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: **WC013**

DATE VERIFIED: **September 18, 2012**

QUALITY ASSURANCE TECHNICIAN: **Leah Hardenbergh**

Leah Hardenbergh

LOCATION: WILLIAMSBURG, VIRGINIA

Stormwater Division

MEMORANDUM

DATE: March 12, 2010

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

FROM: Tina Cantwell, Stormwater

PO: 270712

RE: Files Approved for Scanning

General File ID or BMP ID: WC013

PIN: 1340100039

Subdivision, Tract, Business or Owner Name (if known): Child Development Resources, Inc.

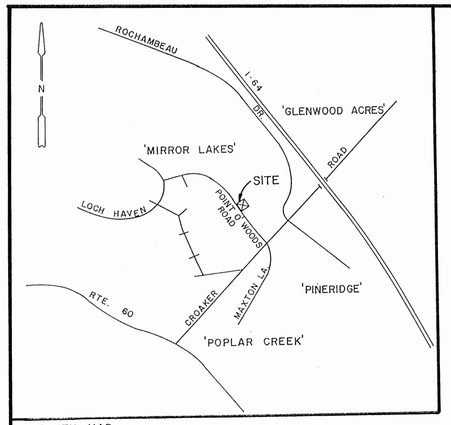
Property Description: Design Masters, Child Development

Site Address: 151 Point O' Woods

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

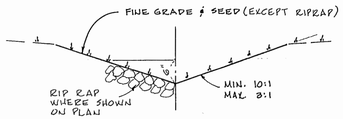
Agreements: (in file as of scan date) **N** **Book or Doc#:** **Page:**

Comments



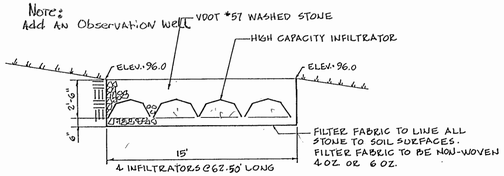
VICINITY MAP
SCALE: 1" = 2000'

BMP #76

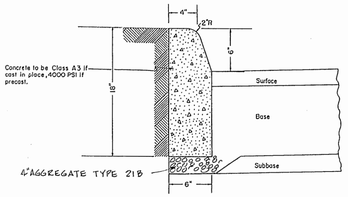


TYPICAL SWALE
N.T.S.

Note:
Add An Observation Well

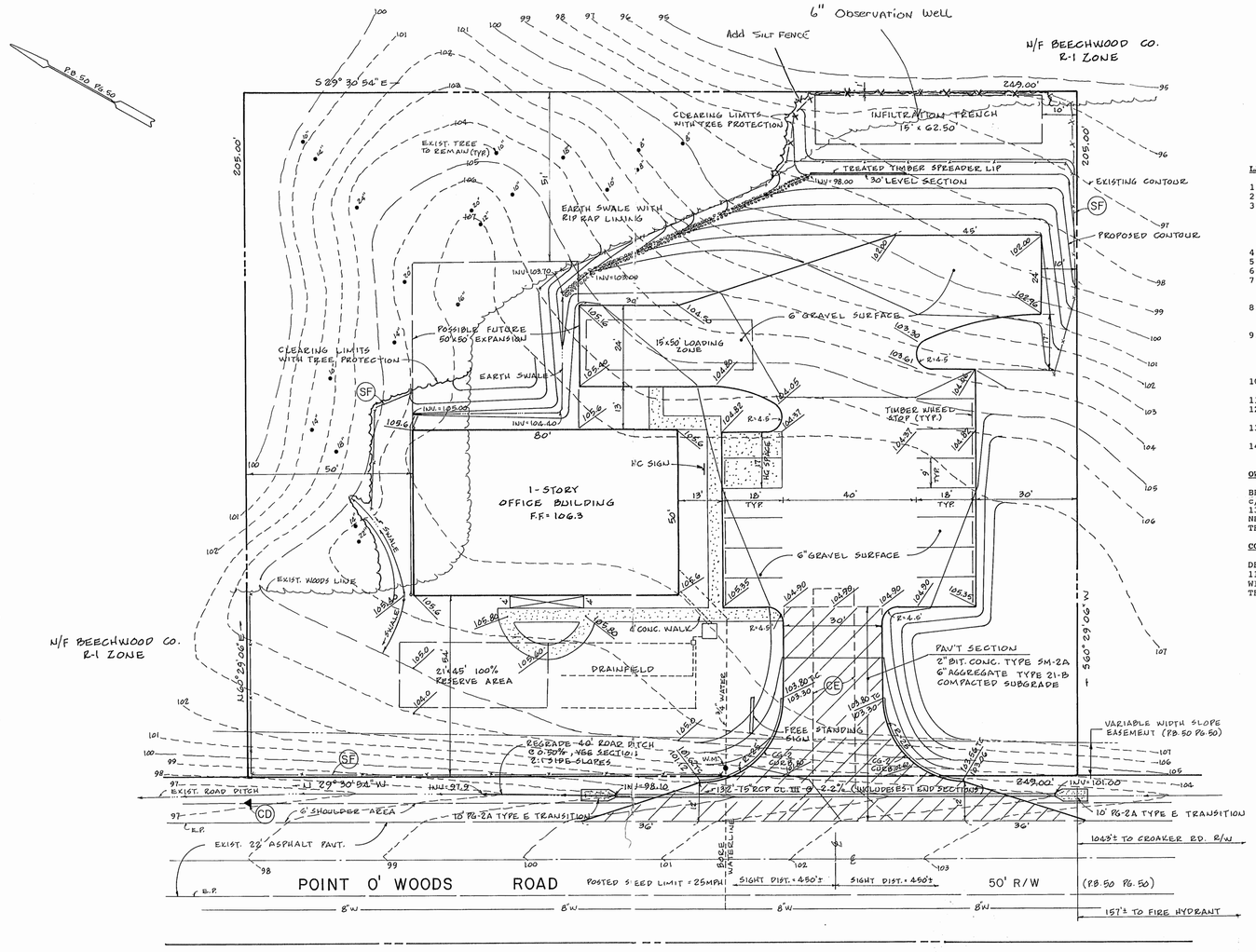


TRENCH SECTION
N.T.S.



CG-2 CURB
N.T.S.

WC013



PLAN
SCALE: 1" = 20'

VDOT NOTES

1. ALL MATERIALS AND CONSTRUCTION WITHIN THE PUBLIC RIGHT OF WAY SHALL BE IN ACCORDANCE WITH CURRENT VIRGINIA DEPARTMENT OF TRANSPORTATION'S SPECIFICATIONS AND STANDARDS.
2. PERMITS MUST BE OBTAINED FROM THE VIRGINIA DEPARTMENT OF TRANSPORTATION BEFORE CONSTRUCTION IS STARTED WITHIN THE EXISTING RIGHT OF WAY.
3. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONSULT THE ENGINEER AND VERIFY THE APPROVAL OF THE PLANS BY THE VARIOUS AGENCIES.
4. THE CONTRACTOR SHALL VERIFY THE ELEVATIONS OF ALL POINTS OF CONNECTION OR PROPOSED WORK TO EXISTING CURBS, SANITARY LINES, WATER LINES, ETC. PRIOR TO CONSTRUCTION.
5. WHEN SOILS OCCUR THAT ARE UNSUITABLE FOR FOUNDATIONS, SUBGRADES, OR OTHER ROADWAY PURPOSES, THE CONTRACTOR SHALL BE REQUIRED TO EXCAVATE SUCH MATERIAL BELOW THE GRADE SHOWN ON THE PLANS. THE AREAS SO EXCAVATED SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND COMPACTED IN ACCORDANCE WITH VDOT SPECIFICATIONS. THE CONTRACTOR SHALL IMMEDIATELY INFORM THE ENGINEER UPON DISCOVERY OF THE UNSUITABLE MATERIAL. CONCURRENCE OF THE DEVELOPER SHALL BE OBTAINED BEFORE ADDITIONAL ON-SITE WORK IS UNDERTAKEN.
6. ALL STORM SEWER PIPE SHALL BE REINFORCED TONGUE AND GROOVE CONCRETE PIPE IN ACCORDANCE WITH ASTM-C-76 OR ALTERNATIVE PIPE THAT HAS BEEN APPROVED ON THE PLANS.
7. TEMPORARY DRAINAGE DURING CONSTRUCTION IS TO BE PROVIDED BY THE CONTRACTOR TO RELIEVE AREAS THAT MAY CAUSE DAMAGE TO ROADWAYS OR ADJACENT PROPERTY.
8. ALL CONCRETE SHALL BE CLASS A3-AE(AIR ENTRAINED 3,000 PSI).
9. CURB AND GUTTER SHALL HAVE 4" OF AGGREGATE BASE 21B UNDER THE CURB AND GUTTER AND AGGREGATE SHALL EXTEND 1' BEYOND THE BACK OF THE CURB.
10. ALL ENTRANCES ARE TO BE BUILT IN ACCORDANCE WITH VDOT STANDARDS.
11. DESIGN OR SPECIFIED MATERIALS CHANGES FROM THE APPROVED PLANS NEED TO BE RE-SUBMITTED TO VDOT. A LETTER NEEDS TO ACCOMPANY THE REVISED PLANS AND/OR DRAINAGE CALCULATIONS WHICH SHALL BE SUBMITTED TO VDOT FOR REVIEW AND APPROVAL BY THE RESIDENT ENGINEER.
12. VDOT IS TO RECEIVE WRITTEN NOTIFICATION 48 HOURS PRIOR TO THE START OF ANY WORK.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES, WHETHER OR NOT SHOWN ON THE PLANS, AND SHALL REPAIR AT HIS OWN EXPENSE ALL UTILITIES DAMAGED BY CONSTRUCTION. MISS UTILITY MUST BE CONTACTED AT 1-800-552-7001 72 HOURS PRIOR TO THE BEGINNING OF CONSTRUCTION.
14. ALL STORM SEWER PIPES, DROP INLETS, AND CURB INLETS SHALL BE CLEANED OF DEBRIS AND ERODED MATERIAL DURING THE LAST STAGES OF CONSTRUCTION.
15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING, WITH MATCHING MATERIALS, ANY PAVEMENT, DRIVEWAYS, WALKS, CURBS, ETC. THAT MUST BE CUT OR THAT ARE DAMAGED DURING CONSTRUCTION.
16. ANY ERRORS, CONFLICTS, OR DISCREPANCIES IN THIS PLAN SHALL BE REPORTED TO THE ENGINEER FOR RESOLUTION BEFORE PROCEEDING WITH THE WORK.
17. COMPACTION REPORTS, WITH PROCTOR, ARE REQUIRED FOR SUBGRADE, SUBBASE, BASE, SURFACE COURSES, CULVERTS, DRAINAGE STRUCTURES, AND UTILITIES WITHIN THE RIGHT OF WAY BY A CERTIFIED MATERIALS TEST LAB IN ACCORDANCE WITH VDOT SPECIFICATIONS AND STANDARDS.
18. INSTALLATION OF PIPE CULVERTS, STORM SEWERS, AND DRAINAGE STRUCTURES SHALL HAVE BEDDING MATERIAL IN ACCORDANCE WITH VDOT SPECIFICATIONS AND STANDARDS. BACKFILL SHALL BE SUITABLE MATERIAL FREE OF DEBRIS, TREE ROOTS, AND EXCESS MOISTURE, AND COMPACTED.
19. VDOT APPROVAL OF THESE PLANS WILL EXPIRE THREE YEARS FROM THE DATE OF APPROVAL.
20. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
21. WATERLINE SHALL BE BORED UNDER POINT O' WOODS ROAD PER SECTION 2.3B OF SUBDIVISION STREET REQUIREMENTS.

