	0.0000	

$$Avg.V = Csf * (s)^{0.5}$$ ft/s 0.0000

where: Unpaved Csf = 16.1345
Paved Csf = 20.3282

T = L / (3600*V) hrs 0.00 = 0.00

CHANNEL FLOW

Segment ID			
Cross Sectional Flow Area, a	sq.ft	3.14	
Wetted perimeter, Pw	ft	6.28	
Hydraulic radius, r = a/Pw	ft	0.500	
Channel slope, s	ft/ft	0.0100	
Manning's roughness coeff., n		0.0130	

$$V = \frac{1.49 * r^{2/3} * s^{1/2}}{n}$$ ft/s 7.2203

Flow length, L ft 1450

T = L / (3600*V) hrs 0.06 = 0.06

::

TOTAL TIME (hrs) 0.14

Quick TR-55 Ver.5.46 S/N:
Executed: 19:11:31 02-17-1998 C:\96038\BMPS\6C-6B\FUTURE.TCT

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

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

Subarea descr.	Tc or Tt	Time (hrs)
	Tc	0.14

Quick TR-55 Ver.5.46 S/N:
Executed: 19:12:09 02-17-1998

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

RUNOFF CURVE NUMBER SUMMARY

::

Subarea Description	Area (acres)	CN (weighted)
	27.50	73

Quick TR-55 Ver.5.46 S/N:
Executed: 19:12:09 02-17-1998

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

RUNOFF CURVE NUMBER DATA

::

Composite Area:

SURFACE DESCRIPTION	AREA (acres)	CN	
SF RES, C SOIL	18.10	80	
SF RES, B SOIL	3.90	70	
SF RES, A SOIL	5.50	54	
COMPOSITE AREA --->	27.50	73.4	(73)

::

Return Frequency: 2 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used	
	27.50	73.0	0.10	0.00	3.36	1.09	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 = 27.50 acres or 0.04297 sq.mi
Peak discharge = 45 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
	0.14	0.00	0.10	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 2 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	45	12.1
Composite Watershed	45	12.1

Return Frequency: 2 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-2.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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
	0	1	1	11	28	45	26	10	8
Total (cfs)	0	1	1	11	28	45	26	10	8

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
	6	5	5	4	4	3	3	3	2
Total (cfs)	6	5	5	4	4	3	3	3	2

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
	2	2	2	2	2	1	1	1	1
Total (cfs)	2	2	2	2	2	1	1	1	1

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	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: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	27.50	73.0	0.10	0.00	5.04	2.31	I.15 .15

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

Total area = 27.50 acres or 0.04297 sq.mi
Peak discharge = 98 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
	0.14	0.00	0.10	0.00	Yes	--

* Travel time from subarea outfall to composite watershed outfall point.

Return Frequency: 10 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	98	12.1
Composite Watershed	98	12.1

Return Frequency: 10 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-10.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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
	2	3	4	29	62	98	60	22	15
Total (cfs)	2	3	4	29	62	98	60	22	15

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
	13	11	9	8	7	6	6	5	5
Total (cfs)	13	11	9	8	7	6	6	5	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
	4	4	4	3	3	3	2	2	2
Total (cfs)	4	4	4	3	3	3	2	2	2

Subarea Description	18.0 hr	19.0 hr	20.0 hr	22.0 hr	26.0 hr
	2	2	1	1	0
Total (cfs)	2	2	1	1	0

Return Frequency: 100 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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

Subarea Description	AREA (acres)	CN	Tc (hrs)	* Tt (hrs)	Precip. (in)	Runoff (in)	Ia/p input/used
	27.50	73.0	0.10	0.00	7.68	4.53	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 = 27.50 acres or 0.04297 sq.mi
Peak discharge = 197 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
	0.14	0.00	0.10	0.00	No	Computed Ia/p < .1

* Travel time from subarea outfall to composite watershed outfall point.

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

>>>> Summary of Subarea Times to Peak <<<<

Subarea	Peak Discharge at Composite Outfall (cfs)	Time to Peak at Composite Outfall (hrs)
	197	12.1
Composite Watershed	197	12.1

Return Frequency: 100 years

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

Executed: 02-17-1998 19:14:40
Watershed file: --> C:\96038\BMPS\6C-6B\FUTURE .MOP
Hydrograph file: --> C:\96038\BMPS\6C-6B\FUT-100.HYD

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FUTURE CONDITIONS

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
	5	7	10	65	126	197	122	42	29
Total (cfs)	5	7	10	65	126	197	122	42	29

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
	24	20	17	15	13	11	10	9	8
Total (cfs)	24	20	17	15	13	11	10	9	8

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
	7	7	6	6	5	4	4	4	4
Total (cfs)	7	7	6	6	5	4	4	4	4

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

VOLUME COMPUTATION

POND-2 Version: 5.20
S/N:

STONEHOUSE SECTIONS VIB AND VIC
STORMWATER MANAGEMENT FACILITY
FIELD RUN CONTOURS

CALCULATED 02-17-1998 18:19:56
DISK FILE: c:\96038\BMPS\6C-6B\SWMF-FR .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	* Volume (acre-ft)	Volume Sum (acre-ft)
35.00	0.00	0.00	0.00	0.00	0.00
36.00	0.85	0.05	0.05	0.02	0.02
38.00	3.27	0.19	0.33	0.22	0.24
40.00	6.00	0.34	0.79	0.52	0.76
42.00	9.61	0.55	1.33	0.89	1.65
44.00	12.74	0.73	1.92	1.28	2.93
46.00	15.38	0.88	2.42	1.61	4.54

Elevations With Areas Interpolated From
The Closest Two Planimeter Readings

39.50	-----	0.30	0.73	0.36	0.60
41.00	-----	0.44	1.18	0.39	1.15

$$IA = (sq.rt(Area1) + ((Ei-E1)/(E2-E1))*(sq.rt(Area2)-sq.rt(Area1)))^2$$

where: E1, E2 = Closest two elevations with planimeter data
Ei = Elevation at which to interpolate area
Area1,Area2 = Areas computed for E1, E2, respectively
IA = Interpolated area for Ei

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

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

OUTLET STRUCTURE

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
35.00	0.0	7
35.30	0.1	4
35.60	0.2	4
35.90	0.2	4
36.20	0.2	4
36.50	0.3	4
36.80	0.3	4
37.10	0.3	4
37.40	0.4	4
37.70	0.4	4
38.00	0.4	4
38.30	0.4	4
38.60	0.4	4
38.90	0.5	4
39.20	0.5	4
39.50	0.5	4
39.80	0.5	4
40.10	0.5	4
40.40	0.5	4
40.70	0.6	4
41.00	0.6	4 +1
41.30	9.1	4 +1
41.60	21.4	2
41.90	21.9	2
42.20	22.4	2
42.50	22.9	2
42.80	23.4	2
43.10	24.8	2 +15
43.40	31.9	2 +15
43.70	42.3	2 +15
44.00	55.2	2 +15
44.30	70.1	2 +15
44.60	86.7	2 +15
44.90	105.0	2 +15
45.20	124.7	2 +15
45.50	145.8	2 +15
45.80	168.2	2 +15
46.00	183.8	2 +15

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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***************************
  STONEHOUSE SECTION VI-B/C
        SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

***************************
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Outlet Structure File: c:\96038\BMPS\6C-6B\6B-6C-FR.STR
Planimeter Input File: c:\96038\BMPS\6C-6B\SWMF-FR .VOL
Rating Table Output File: c:\96038\BMPS\6C-6B\SWMF-FR .PND

Min. Elev.(ft) = 35 Max. Elev.(ft) = 46 Incr.(ft) = .3

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

```
*********************************************
                SYSTEM CONNECTIVITY
*********************************************
```

Structure	No.	Q Table		Q Table
TABLE	7		->	7
ORIFICE-VC	4		->	4
STAND PIPE	1	+ 4	->	5
ORIFICE-VC	2	? 5	->	3
WEIR-VR	15		->	15

Outflow rating table summary was stored in file:
c:\96038\BMPS\6C-6B\SWMF-FR .PND

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

>>>>>> Structure No. 7 <<<<<<
(Input Data)

TABLE
Input your own rating table.
E1 (ft) =35.0 E2 (ft) =35.25

Constant (ft) added to each elevation was:

Elev. (ft)	Q (cfs)
35	0
35.25	.1

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	35.25
E2 elev.(ft)?	46.001
Orifice coeff.?	.6
Invert elev.(ft)?	35.0
Datum elev.(ft)?	35.125
Diameter (ft)?	0.25 - 3"

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

```
****************************
  STONEHOUSE SECTION VI-B/C
        SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****************************


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

STAND PIPE
Stand Pipe with weir or orifice flow


E1 elev.(ft)?            41.0
E2 elev.(ft)?             46.001
Crest elev.(ft)?         41.0
Diameter (ft)?           5.0
Weir coefficient?        3.3
Orifice coefficient?     .6
Start transition elev.(ft) @ ?
Transition height (ft)?
```

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

```
***************************
  STONEHOUSE SECTION VI-B/C
        SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

***************************


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

ORIFICE-VC
Orifice - Vertical Circular


E1 elev.(ft)?           41.0
E2 elev.(ft)?            46.001
Orifice coeff.?         .6
Invert elev.(ft)?       34.5
Datum  elev.(ft)?       35.25
Diameter (ft)?          1.5
```

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

```
****************************
  STONEHOUSE SECTION VI-B/C
        SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****************************


>>>>>> Structure No. 15 <<<<<<
         (Input Data)

WEIR-VR
Weir - Vertical Rectangular


E1 elev.(ft)?            43.0
E2 elev.(ft)?             46.001
Weir coefficient?        3.0
Weir elev.(ft)?          43.0
Length (ft)?             10
Contracted/Suppressed (C/S)?  S
```

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

Outflow Rating Table for Structure #7
TABLE Input your own rating table.

Elevation (ft)	Q (cfs)	Computation Messages
35.00	0.0	
35.30	0.0	E = or > E2=35.25
35.60	0.0	E = or > E2=35.25
35.90	0.0	E = or > E2=35.25
36.20	0.0	E = or > E2=35.25
36.50	0.0	E = or > E2=35.25
36.80	0.0	E = or > E2=35.25
37.10	0.0	E = or > E2=35.25
37.40	0.0	E = or > E2=35.25
37.70	0.0	E = or > E2=35.25
38.00	0.0	E = or > E2=35.25
38.30	0.0	E = or > E2=35.25
38.60	0.0	E = or > E2=35.25
38.90	0.0	E = or > E2=35.25
39.20	0.0	E = or > E2=35.25
39.50	0.0	E = or > E2=35.25
39.80	0.0	E = or > E2=35.25
40.10	0.0	E = or > E2=35.25
40.40	0.0	E = or > E2=35.25
40.70	0.0	E = or > E2=35.25
41.00	0.0	E = or > E2=35.25
41.30	0.0	E = or > E2=35.25
41.60	0.0	E = or > E2=35.25
41.90	0.0	E = or > E2=35.25
42.20	0.0	E = or > E2=35.25
42.50	0.0	E = or > E2=35.25
42.80	0.0	E = or > E2=35.25
43.10	0.0	E = or > E2=35.25
43.40	0.0	E = or > E2=35.25
43.70	0.0	E = or > E2=35.25
44.00	0.0	E = or > E2=35.25
44.30	0.0	E = or > E2=35.25
44.60	0.0	E = or > E2=35.25
44.90	0.0	E = or > E2=35.25
45.20	0.0	E = or > E2=35.25
45.50	0.0	E = or > E2=35.25
45.80	0.0	E = or > E2=35.25
46.00	0.0	E = or > E2=35.25

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS
****

Outflow Rating Table for Structure #4
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
35.00	0.0	E < E1=35.25
35.30	0.1	H =.175
35.60	0.2	H =.475
35.90	0.2	H =.775
36.20	0.2	H =1.075
36.50	0.3	H =1.375
36.80	0.3	H =1.675
37.10	0.3	H =1.975
37.40	0.4	H =2.275
37.70	0.4	H =2.575
38.00	0.4	H =2.875
38.30	0.4	H =3.175
38.60	0.4	H =3.475
38.90	0.5	H =3.775
39.20	0.5	H =4.075
39.50	0.5	H =4.375
39.80	0.5	H =4.675
40.10	0.5	H =4.975
40.40	0.5	H =5.275
40.70	0.6	H =5.575
41.00	0.6	H =5.875
41.30	0.6	H =6.175
41.60	0.6	H =6.475
41.90	0.6	H =6.775
42.20	0.6	H =7.075
42.50	0.6	H =7.375
42.80	0.7	H =7.675
43.10	0.7	H =7.975
43.40	0.7	H =8.275
43.70	0.7	H =8.575
44.00	0.7	H =8.875
44.30	0.7	H =9.175
44.60	0.7	H =9.475
44.90	0.7	H =9.775

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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

Outflow Rating Table for Structure #4
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
45.20	0.8	H =10.075
45.50	0.8	H =10.375
45.80	0.8	H =10.675
46.00	0.8	H =10.875

C = .6 A = 4.908739E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (35.125 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

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

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

Elevation (ft)	Q (cfs)	Computation Messages
35.00	0.0	E < Inv.El.= 41
35.30	0.0	E < El=41.0
35.60	0.0	E < El=41.0
35.90	0.0	E < El=41.0
36.20	0.0	E < El=41.0
36.50	0.0	E < El=41.0
36.80	0.0	E < El=41.0
37.10	0.0	E < El=41.0
37.40	0.0	E < El=41.0
37.70	0.0	E < El=41.0
38.00	0.0	E < El=41.0
38.30	0.0	E < El=41.0
38.60	0.0	E < El=41.0
38.90	0.0	E < El=41.0
39.20	0.0	E < El=41.0
39.50	0.0	E < El=41.0
39.80	0.0	E < El=41.0
40.10	0.0	E < El=41.0
40.40	0.0	E < El=41.0
40.70	0.0	E < El=41.0
41.00	0.0	Weir: H =0.0
41.30	8.5	Weir: H =.3
41.60	24.1	Weir: H =.6
41.90	44.3	Weir: H =.9
42.20	68.1	Weir: H =1.2
42.50	95.2	Weir: H =1.5
42.80	125.2	Weir: H =1.8
43.10	137.0	Orifice: H =2.1
43.40	146.5	Orifice: H =2.4
43.70	155.3	Orifice: H =2.7
44.00	163.8	Orifice: H =3.0
44.30	171.7	Orifice: H =3.3

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
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
44.60	179.4	Orifice:	H =3.6
44.90	186.7	Orifice:	H =3.9
45.20	193.8	Orifice:	H =4.2
45.50	200.6	Orifice:	H =4.5
45.80	207.1	Orifice:	H =4.8
46.00	211.4	Orifice:	H =5.0

Weir Cw = 3.3 Weir length = 15.70796 ft
Orifice Co = .6 Orifice area = 19.63496 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.= 42.82386 ft

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

Outflow Rating Table for Structure #2
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
35.00	0.0	E < E1=41.0
35.30	0.0	E < E1=41.0
35.60	0.0	E < E1=41.0
35.90	0.0	E < E1=41.0
36.20	0.0	E < E1=41.0
36.50	0.0	E < E1=41.0
36.80	0.0	E < E1=41.0
37.10	0.0	E < E1=41.0
37.40	0.0	E < E1=41.0
37.70	0.0	E < E1=41.0
38.00	0.0	E < E1=41.0
38.30	0.0	E < E1=41.0
38.60	0.0	E < E1=41.0
38.90	0.0	E < E1=41.0
39.20	0.0	E < E1=41.0
39.50	0.0	E < E1=41.0
39.80	0.0	E < E1=41.0
40.10	0.0	E < E1=41.0
40.40	0.0	E < E1=41.0
40.70	0.0	E < E1=41.0
41.00	20.4	H =5.75
41.30	20.9	H =6.05
41.60	21.4	H =6.35
41.90	21.9	H =6.65
42.20	22.4	H =6.95
42.50	22.9	H =7.25
42.80	23.4	H =7.55
43.10	23.8	H =7.85
43.40	24.3	H =8.150
43.70	24.7	H =8.450
44.00	25.2	H =8.75
44.30	25.6	H =9.05
44.60	26.0	H =9.35
44.90	26.4	H =9.650

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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

Outflow Rating Table for Structure #2
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
45.20	26.8	H =9.950
45.50	27.2	H =10.25
45.80	27.6	H =10.55
46.00	27.9	H =10.75

C = .6 A = 1.767146 sq.ft.
H (ft) = Table elev. - Datum elev. (35.25 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

Outflow Rating Table for Structure #15
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
35.00	0.0	E < Inv.El.= 43
35.30	0.0	E < Inv.El.= 43
35.60	0.0	E < Inv.El.= 43
35.90	0.0	E < Inv.El.= 43
36.20	0.0	E < Inv.El.= 43
36.50	0.0	E < Inv.El.= 43
36.80	0.0	E < Inv.El.= 43
37.10	0.0	E < Inv.El.= 43
37.40	0.0	E < Inv.El.= 43
37.70	0.0	E < Inv.El.= 43
38.00	0.0	E < Inv.El.= 43
38.30	0.0	E < Inv.El.= 43
38.60	0.0	E < Inv.El.= 43
38.90	0.0	E < Inv.El.= 43
39.20	0.0	E < Inv.El.= 43
39.50	0.0	E < Inv.El.= 43
39.80	0.0	E < Inv.El.= 43
40.10	0.0	E < Inv.El.= 43
40.40	0.0	E < Inv.El.= 43
40.70	0.0	E < Inv.El.= 43
41.00	0.0	E < Inv.El.= 43
41.30	0.0	E < Inv.El.= 43
41.60	0.0	E < Inv.El.= 43
41.90	0.0	E < Inv.El.= 43
42.20	0.0	E < Inv.El.= 43
42.50	0.0	E < Inv.El.= 43
42.80	0.0	E < Inv.El.= 43
43.10	0.9	H =.1
43.40	7.6	H =.4
43.70	17.6	H =.7
44.00	30.0	H =1.0
44.30	44.5	H =1.3
44.60	60.7	H =1.6
44.90	78.6	H =1.9

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

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

Outflow Rating Table for Structure #15
WEIR-VR Weir - Vertical Rectangular

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

Elevation (ft)	Q (cfs)	Computation Messages
45.20	97.9	H =2.2
45.50	118.6	H =2.5
45.80	140.6	H =2.8
46.00	155.9	H =3.0

C = 3 L (ft) = 10
H (ft) = Table elev. - Invert elev. (43 ft)
Q (cfs) = C * L * (H**1.5) -- Suppressed Weir

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS
****

Outflow Rating Table 5
Table 5 = 4 + 1

Elevation (ft)	Q (cfs)	Contributing Structures
35.00	0.0	-
35.30	0.1	4
35.60	0.2	4
35.90	0.2	4
36.20	0.2	4
36.50	0.3	4
36.80	0.3	4
37.10	0.3	4
37.40	0.4	4
37.70	0.4	4
38.00	0.4	4
38.30	0.4	4
38.60	0.4	4
38.90	0.5	4
39.20	0.5	4
39.50	0.5	4
39.80	0.5	4
40.10	0.5	4
40.40	0.5	4
40.70	0.6	4
41.00	0.6	4 +1
41.30	9.1	4 +1
41.60	24.7	4 +1
41.90	44.9	4 +1
42.20	68.8	4 +1
42.50	95.9	4 +1
42.80	125.8	4 +1
43.10	137.7	4 +1
43.40	147.1	4 +1
43.70	156.0	4 +1
44.00	164.5	4 +1
44.30	172.5	4 +1
44.60	180.1	4 +1
44.90	187.4	4 +1
45.20	194.5	4 +1
45.50	201.3	4 +1
45.80	207.9	4 +1
46.00	212.2	4 +1

Outlet Structure File: 6B-6C-FR.STR

POND-2 Version: 5.20 S/N:
Date Executed: Time Executed:

****
STONEHOUSE SECTION VI-B/C
SWMF VI-B/C
BASED ON FIELD RUN CONTOURS

****

Outflow Rating Table 3
Table 3 = 5 ? 2

Elevation (ft)	Q (cfs)	Contributing Structures
35.00	0.0	-
35.30	0.1	4
35.60	0.2	4
35.90	0.2	4
36.20	0.2	4
36.50	0.3	4
36.80	0.3	4
37.10	0.3	4
37.40	0.4	4
37.70	0.4	4
38.00	0.4	4
38.30	0.4	4
38.60	0.4	4
38.90	0.5	4
39.20	0.5	4
39.50	0.5	4
39.80	0.5	4
40.10	0.5	4
40.40	0.5	4
40.70	0.6	4
41.00	0.6	4 +1
41.30	9.1	4 +1
41.60	21.4	2
41.90	21.9	2
42.20	22.4	2
42.50	22.9	2
42.80	23.4	2

ROUTING

```
*************************************
*                                   *
* STONEHOUSE SECTIONS VIB AND VIC   *
*  STORMWATER MANAGEMENT FACILITY   *
*     WITH FIELD RUN CONTOURS       *
*                                   *
*                                   *
*************************************
```

Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-2 .HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 35.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
35.00	0.0	0.000
35.30	0.1	0.000
35.60	0.2	0.004
35.90	0.2	0.012
36.20	0.2	0.027
36.50	0.3	0.047
36.80	0.3	0.072
37.10	0.3	0.103
37.40	0.4	0.141
37.70	0.4	0.186
38.00	0.4	0.238
38.30	0.4	0.297
38.60	0.4	0.363
38.90	0.5	0.435
39.20	0.5	0.514
39.50	0.5	0.601
39.80	0.5	0.695
40.10	0.5	0.797
40.40	0.5	0.907
40.70	0.6	1.026
41.00	0.6	1.154
41.30	9.1	1.291
41.60	21.4	1.438
41.90	21.9	1.595
42.20	22.4	1.762
42.50	22.9	1.936
42.80	23.4	2.118
43.10	24.8	2.308
43.40	31.9	2.507
43.70	42.3	2.713
44.00	55.2	2.928

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
0.1	0.2
0.9	1.1
2.9	3.1
6.5	6.7
11.4	11.7
17.5	17.8
25.0	25.3
34.1	34.5
44.9	45.3
57.6	58.0
71.9	72.3
87.8	88.2
105.3	105.8
124.5	125.0
145.4	145.9
168.2	168.7
192.9	193.4
219.6	220.1
248.3	248.9
279.3	279.9
312.5	321.6
348.1	369.5
386.1	408.0
426.4	448.8
468.6	491.5
512.6	536.0
558.7	583.5
606.6	638.5
656.6	698.9
708.7	763.9

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
44.30	70.1	3.151	762.5	832.6
44.60	86.7	3.380	818.0	904.7
44.90	105.0	3.616	875.1	980.1
45.20	124.7	3.859	933.8	1058.5
45.50	145.8	4.108	994.2	1140.0
45.80	168.2	4.365	1056.3	1224.5
46.00	183.8	4.540	1098.6	1282.4

Time increment (t) = 6.0 min.

