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: **MC007**

DATE VERIFIED: **December 3, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

Date: March 28, 2012

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

From: Leah Hardenbergh

PO: 110426

Re: Files Approved for Scanning

General File ID or BMP ID:	**MC007**
PIN:	**4711900001A**
Owner Name (if known):	**SETTLER'S MILL**
Legal Property Description:	**COMMON AREA/CONSERVATION EASEMENT S-6 SETTLERS MILL**
Site Address:	**BEHIND 309 MILL STREAM WAY**

(For internal use only):

Box # 3

Agreements (in file as of scan date): Y Book or Doc #: DB 796 p 124

MC-007

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

COPY

DECLARATION OF COVENANTS

INSPECTION/MAINTENANCE OF RUNOFF CONTROL FACILITY

THIS DECLARATION, made this 14TH day of June, 19 96, between Settler's Mill Inc., and all successors in interest, hereinafter referred to as the "COVENANTOR(S)," owner(s) of the following property: BMP #5, as shown on Sheet 6 of 9, Section 6, Settler's Mill Subdivision, James City County, Virginia Deed Book 483, Page 448.

and James City County, Virginia, hereinafter referred to as the "COUNTY."

WITNESSETH:

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

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

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

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

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

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

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

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

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

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

Book 796
Pg 124

IN WITNESS WHEREOF, the COVENANTOR(S) have executed this DECLARATION OF COVENANTS as of this 14th day of June, 1996.

COVENANTOR(S)

Settlers Mill Inc.
By: [illegible], Pres.

ATTEST:

[illegible]

COVENANTOR(S)

Settlers Mill Inc
By: [illegible] - Treasurer

ATTEST:

[illegible]

COMMONWEALTH OF VIRGINIA
CITY/COUNTY OF James City

I, the undersigned Notary Public, in and for the jurisdiction aforesaid, do certify that LARRY R. MCCARTLE, whose name is signed as such to the foregoing writing bearing date 14 day of June, 1996 this day sworn the same before me in my jurisdiction aforesaid.

GIVEN under my hand this 14 day of June, of 1996.

Marcell W. Moore
Notary Public
Was Commissioned as Marcell Wynne

My Commission expires: 10-31-96

Approved as to form:

[illegible]

0261U.Wpf
Revised 9/92

James City County, Virginia
Environmental Division

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

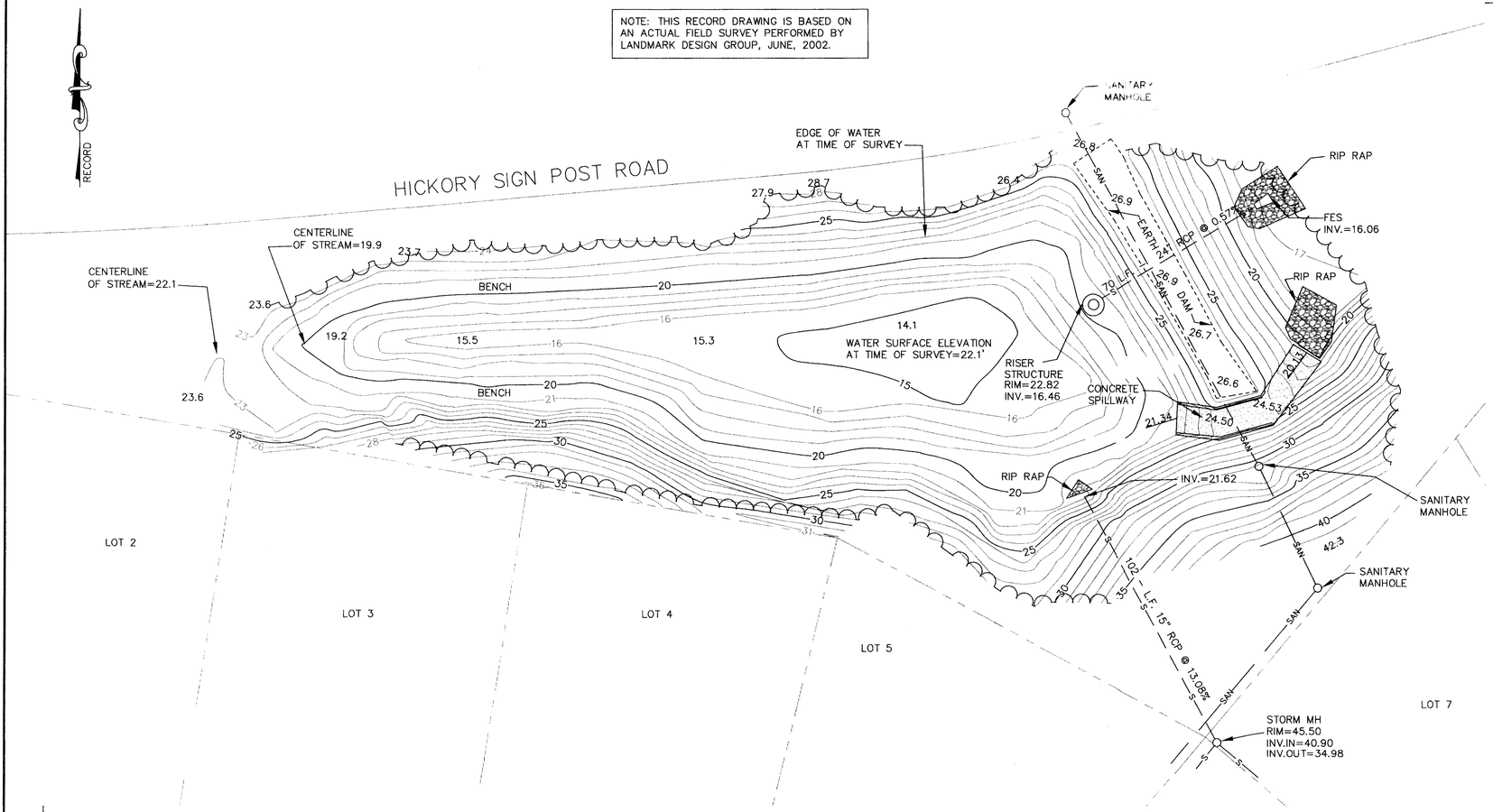
County Plan No.: S-19-95
Project Name: Settlers Mill Sec 6
Stormwater Management Facility: Wet Pond
Phase: ☒ I ☐ II ☐ III

- ☑ Information Received. Date: 6-19-02
- ☐ Administrative Check.
  - ☑ Record Drawing Date: 6-19-02 Land Mark
  - ☑ Construction Certification Date: Waiver dated 2/06/06
  - ☑ RD/CC Standard Forms (Required after Feb 1st 2001Only)
  - ☑ Insp/Maint Agreement Info: BK 796 P 124
  - ☑ BMP Maintenance Plan Location: NO, NOT REQ
  - ☐ Other:
- ☑ Standard E&SC Note on Approved Plan Requiring RD/CC or County comment in plan review file.
  ☐ Yes ☐ No Location: Note 18 Sheet 8; Comm 5 3/12/95
- ☑ Assign County BMP ID Code Code: MC 007
- ☑ Log into Division's "As-Built" Tracking Log
- ☑ Add Location to GIS Database Map. Obtain GIS site information (GPIN, Owner, Site Area, Address, etc.)
- ☑ Preliminary Log into BMP Database (BMP ID #, Site Plan #, GPIN, Project Name)
- ☑ Active Project File Review (correspondence, H&H, etc.).
- ☑ Initial As-Built File setup (label, copy hydraulics, BMP information, etc.).
- ☑ Inspector Check of RD/CC.
- ☐ Pre-Inspection Drawing Review - Approved Plan (Quick look prior to field inspection).
- ☐ Final Inspection (FI) Performed Date: 2/03/06 BY SJT.
- ☐ Record Drawing (RD) Review Date: 04/03/06 SJT
- ☐ Construction Certification (CC) Review Date: 04/03/06 SJT
- ☐ Actions:
  - ☐ No comments.
  - ☑ Comments. Letter Forwarded. Date: Email 2/03/06
    - ☑ Record Drawing (RD)
    - ☑ Construction Certification (CC)
    - ☑ Construction-Related (CR) Relayed to Larry McCardle, Gary Massie & Rick Cook at field meeting 2/3/06.
    - ☐ Site Issues (SI)
    - ☐ Other :
- ☐ Second Submission: Reinspect 3/24/06
- ☐ Third Submission:
- ☑ Acceptable for stormwater managment facility purposes (RD/CC/CR/Other). Proceed with bond release.
- ☑ Notify Darryl/Joan/Pat of acceptability using email (preferred), form or verbal.
- ☑ Check/Clean active file of any remaining material and finish "As-Built" file.
- ☑ Add to County BMP Inventory/Inspection schedule (Phase I, II or III).
- ☑ Copy Final Inspection Report into County BMP Inspection Program file.
- ☑ Digital Photographs obtained.
- ☐ NO Add to JCC Hydrology & Hydraulic database (optional).

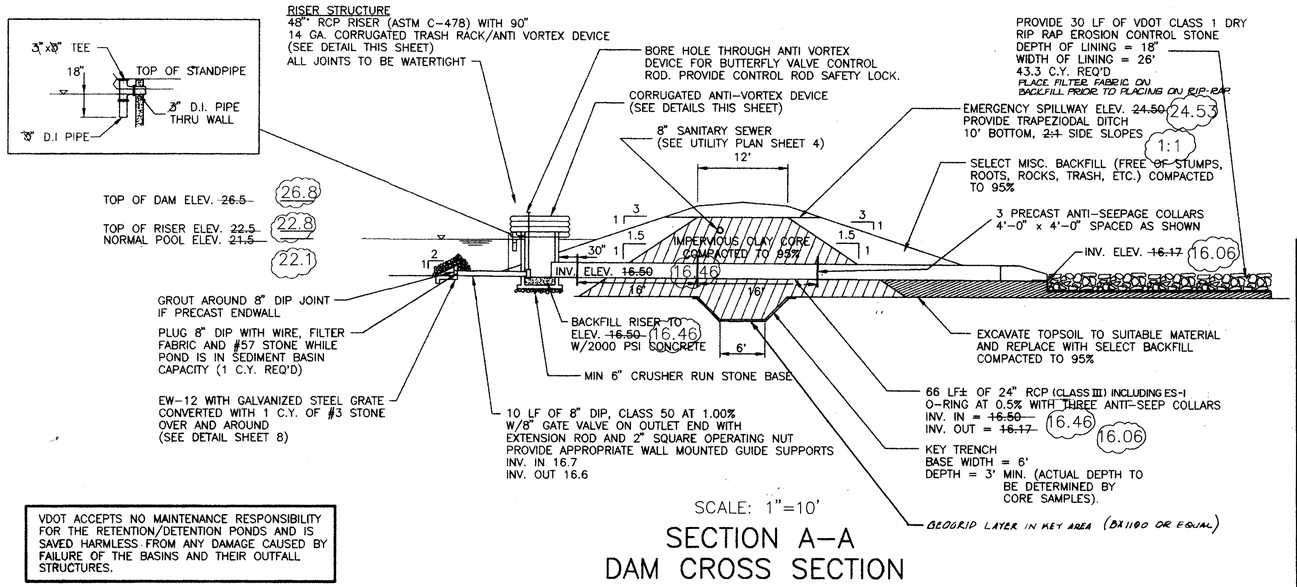
BMP Certification Information Acceptable

Plan Reviewer: [signature] Date: 04/03/06

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY LANDMARK DESIGN GROUP, JUNE, 2002.



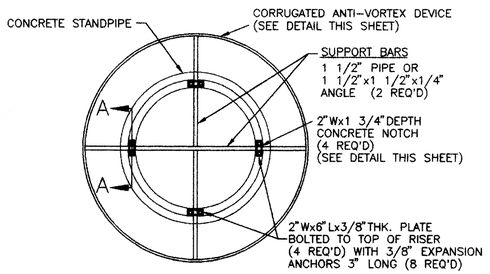
(24.53) REVISED PER FIELD SURVEY



VDOT ACCEPTS NO MAINTENANCE RESPONSIBILITY FOR THE RETENTION/DETENTION PONDS AND IS SAVED HARMLESS FROM ANY DAMAGE CAUSED BY FAILURE OF THE BASINS AND THEIR OUTFALL STRUCTURES.

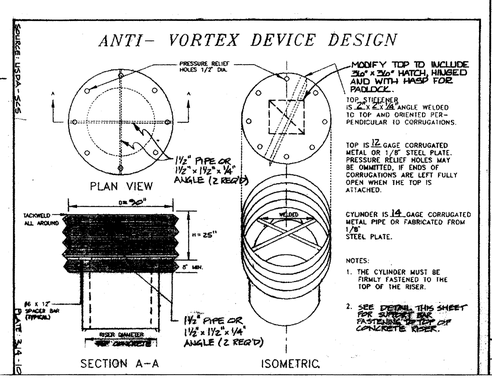
SCALE: 1"=10'

SECTION A–A
DAM CROSS SECTION



ANTI–VORTEX PLAN VIEW
TOP REMOVED

N.T.S.



SOURCE: USDA-SCS

GENERAL NOTES - DAM CONSTRUCTION

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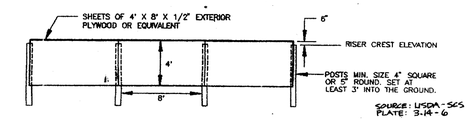
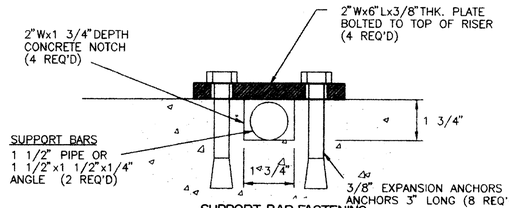


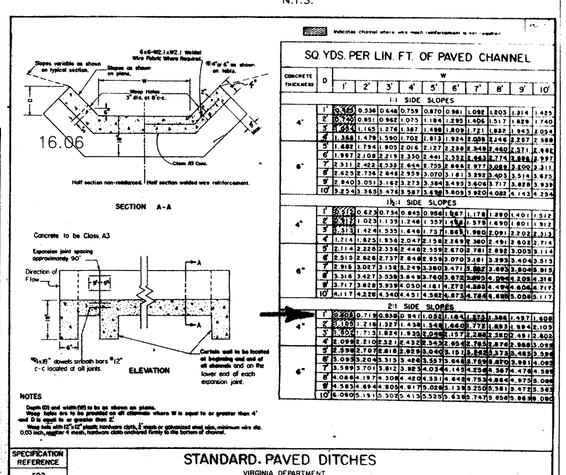
BAFFLE DETAIL

N.T.S.



SECTION A–A

N.T.S.



COUNTY PLAN NO. _____ BMP ID NO. _____

COMMONWEALTH OF VIRGINIA
6-19-02
PETER FARRELL
NO.002036
LAND SURVEYOR

4029 Ironbound Road
Suite 100
Williamsburg, VA 23188
Tel. (757) 220-9035
Fax. (757) 229-0049
Email: lmdg@landmarkdg.com

5544 Greenwich Road
Suite 200
Virginia Beach, VA 23462
Tel. (757) 473-2000
Fax. (757) 473-2021
Email: lmdgvb@landmarkdg.com

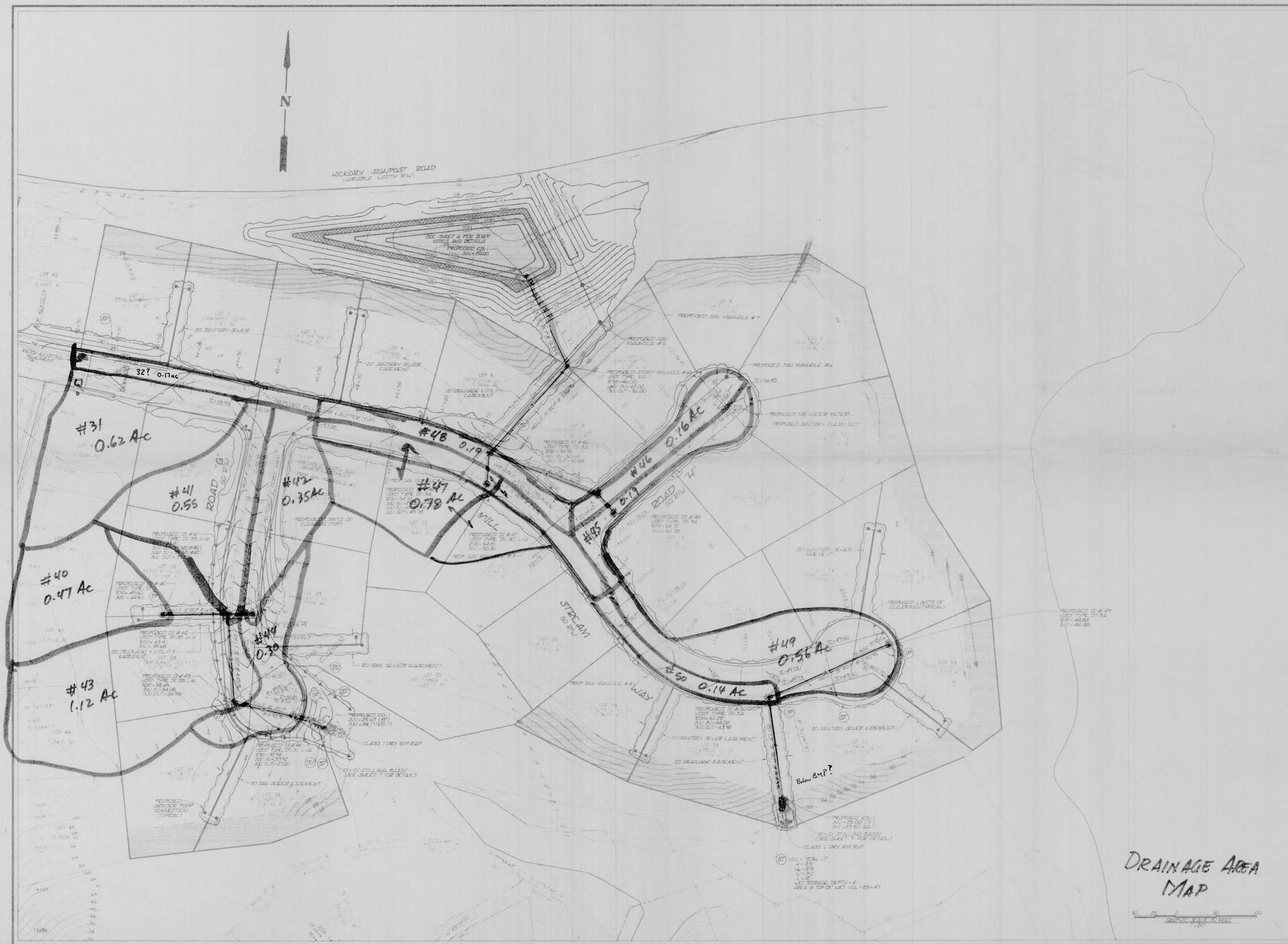
LANDMARK DESIGN GROUP
Engineers • Planners • Surveyors
Landscape Architects • Environmental Scientists

BMP RECORD DRAWING
SETTLERS MILL
AT JAMESTOWN, SECTION 6
OWNER/ DEVELOPER: SETTLERS MILL INC.
JAMESTOWN DISTRICT
JAMES CITY COUNTY, VIRGINIA

Designed: LMDG	Date: 06/19/02
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: SM6-BMP-2
Project Number: 1930047-000.21	Dwg. File No.: 13332W
Drawing Number	R-1

1 OF 1

MC007_COMMON_AREA_SETTLERS_MILL - 007



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

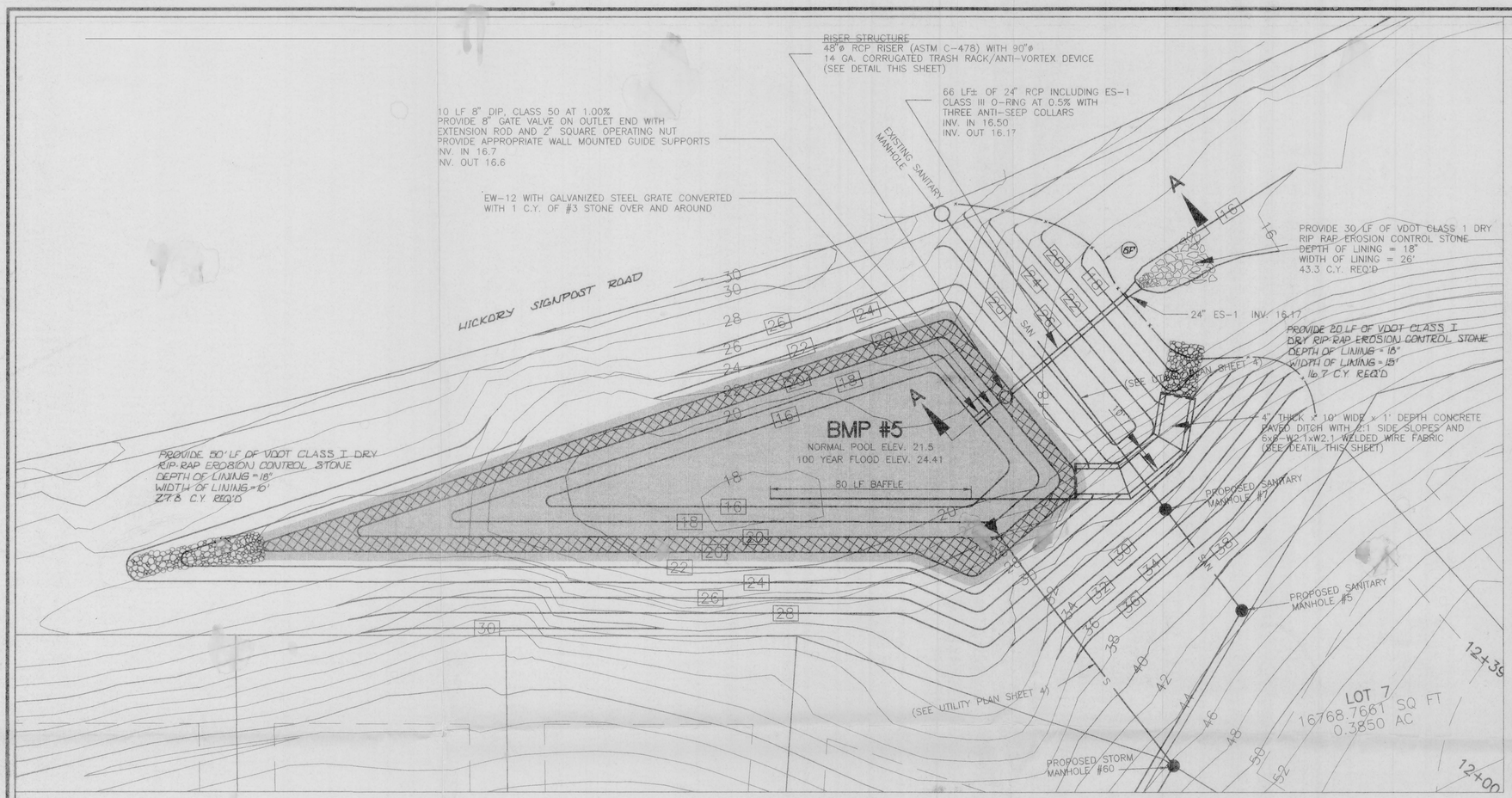
DES	DEW
DWN	GSW
CHK	JLH
DATE	2/15/95

ROAD AND DRAINAGE,
EROSION AND SEDIMENT CONTROL PLAN
SETTLERS MILL
AT JAMESTOWN
SECTION 6
OWNER DEVELOPER: SETTLERS MILL INC.
JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA

SHEET	3 OF 9
DISK	
PROJ. NO	93047-2
DWG	5558W

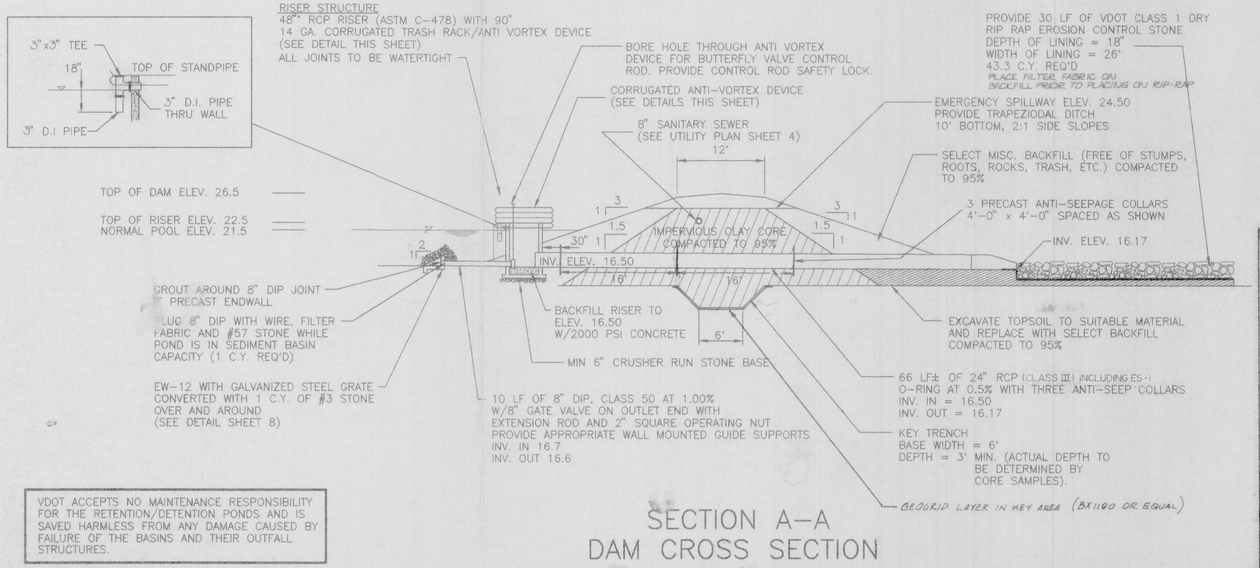
S-1945

MC007_COMMON_AREA_SETTLERS_MILL - 008



BMP PLAN

SCALE: 1" = 25'



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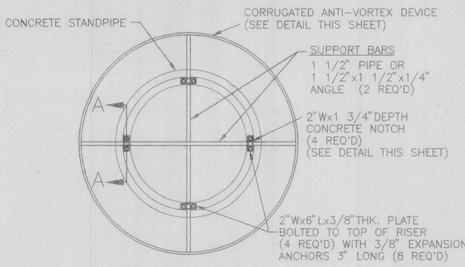

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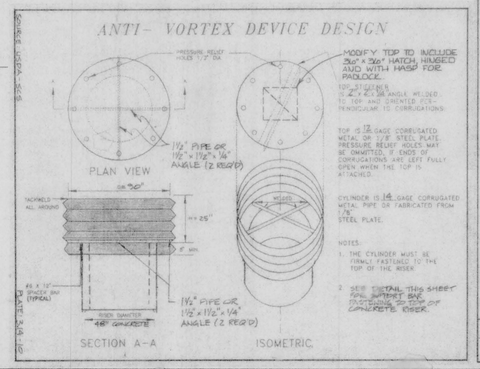

BAFFLE DETAIL

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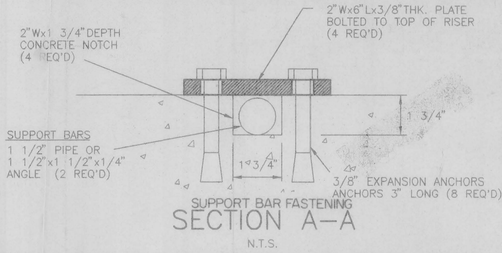

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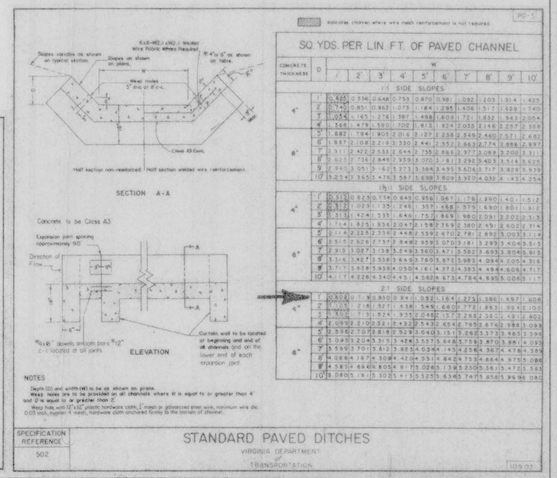

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COMMONWEALTH OF VIRGINIA
JOHN L. HOLCHERSON
No. 7753
REGISTERED PROFESSIONAL ENGINEER

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

DES.	JLH
DWN.	SAG
CHK.	JLH
DATE	2/15/95

BMP NOTES AND DETAILS
SETTLERS MILL
SECTION 6
AT JAMESTOWN
OWNER/DEVELOPER: SETTLERS MILL INC.
JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA

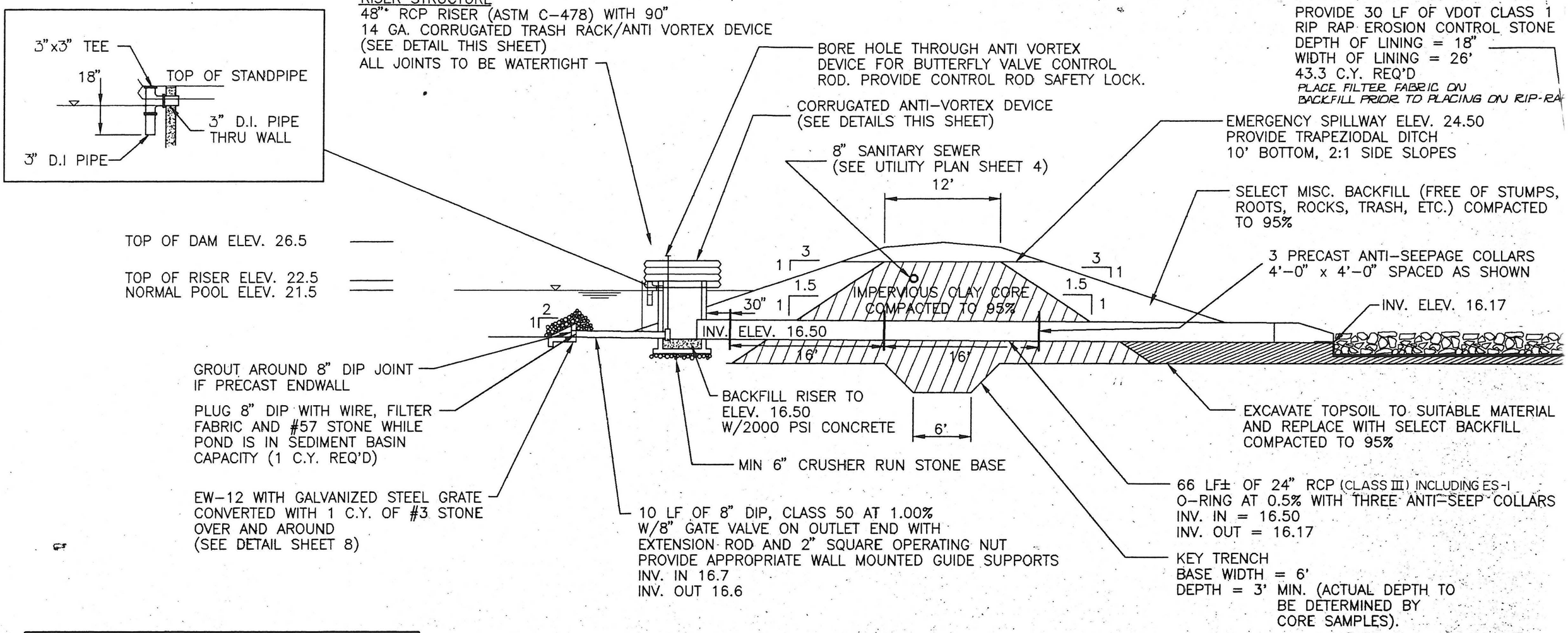
SHEET	6 OF 9
DISK	
PROJ. NO.	94037-2
DWG.	5555W

3/20/96 REVISION PER 2000 COMPLIANCE REVIEW. ADD GEOGRID TO KEYWAY
REVISIONS PER COUNTY COMMENTS 11/2/00
REVISIONS PER COUNTY COMMENTS 3/20/00

MC007_COMMON_AREA_SETTLERS_MILL - 009

BMP PLAN

SCALE: 1" = 25'



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SECTION A-A
DAM CROSS SECTION

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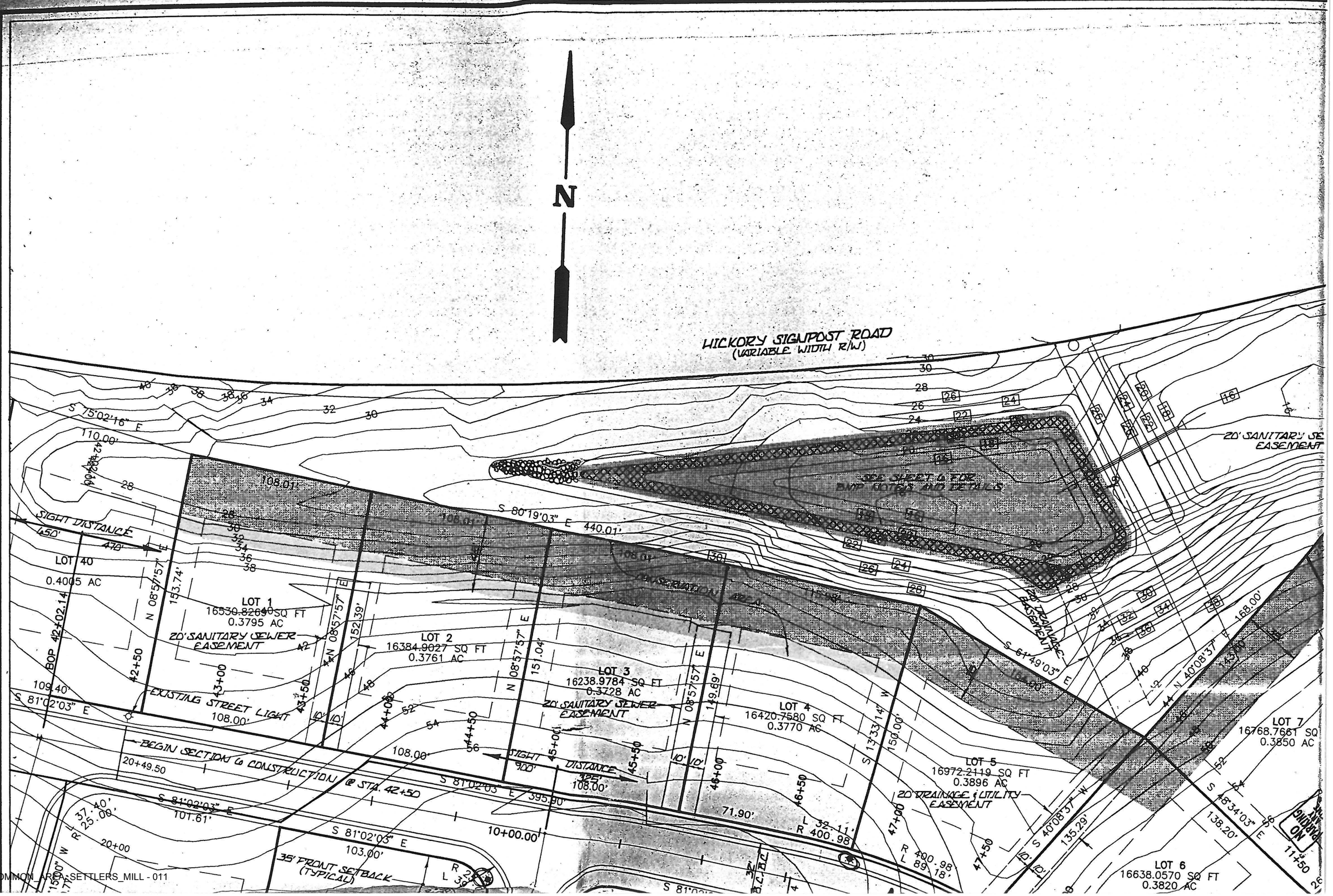
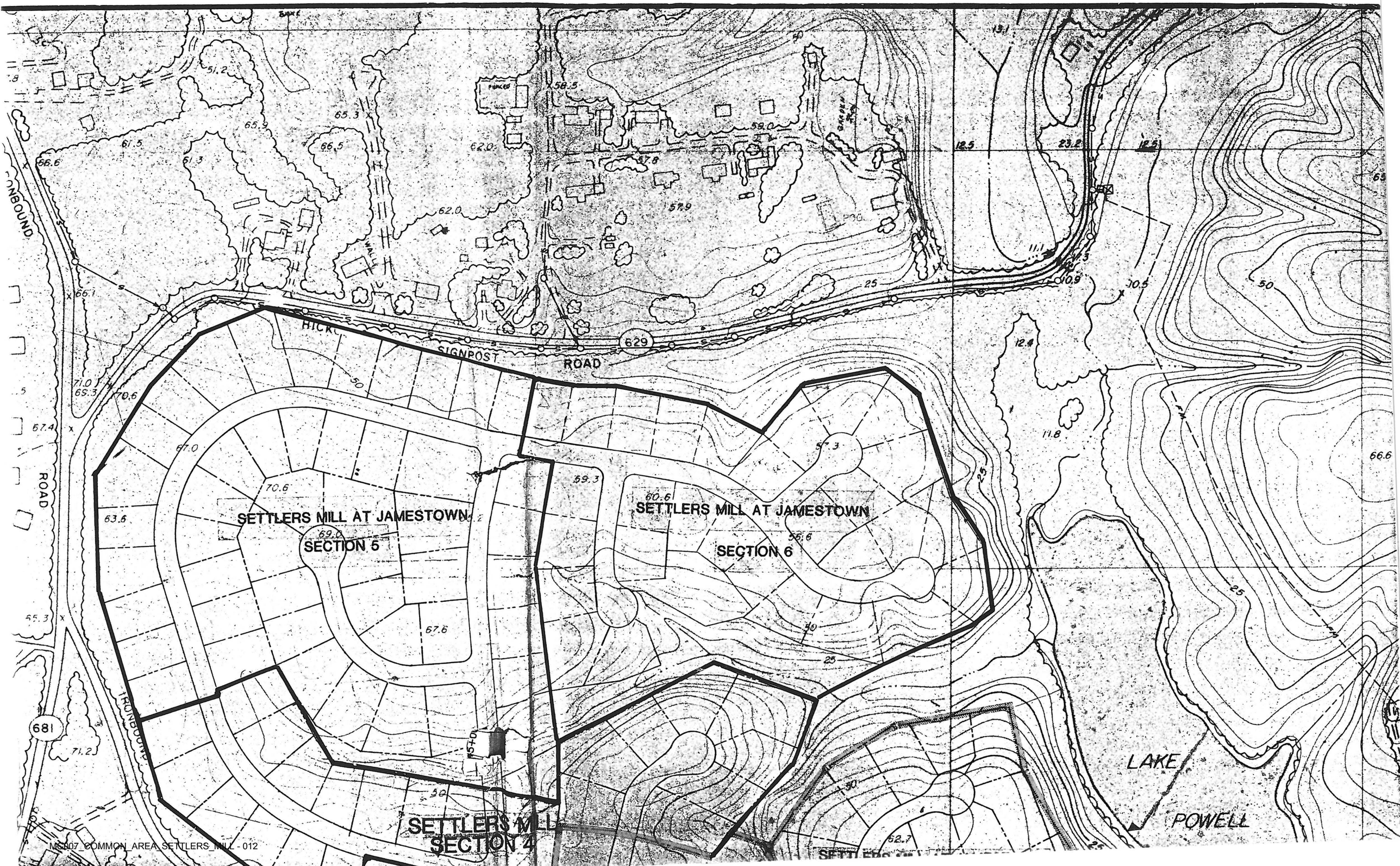

N
HICKORY SIGNPOST ROAD
(VARIABLE WIDTH R/W)
S 15°02'16" E
110.00'
SIGHT DISTANCE
450'
478'
LOT 40
0.4005 AC
N 08°57'57" E
153.74'
LOT 1
16530.8264 SQ FT
0.3795 AC
20' SANITARY SEWER EASEMENT
BOP 42+02.14
42+50
43+00
43+50
44+00
44+50
45+00
45+50
46+00
46+50
47+00
47+50
10+00.00
20+49.50
20+00
109.40'
S 81°02'03" E
EXISTING STREET LIGHT
108.00'
BEGIN SECTION @ CONSTRUCTION @ STA. 42+50
S 81°02'03" E
101.61'
S 81°02'03" E
103.00'
35' FRONT SETBACK
(TYPICAL)
R 37.40'
L 25.00'
108.01'
N 08°57'57" E
152.39'
LOT 2
16384.9027 SQ FT
0.3761 AC
N 08°57'57" E
151.04'
LOT 3
16238.9784 SQ FT
0.3728 AC
20' SANITARY SEWER EASEMENT
SIGHT DISTANCE
900'
425'
108.00'
S 81°02'03" E 395.90'
S 80°19'03" E 440.01'
N 08°57'57" E
149.69'
LOT 4
16420.7580 SQ FT
0.3770 AC
S 13°33'14" W
150.00'
71.90'
L 32.11'
R 400.98'
R 400.98'
L 89.18'
LOT 5
16972.2119 SQ FT
0.3896 AC
20' DRAINAGE & UTILITY EASEMENT
S 40°08'37" W
135.29'
S 48°34'03" E
138.20'
LOT 6
16638.0570 SQ FT
0.3820 AC
20' DRAINAGE EASEMENT
S 61°49'03" E
N 40°08'37" E
168.00'
LOT 7
16768.7661 SQ
0.3850 AC
20' SANITARY SE
EASEMENT
NO PARKING ANY TIME
11+50


SIGNPOST
ROAD
629
681
SETTLERS MILL AT JAMESTOWN
SECTION 5
SETTLERS MILL AT JAMESTOWN
SECTION 6
SETTLERS MILL
SECTION 4
LAKE
POWELL

ORRUGATED TRASH RACK/ANTI-VORTEX DEVICE
IL THIS SHEET)

66 LF± OF 24" RCP INCLUDING ES-1
CLASS III O-RING AT 0.5% WITH
THREE ANTI-SEEP COLLARS
INV. IN 16.50
INV. OUT 16.17

EXISTING SANITARY MANHOLE

PROVIDE 30 LF OF VDOT CLASS 1 DRY
RIP RAP EROSION CONTROL STONE
DEPTH OF LINING = 18"
WIDTH OF LINING = 26'
43.3 C.Y. REQ'D

24" ES-1 INV. 16.17

Extend Rip Rap

PROVIDE 20 LF OF VDOT CLASS I
DRY RIP-RAP EROSION CONTROL STONE
DEPTH OF LINING = 18"
WIDTH OF LINING = 15'
16.7 C.Y. REQ'D

(SEE UTILITY PLAN SHEET 4)

4" THICK x 10' WIDE x 1' DEPTH CONCRETE
PAVED DITCH WITH 2:1 SIDE SLOPES AND
6x6-W2.1xW2.1 WELDED WIRE FABRIC
(SEE DEATIL THIS SHEET)

#5
ELEV. 21.5
D ELEV. 24.41

AFFLE

PROPOSED SANITARY MANHOLE #7

PROPOSED SANITARY MANHOLE #5

(SEE UTILITY PLAN SHEET 4)

PROPOSED STORM MANHOLE #60

LOT 7
16768.7661 SQ FT
0.3850 AC

12+39

12+00

CONCRETE STANDPIPE

CORRUGATED ANTI-VORTEX DEVICE
(SEE DETAIL THIS SHEET)

SUPPORT BARS
1 1/2" PIPE OR
1 1/2"x1 1/2"x1/4"
ANGLE (2 REQ'D)

2"Wx1 3/4" DEPTH
CONCRETE NOTCH
(4 REQ'D)
(SEE DETAIL THIS SHEET)

2"Wx6"Lx3/8"THK. PLATE
BOLTED TO TOP OF RISER
(4 REQ'D) WITH 3/8" EXPANSION
ANCHORS 3" LONG (8 REQ'D)

ROVIDE 30 LF OF VDOT CLASS 1 DRY
IP RAP EROSION CONTROL STONE
EPTH OF LINING = 18"
IDTH OF LINING = 26'
3.3 C.Y. REQ'D
ACE FILTER FABRIC ON
CKFILL PRIOR TO PLACING ON RIP-RAP

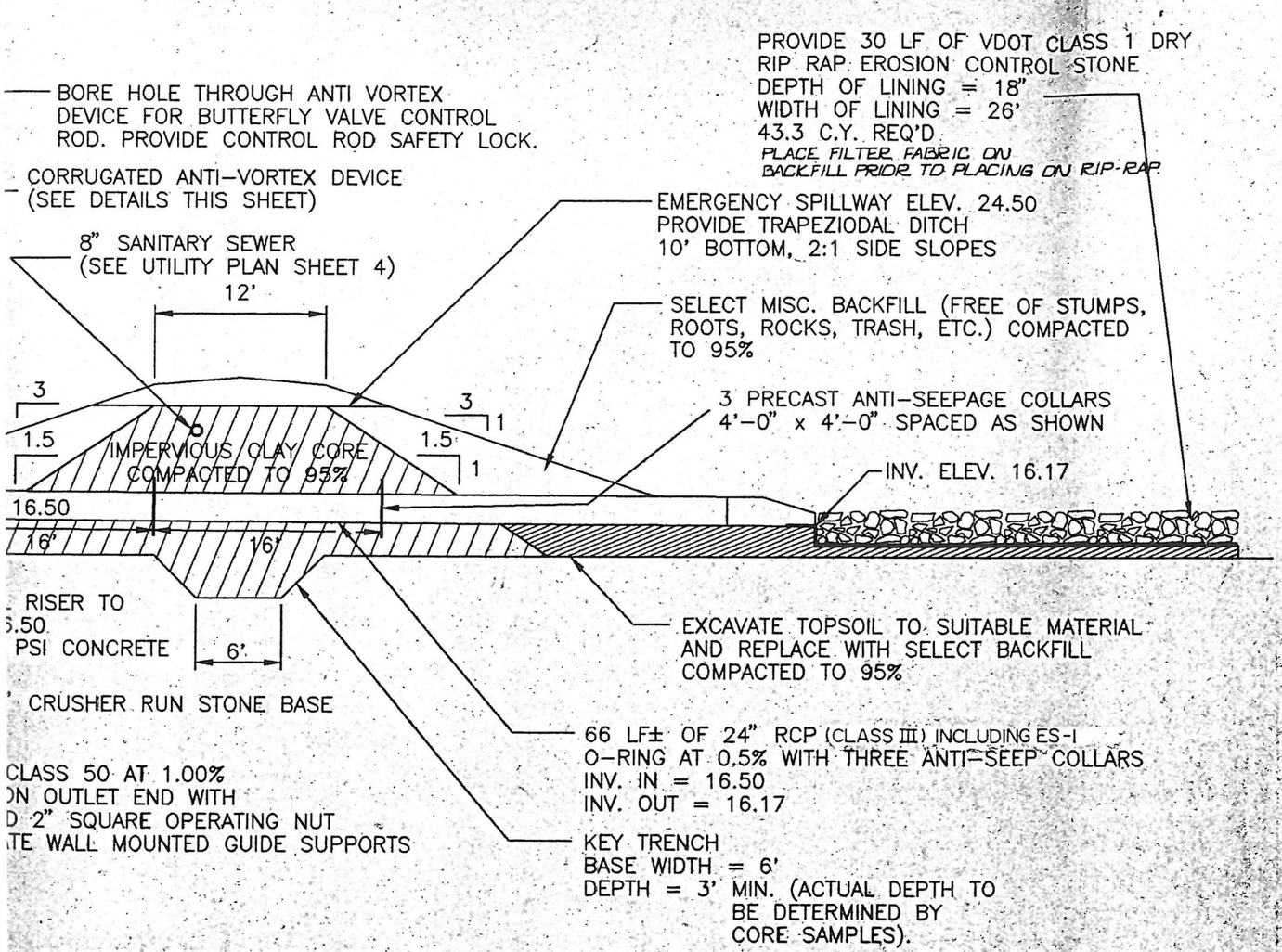
SPILLWAY ELEV. 24.50
RAPEZIODAL DITCH
, 2:1 SIDE SLOPES

ISC. BACKFILL (FREE OF STUMPS,
OCKS, TRASH, ETC.) COMPACTED

ANTI-VORTEX PLAN VIEW
TOP REMOVED

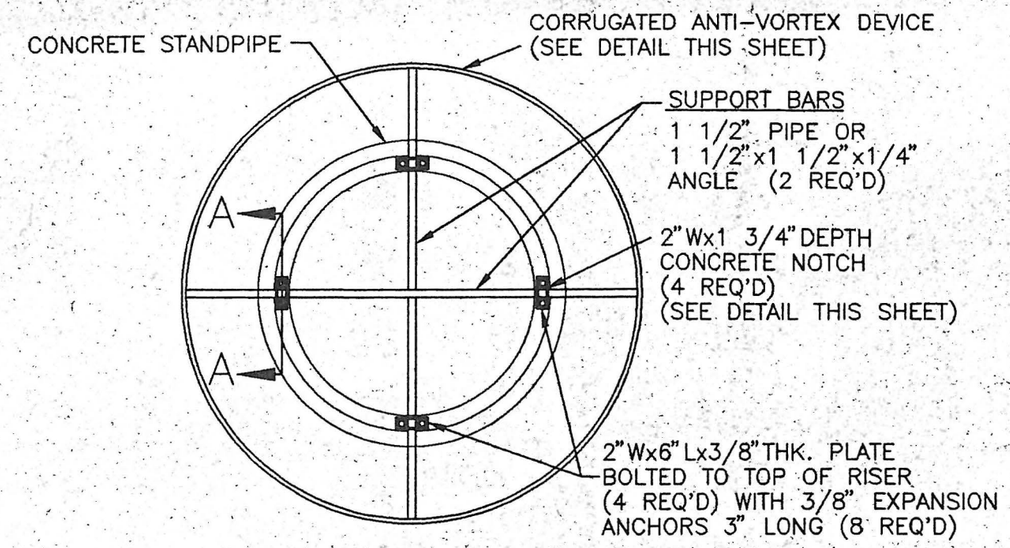
BMP PLAN

SCALE: 1" = 25'



SECTION A-A
AM CROSS SECTION

SCALE: 1" = 10'

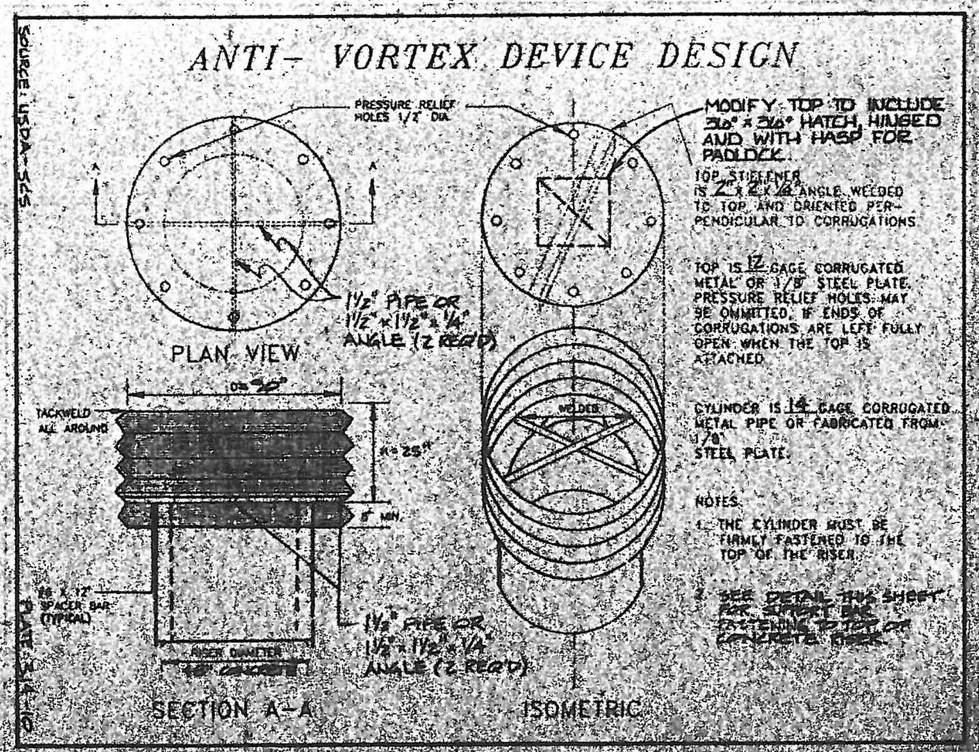


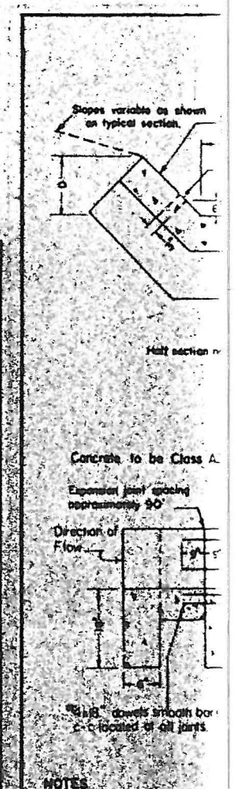
2"Wx1 3/4
CONCRETE
(4 REQ'D)

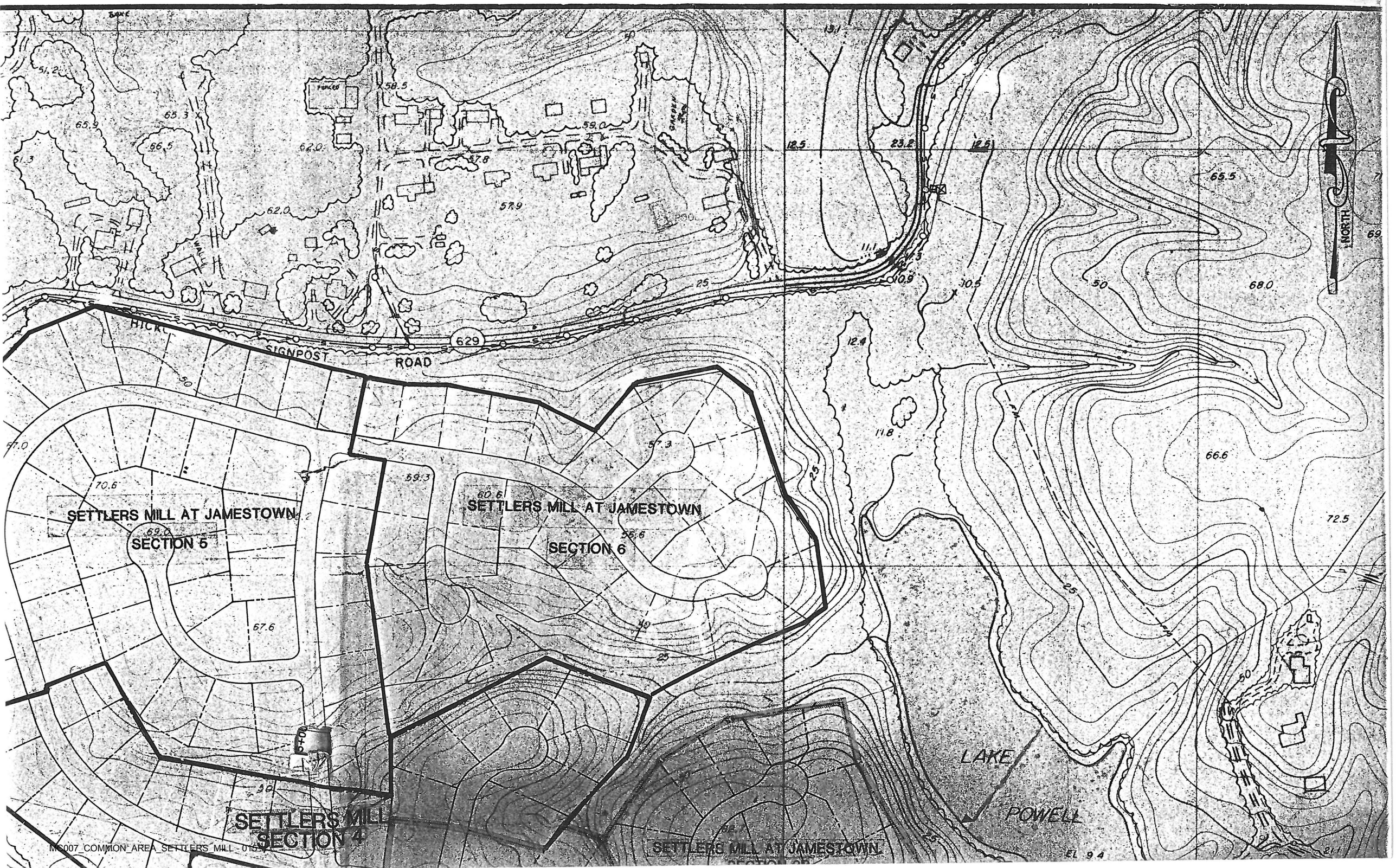
SUPPORT BA
1 1/2" PIPE
1 1/2"x1 1
ANGLE (2 F

ANTI-VORTEX PLAN VIEW
TOP REMOVED

N.T.S.






SIGNPOST ROAD
629
SETTLERS MILL AT JAMESTOWN
SECTION 5
SETTLERS MILL AT JAMESTOWN
SECTION 6
SETTLERS MILL
SECTION 4
SETTLERS MILL AT JAMESTOWN
LAKE
POWELL
NORTH
FENCES
WALL
GARDEN
EL 9.4

N

HICKORY SIGNPOST ROAD
(VARIABLE WIDTH R/W)

NATURAL OPEN SP

20' SANITARY SEWER EASEMENT

S 80°19'03" E 440.01'

BMP NOTES AND DETAILS

RESTORATION AREA

20' DRAINAGE EASEMENT

S 61°49'03" E

N 84°54'39" E

LOT 2
16384.9027 SQ FT
0.3761 AC

LOT 3
16238.9784 SQ FT
0.3728 AC

20' SANITARY SEWER EASEMENT

LOT 4
16420.7580 SQ FT
0.3770 AC

LOT 5
16972.2119 SQ FT
0.3896 AC

20' DRAINAGE & UTILITY EASEMENT

LOT 6
16638.0570 SQ FT
0.3820 AC

VARIABLE WIDTH DRAINAGE EASEMENT

LOT 7
16768.7661 SQ FT
0.3850 AC

LOT 8
18129.3121 SQ FT
0.4162 AC

LOT 9
19806.9458
0.4547 A

LOT 11
16350.4951 SQ FT
0.3754 AC

LOT 22
15955.1537 SQ FT

LOT 23
15490.8739 SQ FT
0.3556 AC

LOT 30
15865.8739 SQ FT
0.3642 AC

CONSTRUCTION @ STA 42+50

S 81°02'03" E 395.90'

S 81°02'03" E
103.00'

35' FRONT SETBACK (TYPICAL)

N 81°02'03" W
128.00'

S 81°02'03" E
100.00'

10+50 VARIABLE WIDTH DRAINAGE EASEMENT

STOP

MILL STREAM WAY
50' R/W

ROAD "G"
50' R/W

ROAD "H"
50' R/W

PROPOSED STREET (TYPICAL)

N 47°27'57" E 126.18'

S 16°34'03" E 138.20'

S 40°08'37" W 135.29'

N 40°08'37" E 137.70'

N 31°42'10" W 135.93'

S 28°17'04" W 168.00'

S 96°01'02" E 143.93'

S 42°32'

MC007_COMMON_AREA_SETTLERS_MILL - 016

6. ALL EXISTING VEGETATION WITHIN THE RPA BUFFER SHALL REMAIN IN ITS UNDISTURBED STATE, EXCEPT DAMAGES DUE TO NATURAL CAUSES. DEVELOPER SHALL INSTALL SIGNS DENOTING THE LANDWARD LIMITS OF THE RPA BUFFER.
7. THIS PROPERTY IS PART OF PARCEL (47-1) (1-109) AND IS RECORDED IN PB 46, PG 93 AS REMAINDER OF 104.73 AC±.
8. THE OVERALL DRAINAGE AND STORMWATER MANAGEMENT PLAN AND THE OVERALL SOILS MAP FOR THIS DEVELOPMENT WERE SUBMITTED WITH THE SECTION 2 PLANS DATED 2/91 BY AES CONSULTING ENGINEERS OF WILLIAMSBURG, VA.
9. THE REVISED OVERALL STORMWATER MANAGEMENT PLAN, MASTER WATER MODEL AND MASTER SEWER MODEL WERE SUBMITTED WITH THE SECTION 3 PLANS DATED 6/1993 BY LANGLEY AND McDONALD.

SETTLERS MILL		
AREA TABULATIONS		
	SECTION 6	
	S.F.	AC.
AREA OF RESIDENTIAL LOTS	534,046	12.260
RIGHT-OF-WAY	99,848	2.292
COMMON AREA	504,686	11.586
TOTAL AREA	1,138,580	26.138
AVERAGE LOT SIZE	17,801	0.409
NUMBER OF LOTS	30	
GROSS LOT YIELD	1.148 LOTS/AC.	

NOTE: SETTLERS MILL SECTION 1 IS RECORDED AS LAKEWOOD SECTION 2 IN PLAT BOOK 45, PAGE 80 AND PLAT BOOK 44, PAGE 56. LAKEWOOD SECTION 1 IS RECORDED IN PLAT BOOK 22, PAGE 39. SETTLERS MILL SECTION 2A IS RECORDED IN PLAT BOOK 55, PAGE 12, SECTION 2B IS RECORDED IN PLAT BOOK 56, PAGE 43, SECTION 3A IS RECORDED IN DEED BOOK 69, PAGE 584, SECTION 3B IS RECORDED IN PLAT BOOK 60, PAGES 77 & 78.

MAY 1996
RECEIVED
PLANNING DEPARTMENT

S-19-95

DES. L.B.
DWN. L.B.
CHK. J.H.
DATE 2/15/

OVERALL PLAN OF DEVELOPMENT

SETTLERS MILL

AT JAMESTOWN
SECTION 6

OWNER/DEVELOPER: SETTLERS MILL INC.

JAMES CITY

JAMESTOWN DISTRICT

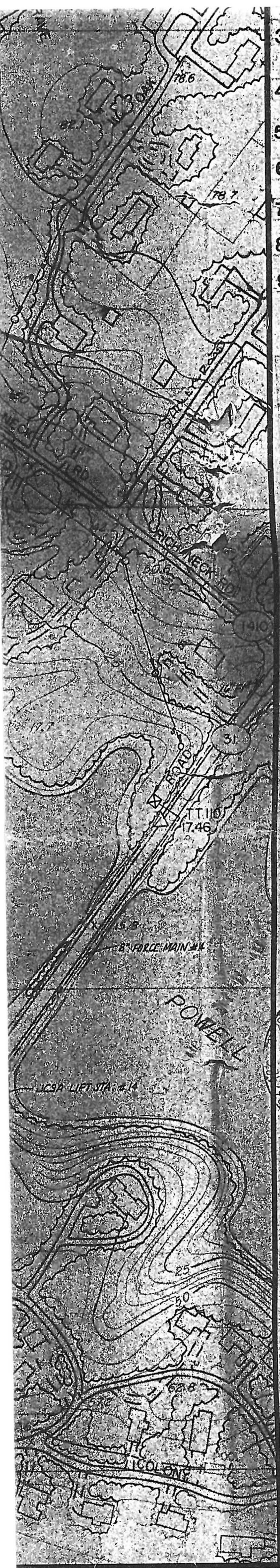
SETTLERS MILL INC.

SHEET 1 OF 9

PROJ. NO. 95047

G. 5560W

REVISIONS PER COUNTY COMMENTS 1/2/9



3 ROAD AND DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

4 UTILITY PLAN

5 ROAD AND UTILITY PROFILES

6 BMP NOTES AND DETAILS

7 STANDARD GRINDER PUMP NOTES AND DETAILS

8 NOTES AND DETAILS

9 NOTES AND DETAILS

GENERAL NOTES

1. PROPERTY IS ZONED LIMITED RESIDENTIAL DISTRICT, R-1.
2. LOTS ARE SERVED BY PUBLIC WATER AND PUBLIC SEWAGE SYSTEMS WHICH ALLOWS A MINIMUM LOT SIZE OF 15,000 S.F.
3. MINIMUM LOT SETBACK REQUIREMENTS ARE AS FOLLOWS

FRONT:	35 FEET
REAR:	35 FEET
SIDE:	15 FEET

SEVERAL SETBACKS HAVE BEEN ADJUSTED DUE TO THE 25% SLOPES

4. LOTS OF UP TO 43,560 SQUARE FEET HAVE A MINIMUM WIDTH OF 100 FEET AT THE SETBACK. (CORNER LOTS NEED 125 FEET.) LOTS OVER 43,560 SQUARE FEET HAVE A MINIMUM WIDTH OF 150 FEET AT THE SETBACK.
5. ALL STREET LIGHTS TO BE 5000 LUMEN (HIGH PRESSURE SODIUM VAPOR) LOCATED NO CLOSER THAN 10 FEET TO THE BACK OF CURB AND NOT MORE THAN 15 FEET IN HEIGHT.
6. ALL EXISTING VEGETATION WITHIN THE RPA BUFFER SHALL REMAIN IN ITS UNDISTURBED STATE, EXCEPT DAMAGES DUE TO NATURAL CAUSES. DEVELOPER SHALL INSTALL SIGNS DENOTING THE LANDWARD LIMITS OF THE RPA BUFFER.
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BMP # MC007

S-19-95

Langley and McDonald
Engineers • Planners
Landscape Architects
VIRGINIA BEACH

DES. L & M
DWN. L & M
CHK. L & M
DATE 2/16/95

OVERALL PLAN OF DEVELOPMENT

SETTLERS MILL

AT JAMESTOWN
SECTION 6

OWNER/DEVELOPER: SETTLERS MILL INC.

JAMES CITY COUNTY, VIRGINIA JAMESTOWN DISTRICT

SHEET 1 OF 9

PROJ. NO. 93047

G. 5560W

REVISIONS PER COUNTY COMMENTS 1/2/96

GENERAL NOTES - DAM CONSTRUCTION

1. EMBANKMENT SUBGRADES TO BE STRIPPED OF ALL TOPSOIL, ORGANIC MATTER, AND SOFT AND LOOSE SOILS PRIOR TO PLACEMENT OF FILL MATERIALS.

2. SUBGRADE TO BE PROOF ROLLED WITH A LOADED TANDEM DUMP TRUCK OR SIMILAR EQUIPMENT UNDER THE OBSERVATION OF THE ENGINEER.

3. AREAS THAT EXHIBIT EXCESSIVE PUMPING OR WEAVING WILL REQUIRE UNDERCUTTING.

4. COMPACTED EMBANKMENT FILL TO BE FREE OF ORGANIC MATTER AND CLASSIFY SM, SC, ML, MH OR CL IN ACCORDANCE WITH UNIFIED SOIL CLASSIFICATION SYSTEM ASTM D-2487.

5. EMBANKMENT FILL TO BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8 INCHES IN THICKNESS AND SHOULD BE COMPACTED TO AT LEAST 95% OF MAXIMUM DRY DENSITY ACCORDING TO ASTM D-698, STANDARD PROCTOR. FILL SHOULD BE COMPACTED AT MOISTURE CONTENTS WITHIN ± 20% OF THE OPTIMUM MOISTURE CONTENT FOR THE MATERIAL USED.

6. THE SURFACE OF EACH COMPLETED LIFT OF COMPACTED EMBANKMENT FILL SHOULD BE SCARIFIED TO A DEPTH OF 2 TO 3 INCHES PRIOR TO PLACING ADDITIONAL FILL TO LIMIT THE DEVELOPMENT OF HORIZONTAL SEEPAGE PLAINS WITHIN THE EMBANKMENT.

7. COMPACTED EMBANKMENT FILL TO BE PLACE IN HORIZONTAL LIFTS.

8. SURFACES STEEPER THAN 4:1 TO BE BENCHED TO RECEIVE FILL. BENCH HEIGHTS NOT TO EXCEED 2 FEET.

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

10. THE PRINCIPAL SPILLWAY PIPE TO BE SUPPORTED ON NATURAL GROUND OR COMPACTED EMBANKMENT FILL OR AS SHOWN ON THE PLANS.

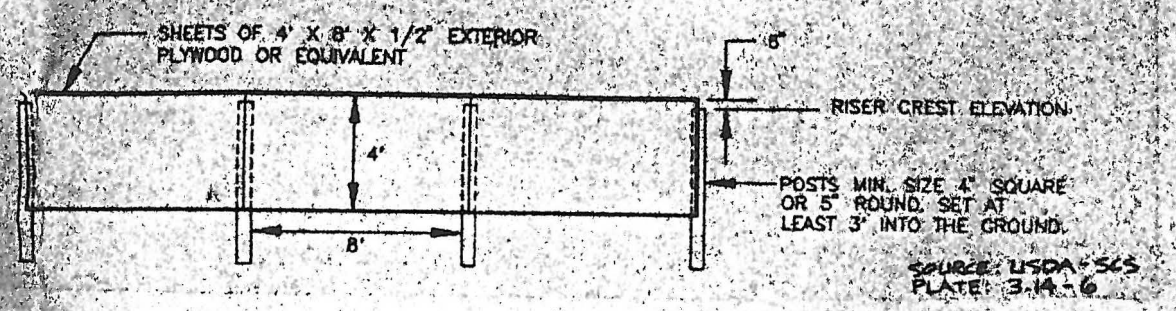
11. SUFFICIENT CLEARANCE SHOULD BE PROVIDED FOR STANDARD COMPACTION EQUIPMENT TO ACCESS DURING BACKFILLING ALONG THE PRINCIPAL SPILLWAY CONDUIT. THE BACKFILL SHOULD BE RAMMED UP AGAINST THE CONDUIT ON A MAXIMUM SLOPE OF 6:1. WHERE ACCESS IS LIMITED, THINNER LIFT THICKNESS, HAND COMPACTION AND TIGHT CONTROL ON MATERIAL QUALITY WILL BE NECESSARY.

12. WHERE TRENCH EXCAVATION FOR THE INSTALLATION OF THE PRINCIPAL SPILLWAY CONDUIT IS NECESSARY, SLOPE TO BE CUT NO STEEPER THAN 2:1.

13. SITE DRAINAGE TO BE PROVIDED TO MAINTAIN SUBGRADES FREE OF WATER AND TO AVOID SATURATION AND DISTURBANCE OF THE SUBGRADE SOILS PRIOR TO CONSTRUCTING FOUNDATIONS AND PLACING FILL. ANY SOILS THAT HAVE BEEN WEAKENED DUE TO SATURATION AND DISTURBANCE TO BE REMOVED AS RECOMMENDED BY THE ENGINEER.

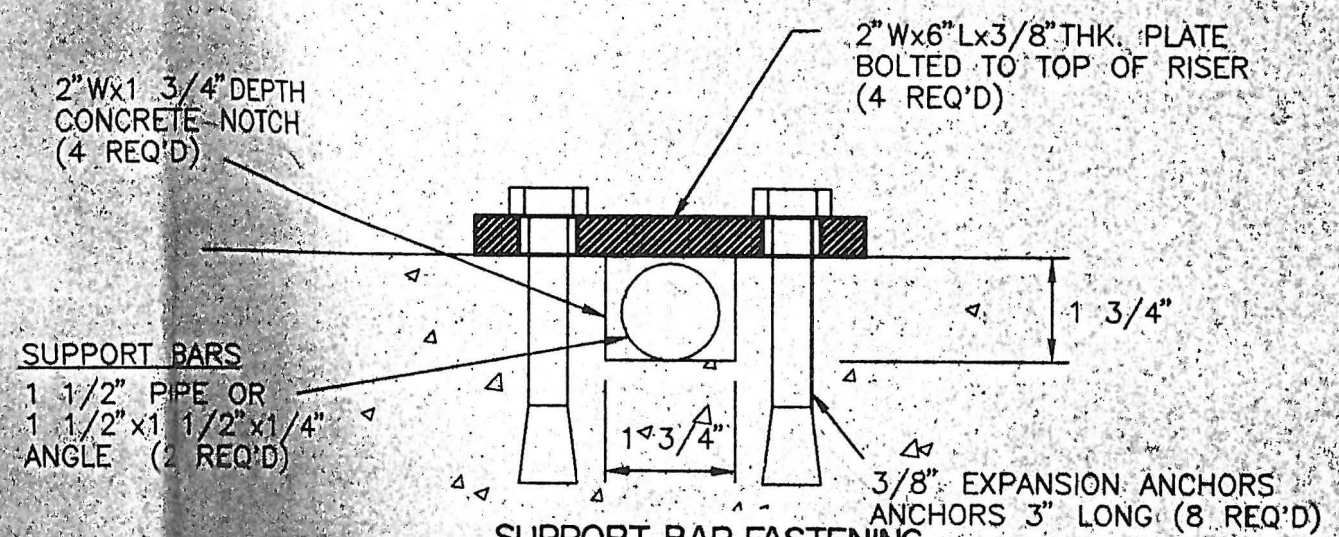
14. DEWATERING OF THE DAM FOUNDATION AREAS (WELL POINTING OR PUMPING FROM SUMPS), AND THE DIVERSION OF SURFACE WATER AWAY FROM THE WORK AREA MAY BE NECESSARY TO ALLOW PROPER EXECUTION OF THE CONSTRUCTION WORK. DEWATERING SHOULD BEGIN PRIOR TO EARTHWORK SO THAT THE SPILLWAY CONDUIT CAN BE INSTALLED AND SURFACE WATER WOULD THEN BE DIVERTED THROUGH THE PRINCIPAL SPILLWAY.

15. THE EMBANKMENT FOUNDATION TO BE FREE OF PONDED WATER, EXCESSIVELY MUDDY CONDITIONS AND IN DRAINABLE CONDITION AS NEEDED FOR PROPER EXECUTION OF THE CONSTRUCTION WORK.



BAFFLE DETAIL

N.T.S.



SUPPORT BAR FASTENING

SECTION A–A

N.T.S.

Indicates channel where wire mesh reinforcement is not required

COMMONWEALTH OF VIRGINIA
JOHN L. HUTCHERSON
No. 7753
REGISTERED PROFESSIONAL ENGINEER

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

DES.	JLH
DWN.	SAG
CHK.	JLH
DATE	2/15/96

ETAILS
MILL
ERS MILL INC.
COUNTY, VIRGINIA

JAMES CITY COUNTY
EROSION AND SEDIMENT CONTROL NOTES

THE PURPOSE OF THE EROSION CONTROL MEASURES SHOWN ON THESE PLANS SHALL BE TO PRECLUDE THE TRANSPORT OF ALL WATERBORNE SEDIMENTS RESULTING FROM CONSTRUCTION ACTIVITIES FROM ENTERING ONTO ADJACENT PROPERTIES OR STATE WATERS. IF FIELD INSPECTION REVEALS THE INADEQUACY OF THE PLAN TO CONFINE SEDIMENT TO THE PROJECT SITE, APPROPRIATE MODIFICATIONS WILL BE MADE TO CORRECT ANY PLAN DEFICIENCIES. IN ADDITION TO THESE NOTES, ALL PROVISIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS SHALL APPLY TO THIS PROJECT.

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE "VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK". THE CONTRACTOR SHALL BE THOROUGHLY FAMILIAR WITH ALL APPLICABLE MEASURES CONTAINED THEREIN WHICH MAY BE PERTINENT TO THIS PROJECT.

2. ALL POINTS OF CONSTRUCTION INGRESS AND EGRESS SHALL BE PROTECTED BY A TEMPORARY CONSTRUCTION ENTRANCE TO PREVENT TRACKING OF MUD ONTO PUBLIC RIGHT-OF-WAYS. AN ENTRANCE PERMIT FROM VDOT IS REQUIRED PRIOR TO ANY CONSTRUCTION ACTIVITIES WITHIN STATE RIGHT-OF-WAYS. WHERE SEDIMENT IS TRANSPORTED ONTO A PUBLIC ROAD SURFACE, THE ROAD SHALL BE THOROUGHLY CLEANED AT THE END OF EACH DAY.

3. A PRECONSTRUCTION MEETING SHALL BE HELD ON-SITE BETWEEN THE COUNTY, THE DEVELOPER, THE PROJECT ENGINEER, AND THE CONTRACTOR PRIOR TO ISSUANCE OF THE LAND DISTURBING PERMIT. THE CONTRACTOR SHALL SUBMIT A SEQUENCE OF CONSTRUCTION TO THE COUNTY FOR APPROVAL PRIOR TO THE PRECONSTRUCTION MEETING. THE CONTRACTOR WILL SUPPLY CODE COMPLIANCE WITH THE NAME OF THE INDIVIDUAL WHO WILL BE RESPONSIBLE FOR ENSURING MAINTENANCE OF INSTALLED MEASURES ON A DAILY BASIS.

4. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT ON-SITE MUST BE CONSTRUCTED AS A FIRST STEP IN GRADING AND BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE. EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS MUST BE SEEDED AND MULCHED IMMEDIATELY AFTER INSTALLATION. PERIODIC INSPECTIONS OF THE EROSION CONTROL MEASURES SHALL BE MADE TO ASSESS THEIR CONDITION. ANY NECESSARY MAINTENANCE OF THE MEASURES SHALL BE ACCOMPLISHED IMMEDIATELY UPON NOTIFICATION BY THE COUNTY AND SHALL INCLUDE THE REPAIR OF MEASURES DAMAGED BY ANY SUBCONTRACTOR INCLUDING THOSE OF THE PUBLIC UTILITY COMPANIES.

5. SURFACE FLOWS OVER CUT AND FILL SLOPES SHALL BE CONTROLLED BY EITHER REDIRECTING FLOWS FROM TRANSVERSING THE SLOPES OR BY MECHANICAL DEVICES TO SAFELY LOWER WATER DOWNSLOPE WITHOUT CAUSING EROSION. A TEMPORARY FILL DIVERSION (STD. & SPEC. 3.10) SHALL BE INSTALLED PRIOR TO THE END OF EACH WORKING DAY.

6. SEDIMENT CONTROL MEASURES MAY REQUIRE MINOR FIELD ADJUSTMENTS AT TIME OF CONSTRUCTION TO INSURE THEIR INTENDED PURPOSE IS ACCOMPLISHED. DIVISION OF CODE COMPLIANCE APPROVAL WILL BE REQUIRED FOR OTHER DEVIATIONS FROM THE APPROVED PLANS.

7. THE CONTRACTOR SHALL PLACE SOIL STOCKPILES AT THE LOCATIONS SHOWN ON THIS PLAN OR AS DIRECTED BY THE ENGINEER. SOIL STOCKPILES SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. OFF-SITE WASTE OR BORROW AREAS SHALL BE APPROVED BY THE DIVISION OF CODE COMPLIANCE PRIOR TO THE IMPORT OF ANY BORROW OR EXPORT OF ANY WASTE TO OR FROM THE PROJECT SITE.

8. THE CONTRACTOR SHALL COMPLETE DRAINAGE FACILITIES WITHIN 30 DAYS FOLLOWING COMPLETION OF ROUGH GRADING AT ANY POINT WITHIN THE PROJECT. THE INSTALLATION OF DRAINAGE FACILITIES SHALL TAKE PRECEDENCE OVER ALL UNDERGROUND UTILITIES. OUTFALL DITCHES FROM DRAINAGE STRUCTURES SHALL BE STABILIZED IMMEDIATELY AFTER CONSTRUCTION OF SAME. THIS INCLUDES INSTALLATION OF EROSION CONTROL STONE OR PAVED DITCHES WHERE REQUIRED. ANY DRAINAGE OUTFALLS REQUIRED FOR A STREET MUST BE COMPLETED BEFORE STREET GRADING OR UTILITY INSTALLATION BEGINS.

9. PERMANENT OR TEMPORARY SOIL STABILIZATION MUST BE APPLIED TO ALL DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. SOIL STABILIZATION MUST ALSO BE APPLIED TO DENUDED AREAS WHICH MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT (UNDISTURBED) FOR LONGER THAN 30 DAYS. SOIL STABILIZATION MEASURES INCLUDE VEGETATIVE ESTABLISHMENT, MULCHING AND THE EARLY APPLICATION OF GRAVEL BASE MATERIAL ON AREAS TO BE PAVED.

10. NO MORE THAN 300 FEET OF SANITARY SEWER, STORM SEWER, WATERLINES, OR UNDERGROUND UTILITY LINES ARE TO BE OPEN AT ONE TIME. FOLLOWING INSTALLATION OF ANY PORTION OF THESE ITEMS, ALL DISTURBED AREAS ARE TO BE IMMEDIATELY STABILIZED (I.E., THE SAME DAY).

11. IF DISTURBED AREA STABILIZATION IS TO BE ACCOMPLISHED DURING THE MONTHS OF DECEMBER, JANUARY, OR FEBRUARY, STABILIZATION SHALL CONSIST OF MULCHING IN ACCORDANCE WITH SPECIFICATION 3.35. SEEDING WILL THEN TAKE PLACE AS SOON AS THE SEASON PERMITS.

12. THE TERM SEEDING, FINAL VEGETATIVE COVER OR STABILIZATION, ON THIS PLAN SHALL MEAN THE SUCCESSFUL GERMINATION AND ESTABLISHMENT OF A STABLE GRASS COVER FROM A PROPERLY PREPARED SEEDBED CONTAINING THE SPECIFIED AMOUNTS OF SEED, LIME, AND FERTILIZER IN ACCORDANCE WITH SPECIFICATION 3.32, PERMANENT SEEDING. IRRIGATION SHALL BE REQUIRED AS NECESSARY TO ENSURE ESTABLISHMENT OF GRASS COVER.

13. ALL SLOPES STEEPER THAN 3:1 SHALL REQUIRE THE USE OF EROSION CONTROL BLANKETS SUCH AS EXCELSIOR BLANKETS TO AID IN THE ESTABLISHMENT OF A VEGETATIVE COVER. INSTALLATION SHALL BE IN ACCORDANCE WITH SPECIFICATION 3.35, MULCHING AND MANUFACTURER'S INSTRUCTIONS. NO SLOPE SHALL BE STEEPER THAN 2:1.

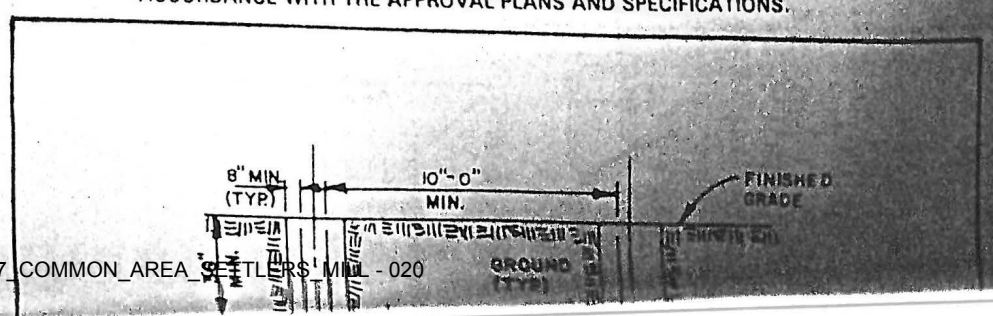
14. INLET PROTECTION IN ACCORDANCE WITH SPECIFICATION 3.07 SHALL BE PROVIDED FOR ALL STORM DRAIN INLETS AS SOON AS PRACTICAL FOLLOWING CONSTRUCTION OF SAME.

15. TEMPORARY LINERS, SUCH AS POLYETHYLENE SHEETS, SHALL BE PROVIDED FOR ALL PAVED DITCHES UNTIL THE PERMANENT CONCRETE LINER IS INSTALLED.

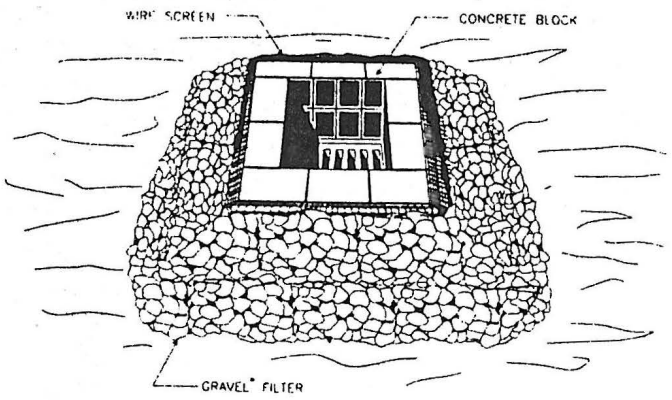
16. PAVED DITCHES SHALL BE REQUIRED WHEREVER EROSION IS EVIDENT. PARTICULAR ATTENTION SHALL BE PAID TO THOSE AREAS WHERE GRADES EXCEED 3 PERCENT.

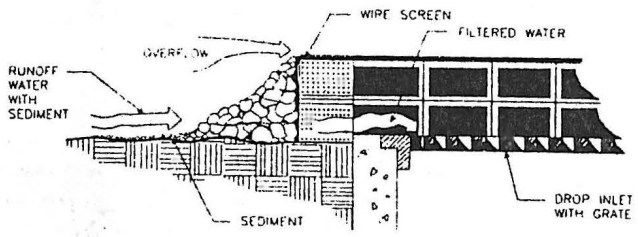
17. TEMPORARY EROSION CONTROL MEASURES ARE NOT TO BE REMOVED UNTIL ALL DISTURBED AREAS ARE STABILIZED. AFTER STABILIZATION IS COMPLETE, ALL MEASURES SHALL BE REMOVED WITHIN 30 DAYS. TRAPPED SEDIMENT SHALL BE SPREAD AND SEEDED.

18. AS-BUILT DRAWINGS MUST BE PROVIDED FOR ALL DETENTION/BMP FACILITIES. ALSO UPON COMPLETION, THE CONSTRUCTION OF ALL DETENTION/BMP FACILITIES SHALL BE CERTIFIED BY A PROFESSIONAL ENGINEER WHO INSPECTED THE STRUCTURE DURING CONSTRUCTION. THE CERTIFICATION SHALL STATE THAT TO THE BEST OF HIS/HER JUDGMENT, KNOWLEDGE, AND BELIEF, THE STRUCTURE WAS CONSTRUCTED IN ACCORDANCE WITH THE APPROVAL PLANS AND SPECIFICATIONS.



BLOCK AND GRAVEL DROP INLET SEDIMENT FILTER





SPECIFIC APPLICATION

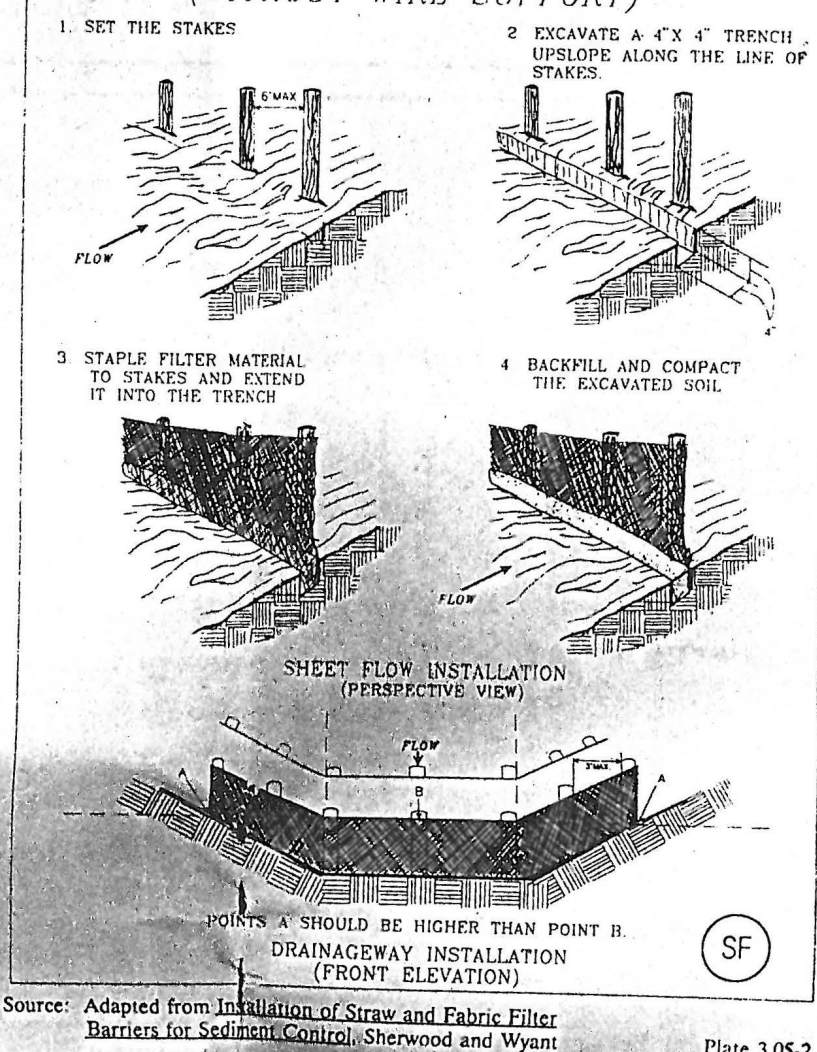
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE HEAVY FLOWS ARE EXPECTED AND WHERE AN OVERFLOW CAPACITY IS NECESSARY TO PREVENT EXCESSIVE PONDING AROUND THE STRUCTURE.

* GRAVEL SHALL BE VDOT #3, #357 OR #5 COARSE AGGREGATE

IP

1992 3.05

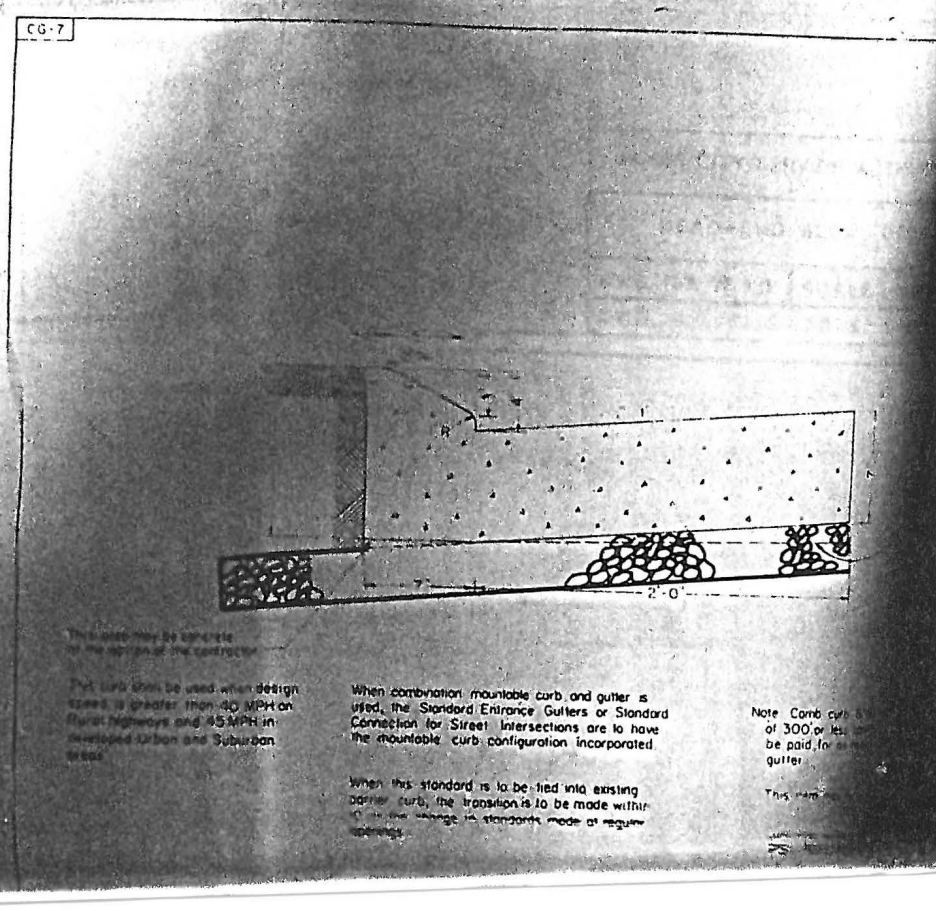
CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



SF

Source: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-2



DRAINAGE CALCULATIONS

SETTLERS MILL

AT JAMESTOWN

SECTIONS 5 & 6

MC 007
5-19-95

FEBRUARY 13, 1995

REVISED DRAINAGE, STORMWATER MANAGEMENT, AND EROSION CONTROL DESIGN FOR BMP 5 FOR SECTIONS 4 AND 5

The Drainage, Stormwater Management, and Erosion control facilities for Sections 3, 4, 5 and 6, Settlers Mill have been developed in basic conformance with the "Overall Drainage and Stormwater Management Plan" developed by AES Consulting Engineers of Williamsburg, Virginia as shown on their plans of Section 2 of Settlers Mill. We previously combined Pond #3 and Pond #4 shown on Sheet 2 of the AES plans, dated 2/91. At the owners request, BMP 5 has been designed as a wet pond. The preliminary design criteria used specified a 8 point BMP with 2.5 times the volume required by the Chespeake Bay Preservation Act. The pond is also needed for sediment control during construction. These parameters increased the pond volume. The design volume required is as follows:

Required Volume of BMP 5

$$V_r = \frac{(R_m)(R_v)}{12} \times Ac.$$

$R_v = (0.05 + 0.009I) = [0.05 + 0.009(22.6)] = 0.253$
(Where I = 22.6% from CBLAM Sheet C-10, attached)

$R_m = 0.45"$

Ac. = 30.97 Acres

$$V_r = \frac{(0.45)(0.253)}{12} \times 30.97 = 0.294 \text{ ac.-ft.} = 12{,}799 \text{ cu. ft.}$$

A 8 Point BMP wet pond requires 2.5 x V_r normal storage.

V_r x 2.5 = 0.294 ac.-ft. x 2.5 = 0.735 ac.-ft. = 30,017 cu. ft.

V provided = 60,896 or a 4.76 Vol: BMP

needs to be TR-55 - SCS Method

The BMP pond was designed using the Modified Rational Method and run on Haestad Methods Inc.'s Quick TR-55 and Pond-2 software. Intensity, Duration, and Frequency Curve data from the VDOT Drainage Manual for Norfolk (Rev. 6/92). The use of this method is consistent with what has been used thus far for this development.

The BMP pond will be used as a sediment basin during construction. The total contributing acreage to BMP 5 is 30.97 acres. Thus, the required sediment trap volume is 2.58 Ac.-ft. For the 25-year storm frequency, the pond provides 1.44 ac.-ft. of wet storage volume and 1.94 ac.-ft. of dry storage volume for a total storage volume of 3.38 ac.-ft.

Annual Storm Phosphorous Export — *Table 1*

For Existing Urban Land Uses
(in pounds/acre/year)

LAND USES	IMPERVIOUS COVER (%)	ANNUAL RAINFALL (in) 40	41	42	43	44	45
	0	0.11	0.11	0.11	0.11	0.12	0.12
5.0 acre residential lots	5	0.20	0.21	0.21	0.22	0.22	0.23
2.0 acre residential lots	10	0.30	0.30	0.31	0.32	0.33	0.33
1.0 acre residential lots	15	0.39	0.40	0.41	0.42	0.43	0.44
	16	0.41	0.42	0.43	0.44	0.45	0.46
	17	0.43	0.44	0.45	0.46	0.47	0.48
	18	0.45	0.46	0.47	0.48	0.49	0.51
	19	0.47	0.48	0.49	0.50	0.52	0.53
0.50 acre residential lots	20 → 22.6	2.03	2.08	2.13	2.18	2.23	2.28
0.41 0.33 acre residential lots	25	2.42	2.48	2.54	2.61	2.67	2.72
0.25 acre residential lots	30	2.82	2.89	2.96	3.03	3.10	3.17
	35	3.22	3.30	3.38	3.46	3.54	3.62
Townhouses	40	3.61	3.70	3.79	3.88	3.97	4.06
	45	4.01	4.11	4.21	4.31	4.41	4.51
	50	4.41	4.52	4.63	4.74	4.85	4.96
Garden Apartments	55	4.80	4.92	5.04	5.16	5.28	5.40
	60	5.20	5.33	5.46	5.59	5.72	5.85
	65	5.60	5.74	5.88	6.02	6.16	6.30
Light Commercial/Industrial	70	5.99	6.14	6.29	6.44	6.59	6.74
	75	6.39	6.55	6.71	6.87	7.03	7.19
	80	6.79	6.96	7.13	7.29	7.46	7.63
Heavy Commercial/Industrial	85	7.98	8.17	8.37	8.57	8.77	8.97
	90	7.58	7.77	7.96	8.15	8.34	8.53
	95	7.98	8.17	8.37	8.57	8.77	8.97
Asphalt/Pavement	100	8.37	8.58	8.79	9.00	9.21	9.42

For Non-Urban Land Uses
(in pounds/acre/year)

LAND USE	SILT LOAM SOILS	LOAM SOILS	SANDY LOAM SOILS
Conventional Tillage Cropland	3.71	2.42	0.83
Conservation Tillage Cropland	2.32	1.52	0.52
Pasture Land	0.91	0.59	0.20
Forest Land	0.19	0.12	0.04

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
#1 EXIST BY AES	9	x	$\frac{6.36}{105} = 6.06$	=	0.55
#2 EXIST BY AES	8	x	$\frac{13.57}{105} = 1292$	=	1.03
* #3 & 4 EXIST BY L&M	8 (REVISED)	x	$\frac{64.53}{105} = 61.46$	=	4.92
#5 PROP	8	x	$\frac{30.97}{105} = 29.50$	=	2.36
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 8.23

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit		Points for Natural Open Space
26.08 %	x	0.1 (0.1 per 1%)	=	2.61

C. TOTAL WEIGHTED POINTS

8.23	+	2.61	=	10.84
Structural BMP Points		Natural Open Space Points		TOTAL

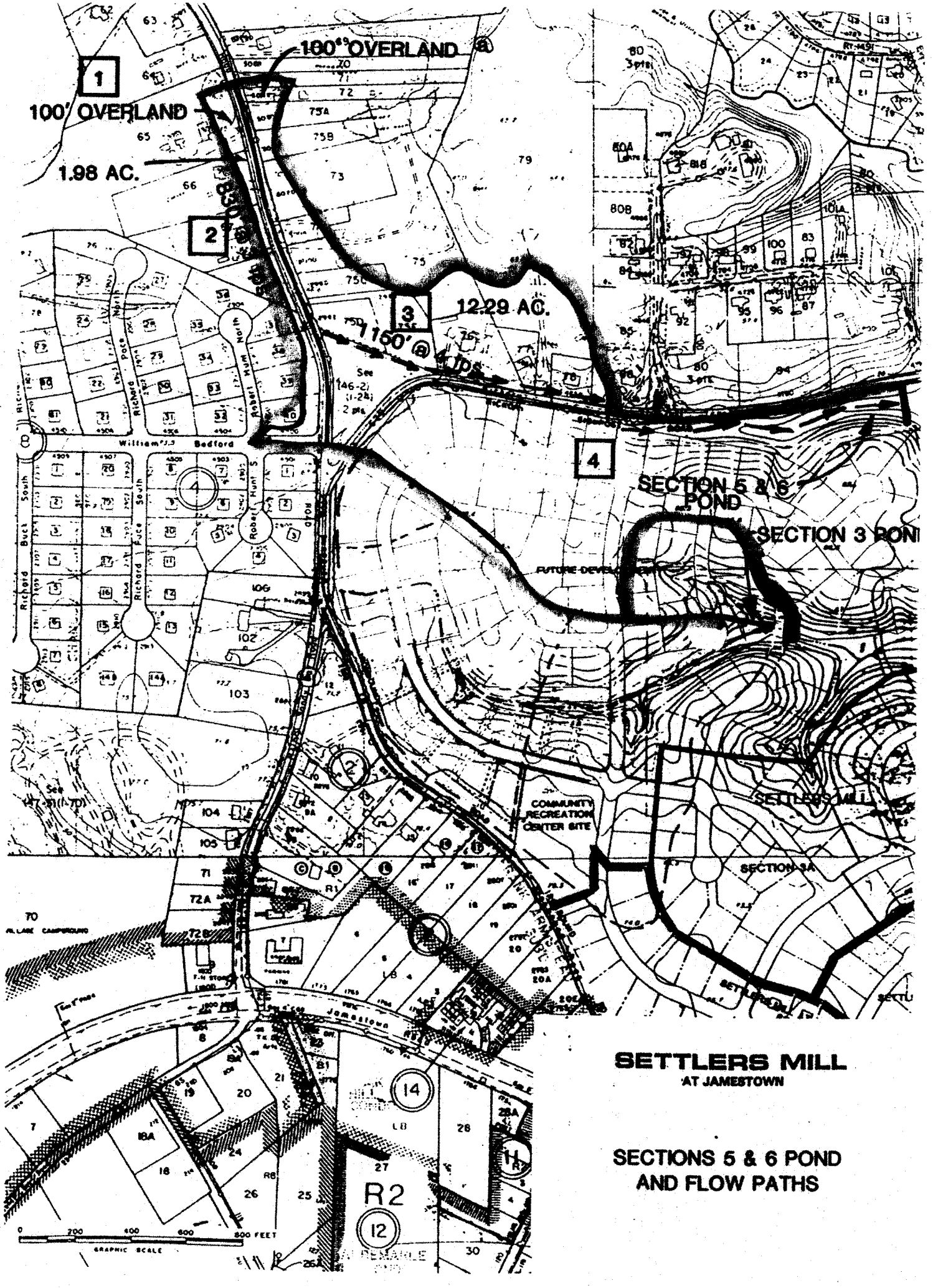
ONLY USED 18.59 AC TO MEET 10 POINT REQUIREMENT

TOTAL AREA OF DEVELOPMENT		105 AC ±
TOTAL AREA TO BMP #1		6.36 AC.
TOTAL AREA TO BMP #2		13.57 AC
TOTAL AREA TO BMP #3 & 4 (COMBINED)	ONSITE	48.00 AC
	OFF SITE	16.53 AC
TOTAL AREA TO BMP #5	ON SITE	16.70 AC
	OFF SITE	14.27 AC
TOTAL ACREAGE TREATED		115.43 AC

TOTAL NATURAL OPEN SPACE INCLUDING CONSERVATION EASEMENTS + 0.85 ACRES ON RECREATION CENTER SITE — 27.38 AC

* BMP'S 3 & 4 ARE COMBINED AS ONE BMP.

REVISED JAN 3, 1995



SETTLERS MILL
AT JAMESTOWN

SECTIONS 5 & 6 POND AND FLOW PATHS

SECTION 6 POND

TIMES OF CONCENTRATION

PRE-DEVELOPMENT

1.	100' OVERLAND (RESIDENTIAL) AT 1%	15.0 MIN.
2.	830' ROADSIDE SWALE AT 3 fps	5.0 MIN.
3.	1150' DITCH AT 4 fps	5.0 MIN.
	TIME TO HEAD OF RAVINE	25.0 MIN.
4.	900' RAVINE AT 2 fps	7.5 MIN.
	TIME TO DAM	32.5 MIN.

POST-DEVELOPMENT

NO CHANGE	32.5 MIN.

RAVINE BEHIND LOTS 36 - 39

TIMES OF CONCENTRATION

PRE-DEVELOPMENT

1.	200 L.F. WOODED AT 1% SLOPE	25.0 MIN.
2.	100 L.F. CHANNELIZED FLOW AT 2% & 2 fps	1.0 MIN.
3.	300 L.F. RAVINE WITH 30' FALL 7 fps	1.0 MIN.
		27.0 MIN.

POST-DEVELOPMENT

1.	200 L.F. LAWN AT 2% SLOPE	17.0 MIN.
2.	350 L.F. RAVINE WITH 20' FALL, 7 fps	1.0 MIN.
		18.0 MIN.

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

Subject TIME OF CONCENTRATION
Computed By _____ Checked By _____

Project No. 93047
Client SETTLERS MILL
Date 12-13-94 Sheet No. _____

OVERLAND FLOW

BASIN 21

OVERLAND 100 LF WOODED @ 1 % SLOPE — 17 min
100 LF GRASS @ 2 % SLOPE — 11 min

GUTTER FLOW - 100 LF @ 2 % SLOPE ⇒ 2fps — 1 min
29 min

BASIN 22
500 LF GUTTER FLOW @ S = 2% @ 2fps ⇒ — 4 min ⇒ use 5

BASIN 23
240 LF OVERLAND GRASS @ 2.5% ⇒ — 15 min
160 LF GUTTER @ 4% ⇒ 4fps ⇒ — 1 min
16 min

BASIN 24
300 LF OVERLAND, WOODS @ 1.3% ⇒ — 27 min
100 LF CHANNELIZED FLOW @ 2.5fps ⇒ — 1 min
28 min

BASIN 25 SIMILAR TO #23
USE 29 MIN

BASIN 27 a) 80 LF GRASS

b) 50 LF GRASS
20 LF GUTTER FLOW

BASIN 31 200 LF GRASS
LESS THAN 29 MIN (BASIN 25)

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VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject _____

Computed By _____ Checked By _____

Project No. _____

Client _____

Date _____ Sheet No. _____

BASIN 28

160 LF	GRASS	2%	15 min
230 LF	GUTTER	4%	1 min

BASIN 29 - SUMP

Langley and McDonald
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VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject _____

Computed By _____ Checked By _____

Project No. _____

Client _____

Date _____ Sheet No. _____

Basin 40	180 LF Grass @ 7%	13 min
Basin 42	150 LF Grass @ 5%	13 min
	40 LF Gutter @ 7%	1 min
		14 min
Basin 41	100 LF Dense Grass @ 3%	14 min
	110 LF Grass @ 10%	7 min
		21 min
Basin ~~44~~ 43	200 LF Dense Gr. @ 5%	17 min
	80 LF Grass @ 14%	9 min
		26 min
Basin 44	140 LF Grass @ 12%	11 min
	100 LF Gutter @ 3%	–
		11 min
Basin 45	230 LF Gutter @ 1%	7 min
Basin 46	230 LF Gutter @ 1%	7 min
Basin 47	80 LF Grass @ 1%	8 min
	120 LF Gutter @ 2%	4 min
		12 min
Basin 48	220 LF Gutter @ 2%	6 min
Basin 49	50 LF Grass @ 5%	8 min
	120 LF Gutter @ 1.5%	6 min
		14

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Executed: 10:19:09 01-04-1995

SETTLERS MILL SECTION 6, BMP 5
PREDEVELOPMENT CONDITIONS

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.250	16.70						
		30.97	32.50	0.312	0.312	2.625	30.97	25.27

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SETTLERS MILL SECTION 6, BMP 5
PREDEVELOPMENT CONDITIONS

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.250	16.70						
			32.50	0.312	0.312	3.600	30.97	34.79

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SETTLERS MILL SECTION 6, BMP 5
PREDEVELOPMENT CONDITIONS

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.250	16.70						
			32.50	0.312	0.343	4.200	30.97	44.65

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SETTLERS MILL SECTION 6, BMP 5
PREDEVELOPMENT CONDITIONS

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.250	16.70						
			32.50	0.312	0.390	5.063	30.97	61.16

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SETTLERS MILL SECTION 6, BMP 5

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.400	16.70						
			32.50	0.393	0.393	2.625	30.97	31.94

vs 25.4 pre

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SETTLERS MILL SECTION 6, BMP 5

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.400	16.70						
			32.50	0.393	0.393	3.600	30.97	43.81

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SETTLERS MILL SECTION 6, BMP 5

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.400	16.70						
			32.50	0.393	0.432	4.200	30.97	56.22

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SETTLERS MILL SECTION 6, BMP 5

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

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

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

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
OFFSITE	0.600	1.98						
OFFSITE	0.350	12.29						
ONSITE	0.400	16.70						
			32.50	0.393	0.491	5.063	30.97	77.01

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

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

SETTLERS MILL SECTION 6, BMP 5

```
*****************************************************************************
*  RETURN FREQUENCY:   2 yr      |  Allowable Outflow:     25.37 cfs      *
*  'C' Adjustment: 1.000         |  Required Storage:     12,797 cu.ft.  *
*---------------------------------------------------------------------------*
*  Peak Inflow:   31.64 cfs        Inflow .HYD stored: 34752N  .HYD        *
*****************************************************************************
```

```
|                Td =  33 minutes                      |  Return Freq:      2 yr
/-------- Approx. Duration for Max. Storage -------/  C adj.factor: 1.00
|                                                     |
|                                                     |
|                Tc=   32.50  minutes                 |
|                I =   2.625  in/hr                   |  Area (ac):     30.97
|              . Q =   31.94  cfs                     |  Weighted C:     0.39
|             .|.                                     |  Adjusted C:     0.39
F|            .   .                                   |
L|           .  |  .              Required Storage    |
O|          .      .        .--     12,797 cu.ft.    |  Td=       33 minutes
W|         .    |    .      |                        |  I =    2.600 in/hr
|        .      x x x x x x x|x x x x x x x x x x x   Q =    31.64 cfs
c|       .                   |
f|      .    x                                        x
s|     .                                                o   Q=   25.37 cfs
|    .   x                                o            |x  (Allow.Outflow)
|   .  x                     .     o                   |
|  .  x                o     .        NOT TO SCALE     |   x
| . x       o                 .       ============     |
| o                            .                       |       x
`-----------------------------------------------------|-------------
                                                     39.44 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

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

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

SETTLERS MILL SECTION 6, BMP 5

```
*****************************************************************************
*  RETURN FREQUENCY:  10 yr      |  Allowable Outflow:     34.79 cfs      *
*  'C' Adjustment: 1.000         |  Required Storage:     17,732 cu.ft.  *
*---------------------------------------------------------------------------*
*  Peak Inflow:    42.71 cfs        Inflow .HYD stored: 347510N .HYD      *
*****************************************************************************

 |                Td =  34 minutes                    |  Return Freq:     10 yr
 /-------- Approx. Duration for Max. Storage -------/  C adj.factor: 1.00
 |                                                    |
 |                                                    |
 |                Tc=   32.50  minutes                |
 |                I =   3.600  in/hr                  |  Area (ac):     30.97
 |              . Q =   43.81  cfs                    |  Weighted C:     0.39
 |            .|.                                     |  Adjusted C:     0.39
F|           .   .                                    |
L|          .  |  .              Required Storage    |
O|         .      .         .--     17,732 cu.ft.    |  Td=       34 minutes
W|        .    |    .       |                        |  I =    3.510 in/hr
 |       .     x x x x x x x|x x x x x x x x x x x   |  Q =    42.71 cfs
c|      .                   |
f|     .    x                                        |  x
s|    .                                               |    o   Q=   34.79 cfs
 |   .   x                                o          |x  (Allow.Dutflow)
 |  .  x                   .     o                   |
 | .  x                o     .        NOT TO SCALE   |   x
 | . x        o                .      ============   |
 | o                            .                    |       x
 `-------------------------------------------------------|-------------
                                                      40.03 minutes
```

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

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

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

SETTLERS MILL SECTION 6, BMP 5

```
*********************************************************************
*  RETURN FREQUENCY:  25 yr      |  Allowable Outflow:     44.65 cfs    *
*  'C' Adjustment: 1.100         |  Required Storage:     22,524 cu.ft. *
*-------------------------------------------------------------------*
*  Peak Inflow:    55.69 cfs        Inflow .HYD stored: 347525N .HYD   *
*********************************************************************
```

```
|                Td =  33 minutes                    |  Return Freq:     25 yr
/-------- Approx. Duration for Max. Storage -------/  C adj.factor: 1.10
|                                                    |
|                                                    |
|                 Tc=   32.50  minutes               |
|                 I =    4.200  in/hr                |  Area (ac):     30.97
|               . Q =   56.22  cfs                   |  Weighted C:     0.39
|              .|.                                   |  Adjusted C:     0.43
F|            .   .                                  |
L|           .  |  .              Required Storage   |
O|          .       .        .--     22,524 cu.ft.  |  Td=       33 minutes
W|         .    |    .       |                      |  I =    4.160 in/hr
|        .     x x x x x x x|x x x x x x x x x x x  Q =    55.69 cfs
c|       .                   |
f|      .    x                                      x
s|     .                                              o   Q=    44.65 cfs
|    .   x                                o           |x  (Allow.Outflow)
|   .  x                     .     o                 |
|  .  x                o     .       NOT TO SCALE     |   x
| . x        o                .      ============     |
| o                            .                      |       x
`-----------------------------------------------------|------------
                                                     39.44 minutes
```

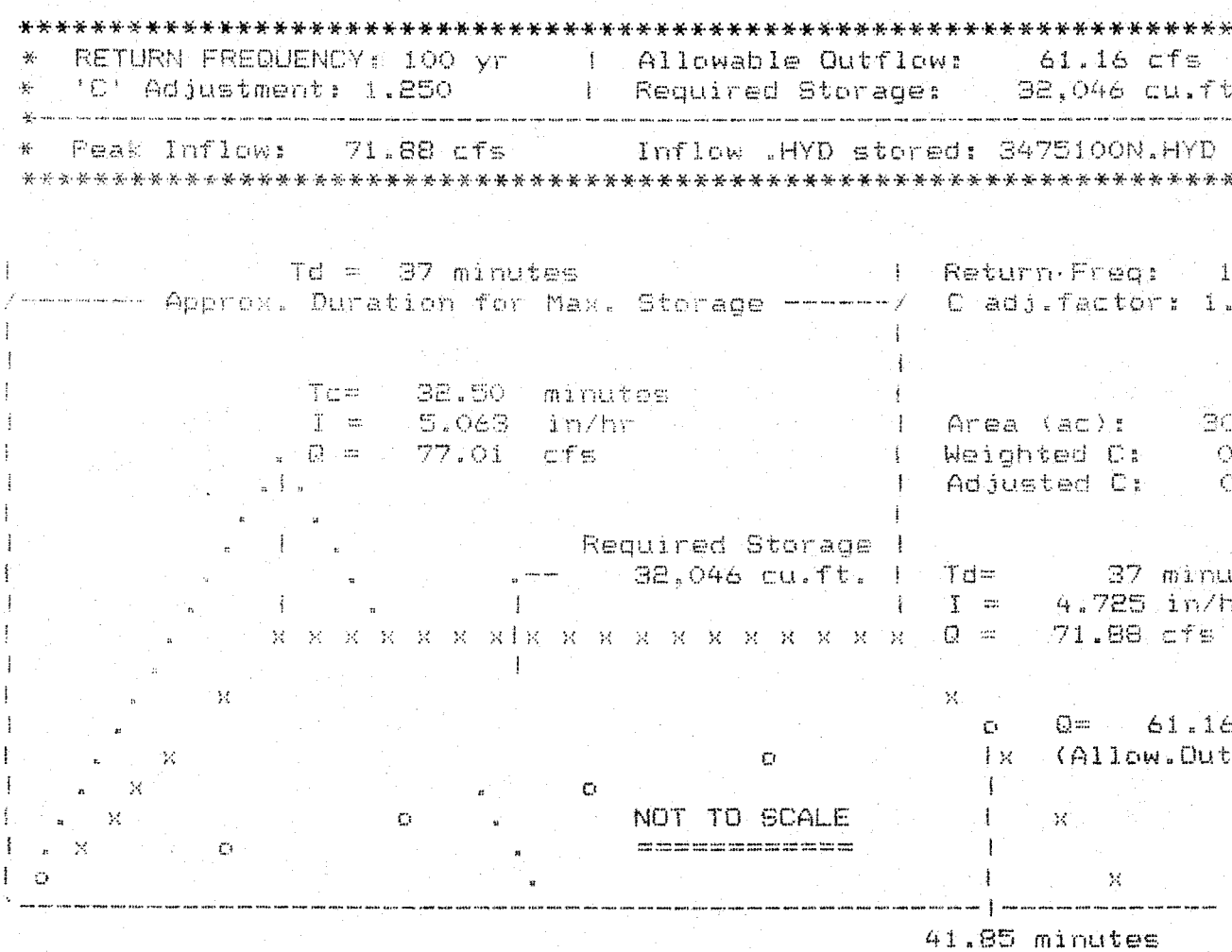
Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

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

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

SETTLERS MILL SECTION 6, BMP 5

```
*****************************************************************************
*  RETURN FREQUENCY: 100 yr      |  Allowable Outflow:     61.16 cfs      *
*  'C' Adjustment: 1.250         |  Required Storage:     32,046 cu.ft.  *
*---------------------------------------------------------------------------*
*  Peak Inflow:    71.88 cfs        Inflow .HYD stored: 3475100N.HYD       *
*****************************************************************************
```



Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

SETTLERS MILL SECTION 6, BMP 5

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

Weighted C = 0.393 Area= 30.970 acres Tc = 32.50 minutes

Adjusted C = 0.393 Td= 33.00 min. I= 2.60 in/hr Qp= 31.64 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 34752N .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

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

Time Minutes							
0.50	0.49	1.46	2.43	3.41	4.38	5.35	6.33
7.50	7.30	8.28	9.25	10.22	11.20	12.17	13.14
14.50	14.12	15.09	16.06	17.04	18.01	18.98	19.96
21.50	20.93	21.91	22.88	23.85	24.83	25.80	26.77
28.50	27.75	28.72	29.69	30.67	31.64	31.15	30.19
35.50	29.21	28.23	27.26	26.29	25.31	24.34	23.37
42.50	22.39	21.42	20.44	19.47	18.50	17.52	16.55
49.50	15.58	14.60	13.63	12.66	11.68	10.71	9.74
56.50	8.76	7.79	6.81	5.84	4.87	3.89	2.92
63.50	1.95	0.97	0.00				

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

SETTLERS MILL SECTION 6, BMP 5

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

Weighted C = 0.393 Area= 30.970 acres Tc = 32.50 minutes

Adjusted C = 0.393 Td= 34.00 min. I= 3.51 in/hr Qp= 42.71 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 347510N .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

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

Time Minutes							
0.50	0.66	1.97	3.29	4.60	5.91	7.23	8.54
7.50	9.86	11.17	12.49	13.80	15.11	16.43	17.74
14.50	19.06	20.37	21.69	23.00	24.31	25.63	26.94
21.50	28.26	29.57	30.89	32.20	33.51	34.83	36.14
28.50	37.46	38.77	40.09	41.40	42.71	42.71	42.06
35.50	40.74	39.43	38.11	36.80	35.49	34.17	32.86
42.50	31.54	30.23	28.91	27.60	26.29	24.97	23.66
49.50	22.34	21.03	19.71	18.40	17.09	15.77	14.46
56.50	13.14	11.83	10.51	9.20	7.89	6.57	5.26
63.50	3.94	2.63	1.31	0.00			

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

SETTLERS MILL SECTION 6, BMP 5

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

Weighted C = 0.393 Area= 30.970 acres Tc = 32.50 minutes

Adjusted C = 0.432 Td= 33.00 min. I= 4.16 in/hr Qp= 55.69 cfs

RETURN FREQUENCY: 25 year storm Adj.factor = 1.10
Output file: 347525N .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 25 Year Storm

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

Time Minutes							
0.50	0.86	2.57	4.28	6.00	7.71	9.42	11.14
7.50	12.85	14.56	16.28	17.99	19.70	21.42	23.13
14.50	24.85	26.56	28.27	29.99	31.70	33.41	35.13
21.50	36.84	38.55	40.27	41.98	43.69	45.41	47.12
28.50	48.83	50.55	52.26	53.97	55.69	54.83	53.12
35.50	51.40	49.69	47.98	46.26	44.55	42.84	41.12
42.50	39.41	37.70	35.98	34.27	32.56	30.84	29.13
49.50	27.42	25.70	23.99	22.28	20.56	18.85	17.13
56.50	15.42	13.71	11.99	10.28	8.57	6.85	5.14
63.50	3.43	1.71	0.00				

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:56:03 01-04-1995

SETTLERS MILL SECTION 6, BMP 5

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

Weighted C = 0.393 Area= 30.970 acres Tc = 32.50 minutes

Adjusted C = 0.491 Td= 37.00 min. I= 4.72 in/hr Qp= 71.88 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: 3475100N.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 1.00 Minutes
Time on left represents time for first 0 in each row.

Time Minutes							
0.50	1.11	3.32	5.53	7.74	9.95	12.16	14.38
7.50	16.59	18.80	21.01	23.22	25.43	27.64	29.86
14.50	32.07	34.28	36.49	38.70	40.91	43.13	45.34
21.50	47.55	49.76	51.97	54.18	56.40	58.61	60.82
28.50	63.03	65.24	67.45	69.66	71.88	71.88	71.88
35.50	71.88	71.88	70.77	68.56	66.35	64.14	61.92
42.50	59.71	57.50	55.29	53.08	50.87	48.65	46.44
49.50	44.23	42.02	39.81	37.60	35.39	33.17	30.96
56.50	28.75	26.54	24.33	22.12	19.90	17.69	15.48
63.50	13.27	11.06	8.85	6.63	4.42	2.21	0.00

Quick TR-55 Ver.5.46 S/N:1315430271
Executed: 10:19:09 01-04-1995

SETTLERS MILL SECTION 6, BMP 5
PREDEVELOPMENT CONDITIONS

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

Weighted C = 0.312 Area= 30.970 acres Tc = 32.50 minutes

Adjusted C = 0.390 Td= 36.00 min. I= 4.80 in/hr Qp= 57.99 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.25
Output file: P475100N.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

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

Time Minutes							
0.50	0.89	2.68	4.46	6.24	8.03	9.81	11.60
7.50	13.38	15.17	16.95	18.73	20.52	22.30	24.09
14.50	25.87	27.66	29.44	31.22	33.01	34.79	36.58
21.50	38.36	40.14	41.93	43.71	45.50	47.28	49.07
28.50	50.85	52.63	54.42	56.20	57.99	57.99	57.99
35.50	57.99	57.09	55.31	53.53	51.74	49.96	48.17
42.50	46.39	44.61	42.82	41.04	39.25	37.47	35.68
49.50	33.90	32.12	30.33	28.55	26.76	24.98	23.19
56.50	21.41	19.63	17.84	16.06	14.27	12.49	10.71
63.50	8.92	7.14	5.35	3.57	1.78	0.00	

POND-2 Version: 5.17
S/N: 1295130250

SETTLERS MILL SECTION 6, BMP 6

CALCULATED 02-10-1995 08:42:46
DISK FILE: b:93047-5 .VOL

Planimeter scale: 1 inch = 50 ft.

	Elevation (ft)	Planimeter (sq.in.)	Area (sq.ft)	A1+A2+sqr(A1*A2) (sq.ft)	* Volume (cubic-ft)	Volume Sum (cubic-ft)
	16.00	2.35	5,875	0	0	0
	18.00	3.55	8,875	21,971	14,647	14,647
	20.00	5.00	12,500	31,908	21,272	35,919
	20.10	6.55	16,375	43,182	1,437	37,358
NP →	21.50	*I*	20,175	54,723	25,537	68,896
	22.00	8.65	21,625	56,816	33,783	73,243
	24.00	9.00	24,625	67,586	46,212	119,561
	26.00	15.25	38,125	98,390	62,561	181,821
	28.00	17.50	43,875	122,165	20,361	202,182

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

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

NP AB 22.1

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

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

Elevation (ft)	Q (cfs)	Contributing Structures
18.00	0.0	
18.50	0.0	
19.00	0.0	
19.50	0.0	
20.00	0.0	
20.50	0.0	
21.00	0.0	
21.50	0.0	
22.00	0.1	1
22.50	0.2	1
23.00	14.0	1 +2
23.50	39.2	1 +2
24.00	44.0	1 +3
24.50	45.8	1 +3 +5
25.00	59.7	1 +3 +5
25.50	86.8	1 +3 +5
26.00	125.9	1 +3 +5
26.50	0.0	

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outlet Structure File: b:93047-5 .STR
Planimeter Input File: b:93047-5 .VOL
Rating Table Output File: b:93047-5 .PND

Min. Elev.(ft) = 18 Max. Elev.(ft) = 26.5 Incr.(ft) = .5

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

****
SYSTEM CONNECTIVITY
****

Structure	No.	Q Table		Q Table
ORIFICE-VC	1		->	1
STAND PIPE	2		->	2
CULVERT-CR	3	? 2	->	4
WEIR-XY	5		->	5

Outflow rating table summary was stored in file:
b:93047-5 .PND

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

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

ORIFICE-VC
Orifice - Vertical Circular

E1 elev.(ft)?	21.501
E2 elev.(ft)?	26.5
Orifice coeff.?	.6
Invert elev.(ft)?	21.501
Datum elev.(ft)?	21.625
Diameter (ft)?	.25

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

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

STAND PIPE
Stand Pipe with weir or orifice flow

E1 elev.(ft)?	22.501
E2 elev.(ft)?	26.5
Crest elev.(ft)?	22.501
Diameter (ft)?	4.00
Weir coefficient?	3.1
Orifice coefficient?	.6
Start transition elev.(ft) @ ?	
Transition height (ft)?	

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

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

CULVERT-CR
Circular Culvert (With Inlet Control)

E1 elev.(ft)?	22.501
E2 elev.(ft)?	26.5
Diam. (ft)?	2
Inv. el.(ft)?	16.5
Slope (ft/ft)?	.005
T1 ratio?	
T2 ratio?	
K Coeff.?	.0045
M Coeff.?	2
c Coeff.?	.0317
Y Coeff.?	.69
Form 1 or 2?	1
Slope factor?	-.5

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

>>>>>> Structure No. 5 <<<<<<
(Input Data)

WEIR-XY
Weir - Defined by X, Y Coordinates
E1 (ft) =24.5 E2 (ft) =26.5

X dist.(ft)	Y elev.(ft)
0	26.5
6	24.5
16	24.5
22	26.5

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outflow Rating Table for Structure #1
ORIFICE-VC Orifice - Vertical Circular

Elevation (ft)	Q (cfs)	Computation Messages
18.00	0.0	E < E1=21.501
18.50	0.0	E < E1=21.501
19.00	0.0	E < E1=21.501
19.50	0.0	E < E1=21.501
20.00	0.0	E < E1=21.501
20.50	0.0	E < E1=21.501
21.00	0.0	E < E1=21.501
21.50	0.0	E < E1=21.501
22.00	0.1	H =.375
22.50	0.2	H =.875
23.00	0.3	H =1.375
23.50	0.3	H =1.875
24.00	0.4	H =2.375
24.50	0.4	H =2.875
25.00	0.4	H =3.375
25.50	0.5	H =3.875
26.00	0.5	H =4.375
26.50	0.0	E = or > E2=26.5

C = .6 A = 4.908739E-02 sq.ft.
H (ft) = Table elev. - Datum elev. (21.625 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outflow Rating Table for Structure #2
STAND PIPE Stand Pipe with weir or orifice flow

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

Elevation (ft)	Q (cfs)	Computation Messages
18.00	0.0	E < Inv.El.= 22.501
18.50	0.0	E < E1=22.501
19.00	0.0	E < E1=22.501
19.50	0.0	E < E1=22.501
20.00	0.0	E < E1=22.501
20.50	0.0	E < E1=22.501
21.00	0.0	E < E1=22.501
21.50	0.0	E < E1=22.501
22.00	0.0	E < E1=22.501
22.50	0.0	E < E1=22.501
23.00	13.7	Weir: H =.499
23.50	38.9	Weir: H =.999
24.00	71.5	Weir: H =1.499
24.50	85.5	Orifice: H =1.999
25.00	95.7	Orifice: H =2.499
25.50	104.8	Orifice: H =2.999
26.00	113.2	Orifice: H =3.499
26.50	0.0	E = or > E2=26.5

Weir Cw = 3.1 Weir length = 12.56637 ft
Orifice Co = .6 Orifice area = 12.56637 sq.ft.
Q (cfs) = (Cw * L * H**1.5) or (Co * A * sqr(2*g*H))
No transition used, transition height = 0.0
Weir equation = Orifice equation @ elev.= 24.05422 ft

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outflow Rating Table for Structure #3
CULVERT-CR Circular Culvert (With Inlet Control)

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

Elevation (ft)	Q (cfs)	Computation Messages
18.00	0.0	E < E1=22.501
18.50	0.0	E < E1=22.501
19.00	0.0	E < E1=22.501
19.50	0.0	E < E1=22.501
20.00	0.0	E < E1=22.501
20.50	0.0	E < E1=22.501
21.00	0.0	E < E1=22.501
21.50	0.0	E < E1=22.501
22.00	0.0	E < E1=22.501
22.50	0.0	E < E1=22.501
23.00	40.0	Submerged: HW =6.5
23.50	41.9	Submerged: HW =7.0
24.00	43.7	Submerged: HW =7.5
24.50	45.4	Submerged: HW =8.0
25.00	47.1	Submerged: HW =8.5
25.50	48.7	Submerged: HW =9.0
26.00	50.3	Submerged: HW =9.5
26.50	0.0	E = or > E2=26.5

Used Unsubmerged Equ. Form (1) for elev. less than 18.68 ft
Used Submerged Equation for elevations greater than 18.89 ft
HW=Headwater (ft) dc=Critical depth (ft) Ac=Area (sq.ft) at dc

Transition flows interpolated from the following values:
E1=18.68 ft; Q1=15.55 cfs; Dc=1.42 ft; E2=18.89 ft; Q2=17.77 cfs

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outflow Rating Table for Structure #5
WEIR-XY Weir - Defined by X, Y Coordinates

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

Elevation (ft)	Q (cfs)	Computation Messages
18.00	0.0	E < Y min= 24.5
18.50	0.0	E < E1=24.5
19.00	0.0	E < E1=24.5
19.50	0.0	E < E1=24.5
20.00	0.0	E < E1=24.5
20.50	0.0	E < E1=24.5
21.00	0.0	E < E1=24.5
21.50	0.0	E < E1=24.5
22.00	0.0	E < E1=24.5
22.50	0.0	E < E1=24.5
23.00	0.0	E < E1=24.5
23.50	0.0	E < E1=24.5
24.00	0.0	E < E1=24.5
24.50	0.0	E = Y min= 24.5
25.00	12.1	W(ft)=13.0 Max. D(ft)=.5
25.50	37.6	W(ft)=16.0 Max. D(ft)=1.0
26.00	75.1	W(ft)=19.0 Max. D(ft)=1.5
26.50	0.0	E = or > E2=26.5

Outlet Structure File: 93047-5 .STR

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

****
SETTLERS MILL SECTION 6, BMP 5

****

Outflow Rating Table 4
Table 4 = 2 ? 3

Elevation (ft)	Q (cfs)	Contributing Structures
18.00	0.0	-
18.50	0.0	-
19.00	0.0	-
19.50	0.0	-
20.00	0.0	-
20.50	0.0	-
21.00	0.0	-
21.50	0.0	-
22.00	0.0	-
22.50	0.0	-
23.00	13.7	2
23.50	38.9	2
24.00	43.7	3
24.50	45.4	3
25.00	47.1	3
25.50	48.7	3
26.00	50.3	3
26.50	0.0	-

EXECUTED: 01-11-1995 09:47:37 Return Freq: 2 years

```
*************************************
*                                   *
*  SETTLERS MILL SECTION 6, BMP 5   *
*                                   *
*                                   *
*                                   *
*                                   *
*************************************
```

Inflow Hydrograph: b:34752N .HYD
Rating Table file: b:93047-5 .PND

-----INITIAL CONDITIONS-----
Elevation = 21.50 ft
Outflow = 0.00 cfs
Storage = 62,896 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
18.00	0.0	14,647	488.1	488.1
18.50	0.0	19,295	643.0	643.0
19.00	0.0	24,377	812.4	812.4
19.50	0.0	29,912	996.9	996.9
20.00	0.0	35,919	1197.1	1197.1
20.50	0.0	44,116	1470.2	1470.2
21.00	0.0	53,162	1771.7	1771.7
21.50	0.0	62,896	2096.1	2096.1
22.00	0.1	73,343	2444.3	2444.4
22.50	0.2	84,338	2810.7	2810.9
23.00	14.0	95,702	3189.4	3203.4
23.50	39.2	107,441	3580.6	3619.8
24.00	44.0	119,560	3984.6	4028.6
24.50	45.8	132,640	4420.5	4466.3
25.00	59.7	147,316	4909.5	4969.2
25.50	86.8	163,678	5454.9	5541.7
26.00	125.9	181,821	6059.5	6185.4

Time increment (t) = 1.0 min.

POND-2 Version: 5.17 S/N: 1295130250
EXECUTED: 01-11-1995 09:47:37 Return Freq: 2 years

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:34752N .HYD
Outflow Hydrograph: b:347520U .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.5	0.49	------	2096.1	2096.1	0.00	21.50
1.5	1.46	2.0	2098.1	2098.1	0.00	21.50
2.5	2.43	3.9	2101.9	2101.9	0.00	21.51
3.5	3.41	5.8	2107.8	2107.8	0.00	21.52
4.5	4.38	7.8	2115.6	2115.6	0.01	21.53
5.5	5.35	9.7	2125.3	2125.3	0.01	21.54
6.5	6.33	11.7	2136.9	2136.9	0.01	21.56
7.5	7.30	13.6	2150.5	2150.6	0.02	21.58
8.5	8.28	15.6	2166.1	2166.1	0.02	21.60
9.5	9.25	17.5	2183.5	2183.6	0.03	21.63
10.5	10.22	19.5	2203.0	2203.0	0.03	21.65
11.5	11.20	21.4	2224.3	2224.4	0.04	21.68
12.5	12.17	23.4	2247.6	2247.7	0.04	21.72
13.5	13.14	25.3	2272.8	2272.9	0.05	21.75
14.5	14.12	27.3	2299.9	2300.1	0.06	21.79
15.5	15.09	29.2	2329.0	2329.1	0.07	21.83
16.5	16.06	31.2	2360.0	2360.2	0.08	21.88
17.5	17.04	33.1	2392.9	2393.1	0.09	21.93
18.5	18.01	35.1	2427.8	2428.0	0.10	21.98
19.5	18.98	37.0	2464.6	2464.8	0.11	22.03
20.5	19.96	38.9	2503.3	2503.5	0.12	22.08
21.5	20.93	40.9	2543.9	2544.2	0.13	22.14
22.5	21.91	42.8	2586.5	2586.8	0.14	22.19
23.5	22.88	44.8	2631.0	2631.3	0.15	22.25
24.5	23.85	46.7	2677.4	2677.7	0.16	22.32
25.5	24.83	48.7	2725.7	2726.1	0.18	22.38
26.5	25.80	50.6	2775.9	2776.3	0.19	22.45
27.5	26.77	52.6	2826.9	2828.5	0.82	22.52
28.5	27.75	54.5	2876.0	2881.4	2.68	22.59
29.5	28.72	56.5	2923.6	2932.5	4.48	22.65
30.5	29.69	58.4	2969.5	2982.0	6.21	22.72
31.5	30.67	60.4	3014.1	3029.9	7.90	22.78
32.5	31.64	62.3	3057.3	3076.4	9.53	22.84
33.5	31.15	62.8	3098.0	3120.1	11.07	22.89
34.5	30.18	61.3	3134.4	3159.3	12.45	22.94
35.5	29.21	59.4	3166.5	3193.8	13.66	22.99
36.5	28.23	57.4	3193.4	3223.9	15.24	23.02
37.5	27.26	55.5	3215.4	3248.9	16.75	23.05
38.5	26.29	53.6	3233.0	3269.0	17.97	23.08
39.5	25.31	51.6	3246.8	3284.6	18.92	23.10
40.5	24.34	49.7	3257.2	3296.5	19.63	23.11
41.5	23.37	47.7	3264.6	3304.9	20.14	23.12
42.5	22.39	45.8	3269.4	3310.4	20.47	23.13
43.5	21.42	43.8	3272.0	3313.3	20.65	23.13
44.5	20.44	41.9	3272.5	3313.8	20.68	23.13

POND-2 Version: 5.17 S/N: 1295130250
EXECUTED: 01-11-1995 09:47:37 Return Freq: 2 years

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:34752N .HYD
Outflow Hydrograph: b:34752OU .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.5	19.47	39.9	3271.2	3312.4	20.59	23.13
46.5	18.50	38.0	3268.4	3309.2	20.40	23.13
47.5	17.52	36.0	3264.2	3304.4	20.11	23.12
48.5	16.55	34.1	3258.8	3298.2	19.74	23.11
49.5	15.58	32.1	3252.3	3290.9	19.29	23.11
50.5	14.60	30.2	3244.9	3282.5	18.78	23.09
51.5	13.63	28.2	3236.7	3273.1	18.22	23.08
52.5	12.66	26.3	3227.8	3263.0	17.60	23.07
53.5	11.68	24.3	3218.2	3252.1	16.95	23.06
54.5	10.71	22.4	3208.1	3240.6	16.25	23.04
55.5	9.74	20.5	3197.5	3228.6	15.52	23.03
56.5	8.76	18.5	3186.5	3216.0	14.76	23.02
57.5	7.79	16.6	3175.1	3203.0	13.99	23.00
58.5	6.81	14.6	3165.6	3189.7	13.22	22.98
59.5	5.83	12.7	3149.3	3175.3	12.41	22.96
60.5	4.85	10.7	3135.0	3160.0	12.47	22.94
61.5	3.88	8.8	3120.0	3143.8	11.90	22.92
62.5	2.91	6.8	3104.2	3126.8	11.31	22.90
			3087.7	3109.1	10.68	22.88
				[illegible]	[illegible]	[illegible]
				[illegible]	[illegible]	[illegible]

POND 2 Version: 4.17 5/6/1993
EXECUTED: 01-11-1993 [illegible]

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

Pond File: b:936047-5 .PND
Inflow Hydrograph: b:847528N .HYD
Outflow Hydrograph: b:847528OU .HYD

Starting Pond W.S. Elevation = 21.50 ft

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

Peak Inflow = 31.66 cfs
Peak Outflow = 20.98 cfs
Peak Elevation = 28.13 ft

20.9 cfs
vs 25.4 pre

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

Initial Storage = 62,896 cu-ft
Peak Storage From Storm = 35,918 cu-ft

Total Storage in Pond = 98,814 cu-ft

Warning: Inflow hydrograph truncated on left side.

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*************************************
*                                   *
*  SETTLERS MILL SECTION 6, BMP 5   *
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Inflow Hydrograph: b:347510N .HYD
Rating Table file: b:93047-5 .PND

----INITIAL CONDITIONS----
Elevation = 21.50 ft
Outflow = 0.00 cfs
Storage = 62,896 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
18.00	0.0	14,647	486.1	486.1
18.50	0.0	19,295	645.0	645.0
19.00	0.0	24,377	812.4	812.4
19.50	0.0	29,912	996.9	996.9
20.00	0.0	35,919	1197.1	1197.1
20.50	0.0	44,116	1470.2	1470.2
21.00	0.0	53,162	1771.7	1771.7
21.50	0.0	62,896	2096.1	2096.1
22.00	0.1	73,343	2444.3	2444.4
22.50	0.2	84,338	2810.7	2810.9
23.00	14.0	95,702	3189.4	3203.4
23.50	39.2	107,441	3580.6	3619.8
24.00	44.0	119,560	3984.6	4028.6
24.50	45.8	132,640	4420.5	4466.3
25.00	59.7	147,316	4909.5	4969.2
25.50	86.8	163,678	5454.9	5541.7
26.00	125.9	181,821	6059.5	6185.4

Time increment (t) = 1.0 min.

POND-2 Version: 5.17 S/N: 1295130250
EXECUTED: 01-11-1995 09:48:27 Return Freq: 10 years

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347510N .HYD
Outflow Hydrograph: b:347510OU.HYD

INFLOW HYDROGRAPH — ROUTING COMPUTATIONS

TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.5	0.66	-----	2096.1	2096.1	0.00	21.50
1.5	1.97	2.6	2098.7	2098.7	0.00	21.50
2.5	3.29	5.3	2104.0	2104.0	0.00	21.51
3.5	4.60	7.9	2111.9	2111.9	0.00	21.52
4.5	5.91	10.5	2122.4	2122.4	0.01	21.54
5.5	7.23	13.1	2135.5	2135.5	0.01	21.56
6.5	8.54	15.8	2151.2	2151.3	0.02	21.58
7.5	9.86	18.4	2169.6	2169.6	0.02	21.61
8.5	11.17	21.0	2190.6	2190.6	0.03	21.64
9.5	12.49	23.7	2214.2	2214.2	0.03	21.67
10.5	13.80	26.3	2240.4	2240.4	0.04	21.71
11.5	15.11	28.9	2269.2	2269.3	0.05	21.75
12.5	16.43	31.5	2300.6	2300.7	0.06	21.79
13.5	17.74	34.2	2334.6	2334.8	0.07	21.84
14.5	19.06	36.8	2371.3	2371.4	0.08	21.90
15.5	20.37	39.4	2410.5	2410.7	0.09	21.95
16.5	21.69	42.1	2452.4	2452.6	0.10	22.01
17.5	23.00	44.7	2496.8	2497.1	0.11	22.07
18.5	24.31	47.3	2543.9	2544.1	0.13	22.14
19.5	25.63	49.9	2593.5	2593.8	0.14	22.20
20.5	26.94	52.6	2645.8	2646.1	0.16	22.28
21.5	28.26	55.2	2700.7	2701.0	0.17	22.35
22.5	29.57	57.8	2758.1	2758.5	0.19	22.43
23.5	30.89	60.5	2817.6	2818.6	0.47	22.51
24.5	32.20	63.1	2875.4	2880.7	2.66	22.59
25.5	33.51	65.7	2931.6	2941.1	4.78	22.67
26.5	34.83	68.3	2986.2	2999.9	6.85	22.74
27.5	36.14	71.0	3039.5	3057.2	8.86	22.81
28.5	37.46	73.6	3091.4	3113.1	10.82	22.88
29.5	38.77	76.2	3142.2	3167.7	12.74	22.95
30.5	40.09	78.9	3190.9	3221.0	15.07	23.02
31.5	41.40	81.5	3236.0	3272.4	18.17	23.08
32.5	42.71	84.1	3278.0	3320.2	21.06	23.14
33.5	42.71	85.4	3316.1	3363.4	23.68	23.19
34.5	42.06	84.8	3349.0	3400.8	25.95	23.24
35.5	40.74	82.8	3376.1	3431.8	27.82	23.27
36.5	39.43	80.2	3397.7	3456.3	29.30	23.30
37.5	38.11	77.5	3414.3	3475.2	30.45	23.33
38.5	36.80	74.9	3426.6	3489.2	31.30	23.34
39.5	35.49	72.3	3435.2	3498.9	31.68	23.35
40.5	34.17	69.7	3440.3	3504.8	32.24	23.36
41.5	32.86	67.0	3442.6	3507.4	32.39	23.36
42.5	31.54	64.4	3442.2	3507.0	32.37	23.36
43.5	30.23	61.8	3439.6	3504.0	32.19	23.36
44.5	28.91	59.1	3435.0	3498.8	31.87	23.35

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347510N .HYD
Outflow Hydrograph: b:347510OU.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.5	27.60	56.5	3428.7	3491.5	31.44	23.35
46.5	26.29	53.9	3420.8	3482.6	30.89	23.34
47.5	24.97	51.3	3411.5	3472.0	30.26	23.32
48.5	23.66	48.6	3401.1	3460.2	29.54	23.31
49.5	22.34	46.0	3389.6	3447.1	28.75	23.29
50.5	21.03	43.4	3377.2	3433.0	27.89	23.28
51.5	19.71	40.7	3364.0	3417.9	26.98	23.26
52.5	18.40	38.1	3350.0	3402.1	26.02	23.24
53.5	17.09	35.5	3335.5	3385.5	25.02	23.22
54.5	15.77	32.9	3320.4	3368.3	23.98	23.20
55.5	14.46	30.2	3304.8	3350.6	22.91	23.18
56.5	13.14	27.6	3288.8	3332.4	21.80	23.15
57.5	11.83	25.0	3272.4	3313.8	20.68	23.13
58.5	10.51	22.3	3255.7	3294.7	19.53	23.11
59.5	9.20	19.7	3238.7	3275.4	18.36	23.09
60.5	7.89	17.1	3221.4	3255.8	17.17	23.06
61.5	6.57	14.5	3204.0	3235.9	15.97	23.04
62.5	5.26	11.8	3186.3	3215.8	14.75	23.01
63.5	3.94	9.2	3168.1	3195.5	13.72	22.99
64.5	2.63	6.6	3148.7	3174.6	12.99	22.96
65.5	1.31	3.9	3128.2	3152.6	12.21	22.94
66.5	0.00	1.3	3106.7	3129.5	11.40	22.91

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

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347510N .HYD
Outflow Hydrograph: b:3475100U.HYD

Starting Pond W.S. Elevation = 21.50 ft

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

Peak Inflow = 42.71 cfs
Peak Outflow = 32.39 cfs
Peak Elevation = 23.36 ft

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

Initial Storage = 62,896 cu-ft
Peak Storage From Storm = 41,375 cu-ft

Total Storage in Pond = 104,270 cu-ft

Warning: Inflow hydrograph truncated on left side.

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*                                   *
*  SETTLERS MILL SECTION 6, BMP 5   *
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Inflow Hydrograph: b:347525N .HYD
Rating Table file: b:93047-5 .PND

----INITIAL CONDITIONS----
Elevation = 21.50 ft
Outflow = 0.00 cfs
Storage = 62,896 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
18.00	0.0	14,647	488.1	488.1
18.50	0.0	19,295	643.0	643.0
19.00	0.0	24,377	812.4	812.4
19.50	0.0	29,918	996.9	996.9
20.00	0.0	35,919	1197.1	1197.1
20.50	0.0	44,116	1470.2	1470.2
21.00	0.0	53,162	1771.7	1771.7
21.50	0.0	62,896	2096.1	2096.1
22.00	0.1	73,343	2444.3	2444.4
22.50	0.2	84,338	2810.7	2810.9
23.00	14.0	95,702	3189.4	3203.4
23.50	39.2	107,441	3580.6	3619.8
24.00	44.0	119,560	3984.6	4028.6
24.50	45.8	132,640	4420.5	4466.3
25.00	59.7	147,316	4909.5	4969.2
25.50	86.8	163,678	5454.9	5541.7
26.00	125.9	181,821	6059.5	6185.4

Time increment (t) = 1.0 min.

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347525N .HYD
Outflow Hydrograph: b:3475250U.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.5	0.86	-----	2096.1	2096.1	0.00	21.50
1.5	2.57	3.4	2099.5	2099.5	0.00	21.50
2.5	4.28	6.9	2106.4	2106.4	0.00	21.51
3.5	6.00	10.3	2116.6	2116.7	0.01	21.53
4.5	7.71	13.7	2130.3	2130.4	0.01	21.55
5.5	9.42	17.1	2147.4	2147.5	0.01	21.57
6.5	11.14	20.6	2168.0	2168.0	0.02	21.60
7.5	12.85	24.0	2191.9	2191.9	0.03	21.64
8.5	14.56	27.4	2219.2	2219.3	0.04	21.68
9.5	16.28	30.8	2250.0	2250.1	0.04	21.72
10.5	17.99	34.3	2284.1	2284.3	0.05	21.77
11.5	19.70	37.7	2321.7	2321.8	0.06	21.82
12.5	21.42	41.1	2362.7	2362.8	0.08	21.88
13.5	23.13	44.6	2407.0	2407.2	0.09	21.95
14.5	24.85	48.0	2454.8	2455.0	0.10	22.01
15.5	26.56	51.4	2506.0	2506.2	0.12	22.08
16.5	28.27	54.8	2560.6	2560.8	0.13	22.16
17.5	29.99	58.3	2618.5	2618.8	0.15	22.24
18.5	31.70	61.7	2679.9	2680.2	0.16	22.32
19.5	33.41	65.1	2744.6	2745.0	0.18	22.41
20.5	35.13	68.5	2812.6	2813.2	0.28	22.50
21.5	36.84	72.0	2879.0	2884.6	2.79	22.59
22.5	38.55	75.4	2943.9	2954.4	5.24	22.68
23.5	40.27	78.8	3007.4	3022.7	7.65	22.77
24.5	41.98	82.3	3069.7	3089.7	10.00	22.86
25.5	43.69	85.7	3130.7	3155.3	12.31	22.94
26.5	45.41	89.1	3189.8	3219.8	14.99	23.02
27.5	47.12	92.5	3244.8	3282.4	18.78	23.09
28.5	48.83	95.9	3296.1	3340.8	22.31	23.16
29.5	50.55	99.4	3344.3	3395.5	25.63	23.23
30.5	52.26	102.8	3389.6	3447.1	28.75	23.29
31.5	53.97	106.2	3432.4	3495.8	31.69	23.35
32.5	55.69	109.7	3473.1	3542.1	34.49	23.41
33.5	54.83	110.5	3509.6	3583.6	37.01	23.46
34.5	53.12	108.0	3539.4	3617.6	39.06	23.50
35.5	51.40	104.5	3565.0	3644.0	39.48	23.53
36.5	49.69	101.1	3586.6	3666.1	39.74	23.56
37.5	47.98	97.7	3604.3	3684.3	39.96	23.58
38.5	46.26	94.2	3618.3	3698.6	40.12	23.60
39.5	44.55	90.8	3628.6	3709.1	40.25	23.61
40.5	42.84	87.4	3635.4	3716.0	40.33	23.62
41.5	41.12	84.0	3638.6	3719.3	40.37	23.62
42.5	39.41	80.5	3638.4	3719.1	40.37	23.62
43.5	37.70	77.1	3634.9	3715.5	40.32	23.62
44.5	35.98	73.7	3628.1	3708.5	40.24	23.61

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347525N .HYD
Outflow Hydrograph: b:3475250U.HYD

INFLOW HYDROGRAPH

TIME (min)	INFLOW (cfs)
45.5	34.27
46.5	32.56
47.5	30.84
48.5	29.13
49.5	27.42
50.5	25.70
51.5	23.99
52.5	22.28
53.5	20.56
54.5	18.85
55.5	17.13
56.5	15.42
57.5	13.71
58.5	11.99
59.5	10.28
60.5	8.57
61.5	6.85
62.5	5.14
63.5	3.43
64.5	1.71
65.5	0.00

ROUTING COMPUTATIONS

I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
70.3	3618.1	3698.3	40.12	23.60
66.8	3605.0	3684.9	39.96	23.58
63.4	3588.8	3668.4	39.77	23.56
60.0	3569.7	3648.8	39.54	23.54
56.6	3547.7	3626.3	39.28	23.51
53.1	3524.7	3600.8	38.05	23.48
49.7	3501.5	3574.4	36.45	23.45
46.3	3478.1	3547.8	34.84	23.41
42.8	3454.5	3521.0	33.22	23.38
39.4	3430.8	3493.9	31.58	23.35
36.0	3406.9	3466.8	29.94	23.32
32.6	3382.9	3439.4	28.28	23.28
29.3	3358.8	3412.0	26.62	23.25
25.7	3334.5	3384.5	24.96	23.22
22.3	3310.2	3356.8	23.28	23.18
18.9	3285.9	3329.1	21.61	23.15
15.4	3261.5	3301.3	19.92	23.12
12.0	3237.0	3273.4	18.24	23.08
8.6	3212.4	3245.5	16.55	23.05
5.1	3187.9	3217.6	14.66	23.02
1.7	3162.6	3189.6	13.51	22.98

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

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:347525N .HYD
Outflow Hydrograph: b:347525OU.HYD

Starting Pond W.S. Elevation = 21.50 ft

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

Peak Inflow	=	55.69 cfs
Peak Outflow	=	40.37 cfs
Peak Elevation	=	23.62 ft

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

Initial Storage	=	62,896 cu-ft
Peak Storage From Storm	=	47,495 cu-ft
Total Storage in Pond	=	110,391 cu-ft

Warning: Inflow hydrograph truncated on left side.

```
*************************************
*                                   *
*  SETTLERS MILL SECTION 6, BMP 5   *
*                                   *
*                                   *
*                                   *
*                                   *
*************************************
```

Inflow Hydrograph: b:3475100N.HYD
Rating Table file: b:93047-5 .PND

----INITIAL CONDITIONS----
Elevation = 21.50 ft
Outflow = 0.00 cfs
Storage = 62,896 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + O (cfs)
18.00	0.0	14,647	488.1	488.1
18.50	0.0	19,295	643.0	643.0
19.00	0.0	24,377	812.4	812.4
19.50	0.0	29,912	996.9	996.9
20.00	0.0	35,919	1197.1	1197.1
20.50	0.0	44,116	1470.2	1470.2
21.00	0.0	53,162	1771.7	1771.7
21.50	0.0	62,896	2096.1	2096.1
22.00	0.1	73,343	2444.3	2444.4
22.50	0.2	84,338	2810.7	2810.9
23.00	14.0	95,702	3189.4	3203.4
23.50	39.2	107,441	3580.6	3619.8
24.00	44.0	119,560	3984.6	4028.6
24.50	45.8	132,640	4420.5	4466.3
25.00	59.7	147,316	4909.5	4969.2
25.50	86.8	163,678	5454.9	5541.7
26.00	125.9	181,821	6059.5	6185.4

Time increment (t) = 1.0 min.

POND-2 Version: 5.17 S/N: 1295130250
EXECUTED: 01-11-1995 09:51:11 Return Freq: 100 years

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:3475100N.HYD
Outflow Hydrograph: b:3475100O.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.5	1.11	------	2096.1	2096.1	0.00	21.50
1.5	3.32	4.4	2100.5	2100.5	0.00	21.51
2.5	5.53	8.9	2109.4	2109.4	0.00	21.52
3.5	7.74	13.3	2122.6	2122.6	0.01	21.54
4.5	9.95	17.7	2140.3	2140.3	0.01	21.56
5.5	12.16	22.1	2162.4	2162.4	0.02	21.60
6.5	14.38	26.5	2188.9	2188.9	0.03	21.63
7.5	16.59	31.0	2219.8	2219.8	0.04	21.68
8.5	18.80	35.4	2255.1	2255.1	0.05	21.73
9.5	21.01	39.8	2294.8	2294.9	0.06	21.79
10.5	23.22	44.2	2338.8	2339.0	0.07	21.85
11.5	25.43	48.7	2387.3	2387.5	0.08	21.92
12.5	27.64	53.1	2440.2	2440.4	0.10	21.99
13.5	29.86	57.5	2497.5	2497.7	0.11	22.07
14.5	32.07	61.9	2559.1	2559.4	0.13	22.16
15.5	34.28	66.3	2625.2	2625.5	0.15	22.25
16.5	36.49	70.8	2695.6	2696.0	0.17	22.34
17.5	38.70	75.2	2770.4	2770.8	0.19	22.45
18.5	40.91	79.6	2846.9	2850.0	1.58	22.55
19.5	43.13	84.0	2922.1	2930.9	4.42	22.65
20.5	45.34	88.5	2996.1	3010.6	7.22	22.75
21.5	47.55	92.9	3069.1	3089.0	9.98	22.85
22.5	49.76	97.3	3141.0	3166.4	12.70	22.95
23.5	51.97	101.7	3209.9	3242.7	16.38	23.05
24.5	54.18	106.2	3274.5	3316.1	20.82	23.14
25.5	56.40	110.6	3335.1	3385.0	24.99	23.22
26.5	58.61	115.0	3392.2	3450.1	28.93	23.30
27.5	60.82	119.4	3446.3	3511.6	32.65	23.37
28.5	63.03	123.9	3497.8	3570.2	36.20	23.44
29.5	65.24	128.3	3547.5	3626.1	39.27	23.51
30.5	67.45	132.7	3600.4	3680.2	39.91	23.57
31.5	69.66	137.1	3656.3	3737.5	40.58	23.64
32.5	71.88	141.5	3715.3	3797.9	41.29	23.72
33.5	71.88	143.8	3775.0	3859.1	42.01	23.79
34.5	71.88	143.8	3833.4	3918.8	42.71	23.87
35.5	71.88	143.8	3890.3	3977.1	43.40	23.94
36.5	71.88	143.8	3946.1	4034.1	44.02	24.01
37.5	70.77	142.7	4000.2	4088.7	44.25	24.07
38.5	68.56	139.3	4050.6	4139.5	44.46	24.13
39.5	66.35	134.9	4096.3	4185.5	44.65	24.18
40.5	64.14	130.5	4137.1	4226.7	44.82	24.23
41.5	61.92	126.1	4173.2	4263.2	44.96	24.27
42.5	59.71	121.6	4204.7	4294.9	45.10	24.30
43.5	57.50	117.2	4231.5	4321.9	45.21	24.34
44.5	55.29	112.8	4253.7	4344.3	45.30	24.36

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:3475100N.HYD
Outflow Hydrograph: b:34751000.HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (min)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
45.5	53.08	108.4	4271.3	4362.0	45.37	24.38
46.5	50.87	104.0	4284.4	4375.2	45.43	24.40
47.5	48.65	99.5	4293.0	4383.9	45.46	24.41
48.5	46.44	95.1	4297.1	4388.1	45.48	24.41
49.5	44.23	90.7	4296.8	4387.8	45.48	24.41
50.5	42.02	86.3	4292.2	4383.1	45.46	24.41
51.5	39.81	81.8	4283.2	4374.0	45.42	24.39
52.5	37.60	77.4	4269.8	4360.6	45.37	24.38
53.5	35.39	73.0	4252.3	4342.8	45.29	24.36
54.5	33.17	68.6	4230.4	4320.8	45.20	24.33
55.5	30.96	64.1	4204.3	4294.5	45.09	24.30
56.5	28.75	59.7	4174.1	4264.1	44.97	24.27
57.5	26.54	55.3	4139.8	4229.4	44.83	24.23
58.5	24.33	50.9	4101.3	4190.6	44.67	24.19
59.5	22.12	46.5	4059.8	4147.7	44.49	24.14
60.5	19.90	42.0	4012.2	4100.8	44.30	24.08
61.5	17.69	37.6	3961.6	4049.8	44.09	24.02
62.5	15.48	33.2	3907.6	3994.8	43.60	23.96
63.5	13.27	28.8	3850.5	3936.3	42.92	23.89
64.5	11.06	24.3	3790.4	3874.8	42.19	23.81
65.5	8.85	19.9	3727.5	3810.3	41.44	23.73
66.5	6.63	15.5	3661.7	3742.9	40.65	23.65
67.5	4.42	11.1	3593.1	3672.7	39.82	23.56
68.5	2.21	6.6	3523.7	3599.7	37.98	23.48
69.5	0.00	2.2	3458.9	3525.9	33.52	23.39

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

Pond File: b:93047-5 .PND
Inflow Hydrograph: b:3475100N.HYD
Outflow Hydrograph: b:3475100O.HYD

Starting Pond W.S. Elevation = 21.50 ft

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

Peak Inflow = 71.88 cfs
Peak Outflow = 45.48 cfs
Peak Elevation = 24.41 ft

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

Initial Storage = 62,896 cu-ft
Peak Storage From Storm = 67,408 cu-ft

Total Storage in Pond = 130,304 cu-ft

Warning: Inflow hydrograph truncated on left side.

Langley and McDonald
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VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject CHANNEL ADEQUACY
SECTION 5 & 6
Computed By DSL Checked By

Project No. 93047
Client SETTLER'S MILL
Date 1-4-95 Sheet No. 1/

STREAM ALONG HICKORY SIGNPOST RD

- AT HEAD OF RAVINE (LOT 36)

PREDEVELOPMENT AREA = 3.73 AC
T_c = 27 MIN i_2 = 2.9 in/hr
C = 0.25

Q_{pre_2} = (0.25)(2.9)(3.73) = 2.70 cfs

POST DEVELOPMENT AREA = 1.98 AC (UPHILL LOTS PIPED DOWNSTREAM)
T_c = 18 MIN i_2 = 3.6 in/hr
C = 0.30 (no road)

Q_{post_2} = (0.30)(3.6)(1.98) = 2.14 cfs < Q_{pre} OK
No improvements req'd.

- UPSTREAM OF OUTFALL #32 & DOWNSTREAM OF PIPE UNDER HICKORY SIGNPOST

PREDEVELOPMENT AREA = 24.9 AC
T_c = 32.5 MIN i_2 = 2.5 in/hr
C (COMPOSITE) = 0.32
Q_{pre_2} = (0.32)(2.5)(24.9) = 19.9 cfs

POST DEVELOPMENT AREA = 18.13 AC
T_c = 32.5 MIN i_2 = 2.5 in/hr
C = 0.4
Q_{post_2} = (0.4)(2.5 in/hr)(18.13) = 18.13 cfs < Q_{pre} OK
No improvements req'd

- DOWNSTREAM OF OUTFALL #32

PREDEVELOPMENT AREA = 25.0 AC
T_c = 32.5 i_2 = 2.5 in/hr
C = 0.32
Q_{pre_2} = (0.32)(2.5)(25.0) = 20 cfs

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VIRGINIA BEACH - WILLIAMSBURG, VIRGINIA

Subject CHANNEL ADEQUACY
SECTION 5
Computed By DSC Checked By

Project No. 93047
Client SETTLER'S MILL
Date 1/4/94 Sheet No. 2/

POST DEVELOPMENT AREA = 25.0 AC

$T_C = 32.5$ $i_2 = 2.5$ in/hr

$C = 0.40$

$Q_{POST\ 2} = (0.40)(2.5)(25) = 25$ cfs $> Q_{pre}$

check channel velocit

DOWNSTREAM FLOWS

100' DOWNSTREAM

$T_C = 32.5$ $i_2 = 2.5$ in/hr $C_{pre} = 0.32$, $C_{post} = 0.40$

Area = 25.69 AC

$Q_{pre} = (0.32)(2.5)(25.69) = 20.55$

$Q_{POST} = (0.40)(2.5)(25.69) = 25.69$

200' DOWNSTREAM A = 26.38 AC $T_C = 33.5$ $i = 2.5$

$Q_{pre} = (0.32)(2.5)(26.38) = 21.11$

$Q_{post} = (0.40)(2.5)(26.38) = 26.38$

69,632 bytes free

C:>>

100' DOWN STREAM OUTFALL #2 NATURAL CHANNELS
PREDEVELOPMENT

VARIABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 20.55
S (FT/FT) ? .028

Enter up to 20 cross-section points.
Enter (Return) only for distance to end.

CROSS-SECTION POINTS

DIST	ELEV	COEFF	DIST	ELEV	COEFF
0	30	.035			
10	28	.035			
23	26	.035			
39	25.2	.045			
61	26	.035			
69	28	.035			
76	30	.035			

RESULTS
==========
Y= 25.77 FT
A= 7.68 SF
P= 27.04 FT
V= 2.68 FPS
F= 0.88 SUB-CRITICAL FLOW

(Shift) (Prt Sc) print (Return) repeat (Space Bar) back to menu

POST DEVELOPMENT NATURAL CHANNELS

VARIABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 25.69
S (FT/FT) ? .028

Enter up to 20 cross-section points.
Enter (Return) only for distance to end.

CROSS-SECTION POINTS

DIST	ELEV	COEFF	DIST	ELEV	COEFF
.0	30	.035			
10	28	.035			
23	26	.035			
39	25.2	.045			
61	26	.035			
69	28	.035			
76	30	.035			

RESULTS
==========
Y= 25.82 FT
A= 9.08 SF
P= 29.40 FT
V= 2.83 FPS
F= 0.90 SUB-CRITICAL FLOW

(Shift) (Prt Sc) print (Return) repeat (Space Bar) back to menu

200' DOWNSTREAM
OUTFALL #32
PREDEVELOPMENT

NATURAL CHANNELS

VARIABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 21.1
S (FT/FT) ? .011

Enter up to 20 cross-section points.
Enter (Return) only for distance to end.

CROSS-SECTION POINTS

DIST	ELEV	COEFF	DIST	ELEV	COEFF
0	26	.035			
13	24	.035			
23.5	23.3	.045			
34	24	.035			
42	26	.035			

RESULTS
==========
Y= 24.09 FT
A= 9.27 SF
P= 22.00 FT
V= 2.28 FPS
F= 0.62 SUB-CRITICAL FLOW

(Shift) (Prt Sc) print (Return) repeat (Space Bar) back to menu

POST DEVELOPMENT

NATURAL CHANNELS

VARIABLES LIST:
Y - FLOW ELEVATION Q - FLOWRATE S - CHANNEL SLOPE

VARIABLE TO BE SOLVED (Y,Q OR S) ? Y

Q (CFS) ? 26.38
S (FT/FT) ? .011

Enter up to 20 cross-section points.
Enter (Return) only for distance to end.

CROSS-SECTION POINTS

DIST	ELEV	COEFF	DIST	ELEV	COEFF
0	26	.035			
13	24	.035			
23.5	23.33	.045			
34	24	.035			
42	26	.035			

RESULTS
==========
Y= 24.17 FT
A= 10.67 SF
P= 22.82 FT
V= 2.47 FPS
F= 0.64 SUB-CRITICAL FLOW

(Shift) (Prt Sc) print (Return) repeat (Space Bar) back to menu

PROJECT 93047-2
HEC12 Version: V2.91

Run Date: 11-28-1994

==========

INLET NUMBER 1 DI-3B LENGTH 6.0 STATION 31+40

DRAINAGE AREA = 0.810 ACRES C VALUE = .400 CA = 0.324
SUM CA= 0.324 INT= 3.50 CFS= 1.134 CO= 0.000 GUTTER FLOW= 1.134

GUTTER SLOPE = 0.0080 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
5.95	2.0	0.34	0.0833	4.0	0.82	3.5	0.146	0.140

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.0 EFFICIENCY= 1.00
CFS INTERCEPTED= 1.13 CFS CARRYOVER= 0.00

==========

INLET NUMBER 2 DI-3B LENGTH 6.0 STATION 30+82

DRAINAGE AREA = 0.810 ACRES C VALUE = .400 CA = 0.324
SUM CA= 0.324 INT= 3.50 CFS= 1.134 CO= 0.000 GUTTER FLOW= 1.134

GUTTER SLOPE = 0.0109 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
5.41	2.0	0.37	0.0833	4.0	0.86	3.5	0.146	0.146

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.4 EFFICIENCY= 0.99
CFS INTERCEPTED= 1.13 CFS CARRYOVER= 0.01

==========

INLET NUMBER 45 DI-4B LENGTH 6.0 STATION 28+00

DRAINAGE AREA = 0.310 ACRES C VALUE = .750 CA = 0.233
SUM CA= 0.233 INT= 3.50 CFS= 0.814 CO= 0.010 GUTTER FLOW= 0.824

GUTTER SLOPE = 0.0175 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.58	2.0	0.56	0.0833	4.0	0.97	3.5	0.146	0.162

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.1 EFFICIENCY= 1.00
CFS INTERCEPTED= 0.82 CFS CARRYOVER= 0.00

==========

INLET NUMBER 5 LENGTH 6.0 STATION

DRAINAGE AREA = 0.980 ACRES C VALUE = .400 CA = 0.392
SUM CA= 0.392 INT= 3.50 CFS= 1.372 CO= 0.000 GUTTER FLOW= 1.372

GUTTER SLOPE = 0.0110 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
6.16	2.0	0.32	0.0800	3.8	0.77	3.4	0.143	0.130

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 7.5 EFFICIENCY= 0.95
CFS INTERCEPTED= 1.30 CFS CARRYOVER= 0.07

==========

INLET NUMBER 6 LENGTH 4.0 STATION

DRAINAGE AREA = 0.240 ACRES C VALUE = .500 CA = 0.120
SUM CA= 0.120 INT= 3.50 CFS= 0.420 CO= 0.070 GUTTER FLOW= 0.490

GUTTER SLOPE = 0.0110 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.85	2.0	0.70	0.0800	3.8	0.99	3.4	0.143	0.162

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 4.3 EFFICIENCY= 0.99
CFS INTERCEPTED= 0.49 CFS CARRYOVER= 0.00

PROJECT SETTLERS MILL
HEC12 Version: V2.91 Run Date: 02-10-1995

==========

INLET NUMBER 7 LENGTH 6.0 STATION

DRAINAGE AREA = 0.400 ACRES C VALUE = .800 CA = 0.320
SUM CA= 0.320 INT= 3.50 CFS= 1.120 CO= 0.000 GUTTER FLOW= 1.120

GUTTER SLOPE = 0.0110 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
5.47	2.0	0.37	0.0800	3.8	0.82	3.4	0.143	0.137

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 6.6 EFFICIENCY= 0.98
CFS INTERCEPTED= 1.10 CFS CARRYOVER= 0.02

```
INLET NUMBER 8A                LENGTH   6.0        STATION

DRAINAGE AREA =  0.260 ACRES        C VALUE = .500        CA =  0.130
DRAINAGE AREA =  0.320 ACRES        C VALUE = .500        CA =  0.160

FOR THE FIRST SIDE
SUM CA=   0.130 INT=  3.50  CFS=   0.465  CO=  0.000 GUTTER FLOW=   0.455
FOR THE OTHER SIDE
SUM CA=   0.160 INT=  3.50  CFS=   0.560  CO=  0.000 GUTTER FLOW=   0.560
AT THE INLET

SUM CA=   0.290 INT=  3.50  CFS=   1.015  CO=  0.000 GUTTER FLOW=   1.015

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.56 (cfs) IS  7.25 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  9.60                H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.13          SPREAD (ft)  =  6.16


==========================================================================
INLET NUMBER 8                 LENGTH   2.5        STATION

DRAINAGE AREA =  0.250 ACRES        C VALUE = .600        CA =  0.150
DRAINAGE AREA =  0.040 ACRES        C VALUE = .600        CA =  0.024

FOR THE FIRST SIDE
SUM CA=   0.150 INT=  3.50  CFS=   0.525  CO=  0.020 GUTTER FLOW=   0.545
FOR THE OTHER SIDE
SUM CA=   0.024 INT=  3.50  CFS=   0.084  CO=  0.000 GUTTER FLOW=   0.084
AT THE INLET

SUM CA=   0.174 INT=  3.50  CFS=   0.629  CO=  0.000 GUTTER FLOW=   0.629

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.55 (cfs) IS  7.15 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  6.10                H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.13          SPREAD (ft)  =  6.06
==========================================================================
INLET NUMBER 9                 LENGTH   2.5        STATION

DRAINAGE AREA =  0.030 ACRES        C VALUE = .900        CA =  0.027
SUM CA=   0.027 INT=  3.50  CFS=   0.094  CO=  0.000 GUTTER FLOW=   0.094

GUTTER SLOPE = 0.0350 FT/FT        PAVEMENT CROSS SLOPE =  0.0208 FT/FT

SPREAD      W      W/T      SW        SW/SX      Eo      a      S'W     SE
 0.97      2.0    2.06   0.0800      3.8       1.00    3.4    0.143  0.163

       XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
    REQUIRED LENGTH (ft) =  3.0                EFFICIENCY= 0.96
    CFS INTERCEPTED=  0.09                CFS CARRYOVER=  0.00
```

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==========================================================================
INLET NUMBER 10                LENGTH   6.0        STATION

DRAINAGE AREA =  0.120 ACRES        C VALUE = .800        CA =  0.096
DRAINAGE AREA =  0.110 ACRES        C VALUE = .800        CA =  0.088

FOR THE FIRST SIDE
SUM CA=   0.096 INT=  3.50  CFS=   0.336  CO=  0.000 GUTTER FLOW=   0.336
FOR THE OTHER SIDE
SUM CA=   0.088 INT=  3.50  CFS=   0.308  CO=  0.000 GUTTER FLOW=   0.308
AT THE INLET

SUM CA=   0.184 INT=  3.50  CFS=   0.644  CO=  0.000 GUTTER FLOW=   0.644

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.34 (cfs) IS  5.45 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  9.60                  H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.09            SPREAD (ft)  =  4.55

==========================================================================
INLET NUMBER 11                LENGTH   6.0        STATION

DRAINAGE AREA =  0.160 ACRES        C VALUE = .800        CA =  0.128
DRAINAGE AREA =  0.160 ACRES        C VALUE = .800        CA =  0.128

FOR THE FIRST SIDE
SUM CA=   0.128 INT=  3.50  CFS=   0.448  CO=  0.000 GUTTER FLOW=   0.448
FOR THE OTHER SIDE
SUM CA=   0.128 INT=  3.50  CFS=   0.448  CO=  0.000 GUTTER FLOW=   0.448
AT THE INLET

SUM CA=   0.256 INT=  3.50  CFS=   0.896  CO=  0.000 GUTTER FLOW=   0.896

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.45 (cfs) IS  6.44 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  9.60                  H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.12            SPREAD (ft)  =  5.67
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PROJECT 93047
HEC12 Version: V2.91 Run Date: 12-13-1994

INLET NUMBER 22 ✓ LENGTH 8.0 STATION 38+78L

DRAINAGE AREA = 0.440 ACRES C VALUE = .850 CA = 0.374
SUM CA= 0.374 INT= 3.50 CFS= 1.309 CD= 0.000 GUTTER FLOW= 1.309

GUTTER SLOPE = 0.0300 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
9.34	2.8	0.46	0.0800	3.8	0.91	2.4	0.143	0.150

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 9.1 EFFICIENCY= 0.98
CFS INTERCEPTED= 1.28 CFS CARRYOVER= 0.03

INLET NUMBER 21 ✓ LENGTH 8.0 STATION 37+08

DRAINAGE AREA = 0.890 ACRES C VALUE = .400 CA = 0.356
SUM CA= 0.356 INT= 3.50 CFS= 1.246 CD= 0.000 GUTTER FLOW= 1.246

GUTTER SLOPE = 0.0300 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
9.18	2.8	0.46	0.0800	3.8	0.93	2.4	0.143	0.151

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.8 EFFICIENCY= 0.98
CFS INTERCEPTED= 1.23 CFS CARRYOVER= 0.02

INLET NUMBER 23 ✓ LENGTH 8.0 STATION 38+75

DRAINAGE AREA = 0.830 ACRES C VALUE = .400 CA = 0.332
SUM CA= 0.332 INT= 3.50 CFS= 1.162 CD= 0.020 GUTTER FLOW= 1.182

GUTTER SLOPE = 0.0300 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
9.02	2.8	0.50	0.0800	3.8	0.93	2.4	0.143	0.153

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.4 EFFICIENCY= 0.99
CFS INTERCEPTED= 1.17 CFS CARRYOVER= 0.01

INLET NUMBER 25 ✓ LENGTH 8.0 STATION 40+40R

DRAINAGE AREA = 1.230 ACRES C VALUE = .400 CA = 0.492
SUM CA= 0.492 INT= 3.50 CFS= 1.722 CO= 0.520 GUTTER FLOW= 2.242

GUTTER SLOPE = 0.0120 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
7.80	2.0	0.26	0.0800	3.8	0.65	3.4	0.143	0.114

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 10.8 EFFICIENCY= 0.90
CFS INTERCEPTED= 2.10 CFS CARRYOVER= 0.14

INLET NUMBER 27 ✓ LENGTH 6.0 STATION 41+00R

DRAINAGE AREA = 0.080 ACRES C VALUE = .600 CA = 0.048
DRAINAGE AREA = 0.070 ACRES C VALUE = .800 CA = 0.056
SUM CA= 0.104 INT= 3.50 CFS= 0.364 CO= 0.140 GUTTER FLOW= 0.504

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.31 (cfs) IS 5.16 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 9.60 H (ft) = 0.458
DEPTH OF WATER (ft) = 0.08 SPREAD (ft) = 3.86

PROJECT 93047
HEC1R Version: V8.91 Run Date: 12-14-1994

INLET NUMBER 22 LENGTH 5.0 STATION 18+80

DRAINAGE AREA = 0.590 ACRES C VALUE = .450 CA = 0.265
SUM CA= 0.265 INT= 3.50 CFS= 0.929 CO= 0.000 GUTTER FLOW= 0.929

GUTTER SLOPE = 0.0600 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Ep	a	S'W	SE
8.22	2.0	0.90	0.0800	3.8	1.00	3.4	0.143	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 9.2 EFFICIENCY= 0.97
CFS INTERCEPTED= 0.90 CFS CARRYOVER= 0.02

Note - need more intercept for #29

INLET NUMBER 28 ✓ LENGTH 8.0 STATION 19+~~25~~ 35

DRAINAGE AREA = 0.640 ACRES C VALUE = .450 CA = 0.288
SUM CA= 0.288 INT= 3.50 CFS= 1.008 CO= 0.000 GUTTER FLOW= 1.008

GUTTER SLOPE = 0.0626 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Ep	a	S'W	SE
8.40	8.0	0.93	0.0800	3.8	1.00	3.4	0.143	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 9.7 EFFICIENCY= 0.96
CFS INTERCEPTED= 0.97 CFS CARRYOVER= 0.04

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==========================================================================
INLET NUMBER 29 ✓            LENGTH    2.3          STATION  20+07L

DRAINAGE AREA =  0.100 ACRES        C VALUE = .600        CA =  0.060
DRAINAGE AREA =  0.060 ACRES        C VALUE = .600        CA =  0.036

FOR THE FIRST SIDE
SUM CA=   0.060 INT=  3.50  CFS=   0.210  CO=  0.040 GUTTER FLOW=   0.250
FOR THE OTHER SIDE
SUM CA=   0.036 INT=  3.50  CFS=   0.126  CO=  0.000 GUTTER FLOW=   0.126
AT THE INLET

SUM CA=   0.096 INT=  3.50  CFS=   0.336  CO=  0.040 GUTTER FLOW=   0.376

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.25 (cfs) IS  4.48 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  5.93                    H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.09            SPREAD (ft)  =  4.38

==========================================================================
INLET NUMBER 24              LENGTH    2.5          STATION

DRAINAGE AREA =  1.390 ACRES        C VALUE = .300        CA =  0.417
SUM CA=   0.417 INT=  3.50  CFS=   1.460  CO=  0.000 GUTTER FLOW=   1.460

     XXXXXXXXXX GRATE INLET IN A TRAPEZOIDAL CHANNEL XXXXXXXXXX
DEPTH OF WATER (ft) = 0.12       VELOCITY (ft/sec) =  3.09     EFFICIENCY = 0.6
    CFS INTERCEPTED=  0.95                  CFS CARRYOVER=  0.51
```

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 7.0 EFFICIENCY= 0.78
CFS INTERCEPTED= 0.68 CFS CARRYOVER= 0.19

==========

INLET NUMBER 30 ✓ LENGTH 4.0 STATION 20+07R

DRAINAGE AREA = 0.310 ACRES C VALUE = .600 CA = 0.186
DRAINAGE AREA = 0.060 ACRES C VALUE = .800 CA = 0.048
SUM CA= 0.234 INT= 3.50 CFS= 0.819 CO= 0.190 GUTTER FLOW= 1.009

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.65 (cfs) IS 7.83 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 7.60 H (ft) = 0.458
DEPTH OF WATER (ft) = 0.15 SPREAD (ft) = 7.17

INLET NUMBER 32 ✓ LENGTH 4.0 STATION 42+55L

DRAINAGE AREA = 0.170 ACRES C VALUE = .800 CA = 0.136
SUM CA= 0.136 INT= 3.50 CFS= 0.476 CO= 0.000 GUTTER FLOW= 0.476

GUTTER SLOPE = 0.0250 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.89	2.0	1.06	0.0800	3.8	1.00	3.4	0.143	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 5.4 EFFICIENCY= 0.92
CFS INTERCEPTED= 0.44 CFS CARRYOVER= 0.04

INLET NUMBER 26 ✓ LENGTH 2.3 STATION 41+00L

DRAINAGE AREA = 0.130 ACRES C VALUE = .800 CA = 0.104
DRAINAGE AREA = 0.090 ACRES C VALUE = .800 CA = 0.072
SUM CA= 0.176 INT= 3.50 CFS= 0.616 CO= 0.070 GUTTER FLOW= 0.686

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.39 (cfs) IS 5.99 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 5.93 H (ft) = 0.458
DEPTH OF WATER (ft) = 0.14 SPREAD (ft) = 6.54

INLET NUMBER 31 ✓ LENGTH 4.0 STATION 42+55

DRAINAGE AREA = 0.620 ACRES C VALUE = .400 CA = 0.248
SUM CA= 0.248 INT= 3.50 CFS= 0.868 CO= 0.000 GUTTER FLOW= 0.868

GUTTER SLOPE = 0.0250 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
3.34	2.0	0.60	0.0800	3.8	0.97	3.4	0.143	0.159

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 7.0 EFFICIENCY= 0.78
CFS INTERCEPTED= 0.68 CFS CARRYOVER= 0.19

INLET NUMBER 42 LENGTH 6.0 STATION 12+54 l

DRAINAGE AREA = 0.350 ACRES C VALUE = .600 CA = 0.210
SUM CA= 0.210 INT= 3.50 CFS= 0.735 CO= 0.000 GUTTER FLOW= 0.735

GUTTER SLOPE = 0.0700 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
1.84	2.0	1.09	0.0800	3.8	1.00	3.4	0.143	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 8.8 EFFICIENCY= 0.88
CFS INTERCEPTED= 0.64 CFS CARRYOVER= 0.09

INLET NUMBER 41 LENGTH 6.0 STATION 12+54 r

DRAINAGE AREA = 0.550 ACRES C VALUE = .500 CA = 0.275
SUM CA= 0.275 INT= 3.50 CFS= 0.963 CO= 0.000 GUTTER FLOW= 0.963

GUTTER SLOPE = 0.0700 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
2.10	2.0	0.95	0.0800	3.8	1.00	3.4	0.143	0.163

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 9.8 EFFICIENCY= 0.82
CFS INTERCEPTED= 0.79 CFS CARRYOVER= 0.17

INLET NUMBER 43 LENGTH 6.0 STATION 13+81 R

DRAINAGE AREA = 1.180 ACRES C VALUE = .350 CA = 0.413
SUM CA= 0.413 INT= 3.50 CFS= 1.445 CO= 0.170 GUTTER FLOW= 1.615

GUTTER SLOPE = 0.0250 FT/FT PAVEMENT CROSS SLOPE = 0.0208 FT/FT

SPREAD	W	W/T	SW	SW/SX	Eo	a	S'W	SE
5.32	2.0	0.38	0.0800	3.8	0.83	3.4	0.143	0.139

XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
REQUIRED LENGTH (ft) = 9.8 EFFICIENCY= 0.82
CFS INTERCEPTED= 1.32 CFS CARRYOVER= 0.30

```
==========================================================================
INLET NUMBER 44                LENGTH   6.0          STATION  13+77 L

DRAINAGE AREA =  0.200 ACRES        C VALUE = .700        CA =  0.140
DRAINAGE AREA =  0.100 ACRES        C VALUE = .700        CA =  0.070

FOR THE FIRST SIDE
SUM CA=   0.140 INT=  3.50  CFS=   0.490  CO=  0.090 GUTTER FLOW=   0.580
FOR THE OTHER SIDE
SUM CA=   0.070 INT=  3.50  CFS=   0.245  CO=  0.300 GUTTER FLOW=   0.545
AT THE INLET

SUM CA=   0.210 INT=  3.50  CFS=   0.735  CO=  0.390 GUTTER FLOW=   1.125

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


SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.58 (cfs) IS  7.38 (ft.)

      XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
   P EFFEC. LENGTH (ft) =  9.60                    H (ft) = 0.458
   DEPTH OF WATER (ft) =   0.14            SPREAD (ft)  =  6.60


==========================================================================
INLET NUMBER 45                LENGTH   2.3          STATION  10+50 R

DRAINAGE AREA =  0.050 ACRES        C VALUE = .800        CA =  0.040
DRAINAGE AREA =  0.140 ACRES        C VALUE = .800        CA =  0.112

FOR THE FIRST SIDE
SUM CA=   0.040 INT=  3.50  CFS=   0.140  CO=  0.000 GUTTER FLOW=   0.140
FOR THE OTHER SIDE
SUM CA=   0.112 INT=  3.50  CFS=   0.392  CO=  0.000 GUTTER FLOW=   0.392
AT THE INLET

SUM CA=   0.152 INT=  3.50  CFS=   0.532  CO=  0.000 GUTTER FLOW=   0.532

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


SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.39 (cfs) IS  5.97 (ft.)

      XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
   P EFFEC. LENGTH (ft) =  5.93                    H (ft) = 0.458
   DEPTH OF WATER (ft) =   0.11            SPREAD (ft)  =  5.52
```

INLET NUMBER 46 LENGTH 2.3 STATION 10+50 L

DRAINAGE AREA = 0.020 ACRES C VALUE = .800 CA = 0.016
DRAINAGE AREA = 0.140 ACRES C VALUE = .800 CA = 0.112

FOR THE FIRST SIDE
SUM CA= 0.016 INT= 3.50 CFS= 0.056 CO= 0.000 GUTTER FLOW= 0.056
FOR THE OTHER SIDE
SUM CA= 0.112 INT= 3.50 CFS= 0.392 CO= 0.000 GUTTER FLOW= 0.392
AT THE INLET

SUM CA= 0.128 INT= 3.50 CFS= 0.448 CO= 0.000 GUTTER FLOW= 0.448

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

SPREAD AT A SLOPE OF .001 (ft./ft.) AND 0.39 (cfs) IS 5.97 (ft.)

XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
P EFFEC. LENGTH (ft) = 5.93 H (ft) = 0.458
DEPTH OF WATER (ft) = 0.10 SPREAD (ft) = 4.93

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==========================================================================
INLET NUMBER 47                LENGTH   6.0        STATION  47+87 R

DRAINAGE AREA =  0.450 ACRES        C VALUE = .400        CA =  0.180
DRAINAGE AREA =  0.330 ACRES        C VALUE = .500        CA =  0.165

FOR THE FIRST SIDE
SUM CA=   0.180 INT=  3.50  CFS=   0.630  CO=  0.000 GUTTER FLOW=   0.630
FOR THE OTHER SIDE
SUM CA=   0.165 INT=  3.50  CFS=   0.578  CO=  0.000 GUTTER FLOW=   0.578
AT THE INLET

SUM CA=   0.345 INT=  3.50  CFS=   1.207  CO=  0.000 GUTTER FLOW=   1.207

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


SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.63 (cfs) IS  7.70 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  9.60                  H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.14          SPREAD (ft)  =  6.92


==========================================================================
INLET NUMBER 48                LENGTH   2.3        STATION  47+73 L

DRAINAGE AREA =  0.120 ACRES        C VALUE = .800        CA =  0.096
DRAINAGE AREA =  0.070 ACRES        C VALUE = .800        CA =  0.056

FOR THE FIRST SIDE
SUM CA=   0.096 INT=  3.50  CFS=   0.336  CO=  0.000 GUTTER FLOW=   0.336
FOR THE OTHER SIDE
SUM CA=   0.056 INT=  3.50  CFS=   0.196  CO=  0.000 GUTTER FLOW=   0.196
AT THE INLET

SUM CA=   0.152 INT=  3.50  CFS=   0.532  CO=  0.000 GUTTER FLOW=   0.532

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


SPREAD AT A SLOPE OF .001 (ft./ft.) AND   0.34 (cfs) IS  5.45 (ft.)

       XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
    P EFFEC. LENGTH (ft) =  5.93                  H (ft) = 0.458
    DEPTH OF WATER (ft) =   0.11          SPREAD (ft)  =  5.52
```

```
==========================================================================
INLET NUMBER 49              LENGTH   2.3        STATION  53+80

DRAINAGE AREA =  0.450 ACRES        C VALUE = .700        CA =  0.315
DRAINAGE AREA =  0.100 ACRES        C VALUE = .800        CA =  0.080

FOR THE FIRST SIDE
SUM CA=   0.315 INT=  3.50  CFS=   1.102  CO=  0.000 GUTTER FLOW=   1.102
FOR THE OTHER SIDE
SUM CA=   0.080 INT=  3.50  CFS=   0.280  CO=  0.070 GUTTER FLOW=   0.350
AT THE INLET

SUM CA=   0.395 INT=  3.50  CFS=   1.383  CO=  0.070 GUTTER FLOW=   1.453

GUTTER SLOPE = 0.0075 FT/FT        PAVEMENT CROSS SLOPE =  0.0300 FT/FT

SPREAD AT A SLOPE OF .007 (ft./ft.) AND   1.10 (cfs) IS  4.98 (ft.)

      XXXXXXXXXX CURB INLET IN A SUMP XXXXXXXXXX
   P EFFEC. LENGTH (ft) =  5.93                  H (ft) = 0.458
   DEPTH OF WATER (ft) =   0.22            SPREAD (ft)  =  7.48

==========================================================================
INLET NUMBER 50              LENGTH   2.3        STATION  52+26R

DRAINAGE AREA =  0.140 ACRES        C VALUE = .800        CA =  0.112
SUM CA=   0.112 INT=  3.50  CFS=   0.392  CO=  0.000 GUTTER FLOW=   0.392

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

SPREAD      W      W/T      SW        SW/SX      Eo      a      S'W     SE
 2.32      2.0    0.86   0.0800      3.8       1.00    3.4    0.143  0.163

      XXXXXXXXXX CURB INLET ON A CONTINUOUS GRADE XXXXXXXXXX
   REQUIRED LENGTH (ft) =  3.8                EFFICIENCY= 0.83
   CFS INTERCEPTED=  0.32              CFS CARRYOVER=  0.07
```

STORM - SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SETTLERS MILL Section 5&6
COUNTY _____ DISTRICT _____
DESCRIPTION _____
SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1	2	0.81	0.4	—	0.32	12	5.8	1.86	59.45	58.83	68'	0.0091	15"	6.16	4.40	15.5	
2	4	0.81	0.4	0.32	0.64	12.25	5.8	3.71	58.73	54.10	111'	0.0417	15"	13.19	9.23	12.0	
3	4	18.01	0.4	—	7.20	25.0	4.2	30.24	58.5	52.35	175'	0.0351	36"	124.96	10.56	12.0	HW/D=.31 60 MH 1
4	Sect 4-45	2.16	0.3	[illegible]	8.49	25.2	4.2	35.66	52.25	51.63	173'	0.0036	36"	40.02	6.40	27.0	
Sect 4-46	Sect 4-45	0.38	0.75	—	0.29	12	5.8	1.68	54.29	53.38	38'	0.0239	15"	9.99	6.05	6.3	
Sect 4-45	Sect 4-44	0.31	0.75	0.23	9.01	25.65	4.2	37.84	51.53	51.03	140'	0.0036	36"	40.02	6.44	21.7	ok per Sect 4
Sect 4-44	Sect 4-43	0.26	0.5	0.13	9.14	26.0	4.1	37.47	50.93	49.90	80'	0.0129	[illegible]	75.75	10.73	7.46	
Sect 4-43A	[illegible]	1.25	0.50	—	[illegible]	15.0	5.6	3.78	63.00	51.65	144'	0.0788	15"	18.13	11.21	12.85	HW/D=.85
Sect 4-43	Sect 4-42	0.80	0.45	0.36	10.29	26.20	4.1	42.19	49.80	49.56	38'	0.0062	36"	52.52	8.26	5.13	
Sect 4-42	Sect 4-38	0.16	0.35	0.14	10.43	26.30	4.1	42.76	49.46	49.15	50'	0.0062	36"	52.52	8.28	4.18	
Sect 4-40	Sect 4-39	1.18	0.4	—	0.47	12	5.8	2.72	56.0	51.90	242'	0.0169	15"	8.40	6.11	39.6	
Sect 4-39	Sect 4-38	1.12	0.4	0.45	0.92	12.66	5.7	5.24	51.80	51.02	38'	0.0205	15"	9.26	7.77	4.89	
Sect 4-38	Sect 4-37	0.24	0.85	0.20	11.55	26.30	4.1	47.36	43.70	39.20	90'	0.050	36"	149.14	13.73	4.81	
Sect 4-37	Sect 4-37A	—	—	—	—	—	—	47.36	37.86	37.6	50'	0.0052	36"	43.10	7.76	6.70	

L-72

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: SETTLERS MILL SEC 5

Comment: STR 1 TO STR 2

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0091 ft/ft
Manning's n.....	0.013
Discharge.....	1.86 cfs

Computed Results:

Depth.....	0.47 ft
Velocity.....	4.40 fps
Flow Area.....	0.42 sf
Critical Depth....	0.54 ft
Percent Full.....	37.68 %
Full Capacity.....	6.16 cfs
QMAX @.94D.....	6.63 cfs
Froude Number.....	1.31 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: SETTLERS MILL SEC 5

Comment: STR 2 TO STR 4

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0417 ft/ft
Manning's n.....	0.013
Discharge.....	3.71 cfs

Computed Results:

Depth.....	0.45 ft
Velocity.....	9.23 fps
Flow Area.....	0.40 sf
Critical Depth....	0.78 ft
Percent Full.....	36.28 %
Full Capacity.....	13.19 cfs
QMAX @.94D.....	14.19 cfs
Froude Number.....	2.81 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: SETTLERS MILL SEC 5

Comment: STR 3 TO STR 4

Solve For Actual Depth

Given Input Data:

Diameter.....	3.00 ft
Slope.....	0.0351 ft/ft
Manning's n.....	0.013
Discharge.....	30.24 cfs

Computed Results:

Depth.....	1.00 ft
Velocity.....	14.56 fps
Flow Area.....	2.08 sf
Critical Depth....	1.78 ft
Percent Full.....	33.50 %
Full Capacity.....	124.96 cfs
QMAX @.94D.....	134.42 cfs
Froude Number.....	3.00 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

STORM - SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SETTLER MILL SECTION 5
COUNTY JAMES CITY DISTRICT SUFFOLK
DESCRIPTION _____ SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
5	7	0.98	0.4	—	0.39	12	5.8	2.26	59.60	58.20	120'	0.012	15"	7.2	5.7		CO=0.07 1.1% L=16
6	7	0.24	0.5	—	0.12	10	6.0	0.72	58.25	58.15	28	0.004	15"	3.9	3.1		CO=0.D 1.1% L=28
7	8	0.40	0.8	0.32	0.83	14	5.3	4.40	58.03	56.37	144	0.012	15	7.2	5.7		COO.02 K1% L=
8A	8	0.58	0.5	—	0.29	12	5.8	1.68	56.74	56.37	28	0.013	15"	7.4	6.0		DI3C LP L=6
8	9	0.29	0.6	0.17	1.29	15	5.1	6.58	56.27	55.61	60	0.011	15	6.8	5.5		DI3A LP
9	10	0.03	0.9	0.03	1.32	15	5.1	6.73	55.51	53.00	174	0.0144	15	7.8	6.2		DI3A 3.5%
10	11	0.23	0.8	0.18	1.50	15	5.1	7.65	52.90	52.00	32	0.0281	15	10.9	8.7		DI3A L=6 LP
11	12 mH	0.32	0.8	0.26	1.76	15	5.1	8.98	49.00	46.75	24	0.0938	15	19.8	15.7		DI3C LP L=6
12 mH	13 mH							8.98	40.50	38.50	24	0.0833	15	14.6	15.0		
13 mH	14 FES							8.98	32.25	30.00	32	0.0703	18	27.8	14.0		

MC007_COMMON_AREA_SETTLERS_MILL - 099

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: pipe from 11 to 12

Comment:

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0938 ft/ft
Manning's n.....	0.013
Discharge.....	8.98 cfs

Computed Results:

Depth.....	0.59 ft
Velocity.....	15.73 fps
Flow Area.....	0.57 sf
Critical Depth....	1.15 ft
Percent Full.....	47.26 %
Full Capacity.....	19.78 cfs
QMAX @.94D.....	21.28 cfs
Froude Number.....	4.10 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: pipe from 12 to 13

Comment:

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.0833 ft/ft
Manning's n.....	0.013
Discharge.....	8.98 cfs

Computed Results:

Depth.....	0.61 ft
Velocity.....	15.05 fps
Flow Area.....	0.60 sf
Critical Depth....	1.15 ft
Percent Full.....	48.92 %
Full Capacity.....	18.64 cfs
QMAX @.94D.....	20.06 cfs
Froude Number.....	3.84 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name: pipe from 13 to 14

Comment:

Solve For Actual Depth

Given Input Data:

Diameter.....	1.50 ft
Slope.....	0.0703 ft/ft
Manning's n.....	0.013
Discharge.....	8.98 cfs

Computed Results:

Depth.....	0.59 ft
Velocity.....	14.05 fps
Flow Area.....	0.64 sf
Critical Depth....	1.16 ft
Percent Full.....	39.05 %
Full Capacity.....	27.85 cfs
QMAX @.94D.....	29.96 cfs
Froude Number.....	3.75 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Langley and McDonald, P.C.

Engineers
Surveyors
Planners
Landscape Architects
Environmental Consultants

GEORGE E. LANGLEY
Consultant
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FAX TRANSMITTAL COVER SHEET

PLEASE DELIVER THE FOLLOWING MATERIAL AS SOON AS POSSIBLE

TO: DARRYL COOK TELECOPIER NUMBER: 253-6850

FROM: DOUG WHITE NUMBER OF PAGES: 3 (INCLUDING COVER SHEET)

IF NOT RECEIVED PROPERLY PLEASE NOTIFY US IMMEDIATELY BY CALLING : (804) 253-2975

JOB NUMBER: 93047 DATE SENT: 2-2-96

IF YOU WISH TO RESPOND BY FAX, OUR FAX NUMBER IS: (804) 229-0049

SPECIAL MESSAGE:

Storm Sewer Calculations - revised.

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

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

REVISED: 12-15-95

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SETTLER'S MILL SECTION 5
COUNTY JAMES CITY DISTRICT SUFFOLK
DESCRIPTION _____

SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
21	23	0.89	0.40	0.356	0.356	29	3.7	1.32	56.55	49.83	168	0.040	15	13.0	10	17	
22	23	0.44	0.85	0.374	0.374	4	7.5	2.81	49.95	49.83	30	0.004	15	4.2	3.3	7	
23	25	0.83	0.40	0.332	1.062	29	3.7	3.93	49.73	44.69	168	0.030	15	11.2	9	19	
24	25	1.39	0.30	0.417	0.417	28	3.8	1.58	47.89	44.69	64	0.050	15	14.5	11.8		
25	27	1.23	0.40	0.492	1.971	29	3.7	7.29	44.44	44.10	56	0.006	18	8.3	4.6	15	
26	27	0.22	0.80	0.176	0.176	3	7.0	1.23	44.34	44.22	24	0.004	15	4.2	3.3		
27	29	0.15	0.70	0.105	2.147	29	3.8	8.16	44.00	42.64	80	0.017	18	13.9	7.7	10	
28	29	0.64	0.45	0.288	0.288	16	5.1	1.47	47.51	43.91	72	0.050	15	14.5	11.5		
29	30	0.16	0.60	0.096	2.636	30	3.7	9.75	42.54	42.22	32	0.015	18	13.2	7.2		
30	31	0.37	0.60	0.222	2.858	30	3.7	10.57	41.96	41.29	45	0.015	18	13.2	7.2		
31	32	0.62	0.40	0.248	3.106	30	3.7	11.49	41.19	40.71	32	0.015	18	13.2	7.2		
32	Outfall	0.17	0.80	0.136	3.242	30	3.7	12.00	35.12	30.00	125	0.040	18	21.2	11.8		

FEB-02-1996 10:00 FROM L & M TO 2536850 P.02

L & D 229.

STORM SEWER DESIGN COMPUTATIONS

ROUTE _____ PROJ. SETTLERS MILL - SECTION 5
COUNTY JAMES CITY DISTRICT SUFFOLK
DESCRIPTION SUPPLEMENTAL SHEET TO FEB. 13, 1995 RE

SHEET 1 OF

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMA
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(1
33	34	1.84	0.4	0.74	0.74	15	5.3	3.92	48.5	44.1	95	0.046	15	14.0	11.2	15	
34	FES (35)	0.67	0.4	0.27	1.01	15	5.3	5.35	43.9	37.6	115	0.055	15	15.2	12.1	15	

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SETTLERS MILL SECTION 5 L&M # 93047
COUNTY JAMES CITY DISTRICT SUFFOLK
DESCRIPTION _____

SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
21 37+08	23 37+08	~~0.89~~ 0.49	0.40	0.356	0.356	29	3.7	1.32	56.55	49.83	168	0.040	15"	13	10	17	
22	23	0.11	0.85	0.094	0.094	4	7.0	0.66	49.95	49.83	30	0.004	15	4.2	3.3	7	
23	25	0.83	0.40	0.332	0.782	29	3.7	2.89	49.73	44.69	168	0.03	15"	11.2	9	19	
24	25	1.39	0.30	0.417	0.417	28	3.8	1.58	49.89	44.69	64	0.05	15	14.5	11.8		
25	27	1.23	0.40	0.492	1.691	29	3.7	6.26	44.44	44.22	56	0.004	18	6.8	3.7	15	
26	27	0.22	0.80	0.176	0.176	3	7.0	1.23	44.34	44.22	24	0.004	15	4.2	3.3		
27	29	0.15	0.70	0.105	1.972	29	3.8	7.49	44.12	42.64	80	0.0185	18	14.0	7.7	10	
28	29	0.64	0.45	0.288	0.288	16	5.1	1.47	47.51	43.91	72	0.050	15	14.5	11.5		
29	30	0.16	0.60	0.096	2.356	30	3.7	8.72	42.54	42.22	32	0.010	18	10.6	5.9		
30	31	0.37	0.60	0.222	2.578	30	3.7	9.54	42.12	41.67	45	0.010	18	10.6	5.9		
31	32	0.62	0.40	0.248	2.826	30	3.7	10.46	41.57	40.93	32	0.02	18	15.0	8.3		
32	outfall	0.17	0.80	0.136	2.962	30	3.7	10.96	35.12	30.00	125	0.04	18	21.2	11.8		

Copy 12/15/93

4-72

STORM SEWER DESIGN COMPUTATIONS

L & D 229

ROUTE _____ PROJ. SETTLER'S MILL SECTION 6 L&M # 93047

COUNTY JAMES CITY DISTRICT SUFFOLK

DESCRIPTION _____

SHEET ____ OF ____

FROM POINT	TO POINT	AREA DRAIN. "A" ACRES	RUN-OFF COEF. C	CA INCRE-MENT	CA ACCUM-ULATED	INLET TIME MIN-UTES	RAIN FALL IN./HR.	RUNOFF Q C.F.S.	INVERT ELEVATIONS UPPER END	INVERT ELEVATIONS LOWER END	LENGTH FT.	SLOPE FT./FT.	DIA. IN.	CAPA-CITY C.F.S.	VEL. F.P.S.	FLOW TIME SEC.	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
40	41	0.47	0.3	0.141	0.141	13	5.6	0.79	44.50	39.38	80	0.0640	15	16.4	13.2		
42	41	0.35	0.6	0.21	0.210	14	5.3	1.11	39.48	39.38	24	0.004	15"	4.2	3.4	14	
41	43	0.55	0.5	0.275	0.626	21	4.6	2.88	38.90	34.65	104	0.0445	15	13.7	11.0		
43	44	1.12	0.35	0.392	1.018	26	4.0	4.07	34.55	33.92	70	0.009	15	6.2	4.9		
44	outfall	0.30	0.70	0.210	1.228	26	4.0	4.91	27.00	25.50	56	0.033	15	11.8	9.4		
45	46	0.19	0.80	0.152	0.152	7	6.6	1.00	50.78	50.68	30	0.0033	15	3.78	3.1		
46	48	0.16	0.80	0.128	0.280	7	6.6	1.85	50.58	49.93	130	0.0050	15	4.6	3.7		
47	48	0.78	0.45	0.351	0.351	12	5.8	2.04	50.81	49.03	30	0.0293	15	11.0	8.9		
48	MH 60	0.19	0.80	0.152	0.783	12	5.8	4.54	49.83	43	135	0.0533	15	15	12.0		
MH 60	OUTFALL	0.19	0.80	0	0.783	12	5.8	4.54	38.00	22.00	120	0.1333	15	23.58	14.84		
49	50	0.56	0.70	0.392	0.392	14	5.5	2.16	44.88	44.08	160	0.005	15	4.6	3.7		
50	outfall	0.14	0.80	0.112	0.504	14	5.5	2.77	43.98	25.00	120	0.1583	25	25.84	13.74		

MC007_COMMON_AREA_SETTLERS_MILL - 07

Circular Channel Analysis & Design
Solved with Manning's Equation

Open Channel - Uniform flow

Worksheet Name:

Comment:

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.1600 ft/ft
Manning's n.....	0.013
Discharge.....	2.77 cfs

Computed Results:

Depth.....	0.28 ft
Velocity.....	13.74 fps
Flow Area.....	0.20 sf
Critical Depth....	0.67 ft
Percent Full.....	22.11 %
Full Capacity.....	25.84 cfs
QMAX @.94D.....	27.80 cfs
Froude Number.....	5.49 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

Circular Channel Analysis & Design
Solved with Manning s Equation

Open Channel - Uniform flow

Worksheet Name:

Comment:

Solve For Actual Depth

Given Input Data:

Diameter.....	1.25 ft
Slope.....	0.1333 ft/ft
Manning's n.....	0.013
Discharge.....	4.54 cfs

Computed Results:

Depth.....	0.37 ft
Velocity.....	14.84 fps
Flow Area.....	0.31 sf
Critical Depth....	0.86 ft
Percent Full.....	29.74 %
Full Capacity.....	23.58 cfs
QMAX @.94D.....	25.37 cfs
Froude Number.....	5.06 (flow is Supercritical)

Open Channel Flow Module, Version 3.09 (c) 1990
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708

LD-347

HYDRAULIC GRADE LINE

PROJECT SETTLERS MILL SECTION 5 87042

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS												Final H	Inlet Water Surface Elev.	Rim Elev.
							V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	$1.3\ H_t$	$0.5\ H_t$			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
SECTION 4 #45																				53.84	
4	54.03	36	35.66	173	0.24	0.42	4.9	0.09	30.24	4.2		0.27	0.10	90	0.19	0.38	0.49	0.25	0.67	54.70	
									5.8	4.6		0.33	0.11	10	-	0.20					
3	54.75	36"	30.24	175	0.18		4.2	0.07	-							0.07			0.25	55.0	FES INV 58.5
2	55.10	15"	5.8	111	0.66	0.73	4.6	0.08	1.86	1.5		0.03	0.008	30	0.01	0.10	0.13	0.07	0.80	55.90	
1	59.83	15"	1.86	68	0.07	0.05	1.5	0.008	-							0.008	0.01	0.005	0.06	59.89	

$H_i = 0.35 \frac{V_i^2}{2g}$ $H_o = 0.25 \frac{V_o^2}{2g}$ $H_\Delta = K \frac{V_i^2}{2g}$

FINAL $H = H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	
60° K = 0.55	15° K = 0.22	

LD-347

HYDRAULIC GRADE LINE

SETTLERS MILL
SECTION 5

PROJECT 93046

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS												Final H	Inlet Water Surface Elev.	Rim Elev.
							V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	$1.3\ H_t$	$0.5\ H_t$			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
13MH	31.2	18"	8.98	32	0.70	0.22	5.0	0.10	8.98	7.0		0.76	0.27	0	—	0.37	—	0.185	0.41	31.61	42.25
12MH	39.59	15"	8.98	24	1.85	0.44	7.0	0.19	8.98	7.0		0.76	0.27	30°	0.21	0.67	—	0.335	0.78	40.37	50.50
11	47.75	15"	8.98	24	1.85	0.44	7.0	0.19	7.65	6.1		0.58	0.20	0°	—	0.39	0.51	0.25	0.69	48.44	57.01
10	53.0	15"	7.65	32	1.40	0.45	6.1	0.14	6.73	5.5		0.47	0.16	90°	0.33	0.63	0.82	0.41	0.86	53.86	57.01
9	54.0	15"	6.73	174	1.10	1.91	5.5	0.12	6.58	5.3		0.44	0.15	45°	0.19	0.46	0.60	0.30	2.21	56.21	59.67
8	56.61	15"	6.58	56	1.02	0.57	5.3	0.11	1.68	1.35		0.03	0.01	45°	0.01	0.13	0.17	0.09			60.74
									4.90	3.5		0.19	0.07	45°	0.08	0.26	0.34	0.17	0.74	57.35	
8A	57.35	15	1.68	28	0.065	0.02	1.35	0.01	—							0.01	0.01	0.01	0.03	57.38	60.74
7	57.35	15	4.40	144	0.45	0.65	3.5	0.05	2.26	1.8		0.05	0.02	35°	0.02	0.07	0.09	0.05	0.70	58.05	62.20
									0.72	0.6		0.006	0.01	90°	0.04						
5	59.15	15	2.26	120	0.115	0.14	1.8	0.01	—							0.01	0.01	0.01	0.15	59.30	63.52
6	59.15	15	0.72	28	0.03	0.01	0.6	0.002	—							0.02	0.03	0.02	0.03	59.18	62.20

$H_i = 0.35 \frac{V_i^2}{2g}$ $H_o = 0.25 \frac{V_o^2}{2g}$ $H_\Delta = K \frac{V_i^2}{2g}$ FINAL $H = H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70
80° K = 0.66
70° K = 0.61

50° K = 0.47
40° K = 0.38
30° K = 0.28

20° K = 0.16
15° K = 0.10

LD-347

HYDRAULIC GRADE LINE

PROJECT SETTLERSMILL SECTION 6 93046

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS												Final H	Inlet Water Surface Elev.	Rim Elev.
							V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	$1.3\ H_t$	$0.5\ H_t$			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
44	26.67	15"	4.91	40	0.56	0.22	4.0	0.06	4.07	3.3		0.17	0.06	0	0	0.12	0.16	0.08	0.30	26.97	37.98
43	34.92	15"	4.07	70	0.39	0.27	3.3	0.06	2.88	2.3		0.08	0.03	70	0.05	0.14	0.18	0.09	0.36	35.28	38.65
41	35.55	15"	2.88	104	0.19	0.20	2.3	0.02	1.11	0.9		0.01	0.004	90	0.009	0.034	0.04	0.02	0.22	35.77	43.41
									0.79	0.7		0.008	0.002	90	0.005						
42	40.38	15"	1.11	24	0.03	0.007	0.9	0.003	—							0.003	0.004	0.002	0.009	40.39	43.41
40	40.38	15"	0.79	80	0.03	0.02	0.7	0.002	—							0.002	0.003	0.002	0.022	40.40	49.50

$H_i = 0.35 \frac{V_i^2}{2g}$ $H_o = 0.25 \frac{V_o^2}{2g}$ $H_\Delta = K \frac{V_i^2}{2g}$ FINAL $H = H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

SEE LD-72(D)67

90° K = 0.70	50° K = 0.47	20° K = 0.16
80° K = 0.66	40° K = 0.38	15° K = 0.10
70° K = 0.61	30° K = 0.28	

LD-347

HYDRAULIC GRADE LINE

PROJECT SETTLERS MILL SECTION 6 93047

2/8/95

INLET STATION	Outlet Water Surface Elev.	D_o	Q_o	L_o	S_{f_o} %	H_f	JUNCTION LOSS												Final H	Inlet Water Surface Elev.	Rim Elev.
							V_o	H_o	Q_i	V_i	Q_iV_i	$\frac{V_i^2}{2g}$	H_i	Angle	H_Δ	H_t	$1.3\ H_t$	$0.5\ H_t$			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
50	INV+.8ϕ = 26.0	15"	2.77	120	0.18	0.22	2.2	0.02	2.16	1.8		0.05	0.02	75°	0.03	0.07	0.09	0.05	0.27	26.22	50.22
49	45.08	15"	2.16	160	0.11	0.18	1.8	0.01	—								0.01	0.01	0.19	45.27	48.88
	BMP#5																				
60MH	23.4	15	4.54	120	0.48	0.58	3.6	0.05	4.54	3.6		0.20	0.07	70°	0.12	0.24	—	0.12	0.70	24.1	46.00
48	43.0	15	4.54	140	0.48	0.67	3.6	0.05	2.04	1.65		0.04	0.01	40°	0.02	0.08	0.10	0.05	0.72	43.72	54.70
									1.85	1.50		0.03	0.01	70°	0.02						
47	50.88	15	2.04	32	0.17	0.03	1.65	0.02	—							0.02	0.03	0.02	0.05	50.93	54.81
46	50.88	15	1.85	140	0.08	0.11	1.50	0.01	1.00	0.8		0.01	.0035	30°	.0028	0.02	0.03	0.02	0.13	51.01	54.72
45	51.68	15	1.00	26	0.03	0.008	0.8	0.002	—							0.002	0.003	0.002	0.01	51.69	54.72

$H_i = 0.35 \frac{V_i^2}{2g}$ $H_o = 0.25 \frac{V_o^2}{2g}$ $H_\Delta = K \frac{V_i^2}{2g}$ FINAL $H = H_f + H_t$

$H_t = H_o + H_i + H_\Delta$

90° K = 0.70
80° K = 0.66
75 K = 0.64
70° K = 0.61

50° K = 0.47
40° K = 0.38
30° K = 0.28

20° K = 0.16
15° K = 0.10

SEE LD-72(D)67

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

(with or without an emergency spillway)

Project SETTLERS MILL

Basin # 5 Location SOUTH SIDE OF HICKORY SIGNPOST RD

Total area draining to basin: 30.97 acres.

Basin Volume Design

Wet Storage:

1. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 30.97 acres = 2075 cu. yds.

2. Available basin volume = 2,329 cu. yds. at elevation 21.50. (From storage - elevation curve) including excavation

~~3. Excavate _____ cu. yds. to obtain required volume*.~~

   * Elevation corresponding to required volume = invert of the dewatering orifice.

4. Available volume before cleanout required.

   33 cu. yds. x 30.97 acres = 1022 cu. yds. = 27,594 CF

5. Elevation corresponding to cleanout level = 19.25.

   (From Storage - Elevation Curve)

6. Distance from invert of the dewatering orifice to cleanout level = 2.25 ft. (Min. = 1.0 ft.) OK

Dry Storage:

7. Minimum required volume = 67 cu. yds. x Total Drainage Area (acres).

   67 cu. yds. x 30.97 acres = 2075 cu. yds.

84,338 CF

8. Total available basin volume at crest of riser* = 3,124 cu. yds. at elevation 22.5. (From Storage - Elevation Curve)

* Minimum = 134 cu. yds./acre of total drainage area.

9. Diameter of dewatering orifice = 3 in.

10. Diameter of flexible tubing = 6 in. (diameter of dewatering orifice plus 2 inches).

Preliminary Design Elevations

11. Crest of Riser = 22.5

Top of Dam = 26.0

Design High Water = 24.41

Upstream Toe of Dam = 16.0

Basin Shape

12. Length of Flow / Effective Width $\frac{L}{We} = \frac{L^2}{A} = \frac{300^2}{15000} = 6$, for natural channel

$\frac{L^2}{A} = \frac{300^2}{15000} = 0.16$ for discharge from #60

If > 2, baffles are not required _____

$L^2 = 2A$

If < 2, baffles are required #60 requires baffle

$L_{req'd} = \sqrt{2A} = \sqrt{2 \cdot 15000} = 173$ LF

Length of baffle $= \frac{1}{2} L_{req'd}$ 87 Feet

Runoff

13. Q_2 = 31.94 cfs (From Chapter 5)

14. Q_{25} = 56.22 cfs (From Chapter 5)

Principal Spillway Design

15. → With emergency spillway, required spillway capacity $Q_p = Q_2$ = 31.94 cfs. (riser and barrel)

Without emergency spillway, required spillway capacity $Q_p = Q_{25}$ = _____ cfs. (riser and barrel)

16. With emergency spillway:

Assumed available head (h) = 24.5-22.5 = 2 ft. (Using Q_2)

h = Crest of Emergency Spillway Elevation - Crest of Riser Elevation

Without emergency spillway: N/A

Assumed available head (h) = _____ ft. (Using Q_{25})

h = Design High Water Elevation - Crest of Riser Elevation

17. Riser diameter (D_r) = 48" in. Actual head (h) = 2 ft.

(From Plate 3.14-8.)

Note: Avoid orifice flow conditions.

18. Barrel length (l) = 60 ft.

Head (H) on barrel through embankment = 8.4 ft.

(From Plate 3.14-7).

19. Barrel diameter = 24 in.

(From Plate 3.14-B [concrete pipe] or Plate 3.14-A [corrugated pipe]).

20. Trash rack and anti-vortex device - corrugated metal

Diameter = 78 inches.

Height = 25 inches.

(From Table 3.14-D).

Emergency Spillway Design

21. Required spillway capacity $Q_e = Q_{25} - Q_p$ = 56.22 - 31.94 = 24.28 cfs.

22. Bottom width (b) = 10 ft.; the slope of the exit channel (s) = 0.03 ft./foot; and the minimum length of the exit channel (x) = 31 ft.
(From Table 3.14-C).

Anti-Seep Collar Design

23. Depth of water at principal spillway crest (Y) = 6.5 ft.

Slope of upstream face of embankment (Z) = 3 :1.

Slope of principal spillway barrel (S_b) = 0.55 %

Length of barrel in saturated zone (L_s) = 50 ft.

24. Number of collars required = 3 dimensions = 3'6"x3'6"

(from Plate 3.14-12). use 4'0x4'0 for 1' projection

Final Design Elevations

25. Top of Dam = 26.5

Design High Water = 24.41

Emergency Spillway Crest = 24.5

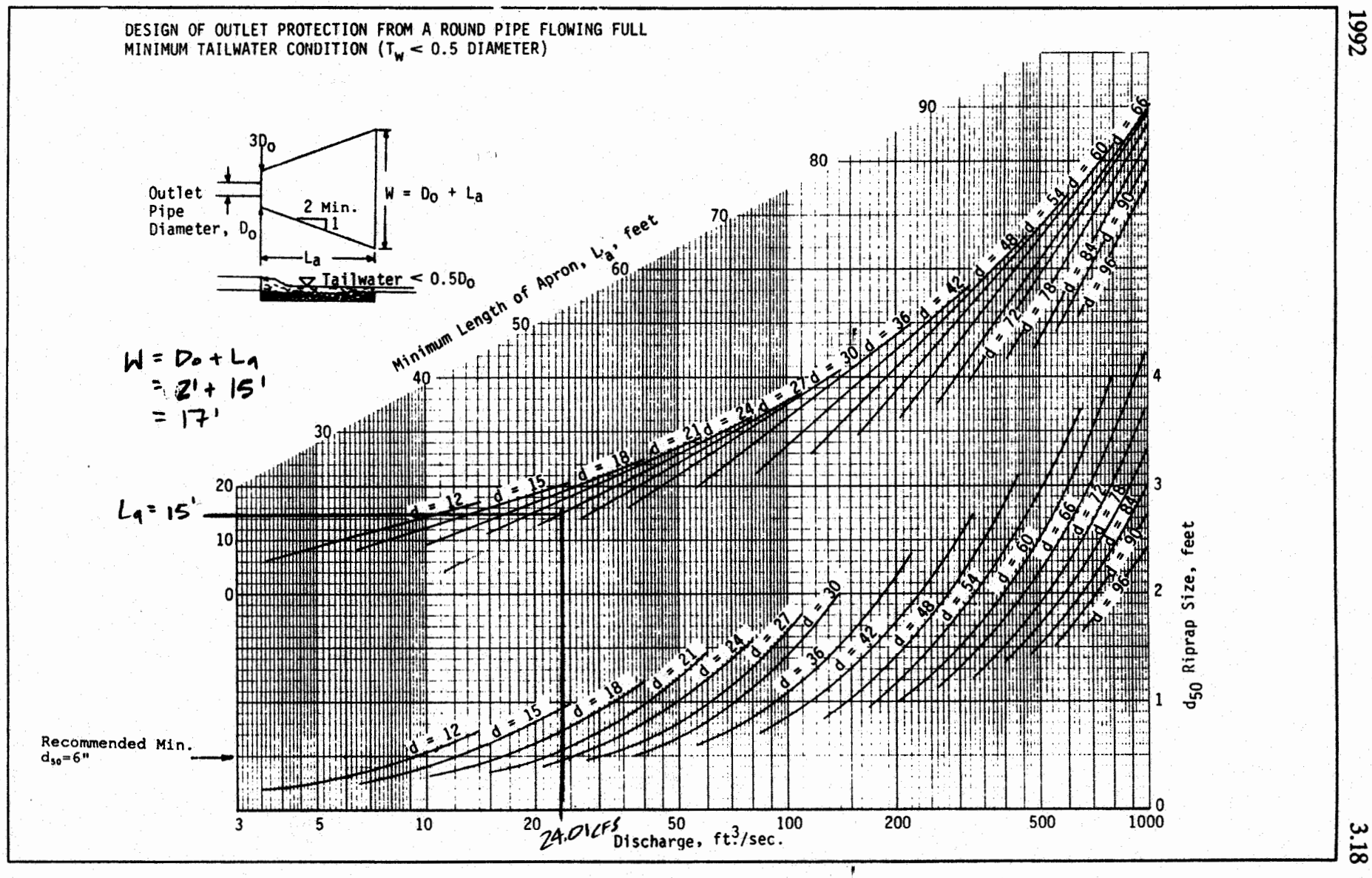
Principal Spillway Crest = 22.5

Dewatering Orifice Invert = 16.0

Cleanout Elevation = 19.25

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = 16.0

MC007_COMMON_AREA_SETTLERS_MILL - 117



Source: USDA-SCS

Plate 3.18-3

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

Subject SEDIMENT TRAP
Computed By DBL Checked By JLH

Project No. 93047
Client SETTLER'S MILL
Date 2/10/95 Sheet No. ____

DOWNSTREAM OF DI #50

DRAINAGE AREA = 2 AC

DRY VOLUME REQ'D = $67 \frac{CY}{AC} \times 2 = 134 CY = 3618 CF$

WITH 2:1 SIDE SLOPES EXCAVATE 4' DEEP
TOP AREA = 25 x 47

$\frac{(25 \times 47) + (17 \times 39)}{2} \times 4 = 3676 CF$ OK

WET VOL REQ'D = 3618 CF
WITH 3:1 SIDE SLOPES
DEPTH REQ'D = h_o

$$3618 = \frac{(25 \times 47) + (25 + 6h_o)(47 + 6h_o)}{2} \times h_o$$

try $h_o = 2 \Rightarrow \frac{(25 \times 47) + (25 + 12)(47 + 12)}{2} 2 = 3358 CF$

try $h_o = 2.5 \Rightarrow \frac{(25 \times 47) + (25 + 15)(47 + 15)}{2} 2.5 = 4569 CF$ USE

L = 6 AREA = 6 · 2 = 12 FEET

h = 3.5
h_o = 3.5
W = 3.0

TOTAL VOL = 3618 + 3618 = 7236 CF

SETTLERS MILL - SECTIONS 5&6
MC007

TABLE 3

WORKSHEET FOR BMP POINT SYSTEM

A. STRUCTURAL BMP POINT ALLOCATION

BMP	BMP Points		Fraction of Site Served by BMP		Weighted BMP Points
#1 EXIST BY AES	9	x	$\frac{6.36}{105} = 6.06$	=	0.55
#2 EXIST BY AES	8	x	$\frac{13.57}{105} = 12.92$	=	1.03
* #3 & 4 EXIST BY L&M	8 (REVISED)	x	$\frac{64.53}{105} = 61.46$	=	4.92
#5 PROP	8	x	$\frac{30.97}{105} = 29.50$	=	2.36
		x		=	

TOTAL WEIGHTED STRUCTURAL BMP POINTS: 8.23

B. NATURAL OPEN SPACE CREDIT

Fraction of Site		Natural Open Space Credit (0.1 per 1%)		Points for Natural Open Space
26.08 %	x	0.1	=	2.61

C. TOTAL WEIGHTED POINTS

8.23	+	2.61	=	10.84
Structural BMP Points		Natural Open Space Points		TOTAL

ONLY NEED 18.59 AC TO MEET 10 POINT REQUIREMENT

TOTAL AREA OF DEVELOPMENT		105 AC ±
TOTAL AREA TO BMP #1		6.36 AC.
TOTAL AREA TO BMP #2		13.57 AC
TOTAL AREA TO BMP #3 & 4 (COMBINED)	ONSITE	48.00 AC
	OFF SITE	16.53 AC
TOTAL AREA TO BMP #5	ON SITE	16.70 AC
	OFF SITE	14.27 AC
TOTAL ACREAGE TREATED		115.43 AC

TOTAL NATURAL OPEN SPACE INCLUDING CONSERVATION EASEMENTS + 0.85 ACRES ON RECREATION CENTER SITE — 27.38 AC

* BMP's 3 & 4 ARE COMBINED AS ONE BMP.

REVISED JAN 3, 1995

MC007_COMMON_

GEOTECHNICAL ENGINEERING SERVICES

PROPOSED STORMWATER RETENTION POND SETTLER'S MILL AT JAMESTOWN

Geo Project No: 96NNE.191

Prepared For: DMI CORPORATION

GEO DESIGN CONSULTANTS, INC.

April 29, 1996

DMI Corporation
1111 Old Colony Lane
Williamsburg, Virginia 23185

Attn: Mr. Larry McCardle

Re: Geotechnical Engineering Services
Proposed Stormwater Retention Pond
Settler's Mill at Jamestown
James City County, Virginia
Geo Project No: 96NNE.191

Dear Mr. McCardle:

Geo Design Consultants, Inc. has completed geotechnical engineering services for the proposed stormwater retention pond at the above referenced project site. The geotechnical engineering services were authorized by Mr. Larry McCardle on April 17, 1996 and conducted in general accordance with Geo Proposal No. 96NNP.158, dated April 10, 1996. The subsurface exploration program consisted of drilling a series of soil auger borings within the site of the proposed development. The subsurface information obtained and the available project characteristics were then evaluated in regards to applicable construction procedures and the suitability of the soils within the proposed retention pond area to be utilized as structural fill material.

INTRODUCTION

Site Description

The site of the proposed development is located in James City County, Virginia. Specifically, this site is located at the southeast corner of the intersection of Ironbound Road and Hickory Signpost Road. During the time of the site visit, the proposed development area was essentially undeveloped and was composed of a heavily wooded region. It is important to note that during the time of our site visit, the proposed stormwater retention pond site location was observed to consist of a small creek containing surface runoff water.

Based on the topographic drawing provided by Langley & McDonald, P.C., the ground surface across the development area appeared to be a "rolling" terrain; ground surface elevations appeared to approximately range from 10 to 65 feet National Geodetic Vertical Datum of 1929 (NGVD).

Project Characteristics

The proposed development is planned to consist of the construction of a stormwater retention pond area. The stormwater retention pond area is expected to require the construction of an earthen dam with an approximate length on the order of seventy (70) feet and an approximate height of ten (10) feet in height. It is expected that the dam require the construction of an impervious "core".

PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to obtain information on the general subsurface soil and groundwater conditions at the proposed project site. The subsurface materials encountered were evaluated with respect to the available project characteristics. In this regard, engineering assessments for the following items were formulated:

1. General assessment of soil borings performed at the proposed development, including assessment of project area geology based on our knowledge and review of available published literature.

2. General location and description of potentially deleterious materials encountered in the subsurface exploration which may interfere with construction progress or equipment performance, including existing fills.

3. Soil subgrade preparation, including stripping, grading and compaction. Engineering criteria for placement and compaction of approved fill materials.

4. Suitability and availability of materials on site that may be moved during site grading for use as dam core and embankment fill in the construction area, subgrade fill and as general backfill.

5. Identification of some critical design or construction details, including groundwater levels (and groundwater seasonal fluctuations).

6. Determination of the infiltration characteristics of the upper soils at the proposed retention pond area. The infiltration characteristics of the dam/core embankment will be performed when completed. A slope stability analysis for the proposed dam embankment, including rapid draw down analysis.

The following services were provided in order to achieve the preceding objectives:

1. Reviewed readily available published geologic and topographic information. The published information was obtained from quadrangle maps published by the United States Geological Survey (USGS) and "Soil Survey of James City and York Counties and the City of Williamsburg, Virginia" published by the United States Department of Agriculture (USDA) Soil Conservation Services (SCS).

2. We executed a program of subsurface exploration consisting of subsurface sampling and field testing. We performed three (3) auger borings in the proposed construction area; the borings extended to an approximate depth of ten (10) feet or boring refusal. In the auger borings, samples were collected continuously for the top ten (10) feet.

3. Visually classified and stratified representative soil samples in the laboratory using the Unified Soil Classification System (USCS). Conducted a limited laboratory testing program that consisted of natural moisture content, limited grain-size analysis (-#200) and Atterberg Limits tests. Identified soil conditions at the boring location and formed an opinion of the site soil stratigraphy.

4. Collected groundwater level measurements and estimated the normal seasonal high groundwater level.

5. The results of the field exploration and laboratory tests were used in determining the subsurface soil suitability for the proposed earthen dam core and embankment construction. The results of the subsurface exploration, including the design recommendations and the data on which they are based, are presented in this report.

FIELD EXPLORATION

In order to explore the general soil types at the proposed dam for the stormwater retention pond and the cut section along Lockwood Drive, a total of three (3) auger borings were drilled at locations which were within the proposed development area. These borings were located in the field by measuring with a cloth tape from existing ground surface features and the staked centerline of survey for ~~Lockwood~~ Lakewood Drive, which was staked by others. The approximate locations of the borings are illustrated of Figure 3 which has been included in the appendix of this report. The soil auger borings were drilled to approximate depths ranging from 6½ to 10 feet below the existing grades.

Auger Borings (AB)

The auger borings were performed with the use of a three (3) inch diameter hand bucket auger. The soil sampling was performed in general accordance with ASTM test designation D-1452, titled "Soil Investigation and Sampling by Auger Borings". These samples were taken continuously from the ground surface to a depth of five (5) feet. Representative portions of these soil samples were sealed in glass jars, labeled and transferred to our Newport News laboratory for classification and testing. The auger borings were performed in order to define the near-surface soil characteristics encountered within the pavement areas of the proposed development.

LABORATORY TESTING

General

The soil samples were transported to our laboratory and were classified by the Geotechnical Engineer in accordance with the American Society of Testing and Materials (ASTM) test designation D-2488 and D-2487, titled "Description and Identification of Soils (Visual-Manual Procedure)". Representative soil samples were selected and subjected to grain-size analysis (-#200 Sieve), natural moisture content determination and Atterberg Limits testing. The laboratory test results are presented in a tabular format below and in the appendix of this report.

LABORATORY TEST	NO. OF TESTS
Grain-Size Analysis (-#200 Sieve)	4
Natural Moisture Content	4
Atterberg Limits	2

LOCATION	SAMPLE DEPTH (feet)	NATURAL MOISTURE CONTENT (%)	-#200 SIEVE (%)	LL (%)	PI (%)	USCS
AB-1	3-4	19.9	27.9	--	--	SC
AB-2	4-5	23.4	16.4	--	--	SM-SC
AB-3	1-2	14.0	53.7	18	6	CL-ML
AB-3	4-5	19.0	66.0	40	25	CL

GENERALIZED SUBSURFACE CONDITIONS

Soil Survey

The "Soil Survey of James City and York Counties and The City of Williamsburg, Virginia", published in 1980 by the United States Department of Agriculture (USDA) Soil Conservation Service (SCS), was reviewed for general near-surface soil information within the general project vicinity. This information indicated that there are nine (9) primary mapping units (11C, 14B, 15D, E, & F, 17, 21, 27 and 29A) within the proposed project area. The USDA Soil Conservation Service (SCS) Survey map for the project vicinity is presented on Figure 1 in the appendix of this report. The map soil units encountered are as follows:

SOIL SERIES	SOIL TYPE AND DEPTH (INCHES)	USCS[1]	USDA SEASONAL HIGH GROUNDWATER TABLE		K[2] (IN/HR)	SHRINK/SWELL POTENTIAL
			DEPTH (FEET)	MONTHS		
Craven-Uchee Complex (11C)	0-24 Loamy Fine Sand	SM	3.5-5 perched	Dec-Apr	6-20	low
	24-36 Sandy Loam, Sandy Clay Loam	SC,SM-SC			0.6-2	low
	36-56 Sandy Clay Loam, Sandy Clay	MH,CH,CL,SC			0.2-0.6	moderate
	56-65 Sandy Loam, Sandy Clay Loam, Sandy Clay	MH,CH,CL,SC			0.2-2	moderate

SOIL SERIES	SOIL TYPE AND DEPTH (INCHES)	USCS[1]	USDA SEASONAL HIGH GROUNDWATER TABLE		K[2] (IN/HR)	SHRINK/SWELL POTENTIAL
			DEPTH (FEET)	MONTHS		
Emporia Fine Sandy Loam (14B)	0-17 Fine Sandy Loam 13-37 Sandy Clay Loam, Sandy Loam, Clay Loam 37-58 Sandy Clay Loam, Clay Loam, Sandy Clay 58-75 Stratified Sandy Loam to Clay Loam	CL,SC,SM,ML SC,CL SC,CL SM,SC,ML,CL	3-4.5 perched	Nov-Apr	2-6 0.2-2 .06-0.6 .06-2	low low moderate moderate
Emporia Complex (15D)	0-11 Fine Sandy Loam 11-37 Sandy Clay Loam, Sandy Loam, Clay Loam 37-54 Sandy Clay Loam, Clay Loam, Sandy Loam 54-75 Stratified Sandy Loam to Clay Loam	CL,SC,SM,ML SC,CL SC,CL SM,SC,ML,CL	3-4.5 perched	Nov-Apr	2-6 0.2-2 .06-0.6 .06-2	low low moderate moderate
Emporia Complex (15E)	0- 9 Fine Sandy Loam 9-37 Sandy Clay Loam, Sandy Loam, Clay Loam 37-50 Sandy Clay Loam, Clay Loam, Sandy Loam 50-75 Stratified Sandy Loam to Clay Loam	CL,SC,SM,ML SC,CL SC,CL SM,SC,ML,CL	3-4.5 perched	Nov-Apr	2-6 0.2-2 .06-0.6 .06-2	low low moderate moderate

SOIL SERIES	SOIL TYPE AND DEPTH (INCHES)	USCS[1]	USDA SEASONAL HIGH GROUNDWATER TABLE		K[2] (IN/HR)	SHRINK/SWELL POTENTIAL
			DEPTH (FEET)	MONTHS		
Emporia Complex (15F)	0- 6 Fine Sandy Loam 6-37 Sandy Clay Loam, Sandy Loam, Clay Loam 37-45 Sandy Clay Loam, Clay Loam, Sandy Loam 45-75 Stratified Sandy Loam to Clay Loam	CL,SC,SM,ML SC,CL SC,CL SM,SC,ML,CL	3-4.5 perched	Nov-Apr	2-6 0.2-2 .06-0.6 .06-2	low low moderate moderate
Johnston Complex (17)	0- 8 Silt Loam 8-49 Stratified Fine Sandy Loam to Silty Clay Loam 49-60 Stratified Sand to Sandy Clay Loam	ML,SM SM,ML SM,ML	+1-1.5	Nov-Jan	2-6 0.6-2 0.6-2	low low low
Levy Silty Clay (21)	0-18 Silty Clay 18-80 Silty Clay, Clay Silty Clay Loam	CL,CH,ML,MH CL,CH,ML,MH	+2-+1	Jan-Dec	0.06-0.2 0.06-0.2	high high
Peawick Silt Loam (27)	0- 7 Silt Loam 7-99 Clay Loam, Silty Clay, Clay	SM,SC,CL-ML CL,CH	1.5-3.0 perched	Nov-Mar	0.6-2.0 <0.06	low high
Slagle Fine Sandy Loam (29A)	0- 9 Fine Sandy Loam 9-25 Fine Sandy Loam 25-60 Sandy Clay Loam	SM-SC,ML,CL SC,SM-SC CL,CL-ML	1.5-3.0 Perched	Nov-Apr	0.06-6.0	Low Low Moderate

(1) USCS = Unified Soil Classification System
(2) K = Permeability

USGS Topographic Survey

The topographic survey map published by the United States Geological Survey titled "Williamsburg, Virginia", "Norge, Virginia", "Surry, Virginia" and "Hog Island, Virginia" were reviewed for ground surface features at the proposed project location. Based on this review, the natural ground surface elevation ranges from ten (10) and sixty-five (65) feet National Geodetic Vertical Datum of 1929 (NGVD). The USGS topographic map for the project vicinity is presented on Figure 2 in the appendix of this report.

Subsurface Soil Conditions

Soil stratification is based on visual examination of the recovered soil samples, laboratory testing and interpretation of the field boring logs by a geotechnical engineer. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The boring profiles present the conditions at the particular boring location and variations do occur among the borings.

The soil test borings encountered approximately twelve (12) to twenty-four (24) inches of a brown silty fine sand with roots ("Topsoil") along the surface of the project site and with a "root-mat" of twenty-four (24) inches at the stormwater retention pond location within the creek area. Underlying the "Topsoil", the subsurface soils were generally arranged in a one (1) layer configuration. This soil layer encountered extended to a depth of approximately ten (10) feet below the existing grades. This soil layer consisted of a clayey sand (SC) to sandy clay (CL).

The subsurface exploration program indicated that the subsurface soils are generally uniform across the proposed development site. Specific details concerning the subsurface materials and conditions encountered at each test location may be obtained from the soil test boring profiles located in the appendix of this report.

Groundwater Conditions

The groundwater table was measured at each boring location immediately following completion of drilling operations on April 23, 1996. The depths to the "static" groundwater table at the development area ranged from two (2) to four (4) feet below the existing grades.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences, such as existing swales, drainage ponds, underdrains and areas of covered soil (paved parking lots, side walks, etc.).

The estimated normal seasonal high groundwater table level is expected to be encountered along the existing ground surface at the tested locations for boring AB-1 and AB-2; and at a depth in excess of ten (10) feet at boring AB-3. This estimate is based on the soil stratigraphy, measured groundwater levels in the borings, USDA Soil Survey information and our past experience with similar soil conditions.

EARTHWORK RECOMMENDATIONS

General

The following design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered. If there is any change in these project criteria, including project location on the site, a review must be made by **Geo Design Consultants, Inc.**, to determine if any modifications in the recommendations will be required. The findings of such a review should be presented in a supplemental report.

Once final design plans and specifications are available, a general review by **Geo Design Consultants, Inc.**, is strongly recommended as a means to check that the evaluations made in preparation of this report are correct and that earthwork and foundation recommendations are properly interpreted and implemented.

Clearing

Prior to dam construction, the location of any existing underground utility lines within the dam construction area should be established. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations. In this regard, it should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which subsequently may result in excessive settlements and/or slope instability.

The dam site should also be cleared; this primarily includes removing tree stumps, and ground brush. The results of our field investigation indicate the presence of approximately twelve (12) to twenty-four (24) inches, with an average of twelve (12) inches, of brown silty fine sand with roots ("topsoil") along the existing surface of the project site. It is recommended that this undesirable material be removed to the satisfaction of **Geo Design Consultants, Inc.**, prior to beginning construction at the site. As a minimum, it is recommended that the clearing operations extend at least

two (2) feet beyond the earthen dam perimeter. Any "topsoil" removed from the proposed earthen dam area should be stockpiled in designated locations and used in areas to be grassed.

Grading

Following the clearing operations, the exposed subgrade should be evaluated by representatives of **Geo Design Consultants, Inc.** to confirm that all unsuitable surficial materials have been removed. Following the approval of **Geo Design Consultants, Inc.**, it is recommended that within the earthen dam area, the exposed subgrade be compacted to a dry density of at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698) to a minimum depth of twelve (12) inches. The "key" of the dam should be excavated in general accordance with the project plans and specifications. Following the excavation procedures, the key area should be stabilized by placement of a layer of Geogrid (such as BX1100 or equivalent). Following placement of the Geogrid, the key area of the dam can be constructed by utilizing soils consisting of clayey sand (SC) or sandy clay (CL) containing at least twenty percent (20%), by weight, of material finer than the number 200 Sieve. The filling and compaction of the materials to be placed in the key, core and cover should be performed in general accordance with the plans and specifications and structural fill section below.

Prior to beginning compaction, soil moisture contents may need to be controlled in order to facilitate proper compaction. If additional moisture is necessary to achieve compaction objectives, then water should be applied in such a way that it will not cause erosion or removal of the subgrade soils. A moisture content within two (2) percentage points of the optimum indicated by the Standard Proctor test (ASTM D-698) is recommended.

Structural Fill

All materials to be used for backfill or compacted fill construction should be evaluated and tested by **Geo Design Consultants, Inc.** prior to placement to determine if they are suitable for the intended use. Suitable structural fill materials for the key and core of the dam should consist of clayey sand to clay (SC and CL). Suitable structural fill materials for the dam cover should consist of sand to clay consisting of SM, SC and CL and should be free of rubble, organics, debris and other deleterious material.

All structural fill should be compacted to a dry density of at least 95 percent of the Standard Proctor maximum dry density (ASTM D-698). In general, the compaction should be accomplished by placing the fill in maximum twelve (12) inches loose lifts and mechanically compacting each lift to at least the specified minimum dry density. Backfill in utility trenches beneath structure areas should be compacted in four (4) to six (6) inch lifts to the above specified densities using hand compaction equipment.

A soils technician under the direct supervision of **Geo Design Consultants, Inc.** should perform field density tests on each lift as necessary to assure that adequate compaction is achieved.

Temporary Side Slopes

Side slopes for temporary excavations may stand near one (1) horizontal to one (1) vertical (1H:1V) for short dry periods of time and a maximum excavation depth of four (4) feet. Where restrictions do not permit slopes to be constructed as recommended above, the excavation should be shored in accordance with current OSHA requirements. Furthermore, open-cut excavations up to a maximum depth of ten (10) feet (for periods longer than 24 hours) should be properly de-watered and sloped on 1½H:1V or flatter slopes or be braced using an approved bracing plan. In addition, any open-cut excavations adjacent to existing structures should be evaluated by a geotechnical engineer on a case-by-case basis. During foundation construction, excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

Groundwater Control

Depending upon groundwater levels at the time of construction, some form of dewatering may be required to achieve the required compaction. Groundwater can normally be controlled in shallow excavations with a sump pump. During dam subgrade soil preparation any plastic soils below design grade could become disturbed by construction activities. If this becomes the case, the contractor may be directed by the owners representative to remove the disturbed or pumping soils to a depth of 12 to 18 inches below design grade and backfill the area with structural fill.

Surface water and groundwater control will be necessary during construction to permit establishment of a stable sand bottom. A section of the construction area could be dammed off and water diverted through a temporary ditch or pumped around construction activities. If a pump is used, a standby pump is recommended.

On-Site Soil Suitability

All materials to be used for backfill or compacted fill construction should be evaluated and, if necessary, tested by **Geo Design Consultants, Inc.**, prior to placement to determine if they are suitable for the intended use. In general, based on the boring results, the majority of the on-site sandy to clayey material can be used as structural fill in the key, core and dam cover areas and as general subgrade fill and backfill in other areas, provided the fill material is free of rubble, rock [greater than four (4) inches], roots and organics. Any off-site materials used as fill should be approved by **Geo Design Consultants, Inc.** prior to acquisition.

Erosion Control Measures

Adequate slope protection must be provided for all earth berms against wind and wave erosion and potential damage from floating debris. methods for protecting slopes include:

- Sod;
- A synthetic erosion control blanket such as North American Green DS150, S150 or P300; and,
- Water plants which dampen wave action.

Upstream slopes require more extensive treatment than downstream slopes because they are exposed to wave action and surges of influent. Where a permanent pool exists, elaborate protection below the minimum water surface is seldom needed since erosive action would be negligible below that level and the water plants will afford sufficient protection. On the downstream slope, only erosion from surface runoff or wind erosion must be considered except for sections that may be affected by wave action in the tailwater pool.

Sod (turf) is recommended for downstream slope protection, assuming that this slope will not be exposed to tailwater. Note that a slope of approximate 2½ horizontal to 1 vertical (2½H:1V) is about the steepest on which mowing and fertilizing equipment can operate efficiently.

SLOPE STABILITY

A slope stability analyses was performed for the dam at the proposed stormwater retention pond. General slope stability analysis by a two-dimensional limit equilibrium method using the computer program "STABL5" was utilized. This program was developed at Purdue University under sponsorship of the Federal Highway Administration. The program uses the method of slices to determine the safety factor against slope failure. The slope stability analysis was performed using "CIRCL2" Modified Bishop method with a rapid drawdown to compute the factor of safety against deep seated circular failure. Using a three (3) horizontal to one (1) vertical (3H:1V) dam embankment slope and compacted dam fill material consisting of clayey sand (SC) and sandy clay (CL), we evaluated the stability against slope failure. The soil parameters used for the dam embankment compacted fill were 30 degrees for friction angle, 300 pounds per square foot (psf) for cohesion and a total unit weight of 120 pounds per cubic foot (pcf). Input data for the subsurface soils were obtained from the auger boring based on our interpretations of the soil boring resistance to augering. The soil parameters utilized for the subsurface soil conditions were zero

degrees for friction angle, 300 psf for cohesion and a total unit weight of 120 pcf. The safety factor for the most critical failure surface at the dam embankment was computed to exceed 1.5. The slope stability analyses have been included in the appendix of this report.

GENERAL CONDITIONS

The design recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions. If there is any change in these project criteria, including project location on the site, a review must be made by **Geo Design Consultants, Inc.** to determine if any modifications in the recommendations will be required. The findings of such a review should be presented in a supplemental report.

These recommendations were developed from the information obtained in the test borings which depict subsurface conditions only at these specific locations and at the particular time designated on the logs. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the soil conditions at these boring locations. The nature and extent of variations between the borings may not become evident until the course of construction. If variations then appear evident, it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of any variation. It is recommended that **Geo Design Consultants, Inc.** be retained to perform inspections during construction of the soils connected phases of the work.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted Geotechnical Engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data.

We appreciate the opportunity to be of service to **DMI Corporation** on this important project and look forward to its successful completion. If we can be of any further assistance, please contact this office at (804) 873-4611.

Respectfully submitted,
Geo Design Consultants, Inc.

Raja S. Elawar, P.E.
Senior Project Manager
VA Registration No. 026383

Donald R. Stites, P.E.
Principal Engineer
VA Registration No. 19081

DRS/RSE/rm:\wpdxin60\wpdocs\engr\96nne191.001

Attachments: **Appendix**
Figures
Figure 1 - USDA Soil Conservation Survey Map
Figure 2 - USGS Quadrangle Map
Figure 3 - Boring Location Sketch
Laboratory Test Results
Log of Boring Sheets
Slope Stability Analyses

cc: (3) Client

APPENDIX

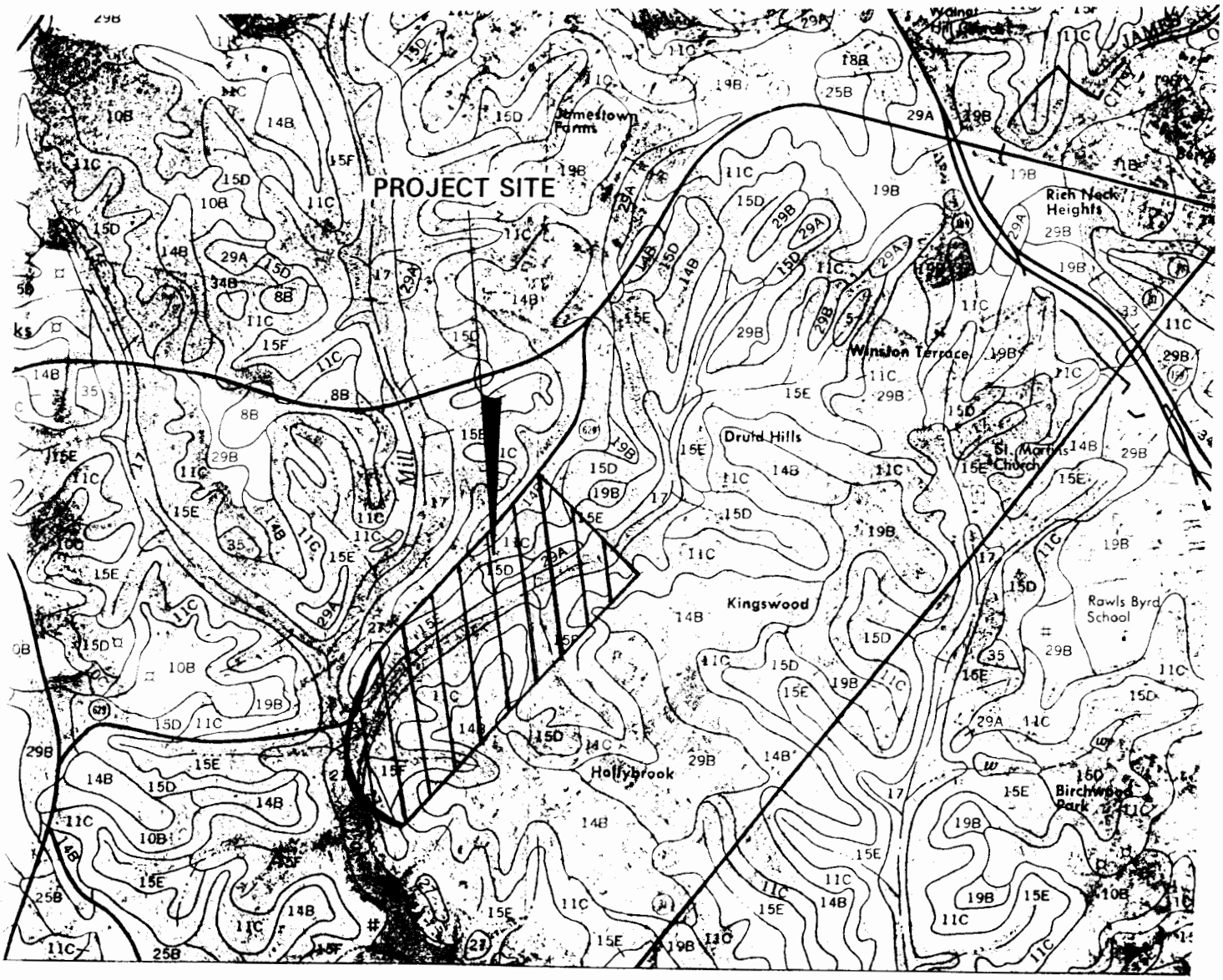
FIGURES

Figure 1 - USDA Soil Conservation Survey Map

Figure 2 - USGS Quadrangle Map

Figure 3 - Boring Location Sketch

FIGURE 1



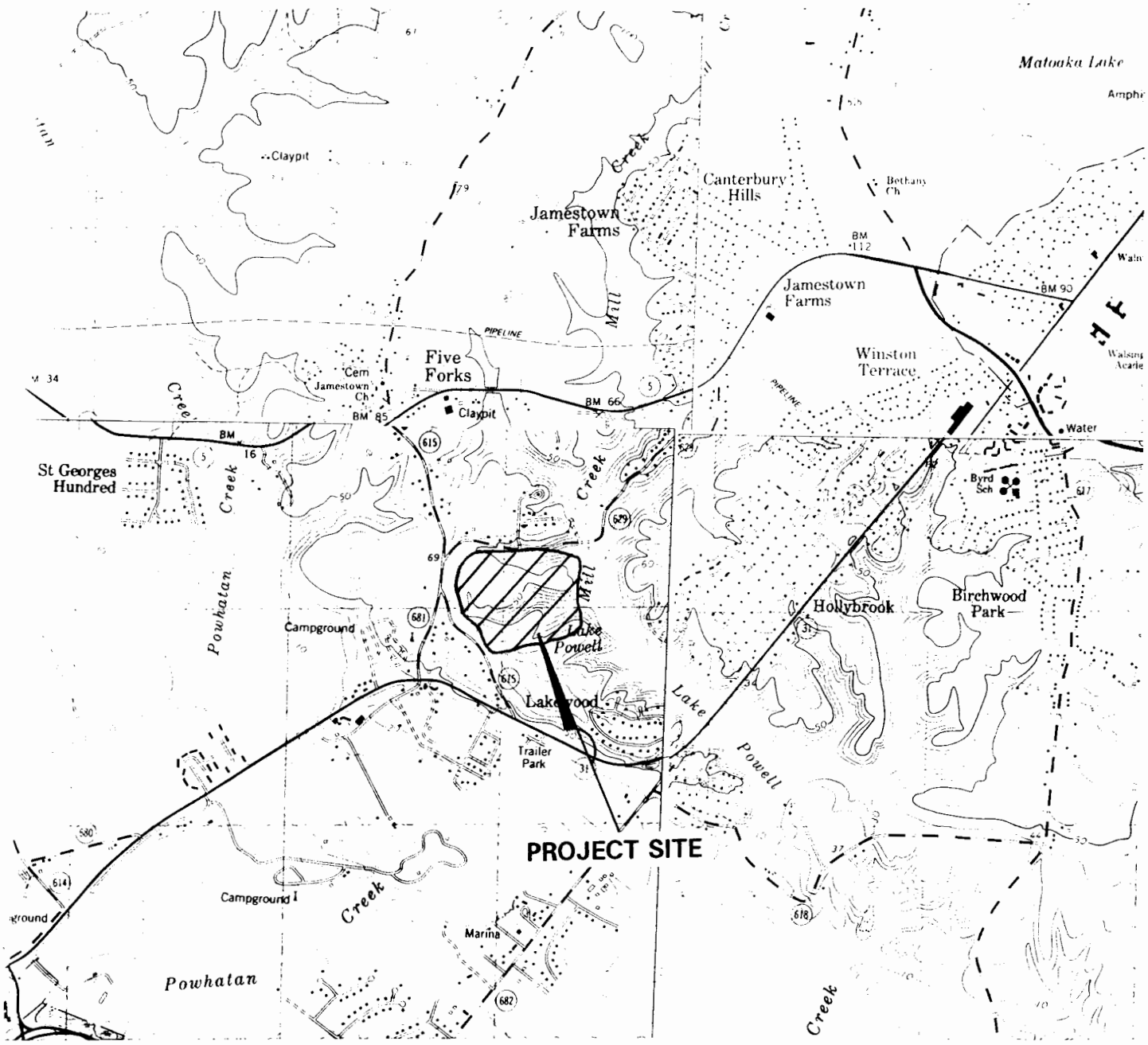
USDA SOIL CONSERVATION SURVEY MAP

"Soil Survey of James City and York Counties and The City of Williamsburg, Virginia"

PROJECT NAME:	Settler's Mill at Jamestown - Section 6		
LOCATION:	James City County, Virginia	**SCALE:**	N/A
GEO PROJECT NUMBER:	96NNE.191	**DATE:**	April, 1996
CLIENT:	DMI Corporation		

Geo Design Consultants, Inc.

FIGURE 2



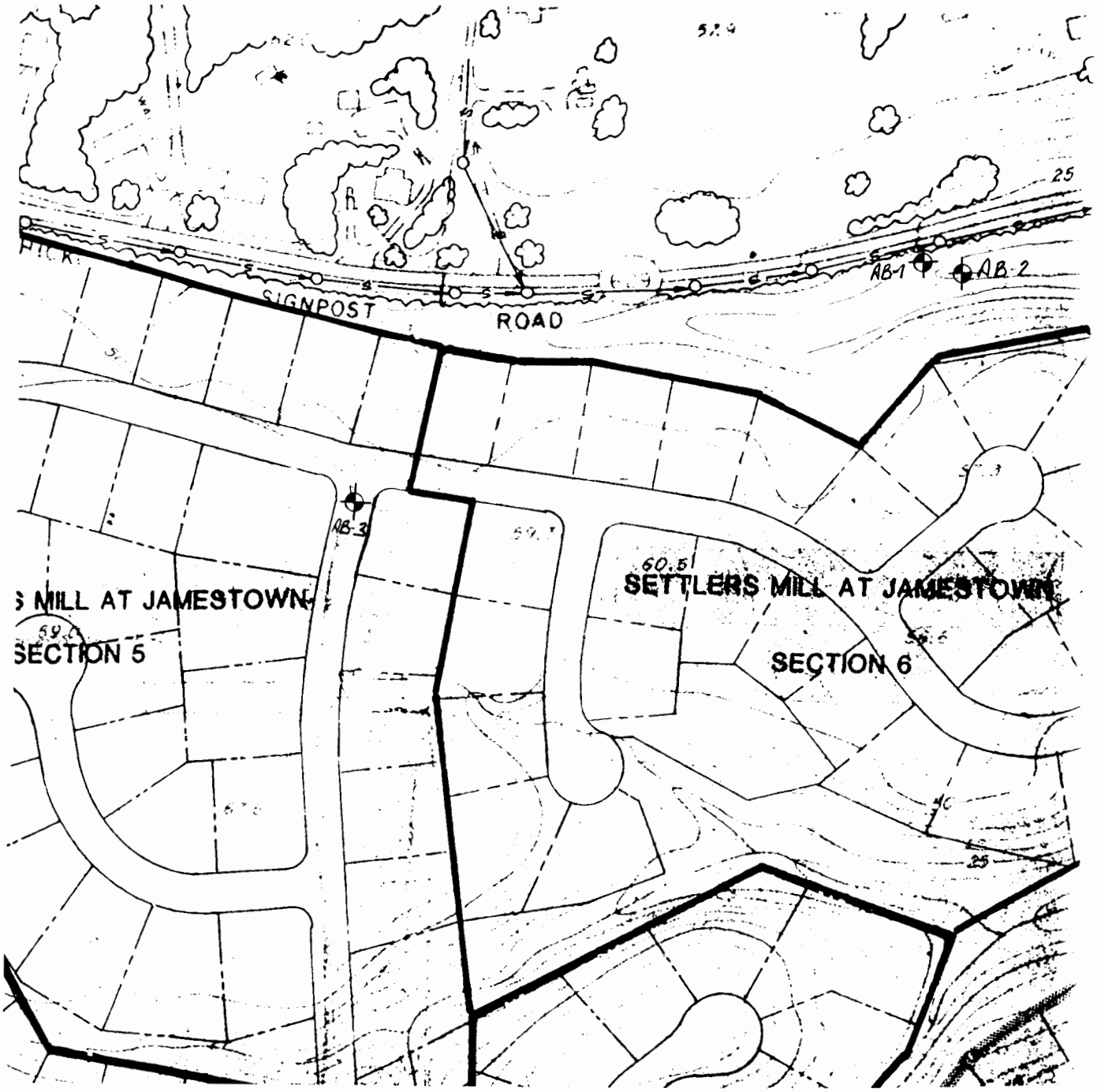
USGS QUADRANGLE MAP

"Williamsburg, Virginia", Norge, Virginia", "Surry, Virginia" and "Hog Island, Virginia"

PROJECT NAME:	Proposed Stormwater Retention Pond - Settler's Mill at Jamestown		
LOCATION:	James City County, Virginia	**SCALE:**	N/A
GEO PROJECT NUMBER:	96NNE.191	**DATE:**	April, 1996
CLIENT:	DMI Corporation		

Geo Design Consultants, Inc.

FIGURE 3



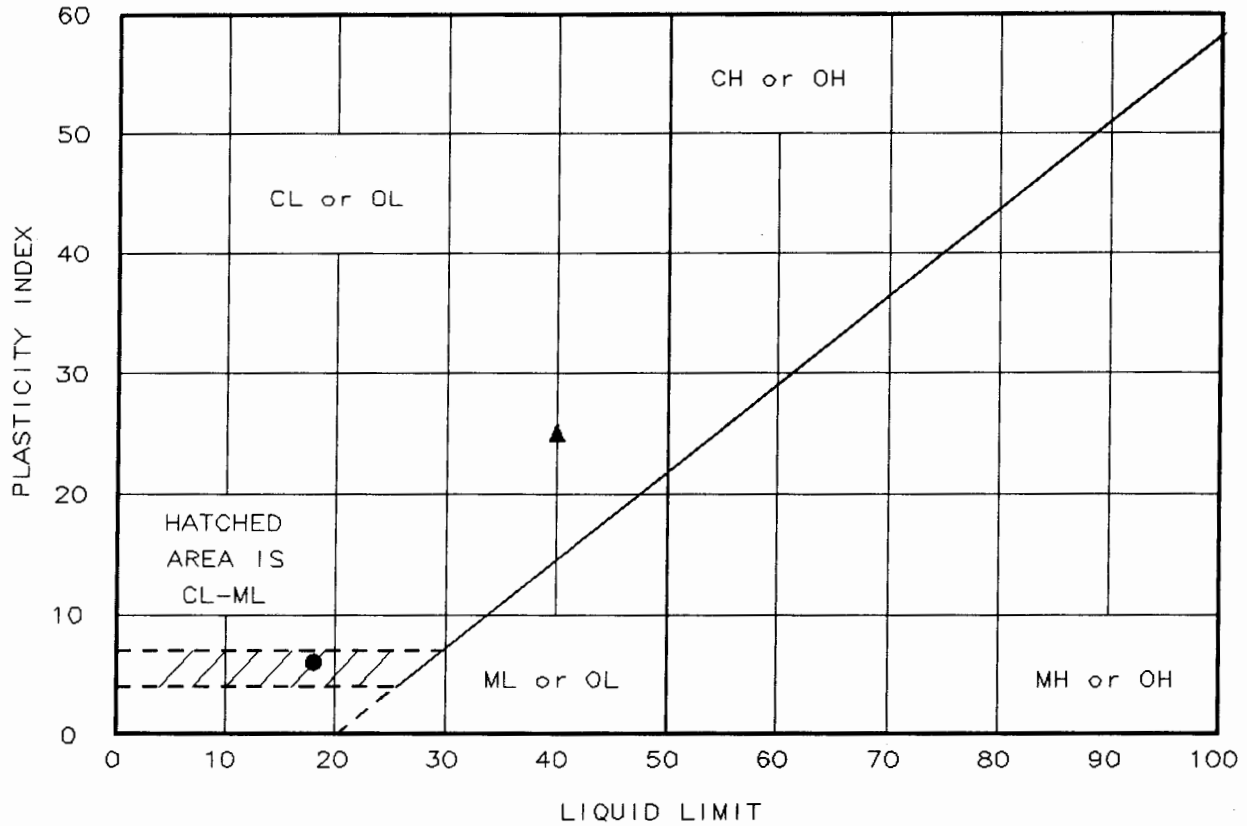
BORING LOCATION SKETCH

PROJECT NAME:	Settler's Mill at Jamestown - Section 6		
LOCATION:	James City County, Virginia	**SCALE:**	N/A
GEO PROJECT NUMBER:	96NNE.191	**DATE:**	April, 1996
CLIENT:	DMI Corporation		

Geo Design Consultants, Inc.

LABORATORY TEST RESULTS

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-90
●	AB 3 1'-2' Sandy Silty Clay	18	12	6	53.70	CL-ML, Sandy silty clay
▲	AB-3 4'-5' Reddish Brown Sandy Clay	40	15	25	66.02	CL, Sandy lean clay

Project No.: 96NNE.191
Project: Storm Water Retention Pond
Settlers Mill
Client: DMI Corporation
Location: James City County, Virginia

Date: 4-28-96

Remarks:

LIQUID AND PLASTIC LIMITS TEST REPORT

GEO DESIGN CONSULTANTS, INC.

Fig. No. 4

LOG OF BORING SHEETS

GEO DESIGN CONSULTANTS, INC.	PROJECT NO. 96NNE.191	SHEET 1 OF 1
Project Name: PROPOSED STORMWATER RETIONTION POND		Date: 4/23/96
Client: DMI CORPORATION	Boring Location: SEE BORING LOCATION SKETCH	Hole No.: AB-1
Project Location: JAMES CITY COUNTY, VIRGINIA	Drill Method: HAND AUGER / Station:	Depth of Hole:(Ft): 10
Name of Foreman:	Water Level Observations: (all levels noted in feet) / Noted on Rods:(Ft): 4.0	At Completion:(Ft):
Name of Inspector: J. NORMAN/R. ELAWAR, P.E.	After Hours Feet	Cave in at:(Ft):
Signature of Inspector:		

DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	REMARKS
0		12" TOPSOIL	
1		BROWN, MOIST, SILTY SAND (SM), TRACE OF ROOTS	
2		BROWN, VERY MOIST, CLAYEY SAND (SC)	
3			
4			
5			
6			
7			
8			
9			
10			
		BORING TERMINATION AT 10 FT.	

Project	PROPOSED STORMWATER RETIONTION POND	HOLE NO. AB-1

GEO DESIGN CONSULTANTS, INC.	PROJECT NO. 96NNE.191		SHEET 1 OF 1
Project Name: PROPOSED STORMWATER RETIONTION POND			Date: 4/23/96
Client: DMI CORPORATION	Boring Location: SEE BORING LOCATION SKETCH		Hole No.: AB-2
Project Location: JAMES CITY COUNTY, VIRGINIA	Drill Method: HAND AUGER	Station:	Depth of Hole:(Ft): 6.5
Name of Foreman:	Water Level Observations: (all levels noted in feet)	Noted on Rods:(Ft): 2.0	At Completion:(Ft):
Name of Inspector: J. NORMAN/R. ELAWAR, P.E.	After Hours	Feet	Cave in at:(Ft):
Signature of Inspector:			

DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	REMARKS
0		DARK BROWN, SILTY SAND AND ORGANIC MAT (PT)	
1			
2		BROWN AND GRAY, MOTTLED, SATURATED, SILTY TO CLAYEY SAND (SM-SC)	
3			
4			
5			
6			
6.5		BORING TERMINATION AT 6.5 FT.	

Project	PROPOSED STORMWATER RETIONTION POND	HOLE NO. AB-2

GEO DESIGN CONSULTANTS, INC.	PROJECT NO. 96NNE.191	SHEET 1 OF 1
Project Name: PROPOSED STORMWATER RETIONTION POND		Date: 4/23/96
Client: DMI CORPORATION	Boring Location: SEE BORING LOCATION SKETCH	Hole No.: AB-3
Project Location: JAMES CITY COUNTY, VIRGINIA	Drill Method: HAND AUGER / Station:	Depth of Hole:(Ft): 10
Name of Foreman:	Water Level Observations: (all levels noted in feet) / Noted on Rods:(Ft)	At Completion:(Ft)
Name of Inspector: J. NORMAN/R. ELAWAR, P.E.	After Hours Feet	Cave in at:(Ft)
Signature of Inspector:		

DEPTH	LEGEND	CLASSIFICATION OF MATERIAL (Description)	REMARKS
0		9" TOPSOIL	
1		BROWN, MOIST, SANDY CLAY TO SANDY SILT (CL, CL-ML)	
2			
3			
4			
5			
6			
7			
8			
9			
10			
		BORING TERMINATION AT 10 FT.	

Project	PROPOSED STORMWATER RETIONTION POND	HOLE NO. AB-3

SLOPE STABILITY ANALYSES

** PCSTABL5 **

by
Purdue University

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer's Method of Slices

Run Date:	01-28-80
Time of Run:	7:00am
Run By:	Raja S. Elawar
Input Data Filename:	C:96NNE19.IN
Output Filename:	C:96NNE19.OUT
Plotted Output Filename:	C:96NNE19.PLT

PROBLEM DESCRIPTION Stormwater Management Retention Pond
Settlers Mill At Jamestown, Section 6

BOUNDARY COORDINATES

5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	16.00	150.00	16.50	2
2	150.00	16.50	180.00	26.50	1
3	180.00	26.50	192.00	26.50	1
4	192.00	26.50	222.00	16.50	1
5	222.00	16.50	280.00	17.00	2

ISOTROPIC SOIL PARAMETERS

2 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	120.0	600.0	5.0	.00	.0	1
2	120.0	120.0	300.0	.0	.00	.0	2

2 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	204.00	22.50
2	280.00	22.50

Piezometric Surface No. 2 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	16.00
2	150.00	16.50

Searching Routine Will Be Limited To An Area Defined By 1 Boundaries Of Which The First 1 Boundaries Will Deflect Surfaces Upward

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)
1	.00	.00	280.00	.00

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

10 Trial Surfaces Have Been Generated.

5 Surfaces Initiate From Each Of 2 Points Equally Spaced Along The Ground Surface Between X = 100.00 ft.
and X = 160.00 ft.

Each Surface Terminates Between X = 180.00 ft.
and X = 195.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

2.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 50 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	16.33
2	101.45	14.95
3	102.95	13.63
4	104.49	12.36
5	106.08	11.15
6	107.72	10.00
7	109.40	8.91
8	111.11	7.88
9	112.86	6.91
10	114.65	6.01
11	116.47	5.18
12	118.32	4.42
13	120.19	3.72
14	122.09	3.09
15	124.01	2.54
16	125.95	2.05
17	127.91	1.64
18	129.88	1.30
19	131.86	1.03
20	133.85	.84
21	135.85	.72
22	137.85	.67
23	139.85	.69
24	141.84	.79
25	143.84	.97
26	145.82	1.22
27	147.80	1.54
28	149.76	1.93
29	151.70	2.39
30	153.63	2.93
31	155.53	3.54
32	157.42	4.21
33	159.27	4.96
34	161.10	5.77
35	162.90	6.65
36	164.66	7.60
37	166.38	8.61
38	168.07	9.68
39	169.72	10.81
40	171.32	12.01
41	172.88	13.26
42	174.39	14.57

43	175.86	15.94
44	177.27	17.35
45	178.63	18.82
46	179.93	20.34
47	181.17	21.90
48	182.36	23.51
49	183.49	25.16
50	184.33	26.50

Circle Center At X = 138.1 ; Y = 54.9 and Radius, 54.2

*** 3.751 ***

Failure Surface Specified By 52 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	16.33
2	101.75	15.36
3	103.52	14.43
4	105.31	13.54
5	107.12	12.70
6	108.96	11.90
7	110.81	11.15
8	112.68	10.44
9	114.57	9.78
10	116.47	9.16
11	118.39	8.60
12	120.32	8.08
13	122.26	7.60
14	124.22	7.18
15	126.18	6.80
16	128.16	6.48
17	130.14	6.20
18	132.12	5.97
19	134.11	5.78
20	136.11	5.65
21	138.11	5.57
22	140.11	5.53
23	142.11	5.55
24	144.11	5.61
25	146.10	5.73
26	148.10	5.89
27	150.09	6.10
28	152.07	6.36
29	154.05	6.67
30	156.01	7.02
31	157.97	7.43
32	159.92	7.88
33	161.86	8.38
34	163.78	8.93
35	165.69	9.53
36	167.58	10.17
37	169.46	10.86
38	171.32	11.59

39	173.16	12.38
40	174.98	13.20
41	176.78	14.07
42	178.56	14.98
43	180.32	15.94
44	182.05	16.94
45	183.76	17.98
46	185.44	19.07
47	187.09	20.19
48	188.72	21.36
49	190.31	22.56
50	191.88	23.81
51	193.42	25.09
52	194.19	25.77

Circle Center At X = 140.5 ; Y = 86.9 and Radius, 81.4

*** 3.966 ***

1

Failure Surface Specified By 49 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	16.33
2	101.47	14.97
3	102.98	13.67
4	104.55	12.42
5	106.16	11.24
6	107.81	10.11
7	109.51	9.05
8	111.24	8.06
9	113.01	7.13
10	114.82	6.27
11	116.66	5.48
12	118.52	4.75
13	120.41	4.10
14	122.33	3.53
15	124.26	3.02
16	126.21	2.59
17	128.18	2.23
18	130.16	1.95
19	132.15	1.74
20	134.15	1.61
21	136.15	1.55
22	138.15	1.57
23	140.14	1.67
24	142.14	1.84
25	144.12	2.09
26	146.10	2.41
27	148.06	2.81
28	150.00	3.28
29	151.92	3.82
30	153.83	4.44
31	155.70	5.13

32	157.55	5.89
33	159.37	6.72
34	161.16	7.61
35	162.91	8.58
36	164.63	9.61
37	166.30	10.70
38	167.93	11.86
39	169.52	13.08
40	171.06	14.35
41	172.55	15.69
42	173.99	17.08
43	175.37	18.52
44	176.70	20.02
45	177.97	21.56
46	179.18	23.15
47	180.33	24.79
48	181.42	26.47
49	181.44	26.50

Circle Center At X = 136.6 ; Y = 54.3 and Radius, 52.7

*** 4.207 ***

Failure Surface Specified By 51 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	16.33
2	101.88	15.64
3	103.77	14.99
4	105.67	14.37
5	107.58	13.79
6	109.51	13.24
7	111.44	12.73
8	113.38	12.25
9	115.33	11.81
10	117.29	11.41
11	119.26	11.04
12	121.23	10.71
13	123.21	10.41
14	125.19	10.16
15	127.18	9.93
16	129.17	9.75
17	131.17	9.60
18	133.16	9.49
19	135.16	9.42
20	137.16	9.38
21	139.16	9.38
22	141.16	9.41
23	143.16	9.49
24	145.16	9.60
25	147.15	9.75
26	149.14	9.93
27	151.13	10.15
28	153.11	10.41

29	155.09	10.70
30	157.06	11.04
31	159.03	11.40
32	160.99	11.81
33	162.94	12.25
34	164.88	12.72
35	166.82	13.23
36	168.74	13.78
37	170.65	14.36
38	172.55	14.98
39	174.44	15.63
40	176.32	16.32
41	178.19	17.05
42	180.04	17.80
43	181.88	18.59
44	183.70	19.42
45	185.50	20.28
46	187.29	21.17
47	189.07	22.09
48	190.82	23.05
49	192.56	24.04
50	194.28	25.06
51	194.99	25.50

Circle Center At X = 138.2 ; Y = 117.6 and Radius, 108.2

*** 5.255 ***

1

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	19.83
2	161.51	18.53
3	163.16	17.39
4	164.92	16.44
5	166.77	15.68
6	168.69	15.13
7	170.66	14.79
8	172.66	14.66
9	174.66	14.75
10	176.63	15.06
11	178.56	15.57
12	180.43	16.30
13	182.20	17.22
14	183.87	18.33
15	185.41	19.61
16	186.79	21.05
17	188.02	22.63
18	189.07	24.33
19	189.92	26.14
20	190.05	26.50

Circle Center At X = 172.8 ; Y = 33.1 and Radius, 18.5

*** 6.242 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	19.83
2	161.42	18.42
3	163.00	17.19
4	164.72	16.18
5	166.55	15.38
6	168.47	14.82
7	170.45	14.50
8	172.44	14.43
9	174.44	14.61
10	176.39	15.04
11	178.28	15.71
12	180.06	16.60
13	181.72	17.72
14	183.23	19.03
15	184.57	20.52
16	185.71	22.16
17	186.63	23.94
18	187.33	25.81
19	187.49	26.50

Circle Center At X = 172.0 ; Y = 30.4 and Radius, 16.0

*** 6.306 ***

Failure Surface Specified By 45 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	100.00	16.33
2	101.77	15.41
3	103.57	14.54
4	105.40	13.72
5	107.24	12.95
6	109.11	12.23
7	111.00	11.56
8	112.90	10.95
9	114.82	10.39
10	116.76	9.89
11	118.71	9.44
12	120.67	9.05
13	122.64	8.71
14	124.62	8.43

15	126.61	8.20
16	128.60	8.03
17	130.59	7.92
18	132.59	7.86
19	134.59	7.86
20	136.59	7.91
21	138.59	8.02
22	140.58	8.19
23	142.57	8.42
24	144.55	8.70
25	146.52	9.03
26	148.48	9.42
27	150.43	9.87
28	152.37	10.37
29	154.29	10.92
30	156.20	11.53
31	158.08	12.19
32	159.95	12.91
33	161.80	13.67
34	163.62	14.49
35	165.42	15.36
36	167.20	16.28
37	168.95	17.25
38	170.67	18.27
39	172.36	19.34
40	174.02	20.45
41	175.65	21.62
42	177.25	22.82
43	178.81	24.07
44	180.33	25.37
45	181.59	26.50

Circle Center At X = 133.6 ; Y = 78.8 and Radius, 71.0

*** 6.336 ***

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	19.83
2	161.57	18.59
3	163.24	17.49
4	165.00	16.55
5	166.84	15.75
6	168.74	15.12
7	170.68	14.66
8	172.66	14.37
9	174.66	14.25
10	176.66	14.30
11	178.64	14.53
12	180.60	14.93
13	182.52	15.50
14	184.38	16.23
15	186.17	17.12

16	187.88	18.17
17	189.48	19.36
18	190.98	20.68
19	192.36	22.13
20	193.61	23.69
21	194.72	25.36
22	194.83	25.56

Circle Center At X = 175.0 ; Y = 37.2 and Radius, 23.0

*** 6.528 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	19.83
2	161.86	19.09
3	163.76	18.47
4	165.70	18.00
5	167.68	17.67
6	169.67	17.48
7	171.67	17.43
8	173.66	17.53
9	175.65	17.77
10	177.61	18.15
11	179.54	18.67
12	181.43	19.33
13	183.27	20.12
14	185.04	21.04
15	186.75	22.09
16	188.37	23.25
17	189.91	24.53
18	191.35	25.92
19	191.87	26.50

Circle Center At X = 171.3 ; Y = 45.3 and Radius, 27.9

*** 6.989 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	160.00	19.83
2	161.81	18.98
3	163.70	18.34
4	165.66	17.93
5	167.65	17.76

6	169.65	17.82
7	171.63	18.12
8	173.56	18.65
9	175.41	19.40
10	177.16	20.37
11	178.79	21.54
12	180.26	22.89
13	181.56	24.41
14	182.68	26.07
15	182.90	26.50

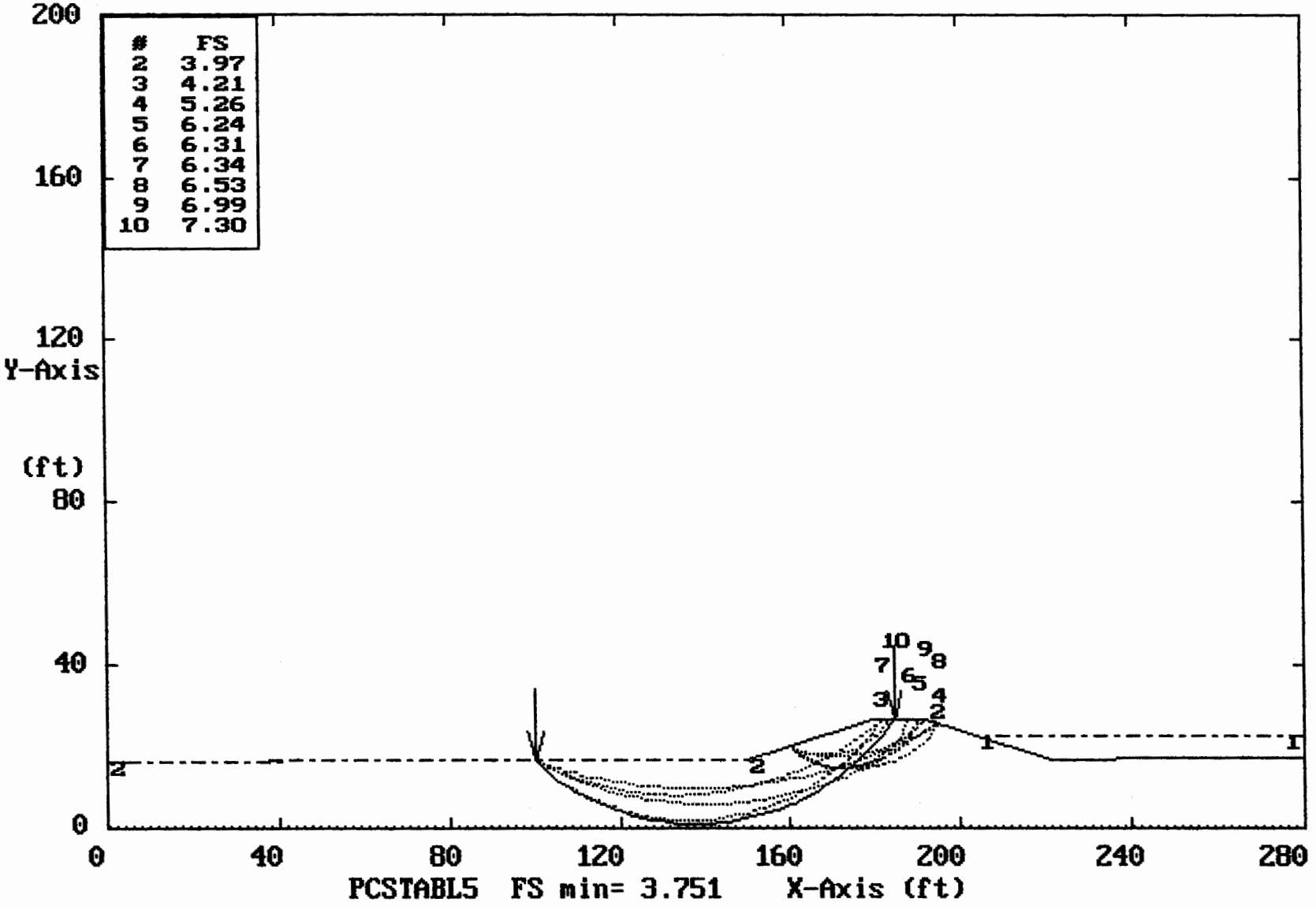
Circle Center At X = 168.1 ; Y = 34.7 and Radius, 16.9

*** 7.296 ***

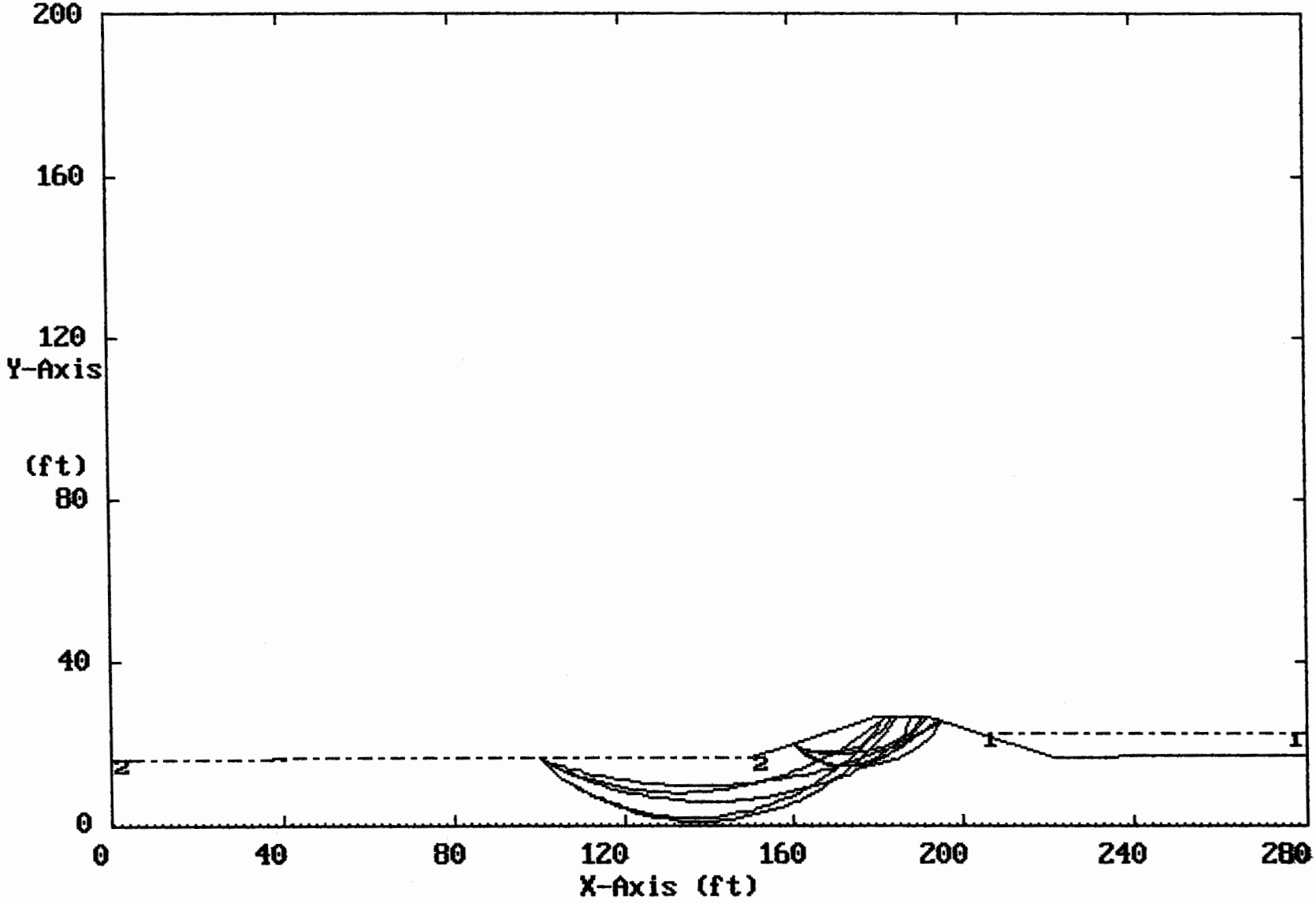
```
            Y            A     X     I     S            F     T

             .00     35.00     70.00    105.00    140.00    175.00

X        .00 L----*----+---------+---------+---------+---------+
             -
             -
             -
             -
             -
      35.00 +
             -
             -
             -
             -
             -
A     70.00 +
             -
             -
             -
             -
             -   11
X    105.00 +  11
             - 114
             -112
             -124
             1124
             1 24
I    140.00 1324
            1324
            -124 *
            -1247 5
            - 1245
            - 1137
S    175.00 +   1137
            -   2111*
            -    2251
            -     22*
            -
```

```
                -      W
        210.00  +
                -
                -     *
                -
                -
                -
F       245.00  +
                -
                -
                -
                -
                -
T       280.00  L     *W
```

Stormwater Management Retention Pond Settlers Mill At Jamestown, Section 6
Ten Most Critical. C:96NNE19.PLT By: Raja S. Elawar 01-28-80 6:56am



Stormwater Management Retention Pond Settlers Mill At Jamestown, Section 6
All surfaces evaluated. C:96NNE19.PLT By: Raja S. Elawar 01-28-80 7:00am



Gary

SEP 24 REC'D!

File #4120

September 18, 1996

DMI Corporation
1111 Old Colony Lane
Williamsburg, Virginia 23185

Attn: Mr. Larry McCardle

Re: Laboratory Testing Program
Settler's Mill - Section 5
James City County, Virginia
Geo Project No: 96NNT.184
Report No. 6

Dear Mr. McCardle:

Geo Design Consultants, Inc. has completed laboratory testing on two (2) bulk soil samples obtained from on-site material for the proposed subject project. The laboratory testing program consisted of soil classification in general accordance with the American Association of State Highway Transportation Officials (AASHTO) test designation M-145, performing natural moisture content determination, partial grain-size analysis (percent passing -200 Sieve), moisture-density relations in general accordance with the American Society of Testing and Materials (ASTM) test designation D-698 and Atterberg Limits (liquid and plastic limits). The laboratory test results are tabulated below and shown in the appendix of this report.

Bulk Soil Sample Number	Soil Description	AASHTO	Natural Moisture Content (%)	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Percent Passing No. 200 Sieve	Atterberg Limits (%)	
							LL (%)	PI
Proctor 3	Reddish Tan Sandy Silty Clay	A-7-6	21.1	100.3	21.4	53.8	45	16
Proctor 4	Tan Sandy Clay	A-6	10.6	115.5	13.9	45.2	40	22

LL = Liquid Limit
PI = Plasticity Index

We appreciate the opportunity to be of service to **DMI Corporation** on this important project and look forward to its successful completion. Should you have any questions regarding this report, please do not hesitate to call our office at (804) 873-4611.

Respectfully submitted,
Geo Design Consultants, Inc.

Donald R. Stites, P.E.
Principal Engineer
VA Reg. No. 19081

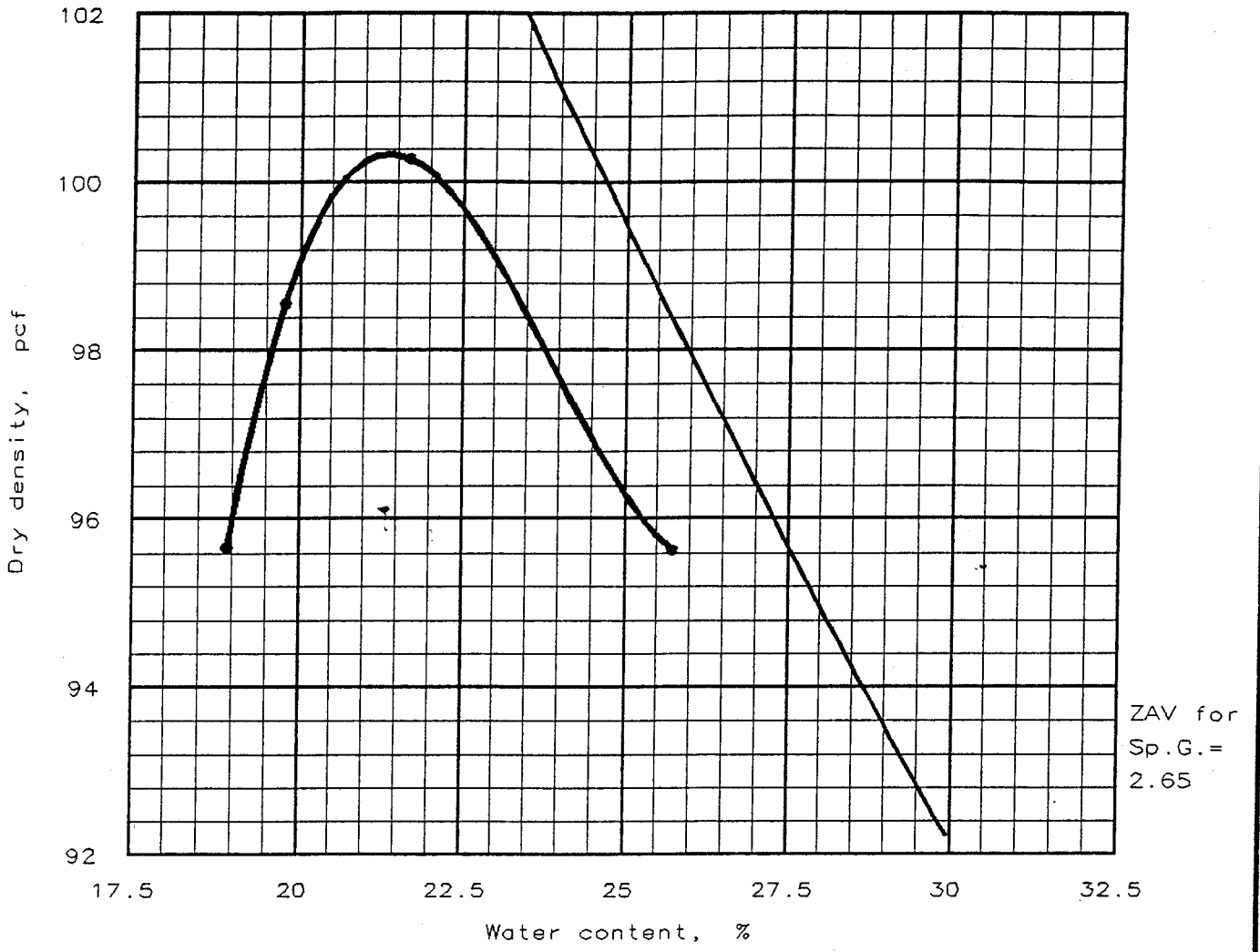
Raja S. Elawar, P.E.
Senior Project Manager
VA Reg. No. 26383

Attachments: Laboratory Test Data

Copies: (1) Jack L. Massie Contractors (Attn: Mr. Steve Massie)
(1) Langley & McDonald, P.C. (Attn: Mr. Doug White)

doc no. c:\wpdocs\testing\96nnt184.006

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	ML	A-7-6(7)	21.1 %	-	45	16	4.2 %	53.8 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 100.3 pcf Optimum moisture = 21.4 %	Reddish Tan

Project No.: 96NNT. 184

Project: Settler's Mill

Location: James City County

Date: 9-16-1996

Remarks:

Proctor # 3

Sampled 9-9-96

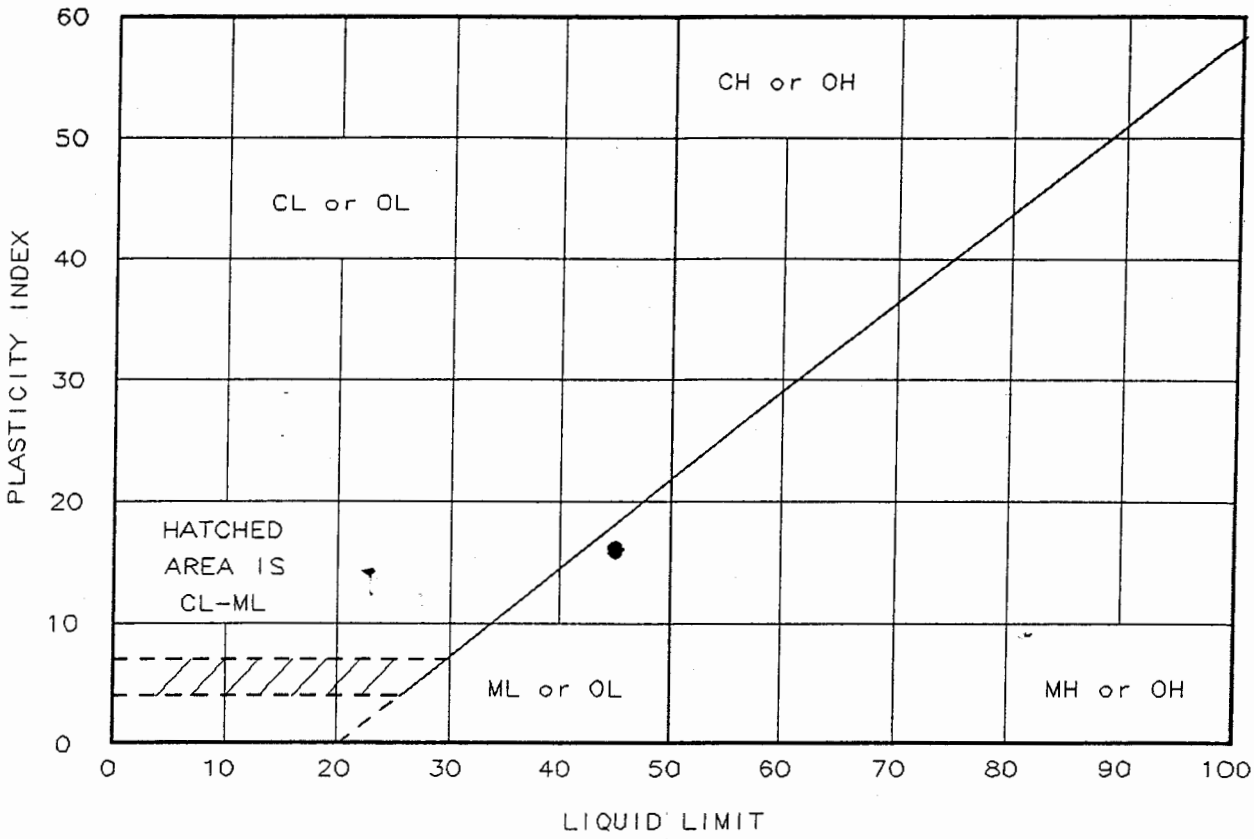
On Site Dam & Key Way

MOISTURE-DENSITY RELATIONSHIP TEST

GEO DESIGN CONSULTANTS, INC.

Fig. No. _____

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	USCS	AASHTO
●	Proc. #3 Reddish Tan	45	29	16	53.8	ML	A-7-6(7)

Project No.: 96NNT.184
Project: Settler's Mill

Client:
Location: James City Co.

Date: 9-16-96

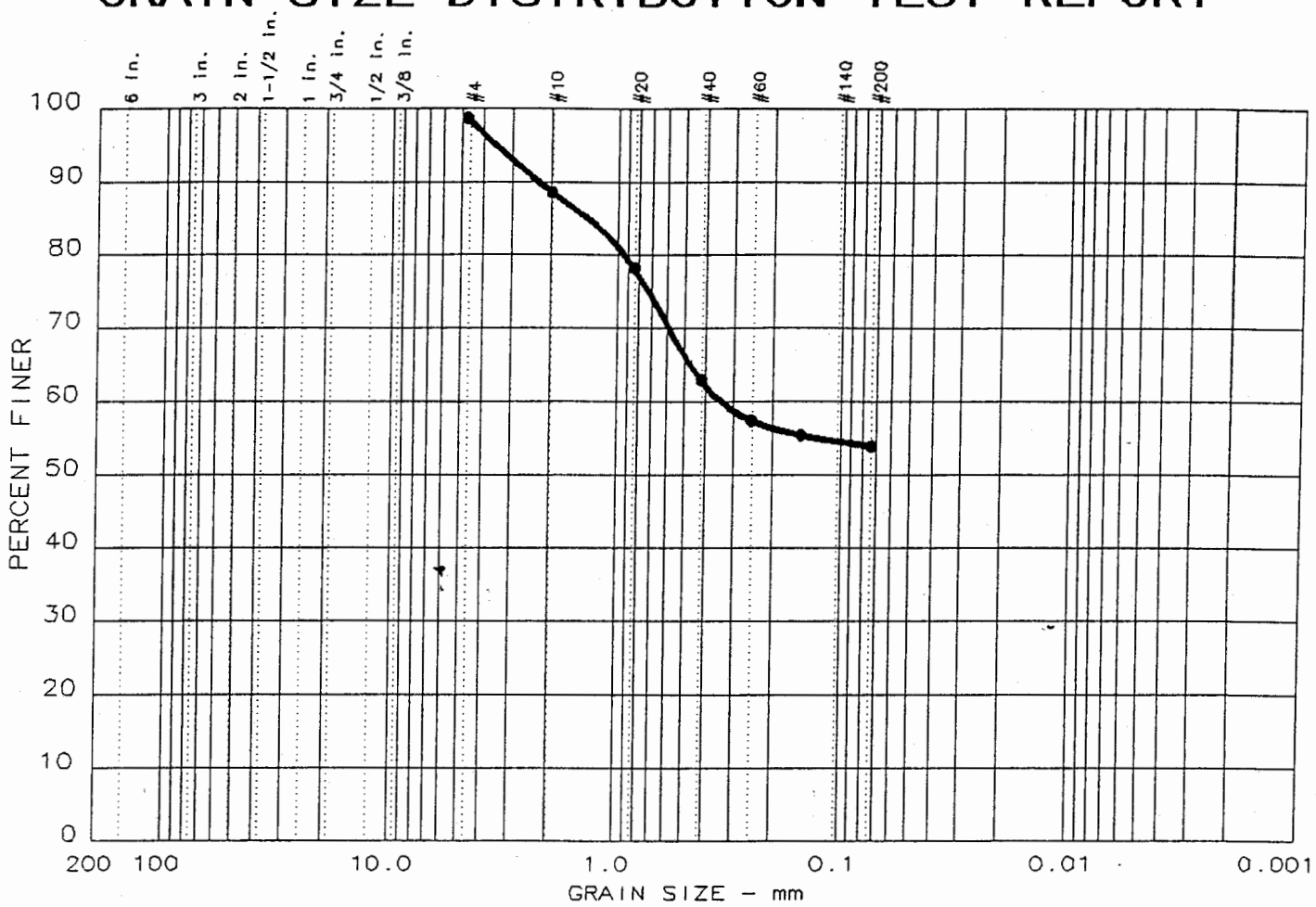
Remarks:
Limits for Proctor #3

LIQUID AND PLASTIC LIMITS TEST REPORT

GEO DESIGN CONSULTANTS, INC.

Fig. No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	8	0.0	0.0	46.2	53.8	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	45	16	1.38	0.343						

MATERIAL DESCRIPTION	USCS	AASHTO
● Reddish Tan	ML	A-7-6(7)

Project No.: 96NNT.184
Project: Settler's Mill
● Location: James City Co.

Date: 9-9-96

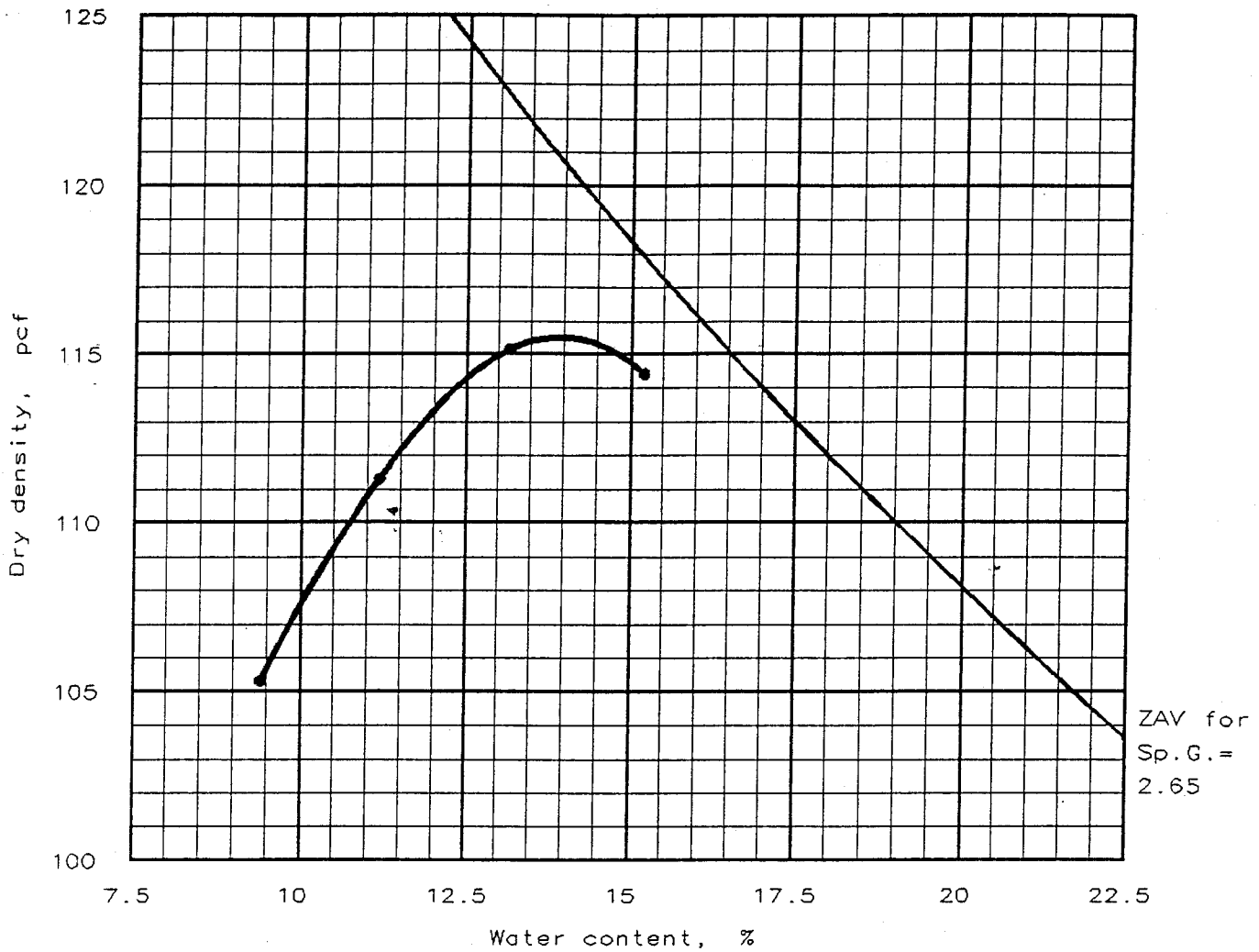
Remarks:
Sieve Anaylsis for
Proc #3

GRAIN SIZE DISTRIBUTION TEST REPORT

GEO DESIGN CONSULTANTS, INC.

Figure No. _____

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SC	A-6(6)	10.6 %	-	40	22	0.0 %	45.2 %

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 115.5 pcf Optimum moisture = 13.9 %	Tan

Project No.: 96NNT. 184

Project: Settler's Mill

Location: James City County

Date: 9-16-1996

Remarks:

Proctor # 4

Sampled 9-10-96

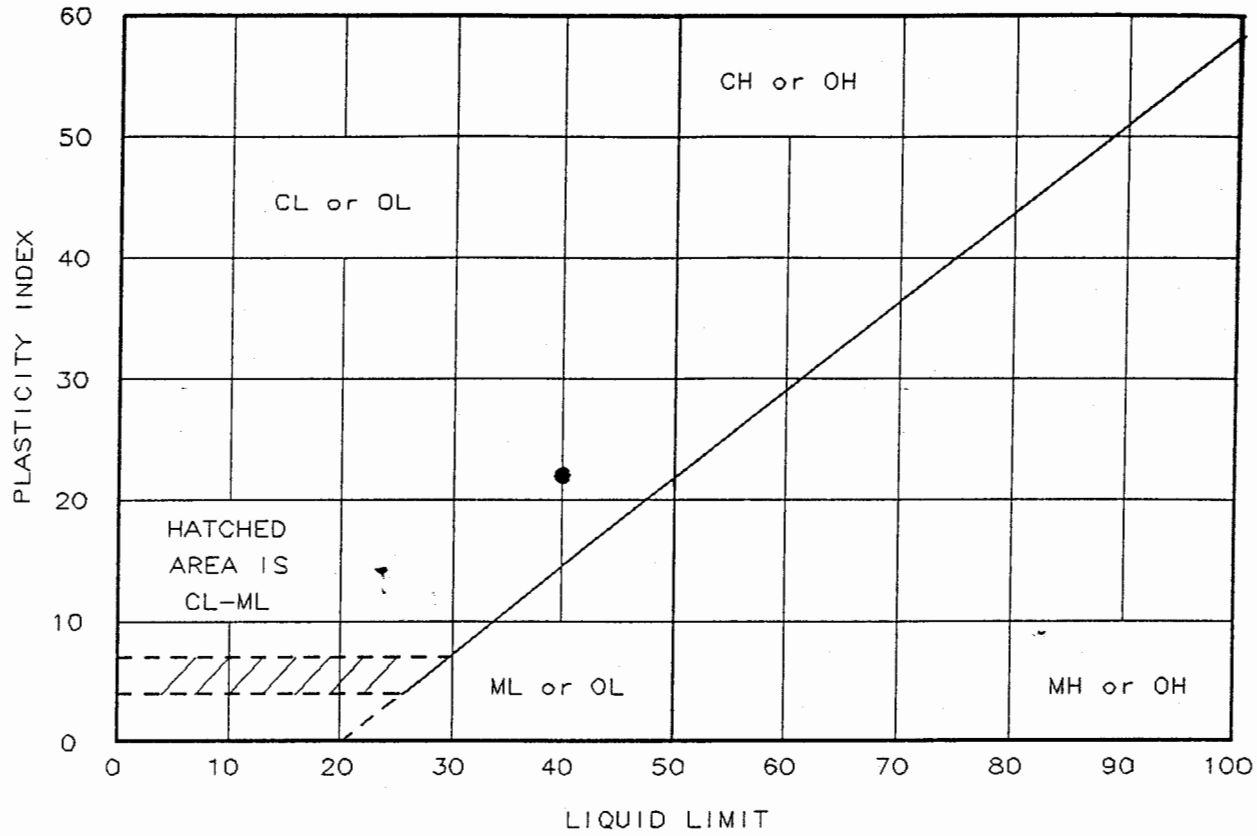
On site Roadway Mat.

MOISTURE-DENSITY RELATIONSHIP TEST

GEO DESIGN CONSULTANTS, INC.

Fig. No. _____

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	USCS	AASHTO
● Proc #4 Tan	40	18	22	45.2	SC	A-6(6)

Project No.: 96NNT.184
Project: Settler's Mill

Client:
Location: James City Co.

Date: 9-16-96

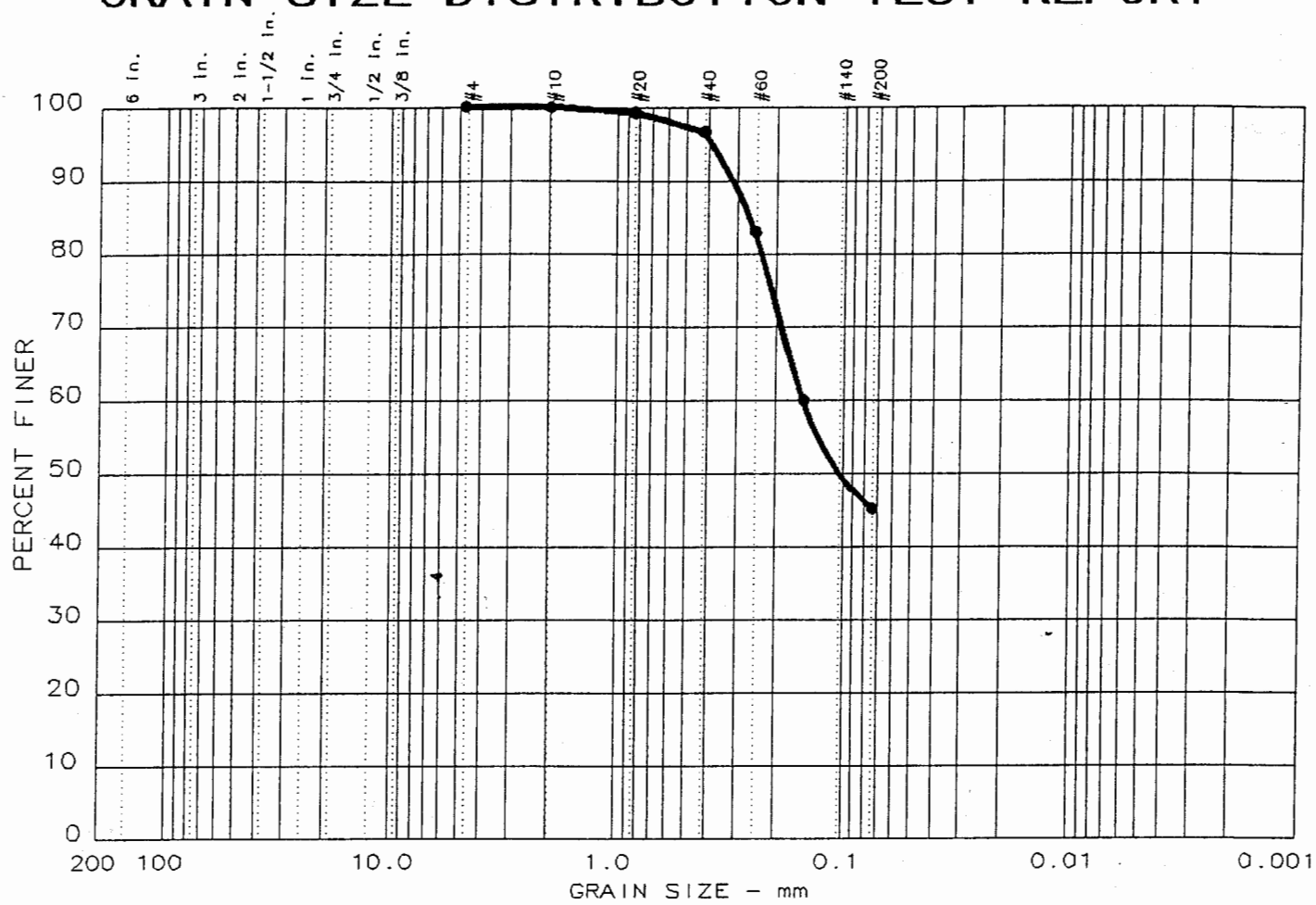
Remarks:
Limits for proctor #4

LIQUID AND PLASTIC LIMITS TEST REPORT

GEO DESIGN CONSULTANTS, INC.

Fig. No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	9	0.0	0.0	54.6	45.4	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	40	22	0.263	0.150	0.104					

MATERIAL DESCRIPTION	USCS	AASHTO
● Tan	SC	A-6(6)

Project No.: 96NNT.184
Project: Settler's Mill
● Location: James City Co.

Date: 9-10-96

Remarks:
Sieve Anaylsis for
Proc #4

GRAIN SIZE DISTRIBUTION TEST REPORT

GEO DESIGN CONSULTANTS, INC.

Figure No. _____

OCT - 5 RECD

September 30, 1996

DMI Corporation
1111 Old Colony Lane
Williamsburg, Virginia 23185

Attn: Mr. Larry McCardle

Re: In-Place Density Test Results
Settler's Mill at Jamestown - Section 5
James City County, Virginia
Geo Project No: 96NNT.184
Report No. 3

Pursuant to the request of Mr. Jack L. Massie with Jack L. Massie Contractor Inc., an experienced Engineering Technician visited the project site on August 21 and September 3, 10, 16, 19, 20 and 21, 1996. The specific purpose of these visits was to conduct in-place density testing at the subject site. The in-place density tests were performed in general accordance with the American Society for Testing and Materials (ASTM) Test Designation D-2922. The density test results have been attached to this report.

DENSITY TEST RESULTS

Roadway Area

In-place density testing of the fill material for the roadway area resulted in field density test results ranging from 96.6 to 121.5 pounds per cubic foot (pcf) at moisture contents ranging from 12.3 to 20.4 percent. When compared to the appropriate proctor value, the test results indicated the in-place soils tested had been densified to relative compactions ranging from 89.4 to 100+ percent. The in-place density test results met the required minimum relative compaction of 95 percent per the project plans and specifications, with the exception of test numbers 3 and 4 conducted on August 21, 1996.

Dam Area

In-place density testing of the fill material for the dam area resulted in field density test results ranging from 95.3to 103.4 pcf at moisture contents ranging from 20.3 to 26.5 percent. When compared to the appropriate proctor value, the test results indicated the in-place soils tested had been densified to relative compactions ranging from 95.0 to 100+ percent. The in-place density test results met the required minimum relative compaction of 95 percent per the project plans and specifications.

We appreciate the opportunity to be of service to **DMI Corporation** on this important project and look forward to its successful completion. Should you have any questions regarding this report or if you need further assistance, please do not hesitate to call our office at (804) 873-4611.

Respectfully submitted,
Geo Design Consultants, Inc.

David L. Doran/pRW
David L. Doran
Staff Engineer

Donald R. Stites, P.E.
Principal Engineer
VA Reg. No. 19081

Attachments: Field Density Test Results

Copies: (3) Client

wpwin60\wpdocs\testing\96nnt184.003

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/19/96
Weather: CLEAR Temp.(°F): 77°
Field Copy Given to Client? ___ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	23.8	100.8	3	95	100+	X		-11	DOWNSTREAM TOE; 75' S. OF ROAD
2	24.7	101.3	3	95	100+	X		-10	KEYWAY; 75' S. OF ROAD
3	25.4	96.8	3	95	96.5	X		-10	DOWNSTREAM TOE; 60' S. OF ROAD
4	24.8	99.7	3	95	99.4	X		-10	20' UPSTREAM FROM TEST NO. 3
5	25.8	96.2	3	95	95.9	X		-9	DOWNSTREAM TOE; 70' S. OF ROAD
6	26.5	98.4	3	95	98.1	X		-9	KEYWAY; 70' S. OF ROAD
7	24.9	97.2	3	95	96.9	X		-8	DOWNSTREAM TOE; 55' S. OF ROAD
8	20.3	103.4	3	95	100+	X		-8	UPSTREAM KEYWAY; 75' S. OF ROAD

Compaction Equipment Used: SHEEPSFOOT ROLLER
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.
Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON DAM & KEYWAY AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/19/96
Weather: CLEAR Temp.(°F): 77°
Field Copy Given to Client? ____ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
9	24.2	95.3	3	95	95.0	X		-7	DOWNSTREAM TOE; 45' S. OF ROAD
10	25.6	95.3	3	95	95.0	X		-7	UPSTREAM TOE; 50' S. OF ROAD

Compaction Equipment Used: SHEEPSFOOT ROLLER/VIBRATOR
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.____
Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON DAM AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/20/96
Weather: CLEAR Temp.(°F): 60°
Field Copy Given to Client? ___ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	25.0	95.5	3	95	95.2	X		-6	DOWNSTREAM TOE; 70' S. OF ROAD
2	24.1	100.0	3	95	99.7	X		-6	DOWNSTREAM TOE; 60' S. OF ROAD
3	24.4	98.3	3	95	98.0	X		-5	DOWNSTREAM TOE; 50' S. OF ROAD
4	25.0	95.7	3	95	95.4	X		-5	UPSTREAM TOE; 50' S. OF ROAD
5	23.9	95.8	3	95	95.5	X		-5	DOWNSTREAM TOE; 80' S. OF ROAD
6	20.4	100.7	3	95	100+	X		-5	UPSTREAM TOE; 80' S. OF ROAD

Compaction Equipment Used: SHEEPSFOOT ROLLER
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.
Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON DAM AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/20/96
Weather: CLEAR Temp.(°F): 77°
Field Copy Given to Client? ____ Yes __X__ No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	12.0	112.7	4	95	97.6	X		-4	RE-TEST OF TEST NO. 12 (9/10/96)

Compaction Equipment Used: SHEEPSFOOT ROLLER/VIBRATOR
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.____
Proctor No.: 4
Max. Density (PCF): 115.5
Opt. Moisture (%): 13.9

Remarks: TESTS CONDUCTED ON ROADWAY AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/21/96
Weather: CLEAR Temp.(°F): 70°
Field Copy Given to Client? ___ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	24.3	97.2	3	95	96.9	X		-8	1' OVER PIPE OVERFLOW
2	22.0	100.9	3	95	100+	X		-7	2' OVER PIPE OVERFLOW
3	23.1	95.5	3	95	95.2	X		-6	3' OVER PIPE OVERFLOW

Compaction Equipment Used: JUMPING JACK
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.
Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON DAM OVERFLOW INSTALLATION AREA.

October 15, 1996

OCT 23 REC'D

DMI Corporation
1111 Old Colony Lane
Williamsburg, Virginia 23185

Attn: Mr. Larry McCardle

Re: In-Place Density Test Results
Settler's Mill at Jamestown - Section 5
James City County, Virginia
PSI/Geo Project No: 239-60184
Report No. 7

Pursuant to the request of Mr. Rick Cook with Jack L. Massie Contractor, Inc., an experienced Engineering Technician visited the project site on September 23, 24, 25, 27, 28, October 1, 2, 3, 4 and 7, 1996. The specific purpose of these visits was to conduct in-place density testing at the subject site. The in-place density tests were performed in general accordance with the American Society for Testing and Materials (ASTM) Test Designation D-2922. The density test results have been attached to this report.

DENSITY TEST RESULTS

Roadway Area

In-place density testing of the fill material for the roadway area resulted in field density test results ranging from 98.6 to 118.6 pounds per cubic foot (pcf) at moisture contents ranging from 12.2 to 26.2 percent. When compared to the appropriate proctor value, the test results indicated the in-place soils tested had been densified to a relative compactions ranging from 95.0 to 100+ percent. The in-place density test results met the required minimum relative compaction of 95 percent per the project plans and specifications.

Dam Area

In-place density testing of the fill material for the dam area resulted in field density test results ranging from 95.2 to 112.6 pcf at moisture contents ranging from 17.4 to 26.3 percent. When compared to the appropriate proctor value, the test results indicated the in-place soils tested had been densified to relative compactions ranging from 95.2 to 100+ percent. The in-place density test results met the required minimum relative compaction of 95 percent per the project plans and specifications.

Utility Line Area

In-place density testing of the backfill material for the utility line area resulted in field density test results ranging from 91.5 to 109.5 pcf at moisture contents ranging from 14.0 to 23.6 percent. When compared to the appropriate proctor value, the test results indicated the in-place soils tested had been densified to relative compactions ranging from 91.2 to 100+ percent. The in-place density test results met the required minimum relative compaction of 90 and 95 percent per the project plans and specifications, with the exception of test numbers 1 and 2 conducted on October 4, 1996.

We appreciate the opportunity to be of service to **DMI Corporation** on this important project and look forward to its successful completion. Should you have any questions regarding this report or if you need further assistance, please do not hesitate to call our office at (757) 873-4611.

Respectfully submitted,
PSI/Geo Design Consultants, Inc.

David L. Doran/PRW

David L. Doran
Staff Engineer

Donald R. Stites, P.E.
Branch Manager
VA Reg. No. 19081

Attachments: Field Density Test Results

Copies: (3) Client

wpwin60\wpdocs\testing\96nnt184.007

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/23/96
Weather: CLOUDY Temp.(°F): 70°
Field Copy Given to Client? ____ Yes __X__ No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	23.4	99.1	3	95	98.8	X		-6	UPSTRM OF KEYWAY;PRIM. SPILLWAY
2	24.4	98.4	3	95	98.1	X		-7	AT MANHOLE OF PRIMARY SPILLWAY
3	24.5	97.3	3	95	97.0	X		-7	DOWNSTREAM OF M.H. AT TEST NO. 2
4	17.4	112.6	4	95	97.5	X		-8	90' S. OF RD.; DWNSTRM OF KEYWAY

Compaction Equipment Used: JUMPING JACK/SHEEPSFOOT ROLLER/VIBRATOR Field Rep.

(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Proctor No.: 3/4
Max. Density (PCF): 100.3/115.5
Opt. Moisture (%): 21.4/13.9

Remarks: TESTS CONDUCTED ON DAM & DAM OVERFLOW AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/24/96
Weather: CLOUDY Temp.(°F): 70°
Field Copy Given to Client? ____ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	19.1	100.5	3	95	100+	X		-11	IN KEYWAY; 100' S. OF ROAD
2	19.1	106.6	1	95	98.6	X		-10	BRIDGE LIFT DWNSTRM OF KEYWAY

Compaction Equipment Used: SHEEPSFOOT ROLLER/VIBRATOR
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.
Proctor No.: 1/3
Max. Density (PCF): 108.1/100.3
Opt. Moisture (%): 18.0/21.4

Remarks: TESTS CONDUCTED ON DAM & KEYWAY AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (804) 873-4611
Fax: (804) 873-4612

Project: SETTLER'S MILL - PHASE 5
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 9/25/96
Weather: CLEAR Temp.(°F): 68°
Field Copy Given to Client? ___ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation at Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	21.3	97.4	3	95	97.1	X		-5	OVER KEYWAY
2	24.8	100.5	3	95	100+	X		-4	UPSTREAM OF KEYWAY
3	26.3	95.7	3	95	95.4	X		-3	OVER KEYWAY
4	19.2	105.0	3	95	100+	X		-2	50' S. OF ROAD; TOP OF DAM CORE
5	24.0	95.5	3	95	95.2	X		-1	35' S. OF ROAD

Compaction Equipment Used: SHEEPSFOOT ROLLER/VIBRATOR
(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Field Rep.
Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON DAM CORE AREA.

GEO DESIGN CONSULTANTS, INC.
11835 CANON BOULEVARD, SUITE C-108
NEWPORT NEWS, VIRGINIA 23606
Phone: (757) 873-4611
Fax: (757) 873-4612

Project: SETTLERS MILL - SECTION B
Client: DMI CORPORATION
General Contractor: JACK L. MASSIE CONTRACTOR, INC.
Grading Contractor: JACK L. MASSIE CONTRACTOR, INC.
Technician: BRIAN BURDETTE

Job No.: 96NNT.184
Client Job No.:
Date: 10/03/96
Weather: CLOUDY Temp.(°F): 67°
Field Copy Given to Client? ___ Yes X No

Test No.	Moisture (%)	Dry Density (PCF)	Proctor Number	% of Proctor		Pass	Fail	Elevation At Finish Grade (FT)	Location, Grid, Coordinates, or Roadway Station
				Spec	Actual				
1	23.4	100.2	3	90	99.9	X		FG	SEWER LINE ACROSS DAM @ PRIMARY SPILLWAY
2	23.6	91.5	3	90	91.2	X		FG	SEWER LINE ACROSS DAM BTWN PRIMARY & EMER. SPILLWAY

Compaction Equipment Used: JUMPING JACK & SMALL SHEEPS FOOT ROLLER/VIBRATOR Field Rep.

(1) **Test Location Established By:** ESTIMATION
(2) **Depth of Elev. of Test Established By:** ESTIMATION
(3) **Test Conducted On:** FILL MATERIAL
(4) **Proctor Type:** ASTM D698 (Standard)

Proctor No.: 3
Max. Density (PCF): 100.3
Opt. Moisture (%): 21.4

Remarks: TESTS CONDUCTED ON SEWER LINE; OUT OF DAM CORE = 90% OR BETTER COMPACTION

Larry McCardle
910 S. Henry Street
Williamsburg VA 23185
Phone 757 220-9100 Fax 757 220-9209
E-mail: lrm910@cox.net

RECEIVED
FEB - 7
ENVIRONMENTAL DIVISION

February 6, 2006

Scott J. Thomas, P.E.
James City County, Environmental Division
PO Box 8784
Williamsburg, VA 23187

Reference : Wet Pond Section 6 MC 007 SP-19-95
Request to waive Construction Certification Requirement

Dear Mr. Thomas

We appreciate your attending a site visit at the above referenced wet pond on February 3, 2006. We are in receipt of your e-mail of 2-3-06 and are proceeding to complete all items of work that you outlined. Based on the following we request that you waive the construction certification requirement for the above referenced Wet Pond:

1) The pond was constructed in the fall of 1996 and a certification cannot be prepared this late after the fact.
2) Laboratory test report on bulk sample from project used in dam construction is provided attached.
3) Field density test results on Dam construction summarized on 9-30-96 for work performed 9-19, 20, 21-1996 is provided attached.
4) Field density test results on Dam construction summarized on 10-15-96 for work performed 9-23, 24, 25, & 10-03 1996 is provided attached.
5) The dam and structure has functioned well through out the past 9+ years through major hurricanes without incident.

We request, based on the information above that you waive the Construction Certification Requirement for the above referenced Wet Pond. Upon completion of the punch list items in your 2-3-06 e-mail copy attached please release our bond in the amount of $ 25,000.00. I write this on behalf of Settlers Mill Inc. of which I am President.

Sincerely,

Larry McCardle

Scott Thomas

From: Scott Thomas
Sent: Monday, April 03, 2006 4:05 PM
To: 'lrm910@cox.net'; 'gary@jackmassie.com'
Cc: Joan Etchberger; Tina Cooke
Subject: BMP at Settlers Mill Section 6
Attachments: S1995.mc007.pdf

Project: Settlers Mill Section 6 (S-19-95)
County BMP ID Code: MC 007

Attached is a response to your BMP Construction Certification variance request dated February 6, 2006. A hard copy on letterhead will be sent via regular mail to you.

Scott J. Thomas, P.E.
James City County
Environmental Division

Visit:
http://www.james-city.va.us/resources/devmgmt/div_devmgmt_environ.html
and
www.protectedwithpride.org

DEVELOPMENT MANAGEMENT

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

CODE COMPLIANCE
(757) 253-6626
codecomp@james-city.va.us

ENVIRONMENTAL DIVISION
(757) 253-6670
environ@james-city.va.us

PLANNING
(757) 253-6685
planning@james-city.va.us

COUNTY ENGINEER
(757) 253-6678
MOSQUITO CONTROL
(757) 259-4116

April 3, 2006

Mr. Larry McCardle
910 South Henry Street
Williamsburg, Va. 23185

Re: Settlers Mill Section 6
Wet Pond BMP # 5
Construction Certification Waiver Request
County Plan No. S-19-95; County BMP ID Code: MC 007

Dear Mr. McCardle:

The Environmental Division is in receipt of your written request dated February 6, 2006 to waive construction certification requirements for the above referenced BMP facility. The BMP for the project is an 8-point wet pond BMP which services about 31 acres within Settlers Mill Sections 5 and 6. The BMP is about 1.5 acres in size and is situated along Hickory Sign Post Road within the Section 6 development area. For this specific project, Note # 18 on Sheet 8 of the approved plan set indicated the following:

> *"Asbuilt drawings must be provided for all detention/BMP facilities. Also, upon completion, the construction of all detention/BMP facilities shall be certified by a professional engineer who inspected the structure during construction. The certification shall state that to the best of his/her judgement, knowledge and belief the structure was constructed in accordance with the approval plans and specificiations."*

As this note was present on the approved plans and specifications, it was responsibility of the Owner or Contractor to ensure a professional engineer was present during the construction process to observe construction and to provide proper construction certification once the structure was completed.

Although recently, we have strengthened and provided better definition to the record drawing (as-built) and construction certification process for stormwater management facilities, the requirement for construction certification by a registered professional engineer has not changed since review and approval of this plan (around 1996).

In full consideration of your request, there appears to be adequate documentation to substantiate that testing was performed on the dam during it's construction; however, there was an apparent failure by the Owner or Contractor to properly retain the services of a professional engineer to provide subsequent construction certification. The basis of the variance request is that too much time has passed in order to obtain a construction certification for BMP # 5 without use of invasive postconstruction testing methods.

Based on our field inspection of the BMP and a full review of the active file, approved design plan, onsite and offsite adjacent land uses and post-construction certification information as submitted (Testing Reports dated September 18, September 30 and October 15, 1996 by GEO Design Consultants Inc.), it has been determined that for ***this specific review case only***, the construction certification requirement will be waived. The primary reasons for granting a waiver for this case are outlined as follows. (Note: Specific conditions to granting of the waiver follow below.)

- It appears that adequate and proper geotechnical testing was performed during construction of the dam embankment. The laboratory report dated September 18, 1996 shows proctor tests performed on soils used for dam construction. The laboratory report dated September 30, 1996 shows twenty (20) passing tests for density and soil moisture as performed for the dam embankment, keyway and barrel. The laboratory report dated October 15, 1996 shows over thirteen (13) passing tests for density and soil moisture as performed for the keyway, principal spillway, bridge lift, dam core and for the sewer constructed across the dam.

- The dam embankment has not exhibited any unusual signs of seepage, stress, malfunction or failure since it's completion, even during Hurricanes Floyd and Isabel. The basin appears to fill and draw down per the intended design.

- Overall, there are no obvious signs indicating threatening conditions to the stormwater function or structural integrity of the stormwater management facility.

- The facility appears to have been reasonably maintained by the Developer/Contractor since completion.

Conditions

- Based on our re-inspection of the BMP on March 24, 2006, the metal access hatch on the riser had a new lock. Two (2) sets of keys must be forwarded to our Division.

In the meantime, our office will proceed with release of the erosion and sediment control surety in accordance with our usual administrative process. It should be realized that granting of variances of this nature are seldom performed by our Division. Lack of knowledge about the process or overlooking items that are clearly delineated on approved plans are not normally justification to grant a variance. For this specific case, many factors and the overall history and general function of the facility were weighed into the decision.

If you have any additional questions or comments, you can contact me at 253-6639 or the assigned Environmental Division inspector, Ms. Tina Cooke at 757-253-6743. Thank you for your consideration on this matter.

Sincerely,

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

Attachments
SJT/sjt

cc: Tina Cooke, Environmental Division Inspector (email)

Asbuilts\Variances\S1995.mc007

Larry McCardle
910 S. Henry Street
Williamsburg VA 23185
Phone 757 220-9100 Fax 757 220-9209
E-mail: lrm910@cox.net

RECEIVED
FEB - 7 2006
ENVIRONMENTAL DIVISION

February 6, 2006

Scott J. Thomas, P.E.
James City County, Environmental Division
PO Box 8784
Williamsburg, VA 23187

Reference : Wet Pond Section 6 MC 007 SP-19-95
Request to waive Construction Certification Requirement

Dear Mr. Thomas

We appreciate your attending a site visit at the above referenced wet pond on February 3, 2006. We are in receipt of your e-mail of 2-3-06 and are proceeding to complete all items of work that you outlined. Based on the following we request that you waive the construction certification requirement for the above referenced Wet Pond:

1) The pond was constructed in the fall of 1996 and a certification cannot be prepared this late after the fact.
2) Laboratory test report on bulk sample from project used in dam construction is provided attached.
3) Field density test results on Dam construction summarized on 9-30-96 for work performed 9-19, 20, 21-1996 is provided attached.
4) Field density test results on Dam construction summarized on 10-15-96 for work performed 9-23, 24, 25, & 10-03 1996 is provided attached.
5) The dam and structure has functioned well through out the past 9+ years through major hurricanes without incident.

We request, based on the information above that you waive the Construction Certification Requirement for the above referenced Wet Pond. Upon completion of the punch list items in your 2-3-06 e-mail copy attached please release our bond in the amount of $ 25,000.00. I write this on behalf of Settlers Mill Inc. of which I am President.

Sincerely,

Larry McCardle

Scott Thomas

From: Scott Thomas
Sent: Friday, February 03, 2006 3:08 PM
To: 'Susie Powell'
Subject: RE: Settlers Mill BMP MC007

Sorry I haven't responded to you sooner, but when you emailed me I had no further information to give. I can give you an update now on the situation as there have been some recent events. Larry McCardle has been in contact with me on several occasions to discuss what is necessary to release bond on Section 6. One of the issues, as you may remember, is that I needed construction certification on BMP MC 007. That is the main reason why we still hold bond on that section. He had been trying to dig up information that I need and we are almost there with that end of it. They are to forward me the last piece of information I need for the construction certification.

I met with him and folks from Jack Massie today 2/3/06 in the field to go over field items that need done concurrently (we will not release until the field items are performed). Based on our meeting today, here is the punch list. I asked them to contact me prior to mobilizing at the BMP (so I know because we may get some calls) and also so I can inform you or appropriate board members so they know.

Punchlist

- Clear trees and woody vegetation from the entire downstream dam fill embankment.
- Clear all obstructions to and within the emergency spillway (vegetation, sediment, debris, etc.)
- Clear and remove all obstructions from the outfall end of the 24-inch pipe through the dam (log debris, vegetation, sediment) and from the concrete end section of the pipe (sediment).
- Clear and remove all trash and debris from the riser structure (there was minimal amount) and clean low flow orifices of any obstructions.
- Remove the plywood baffle wall. This should have been taken out when the basin was converted from a temporary sediment basin to a permanent wet pond BMP. Although baffle walls are helpful to prevent short-circuiting, in this case, the plywood and posts are very old and rotted and if left in place may dislodge and clog the riser, which in turn can cause serious consequences to function of the BMP.
- They will put a lock on the access lid/door on the riser and provide me two sets of keys. One our Division will keep and the second set I will forward on to the HOA.
- Seed and mulch any areas disturbed as a result of the above items.

My sense is that once adjacent owners see trees being taken down on the dam there may be some phone calls. However, this is a dam fill and County/state regulations do not allow trees, shrubs and woody vegetation to be present on dam embankments. Any assistance from the HOA's end on that matter would be appreciated. Keep me posted who will be my contact if it is not you. Hope all is well.

Scott J. Thomas, P.E.
James City County
Environmental Division

-----Original Message-----
From: Susie Powell [mailto:etpmom1@cox.net]
Sent: Sunday, January 15, 2006 5:18 PM
To: Scott Thomas
Subject: Settlers Mill BMP MC007

Scott,

As I am preparing to leave office at the first of February I have a pressing question for you - What is the

best way for the Settlers Mill Association to ensure that BMP MC007 is brought up to standard before the developer can receive his bond? Is there a form to complete or a letter the Association should draft outlining our concerns? To whom should we address our concerns?

Thanks for your assistance in this matter,

Susie Powell, Settlers Mill Association Board

Scott Thomas

From: Scott Thomas
Sent: Friday, February 03, 2006 3:23 PM
To: 'gary@jackmassie.com'; 'rick@jackmassie.com'
Subject: Settler's Mill Section 6 - BMP # MC 007

As a follow-up to today's meeting, attached is a punch list:

Construction Certification

- Need waiver request letter
- Provide copies of supporting test and inspection reports on dam

Field Items

- ✓ Clear trees and woody vegetation from the entire downstream dam fill embankment.
- ✓ Clear all obstructions to and within the emergency spillway (vegetation, sediment, debris, etc.)
- ✓ Clear and remove all obstructions from the outfall end of the 24-inch pipe through the dam (log debris, vegetation, sediment) and from the concrete end section of the pipe (sediment).
- ✓ Clear and remove all trash and debris from the riser structure (there was minimal amount) and clean low flow orifices of any obstructions.
- ✓ Remove the plywood baffle wall. This should have been taken out when the basin was converted from a temporary sediment basin to a permanent wet pond BMP. Although baffle walls are helpful to prevent short-circuiting, in this case, the plywood and posts are very old and rotted and if left in place may dislodge and clog the riser, which in turn can cause serious consequences to function of the BMP.
- Put a lock on the access lid/door on the riser and provide me two sets of keys. One our Division will keep and the second set I will forward on to the HOA.
- Seed and mulch any areas disturbed as a result of the above items.

Scott J. Thomas, P.E.
James City County
Environmental Division

Reinspect 3/24/06 w/ Jerry Prosek HOA rep. SAT.

DEVELOPMENT MANAGEMENT

101-E MOUNTS BAY ROAD, P.O. BOX 8784, WILLIAMSBURG, VIRGINIA 23187-8784
(757) 253-6671 Fax: (757) 259-4032 E-MAIL: devtman@james-city.va.us

ENVIRONMENTAL DIVISION (757) 253-6670 environ@james-city.va.us
PLANNING (757) 253-6685 planning@james-city.va.us
COUNTY ENGINEER (757) 253-6678
MOSQUITO CONTROL (757) 259-4116

April 19, 2006

Mr. Jerry Prosek
Settlers Mill HOA
305 Mill Stream Way
Williamsburg, VA 23185

Re: Settlers Mill Section 6
Wet Pond BMP # 5
County BMP ID Code: MC 007

Dear Mr. Prosek:

Thank you for meeting with me on Friday March 24, 2006 to look at some of the BMPs in Settlers Mill. As it pertains to the wet pond along Hickory Sign Post Road (as referenced above), attached is one (1) set of keys for the lock on the access hatch on the riser structure. These keys were forwarded to me by Jack L. Massie Contractors Inc. on April 17, 2006. One additional set of keys will be retained at our office for our use to perform future inspections on the BMP and should the HOA need to make a copy.

I have also attached basic educational materials from our PRIDE program. I encourage you to visit the PRIDE website at www.protectedwithpride.org. If you have any additional questions or comments, contact me at 757-253-6639 or by email at scottt@james-city.va.us.

Sincerely,

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

SJT/sjt

SWMProg\Education\HOA\SettlersMill.let2

JACK L. MASSIE
CONTRACTOR, INC.

Road & Site Construction
Since 1947
3900 Cokes Lane
Williamsburg, VA 23188-7010
(757) 566-8643
FAX (757) 566-8566

April 17, 2006

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

Re: Settlers Mill Section 6
Wet Pond BMP # 5
Construction Certification Waiver Request
County Plan No. S-19-95: County BMP ID Code: MC 007

Dear Mr. Thomas

In regards to your letter of April 3, 2006 we enclose two keys to the padlock on the metal access hatch. Please sign and acknowledge receipt of the keys and return a copy of this acknowledgement so we can forward to Mr. McCardle to complete our work on this project.

Sincerely,

Jack L Massie Contractor, Inc.

Gary M. Massie
President

Attachments:

I acknowledge receipt of two keys to the padlock on MC 007.

Scott Thomas 04-19-06 ONE SET WILL BE FORWARD TO Jerry Prosek with Settlers Mill HOA.

F:\Document Files\GARY\Settlers Mill\Letter transmitting the keys.doc

THANKS!

Langley and McDonald Transmittal

ENGINEERS•PLANNERS•SURVEYORS

5544 Greenwich Road
☐ Virginia Beach, Virginia 23462
(804) 473-2000

201 Packets Court
☐ Williamsburg, Virginia 23185
(804) 253-2975

Project: SETTLERS MILL - SECTS 5 & 6

To: DARRYL COOK
CODE COMPLIANCE
JAMES CITY CO.

From: DOUG WHITE

Date: 5-2-96

Reply requested: ☐ Yes ☐ No

Reply to:

We are sending you:
☒ Attached
☐ Under separate cover via:

☐ Prints
☐ Copy of letter
☐ Plans
☐ Specifications
☐ Shop drawings
☐ GEOTECHNICAL REPORT

Transmitted as checked below:
☐ For your use
☒ As requested
☐ For review and comment
☐ For approval
☐ Return for correction
☐ Approved as noted
☐ Approved
☐

Copies	Date	No.	Description
1	4/29/96		GEOTECHNICAL REPORT BMP SECTION 6

Remarks:

Copies
1. File: 93047-2
2.
3.
4.

Enclosures
☐
☐
☐
☐

Langley and McDonald
By: D. White

If enclosures are not as noted, kindly notify us at once.

#4

James City County Stormwater Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

Submit by Email | Print Form

County BMP ID Code: MC007

Name of Facility: Settlers Mill sec. 6 | BMP No: 1 of 1 | Date: Feb 6, 2009

Location: Hickory Sign Post Rd. Behind 309 Mill Stream Way

Owner Name: Settlers Mill Association

Inspector Name: Michael Milkavich

Type of Facility: Detention and Retention Pond

Weather Conditions: Sunny/warm

Type: ☐ Final Inspection ☒ County BMP Inspection Program ☐ Owner Inspection

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

O.K - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.

Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.

Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:				
Grass Height	X			
Vegetation Condition	X			
Tree Growth	X			SMALL TREES ON DAM
Erosion	X			
Trash & Debris	X			
Seepage	X			
Fencing or Benches	N/A			
Interior Landscaping/ Planted Areas:	☒ **None**	☐ **Constructed Wetland Shallow Marsh**	☐ **Naturally Established Vegetatation**	
Vegetated Conditions	X			
Trash & Debris		X		REMOVE TRASH
Floating Material	X			
Erosion	X			
Sediment	X			
Dead Plant	X			
Aesthetics	X			
Other				

Notes:

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools:	☒ **Permanent Pool (Retention Basisn)**	☐ **Shallow Marsh (Detention Basin)**	☐ **None, Dry (Detention Basin)**	
Shoreline Erosion	X			
Algae	X			
Trash & Debris	X			
Sediment	X			
Aesthetics	X			
Other				
Inflows (Describe Types/Locations): 15" RCP				
Condition of Structure	X			
Erosion		X		SOME EROSION AT END OF PIPE
Trash & Debris	X			
Sediment	X			
Outlet Protection		X		ADD RIP-RAP
Other				
Principal Flow control Structure - Riser, Intake, etc. (Describe Type): 48" RCP RISER				
Condition of Structure	X			
Corrosion	X			
Trash & Debris	X			
Sediment	X			
Vegetation	X			
Other				
Principal Outlet Structure - Barrel, conduit, etc.: 24" RCP				
Condition of Structure	X			
Settlement	X			
Trash & Debris		X		REMOVE DEBRIS IMPEDING DOWNSTREAM FLOW
Erosion/Sediment	X			
Outlet Protection		X		ADD RIP-RAP
Other		X		REMOVE VEGETATION
Emergency Spillway (Overflow):				
Vegetation		X		REMOVE TREES FROM NEAR SPILLWAY
Lining	X			
Erosion	X			
Trash & Debris	X			
Other				

Notes

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type conditions:				
Mosquito Breeding	X			
Animal Burrows	X			
Graffitti	X			
Other				
Surrounding Perimeter Conditions:				
Land Uses	X			
Vegetation	X			
Trash & Debris	X			
Aesthetics	X			
Access/Maintenance Roads or Paths	X			
Other				

Remarks

REMOVE TREES FROM DAM.
REMOVE TRASH FROM IN AND AROUND BMP.
ADD RIP-RAP TO BOTH THE INFLOW AND OUTFALL.
REMOVE TREES FROM NEAR THE EMERGENCY SPILLWAY.
REMOVE DEBRIS AND VEGETATION IMPEDING DOWNSTREAM FLOW FROM OUTFALL.

Overall Stormwater Division Internal Rating: 3

Signature

Date Feb 6, 2009

Title Intern

James City County Environmental Division
Stormwater Management / BMP Inspection Report
Detention and Retention Pond Facilities

5-19-95 - MC 007
3/24/06 REINSPECT / FOLLOWING PUNCHLIST COMPLETION

County BMP ID Code (if known): MC 007

Name of Facility: Settlers Mill Sec 6 BMP No.: 4 of 4 Date: 3/24/06

Location: Along Hickory Sign Post Road

Name of Owner: Settlers Mill Inc.

Name of Inspector: S/Thomas (Jerry Prosek HOA)

Type of Facility: Wet Pond

Weather Conditions: Sunny, Warm 60s Type: ☒ Final Inspection ☐ County BMP Inspection Program ☐ Owner Inspection

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

O.K. - The item checked is in adequate condition and the maintenance program is currently satisfactory. No action required.
Routine - The item checked requires attention, but does not present an immediate threat to the function/integrity of the BMP.
Urgent - The item checked requires immediate attention to keep the BMP operational and to prevent damage to the facility.

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

Facility Item	O.K.	Routine	Urgent	Comments
Embankments and Side Slopes:	EARTH DAM, ~10' HIGH			
Grass Height	✓			
Vegetation Condition	✓			Trees cleared
Tree Growth	✓			"
Erosion	✓			
Trash & Debris	✓			
Seepage	✓			None observed
Fencing or Benches				
Interior Landscaping/Planted Areas:	☒ None ☐ Constructed Wetland/Shallow Marsh ☐ Naturally Established Vegetation			
Vegetated Conditions	✓			Wet Pool ~ 6' deep
Trash & Debris	✓			
Floating Material	✓			
Erosion	✓			
Sediment	✓			
Dead Plant	✓			
Aesthetics	✓			
Other				
Notes: Serves SF Homes + Roadways				

Facility Item	O.K.	Routine	Urgent	Comments
Water Pools: ☒ Permanent Pool (Retention Basin) ☐ Shallow Marsh (Detention Basin) ☐ None, Dry (Detention Basin)				
Shoreline Erosion	✓			Minor
Algae	✓			None
Trash & Debris	✓			
Sediment	✓			
Aesthetics				
Other	✓			5 or 6 geese present
Inflows (Describe Types/Locations): 15" RCP @ South side / Perennial Stream West				
Condition of Structure	✓			
Erosion	✓			
Trash and Debris	✓			
Sediment	✓			Some plume; difficult access
Outlet Protection	✓			
Other				
Principal Flow Control Structure - Riser, Intake, etc. (Describe Type): 48" RCP Riser				
Condition of Structure	✓			
Corrosion	✓			
Trash and Debris	✓			
Sediment	✓			
Vegetation	✓			
Other	✓			Lock present
Principal Outlet Structure - Barrel, Conduit, etc. : 24" RCP Barrel				
Condition of Structure	✓			
Settlement	✓			
Trash & Debris	✓			Some Trees Down ~20' from Pipe
Erosion/Sediment	✓			
Outlet Protection	✓			Older but OK
Other				
Emergency Spillway (Overflow): 10' W Conc-Lined Spillway				
Vegetation	✓			None
Lining	✓			Good Shape
Erosion	✓			
Trash & Debris	✓			
Other	✓			
Notes:				

Facility Item	O.K.	Routine	Urgent	Comments
Nuisance Type Conditions:				
Mosquito Breeding	✓			
Animal Burrows	✓			
Graffiti	✓			
Other				
Surrounding Perimeter Conditions:	Nearly all Wooded Pond Buffer; Hickory Sign Post to North			
Land Uses	✓			SF & Woods, downspouts
Vegetation	✓			direct to pond at 2 or 3 homes
Trash & Debris	✓			
Aesthetics	✓			
Access /Maintenance Roads or Paths	✓			Easy Access from Hickory Sign Post
Other				

Remarks:

- Remove Trees from dam
- Clear ES
- Clean Riser
- Clean Barrel out
- Remove baffle

See punchlist to Massie dated 2/03/06. Items completed + reinspected 3/24/03 Photos Taken

Overall Environmental Division Internal Rating: 3

Signature: [signature] P.E. **Date:** 03/24/06

Title: Senior Engineer

SWMProg\BMP\CoInspProg\InspForms\DetRet.wpd

WATERSHED	MC	MAINTENANCE PLAN	No	CTRL STRUC DESC	RCP Riser
BMP ID NO	007	SITE AREA acre	26.13	CTRL STRUC SIZE inches	48
PLAN NO	S-19-95	LAND USE	SF Residential	OTLT BARRL DESC	RCP Barrel
TAX PARCEL	(47-01)(09-1A)	old BMP TYP	Wet Pond	OTLT BARRL SIZE inch	24
PIN NO	4711900001A	JCC BMP CODE			
CONSTRUCTION DATE	9/30/1996	POINT VALUE	9	EMERG SPILLWAY	Yes
PROJECT NAME	Settlers Mill Sec 6 (BMP # 5)			DESIGN HW ELEV	24.41
FACILITY LOCATION	Behind (north of) 309 Mill Stream Way			PERM POOL ELEV	22.10
CITY-STATE	Williamsburg, Va. 23185	SVC DRAIN AREA acres	30.97	2-YR OUTFLOW cfs	20.68
CURRENT OWNER	Settlers Mill Association			10-YR OUTFLOW cfs	32.39
OWNER ADDRESS	PO Box 1295			REC DRAWING	Yes
OWNER ADDRESS 2		SERVICE AREA DESCRI	Sec 6 & Hickory Sign Post Road		
CITY-STATE-ZIP CODE	Williamsburg, VA 23187	IMPERV AREA acres		CONSTR CERTIF	No
OWNER PHONE		RECV STREAM	UT of Mill Ck-Lake Powell		
MAINT AGREEMENT	Yes	EXT DET-WQ-CTRL	Yes	LAST INSP DATE	1/10/2001
EMERG ACTION PLAN	No	WTR QUAL VOL acre-ft	1.4	INTERNAL RATING	4
		CHAN PROT CTRL	No	MISC/COMMENTS	
		CHAN PROT VOL acre-ft	0	BMP # 5. I/M Bk 796, Pg 124. San Sewer thru dam.	
		SW/FLOOD CONTROL	Yes		
		GEOTECH REPORT	Yes		

Get Last BMP No

Return to Menu

CODE COMPLIANCE REVIEW COMMENTS
SETTLERS MILL, SECTION 6
PLAN NO. S-19-95
March 12, 1995 DEC

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

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

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

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

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

6. A streetlight rental fee for 5 lights must be paid prior to the recordation of the subdivision plat.

7. The following comments pertain to the design of the detention basin:
   a. The detention basin outlet orifice diameter is stated as being 3 inches in the calculations but is shown as 6 inches on the plan. Please correct the drawing.
   b. Provide an access path into the riser through the trash rack.
   c. Provide the geotechnical report used to develop the recommendations for construction of the dam.
   d. Provide riprap at the toe of the emergency spillway to protect against erosion.
   e. Provide riprap lining in the upper portion of the basin where flows from the upstream channel enter the basin. The riprap needs to begin at elevation 24 and extend to the normal pool elevation.
   f. Place filter fabric under the riprap for the barrel outlet.

8. Perform an environmental inventory for the site showing RPA areas, steep slopes, etc.

9. Submit a request to the Director of Code Compliance for an exception to disturb any slopes in excess of 25%. State what special measures, sodding etc., will be undertaken to restabilize these slopes.

10. Provide evidence that any required wetlands permits have been obtained.

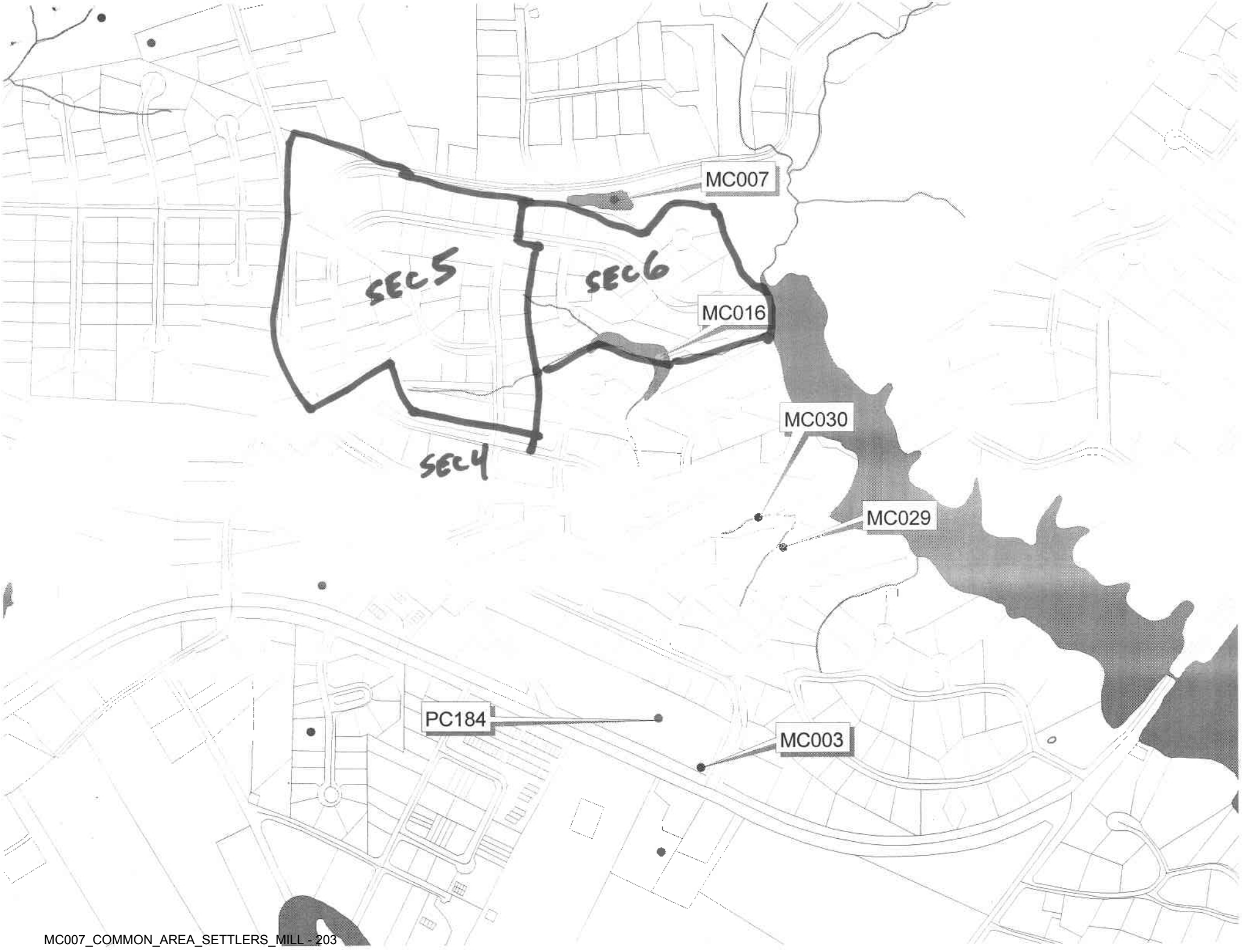
11. The sewer line is to be constructed within the embankment for the detention basin. Submit a sequence of construction that has this line of sewer being build in conjunction with the detention basin as a first step in construction process.

12. Provide a drainage swale along the rear lot lines of lots 27, 28, and 29 starting at the lot 27/44 (Section 5) junction and continuing to the lot line of 29/30. Then provide a ditch to convey water to structure 40 along the lot 28/29 line. Provide calculations to verify size and lining of the ditches and provide drainage easements to contain them.

13. Provide silt fence around the cul-de-sac of Road H starting from the midpoint of lot 11 and continuing to the lot 7/8 line.

14. Relocate the light at the intersection of Road G and Mill Stream Way from lot 30 to 23. Also, move the light from lot 12/13 to lot 12 at the intersection of Road H and Mill Stream Way.

MC007_COMMON_AREA_SETTLERS_MILL - 202


MC007
SEC5
SEC6
MC016
MC030
SEC4
MC029
PC184
MC003

Settlers
Mill Sec 6
MC 007
cc waiver
request

Record Drawing/Construction Certification Submittal for a BMP Facility

Date: 6/25/02

Inspector:
- ☐ Pat Menichino
- ☐ Gerry Lewis
- ☐ Beth Davis
- ☐ Mike Woolson
- ☒ Joe Buchite
- ☐ Other: _____

Project: Settlers Mill Section 6
BMP Facility: BMP#5 WET POND (ALONG HICKORY SIGN POST RD.)
Plan No. 5-19-95
BMP ID Code: MC 007

I have received a transmittal for a ☒ Record Drawing and ☐ Construction Certification for the above referenced facility on June 19 '02. Prior to full engineering review of these items and a field inspection, I am first forwarding the items to you to cursory review in case any major field changes were performed that I should be aware of and/or to ensure the record drawing accurately portrays what you saw in the field. Please review the drawing and return to me promptly so I can proceed with the review for certification purposes.

During my review, I will look at issues related to the BMP and its primary inflow and outflow conveyance systems, and will make comment in the following areas: Record Drawing (RD), Construction Certification (CC) and Construction-Related (CR) punch list items. If you have any other related non-BMP site issues such as erosion, stabilization, removal of erosion & sediment controls, etc. that are not related to the BMP, I can easily add these items to any comment letter that I may forward to the Owner/Engineer. Let me know if any outstanding site issues remain.

If I don't hear from you I will ask you if any other outstanding issues remain before I forward any letters to the Owner/Engineer.

Scott

SWMProg\BMP\ConInsp\Insp.trans

LANDMARK DESIGN GROUP
TRANSMITTAL

JUN 2002 RECEIVED ENVIRONMENTAL DIVISION

To: SCOTT THOMAS

Company: JAMES CITY COUNTY, ENVIROMENTAL

From: SCOTT ~~THOMPSON~~ THOMAS

Date: 6-19-02

Subject: BMP RECORD DRAWINGS-SETTLERS MILL SECTION 6

LMDG Job No.: 1930047-000.21

MC 007; 5-19-95

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

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

Copies	Date	Drawing No.	Description
3	06/19/02	13332W	RECORD DRAWING FOR THE BMP AT SETTLERS MILL AT JAMESTOWN SECTION 6

Notes:

BMP #5 Sec 6 5-19-95 (BMP for SEC 4+5) 1/m BK 796, p 124 Hold $20,000

Behind Lot 5 309 Mill Stream Way near Nicholson Post Road

47119 00001A Settlers Mill Assoc. P.O Box 1295 Wmbg VA 23187

Common Area 5-6

Copies
1. File:
2.
3.
4.

Enclosures
- ☐
- ☐
- ☐
- ☐

LandMark Design Group, Inc.

BY: AST

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

Sett M:11, Sect 6

Unproofed Draft

JAMES CITY COUNTY
STORMWATER DETENTION BASIN DESIGN CHECKLIST

I. STORMWATER MANAGEMENT COMPUTATIONS

A. HYDROLOGY - An SCS-based methodology is required for stormwater detention structures with watersheds exceeding 20 acres. Under 20 acres, other generally accepted methodologies such as the modified rational, critical storm are allowable. See Chapter 5, VESCH for more information.

OK as Rational — RCN determinations: predeveloped and ultimate development land use scenarios.

/ — Time of concentration: predeveloped and ultimate development indicating overland, shallow concentrated, and channel flow components.

/ — Hydrograph generation: predevelopment and ultimate development peak flows for 2-, 10-, and 100-year design storms.

B. RESERVOIR ROUTING

/ — Storage indication routing of ultimate development hydrographs for 2-, 10-, and 100-year design storms. Structure must discharge up to 10-year storm through principal spillway and pass the 100-year storm with 1 foot of freeboard through a combination of the principal and emergency spillways.

/ — Downstream hydrographs at established study points (if required).

C. HYDRAULIC COMPUTATIONS

/ — Elevation-Storage (curve)

/ — Weir/Orifice control - extended detention control.

/ — Weir/Orifice control - riser 2 year control.

/ — Weir/Orifice control - riser 10 year control.

/ — Inlet/Outlet (barrel) control - (all storms).

/ — Check for barrel control prior to riser orifice flow.

/ — Emergency spillway capacity.

/ — Elevation-Discharge (provide for equations and cite references).

D. MISCELLANEOUS COMPUTATIONS

/ — Water quality volume for permanent pool.

NA — Water quality volume for extended detention with drawdown computations.

/ — Anti-seep collar design.

NA — Filter diaphragm design (or alternative method of controlling seepage).

MC007_COMMON_AREA_SETTLERS_MILL - 207

✓	Riser structure flotation analysis (factor of safety = 1.2 min.).
NA	Danger reach study (if required).
NA	100 year floodplain impacts (if required).

II. SOILS INVESTIGATION

NA	Geotechnical report.
✓	Minimum boring locations: borrow area; pool area; principal spillway; top of dam near one abutment or emergency spillway if provided.
✓	Boring logs with Unified Soil Classification, and soil description, with depth to bedrock, seasonal water table.

III. STORMWATER MANAGEMENT PLAN

A. PLAN VIEW 1"=50' or less (40', 30', etc.)

1. GENERAL TERMS

✓	North arrow.
✓	Sealed by P.E.
✓	Existing and proposed contours (1' or 2' interval).
✓	Existing and proposed improvements.
NA	Delineation of permanent/extended detention, 2, 10, and 100-year pools.
✓	Locations of test borings.
~~Needed~~ ✓	Outflow pipe, outlet protection (detail required), and outfall channel.
Need outlet prot.	Emergency spillway level section and outlet channel.
✓	Existing and proposed utility location/protection.

B. MAINTENANCE ITEMS

✓	Person or organization responsible for maintenance.
✓	Inspection and maintenance agreement.
	Maintenance access from public right-of-way or publicly traveled road.
	Maintenance easement, minimum 15 feet around 100-year pool elevation.
NA	Forebay (if proposed).
✓	Temporary erosion and sediment control measures for pond construction.
✓	Fence, minimum or 10' wide safety shelf for public safety.
	Provisions for use as a temporary sediment basin with cleanout schedule and instructions for conversion to permanent facility.

C. PRINCIPAL SPILLWAY PROFILE AND ASSOCIATED DETAILS

1. EXISTING GROUND AND PROPOSED GRADE

/ Dam side slopes labeled.
/ Top width labeled (per VESCH).
/ Removal of unsuitable material under proposed dam (per geotechnical report).

2. CORE TRENCH

/ Materials (per construction specifications)
/ Bottom width (4' minimum or greater as dictated by geotechnical report)
/ Side slopes (1:1 maximum steepness)
/ Depth (4' minimum or greater as dictated by the geotechnical report)

3. RISER OR SIMILAR STRUCTURE (DETAIL REQUIRED)

/ Materials (as required)
/ All structure dimensions
Modify Control orifice dimensions
/ Trash rack - removable - for each release (detail as required for construction)
/ Anti-vortex device (detail as required for construction)
/ Proper structure footing
Needed Maintenance access

4. BARREL

/ Materials (ASTM C-361 or as required)
NA Bedding for concrete barrels (detail required)
NA Gauge and corrugation size for metal barrels

5. SEEPAGE CONTROL

/ Phreatic line (4:1 slope measured from the intersection of the dam and the principal spillway design high water.

a. ANTI-SEEP COLLAR

/ Anti-seep collar (detail required)
/ Size - 15% increase in length of saturation using outside pipe diameter

✓ Spacing and location on barrel (located at least 2' from a pipe joint)

b. FILTER DIAPHRAGM

NA Design based on latest SCS methods and certified by a professional geotechnical engineer

6. OUTFALL PROTECTION

✓ Size for maximum barrel release (but not greater than 10 year storm)
✓ Cross-section at end of barrel in accordance with receiving channel section
NA Endsection with footer
✓ Outfall dimensions
✓ Slope - 0%
✓ Median rip-rap size (d50)
✓ Thickness (2.25 x d50)
✓ Approved filter fabric (nonwoven)

7. ELEVATIONS

✓ Top of dam - construction height and settled height (10% settlement)
✓ Crest of emergency spillway
✓ Crest of riser structure
✓ Inverts of control release orifice/weirs
✓ Pools: permanent; extended detention; 2-year; 10-year; 100-year; and appropriate safety storms
✓ Appropriate freeboard per SCS National Engineering Handbook
✓ Inlet and outlet inverts of pipes (with slopes in %)

D. CROSS SECTION THROUGH DAM ALONG CENTERLINE

✓ Existing ground
✓ Proposed grade
✓ Top of dam - constructed and settled
✓ Location of emergency spillway with side slopes labeled (emergency spillway in cut)
✓ Bottom of core trench (4' minimum)
✓ Location of each soil boring
✓ Barrel location
✓ Existing and proposed utility location/protection

E. EMERGENCY SPILLWAY PROFILE

- ✓ Existing ground
- ✓ Inlet, level (control), and outlet sections per SCS
- ✓ Spillway and crest elevations

F. CONSTRUCTION SPECIFICATIONS

- Needed Sequence of construction
- ✓ Care of base flow during construction
- ✓ Site preparation
- _____ Earthfill: _____ Material, _____ Placement, _____ Compaction, _____ Core trench
- _____ Structural backfill
- _____ Pipe conduits
- ✓ Concrete
- ✓ Rip-Rap and slope protection
- NA Fencing
- ✓ Stabilization
- ✓ Inspection and Certification by Engineer

COMMENTS:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

BY: _____

DATE: _____

sdbdc.txt

MC007, MC016, MC029, MC030

090027576

VIRGINIA:

IN THE CIRCUIT COURT FOR THE CITY OF WILLIAMSBURG
AND JAMES CITY COUNTY

SETTLERS MILL ASSOCIATION,

Plaintiff,

v. Civil Case No. CL08-657-00

LAWRENCE E. LUCK
and
TRACY M. LUCK,

Defendants.

FINAL JUDGMENT ORDER

On September 18, 2009 came the Plaintiff, Settlers Mill Association, and the Defendants, Lawrence E. Luck and Tracy M. Luck, in person and by counsel, on the Plaintiff's Complaint for declaratory judgment. Upon consideration whereof, and the pleadings and papers filed herein, and of the evidence and argument of counsel, *ore tenus*, the Court finds and declares:

A. That, as pertaining to Lot 29 ("Lot 29") as shown on Plat of Lakewood Section II Lot 1 thru Lot 29, which is recorded in Plat Book 45, page 80 in the land records of the Clerk of this Court, the First Amendment to Declaration of Covenants and Restrictions ("First Amendment"), which is recorded in Deed Book 476, page 143 in the land records of the Clerk of this Court and Second Amendment to Declaration of Covenants and Restrictions ("Second Amendment"), which is recorded as Instrument No. 050026910 in the land records of the Clerk of this Court, as corrected by Correction of Clerical Error, which is recorded as Instrument No. 070025362 in the land records of the Clerk of this Court are not valid amendments of the Declaration of Covenants and Restrictions, which is recorded in Deed Book 352, page 122 in the

land records of the Clerk of this Court ("Original Declaration);

B. That Lot 29 is not subject to the provisions of the Original Declaration, as amended; and,

C. That Lot 29 is not subject to architectural review as described in the Original Declaration, as amended. Accordingly, it is

ORDERED that judgment be and hereby is entered for the Defendants denying the relief requested by the Plaintiff, and the claims of the Plaintiff are hereby dismissed, with prejudice. It is further

ORDERED that each party shall bear its or their own attorney's fees and costs. It is further

ORDERED that the Clerk record this Final Judgment Order forthwith in the land records of the Circuit Court of the County of James City with **SETTLERS MILL ASSOCIATION**, Lawrence E. **LUCK** and Tracy M. **LUCK** to be indexed as Grantors and Lawrence E. **LUCK** and Tracy M. **LUCK** to be indexed as Grantees.

The Clerk is directed to send attested copies hereof to counsel of record.

ENTER / , October 6, 2009

Martin J. Fox
Judge

I ask for this:

Lawrence E. Luck
VSB No. 26404
TRACY MCMURTRIE LUCK & ASSOCIATES
3917 Midlands Rd., Bldg. Two, Ste. 100
Williamsburg, Virginia 23188
(757) 221-0284
(757) 229-4670 (facsimile)
Counsel for Defendants

Seen and objected to: FOR THE REASONS STATED BELOW AND THE REASONS SET OUT IN PLAINTIFF'S OPENING BRIEF AND PLAINTIFF'S REBUTTAL BRIEF PREVIOUSLY FILED HEREIN.

Sheldon M. Franck, Esquire
GEDDY, HARRIS, FRANCK & HICKMAN, L.L.P.
1177 Jamestown Rd.
Williamsburg, Virginia
(757) 220-6500
Counsel for Plaintiff

THE PLAINTIFF EXCEPTS TO ANY FINDINGS BY THE COURT THAT THE ORIGINAL DECLARATION, AS AMENDED BY THE FIRST AMENDMENT, SECOND AMENDMENT AND CORRECTION OF CLERICAL ERROR, CONTAINS ANY AMBIGUITY WHICH WOULD IMPAIR ITS ENFORCEMENT.

Printed On 10/24/2013 By JCC STORM WATER

File MC007, MC016, MC029, MC030

000009283

THIS DEED OF GIFT IS EXEMPT FROM RECORDATION TAXES UNDER THE CODE OF VIRGINIA SECTION 58.1-811 (D).

DEED OF GIFT AND DEDICATION

THIS DEED OF GIFT AND DEDICATION, MADE the 4th day of May, in the year 2000, between

SETTLERS MILL, INCORPORATED, a Virginia corporation, Grantor, and **SETTLERS MILL ASSOCIATION, a Virginia corporation,** Grantee.

WITNESSETH:

That in accordance with the Declaration of Covenants and Restrictions recorded in James City County Deed Book 536 Page 558, as amended the said Grantor does grant and convey, with **SPECIAL WARRANTY OF TITLE** unto the said Grantee the following described property, to-wit:

PARCEL 1: RECREATION LOT

All that certain lot, piece or parcel of land situate, lying and being in James City County, Virginia, known and designated as "Recreation Lot 109,925 S.F. ± 2.524 AC ±" as shown on that certain plat entitled, "PLAT SHOWING RECREATION LOT SETTLERS MILL OWNER/DEVELOPER: SETTLERS MILL, INC. JAMES CITY COUNTY, VIRGINIA" dated January 14, 1991 and made by AES Consulting Engineers and duly recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 59 Page 41.

MAY 15 00 0045

This document prepared by
Geddy, Harris, Franck & Hickman, L L P

Printed On 10/24/2013 By JCC STORM WATER

PARCEL 2: COMMON AREA, SECTION 2A

All that certain lot, piece or parcel of land situate, lying and being in James City County, Virginia, known and designated as "Common Area 46.683 S.F. 1.0717 AC ±" as shown on that certain plat entitled "PLAT OF SUBDIVISION SETTLERS MILL AT JAMESTOWN SECTION 2A OWNER: SETTLERS MILL INC. JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA" dated June 1991, made by AES Consulting Engineers and duly recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 55 Page 42.

PARCEL 3: COMMON AREA, SECTION 3B

All those certain lots, pieces or parcels of land situate, lying and being in James City County, Virginia known and designated as "Common Area" as shown on that certain plat entitled "PLAT OF SUBDIVISION SETTLERS MILL AT JAMESTOWN SECTION 3B FOR SETTLERS MILL, INC. JAMES CITY COUNTY, JAMESTOWN DISTRICT, VIRGINIA" dated November 10, 1994, made by Langley and McDonald, P.C. and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 60 Pages 77 and 78.

MAY 15 8 0046

PARCEL 4: COMMON AND CONSERVATION AREA, SECTION 4

All those certain lots, pieces or parcels of land situate, lying and being in James City County, Virginia known and designated as "Common and Conservation Area 12,038.9 S.F. 0.2764 AC", "Common and Conservation Area 37,641 S.F. 0.8641 AC" and "Conservation and Common Area 12,328.6 S.F. 0.2830 AC" as shown on that certain plat entitled "PLAT OF SETTLERS MILL AT JAMESTOWN SECTION 4 FOR SETTLERS MILL, INC. JAMESTOWN DISTRICT JAMES CITY COUNTY, VIRGINIA" dated August 22, 1995, made by Langley and McDonald, P.C. and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 63 Pages 18 - 20.

Printed On 10/24/2013 By JCC STORM WATER

PARCEL 5: COMMON AND CONSERVATION AREA, SECTION 5

All those certain lots, pieces or parcels of land, situate, lying and being in James City County, Virginia known and designated as "Common and Conservation Area 29,489 SQ. FT. 0.6770 Acres", "Conservation and Common Area 23,104 SQ FT. 0.5304 Acres", "Common Area and Conservation Area 27,116 SQ. FT. 0.6225 AC." and "Common and Conservation Area 29,860 SQ. FT. 0.6855 AC", as shown on that certain plat entitled "PLAT OF SETTLERS MILL AT JAMESTOWN SECTION 5 FOR SETTLERS MILL, INC. BERKELEY DISTRICT JAMES CITY COUNTY, VIRGINIA" dated April 30, 1997, made by Langley and McDonald, P.C. and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 66 Pages 97-100.

PARCEL 6: COMMON AND CONSERVATION AREA, SECTION 6

All that certain lot, piece or parcel of land, situate, lying and being in James City County, Virginia known and designated as "Common Area & Conservation Easement" as shown on that certain plat entitled "PLAT OF SETTLERS MILL AT JAMESTOWN SECTION 6 FOR SETTLERS MILL, INC. JAMESTOWN DISTRICT JAMES CITY COUNTY VIRGINIA" dated December 7, 1998, made by Langley and McDonald, P.C. and recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 73 Pages 13-15.

Together with all and singular the buildings and improvements thereon, the tenements, hereditaments and appurtenances thereunto belonging or in anywise appertaining.

Subject, however, to all easements, conditions, and restrictions of record affecting said property.

Being a portion of the same property as that conveyed to the Grantor by deed dated July 5, 1990 and recorded July 31, 1990 in the aforesaid Clerk's Office in Deed Book 483, page 448.

This conveyance is made subject to all easements, restrictions and limitations of record or apparent on the ground.

MAY 15 8 0047

Printed On 10/24/2013 By JCC STORM WATER

Whenever used herein the masculine gender shall include the feminine and neuter and the neuter gender shall include the masculine and the feminine and the singular form shall include the plural.

WITNESS the following signatures and seals:

Settlers Mill, Incorporated

By: _____(SEAL)
Larry R. McCardle, President

MAY 15 8 00 0048

STATE OF VIRGINIA

CITY OF WILLIAMSBURG

The foregoing instrument was acknowledged before me this 10th day of May, 2000 by Larry R. McCardle, President, Settlers Mill, Inc.

Marcia W. Moore
NOTARY PUBLIC

My commission expires: 10-31-2000

Grantee's Address: 1111 Old Colony Lane
Williamsburg, VA 23185

Prepared by
Geddy, Harris, Franck & Hickman, L.L.P.

VIRGINIA: City of Williamsburg and County of James City, to-wit:
This Deed of Gift was presented with certificate annexed and admitted to record on May 15, 2000, at 10:46 AM/PM in the Clerk's Office of the Circuit Court of the City of Williamsburg and County of James City.
TESTE: BETSY B. WOOLRIDGE, CLERK
BY: Betsy B. Woolridge Deputy Clerk

4-4

Stormwater Division

MEMORANDUM

DATE: August 6, 2014
TO: Michael J. Gillis, Virginia Correctional Enterprises Document Management Services
FROM: Jacob Smith, Stormwater Intern
PO: 110426
RE: Files Approved for Scanning

NAME PDF/SCANNED FILE:	**SETTLERS MILL SEC 6 HICKORY SIGN WET POND BMP #5**		
BMP ID OR GEN FILE NUMBER:	MC007	**OWNER NAME:**	SETTLERS MILL
PIN:	4711900001A	**SITE ADDRESS:**	BEHIND 309 MILL STREAM WAY
		LEGAL DESCRIPTION:	N/A

MAINTENANCE AGREEMENT IN FILE:	**N/A**	**BOOK/PAGE OR DOCUMENT NO.:**	**N/A**	**OTHER DESCRIPTION:**	N/A

BOX NO.:	4	**COMMENTS:**	PARTIAL FILE

MC 007
to be scanned

POOR QUALITY

ORIGINAL(S) FOLLOW

THIS IS THE BEST COPY AVAILABLE

VCE DOCUMENT CONVERSION CENTER

CONTENTS WITHIN ± 20% OF THE OPTIMUM MOISTURE CONTENT FOR THE MATERIAL USED.

6. THE SURFACE OF EACH COMPLETED LIFT OF COMPACTED EMBANKMENT FILL SHOULD BE SCARIFIED TO A DEPTH OF 2 TO 3 INCHES PRIOR TO PLACING ADDITIONAL FILL TO LIMIT THE DEVELOPMENT OF HORIZONTAL SEEPAGE PLAINS WITHIN THE EMBANKMENT.

7. COMPACTED EMBANKMENT FILL TO BE PLACE IN HORIZONTAL LIFTS.

8. SURFACES STEEPER THAN 4:1 TO BE BENCHED TO RECEIVE FILL. BENCH HEIGHTS NOT TO EXCEED 2 FEET.

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

10. THE PRINCIPAL SPILLWAY PIPE TO BE SUPPORTED ON NATURAL GROUND OR COMPACTED EMBANKMENT FILL OR AS SHOWN ON THE PLANS.

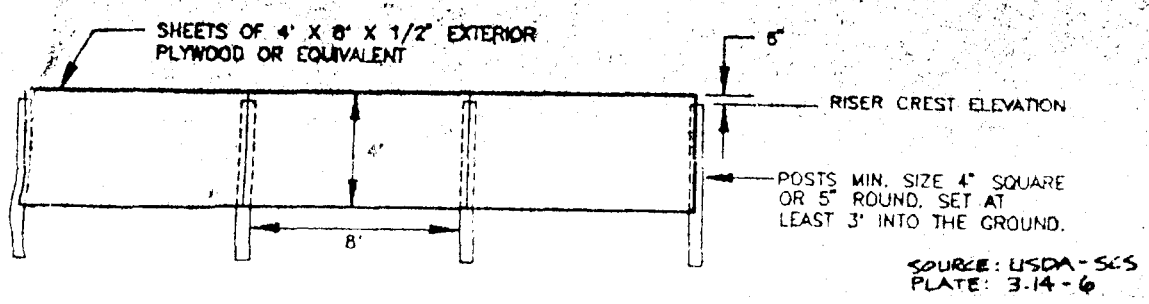
11. SUFFICIENT CLEARANCE SHOULD BE PROVIDED FOR STANDARD COMPACTION EQUIPMENT TO ACCESS DURING BACKFILLING ALONG THE PRINCIPAL SPILLWAY CONDUIT. THE BACKFILL SHOULD BE RAMMED UP AGAINST THE CONDUIT ON A MAXIMUM SLOPE OF 6:1. WHERE ACCESS IS LIMITED, THINNER LIFT THICKNESS, HAND COMPACTION AND TIGHT CONTROL ON MATERIAL QUALITY WILL BE NECESSARY.

12. WHERE TRENCH EXCAVATION FOR THE INSTALLATION OF THE PRINCIPAL SPILLWAY CONDUIT IS NECESSARY, SLOPE TO BE CUT NO STEEPER THAN 2:1.

13. SITE DRAINAGE TO BE PROVIDED TO MAINTAIN SUBGRADES FREE OF WATER AND TO AVOID SATURATION AND DISTURBANCE OF THE SUBGRADE SOILS PRIOR TO CONSTRUCTING FOUNDATIONS AND PLACING FILL. ANY SOILS THAT HAVE BEEN WEAKENED DUE TO SATURATION AND DISTURBANCE TO BE REMOVED AS RECOMMENDED BY THE ENGINEER.

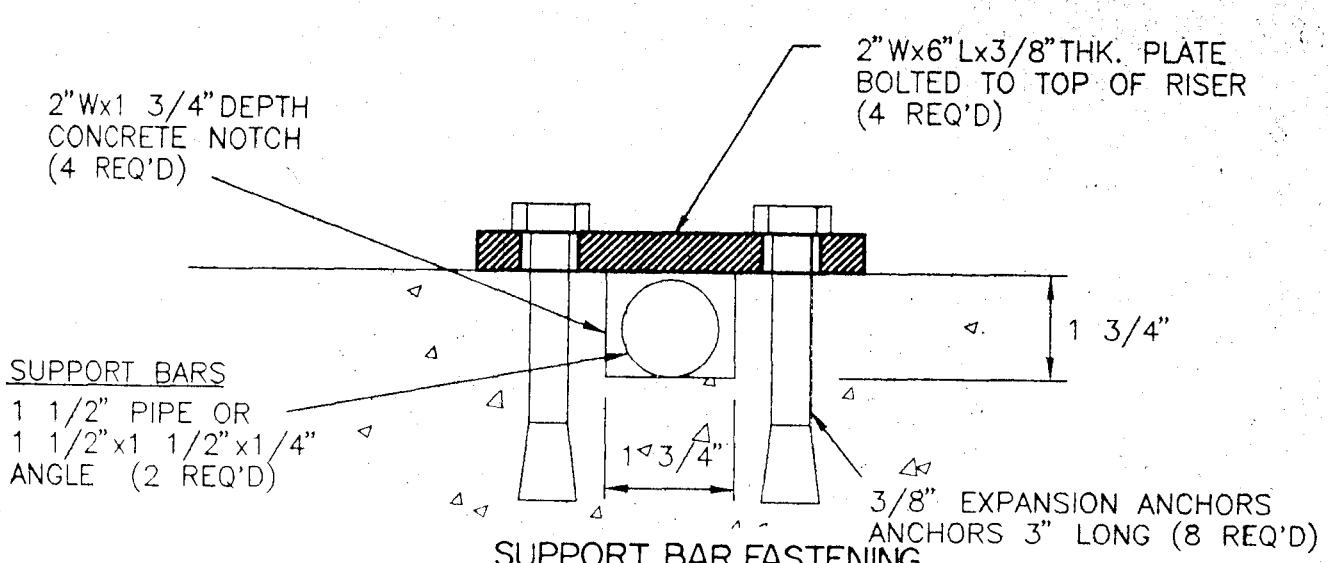
14. DEWATERING OF THE DAM FOUNDATION AREAS (WELL POINTING OR PUMPING FROM SUMPS), AND THE DIVERSION OF SURFACE WATER AWAY FROM THE WORK AREA MAY BE NECESSARY TO ALLOW PROPER EXECUTION OF THE CONSTRUCTION WORK. DEWATERING SHOULD BEGIN PRIOR TO EARTHWORK SO THAT THE SPILLWAY CONDUIT CAN BE INSTALLED AND SURFACE WATER WOULD THEN BE DIVERTED THROUGH THE PRINCIPAL SPILLWAY.

15. THE EMBANKMENT FOUNDATION TO BE FREE OF PONDED WATER, EXCESSIVELY MUDDY CONDITIONS AND IN DRAINABLE CONDITION AS NEEDED FOR PROPER EXECUTION OF THE CONSTRUCTION WORK.



BAFFLE DETAIL

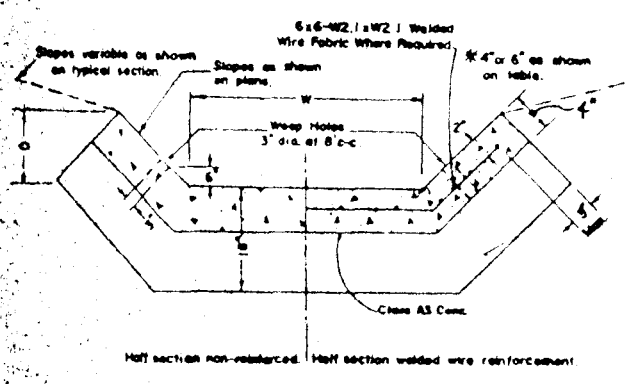
N.T.S.



SUPPORT BAR FASTENING

SECTION A–A

N.T.S.



SECTION A-A

Concrete to be Class A3

Expansion joint spacing approximately 90'

PG-5.

Indicates channel where wire mesh reinforcement is not required

SQ. YDS. PER LIN. FT. OF PAVED CHANNEL

CONCRETE THICKNESS	D	W 1'	2'	3'	4'	5'	6'	7'	8'	9'	10'
1:1 SIDE SLOPES											
4"	1'	0.425	0.536	0.648	0.759	0.870	0.981	1.092	1.203	1.314	1.425
	2'	0.740	0.851	0.962	1.073	1.184	1.295	1.406	1.517	1.628	1.740
	3'	1.054	1.165	1.276	1.387	1.498	1.609	1.721	1.832	1.943	2.054
	4'	1.368	1.479	1.590	1.702	1.813	1.924	2.035	2.146	2.257	2.368
6"	5'	1.682	1.794	1.905	2.016	2.127	2.238	2.349	2.460	2.571	2.682
	6'	1.997	2.108	2.219	2.330	2.441	2.552	2.663	2.774	2.884	2.997
	7'	2.311	2.422	2.533	2.644	2.755	2.866	2.977	3.089	3.200	3.311
	8'	2.625	2.736	2.848	2.959	3.070	3.181	3.292	3.403	3.514	3.625
	9'	2.940	3.051	3.162	3.273	3.384	3.495	3.606	3.717	3.828	3.939
	10'	3.254	3.365	3.476	3.587	3.698	3.809	3.920	4.032	4.143	4.254
1½:1 SIDE SLOPES											
4"	1'	0.512	0.623	0.734	0.845	0.956	1.067	1.178	1.290	1.401	1.512
	2'	0.812	1.023	1.135	1.246	1.357	1.468	1.579	1.690	1.801	1.912
	3'	1.313	1.424	1.535	1.646	1.757	1.869	1.980	2.091	2.202	2.313
	4'	1.714	1.825	1.936	2.047	2.158	2.269	2.380	2.491	2.602	2.714
6"	5'	2.114	2.225	2.336	2.448	2.559	2.670	2.781	2.892	3.003	3.114
	6'	2.515	2.626	2.737	2.848	2.959	3.070	3.181	3.293	3.404	3.515

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

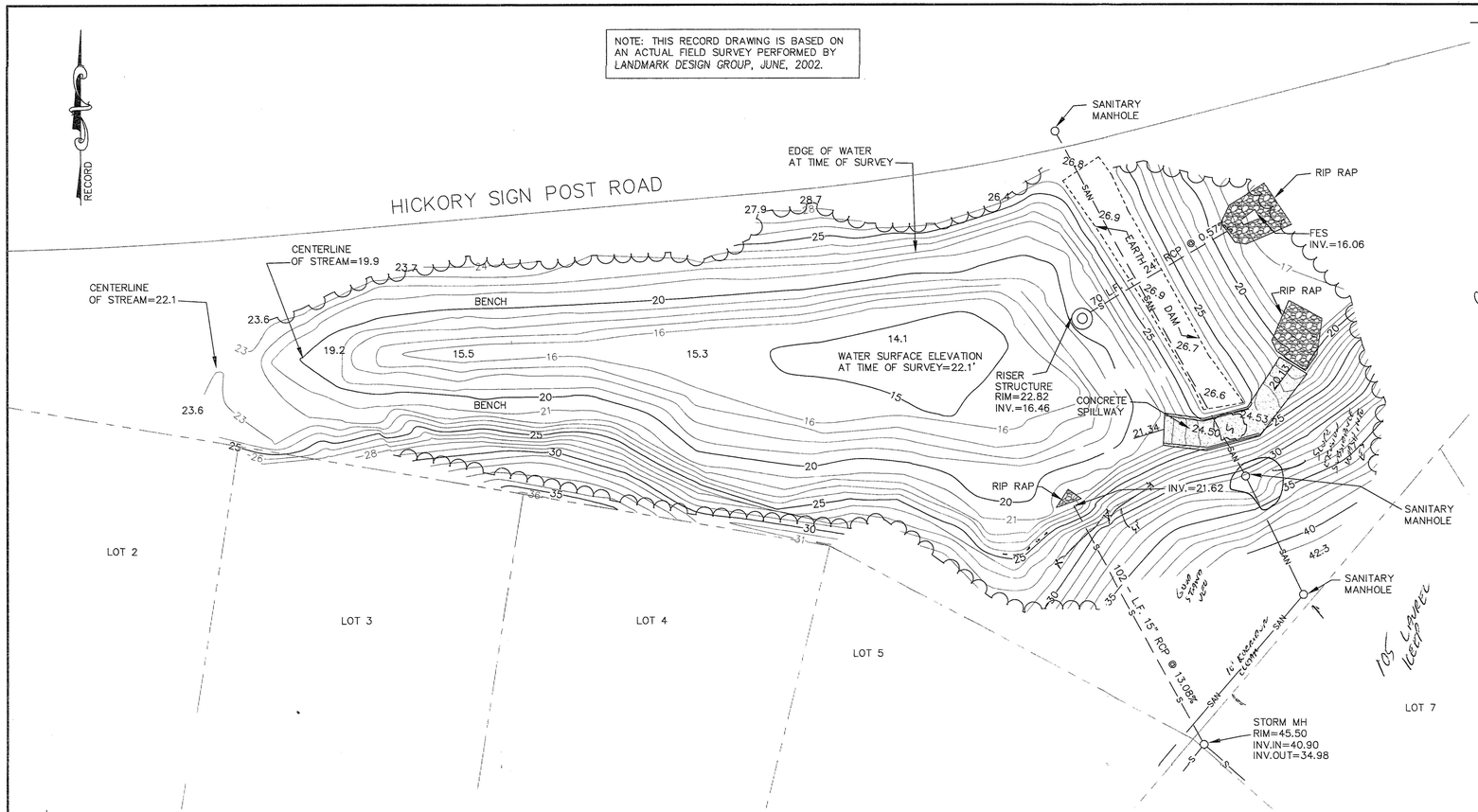
DES.	JLH
DWN.	SAG
CHK.	JLH
DATE	2/15/95

BMP NOTES AND DETAILS
SETTLERS MILL
AT JAMESTOWN
SECTION 6
OWNER/DEVELOPER: SETTLERS MILL INC.
JAMES CITY COUNTY, VIRGINIA

NC007 to be
Scanned

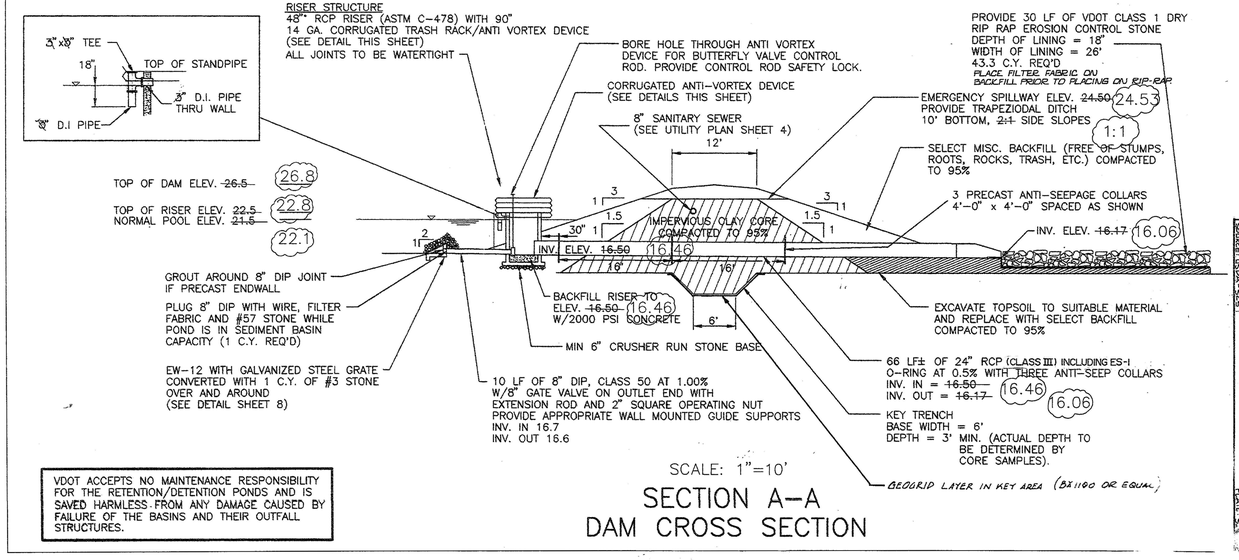
MET 2/3/00 G. WARREN L. McCARDLE R. COOK

NOTE: THIS RECORD DRAWING IS BASED ON AN ACTUAL FIELD SURVEY PERFORMED BY *LANDMARK DESIGN GROUP, JUNE, 2002.*



DHW = 24.41

(24.53) REVISED PER FIELD SURVEY



VDOT ACCEPTS NO MAINTENANCE RESPONSIBILITY FOR THE RETENTION/DETENTION PONDS AND IS SAVED HARMLESS FROM ANY DAMAGE CAUSED BY FAILURE OF THE BASINS AND THEIR OUTFALL STRUCTURES.

SCALE: 1"=10'

SECTION A–A
DAM CROSS SECTION

GENERAL NOTES - DAM CONSTRUCTION

1. EMBANKMENT SUBGRADES TO BE STRIPPED OF ALL TOPSOIL, ORGANIC MATTER, AND SOFT AND LOOSE SOILS PRIOR TO PLACEMENT OF FILL MATERIALS.
2. SUBGRADE TO BE PROOF ROLLED WITH A LOADED TANDEM DUMP TRUCK OR SIMILAR EQUIPMENT UNDER THE OBSERVATION OF THE ENGINEER.
3. AREAS THAT EXHIBIT EXCESSIVE PUMPING OR WEAVING WILL REQUIRE UNDERCUTTING.
4. COMPACTED EMBANKMENT FILL TO BE FREE OF ORGANIC MATTER AND CLASSIFY SM, SC, ML, MH OR CL IN ACCORDANCE WITH UNIFIED SOIL CLASSIFICATION SYSTEM ASTM D-2487.
5. EMBANKMENT FILL TO BE PLACED IN LOOSE LIFTS NOT EXCEEDING 8 INCHES IN THICKNESS AND SHOULD BE COMPACTED TO AT LEAST 95% OF MAXIMUM DRY DENSITY ACCORDING TO ASTM D-698, STANDARD PROCTOR. FILL SHOULD BE COMPACTED AT MOISTURE CONTENTS WITHIN ± 20% OF THE OPTIMUM MOISTURE CONTENT FOR THE MATERIAL USED.
6. THE SURFACE OF EACH COMPLETED LIFT OF COMPACTED EMBANKMENT FILL SHOULD BE SCARIFIED TO A DEPTH OF 2 TO 3 INCHES PRIOR TO PLACING ADDITIONAL FILL TO LIMIT THE DEVELOPMENT OF HORIZONTAL SEEPAGE PLAINS WITHIN THE EMBANKMENT.
7. COMPACTED EMBANKMENT FILL TO BE PLACE IN HORIZONTAL LIFTS.
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10. THE PRINCIPAL SPILLWAY PIPE TO BE SUPPORTED ON NATURAL GROUND OR COMPACTED EMBANKMENT FILL OR AS SHOWN ON THE PLANS.
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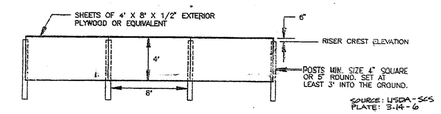
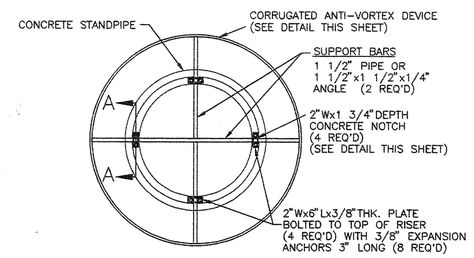
15. THE EMBANKMENT FOUNDATION TO BE FREE OF PONDED WATER, EXCESSIVELY MUDDY CONDITIONS AND IN DRAINABLE CONDITION AS NEEDED FOR PROPER EXECUTION OF THE CONSTRUCTION WORK.

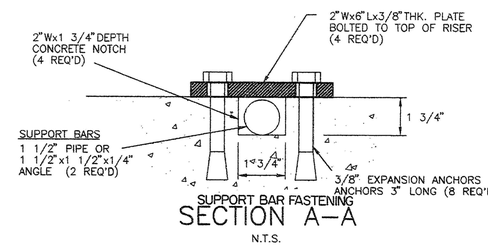
① Remove one cy of ground, clearing, grubbing, stripping & disposal of surplus fill material off site
② Compact fill surrounding pipe to 95% standard proctor



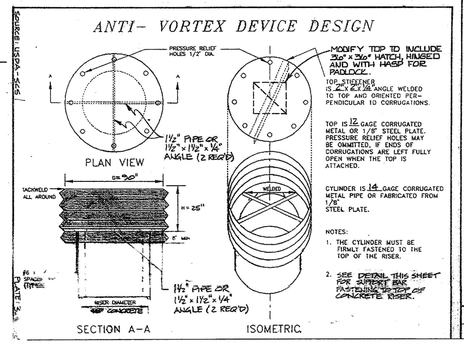
BAFFLE DETAIL
N.T.S.

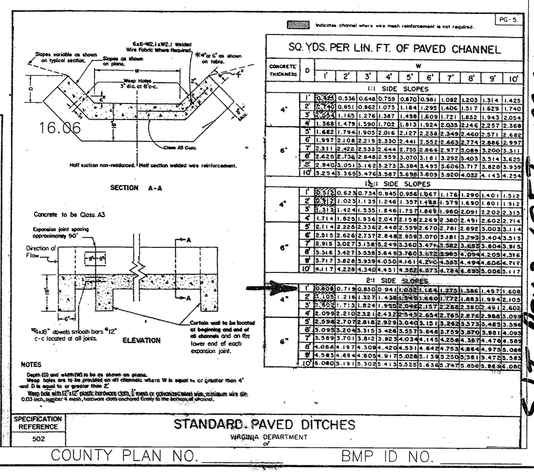


ANTI–VORTEX PLAN VIEW
TOP REMOVED
N.T.S.



SECTION A–A
N.T.S.





COUNTY PLAN NO. _____ BMP ID NO. _____

COMMONWEALTH OF VIRGINIA
6-19-02
PETER FARRELL
NO.002036
LAND SURVEYOR

4029 Ironhound Road
Suite 100
Williamsburg, VA 23188
Voice (757) 220-9393
Fax (757) 229-6949
Email: lmdg@landmarkdg.com

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

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

SJT REVIEW SET MC 007; 5-19-95

BMP RECORD DRAWING
SETTLERS MILL
AT JAMESTOWN
SECTION 6
OWNER/ DEVELOPER: SETTLERS MILL INC.
JAMES CITY COUNTY, VIRGINIA
JAMESTOWN DISTRICT

Designed: LMDG	Date: 06/19/02
Checked: PF	Scale: 1"=25'
File Mgr./Drawn: AST	CADD File name: SM6-BMP-2
Project Number: 1930047-000.21	Dwg. File No.: 13332W
Drawing Number	R-1

1 OF 1

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

Name	Content	Date
Jo Anna Ripley	MC007,MC016, MC029, MC030 SETTLERS MILL ASSOCIATION DOC #090027576 RE: LOT29	1/14/2014
Jo Anna Ripley	MC007, MC016, MC029, MC030 DEED OF GIFT DOC #000009283	1/14/2014

MC007, MC016, MC029, MC030

090027576

VIRGINIA:

IN THE CIRCUIT COURT FOR THE CITY OF WILLIAMSBURG
AND JAMES CITY COUNTY

SETTLERS MILL ASSOCIATION,

Plaintiff,

v. Civil Case No. CL08-657-00

LAWRENCE E. LUCK
and
TRACY M. LUCK,

Defendants.

FINAL JUDGMENT ORDER

On September 18, 2009 came the Plaintiff, Settlers Mill Association, and the Defendants, Lawrence E. Luck and Tracy M. Luck, in person and by counsel, on the Plaintiff's Complaint for declaratory judgment. Upon consideration whereof, and the pleadings and papers filed herein, and of the evidence and argument of counsel, *ore tenus*, the Court finds and declares:

A. That, as pertaining to Lot 29 ("Lot 29") as shown on Plat of Lakewood Section II Lot 1 thru Lot 29, which is recorded in Plat Book 45, page 80 in the land records of the Clerk of this Court, the First Amendment to Declaration of Covenants and Restrictions ("First Amendment"), which is recorded in Deed Book 476, page 143 in the land records of the Clerk of this Court and Second Amendment to Declaration of Covenants and Restrictions ("Second Amendment"), which is recorded as Instrument No. 050026910 in the land records of the Clerk of this Court, as corrected by Correction of Clerical Error, which is recorded as Instrument No. 070025362 in the land records of the Clerk of this Court are not valid amendments of the Declaration of Covenants and Restrictions, which is recorded in Deed Book 352, page 122 in the

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B. That Lot 29 is not subject to the provisions of the Original Declaration, as amended; and,

C. That Lot 29 is not subject to architectural review as described in the Original Declaration, as amended. Accordingly, it is

ORDERED that judgment be and hereby is entered for the Defendants denying the relief requested by the Plaintiff, and the claims of the Plaintiff are hereby dismissed, with prejudice. It is further

ORDERED that each party shall bear its or their own attorney's fees and costs. It is further

ORDERED that the Clerk record this Final Judgment Order forthwith in the land records of the Circuit Court of the County of James City with **SETTLERS MILL ASSOCIATION**, Lawrence E. **LUCK** and Tracy M. **LUCK** to be indexed as Grantors and Lawrence E. **LUCK** and Tracy M. **LUCK** to be indexed as Grantees.

The Clerk is directed to send attested copies hereof to counsel of record.

ENTER / , October 6, 2009

Walter J. Ford
Judge

I ask for this:

Lawrence E. Luck
VSB No. 26404
TRACY MCMURTRIE LUCK & ASSOCIATES
3917 Midlands Rd., Bldg. Two, Ste. 100
Williamsburg, Virginia 23188
(757) 221-0284
(757) 229-4670 (facsimile)
Counsel for Defendants

Seen and objected to: FOR THE REASONS STATED BELOW AND THE REASONS SET OUT IN PLAINTIFF'S OPENING BRIEF AND PLAINTIFF'S REBUTTAL BRIEF PREVIOUSLY FILED HEREIN.

Sheldon M. Franck, Esquire
GEDDY, HARRIS, FRANCK & HICKMAN, L.L.P.
1177 Jamestown Rd.
Williamsburg, Virginia
(757) 220-6500
Counsel for Plaintiff

THE PLAINTIFF EXCEPTS TO ANY FINDINGS BY THE COURT THAT THE ORIGINAL DECLARATION, AS AMENDED BY THE FIRST AMENDMENT, SECOND AMENDMENT AND CORRECTION OF CLERICAL ERROR, CONTAINS ANY AMBIGUITY WHICH WOULD IMPAIR ITS ENFORCEMENT.

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PARCEL 5: COMMON AND CONSERVATION AREA, SECTION 5

All those certain lots, pieces or parcels of land, situate, lying and being in James City County, Virginia known and designated as "Common and Conservation Area 29 489

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File MC007, MC016, MC029, MC030

000009283

THIS DEED OF GIFT IS EXEMPT FROM RECORDATION TAXES UNDER THE CODE OF VIRGINIA SECTION 58.1-811 (D).

DEED OF GIFT AND DEDICATION

THIS DEED OF GIFT AND DEDICATION, MADE the 4th day of May, in the year 2000, between

SETTLERS MILL, INCORPORATED, a Virginia corporation, Grantor, and **SETTLERS MILL ASSOCIATION, a Virginia corporation,** Grantee.

WITNESSETH:

That in accordance with the Declaration of Covenants and Restrictions recorded in James City County Deed Book 536 Page 558, as amended the said Grantor does grant and convey, with **SPECIAL WARRANTY OF TITLE** unto the said Grantee the following described property, to-wit:

PARCEL 1: RECREATION LOT

All that certain lot, piece or parcel of land situate, lying and being in James City County, Virginia, known and designated as "Recreation Lot 109,925 S.F. ± 2.524 AC ±" as shown on that certain plat entitled, "PLAT SHOWING RECREATION LOT SETTLERS MILL OWNER/DEVELOPER: SETTLERS MILL, INC. JAMES CITY COUNTY, VIRGINIA" dated January 14, 1991 and made by AES Consulting Engineers and duly recorded in the Clerk's Office of the Circuit Court for the City of Williamsburg and County of James City, Virginia in Plat Book 59 Page 41.

MAY 15 8 0045

This document prepared by
Geddy, Harris, Franck & Hickman, L L P

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Whenever used herein the masculine gender shall include the feminine and neuter and the neuter gender shall include the masculine and the feminine and the singular form shall include the plural.

WITNESS the following signatures and seals:

Settlers Mill, Incorporated

By: _____(SEAL)
Larry R. McCardle, President

MAY 15 8 00 48

STATE OF VIRGINIA

CITY OF WILLIAMSBURG

The foregoing instrument was acknowledged before me this 10th day of May, 2000 by Larry R. McCardle, President, Settlers Mill, Inc.

Marcia W. Moore
NOTARY PUBLIC

My commission expires: 10-31-2000

Grantee's Address: 1111 Old Colony Lane
Williamsburg, VA 23185

Prepared by
Geddy, Harris, Franck & Hickman, L L P

VIRGINIA: City of Williamsburg and County of James City, to-wit:
This Deed of Gift was presented with certificate annexed and admitted to record on May 15, 2000, at 10:46 AM/PM in the Clerk's Office of the Circuit Court of the City of Williamsburg and County of James City.
TESTE: BETSY B. WOOLRIDGE, CLERK
BY: Betsy B. Woolridge, Deputy Clerk

4-4