LAND USE SUMMARY AND GENERAL NOTES

1. ZONING OF SITE: B-1
2. TAX MAP (13-4) PART OF PARCEL (1-13)
3. AREA TABULATIONS
   TOTAL AREA OF SITE: 51,045 SF = (100.0%)
   NEW OFFICE BLDG. : 4,000 SF = (7.8%)
   PARKING & WALKS : 11,235 SF = (22.0%)
   NET OPEN SPACE : 35,810 SF = (70.2%)
4. BUILDING CONSTRUCTION : FRAME (BOCA TYPE 5B)
5. MAXIMUM BUILDING HEIGHT: 25 FEET
6. THE PROJECTED OVERALL IMPERVIOUS AREA OF SITE = (29.8%)
7. PARKING REQUIRED:
   OFFICE: 1000 SF / 250 SF = 4 SPACES
   WAREHOUSE: 6 EMPLOYEES / 2 = 3 SPACES
8. PARKING PROVIDED:
   (12) - 9'x18' STANDARD SPACES
   (1) - 17'x18' HANDICAP SPACE
9. REZONING PROFFER: THE PROPERTY SHALL BE USED ONLY FOR BUSINESS, GOVERNMENT AND PROFESSIONAL OFFICES, PHOTOGRAPHY STUDIOS AND SALES, ARTIST AND SCULPTOR STUDIOS, ART AND CRAFTS AND HANDICRAFT SHOPS, ANTIQUE SHOPS, REPRODUCTION AND GIFT SHOPS. THERE SHALL BE NO EXTERIOR STORAGE SPACE ON THE SITE, EXCEPT FOR STORAGE WITHIN A FULLY ENCLOSED BUILDING.
10. THE FREESTANDING SIGN SHALL BE IN ACCORDANCE WITH THE PROFFERS AND/OR THE SIGN ORDINANCE, WHICHEVER HAS GREATER RESTRICTIONS.
11. EXISTING TREES SPOTTED ON THE PLAN ARE TO REMAIN.
12. RUNOFF FROM THE FRONT LEFT CORNER OF THE BUILDING IS TO BE DIVERTED TO THE REAR SWALE THROUGH THE ROOF GUTTER SYSTEM.
13. THE CONSTRUCTION OF THE INFILTRATION TRENCH SHALL BE DELAYED UNTIL ALL UPSLOPE DISTURBED AREAS HAVE BEEN STABILIZED.
14. THE WATERLINE FROM THE 8" MAIN TO THE METER BOX SHALL BE INSTALLED BY JCSA.

OWNER

BEECHWOOD COMPANY
c/o NICE BROTHERS
13127 WARWICK BOULEVARD
NEWPORT NEWS, VIRGINIA 23602
TELEPHONE: 804-249-0246

CONTRACT PURCHASER

DESIGN MASTER ASSOCIATES, INC
114 BLACKHEATH
WILLIAMSBURG, VIRGINIA 23188
TELEPHONE: 804-258-4500

COUNTY OF JAMES CITY
FINAL SITE PLAN
Received .....

APPROVALS		DATE
Fire Dept.		5-19-94
Health Dept.		5-31-94
Highwy. Dept.		6-27-94
Plan. Comm.		7/6/94
Pub Wks. Dept.		5-27-94
Zoning Adm.		7/15/94
JCSA		5-19-94
Other		5-18-94
Other		

JUN 1994
RECEIVED
PLANNING DEPARTMENT

I CERTIFY TO THE BEST OF MY KNOWLEDGE AND BELIEF THAT THESE PLANS CONFORM TO ALL VDOT DESIGN STANDARDS AND COUNTY ORDINANCES, COMPREHENSIVE PLANS AND REGULATIONS.

Louis M. Penci
LOUIS M. PENCI L.S. NO. 1328B

20' 0 20'
SCALE: 1" = 20'

COMMONWEALTH OF VIRGINIA
LOUIS M. PENCI
No. 1328-B
Louis M. Penci
1-26-94
LAND SURVEYOR

REVISED JUNE 15, 1994
REVISED MAY 5, 1994

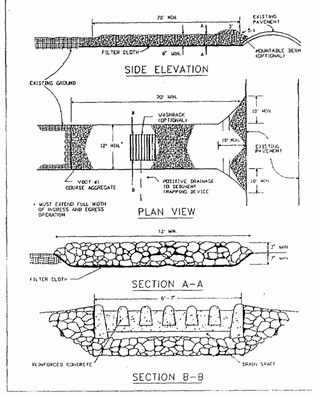
SITE PLAN	DATE JAN. 26, 1994
PROPOSED OFFICE BUILDING DESIGN MASTER ASSOC.'S POINT O' WOODS ROAD JAMES CITY COUNTY, VIRGINIA	SCALE 1" = 20'
	DESIGN/DRAWN LMP
	CHECK/APPROVED
LOUIS M. PENCI, INC. 863 Catalina Drive, Newport News, Virginia 23602 (804) 874-6388 LAND PLANNING SUBDIVISIONS SITE PLANS SURVEYING	JOB NO. 93041I
	SHEET 1 of 3

SP-15-94

WC013_DESIGN_MASTERS - 003

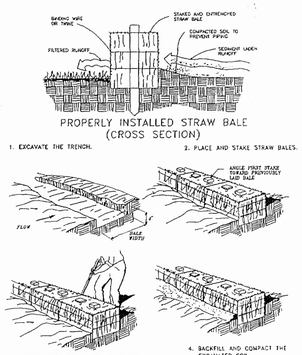
3.02 TEMPORARY STONE CONSTRUCTION ENTRANCE (CE)

STONE CONSTRUCTION ENTRANCE



3.04 STRAW BALE BARRIER (STB)

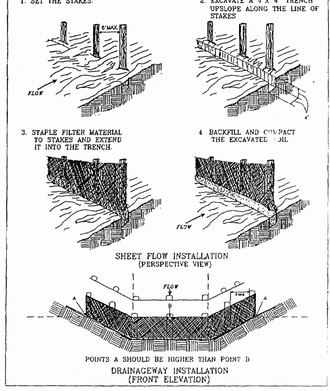
STRAW BALE BARRIER



CONSTRUCTION OF STRAW BALE BARRIER

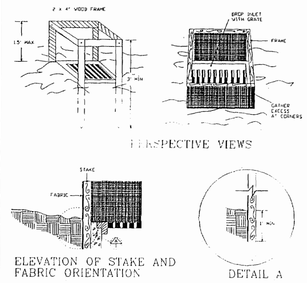
3.05 SILT FENCE (SF)

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



3.07 STORM DRAIN INLET PROTECTION (IP)

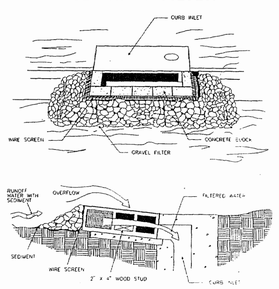
SILT FENCE DROP INLET PROTECTION



SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE THE INLET DRAINS A RELATIVELY FLAT AREA (SLOPE NO GREATER THAN 5%) WHERE THE INLET SHEET OR OVERLAND FLOWS (NOT EXCEEDING 1 C.F.S.) ARE TYPICAL. THE METHOD SHALL NOT APPLY TO INLETS RECEIVING CONCENTRATED FLOWS SUCH AS IN STREET OF HIGHWAY MEDIANS

BLOCK & GRAVEL CURB INLET SEDIMENT FILTER

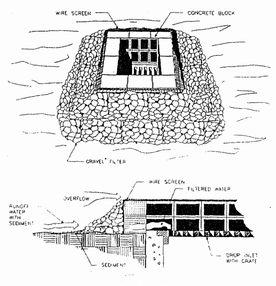


SPECIAL APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE AN OVERFLOW CAPABILITY IS NECESSARY TO PREVENT EXCESSIVE PONDING IN FRONT OF THE STRUCTURE

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

BLOCK AND GRAVEL DROP INLET SEDIMENT FILTER

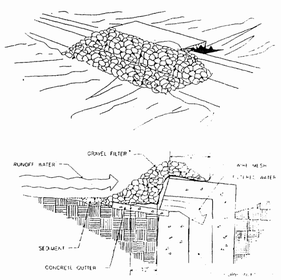


SPECIFIC APPLICATION

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

GRAVEL CURB INLET SEDIMENT FILTER



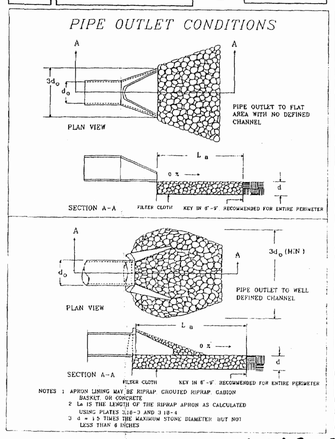
SPECIFIC APPLICATION

THIS METHOD OF INLET PROTECTION IS APPLICABLE AT CURB INLETS WHERE PONDING IN FRONT OF THE STRUCTURE IS NOT LIKELY TO CAUSE INCONVENIENCE OR DAMAGE TO ADJACENT STRUCTURES AND PAVEMENT AREAS

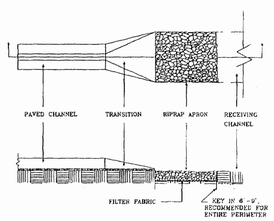
* GRAVEL SHALL BE VDOT #3, #357 OR #5 COARSE AGGREGATE

3.18 OUTLET PROTECTION (OP)

PIPE OUTLET CONDITIONS



PAVED CHANNEL OUTLET



NOTES

1. RIPRAP APRON REDUCES THE FLOW VELOCITY BELOW THE PERMISSIBLE VELOCITY OF THE NATURAL RECEIVING CHANNEL
2. TRANSITION SIDE DIVERGENCE IS 1 IN 3? WHERE

