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

BMP NUMBER: CC-010

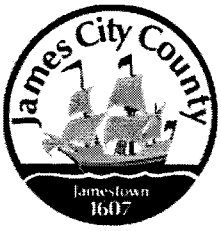
DATE VERIFIED: March 15, 2012

QUALITY ASSURANCE TECHNICIAN:

Leah Hardenbergh

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA



Stormwater Division

MEMORANDUM

DATE: March 11, 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: CC010

PIN: 5020100003

Subdivision, Tract, Business or Owner

Name (if known):

Newsom, Donald

Property Description:

Delightful Gardens Nursery

Site Address:

7242 Merrimac Trail

(For internal use only)

Box 11

Drawer: 6

Agreements: (in file as of scan date)

N

Book or Doc#:

Page:

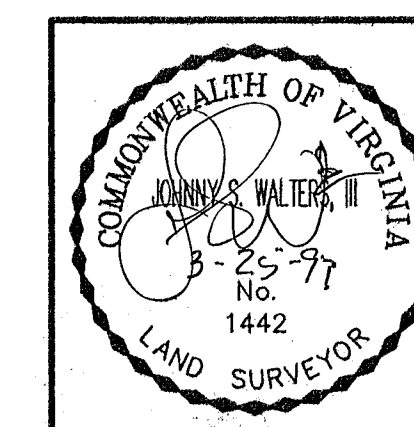
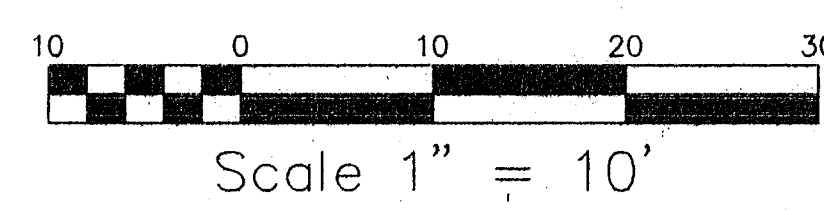
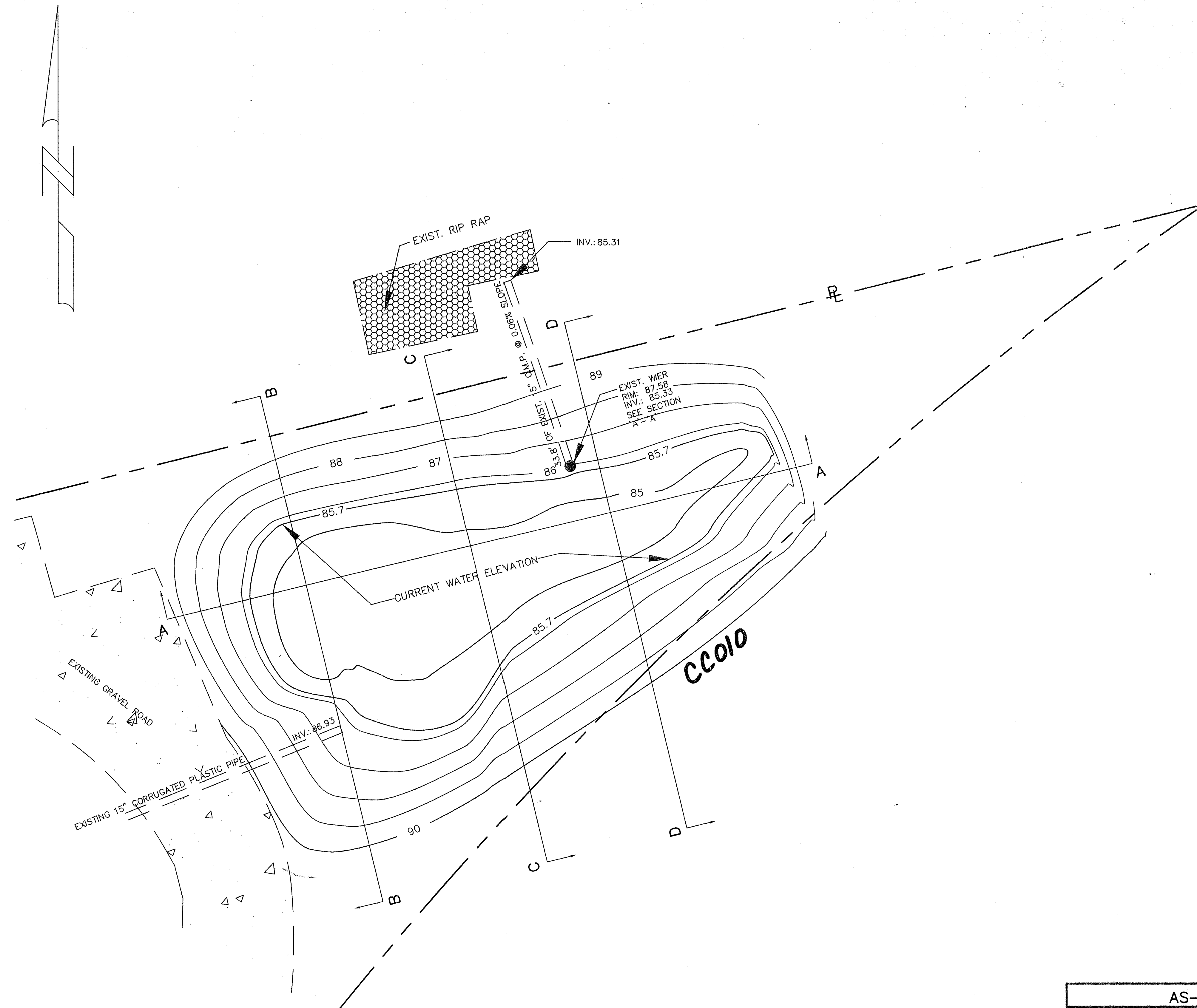
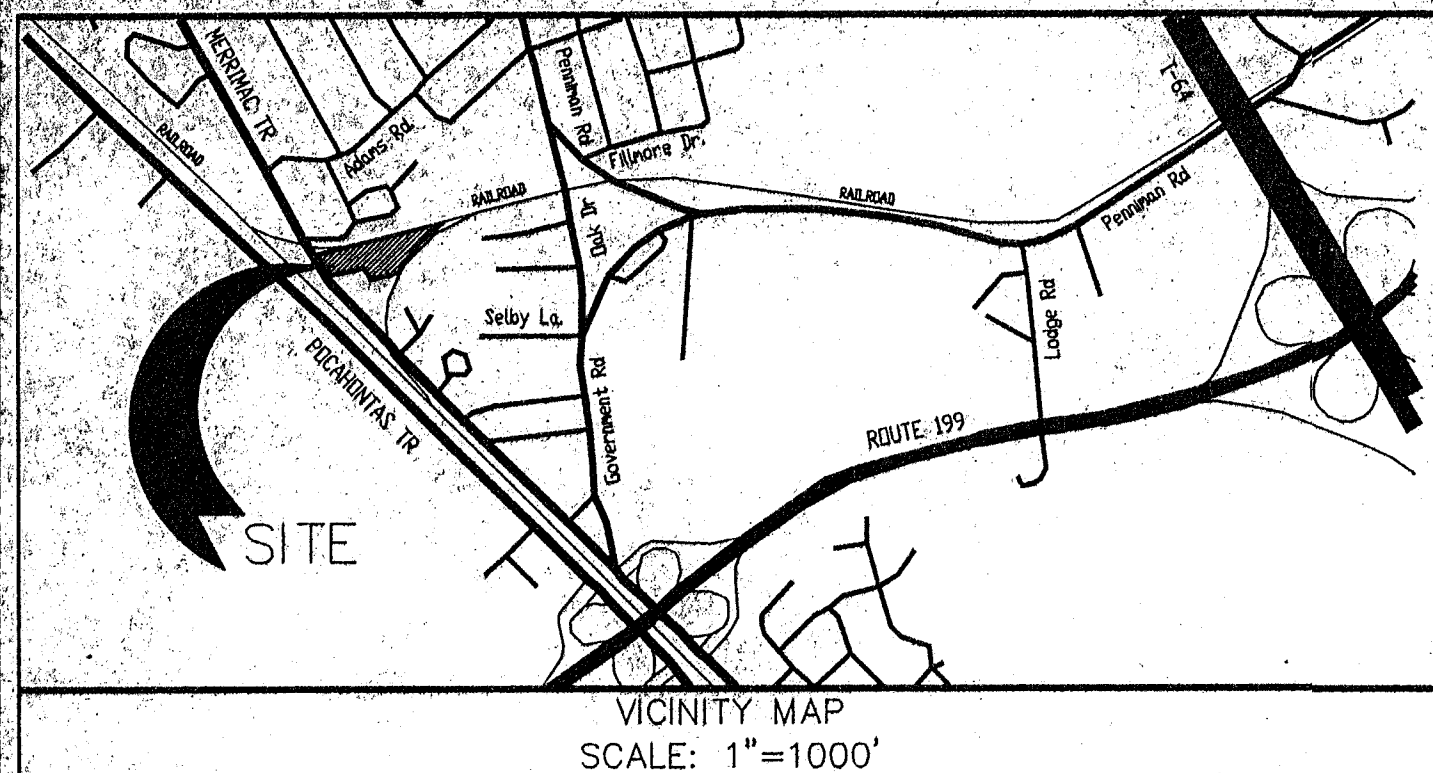
Comments

CC010

Contents for Stormwater Management Facilities As-built Files

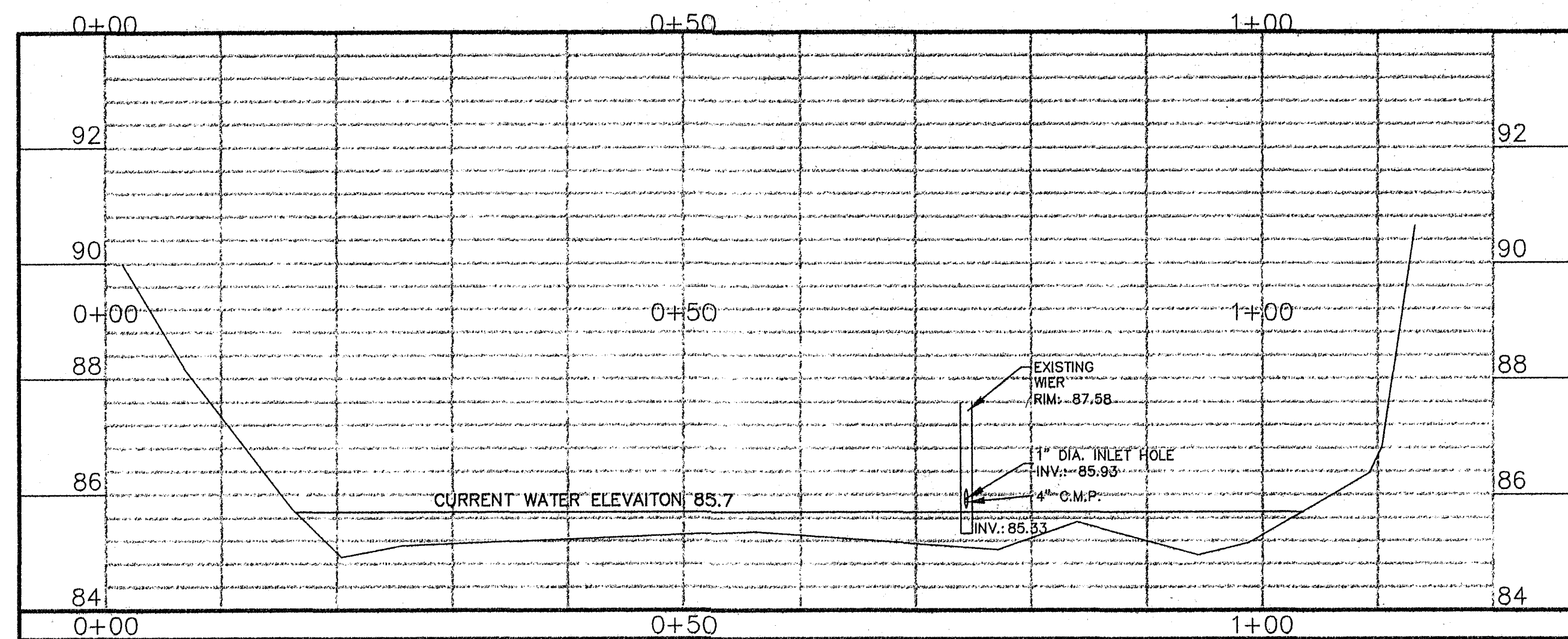
Each file is to contain:

- ① As-built plan
2. Completed construction certification
- ③ Construction Plan
- ④ Design Calculations
- ⑤ Watershed Map
6. Maintenance Agreement
7. Correspondence with owners
8. Inspection Records
9. Enforcement Actions

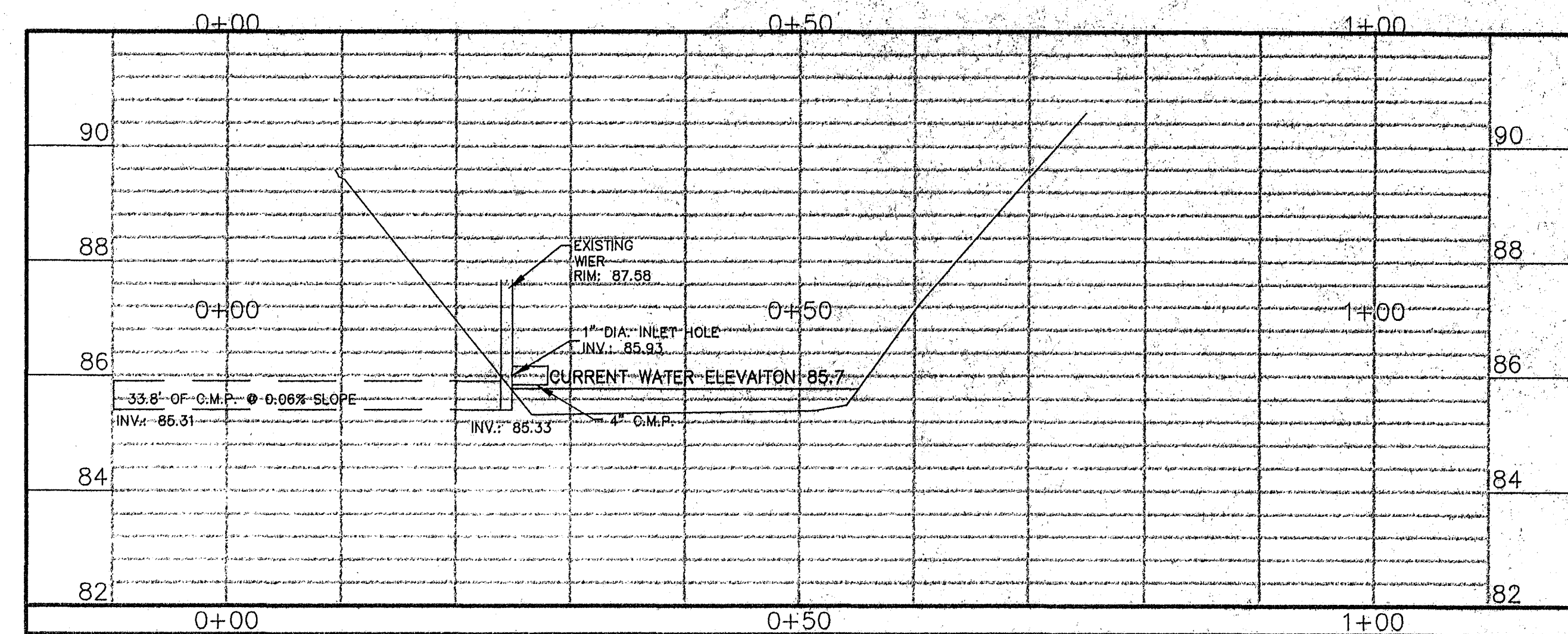


AS-BUILT SURVEY			
DELIGHTFUL GARDENS STORMWATER RETENTION POND			
WILLIAMSBURG, VIRGINIA			
WALTERS LAND SURVEYING, LTD.			
710 DENBIGH BOULEVARD, SUITE 4C			
NEWPORT NEWS, VIRGINIA 23602			
(P.O. BOX 1594 YORKTOWN, VIRGINIA 23692)			
PHONE: (757)898-1057		PHONE: (757)898-2862	
DATE: 2-25-97	JOB #: 970051	CLIENT: NEWSOM	SHEET 1 OF 2
SCALE: 1"=10'	F.B.: 126 Pg. 63	DRAWN BY: RDM	

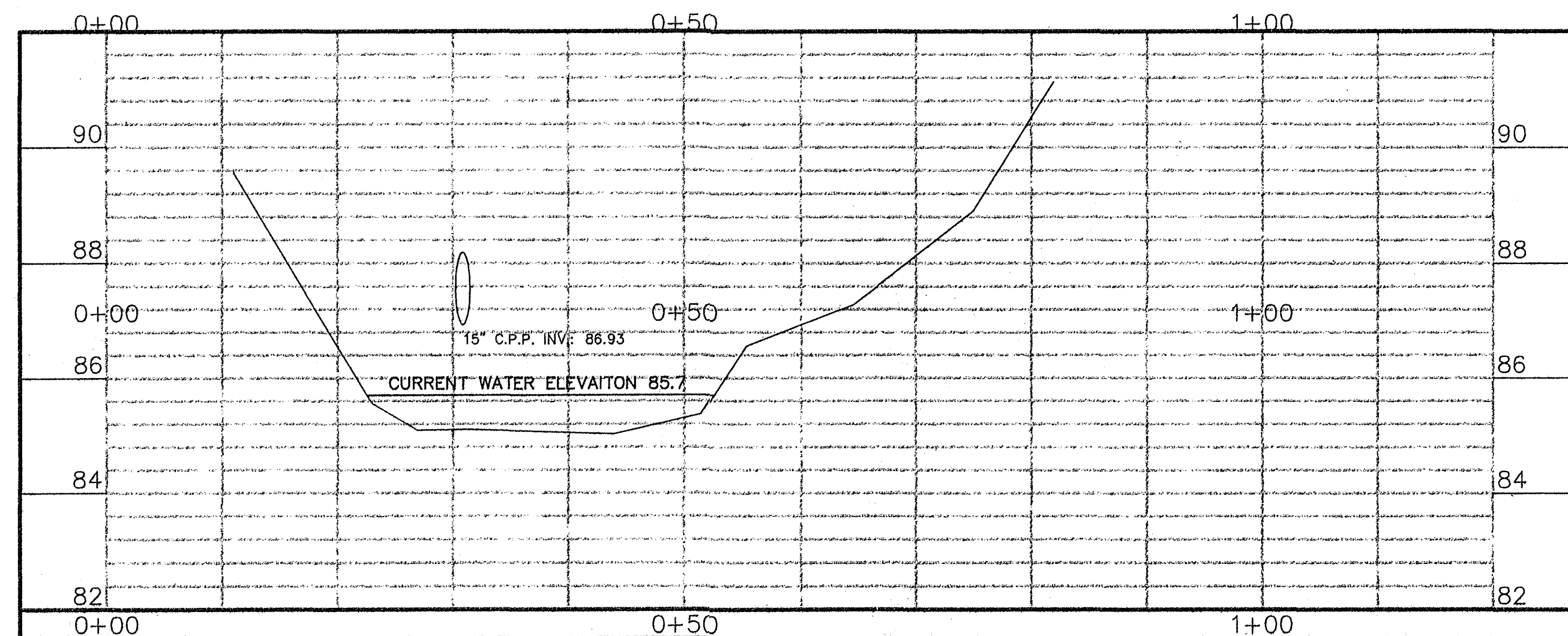
SECTION 'A'-'A'



