



## 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:** MC001

**DATE VERIFIED:** October 29, 2012

**QUALITY ASSURANCE TECHNICIAN:** Leah Hardenbergh

*Leah Hardenbergh*

**LOCATION:** WILLIAMSBURG, VIRGINIA



# Stormwater Division

## MEMORANDUM

Date: March 30, 2012  
To: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services  
From: Leah Hardenbergh  
PO: 110426  
Re: Files Approved for Scanning

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**General File ID or BMP ID:** MC001  
**PIN:** 3840100040  
**Owner Name (if known):** MILL CREEK LANDING  
**Legal Property Description:** PT INDIGO DAM JMSTWN FRMS  
**Site Address:** EAST OF 3609 BRIDGEWATER DR

*(For internal use only):*

Box # 3

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

MC-001

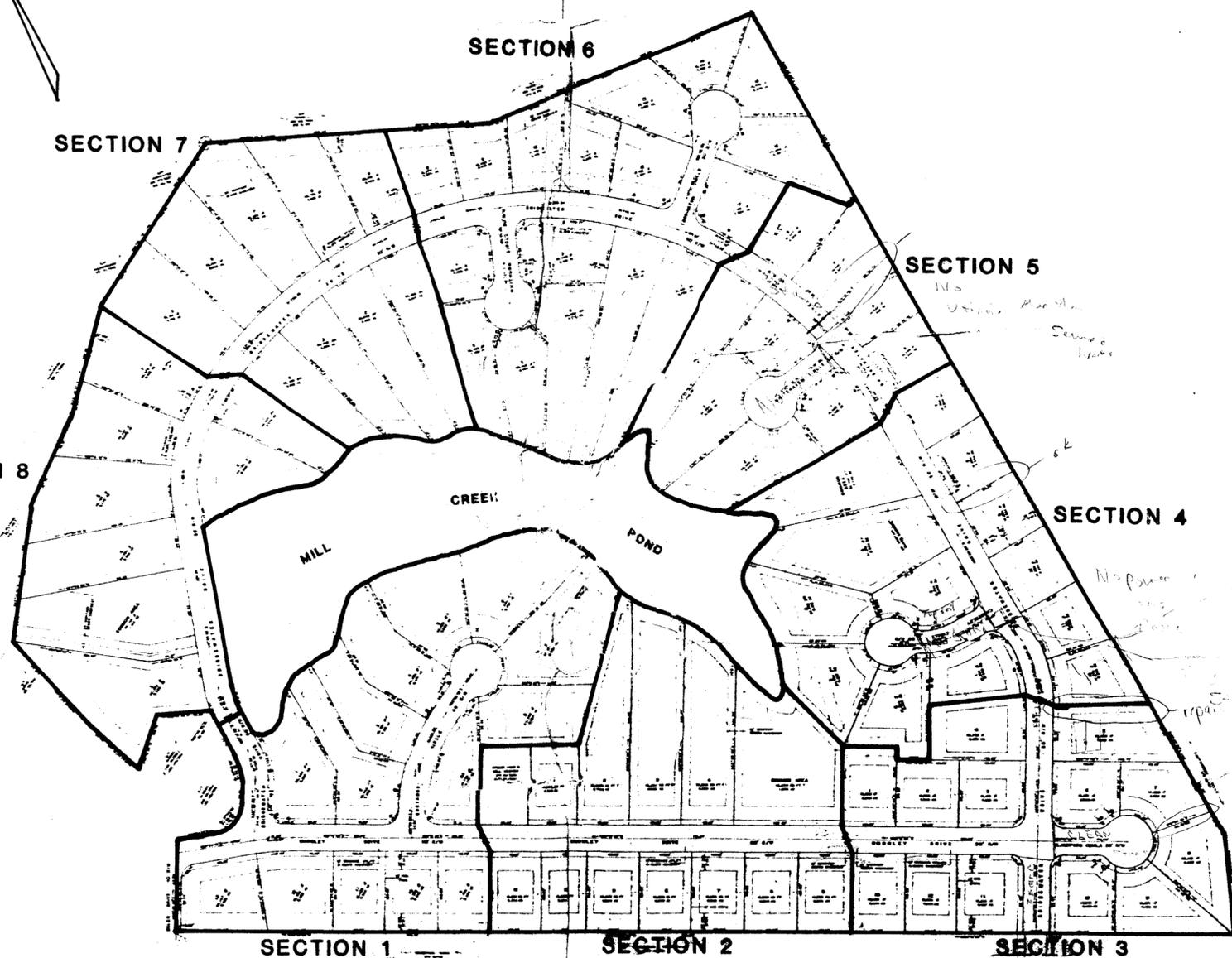
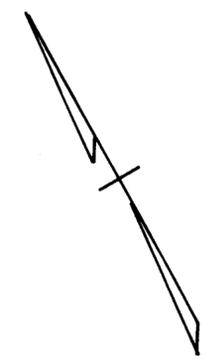
**Contents for Stormwater Management Facilities As-built Files**

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

# MILL CREEK LANDING

BY JOHN GRIER CONSTRUCTION CO.



| CONSTRUCTION            |          | INDEX TO DRAWINGS |  | RECORD    |          |
|-------------------------|----------|-------------------|--|-----------|----------|
| DAM SITE                | SHEET 2  |                   |  | SECTION 1 | SHEET 14 |
| DEVELOPMENT PLAN        | SHEET 3  |                   |  | SECTION 2 | SHEET 15 |
| DEVELOPMENT PLAN        | SHEET 4  |                   |  | SECTION 3 | SHEET 16 |
| DEVELOPMENT PLAN        | SHEET 5  |                   |  | SECTION 4 | SHEET 17 |
| ROAD & UTILITIES        | SHEET 6  |                   |  | SECTION 5 | SHEET 18 |
| ROAD & UTILITIES        | SHEET 7  |                   |  | SECTION 6 | SHEET 19 |
| ROAD & UTILITIES        | SHEET 8  |                   |  | SECTION 7 | SHEET 20 |
| ROAD & UTILITIES        | SHEET 9  |                   |  | SECTION 8 | SHEET 21 |
| ROAD & UTILITIES        | SHEET 10 |                   |  |           |          |
| DETAILS                 | SHEET 11 |                   |  |           |          |
| EROSION CONTROL DETAILS | SHEET 12 |                   |  |           |          |
| DAM DETAILS             | SHEET 13 |                   |  |           |          |
| GRAVITY SEWER A         | SHEET 22 |                   |  |           |          |
| GRAVITY SEWER A         | SHEET 23 |                   |  |           |          |
| GRAVITY SEWER B         | SHEET 24 |                   |  |           |          |
| GRAVITY SEWER B         | SHEET 25 |                   |  |           |          |

*Sewer  
Water  
Gas  
Phone  
110  
Street  
contaminated*

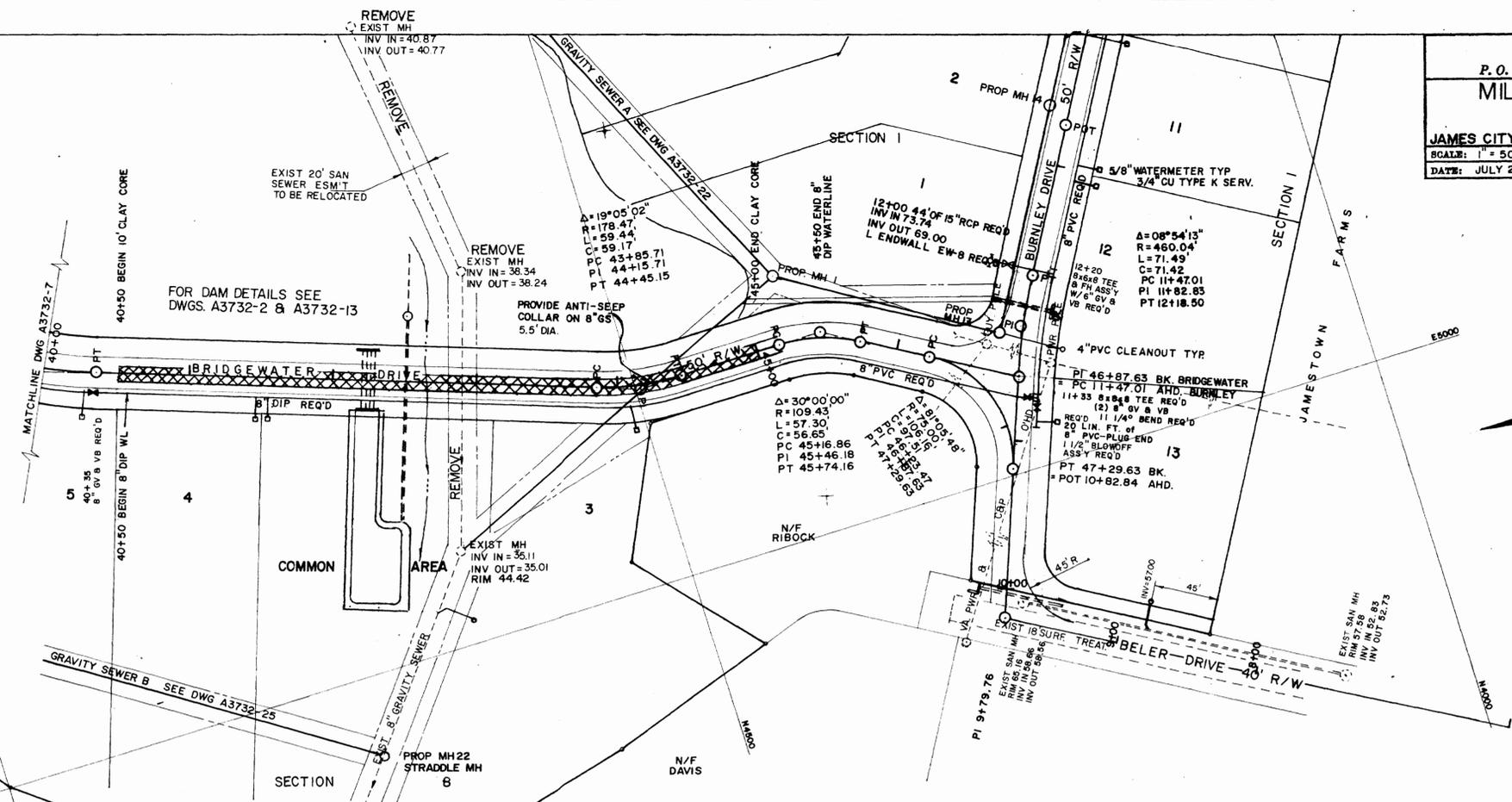
*Sewer  
Water  
Gas  
Phone  
110  
Street  
contaminated*

L. V. WOODSON & ASSOCIATES  
ENGINEERS & SURVEYORS  
P. O. BOX 688 WILLIAMSBURG, VIRGINIA

**MILL CREEK LANDING**  
ROAD AND UTILITIES

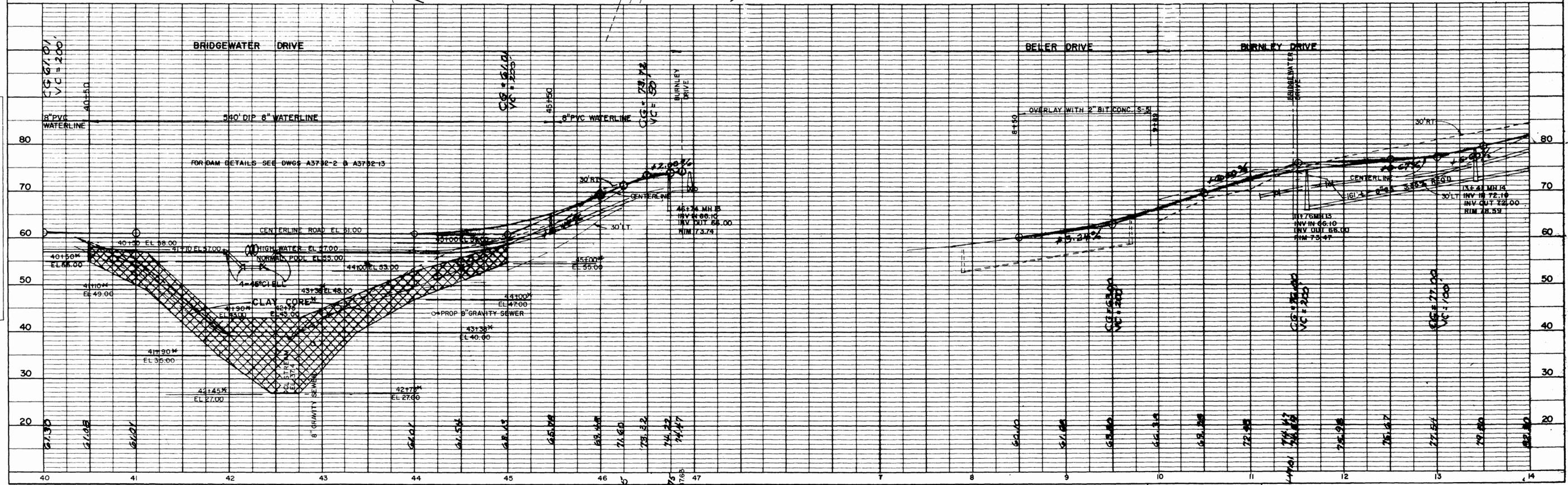
JAMES CITY COUNTY VIRGINIA

SCALE: 1" = 50' DWG. A3732-8 REV 10-1-87  
DATE: JULY 23, 1987 REV 11-27-87



PLAN SURVEYED BY DATE  
NOTE BOOK ALIGNMENT CHECKED  
NO. RT OF WAY CHECKED

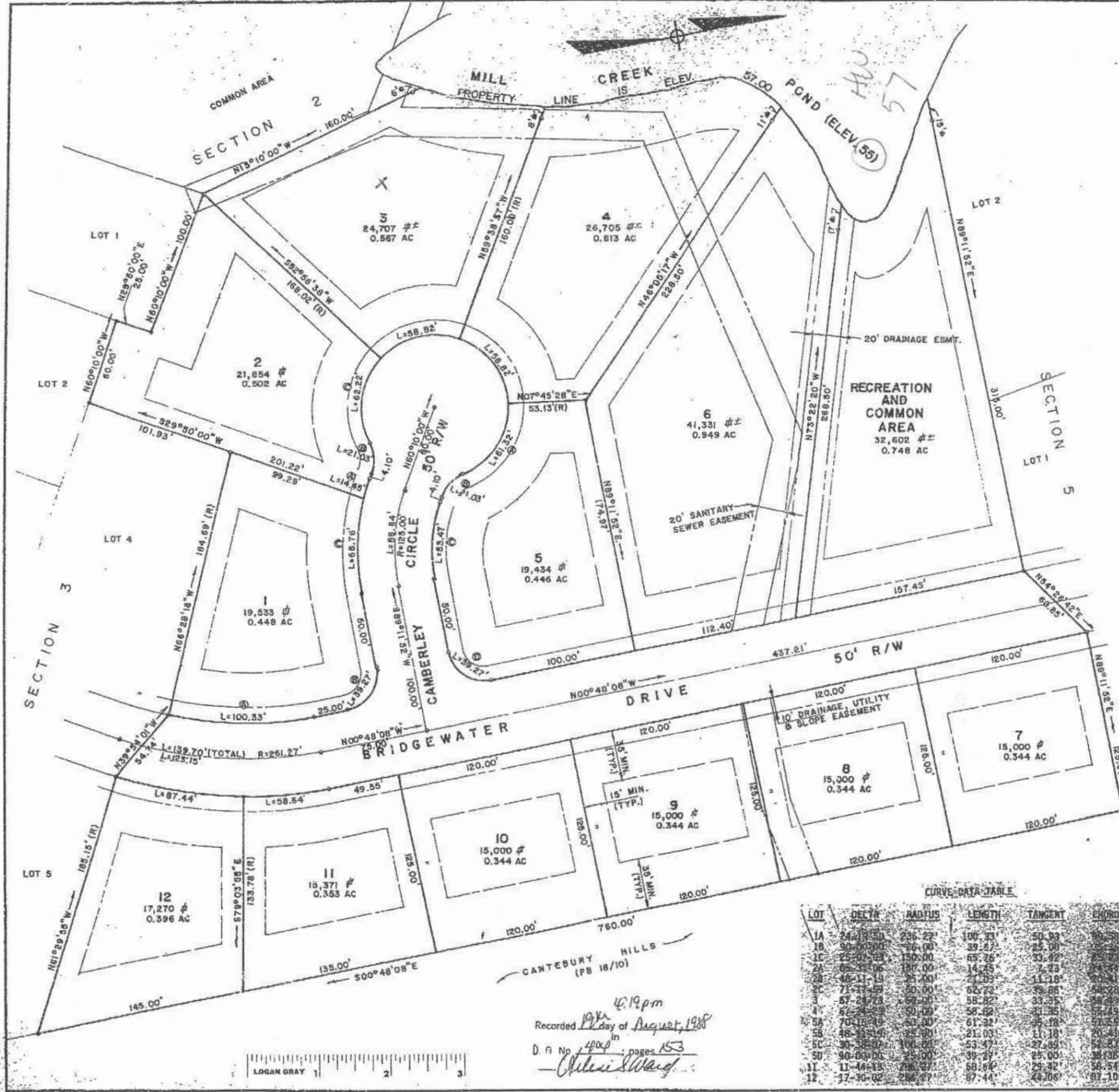
NOTE: FOR DRAINAGE, EROSION & SEDIMENT CONTROL DETAILS SEE DWGS A3732-3, 4 & 5



PROFILE SURVEYED BY DATE  
NOTE BOOK GRADES CHECKED  
NO. STRUCTURE NOTATION CHECKED

PLATE 1. PLAN - PROFILE C.A.S.  
CLEARPRINT PAPER CO., S.F. CAL.  
NO. 1000-1





**SOURCE OF TITLE:**  
 THE LAND EMBRACED WITHIN THIS SUBDIVISION WAS CONVEYED TO JOHN GRIER CONSTRUCTION COMPANY BY DEED DATED 1981 AND RECORDED IN DEED BOOK 345, PAGE 364 IN THE PUBLIC RECORDS OF JAMES CITY COUNTY, VIRGINIA.

**OWNER'S CONSENT:**  
 THIS SUBDIVISION IS WITH THE FREE CONSENT AND IN ACCORDANCE WITH THE WISHES AND DESIRES OF THE UNDERSIGNED OWNER.

BY: Joseph S. Terbell DATE: 5/23/88  
 JOSEPH S. TERBELL, SR., V.P.

I, Joseph S. Terbell, A NOTARY PUBLIC, DO HEREBY CERTIFY THAT THE PERSONS WHOSE NAMES ARE SIGNED TO THE FOREGOING WRITING HAVE ACKNOWLEDGED THE SAME BEFORE ME IN MY CITY AND STATE AFORESAID.

GIVEN UNDER MY HAND THIS 23 DAY OF May, 1988.

MY COMMISSION EXPIRES June 20, 1990

**ENGINEER'S CERTIFICATE:**  
 I CERTIFY THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL OF THE REQUIREMENTS OF THE BOARD OF SUPERVISORS AND ORDINANCES OF JAMES CITY COUNTY, VIRGINIA, REGARDING THE PLATTING OF SUBDIVISIONS WITHIN THE COUNTY, HAVE BEEN COMPLETED WITH

BY: L. V. Woodson DATE: 7/3/88  
 L. V. WOODSON, ELS #1201

APPROVED: 3-22-88 Allen D. King  
 JAMES CITY COUNTY HEALTH DEPARTMENT

APPROVED: 3-22-88 S. N. Hill  
 VIRGINIA DEPARTMENT OF HIGHWAYS & TRANSPORTATION

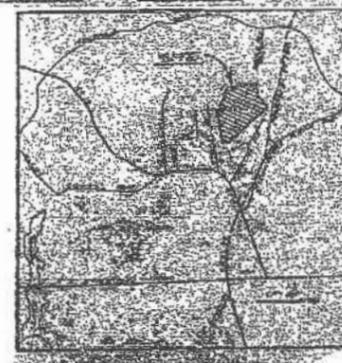
THIS SUBDIVISION IS APPROVED BY THE UNDERSIGNED IN ACCORDANCE WITH EXISTING REGULATIONS AND MAY BE COMMITTED TO RECORD AS THE LAW REQUIRES.

BY: [Signature] DATE: 4/1/88  
 FOR JAMES CITY COUNTY

STATE OF VIRGINIA, COUNTY OF JAMES CITY,  
 IN THE CLERK'S OFFICE OF THE CIRCUIT COURT FOR THE COUNTY OF JAMES CITY THIS 10 DAY OF August, 1988, THIS MAP WAS PRESENTED AND ADMITTED TO THE RECORDS AS THE LAW DIRECTS.