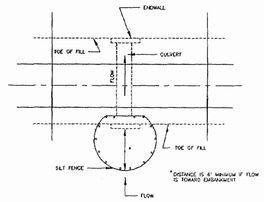
$F = \text{FROUDE NUMBER} = \frac{V}{\sqrt{gd}}$ WHERE

V = VELOCITY AT THE BEGINNING OF THE TRANSITION
d = DEPTH OF FLOW AT THE BEGINNING OF THE TRANSITION

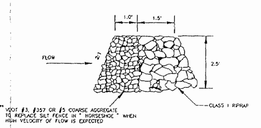
$g = 32.2\ ft./sec^2$

3.08 CULVERT INLET PROTECTION (CIP)

SILT FENCE CULVERT INLET PROTECTION



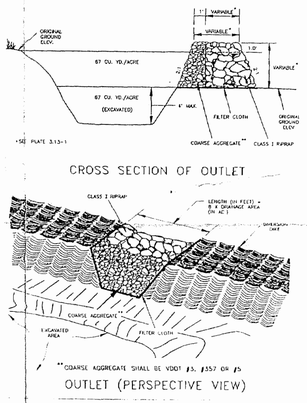
OPTIONAL STONE COMBINATION**



** VDOT #3, #357 OR #5 COARSE AGGREGATE TO REPLACE SILT FENCE IN "OPTIONAL" WHEN HIGH VELOCITY OF FLOW IS EXPECTED

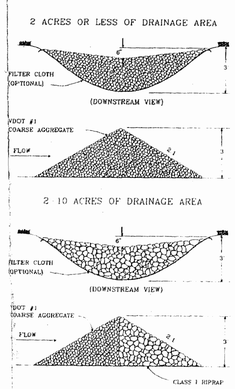
3.13 TEMPORARY SEDIMENT TRAP (ST)

TEMPORARY SEDIMENT TRAP



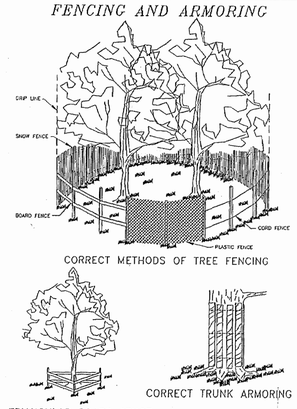
3.20 ROCK CHECK DAMS (CD)

ROCK CHECK DAM



3.38 TREE PRESERVATION AND PROTECTION (TP)

FENCING AND ARMORING



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.

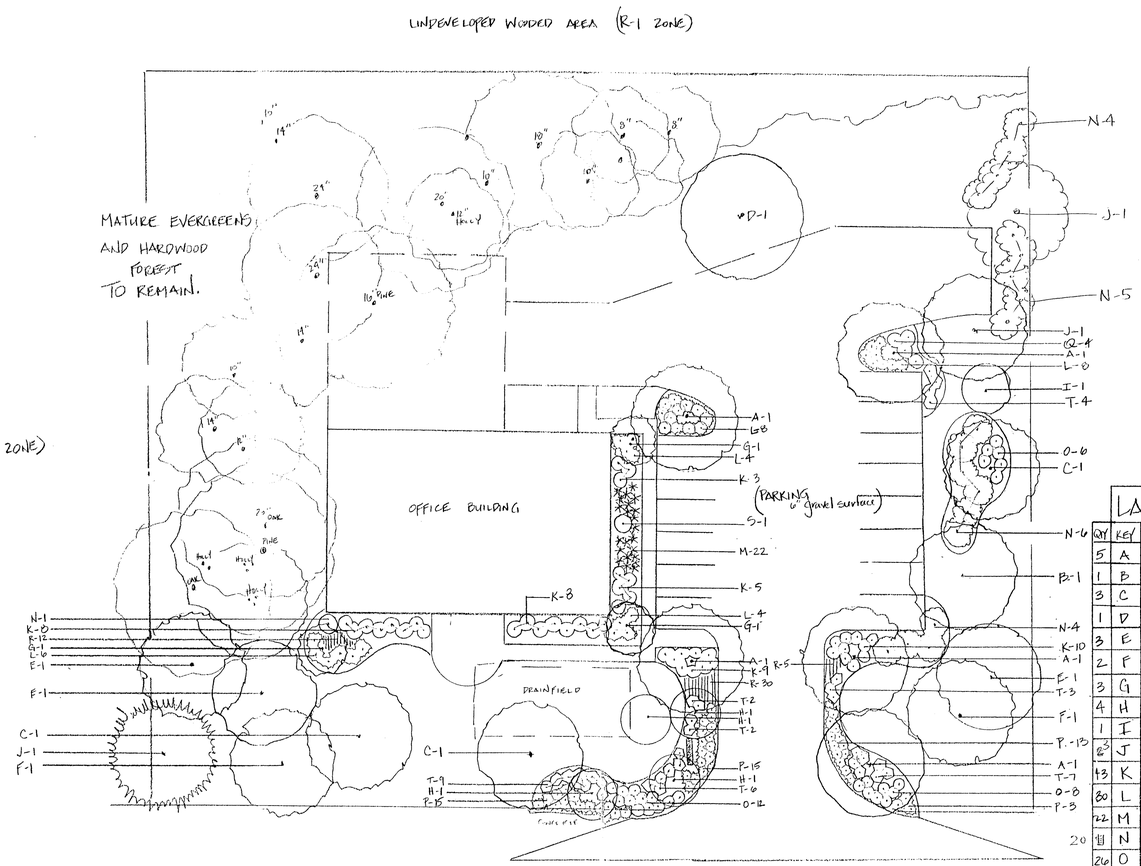
1. All erosion and sediment control measures shall be installed and maintained in accordance with the "Virginia Erosion and Sediment Control Handbook." The contractor shall be thoroughly familiar with all applicable measures contained therein which may be pertinent to this project.
2. All points of construction 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.
3. 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. An on-site pre-construction meeting will be held between the Office of Code Compliance and the contractor to identify those measures to be initially installed.
4. Maintenance of all erosion and sediment control measures shall include the repair of measures damaged by any subcontractor including those of the public utility companies. At the pre-construction 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.
5. Surface flows over cut and fill slopes shall be controlled by either redirecting flows from transversing the slopes or by installing 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 adjustements at time of construction to insure their intended purpose is accomplished. Office 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.
8. The contractor shall complete drainage facilities within 30 days after 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 where required. Any drainage outfalls required for a street must be completed before street grading 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' of sanitary sewer, storm sewer, or waterlines 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 vegetative cover. Installation shall be in accordance with Specification 3.35, Mulching and Manufacturer's Instructions.
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. Off-site waste or borrow areas shall be approved by the Office of Code Compliance prior to the import of any borrow or export of any waste to or from the project site.
19. All paved and/or piped outfalls will be constructed before road grading and utility installation begins.

REVISED MAY 5,1994

COMMONWEALTH OF VIRGINIA
LOUIS M. PENCI
No. 1323-B
Louis M. Penci
1-26-94
LAND SURVEYOR

EROISON & SEDIMENT CONTROL DETAILS	DATE JAN. 26, 1994
PROPOSED OFFICE BUILDING DESIGN MASTER ASSOC'S POINT O' WOODS ROAD JAMES CITY COUNTY, VIRGINIA	SCALE NONE DESIGN/DRAWN LMP CHECK/APPROVED
LOUIS M. PENCI, INC. 863 Catalina Drive, Newport News, Virginia 23602 (804) 874-6388 LAND PLANNING SUBDIVISIONS SITE PLANS SURVEYING	JOB NO. 930411 SHEET 2 of 3

WC013



QT	KEY	SCIENTIFIC NAME	COMMON NAME	SIZE
5	A	Gleditsia triacanthos	Locust	2½" cal.
1	B	Acer rubrum 'October Glory'	'October Glory' Maple	2½" cal.
3	C	Quercus palustris	Pin Oak	2½" cal.
1	D	Platanus occidentalis	Sycamore	2½" cal.
3	E	Pinus taeda	Loblolly Pine	8' ht.
2	F	Magnolia grandiflora	Southern Magnolia	8' ht.
3	G	Lagerstroemia x 'Natchez'	Natchez Crape Myrtle	8' ht.
4	H	Cornus florida	White Flowering Dogwood	8' ht.
1	I	Cercis Canadensis	Eastern Redbud	8' ht.
23	J	Ilex opaca ferina	American Holly	8' ht.
13	K	Ilex cornuta 'Hetzi'	Hetzi Holly	18-24" cont.
80	L	Juniperus chinensis 'Pfitzeriana'	Parsons Juniper	18-15" cont.
22	M	Liriope muscari	Liriope	1 gal.
20	N	Myrica cerifera	Southern Waxmyrtle	18-24" cont.
26	O	Ilex cornuta 'Burfordii Nana'	Dwarf Burford Holly	18-24" cont.
46	P	Juniperus horizontalis	Compact Andorra Juniper	12-18" cont.
4	Q	Rhododendron spp.	Delaware Valley White Azalea	18-24" cont.
47	R	Hemerocallis spp.	Yellow Dwarf Daylily	1 gal.
1	S	Corylus avellana 'Contorta'	Harry Lauder's Walking Stick	24" cont.
33	T	Abelia grandiflora 'Edward Goucher'	Edward Goucher Glossy Abelia	18-24" cont.

LANDSCAPE DEVELOPMENT PLAN FOR

DESIGN MASTER ASSOCIATES

SCALE: 1" = 20' DATE: 2 MAY 94 , REV. #3

COCKES GREENHOUSES & GARDEN CENTERS SHARON B. BAILEY, DESIGNER

DRAINAGE CALCULATIONS

FOR

DESIGN MASTER ASSOCIATES, INC.

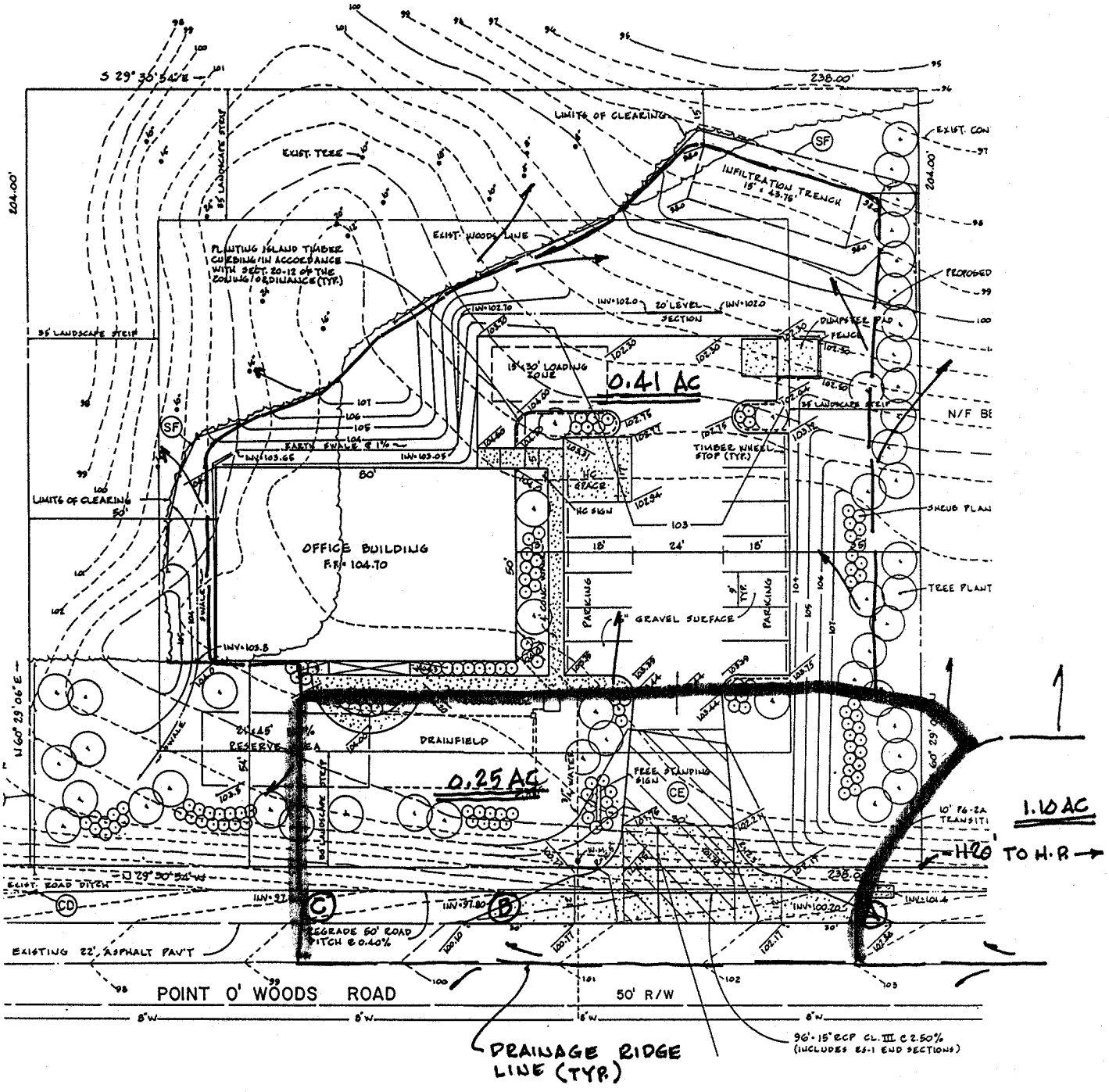
JAMES CITY COUNTY, VIRGINIA

JANUARY 1994

LOUIS M. PENCI, INC.

LAND PLANNING SUBDIVISIONS SITE PLANS SURVEYING

863 Catalina Drive • Newport News, Virginia 23602 • (804)-874-6388



DRAINAGE AREA MAP
DESIGN MASTER ASSOC. INC.
POINT O' WOODS RD.

Calculated By: L.PENCI Date: 1-24-94
Checked By: Date:
N= 0.013 RCP ; 0.030 VEE DITCH
Storm Frequency

LOUIS M. PENCI, INC.

LAND PLANNING SUBDIVISIONS SITE PLANS SURVEYING

STORM DRAINAGE COMPUTATION SHEET

Project No.: 930411
Project Desc. DESIGN MASTERS SITE
POINT O' WOODS DRIVE
Sheet of Sheets

LOCATION				RUN-OFF										PIPE - CHANNEL DESIGN						HYDRAULIC GRADE LINE								
				AREA-ACRES					TIME OF FLOW - MIN.																			
LINE	RUN	FROM	TO	INCREMENT	TOTAL	RUN-OFF COEFF.	INCREMENTAL CA	ACCUMULATED CA	TO INLET/ UPPER REACH	WITHIN REACH CONVEYANCE	TIME OF CONCENTRATION	INTENSITY	DISCHARGE C.F.S.	PIPE SIZE	CHANNEL SECTION	SLOPE FT./FT.	CAPACITY FULL C.F.S.	VELOCITY FULL F.P.S.	DESIGN VELOCITY F.P.S.	CONVEYANCE LENGTH FT.	INVERT UPSTREAM	INVERT DOWNSTREAM	FRICTION SLOPE FT./FT.	VELOCITY F.P.S.	$V^2/2G$ FT.	H.G.L. ELEV. UPSTREAM	H.G.L. ELEV. DOWNSTREAM	COVER ELEV. TOP OF BANK
		A	B	1.10	1.10	0.5	0.55	0.55			15.0	5.10	2.81	15"		0.0250	10.20	8.29	6.80	96	100.20	97.80	0.0019	2.28				
		B	C	0.25	1.35	0.5	0.13	0.68				5.10	3.47	d=0.98'	2:1 / 2:1	0.0040	3.47	1.81	1.81									

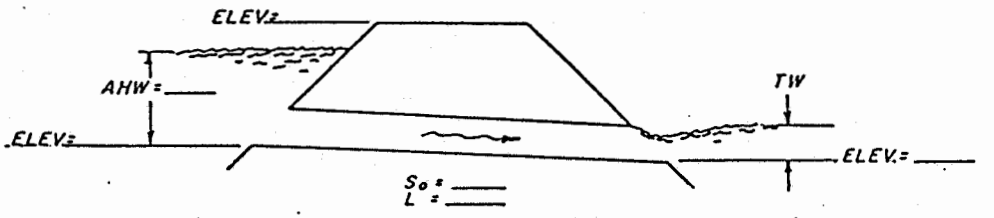
CALCULATED BY: PENCI DATE 1-24-94
CHECKED BY: _____ DATE _____

CULVERT COMPUTATION SHEET

JOB NO. 930411
PROJECT DESIGN MASTER ASSOC.
POINT OF WOODS DRIVE
SHEET _____ OF _____ SHEETS

HYDROLOGIC AND CHANNEL INFORMATION

SKETCH



CULVERT LOCATION _____

CULVERT DESCRIPTION (ENTRANCE TYPE)	Q	SIZE	HEADWATER COMPUTATION										CONT. HW	OUTLET VEL.	COST.	COMMENTS
			INLET CONT.		OUTLET CONTROL HW= H + ho − LSo											
			HW/D	HW	Ke	H	dc	(dc+D)/2	TW	ho	LSo	HW				
ENTRANCE PIPE (A-B)	2.81	15"	0.8	1.00	0.5	0.35	0.75	1.00	1.00	1.00	2.40	—	1.00			

SUMMARY & RECOMMENDATIONS:

Triangular Channel Analysis & Design
Open Channel - Uniform flow

Worksheet Name:

Comment: POINT O' WOODS ROAD DITCH

Solve For Depth

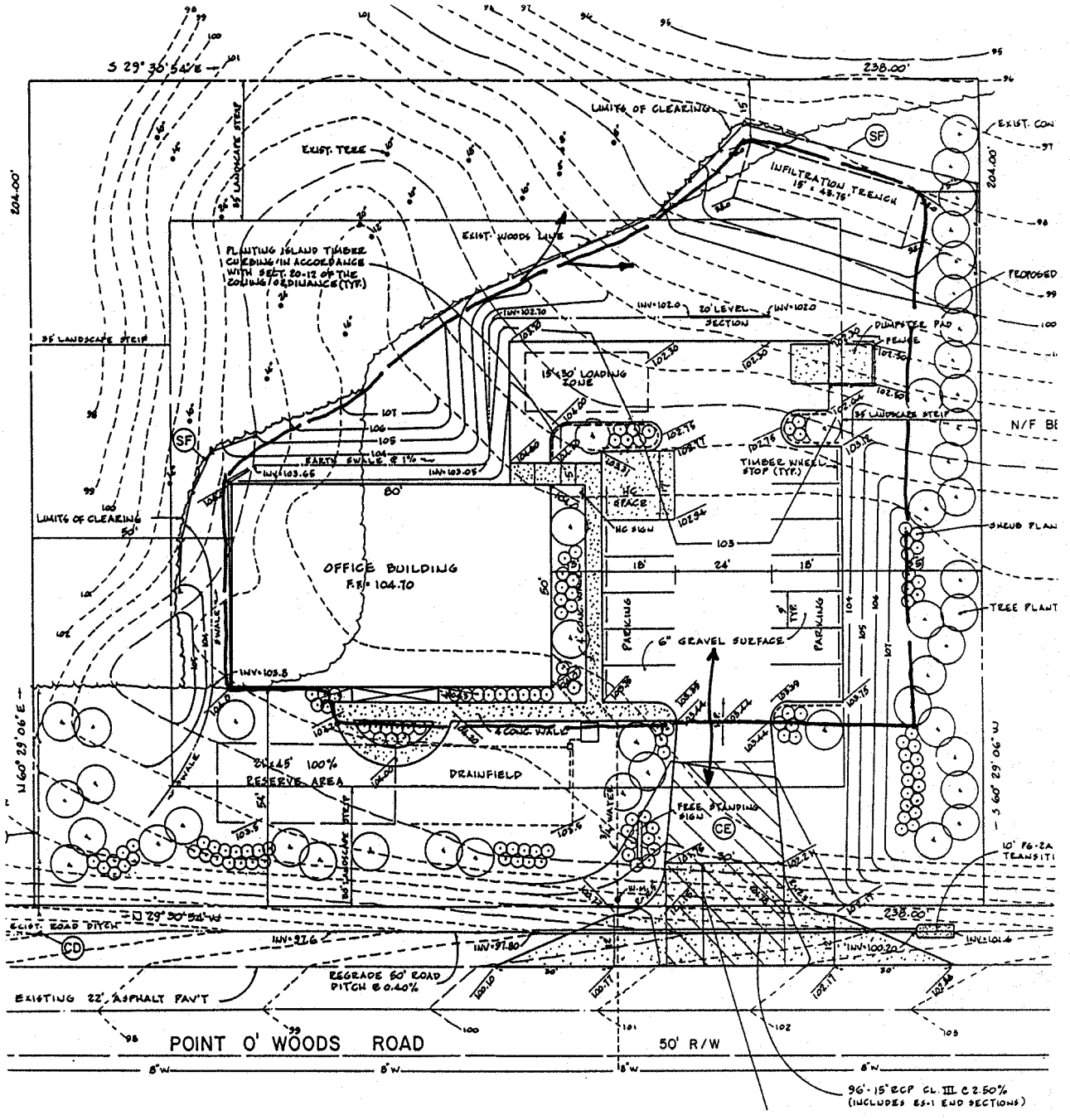
Given Input Data:

Left Side Slope..	2.00:1 (H:V)
Right Side Slope.	2.00:1 (H:V)
Manning's n.....	0.030
Channel Slope....	0.0040 ft/ft
Discharge.....	3.47 cfs

Computed Results:

Depth.....	0.98 ft
Velocity.....	1.81 fps
Flow Area.....	1.92 sf
Flow Top Width...	3.92 ft
Wetted Perimeter.	4.38 ft
Critical Depth...	0.72 ft
Critical Slope...	0.0215 ft/ft
Froude Number....	0.46 (flow is Subcritical)

Open Channel Flow Module, Version 3.3 (c) 1991
Haestad Methods, Inc. * 37 Brookside Rd * Waterbury, Ct 06708



INFILTRATION TRENCH DESIGN:

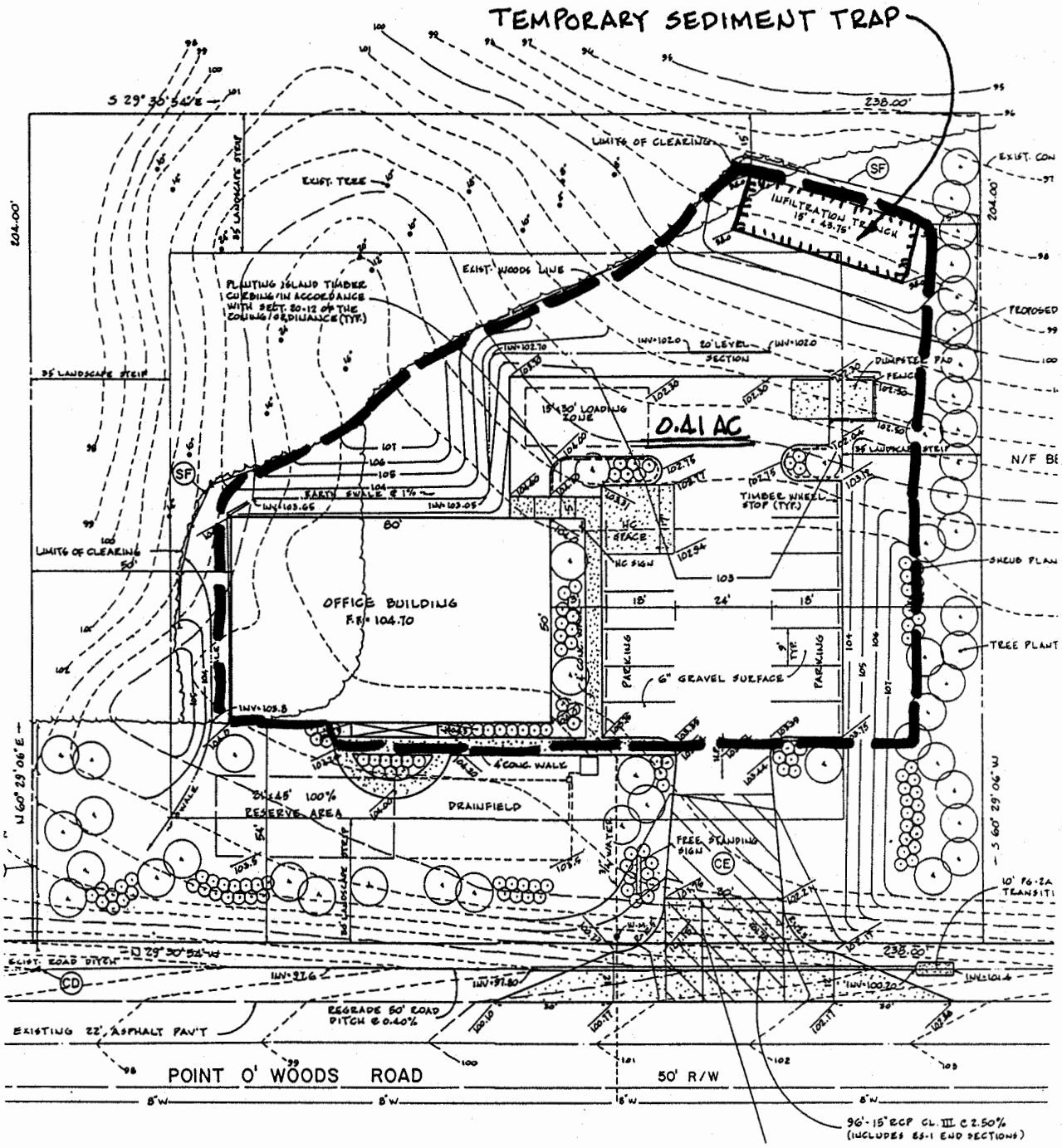
BUILDING = 4000 SF.
PARKING = 5850 SF
TOTAL = 9850 SF @ 1" = 818 C.F. REQUIRED STORAGE

11 PT BMP

USE 4 LINES OF INFILTRATORS (2.5' DEPTH & 15' WIDTH)

TRENCH VOLUME = 15' x 2.5' − (4 x 2.35) x 0.40 = 11.24 CF
INFILTRATORS = 4 x 2.35 = 9.40 CF
TOTAL = 20.64 CF PER FOOT

TRENCH LENGTH = 818 CF ÷ 20.64 CF = 39.6 L.F. MIN.
USE 7 PIPE LENGTHS @ 6.25' = 43.75 L.F. PROVIDED



VOLUME REQUIRED : 134 C.Y. @ 0.41 AC = 55 C.Y.

TRAP DIMENSIONS : 15' x 43.75' x 2.3' DEPTH

PEAK DISCHARGE TO TRAP:

A = 0.41 ACRES

C = 0.59

T_c = 8 MIN. I_2 = 5.00 I_{10} = 6.50

Q_2 = 1.21 CFS

Q_{10} = 1.57 CFS

RUNOFF ANALYSIS

DEC 1993
RECEIVED
PLANNING DEPARTMENT

FOR

DESIGN MASTER ASSOCIATES, INC.

JAMES CITY COUNTY, VIRGINIA

DECEMBER 10, 1993

LOUIS M. PENCI, INC.

LAND PLANNING SUBDIVISIONS SITE PLANS SURVEYING

863 Catalina Drive • Newport News, Virginia 23602 • (804)-874-6388

SUP-36-93

TABLE OF CONTENTS

I. INTRODUCTION 2
Scope of Report 2
Summary of Findings 2

II. DESCRIPTION OF PROJECT 3
Location and Land Use 3
Topography and Soils 3
Proposed Site Improvements 4

III. CHARACTERISTICS OF RUNOFF 5
Rainfall Criteria 5
Stormwater Runoff 5
Nonpoint Pollution 6

IV. POLLUTION MITIGATION AND
PERFORMANCE CRITERIA 9
Introduction 9
Control Practices 10
Summary 13

V. APPENDICES 14
A APPENDIX 15
Preliminary Site Plan Exhibit
B APPENDIX 16
Design data and criteria details for the infiltration trenches
C APPENDIX 17
Computer output SCS modified rational method
D APPENDIX 18
James City County Design Manual design guidelines for infiltration trenches and grassed filter strips
E APPENDIX 21
James City County Design Manual loading rate tabulations for sediment and phosphorus

I. INTRODUCTION

Scope of Report:

This runoff analysis report for Design Master Associates, Inc., has been prepared in accordance with the requirements and guidelines as set forth in Article X. Overlay Districts, James City County Zoning Ordinance and Design Manual for Runoff Analysis Reservoir Protection Overlay District. The study addresses a descriptive critique of the proposed site improvements, characteristics of pre-development natural runoff and projected post-development runoff, characteristics of pollutant loadings, measures to reduce the loadings both during and after construction, proposed runoff control and reservoir protective measures, and performance criteria of the control practices.

Summary of Findings:

Based upon application of BMP practices and specific control measures as presented in this study, it is anticipated that an **overall net gain** in quality of stormwater runoff from the proposed site can be expected. By comparison of the existing site conditions and the proposed developed site conditions, a **76% reduction** in sediment, and a **24% reduction** in phosphorus can be predicted. The following summarizes the predicted loading rates for existing and proposed site conditions and expected reduction:

POLLUTANT LOADING RATES

Sediment:			
Existing conditions - uncontrolled	=	0.34	tons/yr
Proposed conditions - controlled	=	0.08	tons/yr
Net reduction	=	**0.26**	**tons/yr**
Phosphorus:			
Existing conditions - uncontrolled	=	0.83	lbs/yr
Proposed conditions - controlled	=	0.63	lbs/yr
Net reduction	=	**0.20**	**lbs/yr**

II. DESCRIPTION OF PROJECT

Location and Land Use:

Design Master Associates, Inc. is proposing to develop a 4,000 SF office building located on a 32,640 SF parcel situate on the northeast side of Point O' Woods Road approximated 1120' northwest of Croaker Road. The proposed site will be subdivided from existing parcel number (1-13) shown on tax map sheet (13-4) currently owned by Beechwood Company. The site is currently zoned R1 and is in the process of being rezoned to B1. Since the proposed office building site is contained in the Reservoir Protection Overlay District (RP) any new development creating 5,000 SF or more of impervious surfaces requires issuance of a Special Use Permit and approval of a runoff analysis in accordance with Article X, Section 20-533 of the James City County Ordinance.

The proposed site and surrounding parent parcel is currently undeveloped open cropland and forest with no improvements. Upon development of the subdivided parcel, the site usage will be approximately 12.2% proposed building, 18.1% proposed parking and walkway and the remaining 69.7% being open space.

Topography and Soils:

The general land form in the area varies, ranging from flat to gentle slopes (0-3%) to steeper slopes (above 8%) found along the natural drainage ravines adjacent to the proposed site on the north and east. The site slopes in a general northerly direction with drainage accommodated by overland flow, and man-made ditches, ponds and channels directed to natural ravines of France Swamp, a tributary of the proposed Ware Creek Reservoir.

The soils on the site are classified as Emporia Complex and Kempsville-Emporia Fine

Sandy Loam as depicted on Map Sheet 6 of the Soil Survey of James City and York Counties and the City of Williamsburg prepared by the United States Department of Agriculture, Soil Conservation Service. These soils consist of deep, gently sloping, well drained soils with moderate permeability. The erosion hazard in these series is moderate to severe.

The Williamsburg - James City County Health Department has investigated the site for sanitary drainfield purposes. Mr. Dave Tiller of the Health Department has performed onsite soil borings on December 2, 1993. He has provided the James City County Service Authority with his soils analysis and recommendations for drainfield location. According to Mr. Tiller, the average percolation rate for the site ranges between 40 minutes per inch to 45 minutes per inch at a depth of 30 inches.

Proposed Site Improvements:

Design Master Associates, Inc. proposed a 4,000 SF professional office building with ancillary site improvement. A preliminary site layout plan which depicts the location and extent of the proposed building, parking, walks, etc. is included as Appendix A. Of the 32,640 SF parcel, approximately 9,900 SF or 30.3% is identified as impervious surfaces. The remaining 22,740 SF or 69.7% will be maintained as natural and landscaped open space.