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

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-2 .HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\OUT2FR .HYD

Starting Pond W.S. Elevation = 35.00 ft

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

Peak Inflow = 45.00 cfs vs 6
Peak Outflow = 4.24 cfs
Peak Elevation = 41.13 ft

- need to control 1" storm w/ 24 hour drawdown

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 1.21 ac-ft

Total Storage in Pond = 1.21 ac-ft

```
*************************************
*                                   *
* STONEHOUSE SECTIONS VIB AND VIC   *
*  STORMWATER MANAGEMENT FACILITY   *
*     WITH FIELD RUN CONTOURS       *
*                                   *
*                                   *
*************************************
```

Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-10 .HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 35.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
35.00	0.0	0.000
35.30	0.1	0.000
35.60	0.2	0.004
35.90	0.2	0.012
36.20	0.2	0.027
36.50	0.3	0.047
36.80	0.3	0.072
37.10	0.3	0.103
37.40	0.4	0.141
37.70	0.4	0.186
38.00	0.4	0.238
38.30	0.4	0.297
38.60	0.4	0.363
38.90	0.5	0.435
39.20	0.5	0.514
39.50	0.5	0.601
39.80	0.5	0.695
40.10	0.5	0.797
40.40	0.5	0.907
40.70	0.6	1.026
41.00	0.6	1.154
41.30	9.1	1.291
41.60	21.4	1.438
41.90	21.9	1.595
42.20	22.4	1.762
42.50	22.9	1.936
42.80	23.4	2.118
43.10	24.8	2.308
43.40	31.9	2.507
43.70	42.3	2.713
44.00	55.2	2.928

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
0.1	0.2
0.9	1.1
2.9	3.1
6.5	6.7
11.4	11.7
17.5	17.8
25.0	25.3
34.1	34.5
44.9	45.3
57.6	58.0
71.9	72.3
87.8	88.2
105.3	105.8
124.5	125.0
145.4	145.9
168.2	168.7
192.9	193.4
219.6	220.1
248.3	248.9
279.3	279.9
312.5	321.6
348.1	369.5
386.1	408.0
426.4	448.8
468.6	491.5
512.6	536.0
558.7	583.5
606.6	638.5
656.6	698.9
708.7	763.9

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + 0 (cfs)
44.30	70.1	3.151	762.5	832.6
44.60	86.7	3.380	818.0	904.7
44.90	105.0	3.616	875.1	980.1
45.20	124.7	3.859	933.8	1058.5
45.50	145.8	4.108	994.2	1140.0
45.80	168.2	4.365	1056.3	1224.5
46.00	183.8	4.540	1098.6	1282.4

Time increment (t) = 6.0 min.

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

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-10 .HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\OUT10FR .HYD

Starting Pond W.S. Elevation = 35.00 ft

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

Peak Inflow = 98.00 cfs
Peak Outflow = 23.33 cfs
Peak Elevation = 42.76 ft

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 2.09 ac-ft

Total Storage in Pond = 2.09 ac-ft

Warning: Inflow hydrograph truncated on left side.

```
*************************************
*                                   *
* STONEHOUSE SECTIONS VIB AND VIC   *
*  STORMWATER MANAGEMENT FACILITY   *
*     WITH FIELD RUN CONTOURS       *
*                                   *
*                                   *
*************************************
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Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-100 .HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 35.00 ft
Outflow = 0.00 cfs
Storage = 0.00 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
35.00	0.0	0.000
35.30	0.1	0.000
35.60	0.2	0.004
35.90	0.2	0.012
36.20	0.2	0.027
36.50	0.3	0.047
36.80	0.3	0.072
37.10	0.3	0.103
37.40	0.4	0.141
37.70	0.4	0.186
38.00	0.4	0.238
38.30	0.4	0.297
38.60	0.4	0.363
38.90	0.5	0.435
39.20	0.5	0.514
39.50	0.5	0.601
39.80	0.5	0.695
40.10	0.5	0.797
40.40	0.5	0.907
40.70	0.6	1.026
41.00	0.6	1.154
41.30	9.1	1.291
41.60	21.4	1.438
41.90	21.9	1.595
42.20	22.4	1.762
42.50	22.9	1.936
42.80	23.4	2.118
43.10	24.8	2.308
43.40	31.9	2.507
43.70	42.3	2.713
44.00	55.2	2.928

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
0.1	0.2
0.9	1.1
2.9	3.1
6.5	6.7
11.4	11.7
17.5	17.8
25.0	25.3
34.1	34.5
44.9	45.3
57.6	58.0
71.9	72.3
87.8	88.2
105.3	105.8
124.5	125.0
145.4	145.9
168.2	168.7
192.9	193.4
219.6	220.1
248.3	248.9
279.3	279.9
312.5	321.6
348.1	369.5
386.1	408.0
426.4	448.8
468.6	491.5
512.6	536.0
558.7	583.5
606.6	638.5
656.6	698.9
708.7	763.9

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
44.30	70.1	3.151
44.60	86.7	3.380
44.90	105.0	3.616
45.20	124.7	3.859
45.50	145.8	4.108
45.80	168.2	4.365
46.00	183.8	4.540

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
762.5	832.6
818.0	904.7
875.1	980.1
933.8	1058.5
994.2	1140.0
1056.3	1224.5
1098.6	1282.4

Time increment (t) = 6.0 min.

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

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\FUT-100 .HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\OUT100FR.HYD

Starting Pond W.S. Elevation = 35.00 ft

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

Peak Inflow = 197.00 cfs
Peak Outflow = 102.92 cfs
Peak Elevation = 44.87 ft

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

Initial Storage = 0.00 ac-ft
Peak Storage From Storm = 3.59 ac-ft

Total Storage in Pond = 3.59 ac-ft

Warning: Inflow hydrograph truncated on left side.

Langley and McDonald, P.C.
ENGINEERS • SURVEYORS • PLANNERS
LANDSCAPE ARCHITECTS • ENVIRONMENTAL CONSULTANTS
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject: STONEHOUSE SWMF FOR WC3/2
Computed By: DJB Checked By: _____

Project No. 97087-
Client: _____
Date: 11/13/97 Sheet No. 1

24-HR EXTENDED DETENTION OF RUNOFF FROM 1" RAIN:

RUNOFF VOL = $\frac{1''}{12}$ [.05 + .009 (25)] (27.5 Ac) = 0.63 AC-FT

AT ELEV 37.2, VOL PROVIDED = 0.64 AC-FT

RISER CREST AT ELEV 39.0 → DRAWDOWN
VOL PROVIDED = 1.27 AC-FT > 0.63 AC-FT

$$\frac{1.27 \text{ AC-FT} \times 43560}{24 \text{ HR} \times 3600} = 0.64 \text{ CFS}$$

$$Q = C_d A \sqrt{2gh}$$

$$0.64 = 0.6 \, \pi \frac{D^2}{4} \sqrt{64.4 \left(\frac{39 - 32 - 2\frac{1}{2}}{2}\right)}$$

$D \doteq 0.3'$ or $3.6''$ → use 3" orifice

229-4683

DRAWDOWN ROUTING: (SEE ATTACHED CALC'S)
ELEV 41.0 → ELEV 35.0

FROM 1 OUT EL 41 to EL 39.17 $\frac{1554 \text{ MIN} - 660 \text{ MIN}}{60} = 14.9 \text{ HR}$

FROM 2 OUT EL 39.17 to EL 36.21 $\frac{1554 \text{ MIN} - 660 \text{ MIN}}{60} = 14.9 \text{ HR}$

FROM 3 OUT EL 36.21 to EL 35.0 $\frac{774 \text{ MIN} - 660 \text{ MIN}}{60} = 1.9 \text{ HR}$

DRAWDOWN TIME = 31.7 HR
> 24 HR

Return Freq: 1 years

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*************************
*                       *
*  DRAWDOWN TIME FOR BMP *
*                       *
*                       *
*                       *
*                       *
*************************
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Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 41.00 ft
Outflow = 0.60 cfs
Storage = 1.15 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
35.00	0.0	0.000	0.0	0.0
35.30	0.1	0.000	0.1	0.2
35.60	0.2	0.004	0.9	1.1
35.90	0.2	0.012	2.9	3.1
36.20	0.2	0.027	6.5	6.7
36.50	0.3	0.047	11.4	11.7
36.80	0.3	0.072	17.5	17.8
37.10	0.3	0.103	25.0	25.3
37.40	0.4	0.141	34.1	34.5
37.70	0.4	0.186	44.9	45.3
38.00	0.4	0.238	57.6	58.0
38.30	0.4	0.297	71.9	72.3
38.60	0.4	0.363	87.8	88.2
38.90	0.5	0.435	105.3	105.8
39.20	0.5	0.514	124.5	125.0
39.50	0.5	0.601	145.4	145.9
39.80	0.5	0.695	168.2	168.7
40.10	0.5	0.797	192.9	193.4
40.40	0.5	0.907	219.6	220.1
40.70	0.6	1.026	248.3	248.9
41.00	0.6	1.154	279.3	279.9
41.30	9.1	1.291	312.5	321.6
41.60	21.4	1.438	348.1	369.5
41.90	21.9	1.595	386.1	408.0
42.20	22.4	1.762	426.4	448.8
42.50	22.9	1.936	468.6	491.5
42.80	23.4	2.118	512.6	536.0
43.10	24.8	2.308	558.7	583.5
43.40	31.9	2.507	606.6	638.5
43.70	42.3	2.713	656.6	698.9
44.00	55.2	2.928	708.7	763.9

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
44.30	70.1	3.151
44.60	86.7	3.380
44.90	105.0	3.616
45.20	124.7	3.859
45.50	145.8	4.108
45.80	168.2	4.365
46.00	183.8	4.540

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
762.5	832.6
818.0	904.7
875.1	980.1
933.8	1058.5
994.2	1140.0
1056.3	1224.5
1098.6	1282.4

Time increment (t) = 6.0 min.

Return Freq: 1 years

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD1OUT.HYD

INFLOW HYDROGRAPH / ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	0.00	-----	278.7	279.9	0.60	41.00
666.0	0.00	0.0	277.5	278.7	0.60	40.99
672.0	0.00	0.0	276.3	277.5	0.60	40.98
678.0	0.00	0.0	275.1	276.3	0.60	40.97
684.0	0.00	0.0	273.9	275.1	0.60	40.95
690.0	0.00	0.0	272.7	273.9	0.60	40.94
696.0	0.00	0.0	271.5	272.7	0.60	40.93
702.0	0.00	0.0	270.3	271.5	0.60	40.92
708.0	0.00	0.0	269.1	270.3	0.60	40.91
714.0	0.00	0.0	267.9	269.1	0.60	40.90
720.0	0.00	0.0	266.7	267.9	0.60	40.88
726.0	0.00	0.0	265.5	266.7	0.60	40.87
732.0	0.00	0.0	264.3	265.5	0.60	40.86
738.0	0.00	0.0	263.1	264.3	0.60	40.85
744.0	0.00	0.0	261.9	263.1	0.60	40.84
750.0	0.00	0.0	260.7	261.9	0.60	40.83
756.0	0.00	0.0	259.5	260.7	0.60	40.81
762.0	0.00	0.0	258.3	259.5	0.60	40.80
768.0	0.00	0.0	257.1	258.3	0.60	40.79
774.0	0.00	0.0	255.9	257.1	0.60	40.78
780.0	0.00	0.0	254.7	255.9	0.60	40.77
786.0	0.00	0.0	253.5	254.7	0.60	40.76
792.0	0.00	0.0	252.3	253.5	0.60	40.74
798.0	0.00	0.0	251.1	252.3	0.60	40.73
804.0	0.00	0.0	249.9	251.1	0.60	40.72
810.0	0.00	0.0	248.7	249.9	0.60	40.71
816.0	0.00	0.0	247.5	248.7	0.60	40.70
822.0	0.00	0.0	246.3	247.5	0.60	40.69
828.0	0.00	0.0	245.1	246.3	0.59	40.67
834.0	0.00	0.0	244.0	245.1	0.59	40.66
840.0	0.00	0.0	242.8	244.0	0.58	40.65
846.0	0.00	0.0	241.6	242.8	0.58	40.64
852.0	0.00	0.0	240.5	241.6	0.57	40.62
858.0	0.00	0.0	239.4	240.5	0.57	40.61
864.0	0.00	0.0	238.2	239.4	0.57	40.60
870.0	0.00	0.0	237.1	238.2	0.56	40.59
876.0	0.00	0.0	236.0	237.1	0.56	40.58
882.0	0.00	0.0	234.9	236.0	0.56	40.57
888.0	0.00	0.0	233.8	234.9	0.55	40.55
894.0	0.00	0.0	232.7	233.8	0.55	40.54
900.0	0.00	0.0	231.6	232.7	0.54	40.53
906.0	0.00	0.0	230.5	231.6	0.54	40.52
912.0	0.00	0.0	229.4	230.5	0.54	40.51
918.0	0.00	0.0	228.4	229.4	0.53	40.50
924.0	0.00	0.0	227.3	228.4	0.53	40.49

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD1OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	0.00	0.0	226.3	227.3	0.53	40.48
936.0	0.00	0.0	225.2	226.3	0.52	40.46
942.0	0.00	0.0	224.2	225.2	0.52	40.45
948.0	0.00	0.0	223.2	224.2	0.51	40.44
954.0	0.00	0.0	222.1	223.2	0.51	40.43
960.0	0.00	0.0	221.1	222.1	0.51	40.42
966.0	0.00	0.0	220.1	221.1	0.50	40.41
972.0	0.00	0.0	219.1	220.1	0.50	40.40
978.0	0.00	0.0	218.1	219.1	0.50	40.39
984.0	0.00	0.0	217.1	218.1	0.50	40.38
990.0	0.00	0.0	216.1	217.1	0.50	40.37
996.0	0.00	0.0	215.1	216.1	0.50	40.36
1002.0	0.00	0.0	214.1	215.1	0.50	40.34
1008.0	0.00	0.0	213.1	214.1	0.50	40.33
1014.0	0.00	0.0	212.1	213.1	0.50	40.32
1020.0	0.00	0.0	211.1	212.1	0.50	40.31
1026.0	0.00	0.0	210.1	211.1	0.50	40.30
1032.0	0.00	0.0	209.1	210.1	0.50	40.29
1038.0	0.00	0.0	208.1	209.1	0.50	40.28
1044.0	0.00	0.0	207.1	208.1	0.50	40.27
1050.0	0.00	0.0	206.1	207.1	0.50	40.25
1056.0	0.00	0.0	205.1	206.1	0.50	40.24
1062.0	0.00	0.0	204.1	205.1	0.50	40.23
1068.0	0.00	0.0	203.1	204.1	0.50	40.22
1074.0	0.00	0.0	202.1	203.1	0.50	40.21
1080.0	0.00	0.0	201.1	202.1	0.50	40.20
1086.0	0.00	0.0	200.1	201.1	0.50	40.19
1092.0	0.00	0.0	199.1	200.1	0.50	40.18
1098.0	0.00	0.0	198.1	199.1	0.50	40.16
1104.0	0.00	0.0	197.1	198.1	0.50	40.15
1110.0	0.00	0.0	196.1	197.1	0.50	40.14
1116.0	0.00	0.0	195.1	196.1	0.50	40.13
1122.0	0.00	0.0	194.1	195.1	0.50	40.12
1128.0	0.00	0.0	193.1	194.1	0.50	40.11
1134.0	0.00	0.0	192.1	193.1	0.50	40.10
1140.0	0.00	0.0	191.1	192.1	0.50	40.08
1146.0	0.00	0.0	190.1	191.1	0.50	40.07
1152.0	0.00	0.0	189.1	190.1	0.50	40.06
1158.0	0.00	0.0	188.1	189.1	0.50	40.05
1164.0	0.00	0.0	187.1	188.1	0.50	40.04
1170.0	0.00	0.0	186.1	187.1	0.50	40.02
1176.0	0.00	0.0	185.1	186.1	0.50	40.01
1182.0	0.00	0.0	184.1	185.1	0.50	40.00
1188.0	0.00	0.0	183.1	184.1	0.50	39.99
1194.0	0.00	0.0	182.1	183.1	0.50	39.98
1200.0	0.00	0.0	181.1	182.1	0.50	39.96

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD1OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	0.00	0.0	180.1	181.1	0.50	39.95
1212.0	0.00	0.0	179.1	180.1	0.50	39.94
1218.0	0.00	0.0	178.1	179.1	0.50	39.93
1224.0	0.00	0.0	177.1	178.1	0.50	39.91
1230.0	0.00	0.0	176.1	177.1	0.50	39.90
1236.0	0.00	0.0	175.1	176.1	0.50	39.89
1242.0	0.00	0.0	174.1	175.1	0.50	39.88
1248.0	0.00	0.0	173.1	174.1	0.50	39.87
1254.0	0.00	0.0	172.1	173.1	0.50	39.85
1260.0	0.00	0.0	171.1	172.1	0.50	39.84
1266.0	0.00	0.0	170.1	171.1	0.50	39.83
1272.0	0.00	0.0	169.1	170.1	0.50	39.82
1278.0	0.00	0.0	168.1	169.1	0.50	39.81
1284.0	0.00	0.0	167.1	168.1	0.50	39.79
1290.0	0.00	0.0	166.1	167.1	0.50	39.78
1296.0	0.00	0.0	165.1	166.1	0.50	39.77
1302.0	0.00	0.0	164.1	165.1	0.50	39.75
1308.0	0.00	0.0	163.1	164.1	0.50	39.74
1314.0	0.00	0.0	162.1	163.1	0.50	39.73
1320.0	0.00	0.0	161.1	162.1	0.50	39.71
1326.0	0.00	0.0	160.1	161.1	0.50	39.70
1332.0	0.00	0.0	159.1	160.1	0.50	39.69
1338.0	0.00	0.0	158.1	159.1	0.50	39.67
1344.0	0.00	0.0	157.1	158.1	0.50	39.66
1350.0	0.00	0.0	156.1	157.1	0.50	39.65
1356.0	0.00	0.0	155.1	156.1	0.50	39.63
1362.0	0.00	0.0	154.1	155.1	0.50	39.62
1368.0	0.00	0.0	153.1	154.1	0.50	39.61
1374.0	0.00	0.0	152.1	153.1	0.50	39.59
1380.0	0.00	0.0	151.1	152.1	0.50	39.58
1386.0	0.00	0.0	150.1	151.1	0.50	39.57
1392.0	0.00	0.0	149.1	150.1	0.50	39.56
1398.0	0.00	0.0	148.1	149.1	0.50	39.54
1404.0	0.00	0.0	147.1	148.1	0.50	39.53
1410.0	0.00	0.0	146.1	147.1	0.50	39.52
1416.0	0.00	0.0	145.1	146.1	0.50	39.50
1422.0	0.00	0.0	144.1	145.1	0.50	39.49
1428.0	0.00	0.0	143.1	144.1	0.50	39.47
1434.0	0.00	0.0	142.1	143.1	0.50	39.46
1440.0	0.00	0.0	141.1	142.1	0.50	39.45
1446.0	0.00	0.0	140.1	141.1	0.50	39.43
1452.0	0.00	0.0	139.1	140.1	0.50	39.42
1458.0	0.00	0.0	138.1	139.1	0.50	39.40
1464.0	0.00	0.0	137.1	138.1	0.50	39.39
1470.0	0.00	0.0	136.1	137.1	0.50	39.37
1476.0	0.00	0.0	135.1	136.1	0.50	39.36

EXECUTED: 02-18-1998 15:31:09 Return Freq: 1 years

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD1OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	134.1	135.1	0.50	39.34
1488.0	0.00	0.0	133.1	134.1	0.50	39.33
1494.0	0.00	0.0	132.1	133.1	0.50	39.32
1500.0	0.00	0.0	131.1	132.1	0.50	39.30
1506.0	0.00	0.0	130.1	131.1	0.50	39.29
1512.0	0.00	0.0	129.1	130.1	0.50	39.27
1518.0	0.00	0.0	128.1	129.1	0.50	39.26
1524.0	0.00	0.0	127.1	128.1	0.50	39.24
1530.0	0.00	0.0	126.1	127.1	0.50	39.23
1536.0	0.00	0.0	125.1	126.1	0.50	39.22
1542.0	0.00	0.0	124.1	125.1	0.50	39.20
1548.0	0.00	0.0	123.1	124.1	0.50	39.19
1554.0	0.00	0.0	122.1	123.1	0.50	39.17

1554
-660
894/24 = 15 hrs o/c

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

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD1OUT.HYD

Starting Pond W.S. Elevation = 41.00 ft

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

Peak Inflow = 0.00 cfs
Peak Outflow = 0.60 cfs
Peak Elevation = 41.00 ft

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

Initial Storage = 1.15 ac-ft
Peak Storage From Storm = 0.00 ac-ft

Total Storage in Pond = 1.15 ac-ft

>>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<

Return Freq: 1 years

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*                         *
*   DRAWDOWN TIME FOR BMP *
*                         *
*                         *
*                         *
*                         *
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Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 39.17 ft
Outflow = 0.50 cfs
Storage = 0.51 ac-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)	2S/t (cfs)	2S/t + O (cfs)
35.00	0.0	0.000	0.0	0.0
35.30	0.1	0.000	0.1	0.2
35.60	0.2	0.004	0.9	1.1
35.90	0.2	0.012	2.9	3.1
36.20	0.2	0.027	6.5	6.7
36.50	0.3	0.047	11.4	11.7
36.80	0.3	0.072	17.5	17.8
37.10	0.3	0.103	25.0	25.3
37.40	0.4	0.141	34.1	34.5
37.70	0.4	0.186	44.9	45.3
38.00	0.4	0.238	57.6	58.0
38.30	0.4	0.297	71.9	72.3
38.60	0.4	0.363	87.8	88.2
38.90	0.5	0.435	105.3	105.8
39.20	0.5	0.514	124.5	125.0
39.50	0.5	0.601	145.4	145.9
39.80	0.5	0.695	168.2	168.7
40.10	0.5	0.797	192.9	193.4
40.40	0.5	0.907	219.6	220.1
40.70	0.6	1.026	248.3	248.9
41.00	0.6	1.154	279.3	279.9
41.30	9.1	1.291	312.5	321.6
41.60	21.4	1.438	348.1	369.5
41.90	21.9	1.595	386.1	408.0
42.20	22.4	1.762	426.4	448.8
42.50	22.9	1.936	468.6	491.5
42.80	23.4	2.118	512.6	536.0
43.10	24.8	2.308	558.7	583.5
43.40	31.9	2.507	606.6	638.5
43.70	42.3	2.713	656.6	698.9
44.00	55.2	2.928	708.7	763.9

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
44.30	70.1	3.151
44.60	86.7	3.380
44.90	105.0	3.616
45.20	124.7	3.859
45.50	145.8	4.108
45.80	168.2	4.365
46.00	183.8	4.540

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + 0 (cfs)
762.5	832.6
818.0	904.7
875.1	980.1
933.8	1058.5
994.2	1140.0
1056.3	1224.5
1098.6	1282.4

Time increment (t) = 6.0 min.

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD2OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	0.00	-----	122.1	123.1	0.50	39.17
666.0	0.00	0.0	121.1	122.1	0.50	39.15
672.0	0.00	0.0	120.1	121.1	0.50	39.14
678.0	0.00	0.0	119.1	120.1	0.50	39.12
684.0	0.00	0.0	118.1	119.1	0.50	39.11
690.0	0.00	0.0	117.1	118.1	0.50	39.09
696.0	0.00	0.0	116.1	117.1	0.50	39.08
702.0	0.00	0.0	115.1	116.1	0.50	39.06
708.0	0.00	0.0	114.1	115.1	0.50	39.04
714.0	0.00	0.0	113.1	114.1	0.50	39.03
720.0	0.00	0.0	112.1	113.1	0.50	39.01
726.0	0.00	0.0	111.1	112.1	0.50	39.00
732.0	0.00	0.0	110.1	111.1	0.50	38.98
738.0	0.00	0.0	109.1	110.1	0.50	38.97
744.0	0.00	0.0	108.1	109.1	0.50	38.95
750.0	0.00	0.0	107.1	108.1	0.50	38.94
756.0	0.00	0.0	106.1	107.1	0.50	38.92
762.0	0.00	0.0	105.1	106.1	0.50	38.90
768.0	0.00	0.0	104.1	105.1	0.50	38.89
774.0	0.00	0.0	103.1	104.1	0.49	38.87
780.0	0.00	0.0	102.1	103.1	0.48	38.85
786.0	0.00	0.0	101.2	102.1	0.48	38.84
792.0	0.00	0.0	100.2	101.2	0.47	38.82
798.0	0.00	0.0	99.3	100.2	0.47	38.80
804.0	0.00	0.0	98.4	99.3	0.46	38.79
810.0	0.00	0.0	97.5	98.4	0.46	38.77
816.0	0.00	0.0	96.5	97.5	0.45	38.76
822.0	0.00	0.0	95.7	96.5	0.45	38.74
828.0	0.00	0.0	94.8	95.7	0.44	38.73
834.0	0.00	0.0	93.9	94.8	0.44	38.71
840.0	0.00	0.0	93.0	93.9	0.43	38.70
846.0	0.00	0.0	92.2	93.0	0.43	38.68
852.0	0.00	0.0	91.3	92.2	0.42	38.67
858.0	0.00	0.0	90.5	91.3	0.42	38.65
864.0	0.00	0.0	89.7	90.5	0.41	38.64
870.0	0.00	0.0	88.9	89.7	0.41	38.62
876.0	0.00	0.0	88.0	88.9	0.40	38.61
882.0	0.00	0.0	87.2	88.0	0.40	38.60
888.0	0.00	0.0	86.4	87.2	0.40	38.58
894.0	0.00	0.0	85.6	86.4	0.40	38.57
900.0	0.00	0.0	84.8	85.6	0.40	38.55
906.0	0.00	0.0	84.0	84.8	0.40	38.54
912.0	0.00	0.0	83.2	84.0	0.40	38.52
918.0	0.00	0.0	82.4	83.2	0.40	38.51
924.0	0.00	0.0	81.6	82.4	0.40	38.49

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD2OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	0.00	0.0	80.8	81.6	0.40	38.48
936.0	0.00	0.0	80.0	80.8	0.40	38.46
942.0	0.00	0.0	79.2	80.0	0.40	38.45
948.0	0.00	0.0	78.4	79.2	0.40	38.43
954.0	0.00	0.0	77.6	78.4	0.40	38.42
960.0	0.00	0.0	76.8	77.6	0.40	38.40
966.0	0.00	0.0	76.0	76.8	0.40	38.39
972.0	0.00	0.0	75.2	76.0	0.40	38.37
978.0	0.00	0.0	74.4	75.2	0.40	38.35
984.0	0.00	0.0	73.6	74.4	0.40	38.34
990.0	0.00	0.0	72.8	73.6	0.40	38.32
996.0	0.00	0.0	72.0	72.8	0.40	38.31
1002.0	0.00	0.0	71.2	72.0	0.40	38.29
1008.0	0.00	0.0	70.4	71.2	0.40	38.28
1014.0	0.00	0.0	69.6	70.4	0.40	38.26
1020.0	0.00	0.0	68.8	69.6	0.40	38.24
1026.0	0.00	0.0	68.0	68.8	0.40	38.23
1032.0	0.00	0.0	67.2	68.0	0.40	38.21
1038.0	0.00	0.0	66.4	67.2	0.40	38.19
1044.0	0.00	0.0	65.6	66.4	0.40	38.18
1050.0	0.00	0.0	64.8	65.6	0.40	38.16
1056.0	0.00	0.0	64.0	64.8	0.40	38.14
1062.0	0.00	0.0	63.2	64.0	0.40	38.13
1068.0	0.00	0.0	62.4	63.2	0.40	38.11
1074.0	0.00	0.0	61.6	62.4	0.40	38.09
1080.0	0.00	0.0	60.8	61.6	0.40	38.08
1086.0	0.00	0.0	60.0	60.8	0.40	38.06
1092.0	0.00	0.0	59.2	60.0	0.40	38.04
1098.0	0.00	0.0	58.4	59.2	0.40	38.03
1104.0	0.00	0.0	57.6	58.4	0.40	38.01
1110.0	0.00	0.0	56.8	57.6	0.40	37.99
1116.0	0.00	0.0	56.0	56.8	0.40	37.97
1122.0	0.00	0.0	55.2	56.0	0.40	37.95
1128.0	0.00	0.0	54.4	55.2	0.40	37.94
1134.0	0.00	0.0	53.6	54.4	0.40	37.92
1140.0	0.00	0.0	52.8	53.6	0.40	37.90
1146.0	0.00	0.0	52.0	52.8	0.40	37.88
1152.0	0.00	0.0	51.2	52.0	0.40	37.86
1158.0	0.00	0.0	50.4	51.2	0.40	37.84
1164.0	0.00	0.0	49.6	50.4	0.40	37.82
1170.0	0.00	0.0	48.8	49.6	0.40	37.80
1176.0	0.00	0.0	48.0	48.8	0.40	37.78
1182.0	0.00	0.0	47.2	48.0	0.40	37.76
1188.0	0.00	0.0	46.4	47.2	0.40	37.75
1194.0	0.00	0.0	45.6	46.4	0.40	37.73
1200.0	0.00	0.0	44.8	45.6	0.40	37.71

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD2OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	0.00	0.0	44.0	44.8	0.40	37.69
1212.0	0.00	0.0	43.2	44.0	0.40	37.66
1218.0	0.00	0.0	42.4	43.2	0.40	37.64
1224.0	0.00	0.0	41.6	42.4	0.40	37.62
1230.0	0.00	0.0	40.8	41.6	0.40	37.60
1236.0	0.00	0.0	40.0	40.8	0.40	37.58
1242.0	0.00	0.0	39.2	40.0	0.40	37.55
1248.0	0.00	0.0	38.4	39.2	0.40	37.53
1254.0	0.00	0.0	37.6	38.4	0.40	37.51
1260.0	0.00	0.0	36.8	37.6	0.40	37.49
1266.0	0.00	0.0	36.0	36.8	0.40	37.46
1272.0	0.00	0.0	35.2	36.0	0.40	37.44
1278.0	0.00	0.0	34.4	35.2	0.40	37.42
1284.0	0.00	0.0	33.6	34.4	0.40	37.40
1290.0	0.00	0.0	32.9	33.6	0.39	37.37
1296.0	0.00	0.0	32.1	32.9	0.38	37.35
1302.0	0.00	0.0	31.4	32.1	0.37	37.32
1308.0	0.00	0.0	30.6	31.4	0.37	37.30
1314.0	0.00	0.0	29.9	30.6	0.36	37.27
1320.0	0.00	0.0	29.2	29.9	0.35	37.25
1326.0	0.00	0.0	28.5	29.2	0.34	37.23
1332.0	0.00	0.0	27.9	28.5	0.33	37.20
1338.0	0.00	0.0	27.2	27.9	0.33	37.18
1344.0	0.00	0.0	26.6	27.2	0.32	37.16
1350.0	0.00	0.0	25.9	26.6	0.31	37.14
1356.0	0.00	0.0	25.3	25.9	0.31	37.12
1362.0	0.00	0.0	24.7	25.3	0.30	37.10
1368.0	0.00	0.0	24.1	24.7	0.30	37.08
1374.0	0.00	0.0	23.5	24.1	0.30	37.05
1380.0	0.00	0.0	22.9	23.5	0.30	37.03
1386.0	0.00	0.0	22.3	22.9	0.30	37.00
1392.0	0.00	0.0	21.7	22.3	0.30	36.98
1398.0	0.00	0.0	21.1	21.7	0.30	36.96
1404.0	0.00	0.0	20.5	21.1	0.30	36.93
1410.0	0.00	0.0	19.9	20.5	0.30	36.91
1416.0	0.00	0.0	19.3	19.9	0.30	36.88
1422.0	0.00	0.0	18.7	19.3	0.30	36.86
1428.0	0.00	0.0	18.1	18.7	0.30	36.84
1434.0	0.00	0.0	17.5	18.1	0.30	36.81
1440.0	0.00	0.0	16.9	17.5	0.30	36.79
1446.0	0.00	0.0	16.3	16.9	0.30	36.76
1452.0	0.00	0.0	15.7	16.3	0.30	36.73
1458.0	0.00	0.0	15.1	15.7	0.30	36.70
1464.0	0.00	0.0	14.5	15.1	0.30	36.67
1470.0	0.00	0.0	13.9	14.5	0.30	36.64
1476.0	0.00	0.0	13.3	13.9	0.30	36.61

EXECUTED: 02-18-1998 15:31:11 Return Freq: 1 years

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD2OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	12.7	13.3	0.30	36.58
1488.0	0.00	0.0	12.1	12.7	0.30	36.55
1494.0	0.00	0.0	11.5	12.1	0.30	36.52
1500.0	0.00	0.0	10.9	11.5	0.30	36.49
1506.0	0.00	0.0	10.4	10.9	0.28	36.45
1512.0	0.00	0.0	9.8	10.4	0.27	36.42
1518.0	0.00	0.0	9.3	9.8	0.26	36.39
1524.0	0.00	0.0	8.8	9.3	0.25	36.35
1530.0	0.00	0.0	8.3	8.8	0.24	36.32
1536.0	0.00	0.0	7.8	8.3	0.23	36.29
1542.0	0.00	0.0	7.4	7.8	0.22	36.27
1548.0	0.00	0.0	7.0	7.4	0.21	36.24
1554.0	0.00	0.0	6.6	7.0	0.20	36.21

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

Pond File:           c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph:   c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph:  c:\96038\BMPS\6C-6B\FRDD2OUT.HYD

Starting Pond W.S. Elevation =    39.17 ft

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

                    Peak Inflow    =     0.00 cfs
                    Peak Outflow   =     0.50 cfs
                    Peak Elevation =    39.17 ft

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

              Initial Storage          =     0.51 ac-ft
              Peak Storage From Storm  =     0.00 ac-ft
                                       ---------------
              Total Storage in Pond    =     0.51 ac-ft

  >>>>> Warning, initial pond outflow > 1st inflow ordinate. <<<<<
```

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***************************
*                         *
*   DRAWDOWN TIME FOR BMP *
*                         *
*                         *
*                         *
*                         *
***************************
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Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Rating Table file: c:\96038\BMPS\6C-6B\SWMF-FR .PND

----INITIAL CONDITIONS----
Elevation = 36.21 ft
Outflow = 0.20 cfs
Storage = 0.03 ac-ft

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
35.00	0.0	0.000
35.30	0.1	0.000
35.60	0.2	0.004
35.90	0.2	0.012
36.20	0.2	0.027
36.50	0.3	0.047
36.80	0.3	0.072
37.10	0.3	0.103
37.40	0.4	0.141
37.70	0.4	0.186
38.00	0.4	0.238
38.30	0.4	0.297
38.60	0.4	0.363
38.90	0.5	0.435
39.20	0.5	0.514
39.50	0.5	0.601
39.80	0.5	0.695
40.10	0.5	0.797
40.40	0.5	0.907
40.70	0.6	1.026
41.00	0.6	1.154
41.30	9.1	1.291
41.60	21.4	1.438
41.90	21.9	1.595
42.20	22.4	1.762
42.50	22.9	1.936
42.80	23.4	2.118
43.10	24.8	2.308
43.40	31.9	2.507
43.70	42.3	2.713
44.00	55.2	2.928

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + O (cfs)
0.0	0.0
0.1	0.2
0.9	1.1
2.9	3.1
6.5	6.7
11.4	11.7
17.5	17.8
25.0	25.3
34.1	34.5
44.9	45.3
57.6	58.0
71.9	72.3
87.8	88.2
105.3	105.8
124.5	125.0
145.4	145.9
168.2	168.7
192.9	193.4
219.6	220.1
248.3	248.9
279.3	279.9
312.5	321.6
348.1	369.5
386.1	408.0
426.4	448.8
468.6	491.5
512.6	536.0
558.7	583.5
606.6	638.5
656.6	698.9
708.7	763.9

GIVEN POND DATA

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (ac-ft)
44.30	70.1	3.151
44.60	86.7	3.380
44.90	105.0	3.616
45.20	124.7	3.859
45.50	145.8	4.108
45.80	168.2	4.365
46.00	183.8	4.540

INTERMEDIATE ROUTING COMPUTATIONS

2S/t (cfs)	2S/t + 0 (cfs)
762.5	832.6
818.0	904.7
875.1	980.1
933.8	1058.5
994.2	1140.0
1056.3	1224.5
1098.6	1282.4

Time increment (t) = 6.0 min.

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD3OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
660.0	0.00	-----	6.5	6.9	0.20	36.21
666.0	0.00	0.0	6.1	6.5	0.20	36.18
672.0	0.00	0.0	5.7	6.1	0.20	36.15
678.0	0.00	0.0	5.3	5.7	0.20	36.11
684.0	0.00	0.0	4.9	5.3	0.20	36.08
690.0	0.00	0.0	4.5	4.9	0.20	36.05
696.0	0.00	0.0	4.1	4.5	0.20	36.02
702.0	0.00	0.0	3.7	4.1	0.20	35.98
708.0	0.00	0.0	3.3	3.7	0.20	35.95
714.0	0.00	0.0	2.9	3.3	0.20	35.92
720.0	0.00	0.0	2.5	2.9	0.20	35.87
726.0	0.00	0.0	2.1	2.5	0.20	35.82
732.0	0.00	0.0	1.7	2.1	0.20	35.76
738.0	0.00	0.0	1.3	1.7	0.20	35.70
744.0	0.00	0.0	0.9	1.3	0.20	35.64
750.0	0.00	0.0	0.5	0.9	0.18	35.55
756.0	0.00	0.0	0.3	0.5	0.14	35.42
762.0	0.00	0.0	0.0	0.3	0.11	35.32
768.0	0.00	0.0	0.0	0.0	0.02	35.07
774.0	0.00	0.0	0.0	0.0	0.00	35.00
780.0	0.00	0.0	0.0	0.0	0.00	35.00
786.0	0.00	0.0	0.0	0.0	0.00	35.00
792.0	0.00	0.0	0.0	0.0	0.00	35.00
798.0	0.00	0.0	0.0	0.0	0.00	35.00
804.0	0.00	0.0	0.0	0.0	0.00	35.00
810.0	0.00	0.0	0.0	0.0	0.00	35.00
816.0	0.00	0.0	0.0	0.0	0.00	35.00
822.0	0.00	0.0	0.0	0.0	0.00	35.00
828.0	0.00	0.0	0.0	0.0	0.00	35.00
834.0	0.00	0.0	0.0	0.0	0.00	35.00
840.0	0.00	0.0	0.0	0.0	0.00	35.00
846.0	0.00	0.0	0.0	0.0	0.00	35.00
852.0	0.00	0.0	0.0	0.0	0.00	35.00
858.0	0.00	0.0	0.0	0.0	0.00	35.00
864.0	0.00	0.0	0.0	0.0	0.00	35.00
870.0	0.00	0.0	0.0	0.0	0.00	35.00
876.0	0.00	0.0	0.0	0.0	0.00	35.00
882.0	0.00	0.0	0.0	0.0	0.00	35.00
888.0	0.00	0.0	0.0	0.0	0.00	35.00
894.0	0.00	0.0	0.0	0.0	0.00	35.00
900.0	0.00	0.0	0.0	0.0	0.00	35.00
906.0	0.00	0.0	0.0	0.0	0.00	35.00
912.0	0.00	0.0	0.0	0.0	0.00	35.00
918.0	0.00	0.0	0.0	0.0	0.00	35.00
924.0	0.00	0.0	0.0	0.0	0.00	35.00

POND-2 Version: 5.20 S/N:
EXECUTED: 02-18-1998 15:31:14

Return Freq: 1 years

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD3OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
930.0	0.00	0.0	0.0	0.0	0.00	35.00
936.0	0.00	0.0	0.0	0.0	0.00	35.00
942.0	0.00	0.0	0.0	0.0	0.00	35.00
948.0	0.00	0.0	0.0	0.0	0.00	35.00
954.0	0.00	0.0	0.0	0.0	0.00	35.00
960.0	0.00	0.0	0.0	0.0	0.00	35.00
966.0	0.00	0.0	0.0	0.0	0.00	35.00
972.0	0.00	0.0	0.0	0.0	0.00	35.00
978.0	0.00	0.0	0.0	0.0	0.00	35.00
984.0	0.00	0.0	0.0	0.0	0.00	35.00
990.0	0.00	0.0	0.0	0.0	0.00	35.00
996.0	0.00	0.0	0.0	0.0	0.00	35.00
1002.0	0.00	0.0	0.0	0.0	0.00	35.00
1008.0	0.00	0.0	0.0	0.0	0.00	35.00
1014.0	0.00	0.0	0.0	0.0	0.00	35.00
1020.0	0.00	0.0	0.0	0.0	0.00	35.00
1026.0	0.00	0.0	0.0	0.0	0.00	35.00
1032.0	0.00	0.0	0.0	0.0	0.00	35.00
1038.0	0.00	0.0	0.0	0.0	0.00	35.00
1044.0	0.00	0.0	0.0	0.0	0.00	35.00
1050.0	0.00	0.0	0.0	0.0	0.00	35.00
1056.0	0.00	0.0	0.0	0.0	0.00	35.00
1062.0	0.00	0.0	0.0	0.0	0.00	35.00
1068.0	0.00	0.0	0.0	0.0	0.00	35.00
1074.0	0.00	0.0	0.0	0.0	0.00	35.00
1080.0	0.00	0.0	0.0	0.0	0.00	35.00
1086.0	0.00	0.0	0.0	0.0	0.00	35.00
1092.0	0.00	0.0	0.0	0.0	0.00	35.00
1098.0	0.00	0.0	0.0	0.0	0.00	35.00
1104.0	0.00	0.0	0.0	0.0	0.00	35.00
1110.0	0.00	0.0	0.0	0.0	0.00	35.00
1116.0	0.00	0.0	0.0	0.0	0.00	35.00
1122.0	0.00	0.0	0.0	0.0	0.00	35.00
1128.0	0.00	0.0	0.0	0.0	0.00	35.00
1134.0	0.00	0.0	0.0	0.0	0.00	35.00
1140.0	0.00	0.0	0.0	0.0	0.00	35.00
1146.0	0.00	0.0	0.0	0.0	0.00	35.00
1152.0	0.00	0.0	0.0	0.0	0.00	35.00
1158.0	0.00	0.0	0.0	0.0	0.00	35.00
1164.0	0.00	0.0	0.0	0.0	0.00	35.00
1170.0	0.00	0.0	0.0	0.0	0.00	35.00
1176.0	0.00	0.0	0.0	0.0	0.00	35.00
1182.0	0.00	0.0	0.0	0.0	0.00	35.00
1188.0	0.00	0.0	0.0	0.0	0.00	35.00
1194.0	0.00	0.0	0.0	0.0	0.00	35.00
1200.0	0.00	0.0	0.0	0.0	0.00	35.00

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD3OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1206.0	0.00	0.0	0.0	0.0	0.00	35.00
1212.0	0.00	0.0	0.0	0.0	0.00	35.00
1218.0	0.00	0.0	0.0	0.0	0.00	35.00
1224.0	0.00	0.0	0.0	0.0	0.00	35.00
1230.0	0.00	0.0	0.0	0.0	0.00	35.00
1236.0	0.00	0.0	0.0	0.0	0.00	35.00
1242.0	0.00	0.0	0.0	0.0	0.00	35.00
1248.0	0.00	0.0	0.0	0.0	0.00	35.00
1254.0	0.00	0.0	0.0	0.0	0.00	35.00
1260.0	0.00	0.0	0.0	0.0	0.00	35.00
1266.0	0.00	0.0	0.0	0.0	0.00	35.00
1272.0	0.00	0.0	0.0	0.0	0.00	35.00
1278.0	0.00	0.0	0.0	0.0	0.00	35.00
1284.0	0.00	0.0	0.0	0.0	0.00	35.00
1290.0	0.00	0.0	0.0	0.0	0.00	35.00
1296.0	0.00	0.0	0.0	0.0	0.00	35.00
1302.0	0.00	0.0	0.0	0.0	0.00	35.00
1308.0	0.00	0.0	0.0	0.0	0.00	35.00
1314.0	0.00	0.0	0.0	0.0	0.00	35.00
1320.0	0.00	0.0	0.0	0.0	0.00	35.00
1326.0	0.00	0.0	0.0	0.0	0.00	35.00
1332.0	0.00	0.0	0.0	0.0	0.00	35.00
1338.0	0.00	0.0	0.0	0.0	0.00	35.00
1344.0	0.00	0.0	0.0	0.0	0.00	35.00
1350.0	0.00	0.0	0.0	0.0	0.00	35.00
1356.0	0.00	0.0	0.0	0.0	0.00	35.00
1362.0	0.00	0.0	0.0	0.0	0.00	35.00
1368.0	0.00	0.0	0.0	0.0	0.00	35.00
1374.0	0.00	0.0	0.0	0.0	0.00	35.00
1380.0	0.00	0.0	0.0	0.0	0.00	35.00
1386.0	0.00	0.0	0.0	0.0	0.00	35.00
1392.0	0.00	0.0	0.0	0.0	0.00	35.00
1398.0	0.00	0.0	0.0	0.0	0.00	35.00
1404.0	0.00	0.0	0.0	0.0	0.00	35.00
1410.0	0.00	0.0	0.0	0.0	0.00	35.00
1416.0	0.00	0.0	0.0	0.0	0.00	35.00
1422.0	0.00	0.0	0.0	0.0	0.00	35.00
1428.0	0.00	0.0	0.0	0.0	0.00	35.00
1434.0	0.00	0.0	0.0	0.0	0.00	35.00
1440.0	0.00	0.0	0.0	0.0	0.00	35.00
1446.0	0.00	0.0	0.0	0.0	0.00	35.00
1452.0	0.00	0.0	0.0	0.0	0.00	35.00
1458.0	0.00	0.0	0.0	0.0	0.00	35.00
1464.0	0.00	0.0	0.0	0.0	0.00	35.00
1470.0	0.00	0.0	0.0	0.0	0.00	35.00
1476.0	0.00	0.0	0.0	0.0	0.00	35.00

EXECUTED: 02-18-1998 15:31:14 Return Freq: 1 years

Pond File: c:\96038\BMPS\6C-6B\SWMF-FR .PND
Inflow Hydrograph: c:\96038\BMPS\6C-6B\DRAWDOWN.HYD
Outflow Hydrograph: c:\96038\BMPS\6C-6B\FRDD3OUT.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
1482.0	0.00	0.0	0.0	0.0	0.00	35.00
1488.0	0.00	0.0	0.0	0.0	0.00	35.00
1494.0	0.00	0.0	0.0	0.0	0.00	35.00
1500.0	0.00	0.0	0.0	0.0	0.00	35.00
1506.0	0.00	0.0	0.0	0.0	0.00	35.00
1512.0	0.00	0.0	0.0	0.0	0.00	35.00
1518.0	0.00	0.0	0.0	0.0	0.00	35.00
1524.0	0.00	0.0	0.0	0.0	0.00	35.00
1530.0	0.00	0.0	0.0	0.0	0.00	35.00
1536.0	0.00	0.0	0.0	0.0	0.00	35.00
1542.0	0.00	0.0	0.0	0.0	0.00	35.00
1548.0	0.00	0.0	0.0	0.0	0.00	35.00
1554.0	0.00	0.0	0.0	0.0	0.00	35.00

STORM SEWER

CALCULATIONS

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=================================================================
============ INLET NUMBER T-23                    LENGTH   8.0
    STATION  70+75
DRAINAGE AREA =  0.100 ACRES       C VALUE = .900       CA =
    0.090
DRAINAGE AREA =  0.030 ACRES       C VALUE = .900       CA =  0.027
DRAINAGE AREA =  0.800 ACRES       C VALUE = .300       CA =  0.240
SUM CA=   0.357 INT=  3.50  CFS=   1.250  CO= 0.000 GUTTER
FLOW=   1.250
GUTTER SLOPE = 0.0196 FT/FT       PAVEMENT CROSS SLOPE =
    0.0208 FT/FT
SPREAD      W     W/T     SW       SW/SX      Eo      a
    S'W     SE
  4.28     2.0    0.47   0.0833    4.0       0.93   3.5
    0.146  0.157
       XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  8.3                EFFICIENCY= 1.00
    CFS INTERCEPTED=  1.25                CFS CARRYOVER=  0.00
=================================================================
============ INLET NUMBER T-~~24~~22A              LENGTH   4.0
    STATION  72+75
DRAINAGE AREA =  0.090 ACRES       C VALUE = .900       CA =
    0.081
DRAINAGE AREA =  0.017 ACRES       C VALUE = .300       CA =  0.005
SUM CA=   0.086 INT=  3.50  CFS=   0.301  CO= 0.000 GUTTER
FLOW=   0.301
GUTTER SLOPE = 0.0180 FT/FT       PAVEMENT CROSS SLOPE =
    0.0208 FT/FT
SPREAD      W     W/T     SW       SW/SX      Eo      a
    S'W     SE
  1.57     2.0    1.28   0.0833    4.0       1.00   3.5
    0.146  0.167
       XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  4.3
    EFFICIENCY=   0.99
    CFS INTERCEPTED=  0.30                CFS
CARRYOVER= 0.00
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PROJECT  1
HEC12 Version: V2.91                                        Run
Date:  03-05-1998
==============================================================
================= INLET NUMBER T-21           LENGTH   6.0
STATION  75+00

DRAINAGE AREA =  0.050 ACRES       C VALUE = .900       CA
=   0.045
DRAINAGE AREA =  0.030 ACRES       C VALUE = .900       CA =  0.027
DRAINAGE AREA =  0.290 ACRES       C VALUE = .300       CA =  0.087
SUM CA=   0.159 INT=  3.50  CFS=   0.556  CO=  0.000 GUTTER
FLOW=   0.556

GUTTER SLOPE = 0.0100 FT/FT        PAVEMENT CROSS SLOPE =
    0.0208 FT/FT
SPREAD      W     W/T     SW       SW/SX      Eo      a
S'W     SE
  2.77     2.0    0.72   0.0833    4.0       0.99   3.5
    0.146  0.166
       XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  4.7                EFFICIENCY= 1.00
    CFS INTERCEPTED=  0.56                 CFS CARRYOVER=  0.00


====================================================================
============ INLET NUMBER T-22           LENGTH   8.0
STATION  72+75

DRAINAGE AREA =  0.110 ACRES       C VALUE = .900       CA =
    0.099
DRAINAGE AREA =  0.040 ACRES       C VALUE = .900       CA =  0.036
DRAINAGE AREA =  0.540 ACRES       C VALUE = .300       CA =  0.162
SUM CA=   0.297 INT=  3.50  CFS=   1.039  CO=  0.000 GUTTER
FLOW=   1.039

GUTTER SLOPE = 0.0184 FT/FT        PAVEMENT CROSS SLOPE =
    0.0208 FT/FT

SPREAD      W     W/T     SW       SW/SX      Eo      a
S'W     SE
  3.78     2.0    0.53   0.0833    4.0       0.96   3.5
    0.146  0.161
       XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  7.5                EFFICIENCY= 1.00
    CFS INTERCEPTED=  1.04                 CFS CARRYOVER=  0.00
```

PROJECT 96038-10871
HEC12 Version: V2.91 Run Date: 04-08-1998

INLET NUMBER T20 LENGTH 6.0 STATION 15+15, 16.5' LT. (CROSS BRANCH)

DRAINAGE AREA = 0.340 ACRES C VALUE = .350 CA = 0.119
DRAINAGE AREA = 0.060 ACRES C VALUE = .900 CA = 0.054
SUM CA= 0.173 INT= 3.50 CFS= 0.606 CO= 0.000 GUTTER FLOW= 0.606

GUTTER SLOPE = 0.0240 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.12	2.0	0.94	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.8 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.61 CFS CARRYOVER= 0.00

INLET NUMBER T19 LENGTH 12.0 STATION 15+80.22, 16.5' LT. (CROSS BRANCH)

DRAINAGE AREA = 0.417 ACRES C VALUE = .350 CA = 0.146
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027
DRAINAGE AREA = 0.291 ACRES C VALUE = .350 CA = 0.102
DRAINAGE AREA = 0.030 ACRES C VALUE = .900 CA = 0.027

FOR THE FIRST SIDE
SUM CA= 0.173 INT= 3.50 CFS= 0.605 CO= 0.000 GUTTER FLOW= 0.605
FOR THE OTHER SIDE
SUM CA= 0.129 INT= 3.50 CFS= 0.451 CO= 0.000 GUTTER FLOW= 0.451
AT THE INLET

SUM CA= 0.302 INT= 3.50 CFS= 1.056 CO= 0.000 GUTTER FLOW= 1.056

GUTTER SLOPE = 0.0010 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.61 (cfs) IS 7.47 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 15.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.10 SPREAD (ft) = 4.58

INLET NUMBER T19A LENGTH 6.0 STATION 15+80.22, 16.5' RT. (CROSS BRANCH)

DRAINAGE AREA = 0.075 ACRES C VALUE = .400 CA = 0.030
DRAINAGE AREA = 0.090 ACRES C VALUE = .900 CA = 0.081
DRAINAGE AREA = 0.050 ACRES C VALUE = .900 CA = 0.045
DRAINAGE AREA = 0.030 ACRES C VALUE = .400 CA = 0.012

FOR THE FIRST SIDE
SUM CA= 0.111 INT= 3.50 CFS= 0.389 CO= 0.000 GUTTER FLOW= 0.389
FOR THE OTHER SIDE
SUM CA= 0.057 INT= 3.50 CFS= 0.199 CO= 0.000 GUTTER FLOW= 0.199
AT THE INLET

SUM CA= 0.168 INT= 3.50 CFS= 0.588 CO= 0.000 GUTTER FLOW= 0.588

GUTTER SLOPE = 0.0010 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.39 (cfs) IS 5.84 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.09 SPREAD (ft) = 4.28

INLET NUMBER T18 LENGTH 6.0 STATION 16+50, 16.5' LT. (CROSS BRANCH)

DRAINAGE AREA = 0.220 ACRES C VALUE = .400 CA = 0.088
DRAINAGE AREA = 0.130 ACRES C VALUE = .900 CA = 0.117
SUM CA= 0.205 INT= 3.50 CFS= 0.717 CO= 0.000 GUTTER FLOW= 0.717

GUTTER SLOPE = 0.0208 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.87	2.0	0.70	0.0833	4.0	0.99	3.5	0.146	0.165

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.72 CFS CARRYOVER= 0.00

INLET NUMBER T17 LENGTH 4.0 STATION 13+00, 16.5' LT. (BENT TREE LANE)

DRAINAGE AREA = 0.100 ACRES C VALUE = .350 CA = 0.035
DRAINAGE AREA = 0.110 ACRES C VALUE = .900 CA = 0.099
SUM CA= 0.134 INT= 3.50 CFS= 0.469 CO= 0.000 GUTTER FLOW= 0.469

GUTTER SLOPE = 0.0208 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.90	2.0	1.05	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.0 EFFICIENCY= 0.95
CFS INTERCEPTED= 0.44 CFS CARRYOVER= 0.02

INLET NUMBER T14 LENGTH 6.0 STATION 16+44, 16.5' LT. (BENT TREE LANE)

DRAINAGE AREA = 0.100 ACRES C VALUE = .350 CA = 0.035
DRAINAGE AREA = 0.123 ACRES C VALUE = .900 CA = 0.111
SUM CA= 0.146 INT= 3.50 CFS= 0.510 CO= 0.020 GUTTER FLOW= 0.530

GUTTER SLOPE = 0.0329 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.82	2.0	1.10	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.53 CFS CARRYOVER= 0.00

INLET NUMBER T14A LENGTH 6.0 STATION 16+44, 16.5' RT. (BENT TREE LANE)
DRAINAGE AREA = 0.080 ACRES C VALUE = .500 CA = 0.040
DRAINAGE AREA = 0.138 ACRES C VALUE = .900 CA = 0.124
SUM CA= 0.164 INT= 3.50 CFS= 0.575 CO= 0.000 GUTTER FLOW= 0.575

GUTTER SLOPE = 0.0329 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.88	2.0	1.06	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.2 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.57 CFS CARRYOVER= 0.00

INLET NUMBER T11 LENGTH 8.0 STATION 19+93, 16.5' LT. (BENT TREE LANE)

DRAINAGE AREA = 0.150 ACRES C VALUE = .350 CA = 0.053
DRAINAGE AREA = 0.120 ACRES C VALUE = .900 CA = 0.108
SUM CA= 0.160 INT= 3.50 CFS= 0.562 CO= 0.000 GUTTER FLOW= 0.562

GUTTER SLOPE = 0.0985 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.52	2.0	1.32	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.6 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.56 CFS CARRYOVER= 0.00

INLET NUMBER T11A LENGTH 8.0 STATION 19+93, 16.5' RT. (BENT TREE LANE)

DRAINAGE AREA = 0.111 ACRES C VALUE = .500 CA = 0.056
DRAINAGE AREA = 0.120 ACRES C VALUE = .900 CA = 0.108
SUM CA= 0.163 INT= 3.50 CFS= 0.572 CO= 0.000 GUTTER FLOW= 0.572

GUTTER SLOPE = 0.0985 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.53	2.0	1.31	0.0833	4.0	1.00	3.5	0.146	0.167

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.6 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.57 CFS CARRYOVER= 0.01

INLET NUMBER V4 LENGTH 4.0 STATION 23+75, 16.5' LT. (BENT TREE LANE)

DRAINAGE AREA = 0.087 ACRES C VALUE = .350 CA = 0.030
DRAINAGE AREA = 0.135 ACRES C VALUE = .900 CA = 0.122
SUM CA= 0.152 INT= 3.50 CFS= 0.532 CO= 0.000 GUTTER FLOW= 0.532

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.08	2.0	0.65	0.0833	4.0	0.99	3.5	0.146	0.165

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 4.2 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.53 CFS CARRYOVER= 0.00

INLET NUMBER V4A LENGTH 4.0 STATION 23+75, 16.5' RT. (BENT TREE LANE)

DRAINAGE AREA = 0.143 ACRES C VALUE = .400 CA = 0.057
DRAINAGE AREA = 0.135 ACRES C VALUE = .900 CA = 0.122
SUM CA= 0.179 INT= 3.50 CFS= 0.625 CO= 0.010 GUTTER FLOW= 0.635

GUTTER SLOPE = 0.0100 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.64	2.0	0.55	0.0833	4.0	0.97	3.5	0.146	0.162

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 4.6 EFFICIENCY= 0.97
CFS INTERCEPTED= 0.62 CFS CARRYOVER= 0.02

INLET NUMBER V6 LENGTH 8.0 STATION 25+63, (BENT TREE LANE)

DRAINAGE AREA = 0.080 ACRES C VALUE = .350 CA = 0.028
DRAINAGE AREA = 0.090 ACRES C VALUE = .900 CA = 0.081
DRAINAGE AREA = 0.060 ACRES C VALUE = .400 CA = 0.024
DRAINAGE AREA = 0.090 ACRES C VALUE = .900 CA = 0.081

FOR THE FIRST SIDE
SUM CA= 0.109 INT= 3.50 CFS= 0.382 CO= 0.000 GUTTER FLOW= 0.382
FOR THE OTHER SIDE
SUM CA= 0.105 INT= 3.50 CFS= 0.368 CO= 0.020 GUTTER FLOW= 0.388
AT THE INLET

SUM CA= 0.214 INT= 3.50 CFS= 0.749 CO= 0.020 GUTTER FLOW= 0.769

GUTTER SLOPE = 0.0010 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.39 (cfs) IS 5.83 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 11.60 H (ft) = 0.385
DEPTH OF WATER (ft) = 0.09 SPREAD (ft) = 4.51

PROJECT 103.50
HEC12 Version: V2.91 Run Date: 04-07-1998

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==============================================================================
INLET NUMBER W2              LENGTH   6.0        STATION  80+75

DRAINAGE AREA =  0.120 ACRES       C VALUE = .900       CA =  0.108
DRAINAGE AREA =  0.090 ACRES       C VALUE = .350       CA =  0.032
SUM CA=   0.139 INT=  3.50  CFS=   0.488  CO=  0.000 GUTTER FLOW=   0.488

GUTTER SLOPE = 0.0252 FT/FT       PAVEMENT CROSS SLOPE =  0.0050 FT/FT

SPREAD      W     W/T     SW       SW/SX      Eo      a     S'W     SE
  1.76     2.0    1.13   0.0833    %16.7       1.00   3.9    0.162  0.167

      XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  5.8                EFFICIENCY= 1.00
    CFS INTERCEPTED=  0.49                 CFS CARRYOVER=  0.00


==============================================================================
INLET NUMBER W3              LENGTH   6.0        STATION  80+75

DRAINAGE AREA =  0.130 ACRES       C VALUE = .900       CA =  0.117
DRAINAGE AREA =  0.150 ACRES       C VALUE = .350       CA =  0.053
SUM CA=   0.169 INT=  3.50  CFS=   0.593  CO=  0.000 GUTTER FLOW=   0.593

GUTTER SLOPE = 0.0276 FT/FT       PAVEMENT CROSS SLOPE =  0.0208 FT/FT

SPREAD      W     W/T     SW       SW/SX      Eo      a     S'W     SE
  1.86     2.0    1.07   0.0833    4.0        1.00   3.5    0.146  0.167

      XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  6.5                EFFICIENCY= 0.99
    CFS INTERCEPTED=  0.59                 CFS CARRYOVER=  0.01
□


==============================================================================
INLET NUMBER X2              LENGTH   6.0        STATION  83+50

DRAINAGE AREA =  0.160 ACRES       C VALUE = .900       CA =  0.144
DRAINAGE AREA =  0.050 ACRES       C VALUE = .350       CA =  0.018
SUM CA=   0.161 INT=  3.50  CFS=   0.565  CO=  0.010 GUTTER FLOW=   0.575

GUTTER SLOPE = 0.0276 FT/FT       PAVEMENT CROSS SLOPE =  0.0208 FT/FT

SPREAD      W     W/T     SW       SW/SX      Eo      a     S'W     SE
  1.84     2.0    1.09   0.0833    4.0        1.00   3.5    0.146  0.167

      XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  6.4                EFFICIENCY= 0.99
    CFS INTERCEPTED=  0.57                 CFS CARRYOVER=  0.00


==============================================================================
INLET NUMBER W3              LENGTH   6.0        STATION  83+50

DRAINAGE AREA =  0.070 ACRES       C VALUE = .900       CA =  0.063
DRAINAGE AREA =  0.310 ACRES       C VALUE = .350       CA =  0.108
SUM CA=   0.171 INT=  3.50  CFS=   0.600  CO=  0.000 GUTTER FLOW=   0.600

GUTTER SLOPE = 0.0276 FT/FT       PAVEMENT CROSS SLOPE =  -.0208 FT/FT

SPREAD      W     W/T     SW       SW/SX      Eo      a     S'W     SE
  1.87     2.0    1.07   0.0833    %-4.0       1.00   4.5    0.187  0.167

      XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  6.5                EFFICIENCY= 0.99
    CFS INTERCEPTED=  0.59                 CFS CARRYOVER=  0.01
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STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"tc"	"i"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM " T"		*	*							*	*	*		*				
ROAD PAVEMENT	T23	0.13	0.9	0.12	0.117	0.02	5.00	7.2	0.84									
SHOULDER	T23	0.8	0.3	0.24	0.357	0.04	5.00	7.2	2.57									
T23 DI -3B, L=8'	T22									102.80	101.80	197	0.0051	15	4.50	4.27	0.77	
PAVEMENT	T22	0.15	0.9	0.14	0.492	0.02	5.00	7.2	3.54									
LOT AREA	T22	0.297	0.3	0.09	0.581	0.02	5.00	7.2	4.19									
SHOULDER	T22A	0.017	0.3	0.01	0.005	1.48	5.00	7.2	0.04									
PAVEMENT	T22A	0.09	0.9	0.08	0.086	0.04	5.00	7.2	0.62									
T22A DI-3B, L=4'	T22									106.00	105.68	32	0.0100	15	6.31	6.00	0.09	
T22 DI-3B, L=8'	T21								4.81	101.55	100.45	222	0.0050	18	7.23	4.77	0.78	
PAVEMENT	T21	0.08	0.9	0.07	0.739	0.02	5.00	7.2	5.32									
CUT SLOPE / SHOULDER	T21	0.29	0.3	0.09	0.826	0.02	5.00	7.2	5.95									
T21 DI-3B, L=6'	T20									100.35	99.11	255	0.0049	18	7.16	4.72	0.90	
PAVEMENT	T20	0.06	0.9	0.05	0.88	0.01	5.00	7.2	6.34									
LOT AREA	T20	0.34	0.35	0.12	0.999	0.01	5.00	7.2	7.20									
T20 DI-3B, L=6'	T19									98.95	98.62	65	0.0051	18	7.32	4.83	0.22	
PAVEMENT	T19A	0.14	0.9	0.13	0.126	0.02	5.00	7.2	0.91									
SHOULDER	T19A	0.105	0.4	0.04	0.168	0.02	5.00	7.2	1.21									
T19A DI-3C, L=6'	T19									100.32	100.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T19	0.06	0.9	0.05	1.221	0.01	5.00	7.2	8.80									
LOT / SHOULDER	T19	0.71	0.35	0.25	1.47	0.01	5.00	7.2	10.58									
T19 DI-3C, L=12'	T18									98.12	97.77	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T18	0.13	0.9	0.12	1.587	0.04	5.00	7.2	11.43									
SHOULDER	T18	0.22	0.4	0.09	1.675	0.04	5.00	7.2	12.06									
T18 DI-3B, L=6'	T17									97.67	97.32	70	0.0050	24	15.64	5.80	0.20	
PAVEMENT	T17	0.11	0.9	0.10	1.774	0.02	5.00	7.2	12.77									
DRAINAGE AREA	T17	0.1	0.35	0.04	1.809	0.02	5.00	7.2	13.03									
T17 DI-3B, L=4'	T16									97.22	96.60	125	0.0050	24	15.57	5.78	0.36	
T16 MH-1	T15									96.50	95.98	105	0.0050	24	15.56	5.78	0.30	
T15 MH-1	T14									95.88	93.88	100	0.0200	24	31.27	11.61	0.14	
PAVEMENT	T14A	0.138	0.9	0.12	0.124	0.03	5.00	7.2	0.89									
SHOULDER / SIDEWALK	T14A	0.08	0.5	0.04	0.164	0.04	5.00	7.2	1.18									
T14A DI-3B, L=6'	T14									94.20	93.88	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T14	0.123	0.9	0.11	2.084	0.03	5.63	7.0	14.62									
SHOULDER	T14	0.1	0.35	0.04	2.119	0.04	5.63	7.0	14.87									
T14 DI-3B L=6 '	T13									93.75	89.75	100	0.0400	24	44.23	16.41	0.10	
T13 MH-1	T12									89.65	83.00	95	0.0700	24	58.50	21.71	0.07	
T12 DROP MH-1	T11									80.45	70.30	145	0.0700	24	58.50	21.71	0.11	
PAVEMENT	T11A	0.12	0.9	0.11	0.108	0.03	5.00	7.2	0.78									
SHOULDER / SIDEWALK	T11A	0.11	0.5	0.06	0.163	0.04	5.00	7.2	1.17									
T11A DI-3B, L=8'	T11									71.00	70.68	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	T11	0.12	0.9	0.11	2.39	0.04	6.00	6.9	16.51									
SHOULDER	T11	0.15	0.35	0.05	2.442	0.04	6.00	6.9	16.88									
T11 DI-3B, L=8'	T10									70.00	58.00	100	0.1200	24	76.60	28.43	0.06	
T10 DROP MH-1	T9									52.00	49.90	105	0.0200	24	31.27	11.61	0.15	
T9 DROP MH-1	ES-1									42.30	42.00	30	0.0100	24	22.11	8.21	0.06	
		4.77																

STORM SEWER DESIGN / RATIONAL METHOD 10 YEAR RETURN PERIOD

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

Concrete Pipe,"n" = 0.013 Capacity @ 80% Full Depth

VDOT L&D 229		Area Drained	Run-off Coeff.	"C x A		Inlet Time	Time of Conc.	Rainfall intensity	RUNOFF	INVERT ELEVATIONS		LENGTH	SLOPE	DIAM	CAPACITY	VELOCITY	TRAVEL"t"	REMARKS
FROM PT.	TO PT.	"Acres"	"C"	INCR.	ACCUM	"t"	"tc"	"i"	"QRational"	UPPER END	LOWER END	ft.	ft/ft	inch	cfs	fps	min.	
(1)	(2)	(3)	(4)	(5)	(6)	*	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	
STORM SYSTEM "V"																		
PAVEMENT	V6	0.18	0.9	0.16	0.162	0.01	5.00	7.2	1.17									
SHOUL;DER / SIDEWALK	V6	0.14	0.4	0.06	0.218	0.02	5.00	7.2	1.57									
V6 DI-3C, L=8'	V5									52.00	51.47	107	0.0050	15	4.44	4.22	0.42	
V5 MH-1	V4									51.37	51.02	70	0.0050	15	4.46	4.24	0.28	
PAVEMENT	V4A	0.14	0.9	0.13	0.126	0.01	5.00	7.2	0.91									
SHOUL;DER / SIDEWALK	V4A	0.14	0.4	0.06	0.182	0.02	5.00	7.2	1.31									
V4A DI-3B, L=4'	V4									52.32	52.00	32	0.0100	15	6.31	6.00	0.09	
PAVEMENT	V4	0.14	0.9	0.13	0.526	0.01	5.00	7.2	3.79									
SHOUL;DER / SIDEWALK	V4	0.09	0.35	0.03	0.558	0.02	5.00	7.2	4.02									
V4 DI-3B, L=4'	V3									50.90	42.58	185	0.0450	15	13.39	12.72	0.24	
V3 MH-1	V2 ES-1									38.50	38.00	50	0.0100	15	6.31	6.00	0.14	

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

STORM SYSTEM "T"

		INVERT ELEV		DIAM	RUNOFF	LENGTH	SLOPE	Yn	Vn
FROM PT.	TO PT.	UPPER	LOWER	inch	"QRational	ft.	ft/ft	ft.	fps
(1)	(2)	(10)	(11)	(14)	(9)	(12)	(13)		
T9 DROP MH-1	ES-1	42.30	42.00	24	16.90	30	0.0100	1.29	7.89
T10 DROP MH-1	T9	52.00	49.90	24	16.90	105	0.0200	1.03	10.32
T11 DI-3B, L=8'	T10	70.00	58.00	24	16.90	100	0.1200	0.63	19.89
T11A DI-3B, L=8'	T11	71.00	70.68	15	1.17	32	0.0100	0.36	4.00
T12 DROP MH-1	T11	80.45	70.30	24	14.89	145	0.0700	0.68	15.82
T13 MH-1	T12	89.65	83.00	24	14.89	95	0.0700	0.68	15.82
T14 DI-3B L=6 '	T13	93.75	89.75	24	14.89	100	0.0400	0.79	12.9
T14A DI-3B, L=6'	T14	94.20	93.88	15	1.18	32	0.0100	0.36	4.00
T15 MH-1	T14	95.88	93.88	24	13.03	100	0.0200	0.889	9.66
T16 MH-1	T15	96.50	95.98	24	13.03	105	0.0050	1.37	5.68
T17 DI-3B, L=4'	T16	97.22	96.60	24	13.03	125	0.0050	1.37	5.68
T18 DI-3B, L=6'	T17	97.67	97.32	24	12.06	70	0.0050	1.3	5.59
T19 DI-3C, L=12'	T18	98.12	97.77	24	10.58	70	0.0050	1.19	5.44
T19A DI-3C, L=6'	T19	100.32	100.00	15	1.21	32	0.0100	0.37	4.03
T20 DI-3B, L=6'	T19	98.95	98.62	18	7.20	65	0.0051	1.19	4.79
T21 DI-3B, L=6'	T20	100.35	99.11	18	5.95	248	0.0050	1.02	4.67
T22 DI-3B, L=8'	T21	101.55	100.45	18	4.81	222	0.0050	0.88	4.47
T22A DI-3B, L=4'	T22	106.00	105.68	15	0.62	32	0.0100	0.26	3.33
T23 DI -3B, L=8'	T22	102.80	101.80	15	2.57	197	0.0051	0.55	4.96

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

STORM SYSTEM "V"

		INVERT ELEV		DIAM	RUNOFF	LENGTH	SLOPE	Yn	Vn
FROM PT.	TO PT.	UPPER	LOWER	inch	"QRational	ft.	ft/ft	ft.	fps
(1)	(2)	(10)	(11)	(14)	(9)	(12)	(13)		
V2 MH-1	ES-1	36.50	36.00	15	4.02	50	0.01	0.71	5.55
V3 MH-1	V2	43.50	37.00	15	4.02	130	0.0500	0.45	10.08
V4 DI-3B, L=4"	V3	50.90	43.70	15	4.02	160	0.0450	0.46	9.70
V4A DI-3B, L=4"	V4	52.32	52.00	15	1.31	32	0.0100	0.38	4.13
V5 MH-1	V4	51.37	51.02	15	1.57	70	0.0050	0.51	3.38
V6 DI-3C, L=8"	V5	52.00	51.47	15	1.57	107	0.0050	0.51	3.38

HYDRAULIC GRADELINE CALCULATION **STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1**

		FRICTION LOSS IN PIPE						JUNCTION LOSS															
INLET STATION	Outlet Water Surface	D_o	Q_o	L_o	n_o	S_{fo}	H_f	V_o	H_o	Q_i	V_i	$Q_i \times V_i$	$V^2/2g$	H_i	Δ	H_{delta}	H_t	.3 x H_t	0.5 x H_t	H Adjusted	Inlet Water Surface Elevation	Rim Elevation
1	2	3	4	5	5A	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
STORM SYSTEM "T"																						
T9 MH-1 / DROP	43.60	24	16.9	30	0.013	0.0056	0.167	5.38	0.11	16.9	10.32	174.41	1.65	0.58	45	0.70	1.39	0.42	-0.70	1.28	44.88	54.50
T10 MH-1 / DROP	50.93	24	16.9	105	0.013	0.0056	0.586	5.38	0.11	16.9	19.89	336.14	6.14	2.15	0	0.00	2.26	0.68	-1.13	2.40	53.33	63.50
T11 DI-3B, L=8'	58.63	24	16.9	100	0.013	0.0056	0.558	5.38	0.11	14.89	15.82	235.56	3.89	1.36	74	2.45	3.92	1.18	-1.96	3.69	62.32	78.39
										1.17	4	4.68										
T12 MH-1 / DROP	70.98	24	14.89	145	0.013	0.0043	0.628	4.74	0.09	14.89	15.82	235.56	3.89	1.36	9	0.23	1.68	0.50	-0.84	1.97	72.95	90.25
T13 MH-1	72.95	24	14.89	95	0.013	0.0043	0.412	4.74	0.09	14.89	12.9	192.08	2.58	0.90	20	0.41	1.41	0.42	-0.70	1.54	74.49	95.75
										1.18	4											
T14 DI-3B, L=6'	74.49	24	14.89	100	0.013	0.0043	0.433	4.74	0.09	13.03	9.66	125.87	1.45	0.51	24	0.30	0.90	0.27	-0.45	1.15	75.64	99.29
T15 MH-1	75.64	24	13.03	100	0.013	0.0033	0.332	4.15	0.07	13.03	5.68	74.01	0.50	0.18	20	0.08	0.32	0.10	-0.16	0.59	76.23	103.00
T16 MH-1	76.23	24	13.03	105	0.013	0.0033	0.348	4.15	0.07	13.03	5.68	74.01	0.50	0.18	8	0.03	0.27	0.08	-0.13	0.56	76.79	106.25
T17 DI-3B , L=4"	76.79	24	13.03	125	0.013	0.0033	0.415	4.15	0.07	12.06	5.59	67.42	0.49	0.17	85	0.33	0.57	0.17	-0.28	0.87	77.66	108.76
T18 DI-3B, L=6'	77.66	24	12.06	70	0.013	0.0028	0.199	3.84	0.06	10.58	5.44	57.56	0.46	0.16	7	0.02	0.24	0.07	-0.12	0.39	78.05	107.45
T19 DI-3C, L=12'	78.05	24	10.58	70	0.013	0.0022	0.153	3.37	0.04	7.2	4.79	34.49	0.36	0.12	7	0.02	0.19	0.06	-0.09	0.30	78.35	106.84
T20 DI-3B, L=6'	78.35	18	7.2	65	0.013	0.0047	0.305	4.07	0.06	5.95	4.67	27.79	0.34	0.12	88	0.23	0.42	0.13	-0.21	0.64	78.99	107.38
T21 DI-3B, L=6'	78.99	18	5.95	248	0.013	0.0032	0.796	3.37	0.04	4.81	4.47	21.50	0.31	0.11	89	0.22	0.37	0.11	-0.18	1.09	80.08	114.47
T22 DI-3B, L=8'	80.08	18	4.81	222	0.013	0.0021	0.465	2.72	0.03	2.57	4.96	12.75	0.38	0.13	2	0.01	0.17	0.05	-0.08	0.60	80.68	110.63
T23 DI-3B, L=8'	80.68	15	2.57	100	0.013	0.0016	0.158	2.09	0.02			0.00	0.00	0.00	0	0.00	0.02	0.01	-0.01	0.17	80.85	106.82
T11A DI-3B, L=8'	71.04	15	1.17	32	0.013	0.0003	0.010	0.95	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	71.05	78.39
T14A DI-3B, L=8'	94.24	15	1.18	32	0.013	0.0003	0.011	0.96	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	94.25	99.29
T19A DI-3C, L=6'	100.37	15	1.21	32	0.013	0.0004	0.011	0.99	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	100.38	106.84
T22A DI-3B, L=8'	105.94	15	0.62	100	0.013	0.0001	0.009	0.51	0.00			0.00	0.00	0.00	90	0.00	0.00	0.00	-0.00	0.01	105.95	111.13
STORM SYSTEM "V"																					39.00	
V2 ES-1	39.00	15	4.02	50	0.013	0.0039	0.194	3.28	0.04	4.02	10.08	40.52	1.58	0.55	0	0.00	0.59	0.18	-0.30	0.67	39.67	NA
V3 MH-1	39.67	15	4.02	130	0.013	0.0039	0.503	3.28	0.04	4.02	9.7	38.99	1.46	0.51	45	0.62	1.17	0.35	-0.59	1.44	41.11	49.50
V4 DI-3B, L=4'	41.11	15	4.02	160	0.013	0.0039	0.620	3.28	0.04	1.57	3.38	5.31	0.18	0.06	90	0.12	0.23	0.07	-0.11	0.80	41.91	58.47
										1.31	4.13	5.41	0.26	0.09	0	0.00	0.09	0.03	-0.05	0.07	41.19	
V5 MH-1	41.91	15	1.57	70	0.013	0.0006	0.041	1.28	0.01	1.57	3.38	5.31	0.18	0.06	20	0.03	0.10	0.03	-0.05	0.12	42.03	58.00
V6 DI-3C, L=8'	42.03	15	1.57	107	0.013	0.0006	0.063	1.28	0.01	0	0	0.00	0.00	0.00	0	0.00	0.01	0.00	-0.00	0.07	42.10	56.72
V4A DI-3B, L=4'	42.10	15	1.31	32	0.013	0.0004	0.013	1.07	0.00	0	0	0.00	0.00	0.00	0	0.00	0.00	0.00	-0.00	0.02	42.12	58.47

STONEHOUSE SECTION VI - B, DEVELOPMENT AREA 1

STRUCTURE NUMBER	INLET PIPE	INV. IN	INLET PIPE	INV. IN	OUTLET PIPE	INV. OUT	RIM /TOP ELEV.	V.LF.	
SYSTEM "T"									
T9 MH-1			24	49.90	24	42.30	54.50	12.2	USE SL-1
T10 DROP MH-1			24	58.00	24	52.00	63.50	11.5	USE SL-1
T11 DI-3B, L=8'	15	70.68	24	70.30	24	70.00	78.39	8.39	
T12 DROP MH-1			24	83.00	24	80.45	90.25	9.8	
T13 MH-1			24	89.75	24	89.65	95.75	6.1	
T14 DI-3B L=6 '	15	93.88	24	93.88	24	93.75	99.29	5.54	
T15 MH-1			24	95.98	24	95.88	103.00	7.12	
T16 MH-1			24	96.60	24	96.50	106.25	9.75	
T17 DI-3B, L=4'			24	97.32	24	97.22	108.76	11.54	USE SL-1
T18 DI-3B, L=6'			24	97.77	24	97.67	107.45	9.78	
T19 DI-3C, L=12'	15	100.00	18	98.62	24	98.12	106.84	8.72	
T20 DI-3B, L=6'			18	99.11	18	98.95	107.38	8.43	
T21 DI-3B, L=6'			18	100.45	18	100.35	114.47	14.12	USE SL-1
T22 DI-3B, L=8'	15	107.00	15	101.80	18	101.55	110.63	9.08	
T23 DI -3B, L=8'					15	102.80	106.82	4.02	
T11A DI-3B, L=8'					15	71.00	78.39	7.39	
T14A DI-3B, L=6'					15	94.20	99.29	5.09	
T19A DI-3C, L=6'					15	100.32	106.84	6.52	
T22A DI-3B, L=4'					15	106.00	111.13	5.13	
SYSTEM "V"									
V2 ES-1			15	38.00	15			0	
V3 MH-1			15	42.58	15	38.50	49.50	11	USE SL-1
V4 DI-3B, L=4"	15	52.00	15	51.02	15	50.90	58.47	7.57	
V4A DI-3B, L=4"					15	52.32	58.47	6.15	
V5 MH-1			15	51.47	15	51.37	58.00	6.63	
V6 DI-3C, L=8"					15	52.00	56.72	4.72	

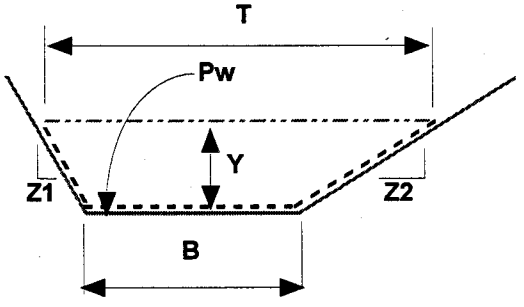
Open Channel Analysis / Uniform Flow :
(USING MANNING'S EQUATION :)
Project : Stonehouse
Location : James City County, VA

$$Q = \frac{1.486 \cdot A \cdot (R_h)^{\frac{2}{3}} \cdot \sqrt{S_o}}{n}$$

$$R_h = \frac{A}{P_w}$$

A = Area of Flow Section
P_w = Wetted Perimeter
R_h = Hydraulic Radius

$$T = B + y \cdot (Z_1 + Z_2)$$



TRAPEZOIDAL, RECTANGULAR or VEE CHANNEL CROSS SECTION

Cross Section Designation :
SECTION VIB SYSTEM "T" OUTFALL :

GIVEN :	**Design flow, Q_{DESIGN} =**	**16.9**	**cubic ft. / sec.**
	Bottom Width, B =	**10**	**feet**
	Channel Slope, S_o =	**0.05**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.03**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	11.91 feet	**Y_{Normal} =**	**0.32**	**feet**
R_{hn} =	0.29 feet	**V_{Normal} =**	**4.85**	**f.p.s.**
T_c =	12.56 feet	**$Y_{Critical}$ =**	**0.43**	**feet**
R_{hc} =	0.38 feet	**$V_{Critical}$ =**	**3.51**	**f.p.s.**
		$S_{Critical}$ =	**0.0183**	**ft. / ft.**
		F =	**1.58**	

Supercritical Flow / Steep Slope

Cross Section Designation :
SECTION VIB SYSTEM "V" OUTFALL :

GIVEN :	**Design flow, Q_{DESIGN} =**	**4.02**	**cubic ft. / sec.**
	Bottom Width, B =	**5**	**feet**
	Channel Slope, S_o =	**0.04**	**feet / foot**
	Side Slopes, Z_1 =	**3**	**Run / Unit rise**
	Z_2 =	**3**	**Run / Unit rise**
	Manning's Coefficient, n =	**0.03**	

CALCULATE : Depth and Velocity, (Normal and Critical Flow):

T_n =	6.30 feet	**Y_{Normal} =**	**0.22**	**feet**
R_{hn} =	0.19 feet	**V_{Normal} =**	**3.29**	**f.p.s.**
T_c =	6.55 feet	**$Y_{Critical}$ =**	**0.26**	**feet**
R_{hc} =	0.22 feet	**$V_{Critical}$ =**	**2.70**	**f.p.s.**
		$S_{Critical}$ =	**0.0219**	**ft. / ft.**
		F =	**1.32**	

Supercritical Flow / Steep Slope

SEDIMENT TRAP

CALCULATION

SEDIMENT TRAP DESIGN : STONEHOUSE SECTION VIB

ST- 1 DRAINED AREA = 1.06 acres WS / DS VOLUME REQD = 71 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	45	21	945	2	4 /	29	5	145	81	72
DRY STORAGE :	57	33	1881	3	2	45	21	945	105	103

WET STORAGE SURFACE / GRATE ELEV. : 101.00
BOTTOM ELEV. : 97.00
DRY STORAGE SURFACE ELEV. : 103.00
EMBANKMENT TOP ELEV. : 104.00

WEIR LENGTH REQD., L_{OUTLET} = 7 feet
H = 3 feet
W = 3 feet

ST- 2 DRAINED AREA = 0.7 acres WS / DS VOLUME REQD = 47 c.y.

	L_{TOP}	B_{TOP}	$AREA_{TOP}$	Z : 1	D_{EXC} / H_O	L_{BOTTOM}	B_{BOTTOM}	$AREA_{BTM}$	VOLUME PROVIDED trapezoid	VOLUME PROVIDED conic
WET STORAGE :	35	20	700	2	3 /	23	8	184	49	46
DRY STORAGE :	44	29	1276	3	1.5	35	20	700	55	54

WET STORAGE SURFACE / GRATE ELEV. : 93.00
BOTTOM ELEV. : 90.00
DRY STORAGE SURFACE ELEV. : 94.50
EMBANKMENT TOP ELEV. : 96.00

WEIR LENGTH REQD., L_{OUTLET} = 5 feet
H = 3 feet
W = 3 feet

PAVEMENT DESIGN

CALCULATIONS

LANGLEY and McDONALD, P.C.
201 Packets Court
Williamsburg, Virginia 23185

PAVEMENT DESIGN
For Primary Routes

PROJECT: STONHOUSE L.L.C.
LOCATION SECTION VI-B
STREET: CROSS BRANCH & BENT TREE LANE NUMBER OF LANES EACH WA 1 1
FROM STA 10+00 TO ST 26+00
DATE:

TRAFFIC ANALYSIS

1. Vehicles Per Day = 310 in 2005
2. % Single Unit Trucks = 5 %
3. % Tractor Trailers = 0 %
4. Design Period 20 Yrs.
5. % Growth per Year= 1 %
6. Growth Factor = 1.208109
7. Design YearTruck Volumes
   a. Single Unit Trucks = 19
   b. Tractor Trailers = 0
8. Convert traffic volumes to ESAL
   a. SU Trucks (x0.37)= 7
   b. Tractor Trailers (x1.28)= 0
   c. Total ESAL = 7
9. Directional Distribution = 4 each way
10. Lane Distribution = 4 per lane
11.Design Volume =
12. Thickness Index Required = 4.4745417 inches

SUBGRADE ANALYSIS

1. CBR Values = 10

2. Enter No. of Tests = 1
3. Average CBR = 10
4. Design CBR = 6.667
5. Soil Resiliency Factor = 3
6. Soil Support Value = 20.001

2. Design

Location	Material	Factor	Thickness	Index	Thickness	Index	Thickness	Index
			Alternate 'A'		Alternate 'B'		Alternate 'C'	
Surface	SM-2B or C	1.00	2.0	2.0		0.0		0.0
Binder	BM-3 or IM	1.00		0.0		0.0		0.0
Base	BM-3	1.00		0.0		0.0		0.0
	C.T.A.	1.00		0.0		0.0		0.0
Drainage Layer	Aggregate	0.40	8.0	3.2		0.0		0.0
Sub-base	Sel. Material	0.20		0.0		0.0		0.0
	Soil Cement	0.40		0.0		0.0		0.0
	Untreated Agg.	0.35	0.0	0.0		0.0		0.0
	CTA over Agg.or Soil Cement	0.80		0.0		0.0		0.0
	CTA over Subgrade	0.60	0.0	0.0		0.0		0.0
		TOTAL	10.0	5.2	0.0	0.0	0.0	0.0

LANGLEY and McDONALD, P.C.
201 Packets Court
Williamsburg, Virginia 23185

PAVEMENT DESIGN
For Primary Routes

PROJECT: STONHOUSE L.L.C.
LOCATION SECTION VI-B
STREET: MILL POND RUN III NUMBER OF LANES EACH WA 1 1
FROM STA 69+75 TO ST 84+00
DATE:

TRAFFIC ANALYSIS

1. Vehicles Per Day = 6600 in 2005
2. % Single Unit Trucks = 5 %
3. % Tractor Trailers = 0 %
4. Design Period 20 Yrs.
5. % Growth per Year= 1 %
6. Growth Factor = 1.208109
7. Design YearTruck Volumes
   a. Single Unit Trucks = 399
   b. Tractor Trailers = 0
8. Convert traffic volumes to ESAL
   a. SU Trucks (x0.37)= 151
   b. Tractor Trailers (x1.28)= 0
   c. Total ESAL = 151
9. Directional Distribution = 75 each way
10. Lane Distribution = 75 per lane
11.Design Volume =
12. Thickness Index Required = 8.7690518 inches

SUBGRADE ANALYSIS

1. CBR Values = 10

2. Enter No. of Tests = 1
3. Average CBR = 10
4. Design CBR = 6.667
5. Soil Resiliency Factor = 3
6. Soil Support Value = 20.001

2. Design

Location	Material	Factor	Thickness	Index	Thickness	Index	Thickness	Index
			Alternate 'A'		Alternate 'B'		Alternate 'C'	
Surface	SM-2B or C	1.00	1.5	1.5		0.0		0.0
Binder	BM-3 or IM	1.00		0.0		0.0		0.0
Base	BM-2	1.00	6.0	6.0		0.0		0.0
	C.T.A.	1.00		0.0		0.0		0.0
Drainage Layer	Aggregate	0.40	8.0	3.2		0.0		0.0
Sub-base	Sel. Material	0.20		0.0		0.0		0.0
	Soil Cement	0.40		0.0		0.0		0.0
	Untreated Agg.	0.35	0.0	0.0		0.0		0.0
	CTA over Agg.or Soil Cement	0.80		0.0		0.0		0.0
	CTA over Subgrade	0.60	0.0	0.0		0.0		0.0
		TOTAL	15.5	10.7	0.0	0.0	0.0	0.0

DEVELOPMENT MANAGEMENT

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

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planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678

INTEGRATED PEST MANAGEMENT
(757) 259-4116

September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

Re: Stonehouse Section 6B Hollow Oak, Phase 3
Dry Pond at Oak Branch Lane
County BMP ID Code: WC 041

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

Based on our review of information as submitted and a concurrent field observation as performed on August 29th 2001, the following items must be addressed for the basin at **HollowOak, Oak Branch Lane (WC 041)** prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated November 15th 2000 is **satisfactory**.

Record Drawing:

2. Add the detention basin outlet structure detail as provided on Sheet 16 of the approved plan set to the as-built (record) drawing for the facility. This detail, entitled "Stormwater Attentuation Basin H Section A-A", provides important information about the facility. Annotate the detail as necessary with field-obtained construction information.

3. Lot numbers 8, 9 and 10 as shown on the record drawing should reflect correct designation as Lots 49, 50 and 51, Section 6B, Hollow Oak. Add an address to one of the lots for information purposes, preferably to Lot 50 (3241 Oak Branch Lane).

4. Show the 20 ft. drainage and utility easement present between Lots 50 and 51and show the approximate location of the stone access road (west of the basin) on the record drawing.

5. Show the following additional information on the record drawing: riser size; label and show dimensions for the stilling basin west of the riser; and crest elevation/dimensions for the emergency spillway.

6. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-27-98 and BMP ID No. WC 041.

Construction-Related Items:

7. Seed and mulch bare soil areas present on the upstream embankment about 10 ft. east of the riser and on the west end of the dam embankment where top of dam meets the access road (20' x 40' area).

8. Clean and remove accumulated sediment (1-2 ft. depth) within the riprap stilling basin west of the riser. The outfall end of the primary storm drain system should be unobstructed by sediment and the forebay should be cleaned to meet original design plan capacity.

9. Clean and remove accumulated sediment, debris and vegetation in the vicinity of the upstream end of the low flow orifice. The low flow orifice for this structure is an 8-inch ductile iron pipe which extends out northward from the riser to an EW-11 endwall structure which serves as a trash rack protection device. Flow into the low flow orifice must not be obstructed. *(Note: At the time of the inspection, the mesh grate on the upstream end of the low flow orifice was considerably blocked with live vegetation, debris and sediment creating a shallow pool in the bottom of the facility about 1 foot deep. The basin is intended to serve as a dry detention facility.)*

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

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

cc: James H. Bennett (fax)

G:/SWMProg/Asbuilts/S27-98.wc041

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
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INTEGRATED PEST MANAGEMENT
(757) 259-4116

September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

Reinspect 4-14-03
Reinspect 7-7-03

Re: Stonehouse Section 6B Hollow Oak, Phase 3
Dry Pond at Oak Branch Lane
County BMP ID Code: WC 041

5-27-98

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

Based on our review of information as submitted and a concurrent field observation as performed on August 29th 2001, the following items must be addressed for the basin at **HollowOak, Oak Branch Lane (WC 041)** prior to release of the developer's surety instrument for the stormwater management/BMP facility:

Construction Certification:

1. The construction certification dated November 15th 2000 is **satisfactory**.

Record Drawing:

2. ~~Add the detention basin outlet structure detail as provided on Sheet 16 of the approved plan set to the as-built (record) drawing for the facility. This detail, entitled "Stormwater Attentuation Basin II Section A-A", provides important information about the facility. Annotate the detail as necessary with field obtained construction information.~~

2-24-03 OK 3. Lot numbers 8, 9 and 10 as shown on the record drawing should reflect correct designation as Lots 49, 50 and 51, Section 6B, Hollow Oak. Add an address to one of the lots for information purposes, preferably to Lot 50 (3241 Oak Branch Lane).

2-24-03 OK 4. Show the 20 ft. drainage and utility easement present between Lots 50 and 51and show the approximate location of the stone access road (west of the basin) on the record drawing.

2-24-03 OK 5. Show the following additional information on the record drawing: riser size; label and show dimensions for the stilling basin west of the riser; and crest elevation/dimensions for the emergency spillway.

2-24-03 OK 6. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-27-98 and BMP ID No. WC 041.

Construction-Related Items:

7. 4-14-03 OK Seed and mulch bare soil areas present on the upstream embankment about 10 ft. east of the riser and on the west end of the dam embankment where top of dam meets the access road (20' x 40' area).

8. OK 4-14-03 Clean and remove accumulated sediment (1-2 ft. depth) within the riprap stilling basin west of the riser. The outfall end of the primary storm drain system should be unobstructed by sediment and the forebay should be cleaned to meet original design plan capacity.

9. Clean and remove accumulated sediment, debris and vegetation in the vicinity of the upstream end of the low flow orifice. The low flow orifice for this structure is an 8-inch ductile iron pipe which extends out northward from the riser to an EW-11 endwall structure which serves as a trash rack protection device. Flow into the low flow orifice must not be obstructed. *(Note: At the time of the inspection, the mesh grate on the upstream end of the low flow orifice was considerably blocked with live vegetation, debris and sediment creating a shallow pool in the bottom of the facility about 1 foot deep. The basin is intended to serve as a dry detention facility.)* NEEDS CLEANED AGAIN. OK 7-7-03

Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

Scott J. Thomas

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

cc: James H. Bennett (fax)

G:/SWMProg/Asbuilts/S27-98.wc041

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September 10, 2001

LandMark Design Group
4029 Ironbound Road
Williamsburg, Va. 23188
Attn: Mr. Peter Farrell

Re: Stonehouse Section 6B Hollow Oak, Phase 3
Dry Pond at Oak Branch Lane
County BMP ID Code: WC 041

Dear Mr. Farrell:

The Environmental Division has reviewed record drawings and construction certifications as submitted to our office on November 16th 2000 for various stormwater management facilities located within Stonehouse. The record drawings and construction certifications provide as-built information for seven (7) stormwater management BMP extended dry detention facilities located within the community. For simplicity, you will receive separate correspondence relative to each of the facilities.

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Construction Certification:

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Record Drawing:

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3. Lot numbers 8, 9 and 10 as shown on the record drawing should reflect correct designation as Lots 49, 50 and 51, Section 6B, Hollow Oak. Add an address to one of the lots for information purposes, preferably to Lot 50 (3241 Oak Branch Lane).

4. Show the 20 ft. drainage and utility easement present between Lots 50 and 51and show the approximate location of the stone access road (west of the basin) on the record drawing.

5. Show the following additional information on the record drawing: riser size; label and show dimensions for the stilling basin west of the riser; and crest elevation/dimensions for the emergency spillway.

6. If possible, add the following County identifiers to the lower right hand corner of the record drawing: County Plan No. S-27-98 and BMP ID No. WC 041.

Construction-Related Items:

7. Seed and mulch bare soil areas present on the upstream embankment about 10 ft. east of the riser and on the west end of the dam embankment where top of dam meets the access road (20' x 40' area).

8. Clean and remove accumulated sediment (1-2 ft. depth) within the riprap stilling basin west of the riser. The outfall end of the primary storm drain system should be unobstructed by sediment and the forebay should be cleaned to meet original design plan capacity.

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Once this work is satisfactorily completed, contact our office appropriately. We can then proceed with final release of the surety on the project. One reproducible and one blue/black line set of the record drawings will be required once the above items are adequately addressed. Please contact me at 757-253-6639 or the assigned Environmental Division inspector, Gerry Lewis, at 757-253-6672 if you have any further comments or questions.

Sincerely,

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

cc: James H. Bennett (fax)

G:/SWMProg/Asbuilts/S27-98.wc041

Scott - 11/20
For Review
Daryl

LANDMARK DESIGN GROUP
TRANSMITTAL

NOV 2000
RECEIVED
ENVIRONMENTAL DIVISION

To: DARYL COOKE

Company: JAMES CITY CO. ENVIRONMENTAL

From: PETER FARRELL

Date: 11/16/00

Subject: STORMWATER POND RECORD DRAWINGS FOR STONEHOUSE

LMDG Job No.: 1990131-000.46

Attached please find:
- X Prints
- ☐ Plans
- ☐ Specifications
- ☐ Drawings
- ☐ Report
- ☐ Letter
- ☐

Transmitted as checked below:
- ☐ For your use
- ☐ As requested
- X For review and comment
- ☐ For approval
- ☐ Approved
- ☐

Copies	Date	Drawing No.	Description
2 EA. 12 TOTAL	11/16/00	11680-11686	RECORD DRAWINGS FOR VARIOUS STORMWATER PONDS AT STONEHOUSE
			WC 037, WC 038, WC 039, WC 040
			WC 041, WC 042, WC 043

Notes: LETTERS OF CERTIFICATION FROM DICK PHILLIPS, P.E. ARE BEING SENT TO YOU SEPERATELY

Copies	Enclosures
1. File:	☐
2.	☐
3.	☐
4.	☐
5.	☐

LandMark Design Group, Inc.

By: PF

Engineers • Planners • Surveyors • Landscape Architects • Environmental Consultants
4029 Ironbound Road, Suite 100, Williamsburg, VA 23188 (757) 253-2975 FAX: (757) 229-0049 lmdg@landmarkdgwb.com

Larry S. Barry, P.E., President
Norman H. Mason, L.S., Vice Pres.
Vaughn B. Rinner, C.L.A.
Kenneth A. Dierks
Robert P. Kerr, R.E.P., P.W.S.

LANDMARK DESIGN GROUP

Clayton E. Massey, P.E.
Charles R. Orsborne, L.S.
Stephen A. Romeo, L.S.
Mark W. Strickland, P.E.
A. Gary Webb, P.E.

NOV 2000
RECEIVED
ENVIRONMENTAL DIVISION

November 15, 2000

Mr. Darryl E. Cook
Environmental Director
James City County
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: Stonehouse Development Co., L.L.C.
BMP Basin Construction Certificate
Section VIB, Phase 3, Hollow Oak
J.C.C. Case No. S-27-98

Dear Darryl:

This is to confirm that periodic inspection was provided by me and persons under my supervision during the progress of construction of the subject storm water management basin. To the best of my knowledge and judgment, the structure has been constructed in accordance with the approved plans and specifications.

Should you have any questions or wish to discuss this further, please call.

Very truly yours,
The LandMark Design Group Inc.

COMMONWEALTH OF VIRGINIA
RICHARD S. PHILLIPS
No. 023631
PROFESSIONAL ENGINEER

Richard S. Phillips, P.E.
Senior Associate

RSP/cjp

Cc: Brandon Forrest
File 1990131-000.46

Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

5-27-98

Database Inventory No. (if known): WC 041

Name of Facility: Stonehouse Sec 6B Hollow OAK PHASE 3 BMP No.: 1 of 1 Date: 08/29/07

Location: NEAR (EAST) OF 3241 ~~HOLLOW OAK~~ OAK BRANCH LANE

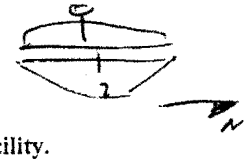
Name of Owner: Stonehouse Dev Co LLC

Inspector: SJ Thomas, JJ Buchite

Type of Facility: Dry Pond

Weather Conditions: Sunny, Mild, High TD's

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



O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory.
Routine - The item checked requires attention, but does not present an immediate threat to the function of the BMP.
Urgent - The item checked requires immediate attention to keep the BMP operational and prevent damage to the facility.

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

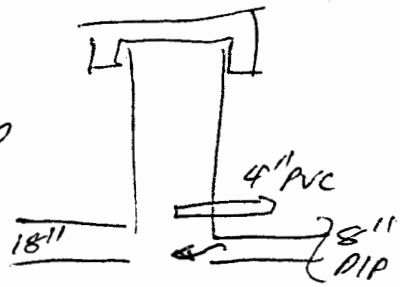
Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes: 10' TW; 2H:1V U/S AND D/S; SANITARY SEWER ACROSS EMB.				
Grass Height	✓	✓		2-4" GRASS ON 80% OF U/S AND D/S
Vegetation Condition	✓			Some weeds, SEDGES.
Tree Growth	✓			
Erosion	✓			Some slope RILL EROSION SOUTH SIDE OF DS EMBANK. NEGLIGIBLE
Trash & Debris	✓			
Seepage	✓			None Observed.
Fencing or Benches	✓			
Interior Landscaping/Planted Areas: ☐ None ☐ Constructed Wetland/Shallow Marsh ☑ Naturally Established Vegetation				
Vegetated Conditions	✓			Cattails in back (west)
Trash & Debris	✓			wet Pool Marsh x 2' deep
Floating Material	✓			
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other				
SERVICES SF LOT & ROAD OAK BRANCH LANE; SMALL POOL AREA				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools ☐ Permanent Pool (Retention Basin) ☑ Shallow Marsh (Detention Basin) ☐ None (Detention Basin)				
Shoreline Erosion	✓			About 2' depth
Algae	✓			
Trash & Debris	✓			
Sediment				Approx 1' deep.
Aesthetics				
Other				
Inflow Stuctures (Describe Locations): 15" RCP west of riser w/ OP rock forebay				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment		✓	✓	1' of depth @ outfall
Aesthetics				
Other				
Principal Flow Control Structure - Intake, Riser, etc. (Describe Location): 5' RCP RISER w/ 9" RCP CAP				
Condition of Structure	✓			Rep conc color. mit LID; LFOFF 6' KUFRSK
Corrosion	✓			(mesh screen)
Trash and Debris	✓	✓		Clean & remove trash, debris, veg &
Sediment	✓	✓		sed at Low Flow OFF GRATE.
Aesthetics	✓			Looks Good
Other	✓			8" DIP LOWFLOW, 4" HIGHER ORIF; END WALL LFOW GRAT
Principal Outlet Structure - Barrel, Conduit, etc. : 18" RCP w/ ES-1; OP AT END				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			
Sediment	✓			
Erosion	✓			
Other				
Emergency Spillway (Overflow): 9' wide, 3' deep CLASS I RIPRAP on GEOTEXTILE				
Vegetation	✓			Little; weed growth
Lining	✓			Some exposed geotextile.
Erosion	✓			Noted: North of ES. Monitor.
Trash & Debris	✓			
Other				

Facility Item	Good	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other				
Surrounding Perimeter Conditions:	MAINLY WOODED ALL SIDE; SAN. SEWER EASEMENT			
Land Uses	✓			
Vegetation	✓			NATURAL WOODS.
Trash & Debris	✓			
Aesthetics	✓			NATURAL Setting;
Access /Maintenance Roads or Paths				10' GRAVEL FROM OAK BRANCH
Other	✓			8/12" Ductile SAN Sewer on Piers, T.O.D.

Remarks:

- ▷ CLEAN & remove sed from 15" pipe inflow in rock forebay area. 1-2' deep full within forebay
- ▷ Ensure Low Flow meet design plan.
- ▷ At time of inspection 1-2' deep water pool. gate at Low Flow orif (about 6' west of riser) was partially clogged with veg, debris and sed. Clear & remove.
- ▷ Seed & mulch bare soil area about 10' NE of RISER on u/s EMB. AND Large area near access road / top south of riser (20 x 40 Area)
- ▷ checked stormdrain system one structure back clean & no obstructions.



Overall Environmental Division Internal Rating: 3

Signature: Scott A Thrume P.E.

Date: 08/29/01 11:10Am

Title: Civil Engineer ENV DIV

SWMProg\BMP\CoInspProg\DetRet.wpd

James City County, Virginia
Environmental Division

Stormwater Management/BMP Facilities
Record Drawing/Construction Certification
Review Tracking Form

County Plan No.: S-27-98
Project Name: Stonehouse Sec 6B Hollow Oak Ph 3
Stormwater Management Facility: Dry Pond Oak Branch Lane (east of) 3241 Oak Branch Lane
Phase: ☐ I ☑ II ☐ III

- ☑ Information Received. Date: 11/16/00 Landmark
- ☐ Administrative Check.
  - ☑ Record Drawing Date: 11/16/00 Landmark
  - ☑ Construction Certification Date: 10/15/00 Landmark
  - ☐ RD/CC Standard Forms (Required after Feb 1st 2001Only)
  - ☑ Insp/Maint Agreement Info: Yes, instrument # 990019067 Sept 9 '99
  - ☐ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  - ☐ Yes ☐ No Note/Sheet: Note #18 Sheet 18 of 23.
- ☑ Assign County BMP ID Code Code: WE041
- ☑ Log into Division's "As-Built" Tracking Log
- ☑ Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (label, copies of hydraulics, etc.).
- ☑ Inspector Check of RD/CC.
- ☑ Pre-Inspection Drawing Review (Quick look prior to field inspection).
- ☑ Final Inspection (FI) Date: 8/29/01
- ☑ Record Drawing (RD) Review Date: 9/10/01
- ☑ Construction Certification (CC) Review Date: 9/10/01
- ☑ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: Sept 10 '01
    - ☑ Record Drawing (RD)
    - ☑ Construction Certification (CC) Addressed 2-24-03
    - ☑ Construction-Related (CR)
    - ☐ Site Issues (SI)
    - ☐ Other :
- ☐ Second Submission: 4/14/03 RD ok; Reinspect 4-14-03; Reinspect 7-7-03
- ☐ Third Submission:

- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☑ Notify Darryl & Joan of acceptability using email (preferred) or verbal.
- ☑ Clean active file of all stormwater management related material and finish/establish "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.
- ☑ Add to JCC Hydrology & Hydraulic database (optional).

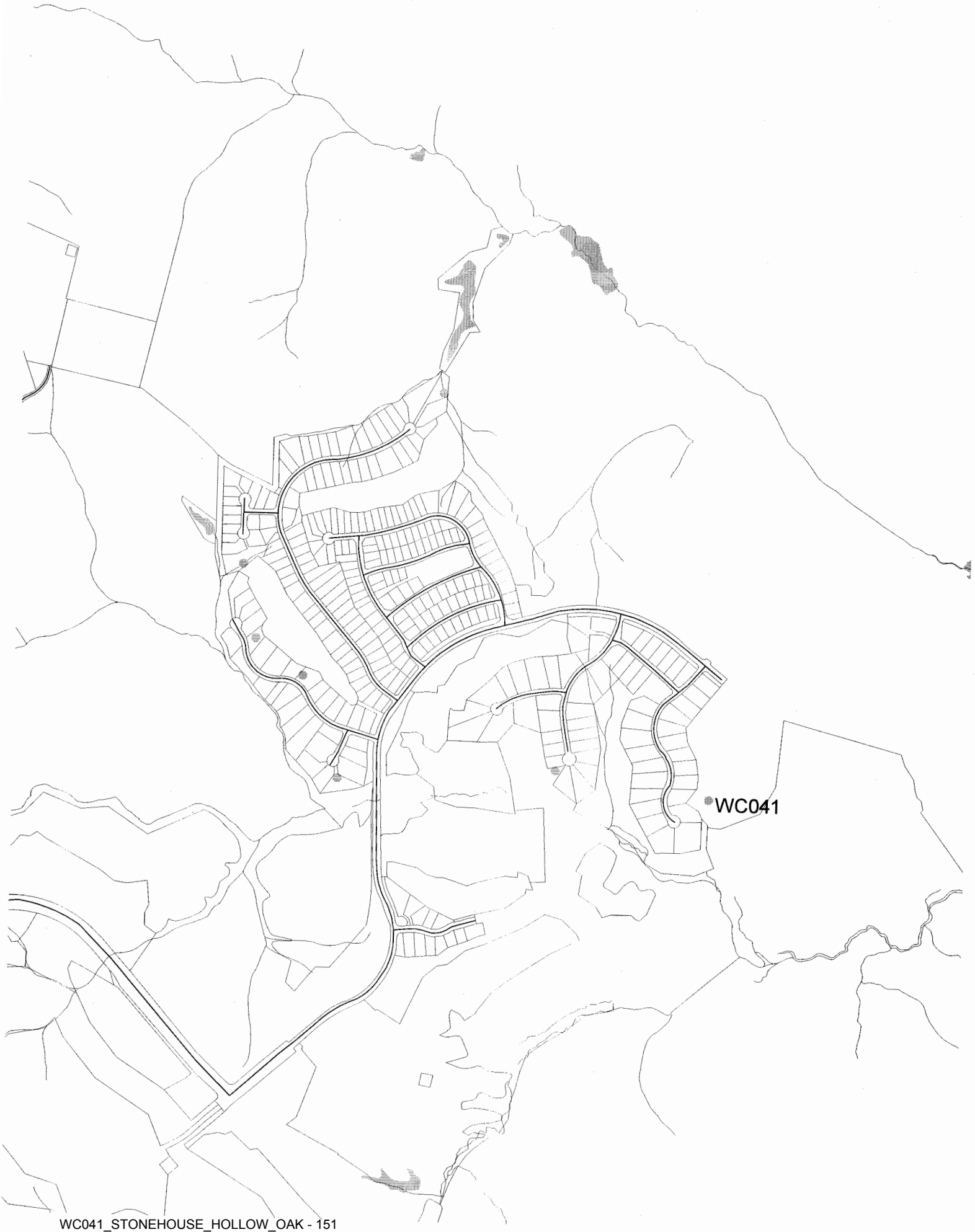
BMP Certification Information Acceptable

Plan Reviewer: Scott J. Thomas P.E. Date: 7/8/03

WATERSHED	WC	MAINTENANCE PLAN	No	CTRL STRUC DESC	RCP Riser
BMP ID NO	041	SITE AREA acre	32.41	CTRL STRUC SIZE inches	60
PLAN NO	S-27-98	LAND USE	Res Planned Unit D	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(04-04)(01-24)	old BMP TYP	Dry Pond	OTLT BARRL SIZE inch	18
PIN NO	0440100024	JCC BMP CODE			
CONSTRUCTION DATE	1/1/2000	POINT VALUE	4	EMERG SPILLWAY	Yes
PROJECT NAME	Stonehouse Sec 6B Ph 3 Hollow Oak			DESIGN HW ELEV	44.87
FACILITY LOCATION	Near 3241 Oak Branch Lane			PERM POOL ELE	None
CITY-STATE	Williamsburg, Va. 23011	SVC DRAIN AREA acres	27.5	2-YR OUTFLOW cfs	4.24
CURRENT OWNER	Stonehouse Development LLC			10-YR OUTFLOW cfs	23.33
OWNER ADDRESS	120 Tredegar St.			REC DRAWING	Yes
OWNER ADDRESS 2	6th Floor	SERVICE AREA DESCRI	SF Lots & Roadways and Future area.		
CITY-STATE-ZIP CODE	Richmond, Va. 23219	IMPERV AREA acres	6.87	CONSTR CERTI	Yes
OWNER PHONE		RECV STREAM	UT of Bird Swamp WC		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	8/29/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	1.27	INTERNAL RATING	3
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	Basin H. Sewer Line thru embankment.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	No		

Get Last BMP No

Return to Menu


WC041

From this point forward the file is not certified. The list below details the documents that have been added to the file, the person that added the documents and the data they were added.

Name	Content	Date
Jo Anna Ripley	Letter from Stonehouse regarding BMPs - WC025,WC040, WC041, WC071, WC073, WC079, WC080	5/30/2013

The Association at Stonehouse, Inc.

May 14, 2012

James City County
Stormwater Management Division
101 Mounts Bay Rd.
PO Box 8784
Williamsburg VA 23187-8784
Attn: Mr. Patrick T. Menichino

Subject: 2010 Stormwater Management Facility (BMP) Inspection Findings

References: (a) JCC/Stormwater Division, six letters addressing BMPs WC040, WC041, WC071, WC073, WC079, WC080, all dated 3 April 2012.
(b) JCC/Stormwater Division, six letters addressing BMPs WC025, WC041, WEC071, WC073, WC080, all dated February 2013.

Mr. Menichino,

Please let me take a few minutes to bring you up to date on the actions we have taken to close the referenced inspection findings. Your letters and previous visit to assist our Grounds and Maintenance Committee were most helpful and resulted in the following actions and long-term commitments:

- A self-inspection and inventory of all components for the 21 BMPs was completed in 2012;

- Our BMP maintenance contract has been completely rewritten and competed to address more thorough maintenance of all BMP components. The new contract was just awarded on 8 May 2013; and

- We are now in the process of updating our Reserve Study to include all BMP components for long-term planning and replacement.

Through volunteer and contracted actions, we have addressed all of the open inspection findings. Our volunteers have cut and stacked well over 1,200 small to medium sized trees that were growing on the dams and in the spillways. Other findings have been addressed through contract actions. I believe that we now have the best and most proactive BMP maintenance program of any community in James City County.

More specific information concerning our corrective actions for each of the open findings are as follows:

1. <u>BMP WC025, 9330 Fieldstone Parkway, 1/7/2010</u>. This inspection finding addressed a "vegetated filter strip" BMP on Fieldstone Parkway.

Conflict in Finding: BMP WC025 is located on Mill Pond Run and is a detention pond. Additionally, BMP WC081 is located at 9330 Fieldstone Parkway and we have been notified by the James City County Environmental Division that it will be extensively rebuilt when Land Bay 3 is developed. COORDINATE W/ ERP + SITE PLANS

2. BMP WC040, Hollow Oak Drive, 1/14/2010. This finding addressed erosion at the inlet discharge point.

Corrective Actions: The Association contracted major work with heavy machinery to correct this problem in 2011. Additionally, trees and wooded vegetation were cleared from the dam top and sides, spillway channel, and outflow basin areas in 2013 to bring this BMP within acceptable standards.

3. BMP WC041, Oak Branch Drive, 1/12/2010. This finding addressed problems at the inlet discharge pipe to include erosion, excessive sediment, and separation at the top of flared end-section of discharge pipe. It also addressed erosion at outlet discharge pipe and debris and trees around the outlet.

Corrective Actions: Routine quarterly maintenance cleared debris and unblocked outlet discharge points. In 2013, all trees and wooded vegetation were cut and removed from the dam top and sides, around the inlet discharge pipe, the overflow spillway, and the outlet settlement basin. On 8 May 2013, a contract work order was approved to remove sediment from the inlet discharge pipe settlement basin and to repair the separation of the flared outlet discharge pipe. These repairs are scheduled to be accomplished before the end of May 2013 to bring this BMP within acceptable standards.

4. BMP WC071, Longwood Drive, 1/11/2010. This finding addressed subsidence around the principal spillway.

Corrective Actions: On 7 May 2013, Mr. William Cain, the Chief Civil Engineer for James City County, inspected the principal spillway riser and advised that it could be repaired from the inside by application of an elastic polymer based grout to seal the minor opening at the top of the outlet discharge pipe where it joins to the vertical riser. He further advised that the eroded area behind the principal spillway riser can then be simply back-filled with a clay based soil. The Association will issue contract work orders to accomplish this work prior to 31 May 2013. Additional actions accomplished in 2013 included cutting and removing all trees and wooded vegetation from the dam tops and sides, overflow spillway channel, and around the outlet discharge settlement basin. The above actions will bring this BMP within acceptable standards by the end of May 2013.

5. BMP WC073, Windy Branch Drive, 1/11/2010. This finding addressed erosion and debris at the inlet discharge point, a blocked outlet structure and channel, removal of trash and debris, and removal of woody vegetation from embankments and spillways.

Corrective Actions: Routine quarterly maintenance has removed trash and debris. In 2013, all trees and wooded vegetation were cut and removed from the dam top and sides, emergency spillways, and inlet settlement basins. On 8 May 2013, a contract work order was approved to remove two large fallen trees that are blocking access to the

outflow discharge pipe and settlement basin at the base of the dam. This work is scheduled to be accomplished prior to the end of May 2013. These collective corrective actions will bring this BMP within acceptable standards by the end of May 2013.

6. BMP WC079, Splitwood Road, 1/8/2010. These findings included erosion at the inlet discharge point, excessive accumulation of sediment in the pond basin, reestablishment of ground cover in the basin bottom and side slopes, lack of routine maintenance, excessive debris, and areas of erosion or slippage on side slopes.

Corrective Actions: In 2011, the developer addressed and repaired the majority of these problems. In 2012, the Association contracted for additional repair of erosion based slippage of riprap on side slopes, rebuilding of inlet settlement basins, and reestablishment of ground cover on the slopes. In 2013, all wooded vegetation and trees were cut and removed from the dam top and sides, spillway channels, and around the outlet discharge settlement basin. These actions have brought this BMP to acceptable standards.

7. BMP WC080, E. Cork Road, 1/8/10. These findings included erosion along inlet pipes and flared end sections, realignment of flared end section of inlet adjacent to emergency spillway, and sink holes adjacent to the outlet pipe.

Corrective Actions: On 8 May 2013, a contract work order was approved to correct for erosion in and around all inlet discharge points, the riprap channel in the pond basin, and to correct for the erosion/sink holes at the outlet discharge point. Additionally, in 2013 all trees and wooded vegetation were cut and removed from the dam top and sides, emergency spillways, and outlet discharge areas. These actions will bring this BMP within acceptable standards by the end of May 2013.

Note: The James City County Environmental Division advises that the inlet discharge pipe adjacent to the emergency spillway is in accordance with their approved construction plans and there is no need for the Association to realign the flared end section.

From the Association's viewpoint, the above actions have addressed all open inspection findings necessary to bring these BMPs back to acceptable standards. Please accept our apologies for the extended time frame in responding to the inspection findings and let me know if you have questions or need additional information.

Sincerely,

Ellen Clark

Ellen Clark, CMCA, AMS, PCAM
Association Manager

9701 Mill Pond Run Toano VA 21368 757-566-0128 fax 757-566-1198

THIS IS NOT AN INVOICE

JAMES RIVER

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO:	THE ASSOCIATION AT STONEHOUSE, INC	QUOTE#:	
		DATE	4/8/2013
PROPERTY	STONEHOUSE (BMP WC 73) 9701 MILL POND ROAD TOANO, VA 28168	TERMS:	

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 73. REMOVAL OF FALLEN OAK TREE FROM THE BACKSIDE OF DAM TO CLEAR OUTFLOW. TREE WILL BE CUT BACK 8-10 FROM UP-ROOTED STUMP		
	LABOR / SITE PREP:	$600.00	$600.00
	ALL DEBRIS WILL BE CHIPPED ON SITE AND DISPURSED		

SUBTOTAL:	$600.00
VA TAX:	$0.00
TOTAL DUE	$600.00

APPROVED BY & DATE:

5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation. We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality. Transplanted material carries no warranty. Annual plantings carry no warranty.

**By executing this quote I hereby agree (1) to pay interest on any past due amount at a rate of 18 percent (18%) per annum (1.5 percent per month of the outstanding balance); and (2) to pay all costs and expenses, including court costs and reasonable attorneys' fees, incurred in the collection of any past due amount.

THIS IS NOT AN INVOICE

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO:	THE ASSOCIATION AT STONEHOUSE, INC	QUOTE#:	
		DATE	4/8/2013
PROPERTY	STONEHOUSE (BMP WC 80) 9701 MILL POND ROAD TOANO, VA 23168	TERMS:	

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 80. ADDTION OF CLASS A RIP RAP STONE AROUND RIGHT SIDE OF UPPER OUTFLOW PIPE AND ERODED AREAS ALONG THE MAIN DRIAN FLOW THROUGHOUT THE BOTTOM CENTER OF BASIN FLOOR.		
	MATERIALS:		
3	TONS OF CLASS A RIP-RAP (GREY)	$55.70 P/T	$167.10
	LABOR / SITE PREP: **(INCLUDES TRACT SKIDSTEER)**	$385.00	$385.00
		SUBTOTAL:	$552.10
		VA TAX:	$8.35
		TOTAL DUE	$560.45

APPROVED BY & DATE:

5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation.
We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality. Transplanted material carries no warranty. Annual plantings carry no warranty.
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THIS IS NOT AN INVOICE

JAMES RIVER
GROUNDS MANAGEMENT

JAMES RIVER GROUNDS MANAGEMENT, INC.
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188
(757) 566-1800 FAX (757) 566-4334

COPY

TO: THE ASSOCIATION AT STONEHOUSE, INC

QUOTE#:

DATE 4/8/2013

PROPERTY STONEHOUSE (BMP WC 41)
9701 MILL POND ROAD
TOANO, VA 23168

TERMS:

QTY/ HOURS	ITEM / DESCRIPTION	CHARGE	TOTAL CHARGE
	SCOPE OF WORK INCLUDES THE FOLLOWING TO BE COMPLETED AT BMP WC 41. REMOVAL OF SEDIMENT FROM OUTFLOW COLLECTION BASIN, THE SEDIMENT WILL DISPURSED ON THE DOWN SIDE OF DAM. EXCAVATING SECTION ABOVE OUTFLOW PIPE TO INSTALL GEO-TEXTILE FABRIC AND 57 STONE TO KEEP FUTURE SEDIMENT FROM ENTERING CRACK IN THE LAST CONNECTION.		
	LABOR / SITE PREP: (INCLUDES MINI EXCAVATOR)	$590.00	$590.00
	MATERIALS:		
1	**GEO TEXTILE FABRIC**	$15.00 P/P	$15.00
0.5	**YARD OF 57 STONE (1-2" GREY)**	$38.50 P/Y	$19.25
		SUBTOTAL:	$624.25
		VA TAX:	$1.71
		TOTAL DUE	$625.96

APPROVED BY & DATE: 5/13/13

AUTHORIZED SIGNATURE

THIS QUOTE IS VALID FOR 30 DAYS.

WARRANTY: We will replace one-time any plant 90 days from the date of installation.
We are not obligated to replace any plant that dies as a result of improper care, drought, freezing, vandalism, theft, poor drainage, inadequate irrigation, or neglect. Sod carries no warranty but is guaranteed to be of good quality.
Transplanted material carries no warranty. Annual plantings carry no warranty.
**By executing this quote I hereby agree (1) to pay interest on any past due amount at a rate of 18 percent (18%) per annum (1.5 percent per month of the outstanding balance); and (2) to pay all costs and expenses, including court costs and reasonable attorneys' fees, incurred in the collection of any past due amount.

STONEHOUSE - BMP COMPONENT LISTING - 11 JAN 2013

Stormwater Dry Retention Pond - BMPs		BMP Inlet Components							BMP Outlet Components			
BMP #	Earth Berm Dams	Inlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels	Stone Gabion Barrier	Concrete Drain Box	Metal Drain Grate	Concrete Spillway Riser	Riprap Spillway Overflow	Outlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels
WC019	Mill Pond Run & Leatherleaf Drive	2	2	0	0	1	1	1	0	1	0	0
WC025	Mill Pond Run & Old Grove Lane	1	0	1	0	1	1	1	0	1	0	0
WC037	Leatherleaf Drive, CA-3	2	1	0	0	1	1	1	0	1	1	0
WC038	Turning Leaf Drive, CA-4	1	0	0	0	1	1	1	0	1	1	0
WC039	Leatherleaf Drive, CA-2	1	0	0	0	1	1	1	0	1	1	1
WC040	Hollow Oak Drive, CA-7/CA-8	1	1	0	0	1	1	1	1	1	1	0
WC041	Oak Branch Lane, CA-44	1	1	0	0	1	1	1	1	1	1	0
WC069	Golf Course Maintenance Road	0	0	0	0	1	1	1	1	1	1	0
WC071	Longwood Drive, CA-50	2	2	0	0	1	0	1	1	1	1	1
WC072	Sapling Drive, CA-40	2	2	0	0	1	1	1	1	1	1	0
WC073	Windy Branch Drive, CA-36	1	1	1	0	1	1	1	1	1	1	1
WC074	Trailwood Lane, CA-48C	1	1	1	0	1	1	1	1	1	1	0
WC079	Splitwood Road, CA-50	2	2	3	0	1	1	1	1	1	1	0
WC080	E. Cork Road, CA-50	2	3	2	0	1	1	1	1	1	1	0
WC081	Fieldstone Parkway	1	1	0	1	0	0	1	1	1	1	0
BMP #	Concrete Wall Dams											
WC042	Mountain Berry Court	1	1	0	0	1	1	1	1	1	1	0
WC043	Ridge Drive, CA-51	0	0	0	0	0	0	0	1	2	1	0
BMP #	Timber Dams											
WC075	Morning Mist Lane, CA-48C	1	1	1	0	0	0	0	0	1	0	0
WC076	Sawyer Way, CA-46	1	1	0	0	0	0	0	0	1	0	0
WC077	Mill Pond Run, CA-45D	0	0	0	0	0	0	0	0	1	1	0
WC078	Yarding Way, CA-45C	1	1	1	0	0	0	0	0	1	0	0
	Totals:	24	21	10	1	15	14	16	12	22	16	3

Total Components:	
Earth Berm Dams	15
Concrete Wall Dams	2
Timber Dams	4
Concrete Spillway Risers	16
Concrete Drain Boxes	15
Metal Drain Grates	14
Concrete Discharge Pipes	34
PVC/Steel Discharge Pipes	12
Stone Gabion Barrier	1
Riprap Settlement Basins	37
Riprap Drainage Channels	13

James River

COPY

REQUEST FOR PROPOSALS
Stormwater Detention Pond (BMP) Maintenance

This Request for Proposals (RFP) is issued by The Association at Stonehouse, Inc., and is for professional maintenance service of specified Stormwater Detention Ponds (BMPs) located in the common areas owned and maintained by The Association at Stonehouse for its resident membership.

Response to this RFP is requested no later than 4-9-13. Replies to and questions about this RFP should be forwarded to:

The Association at Stonehouse, Inc.
9701 Mill Pond Run
Toano, VA 23168
Tel: 757- 566-0128
Fax: 757- 566-1198
Email: manager@mpstonehouse.com

Contractor bids are requested for the services specified in the following pages for the remainder of base calendar year January 1 - December 31, 2013, with two contract option years that may be exercised by the Association for calendar years 2014 and 2015.

Contractor bids shall clearly identify costs for each major area of work specified in Exhibit A.

This RFP includes the following information:

BMP Maintenance Contract ..... Page 2
Remuneration Schedule ..... Page 5
Exhibit A ..... Page 6
- Statement of Work ..... Page 6
- Scope of Work ..... Page 7
- BMP Management & Maintenance Requirements ..... Page 8
- Additional Services & Obligations ..... Page 9

Exhibit B, BMP Maintenance Component List ..... Page 10
Exhibit C, Site Plan Identifying all BMP Locations

STORMWATER DETENTION POND (BMP) MAINTENANCE CONTRACT
BY AND BETWEEN _____ *AND*
THE ASSOCIATION AT STONEHOUSE, INC.

This Stormwater Detention Pond (BMP) Maintenance Contract ("Agreement") dated 4-9-13, 2013 between JAMES RIVER GROUNDS MGMT. a Virginia Corporation (also referred to herein as "Contractor"), and The Association at Stonehouse, Inc. a Virginia non-stock corporation (also referred to herein as "Association") provides:

Recitals

Association desires to hire and engage Contractor to provide certain maintenance services in the Association's common areas as more particularly set forth in the attached specifications described as Exhibits A, B, and C which exhibits are expressly incorporated herein by reference and made a part hereof.

Terms and Conditions

Now, therefore, in consideration of the terms and conditions herein contained and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Contractor and Association agree as follows:

1. Contractor agrees to perform the services outlined in Exhibit A attached hereto. The relationship between Contractor and Association is that of an independent site support services contractor and not a partner, joint venture, employer, etc. Contractor shall be responsible for the selection and supervision of its employees, the payment of all their payroll taxes, insurance benefits and workman's compensation associated therewith. All employees and subcontractors hired by the Contractor shall be lawfully entitled to work in the United States. Contractor shall be fully liable for and hereby indemnifies and agrees to hold harmless the Association, its Board of Directors, agents and unit owners from any and all violations of federal immigration laws as the result of the immigration status of any of its subcontractors or employees.

2. Contractor shall be compensated for services rendered in accordance with the Remuneration Schedule and in accordance with the other provisions of this Agreement. Association reserves the right to offset against any payment made to Contractor any expenses incurred by the Association in performing any of the Contractor's obligations hereunder should Contractor fail to perform such obligations.

3. Association may direct Contractor to perform additional service for which Association shall bear all expenses. Contractor shall not incur any such additional expense without the prior written approval of the Association. The parties shall sign written agreements specifying the work and listing all costs of any additional services requested or required by the Association.

4. Contractor hereby indemnifies and holds Association, its directors, employees, agents or assigns harmless from all liability, damages, causes of actions, suit or judgment arising from injury to persons or property on the site, which may arise from a breach of this Agreement by Contractor or any negligent or intentional act of Contractor or its agents, subcontractors or employees. The provisions of this Section shall survive the expiration or termination of this Agreement.

5. Contractor's Insurance, Licenses and Permits. At the time the Contract is executed, the Contractor must produce proof of insurance coverage as follows:

a. Certificate of Liability Insurance providing:
   1) Property damage in an amount equal to or more than $500,000.00 minimum;
   2) Bodily injury with a limit of not less than $1 million for each person and for each accident;
   3) If motor vehicles are used, automobile (or truck) bodily injury with a limit of not less than $1 million for each accident and property damage liability with a limit of not less than $500,000.00 for each accident;
b. Workmen's Compensation insurance for all employees on Association property; and
c. The Association at Stonehouse and its managing agent shall be named as additional insured on all the above policies.
d. In addition to the above required insurance, the Contractor shall, at a minimum, maintain and provide proof of the following: State of Virginia Class A Contractors License, Business License, Business Pesticide License with Insurance, and Virginia Registered Commercial Applicators License.
e. Contractor shall maintain the insurance set forth and described above during the term of this agreement. Failure to maintain the required insurance, licenses and/or permits will result in immediate termination of the Contract.

6. Contractor shall be liable for damages to any person or property while performing duties as outlined in Exhibit A, attached hereto.

7. Contract oversight and point of contact for all Contractor inquiries is through the Association Manager for the Board of Directors (BOD). The Association Manager may appoint a Contract Officer Representative (COR) to perform inspection and acceptance of Contractor's work.

8. This Agreement may be terminated at the discretion of the Association upon thirty (30) days written notice to the Contractor without any further obligation or liability hereunder, except as otherwise expressly provided for herein. Upon such termination, Contractor shall only be entitled to receive such remuneration as it would otherwise be entitled to receive hereunder through the date of termination.

9. In addition to any other rights it might have under this Agreement, the Association may withhold any amounts due Contractor under this Agreement which the Association deems necessary to reimburse the Association for any costs or liabilities incurred by the Association as the result of the Contractor's actions or omissions, or failure to fairly perform any or all service obligations in a satisfactory manner. Appropriate adjustments to these withholdings shall be made when the exact amounts owed by the Contractor are determined by the Association Manager.

10. A waiver by the Association of any breach of any term or condition hereof shall not be deemed a waiver of any other, or subsequent breach. In the event of a breach of this Agreement by Contractor, the Association shall have the right to pursue its legal remedies and the right to terminate the Agreement. In the event either party to this Agreement is required to file a legal action due to a breach hereof, the costs of the action, including, but not limited to, reasonable attorney's fees as determined by the Court shall be paid to the prevailing party.

11. This Agreement shall be interpreted and enforced in accordance with the laws of the Commonwealth of Virginia. Both parties hereto expressly agree that if legal action is required to interpret or enforce this Agreement, said action shall be filed in the appropriate court in James City County, Virginia.

12. In the event that any part or provision of this Agreement shall be adjudged unlawful or unenforceable under Virginia law, any lawful intent of the provision and the remainder of this Agreement shall nonetheless survive and remain in full force and effect.

13. Contractor shall ensure all employees and subcontractors while on Association Common Areas are in uniform, i.e., hat and shirt clearly marked with company logo, and present a neat and orderly appearance at all times.

14. Contractor shall use due care, skill and diligence in the performance of its obligations under this Agreement. All services and work to be performed under this Agreement shall be performed in accordance with accepted standards of the profession or trade.

15. This Agreement may not be assigned by Contractor without the prior written approval of the Association, which approval can be withheld in the Association's sole discretion.

16. Each of the undersigned, by evidence of their signature thereto, affirms that it has the authority to bind their respective party to this Agreement.

17. Notices allowed or required pursuant to this Agreement shall be either hand delivered or sent by United States mail, postage paid, to the addresses of the parties set forth below:

a. To the Association:

The Association at Stonehouse, Inc.
9701 Mill Pond Run
Toano, Virginia 23168
Attn: Association Manager

b. To the Contractor:

JAMES RIVER GROUNDS MANAGEMENT
4614 ROCHAMBEAU DRIVE
WILLIAMSBURG, VA 23188

18. This Agreement may not be amended except by a written document signed by both parties.

19. The Parties hereto agree to keep the terms, conditions, and remuneration for this Agreement confidential.

20. This Agreement shall not automatically renew itself without the express written consent of the Association.

Remuneration Schedule

This contract is for the base year 2013, with two option years 2014 & 2015.

For the base contract period beginning MAY, 2013 and ending December 31, 2013, Association shall pay Contractor an annual fee of: $ 11,865.00 in equal monthly payments of $ 988.75.

For the option contract period beginning January 1, 2014 and ending December 31, 2014, Association shall pay Contractor an annual fee of: $ ~~15,816.00~~ 15,180.00 in equal monthly payments of $ ~~1318.00~~ 1265.00

For the option contract period beginning January 1, 2015 and ending December 31, 2015, Association shall pay Contractor an annual fee of: $ ~~15,816.00~~ 14,868 in equal monthly payments of $ ~~1318.00~~ 1239.00

Payment shall be due within thirty (30) days of receipt of written request for payment thereof, which payment shall be subject to the terms and conditions of the Agreement.

The Association shall provide Contractor written notice sixty (60) days prior to the end of the contract period if it wants to exercise the above option contract periods.

Contractor: _____ Date: 4-9-13

By: DALE C. OGNNELL
BRANCH MANAGER

The Association at Stonehouse, Inc. Date: 5-13-13

By: _____

1. STATEMENT OF WORK

This Statement of Work (SOW) is issued by the Association at Stonehouse, Inc. and is specifically for the maintenance of all stormwater detention ponds (BMPs) located in the common areas of the Mill Pond at Stonehouse community.

A. Background. The Association owns and is responsible for the maintenance of twenty-one (21) dry stormwater detention pond BMPs. Fifteen (15) of these BMPs are built around earth berm dams, two (2) BMPs have concrete block dams, and four (4) BMPs have timber dams. The structural components of each BMP are as delineated in Exhibit B. The locations of all BMPs are as delineated in Exhibit C.

B. Objectives.

1. The Association's objectives are to ensure all twenty-one (21) BMPs meet requirements of the Chesapeake Bay Preservation ordinances of the Code of James City County, Virginia; and
2. The objective of this contract is to provide routine quarterly maintenance for all components of each BMP, to include, but not be limited to, the pond basin, dam tops and sides, all inlet and outlet structures, drain boxes and grates, overflow spillways, riprap protected channels and settlement basins.

2. SCOPE OF WORK

A. General Contract Requirements. The Contractor shall:

1. Maintain the twenty-one (21) BMPs year round with maintenance accomplished on a quarterly basis;
2. Provide all materials, labor and equipment required to complete all aspects of BMP maintenance work at each maintenance visit;
3. Ensure a response time of 48 hours for any BMP problem related to this contract;
4. Provide the Association with consultation upon request to assist in resolving problems associated with BMPs at no additional cost;
5. Notify the Association Manager one week prior to all maintenance visits and when the work is done; and
6. Provide written quarterly status reports to the Association Manager of work accomplished during each maintenance visit. The reports shall include problems encountered, changes required, and/or additional work recommended.

B. Personnel. The Contractor shall:

1. Provide the personnel necessary to service and maintain the BMPs;
2. Provide dedicated on-site supervision of its employees during all visits to Stonehouse to clearly assign and review all work accomplished to ensure Association property is maintained in a consistent and professional manner;
3. Provide training for on-site employees to include maintenance and equipment operation procedures which are specific to the common areas, instructions and necessary certifications concerning BMP maintenance and chemical applications, and the professional conduct and courtesy expected of all employees at all times when working on Association property;

4. Ensure all work is performed in a manner that meets applicable OSHA regulations and is safe to its operators, residents, guests, and any pedestrian or vehicle in close proximity to operational machinery;
5. Ensure the On-site Supervisor meets with the Association Manager on a quarterly basis to tour the BMPs and/or discuss maintenance issues or problems encountered. Additional meetings may be called at any time by the Association Manager on an as-needed basis; and
6. In the performance of the work, the Contractor and its employees shall comply with all applicable state and county laws, statues, regulations and instructions issued that pertain to maintenance of stormwater detention ponds, to include all applicable environmental, safety, and security requirements issued by governmental officials, regulatory agencies, law enforcement officials, security guards, etc.

3. *BMP MANAGEMENT & MAINTENANCE REQUIREMENTS*

The Contractor shall provide maintenance services to meet the following specifications:

A. *Control of Vegetation and Wooded Growth.*

1. Grasses. The Contractor shall mow or use sting cutters (weed eaters) at each visit to maintain grasses and vegetation on dam tops and sides at an 8-inch height. Grasses and vegetation shall be removed from all riprap structures.
2. Pine Saplings. Pine saplings shall be cut and removed at each visit from all areas of the BMP, to include the pond basin, dam top and sides, and all riprap structures.
3. Other Wooded Vegetation. Trees and brush shall be cut and removed from the dam top and sides, overflow spillway channels, and all riprap structures.
4. Removal of Cut Wooded Vegetation. Cut pine saplings and other wooded vegetation shall be removed from Association property at each visit. Use of wood chippers to dispose of cut brush and trees shall require the Association Manager's approval on a case-by-case basis.

B. *Cleaning & Sediment Control.*

1. Pond Basins. Loose wooded debris, water-carried tree limbs and trunks, and trash shall be removed from all cleared areas within the pond basin.
2. Concrete Drain Boxes & Grates. Drain boxes and grates shall be cleaned out at each visit to remove all sediment and debris to ensure proper drainage.
3. Inlet and Outlet Settlement Basins. Sediment and debris shall be removed at each visit from all riprap settlement basins.
4. Riprap Channels and Overflow Spillways. Sediment and debris shall be cleared at each visit from all riprap channels and overflow spillways.
5. Sediment Disposal. Sediment removed during cleaning shall be discarded on the outlet side of the dam well away from the outlet and overflow spillway channels.

C. *Clean-Up and Trash Removal.*

1. Trash & Wooded Debris Removal. Trash shall be removed at each visit from all areas and structures within each BMP. Loose wooded debris, to include tree limbs and trunks, that are blocking drain grates, settlement basins, or drainage channels shall be removed at each visit.
2. Trash & Wooded Debris Disposal. Trash and wooded debris shall be removed from Association Property at each visit.

4. *ADDITIONAL SERVICES AND OBLIGATIONS*

A. Additional Work Cost Estimates. If required by the Association Manager, the Contractor shall provide cost estimates for additional work to bring the BMPs into acceptable norms, and for the following additional work:

1. Removal of trees that have fallen into BMPs.
2. Removal of illegal trash dumping (appliances, etc.).
3. Repair of damaged BMP components.
4. Clean-up of debris resulting from hurricanes, tropical storms, etc..
5. Removal of excessive sediment.

B. Property Damage. The Contractor shall assume liability for any property damaged by trimmers, edgers or other equipment operated by the Contractor - including, but not limited to, fences, irrigation systems, plants, shrubs, flowers, windows, signs, structures, lamp posts or automobiles. Damage to these items shall be the responsibility of the contractor to repair or replace. The Association Manager shall be the determining party as to responsibility for repairs/replacement.

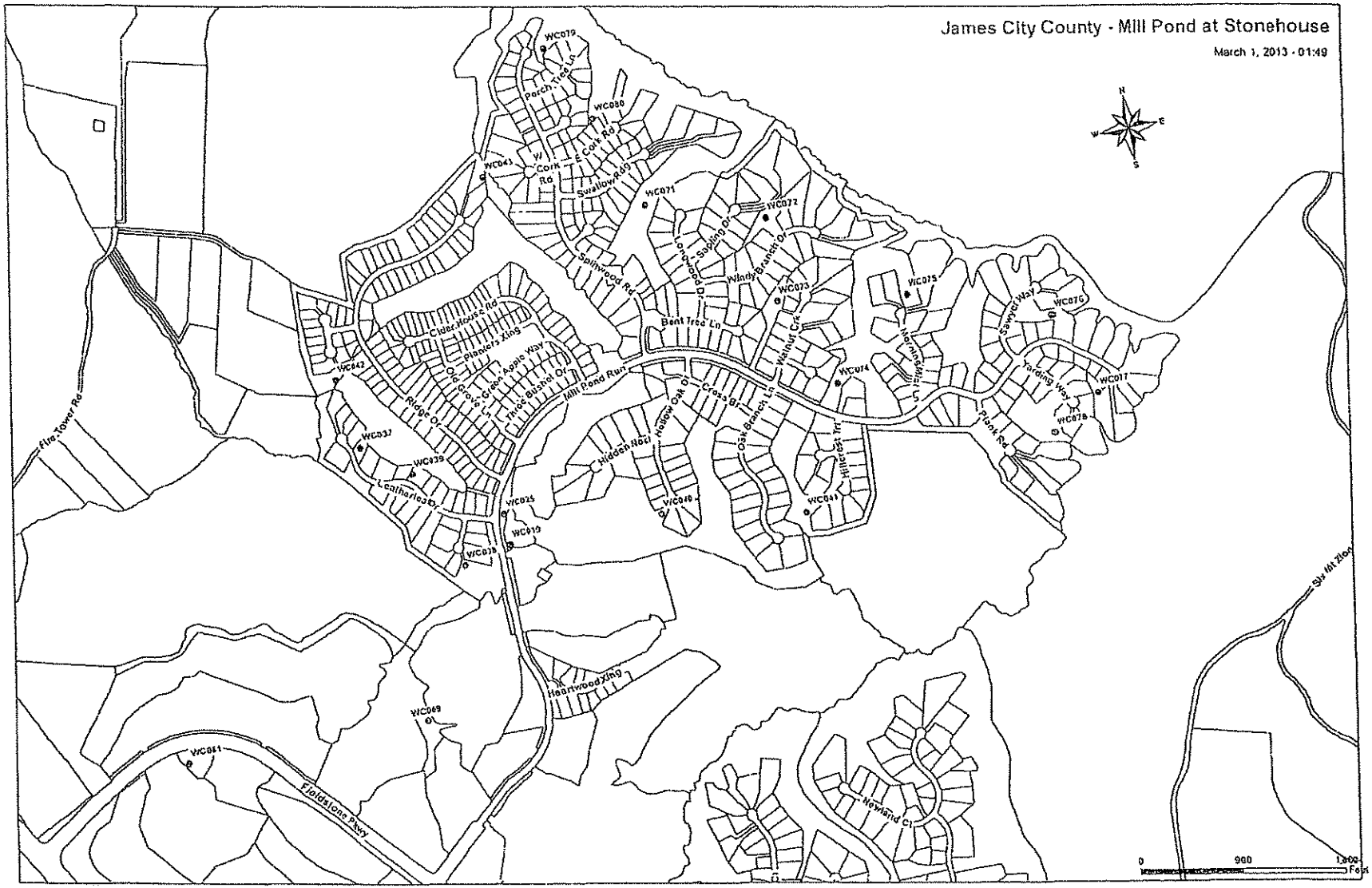
C. Contractor Product Compliance. The Contractor shall warranty that all BMP maintenance products, procedures, and methods of application used in performance of this Agreement comply in all respects with Federal, State, and local laws, ordinances, regulations, and manufacturer's instructions.

D. Complaints and Verbal Abuse. The Contractor shall ensure that all complaints made to the Contractor or its employees by community residents shall be handled professionally and diplomatically with instructions that the complaint should be addressed to the Association Manager. All incidents of verbal abuse by community residents toward Contractor or its employees shall immediately be reported to the Association Manager.

E. Threats to Health and Safety. The Contractor shall immediately report any condition that is or may be threatening to the health and/or safety of any person to the Association Manager.

STONEHOUSE - BMP COMPONENT LISTING - 11 JAN 2013

Stormwater Dry Retention Pond - BMPs		BMP Inlet Components							BMP Outlet Components			
BMP #	Earth Berm Dams	Inlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels	Stone Gabion Barrier	Concrete Drain Box	Metal Drain Grate	Concrete Spillway Riser	Riprap Spillway Overflow	Outlet Discharge Pipes	Riprap Settlement Basins	Riprap Drainage Channels
WC019	Mill Pond Run & Leatherleal Drive	2	2	0	0	1	1	1	0	1	0	0
WC025	Mill Pond Run & Old Grove Lane	1	0	1	0	1	1	1	0	1	0	0
WC037	Leatherleal Drive, CA-3	2	1	0	0	1	1	1	0	1	1	0
WC038	Turning Leaf Drive, CA-4	1	0	0	0	1	1	1	0	1	1	0
WC039	Leatherleaf Drive, CA-2	1	0	0	0	1	1	1	0	1	1	1
WC040	Hollow Oak Drive, CA-7/CA-8	1	1	0	0	1	1	1	1	1	1	0
WC041	Oak Branch Lane, CA-44	1	1	0	0	1	1	1	1	1	1	0
WC069	Golf Course Maintenance Road	0	0	0	0	1	1	1	1	1	1	0
WC071	Longwood Drive, CA-50	2	2	0	0	1	0	1	1	1	1	1
WC072	Sapling Drive, CA-40	2	2	0	0	1	1	1	1	1	1	0
WC073	Windy Branch Drive, CA-36	1	1	1	0	1	1	1	1	1	1	1
WC074	Trailwood Lane, CA-48C	1	1	1	0	1	1	1	1	1	1	0
WC079	Splitwood Road, CA-50	2	2	3	0	1	1	1	1	1	1	0
WC080	E. Cork Road, CA-50	2	3	2	0	1	1	1	1	1	1	0
WC081	Fieldstone Parkway	1	1	0	1	0	0	1	1	1	1	0
BMP #	Concrete Wall Dams											
WC042	Mountain Berry Court	1	1	0	0	1	1	1	1	1	1	0
WC043	Ridge Drive, CA-51	0	0	0	0	0	0	0	1	2	1	0
BMP #	Timber Dams											
WC075	Morning Mist Lane, CA-48C	1	1	1	0	0	0	0	0	1	0	0
WC076	Sawyer Way, CA-46	1	1	0	0	0	0	0	0	1	0	0
WC077	Mill Pond Run, CA-45D	0	0	0	0	0	0	0	0	1	1	0
WC078	Yarding Way, CA-45C	1	1	1	0	0	0	0	0	1	0	0
	Totals:	24	21	10	1	15	14	16	12	22	16	3
	Total Components:											
	Earth Berm Dams	15										
	Concrete Wall Dams	2										
	Timber Dams	4										
	Concrete Spillway Risers	16										
	Concrete Drain Boxes	15										
	Metal Drain Grates	14										
	Concrete Discharge Pipes	34										
	PVC/Steel Discharge Pipes	12										
	Stone Gabion Barrier	1										
	Riprap Settlement Basins	37										
	Riprap Drainage Channels	13										


James City County - Mill Pond at Stonehouse
March 1, 2013 - 01:49
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W
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S
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900
1,800
Feet
WC079
Porch Trail
WC080
Cork Rd
W Cork Rd
E Cork Rd
WC041
Swallow Rd
WC071
WC072
Sapling Dr
Longwood Dr
Spillwood Rd
Windy Branch Dr
WC073
WC075
Bent Tree Ln
Walnut Crk
Hornsbury Ln
Sawyer Way
WC076
Cidar Houses Rd
Planters Xing
Old Forge Green Apple Way
Thick Bushel Dr
Mill Pond Run
WC074
Trading Way
WC017
WC078
Flora Tower Rd
WC042
Ridge Dr
Creek Br
Hollow Oak Dr
Hidden Nest
Oak Branch Ln
Hillside Trl
Plank Rd
WC037
WC039
Leatherleaf Dr
WC040
WC041
WC025
WC019
WC038
Sly Mt Zion
Heartwood Xing
WC069
WC081
Fieldstone Pkwy
Newland Ct