TESTE: [Signature] CLERK

PLAT BOOK 49 PAGE 35



**CURVE DATA TABLE**

| LOT | DELTA    | RADIUS | LENGTH | TANGENT | CHORD  |
|-----|----------|--------|--------|---------|--------|
| 1A  | 24-00-00 | 236.22 | 100.33 | 50.03   | 100.00 |
| 1B  | 30-00-00 | 26.00  | 39.27  | 25.00   | 39.27  |
| 1C  | 25-00-00 | 150.00 | 65.76  | 33.12   | 65.76  |
| 2A  | 68-30-00 | 180.00 | 142.25 | 7.23    | 142.25 |
| 2B  | 46-11-13 | 25.00  | 23.03  | 11.18   | 23.03  |
| 2C  | 71-17-53 | 50.00  | 62.72  | 39.88   | 62.72  |
| 3   | 67-24-28 | 50.00  | 58.82  | 33.35   | 58.82  |
| 4   | 56-28-28 | 50.00  | 58.82  | 31.35   | 58.82  |
| 5A  | 70-15-19 | 50.00  | 61.32  | 35.18   | 61.32  |
| 5B  | 48-35-54 | 25.00  | 21.03  | 11.18   | 21.03  |
| 5C  | 39-38-00 | 100.00 | 53.47  | 27.89   | 53.47  |
| 5D  | 30-00-00 | 75.00  | 39.27  | 25.00   | 39.27  |
| 11  | 11-44-13 | 298.27 | 58.64  | 29.32   | 58.64  |
| 12  | 17-30-00 | 286.27 | 87.44  | 48.06   | 87.44  |

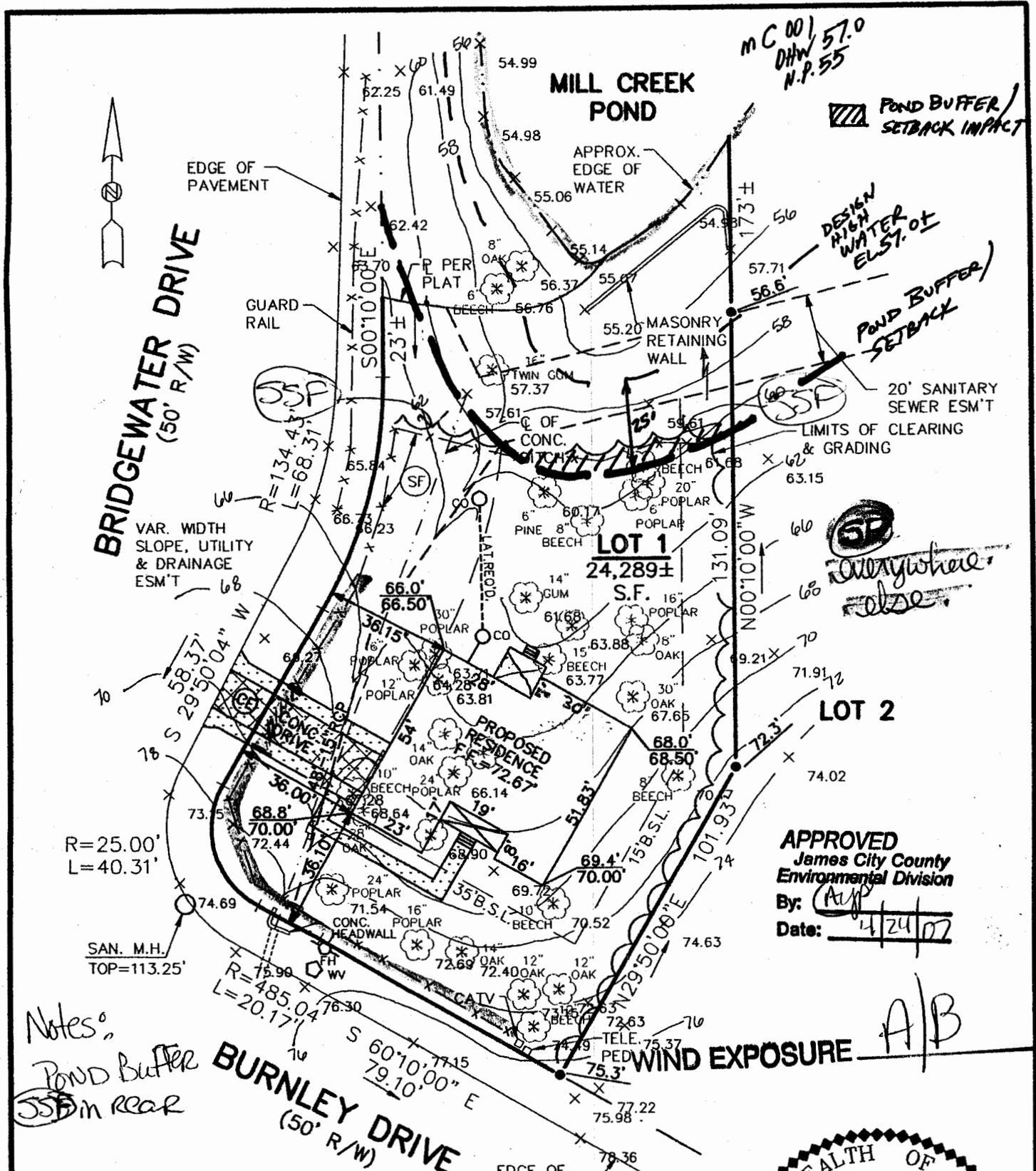
**L. V. WOODSON & ASSOCIATES INC.**  
**ENGINEERS, SURVEYORS & PLANNERS**  
 P. O. BOX 638 WILLIAMSBURG, VIRGINIA 23195

PLAT OF  
**MILL CREEK LANDING**  
**SECTION 4**  
 OWNER/DEVELOPER  
 JOHN GRIER CONSTRUCTION COMPANY  
 JAMES CITY COUNTY VIRGINIA

SCALE: 1" = 50' DWG. **A3732-17**  
 DATE: AUG. 11, 1987

4:19 pm  
 Recorded 19 day of August, 1988  
 D. A. No. 4000 pages 153  
Allen D. King





MC 001  
DHW 57.0  
N.P. 55

**POND BUFFER / SETBACK IMPACT**

DESIGN HIGH WATER EL 57.0

**POND BUFFER / SETBACK**

20' SANITARY SEWER ESM'T

**GP**

Anywhere else

**APPROVED**  
James City County  
Environmental Division  
By: *[Signature]*  
Date: 4/24/07

**A/B**

Notes:  
Pond Buffer  
SSP in Rear

**NOTES:**

- CONTRACTOR TO MATCH CONC. DITCH FLOW LINE.
- ELEVATIONS ARE FROM ASSUMED DATUM.
- THIS PLAT DOES NOT REPRESENT A PHYSICAL SURVEY, IT IS FOR BUILDING PERMIT PURPOSES ONLY.
- BUILDING DIMENSIONS ARE TO THE FRAME LINE.
- PROPERTY SHOWN HEREON IS LOCATED IN ZONE X AS SHOWN ON FLOOD INSURANCE RATE MAP COMMUNITY PANEL NUMBER 510201 0035 B, EFFECTIVE DATE: FEB. 6, 1991.
- BUILDING LOCATIONS SHOWN HEREON ARE SUBJECT TO APPROVAL BY APPLICABLE ZONING ADMINISTRATORS PRIOR TO ANY CONSTRUCTION.
- THE BUILDER MUST VERIFY THE BUILDING DIMENSIONS FROM THE ARCHITECTURAL PLANS BEFORE ANY CONSTRUCTION TAKES PLACE.

COMMONWEALTH OF VIRGINIA  
*[Signature]*  
DONALD W. DAVIS  
No. 1402(a)  
1418(b)  
LAND SURVEYOR  
3/27/07

- (CE) - DENOTES CONSTRUCTION ENTRANCE.
- (SF) - DENOTES SILT FENCE.

DAVIS & ASSOCIATES, P.C.  
SURVEYORS - PLANNERS  
YORK COUNTY, VIRGINIA

|   |                                   |                 |            |                    |
|---|-----------------------------------|-----------------|------------|--------------------|
| DEVELOPMENT PLAN  | JOB LOCATION: #4905 BURNLEY DRIVE |                 |            |                    |
| <b>LOT 1</b><br>PLAT OF<br><b>MILL CREEK LANDING</b><br>SECTION 1<br>JAMES CITY COUNTY, VIRGINIA<br>(P.B. 48, PG. 84) |                                   |                 |            |                    |
| CODE: 07-0151   | DWN. BY: HMR                      | SCALE: 1" = 40' | TO: HARBIN | DATE: 27 MAR. 2007 |

POND CALCULATIONS (SOYR STORM - 24" RISER)

MC001

PREDEVELOPMENT

$$\begin{aligned} \text{OVERLAND DIST} &= 3400' \\ \text{DIFF IN ELEVATION} &= 100 - 37 = 63' \\ \text{AREA} &= 97.5 \text{ AC} \end{aligned}$$

$$C = 0.25 \text{ WOODED} \therefore T_c = 39 \text{ min } (19.5 \times 2)$$

$$\therefore I_{10} = 3 \text{ IN/HR} ; I_{25} = 3.5 \text{ IN/HR} ; I_{50} = 4 \text{ IN/HR} ; I_{100} = 4.3 \text{ IN/HR}$$

$$Q_{10} = (.25)(97.5)(3 \text{ IN/HR}) = 73.1 \text{ CFS}$$

$$Q_{25} = (.25)(97.5)(3.5 \text{ IN/HR}) = 85.3 \text{ CFS}$$

$$Q_{50} = (.25)(97.5)(4 \text{ IN/HR}) = 97.5 \text{ CFS}$$

$$Q_{100} = (.25)(97.5)(4.3 \text{ IN/HR}) = 104.8 \text{ CFS}$$

POST DEVELOPMENT

$$\begin{aligned} \text{OVERLAND DIST} &= 3400' \\ \text{DIFF IN ELEV} &= 100 - 37 = 63' \\ \text{AREA} &= 97.5 \text{ AC} \end{aligned}$$

$$C = 0.45 \text{ DEVELOPED SINGLE FAMILY} \quad T_c = 29.3 \text{ min } (19.5 \times 1.5)$$

$$T_b = 29.3 \times 2.67 = 78.2 \text{ min}$$

$$\therefore I_{10} = 3.6 \text{ IN/HR} ; I_{25} = 4.2 \text{ IN/HR} ; I_{50} = 4.8 \text{ IN/HR} ; I_{100} = 5.2 \text{ IN/HR}$$

$$Q_{10} = (.45)(97.5)(3.6 \text{ IN/HR}) = 158.0 \text{ CFS}$$

$$Q_{25} = (.45)(97.5)(4.2 \text{ IN/HR}) = 184.3 \text{ CFS}$$

$$Q_{50} = (.45)(97.5)(4.8 \text{ IN/HR}) = 210.6 \text{ CFS}$$

$$Q_{100} = (.45)(97.5)(5.2 \text{ IN/HR}) = 228.2 \text{ CFS}$$

$$\text{SURF AREA POND} = 6.45 \text{ AC} = 281,125 \text{ SQ. FT/FT}$$

$$\text{FOR } 50 \text{ YRS } - (210.6 \text{ FT}^3/\text{SEC}) (29.3 \times 60) = 370,235 \text{ FT}^3$$

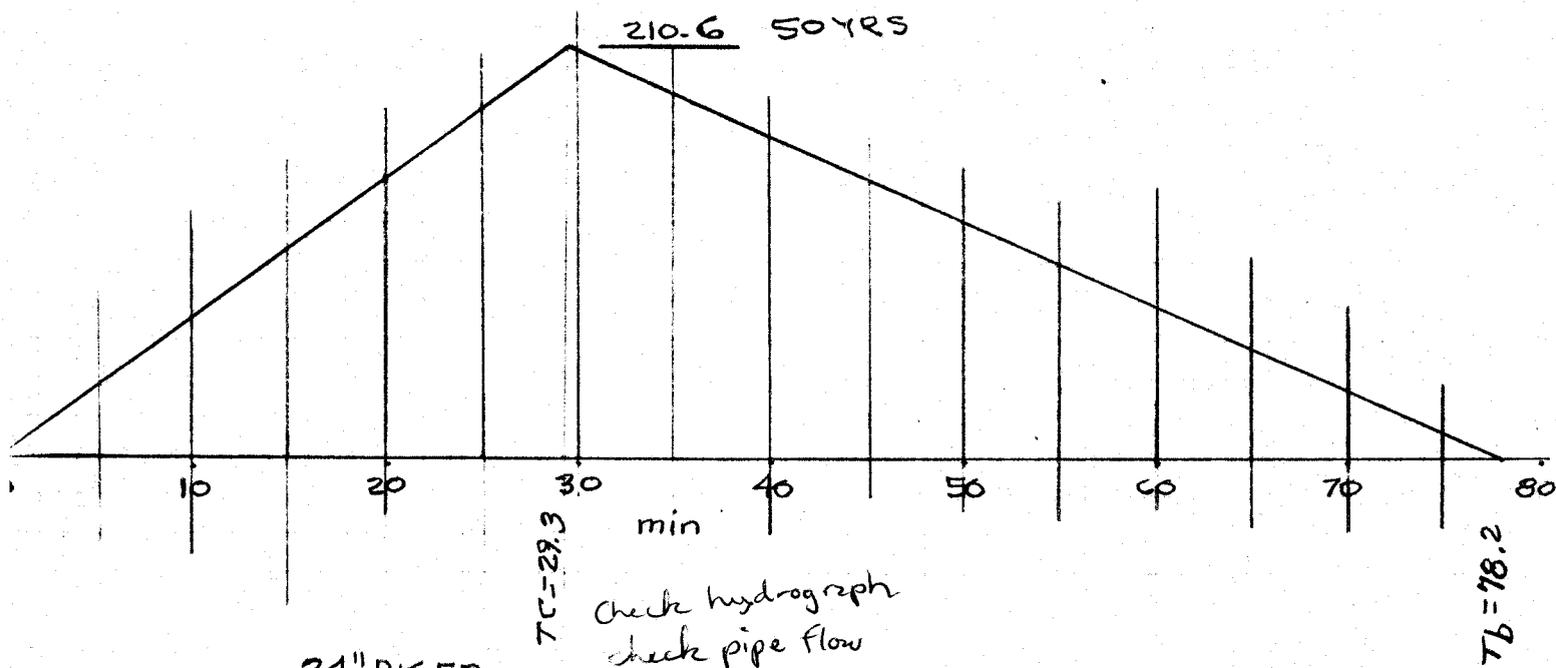
$$\therefore \text{MAX H}_2\text{O RISE NO OUTLET} = 370,235 / 281,125 = 1.6 \text{ FT}$$

$$\text{FOR } 10 \text{ YRS } (158)(29.3 \times 60) = 277,764 \text{ FT}^3 \therefore \text{RISE} = \frac{277,764}{281,125} = 0.99 \text{ FT.}$$

Mill Creek LANDING  
JO A3732

2/  
AUG 4, 1987

POND CALCULATIONS (50YR STORM - 24" RISER)



24" RISER

| HW<br>LEV | OUTFLOW |        | STORAGE<br>FT <sup>3</sup> | 150'<br>18" RCP |
|-----------|---------|--------|----------------------------|-----------------|
|           | WIER    | ORFICE |                            |                 |
| 55        | 0       |        | 0                          |                 |
| 55.1      |         |        | 28,113                     |                 |
| 55.2      | 1.7     |        | 56,225                     |                 |
| 55.3      | 3.1     |        | 84,338                     |                 |
| 55.4      | 4.8     |        | 112,450                    |                 |
| 55.5      | 6.7     |        | 140,563                    | 4 140,563       |
| 55.6      | 9.0     |        | 168,675                    |                 |
| 55.7      | 11.2    |        | 196,788                    |                 |
| 55.8      | 12.0    |        | 224,900                    |                 |
| 55.9      | 13.6    | 13.5   | 253,013                    |                 |
| 56.0      | 15.1    | 14.4   | 281,125                    | 28 + 140,563    |
| 56.1      | 16.6    | 15.9   | 309,238                    |                 |
| 56.2      |         | 16.6   | 337,350                    |                 |
| 56.3      |         | 17.3   | 365,463                    |                 |
| 56.4      |         | 17.9   | 393,575                    |                 |
| 56.5      |         | 18.5   | 421,688                    | 140,563         |
| 56.6      |         | 19.1   | 449,800                    |                 |
| 56.7      |         | 19.7   | 477,913                    |                 |
| 56.8      |         | 20.3   | 506,025                    |                 |
| 56.9      |         | 20.8   | 534,138                    |                 |
| 57.0      |         | 21.4   | 562,250                    | 28.9 140,563    |
| 57.5      |         |        | 702,814                    | 59.5 1,265,066  |
| 58        |         |        | 843,377                    | 60 1,405,629    |
| 58.5      |         |        | 1,024,303                  | 60.5 1,546,192  |
|           |         |        |                            | 61.0 1,686,755  |

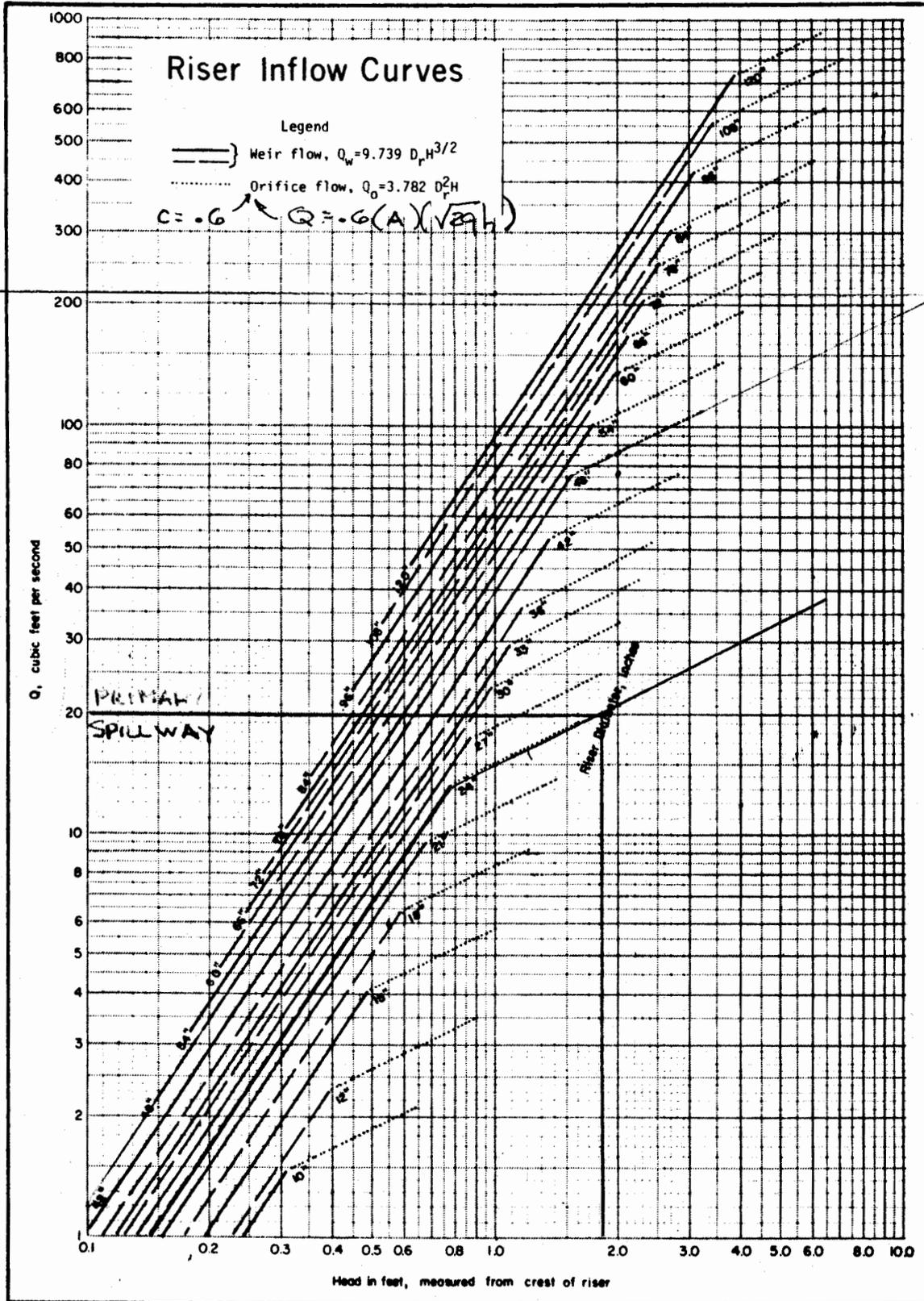
$(H)^{3/2}$  233.736 Weir + 1000

19.478

1980

1.26

= 211



Source: USDA-SCS

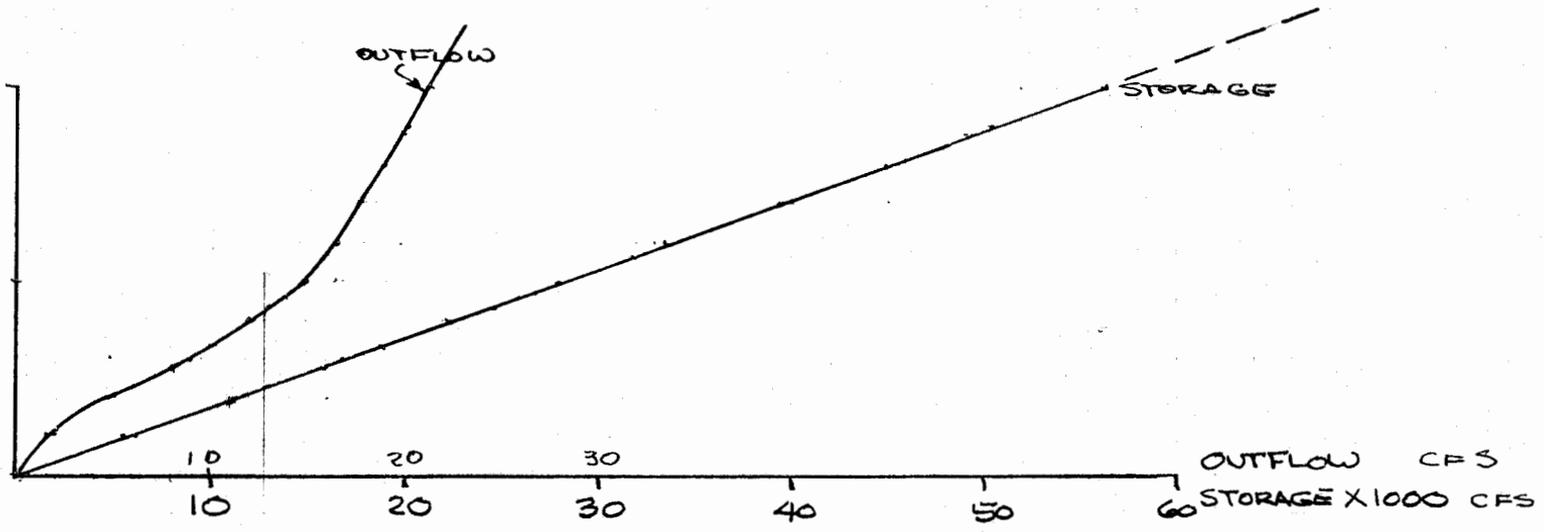
Plate 1.26h

III-73

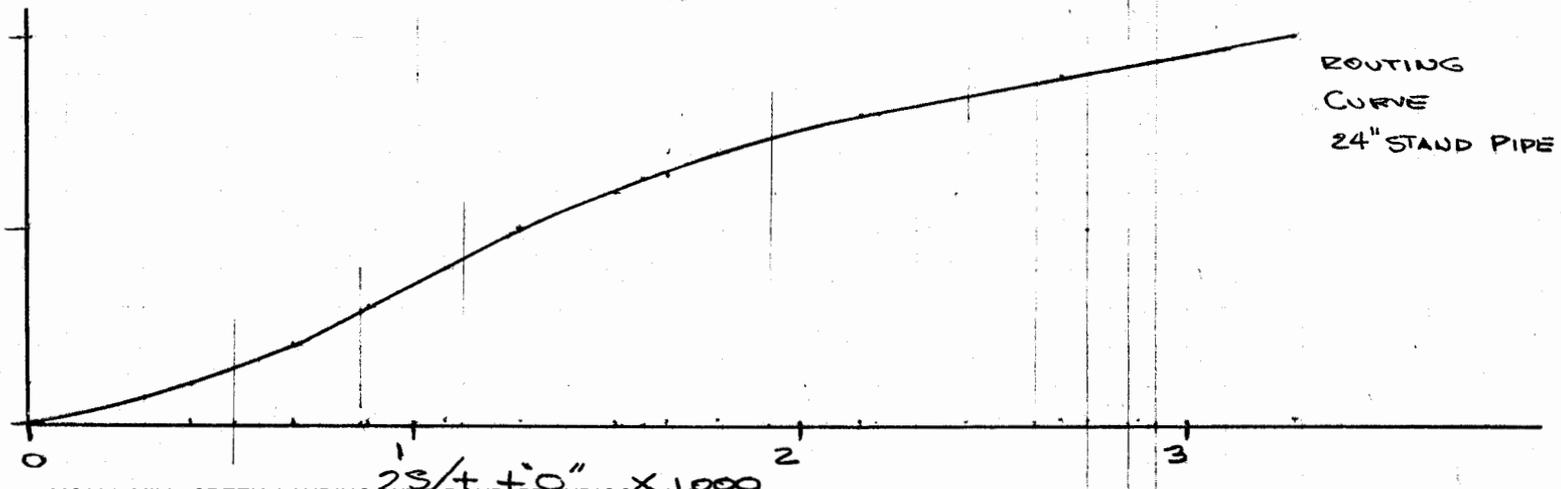
MILL CREEK LANDING  
JO A3732

AUG 4, 1987

POND CALCULATIONS (50YR STORM - 24" RISER)



| Flow | S (STORAGE) | $2S/t$ | $2S/t + \text{OUTFLOW}$ | $t = 5 \text{ min} = 300 \text{ SEC}$ |
|------|-------------|--------|-------------------------|---------------------------------------|
| 0    | 0           | 0      | 0                       |                                       |
| 2    | 60,000      | 400    | 402                     |                                       |
| 4    | 102,000     | 680    | 684                     |                                       |
| 6    | 130,000     | 867    | 873                     |                                       |
| 8    | 160,000     | 1067   | 1075                    |                                       |
| 10   | 190,000     | 1267   | 1277                    |                                       |
| 12   | 225,000     | 1500   | 1512                    |                                       |
| 13   | 245,000     | 1633   | 1646                    |                                       |
| 14   | 265,000     | 1767   | 1784                    |                                       |
| 16   | 320,000     | 2133   | 2149                    |                                       |
| 18   | 390,000     | 2600   | 2618                    |                                       |
| 20   | 490,000     | 3267   | 3287                    |                                       |



# Mill Creek Landing JO 3732

AUG 4, 1987

## POND CALCULATIONS (50YR STORM - 24" RISER)

| ME<br>N | INFLOW<br>CFS | 2S/t - OUTFLOW | 2S/t + OUTFLOW | OUTFLOW |
|---------|---------------|----------------|----------------|---------|
| 0       | 0             | 0              | 0              | 0       |
| 5       | 28            | 27             | 28             | 0.5     |
| 10      | 70            | 123            | 125            | 1.0     |
| 15      | 103           | 293            | 296            | 1.5     |
| 20      | 142           | 532            | 538            | 3.0     |
| 25      | 178           | 840            | 852            | 6.0     |
| 30      | 205           | 1206           | 1223           | 8.5     |
| 35      | 185           | 1570           | 1596           | 13.0    |
| 40      | 165           | 1890           | 1920           | 15.0    |
| 45      | 140           | 2163           | 2195           | 16.0    |
| 50      | 120           | 2389           | 2423           | 17.0    |
| 55      | 100           | 2574           | 2609           | 17.5    |
| 60      | 78            | 2716           | 2752           | 18.0    |
| 65      | 55            | 2812           | 2849           | 18.5    |
| 70      | 35            | 2864           | 2902           | 19.0    |
| 75      | 8             | 2869           | 2907           | 19.0    |
| 78.2    | 0             | 2839           | 2877           | 18.8    |

@ 24"  $\phi$  @ 19 CFS  
 $V = 19 / 3.14 = 6.05 \text{ FPS}$

← PEAK OUTFLOW  
24" RISER

$\therefore 2S/t = 2907 - 19 = 2888$   
 $2S = 2888 \times 300 = 866,400$   
 $\therefore S = 433,200 \text{ FT}^3$

SURFACE AREA POND = 281,125  $\#$  (6.45 AC.)

$\therefore$  RISE IN POND =  $433,200 \text{ FT}^3 / 281,125 \# = 1.54' < 2.0' \therefore \text{OK}$

### EMERGENCY SPILLWAY

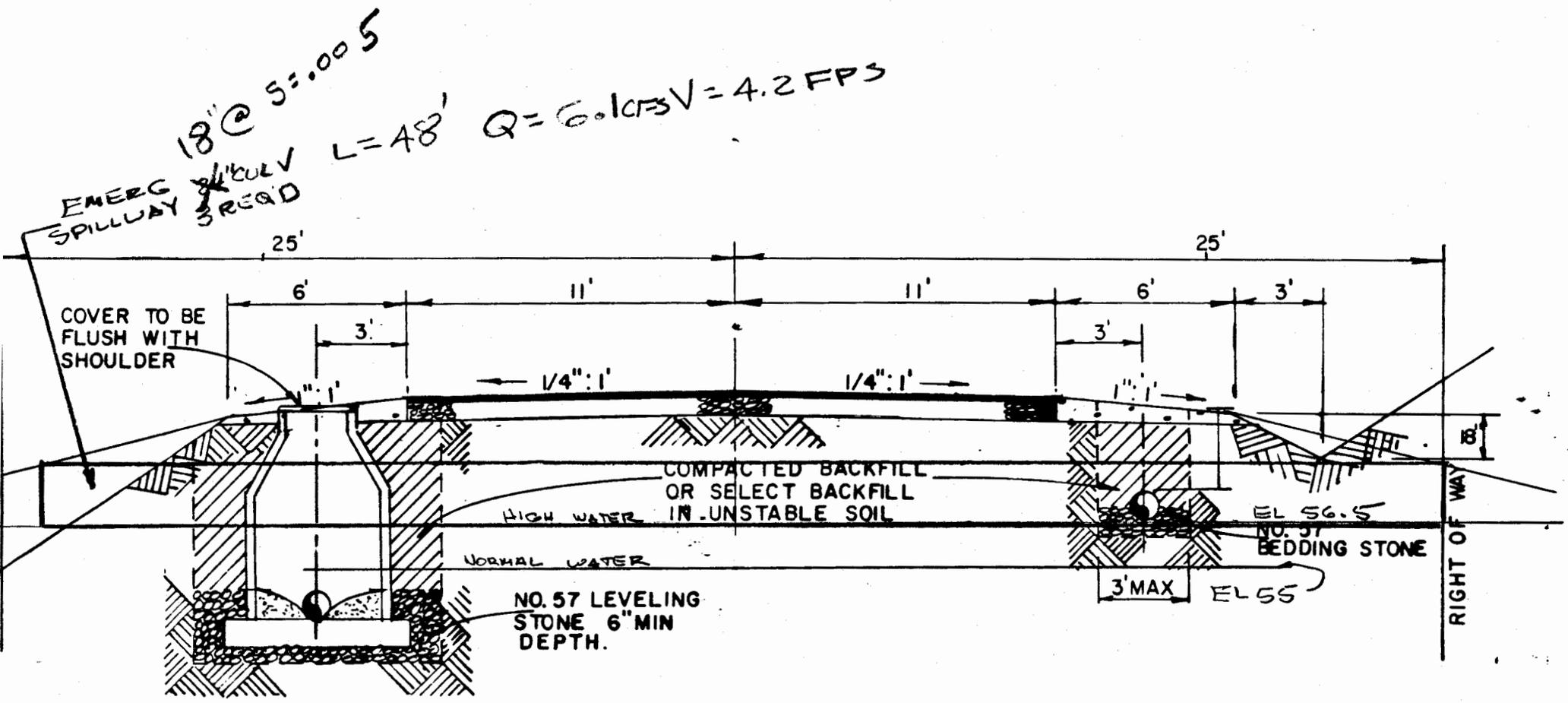
ASSUME ADDITIONAL 1.5' RISE @ EMERGENCY SPILLWAY WILL DISCHARGE @ SAME RATE AS PRIMARY SPILLWAY IE 18.5 CFS. USE 3 CULVERTS WITH  $Q = 18.5 \text{ CFS} / 3 = 6.2 \text{ CFS}$

FOR INLET CONTROL: 24" CULV  $\therefore H_w/D = 18"/24" = .75$   $Q = 9 \text{ CFS}$   
 18" CULV  $\therefore H_w/D = 18"/18" = 1$   $Q = 6.1 \text{ CFS}$

FOR OUTLET CONTROL: 24" CULV X 48'  $H_w/D = .75$

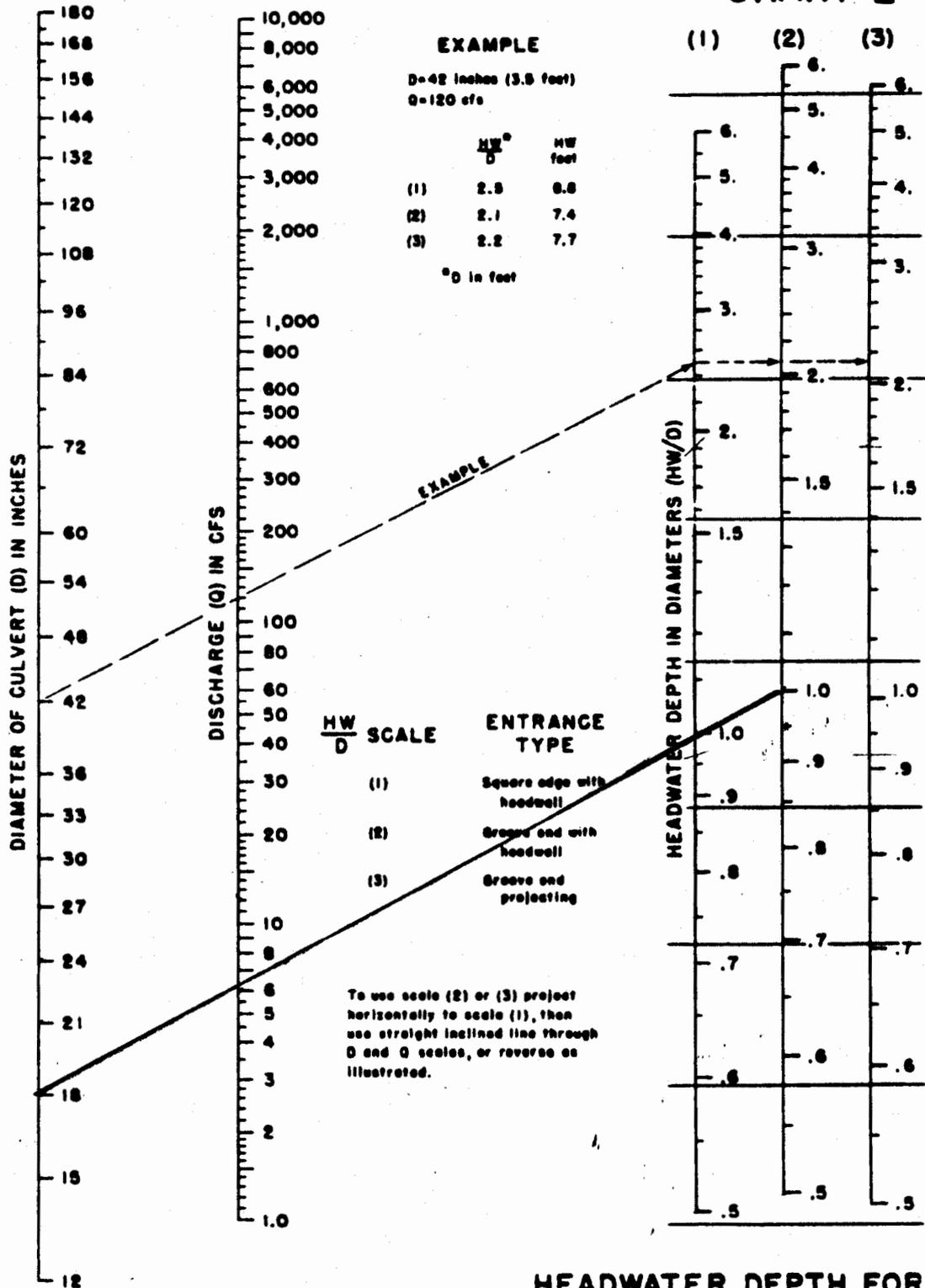
$\therefore$  USE 3 18" CONC CULV. @  $S = .005$   $n = .015$   $V = 4.2 \text{ FPS}$

61  
55



TYPICAL WATER & SEWER IN ROADWAY

# CHART 2

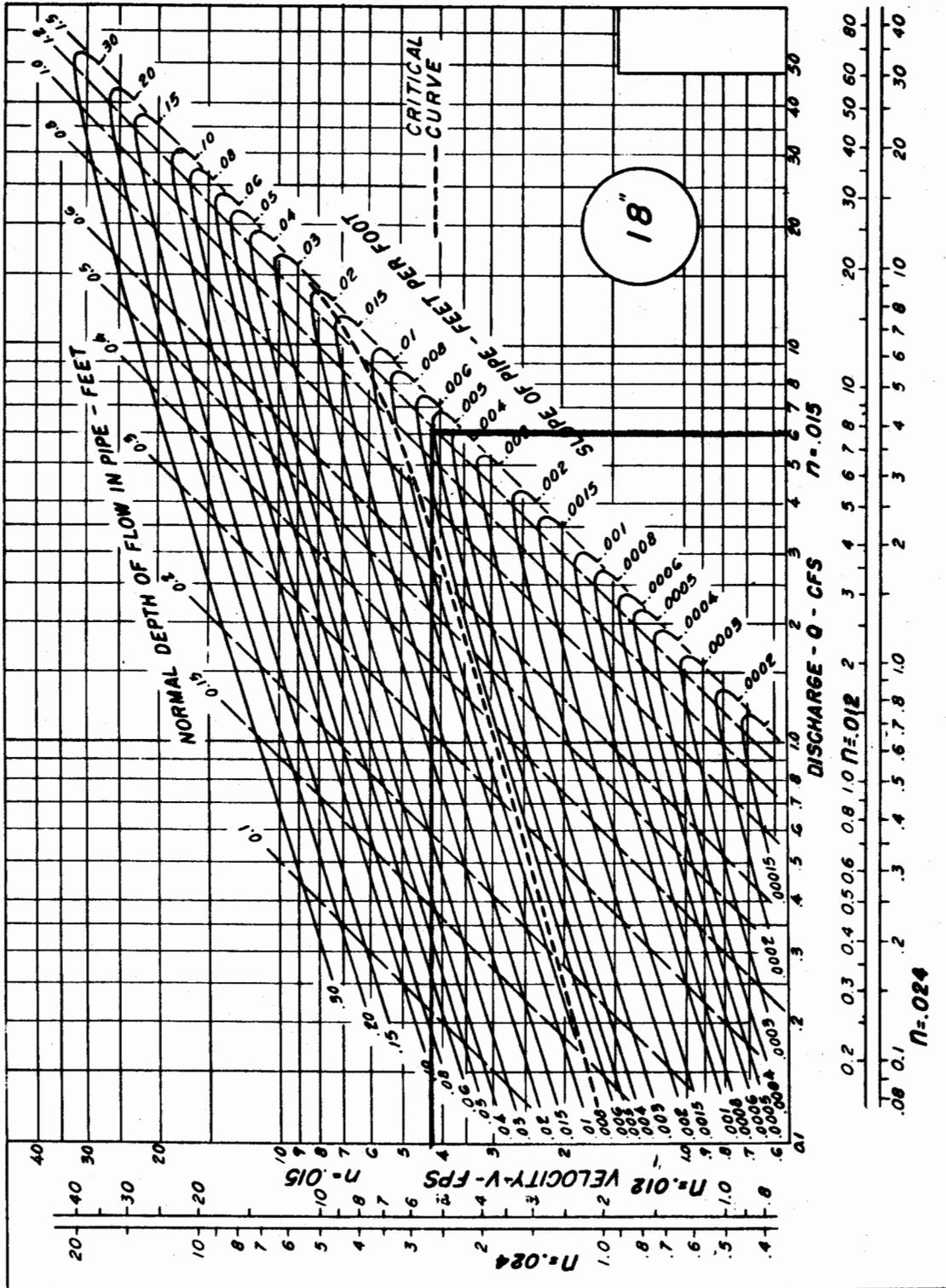


## HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 283  
 REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN 1963

FIG. 3.9.3.3



PIPE FLOW CHART  
18-INCH DIAMETER

POND CALCULATIONS (50 YR STORM - 24" RISER)

Emergency Spillway DISCHARGE CHANNEL

$$3 - 18" \text{ CONC CULV @ } .005 = 6.1 \text{ CFS} \times 3 = 18.3 \text{ CFS}$$

$$V = 4.2 \text{ FPS}$$

$$\text{INV @ } \overset{\text{CULV.}}{\text{DISCHARGE}} = 57.5 - (48 \times .005) = 57.26'$$

$$\text{INV @ CHANNEL DISCHARGE} = 37.00$$

$$\text{DIFF} = 57.26' - 37.00' = 20.26'$$

$$\therefore S = 20.26' / 83' = 24.41\%$$

ASSUME CHANNEL IS 13' WIDE & 2' DEEP, <sup>1' Freshboard</sup>  $n = 0.03$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

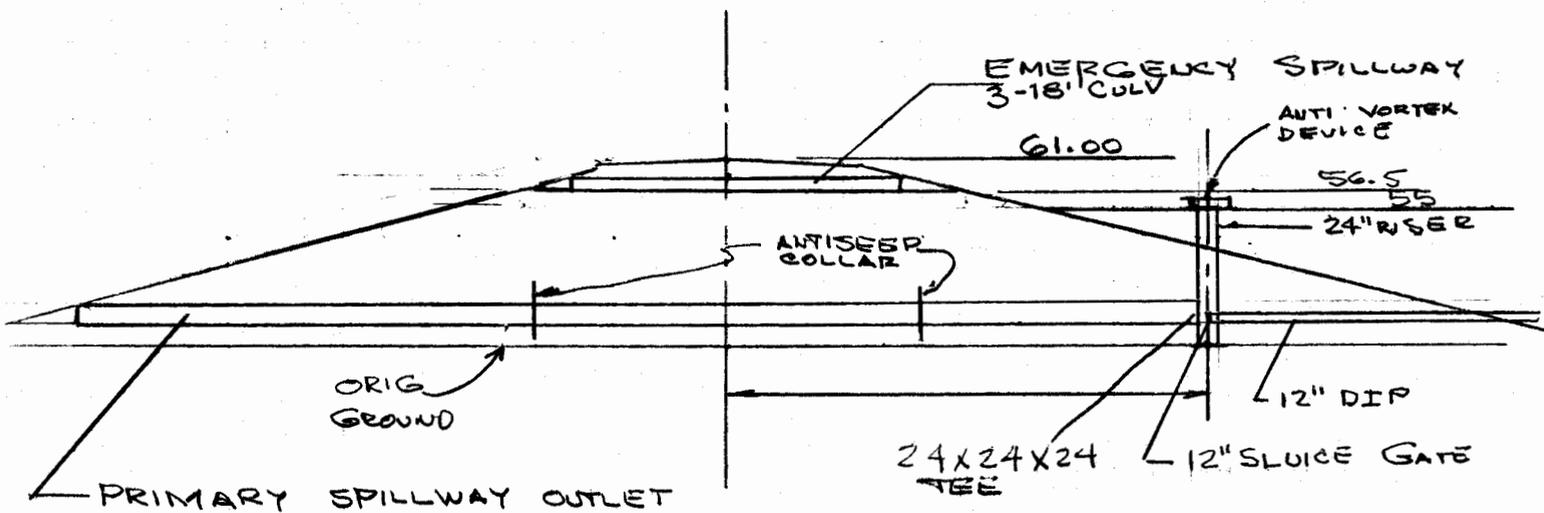
$$V = \frac{1.486}{n} R^{2/3} S^{1/2} = \left( \frac{1.486}{.03} \right) \left( \frac{13}{15} \right)^{2/3} (.2441)^{1/2}$$

$$= (49.53) (0.91) (.49) = 22.09 \text{ FPS}$$

$$\therefore \text{DEPTH} = (18.3 \text{ CFS} / 22.09 \text{ FPS}) / 13' = 0.06 \text{ FT}$$

• @ 22 FPS Riprap = 3.2 FT Spherical Dia = 3000 lb/stone

POND CALCULATIONS



CHECK CAPACITY OF PRIMARY SPILLWAY OUTLET

ASSUME 24  $\phi$  CONC - RISER = 24',  $Q = 18.3$  CFS  
 MAX HW/D =  $56.5 - 37/2 = 9.75$   
 $\therefore$  MIN HW/D = 1.35 < 9.75  $\therefore$  OK

RISER SUPPORT SLAB

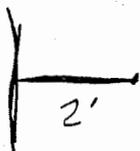
ANTI VORTEX DEVICE = 2087#  
 16' 24" RCP 2X 2160 = 4320#  
 24" TEE 1.5X 2160 = 3240  
 12" Sluice Gate = 1000  
 CONC ENVELOPE = 8000  
 CONC PLUG = 3000  
 21,647#

Assume Allow soil Press = 1000 PSF

REQ'D AREA =  $21,647 / 1000 = 21.6$  FT<sup>2</sup> Say 24 FT<sup>2</sup> for SLAB WT ALSO.

For slab 10' Long width =  $24 \text{ FT}^2 / 10 \text{ FT} = 2.4'$

USE slab 4' x 10' = 40#  $\therefore$  Soil Press =  $21,647 / 40 = 541$  PSF

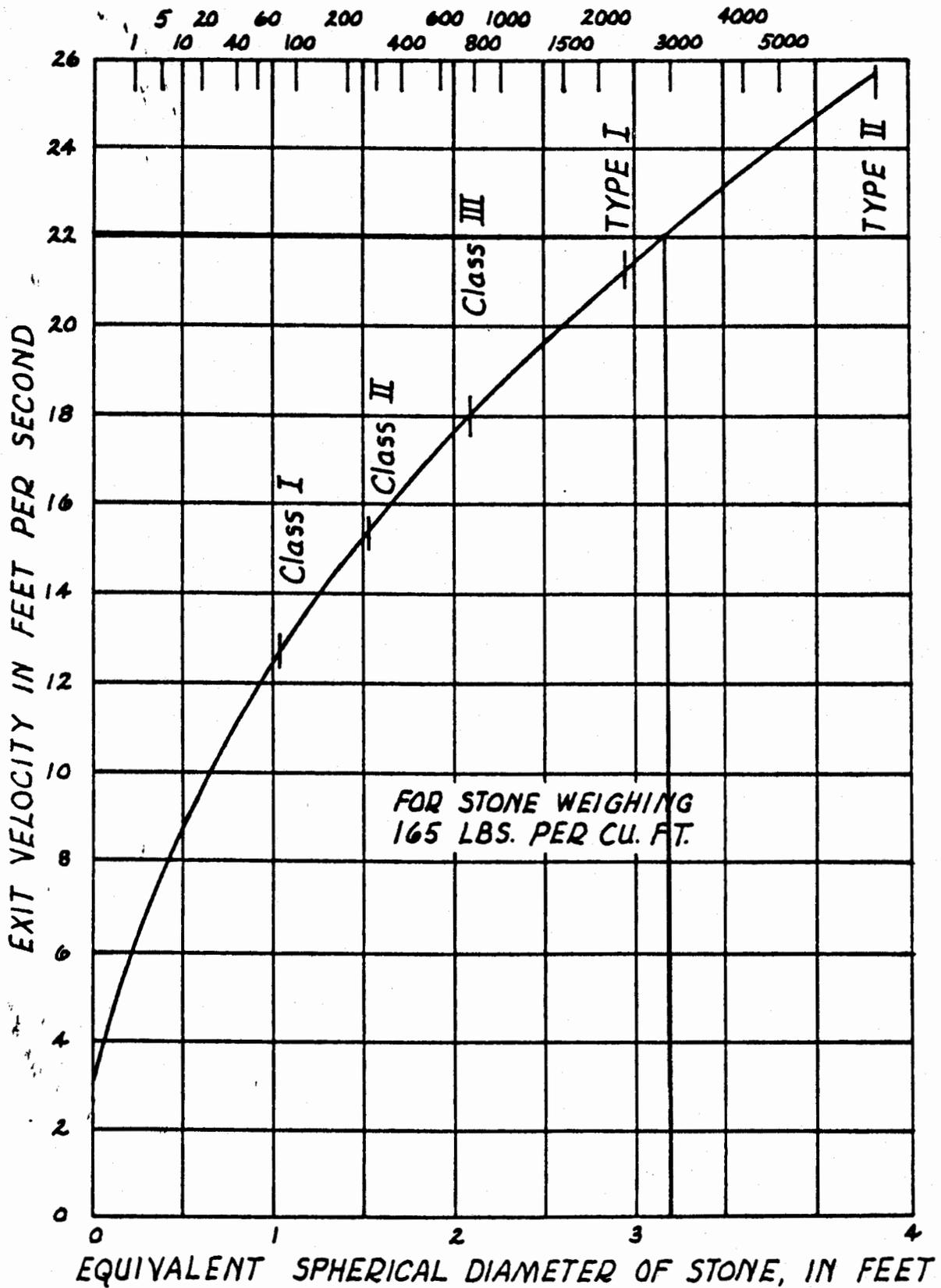


$$M = \frac{(541)(2)^2}{2} = 1,082 \text{ F/ft} = 12,984 \text{ IN/ft}$$

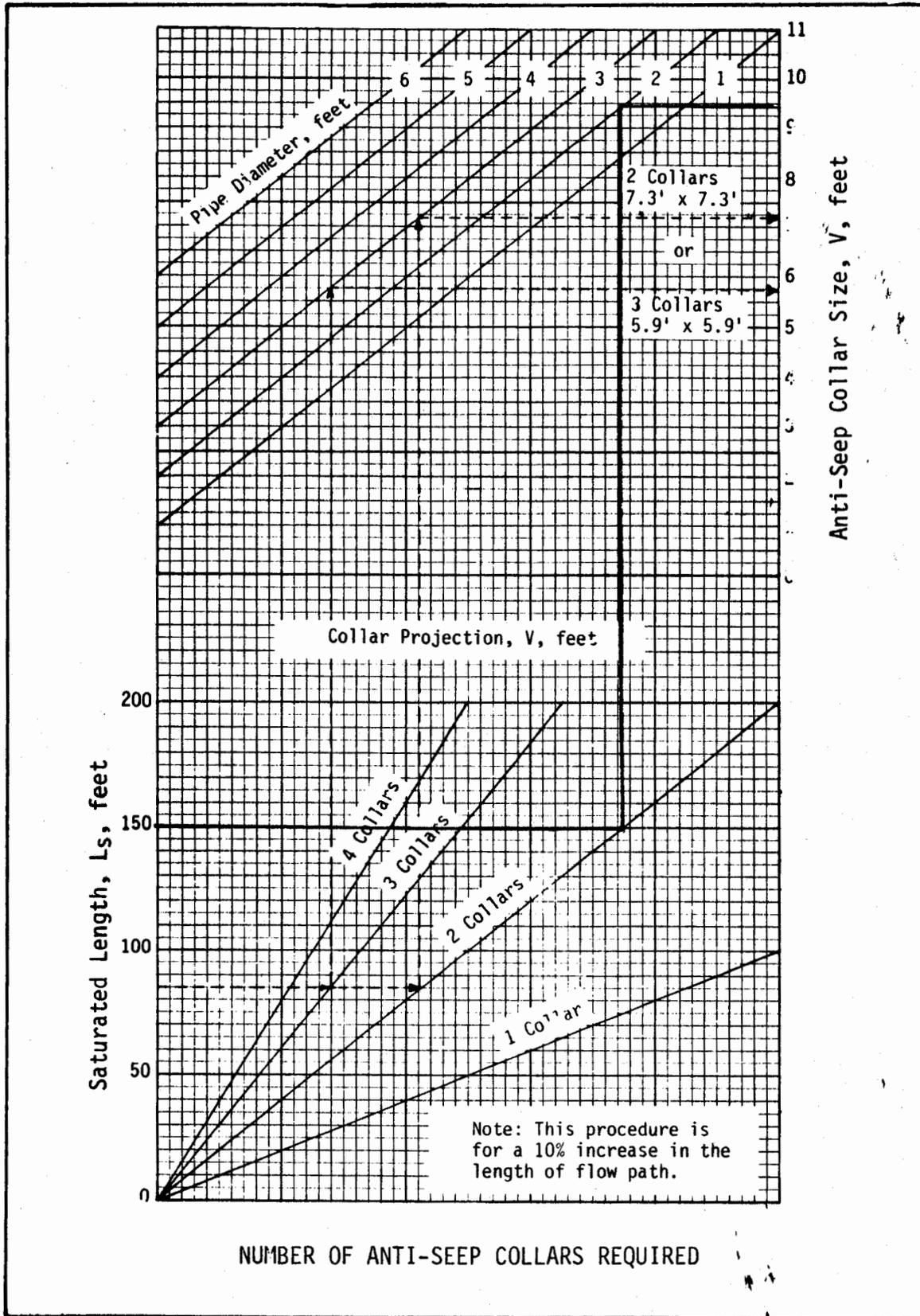
$$A_s = \frac{12,984}{36,000} \times 12 \times 1.866 = 0.03 \text{ IN}^2/\text{FT}$$

$\therefore$  Use #2 @ 12" OC

# STONE WEIGHT, IN POUNDS



RIPRAP SIZE FOR USE DOWNSTREAM  
OF ENERGY DISSIPATORS

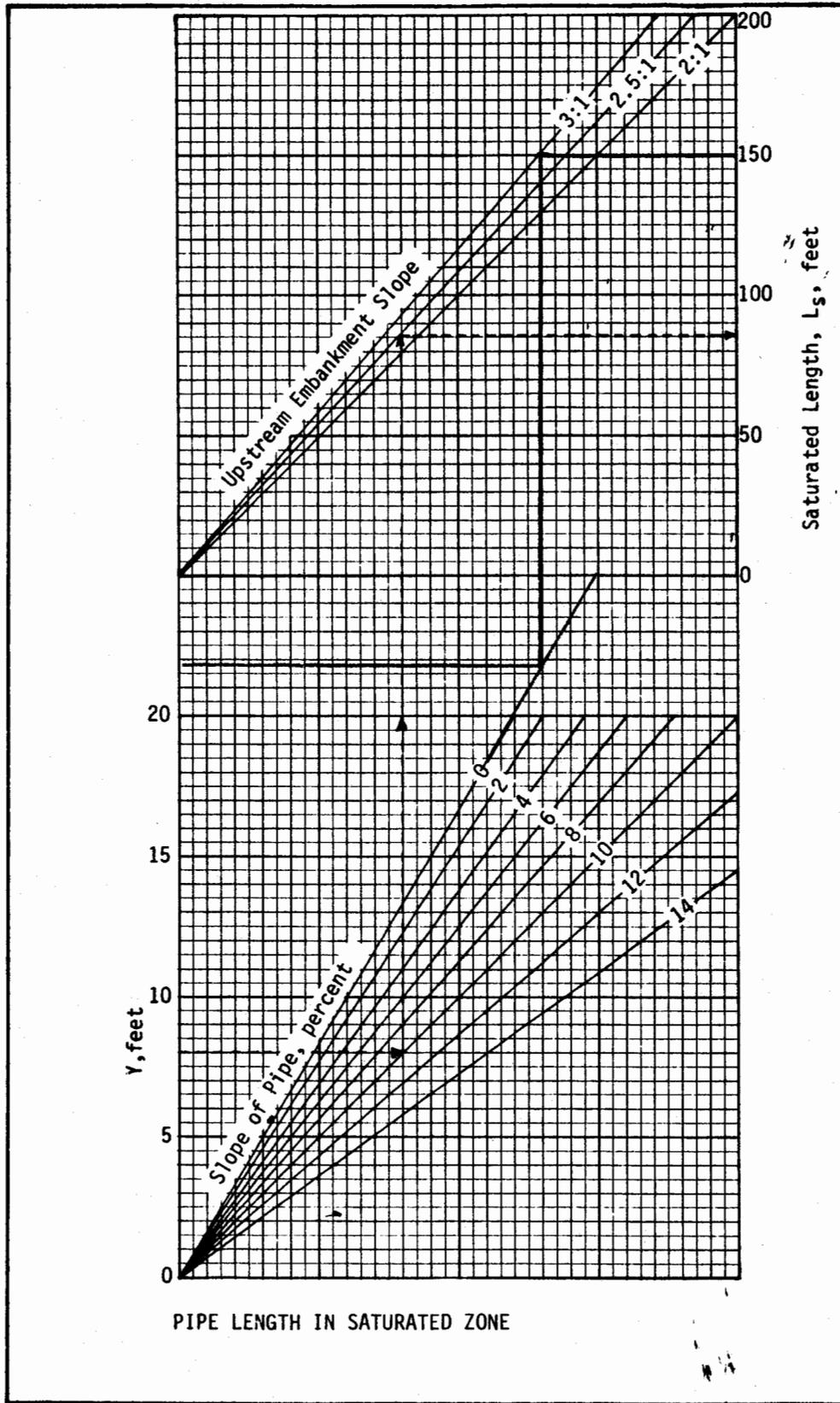


Source: USDA-SCS

Plate 1.261

SPACING = 15 X 1.25 = 18.75  
 Use 20'

III-82

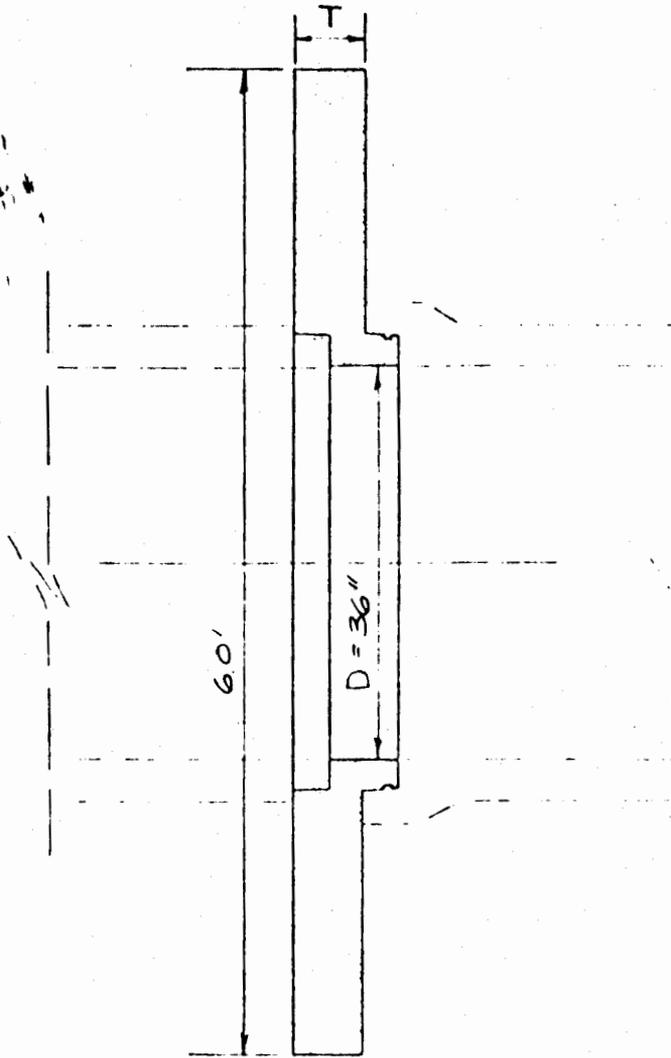


Source: USDA-SCS

Plate 1.26k

III-81

T = 6" FOR D = 12" - 42"  
T = 8" FOR D = 48" & LARGER



ANTI-SEEP COLLAR FOR DAM SECTION

CONCRETE PIPE & PRODUCTS CO., INC.

|          |         |     |
|----------|---------|-----|
| DATE     | 1-5-62  | RWS |
| SCALE    | NONE    |     |
| DWG. No. | RS-82-3 |     |

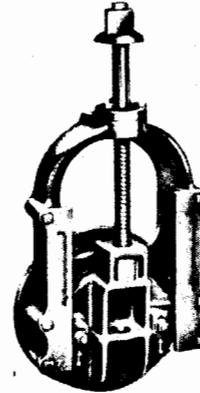
**SLUICE GATES**

**MANUAL, HYDRAULIC,  
OR  
ELECTRIC MOTOR OPERATION**

Clow Sluice Gates are cast iron, bronze mounted, and have solid bronze adjustable wedges. They are available in sizes 4-inch thru 14-inch, with circular opening, and can be installed in lines having both seating and unseating pressure. Sluice gates are suitable for low head applications only.

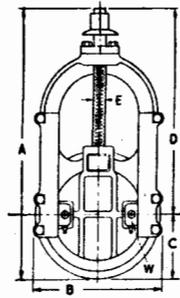
These sluice gates are available with non-rising stem or sliding stem with flanged end connection.

Complete specifications should accompany orders or requests for quotation. Unless otherwise specified, flanged connections will be faced and drilled to the ANSI 125 pound template.

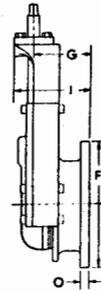


**F-5350**  
Flanged, Non-rising stem

**DIMENSIONS**



Front View



Side View

**F-5350 Flanged, NRS**

**Dimensions in Inches**

| Valve Size Inches | A                              | B                              | C                              | D                              | E                             | F                              | G                             | I                             | O                             | W                       |
|-------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------|
| 4                 | 18 <sup>7</sup> / <sub>8</sub> | 8 <sup>1</sup> / <sub>4</sub>  | 4 <sup>1</sup> / <sub>2</sub>  | 14 <sup>3</sup> / <sub>8</sub> | 1                             | 9                              | 4 <sup>3</sup> / <sub>8</sub> | 6 <sup>3</sup> / <sub>8</sub> | 3 <sup>4</sup> / <sub>8</sub> | Number of Side Wedges-2 |
| 6                 | 24                             | 11 <sup>1</sup> / <sub>4</sub> | 5 <sup>1</sup> / <sub>2</sub>  | 18 <sup>1</sup> / <sub>2</sub> | 1 <sup>1</sup> / <sub>8</sub> | 11                             | 5 <sup>1</sup> / <sub>2</sub> | 6 <sup>1</sup> / <sub>4</sub> | 7 <sup>1</sup> / <sub>8</sub> |                         |
| 8                 | 29                             | 13 <sup>3</sup> / <sub>4</sub> | 6 <sup>3</sup> / <sub>4</sub>  | 22 <sup>1</sup> / <sub>4</sub> | 1 <sup>1</sup> / <sub>4</sub> | 13 <sup>1</sup> / <sub>2</sub> | 6                             | 8 <sup>1</sup> / <sub>8</sub> | 7 <sup>1</sup> / <sub>8</sub> |                         |
| 10                | 32 <sup>7</sup> / <sub>8</sub> | 15 <sup>1</sup> / <sub>2</sub> | 8                              | 24 <sup>7</sup> / <sub>8</sub> | 1 <sup>3</sup> / <sub>8</sub> | 16                             | 6 <sup>1</sup> / <sub>4</sub> | 8 <sup>7</sup> / <sub>8</sub> | 1                             | Number of Side Wedges-2 |
| 12                | 38 <sup>1</sup> / <sub>4</sub> | 18 <sup>1</sup> / <sub>2</sub> | 9 <sup>1</sup> / <sub>2</sub>  | 28 <sup>3</sup> / <sub>4</sub> | 1 <sup>1</sup> / <sub>2</sub> | 19                             | 6 <sup>3</sup> / <sub>8</sub> | 8 <sup>7</sup> / <sub>8</sub> | 1                             |                         |
| 14                | 43                             | 20 <sup>1</sup> / <sub>2</sub> | 10 <sup>1</sup> / <sub>2</sub> | 32 <sup>1</sup> / <sub>2</sub> | 1 <sup>1</sup> / <sub>2</sub> | 21                             | 6 <sup>7</sup> / <sub>8</sub> | 9 <sup>3</sup> / <sub>8</sub> | 1                             |                         |

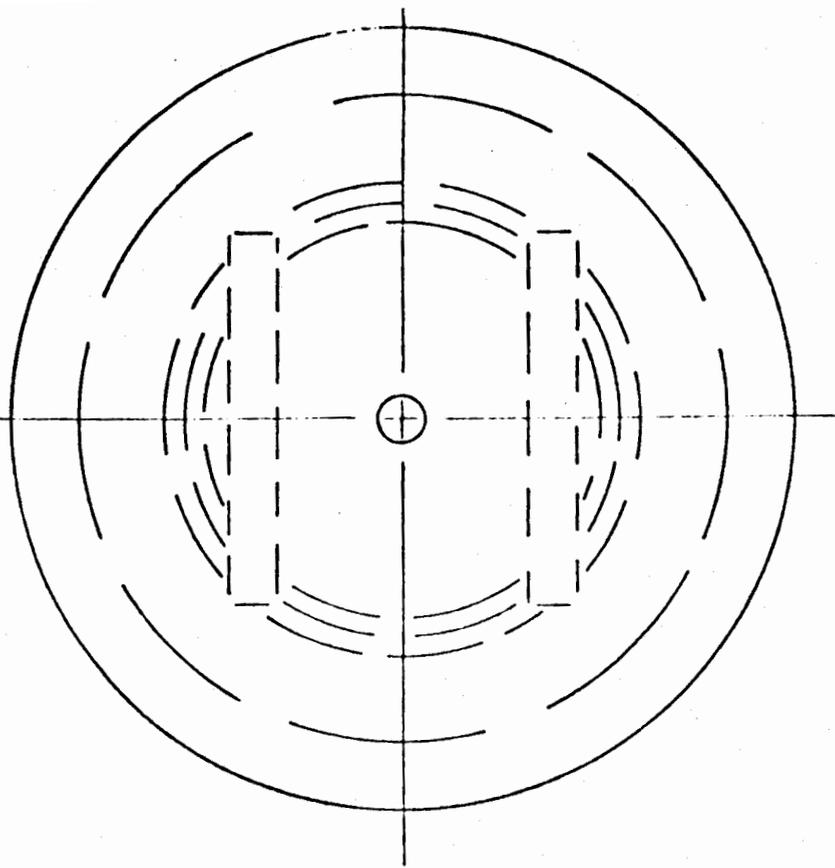
**ORDERING INFORMATION**

- 1. Size of openings.**
- 2. State** whether gate connects directly to pipe, wall casting, or masonry. Anchor or connecting bolts are not furnished unless specified.
- 3. Give maximum head** of water in feet on center of opening, and whether direct or back pressure. Direct, or seating pressure forces the valve to its seat. Back, or unseating pressure forces the valve away from its seat.
- 4. Give distance** from center of gate to base

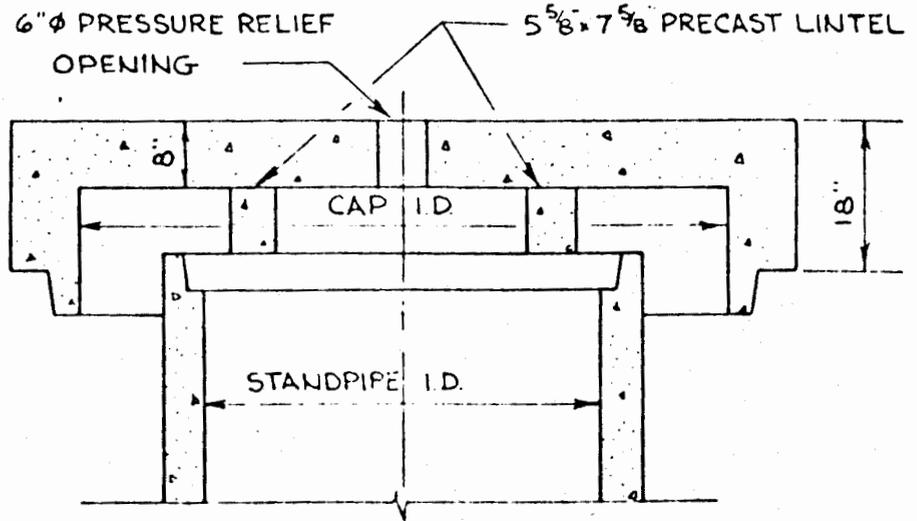
of floor stand or cylinder. In the case of gates with extended stems, give distance from center of gate opening to top of extension stem.

- 5. Method of operation**, whether manual, hydraulic, or electrical.
- 6. Type and material of stem.** State whether non-rising or sliding, and whether stem shall be of steel, bronze, etc.
- 7. Direction of opening.** Unless otherwise specified, sluice gates are opened by turning stem to left (counterclockwise).

| STAND-PIPE I.D. | CAP I.D. | STNPIPE. JOINT WEIGHT | CAP WEIGHT |
|-----------------|----------|-----------------------|------------|
| 12"             | 21"      | 368#                  | 564#       |
| 15"             | 27"      | 504#                  | 903#       |
| 18"             | 30"      | 688#                  | 1,098#     |
| 21"             | 36"      | 864#                  | 1,549#     |
| 24"             | 42"      | 2,160#                | 2,087#     |
| 27"             | 48"      | 2,616#                | 2,701#     |
| 30"             | 48"      | 3,120#                | 2,701#     |
| 36"             | 60"      | 4,256#                | 4,441#     |
| 42"             | 66"      | 5,568#                | 5,314#     |
| 48"             | 78"      | 7,056#                | 7,307#     |
| 54"             | 90"      | 10,024#               | 8,887#     |
| 60"             | 96"      | 11,992#               | 10,361#    |
| 66"             | 108"     | 14,136#               | 12,958#    |
| 72"             | 114"     | 16,448#               | 15,115#    |



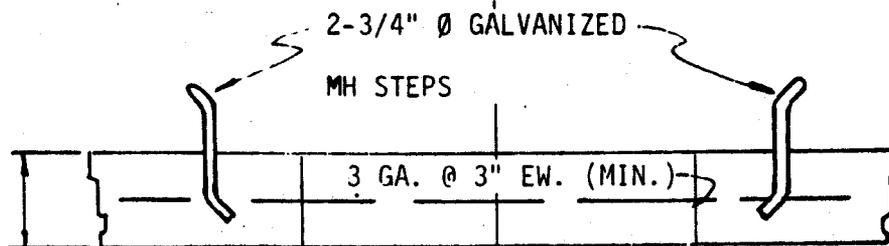
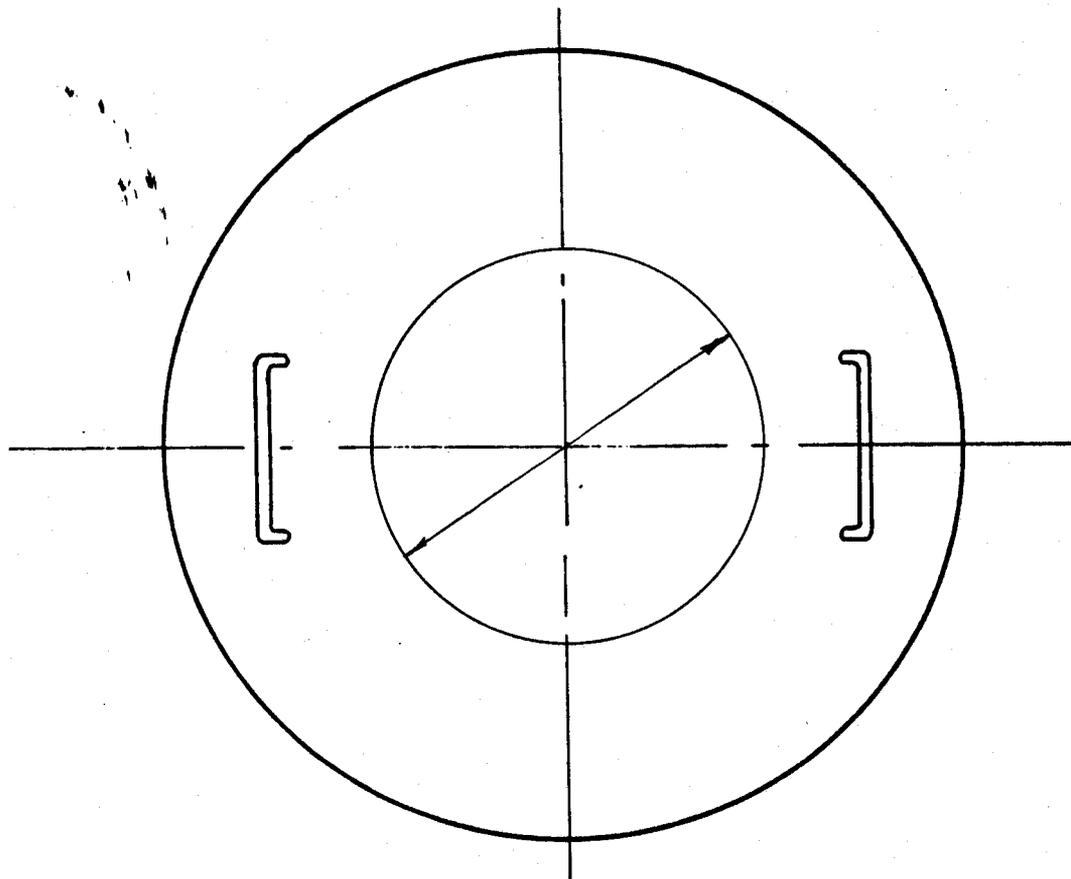
PLAN



SECTION

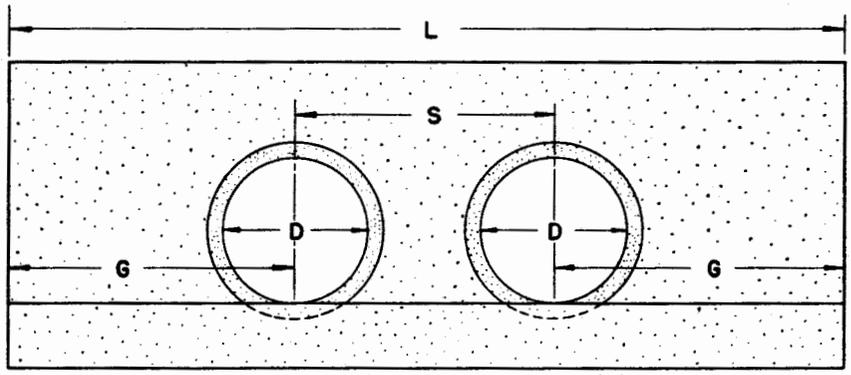
OR PIPE DETAILS, SEE DWG RS-74-53

|                                     |          |                            |     |
|-------------------------------------|----------|----------------------------|-----|
| PRECAST CONCRETE ANTI-VORTEX DEVICE | DATE     | 1-27-83                    | RWS |
|                                     | SCALE    | 1/2" = 1'-0" FOR 48" & 78" |     |
| CONCRETE PIPE & PRODUCTS CO., INC.  | DWG. No. | RS-83-9                    |     |

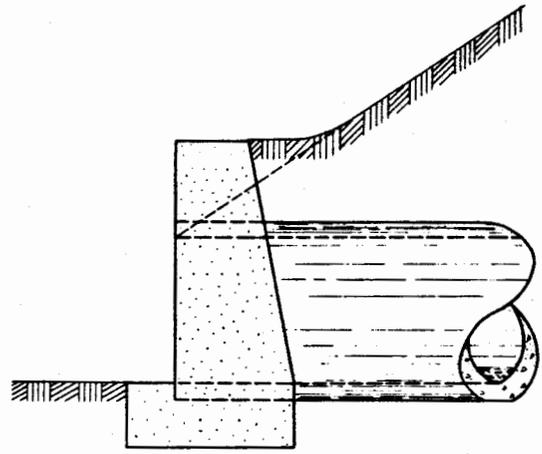


PLUG DESIGNED FOR WATER TIGHTNESS ONLY.  
 FORCES RESULTING FROM INTERNAL PRES-  
 SURE TO BE RESISTED BY EXTERNAL BRACING  
 (BY OTHERS) UNIFORMLY DISTRIBUTED TO PRE-  
 VENT MOVEMENT OR DISTORTION OF PLUG.

|   |                 |          |     |
|---|-----------------|----------|-----|
| <b>SPIGOT PLUG FOR O-RING PIPE</b>            | <b>DATE</b>     | 1-25-71  | RVD |
|   |                 |          |     |
| <b>CONCRETE PIPE &amp; PRODUCTS CO., INC.</b> | <b>SCALE</b>    | NONE     |     |
|   | <b>DWG. No.</b> | RS-71-08 |     |



FRONT ELEVATION



SIDE ELEVATION

Note: On shallow fills, where endwalls are 1' or less below shoulder line, the top of the endwall shall be constructed parallel to the grade of the road.

This item may be precast or cast in place.

All concrete to be Class A3 if cast in place, Class A4 if precast.

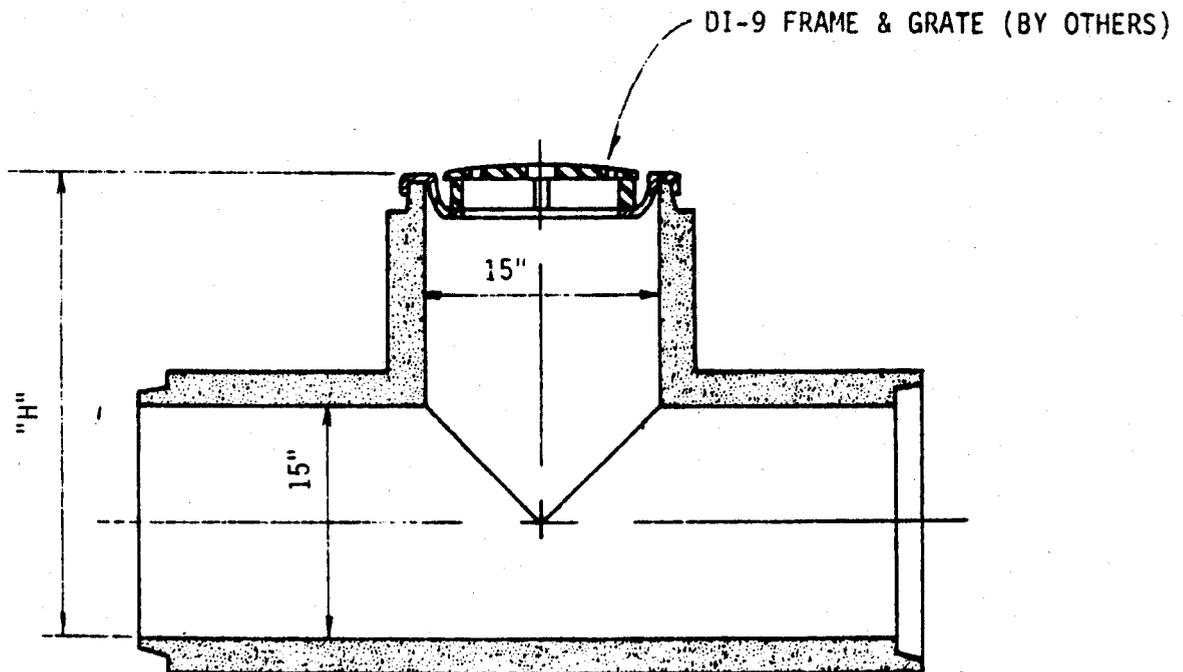
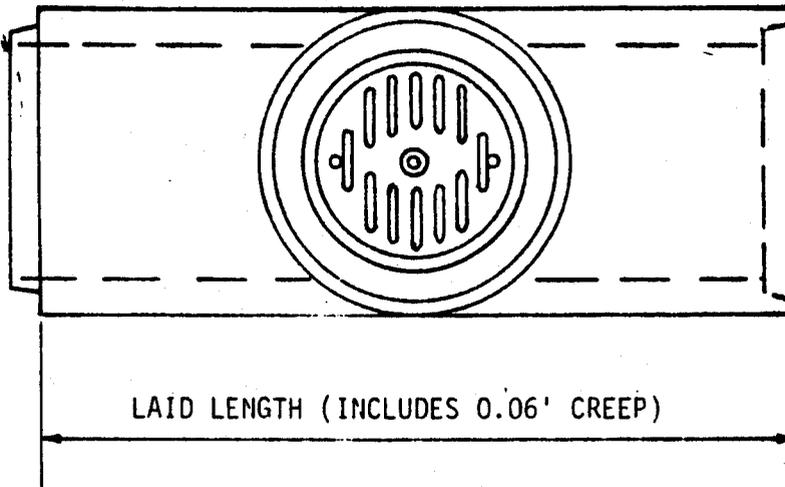
Quantities given are for one endwall.

All dimensions not given in table are same as those for single endwalls for same size of pipe.

| FOR CONCRETE PIPE        |        |       |        |   |  |
|--------------------------|--------|-------|--------|---|--|
| Diameter<br>D<br>Of Pipe | S      | G     | L      | Cu. Yds.<br>Concrete<br>One Double<br>Endwall | Increase<br>Cu. Yds. For<br>Each<br>Additional<br>Pipe |
| 12"                      | 1'-10" | 2'-0" | 5'-10" | 0.329   | 0.088  |
| 15"                      | 2'-3"  | 2'-6" | 7'-3"  | 0.671   | 0.179  |
| 18"                      | 2'-8"  | 3'-0" | 8'-8"  | 0.941   | 0.244  |
| 24"                      | 3'-6"  | 4'-0" | 11'-6" | 1.763   | 0.444  |
| 30"                      | 4'-4"  | 5'-0" | 14'-4" | 2.730   | 0.663  |
| 36"                      | 5'-2"  | 6'-0" | 17'-2" | 3.854   | 0.907  |

| FOR CORRUGATED METAL PIPE |        |       |         |   |  |
|---------------------------|--------|-------|---------|---|--|
| Diameter<br>D<br>Of Pipe  | S      | G     | L       | Cu. Yds.<br>Concrete<br>One Double<br>Endwall | Increase<br>Cu. Yds. For<br>Each<br>Additional<br>Pipe |
| 12"                       | 1'-7"  | 2'-0" | 5'-7"   | 0.344   | 0.087  |
| 15"                       | 1'-11" | 2'-6" | 6'-11"  | 0.696   | 0.175  |
| 18"                       | 2'-4"  | 3'-0" | 8'-4"   | 0.980   | 0.241  |
| 24"                       | 3'-1"  | 4'-0" | 11'-1"  | 1.840   | 0.442  |
| 30"                       | 3'-10" | 5'-0" | 13'-10" | 2.868   | 0.670  |
| 36"                       | 4'-7"  | 6'-0" | 16'-7"  | 4.076   | 0.931  |

STANDARD ENDWALLS FOR MULTIPLE PIPE CULVERTS  
 12"-36" PIPE  
 VIRGINIA DEPARTMENT  
 of  
 HIGHWAYS AND TRANSPORTATION



FOR PIPE DETAIL SEE DWG. RS-72-51

|                                    |          |          |     |
|------------------------------------|----------|----------|-----|
| VDH&T DI 9                         | DATE     | 9-17-80  | RWS |
|                                    | SCALE    | 1"=1'-0" |     |
| CONCRETE PIPE & PRODUCTS CO., INC. | DWG. No. | RS-80-79 |     |



## MILL CREEK LANDING

### 1) Flow Data -

From Vic Woodson

Queens Lake - 40 ac lake

Mill Creek Lake - 6½ ac lake

Flow in - 18 gal/min - Queens  
4 gpm - Mill Creek

Ratio - .45 gpm/acre of lake - Queens  
.57 gpm/acre of lake - Mill Creek

∴ should be ok

$$\begin{aligned} \text{DA / Vol of Pond ratio} &= \frac{97.5 \text{ ac}}{.4 \times 17 \times 6.5} \\ &= 2.21 : 1 \\ \text{recommended ratio} &= 3 : 1 \end{aligned}$$

close but the field data indicate should be ok.

187  
114  
69

246-9644

**GEOTECHNICAL STUDY**  
**MILL CREEK LANDING DAM**  
Mill Creek Landing Development  
James City County, Virginia

Prepared for  
**L. V. WOODSON & ASSOCIATES, INC.**  
Williamsburg, Virginia

Prepared by  
**SAYRE & ASSOCIATES, p.c.**  
Richmond, Virginia

Project: 87106

August 1987



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| Subsurface Investigation | 2           |
| Description of Soil      | 2           |
| Engineering Analysis     | 3           |
| Discussion               | 4           |
| Limitations              | 5           |

## APPENDIX

|                             |
|-----------------------------|
| Locations of Borings Sketch |
| Notes to Boring Logs        |
| Boring Logs 1 through 9, 1A |

**GEOTECHNICAL STUDY**  
**MILL CREEK LANDING DAM**  
Mill Creek Landing Development  
James City County, Virginia

**INTRODUCTION**

In accordance with our accepted proposal dated June 15, 1987, we have completed a geotechnical study for the Mill Creek Landing Dam in James City County, Virginia. The purpose of the Study was to provide professional opinions and recommendations concerning the soil design criteria for the earth embankment. The study included an observation of the site, test borings, and an analysis of the data gathered.

**SUMMARY OF FINDINGS**

The proposed borrow material from the Midlands will be acceptable for use in the embankment provided it is placed within 2% of the optimum moisture content and is compacted to at least 95% of maximum dry density as determined by ASTM Method D-6908.

A cut-off trench is required under the embankment. The depth of the cut-off varies. It is recommended that the cut-off extend 3 feet up into the embankment and be composed of an impermeable clay.

Very soft soil and high groundwater will create serious construction problems with the embankment and cut-off trench in the creek bottom.

The riser pipe structure foundation, upstream from the dam, must be undercut to firm soil and be backfilled with crushed stone. The outlet pipe must have at least two seepage collars where it passes through the embankment. Backfilling around the pipe is critical for the integrity of the dam.

**DESCRIPTION OF SITE**

Mill Creek Landing development will be located west of Ferncliff Drive, north of Stanley Drive, and south of the proposed Route 199 in James City County, Virginia. The topography in Mill Creek Landing consists of a number of ridges which slope

down to Mill Creek. Mill Creek begins near the east side of this area and flows in a generally westward direction. The creek is 30 to 40 feet lower than the surrounding ridges. The area is wooded with mature softwood trees. The underbrush is light.

This area is in the Atlantic Coastal Plain physiographic province. Geologically the soil consists of the Windsor formation overlying the Yorktown formation. The Windsor formation is composed of a heterogeneous mixture of sand, silt and clay in the upper portion. Typically it is composed of 30 to 40 percent sand and the remainder is evenly divided between silt and clay. The lower portion of the Windsor formation is fine sand with minor amounts of silt and clay. The Yorktown formation is composed of large shell fragments in a matrix of sand and clay.

### **DESCRIPTION OF PROJECT**

Mill Creek Landing Dam will be an earthen embankment approximately 490 feet long with a maximum height of about 20 feet. The crest of the dam will be 34 feet wide. A residential street, Broadwater Drive, will cross the dam on the crest.

The normal pool elevation will be 55 feet, and the flood level will be elevation 57 feet. The roadway centerline will be at elevation 61 feet.

The outlet structures and hydrology are outside the scope of this study.

### **SUBSURFACE INVESTIGATION**

Six borings were made along the centerline of the dam and four borings were made in the bottom of the reservoir area. The locations of the borings are shown on a sketch in the Appendix. The borings were drilled with hollow-stem augers. Split-spoon samples and penetration resistance values were obtained in accordance with ASTM Method D-1586 at depths of 0, 2, 4, 7 and 9 feet, and then at 5-foot intervals to the bottom of the borings. The borings were terminated at depths of 20 to 30 feet along the dam and 10.5 feet in the reservoir area. The logs of the borings are in the Appendix.

### **DESCRIPTION OF SOIL**

The soil along the proposed embankment consists of thin layers of sand and clay in various proportions overlying the shell and sand deposit of the Yorktown formation.

As is typical of water-deposited soil, the sand and clay layers are discontinuous. The top of the Yorktown slopes downward from elevation 39 +/- feet at the north abutment to 33 +/- feet at the creek, and 26 +/- feet at the south abutment. The surface elevation along the dam varies from 57 feet at the abutments to 38 feet in the bottom of the creek valley.

There are pervious soils at the surface, along the centerline of the dam. From the north abutment to Station 41+10, the pervious soil is 2 feet deep. From Station 41+10 to Station 41+90, the depth of the pervious soil increases to 5 feet (elevation 35.5 feet). The bottom of the pervious soil slopes downward to elevation 27 feet at Station 42+45 and remains at that level to Station 42+75. The pervious soil is 6 feet deep at Station 43+38 and gradually rises to a depth of 2 feet at Station 44+00. From Station 44+00 to the south abutment, the pervious soil continues to be 2 feet thick.

The soil between the soft, pervious material and the Yorktown formation is composed of discontinuous layers of silty clay, sandy clay and clayey sand. These layers are moderately dense with penetration resistance values in the range of 10 to 20 blows per foot.

At this site, the Yorktown formation is composed of fragments of large shells with varying amounts of sand. This material becomes increasingly dense with depth.

Groundwater was found at approximate elevation 27 feet along the dam centerline.

In the reservoir bottom, three of the borings (6, 7 and 9) were adjacent to the creek. Boring 8 was about 40 feet north of the creek. In the creek bottom the soil consists of 3.5 to 8.5 feet of very soft creek deposits. These deposits are composed of silt and sand with varying amounts of organic matter. Underlying the creek deposits is the Yorktown formation. The Yorktown is composed of shells with some sand and is very loose in the upper 5 feet. Below 5 feet the shells and sand become significantly more dense. Groundwater in the creek bottom was 1.5 to 2.5 feet below the surface.

In boring 8 the soil was composed of thin layers (2 to 4 feet) of silty clay, sandy clay, and sand. These soils are generally soft.

### **ENGINEERING ANALYSIS**

With the exception of the soils in the creek bottom, the soil along the dam centerline is firm with penetration resistance values in the range of 10 to 20 blows per foot. This is indicative of good supporting characteristics for an embankment.

In the creek bottom (Station 42+25 +/- to Station 42+75 +/-) very soft and saturated soil is anticipated. This soil is not capable of supporting the embankment, or any load.

The pervious soils identified previously will permit water to flow through them with very little head. Directly under a dam embankment, these soils could result in piping or leakage.

## DISCUSSION

It has been proposed to use soil from The Midlands development for the dam embankment. Past experience with this material has shown that it consists primarily of clayey sand. In view of the thickness of the proposed embankment, it is our opinion that the proposed soil is acceptable for use in the embankment provided the moisture content is within 2% of the optimum moisture and that it is compacted to at least 95% of maximum dry density as determined by ASTM Method D-698.

We recommend that the upstream face of the embankment constructed of the clayey sand have a minimum slope of 2-1/2 horizontal to 1 vertical. The recommended slope of the downstream face is 3 horizontal to 1 vertical. It is understood that the downstream slope will be increased to 4:1 to permit maintenance of the slope.

Due to the presence of pervious soil at the contact of the natural ground and the embankment, we recommend a cut-off trench under the embankment along the upstream side of the centerline. The trench should be about 10 feet wide to permit the operation of excavating and compacting equipment. The cut-off trench should be backfilled with impervious clay compacted to at least 95% of maximum dry density as determined by ASTM Method D-698 and extending at least 3 feet up into the embankment. The elevation of the bottom of the trench and the elevation of the top of the clay cut-off are in the following table.

| <u>Station</u> | <u>Elevation<br/>Top of Cut-off</u> | <u>Elevation<br/>Bottom of Cut-off</u> |
|----------------|-------------------------------------|--|
| 40+50          | 58.0                                | 55.0                                   |
| 41+10          | 57.0                                | 49.0                                   |
| 41+90          | 43.0                                | 35.0                                   |
| 42+45          | 43.0                                | 27.0                                   |
| 42+75          | 43.0                                | 27.0                                   |
| 43+48          | 48.0                                | 40.0                                   |
| 44+00          | 53.0                                | 47.0                                   |
| 45+00          | 59.0                                | 55.0                                   |

Construction problems are anticipated for the embankment and the cut-off in the creek bottom (approximate Station 42+00 to Station 42+75) due to soft soil and groundwater. It will be necessary to remove the soft soil from the entire area of the embankment. It is anticipated that the depth of undercut will be a minimum of 5 to 6 feet. Groundwater is about 2 feet below the surface. Dewatering will be required to place and compact both the cut-off and the embankment in the creek bottom.

It is understood that the riser pipe structure will be in the creek bottom about 50 feet upstream from the embankment. The very soft soil in the creek bottom is not capable of supporting any structural loads. We recommend that the foundation excavation for the riser pipe be extended to the top of the shell and sand layer (Yorktown formation). The excavation should be filled with crushed stone to the level of the bottom of the foundation. Groundwater will be encountered within 2 feet of the surface in this work.

We recommend that at least two seepage collars be installed on the outlet pipe

where it passes through the embankment. This area is probably the most vulnerable to seepage and possible failure in the entire project. Extreme care must be used in correctly installing the collars and properly compacting the soil around the pipe.

There is an exiting 8-inch sewer line running at an approximate right angle to the dam centerline near Station 42+90. In the embankment area, the original trench for the pipe should be re-excavated, a seepage collar installed, and the trench back-filled with the same material and to the same specifications as the embankment.

### LIMITATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations shown on the sketch in the Appendix. This report does not reflect any variations which may occur between these borings. The nature and extent of variations between the borings may not become evident until construction is underway. If variations become evident, this firm should be notified so that immediate observations can be made of the conditions and appropriate recommendations can be rendered.

This report has been prepared for L. V. Woodson & Associates, Inc. to be used in the design of the proposed structure. Anyone using this report for any purpose other than design of the structure described herein must draw his own conclusions regarding construction procedures and soil conditions.

We recommend that this report in its entirety, including the Appendix, be furnished as information to prospective bidders. We disclaim all responsibility and liability for any part which is removed, quoted or reproduced separately from the entire report.

We request the opportunity to review those portions of the plans and specifications for this project which pertain to earthwork to determine if they are consistent with our recommendations.

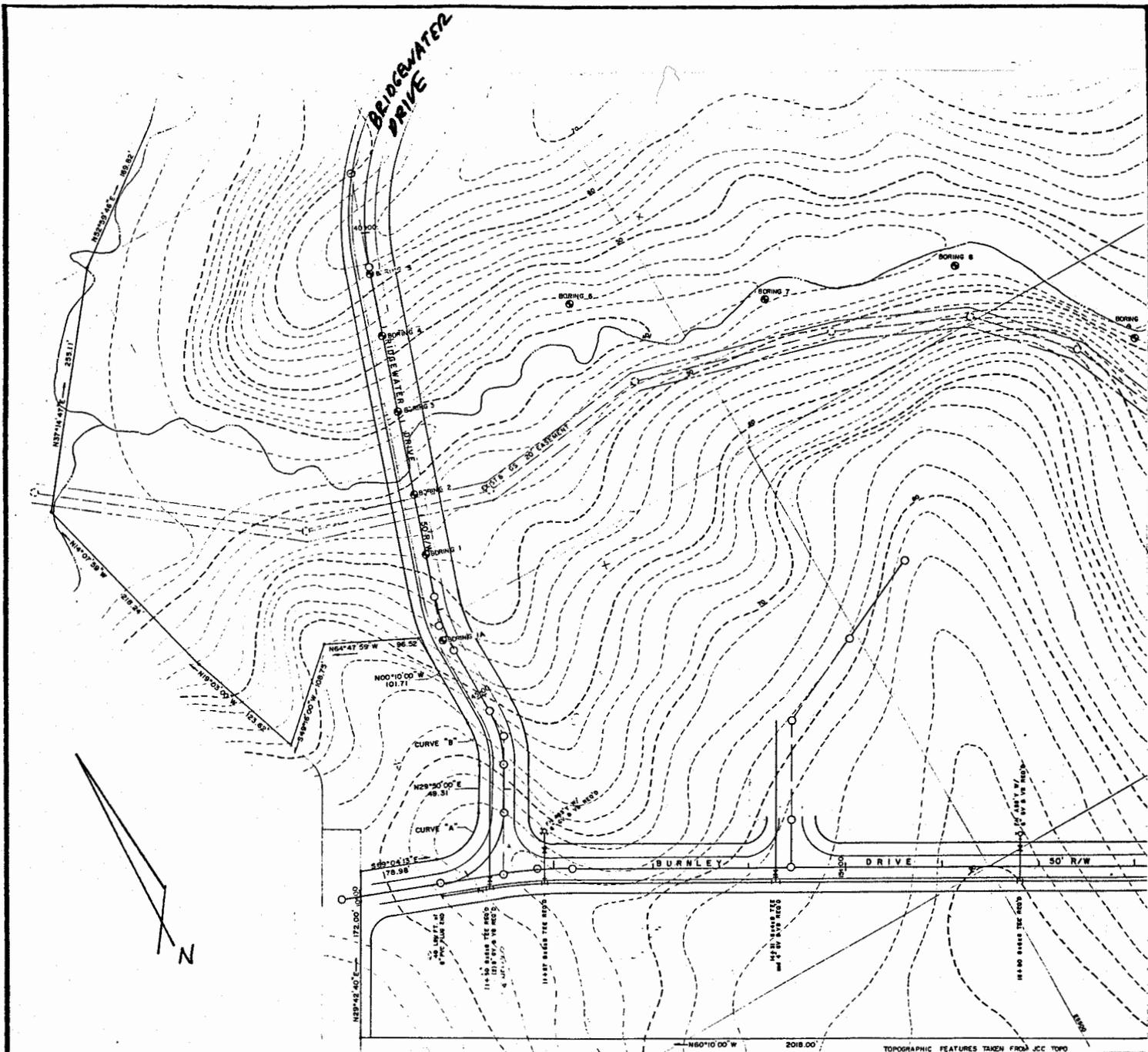
SAYRE & ASSOCIATES, p.c.



Robert D. Sayre, P.E.

August 24, 1987

**A P P E N D I X**



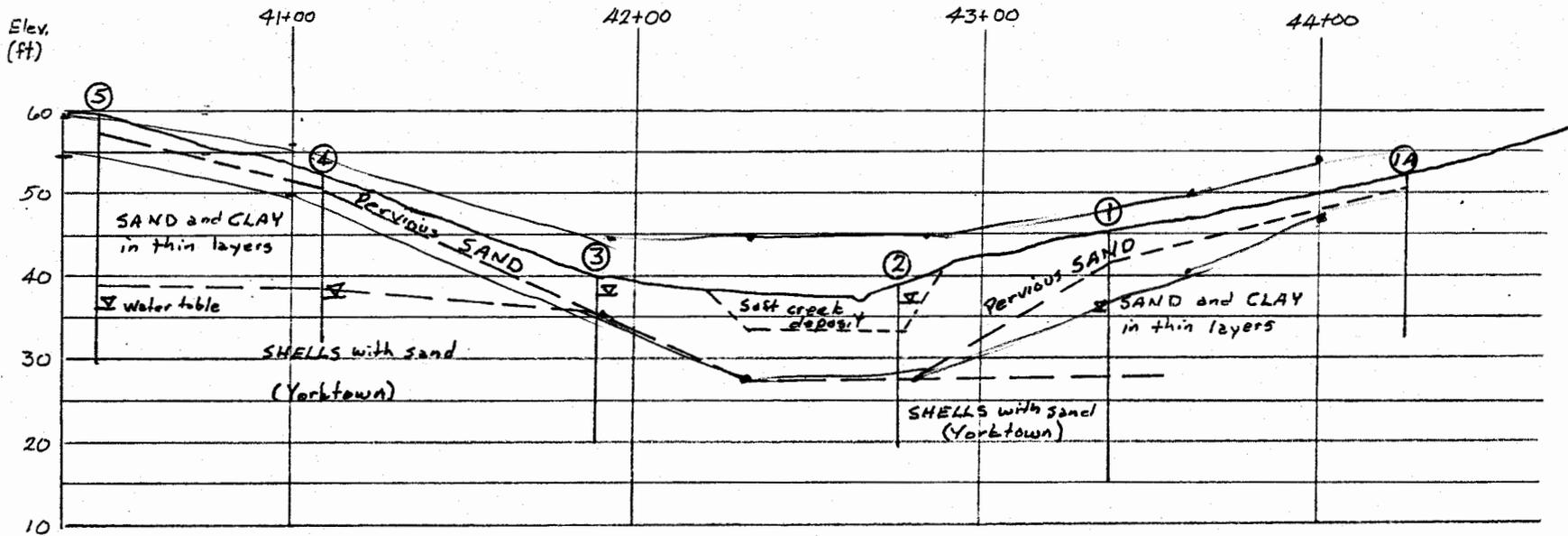
From L. K. Woodson & Associates drawing,  
 Mill Creek Landing, Development Plan Sheet 1

# LOCATIONS OF BORINGS

MILL CREEK LANDING DAM  
 JAMES CITY COUNTY, VIRGINIA

date AUGUST 1987  
 geotechnical engineers

SAYRE & ASSOCIATES, p.c.



X-SECTION THROUGH DAM CENTERLINE

Lines between strata are approximate and based on interpolation between borings.

MILL CREEK LANDING DAM  
 JAMES CITY COUNTY, VIRGINIA

SAYRE & ASSOCIATES, p.c.

scale 1 VERTICAL:  
 2.5 HORIZONTAL  
 date AUGUST 1987  
 geotechnical engineers

## NOTES TO BORING LOGS

These notes refer to and are a part of the accompanying boring logs.

1. The borings were made by a boring contractor under the continuous observation of an engineer of Sayre & Associates, p.c. These boring logs were compiled from Sayre & Associates field logs and the results of visual examination of the soil samples in our laboratory.
2. The logs of the borings apply only at the specific boring locations and at the dates indicated. They are not warranted to be representative of subsurface conditions at other locations and times.
3. The depth of the indicated boundaries between soil or rock strata is approximate. The transition between the strata may be gradual.
4. The groundwater levels shown on the boring logs represent average or typical values observed during the period of the boring operation or shortly after completion of a boring. These observations do not reflect seasonal changes in the water table or the effects of intense rainfall or runoff. In any excavation, trickling flow or seepage may be encountered from perched water which is at levels above the water table observed in the borings.
5. Soil samples recovered from the borings and which remained after laboratory testing have been stored at Ayers & Ayers, Inc., Powhatan, Virginia, and are available for inspection by appointment. The soil samples will be discarded sixty days after completion of the borings unless a request is received to retain them for a longer period.
6. The locations of borings were determined by others. Elevations of borings were approximately determined by interpolation of plan contours. The location and elevation of the borings should be considered accurate only to the degree implied by the method used.

## NOTES TO BORING LOGS (continued)

### Definitions of Terms and Abbreviations

#### Components

- GRAVEL - particles larger than 1/4" diameter
- SAND - particles smaller than 1/4" diameter and larger than No. 200 sieve (individual grains visible to naked eye)
- SILT - particles smaller than No. 200 sieve (individual grains not distinguishable); low plasticity to non-plastic
- CLAY - particles smaller than No. 200 sieve; medium to high plasticity
- TOPSOIL - surface soil containing a significant proportion of organic matter
- FILL - man-made deposit

#### Composition

- GRAVEL, SAND, SILT, CLAY
  - major component (50% or more)
- gravelly, sandy, silty, clayey
  - secondary component (33% to 50%)
- some
  - minor component (10% to 33%)
- trace
  - minor component (1% to 10%)
- and
  - two major components (nearly equal proportions)

#### Moisture

- saturated - below water table
- wet - much above optimum
- moist - near optimum
- dry - much below optimum

#### Structure

- stratified - layers 1/2 to 12 inches thick
- laminated - layers less than 1/2 inch thick

#### Color

- dark, light - significant difference in shade
- mottled - irregularly colored (usually indicates lack of drainage)

#### WOH

- weight of hammer

#### ROD

- rock quality designation (% of core which is 4" or longer)

#### NSR

- no sample recovered

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 1A                                      | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description              | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                              |
|-------|----------------------------------|--------------|----------------------------------|---|
| 0     | TOPSOIL - 8"                     | 0.5          |                                  |   |
|       | Silty SAND                       | 1.5          | 3-3                              | Tan silty SAND, dry                             |
|       | Silty CLAY, stiff, dry           | 2.5          |                                  |   |
|       |                                  | 3.5          | 5-8                              | Brown mottled silty CLAY, some fine sand, dry   |
|       |                                  | 4.5          |                                  |   |
| 5     |                                  | 5.5          | 11-13                            | Brown mottled sandy CLAY, moist                 |
|       | Silty CLAY, stiff, moist         | 7.5          |                                  |   |
|       |                                  | 8.5          | 6-7                              | Brown mottled silty CLAY, some fine sand, moist |
|       |                                  | 9.5          |                                  |   |
| 10    |                                  | 10.5         | 5-7                              | Brown mottled silty CLAY, some fine sand, moist |
|       |                                  |              |                                  |   |
| 15    | Clayey SAND, loose, wet          | 14.5         |                                  |   |
|       |                                  | 15.5         | 2-2                              | Brown clayey SAND, wet                          |
|       | Sandy CLAY, very soft, saturated | 19.0         |                                  |   |
| 20    | Boring terminated at 20.0 ft.    | 20.0         | 1/12"                            | Brown sandy CLAY, saturated                     |
|       |                                  |              |                                  |   |
| 25    |                                  |              |                                  |   |
|       |                                  |              |                                  |   |
| 30    |                                  |              |                                  |   |
|       |                                  |              |                                  |   |
| 35    |                                  |              |                                  |   |
|       |                                  |              |                                  |   |
| 40    |                                  |              |                                  |   |
|       |                                  |              |                                  |   |
| 45    |                                  |              |                                  |   |

|  |  |
|--|--|
| <p>Ground Water Data:</p> <p>Water level is _____ ft. below ground surface _____ hrs. after completion.</p> <p style="text-align: center;">No groundwater encountered during drilling.</p> | <p><b>SAYRE &amp; ASSOCIATES, p.c.</b></p> <p><i>Geotechnical Engineers<br/>Richmond, Virginia</i></p> |
|--|--|

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.  
 See NOTES TO BORING LOG which are a part of this log.



# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 2                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description                       | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                      |
|-------|---|--------------|----------------------------------|---|
| 0     | Organic SILT and SAND<br>(stream deposit) | 0.5          |                                  | Gray organic SILT, some sand, wet       |
|       |   | 1.5          | 1-1                              |   |
|       |   | 2.5          |                                  |   |
|       |   | 3.5          | WOR                              |   |
| 5     | Silty SAND, saturated                     | 4.5          | WOR                              | Brown silty fine SAND, saturated        |
|       |   | 5.5          |                                  |   |
|       | Sandy SHELLS, saturated                   | 7.5          |                                  | Tan sandy SHELLS, trace clay, saturated |
|       |   | 8.5          | 3-2                              |   |
|       |   | 9.5          |                                  |   |
| 10    |   | 10.5         | 3-3                              |   |
|       | SAND and SHELLS, wet                      | 14.5         |                                  | Tan SAND and SHELLS, trace clay, wet    |
| 15    |   | 15.5         | 6-8                              |   |
|       |   | 19.0         |                                  |   |
| 20    | Boring terminated at 20.0 ft.             | 20.0         | 7-8                              | Gray SAND and SHELLS, trace clay, wet   |
| 25    |   |              |                                  |   |
| 30    |   |              |                                  |   |
| 35    |   |              |                                  |   |
| 40    |   |              |                                  |   |
| 45    |   |              |                                  |   |

**Ground Water Data:**

Water level is 2.0 ft. below ground surface 0 hrs. after completion.  
 " " " 2.0 " " " " " 24 " " " "

Groundwater encountered at 2.0 ft. during drilling.

**SAYRE & ASSOCIATES, p.c.**

*Geotechnical Engineers  
Richmond, Virginia*

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 3                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description                           | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                          |
|-------|---|--------------|----------------------------------|---|
| 0     | TOPSOIL                                       | 0.5          |                                  |   |
|       | Silty SAND, loose to medium dense, wet to dry | 1.5          | 3-9                              | Brown silty fine SAND, dry                  |
|       |   | 2.5          |                                  |   |
|       |   | 3.5          | 8-4                              | Tan and gray silty fine SAND, dry           |
|       |   | 4.5          |                                  |   |
| 5     |   | 5.5          | 2-2                              | Brown and gray clayey fine SAND, wet        |
|       | SHELLS, saturated                             | 7.5          | 4-5                              | Gray clayey SHELLS, some fine sand, wet     |
| 10    |   | 8.5          |                                  |   |
|       |   | 9.5          | 3-3                              | Brown SHELLS, some clay and sand, saturated |
|       |   | 10.5         |                                  |   |
| 15    |   | 14.5         | 3-4                              | Gray SHELLS, some clay and sand, saturated  |
|       |   | 15.5         |                                  |   |
| 20    | Boring terminated at 20.0 ft.                 | 19.0         |                                  |   |
|       |   | 20.0         | 7-6                              | Gray sandy SHELLS, saturated                |
| 25    |   |              |                                  |   |
| 30    |   |              |                                  |   |
| 35    |   |              |                                  |   |
| 40    |   |              |                                  |   |
| 45    |   |              |                                  |   |

|  |  |
|--|--|
| <p>Ground Water Data:</p> <p>Water level is <u>9.0</u> ft. below ground surface <u>0</u> hrs. after completion.<br/> <u>3.0</u></p> <p>Groundwater encountered at 9.0 ft. during drilling.</p> | <p><b>SAYRE &amp; ASSOCIATES, p.c.</b></p> <p><i>Geotechnical Engineers<br/>Richmond, Virginia</i></p> |
|--|--|

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 4                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description              | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                         |
|-------|----------------------------------|--------------|----------------------------------|--|
| 0     | TOPSOIL                          |              |                                  |  |
| 0.5   | Silty SAND, medium dense, dry    | 0.5          |                                  | Brown silty SAND, dry                      |
| 1.5   |                                  | 1.5          | 5-7                              |  |
| 2.5   | Sandy SILT, medium dense, dry    | 2.5          |                                  | Brown fine sandy SILT, dry                 |
| 3.5   |                                  | 3.5          | 6-8                              |  |
| 4.5   | Silty CLAY, very stiff, moist    | 4.5          |                                  | Brown silty CLAY, moist                    |
| 5.5   |                                  | 5.5          | 7-12                             |  |
| 7.5   | Clayey SAND, medium dense, moist | 7.5          |                                  | Brown clayey SAND, moist                   |
| 8.5   |                                  | 8.5          | 5-8                              |  |
| 9.5   |                                  | 9.5          |                                  | Brown silty SAND, moist                    |
| 10.5  | Silty SAND, medium dense, moist  | 10.5         | 5-7                              |  |
| 14.5  |                                  | 14.5         |                                  | Gray SHELLS, some sand and clay, saturated |
| 15.5  | SAND and SHELLS, saturated       | 15.5         | 7-6                              |  |
| 19.0  |                                  | 19.0         |                                  | Gray SAND and SHELLS, saturated            |
| 20.0  | Boring terminated at 20.0 ft.    | 20.0         | 2-3                              |  |

**Ground Water Data:**

Water level is 14.5 ft. below ground surface 0 hrs. after completion.  
 " " " " 14.5 " " " " " " 24 " " " "

Groundwater encountered at 14.0 ft. during drilling.

**SAYRE & ASSOCIATES, p.c.**

*Geotechnical Engineers  
Richmond, Virginia*

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 5                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description           | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                                |
|-------|-------------------------------|--------------|----------------------------------|---|
| 0     | TOPSOIL                       | 0.5          |                                  |   |
|       | Silty SAND, loose, dry        | 1.5          | 4-5                              | Brown silty fine SAND, dry                        |
|       |                               | 2.5          | 6-10                             | Brown silty CLAY, moist                           |
|       |                               | 3.5          |                                  |   |
| 5     | Silty CLAY, stiff, moist      | 4.5          | 6-8                              | Brown and gray silty CLAY, moist                  |
|       |                               | 5.5          |                                  |   |
|       |                               | 7.5          | 7-9                              | Brown and gray silty CLAY, trace fine sand, moist |
|       |                               | 8.5          |                                  |   |
| 10    |                               | 9.5          | 5-9                              | Brown and gray silty CLAY, trace fine sand, moist |
|       |                               | 10.5         |                                  |   |
|       | Sandy CLAY, stiff, wet        | 14.5         | 4-7                              | Brown sandy CLAY, wet                             |
| 15    |                               | 15.5         |                                  |   |
|       | Silty CLAY, stiff, wet        | 19.5         | 4-6                              | Brown CLAY, streaks of sand, wet                  |
| 20    |                               | 20.5         |                                  |   |
|       | SHELLS and SAND, saturated    | 24.5         | 6-4                              | Tan SHELLS and fine SAND, trace clay, saturated   |
| 25    |                               | 25.5         |                                  |   |
|       |                               | 29.0         | 4-6                              | Gray SHELLS and fine SAND, some clay, saturated   |
| 30    | Boring terminated at 30.0 ft. | 30.0         |                                  |   |
| 35    |                               |              |                                  |   |
| 40    |                               |              |                                  |   |
| 45    |                               |              |                                  |   |

**Ground Water Data:**

Water level is 25 ft. below ground surface 0 hrs. after completion.  
" " " " " " " " " " " "

Groundwater encountered at 24.0 ft. during drilling.

**SAYRE & ASSOCIATES, p.c.**

*Geotechnical Engineers  
Richmond, Virginia*

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.

\*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 6                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description                     | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                             |
|-------|---|--------------|----------------------------------|--|
| 0     | SILT and SAND, organic, very loose, wet | 0.5          | 2/18"                            | Organic SILT and SAND, wet                     |
|       |   | 1.5          |                                  |  |
|       | SAND, very loose, saturated             | 2.5          | 1-1                              | Gray SAND, some organic and clay, saturated    |
|       |   | 3.5          |                                  |  |
| 5     | SHELLS and SAND, saturated              | 4.5          | 1-5                              | Tan SHELLS and fine SAND, some clay, saturated |
|       |   | 5.5          |                                  |  |
|       |   | 7.5          | 5-5                              | Tan SHELLS and fine SAND, some clay, saturated |
|       |   | 8.5          |                                  |  |
| 10    | Boring terminated at 10.5 ft.           | 9.5          | 5-5                              | Tan SHELLS and fine SAND, some clay, saturated |
|       |   | 10.5         |                                  |  |
| 15    |   |              |                                  |  |
| 20    |   |              |                                  |  |
| 25    |   |              |                                  |  |
| 30    |   |              |                                  |  |
| 35    |   |              |                                  |  |
| 40    |   |              |                                  |  |
| 45    |   |              |                                  |  |

|  |  |
|--|--|
| <p>Ground Water Data:</p> <p>Water level is <u>3.0</u> ft. below ground surface <u>0</u> hrs. after completion.</p> <p style="margin-left: 20px;">" " " <u>1.5</u> " " " " " <u>1.5</u> " " "</p> <p>Groundwater encountered at 4.0 ft. during drilling.</p> | <p><b>SAYRE &amp; ASSOCIATES, p.c.</b></p> <p><i>Geotechnical Engineers<br/>Richmond, Virginia</i></p> |
|--|--|

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 7                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description                    | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                        |
|-------|--|--------------|----------------------------------|---|
| 0     | Silty SAND, very loose, moist          | 0.5          |                                  |   |
|       |  | 1.5          | 1-1                              | Brown silty fine SAND, moist              |
|       |  | 2.5          |                                  |   |
|       | Organic SILT and SAND, very loose, wet | 3.5          | 1-2                              | SILT and SAND, organic, wet               |
|       |  | 4.5          |                                  |   |
| 5     | Silty SAND, very loose, saturated      | 5.5          | 1/12"                            | Light gray silty fine SAND, saturated     |
|       |  | 7.5          |                                  |   |
|       | SHELLS, saturated                      | 8.5          | 2-2                              | Tan SHELLS, some sand and clay, saturated |
|       |  | 9.5          |                                  |   |
| 10    |  | 10.5         | 2-3                              | Tan SHELLS, some sand and clay, saturated |
|       | Boring terminated at 10.5 ft.          |              |                                  |   |
| 15    |  |              |                                  |   |
| 20    |  |              |                                  |   |
| 25    |  |              |                                  |   |
| 30    |  |              |                                  |   |
| 35    |  |              |                                  |   |
| 40    |  |              |                                  |   |
| 45    |  |              |                                  |   |

**Ground Water Data:**

Water level is 4.0 ft. below ground surface 0 hrs. after completion.  
 " " " 2.0 " " " " " 1 " " " "

Groundwater encountered at 4.0 ft. during drilling.

**SAYRE & ASSOCIATES, p.c.**

*Geotechnical Engineers  
Richmond, Virginia*

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.

See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 8                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description             | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description               |
|-------|---------------------------------|--------------|----------------------------------|----------------------------------|
| 0     | TOPSOIL                         |              |                                  |                                  |
|       | Silty SAND, very loose, dry     | 0.5          |                                  |                                  |
|       |                                 | 1.5          | 2-1                              | Brown silty fine SAND, dry       |
|       | Silty CLAY, very stiff, moist   | 2.5          |                                  |                                  |
|       |                                 | 3.5          | 2-2                              | Brown silty CLAY, moist          |
|       |                                 | 4.5          |                                  |                                  |
| 5     | Sandy CLAY, medium stiff, moist | 5.5          | 4-3                              | Brown sandy CLAY, moist          |
|       |                                 | 7.5          |                                  |                                  |
|       |                                 | 8.5          | 3-4                              | Gray sandy CLAY, wet             |
|       | SAND, very loose, saturated     | 9.5          |                                  |                                  |
| 10    | Boring terminated at 10.5 ft.   | 10.5         | 1-1                              | Brown SAND, some clay, saturated |
| 15    |                                 |              |                                  |                                  |
| 20    |                                 |              |                                  |                                  |
| 25    |                                 |              |                                  |                                  |
| 30    |                                 |              |                                  |                                  |
| 35    |                                 |              |                                  |                                  |
| 40    |                                 |              |                                  |                                  |
| 45    |                                 |              |                                  |                                  |

|  |  |
|--|--|
| <p>Ground Water Data:</p> <p>Water level is <u>7.5</u> ft. below ground surface <u>0.5</u> hrs. after completion.</p> <p>Groundwater encountered at 9.0 ft. during drilling.</p> | <p><b>SAYRE &amp; ASSOCIATES, p.c.</b></p> <p><i>Geotechnical Engineers<br/>Richmond, Virginia</i></p> |
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\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.  
 See NOTES TO BORING LOG which are a part of this log.

# BORING LOG

|                      |   |                            |                 |
|----------------------|---|----------------------------|-----------------|
| Boring No.:          | 9                                       | Elevation - Top of Boring: | Date of Boring: |
| Project:             | 87106 Mill Creek Landing Dam            |                            |                 |
| Location:            | James City County, Virginia             |                            |                 |
| Type of Boring:      | Hollow-stem auger                       |                            |                 |
| Drilling Contractor: | Ayers & Ayers, Inc., Powhatan, Virginia |                            |                 |

| Depth | Stratum Description                | Sample Depth | Sample Blows*<br>Core Recovery** | Sample Description                      |
|-------|------------------------------------|--------------|----------------------------------|---|
| 0     | TOPSOIL                            | 0.5          |                                  |   |
|       | Silty SAND, very loose, moist      | 1.5          | 1-1                              | Brown silty SAND, moist                 |
|       | Organic SILT, very soft, moist     | 2.5          |                                  |   |
|       | Clayey SAND, very loose, saturated | 3.5          | 2-1                              | Gray clayey SAND, saturated             |
|       |                                    | 4.5          |                                  |   |
| 5     | Sandy CLAY, very soft, saturated   | 5.5          | 1/12"                            | Gray sandy CLAY, saturated              |
|       |                                    | 7.5          |                                  |   |
|       |                                    | 8.5          | 1-2                              | Gray sandy CLAY, saturated              |
|       | SHELLS and SAND, saturated         | 9.5          |                                  |   |
| 10    | Boring terminated at 10.5 ft.      | 10.5         | WOR                              | Tan and gray SHELLS and SAND, saturated |
| 15    |                                    |              |                                  |   |
| 20    |                                    |              |                                  |   |
| 25    |                                    |              |                                  |   |
| 30    |                                    |              |                                  |   |
| 35    |                                    |              |                                  |   |
| 40    |                                    |              |                                  |   |
| 45    |                                    |              |                                  |   |

|  |   |
|--|---|
| <p>Ground Water Data:</p> <p>Water level is <u>2.5</u> ft. below ground surface <u>0</u> hrs. after completion.</p> <p>Groundwater encountered at 9.0 ft. during drilling; rose immediately to 4.0 ft.</p> | <p><b>SAYRE &amp; ASSOCIATES, p.c.</b></p> <p><i>Geotechnical Engineers</i><br/><i>Richmond, Virginia</i></p> |
|--|---|

\* No. of Blows 140-lb. Hammer, 30-in. Fall, Required to Drive 2 in. O.D., 1.375 in I.D. Sampler 6 Inches.  
 \*\* Core Recovery as Percent of Length of Drill Run.  
 See NOTES TO BORING LOG which are a part of this log.





# SAYRE & ASSOCIATES

A PROFESSIONAL CORPORATION

*Geotechnical Engineers*

5407 LAKESIDE AVENUE · P.O. BOX 9457 · RICHMOND, VIRGINIA 23228 · Telephone 804/266-9646

ROBERT D. SAYRE, P.E.

August 22, 1988

WILLIAM R. PULLY, P.E.

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for the period August 12 through August 19, 1988.

If you have any questions concerning these reports, please call me.

Yours sincerely,

SAYRE & ASSOCIATES, p.c.



William R. Pully, P.E.



# SAYRE & ASSOCIATES, p.c.

GEOTECHNICAL ENGINEERS  
RICHMOND, VIRGINIA

## REPORT OF FIELD DENSITY TESTS

87106

|  |                              |
|--|------------------------------|
| PROJECT Mill Creek Landing Dam                   | DATE 15, 16, 17, August 1988 |
| LOCATION Williamsburg, Virginia                  |                              |
| COMPACTION EQUIPMENT Steel drum vibratory roller | WEATHER clear; hot           |
| SOURCE OF FILL On-site                           |                              |
| SOIL DESCRIPTION Sandy clayey SILT               |                              |

| Field Test No. | LOCATION OF TEST                 | Field Moisture % | In-Place Dry Density, pcf | Optimum Moisture % | Max Dry Density, pcf | Percent Compaction |
|----------------|----------------------------------|------------------|---------------------------|--------------------|----------------------|--------------------|
|                | <u>15 August 1988</u>            |                  |                           |                    |                      |                    |
| 13             | East toe of dam, elevation 34.00 | 6.0              | 113.7                     | 15.5               | 113.7                | 100                |
| 14             | West Toe of dam, elevation 34.00 | 10.2             | 117.7                     | 15.5               | 113.7                | 100                |
|                | <u>16 August 1988</u>            |                  |                           |                    |                      |                    |
| 15             | Dam core, elevation 36.00        | 19.5             | 98.8                      | 22                 | 100.6                | 98.2               |
| 16             | West toe of dam, elevation 35.00 | 21.9             | 103.7                     | 22                 | 100.6                | 100                |
| 17             | East toe of dam elevation 35.00  | 15.8             | 114.6                     | 22                 | 100.6                | 100                |
| 15A            | Retest # 15                      | 14.1             | 119.3                     | 22                 | 100.6                | 100                |
| 18             | Dam core, elevation 38.00        | 4.5              | 115.6                     | 22                 | 100.6                | 100                |
|                | <u>17 August 1988</u>            |                  |                           |                    |                      |                    |
| 19             | West toe of dam 38.00            | 14.9             | 109.2                     | 15.5               | 113.7                | 96                 |
| 20             | East toe of dam 38.00            | 12.8             | 118.1                     | 15.5               | 113.7                | 100                |
| 21             | West toe of dam 39.00            | 11.5             | 111.8                     | 15.5               | 113.7                | 98                 |
| 22             | Dam core, elevation 39.00        | 17.9             | 116.4                     | 13                 | 120.5                | 96                 |
| 22A            | Retest # 22                      | 7.4              | 125.6                     | 13                 | 120.5                | 100                |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |

|                         |
|-------------------------|
| OBSERVATION AND REMARKS |
| Approximate elevations  |
|                         |
|                         |

# SAYRE & ASSOCIATES, p.c.

GEOTECHNICAL ENGINEERS  
RICHMOND, VIRGINIA

## REPORT OF FIELD DENSITY TESTS

87106

|  |                          |
|--|--------------------------|
| PROJECT Mill Creek Landing Dam   | DATE August 18, 19, 1988 |
| LOCATION Williamsburg, Virginia  |                          |
| COMPACTION EQUIPMENT Steel drum vibratory roller and sheepsfoot          | WEATHER clear; hot       |
| SOURCE OF FILL On-site   |                          |
| SOIL DESCRIPTION Clayey SILT in dam core, tan SAND on east and west toes |                          |

| Field Test No. | LOCATION OF TEST          | Field Moisture % | In-Place Dry Density, pcf | Optimum Moisture % | Max Dry Density, pcf | Percent Compaction |
|----------------|---------------------------|------------------|---------------------------|--------------------|----------------------|--------------------|
|                | <u>August 18, 1988</u>    |                  |                           |                    |                      |                    |
| M-1            | Moisture from Borrow      | 19.0             |                           |                    |                      |                    |
| 23             | Dam core, elevation 40.00 | 14.8             | 115.4                     | 13.6               | 117.9                | 98                 |
| 24             | West toe, elevation 39.00 | 9.0              | 108.6                     | 15.5               | 113.7                | 96                 |
| 25             | East toe, elevation 39.00 | 10.8             | 111.8                     | 15.5               | 113.7                | 98                 |
| 26             | West toe, elevation 40.00 | 11.3             | 109.8                     | 15.5               | 113.7                | 97                 |
| 27             | Dam core, elevation 41.00 | 16.1             | 97.2                      | 22                 | 100.6                | 97                 |
| 28             | West toe, elevation 40.00 | 11.0             | 112.2                     | 15.5               | 113.7                | 99                 |
| 27A            | Retest # 27               | 19.8             | 109.4                     | 22                 | 100.6                | 100                |
| 29             | East toe, elevation 40.00 | 11.4             | 107.8                     | 15.5               | 113.7                | 95                 |
|                |                           |                  |                           |                    |                      |                    |
|                | <u>August 19, 1988</u>    |                  |                           |                    |                      |                    |
| 30             | Dam core, elevation 43.00 | 17.3             | 113.3                     | 22                 | 100.6                | 100                |
| 31             | West toe, elevation 42.00 | 8.4              | 108.1                     | 15.5               | 113.7                | 95                 |
|                |                           |                  |                           |                    |                      |                    |
|                |                           |                  |                           |                    |                      |                    |
|                |                           |                  |                           |                    |                      |                    |
|                |                           |                  |                           |                    |                      |                    |
|                |                           |                  |                           |                    |                      |                    |

|  |
|--|
| OBSERVATION AND REMARKS<br>Elevation approximate |
|  |
|  |

# SAYRE & ASSOCIATES

A PROFESSIONAL CORPORATION

*Geotechnical Engineers*

5407 LAKESIDE AVENUE · P.O. BOX 9457 · RICHMOND, VIRGINIA 23228 · Telephone 804/266-9646

ROBERT D. SAYRE, P.E.

September 8, 1988

WILLIAM R. PULLY, P.E.

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

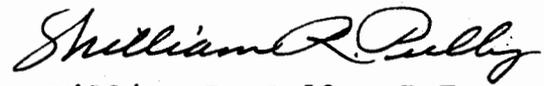
Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for the period August 31, 1988 through September 2, 1988.

If you have any questions concerning these reports, please call me.

Yours sincerely,

SAYRE & ASSOCIATES, p.c.



William R. Pully, P.E.

# SAYRE & ASSOCIATES, p.c.

GEOTECHNICAL ENGINEERS  
RICHMOND, VIRGINIA

87106

## REPORT OF FIELD DENSITY TESTS

|  |                      |
|--|----------------------|
| PROJECT Mill Creek Landing Dam                     | DATE 8-31-88--9-2-88 |
| LOCATION Williamsburg, Virginia                    |                      |
| COMPACTION EQUIPMENT Steel drum vibratory roller   | WEATHER clear        |
| SOURCE OF FILL On-site                             |                      |
| SOIL DESCRIPTION Tan sandy SILT, brown clayey SILT |                      |

| Field Test No. | LOCATION OF TEST             | Field Moisture % | In-Place Dry Density, pcf | Optimum Moisture % | Max Dry Density, pcf | Percent Compaction |
|----------------|------------------------------|------------------|---------------------------|--------------------|----------------------|--------------------|
|                | <u>August 31, 1988</u>       |                  |                           |                    |                      |                    |
| 36             | East toe dam elevation 44.00 | 17.8             | 102.3                     | 12.4               | 111.8                | 92                 |
| 37             | West toe dam elevation 44.00 | 17.0             | 109.4                     | 12.4               | 111.8                | 98                 |
| 38             | Dam core elevation 45.00     | 21.4             | 108.4                     | 22                 | 100.6                | 100                |
|                |                              |                  |                           |                    |                      |                    |
|                | <u>September 1, 1988</u>     |                  |                           |                    |                      |                    |
| 37A            | Retest # 37                  | 15.7             | 109.0                     | 12.4               | 111.8                | 98                 |
| 39             | East toe dam elevation 44.00 | 8.4              | 117.0                     | 12.4               | 111.8                | 100                |
| 40             | Dam core elevation 46.00     | 15.1             | 114.4                     | 22                 | 100.6                | 100                |
|                |                              |                  |                           |                    |                      |                    |
|                | <u>September 2, 1988</u>     |                  |                           |                    |                      |                    |
| 41             | West toe dam elevation 45.00 | 16.3             | 106.7                     | 12.4               | 111.8                | 96                 |
| 42             | West toe dam elevation 46.00 | 15.0             | 114.3                     | 12.4               | 111.8                | 100                |
| 43             | Dam core elevation 47.00     | 16.1             | 106.7                     | 22                 | 100.6                | 100                |
|                |                              |                  |                           |                    |                      |                    |
|                |                              |                  |                           |                    |                      |                    |
|                |                              |                  |                           |                    |                      |                    |
|                |                              |                  |                           |                    |                      |                    |
|                |                              |                  |                           |                    |                      |                    |

|   |
|---|
| OBSERVATION AND REMARKS<br>Approximate elevations |
|   |
|   |

# SAYRE & ASSOCIATES

A PROFESSIONAL CORPORATION

*Geotechnical Engineers*

5407 LAKESIDE AVENUE · P.O. BOX 9457 · RICHMOND, VIRGINIA 23228 · Telephone 804/266-9646

ROBERT D. SAYRE, P.E.

August 29, 1988

WILLIAM R. PULLY, P.E.

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

Gentlemen:

Enclosed is a copy of REPORT OF FIELD DENSITY TESTS for August 27, 1988.

If you have any questions concerning these reports, please call me.

Yours sincerely,

SAYRE & ASSOCIATES, p.c.



William R. Pully, P.E.





HATCHER-SAYRE, INC.

September 14, 1988

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for the period of September 7, 1988 through September 9, 1988.

If you have any questions concerning these reports, please call me.

Yours sincerely,

HATCHER-SAYRE, INC.

William R. Pully, P.E.

# HATCHER-SAYRE, INC.

Richmond, Virginia

## REPORT OF FIELD DENSITY TESTS

87106

|                      |                                   |         |               |
|----------------------|-----------------------------------|---------|---------------|
| PROJECT              | Mill Creek Landing Dam            | DATE    | 9-7,8,9, 1988 |
| LOCATION             | Williamsburg, Virginia            |         |               |
| COMPACTION EQUIPMENT | Steel drum vibratory roller       | WEATHER | Clear         |
| SOURCE OF FILL       | On-Site                           |         |               |
| SOIL DESCRIPTION     | Tan silty SAND, brown clayey SILT |         |               |

| Field Test No. | LOCATION OF TEST                 | Field Moisture % | In-Place Dry Density, pcf | Optimum Moisture % | Max Dry Density, pcf | Percent Compaction |
|----------------|----------------------------------|------------------|---------------------------|--------------------|----------------------|--------------------|
| 44             | Dam core elevation 49.00         | 14.8             | 113.7                     | 22                 | 100.6                | 100                |
| 45             | West toe elevation 48.00         | 14.5             | 111.5                     | 12.4               | 111.8                | 100                |
| 46             | East toe elevation 45.00         | 13.0             | 109.3                     | 12.4               | 111.8                | 98                 |
|                |                                  |                  |                           |                    |                      |                    |
|                | <u>SEPTEMBER 8, 1988</u>         |                  |                           |                    |                      |                    |
| 47             | East toe elevation 46.00         | 13.1             | 109.3                     | 12.4               | 111.8                | 98                 |
| 48             | West toe elevation 49.00         | 14.2             | 118.5                     | 12.4               | 111.8                | 100                |
|                |                                  |                  |                           |                    |                      |                    |
|                | <u>SEPTEMBER 9, 1988</u>         |                  |                           |                    |                      |                    |
| 49             | Dam core elevation 49.00         | 10.2             | 116.5                     | 22                 | 100.6                | 100                |
| 50             | West toe elevation 50.00         | 15.5             | 117.9                     | 12.6               | 117.9                | 100                |
| 51             | East toe elevation 48.00         | 14.9             | 115.7                     | 12.4               | 111.8                | 100                |
| 52             | East toe elevation 49.00         | 15.3             | 123.2                     | 13.6               | 117.9                | 100                |
| M-2            | Moisture from stockpile (bottom) | 21.7             |                           |                    |                      |                    |
| M-3            | Moisture from Stockpile (top)    | 18.6             |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |
|                |                                  |                  |                           |                    |                      |                    |

|   |
|---|
| <b>OBSERVATION AND REMARKS</b><br>Elevation approximate. Spot tests |
|   |
|   |



HATCHER-SAYRE, INC.

September 26, 1988

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for  
September 16, 1988.

Please note we are now: HATCHER-SAYRE, INC.  
905 Southlake Blvd  
Richmond, Virginia 23236  
Phone: (804) 794-0216

Additional testing will be made when we receive notification  
from your office.

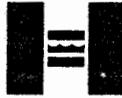
If you have any questions concerning these reports, please  
call me.

Yours sincerely,

HATCHER-SAYRE, INC.

William R. Pully, P.E.





HATCHER-SAYRE, INC.

October 3, 1988

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Mill Creek Landing Dam  
Williamsburg, Virginia  
Project: 87106

Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for  
September 27, 1988.

If you have any questions concerning these reports, please  
call me.

Yours sincerely,

HATCHER-SAYRE, INC.

*William R. Pully*  
William R. Pully, P.E.



# SAYRE & ASSOCIATES

A PROFESSIONAL CORPORATION

*Geotechnical Engineers*

5407 LAKESIDE AVENUE · P.O. BOX 9457 · RICHMOND, VIRGINIA 23228 · Telephone 804/266-9646

ROBERT D. SAYRE, P.E.

August 8, 1988

WILLIAM R. PULLY, P.E.

JOSEPH S. TERRELL, INC.  
P. O. Box 191  
Williamsburg, Virginia 23187

Attn: Mr. Joseph S. Terrell

Mill Creek Landing Dam  
James City County, Virginia  
Project: 87106

Gentlemen:

Enclosed are copies of REPORT OF FIELD DENSITY TESTS for the period August 3, and 4, 1988.

If you have any questions concerning these reports, please call me.

Yours sincerely,

SAYRE & ASSOCIATES, p.c.



William R. Pully, P.E.

## Pat Menichino

---

**From:** Frances Geissler  
**Sent:** Monday, March 14, 2011 3:34 PM  
**To:** Adam Kinsman  
**Cc:** Pat Menichino  
**Subject:** Mill Creek Landing Neighborhood Lawsuit  
**Attachments:** zuckerwar\_0001.pdf

Adam: Mr. Allan Zuckerwar was referred to Stormwater from Environmental regarding an issue with the Mill Creek Landing HOA and the BMP (wet pond) in Mr. Zuckerwar's back yard. The HOA has asked for permission to build a walking trail across the back of his lot adjacent to the BMP. Mr. Zuckerwar does not want to grant permission. The HOA hired a surveyor/engineer (LandTech) to survey the area in question and there are discrepancies between the LandTech data and our file data. Our information is limited to what is in the file.

Mr. Zuckerwar has hired an attorney (Mr. Lew Heath) to sue the HOA and the attorney contacted Pat Menichino. Mr. Zuckerwar wants Pat to be a witness regarding this situation.

Pat will refer the attorney to you since this is beyond the scope of our office. Our interest extends only to the operational condition of the BMP.

I've attached the LandTech plat for your use. Mr. Zuckerwar's lot is #3, his address is 4909 Chamberley Cr, his number is 564-9504.

THANKS

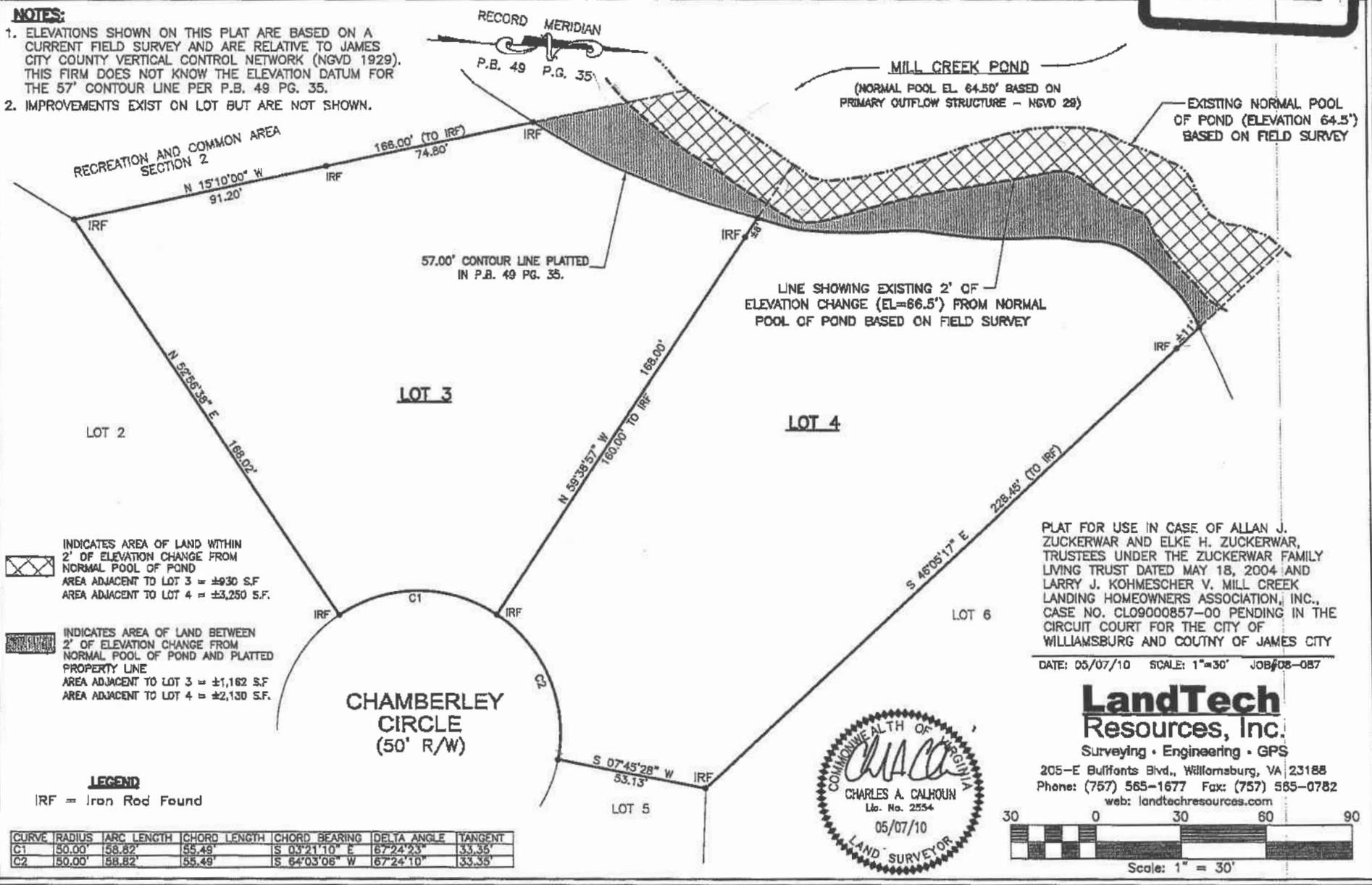
Fran Geissler  
Stormwater Director



General Services Department  
5320 Palmer Lane, Suite 2A  
Williamsburg, VA 23188  
P: 757-259-1440  
F: 757-259-5833  
jccEgov.com

**NOTES:**

- ELEVATIONS SHOWN ON THIS PLAT ARE BASED ON A CURRENT FIELD SURVEY AND ARE RELATIVE TO JAMES CITY COUNTY VERTICAL CONTROL NETWORK (NGVD 1929). THIS FIRM DOES NOT KNOW THE ELEVATION DATUM FOR THE 57' CONTOUR LINE PER P.B. 49 PG. 35.
- IMPROVEMENTS EXIST ON LOT BUT ARE NOT SHOWN.



RECREATION AND COMMON AREA SECTION 2

RECORD MERIDIAN

MILL CREEK POND

(NORMAL POOL EL. 64.50' BASED ON PRIMARY OUTFLOW STRUCTURE - NGVD 29)

EXISTING NORMAL POOL OF POND (ELEVATION 64.5') BASED ON FIELD SURVEY

57.00' CONTOUR LINE PLATTED IN P.B. 49 PG. 35.

LINE SHOWING EXISTING 2' OF ELEVATION CHANGE (EL=66.5') FROM NORMAL POOL OF POND BASED ON FIELD SURVEY

LOT 3

LOT 4

LOT 2

LOT 6

CHAMBERLEY CIRCLE (50' R/W)

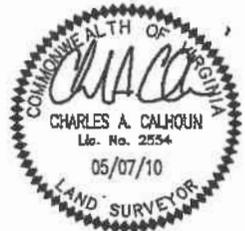
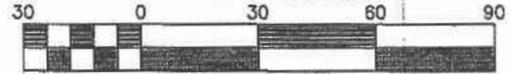
PLAT FOR USE IN CASE OF ALLAN J. ZUCKERWAR AND ELKE H. ZUCKERWAR, TRUSTEES UNDER THE ZUCKERWAR FAMILY LIVING TRUST DATED MAY 18, 2004 AND LARRY J. KOHMESCHER V. MILL CREEK LANDING HOMEOWNERS ASSOCIATION, INC., CASE NO. CLO9000857-00 PENDING IN THE CIRCUIT COURT FOR THE CITY OF WILLIAMSBURG AND COUNTY OF JAMES CITY

DATE: 05/07/10 SCALE: 1"=30' JOB#08-087

**LandTech Resources, Inc.**

Surveying • Engineering • GPS

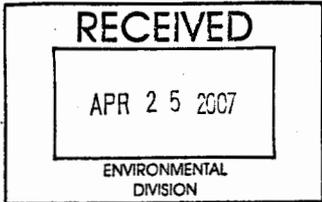
205-E Bulifants Blvd., Williamsburg, VA 23188  
Phone: (757) 565-1677 Fax: (757) 565-0782  
web: landtechresources.com



**LEGEND**

IRF = Iron Rod Found

| CURVE | RADIUS | ARC LENGTH | CHORD LENGTH | CHORD BEARING | DELTA ANGLE | TANGENT |
|-------|--------|------------|--------------|---------------|-------------|---------|
| C1    | 50.00' | 58.82'     | 55.49'       | S 03°21'10" E | 67°24'23"   | 33.35'  |
| C2    | 50.00' | 58.82'     | 55.49'       | S 64°03'06" W | 67°24'10"   | 33.35'  |

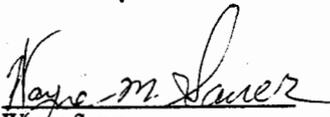


TO: Scott Thomas  
 FROM: Wayne & Brenda Sauer  
 DATE: April 25, 2007  
 RE: Request for pond buffer ~~maintenance~~ <sup>VARIANCE</sup>

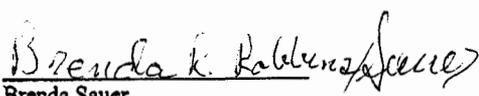
We would like to request a variance to the 25' pond buffer on our property at 4905 Burnley Drive in Mill Creek Landing Subdivision.

Our current address is: 107 Glenkinchey Court  
 Yorktown, VA 23693  
 Our contact information is: Home: 757-898-2842  
 Wayne's cell: 757-871-2083

Should you have any questions, Wayne's cell is the best number to use for immediate response. Thank you very much.

  
 Wayne Sauer

4/25/07  
 Date

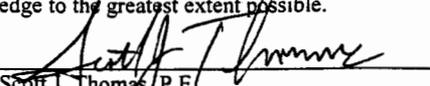
  
 Brenda Sauer

4/25/07  
 Date

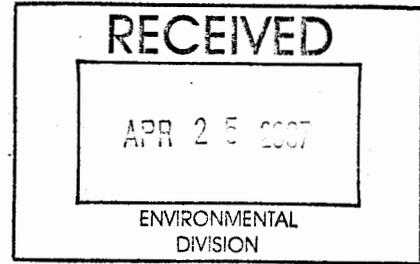
**LOCATION: Lot 1, Section 1 Mill Creek Landing, 4905 Burnley Drive (County BMP ID Code: MC 001)**

Variance request as submitted by Owner dated April 25, 2007 for clearing and minor grading in the pond buffer/setback was reviewed and found to be acceptable. The pond buffer/setback extends 25 feet outward from the maximum water surface elevation of the adjacent stormwater management pond facility. Based on available information, it appears the 100-year design high water elevation for the adjacent stormwater management facility (Mill Creek Pond, County BMP ID Code: MC 001) is at Elevation 57.0.

As a condition of approval, efforts should be made to preserve existing trees and vegetation in the pond buffer during construction; to landscape or stabilize impacted buffer to resemble meadow or forest area with native trees, shrubs and ground cover; and to refrain from turfing to the water's edge to the greatest extent possible.

  
 Scott J. Thomas, P.E.  
 Chief Engineer - Stormwater  
 Environmental Division

04-27-07  
 Date



TO: Scott Thomas

FROM: Wayne & Brenda Sauer

DATE: April 25, 2007

RE: Request for pond buffer ~~maintenance~~ <sup>VARIANCE</sup>

We would like to request a variance to the 25' pond buffer on our property at 4905 Burnley Drive in Mill Creek Landing Subdivision.

Our current address is: 107 Glenkinchey Court  
Yorktown, VA 23693

Our contact information is: Home: 757-898-2842  
Wayne's cell: 757-871-2083

Should you have any questions, Wayne's cell is the best number to use for immediate response. Thank you very much.

Wayne M. Sauer  
Wayne Sauer

4/25/07  
Date

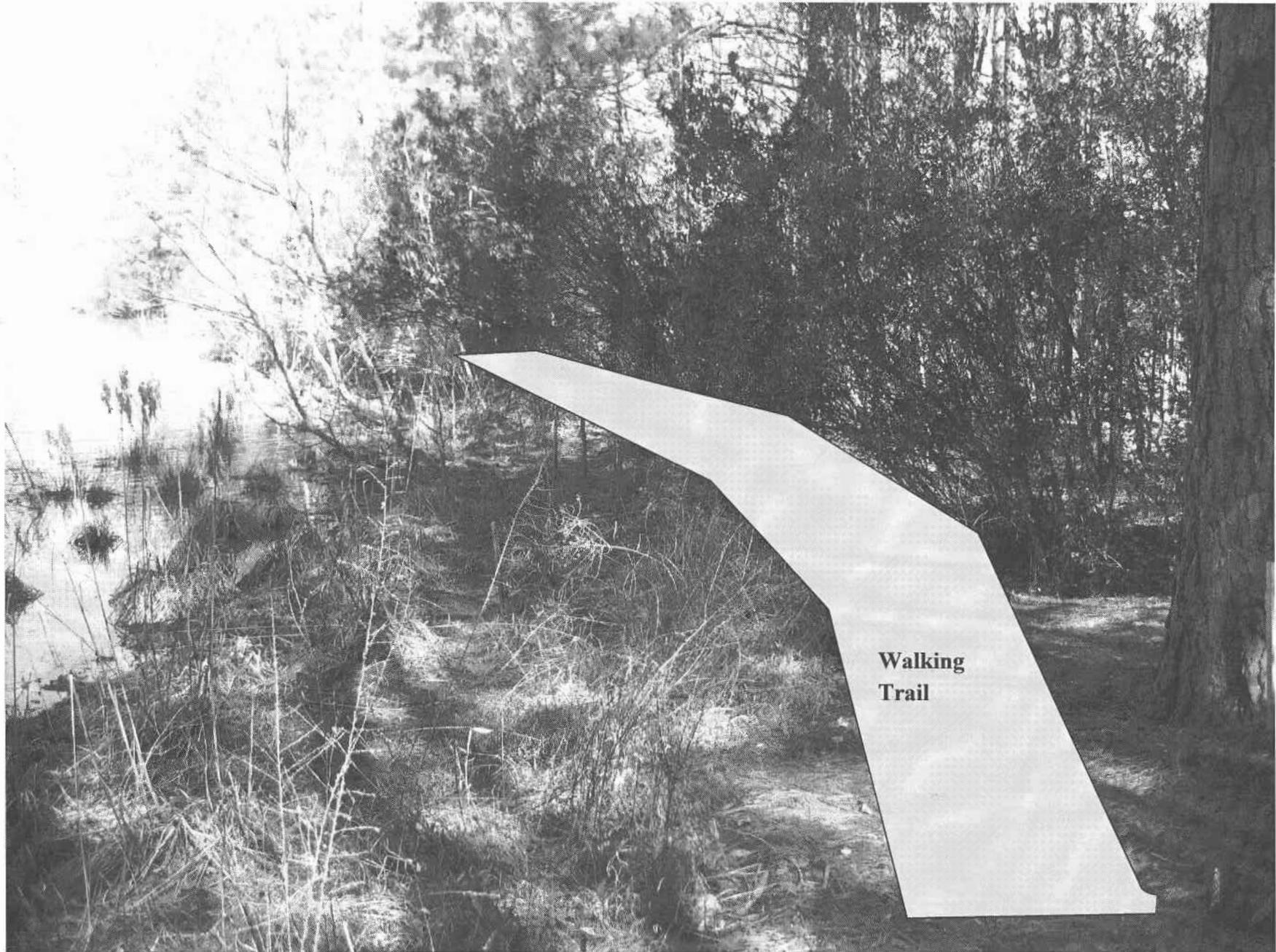
Brenda K. Sauer  
Brenda Sauer

4/25/07  
Date

ALLAN ZUCKERWALD  
564-9504

Lew Heath  
926-5250

3601  
BURNLEY



**Walking  
Trail**

# Installation Instructions

## Waterborne

A waterborne application of ESS-13 can be used in ponds that are losing up to eight inches of water per day. Seepage problems with PVC, native clay, sand and bentonite can be solved with this method. ESS-13 also works very well in ponds lined with concrete, gunnite or shotcrete.

The waterborne treatment of ESS-13 works best in lakes and ponds that are kept full. Freezing conditions and normal irrigation cycles will not harm the effectiveness of an ESS-13 seal.

A waterborne application of ESS-13 to existing bodies of water usually requires one gallon of ESS-13 to each 2,000 gallons of water, although application rates may vary. Prior to the application, a staff gauge or yardstick should be driven into the lake and the loss in vertical inches measured for 24 hours. This should be done at the full water level. The majority of the sealing action takes place in the first 72 hours. After this 72 hour period the water will remain hazy white for several days to several weeks. In most cases the water can be used for irrigation before the water clears, however please contact your Seepage Control representative prior to irrigating. Seventy two hours after the treatment take another 24-hour loss measurement. The comparison will give you an initial seepage rate reduction (*typically 80-90%, neglecting projects involving mechanical failure (ie. pipe penetrations, sink holes, etc.)*). Whatever the initial reduction is, remember that the product continues to reduce the seepage rate of the pond with time.

The drums of ESS-13 must be stirred before application to ensure ingredients are properly mixed. Pump or pour the ESS-13 into the water at various locations and it will mix and distribute by itself. This usually takes from six to ten hours. Utilizing aeration or other forms of turbulent mixing is a great way to speed up the dispersion process. A 2" self-priming trash/water pump is ideal for pumping ESS-13 into the lake.

ESS-13 is an environmentally safe, non-toxic, vegetable oil based product. If there are any fish in the pond, they should be removed before the application of ESS-13 as the oil content can coat their gills and cause suffocation. Contact your Seepage Control representative about the timing for fish reintroduction.

Please mention as many details about your particular project to your Seepage Control representative.

**Pour it in directly**



**Pump it in**



**Initial dispersion**



**Complete dispersion**



[www.seepagecontrol.com](http://www.seepagecontrol.com)  
**1-800-214-9640**

Seepage Control, Inc. 7301 W. Boston St. Chandler, AZ 85226



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# Contact Details

|                             |  |
|-----------------------------|--|
| <b>Company Name:</b>        | Seepage Control, Inc.  |
| <b>Founded:</b>             | 1958   |
| <b>Email:</b>               | info@seepagecontrol.com  |
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| <b>Web Site:</b>            | <a href="http://www.seepagecontrol.com">www.seepagecontrol.com</a> |
| <b>Special Status:</b>      | Woman-Owned, Small Business  |
| <b>CCR Status:</b>          | Registered   |
| <b>GSA Contract Holder:</b> | GS-07F-9450S<br>SIN # 563-99                                       |

**Capabilities:** We manufacture and sell ESS-13 which is a liquid polymer emulsion. ESS-13 reduces the hydraulic conductivity of the native soil thereby decreasing water loss due to seepage. This product is cost effective and compliant with EPA regulations. Three methods of application make our pond lining system a viable option. These are:

- Waterborne – for a full, existing lake
- Treat & Compact – for new pond construction
- Spray-On – a concentrated formula applied via water truck thereby minimizing both construction cost and time

Successful projects include: fish hatcheries, golf course ponds, ski lakes, wastewater lagoons and wetlands; from a quarter acre to 250 acres. Testimonials on file include projects from the early 1960's – still holding fine.



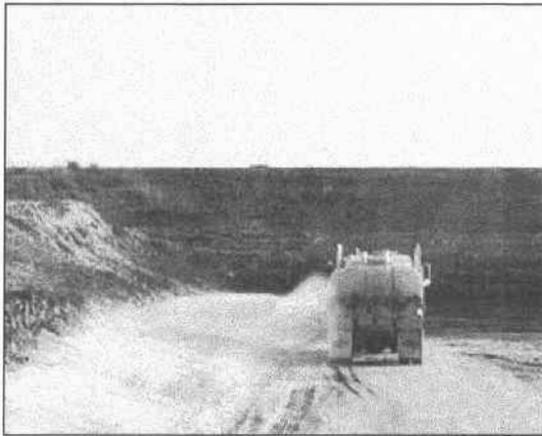
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# How ESS-13® Works



## Components of ESS-13

ESS-13 stands for 'Environmental Soil Sealant'. It reduces the hydraulic conductivity of soils beyond their natural capability by filling voids in the soil and by chemically and electrically modifying the alignment of the clay platelets in the soil.

ESS-13 contains:

Surfactants – specially designed to reduce the electrical charges on clay platelets. This reduction of electrical charge minimizes the natural electrical repulsion of the clay particles at the molecular level.

Emulsified vegetable oil – micron sized droplets fill voids and 'lubricate' the clay platelets allowing for more efficient re-alignment.

Both of these components work together to improve the mechanical compaction of soils. Without ESS-13, the clay platelets exist in a jumbled order and cannot effectively form a water barrier.

Laboratory and field tests repeatedly show that introducing ESS-13 into a soil matrix decreases the hydraulic conductivity of the soil significantly; many times by a magnitude to a magnitude and a half.

In the waterborne treatment, ESS-13 stays in suspension, acting as a colloidal dispersion, and is drawn into the soil as the seepage occurs. It then envelops the soil particles and attenuates to the cation exchange sites, thus filling the existing voids. Because it works with the soil rather than creating a membrane over the soil, it will not deteriorate with time.

## The Longevity of ESS-13

By using one of the ESS-13 systems, an environment is created that allows for continual seepage rate reduction. This is due to the stabilization of the soil and the reduction of voids. Microscopic fines that would ordinarily have passed through the larger voids in the native soil will build up on the ESS-13 liner surface. **The ESS-13 system is the only lining system that actually improves with time.**

# James City County Stormwater Division - WORK ORDER

Work Order Number: 646

Status:

|                                    |                                 |                                |
|------------------------------------|---------------------------------|--------------------------------|
| <b>PROPERTY DETAIL:</b>            | PIN: <input type="text"/>       | DISTRICT: <input type="text"/> |
| SITE ADDRESS: <input type="text"/> | YEAR BUILT <input type="text"/> |                                |
| OWNER: <input type="text"/>        | SALE DATE: <input type="text"/> |                                |
| SUBDIVISION: <input type="text"/>  |                                 |                                |

**COMPLAINT DETAIL:** Call Date:  Caller Name

Phone Home:  Email:

Phone Cell:

Phone Work:

Fax:

Complaint Request

### Complaint Comments

Would like information about a BMP in Mill Creek Landing

### Inspector Comments Date Inspected:

Called on 3-2-11 - (He was not IN)