III. CHARACTERISTICS OF RUNOFF

Rainfall Criteria:

The design storm chosen to determine the quantity of rainfall is described by using two variables: the return period and duration. The return period or recurrence interval is the probable period of time within which combinations of intensity and duration repeat themselves. The duration is the time during which rainfall prevails at that rate. The storm frequency used to determine peak runoff rates summarized in this report is the two year storm. The two year design storm corresponds with the minimum state stormwater management criteria presented in the Virginia Erosion and Sediment Control Handbook.

The procedure used to estimate peak runoff rates is the "rational method." This method is an accepted standard design procedure recommended in the Virginia State Drainage Design Manual for small drainage areas. For determining the runoff volume to design the proposed BMP applications, the first one-inch of runoff from impervious areas is used. This criteria is consistent with common practice to accommodate the "first flush" runoff from impervious areas which according to various authoritative studies contain the predominant amount of pollutant loadings that can be effectively mitigated.

Stormwater Runoff:

All proposed impervious site improvements is anticipated drain to BMP infiltration facilities. The proposed infiltration facilities have excess capacity over the State minimum two year design storm runoff volume computed using the rational method based on net resultant change in amount of newly created impervious area and volume requirements based on net change of impervious areas.

The following summary lists the two year design storm peak runoff rates and volumes as computed by the standard rational method for peak rates, the Virginia Soil Conservation Service modified rational method for runoff volumes, and the first one-inch of runoff volume method.

Net area of impervious improvements:	9,900	SF
Runoff coefficient:	0.20	Existing condition
	0.90	Improved condition
Time of concentration:	5	Minutes
Intensity for two year storm:	5.70	Inches/hour

Rational Method: Q = CIA
Q = 0.26 CFS 2 year existing condition
Q = 1.17 CFS 2 year improved condition

SCS Modified Rational Method:
Volume of runoff required based on 2 year storm = 748 CF

First one-inch runoff Method:
Volume required based on net area of impervious surface = 822 CF
Volume provided by proposed infiltration facilities = 889 CF

The above summary demonstrates that the proposed infiltration facilities have a 19% capacity excess to accommodate runoff volume predicted by conventional rational method and an 8% capacity excess computed by the first one-inch volume method.

Nonpoint Pollution:

When a comparison of quality characteristics of storm runoff as a response to urbanization versus existing conditions is made, the order of magnitude of percentage increase in pollutant loadings is directly associated with the intensity of development.

Louis M. Penci, Inc.

Typically, natural areas are developed or converted to buildings, roads, parking and driveways which does not allow rainfall to percolate into the soil. As a result, this rainfall in converted to direct runoff which conveys sediment and other pollutants as washoff from the impervious areas to receiving drainage systems. This pollutant washoff can adversely affect the quality of the downstream receiving waters. In this case the development, or site improvements proposed for Design Master Associates, Inc. consists of new construction of a professional use building and ancillary site improvements which results in an overall increase of impervious area and rainfall washoff directed to drainageways ultimately conveying this runoff to tributaries of the proposed Ware Creek Reservoir.

The James City County Design Manual for Runoff Analysis lists sediment and phosphorus as nonpoint pollutants which must be addressed by Best Management Practices. The Design Manual further categorizes development land use, soil type classifications and pollution loading rates which are to be used in predicting overall pollutant loadings. Since the site is currently undeveloped, the existing loading volumes were computed using the Design Manual loading rates for minimum tillage cropland with sandy loam soils, applied to the total site area. Upon a developed condition, the loading volumes were computed using the Design Manual loading rates for industrial usage, medium imperviousness and sandy loam soils applied to the total site area based upon a 60% maximum imperviousness. The following summaries tabulate the loading volumes for existing conditions and predicted loading volumes for developed conditions with no BMP practices in place (uncontrolled condition).

UNCONTROLLED POLLUTANT LOADING
EXISTING UNDEVELOPED CONDITION

Sediment:	Total Area	=	0.75 acres
	Loading Rate	=	0.45 tons/acre/year
	Total Loading	=	0.75 x 0.45 = 0.34 tons/yr
Total Phosphorus:	Total Area	=	0.75 acres
	Loading Rate	=	1.1 lbs/acre/yr
	Total Loading	=	0.75 x 1.1 = 0.83 lbs/yr

UNCONTROLLED POLLUTANT LOADING
DEVELOPED CONDITION

Sediment:	Total Area	=	0.75 acres
	Loading Rate	=	0.16 ton/acre/yr
	Total Loading	=	0.75 x 0.16 = 0.12 tons/yr
Total Phosphorus:	Total Area	=	0.75 acres
	Loading Rate	=	1.2 lbs/acre/yr
	Total Loading	=	0.75 x 1.2 = 0.90 lbs/yr

Based on land use only and a comparison of existing site conditions and proposed developed site conditions, a 65% reduction in sediment and a minimal increase of 8% in phosphorus can be predicted. The net pollutant loadings are computed to be a reduction of 0.22 tons per year for sediment and an increase of 0.07 pounds per year for phosphorus. Since there is an existing stormwater detention pond downstream from the proposed site, any effect of the minimal increase in phosphorus loading will be negligible when considering no onsite BMP control practices.

IV. POLLUTION MITIGATION AND PERFORMANCE CRITERIA

Introduction:

Studies in the development of pollution and runoff control practices have addressed various control methodologies for water quality management. The State Water Control Board Best Management Practices Handbook contains a collection of practices that have been determined to have the greatest potential for application in Virginia. These practices deal with various aspects of water quality, runoff volume and discharge control. Certain practices rely on physical structures while others involve establishment and maintenance of vegetative controls. The practices contained in the BMP Handbook have been divided into various basic categories each representing different control methodologies. The categories applicable to the Design Master Associates, Inc. site improvements are described as follows:

A. **Source Controls** are nonstructural measures that control nonpoint pollution by reducing the generation and accumulation of potential runoff contaminants at or near their source. Examples are solid waste collections and disposal, fertilizer management activities, and utilization of grassed filter areas.

B. **Volume Controls** are multipurpose structural measures that reduce the volume and rate of runoff and associated nonpoint pollutant loading by diverting stormwater to detention storage and the soil profile where pollutant removal can occur through natural physical and biological processes. Examples are infiltration improvements.

In addition to these control categories, minimum statewide standards for erosion and sediment control practices have been established by the Virginia Soil and Water Conservation Commission and are contained in the Virginia Erosion and Sediment

Control Handbook. The Handbook contains minimum design criteria, standards, and specifications for numerous conservation practices.

These practices account for perimeter control, slope protection, sediment trapping, drainageway and stream protection, temporary stabilization, and permanent stabilization. James City County has adopted the minimum statewide standards for compliance of any development related land disturbing activity. Additionally, any such activity cannot commence without an approved erosion and sediment control plan for that activity. The purpose of the plan and control measures is to preclude the transport offsite of all waterborne sediments resulting from onsite construction activities.

Control Practices:

Practices in each of the above described categories, in addition to basic erosion and sediment control, are applicable to the overall Design Master Associates, Inc. site improvement project.

The primary measure for pollutant mitigation will be the proposed infiltration facilities. Infiltration measures are typically subsurface structures that allow quick penetration of surface runoff into the underlying soil profile, usually by utilizing a stone material with al large voids ratio in order to provide some measure of temporary storage. Through the method of infiltration, pollutant removal is assured to occur within the soil profile by filtering and aerobic decomposition. Designed infiltration measures offer a way to restore the hydrologic balance on a developed site by providing a facsimile of the natural process of infiltration.

Infiltration structures usually involve a trench filled with aggregate, that may receive inflow from surface runoff as well as a pipe or other inlet structure. Outflow usually occurs via infiltration through the soils below the bottom of the facility. The usage of

infiltration practices depends upon various site conditions to determine the potential for positive results. These conditions include soil texture and related seepage rates, depth to seasonal high groundwater table and topographic character of the site including the slope and nature of the soil (natural or fill).

Infiltration practices are generally applicable where the subsoil is sufficiently permeable to provide a reasonable rate of infiltration, and where the water table is sufficiently lower than the design depth of the trench facility. According to the Soil Conservation Service Soil Survey mapping, the soils in the area of the proposed infiltration facilities exhibit a permeability ranging from 0.60 in/hr to 6.0 in/hr and a seasonal high water table depth greater than 6.0 ft. The James City County Health Department has determined an average rate of 45 min/in or 1.5 in/hr. Therefore these soils are well suited for the BMP infiltration applications proposed.

The James City County Design Manual for Runoff Analysis implies the effectiveness of infiltration practices will range from 75% to 90% reduction of sediment and phosphorus loading from the first one-inch of runoff from impervious surfaces. Also according to the Manual, the use of grassed filter strips will also provide a nominal reduction in initial loading. Since the proposed infiltration trenches are designed with grassed filter strips adjoining, a value of 90% reduction for sediment and a value of 75% reduction for phosphorous was used to compute overall effectiveness of the proposed BMP facilities for that portion of the site directed to the infiltration facility. The following is a summary of volume capacities of the BMP measures proposed and capacity requirements based on site improvements.

- Total volume of infiltration facilities proposed = 889 CF
- Total impervious area facilities can accommodate = 10,715 SF
- Total net impervious area of proposed improvements = 9,900 SF

It is anticipated that 40% of the total site area will be directed to the infiltration trenches. This amount comprises 9,900 SF impervious area (30%) and 3,260 SF open area (10%). The following is a summary of the controlled loading rates and reductions anticipated by the proposed BMP practices.

UNCONTROLLED POLLUTANT LOADINGS
40% of TOTAL SITE

Sediment:	0.12	tons/yr @ 40%	=	0.05	tons/yr
Phosphorus:	0.90	lbs/yr @ 40%	=	0.36	lbs/yr

CONTROLLED POLLUTANT LOADINGS
40% OF TOTAL SITE

Sediment:	0.05	tons/yr @ 90% efficiency	=	0.04	tons/yr reduction
Phosphorus:	0.36	lbs/yr @ 75% efficiency	=	0.27	lbs/yr reduction

NET POLLUTANT LOADINGS
100% of SITE

Sediment:	0.12	tons/yr less 0.04 tons/yr	=	0.08	tons/yr
Phosphorus:	0.90	lbs/yr less 0.27 lbs/yr	=	0.63	lbs/yr

By comparing the controlled pollutant loadings attained by the infiltration facilities for the proposed developed conditions to the uncontrolled loadings based on existing undeveloped conditions, will yield a net effectiveness of overall pollutant removal anticipated.

Louis M. Penci, Inc.

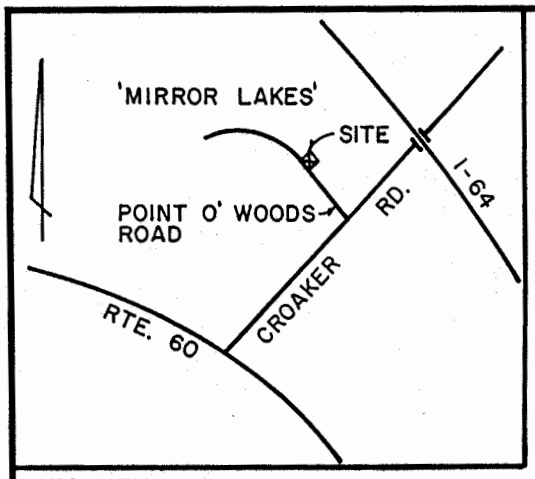
NET POLLUTANT LOADING REDUCTION

Sediment:			
Uncontrolled conditions:	=	0.34	tons/yr
Controlled conditions:	=	0.08	tons/yr
Net Loading Reduction	=	0.26	tons/yr
Phosphorus:			
Uncontrolled conditions:	=	0.83	lbs/yr
Controlled conditions:	=	0.63	lbs/yr
Net Loading Reduction	=	0.20	lbs/yr

Summary:

This analysis demonstrates that the proposed BMP facilities will produce a 76% reduction in sediment and a 24% reduction in phosphorus by virtue of the project proposed by Design Master Associates, Inc. Additional measures shall be employed during the construction phases and final stabilization procedures in accordance with the James City County Erosion and Sedimentation Ordinances to control temporary erosion and siltation.

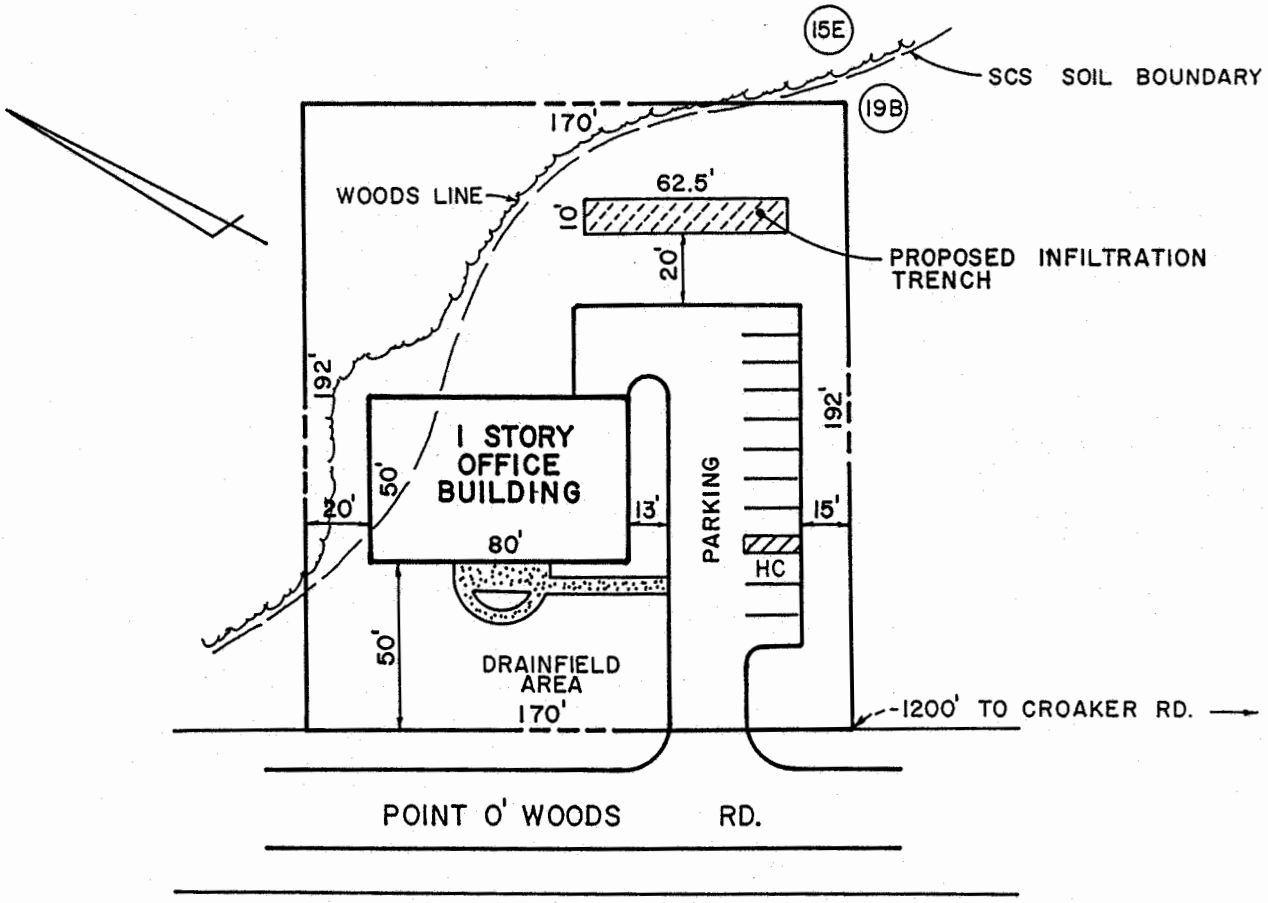
V. APPENDICES



VICINITY MAP
SCALE: 1" = 2000'

GENERAL NOTES

CURRENT ZONING = RI
PROPOSED ZONING = BI
TAX MAP 13-4 , PART OF PARCEL 1-13
TOTAL AREA OF SITE = 32,640 SF (100%)
BUILDING = 4,000 SF (12.2%)
PARKING , WALKS = 5,900 SF (18.1%)
OPEN SPACE = 22,740 SF (69.7%)



PRELIMINARY SITE LAYOUT PLAN & RUNOFF ANALYSIS EXHIBIT
DESIGN MASTER ASSOCIATES, INC.
JAMES CITY COUNTY, VIRGINIA

A APPENDIX

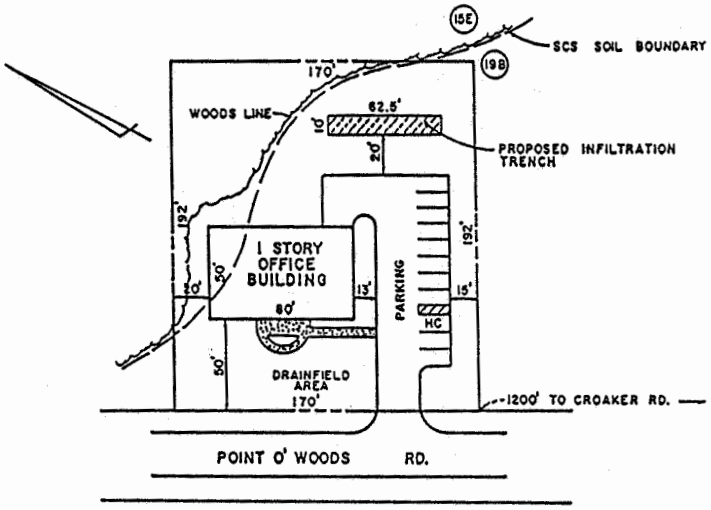
Preliminary Site Plan

LOUIS M. PENCI, INC.
863 Catalina Drive
Newport News, VA 23602 (804) 874-6388

SCALE: 1" = 60' DATE: DEC. 10, 1993 JOB# 930410

B APPENDIX

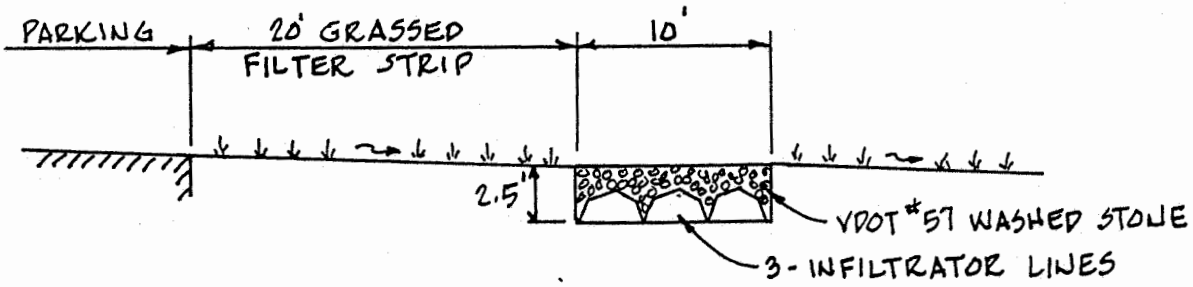
Design data and criteria details for the infiltration trenches



PROPOSED ZONING = B1
TAX MAP 13-4 , PART OF PARCEL 1-13
TOTAL AREA OF SITE = 32,640 SF (100%)
BUILDING = 4,000 SF (12.2%)
PARKING , WALKS = 5,900 SF (18.1%)
OPEN SPACE = 22,740 SF (69.7%)

Design 10 Bmp Points

TRENCH DESIGN: PROVIDE VOLUME OF 1" RUNOFF FROM ALL IMPERVIOUS SURFACES.
9900 S.F. @ 1" RUNOFF = 822 C.F. REQUIRED



TRENCH VOLUME = 10' x 2.5' - (3 x 2.35) x 0.40 = 7.18 C.F.
INFILTRATORS = 3 x 2.35 = 7.05 C.F.
TOTAL = 14.23 C.F. PER L.F.

TRENCH LENGTH = 822 C.F. ÷ 14.23 = 57.8 L.F. MIN.
USE 10 PIPE LENGTHS @ 6.25' = 62.5 L.F. PROVIDED

Louis M. Penci, Inc.

C APPENDIX

Computer output SCS modified rational method

```
SOIL CONSERVATION SERVICE MODIFIED RATIONAL METHOD
DESIGN MASTER ASSOCIATES OFFICE BLDG. PROJECT

DESIGN STORM FOR ANALYSIS =  2  YEAR
DRAINAGE AREA (ACRES) =  .227
TIME OF CONCENTRATION - UNDEVELOPED (MIN.) =  5
TIME OF CONCENTRATION - DEVELOPED (MIN.) =  5
RUNOFF COEFFICIENT - UNDEVELOPED =  .2
RUNOFF COEFFICIENT - DEVELOPED =  .9


    COMPUTATION RESULTS
REQUIRED STORAGE VOLUME FOR INFILTRATION DESIGN =  748  CUBIC FEET
CRITICAL STORM LENGTH =  39  MINUTES
INFILTRATION DRAWDOWN =  2  DAY AVERAGE
```

D APPENDIX

James City County Design Manual design guidelines for infiltration trenches and grassed filter strips

INFILTRATION PITS AND TRENCHES

Measure: Excavated pits or trenches, back filled with sand and/or graded aggregates, in which stormwater runoff is collected for temporary storage and infiltration.

Purpose:

1. To reduce the runoff volume and peak discharge rate from a site.

2. To filter contaminants out of runoff before it reaches receiving waters.

Conditions Where Practice Applies: Where the subsoil is sufficiently permeable to provide a reasonable rate of infiltration, and where the water table is sufficiently lower than the design depth of the facility to prevent pollution of the groundwater.

Concept: Infiltration may be incorporated as one part of an overall runoff control system utilizing several different techniques. Infiltration pits vary in depth from about six to several hundred feet, depending upon the depth of the permeable soil strata and the depths to groundwater and bedrock. Infiltration trenches consist of long narrow excavations with depths normally less than 6 feet. Some type of filtering mechanism is needed to prevent the infiltration facility from becoming clogged with sediment or debris.

Design Criteria:

1. Grease, oil, floatable organic materials, and settleable particles should be removed from runoff water before it enters the infiltration facility. Runoff filtering devices such as grass filter strips, sediment traps, grease traps, and filter fabric may be used to remove objectionable materials.

2. Infiltration facilities shall be sized to accommodate the first one-inch of runoff from impervious areas of the development site.

3. Most infiltration facilities are designed with aggregate fillers. VDH&T No. 57 aggregate is often used. This aggregate has a void ratio of 0.40; therefore, the excavation should be 2.5 times the required storage volume.

4. Infiltration facilities shall be designed to completely drain within 5 days.

5. Unless the facility is designed to accommodate the total amount of anticipated runoff from a design storm, provisions shall be made for overflow. The capacity and cost of overflow discharge systems can be reduced by allowing temporary storage space above the infiltration trenches.

6. A soils analysis to determine percolation rates is required. Existing soil surveys may provide an estimate of soil percolation rates; however, percolation tests will need to be performed on soils at the bottom of the infiltration facility.

7. Infiltration facilities shall be located only in areas where they will be above the groundwater table at all times.

Effectiveness: The effectiveness of this practice for runoff and pollution control is dependent upon the size and design of the infiltration facility. Removal efficiencies will range from 75-90% for both suspended solids and phosphorus.

GRASSED FILTER STRIPS

Measure: A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and waste water.

Purpose: To remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, decomposition, and volatilization, thereby reducing pollution and protecting the environment.

Conditions Where Practice Applies: Most applicable in new low-to-moderate density developments where the percentage of impervious cover is to be relatively small, and natural drainage systems can more nearly accommodate post-development runoff. The successful application of this practice is dependent upon anticipated runoff velocities, steepness of slopes, soil porosity and erodibility, water table depth, the type of grass selected for surface cover, and proper maintenance.

Concept: This practice involves the concept of using grassed areas for managing stormwater runoff. All of the following applications of this concept tend to maintain the natural drainage characteristics of the site, allow for infiltration of at least part of the runoff, and filter some contaminants out of the water.

1. Grassed waterways: Directing concentrated flows of surface runoff through grass-covered drainage swales or channels, where the grass provides a non-erodible channel lining that retards the flow velocity.

2. Filter Strips: Directing sheet flows of surface runoff across grass buffer strips that retard flow velocities and filter out particulate contaminants.
3. Seepage Areas: Directing surface runoff into small grass-covered seepage areas that infiltrate the water and filter out particulate contaminants. The grass will also tend to absorb some of the soluble pollutants.

D APPENDIX

Design Criteria:

Filter Strips - Strips of close growing grasses established at the perimeter of disturbed or impervious areas to intercept runoff in sheet flow and remove particulate contaminants. The vegetation slows the sheet flow, causing heavy particulates to fall out. Infiltration is also enhanced.

- Grass area filter strips shall be generally on the contour and sufficiently wide to pass the peak flow (based on a 2-year storm) at a depth of 0.5 inches or less. Flow length shall be sufficient to provide at least 15 minutes flow through time.

- At a minimum, overland flow filter strips shall be installed on natural or constructed slopes of 2 to 6 percent. They shall have minimum flow lengths of 100 ft. on 2 percent slopes proportionately up to 300 ft. on 6 percent slopes.

Effectiveness:

Filter strips and seepage areas - These facilities are effective in removing particulate pollutants from runoff. Removal efficiencies will range from 50 to 95 percent for both phosphorus and suspended solids.

E APPENDIX

James City County Design Manual loading rate tabulations for sediment and phosphorus

TABLE 2-1.0. UNCONTROLLED NONPOINT POLLUTION RATES: SEDIMENT

LAND USE	PERCENT IMPERVIOUSNESS	ANNUAL LOADING RATE (TONS/ACRE/YR) CLAY LOAM SOILS	SILT LOAM SOILS	LOAM SOILS	SANDY LOAM SOILS
ESTATE SINGLE FAMILY RESIDENTIAL					
A. 0.05 DU/Acre	1.5%	0.08	0.07	0.06	0.02
B. 0.10 DU/Acre	3%	0.08	0.08	0.06	0.03
C. 0.20 DU/Acre	6%	0.10	0.09	0.08	0.04
LARGE-LOT SINGLE FAMILY RESIDENTIAL					
A. 0.5 DU/Acre	9%	0.11	0.11	0.09	0.06
B. 1.0 DU/Acre	12%	0.12	0.12	0.11	0.08
C. 2.0 DU/Acre	18%	0.15	0.15	0.14	0.11
MEDIUM DENSITY SINGLE FAMILY RESIDENTIAL					
A. 3.0 DU/Acre	20%	0.16	0.16	0.15	0.12
B. 4.0 DU/Acre	25%	0.19	0.18	0.17	0.15
C. 5.0-6.0 DU/Acre	35%	0.23	0.23	0.22	0.20
TOWNHOUSE/GARDEN APT. RESIDENTIAL					
A. 6 DU/Acre	35%	0.27	0.26	0.24	0.21
B. 8-10 DU/Acre	40%	0.29	0.29	0.27	0.23
C. 10-20 DU/Acre	50%	0.33	0.33	0.31	0.28
INDUSTRIAL					
A. MEDIUM IMPERVIOUSNESS	60%	0.18	0.18	0.18	0.16
B. HIGH IMPERVIOUSNESS	80%	0.22	0.22	0.22	0.22
SUBURBAN SHOPPING CENTER	90%	0.24	0.24	0.24	0.24
CENTRAL BUSINESS DISTRICT	95%	0.25	0.25	0.25	0.25
CROPLAND					
A. CONVENTIONAL TILLAGE	1%	2.10	1.80	1.44	0.79
B. MINIMUM TILLAGE	1%	0.89	0.76	0.64	0.45
COW PASTURE	1%	0.07	0.06	0.05	0.01
FOREST	1%	0.07	0.06	0.05	0.01
IDLE LAND	1%	0.07	0.05	0.05	0.01

E APPENDIX

TABLE 2-2. UNCONTROLLED NONPOINT POLLUTION LOADING RATES: TOTAL PHOSPHORUS

LAND USE	PERCENT IMPERVIOUSNESS	UNCONTROLLED LOADING RATE (LBS/ACRE/YR) CLAY LOAM SOILS	SILT LOAM SOILS	LOAM SOILS	SANDY LOAM SOILS
ESTATE SINGLE FAMILY RESIDENTIAL					
A. 0.05 DU/Acre	1.5%	0.3	0.3	0.3	0.2
B. 0.10 DU/Acre	3%	0.3	0.3	0.3	0.2
C. 0.20 DU/Acre	6%	0.4	0.4	0.4	0.3
LARGE-LOT SINGLE FAMILY RESIDENTIAL					
A. 0.5 DU/Acre	9%	0.8	0.8	0.8	0.5
B. 1.0 DU/Acre	12%	0.9	0.9	0.8	0.6
C. 2.0 DU/Acre	18%	1.0	1.0	0.9	0.7
MEDIUM DENSITY SINGLE FAMILY RESIDENTIAL					
A. 3.0 DU/Acre	20%	1.0	1.0	1.0	0.8
B. 4.0 DU/Acre	25%	1.1	1.1	1.1	0.9
C. 5.0-6.0 DU/Acre	35%	1.3	1.3	1.3	1.1
TOWNHOUSE/GARDEN APT. RESIDENTIAL					
A. 6 DU/Acre	35%	1.6	1.5	1.4	1.2
B. 8-10 DU/Acre	40%	1.7	1.6	1.5	1.5
C. 10-20 DU/Acre	50%	1.8	1.8	1.7	1.7
INDUSTRIAL					
A. MEDIUM IMPERVIOUSNESS	60%	1.2	1.2	1.2	1.2
B. HIGH IMPERVIOUSNESS	80%	1.4	1.5	1.5	1.4
SUBURBAN SHOPPING CENTER	90%	1.6	1.6	1.6	1.6
CENTRAL BUSINESS DISTRICT	95%	2.7	2.7	2.7	2.7
CROPLAND					
A. CONVENTIONAL TILLAGE	1%	4.9	4.2	3.5	2.3
B. MINIMUM TILLAGE	1%	1.8	1.5	1.4	1.1
COW PASTURE	1%	0.5	0.5	0.5	0.3
FOREST	1%	0.1	0.1	0.1	0.1
IDLE LAND	1%	0.2	0.2	0.2	0.1

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WATERSHED	WC
BMP ID NO	013
PLAN NO	SP-15-94
TAX PARCEL	(13-4)(1-13)
PIN NO	13401000013
CONSTRUCTION DATE	7/5/1994
PROJECT NAME	Design Masters, Child Development
FACILITY LOCATION	151 Point O' Woods Road
CITY-STATE	Williamsburg, VA
CURRENT OWNER	Child Development Resources Incorporated
OWNER ADDRESS	151 Point o' Woods Rd.
OWNER ADDRESS 2	
CITY-STATE-ZIP CODE	Williamsburg, VA 23188
OWNER PHONE	
MAINT AGREEMENT	Yes
EMERG ACTION PLAN	No

Get Last BMP No

Return to Menu

MAINTENANCE PLAN	No	CTRL STRUC DESC	
SITE AREA acre	0.7	CTRL STRUC SIZE inches	
LAND USE	commercial	OTLT BARRL DESC	none
old BMP TYP	Infiltration Trench	OTLT BARRL SIZE inch	0
JCC BMP CODE	C1 Infiltration Trench .5		
POINT VALUE	11	EMERG SPILLWAY	No
		DESIGN HW ELEV	
		PERM POOL ELEV	
SVC DRAIN AREA acres	0.4	2-YR OUTFLOW cfs	1.21
		10-YR OUTFLOW cfs	1.57
		REC DRAWING	No
SERVICE AREA DESCRI	NONE		
IMPERV AREA acres		CONSTR CERTIF	No
RECV STREAM	TRIB OF WARE CK		
EXT DET-WQ-CTRL	No	LAST INSP DATE	12/10/2001
WTR QUAL VOL acre-ft	0.02	INTERNAL RATING	4
CHAN PROT CTRL	No		
CHAN PROT VOL acre-ft	0.02	MISC/COMMENTS	
SW/FLOOD CONTROL	No		
GEOTECH REPORT	No		

Inspected by:

Additional Comments: