CERTIFICATE OF AUTHENTICITY

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

BMP NUMBER: **PC026**

DATE VERIFIED: **October 9, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 13, 2010

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

FROM: Jo Anna Ripley, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: PC026

PIN: 3740900001A

Subdivision, Tract, Business or Owner Name (if known): Powhatan Secondary

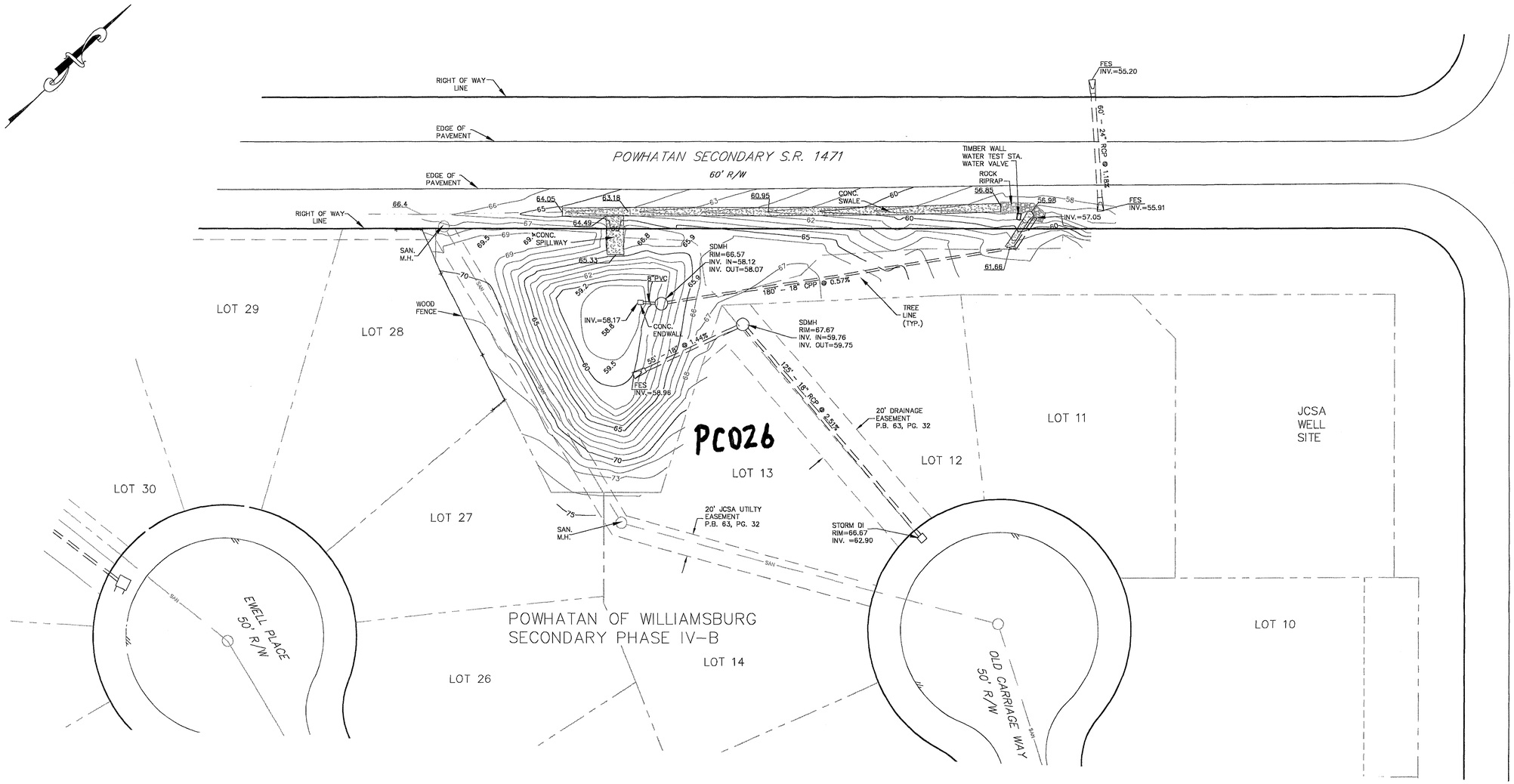
Property Description: Common Area Phase 4A

Site Address:

(For internal use only) **Box** 4 **Drawer:** 3

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

Comments

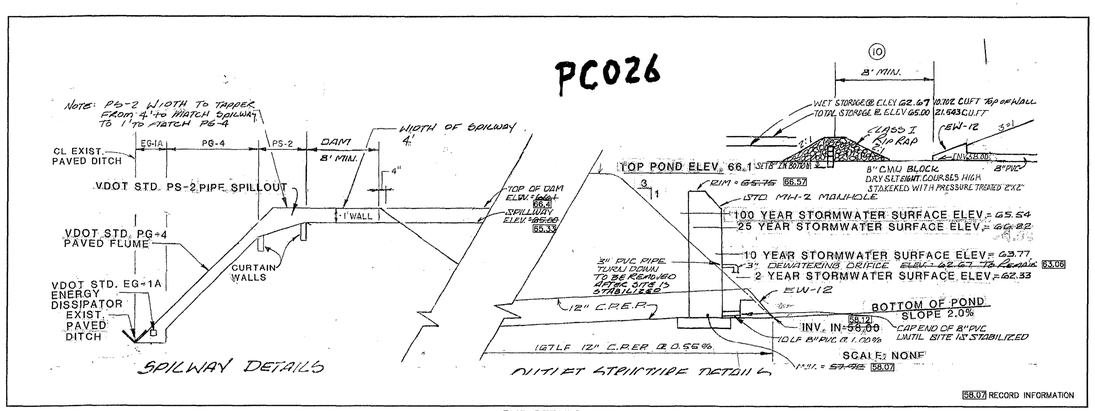


GRAPHIC SCALE

25 0 13 25 50 100

(IN FEET)
1 inch = 25 ft.

PC026



BMP DETAILS
NOT TO SCALE

PC026; S-58-94

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, JANUARY 26, 2006.

RECEIVED
FEB - 3 2006
ENVIRONMENTAL DIVISION

COMMONWEALTH OF VIRGINIA
1/30/06
PETER FARRELL
No. 002036
LAND SURVEYOR

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 253-2975
Fax (757) 220-9056
Email: lmdg@landmarkdg.com

3546 Greenwich Road
Suite 202
Virginia Beach, VA 23462
Tel. (757) 473-2030
Fax (757) 473-2033
Email: vbdg@landmarkdg.com

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

BMP RECORD DRAWING

POWHATAN OF WILLIAMSBURG SECONDARY
PHASE IV-B

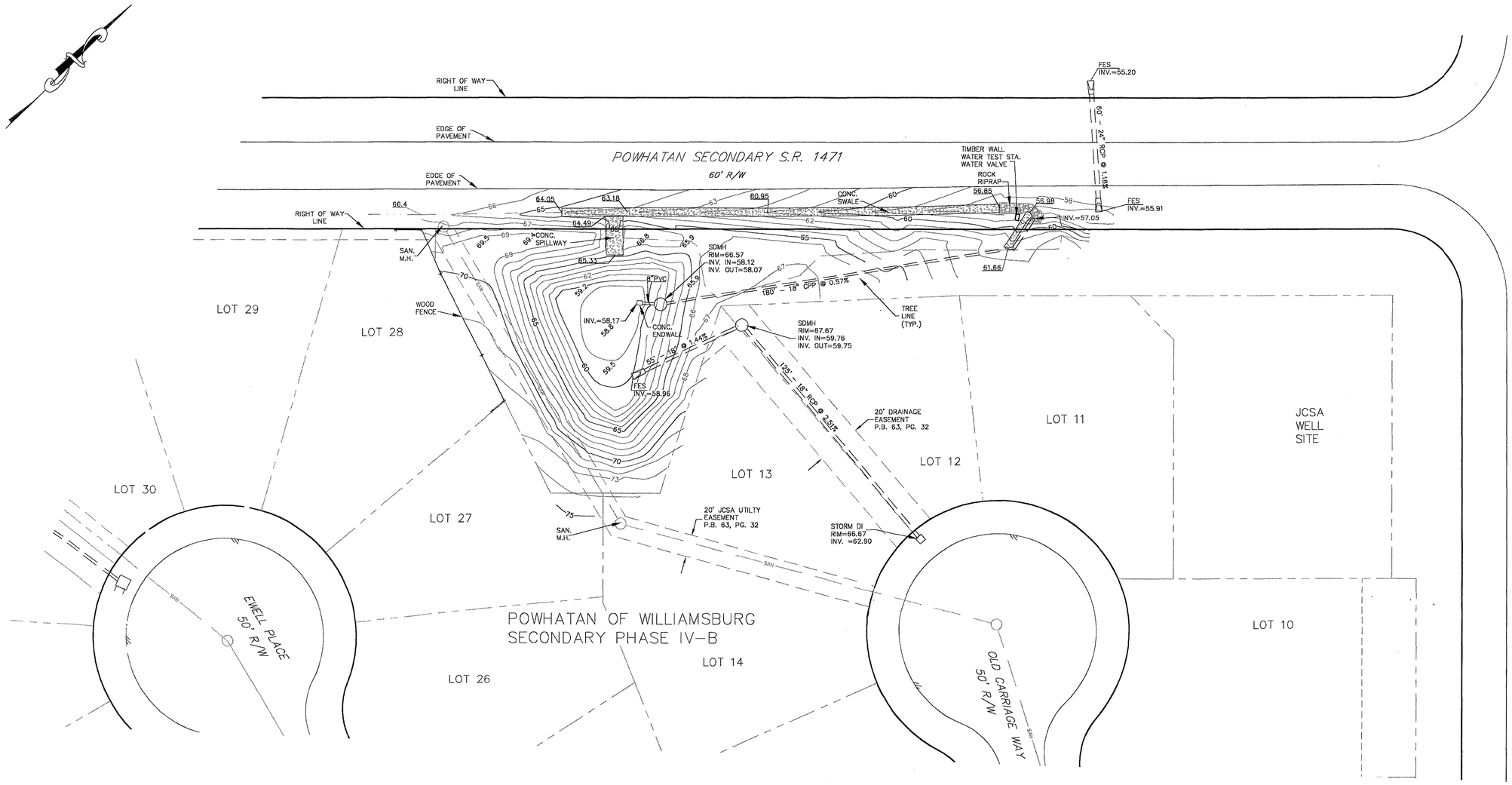
JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 01/30/06
Checked: PF	Scale: AS-SHOWN
File Mgr./Drawn: AST	CADD File name: REC-BMP
Project Number: 1780041-MKT.99	Dwg. File No.: 16799W
Drawing Number: R-1	

1 OF 1

16820W

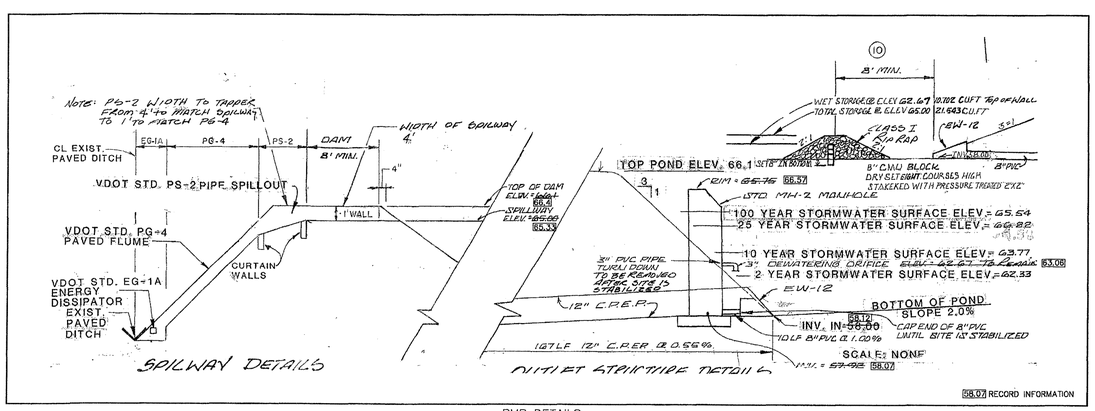
PC026_POWHATAN_SECONDARY_PHASE_4B - 003



GRAPHIC SCALE

25 0 13 25 50 100

(IN FEET)
1 inch = 25 ft.



BMP DETAILS
NOT TO SCALE

NOTE: THESE RECORD DRAWINGS ARE BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, JANUARY 26, 2006.

RECEIVED
FEB - 3 2006
ENVIRONMENTAL DIVISION

PC 026; S-58-94

COMMONWEALTH OF VIRGINIA
1/30/06
PETER FARRELL
No. 002036
LAND SURVEYOR

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

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2020
Fax. (757) 497-7933
Email: lmdg@landmarkdg.com

LANDMARK DESIGN GROUP
Engineers · Planners · Surveyors
Landscape Architects · Environmental Scientists

BMP RECORD DRAWING

POWHATAN OF WILLIAMSBURG SECONDARY PHASE IV-B

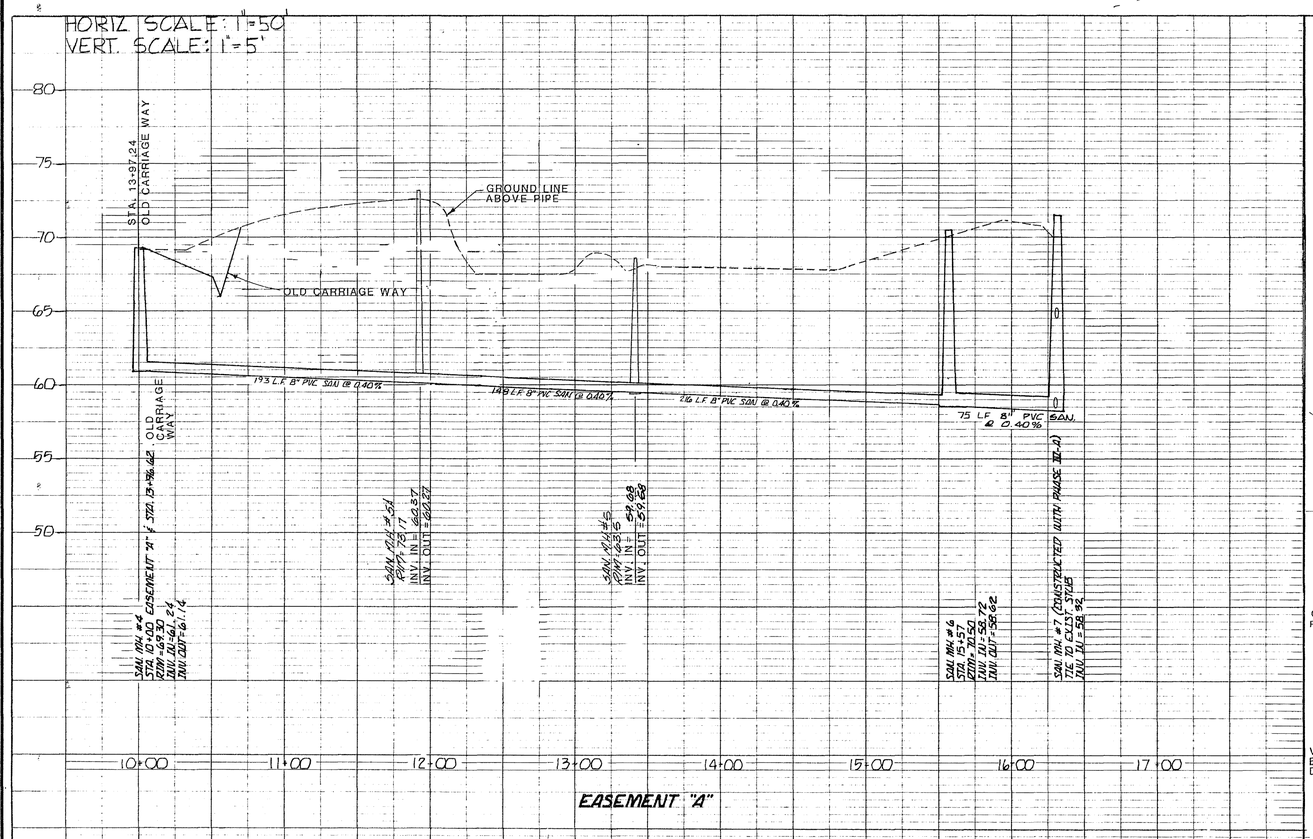
JAMES CITY COUNTY VIRGINIA

Designed: LMDG	Date: 01/30/06
Checked: PF	Scale: AS-SHOWN
File Mgr./Drawn: AST	CADD File name: REC-BMP
Project Number: 1780041-MKT.99	Dwg. File No.: 16790W
Drawing Number 1 OF 1	R-1

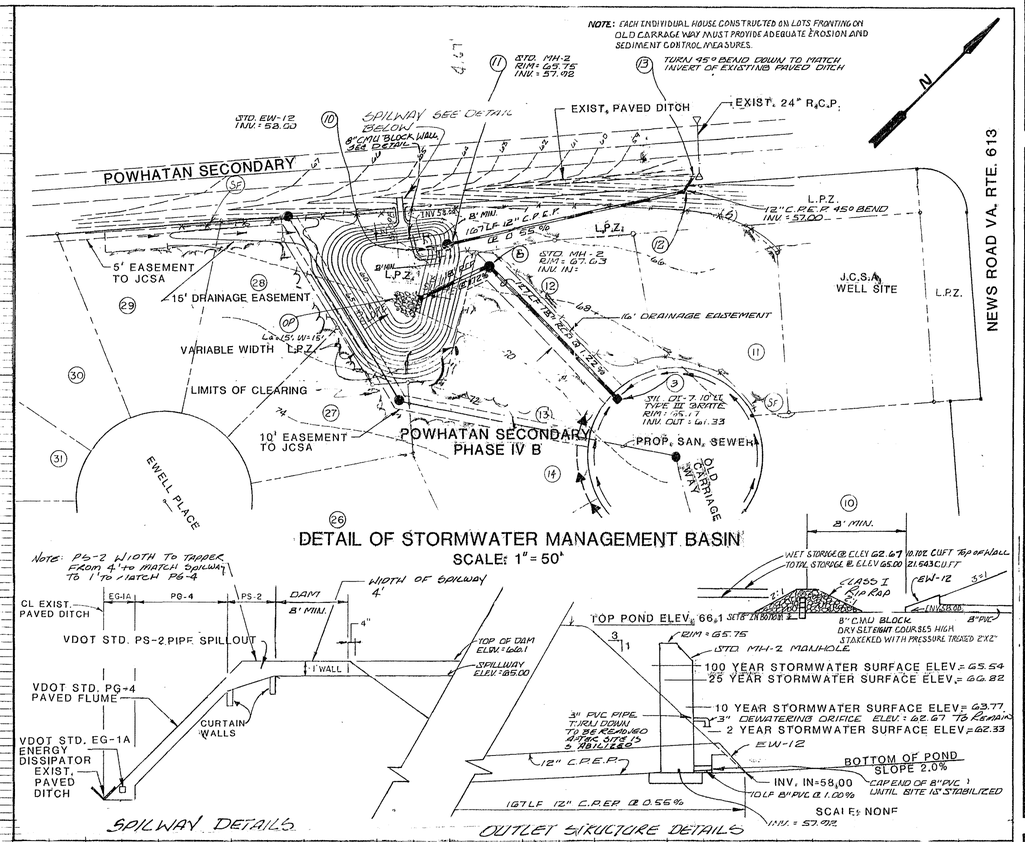
16820W

A F 39820A 9

HORIZ SCALE: 1"=50'
VERT. SCALE: 1"=5'



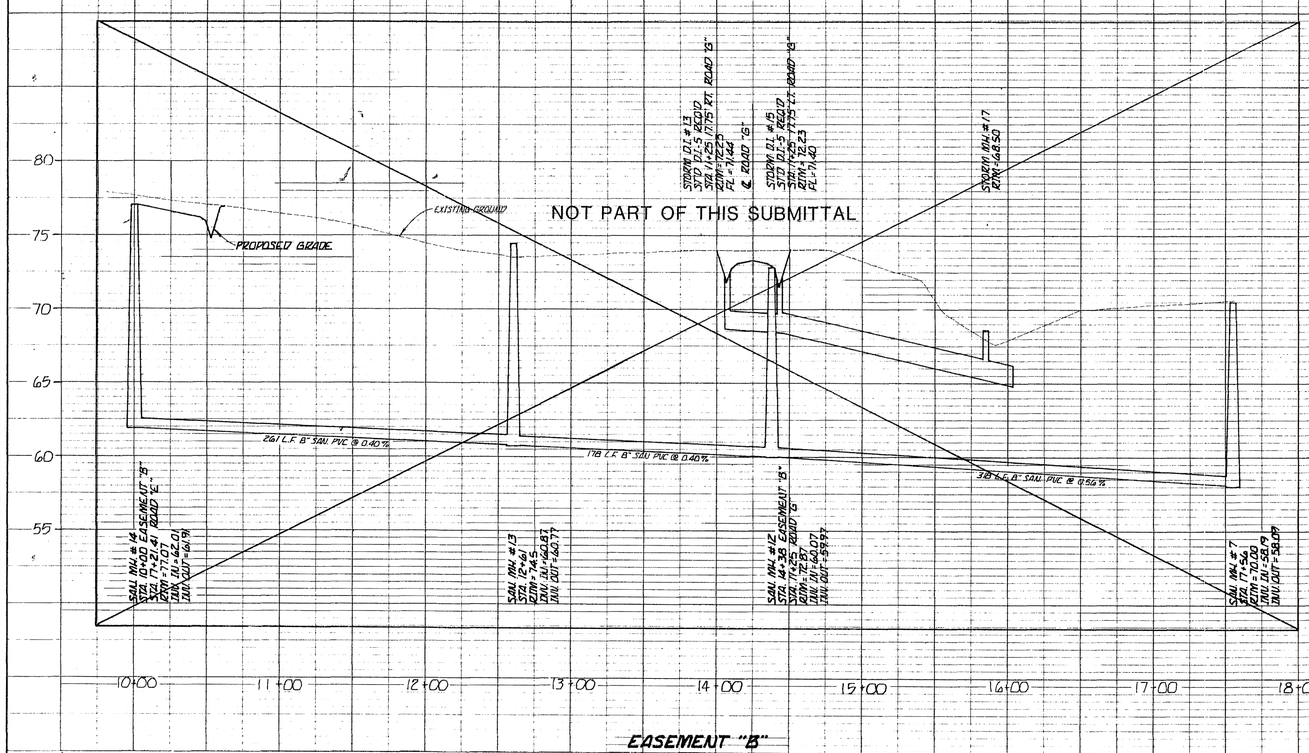
EASEMENT "A"



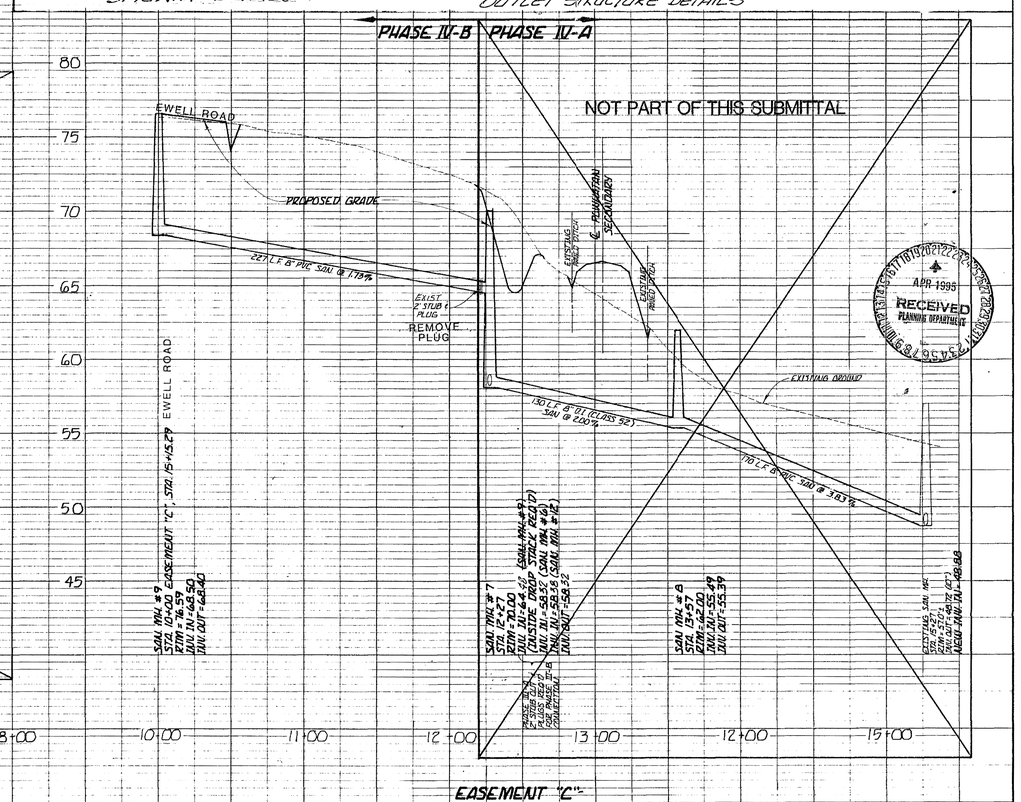
DETAIL OF STORMWATER MANAGEMENT BASIN
SCALE: 1" = 50'

SPILWAY DETAILS

OUTLET STRUCTURE DETAILS



EASEMENT "B"



EASEMENT "C"

APR 1995
RECEIVED
PLANNING DEPARTMENT

COMMONWEALTH OF VIRGINIA
STEPHEN A. ROMEO
No. 1443-B
LAND SURVEYOR

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

DES.	DWN.	CHK.	DATE
		SAR	7/20/94

POWHATAN OF WILLIAMSBURG SECONDARY
PHASE IV-B
PREPARED FOR
BEAMER CONSTRUCTION CO.
JAMES CITY COUNTY, VA

SANITARY SEWER EASEMENT PROFILES

PROJ. NO.	78041
FLD. BK. NO.	
SHEET	5 OF 9
DWG.	4898W

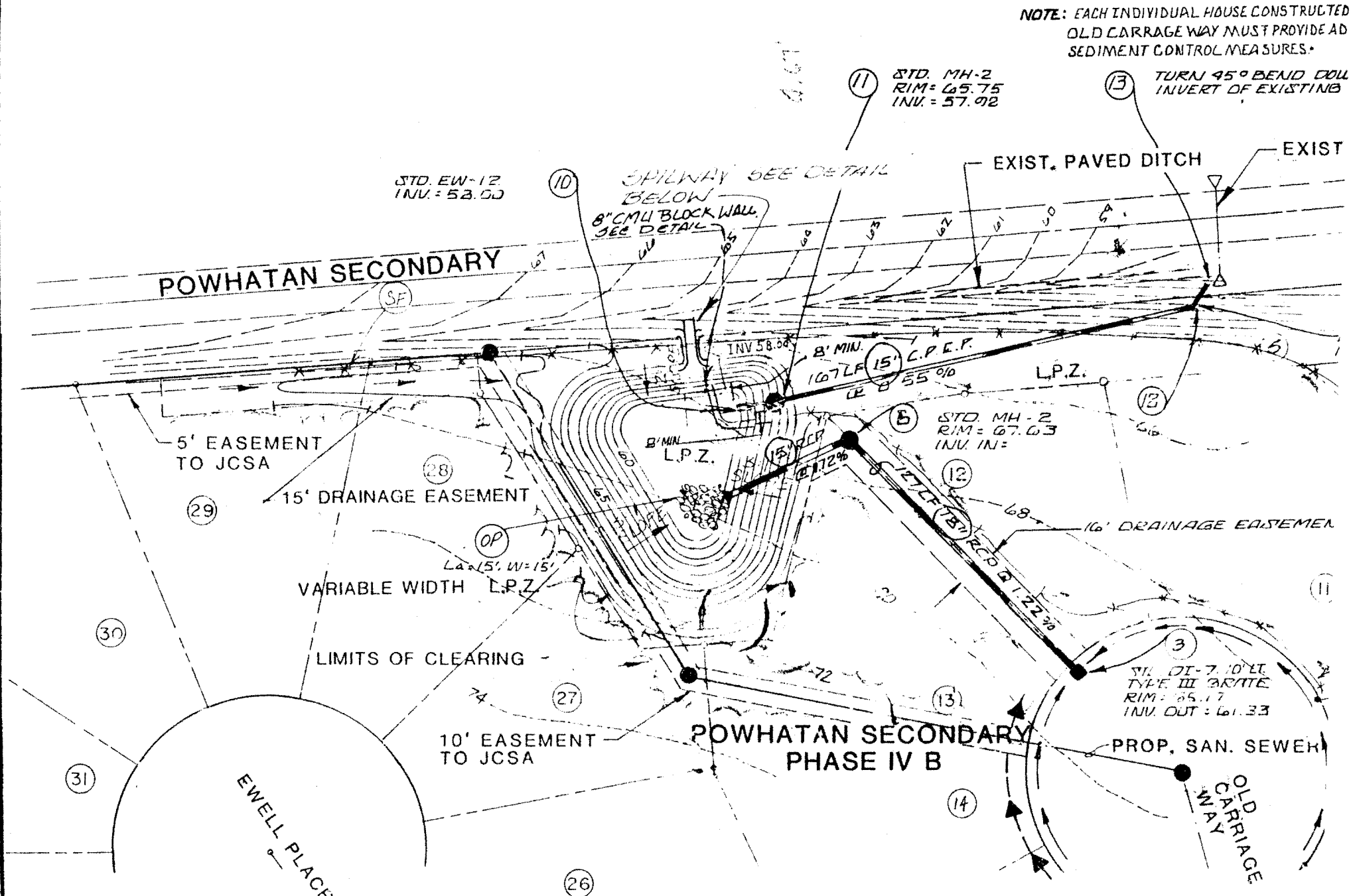
PC026_POWHATAN_SECONDARY_PHASE_4B - 005

REVISED: 4/21/95 PER COUNTY FOR COMMENTS

REVISED: NOV 4 1994 PER COUNTY COMMENTS

REVISED: DEC 12 93

NOTE: EACH INDIVIDUAL HOUSE CONSTRUCTED OLD CARRAGE WAY MUST PROVIDE AD SEDIMENT CONTROL MEASURES.



DETAIL OF STORMWATER MANAGEMENT BASIN

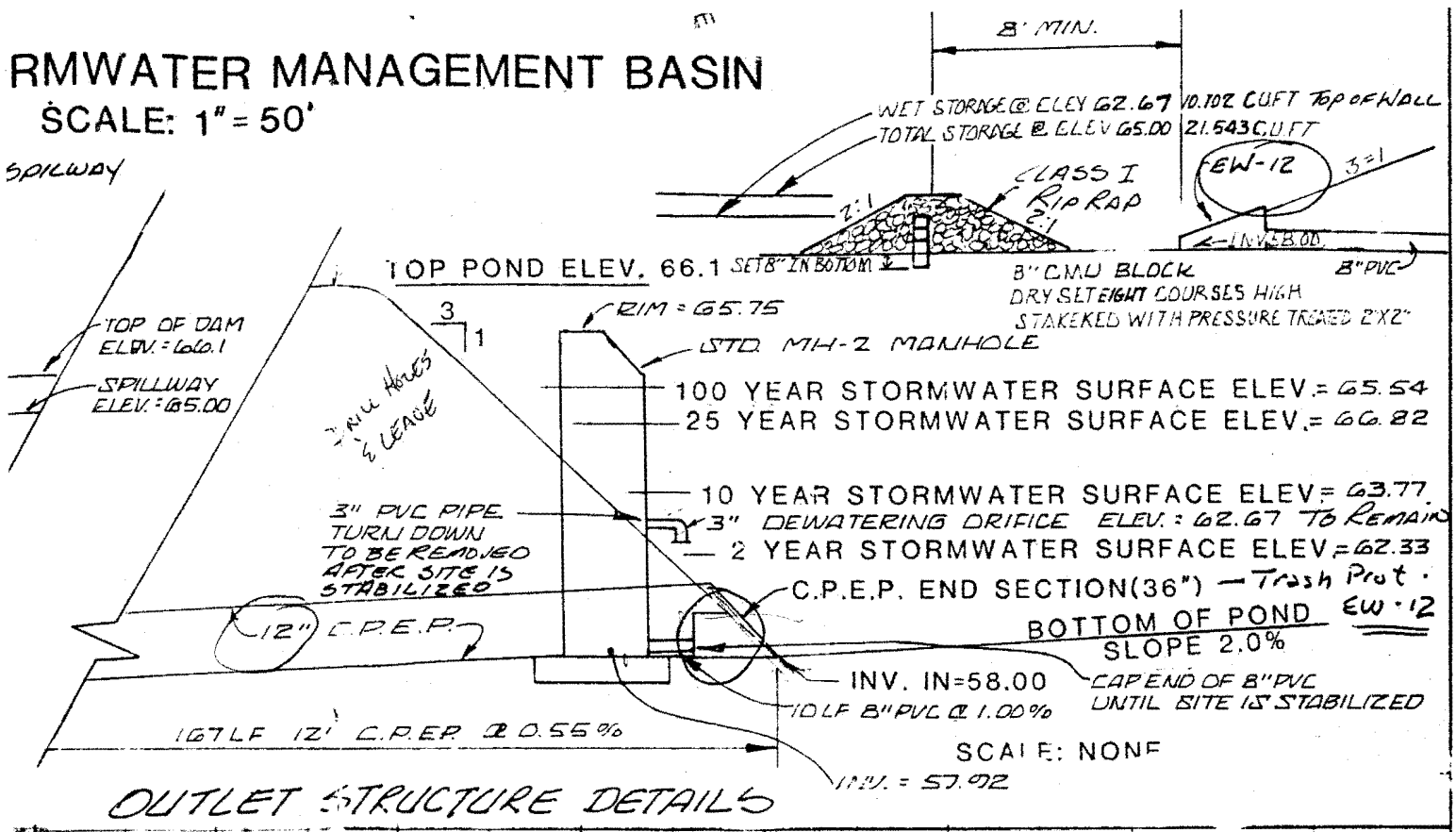
SCALE: 1" = 50'

NOTE: PS-2 WIDTH TO TAPPER FROM 4' to MATCH SPILWAY

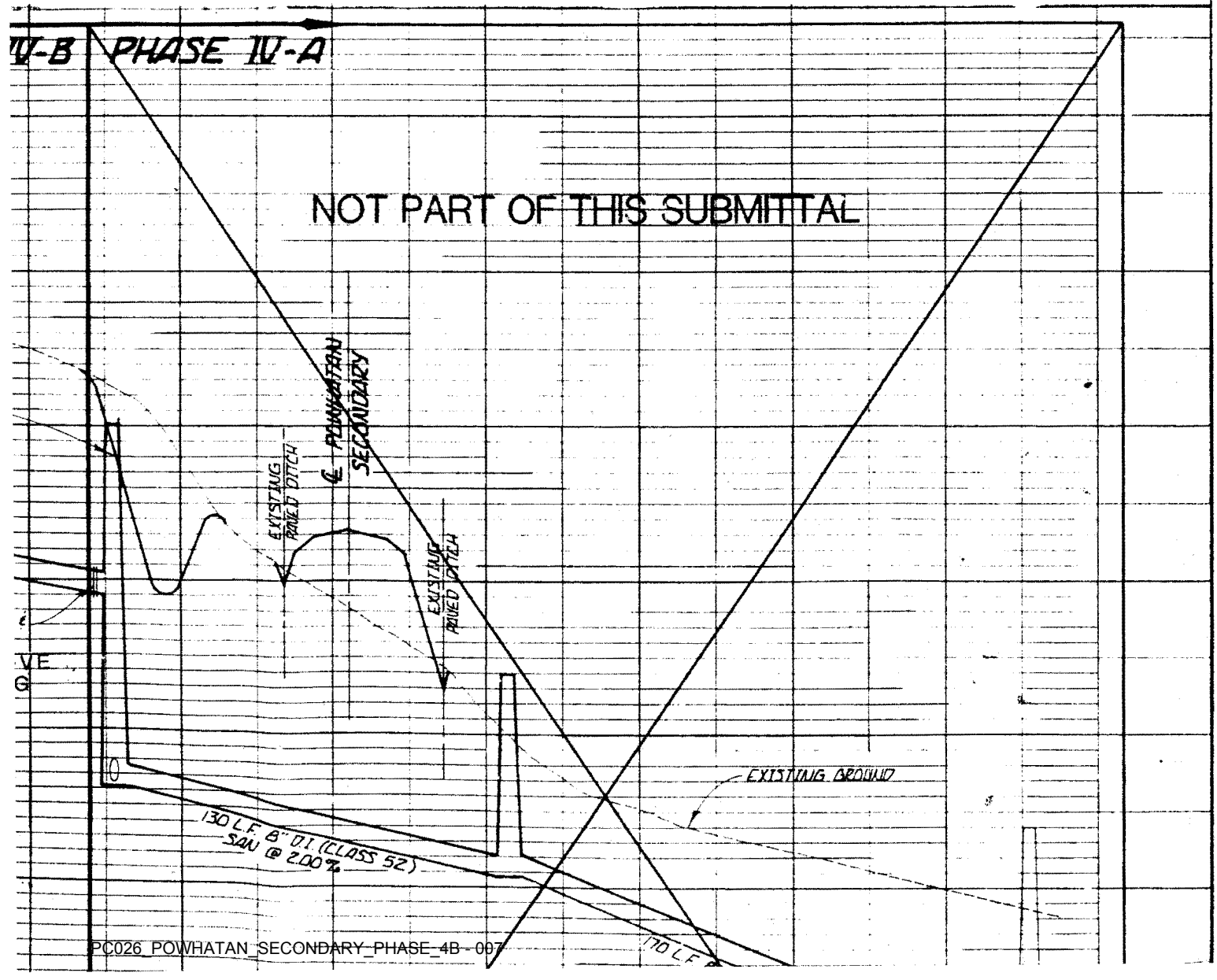
WIDTH OF SPILWAY

RMWATER MANAGEMENT BASIN

SCALE: 1" = 50'



OUTLET STRUCTURE DETAILS



DES.

WILLIAMSBURG SECONDARY

5' EASEMENT TO JCSA

15' DRAINAGE EASEMENT

VARIABLE WIDTH L.P.Z.

LIMITS OF CLEARING

10' EASEMENT TO JCSA

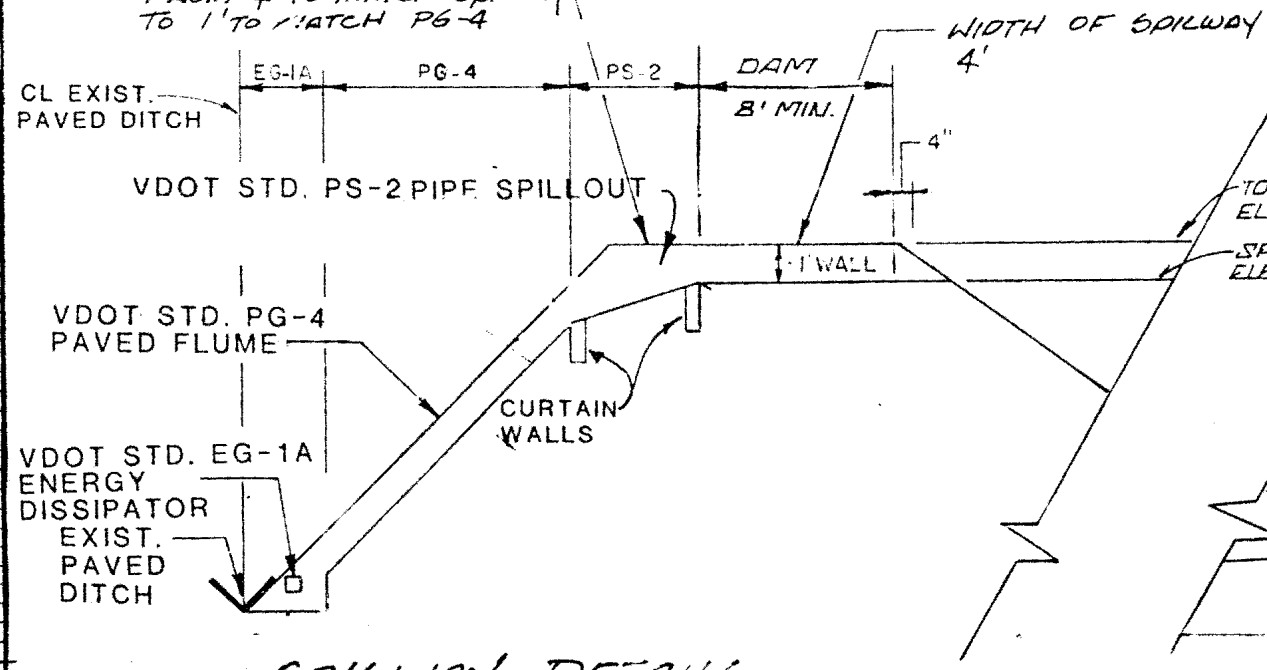
EWELL PLACE

POWHATAN SECONDARY PHASE IV B

DETAIL OF STORMWATER MAN

SCALE: 1" = 50'

NOTE: PS-2 WIDTH TO TAPPER FROM 4' TO MATCH SPILWAY TO 1' TO MATCH PG-4



SPILWAY DETAILS

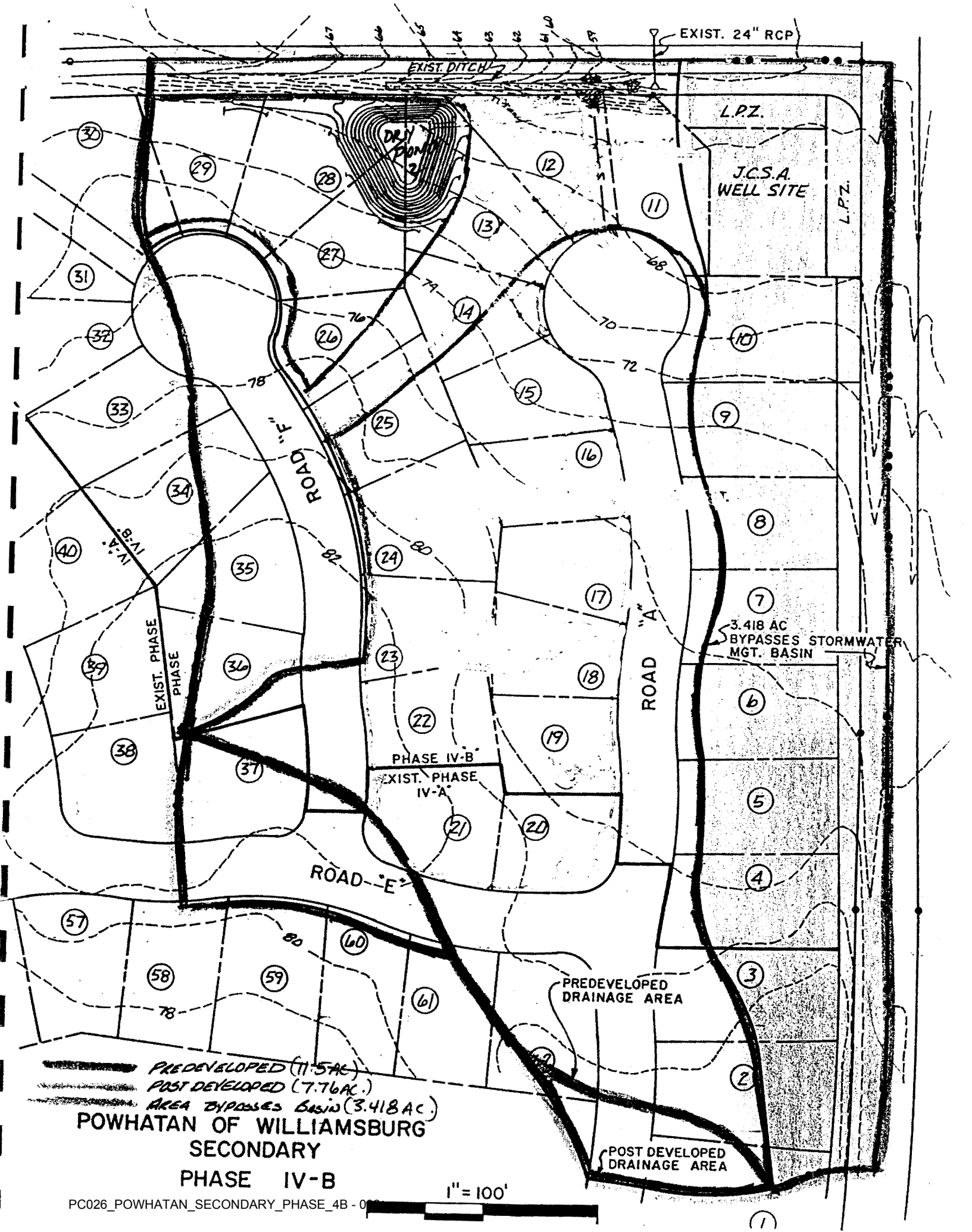
OUTLET STR

PHASE IV-B | PHASE IV-A

80

75

EWELL ROAD


EXIST. 24" RCP
EXIST. DITCH
DRY POND #2
L.P.Z.
J.C.S.A. WELL SITE
L.P.Z.
ROAD "F"
ROAD "A"
ROAD "E"
IV-A
IV-B
EXIST. PHASE
PHASE
PHASE IV-B
EXIST. PHASE IV-A
3.418 AC BYPASSES STORMWATER MGT. BASIN
PREDEVELOPED DRAINAGE AREA
POST DEVELOPED DRAINAGE AREA
PREDEVELOPED (11.5AC)
POST DEVELOPED (7.76AC.)
AREA BYPASSES BASIN (3.418 AC.)
POWHATAN OF WILLIAMSBURG
SECONDARY
PHASE IV-B
1" = 100'

Pow Sec IV-B

DIVERSION DIKE
SEED FERTILIZED
SEDIMENT CONTROL
CARRIAGE WAY WILL SEPARATION OF DIVERSION DIKE
TEMPORARY STONE CULVERT INLET PROTECTION
VESC #3.08 TO REMAIN IN PLACE UNTILL
SITE HAS STABILIZED.

New location of outlet structure

EXIST. PAVED DITCH

EXIST. 24" R.C.P.

OWHATAN SECONDARY

EG-1A ENERGY DISSIPATOR

INV. 58.5

PG-4 PAVED FLUM
L.P.Z.

PS-2 PIPE SPILLOUT
(MODIFIED FOR DI-7

EASEMENT
JCSA

15' DRAINAGE EASEMENT

INV 58.00

18'-8" CPEP @ 1.1%

L.P.Z.

60" M.H.
W/ DI-7 TOP
RIM = 64.75
INV. IN 36" = 57.30
INV. IN 18 = 57.30
INV. OUT 8" = 57.30

145'-36" C.P.E.P. @ 0.48%

L.P.Z.

INV 59.00

SLOPE

TEMP. 12" C.P.E.P.

TEMP. 12" CPEP @ 1.33% SLOPE

105'-18" RCP @ 3.84%

J.C.S.A. WELL SITE

20' DRAINAGE EASEMENT

VARIABLE WIDTH L.P.Z.

LIMITS OF CLEARING

SODDED

TEMPORARY PLUG IN STONE IS PLACED INC HAVE STABILIZED

STD DI-7
RIM = 64.42
INV. OUT = 61.33

Relocate

10' EASEMENT TO JCSA

POWHATAN SECONDARY
PHASE IV B

NOTE: 12" CPEP SHALL REMAIN IN PLACE UNTILL THE BASE STONE HAS BEEN PLACED IN OLD CARRAGE WAY AND ROAD SIDE DITCHES HAVE STABILIZED. PIPE SHALL THEN BE REMOVED AND 12" HOLE IN DI-7 TO BE PLUGED. ALL DISTURBED AREAS TO BE IMMEDIATELY SEEDED AND MULCHED.

PROP. SAN. SEWER

TEMI TO C WAT TO P

OLD CARRIAGE WAY

EWELL PLACE

DETAIL OF STORMWATER MANAGEMENT BASIN

SCALE: 1" = 50'

4" TO MATCH OF PS-2 TO MATCH PG-4

27.5

PG-4 | PS-2 | DI-7

NOTE: SEE STD. PS-4 FOR DETAILS OF REBAR IN WALL

-2 PIPE SPILLOUT
1' WALL
RFLOW

5'-4"

4"

3'-0"

1' WALL

RIM = ELEV. 64.75

WET STO
TOTAL ST

TOP POND ELEV. 66.1 SET 8" IN BOTTOM

3
1

Post-it® Fax Note 7671

To Bill Brown		Date 3/28/95	# of pages ▶ 1
Co./Dept. L & M		From Darryl Cook	
Phone #		Co. JCC	
Fax #		Phone # 253-6673	
Fax #			

TOWNHOMES
NEWS ROAD
ROUTE 613
PROPOSED 80' R/W
BARLEY MILL PLACE
POWHATAN OF WILLIAMSBURG SECONDARY PHASE I
CART ROAD
RIDGE ROAD
FIRST PATENT ROAD
OAK
L.P.Z.
BMP
RESERVED PARCEL P-2
POWHATAN SECONDARY
PHASE III
PHASE IV
PROPOSED PARCEL
AREA OF ROADS
NON DEFINITIVE PROPERTY LINE
CONTINUATION

Powhatan Enterprises, Inc.
212 Powhatan Secondary
Williamsburg, VA 23188
(757) 258-2822 office
(757) 880-6030 cell

January 23, 2006

Scott J. Thomas, P.E.
Senior Engineer
James City County
Environmental Division
101-E Mounts Bay Road
P.O. Box 8784
Williamsburg, VA 23187-8784

Re: Powhatan Secondary of Williamsburg Phase IV-B

Dear Scott:

Thank you for your letter regarding the above referenced project. As condition for the release of the Letter of Credit, we will provide record drawings for the two BMPs in Section IV-B. The BMP record drawings will be provided within 90 days, as requested.

If you have any questions, please do not hesitate to call.

Best regards,

Lawrence E. Beamer
President

DESIGN CALCULATIONS

FOR

STORM WATER MANAGEMENT POND

THAT SERVES PHASE IV-B

OF

POWHATAN SECONDARY

PC026

12"
CP&A

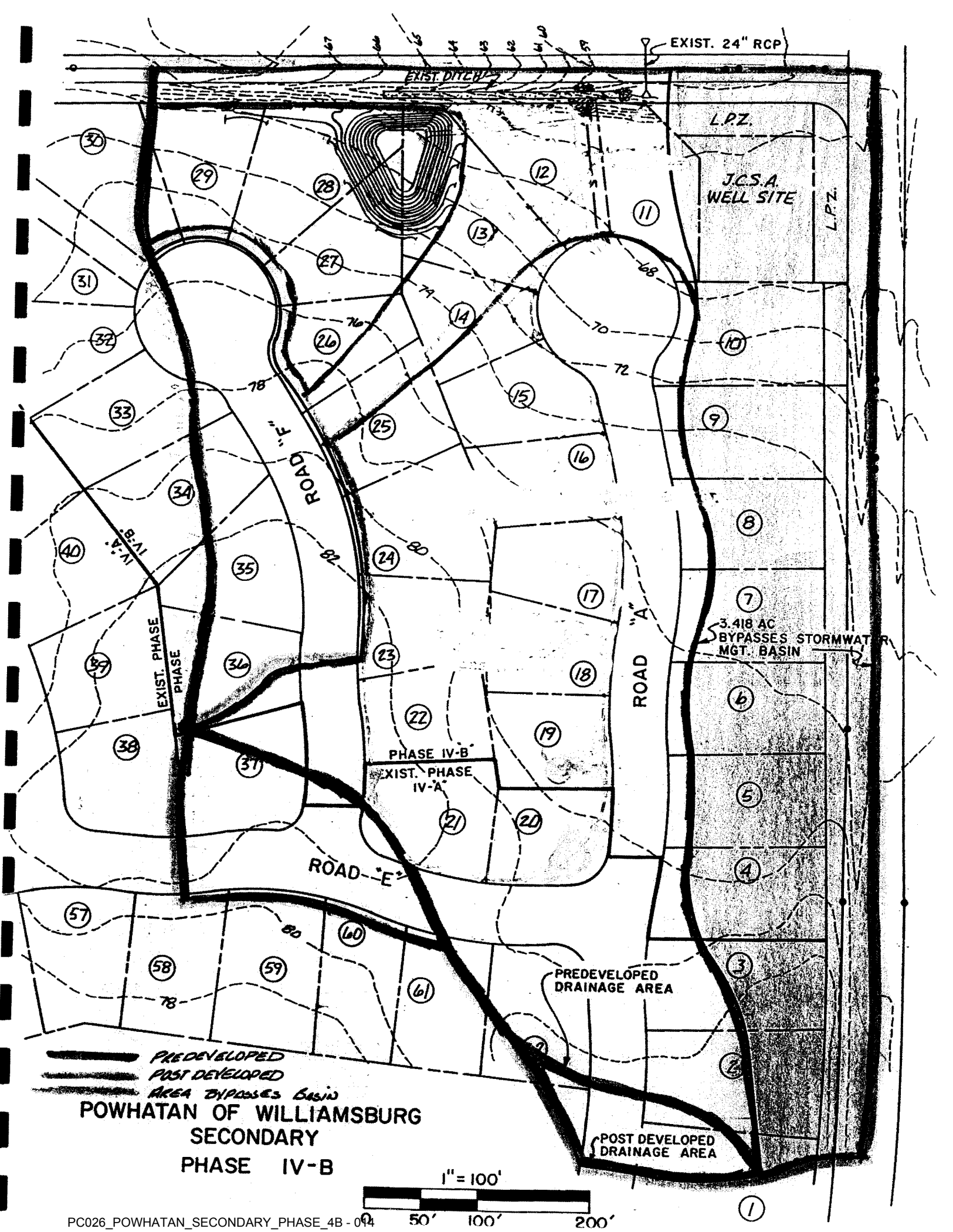
August 25, 1994
Revised April 14, 1995

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

5544 Greenwich Road, Virginia Beach, VA 23462
(804) 473-2000 FAX: (804) 497-7933

201 Packets Court, Williamsburg, VA 23185
(804) 253-2975 FAX: (804) 229-0049


EXIST. 24" RCP
EXIST. DITCH
L.P.Z.
J.C.S.A.
WELL SITE
L.P.Z.
ROAD "F"
ROAD "A"
ROAD "E"
IV-A
IV-B
EXIST. PHASE
PHASE
PHASE IV-B
EXIST. PHASE
IV-A
3.418 AC
BYPASSES STORMWATER
MGT. BASIN
PREDEVELOPED
DRAINAGE AREA
POST DEVELOPED
DRAINAGE AREA
PREDEVELOPED
POST DEVELOPED
AREA BYPASSES BASIN
POWHATAN OF WILLIAMSBURG
SECONDARY
PHASE IV-B
1" = 100'
0
50'
100'
200'

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject POWHATAN OF WILLIAMSBURG PHASE IVB
Computed By _____ Checked By _____

Project No. 78041-48
Client _____
Date _____ Sheet No. 1

STORMWATER MANAGEMENT
POWHATAN PHASE 4B
NEAR WELL LOT

WATERSHED DATA:

PRE DEVELOPMENT
AREA = 11.5 ACRES
C = 0.25
CA = 2.88
$t_{c\,PRE}$ = 24.5 MIN.

i_2 = 3.2 = Q_2 9.22
i_{10} = 4.3 = Q_{10} 12.38
i_{25} = 4.9 = Q_{25} 14.11
i_{100} = 6.0 = Q_{100} 17.28

POST DEVELOPMENT
AREA = 7.76 ACRES
C = 0.4
CA = 3.10
$t_{c\,POST}$ = 17 MIN.

i_2 = 3.7 = Q_2 = 11.48
i_{10} = 5.0 = Q_{10} = 15.52
i_{25} = 5.7 = Q_{25} = 17.69
i_{100} = 6.9 = Q_{100} = 21.42

3.418 ACRES BY PASSES BASIN
C = 0.4
CA = 1.37

i_2 = 3.7 = Q_2 = 5.07
i_{10} = 5.0 = Q_{10} = 6.85
i_{25} = 5.7 = Q_{25} = 7.81
i_{100} = 6.9 = Q_{100} = 9.45

STORM FREQUENCY	PRE DEVELOPED DISCHARGE	Q BYPASSING BASIN	ALLOWABLE DISCHARGE	DESIGNED DISCHARGE
2 YEAR	9.22 cfs	− 5.07 cfs	= 4.15 cfs	3.45 cfs
10 YEAR	12.38 cfs	− 6.85 cfs	= 5.53 cfs	4.22 cfs
25 YEAR	14.11 cfs.	− 7.81 cfs	= 6.30 cfs	5.10 cfs
100 YEAR	17.28 cfs.	− 9.45 cfs	= 7.83 cfs	10.75 cfs

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject POWHATAN DF
WILLIAMSBURG PHASE 4B
Computed By _____ Checked By _____

Project No. 78041-4B
Client _____
Date _____ Sheet No. 2

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject _____

Computed By _____ Checked By _____

Project No. _____

Client _____

Date _____ Sheet No. _____

SEDIMENT BASIN
POWHATAN PHASE IV B
NEAR WELL LOT

DRAINAGE AREA = 6.53 AC.

WET STORAGE REQUIRED =
6.53 X 67 cu yd = 437.5 X 27 = 11,812.7 cu ft

TOTAL STORAGE REQUIRED =
6.53 X 134 cu yd. = 875.0 X 27 = 23,625.5 cu ft.

STORAGE PROVIDED =

WET STORAGE = 10,702 cu ft. @ ELEV = 62.67

TOTAL STORAGE = 21,543 cu ft. @ ELEV = 65.00

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

```
*************************************************************************
*************************************************************************
*                                                                       *
*                                                                       *
*                        MODIFIED RATIONAL METHOD                       *
*            ---- Grand Summary For All Storm Frequencies ----          *
*                                                                       *
*                                                                       *
*************************************************************************
*************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

Area = 7.76 acres Tc = 17.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
2	0.400	82	1.562	4.85	4.15	23,849	11,524
10	0.400	85	2.096	6.51	5.53	33,178	16,256
25	0.440	51	3.205	10.94	6.30	33,486	20,634
100	0.500	92	2.787	10.81	7.83	59,684	34,080

PostDev to BMP

POND-2 Version: 5.17
S/N: 1295130250

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

CALCULATED 04-14-1995 08:00:53
DISK FILE: b:POW4B .VOL

Planimeter scale: 1 inch = 50 ft.

Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
57.92	0.00	0	0	0	0
58.00	0.02	60	60	2	2
59.00	0.68	1,705	2,085	695	697
60.00	0.91	2,286	5,966	1,989	2,685
61.00	1.12	2,790	7,602	2,534	5,219
62.00	1.35	3,371	9,228	3,076	8,295
63.00	1.62	4,049	11,115	3,705	12,000
64.00	1.92	4,805	13,265	4,422	16,422
65.00	2.18	5,444	15,364	5,121	21,543
66.00	2.49	6,225	17,491	5,830	27,374
66.50	2.55	6,375	18,900	3,150	30,524

Elevations With Areas Interpolated From
The Closest Two Planimeter Readings

62.67	-----	3,819	10,778	2,407	10,702
64.75	-----	5,281	15,123	3,781	20,203
65.57	-----	5,883	16,987	3,227	24,771

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

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 File: POW4B .STR

POND-2 Version: 5.17 S/N: 1295130250
Date Executed: Time Executed:

****
POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

****

Outlet Structure File: b:POW4B .STR
Planimeter Input File: b:POW4B .VOL
Rating Table Output File: b:POW4B .PND

Min. Elev.(ft) = 57.9199 Max. Elev.(ft) = 66.5 Incr.(ft) = .75

Additional elevations (ft) to be included in table:
* *
64.75

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
WEIR-VR	3		->	3
ORIFICE-VC	2		->	2
ORIFICE-VC	1		->	1

Outflow rating table summary was stored in file:
b:POW4B .PND

Outlet Structure File: POW4B .STR

POND-2 Version: 5.17 S/N: 1295130250
Date Executed: Time Executed:

****
POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
57.92	0.0	
58.67	1.1	1
59.42	1.8	1
60.17	2.4	1
60.92	2.8	1
61.67	3.1	1
62.42	3.5	1
63.17	3.9	2 +1
63.92	4.3	2 +1
64.67	4.6	2 +1
64.75	4.7	2 +1
65.42	8.6	3 +2 +1
66.17	22.1	3 +2 +1
66.50	0.0	

Outlet Structure File: POW4B .STR

POND-2 Version: 5.17 S/N: 1295130250
Date Executed: Time Executed:

****
POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

****

>>>>>> Structure No. 3 <<<<<<
(Input Data)

WEIR-VR
Weir - Vertical Rectangular

E1 elev.(ft)?	65.00
E2 elev.(ft)?	66.5
Weir coefficient?	3.33
Weir elev.(ft)?	65.00
Length (ft)?	4.0
Contracted/Suppressed (C/S)?	S

Outlet Structure File: POW4B .STR

POND-2 Version: 5.17 S/N: 1295130250
Date Executed: Time Executed:

****
POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	62.67
E2 elev.(ft)?	66.5
Orifice coeff.?	.6
Invert elev.(ft)?	62.67
Datum elev.(ft)?	62.795
Diameter (ft)?	.25 (3")

Outlet Structure File: POW4B .STR

POND-2 Version: 5.17 S/N: 1295130250
Date Executed: Time Executed:

****
POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	57.92
E2 elev.(ft)?	66.5
Orifice coeff.?	.6
Invert elev.(ft)?	57.921
Datum elev.(ft)?	58.25
Diameter (ft)?	0.67 (8")

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

```
*****************************************************************************
*  RETURN FREQUENCY:   2 yr     |  Allowable Outflow:     4.15 cfs     *
*  'C' Adjustment: 1.000        |  Required Storage:    11,524 cu.ft. *
*---------------------------------------------------------------------------*
*  Peak Inflow:     4.85 cfs       Inflow .HYD stored: 4B2      .HYD    *
*****************************************************************************
```

11.48

```
    |                Td =  82 minutes                  |  Return Freq:     2 yr
   /------- Approx. Duration for Max. Storage ------/   C adj.factor: 1.00
    |                                                  |
    |                                                  |
    |                Tc=   17.00  minutes              |
    |                I =   3.800  in/hr                |  Area (ac):      7.76
    |              . Q =   11.80  cfs                  |  Weighted C:     0.40
    |            .|.                                   |  Adjusted C:     0.40
F   |           .   .                                  |
L   |         .  |  .              Required Storage    |
O   |        .       .         .--    11,524 cu.ft.    |  Td=       82 minutes
W   |       .    |    .        |                      |  I =    1.562 in/hr
    |      .     x x x x x x x|x x x x x x x x x x x x |  Q =     4.85 cfs
c   |     .                   |
f   |    .    x                                        x
s   |   .                                                o   Q=     4.15 cfs
    |  .   x                                o           |x  (Allow.Outflow)
    | .  x                  .     o                     |
    | .  x              o    .       NOT TO SCALE       |   x
    | . x       o               .      ============     |
    | o                          .                      |       x
    `-------------------------------------------------|------------
                                                      84.45 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

**** Modified Rational Hydrograph *****

Weighted C = 0.400 Area= 7.760 acres Tc = 17.00 minutes

Adjusted C = 0.400 Td= 82.00 min. I= 1.56 in/hr Qp= 4.85 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 4B2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.29	0.57	0.86	1.14	1.43	1.71
7.00	2.00	2.28	2.57	2.85	3.14	3.42	3.71
14.00	3.99	4.28	4.56	4.85	4.85	4.85	4.85
21.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
28.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
35.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
42.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
49.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
56.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
63.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
70.00	4.85	4.85	4.85	4.85	4.85	4.85	4.85
77.00	4.85	4.85	4.85	4.85	4.85	4.85	4.56
84.00	4.28	3.99	3.71	3.42	3.14	2.85	2.57
91.00	2.28	2.00	1.71	1.43	1.14	0.86	0.57
98.00	0.29	0.00					

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
RES. AREA	0.400	7.76						
			17.00	0.400	0.400	3.800	7.76	11.80

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

RETURN FREQUENCY: 2 yr 'C' Adjustment = 1.000 Allowable Q = 4.15 cfs

Hydrograph file duration= 82.00 minutes
Hydrograph file: 4B2 .HYD Tc = 17.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.400	0.400	17	3.800	7.76	11.80	12,031	7,798
0.400	0.400	20	3.500	7.76	10.86	13,037	8,430
0.400	0.400	30	2.750	7.76	8.54	15,365	9,513
0.400	0.400	40	2.250	7.76	6.98	16,762	9,665
0.400	0.400	50	2.000	7.76	6.21	18,624	10,283
0.400	0.400	60	1.800	7.76	5.59	20,114	10,527
********** Storage Maximum							
0.400	0.400	82	1.562	7.76	4.85	23,849	11,524
0.400	0.400	120	1.150	7.76	3.57	Qpeak < Qallow	

```
*************************************************
*                                               *
*  POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B  *
*  STORMWATER MANAGEMENT FACILITY NEAR WELL LOT *
*                                               *
*                                               *
*                                               *
*************************************************
```

Inflow Hydrograph: b:4B2 .HYD
Rating Table file: b:POW4B .PND

----INITIAL CONDITIONS----
Elevation = 57.92 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
57.92	0.0	0	0.0	0.0
58.67	1.1	271	9.0	10.1
59.42	1.8	1,461	48.7	50.5
60.17	2.4	3,081	102.7	105.1
60.92	2.8	4,997	166.5	169.3
61.67	3.1	7,215	240.5	243.6
62.42	3.5	9,768	325.5	329.0
63.17	3.9	12,699	423.2	427.1
63.92	4.3	16,040	534.5	538.8
64.67	4.6	19,782	659.3	663.9
64.75	4.7	20,203	673.3	678.0
65.42	8.6	23,897	796.4	805.0
66.17	22.1	28,436	947.7	969.8

Time increment (t) = 1.0 min.

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B2 .HYD
Outflow Hydrograph: b:2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	57.92
1.0	0.29	0.3	0.2	0.3	0.03	57.94
2.0	0.57	0.9	0.9	1.1	0.12	58.00
3.0	0.86	1.4	1.8	2.3	0.25	58.09
4.0	1.14	2.0	3.0	3.8	0.41	58.20
5.0	1.43	2.6	4.3	5.5	0.60	58.33
6.0	1.71	3.1	5.9	7.5	0.81	58.47
7.0	2.00	3.7	7.5	9.6	1.04	58.63
8.0	2.28	4.3	9.5	11.8	1.13	58.70
9.0	2.57	4.9	12.0	14.4	1.17	58.75
10.0	2.85	5.4	15.0	17.4	1.23	58.81
11.0	3.14	6.0	18.4	21.0	1.29	58.87
12.0	3.42	6.6	22.2	25.0	1.36	58.95
13.0	3.71	7.1	26.5	29.4	1.43	59.03
14.0	3.99	7.7	31.2	34.2	1.52	59.12
15.0	4.28	8.3	36.2	39.4	1.61	59.21
16.0	4.56	8.8	41.7	45.1	1.71	59.32
17.0	4.85	9.4	47.5	51.1	1.81	59.43
18.0	4.85	9.7	53.4	57.2	1.87	59.51
19.0	4.85	9.7	59.2	63.1	1.94	59.59
20.0	4.85	9.7	64.9	68.9	2.00	59.67
21.0	4.85	9.7	70.5	74.6	2.07	59.75
22.0	4.85	9.7	75.9	80.2	2.13	59.83
23.0	4.85	9.7	81.3	85.6	2.19	59.90
24.0	4.85	9.7	86.5	91.0	2.24	59.98
25.0	4.85	9.7	91.6	96.2	2.30	60.05
26.0	4.85	9.7	96.6	101.3	2.36	60.12
27.0	4.85	9.7	101.4	106.3	2.41	60.18
28.0	4.85	9.7	106.3	111.1	2.44	60.24
29.0	4.85	9.7	111.0	116.0	2.47	60.30
30.0	4.85	9.7	115.7	120.7	2.50	60.35
31.0	4.85	9.7	120.4	125.4	2.53	60.41
32.0	4.85	9.7	125.0	130.1	2.56	60.46
33.0	4.85	9.7	129.5	134.7	2.58	60.52
34.0	4.85	9.7	134.0	139.2	2.61	60.57
35.0	4.85	9.7	138.4	143.7	2.64	60.62
36.0	4.85	9.7	142.8	148.1	2.67	60.67
37.0	4.85	9.7	147.1	152.5	2.69	60.72
38.0	4.85	9.7	151.3	156.8	2.72	60.77
39.0	4.85	9.7	155.5	161.0	2.75	60.82
40.0	4.85	9.7	159.7	165.2	2.77	60.87
41.0	4.85	9.7	163.8	169.4	2.80	60.92
42.0	4.85	9.7	167.8	173.5	2.82	60.96
43.0	4.85	9.7	171.9	177.5	2.83	61.00
44.0	4.85	9.7	175.9	181.6	2.85	61.04

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B2 .HYD
Outflow Hydrograph: b:2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	4.85	9.7	179.8	185.6	2.87	61.08
46.0	4.85	9.7	183.8	189.5	2.88	61.12
47.0	4.85	9.7	187.7	193.5	2.90	61.16
48.0	4.85	9.7	191.6	197.4	2.91	61.20
49.0	4.85	9.7	195.4	201.3	2.93	61.24
50.0	4.85	9.7	199.2	205.1	2.94	61.28
51.0	4.85	9.7	203.0	208.9	2.96	61.32
52.0	4.85	9.7	206.7	212.7	2.98	61.36
53.0	4.85	9.7	210.5	216.4	2.99	61.40
54.0	4.85	9.7	214.2	220.2	3.01	61.43
55.0	4.85	9.7	217.8	223.9	3.02	61.47
56.0	4.85	9.7	221.4	227.5	3.04	61.51
57.0	4.85	9.7	225.0	231.1	3.05	61.54
58.0	4.85	9.7	228.6	234.7	3.06	61.58
59.0	4.85	9.7	232.2	238.3	3.08	61.62
60.0	4.85	9.7	235.7	241.9	3.09	61.65
61.0	4.85	9.7	239.2	245.4	3.11	61.69
62.0	4.85	9.7	242.6	248.9	3.12	61.72
63.0	4.85	9.7	246.0	252.3	3.14	61.75
64.0	4.85	9.7	249.4	255.7	3.16	61.78
65.0	4.85	9.7	252.8	259.1	3.17	61.81
66.0	4.85	9.7	256.1	262.5	3.19	61.84
67.0	4.85	9.7	259.4	265.8	3.20	61.87
68.0	4.85	9.7	262.6	269.1	3.22	61.89
69.0	4.85	9.7	265.9	272.3	3.23	61.92
70.0	4.85	9.7	269.1	275.6	3.25	61.95
71.0	4.85	9.7	272.2	278.8	3.26	61.98
72.0	4.85	9.7	275.4	281.9	3.28	62.01
73.0	4.85	9.7	278.5	285.1	3.29	62.03
74.0	4.85	9.7	281.6	288.2	3.31	62.06
75.0	4.85	9.7	284.6	291.3	3.32	62.09
76.0	4.85	9.7	287.7	294.3	3.34	62.12
77.0	4.85	9.7	290.7	297.4	3.35	62.14
78.0	4.85	9.7	293.6	300.4	3.37	62.17
79.0	4.85	9.7	296.6	303.3	3.38	62.19
80.0	4.85	9.7	299.5	306.3	3.39	62.22
81.0	4.85	9.7	302.4	309.2	3.41	62.25
82.0	4.85	9.7	305.2	312.1	3.42	62.27
83.0	4.56	9.4	307.8	314.6	3.43	62.29
84.0	4.28	8.8	309.7	316.6	3.44	62.31
85.0	3.99	8.3	311.1	318.0	3.45	62.32
86.0	3.71	7.7	311.9	318.8	3.45	62.33
87.0	3.42	7.1	312.1	319.0	3.45	62.33
88.0	3.14	6.6	311.8	318.7	3.45	62.33
89.0	2.85	6.0	310.9	317.8	3.45	62.32
90.0	2.57	5.4	309.4	316.3	3.44	62.31

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B2 .HYD
Outflow Hydrograph: b:2OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
91.0	2.28	4.9	307.4	314.3	3.43	62.29
92.0	2.00	4.3	304.8	311.7	3.42	62.27
93.0	1.71	3.7	301.7	308.5	3.40	62.24
94.0	1.43	3.1	298.1	304.9	3.39	62.21
95.0	1.14	2.6	293.9	300.7	3.37	62.17
96.0	0.86	2.0	289.2	295.9	3.35	62.13
97.0	0.57	1.4	284.0	290.7	3.32	62.08
98.0	0.29	0.9	278.3	284.9	3.29	62.03
99.0	0.00	0.3	272.1	278.6	3.26	61.98

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

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B2 .HYD
Outflow Hydrograph: b:2OUT .HYD

Starting Pond W.S. Elevation = 57.92 ft

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

Peak Inflow = 4.85 cfs 11.48
Peak Outflow = 3.45 cfs
Peak Elevation = 62.33 ft

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

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	9,469 cu-ft
Total Storage in Pond	=	9,469 cu-ft

.22 Ac-Ft

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

```
*****************************************************************************
*  RETURN FREQUENCY:  10 yr      |  Allowable Outflow:      5.53 cfs      *
*  'C' Adjustment: 1.000         |  Required Storage:     16,256 cu.ft.  *
*---------------------------------------------------------------------------*
*  Peak Inflow:     6.51 cfs        Inflow .HYD stored: 4B10     .HYD      *
*****************************************************************************
```

15.52

```
|                Td =  85 minutes                    |  Return Freq:     10 yr
/------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.00
|                                                   |
|                                                   |
|                Tc=   17.00  minutes               |
|                I =   5.030  in/hr                 |  Area (ac):      7.76
|              . Q =   15.61  cfs                   |  Weighted C:     0.40
|            .|.                                    |  Adjusted C:     0.40
F |            .   .                                 |
L |          .  |  .              Required Storage  |
O |        .       .         .--     16,256 cu.ft.  |  Td=       85 minutes
W |      .    |    .        |                      |  I =    2.096 in/hr
  |     .     x x x x x x x|x x x x x x x x x x x   Q =     6.51 cfs
c |    .                   |
f |   .    x                                         x
s |  .                                                 o   Q=     5.53 cfs
  |  .   x                                o           |x  (Allow.Outflow)
  |  .  x                 .     o                     |
  |  .  x              o     .       NOT TO SCALE     |   x
  | . x       o              .      ============      |
  | o                          .                      |       x
  `-------------------------------------------------|------------
                                                   87.55 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

**** Modified Rational Hydrograph *****

Weighted C = 0.400 Area= 7.760 acres Tc = 17.00 minutes

Adjusted C = 0.400 Td= 85.00 min. I= 2.10 in/hr Qp= 6.51 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 4B10 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.38	0.77	1.15	1.53	1.91	2.30
7.00	2.68	3.06	3.44	3.83	4.21	4.59	4.97
14.00	5.36	5.74	6.12	6.51	6.51	6.51	6.51
21.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
28.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
35.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
42.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
49.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
56.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
63.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
70.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
77.00	6.51	6.51	6.51	6.51	6.51	6.51	6.51
84.00	6.51	6.51	6.12	5.74	5.36	4.97	4.59
91.00	4.21	3.83	3.44	3.06	2.68	2.30	1.91
98.00	1.53	1.15	0.77	0.38	0.00		

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
'C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
RES. AREA	0.400	7.76						
			17.00	0.400	0.400	5.030	7.76	15.61

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

RETURN FREQUENCY: 10 yr 'C' Adjustment = 1.000 Allowable Q = 5.53 cfs

Hydrograph file duration= 85.00 minutes
Hydrograph file: 4B10 .HYD Tc = 17.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.400	0.400	17	5.030	7.76	15.61	15,925	10,285
0.400	0.400	20	4.700	7.76	14.59	17,507	11,368
0.400	0.400	30	3.750	7.76	11.64	20,952	13,155
0.400	0.400	40	3.150	7.76	9.78	23,466	14,010
0.400	0.400	50	2.750	7.76	8.54	25,608	14,493
0.400	0.400	60	2.450	7.76	7.60	27,377	14,603
********** Storage Maximum							
0.400	0.400	85	2.096	7.76	6.51	33,178	16,256
0.400	0.400	120	1.600	7.76	4.97	Qpeak < Qallow	

```
*************************************************
*                                               *
*  POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B  *
*  STORMWATER MANAGEMENT FACILITY NEAR WELL LOT *
*                                               *
*                                               *
*                                               *
*************************************************
```

Inflow Hydrograph: b:4B10 .HYD
Rating Table file: b:POW4B .PND

----INITIAL CONDITIONS----
Elevation = 57.92 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
57.92	0.0	0	0.0	0.0
58.67	1.1	271	9.0	10.1
59.42	1.8	1,461	48.7	50.5
60.17	2.4	3,081	102.7	105.1
60.92	2.8	4,997	166.5	169.3
61.67	3.1	7,215	240.5	243.6
62.42	3.5	9,768	325.5	329.0
63.17	3.9	12,699	423.2	427.1
63.92	4.3	16,040	534.5	538.8
64.67	4.6	19,782	659.3	663.9
64.75	4.7	20,203	673.3	678.0
65.42	8.6	23,897	796.4	805.0
66.17	22.1	28,436	947.7	969.8

Time increment (t) = 1.0 min.

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B10 .HYD
Outflow Hydrograph: b:10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	57.92
1.0	0.38	0.4	0.3	0.4	0.04	57.95
2.0	0.77	1.2	1.1	1.4	0.16	58.03
3.0	1.15	1.9	2.4	3.1	0.33	58.15
4.0	1.53	2.7	4.0	5.1	0.55	58.29
5.0	1.91	3.4	5.8	7.4	0.80	58.47
6.0	2.30	4.2	7.8	10.0	1.09	58.66
7.0	2.68	5.0	10.5	12.8	1.15	58.72
8.0	3.06	5.7	13.9	16.3	1.21	58.78
9.0	3.44	6.5	17.8	20.4	1.28	58.86
10.0	3.83	7.3	22.4	25.1	1.36	58.95
11.0	4.21	8.0	27.5	30.4	1.45	59.05
12.0	4.59	8.8	33.2	36.3	1.55	59.16
13.0	4.97	9.6	39.4	42.7	1.67	59.28
14.0	5.36	10.3	46.2	49.7	1.79	59.41
15.0	5.74	11.1	53.5	57.3	1.87	59.51
16.0	6.12	11.9	61.5	65.4	1.96	59.62
17.0	6.51	12.6	70.0	74.1	2.06	59.74
18.0	6.51	13.0	78.7	83.0	2.16	59.87
19.0	6.51	13.0	87.2	91.7	2.25	59.99
20.0	6.51	13.0	95.5	100.2	2.35	60.10
21.0	6.51	13.0	103.7	108.5	2.42	60.21
22.0	6.51	13.0	111.8	116.7	2.47	60.31
23.0	6.51	13.0	119.7	124.8	2.52	60.40
24.0	6.51	13.0	127.6	132.8	2.57	60.49
25.0	6.51	13.0	135.4	140.6	2.62	60.59
26.0	6.51	13.0	143.1	148.4	2.67	60.68
27.0	6.51	13.0	150.7	156.1	2.72	60.77
28.0	6.51	13.0	158.1	163.7	2.76	60.85
29.0	6.51	13.0	165.6	171.2	2.81	60.94
30.0	6.51	13.0	172.9	178.6	2.84	61.01
31.0	6.51	13.0	180.2	185.9	2.87	61.09
32.0	6.51	13.0	187.4	193.2	2.90	61.16
33.0	6.51	13.0	194.6	200.4	2.93	61.23
34.0	6.51	13.0	201.7	207.6	2.95	61.31
35.0	6.51	13.0	208.7	214.7	2.98	61.38
36.0	6.51	13.0	215.7	221.8	3.01	61.45
37.0	6.51	13.0	222.7	228.8	3.04	61.52
38.0	6.51	13.0	229.6	235.7	3.07	61.59
39.0	6.51	13.0	236.4	242.6	3.10	61.66
40.0	6.51	13.0	243.2	249.4	3.13	61.72
41.0	6.51	13.0	249.9	256.2	3.16	61.78
42.0	6.51	13.0	256.5	262.9	3.19	61.84
43.0	6.51	13.0	263.1	269.5	3.22	61.90
44.0	6.51	13.0	269.6	276.1	3.25	61.96

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B10 .HYD
Outflow Hydrograph: b:10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	6.51	13.0	276.0	282.6	3.28	62.01
46.0	6.51	13.0	282.4	289.1	3.31	62.07
47.0	6.51	13.0	288.8	295.5	3.34	62.13
48.0	6.51	13.0	295.0	301.8	3.37	62.18
49.0	6.51	13.0	301.3	308.1	3.40	62.24
50.0	6.51	13.0	307.4	314.3	3.43	62.29
51.0	6.51	13.0	313.5	320.4	3.46	62.34
52.0	6.51	13.0	319.6	326.5	3.49	62.40
53.0	6.51	13.0	325.6	332.6	3.51	62.45
54.0	6.51	13.0	331.5	338.6	3.54	62.49
55.0	6.51	13.0	337.4	344.5	3.56	62.54
56.0	6.51	13.0	343.2	350.4	3.59	62.58
57.0	6.51	13.0	349.0	356.3	3.61	62.63
58.0	6.51	13.0	354.8	362.1	3.63	62.67
59.0	6.51	13.0	360.5	367.8	3.66	62.72
60.0	6.51	13.0	366.1	373.5	3.68	62.76
61.0	6.51	13.0	371.8	379.2	3.70	62.80
62.0	6.51	13.0	377.3	384.8	3.73	62.85
63.0	6.51	13.0	382.8	390.3	3.75	62.89
64.0	6.51	13.0	388.3	395.9	3.77	62.93
65.0	6.51	13.0	393.7	401.3	3.79	62.97
66.0	6.51	13.0	399.1	406.8	3.82	63.01
67.0	6.51	13.0	404.5	412.2	3.84	63.06
68.0	6.51	13.0	409.8	417.5	3.86	63.10
69.0	6.51	13.0	415.0	422.8	3.88	63.14
70.0	6.51	13.0	420.2	428.1	3.90	63.18
71.0	6.51	13.0	425.4	433.3	3.92	63.21
72.0	6.51	13.0	430.6	438.4	3.94	63.25
73.0	6.51	13.0	435.7	443.6	3.96	63.28
74.0	6.51	13.0	440.7	448.7	3.98	63.31
75.0	6.51	13.0	445.8	453.7	4.00	63.35
76.0	6.51	13.0	450.7	458.8	4.01	63.38
77.0	6.51	13.0	455.7	463.8	4.03	63.42
78.0	6.51	13.0	460.6	468.7	4.05	63.45
79.0	6.51	13.0	465.5	473.6	4.07	63.48
80.0	6.51	13.0	470.4	478.5	4.08	63.52
81.0	6.51	13.0	475.2	483.4	4.10	63.55
82.0	6.51	13.0	480.0	488.2	4.12	63.58
83.0	6.51	13.0	484.7	493.0	4.14	63.61
84.0	6.51	13.0	489.4	497.7	4.15	63.64
85.0	6.51	13.0	494.1	502.4	4.17	63.68
86.0	6.12	12.6	498.4	506.7	4.19	63.70
87.0	5.74	11.9	501.8	510.2	4.20	63.73
88.0	5.36	11.1	504.5	512.9	4.21	63.75
89.0	4.97	10.3	506.4	514.8	4.21	63.76
90.0	4.59	9.6	507.5	516.0	4.22	63.77

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B10 .HYD
Outflow Hydrograph: b:10OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
91.0	4.21	8.8	507.9	516.3	4.22	63.77
92.0	3.83	8.0	507.5	515.9	4.22	63.77
93.0	3.44	7.3	506.4	514.8	4.21	63.76
94.0	3.06	6.5	504.4	512.9	4.21	63.75
95.0	2.68	5.7	501.8	510.2	4.20	63.73
96.0	2.30	5.0	498.4	506.8	4.19	63.70
97.0	1.91	4.2	494.3	502.6	4.17	63.68
98.0	1.53	3.4	489.4	497.7	4.15	63.64
99.0	1.15	2.7	483.8	492.1	4.13	63.61
100.0	0.77	1.9	477.5	485.7	4.11	63.56
101.0	0.38	1.2	470.5	478.7	4.08	63.52
102.0	0.00	0.4	462.8	470.9	4.06	63.46

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

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B10 .HYD
Outflow Hydrograph: b:10OUT .HYD

Starting Pond W.S. Elevation = 57.92 ft

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

Peak Inflow = 6.51 cfs 15.52
Peak Outflow = 4.22 cfs
Peak Elevation = 63.77 ft

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

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	15,367 cu-ft
Total Storage in Pond	=	15,367 cu-ft

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

```
*****************************************************************
*  RETURN FREQUENCY:  25 yr     |  Allowable Outflow:     6.30 cfs    *
*  'C' Adjustment: 1.100        |  Required Storage:    20,634 cu.ft. *
*---------------------------------------------------------------*
*  Peak Inflow:   10.94 cfs       Inflow .HYD stored: 4B25    .HYD   *
*****************************************************************
```

```
    |                Td =  51 minutes                  |  Return Freq:    25 yr
    /------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.10
    |                                                  |
    |                                                  |
    |                Tc=   17.00  minutes              |
    |                I =   5.760  in/hr                |  Area (ac):      7.76
    |              . Q =   19.67  cfs                  |  Weighted C:     0.40
    |            .|.                                   |  Adjusted C:     0.44
F   |           .   .                                  |
L   |          .  |  .              Required Storage   |
O   |         .       .         .--    20,634 cu.ft.  |  Td=       51 minutes
W   |        .    |    .       |                      |  I =    3.205 in/hr
    |       .     x x x x x x x|x x x x x x x x x x x  Q =    10.94 cfs
c   |      .                   |
f   |     .    x                                       x
s   |    .                                               o   Q=    6.30 cfs
    |   .   x                                o          |x  (Allow.Outflow)
    |  .  x                 .     o                     |
    |  .  x               o    .        NOT TO SCALE    |   x
    | . x       o               .       ============    |
    | o                          .                      |       x
    `-------------------------------------------------|------------
                                                      58.21 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

**** Modified Rational Hydrograph *****

Weighted C = 0.400 Area= 7.760 acres Tc = 17.00 minutes

Adjusted C = 0.440 Td= 51.00 min. I= 3.20 in/hr Qp= 10.94 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 4B25 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.64	1.29	1.93	2.57	3.22	3.86
7.00	4.51	5.15	5.79	6.44	7.08	7.72	8.37
14.00	9.01	9.66	10.30	10.94	10.94	10.94	10.94
21.00	10.94	10.94	10.94	10.94	10.94	10.94	10.94
28.00	10.94	10.94	10.94	10.94	10.94	10.94	10.94
35.00	10.94	10.94	10.94	10.94	10.94	10.94	10.94
42.00	10.94	10.94	10.94	10.94	10.94	10.94	10.94
49.00	10.94	10.94	10.94	10.30	9.66	9.01	8.37
56.00	7.72	7.08	6.44	5.79	5.15	4.51	3.86
63.00	3.22	2.57	1.93	1.29	0.64	0.00	

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 25 years
'C' adjustment, k = 1.1
Adj. 'C' = Wtd.'C' x 1.1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
RES. AREA	0.400	7.76						
			17.00	0.400	0.440	5.760	7.76	19.67

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

RETURN FREQUENCY: 25 yr 'C' Adjustment = 1.100 Allowable Q = 6.30 cfs

Hydrograph file duration= 51.00 minutes
Hydrograph file: 4B25 .HYD Tc = 17.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.400	0.440	17	5.760	7.76	19.67	20,060	13,634
0.400	0.440	20	5.400	7.76	18.44	22,125	15,132
0.400	0.440	30	4.400	7.76	15.02	27,042	18,159
0.400	0.440	40	3.600	7.76	12.29	29,500	18,727
0.400	0.440	50	3.250	7.76	11.10	33,290	20,627
********** Storage Maximum							
0.400	0.440	51	3.205	7.76	10.94	33,486	20,634
0.400	0.440	60	2.800	7.76	9.56	34,417	19,864
0.400	0.440	120	1.750	7.76	5.98	Qpeak < Qallow	

```
*****************************************************
*                                                   *
*  POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B      *
*  STORMWATER MANAGEMENT FACILITY NEAR WELL LOT     *
*                                                   *
*                                                   *
*                                                   *
*****************************************************
```

Inflow Hydrograph: b:4B25 .HYD
Rating Table file: b:POW4B .PND

----INITIAL CONDITIONS----
Elevation = 57.92 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
57.92	0.0	0	0.0	0.0
58.67	1.1	271	9.0	10.1
59.42	1.8	1,461	48.7	50.5
60.17	2.4	3,081	102.7	105.1
60.92	2.8	4,997	166.5	169.3
61.67	3.1	7,215	240.5	243.6
62.42	3.5	9,768	325.5	329.0
63.17	3.9	12,699	423.2	427.1
63.92	4.3	16,040	534.5	538.8
64.67	4.6	19,782	659.3	663.9
64.75	4.7	20,203	673.3	678.0
65.42	8.6	23,897	796.4	805.0
66.17	22.1	28,436	947.7	969.8

Time increment (t) = 1.0 min.

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B25 .HYD
Outflow Hydrograph: b:25OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	57.92
1.0	0.64	0.6	0.5	0.6	0.07	57.97
2.0	1.29	1.9	1.9	2.4	0.26	58.10
3.0	1.93	3.2	4.0	5.1	0.56	58.30
4.0	2.57	4.5	6.7	8.5	0.92	58.55
5.0	3.22	5.8	10.2	12.5	1.14	58.71
6.0	3.86	7.1	14.8	17.3	1.22	58.80
7.0	4.51	8.4	20.5	23.2	1.33	58.91
8.0	5.15	9.7	27.3	30.2	1.45	59.04
9.0	5.79	10.9	35.1	38.2	1.59	59.19
10.0	6.44	12.2	43.8	47.3	1.74	59.36
11.0	7.08	13.5	53.6	57.3	1.88	59.51
12.0	7.72	14.8	64.4	68.4	2.00	59.67
13.0	8.37	16.1	76.2	80.5	2.13	59.83
14.0	9.01	17.4	89.0	93.6	2.27	60.01
15.0	9.66	18.7	102.9	107.7	2.42	60.20
16.0	10.30	20.0	117.8	122.8	2.51	60.38
17.0	10.94	21.2	133.8	139.1	2.61	60.57
18.0	10.94	21.9	150.3	155.7	2.72	60.76
19.0	10.94	21.9	166.5	172.2	2.81	60.95
20.0	10.94	21.9	182.7	188.4	2.88	61.11
21.0	10.94	21.9	198.7	204.5	2.94	61.28
22.0	10.94	21.9	214.5	220.5	3.01	61.44
23.0	10.94	21.9	230.3	236.4	3.07	61.60
24.0	10.94	21.9	245.9	252.1	3.14	61.75
25.0	10.94	21.9	261.3	267.7	3.21	61.88
26.0	10.94	21.9	276.6	283.2	3.29	62.02
27.0	10.94	21.9	291.8	298.5	3.36	62.15
28.0	10.94	21.9	306.8	313.7	3.43	62.29
29.0	10.94	21.9	321.7	328.7	3.50	62.42
30.0	10.94	21.9	336.5	343.6	3.56	62.53
31.0	10.94	21.9	351.1	358.3	3.62	62.64
32.0	10.94	21.9	365.6	373.0	3.68	62.76
33.0	10.94	21.9	380.0	387.5	3.74	62.87
34.0	10.94	21.9	394.3	401.9	3.80	62.98
35.0	10.94	21.9	408.5	416.2	3.86	63.09
36.0	10.94	21.9	422.5	430.4	3.91	63.19
37.0	10.94	21.9	436.5	444.4	3.96	63.29
38.0	10.94	21.9	450.3	458.4	4.01	63.38
39.0	10.94	21.9	464.1	472.2	4.06	63.47
40.0	10.94	21.9	477.8	486.0	4.11	63.57
41.0	10.94	21.9	491.3	499.6	4.16	63.66
42.0	10.94	21.9	504.8	513.2	4.21	63.75
43.0	10.94	21.9	518.2	526.7	4.26	63.84
44.0	10.94	21.9	531.4	540.0	4.30	63.93

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B25 .HYD
Outflow Hydrograph: b:25OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	10.94	21.9	544.6	553.3	4.33	64.01
46.0	10.94	21.9	557.8	566.5	4.37	64.09
47.0	10.94	21.9	570.9	579.7	4.40	64.16
48.0	10.94	21.9	583.9	592.8	4.43	64.24
49.0	10.94	21.9	596.9	605.8	4.46	64.32
50.0	10.94	21.9	609.7	618.7	4.49	64.40
51.0	10.94	21.9	622.6	631.6	4.52	64.48
52.0	10.30	21.2	634.7	643.8	4.55	64.55
53.0	9.66	20.0	645.5	654.7	4.58	64.61
54.0	9.01	18.7	655.0	664.2	4.60	64.67
55.0	8.37	17.4	663.0	672.4	4.66	64.72
56.0	7.72	16.1	669.7	679.1	4.74	64.76
57.0	7.08	14.8	674.7	684.5	4.90	64.78
58.0	6.44	13.5	678.2	688.2	5.01	64.80
59.0	5.79	12.2	680.2	690.4	5.08	64.82
60.0	5.15	10.9	681.0	691.2	5.10	64.82
61.0	4.51	9.7	680.4	690.6	5.09	64.82
62.0	3.86	8.4	678.8	688.8	5.03	64.81
63.0	3.22	7.1	675.9	685.8	4.94	64.79
64.0	2.57	5.8	672.1	681.7	4.82	64.77
65.0	1.93	4.5	667.2	676.6	4.69	64.74
66.0	1.29	3.2	661.2	670.4	4.65	64.71
67.0	0.64	1.9	653.9	663.1	4.60	64.67
68.0	0.00	0.6	645.4	654.5	4.58	64.61

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

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B25 .HYD
Outflow Hydrograph: b:25OUT .HYD

Starting Pond W.S. Elevation = 57.92 ft

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

Peak Inflow = 10.94 cfs
Peak Outflow = 5.10 cfs
Peak Elevation = 64.82 ft

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

Initial Storage = 0 cu-ft
Peak Storage From Storm = 20,586 cu-ft

Total Storage in Pond = 20,586 cu-ft

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

```
*****************************************************************
*  RETURN FREQUENCY: 100 yr     |  Allowable Outflow:     7.83 cfs    *
*  'C' Adjustment: 1.250        |  Required Storage:    34,080 cu.ft. *
*---------------------------------------------------------------*
*  Peak Inflow:    10.81 cfs       Inflow .HYD stored: 4B100   .HYD   *
*****************************************************************
```

21.42

```
    |                Td =  92 minutes                  |  Return Freq:   100 yr
   /------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.25
    |                                                 |
    |                                                 |
    |                Tc=   17.00  minutes             |
    |                I =   6.920  in/hr               |  Area (ac):      7.76
    |              . Q =   26.85  cfs                 |  Weighted C:     0.40
    |            .|.                                  |  Adjusted C:     0.50
F   |           .   .                                 |
L   |          .  |  .             Required Storage   |
O   |         .       .        .--    34,080 cu.ft.  |  Td=       92 minutes
W   |        .    |    .       |                     |  I =    2.787 in/hr
    |       .     x x x x x x x|x x x x x x x x x x x  Q =    10.81 cfs
c   |      .                   |
f   |     .    x                                      x
s   |    .                                              o   Q=    7.83 cfs
    |   .   x                                o         |x  (Allow.Outflow)
    |  .  x                  .     o                   |
    | .  x               o    .       NOT TO SCALE      |   x
    | . x       o              .      ============      |
    | o                          .                      |      x
    `-------------------------------------------------|------------
                                                   96.69 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

**** Modified Rational Hydrograph *****

Weighted C = 0.400 Area= 7.760 acres Tc = 17.00 minutes

Adjusted C = 0.500 Td= 92.00 min. I= 2.79 in/hr Qp= 10.81 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 4B100 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first Q in each row.

Time Minutes							
0.00	0.00	0.64	1.27	1.91	2.54	3.18	3.82
7.00	4.45	5.09	5.72	6.36	7.00	7.63	8.27
14.00	8.90	9.54	10.18	10.81	10.81	10.81	10.81
21.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
28.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
35.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
42.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
49.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
56.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
63.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
70.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
77.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
84.00	10.81	10.81	10.81	10.81	10.81	10.81	10.81
91.00	10.81	10.81	10.18	9.54	8.90	8.27	7.63
98.00	7.00	6.36	5.72	5.09	4.45	3.82	3.18
105.00	2.54	1.91	1.27	0.64	0.00		

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
'C' adjustment, k = 1.25
Adj. 'C' = Wtd.'C' x 1.25

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
RES. AREA	0.400	7.76						
			17.00	0.400	0.500	6.920	7.76	26.85

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 12:59:25 06-21-1994

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B
STORMWATER MANAGEMENT FACILITY NEAR WELL LOT

RETURN FREQUENCY: 100 yr 'C' Adjustment = 1.250 Allowable Q = 7.83 cfs

Hydrograph file duration= 92.00 minutes
Hydrograph file: 4B100 .HYD Tc = 17.00 minutes

Weighted 'C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.400	0.500	17	6.920	7.76	26.85	27,387	19,400
0.400	0.500	20	6.500	7.76	25.22	30,264	21,573
0.400	0.500	30	5.250	7.76	20.37	36,666	25,626
0.400	0.500	40	4.500	7.76	17.46	41,904	28,515
0.400	0.500	50	3.800	7.76	14.74	44,232	28,494
0.400	0.500	60	3.400	7.76	13.19	47,491	29,404
********** Storage Maximum							
0.400	0.500	92	2.787	7.76	10.81	59,684	34,080
0.400	0.500	120	2.250	7.76	8.73	62,856	30,675
0.400	0.500	180	1.700	7.76	6.60	Qpeak < Qallow	

```
*************************************************
*                                               *
*  POWHATAN OF WILLIAMSBURG SECONDARY PHASE 4B  *
*  STORMWATER MANAGEMENT FACILITY NEAR WELL LOT *
*                                               *
*                                               *
*                                               *
*************************************************
```

Inflow Hydrograph: b:4B100 .HYD
Rating Table file: b:POW4B .PND

----INITIAL CONDITIONS----
Elevation = 57.92 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
57.92	0.0	0	0.0	0.0
58.67	1.1	271	9.0	10.1
59.42	1.8	1,461	48.7	50.5
60.17	2.4	3,081	102.7	105.1
60.92	2.8	4,997	166.5	169.3
61.67	3.1	7,215	240.5	243.6
62.42	3.5	9,768	325.5	329.0
63.17	3.9	12,699	423.2	427.1
63.92	4.3	16,040	534.5	538.8
64.67	4.6	19,782	659.3	663.9
64.75	4.7	20,203	673.3	678.0
65.42	8.6	23,897	796.4	805.0
66.17	22.1	28,436	947.7	969.8

Time increment (t) = 1.0 min.

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B100 .HYD
Outflow Hydrograph: b:100OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.0	0.00	-----	0.0	0.0	0.00	57.92
1.0	0.64	0.6	0.5	0.6	0.07	57.97
2.0	1.27	1.9	1.9	2.4	0.26	58.10
3.0	1.91	3.2	4.0	5.1	0.55	58.29
4.0	2.54	4.5	6.6	8.4	0.91	58.54
5.0	3.18	5.7	10.0	12.3	1.14	58.71
6.0	3.82	7.0	14.6	17.0	1.22	58.80
7.0	4.45	8.3	20.2	22.9	1.32	58.91
8.0	5.09	9.5	26.9	29.8	1.44	59.03
9.0	5.72	10.8	34.5	37.7	1.58	59.18
10.0	6.36	12.1	43.2	46.6	1.73	59.35
11.0	7.00	13.4	52.8	56.5	1.87	59.50
12.0	7.63	14.6	63.4	67.4	1.99	59.65
13.0	8.27	15.9	75.1	79.3	2.12	59.82
14.0	8.90	17.2	87.8	92.3	2.26	59.99
15.0	9.54	18.4	101.4	106.2	2.41	60.18
16.0	10.18	19.7	116.1	121.1	2.50	60.36
17.0	10.81	21.0	131.9	137.1	2.60	60.54
18.0	10.81	21.6	148.1	153.5	2.70	60.74
19.0	10.81	21.6	164.1	169.7	2.80	60.92
20.0	10.81	21.6	180.0	185.7	2.87	61.09
21.0	10.81	21.6	195.8	201.6	2.93	61.25
22.0	10.81	21.6	211.4	217.4	2.99	61.41
23.0	10.81	21.6	226.9	233.0	3.06	61.56
24.0	10.81	21.6	242.3	248.5	3.12	61.71
25.0	10.81	21.6	257.5	263.9	3.20	61.85
26.0	10.81	21.6	272.6	279.1	3.27	61.98
27.0	10.81	21.6	287.5	294.2	3.34	62.11
28.0	10.81	21.6	302.4	309.2	3.41	62.25
29.0	10.81	21.6	317.0	324.0	3.48	62.38
30.0	10.81	21.6	331.6	338.6	3.54	62.49
31.0	10.81	21.6	346.0	353.2	3.60	62.60
32.0	10.81	21.6	360.3	367.6	3.66	62.71
33.0	10.81	21.6	374.5	381.9	3.72	62.82
34.0	10.81	21.6	388.6	396.1	3.77	62.93
35.0	10.81	21.6	402.5	410.2	3.83	63.04
36.0	10.81	21.6	416.4	424.1	3.89	63.15
37.0	10.81	21.6	430.1	438.0	3.94	63.24
38.0	10.81	21.6	443.7	451.7	3.99	63.34
39.0	10.81	21.6	457.3	465.4	4.04	63.43
40.0	10.81	21.6	470.7	478.9	4.09	63.52
41.0	10.81	21.6	484.1	492.4	4.13	63.61
42.0	10.81	21.6	497.3	505.7	4.18	63.70
43.0	10.81	21.6	510.5	519.0	4.23	63.79
44.0	10.81	21.6	523.6	532.1	4.28	63.87

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B100 .HYD
Outflow Hydrograph: b:100OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.0	10.81	21.6	536.6	545.2	4.32	63.96
46.0	10.81	21.6	549.5	558.2	4.35	64.04
47.0	10.81	21.6	562.4	571.1	4.38	64.11
48.0	10.81	21.6	575.2	584.0	4.41	64.19
49.0	10.81	21.6	587.9	596.8	4.44	64.27
50.0	10.81	21.6	600.6	609.5	4.47	64.34
51.0	10.81	21.6	613.2	622.2	4.50	64.42
52.0	10.81	21.6	625.8	634.8	4.53	64.50
53.0	10.81	21.6	638.3	647.4	4.56	64.57
54.0	10.81	21.6	650.7	659.9	4.59	64.65
55.0	10.81	21.6	663.0	672.3	4.66	64.72
56.0	10.81	21.6	674.8	684.6	4.90	64.78
57.0	10.81	21.6	685.9	696.4	5.27	64.85
58.0	10.81	21.6	696.3	707.5	5.61	64.91
59.0	10.81	21.6	706.1	717.9	5.93	64.96
60.0	10.81	21.6	715.2	727.7	6.23	65.01
61.0	10.81	21.6	723.8	736.9	6.51	65.06
62.0	10.81	21.6	731.9	745.5	6.77	65.11
63.0	10.81	21.6	739.5	753.5	7.02	65.15
64.0	10.81	21.6	746.6	761.1	7.25	65.19
65.0	10.81	21.6	753.3	768.2	7.47	65.23
66.0	10.81	21.6	759.6	774.9	7.68	65.26
67.0	10.81	21.6	765.4	781.2	7.87	65.29
68.0	10.81	21.6	771.0	787.1	8.05	65.33
69.0	10.81	21.6	776.1	792.6	8.22	65.35
70.0	10.81	21.6	781.0	797.8	8.38	65.38
71.0	10.81	21.6	785.6	802.6	8.53	65.41
72.0	10.81	21.6	789.6	807.2	8.78	65.43
73.0	10.81	21.6	793.0	811.3	9.11	65.45
74.0	10.81	21.6	795.9	814.6	9.39	65.46
75.0	10.81	21.6	798.2	817.5	9.62	65.48
76.0	10.81	21.6	800.2	819.9	9.82	65.49
77.0	10.81	21.6	801.9	821.8	9.98	65.50
78.0	10.81	21.6	803.3	823.5	10.12	65.50
79.0	10.81	21.6	804.4	824.9	10.23	65.51
80.0	10.81	21.6	805.4	826.0	10.33	65.52
81.0	10.81	21.6	806.2	827.0	10.40	65.52
82.0	10.81	21.6	806.9	827.8	10.47	65.52
83.0	10.81	21.6	807.5	828.5	10.53	65.53
84.0	10.81	21.6	807.9	829.1	10.57	65.53
85.0	10.81	21.6	808.3	829.5	10.61	65.53
86.0	10.81	21.6	808.7	829.9	10.64	65.53
87.0	10.81	21.6	808.9	830.3	10.67	65.54
88.0	10.81	21.6	809.2	830.6	10.69	65.54
89.0	10.81	21.6	809.4	830.8	10.71	65.54
90.0	10.81	21.6	809.5	831.0	10.73	65.54

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B100 .HYD
Outflow Hydrograph: b:1000UT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
91.0	10.81	21.6	809.7	831.1	10.74	65.54
92.0	10.81	21.6	809.8	831.3	10.75	65.54
93.0	10.18	21.0	809.3	830.8	10.71	65.54
94.0	9.54	19.7	807.9	829.1	10.57	65.53
95.0	8.90	18.4	805.7	826.4	10.35	65.52
96.0	8.27	17.2	802.7	822.8	10.06	65.50
97.0	7.63	15.9	799.2	818.6	9.71	65.48
98.0	7.00	14.6	795.2	813.8	9.32	65.46
99.0	6.36	13.4	790.7	808.5	8.89	65.44
100.0	5.72	12.1	785.8	802.8	8.53	65.41
101.0	5.09	10.8	779.9	796.6	8.34	65.38
102.0	4.45	9.5	773.2	789.4	8.12	65.34
103.0	3.82	8.3	765.7	781.4	7.88	65.30
104.0	3.18	7.0	757.5	772.7	7.61	65.25
105.0	2.54	5.7	748.6	763.2	7.32	65.20
106.0	1.91	4.5	739.0	753.0	7.00	65.15
107.0	1.27	3.2	728.8	742.2	6.67	65.09
108.0	0.64	1.9	718.1	730.8	6.32	65.03
109.0	0.00	0.6	706.9	718.8	5.95	64.97

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

Pond File: b:POW4B .PND
Inflow Hydrograph: b:4B100 .HYD
Outflow Hydrograph: b:100OUT .HYD

Starting Pond W.S. Elevation = 57.92 ft

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

Peak Inflow = 10.81 cfs 21.42cfs
Peak Outflow = 10.75 cfs
Peak Elevation = 65.54 ft

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

Initial Storage	=	0 cu-ft
Peak Storage From Storm	=	24,621 cu-ft
Total Storage in Pond	=	24,621 cu-ft

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject POWHATAN OF WILLIAMSBURG PHASE IVB
Computed By _____ Checked By _____

Project No. 78041-48
Client _____
Date _____ Sheet No. 1

STORMWATER MANAGEMENT
POWHATAN PHASE 4B
NEAR WELL LOT

CURRENT DESIGN DATA

WATERSHED DATA:

PRE DEVELOPMENT
AREA = 11.5 ACRES
C = 0.25
CA = 2.88
$t_{c\,pre}$ = 24.5 MIN.

i_2 = 3.2 = Q_2 9.22
i_{10} = 4.3 = Q_{10} 12.38
i_{25} = 4.9 = Q_{25} 14.11
i_{100} = 6.0 = Q_{100} 17.28

POST DEVELOPMENT
AREA = 7.76 ACRES
C = 0.4
CA = 3.10
$t_{c\,post}$ = 17 MIN.

i_2 = 3.7 = Q_2 = 11.48
i_{10} = 5.0 = Q_{10} = 15.52
i_{25} = 5.7 = Q_{25} = 17.69
i_{100} = 6.9 = Q_{100} = 21.42

3.418 ACRES BY PASSES BASIN
C = 0.4
CA = 1.37

i_2 = 3.7 = Q_2 = 5.07
i_{10} = 5.0 = Q_{10} = 6.85
i_{25} = 5.7 = Q_{25} = 7.81
i_{100} = 6.9 = Q_{100} = 9.45

Langley and McDonald
A PROFESSIONAL CORPORATION
ENGINEERS • PLANNERS • SURVEYORS
VIRGINIA BEACH • WILLIAMSBURG, VIRGINIA

Subject POWHATAN DR
WILLIAMSBURG PHASE 4B
Computed By _____ Checked By _____

Project No. 78041-4B
Client _____
Date _____ Sheet No. 2

STORM FREQUENCY	PRE DEVELOPED DISCHARGE	Q BY PONDING BASIN	ALLOWABLE DISCHARGE	DESIGNED DISCHARGE
2 YEAR	9.22 CFS	− 5.07 CFS	= 4.15 CFS	3.45 CFS
10 YEAR	12.38 CFS	− 6.85 CFS	= 5.53 CFS	4.22 CFS
25 YEAR	14.11 CFS	− 7.81 CFS	= 6.30 CFS	5.10 CFS
100 YEAR	17.28 CFS	− 9.45 CFS =	7.83 CFS	10.75 CFS

USING SCS Method (SJT TRIAL)

					WSEL
1	5.5 CFS	3.10 (CN=74)	2.4	2.36	60.93
2	10.1 CFS	5.13 "	4.97	3.05	62.47
10	28.64 CFS	12.80 "	15.84	13.51	65.66
100	48.63 CFS	20.74	27.89	▷ OVERTOPS EL 66.5 ◁ (29.5 CFS out)	

BY: _____ DATE: _____ SHEET ___ OF _____

CHKD: _____ DATE: _____ PROJECT NO.

APRVD: _____ DATE: _____

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

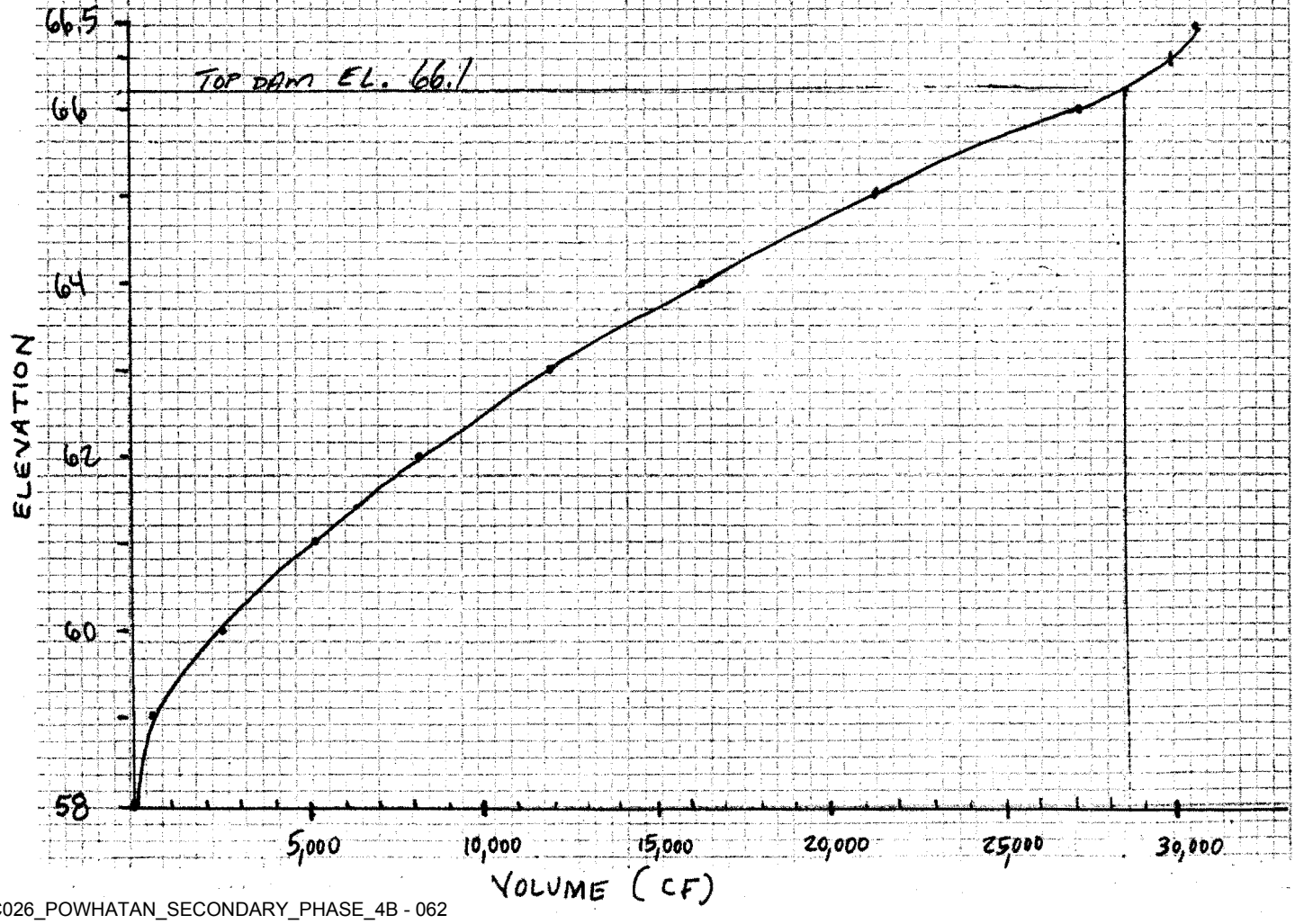
CODE COMPLIANCE (757) 253-6626 codecomp@james-city.va.us
ENVIRONMENTAL DIVISION (757) 253-6670 environ@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
INTEGRATED PEST MANAGEMENT (757) 253-2620

JANE Julit Henderson Inc

Joan Biendarth Rerwith

Stage - Storage Curve Using Report 4/14/95

1-YEAR VOL = 29,403. CF.



Powhatan Secondary Phase IV-B

POWHATAN OF WILLIAMSBURG
SECONDARY
PHASE IV B

S-58-94

Dry Pot #2

Design HW
2 = 62.33
10 = 63.77
25 = 64.82
100 = 65.54

FB = 0.56
NO GOOD

POND OUTS
2 - 3.45 CFS
10 - 4.22 CFS
100 - 10.75 CFS

o J.

PreDev	PostDev to BMP	BYPASS NOT TO BMP
11.5 AC	7.76 AC.	3.418 AC
C = 0.25 (70)	C = 0.4 (79)	C = 0.4 (79)
t_c = 24.5	t_c = 17 min	t_c = ?
Q_2 = 9.22	Q_2 = 11.48 CFS	Q_2 = 5.07 I_2 = 3.7
Q_{10} = 12.38	Q_{10} = 15.52	Q_{10} = 6.85 I_{10} = 5.0
Q_{100} = 17.28	Q_{100} = 21.42	Q_{100} = 9.45 I_{100} = 6.9

ALLOW OUT BMP
2 - 3.45 CFS
10 - 4.22 CFS
100 - 10.75 CFS

DID NOT GIVE Tc

≈ 15 MINUTES PROBLEM

SS-Curve

57.92	0 SF
58	60
59	1705
60	2286
61	2790
62	3371
63	4049
64	4805
65	5444
66	6225
TOP DAM 66.1	
66.5	6375

CONTROLS

8" ORIFICE @ 58.0 10 LF @ 1.00%

ORIG 3" → 8" ORIFICE @ 62.67

ES @ EL 65.0 BW = 4', D = 1.10' ~~SS 2H:1V~~ RECT. CONCRETE

BARREL

167 L.F. 12" C.P.P. @ 0.56%
INV U/S 57.92 INV. 57.0

SOILS
18 B (B)
29 B (C)
14 B (C)
USE C HSG

AVG LOT SIZE LOTS 7.7174/31 = 0.2489 AC (10,844.19 SF)

≈ 38% IMPERV ≈ CN = ~~[illegible]~~ (79) HSG B/C

SAY FOR CHECK:

WOODED	2.70	(70)
IMPERV (30%)	2.317	(98)
OPEN SPACE	2.70	(79)
7.7174	7.717	[82] > 79 USE 79

WOODED = 2.7
OS = 2.7
5.4 OR 70%

To Pond

CN = 79

Q_1	8 cfs @ 12.2 hrs.	
Q_2	12 cfs @ 12.2 hrs	11.48
Q_{10}	29 cfs @ 12.2 hrs	15.52
Q_{100}	45 cfs @ 12.2 hrs	21.42

RUNOFF VOLUME

$Q_{1\,YEAR}$ = 1.0444 IN 1" 3,630 CF/AC 7.76

1-YEAR 0.675 AC-FT (29,403.00)

1-YEAR VOLUME = 29,403 C.F.

MIN 24 hour drawdown (SIZE ORIFICE)

$$\frac{29{,}403 \text{ C.F.}}{24 \times 60 \times 60} = 0.3403 \text{ CFS}$$

EL. 1-YR VOL. 66.3
INV. ORIF = 58.0
8.3 ft

$$\frac{0.3403 \text{ CFS}}{0.6\sqrt{64.4 \times 4.15}} = 0.0347 \text{ S.F.}$$

$\frac{1}{2}$ POOL = 8.3/2 = 4.15'

$$\frac{\pi d^2}{4} = 0.0347 \text{ SF}$$

$d^2 = 0.0442$

$d = 0.2102' = 2.5''$ 2.5" ORIFICE, 24 hour drawdown OF 1-YEAR POOL.

Currently, Assume pond fills to "elbow" ORIFICE
8 inch @ INV. 62.67

INV 8" 62.67
BOTTOM IN 58.00
4.67'

8" ORIFICE, Using Full d = 4.67'

$\frac{\pi d^2}{4} = \frac{\pi (8/12)^2}{4} = 0.3491$ s.f.

VOLUME @ 62.67 = 10,702 C.F.
(FROM S-S CURVE)

$\frac{Q}{0.6\sqrt{64.4 \times 4.67}} = 0.3491$

$Q = 3.63$ CFS

@ HALF DEPTH $4.67'/2 = 2.33$

$\frac{Q}{0.6\sqrt{64.4 \times 2.33}} = 0.3491$

$Q = 2.565$ CFS

$\frac{10{,}702 \text{ c.f.}}{d_t \times 60 \times 60} = 3.63$ CFS

$\frac{10{,}702 \text{ CF}}{d_t \times 60 \times 60} = 2.565$

$d_t = 0.81$ hours. $\longleftrightarrow$ $d_t = 1.15$ hrs.

Existing drawdown time for 8" is ≈ 1 HR. FROM ELBOW

~~From emb. spillway, El. 65.0~~

~~INV. ES~~

PREDEV USING SCS

A = 11.5 AC
CN = 70
t_c = 24.5 MIN.

		HYDROG VOL
1-YEAR	5.50 CFS	(0.581 AC-FT.)
2-YEAR	10.11 CFS	(0.966 AC-FT.)
10-YEAR	28.64 CFS	(2.537 AC-FT)
100-YEAR	48.63 CFS	(4.278 AC-FT)

STORAGE

STORAGE REQUIRED (PRE VS POST) 2-YR = 0.299 AC-FT. (13,024.44 CF)
(DEV 39.82 CFS → PRE 28.64 CFS) 10-YR = 0.667 AC-FT. (29,054.52 CF)

Post Dev w/o Det Routing (Scenario A) CN=79 (CN=74)

		CN 74	CN 79	HYG VOL CN79	CN 74 = 0.510 AC-FT	DESIGN RATIONAL
1 YEAR	DEV 1	(6.44)	9.06 CFS	(0.679 AC-FT.)		
	BYPASS	(3.10)	4.35 CFS			
	COMBINED	(9.49)	13.41 CFS			
2-YEAR	DEV 1	(10.67)	13.90 cfs	(1.018 AC-FT)		[11.48 CFS]
	BYP	(5.13)	6.62 cfs			
	COMB	(15.79)	20.51 cfs			
10-YEAR	DEV 1	(27.02)	31.34 cfs	(2.276 AC-FT)		[15.52 CFS]
	BYP	(12.80)	14.77 cfs			
	COMB	(39.82)	46.10 cfs			
100-YEAR	DEV 1	(44.04)	48.77 cfs	( )		[21.42 CFS]
	BYP	(20.74)	22.88 cfs			
	COMB	(64.78)	71.65 cfs			

Post-Dev with Det (Scenario B - Current Condition) CN=74

1-YEAR	POND OUT	2.36 CFS @ WSEL 60.93
	COMB	4.95 CFS < 5.5 cfs SCS ; Rational 9.22 cfs
2-	POND OUT	3.05 CFS @ 62.47
	COMB	7.43 CFS < 10.11 cfs SCS ; Rational 12.38 cfs
10-	POND OUT	13.51 cfs @ 65.66
	COMB	19.09 < 28.64 cfs SCS ; Rational 14.11 cfs
100-	POND OUT	29.5 cfs @ 766.5 OVERTOPS
	COMB	48.43 CFS

Date Record Created: [redacted]

Created By: [redacted]

WS_BMPNO: PC026

PRINTED ON
Thursday, March 04, 2010
3:37:36 PM

WATERSHED	PC
BMP ID NO	026
PLAN NO	S-58-94
TAX PARCEL	(37-4)(9)
PIN NO	374090000
CONSTRUCTION DATE	
PROJECT NAME	Powhatan Secondary Phase 4B
FACILITY LOCATION	Across road from 102 First Patent Court
CITY-STATE	Williamsburg, VA
CURRENT OWNER	Powhatan Enterprises Inc.
OWNER ADDRESS	13441 Warwick Blvd.
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Newport News, VA 23602
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

MAINTENANCE PLAN	No
SITE AREA acre	9.5
LAND USE	Residential
old BMP TYP	Dry Pond
JCC BMP CODE	F2 Dry ED with forebay
POINT VALUE	0
SVC DRAIN AREA acres	7.8
SERVICE AREA DESCRI	SF Lots & Roadways
IMPERV AREA acres	
RECV STREAM	UT of Powhatan Creek
EXT DET-WQ-CTRL	No
WTR QUAL VOL acre-ft	0
CHAN PROT CTRL	No
CHAN PROT VOL acre-ft	0.2
SW/FLOOD CONTROL	No
GEOTECH REPORT	No

CTRL STRUC DESC	MH-2
CTRL STRUC SIZE inches	
OTLT BARRL DESC	CPEP
OTLT BARRL SIZE inch	12
EMERG SPILLWAY	Yes
DESIGN HW ELEV	65.54
PERM POOL ELEV	na
2-YR OUTFLOW cfs	
10-YR OUTFLOW cfs	
REC DRAWING	Yes
CONSTR CERTIF	No

LAST INSP DATE 9/20/2000 Inspected by: [redacted]

INTERNAL RATING 3

MISC/COMMENTS

Small basin near Lot 12/13. 8" LFO and 3" higher orifice.

Get Last BMP No | Return to Menu | Print Record

Additional Comments: [redacted]

Environmental Division
Stormwater Management Program
Project Assessment - Report

Date:	March 9th 2000
Project Name:	Powhatan of Williamsburg Secondary Phase IV B
Project No.:	S-58-94
Location:	Dry Detention Pond # 2 located back Lot 13 and near intersection with Old Cart Road and Powhatan Secondary Road within Powhatan Phase IV-B.
ADC Map Reference:	5/D8
Reason:	Citizen was concerned about drawdown time of BMP. Says it is 4 hours of less.
Other Info:	3 inch design orifice at El. 62.67 was replaced with 8 inch. Also facility served as TSB during construction. Has since been upgraded to BMP status.
Field Observation:	BMP appears to be operating properly. Some minor leaves and debris on trash screen on 8 inch bottom of pond orifice. Appears to function properly and is in good conditon. Was able to climb down into riser for inspection. However, downstream erosion and inadequate capacity of roadside grassed channels along Old Cart Path was clearly visible. Property owner says that normal drainage erodes channel and overtops channel and crosses roadway back & forth to the inlet at the intx of Old Cart and First Patent. At Lot 1 (Phase I) a large deep cut is present in the channel and minor utilities are exposed (cable lines, etc.). Soils appear sandy and vegetation is good.
Results:	Field inspection revealed no major concerns except that the 15 inch inflow pipe may have some debris. Performed a review of hydrology and hydraulics. The basin was designed using the Modified Rational, Critical Storm method. BMP calcs appear in order except the intensities used for the "bypass" area would result in a Tc of about 15 minutes which is way less that field conditions. Tc would range from 5 to 10 minutes, thus increasing the bypass flow and reducing the allowable pond discharge. Although initially it appeared there was room to reduce the bottom orifice of 8 inch to a smaller diameter to increase detention time, there was not enough conservancy in the design to allow this to occur, without requiring additonal storage volume in the basin (grading, cut, etc.). The calculated drawdown time of the 8 inch orifice was around 1 hour, if the elevation reached the emergency spillway. A 2.5 inch diam. orifice would be required to meet 24-hour drawdown. Presently the BMP appears to be operating effectively without modification. There is no problem currently with drawdown time at the BMP. However, there is a clear downstream MS #19 erosion problem caused by upslope development. Channel improvements would be feasible (ie. Paved channels along Old Cart) to reduce erosion and flooding along the roadway based on combined flows (bypass and pond).

Resident
Lot 1 - POWHATAN
OF WILLIAMSBURG
SECONDARY - PHASE I
DAVID HUDGINS
258-5200

03-09-00
Signature & Date

CODE COMPLIANCE REVIEW COMMENTS
POWHATAN SECONDARY, PHASE 4B
PLAN NO. S-58-94
September 6, 1994 DEC

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

2. A Subdivision Agreement, with surety, shall be executed with the County prior to recordation of lots.

3. Water and sewer inspection fees must be paid prior to the issuance of a Land Disturbing Permit.

4. An Inspection/Maintenance Agreement shall be executed with the county for the BMP facility for this project.

5. As-built drawings must be provided for the detention basin on completion.

6. A detention facility is needed to reduce post-development flows to pre-development levels for the 2- and 10-year storms as the downstream capacity for additional storm flows appears to be zero. The basin can be designed to meet the Chesapeake Bay criteria to provide additional BMP points for the overall project and to further reduce storm discharges. This basin cannot be located in an easement on lots but must be on common property. Therefore, relocate the basin shown on lots 13, 27 and 28 to lot 11 and eliminate this as a building lot. The basin also needs to be designed as a sediment basin serving the entire drainage area; the diversion dike system to a small bypass basin/pipe system will not work because of conflicts with house construction.

7. Provide silt fence from sewer manhole #5 to BMP #5. Also, provide silt fence around Ewell Place cul-de-sac from lot 30/31 line around to the radius point on lot 26.

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

9. Identify the limits of clearing on the plan.

10. Provide rock check dams at 100 foot intervals in all ditches.

11. Pave the left side roadside ditch on Old Carriage Way from station 12+00 around the cul-de-sac to the discharge point and line the right side with EC-3 matting.

12. Provide calculations for all pipe storm drain systems.