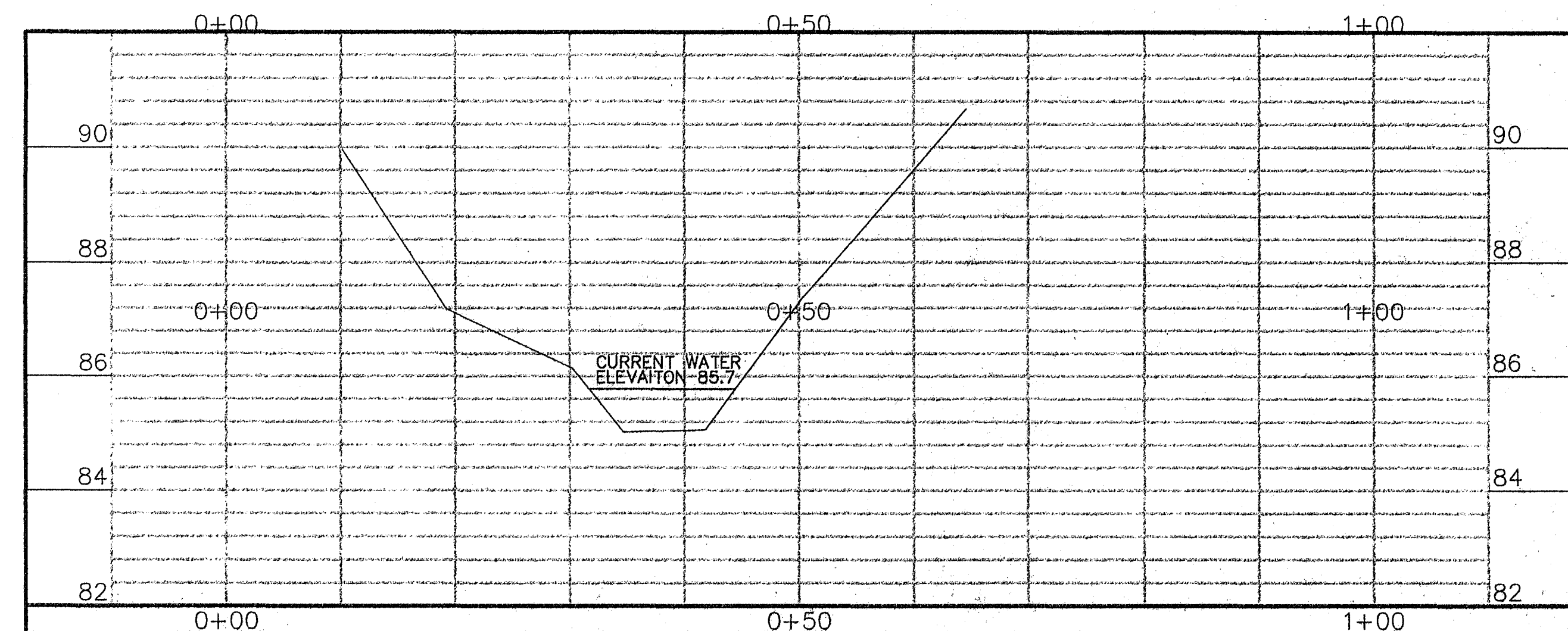
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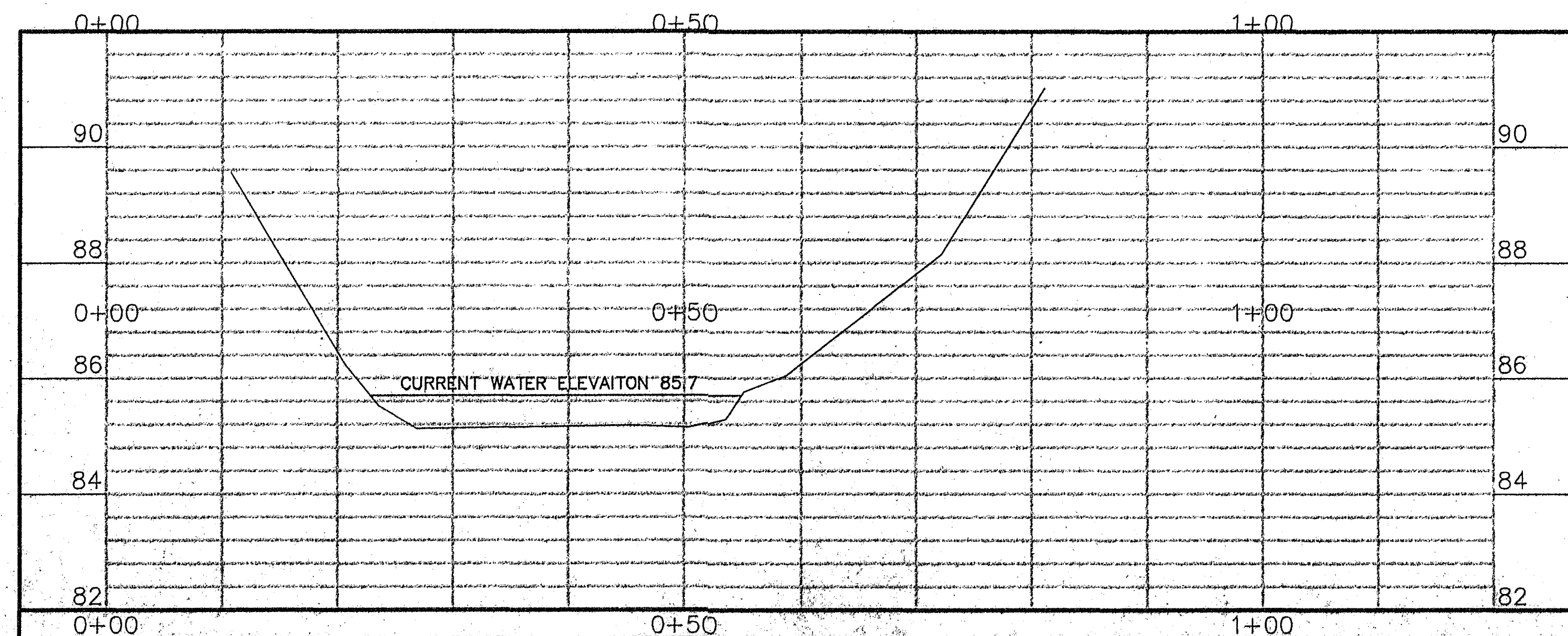
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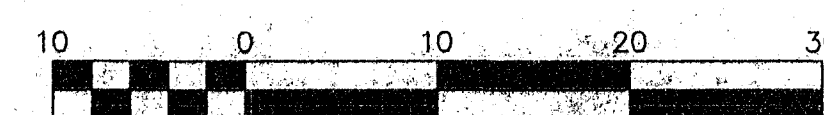
SECTION 'E'-'E'



SECTION 'C'-'C'



HORZ: 1"=10'
VERT: 1"=2'



Scale 1" = 10'

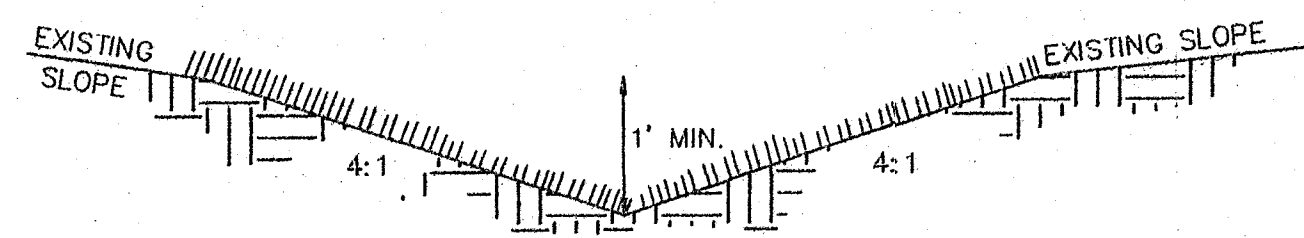
AS-BUILT SURVEY

DELIGHTFUL GARDENS
STORMWATER RETENTION POND

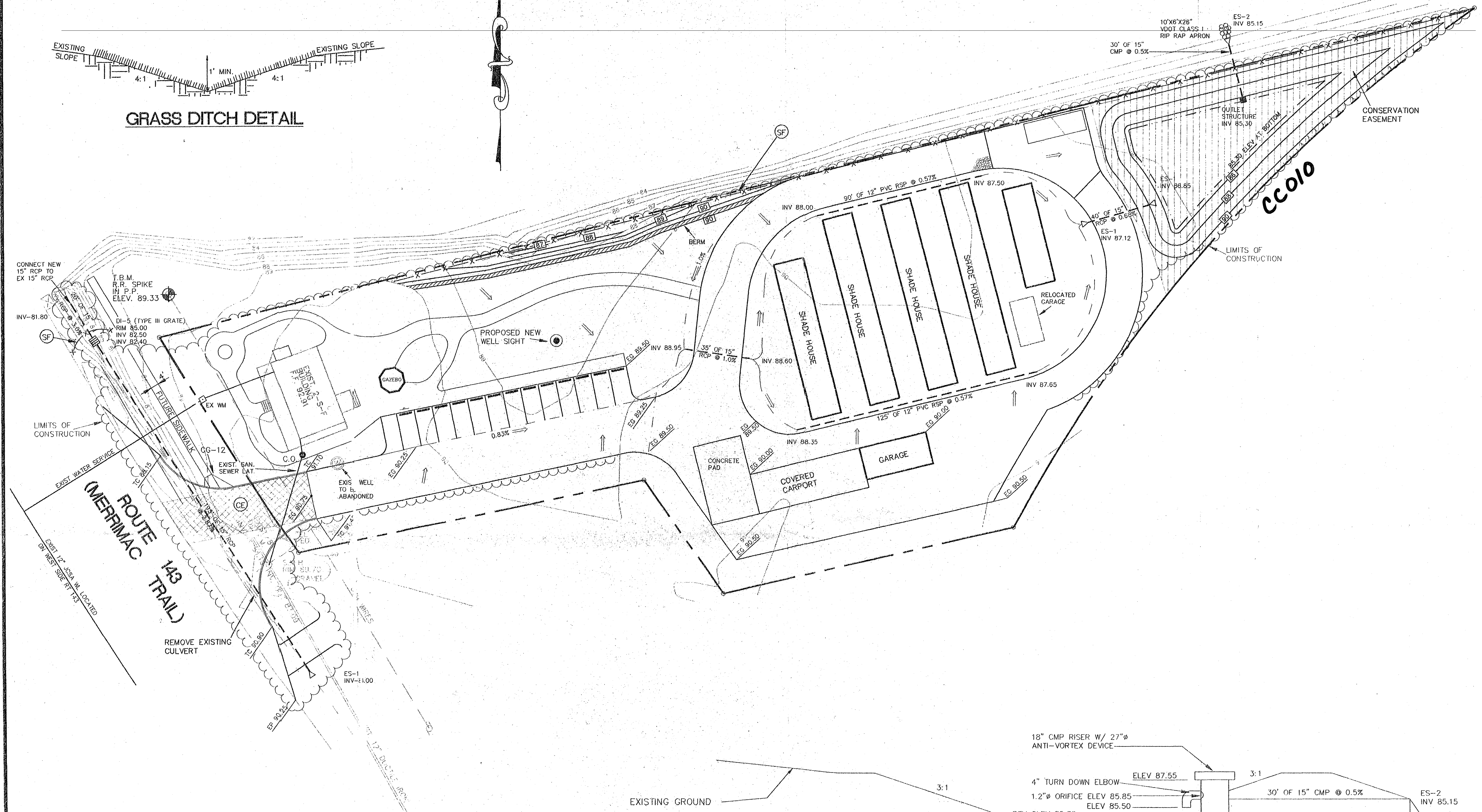
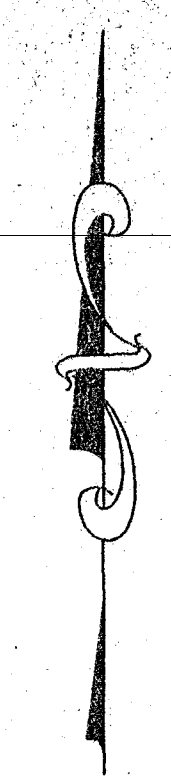
WILLIAMSBURG, VIRGINIA

WALTERS LAND SURVEYING, LTD.
710 DENBIGH BOULEVARD, SUITE 4C
NEWPORT NEWS, VIRGINIA 23602
(P.O. BOX 1594 YORKTOWN, VIRGINIA 23692)
PHONE: (757) 898-1057 PHONE: (757) 898-2862

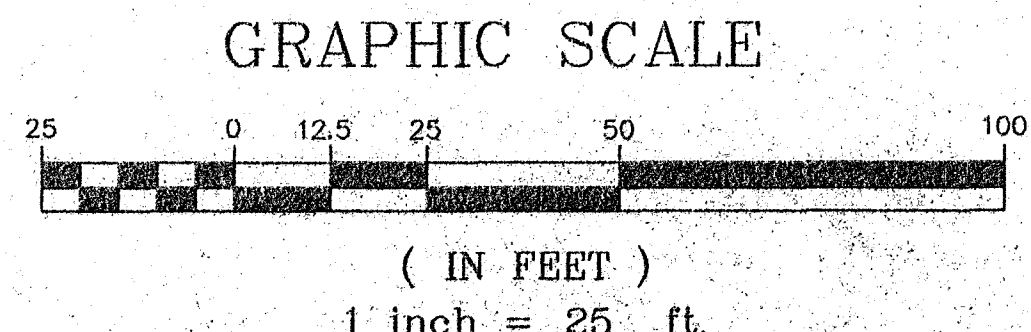
DATE: 2-28-97 JOB #: 970051 CLIENT: NEWSOM SHEET 2 OF 2
SCALE: 1"=10' F.B.: 126 Pq: 63 DRAWN BY: JRM



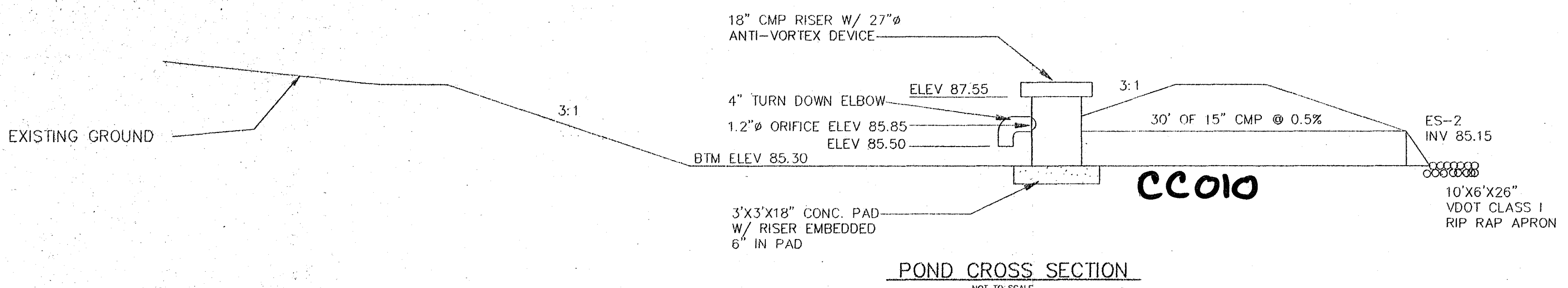
GRASS DITCH DETAIL



- NOTES:
- 1) FILTER FABRIC TO LINE ALL RIP RAP TO SOIL SURFACES.
 - 2) AREA OF CONSERVATION EASEMENT 0.20 ACRES.
 - 3) ANY OLD WELLS THAT ARE ON THE PROPERTY THAT WILL NOT BE USED MUST BE PROPERLY ABANDONED ACCORDING TO THE STATE PRIVATE WELL REGULATIONS.
 - 4) THE DETENTION POND IS TO BE USED AS A SEDIMENT BASIN DURING THE CONSTRUCTION PHASE BY PLUGGING THE 1.2" ORIFICE. ONCE CONSTRUCTION IS COMPLETE THE 1.2" ORIFICE SHALL BE UNPLUGGED SO THE POND CAN FUNCTION AS A DETENTION POND.
 - 5) SIDEWALK ON RTE. 143 SHALL BE BUILT WHERE THE TOP ELEVATIONS WILL NOT BE 1' MORE OR LESS THAN THE EXIST. EDGE OF PAVEMENT ELEVATION OF RTE. 143.



BEFORE DIGGING CALL "MISS UTILITY"
OF VIRGINIA AT 1 - 800 - 552 - 7001



POND CROSS SECTION
NOT TO SCALE

Rickmond Engineering, Inc.
Civil Engineering
Environmental Engineering
Land Surveying
1643-C Merrimac Trail
Richmond, VA 23188-4149
(804)229-1776 or 898-4149

Designed By: **RCS**
Drawn By: **MSF**
Scale: **1"=25'**
Date: **11/28/94**
Job No.: **94199**
File Name: **94199G**

COMMONWEALTH OF VIRGINIA
K. Jenkins II
Professional Engineer
No. 002292
6/2/95

No.	By	Rev	Per	County	Comments	Ltr	Dtd	App.	Date
1	KMJ				REV PER COUNTY COMMENTS LTR DTD		1/70/95		

DELIGHTFUL GARDENS
GRADING & UTILITY PLAN
JAMES CITY COUNTY
VIRGINIA

DELIGHTFUL GARDENS

Drainage & BMP Calculations

Rickmond Engineering, Inc.
1643 Merrimac Trail
Williamsburg, Virginia 23185

November 30, 1994

Project No. 94199

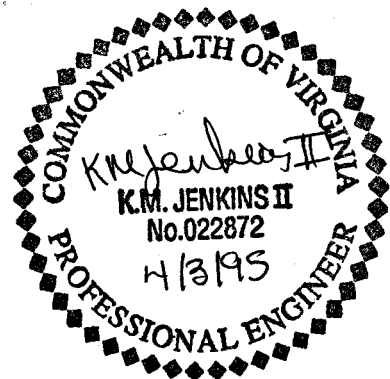


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Preface

The following drainage and BMP calculation pertain to Delightful Gardens located at 7242 Merrimac Trail in James City County, Virginia.

The site currently consists of a two-story building. After development the site will consist of a two-story building, shadehouses, driveway loop, parking spaces, sidewalks, and garages.

To comply with the state law to control the two-year and ten-year post-development storm to the pre-development rate and achieve the ten points required by the James City Count BMP point system, a detention pond is utilized.

The Detention Pond is designed as an Extended Dry Detention Pond (Design 4) and also controls the two and ten year storms. The pond also passes the 100 year storm through the outlet structure. The site only achieves 9.78 points with the BMP point system by a combination of a conservation easement and the detention pond. A request for exception to the 10-point criteria of the Chesapeake Bay Ordinance has been submitted.

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

JOB 94199
SHEET NO. 1 OF
CALCULATED BY KMT DATE 11/30/94
CHECKED BY DATE
SCALE

CULVERT DESIGN
Entrance Culvert

$c = .71$

$A = .62 \text{ Ac.}$

OVERLAND FLOW

$L = \text{—} \text{ ft.}$

$S = \text{—} \%$

$T_c = \text{—} \text{ min.}$

	$\frac{C}{A}$	$\frac{A}{CA}$	$\frac{CA}{CA}$
Road	.90	.44	.40
Grass	.20	.18	.04
		.62	.44

CHANNEL FLOW

$H = 8 \text{ ft.}$

$L = 800 \text{ ft.}$

$T_c = 8 \text{ min.}$

$T_c = 8 \text{ min}$

$i_{10} = 6.4 \text{ in/hr}$

$Q = CAi = (.71)(.62 \text{ Ac.})(6.4 \text{ in/hr})$

$Q = 2.82 \text{ cfs}$

$L = 193 \text{ ft.}$

$S = 2.87 \%$

$HW = 2.5 \text{ ft.}$

$Inv_1 = 88.0$

$Inv_0 = 82.50$

INLET CONTROL

$D = 15 \text{ in. or } 1.25 \text{ ft.}$

$HW/D = .79$

$HW = (1.25 \text{ ft.})(.79) = .99 \text{ ft.} < 2.5 \text{ ft.}$

RICKMOND ENGINEERING, INC.

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WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776
(804) 875-1785

JOB 94199
SHEET NO. 2 OF
CALCULATED BY KMJ DATE 11/30/94
CHECKED BY DATE
SCALE

OUTLET CONTROL

$$d_e = .67$$

$$h_o = \frac{d_e}{2} + D = \frac{.67}{2} + 1.25 = .96$$

$$S_o L = (.0287)(195) = 5.50$$

$$d_n = .43$$

$$\frac{d}{D} = .34$$

$$\frac{r}{D} = .1891$$

P.E. Manual Pg 3-43

$$R = .24$$

$$v = 7.48 \text{ fps}$$

$$H = \left(1 + k_e + \frac{29n^2 L}{R^{4/3}}\right) \frac{v^2}{2g} = 6.84$$

$$HW = H + h_o - S_o L = 2.30' < 2.50' \quad \underline{OK}$$

outlet Control Governs

RICKMOND ENGINEERING, INC.

1643 Merrimac Trail
WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776

JOB 94199

SHEET NO. 4

OF _____

CALCULATED BY KWJ

DATE 11/30/94

CHECKED BY _____ DATE _____

SCALE _____

DA- Onsite Culverts

$c = .61$
 $A = 1.53 \text{ Ac.}$

OVERLAND FLOW

$L = 140 \text{ ft.}$
 $S = 0.8 \%$
 $T_c = 13 \text{ min.}$

CHANNEL FLOW

$H = 2 \text{ ft.}$
 $L = 300 \text{ ft.}$
 $T_c = 4 \text{ min.}$

$T_c = 17 \text{ min.}$

$i_{10} = 4.85 \text{ in/hr}$

$$Q = CAi = (.61)(1.53 \text{ Ac.})(4.85 \text{ in/hr})(C_f 1.0)$$

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

$Q = 4.53 \text{ cfs}$

	<u>C</u>	<u>A</u>	<u>CA</u>
Grass/Trees	.20	.62	.12
Roof/Road	.90	.91	.82
		1.53	.94

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

JOB 94199
SHEET NO. 5 OF
CALCULATED BY KWT DATE 11/30/94
CHECKED BY DATE
SCALE

CULVERT DESIGN

Onsite Culverts
"Worst Case"
15" RCP

$c = \underline{.61}$

$A = \underline{1.53}$ Ac.

OVERLAND FLOW

$L = \underline{140}$ ft.

$S = \underline{0.8}$ %

$T_c = \underline{13}$ min.

CHANNEL FLOW

$H = \underline{2}$ ft.

$L = \underline{300}$ ft.

$T_c = \underline{4}$ min.

$T_c = \underline{17}$ min

$i_{10} = \underline{4.85}$ in/hr

$Q = CAi = (\underline{.61})(\underline{1.53} \text{ Ac.})(\underline{4.85} \text{ in/hr})$

$Q = \underline{4.53}$ cfs

$Inv_1 = \underline{87.12}$

$L = \underline{40}$ ft.

$Inv_0 = \underline{86.89}$

$S = \underline{0.68}$ %

$HW = \underline{2.25}$ ft.

INLET CONTROL

$D = \underline{15}$ in. or $\underline{1.25}$ ft.

$HW/D = \underline{1.07}$

$HW = (\underline{1.25} \text{ ft.})(\underline{1.07}) = \underline{1.34} \text{ ft.} < \underline{2.25} \text{ ft.}$

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(804) 875-1785

JOB 94199
SHEET NO. 6 OF _____
CALCULATED BY KMS DATE 11/30/94
CHECKED BY _____ DATE _____
SCALE _____

OUTLET CONTROL

$$d_c = .86$$

$$h_o = \frac{d_o}{2} + \frac{D}{2} = \frac{.86}{2} + \frac{1.25}{2} = 1.06$$

$$S_o L = (.0068)(.40) = .27$$

$$d_n = .89$$

$$\frac{d}{D} = .71$$

$$\frac{r}{D} = .2973$$

P.E. Manual Pg 3-43

$$R = .37$$

$$v = 4.87 \text{ fps}$$

$$H = \left(1 + k_e + \frac{20n^2 L}{R^{4/3}}\right) \frac{v^2}{2g} = .82$$

$$HW = H + h_o - S_o L = 1.61 \times 2.25'$$

Outlet Control Governs

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

JOB 94199
SHEET NO. 7 OF _____
CALCULATED BY KMJ DATE 11/30/94
CHECKED BY _____ DATE _____
SCALE _____

CULVERT DESIGN
Onsite Culverts
"Worst Case"
12" RCP

$c = .56$
 $A = .93$ Ac.
OVERLAND FLOW

$L = 140$ ft.
 $S = 0.8\%$
 $T_c = 13$ min.

	$\frac{C}{A}$	$\frac{A}{CA}$
Gross/Trees	.20	.40
Roof/Road	.90	.53
		<u>.93</u>
		<u>.08</u>
		<u>.48</u>
		<u>.52</u>

CHANNEL FLOW

$H = .5$ ft.
 $L = 80$ ft.
 $T_c = \text{---}$ min.

$T_c = 13$ min

$i_{10} = 5.05$ in/hr

$Q = CAi = (.56)(.93 \text{ Ac.})(5.05 \text{ in/hr})$

$Q = 2.63$ cfs

$Inv_1 = 88.35$

$L = 125$ ft.

$Inv_0 = 87.65$

$S = 0.57\%$

$HW = 1.5$ ft.

INLET CONTROL

$D = 12$ in. or 1.0 ft.

$HW/D = 1.04$

$HW = (1.0 \text{ ft.})(1.04) = 1.04 \text{ ft.} < 1.50 \text{ ft.}$

RICKMOND ENGINEERING, INC.

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WILLIAMSBURG, VIRGINIA 23185
(804) 229-1776
(804) 875-1785

JOB 94199
SHEET NO. 8 OF
CALCULATED BY KMT DATE 11/30/94
CHECKED BY DATE
SCALE

OUTLET CONTROL

$$d_e = .70$$

$$h_o = \frac{d_e}{2} + D = \frac{.70}{2} + 1.0 = .85$$

$$S_o L = (.0057)(125) = .70$$

$$d_n = .80$$

$$\frac{d}{D} = \frac{.80}{1.0}$$

$$\frac{r}{D} = \frac{.3042}{1.0}$$

P.E. Manual Pg 3-43

$$R = .30$$

$$v = 3.90 \text{ fps}$$

$$H = \left(1 + k_e + \frac{29n^2 L}{R^{4/3}}\right) \frac{v^2}{2g} = 1.07$$

$$HW = H + h_o - S_o L = 1.22' < 1.5'$$

Outlet Control Governs

Worksheet 2: Runoff curve number and runoff

Project Delightful Gardens By KWS Date 11/30/94
 Location James City County, Va. Checked _____ Date _____
 Circle one: Present Developed _____

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area ☒ acres ☐ mi ² ☐ %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
slagle C	Grass / Trees Good Condition	74			1.78	
Totals =					1.78	

^{1/} Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = _____; Use CN = 74

2. Runoff

Frequency yr
 Rainfall, P (24-hour) in
 Runoff, Q in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	50
3.5	6.0	7.0
1.2	3.2	4.0

Worksheet 3: Time of concentration (T_c) or travel time (T_t)

Project Delightful Gardens By KWS Date 11/30/94

Location James City County, Va Checked _____ Date _____

Circle one: Present Developed _____

Circle one: T_c T_c through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (table 3-1)
2. Manning's roughness coeff., n (table 3-1) ..
3. Flow length, L (total $L \leq 300$ ft) ft
4. Two-yr 24-hr rainfall, P_2 in
5. Land slope, s ft/ft
6. $T_c = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_c hr

Shrub Grass	
.15	
230	
3.5	
0.005	
.53	+

=

Shallow concentrated flow

Segment ID

7. Surface description (paved or unpaved)
8. Flow length, L ft
9. Watercourse slope, s ft/ft
10. Average velocity, V (figure 3-1) ft/s
11. $T_c = \frac{L}{3600 V}$ Compute T_c hr

	+

=

Channel flow

Segment ID

12. Cross sectional flow area, a ft²
13. Wetted perimeter, p_w ft
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft
15. Channel slope, s ft/ft
16. Manning's roughness coeff., n
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft/s
18. Flow length, L ft
19. $T_c = \frac{L}{3600 V}$ Compute T_c hr
20. Watershed or subarea T_c or T_t (add T_c in steps 6, 11, and 19) hr

	+

= .53

Worksheet 5a: Basic watershed data

Project Delightful Gardens Location James City County, Va. By RMS Date 11/30/94

Circle one: Present Developed _____ Frequency (yr) _____ Checked _____ Date _____

Subarea name	Drainage area A_m (mi ²)	Time of concentration T_c (hr)	Travel time through subarea T_t (hr)	Downstream subarea names	Travel time summation to outlet ΣT_t (hr)	24-hr Rain-fall P (in)	Runoff curve number CN	Run-off Q (in)	$A_m Q$ (mi ² -in)	Initial abstraction I_a (in)	I_a/P
2	.0028	.53				3.5	74	1.2	.0033	.703	.20
10	.0028	.53				6.0	74	3.2	.0090	.703	.12
50	.0028	.53				7.0	74	4.0	.0112	.703	.10

↑↑↑↑↑↑↑↑↑↑
From worksheet 3

↑↑↑↑↑↑↑↑↑↑
From worksheet 2

↑↑↑↑
From table 5-1

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 5b: Tabular hydrograph discharge summary

Project Delightful Gardens Location James City County, Va By KMS Date 11/30/94

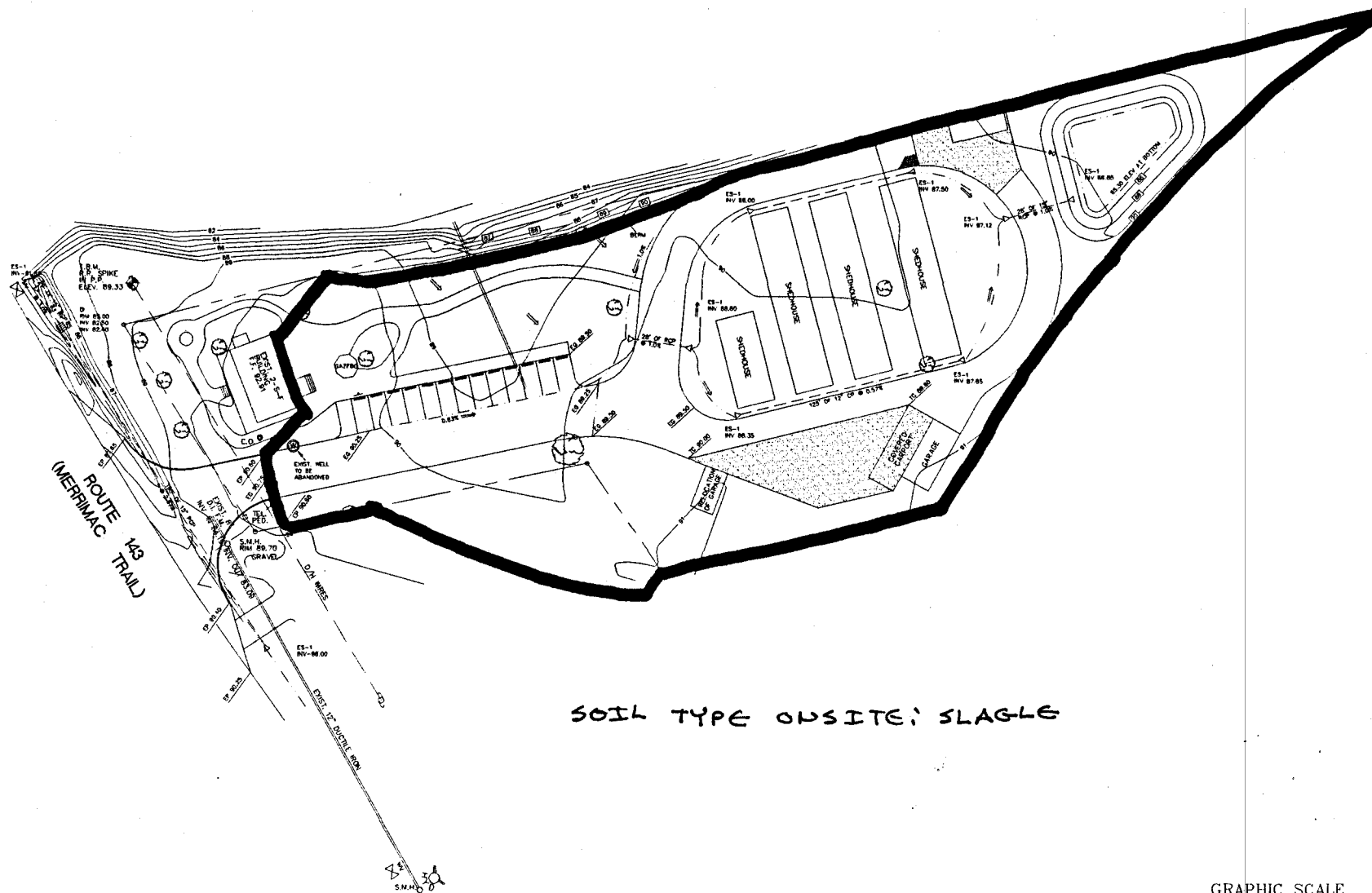
Circle one: Present Developed _____ Frequency (yr) _____ Checked _____ Date _____

Subarea name	Basic watershed data used ^{1/}				Select and enter hydrograph times in hours from exhibit 5- II ^{2/}										
	Sub-area T_c (hr)	ET_t to outlet (hr)	I_a/P	$A_m Q$ (mi ² -in)			12.4	12.5							
					Discharges at selected hydrograph times ^{3/}										
					----- (cfs) -----										
2	.53		.20	.0033				1.45							
10	.53		.12	.0090			4.76								
50	.53		.10	.0112			5.92								
Composite hydrograph at outlet															

^{1/} Worksheet 5a. Rounded as needed for use with exhibit 5.

^{2/} Enter rainfall distribution type used.

^{3/} Hydrograph discharge for selected times is $A_m Q$ multiplied by tabular discharge from appropriate exhibit 5.



POST-DEVELOPMENT

BEFORE DIGGING CALL "MISS UTILITY"
OF VIRGINIA AT 1 - 800 - 552 - 7001

DELIGHTFUL
GARDENS
GRADING & UTILITY PLAN
JAMES CITY COUNTY
VIRGINIA

Job Number: 94199
Sheet No: C3

Rickmond Engineering, Inc.
1843-C Merrimac Trail
Williamsburg VA 23185
(804) 221-1775 or 888-4149
Civil Engineering
Environmental Engineering
Land Surveying
Date: 11/28/94
Scale: 1"=25'
Author: B.S.
Checked By: R.C.S.
Title: Grading & Utility Plan

Worksheet 2: Runoff curve number and runoff

Project Delightful Gardens By HMS Date 11/30/94
 Location James City County, Va Checked _____ Date _____
 Circle one: Present Developed

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN ^{1/}			Area ☒ acres ☐ mi ² ☐ %	Product of CN x area
		Table 2-2	Fig. 2-3	Fig. 2-4		
slagle C	Grass / Trees	74			.87	64.38
slagle C	Roof / Road	98			.91	89.18
Totals =					1.78	153.56

^{1/} Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{153.56}{1.78} = 86.2; \quad \text{Use CN} = \boxed{86}$$

2. Runoff

Frequency yr
 Rainfall, P (24-hour) in
 Runoff, Q in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	50
3.5	6.0	7.0
2.1	4.4	5.4

100
8.0
6.3

Worksheet 3: Time of concentration (T_c) or travel time (T_t)Project Delightful Gardens By KMS Date 11/30/94Location James City County, Va Checked _____ Date _____Circle one: Present DevelopedCircle one: T_c T_c through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet.

Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID

1. Surface description (table 3-1)
2. Manning's roughness coeff., n (table 3-1) ..
3. Flow length, L (total $L \leq 300$ ft) ft
4. Two-yr 24-hr rainfall, P_2 in
5. Land slope, s ft/ft
6. $T_c = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute T_c hr

Shallow Grass	
.15	
140	
3.5	
.008	
.29	+
	=

Shallow concentrated flow

Segment ID

7. Surface description (paved or unpaved)
8. Flow length, L ft
9. Watercourse slope, s ft/ft
10. Average velocity, V (figure 3-1) ft/s
11. $T_c = \frac{L}{3600 V}$ Compute T_c hr

	+
	=

Channel flow

Segment ID

12. Cross sectional flow area, a ft²
13. Wetted perimeter, p_w ft
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ft
15. Channel slope, s ft/ft
16. Manning's roughness coeff., n
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V ft/s
18. Flow length, L ft
19. $T_c = \frac{L}{3600 V}$ Compute T_c hr
20. Watershed or subarea T_c or T_t (add T_c in steps 6, 11, and 19) hr

1.23	
.31	
.0067	
.25	
.22	
300	
.37	+
	=

Average Grass
Ditch + Conc.
Pipe

.66

Worksheet 5a: Basic watershed data

Project Delightful Gardens Location James City County, Va. By RMS Date 11/30/94

Circle one: Present Developed Frequency (yr) _____ Checked _____ Date _____

Subarea name	Drainage area A_m (mi ²)	Time of concentration T_c (hr)	Travel time through subarea T_t (hr)	Downstream subarea names	Travel time summation to outlet ΣT_t (hr)	24-hr Rain-fall P (in)	Runoff curve number CN	Run-off Q (in)	$A_m Q$ (mi ² -in)	Initial abstraction I_a (in)	I_a/P
	.0028	.66				3.3	86	2.1	.0059	.326	.09
	.0028	.66				6.0	86	4.4	.0123	.326	.05
	.0028	.66				8.0	86	6.3	.0176	.326	.04
	.0028	.66				7.0	86	5.4	.0151	.326	.05

↑↑↑↑↑↑↑↑↑↑
From worksheet 3

↑↑↑↑↑↑↑↑↑↑
From worksheet 2

↑↑↑↑
From table 5-1

(210-VI-TR-55, Second Ed., June 1986)

D-6

Worksheet 5b: Tabular hydrograph discharge summary

Project Delightful Garden Location James City County, Va. By HMS Date 11/30/94
 Circle one: Present Developed Frequency (yr) _____ Checked _____ Date _____

Subarea name	Basic watershed data used ^{1/}				Select and enter hydrograph times in hours from exhibit 5- ^{2/}									
	Sub-area T_c (hr)	IT_t to outlet (hr)	I_a/P	$A_m Q$ (mi ² -in)					12.6					
Discharges at selected hydrograph times ^{3/}														
----- (cfs) -----														
2	.66		.09	.0059					2.50	1.45				
10	.66		.09	.0123					5.22	4.76				
100	.66		.04	.0176					7.46					
50	.66		.05	.0151					6.40	5.92				
Composite hydrograph at outlet														

^{1/} Worksheet 5a. Rounded as needed for use with exhibit 5.

^{2/} Enter rainfall distribution type used.

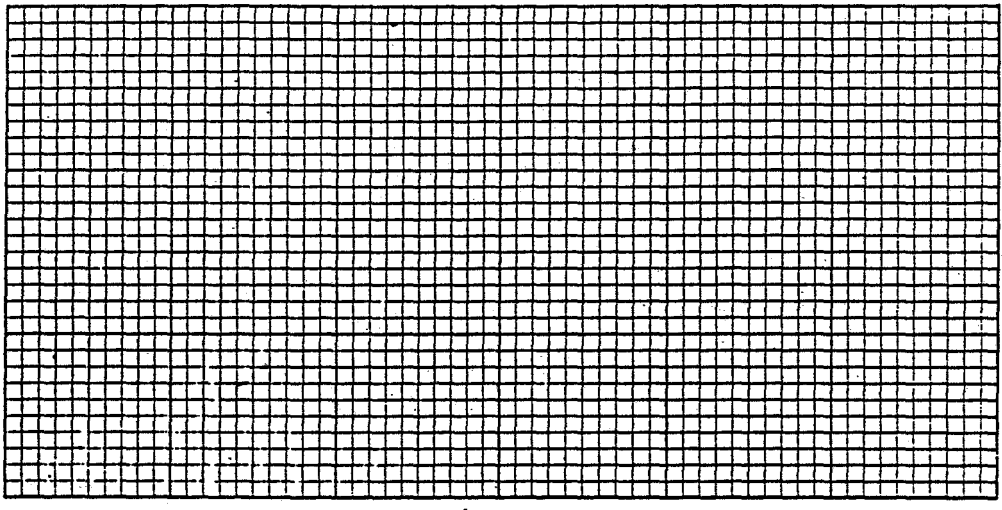
^{3/} Hydrograph discharge for selected times is $A_m Q$ multiplied by tabular discharge from appropriate exhibit 5.

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 6a: Detention basin storage,
peak outflow discharge (q_o) known

Project Delightful Gardens By KWS Date 11/30/94
Location James City County, Va Checked _____ Date _____
Circle one: Present Developed

Elevation or stage



Detention basin storage

1. Data:
Drainage area $A_m = 0.0028 \text{ mi}^2$
Rainfall distribution
type (I, IA, II, III) = II
- | | 1st stage | 2nd stage | |
|---|-----------|-----------|--------------------|
| 2. Frequency yr | 2 | 10 | 50 |
| 3. Peak inflow discharge, q_1 cfs | 2.50 | 5.22 | 6.40 ⁹ |
| (From worksheet 4 or 5b) | | | |
| 4. Peak outflow discharge, q_o cfs | 1.45 | 4.76 | 5.92 ^{1/} |
| 5. Compute $\frac{q_o}{q_1}$ | .58 | .91 | .93 |
| 6. $\frac{V_s}{V_r}$ | .25 | .18 | .18 |
| (Use $\frac{q_o}{q_1}$ with figure 6-1) | | | |
| 7. Runoff, Q in | 2.1 | 4.4 | 5.4 |
| (From worksheet 2) | | | |
| 8. Runoff volume, V_r ac-ft | .31 | .66 | .81 |
| ($V_r = QA_m 53.33$) | | | |
| 9. Storage volume, V_s ac-ft | .08 | .12 | .145 |
| ($V_s = V_r (\frac{V_s}{V_r})$) | | | |
| 3,375 cf 5,175 cf 6,325 cf | | | |
| 10. Maximum stage, E_{max} | | | |
| (From plot) | | | |

^{1/} 2nd stage q_o includes 1st stage q_o .

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JOB 94199SHEET NO. 20

OF

CALCULATED BY KMSDATE 11/30/94

CHECKED BY

DATE

SCALE

Size Pond as Extended Dry Pond Design 4 (shallow marsh)From Controlling Urban Runoff
Chapter 3:Using Sizing Rule 4 - volume equivalent to 1" of runoff
distributed over the contributing
watershed released over 24 hrs
with shallow marsh bottom pond

Watershed Area = 1.78 Ac

Imp. Area = .91

I = 51

$$R_v = .05 + .009 I$$

$$R_v = .05 + .009 (51)$$

$$R_v = .51$$

Volume =	.51	1.78 ac	43560 sf	1 in	.0833 ft	= 3,295 cf
		1 ac			1 in	

Volume Required to be released over 24 hrs = 3,295 cf

Volume Required to control 2yr storm = 3,375 cf

Volume Required to control 10yr storm = 5,175 cf

Volume Required to control 50yr storm = 6,325 cf

To simplify the outlet structure 6,325 cf will be
released over 24 hrs at the rate 3,295 cf would
be released over 24 hrs.1481 ft³ for marsh - 6" deep · 3050 ft²

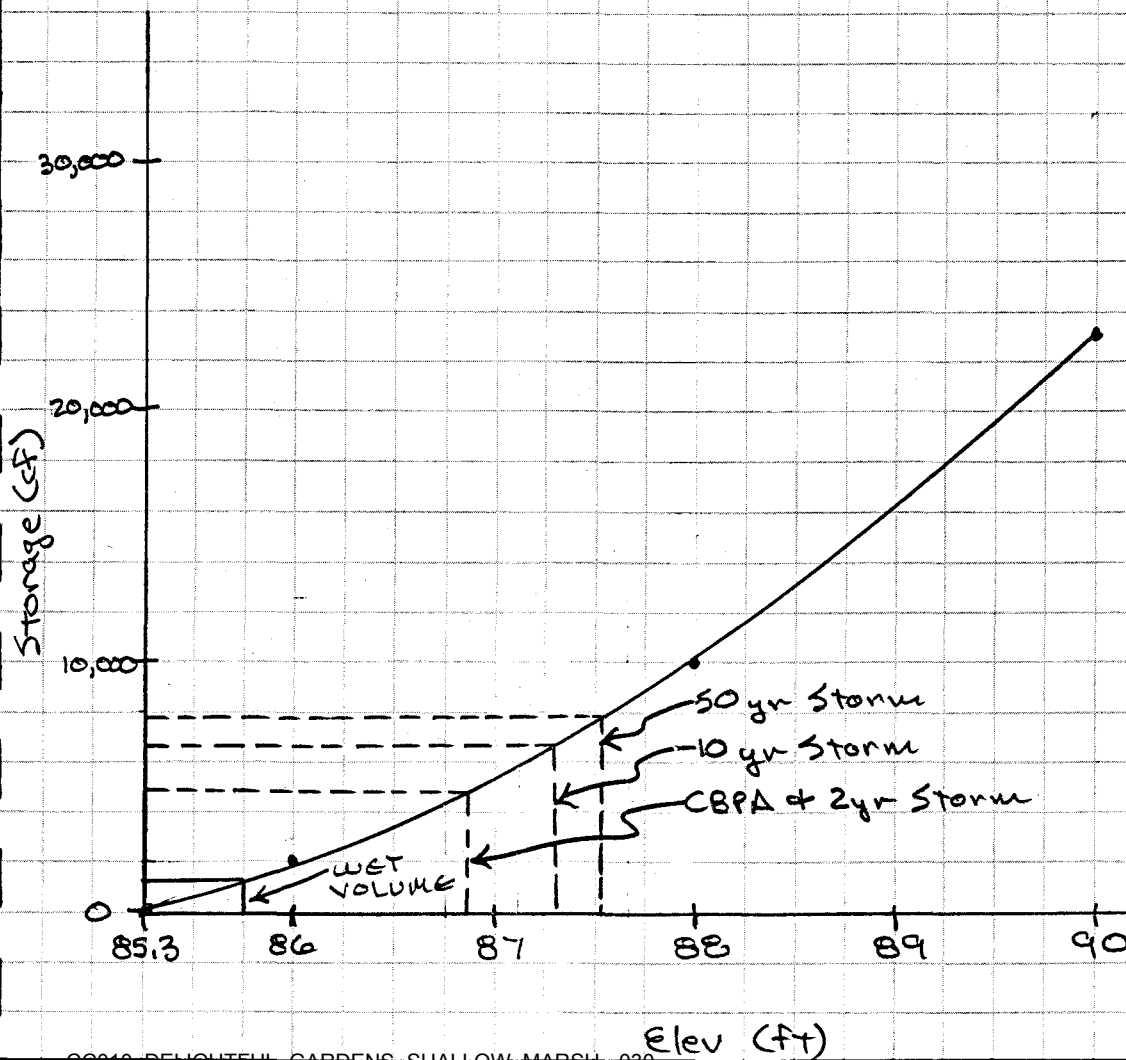
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Stage - Storage

Elev (ft)	Δ Elev (ft)	Area (sf)	Incrum Vol (cf)	Accum Vol (cf)
85.30		2605		0
	.70		2025	
86.0		3178		2025
	2.0		8293	
88.0		5115		10,318
	2.0		12,625	
90.0		7510		22,943



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SHEET NO. 22 OF
CALCULATED BY KMT DATE 11/30/94
CHECKED BY DATE
SCALE

Design Orifice to release 3,295 cf over 24 hrs

$$V = 3295 \text{ cf}$$

$$Q_R = 24 \text{ hr release rate} = \frac{3295 \text{ cf}}{24 \text{ hr}} \times \frac{1 \text{ hr}}{3600 \text{ s}} = .038 \text{ cfs}$$

H for storage of 3295 cf is 1.25 @ elev 86.50

$$h = \frac{2}{3} H = \frac{2}{3} (1.25) = .83$$

$$Q = CA \sqrt{2gh}$$

$$.038 = .6 A \sqrt{2(32.2)(.83)}$$

$$A = \pi r^2 = .008 \text{ ft}^2$$

$$r = .051' = .6''$$

USE 1.2" DIA ORIFICE

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SHEET NO. 23 OF
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SCALE

DESIGN POND AS SHALLOW MARSH

STEP 1: The Volume of the lower stage is equal to:

$$V = [RM R_v / 12] A$$

$$V = [(.45)(.51) / 12] 1.78$$

$$V = .034 \text{ ac-ft}$$

STEP 2: Annual Nutrient Load to lower stage:

$$[(P)(P_f)(R_v) / 12] CA(2.72)$$

$$N = [(45)(.9)(.51) / 12] (2.00)(1.78)(2.72) = 16.67 \text{ lbs/yr}$$

$$P = [(45)(.9)(.51) / 12] (.26)(1.78)(2.72) = 2.17 \text{ lbs/yr}$$

$$\text{STEP 3: Area bottom stage} = \frac{.034}{.42} = .081 \text{ acres}$$

Average Annual Loading per Wetland Acre:

$$\frac{16.67}{.081} = 206 \text{ lbs/acre/yr of nitrogen}$$

$$\frac{2.17}{.081} = 26.7 \text{ lbs/acre/yr of phosphorus}$$

$$\text{STEP 4: } 206 \text{ lbs/acre/yr} < 225 \text{ lbs/acre/yr} \quad \underline{\underline{OK}}$$

$$26.7 \text{ lbs/acre/yr} < 45 \text{ lbs/acre/yr} \quad \underline{\underline{OK}}$$

$$5.6" \text{ deep} \cdot 0.073 = 3180 \text{ ft}^2$$

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SHEET NO. 24 OF
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CHECKED BY DATE
SCALE

DESIGN OUTLET WEIR

Weir Data:

Weir = 18" dia riser

$$C = 3.1$$

$$L = 9.42'$$

$$Q = 7.46 \text{ cfs (100 yr storm)}$$

$$Q = CLH^{3/2}$$

$$7.46 \text{ cfs} = (3.1)(9.42) H^{3/2}$$

$H = .40$ above weir to pass 100 yr storm

→ the 100 yr storm rises to Elev 88.00

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SHEET NO. 25 OF
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DESIGN OUTLET BARREL

From Table 3.14-B of the VESCH

$$L = 30'$$

$$d = 15''$$

$$Q = 7.46 \text{ cfs}$$

$$\text{Head Required} = 2.0'$$

$$\text{Correction Factor} = 1.18$$

$$\text{Actual Head Required} = 2.0' \times 1.18 = 2.36'$$

$$\text{Head Provided} = 90.00' - 85.30' = 4.70'$$

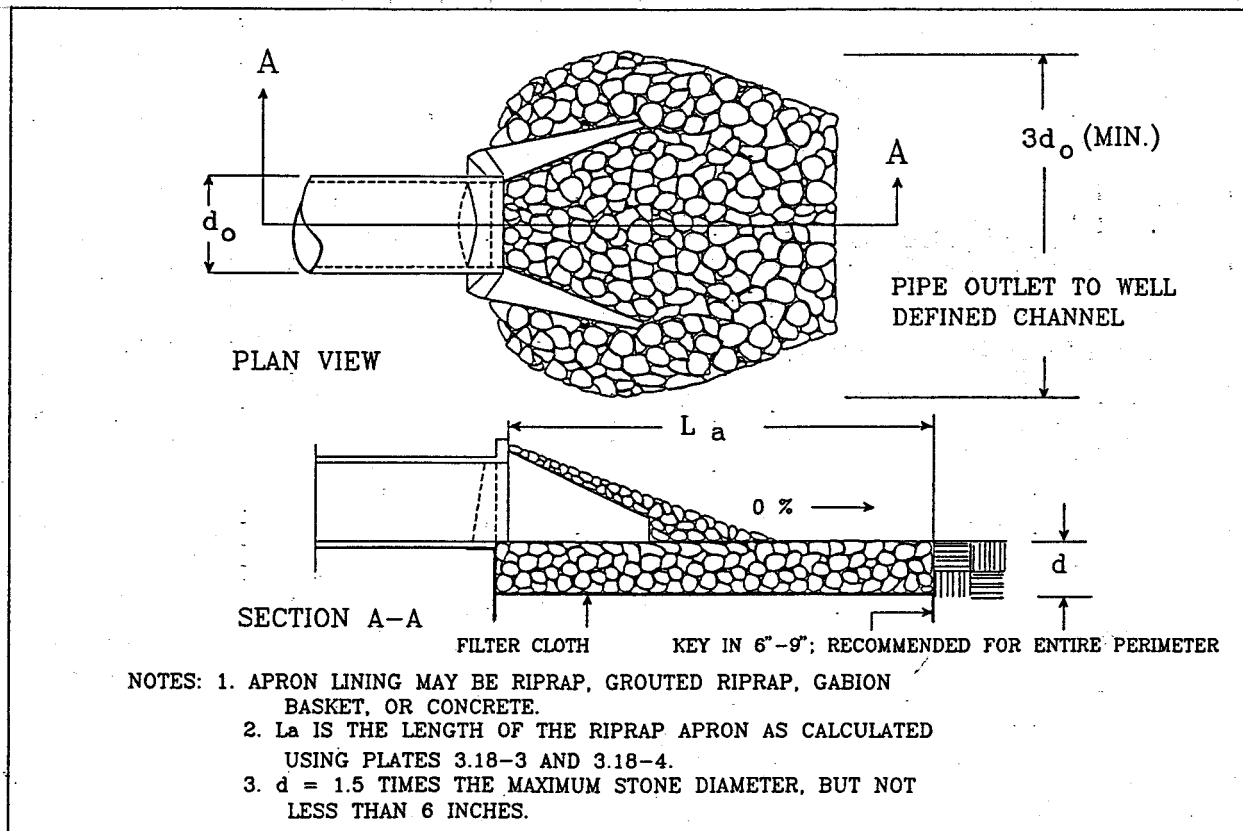
Since $4.70' > 2.36'$ 15" CP is adequate to pass 100 yr storm

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JOB 94199
SHEET NO. 26 OF
CALCULATED BY KMS DATE 11/30/94
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SCALE

DESIGN DETENTION POND OUTLET STRUCTURE



$$Q = 7.46 \text{ cfs}$$

$$d_o = 1.25'$$

$$3d_o = 4'$$

$$L_a = 10'$$

$$W = D_o + .4L_a = 1.25 + .4(10) = 6'$$

$$d_{50} = .1' \Rightarrow \text{USE VDOT CLASS I RIP RAP}$$

WORKSHEET FOR BMP POINT SYSTEM

1.84 ac

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP POINTS	Fraction of Site Served by BMP	Weighted BMP Points
(1.78Ac) Design 4	9	x .97	= 8.73
		x	=
		x	=
		x	=
TOTAL WEIGHTED STRUCTURAL BMP POINTS:			

B. NATURAL OPEN SPACE CREDIT

Fraction of Site	Natural Open Space Credit	Points for Natural Open Space
(.20Ac) .109	x 10	= 1.09

C. TOTAL WEIGHTED POINTS

8.73	+	1.09	=	9.82
Structural BMP Points		Natural Open Space Points		TOTAL

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SHEET NO. 28 OF
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CHECK PERFORMANCE OF POND AS SEDIMENT TRAP

The detention pond will be used as a sediment trap during the construction phase by plugging the 12" dia orifice. The orifice will be unplugged once construction is complete.

Wet Storage Required = $67 \text{ cyd/ac} \times 1.78 \text{ ac} = 120 \text{ cyd} = 3240 \text{ cf}$
Wet Storage Provided @ Elev 87.55 = 6325 cf

Dry Storage Required = $67 \text{ cyd/ac} \times 1.78 \text{ ac} = 120 \text{ cyd} = 3240 \text{ cf}$
Dry Storage Provided from Elev 87.55 to Elev 90.00 = 16,618 cf

Detention Pond is adequate to serve as a sediment trap.

Date Record Created:
Created By:

WS_BMPNO:
CC010

Print
Record

WATERSHED CC
BMP ID NO 010
PLAN NO
TAX PARCEL (50-2)(1-3)
PIN NO 5020100003
CONSTRUCTION DATE 6/1/1995
PROJECT NAME Delightful Gardens
FACILITY LOCATION 7242 Merrimac Trail
CITY-STATE Williamsburg, VA
CURRENT OWNER Donald Newsom
OWNER ADDRESS 7242 Merrimac Trail
OWNER ADDRESS 2
CITY-STATE-ZIP CODE Williamsburg, VA 23185
OWNER PHONE
MAINT AGREEMENT Yes
EMERG ACTION PLAN No

PRINTED ON
Thursday, March 11, 2010
11:47:44 AM

MAINTENANCE PLAN No
SITE AREA acre 1.9
LAND USE COMM
old BMP TYP Dry Pond - SM
JCC BMP CODE B1 Shallow Marsh
POINT VALUE 9

SVC DRAIN AREA acres 1.8

SERVICE AREA DESCRI NONE
IMPERV AREA acres
RECV STREAM COLLEGE CK TRIB
EXT DET-WQ-CTRL No
WTR QUAL VOL acre-ft 0.1
CHAN PROT CTRL No
CHAN PROT VOL acre-ft 0.2
SW/FLOOD CONTROL No
GEOTECH REPORT No

CTRL STRUC DESC
CTRL STRUC SIZE inches 18
OTLT BARRL DESC CMP
OTLT BARRL SIZE inch 15

EMERG SPILLWAY No
DESIGN HW ELEV 87.55
PERM POOL ELEV 85.7
2-YR OUTFLOW cfs 1.45
10-YR OUTFLOW cfs 4.76
REC DRAWING No

CONSTR CERTIF No

LAST INSP DATE 1/31/2001 Inspected by:
INTERNAL RATING 4
MISC/COMMENTS

Get Last BMP No
Return to Menu

Additional Comments: